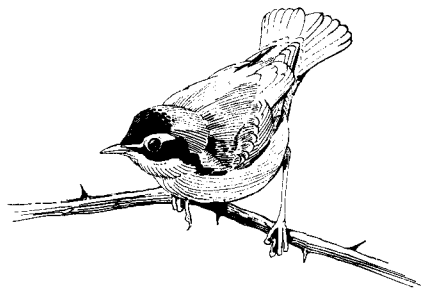


THE BIRDS OF KENTUCKY



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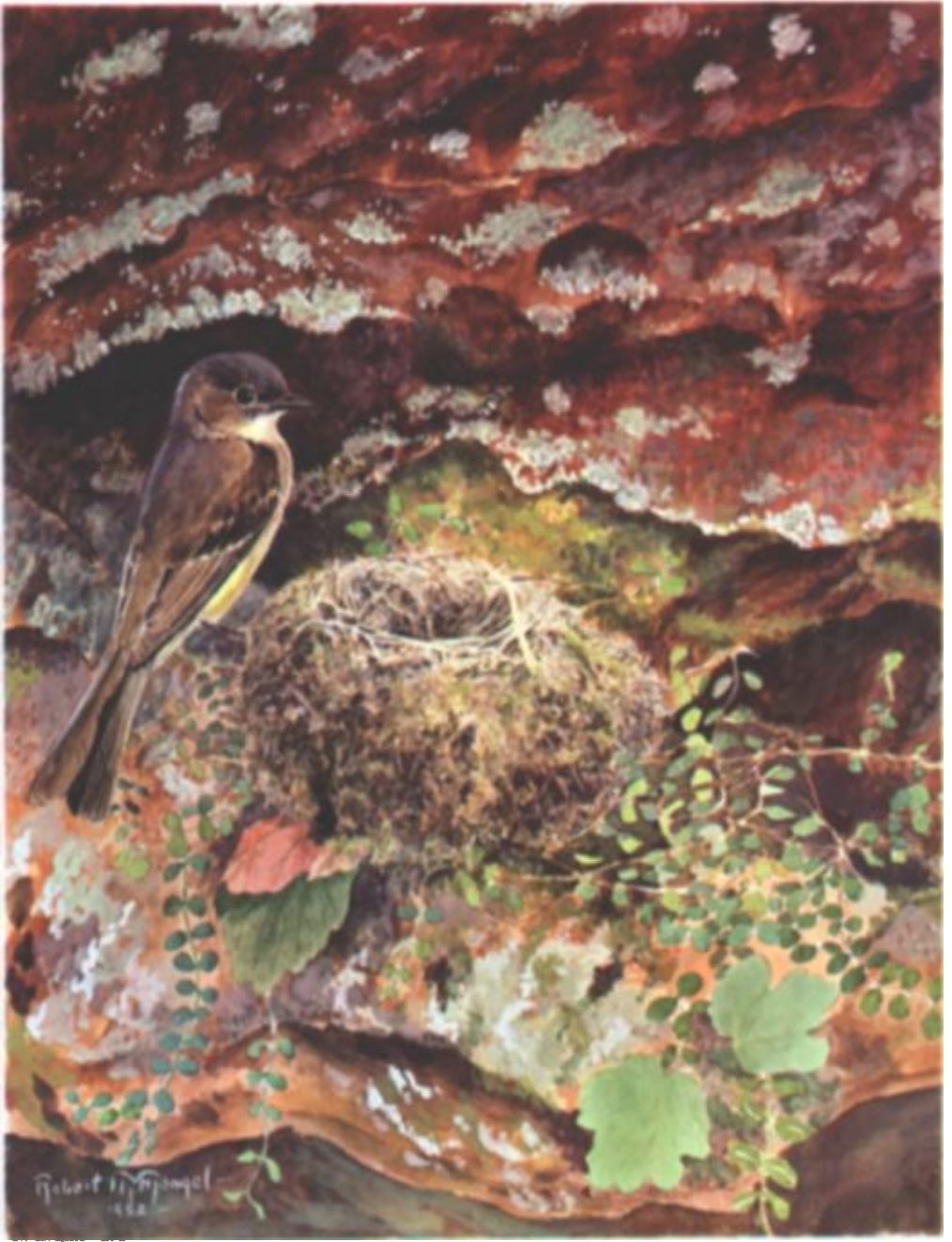
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PHOEBE

Adult at nest in a very deep recess beneath a sandstone cliff and above a spring, Laurel County, Kentucky (on the Cumberland Plateau at an elevation of 1,100 feet above sea level). This was a very cool site in the unusually hot weather of the several days around June 15, 1952, when the water color was made.

THE BIRDS OF KENTUCKY

BY

ROBERT M. MENGEL

ORNITHOLOGICAL MONOGRAPHS NO. 3

PUBLISHED BY

THE AMERICAN ORNITHOLOGISTS' UNION

DEDICATION

*To the memory of Josselyn Van Tyne (1902–1957), who insisted;
and to Burt Leavelle Monroe, Sr., who encouraged.*

PREFACE

In the ornithological library of the late Ralph N. Ellis, Jr., housed in the Department of Special Collections of The University of Kansas Library, is an unpublished letter from Dr. Elliott Coues to George N. Lawrence, dated at Fort Macon, North Carolina, August 31, 1870. In this letter, quite off-handedly, Dr. Coues remarked: "Did I tell you that my [Birds of Arizona] is not to be published? It got altogether too *big* and unwieldy, so I destroyed it, to have it off my mind." Reading this, I was amazed anew at this singular man, who permitted himself a remedy so drastic (and doubtless satisfactory) for a feeling that I have come to know too well.

Like the unpublished "Birds of Arizona," the present work has been long in the making, and there is no doubt that it has become unwieldy. Whether it is too large I do not know—certainly it could contain more information than it does, but were this available, the work would probably shrink, because summation is less space-consuming than detailed exposition. In any event, I relinquish it herewith, with a feeling of relief possibly less profound but I hope ultimately more satisfying than that felt by Dr. Coues.

The mixed feelings that I have come to have for the work are only distantly related to the birds of Kentucky, and to the interesting area that they inhabit. The awesome, yellow sandstone cliffs lining the chasms of the North Fork of Red River are surely as sublime as ever, the pines of the cliff edges still etched against the white of cloud and deep blue of sky; the mists of an early June morning must rise as mysteriously as always from Cane Creek, where it empties between giant hemlocks into the Rockcastle River, just below the rumbling "Narrows" of that beautiful stream (here wan shafts of sunlight may slant through the deep shade of the old trees, and I remember still the electric impression created by a shrillingly vocal Pileated Woodpecker illuminated momentarily in one of these beams of golden light). But these and similar memories of days spent where an ornithologist should really be are slowly fading. So too, the data gathered in field, museum, and library have been assessed and reassessed, the problems wrestled with, the solutions of which I have been capable reached, organized, and reorganized. The pleasurable processes of gathering and marshalling data have been concluded, and at times it has seemed that left in their place there remained only an immense, inert mass of paper etched with interminable rows of meaningless characters. It is time to quit.

But before doing so, I must satisfy a compulsion to make a few observations.

Major projects have a way of growing for a time without conscious direction, of assuming considerable proportions and momentum before their nature is fully realized. When the seeds of this one first germinated in my then fifteen-year-old mind, ornithology, although I had no way of knowing it, stood at the end of one era and at the threshold of a new one. The period of faunal exploration and inventory had passed through a long maturity into ripe senescence. For the ornithologist undertaking faunal work in the United States, there still stood as conspicuous models the great "state books" of Eaton, Forbush, Roberts, and Howell. The "state books" of this kind, as precedent clearly showed, dealt with the ornithology of entire states, in all aspects, and were usually authored, so it seemed, by kindly old gentlemen with white beards.

But things were changing. The young ornithologist in 1935 had no way of knowing this, perhaps; of knowing, for example, that a worker at the University of California had not long since completed a paper on shrikes (and was beginning another on juncos) that was soon to establish new standards for all studies of the infraspecific variation of birds; that an unassuming Ohio housewife was observing Song Sparrows in her suburban neighborhood with so much perspicacity that no one would ever watch birds in quite the same way again; that another Ohioan, an ichthyologist primarily, was recording the economy of the birds in the limited area of Buckeye Lake with such thoroughness as, seemingly, to bring all outdoors in (but somehow clarified); that across the sea, an Englishman, on one hand, had made sense of why birds sing, while a brilliant Austrian, on the other, had started to clarify why birds do anything at all, and why scientists should care; and that in New York, a German become American was synthesizing much of this, and many other things, into a single work that was soon to change, to greater or lesser degree, everybody's approach to vertebrate natural history. To deal with the ornithology of an entire state, in all its aspects, in such a way as to honor the expanding areas of interest in birds that these happenings led to, presents problems almost unimaginable in 1935.

These problems are not unconquerable, and I am not suggesting that no more state ornithologies should be done (although there are various, good objections to the delimitation of areas chosen for biological study by political, rather than by natural, boundaries). Whether we like it or not, we are to some extent committed to an inherited system, and it is probable that we will, for one reason or another, have to live with it for some time to come.

It is not faunal work as such against which I would warn the young student suddenly struck by the desire to emulate the aforementioned old gentlemen with the white beards. What I would say is this: think twice, at least, before single-handedly undertaking the task of faunal monography, *sensu stricto*, in the bright light of the mid-twentieth century. Summarize distribution, perhaps, or some phase thereof; summarize systematics, migration, breeding biology, ecology, or what have you, of the birds of an area, but remember that today, in any state-sized area, with its likely vast and growing literature, its many living forms, and its countless problems, each of these is a good-sized job for one man. If a faunal monograph must be, let it be authored by committee, supported in its preparation by ample funds, and its plan carefully marked before the filing of the first record. One or two works so authored and planned have already appeared, but none has carried the approach near its potential.

There remains the pleasant task of thanking, too briefly, the many people who have contributed to the present undertaking, and without whose collective assistance it would never have been completed.

For courteous assistance while examining the collections under their care (as well as for occasional help of other kinds), I am especially indebted to Alexander Wetmore, Herbert Friedmann, and H. G. Deignan (United States National Museum), and to John W. Aldrich and Allan J. Duvall (U. S. Fish and Wildlife Service). Various problems were clarified by consultation of the collections under the care of Alden H. Miller (Museum of

Vertebrate Zoology, University of California), James C. Greenway, Jr. (Museum of Comparative Zoology, Harvard University), Dean Amadon (American Museum of Natural History), and George H. Lowery, Jr. (Museum of Zoology, Louisiana State University). Similar courtesy was shown me in visits to the small collections under the care, at the times of examination, of Fenton T. West (Morehead State College), L. Y. Lancaster and Gayle Carver (Western Kentucky State College), Lucien Beckner (Louisville Public Library), W. R. Allen (University of Kentucky), Robert Paul (Bernheim Foundation), and Sister Margaret Gertrude (Nazareth Academy). F. W. Miller (Dallas Museum of Natural History) kindly arranged for prolonged loan of J. D. Figgins' specimens.

Extensive notes and other assistance of varied kinds were contributed by the late Brasher C. Bacon, Burt L. Monroe, Sr. (see history), Anne L. Stamm, and James William Hancock. Others who furnished notes or who graciously responded, either in person or in correspondence, to specific requests for information were Harold Alexander, Ronald Austing, Roger W. Barbour (who also made available a valuable collection), Benedict J. Blincoe, Leonard C. Brecher, George Breiding, Richard Brewer, John Cheek, Ben B. Coffey, Jr., Eugene Cypert, John DeLime, the late V. K. Dodge, J. P. Doughty, Mrs. J. D. Figgins, Thomas Fuller, Frederick C. Hardy, David H. Johnson, Emerson Kemsies, F. W. Loetscher, Jr., Dulaney Logan, Harvey B. Lovell, Burt L. Monroe, Jr., Albert J. Powell, Jr., Chandler S. Robbins, Evelyn J. Schneider, Sue Wyatt Semple, the late Walter Shackelton, Thomas P. Smith, Donald Summerfield, the late Susan Starling Towles, Haven Wiley, Jr., Glen Woolfendon, and James B. Young.

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The officials of the Kentucky Division of Game and Fish were uniformly cooperative and helpful. Field work was carried on under permits issued by Major James Brown, Earl Wallace, or others under their direction.

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To all the rest, too numerous to name, who in one way or another have helped—and to any whose names should appear above but have been omitted inadvertently, I tender herewith my sincere thanks.

Note.—The foregoing acknowledgments all refer to obligations incurred in preparing the work. But there is more. For friendly and efficient cooperation—far beyond the minimal requirements of effective business—in the course of printing this paper I thank Harold Allen, Walter Snow, and numerous others unseen in the busy workrooms of the Allen Press. Finally, I must register my appreciation to Mrs. Carll Tucker, to whose open generosity American ornithology owes so much. The publication of this book is but one more item in the very long list of her gifts.

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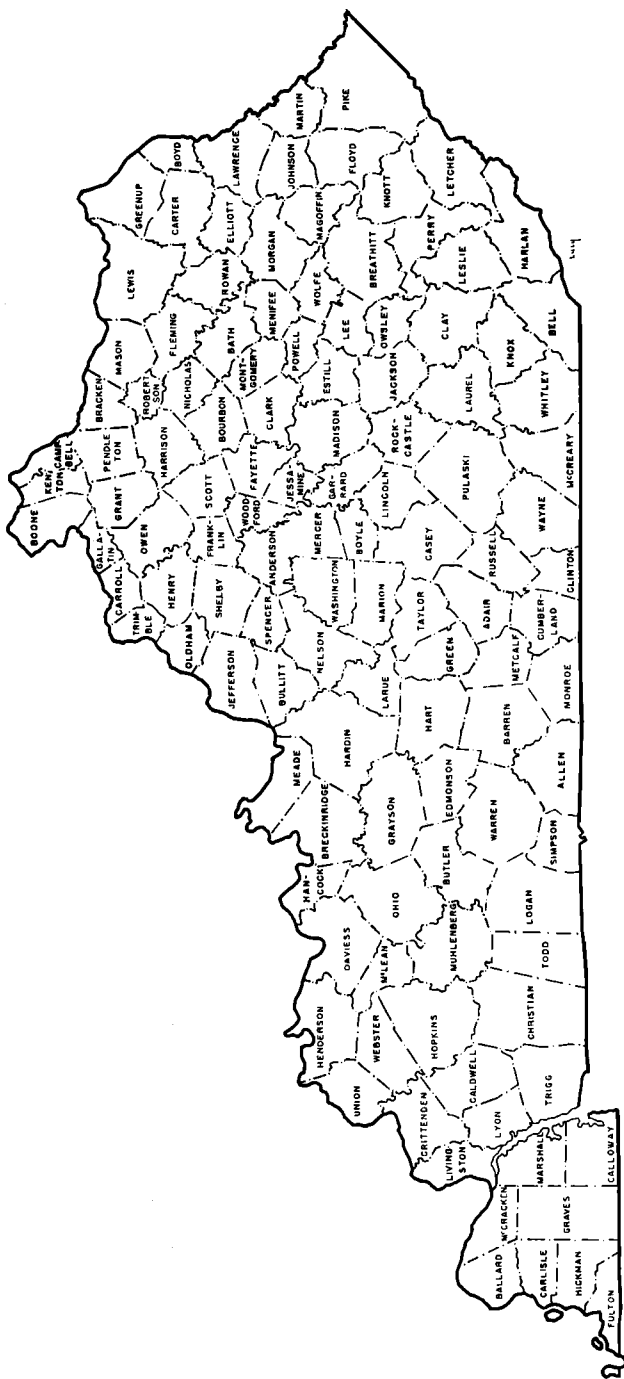
P. 128. Wild Turkeys are fond of grazing in clearings such as this one in the well developed mixed forests of Kentucky Woodlands National Wildlife Refuge, in Trigg County "between the rivers."

P. 134. Looking west from Pine Mountain, in Letcher County, over the "Rugged Eastern Area" of the Cumberland Plateau, one still sees the endless series of cloud-shadowed, majestically forested hills that must have greeted Boone.

P. 136. Yellowed sandstone cliffs such as this, once the domain of Peregrine Falcons, ravens, and (probably) Golden Eagles are numberless in the "Cliff Section" of the Cumberland Plateau. Mountain laurel grows beneath the lacy fringe of pines at the cliff edge; beneath the towering hemlocks in the gorge below rhododendron forms impenetrable thickets; mixed mesophytic forest occupies the slopes between. This cliff is in Powell County.

P. 560. A Parula Warbler, belonging to the mesic forest below, may sing in dead twigs close by the watcher on the xeric, piney cliff-edge above.

Cover and half-title. Kentucky Warbler.



INTRODUCTION

The present work treats 296 species and 33 additional subspecies (329 forms in all) of birds considered by me to be valid and to have been reliably recorded within the boundaries of Kentucky from the earliest times up to and including December 31, 1960. In general, a species was considered to have been reliably recorded when (a) an extant specimen from the state has been available for examination in the course of the work, (b)¹ when a specimen from the state has at some time been examined in the hand of someone capable, in my opinion,² of accurately identifying it, (c) when one or more individuals of the species have been well observed in the field, either on one occasion by three or more people (collectively capable, in my opinion, of making identification accurately), or on repeated occasions by one person (similarly deemed capable). While the taking of documentary specimens is definitely to be encouraged as a matter of scientific principle, the rapid improvement in techniques of field identification has made the acceptance of the last criterion (c) rather general in recent years; judiciously applied, it requires, I think, no special defense today.

An additional 17 species are discussed in a hypothetical list reserved for cases where the observations do not quite satisfy at least one of the above criteria (borderline cases in either the main or the hypothetical list are discussed wherever appropriate). These would bring the total to 313 species and 346 forms.

My own field work related to the present project was concluded on July 15, 1952 (see history). The writing of the accounts of the individual species was begun in December of 1952 and a first draft was completed in early 1956. All materials available to me, in the form of prior literature (of which I have seen virtually all), specimens (of which I have seen all but very few), and notes contributed by others (which I have gratefully accepted, and sought in numerous instances, but have not widely solicited) were assessed in connection with this writing and incorporated when usable. This draft served as the factual basis for the introductory portions of the work written in 1956 and 1957 and slightly revised since.³ The species accounts have subsequently been completely revised, in many cases several times, and in the course of this revision I have added new records and information (accumulated January 1, 1953, through December 31, 1960) whenever this resulted in changing our knowledge of the status of a species or materially improved our understanding of its occurrence and biology in the state.

The work following first provides a minimal description of the environmental features of Kentucky, followed by a detailed description and analysis of the distributions of 153 species of birds considered certainly to breed, or formerly to have bred, in the state.

We wish to know in what ways different birds have utilized the varied environments comprised in Kentucky's 40,000-odd square miles. While data of the kinds necessary for definitive analysis are still far from what might

¹ Species in class *b* are distinguished in text by a single asterisk (*) beside the scientific names heading their accounts; those in group *c* by a double asterisk (**).

² I must apologize that these statements sound devoid of humility. The necessary decisions are often difficult and painful, yet there is no way to avoid making them and, doubtless, no way to make them perfectly.

³ This portion of the work was submitted in partial fulfillment of the requirements for the Ph.D. at The University of Michigan, 1958.

be wished for, both in quality and quantity, enough are now available to permit gratifying examination from various standpoints. While an equally strong case might be made for analyzing the state's contribution to the brumal and equinoctial requirements of migrant populations, it seems to me that data are still too few for analysis of sufficient sophistication to justify the space required. Thus none is included.

The analysis of breeding distributions, upon which I hope the workers of a few years hence will be able to improve greatly, is followed by a brief history of ornithological work in the state, which serves to introduce, and in an important sense to qualify, the accounts of the species themselves.

I think that the format adopted for the discussion of the species is self-explanatory in its major features. I have given only information that seemed specially applicable to Kentucky. There is a large amount of detail, much more than I should have liked to include, and a minimum of generalization. This is the case not because I want it to be, but because, although I have tried to place the emphasis on the modes, rather than the extremes, of such biological phenomena as migration and nesting, the present state of our knowledge is such that these modes are frequently not susceptible of accurate detection or of statistically meaningful statement (this is particularly true of the kind of migration data currently available). This problem, in essence, has affected much of the work. Because of the scarcity of information concerning many species when I started writing, and the rapid accumulation, in some cases, of new knowledge, I have been constantly in the position of proceeding, albeit cautiously, from the particulate to the general, a process which has left unbeautiful scars upon some of the species accounts but which has seemed unavoidable.

Terms denoting manner of occurrence have been used in the following way.

Permanent resident: a sedentary breeding species in which migration (not to be confused with dispersal) in any ordinary sense occurs neither in adults nor young.

Resident: a breeding species an appreciable number of which is present at all times of year (see also summer resident). In some cases, probably, adults are sedentary and young birds more or less migratory; in others there may be partial or complete replacement in winter, of breeding populations by others from farther north.

Summer resident: a breeding species absent or nearly so in winter (see also resident). In a few cases the decision as to whether a species is best described as resident or summer resident is essentially arbitrary. Most typical residents are of northern or indeterminate origin and only imperfectly migratory, while most summer residents are of tropical origin and are more or less long-distance migrants.

Winter resident: a species present in winter and absent, or nearly so, in summer.

Transient: a species present only in migration to or from breeding grounds elsewhere, or individuals fitting this description. In this usage the term receives preference over "migrant." All transients are migrants, but

all migrants (*e.g.*, newly arrived breeding birds, etc.) are not necessarily transients.

Vagrant: a species whose wandering members are irregularly present, with or without regard to season, as a result (usually) of movements less regular and purposive than typical migration.

Summer visitant: a species regularly present in summer but not breeding.

Winter visitant: a species whose presence in winter is without sufficient duration or regularity for it to be regarded as a winter resident.

With occasional probable lapses, and once in a while with qualified deviations, terms denoting quantity have been used as defined herewith.

Abundant: considering the conspicuousness and spatial requirements of the species,¹ very many are recorded per unit area of available habitat. Marginal and even poor habitats, as well as optimum ones, are likely to be occupied. Term rarely used.

Common: large numbers are recorded per unit area of available habitat; all or nearly all optimum, and probably some marginal, habitats are occupied.

Fairly common: small to moderate numbers are recorded per unit area of available habitat; all optimum habitat is not occupied at any given time.

Uncommon: small numbers are recorded per unit area of available habitat; much seemingly optimum habitat is unoccupied at any given time.

Rare: very small numbers are recorded per unit area of available habitat. Many seemingly ideal habitats must be investigated to find the species. With search, a few can be found each season by a skilled observer.

Very rare: may not be recorded at all in one or even in several consecutive seasons; a few records, however, should accumulate in a decade.

Casual: describes individuals of a species (usually at best very rare) outside of their "normal" range, but not so far that their occurrence should occasion great surprise. With adequate observation a few records should accumulate in half a century, or perhaps less. With increasing knowledge, species thought of as casual may prove rather to be very rare but of regular occurrence.

Accidental: a species far from its normal range and whose presence cannot seemingly be accounted for by innate dispersal tendency. Hurricane-blown individuals are an example.

No matter how carefully these terms are defined and applied, cases arise which cannot be handled properly without qualification. Part of the difficulty is semantic, and is caused by the seeming contradiction that a species may be common in an area in a valid ecological sense, but still present there only in very small numbers because of restricted habitat. This is because degrees of abundance, as I think they should be construed (see Pitelka, 1941:117), are based on frequency of occurrence in available habitat, while actual numbers result from this frequency times the amount of habitat available.

¹This consideration applies also to each of the definitions following.

Further, the number of birds per unit area indicated by a given term of abundance varies in general with the size of the bird and individually with each species.

For this reason, using these terms to connote numbers of individuals seen per unit of time and/or area, as has sometimes been done, strikes me as an unrealistic refinement, which I have declined to adopt. Had I the work to do over, probably I should also use fewer terms of abundance. As it is, although I may be accused of measuring in toothpicks what ought to be stated in hoe handles, I think it not worth the time to re-evaluate all of the terms as originally written. The shade of difference between (for example) fairly common and uncommon, while slight, probably has an average validity, at least in reference to my own observations.

The *nomenclature employed*, both scientific and vernacular, is that of the American Ornithologists' Union *Check-list of North American birds*, fifth edition, 1957, except in a few cases that are fully explained and defended.

The majority of *people referred to in the text* are mentioned by last name only. Such use is assurance that their names appear either in the list of literature cited at the end of the work or in the acknowledgments which conclude the preface. Where not stated, Wilson, with reference to the twentieth century, means Gordon; with reference to the nineteenth century, Alexander; similarly with Dury, Ralph, and Dury, Charles. Monroe without a suffix refers to Burt L. Monroe, Sr., B. L. Monroe, Jr., being so indicated (Monroe and Monroe refers to the two, Sr. first).

In citing observations I have tried to make it clear when the author of a published record is responsible (if this is known) also for the record in the field, and this, I think, has been accomplished with virtually all important records singled out for special mention. In long lists of authorities for migration and nesting data (involving citation of numerous papers which are in themselves compilations), however, while I have tried when convenient to be explicit in this respect (usually by the common usage: "Observer, *fide* Author, 1925:240"), this has not always seemed feasible or even desirable. When citing such parts of this work, therefore, in the absence of clear indication of responsibility, the purist would be safer in saying: "author reported," rather than "author saw." The matter can usually be clarified, if important, by consulting the original source. In the particular case of the long series of (largely) unpublished migration records from the Louisville area, most of which are attributed to Monroe, the majority are in fact by Monroe himself, and this, when I have been certain, is often indicated. Some of the records simply cited as "Monroe," however, have been reported to (and carefully screened by) him over the years by others (also usually indicated, when known), chiefly Leonard C. Brecher, Floyd S. Carpenter, Joseph Croft, Frank Krull, Harvey B. Lovell, R. M. Mengel, Burt L. Monroe, Jr., Roderic Sommers, Anne L. Stamm, Don Summerfield, Haven Wiley, Jr., and James B. Young. These Louisville area records apply either to Jefferson or Oldham counties, in the vast majority of cases or, in a few, to parts of Meade and Bullitt counties, the area involved being a rough half-circle some 20 miles in diameter.

A few words concerning *breeding data* may be in order. These are summarized, when possible, beginning with a statement of the breeding period,

shown by a stated number of dated observations. These observations may apply to any point in the breeding cycle, so long as they are "correctible" to show the approximate time of clutch-completion. In the absence of precise information, "eggs" are taken to be one-half incubated and young in the nest one-half way through the nestling period.¹ The corrected data are then assigned to the appropriate divisions (the first, second, or final third) of the months in question and a curve developed. It is believed that the minor errors involved in this process become negligible with large series of observations. While I have sometimes mentioned apparent first and second peaks of clutch-completion, for two-brooded species, it should be pointed out that these are only the factual peaks of small-sample curves. Experience shows that large samples of multi-brooded species frequently show single but prolonged peaks.

Clutch-sizes are similarly summarized, when possible (5-7 clutches being a minimum for summarization), and stated with mean, standard error, and extremes: *e.g.*, 5.7 ± 0.12 (3-7). In some cases all clutches are listed, so that the most frequent size is evident, but if not, in nearly every case experience shows that the most frequent clutch is nearest the mean, thus, in the example above, it would be 6 eggs. Indicated clutch-sizes probably run a trifle below true size; the nature of the available data, in some cases, has made it necessary to use a few clutches which *may* not have been complete, and brood-sizes, where one or more eggs *may* have been lost. I have tried to keep this to a minimum.

¹Periods determined from a wide variety of standard and recent sources; some may yet be a little in error, but this should not affect these crude calculations greatly.



DESCRIPTION OF THE ENVIRONMENT

PHYSIOGRAPHY

Kentucky extends from the Cumberland Mountains to the Mississippi River and occupies 40,598 square miles enclosed with irregular boundaries extending from 39° 15' North to 36° 30' North Latitude and from 82° West to 89° 38' West Longitude (*Encyclopædia Britannica*, 11th edit.).

The state displays a moderately diverse terrain ranging in elevation above sea level from approximately 4,150 feet at the summit of Black Mountain in Harlan County, on the southeastern border, to 275 feet on the Mississippi River in Fulton County, in the extreme southwest. The distribution of its biota shows a definite correlation with physiography and a thorough understanding of the latter is necessary for interpretation of the former.

On the basis of both its surface features and underlying geology, Kentucky has been divided (Fig. 1) into three major and eight or more minor regions, and a considerable number of still lesser subdivisions are recognizable. All of the state except its extreme western portion is geologically related to the great system of the Appalachian Mountains and their outlying plateaus. Its westernmost portion has geologic affinities with the Gulf Coastal Plain.

The physiographic nomenclature employed in the present description is that of Fenneman (1938). This differs somewhat from the nomenclature generally used by the Kentucky Geological Survey, especially in its older reports, and that in popular use locally. It has, however, the distinct advantage of relating the physiographic areas of Kentucky to the larger regions of which they are a part. Common physiographic and geographic terms in local use are given below with indication of their equivalence with Fenneman's nomenclature. For further detail concerning physiography see Fenneman (*op. cit.*) and McFarlan (1950).

Appalachian Plateau Province

This Province is the westernmost of several into which the Appalachian system is divided by Fenneman. Like the mountain system of which it is a part, it has its long axis in a northeast-southwest direction. In the south it is separated from the main backbone of the Appalachians (Blue Ridge Province) by the southern portion of the Ridge and Valley Province (the "Great Valley" of Virginia). Its biota is thereby somewhat isolated from the main Appalachian biota. The Province consists of a series of diverse plateaus of varying elevation and degree of dissection, some of them being high, extremely rugged, and geographically known as mountains. These plateaus have certain faunal features in common, but differences in altitude and latitude play a considerable part in diversifying the fauna.

The Appalachian region is old and has several times been uplifted and reduced, as shown by a number of remnantal penepains at various levels and localities. Within the Province, Fenneman recognizes seven Sections, three of which (Cumberland Mountains, Cumberland Plateau, Unglaciated Allegheny Plateau) extend into Kentucky. Locally these three sections are often designated collectively as the *Eastern Coal Field*, or simply as *The Mountains*.

In Kentucky the Appalachian Plateau Province embraces the entire eastern upland, approximately one-fourth of the state, or that area east of a

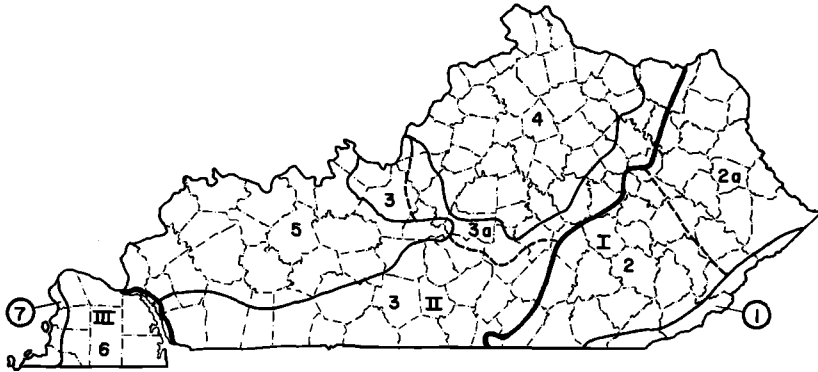


Fig. 1. Physiographic subdivisions of Kentucky, adapted from Fenneman (1938) and other sources (see text). I. *Appalachian Plateau Province* (1. Cumberland Mountain Section. 2. Cumberland Plateau Section. 2a. Unglaciaded Allegheny Plateau Section.). II. *Interior Low Plateau Province* (3. Highland Rim Section, Pennyroyal district. 3a. Same, the Knobs. 4. Bluegrass Section. 5. Shawnee Section.). III. *Coastal Plain Province* (6. Red Hills Belt. 7. Mississippi Alluvial Plain.).

sinuous line drawn from eastern Lewis County in the north to eastern Wayne County in the south. The unglaciaded portion of the Province conforms rather closely with the Mixed Mesophytic Forest region of Braun, the conformation within Kentucky being almost perfect (of which more below). Except for certain differences correlated with elevation, the unglaciaded part of the Province is rather uniform faunally and is considerably different in fauna from the Province to the west.

Cumberland Mountain Section.—This Section is approximately 150 miles long and 25 miles wide. It extends southwest from the easternmost tip of Kentucky and a small adjoining portion of Virginia to a point immediately west of Knoxville, Tennessee. It includes all of Bell and Harlan counties, most of Letcher County, eastern Pike County, southern Whitley County, and the extreme eastern parts of Knox, Leslie, and Perry counties. Its principal feature is the Cumberland Mountains. These include Pine Mountain, the long, continuous ridge along the northwestern border of the Section; Cumberland Mountain, an almost parallel and slightly higher ridge along the southeastern border; and several less extensive but not necessarily lower ridges, notably Black Mountain and Log Mountain, rising in the basin between. According to Fenneman (1938:329):

[The Section] is distinguished empirically by its altitude and relief, being everywhere higher than the adjacent Cumberland Plateau. These features are the result of differential erosion. The extent of the higher area is determined by structure and stratigraphy. Its largest and most characteristic part is a great fault block thrust northwestward at least 6 miles with some upturning at the edges, bringing the resistant Lee conglomerate (basal Pottsville) to a level above that of younger and softer rocks to the northwest.

This overthrust block (variously called Pine Mountain Overthrust Fault, or Cumberland Thrust Block; see McFarlan, 1950:140) is bordered and defined at each end by "shear faults" (Russell Fork Fault, Pike County, on

the northeast; Jacksboro Fault, northern Tennessee, on the southwest). The area between Pine Mountain and Cumberland Mountain is a geosyncline, and the out-facing scarps of both mountains are formed by the same resistant beds (Lee conglomerate, basal Pottsville series) where these are turned up at the edges of the geosyncline (for stratigraphy see McFarlan, 1950:141, Fig. 12). The area between, known as the Middlesboro Basin, contains several high mountains (Black Mountain, Log Mountain) carved from resistant beds, largely sandstones, overlying the Lee. The geology and surface rocks of the Section are roughly similar to those of the plateau to the northwest, since the Cumberland Thrust Block is merely an overthrust portion of the same geologic section. Except in areas where the broadest sections are exposed, revealing the underlying Mississippian and older rocks, the surface rocks of the entire Section are Pennsylvanian sandstones, shales, conglomerates, and coals belonging to the Pottsville series. Submature soils throughout the area, therefore, tend to be acidic, with consequent influence on plant distribution.

The topography of the Section is very rugged. Pine Mountain, with its steep, northwest-facing scarp, ranges from 2,100 to 2,300 feet in the southwest to more than 2,800 feet in the northeast (McFarlan, 1950:180). The inner or southeastern slope, following the surface of the dipping beds of the geosyncline, is much gentler. Cumberland Mountain, on the southeastern side of the syncline, follows the Kentucky line only in Bell County and southeastern Harlan County, whence it continues northeastward into Virginia. Its crest ranges from 3,000 to 3,451 feet in elevation. Its steeper slope is the outer one, on the southeastern side of the syncline. To the northeast is Black Mountain, of dendritic pattern and carved from more or less horizontal strata. It occupies a central portion of the syncline just southeast of Pine Mountain, from which it is separated by the narrow valley of the Poor Fork of the Cumberland River. The Kentucky-Virginia line follows the crest of Black Mountain for several miles along the boundaries of Harlan and Letcher counties (Kentucky). The slopes of Black Mountain are moderately to very steep and the elevation of the crest ranges mainly from 3,000 to 4,000 feet, reaching 4,150 feet, the highest point in Kentucky, at "The Doubles" just above Lynch. It is here known as Big Black Mountain. Some distance to the southwest, in Bell County, Log Mountain also lies in the syncline and reaches elevations above 3,200 feet.

The higher mountains in the Section (those possessing appreciable areas above the 3,000-foot contour) are of considerable interest faunally and are inhabited by a number of species not found elsewhere in the state. The elevation appears to have less effect on the flora; the biota of the lower slopes of the Cumberland Mountains is much like that of the Cumberland Plateau to the west.

Although these mountains are not particularly high, they are fairly large, local relief through the Section ranging from 900 or so to more than 2,000 feet. No comprehensive physiographic terms precisely equivalent to the Cumberland Mountain Section as here defined seem to be in general local use. In this work "Cumberland Mountains" refers to the Section as just defined.

Unglaciated Allegheny Plateau Section.—This Section is the northernmost of the Province and occupies much of western Pennsylvania, West Virginia,

eastern Ohio, and northeastern Kentucky. In Kentucky, according to Fenneman, the Section occupies all of that portion of the Province lying north of the Kentucky River drainage basin. "The plateau which is called Allegheny in the north is called Cumberland in the south. If a boundary is specified at all, it must be arbitrary. None the less, the two names are useful, partly for mere geographical reasons, and partly because the character changes somewhat with latitude" (Fenneman, 1938:333). The "Allegheny" Plateau is somewhat more maturely dissected than the "Cumberland," the surface rock of which is generally thicker and more resistant. Within Kentucky few, if any, important features of the biota appear to be correlated with the arbitrary boundary adopted by Fenneman, and subdividing the plateau serves no useful purpose for the faunist. Therefore, I have used the name Cumberland Plateau for all of the Province within Kentucky not included in the Cumberland Mountain Section.

Cumberland Plateau Section.—As here used for faunal purposes, and with reference to Kentucky only, the Cumberland Plateau embraces also the Unglaciated Allegheny Plateau of Fenneman. The Cumberland Plateau Section, thus altered in definition, extends from the Ohio River (north of which it is replaced by the Unglaciated Allegheny Plateau) southwest to Tennessee and through that state into northern Alabama where it merges gradually with the Coastal Plain. It is a relatively narrow belt, nowhere more than 75 miles wide, the eastern flank of which is formed in the north by the Cumberland Mountain Section and farther south, outside of Kentucky, by the Great Valley of east Tennessee (Ridge and Valley Province). Its entire western margin bounds the next Province to be discussed.

The Cumberland Plateau in Kentucky forms the broad northwestern flank of the Cumberland Mountains. Its western margin drops off sharply to the Lexington Plain (Bluegrass) in the north and the Pennyroyal, or Mississippian Plateau, in the south, its elevations being generally 300 to 500 feet higher than the areas immediately westward (Interior Low Plateau Province). The plateau gradually increases in altitude from 1,200 to 1,300 feet in the north to 1,800 feet at the Tennessee line in the south, and ranges from 1,300 to 1,500 feet in much of its middle section. It dips slightly to the southeast from its western edge, before beginning a gradual rise toward the base of Pine Mountain where the adjoining Section begins.

Much of the Section is underlain by Pennsylvanian rocks of the Pottsville series, predominantly sandstones alternating with shales. Along the western edge of the plateau, especially towards the north, underlying Mississippian rocks, often limestones, are frequently exposed beneath the outcropping Pottsville sandstones and conglomerates, which support the plateau surface and often form strong scarps. Dissection along much of the northwestern edge of the plateau (often called the Pottsville escarpment) is immature and the area is extremely rugged, especially in parts of the Kentucky and Cumberland river drainage basins. This region is distinctive in a number of ways and is interesting in its faunal and floral aspects. In these, as well as geologically, it bears a strong resemblance to Pine Mountain, which represents an abrupt, thrust-faulted outcropping of essentially the same geologic section.

Between the Pottsville escarpment and Pine Mountain the strong, resistant beds dip beneath shales and weaker sandstones and a much gentler

land surface results, until Pine Mountain is approached. In a broad belt beneath the northwestern scarp of the mountain the plateau again becomes very rugged.

The biotic composition of the Cumberland Plateau and the lower Cumberlands is recognizably different from that of all but limited areas in other parts of Kentucky. In local usage the term Cumberland Plateau is equivalent to the Section as here defined, whenever distinguished from the Cumberland Mountains.

Interior Low Plateau Province

This Province includes all of central Kentucky and central Tennessee, extreme northern Alabama, and those portions of Ohio, Indiana, and Illinois south of the glacial boundary (exclusive of extreme southern Illinois). In Kentucky it extends from the Cumberland Plateau west to the Tennessee River, where it is bordered by the Coastal Plain Province. The area is a low, central plateau based largely upon Mississippian rocks. It is quite diverse, and the "relation between stratigraphy and structure on the one hand and physiography on the other is very close . . ." (Fenneman, 1938:413). Physiography and biotic features, likewise, are closely related in the area. Fenneman recognized four Sections in the Province, all but one of which (Nashville Basin) are wholly or partly in Kentucky. These are the Highland Rim, Bluegrass, and Shawnee sections.

The Interior Low Plateau Province conforms closely with the Western Mesophytic Forest region of Braun (a predominantly ecotonal area), and its fauna, like its forests, is diverse and somewhat transitional in nature.

No term in common local usage, either popular or technical, stands for the Kentucky portion of the Province as here defined. The Province as a whole is seldom referred to in this work, reference being made usually to one or another of its component Sections.

Highland Rim Section.—As defined by Fenneman, this Section includes all of the Province within Kentucky, exclusive of the Shawnee and Bluegrass sections. It thus embraces those regions designated by the Kentucky Geological Survey and in local popular usage as "The Knobs" and the Mississippian Plateau, or Pennyroyal ("Pennyrile"). The term "Highland Rim" is taken from a phrase in popular usage in the upland immediately surrounding the Nashville Basin in Tennessee.

In Kentucky the Section is generally a broad plateau of moderate elevation, decreasing gradually southward and westward from 1,100 to 1,400 feet in the north and east to approximately 400 feet in the south and west, near the Tennessee River. It is generally characterized by gentle land forms and relatively slight local relief. It lies for the most part on rocks of Mississippian age, very largely limestones, which in the western and southern portions form karst areas of predominantly subterranean drainage. This plateau forms a long, horseshoe-shaped cuesta surrounding the Bluegrass Section and known as Muldraugh's Hill, this being the highest portion of the area and attaining in its eastern parts elevations near 1,400 feet. The belt just inside this cuesta, also included by Fenneman in the Section, lies on Devonian beds, especially the Jeffersonville limestone, and is a hilly, heavily eroded section generally known as "The Knobs." These hills, often characteristically conical in shape, encircle the Bluegrass in a broad oval belt

usually 10 to 15 miles wide, abutting in the east against the higher Cumberland Plateau. The hills are capped and preserved by weak sandstones of the Waverly or "Knobstone" series and cherty limestones, such as the Warsaw. The Knobs, long recognized as a distinct physiographic section in most treatments, are of considerable biotic interest because they form a narrow corridor connecting the Cumberland Plateau on the east with the highlands of the Shawnee Section in the west. Still heavily forested and with poor soils derived from sandstones and shales, they form a distinct contrast with the largely agricultural, calcareous regions to the north (Bluegrass) and south (Pennyroyal).

The Pennyroyal district takes up all the rest of the Section and is much like the Bluegrass, although its soils are not quite so good, so that the area has remained more extensively forested, especially in its eastern portion. Its western karst and sinkhole areas are of particular interest; it was in this region of subsurface drainage that most of the original prairies were found.

That part of the Highland Rim Section occurring in Kentucky has often been called the Mississippian Plateau. When so treated the area is usually separated from the Knobs. In this work the two parts of the Section are referred to as the Knobs and the Pennyroyal.

Bluegrass Section.—Except for a small area extending into southeastern Ohio, this Section lies entirely within Kentucky, where it occupies almost 8,000 square miles. This area is perhaps more homogeneous topographically and in its fauna than any other region of similar size within the state. The soils, predominantly derived from limestones, are for the most part very fertile, and the land surface is generally rather level. Deforestation has been extensive and the forest fauna of the region has been largely wiped out. Open country species favored by "clean" farming practices have increased greatly. The underlying geology of the region is somewhat more diverse than the surface topography and accounts for certain differences in soils which, in view of the present artificiality of the area, are of more interest to the agriculturalist than the biologist.

Structurally the Bluegrass Section is a great dome, which has been reduced and nearly leveled by erosion to elevations around 900 to 1,000 feet at the center of the dome and somewhat less at the periphery. A central area of approximately 2,400 square miles is called the Inner Bluegrass and lies on Ordovician limestones. It possesses the richest soils and is the most intensely cultivated and devoted to livestock production (notably horses). Outside this region in an irregularly circular belt, 2,500 square miles in area, distinguished by the outcrop of Eden shales of Ordovician age. This belt, sometimes called the Hills of the Bluegrass, displays the hilliest topography and poorest soils of the region, and deforestation is slightly less severe than in other parts of the Bluegrass. It possesses many scrub-grown, eroded, steep slopes inhabited by birds rarely or never found elsewhere in the Section. The circumference of the dome is formed by Ordovician and Silurian limestones, and is called the Outer Bluegrass, an area of 3,000 square miles. Its soils are nearly as rich as those of the Inner Bluegrass, and it is largely devoted to agriculture and the production of livestock, especially cattle, sheep, and pigs. Its northern boundary is formed by the Ohio River. Elsewhere it merges more or less abruptly with the Knobs of the foregoing Section.

The Kentucky River flows northwestward across the Bluegrass and in the central portion of the dome is deeply entrenched in a steep-sided valley on the narrow floor of which occur some of the few relatively unaltered forests of the Section.

The Section is locally called the Bluegrass, Blue Grass, or Bluegrass Region (physiography). It is also referred to, by physiographers, as the Lexington Plain. In this work it is called the Bluegrass.

Shawnee Section.—This Section is a low plateau lying in the northwestern corner of Kentucky, stretching from Meade County west to the Tennessee River and into southwestern Indiana and southern Illinois. It is interrupted along the Ohio River by the lowlands of that stream, these being, ecologically, an extension of the Mississippi Alluvial Plain. The eastern and southern boundaries of the Section in Kentucky, those bordering the Pennyroyal district of the Highland Rim Section, are formed by the outfacing Dripping Springs Escarpment. Fenneman arbitrarily extends the Section westward to the Tennessee River, where it adjoins the Coastal Plain Province. He thus includes in it most of the narrow, hilly, heavily wooded section between the Cumberland and Tennessee rivers locally called "Between the Rivers." This last area contains surface deposits of Tertiary and Cretaceous gravels belonging geologically with the Mississippi embayment.

The majority of the Shawnee Section lies on Pennsylvanian sandstones and shales resembling those of the Cumberland Plateau and is a low, maturely dissected plateau. It is generally lower, of slighter relief, and more maturely dissected than the Cumberland Plateau. Within Kentucky it covers an area of approximately 4,700 square miles. Its two most prominent geologic strata are the Cypress sandstone, which outcrops along its entire southern and eastern border to form the steep Dripping Springs escarpment, generally from 150 to 200 feet high, and, within this escarpment, the less pronounced outcrop of the massive Chester (Pottsville) sandstone. Near the southern edge of the Section, where these sandstones are submaturely dissected, there is some very rough topography resembling the Pottsville escarpment of the Cumberland Plateau but less rugged. The two areas have certain interesting faunal and floral similarities. In the southeastern quarter of this rugged part of the Shawnee upland, soluble limestones underlie the sandstones, producing a karst situation in which the sandstone forms durable ceilings for great solution caves, the best known being Mammoth Cave.

The more resistant beds of the Section dip northward, the elevations becoming lower and the surface more even as the Ohio River is approached. Extensive invasion of the area by floodplain forests occurs in the valleys of the Green and Tradewater rivers.

In official Kentucky geological and geographical surveys the Section is usually designated the Western Coal Field. In these reports the area "Between the Rivers" is usually excluded from the Section and placed with "The Purchase" (see below). The area is often popularly called the Western Highlands. This term and "Shawnee Highlands" or "Shawnee Section" are used interchangeably in this work.

Coastal Plain Province

This great Province extends completely around the Atlantic and Gulf

coasts of the United States, and a long northern extension of it, the "Mississippi embayment," extends north to southern Illinois. This embayment marks the extreme limits of the Cretaceous seas and their adjacent plains. As delimited by Fenneman, the Province includes that area in Kentucky west of the Tennessee River. This is locally called "The Purchase" or "Jackson Purchase." Geologically the area is very different from the rest of the state. Its surface rocks are unconsolidated or loosely consolidated Cretaceous, Tertiary, and "Quaternary" sediments consisting largely of sands, gravels, and clays subject to rapid erosion. These are underlain by cherty Mississippian rocks which outcrop in places. The gullied, sharply eroded section just west of the Tennessee River is sometimes called the Breaks of the Purchase.

Fenneman does not clearly designate sections of the Coastal Plain Province; judging from his map (1938, Fig. 21) the portion in Kentucky is included in his East Gulf Coastal Plain. Two distinct divisions in Kentucky are easily recognizable, a gently undulating central section (representing the poorly marked northernmost extension of the "Red Hills Belt" as defined by Fenneman), with elevations generally from 350 to 400 feet, and a swampy western lowland along the Mississippi River (the northernmost extension of the Mississippi Alluvial Plain). The topographic and biotic features of the floodplains of the lower Ohio and its larger tributaries are practically indistinguishable from those of the Mississippi. The biota of these floodplains is distinct from that of the closely adjoining higher ground and has some affinities with more southern regions. Much of the area is capped with a thin mantle of Pleistocene loess which becomes thicker towards the Mississippi River and contributes to the formation of steep bluffs along it.

As in popular usage the area is called the Purchase in this work.

SOILS

The soils of Kentucky have not been completely mapped; not more than 20 counties had been surveyed in full by 1949, and many of the older surveys are inadequate today (Ligon and Karraker, 1949:91-99). For brief, general descriptions of Kentucky's soil areas see Ligon and Karraker (*op. cit.*) and Karraker (1950). The principal soil divisions and the major soil associations recognized by them correspond so closely with physiographic divisions that they shed no light on bird distribution not already available from physiography. In a general way soil fertility and utility for agriculture is greatest in the Bluegrass and progressively less in the Pennyroyal, Purchase, Shawnee Section, Cumberland Plateau and Mountains, and in the Knobs.

No purpose would be served here by introducing the names of the various soil series, which may be ascertained from the above sources. Even if elaborate soil surveys were available for the entire state, the details of bird distribution are too slightly known to make full use of such information. In respect to mature forest soils, according to some authorities Kentucky lies within the area characterized by dark, melanized soils typical of the mixed deciduous forests, while others have included the state in the area characterized by gray-brown (mostly) and red and yellow (slightly) podzolic soils (for detailed discussion see Braun, 1950:23-27).

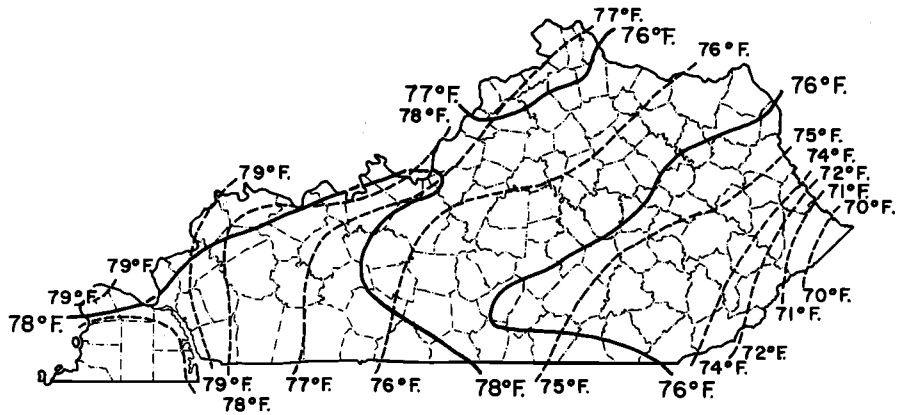


Fig. 2. Mean July temperatures in Kentucky, according to Kendall (1941:888—solid lines), and according to Visher (1929:98—dotted lines).

CLIMATE

Climatic data from Kentucky have been summarized briefly by Kendall (1941) and in greater detail by Visher (1929). The two authorities are frequently in disagreement; except as noted, data below are from the more recent Kendall report.

The climate of Kentucky is continental in nature, with considerable variation in temperature and precipitation in a given year and between different years. Contrasts are not so marked, however, as in states to the north and west, which lie more nearly in the path of the polar air masses that periodically move southeastward over the central United States.

Kentucky's summers are long and moderately hot. The winters are moderately cold, but usually without prolonged severe weather, and the springs and autumns are long and pleasant. Extreme summer temperatures usually reach or slightly exceed 100° F., and short periods with temperatures below 0° F. are not infrequent in winter. Recorded extremes of temperature are 114° F. and -30° F. The latter is most unusual; temperatures as low as -15° are extremely rare.

The mean annual temperature for the entire state is approximately 57° F., ranging from 54° in the northernmost part of the state to 59° along the southwestern border. Climate is rather uniform throughout the state, but is slightly cooler, with greater rainfall, in the mountainous east. The two authorities cited differ somewhat in detail (see Fig. 2), but both, using data collected mainly since 1900, are essentially in agreement that July temperatures on the Cumberland Plateau in eastern Kentucky average 76° or less, being somewhat lower than those in the central and western portions of the state (according to Visher ranging from roughly 75° at the western edge of the Plateau down to 72° or less as the Cumberland Mountains are approached, or from 2° to 8° lower than more western areas). Temperature records of long standing for the mountain and plateau counties are scarce, but there seems to be no doubt that the plateau exerts a definite, if slight, influence on summer climate. In midwinter the influence of the plateau

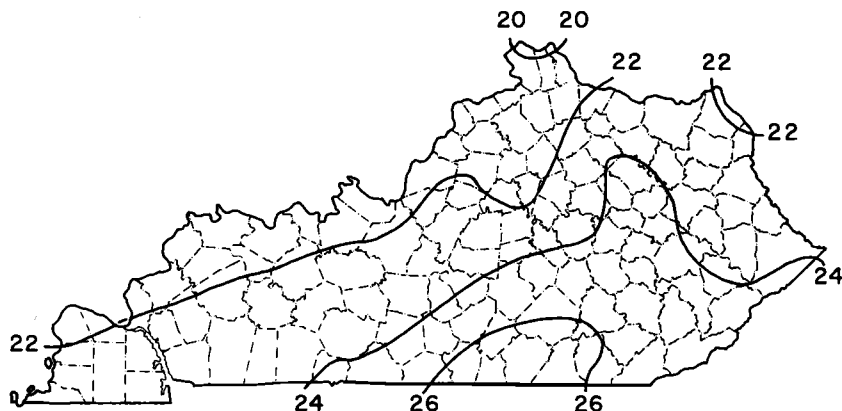


Fig. 3. Average warm-season precipitation in Kentucky (in inches), April-September, inclusive. Adapted from Kendall (1941:890). Average annual precipitation is approximately twice the amount shown and is more evenly distributed from north to south (see text).

on temperature seems to be less marked, and mean January temperatures across the state range rather evenly from 32° F. in the north to 38° F. in the south. Earliest autumn and latest spring killing frosts, however, come a little earlier and later, respectively, on the plateau than in areas to the west.

Local climates throughout the state vary considerably. Certainly summer temperatures in the many deep, shaded ravines and gorges of the Cumberland Plateau average several degrees lower than the means recorded in nearby towns. The temperature is considerably lower on the upper slopes of the few high ridges of the Cumberland Mountains than at their bases. Mean temperature for July, 1948, as unofficially recorded at 4,050 feet elevation on Black Mountain, Harlan County (Barbour, 1950:101), was 65.9° F. (maximum high, 90°; minimum low, 48°). The average July temperature at Middlesboro, Bell County, at the base of Cumberland Mountain, is 75.4° F., nearly 10 degrees higher.

Precipitation throughout Kentucky is representative of the wooded eastern United States, being everywhere well above the minimum necessary, other things being favorable, to permit forest growth. Mean annual precipitation for the whole state is approximately 45 inches, ranging from 40 to 46 inches at various localities in the north to 46 to 50 inches in southern localities (Fig. 3). Precipitation is rather evenly divided between summer and winter, approximately half falling from April through September, inclusive.

Topography appears to have slight influence on precipitation, but the Cumberland Plateau receives a little more rainfall than do more westerly areas, especially in summer (Fig. 3; see also Visher, 1929, Fig. 48). From a biological standpoint the slightly cooler Cumberland Plateau and still cooler mountains may receive significantly more effective summer precipitation than do areas to the west, because of a correspondingly lower evaporation rate (perhaps offset to some extent, in the Cumberlands, by increased elevation). The much greater area occupied in these regions by compara-

tively moist forests suggests that this is the case, although other factors are also involved.

The amount of snowfall is variable, ranging on the average from 20 inches in the northeast to 10 inches in the southwest. According to Barbour (1950:101) winter drifts of snow on Black Mountain sometimes reach four feet in depth and a foot of snow often accumulates in level places.

Other data: killing frosts occur on the average between October 24 and April 9 in the west (average growing season 197 days) and October 15 and April 23 in the east (average growing season 176 days). Recorded extremes in growing season: 149 days to 232 days. Percentage of possible sunshine averages 35 to 45 in winter, 56 to 60 in March and April, 60 to 70 from May to October.

VEGETATION

Kentucky lies entirely within the area characterized by the Deciduous Forest Formation, which occupies most of the eastern United States. The original forests were extremely complex and luxuriant, especially in the eastern and central portions of the state, and contained many species of large trees, particularly the tuliptree. Excluding small, naturally disturbed areas and a few moderately extensive prairies in the south and west, the entire state was originally blanketed by this deciduous or "summer green" forest. This has been said to have covered approximately 96 per cent of the state, but according to recent estimates of the prairies (see Transeau, 1935, Fig. 1) the forested area may have been somewhat less, closer to 90 per cent. The original stand has been estimated at 122 billion board feet (Taylor *et al.*, 1945:125). Stands containing 15,000 board feet per acre were not unusual (Duerr and Gustafson, 1948:9), and 8,000 was average.

Deforestation proceeded rapidly in the last century. By 1900, little over half of Kentucky was forested (*Encyclopædia Britannica*, 11th edit., 15:742). A United States Forest Service survey completed in 1945 indicated that only 46 per cent of the state's area was then forested (Taylor *et al.*, 1945:129). Probably the state's forests were poorest, and least in extent, somewhere around 1920, immediately after the logging boom of World War I, and some slight improvement has been realized since.

The widespread clearing of forests and alteration of surviving forest by lumbering, fire, and grazing have wrought tremendous changes in the aspect of the state and in its wildlife. Although we can surmise original conditions from examination of small, relatively unaltered areas, these are so few, and the written record of early conditions is so scant, that we shall never have a clear picture of the original forest or its fauna. The last statement applies with variable force to different parts of the state, since the extent of deforestation and forest alteration differs sharply in different areas, being considerably less in eastern Kentucky, in the Knobs, and in parts of the Western Highlands, than in the Bluegrass, Pennyroyal, and Purchase.

The degree of deforestation everywhere is closely related to topography and soil fertility, those areas most suitable for agriculture having been most extensively cleared (see Sauer, 1927, Fig. 75). Thus, in 33 counties of rugged eastern Kentucky with its comparatively poor, acidic soils, 56 per cent of the land was estimated to be forested in 1948 (Duerr and Gustafson, 1948:6, Table 1), as opposed to 46 per cent for the entire state. Within

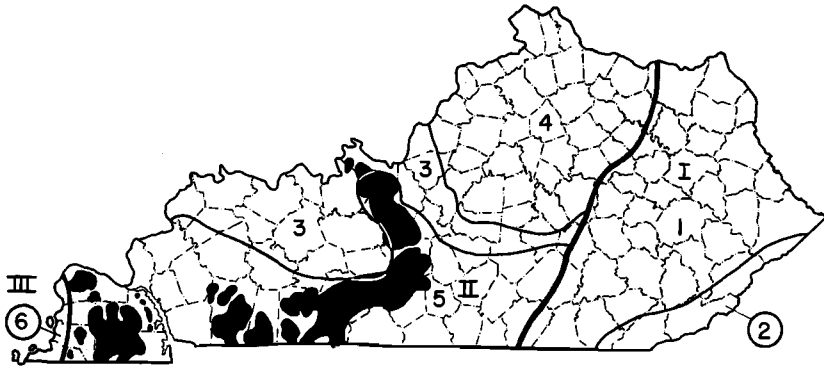


Fig. 4. Forest regions of Kentucky, after Braun (1950). I. *Mixed Mesophytic Forest region* (1. Cumberland Plateau. 2. Cumberland Mountains.) II. *Western Mesophytic Forest region* (3. Hill section. 4. Bluegrass. 5. Mississippian Plateau.) III. *South-eastern Evergreen Forest region* (6. Mississippi alluvial forest—for discussion see text, pp. 68–69). Black areas indicate extent of original prairies, after Transeau (1935).

remaining forested areas the ruggedest and most remote—those most difficult to lumber—are least altered. Only a few small stands of virgin forest remain, and only one or two of these seem assured of preservation (see Shelford *et al.*, 1926:352–354). Unwise lumbering practices, repeated fires, and chestnut blight, which has nearly eliminated one of the most important dominant trees, have likewise contributed to the alteration of original forest conditions and made way for a vast, confusing complex of disturbed areas and successional stages. For further detail on misuse of forest in eastern Kentucky see Duerr and Gustafson (1948) on Breathitt County, which unfortunately is probably representative.

Luckily the complex nature, history, and interrelationships of the Deciduous Forest Formation have received intensive study by E. Lucy Braun, culminating in her monographic *Deciduous forests of eastern North America*¹ (Braun, 1950). A great deal of her original field work (many papers cited later) has been conducted in Kentucky, making available an almost embarrassingly rich mass of detailed information on the forests of the state, where reliable data would otherwise have been scarce and scattered.

According to Braun's classification, adopted through this work, Kentucky is almost completely occupied by parts of two forest regions of the Deciduous Forest Formation, the Mixed Mesophytic Forest region and the Western Mesophytic Forest region, within which lesser regions are recognizable (Fig. 4).

Mixed Mesophytic Forest Region

Braun (1950:35) writes of this region as follows:

[It] is characterized by the prevalence of mixed mesophytic climax communities. It is the stronghold of the Mixed Mesophytic association—the climax association in which dominance is shared by a number of species, particularly

¹ Appropriately, nearly all of the plant names used in the present paper follow Dr. Braun's usage in this work, wherein nomenclatural differences from other standard manuals are clearly indicated.

beech, tuliptree, several species of basswood (but not *T. americana*), sugar maple, sweet buckeye, chestnut, red oak, white oak, and hemlock. This association develops only on moist but *well-drained* sites. Deeply melanized soil and a mull humus layer are characteristic features. This climax reaches its best development in the Cumberland Mountains where many variants occur. Although characteristic, the climax is not universally present. Certain physiographic climaxes (preclimaxes) resembling the climaxes of other regions and the many edaphic and secondary communities add to the diversity of the region.

Occupying most of the unglaciated portion of the Appalachian Plateau Province, this forest region embraces all of eastern Kentucky lying within the Province, including the Cumberland Mountains, Cumberland Plateau, and immediately adjacent portions of the Knobs. Anyone familiar with the forests of the Appalachian Plateau knows their variability and complexity. Braun has thoroughly described and analyzed this complexity, and uses the term *association-segregates* (Braun, 1935; 1950:11) to describe climax associations consisting of various groups of dominants sorted according to site conditions and together comprising the Mixed Mesophytic association. These association-segregates of the Appalachians may become the climax associations of other large regions elsewhere, as beech-maple in the north and oak-hickory in the Ozarks. The utility and clarity of Braun's analysis can perhaps not be thoroughly appreciated by anyone who has never stood in an Appalachian forest and attempted to reconcile the baffling diversity before him with the few and simple regional "associations" of the deciduous forest earlier recognized by such workers as Weaver and Clements (1938:508-516) and based on the much simpler forests of other regions (*cf.* Braun, 1950:42-43).

Much of the distinctive character of the Mixed Mesophytic forest is supplied by southern species and a lesser amount by Appalachian endemics. The following list of the more characteristic species is adapted from Braun (1950:40-46):

Canopy trees.—Important and widespread species: beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), basswood (*Tilia heterophylla*, *T. h.* var. *michauxii*, *T. floridana*, *T. neglecta*), sugar maple (*Acer saccharum*, *A.* [s. var.] *nigrum*, *A. s.* var. *rugellii*), chestnut (*Castanea dentata*), sweet buckeye (*Aesculus octandra*), red oak (*Quercus borealis* var. *maxima* = *Q. rubra* of authors), white oak (*Q. alba*), hemlock (*Tsuga canadensis*).

Additional species, "more or less abundant or local": silverbell (*Halesia monticola*), birch (*Betula lutea* var. *alleggheniensis*, *B. lenta*), black cherry (*Prunus serotina*), cucumber tree (*Magnolia acuminata*), white ash (*Fraxinus americana*, including var. *biltmoreana*), red maple (*Acer rubrum*), sour gum (*Nyssa sylvatica*), black walnut (*Juglans nigra*), hickory spp. (especially *Carya ovata*, *C. cordiformis*). "About a dozen others which sometimes appear in climax stands could be added."

Subcanopy trees.—Important species: dogwood (*Cornus florida*), magnolia spp. (*Magnolia tripetala*, *M. macrophylla*, *M. fraseri*), sourwood (*Oxydendrum arboreum*), striped maple (*Acer pensylvanicum*), redbud (*Cercis canadensis*), ironwood (*Carpinus caroliniana*), hophornbean (*Ostrya virginiana*), holly (*Ilex opaca*), service-berry (*Amelanchier arborea*).

Shrubs.—The following are important: *Lindera benzoin*, *Hamamelis virginiana*, *Asimina triloba*, *Hydrangea arborescens*, *Cornus alternifolia*.

Additional species: *Viburnum acerifolium*, *Ribes cynosbati*, *Pyrularia pubera*, *Stewartia ovata* (*S. pentagyna*), *Sambucus canadensis*, *Evonymus americanus*, *E. atropurpureus*, *Clethra acuminata*, *Aralia spinosa*.

"*Rhododendron maximum*, a dominant shrub in many situations, is very local in, or entirely absent from, most of the more typical mixed mesophytic communities. . . . Many more species, especially ericads, occur in subclimax situations" (Braun, 1950:43).

Woody lianas.—*Parthenocissus quinquefolia*, *Vitis* spp., *Celastrus scandens*, *Bignonia capreolata*, *Aristolochia durior*, *Smilax* [*tamnoides*, var.] *hispida*.

Herbaceous vegetation.—It is convenient to quote directly from Braun (1950:45–46):

The herbaceous vegetation is exceedingly rich and varied. The vernal flora is unexcelled in the deciduous forest and is accented by such showy flowers as *Trillium grandiflorum*, *T. erectum*, *Erythronium americanum*, *Cypripedium Calceolus* var. *pubescens* (*C. parviflorum* var. *pubescens*), numerous species of *Viola*, *Sanguinaria canadensis*, *Stylophorum diphyllum*, *Delphinium tri-corne*, *Hydrophyllum* (four species), *Phacelia bipinnatifida*, *Phlox divaricata*, and *Synandra hispidula*. Among the numerous though smaller white, whitish, or greenish flowers are *Anemone lancifolia*, *A. quinquefolia*, *Anemonella thalictroides*, *Actaea pachypoda*, *Caulophyllum thalictroides*, *Claytonia virginica*, *C. caroliniana*, *Dicentra canadensis*, *D. Cucullaria*, *Cardamine Douglassii*, *Tiarella cordifolia*, etc. In summer, under the deep shade of the forest canopy, there are few flowering plants with showy flowers; ferns, especially *Dryopteris Goldiana*, *Phegopteris hexagonoptera*, *Adiantum pedatum*, *Athyrium pycnocarpon*, *A. thelypteroides*, and *Osmunda Claytoniana* are very abundant in undisturbed areas. The late summer and fall flora contain a variety of mesophytic asters, goldenrods, and other composites (especially *Aster cordifolius*, *A. divaricatus*, *Solidago caesia*, *S. latifolia*, and *Eupatorium rugosum*), as well as a scattering of species from other families. . . . By far the larger number of the herbaceous plants are typical mull plants rooting in the porous and friable melanized soil. Few of them can grow in the ground layer conditions of oak-chestnut or oak-hickory forests.

Of course, not all, or even most, of the above species necessarily occur in any given mixed mesophytic community. Also, today, only a small part of the total area of the Mixed Mesophytic Forest region is occupied by more or less typical and undisturbed mixed mesophytic climax, and even the areas so occupied are broken by physiographic climaxes of different types. Various subclimax and preclimax communities of the region are described later, in connection with discussions of bird distribution. Finally it should be stressed that mixed mesophytic associations are by no means limited to this forest region, being only most numerous and best developed there.

Western Mesophytic Forest Region

This region occupies all of the considerable area west of the Cumberland Plateau and east of the Mississippi River from southern Ohio, Indiana, and Illinois south to northern Alabama and northern Mississippi, or, in a gen-

eral way, the Interior Low Plateau Province of physiography. Braun (1950: 35) characterizes it as follows:

Its vegetation is a mosaic of unlike climaxes and subclimaxes, and thus may be thought of as an ecotone. Representative examples of the Mixed Mesophytic association occur frequently in its eastern part, and more locally westward. Oak-hickory and prairie communities resembling the climaxes to the west and several intermediate types, as oak-tuliptree and beech-chestnut, take part in the mosaic. Edaphic and secondary communities further complicate the picture. Gray-brown podzolic, lateritic, and melanized soils, together with certain intra-zonal types (rendzinas, planosols), present a mosaic pattern comparable to that of the vegetation.

Unlike the Mixed Mesophytic Forest region, which is characterized by a climax forest of the same name, the Western Mesophytic Forest region is characterized by no single climax. The structure of some of its forest types has been discussed below in connection with bird distribution, further detail being available in Braun (1950), from whose introductory passages devoted to the region the following (pp. 123-124) will serve in summary:

The forests of this transition region are in general less luxuriant in aspect than are those of the Mixed Mesophytic Forest region. In its eastern part, mixed mesophytic forests are of frequent occurrence; westward they become more and more limited in extent and more closely dependent on very favorable habitat conditions. The forest communities of some parts of this transition region, although mixed forests, can hardly be called mixed mesophytic forest. There is a greater tendency toward dominance of a few species. Some of these mixed forests suggest certain of the segregates of the Mixed Mesophytic association which develop in the Cumberland Mountains. . . . Because of the many mixed forest communities, and of the gradual change from east to west in extent of mixed mesophytic communities and in composition of forest, and of the increasing frequency of communities in which oaks are dominant, this is considered a transition region.

In addition to the wide variety of forest types of the uplands in the Western Mesophytic Forest region, there are extensive alluvial swamps, especially in the lower Green River [and other] basins. Vegetationally, these are extensions from the alluvial lands of the Mississippi embayment. . . . the cedar barrens of limestone slopes in the "Barrens" of Kentucky are interesting edaphic communities. The prairies or barrens of the western part of the region together with the small local patches of prairie which extend northward through the Knobs into Indiana and around the southern side of the Bluegrass into the Knobs Border area of the Mixed Mesophytic Forest region are of value in reconstructing vegetational history and migrations in the region.

The transition from extensive mixed mesophytic communities in the east to extensive oak and oak-hickory communities in the west is well-marked, in spite of the mosaic pattern of communities, and the many and large prairie areas. This change is further emphasized by the dropping out westward of the most characteristic trees of the Mixed Mesophytic Forest—*Tilia heterophylla* and *Aesculus octandra*.

The regional boundary on the east is emphasized by the differences in specific content of adjacent communities on either side of the boundary. Many Appalachian species extend beyond the western escarpment of the plateau only locally, if at all. Heaths are almost absent from the extended limestone areas of the Western Mesophytic Forest region, thus their ranges are abruptly interrupted at the regional boundary. (Some of them recur in the Knobs and Western Coal Fields.) *Quercus montana*, a dominant in many subclimax communities of the Mixed Mesophytic Forest region, is absent from

large areas of the transition region. Here, on the limestone soils, *Q. Muhlenbergii* is its ecologic equivalent. *Cladrastis lutea*, which occurs only sparingly in mixed mesophytic communities in the Cumberland Mountains and Cliff Section of the Cumberland Plateau . . . is an abundant tree on river bluffs in the eastern part of the transition region, where it extends from southern Indiana (very rare) south through Kentucky and Tennessee. The reputedly rare *Pachysandra procumbens* is an abundant plant of mesophytic woods of this region, rarely extending slightly east of the regional boundary, in valleys which are little more than tongues of the Low Plateau. *Trillium recurvatum*, unknown in the Mixed Mesophytic Forest region, is abundant in many of the mesophytic woods of the Western Mesophytic Forest region. *Trillium Gleasoni* replaces *T. grandiflorum* in mesophytic woods in many parts of the region. *Hypericum dolabriforme* is an endemic of this transition region. *Helenium tenuifolium*, a very common weed in grazed and much disturbed open places in Missouri, Arkansas, eastern Oklahoma, western Tennessee, and western Kentucky, rapidly decreases in abundance eastwardly as that part of the transition region is reached where mixed mesophytic communities are more or less frequent. It perhaps might be called an indicator of oak-hickory forest. *Coreopsis major*, although not a plant of mixed mesophytic communities, is common in the Mixed Mesophytic Forest region and extends west in decreasing amounts, dropping out completely in the Oak-Hickory region. Examples could be multiplied indefinitely which illustrate the distinctness of the boundary between the Mixed Mesophytic Forest region and the Western Mesophytic Forest region, or which emphasize the transitional nature of the region under consideration.

The prairies.—Perhaps 8 per cent, or 3,000 square miles, of Kentucky's area was originally occupied by prairie communities evidently resembling and perhaps representative of the tall-grass prairie (for description see Weaver and Clements, 1938:520-521). This prairie country was called "the Barrens" by the original settlers because of an incorrect theory that it was infertile. The major prairies (Fig. 4) were dispersed on the Mississippian Plateau in a broad semicircle surrounding the upland area known physiographically as the Shawnee Section, and westward in the central flatlands of the Purchase. The distribution of prairies was rather closely correlated with areas of cavernous limestone and sinkhole topography (see Fenneman, 1938, Fig. 124, for map).

Brief general descriptions of the "Barrens" are common in earlier writings on Kentucky, but accurate botanical information is scant. There seems, however, to be little doubt that big bluestem (*Andropogon furcatus* Muhl. = *A. gerardi* Vitman) and other grasses of the tall-grass prairie were prominent. Loughridge wrote in 1888: "A person could hardly get a switch between Mayfield [Graves County] and Obion Creek" and "Prairie grass grew as high as the head of a man on horseback and devil's shoestrings and Indian red root plant were abundant." The quotation is from Davis (1923:54-55), who added: "This condition persisted as late as 1863." Our slight knowledge of the bird life of these prairies is entirely due to the brief visits and occasional remarks of Alexander Wilson and John James Audubon.

The ecological status of the prairies has occasioned considerable argument and conjecture. Early settlers and writers (see McInteer, 1942) were more or less unanimous in the belief that the prairies were maintained by fires set by the Chickasaw Indians, and perhaps others, who inhabited and visited the country and hunted the bison and other game (which in turn, supposedly, helped to maintain the grassland). More recent writers have

been Transeau (1935), McInteer (1942, 1946), and Braun (1950:155-156). Transeau attacked the traditional concept that these prairies were subclimax in a forest climax, regarding them as outliers of the "prairie peninsula" (extending eastward through Illinois, southern Wisconsin, and northwestern Indiana into Ohio, and formerly farther). He doubted that the prairies were maintained by human agency and considered them, if I interpret him correctly, essentially climax, although of relict nature.

In any event the prairies are only of historical interest to the present-day ornithologist, since they have been virtually obliterated. Accounts of successional trends in the prairie areas as seen today have been given by Braun (1950:155-156) and McInteer (1946). In general, where woodland has come in, oaks have been predominant.

Southeastern Evergreen Forest Region

The alluvial forests of the Gulf Coastal plain in extreme western Kentucky are included in this region by Braun (1950). Appropriate detail concerning these forests appears on pp. 68-69.

This concludes a brief survey of the major vegetational regions of Kentucky, past and present. Present conditions are complex and much altered from the original. Further detail appears beyond, as required in discussing the bird life of different parts of the state. The botany of Kentucky is still rather poorly known. For information on the distribution of plant species the reader is referred to the lists of Kentucky plants by McFarland (1942) and Braun (1943). McCoy's list (1938) of ferns may also be consulted.



DISTRIBUTION OF THE BREEDING BIRDS OF KENTUCKY

The problems and pitfalls of faunal analysis will probably never be better stated than they were by Miller (1951:531):

Efforts to develop broad distributional principles and categories commonly run beyond the facts and violate the essentially statistical character of distributional data. There is an urge to create simplified concepts, perhaps unwittingly as paths of least intellectual resistance. These may become lines of escape from exhaustive factual comprehension. Realization of such dangers is helpful to author and reader alike in approaching a treatise of generalized character.

We may acknowledge, to begin with, that we are unable to resolve distributional patterns into a neat system comparable to the periodic table of chemistry, the chromosome map of genetics, or even the imperfect phyletic taxonomy of the systematist. There is no single sequential organization of distributional data. We are confronted with the end results of an array of delicate and complicated equilibria, in which the spatial balance of each species is a phenomenon peculiar to itself because of heritable differences interacting with the influences of many other species and of inorganic factors.

Despite the real hazards stated above, the development of various types of distributional categories has done much to advance our comprehension of the principles governing the distributions of animals.

No extensive analysis seems to have been made of the avifauna of any state or other area of comparable size in the east,¹ although valuable analyses of the avifaunas of very small areas, emphasizing ecological considerations, have been made in the eastern United States in recent decades by Hicks (1933), Saunders (1936), Trautman (1940), Beecher (1942), and others. In the west, on the contrary, Miller (1951) has intensively analyzed the distribution of breeding birds in the large state of California, which in faunal and ecological diversity nearly equals North America east of the Mississippi River. The last-named work, which sets a high standard for faunal analysis, will be mentioned often.

The bird fauna of Kentucky, unlike that of California, is not strikingly variable. It is not broken down into clear-cut subfaunas, or divided among regions characterized by many forms with wholly or partly coincident limits of occurrence. Yet it is by no means uniform throughout the state. Indeed, in a subtle way, it appears to be infinitely variable, and every species seems to behave differently.

This is what a preliminary appraisal of the environment would lead us to expect. The entire state lies within the range of a single forest formation. Climate is rather similar throughout the region. Great elevations are not attained by the mountains, and there is a marked absence of conspicuous physiographic, ecologic, and climatic barriers. We are confronted by that distressing biological phenomenon, a virtual continuum. Nevertheless, there are extensive portions of the state whose bird populations are constantly and perceptibly different from those of other areas, even though the differences are subtle and elusive, and transitions are gradual and perplexing.

Because of the intricacy and subtlety of the distributional patterns before

¹ Since this was written, Robert A. Norris has prepared an analysis somewhat similar to part of the present one, for T. D. Burleigh's *Georgia birds* (Norman, Univ. Oklahoma Press, 1958).

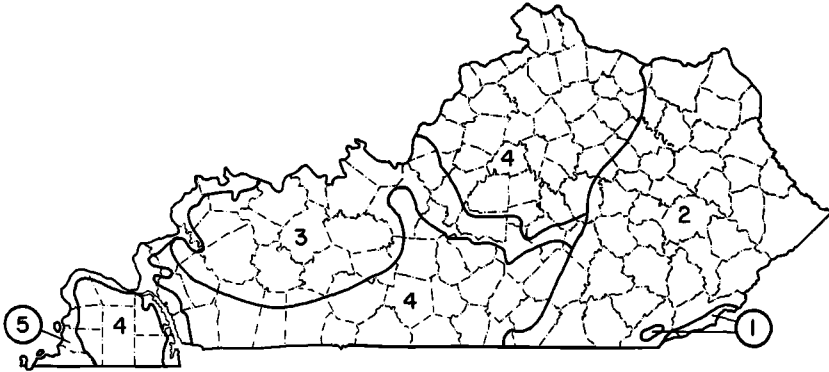


Fig. 5. The avifaunal regions of Kentucky. 1. Cumberland Crest avifaunal region. 2. Cumberland Upland avifaunal region. 3. Western Upland avifaunal region. 4. Limestone Plateau avifaunal region. 5. Alluvial Forest avifaunal region.

us, I have departed from the common procedure of beginning with a classification of the avifauna according to its occurrence in various major biotic zones. These have not been adequately defined and have not been previously subdivided in the area under consideration. As nearly all Kentucky lies within a single biome, a single life-zone, and a single biotic province, the degree of faunal differentiation encountered is bound to be mainly subzonal, interpreted in respect to any of these systems of faunal classification. Birds generally show far from consistent correlation with the limits even of major units in these systems, so it is not surprising that still poorer correlation is shown (or that correlation is shown by fewer species) with the boundaries of minor environmental units such as forest associations.

I have therefore found it expedient to begin with a detailed review of the facts of bird distribution in the state, with particular attention to the associated environmental complexes. Upon completion of this review, I have attempted to relate the discernible patterns of distribution to existing systems of faunal classification and to particular environmental features. It is necessary to begin with certain assumptions which, it is hoped, are justified later.

THE AVIFAUNAL REGIONS OF KENTUCKY

The regional variations in the avifauna of Kentucky may be most readily indicated by division of the state (Fig. 5) into five *avifaunal regions*. The term "region" is meant to represent no specific rank of distinctness in any existing faunal classification. The regions are not equal in rank or distinctness, and certain peculiarities of bird distribution contributing to the distinctness of one may be different in kind from those marking another. The regions may be ranged in a hierarchy according to relationships and degrees of difference, but in the initial descriptions each region is introduced as though equal to the next and explanations of ranking are presented later. The range-limits of many species do not precisely conform with regional boundaries, and formal division or quantitative comparison of divisions often suggests sharper distinctness than actually exists. This weakness applies to all systems of faunal classification.

Criteria for Recognition of Avifaunal Regions

An avifaunal region is defined as an area which will sustain the maximum number of generalizations not applicable to other avifaunal regions, a definition adapted from physiography (see Fenneman, 1938:vi). It is characterized by the general prevalence in similar habitats of a bird fauna of distinctive composition, both in component species and in relative abundance of species.

A distinction should be made between the avifaunal region and the avifauna characteristic of it. An avifaunal region is an area characterized by the prevalence of an avifauna of particular structure. Bird populations of similar structure, however, may occur locally beyond the boundaries of the region. Boundaries of avifaunal regions often must be arbitrarily fixed (for related problems see Dice, 1943:4-5) along lines which cause minimal conflict with known facts. The region is a *geographical unit* rather than a biological unit.

An *avifauna* of particular structure is a *biological unit* and is essentially conceptual. The abstract concept of an avifauna, however, is based upon experience in the field with actual examples thereof, which are concrete. This observation has been borrowed from Braun (1950:11-12), who stated it clearly in writing of the forest association.

Avifaunas may differ in the species of which they are composed, or in the abundance (hence importance) of species shared. Species whose presence (or absence) distinguishes one avifauna or zone from another have often been called "indicators." Such species provide what I have called the *faunal features* of avifaunas or regions. On the other hand, species whose peculiar abundance or rarity distinguishes an avifauna or region provide what I have called *ecological features*. So far as possible the avifaunal regions here recognized have been delimited on the basis of both faunal and ecological features. Although both are important, the first are easier to determine.

The severest difficulty encountered was posed by the scarcity of precise quantitative data concerning population structure. Local students today can perhaps pursue no activity more worthwhile than accurately measuring bird populations in representative habitat types, and the series of breeding bird censuses published for some years in *Audubon Field Notes* is to be commended. Unfortunately, but one such census had been available for any part of Kentucky,¹ and I have been compelled to rely mainly upon impressions and estimates derived from long experience in various parts of the state, often supplemented by observations of others. Six breeding bird censuses made by me in representative forests in eastern Kentucky, while scarcely scratching the surface, have provided me with a valuable yardstick in assessing other areas.

The Problem of Disturbance

The avifauna of a given region is composed of the populations of all of the vegetational stages present. There is a pronounced succession of bird populations in response to vegetational succession; for example (eastern localities) see Hicks (1933), Saunders (1936), Aldrich (1945), and Ken-

¹ *Aud. Field Notes*, 8:375, 1954 (Owen County).

deigh (1948). It was stated by Adams (1908), and the idea was further developed by Kendeigh (1948), that climax and subclimax avian associations, etc., exist within biomes.

Succession as such need not trouble the faunal analyst, but considerable difficulty is introduced by the extensive disturbance of natural habitats, whether climax or successional, by man. Such disturbance not only greatly increases the area occupied by more or less natural successional stages, but it also creates a great array of artificial environments (disclimaxes), some much like the climaxes of other areas and available to species formerly restricted thereto. The slow process of faunal change prevailing under natural conditions is thereby tremendously accelerated.

Many species have expanded their ranges into newly available environments at various rates and with varying success, or have become more numerous through their original ranges due to the increase of favorable habitat (see Odum, 1945:195). Such species may be supposed to have been pre-adapted for the altered conditions (Beecher, 1942:62).

Without question some species have recently occupied much or all of the area under consideration. Some have still not attained sufficient distributional stability so that conclusions can safely be drawn from their present distributions. Newly established species, and those presently expanding their ranges, are of interest, of course, but they are troublesome to the faunal analyst. As man has broken down natural barriers, old and relatively stable biotic groups and zones have shifted or become depleted or swamped; new equilibria and new groups are doubtless becoming established but are in a state of instability which may be rendered permanent by man's interminable activities. Therefore, species of comparatively stable distribution (presumably of long standing) are of special interest, since they may indicate something of conditions naturally prevailing under existing climate and topography. As Beecher put it (1942:61): "It seems apparent that a species in dynamic equilibrium with its present environment has become adjusted to that environment during a period when its plant communities, whether seral or climax, were fairly stable in type." I have emphasized species of the latter type in describing the avifaunal regions, species of changing distribution or recently altered status being discussed at greater length later.

It must, therefore, be kept in mind that many of the most obvious differences between the present-day bird populations of different parts of Kentucky are due to differences in the degree of disturbance of the habitat by man, particularly differential deforestation. These differences are doubtless relatively new and are more conspicuous but no more important than other more subtle differences here emphasized, differences which seem clearly to be inherited from the original avifauna and to represent faunal distinctions established, presumably, in the course of post-Wisconsin times and perhaps even earlier.

For descriptive convenience, in order to distinguish between differences of these two kinds I have used the terms primary and secondary avifaunas. Bird populations believed to be derived with relatively little change from the original populations of the areas concerned have been called *primary avifaunas*, as opposed to *secondary avifaunas* of composition clearly unlike the original. In the lack of adequate historic records, these terms have perforce been applied with reservations. It is obvious, however, that a

primary avifauna is more nearly "climax" than a secondary avifauna. In this region primary avifaunas all belong with the deciduous forest "biociation" of Kendeigh (1948:108), discussed further below. A well-developed secondary avifauna is likely to contain at least some species not present at all in the original avifauna, although this is not necessarily so. Secondary avifaunas in Kentucky are nearly always mixtures consisting (in Kendeigh's terminology) of fragments of the original biociation plus an assortment of "biocies" much increased in area and importance.

Names of the Avifaunal Regions

The five regions recognized are: the *Cumberland Crest avifaunal region*, limited to the Cumberland Mountains above approximately 3,000 feet above sea level; the *Cumberland Upland avifaunal region*, consisting of the lower slopes of the Cumberland Mountains and the entire Cumberland Plateau; the *Western Upland avifaunal region*, including the Knobs and the Western Highlands or Shawnee Section; the *Limestone Plateau avifaunal region*, embracing the Bluegrass, Pennyroyal (or Mississippian Plateau), and the "uplands" of the Purchase; and, finally, the *Alluvial Forest avifaunal region*, confined to the floodplains of the Mississippi and lower Ohio rivers and their major tributaries.

Cumberland Crest Avifaunal Region

Although this is the smallest avifaunal region in the state, it is one of the most distinct and interesting. Restricted to the tops and upper slopes of the highest ridges in Bell, Harlan, and Letcher counties, the region is appropriately called the Cumberland Crest. It is characterized by the presence of a number of species found nowhere else in the state and the absence of other more or less widespread species. It is the only avifaunal region whose distinctness seems to result largely from factors associated with elevation.

The region is arbitrarily defined as that area lying above the 3,000-foot level in the Cumberland Mountains. It is thus restricted to the highest parts of three ridges, Log Mountain, in Bell County (approximately 3,200 feet), Cumberland Mountain, in southeastern Harlan County (3,451 feet), and Black Mountain, in Harlan and Letcher counties (4,150 feet). Its total area amounts to little more than a score of square miles, most of which lie on the upper slopes of Black Mountain in Harlan County. Here, too, the avifauna is best known and probably best developed. In Letcher County, Black Mountain scarcely exceeds 3,200 feet, and the Cumberland Crest avifauna is possibly not perfectly represented there (some characteristic species reported by Lovell, 1950c). Since the vegetation of all of the Cumberlands southwest of Pine Mountain is rather similar (Braun, 1940:240), it may be inferred that the bird faunas of the small, remote tops of Cumberland and Log mountains are much like that of Black Mountain. Several species typical of the Cumberland Crest were collected and observed on Log Mountain in September, 1938 (Wetmore, 1940), but at that time they may have been transients.

The region is heavily forested almost throughout and has undergone comparatively little disturbance. Its avifauna, therefore, is largely primary and nearly devoid of prairie species and recent immigrants, or supposed immigrants, to the state (the Song Sparrow, rare, provides an exception).

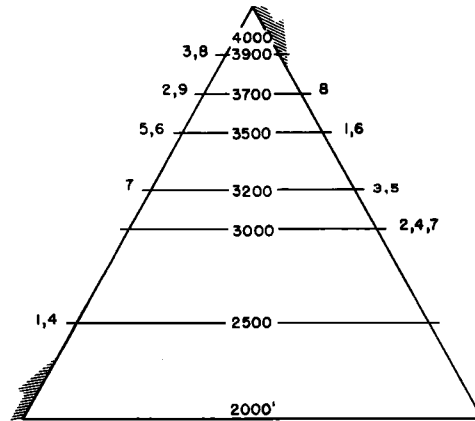


Fig. 6. Approximate upper (left) and lower (right) limits of average occurrence of some southern and northern species, respectively, on Black Mountain, Harlan County. *Left* (southern): 1, Acadian Flycatcher; 2, Tufted Titmouse; 3, Carolina Wren; 4, White-eyed Vireo; 5, Worm-eating Warbler; 6, Cerulean Warbler; 7, Prairie Warbler; 8, Kentucky Warbler; 9, Cardinal. *Right* (northern): 1, Veery; 2, Solitary Vireo; 3, Black-throated Blue Warbler; 4, Blackburnian Warbler; 5, Chestnut-sided Warbler; 6, Canada Warbler; 7, Rose-breasted Grosbeak; 8, Slate-colored Junco.

The forest avifauna of the Cumberland Crest is much like that of the surrounding Cumberland Upland.

Ornithological knowledge of the region.—The birds of Black Mountain, especially its summit, have been rather intensively studied, contributing observers including Howell (1910), Perrygo and others (Wetmore, 1940), Barbour (1941a), Breiding (1947), Lovell (1950, 1950c), and me and associates in 1946, 1951, and 1952 (approximately 42 days in all, May–July).

Faunal features.—The positive faunal distinctness of the region is provided by eight species, and a ninth (the Solitary Vireo) is shared with the Cumberland Upland to such a limited extent that it may also be considered diagnostic of the Cumberland Crest. Common are the forest-inhabiting Veery, Black-throated Blue Warbler, Canada Warbler, Rose-breasted Grosbeak, and Slate-colored Junco, and the Chestnut-sided Warbler of slashings and brushy clearings. The less numerous Blackburnian Warbler inhabits the upper levels of mature forest and forest edge in limited areas; the Golden-winged Warbler is rare, occurring in a few clearings. The common Solitary Vireo, here restricted to the Cumberland Crest, occurs on the upper slopes of nearby Pine Mountain in the adjacent region, where it ranges as low as 1,800 feet in pine-oak consociates.

The aforementioned species do not extend downward to precisely equivalent lower limits (Fig. 6) and their lower limits, in each case, vary somewhat in different areas depending on vegetation, slope exposures, etc. The level of 3,000 feet, however, seems to lie nearest to the average line of greatest faunal change.

Four additional species reported from Black Mountain in summer are the Yellow-bellied Sapsucker, Least Flycatcher, Brown Creeper, and Winter

Wren. I consider evidence for occurrence of the first three unsatisfactory, and although the Winter Wren has been recorded with certainty, I am not convinced that it breeds on the mountain. None of these four species, at any rate, is important in the avifauna.

The above-named 13 species are birds of generally more northern summer distribution, breeding in the southeastern and south-central states chiefly in the Appalachian uplands. The bird fauna therefore resembles that of forests well to the north. Also mainly more northern in distribution, but not diagnostic of the present region, are the Black-throated Green Warbler and Black-billed Cuckoo. The former, in fact, although numerous in the Cumberland Upland, especially near hemlocks, is very rare on Black Mountain, where no hemlocks occur at high elevations; the cuckoo is rare in both regions.

The region is further characterized (see Tables 7-10, beyond) by many deficiencies in comparison with the adjacent Cumberland Upland. Because of the small size of the region, its limited range of habitats, and the fact that it is essentially an arbitrarily delimited part of an altitudinal gradient, many of these negative differences are difficult to refer to such categories—convenient in describing larger regions—as “faunal” and “ecological” features. Correlations with elevation, and perhaps causally related to climate, are hard to distinguish from correlations with subtle changes in habitat, and differential availability of gross habitat types at different levels further complicates the picture. Purely for convenience, therefore, deficiencies of any kind, whether total (negative “faunal features”) or partial (negative “ecological features”—species comparatively rare in the present region) are discussed under the next heading.

Ecological features.—Since the Cumberland Mountains are largely covered by a rather uniform forest, particular attention has been given to forest or forest-opening species. Several such species, common at the bases of the Cumberlands, form a group ordinarily thought of as southern, or “Carolinian.” Some of these occur in progressively smaller numbers to the tops of the mountains, while others drop out at various elevations.

Entirely absent above 3,000 feet, although seemingly suitable habitat is present, are the Acadian Flycatcher and White-eyed Vireo. Barely to poorly represented, likewise (only two or three have been recorded at the very top of Black Mountain), are the Carolina Wren, Blue-gray Gnatcatcher, Worm-eating, Cerulean, Prairie, and Kentucky warblers, Summer Tanager, and Cardinal. Although characterizing the Cumberland Crest avifauna by their scarcity, these species by their very presence endow it with a flavor which distinguishes it at once from truly northern avifaunas, as do several other essentially southern species common over the whole area (Carolina Chickadee, Tufted Titmouse, Yellow-breasted Chat, Hooded Warbler).

The Cumberland Crest, in fact, is a characteristic middle elevation Appalachian avifauna, sharing with others of its kind the complexity and intermingling of northern and southern elements (baffling, to be sure, if interpreted rigidly in terms of the embattled “life-zone” theory) which has evoked considerable comment from Brooks (1940:252-256; 1947), Murray (1940), and others. Here we find Blackburnian Warblers “typical” of boreal spruce-fir singing in giant basswoods and sugar maples directly above the low song-perches of Worm-eating Warblers in the luxuriant under-

growth, while nearby Black-throated Blue (northern mixed forest) and Kentucky (southern deciduous forest) warblers sing within a few feet of each other.

This mixing of "Canadian" and "Carolinian" species, and the "aberrant" habitat preferences of certain northern species, in a middle-elevation Appalachian forest need not surprise us if we consider that in Wisconsin (or even earlier) glacial times many or all of the species now present must have bred in a comparatively limited area, and that many of the niche-preferences displayed with greater or lesser exclusiveness today must have been then in the course of establishment. It may further be supposed that the ancestral homes of the parulids were in deciduous forest, since they are a group of North American origin (Mayr, 1946:21, 33) and are not cold-adapted. It is erroneous to suppose, as Brooks did (1947:295), that the ancestral homes of any of them, except in a comparatively recent sense, were in coniferous forest, a habitat which seems likely to have been exploited by various members of the group only within rather late geologic time. Thus, it should not be startling to find conservative populations of such "coniferous forest" wood warblers as the Blackburnian, Black-throated Blue, and Black-throated Green still occupying large areas of deciduous forest, as they do in much of the southern Appalachians, nor is there reason to suppose (as Brooks did) that this is a recent response to Pleistocene events, cutting of the spruce forest, etc. Never in historic times has there been spruce on Black Mountain, yet Howell found the Blackburnian common there in 1908. It seems more logical to regard the coniferous forest populations of these wood warblers as progressive populations of species not completely committed to this habitat (Mengel, 1964).

Further deficiencies of the region may be determined from Tables 7 to 10, beyond. These deficiencies cannot all be discussed in detail here. As stated above, the small size of the region and other considerations make interpretation difficult and call for much inference. Some species are certainly rare or lacking in the Cumberland Crest because little or no suitable habitat is available, others (probably) because they have rarely or never penetrated to the little available habitat. A few representative examples may be mentioned.

The absence of any but the smallest streams precludes occurrence of the Belted Kingfisher and possibly the Louisiana Waterthrush; the scarcity of suitable banks and road cuts may account for the rarity of the Rough-winged Swallow; the lack of flat, extensively cleared areas for the absence of the Horned Lark; and the virtual lack of pines for the absence of the Pine and Yellow-throated warblers. A rather large number of the species that today are widespread in Kentucky and are characteristic of extensively cleared areas and early successional stages of vegetation are rare or lacking in the Cumberland Crest. Many of these are wide-ranging birds and certainly are hardy enough to endure local climatic conditions. Their rarity or absence in the Cumberland Crest is probably due to (1) a scarcity or lack of suitable ecological niches, or (2) their failure to find the available habitats, which are far from the nearest similar areas. For example, the Mourning Dove, Common Grackle, and Red-winged Blackbird probably are absent, and the Bobwhite, Eastern Meadowlark, and Common Crow probably rare for the first reason. One must suppose that the Mockingbird, Bewick's Wren,

Yellow Warbler, Orchard Oriole, and Bachman's Sparrow (to name five) are absent for the second reason, since seemingly suitable habitat is available and they occur at similar altitudes elsewhere in the Appalachians (in this connection see Odum, 1945:196). Widespread, hardy, open-country and shrub-stage species absent from cleared areas in the Cumberland Crest were probably once lacking from much of forested Kentucky (see also pp. 81-82).

"Interspecific competition," often invoked and rarely demonstrated, may play a part in governing some of the altitudinal distributions on Black Mountain. For example, the Yellow-throated Vireo becomes rare, upwards, as the Solitary Vireo becomes numerous (these two species seem to be mutually exclusive, also, on nearby Pine Mountain); the Chestnut-sided Warbler, likewise, appears approximately where the Prairie Warbler disappears; and as the Kentucky and Worm-eating warblers become scarce, the Canada Warbler, an inhabitant of much the same forest-floor niche, becomes numerous. At upper levels in some areas the Blackburnian replaces the Cerulean and Parula warblers in the forest canopy.

Other species rare or absent in the Cumberland Crest are uncommon even at low elevations on the Cumberland Upland. They may be limited or excluded by ecological factors independent of elevation. Among such species are the Red-shouldered Hawk, Barred Owl, and Red-bellied Woodpecker.

Forest vegetation of the region.—The Cumberland Mountains are clothed with a magnificent, moist deciduous forest which represents the maximum development of the Mixed Mesophytic Forest association (Braun, 1950:50). With the exception of Pine Mountain, which is not included in the Cumberland Crest, forests throughout the Cumberlands are much the same. Braun has described the forests of Black Mountain (1940) and the Cumberlands in general (1942; 1950:49-75) in great detail. For present purposes it is sufficient to state that the most important dominant trees of the Mixed Mesophytic Forest on Black Mountain are *Acer saccharum* (sugar maple), *Tilia heterophylla* (basswood), *Liriodendron tulipifera* (tuliptree), *Castanea dentata* (chestnut; now essentially extirpated by blight), *Fagus grandifolia* (beech), *Aesculus octandra* (sweet buckeye), *Quercus borealis* var. *maxima* = *Q. rubra* of authors (northern red oak), and *Q. alba* (white oak). These trees make up 68 to 76 per cent of the canopy of south-facing slopes and 73 to 93 per cent of other more mesic situations (Braun, 1950:54). There is some altitudinal variation in the distribution of these and other species. White oak and beech tend to become unimportant above 2,000 feet (although beech is again locally important in some situations near 4,000 feet). The sugar maple-basswood-buckeye forest is dominant from 2,000 to 3,000 feet or higher, and sugar maple increases in importance to the crest. Above 3,500 feet basswood and buckeye tend to decrease and birch (*Betula lutea* var. *allegheniensis*) becomes an important dominant. The forest of the Cumberland Upland avifaunal region, therefore, differs slightly in composition from that of lower areas, bearing a somewhat closer resemblance to the "northern hardwoods" type; beech, basswood, and buckeye tend to be scarcer, birch more numerous, and hemlock drops out. There are also differences in the understories of the various associations. *Rhododendron maximum* and *R. catawbiense* are scarce everywhere, occurring only

near rock outcrops, especially along streams. Other heaths tend to be more numerous in beech-chestnut and ("subclimax") oak-chestnut associations on dry ridges. But while the forest of the Cumberland Crest can be shown to differ slightly from that below, the intergradation is subtle and gradual; the forests of upper and lower levels in the Cumberlands, on the whole, are rather similar, and on the average equally mesic. Through most of the area, a deep mantle of mature forest soil prevents much influence of the underlying acidic rocks on forest type. Black locust is a conspicuous tree in disturbed areas at all elevations, especially along the roads, and in the same areas grape (*Vitis* spp.) festoons and chokes the trees in spectacular profusion.

Deforestation and disturbance.—The Cumberland Crest probably has undergone less deforestation than any other area of similar size in the state, although mining activities in recent years have produced some ugly scars on the mountainsides. There are clearings, however, and for several decades (according to local report) one or two small farms were operated at the top of Black Mountain near "The Doubles," its highest point. These farms may have been present at the time of Howell's visit in 1908, judging from some of the species he reported (notably the Chipping Sparrow), but they had been recently abandoned in 1946. The cleared areas are now reverting and are being invaded by a mixture of shrub species, especially heaths, among which the endemic *Rhododendron (Azalea) cumberlandense* Braun is conspicuous. In the face of this succession some of the farmland birds are disappearing; the Bobwhite and Eastern Meadowlark, found in 1939 by Barbour (1941a:46-47), were no longer evident in 1946-1952. No recent observer has reported the Chipping Sparrow.

Typical habitats within the region.—Three distinct habitat types are found on Black Mountain above 3,000 feet. These are (1) the meadows, including those areas reverting from farmland and a few small, natural heath balds (for composition see Braun, 1940:229) much like those in the Great Smoky Mountains. These meadows are dotted with shrubs, and here and there stand small groves of sugar maples and the skeletons of ancient, blight-killed chestnuts. The most numerous and conspicuous birds are Chestnut-sided Warblers, Yellow-breasted Chats, Yellowthroats, Brown Thrashers, American Goldfinches, Indigo Buntings, and Field Sparrows. A few Robins occur, and Sparrow Hawks, Yellow-shafted Flickers, and Eastern Bluebirds nest in holes in the dead trees. (2) Brushy slashings, new forest reproduction, windfalls, and similar openings, including the lanes cleared for telephone lines, and mining disturbances. Especially typical of these areas are Ruffed Grouse, Catbirds, Brown Thrashers, Cedar Waxwings, Chestnut-sided Warblers, American Redstarts, and Rufous-sided Towhees. Some of the forest species, particularly the Canada Warbler, encroach upon these semi-open areas wherever herbaceous vegetation is thick. (3) Mature forest. In many areas, especially on steep slopes, the forest is virtually primeval. In other places it has been more or less extensively cut over, mostly 25 to 50 years ago (some lumbering still in progress in 1952), and the amount of disturbance is variable. Much of the forested area, however, is climax or near-climax mixed mesophytic forest, in which a considerable number of consociations occur with endless variation and intergradation. Detailed understanding of the differences in the bird populations of these

diverse "segregates" will necessitate much further work, and the vegetational mosaic is so complex that this will prove a considerable task. A few general observations may be risked at present. At higher elevations on Black Mountain the most mesic habitats seem to be especially favored by Veeries, Black-throated Blue Warblers, Canada Warblers, and Slate-colored Juncos; the moderately mesic habitats by Ovenbirds, Hooded Warblers, and Blackburnian Warblers; and the least mesic (especially oak-chestnut physiographic climaxes of dry, well-drained ridges), by Great Crested Flycatchers, Eastern Wood Pewees, Solitary Vireos, and Scarlet Tanagers.

In 1951 (July 3, 6, 7) and 1952 (May 21, 23, 26, 31) I counted the singing males (here and in censuses reported beyond using the so-called Williams mapping method; see Kendeigh, 1944:90) of two rather similar, moderately disturbed climax forest areas of 16 and 20 acres, respectively, lying one-half mile apart at elevations of 4,000 and 3,900 feet, near the summit of Big Black Mountain. While sufficient time could not be spent to determine with very great accuracy the number of breeding birds present, I think that the order of abundance of the most important species is close to correct. The two stands censused are decidedly mesic, as is most of the forest of the immediate area. Principal dominant trees, in order of importance, were yellow birch, sugar maple, chestnut (largely fallen, much sprouting), beech, buckeye, black cherry, and basswood. Understory trees consisted of sparse reproduction of the above species, along with considerable flowering dogwood, a few striped maples, sassafras, and other species. A small amount of *Rhododendron catawbiense* grew in the first area. *Rhododendron* (*Azalea*), *Ribes*, *Smilax*, several species of ferns, and a luxuriant herbaceous growth characterized both areas, which were on north- and east-facing slopes, respectively. Some of the small openings in the forest were due to the fall of large chestnuts. Such openings probably account for the presence of Chestnut-sided Warblers, American Redstarts, Catbirds, and Rufous-sided Towhees. The results of censusing (Table 1) were so similar that they were combined. Numbers are therefore based on the average of the two, expressed in terms of males per 100 acres (40 hectares).

The precise totals of only the 12 most numerous species are given in Table 1. However, at least 40 males of 8 additional species, seemingly present in a frequency of at least 1 per 20 acres, were included in the total. Other species (those italicized in the table) were recorded in a density of one-half territory or less per census area. These were not included in the total, but because they and other species actually contribute to the population of any equivalent area so large as 100 acres, they are indicated by the plus sign. Because of the preliminary nature of the censusing, these species of very low density are not listed in order of abundance. Of the more numerous species, although any one might be changed two or even three places in the order of abundance, I think that the general indications of relative abundance are meaningful and that populations in mesic forest on the Cumberland Crest do not vary greatly from that indicated.

However, because of the short duration of the census, the population figures obtained are probably low (this applies also to the results shown in Tables 2 to 5). The indicated density of 193+ males per 100 acres is rather low compared with those of similar regions in adjacent states as reported in breeding bird censuses in *Audubon Field Notes*. Caution must be used

TABLE I

ESTIMATED POPULATION OF SINGING MALES IN MODERATELY DISTURBED CLIMAX MIXED MESOPHYTIC FOREST AT 3,900-4,000 FEET ELEVATION ON BIG BLACK MOUNTAIN, HARLAN COUNTY

Order of abundance	Species	Males per 100 acres
1.	Canada Warbler (N, F)	25
2.	Black-throated Blue Warbler (N, F)	19
3.	Veery (N)	18
4.	Red-eyed Vireo	15
5.	Ovenbird (N)	14
6.	Slate-colored Junco (Y)	12
7.	Hooded Warbler (N)	11
8.	Black-and-white Warbler (N)	10
9.	Rose-breasted Grosbeak (N)	8
10.	Wood Thrush (N)	7
11.	American Redstart (F)	7
12.	Rufous-sided Towhee (N)	7

Notes. Also present: *Ruffed Grouse*, *Yellow-billed Cuckoo*, *Yellow-shafted Flicker*, *Hairy Woodpecker*, *Downy Woodpecker*, *Blue Jay* (N), *Tufted Titmouse*, *Carolina Chickadee*, *White-breasted Nuthatch*, *Catbird*, *Solitary Vireo*, *Chestnut-sided Warbler*, *Scarlet Tanager*. (Species in italics present in low density and not included in totals.)

Total of 12 most numerous species	153
Estimated total of 8 additional species	40 +
Total	193 +

N = nest(s); Y = dependent young; F = family group(s).

in applying results of such censuses to extensive areas, since the populations of small, seemingly similar plots may differ sharply, and even the most exhaustive and careful censuses probably contain considerable error.

After considerable experience in the Appalachians, I think the avifauna of the Cumberlands is comparatively rich and that the density of forest-breeding birds in this area is not greatly exceeded in many climax deciduous forests elsewhere.

Other features of the region.—The remaining vertebrates of Black Mountain have been studied by Barbour, who has reported on the mammals¹ (1941, 1951), reptiles (1950), and amphibia (1953). As do the birds, some of the other vertebrates show distributional peculiarities correlated with elevation. Among mammals of generally more northern distribution, *Sorex cinereus*, *Napaeozapus insignis*, *Clethrionomys gapperi* (*C. g. maurus*, an endemic subspecies), *Peromyscus maniculatus nubiterrae*, and *Sylvilagus transitionalis* are known in Kentucky only from the upper slopes of Black Mountain. Another northern species, *Sorex fumeus*, occurs also on the Cumberland Plateau and near Mammoth Cave. On Black Mountain most of these mammals occur between 2,700 and 4,100 feet, conforming in distribution with the northern element in the bird fauna. According to Barbour (1951:106) certain northern mammals, when taken at lower elevations, were found in "dense forests of beech, birch, and maple. In such areas the forest floor remained quite cool and moist, even in the hottest, dryest part of summer." But "specimens taken above 3900 feet exhibited a much wider

¹ Mammal names throughout follow Miller and Kellogg (*U. S. Natl. Mus., Bull.* 205, 1955).

range of habitats." The same appears to be true of most of the northern birds. Most of the northern mammals listed have disjunct ranges in the southern Appalachians, providing some additional evidence for the widespread belief in a general chilling of the area during periods of Pleistocene glaciation. A number of southern mammals and some of the reptiles are rare or absent at higher elevations in the Cumberlands, again repeating the pattern shown by some bird species.

Northern plants listed from the Cumberland Mountains by Braun (1937:200-201) and McInteer (1940) include *Oxalis montana*, *Trillium undulatum*, *Circaea alpina*, *Luzula saltuensis*, *Streptopus roseus* var. *perspectus*, *Corydalis sempervirens*, *Acer pensylvanicum*, *Rubus canadensis*, and *Sambucus pubens*. In general the more northern plants do not seem so restricted altitudinally as the vertebrates are, and therefore do not conform with the Cumberland Crest as here defined. Some are rare and the distributions of several in the area are poorly known. (For further notes on plants see McInteer, 1944; Braun, 1941, 1941a; Barbour and Barbour, 1950a.)

Remarks on climate.—It takes no special, sensitive apparatus to determine the fact that the Cumberland Crest is cool in relation to surrounding regions. Anyone who has ascended, on a sweltering July day, from Lynch, or Big Stone Gap (Virginia), to the summit of Black Mountain knows this, particularly if he has encountered one of the cold, violent, thunderstorms that sometimes sweep the mountaintop even in midsummer. Detailed, official weather data are lacking, however, and long-term weather data for the entire area are scarce. Observations showing temperature lapse with elevation in the Cumberlands seem to be entirely lacking. However, Barbour (1950:101) has reported the average July temperature at the summit of Black Mountain in 1948 to be 65.9° F. (extremes 90° and 48°) as recorded by him. This is 9.5° lower than the over-all mean July temperature at Middlesboro, Bell County, at the base of Cumberland Mountain (*Climate and Man*, U. S. Yearbook of Agric., 1941, p. 884) and is close to July temperatures reported from central and northern Michigan. The summer of 1948 was comparatively cool throughout Kentucky. Probably the mean July temperature of the Cumberland Crest over a period of years would average slightly higher. The Middlesboro figure given, further, is probably somewhat higher than woodland climate at the same elevation. The lower temperatures of the Cumberland Crest may result in a precipitation-evaporation ratio locally increasing the effectiveness of the regional rainfall (local rainfall, in turn, may be slightly greater). The degree to which this effect may be offset by the increase of evaporation rate with elevation is unknown at present. Even in midsummer the mountain crests are frequently shrouded in clouds and the area above 3,000 feet might almost be called a fog belt. Humidity, absolute moisture, and temperature are all eligible for consideration as factors influencing animal distribution in the area.

Summary.—The avifauna of the Cumberland Crest is more or less typical of forests at middle elevations in the central Appalachians. Deforestation is comparatively slight and birds of early successional stages, especially recent arrivals in the state, are of little importance. Forest birds chiefly characterize the area, which is probably little changed from its original condition. The forest avifauna is largely composed of species widespread in Kentucky or in the Appalachian plateaus, including the Cumberland Upland avi-

faunal region. The Cumberland Crest is a highland division of the latter, distinguished by the presence of a few more northern species and the rarity or absence of a few more southern ones, all of which frequent either forest and forest edge, or small clearings. The general similarity of such habitats throughout the Cumberlands suggests that climatic factors are causes of the marked faunal change occurring between approximately 2,700 and 3,500 feet. Many additional species common in much or all the rest of Kentucky are lacking in the Cumberland Crest, but it is likely that lack of suitable habitats is responsible for the absence of many, while others have not discovered and occupied remote patches of suitable habitat.

The region resembles much of the upland Appalachian forest in the mixing of northern and southern elements which occurs.

Cumberland Upland Avifaunal Region

The entire Cumberland Plateau within Kentucky, the immediately adjacent portions of the Knobs, and the slopes of the Cumberland Mountains below approximately 3,000 feet in elevation are inhabited by a comparatively homogeneous bird fauna. The region characterized by this avifauna may be called the Cumberland Upland avifaunal region.

This region, largely because of its rugged physiography, is today more heavily and extensively forested than any major portion of Kentucky lying to the west, and its bird life is conspicuously different from that of most of the western two-thirds of the state for this reason alone. More or less primary avifaunas are extensive; definitely secondary avifaunas, though widespread in some parts of the region, are not nearly so prominent as to the west. Careful examination of forest remnants to the west suggests also that certain distinct differences in bird life have existed since long before the arrival of the earliest settlers.

The region is marked by the richest forest avifauna in Kentucky, both in numbers of species and numbers of common species. Thus it makes an excellent basis of comparison for the two succeeding regions, whose avifaunas are distinguished by progressive impoverishment in common forest species. Kentucky being essentially a forest state, the forest avifauna is of primary interest and importance. This decrease in the richness of the forest avifauna and remaining biota in three successive regions reveals a natural order of relationship between them, as steps from the humid, populous, Appalachian highland forest regions to the dry, more sparsely populated oak-hickory forested areas bordering the prairies.

Ornithological knowledge of the region.—Until recently, knowledge of the birds of eastern Kentucky (essentially occupied by this region) was comparatively meager. Today, however, the reverse is true; considerable expanses of more western areas are less known ornithologically than the Cumberland Upland. Besides extensive work of my own, 1939–1942, 1946, 1948–1952, particularly in parts of the “Cliff Section,” “Low Hills Belt,” and Cumberland Mountains (see below for definition of these and other terms), numerous papers are available on the birds of various restricted parts of the region. To be mentioned at least are the contributions of Barbour (1950a, 1951a, 1956) on the birds of Rowan County (northern Cliff Section) and Breathitt County (Low Hills Belt), Kozee (1938, 1940, 1944) on the birds of Carter County (northern Low Hills Belt), Patten (1946) on

eastern Madison County (Knobs Border area), and Patten (1937) on the birds of Floyd County (Rugged Eastern area). Also Lovell (1948, 1948*b*), Horsey (1922, 1923, 1927), Howell (1910), Wetmore (1940), and others have reported on birds observed in various parts of the region. Information from nearby states has been supplied for Pickett County (Ganier, 1937*a*) and Van Buren and Bledsoe counties (Ganier and Clebsch, 1940), Tennessee, all on the Cumberland Plateau, and from the Unglaciated Allegheny Plateau of southwestern West Virginia (Seeber and Edeburn, 1952), the avifaunas of these extralimital areas evidently being similar to the Cumberland Upland avifauna as here described.

Faunal features.—Unlike the Cumberland Crest avifaunal region, the present region possesses almost no unique and few distinctive faunal features. The only species unique to the Cumberland Upland is the Red-cockaded Woodpecker, whose peculiar pine forest habitat requirements limit it to a narrow belt along the western edge of the region. Other species distinguishing the region from one or more others here reach either the western or eastern limits of their ranges in Kentucky and are shared with other regions.

Species shared with the Cumberland Crest and here reaching the western (and in a sense "southern," or lower) limits of their ranges are the Black-billed Cuckoo, Solitary Vireo, and Black-throated Green Warbler. The vireo can hardly be said to characterize the region, since it occurs only at elevations of 1,800 to 3,000 feet on Pine Mountain in Bell, Letcher, and doubtless Harlan counties. It is a common species on the Cumberland Crest and may possibly have invaded Pine Mountain only recently, since it is expanding its range elsewhere in the south (Odum, 1948). There is, however, no evidence for such invasion. The Black-billed Cuckoo, rare or at best uncommon, occurs through the whole region, and it is not improbable that it breeds occasionally to the west. This cuckoo and the Black-throated Green Warbler, which occurs throughout the region in variable numbers, are the only species ranging over the whole region which distinguish it positively from more western areas. They, together with the Cedar Waxwing, here nearly at the limits of its range, make up a very weak northern element. Most species of the avifauna are either widespread or generally southern in distribution, the detailed composition of this avifauna being shown in Tables 7 to 10. The Red-cockaded Woodpecker, characteristic of southern pine and pine-oak forests, is here at the northern limit of its range, occurring in more or less isolated outposts of the southeastern pine-oak forest. All of the species so far mentioned are probably representatives of the primary avifauna of the region.

As we have seen, the situation in regard to species reaching their eastern (and some of them, in a sense, their "northern," or upper) limits of distribution in the region is much more complex. Such species, mostly limited at the Cumberland Upland-Cumberland Crest boundary, have been discussed under the latter region and need not be listed again.

A number of other species (Table 9, Groups D, F), some generally more northern or more southern in distribution, and none characteristic of mature forest, either reach only the western edge of the Cumberland Upland or have invaded the region to various extents from that quarter. Probably some of these species have recently expanded their ranges in Kentucky, and

others are still advancing. Under present conditions most of them are either demonstrably or potentially unstable in distribution. Among them, a group of open-country and shrub-stage species of apparently recent arrival in Kentucky, or at least recent expansion within the state, has found a foothold in the Cumberland Upland. The Song Sparrow has occupied the entire region, but apparently not for very long; the House Wren, Short-billed Marsh Wren, Henslow's Sparrow, and possibly the Vesper Sparrow are rare and local. The Dickcissel (a prairie species) and the Chuck-will's-widow (a southern oak-grove and forest-edge species now expanding its range in much of Kentucky) seem to be very recent arrivals in the region. Both, according to my observations, have appeared since 1946, and probably still later, only in western Laurel County. Perhaps significantly, this is the most extensively cleared and altered section in the region. Other species seem at present to be static in distribution. The Brown-headed Cowbird occupies most of the Cumberland Plateau but not the Cumberland Mountains, while the Black Vulture is restricted in the region chiefly to rocky canyons along the western margin of the Cumberland Plateau. The Loggerhead Shrike has not yet been recorded from the region in the breeding season, although I have found it there in fall and winter. Judging from their distributions elsewhere it seems likely that the last two species will eventually occupy the area.

Species barely penetrating the region, of course, virtually provide faunal deficiencies at present, but the enduring significance of these is questionable because of the instability of many open-country and early forest-stage species in the wake of widespread environmental changes affecting the eastern forests. Faunal deficiencies would be of little use in delimiting the western edge of the region; most are provided by aquatic and swamp-forest birds variously lacking, rare, or partially distributed in the two regions adjacent on the west.

Delimitation of the Cumberland Upland on the basis of coincident range-boundaries alone would leave the region rather weakly defined. Yet those range-boundaries which do coincide contribute (as do environmental features) to the selection of quasi-arbitrary limits which are sometimes found best to express the average of other, divergent range-boundaries. The failure of range-limits to coincide perfectly, or even nearly to coincide, is conspicuous through most of Kentucky, and coincidence itself often seems likely to result from different factors in the cases of different species. Other factors remain to be considered, however, which reinforce the definition of the present region.

Ecological features.—Much of the distinctness of the Cumberland Upland results from the high frequency of occurrence throughout, compared with other regions, of 12 species, the American Woodcock, Whip-poor-will, Yellow-throated Vireo, Black-and-white, Worm-eating, Parula, Prairie, and Pine warblers, Ovenbird, Hooded Warbler, American Redstart, and Scarlet Tanager. A few of these species are common, although often only locally, in regions to the west, but in none of these regions are all or even most of them generally common (see Table 8, beyond). The Cumberland Upland is also characterized by the comparative rarity of the Red-bellied Woodpecker, Red-shouldered Hawk, Barred Owl, Blue-winged Warbler, and Cerulean Warbler, which are somewhat to much more numerous in the

three more western regions, and, at present at least, by the abundance of the Broad-winged and Red-tailed hawks and Great Horned Owl. Possibly the last three are of questionable worth in diagnosing the primary fauna, since their present relative abundance here may be the result of differential persecution and deforestation in various regions. This is definitely true of the Ruffed Grouse, today almost restricted to the Cumberland Crest and Cumberland Upland but once widespread.

Here certain forest species, for example the Black-and-white, Worm-eating, Parula, and Hooded warblers, and the Ovenbird, occur both in highly mesic habitats and, to a lesser extent, in relatively xeric situations; in avifaunal regions to the west these species are generally restricted to the most mesic habitats. Conversely, the Great Crested Flycatcher, Eastern Wood Pewee, Wood Thrush, Yellow-throated Vireo, and Scarlet and Summer tanagers here tend to be rather scarce in mesic climax forest, occurring mainly in more xeric subclimaxes, while to the westward they occupy forest habitats generally, or even tend to prefer (Wood Thrush, Yellow-throated Vireo) the more mesic situations.

Although some of the species listed above prefer forest edge, all except the American Woodcock, Blue-winged Warbler, and Prairie Warbler also inhabit mature forest, including various regional and physiographic climaxes. None reaches the absolute limits of its breeding range in Kentucky, and although certain portions of the state appear to lack, or nearly to lack, acceptable habitat for some of them, all may in a sense be considered state-wide in occurrence. The regional abundance of these species is correlated in interesting ways with vegetational types, and will be considered further below. Their presence in varying combinations of abundance in different parts of Kentucky facilitates division of the state into avifaunal regions, and since they are mostly forest species, the forest habitat is of special interest in relation to their distributions.

Forest vegetation of the region.—Throughout the Cumberland Upland mixed mesophytic forest, occurring in varied "segregates," is the climax, the most important dominant species being beech, sugar maple, red maple, tuliptree, white oak, sweet buckeye, chestnut, white basswood, and hemlock. These occur in many combinations with each other and other dominant species. On many ridges characterized by immature soils, physiographic climaxes are important. In these, pine, pine-oak, oak-hickory, and oak-chestnut types are found, among the most important species being pitch, shortleaf, and Virginia pine, scarlet and chestnut oak, and (formerly) chestnut. Disturbed and secondary forests of the region are extremely varied, and sometimes resemble physiographic climaxes. Extensively disturbed and cleared areas are characterized by various intolerant species, including elms, ashes, oaks, honey locust, black locust, and pawpaw, the trees of these areas being much like those of similar situations in other parts of the state, although poor in species, such as red cedar, restricted mainly to calcareous soils. Permanently disturbed localities along streams support trees typical of such sites, including sycamore, river birch, cottonwood, and various willows. The richness of the regional avifauna is probably due to the variety of niches provided by the diversity of vegetation. This, however, is not uniform throughout the region.

Variations within the region.—While the Cumberland Upland avifauna

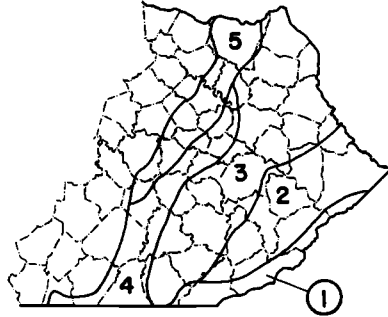


Fig. 7. Approximate boundaries, according to Braun (1950), of five forest areas of eastern Kentucky related to physiography: 1, Cumberland Mountains; 2, Rugged Eastern Area; 3, Low Hills Belt; 4, Cliff Section; 5, Knobs Border Area.

is comparatively homogeneous, it displays variations in different areas, and the variation is correlated with differences in the environment. Physical features of the region are related to differences in the forest habitat with resultant variations in the primary avifauna, and to more conspicuous variations in the amount and nature of disturbance, with consequently variable development of secondary avifaunas.

Braun's classification (1950:87-88) of the Cumberland Plateau into four forest areas related to physiography is useful in the description and interpretation of bird distribution. She divided the plateau (Fig. 7) into: (1) a "Rugged Eastern area," just below and northeast of the Cumberland Mountains, and marked by maturely dissected topography of considerable relief largely covered with mesophytic forest; (2) a "Low Hills Belt" of gentler relief and somewhat higher percentage of oak-hickory in the original forest (now removed in some areas); (3) a "Cliff Section," physiographically the Pottsville escarpment, on or near the western edge of the Plateau and characterized by rugged, submaturely dissected surface and diverse, largely mesophytic forest resembling that of the Cumberland Mountains; and (4) a "Knobs Border area" based on outcropping Mississippian rocks just below and west of the Cliff Section. Faunally the last is ecotonal in nature; it is discussed under the next region. To these areas, for present purposes, may be added all of the Cumberland Mountains except the small area above 3,000 feet included in the Cumberland Crest. The lower slopes of the Cumberlands are characterized by high local relief and diverse climax and subclimax forests.

An interesting feature of bird distribution in eastern Kentucky is the marked similarity of the avifauna of the lower Cumberlands, especially Pine Mountain, near the eastern edge of the region, to that of the western edge of the Cumberland Plateau. These areas comprise a large part of the region and are of particular interest because their rugged physiography has permitted the persistence of conditions approximating the original over a considerable area. Their complex avifaunas serve as a convenient basis of comparison for the simpler ones of the more extensively disturbed areas intervening, the Low Hills Belt and Rugged Eastern area.

The similarity of the forests of the two areas has been emphasized by

Braun (1937, 1950). This similarity reflects physiographical and geological similarities, both areas having extensive outcropping of resistant Pottsville sandstones and conglomerates. When uplifted and tilted, as in the Cumberlands, or deeply dissected by down-cutting, rejuvenated streams, as in the Cliff Section, these resistant strata form prominent cliffs, canyons, and narrow ravines. There are many slopes of every pitch and direction of exposure. Mature melanized soils develop on some slopes, which support luxuriant mesophytic forests varying in composition with pitch, exposure, and other factors, while pine-oak, pine, oak-hickory, and oak-chestnut subclimaxes (here physiographic climaxes) occur on ridge-tops, cliff edges, and other sites where soils remain shallow and immature. The result in both areas is the presence within comparatively narrow limits of a varied mosaic of vegetation and a correspondingly rich and diverse bird fauna (16 forest types of 4 major communities were recognized on Pine Mountain by Braun, 1935a:563). For further detail on the vegetation see Braun, as follows: 1935a, Pine Mountain; 1950:49-75, Cumberlands in general; 1950:97-118, Cliff Section; 1937:197-200, floral similarities of Cumberlands and Cliff Section. Certain plants of the Cliff Section belong to a Coastal Plain element regarded by Braun (1937a) as a relict population representing the vegetation of an earlier (Schooley) peneplain.

The Cliff Section is best developed along the three forks of the Red River (Kentucky River drainage) in Powell, Wolfe, and Menifee counties, along parts of the upper Kentucky, near the Rockcastle River in Rockcastle, Laurel, and Pulaski counties, along the Cumberland River in Whitley County, and on the Big South Fork of the Cumberland in McCreary and Wayne counties. Almost the whole section is included within the Cumberland National Forest (approximately 450,000 acres), extending from the Tennessee line northeast to southern Lewis County. Wilder and better preserved areas in the Cumberland Mountains are scattered along the several mountain ridges, readily accessible areas lying in Bell County (Pine Mountain State Park), on parts of Black Mountain, and on Pine Mountain above Whitesburg, in Letcher County. A fine primitive area lies near the Breaks of the Sandy River (Russell Fork) in Pike County, where a water gap 1,400 feet deep cuts through the northernmost extension of Pine Mountain.

These are rugged regions, among the most beautiful in Kentucky. Some of the larger, remote cliffs harbor—or did into the 1950's, anyway—possibly the only regularly breeding Peregrine Falcons in the state, and there is evidence that Common Ravens occurred until recently (Mengel, 1949). The black bear and other large mammals found their last strongholds in such areas (bears and white-tailed deer have been reintroduced) and the bobcat is still fairly numerous in some places.

Physiographic and edaphic factors in the Cliff Section have resulted in a tendency toward stratification of communities, the most xeric (pine, pine-oak, oak-hickory, oak-chestnut) occupying the warmer, drier, sandy ridge-tops and promontories, and the mesic forests occurring on the cool, moist slopes below. The most mesic associations are found on steep north slopes and in narrow, well-shaded ravines. Braun's description (1950:102) is appropriate:

The contrast between the dry pine or oak forest of the plateau and the forest of the slopes below the cliffs (over which one can look from the edge of

the plateau above) is extreme. Every such slope, unless at some time completely cleared, is occupied by mesophytic forest. Mixed mesophytic forest occupies all except extreme situations, its composition varying with slope exposure. Hemlock is the dominant tree in the narrowest gorges and reentrant angles where streams drop from the plateau above and on north-facing talus slopes, if these are composed mostly of large sandstone fragments. In such places, *Rhododendron* often forms impenetrable thickets. Hemlock also occurs as a dominant with white oak and beech in ravines opening widely to the south, thus suggesting the white oak-beech-hemlock and hemlock-white oak segregates of the Cumberland Mountains. Beech is the dominant tree of the gradually sloping valley floor, which develops as soon as the gorge widens or the stream emerges from between the bordering cliffs. As in the Cumberland Mountains, white oak and beech are most abundant on many southerly slopes; while the more representative mixed mesophytic forest communities occupy the more mesic slopes. Few virgin areas remain, although much of the forest of slopes in deep valleys and gorges is in part primary. Inaccessibility delayed, but did not prevent, the logging of these rich forests.

Herbaceous growth is profuse in some of the mixed mesophytic associations, very sparse beneath hemlock where thick mor humus excludes most species. Various heaths are prominent in the understorey of the plateau forests on the ridges and near the edges of the cliffs. According to Braun (1950:100-102):

[These are] usually *Kalmia latifolia*, *Gaylussacia baccata*, and *Vaccinium vacillans* (with *Epigaea* and *Gaultheria* underneath), but in some areas the box huckleberry (*Gaylussacia brachycera*) is the dominant shrub. Pines (*P. rigida*, *P. virginiana*, and, sometimes, *P. echinata*) grow nearly at the cliff margin; scarlet oak and chestnut oak (*Q. coccinea* and *Q. montana*) often mingle with the pines. Instead of this pine-heath or pine-oak-heath community, some of the promontories are occupied by open pine woods (the three species of pine) with a grassy layer of *Andropogon scoparius*, *A. glomeratus*, and *Sorghastrum nutans*, in which are a few scattered forbs. Fires have modified most (perhaps all) of these pine summits, although the abundance of large *Cladonia* mats is an indication that there has been no fire for many years. The pine and pine-oak of the plateau margin are stable communities which can be considered as physiographic climaxes. Reduction of the sandstone margin of the cliff is infinitely slow.

Often, when cliffs do not intervene between ridge-top and ravine floor, there is a gradual transition from pine-oak-heath communities to mixed mesophytic (and sometimes rhododendron-hemlock) communities. In traversing such series one sometimes passes through a fairly clear-cut succession of heaths, in the shrub layer, from *Gaylussacia-Vaccinium* to *Kalmia* to *Rhododendron*.

In the Cliff Section the most characteristic birds of xeric upland forests are perhaps the Eastern Wood Pewee, Pine Warbler, Prairie Warbler, Yellow-throated Warbler (here an inhabitant of pines, shunning streamside sycamores in the valleys), Scarlet Tanager, Rufous-sided Towhee, and Chipping Sparrow. Many other forest and forest-edge species occur with fairly high frequency, especially wherever slightly more mesic elements are mixed with pine-oak, as is very common. Wood Thrushes, Yellow-throated Vireos, Ovenbirds, and Summer Tanagers are particularly numerous in the ecotones between relatively xeric and more mesic habitats, the Ovenbird especially in "*Kalmia* belts." Ruffed Grouse are also fond of these areas, immediately

taking refuge, when flushed, in the dense mesic forests below the cliffs. South of Wolfe County, wherever pine is very extensive the Red-cockaded Woodpecker occurs, sometimes in moderate numbers.

Particularly characteristic of mixed mesophytic associations of slopes and ravines in the Cliff Section are the Black-and-white, Worm-eating, Parula, Hooded, and Kentucky warblers. Most of these species occur also at the edges of less mesic habitats, but caution must be observed in noting habitat preferences because breeding birds of the mesic forest beneath cliffs often use song perches at the edge of the xeric forest immediately overhead.

Many more species are common in both xeric and mesic habitats, and throughout the region clearings and brushy areas are occupied by such ubiquitous southern forms as Cardinals, Yellow-breasted Chats, and White-eyed Vireos. American Redstarts are common in willows and sycamores along streams in the more open valleys, with Yellow Warblers and sometimes Parulas.

In the Cumberland Mountains the clear-cut stratification of xeric and mesic communities found in the Cliff Section tends to break down, these habitats being everywhere complexly distributed and interrelated according to local conditions of soil, geologic structure, and exposure. Thus, while the whole avifauna is very similar to that of the Cliff Section, it tends to be more complex and diverse at any given point.

Only four forest or forest-edge species of the Cumberland Upland appear not to be common to the Cliff Section and the Cumberland Mountains. These are the Red-cockaded Woodpecker of the piney uplands in the Cliff Section (pine stands, while frequent, are much more restricted in extent in the Cumberlands), the Chuck-will's-widow, which has only recently invaded the Cliff Section from the west, the Solitary Vireo of Pine Mountain, and the Swainson's Warbler, in the Appalachians an inhabitant of mesic forests, particularly hemlock-rhododendron associates. The latter species occurs on Pine Mountain in Pike County and the lower slopes of Black Mountain in Harlan County (and perhaps elsewhere in the Cumberlands), but is unrecorded, despite much search, from the whole Cumberland Plateau (far to the west it occurs in the Alluvial Forest avifaunal region).

In 1951 and 1952 I made censuses of the breeding birds (singing males) in selected tracts on Pine Mountain, in Pike County, and in both mesic and xeric habitats in the Cliff Section, in Laurel County southwest of London. These counts (Tables 2 to 5) give an idea of certain typical forest bird populations in the areas.

Pine Mountain. Censused June 23-26, 1951. Plot of approximately 25 acres (shape irregular, maximum dimensions 500 × 300 yards), elevation near 2,200 feet. Long axis of plot along a low ridge oriented nearly north-south. Plot covered with mixed mesophytic forest and a few small subclimax pine-oak stands. Forest mainly secondary, approaching maturity in some places, disturbed by fire and lumbering within past few decades. Crown cover almost continuous, many large, old trees standing. Ravines contained much hemlock and rhododendron, and little streams bordered in places by small, open glades containing sphagnum and sedges. A few large beeches near the streams. Forest of slopes consisted of sugar and red maple and tuliptree, some of it fine, with understory largely of *Kalmia*, containing also holly, flowering dogwood, and magnolia. Ridge-top supported mixed

TABLE 2

ESTIMATED POPULATION OF SINGING MALES IN MODERATELY DISTURBED MIXED MESOPHYTIC FOREST AT 2,200 FEET AT THE NORTHERN END OF PINE MOUNTAIN, PIKE COUNTY¹

Order of abundance	Species	Males per 100 acres
1.	Hooded Warbler	24
2.	Worm-eating Warbler (F)	22
3.	Red-eyed Vireo	20
4.	Kentucky Warbler (Y)	12
5.	Tufted Titmouse	10
6.	Black-and-white Warbler	10
7.	Carolina Chickadee	8
8.	Cardinal	8
9.	Rufous-sided Towhee	8
10.	Yellow-shafted Flicker	6
11.	Ovenbird	6
12.	Scarlet Tanager	6
13.	Swainson's Warbler	6
14.	Yellow-billed Cuckoo	6

Notes. Also present: *Ruffed Grouse* (F), *American Woodcock*, Whip-poor-will, Ruby-throated Hummingbird, Downy Woodpecker, Hairy Woodpecker, Great Crested Flycatcher, Blue Jay, White-breasted Nuthatch, Carolina Wren, Yellow-throated Vireo, Summer Tanager, *American Goldfinch*. (Species in italics present in low density and not included in totals.)

Total of 14 most numerous species	152
Estimated total of 10 additional species	40 +
Total	192 +

F = family group(s); Y = dependent young

¹ Virtually on Dickenson County, Virginia, line.

growth of several species of oaks, hickories, and chestnut, with a few Virginia and pitch pines. A few very large white pines, some dead, on the slopes. Results of the count are shown in Table 2.

The population indicated in Table 2 contains a rather high proportion of brush- and clearing-inhabiting species, revealing the disturbed nature of the area. The indicated population of Ovenbirds seems low for forests of this type in the immediate vicinity. More mesic and less disturbed slopes nearby were inhabited by many Black-and-white, Parula, and Black-throated Green warblers, as well as many Hooded, Worm-eating, and Kentucky warblers. So far as the five or six most numerous species are concerned, I think the census is reasonably accurate and fairly representative of the vicinity.

The following counts were made in the Cliff Section of the Cumberland Plateau.

Mature ridge forest, rather open, on gentle slope of approximately 10° facing south, elevation about 1,200 feet, 15 miles southwest of London, Laurel County, Cumberland National Forest near Bald Rock Lookout. Area of 20 acres (irregular in outline, maximum dimensions 450 × 200 yards) covered with open forest of rather large pines (*Pinus echinata*, some *P. rigida*), several species of red oaks (mainly *Quercus coccinea*) and a few white oaks, with oak reproduction in open understory. Forest floor with moderate growth of *Gaylussacia* and *Vaccinium*; some encroachment of *Kal-*

TABLE 3

ESTIMATED POPULATION OF SINGING MALES IN PINE-OAK RIDGE FOREST (WITH MESOPHYTIC INTRUSIONS) AT 1,200 FEET ELEVATION IN WESTERN LAUREL COUNTY

Order of abundance	Species	Males per 100 acres
1.	Pine Warbler (F)	28
2.	Red-eyed Vireo (old N)	25
3.	*Ovenbird	20
4.	Prairie Warbler (N, F)	15
5.	*Hooded Warbler (3N)	12
6.	Tufted Titmouse	10
7.	Great Crested Flycatcher (N)	10
8.	Yellow-billed Cuckoo (N)	10
9.	Cardinal	10
10.	Chipping Sparrow (F)	10

Notes. Also present: *Ruffed Grouse* (F), *Whip-poor-will*, Ruby-throated Hummingbird, *Red-bellied Woodpecker*, *Hairy Woodpecker*, Downy Woodpecker, *Red-cockaded Woodpecker*, Eastern Wood Pewee (N), Blue Jay, Carolina Chickadee, White-breasted Nuthatch, Carolina Wren, Brown Thrasher, *Robin*, Wood Thrush (N), Blue-gray Gnatcatcher, Yellow-throated Vireo, Black-and-white Warbler, * Worm-eating Warbler, * Black-throated Green Warbler, * Yellow-throated Warbler, *Brown-headed Cowbird*, Scarlet Tanager, Summer Tanager, *American Goldfinch*, Rufous-sided Towhee. (Species in italics present in low density and not included in totals.)

Total of 10 most numerous species	150
Estimated total of 18 additional species	90 +
Total	240 +

N = nest; Y = young; F = family group(s)

* Not typical of pine-oak ridge forest; numbers present probably due to mesophytic intrusions.

mia along lower (downhill) margin. Two small ravines heading in lower edge of area occupied by mesophytic growth including red maples and tulip-trees, with sparse growth of rhododendron in one. A few persimmons and hickories among the pines and oaks. Counts made June 11, 12, 14, 15, 23, 1952. Results are shown in Table 3.

While the count described in Table 3 does not give a perfectly representative picture of the bird population of pine-oak forest in the Cliff Section, because of mesic elements present on part of the census plot, it does give an idea of the bird life of many ridge and upper slope habitats in the vicinity, few of which are devoid of mesic elements over an area so large as 20 acres. Comparison of this census with the next, made in mesophytic forest, is revealing.

"Cove forest." Climax mixed mesophytic growth in deep canyon opening to the west on Rockcastle River (here now an arm of the newly impounded Cumberland Lake), 19 miles southwest of London, Laurel County. Forest not virgin, but little disturbed. The canyon is approximately 350 yards long and 150 yards wide, nearly all but its upper end being included in an irregularly shaped census plot of approximately 10 acres. Since the walls of the gorge formed the boundaries not only of the plot on two sides but also of the habitat, it is felt that the results are more than usually accurate for a plot of this small size. A small stream (Rock Creek) enters the canyon by a waterfall at its head. The forest of this gorge has been described in detail by Braun (1950:107-108, and Table 15, column B). Large hemlocks,

TABLE 4

ESTIMATED POPULATION OF SINGING MALES IN HEMLOCK-TULIP-RED MAPLE MIXED MESOPHYTIC "COVE" FOREST AT 900 FEET ELEVATION IN WESTERN LAUREL COUNTY

Order of abundance	Species	Males per 100 acres
1.	Red-eyed Vireo	35
2.	Kentucky Warbler	30
3.	Hooded Warbler (F)	30
4.	Acadian Flycatcher	20
5.	Carolina Wren	20
6.	Parula Warbler	20
7.	Black-throated Green Warbler	20
8.	*Pileated Woodpecker (F)	10
9.	Eastern Phoebe (old N)	10
10.	Tufted Titmouse	10
11.	Yellow-throated Vireo	10
12.	Black-and-white Warbler	10
13.	Worm-eating Warbler (F)	10

Notes. Also present (but not definitely resident in area and not included in totals): Yellow-billed Cuckoo, Cardinal (along cleared river bank).

Total of 13 most numerous species 235
Total 235 +

N = nest; F = family group(s)

* The figure of 10 males per 100 acres is undoubtedly high for this species.

tuliptrees, and red maples comprise 75 per cent of the canopy, in which 9 additional species occur (beech, red oak, black birch, holly, chestnut, sour gum, chestnut oak, sourwood, and big-leaf magnolia). *Rhododendron maximum* is important in the understory. There is comparatively little herbaceous growth. This typical ravine forest was censused June 25, July 1, and July 2, 1952 (Table 4).

Table 4 gives a good idea of the population of a small, richly forested "cove" in this vicinity. All species definitely present in the area studied were represented by 1, 2, or 3 males, except for the Red-eyed Vireo with 3.5 (territories). It is obvious that the breakdown into four sharply distinct orders of abundance is probably not significant on the basis of such a small sample. However, experience shows that the 13 species tabulated, with the possible exception of the Tufted Titmouse and Yellow-throated Vireo, are all common inhabitants of gorges and ravines throughout the Cliff Section. Compared with the open, xeric, upland forest (*cf.* Table 3), which has many species, all but a few of which tend to occur in small numbers, the rich, dense, mesophytic forests of ravines and slopes have fewer species, most of them numerous. On Pine Mountain, however (see Table 2), and in other parts of the Cumberlands where xeric and mesic habitats tend to be mixed, a heterogeneous bird population is often found.

Between the Cliff Section and the Cumberland Mountains is a fairly wide band of variable terrain. Here the strong sandstones are buried and dissection of the weak shales overlying them is relatively mature. Of this area Braun has written (1950:87):

The Rugged Eastern area, lying immediately to the west of the Cumberland Mountains . . . is a maturely dissected area of strong relief. Most of the slopes

are covered with mixed mesophytic forest. Adjacent to this is the Low Hills Belt, an area of low relief and relatively gentle slopes. It is an irregular band extending from southern Kentucky (where it is very narrow) northeastward . . . and is widest in southeastern Ohio and adjacent Kentucky Here, there was a larger proportion of oak in the original mixed forest, and much of the second growth strongly suggests oak-hickory forest.

The central area differs from the Cliff Section and the lower Cumberlands in that the most xeric associations (pine, pine-oak, etc.), characteristic of sandstone outcrop, are restricted in area and frequency, and in the scarcity of deep gorges and entrenched streams (with a resultant decrease in hemlock and rhododendron). The forest avifauna is therefore generally less complex than those just discussed and certain species of restricted habitats are much less general, notably the pine-inhabiting Yellow-throated and Pine warblers, and the Black-throated Green Warbler with its fondness for hemlock.

Particularly in the Rugged Eastern area, however, and to a lesser extent in the Low Hills Belt, such typical Cumberland Upland birds as the Scarlet Tanager, Yellow-throated Vireo, Ovenbird, Worm-eating, Hooded, and Parula warblers, and American Redstart are more or less common. All of these species are numerous on many forest slopes of Leslie, Perry, Knott, Breathitt, Floyd, and Pike counties.

In parts of Laurel and Whitley counties, in the southern part of the "Low Hills Belt," are broad flats drained by sluggish streams of the old peneplane surface. The forests in marshy and swampy areas of these flats are suggestive of swamp forests farther west, although lacking in some characteristic species. They consist largely of red maple, sweet gum, pin oak, and beech (in drier places) with alder and swamp herbs in patches in the more open areas (Braun, 1950:93). The Barred Owl, Red-shouldered Hawk, Red-headed and Red-bellied woodpeckers are much more numerous in these swampy flats than elsewhere on the Cumberland Plateau. In such an area just south of London, American Woodcocks are common in an alder marsh (recently drained and largely destroyed) and Henslow's Sparrows may have bred at least once in an adjacent wet meadow.

In the northeast the Low Hills Belt lacks swampy areas and is rolling, with a largely secondary forest of oak-hickory type, beech and white oak being important in primary stands. Carter, Greenup, Boyd, and Lawrence counties display this type of habitat (for forests see Braun, 1950:93-96). The several reports of Kozee (1938, 1940, 1944) from Carter County suggest the presence there of a poorly preserved Cumberland Upland woodland fauna (Black-and-white Warbler, Worm-eating Warbler, Ovenbird, Hooded Warbler, Scarlet Tanager, etc.). In the south, despite considerable deforestation, the Low Hills Belt shows certain similarities to other parts of the region. The Parula Warbler and American Redstart are often numerous along streams and on mesic slopes, and the Hooded Warbler occurs in all but the driest woodlands. Even second-growth oak-hickory in this region possesses a Cumberland Upland flavor in its avifauna. Such an area, in Levi Jackson State Park just south of London, Laurel County, was censused on June 27, June 29, and July 2, 1952.

Plot of 20 acres (approximately 450 × 200 yards) on rather level upland at 1,100 feet elevation. One corner of area included a gentle, east-facing slope. This and a small, shallow ravine near the opposite end of the plot

TABLE 5

ESTIMATED POPULATION OF SINGING MALES IN OAK-HICKORY FOREST (WITH SMALL, MODERATELY MESIC INTRUSIONS) ON LEVEL UPLAND AT 1,100 FEET ELEVATION IN WESTERN LAUREL COUNTY

Order of abundance	Species	Males per 100 acres
1.	Wood Thrush (N)	20
2.	Cardinal	15
3.	Tufted Titmouse (F)	13
4.	Yellow-billed Cuckoo	10
5.	*Acadian Flycatcher	10
6.	Eastern Wood Pewee	10
7.	Carolina Chickadee (F)	10
8.	Ovenbird	10
9.	Yellow-throated Vireo	8
10.	Summer Tanager (N)	8
11.	Rufous-sided Towhee	8

Notes. Also present: *Great Horned Owl*, *Barred Owl*, *Pileated Woodpecker* (old N, F), *Yellow-shafted Flicker*, *Red-bellied Woodpecker*, *Downy Woodpecker*, *Great Crested Flycatcher*, *Blue Jay* (F), *Common Crow*, *White-breasted Nuthatch*, *Carolina Wren*, *Brown Thrasher* (N), *Robin*, *White-eyed Vireo* (old N, edge), *Red-eyed Vireo*, *Black-throated Green Warbler*,* *Scarlet Tanager*. (Species in italics present in low density and not counted in totals.)

Total of 11 most numerous species	122
Estimated total of 12 additional species	60 +
Total	182 +

N = nest; F = family group(s)

* Not typical of oak-hickory forest in this area. The Acadian Flycatchers were noted in the red maples along the little ravines.

were moist underfoot and deeply shaded by red maples. Plot covered with mature second-growth forest mainly of red oaks (spp.), smaller numbers of white oaks, two or more species of hickory, and a few black cherry and persimmon trees. Stand rather open, some flowering dogwood in understory. Moderate small reproduction of crown species and almost no middle-sized reproduction, suggesting either grazing or periodic burning some decades ago (likely in view of history of immediate area). Herbaceous growth scant. Readily classifiable as oak-hickory type. Results of count shown in Table 5.

The absence of the Hooded Warbler from this oak-hickory stand may be due to the open nature of the forest floor. Although this population resembles those of similar forests farther west, the presence of the Yellow-throated Vireo, Black-throated Green Warbler (rare in oak-hickory on the Cumberland Upland), Ovenbird, and Scarlet Tanager is enough to mark the population as a Cumberland Upland avian association. The presence of this combination in a relatively xeric subclimax is especially significant; farther west those combinations most resembling the Cumberland Upland are to be sought only in the most mesic of available habitats.

Deforestation and disturbance.—Although removal and alteration of forests has been less severe in the Cumberland Mountains and Plateau than to the west and bird life of this region has undergone comparatively lesser modification, man has still effected important changes. Many secondary

forests in various stages of succession are occupied by birds of edge habitats and open subclimaxes, in places where the original populations must have been those of mature mesophytic forest. Complete deforestation, in other places, with the change to pasture lands and cultivated fields, has wrought still greater changes and permitted encroachment of open-country avifaunas into a country where these must have been lacking. The amount of deforestation in different parts of the region is directly related to physical variations.

Although the soils of the Cumberland Mountains and Plateau (Muskingum, Wellston, and Tilsit series, mainly loams) are derived from sandstones and shales and tend when submature to be somewhat acid, they are fairly well suited to agriculture if systematically fertilized (Karraker, 1950:4-5). Since the Low Hills Belt possesses the least rugged terrain in the region, deforestation has here been most extensive, especially in the southern portion in parts of Laurel, Whitley, and Knox counties.

Near London, Laurel County, Corbin and Williamsburg in Whitley County, and Barboursville, Knox County, the aspect of some of the farmland is much like that in parts of the Bluegrass and Pennyroyal, with a bird fauna virtually indistinguishable from that of farmland-woodlot areas in avifaunal regions to the west. Unlike the narrow, widely scattered clearings of the Cumberland Crest and parts of the Cliff Section and Cumberland Mountains of the present region, the open farmlands of these cleared areas are occupied by all of the widespread Kentucky species characteristic of open, cultivated areas. Grasshopper Sparrows, Eastern Meadowlarks, and Horned Larks occur in the meadows and pastures, Red-winged Blackbirds in the wetter areas, Mockingbirds and Common Grackles in groves of shade trees, and Bachman's Sparrows at the edges of old fields. Here the Dickcissel and Chuck-will's-widow have recently appeared, evidently having hurdled the forests of the Cliff Section which isolate these areas from the nearest populations to the west.

Also in the Low Hills Belt the Henslow's Sparrow and Short-billed Marsh Wren, both presumably recent invaders from the north, have been found, the latter as long ago as 1908 (Howell, 1910:297). The Song Sparrow, evidently a recent invader in all or most of its range in Kentucky, was not noted by Howell at several points in the region (as far north as Breathitt County) in 1908 and 1909. Colonizing presumably via stream valleys, the species now occurs throughout the region in shrubby environments but is still much more numerous along streams and in areas largely cleared of forest.

Other features of the region.—The remaining vertebrates are yet rather poorly known, here and throughout Kentucky. Papers on the mammals are available for Black Mountain, Harlan County (Barbour, 1951), Rowan County and vicinity (Welter and Sollberger, 1939), and Breathitt County (Hamilton, 1930). (See also miscellaneous contributions of Barbour, 1952a, and Barbour and Gault, 1953.) The reptiles and amphibia of Black Mountain were discussed by Barbour (1950, 1953, respectively), those of Rowan County by Welter and Carr (1939), and miscellaneous notes contributed by Welter and Barbour (1940) and Barbour (1950c, 1950d).

From the little evidence now available it seems likely that Brewer's mole (*Parascalops breweri*) is rare in and restricted to the present region, and

the smoky shrew (*Sorex fumeus*) and Allegheny cave-rat (*Neotoma magister*), although occurring in the Shawnee Section, are here most numerous and generally distributed. The meadow vole (*Microtus pennsylvanicus*) displays a similar distribution, tending to be replaced westward by *Pedomys ochrogaster*. All of these are species either of northern or Appalachian affinities. Among mammals of western affinities, the prairie vole (*Pedomys ochrogaster ohionensis*) occurs at least in the northern part of the region (Barbour, 1952a), being perhaps a recent invader. So far as known, the prairie deer mouse (*Peromyscus maniculatus bairdii*) does not enter the region although it occurs not far to the west (Barbour and Gault, 1953).

The chorus frog (*Pseudacris brachyphona*), common also in the Shawnee Section (Hibbard, 1936:279) is otherwise replaced in the west by *P. nigrita triseriata* (Barbour, 1950c:759). Certain salamanders, among them *Plethodon cinereus* and *P. richmondi*, common at Morehead (Welter and Barbour, 1940) were not reported from the Mammoth Cave area (Shawnee Section) in the Western Upland by Bailey (1933) or Hibbard (1936). The present region is entirely occupied by an endemic salamander, *Desmognathus fuscus welteri* Barbour (Barbour, 1950d). The salamander *Aneides aeneus* occurs, as do several locally distributed plants, both at Pine Mountain and in the Cliff Section as far north as Rowan County (Welter and Barbour, 1940).

Differences between the flora of the region and those to the west (*i.e.*, between the Mixed Mesophytic and Western Mesophytic forest regions) have been listed by Braun (1950:123-124) and McInteer (1947). Many plants reach or nearly reach the limits of their ranges at the western edge of the Cumberland Upland; others occur with decreasing frequency in the similar acidic soils of the Knobs and Shawnee Section of the Western Upland avifaunal region. Yet other plants, characteristic of calcareous soils and numerous in much or all of the Limestone Plateau avifaunal region (Bluegrass, Pennyroyal, etc.), are rare and local or lacking on the Cumberland Upland. The following, abbreviated list, of important woody plants only, has been abstracted from Braun's list (1943) of Kentucky spermatophytes.

Absent or very rare west of present region: *Pinus echinata* (shortleaf pine), *P. rigida* (pitch pine), *Betula lenta* (sweet birch), *B. lutea* (yellow birch; replaced in Western Upland by *B. lutea* var. *macrolepis*), *Acer pennsylvanicum* (striped maple), and the heaths *Clethra acuminata* (mountain sweet pepperbush), *Rhododendron maximum* (rhododendron, great laurel), *R. catawbiense* (purple rhododendron), *Rhododendron* (*Azalea*), several spp., *Epigaea repens* (trailing arbutus), *Gaultheria procumbens* (wintergreen), *Gaylussacia brachycera* (box huckleberry), and *G. baccata* (huckleberry).

Of similar distribution but represented by populations of various extent and importance, perhaps relict, in the Western Upland (Knobs and/or Shawnee Section) are: *Pinus strobus* (white pine), *Tsuga canadensis* (hemlock), *Quercus montana* (chestnut oak), *Magnolia acuminata* (cucumber tree), *M. macrophylla* (big-leaf magnolia), and *M. tripetala* (umbrella tree), and the heaths *Kalmia latifolia* (mountain laurel), *Oxydendrum arboreum* (sourwood), and *Vaccinium* (blueberry, several spp.; mostly decreasing westward).

The following important constituents of the Mixed Mesophytic Forest climax become rarer and more local westward, being generally least numer-

ous in the limestone soils areas: *Fagus grandifolia* (beech), *Acer saccharum* (sugar maple, largely replaced westward by *A. saccharum* var. *nigrum*—black maple), *Aesculus octandra* (sweet buckeye), and *Tilia heterophylla* (white basswood). Other species of the last two genera are somewhat more numerous west of the Cumberland Upland, decreasing eastward.

Rare and local in the Cumberland Upland are several species typical of limestone (calcareous) soils, among them: *Juniperus virginiana* (red cedar), an important tree of dry slopes and barrens to the westward, *Quercus muhlenbergii* (chinquapin oak), replacing *Q. montana* on limestone soils, *Rhamnus caroliniana* (Carolina buckthorn), and *Viburnum rufidulum* (southern blackhaw).

The flora of the Cumberland Upland is rather rich in Appalachian elements, these occurring in decidedly lesser frequency to the westward. "Examples could be multiplied indefinitely which illustrate the distinctness of the boundary" (Braun, 1950:124) between the Mixed and Western mesophytic forest regions, and hence between the Cumberland Upland and avifaunal regions to the west.

Summary.—The diverse deciduous forest habitats of the Cumberland Upland are occupied by a rich, complex avifauna. This is an avifauna typical of lower elevations in the Appalachians, and distinguished from middle elevation Appalachian avifaunas, such as that of the Cumberland Crest, at comparable latitudes by the absence or near-absence of nine generally more northern species (see p. 28) and the abundance of several typically southern species, especially the Acadian Flycatcher, Blue-gray Gnatcatcher, Carolina Wren, White-eyed Vireo, Worm-eating, Prairie, and Kentucky warblers, Summer Tanager, and Cardinal.

The Cumberland Upland is distinguished from more western regions by a weak northern element (Black-billed Cuckoo and Black-throated Green Warbler). The region is unique in the presence of the southern Red-cockaded Woodpecker.

Ecologically, the forests and forest clearings of the region are characterized by the rather uniform abundance of 12 species, compared with areas to the west, and the comparative scarcity of 4 or 5 more (pp. 38–39).

Through most of the region the forest component is still by far the most important in the avifauna. Fairly extensive portions of the region, however, have been much altered or entirely cleared. The secondary avifauna in these areas has not yet attained stability, but in the most extensively cleared areas it seems well on its way to becoming inseparable from the avifaunas of other agricultural areas in Kentucky.

Both floristic and faunistic features ally the Cumberland Upland with the Appalachians and mark it as subtly but definitely distinct from more western regions. While the summer climate of the Cumberland Plateau averages a little cooler, with a trifle more rainfall (Figs. 2 and 3), than that of areas to the west, no abrupt change in climate occurs at the boundary of the region. While some species reaching their range-limits within or at the edge of the region may be directly limited by climatic factors, it seems likely that the biotic distinctness of the region is due to many factors, among which physiography, soils, microclimates, vegetation types, and geographic position are all probably of some importance.

Western Upland Avifaunal Region

While the Cumberland Upland avifaunal region has a typical Appalachian avifauna, the present region is marked by an impoverished Appalachian avifauna. The bird life of the Western Upland, therefore, while not so rich as that of the Cumberland Upland, is more similar to it than to that of the remaining regions, being distinguished from it mainly by deficiencies, including the decrease in numbers of several species.

Included within the region is the hilly belt encircling the Bluegrass and known as the Knobs (with small, well-forested adjacent areas belonging to the cuesta called Muldraugh's Hill), and the entire upland area of western Kentucky based on sandstones (the Shawnee Section). The low, hilly area called "Between the Rivers" (Cumberland, Tennessee) has been arbitrarily placed with the next region, although it is intermediate, containing faunal elements from immediately adjacent habitats of the Western Upland, Limestone Plateau, and Alluvial Forest.

The Knobs are important in providing a narrow but continuous corridor of relatively uniform conditions connecting the extensive western portions of the region with the Cumberland Plateau, which these wooded hills adjoin in their eastern portion. Although different in geological age and structure, the Knobs and the Shawnee Section are rather similar in their relatively rugged surface, bedrock (sandstones, shales), and derived soils. Except for the area "Between the Rivers," the region coincides with the Kentucky portion of the Hill Section of Braun's Western Mesophytic Forest region and is characterized by mixed mesophytic climaxes and various physiographic and edaphic climaxes much like those of the Cumberland Plateau but poorer in species and in frequency of well-developed mesophytic communities.

Ornithological knowledge of the region.—The Western Upland is not so well known throughout as the Cumberland Upland. In the Shawnee Section, especially near Mammoth Cave, considerable work has been done by Wilson (1940*c*, 1946, 1947, 1947*b*, 1950, 1958, and other notes), F. M. Bailey (1933), and Hibbard (notes). Bacon (mainly unpublished notes) and Hancock have long studied the birds of Hopkins County, to the west, and the latter has published a series of useful short contributions culminated by his valuable "The breeding birds of Hopkins County" (Hancock, 1954). The Knobs are less well known, but Lovell's study (1949*b*) of the birds of Otter Creek, Meade County (on Muldraugh's Hill, just south of the Knobs proper) is applicable, and the papers of Beckham (1885) and Blincoe (1925) on Nelson County are partly applicable to the Knobs. From 1937 to 1941 Monroe and I periodically investigated parts of the Knobs in Bullitt and southern Jefferson counties, and Monroe and others have continued occasional field work in this area, especially at the well-forested Bernheim reservation near Shepherdsville. I have made brief reconnaissance of the Mammoth Cave area and Hopkins County, where I was fortunate to go over parts of the area with Hancock.

Faunal features.—The region possesses no positive faunal distinctions of note. A few species of currently unstable distribution, such as the Short-billed Marsh Wren (probably), Henslow's Sparrow, and Song Sparrow do not now occur in the part of the adjacent Limestone Plateau south and west of the region. Likewise the Cedar Waxwing, which is here rare and irregu-

lar, does not seem to occur to the south as a breeding bird. The region is distinct from the Cumberland Upland in lacking the Black-throated Green Warbler and (probably) the Black-billed Cuckoo. Other faunal deficiencies are provided, in relation to the Limestone Plateau, by open-country species barely established in the northernmost part (Bluegrass) of that region, and in relation to the Alluvial Forest by species requiring extensive aquatic habitats and restricted to that region. A few other species of the Alluvial Forest occur, or in some cases perhaps formerly occurred, in bottomland woods of the western part of the present region, which is transitional in nature. For structure of the avifauna in detail, and deficiencies, see Tables 7 to 10.

Ecological features.—The region is distinguished chiefly by ecological features, especially the relative abundance of the American Woodcock, Whip-poor-will, Yellow-throated Vireo, Black-and-white, Worm-eating, Parula, Prairie, Pine, and Hooded warblers, Ovenbird, American Redstart, and Scarlet Tanager. Most of these species are less numerous and less generally distributed than in the Cumberland Upland, but all are somewhat to much more numerous and general than in the Limestone Plateau avifaunal region. While in the Cumberland Upland these species (discounting the Pine and Prairie warblers, everywhere characteristic of xeric habitat types) not only occupy variously mesic habitats, but also encroach upon or even occur typically (Yellow-throated Vireo, Scarlet Tanager), in habitats there relatively xeric, in the present region they tend to be most numerous in or even restricted sharply to relatively mesic environments, and these in turn are less frequent and extensive. This tendency reaches its extreme in the Limestone Plateau. The Broad-winged and Red-tailed hawks and Great Horned Owl are also more numerous than in the Limestone Plateau, but this may be due to the scarcity of extensive forest remnants in the latter. The Red-shouldered Hawk, Barred Owl, Red-bellied Woodpecker, and Cerulean Warbler are nearly or quite as common as in the Limestone Plateau and more numerous than in the Cumberland Upland. The region is thus intermediate in many ways between the Cumberland Upland and Limestone Plateau and, at its western end, between the former and the Alluvial Forest. The Yellow-throated Warbler, in the Cumberland Upland an inhabitant of pine, here occurs in the sycamores of stream valleys, ignoring available pine stands so far as known.

Forest vegetation of the region.—Braun has described the forests of the Knobs (1950:136–141) and Shawnee Section (1950:146–151). Of the former she wrote (pp. 136–138):

A wide variety of topographic situations and unlike soils in the Knobs afford habitats ranging from the most mesophytic of deep ravines and lower sheltered slopes to the most xerophytic of shaly knobs, sandy ridge crests, and limestone ledges. Extensive mixed mesophytic forest communities occupy (or originally occupied) the more favorable sites. Oak, oak-hickory, and oak-chestnut communities occupy many of the drier slopes and uplands; while mesophytic uplands sometimes support a chestnut-beech-tuliptree type. An oak-tuliptree type is represented on areas of low relief. Pine woods (*P. virginiana*), more extensive in secondary than in primary growth, cover many of the dry and barren Devonian shale slopes. In the driest situations where limestone outcrops, xerophytic red cedar communities and occasional typical prairie patches interrupt the deciduous forest cover.

The vegetation of the Knobs, in contrast with that of the Bluegrass, suggests that of the Appalachian Plateau. Many of its plants are Appalachian species, and essentially absent from the Bluegrass, as for example, *Pinus virginiana*, *Quercus montana*, *Castanea dentata*, *Oxydendrum arboreum*, *Vaccinium vacillans*, *V. stamineum*, *V. arboreum*, and *Gillenia stipulata*. . . .

Some of the outlying relics of mixed mesophytic forest contain its characteristic trees, *Tilia heterophylla* and *Aesculus octandra*, and its wealth of herbaceous plants

Of the Shawnee Section, especially near its out-facing Dripping Springs escarpment, Braun wrote (1950:146-147):

Secondary oak or oak-hickory forest prevails on the rolling plateau, and there is evidence, from remnants of original vegetation, and from statements in early surveys, of the dominance of oaks in much of the original forest. Locally, there were flat areas known as "post-oak glades" (Ky. Geol. Surv., vol. III, p. 402, 1857). However, beech occurs on most ravine slopes, accentuating the transitional status of the region. On some of the better soils, the original forest contained beech, tuliptree and sugar maple, as well as oaks, hickories and other trees.

Mesophytic forests, at least some of which are best classified as mixed mesophytic, characterize mesic slopes of the rugged bordering belt. Where streams cut gorges in the Pottsville sandstone, hemlock is locally abundant, and with it may be associated a number of Appalachian and mixed mesophytic forest species, including white pine, yellow birch (*Betula lutea* var. *macrolepis*), beech, oaks (*Q. alba*, *Q. montana*), chestnut, shellbark hickory, butternut, mulberry, tuliptree, magnolia (*Magnolia macrophylla*, *M. tripetala*), red maple, sugar maple, holly (*Ilex opaca*), sour gum, sourwood (*Oxydendrum*), and white ash. *Kalmia* is conspicuous in the undergrowth. That this is a disjunct community is evident. In aspect and floristic composition it resembles communities of gorges of the Cliff Section at the western margin of the Mixed Mesophytic Forest region. *Silene rotundifolia*, *Heuchera parviflora* var. *Rugellii*, and *Thalictrum clavatum* on the sandstone cliffs accentuate the similarity. *Rhododendron maximum*, common in such situations at the edge of the Appalachian Plateau, is lacking here.¹

Ravine slopes and the deep soil of talus accumulations in both sandstone and limestone areas of this rugged belt are occupied by mixed mesophytic forest. As is general throughout this region, beech usually is the most abundant species, while sugar maple (and/or black maple), tuliptree, white ash, red oak and white oak are its principal associates. Where a valley floor has developed in ravines, sweet gum and sycamore may be present, and butternut more abundant than on the slopes. Such mesophytic forests contrast strongly with the upper slope and plateau forests where oaks and hickories, or oaks and tuliptree are dominant.

In the western parts of the Shawnee Section the forests become particularly complex in their relationships, as do the avifaunas inhabiting them. Upland woods of this relatively low and level portion of the region are largely occupied by oak-hickory forest, with more mesic associations in the ravines; both of these tend to merge gradually with bottomland forests closely related to the Mississippi alluvial forests and here treated as marginal portions of the Alluvial Forest avifaunal region. Braun has described such forests briefly (1950:150), as they occur within the Hill Section, but further discussion of the Alluvial Forest will be deferred.

¹ For additional floral deficiencies see pp. 50-51.

TABLE 6

APPROXIMATE ABUNDANCE OF 17 FOREST SPECIES IN VARIOUS PARTS OF THE WESTERN UPLAND AVIFAUNAL REGION AND IN THE TRANSITIONAL KNOBS BORDER AREA OF THE CUMBERLAND UPLAND AVIFAUNAL REGION

Species	Area				
	A	B	C	D	E
Red-shouldered Hawk	U	R	?	R	FC*
Barred Owl	FC	FC	FC	FC	FC*
Whip-poor-will	C	C	C	C	C
Red-bellied Woodpecker	R	FC	FC	C	C
Cedar Waxwing		R	R	VR	R
Yellow-throated Vireo	C	U	U	C	U
Black-and-white Warbler	C	R	FC	C	R
Worm-eating Warbler	C	R	R	FC	R
Parula Warbler				R	R*
Black-throated Green Warbler	U				
Cerulean Warbler	C	FC	FC	C	FC*
Prairie Warbler	FC	FC	FC	FC	FC
Pine Warbler	FC	VR		VR	
Ovenbird	C	VR		C	R
Hooded Warbler	C	R	FC	C	R*
American Redstart	C			C	R*
Scarlet Tanager	C	R	R	C	R

C = common; FC = fairly common; U = uncommon; R = rare; VR = very rare

AREAS:

- A. Knobs and adjacent Cumberland Plateau (Knobs Border area), 5 miles southeast of Berea, Madison County (Cumberland Upland avifaunal region).
- B. Western portion of Knobs in Bullitt and southern Jefferson counties.
- C. Otter Creek, Meade County, on Muldraugh's Hill just south of western portion of the Knobs.
- D. Mammoth Cave area, rugged portion of Shawnee Section.
- E. Hopkins County.

* These species here occur in mesic forest of river bottoms, as in the Alluvial Forest avifaunal region, rather than in upland mesophytic forest. This is clearly a transitional area.

Variations within the region.—It may here be emphasized that that portion of the Knobs immediately adjacent to the Cumberland Plateau, although transitional in the nature of its avifauna, seems best placed with the Cumberland Upland avifaunal region. I have studied parts of this area, especially in western Powell and eastern Clark counties, and Patten (1946) has reported on observations made in the Knobs of Madison County at the edge of the plateau. This is the area, partly belonging to the Cumberland Plateau proper (Mississippian outcrops, largely limestones) and partly to the Knobs (Devonian outcrops, largely shales), recognized by Braun as the Knobs Border area, a part of the Mixed Mesophytic Forest region (Braun, 1950:118-121). Like the bird life, the forests of this area are transitional in nature. Hemlock and rhododendron are scarce in mesic situations, and the vegetational units based on limestones differ somewhat from those on acidic rocks.

Table 6, based on various sources listed above, shows the approximate abundance of certain forest species in the avifaunas of several parts of the Western Upland, included for comparison being the Madison County area (transitional Cumberland Upland) studied by Patten (1946). I have used

local observers' estimates of abundance except in a few cases where personal experience indicated modification. Patten reported his data in terms of total numbers of birds recorded in trips made in June, 1941, and in birds seen per day (an average for each species based on the number of days the species was seen). Even though the data are incomplete, I have supplied terms of abundance for the species in the column of Table 6 based on his work, my judgments being assisted by experience in nearby areas. Most species of Table 6 are listed under "ecological features" of the region and characterize the Western Upland.

Table 6 serves fairly well to illustrate what all other evidence taken together tends to indicate: (1) that the Knobs in their eastern portion adjacent to the Cumberland Plateau are occupied by a bird fauna best placed with that of the Cumberland Upland. The presence of the Black-throated Green Warbler and the relative abundance, especially, of the Yellow-throated Vireo, Black-and-white Warbler, Worm-eating Warbler, Ovenbird, Hooded Warbler, American Redstart, and Scarlet Tanager all mark this as a Cumberland Upland avifauna, while the apparent absence (or rarity?) of the Cedar Waxwing and Parula Warbler, the relative abundance of the Cerulean Warbler, and the presence in the area also (not shown in table) of the Chuck-will's-widow, Black Vulture, and other species of westerly distribution reported by Patten (1946) emphasizes the intermediate nature of the avifauna. (2) That the Western Upland avifauna is richest (*i.e.*, most like that of the Cumberland Upland) in the Mammoth Cave area (compare columns A and D), where the flora and fauna suggest their counterparts on the Cumberland Plateau. It can hardly be doubted that the biota of the Mammoth Cave area is relict, preserved by favorable topography, and related to that of the Cumberland Plateau. (3) That the westernmost portion of the region (column E) is poorly defined, as might be expected since it is remote from the Cumberland Upland, low in relief, and infiltrated by broad lowlands directly connected with the Mississippi alluvial plain. Here several species of mesic environmental preferences (Parula Warbler, Hooded Warbler, American Redstart) are more or less restricted to floodplain forests, suggesting their status in the Alluvial Forest avifaunal region, to which in fact these bottomlands may tentatively be referred. The presence of the Ovenbird and Worm-eating Warbler, however, is indication of the affinity of the area in its upland portions with the rest of the region and with the Cumberland Upland.

Deforestation and disturbance.—Deforestation has been much less extensive in this region than on the Limestone Plateau. It has been greatest in the northern and western parts of the Shawnee Section, where topography is more level, and least in the Knobs and rugged southern parts of the Shawnee Section. According to Sauer (1927, Fig. 75), in the 1920's nearly 50 per cent of the "Western Coal Basin" (= Shawnee Section) and close to 75 per cent of the Knobs were occupied by "land not in farms," "woodland in farms," and "unimproved farmland." Locally, in the Shawnee Section, coal mining by the stripping or open-pit method has been important in the destruction of forest habitat. According to Merz (1949:23): "[In 1947 and 1948] 7,267 acres had been mined for coal by the open-pit method. Approximately 75 percent of the stripped area was in the Western Coal Field [most of the rest on Cumberland Plateau], and 52 percent was in Hopkins County."

As a result of disturbance, secondary avifaunas are characteristic of much of the region, being more prevalent and generally better developed than in the Cumberland Upland, but not nearly so important as on the Limestone Plateau. The Black Vulture, Chuck-will's-widow, Loggerhead Shrike, and Dickcissel, which are absent or barely represented in the Cumberland Upland, have become well established and have long been present in parts of the region. Successional replacement of secondary avifaunas, however, is taking place in some parts of the region now reverting to forest, as at Otter Creek in Meade County (Lovell, 1946*b*) and more extensively in Mammoth Cave National Park (Wilson, 1950). In the latter area the Whip-poor-will is increasing at the expense of the Chuck-will's-widow, the converse of the situation in much of Kentucky. Although more or less modified in most areas, essentially primary avifaunas still occupy much of the region.

Other features of the region.—The amphibia and reptiles of the Mammoth Cave area have been studied briefly by V. Bailey (1933) and Hibbard (1936), and the mammals by the former author (*op. cit.*). Barbour and Barbour (1950) have reported on a few mammals from Hart County. Similarities of the mammalian fauna of this area with that of the Cumberland Plateau have already been mentioned (p. 50). The variety of salamanders in the region provides further evidence of its relationship with the Appalachian plateaus, as do some floristic features listed earlier (p. 50).

Summary.—The Western Upland is chiefly distinguishable as a homogeneous avifaunal region by the status of a group of deciduous forest species, especially the Whip-poor-will, Yellow-throated Vireo, Black-and-white, Worm-eating, Parula, and Hooded warblers, Ovenbird, American Redstart, and Scarlet Tanager. Given forest habitat referable to the regional climax or most nearly resembling it, we find these species less numerous and more restricted in distribution than in the Cumberland Upland, and decidedly more general in distribution than on the Limestone Plateau.

The region lacks the northern species of the Cumberland Upland (Black-billed Cuckoo, Black-throated Green Warbler), while the southern Red-bellied Woodpecker and Cerulean Warbler are here more numerous than on the Cumberland Upland. Also more numerous are the lowland forest-loving Red-shouldered Hawk and Barred Owl.

The region is a diluted counterpart of the Cumberland Upland, with similar physiography and aspect but with lesser relief and less rugged topography. Preserved by physiographic influences against currently adverse climatic conditions, its fauna and flora are Appalachian in affinity but impoverished in species and in the numbers of certain species. Historically the region appears to be relict; ecologically it is ecotonal.

Limestone Plateau Avifaunal Region

This region consists of two distinct areas. The northern portion (Blue-grass) is separated from the southern (Pennyroyal, etc.) by the narrow band of the Knobs, of the Western Upland avifaunal region. Although separate, the two parts of the region are similar in many ways, based mainly on calcareous rocks, gentle in relief, moderate in elevation, and largely cleared and devoted to agriculture.

Because of extensive deforestation and the high degree of disturbance, frequently by grazing, of the little remaining forest, the region today is

conspicuously different from its neighbors. It is an area of rolling, carefully tended farmlands, interspersed with woodlots and traversed here and there by wooded stream valleys. Adjoining regions on all sides are more primitive and more heavily forested.

The present conspicuous dissimilarities between the bird life of the Limestone Plateau and that of more extensively forested regions adjacent are due to the prevalence in the former of secondary avifaunas. These are composed of those species of early successional stages of the original forest which were able to adapt to and increase in radically changed conditions, and of open-country and forest-edge species which have probably or certainly invaded the region since clearing of the land. These dissimilarities are essentially quantitative rather than qualitative. In similar but smaller cleared agricultural areas in the Cumberland Upland and Western Upland avifaunal regions we find similar secondary avifaunas.

Because of the scarcity here of well-preserved forest remnants it is impossible to determine certainly the differences between the primary avifaunas of this and adjacent regions. The records of early naturalists are inadequate for use in this connection. However, study of bird populations of the most mature secondary forests in the region indicates the probability of a considerable difference between the original avifaunas of this and other regions. Botanical evidence suggests that the original forests were quite distinct, as might be expected because of the pronounced edaphic distinctness of the region.

Ornithological knowledge of the region.—This is fairly extensive. In addition to scattered materials, there are the published lists of Beckham (1883, 1885) for Nelson County and Blincoe (1925) in the same area (outer Bluegrass), Van Arsdall (1949) for Mercer County (inner Bluegrass), Wilson (1922) for Warren County (Pennyroyal), and Wilson (1923c) for Calloway County (Purchase). The Purchase was studied also by Pindar (1887a, 1889b, 1925a), whose work applies in part to this region and partly to the Alluvial Forest. Monroe and I have worked for years in Jefferson and Oldham counties, in the outer Bluegrass (see also Stamm, Shackleton, and Slack, 1953), and I have investigated many parts of the region, especially from 1948 to 1952. More recently, Lovell, Stamm, and Pierce (1955) have studied breeding birds in Owen County.

Faunal features.—The region possesses no positive faunal features characterizing it as a whole. In the north it is occupied by the Vesper Sparrow, known nowhere else in the state as a breeding bird, but recorded in the Bluegrass as far south as Mercer County. The species was reported years ago from one or two localities in other regions, but no one has been able to confirm these records. Possibly the Vesper Sparrow is unstable in distribution, being here at the southern boundary of its range. This may be true also of the Upland Plover and Traill's Flycatcher, two more species recorded breeding (very rarely) only in the Bluegrass. Certainly the Henslow's Sparrow, which has only recently appeared in the state as a breeding bird, is most numerous in parts of the Bluegrass as, also, is the Short-billed Marsh Wren.

Like those of the Western Upland and Alluvial Forest, the forests of the present region completely lack the Black-throated Green Warbler, and probably also the Black-billed Cuckoo. The Cedar Waxwing, fairly com-

mon in the northern part of the Bluegrass, is rare in the southern Bluegrass and seems to be lacking from those portions of the Limestone Plateau south and west of the Knobs.

Ecological features.—The conspicuous ecological distinctions of the Limestone Plateau resulting from extensive deforestation and agriculture have already been mentioned. Other ecological features distinguish the remaining forest avifauna of the region and help to give an idea of original conditions. These features are mainly negative and are provided by a group of forest species already mentioned several times. This group includes the Whip-poor-will, Yellow-throated Vireo, Black-and-white Warbler, Worm-eating Warbler, Parula Warbler, Pine Warbler, Ovenbird, Hooded Warbler, American Redstart, and Scarlet Tanager, and the American Woodcock and Prairie Warbler of earlier successional stages. Even in the best-developed remaining forests of the region these species range from uncommon to very rare, and one or two (Parula Warbler, Pine Warbler) are virtually lacking. The Parula may be absent because of the lack of suitable lichens for construction of nests, but this argument is weak since the species is common in parts of the Alluvial Forest where no such lichens occur, and usnea is hardly profuse anywhere in Kentucky. The Pine Warbler is closely restricted to edaphic situations permitting the growth of the various "yellow" pines furnishing its highly circumscribed breeding niche. The distributions of the remaining species are harder to explain and are of greater interest. The fact that all of them occur in the forests of the region, but only rarely, suggests sharp localization of habitats suited to their requirements. Perhaps significantly, most are restricted in this area to the most mesic situations available, occurring in low frequency even in these. At the same time, even the most mesic situations are here inhabited by Wood Thrushes, Great Crested Flycatchers, Eastern Wood Pewees, and other species which farther east (in the Mixed Mesophytic Forest region) tend to be restricted to or most numerous in relative xeric "subclimax" associations.

A few of the species mentioned may once have been more numerous in the region, especially the Parula Warbler (old records from the Bluegrass) and Whip-poor-will (which seems to have been largely replaced by the Chuck-will's-widow). There is no reason to doubt that most of them were more numerous when the area was largely covered by primary forest. There is also, however, considerable reason to suppose, from observation of their habitat preferences, that they were never so common here as in either the Cumberland Upland or Western Upland. It is difficult to say whether this is also true of the Great Horned Owl and the Sharp-shinned, Red-tailed, and Broad-winged hawks, which today are rare or absent in most of the region. How much the scarcity of these birds is due to habitat destruction and persecution is uncertain.

A few species are more common here than in the two regions previously treated, and may always have been so. These are the Red-shouldered Hawk, Barred Owl, Red-bellied Woodpecker, and the Cerulean Warbler, which seems to find ideal habitat in the best forests of the Limestone Plateau.

Forest vegetation of the region.—Together with the Western Upland, the Limestone Plateau is entirely included within the Western Mesophytic Forest region, which in turn is more or less coextensive with the Interior Low Plateau of physiography. The forests west of the Cumberland Plateau

are varied, but they have features in common which separate the region as a whole from the Mixed Mesophytic Forest region to the east. They are decidedly transitional, from mesophytic to xerophytic, an oak-hickory type climax becoming more and more prevalent towards the west. Although both the Western Upland and Limestone Plateau belong in the Western Mesophytic Forest region, the forests of the Western Upland are much more like those of the Mixed Mesophytic Forest region than are (or were) those of the Limestone Plateau.

For a picture of original forest conditions, constructed with great pains and, especially for the intensively cultivated Bluegrass, with considerable difficulty, see Braun (1950) as follows: Bluegrass (1950:125-131), Mississippian Plateau, or Pennyroyal (151-152, 153-157), and Mississippi Embayment, or Purchase (157-161).

Braun wrote (1950:128): "That the Bluegrass was originally a forest region appears evident. That it was unlike any existing forest is also evident." This forest was evidently rather open in large areas, consisting of such trees as *Quercus macrocarpa* (bur oak), *Q. muhlenbergii* (chinquapin oak), *Q. alba* (white oak), *Fraxinus quadrangulata* (blue ash), *F. americana* (white ash), *Celtis occidentalis* (hackberry), *Acer saccharum* (sugar maple), *Juglans nigra* (walnut), *Prunus serotina* (black cherry), *Gleditsia triacanthos* (honey locust), *Gymnocladus dioicus* (Kentucky coffee tree), *Carya ovata* (shellbark hickory), *Ulmus americanus* (American elm), *Aesculus glabra* (Ohio buckeye), *Morus rubra* (mulberry), *Fagus grandifolia* (beech; lacking in inner Bluegrass), *Liriodendron tulipifera* (tulip-tree), and a few others (note absence of chestnut). Among North American deciduous forests this was evidently unique in possessing luxuriant growths of cane (*Arundinaria gigantea*) in the understory, which was also unusual in being rich in showy flowers, "wild rye" (*Elymus* sp.?), and "clover" (*Amphicarpa?*), all suggesting an open form of forest (Braun, 1950:128).

Except for the absence of beech in the former, the forests of the inner and outer Bluegrass were evidently very similar. The Eden Shale belt differed somewhat, being occupied mainly by an oak-hickory type. According to Braun (1950:129): "It seems evident that there were several more or less distinct forest communities. One . . . composed of bur oak, blue ash, sugar maple, honey locust, walnut, and some additional species, appears to have occupied the 'cane land.' Remnants of this community, without any cane, can still be seen." Further (*op. cit.*:130): "A forest in which beech, tulip-tree, sugar maple, white oak, and red oak were most abundant, originally occupied much of the more rolling topography near the periphery."

Large trees once part of the original forest still stand in the meadows of most of the region, and a few forest remnants, practically all in the outer Bluegrass and Eden Shales belt, give some idea of original conditions. Two of these were measured by Braun (1950:130-131). The first, in Grant County (outer Bluegrass), supported mixed slope forest. Its composition (per cent of canopy occupied by most important species: beech, 22.2; white oak, 16.2; sugar maple, 15.0; black walnut, 9.6; black oak, *Quercus velutina*, 9.0; white ash, 6.6; basswood, *Tilia neglecta*, 5.4; shellbark hickory, 4.2; slippery elm, *Ulmus fulva*, 3.0; chinquapin oak, 2.4; etc.) strongly suggests the aspect of some of the richer slope forests in parts of Oldham and Trimble counties where Monroe and I have long observed birds. The second, in

the Eden Shales belt, in Campbell County, supported a forest largely composed of white oak, chinquapin oak, shellbark hickory, white ash, and the oak *Quercus shumardii schneckii*.

While this original forest (and its few remnants) may certainly be called a mixed forest, it can scarcely be called a mixed mesophytic forest (see Braun, 1950:123). Underdrainage is rapid and thorough in the porous limestones beneath most of the area, contributing to the xeric nature of the surface, and xerophytes such as prickly pear cactus (*Opuntia rafinesquii*) are numerous and widespread today in most of the remaining mixed woodlands.

In many ways the Pennyroyal is similar to the Bluegrass, although more diverse, and its limestones are even more porous, becoming cavernous in the western portion, which is characterized by many areas of exclusively subsurface drainage. Of this part of the region Braun wrote (1950:151-152):

The primary vegetation pattern is a mosaic of unlike communities. In the dissected and hilly areas of the eastern half of the Mississippian Plateau, mixed mesophytic forest in which beech is dominant occupies many of the slopes; oak, oak-hickory, oak-chestnut, and related forest types occupy the drier slopes and ridges. Westward, mixed mesophytic forest becomes more circumscribed. Phases of oak forest prevail over much of the rolling plateau surface, generally on red or red-brown soil areas, and oak-hickory forest occupies many isolated hills. Because of the dominance of oak forest over much of the Mississippian Plateau, and the increasing limitation from east to west of mixed mesophytic forest to the most favorable habitats, this section particularly demonstrates the transition character of the region. Furthermore, extensive areas of prairie in the original vegetation cover (called "barrens" by the early settlers) emphasize the western relationship. Cedar barrens on some of the drier slopes, and swamp forests with their included herbaceous and shrub communities in depressions and on wet flats, add to the number of distinct vegetation types occurring in this section.

In the eastern part of the Pennyroyal, in the zone of intergradation towards the Mixed Mesophytic Forest region, the bird life also is somewhat intermediate between the Limestone Plateau and Cumberland Upland avifaunas.

Forest bird life of the region.—Although sadly depleted and restricted because of extensive deforestation, the forest bird populations of the region deserve, indeed require, careful attention. Our concept of the primary avifauna can only be based on evidence from the few remaining forest remnants.

The composition of the forest avifauna of the region is given in Tables 7 to 10. Throughout the region today, typical and common inhabitants of the maturest remaining mixed forests are such species as the Downy Woodpecker, Red-bellied Woodpecker, Great Crested Flycatcher, Eastern Wood Pewee, Tufted Titmouse, Carolina Chickadee, Carolina Wren, Wood Thrush, Red-eyed Vireo, Cerulean Warbler, Kentucky Warbler, and Summer Tanager. Other forest species (listed under "ecological features"), common in forests of the Cumberland Upland and less so in the Western Upland, are here uncommon to extremely rare. A few areas may be mentioned in particular.

In the outer Bluegrass fairly extensive forest remnants occur along a few streams in the eastern part of the area. For years Monroe and I have studied

some of these, especially along Harrod's Creek in Oldham County. Also, in July, 1950, I briefly investigated secondary forests of some extent along the Kentucky River in Carroll and Oldham counties. In all of these the Worm-eating Warbler, Parula Warbler, Ovenbird, and Scarlet Tanager are virtually absent as breeding birds, the American Woodcock, Black-and-white Warbler, and American Redstart are very rare, and the Yellow-throated Vireo and Whip-poor-will are uncommon (the Chuck-will's-widow has increased markedly in recent years).

Van Arsdall (1949) studied the birds of Mercer County in the inner Bluegrass and Eden Shales belt. The least disturbed forest in this area is in the valleys of the Kentucky and Dix rivers and (Van Arsdall, 1949:22) "the narrow gorges of the few short tributaries of these" which are "grown up with maple, walnut, ash, oak, hackberry, redbud, tulip tree, and beech and contain an undergrowth of grasses, ferns, trillium, anemone, fire-pink, shooting-star, and other wild flowers. . . . The Wood Thrush, Louisiana Water-thrush, Worm-eating Warbler [one record], Summer Tanager, Kentucky Warbler, and Acadian Flycatcher are found" Van Arsdall had but one summer record of the Black-and-white Warbler and none of the Whip-poor-will, Yellow-throated Vireo, Parula Warbler, Cerulean Warbler (!), Hooded Warbler, American Redstart, and Scarlet Tanager.

The above-described woodlands and others for which scattered data are available are mature and in some places have not been disturbed for several decades; herbaceous growth is profuse in many sheltered slope areas. Such typical species of mature deciduous forest as the Acadian Flycatcher, White-breasted Nuthatch, Cerulean Warbler, Kentucky Warbler, and Louisiana Waterthrush are common in most or all of them; so far as age of stands, density, shade, and ground cover are concerned, these areas would seem to be suitable for the species conspicuously lacking.

I have briefly investigated forested areas near Shopville, Pulaski County, in the rugged eastern section of the Highland Rim (easternmost portion of the Mississippian Plateau, or Pennyroyal) just adjacent to the Cumberland Plateau. These are on the boundary between the present region and the Cumberland Upland. The transition here is rather gradual; forest is heavy, the slopes largely mesophytic; red cedar is fairly common in open areas (betraying limestone outcrop) and pine and hemlock are scarce. Here the Worm-eating Warbler and Hooded Warbler are fairly common, although not nearly so numerous as a few miles to the eastward; the Whip-poor-will is common; and the Yellow-throated Vireo, Black-and-white Warbler, Ovenbird, American Redstart, and Scarlet Tanager uncommon. A few Ruffed Grouse persist in this section, where I have not recorded the Parula Warbler.

Farther to the west, well into the Pennyroyal, several of the forest species under consideration are as difficult to find as they are in the Bluegrass. On May 8 and June 18 and 22, 1949, I visited several well-forested ravines in the northwestern part of Warren County, just below the Dripping Springs escarpment. Acadian Flycatchers, Cerulean Warblers, and Kentucky Warblers were common in these ravines, which contained fairly mature second-growth forest largely composed of beech, maple, ash, and several species of oaks. I succeeded with much effort in recording three Hooded Warblers and one Worm-eating Warbler; no Black-and-white or Parula Warblers, Ovenbirds, Yellow-throated Vireos, or Scarlet Tanagers

could be found. All of these species are regarded by Wilson (personal communication and various papers) as very rare at best, even in the most heavily wooded portions of Warren County.

The same birds are rare or absent in the oak forests of uplands in the Purchase, where in the course of considerable observation I have recorded, of the species above stressed, only a few Black-and-white Warblers and Yellow-throated Vireos. The recurrence of some of these species in the bottomland forests of the Alluvial Forest avifaunal region (and in mesophytic forest on the loess hills immediately adjacent to the Mississippi floodplain) will be discussed later.

The moist forests of floodplains in the broader river valleys within the Limestone Plateau are variously suggestive of those in the Alluvial Forest avifaunal region to the west, from which, indeed, they must be more or less arbitrarily separated. Such valleys in the present region are distinguished by the presence of such species as the Prothonotary Warbler and Wood Duck (each of which grows less numerous upstream, or away from the Mississippi or Ohio as the case may be) and the greater abundance of the more generally distributed Red-shouldered Hawk and Barred Owl. For various reasons the valleys of the Ohio and its major tributaries above Owensboro (Davies County) have been included in the present region. Swamp and lowland forests above this point lack a number of features of those farther west. Scattered streams and sink-hole swamps in the western part of the Pennyroyal, however, are occupied by swamp forests much like those in the Mississippi alluvial plain. The bird faunas of these areas are rather similar to those found in the Alluvial Forest avifaunal region proper. The Swainson's Warbler has been recorded in one such area (Chaney Lake, Warren County) and the sole Kentucky locality for the Bachman's Warbler (Embody, 1907) lies in another, at Wolf Lick, Logan County. Although they lie within it, these areas are not properly a part of the Limestone Plateau avifaunal region; for purposes of constructing Tables 7 to 10 they have been considered as atypical outliers of the Alluvial Forest. Their inclusion in either region could be either defended or attacked with reason.

Deforestation and disturbance.—This is the most extensively deforested region. Deforestation is most severe in the Bluegrass, especially the inner Bluegrass. In the Pennyroyal, deforestation is progressively more complete from east to west. The western portion and the adjoining uplands of the Purchase, less deforested than the inner Bluegrass, appear to be about equal to the outer Bluegrass in this respect. In the Bluegrass, the Eden Shales belt contains more remnants of forest and shrubby environments than the rest of the area, except for isolated portions of the outer Bluegrass near the periphery. Brush-inhabiting species, notably the Prairie Warbler, Blue-winged Warbler, and Bachman's Sparrow, are consequently more numerous in the Eden Shales belt than elsewhere. Also especially numerous in the Eden Shales, perhaps because of the rather heavy erosion of some of the steeper slopes, with consequent creation of rocky and guttered pastures and open, prairie-like areas dotted with cedars, are the Vesper Sparrow, Lark Sparrow, and Horned Lark, all of which have probably invaded the area from the north and west within historic times.

Throughout the Limestone Plateau secondary avifaunas are of course predominant. Field-inhabiting species, such as the Grasshopper Sparrow,

Eastern Meadowlark, Horned Lark, and Field Sparrow are conspicuous, and such woodlot and forest-edge forms as the Red-headed Woodpecker, Yellow-shafted Flicker, Eastern Bluebird, Mockingbird, Brown Thrasher, Catbird, Yellowthroat, Yellow-breasted Chat, Orchard Oriole, and Rufous-sided Towhee are common. Adaptable birds at home about human habitations are numerous throughout the region, and most of them have probably increased in the last 50 years. Among these are the Common Nighthawk, Chimney Swift, Yellow-billed Cuckoo, Eastern Phoebe, Eastern Wood Pewee, Great Crested Flycatcher, Barn Swallow, Purple Martin, Wood Thrush, Robin, Common Grackle, Cardinal, and Chipping Sparrow. Many other typical farmland species, of course, are numerous in the region.

According to Sauer (1927: fig. 75), in the 1920's not more than 15 per cent of the Bluegrass was in other than "improved farmland," while approximately 35 per cent of the Purchase and 40 per cent of the Pennyroyal were in such categories, and "woodland in farms" comprised about 25 per cent of the area of the last two regions.

Other features.—Knowledge of other vertebrates in the region is slight and available only in a few notes and papers already cited. No mammal, reptile, or amphibian seems to be limited to the region, but probably the prairie deer mouse (*Peromyscus maniculatus bairdii*) and prairie vole (*Pedomys ochrogaster*) are more numerous here than elsewhere and are more or less limited at the eastern border of the region (see Barbour, 1952a; Barbour and Barbour, 1950; Barbour and Gault, 1953). A few southern mammals, for example the Le Conte big-eared bat (*Corynorhinus macrotis*), cotton mouse (*Peromyscus gossypinus*), and rice rat (*Oryzomys palustris*) range northward into the Pennyroyal (see Hamilton, 1943: figs. 53, 131, 137), and the last two, at least, are common in the Purchase. The meadow vole (*Microtus pennsylvanicus*) seems not to occur south or west of the Shawnee Section (Western Upland avifaunal region), having a distribution much like the breeding range of the Cedar Waxwing. Knowledge of reptiles and amphibians is yet too slight to risk generalization. The larger and more conspicuous mammals and reptiles are uniformly scarce in the region today as a result of intensive agriculture.

Vegetational distinctions of the region have already been emphasized. Heaths, pines, hemlock, and chestnut are lacking or at best very rare, while red cedar (rare elsewhere) is common. Chinquapin oak replaces scarlet and chestnut oaks, and several trees and shrubs are here most numerous in the state, among them blue ash (*Fraxinus quadrangulata*), Ohio buckeye (*Aesculus glabra*), wahoo (*Evonymus atropurpureus*), fragrant sumac (*Rhus aromatica*), and American basswood (*Tilia americana*). Most of these species are most numerous in the Bluegrass, where, finally, the Kentucky coffee tree (*Gymnocladus dioica*) is much more numerous than elsewhere.

Bird life of the original prairies.—In Kentucky the prairies (see pp. 21–22) were nearly confined to the Pennyroyal and Purchase of the present region. Knowledge of the bird life of these "barrens" is very slight and limited to a few observations by Audubon and Wilson. That the avifauna was related to that of the long-grass prairie seems evident from the fact that the Greater Prairie Chicken was abundant. Audubon stated also that the Marsh Hawk, a common prairie species, nested on the Barrens. Probably

such birds as the Upland Plover, Dickcissel, Loggerhead Shrike, and possibly Henslow's Sparrow were also present in these large openings, and Mississippi Kites may have fed over some of the grasslands, as they do today in much of south-central Kansas. Many other species of open groves, shrubby environments, and forest-edge habitats must have been present in and around the prairies and must have expanded their ranges rapidly into other portions of the state as these were cleared. Conversely, true prairie species such as the Greater Prairie Chicken were eliminated with destruction of the prairie grasses and might have vanished even without persecution.

Summary.—Geologically and botanically the Limestone Plateau is a rather diverse region, most conspicuously marked today by extensive deforestation made inevitable by gentle terrain and suitability for farming. The region is mainly occupied by a secondary avifauna of fairly uniform composition, the chief variations in this being provided by open-country species which have recently invaded the state but which may not have reached the potential limits of their distributions.

With minor exceptions locally, the region is based on limestones of great porosity, and although considerable variation is encountered in forest remnants and evidently existed in the original forests, excessive underdrainage has contributed to making these forests xeric in comparison with the foregoing, even under highly localized conditions of optimum moisture conservation. These forests tend to be mixed forests in many areas—in others they are largely oak-hickory—but rarely, if ever, are they truly mixed mesophytic forests.

The forest and forest-edge avifauna of the region is characterized by the general scarcity or absence of approximately 12 species (p. 38) generally common in the Cumberland Upland (where most inhabit mixed mesophytic forests) and at least locally common in the Western Upland. A few other species are more common in the drier forests of this region than in the Cumberland Upland.

The forest avifauna of the Limestone Plateau is and has probably long been transitional between those of the mixed mesophytic forests of the Appalachians and the dry oak-hickory forest of the prairie edges. The region is impoverished in typically Appalachian species of birds, mammals, cold-blooded vertebrates, and plants. Its extreme manifestation of xeric conditions was a prairie community which originally occupied a considerable portion of the region and endowed it with a western character.

Alluvial Forest Avifaunal Region

The forests of the broad floodplains of the Mississippi and lower Ohio rivers and the lower reaches of their major tributaries in western Kentucky are occupied by a bird population somewhat different from others in the state. These floodplain forests are themselves distinct in aspect and composition. The region has zoological and floristic affinities in part with the south and in places presents a quasi-tropical aspect. The region is difficult to define exactly and must be arbitrarily bounded in some places. Included in it here are all alluvial plains of appreciable extent along the Mississippi, lower Ohio, lower Tennessee, and lower Cumberland rivers, Clark's River in the Purchase, Pond and Tradewater rivers near their entrances into the Ohio, and lower Green River. Most of the creeks, ox-bow lakes, and sloughs

in the Purchase are bordered by lowlands characteristic of the region, and isolated habitats in the southern Pennyroyal and parts of the Shawnee Section, although disjunct, are more or less representative. In the Ohio Valley the region may be considered as ending, for practical purposes, in the bottomlands near Owensboro, Daviess County.

The avifauna of the Alluvial Forest derives its distinctness from two elements of different kind; first from a small number of forest-inhabiting passerine species occurring in the area, variously, in distinctive numbers; second from a group of large raptorial and aquatic species, some of the latter of southern or even tropical affinities. In Kentucky a number of vertebrates other than birds are restricted to the region or are here most numerous, as are several plants.

Anyone familiar with southern swamp forests can accurately picture the lowland forests of the region. Plant growth is exceedingly luxuriant, the trees in mature forest very large; shade is dense, summer temperatures and humidity high, and insect pests abundant. The rich, alluvial black soils, frequently flooded, are usually moist or wet underfoot, nearly devoid of humus, and thickly covered at times with a rather small variety of shrubs and herbs. There are many local variations dependent upon human disturbance, frequency of flooding, and proximity to standing water. Spanish moss (*Tillandsia usneoides*), common farther south, is lacking. Much of the region has been cleared and in its more typical portions cotton, soybean, and corn are important crops.

Ornithological knowledge of the region.—Among localities typical of the region, the interesting Reelfoot Lake area, in extreme northwestern Tennessee, with a long arm extending northward just into Fulton County, Kentucky, is especially well known ornithologically. Information is available in the papers of Ganier (1932, 1933*a*, 1937*b*, 1951, etc.), Whittemore (1937), Gersbacher (1939), and in notes by many others. I worked briefly in the Reelfoot area in 1941 and 1942, and more extensively in 1949 and 1951, and in the same years visited many other localities in the Alluvial Forest, especially in Fulton, Hickman, Carlisle, Ballard, and McCracken counties. In 1940, 1941, and 1949 I spent some time in Ohio River swamps of Union and Henderson counties near the eastern limits of the region (records from this area are also given by Wetmore, 1940). Available in addition are scattered notes, and papers by Pindar (1887*a*, 1889*b*, 1925*a*) on Fulton County, Wilson (1922*b*) on Ballard County, and Wilson (1923*c*) on Callo-way County. I have also profited from Hancock's useful paper (1954) on the birds of Hopkins County, where lowland swamps seem to represent dilute extensions of the region.

Faunal features.—In Kentucky several large aquatic birds are today limited to this region as breeding species, but none occurs uniformly throughout. Among these are the Great Blue Heron, Anhinga, and Double-crested Cormorant, and the Common Egret is virtually restricted to the region. At present the Bald Eagle and Osprey breed nowhere else in the state, and it seems likely that they and the Swallow-tailed Kite, which no longer occurs, were always most numerous here. Although occurring up the Ohio Valley beyond the arbitrary borders of the Alluvial Forest, the Wood Duck, Hooded Merganser, Yellow-crowned Night Heron, and Prothonotary Warbler characterize the region by their abundance. The presence of the

larger species here may be accounted for by the combination of secluded sites for nests or breeding colonies and the prodigious amount of food available in the many sloughs, ponds, and backwaters along the larger rivers.

The single Kentucky record of Bachman's Warbler, based on a population once occupying swamps along Wolf Lick in Logan County (western Pennyroyal), is from an outlying, disjunct habitat related to this region. Possibly the species occurs elsewhere in the region. Swainson's Warbler occurs in fair numbers over much of the Alluvial Forest and perhaps in suitable habitats in all of it. (In smaller numbers it is also found far to the eastward in the very different habitats along mountain ridges in the Cumberland Upland.) The Ivory-billed Woodpecker, now extinct in Kentucky, was almost certainly most numerous in, if not restricted to, the Alluvial Forest.

Ecological features.—The peculiar features of the relative abundance in which certain small passerine species occur in the Alluvial Forest are of interest. Three typical deciduous forest species already shown to be of peculiar distributional interest are nearly or quite lacking from the Alluvial Forest. These are the Black-and-white Warbler (extremely rare), Worm-eating Warbler, and Ovenbird (last two unrecorded). These species, as we have seen, become less numerous from east to west in correspondence with the progressive decrease of mixed mesophytic associations. Interestingly, however, the Yellow-throated Vireo, Parula Warbler, Hooded Warbler, and American Redstart, which display a somewhat similar east-west decrease, again become numerous in the Alluvial Forest. To these may be added Swainson's Warbler, which seems to be completely absent between the Alluvial Forest and the eastern part of the Cumberland Upland. There is at least one obvious difference between the two groups aforementioned. Those which drop out in the Alluvial Forest are ground-nesting species; those which again become common in this mesic habitat (as they are in mesophytic associations of the Cumberland Upland) are tree- and bush-nesting species. Although the matter is probably complex, it seems likely that unsuitability of ground conditions (humus, cover, etc.), coupled with frequency of flooding, is a factor operating against the occurrence of the former group (see also p. 89).

Other species decreasing in numbers from east to west are the American Woodcock, Whip-poor-will, and Scarlet Tanager, which seemingly have not been recorded breeding in the Alluvial Forest. Neither do the last two occur in any numbers on adjacent higher ground where the Chuck-will's-widow and Summer Tanager are common.

The Red-shouldered Hawk and Barred Owl, species particularly characteristic of floodplain and swampy forests through much of their ranges, are here more numerous than anywhere else in the state. The Cerulean Warbler and Red-bellied Woodpecker are common here, both becoming rare or at best local in the east (Cumberland Upland).

Definition of the boundaries of the Alluvial Forest is not easy. Along the Mississippi River there is a long band of loess hills supporting, in places, relict stands of dilute mixed mesophytic forest. The bird populations of these forests are much like those of the adjacent floodplain forests, perhaps as a result of mere proximity. Possibly the Black-and-white Warbler, Ovenbird, and Worm-eating Warbler will be found in some of these areas, as they are in southern Illinois (J. W. Hardy, verbal com.). Much of the

adjacent upland is difficult to classify but is relatively xeric and seems best placed with the Limestone Plateau.

Forest vegetation of the region.—Braun (1950:151, 281) considered that the true bottomland forests of the Mississippi alluvial plain extend north to western Kentucky and southern Indiana. These are virtually permanent edaphic communities and are a deciduous forest climax in every practical sense. This forest is part of Braun's Southeastern Evergreen Forest region, here at its northern limit, "sending tongues into the adjacent Western Mesophytic . . . Forest" region (Braun, 1950:281). Braun considered further, interestingly (p. 282), that the "flora of the hardwood communities of the Coastal Plain has evidently migrated from the Appalachian area," and named a long list of species common to both. Among the forests of the alluvial lowlands here under consideration she recognized three distinct communities, Swamp Forest, Hardwood Bottoms, and Ridge Bottoms (Braun, 1950:291).

The swamp forest occupies land on which water stands throughout the year except during extreme droughts; its principal trees are cypress and tupelo gum. The hardwood bottoms are subject to frequent overflow, and are usually covered with water through the late winter and spring; the forest is made up of a large number of species. The ridge bottoms, elevated but a few feet above the general level of the bottoms, are covered by water only during floods This forest contains some of the species of the hardwood bottoms, and a larger number of oaks and hickories.

Also occurring throughout the area are typical stream-margin communities of "black willow, hackberry, pecan, poplar (cottonwood), and sycamore." These last are inhabited characteristically by a number of birds of disturbed areas, notably Warbling Vireos and American Redstarts.

Braun described the swamp forests as follows (1950:292-293):

The principal trees of the river swamps and sloughs are bald cypress [*Taxodium distichum*] and water tupelo [*Nyssa aquatica*]; with these are occasional other trees, as silver maple (*Acer saccharinum*), red maple (*Acer rubrum* and var. *Drummondii*), water and pumpkin ash (*Fraxinus caroliniana*, *F. tomentosa*) Pecan is a frequent constituent in the Mississippi bottoms. Waterelm (*Planera aquatica*) forms thickets in the swamp forests

Near the borders of the deeper swamps, many other species of trees are associated with the cypress and tupelo, or replace them, resulting in the growth of a mixed hardwood stand of bottomland trees.

The bird populations of swamp forests are not particularly dense since, as might be expected, they are impoverished in species of the forest floor, which is usually under water. Alone among the low-ranging passerines, the Prothonotary Warbler is numerous. The cypress crowns provide an open, airy forest ceiling not unlike that of pine forests and admit much light. Yellow-throated Vireos, Parula Warblers, Yellow-throated Warblers, and other high-ranging species are characteristic of mature swamp forest, as are Great Crested Flycatchers, Acadian Flycatchers, and Eastern Wood Pewees. Large swamps with extensive swamp forest are usually the sites of the few great rookeries of mixed species of large water birds. Fine swamp forests occur about Reelfoot Lake, at Murphy's Pond in Hickman County, and around sloughs and ox-bows all along the Mississippi and (to a lesser extent) Ohio as far upstream as Henderson.

"Hardwood bottoms" form a somewhat drier habitat. They have been described by Braun as follows (1950:293):

Although flooded for a considerable period, the surface through much of the year is dry. The hardwood bottoms forest of the Mississippi Valley consists of the following species, arranged in order of abundance: sweet (red) gum, red maple, swamp chestnut (cow) oak, swamp red oak, shingle oak, overcup oak, willow oak, elm, sassafras, hackberry (*Celtis laevigata*), papaw, dogwood, and Carpinus.

Birds are more numerous in forests of this type than in swamp forest proper. The species already mentioned occur, with the exception of the Yellow-throated Warbler, which is usually absent unless there are inclusions of sycamore or cypress, and many more species are typically found, among them the Wood Thrush, Catbird, Swainson's Warbler, Cerulean Warbler, Louisiana Waterthrush, Kentucky Warbler, and Hooded Warbler. American Redstarts, Hairy Woodpeckers, and White-breasted Nuthatches are also fairly common in typical hardwood bottoms, and among the larger species Red-shouldered Hawks, Barred Owls, and Pileated Woodpeckers are numerous.

"Ridge bottoms," the driest habitat of the alluvial forests, contain the finest broadleaf forest and the richest small bird populations of the region. It is in such areas that Swainson's Warbler is most numerous. The Eastern Wood Pewee, Carolina Wren, White-breasted Nuthatch, Wood Thrush, Yellow-throated and Red-eyed vireos, Parula, Cerulean, Kentucky, and Hooded warblers, American Redstart, Summer Tanager, and various other forest species are common in ridge bottom forests, excellent examples of which may be found in the broad lowlands near Wickliffe in Ballard County, along Bayou du Chien in Hickman County, and in parts of Fulton County near Reelfoot Lake. The bird populations of these ridge bottom forests in some ways resemble those of the mixed mesophytic forests of eastern Kentucky. Braun (1950:295) described the ridge bottoms thus:

What are locally known as ridges occur in the bottomlands. These, although elevated but a few feet above the surrounding bottoms and almost imperceptible to the eye, are free of water most of the year; their soil is better drained and better aerated. Here are found some of the finest bottomland forests. Sweet gum is, as on the lower land, the predominant tree; with it are oaks (including white oak), shagbark hickory, and pecan. In addition, most of the species of the wetter bottoms are found. . . . These ridges are (or were originally) covered by dense stands of cane.

The Prothonotary Warbler is often an important breeding bird even on these relatively dry "ridges."

Deforestation and disturbance.—The permanently and naturally disturbed areas along stream margins in the Alluvial Forest are occupied by a characteristic developmental community usually consisting of willow, cottonwood, river birch, silver maple, box elder, hackberry, pecan, sycamore, and other species. Many forest-edge and open-grove birds frequent these communities, conspicuous being Blue Jays, Carolina Chickadees, Downy Woodpeckers, Catbirds, Rufous-sided Towhees, White-eyed and Warbling vireos, Orchard Orioles, Indigo Buntings, and American Redstarts.

Having fine alluvial soils, the region has been deforested to a considerable extent, and cleared areas are occupied by a secondary avifauna containing

most of the common, widespread species characteristic of open country. The Dickcissel and Loggerhead Shrike are particularly numerous and the Black Vulture is conspicuous and common. Species invading from the north in recent decades are generally absent, although the Song Sparrow and House Wren have reached the northern- and easternmost portions of the region.

The Common Nighthawk is numerous over the area. The Chuck-will's-widow is common, especially on slightly higher ground. The Whip-poor-will seems to be unknown in the Alluvial Forest proper. In former days the Mississippi Kite probably fed over the fields in the river bottoms.

Other features.—A number of vertebrates other than birds here reach or nearly reach the northern limits of their ranges, among the reptiles being the water moccasin (*Agkistrodon piscivorus*), common in suitable habitats in the Purchase, the red-bellied water snake (*Natrix erythrogaster*), the horn snake (*Farancia abacura*), and probably the alligator snapping turtle (*Macrochelys temminckii*). The herpetology of Reelfoot Lake has been studied by Parker (1937, 1939). North of that point the herpetology of the region is not well known. I have recorded all of the above-mentioned species myself, except for the turtle, at various points in the Purchase, and the *Natrix* as far up the Ohio River as Henderson. Among southern mammals the swamp rabbit (*Sylvilagus aquaticus*) and rice rat (*Oryzomys palustris*) are common throughout most of the region and the cotton rat (*Sigmodon hispidus*), which occurs at Reelfoot Lake in Tennessee (Goodpaster, verbal com.) very likely ranges into Kentucky. Undoubtedly a number of additional forms range north to the region and little or no farther. The fauna of the Mississippi alluvial plain is fairly well characterized but no two species seem to have identical northern limits and delimitation of the region is not nearly so definite at any given locality as the total list of typical species would suggest. Some of the floral distinctions of the region have been mentioned, the most conspicuous species restricted to it in Kentucky being the bald cypress and tupelo gum. The gradual disappearance of the true alluvial forest, completed in the Ohio Valley near Owensboro, seems to result from progressive narrowing of the floodplain and increased gradient of the stream, although other factors doubtless contribute.

Summary.—The Alluvial Forest avifaunal region is coextensive with the Mississippi alluvial plain and Ohio Valley extensions thereof. It is a region of rich bottomland forests of a type found nowhere else in Kentucky. It is warm-temperate, almost subtropical, in aspect and characterized ornithologically by a partly southern element of large water birds and birds of prey and by the peculiar combination of certain small passerine species in its forests. Difficult to delimit exactly, it is well marked as a whole.

SUMMARY OF THE DISTRIBUTIONS OF BREEDING BIRDS

In the foregoing account some species have been stressed to the exclusion of others. A summary of the distributions of all the breeding birds of Kentucky is therefore necessary to provide a thorough basis for analysis. The 153 species¹ regarded beyond reasonable doubt as breeding, or having bred,

¹ Comparison of this figure with the 135 species reported by Hicks (1935a), many erroneously or on inadequate grounds, gives an idea of the recent increase in knowledge of Kentucky birds. The total of 153 includes the introduced Rock Dove, Starling, and House Sparrow, none of which is analyzed here.

TABLE 7

SPECIES EVENLY DISTRIBUTED THROUGHOUT KENTUCKY, WITH SOME EXCEPTIONS (*) IN REGARD TO THE CUMBERLAND CREST AVIFAUNAL REGION

Species	Abundance ¹		Habitat ²					
			I	II	III	IV	XI	
Killdeer*	-	C	x					
Horned Lark*	-	FC	x					
Eastern Meadowlark*	VR	C	x	x				
Grasshopper Sparrow*	-	C	x	x				
Lark Sparrow*	-	R	x	x				
Field Sparrow		C		x				
Red-winged Blackbird*	-	C		x				
Bachman's Sparrow*	-	FC		x				
Bobwhite*	VR	C		x				
Yellowthroat		C		x	x			
Indigo Bunting		C		x	x			
Rufous-sided Towhee		C		x	x			
Mourning Dove*	-	C			x			
Ruby-throated Hummingbird		C			x			
Eastern Kingbird*	-	C			x			
Common Crow*	VR	C			x			
Bewick's Wren*	-	C			x			
Mockingbird*	-	C			x			
Catbird		C			x			
Brown Thrasher		C			x			
Blue-gray Gnatcatcher*	VR	C			x			
White-eyed Vireo*	-	C			x			
Warbling Vireo*	-	C			x			
Yellow Warbler*	-	FC			x			
Yellow-breasted Chat		C			x			
Orchard Oriole*	-	C			x			
Baltimore Oriole*	-	R			x			
Common Grackle*	-	C			x			
Cardinal*	R	C			x			
American Goldfinch		C			x			
Chipping Sparrow*	VR	C			x			
Cooper's Hawk		FC			x	x		
Yellow-billed Cuckoo		C			x	x		
Yellow-shafted Flicker		C			x	x		
Pileated Woodpecker		FC			x	x		
Hairy Woodpecker		FC			x	x		
Downy Woodpecker		C			x	x		
Great Crested Flycatcher*	R	C			x	x		
Eastern Wood Pewee		C			x	x		
Blue Jay		C			x	x		
Carolina Chickadee		C			x	x		
Tufted Titmouse		C			x	x		
White-breasted Nuthatch		FC			x	x		
Carolina Wren*	R	C			x	x		
Robin		C			x	x		
Wood Thrush		C			x	x		
Red-eyed Vireo		C			x	x		
Yellow-throated Warbler*	-	FC			x	x		
Summer Tanager*	VR	C			x	x		
Acadian Flycatcher*	-	C				x		
Louisiana Waterthrush*	-	C				x		
Kentucky Warbler*	R	C				x		
Green Heron*	-	FC						x
Turkey Vulture*	VR	C						x

TABLE 7—Continued

Species	Abundance ¹	Habitat ²				
		I	II	III	IV	XI
Sparrow Hawk	C					x
Common Nighthawk	C					x
Chimney Swift*	—					x
Barn Owl*	—					x
Screech Owl*	—					x
Belted Kingfisher*	—					x
Red-headed Woodpecker*	—					x
Eastern Phoebe	C					x
Rough-winged Swallow*	VR					x
Barn Swallow*	—					x
Purple Martin*	—					x
Eastern Bluebird	C					x
Totals: 66 species, 39 marked*		5	10	40	21	14

* Species rare or absent in the Cumberland Crest avifaunal region are included here because of the small area and low environmental diversity of that region and their general occurrence elsewhere. Their numerical status in the Cumberland Crest precedes their general status, a dash indicating absence.

¹ In this and the following tables C = common; FC = fairly common; U = uncommon; R = rare; VR = very rare; Cas = casual.

² For definition of habitat categories see pp. 76–78.

in the state may be divided into four categories to show the manner of their occurrence. The species are ranged in Tables 7 to 10 and the categories are the following:

I. Species uniformly distributed and essentially equal in abundance¹ throughout the state (Table 7), or through all except the Cumberland Crest with its limited range of habitats. These species are deciduous forest forms or more widespread and adaptable forms which together make up an important part of the total avifauna and account for the considerable similarity of all of the regions. The species rare or absent in the Cumberland Crest (see also Tables 8 to 10) are marked with an asterisk and their status there given just after the species' name and before the statement of general status.

II. Species whose total ranges embrace all of Kentucky, but which occur in conspicuously different abundance in different parts of the state (Table 8). These species provide the so-called "ecological features" of the various avifaunal regions. The fact that the extreme limits of their ranges do not pass through Kentucky² suggests that they are not limited here by physical factors, or what Odum (1945:198) has called "non-habitat factors," but by ecological, or "habitat factors." While not at the limits of their ranges, several species, for example the Scarlet Tanager, are near them and possibly they *are* restricted by physical factors to habitats locally optimum, that is, habitats buffering the effects of macroclimate. In Table 8 the species have been arranged in three groups, according to whether they are decreasingly abundant from east to west (group A), west to east (C), or are abundant at both extremes and less abundant in the middle (B).

¹ Here and elsewhere, "abundance" and terms denoting it are used as ecological values expressing the frequency of occurrence in suitable habitat. Abundance does not indicate over-all numbers or "numerousness," which is an expression of abundance \times amount of suitable habitat.

² It must be admitted, however, that the exact limits of a range are sometimes difficult to fix in detail, particularly with the limitations of our present knowledge of bird distribution.

TABLE 8
SPECIES OF WIDE DISTRIBUTION AND VARYING ABUNDANCE IN KENTUCKY

Species	Avifaunal Regions ¹					Habitat ² Group
	CC	CU	WU	LP	AF	
American Woodcock	FC	C	U	R	?	III
Prairie Warbler	VR	C	FC	U	?	III
Sharp-shinned Hawk	R	R	VR	?		III-IV
Red-tailed Hawk ³	C	C	FC	VR	?	III-IV
Great Horned Owl ³	C	C	FC	R	?	III-IV
Whip-poor-will	FC	C	C	R		III-IV
Scarlet Tanager	C	C	FC	?		III-IV
Broad-winged Hawk ³	C	C	FC	VR		IV
Black-and-white Warbler	C	C	FC	VR	VR	IV
Worm-eating Warbler	U	C	U	VR		IV
Ovenbird	C	C	FC			IV
Pine Warbler		C	R			IX
Parula Warbler	VR	C	U	VR	C	III-IV
American Redstart	C	C	FC	VR	C	III-IV
Yellow-throated Vireo	R	C	FC	R	C	III-IV
Hooded Warbler	C	C	FC	VR	C	IV
Blue-winged Warbler		R	FC	FC	?	II-III
Red-bellied Woodpecker		R	FC	C	C	III-IV
Red-shouldered Hawk ³		R	R	FC	C	IV
Barred Owl ³	R	R	FC	C	C	IV
Cerulean Warbler	U	FC	C	C	C	IV
Totals: 21 species	17	21	21	17	9	

¹ CC = Cumberland Crest; CU = Cumberland Upland; WU = Western Upland; LP = Limestone Plateau; AF = Alluvial Forest.

² For definition of habitat symbols see pp. 76-77.

³ Abundance possibly influenced by persecution, etc.

III. Species at the limits of their ranges (Table 9). A line drawn around the breeding range of any of these species would pass through Kentucky. They may be limited wholly or partly by physical factors, since they do not occur in seemingly suitable habitats beyond the boundaries of their ranges. However, the conclusion that any species is limited exclusively by physical factors is risky, as shown by many recent and abrupt expansions of range.

The species of Table 9 have been divided into seven groups to reveal similar patterns of distribution. Groups A, B, C, E, G, and H consist of species more or less restricted to a single avifaunal region or a group of adjacent regions. Group D consists of seven open-country and shrub-stage species which are invading or seem recently to have invaded Kentucky from the north and west. Of this group, at least the House Wren and Song Sparrow are now increasing their ranges. The others are rare (Upland Plover, Traill's Flycatcher) or fluctuating in numbers and area occupied (Henslow's Sparrow; possibly Vesper Sparrow and Short-billed Marsh Wren). Group F contains four species which have probably entered Kentucky in the recent past from the west and south, together with the Brown-headed Cowbird (history unknown). Of this group, the Dickcissel and Chuck-will's-widow are still unstable in distribution, and at least the latter is expanding its range. The Yellow-crowned Night Heron and Common

TABLE 9
SPECIES REACHING THE LIMITS OF THEIR GEOGRAPHIC RANGES IN KENTUCKY

Species	Avifaunal Regions ¹					Habitat ² Group
	CC	CU	WU	LP	AF	
Chestnut-sided Warbler	C					III
Veery	C					III-IV
Black-throated Blue Warbler	C					III-IV
Blackburnian Warbler	FC					III-IV
Canada Warbler	C					III-IV
Rose-breasted Grosbeak	C					III-IV
Slate-colored Junco	C					III-IV
Golden-winged Warbler	R	?				II-III
Cedar Waxwing	C	C	R	R		III
Black-billed Cuckoo	R	R	?			III-IV
Solitary Vireo	C	R				III-IV
Black-throated Green Warbler	VR	C				III-IV
Red-cockaded Woodpecker		U				IX
Vesper Sparrow*		?	?	U		I-II
Upland Plover*				Cas		II
Short-billed Marsh Wren*		R	VR	U		II
Henslow's Sparrow*		R	R	C		II
Traill's Flycatcher*				Cas		III
House Wren*		VR	VR	C	FC	III
Song Sparrow*	R	FC	U	C	VR	III
Swainson's Warbler		R			FC	IV
Dickcissel*		R	U	FC	C	II-III
Chuck-will's-widow*		R	U	C	C	III
Loggerhead Shrike			FC	FC	C	III
Brown-headed Cowbird		U	C	C	C	I-IV
Black Vulture		R	FC	FC	C	XI
Swallow-tailed Kite†				x ³	x	III-IV
Prothonotary Warbler			U	FC	C	III-IV
Ivory-billed Woodpecker†				x	x	IV
Common Egret*				?	U	VII
Yellow-crowned Night Heron*				U	FC	VII
Bachman's Warbler				Cas	?	IV
Anhinga					R	VII
Double-crested Cormorant					U	VII
Great Blue Heron					FC	VII
Totals: 35 species	13	14	11	18	16	

¹ For abbreviations see Table 8.

² For definitions see pp. 76-78.

³ Lower case x indicates former occurrence in unknown members.

* Unstable in distribution.

† Extinct in Kentucky.

Egret of group G are also expanding their ranges, but this is probably re-occupation of former range.

IV. Species of limited distribution in Kentucky but not at the limits of their ranges (Table 10). Most of these species are probably limited in this area by the distribution of peculiar habitat types. A few were hard to place, as between Tables 9 and 10, since it is sometimes difficult to distinguish between over-all distribution and local distribution. In general, species lack-

TABLE 10

SPECIES OF RESTRICTED DISTRIBUTION IN KENTUCKY, BUT NOT AT THE LIMITS OF THEIR RANGES¹

Species	Avifaunal Regions ²					Habitat ³
	CC	CU	WU	LP	AF	
Pied-billed Grebe			FC	FC	C	V
Black-crowned Night Heron			VR	U	R	VII
American Bittern			VR	?	?	V
Least Bittern			R	R	R	V
Canada Goose					Cas	V?
Mallard			VR	VR	VR	V
Blue-winged Teal			VR	VR	VR	V
Wood Duck		?	R	U	C	VII
Lesser Scaup				Cas		V
Hooded Merganser				VR	U	VII
Bald Eagle					R	VII
Marsh Hawk*				x ⁴		X
Osprey				x	VR	VII
Peregrine Falcon		R		?	?	VIII
Ruffed Grouse†	C	FC	x	x	x	III
Greater Prairie Chicken*				x		X
Turkey†	x	x	x	U	x	III
King Rail			R	R	R	V
Common Gallinule				VR	?	V
American Coot				VR	?	V
Spotted Sandpiper		?		R	?	VI
Least Tern					U	VI
Black Tern				VR		V
Passenger Pigeon‡			details unknown			IV
Carolina Parakeet‡			details unknown			III-IV
Bank Swallow			?	R	U	XI
Cliff Swallow				VR	VR	XI
Common Raven*	?	x				VIII
Totals: 28 species	2	4	10	20	16	

¹ Including also very rare and poorly known species, whether or not at the limits of their ranges.² For abbreviations see Table 8.³ For definitions see pp. 77-78.⁴ Lower case x indicates former occurrence in unknown numbers.

* Extinct in Kentucky.

† Original range much reduced.

‡ Extinct.

ing from the Appalachian uplands, including the larger valleys, were put in Table 9, while those occurring in various parts of the mountain area were placed here. A few decisions (*i.e.*, Loggerhead Shrike) were virtually arbitrary. Also in this table are a few extinct or very poorly known species. Some of the species, especially the Pied-billed Grebe, Black-crowned Night Heron, Wood Duck, Ruffed Grouse, and Bank Swallow, are locally common in some regions, and one or two others (Turkey, Passenger Pigeon) were formerly very numerous.

Indication of Habitat

It is revealing to consider the habitat preferences of birds together with their distributions. Accordingly, each species in Tables 7 to 10 has been assigned to one or more of 10 habitat types, indicated by the roman numerals

I to X, with XI serving for a few species difficult to classify.

Types I to IV stand roughly for stages in the normal xerosere from bare ground to deciduous forest. Types V to X stand for specialized and essentially permanent (or recurrent) ecological "formations" (see pp. 106-107), some of which occur only in part of the state.

In each table, or group (where tables are subdivided), the species are arranged in order of their occurrence in successional habitats so that this may be determined at a glance, taxonomic order being preserved so far as possible under this system. Species classified V to X, however, or unclassified (XI) have been placed after those classed I to IV, in whatever group they fall, and kept in taxonomic order, since the categories V to XI represent no particular successional series.

No attempt has been made at a detailed subdivision of successional habitats. Far more than four categories would be necessary in such a classification, and present knowledge will not permit one. A wide variety of vegetational communities, each characteristically occupied by slightly different groups of birds, falls within the broad outlines suggested by the designations I to IV. A few of the variations are briefly indicated below. While the detailed composition of habitats falling within any category is infinitely varied, the range of life forms represented by any category is decidedly limited, being one only in all categories except II and III, in which grassy and shrubby or shrubby and tree forms, respectively, may both be comprised. The categories are defined as follows:

I. *Bare soil and short grass.* Sandy areas, eroded slopes, rocky outcrops, road-shoulders, overgrazed pastures, golf courses, etc., fall within this category.

II. *Meadow and old field.* Includes many combinations of grasses, composites, legumes, and other (mainly annual) herbs, tall weeds, etc.; in pastures, fallow fields, grassy banks, and similar situations. Also crop grasses, such as orchard grass, barley, oats, rye, and wheat (when pure these are occupied by very few bird species). The category includes the "old field" type of habitat, often composed of broomsedge and related grasses and sometimes including blackberry and other shrubs and encroaching forest reproduction (pioneers are often black locust, red cedar, sweet gum, elms, and redbud). Certain species of birds seem to be importantly affected in choice of breeding territory by the general openness of the vicinity. Such species are rather difficult to classify; where their most basic need appears to be grassy cover or its equivalent they have been classed II; where the presence of shrubs or trees seems essential for their nesting requirements or feeding needs they have been classed III. Thus II and III species often occur together, but there may be stratification of the groups. Class III species are essentially forest-edge species. A single tree in an open field constitutes in effect a minute bit of "forest edge," though by no means all forest-edge species would use such a habitat.

III. *Forest edge; forest opening; open grove.* Small openings in mature forest, the edge zone of forest and field contacts, and artificial situations such as parks and grazed woodlots. There is often a rather open spacing of trees with considerable admission of light, and unless grazed or tended the habitat usually has a shrubby understory. Many of Kentucky's disturbed forests and farmland habitats are nearest the forest-edge type, although they may not in fact be forest edge. Pine and pine-oak woodland has character-

istics suggestive of open or disturbed deciduous forest and supports rather similar bird populations. Species classed III are usually important in such woodlands, species restricted to piney woods—there are only two such birds in Kentucky—being classed IX (see below).

IV. *Forest*. All mature forests, whether or not climax, fall in this category. Habitats so classified afford essentially closed crown cover with consequent restriction of light and reduction of shrubby understory. Most such forests in Kentucky are secondary and have undergone considerable disturbance. It is obvious, however, that species most closely adapted to the climax will be most closely restricted to class IV.

Note. The facts will frequently not permit restriction of species to a single successional category. Where necessary, therefore, I have classed species III to IV, etc., to indicate the full range of their tolerances. *Species have only been assigned to categories V to X, representing various specialized habitat types and "formations," if restricted to them.* Thus the Red-winged Blackbird, occurring in upland fields (II), is an important inhabitant of marshes (V) but is listed according to its terrestrial successional preference only, while the Least Bittern, occurring only in marshes, is classed V. Many class III and IV species, for further example, inhabit the "swamp forest pond and slough" type (VII) recognized to express the distributions of a few species (Great Blue Heron, etc.) restricted to the type.

V. *Marsh*. Characteristically consists of wet areas supporting conspicuous growth of cattail (*Typha*) and willows (*Salix*), with various other semi-aquatic and aquatic species figuring in various degrees, especially button-bush (*Cephalanthus*), bur-reed (*Sparganium*), sedges (*Carex*), and (along streams) arrowhead (*Sagittaria*) and various water lilies (*Nelumbo*, *Nymphaea*, etc.).

VI. *River-bars*. Sand and gravel bars (usually mixed sand and gravel, with clay). Extensive sand bars (some of the largest are probably several hundred acres in area) are restricted, at least today, to the Mississippi and lower Ohio rivers where these streams approach grade level. Bars are very subject to change or destruction by water action and some of the smaller ones are ephemeral. Some grasses and shrubs, and even small willows and cottonwoods, usually grow on the higher parts of well-developed bars. Most bars contain much clay and the habitats are decidedly sterile, being comparatively unattractive to shorebirds, herons, etc.

VII. *Swamp forest ponds and sloughs*. Includes all situations where fairly large sloughs, ponds, or small lakes occur next to or within mature swamp forest. Where well-developed and permanent the complex usually includes a cypress fringe about the standing water (for further description see pp. 68-69).

VIII. *Cliffs*. By "cliffs" is implied massive rock outcrops with a considerable amount of rock exposed above the crowns of trees growing at the bases of the cliffs.

IX. *Piney woods*. This habitat consists of an admixture of yellow pines (*Pinus echinata* and/or *P. virginiana* and *P. rigida*), usually openly spaced, with various species of oaks, hickories, and other trees.

X. *The original prairies*. This class has been used only for the Greater Prairie Chicken, now extinct in Kentucky. Many meadows (II) bear some resemblance to the prairie form and are occupied by species doubtless once

important on the prairies. The Kentucky prairies have been effaced by agricultural development.

XI. *Difficult to classify.* This category was created to deal with, or rather to avoid dealing with, species of complex ecological relations which defy expression in simple terms. Many of the species are predatory, hole-nesting, or aerial feeders, and seem relatively independent of vegetational and formational influences. While they are not unclassifiable, I think little would be gained at present by the effort of classification, which would introduce considerable complication into the tables. Also assigned here have been one or two extinct or very poorly known forms.



RECENT CHANGES IN THE KENTUCKY AVIFAUNA

It is sometimes said that the past is the key to the present. Certainly, before attempting to interpret the distribution of birds in an area which within a century and a half has undergone great modification, it is desirable to discover or infer so far as possible what the effects of this modification have been. Since, however, the record of original bird life in Kentucky and of its subsequent alteration is extremely fragmentary, the present must here serve as the key to the past.

This is not altogether impossible. Kentucky was mainly a forest state, and thanks to the diligence of forest ecologists, a good deal is known about the composition of the original forests. If the supposition is valid that forest habitats surviving today in unchanged or little changed condition are occupied by bird populations very like those originally occurring, then the bird life of little changed habitats may be compared with that of habitats variously altered, and revealing inferences may be drawn as to the probable sequence of historical events. In some cases such inferences are augmented by early records, and by actual observations of trends in bird distribution now in progress, some of which suggest the patterns of former trends. Several types of changes may be recognized.

Vanished Species

The following have been extirpated from Kentucky.

Swallow-tailed Kite	Carolina Parakeet
Greater Prairie Chicken	Ivory-billed Woodpecker
Passenger Pigeon	Common Raven

All are known to have bred in the state or may logically be assumed to have done so. The Passenger Pigeon and Carolina Parakeet are extinct and the Ivory-billed Woodpecker is nearly so. The Greater Prairie Chicken is much reduced in range, at least in the eastern United States, and the range of the Swallow-tailed Kite has shrunken drastically. The Common Raven has decreased in or disappeared from the more settled portions of the Appalachian region.

Although their original distributions in Kentucky are imperfectly known, available evidence indicates that these species were once conspicuous and important, the prairie chicken on the original prairies, the kite in the broad river valleys of western Kentucky, the woodpecker probably with a somewhat similar distribution, the raven in rugged eastern Kentucky, and the parakeet and pigeon widespread. All but the prairie chicken were forest or forest-edge species.

Persecution doubtless played some part in the elimination of all of these birds from Kentucky, but close dependence upon climax vegetational conditions early and largely destroyed was probably more important in some cases. The Marsh Hawk, which seems to have bred on the original prairies, no longer breeds in Kentucky and perhaps should be included here, but since there are recent breeding records from southern Ohio it may again be found nesting in the state.

Species Much Reduced in Numbers and Range

This category may be subdivided. Most evidently belonging here are two galliform birds.

Ruffed Grouse

Turkey

The Ruffed Grouse is now nearly limited to eastern Kentucky, where it is fairly common, but was once numerous through most or all of the state. Almost all accounts of early travelers refer to the abundance of the Turkey, which until restocked had been reduced to a mere remnant in western Kentucky. The Turkey was evidently numerous in the original forests of the entire state. It occurs largely in forest-edge habitats, and its near-extirpation in Kentucky was obviously due mainly to intensive year-round hunting pressure. The local survival of the grouse has been closely correlated with rugged topographic conditions facilitating escape from pursuit and delaying deforestation.

Undoubtedly other large birds have been severely reduced in numbers and range by systematic persecution and deforestation. At least the following should be mentioned.

Common Egret

Bald Eagle

Yellow-crowned Night Heron

Osprey

Broad-winged Hawk

Great Horned Owl

Red-tailed Hawk

Pileated Woodpecker

The Broad-winged and Red-tailed hawks and the Great Horned Owl seem in Kentucky to be more sensitive to disturbance than the Red-shouldered Hawk and Barred Owl. The Common Egret, Yellow-crowned Night Heron, and Pileated Woodpecker seem to be adapting to changed conditions and slowly increasing and spreading.

Many other species, particularly those restricted to mature forest habitats, have undoubtedly been more or less reduced in numbers and total area occupied, particularly in such thoroughly cleared areas as the Bluegrass. A few forest birds, especially, seem to have been unable to adjust well to radically changed conditions.

Hairy Woodpecker

Worm-eating Warbler

White-breasted Nuthatch

Cerulean Warbler

Yellow-throated Vireo

Louisiana Waterthrush

Black-and-white Warbler

Hooded Warbler

Doubtless no forest species has been completely unaffected by environmental changes, but in Kentucky the majority seem to have adapted well to change and many (for example, such typical woodland birds as the Eastern Wood Pewee and Wood Thrush) are common today in artificial situations like city parks and suburban estates. Probably species most closely adapted to climax conditions have been most seriously affected by change. Many "forest" species are perhaps more properly forest-edge species; they are "pre-adapted" (see Beecher, 1942:62) for conditions brought about by extensive forest clearance and may actually profit thereby (the Robin is an excellent example).

Species of the Forest Openings

Species probably once restricted to the edges of forest and natural open-

ings therein have undoubtedly become more numerous throughout their original ranges. A minimum list should include the following.

Whip-poor-will	Yellowthroat
Ruby-throated Hummingbird	Yellow-breasted Chat
Catbird	Cardinal
Brown Thrasher	Indigo Bunting
Blue-gray Gnatcatcher	American Goldfinch
White-eyed Vireo	Rufous-sided Towhee
Prairie Warbler	

These and other forest-edge species capable of existing in small openings must have formed a part, if numerically unimportant, of the original avifauna of most of Kentucky. Perhaps they did not occur in unbroken stretches of climax forest, but it is doubtful that such were extensive; wind, fire, flood, rock outcrops, and slides always provide some glades. While they are properly part of primary avifaunas, these species, greatly increased in numbers, today form an important part of the state's secondary avifaunas. They are the successional-stage birds which were already on hand and ready to utilize increased environment made available by partial deforestation.

There is evidence for this supposition. These species figure in most of the earliest lists of Kentucky birds, and there is no indication that they have invaded the state or changed their ranges there in historic times. They are found today even in the smallest natural openings in the best-preserved and most extensive forests of mountainous eastern Kentucky. A partial exception is met on the summit of Black Mountain, where the Blue-gray Gnatcatcher, White-eyed Vireo, Prairie Warbler, and Cardinal are lacking, but these are southern species possibly affected by factors related to elevation. The abundance of the others in the cleared areas high on Black Mountain and remote from other disturbed habitats is in sharp contrast to the status of the species in the following list, most of which are very rare or absent there.

The present list could undoubtedly be expanded with more complete knowledge. The original avifauna in many places must have included such additional forest-edge species as the American Woodcock, Cedar Waxwing, and Blue-winged Warbler. Aside from the more obvious cases, however, it is perhaps easier to conjecture which species were not present in the avifauna of forested wilderness Kentucky.

Species of Extensive Openings

This category includes species now widespread in successional habitats—open areas and forest-edge—but probably once restricted to major disturbed areas, the edges of the prairies, or in some cases altogether lacking from the state. Species unlikely to have been present in small natural openings of the original forests are the following.

Bobwhite	Eastern Meadowlark
Killdeer	Red-winged Blackbird
Mourning Dove	Orchard Oriole
Eastern Kingbird	Baltimore Oriole
Horned Lark	Common Grackle
Common Crow	Grasshopper Sparrow

Bewick's Wren	Lark Sparrow
Mockingbird	Bachman's Sparrow
Warbling Vireo	Chipping Sparrow
Yellow Warbler	Field Sparrow

These are birds generally absent even today in the smaller clearings and, especially, natural openings in extensively forested parts of the state. The birds of cleared areas near the top of Black Mountain, Harlan County, are especially interesting in this connection. Small parts of the upper slopes of this mountain (see p. 32) have now been cleared for many years and today are reverting slowly to forest. Consequently, there is available a fairly complete range of the terrestrial seral stages occurring locally, but these habitats are small and isolated from similar areas by many miles of dense, mostly mature forest.

While successional-stage species of the last group, such as the Catbird, Brown Thrasher, Yellowthroat, Yellow-breasted Chat, Indigo Bunting, American Goldfinch, and Rufous-sided Towhee are common in these mountain clearings, only five species of the present list, the Bobwhite, Common Crow, Eastern Meadowlark, Chipping Sparrow, and Field Sparrow have been recorded at all, and only the last is common. But the general distributions of the species in the list do not suggest that the moderate elevation of Black Mountain (4,150 feet) would preclude their occurrence there because of climate. It seems more likely that they were simply not on hand to colonize the newly created habitats and have not yet penetrated to them. I think that if Black Mountain and its environs were extensively deforested all of the above species would eventually occupy open areas regardless of elevation. A similar prediction has been made by Odum (1945:196) concerning the Yellow Warbler in the mountains of Virginia.

In groves on the original prairies, in prairie-forest ecotones, and perhaps in larger disturbed areas elsewhere, the Bobwhite, Mourning Dove, Eastern Kingbird, Common Crow, Bewick's Wren, Mockingbird, Eastern Meadowlark, Red-winged Blackbird (in wetter areas), Orchard and Baltimore orioles, Common Grackle, and Field Sparrow seem likely to have been among the important or representative species. The Chipping Sparrow may have occupied the pine-oak woods and cliff-edge habitats common in eastern Kentucky, as well as prairie groves and edges. The Killdeer was doubtless present in places and probably bred also on bars and flats near streams. Yellow Warblers and Warbling Vireos probably occurred originally, as they do today, in the more or less permanent willow-cottonwood belts along larger streams, and the warbler in the willows and marshy places of streambanks generally.

Considering their habitat preferences, it seems unlikely that the Horned Lark, Grasshopper Sparrow, Bachman's Sparrow, and Lark Sparrow, if present, occurred anywhere but on and near the prairies. These species must have been early invaders of new clearings, however, and appear to have attained their present distributions so rapidly that little record remains of their expansion. (Some published observations, not entirely convincing, suggest that the Horned Lark is a more recent invader than the others.) Brooks (1938, 1938a) has recorded apparent evidence of the general eastward spread of the Bachman's and Lark sparrows in the upper Ohio Valley.

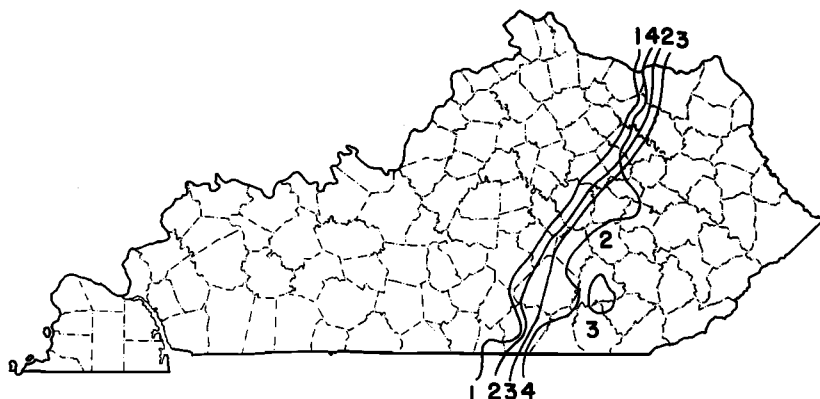


Fig. 8. Approximate eastern range limits of four species which probably entered Kentucky from the west and/or south. 1, Loggerhead Shrike; 2, Chuck-will's-widow; 3, Dickcissel; 4, Black Vulture. The isolated, extra numerals 2 and 3 both apply to the eastern closed circle, wherein the Dickcissel and Chuck-will's-widow occur in a disjunct pocket.

Completing the list of birds which have probably increased in numbers and perhaps in range with deforestation is a group of species of complex habitat requirements inadequately summarized by such simple adjectives as "open-country," "forest," or "forest-edge." All probably benefited, however, by partial deforestation, and most of them also by the ability to use man-made nesting sites. Certainly to be named are 10 species.

Turkey Vulture	Eastern Phoebe
Sparrow Hawk	Rough-winged Swallow
Common Nighthawk	Barn Swallow
Chimney Swift	Purple Martin
Red-headed Woodpecker	Eastern Bluebird

Probable Invaders from the West and South

The following species have probably entered the state, or greatly increased their ranges and numbers there, within historic times.

Black Vulture	Loggerhead Shrike
Chuck-will's-widow	Dickcissel

The present ranges of these dissimilar species are nearly alike, embracing the state west of the Cumberland Plateau (Fig. 8). None may properly be considered an inhabitant of climax forest and the last three are definitely forest-edge (Chuck-will's-widow, shrike) or open-country forms (Dickcissel). The Dickcissel and Chuck-will's-widow seem recently to have invaded a small part of the plateau, entering the new area in the same place (see p. 38). These two species are unstable at the edges of their ranges today, this characteristic of the Dickcissel in the eastern United States being well known. The Chuck-will's-widow has increased in Kentucky and expanded its range toward the north and east in recent decades. In time both will probably become numerous in many seemingly suitable parts of the Cumberland Plateau.

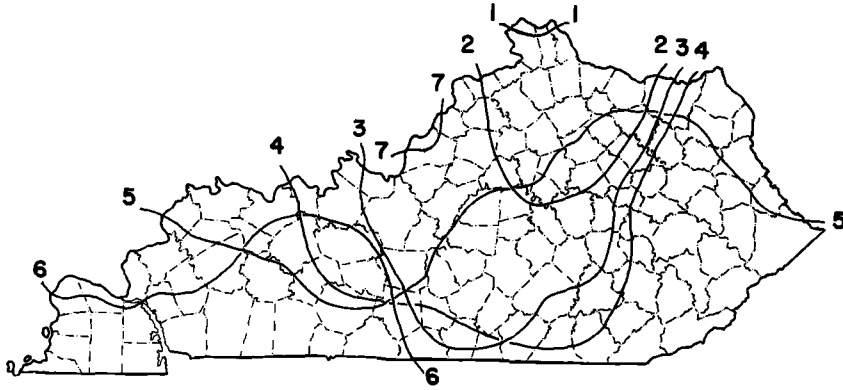


Fig. 9. Approximate southern range limits of seven species which probably entered Kentucky from the north. All are open-country or brush-inhabiting forms and several are actively expanding their ranges. 1, Upland Plover; 2, Vesper Sparrow; 3, Henslow's Sparrow; 4, Short-billed Marsh Wren; 5, House Wren; 6, Song Sparrow; 7, Traill's Flycatcher.

The failure of these two species to occupy cleared areas of the plateau in the many years that these have been available indicates considerable effectiveness as a barrier of the band of heavy forest 15 to 30 miles wide along the western rim of the plateau. Both species may only recently have become sufficiently numerous just west of the plateau margin for population pressures to result in expansion across this barrier.

The Loggerhead Shrike and Black Vulture have not penetrated the plateau to any extent and both appear to be static in distribution. Nevertheless, the occurrence of shrikes in many highland areas of the Appalachian region, the recent, remarkable northward advance of the Black Vulture east of the mountains, and the apparent suitability of parts of the plateau for both species warn against postulation of enduring stability of their range boundaries in this area.

The correlation of the ranges of all four species with the plateau margin suggests that the advance of these open-country and forest-edge birds has been impeded by this area of rugged topography and extensive forests. Such species evidently advance gradually, one territory at a time, as it were, more effectively than by leaps dependent upon the discovery and colonization of isolated habitats. The ranges of the next group also suggest this.

Open-country Invaders from the North

At least seven species of grassy, shrubby, or forest-edge habitats seem to have invaded Kentucky from the north. None occurs throughout the state.

Upland Plover (casual)	Henslow's Sparrow
Traill's Flycatcher (casual)	Vesper Sparrow
Short-billed Marsh Wren	Song Sparrow
House Wren	

The House Wren, Song Sparrow, and Henslow's Sparrow have increased their ranges in the state within historic times, the last very recently. Recent

range expansions of the Vesper Sparrow and Short-billed Marsh Wren have not been recorded (but may have occurred), and the Traill's Flycatcher and Upland Plover are little known. The habitat requirements and present distributions of all make it seem improbable that these species were important, if present, in forested early Kentucky. The Upland Plover may have bred on the original prairies, since it is a characteristic species of such habitats, but as a breeding bird today it is known only from a single record in extreme northern Kentucky.

Most of these species have invaded the state most successfully in its northernmost and most extensively deforested area, the Bluegrass. The accompanying map (Fig. 9) suggests that the forested areas adjacent to the Bluegrass (Cumberland Plateau, Knobs, Shawnee Section) have been fairly effective barriers to their progress. Stream valleys seem to have served as special avenues of invasion for the Song Sparrow and House Wren.

It would be unsafe to conclude that any of the above species is in equilibrium with the environment or limited to its present range by physical factors. An ingenious effort to demonstrate the latter in the case of the House Wren (Kendeigh, 1934:397, 407, etc.) did not prevent the species from colonizing a broad band of territory "shown" to be uninhabitable or barely inhabitable. If present trends continue, at least some of these species, especially the Song Sparrow and House Wren, will inevitably occupy the whole state. There is some evidence that the Robin, now found throughout Kentucky, has occupied much of the state within historic times, moving southward earlier and faster than the above species.



BIRD DISTRIBUTION IN RELATION TO CERTAIN ENVIRONMENTAL FEATURES

The life histories, not to mention the physiological tolerances, of few vertebrate species are well enough known to reveal limiting factors and optimal conditions, and the physical characteristics of many environments, especially microclimates, are themselves yet poorly known. Determination of such matters, in any event, is usually beyond the scope or reach of the faunal analyst, who is still practically limited to the search for correlations. Further, even the most interesting and suggestive correlations are not proof of direct cause-and-effect relationships (Elton, 1927:42); the failure to understand this handicapped the "life-zone" theory as originally propounded. Yet the discovery of correlations is useful in suggesting areas for further work.

A problem often facing the faunal analyst stems from disturbance of natural habitats and consequent alteration in the ranges of many species, some of which are still moving toward new equilibria. In the analysis of an extensively disturbed area it is most difficult to distinguish the stable and old from the unstable and transitory; conclusions adopted today must be abandoned tomorrow. But disturbance is not entirely a liability, because it has provided a laboratory but for which we might still be unaware that certain species thought a generation ago to be limited by, say, temperature factors are actually bound to vegetational complexes, following these wherever man permits them to go until physical limiting factors are met (see Pitelka, 1941:132-133).

Nevertheless, before any extensive understanding of existing situations is achieved, distinction must somehow be attempted between anciently established distributions or remnants thereof, newly established distributions, and present distributional trends.

Although without an adequate historical record this cannot be perfectly accomplished, it seems probable that the populations of vegetational climaxes are relatively conservative, while those of successional stages and disclimaxes are more likely to display newly established patterns and greater disbalance. This assumption is supported in Kentucky, where comparison of the distribution of forest species (climax or near climax) and those of successional stages reveals distinct differences.

DISTRIBUTION IN RELATION TO VEGETATIONAL STAGES AND DISTURBANCE

In Table 11 certain aspects of the distributions of nonforest and forest-edge birds—here collectively called "subforest species"—are compared with those of forest birds. The 98 species considered are those of Tables 7 to 9, exclusive of species of specialized habitats (classes VI-X, XI) and extinct forms. Subforest birds are those in the habitat categories I to III of the tables, forest forms being those classified III to IV and IV. Thus accounted for are all terrestrial Kentucky species readily classifiable in the deciduous forest sere. The numbers of subforest and forest species are almost equal, 48 and 50, respectively.

Table 11 shows that the forest species display a greater tendency to dis-

TABLE 11

SUBFOREST¹ AND FOREST SPECIES COMPARED WITH REGARD TO REGULARITY OF DISTRIBUTION

	Subforest species (habitat categories I, I-II, II, II-III, III)		Forest species (habitat categories III-IV, IV)	
	Number	Per cent	Number	Per cent
Table 7 ²	31	64.5	21	42.0
Tables 8 ³ and 9— (stable species)	8	16.7	29	58.0
Tables 8 and 9— (unstable species)	9	18.8	0	0.0
Totals	48	100.0	50	100.0

¹ See text, p. 86.² Species evenly distributed throughout Kentucky.³ Species irregularly distributed in Kentucky.

tributional irregularity than the subforest birds. Of the forest forms 29 of 50 (58 per cent) exhibit such irregularities, either being limited to part of the state or occurring in different abundance in different areas, while only 17 of 48 subforest species (35.5 per cent) do so. Further, if 9 subforest species known or suspected to be unstable in distribution (and likely in time to occupy all of the state) are discounted, only 8 subforest species of irregular distribution remain (16.7 per cent). Stating this conversely, 64.5 per cent of the subforest species are evenly distributed throughout Kentucky, compared with 42 per cent of the forest species, and the former figure might well become higher if trends known or suspected continue.

Probably some species of successional stages occurred throughout the state originally and others rapidly spread through it as suitable habitat became available (see pp. 80-82). Forest species, on the other hand, seem to have remained relatively stable and somewhat more limited in distribution, so that their range-limits are more often met within the area.

This is probably because natural successional stages tend to be more alike everywhere, both in life form and specific composition, than are climaxes, and birds of successional stages consequently tend to be widespread (Pitelka, 1941:131; Odum, 1945:198). More or less artificial habitats, or quasi-successional stages resulting from disturbance, tend even more to be widely uniform. The same crops are planted, the same weeds introduced, and the same farming practices followed. Species adapted to such artificial conditions are likely in time to colonize all of the habitat available. Some of these may be species of other climaxes, in the present case notably of the grasslands, which in the deciduous forest region become successional-stage species.

Forest species, on the other hand, in Kentucky are within a region where their environmental relationships have presumably been established over long periods of time. Some—here 42 per cent—are adaptable and widespread, seemingly capable of flourishing wherever broad-leaved forest occurs; others (58 per cent) are evidently more sensitive, perhaps more closely adapted to specific environmental complexes, and so display distributional irregularity.

ties. The stability of their distributions suggests that these are of long standing, and so of special interest. It remains to examine them further.

DISTRIBUTION OF BIRDS IN RELATION TO FOREST TYPE¹

We have seen that in Kentucky species of advanced and climax stages of the deciduous forest display more distributional irregularity than species of subforest successional stages. This discussion deals with the irregularly distributed forest species. Their distributional patterns have been suggested by the organization of Tables 8 and 9, above. Let us first consider species occurring throughout Kentucky, but differing in abundance in different parts of the state (Table 8).

The forest species of Table 8 here of particular interest are the Whip-poor-will, Black-and-white Warbler, Worm-eating Warbler, Ovenbird, and Scarlet Tanager (group A), increasingly rare from east to west; the Yellow-throated Vireo, Parula Warbler, Hooded Warbler, and American Redstart (group B), numerous in the east, rare in central Kentucky, and again common in the west; and the Red-bellied Woodpecker and Cerulean Warbler (group C), which are decreasingly common from west to east. Several hawks and owls of groups A and C have been eliminated, since their distributions are possibly influenced by persecution. For practical purposes, the Swainson's Warbler of Table 9 has been added to group B. Although at the limits of its range, it has a distribution allying it with that group. Likewise, the Prairie Warbler and American Woodcock of Table 8, although not forest species, are among the few successional-stage birds combining apparent stability of range with distributional irregularity and may well be considered with group A. Group A thus comprises seven species, group B five, and group C two.

The species of group A average common in the two eastern avifaunal regions (Cumberland Crest, Cumberland Upland), fairly common in the Western Upland avifaunal region, rare in the Limestone Plateau, and are absent in the Alluvial Forest; the species of group B are similar in distribution, except that they average common in the Alluvial Forest; the species of Group C average common in the Alluvial Forest, Limestone Plateau, and Western Upland, and uncommon in the eastern regions (the Red-bellied Woodpecker is lacking from the Cumberland Crest).

These species were repeatedly mentioned in the definition of the several avifaunal regions (providing the "ecological features" thereof), with which their distributional patterns are in close accord.

It is easy to discover environmental features correlated with these distributional patterns. One need only note the similarity of Fig. 5, showing the avifaunal regions, and Fig. 4, adapted from Braun's classification of the deciduous forest formation. Except for terminology, slight differences in the rank of units, and minor differences of arbitrary delimitation, they are identical. In other words, a map of the prevailing forest types of Kentucky serves as a map of the distributional peculiarities of the birds listed. The Cumberland Crest and Cumberland Upland avifaunal regions equal the Mixed Mesophytic Forest region; the Western Upland equals the Hill Section of the Western Mesophytic Forest region, and the Limestone Plateau equals the Mississippian Plateau, Bluegrass, and Purchase divisions of the

¹ In connection with this section see also the supplementary note following.

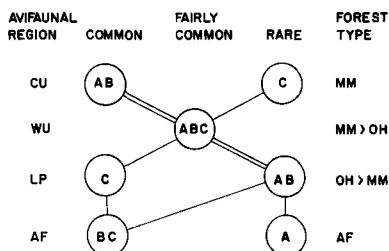


Fig. 10. The relative abundance of three groups of forest-adapted species in relation to the prevailing forest types of four avifaunal regions (the small Cumberland Crest avifaunal region is not included). *Group A*: Whip-poor-will, Scarlet Tanager, Black-and-white Warbler, Worm-eating Warbler, and Ovenbird; and the Prairie Warbler and American Woodcock of successional stages. *Group B*: American Redstart, Parula Warbler, Warbler, Yellow-throated Vireo, Hooded Warbler, Swainson's Warbler. *Group C*: Red-bellied Woodpecker, Cerulean Warbler. The lines indicate the trend in commonness of a group (single line) or groups (double line) from region to region. Regions: *CU*, Cumberland Upland; *WU*, Western Upland; *LP*, Limestone Plateau; *AF*, Alluvial Forest. Forest types: *MM*, moist, luxuriant mixed mesophytic forest; *OH*, dry oak-hickory and mixed forests; *AF*, moist, luxuriant swamp or alluvial forests. Mixed mesophytic forests, in regions where two forest types are indicated, are dilute and imperfectly developed.

same region; the Alluvial Forest, finally, equals the corresponding division of the Southeastern Evergreen Forest region.

The essentials of the relationship between these regional forest types and the abundance of the birds under consideration are shown in Fig. 10.

It is probable that there is a causal relationship between the abundance of the three groups and the type of forest mainly available. The abundance of groups A and B seems to depend upon the prevalence of luxuriant moist forest, group A being abundant only in areas rich in mixed mesophytic forest, group B in areas rich in moist forest whether or not mixed mesophytic. The abundance of the two species of group C is inversely correlated with the prevalence of moist forest, especially mixed mesophytic forest, but the situation is less clearly defined than that in respect to A and B. The abundance of all of these species, however, seems to be correlated, directly (in 12) or inversely (in 2), with the relative "mesicness" of the forest environment.

Of the 14 species considered, 11 are definitely forest birds. The Worm-eating Warbler, Ovenbird, Hooded Warbler, and Swainson's Warbler are large-eyed, shade-loving, low-ranging species adapted to the lower strata of deep forest.

Conjecture concerning factors possibly limiting certain specialized species to moist forests with abundant shade and high humidity may not be out of place. The following may be important: (1) susceptibility of eggs and small, nearly naked young to desiccation—a hazard which would increase in direct proportion to temperature; (2) dependence of young and perhaps adults upon kinds of food restricted to moist forests; (3) development of foraging techniques most effective in such environments; (4) lucifugous tendencies of adults resulting from long adaptation to deep shade.

Conversely, adaptations opposite to 2, 3, and 4 above might exclude the species of group C (and perhaps others) from extremely mesic forests. It

is also conceivable that small young of species not adapted to highly mesic environments might there be adversely affected by too great moisture, perhaps being subject to fungus infections or other diseases (see Andrewartha and Birch, 1954:209-210).

Experimental work has been conducted on the relations of other vertebrates to environmental moisture (see Bogert and Cowles, 1947). Such work on young birds of various types and species might be very rewarding (see, in this connection, Shelford and Martin, 1946, on young pheasants).

Another requirement perhaps restricting some species to certain types of forest may be a need for humus, leaf-mold, herbaceous ground cover, or some combination thereof, of given type and texture for the construction and concealment of nests. This requirement would apply mainly to ground-nesting species and is suggested by the distributions of the ground-nesting, mesophytic forest-loving Black-and-white Warbler, Worm-eating Warbler, and Ovenbird of group A, none of which occurs to an appreciable extent in the moist, oft-flooded, and frequently rather bare-floored alluvial forests, and those of the bush- or tree-nesting, equally mesophytic forest-loving Yellow-throated Vireo, Swainson's Warbler, Parula Warbler, Hooded Warbler, and American Redstart (group B), all of which are common in moist alluvial forests.

The likelihood that environmental moisture (or factors related thereto) in the immediate vicinity of the nesting area (perhaps best expressed by relative humidity, or by the precipitation-evaporation ratio—see Beecher, 1942:52; Andrewartha and Birch, 1954:207) is an important factor in governing the distributions of these species under extreme conditions, *i.e.*, near the warmer and drier edges of their ranges, is further suggested by their habitat preferences in different localities in and out of Kentucky.

In the Cumberland Plateau and Mountains, where temperatures average somewhat lower and moisture somewhat higher than to the westward (Figs. 2 and 3), the species of groups A and B exhibit comparatively broad habitat tolerances, tending to encroach upon or even fully to occupy communities locally relatively xeric (for example, physiographic climaxes of oak, oak-hickory, oak-chestnut, and even pine-oak). However, the farther west and south one goes in Kentucky, in the direction of higher temperatures and lesser moisture, the more sharply restricted are these species to the most mesic environments available. Highly mesic situations, in turn, are progressively fewer, assuming the role of postclimaxes. Thus, in western Kentucky one would never think of searching for a Worm-eating Warbler, Hooded Warbler, or Ovenbird in a dry oak-hickory woods (they would be found, if at all, in some shaded, mesophytic ravine or—Hooded only—in a dank, bottomland forest), while all three are frequently found in the most xeric oak-hickory stands in the Cumberlands. Again, the Ovenbird is common in oak-hickory communities northward, as in southern Michigan, but in dry, hot eastern Kansas, where this is the predominant forest, the species is very rare at best. Similarly, the other species of groups A and B (and additional birds not thought of, in Kentucky, in connection with mesic environments) tend in eastern Kansas to be rare or absent in the dry, upland forests of chestnut oak and hickories, if present, occurring only in the most luxuriant growth of ravines, north slopes, or along the floodplains of small streams, in distinctly postclimax situations.

An opposite tendency may be noted in several species. The facts at present are insufficient to justify extensive discussion, but certain typically forest species common throughout western and central Kentucky, even in the most mesic environments, seem in eastern Kentucky to be least numerous, or even absent, in fully developed mixed mesophytic forests. Among species showing this tendency are the Red-bellied Woodpecker, Great Crested Flycatcher, Eastern Wood Pewee, and Wood Thrush. Of these species, at least the Wood Thrush is restricted in Kansas to the most mesic communities.

The Cerulean Warbler is puzzling; common in most mature and comparatively mesic forest environments in western and central Kentucky, it becomes increasingly rare and local in the highly developed mixed mesophytic forests of eastern Kentucky, and farther east is virtually absent. The factors influencing its distribution must be complex. Interspecific competition may possibly be among these, since in Kentucky this species and the Parula Warbler tend to be mutually exclusive; in any case, there is obviously a general similarity in their songs, feeding levels, and color patterns.

A tentative summary of the foregoing observations may be attempted. In the deciduous forest formation in Kentucky certain birds are "forest sensitive," being correlated in density and frequency of occurrence with variations in forest type. Several species important in the Mixed Mesophytic Forest region, particularly its climax communities (but there displaying relatively broad habitat tolerances), tend progressively to be restricted to postclimaxes in a westerly and southerly direction, that is, in the Western Mesophytic Forest region. Other forest-sensitive species, although important in most of the forests of the Western Mesophytic Forest region, including its postclimaxes, tend to be restricted to preclimax situations in the Mixed Mesophytic Forest region. Environmental moisture may well be one factor influencing these tendencies, which seem to apply to an area considerably larger than Kentucky; shade may be another factor, and there are doubtless many more.

Forest species reaching the limits of their ranges in Kentucky (Table 9, above) remain to be considered. Of these, 2 of 10 species considered (disregarding extinct and little known forms, and Swainson's Warbler treated above) have distributions here coextensive with vegetational regions. These are the Black-throated Green Warbler and Black-billed Cuckoo, whose ranges are virtually restricted to the Cumberland Upland (and Cumberland Crest) avifaunal region and the Mixed Mesophytic Forest region.

Other species of Table 9, forest and subforest birds alike, show no obvious correlations with readily appreciable vegetational boundaries. The Chestnut-sided, Black-throated Blue, Blackburnian, Canada, and Golden-winged warblers, Veery, Solitary Vireo, Rose-breasted Grosbeak, and Slate-colored Junco seem to be restricted by elevational limits cutting across comparatively homogeneous vegetational units. The Cedar Waxwing, common through the mountains and plateau, becomes gradually less numerous to the west and south without apparent relation to vegetational units.

On the basis of all the distributions considered, there seems to be a considerable relationship between forest type and the abundance, and in some cases the range-limits, of some forest species, while in many other cases little or no direct relationship is evident. This will be discussed further below.

TABLE 12
 RICHNESS OF THE FOREST AVIFAUNAS¹ OF THE FIVE AVIFAUNAL REGIONS²

	CC	CU	WU	LP	AF
Table 7 ³	73 (18)	95 (20)	95 (20)	95 (20)	95 (20)
Table 8 ⁴	57 (15)	72 (17)	63 (17)	32 (14)	41 (9)
Table 9 ⁵	37 (9)	16 (5)	8 (2)	9 (2)	14 (3)
Total Score ⁶	167 (42)	183 (42)	166 (39)	136 (36)	150 (32)
Average "common-ness" per species	3.9	4.4	4.3	3.8	4.7

¹ Habitat categories III-IV and IV; see pp. 76-77.

² See Table 8 for abbreviations.

³ Species evenly distributed throughout Kentucky, with some exceptions in the case of the Cumberland Crest.

⁴ Species irregularly distributed, but not at the limits of their ranges.

⁵ Species reaching the limits of their ranges in Kentucky.

⁶ See p. 92 for details of computation. Numbers in parentheses are numbers of species contributing to each score.

The capacities of different types of forest to support individuals and species may be shown in another way by consideration of forest species according to their occurrence in the several avifaunal regions which, as we have seen, are rather closely correlated with variations in prevalent forest type (excepting the Cumberland Crest).

The relative "richness" of the forest avifaunas of the regions may be demonstrated quantitatively in a rough way by awarding numerical values to the terms representing the abundance of each species (common = 5; fairly common = 4; uncommon = 3; rare = 2; very rare = 1; absent = 0) and adding up the total scores for each region (for results see Table 12).

It is doubtful whether the scores shown in the table are directly comparable with scores determined by others, since terms of abundance are awarded by a subjective process. However, the scores should be comparable among themselves, since the terms have all been awarded by me.

The scores suggest the capacity of the forests of each avifaunal region to support both species and individuals, the number of species providing a direct indication of the former property. For example, the Cumberland Crest and the Cumberland Upland both support the same number of species (42), but a considerably greater number of species is important and common in the latter, resulting in a higher total score (183 to 167). The Alluvial Forest supports the fewest species (32), but a high percentage is common, resulting in a higher total score (150) than in the Limestone Plateau with 36 species (136).

Probably the number of species present is partly an indication of variety of habitat, or the number of niches available, while the total score is a product of this factor times the extent of the niches. Thus the high total score of the Cumberland Upland avifaunal region may be due to the great variability of the mixed mesophytic forest characteristic of this region and the abundance of niches available as a result.

The richness of the forest avifauna of Kentucky appears to be directly proportional to the local representation of mesic forest, especially mixed mesophytic forest, but an inverse proportion with elevation may exist within

this gradient. The comparatively warm, dry, mixed and oak-hickory forests of central Kentucky do not support so rich an avifauna as either the alluvial forests or the rich, moist mesophytic forests of the Cumberland Plateau.

Table 12 is incidentally revealing in another way, showing the approximate ecological importance of the groups of species of Tables 7, 8, and 9 in each avifaunal region.

Considering the distributions of North American birds in relation to major biotic communities, Pitelka (1941:130) commented: "Birds apparently do not respond to any specific differences among the dominant plants of a climax or any of its seral stages." He restated this (p. 135) as follows: "Correlation of birds with vegetation reveals no relation to specific dominants or groups of dominants in a single biome . . ." In the broadest sense these statements have proven valid. They were made in the course of a correct emphasis of the strong correlations observable between bird distribution and life forms of vegetation, and it is probably true that no close and continuous correlation throughout a biome can be found between a bird species and a single dominant or group of dominants. But differences do prevail between the avian populations of different associations within a biome, and strong correlations are shown between birds and plant associations or consociations in some areas.

Kentucky is too small to allow the formation of conclusions applicable to the entire deciduous forest biome, but within the state, as I have attempted to show, fairly close correlations are found between the distributions of certain birds and rather distinct and constant groups of dominant plants (Fig. 10). Several species were seen to be rather closely correlated with the Mixed Mesophytic Forest association (which, though variable, consists by definition of certain basic groups of dominants occurring together). Others, correlated with this association in part of the state, assume a new correlation with the alluvial forest subclimax in another part (the "subclimax" nature of this forest being a mere technicality so far as birds are concerned—it is a stable broad-leaved forest of definite composition). These correlations are in fact probably somewhat closer than is shown above. Present knowledge permitted only correlation of species' distributions with forest regions, that is, areas where certain types of forest were more, or less, prevalent. So, for example, certain species were "common" in the Mixed Mesophytic Forest region (where mixed mesophytic forest is prevalent) and "uncommon" in the Hill Section of the Western Mesophytic Forest region (where mixed mesophytic forest mingles with oak-hickory and other associations). But it is likely that these species in the latter area are largely restricted to the mixed mesophytic communities, so that what seems to be a partial correlation may be nearly a perfect correlation.

In pointing out regional correlations between birds and particular groups of dominants (*i.e.*, associations) I am not attempting to imply a direct causal relationship between the distributions of trees or associations and those of birds. In fact I have suggested that factors related to moisture, in themselves partly influencing the distribution of forest types, and perhaps birds, and in turn modified by forest, might be very important and account to some extent for the distributions of both plants and birds.

Neither, however, do I say that there is not a direct causal relationship behind observable correlations of the kind under consideration, granting, as everyone seems to, that there seem to be definite causal factors influencing

TABLE 13

DISTRIBUTION OF FOREST SPECIES IN KENTUCKY AND THEIR GENERAL DISTRIBUTIONS (SPECIES LOCALLY CORRELATED IN DISTRIBUTION WITH FOREST TYPE ARE NUMBERED)

Species mainly confined to deciduous forest biome	Species ranging over two or more biomes, or adapted to two or more climaxes (*)
I. Evenly distributed through Kentucky	
Great Crested Flycatcher	*Cooper's Hawk
Acadian Flycatcher	Yellow-billed Cuckoo
Eastern Wood Pewee	Yellow-shafted Flicker
Carolina Chickadee	*Pileated Woodpecker
Tufted Titmouse	*Hairy Woodpecker
Carolina Wren	Downy Woodpecker
Wood Thrush	Blue Jay
Red-eyed Vireo	White-breasted Nuthatch
Yellow-throated Warbler	*Robin
Louisiana Waterthrush	
Kentucky Warbler	
Summer Tanager ¹	
II. Abundance varies in different parts of Kentucky	
1. Red-shouldered Hawk ^{1,2}	1. *Sharp-shinned Hawk
2. Whip-poor-will ¹	2. *Red-tailed Hawk
3. Red-bellied Woodpecker	3. *Broad-winged Hawk
4. Yellow-throated Vireo	4. *Great Horned Owl
5. Black-and-white Warbler ²	5. *Barred Owl
6. Worm-eating Warbler	6. *Parula Warbler
7. Cerulean Warbler	
8. Ovenbird ²	
9. Hooded Warbler	
10. American Redstart ²	
11. Scarlet Tanager ³	
III. Limited to part of Kentucky	
12. Black-billed Cuckoo ³	*Solitary Vireo
Veery ³	Black-throated Blue Warbler ⁴
Prothonotary Warbler	7. *Black-throated Green Warbler
13. Swainson's Warbler	*Blackburnian Warbler
14. Bachman's Warbler	Canada Warbler ⁴
Rose-breasted Grosbeak	*Brown-headed Cowbird
	*Slate-colored Junco
29 species	22 species

¹ Well differentiated, disjunct eastern subspecies.

² Occupies a climax habitat in the deciduous forest biome proper, spreading into deciduous subclimaxes in the coniferous forest biome.

³ Most numerous and important in the deciduous-coniferous forest ecotone (where adapted mainly to deciduous growth), progressively less numerous in the deciduous forest to the south.

⁴ Important throughout much of the coniferous forest biome and the coniferous-deciduous forest ecotone, occupying mainly subclimax deciduous growth; less important in the deciduous forest biome and restricted to northern and elevated portions, where assuming a climax role, at least in some areas.

the correlation of birds with life forms of vegetation. It seems to me that the perfectly proper emphasis of the great importance to birds of radical differences in life form, as between grassland and shrubs, or coniferous and deciduous forest, has tended to obscure the probability that minor differences within these major divisions are readily perceptible and important to

some species. I see no reason to suppose that the "life form" of an oak-hickory association is identical with that of a beech-maple association in the eyes of highly adapted deciduous forest birds. It does follow, however, that the slighter the differences in "life form" (*i.e.*, differences within a major life form), the more readily these may be duplicated by other plant species, possibly accounting for some of the changing correlations of deciduous forest birds with different associations in different areas.

It might be expected, finally, that within the deciduous forest the species most sensitive to variation in forest type would be those most specialized in their adaptation to this kind of forest and, presumably, thereby most closely restricted to the deciduous forest biome. Species with tolerances broad enough to permit their occurrence (in whatever habitat) through two or more biomes, or adaptation to two or more climaxes, should not be as sensitive to minor variations in forest type as species restricted to a single climax.

A brief consideration of this hypothesis lends some support to it (Table 13). To facilitate comparison of their distributions in Kentucky, species more or less restricted to the deciduous forest appear in one column of Table 13, while those ranging through two or more biomes and/or adapted to two or more climaxes are ranged opposite.

Of the 29 deciduous forest species considered, 14 (48 per cent) are correlated in some way with forest types, while only 7 (32 per cent) of 22 more widely distributed species show such correlations, and some of these are of dubious significance (hawks, owls) because of the possible effects of persecution, degree of disturbance, etc.

SUPPLEMENTARY NOTE

The preceding section was written just too soon for consideration during its preparation of an important paper by Richard Bond (1957) on the "Ecological distribution of breeding birds in the upland forests of southern Wisconsin," a work of peculiar pertinence to the present and similar undertakings. While the temptation to rewrite the foregoing section, after study of Bond's findings, is great, I have suppressed it, not only because numerous such temptations must be withstood if a large work is ever to be finished, but also because I feared something might be lost. In compromise I have included the present note, because there is a certain interest in comparing somewhat similar conclusions independently reached by radically different methods and in noting certain relationships suggested by comparison of the distribution of birds along a vegetational continuum in one case essentially local (Wisconsin) and in the other somewhat extended geographically (Kentucky). The continuum meant is that from pioneer (comparatively xeric) to climax (comparatively mesic) forest. Such a continuum will always be found in a given area, but since the "xericness" and "mesicness" of pioneer and climax communities vary from place to place, a larger continuum, or "continuum of continua," may exist along a geographic gradient.

The data available in the present study, obtained incidentally to the many kinds of activity pursued in preparing a "state list," are essentially subjective and inescapably somewhat crude. Attempting to refine them further or extend them too far would be like performing brain surgery in boxing gloves. Bond's data, on the other hand, obtained at great pains with a single objective in mind, are precise, quantitative, and objective. A short statement (the paper should be read) of the most pertinent of his findings is attempted herewith.

The forest stands studied by Bond in southern Wisconsin had previously been carefully measured, subjected to statistical analysis, and arranged (by Curtis and

McIntosh, and others cited by Bond, 1957) to form a phytosociological continuum from the most pioneer (and most xeric) to the most advanced, or climax (and most mesic). In the area concerned, black oaks predominated at the former end and sugar maples at the latter end of the continuum.

Studying 64 of the stands along this gradient with an eye to characteristics of possible importance to breeding birds, Bond found the following trends, from pioneer to climax (xeric to mesic): 1, increasing height of trees; 2, slightly increasing density of trees; 3, increasing density of sapling layer; 4, decrease, after an early slight increase, in shrub layer; 5, increasing density of canopy (and hence, of shade); 6, increasing environmental moisture.

After careful estimation of the bird populations of the same stands, and along the same gradient, by a standardized strip-census method, the following generalities emerged: 1, a decrease in birds feeding on vegetable foods; 2, an increase of foliage gleaners and ground-feeding insectivorous birds; 3, little change among hole-nesters and bark-gleaners; 4, highest population density in intermediate stands, lowest density in xeric stands, and fewer species but high density in mesic stands.

All of this, in a general way, seems to coincide with my impressions formed in Kentucky, although some of the latter, admittedly, may seem sharper after reading Bond than before.

Bond's most specific findings, of particular interest here, relate to the distribution of individual species along the continuum. These in a considerable number of instances varied in density, and those which did so markedly tended to form Gaussian (normal) curves, or parts of Gaussian curves, along the gradient. Other species ranged throughout the continuum with comparatively little change, but "extension of the gradient in any direction . . . would probably eliminate these apparent duplications" (p. 378). Similarly, those species showing parts of Gaussian curves at one or the other end of the continuum would probably complete their curves were the gradient continued.

Interesting comparisons may be made between the distributional tendencies of the few species for which both detailed observations in Wisconsin and general but strong impressions obtained in Kentucky are available (*headings denote the status in Wisconsin*).

Species Most Numerous in Mesic Stands

Cerulean Warbler.—In central and western Kentucky under conditions of comparatively high temperature and varying environmental moisture, the species occurs widely in the more mesic stands, occupying some others that are doubtless intermediate. In eastern Kentucky, slightly cooler, where mesophytic forests are more prevalent, the species unexpectedly becomes rarer, although when found it may still be in comparatively mesic forest. Factors other than forest type seem likely to be important in governing its distribution.

Ovenbird.—In moist, comparatively cool, more or less mountainous eastern Kentucky, the Ovenbird, while occurring in fair numbers in some highly mesic stands, seems probably to be most numerous and most generally distributed in more or less intermediate stands, and occurs even in the most xeric. In drier, warmer, central Kentucky it is rare and limited to the most mesic environments (even more so, it would seem, than in Wisconsin), and in western Kentucky it is virtually if not quite absent.

Red-bellied Woodpecker.—Virtually absent from the higher Cumberlands, on the Cumberland Plateau the species occurs in comparatively small numbers, usually in intermediate or even in comparatively xeric forest types.

Species Most Numerous in Intermediate Stands

American Redstart.—In Wisconsin the numbers of this species peak sharply in the intermediate portion of the vegetational continuum. In Kentucky its distribution is peculiar. In the highly mesic but varied mixed mesophytic forests of eastern

Kentucky it is an edge and opening species, occurring in intermediate stands as in Wisconsin; in drier central Kentucky, where mixed mesophytic stands are rare and intermediate forests abundant the species is nearly absent. In the moist forests (not mixed mesophytic) of lowland western Kentucky it appears again, and again is an edge species and cannot be said to be common either in the most mesic or most xeric stands.

Wood Thrush.—In central and western Kentucky the Wood Thrush occurs in deciduous forests of many types but is *probably* most numerous in the more mesic associations. In the mixed mesophytic forests of eastern Kentucky it tends to shun the more mesic associations, and indeed may be most numerous in somewhat xeric (especially oak-hickory; see Table 5) associations.

Yellow-throated Vireo.—In eastern Kentucky the species is definitely most numerous in the more xeric stands. In central and western Kentucky it is more numerous, and in some cases seemingly limited to, the more mesic forests.

Species Most Numerous in Xeric Stands

Scarlet Tanager.—In eastern Kentucky, as in Wisconsin, the Scarlet Tanager is most numerous in more xeric forests; in central Kentucky it is too rare for an impression at present, and in western Kentucky virtually lacking.

Indeterminate Species

Great Crested Flycatcher.—This species was puzzling in Wisconsin, where the sample figures showed peaks near both xeric and mesic ends of the forest continuum. In Kentucky the species seems to be common in a variety of stands in the western and central portions but it definitely avoids the most mesic situations in the east.

While more precise conclusions cannot be drawn at present, the behavior of the species noted above, as between Wisconsin and various parts of Kentucky, and the variable preferences of a number of additional forest species in reference to Kentucky alone, all suggest that many species tend to "slide" up and down the forest continuum, from one area to another. Whether this is more a result of the effect of different macroclimates on essentially similar continuum conditions, or chiefly due to differences in the vegetational continuum itself ("extension" of the gradient, as it was stated above), or results from both in combination, poses an interesting question and suggests a field for further investigation.

In any event, one point of sharp agreement emerges between Bond's study and this one, namely that a number of deciduous forest birds are sensitive to variations in the configuration and type of forest, resulting from an increase of dominant species at the expense of shade-intolerant trees. The fact that, in a single area, no two species show quite the same patterns of response is doubtless related to the fact that, in a geographic sense, no two species seem to show quite the same distributional peculiarities.

A final point emerging from Bond's studies is the demonstration therein that a number of species sensitive to the "mesicness" gradient are also responsive to woods size. That is, certain species occur in small woods only if highly mesic but may be found in less mesic woods if the extent thereof is great. Some other species tend to be more numerous in larger, or smaller, woods without reference to "mesicness." This suggests that some of the forest species common in the mixed mesophytic forests of eastern Kentucky today, but rare or virtually lacking in the much altered and fragmented forests to the west, may once have been somewhat more numerous in the latter. This has been intimated in various ways earlier in this work.

BIRD DISTRIBUTION IN RELATION TO PHYSIOGRAPHY

Physiographic units are often as difficult to define as biotic units (see Fenneman, 1938:vi-vii). Included within major physiographic regions is usually a variety of soils and topography supporting diverse vegetational

types which may exist under different climates and which influence the nature and extent of human utilization of the regions. There may be strong resemblances, further, between physiographic regions of markedly disparate geologic history. It should therefore not be surprising that few birds conform precisely in distribution with physiographic divisions.

In Kentucky at present only seven species of birds are restricted to and occur more or less throughout one or the other of the two great physiographic provinces occupying most of the state. These are the Ruffed Grouse (originally much more widespread), Black-billed Cuckoo and Black-throated Green Warbler of the Appalachian Plateau Province, and the Black Vulture, Chuck-will's-widow, Loggerhead Shrike, and Dickcissel of the Interior Low Plateau Province (see species accounts for qualification). Other species occur throughout one Province and are more or less restricted in the other. No common species is restricted to and occurs throughout a single physiographic section in Kentucky, although the Red-cockaded Woodpecker (Cumberland Plateau) and Vesper Sparrow (Bluegrass) approach this situation, while the Pine Warbler is limited to and occurs more or less throughout the Cumberland Plateau and Shawnee sections of adjacent provinces. Additional species are restricted to certain physiographic units but are found only in parts of these where some specific habitat requirements are met.

It seems immediately obvious that the influence of physiography upon bird distribution is necessarily indirect and exerted through influence upon (1) plant distribution, (2) climate, and (3) agricultural practice. It is therefore natural that some response to physiographic conditions is displayed by birds, as by other animals, *e.g.*, small mammals in southern Ohio (Enders, 1930:23-24). Reference to these responses and interrelationships is made throughout.



SYSTEMS OF EXPRESSING BIRD DISTRIBUTION

A convenient introduction is provided by Miller's commentary (1951:531) on systems of biotic zonation:

There have been three general plans for grouping distributional information which have been applied extensively to terrestrial animals in North America. These are the zone, biome, and biotic province systems. Each has had modifications and associated auxiliary systems. . . . The three major plans have indeed some common basis, namely climatic and consequent vegetational factors, but each has its special emphasis and some criteria for its divisions which are peculiar to it. Accordingly, we may not regard any one system as a master system to which others are subordinate Rather, each system has some, although perhaps not equal, usefulness and expresses certain truths.

Kentucky is not an adequate laboratory for studying the major units or testing the over-all validity of any of these systems, since the range of environmental variation in the state is too slight to span much more than one of the principal divisions of each. Consequently discussion will be limited to consideration of their utility within Kentucky and of such subdivisions of their major units as seem recognizable.

LIFE-ZONES

The life-zone system was devised by Merriam (1890) to express the facts of animal distribution in the San Francisco Mountains of Arizona, and later modified and applied to the entire continent (Merriam, 1894). Again, as ably summarized by Miller (1951:532):

[It] is based on the concept of occurrence of similar organic life throughout belts where the same temperature phenomena prevail. Just what these temperature phenomena are has been the source of considerable confusion and debate which need not be reviewed here (see Kendeigh, 1932; Shelford, 1932; Grinnell, 1935; Daubenmire, 1938). Although the exact components of "gross temperature" characteristic of each zone have not been determined satisfactorily, one cannot escape the fact that recognizable zones or belts of life exist which follow one another latitudinally or altitudinally in a sequence according with temperature gradients. Where the gradients are steep, as in altitudinally diverse terrain, the belts are more obvious, long transitions between zones are eliminated, and influences other than temperature are overshadowed. Anyone can "see" life-zones or temperature-correlated plant belts on mountain slopes. This circumstance was the stimulus and sound foundation of the system. Its weakness lies in the extension of a set of zones developed on one mountain slope into a continent-wide plan. The fact is that under different conditions of rainfall and humidity, with diverse quantitative and seasonal aspects, sets of organisms occur in the same temperature belt which are so different that there is only a weak common faunal element throughout, a situation admitted only in part by Merriam, the founder of the system.

The concept has met particular difficulty in the east, where conditions are generally more uniform than in the west and altitudinal gradients shorter and frequently less steep. Much of the eastern United States is occupied by what in effect is a "long transition between zones."

Here, too, there has been little agreement on what species are reliable "indicators" of the various zones, a difficulty resulting partly from different

behavior of species in different places. Various workers attempting to modify the life-zone system to make it fit their own areas have sometimes lost sight of the very basis of the system (Pitelka, 1941:133). As observed by Pitelka (*op. cit.*, p. 134): "The most successful application of life zones occurs where vegetation coincidentally agrees with them and where, therefore, there has been no need to 'modify' zones to make them fit the facts of bird distribution."

Yet, as Miller has shown (1951:580-581), in California some species are correlated with temperature belts more definitely than with formational units, this being true also in Africa (Bowen, 1933). Any consideration of life-zones which keeps the basis of the system clearly in view must take special cognizance of such species.

In Kentucky a number of species show a "zonal" type of distribution, their range-limits being oriented in rough conformation with degrees of latitude and elevation—and hence temperature—and not conspicuously correlated with vegetational units. Several of these species, however, open-country or brush-inhabiting birds of generally more northern or more southern distribution, have today unstable range-limits in the state so that one cannot be sure their present distributions indicate ultimate limiting factors (see pp. 83-85, Figs. 8-9). A few other species, apparently stable in distribution, may be at least partly limited by temperature, but their distributions are correlated also to some extent with vegetational regions. Such species are the Black-billed Cuckoo and Black-throated Green Warbler. The Cedar Waxwing shows a zonal type of distribution, conforming to a vegetational boundary only along the western edge of the Cumberland Plateau in its southern portion. As Pitelka stated (1941:132): "the delimiting effect of physical factors is difficult to ascertain; it is often indirect by dint of the climate-vegetation relationship."

In any event, range-limits falling across the central portions of Kentucky are comparatively few, widely spaced, and show poor conformation with each other. The boundaries of zones are preferably drawn at points where a number of range-limits approach coincidence. As we have seen, this is more often the case in mountainous areas and this is so in Kentucky.

As traditionally delimited, only three of the zones occurring in eastern North America (north to south: Alpine, Hudsonian, Canadian, Alleghenian (= humid Transition), Carolinian, Austroriparian, Tropical) are represented in Kentucky, and two of these but slightly. Most of the state lies within the Carolinian Zone; of the two slightly represented zones, only the Alleghenian is well marked and at all clearly defined.

The lower boundaries of the Alleghenian Zone in Kentucky may be drawn somewhat arbitrarily at the 3,000-foot level in the Cumberland Mountains, although the actual level varies from place to place with many factors. The chosen boundary, however, comes closest to expressing the average lower level of occurrence of 10 species of birds generally considered as Alleghenian, or Alleghenian and Canadian, and the upper level of distribution of several species generally regarded as Carolinian.

The Alleghenian species are the Veery, Solitary Vireo, Golden-winged, Chestnut-sided, Black-throated Blue, Black-throated Green, Blackburnian, and Canada warblers, Rose-breasted Grosbeak, and Slate-colored Junco. All occur in some parts of their ranges in the lower Canadian Zone, and the

Black-throated Green (with the widest zonal range of all), Blackburnian, and Canada warblers, and junco are widespread and important in the latter zone. With the exception, perhaps, of the last three, all of them also occur at various points within the upper limits of the Carolinian Zone as customarily outlined. In Kentucky only the Solitary Vireo to a slight, and the Black-throated Green Warbler to a considerable, extent are known to occur regularly within the Carolinian Zone.

Typically Carolinian species absent from the Alleghenian Zone in Kentucky, despite the presence of seemingly suitable niches, are the Acadian Flycatcher and White-eyed Vireo. Also, the Blue-gray Gnatcatcher, Prairie and Kentucky warblers, Summer Tanager, and Cardinal are so rare in the Alleghenian Zone as to be of negligible importance, and the Carolina Wren, Worm-eating Warbler, and Cerulean Warbler are decidedly less numerous than in the lower zone. The altitudinal limits of the various species do not seem to be exactly the same (see Fig. 6). The few hundred feet separating the normal limits of the highest- and lowest-ranging species may be equal, in difference in climate, to several hundred miles at a given elevation.

Differences between zones can be expressed in quantitative terms (see Miller, 1951:533-540). However, an unqualified quantitative expression of the difference between the bird populations of the Alleghenian and Carolinian zones in Kentucky would be misleading. Because of the small area and limited range of habitats within the former (see pp. 30, 81-82), purely ecological differences would obscure the sum of zonal differences. Confusion between zonal and ecological phenomena, that is, between distributions correlated with temperature and those correlated with formational types, seral stages, etc., has been frequent in writings on bird distribution in the southern Appalachians, where various workers have been surprised by the invasion of "Carolinian" species high into newly disturbed portions of the Alleghenian and Canadian zones. These events merely show that vegetationally controlled aspects of bird distribution have often been interpreted as temperature controlled and that direct influence of temperature is rarer than Merriam and his followers believed.

Quantitative zonal comparisons are most revealing between major areas affording comparable ranges of successional and disturbed habitat. Although these conditions are lacking in the present case, a meaningful comparison of the forest species of the Carolinian and Alleghenian zones may be made, since forest habitats are well developed and comparable in both. This comparison is shown in Table 14, in which have been entered all but a few (extinct, etc.) of the species classed III to IV and IV in Tables 7 to 10. Species very rare in one zone and important in the other have been treated as though absent in the zone where very rare, but the fact of their presence is indicated by the use of lower case x. Also, a few species not actually recorded in the Alleghenian Zone in Kentucky, or very rare there (for example, the Parula Warbler), have been treated as though present on the basis of their known behavior in the Appalachian region in general (these forms are entered *). This liberty has been taken because of the small size of the zone in Kentucky, coupled with evidence that these birds are not excluded from the region by temperature factors. Anyone not caring to subscribe to this procedure may freely adjust the differences with the data given.

TABLE 14
THE CAROLINIAN AND ALLEGHENIAN LIFE-ZONES OF KENTUCKY COMPARED
(FOREST SPECIES ONLY)¹

Species	Zone		Species	Zone	
	C ²	A ³		C	A
Sharp-shinned Hawk	X	X	Veery		X
Cooper's Hawk	X	X	Yellow-throated Vireo	X	X
Red-tailed Hawk	X	X	Solitary Vireo	x	X
Red-shouldered Hawk	X	*	Red-eyed Vireo	X	X
Broad-winged Hawk	X	X	Black-and-white Warbler	X	X
Great Horned Owl	X	X	Prothonotary Warbler	X	
Barred Owl	X	X	Swainson's Warbler	X	*
Whip-poor-will	X	X	Worm-eating Warbler	X	X
Yellow-billed Cuckoo	X	X	Parula Warbler	X	*
Black-billed Cuckoo	X	X	Black-throated Blue Warbler		X
Yellow-shafted Flicker	X	X	Black-throated Green Warbler	X	*
Pileated Woodpecker	X	X	Cerulean Warbler	X	X
Red-bellied Woodpecker	X		Blackburnian Warbler		X
Hairy Woodpecker	X	X	Yellow-throated Warbler	X	
Downy Woodpecker	X	X	Ovenbird	X	X
Great Crested Flycatcher	X	X	Louisiana Waterthrush	X	*
Acadian Flycatcher	X		Kentucky Warbler	X	x
Eastern Wood Pewee	X	X	Hooded Warbler	X	X
Blue Jay	X	X	Canada Warbler		X
Carolina Chickadee	X	X	American Redstart	X	X
Tufted Titmouse	X	X	Scarlet Tanager	X	X
White-breasted Nuthatch	X	X	Summer Tanager	X	
Carolina Wren	X	x	Rose-breasted Grosbeak		X
Robin	X	X	Slate-colored Junco		X
Wood Thrush	X	X			

X, important in zone; x, present in zone, but of little importance (see p. 101).

¹ Habitat categories III-IV and IV of Tables 7-9 (for definitions see pp. 76-77).

² Carolinian Zone.

³ Alleghenian Zone.

* See p. 101 for meaning.

As shown in Table 14, a moderate difference is found between the forest components of the Alleghenian and Carolinian avifaunas, 14 species of the 49 considered (29 per cent) being restricted or virtually restricted to one zone or the other. An index of similarity may be obtained (see Simpson, 1947) by dividing the number of species in common by the number of species in the smaller fauna ($35/42 = 83$ per cent). This index is useful in comparing faunas of different size, and is of value here because it gives an index directly comparable with those obtained by Miller in California. The similarity of 83 per cent between the Alleghenian and Carolinian forest faunas in Kentucky is somewhat greater than the 71 per cent found by Miller (his lowest similarity index) between the whole avifaunas of the corresponding Transition and Upper Sonoran zones in California. This is to be expected in view of the generally greater faunal homogeneity prevailing in the east, and since also there is no marked vegetational change at the zonal boundary in Kentucky.

This lack of conspicuous change in forest type at the zonal boundary in the Cumberlands is of interest, since temperature is suggested as an im-

portant factor. Several northern species involved, especially the Blackburnian Warbler, Solitary Vireo, and Slate-colored Junco are, further, ordinarily thought of as coniferous forest species, or birds of the coniferous-deciduous forest ecotone. Common here in pure deciduous forest, they are restricted to higher elevations in the absence of vegetational barriers. (On Pine Mountain, interestingly, the Solitary Vireo occurs in pines at comparatively low elevations, while it does not range much below 3,000 feet in the deciduous forest of Black Mountain.) Unlike the Blackburnian Warbler, the Black-throated Green Warbler, another species important in the coniferous forest, in Kentucky follows hemlock (and occasionally occurs in other trees) to low elevations on the Cumberland Plateau but is very rare in the pure deciduous forest high in the Cumberlands. Just as no marked vegetational barrier is evident to restrict the downward occurrence of northern species, so none bars the several southern species dropping out at higher levels. A similar situation, in the Usambara Mountains of Tanganyika, has been described by Moreau (1935:172-173).

As indicated earlier, the Carolinian Zone occupies most of Kentucky and all of the Cumberland Upland, Western Upland, and Limestone Plateau avifaunal regions as here defined. It seems unnecessary to discuss the zone as such, since it is delimited in the process of considering the Alleghenian and Austroriparian zones. Much of the present analysis is devoted to various ways of considering the avifauna of this zone, the distributions of the several faunas and faunal elements occurring in the area being shown in Tables 16 to 20.

As the Alleghenian Zone in Kentucky coincides with the Cumberland Crest avifaunal region, which is chiefly based on zonal distributions, so the boundaries of the Austroriparian Zone may be drawn, rather arbitrarily, to equal those of the Alluvial Forest avifaunal region (Fig. 5).

Being nowhere bounded by steep altitudinal gradients the Austroriparian Zone is somewhat difficult to delimit and define. Few, if any, terrestrial species of birds are restricted to and occur throughout the zone (the Ground Dove, *Columbigallina passerina*, which does not occur in Kentucky, probably comes as close as any to meeting these requirements). The Austroriparian Zone derives most of its avifaunal distinctness from a group of southern water birds, some of tropical affinities, which occur in different parts of the zone and some of which range well beyond it. Other vertebrates and various plants show a similar variety of distributions in relation to the zone. Two organisms perhaps conforming more closely to the boundaries of the zone as conventionally drawn than any others are the tree *Taxodium distichum* (bald cypress) and the snake *Agkistrodon piscivorus* (water moccasin). Other organisms characteristic of the zone in Kentucky are mentioned on p. 70.

In Kentucky the Austroriparian Zone is distinguished by the presence of several large aquatic birds of generally more southern distribution, the Great Blue Heron (*Ardea herodias wardi*), Double-crested Cormorant, Common Egret, Yellow-crowned Night Heron, Little Blue Heron (not yet found breeding), and Anhinga. Only the species *Anhinga anhinga* and the subspecies *Ardea herodias wardi* are limited in northward distribution to the Austroriparian as usually defined, the remainder all breeding or formerly breeding at various points well to the north. All but the Yellow-crowned Night Heron (which is invading or reoccupying lowland situations in the

central part of the state) seem in Kentucky to be ecologically restricted to broad alluvial bottomlands providing extensive feeding areas necessary for the maintenance of large breeding colonies and may be prevented from demonstrating the full range of their zonal tolerances.

The Austroriparian Zone in Kentucky has no passerine species limited to it save possibly Bachman's Warbler (the one record of which is outside the arbitrary boundaries of the zone), unless the lowland population of Swainson's Warbler be counted. The zone is deficient in a considerable number of passerine species, however, rare or absent in the alluvial forests being, at least, the otherwise widespread Black-and-white Warbler, Worm-eating Warbler, Scarlet Tanager, and Ovenbird, and the nonpasserine Whip-poor-will. As stated already, the distributions of these species seem to be correlated with forest type and so properly related only indirectly, if at all, to the zonal concept. If we recognize the Austroriparian Zone, however, even as no more than an ecological unit in the form of a subclimax swamp forest community, we must admit that it is in fact characterized by those species which it possesses and lacks.

An index of similarity between the Austroriparian and Carolinian zones in Kentucky may be computed from Tables 16 to 20 in the same manner employed in obtaining the Alleghenian-Carolinian index above, but here dealing with all species except those unimportant or extinct (marked x or f) and disregarding the Alleghenian Cumberland Crest avifauna. According to my reading of the tables, 94 species are important in the Austroriparian (possessing the smaller fauna) while 86 species are important in both the Austroriparian and Carolinian. Thus, $86/94 =$ a similarity of 91 per cent.¹ The 32 points of difference recorded between the two zones (one point for each species important in one and unimportant or absent in the other) result chiefly from the larger size of the Carolinian fauna—or from depletions in the Austroriparian Zone.

In Kentucky the utility of the life-zone concept is decidedly limited, especially in respect to its fundamental purpose of expressing temperature-correlated distributions. The latitudinal spread of the state is slight and, except for the Cumberland Mountains, there are no long and steep altitudinal gradients. Temperature gradients are correspondingly gradual and doubtless much complicated locally by the effect of topography and vegetation. Effects of temperature upon bird distribution are consequently obscure and tend to be masked by other factors. As descriptive units the three "life-zones" locally recognized serve no purpose not accomplished equally well by the biotic province system, and in expressing the local distribution of birds the system is less useful than the biome system. The system does appear to have utility in expressing the distributions of certain altitudinally restricted species in the Cumberland Mountains.

THE BIOME SYSTEM

The concept of the biome and the history of its development have been reviewed by Carpenter (1939) and certain biomes named and discussed by Clements and Shelford (1939). Pitelka (1941) has discussed the application of the system to birds; it has been found useful in expressing the dis-

¹ The resemblance noted by Miller (1951:540) for the corresponding Lower and Upper Sonoran zones in California was 82 per cent, the greater zonal difference, again, being found in the western area.

tributions of many species which conform in range with its major units. The relations of California bird life to the system were investigated by Miller (1951).

The biome system is based on the occurrence over large areas of plant formations, of which the climax (ultimate developmental) stages are unique and of distinctive type or "life form," and on the distribution of animals more or less restricted to these. Areas so characterized are called biomes, a term which obviously is approximately equivalent to the botanical formation. Each biome, besides the characteristic climax, includes various successional or arrested stages of subclimax vegetation (and further animals), which may or may not be peculiar to the biome. No plant formation is identical throughout in species composition. The formation is therefore divisible into associations (subdivisions of the climax) and associates (subdivisions of successional stages), and still lesser, often local variations called facies or lociations. Since, returning again to the biome, more or less homogeneous and characteristic groupings of animals often occupy various associations (and/or associates), Kendeigh (1948) has proposed the terms biociation and biocies for such groupings. It should be recognized also that the biociation of one area may become the biocies of another (Snyder, 1950).

Because of the great importance of vegetational life form to animals, the biome system is of great use to zoogeographers. In ornithological practice, however, it does not matter whether "formations" of distinctive life form characterizing distinct areas are climax or theoretically subclimax (Miller, 1951:540), so long as they are virtually permanent in fact, extensive, and allow the development of distinctive avifaunas composed of species adapted to the prevailing conditions. Thus, 21 "ecological formations" analyzed by Miller (*op. cit.*) in California were not necessarily "climax" or of biome rank, but were practical units selected solely on the basis of the "life-form . . . of the plant cover, or on the physical aspects of rock and aquatic habitats, these being of utmost importance in the uses which different species of birds can make of them in exercising their instincts for foraging, nesting, and seeking shelter." Most of Miller's units, however, if not climaxes, practically resemble climaxes in being relatively stable, extensive, and more or less homogeneous.

The great difference in diversity between the eastern and western United States is shown by the situation in Kentucky as compared with that in California. Kentucky lies entirely within the eastern deciduous forest biome, and rocky and aquatic habitats within the state are few and small. Consequently there is a poor representation of stable, extensive, and regionally restricted units of different life form. Almost all of the climax or near-climax vegetation of the state is of the broad-leaved forest form; other vegetational life forms, such as grassland, shrubs, and young trees, do not qualify as ecological formations in the sense used by Miller, being spottily and widely distributed and actively successional in nature.

Consequently, in addition to the deciduous forest formation itself, with its seral stages, only 6 ecological formations utilized by birds for breeding purposes have been recognized, as opposed to 21 in California. These are: (1) marsh, (2) river-bars and banks, (3) swamp forest sloughs and ponds, (4) cliffs, and (5) pine or largely pine forests. Also, in early times there were (6) the prairies, now essentially obliterated. Except for the last, which must once have been very important to bird distribution, none of these

formations alone has great influence on the distribution of birds in the state. Nevertheless, each has certain species exclusive to it, and each is limited by edaphic or physiographic factors to certain parts of the state and is hence restrictive to the distributions of its peculiar species.

The various habitats have been briefly described on pp. 77-78; further details are as given below.

(1) Marsh. Marsh habitat is scarce in Kentucky, rarely extensive, and almost lacking from the Cumberland Plateau and Mountains. Most of the state is well drained, lying south of the glacial boundaries, and the subsurface drainage of large areas is particularly unsuitable for marsh development. Marsh habitat is almost all found about farm ponds, small, artificial lakes, and in overflow sloughs near streams, being increasingly frequent towards the west. Few true marsh habitats in the state exceed a dozen acres in area. Some so-called "buttonbush marshes" in the extreme west may be larger than this, but these are often wooded and seem better placed with the "swamp forest pond and slough" type.

Common species closely restricted to the marsh habitat and occurring more or less generally in it are the *Pied-billed Grebe*, *Least Bittern*, and *King Rail*. The Red-winged Blackbird, Yellowthroat, and sometimes the Yellow Warbler are common and characteristic in marsh habitats but are not restricted thereto. The following, all recorded breeding in or near Kentucky marshes, are so rare as to be of negligible importance: *Lesser Scaup* (accidental), *American Bittern*, *Mallard*, *Blue-winged Teal*, *Common Gallinule*, *American Coot*, and *Black Tern*.

(2) River-bars and banks. There are extensive sand and gravel bars at various points along the Mississippi and lower Ohio rivers, mainly below the points (Owensboro, on the Ohio) where the streams become mature. This habitat is an inland representative of the outer beach in coastal areas and is barren and poor in life. The *Spotted Sandpiper* makes some use of bars as breeding sites. Definitely restricted to the formation is the *Least Tern*, which breeds as far upstream in the Ohio as Union County (Hardy, 1957, fig. 2).

(3) Swamp forest ponds and sloughs. This type of habitat is described on pp. 68-69. Examples may be seen at Murphy's Pond in Hickman County, Fish Lake in Carlisle County, and Swan Pond, Clear Lake, and Long Lake in Ballard County. Similar habitats, usually associated with long-established sloughs, occur with decreasing frequency up the Ohio River at least as far as Henderson. Classification of the habitat as a restrictive "formation" is justified only because of its relation to a few species.

Birds restricted to the complex and occurring more or less throughout are the *Great Blue Heron*, *Double-crested Cormorant*, and *Common Egret*; limited to it, at least today, but less frequently represented are the *Bald Eagle* and *Osprey*. The *Anhinga* occurs as a breeding species, so far as known, only at one site, in Fulton County. The important features of the environment to the species listed are probably seclusion, the presence of large trees for nests or nest-colonies, and an abundant aquatic food supply obtainable through wading or diving.

Perhaps most important in the present habitat, but occurring more or less generally in various floodplain habitats from the Cumberland Plateau west, are the Black-crowned and Yellow-crowned night herons, Green Heron, Wood Duck, Hooded Merganser, and Prothonotary Warbler. The Red-

shouldered Hawk and Barred Owl, although widespread, reach their greatest numbers in the swamp forest pond and slough environment, as probably did the Swallow-tailed Kite in former days.

(4) Cliffs. Cliffs are prominent in Kentucky only in three sections; along the northeast scarp of Pine Mountain, at the western margin of the Cumberland Plateau, and in the gorge of the Kentucky River.

Only the *Peregrine Falcon* and *Common Raven* (both now seemingly extirpated) are or were virtually restricted to the cliff formation for breeding sites. The falcon was rare but probably bred in all of the areas named, and the raven seems to have occurred until recently in the first two.

Some use is made of the formation by species equally or more important in other habitats, notably the Turkey Vulture, Black Vulture, Red-tailed Hawk, Sparrow Hawk, Great Horned Owl, Eastern Phoebe, and Rough-winged Swallow. There is no record of Cliff Swallows using cliffs in Kentucky.

Possibly rock and clay bank habitats should be mentioned here, although they are often of artificial origin, as in road cuts. To such habitats are restricted the Bank Swallow, Rough-winged Swallow, and Belted Kingfisher. The latter two nest in nearly all such situations throughout the state, the Kingfisher, of course, only in clay banks. The Bank Swallow, however, evidently requires high, steep banks of loess or clay, these being found mainly along the larger rivers, especially in the west. The species is thus rather restricted in distribution.

(5) Pine or mainly pine forests. Along the western rim of the Cumberland Plateau is a long belt transecting the state from south to north and varying from 10 to 30 miles in width (see Cliff Section, Fig. 7), in which the sandy uplands are largely occupied by associations composed of pines (*Pinus echinata*, *P. rigida*, and *P. virginiana*), and the oaks *Quercus coccinea* and *Q. montana* (for detail see pp. 41-42). To a lesser extent, such associations are important and more or less continuous on Pine Mountain in the southeast, and outlying communities are to be found throughout the plateau. Pine-oak associations in the Knobs and Western Highlands are depauperate in species and lesser in extent. The birds of this habitat were discussed on pp. 42 and 45. Although usually a mosaic interspersed with more mesic forest, the habitat locally provides a distinct vegetational formation of relative stability and homogeneous structure and occupies a considerable area. It is a dilute northern extension of the southeastern pine and pine-oak "subclimax" of the deciduous forest. Although supporting, because of its oak component, many species of the deciduous forest, most of the "subclimax" has a bird population of distinctive structure which, extending Kendeigh's terminology (1948:108), could be called the *Dendrocopos borealis-Sitta pusilla* piney woods biociation.

The avifauna of the formation in Kentucky is not sufficiently well known quantitatively to justify elaborate comparison with those of other formations. It has two distinctive species, however, the *Pine Warbler*, occurring throughout, and in its best-developed portions, on the Cumberland Plateau, the *Red-cockaded Woodpecker*. Also adapted to the formation, but otherwise adapted elsewhere, is the Yellow-throated Warbler, and some use of the habitat is made by Black-throated Green and Parula warblers, both of which are more numerous elsewhere. Most species of the piney woods are

birds generally classified as forest-edge forms. Species highly adapted to mesophytic forest are rare or lacking.

(6) The original prairies. The extent of these is shown in Fig. 4 and what little is known of them and their bird life has been discussed on pp. 21-22 and 64-65. It may be assumed that the greatest biotic change in primeval Kentucky occurred at the prairie-forest boundary, such transitions everywhere being of the greatest importance to birds (see Chapin, 1932:204). The *Prairie Chicken* was originally restricted to these prairies.

(7) The deciduous forest formation occupies nearly all of the state and has been discussed at length above.

A variety of "life forms" is represented in the seral stages of the formation. On a single farm it is common to find stages ranging from bare ground through grassland, shrubs, and young trees, to remnants of mature forest. Each stage has its characteristic birds, some highly sensitive to variations within stages. The artificially maintained or actively successional stages of the xerosere differ from the ecological formations distinguished above in not being restricted to given areas; they occur all over the state, developing wherever any agency has removed the original forest. They are of ecological, but not of biogeographical, significance.

Throughout the deciduous forest a rather uniform structure is exhibited by the bird population of each major successional stage. For the biome as a whole Kendeigh (1948:108-114) has briefly defined several avifaunas characteristic of different seral stages and of the climax. Besides the ("Vireo-Seiurus broad-leaved forest") *biociation* occupying the climax and advanced subclimax communities, he recognized four *biocies* ("Ammodramus-Sturnella grassland; Spizella-Tyrannus forest-edge; Telmatodytes-Podilymbus marsh; Sterna-Actitis lake") occupying stages below the climax. The work leading to the definition of these groupings was done in northern lower Michigan, but Kendeigh recognized the existence of marked variations, which he called *facies*, elsewhere in the biome, and some of which he briefly discussed.

In Tables 7 to 10 all species known to breed in Kentucky were assigned to classes indicating their local habitat preferences. The species of the deciduous forest formation (*i.e.*, all the breeding birds of Kentucky exclusive of those restricted to other ecological formations just discussed, plus a few difficult to classify) are those designated I, I-II, II, II-III, III, III-IV, and IV (definitions on pp. 76-77). If categories I and II are combined for greater simplicity, we have three basic habitat classes, namely grassland, etc. (I-II), forest-edge (III), and forest (IV), and if we then group the species into these three classes, attempting to place each species indicated as having a span of successional tolerance (such as III-IV) into the class of its probable primary affinity, the combinations resulting are virtually equivalent, respectively, to Kendeigh's "Ammodramus-Sturnella grassland" and "Spizella-Tyrannus forest-edge" *biocies*, and his "Vireo-Seiurus broad-leaved forest" *biociation*. These are inevitably rather crudely defined, elastic associations, as indicated by the considerable difficulty of deciding whether some species are more nearly forest-edge or forest birds (Blue Jay) or forest-edge or meadow species (Bachman's Sparrow). There is much latitude in the definition of forest-edge; some species will nest in a single tree or shrub far from woodland, while others are restricted to the edge of actual forest. Birds classified as forest-edge have a broad range of nesting and feeding requirements, light tolerance, and other needs resulting in different relations to

the edge (see Kendeigh, 1948:101, on birds and ecotones).

The three groupings as they occur in Kentucky are shown below, and give an idea of the avifaunal structure of the formation. To avoid giving the impression that these units are homogeneous throughout Kentucky, I have placed species varying in importance in different areas in italics and species restricted to part of the state in small capitals.

The Meadow Group

(= the "Ammodramus-Sturnella grassland" biocies)

Killdeer	UPLAND PLOVER (casual)
Horned Lark	SHORT-BILLED MARSH WREN
Eastern Meadowlark	DICKCISSEL
Red-winged Blackbird	HENSLow'S SPARROW
Grasshopper Sparrow	VESPER SPARROW
Lark Sparrow (rare)	

This group shows fair conformation with Kendeigh's definition; the diagnostic Eastern Meadowlark and Grasshopper Sparrow occur throughout. However, several species important in Michigan do not reach Kentucky, and others barely do (Upland Plover, Short-billed Marsh Wren, Henslow's Sparrow, Vesper Sparrow). Interestingly, no numerically important species replace the missing species, save for the Dickcissel in western Kentucky. The meadow community is comparatively poor in the southern portion of the biome, although many species of this community now seem to be moving southward.

I stated earlier (pp. 84-85) that the species of this group may have invaded the parts of Kentucky originally covered with deciduous forest only in very recent times. Probably there was originally no well-developed meadow avifauna in much of the area occupied by the mixed mesophytic forest, and possibly none in some of the other deciduous forest associations. The populations of most of the typical meadow species originally occurring in the eastern United States were probably restricted to (1) the prairie-forest ecotone, (2) prairie outliers and peninsulae near the edge of the forest, (3) edaphically maintained grasslands in sandy coastal areas, and (4) marshes, bogs, and wet meadows in the glaciated area. I am not sure that it is correct, in the historical sense, to recognize a meadow biocies in the deciduous forest biome (as distinguished from its ecotones); there is, of course, no question that there is one now, but this may be essentially a disturbance effect.

The Forest-edge Group

(= the "Spizella-Tyrannus forest-edge" biocies)

Bobwhite	Cardinal
Mourning Dove	Indigo Bunting
Ruby-throated Hummingbird	American Goldfinch
Yellow-billed Cuckoo	Rufous-sided Towhee
Yellow-shafted Flicker	Bachman's Sparrow
Eastern Kingbird	Chipping Sparrow
Common Crow	Field Sparrow
Bewick's Wren	<i>American Woodcock</i>
Mockingbird	<i>Blue-winged Warbler</i>
Catbird	<i>Prairie Warbler</i>
Brown Thrasher	<i>American Redstart</i>

Robin	CHUCK-WILL'S-WIDOW
Eastern Bluebird	BLACK-BILLED CUCKOO
Blue-gray Gnatcatcher	TRAIL'S FLYCATCHER (casual)
White-eyed Vireo	HOUSE WREN
Warbling Vireo	CEDAR WAXWING
Yellow Warbler	LOGGERHEAD SHRIKE
Yellowthroat	GOLDEN-WINGED WARBLER (rare)
Yellow-breasted Chat	CHESTNUT-SIDED WARBLER
Orchard Oriole	* BROWN-HEADED COWBIRD
Baltimore Oriole	SONG SPARROW
Common Grackle	

* The Brown-headed Cowbird clearly has no niche of its own so far as breeding is concerned. It is placed here because of a preference for forest-edge cover in the breeding season.

Detailed comparison of this group with Kendeigh's definition of the biocies is impossible, since he made no indication that he had listed all the species that he considered part of it. Obviously some of the present species are unimportant in Michigan and some species important there are negligible here. Other differences between Kendeigh's list and mine may be due to differences in judgment, but some species doubtless behave differently in the two areas. For example, the Red-tailed and Red-shouldered hawks and the Black-and-white Warbler, placed here by Kendeigh, seem definitely to belong with the next group in Kentucky. There are many "faciations" of the forest-edge community in Kentucky but these cannot be classified with present knowledge.

*The Forest Group**

(= the "Vireo-Seiurus broad-leaved forest" biociation)

Cooper's Hawk	<i>Barred Owl</i>
Pileated Woodpecker	<i>Whip-poor-will</i>
Hairy Woodpecker	<i>Red-bellied Woodpecker</i>
Downy Woodpecker	<i>Yellow-throated Vireo</i>
Great Crested Flycatcher	<i>Black-and-white Warbler</i>
Acadian Flycatcher	<i>Worm-eating Warbler</i>
Eastern Wood Pewee	<i>Parula Warbler</i>
Blue Jay	<i>Cerulean Warbler</i>
Carolina Chickadee	<i>Ovenbird</i>
Tufted Titmouse	<i>Hooded Warbler</i>
White-breasted Nuthatch	<i>Scarlet Tanager</i>
Carolina Wren	VEERY
Wood Thrush	SOLITARY VIREO
Red-eyed Vireo	PROTHONOTARY WARBLER
Yellow-throated Warbler	SWAINSON'S WARBLER
Louisiana Waterthrush	BACHMAN'S WARBLER (casual)
Kentucky Warbler	BLACK-THROATED BLUE WARBLER
Summer Tanager	BLACK-THROATED GREEN WARBLER
<i>Sharp-shinned Hawk</i> (rare)	BLACKBURNIAN WARBLER
<i>Red-tailed Hawk</i>	CANADA WARBLER
<i>Red-shouldered Hawk</i>	ROSE-BREASTED GROSBEAK
<i>Broad-winged Hawk</i>	SLATE-COLORED JUNCO
<i>Great Horned Owl</i>	

* Omitted are extinct species.

In defining the biociation Kendeigh pointed out that there seemed to be no important differences between the bird life of climax associations and

various advanced subclimaxes, an observation confirmed by the present study. That there are, however, distinct and even great differences, or facies of the biociation, in different areas is undeniable. For instance, in much of Kentucky the Ovenbird, considered by Kendeigh one of the two most typical species of the biociation, is very rare or virtually absent, its niche seemingly being filled by the Kentucky Warbler and other species. This does no serious damage to the ecological utility of the concept. Bird communities of similar type are continuous and may be followed through their gradations from one place to another. The biociation differs from the association in being a type of community rather than a specific community.

The biogeographer, however, must concern himself with the distributions of species and communities. Within a given formation, this leads inevitably to a consideration of differences at the association level—differences of magnitude well below that displayed at the formational level. As discussed above, Pitelka suggested (1941), or seemed to suggest, that correlation of bird distribution with associational boundaries within biomes is nonexistent, and considerable argument was devoted to an effort to show that this is not strictly the case. On the basis of distributions in Kentucky, indeed, it seems to be among those species most closely restricted to the climax that the greatest responsiveness to variations within the climax is found (see pp. 93–95 and Table 13). The generally more widespread species adapted to successional stages or to two or more climaxes show little or no conformation with associational boundaries. Clearly fitted for existence in a wide range of vegetational types, they are naturally not sensitive to small variations.

It is possible within the broad-leaved forest biociation in Kentucky to recognize at least four distinct “facies,” three of which are correlated with forest type (a limited range of associations) and one of which is correlated with elevation. These may be called the Mixed Mesophytic Forest, Oak-hickory Forest, Alluvial Forest, and Black Mountain facies, respectively. The distinctive nature of the several avifaunal regions, at least from an ecological standpoint, rests partly upon the relative abundance of these facies. The Cumberland Crest avifaunal region contains only the fourth; the Cumberland Upland contains much of the first and a small amount of the second; the Western Upland is characterized by a fairly even mixture of the first and second; the Limestone Plateau contains mainly the second with scattered traces of the first; the Alluvial Forest contains only the third. Although there are many other lesser differences, these facies differ chiefly in the relative abundance of a moderate number of typical forest species or, between the Black Mountain facies and the rest, in the presence and absence of a number of northern and southern species. The relationship of these important forest species to the different facies is shown in Table 15 (see also Fig. 10).

The biome system, stressing as it does the important relationships between birds and the type of vegetative cover or physical surface frequented, is of considerable usefulness in expressing the distributions of Kentucky birds. At least 23 species are restricted to six minor but recognizable “formations” (stable or recurrent habitat types distinguished by peculiar life form or physical surface) found only in certain parts of the state. Areas typical of the major formation, or biome (within which all of Kentucky theoretically lies) embrace the rest of the state and are occupied by a rather homogeneous avifauna. However, the distributions (or at least the local abundance) of a

TABLE 15

SPECIES CONTRIBUTING IMPORTANTLY TO THE DIFFERENCES OF FOUR FACIES OF THE "VIREO-SEIURUS BROAD-LEAVED FOREST" BIOCIATION IN KENTUCKY

Species	Facies ¹			
	MM	OH	AF	BM
Whip-poor-will	C	R		FC
Red-bellied Woodpecker	R	C	C	
Acadian Flycatcher	C	C	C	
Veery				C
Yellow-throated Vireo	C	R	C	U
Solitary Vireo				C
Black-and-white Warbler	C	R	VR	C
Swainson's Warbler	R		FC	
Worm-eating Warbler	C	R		FC
Parula Warbler	C	VR	C	VR
Black-throated Blue Warbler				C
Black-throated Green Warbler	C			VR
Cerulean Warbler	C	C	C	R
Blackburnian Warbler				FC
Ovenbird	C	VR		C
Kentucky Warbler	C	C	C	R
Hooded Warbler	C	VR	C	C
Canada Warbler				C
American Redstart	C	VR	C	C
Summer Tanager	C	C	C	
Scarlet Tanager	C	R		C
Rose-breasted Grosbeak				C
Slate-colored Junco				C

¹ MM, Mixed mesophytic forest; OH, Oak-hickory forest; AF, Alluvial forest; BM, Black Mountain.

number of species seem to be correlated with regional forest types within the climax formation. The distributions and local abundance of more than 20 species, therefore, can be fairly well expressed in terms of forest regions.

BIOTIC PROVINCES; FAUNAL AREAS

Besides the life-zone and biome systems, which express the distributions of plants and animals with particular emphasis upon their correlations with special environmental factors, other systems have been proposed that attempt to divide all or parts of the continent into geographic areas of recognizably distinct biotic composition. Such biotic areas presumably reflect the sum of environmental influences and historical events. Some of the efforts at division of the North American continent into biotic areas were listed by Dice (1943:3-4) in summarizing his own conclusions and divisions. The biotic province and related systems are handicapped by inadequate knowledge of the many groups of plants and animals (Dice, 1943:7) and by the necessarily subjective nature of the criteria used for their delimitation (Johnson, Bryant, and Miller, 1948:236-237).

To Dice (1943:3) the biotic province was a conceptual unit that:

covers a considerable and continuous geographic area and is characterized by the occurrence of one or more important ecologic associations that differ, at least in proportional area covered, from the associations of adjacent provinces.

In general, biotic provinces are characterized also by peculiarities of vegetation type, ecological climax, flora, fauna, climate, physiography, and soil.

Emphasis is thus on the characteristics of the chief communities within the area. Dice's provinces, however, frequently contain several major and very different communities, sometimes of biomal and zonal rank (where stratified altitudinally he called these "life-belts"), which are often continuous with the same or very similar communities in adjoining provinces. This has proved disturbing to some, among them Miller (1951:582), who commented on the "undesirable diversity of zonal and formational types which have often characterized biotic areas."

In general, faunal analysts have found the community criterion for biotic areas nebulous and difficult to apply in practice. Thus Johnson, Bryant, and Miller wrote (1948:237):

A biotic area has significance, we now think, only as its fauna contains unique forms and as its limits are set by the approximate coincidence of range boundaries of the unique forms and of parts of the boundaries of other members of its fauna. In continental areas boundaries will be sharp largely in conformance with the distinctness of boundaries of plant formations.

It was further suggested by these authors and reaffirmed by Miller (1951:582) that:

in a system of biotic provinces too much emphasis is often placed on purely geographic aspects. It is best to stress actual faunas and their differences as much as or more than the areas and boundaries within which they occur, since faunas are "associations of species with similar, though not identical, climatic and biotic tolerances, with ranges partly in common, and often with similar areas of origin as species." Yet, admittedly, to define faunas may be just as difficult as to define biotic provinces.

The distinction between faunal areas and faunas is not always easy to grasp in practice. Of course, all faunas are related to areas, but each fauna usually overlaps other faunas. Emphasizing faunas in the analysis of areas means assigning the species of each area considered to the faunas they are believed to represent. The total fauna of an area may be, and usually is, composed of parts of several faunas delimited (Miller, 1951:582) "on the basis of strong or repeated associations of species which have similar centers of distribution and probably often similar areas of origin." The total distinctness of one area, compared with another, stems from all the differences between the areas, but different faunas, in the sense defined just above, may contribute differentially to this distinctness and their recognition is important to the zoogeographer.

In rare instances, usually in the presence of a marked barrier, two quite different faunas may be in fact almost completely separate in an areal sense, complementing one another on opposite sides of the barrier. In California, Miller was able to recognize two great, almost complementary avifaunas (boreal and austral), each variously represented in many faunal areas and one (austral) further divisible into three avifaunas of considerable but not so great areal separation. More often, and most notably in areas conspicuously lacking in barriers, considerable blending and overlapping of faunas occurs, complicating the problems of analysis. In cases of extreme blending, species are difficult to assign to faunas of origin, and comparison of the variations between areas occupied by the various members of the

blended fauna becomes an almost exclusively ecological exercise. The situation in the eastern United States (and Kentucky), as might be expected in view of a marked lack of conspicuous physiographic, climatic, and biotic barriers, falls rather close to the latter extreme.

Almost all of Kentucky lies within Dice's Carolinian Province (1943, map 1), which approximately equals both the deciduous forest biome (appropriately minus its pine-oak coastal plain "subclimax," which forms much of another province) and the Carolinian life-zone. Much of the typical biota of this region is composed of species finding their centers of present distribution and greatest abundance in the Appalachian plateaus (for vegetation see Braun, 1950). "Appalachian" species, however, are difficult to enumerate precisely, there being an even gradation from these to "intrusive" species of more northern and more southern distribution. Many widespread species are present. A broad zone of transition extends westward from the Cumberland Plateau toward the prairie type of biota (the Illinoian Province of Dice). This transition is partly interrupted for a short space by the alluvial forests of the Mississippi River, represented in Dice's map by an intrusion into western Kentucky of his Austroriparian Province (= essentially the Austroriparian life-zone = [in Kentucky] the Alluvial Forest avifaunal region). This province may be recognized in Kentucky only so far as lowland and floodplain communities are concerned.

Within this area of the "Carolinian Province" we have already noted many minor regional variations in the avifauna, some resulting from distributions of zonal type and some correlated with vegetational and formational types. Recognition of these variations in a system of faunal areas necessarily involves subdivision below the province level. Dice (1943:3) proposed the subdivision of biotic provinces into "biotic districts," but did not attempt this in the Carolinian Province.

Since it takes account of all kinds of distributions, as well as of the numerousness of species, the system of avifaunal regions adopted for descriptive convenience earlier in this work actually represents such a subdivision, based on the avifauna. It was remarked above, however, that the various "avifaunal regions" are not of equal rank. Variation in the degrees of difference encountered between regions in nature is evenly graded, which caused Miller to conclude (1951:588) that "several levels of areal and faunal differentiation must be acknowledged in any set of terms used." Miller employed the terms *province*, *district*, and *area*, with recognition of still lesser divisions, and erected arbitrary limits for these ranks, based on the actual numerical difference scores between regions.

Such difference scores are simply computed, one point of difference being awarded for each species present in one area and lacking from another. Certain refinements employed for subspecies need not be considered here, subspecies being virtually useless in comparing faunal areas in Kentucky. Before the terminology applied to one system of faunal areas is properly comparable with that used for another, difference scores should be adjusted to allow for the relative sizes of the faunas concerned (Miller, 1951:603).

In attempting to give primary consideration to actual faunas, as they contribute to the differences between avifaunal regions in Kentucky, considerable difficulty is encountered. Barriers are weak through most of the eastern United States and a great deal of blending of faunas has occurred.

Discounting certain widespread and unclassifiable species and a small

prairie element, Kentucky is occupied by a single, blended, eastern austral fauna devoid of truly boreal species. Within this fauna, however, certain groups of species, which may be termed subfaunas, have present distributions more or less in common, either centered in the northern part of the area (many of these are species of greatest abundance in the ecotone between the coniferous and deciduous forests) or in its southern portion (the "Carolinian" and "Austro-riparian" species of authors). Considering these groups as "subfaunas" is revealing in some ways; these are groups of species which have arrived at more or less similar distributions and, presumably, environmental tolerances. There seems to me to be little assurance, however, that the present distributions of these groups indicate common areas of differentiation of their species. Many arbitrary decisions have had to be made in allocating some species to subfaunas.

For practical purposes, then, two major faunas are recognizable in Kentucky, an important eastern austral fauna and a very weak prairie fauna. The former may further be divided into northeastern and southeastern subfaunas, leaving a third group of more widespread eastern forms. The remainder of the avifauna consists of forms not readily classifiable in any of the above units. Each breeding species has been placed in one of these groups and each group considered separately in its relation to the several avifaunal regions. This follows the method used by Miller (1951:581-607) in California and should afford results as nearly comparable as possible. The fact, however, discussed further below, that subspecies are virtually useless in the present instance, leads to difficulty in establishing equivalence of difference scores.

Tables 16 to 20 show the several groupings. Species important in a given region (X) do not necessarily occur throughout the region, but their presence nevertheless adds a measure of characterization. Species so rare or limited in distribution in a region as to be of virtually no importance (x) have been included in the tables for completeness but treated as though absent in computing difference scores. While this involves considerable subjectivity I think it results in the closest approximation of the actual differences between regions. Extinct species and species whose original status is imperfectly known (such as the Ruffed Grouse) have also been disregarded in calculating differences.

Eastern Austral Fauna

Southeastern subfauna.—This subfauna (Table 16) consists (1) of species with the present centers of their distributions, or at least of their greatest abundance, in the southeastern United States south of northern Virginia and the Ohio River, (2) more widespread species whose eastern subspecies show similar distributions, and (3) species with centers of distribution or greatest abundance in the southern Appalachian region. A few of these forms reach part of their northern, or upper altitudinal, limits of distribution in Kentucky. Many range farther northward (or upward) to various extents, but few could be called common along a line connecting New York, southern Ontario, and southern Michigan. Some have been moving gradually northward in recent years. In all, 32 forms fall within the above definition.

An attempt to distinguish a separate Appalachian subfauna posed so many

TABLE 16
SOUTHEASTERN SUBFAUNA OF EASTERN AUSTRAL FAUNA

Species	Avifaunal Region*				
	CC	CU	WU	LP	AF
Turkey Vulture	x	X	X	X	X
Black Vulture		x	X	X	X
(Swallow-tailed Kite)				f	f
Bobwhite	x	X	X	X	X
Chuck-will's-widow		x	X	X	X
Red-bellied Woodpecker		X	X	X	X
Red-cockaded Woodpecker (Ivory-billed Woodpecker)		X			
Acadian Flycatcher			?	f	f
Carolina Chickadee		X	X	X	X
Tufted Titmouse	X	X	X	X	X
Bewick's Wren		X	X	X	X
Carolina Wren	X	X	X	X	X
Mockingbird		X	X	X	X
Blue-gray Gnatcatcher		X	X	X	X
White-eyed Vireo		X	X	X	X
Prothonotary Warbler			X	X	X
Swainson's Warbler	?	x			X
Worm-eating Warbler	X	X	X	x	?
Blue-winged Warbler		X	X	X	
Bachman's Warbler					x
Cerulean Warbler	X	X	X	X	X
Yellow-throated Warbler		X	X	X	X
Prairie Warbler	x	X	X	X	?
Louisiana Waterthrush		X	X	X	X
Kentucky Warbler	x	X	X	X	X
Yellow-breasted Chat	X	X	X	X	X
Hooded Warbler	X	X	X	x	X
Orchard Oriole		X	X	X	X
Summer Tanager	x	X	X	X	X
Cardinal	x	X	X	X	X
Bachman's Sparrow		X	X	X	X
Total present	13	28	27	27	26
Total important	7	25	27	25	25

Key. X, important in region; x, unimportant in region and regarded as absent in computing difference scores; f, formerly present, not counted in totals or in computing difference scores (names of such species are in parentheses).

* For abbreviations see Table 8.

difficult problems as to what was an Appalachian and what merely a southern species that I abandoned the effort.

A number of species, such as the Downy and Hairy woodpeckers, Yellow-shafted Flicker, Blue Jay, Carolina Chickadee, White-breasted Nuthatch, and Eastern Meadowlark, have complementary north-south subspecies in the eastern United States. Variation in these forms, however, is rather slight, mostly clinal in nature, and the lines between subspecies have been drawn rather arbitrarily (see pp. 129-133). Since the differences between such subspecies at these arbitrary lines are virtually imperceptible, subspecies have been disregarded in the present exercise. Awarding points of difference on the basis of such clinal subspecies would give an erroneous conception of the differences between regions.

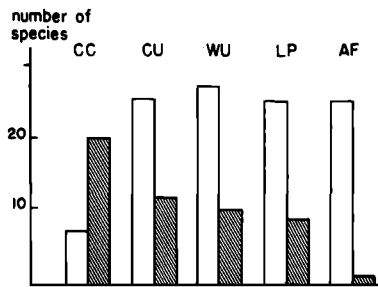


Fig. 11. Comparative representation of important species of the southeastern (white bars) and northeastern (dark bars) subfaunas of the eastern austral fauna in the avifauna regions of Kentucky. CC, Cumberland Crest; CU, Cumberland Upland; WU, Western Upland; LP, Limestone Plateau; AF, Alluvial Forest.

Since an Appalachian subfauna has not proved recognizable, a few weakly differentiated subspecies of the Appalachian Mountains, such as *Vireo solitarius alticola*, *Dendroica caerulescens cairnsi*, and *Junco hyemalis carolinensis* might be regarded as belonging with the present subfauna. However, the species they represent seem incompatible in any zoogeographic or ecologic sense with such birds as Bachman's and Prothonotary warblers, also classified here. While the subspecies mentioned do characterize the mountains of the southeast (as do a few others, if recognizable), they are actually but weak differentiates of a more northern element, and in the absence of a formally recognized Appalachian subfauna it seems best to class them with the northeastern subfauna as representatives of their species.

The distribution of the southeastern subfauna in Kentucky shows the predominantly southern nature of the state so far as classifiable avifaunal elements are concerned. Of 30 species, 5 (17 per cent) are important in all regions, 16 (53 per cent) in four of the five regions (all but one being deficient only in the Cumberland Crest), 6 (20 per cent) in three regions, none in two regions, and 1 (3 per cent) in no regions. A comparison of these values with those obtained for the northeastern subfauna is shown in Fig. 11. An important number of depletions in the subfauna occurs only in the higher parts of the Cumberland Mountains (Cumberland Crest avifaunal region). The four remaining regions are rather evenly matched in the number of southern forms occurring and no significant trend is apparent, there being 25, 27, 25, and 25 important species, respectively, in the Cumberland Upland, Western Upland, Limestone Plateau, and Alluvial Forest avifaunal regions (Fig. 11).

Minor differences in the subfauna in different regions seem to be due mainly to ecological factors, but the differences between the Cumberland Crest and the others may be conveniently expressed, at least in part, in zonal terms (see pp. 102-103). The distinctness of the Cumberland Crest would undoubtedly be somewhat less, as emphasized above, if the region occupied a larger area and afforded a wider range of habitats.

Northeastern subfauna.—Included in this subfauna (Table 17) are (1) species whose centers of distribution or greatest abundance lie in the northeastern part of the continent—especially in the coniferous forest-decidu-

TABLE 17
NORTHEASTERN SUBFAUNA OF EASTERN AUSTRAL FAUNA

Species	Avifaunal Region*				
	CC	CU	WU	LP	AF
Sharp-shinned Hawk (Marsh Hawk)	X	X	?	?	
American Woodcock	X	X	X	X	?
Black-billed Cuckoo	X	X			
Whip-poor-will	X	X	X	X	x
Traill's Flycatcher (Common Raven)	?	f	?	x	
House Wren		x	X	X	x
Short-billed Marsh Wren		X	X	X	
Robin	X	X	X	X	X
Veery	X				
Cedar Waxwing	X	X	X	X	
Solitary Vireo	X	x			
Black-and-white Warbler	X	X	X	x	x
Golden-winged Warbler	X	?			
Black-throated Blue Warbler	X				
Black-throated Green Warbler	x	X			
Blackburnian Warbler	X				
Chestnut-sided Warbler	X				
Ovenbird	X	X	X	x	
Canada Warbler	X				
Scarlet Tanager	X	X	X	x	?
Rose-breasted Grosbeak	X				
Henslow's Sparrow		x	x	X	
Vesper Sparrow				X	
Slate-colored Junco	X				
Song Sparrow	X	X	X	X	x
Total present	20	15	11	13	5
Total important	19	12	10	9	1

* For abbreviations see Table 8; for symbols see Table 16.

ous forest ecotone (see Pitelka, 1941, Fig. 1), (2) Appalachian subspecies of such northern species, and (3) more widespread species whose eastern subspecies are more or less confined to the northeast. Several of the 27 forms falling within the above definition find part of the southern, or lower elevational, limits of their distributions in Kentucky. Only a few range variously farther southward, and often they are then restricted to progressively higher elevations. None is common over appreciable areas of the southern coastal plains and few in the Piedmont and related plateaus in their southern portions. A few of the forms have been actively moving southward in recent years, and some of them, especially open-country species, appear only recently to have invaded Kentucky (pp. 84-85). No such typically boreal forms as *Perisoreus canadensis*, *Sitta canadensis*, *Parus hudsonicus*, or *Loxia curvirostra* are included in the subfauna, although a few species, such as the junco and Black-throated Green and Blackburnian warblers, contribute importantly to boreal avifaunas in eastern North America.

The northeastern subfauna clearly plays a less important role in Kentucky

TABLE 18
REMAINING FORMS OF THE EASTERN AUSTRAL FAUNA

Species	Avifaunal Region*				
	CC	CU	WU	LP	AF
Red-tailed Hawk	X	X	X	X	?
Red-shouldered Hawk		x	X	X	X
Broad-winged Hawk	X	X	X	x	?
Ruffed Grouse	X	X	f	f	f
Turkey	f	f	f	X	f
Mourning Dove		X	X	X	X
(Passenger Pigeon)		detailed status unknown			
(Carolina Parakeet)		detailed status unknown			
Yellow-billed Cuckoo	X	X	X	X	X
Screech Owl		X	X	X	X
Great Horned Owl	X	X	X	x	?
Barred Owl	x	X	X	X	X
Chimney Swift		X	X	X	X
Ruby-throated Hummingbird	X	X	X	X	X
Yellow-shafted Flicker	X	X	X	X	X
Red-headed Woodpecker		X	X	X	X
Eastern Kingbird		X	X	X	X
Great Crested Flycatcher	X	X	X	X	X
Eastern Phoebe	X	X	X	X	X
Eastern Wood Pewee	X	X	X	X	X
Common Crow	x	X	X	X	X
Catbird	X	X	X	X	X
Brown Thrasher	X	X	X	X	X
Wood Thrush	X	X	X	X	X
Eastern Bluebird	X	X	X	X	X
Loggerhead Shrike			X	X	X
Yellow-throated Vireo	x	X	X	x	X
Red-eyed Vireo	X	X	X	X	X
Warbling Vireo		X	X	X	X
Parula Warbler	x	X	X	x	X
Yellow Warbler		X	X	X	X
Pine Warbler		X	x		
American Redstart	X	X	x	x	X
Eastern Meadowlark	x	X	X	X	X
Red-winged Blackbird		X	X	X	X
Baltimore Oriole		X	X	X	X
Common Grackle		X	X	X	X
Brown-headed Cowbird		X	X	X	X
Indigo Bunting	X	X	X	X	X
American Goldfinch	X	X	X	X	X
Rufous-sided Towhee	X	X	X	X	X
Grasshopper Sparrow		X	X	X	X
Chipping Sparrow	x	X	X	X	X
Field Sparrow	X	X	X	X	X
Total present	26	40	40	40	36
Total important	20	39	38	35	36

* For abbreviations see Table 8; for symbols see Table 16.

than the southeastern. The fauna is not only somewhat smaller (27 against 32) but is less evenly distributed, showing progressive depletion from region to region, westward, southward, and away from the mountains. The sub-fauna is well developed only in the higher parts of the Cumberland Moun-

tains (Cumberland Crest avifaunal region); it is moderately developed in the intervening Cumberland Upland, Western Upland, and Limestone Plateau regions, and nearly lacking from the Alluvial Forest avifaunal region. The comparative representation of this and the southeastern subfauna in the various regions is shown in Fig. 11.

The distribution of part of the subfauna is clearly and conveniently expressible in zonal terms, at a point where several ranges nearly coincide at the lower limits of the Alleghenian Zone (to the definition of which they thereby contribute); many of the remaining species also show no clear relation with vegetational or other biotic factors and may be limited in their various degrees of southward penetration by physical factors. Others, however, notably the Whip-poor-will, Black-and-white Warbler, Black-throated Green Warbler, Ovenbird, and Scarlet Tanager show various degrees of correlation with forest types. Possibly these forms are limited by dependence upon microclimatic conditions here available only in specific vegetational complexes (see pp. 88-90).

Remaining forms of the eastern austral fauna.—Definition of the eastern austral fauna as a whole is difficult, partly because of the scarcity of precise information on the habitat and relative importance of many species in parts of their ranges. Besides the elements already discussed, the eastern austral fauna includes (1) typical species of the eastern deciduous forest, such as the Eastern Wood Pewee and the Wood Thrush, and somewhat more widespread species, like the Catbird, which nevertheless find the centers of their distribution and greatest abundance in the eastern deciduous forests, and (2) subspecies, or complexes of subspecies, of more widespread species which have differentiated in or have the centers of their distributions in the eastern deciduous forest. (See Table 18.) Within the definition of eastern deciduous forest I have included the ecotone between the deciduous and coniferous forests, as shown in Pitelka's map (1941, fig. 1), but I have excluded as faunally unclassifiable forms equally common on both sides of this ecotone. A considerable number of rather arbitrary decisions has had to be made, and I have tried to err on the side of exclusion.

Since, as mentioned above, subspecies prove virtually useless for the purpose at hand, I have thought it disadvantageous to use subspecific names in the present listings, where our chief concern is the situation prevailing in Kentucky. This is not meant to imply that subspecies, even if clinal or weakly differentiated, do not in some measure contribute to the distinctness of different areas in the east, considered in relation to the whole continent. However, as subspecific splitting of faintly differentiated entities proceeds beyond the bounds of common sense, use of such entities in considering faunal areas becomes increasingly difficult and meaningless.

Forty-four species breeding or formerly breeding in Kentucky contribute one or more forms to the fauna as here defined, *i.e.*, exclusive of its subfaunas. As is to be expected in view of their wider distributions and environmental tolerances, these species are more evenly distributed in Kentucky than those of the subfaunas discussed above. The rather even representation of the group in four of the five avifaunal regions (important species numbering 39, 38, 35, and 36, respectively, in the Cumberland Upland, Western Upland, Limestone Plateau, and Alluvial Forest avifaunal regions) is in some contrast to the poor representation (20 important species) in the

TABLE 19
PRAIRIE FAUNA

Species	Avifaunal Regions*				
	CC	CU	WU	LP	AF
(Greater Prairie Chicken)				f	
Upland Plover				x	
Horned Lark		X	X	X	X
Dickcissel		x	X	X	X
Lark Sparrow		x	x	X	?
Total present	0	3	3	4	2
Total important	0	1	2	3	2

* For abbreviations see Table 8; for symbols see Table 16.

Cumberland Crest avifaunal region. This large depletion seems to be due to a limited range of habitats in the Cumberland Crest; it seems to me that the distributions of the species in the group are not safely explicable in zonal terms.

Such variations in distribution as are shown by the group in other regions, likewise, seem to be related to ecological factors. The distributions, in particular, of the Yellow-throated Vireo, Parula Warbler, and American Redstart in relation to forest type have been discussed above (pp. 88-89). Some of the hawks and owls contribute to differences between regions, perhaps as a result of biotic factors, but this may also be due in part to differential deforestation and persecution. The Loggerhead Shrike here behaves much as a prairie species (which in fact it may be), being restricted to areas extensively deforested. Rather broad, open areas for hunting seem essential to this species. This and some of the other open-country forms in the group doubtless were absent from much of primeval Kentucky (pp. 83-85).

Prairie Fauna

This fauna (Table 19) is very weakly represented in Kentucky, and only five species have been classed in it. These are the Greater Prairie Chicken (extinct in Kentucky), Upland Plover, Horned Lark, Lark Sparrow, and Dickcissel. The Henslow's Sparrow, listed in the northeastern subfauna of the eastern austral fauna, is an important species of the long-grass prairies and might almost as well have been included here, although it has a wide, spottily occupied eastern range. Likewise, the Loggerhead Shrike and the Grasshopper Sparrow in the present area behave as prairie species, becoming increasingly scarcer as broad, open areas become fewer. The prairie species all become scarcer and more local as one moves into more heavily forested areas, especially in eastern Kentucky. Their present distributions cannot be representative of those originally prevailing, open-country species (whether or not truly prairie birds) having all been affected to varying degrees by removal of the forests. The species contribute, however, to the present-day differences between regions.

TABLE 20
SPECIES UNCLASSIFIED AS TO FAUNA

Species	Avifaunal Region*				
	CC	CU	WU	LP	AF
Pied-billed Grebe			X	X	X
Double-crested Cormorant					X
Anhinga					X
Great Blue Heron					X
Common Egret				x	X
Green Heron		X	X	X	X
Black-crowned Night Heron			x	X	X
Yellow-crowned Night Heron			X	X	X
American Bittern			x	?	?
Least Bittern			X	X	X
Canada Goose					x
Mallard			x	x	x
Blue-winged Teal			x	x	?
Wood Duck			X	X	X
Lesser Scaup				x	
Hooded Merganser				x	X
King Rail			X	X	X
Common Gallinule				x	
American Coot				x	
Spotted Sandpiper		?		x	
Least Tern					X
Black Tern				x	
Cooper's Hawk	X	X	X	X	X
Bald Eagle					X
Osprey				f	x
Peregrine Falcon		X		?	?
Sparrow Hawk	X	X	X	X	X
Killdeer		X	X	X	X
Barn Owl		X	X	X	X
Common Nighthawk	X	X	X	X	X
Belted Kingfisher		X	X	X	X
Pileated Woodpecker	X	X	X	X	X
Hairy Woodpecker	X	X	X	X	X
Downy Woodpecker	X	X	X	X	X
Bank Swallow			?	X	X
Rough-winged Swallow	x	X	X	X	X
Barn Swallow		X	X	X	X
Cliff Swallow				x	
Purple Martin		X	X	X	X
Blue Jay	X	X	X	X	X
White-breasted Nuthatch	X	X	X	X	X
Yellowthroat	X	X	X	X	X
Total present	10	17	25	33	33
Total important	9	17	21	23	30

* For abbreviations see Table 8; for symbols see Table 16.

Unclassified Species

Species not readily classifiable in the eastern austral or prairie faunas number 42. These 42 (Table 20) are all either (1) aquatic species (which have such specialized habitat requirements that they seem best eliminated from considerations involving predominantly terrestrial forms), (2) species

TABLE 21
DIFFERENCE SCORES OF AVIFAUNAL REGIONS

	SE	NE	EA	PR	T	UN	GT	GT†
Cumberland Crest-Cumberland Upland	18	10	19	1	48	8	56	55
Cumberland Upland-Western Upland	3	4	4	1	12	6	18	14
Cumberland Upland-Limestone Plateau	6	9	8	2	25	8	33	28
Western Upland-Limestone Plateau	2	5	4	1	12	2	14	13
Western Upland-Alluvial Forest	4	9	4	0	17	9	26	19
Limestone Plateau-Alluvial Forest	4	8	4	1	17	7	24	18
Cumberland Upland-Alluvial Forest*	8	11	6	1	26	15	41	30

SE = southeastern subfauna of eastern austral fauna; NE = northeastern subfauna of same; EA = eastern austral fauna (remaining species); PR = prairie fauna; T = totals based on these elements; UN = unclassified species; GT = grand total; GT†—grand total without water birds.

* Areas not in contact.

or subspecies of general distribution in eastern North America, or (3) forms occurring widely throughout the continent. A few are North American representatives of more or less cosmopolitan species. Only a few, notably some southern water birds, may be limited by climatic factors, but even these have such specialized ecological requirements that postulation of strict climatic control seems hazardous. By their differential occurrence, however, most of the species contribute to the ecological difference between avifaunal regions.

The unclassified group is progressively better represented towards the west, with 9, 17, 21, 23, and 30 species being important in the Cumberland Crest, Cumberland Upland, Western Upland, Limestone Plateau, and Alluvial Forest avifaunal regions, respectively. This increase is correlated with the increasing size and frequency of aquatic habitats in the same direction. The group consists mainly of aquatic species and birds of lowland forest (such as the Bald Eagle), on the one hand, and of widespread, adaptable terrestrial species on the other, the latter being generally important in all of the regions, or in all but the Cumberland Crest with its limited range of habitats.

The Rank of Avifaunal Regions

The difference scores between the avifaunal regions in actual contact with one another are shown in Table 21, which also shows the difference between the Cumberland Upland and Alluvial Forest avifaunal regions, which do not touch. The table shows the difference based upon the several faunas and subfaunas recognized, the extent to which each contributes, the difference based on unclassified species, and the grand total.

It has been correctly pointed out by Miller, as quoted above, that faunal regions display an evenly graded level of differences one from another. It further becomes evident that a given region may bear decidedly different relationships to several regions adjoining it, being more like some and less like others (Fig. 12). If a set of standard terms is employed to designate different levels of faunal distinctness (Miller proposed *province*, *district*, *area*, and *minor area*) it follows that these terms may be awarded unequivocally only to boundaries. When applied to areas they must inevitably be

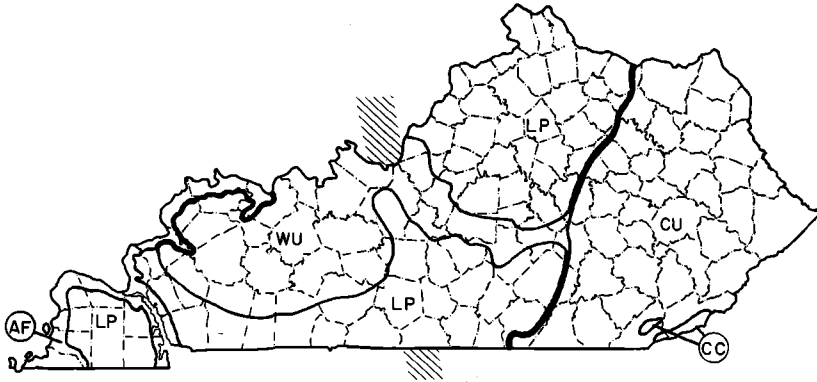


Fig. 12. Boundaries of avifaunal regions in Kentucky, showing degrees of distinctness as represented by terms based on difference scores (see p. 114). Hatched line indicates provincial boundary (for placement see p. 127); thick black line indicates distinctness at district level; thin black line indicates distinctness at area level. *CC*, Cumberland Crest; *CU*, Cumberland Upland; *WU*, Western Upland; *LP*, Limestone Plateau; *AF*, Alluvial Forest avifaunal region.

arbitrarily assigned in some cases. For example, what to call an area which is different from three bounding areas, respectively, at the provincial, district, and areal levels may be a difficult question. This can best be solved by subjective judgment exercised by a faunist acquainted with all of the areas and their relationships to larger portions of the continent.

Another and complex problem arises because of the obvious desirability of applying terms to faunal areas in different parts of the country so that they are equivalent in meaning.

An attempt to equate the regions here recognized with those recognized by Miller in California became immensely involved and ultimately failed. The reasons for this appear to be two. First, Miller's difference scores are based both upon species and subspecies, one point of difference, as already indicated, being awarded to the score between two regions for each species present in one and absent from the other, and one point of difference (not two) being allowed for each complementary pair of subspecies of the same species. The total score, in Miller's words (1951:582), is thus "an index of difference reflecting, first, the forms that reach their limits of occurrence at the boundary between the areas, and second, forms that have differentiated within the areas and are endemic to them, and hence the 'power' of the areas as differentiation centers."

But the "power" of an area, or more properly its boundary, to limit species, and its "power" as a differentiation center are not quite the same thing and do not stem necessarily from the same causes. It would be more revealing if these two types of distinction had been treated separately by Miller. This would have allowed easier comparison of his scores, as based on species alone, with those of areas where endemic subspecies are lacking, or where (as in the present case) complementary "pairs" of more widespread subspecies of the same species are so faintly distinct at regional boundaries as to make their use undesirable. In short, subspecies contribute

extensively and variously to Miller's difference scores in California, not at all to the present difference scores in Kentucky. Of course, the extent to which species alone contribute to the difference scores between Miller's regions can be computed (with some effort) from his tables, but this helps little because his terminology is based upon the total scores, which include subspecific differences. I think using the same term for similar difference scores, based in one case largely upon subspecific and another largely or entirely upon specific differences, is using one word for different things.

A second difficulty in equating terminology with that applied by Miller in California is not serious in the present case but could easily be important in other instances. This potential difficulty results from Miller's omitting to account, in the difference scores between his regions, for those species which he was unable to classify into faunas, "a number of which are water birds," and which "would not greatly alter the relative values of the totals and might obscure the differences in terrestrial conditions which the present totals seem appropriately to indicate" (Miller, 1951:605). Granting the complications encountered in dealing with water birds, found equally perplexing in the present instance, and in view of the relative smallness of the number (38 of 212 breeding species) of land birds that Miller was unable to place in definite faunas, it is easy to see that a system based on regional differences resulting from recognizable "faunas" alone is perfectly adequate for California.

However, faunal provinces, districts, etc. should be expected to reflect to a reasonable degree the *total* faunal and ecological differences between areas. Potential difficulties can therefore be foreseen because of the relatively different proportions of species classifiable into "faunas" (in the sense advocated by Miller; see above, p. 113) in different areas. It seems only proper and logical, if Miller's California faunal regions are based only on classifiable "faunas," that equivalent regions elsewhere should be similarly based. Since Miller (1951:603) has argued, I think effectively, that difference scores should be adjusted so as to be proportional to the sizes of contributing faunas before terminology is applied, it becomes apparent that some very unrealistic situations could develop.

A hypothetical example will suffice to show this. Suppose that in one area 80 of 100 forms prove classifiable into faunas. In another area only 20 of 100 forms are so classifiable. While the *total* faunas of the two areas are the same, the classifiable "fauna" of the first area is four times as large as that of the second. Since only classifiable faunas are treated, a difference score of 10 between two regions in the second area would have to be taken (allowing for proportional differences in size of faunas) as equivalent to a difference score of 40 in the first, and both might be within the range of differences calling (let us say) for the province level of distinctness. Pursuing this line of thought a bit further, we can see that this situation, carried to a ridiculous extreme, could result in a difference between two regions of only 1 calling for the recognition of a provincial boundary. Actually, where the "classifiable" element of the total fauna is large, difference scores based solely thereupon give a fair estimation of the total differences prevailing between regions, but where classifiable elements are small, difference scores based on these alone may give scarcely any idea of these total differences.

This difficulty is not serious in the present instance, since Miller found 174 of 212 mainly terrestrial species (82 per cent) to be classifiable into

faunas, while in Kentucky, 110 of 130 mainly terrestrial species (85 per cent) were assigned to faunas and subfaunas. These figures are essentially comparable, but this coincidence does not seem to me to justify ignoring the fundamental objection just stated.

I do not intend to minimize the importance of attention to recognizable faunas, but I think no system of evaluation of faunal regions can be universally applicable unless it takes account of all species, whether or not classifiable into faunas. I also think that order cannot be achieved in the ranking and understanding of faunal areas until species and subspecies are separated in analysis.

The ranks assigned to the avifaunal regions here recognized, therefore, are not intended to be precisely equivalent to those applied by Miller in California. I hope, however, that the method of procedure used here has been made sufficiently clear so that regions elsewhere, if desired, can be made equivalent in value with those here proposed, so far at least as specific differences are concerned.

A final remark on Miller's classification of avifaunal regions in California bears on a problem of potentially wide concern. This refers to a matter of nomenclature. Miller employed the terms *province*, *district*, and *area* for avifaunal regions within two great and separate systems which he designated as boreal and austral avifaunas. But since Miller's two great avifaunas are largely separate in an areal sense, this seems to leave his most important regions unnamed. In view of its wide use for major units, the term *province* might profitably be used for the areas occupied by Miller's two great avifaunas, while his *provinces*, *districts*, and *areas* within the two major units could be correspondingly downgraded to *districts*, *areas*, and *minor areas*, respectively.

For reasons stated above, and with exceptions to be explained immediately, terms have here been awarded to the regions on the basis of total difference scores, as shown in the second column from the right in Table 21. The contribution of aquatic species to these total scores is readily perceptible by examination of the last column of Table 21.

The scores range from 14 to 56, the smallest difference between adjoining regions being found between the Western Upland and the Limestone Plateau, and the greatest between the Cumberland Crest and Cumberland Upland. It should be clear that these scores do not represent original conditions; many changes due to man's activity have occurred or are now occurring. However, the scores suggest the situation now, and may not be greatly unrepresentative of relationships originally prevailing. It should only be recalled that what must have been a very large difference between the original prairies and all of the adjoining forested regions is no longer evident. This difference would doubtless have been above the province level.

Difference scores between other regions in early times cannot, of course, be determined, but in view of the differences supposed to have existed in the original forests of these regions, it seems likely that their avifaunas would have been relatively different from one another to nearly the same degree as forest avifaunas today. The differences have been affected to a comparatively small extent by open-country species arriving later, which, as noted (see pp. 86-87 and Table 11), tend to become uniformly distributed.

One important adjustment needs to be made in the scores. This concerns the very large difference between the Cumberland Crest and the Cumber-

land Upland. It has frequently been stated that the former is too small and presents too limited a range of habitats to support the fauna potentially capable of occupying an extensive area at comparable elevation and geographic position. From consideration of such areas elsewhere in the Appalachians, it seems probable that the potential distinctness of the Cumberland Crest would best be represented by a score in the neighborhood of 20.

The faunal relationships between the various regions seem appropriately to be indicated by the following system of difference scores:

37 and above	province
25 to 36	district
13 to 24	area
6 to 12	minor area

The degree of distinction represented by each boundary in this system was shown in Fig. 12. In any arbitrarily imposed system, large terminological differences may represent slight actual differences. For example, here the Western Upland and Alluvial Forest, with a difference of 26, qualify as districts in relation to each other, while the Limestone Plateau and Alluvial Forest, with the slightly lesser difference of 24, qualify only as areas.

It is further evident that (adjusting the Cumberland Crest-Cumberland Upland score to 20 as previously noted) no difference of provincial rank occurs between any two regions in actual contact. However, a provincial difference (41) is found between the Cumberland Upland and the Alluvial Forest, and the difference between the Cumberland Crest and Alluvial Forest is greater still. If the intervening area be regarded as an ecotone, which indeed it is, then it is evident that an arbitrarily placed provincial boundary may be drawn somewhere between the Cumberland Upland and the Alluvial Forest. Considering the continent as a whole, the best place for this arbitrary line seems to me to be the boundary of the Alluvial Forest. This has the advantage of separating the Coastal Plain system from the Appalachian plateaus and their outliers, and further, of doing no damage to the provincial line already drawn by Dice on the basis, ostensibly, of the entire community.

The hierarchy of faunal regions may then be summarized as follows:

- Carolinian Avifaunal Province
 - Appalachian Plateaus Avifaunal District
 - Cumberland Crest Avifaunal Area
 - Cumberland Upland Avifaunal Area
 - Interior Low Plateaus Avifaunal District
 - Western Upland Avifaunal Area
 - Limestone Plateau Avifaunal Area
- Austroriparian Avifaunal Province
 - Alluvial Forest Avifaunal (Region)¹

These regional divisions are further characterized by the differential abundance of species occurring over two or more regions (see pp. 72, 88-89), but I felt that any attempt to account quantitatively (that is, to adjust difference scores) for differential abundance would result in complexity

¹ A neutral term, as used throughout this work, implying no specific rank. Consideration of a larger section of the province than is found in Kentucky would be necessary to justify the proposal of names for divisions and areas which might be recognizable.

out of proportion to any gain realized. The extent and nature of this type of contribution to regional distinctness has been dealt with at length elsewhere in this work. The regions, indeed, are better correlated with the variations in abundance of a number of passerine species than with the range-limits of most species.

The fairly impressive difference scores between the various regions, therefore, should not deceive the reader into believing that the regions are highly homogeneous in species composition; many species contributing to the difference scores between regions do not occur throughout the regions concerned.



GEOGRAPHIC VARIATION IN KENTUCKY BREEDING BIRDS

So far as can be told from the available literature and collections, geographic variation of birds in the eastern United States tends in large part to be clinal. The most conspicuous clines in the region are oriented more or less north-south; a few are east-west. The usual trends of variation are from paler, less intense coloration in the north to darker, more intense coloration in the south, with a corresponding trend from large to small size. East-west clines, which are few and generally weak east of the Mississippi River, usually involve a decrease in saturation of color towards the west. These tendencies and some of their more conspicuous exemplars were noted long ago by Allen (1871) and by many workers in the late nineteenth century.

At least the well marked north-south clines in the region were early recognized by the description of two or more subspecies apiece. (For objections to nomenclatural recognition of minor geographical variation in continental populations—especially in clines—see Wilson and Brown, 1953; see also *Systematic Zoology*, 3:98–121, September, 1954.)

The following species occurring in Kentucky are currently regarded (A.O.U. Check-List, 1957) as divisible into northern and southern subspecies separated along boundaries either crossing or falling near Kentucky. Range boundaries used in reaching the arrangement shown immediately below, so far at least as Kentucky is concerned, are based on studies carried out in the course of the present work.

- Ardea herodias wardi* (not *herodias*) S¹
Haliaeetus leucocephalus leucocephalus (not *alascanus*) S
Otus asio asio (not *naevius*) S
Dryocopus pileatus pileatus (not *abieticola*) S
Buteo lineatus lineatus (not *alleni*) N
Strix varia varia (not *georgica*) N
Colaptes auratus luteus (not *auratus*) N
 [*Centurus carolinus zebra* (not *carolinus*)]²
Dendrocopos villosus villosus (not *audubonii*) N
Dendrocopos pubescens medianus (not *pubescens*) N
Corvus brachyrhynchos brachyrhynchos (not *paulus*) N
Parus carolinensis extimus (not *carolinensis*) N
 (*Turdus migratorius* subsp.; needs further study)
Chordeiles minor minor (N)—*C. m. chapmani* (S)
Cyanocitta cristata bromia (N)—*C. c. cristata* (S)
Sitta carolinensis cookei (N)—*S. c. carolinensis* (S)
Sturnella magna magna (N)—*S. m. argutula* (S)

All of the species listed above occur throughout Kentucky and adjacent states in virtually continuous populations, except for the Great Blue Heron and Bald Eagle. At least today the populations of the latter two in the Mississippi Valley are widely separated from populations to the northward, presumably enjoying considerable genetic isolation. It is probably not safe to say that variation in these two species is strictly clinal.

¹ The letters S and N indicate whether the subspecies is the northern or the southern member of the pair, the other member, if not occurring in Kentucky in the breeding season, being named in parentheses.

² *Centurus carolinus zebra* not recognized in this work.

Of the remaining 15 species listed above, approximately twice as many (at least 10) appear to be represented in Kentucky by the more northern of the two subspecies involved than by the more southern. However, the matter is a subtle one in which "changes" have resulted (no change, of course, was effected in the birds themselves) from fairly recent taxonomic work in the area (*e.g.*, Wetmore, 1939, 1940), and examination of the 1931 A.O.U. Check-List and other sources shows that at least the following additional southern subspecies have also been considered to range north in the Mississippi Valley to southern Illinois and western Kentucky: *Colaptes auratus auratus*, *Dendrocopos villosus audubonii*,¹ and *Dendrocopos pubescens pubescens*. The situation as thus classically represented showed as nearly equal the number of northern and southern forms, with the southern member of nearly every pair entering the state in its western lowlands, and the northern members occurring on the central and eastern plateaus.

In a general way this pattern is still evident. With few exceptions, the northern forms of the wide-ranging species listed above all are considered to occur in the Appalachian uplands south, mostly, to northern Georgia, while the southern forms, as indicated in various works by Wetmore and others, in general are considered to occupy, if not the immediately adjacent valleys, at least the broad lowlands of the Mississippi Valley north at least to western Tennessee, and the corresponding lowlands of the Atlantic Slope.

Disregarding for a moment the facts in regard to the birds themselves, we may consider briefly certain peculiarities of systematic work in this area. Since the time, several decades ago, when the broad outlines of geographic variation in eastern birds were stated by Ridgway, Oberholser, Bangs, and others, either in revisionary studies or comprehensive "faunas," taxonomic work on the area has been conducted largely piecemeal, being restricted to the "identification" of single specimens and small series from scattered areas, according to the criteria laid down by the early workers, and the filing of specimens so identified in museum drawers. But Ridgway, Oberholser, and the others worked at a time when materials for revisionary studies were inadequate by present standards, particularly in regard to the southern states, and further at a time when Merriam's newly popular life-zones provided a tempting method for expressing the ranges of subspecies as well as species. Broad reexaminations using extensive materials and statistical methods have rarely been attempted.

In any event two tendencies seem to have been long entrenched in the thinking of taxonomists working on birds of the area. The first was to assume that the factors influencing the distribution of species in the region (that is, causing northern species to occur southward in the mountains and southern species northward in the lowlands) also affected the variation within wide-ranging species or, more precisely, the distribution of subspecies as well. This idea, in fact, does not seem to have been seriously questioned since stated by Baird (1859:300) some 100 years ago. The second tendency, following from the first, was to draw the boundaries between subspecies (which in clinal species must be placed arbitrarily) coincidentally with the boundaries of life-zones. Only the rise of the biome theory has caused some change, as a few taxonomists have sought correla-

¹ Still so indicated in A.O.U. Check-List, 5th edit., 1957.

tions between vegetational formations and subspecies rather than between life-zones and subspecies (see Aldrich and Friedmann, 1943:88).

Thus there evolved the marked impression conveyed by the literature that the generally north-south clines admitted to exist by everybody are modified by the Appalachian mountain mass to a more or less east-west direction on the western slopes (and vice versa), or that physiographical influences have altered a latitudinal to an altitudinal gradient. It naturally follows that subspecies ranges in the area are correlated with, or at least parallel to, zonal boundaries.

A further impression that has become rather general is that there are "steps" (zones of increased gradient) in the clines at these subspecies boundaries, this impression frequently being revealed by the use of such phrases as "broad zone of intergradation" (there can be no zone of intergradation, properly speaking, in a cline).

The existence of such steps may seemingly be confirmed by examination, particularly hasty or incautious examination, of museum series, but danger of serious error exists. This danger results from a weakness of taxonomic practice difficult for even the most scrupulous workers to avoid entirely, namely a tendency to assign specimens to subspecies in a biased manner so that the statistical differences between the subspecies (not to mention those between their most immediately adjacent populations) are magnified in the museum tray.

This bias is often unconsciously incorporated in the most exacting efforts to be scientifically discriminating. The bias may consist either of a preconceived or of a blindly accepted concept of the proper "range of variation" of the subspecies involved, and "scientific discrimination" provides a means of disposing of specimens violating the concept. In this way knowledge of populations is obscured and knowledge of subspecies becomes spurious. We find far too often that specimens (a bit too large) from south of a subspecies boundary are disposed of as "belated migrants"¹ or "early wanderers," while specimens (a bit too small) from north of the boundary are transients carried "in the flush of spring migration beyond their normal breeding grounds," or represent "isolated pockets of southern affinity," etc. The specimens, in any event, end up in drawers containing the subspecies whose "characters" they display, rather than in drawers revealing the characters of the populations to which in all probability they belong. Thus are built up spurious discontinuities which are nonexistent in nature.

All of this is in violation of statistical principles, and indeed, extensive statistical treatment has been applied to few species in the eastern United States and, so far as I know, to none of the species named above except the Carolina Chickadee (Lunk, 1952) and, presumably, the Blue Jay (Pitelka, unpublished).

Kentucky affords a transect of some 400 miles from east to west, reaching from the Appalachian uplands (not quite at their highest, central, portion) to the Mississippi River and Coastal Plain Province, and spanning portions of three life-zones, three physiographic provinces, and the alleged "zones of intergradation" between several pairs of subspecies. As such, the state provides a fairly promising area for testing some of the assumptions and

¹ Often we find that the "belated migrant" is further shown so to be by having unworn plumage, small gonads, etc.—but no specimens within the "proper" size range seem ever to be excluded on such grounds!

concepts reviewed above. Any marked gradients toward larger size in the eastern, mountainous portion of the state, and any steps in the clines should be apparent in large series of birds from the area.

In the course of the present work, series sufficiently large to justify some statistical treatment of mensural characters (wing length)¹ became available from Kentucky and vicinity for the Yellow-shafted Flicker, Hairy and Downy woodpeckers, Blue Jay, Carolina Chickadee, White-breasted Nuthatch, Robin, and Eastern Meadowlark, all of these being analyzed to the extent seemingly warranted by sample size except the Carolina Chickadee (already studied by Lunk, 1952) and Robin (treatment deferred).

Extended discussion of the details, limitations, and results of these analyses will be found in the sections on "geographic variation" of the species concerned (see also Figs. 18-20, 22-23, 37). The following summary of results will suffice for present purposes.

In the Yellow-shafted Flicker no important differences were found between eastern (more upland) and western (more lowland) specimens from Kentucky and Tennessee, but the small (14) Kentucky sample is slightly but significantly larger than the similar (15) Tennessee sample, in respect to wing length. Analysis of the Hairy Woodpecker showed no significant indication of clinal variation across Kentucky, or indeed of significant difference between the populations of lowland southwestern Kentucky and northwestern Tennessee and that of the Great Smoky Mountains. Study of the Downy Woodpecker indicated a probably real but very faint cline of increasing size from the Mississippi River to the Cumberlands (while no two populations are significantly different, the evenness of the gradient from smaller to larger may in itself be significant). Certainly no differences suggesting the placement of a subspecific boundary are shown. In the White-breasted Nuthatch no significant differences between populations emerged, in respect to wing length, and no appreciable trend towards an east-west cline was indicated. In this species, however, a small sample indicates that variation in the crown color of females may possibly be correlated with the boundary between the Appalachian uplands and the lower plateaus to the west. The Blue Jay shows a slight but perhaps significant trend toward small size in the Mississippi lowlands, as opposed to the plateau and mountain areas to the eastward, but this is evidently not marked and there is no indication at present of a strong east-west cline.

The Eastern Meadowlark differs from all other species analyzed in the degree of difference in wing length of eastern and western samples. An east-west size gradient, perhaps accentuated by a step, does seem to exist in this species, which is *the only grassland form studied* in this originally forested area. It seems possible that this discontinuity in size may result from secondary intergradation of stocks originally invading Kentucky from separate centers of differentiation.

The results obtained by comparisons of the small samples of the Screech Owl, Pileated Woodpecker, Red-shouldered Hawk, Barred Owl, Common Nighthawk, and Common Crow suggest nothing contradictory to the indications obtained from the more amply represented species analyzed.

¹Tail length was also studied, less intensively, but in no case did it seem likely to provide results markedly at variance with those obtained from study of wing length; being a more variable measurement, it usually results in lesser separability of populations. Color, finally, was found almost useless, save in the White-breasted Nuthatch, in distinguishing samples of the species under consideration.

Much larger series, representing larger areas and more species, will have to be studied to reach final conclusions. Nevertheless, the present limited study suggests that the whole concept of the effectiveness of the Appalachian Mountains upon the geographic variation of wide-ranging species needs re-examination, and that this effect has been much overrated. Possibly the Appalachian Mountain mass, penetrated and subdivided as it is by many valleys, is not extensive enough to allow marked regional differentiation in the absence of barriers to gene flow. With the exception of the meadow-lark, ecologically limited by forested regions, no barriers capable of impeding the movements of any of the species considered above seem to exist in the area. This will readily be appreciated by anyone who has watched a Hairy Woodpecker fly across a mile-wide valley or a Blue Jay drop 1,500 feet down a mountainside in a matter of moments.

The Appalachians have, of course, served as a center of differentiation, though certainly not a very powerful one, for a number of weakly defined subspecies of northern species which do not occur at lower elevations in the southern states. Only three such forms breed in Kentucky, however, where the area at elevations above 3,000 feet is very small. These Appalachian forms¹ are:

Vireo solitarius alticola
Dendroica caerulescens cairnsi
Junco hyemalis carolinensis

The geographic variation of a few species remaining to be discussed is variously subtle and complex, probably or definitely clinal in some cases, and generally involves differences from east to west rather than north to south. These species are represented by series of small to moderate size, and the details of their variation in Kentucky are not yet clear in all cases. The species may be divided into groups depending on whether Kentucky seems to be occupied by a subspecies with an Appalachian center of distribution (A), by the eastern of two subspecies (E), by the western of two subspecies (W), or by both eastern and western complementary subspecies. They are as follows:

Bonasa umbellus monticola (not *umbellus*²) A
Melospiza melodia euphonia (not *juddi*)
Ammodramus savannarum pratensis (not *perpallidus*) E
Spizella pusilla pusilla (not *arenacea*)
Thryomanes bewickii altus (E) — *T. b. bewickii* (W)
Troglodytes aedon parkmanii (plus "*baldwini*"; not *aedon*) W

The Ruffed Grouse is poorly known, being virtually extirpated in the western two-thirds of the state, from which no specimens remain. Breeding material of the Song Sparrow, likewise, is inadequate, but the Song Sparrows of central Kentucky do not seem so typical of *euphonia* as those of the east, although they are certainly closer to that form than to the more western *juddi*, which ranges into the state in winter.

The most conspicuous variation found in any of the above species is seen

¹ I am not convinced of the validity of *Limnothlypis swainsonii alta* Meanley and Bond (1950), nor that *Dendroica virens waynei* (long considered as nearly restricted to coastal North Carolina) can properly be regarded an Appalachian form, as suggested by Sprunt and Chamberlain (1949:457).

² The population of *umbellus* involved = *B. u. mediana* Todd. See A.O.U. Check-List, 5th edit., 1957, p. 128.

in the Field Sparrow, a long series of which, laid out according to locality, becomes progressively paler and grayer towards the west without, however, ever attaining the characters of typical *arenacea* of the central prairies ("true" *arenacea* strays to Kentucky in winter).

The facts in regard to the Bewick's Wren and the Grasshopper Sparrow are not well known. Tentatively I have admitted the Appalachian *Thryomanes bewickii altus* and the more western *T. b. bewickii* to the Kentucky list with distributions as stated by Aldrich (1944), but more material is desirable. There seems to be a trend toward greater saturation of color in the east.

The House Wrens of most of Kentucky tend toward the western *Troglodytes aedon parkmanii*, to which I have referred them, there being, so far as available material shows, a trend toward darker color and less distinct barring in the east, or approaching "*baldwini*" (which I regard as an intergrade between *parkmanii* and *aedon*).

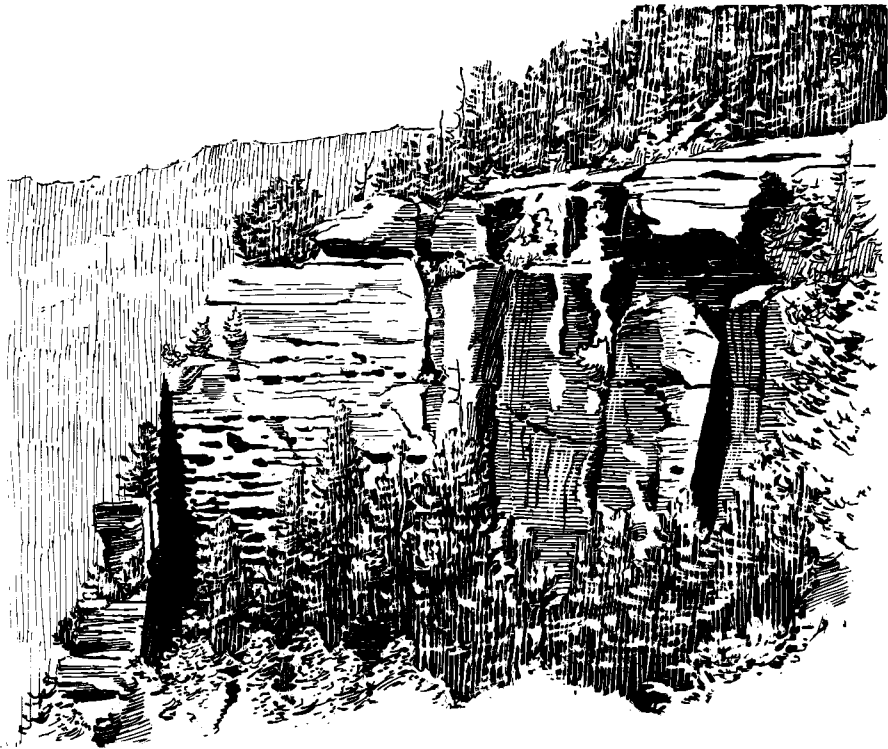
Little is clear and nothing is really striking about the geographic variation of these species in Kentucky. However, all of those last considered, except the grouse, are birds of grassland or of brushy and scrubby environments. It is in these species that the few tendencies toward western subspecies may be noted, suggesting colonization of Kentucky, at least in part, by more western populations. Of the several forest species of Kentucky divisible into eastern and western subspecies in North America, all are unequivocally represented in Kentucky by the eastern form, the same plains which may have provided open-country colonizers serving as effective barriers between eastern and western representatives of the same forest species.

The picture of geographic variation of birds in Kentucky is one of very slight and gradual change in populations from one region to another, with a scarcity of discontinuity or areas of accelerated change. This is to be expected in the almost complete absence of effective isolating agents and in areas of rather uniform vegetation and climate.



Troglodytidae, 4; Mimidae, 3; Polioptilinae (gnatcatchers), 1; Bombycillidae, 1; Vireonidae, 5; Parulidae, 25 (24); Emberizinae (typical buntings), 10. *Pan American*, all probably originally South American, 15, 10 per cent: Trochilidae, 1; Tyrannidae, 6; Icteridae, 6; Thraupidae, 2. *South American*, 4, 2.6 per cent: Richmondinae (cardinals), 4. Total, 150 species, 100 per cent.

From this it appears that the avifauna of Kentucky is made up chiefly of (1) ancient and widely distributed (*i.e.*, unanalyzable) groups and (2) groups originating in North America in (mainly) Tertiary times. Typical of eastern United States avifaunas, it also partakes moderately and nearly equally of Old World and South American, or probably South American, elements.



THE ORIGINS OF THE AVIFAUNA: BREEDING BIRDS

Customary and desirable as it may be, in faunal works, that attention be given to the origins and history of the fauna in the area studied, not very much (that has not already been stated) can safely be said about the matter here.

Definite facts concerning the origins or early history in an area either of species or of larger taxa can be based only upon a fossil record. This, lamentably, is entirely lacking for Kentucky birds (see Leverett, 1929:78; Funkhouser and Webb, 1928; Wetmore, 1956). Neither is help to be had at present from Recent and sub-Recent materials, since bird and mammal bones excavated by parties from the University of Kentucky incidentally to archaeological work have been sold, for lack of storage space, "by the ton" to fertilizer companies (W. S. Webb, letter: March 6, 1952).

Although Braun (1950) has gone to great pains to reconstruct the history of the forests of eastern North America, and many Pleistocene events there and elsewhere have been reviewed by Deevey (1949), it is possible to say at present only that there must have been marked changes in the avifauna of the area (and in the forests) before each glacial advance (the Illinoian alone having actually reached northern Kentucky), and that the post-Columbian avifauna of Kentucky was clearly a deciduous forest assemblage. No attempt has yet been made to summarize the inferential history of the birds of the eastern United States, nor has the fauna of this area been analyzed on a scale comparable to that attempted by Miller (with particular reference to California) in the west (Miller, 1951). The allocations of Kentucky breeding birds to a number of separate "faunas," as was done above (pp. 114-123), represents an effort similar to Miller's, but on a much smaller scale, to divide the breeding species of Kentucky birds among a number of groups defined (Miller, 1951:582) "on the basis of strong or repeated associations of species which have similar centers of distribution and probably often similar areas of origin." Additionally, certain known or probable additions to the avifauna, of very recent date, have been discussed on pp. 83-85.

It may, finally, be instructive to examine the contribution to the present Kentucky avifauna of the great faunal groups (according to the probable geographic origins of major taxa) as defined by Mayr (1946). These are the Unanalyzed, Pantropical, Old World, North American, Pan American, and South American elements. Following Mayr's classification, the breeding avifauna of Kentucky may be divided as follows: *Unanalyzed*, 52 species (46),¹ 34.5 per cent: including Podicipedidae, 1; Phalacrocoracidae, 1; Ardeidae, 7 (6); Anatidae, 6 (4); Accipitridae, 8 (6); Pandionidae, 1; Falconidae, 2; Rallidae, 3; Charadriidae, 1; Scolopacidae, 3 (2); Laridae, 2 (1); Caprimulgidae, 3; Apodidae, 1; Picidae, 8 (7); Hirundinidae, 5. *Pantropical*, 2 (1), 1.2 per cent: Anhingidae, 1; Psittacidae, (1). *Old World*, 22 (20), 14.6 per cent: Columbidae, 2 (1); Cuculidae, 2; Tytonidae, 1; Strigidae, 3; Alcedinidae, 1; Alaudidae, 1; Corvidae, 3 (2); Paridae, 2; Sittidae, 1; Turdidae, 4; Laniidae, 1; Carduelinae (northern finches), 1. *North American*, 55 (53), 37.3 per cent: Cathartidae, 2; Tetraonidae, 2 (1); Odontophorinae (North American quail), 1; Meleagrididae, 1;

¹ Numbers in parentheses are numbers minus species of casual occurrence.

THE HISTORY OF ORNITHOLOGY IN KENTUCKY

Compared with that of many other states, Kentucky's ornithological history is meager, a result, perhaps, both of geography and chance. With a few notable exceptions, the early naturalists who journeyed westward in the late 18th and early 19th centuries either passed quickly down the Ohio River and continued onward, or confined their observations to states to the north. Their immediate successors, for the most part, avoided Kentucky altogether. The state entered upon a long period of development along primarily agricultural lines, but among many cherished traditions which grew over the years, one of thoughtful attention to natural history was conspicuously lacking. Even today there is no museum of natural history or of zoology within the state, and no ornithologist has been professionally occupied as such at any Kentucky institution.

Nor has the ornithology of the state received much attention, at least until recently, from non-resident zoologists. Of perhaps 1,000 titles more or less devoted to Kentucky birds (approximately 850 of which are here cited), scarcely 50 are by workers primarily trained or professionally engaged in ornithology, and only a handful of these are major papers. The record, therefore, is the result almost entirely of spontaneous, mainly recent, amateur effort. Evaluated as such, it is a respectable one.

Short accounts of the history of Kentucky ornithology by Lovell (1949a) and Wilson (1949b) contain numerous details not repeated here, the chief purpose of the present account being to assess the material that has been available for use in the treatise following.

PIONEER PERIOD

In 1750 Dr. Thomas Walker and a small party crossed Cumberland Gap, in what is now Bell County, and explored briefly in the region just to the west, establishing a temporary settlement near the present site of Barbourville, Knox County. Also about 1750, a few intrepid explorers traveled down the Ohio River from Fort Pitt, among them Colonel George Croghan, Christopher Gist, and John Finley. The first permanent settlement in the state was established by James Harrod in 1774 at Harrodsburg (Mercer County), and from this time on, settlement was rapid. Most immigrants arrived by way of the "Wilderness Road" through Cumberland Gap, Crab Orchard, and Bardstown to the present site of Louisville; others descended the Ohio by boat from Fort Pitt. On June 1, 1792, Kentucky was formally separated from Virginia territory, entering the Union as a Commonwealth and as the first state west of the Appalachians (see *Encyclopædia Britannica*, 11th edit., for detail and sources).

The first detailed ornithological observation made in Kentucky seems to have been Col. William Fleming's (see Schorger, 1949), when he obtained and carefully described an Ivory-billed Woodpecker at Logan's Fort (present site of Stanford, Lincoln County) on March 7, 1780. The first attempt at a list of Kentucky birds appeared not much later, in John Filson's *The discovery, settlement, and present state of Kentucke* (1784), where six moot and two definite kinds (Parakeet, Ivory-billed Woodpecker) of birds are briefly noted. This work, which I have not seen in first edition, was included in full with the second edition of Gilbert Imlay's *A topographical*

description of the western territory of North America (1793), where Filson's ornithological matter appears on p. 297. In Imlay's work, based in part on residence in Kentucky, there appears on pp. 237-243 an unannotated list of 110 kinds of birds, many of them not identifiable, which has sometimes been construed as applicable to Kentucky. Nowhere, however, does Imlay give a precise record attributed to the state, and there is no implication that the list is intended to apply to Kentucky only (there are indications that it is not). Both Lovell (1949a) and Allen (1951:527) confused the texts of Filson and Imlay, leading to the impression that the latter was writing exclusively of Kentucky birds. Imlay's list, in fact, is best disregarded, a solution equally applicable to ornithological statements in the rather imaginative work of Thomas Ashe (1808).

In the period around 1800, several travelers in and near Kentucky made short notes in their journals concerning the more conspicuous birds, notably the Carolina Parakeet, Passenger Pigeon, and Turkey. Among these observers were John Heckewelder, Fortescue Cuming, Henry R. Schoolcraft, and Maximilian, Prince of Wied, the last an accomplished ornithologist whose observations, unfortunately, were limited to the vicinity of New Harmony, Indiana. References to the records of these pioneers, taken mainly from various documents assembled and edited in Thwaites' *Early western travels* and the abstracts by Wright (1911, 1912, 1914-1915), will be found under the species concerned. With few exceptions, however, for example that of the botanist André Michaux (who commented briefly but revealingly on numerous birds and mammals noted variously in the years 1793-1795 in different parts of Kentucky and adjacent states), these early travelers provided materials of value chiefly to historians, and of little ornithological interest.

AUDUBONIAN PERIOD

Ornithology in Kentucky really began with the arrival of John James Audubon (1770-1851) at Louisville in September, 1807 (Herrick, I:xxvii, 1917). With various interruptions, Audubon dwelt in and near Kentucky until October, 1820, having moved from Louisville to Henderson in 1810, and to Cincinnati, Ohio, in 1819. He again stayed at Louisville in the winter of 1823-1824 (Herrick, I:xxviii-xxxi, 1917).

Through much of this early part of his life (the height of Audubon's powers as naturalist-artist was not attained until later), such time as Audubon could spare from business activities was spent in the forests and "Barrens" of Kentucky, and there he accumulated many of the impressions, notes, and rough drawings which were later to find elaborate expression in his *Ornithological biography* (1831-1839) and the great plates of its famous companion *The birds of America* (1827-1838). Unaware, unfortunately, of the requirements to be expected of scientific reporting by later generations, Audubon frequently wrote, in the "biography," in terms far less detailed and specific than could be desired.

In his original journals more exact information was recorded, but of these, unfortunately, little has survived a tragic history of loss and destruction. Of only two seemingly remaining intact, but one contains reference to Kentucky birds, an interesting and valuable chronicle of observations made along the Ohio and Mississippi rivers between Cincinnati, Ohio, and the

southwestern corner of Kentucky, October 12 to November 21, 1820. This journal was published verbatim by the Club of Odd Volumes (Audubon, 1929). Fragments of another journal (Audubon, 1868) remain, those pertinent here concerning Audubon's trip from Louisville to Cape Girardeau, Missouri, in the winter of 1810-1811, but the value of the published version of this journal was greatly impaired by the editing of a certain Robert Buchanan (Herrick, I:18-19, 1917). Our final source of information on Audubon's discoveries consists of a few unpublished and little-known early drawings, some bearing data, and a few notations on the original drawings from which the plates of the "elephant folio" were prepared. Fortunately, these notes have been transcribed by Herrick (II:375-379, 1917) in the first case and by Arthur (1937:500-506) in the second. Some of these notes and drawings provide records comparable to those afforded by preserved specimens, among these being drawings of the Northern Shrike and the Goshawk.

Of the same period, although his observations were earlier published, is Alexander Wilson (1766-1813), probably the most astute observer among the early American ornithologists. Regrettably, for present purposes, Wilson's single visit to Kentucky was brief, extending from March 5 to approximately April 18, 1810. Floating down the Ohio River from Pittsburgh in his rowboat "The Ornithologist," Wilson arrived at Louisville on March 18, and there on March 20 occurred his famous and sole meeting with the young Audubon, with whom he spent the day afield, observing, evidently, both Whooping and Sandhill cranes. On March 24 he departed on foot for Lexington, later walking from there southward across the "Barrens" to Bowling Green and thence to Nashville, Tennessee, where he arrived on or before April 18 (Ord, 1825:cxvii-cxlii). A few detailed notes, especially on the Carolina Parakeet, the Passenger Pigeon, and the prairie chicken in his historic *American ornithology*, and casual notes on other species, are the total recorded ornithological results of Wilson's visit to Kentucky.

The final contributor to the record of the period was the remarkable C. S. Rafinesque (1783-1840), prominently mentioned in connection with various unidentifiable species listed at the end of this work. A botanist and scholar of diverse talents, some of which seem to have verged upon the bizarre, Rafinesque appears to have been out of his element with warm-blooded vertebrates, especially birds, and only one or two observations of real worth (see Cliff Swallow, Bonaparte's Gull, Black Tern) resulted from his stay in Kentucky (for sources see Richmond, 1909; Rhoads, 1912; Rafinesque, in bibl.), chiefly while associated, 1819-1825, with historic Transylvania University at Lexington (see Call, 1895:32-49; Fitzpatrick, 1911:27-34).

PERIOD OF BECKHAM

For a span of nearly 60 years, from Audubon's departure in 1821 to the beginning, near 1880, of the work of Charles Wickliffe Beckham (1856-1888), virtually nothing was learned of Kentucky birds. Beckham, unfortunately, lived to publish only nine titles pertaining to the birds of Kentucky (and a number of others on the birds of Maryland, Colorado, Florida, Texas, and Louisiana). His excellent "List of the birds of Bards-

town, Nelson County" (1883; revised, 1885; reviewed, J. A. Allen, 1883, 1885) is the first paper exclusively devoted to the birds of the state. The first version of this contains annotated references to 167 species, and 171 are treated in the second. Beckham's work rested upon the sound basis of more than 1,000 specimens taken in Nelson County. These, although today in poor condition, remain one of the most important local collections of Kentucky birds. Among Beckham's contributions to ornithology were the description (1886*a*) of the first (or juvenal) plumage of the Summer Tanager and of the first autumn (or basic) plumage of the Yellowthroat (1886). His remarks on the scarcity of adult birds in autumn (1887) were noticed by Jonathan Dwight, Jr. (1900:321), in connection with certain theories on bird migration (1900:126-129). Several years before his death, Beckham had been engaged for a time as an assistant in the Department of Birds of the United States National Museum under the supervision of Robert Ridgway (see Ridgway, 1888). Considering his varied activities in other fields, the infrequency of his visits to his Kentucky home, and the prolonged illness that led to his death, Beckham's contribution is remarkable and surely, had he lived longer, would have been much greater still.

Nearly contemporary was Leon Otley Pindar (*ca.* 1870-1936), one of the founders of the Young Oologists' Association which, by complex stages, eventually was to evolve into the Wilson Ornithological Society (see Jones, 1914:24; Burns, 1926:136). Pindar's two periods of ornithological activity were widely separated, and only the first belongs with the present period. From 1884 to 1894 he observed birds in Fulton County, in extreme southwestern Kentucky, and published his observations in three major papers (1887*a*; 1889*b*; 1925*a*) listing 122, 183, and 272 species, respectively, and in a rather large number of short notes, mainly inconsequential and published in obscure journals. Pindar's work suffers in comparison with Beckham's; he did not collect, although he seems occasionally to have shot birds to identify them, and a fair proportion of his notes on Fulton County species are too poorly documented to be accepted without reservation. In fairness, however, it should be mentioned that many of his notes were destroyed by fire (Pindar, 1924*a*:201) and hence unavailable for use in his paper of 1925.

Much later, after retirement from a medical practice which had forced him to suspend bird study, Pindar devoted himself, from about 1922 to 1925, to casual observation of birds in the Bluegrass area (see bibliography, 1923-1925). Near the end of his active life (his last years were plagued by illness) he was one of the founders of the Kentucky Ornithological Society.

In the 1880's and 1890's John B. Lewis, of Eubank, Pulaski County, who published almost nothing himself, kept records of bird migration near his home and latter supplied them to Wells W. Cooke for use in the latter's extensive series, continued by Oberholser, of reports on bird migration (bibliography, many titles). These early data from eastern Kentucky, undetailed as they are, are nevertheless of considerable interest and value.

Concluding the period under consideration is Harrison Garman, one-time Professor of Zoology at the University of Kentucky, whose chief importance in the present context is his authorship of *A preliminary list of the vertebrate animals of Kentucky* (Garman, 1894; reviewed, Chapman, 1894), the ornithological portion of which is the first effort at a complete list of the birds of Kentucky. Garman seems, however, to have possessed little ornitho-

logical skill, had few original observations to contribute, and was evidently unaware of or uninterested in the work of most of his predecessors.

While Beckham, Pindar, and Garman were at work in Kentucky, considerable ornithological activity was going on at Cincinnati, Ohio, under the auspices of the Cincinnati Society of Natural History, whose most prominent members were the capable field students Frank W. Langdon and Charles Dury. Others were John W. Shorten, L. R. Freeman, Ralph Kellogg, and William Hubbell Fisher. This period of activity began around 1865, reached its peak with the appearance of Langdon's instructive "List of Cincinnati birds" (1877; revised, 1879), and drew to a close near 1900. Many short contributions by the individuals just listed, and a few others, appeared during this time in the *Journal of the Cincinnati Society of Natural History*. While the actual Kentucky records reported by the Cincinnati group are virtually limited to observations of water birds on the Ohio River (whose north bank at mean low water coincides roughly with the state line), much essentially pertinent information was accumulated.

A final extralimital work of the period should be mentioned. Edward William Nelson (1855–1934), prominently associated in later life with the U. S. Bureau of Biological Survey, observed and collected briefly, August 17 to 31, 1875, near Cairo, Illinois, at the confluence of the Ohio and Mississippi rivers. These early notes of Nelson's, published in 1877, contain interesting observations on the Swallow-tailed and Mississippi kites then present in the area, and the riverside observations of these and some other notable species are as applicable to Kentucky as to Illinois.

INTERMEDIATE PERIOD

It is difficult to pick a high point among the quiet years from 1900 through, roughly, 1922. In this period comparatively little of consequence was done by resident students. These years were marked, however, by a very short visit, in 1921, to Harlan County by the eastern ornithologist Witmer Stone (1921), and by the more extensive work, on behalf of the then U. S. Bureau of Biological Survey, of Arthur H. Howell (1872–1940), the author of numerous zoological papers and books. Howell worked at seven Kentucky localities, obtaining many notes and a few specimens which are still in the collections of the U. S. Fish and Wildlife Service or the U. S. National Museum. This work was conducted on July 24, and August 9 to 13, 1908, and June 23 to July 14, 1909. His list of 80 species (Howell, 1910) provided the first indication of the weak northern affinities of the breeding avifauna of the higher Cumberland Mountains in southeastern Kentucky. Also about this time a small collection was made in Logan County, 1903–1906, by George C. Embody, later a zoologist at Cornell University, where his collection is now housed (see Mengel, 1948). Of two notes resulting from Embody's work (Embody, 1905, 1907), the more important is a short but interesting account of the Bachman's Warbler. Several brief contributions from adjoining Warren County were made at about the same time by Sarah Price of Bowling Green, who was more interested in plants than in birds (see Lovell, 1959).

In 1911 Benedict J. Blincoe began spare-time observations about Bardstown, the site of Beckham's pioneer work. These investigations were continued until 1921, when Blincoe moved to Dayton, Ohio (to become known

to ornithologists of a wider area, from 1924 to 1927, as treasurer of the Wilson Ornithological Club). Blincoe's useful records were published in three major papers (1920; 1923; 1925) and a number of short notes. He was acquainted with Beckham's work, intelligently critical of it, and alert to changes in the local avifauna. Although without formal training in zoology, he has been a careful observer and lucid writer. He collected but few specimens, unfortunately, but among these were the only Goshawk taken in Kentucky in the present century, and one of the very few Long-eared Owls (both, regrettably, since lost).

MODERN PERIOD

Although some of its chief figures had begun their studies a little earlier, the year 1923 might be taken as the formal beginning of this period, for it was in April of that year that L. O. Pindar, Gordon Wilson, and Brasher C. Bacon founded the Kentucky Ornithological Society, which was to prove a great stimulus to amateur activity in the state. The journal of the new Society, *The Kentucky Warbler*, first appeared in January, 1925, at Bowling Green, where it is still published. It has appeared in printed form from the outset, the first number consisting of two leaves, or four pages, unnumbered. Through the years this journal has appeared regularly and grown slowly, but little of importance appeared in it until approximately 1935.¹ The first volume to be paged was the 13th (1937), and citation of the early volumes is thus somewhat awkward. The journal averaged about 16 pp. per volume for the first decade. In 1960 it contained 72 pp. Editorship: Gordon Wilson (1925–April, 1936, vols. 1–12 [part]; 1940–1944, vols. 16–20; 1954–1963, vols. 30–39 [since 1958 with the assistance of Anne L. Stamm]); Burt L. Monroe (fall 1936–1939, vols. 12 [part]–15); Harvey B. Lovell (1945–1953, vols. 21–29). An extensive collation has been given by Underwood (1954: 95–97; Pindar erroneously listed among the editors). Throughout most of the period, Gordon Wilson has edited the Christmas bird counts and “big spring lists” which have been more or less regular features. Quite a few useful, straightforward, descriptive papers are found in *The Kentucky Warbler*, as are many brief notes of value. By bulk the journal must contain well over half of the material published on Kentucky birds, but a good part of this, befitting the interests of a diverse, amateur membership, is of a popular or “newsy” nature and some of the rest is deficient in value.

The year 1925, when *The Kentucky Warbler* first appeared, witnessed also the publication of William Delbert Funkhouser's² (1861–1948) *Wild life in Kentucky*, which treated all of the reptiles, birds, and mammals of Kentucky known to its author (birds, pp. 143–306). It is not uncharitable to describe this work as an uncritical and incomplete compilation based on inadequate citations of Audubon, Beckham, and Gordon Wilson and on numerous reports of county agents and others of variable and often questionable reliability. Its most useful contribution is a number of Nelson County nesting records of Blincoe's not elsewhere published.

Bad as the foregoing work is, it is much better than *The birds of Kentucky* by Jesse Dade Figgins (1867–1944), published posthumously by the Uni-

¹ The tone of the first several volumes was set by the first word of the first page of the first, which is “Howdy”!

² For years Dean of the Graduate School and Chairman of the Department of Zoology, University of Kentucky.

versity of Kentucky in 1945 (see Sutton, 1945, for extended criticism). There is no point in going into the details concerning the preparation and publication of this book (the story is a sad one, and irrelevant), except to mention a few facts necessary for completeness of this record.

Figgins (an active archaeologist, who from 1910 through 1935 was Director of the Denver Museum of Natural History) had come from retirement in 1937 to direct preparations for a projected museum of the Isaac W. Bernheim Foundation, to be located in or near Louisville. This project collapsed after several frustrating years, during which Figgins made small collections of birds (the specimens obtained, unfortunately, seem now to be without data) and other materials. In 1941, he moved to the University of Kentucky where his activities relating to the unfortunate book were supported by a research grant. In the course of the work he made a collection of more than 250 adequately prepared and labelled specimens, which have been examined in the preparation of the present report.

A few visitors from outside the state may be mentioned before discussing the contributions of recent resident students. R. E. Horsey, a botanist, of Rochester, New York, spent considerable time collecting plants in the (until recently) little-known eastern portions of the state, and, although he collected no birds, he published useful observations made intermittently from 1917 to 1926 (Horsey, 1922, 1923, 1927). Florence Merriam Bailey (1863-1948), the author of several major ornithological works, with her veteran-naturalist husband Vernon, spent part of the summer and fall of 1929 engaged in observations on the birds of the (then projected) Mammoth Cave National Park (Bailey, 1933; reviewed, Stone, 1934). While a number of useful records resulted, her report was popular in nature and is disappointing from a technical standpoint. Thomas D. Burleigh, long associated with the U. S. Fish and Wildlife Service, visited eastern Kentucky briefly in June, 1934, collecting a few specimens and making notes which are in the files of the service.

Finally, in 1938, a field party was dispatched from the U. S. National Museum, under instructions of the then Secretary of the Smithsonian Institution, Alexander Wetmore, whose many contributions to world ornithology require no mention here. This group of professional workers (consisting at various times of W. M. Perrygo, H. G. Deignan, and Gregor Rohwer) operated at selected localities throughout the state from April 19 to July 14 and September 16 to November 14, collecting approximately 1,100 specimens. In September the party was joined briefly by Wetmore himself. The work was part of a larger plan, including besides the Kentucky work (Wetmore, 1940) similar projects in Tennessee (Wetmore, 1939), West Virginia (Wetmore, 1937), North Carolina (Wetmore, 1941), and South Carolina (unpublished). Wetmore's report of this expedition, although primarily taxonomic, contains numerous worthwhile locality records and migration dates, and its careful treatment of 167 kinds of birds laid a foundation for orderly study of geographic variation in the state.

It is now necessary to discuss the activities of a number of local students who have contributed importantly to our knowledge. Among those who have gathered data at given localities over prolonged periods are B. C. Bacon at Madisonville, R. W. Barbour (and W. A. Welter) at Morehead, B. L. Monroe at Louisville, and G. Wilson at Bowling Green.

From 1933 to 1939 Wilfred August Welter (1906-1939; obit., *Auk*, 1940:

448) and Roger William Barbour, with various of their students and associates, studied and collected birds in the vicinity of Rowan County. The results of their activities were published fragmentarily in several short papers (Welter, 1935; Barbour, 1950a, 1951a, 1952). Their collection, numbering around 600 specimens, is housed partly at Morehead State College; when I examined it, part of it was in Barbour's possession. The specimens, unfortunately, are in rather poor condition. Barbour is also the author of short papers on the birds of Black Mountain, Harlan County (1941a) and an area in Breathitt County (1956). Since 1950 he has been a member of the Zoology Department of the University of Kentucky. The more extensive of his efforts have been devoted to other forms of vertebrates.

Brasher Collins Bacon (1892-1959), of Madisonville, was perhaps the possessor of more personally acquired information on the nesting of Kentucky birds (mainly in Hopkins County) than any other local student. His field work, carried out entirely in spare time, began approximately in 1900 and continued to his death but was much curtailed in the last 20 years of his life by erratic health. The first of his few but useful publications (the most important being Bacon and Monroe, 1935-1937; Bacon, 1933; and Bacon, 1954) did not appear until 1933, and for practical purposes he belongs to the modern period. Unfortunately he never found time to make more than a beginning at organizing a large store of notes and recollections. A number of these he generously contributed for use herein. His collections, chiefly of nests and eggs, are now housed at Western Kentucky State College (see *Kentucky Warbler*, 35:18-19, 66-67, 1959).

Burt Leavelle Monroe, Sr., made limited ornithological observations, 1917-1922, but his serious study of birds began around 1933. From then onward, whenever demanding business obligations have permitted, he has collected critical specimens, including the only extant skins from Kentucky of approximately 30 species, and has kept a running record of the ornithology of the Louisville area (Jefferson, Oldham, and Bullitt counties). He has also preserved records and specimens from all parts of the state resulting from occasional personal observations and from the activities of others. He has freely contributed his valuable notes and excellent counsel throughout the course of the present work.

Besides serving the Kentucky Ornithological Society as president, vice president, editor, and curator, Monroe has influenced the course of ornithology and sound conservation in Kentucky in varied ways. Since 1941 he has been State Ornithologist (an advisory office created by the Division of Game and Fish). He has also been behind much of the progressive policy shaped by the influential League of Kentucky Sportsmen. For some years he has written a widely read outdoor column in *The Louisville Courier-Journal*, and for a time part of the editorial section of *Happy Hunting Ground*, the organ jointly of the Division of Game and Fish and the League of Kentucky Sportsmen.

Monroe has authored numerous useful contributions on Kentucky birds listed in bibliography under 1938-1958; and (with R. M. Mengel) 1939 (the earliest comprehensive notes on water birds at the Falls of the Ohio River) and 1941-1948; and (with Burt L. Monroe, Jr.—see also below) 1948-1953. His collection (in part formed in collaboration with the writer) is housed at the University of Louisville.

Monroe was treasurer of the Wilson Ornithological Society (1946-1951)

and president (1954–1956). He was the first (1947) Kentuckian honored by elective membership in the American Ornithologists' Union.

Gordon Wilson, Chairman of the English Department at Western State College, Bowling Green, was mentioned as a founder of the Kentucky Ornithological Society. In duration of activity and number of articles on Kentucky birds, he is clearly the senior bird student of the state. His observations began before 1910, and he early published papers on the birds of Warren, Calloway, and Ballard counties (Wilson, 1922, 1923*c*, 1922*b*). Since then he has concerned himself primarily with chronicling the appearance of aquatic birds at the interesting, ephemeral lakes of the karst country in Warren County, beginning in 1927 and continuing until the present (Wilson, 1929, 1935, 1937, 1940*a*, 1951, 1952*c*, 1956*c*, 1957*b*, 1958*a*). Other useful titles deal with the birds of Mammoth Cave National Park (Wilson, 1946, 1950, 1958) and the distribution of breeding birds in Kentucky based on reports solicited from various local observers (Wilson, 1942). There are, in addition, a host of short notes (see bibliography), mostly concerned with Warren County. Wilson has served the Kentucky Ornithological Society as editor of *The Kentucky Warbler* for all but 12 years of the existence of the journal. He was secretary of the Wilson Ornithological Club (Society) from 1923 to 1925.

Valuable as Wilson's contribution has been, it could have been still more so if some of his many records had been documented by specimens and if his observations had been organized into fewer, larger, and better-summarized papers.

Additional students requiring special mention are James W. Hancock, Harvey B. Lovell, and Anne L. Stamm.

Since before 1934 James William Hancock has observed birds in Hopkins County, reporting the results in a score or more of titles, the most important of which is his summary of breeding records for the county (Hancock, 1954), in which many of the valuable records of James Suthard are also reported. Although without formal zoological training, Hancock has a superior capacity for clear thought, thorough observation, and precise statement that shows in all of his work. His papers clearly display the highest average quality of scientific reporting achieved by any local student in the state.

Harvey B. Lovell, a member since 1929 of the Biology Department of the University of Louisville, published his first note on Kentucky birds in 1939, this being followed by a large number of articles (see bibliography) on the subject. Perhaps his most important papers are devoted to accounts of the breeding birds of Black Mountain, Harlan County (Lovell, 1950, 1950*c*), and the Otter Creek park recreational area in Meade County (Lovell, 1949*b*), and to discussions of the breeding of the Starling (1942), Horned Lark (1944*b*, 1947*a*), Pine Warbler (1948*b*), and other species. All that we know of the nesting of certain species in Kentucky is due to his efforts. With Mabel Slack he authored an annotated "Bibliography of Kentucky ornithology" (1949) which, unfortunately, is somewhat uncritical in its commentary and contains numerous minor errors. Lovell has served the Kentucky Ornithological Society as president (1941–1944) and editor (1946–1952).

Anne L. Stamm, a Louisville housewife of uncommon energy and perceptiveness, began observing birds in the 1930's and since 1943 has published a long series of short but well-conceived notes and papers, among the best of them accounts of the breeding of the House Wren (Stamm, 1951*c*) and

Cedar Waxwing (Stamm, 1951) and (Lovell, Stamm, and Pierce) a paper on breeding birds in Owen County (1955). She has generously contributed a considerable body of unpublished data, mainly detailed notes on the breeding of various species, for use in the present paper.

Many more individuals have made contributions of considerable proportions, most of which have appeared in *The Kentucky Warbler*. Not all can be mentioned, but a few must be listed, especially Leonard C. Brecher, author of a useful paper on the Scarlet Tanager (Brecher, 1946) and other notes; John A. Patten, who studied the birds of Madison County (Patten, 1946); Evelyn J. Schneider, writer of a short paper on the Chuck-will's-widow (Schneider, 1944); the late Walter H. Shackleton, author of several well-documented notes on nesting birds in Oldham County; Catherine Hope Noland, similar data on breeding birds near Louisville; the late C. Alex Van Arsdall, who prepared a short but informative paper (Van Arsdall, 1949) on the breeding birds of Mercer County, and other notes; and the late Robert C. Soaper (obit., *Kentucky Warbler*, 35:14-15, 1959), for years an effective federal wildlife officer, and always a source of quiet and efficient assistance to numerous students of birds.

Among the past and present representatives of the Kentucky Division of Game and Fish (I cannot list them all) who have contributed published notes, or prepared mimeographed reports on game species, are Earl L. Atwood (1948), Eugene Cypert (several notes), John DeLime (several notes), Frederick C. Hardy (1950, 1950a, 1951), and Dan M. Russell (1951, 1954a, 1959).

An encouraging development is the recent increase of the number of contributors to *The Kentucky Warbler*. Participating prominently have been several comparatively young observers of high average ability, among them Joseph Croft, Burt L. Monroe, Jr., Robert Steilberg, and Haven Wiley, Jr.

A final word should be said of several workers in adjacent states who have provided useful information of various kinds. First among these is Albert Franklin Ganier, the elder statesman of Tennessee ornithology, whose friendly interest in his neighbor state and in the present project over the years have been as helpful as his numerous careful papers (chiefly in *The Wilson Bulletin* and *The Migrant*) on adjacent areas in Tennessee have been instructive and stimulating. Similarly helpful have been the interest, occasional companionship in the field, and work in adjacent southern Ohio, of Woodrow Goodpaster and Karl H. Maslowski of Cincinnati. Goodpaster's pioneering "Birds of southwestern Ohio" (1941) has been especially useful and is frequently cited herein, as are two larger and later papers on the same area by Emerson Kemsies (1948a) and Kemsies and Worth Randle (1953; reviewed, Mengel, 1955). A mimeographed paper by Edward L. Seeber and Ralph M. Edeburn (1952) has provided some information on that part of West Virginia adjacent to extreme northeastern Kentucky, still a comparatively little-known part of the state.

The contributions of many others, both in and out of Kentucky, are indicated by entries in the terminal bibliography and references in the text.

Ornithological field work by the author.—In early November of 1934 I set down a list of a dozen or so species of birds seen one day near Louisville, where most of my early life was spent. This list is now lost, but in November, 1936, I began keeping regular records of birds seen and places visited,

and I still have the notes thus made in the years from 1936 onward. From late 1937 through 1945 my observations in Kentucky, although at times extensive, were necessarily sporadic, being restricted to academic vacations and interrupted by three years in the U. S. Army Air Forces.

In this early period a few trips outside of the Louisville area were made with the purpose of learning something of bird distribution in the state (this, in the 1930's, was very poorly known indeed). Among these trips were excursions to mountainous southeastern Kentucky,¹ mainly Laurel County, on March 27-30, 1939 (with the late V. H. Bryan), and July 2-7, 1939 (with E. C. Ritchie), and December 27, 1940 (with G. T. Rogers), and similar trips (with Burt L. Monroe, Sr.) to Bullitt, Henderson, and Laurel counties on weekends in June and July of 1940 and 1941. The period June 27-July 2, 1941, I spent alone in the lowlands of Ballard and (mainly) Fulton counties, and I visited the latter again (with Thomas P. Smith) on August 22 and 23, 1942. In late August, 1942, I spent considerable time also, in the Louisville area, studying the early migration of wood warblers. Many notes and approximately 200 specimens resulted from these activities.

Just after World War II, Dwain W. Warner and I spent the period July 5-14, 1946, collecting at several localities in eastern Kentucky, especially Laurel, Pulaski, Harlan, and Wayne counties, obtaining a few (50) specimens and many notes.

From 1948 through 1952 my field work was intensified, and (with the present work as an ultimate objective) subjected to more definite organization than before. The plan was to spend at least a small part of each season in each of the major divisions of the state, that is, at the very least the eastern, central, and western portions, although this aim was barely realized in full. While at one time or another, I have been in nearly all of the state's 120 counties, emphasis was placed on the study of representative areas, rather than on an effort to cover numerous localities thinly. Study areas were chosen with an eye to the distribution and nature of prior work and to considerations of practicality. Save for the autumn term of 1948 and the spring semester of 1949, which I spent away from the campus, this work necessarily coincided with interruptions in the schedule I was then pursuing at The University of Michigan. In addition to collecting, some attention was paid to exploration of ornithologically little-known areas, study of habitats, search for particular species and plotting of their ranges, study of breeding populations, and search for nests. In these years, a total of approximately 300 man-days were spent in the field by me and my occasional associates, and more than 12,000 miles of travel were completed in Kentucky. The resulting collection numbers approximately 1,100 specimens. The following itinerary lists the localities and inclusive dates of intensive work, but omits various periods of brief observation.

April 2-10, 1948.—Jefferson and Oldham counties (partly with Burt L. Monroe, Sr.).

June 12-18, 1948.—Jefferson and Oldham counties.

June 19-July 3, 1948.—Powell County, with some work also in Wolfe, Menifee, and Lee counties nearby.

July 4-8, 1948.—Laurel County.

July 9-15, 1948.—Whitley and McCreary counties.

¹ Perhaps to be mentioned here also is the week of June 7-15, 1937, spent in Pickett County, Tennessee, adjoining Wayne and McCreary counties, Kentucky, with A. F. Ganier and other members of the Tennessee Ornithological Society.

October 20–22, and 30, 1948.—Meade County, especially Otter Creek recreational area.

October 24, 1948.—Falls of the Ohio River, Jefferson County (with Monroe Sr. and Jr., George Miksch Sutton, and Harold Alexander).

Miscellaneous dates, October 3–November 4, 1948.—Jefferson and Oldham counties.

November 6–14, 1948.—Fulton, Hickman, and Carlisle counties (bases at Tiptonville, Tennessee, and Fulton, Kentucky).

November 16, 1948.—Henderson County (on the Ohio River with R. C. Soaper).

November 21–24, 1948.—Powell, Menifee, Rowan, and Lewis counties.

April 20–25, 1949.—Powell and Wolfe counties, with some work in Menifee County.

April 26–30, 1949.—Laurel and Pulaski counties.

May 1–8, 1949.—Warren County, especially near the wet-weather lakes near Woodburn.

May 9–12, 1949.—Logan County, especially the bottom lands of Wolf Lick (on May 9 with A. F. Ganier, Alfred Clebsch, Sr., and Leroy Herndon).

May 13–June 12, 1949.—Fulton, Hickman, and Ballard (especially); and Carlisle, Graves, and Calloway counties. A few days spent chiefly near Reelfoot Lake, in Lake and Obion counties, Tennessee.

June 13–15, 1949.—Calloway and Marshall counties.

June 16–22, 1949.—Warren County. Especially hills in the northwestern part of the county.

June 23, 1949.—Edmonson County (vicinity of Mammoth Cave).

July 16–26, 1949.—Bell, Harlan, and Pike counties.

September 1–3, 1949.—Jefferson County.

September 4–10, 1949.—Henderson County (with H. B. Tordoff).

September 11, 1949.—Jefferson County (Falls of the Ohio River at Louisville).

February 3–6, 1950.—Laurel and Whitley counties (with E. P. Edwards).

April 8–17, 1950.—Lyon, Trigg, and Marshall counties (with C. O. Handley, Jr.).

July 3–6, 1950.—Counties around and including Carroll.

July 7–19, 1950.—All northern Bluegrass counties, especially Boone, Kenton, Pendleton, Owen, and Grant.

July 20–23, 1950.—Jefferson and Oldham counties.

September 10–20, 1950.—Jefferson and Oldham counties.

December 25–29, 1950.—Fulton, Hickman, and Carlisle counties.

January 4–5, 1951.—Ballard County.

January 7–9, 1951.—Jefferson and Oldham counties.

April 5–14, 1951.—Scattered work in eastern Kentucky: Powell, Wolfe, Estill, Lee, Madison, Laurel, Rockcastle, Pulaski, Wayne, Whitley, Bell, and McCreary counties.

June 20–26, 1951.—Pike County. Especially Cumberland ridges along the eastern border.

June 27–July 10, 1951.—Harlan County, chiefly higher elevations on Big Black Mountain.

July 12–21, 1951.—Ballard and adjacent Purchase region counties.

July 22–August 5, 1951.—Casual work in Jefferson and Oldham counties.

September 16–19, 1951.—Hopkins County.

September 28–October 1, 1951.—Jefferson County.

October 2–11, 1951.—Laurel and Pulaski counties.

May 6–12, 1952.—Laurel County.

May 13–June 7, 1952.—Chiefly Harlan County, especially higher elevations on Big Black Mountain.

June 8–July 6, 1952.—Laurel County.

July 7–15, 1952.—Hopkins County.

Certain periods spent in examining local collections of Kentucky birds are indicated in the accounts of those collections immediately following (ab-

abbreviations are those used in the lists of specimens examined following the accounts of the species).

Collections of Kentucky birds.—Eleven collections examined by me contained enough specimens to make it worthwhile to abbreviate¹ their titles (as shown below) when referring to them.

B.L.M. Collection of Burt L. Monroe, Sr. Approximately 500 study skins and 120 sets of eggs, mostly from Jefferson, Oldham, and Bullitt counties, with a few from Laurel, Harlan, and other counties. The majority taken by Monroe; some by me. An important collection, especially of rarer and larger species. Condition moderately good. Last examined in detail on August 1, 1951, when still housed at Monroe's home in Anchorage. Now located in the Department of Biology, University of Louisville, where curated as necessary by Monroe.

C.M.N.H. Cincinnati Museum of Natural History, Cincinnati, Ohio (Cincinnati Society of Natural History). Among several thousand specimens from southwestern Ohio are a few, chiefly water birds, taken along the Ohio River, in some cases actually within Kentucky, and a few more from localities within Kentucky. Early specimens mostly taken by Charles Dury and F. W. Langdon, later ones mainly by Woodrow Goodpaster and Karl H. Maslowski. Condition poor, mainly due to inadequacy of funds for upkeep. When last examined, April 12–15, 1949, curated by Ralph Dury.

C.W.B. Collection of Charles Wickliffe Beckham, Louisville. Housed in storage rooms in Louisville Public Library under the care, when last examined (June 28–30, 1950), of Col. Lucien Beckner. Collection of perhaps 3,000 specimens in all, more than 1,000 from Kentucky, chiefly Nelson County. When examined stored in miscellaneous boxes and in exceedingly poor condition. Some years ago well-meaning local students impaired the value of the collection by relabelling many of the specimens, not without some error, and removing the original labels. Fortunately many specimens were spared this treatment.

C.U. Cornell University (New York State Dept. of Conservation, College of Agriculture, Cornell University, Ithaca, New York). Contained in the collection are approximately 90 specimens taken in Logan County, Kentucky, by George C. Embody, between 1903 and 1906. There is also a Carolina Wren secured in the wilderness of Breathitt County by the intrepid early explorer W. J. Hamilton, Jr. Collection last examined in the spring of 1947 (see Mengel, 1948). Condition good. Curator: Charles G. Sibley.

J.D.F. Collection of Jesse Dade Figgins, The Dallas Museum of Natural History, Dallas, Texas. Contains 248 study skins, all with minimum data (sex, date, county), collected mainly in various Bluegrass counties, and in Marshall County, near Benton, in 1941 and 1942. Collection has been in my possession on extended loan. Curator: F. W. Miller.

M.S.C. Morehead State College collection, Morehead, Kentucky. Approximately 450 study specimens, taken mainly by W. A. Welter and R. W. Barbour, and their students, between 1933 and 1939, in Rowan and adjacent counties. In general the skins were poorly prepared, carelessly labelled, and frequently unsexed. When examined July 25 and 26, 1949, the collection was in poor condition.

¹The appearance of the abbreviation for a collection, immediately following reference in text to a specimen therefrom, calls attention to the fact that I have personally examined that specimen.

R.W.B. Collection of Roger W. Barbour, Lexington, Kentucky. Approximately 150 study skins, mainly from Rowan and Harlan counties, taken between 1933 and 1941. Collection housed in Department of Biology, University of Kentucky, when examined August 6 and 7, 1951.

U.K. University of Kentucky, Lexington, Kentucky (Department of Biology). When examined on February 6, 1950, contained approximately 100 study specimens with at least minimum data, a few older specimens collected by Harrison Garman and others, the remainder fairly recently taken by Joseph F. Spears, Ernest P. Edwards, and others. Collection in rather poor condition when examined, due to past neglect (Ernest P. Edwards in charge in 1949–1950, since replaced by R. W. Barbour).

U.M.M.Z. University of Michigan Museum of Zoology, Ann Arbor, Michigan. Approximately 1,000 Kentucky specimens (including a few skeletons), almost all taken by me or people working with me, between April 2, 1948, and July 14, 1952 (see itinerary above), while I was studying under the supervision of the late Josselyn Van Tyne, then curator. Present curators: R. W. Storer and H. B. Tordoff.

U.S.B.S. Collection of the U. S. Biological Survey, Washington, D. C. This collection is currently being integrated with the larger collections of the U. S. National Museum. It contains a few specimens taken by Arthur H. Howell, Thomas D. Burleigh, and perhaps others. Present curator: Lester L. Short, Jr.

U.S.N.M. United States National Museum, Washington, D. C. Included are approximately 1,200 specimens from Kentucky, roughly 1,100 of which were taken in 1938 (see history). A few others were collected years ago by E. A. Mearns and C. W. Beckham, and a few recent specimens by J. D. Figgins. Specimens studied and identified by A. Wetmore, J. W. Aldrich, and others. Examined January 28–February 15, 1952, when curated by Herbert Friedmann and H. G. Deignan. Present curator: Philip S. Humphrey.

Seven additional collections contain so few specimens with data that they have been referred to in full or by self-explanatory abbreviations.

Bernheim Foundation Collection, Shepherdsville, Kentucky. Approximately 130 study skins stored, when examined on September 29, 1951, in boxes in a building on the grounds of the Bernheim Foundation's reservation. Specimens collected mainly by J. D. Figgins (a few by J. F. Spears) between 1936 and 1941. Most are labelled solely with numbered tags (a few of which also bear minimal data). They are virtually useless for this reason, since the catalogue kept by Figgins and supposed to contain the data could not be found, according to Robert Paul, Executive Director of the Foundation.

Brasher C. Bacon Collection, Bowling Green, Kentucky. In Bacon's lifetime maintained at Madisonville; now housed in the Kentucky Museum of Western Kentucky State College. Contains about a dozen study skins and approximately 160 sets of eggs from Hopkins County, collected over many years. Some of the egg sets are valuable records. Unfortunately, when examined in September, 1951, they were not marked or otherwise labelled and the data were buried in Bacon's notes.

Jacob P. Doughty Collection, Worthington, Kentucky. Kept at Doughty's home in Oldham County. A small, choice collection of mounted waterfowl

taken by Doughty and hunting associates, including Monroe, at various points along the Ohio River. The specimens are not labelled, but Doughty has preserved notes on the more unusual ones.

Louisville Public Library, Louisville. In addition to the Beckham collection, described above, the library contains several cases of mounted birds, some of which are indicated by placards as being from the Louisville area. Since none of the specimens is labelled, the collection is of dubious value.

Murray State College Collection, Murray. Contains a few mounted specimens taken by C. Wesley Kemper in Calloway and Graves counties. Notes were furnished me by the late Grace Wyatt, because I did not have opportunity to examine the collection at length.

Nazareth Academy Collection, Nazareth, Kentucky. In the Museum of the Academy, just north of Bardstown, Nelson County, are a few mounted specimens (examined on February 8, 1950) from Nelson County, one or two with data.

Western Kentucky State College Collections, Bowling Green. Two collections located at the college were examined on June 17, 1949, and adjacent dates, when one (called the Ogden Science Collection) was maintained in the Science Department, for teaching purposes, by L. Y. Lancaster. It contained approximately 125 rather poorly made study skins, only a few with full data. These were taken mainly by Ottis Willoughby between 1932 and 1935. The Kentucky Museum of the college contained about 500 mounted specimens, mainly without data, supposed to be from Warren and Barren counties. A few of the mounted specimens were labelled, however, and further details were supplied by Gayle Carver, curator at the time of my visit.

A final note on the collections examined may be interposed at this point. Useful as they have been in many cases for the present purpose, several of the collections above described provide sad examples of the deterioration to which bird specimens are subject when not assured of adequate continuity of interest and care. This is equally true whether the collections be private or public, and it appears to me to be eminently desirable that institutions maintaining bird collections, as well as private collectors, be licensed by the U. S. Fish and Wildlife Service, and periodically inspected to determine that their curatorial obligations are being properly discharged.

One of the main reasons that I have appended the lists of specimens examined to the accounts of species following is that so many of the specimens I have seen are in advanced stages of deterioration and decay, and in danger of early loss. These lists are arranged by collections, in each case, rather than by localities. Since, however, most of the collections are rather local, arranging these from east to west has given a certain geographical organization to the lists. It has been impractical to give years of collection for specimens examined, save where these were few, or the information seemed critical. Weight data have been included in the lists because of their continued scarcity in readily available form (fat condition has not been indicated for breeding material, which is scarcely ever fat, or for species—*e.g.*, Blue Jay—which seem not to become fat).

FAMILY GAVIIDAE: LOONS

Gavia immer (Brünnich): COMMON LOON

Status.—Transient, uncommon in spring, fairly common in fall; very rare winter resident.

Spring.—Transients usually appear in late March or early April; main flight usually in April; rare by mid-May. Representative records: (early) March 7 (1911), in Nelson County (specimen; Nazareth Academy); April 2, at Louisville (Monroe; next record, April 5); March 29 (1937), at McElroy Lake, Warren County (Wilson, 1937:19; flock of 18); March 26 (1944), in Christian County (Counce, 1944:30; 1 in winter plumage found in a field); March 28 (1933), in Hopkins County (Bacon, 1938:11; earliest of many records); (late) May 2 (1950), at Lexington (Edwards); May 13 (1955), at Louisville (Monroe); May 6 (1949), in Warren County (Mengel; 2 nuptial-plumaged birds calling); May 10–16, in Hopkins County (Bacon, 1938:10; several dates); June 3 (1949), at Kentucky Lake (Morse, 1949); May 18 (1887), in Fulton County (Pindar, 1925a:78). Small flocks are sometimes seen, the birds often in nuptial plumage. I saw a flock of 10 such birds on the Ohio River at Louisville on April 6, 1939. Although favoring large bodies of water, the species occurs on occasion on small ponds and streams as well. It is little known on the Cumberland Plateau, where it has been reported by Kozec (1944), from Carter County (dead bird), and by Garman (1894:33), from "eastern Kentucky." A specimen in winter plumage (M.S.C.) taken at Clearfield, Rowan County, on February 18, 1936 (see also Barbour, 1952:23), may have been wintering in the area. Records from West Virginia (Brooks, 1944:11) indicate that many loons cross the Appalachians.

Summer.—A loon, perhaps crippled, remained at Spring Lake, Madisonville, from June 27 to July 24, 1927 (Bacon, 1933).

Fall.—Early arrivals appear in October; main flight approximately mid-November. The species is restricted at this season mainly to large water, along the Ohio and Mississippi rivers and elsewhere. Early records at Louisville are for October 8, 1954 (Monroe), and October 25, 1959 (Stamm, Brecher, and Lovell, 1960:4). Bacon (1938:10) had several records for Madisonville between October 12 and 23, 1911–1932. Large flocks are sometimes seen. Carpenter (1942) counted approximately 120 loons along 13 miles of the Ohio River below Brandenburg, Meade County, November 16, 1941. Near Henderson, Soaper and I saw about 37, in several groups, on November 16, 1948. I saw 1 on the Mississippi River at Hickman, November 11, 1948. In late November or early December loons become less numerous.

Winter.—Most of the individuals seen irregularly in December and early January are probably belated transients. Monroe and I have recorded small numbers near Louisville in late December (latest record January 2), and late December records for other localities are numerous. Carpenter (notes) saw 2 on Simon Lake, Bullitt County, January 7, 1933. Definite evidence of wintering is scarce: 2 loons spent the winter of 1951–1952 on Loch Mary, Hopkins County (Hancock, letter: March 19, 1952), and the species is said to winter rarely at Reelfoot Lake, Tennessee (Ganier, 1933a:9).

Specimens examined.—Total, 8. M.S.C.—1 male (winter plumage), Rowan County (Feb. 18); U.K.—1 female, 1 unsexed (both in nuptial plumage), Fayette County (April 7; April 9); Nazareth Academy—1 unsexed (nuptial plumage), Nelson County (March 7); B.L.M.—1 unsexed, Jefferson County (April 6); 1 unsexed, Oldham County (Nov. 11); W. Ky. State College Coll.—1 unsexed (nuptial plumage), Warren County ("spring"); Bacon Collection—1 unsexed (nuptial plumage), Hopkins County (spring).

Gavia stellata (Pontoppidan): RED-THROATED LOON

Status.—Casual transient, thus far recorded only in spring; probably winters on occasion.

Records.—A winter-plumaged male, previously unidentified, was taken in February, 1934, at Morehead, Rowan County, by a collector identified on its label only as Caudill. Butler (1927:13; 1929:198) examined a specimen (now in the Cincinnati Museum of Natural History) said to have been taken at the mouth of the Little Miami River above Cincinnati (and thus in Campbell County, Kentucky). Maslowski and Dury (1931:67) mentioned an "immature" (= some winter plumage) male in the Charles Dury Collection at the Cincinnati Museum of Natural History, taken in April, 1875, in Hamilton County, Ohio, and perhaps also on the Ohio River (*cf.* Langdon, 1879:187). A dead individual found in Fayette County, some time before April 21, 1933, by Dodge (*vide* Figgins, 1945:54), was in winter plumage and was identified on the basis of the distinctive dorsal markings (Dodge, letter: March 16, 1952). Another dead bird has been reported, from Crittenden County, May 21, 1939, by Frazer (1939). Two mounted, winter-plumaged specimens in the collection of the Louisville Public Library are supposed to have been taken locally, but this is not certain.

Specimens examined.—Total, 1. M.S.C.—1 male, Rowan County (Feb., 1934).

FAMILY PODICIPEDIDAE: GREBES

Podiceps grisegena (Boddaert): RED-NECKED GREBE

Status.—Very rare transient, recorded only from central and western Kentucky.

Spring.—The few records are mostly for March and April. Maslowski and Goodpaster (notes) saw a Red-necked Grebe on April 1, 1950, on the Ohio River at the mouth of the Little Miami River (Campbell County, Kentucky), where the species was also reported on March 8, 1947 (Kemsies, 1948a:1). Other records are from near Louisville, March 17, 1934 (Monroe and Mengel, 1939:38), and from the lakes near Woodburn, Warren County (Wilson, 1940a:15; 1951:4; 1952c:45; see also Lovell, 1949), where observations range from January 20 to May 27 (1937–1952). A number of observers have participated in the Warren County observations.

Summer.—The table given by Wilson (1951:4) indicates the observation of 1 to 2 individuals at the Warren County lakes just mentioned, July 1–4, 1950. It must be supposed that, if correctly identified, these were crippled or nonbreeding birds.

Fall.—Few records; the peak of migration cannot be fixed at present. Monroe took a male on the Ohio River in Oldham County, October 23, 1938 (Monroe and Mengel, 1939:38). Audubon (1835:595) mentioned migration of these grebes in "the Western Country" in early September, adding that a few remained to winter. Soaper and I saw 1 on the Ohio near Henderson, November 16, 1948. The presence of the species throughout winter has not been verified; it has occasionally been reported on Christmas bird counts (*Kentucky Warbler*, various years).

Geographic variation.—The subspecies occurring is the New World *Podiceps grisegena holbollii* Reinhardt.

Specimens examined.—Total, 1. B.L.M.—1 male, Oldham County (Oct. 23, 1938).

Podiceps auritus (Linnaeus): HORNED GREBE

Status.—Uncommon transient; very rare winter resident; not recorded from the Cumberland Plateau.

Spring.—Somewhat irregular; arrives occasionally by early March; main flight in April; rare later. Horned Grebes have been reported from widely separated localities west of the Cumberland Plateau. Flocks of 10 or less are often seen at Louisville, where existing records fall between March 21 and May 13 (Monroe; most records in April). Wilson (1940a:15; 1951:4; 1952c:45; 1957b:60) has seen small numbers, infrequently, on the lakes at Woodburn, Warren County, between March 7 and April 22 (12 on April 19, 1939). Other records are from the Ohio River at Cincinnati (Goodpaster, 1941:7), and from Lexington, where I saw 2 winter-

plumaged individuals on a reservoir on March 28, 1939. Some late spring transients are in nuptial plumage.

Summer.—Monroe recorded single birds in nuptial plumage at a small marsh near Louisville, in 1934 until June 17, and in 1947 until June 4.

Fall.—The species appears in mid-October or later, being most numerous in November, mainly on larger waters. Long ago, Audubon (1929:5, journal of 1820) killed 4 from a flock of 30 on the Ohio River near Petersburg, Boone County, October 14, 1820. More recent records are from various localities, chiefly along the Ohio River. At Louisville, Monroe's earliest record is for October 23 (1938). Maslowski and Goodpaster (notes) observed several flocks of 9 or less on the Ohio River above Newport, Campbell County, November 2–10, 1945. Between Carroll and Meade counties, Monroe and J. P. Doughty have seen flocks of 50 or more on the river in November, and several such flocks were seen near Louisville on November 29, 1953 (Stamm, 1954:13). At localities away from the Ohio River Wilson (1957:15) noted 1 bird in Warren County on December 10, 1956, and Hancock (notes; misquoted by Lovell, 1949) saw 14 on two lakes near Earlington, Hopkins County, on November 29, 1948.

Winter.—Most birds seen in early winter are probably belated transients. By late December, Horned Grebes are rare, most records being from Cincinnati westward. Monroe saw a flock of 24 on January 3, 1948, near Louisville, where he and I saw 2 birds on January 7, 1951. There are few midwinter records. In the memorable flood of early February, 1937, Monroe saw a Horned Grebe on a street in downtown Louisville. A specimen was taken near Lexington on February 4, 1899 (U.K.). Near Madisonville, Hancock recorded 2 on a small lake on January 13, 1947 (letter: December 29, 1951).

Geographic variation.—The subspecies occurring is the New World *Podiceps auritus cornutus* Gmelin.

Specimens examined.—Total, 4. U.K.—1 unsexed (winter plumage), Fayette County (Feb. 4); B.L.M.—1 female, Oldham County (Oct. 23); W. Ky. State College Coll.—1 unsexed (winter plumage), Warren County (no date); U.M.M.Z.—1 male, Campbell County (March 4, 1950; Woodrow Goodpaster).

*****Podiceps caspicus* (Hablizl): EARED GREBE**

Status.—Casual vagrant.

Records.—On December 21, 1952, for more than half an hour, Monroe (notes) and Burt L. Monroe, Jr., watched an Eared Grebe on the Ohio River just off downtown Louisville (see also *Kentucky Warbler*, 29:12, 1953). The bird was observed under ideal conditions, as close as 20 yards, with a variety of optical and identification aids and with Horned Grebes nearby for comparison. L. C. Brecher and H. B. Lovell also observed it, and it remained in the area until January 4. On November 27, 1955, another was seen at the same locality by Wiley (1956:18) and Monroe, and this bird remained until December 4. While specimens remain desirable, there seems to be no reasonable doubt concerning the above records. Occasional Eared Grebes are to be expected on the Ohio and Mississippi rivers.

Geographic variation.—Presumably occurring is the North American subspecies *Podiceps caspicus californicus* Heermann.

*****Aechmophorus occidentalis* (Lawrence): WESTERN GREBE**

Status.—Casual in migration.

Records.—Under good conditions, John Morse (1949a) and others saw a Western Grebe on Kentucky Lake in Marshall County on May 25, 1949. Morse had already had experience with the species at the time the record was made. Another Western

Grebe was observed by Monroe and Monroe, Jr. (notes; see also *Kentucky Warbler*, 35:6, 1959), and others on the Ohio River at Louisville on December 21, 1958. Misidentification of this conspicuous species under the above combinations of circumstances seems out of the question.

Podilymbus podiceps (Linnaeus): PIED-BILLED GREBE

Status.—Fairly common summer resident, breeding locally (and only?) west of the Cumberland Plateau; common transient more or less throughout the state, lingering into early winter; very rare winter resident.

Spring.—Arrives rarely in February, usually in March; main flight in April; becomes less numerous by early May. Early dates for northern and eastern localities are mostly for late March: March 30, in Rowan County (Barbour, 1952:23); "third week" of March, at Cincinnati (Kemsies, 1948a:2). At central points recorded a little earlier: March 14 (1950), at Lexington (Edwards, notes); March 5, at Louisville (Monroe); March 22 (1882), in Nelson County (Beckham; specimen, C.W.B.). Recorded near the southern border as early as February 14, in 1957 (Wilson, 1957b:60) and March 1 (Wilson, 1940a:15). The Pied-billed Grebe is widespread at the peak of migration, occurring on ponds and streams throughout the state, but less frequently in the east. I found the species common in early April, 1950 and 1951, at many localities from Wayne County to Trigg County. Small concentrations regularly occur at favorable places, such as McElroy Lake, Warren County (Wilson, 1939c:35; 25 on April 22, 1939), and much larger numbers are probably present there on occasion. At Morehead, where the species has not been found breeding, the latest spring record is April 26 (Barbour, 1952:23). Courtship is often noted in April and May; the loud, ringing yelps of the species are a characteristic sound of central Kentucky marshes large enough to attract it.

Breeding records.—Breeding activities may commence as early as late March and be continued, on occasion into August or early September. Two broods may be reared, but there is no direct evidence. Completion of clutches from late April through early June (chiefly) and to late July (rarely) is indicated by 20 dated breeding records; the lack of a prominent peak in the dates of clutch completion probably owes to the dependence of the species upon a comparatively stable water-level suitable for the anchorage of nests. A number of records are from Jefferson (Monroe, notes), Warren (Wilson, 1929:180), and Hopkins (Bacon, 1938:12; also Bacon and Monroe, 1935) counties, and a few are from Trigg (Wilson, 1941a:40; Cypert, notes) County. Monroe noted construction of a nest near Louisville on April 3, 1932. Other early nestings were noted in Warren County, by Wilson (1929), when 4 or 5 nests constructed in mid-April of 1927 were deserted (because of a rise in water-level) after a few days' incubation. The earliest actual egg-date is for May 3 (1931) in Jefferson County, 3 eggs in a nest which contained 5 on May 10 (Monroe), but a clutch of 7 in the same locality on May 7, 1938, and incubated about a week, represents an earlier nesting. The latest egg-date is for June 15 (1915), 5 slightly incubated eggs in Hopkins County (Bacon, *loc. cit.*). Other early and late nestings are indicated by 6 nearly grown young seen in Trigg County by Cypert (notes), on June 9, 1941, and 2 small young at the same locality, recorded by Wilson (1941a) on August 30, 1941. A single nest containing 1 egg was found in Fulton County by Seth Curlin on May 27, 1919, and reported to Ganier (*vide* Bacon, 1938). Monroe has recorded other nests at Louisville, all in one small marsh, on May 20, 1935 (8 eggs), May 30, 1935 (5 eggs, clutch complete), May 29, 1937 (6 eggs, slightly incubated), and June 2, 1935 (5 eggs, addled). He noted 4 small young on May 31, 1931. The largest clutch, of 9 eggs, was noted by Wilson (1929:180), in Warren County on June 22, 1927—a deserted nest. The average complement of 14 clutches known or thought to be complete is 6.3 ± 0.3 eggs (5 nests with 5 eggs; 4 with 6; 2 with 7; 2 with 8; 1 with 9). All nests found

have been sodden, floating masses of vegetation anchored to cattails or other aquatic plants in comparatively shallow water. As elsewhere, the parent usually covers the eggs with debris when off the nest.

Breeding distribution.—The species breeds throughout the state except (so far as known) for the Cumberland Plateau (casual summaries given by Wilson, 1942:21; Bacon, 1938:11–12; Bacon and Monroe, 1935:[27]–[29]). It has been recorded at scattered localities from Harrison, Fayette, and Pulaski counties westward, favoring the comparatively few cattail and willow marshes of sufficient size that are available. Such marshes are regularly occupied at Louisville, Madisonville, parts of Kentucky Lake, and probably elsewhere. Less regularly the species inhabits button-bush swamps, brush-filled drainage ditches, sink-hole lakes, and other aquatic situations affording the combination of shallow water, cover, and nest anchorage. Most observers consider it rare (see Wilson, 1942), an impression doubtless owing more to a rarity of habitat than of the birds, which occur regularly in all suitable situations investigated. Several pairs often nest in a few acres.

Fall.—An increase is generally apparent in late September; peak of migration in mid-October or later; rare by late November. This grebe has been recorded from Rowan County (specimen, M.S.C.) westward, at many localities, including Winchester (Horsey, 1922:80), Cincinnati (Goodpaster, 1941:7, specimens); and Barren River, Warren County, 10 on November 22, 1924 (Lancaster, 1925). Small numbers are usually seen, frequenting major waters and small ponds alike. Monroe saw 15 on the Falls of the Ohio River at Louisville, September 25, 1946. The species remains common near Louisville until early November, records being scattered later. From October 24 to November 20, 1948, I recorded a few birds on the Ohio and Mississippi rivers, variously at Louisville, near Brandenburg, Meade County, and at Hickman, Fulton County. Bacon (1938:12) listed many records for Madisonville, where noteworthy numbers (11 to 40) were seen on small lakes in various years, November 8–12.

Winter.—At a few localities from Louisville westward, this grebe has been recorded fairly often in late December, and I saw 1 at Louisville on January 4, 1940. Most of these late autumn birds depart with the advent of severe weather, and definite midwinter records are available only from western Kentucky. Hancock (letter: December 29, 1951) recorded 4 birds in Christian County on January 23, 1950, and single birds at small lakes in Hopkins County on February 4, 1935, and February 6, 1950. Vague references to wintering in eastern Kentucky (Patten, 1937:17), and to occurrence commonly in winter in Fulton County (Pindar, 1889b:311) seem to require more satisfactory documentation than is now available.

Geographic variation.—The subspecies occurring is the North American *Podilymbus podiceps podiceps* (Linnaeus).

Specimens examined.—Total, 8. M.S.C.—2 unsexed, Rowan County (April 26; Oct. 10); C.W.B.—1 female, Nelson County (March 22, 1882); B.L.M.—1 male, Oldham County (Oct. 26); W. Ky. State College Coll.—3 mounted specimens, Warren County (no dates); Murray State College Coll.—1 mounted specimen, Graves County (no date).

FAMILY PROCELLARIIDAE: SHEARWATERS, FULMARS

Pterodroma hasitata (Kuhl): BLACK-CAPPED PETREL

Status.—Accidental vagrant.

Records.—Lindahl (1899:75) reported in detail the only records, 3 birds captured on October 4 and 5, 1898, along the Ohio River between Cincinnati, Ohio, and Covington, Kentucky (Kenton and Campbell counties, Kentucky). At least 1 of 2 specimens preserved by Charles Dury is still extant (C.M.N.H.).

Specimens examined.—Total, 1. C.M.N.H.—1 male, Kenton County (Oct. 5, 1898).

FAMILY PELECANIDAE: PELICANS

**Pelecanus erythrorhynchos* Gmelin: WHITE PELICAN

Status.—Very rare transient or vagrant, most frequently recorded in fall but occurring at any season; somewhat less numerous than formerly.

Spring.—Pindar (1925a:79) saw a White Pelican that was captured near Hickman, Fulton County, on May 10, 1887. Morse (1950a) observed a flock of approximately 20 on Kentucky Lake, in Marshall County, May 15–17, 1950.

Summer.—The species has been reported from Hopkins County, where 2 were seen on June 30, 1948, by Hancock (1949a:47); from Reelfoot Lake, Tennessee, by Spears (*vide* Figgins, 1945:57; 60 on July 8, 1940); and, earlier, from Fulton County, where several were seen in June, 1886, by one Harry Millet (Pindar, 1887a:54).

Fall.—One of these pelicans shot near Herrington Lake, Boyle County, on November 15, 1929, was mounted by J. P. Doughty for a Mr. Z. P. Tucker of Harrodsburg (Monroe). Two were seen on the Falls of the Ohio River at Louisville, September 5, 1938, by Hobson (1939) and Slack. Audubon (1838:88–89) observed many at Louisville and Henderson. "G.L.T." (1894) described one killed near Paducah, October 29, 1893. They have been recorded periodically at Reelfoot Lake, in Tennessee, mainly in fall (Ganier, 1933a:9).

Winter.—Writing of the 1890's, Pindar (1925a:79) said the White Pelican was "not rare during the migrating season" in Fulton County and was told that a few wintered regularly at a small lake in Missouri just across the Mississippi River.

General.—Langdon (1878:117) mentioned some killed near Cincinnati, including one at the mouth of the Miami River. C. S. Rafinesque also mentioned the occurrence of the species as far east on the Ohio River as Portsmouth, Ohio [opposite Lewis County, Kentucky], presumably in the 1820's (Rhoads, 1912:196).

FAMILY PHALACROCORACIDAE: CORMORANTS

Phalacrocorax auritus (Lesson): DOUBLE-CRESTED CORMORANT

Status.—Fairly common summer resident in western Kentucky, breeding locally in river bottoms from Henderson westward; rare (eastern Kentucky) to fairly common (western Kentucky) transient; rare winter resident (regular in extreme southwest).

Spring.—Outside of the breeding range, records are few and scattered, mostly for April. Cormorants have been recorded very rarely at the Woodburn lakes near Bowling Green (Wilson, 1939a; 1940a:16). Records at Louisville, where cormorants are occasionally fairly common, but less often so in recent years, range from March 26 to May 21 (Monroe). I saw one bird 5 miles northwest of Monticello, Wayne County, on Cumberland Lake on April 13, 1951, and one on a reservoir at Lexington on March 28, 1939.

Breeding records.—Cormorants have been known to nest in recent years in at least three mixed colonies of water birds, and probably do so in others. Colonies including cormorants were visited by the late R. C. Soaper in 1936 and reported in some detail. These were near Henderson (3 nests), and near Axe Lake, Ballard County (3 nests) (Bacon and Monroe, 1937:13; see also Trout, 1938). A third colony, reported by Ganier (1937b:43) from near Bondurant, Fulton County, contained (on Soaper's authority) no cormorant nests in 1937 but included about 50 nests when visited by Goodpaster and me on May 20, 1949. Nesting data from nearby Reelfoot Lake, Tennessee, were given by Ganier (1933a:11): laying, April 26, 1919; eggs (3–5), April 26–May 29. Young in nests have been observed from May 20 (1949), in Fulton County (Goodpaster and Mengel, notes; small young) to July 7 (1940), in Henderson County (Monroe and Mengel, notes; large young). The composition of these mixed colonies, and other details, are given under the Great Blue Heron (see also Fig. 13, p. 160).

Breeding distribution.—In the Ohio River bottom lands from Henderson west-

ward, and through much of the low country of the Purchase, especially in Fulton, Hickman, Carlisle, and Ballard counties, the species occurs locally but in numbers near colonies above listed and in localities where unknown colonies probably exist. Cypress-bordered sloughs and ox-bow lakes near the great rivers provide typical habitat. I saw 2 to 10 or more cormorants on each of many June and July visits to Swan and Clear lakes in Ballard County in 1941, 1949, and 1951. Oddly, Nelson (1877) recorded none near Cairo, Illinois, August 17 to September 4, 1875, although he listed Anhingas.

Fall.—Most transients are seen in October and November, but at points well removed from local breeding grounds cormorants have been recorded as early as August 1 (1959) and September 22, at Louisville (Stamm, Brecher, and Lovell, 1960:4; Monroe, notes, 1934–1952), September 30 (1916, 1 shot from a flock of 7), in Nelson County (Blincoe, 1917c:153), and August 27 (1935), in Hopkins County (Bacon and Monroe, 1937:13). Most autumn records are from the Ohio River or other large waters, and although observations are widely scattered, the species seems to be increasingly numerous from east to west. There are few records for the Cincinnati, Ohio, area, where a specimen was taken on October 20, 1881 (Langdon, 1881:341). At Louisville the species used to be fairly common but has decreased in recent years. Monroe noted unusual numbers in November, 1935, with flocks up to 200 birds on several occasions. According to Ganiem (1933a:9) the species is very abundant in fall at Reelfoot Lake, Tennessee, but what percentage of the population is made up by local breeding birds is unknown. Cormorants decrease markedly at most localities by early December.

Winter.—Cormorants are rare and irregular, except near Reelfoot Lake, where they are common throughout the year. Most of the birds recorded in late December at Louisville (Monroe *et al.*), in Warren County, and elsewhere (and noted in various Christmas bird counts in *The Kentucky Warbler*) are probably late transients. Monroe has Louisville records for January 1 and February 21. A few cormorants almost certainly winter about Kentucky Lake and on the lower Ohio River. Long ago the species was regarded as rare in Fulton County (Pindar, 1925a:79).

Geographic variation.—The subspecies occurring is *Phalacrocorax auritus auritus* (Lesson), the breeding form of most of the continental United States. Before the distribution of this subspecies in the Mississippi Valley was clarified (by Howell, 1911:16; Oberholser, 1938:39; and others) reference was often made (*e.g.*, Butler, 1897:585; Wheaton, 1882:544; Pindar, 1925a:79) to the occurrence of *P. a. floridanus* (Audubon) in the central Mississippi Valley.

Specimens examined.—Total, 1. B.L.M.—1 female, Carroll County (Nov. 10, 1939).

FAMILY ANHINGIDAE: DARTERS

Anhinga anhinga (Linnaeus): ANHINGA

Status.—Rare summer resident in extreme southwestern Kentucky, breeding in Fulton County; casual vagrant north and east, occasionally as far as Hopkins County.

Spring.—No dates of arrival in Kentucky are available. Presumably adults are present by early April. Pitelka (1939:27) observed approximately 25 Anhingas at "Big Cranetown" of Reelfoot Lake on April 17, 1938.

Breeding records.—The species was first stated to breed in Kentucky by Ganiem (1937b:43), who reported a nest observed by R. C. Soaper on May 26, 1937, in the heronry near Bondurant, Fulton County, locally known as "Kentucky Cranetown." On May 20, 1949, Goodpaster and I visited this heronry, recording approximately 25 pairs of Anhingas among the herons and cormorants and collecting 2 males (U.M.M.Z.), the testes of which measured about 23 × 15 mm. One nest was definitely identified when we saw an Anhinga flush from it. No young were visible and the

nest presumably contained eggs; probably other Anhingas were nesting also, but the birds had all left their nests because of our arrival. Most of the nests in this colony were between 40 and 60 feet up in cypresses. In the following spring Goodpaster (verbal com.), Harvey I. Fisher, and Donald Hoffmeister visited this colony and took additional specimens. Ganier (1933a:12) did not record the species at nearby Reelfoot Lake heronries until 1932, despite numerous earlier visits. On May 29, 1932, he recorded approximately 50 pairs and saw numerous clutches of 4 and 5 eggs (none had then hatched).

Breeding distribution.—So far as known, limited in Kentucky to the one colony mentioned (Fig. 13, p. 160). I can find no definite evidence that the species has nested north of this point in historic times, although there is appreciable documentation of its casual occurrence farther north (Ridgway, 1895:209, Illinois; Van Tyne, 1950, Ontario).

Fall.—Most reports are not certainly authentic. Wilson (1922b:96) saw 2 birds which he thought were Anhingas in Ballard County, August 28, 1917, and the species was reported from this area earlier, near Cairo, Illinois, by Nelson (1877). Pindar (1889b:312) seemingly confused this species with the cormorant in Fulton County, since he wrote "Abundant [!] in spring and fall; common in summer; a few winter" without mentioning the cormorant at all. Bacon (Bacon and Monroe, 1937:13, and verbal com.) was correct, in my opinion, in his identification of Anhingas in Hopkins County ("they seem to prefer the deep recesses of the big woods along the creeks and rivers") on a few occasions between July 7 and November 11, 1908–1932.

Geographic variation.—The subspecies occurring is the North and Central American *Anhinga anhinga leucogaster* (Vieillot).

Specimens examined.—Total, 2. U.M.M.Z.—2 males, Fulton County (May 20, 1949).

FAMILY ARDEIDAE: HERONS AND BITTERNs

Ardea herodias Linnaeus: GREAT BLUE HERON

Status.—Common summer resident in lowlands of western Kentucky, breeding locally from Henderson west, chiefly west of the Tennessee River; elsewhere uncommon to fairly common transient spring and fall and, in favorable habitats, common post-breeding summer visitant or vagrant; rare and irregular winter resident, mainly in western Kentucky.

Spring.—The species arrives in late March or early April at most points, but evidently somewhat earlier on the breeding grounds; it is most numerous everywhere in late April and early May, probably due to the presence of transients; rare or absent by late May, except in the breeding range. Early records of transients: March 28, at Louisville (Monroe); April 8, in Nelson County (Blincoe, 1925:408); usually late March or early April, in Warren County (Wilson, 1935; 1937:19; 1940a:16; 1957b:60; occasionally winters). These big herons are uncommon at any season on the Cumberland Plateau (not seen in Rowan County after April 26, Barbour, 1952:23), in most of the Bluegrass, and in the rugged parts of the Western Highlands, there being little attractive habitat in these areas. In the karst region (Pennyroyal) south of the Dripping Springs Escarpment the species is more numerous, and it is common in much of the above-defined breeding range, where I have made many recent records in April and May of 1949 and 1950, from Trigg County west (see also Wetmore, 1940:533, Union County). Most of the few seen outside of the breeding range are probably northbound migrants.

Breeding records and distribution.—The species is single-brooded. Near Reelfoot Lake, nesting activities are begun some time in March and are concluded in June or July. Dates at Henderson are probably a little later; no birds were present in a Henderson Colony on March 22, 1953 (Watson, 1953:59). Eggs (3–5) and young have been recorded as early as mid-April (April 17 at Reelfoot Lake), there being

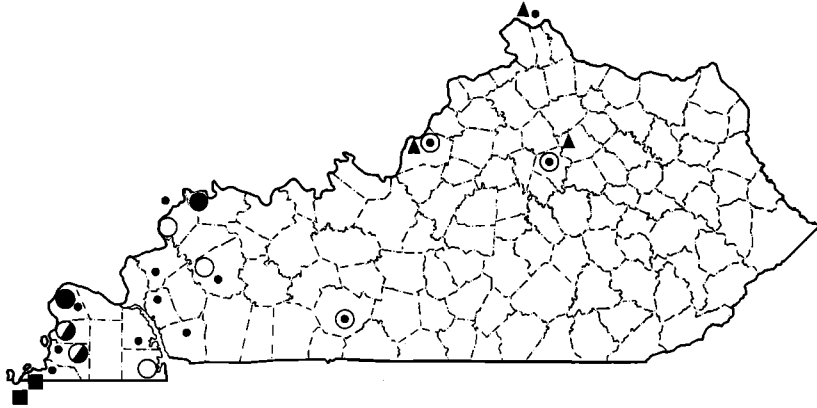


Fig. 13. Breeding colonies of the Great Blue Heron, Common Egret, Double-crested Cormorant, Anhinga, and Black-crowned Night Heron in Kentucky. Squares stand for colonies composed of the first four species; solid circles for colonies composed of the first three; half-solid circles for colonies of the first two; open circles for colonies of Great Blue Herons; triangles for colonies of the Black-crowned Night Heron; small dots for summer records of the Yellow-crowned Night Heron (breeding records if circled).

few precise data for Kentucky (for details of nesting at Reelfoot Lake, Tennessee, see Ganier, 1933a:1951; Gersbacher, 1939). Except near the lower Ohio River in Henderson, Union, and perhaps other counties, the species breeds regularly only west of the Tennessee River, as it does also in Tennessee (Ganier, 1951:1). It frequently nests in mixed colonies, which may include Double-crested Cormorants, Anhingas, and Common Egrets. Five of eight colonies of the Great Blue Heron discovered in recent decades in Kentucky include some combination of the above species (see Fig. 13). Known colonies, with dates of report, are as follows (see map); Murphy's Pond, Hickman County (12 nests, Great Blues and Common Egrets; Morse, 1948); near Barlow, Ballard County, at Axe Lake (more than 300 nests, mainly Great Blues; Bacon and Monroe, 1937:13); southeastern Calloway County (Great Blues; Wilson, 1923c:131); Hopkins County, locality indefinite (12 nests, Great Blues, Hancock, 1954:19; see also Frazer, 1954a:52); bottom lands of western Union County (34 or more nests, Great Blues; Fleetwood, 1938; Durand, 1939); and Henderson County (more than 200 nests, mainly Great Blues; Bacon and Monroe, *loc. cit.*; Trout, 1938; Lovell, 1951b:58). Other colonies are or have been located near Burkley, Carlisle County, at Fish Lake (about 100 nests, Great Blues and Common Egrets; Conservation Officer John McClintock, verbal com., 1949); near Providence, on the Hopkins-Webster County line (12 nests, Great Blues; Semple, verbal com., 1952); and on a northern arm of Reelfoot Lake, just south of Bondurant, Fulton County (about 150 nests of Great Blues, nearly 400 including those of egrets, cormorants, and Anhingas; Goodpaster and Mengel, notes). Most colonies appear to be growing slowly. The Fulton County heronry, apparently the one (?) known about Reelfoot Lake as "Little Cranetown" (Gersbacher, 1939), and called "Kentucky Cranetown" in Fulton County, increased from 46 nests in 1937 (Soaper) to about 400 nests in 1949 (Mengel). In all colonies the nests are placed in large trees, said to be pecan, maple, oak, and sweet gum at Henderson, tupelo gum at Axe Lake, and cypress at most of the others. All are situated near shallow sloughs and backwaters, some with standing water directly beneath nest trees.

Note.—It is tempting to suppose that something like the "Frazer Darling effect"

(see Darling, 1938) may influence the pattern of colony formation in this area, with the present species alone capable of nesting in very small colonies, hence of initiating colonies. Whether or not this is so, small, presumably newly formed colonies do usually consist of this species alone, or this species and a few Common Egrets. No pure colonies of any of the other species concerned have been found. Even large colonies are sometimes made up chiefly of Great Blues, but the other species, especially the Common Egret, tend to increase disproportionately as the colonies grow; only large colonies are known to include cormorants or Anhingas.

Probably the swampy topography of lowland western Kentucky alone provides sufficiently productive feeding grounds for these large mixed colonies (the smaller, faster-flying Black-crowned Night Heron, on the other hand, has established major colonies in less richly endowed environments).

Post-breeding dispersal.—As does the Common Egret, the Great Blue Heron wanders widely in late summer, appearing in many parts of Kentucky where it does not breed. There are no available summer records from the Cumberland Plateau. On July 11, 1946, D. W. Warner and I found a dead individual on a roadside near Monticello, Wayne County, just west of the Plateau. From this point westward there are numerous records. The species becomes common at Louisville, as a rule, by early July, and is sometimes numerous in August and September, especially about the Falls of the Ohio River. The more or less regular presence of small numbers throughout summer in Warren County, where I saw 8 birds at Chaney Lake on June 19, 1949, and where there is no evidence of regular breeding (Wilson, 1929:182; 1936), suggests that non-breeding birds, as well as post-breeding vagrants, contribute to the total of summer records. In the breeding range the species remains common in summer. I saw more than 200 Great Blue Herons about Swan Lake, Ballard County, on June 28, 1941, the nearest known heronry, at Axe Lake, being some 7 miles distant.

Fall.—The species remains common in early fall at the various concentration points favored in summer, being especially well known at the Falls of the Ohio River and at Kentucky Lake. Migrants from the north probably contribute to the total present. In October a gradual decrease occurs, a few birds remaining later in central and western Kentucky. In 1948 I recorded scattered individuals from Meade County to Fulton County, between October 21 and November 16, most of them about sand bars in the rivers.

Winter.—Most, perhaps sometimes all, of the few birds still present in December move away upon the advent of severe weather. A specimen was taken at Morehead, Rowan County, January 15, 1936 (M.S.C.). Others have been reported in early winter from Cincinnati (Goodpaster, 1941:7), Louisville (latest, January 9, 1949; Monroe), Fort Knox, Hardin County (January 6, 1946; Kirkpatrick, 1946); and numerous localities farther west. Wilson (1940a:16) has records for some years from January 28, on, at Bowling Green. There is little doubt that a few birds remain through mild winters, at least in southwestern Kentucky, but detailed records are lacking. Three were recorded near Henderson on February 22, 1953 (Rhoads, 1953:34).

Geographic variation.—Two subspecies occur in the state, but few specimens have been taken and all sight records have been treated together above.

Ardea herodias herodias Linnaeus

The majority of transients and wintering individuals probably belong to this northern subspecies, to which I have referred specimens taken at Morehead, Rowan County, on January 15, 1936 (M.S.C.), and in Oldham County on November 7, 1937 (B.L.M.).

Ardea herodias wardi Ridgway

This southeastern subspecies has long been known to breed at Reelfoot Lake, Tennessee (Ganier, 1933a:12). Two breeding specimens from Fulton County, just

north of the lake, taken May 24 and 26, 1938 (U.S.N.M.) have already been described by Wetmore (1940:532) as intermediate in size, but with the pale coloration of *wardi*. Kentucky breeding birds will probably prove to be closer to *wardi* in their average characters. Save possibly for isolated pairs and small colonies, there is today a pronounced hiatus between the breeding populations of Great Blue Herons in the lower Mississippi Valley and in the lake states to the north. Gene flow between the two, perhaps once appreciable, has probably been reduced as a result of this.

Specimens examined.—Total, 4 (see above for subspecies). M.S.C.—1 unsexed, Rowan County (Jan. 15); B.L.M.—1 female, Oldham County (Nov. 7); U.S.N.M.—2 females, Fulton County (May 24, 26).

Butorides virescens (Linnaeus) : GREEN HERON

Status.—Fairly common to common summer resident, breeding throughout the state; rather local in the Cumberland Plateau and Mountains.

Spring.—Arrives in late March or early April; common by middle or late April. Early records: April 8 (1870), at Cincinnati (Goodpaster, 1941:8); March 26, at Louisville (Monroe); April 6, in Warren County (Wilson, 1940a:16); April 1 (1938), in Hopkins County (Hancock, notes).

Breeding records.—The breeding season extends from late April into July, so far as indicated by 22 dated observations which suggest by their distribution (a pronounced peak of clutch-completion May 1–10, followed by smaller ones as late as June 21–30) that some pairs rear two broods in a single season. Data are from Rowan (Barbour, 1951a:33); Carroll (Lovell, 1952b:54); Nelson (Beckham, 1885:46); Jefferson (J. Smith, 1950:7; Stamm, *vide* Lovell, 1951b:58; Monroe, Mengel, notes); and Hopkins (Hancock, 1950:25–26; 1954:19) counties, in Kentucky, and from Hamilton County, Ohio, just across the state line (Goodpaster, 1941:8). The earliest egg-date at hand is for May 4 (1933), 2 eggs (surely not a complete set) in Rowan County (Barbour, 1951a), and the latest July 1 (1951), 5 eggs in Carroll County (Lovell, 1952b). Other early nestings were reported from Hopkins County, 5 eggs on May 12, 1953 (Hancock, 1954), or are noted below, and additional late nestings are indicated by construction of a nest at Louisville on June 10, 1951, 40 feet (very high) up in an elm (Stamm, *vide* Lovell, 1951a) and by 4 downy young recorded in a nest in the same area on July 8, 1949 (Smith, 1950). The average complement of 13 clutches (chiefly) or broods evidently complete was 4.3 ± 0.17 eggs or young (3–5). The nests may be solitary, or in small colonies, crude, loosely constructed platforms of twigs and sticks placed in small trees, usually in groves or thickets. Locally recorded sites include cedars, wild plum trees, willows, young elms, and orchard trees. Nests may be near or over water but are sometimes found a mile or more from the nearest stream or pond; the average height above ground of 11 nests was 14.8 feet (2.5–40). Monroe noted 5 eggs in nests 15 feet up in small plum trees near Louisville on May 10, 1936, and May 14, 1939, and young just out of another on June 21, 1918. Near Buechel, Jefferson County, on May 24, 1937, I found 5 nests 10 to 20 feet up in a thicket of young elms; on that date these contained 5 eggs (2), 4 small young (2), and an undetermined number of eggs. J. Smith (1950) found a nest on July 8, 1949, at the margin of a colony of Black-crowned Night Herons near Louisville.

Breeding distribution.—Uniquely among North American herons, the Green Heron seems to have generalized requirements with respect to food and habitat. It is the only species of the family that occurs throughout Kentucky in the breeding season, being dependent, obviously, neither upon large bodies of water nor upon the proximity of extensive marshes. In the largely cleared agricultural country west of the Cumberland Plateau it is a common, rather uniformly distributed streamside species familiar to every farm boy. In the extensively forested Cumberland Plateau and Mountains, it is much less numerous, more local, and chiefly

restricted to partly cleared areas near small streams or ponds. In these mountainous or rugged areas I recorded small numbers in Harlan, Powell, Clay, and Laurel counties, 1948–1952, and the species has been reported from Rowan County by Barbour (1951a:33), McCreary and Wayne counties by Wetmore (1940:533), and Madison, Floyd, and Knott counties by Wilson (1942:21). It was probably rare, or even absent, in much of Kentucky before the country was cleared.

Fall.—Green Herons are numerous and conspicuous in late August and early September but decrease sharply late in the latter month. Records late enough to suggest the true time of departure are scarce. Late records: October 10 (1938), in Boone County (Wetmore, 1940:533); October 25 (1942), at Louisville (Monroe); October 21 (1948), in Meade County (Mengel; 3 on Ohio River bank); October 10 (1947), October 11 (1949), October 20 (1951), in Hopkins County (Hancock, notes). I recorded none during extensive work in the Purchase in early November, 1948, but lingering birds may be expected in November, judging from records from localities farther north (e.g., Borror, 1950:14; Kemsies, 1948a:3).

Geographic variation.—The subspecies occurring is the eastern *Butorides virescens virescens* (Linnaeus).

Specimens examined.—Total, 9. M.S.C.—2 males, 1 unsexed, Rowan County (And vicinity? Data incomplete: May 14, 15; May 9); C.W.B.—2 females, 1 unsexed, Nelson County (April 24, Aug. 23; May 5); U.S.N.M.—2 males, Union County (May 13, 16); 1 (sex?), Wayne County (June 8).

Florida caerulea (Linnaeus): LITTLE BLUE HERON

Status.—Post-breeding vagrant, locally common in late summer, mainly west of the Cumberland Plateau and increasing lately; rare in spring and early summer, mainly in southern and western Kentucky; not yet found breeding.

Spring.—Little Blue Herons have been recorded rarely, from April onward, especially in south-central Kentucky (Pennyroyal) and west of the Tennessee River (Purchase). In Warren County, Wilson (1940a:16) has seen a few, April 19–May 25. I noted 6 adults on May 15, 1949, in cottonwoods and willows about a slough at “Kentucky Bend” of the Mississippi River in Fulton County, and 1 adult, with 2 Black-crowned Night Herons, in the wooded bottom lands of Clark’s River, one mile east of Hardin, Marshall County, on April 16, 1950. Monroe has recently acquired records at Louisville for April 17, 1954, and May 18, 1957.

Post-breeding dispersal.—As has the Common Egret, with which it is often associated and which it locally resembles in habits and habitat, the Little Blue Heron has been recorded, although rarely in the east, from Rowan County (Barbour, 1952:23), the Cincinnati area (Goodpaster, 1941:7), and Louisville westward, occurring in fair numbers at some localities. The species tends to arrive a little later than the Common Egret and to depart a little earlier. Early records: June 30, in Warren County (Wilson, 1940a:16); July 22, at Louisville (Monroe). In extreme western Kentucky I saw many small groups, composed largely of adults, standing in unseasonably flooded fields or flying high in the air, July 15 to 21, 1951. The blue-plumaged adults are rare in most of the state, and only recently have one or a few been seen each season at Louisville. Tordoff and I saw approximately 50 Little Blues, including 1 adult and 1 bird in “pied” transitional plumage, at Henderson on September 4, 1949. Late records: September 19 (1959), and October 5 (1952), at Louisville (Stamm, Brecher, and Lovell, 1960:4); September 13 (1950), in Warren County (Wilson, 1951:4). No fall dates, strictly speaking, are available.

History.—The Little Blue Heron formerly nested well to the north of Kentucky, in Indiana (Butler, 1897:664) and elsewhere, but ceased to do so coincident with the general decrease of the “white” herons. It is not certain that the species ever disappeared from Kentucky as a vagrant. Many were seen in Hopkins County in 1924 (Bacon, 1933). In recent decades, however, the species has increased notably from its low point—although a perceptible decrease, perhaps temporary, was noted

at Louisville, 1949–1959 (Stamm, Brecher, and Lovell, 1960:4). A colony just south of Reelfoot Lake, Tennessee, had increased over several years to nearly 1,000 nests in 1950 (Ganier, 1951:4). Breeding in western Kentucky is to be expected.

Geographic variation.—The subspecies occurring is the North American *Florida caerulea caerulea* (Linnaeus).

Specimens examined.—Total, 2. M.S.C.—1 immature female, Rowan County (Aug. 10, 1934); B.L.M.—1 immature male, Jefferson County (July 23, 1939).

*****Bubulcus ibis* Linnaeus: CATTLE EGRET**

Status.—Casual; one autumn record, 1960. The species should be expected to occur again, and with increasing regularity.

Records.—On November 9, 1960, under circumstances which would scarcely permit erroneous identification, Wilson (1960:72) and L. Y. Lancaster studied a Cattle Egret for a considerable period at a small pond at the edge of Bowling Green, Warren County.

Geographic variation.—The subspecies to be expected in Kentucky is *Bubulcus ibis ibis* Linnaeus, which has dramatically colonized much of the New World in the last half century or less.

***Casmerodius albus* (Linnaeus): COMMON EGRET**

Status.—Fairly common to common summer resident in lowlands of western Kentucky, breeding locally from Henderson (and other points?) west, chiefly west of the Tennessee River; elsewhere uncommon transient or vagrant in spring and, in favorable localities, common post-breeding summer visitant or vagrant.

Spring.—Few records were made in the years prior to the great decline of the species in the late 1800's. Shorten (1882:95) reported the capture of a bird in breeding plumage at Maysville on April 22, 1882. Only recently have Common Egrets again started to appear in spring at localities outside the known local breeding range. They were reported at Louisville in the spring of 1949 by Steilberg (*vide* J. Smith, 1950:6). Others were seen there, on April 21, 1951, and April 10, 1958, by Monroe. Wilson (1940a:16; 1951:4; 1957b:60) has recorded a few near Bowling Green, at the Woodburn lakes, April 27–May 30, 1933–1957. Cypert saw 2 at Kentucky Woodlands National Wildlife Refuge, Trigg County, on April 21, 1941 (Refuge files). More recently, Steilberg (1957:41) gave a convincing account of the observation of 1 bird in Meade County on the remarkably early date of February 10, 1957.

Breeding records and distribution.—Adults probably arrive at the heronies in March. Eggs were being incubated at Reelfoot Lake, Tennessee, on April 17, 1938 (Pitelka, 1939:27; see also Ganier, 1933a:14–15; and Gersbacher, 1939, details of breeding). One brood is reared, and nesting is concluded in July. In Kentucky the species has bred in recent decades in at least five mixed colonies (Fig. 13, p. 160) of large water birds (variously, the Great Blue Heron, Double-crested Cormorant, Anhinga, and Common Egret): "Kentucky Cranetown," one mile south of Bondurant, Fulton County (approximately 200 pairs with small young on May 20, 1949); near Burkley, Carlisle County, at Fish Lake (1949; number uncertain); in Hickman County, at Murphy's Pond (2 nests, large young, June 6, 1949; Mengel); near Barlow, Ballard County, at Axe Lake (2 nests in 1936); and near Henderson (3 nests in 1936, Soaper; more than 5 pairs with large young, July 7, 1940, Monroe and Mengel). Further details concerning the colonies are given under Great Blue Heron and Double-crested Cormorant; other colonies have probably escaped detection. In late May, June, and July, the present species is common in lowlands throughout extreme western Kentucky, occurring in small groups about sloughs, ponds, and backwaters. I saw many in all of the Purchase counties in 1941, 1949, 1950, and 1951. On June 28, 1941, I saw more than 100 perched around Swan

Lake, Ballard County. It is possible that a few Common Egrets have nested at Louisville, since 1949, with a colony of Black-crowned Night Herons (J. Smith, 1950; Monroe, personal com.).

Post-breeding dispersal.—Common Egrets have been recorded, chiefly from late July to September, throughout the state, except in mountainous or heavily forested areas lacking suitable aquatic situations. Early records at most localities may be based on non-breeding birds, rather than post-breeding vagrants. Before 1949, when summering (non-breeding?) birds were first noted, the species usually appeared at Louisville in late July, 200 or more individuals sometimes congregating about the Falls of the Ohio River in August and September (Monroe). As does the Little Blue Heron, the Common Egret feeds in shallow water, in rather open areas, perching and roosting in nearby woodland edges. There are numerous records from various localities from Rowan County (regular, July 30–August 20; Barbour, 1952:23) and Fleming County (Grannis, 1944) westward, but few from the intensively cultivated inner Bluegrass. I saw 2 birds in Boone County, near Covington, on July 18, 1950.

Fall.—A few birds may remain until late September or early October. In 1951 the species remained at Louisville until September 28 (Stamm and Summerfield, 1952:41) and in 1959 to October 4 (Stamm, Brecher, and Lovell, 1960:4); the latest Louisville record is for October 31, 1954 (Monroe). There is an older record for October 15. I saw no egrets in the Purchase in much work in early November, 1948.

History.—Many years ago the species was common and more widely distributed in the Mississippi Valley than at present (see Butler, 1897:659; Langdon, 1879:184; Nelson, 1877:60). Early records from Kentucky are few and not very revealing. Pindar (1889b:312) seems to have confused this species with the Snowy Egret. Scarce in Nelson County in the 1880's (Beckham, 1885:46), the species seems virtually to have disappeared from the state by 1900. Ganier (1933a:15) found none at the Reelfoot Lake heronries in 1919 and 1921, but vagrants began to reappear in the general area about that time and were recorded in Ballard County (records accidentally given under Whistling Swan) by Wilson (1922b:96, and letter: October 2, 1952), from 1917 to 1921, mainly in September. Suthard (1926) noted the first appearance of the species at Madisonville, August 30, 1925. Around 1930 it again began to appear regularly in summer, being common at Louisville by 1933 and 1934 and being first noted near Bowling Green in 1933. There seems to be no record of the date of its return (if ever it were completely gone) as a breeding species; it was well established at Reelfoot Lake, Tennessee, by 1932 (Ganier, 1933a:14) and nesting in two Kentucky colonies in 1936 (Bacon and Monroe, 1937:13). If the present trend continues much longer, the species should soon regain its former abundance in the Mississippi Valley.

Geographic variation.—Occurring is the New World subspecies *Casmerodius albus egretta* (Gmelin).

Specimens examined.—Total, 5. M.S.C.—1 unsexed, Rowan County (July 30, 1933); B.L.M.—2 males (not in nuptial plumage), Jefferson County (July 25, 1936; Aug. 28, 1937); U.S.N.M.—1 male, 1 female (both in nuptial plumage), Fulton County (May 23, 1938).

Leucophoyx thula (Molina): SNOWY EGRET

Status.—Vagrant (all records from west of the Cumberland Plateau); casual in spring, rare in late summer, becoming at times fairly common locally in recent years; increasing generally and may soon breed in southwestern Kentucky.

Spring.—Two Snowy Egrets were seen at Louisville, April 29, 1951, by Stamm (1951b; and editor's note), and others on May 17, 1953, and April 17, 1955 (Monroe). On May 7, 1949, I recorded 1, not in nuptial plumage, at Chaney Lake near Bowling Green. Wilson (1951:4) saw 1 there on May 20, 1950.

Post-breeding dispersal.—Since 1937, when Monroe (1938b) and I saw 6 birds on August 21 and 9 on August 22, at the Falls of the Ohio River at Louisville, the

species has been recorded irregularly there, July 28 to September 16 (see also Summerfield and Lovell, 1949:56; Stamm and Summerfield, 1952:41), becoming most numerous in 1950, when I saw 17 on September 16. It has been recorded occasionally at Bowling Green, Warren County, since 1944 (Wilson, 1945), July 29 to September 13, with numbers up to 20 at the Woodburn lakes in 1950 (Wilson, 1951:4). Recorded also at Madisonville, Hopkins County (Hancock, 1949:48), and in Fulton County, where I collected a male from a flock of 7 or 8 on sand bars at "Kentucky Bend" on August 23, 1942 (Mengel, 1948:50). This seems to be the only preserved specimen from the state. When present, these herons behave much as do Little Blue Herons, with which they often associate.

History.—Early references are unconvincing. A record for Bardstown, given by Beckham (1885:46), was properly discarded by Blincoe (1925:419) as based on unreliable evidence. Pindar (1889b:312) seemingly confused the three white herons occurring in Fulton County. Nelson (1877:60) recorded the Snowy Egret about Cairo, Illinois, August 17 to September 4, 1875. Although it formerly nested well to the north of Kentucky (Butler, 1897:662), there is no record of its breeding in the state. It may soon do so, however, as breeding birds were discovered with a colony of Little Blue Herons near Reelfoot Lake, Tennessee, May 19, 1950 (Ganier, 1951:4).

Geographic variation.—The subspecies occurring in Kentucky is the eastern *Leucophoyx thula thula* (Molina).

Specimens examined.—Total, 1. B.L.M.—1 male (not in nuptial plumage), Fulton County (Aug. 23, 1942).

Nycticorax nycticorax (Linnaeus): BLACK-CROWNED NIGHT HERON

Status.—Summer resident west of the Cumberland Plateau, locally distributed and generally rare except near a few breeding colonies; rare to common transient, probably throughout the state; casual in winter.

Spring.—Arrives in late March (occasionally earlier); main migratory movement in April; rare or absent later except near breeding colonies. Early records: March 27, in Rowan County (Barbour, 1952:23); March 14 (1950), at Cincinnati¹ (Maslowski, notes); March 22, at Louisville (Monroe; earliest, 1934–1952); March 21 and 23, in Warren County (Wilson, 1940a:16; 1957b:60). The usual date of first observation at several localities is between March 25 and April 1. The species has been observed in small numbers at many localities. In 1950, Handley and I recorded several daily in Lyon, Trigg, and Marshall counties, April 9–16.

Breeding records.—Little precise information is available, all of it from the vicinity of Louisville, Jefferson County. Until recently, breeding activities had been noted only from April into July: Monroe collected two sets of 3 and one set of 4 fresh eggs on May 2, 1936, and observed large young standing on their nests on July 3, 1937; J. Smith (1950:6–8) recorded broods of 1 to 3 young, about half-grown, on July 8, 1949. The occurrence of later nestings was established, however, when F. W. Stamm (1960:33) noted 12 young in 6 nests on September 26, 1959, and the possibility that these represented second nestings is emphasized by the small average size of the broods. Only three colonies are known (Fig. 13, p. 160). Near Louisville, from the beginning of recent observations, approximately 1930, through 1948, one was situated in tall cottonwoods on Six-Mile Island, Jefferson County, 6 miles upstream from the city. In 1937 this Ohio River colony consisted of 140 nests (Monroe). In 1949 the heronry was abandoned, possibly because of human molestation and another established in willows at the Falls of the Ohio River just below Louisville. Here the nests were placed 15 to 30 feet up, and on July 8, 1949, numbered approximately 250 (J. Smith, 1950:7). The colony has since decreased somewhat (Stamm, Brecher, and Lovell, 1960:4). Another large heronry was discovered in 1949 on the North Fork of Licking River near Paris. Dodge (letter: March 16,

¹ One was taken in the vicinity of nearby Covington, Kentucky, in April, 1878 (Langdon, 1878:117).

1952) counted 283 nests there in the winter of 1949-1950 and 436 in 1950-1951. Near Cincinnati, Ohio, just outside the state, a colony has been well known in recent decades (Goodpaster, 1941:8; Kemsies, 1948a:3).

Distribution in summer.—Probably undiscovered breeding colonies exist from time to time. In the Pennyroyal the species has remained about the Woodburn lakes near Bowling Green well into July in some seasons, but nests have not been found (Wilson, 1940a:16; and other titles). I saw 50 or 60 adults and immatures there on May 5, 1949. The presence of streaked immature birds in early summer does not necessarily indicate breeding, since the streaked plumage is worn into the second year of life. The lack of breeding records for West Virginia (Brooks, 1944: 13) suggests that the absence of summer records from the Cumberland Plateau of Kentucky is significant. I saw an adult in Pickett County, Tennessee, on the Cumberland Plateau only a mile from the Kentucky line, on June 15, 1937 (see Ganier, 1937a:24). In the Western Highlands, Hancock (letter: March 19, 1952) considered the species a rare transient. In the Purchase it is certainly very rare in summer, if present at all. I recorded none there later than May 22 in 1949, and none during much time afield in July, 1951. The species nests in small numbers, however, at nearby Reelfoot Lake, Tennessee (Ganier, 1951:5-6).

Fall.—Little evidence of the duration of migration is available; these herons are rare after mid-October but have been recorded as late as November 16 (1936, 1947), near Cincinnati, Ohio (Goodpaster, 1941:8; Kemsies, 1948a:3), and November 17 (see also winter), at Louisville (Monroe; regular only until about October 12). Tordoff and I saw 3 adults and 8 immatures at a drying slough near Henderson, September 4, 1949.

Winter.—It came as a distinct surprise when Monroe recorded 2 birds at the Falls of the Ohio River on December 24, 1950, and 24 on December 23, 1951. Since then a small number has been found to winter, centering about Towhead Island in the Louisville Municipal Harbor. Goodpaster (1941:8) recorded 1 near Cincinnati, January 2, 1937 (see also Kemsies and Randle, 1953:4).

Geographic variation.—Occurring is the North American subspecies *Nycticorax nycticorax hoactli* (Gmelin).

Specimens examined.—Total, 6. M.S.C.—1 male, 1 unsexed, Rowan County (April 15; March 27); U.K.—1 male, Fayette County (April 6); 1 unsexed, Jessamine County (April 8); B.L.M.—1 male, 1 unsexed immature, Jefferson County (April 18; Aug. 7).

Nyctanassa violacea (Linnaeus): YELLOW-CROWNED NIGHT HERON

Status.—Summer resident, uncommon to fairly common, locally distributed in western and central Kentucky and breeding here and there throughout this area; in recent years the breeding range has been expanded northward and eastward at least to Cincinnati and Lexington. This almost certainly is a real change in distribution rather than an increase in knowledge.

Spring.—The time of arrival of the Yellow-crowned Night Heron is not definitely known. With other observers I saw 2 adults at McElroy Lake, Warren County, on March 27, 1938 (Mengel, 1938), and 4 there on April 2, 1939 (Wilson, 1939a), dates suggesting that the birds arrive about the same time as the Black-crowned Night Heron. Since the appearance of the species at Louisville in 1948, Monroe's earliest record is for March 23 (1952). Wherever it is known, the species is thoroughly established by May.

Breeding records.—Nesting activities may begin as early as the first part of April and continue into July, as indicated by 14 dated breeding observations, which show clutches completed as early as April 11-20 and as late as June 1-10 (peak May 1-10). Published records are from Fayette (Mayfield, 1956:62; Webster, 1960:30) and Jefferson (Halverson, 1955; Fitzhugh, 1959) counties. The first definite evidence of nesting in the state, however, was obtained in Warren County, by Ottis Willoughby, who collected 2 adults (Western Kentucky State College Coll.) on

April 13, 1949, at a nest (which he also collected) in lowland woods about 4 miles south of Bowling Green. Below the empty nest were fragments of eggs presumably blown out by high winds of the preceding night (Wilson, verbal com. and letter: March 16, 1952). J. Smith (1950:7) reported behavior suggesting breeding on the part of an adult seen July 8, 1949, at the colony of Black-crowned Night Herons near Louisville. In bottom lands of the Ohio River just above Louisville, Halverson (1955) observed 3 nests between April 18 and June 14 (when 4 young left one of them), 1955. Although the nests were in the same general area, no two could be seen from a single point. A nest in Fayette County (Mayfield, 1956) contained 4 young on July 22, 1956, these leaving the nest on July 27. Subsequently, in addition to a single nest or two, small, loose colonies have been noted: 4 nests near Seneca Park, Louisville, studied through the spring of 1959 (Fitzhugh, 1959), April 10 to July 5, when the last young left, and 4 near North Elkhorn River in Fayette County, observed June 7, 1958, at which time all contained young (Webster, 1960). Nests have been noted in elm (1), oak (1), walnut (4), and sycamore (7) trees, from 35 to 70 feet above the ground (average, 43 feet). No one has climbed to one to observe a clutch, but 7 broods counted have averaged 4.1 ± 0.27 young (1 brood with 3; 4 with 4; 2 with 5). The herons seem equally at home in open parkland or suburban areas and in the wilder swamp forests where they might more readily be expected. Fitzhugh noted that material was added to the nests throughout the period of use. As nearly as can be estimated from the various accounts, incubation requires approximately 21–25 days and the young remain in the nest about $3\frac{1}{2}$ weeks.

Distribution and history.—The Yellow-crowned Night Heron, unlike the Black-crowned, tends to be a solitary bird, and is, also, more frequently observed in forested situations. In Kentucky it is found about streams, ponds, sloughs, and forested swamps, rarely far from mature timber. It has apparently long occurred in the broad, forested flood plains of southwestern Kentucky, where it was observed as early as 1887 (Pindar, 1925a:81). A long scarcity of records suggests the possibility that the species disappeared for a time, near the turn of the century. In recent decades, however, it seems to have expanded its range considerably (Fig. 13, p. 160). It was recorded for the first time in Hopkins County on June 27, 1926 (Suthard, 1926a); near Shawneetown, Illinois, across the Ohio River from Union County, on June 18, 1928 (Brodkorb, 1929:398); from Warren County in 1938 (Mengel, 1938); from Louisville, May 24, 1948 (Steilberg, 1949, 1949a); and from the Cincinnati area on April 24, 1953, and subsequent dates (Kemsies and Randle, 1953:60). It was breeding near Lexington, Fayette County, in 1956 (Mayfield, 1956:62). It is now regular and undoubtedly nesting in suitable areas throughout the Purchase, the western parts of the Pennyroyal and Western Highlands (see Hancock, 1954:19), up the immediate valley of the Ohio River at least to Cincinnati, and in the Bluegrass (Lexington, Louisville) as noted. In field work conducted 1948–1951, I saw small numbers from May to July in Jefferson, Warren, Marshall, Ballard, Hickman, and Fulton counties, and the species was fairly common in the last three. I took an adult male (B.L.M.) in deep cypress growth at the north end of Reelfoot Lake (Fulton County) on June 29, 1941 (Monroe and Mengel, 1942). More recently I collected immature birds at Chaney Lake, Warren County on June 19, 1949, and in a swamp just east of Louisville on August 4, 1950 (U.M.M.Z.). The species has been reported casually from other localities in the range outlined, including Crittenden, Lyon, and Trigg counties (Wilson, 1942:21).

Fall.—Few records are available, none very late. Tordoff and I recorded 2 birds just south of Henderson, September 8, 1949, and 2 adults in willows at the Falls of the Ohio at Louisville, September 11, 1949. In 1956, 2 were seen by Croft, at Louisville, as late as October 12 (Stamm, 1957a:41).

Geographic variation.—The subspecies occurring is the eastern *Nyctanassa violacea violacea* (Linnaeus).

Specimens examined.—Total, 5. B.L.M.—1 adult male, Fulton County (June 29, 1941); W. Ky. State College Coll.—2 adults, unsexed, Warren County (April 13, 1949); U.M.M.Z.—1 immature female, Jefferson County (Aug. 4, 1950); 1 unsexed immature (weight, 613.2 gm.), Warren County (June 19, 1949).

Ixobrychus exilis (Gmelin): LEAST BITTERN

Status.—Summer resident in small numbers, breeding widely but locally in favorable situations west of the Cumberland Plateau; a seldom observed late spring and early fall transient.

Spring.—Dates early enough to indicate with much certainty the time of arrival are lacking. Little is known of the migration of this furtive species, which is rarely observed except in areas where breeding is known or suspected to occur. It is evidently a late migrant, since Borror (1950:15) gave the earliest record of many for central Ohio as May 1 (average date of first record, May 9). Monroe's earliest record for Louisville is for April 12. Wilson (1922:234) recorded 1 in Warren County on May 1, 1920. Bacon's (1933) earliest published date for Hopkins County, April 6, is early in comparison with other records and I am not certain of its validity. Monroe took a male (B.L.M.), presumably a transient, in a wet upland field in Oldham County on May 17, 1947.

Breeding records.—The breeding season, as indicated by 17 dated observations, extends at least from mid-May into July, with a peak of clutch-completion June 1–10. Completion of clutches as late as July 1–10 suggests that two broods are reared on some occasions. All records are from Carroll (J. Webster, 1951:21; Lovell, 1951b:58, 1952b:53–54), Jefferson (Monroe, 1935; and notes), and Hopkins (Hancock, 1954:19) counties. The earliest and latest egg-dates are for May 20 (1935), 3 eggs (later 4), and July 2 (1935), 5 fresh eggs, both in Jefferson County. The average complement of the 8 clutches recorded is 4.4 ± 0.31 eggs (1 nest with 3; 4 with 4; 2 with 5; 1 with 6). Monroe took sets of 5 and 6 eggs in a small marsh near Louisville, respectively on July 2 and June 2, 1935, and has found numerous nests there (the only breeding place known locally), with a peak of 19 in 1935. All nests found in Kentucky have been just above water and were placed in bushes, cattails, and (1) 4 feet up in the crown of a fallen willow.

Distribution in summer.—Records are scarce and the species has probably been overlooked in many localities. It has been reported from several besides those mentioned above. A male was taken on June 3, 1907, on South Elkhorn Creek near Lexington (U.K.), and Ganier (1935) saw 1 bird at a marshy pond in Clinton County, near Albany, just west of the Cumberland Plateau, on June 1, 1930. I recorded 1 in a small cattail-willow-reed (*Typha-Salix-Juncus*) marsh on Ledbetter Creek Embayment of Kentucky Lake, in Marshall County, June 15, 1949, and 1 in a flooded corn field west of Barlow, Ballard County, July 19, 1951. Undetailed reports were given by Wilson (1942:21; 1923c:131) for Crittenden County and Calloway County. The species will probably be found eventually to breed, at least sporadically, in every marshy spot of any size in the state, but these are rather scarce. The local population of Least Bitterns in the great cutgrass marshes of Reelfoot Lake, Tennessee, just over the state line, is probably the largest in the south.

Fall.—Data are very few. The latest record at Louisville is for September 11 (Monroe). Bacon (1933) recorded the species at Madisonville as late as October 3. The latest record for central Ohio given by Borror (1950:15) is for September 29.

Remarks.—Wilson's reference (1939d:35) to a supposed example of "Cory's Least Bittern" (*Ixobrychus "neoxenus"*) seen near Bowling Green on May 27, 1939, was not mentioned in a later paper (Wilson, 1940a:16). "Cory's Least Bittern" is now generally conceded to be a very rare melanistic phase of *Ixobrychus exilis*. Whatever its status, the record is unacceptable without a specimen.

Geographic variation.—The subspecies occurring is the eastern *Ixobrychus exilis exilis* (Gmelin).

Specimens examined.—Total, 2. U.K.—1 male, Fayette County (June 3); B.L.M.—1 male, Oldham County (May 17).

Botaurus lentiginosus (Rackett): AMERICAN BITTERN

Status.—Transient, fairly common to common, except in forested portions of eastern Kentucky, where probably rare; less frequently observed in fall; casual summer resident in western Kentucky, breeding very rarely.

Spring.—Arrives in the last half of March; main flight in April; rare by mid-May. Early records: March 28 (1944), in Rowan County (specimen, M.S.C.); March 27 (1916), at Bardstown (specimen, Blincoe, 1925:408); March 17 (1948), at Louisville (Monroe); March 22, in Warren County (Wilson, 1940a:16); March 14 (1931), in Hopkins County (Bacon, 1933, and notes). American Bitterns are locally common in April about swamps, marshes, and wet old fields more or less throughout the state. There are several records for Nelson County (Blincoe, 1925:408; specimen taken, April 13, 1916), and many observations for the Louisville area (Monroe). The species is regular also in Warren County (Wilson, 1940a:16; 1951:4), Hopkins County (Bacon), and elsewhere. Handley and I found these bitterns common in wet broomsedge fields and lowland woods in Lyon, Trigg, and Marshall counties, April 10–16, 1950, and took a male (U.M.M.Z.) on April 14. The "pumping" notes are often heard in April and May. Late records of transients are few: May 17, at Louisville (Monroe); May 27, in Warren County (Wilson, 1940a:16).

Breeding records.—The only definite records are those of Bacon (1933, and notes), all for Hopkins County. He found no nests but had seen individuals too young to fly as follows: Loch Mary at Earlington, June 11, 1914 (♂, still with some down); Pond River bottoms, 1 caught alive, June 12, 1927; Atkinson Junction Lake, 2, partly downy, June 14, 1935, and 3 (1 killed by a boy), July 5, 1939; Spring Lake, 1 adult and 1 young bird, June 29, 1943. Most of these were found in growths of cattail and buttonbush at the edges of the small lakes mentioned.

Distribution in summer.—The records now available suggest that individuals of this species summer more frequently in western and southern Kentucky than has generally been realized. Besides those mentioned above, Bacon had seen a few adults in Hopkins County in past years. Hancock's latest record (letter: March 19, 1952) for that area is for June 10, 1946, and he has informed me that widespread strip-mining has recently destroyed much of the suitable habitat. Cooke (1913:27), on the authority of "Alves," described the species as summering near Henderson. Other summer records are as follows: Crittenden County, July 20, 1944 (S. Semple, 1944:53; and letter: March 25, 1952); Fulton County (Pindar, 1925a:81); Warren County, July 29 to August 18, 1950 (Wilson, 1951:4); Reelfoot Lake, Tennessee (Ganier, 1933a:16). Dodge (letter: March 16, 1952) recalled seeing bitterns in the Bluegrass, in the summers of 1886–1888, in dense, giant ragweed (*Ambrosia*) along Stoner Creek, Bourbon County, and Funkhouser (1925:173) listed a record for Fayette County, June 1, 1921.

Fall.—Transients arrive in September; most records are for October, a few birds linger later. Few autumn sight records are available, the scarcity of these presumably owing as much to decreased ornithological field work at this season as to more secretive habits of the birds. One was recorded at Louisville on September 2, 1951 (Monroe). Specimens have been reported killed at Lexington, September 25, 1893 (Garman, 1894:31), Bardstown, November 22, 1917 (Blincoe, 1925:408), and other localities (see below). Bacon (notes) has a number of October records for Hopkins County, including one of a bird found dead October 1, 1927, and records for November 16, 1922, and December 16, 1916, the last apparently the latest date for the state.

?*Winter*.—No definite records. Pindar (1889b:312) claimed to have "good authority for its occurrence in winter" in Fulton County, as did Butler (1897:650) for southern Indiana.

Specimens examined.—Total, 7. M.S.C.—1 male, 2 unsexed, Rowan County (March 28; Sept. 29, Nov. 15); C.W.B.—1 female, Nelson County (Oct. 20); B.L.M.—1 male, Oldham County (April 19); U.S.N.M.—1 male, Boone County (Oct. 10); U.M.M.Z.—1 male, Marshall County (April 14).

FAMILY CICONIIDAE: STORKS AND WOOD IBISES

Mycteria americana Linnaeus: WOOD IBIS

Status.—Vagrant, irregular in late summer and sometimes locally common, chiefly in southwestern Kentucky; formerly more numerous.

Records.—One bird was recorded near Louisville on August 5, 12, and 18, 1934 (Monroe, 1938b), this providing the northeasternmost record for the state. South and west of Louisville the species has been recorded sporadically in recent decades, between July 2 and September 15. Records for Hopkins, Webster, and adjoining counties (July–September, 1908–1950) were summarized by Bacon (1954:28—see also Suthard, 1926; Bacon, 1933). An invasion of some proportions evidently occurred in 1925 (not 1927 as originally reported by Bacon, 1933), when flocks of 52 and 37 were recorded on July 21 and 28, and at least 4 were killed by various people. Reference to a general and unusual northward movement of Wood Ibises in 1925 was made by Ganier (1929:99). Near the Ohio River in Crittenden County, Carpenter (1941a) observed a flock of 12, September 11–15, 1940, and 1 was seen on July 29 and 31, 1941, at Kentucky Woodlands National Wildlife Refuge, Trigg County (Cypert, 1948). C. Wesley Kemper took a specimen in Graves County in 1928 (Murray State College Coll.). In the Purchase, especially in the Mississippi River bottom lands and about Reelfoot Lake, the species has occurred rather regularly (see Ganier, 1933a:17). There are older records of moderate to large numbers. Nelson (1877:59–60) found the species numerous near Cairo, Illinois, August 11 to September 4, 1875, and collected several from a flock of about 50 on a sand bar in the Ohio River at Mound City, Illinois (the bar being probably within Kentucky; disposition of specimens unknown). Pindar (1887c) saw a flock of 250 near Hickman, July 15, 1887, and others later that year (1 killed and wing saved). Later (1889b:312) he wrote that the species was common in Fulton County. It was reported also by Garman (1894:31), from Ballard County, "September." I saw 2 at the north end of Reelfoot Lake, in Fulton County, Kentucky, on July 2, 1941, and 1 on the nearby sand bars of "Kentucky Bend" of the Mississippi River, August 23, 1942. A recent record, of 9 seen on the Mississippi River at Hickman, August 3, 1955, was published by Steilberg (1955:69). The species is not known definitely to have nested this far north. Nelson (1877:59–60) wrote: "I was informed that they [appeared at Cairo] in large numbers every year about the first of August, and remained until the last of September." Ridgway had no conclusive evidence for his belief (mentioned by Butler, 1897:646) that they formerly nested in southwestern Indiana.

Specimens examined.—Total, 1. Murray State College Coll.—1 unsexed mounted specimen, Graves County (1928).

FAMILY ANATIDAE: SWANS, GEESE, AND DUCKS

Olor columbianus (Ord): WHISTLING SWAN

Status.—Very rare transient, chiefly on large waters, recorded mainly in fall; casual in winter.

Spring.—Single swans were seen by Bacon (1954:29) at Spring Lake, in Hopkins

County, on April 1, 1933 (see also Wilson, 1933), and April 1 and 2, 1935. The bird seen in 1933 was probably one of several that had wintered in the vicinity. Several swans were recorded near Cincinnati in late March, 1937 (Maslowski, *vide* Kemsies and Randle, 1953:5).

Fall.—The species occurs mainly from mid-October to mid-December. Although fair numbers may appear in a single season, this swan is sometimes unrecorded for several years. Recent records may be given almost in full. Near Cincinnati, on the Ohio River in Campbell County, 2 swans were seen with large flights of wildfowl between November 2 and 10, 1945 (Maslowski and Goodpaster, notes). An immature specimen was taken on the Ohio River at Carrollton, Carroll County, on November 13, 1940, by J. P. Doughty (Doughty Collection), and another was seen there by Doughty and Monroe on November 23, 1941. According to Doughty (verbal com., 1953) a fair flight was reported by hunters along the Ohio River in November, 1952 (see also Kemsies and Randle, 1953:5). At Louisville Monroe saw 2 swans with many Blue and Snow geese (*e.g.*, Wavies) on October 13, 1937 (Mengel, 1938b:26), and in Hopkins County a flock of 10 seen low over Madisonville on September 27, 1933 (a surprisingly early date), was reported to Bacon (1933, and verbal com.). On November 19, 1938, an immature specimen, now in the Tennessee State Museum at Nashville, was killed by a hunter at a small pond near Russellville, Logan County (Ganier, 1938:97; and notes). There is an unconfirmed record of one ("all-white, long-necked bird weighing 16 pounds") said to have been shot in the fall of 1945 at Kentucky Lake (Morse, 1950b:5). There are no records from the Ohio River in extreme eastern Kentucky, but the species may be expected to occur there. It has been recorded nearby, at Huntington, West Virginia (Seeber and Edeburn, 1952).

Winter.—An adult and an immature seen on the Ohio River near Louisville by Monroe, December 22, 1935 (Monroe and Mengel, 1939:39), were probably late transients. Another was seen there on January 6, 1957 (Monroe). At Madisonville, 5 swans from a flock of 10 on Grapevine Lake were killed by hunters December 9, 1932, and 3 brought to Bacon for identification; the remainder, or other swans, were seen again in the area, February 2-4, 1933 (Bacon, 1933; 1954:28-29). Evidently they wintered there (see also Spring). Another was reported in Hopkins County, at Spring Lake, December 2, 1940 (Bacon, 1954:29).

Remarks.—Early records of swans are not generally reliable as to species. Possibly the Trumpeter Swan was originally the more numerous species in this area (see Bent, 1925:292-293). While recent records are referable with reasonable safety to the present species, it is impossible to say when this became true. Audubon did not report the Whistling Swan from Kentucky, although some of the many swans he considered Trumpeters may well have been Whistling Swans. Langdon (1879:185) considered the Whistling Swan rare at Cincinnati. Pindar (1925a:81) claimed to have identified both species "positively" in Fulton County in 1892 and 1893, and referred also (1887a:55; 1889b:312) to 2 unidentified swans he saw on the Mississippi River in December, 1885. Wilson's reference (1922b:96) to "Whistling Swans" in Ballard County in late summer resulted from an error; the reference applied to the Common Egret (letter: October 2, 1952) but was cited without comment by Funkhouser (1925:171). A record made at Dale Hollow Lake and given as September 29, 1929 [??] is unsatisfactory as reported by Starr (1955).

Specimens examined.—Total, 1. Collection of J. P. Doughty—1 immature, Carroll County (Nov. 13, 1940).

Olor buccinator Richardson: TRUMPETER SWAN

Status.—From all indications (see "remarks" under Whistling Swan) a common transient and winter resident in early times, at least along the Ohio and Mississippi rivers. Not recorded in the present century.

Records.—Audubon (1838:537, 541) wrote that the Trumpeter Swan arrived on

the lower Ohio about the end of October, preferring ponds near the river. In mild winters a few remained until early March. At Henderson he kept a cripple as a pet for two years. With several Shawnee hunters, on or near Christmas day of 1810, Audubon visited, and perhaps was the first European to name, Swan Lake, in what is now Ballard County, only a few miles from the confluence of the Ohio and Mississippi rivers. This event was described in journals no longer extant but reproduced, how accurately we do not know, in the biography edited by Robert Buchanan (Audubon, 1868:26-27). According to this, the party killed more than 50 swans in a few moments, ignoring the many ducks and geese, and Audubon wrote: "when the lake burst on our view there were the swans by hundreds, and white as rich cream, either dipping their black bills in the water, or stretching one leg out on its surface, or gently floating along. . . . it seemed as if thousands of large, fat, and heavy swans were startled." On his trip down the Ohio in 1820, Audubon (1929:26, 28, Journal of 1820-21) saw several swans, perhaps of this species, on November 14 near the mouth of the Tennessee River, and 2 on November 15 near Little America, Illinois (opposite Ballard County). Much later, Cooke (1888:79) listed Trumpeter Swans [?] reported at Shawneetown, Illinois (opposite Union County) on March 19, 1885, presumably by C. J. Lemen and George Rearden, his correspondents there (*op. cit.*:43). Perhaps the last record, and certainly the most publicized (see Langdon, 1879:185; Butler, 1929:198; Trautman, 1940:171) is that of 1 killed from a flock of 3 on the Ohio River 12 miles downstream from Cincinnati (Boone County, Kentucky) by one Max Wocher, in December, 1876. This specimen, with another said to be from the same locality, is now in the collection of the Cincinnati Museum of Natural History, labelled female, with original number 411 of the Cuvier Press Club Collection (Trautman, *loc. cit.*).

Specimens.—Total, 1. C.M.N.H.—1 female, Boone County (Dec., 1876). Identification by Milton B. Trautman.

Branta canadensis (Linnaeus): CANADA GOOSE

Status.—Regular and fairly common transient throughout the state (flocks rarely stop except on larger rivers and lakes); regular winter resident in moderate and growing numbers in the south and west, especially about Kentucky Lake.

Spring.—Some migration is usually in progress by late February; main flight usually in March; rare after mid-April. At Morehead, Rowan County, the earliest record (1933-1939) was for March 9 (Barbour, 1952:24). At Louisville, where the species is not known to winter, a few sometimes appear in late January, often in late February (Monroe, J. P. Doughty). It has been recorded in Hopkins County as early as February 14 (Bacon, 1933). At Kentucky Lake wintering flocks are usually augmented in middle or late February, presumably by transients (Atwood, 1948). More than 10,000 were present on the Ohio below Henderson on February 22, 1953 (Rhoads, 1953:34). In March, migrating flocks are frequently seen more or less throughout the state, but rarely stop. Flocks, usually of 100 birds or less, occasionally rest on larger bodies of water (see Monroe and Mengel, 1939:39; Wilson, 1940a:16). Late records: April 17, in Rowan County (Barbour, 1952:24); April 18 (1953), and May 12 (probably crippled), at Louisville (Monroe); May 12, in Hopkins County (Bacon, 1933); March 24, at Kentucky Lake, latest, 1946-1949 (Morse, 1950b:Table 2).

Breeding records.—Wild Canada Geese occasionally breed well south of the normal range, usually as a result of matings with captive or crippled birds. This occurred at Kentucky Woodlands National Wildlife Refuge, in Lyon and Trigg counties, in 1945 and 1946: 2 young, April 30, 1945, progeny of wild bird and wing-clipped decoy; 5 eggs in 1946, 3 hatched in early May, 2 young survived (Atwood, 1948:25-26). Pindar (1886) reported evidence of breeding at Reelfoot Lake, Tennessee, in 1886 and earlier; the birds concerned were probably crippled in the spring

shooting then prevalent, as suggested by Ganier (1933a:18), but the subspecies *B. c. interior* (see Delacour, 1951; and "geographic variation," below) is supposed to have nested this far south in earlier times.

Summer.—On June 25, 1948, while I was working at Slade, Powell County, on the Cumberland Plateau, a "big flock" of honking geese flew over nearby Nada. The flock was seen by many residents, causing much comment, and called to mind a record of 200 seen (Williams, 1945:104) over Houston, Texas, on July 12, 1932. Wilson (1940a:16) reported individuals summering with domestic flocks in Warren County in 1927 and 1934.

Fall.—A few Canada Geese sometimes arrive by early October; main flight in late October or early November; stragglers occur well into December in areas where wintering is unknown. At Morehead, on the Cumberland Plateau, Barbour's earliest record (1952:24) was for October 29; farther east, Reed (1957:70) noted more than 100 Canada Geese over Pike County hills on October 18, 1957. At more western localities the species has been noted much earlier: on September 30, 1960, at Louisville (Monroe), with 50 on October 10 and 11, 1959 (Stamm, Brecher, and Lovell, 1960:4); September 28 (1885), at Shawneetown, Illinois (Cooke, 1888:77); and as early as October 1 (1946, 12 birds) and September 2 (1947, 5 birds), at Kentucky Woodlands National Wildlife Refuge (Atwood, 1948:26–27). The average date of arrival is somewhat later. At the peak of migration the species is fairly common throughout the state, especially west of the Cumberland Plateau, and is most frequently observed along and near the larger streams. While almost constantly in the field, October 20 to November 25, 1948, I recorded the following (east to west): 40 or 50 (estimate) over Slade, Powell County, the night of November 23; 85 over Otter Creek Park, Meade County, October 22; flocks of 13 and 34, resting on the Ohio River at Henderson, November 16; 2 on the Mississippi at Hickman, November 13; and 70 at "Kentucky Bend" of the Mississippi, Fulton County, November 7.

Winter.—The species seems to winter more or less regularly, though locally, in the Pennyroyal of southern Kentucky, at Kentucky Woodlands National Wildlife Refuge, and in the Purchase. There are no records of certain wintering at Louisville, but these geese are occasionally recorded in late December, and in January. Monroe saw a flock of 23 on December 28, 1945. Blincoe (1925:407) recorded 8 in Nelson County, January 31, 1921. Wintering is well known farther south: Wilson (1929:180; 1939c:34) has reported flocks of up to 200 in Warren County and Funkhouser (1925:171) mentioned the occurrence of flocks up to 300 at a farm near Glasgow, Barren County, where the birds were fed and protected for several years around 1917. At Kentucky Woodlands National Wildlife Refuge the numbers wintering have increased steadily since 1941 when management was begun. A detailed summary of numbers using the Refuge from 1941 to 1948 (peak, 475 in 1948) was given by Atwood (1948). Many thousands winter annually at Horseshoe Lake National Wildlife Refuge, in Illinois near Ballard County, Kentucky, where some of them are often seen in winter. Well up the Ohio River, Cooke (1888:77) reported large numbers wintering in 1884–1885 at Shawneetown, Illinois, opposite Union County, Kentucky, an area where many sometimes winter today (see Soaper, 1958:22–22,000 along 90 miles of the Ohio River, February, 1958).

Note.—An albino Canada Goose was noted on the lower Ohio River on January 27, 1958 (Russell, 1958:24).

Geographic variation.—For years Canada Geese in Kentucky were generally listed as *Branta canadensis canadensis* (Linnaeus), a subspecies so restricted in breeding range (as shown by revisionary work of recent years) that it is unlikely to occur in Kentucky in any numbers. Several subspecies probably occur in the state, but no specimens at all are available for identification! Hanson (1951) has shown that the majority of the wintering population of nearby southern Illinois represents the subspecies *B. c. interior* Todd, to which most Kentucky migrants probably be-

long also. In addition to *B. c. "canadensis"* [= *interior*?], Pindar (1925a:81) listed the small subspecies *B. c. hutchinsii* (Richardson) as a rare migrant in Fulton County around 1890. Wilson (1940a:16) tentatively reported *hutchinsii* in Warren County in the spring of 1937 (see also Wilson, 1952c:45) and noted other small geese there on January 20, 1952 (Wilson, 1956c:60). *Branta canadensis maxima* Delacour is supposed to have nested formerly in western Kentucky and Tennessee. Until specimens are obtained and identified, no subspecies can be formally recorded from Kentucky.

**Anser albifrons* (Scopoli): WHITE-FRONTED GOOSE

Status.—In early times evidently a regular transient and winter resident, at least in western Kentucky; seemingly unrecorded since 1911, the species should be casual on migration.

Records.—Audubon (1835:568), who clearly distinguished this species from other geese, wrote that he saw it in good numbers every winter of his residence in Kentucky (roughly 1807–1819) and mentioned killing 7 on one occasion, near Henderson. He added that the species arrived before the Canada Goose, preferring grassy ponds. His observations that the flocks usually kept apart from other geese and seldom exceeded 30 to 50 individuals could have been made in Kansas today. Langdon (1879:185) referred to a specimen taken by Dury at Miamitown, Ohio, about 6 miles north of the Ohio River. This specimen is seemingly not now in the collection of the Cincinnati Museum of Natural History (see Maslowski and Dury, 1931). Pindar (1925a:80) gave no evidence for his (probably correct) statement that the species was a "rare and irregular migrant" in Fulton County in the 1890's.

The only record I can find for the present century is that of Bacon (1933, and personal com., 1951), who found 1 dead in Hopkins County after a severe storm of October 17, 1911 (not preserved). Some time ago the late R. C. Soaper (verbal com.) recalled seeing a few "speckle-bellies" in comparatively recent years among the many Canada Geese at Horseshoe Lake, Illinois, not far from Ballard County.

Geographic variation.—The North American subspecies, to which any White-fronted Goose occurring in Kentucky would presumably belong, is now known as *Anser albifrons frontalis* Baird.

Chen caerulescens (Linnaeus): WAVY¹

Note.—For a long time I was reluctant to yield to a growing doubt, one by no means new or original (see Mayr, 1942:242–243), that the "Blue Goose, *Chen caerulescens* (Linnaeus)" and "Snow Goose, *Chen hyperborea* (Pallas)" of the A.O.U. Check-List (1957:67–68; and earlier edits.) are distinct species. With the appearance, technically just beyond the deadline for inclusion of new material herein, of Cooch's recent study,² this doubt has finally given way to conviction, namely that *Chen caerulescens* consists of two subspecies, a small, polymorphic *Chen caerulescens caerulescens* (Linnaeus), both color phases of which occur in Kentucky (although in differential numbers and patterns of occurrence), and a large, monomorphic *Chen caerulescens atlantica* Kennard (the old "Greater Snow Goose"), which does not occur in Kentucky.

Status.—Transient (chiefly observed along the Mississippi and lower Ohio rivers, less frequently eastward and overland), fairly common to (occasionally) abundant in autumn, irregular and usually much less numerous in spring; casual in winter in western Kentucky. Dark-phased birds ("blue geese") are far in the majority, but large flocks usually include some light-phased individuals ("snow geese").

¹ There are obvious disadvantages to the use of either blue or snow as the vernacular name of the composite species. The name here proposed, long used by hunters for both "species," and descriptive of the lines they form in flight, has both precedent and esthetics to recommend it.

² G. Cooch. Ecological aspects of the Blue-Snow Goose complex. *Auk*, 78:72–89, 1961.

Since the species is much less numerous in spring, white birds are very rarely recorded at that season.

Spring.—The comparatively few records are mostly for March, but range from February 15 (whether or not representing transients, most January records are given under "winter," below) to May 8. Goodpaster saw 2 dark-phased birds in the Ohio River bottoms near Cincinnati, just across from Campbell County, Kentucky, on March 20, 1949 (Maslowski, notes). Monroe's only spring record at Louisville is for April 9 (dark phase). A few Wavies occasionally stop at the Woodburn lakes near Bowling Green, Warren County, where groups and flocks of 2 to 100 or more birds (white-phased birds recorded only March 8 to April 14, 1956, 5 to 25 with many more dark-phased) have been recorded in various years, as early as February 15 (1939) but mainly in March and April (Wilson, 1933a:142; 1940a:16; 1956c:61; 1957b:60). I saw 10 birds there on May 8, 1937. With some white-phased birds present, the species was recorded at Kentucky Lake between March 16 and 29, 1946–1950 (Morse, 1950; 1950b:8, and Table 2) and at Kentucky Woodlands National Wildlife Refuge on May 3, 1940 (Cypert, Refuge files; 7 birds). Conservation Officer John McClintock observed a large flight, estimated at 10 to 15 thousand and including both phases, at "Kentucky Bend" of the Mississippi River on March 22, 1950 (Morse, 1950). Flights of this size are very unusual this far east. The main spring flight usually passes to the west of the Mississippi River, especially that of the white-phased population. The snowy birds, in Kentucky, are very rare in spring east of the Tennessee River.

Fall.—There is one record—of 25 dark-phased birds—for the early date of September 22 (1955), at Louisville (Carpenter, 1956:21). The size of the flight varies considerably from year to year. The species is much more numerous than in spring, and often fairly common, but is somewhat irregular. Usually arrives mid-October to early November; rare by early December. In the Ohio Valley east of Cincinnati, and in eastern Kentucky generally, the species seems to be rare. About 100 birds, including a few light-phased individuals, were seen by Maslowski and Goodpaster (notes) over the Kinniconick River in Lewis County, in late October, 1945. The species was not recorded in Rowan County (1933–1939) by Barbour (1952) and is very rare at Huntington, West Virginia (Seeber and Edeburn, 1952). In 1951, Conservation Officer G. H. Spann told me that not long before a group containing light and dark birds was killed in attempting to alight on a wet highway in Wayne County, at the edge of the Cumberland Plateau. From Cincinnati and Louisville westward, these geese have been reported from many localities near the Ohio and Mississippi rivers. At Cincinnati, Ohio, a large flight occurred along the Ohio River between November 2 and 10, 1945 (Maslowski and Goodpaster). At Louisville, where the species is fairly regular, a remarkable flight occurred on October 13, 1937, when more than 1,500 birds, mainly dark-phased, passed along the Ohio River just above Louisville (Mengel, 1938b:26). At this time a major flight was noted at other localities, in several states (*e.g.*, Monk, 1937, *re* Nashville, Tennessee). A fair number are taken by hunters along the Ohio River, mainly from Louisville westward. Details of migration at Kentucky Lake were given by Morse (1950b:7), who recorded peaks (chiefly dark-phased birds) on November 4, 1946, and November 14, 1947. Pure flocks of light-phased birds are unusual. Monroe noted 31 over Louisville on October 18, 1936, and DeLime saw 18 at Kentucky Lake on December 8, 1947 (Morse, *loc. cit.*). In the fall of 1948 I observed the following: flocks of 140 (4 light-phased) and 200 (7 light-phased) on the Ohio River near Henderson, November 16; 15 birds (3 light-phased), on Kentucky Lake, Marshall County, November 15; 23 birds (none light-phased) resting on the Mississippi River off Hickman, November 13. Away from the larger rivers the species is seldom recorded. Wilson (1951:4) observed 9 dark-phased and 6 white Wavies at Bowling Green on October 19, 1950. At Mammoth Cave, Edmonson County, he noted migrating flocks of 60 and 250 (mostly dark) on October 22, 1955 (Wilson, 1956:19), and of 24 (all dark) on January 1, 1954 (Wilson, 1954:48).

Other extreme records: October 13 (1937) to December 5 (1948, both phases), at Louisville (Monroe); October 23 to December 8 (1946-1948), at Kentucky Lake (Morse, 1950b:Table 2); December 24 to 29 (1957), several dark-phased birds at Frankfort and Danville (see *Kentucky Warbler*, 34:8, 14, 1958).

Winter.—On several occasions in recent years the species has been seen in very late fall and very early spring at various central and western localities, and reported on occasional Christmas bird counts from scattered points. The majority of birds so listed are probably late or early transients: for example, the birds noted by Wilson at Mammoth Cave (see above) on January 1, 1954; 2 light- and 2 dark-phased birds seen at Louisville by Monroe on January 4, 1949; 7 dark-phased birds with 1 light-phased at Henderson, February 2-3, 1958 (Soaper, 1958:19); and 5 dark-phased birds on the lower Ohio River on January 27, 1958 (Russell, 1958:24). In the winters of 1948-1949 (Lovell, 1949) and 1949-1950 (Talbot Clark, then Refuge Manager, Kentucky Woodlands National Wildlife Refuge, verbal com.), a few birds wintered at Kentucky Lake, mostly white Wavies the first winter, mostly dark the second. A flock of 5 dark birds was seen there at Egner's Ferry Bridge, Trigg-Marshall counties, on January 19, 1950 (Morse, 1950). Near Madisonville an adult, dark-plumaged Wavy which arrived on November 6, 1951, remained on Brown Meadow Lake throughout the winter (Hancock, letter: December 29, 1951, and notes). Old winter records of light-phased birds in southern Indiana and Ohio were given by Butler (1897:632) and Langdon (1879:185). Langdon (1877:16) also mentioned specimens shot "in Kentucky."

Geographic variation.—The subspecies occurring in Kentucky is here considered to be *Chen caerulescens caerulescens* (Linnaeus); see note beginning this account. Reference to the occurrence of the large eastern subspecies (the old "Greater Snow Goose," *Chen hyperborea atlantica* Kennard, new name for *C. h. nivalis* Forster), which has no dark phase, in the Mississippi Valley were common in the older literature (e.g., Butler, 1897:632), until Kennard (1927) showed that most, if not all, of the "snow geese" from this area actually belonged with the smaller subspecies, then called *Chen hyperborea hyperborea* (Pallas) and here considered a morph of *Chen caerulescens caerulescens* (Linnaeus). This is true of the 2 light-phased specimens examined; all sight records have been arbitrarily referred to the last-named subspecies.

Specimens examined.—Total, 3. B.L.M.—2 immature males, Jefferson County (Oct. 24, 1938, dark phase; Oct. 25, 1939, light phase); Jacob P. Doughty Coll.—1 unsexed adult, Carroll County (Oct. 26, 1940; light phase).

Anas platyrhynchos Linnaeus: MALLARD

Status.—Common to abundant transient and winter resident in favorable localities, mainly west of the Cumberland Plateau; occasionally recorded breeding in central and western Kentucky.

Spring.—Since many birds winter, arrival dates of transients are difficult to determine accurately; generally an increase occurs in late February or early March; main flight in mid-March; rather rare by early April. Blincoe (1925:407) found Mallards numerous at Bardstown on February 24, 1918, suggesting that migration had begun. The Mallard, Black Duck, American Widgeon, and Pintail make up the main early flight of dabbling ducks, the Mallard being perhaps the commonest (see also Morse, 1950b:7). It occurs throughout the state, being much more numerous west of the Cumberland Plateau, for which a few probably authentic records have been given by Funkhouser (1925:162) and Barbour (1952:24). During good flights, groups of 30 or 40 to several hundreds, or even thousands, may be seen along the Ohio River and in nearby corn fields at Louisville (Monroe, J. P. Doughty, Mengel), Henderson (see Rhoads, 1953), and at other points. Fair to large numbers are often recorded on ponds and lakes, especially the karst overflows in the Pennyroyal, where hundreds are often present at the Woodburn lakes in Warren County (Wilson, 1940a:17; 1951:4; 1952c:45; 1957b:60), at Kentucky

Lake (Morse, 1950*b*; summary), and at Reelfoot Lake, Tennessee (Ganier, 1933*a*:19). Recently flights have varied considerably in size from year to year. Selected late records: April 16, in Rowan County (Barbour, 1952:24); April 19, at Louisville (Monroe); April 23, at Kentucky Lake (Morse, 1950*b*:Table 2, 1945-1948); May 9, in Warren County (Wilson, 1951:4).

Breeding records.—Long ago Audubon (1835:165) remarked that Mallards nested about ponds in the lowlands of Kentucky, but definite breeding records remain few. A wild female (mate not seen) incubated 12 eggs in Caperton's Swamp near Louisville in late April and early May, 1932, but was killed by someone and the eggs destroyed (Monroe). Small young accompanied by females were recorded at Carrollton, Carroll County (Webster, 1951:21, three broods in a small marsh), and McElroy Lake, Warren County (Wilson, 1929:181, brood of 10 on July 9, 1927). Morse (1950*b*:10) reported indications of breeding at Kentucky Lake, in Calloway County, in 1947 and 1948, and a nest with 4 eggs found nearby in Tennessee in spring, 1948.

Summer.—A small number, perhaps including some breeding birds, summers irregularly, mainly in the south and west. I saw 3 Mallards at Swan Lake, Ballard County on June 27, 1941, and there are reports from Hopkins County (Bacon, 1933, and personal com.) and Reelfoot Lake, Tennessee (Ganier, 1933*a*:19, "crippled" birds breeding). Several times in June, 1949, I saw healthy looking wild Mallards about Reelfoot Lake. At numerous localities, flocks of semi-domestic Mallards are frequently seen about city parks and the docking areas of lakes.

Fall.—A few seen very early may well be locally reared or breeding birds. Early records at the Falls of the Ohio River at Louisville include 6 birds seen on August 1, 1959 (Stamm, Brecher, and Lovell, 1960:4), 9 on August 10, 1957 (Croft, 1958*a*:46), 1 female on September 9, 1951 (Monroe, notes), and other birds on September 14, 1958 (Brecher, 1958*a*:52). There are early records as well for Hopkins County, September 22 (Bacon, 1933), and Rowan County, October 3 (Barbour, 1952:24). In frontier days, according to Audubon (1835:165), transients arrived in mid-September and early October; today conspicuous migratory movement is rarely, if ever, noted before early or mid-October (Monroe's earliest record at Louisville, 1934-1950, was for October 12), with the main flight late October to mid-November or later. Jacob P. Doughty, veteran duck hunter (personal com.), fixes the peak of migration on the Ohio River above Louisville at late October to mid-November in different years, agreeing roughly with data from Kentucky Lake given by Morse (1950*b*:6): peaks November 4-16 and December 11-16, 1946, November 6-13, 1947. In autumn, like most ducks, Mallards frequent large waters more exclusively than in spring. They are often common and are frequently taken by hunters. From November 6 to 12, 1948, I saw hundreds of migrating Mallards, with fewer Black Ducks, flying over farm country and lowland woods in Hickman and Fulton counties, and about 1,100 Mallards and Black Ducks (Blacks 2 or 3 to 1) at Henderson on November 16. In some years large flights do not arrive until winter (see Rhoads, 1953).

Winter.—Mallards tend to occur in large flocks, together with Black Ducks. Large numbers usually remain on the lower Ohio and the Mississippi rivers through all but extremely cold winters, when they are forced to leave, probably by freezing of the water. The numbers remaining along the Ohio River east of Cincinnati, Ohio (where there are few midwinter records) are probably much smaller, as in West Virginia (see Brooks, 1944:14; Seeber and Edeburn, 1952). The Ohio between Carrollton and Louisville has long been a favorite wintering ground.¹ In Oldham and Trimble counties, along this stretch, one or more flocks of 1,000 to 3,000 Black Ducks and Mallards have habitually congregated, the former being usually two or three times the more numerous. Even larger congregations regularly occur along

¹ Since this was written, dredging operations and related developments seem to have made this area much less attractive to wintering ducks (Monroe, personal com., December, 1960).

the lower Ohio River and the Mississippi. Considerable variation in numbers and locations, even in a given winter, is frequent, is sometimes mistaken for migration, and is known to wildfowling as "trading" (see Cooke, 1888:62). While detailed information is still scarce, despite the statement of Morse (1950b:Table 2) that the Black Duck was the most abundant wintering duck at Kentucky Lake, 1946-1948, a survey of 36 Christmas bird counts of the Kentucky Ornithological Society, 1937-1950, suggests that the Mallard is ordinarily increasingly numerous towards the west, while the Black Duck, if not actually decreasing, remains at best equal in numbers from Carrollton westward. My own observations, though limited, tend to support this, as do the much more extensive ones of J. P. Doughty (personal com., 1952). In early and mid-February, 1958, a winter of unusual duck concentrations, Soaper (1958:22) estimated that 430,000 Mallards were present along 90 miles of the Ohio River in the Henderson area (these with some 30,000 Black Ducks and—an unusually small number—3,000 Pintails).

Geographic variation.—The subspecies occurring is the widespread *Anas platyrhynchos platyrhynchos* Linnaeus.

Specimens examined.—None with formal data! Several mounted specimens, Jefferson and Oldham counties, in collection of Jacob P. Doughty.

Anas rubripes Brewster: BLACK DUCK

Status.—Fairly common to common transient and winter resident in favorable localities, mainly west of the Cumberland Plateau.

Spring.—Transients cannot be distinguished certainly from winter residents, but in February or early March there is often an influx of Black Ducks in areas where they were rare or absent in winter. Main flight in late February or March; rare by mid-April. In Warren County, near Bowling Green, where it does not usually winter, the species is often recorded in early February (Wilson, 1937:18; 1939a:35; 1940a:17; 1951:4; 1957b:60) and maximum numbers are usually present in late February and early March. A large concentration in Fulton County, February 18-26, 1887, was recorded by Pindar (1925a:79); another, in Henderson County, February 22, 1953, by Rhoads (1953); and Morse (1950b:7) placed the peak of migration at Kentucky Lake in the first half of March. Practically nothing is known of the species on the Cumberland Plateau, west of which it is generally common, occurring on ponds, reservoirs, and small streams, as well as along the larger rivers. While the Black Duck is common at Cincinnati (Goodpaster, 1941:9; Kemsies and Randle, 1953:6), it is somewhat less numerous on the upper Ohio River (see Seeber and Edeburn, 1952). At the peak of the flight, hundreds often gather along the Ohio River and in nearby fields at Louisville (Monroe); I saw a flock of 50 there as late as April 11 (1949). Late records: April 17 (10), at Lexington, in 1950 (Edwards, notes); April 28 (1958), at Louisville (Monroe); May 4, in Warren County (Wilson, 1940a:17), where I saw 1 at Chaney Lake on May 3, 1949; May 6, at Kentucky Lake (Morse, 1950b:Table 2).

Summer.—Monroe collected a male, the gonads of which were small, on the Ohio River in Oldham County on June 25, 1939 (B.L.M.), and a few individuals summered on the karst lakes near Bowling Green in 1935, 1937, and 1950 (Wilson, 1940a:17; 1951:4). Summering birds should be watched for evidence of breeding, since there is a barely extralimital nesting record from near Cincinnati, Ohio (Kemsies and Randle, 1953:7). Whether the "Mottled Duck" reported by Figgins (1945:84) as seen in Marshall County, August 16, 1941, was, perhaps, a Black Duck or a female Mallard is unknown; it can scarcely be accepted as *Anas fulvigula*. It is interesting, however, that Audubon (1838:15) wrote, of "*Anas obscura*" (a name based on both *A. rubripes* and *A. fulvigula*): "I have found the Black Duck breeding on lakes near the Mississippi, as far up as its confluence with the Ohio, as well as in Pennsylvania and New Jersey." When referring to the nesting of "*Anas obscura*" in Labrador (*A. rubripes*) and Texas (*A. fulvigula*), this account has been prominently quoted (see Bent, 1925:52, 73), but the above-mentioned

portion has been passed over. It does not seem impossible, however, that some southern form of *Anas* once nested well up the Mississippi Valley.

Fall.—Early arrivals may appear in the first two weeks of October; the peak of migration seems usually to fall from late October to mid-November, but sometimes later. Early records: October 11, at Louisville (Monroe); October 4, at Kentucky Lake (Morse, 1950*b*:Table 2, earliest, 1945–1948). Black Ducks are common during the main flight, especially on large waters, and are often killed by hunters. An especially heavy flight was recorded at Cincinnati by Maslowski and Goodpaster (notes), November 2–10, 1945, and from this point westward large flights are often noted (see Morse, 1950*b*, for some details of migration at Kentucky Lake). In 1948 I noted flocks of from 40 to about 130 birds at several points in the Purchase, November 6–13, and about 800, with fewer Mallards, at Henderson on November 16.

Winter.—Small numbers winter on the upper Ohio River, as far east as West Virginia (see Seeber and Edeburn, 1952). The species is common at Cincinnati (Goodpaster, 1941:9; Kemsies and Randle, 1953:6), and down the rest of the Ohio River. Unusual numbers were present and wintering in Warren County in 1952 (Wilson, 1952*c*:45). In general, west of Louisville and at localities removed from the larger rivers, the Black Duck is outnumbered by the Mallard (see account of that species for further notes pertinent to both).

Specimens examined.—Total, 2+. B.L.M.—1 male, Oldham County (June 25, 1939); U.M.M.Z.—1 female, Campbell County (on line, Clermont County, Ohio; March 28, 1942; Woodrow Goodpaster); also several mounted specimens from near Louisville in J. P. Doughty Collection.

Anas strepera Linnaeus: GADWALL

Status.—Transient, rare to uncommon, but regular in favorable localities, and probably a very rare winter resident; all records from west of the Cumberland Plateau.

Spring.—Early arrivals sometimes appear in February, usually late in the month; most Gadwalls are seen in late March and early April; a few remain into May. In the past the species has probably been overlooked by many observers, some of whom think it is now increasing. It is usually seen in small numbers, with other dabbling ducks, about backwaters, shallow ponds, and flooded fields, but frequents larger waters as well. In 1957 the species was noted in Warren County (Wilson, 1957*b*:60) on the unusually early date of February 2. One was seen near Cincinnati on February 18, 1934, by Maslowski (Goodpaster, 1941:9). Near Louisville J. P. Doughty has observed Gadwalls, presumed to be transients, several times around February 22 (verbal com.), and I saw an apparently mated pair in a flooded corn field there on February 28, 1946. In March and April the species has been recorded regularly, in moderate numbers, at Louisville (Monroe) and Cincinnati (Kemsies and Randle, 1953:7). Maslowski's notes refer to 12 seen March 21, 1949, and 18 on March 12, 1950, in the Ohio River bottoms east of Cincinnati, Ohio, and 100 yards from the Kentucky line; 200 were seen near Cincinnati on April 6, 1950 (Kemsies and Randle, *loc. cit.*). On April 12 and 14, 1951, I saw three pairs near Mill Springs, Wayne County, at the edge of the Cumberland Plateau. For some years the Gadwall was recorded only rarely by Wilson (1940*a*:17), in Warren County, and Bacon (1933), at Madisonville. Morse (1950*b*:Table 2) had several records for Kentucky Lake (1945–1948). Late records: May 8 (1949), at Louisville (Monroe); May 3 (1952), in Warren County (Wilson, 1952*c*:45); May 8, at Kentucky Lake (Morse, 1950*b*:Table 2; see also Morse, 1949, record for May 5, 1949).

Summer.—From 3 to 8 presumably non-breeding birds (or migrants?) were recorded at the karst lakes near Bowling Green late in the summer of 1950 (Wilson, 1951:4; and letter of October 2, 1952).

Fall.—Gadwalls sometimes arrive in late October, more often in early November;

they are most numerous later in that month. Early records: October 30 (1960), at Louisville (Monroe); November 1-10, in Hopkins County (Bacon, 1933); November 4, at Kentucky Lake (Morse, 1950b:Table 2). The species is less frequently observed than in spring, probably owing to a tendency to remain more exclusively on large waters. According to J. P. Doughty, probably better qualified than anyone to judge, the numbers occurring along the Ohio River from Carrollton to Louisville in autumn are quite equal to those in spring. He had found limited numbers regularly present, taking specimens from time to time in November and early December. Monroe has a male (B.L.M.) taken December 4, 1938, at a pond in southern Jefferson County. Morse's latest record (1950b) for Kentucky Lake was for December 8.

Winter.—A few Gadwalls linger very late, or arrive (see "spring") very early, and a few probably winter on occasion in central Kentucky. In the west, with its more favorable habitats and milder winters, the probability of wintering is greater. The species winters regularly at Reelfoot Lake, Tennessee (Doughty). Goodpaster took a male on the Ohio River above Cincinnati, in Campbell County, January 4, 1941 (U.M.M.Z.). Doughty killed 1 in Oldham County, January 4, 1947. Jefferson County records include 5 seen with 1 American Widgeon near Harrod's Creek on January 2, 1939 (Mengel), and 5 near Louisville on January 10, 1949 (Monroe). Despite the foregoing, however, absolute proof of wintering is still lacking.

Specimens examined.—Total, 2. B.L.M.—1 male, Jefferson County (Dec. 4); U.M.M.Z.—1 male, Campbell County (Jan. 4).

Anas acuta Linnaeus: PINTAIL

Status.—Transient, common in spring, rare to fairly common in fall; winter resident, irregularly, rare to fairly common.

Spring.—The migration of Pintails, although usually reaching its peak in late February or early March, may begin so early—in late January or early February—and emphatically as to suggest large-scale winter residency, and indeed it is not quite certain that this does not occasionally occur in some areas along the Ohio River. Soaper (1958:22) considered 3,100, along 90 miles of the Ohio River near Henderson in early February, 1958, an unusually low number. Regardless of the numbers wintering in various years, the Pintail, Black Duck, Mallard, and American Widgeon make up the bulk of the early spring migration of dabbling ducks. The present species occurs typically in moderate- to large-sized flocks and is less often seen on small ponds and streams than the other dabblers. Early records: February 24, at Cincinnati, Ohio (Goodpaster, 1941:9—winters rarely); February 8 (1950), at Bardstown, Nelson County, where I saw a female on a stock pond with 2 American Widgeons; January 20 (1952), in Warren County (Wilson, 1952c:45). At Louisville, Monroe and J. P. Doughty have noticed an influx in most years around mid-February. In February and early March, moderate or large numbers have been seen by Maslowski (notes) and Kemsies and Randle (1953:7) near Cincinnati, Ohio (flocks of 200-300); by Monroe and others near Louisville (sometimes hundreds); by Wilson (1935; 1940a:17; 1952c:45; 1957b:60) in Warren County (more than 1,000 on several occasions from 1933 to 1952); and by Soaper (1958:22) near Henderson, where 20 to 30 thousand have sometimes been present along some 90 miles of the Ohio River. Late records: April 14, at Cincinnati, Ohio (Goodpaster, 1941:9); May 4 (1958), at Louisville (Monroe; next record, April 26); May 18 (1937), in Warren County (Wilson, 1937:18, usually rare or gone by mid-April); April 16, in Hopkins County (Bacon, 1933); March 26, at Kentucky Lake (Morse, 1950b:Table 2, 1945-1948).

Summer.—A female, said to be crippled, was seen at McElroy Lake, near Bowling Green, until June 22, 1937, when the lake dried up (Wilson, 1937:18; 1940a:17). Near Louisville, in July, Monroe has seen a few birds, presumably injured or abnormal in some way.

Fall.—Although a few, mainly females, arrive earlier, the main migration of Pintails occurs in October and early November; they are rare by early December. Never as common as in spring, they remain for the most part on larger streams and lakes. At Louisville, Monroe and others have noted a few very early arrivals, presumably all females, between August 28 and September 23. Morse (1950*b*:Table 2) recorded the species at Kentucky Lake as early as September 26. It has been recorded at Cincinnati (Goodpaster, 1941:9), Louisville (scattered records, late October, November, and December; Monroe and J. P. Doughty), and various localities farther west, but from the Cumberland Plateau, so far as I know, only by Barbour (1952:24). The species occurs, however, on the upper Ohio River at Huntington, West Virginia (Seeber and Edeburn, 1952). Small numbers are taken by hunters. I saw 11 over lowland woods near Oakton, Hickman County, November 13, 1948. On November 16, 1948, Soaper and I saw a male hybrid (Pintail × Gadwall) on the Ohio River near Henderson (Mengel, notes).

Winter.—Pintails winter erratically along the Ohio River, at least from Cincinnati westward, and at favorable localities in other parts of western Kentucky. Near Louisville a few are present nearly every January and February (Monroe, J. P. Doughty). Cypert (Refuge files) saw a flock on January 1, 1942, at Kentucky Woodlands National Wildlife Refuge. For other references to wintering, or birds present in winter, see Goodpaster (1941:9—occasional at Cincinnati), Cooke (1888:68—many at Shawneetown, Illinois), Soaper (1958:22—many near Henderson), Morse (1950*b*—Kentucky Lake), and Pindar (1925*a*:80—Fulton County). While belated transients may be present in early January, and early transients in late January, it seems certain that at least some Pintails are present in Kentucky on every date of most winters.

Specimens examined.—Total, 1. B.L.M.—1 male, Meade County (Dec. 1, 1940).

Anas carolinensis Gmelin: GREEN-WINGED TEAL

Status.—Regular transient in small to moderate numbers; very rare winter resident; no definite records from the Cumberland Plateau.

Spring.—Green-winged Teal usually arrive in late February, occasionally earlier; most records are for the period mid-March to early April; rare by late April or early May. A few regularly arrive at Louisville in late February. Early records: February 27, at Cincinnati, Ohio (Goodpaster, 1941:9); February 22, at Louisville (J. P. Doughty); February 9 (1952), in Warren County (Wilson, 1952*c*:45; next record February 14, 1957, Wilson, 1957*b*:60); March 2, in Hopkins County (Bacon, 1933). Seldom numerous, these diminutive teal are usually seen alone or in small flocks, in all sorts of aquatic situations from small ponds and rain-pools to large, open waters. They have been reported from many localities west of the Cumberland Plateau, mainly in March and early April, and regularly recorded in all much-worked areas. Up to 50 in a day occur on the lakes near Bowling Green (Wilson, 1940*a*:17). Late records: May 7 (1950), at Louisville (Monroe; next record, April 16); May 2 (1949), in Warren County (Wilson and Mengel).

Fall.—Migration is rather protracted, as in spring, with no very apparent peak. The earliest Louisville records are for August 24, 1957, and September 11 and 12, 1948 (Monroe), and September 20, 1959 (Stamm, Brecher, and Lovell, 1960:4). Whether or not really less numerous, the species has been recorded less frequently than in spring, at scattered localities from Cincinnati, Ohio (Goodpaster, 1941:9—uncommon), to Fulton County, where Pindar (1887*a*:55) noted several birds in the market at Hickman on November 30, 1886. Bacon (1933) considered the species common at Madisonville, in small flocks, October 28–November 26. Late records: December 5, at Louisville (Monroe); December 19, at Kentucky Lake (Morse, 1950*b*:Table 2).

Winter.—Probably a few Green-wings remain through mild winters, especially in western Kentucky, but more observations are needed. The species has been re-

corded in early winter at Cincinnati, Ohio (Goodpaster, 1941:9, December 25, January 1), Louisville (Monroe; 1 on January 10, 1948), and various western localities (see Christmas bird counts, *Kentucky Warbler*). At Henderson, Soaper recorded 22 on December 29, 1950. Pindar (1925a:80) evidently considered it a fairly common winter visitant in Fulton County.

Specimens examined.—Total, 1. B.L.M.—1 female, Jefferson County (Sept. 28, 1946).

Anas discors Linnaeus: BLUE-WINGED TEAL

Status.—Common transient, chiefly in late spring and early fall; breeds rarely, although perhaps regularly, near the lower Ohio River and elsewhere in southern and western Kentucky; casual at least into early winter.

Spring.—The first Blue-winged Teal may appear in February or early March; the species usually arrives in numbers shortly after mid-March; main flight early to late April; numbers decrease sharply in early May, with a few lingering later, some to breed. A few Blue-wings probably arrive regularly at favored localities in February, as records between February 6 and 25 have been reported (Wilson, 1940a:17; 1951:4; 1952c:45, Warren County; Bacon, 1933, Hopkins County). More representative early records are slightly later: March 28, in Rowan County (Barbour, 1952:24); March 7 (1937), at Cincinnati, Ohio (Goodpaster, 1941:9); March 2 (1957), at Louisville (Monroe); March 24, at Kentucky Lake (Morse, 1950b:Table 2). One of the two or three most numerous ducks from late March to late April, this teal makes up the majority of the late migration of dabbling ducks, which consists also of many Shovelers and smaller numbers of belated American Widgeons, Gadwalls, and Green-winged Teal. The Blue-wing is to be found on practically every marsh, pond, and stream west of the Cumberland Plateau, and less frequently eastward. Flocks of a few to 100 or more are often seen on small ponds, and several hundred may sometimes be found about favored backwaters near the Ohio River and the larger karst lakes in Warren County. In several seasons of field work I found the species common in all areas visited west of the Cumberland Plateau, also recording a pair at London, Laurel County, on the Plateau, on April 10, 1951. As late in spring as May 2, 1949, Wilson and I saw more than 100 on Chaney Lake, Warren County. Many are paired by early April; courtship performances are often seen. Late records: May 25 (1950), at Lexington (Edwards, notes); May 15 (1954), at Louisville (Monroe); May 8, at Kentucky Lake (Morse, 1950b:Table 2).

Breeding records.—Monroe (notes) recorded the successful rearing of a brood in a small bottom land swamp just east of Louisville in the early summer of 1939. A few Blue-wings remain through summer at the karst lakes in Warren County, whenever the water level permits. Wilson (1940a:17) noted evidence of breeding there in 1927 (nest found), 1935, and 1937 (young seen). In 1948 (Wilson, 1948a:54) he saw 2 small young on May 29 and a brood of 9 downy young on June 5. Wilson and I saw 12 adults at Chaney Lake, June 19, 1949. Probably some of those that remain do not breed. I saw 3 in the cut-grass marshes at Reelfoot Lake, Tennessee, on May 27, 1949, and suspect the species of breeding there. Goodpaster (1941:9) saw a female, "probably a cripple," and young on the Miami River near Cincinnati, Ohio, barely outside Kentucky, in the summer of 1939, and Kemsies and Randle (1953:7) have reported further Cincinnati breeding records.

Fall.—Transients arrive early, often in August; main flight in September and early October; a few linger through October; casual later. Early records: August 23 (1936), at Cincinnati, Ohio (Goodpaster, 1941:9); August 10 (1957), at Louisville (Monroe; several records August 12–26); September 2, at Kentucky Lake (Morse, 1950b:Table 2). The migration of Blue-winged Teal is essentially over before other dabblers appear in numbers, and usually before the hunting season begins. Although small to medium-sized flocks are more or less regular on sloughs, lakes, and along the rivers, the autumn flight is not well documented in the literature. The species occurs regularly (Monroe), usually in numbers of 25 or less at a

time, on the Falls of the Ohio River at Louisville, where 65 were noted on September 10, 1959 (Stamm, Brecher, and Lovell, 1960:5). Carpenter (1941a:12) saw a flock of 150 in Crittenden County on September 10, 1940. I saw more than 100 at Caperton's Swamp, Louisville, on September 5, 1938, and Bacon and I saw a flock of 20 on a lake at Madisonville, September 18, 1951. Recorded in October, by authorities already cited, from Cincinnati (October 14, 1938), Louisville (scattered records), and Kentucky Lake (to October 7). There are Louisville records for November 11 (Stamm and Summerfield, 1952:41) and November 18 (Monroe).

Winter.—Occasionally a few birds linger north of the normal winter range. On January 13, 1949, Christian Goetz, an ardent Cincinnati duck hunter, showed Maslowski the head of a female killed on the Ohio River in Campbell County in late December, 1948. Another record for this area, January 23, 1938, was listed by Goodpaster (1941:9). Bacon (1933) recorded 3 on Grapevine Lake, Hopkins County, December 25, 1923. Casual references to wintering, of which there are several in the literature, should be viewed with mistrust.

Geographic variation.—*Anas discors orphna*, an Atlantic Seaboard and Great Lakes area subspecies, was described too late (by Stewart and Aldrich, 1956) for consideration in this work. Probably most Kentucky specimens represent *Anas discors discors* Linnaeus, the subspecies which should breed in the state, and which may be safely included in the present list.

Specimens examined.—Total, 6. M.S.C.—1 male, Carter County (May 6); U.K.—1 male, 1 female, Fayette County (April 7); B.L.M.—(sex?), Oldham County (April 7); W. Ky. State College Coll.—1 male (weight 368.9 gm.), Warren County (May 4, 1949; presented by R. M. Mengel); U.M.M.Z.—1 male, Warren County (May 5, 1949).

***Anas cyanoptera* Vieillot: CINNAMON TEAL

Status.—Casual vagrant or transient.

Records.—On March 20, 1951, Maslowski (letter: March 28, 1951), Goodpaster, and Christian Goetz discovered a male Cinnamon Teal in a backwater pond approximately 200 yards from the Ohio River and two miles east of Cincinnati, Hamilton County, Ohio. They and "at least a dozen other bird watchers" using good binoculars saw it during the next six days, sometimes as close as 50 yards. Maslowski and Goodpaster made repeated but unsuccessful attempts to secure the bird, which several times flew out over the Ohio River and thus into Campbell County, Kentucky. There can be little doubt of the correctness of the identification (see also Kemsies and Randle [1953:7-8], who also observed a bird thought to be a hybrid [Cinnamon Teal \times Wood Duck] at the mouth of the Little Miami River, December 8, 1948). In the market at Hickman, Fulton County, in December, 1892, Pindar (1925a:80) saw a Cinnamon Teal which may have come either from Tennessee or Kentucky "with various other ducks which had been shot on or near Reelfoot Lake." In the fall of 1952 a full-plumaged male was reported killed on the Ohio River by two duck hunters regarded by J. P. Doughty as reliable, but no part of the specimen was preserved.

Geographic variation.—Kentucky birds would presumably belong to the North American subspecies, *Anas cyanoptera septentrionalium* Snyder and Lumsden.

Mareca penelope (Linnaeus): EUROPEAN WIDGEON

Status.—Casual transient, mainly near the Ohio River.

Records.—Two males and a female were found on a backwater pond beside the Ohio River at Harrod's Creek, Jefferson County, on February 22, 1939, and a male was finally secured there, by J. P. Doughty, on February 28 (Monroe, 1939). Another was recorded near Louisville on April 19, 1957, by Stamm and Croft (*vide* Monroe). Maslowski (notes), Worth Randle, and others saw a male with many American Widgeons at a similar pond two miles east of Cincinnati, Ohio, on March 17 and 21, 1949. On March 25 and 26, 1950, they saw another male in the same

place. Several times they watched the latter bird fly out over the Ohio River into Campbell County, Kentucky, and return to the pond. Earlier Cincinnati records were given by Kemsies and Randle (1953:8). Another European Widgeon was seen, at the Woodburn lakes near Bowling Green, by Brecher, Wilson (1958a:43), and others, on April 12, 1958.

Specimens examined.—Total, 1. Jacob P. Doughty Coll.—1 male (mounted), Jefferson County (Feb. 28, 1939).

Mareca americana (Gmelin): AMERICAN WIDGEON

Status.—Transient, common to abundant in spring, somewhat less numerous in fall; very rare winter resident; no records from Cumberland Plateau.

Spring.—Transients occasionally appear before the end of winter, more frequently in late February or early March; main migration through most of March and sometimes into early April; rare by early May. Habitat preference is much like that of the Gadwall, but the American Widgeon usually occurs in larger flocks. It has been recorded as early as January 12 (1952), in Warren County (Wilson, 1952c:46). I saw a pair on a stock pond two miles west of Bardstown on February 8, 1950, and Goodpaster (1941:9) has a record for February 12, 1938, at Cincinnati, Ohio. Early dates from many localities from Louisville to Kentucky Lake range from February 16 to 27. As early as February 28 (1946), I saw more than 20 on the Ohio River at Louisville. The species is common and regular in all suitable areas throughout the region west of the Cumberland Plateau, aggregations of 200 to 400 being not unusual in mid-March, especially on backwaters near rivers and larger lakes (see Kemsies, 1948a:7; Kemsies and Randle, 1953:8; Goodpaster, 1941:9; Lovell, 1949; Wilson, 1940a:17; 1952c:46). Besides many observations at Louisville and Bowling Green, I recorded "Baldpates" in 1939–1940 and 1949–1951 (March 29–April 17, variously) in many counties from Wayne, Madison (70 on one stock pond, April 9, 1951), and Fayette, in the east, to Caldwell in the west. Late records: May 15 (1938), at Louisville (Monroe; next record, May 8); May 17, in Warren County (Wilson, 1940a:17); April 30, at Kentucky Lake (Morse, 1950b:Table 2, 1945–1948).

Summer.—On June 19, 1949, Wilson and I saw a few, probably non-breeders, with other ducks on Chaney Lake near Bowling Green. Presumably 10 widgeons reported seen there by Wilson (1951:4; and letter: October 2, 1952), August 25, 1950, had also summered, as the date seems much too early for transients.

Fall.—The scarcity of records, in comparison with spring, seems to reflect an actual difference in numbers. Audubon (1838:338) mentioned arrival in late September and early October, rather earlier than most recent records. Early recent records: October 2 (1960), at Louisville (Monroe; next record October 20); October 29, at Kentucky Lake (Morse, 1950b:Table 2). The small flight occurs mainly in November. The species tends to resort at this season to larger waters or ponds near these. It is seldom numerous on the Ohio River, whence Monroe has a few October, November, and December records for Louisville (see also "winter"), and where a few are seen by duck hunters in most seasons (J. P. Doughty). Morse (1950b:Table 2) gave the latest record, 1945–1948, at Kentucky Lake as December 8. For dates of occurrence on the upper Ohio River, at Huntington, West Virginia, where the species is an uncommon fall transient, see Seeber and Edeburn (1952).

Winter.—The last transients depart so late, and the first arrive so early, that winter status should be evaluated with caution. There is little doubt that in mild seasons a few birds winter along the Ohio River and other large streams, especially in western Kentucky, as was noted by Audubon (1838:338). I saw 1 on the Ohio River near Louisville on January 2, 1939, and Monroe has a few late December records, including one of 6 birds seen on December 21, 1947. Several Christmas bird counts (*Kentucky Warbler*, 1947–1951) from the vicinity of Kentucky Lake, 1946–1950, list rather large numbers of this widgeon: 60 on December 19, 1947;

50 on January 1, 1949; 108 on December 27, 1946. John DeLime, John Morse, and Grace Wyatt contributed to these counts, which I believe to be reliable. The data suggest, but do not prove, that the species winters in western Kentucky, and more records are needed.

Specimens examined.—Total, 3. C.M.N.H.—1 male, "Ohio River" (April, 1880); B.L.M.—1 male, Oldham County (April 12, 1936); 1 female, Jefferson County (Feb. 28, 1939).

Spatula clypeata (Linnaeus): SHOVELER

Status.—Transient; fairly common to common in spring, rare in fall; casual in early winter.

Spring.—Early transients sometimes arrive in late February, occasionally earlier; the main flight occurs from mid-March to mid-April; a few birds linger into early May. On rare occasions the species has been noted in numbers as early as mid-February. In spring the Shoveler frequents small lakes, ponds, and backwaters, often occurring with Blue-winged Teal. Early records: February 12, at Louisville (Monroe; next record, February 25; usually arrives March 5–15); February 11 (1939), February 15 (1952), and February 16 (1957), in Warren County (Wilson, 1939*d*:35; 1952*c*:46; 1957*b*:60); March 11, at Kentucky Lake (Morse, 1950*b*:Table 2, 1945–1948). There are records from many localities, from Morehead, on the Cumberland Plateau (Barbour, 1952:24, few records, April 12–May 4), westward throughout the state, with small numbers usually recorded near Louisville and in most other areas: recently reported have been flocks of 15 near Cincinnati, Ohio, March 17–21, 1949 (Maslowski, notes), and 15 to 23 on reservoirs at Lexington, March 14 to April 17, 1950 (Edwards, notes). Large numbers sometimes gather on the karst lakes in Warren County, where up to 1,000 were present in 1952 (Wilson, 1952*c*:46), and where I saw 10 as late as May 4, 1949. The species is said to have increased recently at Cincinnati, Ohio (Kemsies and Randle, 1953:8). Late records are May 4 (1938), at Louisville (Monroe), and May 5 (1949), at Kentucky Lake (Morse, 1949:56); for Warren County (Wilson, 1937:18; 1951:4) there are records as late as May 18 (1937) and May 20 (1950).

Summer.—At the Woodburn lakes near Bowling Green, two Shovelers remained in 1935 at least until June 19 (Wilson, 1940*a*:17).

Fall.—The species is much less in evidence than in spring, remaining largely on the rivers, and may really be less numerous. Most migrants are present in October and November. Records are chiefly from the Louisville area, where Shovelers have been noted on the Ohio River in small numbers from September 15 (1957), a very early record, to December 14 (Monroe; 1 killed by J. P. Doughty on the latter date in 1946). Monroe saw 5 on November 9, 1947, and according to Doughty the species is fairly often seen between Carrollton and Louisville. Monroe saw a female at Stephensburg Lake, Hardin County on November 10, 1935. Bacon (1933) said the species was very rare near Madisonville (September 12 [?]-November 14). Morse (1950*b*) listed no fall observations for Kentucky Lake, and Seeber and Edeburn (1952) considered the Shoveler very rare (one record) on the upper Ohio at Huntington, West Virginia.

Winter.—Goodpaster (1941:9) gave records near Cincinnati for December 6, 1939, December 25, 1933, and December 29, 1940, and concluded that the Shoveler wintered occasionally. Available evidence does not seem to me to justify this assumption, as late December birds may be belated transients.

Specimens examined.—Total, 2. M.S.C.—1 female, Rowan County (April 12, 1933); B.L.M.—1 female, Oldham County (April 12, 1936).

Aix sponsa (Linnaeus): WOOD DUCK

Status.—Summer resident, common in lowlands of western Kentucky and breeding regularly, local in stream valleys farther east, rarely to the edge of the Cumberland Plateau; rare in December and may occasionally winter.

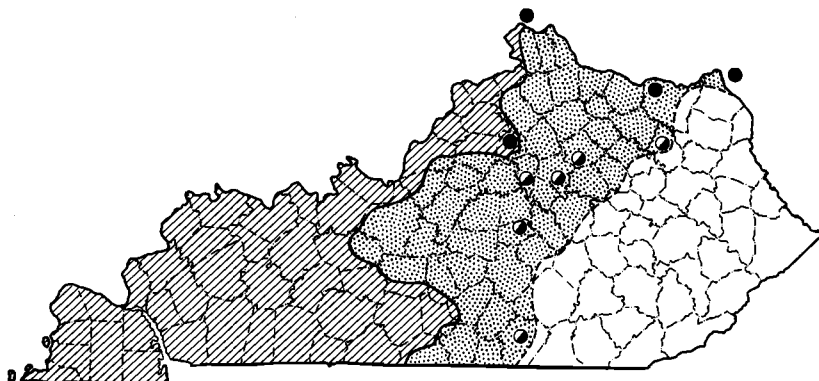


Fig. 14. Breeding-season distribution of the Wood Duck in Kentucky. Hatched area, regular and common; stippled area, irregular and uncommon; solid circles, marginal breeding records; half-solid circles, marginal summer records.

Spring.—The migration period is not certainly known, since transients cannot be distinguished from breeding birds. Early arrivals usually are noted in late February or early March; the species is generally established by late March. Early records: March 5 (1949), at Louisville (Monroe); January 20 (1952; possibly wintering birds), and February 25 (1950), in Warren County (Wilson, 1952c:46; 1951:4; earlier the first record was March 24, Wilson, 1940a:17); March 16, at Kentucky Lake (Morse, 1950b:Table 2, 1945–1948). Wood Ducks are conspicuous in spring, being noisy in courtship, and are common in suitable habitats about sloughs, ponds, and woodland streams, through much of the state west of the Cumberland Plateau. Birds seen March 29, 1923, in Bourbon County (Funkhouser, 1923:115), and April 26 and May 3, 1950, in Fayette County (Edwards, notes), may have been transients, since the species rarely summers in the highly cultivated Bluegrass.

Breeding records.—The Wood Duck is the only member of the family Anatidae for which Kentucky provides an important part of the breeding range. Although many Wood Ducks nest in the state, comparatively few nests have been found. Most breeding records are based upon observations of young, the approximate ages of which have been indicated rather infrequently. Of many records, only 15 seem to me sufficiently precise to justify an estimate of the date of clutch completion. From these, it would seem that clutches are completed at least from March 11–20 to June 21–30 (dates as late as the latter are probably exceptional, perhaps representing renestings following accidents), with a peak March 21–31. Only 4 actual egg-dates are available: Bacon (notes) recorded a set of 14 eggs, incubation advanced, in Hopkins County on April 18, 1952, in the hollow limb of a sycamore, and in the past had seen numerous nests, all in hollow trees, often maples and sycamores, 14–25 feet up. The same observer noted hatching of eggs (number undetermined) at nests 14 and 18 feet up in dead trees (one of them 3 miles from water) in Webster County on April 23, 1952, and April 28, 1952. In Daviess County, Powell (1951:8) noted incubation in progress at a nest 15 feet up in a hollow cavity in a sycamore, on April 15, 1950. Records of young are from the following: Lewis (Maslowski and Goodpaster, notes), Clermont County, Ohio, just north of Campbell County, Kentucky (Goodpaster, 1941:9), Carroll (Lovell, 1951b:59), Oldham (Monroe and Mengel, 1939:40), Jefferson (Monroe and Mengel, 1939:40; Wright, 1945:50; Croft, *vide* Hays, 1957:3), Warren (Wilson, 1948a:54, 1951:3, 1957b:60; Wilson, *vide* Lovell, 1951b:59; Pace, 1959:53), Butler and McClean (Collins, 1953:59–60), Hopkins (Hancock, 1954:19; Bacon, notes),

Trigg (Morse, 1950*b*:10; Lovell, 1951*b*:59; Cypert, notes), and Ballard (Mengel, notes) counties. Not counting dates of hatching noted above, the earliest date of young observed is April 20 (1952), 8 downies in Hopkins County (Bacon), and the latest August 2 (1940), 4 downies in Trigg County (Cypert). The average complement of 20 broods of various sizes was 7.0 young (2-11), a figure undoubtedly well below average clutch size as a result of loss of young and probable failure to observe some strays and stragglers. I saw a brood of 8 very small downies with a female on Swan Lake, Ballard County, June 8, 1949.

Breeding distribution.—The eastern limits of the breeding range are unknown. Wood Ducks have been reported in summer from many counties west of and including Lewis (Maslowski, notes) and Rowan (Barbour, 1951*a*:33), in the northeast, and Wayne (G. H. Spann, verbal com.) in the southeast (Fig. 14). The localities just named are in the valleys of fairly mature streams (Kinniconick, Licking, and Cumberland drainages) near the points where they flow out of the rugged Cumberland Plateau. Despite records for some eastern counties published by Funkhouser (1925:165), on the somewhat unreliable authority of county agents, it seems probable that the main range is essentially limited, in the east, by the abrupt face of the Knobs and the Pottsville Escarpment. The species is supposedly very rare in the highly cultivated Inner Bluegrass, where forest is scarce, but has been recorded recently from Boyle County (Loetscher, verbal com., 1950) and earlier from Franklin County (Pindar, MS). It is rare in the Knobs, reported only from Nelson County (Beckham, 1885:51; Blincoe, 1925:407). Wilson (1950:23) mentioned its rarity in the rugged Mammoth Cave area (Dripping Springs Escarpment of Western Highlands) as contrasted with Barren River 25 miles to the south. The Wood Duck is common in the stream valleys of the Western Highlands north and west of Mammoth Cave and along the lower Ohio River, where it is increasingly numerous westward, frequenting the valleys of sluggish streams near the river. In southwestern Kentucky, where they are most numerous, Wood Ducks are characteristic inhabitants of cypress swamps and densely forested floodplains. In such areas I have seen many in nearly every county west of Logan, Lyon, and Henderson, and Durand (1939) noted a concentration of more than 300 on Swan Lake, Ballard County, on July 8, 1939. Possibly quiet water is essential for the safe rearing of the young and provides refuge for the adults in the period of eclipse. The swift, rocky streams and steep, often cliff-bordered valleys of much of the Cumberland Plateau and parts of the Western Highlands would not meet such a requirement.

Fall.—There is no appreciable evidence of an increase during the migration period; a fair number of Wood Ducks is present in October; rare in November. The species has been recorded in small numbers from Lewis County (Maslowski) and Rowan County (specimens, M.S.C.) westward through the state to the Mississippi River. A small concentration (25-40) was noted near Louisville on November 3, 1956 (Stamm, 1957*a*:41). I saw 2 near Oakton, Hickman County, on November 13, 1948, and 1 the next day 4 miles south of Clinton, Carlisle County. Near Louisville numerous scattered records have been made in October and November (Monroe). At this locality I found a female dead, in rather unusual habitat on the open, rocky Falls of the Ohio River, on September 11, 1949. The species was recorded at Kentucky Lake as late as November 27, 1946-1948 (Morse, 1950*b*:Table 2).

Winter.—A few Wood Ducks remain at least into early winter, but records should be evaluated carefully, since some winter "Wood Ducks" have turned out to be Hooded Mergansers. Monroe has records at Louisville for December 21, 22, 25, and 26 (3 killed by hunters on December 21, 1947; J. P. Doughty). At Kentucky Woodlands National Wildlife Refuge, E. L. Atwood had seen a few as late as January 7 (Morse, 1950*b*:5). They have been reported as wintering in other localities, but many or all records may be based on late-lingering birds. Wood

Ducks recorded in Warren County on January 20, 1952 (Wilson, 1952c:46), may have wintered; in any event the species was recorded regularly thereafter.

Specimens examined.—Total, 6. M.S.C.—2 males (1 missexed), 1 female, Rowan County (Oct. 9, Nov. 1; Nov. 1); B.L.M.—1 male, 1 female, Jefferson County (April 17; Oct. 18); 1 female, Oldham County (July 13).

Aythya americana (Eyton): REDHEAD

Status.—Generally a rare transient, although occasionally recorded in large concentrations and perhaps increasing slightly in recent years; irregular winter resident in small numbers; not recorded from the Cumberland Plateau.

Spring.—A few records, some of them perhaps representing wintering birds, have been made in February; most Redheads are seen in March and early April. They are found on small ponds and backwaters, as well as on the larger lakes and streams that they favor, often occurring with scaup, Ring-necked Ducks, and other divers. In recent decades recorded as follows: uncommon spring transient on the upper Ohio River near Huntington, West Virginia (Seeber and Edeburn, 1952); irregular at Cincinnati, Ohio, mostly March 15–April 14, usually in small numbers (Goodpaster, 1941:10; Maslowski, notes—10 seen March 17–21, 1949, were regarded worthy of special comment), but occasionally in large concentrations, one of which, on February 28, 1948, was estimated at more than 1,000 birds (Kemsies and Randle, 1953:9); 5 seen on reservoirs at Lexington on March 24 and 2 on March 26, 1950 (Edwards, notes), and 1 there on March 28, 1939 (Mengel); single birds and small groups recorded on and near the Ohio River at Louisville, March 4 to April 13 (Monroe); observed occasionally since 1934 on the Woodburn lakes in Warren County, chiefly March 2 to April 6 (rarely, if ever, more than 40 at once), and to May 13, in 1950 (Wilson, 1940a:17; 1951:4; 1952c:46; 1957b:60); 2 on Loch Mary, Hopkins County, March 9, 1935 (Hancock, notes); one record only, March 16, 1948, obtained in Kentucky Lake waterfowl investigations conducted by Morse (1950b:Table 2, 1945–1948).

Summer.—On June 19, 1949, I collected a male (testes small) that could not fly, in a flooded corn field at Chaney Lake, Warren County (U.M.M.Z.).

Fall.—The small flight occurs mainly in November; there are few records except for the Louisville area. Pindar (MS) wrote that a Redhead was captured in November, 1914, at Tyrone, Anderson County, after flying into wires. A few were seen at Lexington, October 28–31, 1949 (Edwards, notes). Rare at Madisonville, October 5 to November 10 (Bacon, 1933). On the Ohio River near Louisville, where the earliest date of observation is October 18, Monroe has numerous records from October 27 through November, but few for any year. J. P. Doughty killed 3 Redheads in Oldham County on November 11, 1938, and a fair number have been taken in the past by him and other hunters. Old hunters regard the species as much less numerous than 40 or 50 years ago.

Winter.—A few Redheads winter irregularly near Louisville, and probably along much of the Ohio River. I saw 3 males on the Ohio in Oldham County on December 26, 1938, and a female at close range in Jefferson County, January 2, 1939. Monroe has a fair number of records from late December through January, and one for February 17.

Specimens examined.—Total, 4. Collection of Jacob P. Doughty—3 mounted specimens, Kentucky (fall); U.M.M.Z.—1 male, Warren County (June 19, 1949).

Aythya collaris (Donovan): RING-NECKED DUCK

Status.—Common transient; rare and irregular winter resident.

Spring.—Varying numbers of Ring-necked Ducks winter, but a decided increase is usually apparent near March 1; main flight usually in the last half of March and early April. Of the diving ducks occurring in Kentucky the Ring-neck is second in numbers only to the scaups, occurring in moderate-sized flocks on all sorts of

waters and sometimes in large numbers on major lakes and streams. Early records probably of transients: February 26 (1938), at Cincinnati, Ohio (Goodpaster, 1941:10); February 16 (1883), in Nelson County (Beckham, 1885:51; specimen, C.W.B.); winters, at Louisville, but more records for late than for early February (1933-1939); February 2 (1957), and February 25 (1950), in Warren County (Wilson, 1951:4; 1957b:60); February 4 (1935), in Hopkins County (Hancock, notes; wintering?). The species has been noted throughout the state, at many localities from Morehead, on the Cumberland Plateau (Barbour, 1952:24, March 28-April 20, 1933-1939), westward to the Mississippi River. Unusually large flights have been recorded at Louisville, where 1,500 to 2,000 were present on the Ohio River, March 21-28, 1937 (Monroe and Mengel, 1939:40), and in Warren County, where nearly 1,000 were seen on McElroy Lake on March 15, 1939 (Wilson, 1939d:35). Late records: May 13, at Louisville (Monroe; next record, May 6); May 10 (1950), at Lexington (Edwards, notes); May 13 (1952) and May 31 (1957), in Warren County (Wilson, 1952c:46; 1957b:60).

Summer.—In 1937 a single bird, unable to fly, was seen at McElroy Lake, Warren County, until July 10 (Wilson, 1940a:17). Another was recorded there on July 29, 1950 (Wilson, 1951:4).

Fall.—As with many other ducks, published autumn records are scarce. The species tends at this season to seek large waters, but hunters' observations indicate no real reduction in numbers as compared with spring. Ring-necks usually appear in late October; main flight in November, more or less throughout the state. Monroe's earliest record at Louisville is for October 19. J. P. Doughty regarded the "blackjack" as regular and common in small flocks from Carrollton to Louisville and has taken many, mainly in November. The late R. C. Soaper considered the species common at Henderson; he and I saw a flock of 30 on the Ohio there on November 16, 1948. "Fairly common" at Madisonville, November 2-25 (Bacon, 1933); "uncommon" at Kentucky Lake (Morse, 1950b:Table 2, 1945-1948). The species decreases at Louisville in December but a few regularly remain (Monroe).

Winter.—A few Ring-necks winter on large waters, along the Ohio River, at least from Cincinnati downstream, and at Kentucky Lake, where Morse (1950b: Tables 2 and 3) saw 250 on January 31 and others on February 10, 1947. The species evidently wintered at the Woodburn lakes in Warren County in 1951-1952, as indicated by observations from January 12 onward (Wilson, 1952c:46).

Specimens examined.—Total, 5. M.S.C.—2 females, Rowan County (April 21, Nov. 1); C.W.B.—1 female, Nelson County (Feb. 16); B.L.M.—1 male, 1 female, Oldham County (March 21).

Aythya valisineria (Wilson): CANVASBACK

Status.—Rare to uncommon transient; rare winter resident; not recorded on the Cumberland Plateau.

Spring.—The migration of Canvasbacks begins in late February or early March; peak of migration in last half of March; rare or gone by mid-April. The species seems to be somewhat more numerous than the Redhead and is definitely more restricted to large waters. At Louisville, Monroe has seen a few which may have been transients between February 17 and 24. Other early records: February 22 (1957), and March 5, in Warren County (Wilson, 1940a:17; 1957b:60); February 22, in Hopkins County (Bacon, 1933). Flocks of 2 or 3 to 10 birds are most often seen, occurring in March more or less throughout the state west of the Cumberland Plateau. Most authors consider the species rare. I saw more than 50 on reservoirs near Lexington on March 28, 1939, and Edwards recorded a few there in 1950 (March 24 and 31). Monroe and I saw a flock of 24 at Louisville, where there are many March records of smaller numbers, on March 20, 1937 (Monroe and Mengel, 1939:40). The largest number recorded at one time by Wilson (1937:19) at McElroy Lake, Warren County, was 20; the species is irregular in occurrence there, and Wilson (1940a:17) corrected his earlier report (1929:182) of "thousands"

seen in April, 1927 (they were, apparently, scaup). Late records: April 20, at Louisville (Monroe; next record, April 7); May 24 (1952), in Warren County (Wilson, 1952c:46), where the Canvasback usually leaves the Woodburn lakes by mid-April.

Fall.—Few published records. The small flight occurs late, varying from early November to mid-December; a few birds arrive earlier. Monroe's earliest date at Louisville is October 27; he has scattered records of small flocks in November and December. Duck hunters near Louisville consider the species uncommon and kill few (J. P. Doughty). Reported from a few other localities, from Cincinnati, Ohio (Goodpaster, 1941:10), westward to Reelfoot Lake (Ganier, 1933a:21, "common transient, arriving late"). Recorded on reservoirs at Lexington, October 31 to December 12, 1949 (Edwards, notes).

Winter.—Canvasbacks occur irregularly in small flocks on larger lakes and streams, associating, as at other seasons, with scaup, Redheads, and other divers. Monroe has Louisville records for December, January, and early February. Morse (1950b: Table 2) listed winter records for Kentucky Lake for December 28, 1946, February 10, 1947, and February 17, 1948. On December 24, 1950, I saw a few Canvasbacks in a great raft of scaups on the Mississippi River at Hickman, where Pindar (1887a:55) years ago mentioned Canvasbacks seen in the markets.

Specimens examined.—Total, 3. Jacob P. Doughty Collection—2 mounted specimens from "Kentucky"; Murray State College Collection—1 mounted specimen, Graves County (1928).

Aythya spp.: SCAUP

Status.—Common to abundant transients; common winter residents; casual in summer, one breeding record.

Note.—The present account is based upon observations of many scaup made through the years, nearly all recorded as Lesser Scaup. Many of these records were made before it was definitely known that the Greater Scaup occurred in Kentucky. Undoubtedly some Greater Scaup have contributed to the data, while some of the "Greater Scaup" reported have probably been Lesser Scaup. The species are virtually inseparable in the field under most conditions, and either intensive collecting or systematic examination of the hunting kill seem to be the most promising means by which reliable information on their relative status can be assembled.

Spring.—The migration of scaup usually begins in middle or late March, sometimes earlier; the main flight occurs in early April; they are rare by mid-May. Generally the most numerous of the diving ducks, scaup occur on the smallest ponds and the largest waters, great numbers sometimes gathering in favorable localities. Monroe has usually noted an increase at Louisville in mid-March. Early records (February 2–19), possibly of newly arrived transients, were given for Warren County by Wilson (1940a:17; 1951:4; 1957b:60). Of wide and frequent occurrence in late March and early April, scaup have been reported throughout the state from Rowan County, on the Cumberland Plateau (Barbour, 1952:24), westward to the Purchase. I recorded them at numerous localities west of the Plateau, 1937–1940, and 1948–1951. On April 29, 1949, I saw 1 male near London, Laurel County, on the Plateau. More than 1,000 are sometimes present on the karst lakes in Warren County (Wilson, 1940a:17), on the Ohio River near Louisville (Monroe), and elsewhere. Late records from various places range from May 17, in Rowan County (Barbour, 1952:24) to June 3, at Kentucky Lake (Morse, 1949), and June 7 (1958), at Louisville (Monroe). Monroe saw a belated flock of 22, perhaps non-breeders, near Louisville on June 11, 1938.

Breeding record.—A nest containing 12 eggs (reported as that of a Lesser Scaup) and attended by an injury-feigning female was found by Webster (1951:21) at a small marsh in the bottom lands of the Ohio River near Carrollton, Carroll County, on June 3, 1950. The normal breeding range of both species is much farther north.

Summer.—In some summers a few have remained at the karst lakes in Warren

County (Wilson, 1935; 1940a:17; 1951:4), but no convincing evidence of breeding has been adduced. Some years ago, Monroe saw 1 scaup near Louisville on July 9.

Fall.—A few were noted at Lexington, September 20 to December 8, 1949 (Edwards, notes), and others were seen at Louisville on September 24, 1955 (Monroe). Scaup usually arrive about mid-October; main flight in November; numbers decrease somewhat by early winter. They are recorded on ponds and small streams much less frequently than in spring. Early records: October 24 (1937), at Cincinnati, Ohio (Goodpaster, 1941:10); October 17 (1960), at Louisville (Monroe; common from late October onward). Very large flights sometimes occur along the Ohio and Mississippi rivers. Maslowski and Goodpaster (notes) recorded a heavy migration along the Ohio in Campbell County, November 2–10, 1945, estimating several flocks seen at from 5,000 to 10,000. Near Louisville hundreds or thousands often pass in November and many are taken by hunters between Carrollton and Brandenburg (J. P. Doughty; see also separate accounts of the two species). R. C. Soaper and I saw two flocks of about 25 each near Henderson on November 16, 1948. I saw a raft of several thousand ducks, mainly scaup, on the Mississippi River near Hickman on November 11 and 13, 1948.

Winter.—Appreciable numbers remain through the season on the Ohio and Mississippi rivers. Limited information is available from the upper Ohio River, where they are uncommon according to Seeber and Edeburn (1952); they are apparently far more numerous below Cincinnati. Rafts of several hundred to a thousand are not unusual, available records being largely from Jefferson and Oldham counties. At Hickman, Fulton County, I saw a raft of more than 2,000 on December 24, 1950, and several thousand more, presumably also scaup, circling over the Mississippi far upstream. Surprisingly, Morse (1950b:7, and Table 2) found scaup only occasional winter visitants at Kentucky Lake (1945–1948). Few winter on small waters, but scaup wintered at the Woodburn lakes in Warren County in 1952, being observed from January 1 onward (Wilson, 1952c:46).

Aythya marila (Linnaeus): GREATER SCAUP

Status.—Not well known; probably a rare transient and winter resident; probably similar to the Lesser Scaup in distribution and seasons of occurrence but seems to be very much less numerous.

Records.—The few acceptable records are based upon specimens. Of these, 2 (B.L.M.) were taken on the Ohio River at Brandenburg, Meade County, by James Fetter on November 9, 1941 (Monroe and Mengel, 1943a). On the Ohio in Oldham County, Jacob P. Doughty and others killed 4 on December 14, 1946, and 10 from a flock of 16 scaup on January 2, 1947. I secured a female on June 19, 1949, at Chaney Lake, Warren County (U.M.M.Z.). The last bird could fly well, although its remiges were badly worn. The ovary measured 29 × 12 mm., no ovum being more than 1 mm. in diameter. The specimens all have extended wing-stripes, are large, and the bills of the Meade County birds measure 26.8 and 25.5 mm. (greatest width), having measurements of the nails 11 and 7 mm. (width) and 11 and 9 mm. (length). According to Doughty, experienced local hunters near Louisville have long recognized the "Big Bluebill," which they regard as rare and think tends to remain in flocks separate from Lesser Scaup. Several published sight records (Wilson, 1939a:20; 1946a; 1952c:46; 1957b:60—see also *Kentucky Warbler*, 35:7, 1959) are less than satisfactory to me (see note under scaup, spp.), and I refrain, accordingly, from adding a couple of my own!

Geographic variation.—The subspecies occurring is the North American *Aythya marila nearctica* Stejneger.

Specimens examined.—Total, 5. B.L.M.—1 immature male, 1 female, Meade County (Nov. 9); Jacob P. Doughty Collection—2 mounted specimens from Kentucky; U.M.M.Z.—1 female (weight 876.6 gm., moderately fat), Warren County (June 19).

Aythya affinis (Eyton): LESSER SCAUP

Status.—See "scaup" above. Probably the statement there given will prove to describe the present species adequately.

Records.—See "specimens examined," below and note the preceding general account of the scaups. Although there is little doubt that the Lesser Scaup is by far the more numerous of the two "bluebills" in Kentucky (according to J. P. Doughty the great majority of scaup killed by him and other experienced hunters along the Ohio River between Carrollton and Louisville belong to this species), continuing uncritically to refer to all scaup seen as Lessers, except when they can be positively identified, is not a procedure well adapted to furthering our knowledge. I may say here, however, that nearly all of the scaup I have been able to examine very well in the field do appear to have been Lessers.

Specimens examined.—Total, 5. M.S.C.—1 (= female), Rowan County (April 1, 1936); U.K.—1 female (misidentified as a Ring-necked Duck), Woodford County (May 10, 1940); Jacob P. Doughty Collection—2 mounted specimens from Kentucky; B.L.M.—1 male, Jefferson County (March 13, 1939).

Bucephala clangula (Linnaeus): COMMON GOLDENEYE

Status.—Common winter resident on larger bodies of water; details of migration not well known, unrecorded from the Cumberland Plateau.

Spring.—No pronounced migratory movement has been noticed; the species is fairly common along the Ohio River until early April. Goodpaster (1941:10) noted an unusual concentration, of 350 birds, near Cincinnati, Ohio, on February 27, 1937. At Louisville, Monroe has many records for early April, a few later. Occasional birds seen on small ponds and lakes are probably transients. One was noted on a reservoir at Lexington on April 12, 1950 (Edwards, notes), and at the karst lakes in Warren County there are scattered records ranging from January 20 to April 15 (Wilson, 1940a:18; 1952c:46; 1957b:60). A few available late records from Cincinnati, Louisville, and Bowling Green fall between April 13 and 21. I saw a male at Louisville on April 19, 1949.

Fall.—There is little published information, but goldeneyes evidently arrive late. Near Louisville Monroe's earliest record is for November 7 (1959). He has other records for November 22 and December 2; the species becomes common by mid-December. I saw 6 males with a large raft of scaup on the Mississippi River at Hickman, November 11, 1948. No conspicuous flights are on record. The species is rare away from the large rivers; Bacon (1933) saw 2 birds on a small lake in Hopkins County, November 18, 1924, and 1 on November 8, 1929.

Winter.—The hardy goldeneye is regular and common along the Ohio and Mississippi rivers, small groups being most often seen. The birds tend to feed close to the banks, sometimes being concealed by overhanging shrubbery, and may be easily surprised at close range when so engaged. The species has been recorded in mid-winter from numerous localities from Cincinnati to the Purchase. Brief mention of records has been made by Goodpaster (1941:10), at Cincinnati, Ohio; Audubon (1838:319-320), at Louisville; Soaper (1958:21) at Henderson; Morse (1950b:Table 2), at Kentucky Lake; and others. There are many Louisville records. I saw 2 males close to the Ohio River bank near Barlow, Ballard County, on January 4, 1951.

Geographic variation.—The subspecies occurring is the North American *Bucephala clangula americana* (Bonaparte).

Specimens examined.—Total, 2. B.L.M.—1 male, Oldham County (March 22, 1936); 1 female, Jefferson County (Jan. 16, 1938).

Bucephala albeola (Linnaeus): BUFFLEHEAD

Status.—Fairly common winter resident, generally confined to larger waters; rare to uncommon transient generally, although not recorded from the Cumberland Plateau.

Spring.—Along the Ohio River Buffleheads are seen irregularly into late April. On small lakes and ponds where the species is rarely, if ever, found in winter, presumably transient Buffleheads are sometimes recorded in March and April. Such birds were noted on reservoirs at Lexington, where I saw 5 on March 28, 1939, and Edwards (notes) observed 1 on April 12, 1950; others have been recorded, rather rarely, at the Warren County karst lakes, February 15 to April 20 (Wilson, 1940a:18; 1951:4; 1952c:46; 1957b:60). Late records: April 22 (1939), at Cincinnati, Ohio (Goodpaster, 1941:10); April 19 (1957), at Louisville (Monroe); April 20, in Warren County (Wilson, 1952c:46).

Fall.—A late migrant, the Bufflehead usually arrives in late October or in November (a few much earlier dates in the literature are of doubtful authenticity). Early records: October 28, at Louisville (Monroe; next record, November 20); November 16 (1948), at Henderson (Mengel); December 5, at Kentucky Lake (Morse, 1950b:Table 2, 1945–1948); November 7 (1886), in Fulton County (Pindar, 1887a:55). The species is rare on smaller waters; a few were noted on Lexington reservoirs, November 27–December 16, 1949 (Edwards, notes). Along the Ohio River the species is irregular, occurring in small flocks, but is sometimes common. J. P. Doughty and other hunters have taken many while hunting between Carrollton and Louisville.

Winter.—Buffleheads winter regularly in small numbers on the Ohio River, Kentucky Lake, and probably other large waters, remaining through the severest weather if open water is available. They are seldom seen in groups larger than 4 or 5. Published records are few, but Monroe, J. P. Doughty, and others have many observations for the Louisville area. Other records are from Cincinnati, Ohio (Goodpaster, 1941:10) and Kentucky Lake (Morse, 1950b:Table 2, common, December 5–March 28, 1945–1948).

Specimens examined.—Total, 3. B.L.M.—1 male, 1 female, Oldham County (Nov. 20, 1937; Nov. 26, 1936); 1 male, Jefferson County (Dec. 13, 1935).

Clangula hyemalis (Linnaeus): OLDSQUAW

Status.—Irregular and uncommon winter resident on large bodies of water; very rare transient elsewhere. Not recorded from the Cumberland Plateau.

Spring.—Oldsquaws remain throughout March and occasionally into April; wintering birds are probably sometimes supplemented by transients. The species is almost entirely restricted to larger expanses of water and fair-sized flocks have been seen along the Ohio River. Kemsies (1948a:9) reported a flock of 20 seen near Cincinnati, Ohio, March 9, 1947. Monroe saw 25 at Louisville on April 7, 1947, and has many records of smaller groups. During a heavy flight of wildfowl, I was surprised to see a fine adult male in winter plumage on a small stock pond at Richmond, Madison County, on March 28, 1939. The bird was with several Blue-winged Teal and some domestic white mallards! The species has been seen rarely at the Warren County karst lakes, March 6–April 3, never more than 4 at once (Wilson, 1940a:18), and at Kentucky Lake, March 14, 1950 (Morse, 1950). Monroe's latest record for Louisville, the only locality for which there are many records, is for April 16 (1947).

Fall.—Sometimes, perhaps usually, Oldsquaws arrive in November, the vanguard consisting mostly of females and immature birds; they are not recorded in some years until mid-December or January. All available autumn records are from the Ohio River between Carrollton and Louisville, where Monroe and J. P. Doughty have many November and December records of small numbers, from November 4 onward.

Winter.—Oldsquaws are irregular, occurring in small numbers on big water; males are most likely to appear. Specimens have been reported from the Ohio River in Boone and Campbell counties, near Cincinnati, Ohio (Langdon, 1881:341; Maslowski, 1935). Maslowski (notes) saw the head of a female killed in the same area by Christian Goetz in late December, 1948. Monroe, Doughty, and others have many January and February records of small groups in the Louisville area, and unusually large flocks of 30 (January 9, 1947) and 55 (January 10, 1948) have been seen by Monroe. Recorded also from Kentucky Lake, where DeLime (1948) saw 2 on February 15, and 4 on February 17, 1948.

Specimens examined.—Total, 3 labelled specimens. B.L.M.—1 female, 1 unsexed, Carroll County (Dec. 1, 1940; Nov. 25, 1940); 1 female, Jefferson County (March 3, 1935). Both Monroe and Doughty have mounted specimens from Kentucky but without exact data.

Somateria spectabilis (Linnaeus): KING EIDER

Status.—Casual (one record) on the Ohio River in winter.

Record.—An immature female taken by Charles P. Broughton, while hunting on December 26, 1959, was turned over to Emerson Kemsies (notes), of the University of Cincinnati Department of Biological Sciences. The bird was taken on the Ohio River in Boone County, near the Kentucky shore and opposite Rising Sun, Indiana.

Specimen.—Total, 1 (see above).

Melanitta deglandi (Bonaparte): WHITE-WINGED SCOTER

Status.—Rare and irregular winter resident along the Ohio River; rare transient, almost completely restricted to large waters; not recorded from the Cumberland Plateau.

Spring.—So far as can be told from records deemed completely reliable, very few White-winged Scoters remain in Kentucky past the end of winter. Kemsies (1948a: 9) mentioned 3 birds reported on the Ohio River at Cincinnati, Ohio, by Sven Sjødahl on March 15, 1947 (see also Kemsies and Randle, 1953:10). Monroe's latest record at Louisville is for March 26 (1956). A few observations for Warren County have been reported by Wilson (1922:234; 1937:19; 1940a:18), but some of these, especially the older ones, seem subject to question.

Fall.—The species arrives late, often not before late November. J. P. Doughty and other hunters have seen a few, usually only 1 or 2 at a time, nearly every season for many years, the black adult males being exceedingly rare. Monroe's earliest record near Louisville is for October 27, 1945 (specimen, B.L.M.). Monroe and Doughty took specimens (B.L.M.) in Oldham County, November 6, 1938 (Monroe and Mengel, 1943a), and others were killed there on November 29, 1936 (Monroe and Mengel, 1939:41). A bird said to be a black male remained on Brown Meadow Lake, Hopkins County, from November 6 to 9, 1951 (Hancock, notes). White-wings have been killed by hunters at Reelfoot Lake (Ganier, 1933a:21).

Winter.—All records are from the Ohio River, mainly between Carrollton and Louisville, where a few birds have been found nearly every winter in recent decades by Doughty, Monroe, and various duck hunters. A few probably winter regularly along the length of the Ohio River. In early February, 1958, one remained for some time at a backwater near Henderson (Soaper, 1958:21).

Geographic variation.—The subspecies occurring is the eastern *Melanitta deglandi deglandi* (Bonaparte).

Specimens examined.—Total, 3. B.L.M.—3 females, Oldham County (Oct. 27, 1945; Nov. 6, 1938 [2]).

Melanitta perspicillata (Linnaeus): SURF SCOTER

Status.—Casual transient or winter resident, chiefly on the Ohio River.

Records.—Mr. James Fetter, of Louisville, took a lone female (B.L.M.) on October 16, 1940, on the Ohio River near Brandenburg, Meade County (Monroe

and Mengel, 1943a). J. P. Doughty killed a female in Carroll County on November 16, 1945 (Jacob P. Doughty Collection). Wiley (1960a:30) carefully observed and described a single immature or female bird observed at Louisville on November 7, 1959. Earlier, Wilson (1940a:18) referred to "4 in company with a good-sized flock of the White-winged [Scoter]" seen on March 28, 1934, at McElroy Lake, Warren County. There is no way to prove or disprove the validity of the last record; were it made today with the benefit of modern manuals, optical equipment, and increased experience, I should view it with less suspicion.

Specimens examined.—Total, 2. B.L.M.—1 female, Meade County (Oct. 16); Jacob P. Doughty Collection—1 female, Carroll County (Nov. 16).

Oidemia nigra (Linnaeus): COMMON SCOTER

Status.—Casual transient or winter visitant, recorded on the Ohio River in fall and winter.

Records.—Jacob P. Doughty collected 2 females (B.L.M.) for Monroe on the Ohio River near Carrollton, Carroll County, on November 9, 1938 (Monroe and Mengel, 1943a:282). On another occasion, exact date no longer known, Doughty (verbal com.) saw a black adult male on the Ohio River above Louisville in November. A sight record of 2 immature birds in the harbor at Louisville, February 17, 1957, was reported by Sommers (1957:56), and another was seen not far away on November 15, 1959 (Sommers, *vide* Wiley, 1960a:31). A record for April 6, 1912, for Bowling Green, Warren County (Wilson, *vide* Funkhouser, 1925:169), seems questionable, and has evidently not been published by Wilson.

Geographic variation.—The subspecies occurring is the North American *Oidemia nigra americana* Swainson.

Specimens examined.—Total, 2. B.L.M.—2 females, Carroll County (Nov. 9, 1938).

Oxyura jamaicensis (Gmelin): RUDDY DUCK

Status.—Transient, uncommon in spring, common in fall; rare winter resident.

Spring.—Migration takes place mainly in March and early April. The species occurs irregularly, in small numbers, on small streams and ponds as well as on larger waters. Early records (probably of transients): March 4, at Cincinnati (Goodpaster, 1941:10); March 12, at Louisville (Monroe); February 28, in Warren County (Wilson, 1952c:46). The Ruddy Duck has been recorded infrequently at most localities, from Cincinnati, Ohio (Goodpaster, 1941:10), south and west to Fulton County (Pindar, 1925a:80) and Reelfoot Lake (Ganier, 1933a:21). Near Louisville a few have been seen nearly every year by Monroe and others. I saw 7, including 4 males in breeding plumage, on a reservoir at Lexington, March 28, 1939, and a male in breeding plumage on a farm pond near Frankfort, April 7, 1951. Late records: May 10 (1956), at Louisville (Monroe); May 13, in Warren County (Wilson, 1951:4); April 19 (1941), at Kentucky Woodlands National Wildlife Refuge (Cypert, Refuge files).

Summer.—A female, not obviously crippled, remained throughout the summer of 1952 on a small pond on the outskirts of Louisville (J. P. Doughty). Wilson (1951:4) recorded 1 in Warren County on August 29, 1950 (cripple or non-breeder?).

Fall.—This species (with the Wavy [= "blue" and "snow" geese] and the Whistling Swan) is among the few waterfowl which in Kentucky are markedly more numerous in autumn than in spring. It arrives late, usually after mid-October; main flight in November; rare by mid-December. More restricted to large waters than in spring. Early records: October 19, at Louisville (Monroe); November 12, at Kentucky Lake (Morse, 1950b:Table 2, uncommon, 1945–1948). Along the Ohio River near Louisville the species is common and regular, mostly in small numbers (J. P. Doughty). Several flocks of more than 50 were seen there in November, 1938 (Monroe and Mengel, 1939:41). On the Ohio River just above

Henderson the late R. C. Soaper and I saw a flock of 24 on November 16, 1948. According to Soaper the species is fairly common there. Bacon (1933) reported 2 killed in Hopkins County on November 10, 1927, and considered Ruddy Ducks very rare on the small local lakes.

Winter.—Available records are few; Ruddy Ducks are recorded occasionally on Christmas bird counts at various central and western localities. Monroe has a number of records, none of more than 5 birds, for late December, January, and February near Louisville (January 2, 7; February 12, 14, 17, 18, 24). Morse (1950b:Tables 2 and 3) gave records from Kentucky Lake for January 27–31, 1947.

Geographic variation.—The subspecies occurring is the North American *Oxyura jamaicensis rubida* (Wilson).

Specimens examined.—Total, 3 with full data. M.S.C.—2 females, Rowan County (Nov. 22, 1935); B.L.M.—1 female, Oldham County (Nov. 29, 1936). A number of mounted specimens from Kentucky are in the collection of Jacob P. Doughty.

Lophodytes cucullatus (Linnaeus): HOODED MERGANSER

Status.—Fairly common to common transient and winter resident; rare summer resident in central and western Kentucky, breeding locally.

Spring.—Migration takes place mainly in March and early April. Except along the larger streams, upon which transients are indistinguishable from numerous wintering birds, the species is uncommon. It sometimes occurs on ponds and lakes where few or none winter. It has been recorded in such situations in Bath County, March 10, the only record for the Morehead area, 1933–1939 (Barbour, 1952:24); in Warren County, February 11–May 1, never more than 10 at a time (Wilson, 1940a:18; 1951:4; 1952c:46; 1957b:60); and in Hopkins County, March 11–29 (Bacon, 1933). Along the Ohio River this merganser is common in March and has been recorded regularly from Cincinnati, Ohio (Goodpaster, 1941:11) westward to Kentucky Lake (Morse, 1950b:Table 2). Maslowski (notes) saw a flock of 24 in a flooded corn field near Cincinnati on March 14, 1950. Near Louisville Monroe and others have found it common, sometimes in flocks of 15 to 20, every year until early April. Late records: April 14, at Cincinnati, Ohio (Goodpaster, 1941:11); April 29, at Louisville (Monroe); March 16, at Kentucky Lake (Morse, 1950b:Table 2, 1945–1948).

Breeding records and distribution.—A number of breeding records was summarized by Monroe (1947). Audubon (1835:247) referred to young caught at Louisville. Monroe (1947:59) found females in Caperton's Swamp at Louisville on May 24 (1) and June 1 (2), 1947. On the latter date they were accompanied by broods of 7 and 12 young respectively and on June 7 he took a two-thirds grown immature bird (B.L.M.). Subsequently other young have been seen at Louisville, three broods in 1951 (Lovell, 1951b:59), and a female with 9 young on May 5, 1956 (Croft, *vide* Hays, 1957:3). Sights (1942:54) recorded a nest containing 14 eggs at Reelfoot Lake, approximately 5 miles south of the state line, on May 18, 1941. At least from Louisville westward, the species summers regularly but locally about wooded swamps and sloughs along the Ohio and Mississippi rivers. At Kentucky Lake, Morse (1950b:10) reported known breeding in Tennessee, and suspected breeding in Kentucky. In nearby Kentucky Woodlands National Wildlife Refuge, Cypert (Refuge files) several times saw adults in the summer of 1941. The late R. C. Soaper, Monroe, and I saw 5 dull-plumaged birds (females and/or young) at a wooded bottom land pond in Henderson County on July 7, 1940; Soaper said the species nested locally. On June 5, 1951, Monroe, Jr., saw 5, all in "female" plumage flying in a southwesterly direction over the crest of Black Mountain, Harlan County (elevation 4,150 feet), a remarkable record. He has also recorded the species recently in summer at Dale Hollow Reservoir near Albany (verbal com.).

Fall.—In autumn Hooded Mergansers are seen mainly on major waters, where

they may begin to appear in October and usually attain maximum abundance near the end of November. The numbers present at this time are usually greater than in midwinter. Monroe's earliest record for the Louisville area is October 18. He has taken 6 specimens (B.L.M.) on the Ohio River in Oldham and Carroll counties between November 16 and December 6, and J. P. Doughty and others have killed many while hunting this water. On November 16, 1948, R. C. Soaper and I saw a flock of 4 females and 1 male on the Ohio near Henderson, where Soaper considered the species common. I saw 1 male on the Mississippi River in Fulton County, November 13, 1948. Other records: common at Kentucky Lake (Morse, 1950*b*:Table 2—earliest date November 5, 1945–1948); rare on small lakes in Hopkins County, October 18–November 3 (Bacon, 1933).

Winter.—Hooded Mergansers winter regularly, in small numbers, in all carefully studied areas from Louisville (Monroe) westward to Kentucky Lake (Morse, 1950*b*:Table 2) and Reelfoot Lake, Tennessee (Ganier, 1933*a*:21). Goodpaster (1941:11) listed a Cincinnati, Ohio, record for January 2, 1939. At Louisville wintering birds occur chiefly on the Ohio River and nearby ponds.

Specimens examined.—Total, 7. B.L.M.—2 males, 1 female, Carroll County (Nov. 16, 1938); 1 male, 2 females, Oldham County (Dec. 6, 1937; Nov. 26, 1936, Dec. 6, 1937); 1 female two-thirds grown, Jefferson County (June 7, 1947).

Mergus merganser Linnaeus: COMMON MERGANSER

Status.—Fairly common to common late fall and early spring transient and winter resident.

Note.—Not all existing sight records of the Common and Red-breasted mergansers are satisfactory. It seems quite probable that some errors have occurred in the identification of females and subadults. The present account, written with this in mind, will have to suffice until more specimens and carefully annotated sight records are available.

Spring.—There is little question that the Common Merganser is the most numerous of the "fish ducks" in Kentucky in late winter and early spring. Migratory movement is probably at its peak in late February or early March; the species is rare by early April, and adult males are very rare after February. The species has been noted in numbers at Cincinnati, Ohio (Goodpaster, 1941:11, Maslowski, notes); near Louisville, where it is regular and common in February and March, rare in April (Monroe); and at Kentucky Lake (Morse, 1950*b*:Table 2). So many winter on the Ohio River and other large waters that the period of migration is best indicated by records from smaller waters; movement from February to early April is evidenced by occasional records from Morehead on the Cumberland Plateau (Barbour, 1952:24) and more frequent observations at the Woodburn lakes in Warren County (Wilson, 1940*a*:18; 1951:4; 1952*c*:46; 1957*b*:60). Late records: April 1, at Morehead (Barbour, 1952:24); April 19, at Louisville (Monroe); May 8, in Warren County (Wilson, 1929:181); March 31, at Kentucky Lake (Morse, 1950*b*:Table 2).

Summer.—In 1939 a female, unable to fly, remained at McElroy Lake, Warren County, until June 10 (Wilson, 1940*a*:18).

Fall.—Transients probably pass from October to December, but no indications of a major migratory movement are available. The species does not become numerous until late November or early December, and a gradual increase continues until winter numbers are attained. Early records: October 30, at Louisville (Monroe); November 9, at Kentucky Lake (Morse, 1950*b*:Table 2). On the Ohio River between Carrollton and Louisville, J. P. Doughty and Monroe noted that Common Mergansers usually become common by the end of November. Pindar (1925*a*:79) wrote that they were fairly common on the Mississippi River in Fulton County in the fall of 1892. There are few records away from larger waters; Bacon (1933)

considered the species rare in Hopkins County, with a few November records for the small lakes there.

Winter.—In Kentucky this big merganser is essentially a bird of cold weather and large waters, being more or less replaced in spring by the Red-breasted Merganser, which is also less restricted to major streams. The Common Merganser winters regularly along the larger rivers, usually occurring in groups of 2 or 3 to 15 or more, which show a tendency to frequent the mouths of creeks. Females and subadult males are much more numerous than adult males, which are usually seen in numbers only after prolonged severe weather. During the extremely cold weeks of early February, 1936, Monroe saw more adult males amid the ice floes of the Ohio River than are seen at Louisville in five ordinary winters. The species is common at Cincinnati, Ohio (Kensies, 1948a:10; Goodpaster, 1941:11), Louisville and vicinity (Monroe), and Kentucky Lake (Morse, 1950b:Tables 2 and 3), and has been recorded at various other localities. Goodpaster (1941:11) noted a concentration of 200 birds at the mouth of the Miami River on February 18, 1934.

Remarks.—Audubon's casual statement (1838:261), "when I first resided in Kentucky, some bred there also, although [now] none . . . summer in that country" cannot be accepted outright.

Geographic variation.—The subspecies occurring is the North American *Mergus merganser americanus* Cassin.

Specimens examined.—Total, 3. B.L.M.—2 males, 1 female, Oldham County ($\sigma\sigma$ Feb. 2, 1936; ♀ April 14, 1935).

Mergus serrator Linnaeus: RED-BREASTED MERGANSER

Status.—Transient, fairly common to common in spring, rare in fall; rare winter resident on large waters. Not recorded from Cumberland Plateau.

Spring.—Early transients cannot be distinguished from wintering birds, at least on large waters. In the main flight, in April, the species occurs on ponds and streams where none have wintered and is more numerous everywhere; rare by early May. In late February and early March small numbers, chiefly females and subadults, have been noted on the Ohio River near Cincinnati, Ohio (Goodpaster, 1941:11), and at Louisville (Monroe); later in spring larger numbers appear, including adult males, which are rarely seen at other seasons. Maslowski (notes) recorded 75 birds on a pond just off the Ohio River near Cincinnati on April 17, 1949. Monroe and I have often seen flocks of 5 or 6 to 50 or more on the Ohio River near Louisville, throughout April, when the species is common also at Kentucky Lake (Morse, 1950b:Table 2). Elsewhere I saw 5 (all adult males) on a reservoir near Lexington, March 28, 1939, and Wilson (1940a:18) saw more than 100 at McElroy Lake, Warren County, April 1, 1939. Late dates: May 15 (1950) at Lexington (Edwards, notes); May 14 (1950, 1959), at Louisville (Monroe); 4 on May 7, 1937, in Warren County (Wilson, 1940a:18), and 1 male acquiring adult plumage seen by me on May 5 and 6, 1949, at Chaney Lake; May 18 (Morse, 1950b:Table 2), and June 3 (1949), at Kentucky Lake (Morse, 1949).

Fall.—The Red-breasted Merganser is decidedly rare at this season, compared with its numbers in spring, and it seems certain that the majority of autumn transients pass elsewhere. The few records range from late September to November. Monroe took a female (B.L.M.) on the Ohio River at Milson, Trimble County, on November 9, 1947, and from 1934 through 1952 made only two other records, both in the Louisville area, these on November 27 and 30. One or a few birds were present there on scattered dates from September 12 through November 29, 1959 (Stamm, Brecher, and Lovell, 1960:5; Monroe, notes). There are records also for October 29 (1960), and November 11 (1951), both at Louisville (Monroe, notes; Stamm and Summerfield, 1952:42). Bacon (1933) recorded several killed or captured in Hopkins County in November and December.

Winter.—Our little knowledge of the species in winter results mainly from the

efforts of Monroe, who, from blinds along the Ohio River near Louisville, has observed small numbers of females and subadults in various winters, throughout January and February. Morse (1950*b*:Table 2) had only one winter record (1945-1948) for Kentucky Lake, January 6, 1948. This merganser was reported as common [?] in Fulton County in the 1890's by Pindar (1925*a*:79).

Remarks.—Audubon's reference (1839:93) to two observations of females with broods in "the lower parts of Kentucky" is interesting but not thoroughly acceptable in the absence of further evidence.

Geographic variation.—The subspecies occurring is the widespread *Mergus serrator* Linnaeus.

Specimens examined.—Total, 4. B.L.M.—1 female, Trimble County (Nov. 9, 1947); 3 males, Jefferson County (adult, April 7, 1935; immatures, Feb. 19 and 22, 1938).

FAMILY CATHARTIDAE: AMERICAN VULTURES

Cathartes aura (Linnaeus): TURKEY VULTURE

Status.—Resident; common and widespread in summer and through most of the year, less numerous in winter, especially in January; breeds locally throughout the state but is uncommon even in summer along the high ridges of the southeastern border counties.

Spring.—Monroe has usually noticed an increase at Louisville about mid-February. Goodpaster (1941:11) wrote that "migrating birds" arrived near Cincinnati in March and April. Through most of the state numbers usual for the breeding season are probably attained by mid-March.

Breeding records.—Data are few. So far as now known, in Kentucky the breeding activities of the Turkey Vulture begin in March or April and some young still have not flown by early August. The egg-laying period indicated by 12 dated breeding records extends from late March to mid-May, with a peak of clutch-completion April 11-20. Records are from Rowan (Barbour, 1951*a*:33), Owen (Hays, 1957:3), Oldham (Bloch, 1960:19; Carpenter, notes), Jefferson (Monroe, notes), Nelson (Blincoe, *vide* Funkhouser, 1925:201; Monroe, notes), McClean (Bigelow, 1953:43), and Hopkins (Suthard, *vide* Hancock, 1954:19) counties, and from nearby Lake County, Tennessee (Goodpaster, verbal com.). Egg-dates range from "late March" (1952), 2 eggs in McClean County (Bigelow), to May 27 (1923), 2 eggs nearly ready to hatch in Hopkins County (Suthard), but later nestings are represented by 1 fresh egg found in Jefferson County on May 9 (1937), by Monroe, and by 2 large young noted in Oldham County on August 8, 1959 (Bloch). Of 10 clutches or broods reported, 8 contained 2 eggs or young and 2 consisted of 1 egg each. Discounting one of the last two (which was fresh and perhaps to be joined by another), the average clutch-size is 1.9. Eggs have been found in hollow logs, the bases of hollow trees, and in rocky caves and clefts. One noted in Clermont County, Ohio (Goodpaster, 1941:11), not far from the Kentucky line, was 40 feet up in the hollow of a beech. In April of 1949 and 1951, in the rugged hills at the western edge of the Cumberland Plateau in Powell, Wolfe, and Menifee counties, I saw ledges of many large sandstone cliffs which were whitened with the excrement of Turkey Vultures. According to the local people, vultures' eggs are often found in such places, and I have been told the same by residents near the gorge of the Kentucky River in Clark and Madison counties.

Distribution.—The Turkey Vulture is common nearly everywhere in the state, being reported from almost every county and, casually, as breeding in many. I have found Turkey Vultures rather more numerous than elsewhere about rugged, rocky areas like those mentioned just above. At sunset on June 22, 1948, I noticed more than 100 perched in trees in a cliff-bordered cove in Powell County, with many more coming in from all directions to roost. They also congregate in numbers at the major heronries in western Kentucky, along with many Black Vultures.

I noticed small numbers—exact figures were impossible to obtain, as the birds came and went constantly—at the heronry at the north end of Reelfoot Lake (Fulton County) on May 20, 1949, and have seen gatherings at various smaller heronries. Quantities of dropped fish and occasional dead young herons are obvious attractions at these sites.

Along the Cumberland Mountain ridges in Bell, Harlan, Letcher, and Pike counties the species is uncommon to rare. In these counties, from July 17 to 23, 1949, I saw only 3 Turkey Vultures, in Pike County, 1 of them near Marrowbone and 2 over the hills at Belfry. In 1951, at the "Breaks of the Sandy River" near Elkhorn City, Pike County, I saw Turkey Vultures on only three occasions, June 20–26, the largest number seen being 4. On the higher reaches of Black Mountain, Harlan County (elevation 4,150 feet), despite intensive observations by numerous observers (Howell, 1910; Wetmore, 1940; Barbour, 1941a; Breiding, 1947; Lovell, 1950c; myself and associates), only 4 appear to have been seen. I recorded single birds near the 4,000-foot level there on July 9, 1946, July 2, 1951, and May 15 and June 6, 1952. I have often seen a few soaring in low valleys on the Virginia side of the mountain.

Fall.—In 1948 I saw moderate numbers throughout most of the state in October and November. Wilson (1925a) noted concentrations of about 150 near Bowling Green on October 28 and November 17, 1924. A gradual diminution of numbers seemingly takes place late in the season.

Winter.—Turkey Vultures become definitely less numerous in December and are often missing from Christmas bird counts; a single flock of 38 seen at Mammoth Cave on the count of December 21, 1949 (*Kentucky Warbler*, 26:10, 12, 1950) evoked special comment from the participants (Wilson *et al.*). From 1934 to 1952 Monroe obtained no records at Louisville between January 5 and 28; Hancock (verbal com.) had very few January records for Madisonville; Edwards and I saw none in Laurel County, February 3 to 5, 1950. A large winter roost (shared with many Black Vultures) has been located for years at Clifty Falls State Park, Indiana (see Butler, 1935), just across the Ohio from Carroll County, Kentucky, but such roosts are unreported from Kentucky.

Remarks.—Where the rather sizable Kentucky population of Turkey Vultures finds adequate food poses an interesting and challenging question. The birds are rarely seen at road-kills as they so often are in states farther south. A few observers (*e.g.*, Kozee, 1938:34, Carter County; Blincoe, 1925:409, Nelson County; Hancock, 1954:19, Hopkins County) have noted a decrease in numbers. Bacon (verbal com., 1951) regarded the species as much less numerous than formerly in Hopkins County, attributing the decrease to the improved disposal of dead livestock in recent years. I am not certain, however, that a significant general change in numbers has occurred in the last half century.

Geographic variation.—The subspecies occurring is the eastern *Cathartes aura septentrionalis* Wied.

Specimens examined.—Total, 2. M.S.C.—1 unsexed, Rowan County (Feb. 23, 1936; Roger W. Barbour); U.S.N.M.—1 male, Gallatin County (Oct. 12, 1938).

Coragyps atratus (Bechstein): BLACK VULTURE

Status.—Resident; rare to fairly common; occurring only west of the Cumberland Plateau and locally distributed; little, if any, less numerous in winter.

Spring.—There often seems to be a slight increase in numbers in February. In field work from 1948 to 1952 I recorded 1 to 8 Black Vultures at a time in April, in Powell (2 around cliffs near Nada, April 22, 1949), Clark, Gerrard, Caldwell, and Marshall counties. Near Bardstown, on March 19 and 22, 1921, Blincoe (1922a) recorded unusual concentrations, of 92 and 85 respectively, "far exceeding the total . . . recorded in any single year" [1911–1921].

Breeding records.—The evidence afforded by very limited data (9 dated ob-

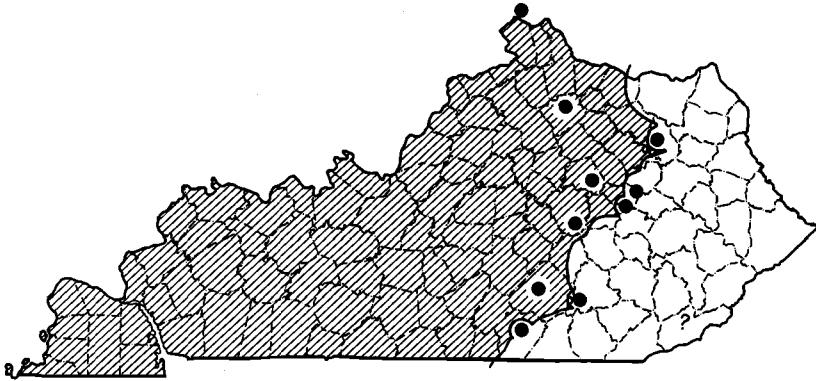


Fig. 15. Breeding-season distribution of the Black Vulture in Kentucky. Hatched area, regular and rare to common; solid circles, marginal summer records.

servations) tends to suggest that the breeding season begins in late February, a little earlier than that of the Turkey Vulture; some young do not fly before the middle of August, and perhaps later. No real peak of clutch-completion is evident, but one may be inferred approximately April 1–10. Data are from Rowan (Barbour, 1951a:33), Madison (Gailey, *vide* Lovell, 1951b:59), Oldham (Carpenter, 1937b:39; Bloch, 1960:19; Monroe, Mengel, notes), and Nelson (Blincoe, *vide* Funkhouser, 1925:202) counties. Extreme egg-dates now available are both from Oldham County, where sets of 2 were noted on March 7, in 1959 (Bloch), and May 18 (slightly incubated), in 1943 (Monroe). Bloch (*loc. cit.*) reported young about the size of chickens from the same locality, on August 4, 1959. Eggs are laid chiefly in rocky caves and clefts, and probably also in hollow logs. A cavity under a heap of boulders in Oldham County has been used for many years, and one of the boulders bears the words "buzzard rock," chiselled long ago by an unknown hand. Lyon (1893) found many nests in caves of the Cumberland River bluffs near Clarksville, Tennessee, approximately 5 miles south of Christian County, Kentucky, from mid-March to early May. Other Tennessee nests have been described in detail by Todd (1938).

Distribution.—The Black Vulture occurs throughout the state west of the Cumberland Plateau (Fig. 15), being found in greatest numbers in two distinct areas: first along the steep, wooded slopes of deep stream valleys in limestone areas of central Kentucky, and again in various parts of the western lowlands, especially near the Mississippi River. With the Turkey Vulture it congregates at heronries. After a storm at the large heronry at Reelfoot Lake, Maslowski (1937:59) noted "scores" of Black Vultures feeding on dead herons. In most of Kentucky, the Black Vulture is much less numerous than the Turkey Vulture, but it outnumbered that species locally along the Kentucky and Little Kentucky rivers in Carroll and Trimble counties, where the streams cut through outlying formations of the Knobs, and perhaps elsewhere. Along the gorge of the Kentucky River in the southern Bluegrass it seems to be at least as numerous as the Turkey Vulture. Lyon (1893) said that the Black was more numerous than the Turkey Vulture near Clarksville, Tennessee, in the 1890's. The Black Vulture is extremely rare, if not absent, over all of the Cumberland Plateau except its western edge. In and near the rugged country of the Cliff Section (see description on pp. 41–43) bounding the Plateau on the west, the species has been recorded as resident near Morehead ("less common than the Turkey Vulture") by Barbour (1951a:33), and on several occasions I have seen 1 or 2 about cliffs in Powell and Wolfe counties (April, 1949; late June,

1948). In much work farther south, in similar country in Laurel, Pulaski, Whitley, and McCreary counties, I have seen the species just once (Laurel County), near Rockcastle River on June 9, 1952. In nearby Pickett County, Tennessee, none was recorded in field work conducted in June, 1937 (Ganier, 1937a). Farther east on the Plateau I have recorded none in much time afield at all seasons, 1946, 1948-1952, nor has the species been reported by others, except for Wilson (1942: 21), who listed it without evidence as breeding rarely in Harlan County. Just west of the Plateau the Black Vulture has been recorded by several observers, including Monroe, Jr. (verbal com.) in Wayne and Pulaski counties, Patten (1946: 33) in Madison County, and me in Wayne County.

East of the Appalachians, the northward movement of the Black Vulture in the last 50 years has been remarkable, and has carried it, as a breeding bird and in some numbers, high up the eastern slopes of the mountains (Murray, 1952:38-39; Brooks, 1944:17). No such invasion has occurred on the western slopes, even on the relatively low Cumberland Plateau. In view of this active range expansion in the east, it seems likely that if Black Vultures appear in eastern Kentucky in the next few years they will come not from the west, where they have long been established, but from the east.

It is my guess that the Black Vulture is less well adapted than the Turkey Vulture for existence in heavily forested terrain, this because of the greater expenditure of energy in food-seeking necessitated by its comparatively high "wing-loading."

History.—Audubon (1834:47) wrote that the species "continues the whole year" in Kentucky, and said it occurred as far east as Cincinnati. In his journal of 1820 (Audubon, 1929:22) he recorded a flock seen November 11 near the Ohio River in the present vicinity of Crittenden County, and commented that the "Carrion Crow" was very scarce. Butler (1897:769) later concluded that the species apparently "withdrew . . . from the Ohio Valley" until reported by Langdon (1877a) near Cincinnati, Ohio, and Quick (1881) at Brookville, Indiana, in 1876 and 1879, respectively. Butler failed to note that this rediscovery was coincident with reawakening of ornithological activity in the area. About the same time, the species was reported from several other localities in and near Kentucky (Ridgway, 1878:166, Mount Carmel, Illinois; Pindar, 1888a, Fulton County; Beckham, 1885:42, Nelson County). Probably a general increase has followed the clearing of the country, but I think Butler's conclusion that the species vanished and reappeared is unjustified; certainly no recent, major invasion such as that east of the Appalachians has occurred. Recently some observers have noted local decreases (see Hancock, 1954:19, Hopkins County).

Fall.—A few recent records are as follows: Wetmore (1940:533) gave a number of records from Gallatin County westward; in 1948, besides lesser numbers seen in several places, I saw 40 or 50 just south of Cayce, Fulton County, November 10, and a flock of 30, flying to a roost in lowland woods near Oakton, Hickman County, on November 13. At Henderson on September 4, 1949, Tordoff and I saw 40 or 50 at a drying slough with an equal number of Turkey Vultures.

Winter.—Many observers have reported the species throughout winter. Monroe has recorded a number near Louisville nearly every winter on various dates in January and February. In Nelson County, Blincoe (1925:409) remarked on the presence of the Black Vulture in winter, contrasted with the absence of the Turkey Vulture. Many Black Vultures winter each year about cliffs near Madison, Indiana, opposite Carroll County (Butler, 1935). Similar roosts probably exist in Kentucky, but exact information is lacking. Tanner (1947) described at some length a vulture roost in the Holston River valley of eastern Tennessee.

Remarks.—Lovell (1947; 1952a) has reported several instances of Black Vultures killing and eating young pigs in two widely separated areas (Meade County and Kentucky Woodlands National Wildlife Refuge).

Specimens examined.—Total, 3. U.K.—1 unsexed, Oldham County (Sept. 24, 1914);

B.L.M.—1 unsexed, Oldham County (no date); U.S.N.M.—1 female, Fulton County (May 31, 1938).

FAMILY ACCIPITRIDAE: KITES, HAWKS, OLD WORLD VULTURES, AND HARRIERS

***Elanoides forficatus* (Linnaeus): SWALLOW-TAILED KITE

Status.—Formerly a summer resident, presumably breeding, at least from Louisville and Cincinnati south and west; not recorded in the present century.

Records.—The deficiency of early ornithological work in Kentucky is indicated by the near lack of records of this conspicuous and probably once common species. Audubon (1831:368) wrote: "Near the Falls of the Ohio, a pair had a nest and reared four young ones, in 1820. In the lower parts of Kentucky it begins to become more numerous." Pindar (1887a:55) recorded "eight or nine" at Woodland Mills, Tennessee, about 2 miles from the Fulton County, Kentucky, line on August 9, 1886. Later (1925a:85) he seemingly implied that others had been seen, usually not "before the last of July or first of August" in Fulton County, adding that there was no evidence of breeding. The species occurred in numbers in the Ohio and Wabash valleys in southern Illinois and Indiana in the late 1800's, as indicated by numerous papers (see Ridgway, 1873:201; Nelson, 1877:42, 49, 57). At least one specimen from that area, a male taken by Ridgway at Mount Carmel, Illinois, on August 1, 1870, is still extant (U.S.N.M.). Farther up the Ohio Valley, Langdon (1879:180) mentioned this kite as a former summer visitant at Cincinnati, and Butler (1929:198) examined an old specimen taken there.

The most thorough account which can be taken as applying to Kentucky was given by Nelson (1877:57), who watched many of these kites over and near the Ohio River (hence within the border of Kentucky) between August 17 and 31, 1875, and wrote:

Numerous in the immediate vicinity of Cairo [Illinois], where I was informed it had been abundant the week previous to my arrival. At the junction of the Ohio and Mississippi Rivers is a long point bearing a growth of cottonwoods. The river was so high during my visit that the land was submerged, thus causing a great many grasshoppers to take refuge in the treetops. This afforded the kites a fine opportunity for capturing their prey, of which they were not long in taking advantage. The kites would first appear about ten o'clock and in a small flock would proceed to work in the following manner: The trees were situated in an oblong patch and the kites would hunt around the border, making a complete circuit. They kept but a few feet above the treetops and when a grasshopper was observed, by a turn of the long tail and a sweep of the wings, the bird would dart towards its prey until within reach, when with a sudden upward turn it would reach forth its feet, and grasping the insect, proceed with outstretched wings to feed upon the remains of its victim while passing slowly along with its companions. As each grasshopper was captured the bird's abdomen and tail would brush against the leaves with a loud 'swish'; in consequence the feathers upon the abdomen and under tail coverts were badly worn and discolored.

Apparently in the 1890's the kites became rare and began to disappear. Chansler (1912) saw 2 in Knox County, Indiana, in August, 1890, and Widmann (1895:116) observed the species in Dunklin County, southeastern Missouri, at least as late as May 12, 1894.

Geographic variation.—Kentucky birds should, of course, have belonged to the North American subspecies *Elanoides forficatus forficatus* (Linnaeus).

***Ictinia mississippiensis* (Wilson): MISSISSIPPI KITE

Status.—Formerly occurred in summer, at least in extreme western Kentucky, possibly breeding; casual in the present century.

Early records.—Only two records definitely attributable to Kentucky are to be found in the early literature. Nelson (1877:58) described the species as "abundant"

near Cairo, Illinois, at the confluence of the Ohio and Mississippi rivers, August 17-31, 1875. He observed it also at Mound City, Illinois, on the Ohio River opposite Ballard County, Kentucky. For nearby Fulton County, Pindar (1887a:55) gave records of 1 seen August 13 and 3 or 4 August 14, 1886, near Hickman. Later (1925a:85) he added "Never seen earlier than July 15." The species was common on the Illinois prairies just to the north, as abundantly documented by Ridgway, Nelson, and others (see references under Swallow-tailed Kite). Two male specimens taken by Ridgway in Richland County, Illinois, August 19, 1871, are still extant (U.S.N.M.). Widmann (1907:90) wrote that the species was common about cypress swamps and cotton fields in southeastern Missouri. Active field work conducted at the turn of the century would probably have disclosed many in western Kentucky, at least as transients. This kite has almost disappeared from the central Mississippi Valley north of Memphis and was nearly gone when Ridgway (1914a:416) made his last record (one pair) at Olney, Illinois, in the summer of 1910. Chansler (1912:239) recorded 1 seen in Knox County, southern Indiana, on September 18, 1911. A few may have remained later in nearby southern Illinois, as suggested by the observation of Cahn and Hyde (1929:36), in April, 1927. The reasons for the disappearance of the species are not clear. Ecological changes arising from intensive cultivation of the original prairies over which the kites fed may have played some part, but it is possible that persecution of these gentle, unwarly birds by farmers and hunters was more important.

Recent records.—It remains to be determined whether a few recent sight records indicate a gradual return of the species or only the presence of occasional vagrants. Single kites have been reported from Bullitt County (date not given), and Charleston, Indiana, June 26, 1937 (Carpenter, 1937:29), and at Louisville, May 3, 1953 (Stamm and Cole, 1954), and May 31, 1955 (Carpenter, 1955a). Recent observations (Coffee, personal com.) made at Reelfoot Lake, Tennessee, may foreshadow the reappearance of the species in southwestern Kentucky.

**Accipiter gentilis* (Linnaeus): GOSHAWK

Status.—Very rare winter visitant, probably more numerous formerly.

Recent records.—Only a handful of records of this species has been made in the present century. Blincoe (1920:3; and letter, January 22, 1949) handled an adult killed near Bardstown on December 1, 1917. This bird was mounted, and Blincoe thought it might have found its way to the museum of the Nazareth Academy at Nazareth, near Bardstown; I was unable to find any trace of it there in February, 1950, and it has evidently been lost. Of a number of sight records of adults, the following are probably authentic: one at Bowling Green on February 2, 1918 (Wilson, 1922:235)—this and the preceding record both being for the severe winter of 1917-1918; one near Louisville on December 19, 1943 (Stamm, 1946; another near Louisville (Maslowski and Mengel) on February 20, 1946 (Mengel, 1948:50). In eastern Jefferson County and adjoining Oldham County, Monroe and Monroe, Jr., have seen a few very large accipiters thought with reasonable certainty to have been Goshawks: one on December 31, 1944, and one or more March 2 to March 23, 1946 (four observations).

Older records.—Immature females killed near Cincinnati, Ohio, just north of Kentucky, in November, 1878, and November, 1882, were reported respectively by Langdon (1879:180) and Fisher (1884:11). In earlier years the species was apparently more numerous, since Audubon (1834:241) wrote:

I have found them rather abundant in the lower parts of Kentucky . . . When residing in Kentucky I shot a great number of these birds, particularly, one cold winter, near Henderson, when I killed a dozen or more on the ice in Canoe Creek . . . They there caught mallards with ease.

The presence in Audubon's day of Goshawks in numbers so far south of their present normal winter range (he recorded them also in Indiana and Louisiana)

may have resulted from their following the great flights of migrating Passenger Pigeons southward, a phenomenon, it seems, actually witnessed by Audubon. At that time, further, unbroken stretches of northern hardwood forests extended farther south than today, providing breeding habitat of greater extent and proximity to the southern states. In southern Michigan, today occupied by a fauna of distinctly southern affinities, there occurred originally such northern mammals as snowshoe rabbits, Canada lynxes, and perhaps wolverines (Burt, 1944:6-7), and it seems likely that Goshawks nested there.

Audubon's original drawing of the adult represented in plate 141 of his "elephant folio" (*Birds of America*, vol. II, ca. 1832) was made at Henderson, Kentucky.

Geographic variation.—Goshawks occurring in Kentucky doubtless represent the eastern American subspecies *Accipiter gentilis atricapillus* (Wilson).

Accipiter striatus Vieillot: SHARP-SHINNED HAWK

Status.—Very rare to rare resident (little is known of breeding), locally, throughout the state; rare to uncommon transient, most frequently seen in autumn.

Note.—The infrequency of observations of the Sharp-shinned Hawk by experienced observers suggests that the species is less numerous than indicated by the literature in general. In my experience it is far less numerous in Kentucky than in either the north-central or prairie states. Sight records should be made with care and published with due detail.

Spring.—No peak of migration is at all evident, although scattered records indicate a slight increase in spring. On the Cumberland Plateau in Powell County I saw small Sharp-shinned Hawks presumed to be males on April 22, 1949, and April 7, 1951, both in the same area. Monroe obtained a specimen in Oldham County on April 2, 1951 (B.L.M.). Near Louisville between 1934 and 1952, Monroe and I saw no more than 9 or 10 positively identified Sharp-shinned Hawks, all in late February, March, and April. Hancock (verbal com.) likewise has found the species very rare near Madisonville in the Western Highlands.

Breeding records.—Audubon's (1838:525) observations of the breeding of this species in and near Kentucky are puzzling, and, if valid, describe departures, as noted already by Bent (1937:98), from the normal type of nesting. Audubon mentioned a nest (with 4 eggs) found in a hole in rocks at "Rock-in-Cave"¹ on the Ohio River opposite Crittenden County in 1819, one (with 5 eggs) in a hollow sycamore near Louisville, and a more normal site in a prairie (or "barren") oak grove near Henderson. The probability that the first observation is authentic is much increased since Audubon secured the female, which served as the basis for Fig. 2 of his plate 374 ("Birds of America," vol. IV, 1837). Little information has been obtained since. Years ago Bacon (verbal com.) found at least two nests in upland oak-hickory woods near Madisonville, Hopkins County. In a dense hemlock grove in Laurel County, 15 miles southwest of London, I found a group of nests typical of and probably built by this accipiter, perhaps by one pair over a period of years, but in several visits from 1949 to 1952 I was unable to locate an active nest. Blincoe (1920:2) recorded a pair nesting in a beech grove in Nelson County. No other nests have been reported from Kentucky. The rarity of records south of the Ohio River was mentioned by Ganier (1923a), who took sets of eggs from nests in pines near Nashville, Tennessee, on May 11, 1919 (4 eggs), May 16, 1920 (4 eggs), and May 17, 1921 (5 eggs).

Distribution in summer.—The species is widespread in the breeding season, occurring mainly in heavily forested areas. It is, consequently, probably most numerous on the Cumberland Plateau and in the Knobs adjacent. In my own field work I have found it rare at best and decidedly local; it follows that some of the estimates (see also Wilson, 1942:21) of abundance noted beyond seem extreme to me. Common, in Rowan County, 1933-1939 (Barbour, 1951a:33); 24 [1] seen

¹ Now generally called Cave-in-Rock.

on 9 days of 30 afield in Madison County, June, 1941 (Patten, 1946:33); rare, in Mercer County (Van Arsdall, 1949:24); common permanent resident, breeding, in Nelson County (Beckham, 1885:41)—fairly common, same locality (Blincoe, 1920:2); 2 June records and no further evidence of breeding near Louisville, 1934–1952 (Monroe, notes; see also T. Smith, 1943); rare in Hopkins County (Hancock, 1954:20). In six seasons afield, I obtained only four records (three on the Cumberland Plateau) on dates indicative of breeding: 1 bird in pine woods near Cumberland Falls, Whitley County, July 10, 1946; 1 subadult near the nests mentioned earlier, in hemlocks and pines on bluffs in Laurel County, May 9, 1952; 1 in pine woods near London, July 5, 1939 (Mengel, 1939:45); and 1 in oak woods near Kentucky Lake, Trigg County, June 16, 1949. Barbour (1956:5) noted 1 in Breathitt County, July 8, 1955, and in Kentucky Woodlands National Wildlife Refuge, Cypert (Refuge files) observed 1 in Lyon County, June 4, 1940.

Fall.—There is little detailed information. The species is evidently most numerous at this season, as noted by Blincoe (1925:409) at Bardstown. Wetmore (1940:534) reported 1 seen on September 17, 1938, on Shady Spur near Middlesboro, and immature birds were collected at other localities in the same year (U.S.N.M.). G. C. Embury collected an immature female (C.U.) on September 14, 1904, at Russellville, Logan County (Mengel, 1948:50). Two birds were seen at Kentucky Lake, October 5, 1947, by Spofford (1948). Monroe has only a few September, October, and November records for the Louisville area where Stamm (1957b:42) noted migrating birds on September 24, 1956. I saw 1 near Morehead, November 22, 1948, individuals at Louisville, October 20, 1948, and September 30, 1951, and 1 near London, October 3, 1951. A few seen by Monroe near Louisville in August may have been early transients.

Winter.—Rare. There are few definite records, although the majority of local lists give the species as a "permanent resident," implying that it winters. Dury (1885:65) referred to a bird captured on January 18 (1885?) at Cincinnati. I saw 1 at Louisville, January 11, 1935, and Monroe has two late January records. Late December reports are more frequent; however, Wilson (1939c:34) listed only two records for all Christmas bird counts at Bowling Green, 1929–1938.

Geographic variation.—The subspecies occurring is the eastern *Accipiter striatus velox* (Wilson).

Specimens examined.—Total, 4. B.L.M.—1 male (adult), Oldham County (April 2); C.U.—1 immature female, Logan County (Sept. 14); U.S.N.M. (see Wetmore, 1940:534)—1 immature female (?), Edmonson County (Nov. 11); 1 immature (sex?), Trigg County (Nov. 1).

Accipiter cooperii (Bonaparte): COOPER'S HAWK

Status.—Resident, uncommon to fairly common, breeding throughout the state, perhaps somewhat more numerous in spring, fall, and winter.

Spring.—Many transients probably pass through the state, but so many Cooper's Hawks winter, and breed, that the details of migration are obscured. I recorded 2 in Jefferson County on April 8, 1948, and 1 on April 15, 1951, single birds in Warren County on May 3 and 6, 1949, and in Calloway County on April 12, 1950. On the last date I also watched an adult stalking small birds on the ground in dense brush at Kentucky Woodlands National Wildlife Refuge, Lyon County.

Breeding records.—Surprisingly little is known of the nesting of this fairly common species. The rather late breeding season extends at least from mid-April to the end of June. Nests have been reported, for the most part in little detail, from only a few areas: Cincinnati, Ohio (Goodpaster, 1941:11); Nelson County (Blincoe, 1920:3; and *vide* Funkhouser, 1925:204); Jefferson, Oldham, and Bullitt counties (Monroe, notes; T. Smith, 1943, and notes); and Hopkins County (Bacon, notes; Hancock, 1954:20). All nests have been found in deciduous forest or woodland. Incubation has been reported as early as April 22 (Blincoe) and a nest

containing 6 young (very small and downy to partly feathered) was found by Monroe, Smith, and me in southern Jefferson County on June 14, 1942. A nest found by Basil Doerhoefer in the Knobs in Bullitt County contained 2 "addled" eggs and 2 young on June 20, 1935. Half a dozen nests found near Louisville, mainly by Smith, have been in hickories, oaks, and elms, usually in forks of the trunks, from 30 to 60 feet above ground; recorded clutches and broods range from 2 (incomplete?) to 6.

Distribution in summer.—Observers throughout the state have reported the species as a permanent resident. While it is perhaps slightly more numerous in rough, forested country, it is frequently seen in woodlots and open farm country in the Bluegrass, Pennyroyal, and Purchase. Probably every fair-sized wooded area in the state has harbored a breeding pair at some time, but the birds are somewhat furtive and easily overlooked. The ratio of abundance of this species to the Sharp-shinned Hawk in most of the state is probably at least 10 to 1 in favor of the Cooper's Hawk—Hicks (1935a:145) considered the ratio near 4 : 1 in much of Ohio. The disparity may be less in parts of eastern Kentucky (see Barbour, 1951a:33; Patten, 1946:33), where, however, data are comparatively few. I recorded Cooper's Hawks there, in Laurel County in July, 1939 (Mengel, 1939:45), in Wayne County in July, 1946, in Powell and Whitley counties in June and July, 1948, and in Pike County in June, 1951, all in rugged, forested country. Warner and I saw 1 at 3,500 feet elevation on Black Mountain, Harlan County, on July 7, 1946.

Fall.—The Cooper's Hawk is most numerous at this season. A number of specimens have been preserved (see below) and many killed, most of them by hunters. In the fall of 1948 I saw individuals in Meade County, October 22, Oldham County, October 29 and November 3, Jefferson County, October 31, Henderson County, November 5, Ballard County, November 5, and Fulton County, near Hickman, November 11. In 1949 Tordoff and I recorded 1 near Henderson on September 5.

Winter.—Cooper's Hawks are often recorded on Christmas bird counts and throughout the winter. The birds often seem to have definite, fairly restricted hunting ranges at this season. In most of the state, the species is exceeded in numbers only by the Red-shouldered and Sparrow hawks; in the Purchase, it is outnumbered also by the many Red-tails which winter there. I saw Cooper's Hawks in Graves and Fulton counties, December 25 and 26, 1950.

Specimens examined.—Total, 14. M.S.C.—1 "female" (almost surely male), Rowan County (Dec. 10); 1 unsexed, Lewis County (Feb. 15); R.W.B.—1 male, Rowan County (Dec. 27); B.L.M.—1 male, Carroll County (Nov. 18); 4 females, Oldham County (Aug. 1, 1, Sept. 14, Nov. 17); 2 males, 1 unsexed (nestling), Jefferson County (Feb. 20, Dec. 4; June 14); 1 male, Meade County (Sept. 26); 1 female, Larue County (Sept. 24); 1 male, Grayson County (Jan. 10).

Buteo jamaicensis (Gmelin): RED-TAILED HAWK

Status.—Resident; rare to fairly common in summer, breeding locally throughout the state, most numerous in eastern Kentucky (*B. j. borealis*); rare to common in winter (and on migration), increasingly numerous westward (*B. jamaicensis* subsp.).

Spring.—Many Red-tailed Hawks winter in some areas, and the dates of spring migration are not well known. Migrating flocks are seen only occasionally, but an apparent increase sometimes occurs in late February or March. Goodpaster (1941:12) recorded 12 birds seen at Glen Este, Clermont County, Ohio, just across the Ohio River, on February 28, 1932.

Breeding records.—Surprisingly few. Nesting is early, most clutches probably being completed in late March and early April. Barbour (1951a:33) gave the earliest nesting date for Rowan County (1933–1939) as May 9 (3 young). Blincoe (1920:3) mentioned a pair which nested for several years in woods near "Beechfork" River, Nelson County. Monroe found a nest 75 feet up in the top of a beech near Brownsboro, Oldham County, on April 12, 1941, and collected 2 slightly

incubated eggs. Bacon (notes, etc.) and Suthard (*vide* Hancock, 1954:20; see also correction, *Kentucky Warbler*, 30:47, 1954) found several nests in Hopkins County, high (45–50 feet) in sycamores, tulip trees, elms, and oaks, mainly on ridge-tops (2 nests on April 11, 1937, contained 2 eggs ready to hatch and 2 very small young, respectively). Average clutch or brood, 2.25 (4). In July, 1948, on the Cumberland Plateau in Powell County, I found an inactive nest in a pothole about 100 feet from the ground in the face of a large, remote cliff, probably a nest of the Red-tailed Hawk like those in cliffs of nearby east Tennessee described by Ganier (1931:8). Throughout the rugged areas of eastern Kentucky these hawks seem especially partial to the edges of high cliffs.

Breeding distribution.—Statewide, as indicated (see also Wilson, 1942) by summer observations from many localities, from Carter County (Kozee, 1938) west to the Mississippi River (Pindar, 1889b:313). Probably as a result both of deforestation and direct persecution, the species has become rather local in recent years. Today it is a bird of relatively unsettled country and of rough hills typically forested with oak-hickory or pine-oak-hickory. It generally shuns the city parks, suburban environments, and riparian habitats often occupied by Red-shouldered Hawks. The Red-tailed Hawk is consequently most numerous in the rugged Cumberland Plateau and Mountains, where I have made many records, April to July, variously 1939–1952, in many counties, especially Harlan, Bell, Letcher, Pike, Powell, Wolfe, Menifee, Pulaski, Lee, Laurel, Whitley, and Wayne. (In these areas the species is called “squirrel hawk.”) In extensively cultivated areas, on the contrary, notably the Bluegrass, the Red-tail is rare, or even unrecorded, as in Mercer County (Van Arsdall, 1949). It is rare to fairly common in the Knobs (Monroe, Mengel; notes), in the Pennyroyal, and in the Western Highlands (rare on oak uplands near Madisonville, Hancock). Farther west the species is rare but regular on the shaly oak-and-hickory-covered hills between the Cumberland and Tennessee rivers, and in upland oak woods of the Purchase (numerous personal records, April–July, 1949–1951), but is seemingly absent from the swamp and flood-plain forests favored by Red-shouldered Hawks.

Fall.—Small migrating flocks are occasionally seen in October and early November. Near the Mississippi River in early November, 1948, I noted moderate numbers of single birds and small groups, soaring high and generally southward. A considerable flight of Red-tails, many probably from more western localities, takes place down the Mississippi Valley (see “geographic variation”).

Winter.—In central Kentucky the species is more numerous, and in western Kentucky much more numerous, than during the breeding season (see also Spofford, 1948a). In the fall of 1948, in December, 1950, and in January, 1951, I estimated the population present in the Purchase to be at least 10, and possibly 20, times as great as that of the summer months. Birds of all descriptions, from nearly albinistic to totally black, were seen, whereas I have never seen other than ordinary light-phased birds in the breeding season. No such increase occurs in eastern Kentucky where, if anything, the species appears to decrease in winter—a decrease perhaps necessitated by the hibernation of the numerous woodchucks (*Marmota monax*) which may provide a substantial portion of the summer food supply in some areas. In several days in Laurel County in early February, 1950, E. P. Edwards and I saw no Red-tails at all. More data from eastern Kentucky are desirable, however, since Murray (1952:40) considered the species more numerous in winter than in summer in western Virginia.

Geographic variation.—At least four racial types of Red-tailed Hawk occur in Kentucky, all currently awarded nomenclatural recognition by some authorities. Unless qualified, all of the foregoing remarks apply to the subspecies immediately following.

Buteo jamaicensis borealis (Gmelin)

This widespread eastern subspecies is the breeding form of the state, and prob-

ably the most numerous subspecies throughout the year. Several specimens (listed below) are all light-phased and typical. Indeed, I have never seen or heard of a melanistic Red-tailed Hawk in Kentucky in the breeding season (see remarks under *B. j. calurus*).

Buteo jamaicensis kriderii Hoopes

A large immature female taken near Brandenburg, Meade County, on October 16, 1940 (B.L.M.), was first identified by J. Van Tyne and is typical of this subspecies (Monroe and Mengel, 1943*b*). In Fulton County, near Cayce, on November 10, 1948, I saw well but could not obtain a very pale, "pink"-tailed, white-headed adult which seemed certainly representative of the *kriderii* type. On December 26, 1950, just west of Fulton, Fulton County, I picked up a dead immature from the highway, the palest example of this form I have ever seen. Some of the feathers were charred and the bird had been dead for several days so that the exact locality of its death is uncertain (head, U.M.M.Z.). I saw rather similar birds locally in the same period.

Buteo jamaicensis calurus (Cassin)

The validity of this subspecies has been questioned in recent years (Hellmayr and Conover, 1949:97). It seems necessary, however, to emphasize that the Red-tailed Hawks of the populations heretofore called *calurus* (if they had no other distinguishing character) are far more variable in coloration than those of the east, totally melanistic birds being extremely rare in eastern populations, common in western. It follows that at least some of the considerable numbers of dark Red-tailed Hawks seen in western Kentucky in autumn and winter are of western origin. Until the status of the western Red-tailed Hawks becomes clearer than it is now, I shall continue to regard *calurus*, at the least, as a name of some convenience, and the following records show that some of our wintering Red-tails almost certainly come from western areas. In Fulton County on November 7, 1948, I saw an adult, entirely melanistic save for its deep red tail, soaring in company with 2 light-phased birds. Similar birds have been reported wintering at nearby Reelfoot Lake (Spofford, 1948*a*:24). Other dark-plumaged birds I have seen in this general area may have represented either *calurus* or *harlani* (see below), as may, also, a melanistic, immature bird taken (Gayle Carver, verbal com.) by Ottis Willoughby in Warren County (Western Kentucky State College, "Kentucky Museum," card catalogue No. 1088). A light-phased adult female (U.M.M.Z.) which I found freshly killed on the road at Lynn Grove, Calloway County, on December 25, 1950, I have called *calurus* on the basis of its fully barred tail, barred femoral "flags," and comparatively dark head and back. *B. j. calurus* has not heretofore been reported from Kentucky.

Buteo jamaicensis harlani (Audubon)

Among the peculiarities inherent in Taverner's (1936:68) curious paper on the Red-tailed Hawks, perhaps the most notable is his award of full specific status to the present form¹ and simultaneous denial of even subspecific recognition to *B. j. kriderii*, on the basis of evidence which—so far at least as he presents it—is essentially identical in both cases. Taverner argued thus: "*Kriderii* and *harlani* occur only in association with each other or with *borealis* or *calurus* [but here see observations to the contrary by Swarth, 1926:105–111]. They therefore cannot be subspecies in the current use of the term. They must be called either dichromatisms or full species." Further, *harlani* could be regarded as "a full species which hybridizes freely with *borealis* [= *jamaicensis*] in all its forms." While *kriderii* is dismissed on the grounds (indefensible from the standpoint of genetics) that "it presents

¹ This is not in itself remarkable, having been done earlier by Peters (1931:232), followed by the A.O.U. (1944:445; 1957:106), and suggested as a possibility by Mayr (1942:150). Mayr's alternative suggestion (*harlani* a color phase of *kriderii*) seems untenable at present, since the main breeding ranges of *harlani* and *kriderii* apparently do not meet.

only a dilution, diminution or suppression of color and hence introduces no new factor into the species," it is stated immediately and somewhat paradoxically that "it is quite possible to postulate *kriderii* as a distinct species far gone in mongrelization with *borealis* and allied strains." *Buteo [jamaicensis?] harlani* escapes the fate of *B. j. kriderii*, it seems, only because the peculiar mottling of the tail which is its chief characteristic is an "entirely new color pattern." Pending fuller understanding of these interesting birds of the remote northern prairies and forests, it seems to me, as it did to Hellmayr and Conover (1949:94), better to consider both "*harlani*" and "*kriderii*" as subspecific names representing the phenotypic expression of geographically localized genes or gene complexes.

Through the courtesy of L. Y. Lancaster, I obtained by trade for the U.M.M.Z. a large, unsexed adult specimen of *harlani* from the Ogden Science Collection of Western Kentucky State College. According to Lancaster and Gordon Wilson, the bird was received from Carlisle County, in the Purchase, in the 1920's from an alumnus residing there. I saw but could not secure 2 other such birds, both with the mottled or grizzled gray, white, and red tail of this form, 1 near Moscow, Hickman County, November 13, 1948, and 1 near Cayce, Fulton County, December 27, 1950. *Buteo jamaicensis harlani* seems not to have been reported previously from Kentucky.

Specimens examined.—Total, 12 (all *B. j. borealis* except as indicated). M.S.C.—2 females (adult, immature), 1 unsexed adult, Rowan County (April 21, July 18; Nov. 6); B.L.M.—1 immature male, Oldham County (Feb. 23); 1 adult female, Jefferson County (Oct. 23); 1 immature female (*kriderii*), Meade County (Oct. 16); W. Ky. State College Coll.—1 unsexed melanistic immature (*calurus?*), Warren County (no date); U.S.N.M.—2 females (immature, adult), Bell County (Sept. 24, 26); U.M.M.Z.—1 adult female (*calurus*), Calloway County (Dec. 25); 1 immature female (*kriderii*; head only), Fulton County (Dec. 26); 1 adult (= female; *harlani*), Carlisle County (1920's).

Buteo lineatus (Gmelin): RED-SHOULDERED HAWK

Status.—Resident, common in western and central Kentucky, breeding generally in forested lowlands; much less numerous and more local in eastern Kentucky.

Spring.—Migratory movement through the state probably occurs but is not conspicuous. Goodpaster (1941:12) reported the species very rare in winter at Cincinnati, Ohio, and said that migrants arrived in late February and early March. In Kentucky no increase has been definitely noted at this time, when courtship is normally begun.

Breeding records.—Breeding activities, as evidenced by 23 dated observations, may begin in February and be continued (rarely) into June, with egg-laying starting in late February or early March and a peak of clutch-completion occurring March 21–31. Records at hand are from Carter (Kozee, 1940:32), Shelby (Covert, 1949:33), Oldham and Jefferson (T. Smith, 1943, 1952:43, and *vide* Lovell, 1951b:59; Croft, 1956:19; Stamm and Croft, *vide* Hays, 1957:3; Monroe, Mengel, notes), Bullitt (Hays, 1957:3), Warren (Wilson, 1952c:45), Daviess (Powell *vide* Hays, 1957:3; Powell, 1960:25), Hopkins (Hancock, 1954:20), Lyon (Mengel, notes), Graves (W. W. B., 1892), and Fulton (Wetmore, 1940:534) counties. Construction of a nest was noted near Louisville by Smith (1952) on February 15 (1943), an early date. Egg-dates range from March 14 (1948), 4 eggs in Shelby County (Covert), to April 26 (1942), 3 eggs in Jefferson County (Monroe). Young would not normally have left the latter nest until late June. The average complement of 14 clutches and broods thus far observed is 2.9 ± 0.30 eggs or young (2 nests with 1; 3 nests with 2; 6 with 3; 2 with 4; 1 with 6—described in detail by T. Smith, 1952:43); the average clutch laid locally is probably somewhat above 2.9 eggs, but the incidence of infertility and nestling mortality in the present sample is unknown. Large trees in open forest and woodland are preferred as nest-sites, 18 recorded nests having been placed in beeches (8; preferred near Louisville), sycamores (4), oaks (3), river birch, tulip tree, and sweet gum (1 each), at an average of 45 feet above ground

(20-75). Handley and I observed an adult incubating on a nest 50 feet up in a sweet gum at Kentucky Woodlands National Wildlife Refuge (Lyon County) on April 9, 1950.

Distribution.—West of the Cumberland Plateau, although it is locally rare in the more cultivated parts of the Bluegrass and Pennyroyal, and in the rugged parts of the Knobs, the Red-shouldered Hawk is rather generally distributed. It is fairly common to common in all of the major river valleys, and other situations affording swamp or lowland forest. Especially in western Kentucky it is a conspicuous and characteristic species of floodplain forests and low hills adjacent. The species tends to be replaced in upland forest by the Red-tailed and Broad-winged hawks, and in the Cumberland Mountains and Plateau it is, therefore, rare, local, and perhaps absent from large areas. It is rare in Carter County (Kozee, 1938, 1940) and was not listed at all by Barbour (1951a:33; 1952:24) in Rowan County. Wetmore (1940:534) recorded 1 seen near Belfry, Pike County, on July 5, 1938, the eastern-most record. In much work in eastern Kentucky I have seen but 1, in Laurel County on October 6, 1951.

Fall.—Some observers (e.g., Wilson, 1946:16) have claimed that the species is more numerous as a transient. Both numbers and choice of habitat, however, seem to change but little with the seasons. In autumn the species is perhaps more frequently seen in upland areas, suggesting the presence of transients.

Winter.—As in fall. Common in bottom lands affording heavy forest and usually recorded on Christmas bird counts through the western two-thirds of the state. I noted many in lowland situations in the Purchase in early winter, 1950-1951.

Geographic variation.—Wetmore (1940:534; 1939:181) has referred western Kentucky and northwest Tennessee specimens to the northern subspecies *Buteo lineatus lineatus* (Gmelin), to which the specimens I have seen also belong. References in literature to the southern subspecies, *Buteo lineatus alleni* Ridgway, at Reelfoot Lake and nearby, by Whittemore (1937:118) and others, are evidently baseless.

Specimens examined.—Total, 8. C.W.B.—1 adult female, Nelson County (Nov. 6, 1880); B.L.M.—1 immature male, Jefferson County (July 16, 1936); U.S.N.M. (all 1938; see Wetmore, 1940:534)—1 immature female, Union County (May 13); 3 males (2 adults, 1 immature), 1 adult female, Fulton County (May 28); U.M.M.Z.—1 adult female (weight 676.1 gm.), Logan County (May 11, 1949).

Buteo platypterus (Vieillot): BROAD-WINGED HAWK

Status.—Rare to fairly common summer resident, chiefly in hilly, forested areas, breeding locally; uncommon transient, sometimes in fair-sized flocks.

Spring.—Data are few but suggest that the species arrives in March and early April. I think local breeding birds will be found to occupy their territories mainly in the former month, while transients may not be noted in some areas until mid-April, if at all. Barbour (1952:24) mentioned dates for Morehead as early as March 7. A record at Danville, April 14, was given by Bent (1937:252, source unstated), and Embury (*vide* Burns, 1911:189) had one for Logan County for April 9 (1906). I observed courting birds in Powell and Menifee counties on April 9, 1951, and April 22, 1949, and in Laurel County on April 10, 1951. I recorded Broad-winged Hawks also in Bell County, April 12, 1951, and Lyon County, at the opposite end of the state, on April 14 and 15, 1950. Near Louisville Monroe has noted a few, probably transients, between April 8 (1958) and May 23. The species is generally distributed by late April at the latest.

Breeding records.—Very few, considering the numbers occurring in summer. Goodpaster (1941:12) took 2 young birds just from the nest in Clermont County, Ohio, on July 21, 1935 (see also Kemsies and Randle, 1953:13). In the Knobs, Monroe collected a set of 2 fresh eggs from a nest 70 feet up in a shagbark hickory at Solitude, Bullitt County, on May 23, 1937. Bacon (notes) found a few nests in Hopkins County in past years but was unable to ascertain the contents. Notes on

breeding near Nashville, Tennessee, were given by Ganier (1949a): construction, April 18; eggs, May 1; young, June 9.

Breeding distribution.—Little information is found in the literature. Strangely enough many authors, especially earlier ones, did not record the species at all. It seems to me unlikely, however, that its status in modern times has differed materially from that indicated by my own notes. As there recorded, it occurs throughout the state, wherever forested hill country is found, and is most frequently associated with upland oak-hickory or pine-oak-hickory communities. It consequently occurs in some numbers over the entire Cumberland Plateau (surprisingly it was not noted by Barbour, 1951a, 1956), being particularly numerous in the rugged Cliff Section (see description, pp. 41–43). From April to July in various years, 1937–1952, I amassed many records from Powell, Wolfe, Menifee, Lee, Pulaski, Laurel, Whitley, and Wayne counties and a few from other less heavily worked Plateau counties. Family groups are often seen in June and July. The species is fairly common also on the Pine and Cumberland Mountain ridges, to the top (4,150 feet) of Black Mountain, Harlan County. I have many records from all of the mountain counties, made in June and July, 1946, and in 1951–1952. West of the Plateau the species is more local but is fairly common in the Knobs wherever heavy forest remains; Monroe and I have numerous June and July records from Bullitt and adjacent counties. As might be expected, it is rare and local in the extensively deforested Bluegrass, and there limited mainly if not entirely to the hilly sections of the outer Bluegrass. There I saw adults in the Kentucky River valley in Owen County on July 5, 1950, and near Bigbone, Boone County, July 18, 1950. In late July, 1952, a family group was active about a ravine (usually occupied by Red-shouldered Hawks) at Glenview, Jefferson County, this being the only indication of breeding in the area immediately around Louisville. Broad-wings are rare and local in settled portions of the Pennyroyal but occur in varying abundance throughout the Western Highlands (Hancock; Wilson, 1946:16), where I have seen them in Hopkins, Edmonson, and Caldwell counties. In May and June, 1949, I saw none in much work in the karst country of southern Warren County but recorded Broad-wings on each trip to the wooded hills along the Dripping Springs Escarpment in the northern part of the country. They are fairly common on the gravelly, oak-covered hills between the Cumberland and Tennessee rivers (Handley and Mengel, notes, April, 1950; Cypert, notes) but rare and local in the Purchase, occurring mainly in high, dry, oak woods in the central and eastern portion (Mengel, notes; 1949, 1951).

Fall.—Few records. The peak of migratory movement appears to fall near late September, as evidenced by small flocks seen near Louisville by Stamm (1957b:42) on September 24, 1956; a flock of 50 seen in Bullitt County by Carpenter (1934) on September 23, 1934; and a flock of 12, mainly immature birds, recorded in Meade County by Schneider (1950) and others on September 23, 1950. In intensive field work in Laurel County in early October, 1951, I saw none and assumed that the resident birds were gone. Barbour (1952:24) gave a Rowan County record for October 25, and Embury (*vide* Burns, 1911:189) recorded 2 birds in Logan County on the late date of November 28 (1903). The average last date for central Ohio was given by Borrer (1950:17) as October 11, latest date October 28.

Winter.—There is no perfectly acceptable evidence of Broad-winged Hawks occurring in Kentucky in winter, a season the species normally spends far south of the United States. Wilson (verbal com.) no longer considers the species a winter resident in Warren County, as reported earlier (Wilson, 1922:236) and repeated by Funkhouser (1925:207). Nevertheless, early winter records of these hawks, mostly unannotated, have continued to appear in the Christmas bird counts published in *The Kentucky Warbler*, for the most part reflecting poorly on the critical standards applied to those columns, and others have been reported recently from the Cincinnati area (Kemsies and Randle, 1953:13). While it is possible that some of these records are valid (most almost certainly are not), one begets another

and a considerable body of misinformation may be built up. Winter records unsupported by specimens should be reported only with the utmost care and in full detail. The difficulty experienced by local students in identifying the present species has not been limited to the field, two specimens examined by the writer (C.W.B., M.S.C.) having been incorrectly labelled as Sharp-shinned Hawks!

Note.—Laskey (1950; and letter to Monroe) banded a nestling at Nashville, Tennessee, on June 29, 1949, which was recovered in Boyle County, Kentucky, 150 miles distant, on June 13, 1950.

Geographic variation.—The subspecies occurring is the North American *Buteo platypterus platypterus* (Vieillot).

Specimens examined.—Total, 3. M.S.C.—1 immature male, Morgan County (May 1, 1938); C.W.B.—1 female, Nelson County (?Sept. 22, 1880; relabelled); B.L.M.—1 adult male, Whitley County (Aug. 16, 1942).

***Buteo lagopus* (Pontoppidan) : ROUGH-LEGGED HAWK

Status.—Very rare winter visitant, chiefly in north-central Kentucky.

Records.—The southern limit of the main winter range of the Rough-legged Hawk lies just to the north of Kentucky, tending to coincide with the boundary of maximum glaciation. Most recent Kentucky records are from the Louisville area, where Monroe accumulated about a dozen records in Jefferson and Oldham counties, October 30 to February 14, 1934–1960, all in rather flat, open farm country on uplands a few miles from the Ohio River. He saw 3 birds on December 5, 1946. Other Louisville area records include birds seen on December 27, 1953, December 29, 1958, and January 3, 1959 (Croft, 1960a:32). I saw 1 bird in the Ohio River bottoms just east of Louisville on March 13, 1938 (Mengel, 1938a). Charles Dury (1885:64) took a male on January 27 [1881] near Cincinnati, Ohio, where the species is said to be regular (Kemsies and Randle, 1953:13)—specimen in C.M.N.H. (Maslowski and Ralph Dury, 1931:70). A more recent record was made by Goodpaster, who saw 2 birds at Lunken Airport, a few yards from the Ohio River and the Campbell County, Kentucky, line on January 29, 1949 (Maslowski, notes). The species was reported, without detail, as occurring in Fulton County (Pindar, 1925a:85) and at Mammoth Cave, Edmonson County (Wilson, 1946:16). It appears nearly every year in various Christmas bird counts published in *The Kentucky Warbler*, but many of the records have been made by inexperienced observers uninstructed in the requirements of reporting rare species. It may be worth mentioning here that prolonged hovering on the part of a *Buteo* is often, but quite improperly, taken as assurance that it is a Rough-legged Hawk.

Geographic variation.—The Rough-legged Hawks occurring in Kentucky presumably belong to the widespread North American subspecies *Buteo lagopus s.johannis* (Gmelin).

Aquila chrysaetos (Linnaeus) : GOLDEN EAGLE

Status.—Today a very rare winter resident or vagrant, probably most numerous in rugged parts of the Cumberland Plateau and about large bodies of water; occasional individuals occur at any season. Probably nested in Kentucky in early times.

Records.—An immature bird was seen soaring near Cumberland Falls, Whitley County, on October 5, 1946, by Monroe and numerous others (Wilson and Brown-ing, 1946). In Adams County, Ohio, just north of the state line, a Golden Eagle was caught in a trap in November, 1937 (Roads, 1938). J. P. Doughty (notes) mounted one for a man who killed it near Flemingsburg, Fleming County, on January 1, 1938 (a rabbit was in the stomach of this bird). E. P. Edwards and I watched a dark adult bird for more than 3 minutes as it soared above rugged pine-and oak-forested uplands in Laurel County, 10 miles southwest of London, on February 3, 1950. With 7 × 50 binoculars we could clearly see the bird's golden

hind-neck as it banked in the sunlight. A specimen captured alive in Rockcastle County was exhibited at the state game farm at Frankfort, where it was seen by Monroe. Many have been reported and several captured in the last two decades in the Highland Rim country near Nashville, Tennessee (Ganier, verbal com.; and numerous titles in *The Migrant*, by Ganier and others, see especially Spofford, 1945). Wilson (1945a:29) has seen 3 dead or captive specimens in south-central Kentucky, some 40 miles to the north of Nashville. One of these was killed on October 14, 1932, and one on or just before December 28, 1944, both near the mouth of Gasper River, Butler County; these are presumably the specimens I examined in the Kentucky Museum of Western Kentucky State College in May, 1949 (unlabelled adult, said to be from Butler County; immature labelled Butler County). A mounted specimen in the Louisville Public Library is supposed to have been taken in the last century on the present site of Shawnee Park, Louisville (Lucien Beckner, personal com.).

Various sight records from scattered localities (Christmas bird counts in *The Kentucky Warbler*, etc.) are subject to doubt. Sight records should be made only by observers thoroughly familiar with the general appearance, habits, and several plumages of our two eagles, and published only when accompanied by full details.

Remarks.—There is considerable evidence that in times past (if not, indeed, at present) the Golden Eagle has been a breeding bird in various parts of the southern Appalachians (see Brooks, 1944:18; Murray, 1952:41, among others), but I have found only one record of an active nest (Bent, 1937:294), this on Waldens Ridge in the Tennessee Cumberlands in 1902. Ganier (1937a:27, and verbal com.) narrowly missed finding another when he and G. R. Mayfield noted a pair of Golden Eagles near a well-preserved empty cliff nest in Fentress County, Tennessee, on the Cumberland Plateau only 10 or 12 miles south of Wayne County, Kentucky, on May 31, 1927. In the same area 3 birds, 1 immature, were present on May 31, 1930. The empty nest found in 1927 had been preempted by Great Horned Owls. In Wayne County, then Conservation Officer G. H. Spann told me in 1946 and 1951 that eagles still occurred at all seasons in that area. Not far away Reed (1935) reported a Golden Eagle captured on the line between Monroe County, Kentucky, and Clay County, Tennessee, on July 4, 1935. Persistent reports of summering, and even of nesting, eagles were still originating in various parts of the Cumberland Plateau in the early 1950's, and several mountain people interviewed by me have been insistent that eagles formerly nested on cliffs in the region. Such reports, needless to say, are very difficult either to verify or disprove.

Geographic variation.—The subspecies occurring is the North American *Aquila chrysaetos canadensis* (Linnaeus).

Specimens examined.—3 (see text for details). W. Ky. State College Coll.—2 unsexed, Butler County (Oct. 14, 1932; ca. Dec. 28, 1944); Louisville Public Library—1 (Kentucky?).

Haliaeetus leucocephalus (Linnaeus): BALD EAGLE

Status.—Very rare summer resident in extreme western Kentucky, breeding locally (resident population); very rare summer visitant (see note, below) more or less throughout the state (chiefly southern population?); rare transient (probably both southern and northern populations); rare to fairly common winter resident (chiefly northern population?); most numerous at all seasons near large bodies of water.

Note.—Since publication (1947) of Broley's remarkable studies, it has been necessary to revise long-standing concepts of the movements and seasonal status of the Bald Eagle, with the result that terms such as "transient" and "summer resident" cannot be used with quite their ordinary implications. We now know, for example, that some of the Bald Eagles occurring in Kentucky in summer may in fact be migrants (biologically "winter residents") from Gulf Coast autumn-breeding populations, while transient birds both spring and fall may be travelling either towards or away from their breeding grounds!

Spring.—Transients are most numerous in March and April, scarce later, being reported from various points throughout the state. Barbour (1952:24) gave records for Rowan County, March 15 to April 26, and Langdon (1879:180) mentioned 4 birds killed and many seen in March, 1877, on the Ohio River at Valley Junction, Ohio (opposite Boone County). Goodpaster (1941:12) gave Cincinnati records for May, 1939, and May 26, 1940 (see also Kemsies and Randle, 1953:13). An eagle banded by Broley as a nestling at Indian Rock, Florida, was recovered at Elliston, Grant County, Kentucky, on May 20, 1947 (see *Kentucky Warbler*, 27:16, 1951). Monroe and I have many March records for the Louisville area, and Monroe saw single birds there April 12, 1948, and April 28, 1951. In Bullitt County Carpenter (notes) saw 2 birds on March 13, 1932, and Wilson (1940a:20) recorded birds seen near Bowling Green on March 15, 1938, and April 10, 1937. These eagles are regularly seen in the Purchase in spring, some of them probably being breeding birds. Goodpaster and I saw 2 adults south of Hickman, Fulton County, on May 20, 1949.

Breeding records.—It is unlikely that more than 5 or 10 pairs nested in the state as of the 1950's. Only a few nests have been found in recent years. On June 28, 1941, I saw 1 adult and 2 flying young near a nest at Swan Lake, Ballard County (Monroe and Mengel, 1941). I found another nest of this or some other pair about a mile distant on June 8, 1949, the latter having been used for some years, according to local people. Both nests were in large, living cypresses in the extensive, swampy, heavily wooded bottom lands east of Wickliffe. I was also informed by two experienced guides of a nest in a large sycamore at Fish Lake, near Burkley, Carlisle County. These men had seen several other nests about the lakes of the Mississippi bottoms in Ballard and Carlisle counties. DeLime (1949) reported a nest in a red oak observed in 1948 and 1949 (1 young each year) in Tennessee, one-half mile from the Kentucky line (Calloway County), on the shore of Kentucky Lake. Vague references to breeding (see Wilson, 1942:21) elsewhere in the Purchase and in Union County require documentation. Nearby in Tennessee, Ganier (1932:4-8) recorded several nests with young just fledged or about to be fledged at Reelfoot Lake in late May, variously 1919-1923 (nests in cypresses). Other nests near Memphis (in white oaks) contained large young on March 9, 1930. Allowing for incubation and nestling periods, laying in this area should occur roughly between January 1 and February 1. The species certainly must have nested more widely and in greater numbers in past years. Audubon (1831:58-60) described the nesting of a pair of "Birds of Washington" (= immature Bald Eagles?) on a cliff near the mouth of Green River, concluding that they could not have been young "white-headed eagles" because of the cliff site (but many such are now known). The chance that they were in fact Golden Eagles is diminished by his account of their catching and feeding upon fish, but it is interesting that Bent (1937:322) had never heard of a mated pair of immature Bald Eagles, matings involving even one immature being very rare. Pindar (1925a:85) wrote that in the 1890's about 6 pairs regularly nested near "Island No. 8"¹ in the Mississippi River near Hickman.

Summer.—It is not known whether our breeding eagles remain long after nesting or wander away. East of the Purchase the species is so rare in summer that it may be considered casual. Beckham (1885:41) mentioned 1 reported near Bardstown in late June, 1881. There are occasional rumors of eagles summering in various localities. The recent nesting of a pair in the comparatively settled area just north of Cincinnati, Ohio (Kemsies and Randle, 1953:13), suggests that occasional pairs may nest in suitable localities anywhere in Kentucky.

Fall.—There are fewer records than in spring; Bald Eagles are generally not seen before mid- or late October. Pindar (1923a) referred to an immature bird killed in Franklin County in the fall of 1922. The Monroes' earliest records at Louisville are for August 26 (1956), September 21 (1956), and October 7 (1950). Monroe

¹ An interesting nomenclature used in river navigation.

and J. P. Doughty regularly saw a few along the Ohio River in late October and early November, 1934-1952. Blincoe (1925:409) mentioned an adult captured near Bardstown and seen by his brother in November, 1921. The species was listed at Reelfoot Lake on October 13 and 14, 1934 (Slack, 1934), and Morse (1950b:21) saw 2 harassing a flock of dabbling ducks at Kentucky Lake on November 27, 1946. On November 7, 1948, I saw an immature soaring over "Kentucky Bend" of the Mississippi River, Fulton County. Between November 13 and 18, 1820, Audubon (1929:24-32) and his party observed more than 12 in various plumages along the lower Ohio and the Mississippi.

Winter.—The Bald Eagle occurs regularly in varying numbers along the Ohio River and about other large bodies of water, being considerably less numerous elsewhere. At Louisville it is regular and usually rare, but groups of 3 or 4 are sometimes seen. In the severe winter of 1935-1936, several were seen perched on ice floes in the Ohio on numerous occasions in January and February (Monroe). An immature killed in Simpson County in January, 1947, was given to the Kentucky Museum at Western Kentucky State College, where I saw it in May, 1949. The species is rather frequently seen in western Kentucky throughout winter (Soaper, verbal com.).

Geographic variation.—Until the subspecies of this eagle are better understood, it seems best to follow Peters (1931:258) in regarding the southern subspecies as including only the breeding eagles of the southern United States. As thus defined both subspecies occur in the state, although few specimens are available. Unless specifically mentioned below, all records here given refer to the species only.

Haliaeetus leucocephalus leucocephalus (Linnaeus)

No breeding specimens are available. Breeding birds may prove to be intermediate, but their affinities should be with the southern form, since western Kentucky lies near the northern terminus of a more or less continuous population breeding in the lower Mississippi Valley. An unsexed mounted specimen from Simpson County taken in January, 1947, has a wing measurement of 557 mm., being too small for either sex of *alascanus*. Another immature specimen, unsexed, in the same collection (Western Kentucky State College), also from Simpson County, measures 583 mm. (wing) and may belong to either subspecies. An immature male killed in Oldham County in September, 1941, has a wing measurement of 568 mm. (B.L.M.), being intermediate in size. A specimen banded in Florida (see above) and taken in Grant County furnishes irrefutable evidence that individuals of the southern subspecies wander to the state.

Haliaeetus leucocephalus alascanus Townsend

The northern subspecies differs from the southern chiefly in being larger. It is admitted to the list on the basis of an immature female (wing 627 mm.) killed by a hunter, who was successfully prosecuted for the act, near Smithland, Lyon County, on March 6, 1948. The bird was confiscated by the late R. C. Soaper, of the U. S. Fish and Wildlife Service, and prepared by me (U.M.M.Z.). Probably many of our wintering birds are migrants of this subspecies from the north.

Specimens examined.—Total, 4 (details and identification to subspecies given above). B.L.M.—1 male, Oldham County (Sept.); W. Ky. State College Coll.—2 unsexed specimens, Simpson County (Jan.; no date); U.M.M.Z.—1 female, Lyon County (March 6).

Circus cyaneus (Linnaeus): MARSH HAWK

Status.—Uncommon to fairly common transient and winter resident, less numerous in spring; possibly breeds rarely, and probably did so regularly on the original prairies.

Spring.—Little or no change in numbers is perceptible in March and early April; Marsh Hawks are usually rare by mid-April and are seldom seen later. Late records:

March 28, in Rowan County (Barbour, 1952:25); April 18 (1937), at Cincinnati (Goodpaster, 1941:12); May 26, at Louisville (Monroe; next record, May 2); April 18, in Nelson County (Blincoe, 1925:409); April 24, in Warren County (Wilson, 1940a:20). I recorded brown-plumaged birds in Lyon County, April 9, 1950, and in Jefferson County, April 16, 1949. A migrating flock of 35 or 40 birds was noted at Henderson on April 2, 1958 (Rhoads, 1958:44).

?*Breeding*.—Audubon (1838:398) wrote simply: "I have found its nest in the Barrens of Kentucky." The extensive grasslands of that time, locally called Barrens, were inhabited by many prairie chickens, today frequently associated with Marsh Hawks, and I have no doubt that Audubon's statement is correct; however, he gives no specific breeding record. Hibbs (1927) made casual mention of nesting in Nelson County in 1926, "in a low plot of ground." This interesting observation is unfortunately without adequate documentation. There have been several recent nestings of this species in Clermont County, Ohio, just across the Ohio River from Campbell County (Kemsies and Randle, 1953:14; Maslowski, notes), and nestings should be watched for carefully in Kentucky. Just to the north, the breeding range seems to conform rather closely with the boundary of maximum glaciation, although the species is rare in the southern part of the glaciated area (see Hicks, 1935a:146).

Summer.—Monroe recorded 1 near Louisville on July 27, 1946. This bird may have been a vagrant.

Fall.—A few Marsh Hawks, mainly immature birds, begin to drift southward early in August; Monroe has records for the Louisville area for August 10, 20, 25, and 26. The species is often noted in early September, usually by dove hunters. Published "early" records from various localities range from September 4 to October 13. In recent field work I recorded Marsh Hawks on September 10, 1949, near Evansville, southern Indiana, and September 18, 1950, at Louisville. In October and November, 1948, I recorded small numbers in Oldham, Fulton, Hickman, and Marshall counties. Records from Madison and Butler counties were given by Wetmore (1940:534).

Winter.—Marsh Hawks occur throughout the state in small to moderate numbers, the gray adult males being rather rare. The species frequents and hunts over broad, open uplands and brushy lowland fields alike. It is probably less numerous on the Cumberland Plateau, where there is less open country, than elsewhere, but Barbour (1952:25) considered it regular and common at Morehead. Observers at Cincinnati (Goodpaster, 1941:12; Kemsies and Randle, 1953:14) are agreed that it is uncommon. Through most of central and western Kentucky it is frequently recorded throughout winter and appears on most Christmas bird counts. Monroe and I noted an unusual concentration on open uplands near Worthington, Oldham County, when we saw at least 9, most of them gray males, on the snowy afternoon of January 7, 1951. In late December, 1950, I recorded 14 Marsh Hawks (3 adult males) in five days afield in Hickman, Graves, Calloway, Marshall, and Fulton counties.

Geographic variation.—The subspecies occurring is the North American *Circus cyaneus hudsonius* (Linnaeus).

Specimens examined.—Total, 6. M.S.C.—1 female, Rowan County (Dec. 10, 1934); B.L.M.—1 immature female, Jefferson County (Oct. 9, 1937); 2 immature females, Larue County (Sept. 14, 1940; Sept. 16, 1939); Murray State College Coll.—1 unsexed, Calloway County (Nov. 20, 1933); 1 unsexed, Graves County (1928).

FAMILY PANDIONIDAE: OSPREYS

Pandion haliaetus (Linnaeus): OSPREY

Status.—Uncommon to fairly common transient; very rare summer resident in extreme western Kentucky, breeding occasionally, formerly more numerous and widespread; casual in winter.

Spring.—Ospreys occasionally arrive in March, usually in early April; main flight in April; rare by early May. The species has been recorded at Cincinnati as early as March 9 (1940), by Goodpaster (1941:12). At Louisville Monroe has records for March 24 and 25 and many records for April. Ospreys occur near ponds, lakes, and streams throughout the state, being reported even from Harlan County in the Cumberland Mountains (Stone, 1921) and Rowan County on the Cumberland Plateau (Barbour, 1952:25; and specimen, M.S.C.). I saw individual birds in eastern Kentucky on April 9, 1951, on the upper Kentucky River in Estill County and April 13, 1951, on Cumberland Lake in Wayne County. Late records: May 25 (1949), in Lexington (Edwards, notes); May 25 (1917; 1 killed), in Nelson County (Blincoe, 1925:409); May 25, at Louisville (Monroe; next record, May 4); June 4 (1935), in Hopkins County (Hancock, notes).

Breeding records.—Audubon (1831:419) stated that several pairs nested near the Falls of the Ohio River early in his residence at Louisville (ca. 1810). Only one nest seems to have been reported recently. DeLime (1949) watched a pair of Ospreys carrying fish to a nest near Blood River, now an arm of Kentucky Lake in Calloway County, in June, 1949. Walker (1937) observed nest construction near Knoxville, Tennessee, April 10–26, 1937. Nestings should be watched for about all of the new T.V.A. lakes.

Distribution in summer.—Ospreys are occasionally recorded in western Kentucky, where I suspect that several pairs probably nest each year. I saw 1 bird at Swan Lake, Ballard County, in the wooded lowlands near the Mississippi River, on June 28, 1941. Handley and I watched a pair, whose behavior suggested breeding, in Lyon County at Hematite Lake, April 12–16, 1950. A few unannotated references to breeding at western localities were given by Wilson (1942:21). Monroe has a single record at Louisville for July 20.

Fall.—Migration begins in late August; main flight in September; rare by mid-October. On the Falls of the Ohio River, at Louisville, Ospreys occasionally appear as early as August 21, and there are several records later in the month (Monroe). They are regular there in September and early October, as many as 6 or 7 sometimes being present at once. They have been recorded from various widely separated localities in September. One was reported killed in Nelson County on October 18, 1919 (Blincoe, 1925:409). Bacon and I saw 1 at Brown Meadow Lake, Hopkins County, on September 18, 1951. Monroe's latest record at Louisville is for October 28.

Winter.—The regular winter range lies well to the south of Kentucky; thus records should be made with great care. Monroe (notes) has seen individuals under good conditions near Louisville on January 15 and 27 and February 12. A few have been reported on Christmas bird counts (*Kentucky Warbler*) from various localities.

Geographic variation.—Occurring in Kentucky is the North American subspecies *Pandion haliaetus carolinensis* (Gmelin).

Specimens examined.—Total, 5. M.S.C.—1 male, Rowan County (May 14, 1937); C.W.B.—1 female, Nelson County (Sept. 28, 1885); Nazareth Academy—1 "female," Nelson County (April 29, 1933); B.L.M.—1 male, 1 female, Jefferson County (Oct. 20, 1941; Sept. 20, 1936).

FAMILY FALCONIDAE: CARACARAS AND FALCONS

***Falco peregrinus* Tunstall: PEREGRINE FALCON

Status.—Rare but regular transient and winter resident, especially about large streams; very rare summer resident or resident in eastern Kentucky, locally distributed and almost certainly breeding at a few points.

Spring.—Transients cannot be distinguished certainly from wintering birds. Near Louisville, Peregrine Falcons have been seen occasionally in March, April, and early May (latest, 1934–1952, May 8; Monroe). Wilson (1940a:20) and others recorded single adults near concentrations of waterfowl at the Woodburn lakes in Warren County on March 19, 1938, and April 25, 1937 (see also Ganier, 1937). On May 20, 1949, Goodpaster and I saw 1 high in the air over a cypress swamp south of Bondurant, Fulton County, this probably a breeding bird from nearby Reelfoot Lake, where these falcons nest from time to time in the tops of hollow cypresses (Bellrose, 1938; Spofford, 1947a).

Breeding records.—Although there is considerable evidence that the species breeds in eastern Kentucky, no active eyrie has yet been found within the state. On June 3, 1952, however, I watched a family group of 2 adults and 3 young birds at a series of cliffs astride the Kentucky-Virginia line (exact locality withheld) and think I located the nest site, this being a few hundred yards on the Virginia side. An eyrie on a cliff overlooking Rockcastle River in Laurel County was well known to local residents (Mengel, 1940), some of whom told Monroe and me in 1940 that they had shot all the young from the pothole site for several years! The accuracy of their unprompted descriptions virtually certifies the authenticity of this eyrie, which was evidently used until approximately 1939. Kentucky breeding dates may be inferred (eggs, February–April; young leave nest mid-May into June) from numerous data for Tennessee (Ganier, 1923:32, 1931:3, 1940:3; Spofford, 1947; and others—various titles in *The Migrant*).

Distribution in summer.—There are two general areas in eastern Kentucky where breeding of the species is most probable:¹ first, certain high cliffs associated with the Pine Mountain thrust fault on and near the Virginia line, in Bell, Harlan, Letcher, and Pike counties; second, extensive rugged areas of the Cumberland Plateau, especially in the region of the (Pottsville) sandstone outcrops in Powell, Wolfe, Menifee, Laurel, Pulaski, Wayne, Whitley, and McCreary counties. I saw individuals about large cliffs in Powell County on June 22 (adult, immature, separately), and June 30 (adult), 1948; in Wolfe County on April 24, 1949; in Laurel County on July 5, 1940; and near Jellico, Whitley County, just over the line in Campbell County, Tennessee, on June 17, 1952 (2 immatures). Wetmore (1940:534) recorded 1 bird seen in eastern Wayne County on June 14, 1938, and just south of there, with Ganier (1937a:25) and others, I saw several birds in Pickett County, Tennessee, in June, 1937, some of these being at times on or across the Kentucky line. A well-known Tennessee eyrie has for years been located in the gorge of Wolfe River a few miles to the west in Pickett County and two or three miles south of the Kentucky line (see Spofford, 1947). In central Kentucky the species may have bred on occasion in the precipitous gorge of the Kentucky River, where it was seen repeatedly some decades ago (Pindar, 1924:121). No evidence of the tree-nesting recorded recently at Reelfoot Lake (see above) and earlier in southern Illinois and in Kansas (Ridgway, 1889:433; Goss, 1879:33) has been found in the lowlands of western Kentucky, but the possibility should not be discounted. At Glenview, Jefferson County, I saw immature birds high in the air on July 5, 1940, and July 11, 1941, and Lovell (1943) and Monroe saw 1 on the Ohio River near there on July 12, 1942. These birds may have been vagrants, but it is also not improbable that the species breeds occasionally on office buildings or bridges in the Louisville area or on the scattered limestone bluffs outcropping along much of the Ohio River.

Fall.—Vagrant or transient birds appear from August onward. Goodpaster (1941:12) and Fisher (1884:10) reported specimens killed near Cincinnati, Ohio, in September and early October. In various years, Monroe and I have seen Peregrines harassing shorebirds on the Falls of the Ohio River in late August, and the species

¹The recent, shocking decline of this magnificent species, possibly due to the accumulation of pesticides (e.g., chlorinated hydrocarbons and their metabolites) in the food chain has seriously reduced this probability. It is likely that no Peregrines now breed in Kentucky.

continues to appear there occasionally (Stamm and Summerfield, 1952:44; Croft, 1958a:46). Wilson (1951b) recorded 1 in Warren County on August 18, 1950, and I saw 1 at Henderson on September 8, 1949. On August 23, 1942, T. Smith and I watched 2 adults walking clumsily about on sand bars at "Kentucky Bend" of the Mississippi River, Fulton County. By late October solitary birds, probably winter residents, are seen nearly every year along the Ohio River (Monroe, J. P. Doughty), and Morse (1950b:21) found the species regular in fall at Kentucky Lake.

Winter.—Regular in very small numbers, mainly about large bodies of water. There are no winter data from eastern Kentucky. One individual, or so it seemed, frequented Goose Island near Louisville during three entire winters, 1933–1934 to 1936–1937, arriving as early as September 21 and remaining as late as March 21 (Mengel, 1937; Monroe, *et al.*). Long ago Audubon (1831:88) noted the species roosting in hollow trees at Louisville, and in cavities of cliffs along Green River. Today one or more usually winter along the Louisville waterfront, about the large bridges, and the birds are occasionally seen in the city (various notes; also Croft, 1958a:46). Cypert recorded an adult at Kentucky Woodlands National Wildlife Refuge on February 10, 1948 (Refuge files).

Geographic variation.—No specimen of this fine falcon has been taken in Kentucky. The breeding population should belong to the widespread North American subspecies, *Falco peregrinus anatum* Bonaparte, long called the Duck Hawk in American literature. On migration, a still unnamed but probably valid Arctic form (see Beebe, *Condor*, 62:152–153, 1960) may occur.

Falco columbarius Linnaeus: PIGEON HAWK

Status.—Rare transient, more numerous in autumn (and, probably, casual winter resident, but no authentic records).

Note.—Pigeon Hawks are usually seen in rather open country. While they are probably more numerous than is generally realized, identification by inexperienced observers should be made with extreme care because of the possibility (negligible with experience) of confusion with the Sparrow Hawk.

Spring.—A few birds may be expected from late March to early May; the small flight probably passes mainly in April. Records which I consider authentic are from Fayette County, May 5, 1950 (Edwards, notes), Warren County, April 13, 1944 (Wilson, 1945a:29), and Cincinnati, Ohio, March 13, 1876 (Langdon, 1877:12, specimen). Additionally I recorded a blue bird (adult male) in Clark County, four miles east of Winchester, on April 26, 1949 (this bird chasing a pigeon!), 1 bird near Shelbyville, Shelby County, April 20, 1949, and 2 brown birds together, flying due north at a leisurely rate near Worthington, Oldham County, on April 9, 1948. The last-mentioned birds were evidently migrating when seen, as they were watched until completely out of sight with powerful binoculars and never deviated from their course.

Fall.—The species seems to be decidedly more numerous than in spring and has been recorded throughout the state, mainly between late September and late October (September 15–December 16, the latter at Cincinnati). In extreme eastern Kentucky 1 was seen by H. G. Deignan on Log Mountain, Bell County, September 22, 1938 (Wetmore, 1940:534). West of the Cumberland Plateau, records have been made at Cincinnati, Ohio, September 24, 1887 (Goodpaster, 1941:13); Mammoth Cave, Edmonson County, September 19, 1929 (Bailey, 1933:473); Warren County, October 3, 1942, and November 19, 1938 (Wilson, 1945a:29); Henderson, in September, 1937 (King, 1938; specimen); Marshall County, October 5, 1947 (Spofford, 1948); and Fulton County (Pindar, 1887a:55). Monroe has specimens taken in Hardin and Trimble counties (B.L.M.) and one was collected by Embody in Logan County (Mengel, 1948:50; C.U.). I recorded Pigeon Hawks at Louisville on October 24, 1948 (2 birds at the Falls of the Ohio River), and in Bullitt County, September 29, 1951. Monroe saw others at Louisville, September 15, 1950, and

October 26, 1946. Dury took a specimen at Cincinnati, Ohio, on December 16, 1891 (Goodpaster, 1941:13). A few Pigeon Hawks undoubtedly remain late, but there is no evidence of wintering other than Pindar's vague statements (1889b:313; 1925a:85), which seem unsatisfactory. Monroe regards a record (see *Kentucky Warbler*, 28:12, 1952) made in Jefferson County on December 23, 1951, by Thomas Fuller and the late Walter Shackleton as probably authentic.

Geographic variation.—All specimens examined, including one which King (1938) thought might represent *Falco columbarius richardsonii*, prove referable to the eastern subspecies *Falco columbarius columbarius* Linnaeus.

Specimens examined.—Total, 4. B.L.M.—1 adult female, Trimble County (Oct. 6, 1945); 1 immature female, Hardin County (Oct. 1, 1941); C.U.—1 immature female, Logan County (Sept. 30, 1904); Virgil King (disposition unknown)—1 immature female, Henderson County (Sept., 1937).

Falco sparverius Linnaeus: SPARROW HAWK

Status.—Fairly common to common resident, seemingly more numerous in winter.

Spring.—No migratory movement is conspicuous; the species is numerous throughout the state at all seasons, preferring comparatively open country. Much of the spring is taken up by breeding activities.

Breeding records.—Detailed data are few. I observed the elaborate aerial courtship (see Brewster's description in Bent, 1938:107) of a pair, over open fields in Madison County, on April 9, 1951. Single brooded. Clutches would appear to be completed as early as mid-March and as late as late April (from only 5 dated records I would guess the peak of clutch-completion as April 1–10). In Jefferson County, Monroe recorded 5 fresh eggs in a hollow 30 feet up in a beech, on April 29, 1942. He and T. Smith have recorded several active, but inaccessible, nests near Louisville. At Madisonville, Hopkins County (Hancock, 1954:20), Suthard noted 3 young approximately two days old in a dead stub on May 13, 1923, and Hancock recorded 4 young out of the nest on May 19, 1952. There is also an unannotated reference to nesting, May 15, 1951, at Danville, Boyle County (Lovell, 1951b:59). I have seen evidence of nesting about potholes in high cliffs, in Laurel County, as has Spofford (1948) in nearby Pickett County, Tennessee. I recorded a nearly fledged young bird (captured by a farmer) in Laurel County on June 1, 1953, and saw family groups at Bardwell, Carlisle County, on June 10, 1949, and about cliffs along Rockcastle River, Laurel County, July 5, 1948.

Breeding distribution.—Statewide; many records (brief summary; Wilson, 1942: 21). I have recorded Sparrow Hawks in small numbers throughout the state; records for many localities, including the top of Black Mountain, Harlan County, have already been published by Wetmore (1940:535). The species is most numerous in agricultural country, as in Mercer County, where Van Arsdall (1949:24) observed that it was "common . . . especially in the open level areas of farmland containing high oaks, dead trees, or telephone poles." In extensively forested terrain these birds frequent openings and cliff-edges, a type of habitat duplicated in some essentials in large cities, where they also occur regularly and doubtless nest in crannies on the larger buildings. Wilson (1950:22) has noted a decline in numbers with reforestation at Mammoth Cave.

Fall and winter.—In late autumn the species seems to become slightly more numerous through most of the state, though perhaps only more conspicuous (see Blincoe, 1925:409). In forested eastern Kentucky it may become less numerous; I have seen very few in limited winter observations there. In past years at Louisville I have noted individuals regularly using crevices under the eaves of houses and window ledges of apartment buildings as winter roosting-sites.

Note.—Croft (1958:25) noted pursuit of Starlings by Sparrow Hawks on three occasions (I have seen this once), with capture accomplished in one instance.

Geographic variation.—The subspecies occurring is the widespread *Falco sparverius sparverius* Linnaeus.

Specimens examined.—Total, 8. M.S.C.—1 female, Fleming County (Aug. 5); U.K.—2 males, Fayette County (Feb. 3, Dec. 30); C.W.B.—1 female, Nelson County (March 21, 1882); B.L.M.—2 males, 2 females, Jefferson County (Dec. 16, 24; Feb. 2, July 17).

FAMILY TETRAONIDAE: GROUSE AND PTARMIGAN

Bonasa umbellus (Linnaeus): RUFFED GROUSE

Status.—Rare to fairly common permanent resident, at present essentially restricted to the Cumberland Mountains, Cumberland Plateau, and the eastern part of the Knobs; formerly occurred throughout the state.

Spring.—Drumming occurs regularly from March to June, with maximum incidence in April, but is heard occasionally in all months. A female in a seemingly dazed condition was caught in the city of Louisville on April 6, 1950 (B.L.M.). There is no known population of grouse anywhere in Kentucky within 80 or more miles of Louisville; the bird may have come from southern Indiana, where a small population is said to persist (Bump, Darrow, Edminster, and Crissey, 1947:50, and Fig. 2).

Breeding records.—Nesting activities probably begin no earlier than late March and (normally) continue no later than mid-June. The indication of 27 dated observations of nests, or young of known size, is that clutch-completion occurs between the periods April 1–10 and May 21–31 (inclusive), with the peak April 21–30. Data are from Pike (Mengel, notes), Harlan (Lovell, 1950b:59; Goodpaster, notes; Mengel, notes), Wolfe (Alexander, 1946), Laurel (Mengel, notes), and McCreary and Pulaski (Hardy, 1950a:10, 13, 1950:2; Hardy, *vide* Hays, 1957:3; Lovell, 1951b:59) counties. The earliest record of a complete clutch is provided by a set of 8 eggs (Alexander, 1946) noted in Wolfe County on April 20 (1946), and the latest egg-date by a set of 6 eggs (Hardy, 1950a:13), hatching, in McCreary County on June 12 (1950). The latest date of clutch-completion, however, approximately May 24, is indicated by young approximately one day old noted in Harlan County (Lovell, 1950c) on June 18 (1947). According to Hardy's studies (1950, 1950a), nests are situated mostly on gentle slopes, occasionally on level ground or steep slopes, in more or less open second-growth forest or old field edges, and are usually placed in such sheltered sites as the bases of trees or saplings, under stumps, or under the crowns of fallen trees. The average complement of 13 nests containing clutches known to be complete is 8.2 ± 0.74 eggs (4–13). Small clutches (4–6 eggs) may be associated with renestings, which may be frequent in view of the rather poor nesting success recorded locally (Hardy, 1950a:12). I recorded a brood of 12 young about the size of Black Rails, at 4,100 feet elevation on Black Mountain, Harlan County, on May 30, 1952. I noted broods of half-grown young (number undetermined) in Pike County on June 25, 1951, and in Laurel County on June 14, 1952.

Present distribution.—Many recent records indicate a present range embracing all of the state within the Cumberland Mountain and Plateau regions and probably including the Knobs adjacent to the Plateau margin, or west to a line Lewis-eastern Clark-western Pulaski-central Wayne counties (Fig. 16). Grouse appear to be most numerous on the Log and Cumberland Mountain ridges and in areas centering about Lewis, Powell, and southern Laurel counties, respectively. The birds are particularly fond of narrow, cliff-bordered ridges in some of these localities, when disturbed taking refuge in dense hemlock and *Rhododendron* in the ravines below. Population densities are low compared with those in some parts of the northern United States. Tentative estimates based on drumming counts by the Division of Game and Fish (Hardy, 1950a:24) indicate a population of one adult to approximately 20 acres on Beaver Creek Refuge, Pulaski County, a density thought to be

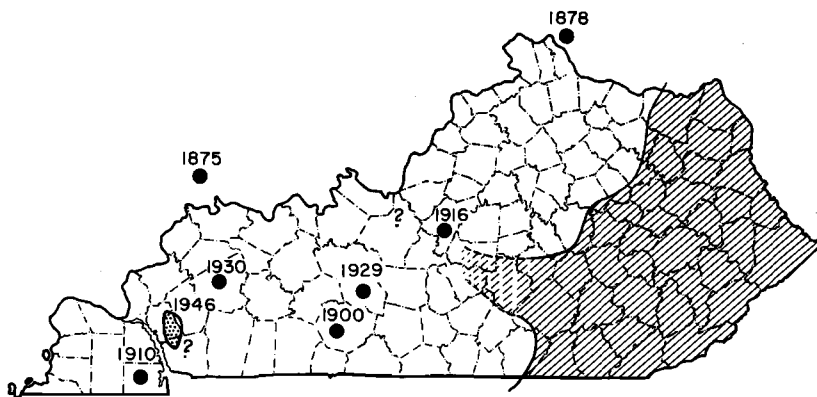


Fig. 16. Recent distribution of the Ruffed Grouse in Kentucky (formerly it occurred state-wide). Eastern hatched area, generally distributed and rare to fairly common; stippled area, possibly extinct but, if so, recently; solid dots, earlier records with approximate last dates of occurrence. There is very recent evidence that a population persists in the stippled area.

near the local optimum. The species is much less numerous in the more settled, less hilly portions of its present Kentucky range (see Kozee, 1938:34, Carter County; Barbour, 1951a:33, Rowan County; Patten, 1946:33, Madison County). It is still occasionally reported from the Knobs and extreme eastern Pennyroyal adjacent to the Cumberland Plateau, but the exact western limits of distribution are unknown. At least as late as 1946 a small population persisted much farther west, in Lyon County on Kentucky Woodlands National Wildlife Refuge where several records were made from 1940 to 1946, including one of a hen with 7 young on May 28, 1940 (Cypert, letter: May 4, 1950).

History.—Originally distributed throughout the state, the species has tended to persist in direct proportion to the roughness of the terrain and in inverse proportion to the arability of the soil, being now extinct in the relatively level, fertile Blue grass and Pennyroyal. Its former abundance along parts of the Ohio River where it no longer occurs may be appreciated from the entries made by Audubon (1929:8–10) in his journal of 1820. The dates of last report from various areas give a general picture of the pattern of disappearance. Arranged chronologically, these show a succession of the localities concerned from fertile and fairly level (limestone soils) to poor and rough (sandstones, shales, gravel). Representative last reports: Mount Carmel, Illinois (near and similar to western Kentucky bottom lands), 1875 (Nelson, 1877:43); Clermont County, Ohio, near Cincinnati, 1878 (Goodpaster, 1941:13); Warren County, about 1900 (Price, 1904:149); Calloway County, about 1910 (Wilson, 1923c:131); southern Nelson County, 1916 (Blincoe, 1925:408); Hopkins County, about 1930 (Bacon, verbal com.); Mammoth Cave region, Edmonson County, 1929 (Bailey, 1933:93). It is possible that a few grouse still occur in some of these areas; the species will probably be reintroduced successfully in many.

Fall.—A short open season in effect each year since 1945 has resulted in a negligible reported (and probably slight actual) kill of grouse, which are little known and little sought by Kentucky sportsmen. Two specimens were taken in Pulaski County, December 2 and 10, 1949, in hunting experiments performed by the Division of Game and Fish (Hardy, 1950a:24).

Winter.—Little information is available. Local residents in the east report small flocks in late fall and early winter. I collected a very large male wearing "snow-

shoes" in Laurel County, 12 miles southwest of London, on February 3, 1950 (U.M.M.Z.). This bird weighed 811 gm. and had a wing measurement of 198 mm., both near the largest formally recorded for the species.

Geographic variation.—After examination of many specimens, Aldrich and Friedmann (1943:94) upheld the validity of the Appalachian subspecies *B. u. monticola* Todd, to which the few Kentucky specimens I have seen are here referred. Study of somewhat smaller series than those available to Aldrich and Friedmann left me with the impression that *monticola*, while appreciably differentiated, is not strikingly well marked. The decidedly gray phase common in many subspecies is nearly lacking in this form, this being perhaps the most immediately apparent of its characters. A number of references of Kentucky grouse to the subspecies *B. u. togata* (see Wetmore, 1940:535) were made before the separation of *monticola*. The affinities of the original population of western Kentucky can never be demonstrated but were probably with the population described by Todd (1940a) as *Bonasa umbellus mediana* and held by the A.O.U. Check-List Committee (1957:128, footnote 1) to be identical with but disjunct from *B. u. umbellus* (Linnaeus).

Specimens examined.—Total, 6. M.S.C.—1 female, 1 unsexed, Rowan County (Oct. 7, 1939; June 1, 1939); 1 female, Wolfe County (April 10, 1944); B.L.M.—1 female, Jefferson County (April 6, 1950); U.M.M.Z.—1 male (weight, 811 gm.), 1 female (weight, 497.5 gm.), Laurel County (Feb. 3, 1950; June 14, 1952).

**Tympanuchus cupido* (Linnaeus): GREATER PRAIRIE CHICKEN

Status.—Long extinct in the state. Formerly a common permanent resident on the original prairies of southern and western Kentucky.

Records.—Sometime between April 14 and 28, 1810, Alexander Wilson (1811:117; see also Wilson in Ord, 1825:CXXXV–CXLIII) found the "pinnated grouse" common on the "Barrens" of southern Kentucky, obtaining the example shown in Fig. 1 of pl. 27 of the *American Ornithology*, vol. III. "The people of the barrens," wrote Wilson, "informed me, that when the weather became severe, with snow, [the grouse] approach the barn and farm-house; are sometimes seen sitting on the fences in dozens; mix with the poultry. . . . At such times great numbers are taken in traps." A nest containing 15 eggs was described to Wilson by a resident near "Bairdstown" (Bardstown), Nelson County, indicating that the range extended at that time to a point less than 40 miles from Louisville. Like Wilson, Audubon (1834:491) found the species numerous in the "Barrens," but commented on its rapid decrease in the first few decades of the nineteenth century. From Audubon's extended and melodramatic account of the "Barrens," none too replete with details, we nevertheless gather that: (1) he did see some prairie chickens in Kentucky, (2) he observed evidence of breeding, and (3) the species occurred north to Henderson.

Remarks.—The exact outlines of the original range in the state will never be known; probably they coincided quite closely with the boundaries of the original prairies (Fig. 4), and in the earliest days of human colonization the species may have invaded cleared areas adjacent to these. No specimen certainly from Kentucky appears to exist today. Populations of prairie chickens still persist in the areas of some of the former prairies of southern Illinois (see Yeatter, 1943:380), and at least one extant in recent years was only a few miles west of Union County, Kentucky. About 1940, 2 birds seen at close range in a corn field near Madisonville, Hopkins County, were identified by Bacon (verbal com.) as prairie chickens. If identification was correct, they may have wandered from southern Illinois colonies then approximately 40 miles distant.

Geographic variation.—It would be unreasonable to suppose that the subspecies occurring in Kentucky was any but *Tympanuchus cupido pinnatus* (Brewster) of the midwestern United States. This subspecies, as noted above, has occurred in recent years quite close to Kentucky, and appears always to have been widely separated from *T. cupido cupido*, the eastern "heath hen" (see Baker, 1953:5). Peters (1934:41, footnote) erred in calling the Kentucky prairies "pine" barrens.

I agree with him, however, that the specimen depicted in Wilson's plate is not positively identifiable to subspecies, even though it does resemble *pinnatus* in lacking conspicuous white spots in the scapulars. The midwestern subspecies was long known as *Typanuchus cupido americanus*, based on *Cupidonia americana* Reichenbach 1852, later shown to be a synonym of *Tetrao Cupido* Linnaeus 1758 (see Hellmayr and Conover, 1942:222; A.O.U. Check-List, 1931:85). Somehow Reichenbach's important name was omitted from the synonymy of *cupido* as given by Ridgway and Friedmann (1946).

Note.—A recent collection of bird bones from Paducah, McCracken County, made by an amateur local archaeologist, and probably representing refuse accumulated by Indians of the "Mound Builder Society," contains 1 complete tibiotarsus, distal portions of 2 tibiotarsi, and the head of a coracoid of the present species (Glen E. Woolfenden, letter: October 27, 1961).

FAMILY PHASIANIDAE: QUAILS, PHEASANTS, AND PEACOCKS

Colinus virginianus (Linnaeus): BOBWHITE

Status.—Fairly common to common permanent resident.

Spring.—The majority of coveys characteristic of the species in winter probably break up by the end of April. I have seen small coveys, of 4 to 8 birds, from April 9 to 28. The "bob-white" whistle is occasionally heard in March, regularly from late April at least into August (late dates lacking).

Breeding records.—The peculiarly long breeding season of the Bobwhite extends in Kentucky at least from early May to August or (probably) September. A prolonged season is characteristic of the species, but there is no evidence that more than one brood is reared by normal pairs (Stoddard, 1931:492). The number of late nestings suggests that early nestings are attended by a high degree of failure. Eight dated records indicate local clutches completed as early as May 11–20 and as late as August 1–10, with a peak near June 1–10. Data are from Pike (Mengel, notes), Mercer (Van Arsdall, 1949:24), Nelson (Beckham, 1885:45; Blincoe, *vide* Funkhouser, 1925:189), and Hopkins (Hancock, 1954:20) counties, and from Cincinnati, Ohio (Goodpaster, 1941:13). Comparatively few nests of this common species have been reported. The earliest egg-date is for May 23 (1913), 14 eggs in Nelson County (Blincoe), the latest for August 2 (1935), 4 eggs in Hopkins County (Hancock, 1954). Young have been noted as late as September 3 (1953), in Hopkins County (3 small young), September 15 (1940), at Cincinnati (Goodpaster, 1941), and October 15 (1884), in Nelson County (Beckham, 1885). The average complement of 5 clutches thought certainly to be complete is 15.0 ± 1.1 eggs (nests with 12, 13, 14, 17, and 19 eggs). Small clutches (4–6 eggs) may be complete when found late in the season, being possibly renestings after repeated earlier failures. Very large clutches (17 eggs and upwards) may be the products of two or more females (see Stoddard, 1931:28). Nests (sometimes domed, sometimes open) are placed in grassy cover in fields and edges, often adjacent to a sheltering post or shrub, and have been found locally in cedar thickets, hay fields, clover patches, and "weed fields." I noted a brood of 13 very small young with two adults on a cleared hillside in Pike County on June 24, 1951.

Distribution.—Statewide. The species frequents varied cover types, from upland hillsides and open woodland to cultivated fields and marshes, but prefers brushy edges. It is less numerous in heavily forested areas of eastern Kentucky, but is nonetheless regular in clearings there, and has been recorded also (at least one season) at the top of Black Mountain, Harlan County (Barbour, 1941a:46). It appears not to be regular at the last locality. Bobwhites are least numerous in heavily cultivated parts of the Bluegrass where "clean" farming is extensively practiced, and in poor, eroded, or extensively (strip) mined sections of western Kentucky. During my field work the population in most areas appeared to me to

be near the existing but sometimes probably low local carrying capacity, as was suggested also by studies of the Kentucky Division of Game and Fish (Gale, 1950:11-12; Pierce, 1951).

Fall and winter.—Coveys of full-grown birds are seen as early as late August. Very large coveys, 25-40, are occasionally found and probably result from the temporary merging of several groups. The Bobwhite is subject in Kentucky to heavy hunting pressure, which, however, is seldom if ever a limiting factor (see Gale, 1950), and is the most sought game bird locally. Late in the season the coveys are likely to resort to woods, dense thickets, and swamps where they are difficult to shoot and to follow up. Near London, Laurel County, I took a male undergoing heavy molt of body tracts on October 10, 1951. The most severe winter weather ordinarily occurring seems not to affect the species adversely (Pierce, 1951:107).

Geographic variation.—Quail from various parts of the species' range have been stocked in Kentucky on many occasions, although it has never been satisfactorily demonstrated here (see Pierce, 1951:153) or elsewhere that this expensive practice has any lasting beneficial effects. Stocking of quail from other areas, chiefly Texas, has probably brought about some temporary intermixture of genes, and perhaps of resultant characters, but I doubt that this has been as great as suggested by Wetmore (1940:535). Studies by Stoddard (1931:484-485) have shown that introduced stock is rapidly assimilated or lost.

The subspecies native to Kentucky is *Colinus virginianus virginianus* (Linnaeus), of which specimens examined are nearly all quite representative. I think that Aldrich (1946) was correct in his analysis of the clines in the species, but I cannot agree with his rather frequent assumptions that extreme local variants (*i.e.*, individuals of one population showing the characters of others) are necessarily either introduced individuals or atypical (when the latter word is used to mean abnormal; see Aldrich, *op. cit.*, frequent footnotes). The birds of the Mississippi Valley, including Kentucky, are paler and grayer on the average than those of the Atlantic seaboard, but I am not satisfied that the difference is sufficiently constant to warrant separation of the former under the name *mexicanus*, as Aldrich proposed.

Quail of the subspecies *Colinus virginianus texanus* (Lawrence) have been stocked in the state many times, and individuals have without reasonable doubt bred on occasion in the wild state. There is, however, no self-sustaining population, and I have been unable to detect clear evidence of *texanus* ancestry in most specimens. However, as pointed out by Wetmore (1940:535), one male from Boone County, October 10, 1938 (U.S.N.M.), is quite typical of *texanus*, being perhaps beyond the normal range of variation in local birds. A few other paler-than-average specimens may have some *texanus* ancestry, but pale and dark strains correlated with different habitat types have been reported from the same region (Aldrich, 1946:494-495).

Specimens examined.—Total, more than the 21 here listed in detail (time did not permit listing of several in C.W.B.). M.S.C.—1 male, 1 female, Rowan County (Oct. 22; Nov. 12); R.W.B.—1 male, Harlan County (Aug. 12); 1 female, Rowan County (Oct. 10); C.W.B.—several from Nelson County; B.L.M.—1 female, Laurel County (June 29); 1 male, 1 female, Jefferson County (Dec. 12; March 22); C.U.—2 males, Logan County (Jan. 16; Nov. 28); U.S.N.M. (see also Wetmore, 1940:535)—1 male, 1 female, Boone County (Oct. 10); 1 male, 1 female, Trimble County (Oct. 13); 1 male, 1 female, Shelby County (Dec. 29); 1 female, Graves County (Dec. 22); 1 female, Hickman County (Dec. 22); U.M.M.Z.—1 male (weight, 182.5 gm.), Laurel County (Oct. 10); 1 female (167.1 gm.), Pulaski County (April 28); 1 male (183.0 gm.), Marshall County (April 10); 1 male (180.2 gm.), Fulton County (Nov. 10).

FAMILY MELEAGRIDIDAE: TURKEYS

**Meleagris gallopavo* Linnaeus: TURKEY

Status.—Permanent resident, formerly common throughout the state; original stock now nearly or quite extinct except in parts of Lyon and Trigg counties where

locally common; a few birds may have persisted in the most remote parts of eastern (and extreme western?) Kentucky; recently reintroduced in several widely separated localities.

Spring.—Winter flocks remain together until late March or mid-April. Handley and I recorded a flock of 23 Turkeys "grazing" in a woodland glade in Lyon County on April 12, 1950. Gobblers were calling regularly throughout our stay there, April 9–17.

Breeding records.—Data from Lyon and Trigg counties were briefly summarized by Baker (1943): mating occurs from early April to mid-May; 14 gobblers were calling within a radius of one-half mile from one point, April 11, 1943; earliest brood recorded May 17, 1942, many through June and July. Pindar (1889b:313) received a set of 10 fresh eggs taken in or near Fulton County on April 30, 1887. Evidence of breeding of recently introduced birds in McCreary County was given by Hardy (1951:20, and Hardy, *vide* Lovell, 1951b:59): half-grown young, July 11, 1950; nest with 12 eggs, May 15, 1951.

Present distribution.—The population on Kentucky Woodlands National Wildlife Refuge was estimated in 1939 at 500 and in 1943 at 1,500 (Baker, 1943:25). The Turkey has remained numerous there despite trapping of many birds for restocking in other areas (for details see Sylvester and Lane, 1946). The survival of the species on this 50,000-acre tract is apparently due to protection afforded by the Hillman Land Company which formerly owned it. Native Turkeys have been periodically reported by the residents of various points in eastern Kentucky, but the reports have been impossible to verify. Restocking in progress for some years has probably by this time obscured the identity of any original populations that may have persisted. From interrogation of natives and conservation personnel I think it likely that a few small bands indeed persisted into the 1940's in southern Wayne and McCreary counties, possibly in Powell and Wolfe counties, especially in Leslie County, and perhaps elsewhere. Some are said to have persisted also in Casey, Russell, and Adair counties (Moynahan, 1949), and a few may have occurred from time to time in the heavily wooded bottom lands and large islands in the Mississippi River in Fulton County, since appreciable populations remain in adjacent Missouri (see Dalke, Leopold, and Spencer, 1946:Fig. 14).

History.—For practical purposes, the Turkey was extinct by 1930 in all but a very small part of Kentucky. References to its original abundance at many localities abound in the early literature (for many references see Wright, 1914–1915), but reports for the present century are few and undetailed. Turkeys were evidently extant over much of the Cumberland Plateau, Knobs, and Western Highlands until the logging boom during and just after the first World War (see Funkhouser, 1925:191; Stone, 1921; Bailey, 1933:96). They had disappeared earlier from the more level and more settled portions of the state (Blincoe, 1925:419; Price, 1904:149; Wilson, 1923c:131).

Recent stocking.—A few Turkeys were released at Mammoth Cave (original stock last reported in 1924) in October, 1932 (Bailey, 1933:96). Since 1946, the Division of Game and Fish, using live-trapped Turkeys from Kentucky Woodlands and hatchery-reared wild stock, has made introductions with some success in Pulaski, McCreary, Breathitt (see also Barbour, 1956:6), Knott, Edmonson (see also Nelson, 1959:13), Metcalfe, Cumberland, and Hardin counties, with other sites under consideration (Moynahan, 1949).

Fall and winter.—Medium-sized to large flocks are maintained during this period (Baker, 1943).

Geographic variation.—No Kentucky specimens seem to have been preserved; Audubon and various other pioneer ornithologists leave no doubt that many Turkeys have been killed and variously utilized in Kentucky. The original population, of course, doubtless belonged to the subspecies of the eastern United States, *Meleagris gallopavo silvestris* Vieillot.

FAMILY GRUIDAE: CRANES

**Grus americana* (Linnaeus): WHOOPING CRANE

Status.—Formerly fairly common in migration, perhaps also wintering. The species was probably rare in Kentucky by 1850 and has not been recorded in the present century.

Records.—The only definite records are those of Audubon and Wilson. According to Audubon (1835:203), who for a time considered the Sandhill Crane to be the young of the present species, the Whooping Crane arrived in the "Western Country" (in which, in his usage, Kentucky figured prominently if not chiefly) in mid-October and early November. He is vague as to whether it wintered in Kentucky, but in spring it remained as late as March. In that month, in 1810, Audubon claimed to have shown a number of both species (*i.e.*, "young" and "old" of the "Whooping Crane") to Alexander Wilson at Louisville. Without reference to Audubon, Wilson (1814:21) mentioned seeing Whooping Cranes there on March 20, 1810.

In the autumn of 1810 (Audubon, 1835:204) both species (*i.e.*, "adults" and "young") arrived at Henderson on October 28, when Audubon killed 7 specimens (species [?]; "ages" not indicated). In his journal of 1820, Audubon (1929:25) unmistakably described a Whooping Crane seen at the mouth of the Tennessee River (locality presently either in Livingston County or McCracken County) on November 14.

The species has been recorded less definitely from the Ohio River in the Cincinnati area by Langdon (1877:16; 1879:184), and on hearsay from Nelson County by Beckham (1885:50). Three statements by Pindar (1887a:55; 1889b:312; 1925a:82) may refer to the same observation in Fulton County, August 20 (26?), 1886, but are contradictory and may be in error.

***Grus canadensis* (Linnaeus): SANDHILL CRANE

Status.—Very rare transient, now irregular in occurrence; formerly regular and much more numerous.

Spring.—Migration is early, records ranging from March 15 to May 9. Recent records: 1 bird near Cincinnati, May 9, 1948, along the Ohio River and hence in Campbell County, Kentucky (Spencer, 1948, and verbal com.); 1 near Louisville remained in a large pasture from March 31 to April 6, 1938 (Monroe, 1938a), and 13 were seen over the Ohio River near Louisville on March 19, 1933, by Monroe and others (Carpenter, 1933; Monroe and Mengel, 1939:41). In late February or early March of 1933, I saw 2 flying north high in the air, just east of Louisville, but the exact date is not recorded. Over Mammoth Cave National Park, Edmonson County, 5 were seen on March 30, 1958, by Dilley (1958:25). Older records: with Whooping Cranes, a number were recorded near Louisville by Audubon (1835:203) in March of 1810 (see under Whooping Crane); journals kept by the South Union Shaker Colony in Logan County, summarized by Wilson (1944a:19-20), mention 168 flying north on March 19, 1857, and others flying north, trumpeting, on March 15, 1877 (whether these were all Sandhill Cranes is conjectural); a record for Hopkins County (number unspecified), for April 20, 1906, was given by Bacon (1933).

Fall.—Migration on the whole seems to be fairly late. Records range from September 17 to December 23 (only one earlier than October 28). The few recent records were provided by Hancock (notes), who saw 1 crane in Hopkins County in early December, 1935; by Stamm (1957:15), who noted 11 over a Louisville suburb on November 8, 1956; and by Wiley (1960b:68) and others, who saw a single crane at the Falls of the Ohio River at Louisville, September 17-18, 1960. Among older records, those kept by the South Union Shaker Colony refer to several flocks seen November 4, 1867, to cranes heard November 12, 1873, and to a

flock of 60 recorded December 23, 1877 (Wilson, 1944a:19–20—Whooping Cranes may figure in some of these records). In his journal of 1820 Audubon (1929:13–18) mentioned "Sand Hill Cranes" seen November 3 and 5 near Henderson and November 6 near Shawneetown (Illinois) on the Ohio River. Probably these records pertain to the present species, which Audubon then regarded as the young of the Whooping Crane. Audubon (1835:204) noted the arrival of Sandhill Cranes and Whooping Cranes at Henderson on October 28, 1810, and Sandhills may have been among the 7 cranes he killed on that date. A reference by Wilson (1922b:96) to cranes seen in Ballard County between July 27 and September 15, 1915–1918, is probably based on error of some kind, since cranes normally summer far to the north of Kentucky (see Walkinshaw, 1949:110–123).

Geographic variation.—No specimens of Sandhill Cranes from Kentucky have been preserved. The subspecies to be expected is *Grus canadensis tabida* (Peters).

FAMILY RALLIDAE: RAILS, GALLINULES, AND COOTS

Rallus elegans Audubon: KING RAIL

Status.—Uncommon summer resident, breeding locally west of the Cumberland Plateau.

Spring.—A secretive species, the King Rail is almost certainly more numerous at all seasons than the records indicate. Available records suggest arrival in April at most localities, but some are quite probably present earlier on occasion. Early records: April 30, in Warren County (Wilson, 1940a:18); April 21, at Louisville (Monroe); April 2, in Hopkins County (Bacon, 1933). The species is probably somewhat more numerous in spring than later, owing to the presence of transients, as suggested by the records of Goodpaster (1941:14) at Cincinnati, Wilson (1929:183) in Warren County, and Bacon (1933) in Hopkins County. Handley and I saw 1 King Rail in rushes at the edge of cypress growth at Murphy's Pond, Hickman County, on April 15, 1950, and I recorded 1 in a small cattail marsh in Fulton County on May 20, 1949. Monroe took a female (B.L.M.), probably transient, in a flooded upland field in Oldham County on April 26, 1947.

Breeding records.—The breeding season of the King Rail in Kentucky probably extends from late March or early April into July, and it is unlikely that the young are all fully grown before August. Extreme dates of clutch-completion indicated by 11 dated records fall in the periods April 11–20 and May 21–31, with a peak May 11–20. The few records, mostly of young, are from Clinton (Ganier, 1935), Jefferson (Monroe, notes), Henderson (Monroe and Mengel, notes), and Fulton (Ganier, 1935; Barbour, 1954:11) counties, Kentucky, and from Cincinnati, Ohio (Goodpaster, 1941:14) and Reelfoot Lake, Tennessee (Ganier, 1933a:22), near the Kentucky line. Only 4 nests are represented among the above-mentioned records: one with 11 eggs (incubated about 7 days) in a sinkhole marsh in Clinton County, on June 1, 1930 (Ganier, 1935); one with 13 eggs on a mat of fallen marsh vegetation 4 inches above ground in a small cattail marsh near Louisville, on May 24, 1931 (Monroe); one with 13 eggs (incubated about 10 days), in a grassy slough in Fulton County, on May 3, 1911 (Ganier, 1935); and one near Reelfoot Lake, Tennessee, containing 12 eggs on May 25, 1921 (Ganier, 1933a). Average clutch (4): 12.3 ± 0.4 eggs. Small young have been noted as early as May 3 (1911), in Fulton County (Ganier, 1935), and as late as June 14 (1953), in the same county (Barbour, 1954). In willow-bordered, dried-up sloughs near the Ohio River in Henderson County, Monroe and I, with the late R. C. Soaper, noted 3 broods of half-grown young (age estimated 40–50 days) on July 7, 1940.

Breeding distribution.—While the species probably occurs at favorable localities throughout the state west of the Cumberland Plateau (from which it has yet to be recorded at any season), it is almost certainly most numerous in the lowlands of western Kentucky. It has been recorded without details (Wilson, 1942:21) as

breeding at a few localities in central and western Kentucky, in addition to those listed above, but has not been recorded, oddly, from the Western Highlands in the breeding season despite considerable work in Hopkins and adjacent counties by Bacon, Hancock, and Suthard and near Mammoth Cave by Wilson. It frequents marshes, which need not be extensive, and in Kentucky is particularly characteristic of the rank, tangled edges of sloughs in the bottom lands of the larger streams. In such areas it is common near Henderson (Soaper), where Audubon (1835:27) made what appears to be the first record for the state, on May 29, 1810.

Fall.—The virtual absence of data is probably due to the comparatively little field work done in fall. Bacon (1933) listed the species as occurring in Hopkins County between October 14 and 22. Published records for other localities give no clue as to time of departure. I took a female (U.M.M.Z.) in a small clump of dried cattails at Bondurant, Fulton County, on November 11, 1948. This bird's right tibiotarsus had been broken and healed, but the injury may not be necessary to explain its presence this late in fall, since the species winters with some regularity at points well north of Kentucky.

Geographic variation.—The subspecies occurring is the continental *Rallus elegans elegans* Audubon.

Specimens examined.—Total, 3. B.L.M.—1 female, Oldham County (April 26, 1947); 1 female, Jefferson County (July 20, 1936); U.M.M.Z.—1 female (weight, 290.6 gm.), Fulton County (Nov. 11).

Rallus limicola Vieillot: VIRGINIA RAIL

Status.—Rare transient; one old breeding record (?) from near Henderson.

Spring.—Seemingly not common anywhere, the species has been recorded sporadically through most of April and May, at scattered localities. Records are at hand from Morehead, Rowan County, "1939" (Barbour, 1952:25), Cincinnati, April 15 to May 30, 1 seen on the first date (1939) by Goodpaster, and 1 taken on the latter (1891) by Charles Dury (Goodpaster, 1941:14); Bardstown, Nelson County, specimen taken May 10, 1882 (Beckham, 1885:48); and Hopkins County, "fairly common," April 7 to May 15 (Bacon, 1933). Also, near Louisville, Monroe has records from April 17 (1948) to May 10 (1947) and has found the species rather regularly in wet upland fields in Oldham County, where he saw 5 and took a male (testes 5×10 mm.) on April 27, 1947.

Breeding records.—None is absolutely acceptable, although Audubon's reference (1835:41) to a female incubating eggs near Henderson in April was accepted by Cooke (1914:22). (Since Audubon was evidently familiar with both the King and Virginia rails the record seems likely to be authentic, although the present breeding distribution of the Virginia Rail is more northerly [see Hicks, 1935a:150].) Bacon's unannotated reference (1933) to the species breeding at Atkinson Lake, Hopkins County, in June, 1932, is open to question in the absence of specimens.

Fall.—The species is infrequently seen in autumn. It has been recorded from September 16 to October 13, in Hopkins County (Bacon, 1933), and September 18 and 21, 1918, in Warren County (Wilson, 1922:234). Audubon (1835:41) referred to its presence in the "Western Country" quite late in fall. Unexpectedly, 1 was seen at close range, in brush on the Ohio River bank in Oldham County, December 23, 1950 (Monroe); another was killed at the Standiford Field ceilometer, Louisville, on October 7, 1951 (Lovell, 1952).

Geographic variation.—The subspecies occurring is the North American *Rallus limicola limicola* Vieillot.

Specimens examined.—Total, 2. B.L.M.—1 male, Oldham County (April 27); 1 female, Jefferson County (April 25, 1936).

Porzana carolina (Linnaeus): SORA

Status.—Uncommon to fairly common transient.

Spring.—Soras arrive in late March or early April; peak of migration near mid-April; rare by early May. Early records: April 15 (1939), at Cincinnati (Goodpaster, 1941:14); March 26, at Louisville (Monroe; next record for April 6); April 6, in Warren County (Wilson, 1940a:18); April 2, in Hopkins County (Bacon, 1933). The Sora, when present, is the most numerous rail in Kentucky and has been observed at many localities from Morehead, Rowan County (Barbour, 1952:25), west to Fulton County (Pindar, 1925a:82). It is fairly common at times, in marshes, brush along stream banks, and wet fields. Wilson (1940a:18) has recorded as many as 10 at once in Warren County, and Monroe saw 9 in a wet upland field in Oldham County on April 27, 1947. In recent field work I recorded Soras in Laurel County, near London, on May 6, 1952; in a cattail marsh in Jefferson County, where I took a male (U.M.M.Z.) on April 7, 1948; and in Marshall County where several were seen April 10–16, 1950, by Handley and me, and 2 males collected April 16 (U.M.M.Z.). Few are seen after early May. Late records: May 9, in Rowan County (Barbour, 1952:25); May 17 (1947), at Louisville (Monroe); May 9 (1937), in Warren County (Wilson, 1937:20); May 11, in Hopkins County (Bacon, 1933).

Summer.—Monroe has one record, presumably of a non-breeding bird, made near Louisville on July 22, years ago.

Fall.—Transients sometimes arrive in late August; migration extends through September and early October. Published records are rather scarcer than in spring, probably as a result of less field observation. The species has been recorded as early as August 25, in Rowan County (Barbour, 1952:25), and "the last week of August, 1913," in Nelson County (Blincoe, 1925:408). In the last, Beckham (1885:48) found it "rather common" in October in fields overgrown with briars. Monroe has fall records for the Louisville area for August 21 (1955) and October 5 (1952) and he took a female (B.L.M.) in Meade County on September 4, 1946. Casually reported records in literature are from various localities, much the same as in spring, from Morehead (see above) west to Fulton County (Pindar, 1925a:82). There are few late records, most of those given falling in September (see Barbour, 1952:25; Wilson, 1940a:18; Bacon, 1933), but it seems likely that the species is usually present in early October. The Sora has been recorded as late as October 14 (1938), at Cincinnati (Goodpaster, 1941:14) and October 12 (1880), in Nelson County (specimen, C.W.B.). I flushed single birds from a brushy stream border one mile south of London, Laurel County, on October 9 and 11, 1951.

Specimens examined.—Total, 7. M.S.C.—1 female, Rowan County (Sept. 1, 1938); C.W.B.—1 female, Nelson County (Oct. 12); B.L.M.—1 male, Jefferson County (April 17, 1937); 1 female, Meade County (Sept. 4); U.M.M.Z.—1 male, Jefferson County (April 7); 2 males, Marshall County (April 16).

Coturnicops noveboracensis (Gmelin): YELLOW RAIL

Status.—One record established beyond doubt; probably a rare but regular transient.

Records.—Extremely secretive and difficult to observe, the Yellow Rail has proven to occur regularly in many localities about the country where its presence was long unsuspected. It is definitely known in Kentucky only from Beckham's record (1885:48) of a male and female (C.W.B.) taken in a briar-grown field near Bardstown, Nelson County, on October 1, 1880. A few other references to the species in Kentucky are inadequately documented (Bacon, 1933, Hopkins County, September 22, 1926; Pindar, 1925a:82, Fulton County, "rare and irregular"; Funkhouser, 1925:180, Woodford County, June [?], 1921).

Geographic variation.—The subspecies occurring is the widespread *Coturnicops noveboracensis noveboracensis* (Gmelin).

Specimens examined.—Total, 2. C.W.B.—1 male, 1 female, Nelson County (Oct. 1, 1880).

Gallinula chloropus (Linnaeus) : COMMON GALLINULE

Status.—Rare transient through most or all of the state; very rare and irregular summer resident, breeding occasionally in south-central and western Kentucky.

Spring.—This gallinule has been recorded rarely, in April and May, at a few localities scattered through the state, mostly in central and western Kentucky. Early records: April 18 (1939), at Morehead, Rowan County (specimen, M.S.C.); April 24 (1934), at Cincinnati, Ohio (Goodpaster, 1941:14); April 6 (1952), at Louisville (Monroe). The species inhabits marshes and ponds similar to those favored by American Coots and Pied-billed Grebes and has never been recorded in large numbers. A number of specimens taken are listed below. Late records: May 19, at Louisville (Monroe and Mengel, 1939:41); May 21 (1933), and May 24 (1935), in Warren County (Wilson, 1933a:142; 1940a:18; 1935).

Breeding records.—The only seemingly authentic record was made when Wilson (1940a:18) recorded the species at McElroy Lake, Warren County, on August 3 and 6, 1935, observing 8 small young on August 3 and catching 1 on August 6. He recorded an adult there on July 7, 1950 (Wilson, 1951:4). Garman's old record (1894:30) of a nearly grown young bird caught in a trap at Lexington, October 4, 1893, is remarkable if accurate. Although Pindar (1925a:82) said the species was common in summer in Fulton County in the 1890's, it could certainly not be called so today. It is fairly common at Reelfoot Lake, Tennessee, just south of Fulton County. A female I took in cut-grass marshes there on May 27, 1949, was nearly ready to breed (U.M.M.Z.; ova up to 12 and 14 mm. in diameter).

Fall.—As nearly as can be told from the few records, most of which are given below, migration occurs mainly from late August or early September through October. Wilson's record (1922:235) of a bird seen on Barren River, Warren County, on August 24, 1921, was later stated to be questionable (Wilson, 1933a:142). However, a very early transient (?) was banded at Louisville on August 1, 1954 (Stamm, *vide* Monroe). The species has been recorded from Cincinnati, Ohio, in September, 1932 (Goodpaster, 1941:14), and in the Louisville area on various dates from September 14 through November 3, the last in 1952 (Monroe, notes; Stamm, Brecher, and Lovell, 1960:5; see also "specimens examined").

Geographic variation.—The subspecies occurring is the North American *Gallinula chloropus cachinnans* Bangs.

Specimens examined.—Total, 4 from Kentucky. M.S.C.—1 unsexed, Rowan County (April 18, 1939); B.L.M.—1 female, Jefferson County (Oct. 5, 1938); 1 female, Oldham County (Sept. 14, 1949); J.D.F.—1 male, Woodford County (May 5, 1942); U.M.M.Z.—1 female (weight, 330.7 gm., not fat; extralimital), Obion County, Tennessee (May 28).

Fulica americana Gmelin: AMERICAN COOT

Status.—Common to abundant transient through most of the state, rare or uncommon in eastern Kentucky; lingers regularly into early winter, being probably a rare winter resident, at least in the extreme west; very rare summer resident, breeding irregularly and locally in southern and probably extreme western Kentucky.

Spring.—Migration is regularly in progress by mid-March, and sometimes in February (coots seem to arrive earlier in southern than in northern Kentucky); the main flight may begin by late March and last throughout April; numbers decrease through May with non-breeding stragglers often present through much of June. Early records (northern Kentucky): March 13 (1937), at Cincinnati, Ohio (Goodpaster, 1941:14); March 14 (1950), at Lexington (Edwards, notes); March 2, at Louisville (Monroe). Early records (southern and western Kentucky): January 20 (1952), February 18 (1950), and February 16 (1957), in Warren County (Wilson, 1952c:46; 1951:4; 1957b:60); February 24, in Hopkins County (Bacon, 1933). Although the most abundant of its family in Kentucky, the species is evidently uncommon on the Cumberland Plateau, where little suitable habitat is

found. Plateau records are available only from Rowan County (Barbour, 1952:25), Floyd County (Patten, 1937), and Laurel County, where I saw 1 bird on a small pond on April 10, 1951. Westward, coots are usually common to abundant at the peak of migration, occurring in varied aquatic situations, especially on larger ponds, lakes, and streams. Thousands sometimes congregate in April and early May on the shallow wet-weather lakes in Warren County (Wilson, 1929:183; 1951:4; 1952c:46). Transients are often recorded in the last half of May and early June, but are much less numerous by then.

Breeding records.—The coot has definitely been recorded breeding only at the unique karst lakes just south of Bowling Green, Warren County. In wet years these lakes, the same where large concentrations sometimes occur in spring, provide suitable breeding habitat. This, however, sometimes vanishes very rapidly with a sudden lowering of the water table. Wilson (1940a:18; 1951:4; etc.) has found nests or summering coots at these lakes nearly every year that water remained into June (1927, 1935, 1939, 1949, 1950, etc.), some 20 birds being present at Chaney Lake when I was there on June 19, 1949. He found 4 nests containing fresh eggs on June 22, 1927 (Wilson, 1929:183), 8 deserted nests (2 containing 6 eggs each) on June 19, 1935 (Wilson, 1935), and 8 or 10 nests "started and abandoned" in the season of 1939 (Wilson, 1939d:36). Without detail the species has been reported to breed at a few other western Kentucky localities (Wilson, 1942:21).

Summer.—Probably most of the coots summering at the above-mentioned lakes, and less frequently elsewhere, do not breed. There was no evidence of breeding on the part of the coots I saw at Chaney Lake in June, 1949, and Wilson (1951) reported no evidence of breeding in 1950, although some 50 coots summered. At Louisville, Monroe has occasionally noted a few along the Ohio River, June 18 to July 9.

Fall.—Transients begin to appear in September, becoming common by early October; the main flight seems to occur in late October and early November; coots are rare by late November or early December. Early records: September 10, at Louisville (Monroe; next record, September 23); September 15, in Hopkins County (Bacon, 1933); September 26, at Kentucky Lake (Morse, 1950b:Table 2, earliest, 1945–1948). The species is distributed as in spring but tends to occur more exclusively on large bodies of water. Hundreds have been recorded in November on the lakes in Hopkins County (Bacon, 1933). Along the Ohio and Mississippi rivers, flocks range from small groups to several hundreds. I saw many such groups in 1948, October 18 to November 16, from Louisville to Hickman, with 200 birds near the latter on November 8 and well over 300 near Henderson on November 16. Late in fall numbers thin out and coots are uncommon at Louisville by late November and rare in early December (Monroe).

Winter.—Absolutely satisfactory evidence of wintering is not available, despite a few statements in literature. Most of the birds present in late December (see various Christmas bird counts, *Kentucky Warbler*) probably depart with severe weather. Recorded at Cincinnati, December 26, 1938 (Goodpaster, 1941:14), and many times near Louisville up to December 27 (Monroe). On January 5, 1951, I found the remains of a coot killed by a predator on the Ohio River bank in Ballard County. Pindar (1925a:82) stated that a few winter in Fulton County. Funkhouser (1925:181) cited a record (by "W. Sams") for Lexington, January 10, 1920. The records from Warren County given under "spring" suggest that extreme southern Kentucky lies near the edge of the species' winter range.

Geographic variation.—The subspecies occurring is the North American *Fulica americana americana* Gmelin.

Specimens examined.—Total, 10. M.S.C.—1 female, 1 unsexed, Rowan County (Oct. 2, 1935; Nov. 11, 1935); U.K.—1 male, 1 female, Fayette County (April, 1939); C.W.B.—1 female, Nelson County (March 22, 1882; other specimens from Nelson County, not seen,

reported taken April 5, April 10, and Sept. 23, 1916, by Blincoe, 1925:408); B.L.M.—1 female, Carroll County (Nov. 17, 1941); 1 female, Jefferson County (April 1, 1946); C.U.—1 male, Logan County (April 10, 1906); Murray State College Coll.—1 unsexed, Graves County (fall, 1928); U.S.N.M.—1 male, Boone County (Oct. 11, 1938).

FAMILY CHARADRIIDAE: PLOVERS, TURNSTONES, AND SURFBIRDS

Charadrius semipalmatus Bonaparte: SEMIPALMATED PLOVER

Status.—Rare to fairly common transient west of the Cumberland Plateau.

Spring.—Occasionally recorded in late April; most records for early and mid-May; a few are found in late May. Extreme records are from the ephemeral lakes at Woodburn, in Warren County south of Bowling Green, where Semipalmated Plovers have been recorded from April 22 (Wilson, 1940a:19) to May 30, in 1950 (Wilson, 1951:4), occasionally in numbers up to 75. I took a female there (U.M.M.Z.), from a flock of 25, on May 6, 1949. Occurring about sand bars, mud flats, and flooded fields, the species has been recorded in small numbers, mainly between May 1 and 20, at scattered points in central and western Kentucky: on the Ohio River at Cincinnati in April, 1878 (specimen, C.M.N.H.), at Lexington, May 14–25, 1949 (Edwards, notes), and at Louisville, May 3–19 (Monroe). In 1949 I saw 3 birds in flooded fields in Logan County on May 12, 6 on the big bar at "Kentucky Bend" of the Mississippi River in Fulton County on May 14, and 1 there on May 22.

Fall.—The period of migration is more prolonged than in spring. The species is noted occasionally in July, more often in August; main flight in September; a few in October. Recorded from Cincinnati (specimens, C.M.N.H.) westward. On the Falls of the Ohio River at Louisville the species is regular, congregating in flocks up to 25 or 30—several of which are sometimes present at once—on the rocks and gravel bars. Extreme records at the Falls are July 26, in 1959, and October 26, in 1946 (Monroe, notes; Stamm, Brecher, and Lovell, 1960:5; Stamm and Summerfield, 1952:42). I saw 5 birds there on October 24, 1948. Near Bowling Green, the species is less regular at the Woodburn lakes, which are often dry in fall, records ranging from July 27 (1950) to September 13, in various years (Wilson, 1940a:19; 1951:4). Recorded less frequently elsewhere. I took 1 bird on the large sand bar at "Kentucky Bend" in Fulton County on August 23, 1942 (B.L.M.).

Specimens examined.—Total, 9. C.M.N.H.—6 (4 males, 2 unsexed), Ohio River near Cincinnati (hence on or near the line of Kenton [and possibly Boone] County, Kentucky), Ohio (April, 1878; Sept., 1878; Sept. 5, 1878; Sept. 5, 1932 [2]; Sept. 15, 1878); B.L.M.—1 male, Jefferson County (Aug. 18, 1946); 1 unsexed, Fulton County (Aug. 23); U.M.M.Z.—1 female (weight, 44.0 gm., very fat), Warren County (May 6).

Charadrius melodus Ord: PIPING PLOVER

Status.—Rare transient, recorded only west of the Cumberland Plateau.

Spring.—A female (C.M.N.H.) was taken on the bank of the Ohio River near Cincinnati, Ohio (hence virtually in Kenton County, Kentucky), by Charles Dury on May 4, 1879 (Goodpaster, 1941:15). Rather large numbers ("several dozen" on May 21, 1933, and 15 on May 26, 1937) were reported from Warren County by Wilson (1933a:142; 1940a:18), but I am not entirely satisfied that the identifications were correct.

Fall.—The species is rare, most of the few records being from the Falls of the Ohio River at Louisville, between August 19 (1959) and October 2 (1948), no more than 2 birds being seen at a time (Monroe, notes; Stamm, Brecher, and Lovell, 1960:5; Stamm and Summerfield, 1952:42). Monroe took immature males there

on September 5, 1937 (Monroe, 1938*b*), and September 7, 1946 (B.L.M.), and Goodpaster took 1 bird on August 27, 1938 (C.M.N.H.). At Bell Island, in the Ohio River near Shawneetown, Illinois, and within Union County, Kentucky, John William Hardy and Richard Brewer (notes) saw 2 birds on September 7, 1953.

Geographic variation.—I have referred the two immature males taken by Monroe and mentioned above to the inland subspecies, *Charadrius melodus circumcinctus* (Ridgway), to which a large majority of Kentucky transients would be expected to belong. The characters of immatures are not marked, however (see Moser, 1942: 35), and adult specimens remain desirable.

Specimens examined.—Total, 4. C.M.N.H.—1 female, Ohio River near Cincinnati (May 4); 1 male, Jefferson County (Aug. 27); B.L.M.—2 males, Jefferson County (Sept. 5, 7).

Charadrius vociferus Linnaeus: KILLDEER

Status.—Resident, common from early spring to late fall; somewhat less numerous, and occasionally rare, in winter.

Spring.—Numbers normal for the breeding season seem to be present by early March. The birds are scattered, tending to flock less than at other seasons.

Breeding records.—Nesting activity is begun in March, and not all young are grown until, at the earliest, some time in July. The evidence of 22 dated breeding records is that clutches are completed at least as early as March 11–20, and as late as June 11–20 (suggesting that two broods may be reared), with a peak of first clutches March 21–31. Records are from Rowan (Barbour, 1951*a*:34), Laurel and Madison (Mengel, notes), Jefferson (Yunker, 1932:[8]; Hays, 1957:3; Monroe, Mengel, notes), Nelson (Blincoe, 1922:79, and *vide* Funkhouser, 1925:187), Warren (Wiley, 1956*a*:50; Mengel, notes), Daviess (Powell, *vide* Lovell, 1951*b*:59), and Hopkins (Hancock, 1954:20) counties. Extreme egg-dates are March 17 (1956), 4 eggs in Jefferson County (Slack, *vide* Hays, 1957), and June 18 (1925), 4 fresh eggs in Hopkins County (Suthard, *vide* Hancock, 1954). Other early and late clutches are indicated by small young noted in Warren County on April 15 (1956), by Wiley (1956*a*), and young about 10 days old noted by Monroe and me (notes) on the Falls of the Ohio River, Jefferson County, July 23 (1938). Nests are merely shallow hollows scraped out of gravel or dirt and are placed in open situations such as golf courses, heavily grazed pastures, and road shoulders. Nearly all clutches consist of 4 eggs; 15 of 18 reported contained this number, the other 3 (if complete?) consisting of 3 (average, 3.9 ± 0.03). Monroe found a nest containing 4 eggs in Jefferson County on April 12, 1941, and I found nests also containing 4 eggs on a road shoulder about 8 miles north of Waco, Madison County, on April 9, 1951, and in the short grass of a field 1 mile south of London, Laurel County, on May 7, 1952. I noted injury-feigning by an adult bird in Warren County on May 6, 1949, but found no nest or young.

Distribution.—Breeding throughout the state, the Killdeer occurs in open country wherever suitable habitat is found, on open shorelines and sand bars, in plowed fields, and in close-cropped pasture. Although such areas are much less numerous and extensive in mountainous southeastern Kentucky and over much of the Cumberland Plateau, the species probably occurs locally in every eastern county, and has been reported from a number (Carter County, Kozee, 1938:34; Rowan County, Barbour, 1951*a*:34; Greenup County, Wetmore, 1940:536; Clark County, Horsey, 1922:80; and several others, Wilson, 1942:21). In the largely open country west of the Plateau it is almost ubiquitous.

Summer.—In late summer and early fall Killdeers congregate in large numbers in favored situations such as the Falls of the Ohio River at Louisville, where numbers up to several hundreds sometimes gather on the rocks and bars (Monroe and Mengel, 1939:42; Stamm, Brecher, and Lovell, 1960:5).

Fall and winter.—The birds are widely distributed, as at other seasons, tending to occur in loose, sometimes large flocks in open situations. I counted approximately 100 on mud flats at a reservoir near Lexington on October 11, 1951, and 37, in Jefferson County in one small field planted in winter wheat, on November 20, 1948. Goodpaster (1941:15) reported 200 seen near Cincinnati on November 6, 1938. By late November or early December numbers have diminished and in winter are subject to noticeable fluctuations, which are reflected in many Christmas bird counts. Numbers tend to be lowest in severe winters. In eastern Kentucky, where Killdeers are less generally distributed than elsewhere at all seasons, the species has been reported wintering in Rowan County (Barbour, 1951a:34) and Floyd County (Patten, 1937). I listed 2 in Laurel County on February 4, 1950.

Geographic variation.—The subspecies occurring is the North American *Charadrius vociferus vociferus* Linnaeus.

Specimens examined.—Total, 10. M.S.C.—2 with incomplete data from eastern Kentucky; C.W.B.—1 male, 1 female, Nelson County (March, 1882); B.L.M.—1 male, Jefferson County (July 22, 1939); U.S.N.M.—1 male, 1 female, Muhlenberg County (Oct. 25, 1938); 2 females, Trigg County (Nov. 4, 1938); 1 male, Fulton County (June 1, 1938).

Pluvialis dominica (Müller): AMERICAN GOLDEN PLOVER

Status.—Rare transient, irregular in spring, regular locally in fall.

Spring.—The scarcity of records is surprising in view of the migration pattern of the species. While the golden plover often occurs at this season, in upland fields and other large open areas where the birds may be hard to see, it seems likely that many overfly Kentucky. Records range from March 15 (1937), in Warren County (Wilson, 1937:19—given in error as May 15 by Wilson, 1940a:19), to May 10, in Lincoln County (Bent, 1929:191, source unstated). The main flight should occur between late March and mid-April. On March 21, 1816, Audubon (1835:629) recorded "great flocks" passing Henderson and secured several specimens. Recently flocks of large to moderate size have been recorded as follows: 26 on March 26, 1952, at the Woodburn lakes in Warren County (Wilson, 1952c:46); 163 on March 29 and 30, 1947, at Murray, Calloway County (Wyatt, 1948:4); 42 on April 10, 1949, at Henderson (Lovell, 1949); 42–80 at Louisville, March 27–28, 1955 (Stamm and F. Krull, 1955:28); and 100 on April 14, 1950, in Ohio River bottom lands near Cincinnati (Maslowski, notes). Other records have been made at Lexington (Garman, 1894:29), Louisville—records for April 8 and 17 (Monroe), and in Warren County, April 24 and 26, 1935 (Wilson, 1940a:19) and April 2, 1952 (Wilson, 1952c:46). Pindar (1925a:83) called the species a fairly common migrant in Fulton County (1890's) without reference to season.

Fall.—Most records are from the Falls of the Ohio River at Louisville, where golden plovers, mainly immature birds, are regular in small numbers. Records made there range from August 20 (1960) to November 11 (1951), the next records being for September 3 and November 2 (Monroe, notes; see also Monroe and Mengel, 1939:42; Stamm and Summerfield, 1952:42; Stamm, Brecher, and Lovell, 1960:5). Flocks of 10 to 20 or more are sometimes seen on the rocks and in the shallows at the Falls, where several specimens have been obtained (see below). I took a female from a flock of 20 there on October 24, 1948 (U.M.M.Z.). Monroe examined a dead bird killed at Brandenburg, Meade County, on October 13, 1945, and I saw a golden plover in nearby southern Indiana on November 11, 1943 (Mengel, 1944). An unsexed specimen (U.K.) collected near Lexington by one Professor Scoville on November 17, 1891, seems to provide the latest fall record for the state.

Geographic variation.—Specimens, as might be expected, are referable to the North American subspecies *Pluvialis dominica dominica* (Müller).

Specimens examined.—Total, 5. U.K.—1 unsexed, Fayette County (Nov. 17); B.L.M.—1 male, 1 female, Jefferson County (Sept. 18, 1937; Sept. 11, 1937); C.M.N.H.—1 (sex?), Jefferson County (Sept. 11, 1938); U.M.M.Z.—1 female (weight, 187.9 gm., very fat), Jefferson County (Oct. 24).

Squatarola squatarola (Linnaeus) : BLACK-BELLIED PLOVER

Status.—Transient, very rare in spring, rare but regular in fall; local in occurrence.

Spring.—The Black-bellied Plover is less numerous than the golden plover in the Mississippi Valley, and the smaller flight passes considerably later. In Kentucky, large plovers seen before May 1 are very likely to be goldens, those after May 15 almost certain to be Black-bellieds. Habitat preferences are much as those of the golden plover, but the Black-bellied is somewhat less likely to occur in dry upland situations. In Kentucky it has been recorded almost exclusively from the remarkable karst lakes at Woodburn near Bowling Green, Warren County, singly and in small flocks (rarely up to approximately 35 birds), on perhaps a dozen scattered occasions between 1934 and 1956, dates of observation ranging from May 3 to June 3 (Lancaster, 1925:44; Wilson, 1933a:142, 1940a:19, 1951:4, 1952c:46, 1956c:60, 1957b:60; Wilson and Lovell, 1950:48). Two winter-plumaged birds recorded (Wilson, 1937:19; 1940a:19) on March 30 (1937) may well have been golden plovers. Many of the later birds have been in nuptial plumage. There are Louisville records for May 8 and June 1 (Monroe). Just north of the state line "a flock" of Black-bellied Plovers was seen by Nathaniel Whitney, Jr., on May 19, 1946, near Glendale, Ohio (Kemsies, 1948a:18).

Fall.—Except for a specimen taken on the Ohio River near Cincinnati on September 21, 1879 (Dury and Freeman, 1880:104), and 1 recorded in Warren County, October 19, 1950 (Wilson, 1951:4), the species has been recorded only at the Falls of the Ohio River at Louisville, where it is fairly regular in small numbers. Flocks of 10 to 15 birds are sometimes seen there, usually from mid-September to mid-October, extreme records being for July 22 and November 13 (Monroe, notes; Monroe and Mengel, 1939:42; Stamm and Summerfield, 1952:42; Stamm, Brecher, and Lovell, 1960:5). Specimens taken include an immature female secured by Monroe on September 18, 1937, an adult female, largely black below, on August 24, 1946, and a third, slightly wounded and banded on September 15, 1948, taken again on October 2 (Lovell, 1951:4).

Specimens examined.—Total, 2. B.L.M.—2 females, Jefferson County (Aug. 24, Sept. 18).

Arenaria interpres (Linnaeus) : RUDDY TURNSTONE

Status.—Transient, casual in spring, rare to very rare in fall.

Spring.—Turnstones have been recorded in Kentucky in spring only at the wet-weather lakes in Warren County, where Wilson (1940a:19; 1948a:54; 1951:4) observed single birds on May 29, 1935, in 1948 (date not given), and on May 24, 1950, on the last date together with Lovell (Wilson and Lovell, 1950:48). Near Cincinnati, Ohio, 1 was seen by Victor Sloane on May 27, 1947 (Kemsies, 1948a:18).

Fall.—The species has been recorded rather infrequently and in small numbers, chiefly in August and September. Most records are from the Falls of the Ohio River at Louisville, where turnstones have appeared nearly every year, 1934–1959. Records at this locality range from August 3 (1947) to October 6 (1951), extremes recorded by Monroe (see also Stamm and Summerfield, 1952:42; Brecher, 1958a:52; Stamm, Brecher, and Lovell, 1960:5). Small flocks are sometimes seen among the slippery, algae-covered rocks at the Falls; 11 turnstones were present there on August 28, 1949, and 3 still in breeding plumage were seen from August 10 to 18, 1946 (Monroe). Records are available for only two other localities: 1 bird in winter plumage was seen on a sand bar in the Ohio River near Mound City, Illinois (Ballard County, Kentucky), by Nelson (1877:59) on August 30, 1875, and Barbour (1952:25) mentioned 1 seen by W. A. Welter on a hotel roof [!] at Morehead, Rowan County, on September 4 (year not given; between 1933 and 1939).

Geographic variation.—Kentucky specimens appear to be referable to the widespread North American subspecies *Arenaria interpres morinella* (Linnaeus).

Specimens examined.—Total, 3. B.L.M.—3 females in winter plumage, Jefferson County (Aug. 3, 1947; Sept. 7, 1937; Sept. 27, 1936).

FAMILY SCOLOPACIDAE: WOODCOCK, SNIPE, AND SANDPIPERS

Philohela minor (Gmelin): AMERICAN WOODCOCK

Status.—Records to date indicate that this rather secretive species is an uncommon to fairly common transient (sometimes locally common), an uncommon summer resident, and a very rare winter resident.

Spring.—Migrants probably begin to arrive in February, on the average, but actual arrival dates are uncertain at present because small numbers may winter, at least in some years. Woodcock appear to be most numerous in March, doubtless indicating the presence of transients at that time (many records; see especially Russell, 1959:5). Whether wintering birds or newly arrived migrants, woodcock have been noted as early as February 3 (1950), in Laurel County (Mengel); February 3 (1954) in McCreary and Casey counties, courting (Russell, 1954a:60); February 12 (1938), at Cincinnati, Ohio (Goodpaster, 1941:15); and January 26 (1936), in Hopkins County (Bacon, 1954:27—several February dates). Barbour's earliest record (1951a:34) in Rowan County, however, was for March 13, while Monroe's at Louisville (1934–1952) was March 4. Courtship performances have been noted as early as February 3 (see above), in McCreary and Casey counties; February 24 (1954), in Edmonson County (Russell, 1954:33); February 20 (1920) and March 3 (1911), in Hopkins County (Bacon, 1954:26); and March 10 (1955), at the summit of Black Mountain, Harlan County (Barbour and Smith, 1955:26). The date of latest observed courtship seems to be April 22, with records for Edmonson County in 1954 (Russell, 1954a:60), and Powell County in 1949, when I found 5 courting males in cleared areas along two and one-half miles of the North Fork of Red River. In the spring of 1954 Russell (*loc. cit.*) and others recorded a considerable number of courtship performances near Mammoth Cave, Edmonson County, with a maximum of 11 "singing" males on March 12. Russell was probably wrong in considering this evidence of a "migrating group," since there is no indication that the species courts in migration. Rather, it suggests that the breeding population is considerably larger than has heretofore been suspected. Courtship performances I have observed seemed identical to those performed in New York and elsewhere.

Breeding records.—As noted above, courtship begins in February, and nesting must at least occasionally commence in late February. Completion of clutches as early as March 1–10 and as late as April 11–20 (peak March 21–31) is indicated by 19 dated breeding observations. Definite records of breeding (*i.e.*, eggs or small young) are from Rowan (Barbour, 1951a:34), Boone and Campbell (Maslowski, notes), Jefferson (Summerfield, 1949:73; Lovell, 1951b:59; Monroe, notes), Barren (Wilson, 1939e:36), Edmonson (Russell, 1954a:60; Wilson, 1954a:63), Hopkins (Hancock, 1954:20; Bacon, 1954:26), Crittenden (Frazer, 1938), Trigg (Cypert, notes), Marshall and Calloway (Morse, 1948a:41), and (all by Russell, 1954a:60) Henderson, Caldwell, Todd, Union, and Christian counties (also available are notes by Maslowski for nearby Clermont County, Ohio). To these, as breeding localities, and bringing the total to 30, may be added 14 additional counties where courtship has been observed: Harlan (Barbour and Smith, 1955:26), Powell (Mengel, notes), and McCreary, Lawrence, Laurel, Bath, Montgomery, Casey, Marion, Oldham, Bullitt, Warren, Daviess, and Ballard (Russell, 1959:11). Egg-dates range from March 17 (1948), in Marshall County (Morse), 4 eggs, to April 18 (1911), in Hopkins County (Bacon), 4 eggs, incubation advanced. A later breeding date is indicated by small young noted in Rowan County on May 11 (Barbour). Of 12 reported clutches, one contained 2 eggs (probably incomplete), ten had 4 eggs, and one contained 5 eggs (Henderson County; Russell, 1954a:60): average (discounting clutch of 2), 4.1. Most broods reported have likewise consisted of 4 young, one of 3 being perhaps incomplete. The majority of nests found

have been in grassy or low shrubby situations at the edges of wooded areas or in open woods.

Breeding distribution.—Statewide, as indicated by the distribution of the 30 counties listed above, for which some form of breeding data is available. In addition to records already listed, there are numerous published observations of woodcocks in summer, from Harlan County (Barbour, 1941a:46) in the east, to Ballard County (Wilson, 1922b:96) in the west (see Wilson, 1942:21; Russell, 1959; brief surveys of distribution). My own recent records include woodcocks seen at Slade, Powell County, June 21, 1948; a female taken 2 miles south of London, Laurel County, July 17, 1949 (U.M.M.Z.); one flushed in a rhododendron-bordered glade at 2,400 feet elevation in Pike County, June 26, 1951; and a bird flushed on a wooded slope in the Kentucky River valley of Owen County, July 5, 1950. The spate of records in recent years, largely occasioned by studies of the Kentucky Division of Game and Fish (Russell, 1954a, 1959), indicates that the species breeds in somewhat greater numbers than was formerly supposed. There are now records for every major physiographic division of the state, the pattern of these, although perhaps not conclusive at present, suggesting that the species is most numerous on the Cumberland Plateau and in the Western Highlands (areas largely covered with mixed mesophytic forest), less numerous in the Pennyroyal and outer Bluegrass (where somewhat drier forests prevail, now drastically reduced in extent), and least numerous in the lowlands of the extreme west, and in the nearly deforested inner Bluegrass (where it seems to be so far unrecorded). There is no question that woodcocks prefer moist, fairly well-shaded conditions. In the Cumberland Plateau and Mountains, I have recorded them in streamside swales of alder, river birch, and sweet gum, in laurel- or rhododendron-bordered glades, and at the margins of old fields bordering mature forest.

Fall.—The published consensus, based on a general increase in records, suggests that the main flight passes in November (see especially Russell, 1959:5). The species has been recorded from many localities throughout the state, some specific records being given by Wetmore (1940:536), Carroll and Butler counties; Blincoe (1925:408), Nelson County; Bacon (1954:27), Hopkins County; and below ("specimens examined"). Monroe has seen small numbers near Louisville on various occasions between October 27 and December 3. I saw 1 bird in upland thickets in Meade County on October 20, 1948, and 2 to 3 daily, probably locally reared birds, in Laurel County 2 miles south of London, October 6–11, 1951. A male taken there (U.M.M.Z.) on October 9 had all body tracts in molt. Game biologists estimate that, on the basis of reported kills, hunters in recent years take 3,500 woodcock per annum in Kentucky (Russell, 1959:7). The species is little sought.

Winter.—January and February records given under "spring," taken together with occasional Christmas census records at various localities, suggest the strong probability that at least a few woodcock remain locally throughout mild winters. Thus far, however, I know of no consecutive observations at any one locality proving occurrence throughout January. Monroe's latest record for the Louisville area is for December 25. A male which I took in Laurel County (U.M.M.Z.) on February 3, 1950, was moderately fat (weight, 154.9 gm.) and had testes measuring 5×8 mm. The winter had been mild with much rain, and I suspect this bird of wintering in the excellent habitat where I secured it.

Specimens examined.—Total, 11. M.S.C.—1 male, 1 female, 2 unsexed, Rowan County (Nov. 19, 1939; March 19, 1936; March 19, 1936, July 3, 1936); R.W.B.—1 female, Harlan County (Aug. 5, 1939—near 4,000 feet elevation); B.L.M.—1 female, Jefferson County (March 4, 1950); C.U.—1 female, Logan County (Oct. 30, 1905); Murray State College—1 unsexed, Calloway County (March 12, 1934); U.M.M.Z.—2 males, 1 female (weight, 164.1 gm.), Laurel County (Feb. 3, Oct. 9; July 17—bird injured, head only preserved).

Capella gallinago (Linnaeus): COMMON SNIPE

Status.—Transient, fairly common to common in spring, rare to fairly common in fall, remaining late; occasional winter resident in small numbers, at least in southern and western Kentucky.

Spring.—Transients sometimes appear in February or early March; peak of migration in late March or early April; rare by early May. Early records (see also "winter"): February 27 (1932), at Cincinnati (Goodpaster, 1941:15); February 18, in Nelson County (Blincoe, 1925:408); March 2, at Louisville (Monroe); February 16 (1957) and February 18 (1950), in Warren County (Wilson, 1957b:60; 1951:4), next record February 23 (Wilson, 1940a:19); February 26, at Russellville, Logan County (Bent, 1927:95, authority of Embury?). The species has been recorded from many points,¹ from Rowan County (Barbour, 1952:25) and Pulaski County, where I saw 1 bird on April 14, 1951, westward, most observers considering it common. Snipe are found at the peak of migration about all sorts of wet places, backwaters, flooded fields, drainage ditches, lake margins, and marshes, sometimes occurring in loose aggregations of 25 to 50 in favorable areas. Even larger concentrations occur at times about the wet-weather lakes near Bowling Green (Wilson, 1940a:19). Handley and I found snipe fairly common in Marshall and Trigg counties, April 10–16, 1950, a female (U.M.M.Z.) which I took on the last date having all body tracts in molt. In early May a few are still to be found in favorable situations; I recorded small numbers at Chaney Lake, Warren County, May 3–7, 1949. Late records: May 9 (1932), at Cincinnati (Goodpaster, 1941:15); May 13, at Louisville (Monroe; next record May 9); May 13 (1950), in Warren County (Wilson, 1951:4), next record May 11 (Wilson, 1940a:19); May 18, in Hopkins County (Bacon, 1933).

Fall.—The Common Snipe has been recorded rarely in late August and early September; the main flight probably occurs in late October and November; rare by late November. Early records (the authenticity of one or two very early autumn records, e.g., August 2, 1886, in Fulton County, Pindar, 1889b:312, and July 23, 1926, in Warren County, Wilson, 1926b, is doubtful): August 24, on the Falls of the Ohio River at Louisville (Monroe; next record September 1); August 10 (1950), in Warren County (Wilson, 1951:4), next record August 24 (Wilson, 1922:235); September 7, in Hopkins County (Bacon, 1933). In October and November snipe are sometimes fairly common, occurring in the same kinds of habitats frequented in spring, but these are fewer and the birds apparently less numerous (see Russell, 1959:15–16). Detailed records are few in literature. A snipe was recorded at Golden Pond, Trigg County, on November 3, 1938 (Wetmore, 1940:536). Monroe and others (Stamm and Summerfield, 1952:42; Stamm, Brecher, and Lovell, 1960:6) have recorded scattered individuals on the Falls of the Ohio River at Louisville throughout October, November, and into early December, and Monroe noted 8 snipe at Stephensburg Lake, Hardin County, on November 10, 1935. I saw 2 at a small mud flat near Moscow, Hickman County, on November 12, 1948. Some observers have found none after late November or early December (i.e., Bacon, 1933; Goodpaster, 1941:15). In recent years the annual kill by hunters, who rarely seek the species, has been near 1,800 birds (Russell, 1959:18).

Winter.—Probably most of the snipe present in December move south with severe weather. At Louisville Monroe has records for December 17, 21, 25, and 28, and Blincoe (1925:408) recorded the species in Nelson County to December 28, while at Cincinnati, Ohio, a little to the north, the latest record seems to be for December 9, 1950 (Kemsies and Randle, 1953:19). I recorded 1 snipe at a flooded ditch in lowland woods near Cayce, Fulton County, on December 28, 1950, although sharp, freezing weather had prevailed for three days previously. A few are reported occasionally on Christmas bird counts from various localities. Despite occasional refer-

¹To those listed below or otherwise available, a considerable number has been added by Russell (1959:14).

ences to wintering (Ganier, 1933a:23, Reelfoot Lake, Tennessee; Barbour, 1952:25, Rowan County), satisfactory evidence of this is still scarce. Some snipe evidently wintered in Warren County, 1951-1952, since Wilson (1952c:46) recorded small numbers January 1 to May 3.

Geographic variation.—The subspecies occurring is the North American *Capella gallinago delicata* (Ord).

Specimens examined.—Total, 8. M.S.C.—1 male, 2 females, Rowan County (March 19, 1936; April 13, 1934, May 8, 1936); U.K.—1 male, Fayette County (April 13, 1938); B.L.M.—2 females, Jefferson County (March 13, 1937, March 24, 1946); Murray State College Coll.—1 (sex?), Calloway County (March 24, 1934); U.M.M.Z.—1 female (weight 112.3 gm., little fat), Trigg County (April 15, 1950).

Bartramia longicauda (Bechstein): UPLAND PLOVER

Status.—Rare to uncommon transient recorded only west of the Cumberland Plateau; one breeding record, extreme northern Kentucky.

Spring.—Transients sometimes appear in late March; main flight in April; rare by early May. Early records: April 3, at Louisville (Monroe; next record April 4); April 1, in Warren County (Wilson, 1940a:19); March 20, at Guthrie, Todd County (Bent, 1929:66); March 29 (1947), in Calloway County (Wyatt, 1948:3). In Tennessee the species has been recorded at least as early as March 10 (*Migrant*, 1940, p. 9). In April, Upland Plovers occur locally in small numbers, usually in fields of alfalfa or short grass, on golf courses, and about airports, in many localities west of the Cumberland Plateau, and quite probably on the Plateau as well. Representative records have been published by Figgins (1945:144), Goodpaster (1941:15), Wilson (1940a:19; 1946b:10; 1952c:46), Bacon (1933), and others. I saw a flock of 9 Upland Plovers in open pastures near Murray, Calloway County, on April 12, 1950, and 1 bird in nearby Trigg County the next day. The latest of Monroe's few dates for Louisville is April 15, and there are very few May records, one (date not given) being reported from Woodford County by Figgins (1945:144). Two seen in Clermont County, Ohio, by Goodpaster (1941:15) on May 30, 1936, may have been breeding birds.

Breeding records.—A nest containing 4 eggs was found at Boone County [Cincinnati Municipal] Airport, in Kentucky near Covington, on June 4, 1950, by Kemsies, Mers, and Randle (1950). The species has recently been found breeding regularly in the Ohio counties just across the Ohio River, and may be expected to breed occasionally in northern and central Kentucky. In the northern Bluegrass, in July, 1950, I noted several Mockingbirds mimicking the calls of Upland Plovers. An alleged Upland Plover's nest found in 1951 near Madisonville, Hopkins County, by Clark Bailey (*vide* Lovell, 1951b:59, and verbal com.) was destroyed before identification could be confirmed. Years earlier Bacon (1933) had reported the species as a rare summer resident in Hopkins County, but without stated evidence. Near Louisville, Monroe has old records (years uncertain) for June 26 and 27, but it is not absolutely assured that these indicate breeding.

Fall.—Migration begins so early that some observers have construed July observations as evidence of breeding, which they may or may not be. Some Upland Plovers are regularly present by late July and a few probably arrive earlier; main flight in September; rare by early October. Early records: July 25, at Louisville (Monroe; next record, July 30); July 9 (1959), at Shepherdsville, Bullitt County (Stamm, 1960:32); July 8 (1950), in Warren County (Wilson, 1951:4); and July 21 (1939), at Nashville, Tennessee (Monk, 1940:11). I recorded 3 birds near Elizabethtown, Hardin County, on July 27, 1949. Flocks of 10 or more are sometimes seen (Monroe and Mengel, 1939:42; Wilson, 1939:10; Powell, 1951a). Probably much overlooked, the species has been observed in upland situations at a few localities from Fayette County (Funkhouser, 1925:186) west to Fulton County (Pindar, 1925a:83). Monroe took a female at Hodgenville, Larue County, September 6, 1937, and a female at Louisville, Jefferson County—the only one recorded

at the Falls of the Ohio River in many years—on August 11, 1936 (B.L.M.). Another was seen on the Falls on September 10, 1959 (Stamm, Brecher, and Lovell, 1960:6). Late dates are few but the reports of reliable hunters indicate that a few birds occasionally remain as late as early November. A record from Lexington (by "Dean")¹ for October 11, 1903, was cited by Cooke (1910:67). Bacon (1933) gave dates up to October 21 for Hopkins County.

Specimens examined.—Total, 2. B.L.M.—1 female, Jefferson County (Aug. 11); 1 female, Larue County (Sept. 6).

Actitis macularia (Linnaeus): SPOTTED SANDPIPER

Status.—Common late spring and early fall transient; rare summer resident, breeding in low density in northern, and possibly eastern, Kentucky.

Spring.—Some birds are usually present by mid-April; main migration in late April and early May; rare by early June. Early records: April 15, in Rowan County (Barbour, 1952:25); April 23 (1932), at Cincinnati (Goodpaster, 1941:16); April 5, in Nelson County (Beckham, 1885:48); April 7, at Louisville (Monroe); March 29, in Warren County (Wilson, 1922:235), next record April 7 (Wilson, 1940a:19); April 2, in Hopkins County (Bacon, 1933). Usual dates of first observation are somewhat later, about April 20–25, and in May the species occurs regularly about ponds, marshes, and streams of all kinds throughout the state, being the most generally distributed of its family. I saw 1 bird on a mud flat near Moscow, Hickman County, on May 25, 1949, and Wetmore (1940:536) reported 1 taken at Hickman, Fulton County, on May 26, 1938 (U.S.N.M.). These and a few other late dates available may represent either late transients or birds remaining to summer.

Breeding records.—Despite numerous casual references to breeding, definite data are scarce. On several occasions, Monroe has seen downy young too small to fly at the Falls of the Ohio River at Louisville, in late July and early August, and he took a one-third grown specimen there on August 10, 1946 (B.L.M.). Two small downy young accompanied by an adult were seen at an artificial pond near Frankfort, Franklin County, on June 18, 1954, by Despard (1954:62). Just outside the state 3 downy young were taken near the Ohio River in Hamilton County, Ohio, by Charles Dury on June 25, 1899 (C.M.N.H.; see also Maslowski and Dury, 1931:73), and the species is regarded as a common breeding bird near Cincinnati (Goodpaster, 1941:15; Kemsies and Randle, 1953:19–20).

Summer.—The period between the departure of the last northbound transients and the arrival of the earliest southbound is very short, extending apparently from about June 10 to July 10. However, a few birds have been noted summering at one time or another, in every part of the state, which led various observers to suppose that the species breeds locally (see Wilson, 1942:22, various localities, and 1940a:15, Warren County; Kozee, 1938:34, Carter County; Van Arsdall, 1949:24, Mercer County), well before more definite evidence of this (noted above) began to accrue. The Spotted Sandpiper may in time prove to be a regular breeding species, although in low density, throughout northern Kentucky and along the streams of the Cumberland Mountains and Plateau (as it is in the adjacent mountainous part of Virginia [Murray, 1952:50]). It has been recorded in summer on the upper Cumberland River in Harlan County (Barbour, 1941a:47), and, on June 17, 1955, on Buckhorn Creek, Breathitt County (Barbour, 1956:6). Through late May, 1952, I frequently heard Spotted Sandpipers "singing" along the Powell River in Wise County, Virginia, only a few miles from Harlan County.

Fall.—Migration begins very early, probably in early July, but the presence of summering birds makes arrival dates uncertain. The species becomes common in late July; a decrease is noticeable by early September; rare by early October. Re-

¹ R. H. Dean, U. S. Weather Bureau.

ported as common by nearly all observers, the general impression is that it is a little less numerous than in spring, but this may be the result of a more protracted migration. I have recorded small numbers at many localities in August and September. The species does not tend to flock, but as many as 45 or 50 individuals may be scattered at one time over the square mile of rocks and shallows at the Falls of the Ohio River, along all of which, as well as along many smaller streams, it is common. Late records: October 19 (1947), at Cincinnati (Kemsies, 1948a:19); September 21, in Nelson County (Blincoe, 1925:408); October 17 (1959), at Louisville (Stamm, Brecher, and Lovell, 1960:6), next record, 1934-1959, October 7 (Stamm and Summerfield, 1952:42); October 22 (1950), in Warren County (Wilson, 1951:4); October 17, in Hopkins County (Bacon, 1933).

Specimens examined.—Total, 7. M.S.C.—1 male, Rowan County (May 7, 1936); R.W.B.—1 male, Harlan County (July 26, 1939); C.W.B.—2 specimens, Nelson County (April, May); B.L.M.—1 unsexed downy young, Jefferson County (Aug. 10, 1946); 1 unsexed adult, Fulton County (Aug. 23, 1942); U.S.N.M.—1 male, Fulton County (May 26, 1938).

Tringa solitaria Wilson: SOLITARY SANDPIPER

Status.—Fairly common to common transient.

Spring.—Occasionally recorded in March or early April; main flight in late April and early May; rare by late May. Early records: April 11, in Rowan County (Barbour, 1952:25); April 5 (1880), at Cincinnati (Goodpaster, 1941:16); March 14 (1954), at Louisville (Monroe); March 15 (1952), in Warren County (Wilson, 1952c:46), next records March 24 (Wilson, 1940a:19; 1957b:60). The Solitary Sandpiper becomes common and generally distributed by late April or earlier, and has been noted in varying numbers at many localities more or less throughout the state. More numerous west of the Cumberland Plateau, it occurs singly or in loose, small groups about moist, often grassy situations from the smallest rain pools, marshes, and streams to mud flats and the shores of large lakes and rivers, generally preferring the less open situations. In 1949 I took specimens (see below) and made sight records in Laurel County, two miles south of London (2 in a small marsh on April 30), and in flooded corn stubble and meadows near the wet-weather lakes in Warren County (1-10 daily, May 2-7). In eastern Kentucky I saw others in Laurel County on May 6 and 7, 1952. Late records: May 27, at Louisville (Monroe; next record May 22); May 25, in Warren County (Wilson, 1940a:19); May 27, in Hopkins County (Bacon, 1933).

Fall.—An early migrant. A few are recorded, irregularly, in early and mid-July; common by late July, remaining so through most of September; rare by early October. Early records: July 16 and 19, at Louisville (Monroe, notes; Stamm, Brecher, and Lovell, 1960:6); July 8 (1950), in Warren County (Wilson, 1951:4)—a few earlier records reported by Wilson (1940a:19, etc.), including some for June, may represent non-breeding, summering birds; July 5, in Hopkins County (Hancock, verbal com.). At the peak of migration the species occurs widely and in some numbers, but has been less generally noted than in spring. My records refer to 1 bird (see "specimens examined") at a muddy slough near Henderson on September 4, 1949, 3 in flooded fields near Louisville on August 4, 1950, and 3 at Brown Meadow Lake, Hopkins County, on September 18, 1951. Figgins took 1 in Marshall County on August 29, 1941 (J.D.F.), and Mrs. Bailey (1933:100) reported 1 shot near Mammoth Cave on August 26, 1929. Late records: October 20 and October 17, at Louisville (Monroe; Stamm, Brecher, and Lovell, 1960:6); October 23 (1904), at Lexington (Cooke, 1910:60); October 18, in Hopkins County (Bacon, 1933).

Geographic variation.—All specimens examined are referable by size and other characters to the eastern subspecies, *Tringa solitaria solitaria* Wilson. The wing measurements of 7 males range from 124 to 133 mm. (mean, 129.3) and 8 females measure 127 to 133 (mean, 129.7). Only one specimen, the smallest male, shows faintly the marbling of the outer primaries usually found in the larger western

subspecies *T. s. cinnamomea*. The latter is to be expected occasionally and has been taken in Tennessee (Wetmore, 1939:185). Also, a male taken by Charles Dury in Hamilton County, Ohio, near Cincinnati, on April 15, 1880 (C.M.N.H.), has the wing 137 mm. in length, the culmen 31, and the outer primaries marbled, and is clearly referable to *cinnamomea*. This subspecies was not listed for Ohio by Borror (1950).

Specimens examined.—Total, 15. M.S.C.—1 male, Rowan County (May 13, 1934); U.K.—1 female, Woodford County (May 5, 1940); C.W.B.—2 males, 1 female, Nelson County (April 24, 1882 [2 ♂ ♂]; April 30, 1877); B.L.M.—1 male, Jefferson County (April 16, 1938); W. Ky. State College Coll.—1 male, Warren County (spring, 1935); J.D.F.—1 female, Marshall County (Aug. 29, 1941); U.S.N.M.—3 females, Union County (May 9, 9, and 16, 1938); U.M.M.Z.—1 male, Laurel County (April 30, 1949); 1 male (weight, 50.7 gm., moderately fat), 1 female (46.8 gm., not fat), Warren County (May 2, 1949; May 3, 1949); 1 female (50.9 gm., moderately fat), Henderson County (Sept. 4, 1949).

Catoptrophorus semipalmatus (Gmelin): WILLET

Status.—Very rare transient.

Spring.—The few records range from March 23 to May 6. Goodpaster (1951:16) reported a specimen taken near Cincinnati (how near the Kentucky line is uncertain) by Charles Dury in April, 1870 (see also Maslowski and R. Dury, 1931:73). In Warren County, Wilson (1957b:60) recorded the species on March 23, and earlier (Wilson, 1940a:19) observed 1 bird on March 30, 1937, 1 on April 2, 1939, and 7 on May 1, 1935. Wetmore (1940:536) reported a female (U.S.N.M.) taken on the bank of the Ohio River near Uniontown, Union County, on May 5, 1938, and Morse (1949) recorded a Willet at Kentucky Lake on May 6, 1949, in Livingston County. The precise locality on Cumberland Lake, southeastern Kentucky, and the exact date (in early May, 1956) when 5 Willets were seen by several observers (Altsheler, 1957:69) are unclear.

Fall.—Records are few, from August 3 to November 17. At the Falls of the Ohio River at Louisville the Willet has been observed, from 1934 through 1960 on nine or ten occasions (Monroe, notes; see also Lovell, 1951:5; *Audubon Field Notes*, February, 1951, p. 19; and Stamm, Brecher, and Lovell, 1960:6) from August 1 (1954) to September 14 (1947). On the last date Monroe recorded 4, the most seen at one time on the Falls. He took a female there (Monroe, 1938b) on August 22, 1937, and has taken 3 specimens since (B.L.M.). In Warren County, Wilson (1940a:19; 1951:4) noted 3 birds at the Woodburn lakes on August 3, 1935, and 2 on August 13, 1950, and Pindar (1889b:312) saw two, one of which was killed by a companion, on the Mississippi River in Fulton County on November 17, 1887.

Geographic variation.—As is to be expected, the 4 specimens examined are referable to the inland subspecies, *Catoptrophorus semipalmatus inornatus* (Brewster). Pindar (1925a:82), with no apparent reason, listed the coastal subspecies, *C. s. semipalmatus*, which has not been taken in the state, as occurring in Fulton County.

Specimens examined.—Total, 4. B.L.M.—1 male, 2 females, Jefferson County (Aug. 18, 1946; Aug. 17, 1946, and Aug. 16, 1947); U.S.N.M.—1 female, Union County (May 5, 1938).

Totanus melanoleucus (Gmelin): GREATER YELLOWLEGS

Status.—Uncommon to fairly common transient.

Spring.—Greater Yellowlegs ordinarily arrive in March, rarely in the last half of February; main flight in April; rare by mid-May. Early records: February 23 (1950), at Cincinnati (Paul Hellman, *vide* Maslowski, notes); March 4, at Louisville (Monroe); February 15, in Warren County (Wilson, 1940a:19), next records March 6, in 1935, and March 12, in 1952 (Wilson, 1935; 1952c:46); March 26 (1887), at Brookville, Indiana (Butler, 1897:720). In April, the Greater Yellowlegs is noted rather frequently, though locally and usually in small numbers, and inhabits the grassy margins of ponds, mud flats, and, more rarely, sand bars and the

open shores of large lakes and streams. It has been recorded at many localities from Morehead, Rowan County (Barbour, 1952:25), westward, often occurring with Lesser Yellowlegs, which are usually in the majority. Fair-sized flocks are sometimes seen, especially at the Woodburn lakes in Warren County, where flocks of 50 to 75 have been noted (Wilson, 1940a:19). Maslowski (notes) saw about 50 birds on mud flats near the Ohio River just above Cincinnati, Ohio, on April 14, 1950, and 12 or 14 near Bondurant, Fulton County, on April 28, 1949. I saw 2 to 6 daily at Chaney and McElroy lakes in Warren County as late as May 2 to 7, in 1949. Late records: May 19, in Rowan County (Barbour, 1952:25); May 14 (1955), at Louisville (Monroe; next records May 13 and 12); May 24 (1950 and 1952), in Warren County (Wilson, 1951:4; 1952c:46); May 13 (1935), in Hopkins County (Hancock, notes).

Fall.—Records from July 16 to November 16 indicate a rather extended migration. Early arrivals usually appear in late July or early August; the species is rare by early November some lingering well into that month. June records given by Wilson (1940a:19) for Warren County may represent non-breeding, summering birds. Early records: August 1 (1937), at Cincinnati (Goodpaster, 1941:16); July 19 (1959), at Louisville (Stamm, Brecher, and Lovell, 1960:6)—usually arrives late July to mid-August (Monroe); July 16 (1950), in Warren County (Wilson, 1951:4); July 21 (1953), 13 at Bell Island, Ohio River in Union County (J. W. Hardy and R. Brewer, notes). Through September and October small to moderate numbers occur at favorable localities, which are fewer than in spring. Twenty-five or more are sometimes present at the Falls of the Ohio River, where I took a female on October 24, 1948 (U.M.M.Z.). On the Ohio River bank near Cincinnati (in or near Boone County, Kentucky) Maslowski took a female (C.M.N.H.) on November 15, 1936. Records for early or mid-November are not unusual, others available being as follows: November 5, at Louisville (Monroe, next record November 2); November 2 (1935), in Larue County (Monroe); November 12 (1950), in Warren County (Wilson, 1951:4). In 1948 I recorded 1 flying over the Mississippi River in Fulton County on November 6 and saw another on a bar in the Ohio River at Henderson on November 16. An occasional Greater Yellowlegs is not unlikely to occur in winter, although none has been reported from Kentucky proper. A Cincinnati, Ohio, record for January 15, 1951, has been reported by Kemsies and Randle (1953:20).

Specimens examined.—Total, 6. C.M.N.H.—1 female, Hamilton County, Ohio, on or near line of Boone County, Kentucky (Nov. 15, 1936); U.K.—1 male, 1 female, Woodford County (April 29, 1940; May 4, 1940); Bernheim Collection—1 male, Woodford County (May 4, 1940); B.L.M.—1 male, Jefferson County (Sept. 11, 1937); U.M.M.Z.—1 female (weight, 315.5 gm., extremely fat), Jefferson County (Oct. 24, 1948).

Totanus flavipes (Gmelin): LESSER YELLOWLEGS

Status.—Fairly common to common transient.

Spring.—Lesser Yellowlegs usually appear in March, becoming common by mid-April; main flight in late April or early May; rare or absent by the last week of May. Early records: March 20 (1938), at Cincinnati (Goodpaster, 1941:16); March 4, at Louisville (Monroe; next record March 22); March 6, in Warren County (Wilson, 1940a:19), next record March 15, in 1952 (Wilson, 1952c:46). On the Cumberland Plateau, where it seems to have been recorded only in Rowan County (Barbour, 1952:25), the species is probably rare. Westward, it occurs during the peak of migration at many localities, preferring open, grassy or muddy habitats about ponds, backwaters, and shorelines. Rather large numbers, up to several hundred, sometimes congregate at favorable situations, notably at the shallow, ephemeral karst lakes in Warren County (Wilson, 1929:184; 1940a:19; 1951:5). The species is usually at least two or three times as numerous as the Greater Yellowlegs, with which it often associates. I saw several in Wayne and Pulaski counties in mid-April, 1951, and many at more western localities. In Warren

County in 1949 I saw dozens at Chaney Lake, May 2-7, and noted 6 at a flooded area in a plowed field four miles east of Russellville, Logan County, on May 12. Late records: May 22, at Louisville (Monroe and Mengel, 1939:42; next record May 19—Monroe); May 27, in Warren County (Wilson, 1940a:19), next record May 24, in 1950 (Wilson, 1951:5).

Summer.—Wilson (1929:184) recorded 3 Lesser Yellowlegs at McElroy Lake, Warren County, on June 22, 1927, and suggested (1929:178) that the species bred there that year. These birds may have been late spring or early fall transients, or non-breeding summering birds, but there is no evidence and very little likelihood of this northern species breeding in Kentucky.

Fall.—Transients occasionally appear in July, more often early in August; main flight spread evenly through late August and September; rare by mid-October. Early records: July 23 (1938), at Cincinnati (Goodpaster, 1941:16); July 19 (1959), at Louisville (Stamm, Brecher, and Lovell, 1960:6; regular from about August 10 to September 30, Monroe); July 16 (1950), in Warren County (Wilson, 1951:5); July 21 (1953), 6 at Bell Island, Ohio River in Union County (J. W. Hardy and R. Brewer, notes). The Lesser Yellowlegs is less hardy than the Greater, arriving later in spring and departing earlier in fall. While probably less numerous than some of the smaller species, at its peaks of migration it is perhaps the most conspicuous sandpiper in Kentucky, spring and fall. At these periods, it is much more numerous than the Greater Yellowlegs, but is outnumbered by the larger species early in spring and late in fall. On October 24, 1948, George M. Sutton, Monroe, and I saw 4 Lesser Yellowlegs at the Falls of the Ohio River, while more than 20 Greater Yellowlegs were present. Earlier, the present species occurs at the Falls in numbers up to 70 or 80 at a time, usually in loose flocks. Late records: November 11, in 1951 (Stamm and Summerfield, 1952:43), and October 31, in 1959 (Stamm, Brecher, and Lovell, 1960:6), at Louisville; November 2 (1950), in Warren County (Wilson, 1951:5).

Specimens examined.—Total, 7. C.M.N.H.—1 male, Hamilton County, Ohio, on or near line of Boone County, Kentucky (April 30, 1932); U.K.—1 male, 1 female, Woodford County (May 3, 1940); Bernheim Collection—2 females, Woodford County (May 4, 1940); B.L.M.—1 male, Jefferson County (Aug. 10, 1946); U.M.M.Z.—1 male (weight, 79.6 gm., not fat), Warren County (May 7, 1949).

Calidris canutus (Wilson): KNOT

Status.—Very rare transient.

Spring.—Wilson (1956c:60) observed 2 Knots, with approximately 30 Black-bellied Plovers, at the Woodburn lakes in Warren County, on May 16, 1956.

Fall.—On August 28, 1941, I saw 2 Knots in winter plumage in an open area of shallow water and slightly emergent bedrock at the Falls of the Ohio River at Louisville (Monroe and Mengel, 1942:138) and obtained a male (B.L.M.). On September 13, 1950, at the same locality and nearly the same spot, I secured a lone female, also in winter plumage (U.M.M.Z.). The second bird was with a number of Killdeers and sandpipers of the genus *Erolia*. In 1959, Knots were noted by various observers at the Falls, September 7-13, with 4 present on September 10 (Stamm, Brecher, and Lovell, 1960:6).

Geographic variation.—The subspecies occurring is *Calidris canutus rufa* (Wilson), of the central portion of Arctic America.

Specimens examined.—Total, 2. B.L.M.—1 male, Jefferson County (Aug. 28); U.M.M.Z.—1 female, Jefferson County (Sept. 13).

Erolia melanotos (Vieillot): PECTORAL SANDPIPER

Status.—Fairly common to common transient.

Spring.—Transients sometimes arrive in March; main flight in April; rare by early May. Early records: March 24 (1940), at Cincinnati, Ohio (Goodpaster,

1941:16); March 14 (1954), at Louisville (Monroe; next record April 1); March 15 (1937, 1952), in Warren County (Wilson, 1937:19; 1952c:46), next records March 23, in 1957, and March 25, in 1950 (Wilson, 1957b:60; 1951:5). Reported from many localities west of the Cumberland Plateau, west to the Mississippi River (Pindar, 1889b:312), the Pectoral Sandpiper is the most numerous of its genus in Kentucky, several hundred sometimes congregating in favorable areas, such as the wet-weather karst lakes in Warren County (Wilson, 1929:183). Very many were seen there, at McElroy Lake, on April 30, 1927. Maslowski (notes) and Goodpaster saw about 125 in the Ohio River bottom lands near Cincinnati on April 14, 1950. The species occurs in spring about flooded fields, small ponds, drainage ditches, and in larger numbers on mud flats and open shorelines. It is easily overlooked, often feeding quietly in grassy places in the manner of the Common Snipe. It probably occurs in small numbers on the Cumberland Plateau, but seems to have been recorded only once, when I saw 5 at a stock pond near Burnside, Pulaski County, on April 14, 1951. I saw numbers ranging from 4 to 20 daily at Chaney Lake, Warren County, as late as May 2-7, 1949. Late records: 4 on May 13 (1920), in Clark County (Horsey, 1922:80); May 15, at Louisville (Monroe; next record May 6); May 13 (1952), in Warren County (Wilson, 1952c:46); May 14, in Hopkins County (Bacon, 1933).

Fall.—Records July 18 to December 18 indicate a prolonged migration period. Transients are sometimes present by mid-July, usually by late July; common from early August to early October; rare by late October, a few stragglers sometimes remaining later. Early records: July 28 (1940), at Cincinnati, Ohio (Goodpaster, 1941:16); July 18 (1939), at Louisville (Monroe); July 20, in Warren County (Wilson, 1940a:19), next record July 27, in 1950 (Wilson, 1951:5); July 21 (1953), at Bell Island, Ohio River in Union County (J. W. Hardy and R. Brewer, notes); July 21 (1951), 5 near Barlow, Ballard County, at edge of a flooded corn field (Mengel). Habitat suitable for the species is more limited than in spring, and the records are from fewer localities. The Pectoral Sandpiper is common at the Falls of the Ohio River at Louisville, where 100 or more are sometimes present (see Monroe and Mengel, 1939:42; Lovell, 1951:5; Stamm and Summerfield, 1952:43). Late records: October 27, at Cincinnati (Goodpaster, 1941:16); November 17, at Louisville (Monroe; next record November 11—see also below); November 2 (1950), in Warren County (Wilson, 1951:5). An extremely late record was obtained on December 18, 1949, when Summerfield (1950) observed 3 birds at some length, with 2 Red-backed Sandpipers and a bird supposed to be a Purple Sandpiper (see "hypothetical list").

Specimens examined.—Total, 14. C.M.N.H.—1 male, 4 females, Hamilton County, Ohio, on or near line of Boone County, Kentucky (♂ Aug. 28, 1932; ♀♀ Aug. 16, 1936, Aug. 28, 1932 [2], Sept. 25, 1932); 1 male, Jefferson County (Sept. 11, 1938); B.L.M.—1 female (no longer extant), Oldham County (July 18, 1939); 5 males, Jefferson County (April 7, 1946 [2], Aug. 3, 1946, Aug. 8, 1937, Oct. 20, 1946); J.D.F.—1 female, Marshall County (Aug. 29, 1941); U.M.M.Z.—1 female, Jefferson County (Sept. 13, 1950).

Erolia fuscicollis (Vieillot): WHITE-RUMPED SANDPIPER

Status.—Very rare or rare transient, probably regular both spring and fall.

Spring.—The first spring record was obtained on May 6, 1949, when I took a male in full spring plumage from a flock of 5 or 6 (with other small shorebirds) in a partly flooded pasture at McElroy Lake, Warren County, 9 miles south of Bowling Green (U.M.M.Z.). Subsequently, Wilson and Lovell (1950:48) recorded an approximately equal number at the same locality on May 24, 1950, and took an unsexed specimen (U.M.M.Z.). Wilson (1952c:46) recorded 2 more in Warren County on May 13, 1952. At reservoirs near Lexington, Edwards (notes) observed numbers from 1 to 4 between May 23 and 31, 1949.

Fall.—Reported only from the Falls of the Ohio River at Louisville. Monroe and Monroe (1949:65) secured 2 males from among several birds seen on August

31, 1946 (B.L.M.). On September 13, 1950, I saw perhaps 7 there and took a male and female (U.M.M.Z.). Others were seen there by Monroe on September 11, 1954 (4), and September 15, 1955 (1). At the Falls these birds seem to prefer areas of rough, wet rocks near the deeper, swiftly flowing channels.

Specimens examined.—Total, 6. B.L.M.—2 males, Jefferson County (Aug. 31); U.M.M.Z.—1 male, 1 female, Jefferson County (Sept. 13); 1 male (weight 35.0 gm., moderately fat), 1 unsexed, Warren County (May 6; May 24).

Erolia bairdii (Coues): BAIRD'S SANDPIPER

Status.—Very rare or rare transient, probably regular.

Note.—The difficulty of identifying Baird's Sandpiper makes records unsupported by specimens questionable unless made by experienced observers. Besides the characters emphasized in the standard identification manuals, a distinctive feature of Baird's Sandpiper, which I do not recall having seen mentioned in print, will serve effectively to separate it from other members of the genus *Erolia* occurring in the eastern United States. This feature, pointed out to me by W. J. Breckenridge, is that the tips of the folded wings in Baird's Sandpiper extend perceptibly beyond the tip of the tail, which in the other species they barely reach.

Spring.—The species has been reported at this season only from the Woodburn lakes in Warren County, where in various years Wilson (1940a:19; 1951:5; 1952c:46) has listed it on approximately 10 occasions between April 20 (1952) and June 13 (1937), in numbers up to 10. In the absence of any spring specimen, these records must be evaluated with caution. My own opinion is that while some of the earlier observations are questionable, most if not all of the recent ones are valid.

Fall.—Nearly all records are from the Falls of the Ohio River and nearby mud flats at Louisville. Relatively few birds have been certainly identified, most records having been reported by Monroe and Mengel (1939:43; 1942), Lovell (1951:5), Stamm and Summerfield (1952:43), and Stamm, Brecher, and Lovell (1960:7). Extreme dates of observation at Louisville are August 15, in 1959, and October 26, in 1946 (Monroe, notes), specimens having been taken by Monroe on September 1, 1941 (B.L.M.), and by Lovell (1951:5) on October 5, 1949. In Warren County, Wilson (1951:5) reported 10 birds seen on August 13, 1950. Fairly recent records for the area of Cincinnati, Ohio, close to the Kentucky line, were reported by Goodpaster (1941:16): September 4, 1938 (specimen); August 19, 1939 (sight record).

Historical¹ note.—Baird's Sandpiper was first reported from the Cincinnati area by Charles Dury and L. R. Freeman (1880:104), but troublesome discrepancies appear in the record of this and related events. The facts at present available are as follows:

According to Dury and Freeman (*loc. cit.*), a Baird's Sandpiper, sex unstated, was taken by Dury at the mouth of the Little Miami River (hence virtually in Campbell County, Kentucky, and if actually so then the first Kentucky record) on October 27, 1878. This record has been cited at least five times (Butler, 1897:711; 1927:11; 1929:197—sex here stated as female; Goodpaster, 1941:16—mis-citing source; Kemsies and Randle, 1953:21—adding another date, September 9, 1878, on above-cited authority of Dury and Freeman, who mention no such thing), but Maslowski and Ralph Dury's catalogue (1931:74) of the Charles Dury collection in the Cincinnati Museum of Natural History lists no Baird's Sandpiper dated October 27, 1878, recording instead the following (identifications presumably verified): *male* Baird's Sandpiper, *September 9, 1878*; *female* Pectoral Sandpiper, *October 27, 1878*; *male* Dunlin, *October 27, 1878* (italics all mine; the Dunlin, seen by me, is in winter plumage, from the "Ohio River," and had a new label numbered 975

¹ Rereading of this section suggests substitution of the word "hysterical"!

and Charles Dury's original label numbered 138).¹ No mention of a Baird's Sandpiper dated September 9, 1878, seems to have been made prior to Maslowski and Dury's list of 1931. The question arises as to what specimen actually served as the basis of Dury and Freeman's original report of Baird's Sandpiper and, if it was in fact of that species, what has become of it. Numerous possibilities, including loss, misidentification, and lapsus in either labelling, relabelling, or manuscript, suggest themselves as sources of original or subsequent error. If solution is still possible, it will require examination of all pertinent specimens and records in the Cincinnati Museum of Natural History, a rather formidable task with the collections housed as they were when I last saw them.

Specimens examined.—Total, 1. B.L.M.—1 female, Jefferson County (Sept. 1, 1941).

Erolia minutilla (Vieillot): LEAST SANDPIPER

Status.—Rare to fairly common transient, more numerous in fall.

Spring.—The Least Sandpiper is a late migrant; occasionally recorded in the first half of April, more frequently later; the main flight appears to be over by mid-May, stragglers sometimes remaining to late May or early June. Early records: April 29, at Louisville (Monroe); April 6 (1957) and April 8 (1952), in Warren County (Wilson, 1957b:60; 1952c:46)—first recorded in 1937 on April 17 (Wilson, 1937:20), and in 1950 on April 26 (Wilson, 1951:5). Some local observers have probably experienced confusion in separating this species from the Semipalmated Sandpiper (*Ereunetes pusillus*), but the Least nevertheless appears to be widespread and has been reported from Morehead, Rowan County (Barbour, 1952:25) west to Fulton County (Pindar, 1925a:82). Erratic in occurrence, it has been regarded by most authors as rare in spring. I think this estimate is correct, but the species may sometimes be quite numerous in favorable situations, as on extensive mud flats at the karst lakes in Warren County (see Wilson, 1929:183; Wilson and Lovell, 1950:48). While Least and Semipalmated sandpipers often occur together, the Least is more addicted to muddy habitats while the Semipalmated tends to prefer sandy, gravelly, or rocky habitats. In 1949 I found a few Leasts daily on mud flats about McElroy and Chaney lakes, Warren County, May 2–6, taking a female (U.M.M.Z.) on the first date. Late records: May 18 (1938), in Rowan County (specimens, M.S.C.); May 20 (1956), at Louisville (Monroe; next record May 15); June 1 (1950), in Warren County (Wilson, 1951:5; see also "summer"), next record May 29 (Wilson, 1940a:19); May 22, in Hopkins County (Bacon, 1933).

Summer.—Non-breeding water birds of various species often summer south of their breeding ranges. While they may have been very late or very early transients, Least Sandpipers observed on June 22, 1927, and June 13, 1937, at the wet-weather lakes in Warren County (Wilson, 1929:183; 1937:20) could have been summering. The implication (Wilson, 1929:177–178) that this northern species may have bred in Warren County is not supported by any known fact or probability.

Fall.—As with most shorebirds, the fall migration of the Least Sandpiper is somewhat more protracted than the spring flight (records July 13–December 8). Early transients are sometimes recorded by mid-July; fairly common by late July or early August; rare by mid-October, a few lingering later. Early records: July 13 (1950), 3 in Harrison County on a small muddy area created by heavy rain and road construction just outside of Cynthiana (Mengel); July 17 (1948), at Louisville (Monroe); July 16 (1950), in Warren County (Wilson, 1951:5); July 21 (1953), 10 birds at Bell Island, in the Ohio River in Union County (J. W. Hardy and R. Brewer, notes). The species is much more numerous in fall than in spring, and occurs locally throughout the state, at least west of the Cumberland Plateau. At the Falls of the Ohio River at Louisville it is regular and fairly common, sometimes

¹ Allowing for slight error, this may be the Dunlin referred to in Langdon's revised list of Cincinnati birds (1879:182) as "one specimen, November, 1878 (Dury)." Baird's Sandpiper is specifically mentioned in this paper as unrecorded, while it is indicated that the Pectoral Sandpiper was well known.

present in numbers up to 40 or 50. The birds tend to remain in small groups, usually with other species, and frequent still, shallow water where mud and algae (mainly *Cladophora*) have collected. The more numerous Semipalmated Sandpiper is less restricted to the muddy areas. Specimens taken at the Falls are listed below (C.M.N.H., B.L.M., U.M.M.Z.). Tordoff and I secured a female from a flock of 6 birds at a muddy slough near Henderson on September 4, 1949, and specimens have been taken along the Ohio River near Cincinnati (September 8, 1878; see Maslow-ski and Dury, 1931:74). Late records: December 7 and 8 (1946), 3 on the Falls of the Ohio at Louisville (Monroe, specimen, B.L.M.; next record November 9); November 2 (1950), in Warren County (Wilson, 1951:5).

Specimens examined.—Total, 7. C.M.N.H.—1 female, Jefferson County (Sept. 12, 1938); M.S.C.—1 male, Rowan County (May 18, 1938); B.L.M.—1 male, 1 female, Jefferson County (Dec. 8, 1946; Aug. 3, 1946); U.M.M.Z.—1 male, Jefferson County (Sept. 13, 1950); 1 female (weight 22.5 gm., very fat), Warren County (May 2, 1949); 1 female (21.6 gm., not fat), Henderson County (Sept. 4, 1949).

Erolia alpina (Linnaeus): DUNLIN

Status.—Rare transient, more regular in autumn.

Spring.—A male specimen (C.M.N.H.) taken by Charles Dury near Cincinnati, Ohio, presumably just outside the Kentucky line, is dated April, 1882. At the wet-weather lakes in Warren County, Wilson (1935; 1936:50; 1940a:19; 1951:5; and personal com.) noted 1 to 3 from May 9 to 13, 1950, 6 on May 19, 1939, 2 on May 24, 1937, and 2 on May 25, 1935. Many of these birds were in full breeding plumage. One bird was seen in Oldham County, on the Ohio River, on May 15, 1960 (Wiley, *vide* Monroe).

Fall.—A late migrant. Most records are for the Falls of the Ohio River at Louisville, where the species was first discovered by Monroe and Monroe (1949), who recorded a flock of approximately 25 and took 2 males (B.L.M.) on October 19, 1946. Since then, Monroe and others have acquired numerous records at the Falls between October 1 (1960) and November 11 (1951), with 20 birds present on October 18, 1959 (see Lovell, 1951:6; Stamm and Summerfield, 1952:43; Stamm, Brecher, and Lovell, 1960:7). Summerfield (1950) saw 2 birds there on the late date of December 18, 1949. In Warren County, Wilson (1951:5) recorded 9 on November 2, 1950. If correctly labelled, a male (C.M.N.H.) taken on the Ohio River bank near Cincinnati, Ohio, and thus virtually in Kentucky (probably Campbell County), by Charles Dury on October 27, 1878, provides the earliest Kentucky record (see "historical note" under Baird's Sandpiper).

Geographic variation.—The subspecies occurring is the widespread breeding form of arctic America, *Erolia alpina pacifica* (Coues).

Specimens examined.—Total, 3. C.M.N.H.—1 male, Hamilton County, Ohio, on line of (probably) Campbell County (Oct. 27, 1878—see also above); B.L.M.—2 males, Jefferson County (Oct. 19, 1946).

Limnodromus spp.: DOWITCHERS

Status.—Transients; rare in spring, uncommon in fall.

Note.—During much of the time since records of birds in Kentucky began to accumulate at an appreciable rate, it was thought that there was recognizable in North America but one species of dowitcher, *Limnodromus griseus*, divisible into eastern (*L. g. griseus*) and western (*L. g. scolopaceus*) subspecies (see A.O.U. Check-List, 1931:122). For no particularly evident reason, most observers in Kentucky and nearby areas have reported the western, or long-billed, form whenever a subspecific name was used. Comparatively recent developments, summarized by Swenk (1940) and Pitelka (1950:63-79), have resulted in the now wide recognition (e.g., A.O.U. Check-List, 1957:200-202) of *Limnodromus scolopaceus* as a species distinct from *L. griseus* (suggested, in recent decades, at least as early as 1932, by

Rowan) and in the division of the latter into additional subspecies, including an interior form, *L. g. hendersoni* Rowan. The last occurs widely in migration in the Mississippi Valley. Since the two species (not to mention subspecies) are virtually inseparable in the field, Kentucky records other than those based on recently identified specimens can be treated only under the general heading used above.

Spring.—There is one record for Louisville, May 6, 1956 (Stamm *et al.*, *vide* Monroe). Most records are from the excellent shorebird habitats periodically present about the karst lakes in Warren County, where dates of observation range from March 15 to May 16, with numbers from 5 to 30 observed on various occasions (Wilson, 1937:19; 1940a:19; 1951:5; 1952c:46; 1956c:61). I saw 1 at Chaney Lake, Warren County, on May 2, 1949, this bird and most seen by Wilson being in nuptial plumage. At a pond near Bondurant, Fulton County, Maslowski (notes) and Goodpaster saw a dowitcher with several yellowlegs on April 28, 1949. Observations made in the Bluegrass by Victor K. Dodge and others (*vide* Figgins, 1945:149) in 1888 and 1896 suggest that dowitchers were then more numerous than now.

Fall.—Most records (chiefly reported by Monroe and Mengel, 1939:43; Lovell, 1951:6; Stamm and Summerfield, 1952:43; Stamm, Brecher, and Lovell, 1960:7) are from the Falls of the Ohio River at Louisville, where dowitchers have been recorded irregularly from July 27 to October 20 (Monroe). Flocks of 10 to 20 or more are occasionally seen at the Falls, the birds usually feeding in water several inches deep. In Warren County, Wilson recorded 2 dowitchers on July 20, 1935, and a few in 1950 from July 16 to August 10 (Wilson, 1940a:19; 1951:5). Dowitchers have been recorded also in the Cincinnati area (Langdon, 1879:182; Kemsies and Randle, 1953:21) and without detail from Fulton County (Pindar, 1925a:82). J. W. Hardy and R. Brewer (notes) saw 1 still in breeding plumage at Bell Island in the Ohio River in Union County on July 21, 1953.

Limnodromus griseus (Gmelin): SHORT-BILLED DOWITCHER

Status.—Probably much as indicated under "dowitcher spp."

Records.—Short-billed Dowitchers have been taken at the Falls of the Ohio River at Louisville as follows: an adult female in worn breeding plumage (culmen, 61 mm.; wing, 144 mm.) on July 27, 1946, and an immature male (culmen, 57; wing, 144) on August 30, 1941, both by Monroe (B.L.M.); I took an immature female (U.M.M.Z.) there on September 11, 1949 (culmen, 59; wing, 143). Also *Limnodromus griseus* is an unsexed and undated specimen (C.M.N.H.) in worn breeding plumage taken somewhere near Cincinnati, Ohio, by Ralph Todd Kellogg (culmen, 56; wing, 134). The presence in the University of Cincinnati's collections of 15 specimens of the present species, recently collected in the Cincinnati area (Kemsies and Randle, 1953:21), against none of *Limnodromus scolopaceus* suggests that most of the dowitchers occurring in the general area under consideration are of the short-billed species.

Geographic variation.—All of the above-named specimens have the characters of *Limnodromus griseus hendersoni* Rowan and are here referred to that subspecies. The University of Cincinnati's specimens were identified by F. A. Pitelka, the rest by me. This centrally distributed subspecies is the one to be expected in Kentucky, although *Limnodromus griseus griseus* (Gmelin), of the eastern coastal region, may prove to be casual. A few early references in the literature to *L. g. griseus* were made before recognition of *hendersoni*, and, in any event, were based on guesswork.

Specimens examined.—Total, 4. C.M.N.H.—1 unsexed, Hamilton County, Ohio (extra-limital, no date); B.L.M.—1 immature male, 1 adult female, Jefferson County (Aug. 30, 1941; July 27, 1946); U.M.M.Z.—1 immature female (weight, 129.2 gm., very fat), Jefferson County (Sept. 11, 1949).

Limnodromus scolopaceus (Say): LONG-BILLED DOWITCHER

Status.—Little known; one authentic record.

Records.—The many unfounded references in the literature to the "Long-billed Dowitcher" are probably based for the most part on observations of *Limnodromus griseus hendersoni* Rowan. The only definite record is provided by an unsexed specimen in full winter plumage (U.M.M.Z.) taken by Monroe at the Falls of the Ohio River at Louisville on October 19, 1946, and prepared by Lovell. This very dark-backed specimen has a short wing (135 mm.) and a long culmen (64 mm.), the last being well above the minimum limit for *scolopaceus* indicated by Rowan (1932:21) and near his maximum for female *griseus*.

Specimens examined.—Total, 1. U.M.M.Z.—1 unsexed, Jefferson County (Oct. 19, 1946).

Micropalama himantopus (Bonaparte): STILT SANDPIPER

Status.—Transient; rare to uncommon in fall, very rare in spring.

Spring.—For the Louisville area, Monroe has records of Stilt Sandpipers for April 3 and 17 and May 7 and 8. On May 7, 1933, he observed 4 in full breeding plumage at a small backwater pond near Harrod's Creek, Jefferson County. In Warren County, Wilson (1952c:46) saw 1 at the Woodburn lakes on March 12, 1952, and noted the species again (Wilson, 1957b:60) on May 4, 1957.

Fall.—Apparently never numerous, the species may have been overlooked to some extent because of its close resemblance at this season to the Lesser Yellowlegs. At Louisville small numbers, rarely more than 4 or 5 at once, have been noted at the Falls of the Ohio River, on dates ranging from July 26, in 1959 (Stamm, Brecher, and Lovell, 1960:7), to October 5, in 1952 (Monroe, notes). Specimens have been taken at Louisville on August 28, 1938 (Monroe and Mengel, 1939:43), and subsequent dates (see below). Elsewhere the species has been recorded only at Kentucky Woodlands National Wildlife Refuge, Trigg County, where Cypert (Refuge files) noted 1 on July 31, 1941, and 3 on September 2, 1941, and at the karst lakes near Bowling Green, Warren County, where Wilson (1951:5) recorded 1 on July 16, 1951.

Specimens examined.—Total, 2. B.L.M.—1 male, 1 female, Jefferson County (Sept. 28, 1946; Sept. 8, 1938).

Ereunetes pusillus (Linnaeus): SEMIPALMATED SANDPIPER

Status.—Transient; rare to uncommon in spring, fairly common in fall.

Spring.—Judging from existing records in Kentucky (May 1–31), the Semipalmated Sandpiper is a later migrant than the Least Sandpiper. It seems to be considerably less numerous in spring than in fall, and has been noted less frequently and less widely at the former season than has the Least Sandpiper. The species has been recorded in small numbers near Cincinnati, where 3 specimens were said to have been taken on May 25, 1878 (Langdon, 1878:116), and where Milton Trautman took a female (C.M.N.H.) on the Ohio River bank opposite Boone County, Kentucky, on May 24, 1931; at Lexington, where Edwards (notes) observed it on May 23, 25, and 31, 1949 (1–7); and in the Louisville area where Monroe has accumulated a few records, May 5 (1956) to May 13 (1955). Somewhat larger numbers—up to 75 on occasion—occur irregularly about the wet-weather lakes at Woodburn in Warren County, where Wilson's records (1922:235; 1935; 1937:20; 1940a:19; 1951:5; 1952c:47) range from May 1 (1920) to May 29 (1935). Many were present there on May 24, 1950 (Wilson and Lovell, 1950:48). Preferring as it does sandy and rocky shores and flats, the species is usually less numerous than the Least Sandpiper at these overflow lakes, and in muddy situations in general. On May 14, 1949, I saw 2 Semipalmated Sandpipers on sand bars at "Kentucky Bend" of the Mississippi River in Fulton County.

Fall.—Early arrivals are sometimes noted in late July or early August; main

flight generally through most of August and September; rare by late September or early October. Early records: July 19 (1959), at Louisville (Monroe; next record July 23); July 24, in Warren County (Wilson, 1940a:19); July 21 (1953), at Bell Island, Ohio River, in Union County (J. W. Hardy and R. Brewer, notes). The species has been reported from Cincinnati, where it was regarded as common, by Goodpaster (1941:17) and Kemsies and Randle (1953:22), and from Louisville (many observers), Warren County (Wilson, 1940a:19; 1951:5), Hopkins County (Bacon, 1933), and Fulton County (Pindar, 1925a:82). It is most numerous in rocky areas such as the Falls of the Ohio River, where it usually outnumbered the Least Sandpiper, as it does also, though in smaller numbers, on sand bars along the Ohio River. At the Falls a hundred or more are sometimes present on the rocks and in the shallows, and several specimens have been taken there and elsewhere (see below). Although Trautman (1940:251) regarded the Semipalmated as a later migrant than the Least at Buckeye Lake, Ohio, at the Falls it seems to depart somewhat earlier. Monroe's latest record is for October 21 (1951), and other late records, October 7, 1949, and October 6, 1951, are given by Lovell (1951:5) and Stamm and Summerfield (1952:43). A sight record for Warren County, November 2, 1950, was given by Wilson (1951:5).

Specimens examined.—Total, 13. C.M.N.H.—5 males, 2 females, Ohio River in Hamilton County, Ohio, on or near Kentucky line, Boone and possibly other counties (Sept. 5, 1932 [2], Sept. 8, 1878 [3]; May 24, 1931, Sept. 8, 1878); B.L.M. (several specimens reported from Jefferson County by Monroe and Mengel, 1939:43, are no longer extant)—2 females, Jefferson County (Aug. 27, 1938, Sept. 13, 1941); U.M.M.Z.—1 male, 2 females, 1 unsexed, Jefferson County (Sept. 13, 1950).

Ereunetes mauri Cabanis: WESTERN SANDPIPER

Status.—Transient; reported but once in spring, and seemingly very rare in fall; probably regular locally and may prove to be somewhat more numerous than here indicated.

Spring.—There is only one record, a sight identification of 1 bird (Donald Summerfield, *vide* Wilson, 1951:5) at the Woodburn lakes in Warren County on May 14, 1950.

Fall.—The first record virtually applying to Kentucky was provided by a male taken by Goodpaster on the Ohio River at California (near Cincinnati), Hamilton County, Ohio, and on the line of Campbell County, Kentucky, August 23, 1936 (C.M.N.H.). This bird (see also Kemsies and Randle, 1953:22) was identified by me in 1949 and was unknown to Monroe and me when we reported (1939a:185) a female taken at the Falls of the Ohio River at Louisville on July 22, 1939, as the first state specimen. At the Falls the species has been observed, in very small numbers, on many occasions by Monroe and others (see Lovell, 1951:5; Stamm and Summerfield, 1952:43; Brecher, 1958a:52; Stamm, Brecher, and Lovell, 1960:7) from July 22 (1939) to October 19 (1946), and additional specimens have been taken (see "specimens examined"; also Lovell, 1951:6). I took a female there on September 13, 1950 (U.M.M.Z.). The largest number recorded at once was 9 or 10, seen by Monroe, and others (Lovell, 1951:5), on August 28, 1949.

Specimens examined.—Total, 5. C.M.N.H.—1 male, Hamilton County, Ohio, on line of Campbell County, Kentucky (Aug. 23); B.L.M.—3 females, Jefferson County (July 22; Aug. 3, 1947; Aug. 13, 1939); U.M.M.Z.—1 female, Jefferson County (Sept. 13).

Tryngites subruficollis (Vieillot): BUFF-BREASTED SANDPIPER

Status.—Very rare transient; unquestionable records are all from the Falls of the Ohio River at Louisville, in autumn.

Records.—The Buff-breasted Sandpiper was first recorded at the Falls of the Ohio River on September 17, 1936, when Monroe (1938b:678) saw 3, obtaining a female (B.L.M.) and a specimen no longer extant. Since then Monroe and I, and various others, have observed the species on perhaps a score of occasions

(partially reported by Monroe and Mengel, 1939:43; Lovell, 1951:6; and Stamm, Brecher, and Lovell, 1960:7) between August 15 (1953) and September 28, never more than 3 birds at a time. Several additional specimens have been secured, including 1 taken by Monroe for A. F. Ganier on September 11, 1938; 1 taken on August 27, 1938, for the Cincinnati Museum of Natural History (C.M.N.H.); and 1 taken by Kemsies (letter to Monroe) on September 8, 1951. Most of the birds have been seen in late August and early September, often far from water, in broad, roughly pitted expanses of the Jeffersonville limestone that composes the bedrock of the Falls.

Earlier sight records may well be considered questionable. In Warren County, Wilson (1923:118) observed birds which he identified as Buff-breasted Sandpipers in April, 1918 (2), and on September 7, 1922 (1), and the species was reported as a casual migrant in Fulton County by Pindar (1923b:163; 1925a:83).

Specimens examined.—Total, 3. C.M.N.H.—1 male, Jefferson County (Aug. 27, 1938); 1 B.L.M.—1 male, 1 female, Jefferson County (Sept. 1, 1941; Sept. 17, 1936).

Crocethia alba (Pallas): SANDERLING

Status.—Very rare to rare transient; recorded only at a few localities along the Ohio River, in autumn.

Records.—Near Cincinnati, a male was taken by Charles Dury on sand bars at the mouth of the Little Miami River, thus virtually on the boundary of Campbell County, Kentucky, in September, 1880 (C.M.N.H.). The species may once have been fairly numerous in the Cincinnati area; a number of early records were given by Langdon (1879:182) and Dury and Freeman (1880:104). Sanderlings have been recorded at the Falls of the Ohio River at Louisville on dates ranging from August 2 (1936, 1959) to October 12, all but 3 records falling between August 10 and October 7. From 1934 to approximately 1940, the Sanderling was fairly regular in occurrence at Louisville and sometimes seen in flocks of as many as 20 or 30 birds (Monroe, 1938b:678; Monroe and Mengel, 1939:43). Specimens taken by Monroe are listed below. More recently the species has been decidedly less numerous and reported in literature only by Lovell (1951:6), Stamm and Summerfield (1952:43), and Stamm, Brecher, and Lovell (1960:7). On September 6, 1937, I saw 2 Sanderlings with other shorebirds on a mud flat two miles east of Louisville in the Ohio River bottom lands, these being apparently the only Sanderlings recorded locally except at the Falls. J. W. Hardy and Richard Brewer (notes) observed Sanderlings at Bell Island in the Ohio River in Union County on August 30, 1952 (2), September 1, 1953, and September 4, 1954 (1 each).

Specimens examined.—Total, 4. C.M.N.H.—1 male, Hamilton County, Ohio, on boundary of Campbell County, Kentucky (Sept., 1880); B.L.M.—2 males, 1 female, Jefferson County (Aug. 2, 1936, Sept. 11, 1937; Aug. 2, 1936).

FAMILY RECURVIROSTRIDAE: AVOCETS AND STILTS

***Recurvirostra americana* Gmelin: AMERICAN AVOCET

Status.—Extremely rare transient or vagrant.

Records.—Morse (1947:5), who had previous experience with avocets in the western United States, observed 1 at close range under good conditions on an arm of Kentucky Lake in Marshall County on September 25, 1946. There seems to be no possibility of his identification being mistaken. Also probably accurate is a recollection of the late R. C. Soaper, of Henderson, who told Monroe and me in July, 1940, that as a boy he once killed an avocet on the banks of the Ohio River near Henderson in September, 1905. The species once nested not far north of

¹ The date August 29 entered in my records of the Cincinnati collection is an error either of mine or the labeller, as shown by my original field notes.

Kentucky, as indicated by Audubon's extensive account (1838:168-171) of breeding avocets near Vincennes, Indiana.

FAMILY PHALAROPODIDAE: PHALAROPES

Phalaropus fulicarius (Linnaeus): RED PHALAROPE

Status.—Very rare transient, recorded only in fall.

Records.—Audubon (1835:404) saw about 100 Red Phalaropes on the Ohio River at Louisville in late October of 1808 and took several at that time. Doughty took a male (B.L.M.) for Monroe on November 15, 1938 (Monroe, 1940:111), as it rested on the Ohio River near Carrollton, Carroll County. Records of single birds were made at the Falls of the Ohio River, at Louisville, on October 2, 1948, September 28, 1949, and October 3, 1951 (Monroe, notes; Lovell, 1951:6), one being trapped and banded on the second date, by Lovell. Sight records by local observers in the Lexington area (Figgins, 1945:154) seem best regarded with doubt, although possibly valid (September 6, 1941; September 28, 1936).

Specimens examined.—Total, 1. B.L.M.—1 male, Carroll County (Nov. 15, 1938).

Steganopus tricolor Vieillot: WILSON'S PHALAROPE

Status.—Very rare transient; definite, dated records are all from Jefferson and Warren counties.

Spring.—Monroe saw a female Wilson's Phalarope in full breeding plumage on a small backwater pond near the Ohio River at Harrod's Creek, Jefferson County, on May 6 and 7, 1933 (Monroe and Mengel, 1939:43, and notes), and 3 females were seen in the same area on April 26, 1956 (Noland, 1956:46). Wilson (1933a:142; 1936:50) reported 2 birds seen at McElroy Lake, Warren County, on May 11, 1933. At nearby Chaney Lake, I secured a female (U.M.M.Z.) in full nuptial plumage on May 2, 1949. This seems to be the only specimen for the state.

Fall.—Monroe saw 1 bird at the Falls of the Ohio River at Louisville on September 28, 1937 (Monroe and Mengel, 1939:43), and in 1959 single birds were seen there, by various observers, on August 8, 22, September 12, 13, and 17 (Croft and Wiley, 1960:17-19). Audubon (1835:400) did not mention the season when he saw 5 and shot 2 at the Falls of the Ohio. Without detail, Pindar (1889b:312; 1925a:82) reported the species from Fulton County.

Specimens examined.—Total, 1. U.M.M.Z.—1 female (weight 49.8 gm., not fat), Warren County (May 2, 1949).

Lobipes lobatus (Linnaeus): NORTHERN PHALAROPE

Status.—Very rare transient, recorded only in fall.

Records.—Monroe took a winter-plumaged female at the Falls of the Ohio River at Louisville on August 24, 1946 (B.L.M.), and another Northern Phalarope was recorded there on October 9, 1947, by J. Smith and Steilberg (Monroe and Monroe, 1949). Still others have been noted at the Falls on September 27, 1953 (Stamm, Brecher, and Lovell, 1960:7), and September 12 and 13, 1959, when 1 was seen by several observers (Croft and Wiley, 1960:18). In the Cincinnati area, just north of Kentucky, Maslowski and Goodpaster saw 1 on the Miami River on August 3, 1936, and another was well seen by various observers on October 28, 1951 (Kemsies and Randle, 1953:23).

Specimens examined.—Total, 1. B.L.M.—1 female, Jefferson County (Aug. 24, 1946).

FAMILY LARIDAE: GULLS AND TERNS

***Larus hyperboreus* Gunnerus: GLAUCOUS GULL

Status.—Casual in winter; records all from the Ohio River.

Records.—An adult Glaucous Gull (or gulls) was seen flying over the Ohio River at Louisville by Carpenter (1942b) on February 21, 24, and 26, 1952. On

December 25, 1949, Monroe and Monroe (1953:13), with other observers, saw an immature in first-year plumage, with many Herring Gulls, at the Falls of the Ohio River at Louisville. On dates from December 26, 1953, to January 31, 1954, another adult was seen about Louisville by Monroe and various others, and still another there was noted December 6-14, 1958 (Stamm *et al.*, *fide* Monroe). It is to be expected that a few northern gulls (see also Iceland Gull, in hypothetical list) will occasionally join thousands of gulls that often winter in the Louisville area.

Geographic variation.—The subspecies ranging to Kentucky is presumably *Larus hyperboreus hyperboreus* Gunnerus.

Larus argentatus Pontoppidan: HERRING GULL

Status.—Uncommon to abundant winter resident along the Ohio and Mississippi rivers, numbers varying locally and annually; elsewhere a rare transient or wanderer, recorded most often in spring.

Spring.—Throughout April Herring Gulls occur regularly about the larger waters where they winter in numbers, and a few are sometimes present in May. Some of the comparatively few sight records reported in literature may be erroneous because of confusion with the Ring-billed Gull. The Herring Gull occurs all along the Ohio River in spring. At Louisville, where it often winters in large numbers, it decreases gradually in late March and throughout April, being rare in early May. Handley and I saw 1 to 3 birds daily in Trigg and Marshall counties, at different parts of Kentucky Lake, April 10 to 12, 1950. Away from the larger rivers the species is rarely seen, occurring about small lakes and ponds, as at Lexington, where I saw 3 birds at the city reservoirs on March 28, 1939 (see also Funkhouser, 1925:156), and in Hopkins County (Bacon, 1933). At the ephemeral wet-weather lakes in Warren County, Wilson (1940a:20; and many other titles) has noted 1 or 2 nearly every season, chiefly in March and April. These "inland" records may represent transients. Late records: April 21 (1940), at Cincinnati (Goodpaster, 1941:17); May 17, at Louisville (Monroe; next records May 16 and 14); May 4 (1935), in Warren County (Wilson, 1935:[23]); May 2, in Hopkins County (Bacon, 1933).

Summer.—Wilson (1940a:20) noted 5 Herring Gulls, evidently non-breeding vagrants, at McElroy Lake, Warren County, on July 3, 1935.

Fall.—A few Herring Gulls sometimes appear at the end of September or early October; the species usually becomes common along the larger rivers some time in November. It seems very unlikely that a "flock of six or eight" seen by Wilson (1922b:95) in Ballard County on August 27, 1917, was really composed of Herring Gulls (the date is rather early even for the Ring-billed Gull). The earliest record at Louisville (Monroe) is for September 18 (1960). In 1948, I noted 4 adults and 1 immature bird on the Ohio River near Cloverport, Breckinridge County, on November 4; 10 on Kentucky Lake, in Trigg County, on November 15; and 3 immature birds with many Ring-billed Gulls at Henderson on November 16. In fall migration the species is sometimes outnumbered by the Ring-billed Gull.

Winter.—The species winters in varying numbers along the whole of the Ohio and Mississippi rivers in Kentucky, and at the large T.V.A. lakes, but records in the literature are widely scattered. At Louisville, numbers normal for winter are usually attained in late November or early December. Along the Louisville waterfront and just downstream at the Falls of the Ohio hundreds, sometimes thousands, congregate annually, attracted, presumably, by refuse from various sources and by favorable resting places. These birds disperse daily to a considerable extent, as much as 20 or 30 miles up and down the river, and are often seen feeding in upland fields several miles from water. The Herring Gull is usually the "common" winter gull, sometimes outnumbering the Ring-bill in this area as much as 50 to 1.

Numbers fluctuate radically, however, and in some seasons, as in late December, 1952 (and often, more recently; see Stamm, Brecher, and Lovell, 1960:7), the Ring-bill is by far the more numerous (Monroe). Elsewhere the Herring Gull has been reported, in lesser numbers, from Cincinnati, Ohio (Goodpaster, 1941:17), west to Fulton County (Pindar, 1887a:54; 1889b:311). I saw about 30 at Kentucky Lake, in Marshall County, on December 25, 1950, and 1 on the Ohio River near Barlow, Ballard County, on January 4, 1951. The species is rarely recorded far from the larger rivers. One was shot in Nelson County on January 21, 1916, and preserved by Blincoe (1925:407). A specimen from Woodford County is listed below. The species has occurred also in Hopkins County (Bacon, 1933).

Geographic variation.—The widespread North American subspecies *L. a. smithsonianus* Coues occurs in Kentucky.

Specimens examined.—Total, 4. U.K.—1 unsexed immature, Woodford County (Feb. 1, 1907); B.L.M.—1 immature male, Carroll County (Nov. 14, 1940); 1 immature female, Jefferson County (Jan. 10, 1938); U.M.M.Z.—1 immature male, Campbell County (Dec. 13, 1941—taken by Woodrow Goodpaster).

Larus delawarensis Ord: RING-BILLED GULL

Status.—Rare to common transient and winter resident.

Spring.—As does the Herring Gull, this species becomes less numerous by mid-April; in late April and occasionally early May Ring-bills occur sporadically about the larger waters where they winter. Almost certainly Ring-billed and Herring gulls have been confused at times by local observers, especially in earlier years. The Ring-billed Gull seems to be more numerous than was formerly supposed and has probably been more often misidentified than the Herring Gull (in this connection see also Kemsies and Randle, 1953:24). The present species, whether or not correctly identified in all cases, has been reported in literature from only a few localities, from Cincinnati (Kemsies, 1948a:23) west to the Purchase region of Kentucky (Pindar, 1925a:78), but is certainly more regular and numerous than the published records suggest. Away from larger bodies of water it is evidently rare, occurring only occasionally, for example, at the wet-weather lakes in Warren County, mainly in March and April (Wilson, 1940a:20; 1957b:60). It has been reported also from Fayette County (Funkhouser, 1925:157). I saw 4 adults on an arm of Cumberland Lake, in southeastern Kentucky at Burnside, Pulaski County, on April 14, 1951, and Joseph Spears took an adult male in Fulton County on April 20, 1940 (U.K.). Monroe's latest record at Louisville, where the species is usually fairly common, is for May 15 (1960). Morse (1949:56) reported 1 bird seen at Kentucky Lake on May 16, 1949.

Fall.—Published records are scarce. Very early arrivals may appear in August, as at Louisville, where single birds were noted on August 8, 1959 (Stamm, Brecher, and Lovell, 1960:8), and August 23, 1958 (Brecher, 1958a:52). Monroe's earliest records for the years 1934–1952 were August 31, 1936 (specimen, B.L.M.), and September 7 and 11, 1948. A few birds are usually present by late September or early October, before Herring Gulls ordinarily arrive, and winter numbers are usually attained by early December. In some years, however, there is a decrease after the autumn migration. The species has been reported from Reelfoot Lake, northwestern Tennessee, in mid-October (Slack, 1934). I saw approximately 30 adults on bars in the Ohio River near Henderson on November 16, 1948.

Winter.—The Ring-billed Gull appears to winter regularly along the Ohio and Mississippi rivers, having been recorded from just east of Kentucky (Seeber and Edeburn, 1952), and from Cincinnati (Goodpaster, 1941:17) west to Fulton County (Pindar, 1925a:78), but evidently occurs in numbers varying greatly with both year and locality. Some little time ago both Seeber and Edeburn (1952) and Kemsies and Randle (1953:24) mentioned an increase. Certainly at Louisville the species, although occasionally present in thousands and far in the majority,

was for a long time usually less numerous than the Herring Gull (Monroe); more recently, it has regularly outnumbered the larger gull (Stamm, Brecher, and Lovell, 1960:8). Christmas bird counts from scattered points show that the Ring-bill is widely distributed, but large concentrations such as those at Louisville have been reported elsewhere only from Kentucky Lake. On December 28, 1950, I saw an adult over the Mississippi River at Hickman, Fulton County.

Specimens examined.—Total, 3. U.K.—1 adult male, Fulton County (April 20, 1940); B.L.M.—1 adult female, Carroll County (Nov. 17, 1940); 1 immature female, Jefferson County (Aug. 31, 1936).

**Larus pipixcan* Wagler: FRANKLIN'S GULL

Status.—Very rare transient; casual in winter.

Records.—Years ago the species was reported from Warren County by Price (1904b), evidently on the basis of a specimen almost certainly obtained locally and recognizably depicted in one of her original drawings preserved in the Missouri Botanic Gardens (see Lovell, 1959:28). A less definite early report is from Fulton County (Pindar, 1889b:311; 1925a:78). More recently, sight records have been made, intermittently, on the Ohio River at and just above Louisville, October 24–February 18, and May 12. The first of these records, involving numbers from 1 to 12 or more seen November 11–19, 1943, was reported by Lovell and Carpenter (1945:31), who saw additional birds (notes) in the area on several occasions between November 8 and 19, 1944 and 1945, and on February 18, 1946. While some doubt attached to these observations at the time, it now seems likely that they were valid. Another bird (or birds) was seen several times by numerous observers including the Monroes, December 22, 1957, to January 1, 1958 (Brecher, 1958:24; see also *Kentucky Warbler*, 34:13, 1958). A flock of 6 seen by Brecher and Roderic Sommers at the Falls of the Ohio on October 25, 1959 (Stamm, Brecher, and Lovell, 1960:8) was probably part of the flock of 8 noted just upstream on the previous day by Wiley (1960:17). Wiley saw 2 more about 4 miles upstream on November 6 and 1 on November 7.

The first spring record, of 3 birds, was made by Stamm and Sommers (*vide* Monroe) on May 12, 1960.

Larus philadelphia (Ord): BONAPARTE'S GULL

Status.—Transient; rare to uncommon in spring, rare in fall and winter.

Spring.—Bonaparte's Gulls have been noted rarely in March; main flight in April; rare by late April. Early records: March 13 (1937), at Cincinnati, Ohio (Goodpaster, 1941:17); March 17 (1950), at Louisville (Monroe). About half of the birds seen are in the breeding (black-headed) plumage. Nearly all records are from the larger streams, mainly the Ohio River, where the species has been recorded in small numbers, mainly in April, at Cincinnati and Louisville. The most notable concentration on record is a flock of 500 seen by Goodpaster (1941:17) on April 16, 1939, in the Ohio River bottom lands near Cincinnati. Far from the larger rivers, 1 bird was seen at the wet-weather lakes in Warren County by O. S. Pettingill, Jr., and L. Y. Lancaster on April 12, 1939 (Wilson, 1940a:20), and Wilson (1957b:60) noted another there on May 4, 1957. In the same county an unsexed specimen in winter plumage was taken in the spring of 1935 by Ottis Willoughby (Western Kentucky State College coll.). A black-headed male (U.K.) taken near Lexington and (label) "skinned on April 23, 1901," was likewise far from major streams. Near Louisville, Monroe took a black-headed female (B.L.M.) from a flock of gulls feeding in a corn field on April 8, 1939. His latest records at Louisville are for May 5 and 6.

Fall.—Most of the comparatively few recent records are for October, November, and early December. Probably the species is somewhat less numerous in Kentucky in fall than in spring. According to Langdon (1879:187), Charles Dury took specimens at the mouth of the Little Miami River near Cincinnati (and on the

border of Campbell County, Kentucky) in September, 1878. At Louisville the earliest record is Croft's (*vide* Monroe) for August 28 (1957); Monroe recorded 5 at the Falls of the Ohio River on October 28, 1951, the second earliest record. According to Stamm and Summerfield (1952:44), "many" were seen there on November 11, 1951, and others were reported in 1959, as early as October 31 (Stamm, Brecher, and Lovell, 1960:8). From 1948 through 1960 a few have usually frequented the Municipal Harbor at Louisville through much of November and December (Monroe). On November 16, 1948, I took an immature male on the Ohio River at Henderson, Henderson County (U.M.M.Z.).

Winter.—While most of a few late-lingering birds probably depart with the onset of severe weather, it appears likely that some winter on occasion. Monroe recorded 1 at Louisville on January 5, 1947, and 2 on January 16, 1949. Others were seen in early January, 1960 (Stamm, Brecher, and Lovell, 1960:8), and there is a record (Monroe) for February 10 (1957). A flock of 60 was reported by T. Atchison Frazer and others at Marion, Crittenden County, on December 26, 1948 (*Kentucky Warbler*, 25:12, 14, 1949). A specimen taken at a pond near Harrodsburg in January, 1821, and described by Rafinesque as *Larus marginatus* was evidently a Bonaparte's Gull (Rafinesque, 1822; see Rhoads, 1912:196–198).

Specimens examined.—Total, 4. U.K.—1 male, Fayette County (near April 23, 1901); B.L.M.—1 female, Jefferson County (April 8, 1939); W. Ky. State College Coll.—1 unsexed, Warren County (spring, 1935); U.M.M.Z.—1 male, Henderson County (Nov. 16, 1948).

Sterna spp.: FORSTER'S AND COMMON TERNS

Status.—Transients: usually uncommon even collectively, occasionally fairly common locally.

Note.—The difficulty, under most circumstances, of separating these two terns in the field makes a combined treatment of records the only satisfactory one at this time. Records based on specimens, and sight records by experienced observers under known conditions, are mentioned under the separate accounts following. Further collecting and careful observation are needed.

Spring.—Most published spring records have been listed by the authors concerned under Common Tern. Terns of one or both species sometimes arrive by early April; most birds are noted in late April and early May, with occasional records in June. Early records: April 24 (1880), at Cincinnati (Maslowski and Dury, 1931:75)—next record April 26, in 1949 (Kemsies and Randle, 1953:24); April 19 (1952), at Louisville (Monroe); April 1 (1939), in Warren County (Wilson, 1940a:20); April 2 (1926), in Hopkins County (Bacon, 1933). Most recent records, all concerning small numbers seen mainly in late April and early May, are from Warren County (Wilson, 1940a:20), Louisville (Monroe), and Cincinnati (Goodpaster, 1941:17; Kemsies, 1948a:24; Kemsies and Randle, 1953:24–25). Late records: May 20, at Louisville (Monroe; next record May 16); 4 on June 11 (1935), in Warren County (Wilson, 1935); May 12 (1949), at Kentucky Lake (Morse, 1949:56).

Fall.—Many records are available, reported under both species. These terns may arrive as early as the first week in July, but usually not before late July; flight scattered through August and September; rare by late September. Terns of one or both species have been reported along the Ohio River from Huntington, West Virginia (Seeber and Edeburn, 1952); Cincinnati, Ohio (Langdon, 1879:187); and Louisville (Monroe); westward to Ballard County (Wilson, 1922b:95); and on the Mississippi River in Fulton County (Pindar, 1889b:311; 1925a:79). From other localities records are far fewer: from Lexington, October, 1920 (Funkhouser, 1925:157); and from Warren County, 5 on July 3, 1935 (Wilson, 1935), and 1 on August 29, 1950 (Wilson, 1951:5). These terns are sometimes fairly common at the Falls of the Ohio River at Louisville and were stated by Pindar to be common "summer residents" in Fulton County. Although Bacon's records (1933) at Madisonville, given as October 12 to November 1, are a little late compared with other local

records, they may be authentic; one wonders what happens to the many terns sometimes present on the Great Lakes until December (Trautman, 1940:267). These late birds are very rarely recorded in the Ohio Valley. Two terns, tentatively identified as Forster's, were observed at Huntington, West Virginia after a storm, on November 3, 1951 (Seeber and Edeburn, 1952), and 4 more appeared at Bowling Green, Warren County, on December 1, 1956 (Wilson, 1957:15).

Sterna forsteri Nuttall: FORSTER'S TERN

Status.—Not known in detail because of probable confusion of Forster's with Common Terns (see joint account above).

Spring.—Some, possibly many, of the spring birds reported in literature as Common Terns may actually have been Forster's Terns, the two species being particularly difficult to separate in the field when in breeding plumage. At Cincinnati, according to Kemsies and Randle (1953:24), Forster's Tern has been regularly recorded in recent years, with 20 present over a small area of the Ohio River on April 26, 1949. Several specimens reported taken in the Cincinnati area on May 4, 1879 (Dury and Freeman, 1880:104), seem to have disappeared, being unmentioned in the catalogue (Maslowski and Ralph Dury, 1931:75) of the Charles Dury collection. At Louisville, Monroe has a tentative sight record of Forster's Tern for May 8.

Fall.—Definite records of Forster's Tern are all from the Falls of the Ohio River at Louisville, where this species seems to outnumber the Common Tern. Monroe and others have scattered records of winter-plumaged birds (separable from Common Terns by having the black of the auricular patches not continuous across the nape) ranging from July 19 (1959) to September 26 (1959), and I saw 1 there on September 13, 1950. A male (B.L.M.) taken by Monroe on August 30, 1936, is in worn breeding plumage, while 2 females taken on the same date, and another, taken August 16, 1947, are in winter dress. Numbers up to 10 or 15 are sometimes present at the Falls. The Dury collection (see Maslowski and Dury, 1931:75) in the Cincinnati Museum of Natural History seems no longer to contain specimens reported taken near Cincinnati in September, 1878 (Dury, *vide* Langdon, 1879:187).

Specimens examined.—Total, 4. B.L.M.—1 male, 3 females, Jefferson County (Aug. 30, 1936; Aug. 16, 1947, Aug. 30, 1936 [2]).

Sterna hirundo Linnaeus: COMMON TERN

Status.—Not known in detail because of probable confusion of Common with Forster's Terns (see joint account of both species).

Spring.—Most spring records have been reported under "Common Tern." The majority of these records are not safely assignable to species, since grounds for identification are not stated and the observers appear to have been unaware of the possibility of confusion with Forster's Tern. At Louisville, Monroe has seen birds thought to be Common Terns on few occasions, from April 19 (1952) to May 20. According to Kemsies and Randle (1953:25) the species is sometimes fairly numerous at Cincinnati, being more often seen in spring than in fall. In their catalogue of the Charles Dury collection, Maslowski and Ralph Dury (1931:75) listed 2 specimens taken in the Cincinnati area on April 24, 1880.

Fall.—For the Falls of the Ohio River at Louisville, Monroe has records of winter-plumaged Common Terns (identifiable by having the auricular patches continuous with black of nape) ranging from July 4 to October 4 (1936) and took an adult male (B.L.M.) still in nuptial plumage on the last date. A specimen was taken on the Ohio River at Cincinnati on September 9, 1878, by Dury (Maslowski and Dury, 1931:75). For many years the Common Tern has been assumed to be more numerous in the Ohio Valley than the Forster's Tern, which was considered very rare (see also Trautman, 1940:267). At Louisville, however, careful

observation and limited collecting have suggested so far that the Forster's Tern is actually the more numerous.

Geographic variation.—The subspecies occurring is the widespread *Sterna hirundo hirundo* Linnaeus.

Specimens examined.—Total, 1. B.L.M.—1 male, Jefferson County (Oct. 4, 1936).

Sterna albifrons Pallas: LEAST TERN

Status.—Uncommon summer resident in southwestern Kentucky, breeding locally; elsewhere a casual spring and very rare fall transient, recorded only west of the Cumberland Plateau.

Spring.—At Reelfoot Lake, Tennessee, a few miles from breeding sites in both Tennessee and Kentucky, Goodpaster and I noted the apparent arrival of many Least Terns on May 20, 1949, none having been seen in daily field work May 14–19. The ovary of a female (U.M.M.Z.), which I took on the lake, in Obion County, Tennessee, on May 27 was only moderately enlarged. Least Terns arrived at a breeding colony at Bell Island, Ohio River in Union County, Kentucky, near Shawneetown, Illinois, on May 25, 1953 (Richard Brewer, *vide* Hardy, 1957:7, and notes). Outside of the breeding range the species has been reported in spring only from two localities: in Warren County, where Wilson (1940:20) reported 2 birds seen at McElroy Lake on April 30, 1939, and near Madisonville, Hopkins County, where Bacon (1933) had a single record for April 28. If authentic, the last two records are unusually early, judging from data compiled by Hardy (1957:6–8).

Breeding records and distribution.—The Least Tern has been definitely recorded breeding in Kentucky at only two localities, clutches, so far as known, being completed from late May to mid-June. On June 13, 1937, Maslowski (1938:31) found a nest containing 2 eggs (incubation advanced) on a sand bar at "Kentucky Bend" of the Mississippi River in Fulton County. At this bar on June 29, 1941, I found approximately 40 Least Terns acting as though they were breeding, but no nests. The gonads of a male and female (B.L.M.) I took at that time were enlarged. A second ternery in Kentucky (Ohio River technically in Union County, best reached from Shawneetown, Illinois) was found by Brewer (1954) on July 5, 1952, on a bar called Bell Island. At that time three nests were found, each containing 2 eggs and/or young. In 1953 this colony was studied in more detail by Hardy (1957:30–34). Of 30 nests located, 24 (80 per cent) contained 3 eggs and 6 (20 per cent) contained 2 eggs. Hatching was noted from June 30 to July 10 (chiefly July 1–7), placing clutch-completion chiefly June 10–17 (incubation period approximately 20 days). Dates of nesting along the river are inescapably influenced by water level in years when the bars are submerged in late spring. It seems probable that the species breeds on suitable bars in the Mississippi River and the lower Ohio, upstream at least to Owensboro, Daviess County (where the stream becomes sub-mature). A colony of about 50 birds feeding [grown?] young was found at a bar near Cairo, at the mouth of the Ohio River, on August 1, 1907, by Bartsch (1922:101), and Pickens (*vide* Wilson, 1942:21) listed the species, without stated evidence, as breeding near Paducah. Just south of the state line, Ganier (1930:104) reported nests on a Mississippi River bar on June 20, 1921, sets of 2 and 3 eggs being taken from two nests. All nests reported have been small, unlined depressions. Local clutch size, based on nests mentioned above, is 2–3 eggs (average, 2.1 ± 0.14 ; $N = 36$).

Summer.—Through much of the probable breeding range, especially along the Mississippi River, although probably best considered uncommon, Least Terns are easily and frequently observed, in small numbers, hunting over the river and about nearby sloughs and ox-bow lakes. In 1949, I saw 3 at Fish Lake, Carlisle County, on June 5, and 4 or 5 at Swan Lake, Ballard County, on June 8.

Fall.—The time of departure of local breeding birds is not known, but probably varies somewhat, dependent upon the time of nesting. In 1953 (not counting a

flock of about 20 seen on August 30 and thought to be transients) Least Terns were last seen at the Bell Island colony on July 27 (Hardy, 1957:53). In late summer Least Terns wander more widely than in spring, occurring up the Ohio River at least to Cincinnati, Ohio, where 2 specimens were taken by Charles Dury on September 8, 1878 (Maslowski and Ralph Dury, 1931:75), and 1 was seen on July 1, 1951 (Kemsies and Randle, 1953:25). Other Ohio River observations are from Louisville, where the species is rare and has been recorded, from 1939 to 1957, about 15 times in as many years, from July 28, in 1957, to October 10, in 1954 (Monroe *et al.*, notes; see also Croft, 1958a:46). No more than 4 have been seen at once at the Falls of the Ohio, where I took an immature male on July 29, 1939, and Monroe secured an adult male in breeding plumage on August 17, 1947 (B.L.M.). Elsewhere the species has been reported from Lexington (Funkhouser, 1925:158); Brookville, Indiana (Butler, 1897:580); Mammoth Cave, Edmonson County (Wilson, 1946:16); and Hopkins County, September 27 and October 2 [?] (Bacon, 1933).

Geographic variation.—The Least Terns of Kentucky are here considered to belong with the subspecies *Sterna albifrons antillarum* (Lesson) of the eastern and Gulf coasts, West Indies, etc., since, after repeated efforts I find myself unable to distinguish Mississippi Valley birds from this subspecies. I have concluded accordingly that the inland subspecies *Sterna albifrons athalassos* Burleigh and Lowery (1942), although recognized by the A.O.U. Check-List (1957:239), fails to satisfy any rule for per cent of separability acceptable to me.

Specimens examined.—Total, 5 (including 1 extralimital). B.L.M.—2 males, Jefferson County (July 29, Aug. 17); 1 male, 1 female, Fulton County (June 29); U.M.M.Z.—1 female (weight, 42.1 gm., not fat), Obion County, Tennessee (May 27).

Hydroprogne caspia (Pallas): CASPIAN TERN

Status.—Transient; very rare in spring, rare in fall; unrecorded from the Cumberland Plateau.

Spring.—The few records range from March 31 to May 4 and may be given nearly in full. The species has been recorded near Cincinnati, where Maslowski (notes) saw 4 on April 30, 1932, and 6 in the Ohio River bottom lands just east of the city on April 15, 1949 (see also Goodpaster, 1941:18, and Kemsies and Randle, 1953:25). At Louisville, Monroe has very few spring records, from April 23 (1950) to May 3 (1959). Wilson (1940a:20) noted 4 at McElroy Lake in Warren County on April 30, 1927, and 1 on March 31, 1934. At Kentucky Lake, Morse (1949:56) recorded 1 on May 4, 1949.

Fall.—The Caspian Tern is apparently somewhat more numerous in fall than in spring. Near Louisville it has been recorded by Monroe and many others (see Monroe and Mengel, 1939:44; Lovell, 1951:7; Stamm and Summerfield, 1952:44; Brecher, 1958a:53) at the Falls of the Ohio River from August 4 to September 27 (1958), most records falling between August 21 and September 21. Very small numbers are usually seen, but as many as 15 have been present at once. The species was first reported in recent years by Monroe (1938b:678), who took the first, and apparently only, extant specimen, a male, on September 6, 1941 (Monroe and Mengel, 1942:139). The scarcity of records from elsewhere is probably due more to lack of observers than of birds. That a few transients pass quite late is indicated by a male taken near Cincinnati on October 16, 1883 (Butler, 1927:13) and a bird that I watched at length on sand bars at "Kentucky Bend" of the Mississippi River in Fulton County on November 8, 1948.

Specimens examined.—Total, 1. B.L.M.—1 male, Jefferson County (Sept. 6, 1941).

Chlidonias niger (Linnaeus): BLACK TERN

Status.—Transient; rare to fairly common in spring, uncommon to common in fall; bred at Louisville in Audubon's time and may occasionally nest today; not recorded from the Cumberland Plateau.

Spring.—A late migrant. The first usually arrive in early May; main flight in middle or late May; a few remain on occasion into early June. Early records: May 6 (1938), at Cincinnati (Goodpaster, 1941:18) [An old specimen from the Cincinnati area in the Dury collection at the Cincinnati Museum is dated "March"; Maslowski and Dury, 1931:76.]; April 27 (1953), at Louisville (Monroe); April 26 (1950), in Warren County (Wilson, 1951:5); April 29, in Hopkins County (Bacon, 1933). In mid- or late May Black Terns are often locally common about lakes, streams, and rivers, sometimes occurring in fair-sized flocks. At Reelfoot Lake, Tennessee, just south of Fulton County, Goodpaster and I saw several flocks of approximately 100 to 300 birds, all in breeding plumage, between May 22 and 28, 1949. The species is more likely to be seen flying over fields, marshy areas, and small ponds than are the less numerous Forster's and Common terns. It has been observed in many localities in central and western Kentucky, usually singly or in loose flocks of 3 to 10 individuals. Late records: June 4 (1939), at Cincinnati (Goodpaster, 1941:18); June 11, at Louisville (Monroe; next record May 20); June 13 (1937), in Warren County (Wilson, 1937:20, see also below); June 16 (1951), in Henderson County (Powell, 1951a:65).

Breeding and summer records.—Audubon (1835:535-536) gave a comparatively complete account, for the times, of the nesting of the species at Louisville in the early part of his stay there, probably around 1808-1810. According to this, he found more than 70 nests at one time, in June, containing up to 4 eggs each, about the margins of a small pond near the town. Laying began in early June, and the young were flying well by mid-August. He further stated: "Now, however, they have abandoned those places and [occur only as transients]." Since he found the species breeding also at Vincennes, Indiana, it seems likely that the Black Tern then nested generally rather farther south than it ordinarily does at present. The observation by Wilson (1929:177, 180-181) of several individuals at McElroy Lake, Warren County, throughout the summer of 1927 led him to state that they "probably or certainly nested." He and L. Y. Lancaster found 6 there on June 22, 1927, and discovered an egg, which they identified [?] as a Black Tern's, on the bank of a "ravine" [drainage ditch?]. No nest was found. The species summered there also in 1935 (Wilson, 1936:50) and, since the habitat provided by McElroy Lake in wet years might be suitable, the possibility cannot be excluded that Black Terns did nest there. Very late spring and very early fall records suggest that non-breeding individuals occasionally summer in other localities.

Fall.—Migration is rather early, mainly in late July, throughout August, and in early September; a few are recorded later. This is the most numerous of the terns locally, occurring with fair regularity along larger streams and about lakes and marshes. It is best known at the Falls of the Ohio River at Louisville, where it is most often seen between August 1 and September 10, being common in some years and rare in others. Occasionally 150 to 200, mostly in pied plumage, are present in late August. The species has been observed at various other localities from Cincinnati and Lexington west to the Mississippi River. Wilson (1922b:95) reported a "very large flock" seen at Hickman, Fulton County, on September 9, 1917. Four specimens taken near Cincinnati, presumably on or near the Ohio River, in September, 1878, are reported from the Charles Dury collection (Maslowski and Ralph Dury, 1931:76). The main flight is apparently over by mid-September. Late dates are scarce; at Louisville, Monroe has only two records later than September 17, these for October 6 and 12.

Note.—Rafinesque (1822) based his proposal of the genus *Chlidonias* on a specimen stated to have been taken at a pond near Harrodsburg, Kentucky, in June, 1821 (Rhoads, 1912:197-198).

Geographic variation.—Kentucky birds belong to the North American subspecies *Chlidonias niger surinamensis* (Gmelin).

Specimens examined.—Total, 3. B.L.M.—2 males, 1 female, Jefferson County (Aug. 22, 1937, Aug. 31, 1947; Aug. 23, 1936).

FAMILY COLUMBIDAE: PIGEONS AND DOVES

Columba livia Gmelin: ROCK DOVE

Status.—Not well known; evidently resident.

Remarks.—Local ornithologists have shown very little interest in the present species. Among the few references to it as a member of the Kentucky avifauna are those of Van Arsdall (1949:24), who described it as a "common permanent resident" in Mercer County, and Barbour (1951a:34), who listed it as a "common resident" in Rowan County. Flocks of these pigeons are common around most Kentucky towns and cities, as well as in agricultural areas. How many are "tame," how many "wild," and just how "wild," are at present matters of conjecture. Without doubt some breed in a feral state, particularly about the larger cities, on some of the bridges over the Ohio River and (rarely) in quarries, on cliffs, etc. Study of the size and dynamics of this feral population is needed. There appears not to be a formal breeding record in the literature, nor a preserved specimen.

Zenaidura macroura (Linnaeus): MOURNING DOVE

Status.—Common to abundant resident, less numerous in mountainous, wooded eastern Kentucky; most numerous and conspicuous in late summer and early fall, least numerous (sometimes rare) in winter.

Spring.—Mourning Doves become conspicuous in late February or early March, when their characteristic courtship flights and monotonous "song" begin to be evident.

Breeding records.—The nesting season is extremely long, February–October, being rivalled in duration, among Kentucky birds, only by that of the House Sparrow. Clutch-completion, as indicated by 65 dated breeding observations, occurs as early as February 11–20 and as late as September 11–20 (early peak March 21–31, later peaks not clear). Breeding records are from Rowan (Barbour, 1951a:34); Laurel (Mengel, notes); Boyle (Van Hook, 1943:15–16); Mercer (Van Arsdall, 1949:24); Nelson (Blincoe, *vide* Funkhouser, 1925:201); Owen (Stamm, notes); Oldham (Monroe, notes); Jefferson (Lovell, 1944:21–22; Winstandley, 1946:51; Hays, 1957:3; Monroe, notes; Stamm, notes); Meade (Lovell, 1949b:44); Bullitt (Monroe, notes); Warren (Wilson, 1920a:221, 1940b:32, 1949:35, 1952b:31, 1959:40; Lancaster, 1946:23; Taylor, 1955:48; Mengel, notes); Edmonson (Bailey, 1933:101; Browning, 1946:41); Daviess (Powell, 1952a:57); Henderson (Klutey, 1953:57); Christian (Walker, 1945:14); Hopkins (Dunn, 1942:5; Hancock, 1947b:31, 1954:21); Crittenden (Frazer, *vide* Lovell, 1951b:59); Livingston (Nickell, 1944:11); McCracken (Durand, 1939:61); Trigg (DeLime, 1947:66); and Ballard (Mengel, notes) counties. Records of active nests range from February 8 (construction of a nest in Jefferson County, 1950; Stamm) and March 1 to September 28. On March 1, nests containing 2 eggs were found in Hopkins County, in 1920, by Suthard (*vide* Hancock, 1954), and in Warren County, in 1946, by Lancaster (1946), while on September 28, 1945, a nest containing 2 young was found in Hopkins County by Hancock (1954). A very early nesting is indicated by barely flying young recorded in Warren County on March 18, 1952 (Wilson, 1952b). The latest nest containing eggs was found on September 26, 1941, in Hopkins County, by Dunn (1942:5). The species is multi-brooded. Three broods in the same nest (the last one mentioned above) in one season, were noted by Dunn (*loc. cit.*), and rearing of two broods in rapid succession was noted in Warren County by Taylor (1955: large young in the same nest on May 4 and June 8, 1955) and Wilson (1959; eggs incubated April 24 in nest containing young on April 20, 1959). Since a complete nesting requires about 30 days, it is clear that the season is actually

long enough to permit five broods to be reared by a single pair, whether or not this ever happens. Approximately 40 clutches and broods reported contained 2 eggs or young; it is improbable that a few clutches of 1 were complete; no clutches of 3 have been reported in Kentucky. Extremely varied sites are chosen for the flimsy stick nests characteristic of the species. Nesting on the ground is not common in Kentucky, but has been reported twice from Warren County (Wilson, 1940*b*; Ganier, *vide* Lovell, 1944:20), and in Hopkins County, where "numerous" nests were found years ago in rye and wheat fields (Suthard, *vide* Hancock, 1954). Elevated nests have been reported from a great variety of trees, shrubs, vines, and other situations such as cliffs (Lovell, 1944; Walker, 1945), cemetery monuments (Slack, *vide* Lovell, 1944), window-ledges (Winstandley, 1946), and the abandoned nests of other birds, including Robins (Wilson, 1920; Lovell, 1944:21, 1949*b*:44), Catbirds (Frazer, *vide* Lovell, 1951*b*:59), Wood Thrushes (Monroe, Mengel; notes), and Blue Jays (Hancock, 1947*b*). Usually the dove's nest is placed atop the deserted nest, but sometimes little or no material is added; in Jefferson County on May 15, 1937, I found 2 Mourning Dove eggs in an unaltered old nest of a Wood Thrush. The average height above ground of 33 elevated nests recorded in the above-cited sources is 10.6 feet (range of 32, 2-24 feet; 1 nest 40 feet up). In Henderson County on June 24, 1953, a Mourning Dove with 2 young was noted apparently trying to feed young Robins in a nearby nest on the same branch as the dove's nest; a parent Robin, in turn, was sometimes seen cleaning the dove's nest (Klutey, 1953). Besides many nests found through the years by Monroe and me in the Louisville area, I have more recently recorded nests in Laurel County, June 28, 1952, 10 feet up in a Virginia pine in a clearing just south of London; in Warren County, 9 miles south of Bowling Green, June 19, 1949, 2 feet up in vines choking a fallen tree in a wooded swamp; and in Ballard County, July 17, 1951, 9 feet up in a small river birch by a roadside.

Breeding distribution.—During the breeding season Mourning Doves are common to abundant through most of Kentucky, being most numerous in the agricultural areas of the central and western portions, where much grain is grown. Relatively few occur in the heavily wooded portions of the Cumberland Plateau and Mountains, in which areas, at least, the original population was probably limited chiefly to the more open pine-oak uplands, burned ridgetops, and open areas near the edges of cliffs, situations characteristically occupied today. The species is not found in climax or near-climax deciduous forest and is rare in regions largely so timbered. It has apparently never been observed on the upper slopes of Black Mountain, Harlan County, in much work by myself and others. I saw none on the lower Pine Mountain ridge near the "Breaks of Sandy," in Pike County, June 20-26, 1951. In 1949 I saw 1 bird over the crest of Pinnacle Mountain (elevation 2,800 feet), near Middlesboro, July 19, and 1 on Pine Mountain, near Whitesburg, July 21. In valleys of the mountain area the species occurs regularly, although in small numbers.

Summer and fall.—By mid-August Mourning Doves begin to gather in large flocks. In central and western Kentucky several hundred may congregate in one large corn field, or along nearby telephone wires, and the over-all numbers in this part of the state are very large. Later on these congregations are probably replaced, at least in part, by migrants from farther north, as noted elsewhere by Aldrich (1952:454-455). By mid-October or thereabouts a definite decrease from the August-September peak of abundance occurs. The species is intensively hunted in Kentucky without apparent adverse effects (although it nests so late that birds not fully grown are often taken), and it is undoubtedly more numerous in Kentucky today than in primeval times. Recently a disease caused by an organism of the genus *Trichomonas* (Protozoa) has affected doves of this area and caused some concern (Russell, 1951) but is apparently receding in incidence.

Winter.—Mourning Doves winter throughout the state but vary considerably in numbers from place to place and winter to winter. They have been reported from

many localities, as rare (in some) to common (in others), but are generally more numerous in open country, particularly where corn is an important crop (see Beckham, 1885:44). Several centrally located observers have mentioned a regular and marked decrease in numbers in winter, which I have noted also (see Blincoe, 1925:409; Goodpaster, 1941:18; Van Arsdall, 1949:24-25). In eastern Kentucky, Barbour (1951:34) apparently regarded the species as quite rare in the vicinity of Morehead, on the heavily wooded plateau, and it is probably rare in winter generally in eastern Kentucky. I saw 2 doves in cleared land near London, Laurel County, on February 3, 1950. In southern (Pennyroyal) and western (Purchase) Kentucky doves winter, at least at times, in numbers. I saw many, in flocks of up to 100, nearly all in and near corn fields, in the Purchase counties in late December, 1950, and early January, 1951.

Geographic variation.—The breeding population of the state belongs with the subspecies *Zenaidura macroura carolinensis* (Linnaeus), to which most of the specimens that I have examined, whether breeding birds or not, are referable by their dark, rich coloration (see also Wetmore, 1940:536). Limited evidence now available suggests, however, that a trend towards the pale coloration of the western subspecies *Z. m. marginella* (Woodhouse) may exist in western Kentucky. Two females which I took, respectively, in Calloway County on April 12 and Hickman County on April 15, 1950, are pale in color and in this respect more like average *marginella* than *carolinensis*. The first may or may not have belonged to the breeding population of the area in question, but the second, judging from the condition of its ovary, was preparing to breed. The real nature of the breeding population of western Kentucky and the occurrence in Kentucky of transients from the range of true *marginella* (which analysis of large samples would in all probability reveal) remain to be demonstrated.¹

Specimens examined.—Total, 13. B.L.M.—1 male, Carroll County (Nov. 17, 1940); 1 male, Jefferson County (Sept. 6, 1937); U.S.N.M. (8, all taken in 1938)—2 males, Wayne County (June 7, 15); 1 male, Meade County (April 26); 1 male, Union County (May 16); 1 male, 1 female, Hopkins County (Oct. 21; Oct. 20); 1 male, Trigg County (Oct. 29); 1 female, Fulton County (May 31); U.M.M.Z.—1 female (weight, 133.9 gm., not fat), Calloway County (April 12); 1 female (131.3 gm., not fat), Hickman County (April 15); 1 female (132.2 gm., very fat), Fulton County (Dec. 27, 1950).

**Ectopistes migratorius* (Linnaeus): PASSENGER PIGEON

Status.—Extinct. Last authentically recorded in Kentucky in 1898 (July and November). In early times apparently resident, being an exceedingly abundant transient and ranging from uncommon to abundant at all seasons; at least on occasion it bred in Kentucky in great numbers.

Note.—For general information concerning the hordes of pigeons that once roamed restlessly and periodically to and fro over the vast deciduous forest the reader should consult Schorger's thorough compilation (1955). The exact biological status of most of the pigeons reported from Kentucky will ever be imperfectly known. The few definite records can be stated only by seasons; it is not at all clear, in most cases, whether great numbers sometimes observed in fall and early winter were migrating southward or merely returning to roosts, or whether similar numbers in spring were migrating northward or foraging out of breeding places. It is equally uncertain whether some of the Kentucky "roosts" reported in literature were roosts or breeding places. Kentucky lay at the southern extremities of the breeding range and in the northern portion of the wintering range of the species.

¹ Since the above was written geographic variation in the Mourning Dove has been reviewed by Aldrich and Duvall (1958), who uphold the subspecific validity of *Z. m. marginella*. Their map (p. 113) suggests that its range extends southeastward to a point close to or in extreme western Kentucky. Further (p. 122), they assign to *marginella* one of the specimens listed above (♂, Meade County, April 26, 1938; U.S.N.M.). While this identification may be correct, and as indicated above *marginella* is to be expected as a transient, I think that nothing will be lost by awaiting statistical evidence of the occurrence of birds from two distinct populations before awarding *marginella* a place in the Kentucky list.

Spring.—Detailed data are few. Negative evidence suggests that the spring flight, while sometimes impressive, averaged smaller than that of fall. Between Shelbyville and Frankfort, Alexander Wilson (1812:105–106) noted great numbers passing overhead on or about March 24, 1810 (date established from Wilson *in Ord*, 1825:cxxx), but thought these might be part of a nesting colony then reported in Green County (see below). In the late nineteenth century occasional observations were still made in spring in the Cincinnati area (Langdon, 1879:181), where specimens now in the Dury collection (C.M.N.H.) were taken as recently as May 3, 1870, and March 7, 1878 (Maslowski and Dury, 1931:76). The precise status of “thousands” seen by Thomas Hulme (see Thwaites, 1904c:45) on June 23, 1819, along the Ohio River near Evansville (and Henderson, Kentucky) is unknown.

Breeding records.—Little information on breeding in Kentucky has been preserved. This pigeon appears to have been an early nester. Local residents near Shelbyville told Alexander Wilson (1812:104–105) that the pigeons arrived at a great breeding place near there “about five years ago” (or *ca.* 1808, if from the time of writing) approximately April 10 and left it “altogether, with their young” before May 25. Even earlier seems to have been a nesting in Green County, approximately 50 miles southwest of Danville, Boyle County, where Wilson (1812:106) was told that “the young begin to fly about the middle of March.” When he traversed this breeding place on April 17, 1810, the birds were evidently through breeding although a few lingered in the area. Wilson (*in Ord*, 1825:cxxx) visited the site of the first-mentioned nesting, then presumably two or more years abandoned, about March 24, 1810, finding it “the greatest curiosity I have seen since leaving home.” Nestings much later in the season were doubtless aberrant. Dury (see Butler, 1927:12) referred to the nesting of a few scattered pairs in woods near Cincinnati, Hamilton County, Ohio, just across the Ohio River, in the 1870’s. The young were said to be barely able to fly in August. This may well have been one of the last nestings this far south. The earlier great nestings described by Wilson were evidently of enormous size. Although there may be some confusion of the two in Wilson’s accounts (see Wilson, 1812:104–106, and Wilson *in Ord*, 1825:cxxxviii), one or both of the breeding places mentioned by him were said to be in the neighborhood of 3 miles wide by 40 miles long, and many trees by Wilson’s own count contained more than 90 nests. Other allusions to nesting in Kentucky are vague; two (Warren County, 1835; Green County, date unspecified) are given by Funkhouser (1925:200), and Davis (1923:60) referred to nesting places in Calloway County. As elsewhere, beech timber seems to have been favored for nesting.

Fall.—Evidently the movements of the pigeons in autumn were somewhat irregular in timing; in any event no clear picture can be reconstructed from remaining evidence. The few actual dates of observation available are scattered through fall as follows: September 1 (1894), in Knox County, Indiana (E. J. Chansler, *vide* Butler, 1897:764); September 27 (1820), many thousands near Cincinnati (James Flint; see Thwaites, 1904b:301); October 5 (1894), in Knox County, Indiana (Butler, 1897:764); October 29 (1893), near Hickman, Fulton County (Pindar, 1925a:83); October 30, at Casky, Christian County (Bent, 1932:402, authority not given); and December 2 (1792), a huge flight along the Ohio near the mouth of the Wabash (Wright, 1911:441, citing a record by John Heckewelder taken from *Penn. Mag. Hist. and Biog.*, 12:182, 1888). Some of the great autumn flights seem almost to have defied rational description. The classic account of Audubon (1831:320–321) of a gigantic flight observed between Hardinsburg (“Hardensburgh”) and Louisville, in 1813, has been quoted at length by Bent (1932:390–391) and Funkhouser (1925:195–196) and need not be repeated here.

Winter.—While Kentucky lay to the north of the major winter range, sporadic wintering even of very large numbers of pigeons seems not to have been unusual. Bent (1932:400) mentioned wintering of numbers at Brookville, Indiana, not far north of the Ohio River, in 1853–1854. Langdon (1879:181) referred to wintering

at Cincinnati, and a specimen from there (C.M.N.H.), dated January 4, 1883, is in the Dury collection (Maslowski and Dury, 1931:76). Maximilian, Prince of Wied, in 1843 (see Thwaites, 1906:195) reported the wintering of pigeons at New Harmony, Indiana, just north of the Ohio River, in 1832. Scattered records between December 8 and February from various Kentucky localities are given by Schorger (1955:272). Some of these indicate the irregularity, or seeming irregularity, of pigeon movements: thus "millions flying northward" (from the *Louisville Courier* for Jan. 23, 1858) on January 22, 1858, and "a great flight southward" in February, 1820, at South Union, Logan County (Coombs, 1940:162). Some of these may have been birds flying between roosting and feeding areas, rather than flights in the migratory sense. The great roosts sometimes established in mast-producing deciduous forest evidently made a memorable impression, and major ones were long recalled even though the details became vague with time. Localities in Kentucky where the memory of roosts was still strong in the early 1900's are found in Laurel, Pulaski, and Warren counties (Funkhouser, 1925:199-200), and in Calloway County (Davis, 1923:60). Large roosts were reported more definitely in the vicinity of Green River, probably not far from Henderson, in Audubon's time there (Audubon, 1831:323-324), and in Ohio County in 1847 (Revoil, 1928, in translation). Undoubtedly the localities of many others have been forgotten.

Disappearance.—The great decline of the species seems to have occurred rather rapidly, a decrease becoming clearly evident about 1860 to 1870; the pigeon was very rare by 1890. According to Langdon (1879:181) the last truly great flight in the Cincinnati area occurred in the fall of 1865. At Bardstown, Nelson County, Beckham wrote (1885:43-44) that the species was still "exceedingly common during some falls but [much decreased]," and mentioned an "enormous flight . . . about fifteen years ago," perhaps the flight of 1865 mentioned by Langdon. Pindar (1925a:83) saw his last 2 pigeons in Fulton County on October 29, 1893. E. J. Chansler recorded a "considerable flock" in Knox County, Indiana, on September 1, 1894 (Butler, 1897:764). An immature male was secured 2 miles east of Owensboro, Daviess County, on July 27, 1898, by one J. G. Taylor, and presented to the Smithsonian Institution (see editorial note, probably by Elliott Coues, in *The Osprey*, 3:12, September, 1898; not by Taylor as given in Schorger, 1955:288; see also Fleming, 1907:237). As of its reception at the Smithsonian, *The Osprey* tells us, this specimen was the sole authentic result of a popular but spurious belief then prevalent that the Smithsonian was offering a large cash reward for pigeons. It may be the last authentic Kentucky record as well, although there is little reason to doubt the report of Col. Lucien Beckner (1927:55-56) of one killed 3 miles southwest of Winchester, Clarke County, on November 20, 1898, by his brother Seth Beckner. To the subsequent regret of everyone concerned, the specimen was eaten instead of preserved! Quoting a letter from Col. Beckner, Pindar (1925a:83) gave the date of the above record as 1897, but preference is to be given Beckner's published article, which is more explicit in every respect.

Note.—Various bones of the present species have been recovered from Indian materials (probably prehistoric) recently collected at Paducah, McCracken County, and studied by Glen E. Woelfenden (letter: October 27, 1961).

FAMILY PSITTACIDAE: LORIES, PARROTS, AND MACAWS

**Conuropsis carolinensis* (Linnaeus): CAROLINA PARAKEET

Status.—Extinct. Once a common resident in the Ohio Valley and over an undetermined portion of Kentucky, disappearing from this area, so far as the few records indicate, by the 1860's or 1870's.

Early records.—The most extensive notes available are those given by Alexander Wilson (1811:92):

In descending the river Ohio, by myself, in the month of February, I met with the first flock of Parakeets at the mouth of the Little Sioto [on March 5, 1810, near Portsmouth, Ohio, and Greenup, Kentucky] . . . I observed flocks of them, afterwards, at the mouth of the Great and Little Miami, and in the neighborhood of numerous creeks that discharge themselves into the Ohio. At Big Bone lick, thirty miles above the mouth of Kentucky river, I saw them in great numbers [Boone County, Kentucky, March 16, 1810]. They came screaming through the woods in the morning, about an hour after sunrise, to drink the salt water, of which they, as well as the [Passenger] pigeons, are remarkably fond. When they alighted on the ground it appeared at a distance as if covered with a carpet of the richest green, orange and yellow.

The dates interpolated above are from Wilson in Ord (1825:cxxiii-cxxvi). At Big Bone Lick, Wilson collected and skinned 12 parakeets and kept 2 slightly injured birds alive. One of these was "Poll," his much-discussed pet, which served as model for his figure of the species (*American ornithology*, vol. 3, pl. 26, Fig. 1, 1811).

Audubon, in the well-known *Ornithological biography* (1831:133-140), gave no definite records of date and locality, but in his less frequently cited journal of 1820 (Audubon, 1929:15) he wrote that he saw many along the Ohio between "High Land Creek" and the mouth of the Wabash [thus in Union County, downstream from Henderson] on November 5.

Most of the few additional records of the species in Kentucky are found in early accounts of travel and exploration, many of which are rare and difficult to consult. Conveniently, such sources have been rather extensively culled by Wright (1912) and Hicks (1935), and some have been reprinted under the editorship of Thwaites. These cite original sources in sufficient detail. Among travellers who referred to the species in or very near Kentucky are the following: David Thomas (Wright, 1912:352-353; Hicks, 1935:76), at "Indian Creek," Kentucky, near Cincinnati, summer of 1816; early Jesuit travellers (Wright, 1912:345), Kentucky or Tennessee in 1661-1662; John Heckewelder (*ibid.*:350), mouth of the Wabash River, December, 1792; Cuming (*ibid.*:352), near the present site of Ashland, prior to 1810; Judge James Hall (*ibid.*:361), abundant below Louisville; H. R. Schoolcraft (*ibid.*:361-362), Louisville; Edwin James (*ibid.*:355), many on May 27, 1819, at Shawneetown, Illinois, and May 25, 1819, near Louisville; Timothy Flint (*ibid.*:357), along Kentucky River; and André Michaux (Thwaites, 1904a:83), on the Tennessee River above the present site of Eddyville, in late December, 1795. Many authors referred to the species in southern Ohio and Indiana also, giving records for most months of the year (for reviews of more recent records see Langdon, 1878:115; and Butler, 1892:52, 1897:820). Maximilian, Prince of Wied (see Thwaites 1906:195) reported parakeets wintering at New Harmony, Indiana, in 1832-1833.

Distribution.—The existing records suggest that in Kentucky the parakeet was mainly confined to swamp and river-bottom forests, occurring along the length of the Ohio River within the state, throughout the lowlands of western Kentucky, and an undetermined distance up the Kentucky River. It seems quite probable that the species occurred only sporadically, if at all, on the Cumberland Plateau and in the mountains, and Wilson (1811:90-91) was told that it was scarcely ever observed in the vicinity of Lexington, in the Bluegrass. He theorized, extensively for his times, concerning the more northerly distribution and greater abundance of the species west of the Appalachians than to the eastward, proposing as possible reasons more extensive suitable habitat, with cypress and other lowland swamps and many sycamores [which, when hollow, are favorable roosting sites]; abundant food supply, including cockleburrs and various nuts and seeds; and the presence of salt licks. He concluded that "even in . . . Ohio, Kentucky, and the Mississippi territory, unless in the neighborhood of such places as have been described, it is rare to see them."

Disappearance.—After speaking of the former abundance of the species Audubon wrote (1831:138):

At the present day, very few are to be found higher than Cincinnati, nor is it until you reach the mouth of the Ohio that Parakeets are met with in considerable numbers. I should think that along the Mississippi there is not now half the number that existed fifteen years ago.

Good accounts of the dwindling of the species were given by Hasbrouck (1891) and Butler (1892). These little parrots were probably gone from southern Ohio, Indiana, and most of Kentucky by the 1860's. In the summer of 1875 Nelson (1877:47) found none in extreme southern Illinois during considerable field work. However, in Fulton County, extreme southwestern Kentucky, Pindar wrote (1887a: 84): "Prof. Caldwell [qualifications unknown—RMM] said he used to see a small flock every summer four or five years ago." Later (1889b:313) he modified this to: "Formerly very common according to all reports, and stragglers are said to have occurred up to 1878." In 1950 Col. Lucien Beckner told me of a mounted parakeet in the Filson Club at Louisville. According to Col. Beckner, long curator of natural history exhibits in the Louisville Public Library and justly noted for his impressive memory, the bird was supposed to have been killed in Ballard County in 1877 or 1878, by one William Mark Linney. If so, it is probably the last parakeet killed in Kentucky and the only one still preserved, but it is improbable that we shall ever be sure. The latest definite record¹ concerns a fair-sized flock well observed near the mouth of Bayou du Chien, Fulton County, on January 2, 1876, and well described by N. H. Bishop (1879:124-126). Still later, although outside of Kentucky, parakeets were reported on hearsay evidence from Stone County, Missouri, in 1891, by Merriam (1892), and from the same area and near Atchison, Kansas, in 1905 and 1904, respectively, by Widmann (1907:116), on the basis of similar but rather impressive evidence. Harris (1919:270) reported 1 killed near Kansas City in 1894 and another seen in 1912. In general, these late records have been tacitly accepted (see Bent, 1940:12; Swenk, 1934:57).

Geographic variation.—The parakeets occurring in Kentucky presumably belonged to the western subspecies, *Conuropsis carolinensis ludoviciana* (Gmelin), and reasonably may so be listed. For what it is worth, Wilson's parakeet taken in Boone County (see above) was decidedly paler green in comparison with a series from Florida, if we may trust the coloration of its portrait in a fine set of the first edition of *The American ornithology* in The University of Kansas Library.

FAMILY CUCULIDAE: CUCKOOS, ROADRUNNERS, AND ANIS

Coccyzus americanus (Linnaeus): YELLOW-BILLED CUCKOO

Status.—Common summer resident.

Spring.—The species arrives rather late, being noted rarely in late April, more often in early May. Unannotated records in literature (see Funkhouser, 1925:217; Wilson, 1922:236), for early April, and even March, are of very doubtful validity. Representative early records: May 1, in Rowan County (Barbour, 1951a:34); April 22, at Eubank, Pulaski County (Bent, 1940:65); April 29, in Nelson County (Blincoe, 1925:410); April 27 (1946), at Louisville (Monroe); April 24, in Warren County (Bent, 1940:65; Wilson, *vide* Brecher, 1945:34); May 1 (1905), in Logan County (specimen; C.U.). In continuous field work in 1949, I recorded the first Yellow-billed Cuckoo on May 7, in Warren County. In 1952, I recorded the first on May 6, in Laurel County, but at high elevations on Black Mountain, where I arrived May 13, the species was not noted until May 22. Normally it is common through most of the state by about May 10; many transients doubtless pass through in May.

Breeding records.—The breeding season is long and the species evidently two-brooded. As indicated by 25 dated breeding observations, clutches are completed as early as May 11-20 and as late as September 1-10 (early peak June 1-10). Rec-

¹ Recently called to my attention by Dr. Alexander Wetmore.

ords are from Laurel (Mengel, notes); Boyle (Van Hook, 1943:16; Lovell, 1951b:59); Nelson (Blincoe, *vide* Funkhouser, 1925:217); Owen (Stamm, notes, and *vide* Hays, 1957:3); Oldham (Brecher, 1945:33; Monroe and Mengel, notes); Jefferson (Brecher, 1945:34; Mitchell, 1950:5; various observers, *vide* Lovell, 1951b:59; Stamm, notes; Monroe and Mengel, notes); Warren (Lovell, *vide* Brecher, 1945:34); Daviess (Powell, 1952a:57); and Hopkins (Hancock, 1947b:32; 1954:21 [including records by Suthard]; Hancock, *vide* Hays, 1957:3) counties. Nests containing eggs have been found as early as May 20 (1956), 4 eggs in Owen County (Stamm, *vide* Hays, 1957), and as late as September 11 (1949), 3 eggs in Jefferson County, nest abandoned by September 20 (Mitchell, 1950). Discounting a brood of 1, the average complement of 20 clutches or broods thought with reasonable certainty to be complete ranged from 2 to 4 eggs or young (average, 2.5 ± 0.17). Nests are usually placed rather low in shrubby or forest-edge situations and have been noted in many kinds of saplings and small trees; tangles of grape seem to be favored and afford additional support for the flimsy nests. The average height above ground of 14 nests was 8.2 feet (2.5-20). Monroe's and my unpublished records include nests with 2 eggs and 2 young, respectively, found by him in Jefferson County on July 10 and 30, 1917, a nest with 2 eggs incubated approximately 7 days, found by us 7 feet up in a small sweet gum in the same county on June 5, 1937, and a nest in Oldham County, 6 feet up in a small maple, containing 1 young perhaps 5 days old on July 2, 1938 (Monroe and Mengel). I found 2 small young being fed in a nest 7 feet up in a grape-choked Virginia pine sapling in Laurel County, 2 miles south of London, on June 11, 1952, and another nest 10 miles southwest of London, 7 feet up in a grape-choked deciduous sapling, on June 12, 1952 (1 egg June 12, 2 eggs June 14; adult incubating each date).

Breeding distribution.—The species is generally fairly common or common in forested situations throughout the state, being particularly partial to forest-edge situations and open woodland. It occurs to the top of Black Mountain, Harlan County, 4,150 feet above sea level. In recent field work I recorded fair numbers in every area visited, from Pike County west to Fulton County.

Fall.—Common through the first two weeks of September, decreasing in the latter part of the month; rarely recorded after October 1. Late records: October 8 (1938), at Morehead, Rowan County (Wetmore, 1940:537); October 10, at Lexington (Bent, 1940:66); October 24 (1960), at Louisville (Monroe); October 26 (1951), at Madisonville (Hancock, letter: March 19, 1952; next record, October 10); also, evidently, on or about October 19 (1820), somewhere near Oldham County (Audubon, 1929:10).

Geographic variation.—The Yellow-billed Cuckoos of Kentucky belong with the subspecies of eastern North America, *Coccyzus americanus americanus* (Linnaeus).

Specimens examined.—Total, 21. R.W.B.—1 unsexed, Fleming County (Sept. 2); B.L.M.—1 male, Fayette County (Aug. 7); 1 male, Bullitt County (June 19); C.W.B.—5, sexes and dates not recorded, Nelson County; C.U.—1 male, Logan County (May 1, 1905); J.D.F.—2 males, 1 female, Marshall County (Sept. 19, 20; Sept. 20); U.S.N.M.—1 male, Rowan County (Oct. 8); 2 females, Bell County (Sept. 17, 25); 1 female, Wayne County (June 15); 1 female, Union County (May 17); U.M.M.Z.—1 female, Powell County (June 26, 1948); 1 male (weight 74.5 gm., very fat), Jefferson County (Sept. 15, 1950); 1 male (63.2 gm., moderately fat), 1 female (61.7 gm., not fat), Henderson County (Sept. 9, 1949).

Coccyzus erythrophthalmus (Wilson): BLACK-BILLED CUCKOO

Status.—Fairly common transient throughout the state; uncommon summer resident in the Cumberland Mountain and Plateau areas of eastern Kentucky; possibly a very rare summer resident in the Western Highlands.

Spring.—The species seems to be a slightly earlier migrant than the Yellow-billed Cuckoo, passing through the state from late April through much of May. The details of this migratory movement are somewhat obscure because of a comparative scarcity of reliable records and the virtual certainty that some birds remain to

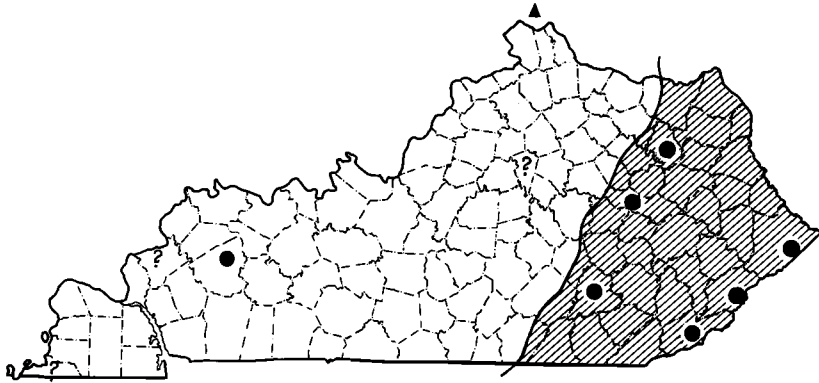


Fig. 17. Breeding-season distribution of the Black-billed Cuckoo in Kentucky. Hatched area, probably of general occurrence; solid circles, localities of definite record; question marks, dubious records; triangle, breeding record.

breed, at least in eastern Kentucky. Early records: April 30, in Rowan County (Barbour, 1951a:34); May 1, at Lexington (Bent, 1940:82); April 28, at Louisville (Monroe); April 24, in Warren County (Wilson, 1922:236). I recorded 2 birds near London, Laurel County, on April 30, 1949, and others in Warren County, May 5 and 6, and in Logan County on May 12 (first Yellow-bills seen May 7). The species has been reported from localities more or less throughout the state, the easternmost published records being Horsey's (1922:80) from Breathitt County, May 11 and 19, 1920 (1 found dead on latter date). For the Louisville area, where no evidence of summering has been discovered, Monroe's latest record is for June 6 (1954).

Distribution in summer.—The species summers regularly, and without reasonable doubt breeds on the Cumberland Plateau and in the mountainous southeastern counties (Fig. 17). It was reported from Letcher County, June 4–11, 1935, by Murray (1939:2), and I recorded it on Black Mountain, Harlan County, at 4,000 feet elevation on July 7, 1951, and 4,100 feet on May 27, 1952 (see also Breiding, 1947:38); in the nearby Powell River valley of Virginia, at Big Stone Gap, on July 11, 1951; and on the Virginia line in Pike County at elevations around 2,400 feet on June 21, 1951 (identified in this instance by song). Barbour (1951a:34) called the species a "common summer resident" near Morehead, where a previously unreported specimen (M.S.C.) was taken on July 3, 1939, by E. O. Cornwell. A male which I took somewhat to the south, 2 miles northeast of Slade, Powell County, on a pine and oak-hickory covered ridge, had testes measuring 5×7 mm. on June 24, 1948 (U.M.M.Z.). I recorded 2 birds in similar habitat 12 miles southwest of London, Laurel County, on June 18, 1952. West of the Cumberland Plateau the species is little known in summer and appears to be very rare at best. Hancock (1959:39) noted Black-billed Cuckoos in Hopkins County on July 30, 1947, and July 14, 1958. Other records are less definite. Reported instances of breeding in Woodford County in May, 1938 (Figgins, 1945:171), and in Crittenden County in 1953 (Frazer, 1954) were not documented in sufficient detail and seem scarcely acceptable. Other undocumented reports implying breeding at various localities were compiled by Wilson (1942:22). Pindar (1889b:313) referred to 1 killed in Fulton County, July 16, 1886, but the specimen, if correctly identified, was not preserved.

Records from adjoining states indicate the likelihood of breeding, at least occasionally, or in very small numbers, throughout Kentucky west of the Cumber-

land Plateau (especially, I should predict, in extreme northern Kentucky and in the Western Highlands). For example, Crook (1935a) reported at least 10 nests (2-4 eggs, May 3-22) from Tennessee localities south and west to Nashville, while Koch (1887:81) reported a nest containing 2 eggs found near Cincinnati, Ohio, on May 17, 1886, and some years ago Maslowski found a nest in the same area (Goodpaster, 1941:18, and verbal com.). Bendire (1895:29) reported a nest and eggs found at Mount Carmel, southern Illinois, on May 7, 1878, by Robert Ridgway.

Fall.—Records are scarce; migration is probably in progress throughout September and into early October. Horsey (1923:143) gave a record for Letcher County, September 26, 1921. Monroe's records at Louisville range from September 4 to September 28 (1958). Wilson (1922:236) gave dates for Bowling Green, Warren County, September 18-27. I saw 1 bird near Henderson on September 5, 1949. Although transients have been infrequently reported in fall, the presence at times of fair numbers was indicated to me on September 28, 1951, when I saw 7 birds in an hour along a brushy, partly wooded ridge just east of Louisville, Jefferson County. On unstated authority, Oberholser (1931:253) gave the latest date in 5 years for Bowling Green as October 18, 1925 (probably Wilson's records), and Bent (1940:83) gave the latest for Danville as October 5. One Black-billed Cuckoo was listed among the victims of each of the "ceilometer accidents" occurring at Nashville (Laskey, 1951:60) and Knoxville (Howell and Tanner, 1951:62), Tennessee, on the night of October 7-8, 1951.

Specimens examined.—Total, 9. M.S.C.—1 female, Rowan County (July 3, 1939); C.W.B.—4 specimens, Nelson County (May and September); B.L.M.—1 female, Jefferson County (May 7, 1938); U.S.N.M.—1 male, 1 female, Union County (May 10, May 16; 1938); U.M.M.Z.—1 male (weight, 41.6 gm., not fat), Powell County (June 24, 1948).

FAMILY TYTONIDAE: BARN OWLS

Tyto alba (Scopoli): BARN OWL

Status.—Resident, rare to uncommon.

Spring.—Precisely dated records are scarce. Edwards (notes) recorded a Barn Owl near Lexington on May 5, 1950. Monroe had only two spring records for the Louisville area for the period 1934-1952: April 19 and May 7. In 1950, Handley saw 1 bird at Kentucky Woodlands National Wildlife Refuge, Trigg County, on April 10, and I heard 1 there on April 12.

Breeding records.—Without further detail, Barbour (1951a:34) mentioned a nest found in a haymow at Clearfield, Rowan County. Blincoe (1920:3) reported hearsay evidence of breeding near Bloomfield, Nelson County. In Jefferson County, Monroe found 4 young ready to leave a nest 30 feet up in the hollow trunk of a beech tree at Pewee Valley on June 29, 1946. From Warren County Wilson (1948a:55) recorded a two-thirds grown young bird which had fallen from a nest cavity just outside of Bowling Green on June 30, 1948. Near Cincinnati, where the species is fairly well known, Maslowski has observed several nests (see also Kemsies, 1948a:26). In Hopkins County years ago Bacon (verbal com.) succeeded in locating several nests.

Distribution.—Remarkably few detailed records of this secretive and little-known species are available, but the impression of rarity resulting from this is almost certainly exaggerated. Most rural people are familiar with the "monkey-faced owl," which obviously occurs widely and regularly, and probably in unsuspected numbers. The odd, screech-like call (resembling, to my mind, the sudden violent ripping of a sheet of heavy canvas) is often the best clue to its presence. Barn Owls have been reported vaguely in the literature from localities throughout Kentucky (see Wilson, 1942:22; Funkhouser, 1925:211). Unpreserved or unlocated specimens have been reported taken in Nelson County (Blincoe, 1925:409; Beckham, 1885:40), Warren County (Wilson, 1922:236), and Foster's Landing [Bracken

County?] (Dury, 1883). Monroe has a female taken at Lexington, Fayette County, in the summer of 1932 (B.L.M.). Within the city limits of Fulton, Fulton County, I heard Barn Owls screeching on the nights of June 2, 10, and 11, 1949, and in the summers of 1939 through 1942 I heard them occasionally at Glenview, Jefferson County. Discussing birds of the Bluegrass region (MS., about 1925), L. O. Pindar wrote:

Before the distilleries ceased operation there was a colony of these owls in an old warehouse near Tyrone, Anderson Co. The large quantities of grain, corn, rye and malt at the distilleries attracted multitudes of mice and rats which in their turn furnished an unending food supply for the owls. At one time this colony contained at least forty adults and this is the only time or place where I ever found the Barn Owl common.

Most reports are from farm country; the species may be less numerous in wilderness areas and is unlisted in many early accounts of the avifauna. Audubon (1834:405) specifically mentioned that he had not seen it in the "western country." Specimens sometimes cause ridiculous comment and speculation in the popular press (for example, see Lattin, 1884).

Fall and winter.—How sedentary individual Barn Owls may be in Kentucky is not known. Although some migratory movement, at least of young birds, is known to occur (Bent, 1938:152), there is little probability that any part of Kentucky is not entirely occupied throughout the year, since some birds winter regularly in states to the north. Definite winter records are desirable, however, the only one known to me being for Lexington, January 28, 1907 (Funkhouser, 1925:211). The next latest record at hand is provided by a specimen (B.L.M.) I took at Buechel, Jefferson County, on November 21, 1936. Monroe has another fall date for the Louisville area (October 27), and a specimen from Augusta, Bracken County, taken September 27, 1904, was listed in the Dury Collection at the Cincinnati Museum of Natural History by Maslowski and Dury (1931:77). Lovell (1946a:54) reported 1 found dead on October 29, 1945, in southern Indiana not far north of Louisville.

Geographic variation.—The subspecies occurring in Kentucky is the North American form, *Tyto alba pratincola* (Bonaparte).

Specimens examined.—Total, 3. B.L.M.—1 female, Fayette County (1932); 1 male, 1 unsexed, Jefferson County (April 19, 1947; Nov. 21, 1936).

FAMILY STRIGIDAE: TYPICAL OWLS

Otus asio (Linnaeus): SCREECH OWL

Status.—Rare to uncommon resident, decreasing in recent decades.

Spring.—The Screech Owl is observed about equally often at all seasons. In recent field work, I recorded 1 calling at Slade, Powell County, April 22, 1949, and 1 (red phase) dead on a highway near Aurora, Marshall County, April 13, 1950.

Breeding records.—Few. Most clutches appear to be completed in late March or early April, complements of 4 clutches or broods ranging from 4 to 6 (average, 5). Monroe found a nest containing 6 fresh eggs (B.L.M.) 15 feet up in a dead hollow tree on the outskirts of Louisville, April 18, 1941. In Hopkins County, Suthard (*vide* Hancock, 1954:21) found 4 young just hatched on April 20, 1920, and took 4 eggs ready to hatch on April 14, 1924. Pindar (1889a) reported a nest containing 4 small young found at Hickman, Fulton County, on April 25, 1888. Fully fledged young were photographed at Morehead, Rowan County (Barbour, 1951a:32), and have been reported as early as May 31, in Nelson County (Beckham, 1885:40). One of 5 or 6 grown young birds destroyed by automobiles within a week at one point on a road near Harrod's Creek, Jefferson County, was secured by Monroe on July 2, 1939.

Distribution.—The Screech Owl occurs throughout the state; now becoming little known, in past years it was familiar to most rural and many urban people.

Papers of early date usually describe it as common, or even abundant, and often it was stated to be the most numerous owl (see Pindar, 1887a:55; Beckham, 1885:40; Garman, 1894:25; Blincoe, 1925:410; Bailey, 1933:107). Save, however, for Van Arsdall (1949:25) in Mercer County, Patten (1937:18) in Floyd County, and Kozee (1938:34) in Carter County, more recent observers have regarded it as less numerous, consistently estimating it to be fairly common or uncommon. Monroe (1955:42-43) has remarked on its decided decrease over 40 years in the Louisville area, and this decline in numbers seems to have been rather general, even within the period of my own observations, or about 30 years. The reasons for this decrease are obscure and probably complex. Persecution by man and predation by Barred Owls have been suggested (Monroe, *loc. cit.*). The vulnerability of these little owls to highway mortality may have had some effect (in recent years more Screech Owls seem to be recorded dead on roads than any other way), at least in populous areas, but probably none (or even all) of these explanations is adequate.

Characteristic of forest-edge situations in farmland and even cities, Screech Owls also occur in the wildest forested country. On June 15, 1952, I heard one "trilling" in a mature stand of hemlock and rhododendron along Craig's Creek, Laurel County, while a Barred Owl (rare in the area) hooted nearby and a Great Horned Owl called from the pine- and oak-covered ridge above. I recorded other Screech Owls at Glenview, Jefferson County, on July 25, 1948, and a family group near Kevil, Ballard County, July 18-21, 1951. One bird was found dead on a road two miles from the last locality on July 21.

Fall.—No notes of particular significance. Recorded about as often as in spring. I saw a red-phased bird dead on a road in Hopkins County on September 18, 1951.

Winter.—No decrease in numbers is evident. On January 6, 1951, I saw a red-phased individual dead on a street at the edge of Eddyville, Lyon County. As shown below, there is evidence of an influx of northern birds in winter.

Geographic variation.—The breeding population of Kentucky is representative of the southern subspecies *Otus asio asio*. Evidence has become available, however, confirming Wetmore's conjecture (1940:537) that the larger northern subspecies, *O. a. naevius*, "perhaps may reach Kentucky during winter," notwithstanding Bangs' edict (1930:403) that the species is absolutely non-migratory. This evidence is provided by a series of 19 specimens measured, of which 7 taken in December, January, and February have average wing measurements significantly larger than those taken in the rest of the year: 3 winter males, wing 160.7 mm.; 7 other males, 151.9; difference, 8.8; 4 winter females, 168.3; 5 other females, 160.4; difference, 7.9. I have not treated these small series statistically (the necessary data are given below), but the difference in wing-length (about 5 per cent) between summer and winter birds is impressive. In both sexes, the winter-collected series average slightly larger than the means for *Otus asio naevius* given by Ridgway (1914:690). The series include several specimens from Cincinnati, Ohio, and 1 from Seymour, Indiana, all of which I take to be essentially representative of Kentucky populations a few miles away. Two subspecies appear to occur in Kentucky.

Otus asio naevius (Gmelin)

Transient or winter resident in unknown numbers, this subspecies has been authoritatively reported from Kentucky in the previous literature only by Ridgway (1914:689), who listed a male with wing measuring 163 mm. taken by an unknown collector at Bloomfield, Nelson County, on December 25, 1892 (data partly supplied by Herbert Friedmann, letter of March 3, 1947). All specimens here referred to *naevius* have been taken in winter, 5 of the 7 available Screech Owls taken December through February being placed here on the basis of large size and pale coloration. In addition to the above-mentioned specimen, these are a male (wing 159 mm.) found dead at Anchorage, Jefferson County, in late December, 1946 (B.L.M.), a male (wing 160) from Cincinnati, Ohio, January 8, 1882 (C.M.N.H.), an unsexed bird (= female; wing 175) taken in Morgan County by "J. Gillam" on

February 15, 1934, and another bird, sexed as a male but almost certainly female (wing 176, equalling the largest measurement for the species given by Ridgway, 1914:690), taken at Morehead, Rowan County, on January 14, 1939, by "J. Kelly" (last 2 specimens M.S.C.). Mean wing-length, 3 ♂ ♂, 160.7 (159-163); 2 ♀ ♀, 175.5 (175-176). Three of the five specimens mentioned are somewhat paler than the average for *asio* and all are well within the size-limits of *naevius* as currently understood.

Otus asio asio (Linnaeus)

The breeding Screech Owl of Kentucky and probably more or less resident through the year. Of the 19 specimens of *Otus asio* examined, 14 (including 4 barely extralimital) are referable by small size and dark coloration to the present subspecies, as already noted for some of them by Wetmore (1940:537). Males are from Morehead, Rowan County (2; wings respectively 154, 155 mm.), November 19, 1933, and November 15, 1934 (both M.S.C.); Lexington, Fayette County (wing 155), November 26, 1939 (U.K.); Bardstown, Nelson County (wing 152), March 29, 1882 (C.W.B.); Todd County (wing 149), November 10, 1938 (U.S.N.M.); Cincinnati, Ohio (2; wings 152, 145), March 12, 1932, and May 13, 1891 (C.M.N.H.); near Seymour, Indiana (wing 156), October 23, 1936 (B.L.M.). Females are from Boone County ("♀?", wing 159), October 11, 1938 (U.S.N.M.); Woodford County (wing 155), November 26, 1939 (U.K.); Lexington, Fayette County (wing 163), December 5, 1898 (U.S.N.M.); Oldham and Jefferson counties (1 each; wings 157, 159), October 30, 1937, and February 7, 1936 (B.L.M.); Cincinnati, Ohio (wing 166), April, 1895 (C.M.N.H.). Mean wing-length: 8 ♂ ♂, 152.3 (145-156); 6 ♀ ♀, 159.8 (155-166).

Specimens examined.—Total, 20 (including both subspecies; see above for details). M.S.C.—2 males, 1 = female, Rowan County (Nov. 15, 19; Jan. 14); 1 = female, Morgan County (Feb. 15); U.K.—1 female, Woodford County (Nov. 26); C.W.B.—2 males (1 immature not full grown), Nelson County (March 29, June 18); B.L.M.—1 female, Oldham County (Oct. 30); 1 male (weight, 158.3 gm.), 2 females, Jefferson County (Dec.; Feb. 7, July 2); 1 male, Jackson County, Indiana (Oct. 23); U.S.N.M.—1 male, Nelson County (Dec. 25); 1 male, Todd County (Nov. 10); 1 female, Fayette County (Dec. 5); 1 female (?), Boone County (Oct. 11); C.M.N.H. (all extralimital)—3 males, 1 female, Hamilton County, Ohio (Jan. 8, March 12, May 13; April).

Bubo virginianus (Gmelin): GREAT HORNED OWL

Status.—Resident, rare to fairly common except in the highly cultivated parts of the Bluegrass, where nearly or quite absent.

Spring.—About equally numerous at all seasons, this rather inconspicuous species has been infrequently recorded in literature. On May 6, 1952, I saw a Great Horned Owl closely pursued by several crows in pine woods 10 miles southwest of London, Laurel County. The species nests so early that the entire spring is taken up with its breeding activities.

Breeding records.—Little is known of the breeding of this early nesting owl in Kentucky. The indications of only 5 dated records (4 from Kentucky, 1 from southern Ohio) are that clutches may be completed as early as January 21-31 and as late as February 11-20 (with a peak, probably, February 1-10). These records are from Clermont County, Ohio (Goodpaster, 1941:19), and Jefferson (Hays, 1957:4), Bullitt (Lovell, 1960:27), and Hopkins (Hancock, 1954:21) counties, Kentucky. They are detailed below. Young just out of the nest: Clermont County, Ohio, May 1, 1932; same in southern Jefferson County, April 22, 1956, and in Hopkins County (Hancock), April 8, 1949 (clearly representing the earliest clutch). Only 2 nests have been reported in literature. Suthard (*vide* Hancock) found 2 eggs in a nest 45 feet up in the top of a hollow shagbark hickory in Hopkins County on March 1, 1937. In Bullitt County, Lovell and his guest, V. C. Wynne-Edwards, found a nest containing 2 young, 40 feet up in a hollow sugar maple. On March 23, 1959,

the young were downy and just feathering out (age here taken as approximately 35 days). The late B. C. Bacon told me of finding several nests in Hopkins County, years ago, in old crow nests in upland oak-hickory woodland. Numerous Tennessee data have been given by Ganier (1947).

Distribution.—Statewide, except for some cleared and highly settled parts of the Bluegrass; doubtless originally common everywhere. References to the numbers of the species at various localities in earlier years were given by Goodpaster (1941:19), Cincinnati; Beckham (1885:40), in Nelson County; Wilson (1923c:132), Calloway County; and Pindar (1887a:55; 1889b:313), for Fulton County. In Kentucky the species has retired before the encroachments of civilization to a much greater extent than the Barred Owl, its numbers at present being more or less directly proportional to the degree of forestation, which in turn is generally greater in precipitous country and on poor soils. Thus it is more numerous in the Cumberland Mountains, on the Cumberland Plateau, and to a lesser degree in the Western Highlands than in the more level and arable parts of the Bluegrass, Pennyroyal, and Purchase. Horned owls are perhaps most numerous in the "coves" and rugged canyons of the Cumberland Plateau, where I have noted them in Laurel, Whitley, Pulaski, Powell, Wolfe, and Wayne counties. Warner and I saw a very dark individual at 3,600 feet elevation on Black Mountain, Harlan County, on July 9, 1946, and I recorded 1 on a ridge in eastern Pike County on June 20, 1951.

In the outer Bluegrass the species is distributed sparsely, mainly in wooded localities close to the Knobs. In Nelson County, Blincoe (1925:410) had but one record, of 1 captured in June, 1920. Monroe has specimens (B.L.M.) taken in the outlying Knobs in southern Jefferson County on July 23, 1937, and August 12, 1939, and recently has recorded a few in wooded ravines in Oldham County. Hancock and I recorded 1 on a deserted farm in Hopkins County, 10 miles northeast of Princeton, on July 15, 1952.

In Kentucky Great Horned Owls are most often found in dry, forested upland situations (often frequenting cliffs) rather than in the rich bottom land forests and mesophytic ravines favored by Barred Owls. The ecological preferences of the two resemble respectively those of the Red-tailed (and Broad-winged) and Red-shouldered hawks in this same region.

Fall and winter.—No notes of special seasonal significance. I heard a bird hooting in hills at Slade, Powell County, on November 20, 1948. In rough upland oak-hickory forest at Kentucky Woodlands National Wildlife Refuge, Cypert recorded 1 on January 9, 1940 (Refuge files). Monroe has recent records for the Louisville area for December 22, 23, and 26. One was found dead in Cincinnati, in early December, 1939 (Goodpaster, 1941:19).

Geographic variation.—As to be expected, Kentucky specimens are referable to the subspecies of temperate eastern North America, *Bubo virginianus virginianus* (Gmelin).

Specimens examined.—Total, 4. M.S.C.—1 female, Rowan County (April 21, 1935); C.W.B.—1 male, Nelson County (June 19, 1881); B.L.M.—1 male, 1 female, Jefferson County (Aug. 12, 1939; July 23, 1937).

Nyctea scandiaca (Linnaeus): SNOWY OWL

Status.—Casual winter visitant.

Records.—According to Audubon (1834:136) Snowy Owls occurred fairly regularly about the Falls of the Ohio River at Louisville in the early 1800's. Wilson (1811a:54) noted one near "Bairdstown" (Bardstown) in April, 1810. Other early records, from Nelson County and Simpson County, respectively, were reported casually by Beckham (1885:40) and Pindar (1887a:55), and the late Miss Susan Starling Towles told me (letter: January 14, 1950) of a Snowy Owl killed near Henderson in the 1840's by her father, Walter Alves Towles (mounted specimen in the Audubon Memorial Museum at Henderson). According to Mr. Dulaney Logan, of Louisville (verbal com.), another was killed near Anchorage in the 1890's by his

father, Emmet G. Logan, and the mounted specimen was kept for some years by the family. One said to have been killed near the present site of Shawnee Park, Louisville, is in the collection of the Louisville Public Library (Beckner). More recent published records refer to 1 "taken 15 years ago" in Nelson County (Blincoe, 1920:4), and 1 killed near Paris, Tennessee, practically on the Kentucky line, December 21, 1930 (Thompson, 1937). One was seen by several observers near Harrod's Creek, Jefferson County, on November 6, 1937 (Brecher, 1938:8-9), and on November 12 a female, probably the same bird, was found dead a few miles away at Avoca. The specimen was mounted by Al Miras, a Louisville taxidermist (see *Kentucky Warbler*, 14:9, 1938), and eventually found its way to the University of Kentucky, where I examined it in 1950. During the great flight year of 1949-1950, several Snowy Owls were reported in Kentucky: 1 was seen by Maslowski and others in Boone County on November 10 and 13, 1949 (Monroe, 1950:13); nearby, Maslowski (notes) secured a male caught the night of December 19, 1949, on a barge in the Ohio River at Cincinnati (= Kenton County, Kentucky); and 1 was reported near Danville, Boyle County (Monroe, *vide* Lovell, 1950b:29). In 1950-1951 a Snowy Owl was reported from Daviess County (Powell, 1951a:64), and another was taken in nearby Hancock County in 1958-1959 (Powell, 1960:55). Among more recent records at hand is that of 1 killed in Washington County on or about November 21, 1954 (Moynahan, 1955:17).

Specimens examined.—Total, 3. U.K.—1 female, Jefferson County (Nov. 12, 1937); Audubon Memorial Museum, Henderson—1 unsexed, Henderson County (1840's); ?—1 male, Kenton County (Dec. 19, 1949), skin in possession of Karl H. Maslowski when examined.

Strix varia Barton: BARRED OWL

Status.—Resident, uncommon in the Cumberland Mountains and Plateau, fairly common to common westward.

Spring.—Barred Owls seem to be present in essentially equal numbers throughout the year but are noisier and more conspicuous in spring and summer. In field work of 1949 and 1950, I found them numerous in the lowlands of Fulton, Hickman, Calloway, Lyon, and Trigg counties.

Breeding records.—The few precisely dated records indicate only that nesting is early, with clutches (seemingly of 2-4 eggs) completed in some cases in February, perhaps more commonly in March. The record is as follows: Goodpaster (1941:19) mentioned nests found near Cincinnati, Ohio, in February. Monroe found a nest in Jefferson County, 5 feet down in the hollow of a dead snag (opening 25 feet above ground), containing 2 heavily incubated eggs on April 4, 1942. On April 9, 1950, Handley and I found a single fresh egg on the ground, in a deserted farm building (about which Barred Owls had lately been seen by local people) in Kentucky Woodlands National Wildlife Refuge, Lyon County. In Hopkins County, Hancock (1954:21) saw flying young on May 8, 1951, and June 7, 1934. In Jefferson County, 2 young out of the nest were seen on April 28, 1956 (Croft and Stamm, *vide* Hays, 1957:4). Family groups with grown young are commonly seen. I took an immature bird, nearly molted from juvenal plumage, from a family group at Glenview, Jefferson County, on June 12, 1942, and such groups have entered Monroe's yard at Anchorage, Jefferson County, every year. I saw 3 grown young in a moist ravine in upland oak-hickory forest near London, Laurel County, on June 26, 1952. Just outside the state, Todd (1939:25) recorded a nest containing 4 young near Murfreesboro, Tennessee, on May 30, 1936.

Distribution.—The Barred Owl is fairly common or common throughout central and western Kentucky, particularly in richly forested stream valleys, and reaches its greatest abundance in the broad flood plains of the Purchase region and the lower Ohio Valley. Despite some statements that it is uncommon, for years I have found it readily and regularly at all seasons in virtually all of many suitable areas visited west of the Cumberland Plateau. On the Plateau and in the mountains, however, it is decidedly less numerous. In recent field work I have recorded a few (May,

June) in rugged country in Laurel County and Powell County, in the Cliff Section (see pp. 41-43) of the Plateau, where the species has been recorded also by Barbour (1951a:34) in Rowan County and Wetmore (1940:537) in Wayne County. Its presence still farther east was attested by Patten (1937:18) in Floyd County, Barbour (1956:6) in Breathitt County, and Barbour (*vide* Wilson, 1942:22) in Harlan County. In considerable field work in the mountainous counties of the southeastern border I have recorded none, but Breiding (1947:38) reported 2 birds seen on Black Mountain, Harlan County, July 5, 1944. Almost everywhere the Barred Owl is less numerous than the Great Horned Owl in upland forests, especially the more xeric ones, while the reverse is true in swamp and river bottom forest. Possibly competition between the two, and even predation by the Great Horned Owl upon the Barred Owl, plays some part in their distribution and abundance. The decrease of the Great Horned Owl over large areas in the face of settlement and cultivation may well have favored the Barred Owl, which is here much less retiring and occurs, given large trees, even in city parks and along populous residential streets.

Fall and winter.—There is no evidence of a decrease in winter. In field work conducted 1948-1952, I noted Barred Owls, from November to early January, in various central and western localities from Jefferson County to Fulton County.

Geographic variation.—Wetmore (1940:537) has identified several Kentucky specimens as the northern subspecies *Strix varia varia* Barton, to which others that I have seen are likewise referable, having the toes more or less fully feathered. This appears to be the resident subspecies of most if not all of Kentucky, although a tendency toward the naked toes characteristic of *S. v. georgica* Latham is apparent in occasional specimens, such as a male (U.K.) taken at Lexington in February, 1940. There is some evidence (see Wetmore, 1939:187-188) of the occurrence of *georgica*, or at least of intermediate specimens, in the vicinity of Reelfoot Lake, Tennessee, where it has long been reported (as *S. v. alleni*) on purely theoretical grounds (by Ganier, 1933:20; Whittemore, 1937:121; and probably others). Although the population of extreme southwestern Kentucky may prove to be intermediate, there is at present no reason for admitting *georgica* to the Kentucky list.

Specimens examined.—Total, 12. M.S.C.—1 unsexed, Rowan County (July 20, 1939); 1 unsexed, "Licking R[iver]." (April 14, 1936); U.K.—1 male, Fayette County (Feb., 1940); B.L.M.—1 female, Oldham County (Aug. 5, 1936); 1 male, 1 unsexed immature, Jefferson County (Aug. 25, 1938; June 12, 1942); 1 female, Green County (Dec. 28, 1940); Western Kentucky State College Coll.—1 unsexed, Warren County ("1920's"); U.S.N.M. (see also Wetmore, 1940:537)—4 specimens from Meade, Muhlenberg, Butler, and Hopkins counties (May 2—Nov. 11, 1938).

**Asio otus* (Linnaeus): LONG-EARED OWL

Status.—Poorly known; recorded only in spring, fall, and winter and seemingly very rare.

Records.—A specimen secured by Blincoe (1920:4) near Bardstown, Nelson County, on February 16, 1914 (given as January 16 by Blincoe, 1925:409), can no longer be located. On March 7, 1917, Blincoe recorded another in the same cedar thicket where the first was obtained. It seems likely that these were wintering birds. At Louisville, Young (1942) saw 1 in cedars at an evergreen nursery on November 1, 1941, and in Warren County, Wilson (1922:236) saw individuals on March 14 and April 13, 1918. A specimen shot in Daviess County, 1 mile from Maceo, was handled by Harry Berkshire, a local taxidermist, who informed A. J. Powell (letter: May 21, 1961) that the bird was killed in November or December of 1955 (the date being a little earlier than first indicated by Powell, 1960:55) and that the specimen had since been thrown away. The same taxidermist had seen another locally taken specimen. A few Long-eared Owls were reported seen in Crittenden County in March, 1959 and 1960 (C. Frazer, 1960). The species has long been known to winter regularly around Cincinnati, Ohio (Langdon, 1879:179; Dury, 1887; Goodpaster, 1951:19), and the numbers recorded there in recent years (Kem-

sies and Randle, 1953:27) suggest that it must frequently have been overlooked in Kentucky, where evergreen plantations and cedar groves should be carefully watched for it. Other extralimital records are from Nashville, Tennessee, where a bird was taken in cedars on January 12, 1923 (Ganier, 1940:4), and near Dyersburg, Tennessee, where a dead specimen was found by Monroe (1944:15) on January 21, 1944. Langdon (1879:179) recorded grown young taken by Dury in Hamilton County, Ohio, in July, 1878, but no specimens are now in the Dury collection. In earlier times, Audubon (1838:572) wrote that the species was "not rare" in Kentucky and mentioned it particularly as frequenting the "barrens" (original prairies). Also, an early drawing, probably based on a specimen secured in Warren County, is among Sarah Price's water colors preserved in the Missouri Botanic Gardens (Lovell, 1959:28).

Geographic variation.—The subspecies occurring in Kentucky is doubtless the eastern North American *Asio otus wilsonianus* (Lesson), although no specimens have as yet been available for comparison.

Asio flammeus (Pontoppidan): SHORT-EARED OWL

Status.—Winter resident, irregular and uncommon.

Spring.—The species departs early. Monroe's latest record at Louisville is February 16 (1947). Lovell (1950b:28) reported 1 bird shot south of the city about March 10, 1950. One was recorded near Owensboro, Daviess County, in the first week of March, 1950 (Powell, 1951:9).

Fall.—Short-eared Owls are rarely recorded before December. The earliest record available is for Oldham County, where a female was taken by Monroe on October 10, 1940 (B.L.M.). Also near Louisville, in late October, 1933, I noted a flock of 9 or 10 individuals frequenting a fallow field in eastern Jefferson County and in early November took 2 specimens, 1 of which is still extant (B.L.M.; mounted specimen). I recorded another, perched in a tree at Buechel, Jefferson County, on November 21, 1936 (Mengel, 1937a:23-24), and Monroe has Louisville area records for November 4 and December 16. Specimens taken in November at various other localities are listed below.

Winter.—The species occurs typically in small, loose flocks which inhabit the grassy uplands also favored by Marsh Hawks and is almost certainly more numerous than the records indicate. Short-eared Owls have been recorded near Louisville, by Monroe and others, almost every winter in recent years. Monroe noted a flock of 8 near Worthington, Jefferson County, on February 16, 1947; he and I saw a single bird at the same place in a heavy snowfall on January 7, 1951, and there are other records for the immediate area (Monroe, Jr., 1945). Near Cincinnati, Ohio, this owl has long been known as a winter resident, occurring at times in fair numbers (Langdon, 1879:179; Goodpaster, 1941:19; Kemsies and Randle, 1953:28). At Kentucky localities other than Louisville it has been reported, rather infrequently and in varying detail, from Floyd County (Patten, 1937) and Rowan County (Barbour, 1952:25) in the east to Fulton County in the extreme west (Pindar, 1889b:313).

Note.—Years ago Wilson wrote that the species was resident in Calloway County (Wilson, 1923c:132) and reported a record for Ballard County (Wilson, 1922b:97) made August 30, 1917. There is no further evidence of the Short-eared Owl summering or breeding in Kentucky and I regard both records as questionable.

Geographic variation.—The subspecies occurring is the Holarctic *Asio flammeus flammeus* (Pontoppidan).

Specimens examined.—Total, 9. M.S.C.—1 female, Rowan County (Nov. 10, 1937); C.W.B.—1 female, Nelson County (Nov. 17, 1881); C.M.N.H.—1 male, 1 female, "Kentucky" (Jan., 1884; Nov. 16, 1931); Murray State College Coll.—1 unsexed, Graves County (1928); B.L.M.—1 female, Oldham County (Oct. 10, 1940); 1 male, 1 female, 1 unsexed (mounted), Jefferson County (Feb. 16, 1947 [2]; Nov., 1933).

Aegolius acadicus (Gmelin): SAW-WHET OWL

Status.—Winter resident, seemingly very rare, but probably more numerous than the records indicate.

Records.—Only four in recent years. Barbour (1940:254) reported a bird captured at Rodburn, Rowan County, on October 21, 1939 (R.W.B.), and on February 19, 1950, Ronald Austing (letter: May 2, 1950), Emerson Kemsies, and Worth Randle saw another in the same county, about 6 miles northwest of Morehead. The latter bird was roosting in a two-acre pine plantation containing trees 10 to 15 feet high, and was almost caught by hand. One was noted regularly in Jefferson County, October–December, 1955, by Frank Krull (see *Kentucky Warbler*, 32:14, 1956), and a bird was found dead in Hopkins County on or about January 23, 1959 (Hancock, 1959a:39). The considerable number of records (recent ones ranging from October 15 to March 12) from the vicinity of Cincinnati, Ohio (Slack, 1936; Goodpaster, 1941:19; Kemsies, 1948a:28) suggests that the species may be more numerous in Kentucky than the records suggest. Audubon (1834:567) stated that he had observed it breeding in Kentucky but gave no details. I regard the last as hypothetical.

Geographic variation.—The subspecies occurring is that of eastern North America, *Aegolius acadicus acadicus* (Gmelin).

Specimens examined.—Total, 1. R.W.B.—1 female, Rowan County (Oct. 21).

FAMILY CAPRIMULGIDAE: GOATSUCKERS

Caprimulgus carolinensis Gmelin: CHUCK-WILL'S-WIDOW

Status.—Summer resident, rare to common, chiefly west of the Cumberland Plateau counties.

Spring.—Occasionally early arrivals are noted in March or early April, more often in mid-April; arrival in numbers appears usually to fall between April 25 and May 1. Early records: April 7, at Covington (Bent, 1940:162; source and validity of record unknown); April 27, at Louisville (Monroe); April 14, in Warren County (Wilson, *vide* Schneider, 1944:15); "middle of March" (1950), at Owensboro (Powell, 1951:9); April 16 (1947), at Wheatcroft, Webster County (Withers, 1947). The species is very noisy at this season.

Breeding records.—Few. Eggs are laid chiefly in the first half of May. Schneider (1944:16) reported two nests, one found near Science Hill, Pulaski County, in May, 1942 (Barbour), and one at Oil Springs, Clark County, by Figgins and others, on May 17, 1942 (Dodge). Withers (1947) reported a nest from Webster County (no date). Hancock (1951b:40; 1954:21) found nests in Hopkins County on May 12, 1952, and May 28, 1951, and in years past Bacon took several sets of eggs there (2 sets in Bacon collection). Fuller (*vide* Hays, 1957:4) found a nest in Marshall County on May 21, 1956. All "nests" have contained 2 eggs and have been situated in leaves or leaf-mold on the floors of open forests of oak, oak-hickory, mixed hardwoods, or (the Clark County nest) pine.

Distribution and history.—At present the species occurs, although in greatly varying numbers, essentially throughout Kentucky west of the Cumberland Plateau (see Fig. 39, p. 468), with the apparent exception of certain extensive, highly cultivated, largely deforested portions of the Bluegrass. Many of the earlier records were summarized by Schneider (1944). The Chuck-will's-widow was not recorded in Kentucky by either Audubon or Alexander Wilson, and it is barely possible that it did not occur in the state in the early 1800's. It has, however, been present in extreme western Kentucky since the 1890's (when it was noted in Fulton County by Pindar, 1925a:87), at the latest, and probably since long before that, Ridgway (1889:367) having noted it in southern Illinois as early as 1865. Writing of the early 1900's Wilson (1923c:133) considered it common to abundant in Calloway

County. The details are vague, but roughly in the last 50 years there appears to have been a definite expansion of the range of the species, accompanied by a gradual increase in numbers in the newly occupied areas. Thus Blincoe (1925:411) recorded it in 1915 and 1917 in Nelson County, where Beckham (1883, 1885) had found none in active work of 30 years earlier. In the last 20 years or less it has become increasingly numerous in the Knobs in parts of Bullitt and Meade counties where it seemingly did not occur before, and since 1942 it has established itself in the Knobs around Louisville both in Kentucky and southern Indiana (Lovell and Lovell, 1944:52-53; Brecher, 1949:10-11) and in parts of eastern Jefferson and southern Oldham counties well within the Bluegrass (Monroe, 1955:45, and notes). Near Cincinnati, where it was earlier unrecorded, Goodpaster took a female in Clermont County, Ohio, on May 20, 1945 (C.M.N.H.). I recorded 1 bird in the Kentucky River valley near Worthville, Owen County, on July 5, 1950. Eastward, along the northeasterly extension of the Knobs where they abut against the Cumberland Plateau, the species' progress has been poorly documented, but it had reached southeastern Ohio (Adams County) as early as 1932 and later became well established there (Hicks, 1935a:155). No record was obtained from the Cumberland Plateau, despite considerable work there both by resident and visiting students (see Schneider, 1944:15, map) until May and June, 1952, when I found at least two pairs in hilly farm country in Laurel County 7 miles east of London (May 8-June 30) and heard a bird singing in poor farm land 2 miles north of Williamsburg, Whitley County, on June 27. These were the first I recorded in 14 years of intermittent field work in these areas, and I think they represent a real and recent extension of range. Nearby, "chucks" have been recorded in valleys interdigitated with the Plateau, as at Stanton, Powell County, where I recorded 2 singing on June 19, 1951, and in Rowan (Barbour, 1952:26), Madison (Patten, 1946:33), and Wayne (Wetmore, 1940:537) counties, and Pickett County, Tennessee (Ganier, 1937a:27).

Wilson (1947b:63) was puzzled by the presence of the species in some areas and its absence from others, in Edmonson and Warren counties. The distribution of the Chuck-will's-widow is indeed perplexing and invites comparison with that of the Whip-poor-will, in Kentucky a species typical of cool, heavily forested, often precipitous terrain, and reaching its greatest abundance in the Mixed Mesophytic Forest region. Occurring in and at the edges of both mixed mesophytic and drier forests, the Whip-poor-will is common and evenly distributed through most of the Cumberland Plateau and Mountains, becoming less generally distributed, though still locally common, in the wooded Knobs and parts of the Western Highlands. In the largely deforested Bluegrass, Pennyroyal, and (especially) Purchase, it is rare and local and there is some indication that it is decreasing in these areas, as it has in cleared northern and western Ohio (Hicks, 1935a:155). The Chuck-will's-widow, on the other hand, is a southern species typical of drier and more open situations such as farm woodlots, oak-hickory and pine groves, and old field margins. Its distribution in Kentucky is thus complementary to that of the Whip-poor-will, with the "chuck" most numerous in the Pennyroyal and Purchase where the Whip-poor-will is least so, and essentially absent from the plateau and mountains where the Whip-poor-will is abundant.

The importance of the part played by interspecific competition or hostility in affecting the occupancy of new territory by either species at the expense of the other is unknown and purely conjectural, although it is a common assumption that such closely related and ecologically similar species are likely to conflict (for example, see Lack, 1947:134-135). In any event it seems evident that general deforestation has facilitated the northward advance and increase of the "chuck," while legislating against the Whip-poor-will. The "chuck" has steadily increased in Hopkins County with deforestation (Hancock, 1954:21), and has succeeded in penetrating the Cumberland Plateau only in its most deforested portion. At the same time, in Mammoth Cave National Park where large areas have been reverting

from farm land to forest since about 1930, the Chuck-will's-widow has decreased and the Whip-poor-will grown more numerous (Wilson, 1950:22-23).

Fall.—No reliable information is available as to time of departure. Singing ceases early, usually in July (with, probably, occasional singing in early autumn), and the birds are seldom recorded later. However, the suggestion of several authors that the species departs in July or August is almost certainly erroneous. Available late records: August 17, in Warren County (Wilson, 1922:236—more recently Wilson gave August 3 as latest; see Schneider, 1944:16); July 23, at Madisonville (Hancock, notes). I recorded several "chucks" in Ballard County July 17 (heard) and 19 (seen), 1951.

Specimens examined.—Total, 1. B.L.M.—1 female, Bullitt County (June 21, 1941); I took the aforementioned at the edge of an oak-hickory woodland. I have not seen a specimen from Nelson County, June 15, 1915 (Blincoe, 1916:173, later reported in error as June 27; Blincoe, 1925:411), nor one from Breckenridge County, 1931 (Schneider, 1944:16).

Caprimulgus vociferus Wilson: WHIP-POOR-WILL

Status.—Summer resident, rare to common, decreasing towards the south and west.

Spring.—Whip-poor-wills are occasionally noted in middle or late March; arrival in numbers usually occurs in mid-April. Early records: April 2 (1893), at Eubank, Pulaski County, average of 13 years April 11 (Oberholser, 1926a:119); April 4, in Rowan County (Barbour, 1951a:34); April 18 (1937), at Cincinnati, Ohio (Goodpaster, 1941:20); March 20 (1948), at Louisville (Young, 1948a:42), next record March 21, average about April 12 (Monroe); "middle of March," 1951, at Owensboro (Powell, 1951:9); March 23 (1945), in Warren County (Wilson, *vide* Deane and Peil, 1946). At Kentucky Woodlands National Wildlife Refuge, Trigg County, Handley and I recorded a mass arrival April 15 and 16, 1950, taking a male (U.M.M.Z.) on the latter date. The birds were singing vigorously.

Breeding records.—Few. Eggs appear to be laid from late April to mid-June. The ovary of a female I took in Laurel County on April 27, 1949 (U.M.M.Z.) contained very large ova. A nest with 2 eggs was found on May 14, 1948, near New Albany, Indiana, just across the river from Louisville (Brecher, 1949:11), and Butler (1897:848) gave southern Indiana laying dates May 1-10. Monroe found a nest containing 2 heavily incubated eggs near Solitude, Bullitt County, on June 1, 1935. Lovell, Stamm, and Pierce (1955:9) reported a nest containing 2 young (Stamm's notes remark that these were of notably different size, 1 wholly downy, the other showing much juvenal plumage) in Owen County on May 30, 1954, and nests with 2 eggs were found there on June 14 and 25, 1955, the last still being incubated on July 3 (Stamm, notes). Other nestings have been reported from Rowan County (Barbour, 1951a:34), Bullitt County (Lovell, 1951b:59—June 8 or 9, 1951), and Hopkins County (Bacon, verbal com.), but without details. On June 13, 1942, Monroe and I took a juvenal-plumaged young bird (B.L.M.) just able to fly, in the Knobs of southern Jefferson County. Two eggs would seem to be the usual number (only 4 clutches and 1 brood have been reported). Nests have been situated among leaves and litter in or near the edges of deciduous woodland.

Breeding distribution.—In a general way the Whip-poor-will is decreasingly numerous from east to west, or from highland to lowland and from a region of well developed mixed mesophytic forest (and lesser deforestation) to one of drier, mixed (but not mixed mesophytic) forest (and generally greater deforestation). Speaking more precisely, it is numerous on the Cumberland Plateau and in the lower reaches of the Cumberland Mountains (for reasons unknown to me it is, rather surprisingly, either absent or very rare in the high Cumberlands, being, apparently, unrecorded above 3,000 feet elevation on Black Mountain, Harlan County) and is common, if not abundant, in suitable habitat throughout this area. To the west, it is common also in forested areas of the Knobs, Western Highlands, and adjacent localities, but is more locally distributed and approaches densities

prevailing in the east only in a few areas possessing well-preserved mature forests, as in parts of Bullitt County (Bernheim Forest), Fort Knox Military Reservation in Meade and Hardin counties, and the sandstone uplands and moist ravines of the Mammoth Cave area. In the more open and extensively cultivated Bluegrass and Pennyroyal, with their drier forests and smaller forest remnants, it is decidedly local and much less numerous. It is here confined mainly to forested knolls, ravines, and gorges such as that of the Kentucky River. Still farther west it is locally common in the low, well-forested hills of Lyon and Trigg counties, between the Cumberland and Tennessee rivers, but reaches its lowest density in the open fields and oak-hickory woodlots of the adjacent Purchase, where the Chuck-will's-widow perhaps attains its greatest abundance. There is some evidence that the Whip-poor-will has decreased with deforestation. Writing of the 1890's, Pindar (1925a:87) considered it slightly more numerous than the Chuck-will's-widow in Fulton County, which is certainly not the case today, and Hancock (1954:21; see also *Kentucky Warbler*, 30:47, 1954) has noted a decrease with deforestation in Hopkins County. For further discussion see the account of the Chuck-will's-widow.

Fall.—Whip-poor-wills call infrequently in late summer and early fall, and records are few. In Jefferson County one sang on September 17, 1956 (Deane, 1958:26). Late records: October 4 (1889), at Eubank, Pulaski County, average of 7 years September 17 (Oberholser, 1926a:120); September 25, at Cincinnati, Ohio (Goodpaster, 1941:20); September 29 (1957), at Louisville (Noland, 1958:26; next record September 22, Monroe); September 8 (1941), in Marshall County (specimen; J.D.F.).

Geographic variation.—The population of Kentucky belongs with *Caprimulgus vociferus vociferus* Wilson, the subspecies of eastern North America.

Specimens examined.—Total, 9. M.S.C.—1 unsexed, Rowan County (July 8, 1935); U.K.—2 females, Woodford County (May 4, 6, 1940); B.L.M.—1 adult male, 1 juvenal-plumaged male (?), Jefferson County (June 13, 1942); C.U.—1 female, Logan County (May 13, 1905); J.D.F.—1 male, Marshall County (Sept. 8, 1941); U.M.M.Z.—1 female (weight, 67.9 gm., not fat), Laurel County (April 27, 1949); 1 male, Lyon County (April 16, 1950).

Chordeiles minor (Forster): COMMON NIGHTHAWK

Status.—Summer resident, uncommon to common.

Spring.—Nighthawks arrive about April 30, sometimes a few days earlier, with maximum numbers usually present by May 10. Early records: April 23 (1893), at Eubank, Pulaski County, average of 12 years April 30 (Oberholser, 1926b:257); April 19 (1903), at Lexington, average of 4 years April 27 (Oberholser, *loc. cit.*)—also April 24 (1917; C. K. Morrell, *vide* Funkhouser, 1925:226); April 26 (1938), at Cincinnati, Ohio (Goodpaster, 1941:20); April 22 (1952), at Louisville (Monroe); April 17, in Warren County (Wilson, 1922:237). The date of March 13 given for Rowan County by Barbour (1951a:34) is almost certainly erroneous. During much of May, nighthawks seem to be more numerous in Kentucky than in the breeding season, as many authors state, but spectacular group migrations such as those of fall are unrecorded. Near Reelfoot Lake, Tennessee, I noted several small flocks of 3 to 8 birds between May 14 and 17, 1949, and a male I took on May 23 had small testes and much fat (weight, 87.8 gm.), suggesting that it was a transient.

Breeding records.—Few. Indeed, only 4 dated observations are at hand, but these are nonetheless sufficient to show that the usual clutch of 2 eggs is laid as early as May 1–10 and as late as July 11–20, and to suggest that two broods are sometimes reared. Slack (1942:15–16) recorded 2 young on a gravel roof in Louisville, Jefferson County, in early June, 1939. In Franklin County, Ringo (1956:63) noted the second of 2 eggs laid on a gravel roof in Frankfort on May 25, 1956. The eggs hatched on June 11 (incubation 18 days) and the young left the roof on July 2 (21 days after hatching). In Calloway County, Slack (1957:64–65) recorded incubation of 2 eggs on a gravel roof in Murray from July 18 to July 28,

1957 (hatching not recorded), and was informed of half-grown young noted nearby on June 4 of the same year. Less definite records have been reported by Funkhouser (1925:226-227), locality unstated but probably Lexington, Fayette County; by Barbour (1951a:34), for Rowan County (see also "specimens examined"); and Bacon (verbal com.) from Hopkins County. A cooperative project could doubtless produce many valuable data on this interesting species, even in a single year.

Distribution.—Statewide; many records. The species is rare in the heavily forested portions of the Cumberland Mountains and Plateau, considerably more numerous in the farm lands and urban areas of central and western Kentucky. It seems to be somewhat less numerous in the Purchase region of extreme western Kentucky than in the broad area between the Cumberland Plateau and the Tennessee River, but is probably much more numerous as a breeding bird today than in primitive times. It occurs in greatest numbers about towns and cities where the gravel rooftops provide ideal nesting sites. In June, 1949, and July, 1951, I watched several pairs, the males of which were courting and apparently patrolling territories in open farm country of the Purchase, in Graves and Ballard counties, respectively, and I suspect that these birds were breeding in natural situations. How commonly this occurs in Kentucky today is unknown.

Fall.—The beginning of migration is evidenced by the appearance of large, cruising flocks, occasionally of as many as several hundred birds, in late August and early September. Among others, Monroe and I have seen numerous such flocks over the years, usually consisting of 40 or so to 100 or more birds drifting slowly over open country, most often in late afternoon. Large flocks have been reported by numerous observers, as early as August 20 (1939), at Cincinnati, Ohio (Goodpaster, 1941:20) and as late as October 3 (1879), in Nelson County (Beckham, 1885:36-37) and other records are given by Dury (1887) and Pindar (1889). Individuals judged by their behavior to be breeding birds are often still on hand in mid-September, but by early October nighthawks are rare, whether resident or transient. Late records: October 9 (1890), at Eubank, average of 7 years September 22 (Oberholser, 1926b:259); October 9 (1936), at Cincinnati (Goodpaster, 1941:20); October 26 (1920), in Nelson County (Blincoe, *vide* Funkhouser, 1925:226); October 25 (1960), at Louisville (Monroe); October 20, in Warren County (Wilson, 1922:237). My own latest record is of 2 birds seen over wooded hills in Rockcastle County on October 2, 1951.

Geographic variation.—The specimens thus far accumulated are insufficient for full understanding of the geographic variation in either the breeding or transient nighthawks of Kentucky. Limited evidence suggests that the breeding population of most of the state belongs with the northern subspecies, *C. m. minor*, but the birds of extreme western Kentucky are intermediate between *minor* and the southeastern race *C. m. chapmani*, to which they may be tentatively referred at present. *C. m. sennetti* of the Great Plains seems to be represented by one specimen, presumably a transient. Present knowledge is perhaps best expressed by the admission of three subspecies, with reservations noted below.

Chordeiles minor minor (Forster)

While this comparatively large, dark-colored, northern subspecies is probably the breeding nighthawk of most of Kentucky east of the Tennessee River, this is inferential because the few specimens examined were all taken at times when transients could have been present in the state. Specimens referable to *minor* are as follows: a very long-winged, dark-colored male (wing 212 mm., weight 77.0 gm., moderately fat) which I took 4 miles north of Richmond, Madison County, on April 26, 1949 (U.M.M.Z.); a female (wing 202) taken by J. F. Spears in Lincoln County on May 8, 1940 (U.K.), and one (wing 207) taken by Monroe at Avoca, Jefferson County, on September 6, 1946 (B.L.M.); and 2 unlabelled adults, presumably from Rowan County (M.S.C.). Two additional males examined have the color characters of *minor* but fall near the lower size-limits of that form and may actually stem from

intermediate populations. These were taken at Motley, Warren County (wing 186), by Ottis Willoughby, April 29, 1935 (W. Kentucky State College Coll.), and 5 miles east of Tiptonville, Tennessee, a few miles south of the Kentucky line (wing 190; weight 87.8 gm., very fat), by me on May 23, 1949 (U.M.M.Z.).

Chordeiles minor sennetti Coues

A single adult female typical of this pale, plains form was taken by Monroe (B.L.M.) at Buffalo, Larue County, on September 6, 1947, and has a wing measuring 195 mm. It seems in color to be well beyond the range of variation observable in *minor* and is larger than average *chapmani* and considerably paler. The presence of *sennetti* in migration in the Mississippi Valley has previously been reported, from Ohio, by Aldrich (1936) and Hicks (1938), but the form does not appear to have been recorded previously in Kentucky.

Chordeiles minor chapmani Coues

Three specimens from extreme western Kentucky show a tendency toward the smaller size and slightly paler coloration of this southeastern subspecies, to which the nighthawks of this area have long been referred (see Oberholser, 1914:75-76; Ridgway, 1914:574; A.O.U. Check-List, 1931:176, 1957:295). As might be expected in this area of clinal geographic variation, the specimens are intermediate in size, being near the large extreme of *chapmani* and, as individuals, within the minimum range of *minor*. They are the following (all U.M.M.Z.): 1 female from 12 miles south of Mayfield, Graves County, June 11, 1949 (wing 187; weight 77.4 gm., moderately fat); 2 females from 4 miles east of Barlow, Ballard County, July 17, 1951 (wings 183, 186; weights 67.4, —; not fat, one molting inner primaries). Also small (wing 186) was a male taken at Mount Carmel, Illinois, June 7, 1874 (Oberholser, 1914:76-77).

Specimens examined.—Total, 12 (subspecies and measurements noted above). M.S.C.—3 unlabelled specimens, Rowan County (?); U.K.—1 female, Lincoln County (May 8); B.L.M.—1 female, Larue County (Sept. 6); W. Kentucky State College Coll.—1 male, Warren County (April 29); U.M.M.Z.—1 male, Madison County (April 26); 1 female, Graves County (June 11); 2 females, Ballard County (July 17); 1 male, Lake County, Tennessee (May 23).

FAMILY APODIDAE: SWIFTS

Chaetura pelagica (Linnaeus): CHIMNEY SWIFT

Status.—Common summer resident.

Spring.—The first swifts generally arrive in early April, usually between April 5 and 15; numbers normal for the breeding season seem usually to be present by about April 20. Early records: April 10, at Morehead, Rowan County (Barbour, 1951a:34); April 6 (1888), at Eubank, Pulaski County, average of 12 years, April 13 (Oberholser, 1926:10); April 14 (1940), at Cincinnati (Goodpaster, 1941:20); April 2 (1913), at Lexington, average of 5 years, April 9 (Oberholser, *loc. cit.*); April 1, at Bardstown (Blincoe, 1925:411); March 31, at Louisville (Monroe); April 1, in Warren County (Wilson, 1922:237).

Breeding records.—The very few dated observations are inadequate to indicate the probable extent and modality of the breeding season. Dates of clutch completion suggested by five records fall only between June 1-10 (3) and July 1-10 (2), but are sufficient, considering the comparatively early arrival of the species, to suggest that two broods are sometimes reared. Six reported clutches or broods range from 2 to 5 eggs or young (average 3.3 ± 1.1). Van Arsdall (1949:25) reported a nest and 2 eggs (hatching June 18) found in Mercer County in 1941. Monroe found 4 eggs in a nest in the chimney of an old farm house at Solitude, Bullitt County, on June 15, 1935 (B.L.M.), and a nest and 5 fresh eggs, six feet from the top of his own chimney at Anchorage, Jefferson County, June 6, 1941. At Otter Creek,

Meade County, Lovell (1949*b*:44) found a nest containing 3 eggs on July 17, 1945, and one with 2 young on August 2, 1945. Hancock (1954:21) noted 4 downy young in Hopkins County on July 6, 1935. Wilson (1946*d*:23) noted swifts breaking off twigs, presumably for nesting material, from a dead elm in Warren County for nearly a month, beginning June 20, 1945.

Breeding distribution.—The Chimney Swift is common in summer in cleared and settled areas throughout the state, but is less numerous in extensively forested tracts. I found it in numbers at every locality visited in several years of field work, with the exception of the higher Cumberland ridges in Bell, Harlan, Letcher, and Pike counties, where it is decidedly uncommon. I saw only a few swifts at higher elevations on Black Mountain, Harlan County, in several weeks of observation in the breeding season, and Barbour (1941*a*:47) recorded none there. Nesting and roosting of swifts in hollow trees, as was observed at Louisville and described at length by Audubon (1834:329, 331), is apparently rare today. From July 15 to 21, 1951, however, I repeatedly saw swifts entering several large, hollow cypresses at Fish Lake near Barlow, Ballard County, where by coincidence Barbour and Gault (1952) made similar observations at almost the same time.

Fall.—Swifts remain numerous through much of September, becoming less so in the last part of the month, and rare by early October. Large flocks sometimes congregate in late summer and early fall, roosting nightly in large chimneys, such as those of school buildings (see Bailey, 1933:114–115; and Wilson, 1922:237). Late records: October 9 (1887), at Eubank, average of 6 years, October 3 (Oberholser, 1926:12); October 19 (1905), at Lexington, average of 3 years, October 12 (Oberholser, *loc. cit.*); October 11 (1936), at Cincinnati (Goodpaster, 1951:20); October 15, at Bardstown, Nelson County (Blincoe, 1925:411); October 14 (1952), at Louisville (Monroe); October 16, at Bowling Green (Wilson, 1922:237). In Laurel County, October 3–11, 1951, I noted a few daily until October 6, on the evening of which cold weather and steady rain commenced and lasted all night. No more swifts were seen, despite a careful watch.

Specimens examined.—Total, 5. M.S.C.—2 unsexed, Rowan County (May); C.W.B.—2 females, Nelson County (April 25 and May 7, 1882); Murray State College Coll.—1 unsexed, Graves County (April 14, 1936).

FAMILY TROCHILIDAE: HUMMINGBIRDS

Archilochus colubris (Linnaeus): RUBY-THROATED HUMMINGBIRD

Status.—Common summer resident.

Spring.—Early arrivals occasionally appear in mid-April, usually in late April; the species is common by May 1. Early records: April 18, in Rowan County (Barbour, 1951*a*:34); April 13 (1893), at Eubank, Pulaski County, average of 11 years, April 22 (Oberholser, 1924:109); April 23, in Nelson County (Blincoe, 1925:411); April 19 (1957), at Louisville (Monroe); April 22 (1929), at Mammoth Cave (Bailey, 1933:116); April 22, in Warren County (Wilson, 1922:237); April 30 (1886), in Fulton County (Pindar, 1887*a*:84).

Breeding records.—Comparatively few. Clutches are completed, as indicated by 12 dated records, from April 21–30 to July 1–10, with no marked peak evident. Records are from Rowan (Barbour, 1951*a*:34; Welter, 1935); Wolfe and Laurel (Mengel, notes); Mercer (Van Arsdall, 1951); Oldham (Stamm, Shackleton, and Slack, 1953:26); Marion (Monroe, notes); Daviess (Powell, 1953:60); Henderson (Cooper, 1952; see also *Kentucky Warbler*, 28:50, 1952), and Hopkins (Hancock, 1954:22) counties, Kentucky; and from New Albany, Floyd County, Indiana (Cannon, 1944), just across the Ohio River from Louisville. The earliest date of clutch completion may probably be inferred from nest construction observed in Rowan County on April 27 (Barbour, 1951*a*), nearly the latest local date being provided by laying of the first egg on July 2, 1934, in a nest in the same county (Welter, 1935). Among the rec-

ords cited above are those of nests studied in some detail by Welter at Morehead, Rowan County, by Cooper at Henderson, and by Cannon at New Albany, Indiana. At Morehead, 2 eggs were laid in one nest on June (from context obviously not July as stated) 25 and 26, 1934, and 1 in another on July 2, 1934, both nests later being destroyed. The Henderson nest was discovered on June 22 (1951?), when it presumably contained eggs; the young left on July 27 and 28. Two eggs laid in the nest at New Albany, July 5 and 6, 1943, hatched on July 18 (incubation 12 days), and the young left on August 1 and 5. One of the nests in Rowan County was completed in one day, and the male was said to have assisted in its construction. The observations made at Henderson by Cooper were more typical, the male not being noted near the nest. Unpublished records are: May 25, 1929, female incubating on a nest 15 feet above Rolling Fork River, in Marion County (Monroe); June 23, 1948, unoccupied nest 3 feet above ground in a small pine 4 miles north of Pine Ridge, Wolfe County, and July 8, 1948, female perched beside a nest on a dead twig 12 feet up in a red oak at the edge of a cliff in Laurel County (Mengel). All of 6 clutches and broods have contained the standard 2 eggs or young. A precariously placed nest at Henderson (see *Kentucky Warbler*, 1953, no. 3, cover) was built on a peach; others have been in various trees including silver maple, oaks, hemlock, and beech, 8 averaging 9.9 feet above ground (3-15 feet, heights up to 30 mentioned by Hancock, 1954).

Breeding distribution.—The species is common in summer throughout the state. Sometimes fair numbers gather about attractive banks of flowers (see Wilson, 1921: 275). I have found Ruby-throated Hummingbirds in many habitats, including pine-oak woodland, cypress swamps, densely forested ravines, and open meadows, at all elevations to the top of Black Mountain (4,150 feet) in Harlan County.

Fall.—The species becomes less numerous by mid-September and is rare by the end of the month. It is seldom encountered later. Late records: September 21-28 (1938), on Log Mountain, Bell County (Wetmore, 1940:538); October 1 (1886), at Eubank, average of 6 years, September 20 (Oberholser, 1924:110); October 17 (1936), at Cincinnati (Goodpaster, 1941:20); October 14 (1954), at Louisville (Monroe); September 28 (1929), at Mammoth Cave (Bailey, 1933:117); October 15, in Warren County (Wilson, 1922:237).

Specimens examined.—Total, 7. U.K.—1 female, Fayette County (May 20, 1905); B.L.M.—2 males, Jefferson County (May 10, 18); U.S.N.M.—1 female, Harlan County (June 25); 1 female, Union County (May 16); 1 male, Fulton County (May 30); U.M.M.Z.—1 male (weight 2.9 gm., moderately fat), Henderson County (Sept. 7, 1949).

FAMILY ALCEDINIDAE: KINGFISHERS

Megasceryle alcyon (Linnaeus): BELTED KINGFISHER

Status.—Resident, common in western and central Kentucky, decreasing eastward; somewhat less numerous in winter.

Spring.—Numbers normal for the breeding season are attained, so far as casual observation shows, by March. Just north of Kentucky, at Brookville, Indiana, Butler (1897:828) noted mating "as early as March 24 (1893), and as late as April 15 (1887)." I saw a pair engaged in what appeared to be courtship activity (repeated chasing) along the Middle Fork of Red River at Slade, Powell County, on April 9, 1951.

Breeding records.—Judging from 13 dated observations, clutches are completed from April 1-10 to May 11-20. Records are from Rowan (Barbour, 1951a:34); Kenton (Grady, 1896:38); ?Franklin (Wilson, 1811:60); Jefferson (Monroe, notes); Daviess (Powell, 1952:57); Hopkins (Hancock, 1954:22); and Ballard and Calloway (Mengel, notes) counties, Kentucky, and nearby Hamilton County, Ohio (Grady, *loc. cit.*; Langdon, 1881:338). Early nestings are indicated by an active nest in Daviess County on March 29, 1952 (Powell), and incubation noted in "early April"

near Frankfort, in 1810 (Wilson). The earliest egg-date is for Jefferson County, where Monroe collected 7 fresh eggs from a hole dug 6 feet into a road-cut bank at Lakeland on April 27, 1941. Suthard (*vide* Hancock, 1954) noted 5 fresh eggs in Hopkins County on May 22, 1928, and in Hamilton County, Ohio, Grady (1896) reported 7 heavily incubated eggs on May 25, 1895 (he found, also, clutches of 7, fresh, and 6, slightly incubated, in Kenton County, Kentucky, on May 11 and 18, 1895). The average complement of 6 clutches and broods is 6.2 ± 0.45 (5-7). Nest-holes are rather commonly seen, in vertical or nearly vertical clay banks, from 4 to 50 feet in height. I found nests containing young in Ballard County near Wickliffe, June 10, 1949, and in Calloway County (I saw a female deliver a frog to this nest) on June 14, 1949. I saw other nest-holes in Carlisle County June 10, 1949 (a dead adult nearby), and at Stearns, McCreary County, June 17, 1952 (nest apparently inactive).

Distribution.—Through central and western Kentucky the species is common, being seen most often near lakes, ponds, and major streams. These habitats are less numerous in the mountains and on the plateau, but kingfishers occur regularly along small streams in these areas (see Kozee, 1938:34, Carter County; Patten, 1937, Floyd County; Barbour, 1951a:34, Rowan County). Besides numerous records for the plateau (Rowan, Wolfe, Menifee, Laurel, McCreary, and other counties), I have seen a few kingfishers in valleys of the Cumberlands in Letcher County (May 20, 1952), near Ashcamp, Pike County (June 3, 1952), and in Wise County, Virginia (June, 1951). On July 18, 1949, I recorded 1 at 2,000 feet elevation on the wooded slope of Pine Mountain in Bell County.

Fall.—Fair numbers occur throughout the season, the species being, as always, more numerous west of the plateau. Representative eastern records are from Middlesboro, Bell County, September 19 and 23, 1938 (Wetmore, 1940:538), and Letcher County, October 4, 1920 (Horsey, 1922:80).

Winter.—There is no doubt that the species becomes less numerous in midwinter, particularly in severe winters with freezing of open water. In mild winters this decrease is much less noticeable, but there seems to be a tendency for the birds to resort to larger waters. Blincoe (1925:410) had no January records for Nelson County, and Wilson (1922:236; 1939c:34) has mentioned its scarcity in winter in Warren County (see also Oberholser, 1930:415).

Geographic variation.—The subspecies occurring is the eastern *Megaceryle alcyon alcyon* (Linnaeus).

Specimens examined.—Total 3. M.S.C.—1 male, 1 female, Rowan County (Aug. 24, 1938; Oct. 31, 1935); B.L.M.—1 male, Jefferson County (May 7, 1936).

FAMILY PICIDAE: WOODPECKERS AND WRYNECKS

Colaptes auratus (Linnaeus): YELLOW-SHAFTED FLICKER

Status.—Fairly common to common resident.

Spring.—There is no conclusive evidence that numbers greater than those of the breeding season are present in spring; a few authors, among them Blincoe (1925:411), have mentioned an increase during migration periods. Courtship is conspicuous from March onward. On April 25, 1949, I took both members of a pair seen copulating at the entrance of their nest-hole 60 feet up in a tall dead tree near Pine Ridge, Wolfe County.

Breeding records.—The breeding season extends at least from March to July, clutches being completed, as indicated by 17 dated records, from April 11-20 to June 1-10 (peak May 11-20). Seemingly single-brooded. Observations of breeding activities are from Harlan (Lovell, 1950c:59; Mengel, notes); Meade (Lovell, 1949b:45); Jefferson (Stamm, *vide* Hays, 1957:4; Monroe, Mengel, notes); Hardin (Monroe, notes); and Hopkins (Hancock, 1954:22) counties. The earliest date

of clutch-completion seems to be indicated by a nest containing 7 fresh eggs in Hopkins County, April 20, 1922 (Suthard, *vide* Hancock, 1954:22), and the latest either by small young noted in a hole 8 feet up in an old, dead tree-trunk in Hardin County, June 20, 1937 (Monroe), or by 5 young 10 feet up in a hole in a post, in Meade County on July 2, 1945 (Lovell, 1949*b*). Seven clutches or broods believed complete averaged 6.3 ± 0.45 eggs or young (4-9). Nest-holes are commonly seen throughout the state, being situated usually in dead trees, but also in dead limbs of living trees and in telephone poles, fence-posts, and other artificial situations. Open areas or situations above the forest canopy are preferred. The average height above ground of 15 nests for which this information is available is 16.9 feet (5-60; median, 10 feet). Among unpublished records, Monroe noted excavation of nest-sites in Jefferson County on April 22, 1934, and April 27, 1918. In the same county, he has recorded: sets of 2 and 6 eggs, May 19, 1917, the first 6 feet up in a telephone pole, the second in a dead tree; young in 2 nests in dead trees, one 20 feet up, the other much lower and containing 4, on May 30, 1917; eggs April 26, 1918, 20 feet up in a dead tree; eggs April 27, 1919, 7 feet up in a telephone pole; 9 fresh eggs 10 feet up in a dead stump and 6 slightly incubated eggs 9 feet up in a sweet gum, on May 9 and May 14, 1936. I noted repeated trips by an adult to an apparently finished hole 40 feet up in a dead tree at Glenview, Jefferson County, on April 20, 1949, and young 40 feet up in a dead chestnut at 4,000 feet elevation on Black Mountain, Harlan County, on May 30, 1952. Some competition for nest-sites with the Starling has been reported, in three instances, at Owensboro (Mercer, 1959:68), at Marion (Frazer, 1939), and in Hopkins County (Hancock, 1954:22), with the flickers prevailing, and in another, at Owensboro (Robinson, 1937), with opposite results.

Distribution.—Statewide. The species occupies a wide variety of habitats, ranging from extensively cleared farm land to edges and clearings in mature forest. There is no marked difference in its frequency of occurrence, in seemingly equivalent habitats, in different parts of the state.

Fall.—Flickers are perhaps more conspicuous in October than any other month, and may then be most numerous, owing to the presence of transients. There is no question that flickers from farther north enter the state, as indicated by banding records (see Bent, 1939:263). On October 10, 1951, I watched a male and female, which remained together as though mated, for about 30 minutes. Some display by the male, as in courtship (bowing, wing-spreading, "flicker" calls) was observed during this period. A number of specimens taken in September are in various stages of postnuptial or postjuvinal molt; October specimens are in fresh plumage (U.M.M.Z.).

Winter.—The species remains throughout winter, probably in much the same abundance as in the breeding season. Some authors claim to have noticed a decrease (*e.g.*, Van Arsdall, 1949:25; Wilson, 1922:236).

Geographic variation.—The Yellow-shafted Flicker has been divided into three subspecies: *Colaptes auratus borealis*, of the far north; *C. a. luteus*, of the northern United States and southern Canada; and *C. a. auratus*, of the southern states. Size has been used to separate the subspecies (large in the north, small in the south), most emphasis having been placed on length of wing. There appear to be no constant color differences, as pointed out long ago by Ridgway (1914:18, footnote *a*).

The flickers of Kentucky are here considered to belong with *Colaptes auratus luteus* Bangs, to which Wetmore (1940:538) assigned a number of Kentucky specimens, concluding that this was the breeding form of the state, save possibly its southwestern corner. One specimen, a male (wing 146.5 mm.) taken near Brownsville, Edmonson County, on November 11, 1938, he identified as *auratus*, perhaps "a wanderer from farther south." He also assigned the flickers of western and central Tennessee (Wetmore, 1939:189) to *auratus*, referring the population of the high

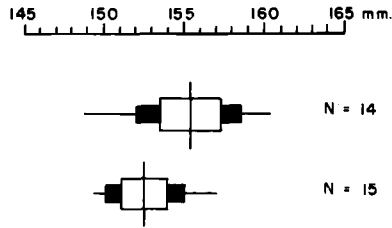


Fig. 18. Statistical characteristics (of wing length) of Yellow-shafted Flickers from Kentucky and Tennessee. Upper figure, 14 specimens from Kentucky; lower figure, 15 specimens from Tennessee. In this, and in Figs. 19-21, 23, 24, and 34, the figures are "Dice squares" (see Dice and Leraas, 1936), in which the vertical lines equal means, horizontal lines equal observed range in measurements, white boxes equal two standard errors to each side of the mean, and black boxes equal one standard deviation to each side of the mean. For actual values see the text.

mountains of eastern Tennessee, and western North Carolina (Wetmore, 1941: 493), to *luteus*.

I have subsequently examined all Kentucky material available, together with some of the birds from Tennessee and North Carolina already studied by Wetmore.

A large series of measurements showed no significant difference in wing length between males and females, which were therefore treated together. Although the mean wing measurement of 8 Kentucky specimens taken between October 16 and April 14 is only 0.2 mm. larger than the mean of 14 taken between April 15 and October 15, or 155.6 over 155.4 mm., I nevertheless discarded the former to eliminate possible migrants. Further investigation showed no significant difference in wing length between the flickers of eastern Kentucky, where 7 specimens from the Cumberland Plateau and Mountains average 155.2 mm. (148-160), and the rest of the state, with 7 specimens averaging 155.6 (152-161), and there was no tendency toward small size in the few specimens from extreme southwestern Kentucky. The sample from western and central Tennessee was limited, 5 birds averaging 151 mm. (149-156) which suggests but certainly does not prove a slightly smaller average for the birds of that area, since 10 from the mountains of eastern Tennessee and western North Carolina average only 153.2 (150-158, or 2.2 mm. larger).

These preliminaries suggested that the most meaningful comparison is that between the wing measurements of the 14 Kentucky and the 15 Tennessee and North Carolina specimens falling within the allotted dates. The results of this (Fig. 18) were as follows:

Fourteen specimens from Kentucky average 155.5 ± 0.9 (148-161); σ , 3.4; V , 2.2; $M \pm 3\sigma$ (theoretical range), 145.3-165.7.

Fifteen specimens from Tennessee and western North Carolina: 152.5 ± 0.7 (149-158); σ , 2.5; V , 1.6; $M \pm 3\sigma$, 145-160.

While the means are significantly different, these figures show a separability of Kentucky flickers from those of Tennessee, on the basis of size, in the neighborhood of 66 per cent of one from 50 per cent of the other, perhaps about what we should expect with clinal variation. It is, however, worth noting that the north-south variation here considerably exceeds that noted in the Hairy and Downy woodpeckers. With present knowledge, nevertheless, placement of the lines between subspecies remains arbitrary. In this area convention has placed the line between *auratus* and *luteus* near the Kentucky-Tennessee border, and the present study shows no cause for modification. I see no justification for admitting *C. a. auratus* to the Kentucky list on the basis of the single specimen mentioned above, the wing measurement of which falls safely within the expected range of variation of breeding Kentucky flickers.

Occasionally flickers in the eastern United States show one or another character of the Red-shafted Flicker (*Colaptes cafer*). Such a specimen, from near Middlesboro, with some red feathers in its moustachial streaks, was reported by Wetmore (1940:539).

Specimens examined.—Total, 54.¹ Kentucky (31). M.S.C.—1 male (wing, 160 mm.), 1 female (wing, 159), 1 unsexed immature, Rowan County (April 16; Jan. 15; July 8); B.L.M.—1 male (wing, 150), 1 immature female, Jefferson County (Dec. 11; June 18); 1 female (wing, 155), Oldham County (June 27); 1 male (wing, 152), Harlan County (July 8); W. Kentucky State College Coll.—1 male (wing, 156), Warren County (spring); J.D.F.—1 female (wing, 152), Marshall County (Sept. 24); U.S.N.M.—1 immature male, Harlan County (June 24); 1 adult male, 2 immature males, Greenup County (July 13); 1 immature male, Wayne County (June 13); 1 male, Fayette County (Dec. 5); 1 male, Meade County (April 21); 2 males, Edmonson County (Nov. 10, 11); 1 male, Muhlenberg County (Oct. 22); 1 female, Butler County (Nov. 11); 1 male, Fulton County (May 21); U.M.M.Z.—1 female (weight, 121.5 gm.; wing, 152 mm.), Whitley County (July 13); 1 male (weight, 137.6; wing, 159), 1 female (weight, 138.3; wing, 157), Laurel County (April 28; Oct. 10); 1 male (weight, 140.7; wing, 158), 1 female (weight, 138.3; wing, 149), Wolfe County (April 25); 1 male (weight, 140; wing, 161), 1 immature female (weight, 123.3), Jefferson County (Sept. 17); 1 male (weight, 131.5; wing, 159), Meade County (Oct. 30); 1 immature female (weight, 116.5), Henderson County (Sept. 9); 1 male (weight, 139.6; wing, 156), Fulton County (June 2). Tennessee (15). U.S.N.M.—1 male, Lake County (Oct. 6); 2 females, Fayette County (April 9); 1 male, 2 females, Obion County (May 3; May 3, Oct. 11); 1 male, Lincoln County (Nov. 3); 1 female, Stewart County (Oct. 28); 1 male, Cumberland County (May 26); 1 male, Giles County (Nov. 2); 1 male, 2 females, Johnson County (June 3; June 5 [2]); 1 male, Cooke County (June 19); 1 female, Granger County (Sept. 28). North Carolina (6). U.S.N.M.—1 male, 1 female, Cherokee County (June 12; June 7); 1 male, 1 immature male, Watauga County (July 12, July 11); 1 male, 1 immature male, Clay County (June 27, June 28). South Carolina (2). U.S.N.M.—2 females, Greenville County, Caesar's Head (July 9, 12).

Dryocopus pileatus (Linnaeus): PILEATED WOODPECKER

Status.—Resident, uncommon to fairly common in all parts of the state except the Bluegrass, where rare and restricted to parts of the outer portion; now increasing.

Spring.—The season is largely occupied by breeding activities.

Breeding records.—Construction of many, if not most, nests must be begun in March. Evidently single-brooded. Dates of clutch-completion indicated by 16 dated observations range from April 1–10 to May 1–10 (peak April 11–20). Although the species is widely distributed, actual breeding records are from few points: in Wayne (Wetmore, 1940:539); Madison (Loefer, 1938); Jefferson (Noland, 1955:27; 1960:29); Bullitt (Altsheler, 1953:56); Hopkins (Bacon, 1954:29–30; Suthard, *vide* Hancock, 1954:22); and Fulton (Wetmore, 1940:539) counties. The earliest date of nesting is probably indicated by an immature female "nearly grown" taken in Fulton County on May 30, 1938 (Wetmore), and the latest by 3 small young in a Hopkins County nest on May 30, 1915 (Bacon). Egg dates range from April 13 (1937), 4 fresh eggs in Hopkins County (Suthard), to May 10 (1925), 4 fresh eggs in the same county (Bacon). The average of 11 clutches and broods is 3.2 ± 0.23 eggs or young (2–4); 2 broods of 2 young may not, of course, represent full clutches. Nest-holes have been found in a variety of dead trees or dead portions of living trees, including elm, sweet gum, maple, tulip tree, red oak, hackberry, and sycamore, the heights above ground of 13 active nests averaging 38 feet (18–70). In Laurel County, I once noted a typical but unoccupied hole of the species in a dead hemlock, only 5 feet above ground. In Hopkins County, Bacon noted 23 days expended in the excavation of a nest cavity, with both birds participating; at 2 nests he recorded incubation periods of 18 days. Young remain in the nests approximately 30 days, and most leave in late May or early June, as noted in Bullitt

¹ For measurements of specimens in U.S.N.M. see Wetmore, 1940:538, 1939:189, 1941:493.

County, June 7, 1953 (Altscheler), and in Jefferson County on May 31, 1954, and May 30, 1957 (Noland).

Distribution.—Statewide, as noted above, with the exception of large parts of the extensively cleared and settled Bluegrass. Many records in literature. Long regarded as rare (probably in part through ignorance), this fine species now seems to be increasing in many areas. Although large, strikingly marked, and sometimes noisy, the Pileated Woodpecker can be almost wraithlike, which at times may have contributed to an incorrect conception of its numbers. In approximately 190 days in the field in suitable habitat, 1948–1952, without special effort I recorded more than 150 birds on 78 dates, and saw many fresh workings as well. These records represent Pike, Harlan, Wolfe, Powell, Menifee, Laurel, Pulaski, Whitley, McCreary, Wayne, Warren, Logan, Hopkins, Henderson, Caldwell, Lyon, Trigg, Marshall, Ballard, Carlisle, Hickman, and Fulton counties. The species is most numerous in heavily timbered situations, whether upland or lowland. It seems, however, not to be numerous on the richly forested slopes of Black Mountain, Harlan County. Breiding (1947:38) recorded 1 bird there on July 5, 1944, and I recorded 1 at 3,000 feet elevation on June 29, 1951. I find no other records for the higher parts of the mountain.

Although Wetmore was incorrect (1940:539) in supposing that the species was absent from northern Kentucky (it has never ceased to occur in the Cumberland Plateau and the Knobs), there is little doubt that a widespread decrease did occur, more or less simultaneously with the clearing and settling of the land. This decrease is poorly documented in literature, however (see Beckham, 1885:37–38, Nelson County; Langdon, 1879:12, Cincinnati area; Butler, 1897:838, southern Indiana). Pindar (MS., about 1925) wrote of the Bluegrass: "I have authentic accounts of . . . former occurrence in Anderson Co. but no reliable record of it later than 1890." The species was clearly absent for many years from most, perhaps all, of the Bluegrass. Since about 1941, however, it has begun to reappear at various localities in the outer Bluegrass, notably in Jefferson and Oldham counties (Monroe, 1955:43; Noland, 1955), and near Cincinnati, Ohio (Goodpaster, 1941:20). Howard Jones (see *Kentucky Warbler*, 36:15, 1960) noted the first (in 20 years) in Franklin County on November 21, 1959. A few others have recently been noted (Christmas bird counts, etc., *Kentucky Warbler*) in the Bluegrass, especially in Boyle County, and the species seems to be making a gradual adjustment to civilization, manifested by its reappearance in these highly cultivated agricultural areas.

Summer and fall.—Several records were given by Wetmore (1940:539). In Laurel County, on July 5, 1946, Warner and I took an immature female (B.L.M.) in postjuvinal molt, the body, wings, and tail all being involved. An adult female I took there on June 25, 1952 (U.M.M.Z.; weight, 228.8 gm.), was already in postnuptial molt of wings and tail, the body molt having not yet started. A male (J.D.F.) from Marshall County, September 8, 1941, was just completing the molt (outermost primaries almost fully grown). Monroe took a specimen, no longer in his possession, at Hardin Spring, Hardin County, on October 6, 1935. The species is perhaps most conspicuous in autumn and early winter.

Winter.—No notes of special interest.

Note.—An apparent attempt by a blacksnake (sp.) to take 1 or more of 3 large young in a nest in Jefferson County, May 30, 1957, was unsuccessful (Noland, 1960).

Geographic variation.—As pointed out by Wetmore (1940:539), the Pileated Woodpeckers of Kentucky are rather small. On the basis of wing measurement, all but one of the specimens I have seen clearly belong with the small southern subspecies. For reasons given below, I have admitted two subspecies to the present list.

Dryocopus pileatus abieticola (Bangs)

On unstated grounds, a number of authors have listed this large, northern subspecies as the breeding form of Kentucky. I have not examined sufficient material

to form an opinion of its subspecific validity, but there is no question, from the measurements given by Ridgway (1914:160) and others, that birds from the northern United States and Canada average much larger than southern specimens. A single male (M.S.C.) from Morehead, Rowan County, taken October 1, 1938, has the extremely large wing measurement of 249 mm., and on the basis of present evidence must be regarded as a vagrant from the north. Though the sample of *D. p. pileatus* described below is small, the measurement of this bird falls 4.4 standard deviations above the mean thereof and would seem to require its placement here. The second largest male (U.K.; wing 232) is also from Morehead, December 16, 1903. The latter specimen, however, may well be a large example of the local population.

Dryocopus pileatus pileatus (Linnaeus)

Seven Kentucky males available for measurement have the following average length of wing: 223.3 ± 2.2 (212–232); σ , 5.8; V, 2.6; maximum expected range ($M \pm 3\sigma$), 205.9–240.7.

Seven females average slightly smaller: 220.4 ± 1.5 (215–227); σ , 4.1; V, 1.9; expected range, 208.1–232.7.

Specimens examined.—Total, 18. M.S.C.—1 male, Rowan County (Oct. 1); U.K.—1 [= male], Rowan County (Dec. 16); B.L.M.—1 female, Laurel County (July 5); 1 female, Meade County (Oct. 1); 1 female, Oldham County (Dec. 7, 1946); Bernheim Collection—1 [= female]. "Kentucky" (undated); C.U.—1 male, Logan County (Dec. 15, 1905); U.S.N.M. (see Wetmore, 1940:539)—3 males, 3 females, from Wayne, Edmonson, Muhlenberg, and Fulton counties (May 21–Nov. 11); J.D.F.—3 males, 1 female, Marshall County (Sept. 5, 8, 26; Sept. 10; all 1941); U.M.M.Z.—1 female, Laurel County (June 25).

Centurus carolinus (Linnaeus): RED-BELLIED WOODPECKER

Status.—Resident, uncommon to fairly common (locally) in eastern Kentucky, common westward.

Spring.—No especially pertinent remarks are at hand save Blincoe's (1923:64–65), on feeding habits in Nelson County.

Breeding records.—Although the Red-bellied Woodpecker is conspicuous and common over large areas, only 5 more or less precisely dated breeding records are available, suggesting egg-laying chiefly from mid-April to mid-May with a probable peak in late April. Monroe took a set of 4 fresh eggs from a nest hole 15 feet up in a sweet gum near Solitude, Bullitt County, May 2, 1937, and sets of eggs were taken by Bacon in Hopkins County (Bacon collection). In the latter county Hancock (1954:22) noted an active nest 20 feet up in a dead tree on April 27, 1953, and one containing young 50 feet up in a living red oak on May 22, 1934. An active nest was found in Jefferson County on April 29, 1945 (Wright, 1945:51), and birds were feeding young at a nest in Oldham County on May 17, 1952 (Stamm, Shackleton, and Slack, 1953:26). Young in the nest were noted in Wayne County on May 28, 1955 (Altsheler, 1955a:68). I observed a nest containing young, perhaps 90 feet up in a dead limb of a huge living cottonwood in the Mississippi River bottom lands of western Fulton County, May 17, 1949, and on June 10, 1949, saw a nearly grown young bird in cypresses at Swan Lake, Ballard County. Average elevation of 4 nests, 44 feet (15–90).

Distribution.—Statewide; no apparent change throughout the year. Through much of Kentucky west of the Cumberland Plateau the species is common, and sometimes locally abundant, especially in floodplain forests, partially wooded farmland on rich agricultural soils, and the varied mixed forests of the Bluegrass and Pennyroyal. In the Cumberland Plateau and Mountains of eastern Kentucky, it is decidedly less numerous and more local, being rare in or lacking from large areas of pine-oak or oak-hickory growth based on sandy upland soils as well as slopes and "coves" supporting well-developed mixed mesophytic forests. In these regions, and to some extent in the somewhat similar Knobs and Western Highlands, the Red-

bellied Woodpecker occurs for the most part about farm clearings, or in woodlots and forest remnants where the country has been partly cleared. In such situations it is little, if any, more numerous than the Red-headed Woodpecker, which today it greatly outnumbers in most of central and western Kentucky. In much work in eastern Kentucky I recorded it infrequently, mainly in Lewis, Wolfe, and Laurel counties—in the last I regularly found a few in clearings and woodlots near London—and there are doubtless many localities where it is regular in small numbers. Others have likewise found it rare on the Cumberland Plateau (e.g., Barbour, 1951a:35, Rowan County; Patten, 1937, Floyd County; Patten, 1946:33, Knobs of Madison County—least numerous woodpecker). In the higher Cumberlands along the southeastern border I recorded the species only once, June 3, 1952, in rich mesophytic forest at Pound Gap, near Jenkins, Letcher County, at 2,400 feet elevation (1 bird). Wetmore (1940:539) reported specimens taken at 2,800–2,900 feet on Log Mountain, Bell County, September 19 and 21, 1938. The species is unrecorded from the higher reaches of Black Mountain in Harlan County, despite considerable observation by various workers.

Summer and fall.—Brief notes on food habits at this season, in Nelson County, were given by Blincoe (1923:64–66). The species is conspicuous in autumn. On occasion I have seen lowland forests of swamp oak, sweet gum, sycamore, and (sometimes) cypress in western Kentucky literally teeming with Red-bellied Woodpeckers. Two females I took near Henderson on September 7, 1949, were just completing molt of the wings and tail.

Winter.—No decrease in numbers is evident.

Geographic variation.—The Red-bellied Woodpeckers of Kentucky are here considered to represent *Centurus carolinus carolinus* (Linnaeus). The matter of nomenclatural recognition of faintly differentiated populations is a difficult one, much discussed in recent literature; nevertheless, the author of a regional work is still compelled to deal with each moot case before him. The Red-bellied Woodpeckers of the northern and western parts of the species' range, roughly the Mississippi Valley, have been separated by Burleigh and Lowery (1944) under the available name *zebra* Boddaert. After prolonged study I still find myself unable to recognize this subspecies, which is said to be characterized by "upper parts averaging decidedly whiter (i.e., white interspaces equal to or wider than black cross-bars); under parts lighter (less grayish) and with a slight suffusion of yellow in fresh specimens; red of belly approaching Peach Red [instead of approaching "Coral Red"]; red of crown and occiput slightly paler" (Burleigh and Lowery, *op. cit.*, p. 297). In the University of Michigan Museum of Zoology, I compared 47 specimens (Michigan, Illinois, Kansas, Louisiana, North Dakota, Nebraska, and Kentucky) from the stated range of *zebra* with 23 (Virginia, District of Columbia, Georgia, Florida, South Carolina, Alabama) from the range of *carolinus* as restricted by Burleigh and Lowery. The differences claimed for coloration of crown and underparts seemed far from constant in either group. Examining the character of dorsal "blackness" vs. "whiteness," I arranged each series, one opposite the other, as nearly as possible from lightest to darkest. This led to the conclusion that, while there may be a slightly greater average tendency toward blackness in southeastern birds, the two series were almost inseparable, at the most not more than 10 or 15 per cent of one being separable from all of the other at either the "light" or "dark" end of the series. An attempt to sort the specimens, mixed, without reference to the labels, resulted in two groups of completely heterogeneous geographic origin, and it seemed to me that Burleigh and Lowery's photograph (*op. cit.*, Fig. 2) of the backs of the two forms could be essentially duplicated with the extremes of either series examined. With similar results I repeated this experiment with the collections of the U. S. National Museum.

Having seen relatively little material, I am not prepared to comment on the validity of the south Florida population named *perplexus* by Burleigh and Lowery

(*op. cit.*). For this reason I treat Kentucky specimens under the trinomial given above.¹

Specimens examined.—Total, 44. M.S.C.—1 female, Rowan County (Dec. 10); R.W.B.—1 female, Rowan County (Aug. 30); C.M.N.H.—1 male, Pulaski County (Dec. 10); U.K.—1 female, Lincoln County (Dec. 15); C.W.B.—10 specimens, Nelson County (through year); B.L.M.—1 female, Carroll County (April 18); 1 male, 1 female, Oldham County (Dec. 23); 1 female, Jefferson County (April 11); Bernheim Collection.—2 females, "Kentucky" (undated); C.U.—1 male, Logan County (April 19); U.S.N.M. (see also Wetmore, 1940:539)—10 males, 8 females, from Bell, Rockcastle, Wayne, Fayette, Boone, Meade, Union, Butler, Muhlenberg, Trigg, and Fulton counties (April 26–Dec. 1); U.M.M.Z.—1 male, Jefferson County (Nov. 2); 1 female (weight, 75.4 gm.), Logan County (May 9); 2 females (70.5, 69.8 gm.), Henderson County (Sept. 7); 1 male (80.2 gm.), Hickman County (Nov. 13).

Melanerpes erythrocephalus (Linnaeus): RED-HEADED WOODPECKER

Status.—Resident, somewhat locally distributed; rare to fairly common in summer, usually less numerous in winter.

Spring.—Whatever decrease in numbers may occur in winter is no longer evident by April. The species begins breeding activities a little later than does the Red-bellied Woodpecker.

Breeding records.—Comparatively few for a conspicuous and well-known species. The species is apparently regularly two-brooded. Judging from 16 dated breeding observations, clutches may be completed as early as May 1–10 and as late as August 1–10 (early peak near May 20; second peak probably July 21–31). The few records, dated or otherwise, are from Shelby (C. C. Bacon, 1891, and *vide* Bent, 1939:197); Jefferson (Krull and Krull, 1952; Monroe, notes); Hopkins (Hancock, 1954:22; Bacon, *vide* Lovell, 1951b:59); and Calloway (Mengel, notes) counties. The earliest date of clutch completion seems to be indicated by young noted in a nest in Jefferson County on May 30, 1917 (Monroe), and the latest by young in a nest in Hopkins County, September 4, 1934 (Hancock). Egg dates range from May 15 (1919), 8 fresh eggs in a nest in Hopkins County, to June 14 (1941), 5 fresh eggs in a nest 35 feet up in a maple in Jefferson County (Monroe). In Hopkins County, Hancock noted Starlings harassing Red-headed Woodpeckers about a nest hole as early as March 28 (1934). In Shawnee Park, Louisville, Krull and Krull (1952) followed a considerable number of nestings in 1952, noting construction of first nests on May 22 and beyond (first young out of nest seen on July 6) and of second nests on July 7 and beyond (all nests but one vacant on August 28). Two of seven pairs observed re-nested in the same cavity used for first nesting, while five pairs constructed new ones, both alternatives noted by Bent (1939:196). A nest early reported from Shelby County (C. C. Bacon; Bent, *loc. cit.*) had removed from it "six sets of eggs, 28 eggs in all . . . in a single season, after which the birds drilled a new hole in the same tree and raised a brood of four young." The average complement of 5 clutches from first nestings, as recorded in sources above-cited is 6.2 ± 0.6 (5–8); including the heavily afflicted nest from Shelby County mentioned above, 12 clutches average 5.3 eggs. Most of the nests for which data are available were in dead trees, a few in dead limbs of living trees (cottonwoods, elms, oaks, black locust, "red gum," maple; also one telegraph pole), the heights above ground of 14 averaging 29 feet (10–60). In Calloway County, I saw adults feeding young in two nests high in living red oaks (probably the branches concerned were partially dead), one 4 miles west of Murray on June 11, 1949, the other in Murray itself on June 15.

Distribution.—The Red-headed Woodpecker, as mentioned by earlier authors (*e.g.*, Wetmore, 1940:540; Wilson, 1942:22), is irregularly distributed, occurring throughout the state. I have found it locally from Fulton County in the west to the Cumberland ridges of Pike County in the east. My records indicate that it is

¹Now to be considered also is *C. carolinus harpaeus* Koelz, Contr. Inst. Regional Expl., 1, pt. 3, 1954 (see A.O.U. Check-List, 1957).

somewhat more local and less numerous in the Cumberland Plateau and Mountains than it is to the west; it seems not to have been recorded at all from the higher parts of Black Mountain, Harlan County. In the breeding season it is associated with open or semi-open situations, mixed woodland and clearings, forest edge, and the like. It is frequently found in parks, farm yards, well-shaded city streets, and riparian growths of large trees, notably cottonwoods.

While it is probably more numerous now than in primeval times the species has undergone a notable decrease in numbers in recent years, especially the last two or three decades, as noted for various widely separated localities by Barbour (1951a:35) in Rowan County; Goodpaster (1941:20), in the Cincinnati area; Monroe (1955:42), at Louisville; Lovell (1949b:45), for Meade County; and Hancock (1954:22), in Hopkins County. Prior to about 1935 nearly all local authors either stated or implied that this was the commonest of woodpeckers, which is clearly no longer the case anywhere in Kentucky. Various reasons put forth to account for the decrease include creosoting of telephone poles, highway mortality (to which the species seems peculiarly susceptible), and the invasion of the Starling (in this connection see Mercer, 1959:68). While no one, or probably not all, of these explanations may be adequate, it does seem worthy of note that the decrease in Kentucky coincided with the establishment of the Starling, as it did also, somewhat earlier, in Ohio (Hicks, 1935a:157).

Summer, fall, and winter.—The species molts late, a tendency probably related to its two-brooded habit. An adult male which I took near Moscow, Hickman County, on November 13, 1948, was about half through postnuptial molt of the wings and just completing molt of the tail, although body molt had not begun (U.M.M.Z.). An immature female (U.M.M.Z.) which I secured near Cayce, Fulton County, on November 11, 1948, had not begun postjuvinal molt, except for the nape where a few red feathers had appeared. Wetmore (1940:540) referred to such a bird taken in Bell County, September 19, 1938 (U.S.N.M.). In fall and winter the species tends to concentrate in thick woods wherever mast is abundant. In lowland woods of Hickman County, on November 13, 1948, I estimated that I saw more Red-headed Woodpeckers than in the previous five years together, while in the same area I saw none at all in the two weeks of observation in May and June, 1949.

There seems to be no question that the species is usually less numerous in winter than at other seasons, all of many authors and observers agreeing on this point. I doubt, however, that it is ever absent from the state, although it may be hard to find locally in some winters. At times it remains fairly common in central and western Kentucky. I have recorded none in late fall or winter in the eastern counties, and definite winter records from the Cumberland Mountains and Plateau seem to be lacking. Barbour (1951a:35) implied that the species does not winter in Rowan County, but it is well known to winter in nearby West Virginia (Brooks, 1944:28) and in mountainous Virginia (Murray, 1952:67), and the absence of eastern Kentucky winter records may result from limited observation.

Geographic variation.—All specimens examined by Wetmore (1940:540) were referred on the basis of small size to the eastern subspecies *Melanerpes erythrocephalus erythrocephalus* (Linnaeus), where the additional specimens I have seen should be placed. The measurements (in millimeters) of 10 specimens (B.L.M.; U.M.M.Z.; U.S.N.M.) are as follows: wing length of 7 males, average, 136.3 (134–141), of 3 females, 134.7 (133–137); tail length of 7 males, average 73.0 (67–77), of 3 females, 74.7 (73–76).

Specimens examined.—Total, 15. M.S.C.—1 male, Rowan County (April 28); C.W.B.—4 specimens, Nelson County; B.L.M.—2 males, Jefferson County (March 10, Dec. 5); 1 female, Hardin County (Aug. 3); U.S.N.M.—(see Wetmore, 1940:540)—3 males, 1 female, from Meade, Wayne, and Bell counties (April 30–Sept. 19); U.M.M.Z.—1 male (weight, 73.2 gm.), Hickman County (Nov. 13); 1 male (66.8 gm.), 1 female (64.3 gm.), Fulton County (May 15; Nov. 11).

Sphyrapicus varius (Linnaeus): YELLOW-BELLIED SAPSUCKER

Status.—Common transient and fairly common winter resident.

Spring.—The species becomes noticeably more numerous in late March or early April, most transients passing in the first three weeks of April; rare by late April, occasionally reported in May. Migrating specimens are usually fat, a condition seldom found in most woodpeckers, and the gonads of some are moderately enlarged in mid-April. Late records: May 30, in Rowan County (Barbour, 1952:26); May 15, in Jefferson County (Monroe); May 17, in Warren County (Wilson, 1922:236).

?*Summer.*—A few vague early references to occurrence in summer (Pindar, 1889b: 313, 1925a:87; Funkhouser, 1925:221–222) should probably be disregarded. Beckham's indication (1885:37), by use of an asterisk, that the species bred in Nelson County was perhaps the result of a *lapsus*. Breiding's casual report (1947:37–38) of 4 birds seen on Black Mountain, Harlan County, on July 5, 1944, seems likely to be based either on an extremely rare occurrence or on error. In view of the amount of work done on Black Mountain in the breeding season by numerous observers, the possibility of an appreciable, regularly occurring population of sapsuckers going otherwise undetected seems almost out of the question.

Fall.—Early arrivals are occasionally noted in late September; peak of migratory movement in October; moderate numbers remain to winter. Early records: September 27 (1921), in Pike County (Horsey, 1923:143); September 25 (1936), at Cincinnati (Goodpaster, 1941:21); September 21, in Nelson County (Blincoe, 1925:410); September 24, at Louisville (Monroe); September 23, in Warren County (Wilson, 1922:236). Average and latest "departure dates" given by Oberholser (1928:256) are misleading and probably were intended to represent arrival dates.

Winter.—Numbers are somewhat erratic. Seldom conspicuous, the species may be rare or lacking in some winters, at least locally (see Blincoe, 1925:410). Most observers, throughout the state from Rowan County (Barbour, 1952:26) and Floyd County (Patten, 1937) westward, have reported it as a fairly common to common winter resident, a status confirmed by my own observations. In eastern Kentucky I recorded 1 bird in pine woods in Laurel County on February 4, 1950. Pine groves, orchards, and fairly open deciduous woodland are favored habitats, as in migration.

Geographic variation.—The subspecies occurring is the eastern *Sphyrapicus varius varius* (Linnaeus). In the remote possibility that a breeding population occurs in the Cumberlands, it might prove referable to *S. v. appalachiensis* Ganier, if that recently described form is valid.¹

Specimens examined.—Total, 22. M.S.C.—1 male, 1 female, Rowan County (March 30; Jan. 6); 1 female, Morgan County (Oct. 1); 1 female, locality uncertain (April 16); R.W.B.—1 unsexed, Rowan County (Oct. 10); B.L.M.—3 males, 1 female, Jefferson County (April 6, Oct. 11, 15; Nov. 28); 1 male, Bullitt County (April 4); U.S.N.M. (see Wetmore, 1940:540)—9 specimens from Rockcastle, Carroll, Nelson, Edmonson, Butler, Muhlenberg, and Trigg counties (Oct. 3–Nov. 26); U.M.M.Z.—1 female (weight, 49.9 gm., very fat), Powell County (April 21); 1 female (49.2 gm., moderately fat), Laurel County (Oct. 4); 1 male (53.2 gm., very fat), Lyon County (April 12).

Dendrocopos villosus (Linnaeus): HAIRY WOODPECKER

Status.—Resident, rare to common, especially in extensively forested areas; varies in numbers locally.

Spring.—No notes of particular interest.

Breeding records.—Very few. Egg-laying seems to occur chiefly in April and May. Thomas Smith took 4 slightly incubated eggs (B.L.M.) from a nest hole 15 feet up in a red maple at Anchorage, Jefferson County, on May 25, 1943. Monroe found a

¹ As held by the A.O.U. Check-List (1957:321).

nest containing young, 15 feet up in a dead snag near Louisville, May 6, 1934. Hancock (1954:22) reported nests found near Madisonville, Hopkins County, in apple trees, on June 8, 1922 (4 fresh eggs; Suthard), and April 25, 1933 (young heard). Full-grown young were reported by Wetmore (1940:540) from Waverly, Union County, May 11, and Rockybranch, Wayne County, June 10, 1938 (U.S.N.M.). I took full-grown young (B.L.M.) in Union County on June 15, 1941, and Bullitt County, June 24, 1939.

Distribution.—Statewide, occurring in all physiographic regions and at all elevations to the summit of Black Mountain, Harlan County, varying locally from rare to common. In general the species is much less numerous than the Downy Woodpecker. The relative numbers and habitat preferences of the two were described by Hicks (1935a:157) in Ohio, where the situation is evidently similar to that in Kentucky. In the settled, largely cleared portions of the Bluegrass, and in parts of the Pennyroyal and Purchase, the Hairy Woodpecker is usually rare, local, and restricted to the more extensive woodlots and forested watercourses (see Van Arsdall, 1949:25, Mercer County). Generally associated with large expanses of woodland, it is most numerous on the Cumberland Plateau and in the Cumberland Mountains, parts of the Knobs, Western Highlands, and mature floodplain forests along the lower Ohio and the Mississippi River.

Summer, fall, and winter.—An adult male that I took in McCreary County, near Cumberland Falls, on July 12, 1948, was molting its remiges (U.M.M.Z.). The species is most conspicuous in fall and winter. A rather long list of observers (including Wilson, 1922:236; Beckham, 1885:37; Blincoe, 1925:410; Patten, 1937:18; and Keith, 1945:53) have reported the species as more numerous in winter, probably indicating greater conspicuousness at this season rather than a real increase in numbers. In upland pine-oak forest in Laurel County, I recorded unusually large numbers on February 3 and 4, 1950 (8–12 daily, 4–5 hours afield each day, along 6 miles of forested roadside).

Geographic variation.—The Hairy Woodpeckers of Kentucky are here considered to represent *Dendrocopos villosus villosus* (Linnaeus). For years there has been uncertainty concerning the correct position of the boundary between the ranges of this subspecies of the northern (but not far northern) part of eastern North America, and *Dendrocopos villosus audubonii* (Swainson) of the southeastern states. Most workers seem to have assumed—although this is rarely stated formally—that the ranges of southern subspecies in the Mississippi Valley are more or less co-extensive with the so-called “Lower Austral Zone” (in relation to the present species see Oberholser, 1911:599, 601). Thus, the Hairy Woodpeckers occurring in the Mississippi Valley north to southern Illinois, Indiana, and western Kentucky have been generally assigned to *D. v. audubonii*. Published references to *D. v. audubonii* in Kentucky (see Pindar, 1925a:86; Bailey, 1933:127) have been based apparently on this assumption, and on the fact that a few specimens from this general area have been marked “*audubonii*” by various taxonomists (see Howell, 1910:296). Careful attention to the problem in Kentucky and Tennessee was first given by Wetmore (1939:195–197; 1940:540–541), who concluded that all of the Hairy Woodpeckers of Kentucky were referable to *villosus* but mentioned two “puzzling” specimens from Muhlenberg County “distinctly within the upper size range of *audubonii*.” Their wing measurements (114.4, 114.8 mm., females), however, it seems to me, are to be expected of occasional *villosus* throughout Kentucky.

I have examined and measured as many specimens as possible (85) from Kentucky and vicinity, including all material from Kentucky and Tennessee studied by Wetmore, but eliminating from statistical consideration badly worn specimens, molting birds if molt affected measurements, and birds in juvenal plumage (which average smaller than adults).

The sexes were treated separately because of a barely significant difference between the wing measurements of males and females. No significant difference in size between winter and summer populations was found, so birds taken throughout

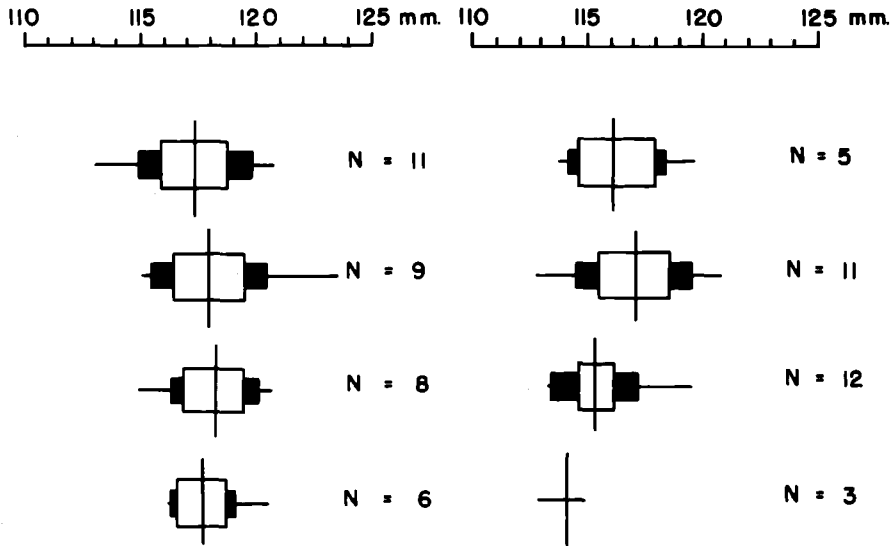


Fig. 19. Statistical characteristics (of wing length) of Hairy Woodpeckers in several parts of Kentucky and vicinity (males on left, females on right). From top down the figures represent samples from: Cumberland Plateau of Kentucky and eastern Tennessee (northern portion); Interior Low Plateau of central Kentucky; Mississippi lowlands of western Kentucky and northwestern Tennessee; high mountains of eastern Tennessee and western North Carolina. For actual values see text. For explanation of diagrams see legend of Fig. 18 (p. 292).

the year were used, permitting the comparison of considerably larger samples than would have been possible with breeding-season specimens alone. This is admittedly less desirable than the comparison of extensive series of known breeding birds. The similarity in measurements of summer and winter populations is interesting, however, since it suggests that no pronounced influx of larger birds from farther north occurs in winter. The wing length of fourteen summer males averaged 117.6 ± 0.5 (115–121); σ , 2.0; V, 1.7. Sixteen winter males: 118.3 ± 0.5 (115–121); σ , 1.9; V, 1.6. Eleven summer females: 115.0 ± 0.6 (113–120); σ , 1.9; V, 1.7. Eighteen winter females: 117.1 ± 0.6 (114–121), σ , 2.5; V, 2.2. "Summer" birds were taken April 1–September 30, "winter" specimens October 1–March 31. The slightly smaller average size of the former may be due to slight wear of the remiges.

After comparisons which showed no significant size difference between specimens from Kentucky and latitude and specimens from Tennessee and latitude, I divided the specimens into groups from four areas: (1) the Cumberland Plateau and Mountains of Kentucky and northern Tennessee (including also a few birds from nearby West Virginia and west-central Virginia); (2) parts of the Interior Low Plateau Province in central Kentucky, including the Knobs, eastern Pennyroyal, and Bluegrass, and extreme southern Ohio; (3) birds variously from the Western Highlands, western Pennyroyal, and Purchase of western Kentucky and adjacent portions of northwest Tennessee, extreme southern Indiana and Illinois, all in or near the conventional boundaries of the "Lower Austral Zone"; (4) the high mountains (Blue Ridge Province) of Tennessee and western North Carolina (Roan Mountain, Shady Valley, Great Smokies), including also a few specimens from Caesar's Head in extreme northwestern South Carolina. The results of statistical analysis of wing length (results from study of tail length do not differ appreciably) are shown below and in Fig. 19.

- (1) Eleven ♂♂ (113-121): 117.5 ± 0.7 ; σ , 2.5; V, 2.1. Five ♀♀ (114-120): 116.6 ± 0.9 ; σ , 2.0; V, 1.8.
- (2) Nine ♂♂ (115-124): 118.2 ± 0.8 ; σ , 2.5; V, 2.1. Eleven ♀♀ (113-121): 117.4 ± 0.8 ; σ , 2.6; V, 2.2.
- (3) Eight ♂♂ (115-121): 118.4 ± 0.7 ; σ , 1.9; V, 1.6. Twelve ♀♀ (114-120): 115.7 ± 0.5 ; σ , 1.8; V, 1.6.
- (4) Six ♂♂ (117-121): 118.0 ± 0.6 ; σ , 1.4; V, 1.2. Mean of three ♀♀, 114.3.

While more material is desirable, it is strongly indicated by the above analysis that no important difference in size exists between the populations of any two major areas in Kentucky, and much of Tennessee. There is no indication of a cline in size from small in the Mississippi Valley to large in the Appalachians. The material examined is inadequate to show anything about a north-south cline except that, as mentioned, Kentucky birds in general do not average appreciably larger than Tennessee birds (contrast with the situation in flickers). Intensive future collecting may show that some part of southern Tennessee is occupied by a population arbitrarily referable to *audubonii*.

Specimens examined.—Total, 85. *Kentucky* (42). R.W.B.—1 male, Elliott County (Aug. 20); U.K.—1 female (mislabelled male), Lincoln County (Feb. 10); C.W.B.—4 males, 6 females, Nelson County (Feb. 2, March 4, 6, 16; Feb. 17, March 21, 22, 30, June 18, Nov. 15); B.L.M.—2 females, Laurel County (July 5, 6); 1 immature male, 1 female, Bullitt County (June 24; June 17); 1 female, Oldham County (July 21); 1 immature male, Union County (June 15); Western Kentucky State College Coll.—1 male, Warren County (spring); C.U.—1 female [?], Logan County (May 31); U.S.N.M.—1 male, Harlan County (June 23); 1 male, Bell County (Sept. 23); 1 immature male, 1 female, Wayne County (June 10; June 14); 1 female, Madison County (Oct. 6); 1 male, Fayette County (Nov. 17); 2 males, Carroll County (Oct. 12, 13); 1 male, 2 females, Muhlenberg County (Oct. 25; Oct. 22, 25); 1 male, Edmonson County (Nov. 9); 1 immature male, 1 female, Union County (May 11); 2 females, Trigg County (Nov. 3); U.M.M.Z.—1 male (weight 62.8 gm.), 1 female (59.2 gm.), Laurel County (Feb. 3); 1 male (61.5 gm.), McCreary County (July 12); 1 male, 1 female, Oldham County (April 3; April 6); 1 female (63 gm.), Fulton County (Nov. 10). *Ohio* (2). C.M.N.H.—1 male, 1 female, Hamilton County (dates?). *West Virginia* (3). U.S.N.M.—1 male, Mingo County (July 8); 1 male, Wayne County (July 7); 1 female, Raleigh County (Oct. 23). *Virginia* (3). U.S.N.M.—3 males, Rockbridge County (May 15, June 9, 9). *Indiana* (4). U.S.N.M.—1 male, 3 females, Knox County (Jan. 15; Jan. 18, 18, May 12). *Illinois* (2). U.S.N.M.—1 male, Wabash County (Oct. 15); 1 immature female, Richland County (June 3). *Tennessee* (24). U.S.N.M.—3 males [? 2 immatures sexed female resemble males], 1 female, Obion County (May 7, 7, Oct. 11; April 28); 1 male, 1 female, Lake County (Oct. 22; Oct. 15); 1 female, Shelby County (April 19); 1 immature female, Wayne County (May 14); 1 male, 1 female, Lincoln County (Nov. 5; Nov. 6); 1 male, 1 female, Cumberland County (May 27); 1 male, Johnson County (June 7); 2 males, Carter County (Sept. 20, 23); 6 males [? 2 of 3 immatures sexed female resemble males], Cocke County (June 21, 23, 23, 24, 24, 26); 2 males, Roane County (March 9, 28); 1 female, Hamilton County (March 18). *North Carolina* (2). U.S.N.M.—1 immature male, 1 female, Ashe County (July 15; July 14). *South Carolina* (3). U.S.N.M.—2 males, 1 female, Greenville County (July 2, 4; July 4).

Dendrocopos pubescens (Linnaeus): DOWNY WOODPECKER

Status.—Fairly common to common resident throughout the state.

Spring.—No notes of special pertinence.

Breeding records.—As suggested by only 12 dated observations, clutches are completed from April 21-30 to May 11-20 (peak May 1-10). Records are from Owen (Stamm and Lovell, *vide* Hays, 1958:4); Oldham (Stamm, Shackleton, and Slack, 1953:26); Jefferson (Croft, *vide* Hays, *loc. cit.*; Monroe, notes); Meade (Lovell, 1949b:45); Marion (Lillard, 1890); Hopkins (Hancock, 1954:22); and Hickman (Mengel, notes) counties. In more detail: Monroe took a set of 4 fresh eggs from a nest hole at Anchorage, Jefferson County, on May 6, 1942. Lillard noted 5 eggs in Marion County on May 23, 1889. Suthard (*vide* Hancock) took 4 fresh eggs in Hopkins County on May 19, 1922, and Hancock recorded young in the nest there on May 21, 1950. Nests containing young were recorded by Lovell in Meade County

on May 20, 1945 ("several") and June 8, 1944 (2 large young), and by Monroe in Jefferson County, May 20 and 27, 1934. Five young just out of the nest were noted in Owen County on May 20, 1956, by Stamm and Lovell, and 2 young just leaving on May 23, 1956, in Jefferson County, by Croft. On June 5, 1949, I observed a male feeding a female at the nest, in a hole 22 feet up in a dead willow stub at the edge of a cypress swamp 8 miles north of Fulgham, Hickman County. The male scolded vigorously when I approached. Other nests have been recorded without detail. All reported have been in dead trees or limbs, the average height above ground of 6 being 21 feet (9-40).

Distribution.—Statewide, varying little if at all through the year. The species occurs in a wide variety of habitats, wherever trees are present in any quantity, and is capable, as pointed out by Hicks (1935a:157), of breeding in second growth, along streams and fence-rows, and in other situations unfavorable to larger woodpeckers. I have recorded it regularly in every forest type in the state, from lowland cypresses to mixed mesophytic associations high on Black Mountain, Harlan County. In mid-summer, the Downy Woodpecker is somewhat less noisy and conspicuous than at other times.

Summer.—The postjuvinal and postnuptial molts occur in August or earlier. Four adult males (J.D.F.) taken in Marshall County on August 16, 17 (2), and 22, were molting their wing and tail feathers, the specimen dated August 22 being almost through with this molt. All were in fresh body plumage, but one taken August 17 still retains a few worn feathers of the breeding plumage. September-taken specimens are nearly all in uniformly fresh plumage, immatures being, apparently, inseparable from adults at this time.

Fall and winter.—The species becomes much more conspicuous, but there is no convincing evidence of a real increase in numbers. At these seasons it is often seen in open and semi-open situations, feeding with sparrows, chickadees, and titmice in patches of ragweed, goldenrod, sumac, and the like. Fall- and winter-taken specimens show no significant increase in weight over breeding birds, fat apparently not being accumulated in quantity by these woodpeckers. The weights of 24 specimens have the following characteristics: 26.3 ± 0.3 gm. (23-28.7); σ , 1.5; V , 5.7; 12 "summer" specimens (April 1-September 30) average 25.8 gm., as opposed to a mean of 26.7 gm. for 12 birds taken in the remainder of the year. Males and females showed no significant difference in weight; 12 of each averaged the same, 26.3 gm.

Geographic variation.—The only subspecies here admitted to the Kentucky list is *Dendrocopos pubescens medianus* (Swainson). The variation of the Downy Woodpecker in Kentucky is much like that of the Hairy Woodpecker, and some confusion has existed as to best placement of the line between northern (larger, "whiter") and southern (smaller, "browner") subspecies—in this case *D. p. medianus* and *D. p. pubescens*. Several references to the occurrence of *D. p. pubescens* in Kentucky (see Wilson, 1922:236, 1923c:132; Funkhouser, 1925:220-221; Cunningham, 1937; Hicks, 1939) are based either on presumption or on inadequate samples, and are inconclusive. Wetmore studied good-sized series (1940:541-542) and referred approximately 25 specimens from Kentucky and most of a sample from Tennessee to *medianus*, remarking (of the Kentucky birds) that "there is some gradation in size, birds from the southwestern section and from the southern counties west of the mountain area being only slightly larger in wing measurement than the southern race." Four specimens were "slightly below the size ordinarily accepted for *medianus*," while in northwestern Tennessee (Wetmore, 1939:198) the birds were "intermediate . . . barely within the size range of the northern form" (*i.e.*, apparently above about 91 mm., wing length).

I examined a somewhat larger series from this area, treating it in exactly the same way as the Hairy Woodpecker except that males (the wings of 38 average 92.2 mm.) and females (34 average 92.5) were lumped in the calculations. As with the Hairy Woodpecker, no significant size increase occurred in winter, and birds from all

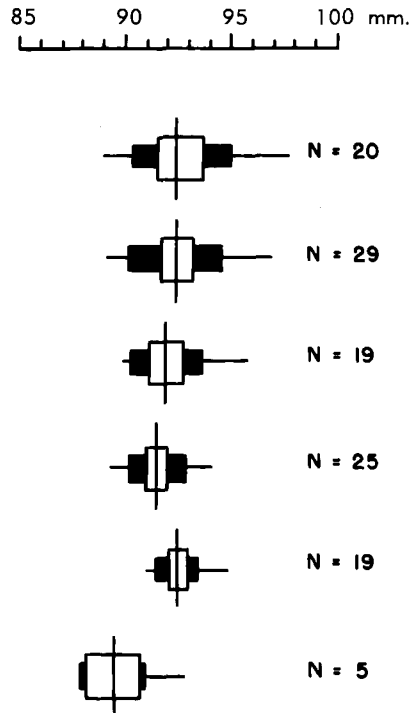


Fig. 20. Statistical characteristics (of wing length) of Downy Woodpeckers in several parts of Kentucky and vicinity. From left: Cumberland Plateau and Mountains of Kentucky; Interior Low Plateau of Kentucky (exclusive of Western Highlands); Western Highlands (or "Shawnee Section") of Kentucky and southern Indiana; Mississippi lowlands of western Kentucky and northwestern Tennessee; high mountains of western North Carolina; extreme southern Tennessee. For explanation of diagrams see legend of Fig. 18 (p. 292). For actual values see text.

seasons were used (36 specimens April 1–September 30 average 92.4 ± 0.3 , σ , 1.9; 40 specimens October 1–March 31 average 92.6 ± 0.3 , σ , 2.1). Not only the means, but also the coefficients of variation (2.0 and 2.25, respectively), of summer and winter birds failed to differ significantly (σ^2 of winter birds, 0.25), and about the same results were indicated by comparison of the summer sample as resulted from study of the whole.

The series was divided into five groups (one more than permitted by the smaller sample of Hairy Woodpeckers), representing the major physiographic regions of the area, and was analyzed statistically with the following results (see Fig. 20):

Cumberland Plateau and Mountains: 20 specimens average 92.8 ± 0.5 (89–98); σ , 2.2; V, 2.4.

Interior Low Plateau, exclusive of the Western Highlands, but including the Knobs, Bluegrass, Pennyroyal, and extreme southern Ohio: 29 specimens average 92.6 ± 0.4 (89–97); σ , 2.1; V, 2.3.

Western Highlands and adjoining lowlands of western Kentucky, southern Indiana, and southern Illinois: 19 specimens average 92.0 ± 0.4 (90–96); σ , 1.7; V, 1.8.

Purchase Region of Kentucky, and adjacent northwest Tennessee: 25 specimens average 91.6 ± 0.3 (89–94); σ , 1.4; V, 1.5.

High mountains of eastern Tennessee and western North Carolina: 19 specimens average 92.7 ± 0.3 (91-95); σ , 1.1; V , 1.2.

Various localities (sample inconclusive) in southern Tennessee: 5 specimens average 89.2 ± 0.6 (88-91); σ , 1.4; V , 1.5.

While a faint cline, from larger in the mountainous east to smaller in the lowlands of the west, appears in these figures, no mean is significantly different from another excepting that of the inconclusive sample from southern Tennessee, which seems to differ from some of the higher means. If such an east-west cline exists in nature, its inclination must be negligible. As in the Hairy Woodpecker, the chief variation in the size of this species must be north-south, since birds of the southern coastal plain are decidedly smaller than those of the far north. Whether or not a significant "plateau," or levelling, of this north-south cline exists in the middle states remains to be demonstrated.

There seems to be a gradual increase in the incidence of buff-bellied birds toward the south. Kentucky lies in an area of intergradation in this character, which does not appear in significantly different proportions in the populations studied.

On the basis of its large size (wing, 99 mm.) and white underparts, Wetmore (1940:542) identified a single female taken 2 miles north of Mount Vernon, Rockcastle County, on October 3, 1938, as an example of *Dendrocopos pubescens nelsoni* (Oberholser), of far northern North America. This necessitates the assumption that the bird was a migrant from Alaska or northern Canada, which seems unlikely in view both of the earliness of the date and of the considerable evidence (see Bent, 1939:48) that the species migrates very little. Large as the wing measurement is, it falls within three standard deviations from the mean of the local population ($92.8 + 6.6 = 99.4$), and I have seen other local specimens as white below. I therefore exclude *D. p. nelsoni* from this list of Kentucky birds.

Specimens examined.—Total, 129. Kentucky (85). M.S.C.—1 male, Rowan County (Oct. 24); R.W.B.—2 males, 1 unsexed, Harlan County (July 24, August 5; August 11); U.K.—1 male, Lincoln County (Feb. 10); 1 male, Franklin County (Feb. 18); C.W.B.—5 males, 2 females, Nelson County (Nov.—Feb.); B.L.M.—1 immature male, 1 immature female, Harlan County (July 7; July 9); 1 immature male, 1 immature female, Laurel County (June 29; July 6); 1 male, Jefferson County (Dec. 11); 1 female, Oldham County (Feb. 9); 1 female, Union County (July 6); W. Kentucky State College Coll.—1 male, Warren County (spring); J.D.F.—1 female, Woodford County (Feb. 9); 5 males, 4 females (the first female immature), Marshall County (Aug. 16, 17, 17, 22, Sept. 8; Aug. 16, Sept. 5, 16, 19); U.S.N.M.—2 males, Harlan County (June 23, 29); 2 males, 1 female, Bell County (Sept. 20, 20; Sept. 23); 1 male, McCreary County (June 16); 1 male, 1 female, Rockcastle County (Oct. 1; Oct. 3); 2 males, Wayne County (June 7, 9); 1 male, 1 female, Fayette County (Dec. 1; Nov. 17); 1 male, 1 female, Boone County (Oct. 11); 1 male, Carroll County (Oct. 11); 2 females, Meade County (April 21, 25); 1 male, 1 female, Muhlenberg County (Oct. 18); 1 female, Butler County (Nov. 9); 1 male, Edmonson County (Nov. 10); 1 female, Hopkins County (Oct. 21); 1 male, 1 female, Trigg County (Oct. 29); 1 immature male, 2 females, Fulton County (May 25; May 21, 21); U.M.M.Z.—1 male, Whitley County (Feb. 5); 1 immature female, Laurel County (July 5); 1 male, Wolfe County (Nov. 21); 1 male, Powell County (June 30); 1 male, Lewis County (Nov. 23); 1 male, 2 females, Jefferson County (April 10; Sept. 16, 19); 1 male, Oldham County (April 3); 2 males, 2 females, Meade County (Oct. 21, 21; Oct. 22, 30); 3 males, 4 females, Henderson County (Sept. 4, 5, 7; Sept. 4, 5, 5, 8); 1 male, 1 female, Marshall County (April 15; April 16); 1 female, Carlisle County (Nov. 12); 1 male, Hickman County (Nov. 13); 1 male, 2 females, Fulton County (Nov. 6; Nov. 6, 8). Ohio (1). C.M.N.H.—1 female, Hamilton County (Feb. 28). Illinois (2). U.S.N.M.—1 male, 1 female, Wabash County (Jan. 18; May 15). Indiana (4). U.S.N.M.—4 males, Knox County (Jan. 18, 20, 20, June 18). Tennessee (25). U.S.N.M.—2 males, 2 females, Lake County (all Oct. 19); 2 females, Obion County (April 29, Oct. 14); 1 male, 1 female, Stewart County (Oct. 27; Oct. 30); 2 males, 1 female, Lincoln County (Nov. 3, 5; Nov. 6); 1 male, Cumberland County (May 24); 1 male, Polk County (July 9); 1 male, 1 female, Fayette County (April 10; April 9); 1 male, 2 females, Roane County (April 11; March 13, April 7); 1 male, 1 female, Cocke County (June 25; June 21); 1 male, Grainger County (Oct. 1); 1 male, 1 female, Carter County (Sept. 17; Sept. 22); 1 male, 1 female, Johnson County (June 4; June 3). North Carolina (12). U.S.N.M.—1 male, Haywood County (June); 1 male, 2 females, Ire-

dell County (Oct. 3; Oct. 4, 7); 1 male, 1 female, Watauga County (July 12); 1 male, 1 immature female, Cherokee County (June 9; June 14); 3 males, 1 female, Rockingham County (Sept. 18, 19, 21; Sept. 18).

Dendrocopos borealis (Vieillot): RED-COCKADED WOODPECKER

Status.—Resident, uncommon to fairly common locally in pine-oak communities of the Cumberland Plateau of eastern Kentucky, north at least to Wolfe County; casual vagrant (?) in Western Highlands.

Spring.—The small bands in which this woodpecker characteristically occurs do not break up until fairly late in spring, just before the breeding period. As late as April 29 (1949), I observed a group of 4 in Laurel County, the ovary of a female taken on this date being moderately enlarged. In the period when nesting is presumably in progress, in May and early June, the birds are quiet and secretive, in marked contrast to their conspicuousness in other seasons.

Breeding records.—I found the only nest known from Kentucky on May 7, 1952, in Laurel County approximately 10 miles southwest of London. The nest hole was in the trunk of a living pitch pine (about 100 feet tall and 16 inches in diameter at its base), on the south side of the tree, approximately 40 feet above ground and 10 feet below the lowest limb. The pine was in the center of an open space in a grove of smaller scrub pines, red oaks, and hickories. The hole was discovered when I noticed reflection of sunlight from a stream of fresh pitch beneath it. Pitch had issued also from several much smaller holes, evidently the results of preliminary drillings, near the main one. I watched a pair of Red-cockaded Woodpeckers flying about and feeding in the grove. They were quiet, squealing softly once or twice. One flew to the hole, entered it for a short period, and then left the area. On May 9 I returned, but no activity was noted. I suspect that the nest was then newly completed and that laying was either in progress or imminent. On June 8, the time of my next visit, the nest appeared to be inactive. A single adult was seen about half a mile from the nest site on June 11, 18, and 24; no others were observed in the area, June 8–25, which was the hottest and one of the driest periods then on record locally. It is possible that the nest failed because of these extreme weather conditions. Spofford (1948b:13) found old nests almost certainly of this species in nearby Pickett County, Tennessee, about 40 miles, airline, to the southwest, in June, 1946 and 1947. On July 9, 1948, I took two juvenal-plumaged females, the primaries of which were not quite fully grown, from a band 4 miles east of Cumberland Falls, Whitley County (U.M.M.Z.). These birds must have emerged from the nest late in June or early in July.

Distribution.—Except for occasional vagrants, probably young birds, the range seems to be fixed throughout the year. I have thus far recorded the species (from north to south) in Wolfe, Powell, Laurel, Pulaski, Whitley, and Wayne counties, and it almost certainly occurs in contiguous and similar habitat in Jackson, Lee, Estill, Rockcastle, McCreary, and probably other counties. The range coincides closely with the Cliff Section (see pp. 41–43) of the western Cumberland Plateau. Here, in an irregular strip from approximately 10 to 25 miles in width, the shallow, sandy, well-drained soils of ridge tops and uplands support an edaphic climax of pines (especially *Pinus echinata*, *P. rigida*, *P. virginiana*) and oaks, intermixed with hickories and other trees. It is on these comparatively xeric ridges that the Red-cockaded Woodpecker typically occurs (Fig. 21; compare range with the distribution of pine in Kentucky as shown by the Central States Forest Experiment Station, Forest Survey Release No. 11, February, 1952, Fig. 3). Fairly large tracts of suitable habitat¹ seem to be important, since the species is much less numerous and less generally distributed in the northern part of the Cliff Section, where more complete dissection has rendered pine-oak covered uplands less extensive. East of the Cliff Section, considerable search of seemingly suitable habitats occurring on restricted sandstone outcrops and shaly hills has produced no records.

¹ As elsewhere, this seems to feature at least some large, mature pines, and rather open spacing of trees.

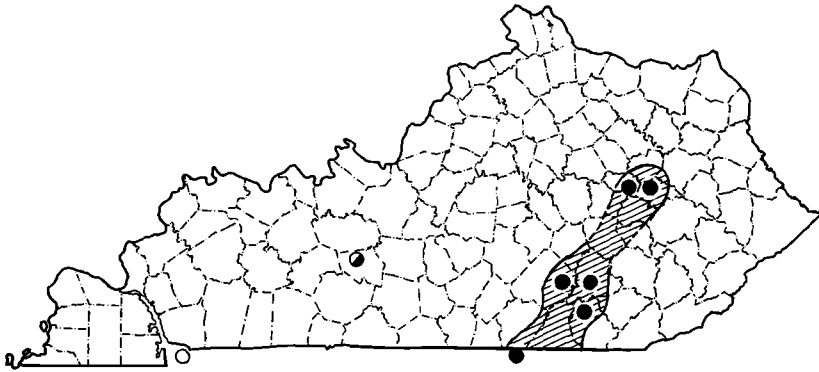


Fig. 21. Distribution of the Red-cockaded Woodpecker in Kentucky and vicinity. Hatched area, more or less regular in occurrence, throughout the year. Solid circles, definite records. Half-solid circle, aberrant summer record. Open circle, aberrant autumn record.

Earlier records of the species outside of the range outlined above are probably at least partly erroneous (included are those of Pindar, 1889*b*:313, 1925*a*:86, in Fulton County, and Brown, 1935, in Muhlenberg County) and may account for the incorrect statement of range (north to "*western Kentucky*"; italics mine) in the A.O.U. Check-List, 4th edition (1931:199). However, C. W. Hibbard's record (verbal com.) of 1 bird seen in pines on a ridge in Edmonson County, near Mammoth Cave, in the summer of 1934, may well be correct.¹ The pine woods in the area are much like those of the Pottsville escarpment, but isolated and of relatively small extent. W. M. Perrygo's record of a single bird in oak woods near Dover, Tennessee, almost in Trigg County, Kentucky, on October 30, 1937 (Wetmore, 1939:198), is probably correct (Wetmore, letter: December 23, 1948). The last bird was almost certainly a vagrant, like the specimen taken at Columbus, Ohio, on March 15, 1872 (Jones, 1903:218).

Summer.—Small bands composed of single family groups, usually 4 to 7 birds, are frequently seen from late June onward. Occasional groups of 12 to 15 birds evidently represent aggregations of several families; I have seen bands of this size on various occasions in Laurel and Whitley counties.

Fall and winter.—Both adults and immatures undergo a complete molt, concluded by early or mid-October. Two immature males and one immature female (age based on ossification of the skull, which I have found reliable in this species) from Laurel County, October 4 and 7, 1951, were just completing renewal of the primaries (outermost still sheathed at bases) and central rectrices (about two-thirds grown). All other flight feathers were fresh, and the final stages of body molt were in progress in the tracts of the head, back, and underparts. The species is here resident throughout the year. Since I first recorded it on July 2, 1939 (for earlier notes see Mengel, 1939:46; 1940:424; 1948:50; see also Ganier, 1937*a*:26, records from Pickett County, Tennessee, almost in Wayne County, Kentucky), I have recorded the species in all months of the year but January and March, when no search was made, and have found it in seemingly undiminished numbers in winter (December 27, 1940; February 2-4, 1950). On February 4, 1950, I noted what appeared to be a courtship performance between 2 birds in the top of a pine in Laurel County (prolonged squealing, fluttering, bowing, and jostling).

¹This, at least, is suggested by a very recent sight record from the same area, September 12, 1958 (G. Wilson, *Kentucky Warbler*, 37 [1]:8, February, 1961).

Geographic variation.—The Red-cockaded Woodpeckers of the Cumberland Plateau of Kentucky and Tennessee are here considered to represent *Dendrocopos borealis borealis* (Vieillot). They are somewhat larger¹ than those of the Coastal Plain, by about the same amount that the birds of southern Florida (*D. b. hylonomus* Wetmore) are smaller. This will be more fully discussed in another paper now (1964) in preparation.

Specimens examined.—Total, 17. B.L.M.—3 adult males, 2 immature males, 1 immature female, Laurel County (June 29, July 6, Dec. 27; June 29, July 7; July 4); U.M.M.Z.—2 adult males (weights 55.0, 50.2 gm.), 5 adult females (47.7, 48.8, 49.2, 48.9, 49.5 gm.), 1 immature female (48.8 gm.), Laurel County (Oct. 4, 7; Feb. 4, 5, 5, April 29, Oct. 4; July 7); 1 adult male (51.5 gm.), Wolfe County (Nov. 21); 2 immature females (48.8, 44.9 gm.), Whitley County (July 9).

**Campephilus principalis* (Linnaeus): IVORY-BILLED WOODPECKER

Status.—Formerly resident along the Mississippi River and the lower Ohio River upstream to an undetermined point; distribution elsewhere in the state unknown; not recorded in the present century.

Records.—Definite dates and localities of occurrence are very few. Audubon wrote (1831:341): "Descending the Ohio, we meet with this splendid bird for the first time near the confluence of that beautiful river and the Mississippi." Butler (1897:829) to the contrary, Audubon said nothing explicit of the species at Henderson (which is a considerable distance above the mouth of the Ohio), although he made oblique reference (*op. cit.*, p. 344) to nesting "in Kentucky and Indiana." The species probably occurred up the Ohio River at least to the mouth of the Wabash, but actual evidence of its former presence in Illinois appears to consist solely of a faded recollection of Ridgway's (1889:375), and Butler's early Indiana records (1897:829) are anything but convincing. There can, however, be no reasonable doubt that the Ivory-bill occurred in extreme western Kentucky, the most explicit record being from Audubon's journal (Audubon, 1929:33), where under date of November 19, 1820, he notes that they are "now plenty" along the Mississippi River about 30 miles below the mouth of the Ohio (in present Carlisle or Hickman County). Of Fulton County, Pindar wrote (1889b:313) that the species was "said to have been common formerly," and that one "A. J. Taylor saw several five or six years ago." Later (1925a:86) he qualified this to "I doubt exceedingly the presence of several or even one so recently," and added that "there is no doubt, however, of [its former occurrence] probably as late as 1872-4." That the last was a conservative view seems to be indicated by a sight record in Dunklin County, Missouri, May 12, 1894 (Widmann, 1895:114), and the capture of a male in nearby Stoddard County, Missouri, approximately 35 miles west of Carlisle County, Kentucky, on November 8, 1895 (Widmann, 1907:119).

There is evidence that in earliest colonial times the species was more widely distributed than the above records suggest. An interesting record unearthed by A. W. Schorger (1949:235)—and independently rediscovered a decade later (McKinley, 1958:380)—comes from the original journal of Colonel William Fleming, who under date of March 7, 1780, recorded the capture of 1 of 2 specimens seen near the present site of Stanford, Lincoln County. Fleming's detailed description, printed, according to Schorger, by "Newton D. Mereness (*Travels in the American Colonies*. Macmillan, N. Y., 1916:632)," leaves little doubt that the specimen was in fact an Ivory-bill. The locality is in the Bluegrass at the base of the Knobs, at an elevation of approximately 1,000 feet, and indicates that the species sometimes occurred well away from the river bottom swamps with which it is traditionally associated. A still more extensive distribution in precolonial times is suggested by bones of Ivory-bills found in Indian archaeological sites in southern Ohio (Wetmore, 1943:55).

¹ Measurements are as follows: wing length, 14 adults ($\sigma\sigma$ and ♀♀ treated together), 120-126 mm. (122.9 \pm 0.53; σ , 1.9; V , 1.5); tail length, 10 adults, 72-82 (78.4 \pm 0.96; σ , 2.9; V , 3.7).

FAMILY TYRANNIDAE: TYRANT FLYCATCHERS

Tyrannus tyrannus (Linnaeus): EASTERN KINGBIRD

Status.—Fairly common to common summer resident.

Spring.—Kingbirds occasionally appear before mid-April; average arrival probably about April 20. Early records: April 12 (1889), at Eubank, Pulaski County, average of 12 years April 19 (Cooke, 1908a:167); April 23, in Rowan County (Barbour, 1951a:35); April 22, in Nelson County (Blincoe, 1917:83); April 10, at Louisville (Monroe); April 10 (1934), at Madisonville (Hancock, notes); April 21 (1940), at Kentucky Woodlands National Wildlife Refuge, Trigg County (Cypert, Refuge files). The species may be more numerous in May, owing to the presence of transients, than later, but no precise evidence of this is available.

Breeding records.—At least some pairs are probably two-brooded, since 22 dated breeding observations indicate clutches completed from May 1–10 to July 21–31 (an early peak near June 1). Records, few providing many details, are from Laurel and Carroll (Mengel, notes), Washington and Nelson (Croft, *vide* Hays, 1957:4), Meade (Lovell, 1949b:45), Jefferson (Stamm, 1951a:23, and notes; Shannon, and Stamm, *vide* Hays, 1957:4; Monroe, notes), Barren (Mengel, notes), and Hopkins (Hancock, 1954:22, including records of Suthard) counties. An early date of nesting is indicated by incubation observed in Hopkins County on May 12, 1952 (Hancock), and the latest by young leaving a nest in Jefferson County on August 13, 1956 (Stamm, *vide* Hays). Only 3 clutches have been examined: Suthard took 1 containing 3 eggs in Hopkins County on May 27, 1925, and Monroe took 4 heavily incubated eggs from a nest 75 feet up [!] in a sycamore at Anchorage, Jefferson County, on May 30, 1942. A nest containing 3 eggs was found at Otter Creek, Meade County, on June 20, 1941, by Lovell. All nests have been found in fairly open situations, on horizontal branches (usually near the tips) of sweet gum, sycamore, elm, and oak trees, the average height above ground of 11 being approximately 33 feet (29 feet without the extremely high nest mentioned above). I recorded young out of the nest on July 1, 1952, in Laurel County (tails $\frac{2}{3}$ grown), on July 6, 1950, in Carroll County (tails $\frac{1}{2}$ grown; 1 taken), and on August 10, 1951, in Barren County (tails $\frac{1}{2}$ grown).

Breeding distribution.—The Eastern Kingbird breeds throughout Kentucky, wherever suitable habitat is available. Noisy and conspicuous throughout the summer, it is characteristic of open farm land or other situations affording widely spaced trees and does not occur in large tracts of mature forest. It is consequently not numerous in much of mountainous, extensively forested eastern Kentucky and is restricted in that region to the larger cleared areas. Its numbers have declined in Mammoth Cave National Park since reforestation was begun (Wilson, 1950:22). In the extensively forested Knobs about Berea, Patten (1946:33) found it one of the least numerous of 88 species recorded in June, 1941.

Fall.—Kingbirds are decidedly rare by early September, the last usually being gone by the middle of the month. Late records: September 23, 1921, in Letcher County (Horsey, 1923:143); September 29, at Danville (Bent, 1942:28); September 23, at Louisville (Monroe); September 23, in Warren County (Wilson, 1922:237).

Specimens examined.—Total, 7. U.K.—1 male, Woodford County (May 8); B.L.M.—1 male, Jefferson County (April 28); U.S.N.M. (see Wetmore, 1940:542)—4 specimens from Wayne, Meade, and Union counties (April 27–June 8); U.M.M.Z.—1 immature (tail half-grown) male (weight, 43.5 gm.), Carroll County (July 6).

**Muscivora tyrannus* (Linnaeus): FORK-TAILED FLYCATCHER

Status.—Accidental.

Records.—The single record is Audubon's (1834:387) of a bird caught near Henderson in late October (most North American records have been autumnal; see Bond, 1940) and brought to him by a friend. At the time of writing, Audubon had

seen other Fork-tailed Flycatchers and was obviously familiar with the species (see *The birds of America*, pl. 168, Vol. II, 1833). I see no valid new ground for rejecting the record, which was long accepted (see A.O.U. Check-List, 1931:203).

Geographic variation.—The subspecies involved was probably *Muscivora tyrannus tyrannus* (Linnaeus).

Myiarchus crinitus (Linnaeus): GREAT CRESTED FLYCATCHER

Status.—Common summer resident (except in the highest parts of the Cumberland Mountains, where nearly absent).

Spring.—Early arrivals are usually seen about April 20, rarely a few days earlier; the species is usually fairly common or common everywhere by April 25. Early records: April 23, in Rowan County (Barbour, 1951a:35); April 13 (1893), at Eubank, Pulaski County, average of 10 years April 17 (Cooke, 1909:12); April 16 (1916), at Bardstown (Blincoe, *vide* Funkhouser, 1925:230); April 15 (1948), at Louisville (Monroe); April 19, at Bowling Green (Wilson, 1922:237). The authenticity of a record for March 24 (Funkhouser, *loc. cit.*) is very doubtful.

Breeding records.—As indicated by 17 dated observations, clutches are completed from May 11–20 to June 21–30 (peak June 1–10). There is no evidence of two-broodedness. Records are from Wayne (Wetmore, 1940:542), Laurel (Mengel), Mercer (Van Arsdall, 1949:25), Owen (Hays, 1957:4), Nelson (Blincoe, 1920b:138, and *vide* Funkhouser, 1925:230), Oldham (W. Shackleton, 1948a:30; Stamm, Shackleton, and Slack, 1953:26), Jefferson (Monroe), Hardin (Fleetwood, 1939:10), Meade (Lovell, 1949b:45), and Hopkins (Hancock, 1954:23) counties. Probable clutch-completion May 11–20 is indicated by incubation in Nelson County, May 24, 1916 (Blincoe), and a late date by nest-building in the same county on June 13, 1915 (Blincoe). The average complement of 10 clutches or broods is 4.5 ± 0.07 (3–5). Nests ranged in height above ground from 4 to 15 feet (average, 8.6 feet), and were situated in mail or newspaper boxes (3), the metal covers of telephone pole guy wires (2), bird boxes (2), the hollow of a pole near a tennis court (1), and in a natural cavity (1). Most were decorated with the usual snakeskin (presence not always recorded). In Oldham County, Shackleton (*loc. cit.*) noted 6 days for construction of a nest, with about 17 days for incubation and 12–13 days for the nestling period (the young left this nest on July 11, 1947). Monroe's data for Jefferson County include records of 1 egg in a nest on May 21, 1918, 5 eggs in another on June 19, 1917, and 4 eggs in a third on June 1, 1941 (all nests in artificial situations). In upland pine-oak forests of Laurel County, a nest located in a hollow 15 feet above ground in the end of a dead limb of a red oak was empty when I found it on June 14, 1952, contained 4 eggs on June 18, and 5 on June 23. Hatching had not occurred by July 1.

Breeding distribution.—The species prefers fairly open, sunlit woodland and is fairly common to common in a wide variety of forest types in all parts of the state, with the apparent exception of higher elevations on Black Mountain, Harlan County, whence there is but one published record (Barbour, 1941a:46). Also, Warner and I recorded 3 birds near the top of the mountain on July 9, 1946, and in 1952, I noted 1 on several occasions, May 31–June 10, on a heavily forested slope at 4,000 feet elevation. In eastern Kentucky the species seems to shun the most mesic forest situations, a tendency not noted west of the Cumberland Plateau.

Fall.—Crested flycatchers are rare after the first week of September and decrease throughout the month. Late records: September 30, at Louisville (Monroe; records also for September 26 and 25); September 20 (1929), at Mammoth Cave (Bailey, 1933:131); September 19, at Bowling Green (Wilson, 1922:237). Monroe has September records for all dates through September 16. I recorded none in intensive late September field work in Jefferson County in 1950 and in Hopkins, Jefferson,

and Laurel counties in 1951. A male (J.D.F.) taken in Marshall County on August 19, 1941, by Figgins, shows molt of wing and tail and had just commenced molt of the body tracts. Near Henderson I took an adult male in perfectly fresh plumage, just completing body molt, on September 8, 1949 (U.M.M.Z.).

Geographic variation.—The subspecies occurring is the northern *Myiarchus crinitus boreus* Bangs.

Specimens examined.—Total, 12. U.K.—1 male, Woodford County (May 3); B.L.M.—1 male, Oldham County (June 12); J.D.F.—1 male, Marshall County (Aug. 19); U.S.N.M. (see Wetmore, 1940:542)—8 specimens from Wayne, Meade, Union, and Fulton counties (April 30–June 15); U.M.M.Z.—1 adult male (weight, 34.2 gm., not fat), Henderson County (Sept. 8).

Sayornis phoebe (Latham): EASTERN PHOEBE

Status.—Fairly common to common summer resident; a few winter.

Spring.—Since the numbers wintering are negligible, most of the phoebes recorded in late February and early March must be early arrivals from farther south. The species is usually present in force a few days before or after March 15. At Eubank, Pulaski County, Cooke (1908b:210) gave the average date of arrival for 6 years as February 27, the earliest as February 13 (1890). At Lexington in 1914, the species was first recorded (1 bird) on March 11, next on March 29, and became common on April 3 (Rogers, 1914:184). Monroe's records show the average arrival date at Louisville, 1934–1952, to be about March 10 but include many from February 20 on. Other early records: March 3, at Morehead (Barbour, 1951a:35); February 23, in Nelson County (Blincoe, 1925:411); March 5, in Warren County (Wilson, *vide* Lovell, 1939). Nesting activities begin almost immediately after arrival of the species in numbers. Notes on flight-singing observed April 8, 1950, were given by Wilson (1952:14). I noted courtship, including chasing and flight-singing, in Powell County on April 21, 1949.

Breeding records.—Dates of clutch-completion, as indicated by 38 dated breeding observations, range from March 21–31 to July 1–10, with an early peak April 1–10. Two broods are commonly reared. Various detailed records are from Rowan (Barbour, 1951a:35); Powell (Stamm, notes); Madison (Lovell, 1951b:60); Owen (Lovell, Stamm, and Pierce, 1955:9; Hays, 1957:4; Stamm, notes); Oldham (E. Shackleton, 1948:42; Stamm, Shackleton, and Slack, 1953:26; Stamm, notes; Monroe, Mengel, notes); Jefferson (Monroe, notes; Stamm, notes); Nelson (Beckham, 1885:34; Blincoe, *vide* Funkhouser, 1925:231); Meade (McClure, 1946:42; Lovell, 1949b:45); Bullitt (Stamm, notes); Edmonson (Bailey, 1933:133); Daviess (Powell, 1953:60); and Hopkins (Hancock, 1954:23) counties, and further from Powell, Laurel, Lyon, and Fulton counties (Mengel, notes). Egg dates range from March 29 (Beckham, 1885), in Nelson County, to July 1 (1952), 3 fresh eggs in Laurel County, a known second nesting (Mengel). The average complement of 18 clutches or broods considered or known to be complete is 4.1 ± 0.24 . Of these, 9 represent clutches probably completed between April 1 and May 10, and average 4.9 ± 0.10 (1 nest with 4, 8 nests with 5), while 9, probably completed May 21–July 1, average 3.3 ± 0.32 (1 nest with 2 eggs, 5 with 3, 2 with 4, 1 with 5). Of 26 nests for which data are adequate, 3 were parasitized by cowbirds. Artificial nest sites (culverts, wooden and concrete bridges, ice houses, porches, etc., of buildings) are most numerous, but cliff-nesting has been reported with fair frequency (Mengel, 1939:46, and numerous notes; Howell, 1910:296; Wilson, 1922:237; Lovell, 1949b:45; Bailey, 1933:133; Monroe, notes). My own hitherto unpublished notes concern nests in Lyon (incubation in progress, April 9, 1950), Fulton (2 fresh eggs, June 2, 1949), Jefferson (5 eggs of known second nesting, June 12, 1933), Powell (2 eggs, 1 small young, June 27, 1948), and Laurel (3 fresh eggs of known second nesting,¹

¹ The same nest is frequently used for both first and second nestings.

July 1, 1952; 1 young cowbird, sole occupant, ready to leave, June 18, 1952; 3 young, ready to leave nest on a beam under a cabin, July 2, 1952) counties.

Breeding distribution (see also winter).—The species occurs throughout Kentucky in all types of country, whether settled or primitive. In the breeding season a pair seems to be present about virtually every bridge and culvert in the state, and every cliff of any size. Phoebes occur to the top of Black Mountain, Harlan County, where the deep crevices in high, vertical road-cuts presumably furnish nesting sites.

Fall.—In early autumn phoebes are particularly numerous and occur in many habitats, being less localized than in the breeding season, when they tend to be limited to the proximity of suitable nest sites. They are more or less numerous through most of October, but a marked decrease occurs in late October or early November, and the species is rare by late November. "Last" dates for late October given by a few authors (Blincoe, 1925:411; Wilson, 1922:237) are misleading. Monroe has many records for early November. I recorded a phoebe at Slade, Powell County, on November 21, 1948.

Winter.—Beckham (1885:34) long ago reported midwinter observations in Nelson County. Records for Jefferson, Warren, and Edmonson counties were summarized by Lovell (1939), who concluded correctly that an appreciable number of phoebes winter in Kentucky, especially in the southern portion. Subsequently Monroe and others have found phoebes more or less regularly in the Louisville area in late December, January, and February, even when snow was on the ground. Hancock (letter: December 29, 1951) recorded 1 in Hopkins County on December 27, 1951. In Laurel County, I recorded 1 in upland woods on February 3, 1 in open country February 4, and in nearby Whitley County 1 at Cumberland Falls on February 5, all in 1950. Blincoe (1925:411) recorded 1 in Nelson County on February 6, 1917. Careful search would probably reveal a few phoebes wintering regularly in all parts of the state except, perhaps, in very severe winters.

Specimens examined.—Total, 21. M.S.C.—4 unsexed, Rowan County (spring, summer); B.L.M.—1 male, Oldham County (March 12); 1 unsexed immature, Jefferson County (July 6); J.D.F.—1 male, Fayette County (April 13); U.S.N.M. (see Wetmore, 1940:543)—12 specimens from Pike, Bell, Rockcastle, Wayne, Boone, Meade, Muhlenberg, Butler, Union, and Trigg counties (April 28–Nov. 9); U.M.M.Z.—1 female (weight, 21.0 gm., not fat), Meade County (Oct. 30); 1 immature female (17.7 gm., not fat), Jefferson County (Sept. 18).

Empidonax flaviventris (Baird and Baird): YELLOW-BELLIED FLYCATCHER

Status.—Transient, probably throughout the state, rare to uncommon in spring, uncommon to fairly common in fall.

Note.—In the field, the members of the genus *Empidonax* are notably difficult and frequently impossible to identify unless clues are afforded by voice and habitat. The status in Kentucky of the transient forms is not well known, and there is still need of vigorous collecting and judicious observation. Below, reliance has been placed chiefly on verified specimen records and particularly convincing sight records. Many unannotated or otherwise unsatisfactory records in the literature have been disregarded.

Spring.—The Yellow-bellied Flycatcher is a late migrant, probably most numerous in Kentucky between May 15 and 25. Specimen records made in or very near the state range from May 12 to June 3, and most of the few creditable sight records fall within this period. At least one May-collected specimen was taken by Beckham (C.W.B.) in Nelson County, and J. D. Figgins secured a male in Clark County on May 12, 1942 (J.D.F.). At Louisville Monroe has carefully made sight records for May 11, 13, 14, 18, and 28, in various years. Wilson (1956a:38) noted a small flight at Bardstown, Nelson County, on May 15, 1954, and others at Bowling Green on the same date, in 1956 (Wilson, 1956b:56). On May 20, 1949, I recorded 1 singing in a cypress swamp in Fulton County, and a female was taken there on May 20, 1938 (Wetmore, 1940:543). Barely extralimital are records from Cincinnati, Ohio,

a male taken by F. W. Langdon (1881:340) on May 28, 1879 (C.M.N.H.), and New Albany, Indiana, where a male is said to have been taken on June 3, 1889 (Butler, 1897:867).

Fall.—An early migrant, seemingly most numerous from late August to mid-September. Specimen records from the state and immediately adjacent points range from August 26 to October 8. Not very long ago the species would have been designated rare or very rare; more recently, collecting by myself and others has suggested that in fact it is fairly common, sometimes common locally, frequenting such varied habitats as deep floodplain forests and upland groves and thickets. Even specimen records at this season must be checked carefully because of the similarity of the Yellow-bellied Flycatcher and the immature Acadian Flycatcher (Mengel, 1952). In Henderson County, September 7–9, 1949, Tordoff and I took 2 females, an unsexed immature, and an immature male, and saw many other birds thought to be of this species. I took a specimen, which could not be saved, in a willow marsh in Jefferson County on September 11, 1950, and watched another, which sang three times, at the same place on September 17. Other specimens (listed below) have been taken in Oldham and Logan counties (Mengel, 1948:51), and Nelson County (Beckham, 1885:35; Blincoe, 1925:411). In Clermont County, Ohio, Goodpaster (1941:21) took a male on September 18, 1938 (C.M.N.H.), and in nearby Hamilton County, Ohio, Langdon took at least 1 female (mislabelled *E. virescens*) on October 8, 1887 (C.M.N.H.). Although some specimens may have been misidentified, an idea of the numbers of this flycatcher in autumn migration is given by the listing of 19 killed at a ceilometer at Nashville, Tennessee, September 9–10, 1948 (Spoford, 1949:88), with 1 each reported at Knoxville (Howell and Tanner, 1951) and Nashville (Laskey, 1951:60) on the late date(s) of October 7–8, 1951.

Specimens examined.—Total, 22. C.W.B.—9 specimens from Nelson County (1 May, 8 early September); B.L.M.—2 males, 1 female, Oldham County (Aug. 26, 30; Aug. 26); 1 female (?), Jefferson County (Sept. 10); C.U.—1 male, Logan County (Sept. 17); J.D.F.—1 male, Clark County (May 12); 1 unsexed, 1 female, Marshall County (Sept. 10; Sept. 5); U.S.N.M.—1 female, Fulton County (May 20); U.M.M.Z.—1 immature male (weight 14.1 gm., very fat), 2 females (adult, 12.3 gm., immature, 12.6 gm.; both moderately fat), 1 unsexed immature (13.0 gm., very fat), Henderson County (Sept. 8; Sept. 8, 9; Sept. 7).

Empidonax virescens (Vieillot): ACADIAN FLYCATCHER

Status.—Fairly common to common summer resident. See note under *Empidonax flaviventris*.

Spring.—Early arrivals are sometimes recorded in mid-April; at least a few birds are regularly present by late April; full numbers are attained by early May. Early records: April 18 (1890), at Eubank, Pulaski County, average of 6 years April 23 (Cooke, 1908:115); April 22 (1951), at Louisville (Monroe); April 28 (1938), in Meade County (Wetmore, 1940:543); April 20, at Lexington (Funkhouser, 1925:233); April 21, at Bowling Green (Wilson, 1922:237); April 18 (1905), in Logan County (specimen; C.U.). Breeding in numbers throughout the state and easily recognized by its loud and characteristic song, this seems to be the most numerous *Empidonax* in Kentucky; in migration, however, it is sometimes outnumbered locally by other, quieter members of the genus.

Breeding records.—As shown by 28 dated breeding observations, clutches may be completed as early as May 11–20 and (possibly) as late as July 21–31 (peak June 1–10). Possibly double-brooded. Records are from Powell (Stamm, notes; Mengel, notes); Rowan (Barbour, 1950a:34); Owen (Lovell, Stamm, and Pierce, 1955:8; Stamm, notes); Nelson (Beckham, 1885:35); Oldham (Stamm, Shackleton, and Slack, 1953:26; Stamm, notes); Jefferson (Brecher, 1944:51; Lovell, 1942:36; Mengel, notes); Meade (Lovell, 1949b:45–46); Hopkins (Hancock, 1954:23); and Fulton (Mengel, notes) counties. Eggs have been recorded as early as May 20 (Nelson and Fulton counties) and as late as June 29 (Powell County). Fifteen clutches (chiefly) and broods known or thought to be complete average 2.6 ± 0.12 (2–3).

The fragile nests, often decorated with pensile "streamers" of rootlets, etc., are situated near the tips of delicate branches, usually over openings (very often, but not always, over streams, the smaller of which are often dry), and have been noted variously in maples, redbuds, beeches, hornbeams, elms, oaks, cypresses, and hemlocks. The average height above ground (or water) of 23 nests is 11.7 feet (2-28). On May 20, 1949, I found a nest containing 1 egg at the tip of a slender cypress branch 8 feet above water approximately 30 inches deep, at a slough in southwestern Fulton County. I secured a female (U.M.M.Z.), which had an egg in the oviduct, in Powell County on June 30, 1948. I found a nest in Jefferson County, containing 3 heavily incubated eggs, on June 24, 1938. I saw young out of the nest, being fed by parents, in Laurel County on July 2, 1952. Nestings near Cincinnati, Ohio, have been reported by Langdon (1881:340) and Koch (1887).

Breeding distribution.—The Acadian Flycatcher is distinctly a forest species and is almost always found near water, whether tiny rivulets in upland ravines or large, sluggish streams in the lowlands. In the south and west it is most frequently found in rich floodplain forest adjoining streams and sloughs. In central Kentucky the species seems to be somewhat less numerous and more local than elsewhere, and is largely restricted to shaded areas along creeks (see Van Arsdall, 1949:25) and heavily wooded ravines. In the moist, mixed mesophytic forests of the valleys and slopes of mountainous eastern Kentucky it finds favorable habitat along streams large and small and is widely distributed. It occupies all the lower Cumberlandds and occurs on the slopes of Black Mountain, Harlan County, at least to an elevation of 3,000 feet.

Summer and fall.—Song is virtually concluded by early August. The postjuvinal molt occurs in August and early September, the postnuptial molt a little later (see Mengel, 1952, for detail). Little is known of the time of departure, but available evidence suggests that a marked decrease occurs by mid-September and that the species becomes rare by about September 20. Near Henderson, Tordoff and I found it common locally in floodplain forest, September 4-9, 1949. A male in very worn plumage just beginning molt was singing persistently when taken on September 4. On September 17, 1950, I recorded a singing bird in woodland near Louisville. A few late records: October 4, at Bowling Green (Wilson, 1922:237); September 23, at Louisville (Monroe); October 7-8, 1951, at Knoxville, Tennessee, a specimen killed in a "ceilometer accident" (Howell and Tanner, 1951).

Specimens examined.—Total 36. R.W.B.—1 male, Harlan County (July 17); C.W.B.—10 specimens, Nelson County (May-August); B.L.M.—3 males, Jefferson County (June 13); C.U.—1 male, Logan County (April 18); J.D.F.—1 male, Clark County (May 12); 2 males, Marshall County (Aug. 30, Sept. 10); U.S.N.M. (see Wetmore, 1940:543)—7 specimens, Wayne, Meade, Union, and Fulton counties (April 28-June 10); U.M.M.Z. (all weighed with little fat)—2 females (skeletons), Harlan County (July 2, 9); 2 males (first unweighed, weight of second 12.7 gm.), 1 female (15.5 gm., egg in oviduct), Powell County (June 24, 25; June 30); 3 males (adult, 12.3 gm.; immatures, 14.1, 12.9 gm.), 2 females (adult, 12.2, immature, 13.0 gm.), Henderson County (♂♂ Sept. 4, 8, 9; ♀♀ Sept. 8, 5); 1 male (12.3 gm.), Fulton County (May 17).

Empidonax traillii (Audubon): TRAILL'S FLYCATCHER

Status.—So far as known, a casual summer resident (one breeding record) and very rare transient. See note under *Empidonax flaviventris*.

Migration records.—I obtained an immature female (U.M.M.Z.) on September 20, 1950, at the edge of a marsh 2 miles east of Louisville. Although I have consciously sought the species, I have never heard its song in the migration period, and of 20 odd specimens of the genus I have taken more or less at random in spring and fall, only the above has proved to be *traillii*. There is only one other definite record of a probable transient *E. traillii* in Kentucky, for Warren County, May 11, 1957 (Wilson, 1957a:58), and the interesting question arises as to the manner in which the large populations breeding to the north have avoided the state, or detec-

tion therein. In the last century, two specimens, possibly transients, were taken near Cincinnati, Ohio, by Charles Dury (C.M.N.H.; September 22, 1878; May 16, ---).

Breeding records.—In the summers of 1937 and 1938 (see also Monroe and Mengel, 1948), on numerous dates between May 4 and July 30, Monroe and I noted a pair of Traill's Flycatchers just east of Louisville in a marshy area locally called Caperton's Swamp, the same where the supposed transient mentioned above was taken. On July 30, 1938, we observed the adults feeding 4 young a few days from the nest, one of these, a male, being taken. Again in 1956, 1957, and 1958, Traill's Flycatchers were noted in summer, in the same area (Monroe). The birds sing the two-syllabled *fitz-bew* song of the midwestern prairie population (or, as a growing number of students think may be the case, species). Maslowski (*vide* Goodpaster, 1941:21) noted similarly singing birds in the late 1930's, in Hamilton County, Ohio, near Cincinnati, and a previously unidentified specimen (C.M.N.H.) was taken in nearby Butler County, Ohio, on July 26, 1936, by Goodpaster. Several references by Pindar (1886a; 1887a; 1888–1889; 1889b:314) to Traill's Flycatcher as a summer resident in Fulton County are less than satisfactory, but extreme western Kentucky should be carefully watched for the species. Perhaps the same may be said of the entire state, since a Traill's Flycatcher was recorded singing in Jackson County, eastern Kentucky, on June 1, 1948 (Herndon, 1958:57).

Geographic variation.—Although careful reading of recent studies of variation in the species (Aldrich, 1951; Snyder, 1953) suggests that the continued recognition by the A.O.U. Check-List (1957:343–344) of only two subspecies is inadequate to express the facts (and indeed, "Traill's Flycatcher" may be two species), I am persuaded by a shortage of comparative material and of Kentucky specimens to follow the Check-List here. The two Kentucky specimens are therefore considered to represent *Empidonax traillii traillii* (Audubon) of the A.O.U. As indicated above, the locally reared bird is from a population with the *fitz-bew* song (*traillii* [Audubon], of Snyder, 1951:23; *campestris* Aldrich, of Aldrich, 1951:195). The specimen of September 20 seems likely, from its dark olive coloration dorsally and its small bill, to stem from a more northern population (birds which sing *zwee-beeo* or *way-bee-o*; *alorum* Brewster, of Snyder, *loc. cit.*; *traillii* [Audubon], of Aldrich, *loc. cit.*).

Specimens examined.—Total, 2. B.L.M.—1 immature male, Jefferson County (July 30); U.M.M.Z.—1 immature female, Jefferson County (Sept. 20).

Empidonax minimus (Baird and Baird) : LEAST FLYCATCHER

Status.—Uncommon to common transient. See note under *Empidonax flaviventris*.

Spring.—The Least Flycatcher seems to be a somewhat earlier migrant than the Yellow-bellied Flycatcher, although this impression may result only from an evident superiority in numbers. Specimen records range from April 25 to May 13 (C.W.B.). Between late April and late May the flight of Empidonaces passing through the state sometimes attains considerable proportions. Not all of these birds are *minimus*, but the regularity with which transients of this species sing the readily recognizable *che-bec* song has resulted in a fair number of creditable sight records, of which the extreme dates (April 17–May 31) are from Monroe's files at Louisville. A few Empidonaces have been noted still later, in early June, but not certainly identified. On April 30, 1949, I took a silent male in the alders and willows of a marshy meadow 2 miles south of London, Laurel County. There I noted 3 singing males on May 8, 1952, taking one on that date and another on May 12 (testes small; U.M.M.Z.).

Summer.—Although the Least Flycatcher breeds in the higher mountains of adjacent states, there is no satisfactory evidence of a breeding population in Kentucky. It is not impossible that a few occur in the Cumberland Mountains, as reported for Black Mountain, Harlan County (Breiding, 1947:38; mention without

detail of 1 bird seen July 5, 1944), but it seems best to consider this hypothetical. A rather large amount of field work at all elevations on Black Mountain (3 trips and 40 days in my own case) in the breeding season has disclosed no other indication of the species' presence.

Fall.—The migration of Empidonaces begins in mid-August or earlier, reaches its peak in early or mid-September, and is virtually over by early October, the latest available reference to any *Empidonax* in Kentucky being for October 21 (Bent, 1942:225). Many of these transients are doubtless Least Flycatchers. Specimen records range from August 21 (J.D.F.) to September 17, on which date in 1950 I took an immature male, one of 2 birds seen, on a brushy hillside 2 miles east of Louisville. I took another in a willow marsh nearby on September 11, 1950. At Louisville, Monroe and I have seen many birds thought to be *Empidonax minimus* on dates up to October 1 (1950).

Specimens examined.—Total, 15. C.W.B.—7 specimens, Nelson County (April 25–May 13); B.L.M.—1 unsexed, Oldham County (Aug. 30; see Mengel, 1948:51); Bernheim coll.—1 unsexed, Kentucky (no date); J.D.F.—1 male, Marshall County (Aug. 21, 1941); U.M.M.Z.—3 males (weight of first, 11.1 gm., moderately fat), Laurel County (April 30, May 8, 12); 2 males (weight of second, 10.4 gm., moderately fat), Jefferson County (Sept. 11, 17).

Contopus virens (Linnaeus): EASTERN WOOD PEWEE

Status.—Common summer resident.

Spring.—Early arrivals are occasionally recorded in the last 10 days of April, more frequently April 28–May 1; common by May 5. Early records: April 29, at Morehead, Rowan County (Barbour, 1951a:35); April 26 (1892), at Eubank, Pulaski County, average of 10 years April 28 (Cooke, 1908a:169); May 1, at Cincinnati (Goodpaster, 1941:22); April 17, at Louisville (Monroe); April 21, at Bowling Green (Wilson, 1922:237). A very early record (April 4, 1906) given by Funkhouser (1925:232) is probably incorrect.

Breeding records.—Clutches, as indicated by 19 dated breeding records, are completed from May 21–31 to August 1–10 (peak of completion of first clutches near June 10). Two broods are reared by some pairs, if not all, and in two reported cases (Fuller, 1951) the same nest was used for both. The rather limited data are from Pike (Mengel, notes), Laurel (Mengel, notes), Oldham (Stamm, Shackleton, and Slack, 1953:26), Jefferson (Hays, 1957:4), Meade (Lovell, 1949b:46), Barren (M. L. Frei, 1940:33), Hopkins (Hancock, 1954:23), Trigg (Cypert, Kentucky Woodlands National Wildlife Refuge files), Marshall (Fuller, 1951:62–63), and Ballard (Mengel, notes) counties. At one nest in Marshall County, Fuller noted construction on May 29, 1951, and incubation on June 6; the latest record of eggs is for August 14, a second nesting in the same nest (clutch probably complete by August 3, when incubation first noted). Young in the nest have been reported from June 10 (1945), in Hopkins County (Hancock, 1954), to July 21 (1951), in Ballard County (Mengel; eggs hatched near July 18). The delicate, lichen-encrusted nests are placed on horizontal limbs or in small crotches, usually some distance from the main trunk and at a considerable elevation (13 nests range from 15 to 50 feet above ground, average, 30.8), and have been recorded in maples, sweet gum, black locust, scrub pine, beech, and red, white, and overcup oaks. The nest is usually over a more or less open space. Few nests have lent themselves to examination of contents: of 5 clutches and 1 brood recorded, the average complement is 2.7 ± 0.34 (2–4). In recent field work I recorded the following: construction in progress, in oak-hickory woods 2 miles south of London, Laurel County, June 8, 1952; laying seemingly in progress at a nest 40 feet up in a red maple over a road, at 2,400 feet elevation near Elkhorn City, Pike County, June 20, 1951; incubation, nest 35 feet up in a scrub pine, over road, 10 miles southwest of London, Laurel County, July 7, 1948; incubation, nest 15 feet up in white oak, in a farmyard at Kevil, Ballard County, July 15–18, 1951 (hatching on last date).

Breeding distribution.—Statewide. The species occurs in a wide variety of forest habitats, both in edge and deep forest, and occurs in numbers in all major forest types examined. In the Cumberland Mountains and Plateau, however, the Eastern Wood Pewee is not numerous in the more mesic communities of the mixed mesophytic forest and tends to favor the more xeric types (see pp. 33, 39). This tendency is not evident west of the Cumberland Plateau. A somewhat similar pattern is shown by the Great Crested Flycatcher and the Wood Thrush.

Fall.—Most early fall specimens seen are in fresh plumage, but an adult male (U.M.M.Z.) which I took near Henderson on September 4, 1949, was in exceedingly worn plumage and had not commenced molt. The species remains common through September and into early October. Some song is heard in this period. In Laurel County, I found it fairly common October 3–5, 1951, noting only 2 (October 8, October 9) after a cold rainstorm on the 7th, and none October 10 or 11. Other late records: October 15 (1888), at Eubank, average of 7 years October 9 (Cooke, 1908a:169); September 30, at Cincinnati (Goodpaster, 1941:22); October 4 (Blincoe, 1925:411) and October 10 (Beckham, 1885:34–35), in Nelson County; October 15 (1950), at Louisville (Monroe); October 8, in Warren County (Wilson, 1922:237). Unannotated records for the weekends of October 13–14, 1934 (Slack, 1934), and October 19–20, 1935 (Slack, 1936), at Reelfoot Lake and Mammoth Cave, respectively, are open to some question.

Specimens examined.—Total, 30. M.S.C.—1 female. Rowan County (July 4); U.K.—1 female, Woodford County (June 1); C.W.B.—5 specimens from Nelson County; R.W.B.—1 male, Harlan County (July 27); B.L.M.—1 male, Harlan County (July 8); U.S.N.M. (see Wetmore, 1940:543)—15 specimens from Harlan, Bell, Wayne, Meade, Union, and Fulton counties (May 3–Sept. 23); U.M.M.Z.—1 male (weight, 15.1 gm., not fat), Warren County (May 3); 1 female, Powell County (June 30); 1 adult male (15.4 gm., not fat), Henderson County (Sept. 4); 1 immature male (12.6 gm., not fat), 1 unsexed, Jefferson County (Sept. 19; Sept. 14); 1 male, Campbell County (Sept. 10).

Nuttallornis borealis (Swainson): OLIVE-SIDED FLYCATCHER

Status.—Rare, regular transient.

Spring.—Migration is late, chiefly in May. Acceptable records range from May 4 to 28, both extremes from Jefferson and Oldham counties, where Monroe has sight records for May 4 (1952), 5, 14, 15, 17–20, 26, and 28 (1949). The species has been reported also from Warren County (Wilson, 1922:237); Breckinridge County (Wilson, 1956a:38); Fayette County (Funkhouser, 1925:231); Jessamine County (Burns, 1956:56); Madison County (Loefer, 1938); and Cincinnati, Ohio (Kemsies, 1948a:32). Still other records, whether or not authentic, appear in scattered trivial lists in *The Kentucky Warbler*. In Laurel County in 1952, I took a specimen (unsexable) from the top of a dead tree in a clearing in upland pine-oak forest approximately 12 miles southwest of London on May 6 and a male on May 9, in a similar situation about 10 miles west of London, on heights overlooking the Rockcastle River (U.M.M.Z.). These seem to be the only preserved specimens from the state. At an elevation of 4,000 feet, near the top of Black Mountain, Harlan County, I saw another, perched in a dead chestnut at the edge of a mountain meadow on May 15, 1952, but was unable to secure it.

Fall.—Migration of the species begins rather early, satisfactory records from Kentucky and near vicinity ranging from August 14 to October 11, with one reference to occurrence later. On August 14, 1952, I saw 1 bird west of London, Laurel County, and the next day observed another (Mengel, 1948:51), at close range, near the top of Black Mountain, Harlan County. Near Louisville, Monroe had made a few autumn records between August 17 and October 7 (1954). One was seen at Louisville also on September 2, 1956 (Stamm, 1957a:41). Pindar (1887a:84) reported 3 seen on September 2, 1886, in Fulton County. For Warren County, Wilson (1922:237) listed dates of occurrence from September 16 to October 25 [?], with a more recent record (Wilson, 1956d:64) in nearby Edmonson County for October 6,

1956. A female was taken at Avondale, Ohio, on October 11, 1908 (Goodpaster, 1941:22; Maslowski and Dury, 1931:83).

Specimens examined.—Total, 2. U.M.M.Z.—1 male (weight, 37.5 gm., moderately fat), 1 unsexed (32.0 gm., moderately fat), Laurel County (May 9; May 6).

Pyrocephalus rubinus (Boddaert): VERMILION FLYCATCHER

Status.—Accidental (or casual vagrant).

Records.—One. On October 8, 1955, Frederick W. Loetscher, Jr. (1957:268), secured an immature male near a small pond one mile north of Danville, Boyle County. Weather conditions of the few days preceding the appearance of the bird were such as to favor its movement from points to the south and southwest where the species has recently proved to be casual in winter.

Geographic variation.—The specimen was identified by Wetmore as *Pyrocephalus rubinus mexicanus* Sclater.

Specimen.—Total, 1 (examined by A. Wetmore and J. Van Tyne). U.M.M.Z.—1 immature male (weight, 15.2 gm., moderately fat), Boyle County (Oct. 8).

FAMILY ALAUDIDAE: LARKS

Eremophila alpestris (Linnaeus): HORNED LARK

Status.—Uncommon to fairly common summer resident, breeding locally (*E. a. praticola*), in open agricultural areas throughout the state; fairly common to common transient and winter resident (*praticola*, *alpestris*, *hoyti*) in the same areas. Probably absent as a breeding bird from primeval Kentucky, or limited to the original prairies (see history).

Spring.—Wintering or transient birds are probably present well after breeding birds have established territories. It is difficult to place the time of departure of transients; most are evidently gone by early March, when large flocks are no longer seen. I took a singing male (*praticola*), which seemed to be a breeding bird (testes greatly enlarged, weight 32.5 gm., not fat), from a fence post in open country just west of London, Laurel County, on February 5, 1950, while a flock of 8 other larks fed in a field nearby. So-called departure dates in the earlier literature are meaningless, because the possible presence of breeding birds was then unsuspected.

Breeding records.—As thus far indicated (by 18 dated observations) clutches are completed from February 21–28 to June 1–10, with a peak for first nestings probably March 21–31, and perhaps another (3 records) June 1–10. Various detailed data are from Rowan (Barbour, 1948:28); Madison (Patten, *vide* Lovell, 1947a:27—see also Figgins, 1944:26); Montgomery (Tandy P. Chenault, *vide* Lovell, *loc. cit.*); Grant (King, 1940); Clinton (Yunker, 1938:45—see also Ganier, 1937a:27); Harrison (Mengel, notes); Woodford (Dodge, *vide* Figgins, 1945:209); Jefferson (Lovell, 1944b:649, 1947a:21–25; Hays, 1957:4; Monroe, notes); Edmonson (Hibbard, 1935); Warren (Wilson, 1949a); Hopkins (Hancock, 1954:23); McCracken (West, 1954:62); and Calloway (Wyatt, 1948:3) counties. The earliest date of nesting is indicated by 3 young probably 3 to 4 days old in a nest in McCracken County (West) on March 15, 1954. The earliest egg date (1 egg, nest later abandoned) is for Jefferson County, March 15, 1944 (Lovell, 1947a:25). Complete clutches are on record for dates from March 29 (1947), in Calloway County (Wyatt), to June 7 (in 1940; not June 11, as given by Lovell, 1944), in Grant County (King). In Jefferson County, a nest reported by Lovell (1947a:21–24) contained 3 eggs on April 4 (misprinted April 9), with hatching April 13–14 and the young leaving April 24–25. Young in the nest have been observed, otherwise, as early as April 28 (1947), in Rowan County (Barbour), and as late as May 11 (1941), in Woodford County (Figgins). Young in juvenal plumage, not long from

the nest, have been noted on April 30 (Barbour, 1951a:35), in Rowan County, and July 13 (1950), in Harrison County (Mengel). The average complement of 9 clutches and 3 broods evidently complete is 3.5 ± 0.19 (3-5). Nests have all been situated in slight depressions in open areas (golf courses, corn stubble, winter wheat fields, pastures), usually alongside of such sheltering objects as corn stalks, dried manure, or lumps of earth.

Breeding distribution.—Essentially statewide. Requiring rather large open areas, the Horned Lark is inevitably local in eastern Kentucky, where it is absent entirely from extensively forested areas. Until a few years ago, listing of the areas for which breeding or breeding-season records exist would have been in order (for earlier summaries see Wilson, 1942:22, Lovell, 1947a); today this would result in a very long series of localities (of which Rowan County appears still to be the eastern-most), scattered throughout the state. To localities previously reported in the literature I can add breeding season records (1948-1952) for the following: Laurel County 2 miles south of London (male persistently flight-singing on June 14, 1952), and Boone, Kenton, Gallatin, Trigg, and Hickman counties (one to several records for each).

History.—The Horned Lark seems to have been unreported in Kentucky in May and the summer months until Embody (1905:54) listed 2 seen May 14, 1904, in Logan County, and Howell (1910:297) reported 2 observed at Midway, Woodford County, on July 9, 1909. There were records for a number of localities by the early 1920's, when Blincoe (1924) queried whether the species bred in Kentucky and noted (1925:411) summer observations in Nelson County. The first published breeding record was Hibbard's (1935) for Edmonson County, young out of nest on July 4, 1934, but the species seems to have been known as a breeding bird in Hopkins County since the turn of the century or before (Frazer, *vide* Lovell, 1947a:27). Summarizing earlier records, Lovell (*op. cit.*, p. 28) concluded that the species had probably bred in the state for "35 years or longer" but "seems to have been very rare and local in its distribution until relatively recently." There seems to be little doubt that the species has increased and become more widespread in recent years; however, it may have been present for some years before it was noted. It was probably absent from all of primeval Kentucky save possibly the original prairies, and it seems that if it had been numerous as a breeding bird before 1900, it would have been detected by such a skilled ornithologist as Beckham, working in the early-cultivated Bluegrass in the 1880's.

Summer and fall.—Resident birds sometimes gather in small flocks, probably representing one or a few family groups, in late summer. The time of arrival of migrants is difficult to fix. Small to moderate-sized flocks are frequently observed from late October on, and it is probable that migration begins about that time. In Muhlenberg and adjacent counties, small flocks were seen in late October and early November, 1938 (Wetmore, 1940:543). I saw small flocks in Oldham County on October 29, 1948, and in Fulton County on November 6 and 9, 1948, with 20 on the former date on sand bars in the Mississippi River. Flocks were also observed by Monroe, in Larue County, October 26, 1935, and by Carpenter (1934), in Jefferson County, October 21, 1934. In Nelson County, perhaps before the species bred in Kentucky, Beckham wrote (1885:32): "irregular flocks about the first week of November." "Arrival" dates given by Oberholser (1918b:349) are of questionable utility because breeding birds may have been included. Really large flocks are rare before early December.

Winter.—The species occurs throughout the state in suitable habitat, being more generally distributed and more often found in large flocks in the flatter, more extensively cleared parts of central and western Kentucky, especially in certain areas in the Bluegrass, Pennyroyal, and Purchase. Horned Larks are particularly partial to corn fields where mechanical harvesters have been used. In some areas, flocks of as many as 400 or 500 birds are not infrequent. At least three subspecies occur at this season (see below), but much more collecting will be necessary to

determine their relative numbers, distribution, and precise seasons of occurrence. There is little doubt that since early times the species has increased as a winter resident, coincident with clearing of the land. It was regarded as "occasional" at Cincinnati by Langdon (1879:176) and "irregular" in Nelson County by Beckham (1885:32).

Geographic variation.—Identification of individual wintering or transient specimens is sometimes difficult, if not quite impossible, but when appreciable series of well-prepared specimens are available, much can be told from winter-collected samples, especially if weights have been recorded. *The idea fostered by various identification manuals, that the subspecies alpestris and praticola can be safely separated in the field should be abandoned.* I have disregarded all references to subspecies based either on sight identification or assumption. Three subspecies have been recorded in the state.

Eremophila alpestris hoyti (Bishop)

This large, northern subspecies that breeds in the great arctic area west of the range of *alpestris* is distinguished from that form by duller coloration and restriction of the yellow wash on the head, which is here confined to the throat. It is separable from *praticola* mainly by size; averaging paler above, it tends to display even less yellow than *praticola*. A single male, which I took in Fulton County on December 27, 1950, with the series of *alpestris* mentioned below, is referred definitely to *hoyti* (wing, 110 mm.; weight, 49.5 gm., very fat; yellow restricted to center of throat). Two females (wings 102 mm., weights 45.5—very fat, and 45.7—moderately fat) are placed here tentatively, since in coloration they are intermediate between *hoyti* and *alpestris*. This is possibly the southernmost record for *hoyti* in the United States.

Eremophila alpestris alpestris (Linnaeus)

This large, pinkish, yellow-headed, northern subspecies has been generally regarded, apparently with little factual basis, as rare this far south. Not counting 2 specimens without data in the Bernheim Collection, taken by J. D. Figgins, desultory collecting before 1950 had produced only 1 specimen referable to *alpestris*, a female which I took in Oldham County on December 23, 1940, along with specimens of *praticola*. However, from December 26 to 28, 1950, I studied several flocks of Horned Larks, averaging from 100 to 200 birds, frequenting corn-stubble fields near Fulton, Fulton County, and collected 9 specimens, all of which proved to be northern birds and 6 definitely *alpestris* (2, mentioned above, tentatively identified as *hoyti*, seem intermediate). The 6 definite *alpestris* all have the color characters of that form with little variation. No specimens of *praticola* were obtained, and it seems likely that these flocks were composed largely or entirely of northern birds. The size data obtained from these birds (including those discussed under *hoyti*) are here summarized (compare with *praticola*).

Wing (6 ♂♂): 111.5 mm. \pm 0.8 (109–114); σ , 1.9; V, 2.0. Wing (4 ♀♀): 102.3 (102–103). Weight (6 ♂♂; all very fat): 48.0 gm. \pm 0.3 (44.5–52.5); σ , 2.9; V, 6.0. Weight (3 ♀♀): 45.1 (44.0–45.7).

Eremophila alpestris praticola (Henshaw)

The breeding Horned Lark of the eastern United States. Only 1 possibly breeding example (Laurel County, February 5, 1950, ♂) seems to have been taken in Kentucky. A few other February specimens may have been preparing to breed locally. On January 6, 1951, shortly after collecting the series of northern birds described above, I took a male of the present subspecies from a small flock near Kuttawa, Lyon County. From January 7 to 9, 1951, near Worthington in eastern Jefferson County, I found Horned Larks common in fresh snow, one flock of perhaps 500 birds being seen, and took 3 more males referable to *praticola*. It is conceivable that most or all of these birds were *praticola*, at essentially the same time

that the majority of the Horned Larks in at least part of the (southwestern) Purchase region were *alpestris* and *hoyti* (see above). Whether or not the different subspecies regularly tend to occur in separate flocks remains to be established. Size data for *praticola* at hand are given herewith.

Wing (9 ♂♂): 105 mm. \pm 0.9 (101–110); σ , 2.6; V, 2.5. Wing (6 ♀♀): 101.4 (97.5–105). Weight (4 ♂♂; all very fat): 41.7 gm. \pm 0.9 (40.1–43.3); σ , 1.5; V, 3.6.

Comparison of these statistics with those derived from northern birds (as originally separated on the basis of color), shows a highly significant difference between the two groups, both in weight and wing measurement.

It is possible that a few birds of western origin move eastward as far as Kentucky. A female (B.L.M.) taken near Solitude, Bullitt County, by Monroe on February 13, 1938 (wing, 100 mm.), is pale and rather ochraceous above, resembling *Eremophila alpestris leucolaema* Coues of the Great Plains. Another specimen (male by plumage, sexed female; wing, 106; B.L.M.), taken by Monroe in Oldham County, December 8, 1940, also stands out from the series, and is close to typical *Eremophila alpestris enthymia* (Oberholser) (= *leucolaema*?) of the eastern High Plains. Close to the latter bird also is the male, mentioned above, from Lyon County, January 6, 1951 (U.M.M.Z.). While Oberholser (1902:827) regarded *praticola* as a remarkably uniform subspecies, I am not at present quite convinced that these atypical specimens are beyond its range of variation and prefer to call them *praticola*, if tentatively so. Extensive collecting will be necessary to determine whether a statistically significant percentage of western-type birds occurs in Kentucky.

Note.—The observation (Van Arsdall, 1951:39) of 4 Horned Larks dust bathing, in Mercer County on June 19, 1949, is of some interest, since few passerines other than Ploceids display this habit (I have noted dust bathing by Brown Thrashers, Mimidae, on several occasions).

Specimens examined.—Total, 35. B.L.M.—(*alpestris*) 1 female, Oldham County (Dec. 23); (*praticola*) 1 male, 1 female, Bullitt County (Feb. 13); 1 male (sexed female, male by plumage), 3 females, Oldham County (Dec. 8; Feb. 9, Dec. 8, 23); C.U.—(*praticola*) 1 male, Logan County (April 19, 1905); Bernheim Collection—(*alpestris*) 2 females, Kentucky (no dates); (*praticola*) 3 males, 3 females, Kentucky (no dates except "Jan. 1940" on 1 specimen); U.S.N.M.—(*praticola*) 3 males, 1 female, Fayette County (Nov. 30); 1 female, Muhlenberg County (Oct. 27); U.M.M.Z.—(*hoyti*) 1 male, 2 females (?*hoyti*), Fulton County (Dec. 27; Dec. 26, 27); (*alpestris*) 5 males, 1 female, Fulton County (Dec. 26–28); (*praticola*) 1 male, Laurel County (Feb. 5); 3 males, Jefferson County (Jan. 7–9); 1 male, Lyon County (Jan. 6).

FAMILY HIRUNDINIDAE: SWALLOWS

**Iridoprocne bicolor* (Vieillot): TREE SWALLOW

Status.—Transient, uncommon to common in spring, rare to uncommon in fall except sometimes along the Mississippi River where periodically common; possibly a rare summer resident, at least formerly, in Mississippi River bottom lands.

Spring.—The migratory movements of Tree Swallows in Kentucky are erratic in timing, sometimes beginning in late March or even earlier, sometimes not until mid-April; peak of flight usually in late April; rare by mid-May. Early records: March 22 (1879), at Cincinnati, Ohio (Langdon, 1880:123); March 16 (1952), at Louisville (Monroe); March 28 (1939), at Lexington (Mengel; more than 100 at city reservoirs); March 29 (1950), in Warren County (Wilson, 1938; Mengel, notes). There are very few detailed published records; it seems certain that many observers have overlooked the species. Most of the few records available are from west of the Cumberland Plateau, but at least two (Stone, 1921, Harlan County; Barbour, 1952:26, Rowan County) are for eastern Kentucky. The information on hand, from published and unpublished field lists, notes, and other sources indicates that Tree Swallows are sometimes fairly common or common locally, occurring mainly near bodies of water. Handley and I recorded 1 on April 10, 1950, at Kentucky Lake, in Marshall County, and 6 on April 16, over Hematite Lake in

nearby Trigg County. More detailed notes on occurrence and migration are desirable. No preserved specimen from Kentucky appears to exist! Goodpaster took a male in Clermont County, Ohio, on April 15, 1939 (B.L.M.). At Louisville years ago, probably about 1932, I handled a dead specimen which I still recall clearly. Late records: May 4, in Rowan County (Barbour, 1952:26); May 14 (1949), at Lexington (Edwards, notes); May 6 (1950), at Louisville (Monroe); May 8, in Warren County (Wilson, 1922:240).

Distribution in summer.—Although Pindar (1889*b*:315; 1925*a*:165) wrote that the Tree Swallow was present (but rare) in summer in Fulton County, there are no recent records made in the breeding season, and in several summer trips to the Purchase region, 1941–1951, I failed to find the species, although much favorable habitat (swamps and sloughs with abundant dead trees) was investigated. Pindar, nevertheless, may well have been correct, since the former presence of the species as a breeding bird in this general area is abundantly documented (Ridgway, 1889:209, southern Illinois; Widmann, 1907:203, south to Dunklin County in Missouri—eggs found May, 1894, Widmann, *vide* Howell, 1911:71). Ganier (1933:24, and *in* Wilson, 1942:22) listed the species without detail as a rare summer resident in western Tennessee, and specifically at Reelfoot Lake. Recent observers, however, do not seem to have recorded it there in the breeding season.

Fall.—Limited evidence suggests that the Tree Swallow is an irregular migrant, sometimes very common along the Mississippi River, increasingly rare eastward. The migration seems to occur later than that of other swallows, occasionally enduring well into October. Records of fall transients are very few. Monroe's files contain few autumn records for the Louisville area, where I bird was noted August 7, 1957 (Croft, 1958*a*:46), and others on August 27, 1958 (Croft, *vide* Monroe), and September 15, 1956 (Brecher, *et al.*, *vide* Monroe). Goodpaster (1941:22) and Kemsies (1948*a*:33) both listed the species at Cincinnati. Carpenter (1941*a*) recorded a flock near Marion, Crittenden County, on September 11, 1940. The species was listed by the Kentucky Ornithological Society (Slack, 1934) at Reelfoot Lake, northwestern Tennessee, October 13–14, 1934. Tabler (1949) reported a flight of thousands there in early October, 1948. Whittemore (1937:123) recorded transients on the lake, July 25 to September 5, 1936, with one flock estimated at 1,200; recorded there also by Carpenter (1938:21) in 1936 and by Wetmore (1939:201), October 5–21, 1939. Widmann (1907:203) placed the peak of migration in the central Mississippi Valley at mid-September, noting the occurrence of many thousands. The lateness of migration is indicated by records for Ohio as late as November 3, 1925 (Borror, 1950:22).

Specimen examined.—Total, 1, Jefferson County (not preserved; see text).

Riparia riparia (Linnaeus): BANK SWALLOW

Status.—Rare to fairly common transient throughout Kentucky; very rare to uncommon summer resident (absent from large areas), except in central and western Kentucky where large colonies breed in high banks along the major streams.

Spring.—More observations are needed. Usually the species is first noted in mid or late April, with the peak of migration probably in early May. Few thoroughly reliable records are available because the Bank Swallow is easily confused with the Rough-winged Swallow. Early records: April 4, in Rowan County (Barbour, 1952:26); April 11 (1938), at Cincinnati, Ohio (Goodpaster, 1941:22); April 6 (1953), at Louisville (Monroe; additional records for April 23, 25, and 30); April 8, in Warren County (Wilson, 1922:240). A specimen (U.S.N.M.) was taken in Union County on May 5, 1938, and reported by Wetmore (1940:543), who recorded others seen at Brandenburg, Meade County, on April 28. The Bank Swallow has been reported from comparatively few localities; many observers, presumably, have overlooked it. It is my own impression that it is rarely met with except near the larger streams, where breeding colonies are situated, and where it may appear to

be common. Significantly late records of known transients are almost lacking, since most records come from areas where the species probably or definitely breeds. In Rowan County, Barbour (1952:26) regarded it strictly as a transient, giving his latest date as April 25.

Breeding records.—Only three active colonies have been found in recent years. Monroe and I discovered a large one, of more than 1,000 burrows, in a bank of sandy clay on the shore of the Ohio River approximately 7 miles west of Henderson, Henderson County, on July 7, 1940. Many of the holes contained nearly grown young, and I secured an adult female (B.L.M.). J. W. Hardy (notes) noted 1,000 or more breeding in clay banks in Union County, in the summers of 1952 and 1953. A small colony, consisting of 12 burrows containing young nearly ready to leave was found in the bank of the Ohio River, in Jefferson County, 6 miles east of Louisville, on July 12 [1942] by Monroe and Lovell (Lovell, 1943). In years past, other colonies have been noted in the Louisville area, but the details are obscure. Colonies are well known near Cincinnati (Goodpaster, 1941:22, see also Langdon, 1879:173). It is probable that such colonies exist locally all along the Ohio and the lower parts of its major tributaries wherever sandy banks are found. The high loess "cliffs" in parts of the Purchase should be ideal for the species. Audubon (1838:585) presumably found the Bank Swallow breeding, as he remarked that it was two-brooded in Kentucky, which is very improbable.

Distribution in summer.—Not well known. In addition to the above-named localities, the species has been reported, with little or no detail, as breeding or resident in summer in Fulton County, common (Pindar, 1889b:315); Calloway County, rare (Wilson, 1923c:135, see below, under Rough-winged Swallow); Warren County, rare (Wilson, 1922:240, see below likewise); and Nelson County, common, suspected of breeding (Beckham, 1885:22). It was not revealed at all in the last locality by the careful later work of Blincoe (1925). In Union County, 4 miles northeast of Uniontown, I took a male near the Ohio River, and probably near a breeding colony, on June 15, 1941 (B.L.M.). I recorded 1 July 18 and 3 July 19, 1951, with other swallows, at a pond near Barlow, Ballard County, and 1 flying over nearby Clear Lake on July 21. Probably the species breeds in that area. Wetmore's report (1940:543) of individuals seen at Rockybranch, Wayne County, on June 8 and 13, 1938, is the easternmost summer record on hand.

Fall.—More records are desirable. So far as available notes show, the species becomes rare quite early. At Louisville, small to moderate numbers are sometimes recorded at the Falls of the Ohio River in late August. Whittemore (1937:123) observed the arrival of transients at Reelfoot Lake, Tennessee, on August 11, 1936, and noted that the species became the most numerous of the swallows. Late records: "about" September 1, at Cincinnati (Langdon, 1879:173); September 30 (1960), at Louisville (Monroe); September 6, in Warren County (Wilson, 1922:240).

Geographic variation.—The North American subspecies is *Riparia riparia riparia* (Linnaeus).

Specimens examined.—Total, 3. B.L.M.—1 female, Henderson County (July 7, 1940); 1 male, Union County (June 15, 1941); U.S.N.M.—1 specimen, Union County (May 5, 1938).

Stelgidopteryx ruficollis (Vieillot): ROUGH-WINGED SWALLOW

Status.—Fairly common to common summer resident.

Spring.—This swallow appears in numbers about mid-April or very shortly thereafter; occasional individuals arrive in late March or early April. Early records: April 12 (1951), at Williamsburg, Whitley County (Mengel, notes); April 7 (1940), at Cincinnati, Ohio (Goodpaster, 1941:22); March 25 (1950), at Louisville (Monroe; average about April 12); April 6 (1902), in Warren County (Oberholser, 1917:329); April 8 (1940), in Trigg County (Cypert, notes). Handley and I found the species present in numbers in the Purchase, April 10–13, 1950.

Breeding records.—Limited data (13 dated breeding records) indicate completion

of clutches from May 1-10 to June 1-10 (peak May 21-31). Exact data on nestings are few, owing in part to the species' proclivity for nesting in inaccessible places. I noted construction of a nest in Pulaski County on April 28, 1949, and Hancock (1954:23) observed the same in Hopkins County on April 30, 1936. Goodpaster (1941:22) reported nesting in Clermont County, Ohio, on April 25, 1937 (stage not noted). Monroe took a set of 6 fresh eggs in Jefferson County on May 15, 1936 (B.L.M.). Young in the nest were reported from Edmonson County, June 12, 1934 (Hibbard, 1935), and from Hardin County, at Sutzer's Lake, on June 20, 1937 (Monroe). Monroe and I found young in two nests in Jefferson County on June 25, 1938, and I found several nests, three of which contained large young, in Calloway County (one nest in a remodelled kingfisher hole, 30 feet up in a bank of red clay) on June 11, 1949, and two nests containing small young in Whitley County (burrows 6 feet up, in fissures of a low clay bank by a roadside) on June 17, 1952. I took a juvenal-plumaged male not fully grown (weight, 16.1 gm.) but out of the nest, in Calloway County on June 14, 1949 (U.M.M.Z.). Other nestings have been reported, but without detail (Murray, 1938:2, Letcher County; Horsey, 1922:82, Johnson County; Barbour, 1951a:35, Rowan County; Lovell, 1951b:60, Fayette County; Beckham, 1885:22-23, Nelson County). Nests found in Kentucky have been in natural cavities of limestone cliffs and caves, in crevices of road cuts, stone walls, and bridge abutments, and excavated in clay banks.

Breeding distribution.—Statewide (many records). The Rough-winged Swallow is fairly common in most areas, but tends to be localized in the vicinity of sites affording nest cavities. Nearly every deep road cut in the state seems to have its small breeding colony, and a few are to be found about most cliffs of any size. The species is probably more numerous than in early times. It is much less colonial than the Bank Swallow, with small colonies being the rule, and solitary pairs are sometimes found. On Black Mountain, Harlan County, it does not seem to occur above approximately 2,500 feet, although there are seemingly suitable nesting sites higher up. Some earlier observers, I think, confused the present species with the Bank Swallow, unless there have been drastic changes in the relative status of the two. For example, Wilson (1922:240) gave only one record for Warren County of the now common Rough-wing, but listed the probably much rarer Bank Swallow as a rare summer resident; the same author (1923c:135) did not list the Rough-wing at all for Calloway County. Blincoe (1925:414) reported the Rough-wing only as a spring migrant, not listing the Bank Swallow, in Nelson County.

Fall.—Reliable information on the time of departure of the species is all but lacking. Langdon (1879:173) gave the latest record for the Cincinnati area as September 1. Monroe's latest record for Louisville is for October 1 (1950). The species remains regularly through most or all of August; later records should be carefully recorded and published. Borrer (1950:22) gave the average date of departure from central Ohio as August 31, the latest as October 15, 1922.

Geographic variation.—The subspecies of most of North America (including Kentucky) is *Stelgidopteryx ruficollis serripennis* (Audubon).

Specimens examined.—Total, 13. M.S.C.—1 unsexed, Rowan County (May); U.K.—1 male, Wayne County (April 28); C.W.B.—1 male, Nelson County (date?); B.L.M.—1 female, Jefferson County (April 21); C.U.—1 male, Logan County (May 31); U.S.N.M. (see Wetmore, 1940:544)—6 specimens from Wayne, Breckinridge, and Union counties (May 4-June 15); U.M.M.Z.—1 immature male (weight, 16.1 gm.), Calloway County (June 14); 1 female (weight, 16.5), Marshall County (April 10).

Hirundo rustica Linnaeus: BARN SWALLOW

Status.—Fairly common to common summer resident, except in the heavily forested mountainous counties along the southeastern border, where very rare to absent.

Spring.—Barn Swallows appear, exceptionally, at the end of March, occasionally in the first few days of April; the species arrives regularly between April 5 and 15, becoming rapidly more numerous thereafter. Pindar (1887:47) noted it in Fulton

County on March 29 (1887?), and Monroe has a record for March 28 (1959), at Louisville. Oberholser (1918a:151) gave the earliest record at Eubank, Pulaski County, as April 1 (1891), average of 10 years April 10; numerous additional early records from scattered points fall between April 2 and 10. In western Kentucky, Handley and I saw 3 in Marshall County on April 11, 1950, 1 in Calloway County the next day, and many throughout the area, April 13-16. In Madison County, I recorded 2 on April 9, 1951. Surprisingly, there seems to be but one preserved specimen from the state, a female taken by Monroe in Oldham County on May 30, 1946 (B.L.M.).

Breeding records.—As indicated by 18 dated observations, clutches are completed from May 1-10 to July 1-10 (early peak May 11-20); two broods are reared. The few more or less detailed records are from Woodford (Dodge, 1945); Oldham (Monroe, notes); Jefferson (Tabler, 1956; Hays, 1957:4; Stamm, notes; Monroe, notes); Daviss (Powell, 1952a:57); Hopkins (Hancock, 1954:23); Trigg (Lovell, 1951b:60); and Ballard and Hickman (Mengel, notes) counties. Eggs have been noted from May 6, 1956, in Jefferson County (first egg laid; Tabler), to July 21, 1951, in Ballard County (eggs hatching). The average complement of 13 clutches or broods is 4.4 ± 0.18 (3-5). Most nests reported have been on rafters or projections in barns or other farm buildings. Nests often contain many chicken feathers in the linings. An interesting nest on a porch-light fixture at Louisville was intelligently studied by Tabler (1956), who, among other worthwhile observations, noted (1) the same nest used in two successive years; (2) incubation periods of 15 days on two occasions; (3) rearing of two consecutive broods in the same nest and season; (4) incubation of a 5-egg clutch beginning with the fourth egg; (5) a nestling period of 18 days; and (6) completion of a clutch of 5 eggs (1 egg per day laid in a first nesting; 1 every other day in a second nesting) on May 20 by the male's second mate after the death on May 6 of his first mate who had then just laid her first egg, the same nest being used and the single egg, seemingly, removed by the second female. My notes contain the following records: a nest containing 4 fresh eggs, under a concrete bridge at Murphy's Pond, Hickman County, June 5, 1949; nest with 4 young about 5 days old (several inactive nests nearby), near La-Center, Ballard County, July 19, 1951; nest with 2 newly hatched young and 2 eggs, same site as Hickman County nest above, July 21, 1951. Young on the wing are commonly seen by mid-June. General references to nesting are available from many localities, of which Rowan County (Barbour, 1951:35) is the easternmost.

Breeding distribution.—The Barn Swallow is undoubtedly much more numerous and generally distributed in Kentucky today than in early times. It is a bird of open farm lands and seems to be especially numerous near ponds and lakes; it is common wherever such habitat is extensive, this in Kentucky being the case through most of the Purchase, Pennyroyal, and Bluegrass, and much of the Knobs and Western Highlands. In certain extensive areas where cultivation has ceased and reforestation begun, the species has decreased or disappeared, as at Mammoth Cave (Wilson, 1950:22) and at Otter Creek Recreation area in Meade County (Lovell, 1949b:46). The Barn Swallow has established itself in most of the cleared areas of the Cumberland Plateau, but is less numerous than it is farther west. The species is unrecorded from most of the area embraced by the mountainous counties of the southeastern tier, Bell, Harlan, Letcher, and Pike, and probably parts of Floyd, Knott, and adjacent counties as well. Never able to find it in the above areas, I did see a few in 1951 and 1952 in the broad valley of the Powell River near Big Stone Gap, Virginia, just across Black Mountain, and it seems probable that a few do breed in valleys of the Kentucky counties mentioned. The expansion of the original range, which is virtually unknown in detail, into the cleared areas of Kentucky must have occurred long ago. The species was already generally numerous in the late 1800's (Beckham, 1885:22; Garman, 1894:15).

Fall.—This swallow is sometimes very conspicuous in late summer, perching along wires in large congregations. Some observers have stated that it is more numerous

in migration, but the evidence is inconclusive (Wilson, 1922:239; Barbour, 1951a:35). Tordoff and I found fair numbers near Henderson, September 5-8, 1949. Much less numerous by mid-September, a few lingering later. Late records: October 8, at Eubank (Bent, 1942:458); September 12 (1931), at Cincinnati, Ohio (Goodpaster, 1941:22); September 20, in Nelson County (Blincoe, 1925:414); September 24 (1945), at Louisville (Monroe; next record September 9); September 17, in Warren County (Wilson, 1922:239). In early October, 1948, Tabler (1949:7) observed migrating Barn Swallows with great numbers of Tree Swallows at Reelfoot Lake, Tennessee.

Geographic variation.—The North American subspecies is *Hirundo rustica erythrogaster* Boddaert.

Specimen examined.—Total, 1. B.L.M.—1 female, Oldham County (May 30, 1946).

Petrochelidon pyrrhonota (Vieillot) : CLIFF SWALLOW

Status.—Irregular transient, usually rare, occasionally fairly common; formerly an uncommon to fairly common summer resident, breeding locally, probably through most of the state; now very rare in summer, with only one breeding colony known.

Spring.—Probably most of the Cliff Swallows seen in recent years have been transients. Usually rare, the species is sometimes locally and briefly common, being observed at most localities irregularly and infrequently. Migration is protracted, extending on some occasions from late March to late May. Available records fall between March 24 (Wilson, 1922:239), in Warren County, and May 30 (1931), at Cincinnati (Goodpaster, 1941:23). Monroe has only a few dates of spring observation for the Louisville area, April 9 (1950) to May 20. In Nelson County from 1911 to 1921 Blincoe (1925:414) recorded the species only twice, May 18 (1916, 1921). Goodpaster (*loc. cit.*) gave a Cincinnati record for April 3, 1938, and Cypert (notes) had a Trigg County observation (1 bird) for May 16, 1940. Pindar (MS., about 1925) gave the earliest date for the Bluegrass as March 26. Scattered, informally reported records, notably from Providence, Murray, and Bowling Green are found in various casual lists appearing in *The Kentucky Warbler*.

Breeding records.—While few detailed records exist, there is evidence that the species once nested more regularly and in greater numbers in this general area than it does at present. Its decrease in Indiana was described by Test (1929) and in southern Illinois by Ridgway (1915:196). Most authors have attributed this decrease to the invasion of the House Sparrow; writing of northern Ohio, Campbell (1940:111) suggested the widespread increase in the painting of barns, often used by these swallows as nest sites, as an additional cause.

In Kentucky the species bred in the years 1815-1819 on buildings of a U. S. Army garrison at Newport, Campbell County, where on April 20, 1819, Audubon (1831:353-354) saw many of the mud nests and was told that the birds arrived each year about April 10. He examined a number of nests, each containing 4 eggs, and was also informed of nests on the "Court-House at the mouth of the Kentucky River" (this would be at Carrollton, Carroll County) around 1815, and of further nests on cliffs along the same stream. Rafinesque also observed the species at Newport, describing it in the *Lexington Kentucky Gazette* for February 14, 1822 (p. 3, column 4, subtitled "The Cosmonist"; details from Rhoads, 1912:192-194), under the long-used name *albilora* and noting that it "builds its nest on the high banks of the river." At Cincinnati, Ohio, just across the river, much later, Langdon (1879:173) still considered the species an abundant summer resident. Although he had seen no nests, Beckham (1885:22) regarded the Cliff Swallow as a breeding bird and common summer resident in Nelson County, while Dodge (1940) wrote that on his farm [in Woodford County] the species nested up to 1886, when the first House Sparrows appeared, being absent from then until 1924 (1 pair) and increasing to 10 pairs in 1926, after which none has been seen. Around 1890 Pindar (1926:23) noted it as rare in summer in Harrison County. These seem to be the

only references to summering or nesting until 1945, when a large colony, containing several hundred nests, was discovered on Kentucky Dam near Gilbertsville (first reported by Weakley, 1945:33; see also Hays, 1957:4). This colony is still flourishing at the time of writing, but because of the inaccessibility of the nests, data on eggs and young have not been obtained.

Summer.—Most of the casual references to the species as a summer resident in recent years (chiefly in Wilson, 1942:22) are undocumented and may be based on late spring or early fall transients.

Warner and I saw 3 Cliff Swallows over the Cumberland River at Cumberland Falls, Whitley County, on July 10, 1946. Possibly nestings on cliffs may occur on the Cumberland Plateau and elsewhere, as suggested by Wilson (1946:17), but no evidence is available. I saw 1 Cliff Swallow with many other swallows at a pond near Barlow, Ballard County, on July 19, 1951. These are all that I recorded in work throughout the state in parts of five summers, 1948–1952. Monroe has a few Louisville records, all after July 8. On July 7, 1940, near Henderson, Monroe and I collected a male and female (B.L.M.) which were *entering holes in a colony of Bank Swallows* (Monroe and Mengel, 1942a)! Pindar (1887a:85) mentioned 1 seen in Fulton County, June 21, 1886, and later wrote that the species was a rare summer resident there. This and some other early reports (for example, Wilson's, 1922:239, for Warren County; and 1923c:135, for Calloway County) may have been based on breeding populations.

Fall.—Erratic, as in spring, and recorded from few localities. Migration begins in July or August, being nearly concluded by mid-September. The species is sometimes common locally, as at Henderson, September 5, 1949, when Tordoff and I recorded more than 100 and took a male (U.M.M.Z.), and at Cairo, Illinois, August 17 to September 4, 1875 (Nelson, 1877:53). Monroe has occasionally found loose, migrating flocks present for several days at the Falls of the Ohio River in late August and early September. Late records: August 27 (1939), at Cincinnati (Goodpaster, 1941:23); September 19 (1938), at Louisville (Mengel, 1938c); September 18, in Warren County (Wilson, 1922:239).

Geographic variation.—The subspecies of most of North America, including Kentucky, is *Petrochelidon pyrrhonota pyrrhonota* (Vieillot).

Specimens examined.—Total, 5. C.W.B.—1 male, Nelson County (May 14); B.L.M.—1 male, Jefferson County (Aug. 26); 1 male, 1 female, Henderson County (July 7, 1940); U.M.M.Z.—1 male (weight, 24.0 gm., very fat), Henderson County (Sept. 5).

Progne subis (Linnaeus): PURPLE MARTIN

Status.—Fairly common to common summer resident.

Spring.—Martins arrive much earlier than other swallows, not infrequently in mid-March, usually in late March or early April. Early records from many localities fall between March 10 and 27 (see Barbour, 1951a:35; Oberholser, 1918a:148; Goodpaster, 1941:23; Blincoe, 1925:414; Beckham, 1885:22; Wilson, 1922:239, 1944a:19–20; Lovell, 1951b:60, notes of Monroe, Hancock, Cypert, and others). In 1950 the martins arrived at Kentucky Woodlands National Wildlife Refuge on the remarkably early date of February 17 (Talbot E. Clark, verbal com.). The species is common and noisy in most areas by early April.

Breeding records.—Although regularly used martin houses are common in Kentucky, few precise observations of actual nestings seem to have been recorded. Fourteen more or less precise breeding observations now at hand suggest that clutch completion occurs from late April (probably) to June 21–30. These few records are from Pulaski (Keller, 1959:12), Rowan (Barbour, 1951a:35), Owen (Stamm, notes), Jefferson (Stamm, notes; Monroe, notes), and Hopkins (Lovell, 1951b:60) counties. Keller noted 5 young in a gourd (martin house), the only recorded full brood or clutch, in Pulaski County in late June, 1958. Additional records are from Trigg County, where Handley and I noticed martins using nest

boxes at Kentucky Woodlands National Wildlife Refuge between April 9 and 16, 1950, and from Knox and Laurel counties, where I noted martins carrying food to martin boxes on hill-country farms June 8–15, 1952.

Breeding distribution.—Statewide, vaguely reported in literature as breeding at many localities, and fairly common everywhere except for the higher elevations in the Cumberlands, especially Black Mountain, Harlan County, where no artificial nest sites are available. There are no records, and I have noted no evidence, of martins breeding in natural situations in Kentucky; in the southern coastal plains, elsewhere, I have noted martins repeatedly in large cypress swamps, where I suspect that hollows high in the great trees provided nest sites; it is possible that such situations are used in western Kentucky. The species seems not to require expanses of open country or the proximity of ponds, as does the Barn Swallow, but is found in the smallest woodland clearings wherever nest sites are provided. Some decrease may have occurred as a result of competition for nesting sites with House Sparrows and Starlings, but the martin continues to be numerous (see notes of Pindar, 1923*b*:163).

Summer.—Not long after young of the year begin to emerge from the nests, martins start to congregate in flocks. These are often small, but sometimes attain proportions in the thousands, roosting for several weeks in given localities, often in towns. In July and August such concentrations have been noted in Laurel County, near London (Mengel, 1939:47; Walker, 1938:32); at Lexington (Garman, 1894:15–16); at Louisville (Monroe, 1955:41), in 1916–1918, with Robins and grackles; at Fort Knox, Hardin County (Clagett, 1955:19), where the martins were associated with Starlings, grackles, and Red-winged Blackbirds; at Mammoth Cave (Bailey, 1933:136); in Grayson County (Kelley, 1958:56); in Logan County (Wilson, 1944*a*:19, notes from records made in the 1860's); and near Cincinnati, Ohio (Goodpaster, 1941:23). In late June of 1952 I noticed a concentration beginning to form near London, where I have repeatedly observed large gatherings of martins. These flocks vanish abruptly, according to all observers, usually late in August.

A peculiar phenomenon recurrent at the east end (Trigg County approach) of Eggner's Ferry Bridge over Kentucky Lake has been the annual destruction by automotive traffic of hundreds or thousands of martins in late summer. On July 22, 1951, I noted 42 dead martins there, ranging from freshly killed birds to flattened, nearly disintegrated remains. Most were young birds. The over-all mortality must be very great. I was told by local people that this occurs each summer, and that the martins' insistence on using this end of the bridge for a roosting place may be influenced by the fact that the east side of the lake is here preferred by bait fishermen, resulting in large concentrations of flies attracted by the debris and garbage scattered about by the less tidy members of the angling fraternity. The same type of mortality was noted in North Carolina by Wetmore (1941:501–502).

Fall.—The species becomes much less numerous near the end of August, only a few birds lingering later; very rare after mid-September. Tordoff and I saw 10 or 15 daily near Henderson on September 4 and 5, 1949. Late records: September 4 (1887), at Eubank, Pulaski County, average of 7 years August 26 (Oberholser, 1918*a*:149); September 6, in Nelson County (Blincoe, 1925:414); September 10, at Louisville (Monroe); September 1, at Lexington (Garman, 1894:15); September 28, in the Bluegrass region (Pindar, MS, about 1925); September 25, at Bowling Green (Wilson, 1922:239).

Geographic variation.—The subspecies of most of North America, including Kentucky, is *Progne subis subis* (Linnaeus).

Specimens examined.—Total, 4. M.S.C.—1 unsexed immature, Rowan County ("July"); U.K.—1 unsexed immature, Fayette County (July 30, 1890; Garman); U.M.M.Z.—2 immature females, Trigg County (July 22).

FAMILY CORVIDAE: JAYS, MAGPIES, AND CROWS

Cyanocitta cristata (Linnaeus): BLUE JAY

Status.—Common resident.

Spring, fall, and winter.—The species is common at all seasons, although perhaps noisiest and most conspicuous in fall and early winter. There is no indication in the records at hand of important seasonal variation in numbers or habits, save those incidental to breeding. I have never seen a specimen showing much accumulation of fat, but Blue Jays definitely weigh less in the breeding season than at other times (see weights under "specimens examined"). Observations of apparent migratory movement were made at Louisville, October 6 and 7, 1956 (Stamm, 1957a:41), and notes on winter roosting sites were published by Cox and Hall (1958:23).

Breeding records.—Clutches are completed by some pairs as early as March 21–31, and as late as June 21–30, with no pronounced peak evident in the distribution indicated by 31 dated observations. Two broods are probably reared at least by some pairs. Data are from Harlan (Mengel, notes), Rowan (Barbour, 1951a:35), Madison (Lovell, 1951b:60), Fayette (Lovell, *loc. cit.*), Owen (Hays, 1957:5), Meade (Lovell, 1949b:46), Nelson (Blincoe, *vide* Funkhouser, 1925:235), Jefferson (Stamm, *vide* Hays, 1957:5; Stamm, notes; Monroe, notes), Logan (Mengel, notes), and Fulton (Pindar, 1887:47) counties. Egg dates range from April 14, in Fulton County, to May 27, in Harlan County (hatching), but earlier dates of clutch completion are indicated by construction observed in Jefferson County on March 17, 1953 (Stamm) and by young just from the nest, in Logan County on May 9, 1949 (Mengel), and later ones by newly flying young in Jefferson County on August 11, 1956 (Stamm). Twelve recorded clutches average 4.1 ± 0.23 (3–5). The bulky nests, usually well concealed, have been found, in Kentucky, in various arboreal situations, in crotches, or on horizontal branches, 18 nests averaging 20.5 feet above the ground (6–45). Sites on record include willows, apple trees, pear trees, sweet gum, yellow birch, red and other oaks, elm, plum, red cedar, and lilac. Nests may be in open woodland, in suburban yards, or in dense forest. In Jefferson County, where he has found several nests, Monroe took a set of 5 fresh eggs from a nest 8 feet up in a willow on May 1, 1941. In dense mixed mesophytic forest at 4,000 feet elevation on Black Mountain, Harlan County, I found a nest containing 4 eggs in the crotch of a yellow birch, 12 feet above ground, on May 26, 1952. By May 28, 3 of the eggs had hatched, the fourth proving to be infertile. In Logan County, on May 9, 1949, I found 2 young soon after their departure from a nest 15 feet up in a sweet gum in a lowland swamp near Russellville. In Powell County on June 24, 1948, I took a female having a brood patch (from first nesting?) and containing two very large ova in the ovary (prior to second nesting?).

Distribution.—Statewide and rather uniform. The Blue Jay occurs in woodland, forest, and edge of many types, in both urban and rural areas. It is common alike in lowland swamp forests along the Mississippi River and in the cool mixed mesophytic forests high in the Cumberlands.

Note.—An albino seen in Daviess County was described by Keeley (1953:28).

Geographic variation.—The Blue Jay is one of several species in the eastern United States showing gradual, evidently clinal, variation from north to south. As in other cases, this has resulted in recognition of more than one subspecies in the area, but the dividing lines between named forms are essentially arbitrary. The Blue Jays of northern North America (*Cyanocitta cristata bromia* Oberholser = *C. cristata cristata* of the A.O.U. Check-List, 4th edit.; see A.O.U., 1944:453) average large and brightly colored, with extensively white-tipped tertials, while southeastern birds (*C. cristata cristata* = *C. cristata florincola* of earlier authors; see A.O.U., *loc. cit.*) are smaller, paler, less intensely blue, and have less white in the tertials.

The Blue Jays of Kentucky, as well as those of mountainous eastern Tennessee (see Wetmore, 1939:204), agree well on the average with the northern subspecies,

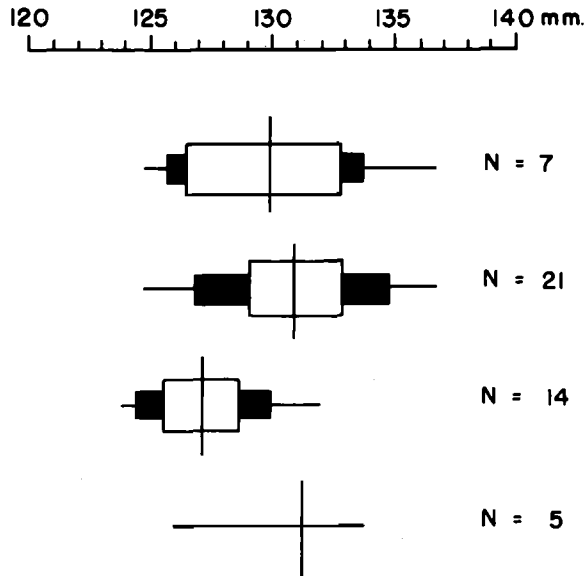


Fig. 22. Statistical characteristics (of wing length) of Blue Jays in several parts of Kentucky and vicinity. From top down: Cumberland Plateau and Mountains of eastern Kentucky; Interior Low Plateau of Kentucky; Mississippi lowlands of western Kentucky; high mountains of eastern Tennessee. For actual values see text. For explanation of diagrams see legend of Fig. 18 (p. 292).

with wing length near the average given for northern birds by Ridgway (1904:348), but there seems to be a tendency toward smaller size in the extreme southwestern part of Kentucky. Satisfactory allocation of the population in the latter area poses a vexing problem.

In this connection, analysis of all available material was undertaken, but limitations in the quantity of this material necessitated some departures from the ideal of analysis based wholly on unworn breeding birds separated into age and sex classes. Males and females were treated together, being approximately equal in size (19 ♂♂ from Kentucky average 130.3 mm. in wing length; 9 ♀♀ average 131.2), and birds taken at all seasons lumped, since I found no significant increase in size in winter (18 specimens taken April–September average 130.6; 10 taken October–March average 130.7). Least desirably, adults and immatures were treated together, although the latter appear to be slightly but significantly shorter-winged and shorter-tailed than adults (9 adults have the wing averaging 133.5 and the tail 127.9; 7 immatures have the wing 130.8 and the tail 124.7). There seemed to be no alternative to these procedures, if adequate samples were to be treated. Possibly analysis of larger series separated into appropriate classes would modify the conclusions here reached. Variation in wing length in the populations studied (Fig. 22) is shown herewith (tail length shows the same general pattern but considerably fewer measurements are available).

Cumberland Plateau and Mountains: 7 birds average 130.0 mm. \pm 1.6 (125–137); σ , 4.2; V, 3.2.

Interior Low Plateau (Knobs, Bluegrass, Pennyroyal, Western Highlands): 21 birds average 131.0 \pm 0.9 (125–138); σ , 4.2; V, 3.2.

Mississippi River lowlands (4 from Fulton County, Kentucky; 10 from near Reelfoot Lake, Tennessee): 14 birds average 127.4 \pm 0.8 (124–132); σ , 3.0; V, 2.4.

High mountains of east Tennessee: 5 birds average 131.4 (126–134).

Since an arbitrary decision must be made, if two subspecies are to be distinguished, it seems best from these data to include extreme southwestern Kentucky within the range of *C. cristata cristata*, with the understanding that the population of this area is somewhat intermediate. Two subspecies are thus admitted to the list.

Cyanocitta cristata bromia Oberholser

The resident Blue Jay of Kentucky east of the Tennessee River, which forms a purely arbitrary boundary between it and the following subspecies. Wetmore (1940:545) identified a specimen from Wayne County as *C. c. florincola* (= *cristata*), but the bird could have been either a wandering individual of that form or a variant, probably immature (see notes below, concerning age), of *C. c. bromia*.

Cyanocitta cristata cristata (Linnaeus)

The breeding Blue Jays of the Purchase region of Kentucky may be placed tentatively with this southern subspecies. This applies only to the breeding population, present to an undetermined extent through the year, and not to individual specimens taken at various seasons. The only specimens actually from Kentucky here considered probably to represent *cristata* are 2 males from Fulton County (U.S.N.M.), taken in May, 1938, and the 2 specimens (listed below) in the U.M.M.Z. from the same county. I have been unable to detect any appreciable average differences in color among the several populations analyzed. Indeed, color is a deceptive character in Blue Jays, since it varies with age. Thus northern birds before their first postnuptial molt average paler than adults of their own subspecies, while closely resembling adult southern birds. In large series not sorted by age groups, the over-all difference in average color between northern and southern birds would doubtless be perceptible (though not so clearly as with the age-groups separated), but identification of individual specimens is hazardous unless they are aged. Fortunately, young birds can be identified throughout their first year (in most cases, anyway) by their retention of juvenal feathers in the alula and greater coverts, as well as by the more pointed tips of the rectrices (Pitelka, 1946).

Specimens examined (all *C. c. bromia* save those from Fulton County, as mentioned above).—Total, 41. Measurements not previously published are given in parentheses with weights where available; specimens not listed as immatures but with data otherwise complete are in fully adult plumage. M.S.C.—5 winter-taken specimens, unsexed, from Rowan County; U.K.—1 immature male (wing, 132 mm.; tail, 129 mm.), 1 immature female (wing 138, tail 134), Union County (April 21); B.L.M.—1 male (wing 131, tail 127), 1 immature male (wing 125), Bullitt County (July 4; June 18); 1 immature male (wing 123; worn), Jefferson County (June 18); J.D.F.—1 unsexed immature (wing 130, tail 116), Marshall County (Sept. 26); U.S.N.M. (for measurements see Wetmore, 1940:544–545)—17 specimens from Harlan, Lewis, Rowan, Wayne, Carroll, Meade, Union, Muhlenberg, Hopkins, and Fulton counties (April–Nov.); U.M.M.Z.—1 female (weight, 88.4 gm.; wing, 133; tail, 125), Lewis County (Nov. 23); 1 female (99.4 gm.; wing 137, tail 133), Wolfe County (April 24); 1 male (84.9 gm.; wing 133, tail 128), 1 female (84.9 gm.; wing 125, tail 117), Powell County (June 24); 1 male (86.6 gm.; wing 136, tail 130), Gallatin County (July 4); 1 female (95.8 gm.; wing 135, tail 130), 1 immature male (92.3 gm.; wing 131, tail 124), 1 immature female (82.0 gm.; wing 133, tail 121), Meade County (Oct. 20; Oct. 21; Oct. 22); 1 male (wing 137, tail 130), Jefferson County (April 10); 1 male (87.7 gm.; wing 135, tail 131), 1 half-grown female, Logan County (May 9); 1 immature male (91.8 gm.; wing 131, tail 122), 1 immature female (81.8 gm.; wing 126, tail 118), Fulton County (Nov. 11).

***Corvus corax* Linnaeus: COMMON RAVEN

Status.—Imperfectly known; probably once resident and breeding locally through much of the Cumberland Plateau and Mountains, appearing elsewhere in the state at least as a vagrant. Now evidently extinct in Kentucky.

Records.—Although the raven disappeared from most of the state many decades ago, evidence gathered by extensive questioning of residents on the Cumberland

Plateau has led me to think that a small population persisted about the high cliffs of certain remote, rugged parts of Powell, Wolfe, Laurel, Pulaski, Wayne, McCreary, and possibly other counties until well into the present century, perhaps as late as 1935 in Powell County. Earlier, I summarized this evidence in some detail (Mengel, 1949), at the same time reviewing unfavorably two fairly recent reports of ravens, from Whitley County, southeastern Kentucky, in 1920 (Funkhouser, 1925:235), and Marshall County, southwestern Kentucky, in 1941 (Figgins, 1945:219). Early sight records are more convincing. Pindar (1889b:314) reported a raven seen in Fulton County on October 3, 1887, later (1925a:88) relating the circumstances of the observation in fuller detail. At that time a few ravens were still appearing in the lowlands of adjoining states (see Langdon, 1880:125; Widmann, 1907:147). In his journal of 1820, writing somewhere near the present site of Carrollton, Audubon (1929:8) mentioned seeing 4 ravens on October 17. Still earlier, André Michaux, in his journal of 1793 (Thwaites, 1904a:45), recorded 1 seen at the carcass of a deer near Cumberland Gap (now Bell County) on November 14, 1793 (if present at all, crows must then have been exceedingly rare in that area). Michaux also listed ravens among the birds seen in western Kentucky, above the present site of Eddyville, on the Cumberland River between December 24, 1795, and January 3, 1796 (*op. cit.*, pp. 81-83).¹ Of particular interest is Butler's (1897:879-880) convincing evidence of the presence in southwestern Indiana of breeding ravens in the hill country of Martin and DuBois counties, approximately 20 to 40 miles north of the Ohio River, as late as the early 1890's. About the same time, Garman (1894:21) referred to sight records in eastern Kentucky made by an unnamed "intelligent hunter." In my paper of 1949, above-cited, I mentioned cliffs in Powell and Pulaski counties established in local tradition and known as "raven rocks." To these may be added an outcrop overlooking the Ohio River near Portsmouth, Ohio. Occasional ravens may still be expected as vagrants in eastern Kentucky, especially in fall and winter, since the species has recently increased in not very distant mountain areas of Virginia and West Virginia.

Geographic variation.—The ravens formerly inhabiting Kentucky probably belonged to the northern subspecies *Corvus corax principalis* Ridgway. An Appalachian form, *C. corax europaeus* Oberholser, appears to be untenable.

Corvus brachyrhynchos Brehm: COMMON CROW

Status.—Resident; common in summer except in the mountainous southeastern counties, where rare; probably more numerous in winter, especially in central and western Kentucky.

Spring.—The pronounced flocking tendencies noticeable in winter are still evident, although in decreasing degree, through spring, and even on occasion into early summer. I noted a large flock in open fields in Clark County on April 26, 1949, and a flock of 31 in Warren County at dusk on May 5, 1949, when the birds were flying to roost. The small flocks sometimes seen in May and early June are presumably composed of non-breeding birds. Aerial maneuvers perhaps related to courtship are sometimes observed as early as February.

Breeding records.—Completion of clutches from March 21-31 to May 11-20 (peak April 1-10) is indicated by 23 dated breeding observations. These are from Mercer (Van Arsdall, 1949:26), Nelson (Blincoe, *vide* Funkhouser, 1925:236; Monroe, notes), Jefferson (Hays, 1957:5; Lovell, 1951b:60; Monroe, notes), Bullitt (Monroe, notes), Hopkins (Bacon, *vide* Lovell, *loc. cit.*; Hancock, 1954:24), and Fulton (Wetmore, 1940:545) counties. The earliest and latest egg dates are for Hopkins County (Suthard, *vide* Hancock), 4 fresh eggs on March 29, 1924, and 5, slightly incubated, on May 22, 1922. The average complement of 10 clutches is 3.9 ± 0.33 (3-5). Nests are placed in forest, woodland, or edge situations, on horizontal limbs

¹ Not far from Paducah, McCracken County, where part of a right humerus referable to *Corvus corax cf. principalis* was recently recovered with pre-Columbian or narrowly post-Columbian Indian materials (Glen E. Woolfenden, letter: October 27, 1961).

or, more frequently, in crotches, the average height above ground of 9 nests being 28.6 feet (15-60). A great many crow's nests have been seen in various localities, by many observers, without adequate data being obtained. Near Louisville, beeches seem to be favored as nesting sites; oaks have been reported in several instances, and red cedars in two. Monroe found a particularly handsome nest containing 5 fresh eggs, 15 feet above ground in a cedar thicket near Solitude, Bullitt County, on April 4, 1937. Young birds in the nest have been noted as early as April 20 (1951), in Hopkins County (Bacon, *vide* Lovell), and young leaving the nest were recorded in Nelson County (Blincoe) on May 10, 1921. Wetmore (1940:545) recorded a young bird just from the nest taken in Fulton County on May 21, 1938, and in nearby Ballard County I saw an immature bird not fully grown on June 10, 1949.

Distribution.—Although it has been common through most of Kentucky for many years, this species, thriving as it does in areas affording mixed farmland and forest, must be much more numerous in the state today than in primeval times, an inference supported by its present distribution. On the Cumberland Plateau, where scattered farm clearings are numerous even in forested areas of great over-all extent, crows are fairly common, but along the higher and almost entirely forested Cumberland Mountain ridges in Harlan, Bell, Letcher, and Pike counties, they are scarce indeed and in some areas essentially absent. So far as I know the only crow yet recorded at high elevations on Black Mountain, Harlan County, is 1 that I saw at 3,000 feet there on May 26, 1952. Wilson (1950:22) has noted a decrease in the number of crows in the Mammoth Cave area since the cessation of farming there. These remarks apply chiefly to the breeding season; less is known of the winter distribution of the species, especially in eastern Kentucky.

Fall and winter.—Crows become more conspicuous, noisier, and probably in fact more numerous in late September and October. By late October large flocks are commonly seen, these often roving restlessly about the countryside. On November 6, 1948, I saw many hundreds of crows, in loose flocks, drifting about "Kentucky Bend" of the Mississippi River in Fulton County, and crossing the river from Missouri in large numbers. Sometimes roosts of many thousands gather nightly, at selected localities, over considerable periods, especially in winter when the species seems to attain maximum numbers. Such roosts have been reported from a number of localities in central and western Kentucky (Wilson, 1922:237; Barrows and Schwarz, 1895:12; Kalmbach, 1918:8; Blincoe, 1925:412; Stamm and Hardwick, 1958:38). In late December, 1950, and early January, 1951, I noted such a roost in the western part of the Purchase. Daily in that area great numbers of small flocks could be seen fanning outward in the morning and converging inward in the evening along lines radiating from a point located somewhere in western Hickman County. This regular daily movement could be detected as far away as southwestern McCracken County, suggesting that the crows in this roost were feeding over an area of thousands of square miles.

Note.—The record of 12 or more albinos in a flock of 50 or 60 crows (Clotfelder, 1954:33) seems very likely to be in error (pigeons?).

Geographic variation.—At this writing, no analysis of geographic variation more detailed than those of Ridgway (1904) and Howell (1913) has become available for eastern crows.¹ Published data show only that some variation, probably clinal, occurs in size from north to south, with long-winged and large-billed birds in the former and shorter-winged, shorter-billed birds in the latter. Crows, however, are wide-ranging, variable birds displaying, at least in the north, a considerable migratory tendency, and there is a marked difference in size between males and females. These factors all increase the need for large series, if significant analysis is to be carried out. Such series are not available for Kentucky, and indeed the material extant for the whole central and southern United States is comparatively limited.

¹One may now refer to D. W. Johnston, *The biosystematics of American crows*. Seattle, Univ. of Washington Press, 1961. This was published too late to be here utilized.

To be sure, many specimens have been "identified" as the northern (*C. b. brachyrhynchus*) or the southern (*C. b. paulus*) subspecies, to which, respectively, Wetmore (1940:545-546) has assigned a number of Kentucky specimens, but I think knowledge of the subject would be little advanced by assigning subspecific names to the few additional birds now available.

Judging from existing measurements, the breeding crows of Kentucky are intermediate in size between northern and southern populations. Eight males (for measurements of individual specimens not already published, see "specimens examined") taken between April 1 and September 30, and thus probably representative of the breeding population, have an average wing length of 303.3 mm. (268-331), as opposed to an average of 321 (305-337) given by Ridgway (1904:267) for eastern crows in general (a series of 11 males, probably in the main from more northern localities), and against a mean of 295.4 (285-318) for 14 southern males (*C. b. paulus*) listed by Howell (1913:201). There is at hand only one measurement for a Kentucky female taken within the above dates, this being 289 mm.: Ridgway gives 305 (282-326.5) for 14 females, as opposed to Howell's mean for *paulus* (10 females), of 290.9 (270-303). Surprisingly, 5 Kentucky males taken between October 1 and March 31 average smaller than the summer males (mean wing measurement 301.6; range 290-315); 6 females from the same period average 292.5 (282-310).

The measurements of specimens from various southern states, irrespective of season or subspecific determination, suggest that no very great size differences occur over a large mid-southern area. Some of these measurements (Wetmore, 1937:415; 1939:205-207; 1940:545-546; 1941:503-504) are as follows: West Virginia, 4 males, 286-315 (300.5), 2 females, 296 (296); North Carolina, 7 males, 280-325 (305.0), 5 females, 280-310 (293.3); Tennessee, 7 males, 290-323 (308.7), 5 females, 295-305 (299.4); Kentucky (see also "specimens examined," below), 13 males, 268-331 (302.6), 7 females, 282-310 (292.0).

Two subspecies may be admitted to the list, with the understanding that the situation is far from clear.

Corvus brachyrhynchus brachyrhynchus Brehm

While the breeding population of Kentucky, as noted above, seems to be intermediate, it does contain some very large individuals, some of which have already been referred by Wetmore to the present form. This alone would seem to be an ambiguous argument for inclusion of the subspecies, but if two are to be recognized, it is inevitable that northern birds enter the state annually and probably in large numbers as migrants.

Corvus brachyrhynchus paulus Howell

Wetmore (1940:546) gave evidence (albeit somewhat limited) that the crows of the southern Appalachians north to southeastern Kentucky average somewhat smaller than those to the west of the mountains, and assigned to the present subspecies several rather small specimens, one of them a male and perhaps a locally reared bird taken in southeastern Kentucky near Middlesboro on September 29, 1938 (wing 289 mm.). To these may be added the smallest bird of all (and if correctly sexed perhaps one of the smallest male crows on record from the eastern United States; wing 268 mm.), taken in central Kentucky, at Lexington, Fayette County, on September 10, 1947 (B.L.M.). Other specimens that I have seen (see below) are also small, being well within the range assigned to *paulus*.

Specimens examined.—Total, 23. M.S.C.—1 unsexed (wing, 293 mm.; culmen 48), Rowan County (Oct. 11); U.K.—1 unsexed (wing, 294; culmen, 51), Woodford County (March 25); B.L.M.—2 males (wings 302, 268; culmens 51, 48), Fayette County (Sept. 10); 1 female (wing, 288, culmen, 51), Larue County (Oct. 5); Bernheim Coll.—1 male (wing, 285; culmen broken), 1 female (wing, 282; culmen, 46), Woodford County (March 20); U.S.N.M. (for

details and measurements see Wetmore, 1940:545-546)—16 specimens from Bell, Rockcastle, Boone, Meade, Muhlenberg, Edmonson, Union, Caldwell, and Fulton counties (April 23–Nov. 12).

FAMILY PARIDAE: TITMICE, VERDINS, AND BUSHTITS

Parus carolinensis Audubon: CAROLINA CHICKADEE

Status.—Common resident.

Spring.—Song is begun in late winter or very early in spring. There is no significant evidence of seasonal changes in the numbers of the species. Most of spring is taken up by breeding activities.

Breeding records.—As indicated by 24 dated breeding observations, clutches are completed from April 1–10 to May 21–31 (peak April 21–30). Records are from Rowan (Barbour, 1951a:35); Madison (Lovell, 1951b:60); Mercer (Van Arsdall, 1949:26); Owen (Stamm, notes); Nelson (Blincoe, *vide* Funkhouser, 1925:298; Beckham, 1885:11); Oldham (Stamm, Shackleton, and Slack, 1953:26; Stamm, notes; Monroe, notes); Jefferson (Wright, 1945; Stamm, notes; Monroe, notes); Bullitt (Monroe, notes); Meade (Lovell, 1949b:46); Hopkins (Hancock, 1954:24); Crittenden (Semple, 1945:48); and Fulton (Mengel, notes) counties. Extreme egg dates, both for Hopkins County (Suthard, *vide* Hancock), are for April 2 (1925), 5, incubation advanced and May 28 (1924), 5 about one-third incubated. The average complement of 15 clutches or broods is 4.8 ± 0.16 (4–6). Beckham (*loc. cit.*) referred to nests in Nelson County containing 7 young, but gave no further data. Most nests reported have been in fence posts, old stumps, and similar situations, the height above ground of five averaging 5.8 feet (2–12). Monroe took a set of 6 eggs, slightly incubated, from a hole in a fence post, two feet above ground, near Solitude, Bullitt County, on May 2, 1937, and another set, of 4 fresh eggs, from a hole in a fence post, four feet above ground, at Brownsboro, Oldham County, on April 26, 1941. I recorded young in the nest, being fed by adults, in a hole 12 feet up in a dead stump in a cypress swamp in Fulton County on May 20, 1949. The hole looked as though it had been excavated in the rotten wood by the chickadees themselves. Groups of full-grown young on the wing are commonly seen in late May and throughout June. Such birds were seen being fed by adults, June 1–2, 1946, in Edmonson County (Browning, 1946), and full-grown young were taken in Fulton County, May 27, 1938 (Wetmore, 1940:546).

Distribution.—Statewide. The Carolina Chickadee is a forest-edge and forest species which frequents every woodland and forest type in Kentucky and occurs to the top of Black Mountain, Harlan County, where it is fairly common.

Summer.—Song is infrequently heard in late summer, when molting occurs. A male and female in the U. S. National Museum, taken in Lewis County on July 11, 1938, were both in molt.

Fall and winter.—This chickadee is common and conspicuous in the colder months, when it is often seen in weedy fields with sparrows and other birds, as well as in the woods, parks, and thickets usually favored. For notes on its feeding habits in Nelson County see Blincoe (1923).

Geographic variation.—All Kentucky specimens are here considered to represent *Parus carolinensis extimus* Todd and Sutton. Since the distinction by them (1936) of this subspecies in the northern part of the species' range, the name has been commonly applied to Kentucky birds, as was done by Wetmore (1940:546), who also, however, identified a few specimens from extreme southeastern Kentucky as the southern *Parus carolinensis carolinensis* Audubon. More recently, in a careful review, Lunk (1952) has shown that no distinction at a subspecific level can be made between the Carolina Chickadees of northeastern Tennessee and those of Kentucky and other more northern localities. Lunk used most of the chickadees available to me, including my own series from Kentucky, and further statistical

analysis would be essentially repetitive. Certainly no significant differences in size or color are found between immediately adjacent populations in this area.

Specimens examined.—Total, 65. M.S.C.—1 male, Rowan County (March 1); R.W.B.—2 males, 2 females, 1 unsexed, Harlan County (Aug. 4, 4; July 24, 24; Aug. 4); U.K.—1 male, Lincoln County (Feb. 2); 1 unsexed, Jessamine County (Oct. 10); B.L.M.—1 immature female, Laurel County (July 6); 1 female, 1 unsexed, Oldham County (Dec. 23; no date); C.U.—1 male, Logan County (Dec. 29); J.D.F.—1 male, 6 females, 1 unsexed, Marshall County (Aug. 26; Aug. 18, 19, 28, Sept. 1, 5, 10; Sept. 10); U.S.N.M.—1 female, Harlan County (June 29); 2 males, 2 females, Bell County (Sept. 20, 23; Sept. 20, 26); 2 males, 1 female, Rockcastle County (Oct. 1); 1 immature male, 1 adult male, Wayne County (June 4, 6); 1 male, 1 female, Lewis County (July 11); 2 females, Boone County (Oct. 10); 1 male, Fayette County (Nov. 19); 1 female, Meade County (April 22); 1 male, Edmonson County (Nov. 8); 1 female, Butler County (Nov. 7); 1 male, 1 female, Muhlenberg County (Oct. 18); 1 male, 1 female, Union County (May 7; May 6); 2 males, Trigg County (Oct. 29); 1 male, 2 immature females, Fulton County (May 28; May 27, 27); U.M.M.Z.—1 immature male, 1 unsexed immature specimen, Harlan County (July 8; July 9); 1 male (weight, 9.7 gm.), Powell County (April 23); 1 male (weight, 10.3), Wolfe County (April 24); 1 male (weight, 8.5), 1 immature male, Laurel County (Feb. 3; July 17); 1 male, 1 female, Jefferson County (April 4); 2 females, Oldham County (April 3); 3 males (weights, 9.7, 10.2, 9.9), 2 females (weights, 9.8, 8.6), 1 unsexed specimen (weight, 9.7), Henderson County (Sept. 5, 7, 7; Sept. 5, 8; Sept. 5); 1 male (weight, 10.0), Carlisle County (Nov. 12); 1 male (weight, 11.2), Fulton County (Nov. 6). Also examined but not listed in detail: 5 from southern Illinois, 4 from southern Indiana, 13 from Tennessee, 5 from western North Carolina (total, 27 extralimital specimens: over-all total, 92).

Parus bicolor Linnaeus: TUFTED TITMOUSE

Status.—Common resident.

Spring.—Even in midwinter, song is sometimes heard on clear, pleasant days, and it is regular well before the vernal equinox. Other than those connected with nesting, no marked seasonal changes in status have been noted.

Breeding records.—Dates of clutch completion shown by 14 dated breeding observations range from April 1–10 to June 1–10 (peak April 21–30). Data are from Lecher (Murray, 1938:2), Rowan (Barbour, 1950a:34), Mercer (Van Arsdall, 1949:26), Jefferson (Monroe, notes; Hays, 1957:5), Meade (Lovell, 1949b:46), Hopkins (Hancock, 1954:24), and Marshall (Lovell, 1951b:60) counties. The average complement of 8 clutches or broods is 5.0 ± 0.46 (3–7). A set of 2 eggs observed by Lovell (1949b:46) on June 9, 1946, may not have been complete, but a complete set of 3 eggs seems to have been noted in Rowan County, by Barbour (1950a), the young leaving the nest on May 2, 1938. An early nesting, in Meade County, was indicated by Lovell's observation (1949b:46) of young being fed on April 19, 1946. Eggs have been reported from April 20 (1935), in Hopkins County, 5 (Hancock, *loc. cit.*), to June 9, in Meade County (see above). Hancock reported young out of the nest being fed on July 28, 1952. Nests have been found in cavities of varied kinds, both natural and artificial, including bird boxes, and vary considerably in elevation (5 ranged from 8 to 35 feet above ground; average 19 feet). Monroe's unpublished notes refer to nests under construction near Louisville on April 20, 1917, and April 22, 1934, and on May 6, 1938, he took a set of 7 heavily incubated eggs from a nest box in Louisville.

Distribution.—Statewide; the species occurs in every major forest type and is not conspicuously more or less numerous in any principal area save one. Workers at higher elevations on Black Mountain, Harlan County, do not seem to have reported it, except possibly Breiding (1947:38), who failed to note the elevation of those listed by him. In spring and summer field work in 1951 and 1952, however, I found that the species occurs above 3,000 feet, in markedly decreasing numbers, to the top of the mountain. There in May and June, 1952, I repeatedly recorded a singing male in one area at 4,000 feet.

Summer and fall.—A male I took in Powell County on July 3, 1948 (U.M.M.Z.),

was undergoing heavy molt on the head, neck, and back. An adult (skull fully ossified) female taken near Henderson on September 4, 1949 (U.M.M.Z.), was in process of molting the tail and was just completing body molt.

Winter.—The species is more conspicuous than during the months when leaves are on the trees, and a few authors have considered it more numerous at this season, a conclusion I think is unjustified by the available evidence. The species frequently forsakes the woods at this time, occurring in weed patches and like situations together with chickadees, juncos, and various sparrows.

Note.—Hiding—and incidentally, thereby planting—of sunflower seeds by this species was noted in Franklin County, October 12, 1956 (Owen and Owen, 1956:62).

Specimens examined.—Total, 33. (All weighed specimens with little fat.) U.K.—1 male, Woodford County (May 6); C.U.—1 male, Logan County (May 26); J.D.F.—1 male, 1 female, Marshall County (Sept. 20); U.S.N.M.—23 specimens (see Wetmore, 1940:547), from Pike, Bell, Wayne, Rockcastle, Fayette, Nelson, Carroll, Meade, Muhlenberg, Butler, Hopkins, Union, Trigg, and Fulton counties (Jan. 18–Dec. 1); U.M.M.Z.—1 male (juvinal plumage; weight, 19.9 gm.), Wolfe County (July 1); 1 male (22.9 gm.), Powell County (July 3); 1 female, Jefferson County (April 5); 1 male (21.7 gm.), 2 females (adult, 22.6 gm.; immature, 21.6 gm.), Henderson County (Sept. 9; Sept. 4, 9).

FAMILY SITTIDAE: NUTHATCHES

Sitta carolinensis Latham: WHITE-BREASTED NUTHATCH

Status.—Uncommon to fairly common resident, sometimes varying considerably in numbers both seasonally and locally.

Spring.—The nasal, monotonous song is sometimes heard as early as the beginning of February. Notes on the fluctuations noted in local populations will be found under the headings "distribution" and "fall and winter."

Breeding records.—Few nests of the White-breasted Nuthatch have been found in Kentucky and none examined in detail. The breeding status of the species in most areas thus rests on no evidence other than the constant presence of the birds, which appear to nest rather early. Suthard (*vide* Hancock, 1954:24) noted an adult carrying nesting material in Hopkins County on March 21, 1937. Without further particulars, Barbour (1951a:36) reported a nesting date of April 23, in Rowan County; other nestings have been reported from Oldham County, in 1952 (Stamm, Shackleton, and Slack, 1953:27), and Meade County, in 1940 (Lovell, 1949b:46). Records of adults feeding young out of the nest are as follows: June 5, 1934 (Hibbard, 1935) and June 1–2, 1946 (Browning, 1946), in Edmonson County; April 20, 1946, in Meade County (Lovell, *loc. cit.*); May 25, 1940, in Jefferson County (Brecher, 1940a).

Breeding distribution.—Statewide, in varying density. A brief survey by Wilson (1942:23) showed that most local students regarded the species as fairly common in the breeding season, its status being given as rare by two. Data sufficient to plot regional abundance with reasonable accuracy are not available. After much generalized field work, I have formed the impression that in eastern Kentucky, on the Cumberland Plateau, this nuthatch favors the more xeric forest types, such as pine-oak and oak-hickory, and tends to avoid the rich, mixed mesophytic forests of slopes and ravines. On Black Mountain, Harlan County, it occurs in small numbers in the varied, mixed mesophytic forest of the Cumberlands. In central and western Kentucky it seems to be more generally distributed, occurring alike on oak- and hickory-covered uplands and in lowland alluvial forests of various types. In these central and western lowlands, I think, it reaches its greatest abundance as a breeding species. I have never in the breeding season recorded it in very large numbers anywhere, and on the basis of over-all observation supplemented by a small number of breeding bird counts, I should think a population of one pair

per 20 or 30 acres would be high in the best of habitats. Further notes on distribution appear below.

Summer.—Molt occurs at this season. In Laurel County I took an immature male in postjuvinal molt of the body tracts on July 5, 1946, and an adult male molting wings and body tracts on July 8, 1948. Most of a small series taken at Henderson in early September, 1949, were just completing body molt, the wing feathers being fresh.

Fall and winter.—Other things being equal, the species is most conspicuous in the colder months. I think that Cooke's statement (1915*b*:443) that all of the subspecies of this nuthatch are nonmigratory is open to question. My observations in Kentucky suggest that, if not truly migratory, it is given to fall and winter movements affecting large areas and suggesting mass shifts of populations. For example, in eastern Kentucky, where in the breeding season I have regularly found few nuthatches, in fall and winter I have several times found many. In extreme western Kentucky, on the other hand, where the species is generally common in summer, a very different situation prevails at least at times. In Fulton, Hickman, and Carlisle counties, November 6–14, 1948, I noted only 2 birds in much field work, and in the same general area, December 24–29, 1950, and January 4 and 5, 1951, I recorded none, although I persistently searched for the species (chickadees, titmice, and various other species ordinarily associated with nuthatches were common in both periods). By contrast with the above, Monroe and I have always considered that in much of central Kentucky the numbers of the species remain regularly much the same throughout the year.

Geographic variation.—The White-breasted Nuthatches of the eastern United States are currently divided into two subspecies, the northern *S. c. cookei* (formerly *carolinensis*; see Aldrich, 1944:601) differing from the southern *S. c. carolinensis* (formerly *athinsi*) in slightly larger size, somewhat paler dorsal coloration, and the gray, rather than black, crowns of females. The geographic variation of the species has been discussed by Aldrich (1944), and with particular reference to Kentucky, by Wetmore (1940:547–548). Examination of somewhat larger series of Kentucky specimens than were available to either Aldrich or Wetmore is summarized herewith.

In analysis of wing length, I separated males and females because of a considerable size difference found in this measurement. Birds taken throughout the year (exclusive of those in juvenal plumage, molting specimens, and unsexed or badly worn individuals) had to be used in order to maintain samples of adequate size. This admittedly risky procedure is justified, I hope, under the circumstances, since no increase in average size in winter is shown by the present series (39 ♂♂ March 15–October 15 average 89.7 mm. in wing length; 16 ♂♂ October 16–March 14 average 89.0 mm.; for the same periods, respectively, 17 ♀♀ average 88.6 and 5 average 87.4). Only males were present in sufficient number for detailed analysis (see Fig. 23, A).

Of these, 22 from the Cumberland Plateau and Mountains, including a few from as far south as Rockwood, Tennessee, average 89.9 mm. \pm 0.43 (87–93); σ , 2.0; V , 2.2.

From the Interior Low Plateau (Bluegrass, Knobs, Western Highlands) 11 average 89.4 \pm 0.56 (87–93); σ , 1.7; V , 1.9.

From the lowlands of western Kentucky, southern Illinois, southern Indiana, and northwestern Tennessee; 18 average 89.3 \pm 0.44 (86–93); σ , 1.8; V , 2.0.

From the high mountains of Tennessee and North Carolina, 7 averaged 89.3 mm. (89–90).

These data suggest that no significant differences in wing length distinguish populations of the eastern mountainous and western lowland areas. Further, the combined average of 58 males (89.5 mm., range 86–93) does not differ significantly from the figures given by Aldrich (1944:600) for 22 male *cookei* from the north-eastern United States (mean, 90.0; range, 87–93.5); thus the populations analyzed

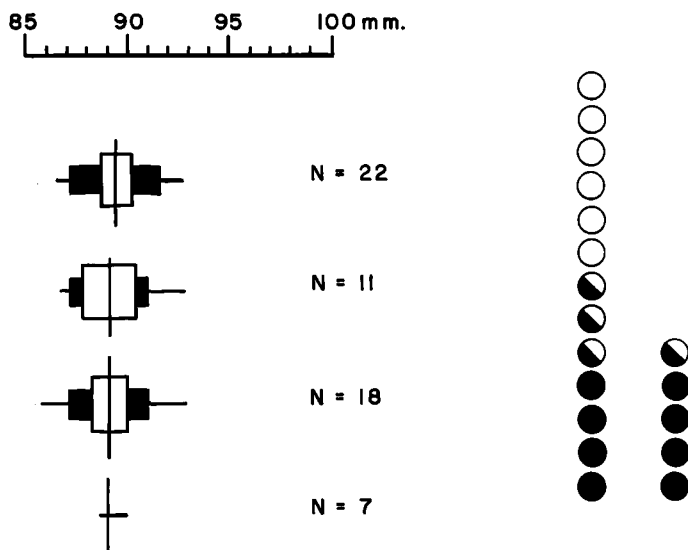


Fig. 23. *Left.* Statistical characteristics of wing length of male White-breasted Nuthatches from several parts of Kentucky and vicinity. From top: Cumberland Plateau and Mountains of eastern Kentucky (including a few specimens from the former in northern Tennessee); Interior Low Plateau of Kentucky; Mississippi and related lowlands of western Kentucky, southern Indiana, southern Illinois, and northwestern Tennessee; high mountains of eastern Tennessee. For actual values see text. For explanation of diagrams see legend of Fig. 18 (p. 292). *Right.* Variations in crown color of female White-breasted Nuthatches in Kentucky. The left column of circles represents specimens from the Cumberland Plateau, the right column represents specimens from west of the Plateau. Black circles stand for specimens with coal-black crowns; white circles represent clear gray crowns; half-black circles represent intermediate conditions.

appear to be quite or nearly typical of *cookei* in wing length, Wetmore's statement (1940:547), perhaps a *lapsus*, that "all the [Kentucky] skins . . . are smaller than the average typical of the northern race" notwithstanding. The mean wing length of local populations, however, does differ somewhat from that of southeastern birds as given by Aldrich (1944:601), 87.0 mm (83.5-90) for 19 males. It is immediately clear, nevertheless, that insufficient differences are found in this character alone to justify subspecific separation under any commonly advocated "per cent rule."

Color remains to be considered, and is difficult to treat objectively. While some average difference can be detected between the dorsal colorations of exactly comparable series from opposite ends of the range occupied by the forms in question, the difference between samples in fresh plumage from eastern mountainous and western lowland Kentucky is slight indeed (*cf.* Ridgway, 1904:442, footnote), so slight that in my opinion reliable determination on this basis of other than clean, freshly molted birds is out of the question. Such fresh-plumaged birds in the eastern series show a faint tendency towards an average difference in dorsal color (perhaps best described as more milky or smoky in appearance, with the blue clouded; opposed to a clearer blue, appearing therefore slightly darker and more intense), from more western birds. This tenuous average difference, however, I think is almost worthless in determining the subspecific identity of individual specimens.

A more definite color character is found in the tendency of northern females to have the crown gray, where in typical southern females this area is coal black and

indistinguishable from the crowns of males (see Ridgway, 1904:442, 444). The limited material examined suggests markedly different frequencies of occurrence of this character in the populations of the Cumberland Plateau and Mountains and those of the areas farther west. Of 13 females (Fig. 23, B) from the former area, 4 have the crown completely black, in 3 the condition is intermediate, and 6 have the fully developed gray crown of northern females. Of 5 females from the area west of the Plateau, 4 have the crown entirely black and in 1 a faint suffusion of gray is visible. Thus in 9 of 13 eastern birds the crown is partly or entirely gray (69 per cent), while this is so in only 1 of 5 western birds (20 per cent). More specimens are to be desired since the samples are small and it is possible, further, that some northern birds are present (although most of these females were taken at dates when the presence of migrants would be rather unlikely).

On the basis of the evidence presently available, two subspecies seem admissible to the list, subject to the reservations indicated just below. The arrangement suggested does not differ greatly from those adopted by Aldrich (1944:Fig. 1) and Wetmore (1940:547-548).

Sitta carolinensis cookei Oberholser

The population of the species occupying the Cumberland Plateau and Mountains of eastern Kentucky seems typical of this subspecies in every respect except, probably, for possessing a slightly higher percentage of black-crowned females than do more northern populations.

Sitta carolinensis carolinensis Latham > *Sitta carolinensis cookei* Oberholser

Throughout Kentucky west of the Cumberland Plateau the population is intermediate. In size the birds are typical, or nearly so, of *cookei*; in color they are on the average very slightly darker above than *cookei*; but in frequency of black-crowned females, the most definite and conspicuous character, they are seemingly closer to *carolinensis*. In the course of these studies, I formed the impression that the various characters supposed to distinguish *cookei* from *carolinensis* are not very closely correlated, although the material examined (if these rather subjective impressions are permissible) suggested that birds possessing the characters of *cookei* approach uniformity over an area wider than that occupied by the populations lumped in current usage under *carolinensis*. Unlike various other northern subspecies (see discussion on pp. 130-133), *cookei* seems definitely to extend southward for some distance in the Appalachian highlands. Outside of this range occupied by typical *cookei*, however, the trends toward the smaller size and deeper coloration of *carolinensis* are probably clinal (the more northern part of this cline having been referred to at times as "a broad zone of intergradation"), while it seems that a more abrupt change may occur in the incidence of gray versus black crown in females. The few females I have seen from southern Indiana and southern Illinois have the crown gray as in *cookei*, while in nearby north-central and northwestern Kentucky, from Louisville to Union County, the majority of females are black-crowned, a statement based upon only a few specimens but supported by much field observation. Except in this respect, however, the specimens from short distances to the north and south of the Ohio River do not differ appreciably.

Specimens examined.—Total, 87. Kentucky (52). M.S.C.—1 male, Rowan County (March 19); R.W.B.—2 males, Harlan County (July 21, Aug. 9); B.L.M.—3 males, 1 female, Laurel County (July 5, Dec. 27, 27; July 6); 1 male, Bullitt County (July 4); 1 male, Union County (June 15); C.U.—1 male, Logan County (May 14); U.S.N.M.—3 males, 1 female, Harlan County (June 27, 28, 28; June 22); 3 males, 2 females, Bell County (Sept. 17, 17, 22; Sept. 20, 20); 2 males, 1 female, Rockcastle County (Oct. 1, 6; Oct. 4); 4 males, Wayne County (June 6, 6, 8, 14); 1 male, Fayette County (Nov. 19); 1 male, Meade County (April 25); 1 male, 1 female, Muhlenberg County (Oct. 26; Oct. 18); 1 male, Butler County (Nov. 11); 1 male, McClean County (Oct. 17); 3 males, Trigg County (Nov. 1, 1, 3); 1 male, 1 female, Fulton County (May 27); U.M.M.Z.—1 female, Harlan County (June 30); 4 males (weights,

20.5, 20.1, 19.8, 20.6 gm.)¹ 4 females (weights, 18.8, 20.0, 20.0, —), Laurel County (Feb. 4, 5, July 8, Oct. 6; Feb. 3, 4, 5, Oct. 6); 2 males (1 not weighed, 1 weighed 20.5 gm.), Jefferson County (Sept. 15, 16); 1 male (20.4 gm.), Meade County (Oct. 21); 1 male (weight, 22.0), 2 females (19.4, 20.5 gm.), Henderson County (Sept. 8; Sept. 8, 9). *Indiana* (4). U.S.N.M.—4 males, Knox County (Jan. 18, 20, May 9, 25). *Illinois* (5). U.S.N.M.—3 males, 2 females, Wabash County (no date, June 11, 21; June 16, Oct. 7). *Tennessee* (13). U.S.N.M.—1 female, Stewart County (Oct. 28); 1 male, Obion County (April 27); 3 males, Wayne County (May 15, 15, 17); 2 males, 1 female, Roane County (March 21, 31; March 30); 2 males, Johnson County (June 4, 9); 2 males, 1 female, Cumberland County (May 26). *North Carolina* (4). U.S.N.M.—1 male, 1 female, Clay County (July 1); 1 male, 1 female, Cherokee County (June 13). *South Carolina* (2). U.S.N.M.—2 males, Greenville County (July 4, 13). *West Virginia* (7). U.S.N.M.—Series typical of *cookei*, not listed in detail.

Sitta canadensis Linnaeus: RED-BREASTED NUTHATCH

Status.—Irregular; rare to common transient, very rare to fairly common winter resident.

Spring.—Usually uncommon at best, the species is irregular at all seasons, but seems to average less numerous in spring than in fall. "Arrival" dates are few and of questionable significance; except when an unusual number has wintered, an increase probably occurs in spring, with maximum numbers present in April. In some years a few birds linger or pass later, when they may be seen at times feeding in new foliage together with migrating wood warblers. Occasionally the species is common for brief intervals, as in Nelson County in 1920 (Blincoe, 1925:417). Late records: May 10 (1911), in "central Kentucky," average of 6 years, May 4 (Cooke, 1915b:444); May 4, in Nelson County (Blincoe, 1925:417); May 5, 1940 (Brecher, 1940a), and May 18 (1946), at Louisville (Monroe; next record, May 7, 1946); May 4, in Warren County (Wilson, 1922:242).

Summer.—Beckham (1886b) took a female, the ovary of which was very small, at Bardstown, Nelson County, on July 16, 1886. This remarkable record remains unique.

Fall.—The species sometimes arrives much earlier than is generally realized, and local students have tended to regard it solely as a winter bird. It is irregular, as in spring, sometimes absent, sometimes numerous, being particularly fond of pine-oak woodland where available. Early records: September 12 (1912), in "central Kentucky," average of 5 years September 20 (Cooke, 1915b:444); September 12 and 18 (1886), at Bardstown (specimens; C.W.B.); September 22 (1878), at Cincinnati (specimen; C.M.N.H.); September 25 (1954), at Louisville (Monroe; I have a record for October 1, 1951); August 30 (1941), in Warren County (Wilson, 1946e: 54), and October 3 (Wilson, 1922:242). In some years the species is very numerous, as least locally, as pointed out by Blincoe (1925:417) and Beckham (1885:12) in Nelson County. In Laurel County, from October 3 to 11, 1951, I found it very numerous, noting many dozens, mainly in pine-oak forest on October 4 and 5. Far fewer were seen on several succeeding days, suggesting the passage of a wave early in the period. Two adults and an immature bird obtained on October 4 were all molting on the crown, back, breast, and scapulars. Wilson and Browning (1946) recorded the species in nearby Whitley County, October 5–6, 1946. Late dates of transients made in years when none were known to winter are lacking. The fall and winter of 1951 were characterized by a major invasion of the species. Judging from specimens taken by Beckham and observations made by Blincoe at Bardstown, the years 1886 and 1912 were also "flight years" for this nuthatch.

Winter.—Erratic in occurrence, the species has been reported from points throughout the state, being sometimes common, sometimes seemingly altogether absent. Around Louisville it has most often been found wintering in groves of large beeches. In pine-oak woodland on ridges and hemlock groves in ravines of Laurel County, Edwards and I recorded 5 on February 4 and 2 on February 5, 1950, taking

¹ All with little fat.

a male on the former date. During the winter of 1951-1952 the species was common over a wide area, many being recorded by Monroe in Bullitt County and by Hancock (notes) in Hopkins County and vicinity, with 18 in Pennyryle State Park on December 24. Pindar (1889b:316) recorded it as "common" in Fulton County, suggesting that major incursions occurred during his observations there.

Specimens examined.—Total, 21. M.S.C.—1 male, Rowan County (March 5); C.W.B.—7 males, 6 females, 1 unsexed, Nelson County (Oct. 12, 27, Nov. 10, 14, 19, 27, Dec. 8; Sept. 12, 18, Nov. 20, 21, 27, Dec. 8; Nov. 13); B.L.M.—1 male, Jefferson County (May 18, 1946); 1 male, Bullitt County (March 20); U.M.M.Z.—2 males (weights, 10.6, 9.8 gm.; not fat), 1 female, 1 unsexed immature (10.7 gm., not fat), Laurel County (Feb. 4, Oct. 4; Oct. 4).

FAMILY CERTHIIDAE: CREEPERS

Certhia familiaris Linnaeus: BROWN CREEPER

Status.—Fairly common to common transient; uncommon to fairly common winter resident.

Spring.—The species winters in numbers large enough to tend to obscure the time migration begins; peak of migration probably near late March; rare by mid-April. Late records: April 11 (1951), in Laurel County (Mengel, notes; 4 on this date); April 19 (1906), in Fayette County, average of 5 years April 16 (Cooke, 1915a:200); April 15, in Nelson County (Blincoe, 1925:417); April 28, at Louisville (Monroe); April 16 (1950), in Lyon County (Mengel, notes). Wilson (1922:242) gave the span of records at Bowling Green as extending to May 21, a very late date. On March 29, 1939, I recorded a singing bird in tall hemlocks along Rockcastle River in western Laurel County.

Summer.—Breiding (1947:38) reported 10 Brown Creepers seen on July 5 and 1 July 6, 1944, in the course of a two-day visit to Black Mountain, Harlan County, by Lawrence E. Hicks, Forrest Buchanan, and himself. This report is unique, and may be based on error of some kind, since no other of the numerous observers who have worked on the mountain has recorded the species there. Howell (1910), Wetmore (1940), Barbour (1941a), and Lovell (1950c) all failed to note it, and I did no better in intensive field work conducted July 7-9, 1946, June 27-July 10, 1951, and May 13-June 6, 1952, with the species constantly in mind. If it occurs in the deciduous forests of Black Mountain, it may safely be said that it plays no important role in the avifauna. Likewise unique, but better documented, are the records of Widmann (1907:253), who found several nests in cypress swamps in southeastern Missouri, far south of the normal breeding range, in 1894 and 1898. A late record of a creeper at Reelfoot Lake, Tennessee, May 10, 1937, prompted Pickering (1937:50) to suggest the possibility of nestings in that area.

Fall and winter.—Occasional transients appear in late September, more frequently in early October; peak of migration in late October or early November. Enough birds usually winter so that there is no abrupt or conspicuous change in numbers in late autumn. Occasionally migrating flocks of 10 or more birds are recorded. Early records: October 1 (1911), at Lexington (Cooke, 1915a:200); October 8, in Nelson County (Blincoe, 1925:417); October 1 (1960), at Louisville (Monroe); September 21 (1886), in Fulton County (Pindar, 1887a:85). In winter small numbers are usually to be found wherever relatively mature forests occur, especially in sheltered stream valleys. I found the species fairly common on pine-oak covered uplands in Laurel County, February 3-5, 1950, and late December, 1940, and throughout the Purchase early in the winter of 1950-1951.

Geographic variation.—All specimens examined are referable to the common subspecies of eastern North America, *Certhia familiaris americana* Bonaparte.

Specimens examined.—Total, 19. M.S.C.—1 unsexed, Rowan County (Jan. 6); U.K.—1 female, Madison County (Feb. 11); 1 male, Henderson County (Oct. 16); B.L.M.—1 un-

sexed, Laurel County (Dec. 29); Bernheim Coll.—1 male, "Kentucky" (no date); C.W.B.—5 specimens from Nelson County (Nov.—April; not listed in detail); U.S.N.M. (see Wetmore, 1940:548)—4 specimens from Fayette, Trigg, and Edmonson counties (Oct. 17—Nov. 30); U.M.M.Z.—2 males (weights, 9.9 gm., not fat, 9.4 gm., moderately fat), Laurel County (Feb. 4, April 11); 1 male, Jefferson County (April 7); 1 male (8.3 gm., moderately fat), 1 unsexed (8.2 gm., not fat), Fulton County (Nov. 11; Dec. 29).

FAMILY TROGLODYTIDAE: WRENS

Troglodytes aedon Vieillot: HOUSE WREN

Status.—Uncommon to common summer resident in most of extreme northern Kentucky (particularly in counties touching the Ohio River, from the eastern boundary west at least to Crittenden County), rare and increasingly local southward, but gradually increasing and extending its range to the south and west; transient throughout the state.

Spring.—The House Wren arrives occasionally in late March, usually in early April, probably averaging a bit later in extreme northern Kentucky. The peak of migration suggested by a few records from areas where the species does not breed is near late April. Early records: April 18 (1936), at Cincinnati, Ohio (Goodpaster, 1941:24);¹ March 31, at Louisville (Monroe); April 2 (1939; probably transient), in Warren County (Wilson, 1939a); before March 25 (1939), in Crittenden County (Frazer, 1939); April 11 (1950; transient), in Marshall County (Mengel, notes). Migrating House Wrens are furtive; the relatively few records known to me from points outside the breeding range fall between April 2 and May 10.

Breeding records.—As indicated by 46 dated breeding records, clutches are completed from April 1–10 to July 11–20, with an early peak May 11–20 and an apparent later one near June 21–30. More than one brood is often, if not regularly, reared (Stamm, 1951c:52, and notes). Records are from Mason (Keith, 1944:46; Stamm, 1951c:49); Pendleton (King, 1940); Boone (King, 1940a; Mengel, notes); Garrard (Kinnaird, 1942); Boyle (Van Hook, 1943); Mercer (Van Arsdall, 1948, 1949:26); Oldham (Monroe, Mengel; notes); Jefferson (Stamm, 1943:35, 1951c:51–54; and extensive notes; Petree, 1947; Lovell, 1951b:60; Hays, 1957:5); Edmonson (Hibbard, 1935); Warren (Wilson, 1948a); Daviess (Powell, 1951a); Crittenden (Frazer, 1939; Lovell, 1951b:60); and Hopkins (Bacon, 1954a; Hays, 1957:5) counties. Attempted breeding was reported also from Carter County (Kozec, 1944:52). Nest building has been noted as early as March 25 (1939), in Crittenden County (Frazer), with the first of 7 eggs laid in the same nest on April 3. The latest egg dates at hand are July 18 (1952), a newly completed set of 7 found by me in Jefferson County, and July 21 (1950), 5 eggs in the same county (Stamm). The average complement of 35 clutches or broods is 5.8 ± 0.15 (4–8). No appreciable difference is evident between the means of 23 early and 12 late clutches. I have seen young still partly in juvenal plumage as late as August 20 (1942), in Jefferson County, and September 5 (1949), in Henderson County. Nests are placed in a wide variety of artificial situations, as elsewhere in the species' range, gourds and wren houses being favored; one was situated in a martin house, and another, reported without detail by Keith (1944:46) from Mason County, in a natural crevice among rocks.

Breeding distribution.—Partly summarized by Stamm (1951c). The species may well not have occurred at all in primeval Kentucky, where Audubon (1831:427) never noted it. There is no doubt that it has extended its breeding range markedly southward, especially in the last few decades, as noted in southern Illinois by Ridgway (1915:196), in general by Odum and Johnston (1951), and in Kentucky by Stamm (1951c), but speculation as to just when the state was invaded is not very profitable. The species was well established, and perhaps had long been pres-

¹ This seems rather late; cf. average date of arrival (April 14) at Columbus, Ohio (Borror, 1950:23).

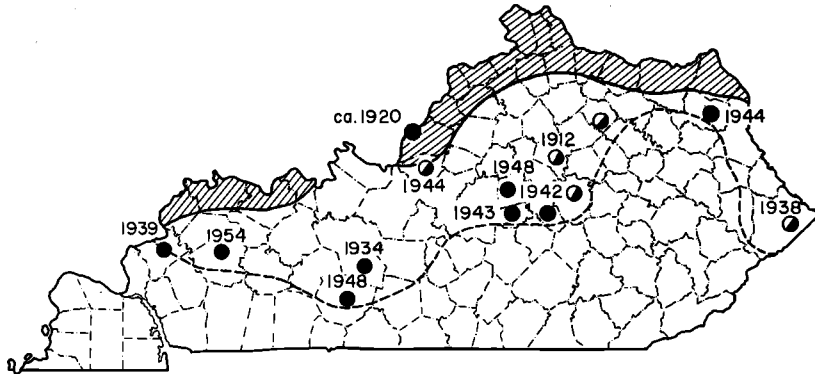


Fig. 24. Breeding distribution of the House Wren in Kentucky. Hatched area, generally distributed and common; dotted line, approximate southern boundary of breeding range; solid circles represent breeding records; half-solid circles represent breeding-season records. Dates are those of apparent arrival in marginal areas.

ent, at Cincinnati by the time of Langdon's (1877; 1879:170) and Koch's (1887) references to it, and it has probably been breeding in extreme northern Kentucky for many years. By 1912 it had probably been bred at least once at Lexington (Lyle, 1912), although it was apparently not common there until about 1930 (W. R. Allen, 1946). It appeared at Louisville in the 1920's (Monroe, 1955:41), becoming numerous by 1930. The dates of its first appearance as a breeding bird at various other localities farther south and west, where observations have been continuous, closely approximate those of the citations following: Mercer County (Van Arsdall, 1948); Warren County (Wilson, 1948a); Crittenden County (Frazer, 1939); and Hopkins County (Bacon, 1954a).

Today the species occurs as a common summer resident in most, if not all, of the counties along the Ohio River from Greenup to Jefferson,¹ and more locally west to Crittenden County, but this zone of abundance seems in many places to be peculiarly and sharply limited. In 1950, for example, in several weeks of summer field work in all Ohio River counties from Mason to Jefferson, I found House Wrens common nearly everywhere in a strip roughly 6 to 10 miles wide, adjacent to the river, but none was recorded in frequent excursions farther "inland." South of the Ohio River counties the species is quite local in occurrence. Aside from the outlying localities in the Bluegrass, Western Highlands, and Pennyroyal already mentioned, there are peripheral records of colonies from Belfry, Pike County (Wetmore, 1940:548), Carter County (Kozee, 1944), and Floyd County (Wilson, 1942:23) on the Cumberland Plateau, and from Mammoth Cave (Hibbard, 1935) in the Western Highlands. Odum and Johnston (1951) have given records from Kentucky and other states, but their map is inaccurate in regard to the detailed picture for Kentucky (*cf.* Fig. 24).

Summarizing, summer records are now available for at least 28 Kentucky counties (authorities given only for those not mentioned above; see also Fig. 24): Pike, Carter, and Floyd; Lewis (Wetmore, 1940:548); Harrison (Wilson, 1942:23); Mason; Bracken, Pendleton, Campbell, Kenton, Boone, Gallatin, and Carroll (Mengel, notes); Madison (Patten, 1946:33); Garrard, Boyle, Mercer, Fayette, Oldham, and Jefferson; Bullitt (Wilson, 1945); Edmonson, Warren, and Daviess; Henderson (Mengel, notes); Union (Wetmore, 1940:548); Crittenden and Hopkins.

Discovery of the reasons underlying the southward advance of the species, need-

¹ Stamm (letter: May 12, 1960) notes a decrease at Louisville since 1956.

less to say, is more difficult than describing the event. Odum and Johnston (1951:363) have theorized on the matter, and after pointing out, probably correctly, that the factors determining the former southern boundary of the range could not have been purely climatic,¹ suggested in effect that the advance might have resulted from increased population pressures owing to the creation by man of more extensive suitable habitat. This hypothesis, however, fails to reveal how increasing the habitat available to a species can alter a value (population pressure) that surely is dependent upon density (spacing) rather than area occupied. It is quite possible that the original limiting factors will remain unknown.

Competition between the House Wren and Bewick's Wren has often been mentioned (Bent, 1948:176; Kendeigh, 1934:391-392; Odum and Johnston, 1951:362) as a factor tending to limit their distributions. Some competition does occur (it seems, at least, actually to have been observed), but this may take place largely in habitats marginal for both species. This is suggested by the rarely mentioned fact that, while the House Wren has been advancing southward, Bewick's Wren has simultaneously been moving northward (Bent, 1948:176), an event which tends to invalidate the hypothesis that competition is very important. There are in fact ecological differences between the two. In Kentucky the House Wren is typical of well-groomed urban and suburban situations and neatly farmed countryside, favoring "clean" areas free of brush, while Bewick's Wren prefers brushy and shrubby environments, whether as a "house" wren about unkempt farms, or on rough hillsides near remote outbuildings. This preference was mentioned both by E. V. Miller (1941:81-83) and Aldrich (1944a:305). These differences may account for a tendency for invading House Wrens to appear first about urban areas, invading the surrounding countryside much more slowly (see Ridgway, 1915:196).

Fall.—The peak of migration probably occurs in late September. Late dates are rare. Migrating House Wrens abandon the conspicuous behavior of the breeding season and become furtive, skulking in hedge rows, dense fields, and the undergrowth of woodlands and swamps. Goodpaster (1941:24) gave the latest Cincinnati, Ohio, record as September 20 (1931). Monroe's latest record at Louisville is for October 16 (1955); he has also a record for October 6 (1947). Powell (1951) recorded individuals seen near Henderson on September 22, 1950. These wrens may be fairly numerous at this season. In 1949, Tordoff and I recorded 3 on September 5 and 3 on September 9 in densely wooded bottom land near Henderson, and near Louisville in 1950, I recorded 3 in a cattail marsh on September 15, 4 along a shrubby ridge on September 18, and 10 more in brushy pastures on swampy ground 10 miles south of the city on September 19. In 1951 I recorded 3 in Jefferson County on September 28 and 30, and at least 2 (1 taken on October 7) in a weedy clearing in forests of the Cumberland Plateau in Laurel County, October 5, 7, and 11. One or two winter records have been made near Cincinnati, Ohio (Kemsies and Randle, 1953:35).

Note.—A banded male returned to the same territory and nesting box at Louisville for at least three consecutive seasons, having a different mate each year (Stamm, 1958:7).

Geographic variation.—All Kentucky specimens seen by me appear to represent *Troglodytes aedon parkmanii* Audubon, although most are not typical of that subspecies. Since Oberholser's separation (1934:90), under the subspecific name *baldwini*, of the House Wrens from, roughly, Ohio east to the beginning of the Atlantic slope, the problem of proper allocation of specimens from Kentucky and adjacent areas has become perplexing. While fully satisfactory decision awaits the accumulation of larger series of specimens in fresh plumage and from known breeding grounds than are now available, after prolonged study of fairly large series in the U. S. National Museum, I reached the following tentative conclusions:

¹ Certainly Kendeigh's climograph (1934:376, Fig. 20) correlating the earlier southern boundary with climatic factors illustrates the hazards of cause and effect relationships deduced from correlations.

(1) House Wrens in the eastern United States are rather variable individually; (2) in the range assigned to *baldwini* there is a tendency toward a higher percentage of birds which are darker and grayer than the average for *parkmanii*, individuals sometimes being almost slaty above and almost pure gray (*i.e.*, not at all rufescent) below; (3) this difference is not sufficiently constant to merit nomenclatural recognition; and (4) no Kentucky specimens examined are of the dark, reddish type common in the range of *aedon*. The variability mentioned under (1) above is noted in the original description of *baldwini*, a name I think applies to an essentially intergrade population, in which an intermixture of characters results from various combinations of the relative saturation of color of *aedon* together with the gray tones of *parkmanii*. Of a variable series of 16 specimens I have examined from Kentucky, only 3 birds from Union County, previously referred by Wetmore (1940:548) to *parkmanii*, an October-taken transient specimen from Laurel County, and an immature (probably transient) female taken in Jefferson County on September 15, 1950, are typical of that form. The remainder are more or less of the *baldwini* type in being darker and grayer in varying degrees. These birds, while here referred to *parkmanii*, may be regarded as intermediate, or not typical.

Specimens examined.—Total, 16. B.L.M.—1 immature male, 1 female, Jefferson County (Aug. 20; May 31); U.S.N.M.—1 male, Lewis County (July 11); 2 males, 1 female, Union County (May 10); U.M.M.Z.—1 male, Laurel County (Oct. 7); 1 male, 1 female, Boone County (July 7; July 12); 5 males, 1 female, Jefferson County (April 10, July 3, 3, Sept. 15, 30; Sept. 19); 1 female, Henderson County (Sept. 5).

Troglodytes troglodytes (Linnaeus): WINTER WREN

Status.—Fairly common transient and winter resident.

Spring.—No peak of migration is evident from the records at hand; the species becomes uncommon by the end of March and has rarely been recorded after mid-April. Late records: April 15 (1934), at Cincinnati, Ohio (Goodpaster, 1941:24); April 20 (1881), and April 27 (1921), in Nelson County (specimen, C.W.B.; and Blincoe, 1925:417); May 7 (1950), at Louisville (Monroe); April 16 (1950), in Lyon County (Mengel). Records extending to May 18 reported in Wilson's (1922:242) early paper from Warren County are questionable. Winter Wrens rarely sing while on migration, but Blincoe (1921*b*) reported and well described a singing individual noted at Bardstown on April 27, 1921.

Summer.—No definite evidence of breeding or summering in Kentucky has been obtained. C.H.B. (1884) reported, quite certainly in error, that Winter Wrens breed commonly at some unnamed Kentucky locality. Wilson's statement (1942:23) that the species breeds rarely in Harlan County appears to be based solely on an immature bird taken by Barbour near the 3,800-foot contour on Black Mountain, August 6, 1939 (see Barbour, 1941*a*:46). The specimen (R.W.B.) is fully grown and in first winter plumage (skull incompletely ossified; Barbour, verbal com., August 5, 1951). It may have been a wanderer from some nearby locality, but the possibility that a few Winter Wrens breed on the mountain is emphasized by the discovery of the species in summer at corresponding elevations 15 miles away on High Knob, in Wise County, Virginia, by Charles O. Handley, Jr. (verbal com.) and C. E. Addy (Murray, 1952:78). High Knob differs from Black Mountain, however, in supporting more extensive growths of hemlock, which (with other conifers) is essentially absent from the higher parts of the latter.

Fall and winter.—Arrives occasionally by early October, rarely earlier. There are slight indications that a peak of migration may occur around the end of October. Early records: September 22 (1938), at 3,000 feet elevation on Log Mountain, Bell County (Wetmore, 1940:549); October 8 (1938), in Rowan County (Wetmore, *loc. cit.*); October 7, in Nelson County (Blincoe, 1925:417); September 26 (1954), at Louisville (Monroe). In winter the species occurs throughout the state in small to moderate numbers and has been reported by many observers. Although infrequently observed, it may be found readily nearly anywhere by those familiar with

its haunts. I have recorded it from London, Laurel County, west to Fulton County at this season; it is particularly fond of Japanese honeysuckle tangles, the understories of dense, bottomland forests, brushy creek banks, and (in the east) tangles of mountain laurel and piles of logs, particularly beneath heavy stands of hemlock.

Geographic variation.—In recent decades two subspecies of Winter Wren have been described from eastern North America: *T. t. pullus* (Burleigh, 1935:61) from the southern Appalachians and *T. t. aquilonaris* (Burleigh and Peters, 1948:116–117) from Newfoundland. These subspecies¹ are rather similar and both are said to differ from the widespread eastern subspecies *Troglodytes troglodytes hiemalis* Vieillot (to which all Kentucky material seen is here referred) in being darker, grayer (less reddish), and more heavily marked below, *pullus* allegedly being the more extreme in these respects. While members of both of these populations may occur on migration in Kentucky, at present the problem of assigning winter-taken specimens of such slightly marked forms to the populations from which they actually originated is so hazardous that I have not undertaken it. Proper allocation of such specimens is possible only in the cases of varying percentages of extreme examples in each case (see Rand, 1948, and Rand and Traylor, 1950), and this presupposes that the ranges of variation of the forms in question have been worked out with adequate series from known breeding populations and in good plumage. In the case of the Winter Wrens another and not inconsiderable difficulty is found; it appears very likely that specimens grow redder in the museum tray with the passing years, as do some other birds of brownish or grayish coloration. I first noted this in The University of Michigan Museum of Zoology, when comparing 2 Kentucky specimens suspected of showing the characters of *aquilonaris*. Two Michigan specimens almost identical to these had been recently collected, while older Michigan specimens were red "*hiemalis*." Somewhat later, I compared 4 Kentucky specimens with 10 (University of Kansas Museum of Natural History) from Kansas and Arkansas. Aligning these, without regard to labels, from grayest to reddest, with gray at the left, I found the dates of collection of the 14 birds to be, respectively, 1948, 1949, 1950, 1945, 1941, 1914, 1908, 1913, 1910, 1912, 1934, 1910, 1910, 1910. The suspicion is inescapable that aging accounts for some of this variation. Of the relatively few Kentucky specimens I have examined, most are rather grayish, seemingly approaching the *aquilonaris-pullus* type, but all of these grayish birds are recently collected. By contrast, a series from Bardstown taken in the 1880's by C. W. Beckham averages very red. I have not had adequate opportunity to analyze the separability of true *aquilonaris* or *pullus*, but after the observations related I cannot help thinking that overconfidence is revealed in Burleigh and Peters' statement (1948:116): "[In examining winter-taken specimens from] the southeastern United States, and originally identified as *pullus*, no difficulty was experienced in recognizing an occasional specimen of *aquilonaris*."

Specimens examined.—Total, 18. M.S.C.—1 male, 1 female, 1 unsexed, Rowan County (March 19; Oct. 29; Oct. 26); R.W.B.—1 unsexed immature, Harlan County (Aug. 6); U.K.—1 female, Scott County (Nov. 18); C.W.B.—3 males, 2 females, Nelson County (April 13, 20, Oct. 31; March 12, April 3); J.D.F.—1 unsexed, Marshall County (Oct. 26); U.S.N.M. (see Wetmore, 1940:549)—5 specimens from Rowan, Carroll, Nelson, Hopkins, and Trigg counties (Oct. 8–Nov. 21); U.M.M.Z.—2 males, Fulton County (Nov. 6, Dec. 28).

Thryomanes bewickii (Audubon): BEWICK'S WREN

Status.—Common summer resident throughout the state; rare to uncommon in winter in western and south-central Kentucky, casual northward and on the Cumberland Plateau.

Spring.—Arrival dates for much of the state are lacking, since the species winters in some numbers at least in southern Kentucky. Disregarding a few winter observations, Monroe's earliest record at Louisville is for March 9, and the species

¹ Only the first is recognized by the A.O.U. Check-List (1957:409).

usually appears about March 15. Goodpaster (1941:24) gave early records for Cincinnati as March 27, 1940, and March 29, 1936.

Breeding records.—Clutch completion may take place as early as March 21–31 and as late as June 21–30 (early peak May 1–10), as shown by 23 dated breeding observations. Data in various detail are from Laurel (Mengel, notes), Boyle (Lovell, 1951b:60), Mercer (Van Arsdall, 1949:26), Nelson (specimens, C.W.B.), Cincinnati (Ohio; Goodpaster, 1941:24), Jefferson (Stamm, 1951c:53; Monroe, notes), Bullitt (Hays, 1957:5), Meade (Lovell, 1949b:46), Christian (H.B.B., 1892), Crittenden (Frazer, 1938), and Hopkins (Hancock, 1954:24) counties. Egg dates range from March 15 (1938), in Crittenden County (set of 6 completed about March 21) to July 8 (year unknown) in Christian County. The average complement of 10 recorded clutches is 5.1 ± 0.52 (3–8). The Bewick's Wren is somewhat less likely than the House Wren to insist on a closed cavity for its nest; nests have been reported from a wide variety of situations in and around outbuildings and (more often than not) abandoned dwellings, in old tires and boxes, on shelves, in hats, farm machinery, and mail boxes, as well as bird boxes and gourds. Several authors have noted two nestings by one pair, a new nest being built in each case. In 1917 Monroe noted construction of a nest by a pair on April 1, with the second nest under construction on June 8. In Laurel County on June 18, 1952, I found a nest between the ceiling and roof of the porch of an abandoned farmhouse. The nest contained 5 eggs when found and the female appeared to be incubating; on July 1, when revisited, this nest contained 5 young evidently about 2 days old, and 1 egg, the last apparently laid well after incubation was begun.

Breeding distribution.—Statewide. Bewick's Wren is common in farmlands, small towns, and clearings in all parts of the state including the Cumberland Plateau and Mountains. There is much evidence from areas farther north that the species has been expanding its range northward (see discussion under House Wren), and it may conceivably not have reached Kentucky in Audubon's time, since his only records (1831:96–97) of the species he discovered were from Louisiana. It may not have bred in extreme northern Kentucky until late in the last century since, despite intensive early work by Langdon and others, it was not recorded at Cincinnati, Ohio, until March 27, 1879 (Dury and Freeman, 1880:101), and further specimens were not obtained there until April 10 and 14, 1891 (Dury and Kellogg, 1891:43). In view of this it may be significant that Beckham (1885:12) found it "not common" at Bardstown, Nelson County, while Blincoe (1925:417) regarded it as "very abundant" there. In recent years the species seems to have been displaced from some situations, chiefly urban and suburban, by the southward-moving House Wren (Monroe, 1955:41).

Fall.—Somewhat less information is available than for spring. Probably a decrease in numbers occurs throughout October. Many records from all parts of the state are available for September and early October, but late October and November records are limited to areas where the species winters. Exclusive of a few winter records, Monroe's latest record at Louisville was made on November 21, 1936.

Winter.—Lovell and Clay (1942) reviewed the winter range in some detail, noting many records from southern and western Kentucky (to which more have been added subsequently), and concluding, I think correctly, that the species winters only rarely north of the Knobs, and on the Cumberland Plateau in eastern Kentucky. They knew of only one record (Dayton, Campbell County) for the northern Bluegrass. At Louisville, a little farther south, the species has been noted very rarely in winter, with records for January 28 (bird remained through February), 1940 (Lovell and Clay, 1942:50), and December 23, 1950, and December 26, 1948 (Monroe). Beckham (1885:12) noted the species wintering in Nelson County. Records for additional areas are now at hand. On the Cumberland Plateau, 7 miles southwest of London, Laurel County, Edwards and I recorded a singing Bewick's Wren in a farmyard on the bright morning of February 4, 1950. Although Blincoe (1925:417) stated that wintering Bewick's Wrens do not sing, both this bird and one I

recorded near Paducah, McCracken County, on January 5, 1951, were singing. Also in the Purchase region, I recorded a Bewick's Wren in the cedars of an old cemetery 5 miles southwest of Hickman, Fulton County, December 28, 1950. Wintering Bewick's Wrens are furtive, inhabiting dense cover such as thick hedgerows, cedar thickets, and shrubby forest edge.

Geographic variation.—Aldrich (1944a) separated the Bewick's Wrens of the Appalachian region under the subspecific name *altus*, drawing the western boundary of the range of this form just east of central Kentucky. I have been unable to bring together at one time enough material of known origin and in fresh plumage to test thoroughly the validity of this race. Material I examined at the U. S. National Museum tended to support Aldrich's claim that Appalachian birds average somewhat darker and sootier in color than those of the lower lands to the west. This difference, however, seemed very slight, and reasonable separability of the subspecies, if valid, would require considerable constancy of characters. I suspect that *altus* is merely the height of expression (as, in fact, was stated by Aldrich) of the general darkening of Bewick's Wrens in the humid east. Further examination of this matter, to be effective, will require the accumulation of much more material than is now available; attaching subspecific names to the few individual Kentucky specimens I have compared with reasonably adequate material appears to be essentially an academic exercise but, for the present, two subspecies may be admitted to the list.

Thryomanes bewickii bewickii (Audubon)

Said to be the subspecies occurring in western Kentucky (Aldrich, 1944a; see also above). A singing male which I took in Logan County on May 9, 1949, although faded, seems to belong here, as do two specimens (U.S.N.M.) taken at Brandenburg, Meade County, on April 22, 1938.

Thryomanes bewickii altus Aldrich

According to Aldrich (1944a; see also above), this is the subspecies of eastern Kentucky. An immature female in fresh plumage taken in Laurel County on October 5, 1951, by me, is a very dark bird of this type, to which also a breeding specimen (not seen) from Barbourville was assigned by Aldrich. Other dark specimens (U.S.N.M.) taken in Bell County on September 26, Rockcastle County on October 4, and Boone County on October 11, 1938, Aldrich called migrants (just why, I am not sure) of this race.

Specimens examined.—Total, 21. R.W.B.—1 male, Rowan County (March 18); C.W.B.—10 specimens, including 3 stub-tailed juveniles, Nelson County (April–Nov. 21); B.L.M.—1 male, Jefferson County (June 5); C.U.—2 males, Logan County (May 10, 20); U.S.N.M. (see Wetmore, 1940:549)—1 specimen, Bell County (Sept. 26); 1, Rockcastle County (Oct. 4); 1, Boone County (Oct. 11); 2, Meade County (April 22); U.M.M.Z.—1 male (weight, 11.8 gm., not fat), Logan County (May 9); 1 immature female (11.9 gm., moderately fat), Laurel County (Oct. 5).

Thryothorus ludovicianus (Latham): CAROLINA WREN

Status.—Common resident.

Spring.—No notes of particular significance, other than those connected with breeding. The species sings, at least sporadically, throughout winter.

Breeding records.—Clutches are completed as early as March 21–31 and as late as July 11–20, as shown by 25 dated breeding observations (early peak probably April 1–10, no later one clearly evident). Evidently two-brooded. Data are from Rowan (Barbour, 1951a:36), Laurel and Wayne (Mengel, notes), Madison (Lovell, 1951b:60), Mercer (Van Arsdall, 1949:26), Woodford (Lovell, *loc. cit.*), Owen (Lovell, Stamm, and Pierce, 1955:8; Hays, 1957:5), Oldham (Stamm, Shackleton, and Slack, 1953:27; Lovell, *loc. cit.*; Stamm, notes; Shackleton, notes; Mengel, notes), Jefferson (Nolan, 1955:31; Hays, 1957:5; Brecher, 1947:41; Stamm, notes; Monroe,

notes; Mengel, notes), Meade (Lovell, 1949b:47), Christian (H.B.B., 1892), and Hopkins (Hancock, 1954:24) counties. Construction of a nest noted at Louisville on the early date of February 25, 1954 (Nolan), was continued in a desultory way through March 11, the first egg being laid March 22 and a set of 5 completed March 26. This is the earliest egg date, the latest being for August 1 and 2 (1951), when I noted the hatching of 4 eggs in a nest at Glenview, Jefferson County. Incubation in the first nest required 18 days; young remained in the first 11 days, in the second nest 12 days. The average complement of 16 nests was 4.7 ± 0.21 (3-6) eggs or young. Nests have been reported from a considerable variety of artificial situations, shelves, doorjams, and similar flat projections in sheds, abandoned houses, and garages being favored sites; Van Arsdall noted one in Mercer County in an old Robin's nest under an eave. A nest situated in a small natural cavity among herb-sheltered rocks on a slope was found in Jefferson County on April 15, 1945, and described by Brecher (1947). On June 25, 1938, Monroe and I found a nest under a hollow stump in Oldham County. I have noted young birds not long from the nest at numerous localities in May and June, and in northern Warren County on June 18, 1949, I watched a pair of adults feeding 3 young Carolina Wrens and a Brown-headed Cowbird.

Breeding distribution.—Statewide. Common to fairly common in primitive areas and cultivated surroundings alike, unless clearing has been very extensive, as in some large portions of the Bluegrass, where the species is rare. The Carolina Wren occupies forest edge and forest types of all kinds, from lowland cypress swamps in western Kentucky to cool hemlock- and rhododendron-choked ravines in the mountainous east. Only on the highest portions of Black Mountain, Harlan County, is it essentially absent. In 1908, Howell (1910:299) recorded several at approximately 3,800 feet elevation on the mountain, and in much work there I recorded only a few above 3,000 feet, the highest being singing birds noted on southeast-facing slopes at 3,700 feet on July 1 and 5, 1951. In 1952 I found none above 3,000 feet. The species is common at the bases of the Cumberlands, but these seem to be the only records from higher elevations.

Fall and winter.—The species is common and conspicuous in the colder months, both its ringing call notes and, less frequently, its song being heard in all months. For notes on winter roosting sites see Cox and Hall (1958:23).

Geographic variation.—The efforts recently made (Lowery, 1940; Godfrey, 1946) to divide the Carolina Wrens of the interior eastern United States into several subspecies seem to me to have extended a sometimes useful system beyond the limits of its utility. Both Lowery and Godfrey did thorough and careful work, attempting to frame objective descriptions of the slight and, so far as I can see, clinal variation in the populations of the continental area north of the Gulf Coast. The dubious propriety of awarding nomenclatural recognition¹ to these populations is best shown by the divergence of the conclusions arrived at by these two workers, after examining roughly similar material (much of which I also have studied, together with additional series not available to them, from Kansas and Oklahoma [*T. l. "alamoensis"* of Godfrey] and from Kentucky [*T. l. "ludovicianus"* of Godfrey; *T. l. "carolinensis" > ludovicianus* of Lowery]). Comparing the two series named in parentheses just above, from populations regarded by Godfrey as subspecifically distinct, I found an exceedingly low percentage of separability, if any. In turn, agreeing with Godfrey, I was unable to detect important differences between northern (Indiana, Ohio, Michigan; "*ludovicianus*" of Lowery) and southern (Tennessee, Mississippi, Louisiana, etc.; "*carolinensis*" of Lowery) series. I thus agree with Lowery in uniting western and central populations and with Godfrey in joining northern and southern! All Kentucky material is here treated as *Thryothorus ludovicianus ludovicianus* (Latham).

¹ Withheld, since the above was written, by the A.O.U. Check-List Committee (see A.O.U. Check-List, 1957:415).

Specimens examined.—Total, at least 57. M.S.C.—1 female, 1 unsexed, Rowan County (Dec. 3; Nov. 2); R.W.B.—1 male, Harlan County (July 23); C.W.B.—a long series, at least 20, from Nelson County (throughout the year); C.U.—1 female, Breathitt County (June 19); 2 males, Logan County (Nov. 14; Dec. 19); B.L.M.—2 males, Jefferson County (Feb. 10, Dec. 5); U.S.N.M. (see Wetmore, 1940:549)—20 specimens from Pike, Bell, Wayne, Rockcastle, Carroll, Meade, Butler, Union, Muhlenberg, Trigg, and Fulton counties (April 20–Nov. 9); U.M.M.Z.—2 females (weights, 19.6 gm., moderately fat, 19.2 gm., not fat), Meade County (Oct. 30); 2 adult females (not fat; 20.3, 16.6), 1 immature female (21.5, not fat), Henderson County (Sept. 5, 8; Sept. 5); 1 male (20.0, moderately fat), Hickman County (Nov. 13); 1 male (21.6, moderately fat), 1 female (18.7, moderately fat), 1 immature female (not fully grown; 18.4), Fulton County (Dec. 26; Nov. 11; May 17).

Telmatodytes palustris (Wilson): LONG-BILLED MARSH WREN

Status.—Transient; very rare in spring, rare to very rare in fall.

Spring.—The few records here regarded as authentic fall between April 5 (specimen, Nelson County; C. W. Beckham) and May 15 (Jefferson County), the majority being for late April and early May. The species has been reported from a number of localities more or less throughout the state, mostly in "big spring bird counts" and the like (*Kentucky Warbler*), the details of which, in many instances, if not of dubious accuracy are at least very difficult to confirm. From 1934 through 1952 only 5 spring records were made in the Louisville area by Monroe (April 30, May 7, 8, and 12) and me (May 15). Hancock observed the species at Madisonville, Hopkins County, on May 1, 1950 (*Kentucky Warbler*, 26:42, 46, 1950); he has recorded very few there (verbal com.). Likewise, Wilson has but a few records for Warren County. In a considerable amount of spring field work I have seen only 2 birds: 1 on May 5, 1949, in brush along a drainage ditch in an open field near Chaney Lake, Warren County (see geographic variation), and 1 May 15, 1937, in a shrubby, flooded field near Buechel, Jefferson County.

Breeding.—Wilson's early reference (1923c:136) to nests found in Calloway County he later regarded (verbal com., 1949) as doubtfully authentic; the nests were probably those of deer mice (*Peromyscus* sp.).¹

Fall.—Perhaps sometimes more numerous than in spring, but generally rare. Goodpaster (1941:24) considered the species "rather common" near Cincinnati, Ohio, evidently basing his conclusion on continued careful work in excellent habitats. In general it has not seemed common in Kentucky, and the collection of 5 specimens in one autumn by the U. S. National Museum's field party of 1938 is noteworthy. Goodpaster's records from Cincinnati ranged from August 23 (1938) to November 15 (1930); extreme Kentucky records are for September 17 (1951), in Hopkins County (Hancock, notes) and November 14, in the Louisville area (Jefferson County), where Monroe also saw 2 birds in a brushy field in Oldham County on October 15, 1949. The few records are from localities scattered throughout the state, from Rockcastle and Madison counties (Wetmore, 1940:549) westward. I have never recorded this wren in fall, despite many hours spent in seemingly good habitats (the best occurring locally in any quantity being, probably, wet situations in densely grown fields or brushy areas). A few birds might winter, given extensive suitable habitat, but this is virtually lacking. I have some doubt concerning Pindar's record (1925a:168) of 1 seen in Fulton County on February 26, 1888.

Geographic variation.—The differences between the subspecies *T. p. palustris* of the central Atlantic coast and *T. p. dissaeptus* of the northern and middle parts of the continent are fairly striking, and I think typical examples are safely separable away from their breeding grounds.

¹ Breeding has been recorded in the Cincinnati area (Kemsies and Randle, 1953:36) and is not out of the question in Kentucky.

Telmatodytes palustris palustris (Wilson)

Two specimens from the state must be assigned here on the basis of their dull, dark dorsal coloration since, of the considerable series of *dissaeptus* I have seen, no specimens were dark enough to match these birds. This disposition may be altered in time, if large series should become available; it seems unlikely that many transients from the range of true *palustris* would cross the Appalachians and reach Kentucky. The specimens are a male (weight, 14.0 gm., moderately fat; testes moderately enlarged; singing), which I took in Warren County (see "spring") on May 5, 1949, and a male (U.S.N.M.) taken near Berea, Madison County, on October 5, 1938 (Wetmore, 1940:549).

Telmatodytes palustris dissaeptus (Bangs)

The remainder of the 7 Kentucky specimens examined is, as might be expected, referable here. There are 4 specimens (U.S.N.M.) reported by Wetmore (1940:549) from Muhlenberg County, October 24 (2), Boone County, October 10, and Rockcastle County, October 6, all 1938, and a male (C.W.B.) taken by Beckham at Bardstown, Nelson County, on April 5, 1887. Several old specimens from near Cincinnati (C.M.N.H.) seemed on brief examination also to belong here.

Specimens examined.—Total, 7. See immediately above.

Cistothorus platensis (Latham): SHORT-BILLED MARSH WREN

Status.—Very rare to uncommon summer resident (recorded more frequently in recent years), breeding locally; rare to uncommon transient; casual in winter.

Spring.—The species is rarely recorded in migration, possibly because of inadequate observation. Several spring records may represent breeding birds, since few observations have been followed up by an intensive search for summering individuals. Pindar (1925a:168) referred to the species as a rare migrant in Fulton County. Beckham (1885:12–13) took a singing male from a blackberry vine in a rye field in Nelson County on May 1, 1882. Wilson (1922:242) had only two records for Warren County, for April 27, 1918, and May 5, 1917. Most of Monroe's numerous records for Jefferson and Oldham counties range from May 5 to 24, but nearly all have been made since 1945, when it was discovered that a small population was regularly breeding there. In previous years near Louisville, the species was very rarely recorded in spring. Just outside Kentucky, I heard a Short-billed Marsh Wren singing at close range in extensive cut-grass marshes (a decidedly atypical habitat) of Reelfoot Lake, Lake County, Tennessee, throughout the night of May 27–28, 1949.

Breeding records.—Historically, the earliest record seems to be Hibbard's (1935:465–466) of a family of young reared in a moist sinkhole in Doyle Valley near Mammoth Cave, Edmonson County, in the summer of 1934. Further evidence of breeding was not obtained until August 4, 1946, when Monroe found three empty nests in one day (one of them a "dummy" nest without central cavity) in grasses and sedges of a weedy field in the Ohio River bottoms near Prospect, Oldham County, and took a female (B.L.M.) which had a fully formed egg in the oviduct. On August 11, 1946, near Worthington, Jefferson County, on uplands several miles from the first locality, also in Oldham County, Monroe found another nest, 18 inches above the ground in a dense clump of sedges growing in a moist spot within a field of cultivated orchard grass. This nest contained 1 fresh egg; on August 15 it contained 5 fresh eggs and was collected (B.L.M.). Later still, Wilson (1951b) noted a family group of 2 adults feeding 3 young, the latter barely able to fly, in a dense, weedy field in Warren County on August 18, 1950. Monroe and I saw several adults and grown young, and a young bird barely able to fly in an orchard grass field near Goshen, Oldham County, on July 23, 1950.

Breeding distribution.—This wren probably breeds, or has bred at times, throughout the state. Possibly it has lately been moving southward, but as long ago as

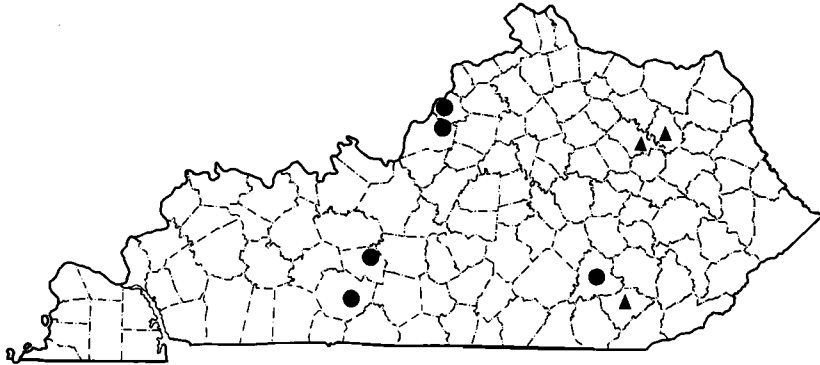


Fig. 25. Breeding distribution of the Short-billed Marsh Wren in Kentucky. Circles represent definite breeding records; triangles represent breeding-season records.

1908, Howell (1910:300) recorded a few pairs, August 9–13, in a small marsh at Barbourville, Knox County, on the Cumberland Plateau. Just off the Plateau, in Bath County, Barbour and Welter took a worn, faded male on August 6, 1934 (M.S.C.), and obtained a sight record as early as July 2. On the Plateau there is a summer record (July 20) for nearby Morehead, Rowan County (Barbour, 1951a: 36). Further evidence of breeding on the Plateau (in Laurel County) is given under "fall." On the basis of definite evidence the species has bred, or probably bred, in Rowan, Knox, Laurel, Bath, Oldham, Jefferson, Edmonson, and Warren counties (Fig. 25).

Fall.—Some of the records, which are slightly more numerous than for spring, may represent lingering breeding birds. A male (M.S.C.) in fresh fall plumage was taken at Morehead, Rowan County, on September 24, 1939. Wetmore (1940: 550) recorded specimens (U.S.N.M.) taken in 1938 at Burlington, Boone County, on October 11, in Muhlenberg County on October 18 and 24, and at Canton, Trigg County, on October 31. In Laurel County, 7 miles east of London, I found a group, apparently a single family, of at least 7 Short-billed Marsh Wrens, all in extensive molt, on October 10, 1951. I took (U.M.M.Z.) an adult male and an immature female, the latter still bearing some juvenal feathers. These birds were in a dense growth of ragweed, ironweed, goldenrod, and grasses on the slope of a bowl-shaped valley with some marshy areas in its lower portions, and I suspect that a pair had bred there. Other records: September 19–October 24, at Cincinnati, Ohio (Goodpaster, 1941:24); August 20, 1948, at Madisonville, Hopkins County (Hancock, 1949a:48); September 4–October 29 (1950), near Louisville (Monroe).

Winter.—Monroe has noted several wintering birds in thickly grown fields in Oldham County, all between December 14 and January 25, in 1946 and 1947 respectively. Others have been reported in recent years on Christmas bird counts of the Kentucky Ornithological Society, notably from Marion, Crittenden County, and from Greenup County, January 2, 1960 (see *Kentucky Warbler*, 36:16, 1960).

Geographic variation.—The subspecies occurring is the North American *Cistothorus platensis stellaris* (Naumann).

Specimens examined.—Total, 12. M.S.C.—1 male, Rowan County (Sept. 24); 2 males, Bath County (Aug. 6); R.W.B.—1 unsexed, Rowan County (Sept. 24); B.L.M.—1 male, 1 female, Oldham County (June 7; Aug. 3); U.S.N.M. (see Wetmore, 1940:550)—4 specimens from Boone, Muhlenberg, and Trigg counties (Oct. 11–31); U.M.M.Z.—1 adult male (weight, 9.8 gm., not fat), 1 immature female (8.8 gm., not fat), Laurel County (Oct. 10).

FAMILY MIMIDAE: MOCKINGBIRDS AND THRASHERS

Mimus polyglottos (Linnaeus): MOCKINGBIRD

Status.—Resident; common in western and central Kentucky, uncommon to rare in mountainous eastern Kentucky; somewhat less numerous in winter.

Spring.—Some individuals, probably adults, are certainly resident throughout the year (see Young, 1939:18), but an increase from moderately depleted winter numbers occurs in spring, probably in March.

Breeding records.—No marked peak of clutch completion is evident from 22 dated breeding observations, which indicate completion of clutches from April 1–10 to July 21–31. Two-brooded. Records are from Letcher (Murray, 1938:2), Boyle (Lovell, 1951b:60), Woodford (Pindar, 1925a:174), Hart (Edna Harlow, notes; *vide* Monroe), Oldham (Stamm, notes; Monroe and Mengel, notes), Jefferson (Jansing, 1947:64; Hays, 1957:5; Church, 1947:43; Stamm, notes; Monroe, notes), Bullitt (Monroe, notes), and Hopkins (Hancock, 1954:24) counties. Early dates are April 15 (1949), 4 eggs in a nest in Hopkins County (Hancock), and April 28 (1956), 2 young in a nest in Jefferson County (Hays); late dates are September 2 (1951), 3 large young in a nest in, again, Hopkins County, and October 1 (1926), on which very late date young birds less than full grown were being fed in Hart County (Harlow, *vide* Monroe). The average complement of 16 nests is 3.5 ± 0.26 eggs or young (3–4; clutches of 5 have been reported, without detail). Nests are found in shrubs, vines, and small trees, usually in rather open situations, as brush along fence rows, scattered reproduction in old fields, and (often) the yards of suburban dwellings; they are placed rather low (16 averaged 5.5 feet above ground; range, 1½–15) and have been found in many shrub and tree species both deciduous and evergreen. Two broods (reared by one pair in one season) in Jefferson County both contained albinos (Jansing, 1947). Monroe and I found a nest containing 4 small young in Oldham County, 4 feet up in a lone rose bush, on July 2, 1938. Monroe took a young bird about two-thirds grown near Anchorage, Jefferson County, on June 26, 1938 (B.L.M.). I saw nearly full-grown young being fed at Fulton, Fulton County, on June 2, 1949. Hancock (1954:24) seems to have found many nests of this species besides those he describes in detail, as I did myself years ago.

Distribution.—Statewide, breeding. Mockingbirds are considerably less numerous on the Cumberland Plateau than in the less densely forested areas to the west; I have seen only a few in eastern Kentucky, most of them in Clark, Powell, Laurel, and Pulaski counties. The species seems to be altogether lacking from large forested tracts and is undoubtedly much more numerous today than in early times. It is decreasing today in areas where cultivation has been terminated and new forest is coming in (see Wilson, 1950:22). Mockingbirds seem never to have been recorded from the high Cumberland ridges, such as Black Mountain in Harlan County, although I saw a few in 1951 and 1952 in the nearby valley at Big Stone Gap, Virginia. In 1951 I failed to note any along the Pine Mountain ridge in eastern Pike County and parts of Letcher County, although the species was noted in the latter by Murray (1938:2). The species was evidently well established in various parts of Kentucky by the time most early authors wrote (see Garman, 1894:9; Pindar, 1889b:315; Murchison, 1893:69), but Beckham (1885:9) remarked on a considerable increase in Nelson County in the 10 years prior to 1885 and Langdon (1879:169) regarded the species as rare at Cincinnati, Ohio, at about the same time.

Fall and winter.—Song is occasionally heard late in the year, Beckham (*loc. cit.*) having referred to an instance on November 8. For observations on territorialism in fall and winter, see Church (1947), Young (1939), and Lovell (1944a). There is some decrease in winter, although this is less conspicuous in areas where the species is common. In eastern Kentucky, where Mockingbirds are uncommon at

best, they are very hard to find in winter, and in the late 1800's, when the species seems to have been less numerous, winter observations caused some excitement in and near northern Kentucky (see Langdon, 1877:3, 1882:56; Beckham, 1885:9), and observers elsewhere commented on a decrease in winter (Murchison, 1893:69, Union County). Several reports refer to decreases after particularly rigorous winters (Blincoe, 1925:417; Wilson, 1922:242). Notes on roosting sites in Crittenden County were made by Cox and Hall (1958:23).

Geographic variation.—The subspecies occurring is the eastern one, *Mimus polyglottos polyglottos* (Linnaeus).

Specimens examined.—Total, 8. M.S.C.—1 female, Rowan County (March 22); B.L.M.—1 unsexed immature (tail not fully grown), Jefferson County (June 26); Bernheim Collection—1 male, Fayette County (March 17); C.U.—1 male, Logan County (April 21); U.S.N.M. (see Wetmore, 1940:550)—3 specimens from Hopkins, Butler, and Trigg counties (Oct. 20–Nov. 12); U.M.M.Z.—1 unsexed, Oldham County (April 10).

Dumetella carolinensis (Linnaeus): CATBIRD

Status.—Common summer resident; casual in winter.

Spring.—Early arrivals sometimes appear in early or mid-April; the species becomes numerous late in the month. Early records: April 19 (1886), in Fulton County (Pindar, 1887a:85); April 14, in Warren County (Wilson, 1922:242); April 19, in Nelson County (Blincoe, 1925:417); April 20, at Cincinnati, Ohio (Langdon, 1879:169); April 16, in Rowan County (Barbour, 1951a:36). Monroe's records for the years 1934–1960 at Louisville show an average arrival date near April 18, with two very early records, one for March 25 and one for April 6. In 1949, I found the species established in the eastern counties of Powell, Wolfe, and Laurel by April 21.

Breeding records.—Clutches are completed at least from May 1–10 to July 21–31; the peak (first broods) shown by 57 dated breeding records is May 11–20, with no very definite later peak evident. Records are from Harlan (Lovell, 1950c:59; Mengel, notes); Rowan (Barbour, 1950a:34; 1951a:36); Perry (Stamm, notes); Grant (King, 1940); Owen (Hays, 1957:5); Nelson (Blincoe, *vide* Funkhouser, 1925:291; Blincoe, 1923); Oldham (Stamm, Shackleton, and Slack, 1953:27; Stamm, notes); Jefferson (Hays, 1957:5; Stamm, notes; Monroe, notes); Meade (Lovell, 1949b:47); Hardin (Monroe, notes); Edmonson (Browning, 1946:41); Hopkins (Hancock, 1954:24, including Suthard's records); Warren (Mengel); and Hickman (Mengel, notes) counties. At Louisville, Monroe noted nest building on the early date of April 26, in 1918. Barbour (1951a:36) mentioned "nesting" in Rowan County on "May 3." Egg dates range from May 11, 3 and 5 eggs reported, respectively, by Hancock from Hopkins County (1922) and Funkhouser from Nelson County (1921), to July 21 (1937), a set of 3 in Grant County (King), and July 28 (1946), 1 egg in a nest in Jefferson County (Stamm). Occasional clutches of 2 may be complete; the present records indicate that 3 is the most common clutch locally (19), the average of 31 clutches or broods being 3.4 ± 0.11 (2–5). Of these clutches, 21 completed April 21–June 10 average 3.6 ± 0.16 (3–5), while 7 completed June 11–July 31 average 2.9 ± 0.15 (2–3). Nests are placed in shrubby and edge situations, in many kinds of shrubs, small trees, and vines, including (rarely) red cedars, willows, and buttonbush (*Cephalanthus*); 23 nests averaged 7 feet above ground (2–15). On May 25, 1949, I noted hatching of 3 eggs in a nest 6 feet up in a cottonwood sapling in a richly forested lowland near Moscow, Hickman County, and at the other end of the state noted a nest containing 3 eggs 5 feet up in a witch hazel bush in a dense thicket at 4,100 feet elevation on Black Mountain, Harlan County, May 31, 1952.

Breeding distribution.—Statewide. The Catbird's chief habitat requirement seems to be dense shrubbery of medium height, and the species occurs wherever this requirement is met, whether in forest burns, slashings, edges, or in old fields and

about human habitations. It is thus common in all major areas of the state and at all elevations.

Summer and fall.—A specimen taken in Fayette County on August 10, 1939 (U.K.), is in fresh plumage and had apparently already completed the annual molt. Song abates somewhat by mid-July. At Madisonville, Hancock (1951*a*) noted the last song of the 1950 breeding season on August 4. I noted a Catbird singing in Laurel County on October 4, 1951, and have heard sporadic singing elsewhere in autumn. The Catbird remains common through September, becoming less numerous in early or mid-October and rare by late October. Representative late records: October 10, in Nelson County (Blincoe, 1925:417); October 11, at Louisville (Monroe); October 25, in Warren County (Wilson, 1922:242). Some of these records seem rather too early. The Catbird is secretive in fall, and I think additional work in dense, brushy cover will produce many later records. On October 21, 1948, I took a male at a brushy spot in a field near Tiptop, Meade County. The bird had been gorging on elderberries (*Sambucus*). In Laurel County, October 3–11, 1951, I found the species inconspicuous but common in all favorable areas visited. An immature female taken on October 7 and an adult male October 9 were, respectively, in fresh plumage, and concluding body molt with three outer primaries being renewed on each wing. At Louisville, I recorded a single Catbird in light snow on November 7, 1936.

Winter.—Not infrequently individuals of various kinds of birds winter north of the normal range of their species. Evidence has been accumulating that a few Catbirds may winter in Kentucky. On the Christmas bird count of 1950, at Henderson (*Kentucky Warbler*, 27:14, 1951), a Catbird was observed by four of the participants, December 29, and presumably identified with certainty. More recent winter records have been reported from Pike and Martin counties, by Reed (1960:32), and from Jefferson County, December 21, 1958 (Shannon and Slack, *vide* Monroe; see also *Kentucky Warbler*, 35:6, 1959).

Specimens examined.—Total, 17. M.S.C.—3 unsexed, Rowan County (no dates); U.K.—1 male, Fayette County (Aug. 10); U.S.N.M. (see Wetmore, 1940:550)—10 specimens from Harlan, Lewis, Bell, Rockcastle, Wayne, Meade, and Union counties (April 30–Oct. 6); U.M.M.Z.—1 adult male (weight, 41.9 gm., moderately fat), 1 immature female (39.5 gm., moderately fat), Laurel County (Oct. 9; Oct. 7); 1 male (36.2 gm., not fat), Meade County (Oct. 21).

Toxostoma rufum (Linnaeus): BROWN THRASHER

Status.—Common summer resident; rare in winter, mainly in the south and west.

Spring.—A few thrashers arrive early, some usually being present by early March; the species becomes common by mid or late March, possibly a little later in extreme northern Kentucky. Early records (exclusive of a few probably based on wintering birds): March 23, in Rowan County (Barbour, 1951*a*:36); March 3, in 1881 (Beckham, 1885:9), and March 6 (Blincoe, 1925:417), in Nelson County; March 6, at Louisville (Monroe; many mid-March dates); March 5, in Warren County (Wilson, 1922:242).

Breeding records.—Clutches are completed from March 21–31 to July 1–10, as indicated by 51 dated breeding observations, with peaks evident at April 11–20 (first nestings) and June 1–10 (second nestings). Data are from Harlan (Lovell, 1950c:59), Laurel (Mengel, notes), Madison (Lovell, 1951*b*:61), Boyle (*idem*), Boone (A. H. 1886), Nelson (Blincoe, *vide* Funkhouser, 1925:291), Oldham (Monroe, notes), Jefferson (Stamm, notes; Monroe, notes; Mengel, notes), Meade (Lovell, 1949*b*:47), Hopkins (Hancock, 1951:9; 1954:25), and McCracken (Mengel, notes) counties. The earliest egg date is provided by a set of 4 eggs in a nest in honeysuckle vines in Hopkins County, March 30, 1945, and the latest by 4 eggs (hatching) in a nest in poison ivy vines at the top of a fence post near Paducah, McCracken County, July 17–18, 1951 (Mengel). Some clutches of 2 eggs are probably complete

(see Hancock, *loc. cit.*). The average complement of 27 clutches or broods is 3.7 ± 0.11 (3-6). The rough, bulky nests are placed low, usually in brushy situations and often in dense masses of thorny shrubbery or vines. They have been found in many kinds of shrubs, vines, and trees (for a long list see Hancock, 1954:25) and, in three cases (Hancock, 1951; 1954:25), on the ground. The average height above ground of 22 elevated nests is 4.3 feet ($1\frac{1}{2}$ to $9\frac{1}{2}$). A nest in Boone County (A. H., 1886) contained 5 eggs of the thrasher and 1 of the Brown-headed Cowbird, the only locally recorded case of parasitism on the Brown Thrasher. A nest I found in Laurel County (4 eggs, hatching) on May 8, 1952, was in an unusually open situation in an alder-willow-river-birch swale, 3 feet up propped against the stem of an alder sapling.

Breeding distribution.—Throughout Kentucky, preferring brushy situations such as forest edge and small, grown-up clearings, old-field margins, hedge rows, and thickly planted residential areas. The thrasher is found alike in wilderness and cultivated areas, and seems to be about equally numerous everywhere in the state.

Fall.—Earlier observers (see Langdon, 1879:169; Wilson, 1922:242; Blincoe, 1925:417) seldom recorded the species after late September and early October, probably the result of oversight, since today it is numerous in suitable habitats throughout October and into early November, with a marked decrease late in this period. Maslowski recorded a thrasher at Cincinnati, where there are very few winter records, on November 15, 1930 (Goodpaster, 1941:25). Monroe has records for the Louisville area for every date to November 21, and one for November 29 (see also winter). I recorded small numbers in Laurel County, October 3-11, 1951.

Winter.—It has gradually become evident that the species winters regularly, although in small numbers, throughout western and much of southern Kentucky, and casually farther north and east. Winter records partially summarized by Lovell (1939:20-21; 1950a:14) included occurrences in Oldham, Jefferson, Hopkins, Henderson, Calloway, Crittenden, Caldwell, and Trigg counties, but omitted Pindar's (1925a:168) observations in Fulton County, where several were seen in heavy cane growth of the Mississippi bottoms on December 27 and 28, 1887. Subsequently, additional winter records have been made in Hopkins County (Bacon and Hancock, 1950; Bacon, 1951; Hancock, letter: December 29, 1951; see also *Kentucky Warbler*, 35:3, 1959), Jefferson County (Monroe, 1 on December 29, 1947; Carpenter, 1955:29-30, 1 or more wintered 1954-1955; Krull, 1957a:58, 3 wintered, 1956-1957), and Oldham County (Shackleton, 1946a:24). Conservation Officer G. H. Spann, of Monticello, Wayne County, at the edge of the Cumberland Plateau, assured me (verbal com., April 13, 1951) that a few winter every year in certain brushy areas entangled with Japanese honeysuckle near Monticello and showed me birds in an area he said had been occupied in the winter of 1950-1951. I recorded 1 in honeysuckle tangles near Moscow, Hickman County, on December 27 and 29, 1950, and 2 in bottom lands near Barlow, Ballard County, on January 4, 1951. Whispersing by birds wintering in Hopkins County was noted by Hancock (*Kentucky Warbler*, 35:3, 1959).

Geographic variation.—All specimens examined are referable to the subspecies of the eastern United States, *Toxostoma rufum rufum* (Linnaeus). Wing measurements and weights of certain specimens are given in the list below.

Specimens examined.—Total, 17. M.S.C.—3 specimens from Rowan County; U.K.—1 female (wing, 99 mm.), Woodford County (May 4); C.W.B.—1 female (106 mm.), Nelson County (Sept. 26); B.L.M.—1 immature male, Jefferson County (July 13), 1 female (103 mm.), Oldham County (March 16); U.S.N.M.—5 specimens from Union, Meade, Wayne, and Lewis counties (April 29-July 12); U.M.M.Z.—1 male (wing, 102; weight, 63.1 gm., not fat), Powell County (April 25); 1 male (wing, 104), Oldham County (April 8); 1 unsexed immature (wing, 102; weight, 74.6 gm., not fat), Jefferson County (Sept. 18); 1 male (wing, 101; weight, 64.2, not fat), Warren County (May 4); 1 immature female (wing, 101; weight, 64.5, not fat), Henderson County (Sept. 9).

FAMILY TURDIDAE: THRUSHES, SOLITAIRES, AND
BLUEBIRDS*Turdus migratorius* Linnaeus: ROBIN

Status.—Resident; uncommon (locally, mainly in mountainous eastern Kentucky) to very common in summer; fairly common to abundant in spring and fall; rare to common in winter, sometimes locally abundant.

Spring.—An increase usually seems to occur in late February or early March; this may result not only from an influx of migrants, but also from the emergence of wintering birds from dense cover into more open areas. Singing begins about the same time.

Breeding records.—Clutches are completed as early as March 11–20 and as late as July 21–31, so far as shown by 83 dated breeding records, which indicate a marked peak (first nestings) April 1–10, but show no clear later peaks. Two broods are probably reared by most pairs, and sometimes three broods are brought off. Records are from Harlan (Lovell, 1950c:59–60), Bell, Powell, and Laurel (Mengel, notes), Rowan (Barbour, 1950a:34), Madison (Lovell, 1951b:61; Clotfelder, 1946:21), Bourbon (Clotfelder, *loc. cit.*; and 1947:65), Scott (Stamm, notes), Jefferson (Stamm, 1951a:23, and notes; Lovell, 1951b:61; Hays, 1957:5; Short, 1957:69; Monroe, Mengel, notes; see also *Kentucky Warbler*, 22:40, 1946), Bullitt and Hardin (Monroe), Meade (Lovell, 1949b:47), Edmonson and Warren (Mengel), Daviess (Powell, 1952a:57; 1953:60), Henderson (Klutey, 1953:57), Hopkins (Hancock, 1954:25), and Ballard (Mengel) counties. The average complement of 33 clutches or broods is 3.5 ± 0.13 (2–5; 3 sets of 2 known to be complete). Stamm (*vide* Lovell, 1951:61) noted construction of a nest in Jefferson County on March 8, 1951. I noted incubation there on March 25, 1937, this being the earliest egg date. I observed incubation at another nest, in Ballard County, on July 21, 1951, and a still later record in Stamm's notes gives completion of a clutch in Jefferson County between July 27 and 31, 1952. I saw stub-tailed young out of the nest being fed in Edmonson County on August 10, 1951. Monroe noted a period of 10 days required for construction of a nest in Jefferson County, with 4 eggs laid on consecutive days (laying on consecutive days noted also by Stamm, on two occasions; one or two other observations show a lapse of one day in egg laying, and several suggest that incubation begins after the second or third egg is laid), and 13 days required for incubation (the young remained in the nest 13 days). Stamm has noted incubation periods of 12 and 13 days, in Jefferson County, where Hays reported 15 days for incubation and 11 days in the nest. Clotfelder recorded incubation requiring 16 days, with a 10-day nestling period, in Bourbon County. The rather bulky nests, characteristically of mud covered and lined with grasses, leaves, etc., have been found in crotches and on horizontal branches of a large variety of trees and shrubs, both wild and ornamental, as well as on porches, beams, and other artificial situations, and ranged in elevation from 1–50 feet (average of 37, 13.3 feet). Several observers have noted two broods consecutively reared by the same pair, with three in one instance, all in the same nest (Short, 1957). Nests have been reported in close proximity to those of other species: Mourning Dove (Klutey, 1953; dove attempted to feed young Robins; Robin cleaned dove's nest); Purple Grackle (Denison, 1952; Robin fed young grackles); Eastern Kingbird, Warbling Vireo, and Orchard Oriole (Stamm, 1951a:23).

Breeding distribution.—Statewide, including the highest of the Cumberland Mountains. Robins are present in virtually all forested and wooded areas of any size, but are considerably less numerous than elsewhere in the heavily forested portions of the Cumberland Plateau and Mountains, where they are dependent on the presence of natural clearings or mountain farms (see also Murray, 1938:2; Horsey, 1922:84). In these forest areas the Robin is scarce, shy, and difficult to observe. Undoubtedly it is much more numerous than in primeval times, especially in the heavily settled portions of the state.

History.—There are indications that the Robin did not occur as a breeding bird in parts of the Pennyroyal of southern Kentucky, or anywhere west of the Tennessee River, until early in the present century. In the period roughly 1886–1892, Pindar (1887a:85; 1889b:316; 1925a:169) noted the species in Fulton County only as a winter resident. In Calloway County, southwestern Kentucky, Wilson (1923c:136) referred to it as formerly “very rare . . . but becoming much more common,” and has told me that it was general knowledge in that region that the Robin did not summer in earlier times. A little to the northwest, however, Nelson (1877:51) reported a few seen near Mound City, across the Ohio River from Ballard County, August 17–31, 1875. Today the Robin is a fairly common to common breeding species throughout the Purchase, its advance in this area probably being part of the same general southward movement recently detailed by Odum and Burleigh (1946).

Fall.—In mid-September or a little later there is an apparent decrease in the numbers of Robins, especially in the residential areas, city parks, and such where they are so numerous in summer. This has led a few observers to suppose that the species becomes less numerous between the departure of breeding birds and the arrival of migrants from farther north, but my experience indicates that there is actually little, if any, decrease at this time. Rather, Robins tend to congregate in large numbers in certain favored, usually densely wooded, habitats, where their behavior is furtive and retiring. The molt is being completed by most birds in this period, as shown by a long series of specimens. The time of arrival of birds from farther north is not definitely known, but usually by late October or early November the numbers of the species have actually decreased somewhat.

Winter.—The numbers wintering vary markedly from year to year. In most areas the species is not ordinarily very numerous although a few can almost always be found. On some occasions, however, it remains common throughout winter. Great roosts of wintering Robins such as are common farther south are rare in Kentucky. A very large roost located in Washington County, February 15 to March 8, 1881, was described by Beckham (1885:8–9), who mentioned the killing of 8,000 by the local citizenry on February 21. An old account in *Forest and Stream*, unearthed by Lovell (1957a:71) describes a large roost in a Barren County cedar thicket in 1881. Another roost, used by a great many Robins as well as other birds, in Meade County, in 1945, was described by Lovell and Kirkpatrick (1946). Krull and Krull (1955) noted a more recent concentration, in Jefferson County, 1955.

Note.—Albinos have been reported from various localities (Frazer, 1944:56; Allen, 1947:5; Cox, 1954:32).

Geographic variation.—For some time two subspecies have been recognized as breeding in the eastern United States: *Turdus migratorius migratorius* Linnaeus in the north and *T. m. achrusterus* (Batchelder) in the south. It has been thought (see Wetmore, 1940:550–551) that Kentucky lies in the zone of intergradation between the two, both of which have been reported from the state on the basis of compared specimens. I here recognize only the former as occurring in Kentucky. At the time of final revision of the present manuscript (April, 1961) I have not, as I had hoped to do, found time to organize and publish the results of considerable study of this problem, involving the collection of many specimens and the examination of very long museum series. This, however, has convinced me that the southern population does not merit nomenclatural recognition. While the full arguments in favor of this conclusion, which I hope yet to publish, are much too lengthy for inclusion here, the following may be stated briefly. There is a faint cline in size, but it is very slight and even far northern birds do not average very much larger (approximately 4 mm., wing length) than the southernmost. Far northern birds (see also below), especially in the extreme east, average somewhat more richly colored than the southernmost, but through most of the range color clines, if they exist at all, are very difficult to detect. Robins are subject to extreme fading in the summer sun and with wear, and cannot, I think, be accurately aged after their skulls are fully ossified. This leads to considerable difficulty in assembling adequate

series for color comparison, particularly since first-year birds average markedly paler than adults. The last is a consideration, so far as I know, taken into account in virtually none of the taxonomic work leading to the presently accepted definition and distribution of the forms. It is my considered belief that a majority of the Robins in museum collections and taken in the "zone of intergradation" have been marked *migratorius* when adult and *achrusterus* when young (in fact, of course, if there is a zone of intergradation, they are neither), while the great majority of breeding material from "safely" northern and southern localities has simply been placed in the appropriate drawers (certainly I see no great differences between comparable series from northern and southern localities). Finally, there is considerable evidence (see Odum and Burleigh, 1946) that much of the range, if not most of it, now occupied by "true" *achrusterus* was not occupied by Robins at all until comparatively recent years.

The richly colored, dark-backed Robins of Newfoundland have been further separated, by Aldrich and Nutt (1939:31-33), under the name *Turdus migratorius nigrideus*, a form now considered to occur also in northern Quebec and Labrador (A.O.U., 1957:432). For some time I have been gathering data pertinent to reviewing the validity of this form, the conclusions finally reached also to be published elsewhere (it is my present opinion that these birds represent the extreme expression of a general tendency to rich coloration in the extreme north; one found also, incidentally, in an appreciable percentage of Appalachian birds). Several specimens from Kentucky show the characters attributed to this subspecies, although it is by no means certain that any is truly a northern bird. These are: a male (U.S.N.M. no. 370999) taken in Woodford County by J. D. Figgins on March 1, 1942; a male (J.D.F.) from Marshall County secured by the same collector on September 24 [?], 1941; and a partly albinistic male (B.L.M.) taken by Monroe in Jefferson County on March 16, 1946. Even if *nigrideus* proves valid, I have seen so many dark-backed specimens taken in the eastern United States in the breeding season that I think it best not to include the race in this list on the basis of three specimens.

Specimens examined.—Total, 100. M.S.C.—3 males, 1 female, 4 unsexed, Rowan County (Mar. 10, 29, May 12; April 13; May 1, 15 (3)); C.M.N.H.—1 male [Woodford County], (April 23); U.K.—1 male, 1 female, Woodford County (April 9; April 9); 2 unsexed, Fayette County (May 14, Aug. 8); B.L.M.—3 males, 1 female, Jefferson County (March 16, July —, Oct. 27; Feb. 16); Bernheim Collection—1 male, 1 female, Lincoln County (Jan. 15; Jan. 23); 2 males, Woodford County (Jan. 23); 2 males, Fayette County (Mar. 4, 17); 3 males, 2 females, without data (catalog lost); W. Ky. State College Coll.—1 male, 1 unsexed, Warren County (Feb. 18; Mar. 26); J.D.F.—2 males, Jessamine County (Mar. 20, April 7); 3 males, 2 females, Woodford County (Feb. 8, Mar. 20, April 19; Mar. 7, 17); 2 males, Fayette County (April 18, June 1); 3 males, 1 female, Marshall County (Sept. 24, 26, 26; Sept. 26); U.S.N.M.—1 female, Harlan County (June 21); 2 males, Lewis County (July 12, 12); 1 male, McCreary County (June 16); 1 male, Madison County (Oct. 6); 2 males, 2 females, Fayette County (April 2, 12; April 19, 19); 3 males, Jessamine County (Mar. 17, 17, April 7); 3 males, Woodford County (Feb. 9, Mar. 1, July 9); 2 males, 1 female, Carroll County (Oct. 11, 14; Oct. 11); 1 male, 1 female, Meade County (April 29); 1 female, Edmonson County (Nov. 10); 1 female, Muhlenberg County (Oct. 22); 1 male, 3 females, Trigg County (Nov. 3; Oct. 31, Nov. 3, 3); 1 female, Marshall County (Sept. 26); U.M.M.Z.—1 female (weight, 83.7 gm.), Powell County (June 26); 1 male (weight, 64.5 gm., immature), 1 female (81.4 gm.), Laurel County (July 7; July 6); 3 males (70.7 gm., 63.9 gm., 72.1 gm., immature), 1 female (66.5 gm.), Whitley County (July 11, 13, 13; July 13); 1 male, Kenton County (July 12); 1 female, Boone County (July 12); 1 male, Oldham County (April 5); 7 males (weights, —, —, —, 82.7 gm., 81.8 gm., 87.0 gm., 86.8 gm.), 8 females (weights, —, —, —, 88.8 gm., —, 80.0 gm., 87.7 gm., 80.2 gm.), Jefferson County (April 5, 8, Sept. 18, 28 [4]; April 8, Sept. 17, 17, 18, 20, 28, Oct. 1, 1); 1 female, Trigg County (April 13); 1 female (69.9 gm.), Calloway County (April 15); 1 male (73.4 gm.), Marshall County (June 15); 2 males (72.9 gm.; 80.8 gm., immature), Fulton County (June 4). No birds weighed were fat; weights are given in same sequence as dates.

Hylocichla mustelina (Gmelin): WOOD THRUSH

Status.—Common summer resident.

Spring.—Rarely recorded before mid-April, the Wood Thrush usually arrives in numbers about April 20–25, although a few are often seen a few days earlier. Early records: April 10 (1893) at Eubank, Pulaski County, average of 9 years, April 16 (Cooke, 1907:32); April 18 (1938), at Cincinnati, Ohio (Goodpaster, 1941:25); April 7 (1951), at Louisville (Mengel, notes), and April 8 (1948), same (Monroe); April 22 (1929), at Mammoth Cave (Bailey, 1933:152); April 11 (1950), in Marshall County (Handley and Mengel, notes; 2 seen April 12, song not heard until April 16). Much earlier records, for March 25 (1886), in Fulton County (Pindar, 1887a:85) and March 22, at Bowling Green (Wilson, 1922:243) may be based on mis-identifications.

Breeding records.—Clutches are completed from May 1–10 to July 21–31, as indicated by 46 dated observations (peak, May 11–20). No second peak is evident, though it appears that two broods are sometimes reared. Records are from Harlan (Mengel, notes); Laurel (Mengel); Rowan (Barbour, 1950a:34; 1951a:36); Knox (Stamm, notes); Oldham (W. Shackleton, 1948:1; Stamm, notes); Jefferson (Thacher, 1946:22; Hays, 1957:6; Stamm, notes; Monroe, Mengel, notes), Meade (Lovell, 1949b:67), Daviess (Powell, 1953:60), Hopkins (Hancock, 1954:25), and Logan, Hickman, and Ballard (Mengel, notes) counties. The earliest egg dates are May 9, 1917 (Monroe, Jefferson County), and May 9, 1953 (Powell, Daviess County), and the latest are July 16, 1945 (Lovell, Meade County), 3 eggs hatching, and August 12, 1950 (Stamm, Jefferson County), eggs hatching. Hancock noted construction of a nest on May 1, 1951, in Hopkins County. In Harlan County, I recorded an incubation period of 15–16 days in a nest found at 3,000 feet elevation on Black Mountain; the clutch of 4 eggs was completed May 16 or 17, 1952, and hatched on May 31. The average complement of 18 clutches or broods is 3.2 ± 0.21 (1–5; an aberrant clutch of 1 thought to be complete). The average height above ground recorded for 24 nests was 10.5 feet (3–30), the nests being placed in vines, shrubs, and, more often, small trees, of many species, usually in open forest or forest edge. They are much like those of the Robin, but slightly smaller. A nest I found in Laurel County contained only 1 egg, being incubated, at least, from June 27 to July 2, 1952. The nest was 3 feet above ground, on the horizontal trunk of a fallen sapling. A set of 5 eggs was found in Rowan County (Barbour, 1951a:36) on May 12. I noted hatching of 4 eggs in a nest in a cottonwood sapling in a wooded swamp in Hickman County on May 26, 1949. Hatching frequently occurs over 2 days, suggesting that incubation begins before deposition of the last egg. In central and western Kentucky the species is rather heavily parasitized by the cowbird, perhaps a quarter of the nests examined being affected; extreme cases (4 eggs of cowbird to 1 of host) have been noted in two cases (W. Shackleton, 1948; Thacher, 1946).

Breeding distribution.—Statewide. More fully, perhaps, than any species except the Red-eyed Vireo, the Wood Thrush is typical of the eastern deciduous forest, in the more representative parts of which it occurs in moderate to high density in virtually all major forest types. In Kentucky it is found from the mixed mesophytic forests of the high Cumberlands to riparian willow-cottonwood growth along the Mississippi River and alike in both cultivated and primitive surroundings. While in western and central Kentucky it seems equally numerous in both the most xeric and the most mesic situations, I think in the Cumberland Plateau and Mountains it tends to be less numerous in the most mesic forest associations and to reach its greatest numbers in (relatively) xeric forests, often of oak, hickory, and similar species.

Fall.—The species remains fairly numerous through most of September, becoming less so late in the month and rare by early October. Late records: October 2 (1937), at Cincinnati, Ohio (Goodpaster, 1941:25); October 12 (1882), in Nelson County



Fig. 26. Young Wood Thrush at 14 or 15 days of age. Laurel County, Kentucky, June 13, 1952. Drawing from living bird. Note *Turdus*-like plumage and compare with young Veery on p. 366.

(specimen, C.W.B.); October 12 (1957), at Louisville (Monroe); October 14, in Warren County (Wilson, 1922:243). I found the species fairly common near Louisville, September 28–October 1, 1951, and recorded 2 in Pulaski County on October 7, 1951.

Specimens examined.—Total, 24. M.S.C.—4 specimens from Rowan County (spring); R.W.B.—1 male, Harlan County (July 20); C.W.B.—1 female, 1 unsexed, Nelson County (Oct. 12; April 23); B.L.M.—1 male, 1 female, Jefferson County (July 4; July 3); J.D.F.—1 female, Marshall County (Sept. 20); U.S.N.M. (see Wetmore, 1940:551)—9 specimens from Pike, Harlan, Bell, Lewis, Meade, and Union counties (April 26–Sept. 23); U.M.M.Z.—1 immature female ($\frac{1}{2}$ grown), Harlan County (July 9); 2 females (weights, 52.9 gm., —), Powell County (June 24, 20); 1 male (45.9 gm., moderately fat), Henderson County (Sept. 9); 1 male (45.0 gm., not fat), Lyon County (April 12).

Hylocichla guttata (Pallas): HERMIT THRUSH

Status.—Common transient; uncommon winter resident.

Spring.—Early records may not indicate dates of arrival of birds from farther south, since small to moderate numbers winter. The main migratory flight passes in late March and April, about a month earlier than the Swainson's Thrushes, Gray-cheeks, and Veeries; rare by early May. Late records: April 24, at Bardstown (Blincoe, 1925:418); May 6 (1940), at Louisville (Monroe); May 14 [?], in Warren County (Wilson, 1922:243). I took a female (U.M.M.Z.) in the last on May 3, 1949. In Powell and Wolfe counties, April 21–25, 1949, I found the species numerous in the understory of dry, upland ridge-forests, indicating a heavy migratory movement; again, on April 11–16, 1950, Handley and I found it common in lowland woods of Lyon, Trigg, and Marshall counties. So far as known, the remarkably beautiful song of the Hermit Thrush is very rarely heard in Kentucky (is it, often, confused with that of the Wood Thrush?). On the evening of April 3, 1938, I heard 2 singing for some time on a wooded hillside near Louisville.

Note.—The species is definitely northern in breeding distribution. The record of a nest found in southern Ohio near Cincinnati on May 10, 1877 (G. Holterhoff, *vide* Dury), and reported by Langdon (1878:111; 1879:169) seems open to serious doubt, although not queried by Jones (1903:210), Kemsies (1948a:39), Kemsies and Randle (1953:38), or other later writers.

Fall.—Hermit Thrushes arrive in late September (rarely), or early October; the

peak of migration appears to be in middle or late October, somewhat later than that of other members of the genus. Representative early records: October 5 (1939), in Rowan County (specimen, M.S.C.); October 8 (1938), same county (Wetmore, 1940:551); October 8 (1890), at Cincinnati, Ohio (specimen; see Maslowski and Dury, 1931:88); October 7, at Bardstown (Blincoe, 1925:418); September 29 (1957), at Louisville (Monroe). On October 21, 1948, I found the species common in upland oak-hickory forest in Meade County. By mid-November relatively few remain, most of them probably wintering birds.

Winter.—Small numbers regularly winter throughout Kentucky. Although early authors were either vague, noncommittal, or uninformed on the subject, a fair number of winter records of this thrush is now available. Barbour (1952:26) considered it fairly common at Morehead, where a specimen (M.S.C.) was taken on February 15, 1933. Also on the Cumberland Plateau, in Laurel and Whitley counties, Edwards and I found several, February 3–5, 1950, while in the extreme western part of the state, I recorded small numbers in Fulton County, December 26–29, 1950. Monroe has records at Louisville for January 1–3, 7, 8, and 27–29. Cypert recorded 1 bird at Kentucky Woodlands National Wildlife Refuge, Trigg County, on January 10, 1940 (Refuge files). Other records have been reported by Goodpaster (1941:25) at Cincinnati and Wilson (1925a:44) in Calloway County. The Hermit Thrush is furtive and retiring in winter and may be found most often in dense cover on heavily wooded hillsides and in ravines, where its low, characteristic, clucking notes are often the best clue to its presence. Song (see also spring) was heard briefly near Harlan, Harlan County, on December 4, 1955 (Cornett, 1956:20).

Geographic variation.—Although examples of various western subspecies are occasionally reported from the eastern United States, where Burleigh and Peters' (1948) Newfoundland subspecies *H. g. crymophila* may also be expected in migration, I am wary of identifying single migrant specimens from Kentucky as any of these forms unless very well marked. In any case, I regard all Kentucky specimens I have seen as within the range of variation of the eastern continental subspecies, *Hylocichla guttata faxoni* Bangs and Penard, although 1 female, taken by me near Slade, Powell County, April 21, 1949, is very gray and closely resembles *H. g. oromela* Oberholser. The last bird was identified as *oromela* (not recognized by A.O.U. Check-List) by Charles O. Handley, Jr. I have compared it with specimens of that race without reaching a definite conclusion as to its true origins.

Specimens examined.—Total, 24. M.S.C.—2 males, 2 unsexed, Rowan County (April 29, Oct. 5; Feb. 14, March 4); C.W.B.—1 male, 1 unsexed, Nelson County (April 5; Oct. 31); B.L.M.—2 females, Jefferson County (April 16; Oct. 15); U.S.N.M.—6 specimens from Rowan, Boone, Edmonson, Butler, and Hopkins counties (Oct. 8–Nov. 9); U.M.M.Z.—2 males (weights, 31.0 gm., 32.6 gm.; moderately fat), 2 females (27.1 gm., 30.2 gm.; moderately fat). Powell County (April 23, 25; April 21, 21); 2 males (28.5 gm., 30.6 gm.; not fat), Meade County (Oct. 21); 1 female (28.6 gm., not fat), Warren County (May 3); 1 male, 1 female, Lyon County (April 13; April 11); 1 male (32.2 gm., not fat), Fulton County (Nov. 11).

Hylocichla ustulata (Nuttall): SWAINSON'S THRUSH

Status.—Transient, common in spring, seemingly less numerous in fall.

Spring.—The species may be fairly common by late April; peak of migration in first half of May. Early records: April 14 (1906), in "central Kentucky," average of 5 years, April 24 (Cooke, 1907a:122); April 14 (1953), at Louisville (Monroe); April 17, in Warren County (Wilson, 1922:243). The Swainson's Thrush is the most numerous of the obscurely plumaged transient hylocichlas. In early May the woods sometimes seem thronged with the species, which often sings on migration. Somewhat lesser numbers of the very similar Gray-cheeked Thrush occur at the same times and some confusion of records has probably resulted. The earliest specimen record of Swainson's Thrush is April 26, the latest May 26 (see "specimens examined"). Late records: May 19 (1920), in Breathitt County (Horse, 1922:84); May 24 (1905), in "central Kentucky," average of 7 years May 21 (Cooke, 1907a:123); May 30, at Louisville (Monroe). I recorded 2 birds and took

1 at 3,600 feet elevation on Black Mountain, Harlan County, May 15, 1952 (U.M.M.Z.).

Fall.—The earliest may appear in late August (rarely) or early September; peak of migration (seemingly never as pronounced as in spring) probably in last half of September; rare by early October. Early records: September 3 (1904), in "central Kentucky" (Cooke, 1907a:123); September 13 (1949), in Lexington (specimen, U.K.); August 31 (1955), at Louisville (Monroe); September 8 (1949), at Henderson (Mengel, notes; bird singing); September 6 (1886), in Nelson County (specimen, C.W.B.). The migration records provided by the several ceilometer kills in Tennessee are also of interest. At Nashville on the night of September 9–10, 1949, but 2 Swainson's Thrushes were among the victims (Spofford, 1949:88), while at Knoxville, October 7–8, 1951, at least 17 were killed, to 4 Gray-cheeks, indicating a somewhat heavier late migration than might otherwise have been suspected. Late records: September 26 (1921), in Letcher County (Horsey, 1923:144); September 25 (1938), at Cincinnati (Goodpaster, 1941:25); October 14 (1950), at Louisville (Monroe; bird banded; next record September 25); October 18, in Warren County (Wilson, 1922:243); October 13–14 (1934), at Reelfoot Lake, Tennessee (Slack, 1934).

Geographic variation.—The subspecies occurring in Kentucky is *Hylocichla ustulata swainsoni* (Tschudi). The A.O.U. (1953:361) has ceased to recognize *H. u. almae* Oberholser which has been reported from Kentucky (Wetmore, 1940:551; Mengel, 1948:51). After examination of material in the U. S. National Museum I am not disposed to defend the subspecies.

Specimens examined.—Total, 38. U.K.—2 females, Fayette County (May 3, Sept. 13); 1 male, 1 female, Woodford County (May 3; May 6); C.W.B. (7; misidentified as *Turdus aliciae* = *Hylocichla minima*) 1–3 males, 3 females, 1 unsexed, Nelson County (April 28, May 10, Sept. 6; May 10, Sept. 11, 14; May 9); B.L.M.—1 male, 1 female, Jefferson County (May 14; May 22); Bernheim Coll.—1 female (no further data); C.U.—2 males, 1 female, Logan County (May 3, 5; April 26); Bacon Collection—1 unsexed, Hopkins County (Sept. 15); J.D.F.—1 male, Clark County (May 12); 3 males, Marshall County (Sept. 8, 24, 26); U.S.N.M. (see Wetmore, 1940:551–552)—7 specimens from Bell, Meade, and Union counties (May 3–Sept. 19); U.M.M.Z.—1 male (weight, 36.4 gm., moderately fat), Harlan County (May 15); 1 female (27.0 gm., not fat), Pulaski County (April 28); 3 males (37.1 gm., moderately fat; 27.8 gm., not fat; 29.6 gm., not fat), 1 female (34.3 gm., moderately fat), Warren County (May 3, 4, 5; May 3); 1 male (28.0 gm., not fat), Logan County (May 12); 1 male (31.8 gm., not fat), 1 female (38.1 gm., very fat), Fulton County (May 15).

Hylocichla minima (Lafresnaye): GRAY-CHEEKED THRUSH

Status.—Fairly common transient.

Spring.—The dates of occurrence of the Gray-cheeked Thrush are much like those of Swainson's Thrush, with which the species is probably sometimes confused. Main migration in early May; rare by about May 20. Representative extreme records: April 24–May 20, in Rowan County (Barbour, 1952:26); April 25 (1939)–May 24 (1936), at Cincinnati, Ohio (Goodpaster, 1941:25); April 16–June 1, at Louisville (Monroe); also, April 22 (1951), in Hopkins County (specimen, Bacon Coll.); and May 23 (1906), in Logan County (specimen, C.U.). Perhaps more than any other, I think, the present species epitomizes the genus, as known in the southern and central states, as furtive, wraithlike, wide-eyed observers in the new-leaved forests. The Gray-cheeked Thrush is better represented in the Kentucky forests than in the literature, and is in fact fairly common, as I found it in the spring of 1949, in various western counties May 4–15, taking 5 specimens (see below).

Fall.—A few birds have been noted in early September, the peak of migration occurring near the end of the month; rare by mid-October. The *Hylocichlas* are less conspicuous in autumn (when not singing) than in spring. Possibly only accidents of sampling are involved, but the records suggest that the present species

¹ See "specimens examined" (C.W.B.), under Gray-cheeked Thrush.



VEERY

Adult at nest found May 26, 1952, in disturbed Mixed Mesophytic Forest at 4,000 feet above sea level, Black Mountain, Harlan County. Water color made at the site.

(while seemingly a little less numerous than in spring) more nearly equals its vernal numbers than does the Swainson's Thrush. I have spent much time in their haunts, both spring and fall, relying little on song to find them, and I am convinced that they are collectively less numerous in Kentucky in autumn. Representative records: (early) September 5 (1939), at Louisville (specimen, B.L.M.); September 9 (1885), in Nelson County (specimen, C.W.B.); (late) October 3, in Rockcastle County (Wetmore, 1940:552); October 7 (1951), and October 13, at Louisville (Lovell, 1952; Monroe, notes); October 23 [?], in Warren County (Wilson, 1922:243). I took a female, characteristically lurking in dense foliage on a brushy hillside in Jefferson County, on September 18, 1950.

Geographic variation.—The subspecies occurring in Kentucky is the large, western *Hylocichla minima minima* (Lafresnaye), as is to be expected, and as shown by the wing measurements of 13 males (95–108 mm., average 102.2) and 7 females (96–101, 108 [?], average 98.1). None of the specimens I have seen is small enough to be assigned with assurance to *H. m. bicknelli* Ridgway of the Adirondacks, New England, etc. (for measurements see the flattened-wing figures of Ridgway, 1907:62–63, and deduct roughly 2 mm. for chord measurement). Figgins' reference (1945:245) to a specimen of *H. m. bicknelli* taken in Marshall County on September 14, 1941, is probably in error. Among his specimens as they have come before me there is no Gray-cheeked Thrush at all, and no Swainson's Thrush taken on September 14. There is, however, a Swainson's Thrush taken in Marshall County on September 24, and it is possible that through both typographical and systematic error this specimen is the basis of the report (if this seems far-fetched, see discussion of his record of the Clay-colored Sparrow in the Hypothetical List).

Specimens examined.—Total, 21. M.S.C.—1 female, unsexed, Rowan County (May 19; May 14); 1 male, Morgan County (Oct. 1); C.W.B. (4, misidentified, "*ustulata*")¹—3 males, 1 female, Nelson County (May 20, Sept. 9, 18; Sept. 14); B.L.M.—1 unsexed, Jefferson County (Sept. 5); Bacon Coll.—1 female, Hopkins County (April 22); C.U.—2 females, Logan County (May 13, 23); U.S.N.M.—2 males, Bell County (Sept. 25, 28); 2 males, Rockcastle County (Oct. 1, 3); U.M.M.Z.—1 female (weight, 29.0 gm., not fat), Jefferson County (Sept. 18); 3 males (31.0 gm., not fat; 32.3 gm., not fat; 38.7 gm., very fat), Warren County (May 4, 7, 8); 1 female (40.0 gm., very fat), Logan County (May 12); 1 male (38.5 gm., very fat), Fulton County (May 15).

Hylocichla fuscescens (Stephens): VEERY

Status.—Uncommon to fairly common transient, seemingly more numerous in spring; common summer resident above 3,000 feet in the Cumberland Mountains in Harlan and Letcher counties.

Spring.—The pattern of migration is approximately the same as those of Swainson's and Gray-cheeked thrushes. Transient Veeries are first noted rarely in mid-April, usually in late April; main flight in early May; rare by mid-May. Early records: April 27 (1949), in Laurel County (Mengel), April 20 (1885), at Cincinnati, Ohio (Goodpaster, 1941:26); April 12 (1948), at Louisville (Monroe). I doubt Wilson's earliest date (1922:243) for April 1, in Warren County. The species seems to be less numerous than the other transient *Hylocichlas* but is not nearly so rare as the scarcity of published records (e.g., Langdon, 1879:169; Beckham, 1885:8; Pindar, 1887a:85; Blincoe, 1925:420; Goodpaster, 1941:26) suggests. In Monroe's experience near Louisville, for example, and in mine accumulated at intervals throughout the state, it is a fairly common transient in forest habitats, and may readily be found by its characteristic and frequently given song. In the spring of 1949, I first noted it in upland forests in Laurel County on April 27. On May 3–5, in Warren County, on May 9 and 12, in Logan County, and on May 17 in Fulton County I found it fairly common, 3 or 4 being recorded in each tract of woodland investigated. On their breeding grounds high on Black Mountain in Harlan County, Veeries were already present upon my arrival on May 13, 1952,

¹ See Swainson's Thrush, "specimens examined" (C.W.B.).



Fig. 27. Young Veery at about 11 days of age. Drawing made July 10, 1951, from living bird taken on Black Mountain, Harlan County, July 3, 1951.

but regular singing on territories did not begin until May 17 (one song was heard on May 15). Late records of transients: May 24 (1917), in Greenup County (Horsey, 1922:83); May 27 (1919), at Cincinnati, Ohio (Goodpaster, 1941:26); May 17, at Louisville (Monroe); May 20 (1949), in Fulton County (Mengel).

Breeding records.—The 4 dated records known to me indicate clutch-completion from May 21–31 to June 11–20. The first nest was found by Lovell (1950c:60) and others at an elevation of 4,000 feet, with 3 eggs hatching on June 19–20, 1950. I found 3 nests, all at 4,000–4,100 feet, as follows: May 26 and 28, 1952, 4 eggs each; July 3, 1951, 3 young 3–4 days old. The nest of May 26 was a bulky structure of dry leaves, tendrils, strips of inner bark, herbaceous stems, and grasses, lined with rootlets and decayed leaves. It was suspended 8 inches above ground in blackberry vines at the end of a large, decayed log. The nest of May 28 was more compactly built and situated 6 inches up in the base of a cluster of tall ferns. The nest of July 3 was built and situated much in the manner of the first described, about 8 inches from the ground and concealed by a heavy growth of spinulose wood ferns and blackberries. The first and third were found in cut-over mixed mesophytic climax of yellow birch, beech, sugar maple, and hickories, the second in a thicket of young chestnut, maple, and birch reproduction. In 1952, I also found two old nests obviously of this species, one on the ground, the other about a foot from the ground and containing many ferns.

Breeding distribution.—In Kentucky in the breeding season the Veery is limited to Black Mountain, mainly in Harlan County, and occurs chiefly if not entirely above the 3,200-foot contour. It is rare below about 3,600 feet, but farther up is

one of the most numerous and conspicuous summer birds. It is most characteristic of edges and small openings, but occurs also in mature, comparatively unbroken forest. On June 18, 1950, Lovell (1950c:60) recorded 1 on the mountain in Letcher County, at about 3,200 feet.

Fall.—At this season the Veery is less numerous than others of the genus, but published records (exclusive of trivial lists, I have found only two!) are much scarcer than my experience indicates the birds to be. Dates of observation range from September 3 to October 10, including the records of Wilson (1922:243) for Warren County and Cooke (1907:34) for Fayette County—September 3, 1905, and September 27, 1903. Two Veeries were included among the victims of the "ceilometer accident" at Nashville, Tennessee, on the night of September 9–10, 1948 (Spofford, 1949:88). I took a male at Henderson on September 9, 1949, and a male (1 of 2 seen) in Hopkins County on September 19, 1951, both in lowland woods. Elsewhere I recorded the species in Jefferson County in both lowland and upland woods near Louisville on September 28, 30, and October 1, 1951, and a few days later, in Laurel County in swampy thickets near London, October 3–10 (1 to 3 recorded daily).

Geographic variation.—Two subspecies occur in Kentucky.

Hylocichla fuscescens fuscescens (Stephens)

The breeding population of Black Mountain is referable to this eastern subspecies; the small series examined is not typical, however, being grayer (less reddish) above than the average of specimens I have examined from the northeastern United States, and approaching *Hylocichla fuscescens salicicola* in this respect. The birds are not, however, so dusky as *salicicola*. I do not know whether this tendency to grayness occurs in all Appalachian breeding populations.

Hylocichla fuscescens salicicola Ridgway

All transient specimens examined (see also Wetmore, 1940:552) prove referable, as might be expected, to the darker, grayer, western subspecies. The collection of larger series may reveal that some eastern birds also migrate through this area. Conclusions, however, should be made cautiously, since the overlap between these forms is likely to prove large upon careful study.

Specimens examined.—Total, 22, all *H. f. salicicola* except Harlan County specimens, which are *fuscescens*. R.W.B.—1 unsexed, Harlan County (no date); B.L.M.—1 male, Harlan County (July 8); 1 male, Jefferson County (May 7); Bernheim Coll.—1 male, 1 female, 1 unsexed (all *salicicola*); no data except collectors' numbers (catalogue lost); J.D.F.—1 female, Marshall County (Sept. 20); U.S.N.M.—4 specimens from Harlan County (June 21–30); 1 specimen from Union County (May 10); U.M.M.Z.—2 males, 3 females, 1 unsexed nestling, Harlan County (June 29, July 6; May 26, June 29, July 7; July 3); 1 male (weight, 38.3 gm., moderately fat), 1 female (30.4 gm., not fat), Warren County (May 3; May 4); 1 male (34.2 gm., moderately fat), Henderson County (Sept. 9); 1 male (32.0 gm., not fat), Hopkins County (Sept. 19).

Sialia sialis (Linnaeus): EASTERN BLUEBIRD

Status.—Common resident, a little less numerous in winter.

Spring.—A slight increase seems to occur in early or mid-March.

Breeding records.—Clutches are completed from March 21–31 to July 1–10, as indicated by 50 dated observations showing a marked peak April 1–10 but no definite peak for second nestings. Records are from Harlan (Wetmore, 1940:552); Letcher (Murray, 1938:2); Rowan (Barbour, 1951a:36); Harrison (Mengel, notes); Boyle (Lovell, 1951b:61); Mercer (Van Arsdall, 1949:26); Owen (Hays, 1957:6); Nelson (Blincoe, *vide* Funkhouser, 1925:306); Oldham (Mengel, notes); Jefferson (Wright, 1945:50; Hays, 1957:6; Tabler, 1959:13; Monroe, Mengel, notes; Stamm, extensive notes); Bullitt (Hays, 1957:6); Meade (Lovell, 1949b:68); Warren (Mengel); Hopkins (Hancock, 1954:25); Crittenden (Litsey, 1890); Trigg (Mengel);

and Marshall (Lovell, 1951b:61) counties. The earliest egg-date is March 26 (1948), 1 egg (clutch later 4) in Jefferson County (Stamm), and the latest June 30 (1945), 5 eggs in Meade County (Lovell). I saw young just out of the nest in Harrison County on July 13, 1950, and a late record in Hopkins County (Hancock) refers to 2 young and an infertile egg noted July 24 (1950). The average complement of 30 nests was 4.4 ± 0.15 eggs or young (3-6). Many nests have been noted in bird boxes (including martin houses), and others in mail boxes, gourds, and tin cans erected for the purpose; also hollow fence posts on several occasions, and natural cavities (Hancock) in oak, walnut, willow, and apple trees, usually in rather open situations. They are placed low, averaging around 4 feet above ground (the highest on record was 11 feet). The eggs are normally pale blue, but some sets (Hancock) are white. Lovell (1949b:68) reported an unusual nest, on a beam in an outbuilding in Meade County, containing 1 egg on May 14, 1944. I noted a nest in Trigg County, Kentucky Woodlands National Wildlife Refuge, in the top of a hollow fence post, containing 5 eggs on April 15, 1950, and another, with 3 eggs, in a Downy Woodpecker hole in a fence post in Warren County, June 22, 1949. Monroe noted the deposition of 5 eggs on successive days, in a nest in Jefferson County, April 11-15, 1919.

Breeding distribution.—Statewide. The species is almost ubiquitous in more or less open areas, even including relatively small mountain clearings, and, although rare there, occurs to the top of Black Mountain, Harlan County, where I recorded 1 bird on May 15, 1952 (see also Wetmore, 1940:552). Lately there is much talk of a decline in numbers, which is probably real but also poorly documented.

Fall.—The species remains as numerous as in summer at least into November. I took immature birds completing postjuvinal molt of the body tracts at Henderson, September 9, 1949, and in Laurel County, October 7, 1951. Other molting birds I have examined are an immature from Harlan County taken July 27, 1939 (R.W.B.), and an adult taken in Marshall County on September 4, 1941 (J.D.F.).

Winter.—Eastern Bluebirds remain common or fairly common in most areas through all but the severest winters, when their numbers may be considerably reduced. There is, however, a general and probably justified feeling among local students that the birds are somewhat less numerous in winter (see Blincoe, 1925:418; Goodpaster, 1941:26).

Geographic variation.—The subspecies occurring is the eastern *Sialia sialis sialis* (Linnaeus).

Specimens examined.—Total, 23. R.W.B.—1 male, 1 female, Harlan County (July 27; Aug. 1); M.S.C.—2 males, Rowan County (Mar. 1, 9); U.K.—1 male, Lincoln County (May 16); B.L.M.—1 female, Jefferson County (Mar. 2); J.D.F.—1 male, Woodford County (Jan. 25); 1 male, Marshall County (Sept. 4); U.S.N.M.—13 specimens from Harlan, Lewis, Rockcastle, Boone, Meade, Edmonson, Butler, Muhlenberg, Union, Trigg, and Fulton counties (April 22-Nov. 11); U.M.M.Z.—1 female (weight, 32.5 gm., not fat), Laurel County (Oct. 7); 1 male (32.7 gm., not fat), Henderson County (Sept. 9).

FAMILY SYLVIIDAE: OLD WORLD WARBLERS, GNATCATCHERS, AND KINGLETS

Polioptila caerulea (Linnaeus): BLUE-GRAY GNATCATCHER

Status.—Fairly common to common summer resident.

Spring.—Arrives in late March or early April. Early records: April 7, in Rowan County (Barbour, 1951a:36); March 22 (1894), average of 11 years April 4, in Pulaski County (Cooke, 1915a:201); March 28 (1882), in Nelson County (Beckham, 1882:93); March 26 (1950), at Louisville (Monroe); March 24, in Warren County (Wilson, 1922:242).

Breeding records.—Clutches, as indicated by 36 dated breeding observations (affording few precise data) are completed as early as April 11-20 and as late as

June 21–30 (peak near May 1). Some pairs, at least, probably rear two broods. Records are from Rowan (Barbour, 1951a:36), Laurel (Mengel, notes); Pulaski (Lewis, 1926:37), Owen (Lovell, Stamm, and Pierce, 1955:7; Hays, 1957:6; Stamm, notes), Nelson (Beckham, 1885:10), Oldham (W. Shackleton, 1948:1; E. Shackleton, 1948:42; Lovell, 1951b:61; Stamm, Shackleton, and Slack, 1953:27; Stamm, notes; Mengel, notes), Jefferson (Brecher, 1944; Hays, 1957:6; Wright, 1945:50; Stamm, notes; Monroe, notes), Meade (Lovell, 1949b:68), Hopkins (Hancock, 1954:25), and Graves (Mengel, notes) counties. Construction of nests has been noted (Barbour) as early as April 20, in Rowan County, with incubation of eggs as early as April 26 (1889), in Pulaski County (Lewis) and April 30 (1944), in Jefferson County (Brecher); eggs have been noted as late as July 2 (Beckham), in Nelson County. Records of young in the nest range from May 30 (1936), 5 large young noted by Monroe in a Jefferson County nest, to July 17 (1954), in Owen County (two nests; Lovell *et al.*). The beautifully made, small, lichen-covered nests (for a good description see Lovell *et al.*, 1955:7) are placed in crotches and forks of small trees (reported have been elms, birches, oaks, sweet and black gum, red maple, black locust, shagbark hickory, and black walnut) in open woodland, 25 averaging 22.2 feet (9–40) above ground. The nests are usually rather inaccessible, only one clutch (4 eggs) and one brood (5 young) having been counted. In Oldham County, W. Shackleton noted construction of a nest on May 1, 1947. This nest contained 2 eggs on May 11 and 4 on May 13. On May 14 it contained 1 egg of the Brown-headed Cowbird, the gnatcatcher's eggs being broken. Re-use of material from old nests for new ones, noted elsewhere by various observers, has been reported in Kentucky by Lewis (1926), and by Lovell, Stamm, and Pierce (1955:7). I found an active nest (contents unknown) in Oldham County on June 13, 1937, and saw grown young being fed on June 9, 1952, in Laurel County and July 15, 1951, in Graves County.

Breeding distribution.—Statewide. The species occurs in a wide variety of forested and semi-forested habitats, being nearly always associated with edge, open woodland, or successional stages. It seems to have been recorded only once at high elevations on Black Mountain, Harlan County, where Warner and I recorded 3 at 3,500 feet on July 9, 1946. I have several times found it at the top of Pine Mountain, at elevations of 1,800 to 2,700 feet, in Bell, Harlan, and Letcher counties.

Fall.—The gnatcatcher is fairly common in early September, but becomes rapidly less numerous thereafter. Late records: September 24 (1886), at Eubank, Pulaski County, average of 5 years September 23 (Cooke, 1915a:202); September 25 (1932), at Cincinnati, Ohio (Goodpaster, 1941:26); September 28, at Louisville (Monroe); September 27, in Warren County (Wilson, 1922:242). Figgins' records (1945:248) of 1 in Woodford County on January 16, 1943, is unacceptable in the absence of a specimen.

Geographic variation.—The subspecies occurring is *Poliophtila caerulea caerulea* (Linnaeus) of the eastern United States.

Specimens examined.—Total, 12. M.S.C.—1 unsexed, Rowan County (March);¹ R.W.B.—1 male, Harlan County (July 25); U.K.—1 male, Woodford County (April 24); B.L.M.—1 female, Oldham County (April 13); C.U.—1 male, Logan County (March 30); J.D.F.—1 male, Marshall County (Aug. 22); U.S.N.M. (see Wetmore, 1940:553)—3 specimens from Wayne and Meade counties (April 21–June 6); U.M.M.Z.—1 male (weight, 5.6 gm., not fat), Powell County (June 30); 1 female (5.6 gm., not fat; skeletonized), Owen County (July 6); 1 male, Jefferson County (April 10).

Regulus satrapa Lichtenstein: GOLDEN-CROWNED KINGLET

Status.—Fairly common to common transient, sometimes locally abundant; uncommon to common winter resident.

¹ According to the catalogue of this collection, the specimen was taken on March 1, 1933. It seems possible that an error is involved and I regard the date as questionable.

Spring.—A definite increase over the numbers wintering occurs, a noticeable influx of transients sometimes appearing by mid-March; main flight near April 1; rare after mid-April. Late records: April 19, in Rowan County (Barbour, 1952:26); April 26 (1903), at Lexington (latest), average of 4 years April 17 (Cooke, 1915:119); "about April 25th," at Bardstown (Beckham, 1885:11); April 26 (1940), at Cincinnati, Ohio (Goodpaster, 1941:26); May 3 (1953), at Louisville (Monroe); April 27, in Warren County (Wilson, 1922:242). In periods of intense migration open woodlands are sometimes thronged with these tame little birds and the following species.

Fall.—The Golden-crowned Kinglet sometimes arrives in late September, usually in early October, with the main flight late October or early November. Early records: October 1 (1938), in Rockcastle County (Wetmore, 1940:553); October 3 (1889), in "central Kentucky," average of 7 years, October 5 (Cooke, 1915:120); October 1, in Nelson County (Blincoe, 1925:418); September 23 (1956), at Louisville (Monroe); October 13, in Warren County (Wilson, 1922:242). Large flights occasionally occur, as reported by Frazer (1946) at Marion, Crittenden County, where hundreds were seen on October 24, 1945. The species is irregular in the time of its arrival in numbers. Wetmore (1940:553) reported 10 birds seen in Rockcastle County on October 3, 1938, while in nearby Laurel County, in piney areas much favored by the species in winter, I recorded none from October 3 through 11, 1951.

Winter.—This kinglet winters throughout the state, in numbers varying locally and from year to year. Wilson (1920:94; 1922a:270; 1922:242) and Blincoe (1920a:100) recorded an apparent decrease in numbers following the severe winter of 1917–1918, a decrease also noted elsewhere (see F. H. Allen, 1919). The species is erratic in Kentucky, common in some winters and rare in others, as has been the case at Louisville over a long period of years. It is likely to be more numerous in areas affording considerable coniferous growth. From February 3 to 5, 1950, Edwards and I found it numerous in upland pine-oak forest in Laurel and Whitley counties on the Cumberland Plateau, where I have never failed to find fair numbers in winter and early spring (see also Barbour, 1952:26, common in Rowan County). Wilson (1921a) referred to its abundance in dense cedar growth of Warren County. In lowland forests of the Mississippi bottom-lands in Fulton, Hickman, and Ballard counties. I again found it common, December 26, 1950, to January 4, 1951.

Geographic variation.—Kentucky specimens belong with the eastern subspecies, *Regulus satrapa satrapa* Lichtenstein.

Specimens examined.—Total, 8. U.K.—1 [= female], Jessamine County (Oct. 10); B.L.M.—1 male, Laurel County (Dec. 27); U.S.N.M. (see Wetmore, 1940:553)—5 specimens from Rockcastle, Fayette, Edmonson, Hopkins, and Trigg counties (Oct. 3–Nov. 17); U.M.M.Z.—1 male (weight, 5.7 gm., not fat), Laurel County (Feb. 3).

Regulus calendula (Linnaeus): RUBY-CROWNED KINGLET

Status.—Common transient; very rare winter resident.

Spring.—Although a few birds have been found to winter, it is virtually certain that the definite increase usually observed in late March and early April is caused by the arrival of early transients; main flight in middle or late April, later than that of the Golden-crowned Kinglet; rare by early May. Representative extreme dates: March 5–April 24, in Rowan County (Barbour, 1952:27); April 1 (1901)–May 7 (1903), at Lexington, averages of 5 and 6 years, respectively, April 6 and April 30 (Cooke, 1915:122–123); March 24–May 10, at Louisville (Monroe, extremes 1934–1952); March 22–May 7, in Warren County (Wilson, 1922:242). The latest record at hand is for Union County, May 16, 1938 (Wetmore, 1940:553). These kinglets are sometimes very numerous in the budding trees and undergrowth, accompanying the early warblers with which they are easily confused.

Fall.—The Ruby-crowned Kinglet is rarely recorded before early October; main flight middle to late October; rare by early November, a very few remaining to winter. Early records: September 27 (1938), in Bell County (Wetmore, 1940:553); September 25 (1905), at Lexington, average of 8 years October 7 (Cooke, 1915:124); September 27, at Bardstown, Nelson County (Blincoe, 1925:418); September 6 (1942), at Louisville (Mengel, 1948:51, specimen), where Monroe's and my next earliest record (1934–1952) was for October 1; September 23, in Warren County (Wilson, 1922:242); September 17 (1941), in Trigg County (Cypert, notes); September 22 (1941), in Marshall County (specimen, J.D.F.). Late fall records given by the observers above range from November 4 to November 23. The species is sometimes common in brushy and openly wooded habitats, moving actively about with the late transient warblers. Frazer (1946) reported a large flight in Crittenden County on October 24, 1945.

Winter.—Until recently there were no winter records of the species in Kentucky, other than Audubon's (1834:547) casual reference to its occurrence at that season. Since 1948, however, Monroe has recorded Ruby-crowned Kinglets in very small numbers on 10 or more occasions between December 17 and February 2. Wilson (1951a) also recorded the species in winter throughout the season of 1949–1950 in Warren County, and has reported a few winter records from Mammoth Cave, Edmonson County, as well (Wilson, 1946). It has been reported as wintering rarely in southern Indiana (Butler, 1897:1141).

Geographic variation.—The subspecies occurring is the eastern *Regulus calendula calendula* (Linnaeus).

Specimens examined.—Total, 18. R.W.B.—2 males, 1 female, Morgan County (Oct. 1); U.K.—1 unsexed, Kentucky (Oct. 10; locality illegible); B.L.M.—2 males, Jefferson County (April 21, Sept. 6); J.D.F.—1 female, Marshall County (Sept. 22); U.S.N.M. (see Wetmore, 1940:553)—8 specimens from Bell, Boone, Meade, Nelson, Muhlenberg, Butler, and Union counties (April 26–Nov. 7); U.M.M.Z.—1 male (weight, 7.7 gm., moderately fat), Wolfe County (April 24); 1 male, Jefferson County (April 8); 1 male (7.2 gm., not fat), Meade County (Oct. 20).

FAMILY MOTACILLIDAE: WAGTAILS AND PIPITS

Anthus spinoletta (Linnaeus): WATER PIPIT

Status.—Rare to uncommon transient, occasionally common locally.

Spring.—Pipits occur in suitable open localities more or less throughout the state, being rather irregular both in numbers and times of appearance. Migration occurs mainly in March and April, with records ranging from February 26 to May 12. Representative early and late records: March 10, in Rowan County (Barbour, 1952:27); March 8 (1949)–May 7 (1932), at Cincinnati, Ohio (Maslowski and Goodpaster, notes; Goodpaster, 1941:26); March 1 (1958)–May 3 (Monroe), and May 12 (1945), at Louisville (Monroe, notes; Lovell, 1945); February 26 (1946), in Bullitt County (Lovell, 1946); April 2 (Wilson, 1939a)–May 8 (1920), in Warren County (Wilson, 1922:242). The peak of abundance, when one is perceptible, may vary from March to May. Wilson (1922:242) recorded hundreds of pipits in wet fields in Warren County on May 1 and 8, 1920. Flocks usually range from a few birds to 50 or so and are found in broad, open areas of short grass or bare ground, frequently near water. Wyatt (1948:3) recorded flocks in Calloway County on March 22, 29, and 30, 1947, and again (verbal com.; about 50 birds) on April 12, 1950.

Summer.—References to supposed breeding (Hibbs, 1926; Wilson, 1929:185, 1940a:20) of this arctic species are undocumented and unacceptable. Non-breeding, summering birds may have been involved in some cases.

Fall.—The species may be less erratic than in spring, although few observers have recorded it. Main migration probably near mid-October. On the broad, rocky

areas of the Falls of the Ohio River at Louisville, pipits are fairly regular in occurrence (records by Monroe and others range from August 22 to November 21). Groups of 2 or 3 to 10 birds are usually seen, with larger numbers occasionally present in October, as on October 24, 1948, when G. M. Sutton, Harold Alexander, the Monroes, and I recorded more than 50 there. Carpenter (1934) recorded a flock, with Horned Larks, on a Louisville airport on October 21, 1934. Other records are from Rowan County, where records are chiefly for September (Barbour, 1952:27); from Cincinnati, Ohio, where Goodpaster (1941:26) noted 100 on October 16, 1937, and others were recorded on November 23, 1936; and from Trigg County, where two flocks were recorded on November 4, 1938 (Wetmore, 1940:553).

Winter.—While it is likely that pipits occasionally winter in Kentucky (cf. Butler, 1897:1105), December and early spring records, which may involve transients, are not sufficient evidence. A few authors (among them Blincoe, 1925:417, and Wilson, 1946:23) have referred casually to wintering. Beckham (1885:13) thought wintering probable in Nelson County. Near Louisville, Stamm (*vide* Monroe) has made sight records for December 23, 1951, and (8 birds) February 1, 1948, the last certainly suggesting wintering.

Geographic variation.—The subspecies occurring is the eastern continental *Anthus spinoletta rubescens* (Tunstall).

Specimens examined.—Total, 5. M.S.C.—1 unsexed, Menifee County (March 10, 1934); C.W.B.—1 female, Nelson County (April 19, 1877); B.L.M.—1 female, Jefferson County (March 13, 1937); U.S.N.M.—2 specimens, Trigg County (Nov. 4, 1938).

FAMILY BOMBYCILLIDAE: WAXWINGS

Bombycilla cedrorum Vieillot: CEDAR WAXWING

Status.—Resident, rather irregular at all seasons; rare to common in summer, breeding locally east and north of the Purchase and Pennyroyal (where it is usually rare or absent in summer); more numerous in spring and fall; rare to common in winter throughout Kentucky.

Spring.—Everywhere most frequently numerous in April and May, occurring in small to medium-sized flocks. Near the end of May there is usually a marked decrease in numbers, particularly in the south and west. For years Wilson had no Warren County record later than June 12, as reported in 1922 (Wilson, 1922:240). Monroe has few Louisville records later than June 9, and Clay (1946) thought a flock of 30 seen on May 30, 1946, rare enough to warrant publication. In southern and western Kentucky, I encountered many waxwings through most of May, 1949, but by the end of the month they were rare, the last 2 being seen at Fulton on June 3.

Breeding records.—Breeding is late, as shown by only 16 dated observations, clutches are completed June 1–10 to August 11–20, with peaks June 11–20 (first nestings) and July 21–31 (second nestings). The species was not known to breed in Kentucky until rather recently, the first nest being found by Monroe in 1934, at Louisville (Monroe, 1946). Since then recorded from the following: Whitley (B. L. Monroe, Jr., notes), Harrison (Mayer, 1949:29–31), Mason (Stamm, 1949:17; 1951:7), Woodford (Van Arsdall, 1948:29; 1949:27), Jefferson (Lovell and Stamm, 1948:462; Tabler, 1948:54; Clark, 1950:67; Stamm, 1951:7; Hays, 1957:6), Daviess (Powell, 1952:4–5), and Hopkins (Bacon; nest collected, possibly before 1934) counties. The earliest and latest recorded dates of incubation are June 10 (1951) in Daviess County and August 17 (1948) in Harrison County. The stage of an active nest noted in Jefferson County (Stamm, *vide* Hays) on August 28, 1956, was not ascertained. The average complement of 8 clutches or broods evidently complete is 3.5 ± 0.36 (2–5). Most nests reported were largely constructed of string or shredded rope and were situated on horizontal branches of sycamores (2), slippery elm, oaks (2), tulip, maples (4), hackberry, pear, and pine, 12

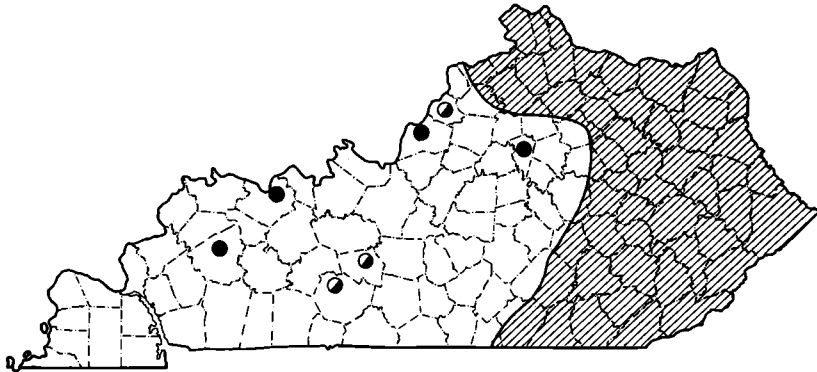


Fig. 28. Breeding distribution of the Cedar Waxwing in Kentucky. Hatched area, regular and rare to common; dark circles, marginal breeding records; half-dark circles, marginal breeding-season records.

averaging 25.2 feet above ground (8–60). Incubation periods of 14–15 days, and nestling periods of the same length were noted at nests in Jefferson (Lovell and Stamm) and Harrison (Mayer) counties, consecutive broods being reared by the two pairs in question.

Breeding distribution.—The breeding records cited above are restricted to the Cumberland Plateau, Bluegrass, and Western Highlands (Fig. 28). In reviewing earlier records, Lovell and Stamm (1948) and Stamm (1951) gave the impression, which for a time was a general one, that the species is rare in summer through the range occupied in Kentucky. This, however, is erroneous, since in recent years, at least, it has proved to be fairly common or common throughout summer over the entire Cumberland Plateau and Mountains. I have regularly and repeatedly observed numbers of pairs, individual birds, and small flocks, variously in June, July, and August, in Bell, Harlan, Letcher, Pike, Wayne, Pulaski, Laurel, Powell, Wolfe, Menifee, Estill, and Clark counties. Other records were given by Wetmore (1940: 553) for Harlan County, Barbour (1951a:36) for Rowan County, Murray (1938:2) for Letcher County, and Ganier (1937a:26) for Pickett County, Tennessee. Also, in the northern Bluegrass the species seems to be fairly common in summer, since in 1950 I regularly saw small numbers in July in Boone, Kenton, and Owen counties. Slightly farther south, in Oldham and Jefferson counties, it is decidedly less numerous, and Monroe has accumulated few summer records at Louisville. In the Pennyroyal, where breeding has not been recorded, Wilson (1947a) acquired his first mid-summer records in 1947. Hancock (1954:41) regarded the species as rare in summer in Hopkins County. I doubt that the recent accumulation of breeding records reflects more than increased awareness of the species by local students. Powell (1952) presented some evidence that Cedar Waxwings have been breeding in Daviess County for many years.¹

Fall and winter.—In late August or early September waxwings begin to become more numerous throughout Kentucky. Wilson (1922:240) reported dates for Warren County as early as August 17, and Bailey (1933:155) recorded waxwings at Mammoth Cave in late August, 1929. On September 8, 1949, I noted a flock of 30 or more in lowland forest near Henderson and took a molting adult female (ovary somewhat enlarged). Also molting, on the head and back, was a streaked immature taken by Figgins in Marshall County on September 24, 1941 (J.D.F.). I have

¹ In an unpublished MS of Pindar's, ca. 1925, appears the note: "Mrs. [Lucas] B[rodhead]. noted a pair . . . tearing up an old oriole's nest at Estill Springs [in the Bluegrass], August 12, 1905."

noted fair numbers in many areas from mid-September on. Streaked immature birds are often seen with flocks of adult-plumaged individuals until well into the fall, my own latest record being for October 20. Extensive notes on feeding habits in Kentucky were published by Blincoe (1923:68-70). The species subsists largely on seasonal berries and fruits, and its rather erratic movements are probably often related to the availability of food. Waxwings have been recorded in winter throughout the state, sometimes common, sometimes rare or absent. Notes on a winter roost of waxwings and other species in Crittenden County were published by Semple (1947).

Specimens examined.—Total, 25. M.S.C.—1 male, 1 unsexed, Rowan County (June 11; Oct. 1); R.W.B.—1 male, 1 unsexed, Harlan County at top of Black Mountain (Aug. 5; Aug. 11); U.K.—1 male, 1 female, Wayne County (April 28); B.L.M.—1 male, Jefferson County (April 21); Bernheim Coll.—1 male, 2 females (numbers but no data, catalog mislaid); 1 unsexed, Fayette County (March 5); J.D.F.—1 immature male, Marshall County (Sept. 16); U.S.N.M.—6 specimens from Harlan, Rockcastle, Nelson, Edmonson, and Trigg counties (June 25–Nov. 12; see Wetmore, 1940:553–554); U.M.M.Z.—1 male (weight, 30.0 gm., not fat, testes moderately enlarged), Wolfe County (June 21); 1 male (31.1 gm., not fat), Powell County (April 24); 1 female (33.6 gm., not fat), Logan County (May 12); 1 male (37.3 gm., very fat), 1 female (36.6 gm., not fat, ovary moderately enlarged), Henderson County (Sept. 8; Sept. 8); 1 male (36.4 gm., not fat), 1 female (38.1 gm., moderately fat), Trigg County (April 14; April 14).

FAMILY LANIIDAE: SHRIKES

**Lanius excubitor* Linnaeus: NORTHERN SHRIKE

Status.—Casual winter visitant.

Records.—For years the American Ornithologists' Union Check-List (see 1931: 271) has described the Northern Shrike as wintering southward to Kentucky, presumably on the basis of Audubon's reference (1834:534) to it as "not a rare bird" in winter. I should be disinclined to consider this statement at all seriously save for the fact that an original drawing of the species made by Audubon at Henderson (labelled "Great American Shrike" and dated November 30, 1812) has been preserved (Herrick, II:377, 1917). Further, examination of his published plate ("Birds of America," pl. 192, 1834) shows clearly that he successfully distinguished this species from the Loggerhead Shrike.

Other records, not entirely acceptable for present purposes, were given by Pindar (1889b:315; 1925a:165) for Fulton County, on the authority of one Professor Caldwell, and by Young (1948), for Jefferson County, where a shrike thought to represent this species was trapped, banded, and released on December 30, 1945. Young's identification, unfortunately, was made retroactively. Also unsatisfactory, as Dr. Wetmore likewise thinks (letter: May 24, 1961), is the basis of the reference to occurrence at Lexington given in the A.O.U. Check-List (1957:462), fifth edition. This rests on two sight records by R. H. Dean and a Mrs. Harkins, reported to the old Biological Survey records as March 12 and April 1, 1906.

An immature female (C.M.N.H.) was taken by Charles Dury at Cincinnati, Ohio, a mile or two from the Kentucky line, on November 3, 1883 (Maslowski and Dury, 1931:90; Goodpaster, 1941:26).

It is probable that in Audubon's time, when cleared areas were fewer and smaller in extent, Northern Shrikes moved farther southward than they do today (see also remarks under Snow Bunting).

Geographic variation.—Northern Shrikes reaching Kentucky would with overwhelming probability represent the northeastern *Lanius excubitor borealis* Vieillot.

Lanius ludovicianus Linnaeus: LOGGERHEAD SHRIKE

Status.—Resident west of the Cumberland Plateau, rare to fairly common, locally distributed, increasingly numerous westward, perhaps slightly more numerous in migration and winter; rare transient and winter resident on the Cumberland Plateau.

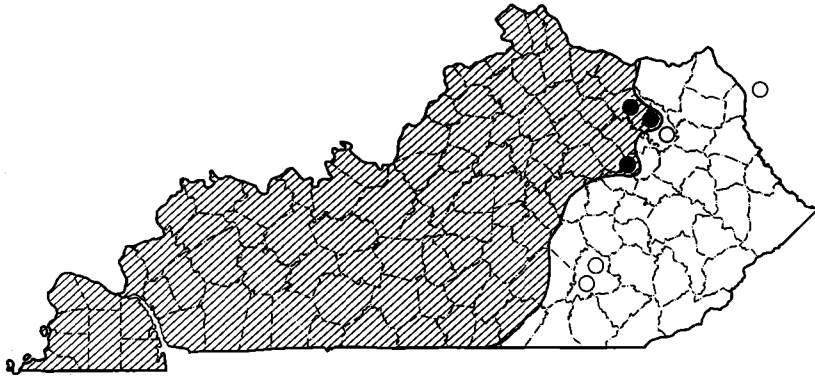


Fig. 29. Distribution of the Loggerhead Shrike in Kentucky. Hatched area, regular throughout the year (progressively more numerous westward); dark circles, marginal breeding-season records; open circles, outlying winter records.

Spring.—No obvious changes in numbers are apparent. Song, rather infrequently reported in literature, is probably begun in March. The species is territorial throughout the year. Most of whatever migration takes place probably involves young birds.

Breeding records.—As shown by only 17 dated observations, clutches are completed April 1–10 to June 11–20 (early peak April 11–20 [4 records] or April 21–30 [5 records]). Possibly two-brooded. Records are from Scott (Stamm, 1956c:49), Mercer (Van Arsdall, 1949:27), Oldham (Lovell, 1954:31; Monroe, Mengel, notes), Jefferson (Lovell, 1954:31; Hays, 1957:6; Stamm, 1954a:61, and notes), Warren (Wilson, 1923b:119), Hopkins (Hancock, 1954:41), and Hickman (Mengel, notes) counties, Kentucky, and from near Cincinnati, Ohio (Goodpaster, 1941:27). The average complement of 11 clutches or broods is 4.9 ± 0.26 (4–6). The bulky, crude nests, in which thorns are sometimes incorporated, are placed in low, dense trees or shrubs in rather open situations (as along fence rows), 10 averaged 9.4 feet above ground (5–12). Nests are rather easily found once their presence is suspected and the data could readily be much augmented. The earliest local egg date is from Cincinnati, where 2 eggs (doubtless an incomplete set) were noted on April 5, 1937; the latest date seems to be June 25 (1938), when Monroe and I noted a set of 4 eggs in Oldham County. I noted 4 young out of the nest and nearly full-grown being fed by their parents 3 miles west of Oakton, Hickman County, June 4, 1949.

Breeding distribution.—This shrike occurs more or less throughout Kentucky west of the Cumberland Plateau (Fig. 29; see also Wilson, 1942:21), preferring broad expanses of open country interspersed with trees and hedge rows. Nowhere really numerous, shrikes are nonetheless conspicuous and frequently observed in the Purchase region, much of the Pennyroyal, and, more locally, in large portions of the Western Highlands and southern Bluegrass. In the eastern and northern portions of the Bluegrass, in the Knobs, and the more heavily forested portions of the Western Highlands, they are rarely seen. In several weeks in July, 1950, in the Bluegrass counties north of Carroll, Owen, and Fayette, I saw no shrikes at all, and nearby, Goodpaster (1941:27) regarded them as rare at Cincinnati. At Morehead, at the western edge of the Cumberland Plateau, Barbour (1951a:36) regarded the species as a rare summer resident and fairly common migrant. Other eastern records are from Fleming County (Grannis, 1944), and Menifee County, where I saw a single shrike at Means, in a Bluegrass valley extending into the outlying Knobs, on April

7, 1951. Extensive summer observations on the Cumberland Plateau have revealed no shrikes in the breeding season. If they invade this area they may well appear first in central Laurel County in the region already colonized by Chuck-will's-widows and Dickcissels.

History.—The species is almost certainly much more numerous today than in primeval times, as a result of the clearing of forests. Early reports are few: the Loggerhead Shrike was not listed by Garman (1894) or, in Nelson County, by Beckham (1885), and in Fulton County, where today it is at least as numerous as anywhere in the state, Pindar (1925a:165) found it "very rare," 1890–1893. Wilson (1922:240) regarded shrikes as "very rare" in Warren County, where they are certainly more numerous now, and "fairly common" in Calloway County (Wilson, 1923c:135).

Fall and winter.—An apparent increase in fall and winter may result from the presence of migrants. At these seasons occasional shrikes reach the Cumberland Plateau, where I saw 1 in hilly farm country 7 miles northwest of London, Laurel County, on October 10, 1951, and took a specimen 8 miles southwest of London on February 5, 1950. Barbour and Welter secured specimens at Morehead in January and September, 1939, at the edge of the Plateau (M.S.C.). These shrikes are rarely seen in extensively wooded areas, but in a period of snow and severe cold one entered Monroe's yard in well-wooded Anchorage and attempted to take a titmouse from a banding trap, being soon trapped itself. Predation on the Carolina Wren and attempted predation on the Cardinal were noted by Lancaster (1954).

Geographic variation.—All Kentucky specimens are referable by color and other characters to the subspecies *Lanius ludovicianus migrans* Palmer. A few decades ago the geographic variation of the species was poorly understood, not being thoroughly clarified until Miller's exhaustive revision (1931). Many casual references in literature (e.g., Pindar, 1925a:165; Cunningham, 1937) to the occurrence of the more southern subspecies *Lanius ludovicianus ludovicianus* Linnaeus in or near Kentucky are without apparent basis in fact.

Specimens examined.—Total, 20. M.S.C.—1 male, 1 female, Rowan County (Jan. 14; Sept. 24); U.K.—1 male, Union County (April 21); B.L.M.—2 males, Jefferson County (June 10, Dec. 23); 1 female, Bullitt County (March 20); 1 immature female, Fulton County (June 28); C.U.—1 male, 2 females, Logan County (Nov. 7; March 11, 22); J.D.F.—1 female, Fayette County (May 27); U.S.N.M.—5 specimens from McClean, Caldwell, Edmonson, and Fayette counties (Oct. 25–Nov. 21; see Wetmore, 1940:554); U.M.M.Z.—1 female (weight, 50.1 gm., moderately fat), Laurel County; 1 male (51.6 gm., not fat, testes enlarged), Hickman County (April 15); 1 male, 1 female (weight 58.7 gm., not fat), Fulton County (Dec. 28; Dec. 29).

FAMILY STURNIDAE: STARLINGS

Sturnus vulgaris Linnaeus: STARLING

Status.—Common to abundant resident, most numerous in extensively cleared agricultural areas; introduced in North America, first recorded in Kentucky in 1919, becoming common about 1928–1932.

Spring.—By early or mid-March the great flocks of winter have dispersed, although small flocks continue to be seen at all seasons. The highly variable song, including much expert mimicry, is heard occasionally through the winter, and regularly from February on.

Breeding records.—Few. Clutches, as indicated by 19 variously detailed breeding observations, are completed from March 21–31 to May 21–31 (peak April 11–20). There is no evidence at present of two-broodedness in Kentucky. Records are from Letcher (Murray, 1938:2), Laurel (Mengel, notes), Mercer (Van Arsdall, 1949:27),

Madison (Lovell, 1951*b*:61), Fayette (Dodge, 1951:41), Jefferson (Lovell, 1942:31-33; Hays, 1957:6, Monroe, notes), Bullitt (Monroe, notes), and Hopkins (Hancock, 1954:41) counties. Egg-dates range from March 30 (1945), in Hopkins County, to May 26 (1942), in Jefferson County (Lovell). Eight recorded clutches average 4.4 ± 0.38 (3-6). Lovell (1942:31-33) described in considerable detail two nestings in his attic in Louisville, 1941-1942. A set of 4 eggs completed about April 16 required 4 days for hatching, April 28-May 1, suggesting that incubation began with the first or second egg (incubation period approximately 16 days); the young left the nest when 12-15 days old and the attic 6 days later. Nests are placed in all sorts of cavities, natural and artificial, frequently in woodpecker holes and martin houses; heights above ground of 7 averaged 29 feet (12-40). Observations on competition for nest sites with woodpeckers have been given by Lovell (1942), Frazer (1939), and Robinson (1937). In 1949 I saw young of the year, just from the nest, in Warren County on May 8 and in Logan County on May 9. I saw an adult carrying food to the top of a hollow telephone pole in Laurel County on May 6, 1952.

History.—Although most of the initial appearances of Starlings in Kentucky, mainly 1925-1930, were in winter, the first record for the state was provided by a pair which appeared on a farm near Lexington, Fayette County, on April 4, 1919 (Dodge, 1951), remaining to rear 4 young. O'Neal (1925) saw 10 near Lexington in the spring of 1925, and Funkhouser (1928) reported a bird seen by Col. Lucien Beckner at Winchester, Clark County, in 1920. Two of these records were published too late to be noted in Cooke's (1928:5) second survey of the spread of the species in North America, in which she gave 1927 (source?) as the year of first breeding in Kentucky. Another early nesting was reported by Frazer, from Marion, Crittenden County, in 1928 (Lovell, 1942:29). Monroe (1955:45) first noted the species at Louisville in January, 1928, with nesting records for 1929 and 1931; Wilson (1930) recorded a nest at Bowling Green on May 2, 1930. By about 1932 the species was breeding in increasing numbers throughout the state, and by 1935 or 1936 was common in most areas at all seasons.

Summer, fall, and winter.—Small flocks, chiefly young birds, begin to form early in June, becoming large by the middle of the month. The roosting habits of the species are well known and, especially in urban areas, a source of considerable irritation to the local populace. Urban roosts of varying, often great, magnitude have occurred in most if not all larger Kentucky towns and cities for a number of years, and Starlings also gather in mixed roosts with other species in rural areas. The great roost in downtown Louisville, which is occupied by some birds the year around, contains many thousands in winter. For accounts of roosts see Lovell (1941), Loefer and Patten (1941), and Lovell and Kirkpatrick (1946). A gigantic roost of millions of Starlings and other species has recently been situated in rural Jefferson County (Stamm and Lovell, 1957, 1958).

Geographic variation.—The subspecies introduced into North America is *Sturnus vulgaris vulgaris* Linnaeus.

Specimens examined.—Total, 5. U.S.N.M.—4 specimens from Union, Meade, and Wayne counties (April 29-June 4); U.M.M.Z.—1 immature male (weight, 71.7 gm., not fat), Warren County (May 8).

FAMILY VIREONIDAE: VIREOS

Vireo griseus (Boddaert): WHITE-EYED VIREO

Status.—Common summer resident, except at high elevations on Black Mountain, Harlan County, where absent.

Spring.—The species arrives earlier than other vireos, usually by early or mid-April, possibly a little later in northern Kentucky. Early records: April 14, in Rowan County (Barbour, 1951*a*:36); April 7 (1890), in Pulaski County, average

of 7 years April 10 (Cooke, 1909b:118); April 24 (1932), at Cincinnati, Ohio (Goodpaster, 1941:27); April 13, in Nelson County (Blincoe, 1925:415); April 15, at Louisville (Monroe); April 7, in Warren County (Wilson, 1922:240); April 10 (1950), in Lyon, Trigg, Calloway, and Marshall counties (Handley and Mengel, notes; common on this date). Singing is begun, apparently, immediately upon arrival.

Breeding records.—Comparatively few. Clutches, as indicated by 12 dated observations, are completed from May 11–20 to July 1–10, with no clearly marked peak evident. Records are from Rowan (Barbour, 1950a:34); Woodford (Van Arsdall, 1949:27); Nelson (Beckham, 1885:21); Marion (Monroe, notes); Jefferson (Stamm, notes; Monroe, Mengel; notes); Meade (Lovell, 1949b:68); Edmonson (Browning, 1946:42); Hopkins (Hancock, 1954:41); and Fulton (Mengel, notes) counties. The few egg dates range between May 16 (Beckham) and June 25 (Monroe and Mengel), 7 clutches averaging 3.3 ± 0.29 (2–4). Six nests (these have been found in shrubs and small saplings, including box elder, sassafras, and apple) average 2.4 feet above the ground (1.5–3.5). They are usually placed in dense shrub growth at forest or woodland edge and are very difficult to find until autumn. A nest found in Hopkins County contained 3 White-eyed Vireo eggs and 1 egg of the Brown-headed Cowbird (June 22, 1948); a nest Monroe and I found in Jefferson County on June 25, 1938, contained 2 eggs of the host and 1 of the cowbird. On May 25, 1949, I found a newly completed nest near Cayce, Fulton County, 2 feet up in a box elder sapling at the dense edge of mature swamp forest. A bird was seen at the nest, which was later deserted.

Breeding distribution.—Statewide, common everywhere in shrubby situations in open forest, forest edge, and clearings, possibly somewhat less numerous in the heavily cultivated portions of the Bluegrass. This southern species apparently does not occur above approximately 2,600 feet elevation on Black Mountain in Harlan and adjacent counties, where all workers have failed to record it at higher altitudes.

Fall.—A specimen taken by Figgins (J.D.F.) in Marshall County on August 22, 1941, was still in full juvenal plumage. Specimens (U.M.M.Z.) taken near Henderson in early September and at Louisville in mid-September, 1949 and 1950, were molting heavily. Many young birds retain considerable juvenal plumage into September, and both adults and immatures in the series show signs of the complete molt mentioned for the species by Dwight (1900:240). Sporadic song is to be heard, apparently, as long as the birds are present (see also Stamm, 1959:68). They remain fairly common into late September and probably into early October. Late records: October 9 (1951), in Laurel County (Mengel, notes; fairly common near London on October 3, 6, and 9, not recorded October 10); October 1 (1891), in Pulaski County, average of 4 years September 26 (Cooke, 1909b:119); September 20 (1931), at Cincinnati, Ohio (Goodpaster, 1941:27); October 5, in Nelson County (Blincoe, 1925:415), October 24 (1956), at Louisville (Monroe); October 10, in Warren County (Wilson, 1922:240). In a brushy area near Cayce, Fulton County, I took a female on November 11, 1948 (U.M.M.Z.). Although this bird seemed to be in good condition it is possible that some injury accounted for its presence at this late date.

Geographic variation.—The material I have seen indicates that Burleigh and Lowery (1945:527) were correct in stating that: "The brightest and most yellowish [White-eyed Vireos] occupy the interior of the eastern United States away from the coastal plain, from Tennessee northward." This brightly colored population is known as *Vireo griseus noveboracensis* (Gmelin), to which all Kentucky specimens seen are here referred.

Specimens examined.—Total, 41. M.S.C.—1 male, 1 female, 1 unsexed, Rowan County (May 9; May 19; July 12); R.W.B.—1 male, Harlan County (July 17); U.K.—1 male, 1 female, Woodford County (May 3; May 4); B.L.M.—1 male, Jefferson County (June 20); Bernheim Coll.—1 male, Fayette County (April 21); C.U.—2 males, 1 female, Logan County (April 14, May 23; April 24); J.D.F.—4 males, 1 unsexed, Marshall County (Aug. 22, 29,

Sept. 20, 22; Sept. 2); U.S.N.M. (see Wetmore, 1940:554)—11 specimens from Bell, Rockcastle, Wayne, Lewis, Meade, Union, and Fulton counties (April 22–Oct. 4); U.M.M.Z.—1 female (weight, 12.4 gm., not fat; juvenal plumage), Powell County (June 26); 1 male (11.2 gm., not fat), Pulaski County (April 28); 1 female (12.9 gm., not fat), 1 unsexed (12.6 gm., moderately fat), Laurel County (April 30; Oct. 3); 1 male, 1 female (11.8 gm., moderately fat), Jefferson County (Sept. 18; Sept. 16); 1 male (11.0 gm., not fat), Warren County (May 7); 1 male (11.0 gm., not fat), 2 females (13.3 gm., 12.8 gm., not fat), Henderson County (Sept. 7; Sept. 8, 9); 1 female, Lyon County (April 13); 2 males (both 11.5 gm., not fat), Marshall County (April 10, 11); 1 female (13.7 gm., very fat), Fulton County (Nov. 11).

Vireo flavifrons Vieillot: YELLOW-THROATED VIREO

Status.—Uncommon to common summer resident over most of the state; rare in the Bluegrass.

Spring.—Probably small numbers regularly arrive by mid-April, but the species has not been well known to some observers and is uncommon in some areas. The following early records, therefore, may average later than they otherwise might: April 18 (1902), at Lexington (Cooke, 1909c:166); April 23 (1939), at Cincinnati, Ohio (Goodpaster, 1941:27, 8 recorded on this date); April 14 (1952), at Louisville (Monroe); April 19, in Warren County (Wilson, 1922:240). In low, oak-hickory covered hills in Lyon County, Handley and I recorded a singing bird on April 10, 1950, and 5 on April 11. The species was common throughout this and adjacent counties April 13–16. In Powell and Wolfe counties in 1949 I found the species well established upon my arrival on April 22.

Breeding records.—Few. Eight dated breeding observations indicate completion of clutches May 1–10 to June 1–10, with no clear peak. In Bacon's collection, when I saw it in 1951, was a nest containing 3 eggs of the Yellow-throated Vireo and 1 of the Brown-headed Cowbird. This was taken in Hopkins County on a date which Bacon seems never to have unearthed from his voluminous records. The following is essentially the full record: constructing nest low in a beech in Oldham County, May 3–5, 1949 (Shackleton and Shackleton, 1950:26); incubating at a nest 15 feet up in an elm sapling in Marshall County, May 10, 1951 (Fuller, *vide* Lovell, 1951b: 61); "nesting" in Carter County, "May 18" (Barbour, 1951a:36); young just out of a nest 40 feet up in a maple, Cherokee Park, Louisville, June 22, 1947 (Stamm, 1949a:37); young several days from nest 10 feet up at tip of a red oak branch in Levi Jackson State Park, Laurel County, June 30, 1952 (Mengel); adults feeding young out of nest, in Breathitt County, June 14, 1955 (Barbour, 1956:8), and in Whitley County, July 10, 1948 (Mengel); adults feeding a young cowbird out of the nest, in Owen County, July 2, 1954 (Lovell, Stamm, and Pierce, 1955:9), and another there on June 4, 1955 (Stamm, notes).

Breeding distribution.—While the Yellow-throated Vireo occurs in the breeding season virtually throughout the state, its numbers vary distinctly in different areas. Everywhere most typical of relatively mature forest, it is a common breeding species on Pine Mountain in the Cumberlands, through most of the Cumberland Plateau, and in parts of the Western Highlands. Seemingly slightly less numerous in most of the Knobs and Western Highlands, it is again common in mature swamp forests of the lower Ohio and Mississippi bottom lands. In the more extensively cleared portions of the Pennyroyal and Bluegrass the species is decidedly less numerous, even in the forest remnants to which it is essentially restricted, as at Louisville where it is rare (though regular) and confined to ravines and heavily wooded slopes. During intensive study of breeding bird populations in Laurel County in 1952, I was unable to detect significant differences in the numbers occurring in pine-oak and oak-hickory upland forests and in mixed mesophytic "cove" forest, and no difference seemed to exist between these areas and upland pine-oak-hickory growth on Pine Mountain ridge in Pike County. The average density of singing males in all seemed to be near one to each 20 or 30 acres. Oddly enough this vireo seems to be rare in similar mesophytic forests at higher elevations on Black Mountain, Harlan County (where I made several June records at 2,600 to 3,600 feet in 1951 and 1952),

for which I cannot account unless related to competition with the Solitary Vireo which is essentially restricted to that area.

Fall.—Song is continued late, as with the preceding species. In Marshall County on August 19, 1941, Figgins took a male, presumably adult, showing heavy molt of the wings, tail, and body (J.D.F.). An immature male which I took near Henderson on September 9, 1949, was completing postjuvinal body molt. The species remains fairly common through most of September and probably rather later than the following late records indicate: September 25 (1938), in Bell County (Wetmore, 1940:555); September 26 (1936), at Cincinnati, Ohio (Goodpaster, 1941:27); October 2, at Louisville (Monroe); September 29, in Warren County (Wilson, 1922:240). Tordoff and I found these vireos fairly common and singing in forested floodplain near Henderson, September 3–9, 1949. Here also one was recorded on October 16, 1949 (latest available definite date), by members of the Kentucky Ornithological Society (Thacher, 1949:78). I found the species in Hopkins County on September 18 and 19, and in Jefferson County on September 28 and October 1, 1951. The same year, in uplands of Laurel County, I saw only 2, in pine woods, on October 4, none being recorded in continuous observation, October 5–11. A specimen from Nelson County in the Beckham collection is dated November 5, 1886, but the record is in question as a new label has been substituted for Beckham's original tag.

Specimens examined.—Total, 29. M.S.C.—2 males, Rowan County (May 1, 17); R.W.B.—1 male, Harlan County (July 27); C.W.B.—2 females, 2 unsexed, Nelson County (Sept. 19, Nov. 5 [? see above]; April 23, Oct. 4); B.L.M.—1 male, Laurel County (July 4); 3 males, Jefferson County (May 30, June 13, 20); 1 male, Fulton County (June 28); J.D.F.—4 males, 3 females, 1 unsexed, Marshall County (Aug. 19, Sept. 5, 8, 19; Aug. 22, 30, Sept. 5; Sept. 26); U.S.N.M. (see Wetmore, 1940:555)—3 specimens from Wayne, Meade, and Fulton counties (May 21–June 14); U.M.M.Z.—1 female (weight, 16.6 gm., this and all others not fat), Powell County (April 23); 2 males (17.6, 18.6 gm.), Laurel County (July 5); 2 immature males (17.4, 17.9 gm.), Henderson County (Sept. 7, 9); 1 male (17.0 gm.), Lyon County (April 11).

Vireo solitarius (Wilson): SOLITARY VIREO

Status.—Rare to uncommon transient throughout Kentucky (*V. s. solitarius*); fairly common to common summer resident in higher mountains of Bell, Harlan, and Letcher counties (*V. s. alticola*).

Spring.—The relatively few records of transients range from April 10 to June 1, tending to center around May 1. Outside of the breeding range, the species is generally rare and may go unrecorded for an entire season in a given locality. Blincoe (1925:415) had only one record for Nelson County, April 25, 1917. Beckham (1882:93) recorded the species there on April 10 (1882). Near Louisville Monroe has acquired only about 25 records for the period 1934–1960, these falling between April 23 and May 28 (1952); in nearby Oldham County, 1 was recorded in 1952 as late as June 1 (Stamm, Shackleton, and Slack, 1953:28). In 1949, I recorded 1 singing bird on a pine-covered ridge in Wolfe County on April 22 and another in a woodlot in Warren County on May 2. Transients have been reported casually from a number of localities other than those named above, from Morehead west to Fulton County.

Breeding records.—Lovell (1950c:60) reported a young bird not long out of the nest taken on Black Mountain, Harlan County, on June 15, 1948. On July 2, 1951, I found a nest of this species at 3,400 feet on Black Mountain, on a steep, southeast slope just across the Kentucky-Virginia line (Harlan County-Wise County), in mature mixed mesophytic forest. The nest was situated in a hickory sapling 30 feet tall and suspended, vireo-fashion, from a fork about 12 feet from the base of the tree but 18 feet above the sloping ground. The female was incubating while the male sang nearby. On July 3, I collected the nest and 3 heavily incubated eggs (B.L.M.). The nest was rather shallow, loosely constructed, and beautifully decorated with lichens, spider-webs, and strips of bark lining. On May

15, 1952, I found a newly completed nest 10 feet up at the tip of a small branch of a beech sapling in open (cut-over) beech-maple woodland at the top of a north slope of the mountain in Harlan County. This nest was later destroyed by an unknown agent.

Breeding distribution.—The species is common near the top of Black Mountain, where it is particularly characteristic of forest edge and the more open forests, such as oak-chestnut communities on dry ridges. On such ridges I have sometimes recorded 3 singing males along 150 yards of trail. I have never recorded the species below 3,200 feet on Black Mountain, and it is distinctly more numerous on the uppermost slopes (see also Howell, 1910:298; Wetmore, 1940:555). It is interesting, therefore, that only a few miles to the west it is fairly common on dry, pine-oak or oak-hickory covered slopes of Pine Mountain, at elevations of only 1,800 to 3,000 feet. On July 18 and 19, 1949, for example, I noted several pairs and at least 6 singing males, at elevations of 1,800 to 2,400 feet in Pine Mountain State Park, Bell County, and on July 21 I took a singing male and recorded another at 2,400 feet on Pine Mountain above Whitesburg, Letcher County (U.M.M.Z.). On June 20, 1950, Lovell (1950c:60) also recorded 1 on Pine Mountain, in Harlan County. At both the Bell and Letcher county localities, the species seemed to replace the Yellow-throated Vireo locally, although the latter was common enough in similar habitats in the same general area. This replacement prevails also on the upper slopes of Black Mountain, where the Yellow-throated is decidedly scarce, and it seems possible that competition is involved.

Whether the Solitary Vireo has only recently established itself on Pine Mountain, as it has in some localities in Georgia (Odum, 1948), is not known. Also unknown are the times of arrival and departure of resident birds; specimens of *alticola* taken in Bell County as late as September 27 (Wetmore, 1940:555) could have been local birds or migrants from somewhat farther north.

Note.—A single bird, presumably a vagrant, non-breeding individual, was carefully identified at Louisville on July 24, 1957, by Stamm (*vide* Monroe).

Fall.—Rather a late transient, rare as in spring. Records thought reliable range from September 10 to October 23, most being for October. Aside from birds reported from Log Mountain, Bell County (see just above), the only September records at hand are from Louisville, September 10 (Monroe), and Boyd County, September 20, 1921 (Horsey, 1923:143). Late records: October 11 (1887), at Cincinnati (Maslowski and Dury, 1931:90—specimen); October 16 (1904), at Lexington (Cooke, 1909c:167); October 20, in Nelson County (Beckham, 1885:21); November 1 (1952), and October 23 (1947), at Louisville (Monroe; next record October 19). There is an old record for November 4, in Warren County (Wilson, 1922: 240).

Geographic variation.—Two subspecies occur in the state.

Vireo solitarius solitarius (Wilson)

Migrant specimens taken in Rowan and McClean counties on October 8 and October 17, 1938, were referred to this subspecies by Wetmore (1940:555). These and additional transients that I have examined (see below) are like northern birds in having small bills and clearly olivaceous backs. It is likely that, except in the extreme east, all transients are birds from northern breeding grounds.

Vireo solitarius alticola Brewster

The breeding population of mountainous southeastern Kentucky is referable to this large-billed, dark-backed subspecies, as indicated by 17 specimens examined to date, all from Bell, Harlan, and Letcher counties.

Specimens examined.—Total, 21. R.W.B.—(*alticola*) 1 unsexed, Harlan County (July 19); U.K.—(*solitarius*) 1 female, Woodford County (May 6); C.W.B.—(*solitarius*) 1 unsexed, Nelson County (May 11); B.L.M.—(*alticola*) 2 males, 1 female, Harlan County (July 8, Aug. 15; July 8); U.S.N.M. (see Wetmore, 1940:555) —(*solitarius*) 1 specimen from Rowan



Fig. 30. *Vireo solitarius alticola*, male. Harlan County, Kentucky, 4,000 feet elevation on Black Mountain, May 15, 1952. The bird is R.M.M. original catalog no. 1487.

County (Oct. 8), 1 from McClean County (Oct. 17); (*alticola*) 6 specimens from Harlan County (June 23-28); 3 from Bell County (Sept. 24-27); U.M.M.Z.—(*alticola*) 2 males (weight of the first 18.7 gm., not fat), Harlan County (May 15, June 30); 1 male, Letcher County (July 21); 1 male (17.0 gm., not fat), Bell County (July 19).

Vireo olivaceus (Linnaeus): RED-EYED VIREO

Status.—Common summer resident.

Spring.—Arrives usually, at least in small numbers, by April 15-20, a few occasionally earlier. Early records: April 15, in Rowan County (Barbour, 1951a:36); April 5 (1892), in Pulaski County, average of 7 years April 14 (Cooke, 1909a:81); April 10 (1882), in Nelson County (Beckham, 1882:93); April 14, at Louisville (Monroe); April 8, in Warren County (Wilson, 1922:240).

Breeding records.—As far as indicated by 22 dated breeding observations, clutches are completed from May 1-10 to June 21-30, with a marked peak May 21-31. Whether 3 clutches presumably completed in late June represent second nestings or replacement nestings is not known. Data are from Harlan (Mengel, notes), Rowan (Barbour, 1951a:36), Powell (Stamm, notes), Breathitt (Barbour, 1956:8), Laurel and Whitley (Mengel), Owen (Hays, 1957:6; Stamm, notes), Oldham (W. Shackleton, 1948:2; Lovell, 1951b:61; Stamm, Shackleton, and Slack, 1953:27; Stamm, notes), Jefferson (Monroe, notes; Stamm, notes), Meade (Lovell, 1949b:68), and Hopkins (Hancock, 1954:41) counties. The earliest egg date at hand is May 7 (1948), in Hopkins County; the latest, July 2 (1951), in Harlan, and July 3 (1945), in Meade County. In the last locality, large young were noted in a nest on July 15, 1945. Some of the sets may not have been complete, but 8 clutches averaged 2.6 ± 0.17 (3 with 2 eggs, 5 with 3 eggs). Nests are usually placed near the tips of small branches and have been found in a large variety of deciduous trees, in-



Fig. 31. Young Red-eyed Vireo, probably three or four days out of the nest. Laurel County, Kentucky, June 28, 1952. Drawing from living bird.

cluding maples, hickory, sycamore, sweet gum, black locust, and sassafras, the average elevation above ground of 18 being 13.3 feet (5–40; median, 9). The species nests in forest edge situations, often near dwellings, and also in mature deciduous forest. I noted incubation at a nest 8 feet up in a sugar maple sapling (but 18 feet above the steep slope below) at 3,300 feet in climax mixed mesophytic forest on Black Mountain, Harlan County, July 2, 1951. In a heavily forested cove in Laurel County I took a young bird just from the nest on June 23, 1952. This vireo is rather frequently parasitized by the Brown-headed Cowbird. In Jefferson County on June 3, 1941, Monroe noted a nest 5 feet up in a small maple; this nest contained 3 eggs of the host and 3 cowbird eggs; 2 young cowbirds and 1 vireo egg were noted in a nest in Owen County, June 12, 1956 (Stamm, *vide* Hays). One large young, and a cowbird egg, were noted in a nest in Meade County, date undisclosed (Lovell), and a nest in Oldham County received 2 cowbird eggs and 3 vireo eggs (clutch completed May 26, 1947), 1 of which was replaced by the second cowbird egg (W. Shackleton, 1948:2). I noted adults feeding young cowbirds out of the nest in Laurel County on June 23, 1952, and in Whitley County on July 14, 1948. Of a total of 16 nestings affording appropriate data, at least 6 were parasitized.

Breeding distribution.—Like the Wood Thrush, the present species is common everywhere in forested and semiforested areas, in pine-oak as well as pure deciduous communities, and with the former is perhaps one of the two most typical birds of the eastern deciduous forest. In Kentucky, it is possibly most numerous in the moist mixed mesophytic forests of eastern Kentucky, where several breeding bird counts that I took in 1951 and 1952 (see pp. 34–46) indicated a density of 15 to 20 singing males per 100 acres. While it is sometimes locally outnumbered by other species, I think the Red-eyed Vireo is unquestionably the most numerous forest bird in Kentucky as a whole.

Fall.—The species sings late, as do other vireos, but less persistently than the White-eyed or Yellow-throated. It remains common into early September, a marked decrease occurring about the middle of the month; rare by early October. Late

records: October 5 (1938), in Rockcastle County (Wetmore, 1940:555); September 30 (Blincoe, 1925:414) and October 24 (1886; specimen, C.W.B.), in Nelson County; October 14 (1958), at Louisville (Monroe); September 27, in Warren County (Wilson, 1922:240). Continued work in early October should result in numerous records of late-lingering individuals. No less than 11 Red-eyed Vireos were among the victims of the ceilometer accident at Nashville, Tennessee, on the nights of October 7-8, 1951 (Laskey, 1951:60) and 42 were killed the same nights at Knoxville (Howell and Tanner, 1951:62), with 1 as late as October 23, 1954, at Topeka, Kansas (Tordoff and Mengel, 1956:9). On September 9-10, 1948, 95 were killed at Nashville (Spofford, 1949:88) indicating a heavy migration over quite a long period. September specimens seen are in fresh plumage. An adult female taken in McCreary County on July 12, 1948, was molting on the throat and crown (U.M.M.Z.).

Specimens examined.—Total, 35. M.S.C.—2 specimens from Rowan County (summer); R.W.B.—1 male, Harlan County (July 25); C.W.B.—1 male, Nelson County (Oct. 24, 1886); B.L.M.—1 male, 1 female, Laurel County (July 5; July 6); 2 males, Oldham County (May 2, June 23); J.D.F.—1 male, Clark County (May 12; 1 male, 1 female, Marshall County (Sept. 8; Aug. 21); U.S.N.M. (see Wetmore, 1940:555)—13 specimens from Pike, Harlan, Bell, Lewis, Wayne, Meade, Union, and Fulton counties (April 20-Sept. 20); U.M.M.Z.—1 female, Powell County (June 30); 1 male (weight, 16.9 gm., not fat), 2 females (18.0 gm., moderately fat; 16.5 gm., not fat), Laurel County (April 27; April 27, July 6); 1 female (17.9 gm., not fat), McCreary County (July 12); 2 females, Campbell County (Sept. 10); 1 immature male (17.2 gm., not fat), 2 females (immature, 15.9 gm., not fat; adult, 19.0 gm., moderately fat), Henderson County (Sept. 9; Sept. 7, 9); 1 male (17.3 gm.), Hickman County (May 25).

Vireo philadelphicus (Cassin): PHILADELPHIA VIREO

Status.—Transient; uncommon in spring, fairly common in fall.

Spring.—Recorded from few localities, probably because local observers tend to be unfamiliar with the species. Representative records range from April 20 to May 24 (both extremes from Louisville; Monroe). Despite the scarcity of records, these inconspicuous little birds are probably regular transients in fair numbers. Monroe took an unsexed specimen (B.L.M.) near Louisville on May 11, 1940, and has recorded a few nearly every season. Beckham (1885:20) reported 1 taken in Nelson County on May 19, 1877. I have recorded only 2 in spring: 1 singing in tall trees of Laurel County Fairgrounds at London, May 12, 1952, and 1 in a swampy woodlot in Warren County, May 5, 1949. Butler (1897:1011) recorded specimens from Brookville, southern Indiana, taken April 30 and May 9, 1887, and May 23, 1883. The species has been recorded also from Madison (Loefer, 1938), Edmonson (Wilson, 1946:19), Fulton (Pindar, 1889b:315), Hopkins (Hancock, notes), and Warren (Wilson, verbal com.) counties.

Fall.—Present from late August to early October; seemingly somewhat more numerous than in spring. Near the peak of migration in mid to late September, Philadelphia Vireos may be fairly common in favorable habitat. On brushy hillsides in Jefferson County, I recorded small flights of these birds (5 to 10, usually, in 2 or 3 hours) daily on September 17-20, 1950, and September 28, 1951 (see also *Kentucky Warbler*, 23:41, 1957). Beckham took a series in Nelson County (1883-1886), September 12-21 (C.W.B.) and reported others (Beckham, 1888). Figgins took 5 in Marshall County between September 12 and 22, 1941. Near Louisville extreme dates (which seem to apply for the whole state) are August 30, 1942 (Mengel, 1948:51) and October 4 (Monroe). Bent (1950:362) listed an early record (August 28) for Versailles, Woodford County, on unstated authority. The latest local records are barely extralimital. Goodpaster (1941:27) took a specimen in Clermont County, Ohio, on October 11, 1936. The most interesting records come from Nashville, Tennessee, where no less than 37 were reported killed in the "ceilometer accident" of October 7-8, 1951 (Laskey, 1951:60) and 4 at Knoxville the same night (Howell and Tanner, 1951:62).

Specimens examined.—Total, 17. C.W.B.—4 males, 1 female, 1 unsexed, Nelson County (Sept. 12, 16, 18, 21; Sept. 20; Sept. 16); B.L.M.—1 male, Oldham County (Aug. 30); 1 unsexed, Jefferson County (May 11); J.D.F.—2 males, 3 females, Marshall County (Sept. 12, 20; Sept. 12, 12, 22); U.M.M.Z.—2 males (adult, weight, 13.6 gm., moderately fat; immature, —), 2 females (immatures, 10.5 gm., 11.5 gm., moderately fat), Jefferson County (Sept. 19, 28; Sept. 18, 20).

Vireo gilvus (Vieillot): WARBLING VIREO

Status.—Summer resident; fairly common west of the Cumberland Plateau, rare on the Plateau and in the Cumberland Mountains.

Spring.—A few may appear a little earlier, but the species usually arrives in force in late April or early May. Early records: April 24, in Rowan County (Barbour, 1951a:36); April 19 (1906), at Lexington, average of 4 years April 22 (Cooke, 1909a:79); April 16, at Louisville (Monroe); April 8, in Warren County (Wilson, 1922:240). Probably more are present in May than later, owing to the presence of transients.

Breeding records.—The few detailed data at hand are all from Stamm's notes made in Jefferson County. In seven nests, observed by her at various stages, clutches would appear to have been completed from May 1–10 to June 1–10. These (one of which was partially reported by Stamm, 1951) were in open areas, in elm, pear, sycamore, and hackberry trees, at elevations above ground ranging from 12 to 35 feet (average, 23.6). One nest contained 4 young on June 7, 1952, and another 3 young on June 12, 1950. Incubation was noted as early as May 10 (1954) and as late as June 9 (1946). One bird was observed singing on the nest. Without data, nests have been reported from several other localities: near Bardstown (Beckham 1885:20: "All the nests I have ever seen were . . . near the tops of trees"); near Providence, Crittenden County (*Kentucky Warbler*, 27:42, 1951); and in Hopkins County (Hancock, 1954:41). Goodpaster (1941:27) noted construction of a nest near Cincinnati, Ohio, on May 13, 1939.

Breeding distribution.—As evidenced by the regular occurrence of singing birds, the species breeds in fair numbers in western and central Kentucky, and more locally in the east (see also Wilson, 1942:23; general distribution). It seems fond of areas affording tall, well-spaced trees, often with little or no understory, such as are found on shaded estates, in pastures containing large old trees, along planted roadsides, and in the tall cottonwoods along river banks. The relative rarity of such situations in mountainous eastern Kentucky may account for its scarcity there. It has been reported from a number of eastern localities (see Barbour, 1951a:36; Rowan County; Kozee, 1940, Carter County; Howell, 1910:298, Knox County; Horsey, 1922:82, Boyd and Breathitt counties). Near London, Laurel County, where many suitable cleared areas occur, I recorded singing birds regularly in May and June at several localities in 1952. I recorded singing birds at about this time also in the valley at Big Stone Gap, Virginia, and it may thus be supposed to occur in nearby Harlan County and adjacent areas in Kentucky. This vireo has decreased markedly at Mammoth Cave since the cessation of cultivation there (Wilson, 1946: 12; 1950:22).

Fall.—Obscurely plumaged and singing infrequently, the species is seldom recorded after early September. Monroe's latest record at Louisville is for October 2 (1949). Wilson (1922:240) reported observations as late as October 8 in Warren County. Figgins took an unsexed specimen near Benton, Marshall County on September 10, 1941, and Tordoff and I recorded 3 singing at a willow-lined slough near Henderson on September 4, 1949. One Warbling Vireo was among the victims of the "ceilometer accident" at Nashville, Tennessee on the night of October 7–8, 1951 (Laskey, 1951:60).

Geographic variation.—The subspecies occurring is the eastern *Vireo gilvus gilvus* (Vieillot).

Specimens examined.—Total, 3. C.U.—1 male, Logan County (April 28); J.D.F.—1 unsexed, Marshall County (Sept. 10); U.M.M.Z.—1 male (weight, 15.1 gm., not fat; testes greatly enlarged), Ballard County (June 10, 1949).

FAMILY PARULIDAE: WOOD WARBLERS

Mniotilta varia (Linnaeus): BLACK-AND-WHITE WARBLER

Status.—Common transient throughout Kentucky; common summer resident in the Cumberland Mountains and Plateau, less numerous westward (common locally in the Knobs and Western Highlands, rare to very rare in the Bluegrass, Pennyroyal, and lowland forests of extreme western Kentucky).

Spring.—A few Black-and-white Warblers have been recorded in early April. The species becomes numerous by mid-April. Early records: April 1 (1888), at Eubank, Pulaski County, average of 10 years, April 4 (Cooke, 1905*b*:203—see also Cooke, 1904:20); April 1, in 1882 (Beckham, 1882:93), and April 12 (Blincoe, 1925:415), in Nelson County; April 3, at Louisville (Monroe); March 29, in Warren County (Wilson, 1922:240). Handley and I found Black-and-white Warblers fairly common in Lyon and Trigg counties, April 9–15, 1950. I suspect that the breeding population arrives a little earlier, on the average, than transients bound farther north.

Breeding records.—Eggs are laid chiefly in May. On May 21, 1952, I found a nest, containing 4 fresh eggs (B.L.M.), tucked into a mossy cavity in a steep slope at the base of an old stump in mixed mesophytic forest at 4,000 feet elevation on Black Mountain, Harlan County. The opening of the nest was shielded from above and in front by dense ferns and a small red maple sapling. The incubating female darted from the nest, ran, mouse-like, a few feet, and then feigned injury. The nest was lined with fine rootlets, some of them reddish in color, and decorated with some of the moss that surrounded it. The exterior was constructed of larger rootlets, tendrils, fine twigs, and a copious layer of dead leaves. The nest was not greatly different from another, described by Stamm and Slack (1957:70), found near a trail in mature forest in the Knobs in Bullitt County; this nest contained 4 newly hatched young on May 19, 1956. Evidently the only additional record of a nest is from Hopkins County, where in July, 1953, Bacon informed me that he had once found a nest of this species, on the ground in upland oak-hickory forest. It contained 3 small young. On the Cumberland Plateau, however, I have often observed adults feeding young out of the nest (records from May into July), variously in Powell, Wolfe, Menifee, Laurel, McCreary, Bell, and Pike counties. Lovell (1950*c*:61) noted young being fed on Black Mountain, Harlan County, on June 16, 1948, as did I in the same area, between elevations of 2,800 and 3,800 feet, on June 29, July 5, and July 6, 1951. Barbour (1951*a*:37) noted flying young near Morehead on June 30. West of the Plateau, Lovell (1949*b*:69) has frequently observed young out of the nest in Meade County, these being fed on one occasion as late as August 2 (1945). Brecher (1950:55) saw young not long from the nest at Mammoth Cave on June 3, 1950.

Breeding distribution.—The species is common in forests throughout the Cumberland Mountains and Plateau, rarer westward, being always most numerous in mature deciduous forest. On the Cumberland Plateau it is found in various segregates of the mixed mesophytic forest association, and in dense hemlock and rhododendron on steep slopes and in coves. In some areas it seems to be most numerous in the ecotone between comparatively xeric upland forest, usually combinations of pine, oak, and hickory, and the mesic growth of the upper slopes adjoining. West of the Plateau the Black-and-white Warbler is most numerous in hilly areas affording mesophytic forest resembling the slope forests of the Plateau, chiefly in the Knobs and parts of the Western Highlands. Monroe and I frequently found it in the Knobs in Bullitt County, and on nearby Muldraugh's Hill, in

Meade County, it is also fairly numerous (Lovell, 1949b:69). Wilson (1946:19; 1950:23) regarded it as common in the heavily forested Mammoth Cave area, which evaluation is confirmed by my own limited observations there. Through the remainder of the state it is much less numerous; Monroe and I have but a few June and July records for the immediate (outer Bluegrass) vicinity of Louisville, and Van Arsdall (1949:27) had but one summer record for the inner Bluegrass county of Mercer. Lovell, Stamm, and Pierce (1955:9) noted one pair in Owen County, outer Bluegrass, in June, 1954. I heard a singing male in sparse, second-growth oak forest southwest of Murray, Calloway County, on June 14, 1949.

In several earlier papers concerning central and western Kentucky the species was reported as more numerous than it appears to be today (see Beckham, 1885:13, Nelson County, and compare with Blincoe, 1925:415; see also Wilson, 1922:240, Warren County, and 1923c:135, Calloway County; Pindar, 1889b:315, Fulton County). Probably the widespread clearing of land in these areas has resulted in a distinct decrease of this forest species. I doubt, however, that it ever occurred in the drier forests of central and western Kentucky in the numbers that it does in the mixed mesophytic forest.

Fall.—One of the earlier transient warblers. Migration probably begins in late July and becomes pronounced by mid-August; main flight in early September; rare by early October. Late records: October 3 (1938), in Rockcastle County (Wetmore, 1940:556); October 12 (1878), at Cincinnati (Maslowski and Dury, 1931:91); October 8, in Nelson County (Blincoe, 1925:415); October 7, at Louisville (Monroe); October 6, in Warren County (Wilson, 1922:240). In 1951, I recorded none in much field work in Laurel County, October 3–11.

Specimens examined.—Total, 32. M.S.C.—1 male, Rowan County (May 7); R.W.B.—1 female, Harlan County (July 1); U.K.—1 female, Wayne County (April 28); C.W.B. (all specimens not listed)—3 females, Nelson County (June 29, July 13, Aug. 7); B.L.M.—1 male, 1 female, Laurel County (July 6; July 2); 1 unsexed, Bullitt County (July 4); 1 male, Jefferson County (July 18); J.D.F.—3 males, 1 unsexed, 3 females, Marshall County (Aug. 15, Sept. 1, 20; Aug. 28; Aug. 30, Sept. 1, 8); U.S.N.M. (see Wetmore, 1940:556)—8 specimens from Harlan, Bell, Wayne, Rockcastle, Nelson, and Meade counties (April 28–Oct. 1); U.M.M.Z.—1 male, Harlan County (May 31); 1 male (weight, 11.0 gm., not fat), Wolfe County (April 22); 1 female (11.8 gm., not fat), Powell County (June 25); 1 male (10.4 gm.), Whitley County (July 11); 1 immature male (11.0 gm., not fat), 1 immature female (11.2 gm., not fat), Henderson County (Sept. 7); 1 male, Lyon County (April 13).

Protonotaria citrea (Boddaert): PROTHONOTARY WARBLER

Status.—Summer resident; common along the streams and in the lowlands of southern and western Kentucky, and as far up the Ohio River valley as Louisville; uncommon to rare farther up the Ohio, and up its larger tributaries, to various points west of the Cumberland Plateau.

Spring.—Walkinshaw (1941:4) found Prothonotary Warblers already present and nesting at Reelfoot Lake, Tennessee, a very few miles from the Kentucky line, on April 9, 1939. Presumably the species arrives there, and in immediately adjacent southwestern Kentucky, at least sometimes, as early as late March. Recorded arrival dates in Kentucky are few, and vary considerably. In Warren County, Wilson (1922:240) has noted the species as early as April 5, but at Louisville, the only other locality for which numerous dates are available, Monroe's earliest record is for April 16 (1945 and 1954), the average being about April 20.

Breeding records.—In most of Kentucky, clutches, as shown by 17 dated breeding records, are completed from May 1–10 to July 1–10 (early peak May 11–20; no later peak evident) and perhaps later. Two broods are reared, at least on occasion. The records so summarized are from Oldham (W. Shackleton, 1946:1; Lovell, 1951b:61); Jefferson (Monroe, notes); Meade (Lovell, 1949b:69); Edmonson (Binnewies, 1943); Warren (Wilson, 1941:39, 1948:15; Mengel, notes); Hopkins (Hancock, 1954:41); Carlisle, Hickman, and Ballard (Mengel, notes), and Fulton (Wetmore, 1940:556) counties. The earliest egg date actually available is provided by a clutch

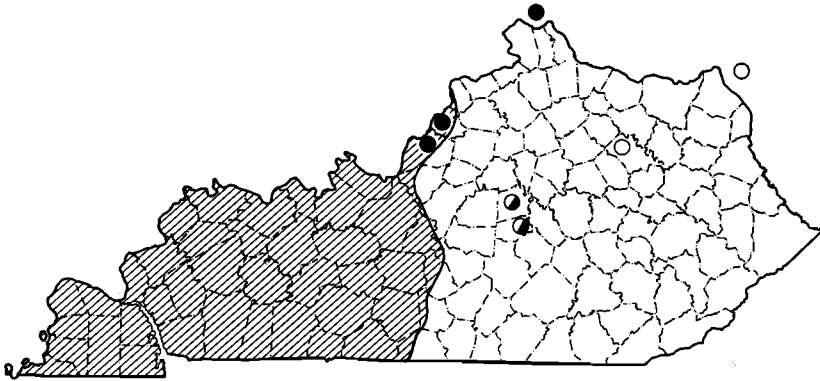


Fig. 32. Breeding distribution of the Prothonotary Warbler in Kentucky. Hatched area, regular and common in suitable habitats; dark circles, marginal breeding records; open and half-open circles, marginal breeding-season records (half-open circles may represent transient birds).

completed in Oldham County on May 14, 1945 (Shackleton), the latest a set of 4, incubated, in Hopkins County, June 6, 1925. In 1944 the young of two broods consecutively reared by the same pair left a nest in Oldham County on June 26 and July 30 (Shackleton). "Nesting" in August was reported in Warren County (Wilson, 1941). At Reelfoot Lake, northwestern Tennessee, and probably in immediately adjacent southwestern Kentucky, nesting seems to occur somewhat earlier. Walkinshaw (1941:19) reported nesting in 1939 between April 6 (laying) and August 10 (termination of last nesting) and in 1940 between about May 1 and August 1, with an average clutch size (of 44) of $4.54 [\pm 0.09]$ (3-6). From Kentucky nests 8 clutches average 4.5 ± 0.20 (4-5). In Kentucky, as elsewhere, nests are built in all sorts of cavities, typically in woodpecker holes or crevices in rotten stumps, often over or near water, occasionally in bird boxes (Walkinshaw, 1941), mail boxes (Wilson, 1941), on boats (Binnewies, 1943; Wilson, 1948), and in other odd locations. The recorded elevations above ground or water of 12 Kentucky nests ranged from 3 to 18 feet (average, 6.8), the highest being one I found in a woodpecker hole in a dead snag in flooded woods of southern Warren County on June 19, 1949. The male was feeding the female on this nest. Despite the species' hole-nesting proclivities, nests are sometimes seriously handicapped by cowbird parasitism. Monroe (1938) recorded 1 cowbird egg in a set of 5 of the warbler, in a hole seemingly too small to admit a cowbird. On June 5, 1949, in the top of a cypress stump in Fish Lake, near Burkley, Carlisle County, I found a nest which contained 1 cowbird egg, 1 Prothonotary egg, and 3 young cowbirds.

Breeding distribution.—A common and typical species of riparian and swamp forest habitats in southern and western Kentucky, where it is widely distributed, the Prothonotary Warbler is also found in fair numbers as far up the Ohio River as Louisville (see Fig. 32) and along the southern border of Kentucky as far east as Glasgow, Barren County (Wilson, 1942:23). Only a few seem to occur farther east and north, at scattered points in the valleys of the Ohio, Green, Kentucky, and Licking rivers. The species is rare at Cincinnati, Ohio (Goodpaster, 1941:28; Kemsies, 1948a:43). A record mentioned by Garman (1894:13) from Midland, Bath County, for April (1893?) appears to be the easternmost for the state. The Prothonotary Warbler is decidedly rare in the Bluegrass away from the Ohio River; it was recorded in Mercer County in June, 1948 (Van Arsdall, 1949:27), and more recently in Boyle County (F. W. Loetscher, verbal com.). No records are available

for the Cumberland Plateau, where I have repeatedly searched the larger stream valleys for the species. There are summer records for Huntingdon, West Virginia (Seeber and Edeburn, 1952).

Fall.—I saw an adult, which was molting the tail, in Graves County, on July 18, 1951. An adult female (U.M.M.Z.), taken by Tordoff at Henderson on September 4, 1949, was completing body molt. Few late records. Still fairly common in early September, Prothonotary Warblers are rare by the end of the month. Monroe's latest record at Louisville, where I recorded 1 on September 15, 1950, is for October 1 (1950). Wilson (1922:240) had records for Warren County up to September 28. Two were killed at Nashville, Tennessee, on the night of September 9–10, 1948, indicating migration at that date (Spofford, 1949:88).

Specimens examined.—Total, 12. B.L.M.—1 male, Fulton County (June 28); Bacon Coll.—1 male, Hopkins County (April 18); J.D.F.—1 female, 1 unsexed, Marshall County (Aug. 16); U.S.N.M. (see Wetmore, 1940:556)—5 specimens from Union and Fulton counties (May 9–27); U.M.M.Z.—1 immature male, Jefferson County (Sept. 11); 1 adult female (weight, 14.8 gm., not fat), Henderson County (Sept. 4); 1 juvenal-plumaged female (16.2 gm.), Ballard County (June 8).

Limnothlypis swainsonii (Audubon): SWAINSON'S WARBLER

Status.—Summer resident, fairly common locally in lowland forests of extreme western Kentucky, rare and local in swamp forests of the Pennyroyal and Western Highlands; also summer resident locally in mixed mesophytic forest in the Cumberland Mountains, and possibly elsewhere in eastern Kentucky, the mountain and lowland populations apparently being discontinuous.

Spring.—Not much is known of time of arrival. There are records (western population) for April 28, 1890, in Fulton County (Pindar, 1925a:166, bird shot, record probably authentic); April 24, 1949, in Hopkins County (Hancock, 1949b: 62); May 4, 1949 (Mengel), in Warren County; and (eastern population) May 4, 1947, in Lawrence County, Ohio, only a few miles from Ashland, Kentucky (Green, 1947).

?Breeding records.—No positively identified nests are on record. On May 17, 1949, I watched a Swainson's Warbler carrying nesting material in western Fulton County but could not find the nest. On May 25, 1949, in dense, swampy forest at Bayou du Chien near Moscow, Hickman County, I found an empty nest that I think was made by this species. It was 5 feet up in the fork of a slender, deciduous shrub, a bulky structure containing many leaves in its exterior and lined with grasses and rootlets. It was found just after I had taken a singing male Swainson's Warbler in a thicket about 30 yards away. On June 3 the nest contained one almost pure white egg, but was afterwards abandoned. On June 10, I collected the egg (B.L.M.). It is unlikely but possible that the nest belonged to an Indigo Bunting. No Indigo Buntings were seen within 500 yards of the nest during the period, however, and the deeply shaded forest habitat seemed unsuited to that species.

Breeding distribution.—See Fig. 33. Contrary to earlier indications, it appears that the Swainson's Warbler is fairly common in much of the lowland alluvial forest near the Mississippi River and the extreme lower Ohio River, where in 1949 I took 4 specimens (all singing males with much enlarged testes) in three counties (B.L.M.; U.M.M.Z.). I recorded pairs and singing males in the following places: at "Kentucky Bend" of the Mississippi River in extreme western Fulton County, May 17–20 (at least 3 pairs with contiguous territories); in swampy woods along Bayou du Chien, near Moscow, Hickman County, May 25–June 10 (2 pairs); and in heavy bottom land forest at Swan Lake near Wickliffe, Ballard County, June 8 (2 pairs)—and 1 bird recorded July 19, 1951 (singing male, in isolated willow-cottonwood thicket near highway). The species also occurs in deep forest around Reelfoot Lake, Tennessee, where Goodpaster took a female (Lake County, Tennessee, about 2 miles south of Fulton County, Kentucky, line) on June 7, 1940 (C.M.N.H.).

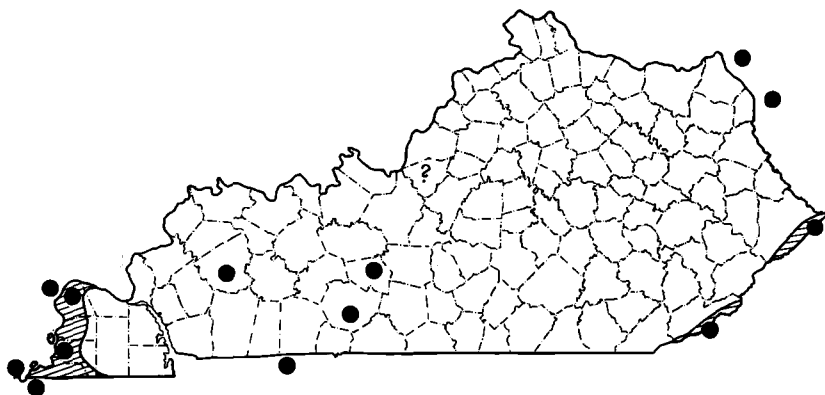


Fig. 33. Breeding distribution of the Swainson's Warbler in Kentucky and vicinity. In hatched areas distribution probably approaches continuity in suitable habitats; the dark circles represent reliable records; the question mark, a questionable record.

Vague early reference to the species in this general area was made by Pindar (1889*b*:315; 1923*b*:163; 1925*a*:166), who gave two definite dates of supposed observation (Fulton County)—August 29, 1887, and April 28, 1890—and considered the species very rare. For years I failed to find it in western Kentucky, having searched too late (song becomes much less frequent around the end of June) and in areas much too swampy (principally in cypress forest). All that I have recorded subsequently have been in or near mature, lowland forests, subject to periodic flooding but usually dry. At "Kentucky Bend" mentioned above:

The area was fairly dry, heavily grown up with ash, maple [red maple, box elder], cottonwood [and sycamore] . . . and with a wealth of grape, poison ivy, and *Va.* creeper,—very shaded, with dense herbaceous undergrowth [field notes, May 17, 1949].

The Hickman County forest was rather wetter, more open, with a high percentage of cottonwood, and with a fringe of willows adjoining a nearby slough of Bayou du Chien. The Ballard County locality was much like the first described. Only in the last was there any appreciable growth of the cane (*Arundinaria gigantea*) sometimes mentioned as a requirement of the species in this area. Other ground-inhabiting or low-nesting parulids found in the Swainson's territories were: Hooded and Prothonotary (few) warblers in all; Kentucky Warblers in the first and third, and transient Connecticut Warblers in the first. Descriptions of habitats in adjacent regions were given by Widmann (1895:115–116) for Dunklin County, Missouri, and Clebsch *et al.* (1941) for various Tennessee localities.

Farther east, where rich alluvial forest is more scattered and less extensive, the species seems to be sparsely distributed. In Logan County, along Wolf Lick, where there is much cane, and where from 1903 to 1905 George C. Embury found numbers of Bachman's Warblers, Ganier, Alfred Clebsch, and I searched for Swainson's Warblers on May 9, 10, and 12, 1949, but without success. The Swainson's occurs, however, eastward at least to Warren County. Here Wilson (1947*a*; 1948*a*:55; 1958*a*) has several times recorded singing males in wet woods at Chaney Lake, where I also found 1 on May 4, 1949. The woodland at Chaney Lake is a rather mature growth of oaks, hickories, and maples, subject to periodic flooding, and is rather like the Hickman County locality. There is little or no cane. The northernmost records for western Kentucky are from the Western Highlands, in Hopkins County, where Hancock (1949; 1951*b*:41) recorded singing males, 1948–1951, in the swamp and lowland forests along Pond River and Clear Creek, and at Mammoth

Cave, where Wilson (1958b:58) noted a singing male along Mill Creek on August 14, 1958. I visited the Pond River site with Hancock in July, 1952, and found it much like the more western habitats, except that there were extensive growths of cane, which he said the warblers favored. Subsequently, Hancock (1958a:44) has noted the species also in upland oak-hickory growth, May 9, 1958. Further search will probably reveal Swainson's Warbler in the Ohio River lowlands, upstream at least to Henderson County, since in Illinois the species has been reported well north of this point along the Wabash River (Ridgway, 1878:163).

From the highlands of eastern Kentucky, not far from areas occupied by the species in West Virginia and elsewhere in the Appalachians (see Brooks and Legg, 1942:76-77), this warbler was first noted by Breiding (1944; 1947:39), in rhododendron tangles low on Black Mountain, Harlan County, on July 5 and 6, 1944.

Near Elkhorn City, on the line between Dickinson County, Virginia, and Pike County, I discovered 2 singing males, June 24-26, 1951, and took 1 on the last date. The birds had territories about 300 yards apart and separated by two low ridges, at an elevation of approximately 2,200 feet.

Each territory consists of a glade, bordering a tiny creek edged with sphagnum and sedge, with heavy growth of *Rhododendron* [*R. catawbiense*] along the creek (in one), and small deciduous growth along the other; the territories extend up the wooded (hemlock, beech, tulip, oak) sides and heads of the little valleys as far up as the *Rhododendron* is dense. About half way up the slope the *Rhododendron* gives way to *Kalmia* and the territories end. One bird ranged over an area 150 to 200 yards long and 75 yards wide, the other over a slightly smaller area [field notes, June 24-26, 1951].

The possibility that Swainson's Warbler occurs also in extreme northeastern Kentucky is strongly suggested by records made near Huntington, West Virginia (Seeber and Edeburn, 1952; unpagged, species no. 218), and Lawrence County, Ohio (Green, 1947), both areas but a few miles from Boyd and Greenup counties, Kentucky. Near here Maslowski and Goodpaster (verbal com., 1950) saw what they thought was a Swainson's Warbler along Kinniconick River in Lewis County in the late 1930's, but they failed to secure it.

Much has been learned about the distribution of Swainson's Warbler since it first began to be realized, in the late 1930's that a species supposedly restricted to southern swamp lands possessed as well an extensive population in the mountain forests of the Appalachians. Whatever the origins and affinities of this mountain population may be, it seems probable that the apparent present-day discontinuity in the distribution of the species in Kentucky is real rather than illusory. Between 1939 and 1952, in any event, my repeated searches for the species in much seemingly suitable habitat in eastern Kentucky west of the Cumberland Mountains met with no success, and considerable work by numerous observers has disclosed no evidence of a continuous population in most of central Kentucky. The only records from localities at all intermediate are those of Carpenter (1937a), who reported 1 bird seen in Bullitt County on June 27, 1937 (I long doubted this record, but now must concede that it may be valid), and Wilson (1958b), at Mammoth Cave as noted above, and these may well represent outlying members of the western population.

Fall.—No late dates from Kentucky are available. Ammann (1939) took an immature female (U.S.B.S.) on the point of land south of Cairo, Illinois, on September 1, 1938, only a mile or two from the Ballard County locality mentioned above. A Swainson's Warbler was killed at Knoxville, Tennessee, in the "ceiometer accident" of October 7-8, 1951, reported by Howell and Tanner (1951).

Geographic variation.—The mountain population has been separated by Meanley and Bond (1950) under the name *L. s. alta*, but I have not seen enough specimens to judge the validity of this proposed subspecies. My one specimen from Pike County is more nearly white below than my western birds, as *alta* is supposed to be. The species is here regarded, as it is by the A.O.U. Check-List (1957), as monotypic.

Specimens examined.—Total, from Kentucky, 5. B.L.M.—1 male (weight 13.3 gm., not fat), Fulton County (May 17); U.M.M.Z. (4)—1 male (16.2 gm., not fat), Pike County

(June 26) ; 1 male, Ballard County (June 8) ; 1 male, Hickman County (May 25) ; 1 male, Fulton County (May 19). Barely extralimital specimens, 2. C.M.N.H.—1 female, Lake County, Tennessee (June 7) ; U.S.B.S.—1 immature female, Alexander County, Illinois (Sept. 1).

Helmitheros vermivorus (Gmelin) : WORM-EATING WARBLER

Status.—Summer resident; common at lower elevations in the Cumberland Mountains and throughout the Cumberland Plateau; west of the Cumberland Plateau nearly restricted to the Knobs and Western Highlands, being increasingly more local and less numerous westward.

Spring.—Time of arrival not well known; probably in mid-April. Available early records are for the last 10 days of April. In Nelson County, Blincoe (1925:415) took a specimen on April 24, 1921. Monroe and others have spring records for the Louisville area, April 21–25, and April 28–30. In 1949, I recorded the first singing bird in Wolfe County on April 23. I cannot accept without reservation Wilson's (1922:240) very early date of April 3 (year not given) for Warren County.

Breeding records.—Seven dated observations indicate clutches completed from May 1–10 to June 11–20. In the Western Highlands, Hancock (1937) found a nest in Hopkins County, 10 miles west of Madisonville, on May 11, 1935 (Bacon coll.). It contained 3 fresh eggs. On May 30, 1951, in the same woodland, Hancock (1951*b*) found another nest, containing 4 young ready to leave. This site, which I saw in July, 1952, is on the steep side of a moist ravine containing many red maples and incised in a slope supporting a fairly open woodland of oaks, hickories, persimmon, sweet gum, and black walnut. Also in the Western Highlands, Hibbard (1935) noted young able to fly being fed near Ugly Creek, close to Mammoth Cave, Edmonson County, on July 10, 1934. On June 9, 1951, Wiegand (1951) and others found a nest containing 3 eggs in Bernheim Forest Reservation near Shepherdsville, Bullitt County, in the Knobs. This nest was "about fifteen feet up the rather steep bank of the creek at the edge of a small ravine . . . snugly imbedded in . . . fallen oak leaves." Small young were present on June 17 and the nest was empty on June 30. The nest was flimsily constructed of decayed leaves, lined with sporophytes of mosses, pine needles, and hair (Lovell, ed. note in Wiegand, 1951). On the Cumberland Plateau, in Rowan County, a fourth nest, containing 5 eggs, was found by Donald E. Howard on June 3, 1955 (Barbour, 1955:55), and contained 5 young on June 9. It was situated in heavy, presumably mixed mesophytic, forest. In Breathitt County, likewise on the Plateau, Barbour (1956:8) noted young just out of the nest on June 15, 1955. In Clermont County, Ohio, Goodpaster (1941:28) found young being fed on July 20, 1940, in a locality where Maslowski and I had taken an adult and young just from the nest on July 12. I took young already in first autumn plumage in Pike County on June 26, 1951, Laurel County on July 6, 1946, and Powell County on June 28, 1948.

Breeding distribution.—In the past this obscurely marked, inconspicuous species has been known to comparatively few observers, and the literature does not prepare one for its abundance in some areas. In fact, except in extensively cleared areas, no steep-sided ravine or deeply shaded slope in eastern Kentucky seems to be without a pair of Worm-eating Warblers. In singing-male counts conducted in Pike County forests in June, 1951, I found the species second in numbers only to the Hooded Warbler, the indicated population being approximately 22 singing males per 100 acres. The density is probably similar in many other areas, where the liquid, whisper-like song issues with monotonous regularity from every suitable habitat. At various times, 1946 to 1952, I found the species common in the rugged area including Powell, Wolfe, Menifee, Morgan, Estill, and eastern Clark counties and, farther south, in the region covered by parts of Rockcastle, Laurel, Pulaski, Whitley, and McCreary counties (all along the Pottsville Escarpment, or Cliff Section of the Cumberland Plateau; see notes on pp. 41–43). On Black Mountain, Harlan County, the species is fairly common, occurring, at least on southerly slopes,

as high as 3,600 feet, at which altitude I recorded several, May to July, 1951 and 1952. It is numerous also on Pine Mountain and elsewhere in the Cumberlands. Several reports contribute additional locality records from eastern Kentucky (Howell, 1910:298; Stone, 1921; Patten, 1937:19, 1946:32; Kozee, 1940:32; Barbour, 1941a:47, 1951a:37; 1956:8).

Typical habitat in eastern Kentucky is characterized by moistness, deep shade, and slope varying in pitch from gentle to almost vertical. The vegetation of habitats meeting these requirements is variable, including well-developed mixed mesophytic associations, mature secondary slope forests, and, in ravines, dense, dark stands of pure hemlock with a jungle-like understory of *Rhododendron maximum*. Less typically, the species occurs in relatively xerophytic subclimaxes and physiographic climaxes such as oak-hickory and oak-chestnut, especially where there is an understory of *Kalmia*.

The species is decidedly less numerous and more locally distributed west of the Cumberland Plateau, being fairly common or common only in parts of the Western Highlands and possibly the Knobs. It has been reported, however, at least sparingly, from every major physiographic subdivision of the state: from the Bluegrass, where it is certainly very rare, by Van Arsdall (1949:27, one record only for Mercer County, June 5, 1948); from localities in or adjoining the Knobs by Blincoe (1921; 1925:415), Wiegand (1951), and Lovell (1949b:69); from the Western Highlands by Hancock (1937; 1951b; 1954:42), Hibbard (1935), Bailey (1933:161), Howell (1910:298), and Wilson (1946:19; 1950:24); from the Pennyroyal by Embody (1905); and from the Purchase [?] by Pindar (1889b:315; 1925a:166), who regarded it as a "rare summer habitant" in Fulton County. On June 18, 1949, I recorded a singing male in a well-wooded ravine just below the Dripping Springs Escarpment in northwestern Warren County. Cypert (Refuge files) had two records of singing birds for Kentucky Woodlands National Wildlife Refuge, between the Cumberland and Tennessee rivers (April 28, May 3, 1940). In Clermont County, Ohio, just outside of the Bluegrass, the species is locally common in beech-maple woodlands (Goodpaster, 1941:28, and notes). In the immediate vicinity of Louisville it has not been recorded in the breeding season, despite considerable search.

All detailed descriptions of habitats in the physiographically and edaphically diverse areas west of the Cumberland Plateau refer to comparatively moist, shady ravines and slopes, and it seems evident that the species is here limited to the most mesic habitats available. It consequently is most numerous in those parts of the Western Highlands and Knobs that support mixed mesophytic forests of composition and extent suggesting those of the Cumberland Plateau, and is least numerous in the Bluegrass, Pennyroyal, and Purchase, where true mixed mesophytic forests are all but absent.

Fall.—Few records. Wetmore (1940:556) recorded a specimen taken at 2,000 feet on Log Mountain, Bell County, on September 27, 1938 (U.S.N.M.). Several records are provided by a series of specimens taken by Beckham in Nelson County between August 4 and October 10, 1886. Tordoff and I recorded 1 bird in alluvial forest near Henderson on September 9, 1949. It is not certain that all of the above records represent transients. Monroe's latest record for the Louisville area is for October 6 (1957). On the remarkably late date of November 1 (1945), Maslowski and Goodpaster (notes) caught a Worm-eating Warbler at night, with a dip-net, while they were collecting invertebrates on the Ohio River bank opposite Campbell County, Kentucky.

Specimens examined.—Total, 23. M.S.C.—2 males, Rowan County (April 26, May 10); R.W.B.—1 male, 1 female, 1 unsexed, Harlan County (Aug. 5; July 25; Aug. 2); C.W.B.—1 male, 6 females, Nelson County (Sept. 19; no date, Aug. 4, Sept. 3, 7, 19, Oct. 10); B.L.M.—1 male, Laurel County (July 6); C.U.—1 male, 1 female, Logan County (May 26; April 21); U.S.N.M.—1 immature male, Bell County (Sept. 27); U.M.M.Z.—2 males (1 skin; 1 skeletonized, weight 13.4 gm.), 2 females (1 skin; 1 immature, skeletonized, weight 12.8 gm.), Pike County (June 25, 26; June 25, 26); 2 males (12.3 gm., 13.4 gm.), 1 female, Powell County (June 24, 25; June 28).

Vermivora chrysoptera (Linnaeus): GOLDEN-WINGED WARBLER

Status.—Rare to uncommon transient; very rare summer resident in parts of the Cumberland Mountains, and possibly on the Cumberland Plateau.

Spring.—Seldom recorded, the species is probably somewhat more numerous than the data suggest. It has been reported from a number of localities on dates from April 17 (1960), to May 20 (1948), both extremes being from Louisville (Monroe). There Monroe noted 10 birds on May 12, 1948, an unusual number for a single day. Other records, exclusive of those appearing in trivial lists in *The Kentucky Warbler*, are from near Cincinnati, Ohio (Maslowski and Dury, 1931:92; Kemsies, 1948a:43), and from Rowan County (Barbour, 1952:27), Martin County (Green, 1957:56), Nelson County (Beckham, 1885:14), and Warren County (Wilson, 1939b:32). I took a female (U.M.M.Z.) in a swamp forest in northern Logan County on May 12, 1948.

Breeding distribution.—There are no definite breeding records. A small summering population persists in shrub-dotted meadows near the summit of Black Mountain, Harlan County (elevation 4,150 feet), where the birds were first recorded by Breiding (1947:39) in July, 1944. Monroe, Jr. (notes) recorded 2 singing males there on June 6, 1951, but from June 28 to July 10 that year I was unable to find them. On May 22 and 23, 1952, I found 2 singing males within one-half mile of the summit, and took 1 which had greatly enlarged testes on the latter date. The remaining bird was still singing on a well-defined territory on May 30.

I have long suspected the species of breeding also at lower elevations to the westward, on the Cumberland Plateau where Ganier (verbal com.) has found it breeding in northern Tennessee. This suspicion was strengthened when I collected a male hybrid ("Brewster's Warbler") in breeding condition in Laurel County on June 15, 1952 (see *V. chrysoptera* × *V. pinus*). Possibly occasional pairs, or individuals mated to Blue-winged Warblers, nest elsewhere in the state; Hancock (1947) recorded a singing male Golden-wing in Hopkins County, June 10–12, 1946, in dry brushy habitat associated in this area with the Blue-winged Warbler. A specimen taken near Cincinnati, Ohio, by Charles Dury on August 1, 1879 (Maslowski and R. Dury, 1931:92) may possibly have been a breeding bird.

Fall.—Although records are few, those available suggest that the species is a little more numerous than in spring. Extreme records at hand are for August 27 and October 6, with a few observations falling between. Probably the peak of migration is in the first half of September. A very late sight record, for November 14, 1887, in Fulton County (Pindar, 1889b:315) is open to question without further evidence. Monroe's few records at Louisville fall between August 27 and September 23; in nearby Oldham County, 1 was seen by Brecher (1937) on September 19, 1935. On September 8 and 9, 1949, Tordoff found 3 or 4 daily in scrubby upland thickets near Henderson, taking 2 males and a female (U.M.M.Z.), while I recorded none in nearby lowland forest. I took a male (U.M.M.Z.) at Glenview, Jefferson County, on September 15, 1950. The species was noted in Whitley County, October 5–6, 1946 (Wilson and Browning, 1946).

Specimens examined.—Total, 13. C.W.B.—2 males, 3 females, Nelson County (May 11, Sept. 11; Sept. 11, 13, 17); B.L.M.—1 male, Jefferson County (May 5); J.D.F.—1 immature female, Marshall County (Aug. 30); U.M.M.Z.—1 male (weight, 8.8 gm., not fat), Harlan County (May 23); 1 immature male (9.7 gm., very fat), Jefferson County (Sept. 15); 2 immature males (8.9 gm., moderately fat; 9.5 gm., not fat), 1 adult female (9.2 gm., moderately fat), Henderson County (Sept. 8, 9; Sept. 8); 1 female (10.5 gm., very fat), Logan County (May 12).

Vermivora pinus (Linnaeus): BLUE-WINGED WARBLER

Status.—Rare to fairly common summer resident, locally distributed; fairly common transient.

Spring.—Blue-winged Warblers sometimes appear in early April; average arrival

probably near mid-April, possibly somewhat later in northern Kentucky. Early records: April 10 (1893), at Eubank, Pulaski County, average of 8 years April 14 (Cooke, 1904:34; 1904c:91); April 28 (1936), at Cincinnati, Ohio (Goodpaster, 1941:28); April 10 (1882), in Nelson County (Beckham, 1882:93); April 20 (1957), at Louisville (Monroe); April 19, in Warren County (Wilson, 1922:240); April 8 (1948), in Hopkins County (Hancock, *cf. Kentucky Warbler*, 24:48, 1948). In 1950, Handley and I found singing males at the swampy margins of old fields and oak-hickory forest in Lyon County on April 11 (3) and 12 (2); a male (U.M.M.Z.) had much enlarged testes. Judging from records made in areas where few summer, the peak of migration occurs in late April or early May. On April 23, 1949, I took a male (testes moderately enlarged) in pines on a ridge in Powell County (U.M.M.Z.). It was probably a transient.

Breeding records.—Few. Egg laying is probably most frequent in May. Barbour (1950a:34, and verbal com.) found a nest containing 5 eggs at Rodburn, Rowan County, in May, 1938. On May 9, 1937, I participated, with Monroe, Ganier, and others, in the discovery of a nest containing 5 fresh eggs north of Nashville, Tennessee, and about 18 miles south of the Kentucky line (Monroe, 1937, and notes). Barbour (1955:56) noted adults carrying food in Rowan County on June 5, 1955; young just out of the nest were noted by Wilson (1940b) at Ugly Creek, Warren County, on June 23, 1940, and by Hancock (1954:42) in Hopkins County on June 1, 1953.

Breeding distribution.—Essentially statewide. The Blue-winged Warbler is rather inconspicuous and probably often overlooked, although it can readily be found, especially in early morning or late evening, by anyone familiar with its insect-like song. In Kentucky the species prefers dry, weedy and brushy hillsides, and scrubby woodland, habitats quite unlike the bogs and marshy situations preferred farther north. Nowhere really common, it has nevertheless been recorded from all major divisions of the state, from Rowan County (Barbour, 1951a:37) west to the Purchase (see Wilson, 1942:23, brief survey). Typical habitat in the Mammoth Cave area was briefly described by Wilson (1947b:61–62), and a breeding territory in the Knobs of Bullitt County by Stamm (1952a). In May, 1949, I recorded males singing, apparently on territories, in typical habitats in northern Warren and Logan counties. Records for the Bluegrass are few: in 1950, in the so-called "hills of the Bluegrass," I found 5 or 6 males singing on a scrubby hillside grown up with locust, red oak, walnut, and elm reproduction in the Kentucky River Valley near Worthville, Owen County, on July 5 and 6, and 2 on July 7 in a similar area at Bigbone, Boone County. The great enlargement of testes of a male (U.M.M.Z.) taken on the last date suggests that breeding activities were still in progress.

Fall.—Little information is available. The migration period is apparently much the same as that of the Golden-winged Warbler, late August to late September. Langdon's (1879:171) latest date for Cincinnati was September 10. At Louisville, in the immediate vicinity of which the species has not been recorded summering, Monroe and I have records for various dates from August 21 to September 30 (1938). Wilson (1922:240) listed fall observations at Bowling Green as September 25–October 5.

Specimens examined.—Total, 22. M.S.C.—2 males, Rowan County (May 14, 19); C.W.B.—10 specimens from Nelson County, April 10–Sept. 21 (4 April, 1 May, 4 July, 1 Sept.); B.L.M.—3 males, Jefferson County (May 1, 4, Aug. 21); C.U.—3 males, Logan County (April 19, May 1, 20); U.M.M.Z.—1 male (weight, 8.3 gm., moderately fat), Powell County (April 23); 1 male (8.9 gm., not fat), Boone County (July 7); 1 male (8.2 gm., not fat), Warren County (May 8); 1 male (8.4 gm., not fat), Lyon County (April 11).

Vermivora chrysoptera (Linnaeus) × *Vermivora pinus* (Linnaeus)

Records.—All hybrids from this cross so far recorded from Kentucky are of the "Brewster's Warbler" type originally called *Helminthophaga leucobronchialis* Brewster. Monroe, Jr. (1952), took single specimens (B.L.M.) at Anchorage,

Jefferson County, on May 1, 1947, and April 24, 1952, and saw another on May 10, 1947. Others were seen in Jefferson County on April 29, 1940 (Carpenter, 1941), and April 20, 1957 (Brecher, *vide* Monroe), and 1 was noted in Martin County on May 5 or 6, 1957 (Green, 1957:56).

In Laurel County, about 12 miles southwest of London, I secured a singing male (U.M.M.Z.) on June 15, 1952, in a moist, brushy clearing traversed by a small brook on pine- and oak-covered uplands at an elevation of approximately 1,100 feet. It was singing a song typical of the Golden-winged Warbler and was presumably the bird heard in the clearing on three previous days. I was unable to find the bird's nest or mate, if any; its testes were much enlarged. So far as I know the most southerly summer records of "Brewster's Warbler" previously published are from West Virginia (Brooks, 1940:260).

A female Golden-winged Warbler (J.D.F.) taken in Marshall County by Figgins on August 30, 1941, and a female taken by Beckham in Nelson County on September 11, 1886 (C.W.B.), are heavily suffused with yellow above and below and may be heterozygous for one or more genes (see Parkes, 1951:11-12). Neither specimen, however, is of the "pure recessive" hybrid type called "Lawrence's Warbler" and first known as *Helminthophaga lawrencei* Herrick.

Specimens examined.—Total, 3. B.L.M.—1 male, 1 female, Jefferson County (April 24; May 1); U.M.M.Z.—1 male (weight, 8.4 gm.), Laurel County (June 15).

Vermivora bachmanii (Audubon): BACHMAN'S WARBLER

Status.—Casual summer resident, once recorded (1906) breeding in Logan County, southwestern Kentucky.

Records.—The only satisfactory records were made by George C. Embody (1907), who in 1905 recorded 2 singing Bachman's Warblers feeding in upland woods 10 miles northeast of Russellville, Logan County, on April 26. In 1906, between May 14 and 22, he took 5 specimens (C.U.; see also Mengel, 1948:52) at two points in swampy forest along Wolf Lick, about 12 miles north of Russellville, and on May 14 found a nest containing 3 fresh eggs. The nest, Embody wrote, "was woven into a tangle of cane [*Arundinaria gigantea*] and blackberry branches about two feet from a slightly elevated bit of ground within a few feet of a pool of stagnant water," and was "lined with a few hairs and some dark colored fibers, resembling tendrils, and covered with several layers of dried leaves held firmly in place by interwoven grasses and rootlets." Embody counted 14 singing males in one locality and 8 in another. Many years later, Ganier, Alfred Clebsch, Dr. Leroy Herndon, and I made a systematic search of the same swamps, May 9-12, 1949, but failed to find the species. In 1949, the areas agreed well with Embody's description, and some error must account for Peterson's statement (1948:181) that the locality where Embody's birds were found is now a corn field.

Remarks.—It seems improbable to me that this mysterious species will not again be discovered in Kentucky. Neither is it unlikely that some authentic basis underlies a few other records in the literature, all of which, however, are unsatisfactory. Wilson (1922:243) tentatively listed the species in Warren County (adjacent to Logan County), and noted several near Mammoth Cave, in Edmonson County, the dates of observation being given by both Funkhouser (1925:273) and Bailey (1933:161-162) as May 10, 1918, and May 11, 1918, respectively. Wilson himself (1940c:41), however, subsequently expressed doubt about these records. Pindar (1923:115) reported a Bachman's Warbler picked up dead at Versailles, Woodford County, on May 12, 1923, "in rather bad condition, but sufficiently well preserved to make identification accurately." The specimen, unfortunately, seems not to have been saved for the benefit of other opinions. If a Bachman's Warbler, it would, I think, provide the northernmost record of the species in the United States.

Specimens examined.—Total, 5. C.U.—3 males, 2 females, Logan County (May 14-22, 1906).

Vermivora peregrina (Wilson): TENNESSEE WARBLER

Status.—Transient; fairly common to common in spring, common to abundant in fall.

Spring.—Early and late records are scarce; main flight probably near May 10. Monroe's records made near Louisville range from April 20 (1957 and 1958) to May 26. In Warren County, Wilson (1922:240) had records from April 19 to May 10. In extreme eastern Kentucky I recorded a few singing birds at high altitudes (up to 4,000 feet) on Black Mountain, Harlan County, May 13–17, 1952. Many other records from all parts of the state fall well within the extremes cited above. The Tennessee Warbler is primarily a forest species, especially in spring, and tends to be high-ranging. The loud, monotonous song is often the best indication of its presence.

Fall.—Considerably more numerous than in spring. At the peak of fall migration, from early to middle September, the species is one of the most numerous warblers. The migration starts early, in late August or before, and continues late, the birds gradually becoming less numerous through October. Late in the season, Tennessee Warblers are often seen feeding low in brushy fields and similar situations. Early records are scarce. I took specimens (B.L.M.) in Jefferson and Oldham counties on August 21 and 30, 1942. Other records from this area range from September 6 onward (Monroe). Wilson's records from Bowling Green (1922:240) fall between September 7 and October 24. Late records: November 6 (1886), in Nelson County (specimen, C.W.B.); November 2 and 3 in 1946 (Monroe; 3 on November 2), and November 1, 2, and 4, in 1957 (Croft, 1958a:46), at Louisville; October 26 (1938), in Muhlenberg County (Wetmore, 1940:556).

Specimens examined.—Total, 40. M.S.C.—1 male, Rowan County (Sept. 24); U.K.—3 unsexed, Fayette County (Sept. 24, Oct. 5, 7); C.W.B.—1 male, 1 unsexed, Nelson County (May 7; Nov. 6); B.L.M.—4 males, Jefferson County (April 28, Aug. 21, Sept. 7, 12); 1 unsexed, Oldham County (Aug. 30); J.D.F.—1 female, 3 unsexed, Marshall County (Sept. 16; Sept. 12, 12, 22); U.S.N.M. (see Wetmore, 1940:556)—11 specimens from Bell, Nelson, Muhlenberg, and Union counties (May 6–Oct. 26); U.M.M.Z.—1 immature female (weight, 11.2 gm., very fat), 1 unsexed immature (12.9 gm., extremely fat), Laurel County (Oct. 9; Oct. 6); 1 female, Campbell County (Sept. 10); 2 males (10.8 gm., 9.8 gm., moderately fat), Meade County (Oct. 20, 21); 1 male (9.1 gm., not fat), Logan County (May 12); 3 males (adults; 9.6 and 10.4 gm., moderately fat; immature, 8.2 gm., not fat), 5 immature females (8.1 and 8.7 gm., moderately fat; 7.9, 9.5, and 7.5 gm., not fat), Henderson County (Sept. 4, 9, 9; Sept. 7 (4), 8).

Vermivora celata (Say): ORANGE-CROWNED WARBLER

Status.—Little known; apparently a very rare transient, but perhaps overlooked to some extent.

Spring.—A male (C.M.N.H.) taken near Cincinnati, in Hamilton County, Ohio, is dated April 27, 1887, and was so reported by Maslowski and R. Dury (1931:92) and Goodpaster (1941:28). This is presumably the specimen referred to by C. Dury (1887:96) and C. Dury and Kellogg (1891:43), who respectively gave the date as April 29 and April 28 (?1878). No specimens have been taken in Kentucky in spring, and definite, dated records are few. At Glasgow, Barren County, on April 29, 1944, 1 was recorded by Wilson (1944b; see also *Kentucky Warbler*, 21:6, 1945). At Louisville, Monroe has sight records for May 15–19; other references to the species lack detail (see Beckham, 1885:14; Wilson, 1946:23, and occasional trivial lists in *The Kentucky Warbler*). It is probably more numerous than the few records indicate, being obscure both in plumage and song.

Fall.—Very few records. At Morehead, Rowan County, an unsexed, apparently immature bird was taken on October 8, 1937, by Barbour, preserved by W. A. Welter (M.S.C.), and entered in the catalog of the bird collection at Morehead State College as a Nashville Warbler, an error subsequently corrected by Barbour (1952:27). On October 12, 1952, Monroe obtained an immature male (B.L.M.)

taken at Louisville (see Stamm, 1956a:27), and Stamm (*loc. cit.*) noted a bird in a banding trap at Louisville on October 22, 1955, with another banded there on October 21, 1957 (Stamm, *vide* Monroe). There is a further sight record for Louisville (Croft, *vide* Monroe), for November 1-2, 1957. The only additional record I have noted is Pindar's (1925a:166) vague one for Fulton County. Although the species is fairly common at times in the lake states to the north, and numerous in eastern Kansas, it seems not to be so in Kentucky. Perhaps mostly too early, I continually searched for it during intensive field work in September and October, 1948-1951, and sporadically at other times, and have critically examined many Tennessee Warblers without obtaining a single record. Four specimens were reported among many birds killed at an airport ceilometer at Knoxville, Tennessee, October 7-8, 1951 (Howell and Tanner, 1951:62), and Dury and Kellogg (1891:43) reported 1 taken at Cincinnati on September 20 (1890?).

Geographic variation.—The two specimens are referable to the eastern *Vermivora celata celata* (Say), the subspecies to be expected in Kentucky.

Specimens examined.—Total, 2. M.S.C.—1 unsexed, Rowan County (Oct. 8); B.L.M.—1 immature male, Jefferson County (Oct. 12).

Vermivora ruficapilla (Wilson): NASHVILLE WARBLER

Status.—Fairly common to common transient.

Spring.—Most records are made between late April and late May. The main flight probably passes in early May, when the species is sometimes very numerous. There are numerous records for all parts of the state, but most early and late dates are probably not representative of true arrival and departure. Monroe's records at Louisville range from April 16 (1960) to May 26. One bird was recorded in Oldham County on June 1, 1952 (Stamm, Shackleton, and Slack, 1953:28). Most transient Nashville Warblers are seen in open woodland, forest edges, and groves of shade trees.

Fall.—I secured an immature male (B.L.M.) at Louisville on August 27, 1942. Transients usually appear in early September, with the main flight near mid-September; rare by early October. Monroe's latest record at Louisville is for October 30 (1952); Wilson (1922:240) gave extreme records in Warren County as August 31 and October 1. Late in the season the species is sometimes seen feeding near the ground in brushy and weedy fields.

Geographic variation.—The form occurring in Kentucky is the eastern subspecies, *Vermivora ruficapilla ruficapilla* (Wilson).

Specimens examined.—Total, 14. U.K.—1 female, Woodford County (May 6); C.W.B.—4 males, 2 females, Nelson County (May 2, 2, 5, 11; May 5, Sept. 16); B.L.M.—2 males, Jefferson County (May 2, Aug. 27); C.U.—1 male, Logan County (April 28); J.D.F.—1 female, Jessamine County (May 4); U.S.N.M. (see Wetmore, 1940:556)—1 male, Nelson County (April 28); 1 male, Union County (May 11); U.M.M.Z.—1 immature female (weight, 9.8 gm., moderately fat), Jefferson County (Sept. 1).

Parula americana (Linnaeus): PARULA WARBLER

Status.—Summer resident, common in the Cumberland Mountains and Plateau and in lowlands of western Kentucky, less numerous and rather local in the Western Highlands, very rare or absent elsewhere; rare transient throughout Kentucky.

Spring.—The time of arrival of the Parula Warbler is not well known, but is evidently rather early. For an eastern Kentucky locality, Eubank, Pulaski County, Cooke (1904:48) gave the average date of arrival for 8 years as April 9, extremes being April 4 (1892) and April 14 (1887). In 1949, after several days in the field in Powell and Wolfe counties, I noted the first birds, singing, on April 23. In all of the above localities the species summers in numbers. Arrival dates of the more western valley birds in Kentucky are nearly lacking (April 10, in Nelson County—Beckham, 1882), but in southern Indiana Ridgway (1882:16) noted arrival in

Knox County on April 18, 1881. In southern Illinois, J. W. Hardy (notes) has recorded Parula Warblers as early as March 31 (1954). At Louisville and Bowling Green, where the species is essentially absent in summer, it seems to be a rare transient. Monroe has only a few records for the former, April 21 (1957)–May 15 (1958), and Wilson (1922:240) regarded the species as rare in the latter, May 3–19. In 1949 and 1950, Edwards (notes) recorded several individuals near Lexington, May 10–June 5 (see below).

Breeding records.—Wilson (1947b:62) has twice seen young being fed in Mammoth Cave National Park, Edmonson County. In early June of 1925, Suthard noted a young bird able to fly being fed in lowlands in Hopkins County (Hancock, 1954:42). In eastern Kentucky Barbour (1956:8) noted adults carrying reindeer moss, presumably nesting material, in Breathitt County on June 13, 1955, and in Knott County Stamm (notes) saw young out of the nest being fed on July 4, 1960. Young still partly in juvenal plumage were taken by Beckham in Nelson County on July 19, 1886 (C.W.B.), and by Barbour in Harlan County on July 31, 1939 (R.W.B.). Although nests have been found on the Cumberland Plateau, in Tennessee, by Ganier (1923:28) and Spofford (1948b:13), none has as yet been found in Kentucky, where most evidence of breeding still resides in the constant presence and considerable abundance of the species in summer, with males singing on territories and those collected having greatly enlarged testes.

Breeding distribution.—The Parula Warbler is irregularly and interestingly distributed in Kentucky.

Although rare on the high ridges of the Cumberlands and apparently unrecorded above about 2,700 feet on Black Mountain, Harlan County, it is common at lower elevations, and more or less throughout the Cumberland Plateau, wherever there are extensive stands of mature forest. It is perhaps most numerous in mixed mesophytic climaxes in moist ravines and on steep slopes, often, but not always, in the vicinity of hemlocks. Near such areas it also occurs in willows, sycamores, and other disturbance growth along streams. In these regions usnea (a lichen) and possibly various mosses occur locally and are sometimes used as nesting material (see Ganier, 1923:28; Barbour, 1956:8), but there does not seem to be enough "moss" to accommodate by any means all of the warblers—certainly I have seen nothing like the pendant strands of usnea in northern bogs or tillandsia in the deep south, in which nests could actually be placed. I have recorded the Parula Warbler at many points on the Cumberland Plateau and in the lower mountains. While it is present in appreciable numbers at virtually all of the localities where the Black-throated Green Warbler (which see) is numerous, especially in the Cliff Section of the Plateau and again along Pine Mountain, unlike the Black-throated Green, the Parula seems also to be almost equally numerous in heavily forested portions of the intervening Low Hills Belt and Rugged Eastern Area (see pp. 39–48). Additional records for various eastern Kentucky localities have been reported by Howell (1910:298) and Barbour (*loc. cit.*), for Breathitt County; Murray (1938:3), for Letcher County; Lovell (1948), for Powell County; and Barbour (1951a:37), for Rowan County.

Far to the westward the species occurs regularly and in considerable numbers in alluvial lowlands and swamp forests, particularly about stands of large bald cypress. In such habitats I have often recorded singing males, in June and July, from Henderson County west along the Ohio River to the Purchase where, especially in the four western counties, the species is common. There is little, if any, moss in this area. I suspect that nests may be placed in masses of debris left well up in trees by flood waters.

The contrast between the areas described and the country intervening is striking. In most of central Kentucky the species is extremely rare or absent. It is, however, regular locally in small numbers at Mammoth Cave National Park, in the most rugged and, today, heavily forested portion of the Western Highlands. There, according to Wilson (1947b:62), it is found "only in tall timber where certain lichens grow, particularly tall oak timber [and is] never common." The habitats

here suggest somewhat those in eastern Kentucky, but a little farther west, near the edge of the same physiographic section, the Parula is rare and seems to inhabit lowlands (Hancock, 1954:42), as it does in the Purchase. In the Pennyroyal, Wilson (*loc. cit.*) had only a few records in Warren County and (1946:54) recorded one bird in Bowling Green in July "some years back." In the Knobs and Bluegrass the species is very rare at best. Near Louisville, at the outer edge of the Bluegrass, two of the very few definite recent records were made on June 18 and July 17, 1948, when I recorded a male singing on a steep slope, among aged, rotting maples and black walnuts, Kentucky coffee trees, and sassafras on an old estate at Glenview, Jefferson County. On June 5, 1949, Edwards (notes) recorded 2 along Buckhorn Creek in Fayette County.

The species may not always have been so rare in the Bluegrass as it is today, since Beckham (1885:14) considered it a common summer resident near Bardstown (where Blincoe [1925:420] found none in extended observations roughly 1911-1920), and Garman or some associate took a specimen (U.K.) 10 miles north of Lexington on June 16, 1882. It seems unlikely, however, that the Parula was ever so numerous in the comparatively xeric Bluegrass forests as it is in either the mixed mesophytic or true swamp forests.

Fall.—All birds of a series taken by Figgins (J.D.F.) in Marshall County, August 15-September 12, 1941, are either in molt or in fresh plumage. One, taken August 15, retains considerable juvenal plumage. They are probably local breeding birds. There are few records of transients from areas where the species is rare or absent in summer. A few late records are as follows: September 22 (1878), at Cincinnati, Ohio (specimen; Maslowski and Dury, 1931:92); September 22-October 5 (1886), in Nelson County (specimens, C.W.B.); September 18 and 19, 1938, in Jefferson County (Mengel, 1938c), and September 26 and October 1 (1948), in the same (Monroe). Tordoff and I recorded 1 at Henderson, where the species is fairly common in summer, on September 9, 1949.

Geographic variation.—The species is now regarded, I think correctly, as monotypic (see A.O.U. Check-List, 1957:485; and Parkes, 1954:165-166). Earlier use of trinomial names for the species in Kentucky chiefly involves *P. a. pusilla* (Wilson), or synonyms thereof, for the then-recognized northern subspecies.

Specimens examined.—Total, 26. R.W.B.—2 males, 2 females, Harlan County (July 25, 26; July 26, 31); U.K.—1 female, Fayette County (June 16, 1882); C.W.B.—4 males, 2 females, 1 unsexed, Nelson County (July 17, Sept. 22, Oct. 4, 5; July 19 [2]; Aug. 4); B.L.M.—1 male, 1 female, Laurel County (July 4; July 6); 1 male, Jefferson County (May 9); 1 male, Fulton County (June 28); Bacon Coll.—1 male, Hopkins County (July 25); J.D.F.—2 males, 1 female, 2 unsexed, Marshall County (Aug. 22, Sept. 3; Sept. 12; Aug. 15, Sept. 12); U.S.N.M. (see Wetmore, 1940:557)—1 male, Fulton County (May 31); U.M.M.Z.—2 males (weights, 7.9 gm. each, not fat, Powell County (June 22, July 3); 1 male (7.7 gm., not fat), Laurel County (July 8).

Dendroica petechia (Linnaeus): YELLOW WARBLER

Status.—Uncommon to common summer resident, seemingly more numerous in spring migration; little known in autumn.

Spring.—The Yellow Warbler is one of the earlier migrants among the wood warblers, recorded at least once in late March, rarely in early April; it arrives in numbers in mid-April or slightly later. Early records: March 28 (Barbour, 1951a:37) and April 1 (1933; specimen, M.S.C.), in Rowan County; April 12 (1889), in Pulaski County, average of 6 years April 16 (Cooke, 1904:55; 1905:33); April 16, in Nelson County (Blincoe, 1925:415); April 3, at Louisville (Monroe; next record, April 12, 1945); April 13, in Warren County (Wilson, 1922:240). Usually common everywhere in suitable habitat by April 20.

Breeding records.—Few. Egg-laying seems to occur mainly May 11-31. In Jefferson County, Monroe found 3 nests, each containing 4 eggs, 4 to 7 feet above ground in shrubs near stagnant sloughs in the Ohio River bottom lands, on May 17, 1939,

May 21, 1938, and June 2, 1935. I saw a female feeding 3 young nearly ready to leave a nest 20 feet up in a small willow beside Troublesome Creek at Stacy, Breathitt County, on June 20, 1951. Average complement of 4 clutches and broods, 3.8; average elevation of 4 nests, 10.1 feet. Murray (1938:3) noted adults carrying food near Blackey, Letcher County, on June 5, 1935, and Hancock (1954:42) noted young out of the nest being fed in Hopkins County on June 10, 1945. Barbour (1951a:37) referred to "nesting" in Rowan County on May 12. Stamm (notes) observed young out of the nest in Powell County on June 29, 1960, and nest construction in Jefferson County on May 7, 1950.

Breeding distribution.—Except for higher levels in the Cumberland Mountains, the species is present in summer, evidently breeding, throughout the state, as indicated by the breeding records above and by numerous summer observations from various localities. I have found the Yellow Warbler somewhat more numerous in eastern and central Kentucky than in the western lowlands. It prefers rather open areas, usually near water, and often grown up with willows, sycamores, birches, alders, and similar trees in various combinations. It is consequently most often found in riparian habitats or the rather similar semi-open situations afforded by orchards and well planted farmyards.

Fall.—Very little is known of the species after midsummer, when it ceases singing and becomes much less conspicuous, as indicated by several long-standing "late" records ranging from July 27 to August 25 (Blincoe, 1925:415; Wilson, 1922:240; Monroe, notes). Certainly the species appears to become very rare quite early, since in much early fall field work in several consecutive years I never saw a Yellow Warbler. Four were, however, listed as casualties at an airport ceilometer at Nashville, Tennessee, September 9–10, 1948 (Spofford, 1949:88). In Kentucky, a male (C.W.B.) from Nelson County is dated September 17, 1886 (relabelled), and the species was reported seen at Cumberland Falls, Whitley County, on October 5–6, 1946 (Wilson and Browning, 1946). More recently, Louisville area records have been made on September 26, 1954 (Croft, *vide* Monroe), and September 26, 1959 (Stamm, *vide* Monroe). These late birds may well be transients from farther north, and perhaps belong to subspecies other than the resident one.

Geographic variation.—All of the few specimens examined (most of which are probably breeding birds) are representatives of the eastern subspecies *Dendroica petechia aestiva* (Gmelin). Migrant specimens of other subspecies seem to occur with some frequency in adjoining eastern states and should eventually be taken in Kentucky.

Specimens examined.—Total, 11. M.S.C.—1 male, Rowan County (April 1); C.W.B.—2 males, 1 female, Nelson County (May 1, Sept. 17 [see under "Fall"]; April 26); B.L.M.—2 males, Jefferson County (May 2, 4); U.S.N.M. (see Wetmore, 1940:557)—1 female, Wayne County (June 9); 1 unsexed, Nelson County (April 23); U.M.M.Z.—1 male (weight, 10.1 gm., not fat), Powell County (June 23); 1 male (9.5 gm., not fat), Laurel County (April 30); 1 male, Warren County (May 6).

Dendroica magnolia (Wilson): MAGNOLIA WARBLER

Status.—Common transient.

Spring.—Occasionally recorded in mid-April; usually first noted in late April; peak of migration in early May; rare after mid-May. Representative extreme dates: April 22–May 24, in Rowan County (Barbour, 1952:27); May 6–29, in Nelson County (Blincoe, 1925:415); April 12 (1931), at Cincinnati, Ohio (Goodpaster, 1941:29); April 21–May 28 (1949), at Louisville (Monroe); April 19–May 17, in Warren County (Wilson, 1922:241). Recorded from points throughout the state by numerous observers, this species is often present in large numbers, frequenting many kinds of forested and wooded situations.

Fall.—Early arrivals appear in late August, and perhaps sometimes earlier, since I found the species fairly common near Louisville on August 21, 1942. The peak of migration occurs about September 5–15, with a few birds lingering well into

October. Representative extreme dates: September 5–October 3, in Nelson County (Blincoe, 1925:415); August 19 (1936)–November 1 (1936), at Cincinnati (Goodpaster, 1941:29); August 21 (1942)–October 17, at Louisville (Monroe, Mengel; next dates August 26–October 11). In the course of intensive field work in Laurel County, October 3–11, 1951, I noted the last on October 6. At the peak of the September warbler migration the Magnolia Warbler throngs in wooded areas, being, with the Tennessee, Blackburnian, and Bay-breasted, one of the four most numerous wood warblers. A high proportion of these transients consists of immature birds.

Specimens examined.—Total, 37. M.S.C.—2 males, 1 unsexed, Rowan County (May 14, 18; May 10); R.W.B.—1 male, Morgan County (Oct. 1); 1 male, Rowan County (Sept. 24); C.W.B.—many specimens (but here counting only 3 May, 4 Sept.), Nelson County; B.L.M.—1 male, Oldham County (Aug. 26); 3 males, 2 females, Jefferson County (May 19, Aug. 21, Sept. 27; May 14, Oct. 4); J.D.F.—1 male, Fayette County (May 28); 2 males, 8 females, 3 unsexed, Marshall County (Sept. 5, 20; Aug. 30, Sept. 1, 4, 8, 16, 19, 19, 26; Sept. 3, 4, 20); U.M.M.Z.—1 immature male (weight, 8.6 gm., moderately fat), Laurel County (Oct. 3); 1 immature male (9.4 gm., moderately fat), 1 immature female, Jefferson County (Sept. 1; Sept. 10); 2 immature females (9.0 gm., moderately fat; 8.8 gm., very fat), Henderson County (Sept. 5, 9).

Dendroica tigrina (Gmelin): CAPE MAY WARBLER

Status.—Transient; usually rare or uncommon; sometimes fairly common locally for short periods.

Spring.—A few have been recorded in late April; most of the small flight occurs in early May. The Cape May Warbler is definitely erratic in occurrence, and although in some years fair numbers may be seen at given stations, it seems never to be really common. Representative extreme dates: April 25–May 9, in Rowan County (Barbour, 1952:27); April 25 (1954)–May 20 (1946), at Louisville (Monroe); April 19–May 13, in Warren County (Wilson, 1922:240). Noted near Cincinnati, Ohio, as late as May 26 (1949), by Goodpaster (*vide* Kemsies and Randle, 1953:44). Records from additional localities, all within the extreme dates given above, have been recorded by several observers, including Loefer (1938) in Madison County, Mayer (1937) in Harrison County, and Beckham (1885:14) in Nelson County. In spring migration the Cape May Warbler is essentially a high-ranging forest species. In several seasons devoted in part to spring field work I recorded only 2, both males singing in tall oaks near London, Laurel County, on May 12, 1952.

Fall.—No more numerous than in spring, and perhaps less so, the species has been recorded, although infrequently, at several localities. It is evidently a late migrant. I noted it at Louisville on September 19, 1938 (Mengel, 1938c), and Monroe has a record made there on October 3, 1951. Wilson (1922:240) recorded it in Warren County, giving extreme dates of September 17–October 14. In Rowan and Morgan counties, eastern Kentucky, W. A. Welter and others took several specimens between September 24 and October 5, 1939 (M.S.C.; R.W.B.).

Specimens examined.—Total, 10. M.S.C.—2 males, 2 females, 1 unsexed, Rowan County (May 8, Sept. 24; May 7, 8; Oct. 5); R.W.B.—1 female, Morgan County (Oct. 1); B.L.M.—1 male, 1 female, Jefferson County (May 18; May 13); Bacon Coll.—1 male, 1 female (both mounted), Hopkins County (April 20).

Dendroica caerulescens (Gmelin): BLACK-THROATED BLUE WARBLER

Status.—Rare transient throughout Kentucky (*D. c. caerulescens*); common summer resident in Cumberland Mountains of Harlan and Letcher counties, above 3,000 feet (*D. c. cairnsi*).

Spring.—Most transients are recorded in May; relatively few records are available. Representative are the following: April 24–May 9, in Rowan County (Barbour, 1952:27); May 6–8, in Nelson County (Blincoe, 1925:415); April 25–May 19, at Louisville (Monroe); May 7–13, in Warren County (Wilson, 1922:240). Recorded

from a fair number of localities, some of which appear under "specimens examined." Although some earlier observers wrote that the species was common (see Beckham, 1885:15, Nelson County; Langdon, 1879:172, Cincinnati, Ohio), the Black-throated Blue seems to be one of the rarest of transient warblers in Kentucky today. Blincoe (1925:415) and Goodpaster (1941:29), respectively, noted decreases in the last two areas, and in several seasons of field work I noted only 1 bird, in Warren County on May 5, 1949. The time of arrival of the population breeding in the mountains is not known. In 1952, the birds were present in numbers and singing on Black Mountain, Harlan County, when I arrived there on May 13.

Breeding records.—Egg laying takes place chiefly in May and June. All records are from Black Mountain in Harlan County, where Breiding (1947:39) seems to have found the first nest, containing 2 young, on July 5 or 6, 1944. Another nest, containing 3 large young on June 17, 1947, at an altitude of 3,800 feet, was found by John Reynolds and described in detail by Lovell (1950:107). It was 18 inches above ground in the understory beneath mature sugar maples. On May 26, 1952, I found a female incubating at a nest containing 4 fresh eggs, just 6 inches above ground in a small chestnut sprout. The site was in a brushy slashing at 4,000 feet at the edge of cut-over mixed mesophytic forest climax. Howell (1910:298) recorded a young bird just able to fly taken at 4,000 feet on July 24, 1908, and I recorded two-thirds grown young being fed at 3,500 feet on July 5, 1951. Two immature birds which I collected on July 7, 1951, were in postjuvinal molt (U.M.M.Z.).

Breeding distribution.—There are no records from points below the 3,000-foot contour, but the species is common at higher elevations on Black Mountain, where it has been recorded in Harlan County by all observers working at or near the summit, and occurs also in Letcher County, where it was noted at about 3,000 feet by Lovell (1950c:61). In several visits to the mountain, I regularly recorded the species from approximately 3,400 feet up, occasionally down to about 3,000 feet. It is rather low-ranging on the breeding grounds, occurring chiefly in open to moderately profuse understory in or at the edge of mature mixed mesophytic forest. In such areas it is one of the most abundant breeding birds. In singing male counts conducted in 1951 and 1952, I recorded a density of approximately 20 males to 100 acres.

Fall.—Except in or near the breeding range, the species is rare, as in spring, recorded occasionally in September and early October at points throughout the state. Records at hand range from September 5 to October 10 (August 31 to October 11, including Cincinnati, Ohio). On September 28, 1951, I took an adult male in Jefferson County, near Louisville (U.M.M.Z.). Monroe (notes) and others have recorded a few there, September 11–October 8 (1957). Other records (see also under specimens examined) have been reported from Letcher County, September 24 and 25, 1921, and October 5, 1920, possibly all *D. c. cairnsi*, by Horsey (1922:82; 1923:143); Nelson County, September 5, 1920 (Blincoe, 1925:415); Jefferson County, September 18 and 19, 1938 (Mengel, 1938c); and from Warren County, by Wilson (1922:240), September 22–October 7. Goodpaster (1941:29) listed recent records from the Cincinnati, Ohio, area for October 2–11, and around 1880 Charles Dury took specimens there August 31–September 22 (see Maslowski and R. Dury, 1931:93).

Geographic variation.—Two subspecies occur, as follows:

Dendroica caerulescens caerulescens (Gmelin)

Breeds to the northward and occurs in Kentucky only as a transient. Most, if not all, of the spring and fall records from points throughout the state, cited above, probably refer to this subspecies, to which Wetmore (1940:557) referred a female taken on Log Mountain, Bell County, on September 22, 1938, and a male from Union County, May 11, 1938 (U.S.N.M.). Additional specimens, referred to this subspecies by me, are listed below.

Dendroica caerulescens cairnsi Coues

The breeding subspecies of the southern Appalachian mountains. The breeding population of Black Mountain, Kentucky, as might be expected, seems to belong here, since the birds are darker above on the average than more northern specimens (see also Wetmore, 1940:557). Also, Wetmore identified as *cairnsi* a male, presumably transient, taken at 2,000 feet on Log Mountain, Bell County, September 25, 1938 (U.S.N.M.). I have not examined sufficient material to comment on the percentage of separability of *cairnsi* from *caerulescens*, but in comparisons I have made, the average difference claimed for the form seems to exist.

Specimens examined.—Total, 31. *D. c. caerulescens*; (11); M.S.C.—2 adult males, Rowan County (May 7, Oct. 8); C.W.B.—4 adult males, Nelson County (May 4, 4, 6, Oct. 10); B.L.M.—1 male, Jefferson County (May 6); C.U.—1 female, Logan County (May 14); U.S.N.M.—1 female, Bell County (Sept. 22); 1 male, Union County (May 11); U.M.M.Z.—1 adult male, Jefferson County (Sept. 28). *D. c. cairnsi* (20): R.W.B.—2 males, 1 female, Harlan County (July 21); B.L.M.—1 male, 1 adult female, 1 immature female, Harlan County (July 6; July 7, 7); U.S.N.M.—4 males, 3 females, Harlan County (June 20–24); 1 male, Bell County (Sept. 25); U.M.M.Z.—2 males, 2 adult females, 2 partly juvenal-plumaged females, Harlan County (June 28–July 7).

Dendroica coronata (Linnaeus): MYRTLE WARBLER

Status.—Common to very common transient; rare to uncommon winter resident.

Spring.—The species begins to increase noticeably in late March or early April; main flight near April 10–20; usually uncommon by May 1 and decidedly rare by mid-May. Late records: May 15 (1950), at Lexington (Edwards, notes); May 13, in Nelson County (Blincoe, 1925:415); May 19, at Louisville (Monroe); May 19, in Warren County (Wilson, 1922:241). In the rather poor warbler migration of 1949, I was in the field continually and recorded the last Myrtle Warbler on May 4, in Warren County. As the trees leaf out in early and mid-April Myrtle Warblers become numerous throughout the state, the soft warbling of the brightly plumaged spring males, which are seldom seen earlier, being one of the most familiar of woodland sounds. When the main body of migrant warblers of other species appears, the Myrtles are already becoming scarce.

Fall.—The first usually arrive, together with the juncos and White-throated Sparrows, in the early days of October. The species is common or abundant from mid-October to mid-November, decreasing gradually thereafter to winter numbers. Although occasional Myrtle Warblers arrive in late September, many older September records (see Pindar, 1887a:85, September 21, 23, 1886, in Fulton County; Wilson, 1922:241, September 5, in Warren County; Horsey, 1922:83, September 6 [?], 1920, in Madison County) seem questionable in the absence of preserved specimens. In extensive observation of warblers in autumn I have never recorded a Myrtle in September, and the earliest of Monroe's many carefully made records in the Louisville area, 1934–1960, is for September 29 (1953). Other early records are later: Beckham (1885:15), "about October 10," and Blincoe (1925:415), October 7, in Nelson County; Goodpaster (1941:29), October 11, at Cincinnati, Ohio. Collections containing many fall warblers taken more or less at random (e.g., U.K., J.D.F., U.S.N.M., M.S.C.) contain no September specimens, and no Myrtles were among the many warblers accidentally killed at Nashville and Knoxville, Tennessee, October 7–8, 1951 (Laskey, 1951:60; Howell and Tanner, 1951:62). Neither was any recorded in the great kills at a Topeka, Kansas, television tower in 1954, until October 9 (Tordoff and Mengel, 1956:9). In 1951, I first recorded small numbers, in Laurel County, on October 6, in areas which for several days previously had seemed devoid of the species. In the Bacon Collection, when I examined it at Madisonville, was a Myrtle Warbler ostensibly taken by James Suthard in Hopkins County on August 22, 1935, but the label accompanying the specimen was not attached thereto and may originally have belonged to another bird.

By mid-October the species is usually common, frequenting brushy roadsides and fields, open woodland, forest edge, and like situations.

Winter.—The species is more numerous in some years than in others. Throughout Kentucky, where appreciable field work has been done, the Myrtle Warbler has been found wintering in small numbers, and in some areas fair-sized flocks have been recorded. These are most often found on juniper-covered hillsides or in dense, shrubby areas grown up with Japanese honeysuckle or tangles of grape (see Semple, 1947:7; Beckham, 1885:15). While little is known of wintering in eastern Kentucky, where Barbour (1952:27) and Welter had no winter records for Rowan County, Edwards and I noted 1 in Laurel County on February 3, 1950, and according to Seeber and Edeburn (1952), the species winters near Huntington, West Virginia.

Geographic variation.—The subspecies occurring regularly is *Dendroica coronata coronata* (Linnaeus). Of the several specimens examined, none has been large enough to be identified as *D. c. hooveri* McGregor, a northwestern subspecies reported from some nearby states.

Specimens examined.—Total, 29. M.S.C.—6 specimens from Rowan County (April, Oct., Nov.); U.K.—2 males, 1 female, Woodford County (May 3, Nov. 22; April 16); C.W.B.—9 specimens (part) from Nelson County (1 Jan. 23, 1882; 1 Feb., 1 March, 3 April, 1 May; 2 November); B.L.M.—2 males, 1 female, Jefferson County (April 7, 24; Feb. 10); Bacon Coll.—1 male, Hopkins County (Aug. 22 [?]); U.M.M.Z.—2 males (weights, 14.1 gm., moderately fat; 11.9 gm., not fat), Powell County (April 21, 23); 2 immature females (11.2 gm., 12.5 gm., not fat), Laurel County (Oct. 7, 9); 1 female, Jefferson County (April 10); 1 male (12.9 gm., moderately fat), 1 female (13.0 gm., moderately fat), Meade County (Oct. 20; Oct. 30).

Dendroica virens (Gmelin): BLACK-THROATED GREEN WARBLER

Status.—Transient throughout Kentucky, fairly common to common in spring, very common in fall; rare to common summer resident, somewhat locally distributed, in the Cumberland Plateau and Mountains.

Spring.—In central and western Kentucky the species occurs only as a transient, arriving rarely in early April, usually in mid-April or slightly later. Peak of flight late April or early May; occasional birds until late May. Selected records: April 30–May 18, in Nelson County (Blincoe, 1925:416); April 1 (1956)–May 28 (1949), at Louisville (Monroe); April 23–May 14, in Warren County (Wilson, 1922:241). Other early records for the Louisville area, where the species is usually first noted about April 25–30, are for April 4 and 5 (specimen, U.M.M.Z.), 1948 (Mengel). Limited evidence suggests earlier arrival in the breeding range. In Laurel County, on March 29, 1939, I recorded a male singing in a grove of tall hemlocks near Rockcastle River. For Eubank, Pulaski County, Cooke (1904b:57) gave the average date of arrival for 4 years as April 11 (earliest, April 9, 1894), the average for Louisville (see above) being about April 20. In Powell County, I found the species common and singing, in some cases apparently on territories, April 21–25, 1949.

Breeding and breeding distribution.—See Fig. 34. No nests or small young have been found. However, on July 18, 1949, I saw a pair feeding 3 fully grown young in mixed mesophytic forest at 2,000 feet elevation on Pine Mountain, Bell County, and Barbour (1956:9) noted a female carrying food in a white pine plantation in Breathitt County on July 8, 1955. Immature birds were taken by Howell (1910:299) in Breathitt and Harlan counties in the summer of 1908, and a young bird taken in Harlan County by Barbour on July 17, 1939, has some juvenal feathers in the plumage (R.W.B.). In McCreary County on July 12, 1948, I took a juvenile female which had completed postjuvinal molt. There is clearly a rather large breeding population, and the finding of nests remains a challenge.

The Black-throated Green Warbler was long thought of as a northern species, restricted in the southern states to coniferous growth at high elevations in the mountains. Appreciation of the considerable numbers occurring, and its broad

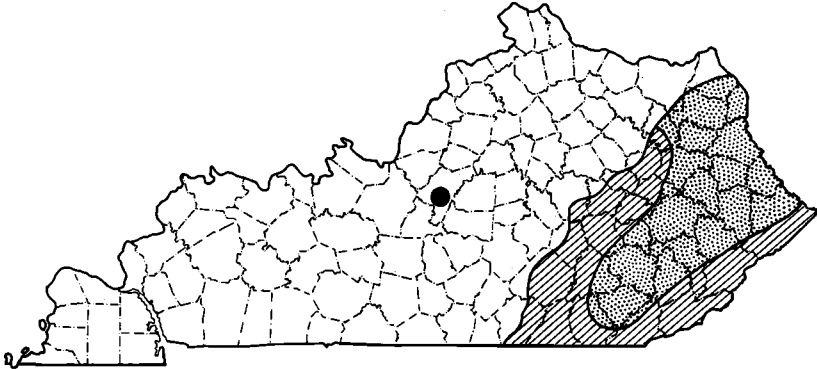


Fig. 34. Breeding distribution of the Black-throated Green Warbler in Kentucky. Hatched area, regular and locally common; stippled area, irregularly distributed and rare; dark circle, an aberrant summer record.

distribution at comparatively low elevations in the southern Appalachians has been rather slow in coming to ornithologists generally. Thus, with reference to Kentucky and Tennessee, although the species had been recorded from scattered points on the Cumberland Plateau some years earlier (Howell, 1910:299; Ganier, 1923:28; Mengel, 1939:47), Wetmore (1940:558) was still surprised to find that it occurred on the Plateau in Wayne County, Kentucky, and even later Wilson (1942:23) and Lovell (1948:16) gave the impression that it was rare in the state. This is not the case, however.

In field work of 1939–1940 and 1948–1952 I found the species locally common throughout the Cliff Section (see pp. 41–43), at elevations of 900 to 1,400 feet, in the western part of the Cumberland Plateau, especially in parts of Menifee, Powell, Wolfe, Lee, Estill, Rockcastle, Jackson, Pulaski, Laurel, Wayne, McCreary, and Whitley counties, and less numerous in several adjacent counties. Although less generally distributed, the species is also common locally along the narrow ridge of Pine Mountain (crest 2,000–3,000 feet), in Pike (Mengel, notes), Letcher (Wetmore, 1940:558), Harlan (specimens, R.W.B.), and Bell (Mengel) counties. The marked floral, faunal, and physiographic similarities of the Cliff Section and Pine Mountain are discussed elsewhere (pp. 40–49).

The areas of maximum abundance are characterized by massive sandstone outcrops, with steep slopes and cool, shaded ravines and canyons where many hemlocks grow in various association with beech, white oak, tuliptree, sugar and red maple, bigleaf magnolia, and other species, with an understory, in some cases, largely of *Rhododendron maximum*. In good habitats I have often found 2 or 3 singing males occupying territories spaced along 150 to 200 yards of ravine or cliff edge, and in a fine cove forest in Laurel County (see pp. 45–46) singing male counts made in 1952 suggested a population of 20 per 100 acres in this habitat. In such areas preferred habitat seems to be saturated, perhaps accounting for the fact that territories are often found in adjoining situations of types seldom occupied elsewhere in eastern Kentucky. For example, in Laurel County, "One pair [had] a territory in dense pine-oak-hickory (some tulip and black cherry) growth on a dry ridge with only one hemlock for many hundreds of yards" (field notes, June 8–30, 1952) and "In Whitley County, on a high ridge [1,800 feet] just west of Williamsburg, I heard one singing in pure deciduous growth—oak-hickory (mainly) and black walnut, with some scrub pines several hundred yards away" (notes, June 17, 1952). I have numerous similar records.

In much of eastern Kentucky (Low Hills Belt and Rugged Eastern Area of Cumberland Plateau) between the sections discussed above, the species is little known and evidently not very numerous in most localities, as in Breathitt County, where Barbour (1956:9) noted only a few along Clemon's Fork in the summer of 1955 and in eastern Laurel County, for which I have obtained only one summer record (see p. 48). Both hemlock and pine are much more local and less extensive in the central part of the Plateau, and are virtually lacking above 2,700 feet on Black Mountain, Harlan County, where, despite the presence of luxuriant mixed mesophytic forest at elevations to 4,150 feet the species seems today to be very rare. This is of some interest since Howell (1910:299) wrote that it was common at the summit in July, 1908, and took 2 specimens. Although the species occupies hemlock groves on some of the lower slopes of the mountain, in much work I have recorded only 2 above 2,500 feet: a singing bird at 3,200 feet on June 29, 1951, and one (possibly a transient), at 4,000 feet on May 15, 1952. A small population evidently occurs, since Lovell (1950c:65) also recorded it (as "very rare") and Barbour took a male (R.W.B.) at 4,100 feet on July 15, 1939. Possibly July birds at the summit are post-breeding wanderers from lower elevations.

The distribution of the species, in any event, is puzzling in Kentucky, as it is elsewhere in the Appalachians. Among others, Brooks has pointed out (1940:261; 1947:293) that hemlocks are not essential to its presence, as was noted above, and mentioned deciduous forest habitats commonly occupied in West Virginia. Of the species on the Cumberland Plateau and in the Cumberland Mountains of Kentucky, however, where it is very near the edge of its range, it can be stated that its presence *in numbers* appears to be correlated with an abundance of hemlocks.

The western limit of the range in Kentucky (see map) coincides for the most part with the western edge of the Cumberland Plateau, but includes as well some of the immediately adjoining Knobs, at least in Madison County (see Patten, 1946: 33) and probably elsewhere. This is essentially the western range-limit of the hemlock as well; the Black-throated Green Warbler does not summer, so far as is known, at Mammoth Cave in the Western Highlands, where small, evidently relict stands of hemlock occur in situations very similar to those on the Plateau. Beckham's (1885:16) sight record of 1 bird in Nelson County on July 14, 1882, is unique.

Fall.—This is one of the most abundant fall warblers in Kentucky. Transients begin to arrive in August and are often common by the end of the month. Monroe's earliest record for Louisville is for August 13, with the species recorded on all dates subsequent to August 18. In 1941 Figgins took specimens in Marshall County on August 22 and 24 (J.D.F.). Other "early" records in the literature are probably somewhat misleading, e.g.: September 5, in Nelson County (Blincoe, 1925:416); September 7, in Warren County (Wilson, 1922:241). Maximum numbers are present about September 1–20, with a gradual decline later; rare by early October, but occurs through most of the month. Transients tend to be high-ranging early in the season, occurring in both upland and lowland forest; later they are likely to be found in weedy fields and brushy areas. Published late records for a number of localities fall between October 14 and 24 (see Blincoe, 1925:416; Cooke, 1904b: 57; Slack, 1936; Wilson, 1922:241; Wetmore, 1940:557). Monroe's latest record for Louisville is for October 25 (1952), and at Otter Creek, Meade County, I took a male (U.M.M.Z.) on October 21, 1948.

Geographic variation.—All specimens examined have been referred to *Dendroica virens virens* (Gmelin). A rather long series of breeding or probably breeding specimens (as indicated by date, locality, and enlargement of gonads) shows no appreciable difference in characters from comparable series of northern birds, and I can see no justification for including eastern Kentucky within the range of *Dendroica virens waynei* Bangs as was recommended by Sprunt and Chamberlain (1949: 457–458).

Specimens examined.—Total, 70. M.S.C.—2 males, 1 unsexed, Rowan County (May 29, Oct. 5; Oct. 10); R.W.B.—1 male (el. 4,000 feet), 1 unsexed (some juvenal feathers), Harlan

County (July 15; July 17); 1 male, Morgan County (Oct. 1); 1 male, Rowan County (Oct. 8); U.K.—1 male, Woodford County (May 4); C.W.B.—19 specimens from Nelson County (April 23–October 12; 1 April, 1 May, 15 Sept., 2 Oct.); B.L.M.—1 male, Laurel County (July 6); 1 male, 2 females, Jefferson County (Sept. 3; May 24, Sept. 3); J.D.F.—1 male, Jessamine County (May 7); 11 males, 3 females, 1 unsexed, Marshall County (August 22, 24, Sept. 5–26—a single adult on last date; Sept. 12–22; Sept. 5); U.S.N.M. (see Wetmore, 1940:557)—9, from Letcher, Bell, Rockcastle, Wayne, Nelson, Union, and Hopkins counties (May 17–Oct. 24; breeding males Wayne County, June 7, Letcher County, June 29); U.M.M.Z.—1 male (weight, 10.0 gm., moderately fat), Menifee County (April 22); 2 males (8.8 gm., not fat; 10.2 gm., moderately fat), Wolfe County (April 22); 2 males (9.1 gm., 8.3 gm.; not fat), 1 female (7.9 gm., not fat), Powell County (April 21); 1 male (9.0 gm., not fat), 1 female (9.8 gm., moderately fat), Laurel County (April 27; Oct. 9); 1 immature female (8.7 gm., not fat), McCreary County (July 12); 1 male, Campbell County (Sept. 10); 1 male, Jefferson County (April 5); 1 male (9.7 gm., not fat), Meade County (Oct. 21); 1 immature male (9.6 gm., moderately fat), 1 immature female (8.6 gm., not fat), Henderson County (Sept. 8; Sept. 7).

Dendroica cerulea (Wilson): CERULEAN WARBLER

Status.—Summer resident, fairly common to common in western and central Kentucky, somewhat less numerous and more local eastward.

Spring.—There are a few records for early April; the species usually arrives in mid-April or slightly later, attaining maximum numbers by May 1. Early records: April 5 (1892), at Eubank, Pulaski County, average of 5 years April 15 (Cooke, 1906a:204); April 11, in Rowan County (Barbour, 1951a:37); April 10 (1882), in Nelson County (Beckham, 1882:93; specimen, C.W.B.); April 25, at Cincinnati, Ohio (Goodpaster, 1941:29); April 17 (1955), at Louisville (Monroe). Unusually large numbers sometimes recorded in spring may result from the presence of transients (see Beckham, 1885:15; Goodpaster, 1941:29).

Breeding records.—Few, considering the numbers of the species. Clutches are completed May 1–10 to June 21–30, as shown by 12 dated observations which suggest no peak. Records are from Clermont County, Ohio (Maslowski and Mengel, notes), and from Oldham (Stamm, Shackleton, and Slack, 1953:27; Stamm, 1954b:63; Altsheler, 1955:23–24), Jefferson (Stamm, *loc. cit.*), Edmonson (Lovell, 1943a:40; Brecher, 1950:54; Pace, Starr, and Wilson, 1958:43), and Hopkins (Hancock, 1954:42; Mengel, notes) counties, Kentucky. No clutch-sizes or brood-numbers have been determined, owing, no doubt, to the tendency of the species to nest very high in mature forest. Nests reported were situated on thin, horizontal branches of walnut, hackberry, elm, maple, and ash, 8 averaging 38 feet above ground (18–60). Near Mammoth Cave, Lovell noted 3 nests under construction on May 1, 1943, and Pace, Starr, and Wilson noted another on May 4, 1958. Brecher observed incubation in the same area, at a nest 18 feet up in an ash sapling on June 3, 1950. Incubation at a nest in Oldham County, 35 feet up in a walnut in mature deciduous forest, was begun approximately June 2, 1954; this nesting was described in some detail by Altsheler. In Hopkins County, Hancock noted adults feeding young out of the nest on June 25, 1951; a young bird I took there, while with him, on July 14, 1952, was just completing the postjuvenile molt. In Clermont County, Ohio, near Cincinnati, Maslowski and I secured a young bird just out of the nest on July 15, 1939. In the few observations of nest construction the female was working alone.

Breeding distribution.—Statewide, tending in most areas to be rather local. The species occurs chiefly in mature, relatively undisturbed deciduous forest. It almost undoubtedly breeds in every county in the state; west of the Cumberland Plateau, it is the only *Dendroica* breeding in mature forest. After work in all parts of the state, I have formed the impression that the species is more generally distributed, and perhaps occurs in greater density, in western and central than in eastern Kentucky. In the first, through the Purchase region and as far east as Hopkins County, it is characteristic of mature swamp and lowland forests, often comprised of various

combinations of swamp oaks, sweet gum, red maple, and sycamore, and in such situations is sometimes quite numerous. It tends in these areas to avoid dry, upland oak-hickory forests. In central Kentucky it varies markedly in abundance through the Interior Low Plateau, befitting the great diversity of environmental types and differences in the degree of deforestation. It is decidedly rare in the inner Bluegrass, not being recorded at all in Mercer County (Van Arsdall, 1949), and is probably limited to a few forested watercourses. Near Lexington Edwards (notes) recorded 1 on May 19 and 2 on June 1 and 5, 1949. It is somewhat more numerous in the Pennyroyal (I noted fair numbers in various habitats in Warren County, May and June, 1949) and is generally fairly common to common in suitable habitats throughout the outer Bluegrass, Knobs, and Western Highlands (for summary of status in the last two see Table 6). In certain of the best-developed outer Bluegrass forests in Jefferson and Oldham counties, where Monroe and I have long observed it, the species is numerous (I have records also for the Kentucky River valley in Owen County) and near Cincinnati is considered the most common nesting bird of deep woodlands (Kemsies and Randle, 1953:45). In these areas it seems particularly fond of beech-maple associations but occurs also in many drier, mixed forests, especially in ravines and on steep slopes.

The distribution and numbers of the species in the Cumberland Plateau and Mountains of eastern Kentucky seem to be irregular and are somewhat perplexing. Occurring in various associations of the mixed mesophytic forest, chiefly the more mesic ones, it seems in general to be somewhat less numerous in the Cumberland Mountains and in the southern part of the Cumberland Plateau than it is in the northern Plateau. On heavily forested lower slopes in the Cliff Section (see pp. 41-43) of the Cumberland Plateau, along the several forks of Red River in Powell, Wolfe, and adjacent counties it is common, and in June, 1948, I considered it the most numerous warbler there; likewise Barbour found it common in Rowan (1951a:37) and Breathitt (1956:9) counties, and I have noted fair numbers east of these points at various scattered localities (Leslie County, July 7, 1946; near Pikeville, Pike County, June 20, 1951) almost to the foot of Pine Mountain. To the southward, however, in seemingly quite similar situations near the Rockcastle and Cumberland rivers in Laurel, Pulaski, and Whitley counties, I have found it rather rare and local, chiefly on gentle lower slopes in associations of large beech, maple, and white oak. In Pickett County, Tennessee, still farther south, none was noted in intensive observations by several observers, June 14-20, 1937 (Ganier, 1937a).

Along much of Pine Mountain itself the species seems to be rare, even in seemingly suitable forest types, my only record being of 1 bird recorded on June 26, 1951, at 2,300 feet elevation above Jenkins, Letcher County (near which Murray, 1938:3, noted several in June, 1935). In the varied mixed mesophytic forests on the northern extension of the mountain in Pike County (Breaks of the Sandy River), at elevations near 2,400 feet, I recorded none June 20-26, 1951, while at nearly the same time (June 28-July 2), the species was fairly common on the lower slopes of Black Mountain, Harlan County, up to approximately 3,600 feet, and was again so, May 13-June 8, 1952. It has been recorded from Black Mountain also by Howell (1910:299-July 24, 1908) and Barbour (specimen, July 16, 1939, R.W.B.), both of whom noted it at the top of the mountain.

It is possible that the numbers of the species are affected in some areas by competition with other warblers of comparable ecological preference, variously the Blackburnian, Black-throated Green, and Parula warblers, but subtle variations in habitat may well be more important. Further work in late May and early June may necessitate revision of the outline set forth above, since the species sings with rapidly diminishing frequency in late June and July, as noted also by Barbour (1956:9), and available estimates of its abundance have not all been made at the same time.

Fall.—Little is known of the species after the general cessation of song in late

July or early August. The majority seem to be gone by early September, after which the species is rare. Late records: September 14 (1887), in Pulaski County (Cooke, 1906a:204); October 5-6, 1946, in Whitley County (Wilson and Browning, 1946); September 15 (1877), near Cincinnati, Ohio (Maslowski and Dury, 1931:94); October 20 (1886), in Nelson County (specimen, C.W.B.); September 5 (1949), in Henderson County (Tordoff, notes).

Specimens examined.—Total, 38. M.S.C.—2 males, 1 female, Rowan County (May 8, 18; May 14); R.W.B.—1 female, Harlan County, 4,100 feet elevation on Black Mountain (July 16); C.W.B.—at least 19 specimens from Nelson County (earliest and latest listed, April 10 [1882]–Oct. 20 [1886]); B.L.M.—1 male, 1 female, Jefferson County (June 13; May 17); 1 male, Oldham County (June 12); C.U.—2 males, 1 female, Logan County (April 19, May 22; May 22); J.D.F.—1 male, Marshall County (Aug. 15); U.S.N.M. (see Wetmore, 1940:558)—5 specimens from Wayne, Nelson, and Meade counties (April 13–June 10); U.M.M.Z.—1 male (originally sexed female, almost certainly by error), Harlan County, 3,400 feet on Black Mountain (June 6); 1 male, Powell County (June 30); 1 unsexed immature, Hopkins County (July 14).

Dendroica fusca (Müller): BLACKBURNIAN WARBLER

Status.—Transient throughout Kentucky, uncommon to fairly common in spring, common to abundant in fall; fairly common summer resident above 3,000 feet elevation on Black Mountain, Harlan County.

Spring.—Although a few have been recorded in early and mid-April, transient Blackburnian Warblers are usually first seen April 25 to May 1, with the main flight before mid-May; a few are recorded into late May. Representative early records: April 22 (1885), at Cincinnati, Ohio (specimen; see Maslowski and Dury, 1931:94); April 17 (1957), at Louisville (Monroe); April 25, 1937, in Meade County (Mengel, notes); April 25, in Warren County (Wilson, 1922:241). In contrast to other observers, Beckham (1885:16) found the species "generally an early arrival," in Nelson County, and took a specimen (C.W.B.; also Beckham, 1882:93) on April 3, 1882, the earliest record available. There are many records throughout Kentucky. Although the species is sometimes common locally at the peak of warbler migration, it is rare in some years. It tends to be high-ranging and is a forest and woodland form. At Louisville, Monroe has accumulated numerous records for early and mid-May and a few later, to May 27 (1947) and May 28 (1949). Breeding birds were present and singing on Black Mountain, Harlan County, on May 13, 1952.

Breeding records and distribution.—No nests have been found, but on June 29, 1951, I took 2 fully grown immature birds (U.M.M.Z.) at an elevation of 3,200 feet on Black Mountain, Harlan County. These were a male and a female in postjuvinal molt, the latter still showing much juvenal plumage, and were being fed by an adult female while a male sang nearby. The location was on a steep, southeast-facing slope where a number of black locust trees grew in an area disturbed by road-construction, immediately surrounded by mixed mesophytic forest, chiefly of beech, sugar maple, and basswood.

The breeding distribution of the species in Kentucky appears to be restricted to this mountain, in Harlan County and perhaps part of Letcher County, at elevations above 2,800–3,000 feet. It was first reported by Howell (1910:299), who found it common in heavy timber on the summit in July, 1908, but it has rarely been recorded there since. Wetmore (1940:558) reported an adult male taken at 4,000 feet on June 23, 1938 (U.S.N.M.), and Barbour (1941a:47) reported 1 only, which he took on August 7, 1939, at 4,000 feet (R.W.B.). Although Lovell (1950c:65) queried its continued presence, I found the species rather numerous on the mountain, particularly in a comparatively narrow belt along the upper slopes, from 2,800 to 3,800 feet. Here from July 4–6, 1946, June 26–July 7, 1951, and May 13–June 6, 1952, numerous males were singing on slopes facing in nearly all directions, most territories being located in maple-beech-basswood associations or in moderately disturbed areas variously forested but usually containing black locusts, or, again, on dry

spurs of the mountain in growths of oak-chestnut. I frequently recorded as many as 8 singing males along a half mile, more or less, of mountainside at one level. Females were recorded only early (some courtship, chasing, etc., was noted May 13-15, 1952) and late (feeding young, June 29-July 5, 1951). The well-known, very high-pitched, ascending song of the species, typically given in migration, was largely replaced about May 20-25 by a song somewhat resembling that of the Black-and-white Warbler. In Ontario, Lawrence (1953:142) associated this type of song with the latter part of the nesting period. Unlike Howell (*loc. cit.*) I noted few Blackburnians at the top of the mountain. It is of interest that here, as in parts of West Virginia (Brooks, 1940:262), a considerable population breeds in the total absence of coniferous trees.

Fall.—The species is an early migrant, but whether or not Pindar's record (1889*b*: 316; 1925*a*:167) of 2 seen in Fulton County on July 25, 1888, should be accepted in the absence of specimens is a matter of personal opinion. I am inclined to reject the record. Transients are rarely noted in mid-August, becoming conspicuous late in the month and remaining common through September; rare by early October, with a few recorded later. Croft (1958*a*:46) noted 2 at Louisville on August 17, 1957; I found the species fairly common there on August 21, 1942. Other early records are from Louisville, August 23 (Monroe), Marshall County, August 22 (1941; specimen, J.D.F.), and Cincinnati, Ohio August 30 (1936; Goodpaster, 1941:29). In mid-September this may be the most numerous transient warbler in Kentucky, rivalled only by the Tennessee, Bay-breasted, Magnolia, and Black-throated Green. Late records: October 7, in Nelson County (Blincoe, 1925:416); October 19 (1954), and November 3 (1946), at Louisville (Monroe); October 8, in Warren County (Wilson, 1922:241). In Laurel County, October 3-11, 1951, I recorded the last 2 on October 4, in upland pine-oak woodland.

Specimens examined.—Total, 64. M.S.C.—1 male, 1 female, 2 unsexed, Rowan County (May 16; May 16; Sept. 25, 29); R.W.B.—1 immature male, Harlan County (Aug. 7); C.W.B.—25, Nelson County (1 male, April 3, 1882; 3 May, 21 September); B.L.M.—4 males, 1 unsexed, Jefferson County (May 8, Aug. 21 [2], Sept. 3; Aug. 21); Bacon Coll.—2 unsexed, Hopkins County (Aug. 22, 31); J.D.F.—4 males, 9 females, 1 unsexed, Marshall County (Aug. 30-Sept. 8; Aug. 22-Sept. 19; Sept. 10); U.S.N.M. (see Wetmore, 1940:558)—1 male, Harlan County (June 23); 1 (sex?), Nelson County (Sept. 11); U.M.M.Z.—1 adult male (weight, 9.8 gm., not fat), 1 immature male, 1 immature female, Harlan County (June 6; June 29; June 29); 1 male, Campbell County (Sept. 10); 1 immature male (10.5 gm., moderately fat), 1 adult female, Jefferson County (Sept. 18; Sept. 20); 1 female (9.8 gm., moderately fat), Warren County (May 5); 2 immature males (11.2 gm., very fat; 14.1 gm., extremely fat), 1 female (9.3 gm., not fat), 1 unsexed immature (10.6 gm., moderately fat), Henderson County (Sept. 7, 9; Sept. 7; Sept. 9).

Dendroica dominica (Linnaeus): YELLOW-THROATED WARBLER

Status.—Summer resident, uncommon in eastern, common in central and western Kentucky.

Spring.—One of the earlier warblers to arrive, the species appears in late March (rarely) or early April and reaches full numbers near mid-April. Early records: March 27, in Nelson County (Blincoe, 1925:416); March 31 (1949), at Louisville (Monroe; next record April 5); March 27, in Warren County (Wilson, 1922:241); April 2 (1904), in Logan County (specimen; C.U.).

Breeding records.—Nests are placed very high and few have been detected. Breeding activities appear to begin by early April, in some cases, and may extend into August, at least on occasion. Three nests were found in successive years in the same sycamore tree on Barren River in Warren County, by Wilson (1922*c*): under construction, April 8, 1920, and April 19, 1919; feeding young in nest, June 22, 1918. The nests ranged from 20 to 50 feet above ground. On April 27, 1953, Hancock (1954:42) noted a nest being constructed 60 feet up in a sweet gum, near Clear Creek, Hopkins County. At Glenview, Jefferson County, I noted an adult gathering nesting material from the ground (at the edge of a lawn) on the rather late date of

July 23, 1950. Grown young being fed have been observed in Letcher County on June 6, 1935 (Murray, 1938:3), Boyle County on June 8, 1951 (Cheek, *vide* Lovell, 1951b:61), and Jefferson County on August 4, 1946 (Monroe).

Breeding distribution.—Statewide in occurrence, the Yellow-throated Warbler tends to inhabit the upper parts of large trees, sometimes in comparatively open areas, sometimes in the crowns of giants rising above the general canopy of mature forest. In such situations the best, and indeed sometimes the only, clue to its presence is the somewhat monotonous, Indigo Bunting-like song. It tends to be tree-specific and occupies different habitats in different areas.

In central and much of western Kentucky, where the species is widespread and fairly common or common nearly everywhere, it prefers the immediate proximity of large sycamores, a well-known habit resulting in the long-used vernacular name of the Mississippi Valley subspecies, and revealed by many records of my own and others in this part of the state.

In extreme western Kentucky, however, and locally up the Ohio River to Henderson, it seems to prefer bald cypresses, wherever they occur, to any other tree, a habit noted also in Louisiana and Mississippi (Bent, 1953:60) and in Arkansas (Howell, 1911:79). I found Yellow-throated Warblers common in the cypress fringe around every ox-bow lake and slough that I visited, variously in 1941, 1942, 1949, and 1951, in Ballard (Swan Lake, Clear Lake, Long Lake), Carlisle (Fish Lake), Hickman (Murphy's Pond), and Fulton (northern arms of Reelfoot Lake) counties, sometimes with singing males on territories every 100 to 200 yards along the shoreline. The species was here more numerous than I have found it anywhere else in the state.

In the Cumberland Mountains and Plateau of eastern Kentucky the species occupies still another habitat, occurring in dry upland forests containing scrub or shortleaf pine. In this choice the birds resemble the coastal plain subspecies *Dendroica dominica dominica*. Little reference has been made in the literature to pine-inhabiting populations of *Dendroica dominica albilora*, the present subspecies. A local preference of *D. d. albilora* for pines, however, in Louisiana, was mentioned by Chapman (1907:184) and is exhibited also on the Cumberland Plateau and in the foothills of the Great Smoky Mountains in Tennessee (personal observations; also Ganier, 1923:28, nest in pine, Grundy County; Ganier, 1937a:27, Pickett County).

In eastern Kentucky, all of my records are from the southern part of the highland area, in Laurel, Pulaski, Wayne, Whitley (see also Lovell, 1948:17), and Bell (1,800–2,000 feet, Pine Mountain State Park) counties. Murray (1938:3) recorded the species, in pines, in Letcher County. Through these areas, although rare or at best uncommon, the species is regular in occurrence wherever pine is an important component of upland forest, and remains unrecorded from valleys affording sometimes appreciable growths of sycamore. Possibly its low density results from competition with the much more numerous Pine Warblers occupying the same habitats and, seemingly, very nearly the same niche. (Both species exhibit to some extent the bark-creeping habit highly developed in the Black-and-white Warbler.)

Farther north on the Cumberland Plateau, in Powell, Wolfe, and adjacent counties, I failed to note the Yellow-throated Warbler in several visits, but find it hard to believe that none occur there, where many stands of pine grow on the ridges. Still farther north, across the Ohio River from Lewis County, the species occurs in Adams and Scioto counties, Ohio (Hicks, 1935a:171) but evidently there inhabits sycamores, as it presumably does in the Ohio Valley farther upstream (Brooks, 1940:262).

That these diverse habitat preferences are firmly, and perhaps genetically, fixed in local populations is suggested by the apparent failure of the Cumberland Plateau birds to occupy the sycamores available in the larger stream valleys while in parts of the Knobs and Western Highlands to the west, the birds occupy sycamores in preference to many available stands of pine.

Fall.—The species remains more or less numerous through mid-September, decreasing later in the month; rare by early October. Late records: October 4, in Nelson County (Blincoe, 1925:416); October 12 (1945), at Louisville (Monroe); October 7, in Warren County (Wilson, 1922:241); September 19 (1929), at Mammoth Cave (Bailey, 1933:165).

Geographic variation.—I have referred all specimens seen to the Mississippi Valley subspecies, *Dendroica dominica albilora* Ridgway, those from west of the Cumberland Plateau being, on the average, quite typical. Although limited evidence suggests that the pine-inhabiting population of eastern Kentucky tends in characters slightly toward the eastern subspecies, *Dendroica dominica dominica* (Linnaeus), the birds examined must be called *albilora* on the basis of present evidence. Three adult males from Laurel County approach *dominica* in bill-length (culmen from base 14.5–15.5 mm., average 15), but these and an immature bird from the same area (Whitley County) resemble *albilora* in being uniformly white-lored or nearly so. Two specimens (immature, U.M.M.Z.; adult, U.S.B.S.) from the mountains of Bell County, extreme southeastern Kentucky, are, however, decidedly yellow-lored, like *dominica*, but are not particularly long-billed. Since *albilora* is considered to be the subspecies of western Virginia (Murray, 1952:94), I should not identify a Cumberland Mountain population as *dominica* without many additional specimens and examination of series from western Virginia.

Twenty-two specimens from west of the Cumberland Plateau have an average bill-length of 14.0 mm. (culmen from base 12.0–15.5, mean 14.0 ± 0.2 , $\sigma = 0.9$), and of 38 specimens from this area, 19 (50 per cent) have the lores almost perfectly white, 17 (44.8 per cent) have them definitely tinged with yellow, and 2 (5.2 per cent) have them decidedly yellow. One such bird, taken at Bardstown, Nelson County, by C. W. Beckham on April 19, 1877 (U.S.N.M.), was identified by Wetmore (1940:558) as *dominica* and considered a straggler. It is, however, definitely short-billed (culmen 13.5 mm.), and I consider it within the range of variation of *albilora* in all characters.

Specimens examined.—Total, 47. C.W.B.—13 males, 5 females, 2 unsexed, Nelson County (April 3–Sept. 18); B.L.M.—1 male, Oldham County (April 27); 1 female, Jefferson County (date?); 1 unsexed, Ballard County (Aug. 24); C.U.—1 male, 1 female, Logan County (April 2; May 14); J.D.F.—1 male, 1 unsexed, Marshall County (Sept. 5; Sept. 12); U.S.B.S.—1 male, Bell County (June 5); 1 male, Cumberland County (June 12); 1 male, Allen County (June 11); U.S.N.M.—1 male, Nelson County (April 19); 1 female, Union County (May 7); U.M.M.Z.—1 immature male (weight, 11.6 gm., not fat), Bell County (July 19); 3 males (9.5 gm., —, 10.4 gm., not fat), Laurel County (April 27, May 9, July 8); 1 unsexed immature, Whitley County (July 14); 1 male, Nelson County (May 16, 1887, Beckham); 2 males, Jefferson County (April 10, Sept. 17); 1 unsexed immature (8.8 gm., not fat), Henderson County (Sept. 8); 2 males, Lyon County (April 13, 14); 1 male (10.4 gm., not fat), Ballard County (June 8); 2 males (11.6 gm., —, not fat), Carlisle County (June 5); 1 male (10.7 gm., not fat), Hickman County (June 4).

Dendroica pensylvanica (Linnaeus): CHESTNUT-SIDED WARBLER

Status.—Transient, uncommon to fairly common in spring, fairly common to common in fall; common summer resident above 3,200 feet on Black Mountain, Harlan County.

Spring.—The species seems to arrive later than most *Dendroicas*, usually in early May; peak of migration around mid-May; rare into late May. Early records: May 1, in Rowan County (Barbour, 1952:27); April 28 (1949), in Pulaski County (Mengel, notes); May 2 (1880), at Cincinnati, Ohio (Maslowski and Dury, 1931:94); April 20 (1958), at Louisville (Monroe); April 18, in Warren County (Wilson, 1922:241). There are May records for many areas, most of the later ones falling between May 10 and 15. In 1949 when I was in the field throughout spring, I recorded the last on May 15, in Fulton County. At Louisville, Monroe has records up to May 28 (1949).

Breeding records and distribution.—All records are from Black Mountain, Harlan

County, where 7 dated observations indicate that egg-laying occurs chiefly May 21–June 10. In 1952 I noted a nest complete except for lining on May 30, and saw a male stealing nesting material from the newly completed nest of a Solitary Vireo on June 15. In the same year I found two nests only 50 yards apart, one with a clutch of 3 completed on May 25 and another with a clutch of 4 completed May 26 or 27. The nests were in brushy slashings at the edges of meadows and clearings between 3,800 and 4,000 feet, and were placed in blackberry tangles from 2.5 to 5 feet above ground. Earlier, Lovell (1950:106–107; 1950c:61–62) found 3 nests in similar situations, one containing 4 well-grown young on June 16, 1947, and two containing 4 small and 3 large young, respectively, on June 14 and 15, 1950. In 1951, I saw young barely out of the nest on June 28 and took a young bird completing postjuvinal molt (although its tail was only two-thirds grown), on July 7 (U.M.M.Z.).

The species is confined to successional stages of vegetation, occurring mainly about blackberry patches and thickets of oak, maple, and chestnut reproduction in meadows at the top of the mountain or in disturbed areas down to about 3,200 feet. In these areas, with the Yellowthroat and Rufous-sided Towhee, it is one of the most numerous birds and has probably increased since primeval times.

Fall.—Noted rarely in mid-August, often a little later; common through most of September; rare by early October. The species is not as numerous as the Bay-breasted, Magnolia, and Tennessee warblers but is recorded regularly through the state. Records for Louisville (Monroe) range from August 26 (1951) to October 8 (1946). In 1941 Figgins took specimens in Marshall County as early as August 22 (J.D.F.). I found the species fairly common to common at Henderson, September 4–9, 1949; at Louisville September 10–20, 1950; in Hopkins County on September 18, 1951; and in Laurel County on October 3 and 6, 1951. I saw 1 bird in Marshall County on October 10, 1954. Other records are found in trivial lists in *The Kentucky Warbler*, and elsewhere: see Thacher (1949:78), October 16, 1949, at Henderson; Slack (1936), October 19 and 20, 1935, at Mammoth Cave; Beckham (1885:15), about October 10, in Nelson County.

Specimens examined.—Total, 36. M.S.C.—1 male, Rowan County (May 4); C.W.B.—5 specimens from Nelson County (2 May, 3 Sept.); R.W.B.—2 males, 2 females, Harlan County (July 21, Aug. 6; July 21, Aug. 6); B.L.M.—2 males, Harlan County (July 7, 8); 2 males, 1 female, Jefferson County (May 19, Sept. 14; May 20); C.U.—1 male, Logan County (Sept. 7); J.D.F.—5 males, 5 females, Marshall County (Sept. 19–26; Aug. 22–Sept. 12); U.S.N.M. (see Wetmore, 1940:558)—6 specimens from Harlan, Bell, and Nelson counties (May 2–Sept. 22); U.M.M.Z.—1 male, 1 immature female, Harlan County (June 28; July 6); 1 immature female (weight, 9.2 gm., moderately fat), Jefferson County (Sept. 1); 1 immature female (weight, 10.2 gm., moderately fat), Henderson County (Sept. 7).

Dendroica castanea (Wilson): BAY-BREASTED WARBLER

Status.—Transient, uncommon in spring, common in fall.

Spring.—A late migrant, recorded mainly in May; peak of migration probably near May 10; rare by late May. Seldom present in large numbers, however, and sometimes rare, the species is erratic, suggesting the Cape May Warbler in the pattern of its appearances. Some observers have listed few seen, others have many records. Wilson (1922:241) listed dates of occurrence as May 3–19; Monroe's records for the Louisville area range from April 28 (1956) to May 28 (1949). Barbour (1952:28) listed the species as common in Rowan County, recorded April 19–May 16. There are scattered records from many areas throughout the state. I took a male (U.M.M.Z.) in upland pine-oak forest in Laurel County on May 9, 1952, and saw another at 3,600 feet on Black Mountain, Harlan County, May 15, 1952.

Fall.—Common everywhere, appearing in late August; large numbers present throughout September; progressively rarer through October. Although this is probably the most numerous transient *Dendroica* in fall, few very early or late records are available. Monroe's records for the Louisville area well illustrate the

occurrence of the species: August 23, 30, September 3, September 5–October 11, October 15, 20, 27 (also November 2, 1957; Croft, 1958a:46). The species has been recorded from many localities, eastern ones having been given by Wetmore (1940:559) and Horsey (1922:83; 1923:143; 1927:119). I found it common at Henderson, September 4–9, 1949; near Louisville, September 10–20, 1950; in Hopkins County, September 18, 1951; in Laurel County, October 3–9, 1951; and casually at other points. A number of mid-October records appear in trivial lists periodically published in *The Kentucky Warbler*.

Specimens examined.—Total, 46. M.S.C.—3 males, 2 females, Rowan County (May 10, 14, Oct. 1; May 18, Sept. 29); R.W.B.—1 unsexed, Rowan County (Sept. 29); U.K.—1 male, Woodford County (May 8); 3 unsexed, Fayette County (Oct. 5, 6, 7); C.W.B.—2 males, Nelson County (May 14); B.L.M.—3 males, 1 female, Jefferson County (May 24, Sept. 3, Oct. 4; May 14); 1 female, Oldham County (Aug. 30); C.U.—2 males, 1 female, Logan County (May 2, 8; —); J.D.F.—1 male, Jessamine County (May 16); 1 female, Clark County (May 17); 3 [=immature males, sexed as females], 6 immature females [sexing?], Marshall County (Sept. 22–26; Aug. 30–Sept. 24); U.S.N.M. (see Wetmore, 1940:559)—4 specimens from Bell and Nelson counties (Sept. 15–22); U.M.M.Z.—1 male, 1 immature female (weight, 11.6 gm., not fat), Laurel County (May 9; Oct. 4); 2 males, 2 females, Campbell County (Sept. 10); 1 immature female (12.0 gm., moderately fat), Jefferson County (Sept. 19); 1 immature male (11.3 gm., not fat), 3 immature females (10.8, 11.5 gm., moderately fat; 11.5 gm., not fat), Henderson County (Sept. 7; Sept. 7, 8, 8).

Dendroica striata (Forster): BLACKPOLL WARBLER

Status.—Transient; fairly common in spring, very rare in fall.

Spring.—The latest migrant of the genus, the Blackpoll Warbler arrives (rarely) in late April, usually in early May; peak of flight probably between May 10 and 20, decreasing thereafter. Representative dates of occurrence: April 30–May 21, in Rowan County (Barbour, 1952:28); April 29 (1951)–May 29 (1954), at Louisville (Monroe); May 5–22, in Warren County (Wilson, 1922:241). A comparatively early record is Blincoe's (1925:415) for April 25 (1914), in Nelson County. Goodpaster (1941:30) took a specimen near Cincinnati, Ohio, on May 30 (1940). Occasional birds will probably be found in early June. In 1949, in a spring spent entirely afield, I recorded the first, in Warren County, on May 4 (fairly common) and the last, in Fulton County, May 27. In eastern Kentucky in 1952, I found the species singing and fairly common in Laurel County, May 8–10, in upland pine-oak growth as well as in the shade trees about London, and on May 13–15 I recorded a fair flight of these birds on Big Black Mountain, Harlan County, where they were the most numerous transient warbler (recorded from the base of the mountain up to 3,600 feet).

Fall.—Very rare, recorded September 30–October 10. The literature is misleading, with many references to the species in autumn and some authors stating it to be common. This impression seems in fact to be far from the case and must result from misidentification of the very similar Bay-breasted Warbler. During intensive observation of transient warblers at various localities, especially in parts of September and October, 1942, and 1948–1952, I recorded only one Blackpoll Warbler, this when I took an immature male on October 10, 1951, in willows of a small marsh near London, Laurel County. Similarly, at Louisville, Monroe has made no positive records, and only one record seems to be authentic, this made on September 30, 1944, when Young (1945:1–3, and letter, October 19, 1949) banded and released a warbler carefully examined in the hand and identified as a Blackpoll. In the Bernheim Collection is a fall specimen taken (by J. D. Figgins) in Kentucky but without further data. Near Cincinnati, Ohio, at least 3 specimens have been taken (C.M.N.H.): male, September 22, 1878 (misidentified as *D. castanea* and so reported by Maslowski and R. Dury, 1931:95); female, October 7, 1877 (both taken by Charles Dury); male, September 25, 1938, taken by Goodpaster (1941:30). The rarity of the species in fall in states to the south of Kentucky was pointed out by Burleigh (1934).

Specimens examined.—Total, 14. M.S.C.—1 male, Rowan County (May 15); U.K.—1 female, Fayette County (May 10); C.W.B.—2 males, 1 female, Nelson County (May 2, 12; May 12); B.L.M.—1 male, 2 females, Jefferson County (May 16; May 13, 23); Bernheim Coll.—1 unsexed, Kentucky (fall; no further data); U.S.N.M. (see Wetmore, 1940:559)—1 specimen, Nelson County (May 8); 2 specimens, Union County (May 14, 16); U.M.M.Z.—1 female, Warren County (May 8); 1 immature male (weight, 11.9 gm., not fat), Laurel County (Oct. 10).

Dendroica pinus (Wilson): PINE WARBLER

Status.—Summer resident, common in parts of the Cumberland Plateau and Mountains, rare and local in the Knobs and Western Highlands; rare transient throughout the state.

Spring.—An early migrant. Data are few, but in the breeding range on the Cumberland Plateau the birds are present in March, and perhaps sometimes earlier. Barbour (1951a:37) gave records for Rowan County for March 11–24. In Laurel and Whitley counties, I found the species established in numbers and singing on March 29 and 30, 1939. It is common there by early April, at the latest.

Outside the areas where it breeds commonly, the Pine Warbler seems to be a rare transient today, although some earlier authors regarded it as fairly common or common. While a change in status is not improbable, it is also possible either that some degree of error was involved in the earlier records, or that transients occur in unsuspected numbers today in the more extensive piney areas of the Knobs and Western Highlands. Beckham (1885:16) considered the species common, in April, in Nelson County, while Wilson (1922:241) called it fairly common in Warren County, April 19–May 13. Monroe's records for the Louisville area are few, April 14 (1952)–May 16. Only 2 specimens (C.W.B., C.U.) seem to have been taken at localities where breeding is unknown.

Breeding records.—In Pine Mountain State Park, Bell County, Lovell (1948b:35) found a nest containing small young on June 13, 1948. The nest was 70 feet above ground, near the end of a horizontal branch of a pine identified as *Pinus virginiana* (but possibly *P. echinata*, judging from its reported size). On July 1, 1948, I saw a young bird just out of the nest being fed by adults in a small thicket of young *Pinus echinata* 4 miles north of Pine Ridge, Wolfe County. While other definite records are lacking, the species undoubtedly breeds in numbers, as indicated not only by the abundance of adults (with gonads enlarged; males singing) over wide areas in June, but also by many small bands of juvenal-plumaged birds energetically begging for food.

Breeding distribution.—Regarded by various authors as rare (brief and somewhat misleading summaries of distribution were given by Wilson, 1942:24, and Lovell, 1948b:33–35, and map), the species is actually common and widespread in the Cumberland Mountains and Plateau, occurring in all extensive and most small stands of pine (Fig. 35). My own records accumulated chiefly 1937, 1939–1942, and 1948–1952, are for Menifee, Powell, Wolfe, Lee, Estill, Pulaski, Rockcastle, Laurel, Wayne (see also Wetmore, 1940:559), McCreary, Whitley, Knox, Bell, Harlan, Letcher, Pike, Floyd, Elliott, and Rowan (see also Barbour, 1951a:37) counties, to which may be added Breathitt and Knott (Barbour, 1956:9), and the Knobs-border (see pp. 55–56) counties of Madison (Patten, 1946:32) and Clark (specimen, J.D.F.). The species, in fact, probably breeds in all the Plateau counties, being most numerous where pine is abundant and more or less continuously distributed, hence in the Cliff Section (see pp. 41–43) along the western edge of the Plateau, and again on Pine Mountain (see pp. 43–44). Elsewhere (Low Hills Belt, Rugged Eastern Area; see pp. 46–48) on the Plateau pines are more scattered, more or less restricted to isolated shaly slopes and ridge crests, and the Pine Warbler is more local. Virtually no pines are found at higher elevations on Black Mountain, Harlan County, and the species does not seem to occur there. Barbour's (1941a:47) reference to the species at the top of Black Mountain is presumably based on a

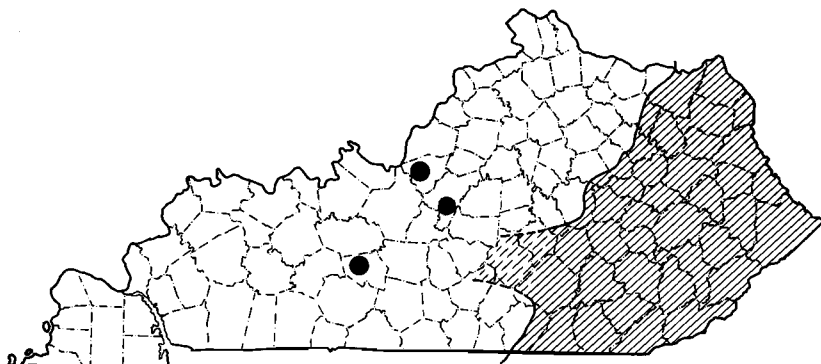


Fig. 35. Breeding distribution of the Pine Warbler in Kentucky. Hatched area, fairly common to common; dark circles, outlying summer records.

Black-throated Green Warbler (R.W.B.) originally misidentified as a Pine Warbler. On typical ridges and upper slopes in Laurel, Whitley, and adjacent counties, the Pine Warbler is very numerous; on several occasions, after light rainfalls, I have seen areas of several acres thronged with family groups. In breeding bird counts in Laurel County in 1952, I found the average population of singing males in these areas to be 25 to 35 per 100 acres.

West of the Plateau and immediately adjacent Knobs, much less is known of the species, which appears to be rare at best. Beckham (1885:16) thought it probably bred in Nelson County, in the southern part of which many pines occur on the Knobs. Monroe and I recorded a singing male in pines on Brooks Hill, in the Knobs of northern Bullitt County, on June 24, 1939. Wilson (1947:12) recorded at least 2 on June 29, 1946, in pines near Mammoth Cave, Edmonson County, where Hibbard (verbal com.) had recorded the species in the breeding seasons of 1933 and 1934. Further work in these areas would probably reveal the presence of a small but widespread breeding population. No evidence of summering has come from the Bluegrass, Pennyroyal, or Purchase.

Young birds become fully grown before beginning postjuvinal molt, differing from the young of various other *Dendroica*s in this respect. I have taken several specimens which had not begun molt, but which had fully grown rectrices. On July 21, 1949, I took an immature male (U.M.M.Z.) in postjuvinal molt, at 2,700 feet elevation on Pine Mountain, Letcher County. First winter plumage had been acquired by this bird on the flanks, rump, and middle of the breast.

Fall.—The time of departure of breeding birds is not known. In Laurel County, October 3–11, 1951, I found the species common and still essentially restricted to its breeding habitat, and collected a series of freshly molted specimens. The males were in full song, louder and more musical than I have heard in the breeding season, and the birds were decidedly gregarious, sometimes feeding with Palm and Myrtle warblers in weed patches adjoining the pine woods.

West of the Plateau data are scarce (see under "spring"). Wilson (1922:241) indicated records for Warren County, September 11–October 17. The few records for the Louisville area (Monroe) range from August 17 (1957) to October 1 (1960). Beckham (1885:16) said that the species was common in September in Nelson County. It is certainly rare today everywhere outside of areas affording pine woods. A record for Warren County for December, 1929 (Wilson, 1939c), is open to question in the absence of a specimen. There are scattered fall (sight) records for other localities.

?*Winter.*—Although I found none in winter visits to Laurel, Whitley, and Mc-

Creary counties, it is likely that a few Pine Warblers winter in the extensive pine woods of southeastern Kentucky, since the species has been recorded in winter in Virginia, even in the mountains (Murray, 1952:95).

Geographic variation.—The Kentucky population is representative of the northern subspecies *Dendroica pinus pinus* (Wilson).

Specimens examined.—Total, 23. M.S.C.—1 male, 1 unsexed, Rowan County (May 8; April 24); R.W.B.—1 unsexed, Rowan County (Oct. 9); C.W.B.—1 female, Nelson County (April 23); B.L.M.—2 males (1 in juvenal plumage), 4 females (2 in juvenal plumage), Laurel County (July 4–5); C.U.—1 male, Logan County (April 19); J.D.F.—1 male, Clark County (May 19); U.S.N.M. (see Wetmore, 1940:559)—1 male, Wayne County (June 6); U.M.M.Z.—1 immature male (weight, 14.7 gm., postjuvinal molt; this and all following with little fat), Letcher County (July 21); 2 males (14.2, 15.5 gm.), Powell County (April 23, June 27); 5 males (juvenals, 12.1, 11.5 gm., adult, 11.7 gm., immatures, 11.5, 13.7 gm.), 1 immature female (11.6 gm.), Laurel County (July 5, 8, Oct. 4, 4, 6; Oct. 7); 1 female (10.6 gm.), Whitley County (July 11).

Dendroica discolor (Vieillot): PRAIRIE WARBLER

Status.—Summer resident throughout Kentucky, common and generally distributed in the east, rare and more local in the west.

Spring.—The species arrives early, usually not long after mid-April, occasionally earlier; full numbers are probably attained by about April 25. Early records: April 13, in Rowan County (Barbour, 1951a:37); April 13 (1893), in Pulaski County, average of 7 years April 20 (Cooke, 1905:34); April 13, in Nelson County (Blincoe, 1925:416); April 16 (1954), at Louisville (Monroe); April 6, in Warren County (Wilson, 1922:241); April 13 (1945), in Hopkins County (Hancock, 1948) and April 12 (1948), same area (see *Kentucky Warbler*, 24:48, 1948). Outside areas where the species breeds, it is rare as a transient, as in the immediate vicinity of Louisville, where Monroe has scattered records up to May.

Breeding records.—Clutches are completed from May 1–10 to July 1–10, as indicated by 22 dated breeding observations, with apparent peaks May 11–20 (first nestings) and June 21–30 (presumably second nestings). Data are from Breathitt (Barbour, 1956:9); Whitley and Laurel (Mengel, notes); Wayne (Ganier, 1937a: 27—on or near Pickett County, Tennessee, line); Owen (Lovell, Stamm, and Pierce, 1955:8; Hays, 1957:6); Nelson (Blincoe, *vide* Funkhouser, 1925:283); Meade (Lovell, 1949b:69–70; 1951b:61); Edmonson (Browning, 1946:42); Hopkins (Hancock, 1948:6; 1951:9; 1954:42); and Marshall (Fuller, *vide* Lovell, 1951b:61) counties. The earliest egg date is for May 16 (1947), in Hopkins County (Hancock, 1948; 3 eggs, incubation advanced), and the latest for July 20 (1945), in Meade County (Lovell, 1949b; 3 eggs hatching). The complement of 14 clutches or broods probably or certainly complete averages 3.5 ± 0.14 (3–4). Of 21 nests examined, 3 contained 1 cowbird egg each, this being the sole contents of the nest in one case (Lovell, 1951b). Nests have all been found in small saplings or young trees, including persimmon, maple, post oak, elm, red cedar, and sassafras; 13 nests ranged in elevation from 2.5 to 8 feet up (average 4.7). Nest sites are characteristically located in old, overgrown fields, forest edge or clearings, brush-bordered logging roads, and like situations. I took a young bird (U.M.M.Z.) just from the nest in upland pine-oak forest of Whitley County on July 9, 1948 (it was being fed small, green measuring worms by the female parent), and noted two broods of 4 newly flying birds (tails very short) in similar situations in Laurel County on June 12 and 15, 1952.

Breeding distribution.—Essentially statewide. The Prairie Warbler in Kentucky is a species of shrubby areas or open forest where much sunlight reaches the ground. It is certainly most conspicuous and best known, and probably most numerous in eastern Kentucky, where it is common in the open pine-oak growth of ridge tops, in slashings and burns, and in new reproduction at the edges of old fields. In midsummer, when most passerines have ceased singing, its droning song can be

heard in the heat of day from virtually every scrubby hillside and ridge top of the Cumberland Plateau. On Black Mountain, Harlan County, I have recorded it in slashings on the lower slopes, but never above approximately 2,800 feet. Westward, it is common in the Knobs, the Western Highlands, and parts of the Bluegrass (hills of the Bluegrass, or Eden shales belt, chiefly) but is more locally distributed than on the Plateau. In the Purchase it is less numerous and comparatively little known; I there recorded a few birds singing in upland oak woods of Calloway and Marshall counties on June 11, 14, and 15, 1949, and 1 in an old field in north-western Graves County on July 15, 1951. In the more fertile and intensively cultivated portions of the Pennyroyal and Bluegrass the species is so rare as to be essentially lacking but may still occur in widely scattered environments, being recorded from Mercer County in the inner Bluegrass (Van Arsdall, 1949:27), and in the northern Pennyroyal in Warren and Logan counties, where I noted a few in May and June, 1949 (see also Wilson, 1922:241). In July, 1950, I noted fair numbers on rough hillsides in Owen, Gallatin, Boone, and Pendleton counties, in the hills of the Bluegrass, and on June 19, 1951, 1 in Franklin County, 5 miles west of Frankfort. At some select localities in these areas, the species is common, having subsequently proved (Lovell, Stamm, and Pierce, 1955:8) to be one of the most numerous species on the brush-grown Kleber Sanctuary in Owen County. Generalizations in the above account have been drawn from a voluminous published and unpublished record, including a great many notes of my own.

A young female (U.M.M.Z.) taken in Whitley County on July 11, 1948, had already completed postjuvinal molt.

Fall.—Most of the few late dates in literature are probably not representative of the end of migration: September 28 (1938), in Bell County (Wetmore, 1940:559); September 23 (1925), in Bath County (Horsey, 1927:120); September 7, in Nelson County (Blincoe, 1925:416); September 23, near Louisville (Monroe); October 15, in Warren County (Wilson, 1922:241). I recorded none in Laurel County, where the species is common in summer, October 3–11, 1951. Outside areas where they breed commonly, these warblers are decidedly rare transients; Monroe has few fall records at Louisville, and I cannot recall ever having seen a definitely transient individual in autumn.

Geographic variation.—Occurring is the northern subspecies *Dendroica discolor discolor* (Vieillot).

Specimens examined.—Total, 18. M.S.C.—1 male, Rowan County (May 29); R.W.B.—1 male, Harlan County (July 31); U.K.—1 male, Wayne County (April 28); B.L.M.—2 males, Laurel County (July 2, 4); C.U.—2 males, Logan County (May 3, 26); U.S.N.M. (see Wetmore, 1940:559)—1 male, Bell County (Sept. 28); 1 male, McCreary County (June 16); 1 male, Wayne County (June 15); 1 specimen, Nelson County (April 26); 1 male, 1 female, Meade County (April 22); U.M.M.Z.—2 males (weights 7.5, 7.8 gm., not fat), Laurel County (July 5, 8); 1 male (just from nest, 7.7 gm.), 1 adult female (7.5 gm.), 1 immature female (8.3 gm.), Whitley County (July 9; July 9, 11).

Dendroica palmarum (Gmelin): PALM WARBLER

Status.—Transient, varying somewhat erratically from uncommon to common; winter resident occasionally and locally.

Spring.—A few very early records probably represent wintering birds: 1 was collected March 7, 1937, at Cincinnati, Ohio (Goodpaster, 1941:30), and 1 recorded February 28, 1948, at Louisville (Monroe). Transients usually appear in the last half of April, occasionally somewhat earlier; peak of migration, when discernible, near early May; rare by mid-May. Early records: April 8 (1936), in Rowan County (specimen, M.S.C.); April 12 (1882), "in Kentucky" near Cincinnati (specimen, C.M.N.H.); April 17, in Nelson County (Blincoe, 1925:416); April 21 (1950), at Louisville (Monroe); April 19, in Warren County (Wilson, 1922:241). Some observers (Wilson, Blincoe) have considered the species common, others (including Monroe) have found it irregular, more often uncommon than not. Late records

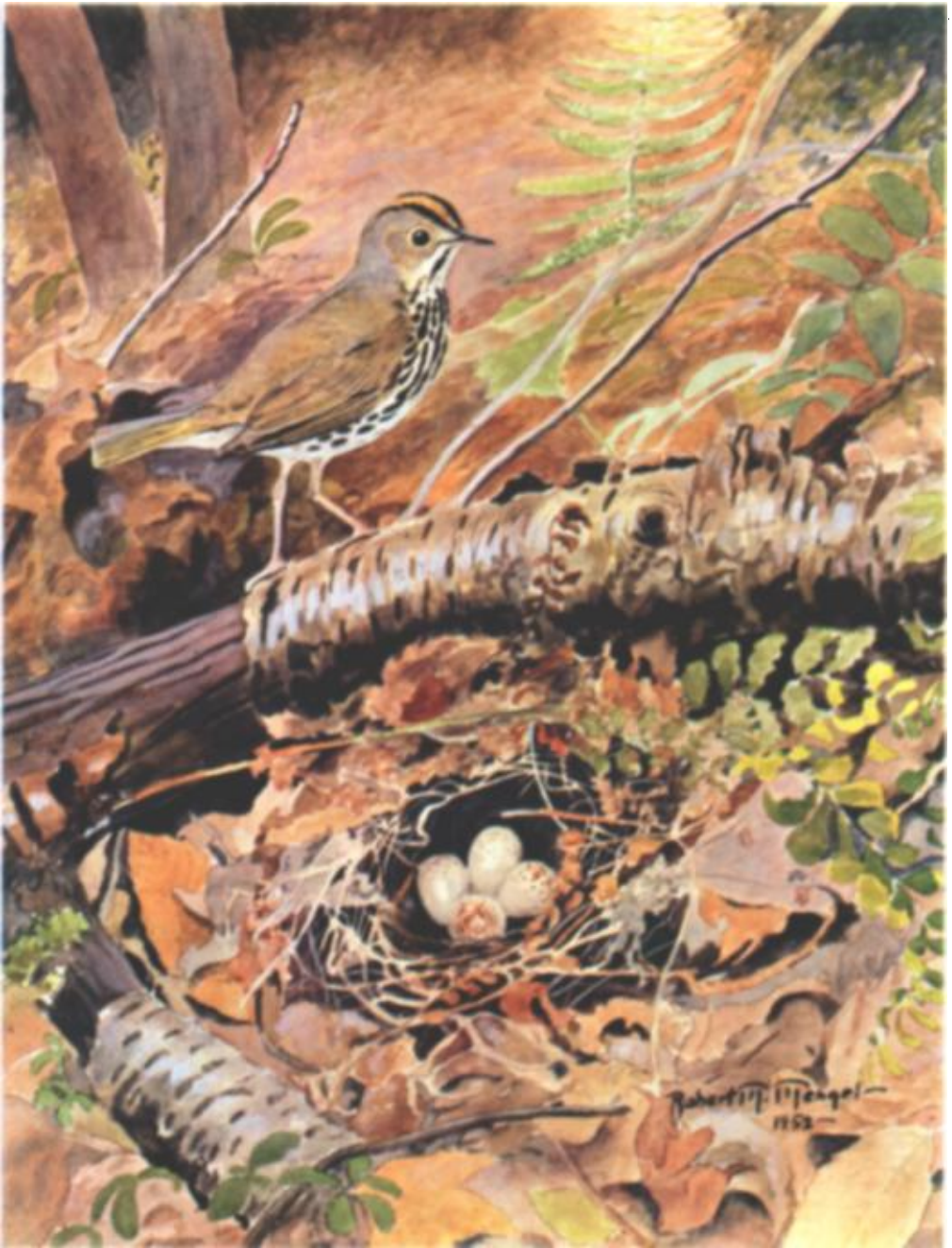
from several localities fall from May 13 to 16 (chiefly sources listed above). Low-ranging, the Palm Warbler is usually found in more or less open country, or in clearings in forest. I recorded several at the 4,100 foot level on Black Mountain, Harlan County, where I took a female (U.M.M.Z.) at the edge of cleared meadows on May 14, 1952. I noted small numbers far to the west, along hedge-rows in Warren County farm country, May 2-4, 1949.

Fall.—Migration is rather late. A few birds arrive in September; peak of flight in early October; rare by late October or before. Early records: September 21 (1938), in Bell County (Wetmore, 1940:559); September 28, in Nelson County (Blincoe, 1925:416); September 14, in Larue County (specimen, B.L.M.); September 23 (1956), at Louisville (Monroe); September 7, in Warren County (Wilson, 1922:241). The species is erratic, as in spring, and often rare at given localities. In Laurel County, I noted a pronounced flight in early October, 1951. On October 5, I recorded 10, in one locality only, with 2 seen on October 6. On October 7, however, every clearing for miles in the Cumberland National Forest between London, Laurel County, and Mount Victory, Pulaski County, seemed to contain a flock of 40 or 50 of these birds. Only a few remained by October 11. Late records indicating the presence of transients are difficult to establish, since a few birds remain to winter. The main migration is essentially over by late October, as evidenced by a general, marked decrease. Monroe's latest mid-fall record at Louisville is for October 22. I recorded 1 bird in Meade County on October 21, 1948. Pindar's latest record (MS., about 1925) for the Bluegrass was for October 29. Scattered November records (Walker, 1930, Hopkins County; Goodpaster, 1941:30, Cincinnati—November 28, 1935) may represent birds which would winter.

Winter.—Beckham (1885:17) was first to report winter records, in Nelson County "in December and in the middle of January." In the same area, Blincoe (1925:416) noted several, in 1920, up to December 28. Near Louisville, Stamm (1944:29) noted 1 on February 16, 1944, and Monroe has acquired several winter dates of observation: among them December 21-26, in various years (a flock of 8 on December 25, 1949); 3 recorded January 4, 1947; 1 January 10, 1948. Near Cincinnati, Ohio, Goodpaster (1941:30) recorded 3 and took 2 on January 14, 1939. Others have been reported from time to time in various Christmas bird counts published in *The Kentucky Warbler*. Winter records have been made chiefly in areas affording much dense shrubbery, often with an abundance of Japanese honeysuckle, these being favorite resorts also of wintering Myrtle Warblers, Brown Thrashers, and Winter Wrens. Although it is probable that many December birds move south with the advent of severe weather, the records available seem to provide satisfactory evidence of occasional wintering.

Geographic variation.—All specimens I have seen are referable to the western subspecies, *Dendroica palmarum palmarum* (Gmelin). A few, while rather yellow below, are not so uniformly so as the more eastern *Dendroica palmarum hypochrysea* Ridgway, and none has the strong dorsal suffusion of yellowish green typical of *hypochrysea*. While the latter form has occasionally been referred to in the Kentucky literature, at least by common name, there is at present no evidence of its occurrence in the state.

Specimens examined.—Total, 25. M.S.C.—1 male, Rowan County (April 8); C.M.N.H.—1 male, Kentucky, "near Cincinnati" (April 12); U.K.—1 male, Woodford County (May 8); C.W.B.—2 males, Nelson County (Sept. 18, Nov. 28); B.L.M.—1 male, 1 female, Jefferson County (May 5; May 7); 1 male, Larue County (Sept. 14); W. Ky. State College Coll.—1 unsexed, Warren County ("spring"); C.U.—1 male, 2 females, Logan County (April 28; May 1, 5); J.D.F.—1 male, Clark County (May 12); 1 female, Jessamine County (May 4); U.S.N.M. (see Wetmore, 1940:559)—7 specimens from Union (May 6), Bell (Sept. 21-29), and Boone (Oct. 10) counties; U.M.M.Z.—1 female (weight, 11.6 gm., moderately fat), Harlan County (May 14); 1 immature female (10.9 gm., much fat), Laurel County (Oct. 7); 1 unsexed immature, Jefferson County (Sept. 30); 1 female (8.3 gm., not fat), Warren County (May 4).



OVENBIRD

Adult at nest found May 22, 1952, on the floor of disturbed Mixed Mesophytic Forest 4,000 feet above sea level, Black Mountain, Harlan County. Water color made at the site.

Seiurus aurocapillus (Linnaeus): OVENBIRD

Status.—Summer resident, common in the Cumberland Plateau and Mountains, locally distributed and uncommon to common in parts of the (eastern) Knobs and Western Highlands, elsewhere rare and local to absent; transient throughout the state, fairly common in spring, common in fall.

Spring.—Early arrivals are occasionally recorded in early April, usually in mid-April; main flight (judging from records made outside areas where common in summer) probably in early May. Breeding birds in eastern Kentucky appear to arrive a little earlier than transients in central and western Kentucky, a tendency displayed by several other species. Early records: April 3 (1888), in Pulaski County, average of 10 years April 10, latest April 17 (Cooke, 1904:101; 1906:100); April 4 (1876), at Cincinnati, Ohio (Maslowski and Dury, 1931:95); April 15 (1948), at Louisville (Monroe); April 10, in Warren County (Wilson, 1922:241). In Powell and Wolfe counties in 1949, I found the species common and singing on April 21. In parts of central and western Kentucky where few breed, transients are mostly gone by mid-May.

Breeding records.—So far as is evident from only 6 dated breeding observations, clutches are completed from May 11–20 to June 11–20. Records are from Harlan (Mengel, notes), Rowan (Barbour, 1950a:34; 1951a:37; 1955:56), Breathitt (Barbour, 1956:9), Laurel (Monroe and Mengel, notes); Whitley (Lovell, 1947b; 1948), and Hopkins (Bacon, notes) counties, Kentucky, and nearby Clermont County, Ohio (Goodpaster, 1941:31). Egg dates range from May 22 (1952), when I found a set of 4, fresh, in a typical nest (neatly domed, tucked under a small birch log on a steep slope, entrance facing downhill and sheltered by small ferns) in climax mixed mesophytic forest at 4,000 feet elevation on Black Mountain, Harlan County, to June 14 (1955), when Barbour noted a set of 4 in Breathitt County, and approximately June 21 (1947), when Lovell noted 4 eggs hatching, at a nest in open pine-oak woods in Whitley County. The last nest contained as well 1 egg of the Brown-headed Cowbird. In similar habitat (pine, oak, hickory; upland forest), Monroe and I found a nest containing 3 newly hatched young, between the tracks of an old logging road 15 miles southwest of London, Laurel County, on June 29, 1940. The few other nests found have been reported in lesser detail: Barbour (1955) noted one containing 3 eggs in mature mesophytic forest in Rowan County, June 9, 1955; the Bacon collection contains a set of 4 taken years ago in Hopkins County. The average complement of 5 clutches or broods is 3.6 (3–4).

Breeding distribution.—The Ovenbird is common and widely distributed throughout the Cumberland Plateau and Mountains, where it is one of the most characteristic forest birds, and is common also in the Knobs immediately adjacent to the Plateau (Patten, 1946:32). In these areas the species occupies various associations, more properly association-segregates (see pp. 17–18), of the mixed mesophytic forest, seeming to prefer mature stands of moderately mesic types. It is here common in oak-hickory and related forest types, and even encroaches broadly (see breeding records, above) upon relatively xeric upland pine-oak communities. In the Cliff Section (see pp. 41–43) of the Plateau and in similar areas along Pine Mountain, I have come to associate it especially with the broad ecotone, in which *Kalmia* is frequently an important component of the understory, between pine- and oak-covered ridge tops (*Vaccinium* understory) and moist, mesic ravines, often forested with beech-maple-hemlock or like communities (*Rhododendron* understory). In these areas, as well as on Black Mountain, Harlan County (where it occurs at all elevations), it tends to avoid the most mesic communities. In the drier and less luxuriantly forested areas to the west of the Plateau, however, these are precisely the habitats occupied. At Mammoth Cave, in the Western Highlands, the species is common and well known, occupying mixed mesophytic associations rather closely resembling those on the Cumberland Plateau. Elsewhere the species is rare, when present at all. In Hopkins County, near the western extremity of the Western

Highlands, Hancock (1954:42) has found it rarely, chiefly in lowland forests, the most mesic there available. Wilson (1922:241) knew of only two breeding localities in Warren County, in the Pennyroyal, and Monroe has only a few summer records for the Louisville (outer Bluegrass) area. Beckham (1885:17) suspected it of breeding in Nelson County. The record for the remainder of the state is poorly documented and vague in the extreme. The species may breed rarely in all major areas of the state, even the Purchase, but records from the southern and western portions of the Pennyroyal, the inner Bluegrass, most of the Knobs, and the Purchase are few, old, unannotated, and in need of verification (see Wilson, 1942:24, Barren and Crittenden counties; Wilson, 1923c:135, Calloway County; Pindar, 1889b:316, 1925a:167, Fulton County).

Fall.—In areas where the species is rare or absent as a breeding bird, transients begin to arrive in late August or early September; through middle and late September they are common in woodlands everywhere; rare by early October, a few lingering later. Early records: September 4, in Nelson County (Blincoe, 1925:416); August 26 and 30, at Louisville (Monroe); September 4 (1949), common in Henderson County (Mengel). Late records: October 27 (1886), in Pulaski County (Cooke, 1906:101); October 6, in Nelson County (Blincoe, 1925:416); October 20, at Louisville (Monroe); also, 1 known to be injured remained until November 6, 1936—see Hobson, 1936); October 12, in Warren County (Wilson, 1922:241). An immature taken in Laurel County on July 6, 1948, had nearly completed postjuvinal molt (U.M.M.Z.).

Geographic variation.—All specimens examined are referable to the eastern *Seiurus aurocapillus aurocapillus* (Linnaeus).

Specimens examined.—Total, 25. M.S.C.—2 males, 1 female, Rowan County (April 25, 29; April 25); R.W.B.—1 unsexed, Harlan County (July 20); U.K.—1 female, Fayette County (May 3); C.W.B.—1 male, 1 female, Nelson County (May 1; August 10—original labels replaced); B.L.M.—1 male, Laurel County (July 3); 1 female, Oldham County (Aug. 26); J.D.F.—2 males, 1 female, Marshall County (Sept. 22, 24; Sept. 24); U.S.N.M. (see Wetmore, 1940:559)—4 specimens from Harlan, Wayne, and Jefferson counties (June 6–Sept. 4); U.M.M.Z.—1 male, Harlan County (May 30); 1 male (weight, 18.0 gm.), 1 female (17.8 gm.), Wolfe County (June 22); 1 unsexed immature (17.2 gm.), Laurel County (July 6); 1 male, Campbell County (Sept. 10); 1 male (20.2 gm., moderately fat), Jefferson County (Sept. 16); 2 males (immature, 24.2 gm., very fat; adult, 18.2 gm., moderately fat), 1 immature female (29.6 gm., extremely fat), Henderson County (Sept. 4, 9; Sept. 5).

Seiurus noveboracensis (Gmelin): NORTHERN WATERTHRUSH

Status.—Transient, fairly common in spring, common in fall.

Spring.—Transients are occasionally noted in early April, usually appearing somewhat later in the month; peak of migration near May 1–10; rare by mid-May. Representative extreme records: April 1 (1933), in Rowan County (specimen; M.S.C.); April 4–May 20 (1948), at Louisville (Monroe); next records, April 8, May 16; April 2 (1944), in Edmonson County (Wilson, 1945a); May 19 (1920), in Breathitt County (Horsey, 1922:83); May 17 (1882), in Nelson County (Beckham, 1885:17, and specimen, C.W.B.). For late April and early May there are many records from all parts of the state. Contrary to the belief of some earlier observers, the species is fairly common, preferring moist, well-shaded habitats, such as flooded lowland forest and steep, brushy stream banks. Transients frequently sing.

Fall.—Northern Waterthrushes sometimes, perhaps regularly, arrive in August and may be common by early September; peak of flight near mid-September; fairly common, at least on occasion, into early October. Early records: August 17 (1957), at Louisville (Croft, 1958a:46); August 19 and 24 (1886), in Fulton County (Pindar, 1887a:85). A number of additional records (Goodpaster, 1941:31; Wilson, 1922:241; specimens examined, below) fall between September 4 and 7. I found the species common or fairly common (usually 5 to 10 could be found in half an hour or so in a few hundred yards of suitable habitat) in Henderson County, Sep-

tember 4 and 7, 1949; Hopkins County, September 18, 1951; and Laurel County, October 3-6, 1951 (4-7 noted daily along 150 yards of alder- and willow-grown creek bank in wet meadows 2 miles south of London). In the last locality a cold front arrived on October 7; 1 bird was recorded on October 9, with none seen on October 10 and 11. Late records are scarce, others being for October 10 (1939), at Cincinnati, Ohio (Goodpaster, 1941:31), and October 8, in Warren County (Wilson, 1922:241).

Geographic variation.—Specimens examined display a considerable amount of variation in respect to color of the dorsum and underparts, combining in various ways the characters long supposed to mark a more richly colored, slightly smaller eastern (*Seiurus noveboracensis noveboracensis* [Gmelin]) and a paler, grayer, slightly larger western (*Seiurus noveboracensis notabilis* Ridgway) subspecies. Analysis of 18 available specimens (4 spring, 14 autumn) shows considerable mixture of characters. These birds were separated into two classes on the basis of dorsal, and again, independently, ventral, coloration (most being somewhat intermediate in both, separation was sometimes difficult). Resemblance to *noveboracensis* was indicated by the letters O (for olive back) and Y (for yellowish belly) and resemblance to *notabilis* by G (for gray back) and W (for white belly). Thus classified, the specimens fell into 4 classes: YO (*noveboracensis* type), 3 (16.6 per cent); WG (*notabilis* type), 3 (16.6 per cent); WO and YG, 6 each (66.6 per cent in all). Since this exercise was conducted, Eaton (1957) has marshalled considerable evidence showing that nomenclatural recognition of the faint trends toward geographic variability in the species is unjustified, a conclusion with which I agree.

Specimens examined.—Total, 22. M.S.C.—1 unsexed, Rowan County (April 1); C.W.B.—3 females, Nelson County (May 17, Sept. 6, 17); B.L.M.—1 male, Jefferson County (May 5); W. Ky. State College Coll.—1 unsexed, Warren County (spring); J.D.F.—1 female, Marshall County (Sept. 20); U.S.N.M. (see Wetmore, 1940:559-560)—1 male, 1 female, Union County (May 9; May 10); U.M.M.Z.—2 immature males (weights, 22.6 gm., 25.6 gm.; extremely fat), 1 female, Laurel County (Oct. 3, 6; May 7); 4 immature males (23.4 gm., extremely fat; 21.4 gm., very fat; —; 16.9 gm., moderately fat), 1 immature female (19.3 gm., moderately fat), Jefferson County (Sept. 15, 15, 16, 19; Sept. 15); 1 male (15.2 gm., not fat), Warren County (May 4); 3 immature females (19.7 gm., very fat; 17.6 gm., not fat; 19.8 gm., moderately fat), Henderson County (Sept. 4, 4, 7); 1 immature male (17.6 gm., not fat), Hopkins County (Sept. 18).

Seiurus motacilla (Vieillot): LOUISIANA WATERTHRUSH

Status.—Fairly common to common summer resident.

Spring.—With the Yellow-throated Warbler, one of the two earliest-arriving resident wood warblers. The species is probably always present by late March, full numbers being attained early in April. Early records: March 22, in Rowan County (Barbour, 1951a:37); March 24 (1888, 1889), in Pulaski County, average of 9 years March 27, latest March 30 (Cooke, 1904:107; 1906:102); March 20, in Nelson County (Blincoe, 1925:416); March 18 (1948), at Louisville (Monroe); I found the species common and singing in Lyon, Trigg, and Caldwell counties, April 9-12, 1950, and in Powell and Laurel counties, April 8-10, 1951.

Breeding records.—So far as evidenced by 15 dated breeding observations, clutches are completed from April 21-30 to June 1-10, with a peak May 1-10. Records (only 3 of which are explicit as to precise contents of nests) are from Martin (Green, 1957:56); Carter (Barbour, 1951a:37; Monroe, Shackleton, and Fuller, notes); Letcher (Murray, 1938:3); Breathitt (Barbour, 1956:9); Powell (Stamm, notes); Oldham (Stamm, Shackleton, and Slack, 1953:27; Monroe and Fuller, notes), Meade (Lovell, 1949b:70); Bullitt (Lovell, 1955:68; Stamm, *vide* Hays, 1957:6); Warren (Wilson, 1955a:69); and Hopkins (Hancock, 1954:42) counties. Thomas Fuller and Monroe observed a nest containing 4 small young in Oldham County, May 20-22, 1948. The nest was tucked in a crevice at the base of a rock, under the overhang of a bank about 15 feet from a small stream. In Carter County, May 1-8, 1954,

Monroe, Walter Shackleton, and Thomas Fuller observed a nest containing 6 eggs, in a rather similar situation. A set of 4 eggs was taken in Hopkins County years ago by Bacon. The sites of other nests have been described by Wilson (1955a), Lovell (1955), and Altscheler (1955a), all being well concealed on steep slopes and banks, usually near water, with the last under construction, on a slope above Cumberland Lake, on the rather late date of May 28, 1955. Remaining observations have referred chiefly to young out of the nest and adults carrying food.

Breeding distribution.—Statewide. The Louisiana Waterthrush is especially characteristic of rocky, rushing streams in heavily shaded areas, but also inhabits the borders of muddy sloughs and small, sluggish creeks in the lowlands of western Kentucky. It has been reported by many observers from all parts of the state, and I found it common to fairly common everywhere from the Cumberland Mountains to the Purchase. Howell (1910:299) recorded it up to 3,000 feet on Black Mountain, Harlan County, and I have found it there, along very small streams, to about the same elevation. In the inner Bluegrass, it is evidently somewhat less numerous than elsewhere (see Van Arsdall, 1949:27, Mercer County; Wilson, 1942:24, various localities). Several were recorded there, in Fayette County, by Edwards (notes) in the spring and early summer of 1949.

A female (U.M.M.Z.) taken at Slade, Powell County, on June 25, 1948, was already in an advanced stage of postnuptial molt.

Fall.—Rare after mid-September. Few reliable late records are available, not many observers, seemingly, having recorded the species after song is concluded in late July or early August. I found it fairly common along streams in Jefferson County, September 16–19, 1950. Late records: October 14 (1940), in Harrison County (Mayer, 1941:15); October 2, at Louisville (Monroe); October 18, in Warren County (Wilson, 1922:241).

Specimens examined.—Total, 18. R.W.B.—1 unsexed, Harlan County (July 18); C.W.B.—6 specimens, Nelson County (1 male, March 30; 1 April, 2 June, 2 July specimens); B.L.M.—2 males, 1 female, Jefferson County (April 6, June 13; June 13); 1 male, Bullitt County (April 11); C.U.—1 male, Logan County (May 22); U.S.N.M. (see Wetmore, 1940:560)—3 specimens, Wayne, Nelson, and Meade counties (April 23–June 9); U.M.M.Z.—1 male (weight, 21.9 gm., testes greatly enlarged), 2 females (20.8 gm., ovary enlarged; 22.0 gm.), Powell County (April 24; April 24, June 25).

Oporornis formosus (Wilson): KENTUCKY WARBLER

Status.—Common summer resident.

Spring.—Usually first noted shortly after mid-April, occasionally a little earlier; maximum numbers are attained by the end of April or early May. Early records: April 24, in Rowan County (Barbour, 1951a:37); April 15 (1886; 1893), in Pulaski County, average of 9 years April 21, latest April 27 (Cooke, 1904:109; 1905a:135); April 22, in Nelson County (Blincoe, 1925:416); April 18 (1948), at Louisville (Monroe); April 21, in Warren County (Wilson, 1922:241). A male taken at Bardstown, Nelson County (C.W.B.), is labelled April 4, 1885 [? original label replaced].

Breeding records.—As indicated by 15 dated observations, clutches are completed from May 1–10 to June 1–10, with a peak May 11–20. Records are from Pike (Mengel, notes); Rowan (Barbour, 1950a:34); Breathitt (Bailey, 1933:168); Laurel (Mengel, notes); Harrison (Mayer, 1941:14); Mercer (Van Arsdall, 1949:28); Owen (Stamm, notes); Nelson (specimens, C.W.B.); Oldham (Stamm, Shackleton, and Slack, 1953:27, and Stamm, notes; Monroe and Mengel, notes); Meade (Lovell, 1943b); Edmonson (Browning, 1946:42); Warren (Mengel); and Hopkins (Hancock, 1954:43) counties. On May 8, 1949, I took a female bearing a fully formed egg in the oviduct, in Warren County. Other early egg dates are provided by two sets of 2 eggs, respectively with 2 and 3 eggs of the Brown-headed Cowbird, found in leafy, herbaceous ground cover on forested slopes (typical nest sites) in Oldham County by Stamm (notes) on May 13, 1952, and by Monroe and me on May 16,

1937. A late date is June 14, 1958, when Stamm (notes) and Lovell recorded a clutch of 4 eggs in Owen County. Seven clutches or broods reported in all (discounting those parasitized) have an average complement of 4.4 ± 0.20 eggs or young (4-5). In rhododendron tangles in the Cumberland Mountains in Pike County, I took a young bird just from the nest on June 25, 1951. On the same date in 1952, in Laurel County, I saw grown young just starting postjuvinal molt. Such a specimen was taken in Nelson County by Beckham (C.W.B.) on June 23, 1886.

Breeding distribution.—Statewide. A ground-inhabiting species, the Kentucky Warbler shares with the Cerulean Warbler of the treetops the distinction of being the most widespread and generally numerous forest parulid in Kentucky. More or less restricted to mature forest, it occurs in numbers in virtually all major associations except the most xeric pine and pine-oak communities, and may even invade the edges of these, especially in eastern Kentucky. In general, however, it prefers the moist habitats and tends to be most numerous in very shady areas where undergrowth is rank. In eastern Kentucky the species occurs in the same areas as the Ovenbird, but is the more numerous of the two in the rhododendron and hemlock of lower slopes and ravines where the Ovenbird occurs sparingly, and somewhat less numerous in the drier oak-hickory-laurel type of growth where the Ovenbird abounds. On Black Mountain, Harlan County, the species is rare above 2,800-3,000 feet, but occurs rarely to the top, where I observed a singing male at 4,100 feet on a southeast slope on May 30, 1952. Lower, I recorded a few, in May and June, 1951-1952, at 3,000 to 3,400 feet. The species is much like the Carolina Wren in its altitudinal distribution on the mountain.

The Kentucky Warbler molts early. Several specimens (U.M.M.Z.) taken in Laurel and Whitley counties June 25-July 9 are either in or through the postjuvinal and postnuptial molt. A completely molted young bird still being fed by an adult was taken in Laurel County by Warner on July 6, 1946 (B.L.M.).

Fall.—The species becomes inconspicuous after cessation of regular singing in middle or late July, and the small number of truly late records among the following is probably the result of this: September 6 (1888), in Pulaski County (Cooke, 1905a:135); September 28, in Nelson County (Blincoe, 1925:416); September 4 (1949), at Henderson (Tordoff and Mengel, notes; only 1 seen in a week of intensive work in good habitat); September 23 (1956), at Louisville (Monroe); also a bird in full song there on September 15, 1950 (Mengel). Some birds probably occur still later, since 2 were killed at an airport ceilometer at Knoxville, Tennessee, on October 7-8, 1951 (Howell and Tanner, 1951:62). Pindar's (1887a:85) record of 1 in Fulton County, November 28, 1886, however, cannot be accepted, since he was apparently unable to find the species at other times.

Specimens examined.—Total, 42. M.S.C.—1 male, 1 female, Rowan County (May 10; May 14); U.K.—1 male, 1 female, Woodford County (May 4; June 1); C.W.B.—19 specimens, Nelson County (3 April; 3 May; 6 June; 7 July); B.L.M.—3 males, 1 female, Laurel County (July 3, 6, 6; July 6); 1 male, Jefferson County (June 13); 1 female, Oldham County (July 1); C.U.—1 male, 1 female, Logan County (May 14; May 22); U.S.N.M. (see Wetmore, 1940: 560)—4 specimens, Wayne and Fulton counties (May 24-June 15); U.M.M.Z.—1 unsexed (just fledged), Pike County (June 25); 1 male, 1 female (skeletons), Harlan County (June 29; July 2); 1 immature male, Powell County (June 27); 1 male (weight, 13.3 gm.), Laurel County (July 6); 1 male (14.2 gm.), Whitley County (July 9); 1 female (16.2 gm., egg in oviduct), Warren County (May 8).

Oporornis agilis (Wilson): CONNECTICUT WARBLER

Status.—Transient, little known; evidently rare or uncommon in spring, casual in fall (one record).

Spring.—A furtive inhabitant of dense thickets and of forest habitats affording profuse understory, the species is probably somewhat more numerous than the small number of records indicates. It is rather a late migrant, rarely appearing before May 1, and is probably at maximum numbers near May 15-20. Reported without

detail from Rowan County (Barbour, 1952:28), April 24 [?]-May 3; and from Fulton County (Pindar, 1925a:167). In reporting more recent Warren County records for May 15 and 19, 1945, Wilson (1946a:10; 1946e:54) expressed doubt concerning his own earlier records (Wilson, 1922:241). Specimens were reported by Beckham (1885:18) as taken in Nelson County, May 12, and May 13, and by Goodpaster (1941:31) near Cincinnati, Ohio, May 16, 1937. The best series of records has been compiled at Louisville by Monroe, a few each year, April 28, 30; May 1, 3-5, 8, 12-14, 18-25, 28; June 4 (1949). In mature floodplain forest at "Kentucky Bend" of the Mississippi River in Fulton County, I recorded 3 singing birds and took a male (U.M.M.Z.) on May 19, 1949.

Fall.—A few casual references to the species in fall are scarcely worthy of serious consideration (Worthington, 1926; Wilson, 1922:241). The species migrates in autumn mainly, though not entirely, along the Atlantic slope. The best evidence of its occurrence in Kentucky at this season is Beckham's (1885:18) record of a specimen taken at Bardstown, Nelson County, on October 11 (year not stated). Although I could not find this specimen in a necessarily incomplete search of his collection, his abilities and caution were such that I regard the record as authentic until proven otherwise. Monroe has a few doubtful records September 21-October 18.

Specimens examined.—Total, 2. B.L.M.—1 male, Jefferson County (May 20, 1946); U.M.M.Z.—1 male (weight, 14.6 gm., moderately fat), Fulton County (May 19).

Oporornis philadelphia (Wilson): MOURNING WARBLER

Status.—Rare to uncommon transient.

Spring.—Although not well known in Kentucky, this secretive species is probably somewhat more numerous than the Connecticut Warbler, and may well occur in considerably greater numbers than is generally suspected. It is a late migrant, occurring mainly in May, with the peak of migration probably near mid-May. The few records may be given in full. Recorded from Bardstown, Nelson County, by Beckham (1885:18), 3 specimens May 9-May 18 (C.W.B.), and Blincoe (1925:416), May 20, 1917, and May 18, 1920. Noted by Wilson (1946a:10) in Warren County on May 19, 1945 (in this note Wilson expresses doubt concerning his own earlier records; cf. Wilson, 1922:241), and May 9, May 27, and June 3, 1959 (Wilson, 1959a:54). In Jefferson County, Monroe has noted a few nearly each spring, May 3-23, and May 26 (1948). Various casual reports of the species give neither additional dates nor significant comment.

Fall.—An early migrant, probably arriving in August; present at least to the end of September, and probably later. The species is difficult to identify in autumn (see Young, 1950), many transients being immature birds which, besides being furtive and inhabiting dense cover, much resemble immature Yellowthroats. Goodpaster (1941:31) reported specimens taken at Cincinnati, Ohio, on August 23, 1886 (by Charles Dury; also see Maslowski and R. Dury, 1931:96), and August 16, 1936. Monroe took a male (B.L.M.) at Anchorage, Jefferson County, on September 13, 1946, and a bird was trapped at Louisville by Lovell on September 24, 1949 (Young, 1950:36). Monroe has other records, September 13-19, and October 8 (1957). I saw an obscurely plumaged Mourning Warbler near Louisville on September 11, 1950, and took an immature female (presumably the same bird) at the identical spot the next day (U.M.M.Z.). This bird occupied a dense growth of buttonbush and cattails over water about 6 inches deep at the edge of a swamp two miles east of Louisville in the Ohio River floodplain. At Henderson, Tordoff took a similar bird (U.M.M.Z.) on September 5, 1949, from a dense patch of ragweed and goldenrod in a clearing in lowland woods, and saw another on September 7. I saw yet another immature bird in the bottoms of Pond River, Hopkins County, on September 19, 1951.

Note.—I seriously doubt the separability of female Mourning and Macgillivray's

warblers (*Oporornis tolmiei*) in the field (indeed, it can be exceedingly difficult in the hand, if not, sometimes, impossible), and so am inclined, reluctantly, to discredit a sight record of the latter made by Burt L. Monroe, Jr., at Anchorage, Jefferson County, on August 25, 1959.

Specimens examined.—Total, 8. C.W.B.—3 males, Nelson County (May 9, 12, 18); B.L.M.—3 males, Jefferson County (May 12, 22, Sept. 13); U.M.M.Z.—1 immature female, Jefferson County (September 12); 1 immature female (weight, 17.0 gm., extremely fat), Henderson County (Sept. 5).

Geothlypis trichas (Linnaeus): YELLOWTHROAT

Status.—Common summer resident.

Spring.—Arrives rarely in early April, usually in mid-April; maximum numbers attained by early May. Early records: April 10 (1892), in Pulaski County, average of 6 years April 15, latest April 22 (Cooke, 1904:117; 1905c:278); April 22, in Nelson County (Blincoe, 1925:416); April 3, and April 15 (1948), at Louisville (Monroe); April 14, in Warren County (Wilson, 1922:241). In 1949, I found the species fairly common in Powell County on April 22. In 1950, Handley and I recorded 2 to 4 singing males daily in Lyon, Trigg, and Marshall counties, April 11–16.

Breeding records.—Nests of this common species are very well concealed in dense grasses or other herbaceous vegetation, often at the shrubby margins of fields, and few have been found. Only 9 dated breeding observations indicate completion of clutches from May 21 to June 10. Data are from Harlan (Mengel, notes); Lewis (Wetmore, 1940:560); Breathitt (Barbour, 1956:9); Wayne (Ganier, 1937a:27); Mason (Keith, 1944); Owen (Stamm, *vide* Hays, 1957:6); Jefferson (Monroe, notes); and Hopkins (Hancock, 1954:43) counties. Nests containing 5 eggs were noted in Hopkins County, by Suthard and Hancock, respectively, on June 4, 1924, and June 2, 1952; and in Jefferson County, Monroe found a nest containing 5 small young on June 10, 1917. A set of 4 eggs, just hatching, was noted by Ganier and others in Pickett County State Park, Tennessee, virtually on the Wayne County, Kentucky, line, on June 17, 1937. Average complement of 4 clutches and broods: 4.8 ± 0.15 (4–5). A nest containing an unspecified number of Yellowthroat and cowbird eggs was reported from Mason County (Keith). Other observations cited above refer to young of various ages, all out of the nest. I noted such, not quite grown, on Black Mountain, Harlan County, on July 1, 1951.

Breeding distribution.—Statewide. Equally at home in marshes, meadows, forest-edge, and varied moist, brushy areas, the Yellowthroat is probably the most numerous breeding warbler of the state. It is common alike in meadows at the top of Black Mountain, Harlan County, at an elevation of 4,100 feet, and in the dense swales and marshes of the Mississippi River lowlands.

Fall.—Remains common throughout most of September, beginning to decrease around the end of the month; sometimes fairly numerous locally in early October; rare by mid-October. Late records: October 4 (1938), in Rockcastle County (Wetmore, 1940:560); October 4 (1937), at Cincinnati, Ohio (Goodpaster, 1941:31); October 5, in Nelson County (Blincoe, 1925:416); October 11 (1958), at Louisville (Monroe); October 29, in Warren County (Wilson, 1922:241); October 22 (1938), in Muhlenberg County (Wetmore, 1940:560). I found the species very numerous at Henderson, September 4–9, 1949; common to fairly common at Louisville, September 13–20, 1950, and September 28–October 1, 1951; and fairly common in Laurel County, October 3–8, 1951, with only 1 noted in much good habitat there on October 10. The birds sing regularly in autumn, with "whisper" songs predominating. Molting takes place throughout summer and early fall, variously in different birds. I took a young bird just starting postjuvenile molt on Black Mountain, Harlan County on July 20, 1949; Howell (1910:299) noted molting adults and young at Barbourville, August 9–13, 1908. September birds examined (see be-

low) were all in molt or had just completed it, the adults showing complete molt including wings and tail, immatures body molt only.

Geographic variation.—As Wetmore has shown (1937:431; 1939:227; 1940:560; 1941:518), the Yellowthroats of the entire area north of northern Georgia, and from the Appalachians west to the Mississippi River, are large and brightly colored and belong with the subspecies *Geothlypis trichas brachidactylus* (Swainson), to which all specimens examined are here referred. Formerly, Kentucky birds were referred to in literature as the "Maryland" Yellowthroat, *G. t. trichas* (Linnaeus), a subspecies which seems, according to present knowledge, to be restricted to the Piedmont and Coastal Plain areas east of the Appalachians. As late as 1948, a single specimen from near Cincinnati, Ohio (not from Kentucky) was seriously referred to *trichas* (Kemsies and Dreyer, 1948:145), one of the last subspecies of which the identification of single specimens far from the breeding range would seem advisable.

Specimens examined.—Total, more than the 43 here listed (all Beckham specimens not recorded in detail). M.S.C.—1 male, 1 unsexed, Rowan County (May 15; May 1); R.W.B.—1 male, Rowan County (July 22); 2 females, Harlan County (July 20, 27); U.K.—1 male, Wayne County (April 28); C.W.B. (part)—8 specimens, Nelson County (1 for April; 3 May; 1 July; 3 Sept.); B.L.M.—1 male, Jefferson County (April 27); 1 male, Oldham County (June 12); J.D.F.—1 adult male, Marshall County (Sept. 1); U.S.N.M. (see Wetmore, 1940:560)—16 specimens from Harlan, Bell, Rockcastle, Lewis, Wayne, Meade, Union, Muhlenberg, and Fulton counties (April 27–Oct. 22); U.M.M.Z.—1 immature female (weight, 8.6 gm.), Harlan County (July 20); 1 male (10.7 gm.), Powell County (June 26); 2 males (adult, 9.5 gm.; immature, 10.8 gm.), Laurel County (April 30, Oct. 5); 1 immature male (11.2 gm.), 1 immature female (10.0 gm.), Jefferson County (Sept. 15); 3 females (2 immatures, 9.2, 10.2 gm.; adult, 14.1 gm.), Henderson County (Sept. 6, 9, 9); 1 male (8.6 gm.), Warren County (May 4).

Icteria virens (Linnaeus): YELLOW-BREASTED CHAT

Status.—Common summer resident.

Spring.—Chats are moderately late arrivals, occasionally appearing just after mid-April, usually in late April. Full numbers are attained by early May. Early records: April 26, in Rowan County (Barbour, 1951a:37); April 19 (1889), in Pulaski County, average of 10 (11?) years April 23 (Cooke, 1904:121; 1904a:23); April 27, in Nelson County (Blincoe, 1925:416); April 22 (1946), at Louisville (Monroe); April 20, in Warren County (Wilson, 1922:241); April 21 (1948), in Hopkins County (see *Kentucky Warbler*, 24:48, 1948).

Breeding records.—Clutches, as indicated by 34 breeding observations, may be completed from April 21–30 to July 11–20, with an early peak May 21–31 and no later one evident. Records are from Rowan (Barbour, 1950a:34; 1951a:37; 1955:56); Carter (Kozee, 1938); Mason (Keith, 1944); Grant (King, 1940:11); Owen (Lovell, Stamm, and Pierce, 1955:6; Stamm, *vide* Hays, 1957:6; Stamm, notes); Oldham (Stamm, notes); Jefferson (Monroe, notes; Lovell, *vide* Hays, 1957:6); Nelson (Blincoe, *vide* Funkhouser, 1925:286); Meade (Lovell, 1949b:70); Marion (Monroe, notes); Edmonson (Browning, 1946:42); and Hopkins (Hancock, 1951:9; 1954:43) counties. Construction of a nest on May 4 was noted in Rowan County (Barbour, 1951a); egg dates range from May 16 (1935), in Hopkins County (4 eggs), to July 21 (1937), in Grant County (4 eggs hatching), and July 23 (1947), in Hopkins County (1 egg). A very early nesting is indicated by the observation, at nearby Cincinnati, Ohio, of small young out of the nest on May 23, 1936 (Goodpaster, 1941:31). The average complement of 27 clutches (chiefly) and broods thought complete is 3.6 ± 0.14 (2–5). Two eggs of the Brown-headed Cowbird were noted in a nest containing four chat eggs, in Hopkins County, June 1, 1950 (Hancock, 1951), and 2 more parasitized nests were noted in Owen County (Stamm). Nests are found in shrubby areas, sometimes in fairly open situations, also in dense tangles of brush, and have been reported in wild cherry, blackberry,



HOODED WARBLER

Adult female incubating at nest in disturbed Mixed Mesophytic Forest 4,000 feet above sea level, Black Mountain, Harlan County. The clutch of four eggs was completed on May 24, 1952. Water color made at the site.

honeysuckle tangles, greenbriar, coralberry, oak and elm saplings, and, in several cases, red cedars, the height above ground of 10 averaging 3.1 feet (2-4). Unpublished notes of Monroe's refer to nests in Jefferson County, one containing 4 fresh eggs (2 feet up in blackberry vines) and one with 1 egg and 2 newly hatched young (4 feet up in a young elm), both on May 30, 1936, and in Marion County, a nest with 4 fresh eggs (4 feet up in an unidentified shrub) on May 20, 1928.

Breeding distribution.—Common throughout the state, the chat occurs in brushy clearings, at the edges of old fields, in slashings and forest windfalls, and wherever early stages of reforestation are predominant. It is common to the top of Black Mountain, Harlan County, at 4,100 feet, where in fact it is one of the most conspicuous species, and figures in practically all local lists of breeding birds in the Kentucky literature. Pindar (1925a:167) corrected his earlier statement (1889:316) that it was very rare in Fulton County.

Fall.—Lurking in dense cover, the chat becomes inconspicuous when song is discontinued in late July or early August, and autumn records are consequently few. Late records: September 18 (1885), in Nelson County (specimen, C.W.B.); October 1 (1950 and 1960), at Louisville (Monroe); September 23, in Warren County (Wilson, 1922:241). I observed a molting bird with the tail half-grown at Henderson on September 10, 1949, and 1 with no visible tail at all near Louisville, September 17, 1950 (both, presumably, adults). A specimen (R.W.B.) taken in Harlan County on July 16, 1939, was already in heavy body molt. A male from Marshall County (J.D.F.), September 2, 1941, is entirely in fresh plumage.

Geographic variation.—The subspecies occurring is the eastern *Icteria virens virens* (Linnaeus).

Specimens examined.—Total, 25. M.S.C.—1 male, Rowan County (May 4); R.W.B.—1 male, Harlan County (July 16); U.K.—1 male, Woodford County (May 8); C.W.B.—8 specimens, Nelson County (May, June, July; 1 male, September 18, 1885); B.L.M.—1 female, Union County (July 6); C.U.—1 male, Logan County (May 31); J.D.F.—1 male, Marshall County (Sept. 2); U.S.N.M. (see Wetmore, 1940:560-561)—8 specimens, Pike, Harlan, Union, and Fulton counties (May 7-July 4); U.M.M.Z.—1 female (skeleton), Harlan County (July 5); 1 male, Wolfe County (June 21); 1 male (weight, 25.2 gm., skeleton), Owen County (July 6).

Wilsonia citrina (Boddaert): HOODED WARBLER

Status.—Summer resident, very rare to common, irregularly distributed throughout the state; uncommon transient.

Spring.—Hooded Warblers usually arrive about mid-April, occasionally earlier; in areas where the species breeds regularly, full numbers are probably attained by April 20-25. Limited evidence suggests that breeding birds arrive slightly earlier than transients. Early records: April 18, in Rowan County (Barbour, 1951a:37); April 8 (1890), in Pulaski County, average of 7 years April 14, latest April 20 (Cooke, 1904:125; 1904a:22); April 14 (1952), at Louisville (Monroe—species does not breed in immediate area); April 13, in Warren County (Wilson, 1922:242). In the cold spring of 1950, Handley and I recorded the first, 3 singing birds, in Trigg County on April 17; in the same area, Lovell (1949:36) recorded the species on April 12, 1949.

In areas where few or none breed, the Hooded Warbler is an uncommon or rare transient, as in Warren County (Wilson, 1922:242); in the Louisville area, where Monroe (notes) has only a few spring records (the latest for May 20); and near Lexington, where Edwards (notes) in the spring of 1950 recorded presumably transient individuals on April 24 and May 7. Beckham (1885:19) and Blincoe (1925:416) reported specimens and a few sight records for Bardstown and vicinity, Nelson County, April 19-May 9. In Meade County, a Hooded Warbler was seen on April 26, 1938 (Wetmore, 1940:561).

Breeding records.—As indicated by only 9 dated observations of various breeding activities, clutches are completed between May 11 and June 10, with a peak May



Fig. 36. Female Hooded Warbler feeding newly fledged young. Laurel County, Kentucky, June 12, 1952. The adult bird is R.M.M. original catalog no. 1494. Females with hoods this fully developed are quite rare and are possibly rather old birds (see Chapman, 1907:270).

21-31. Records are from Harlan and Laurel (Mengel, notes), Letcher (Murray, 1938:3), Rowan (Barbour, 1950a:34), Meade (Lovell, 1949b:70), Edmonson (Hibbard, 1935:465), and Hopkins (Bacon, verbal com.) counties. Those nests previously reported (as noted above) were found in Rowan County in 1938 (one with 2, three with 3 eggs), and in Meade County in 1947 (no details). A nest and set of 4 eggs taken in Hopkins County was in Bacon's collection when I examined it at Madisonville. The complement of 7 clutches and 1 brood averages 3.3 ± 0.21 (2-4), and 4 nests averaged 1.5 feet above ground (0.5-3.0). These figures include additional nests I found in 1952, as follows: (1) discovered May 22, in climax mixed mesophytic forest (predominantly beech, yellow birch, and sugar maple) at 4,000 feet elevation on Big Black Mountain, Harlan County, 15 inches up in the fork of an herbaceous plant (2 eggs when found; 3 eggs May 23, female incubating; 4 eggs May 24, female incubating; nest much like all of the following, beautifully constructed of grasses, strips of inner bark, dried leaves, flower petals, spiderwebs, and old herbaceous twigs, lined with horsehair and grasses, depth $2\frac{1}{2}$ inches, outside diameter $3-3\frac{1}{4}$ inches, inside diameter $1\frac{1}{4}$ inches, depth of cup $1\frac{3}{8}$ inches); (2) discovered June 6, same area, at 3,500 feet, in climax forest composed largely of basswood and sugar maple, situated 3 feet up in crotch of a basswood sapling (1 egg; female not in evidence); (3) found in Laurel County, 12 miles southwest of London, June 11, nest 6 inches above ground in a red oak sapling under a large flowering dogwood in grove of pine, oak, and hickory at edge of a steep slope (4 young, which leaped from nest when disturbed and would not remain there when replaced); (4) found in same area, 130 yards distant, June 14, nest 15 inches up in white oak sapling in thicket of oak reproduction (3 eggs, female incubating; nest destroyed by an unknown predator before June 23). Other records cited above refer to adults carrying food, or to young out of the nest being fed. Also in Laurel County, I saw a brood just out of the nest on June 23, 1952.

Breeding distribution.—Essentially statewide. The species is much more numerous in some areas than in others, however, and may be absent locally. A species of mature forest, especially extensive stands, the Hooded Warbler has undoubtedly been much affected by widespread deforestation. Today it is common and generally distributed without regard to elevation, throughout the Cumberland Mountains and Plateau, being, in the more heavily and extensively forested areas, one of the three or four most numerous species. It is somewhat more locally distributed, common in some areas, rare in others, in the Knobs and Western Highlands, perhaps most numerous in the rugged, well-forested area of Mammoth Cave, diminishing in numbers and frequency of occurrence westward to the Tennessee River. The species is also common and generally distributed in the alluvial forests of western Kentucky lowlands, eastward into the westernmost parts of the Pennyroyal, at least to Logan County, and up the lower Ohio River at least to Henderson. Elsewhere it is rare and local, as it is in most of the Pennyroyal, and the species is virtually if not absolutely lacking as a breeding bird in the Bluegrass.

On the Cumberland Plateau the Hooded Warbler occupies a considerable variety of mixed mesophytic forest communities, including the most mesic, and encroaches to some extent upon comparatively xeric pine-oak communities (see breeding records). On the Plateau, I came to associate it especially with deeply shaded slopes below the great sandstone scarps of the Cliff Section (see pp. 41-43), where its seemingly disembodied, somehow other-worldly song, ringing yet muted, issues regularly from the impenetrable tangles of rhododendron beneath the tall hemlocks and, echoing from the cliffs above, is heard to such excellent effect that in the listener's mind it soon becomes an essential feature of the region.

West of the Cumberland Plateau, the Hooded Warbler is increasingly, if not entirely, restricted to the most mesic mature forests available. In the Western Highlands and in the Knobs (where Monroe and I have accumulated a number of records for southern Jefferson and adjoining Bullitt County) mixed mesophytic associations are occupied, this being, presumably, the case also in the eastern Knobs where they abut against the Plateau (here the species was recorded by Patten, 1946: 31), and on Muldraugh's Hill just south of the Knobs, where Lovell (1949b:70) found the Hooded Warbler fairly common. In the Pennyroyal, records are chiefly from marginal areas adjacent to the Cumberland Plateau in the eastern Pennyroyal (I have records from western Pulaski County), and along the edge of the Dripping Springs Escarpment in the western Pennyroyal (at the margin of the Western Highlands). There I recorded several birds in mesic ravines in north-western Warren County on May 8 and June 18, 1949 (see also Wilson, 1942:24, Barren and Warren counties). In the Purchase, the lowland forests occupied (dry, upland oak-hickory seems here to be avoided) are decidedly mesic but not mixed mesophytic. They are composed variously of swamp oaks, maples, sweet gum, sycamore, scattered cypress, and other trees. The Hooded Warbler is numerous where such swamp forests are well developed, and some resemblance to these is shown by the forests along Wolf Lick, Logan County, where I recorded many birds in May, 1949 (see also Embury, 1907), and again in the Ohio River bottom lands near Henderson, where I found the species common in June of 1940 and 1941. There appear to be no records for the Bluegrass proper; even years ago, Beckham (1885) failed to record the species as breeding in Nelson County, at the very edge of the Bluegrass.

While the Hooded Warbler has doubtless been eliminated from some areas as a result of deforestation and has probably decreased in others, it seems likely that it was never so numerous, if it occurred at all, in the drier forests of the Bluegrass and Pennyroyal as it is in the optimal habitats described above.

Fall.—Hooded Warblers are rather infrequently observed after cessation of regular singing in middle or late July. Most are seemingly gone by early September, but a few remain or pass later. Late records: October 5 (1920), and September 25 (1921), in Letcher County (Horsey, 1922:83; 1923:144); September 22, in Bell

County (Wetmore, 1940:561); September 21, in Rowan County (specimen, M.S.C.); September 29 (1889), in Pulaski County (Cooke, 1904a:22); September 17 (1950), and October 2 (1949) at Louisville (Mengel, Monroe, notes); August 20–October 15 [?], in Warren County (Wilson, 1922:242). I noted 1 bird singing softly in lowland forest at Henderson on September 7, 1949. In Laurel County, where the Hooded Warbler is a common breeding bird, I noted none in continuous field work October 3–11, 1951.

Specimens examined.—Total, 20. M.S.C.—2 males, Rowan County (May 15, Sept. 21); R.W.B.—2 males, 1 female, Harlan County (July 20, 21; July 20); B.L.M.—1 male, 1 female, Laurel County (July 4; July 3); 1 male, Jefferson County (July 20); C.U.—1 male, Logan County (May 22); U.S.N.M. (see Wetmore, 1940:561)—4 specimens from Bell, Harlan, and Fulton counties (May 30–Sept. 22); U.M.M.Z.—2 males (11.4 gm., 9.7 gm.; not fat), 1 female (9.9 gm.), Wolfe County (April 24, July 1; June 22); 1 male (10.4 gm.), Powell County (June 28); 1 male (11.2 gm.), 1 female (10.1 gm.), 1 nestling, unsexed, Laurel County (July 6; June 12; June 11).

Wilsonia pusilla (Wilson): WILSON'S WARBLER

Status.—Transient; uncommon in spring, uncommon to fairly common in fall.

Spring.—A rather late migrant, recorded mainly in May; peak of flight near mid-May. Comparatively few authors have recorded dates of observation. At Louisville, Monroe has recorded the species each year as an uncommon transient, with extreme records for April 29 (1958) and May 26. For Warren County, Wilson (1922:242) listed records ranging from April 18 to May 13, the earlier ones being, I think, subject to question. Remaining records are few and scattered, but represent most of the state (see "specimens examined" and Pindar, 1925a:167; Beckham, 1885:19; Wilson, 1946:20; Patten, 1937:20; Barbour, 1952:28). Goodpaster (1941:32) listed several records for Cincinnati, Ohio, May 16–20. Although the species is probably best considered uncommon, it is often readily found in May, in small numbers, frequenting open woodland, or thickets, hedgerows, and groves of trees in more or less open country. I recorded small numbers in Warren County on May 6, 1949, in Logan County on May 9, 1949, and in Laurel County, May 7–12, 1952. In the last named, I noted birds in willow marshes and thickets near London and also in upland pine-oak forest 10 miles to the southwest. Edwards (notes) recorded the species at Lexington on May 14, 1949 and 1950.

Fall.—The species is evidently a little more numerous than in spring. It is an early migrant, so far recorded only September 3–30 (both extremes from Monroe's records at Louisville). Wilson (1922:242) gave Warren County records as September 6–29, and Goodpaster (1941:32) listed several Cincinnati, Ohio, records, September 8–25. Of 9 September specimens taken in Nelson County by Beckham (C.W.B.), the latest is dated September 18 (1886). In past years I have noted the species several times in early September, recent records being acquired at Henderson, where Tordoff and I saw individuals on September 4 and 8, 1949 (see also specimens examined).

Geographic variation.—The subspecies occurring in the eastern *Wilsonia pusilla pusilla* (Wilson).

Specimens examined.—Total, 18. M.S.C.—1 male, Rowan County (May 14); C.W.B.—10 specimens, Nelson County (1 May bird, 9 Sept.; latest, Sept. 18); B.L.M.—1 male, Jefferson County (Sept. 7); Bacon Coll.—1 male, Hopkins County (Sept. 8); J.D.F.—2 males, Marshall County (Sept. 12, 16); U.S.N.M.—1 male, Union County (May 16); U.M.M.Z.—1 male (weight, 7.1 gm., not fat), Warren County (May 6); 1 male (9.0 gm., moderately fat), Logan County (May 9).

Wilsonia canadensis (Linnaeus): CANADA WARBLER

Status.—Fairly common transient, more numerous in fall; common summer resident above 3,600 feet elevation on Black Mountain, Harlan County.

Spring.—The Canada Warbler is a decidedly late migrant, usually first noted

around May 5. It is a furtive inhabitant of dense, leafy undergrowth (whence its loud song may advertise its presence) and seems to have eluded detection by all but a few local workers. Early and late records are scarce; the peak of migration is probably near mid-May, when in fact the species is often fairly common in the understory of mature forest and woodland. Alone among local records, Monroe's from Louisville, April 30 (1944)–May 30 (1948) give a fair idea of its dates of occurrence. Other records are scattered: May 18 (1921), at Bardstown (Blincoe, 1925:417), where specimens were also taken May 7–13 (Beckham, C.W.B.); May 6 and 20, at Cincinnati, Ohio (Goodpaster, 1941:32); May 14 (1949, 1950) and 22 (1949), at Lexington (Edwards, notes); April 28–May 16, in Warren County (Wilson, 1922:242). I recorded singing males in undergrowth of lowland forest near London, Laurel County, on May 6 and 7, 1952. The time of arrival of breeding birds on Black Mountain, Harlan County, is not known. They were already present at higher altitudes and singing sporadically when I arrived there on May 13, 1952; regular and frequent song was first noted on May 17.

Breeding records and distribution.—In the breeding season the species is limited to the higher parts of Black Mountain, in Harlan County, where it was first discovered by Howell (1910:299) on July 24, 1908, and it possibly occurs also on adjacent portions of the mountain in Letcher County. Most birds are seen from about 3,800 feet to the summit, at 4,150 feet; a few are met with as low as 3,500 feet.

As indicated by only 6 dated breeding observations, clutches are completed from May 11–20 to July 1–10, chiefly (5 of 6) May 11–31. In 1952, I found two nests at 4,000 feet in climax but cut-over forest. Nest No. 1: 5 eggs, heavily incubated, May 28, 1952; nest on the ground, a deep cup, facing downhill on steep slope, tucked in cranny under base of a chestnut sprout, its base merged with moss and leaf mold of the cavity, roofed completely by fallen grasses, ferns, and herbaceous stems, sheltered in front by small chestnut sprouts and ferns; discovered when female flushed and feigned injury. Nest No. 2: 5 newly hatched young, June 6, 150 yards from the first; concealed in a mossy tussock on ground in an open, leafy space on almost level forest floor, opening to one side, entrance partly shielded by ferns; female flushed from nest and feigned injury. Breiding (MS) listed a nest with 1 egg found on the mountain on July 5, 1944. Small young out of the nest were observed by Lovell (1950c:63; 1950:107–108) above 3,500 feet on June 18, 1947, and June 16, 1950. I took a young bird, two-thirds grown, at 3,900 feet on June 29, 1951, and saw full-grown young birds in juvenal plumage being fed on June 28 and July 7, 1951. Wetmore (1940:561) reported a barely grown young bird (U.S.N.M.) taken June 24, 1938.

The species particularly favors dense patches of herbaceous growth at forest edges and the understory of fairly open forest. In singing male counts in 1951 and 1952, I found this one of the two most numerous warblers at the summit of Black Mountain (with the Black-throated Blue Warbler), with an indicated population of 25 singing males per 100 acres.

Fall.—An early migrant; some arrive in August; peak of flight early to mid-September; a few remain into early October. Records are scattered, the best series, as for spring, being that for Louisville (August 18–October 1), where the species is sometimes fairly common by late August. Croft (1958a:46) noted 1 bird on August 18, 1957. On August 21 and 26, 1942, I saw several and took specimens (B.L.M.) on each date. Recorded at Cincinnati, Ohio, on August 27, 1936 (Goodpaster, 1941:32). There are many September records for various localities, the species being somewhat more numerous than in spring. Late records; September 25 (1921), in Letcher County (Horsey, 1923:144); October 1 (1950), at Louisville (next record, September 23; Monroe); September 25, in Warren County (Wilson, 1922:242). Tordoff and I noted several in lowland woods at Henderson, September 7–9, 1949 (2 were singing softly on September 8), and I saw several and took 1 (U.M.M.Z.) at Louisville (swampy woods) on September 16, 1950. A late record

for northern Tennessee was provided by 2 killed at Knoxville, October 7-8, 1951 (Howell and Tanner, 1951:62).

Specimens examined.—Total, 25. C.W.B.—3 males, 1 female, Nelson County (May 7, 12, 12; May 13); B.L.M.—1 male, Harlan County (July 9); 1 male, 1 female, Jefferson County (May 22; Aug. 21); 1 female, Oldham County (Aug. 26); J.D.F.—1 male, Woodford County (Sept. 4); 2 males, 4 females, 1 unsexed, Marshall County (Aug. 21-Sept. 16); U.S.N.M. (see also Wetmore, 1940:561)—3 specimens, Harlan County (June 21-24); U.M.M.Z.—2 males (weights 11.4 gm., —), 3 females (the last a two-thirds grown immature), Harlan County (May 14, June 28; June 28, 29, 29); 1 immature female (weight, 12.9 gm., moderately fat), Jefferson County (Sept. 16).

Setophaga ruticilla (Linnaeus): AMERICAN REDSTART

Status.—Summer resident throughout Kentucky, varying locally from very rare to common; common transient.

Spring.—First noted occasionally in early April, usually near mid-April; peak of migration in early or mid-May; in areas where few breed, rare by late May. Comparison of records from Pulaski County with those from farther west suggests earlier average arrival in eastern Kentucky, where many breed, than in central Kentucky, where most birds are transient. Early records: April 18, in Rowan County (Barbour, 1951a:37); April 12 (1890), in Pulaski County, average of 8 years April 16 (Cooke, 1903:189); April 23, in Nelson County (Beckham, 1885:20); April 24, at Louisville (Monroe); "arrives about April 15" in southern Indiana (Butler, 1897: 1103); April 4 [?], in Warren County (Wilson, 1922:242).

Breeding records.—Although large numbers summer in the state, few nests have been found. As indicated by only 9 dated breeding observations, clutches are completed from May 11-20 to June 11-20 with no marked peak evident. Records are from Harlan (Lovell, 1950c:63; Mengel, notes), Breathitt (Barbour, 1956:10), Rowan (Barbour, 1955:56), Madison (Patten, *vide* Brecher, 1950:56), Nelson (Beckham, 1885:20), and Edmonson (Brecher, 1950:55) counties, and may be given in full. At Bardstown, Nelson County, Beckham noted fresh eggs on May 27, year undisclosed. Brecher described in some detail a nest, which 2 or more young had just left on June 4, 1950, at Mammoth Cave, Edmonson County (nest 15 feet up on horizontal branch of mature box elder, about 4 feet from trunk, in "thick young mixed hardwood forest"). On Black Mountain, Harlan County, where Lovell (*loc. cit.*) had noted young just from the nest on June 16, 1948, I found a nest containing 3 young, 4 to 5 days old, on July 5, 1951, at an elevation of 3,200 feet (on a southeast slope in rather open mixed mesophytic climax of basswood, sugar maple, hickories, tulip, and black walnut; with black locust in disturbed areas). The nest was 25 feet up, in the main fork of a sugar maple sapling 3 inches in diameter at base. On May 13, 1952, I found a nearly completed nest under construction, 100 yards from the above site. A nest containing 1 egg, on June 9, 1955, 30 feet up in a sweet gum in Rowan County, was seen by Barbour (1955), who noted another (Barbour, 1956), containing 3 eggs, 12 feet up in a large sycamore in Breathitt County, on June 15, 1955. The compact, cup-shaped nests are neatly constructed of grasses, rootlets, plant fibers, and like materials, the four nests specifically mentioned above averaging 20.5 feet above ground. Young out of the nest but still being fed are frequently observed on Black Mountain. Most that I saw in 1951 and 1952 were fully grown, but a brood of three-quarter grown birds was watched on July 2, 1951, at 3,600 feet. In bottom lands of the lower Ohio River, near Barlow, Ballard County, I saw grown young being fed on July 16, 1951.

Breeding distribution.—Statewide but irregular. The species resembles the Hooded and Parula warblers, and to a lesser extent the Swainson's Warbler and Yellow-throated Vireo, in being common to fairly common in the (chiefly) mixed mesophytic forests of the mountainous east, rare to completely absent in the drier forests of central Kentucky, and again common in the mesic (but not mixed meso-

phytic) forests of the western lowlands. Although openings and edges of mature forest are inhabited, the species occurs mainly in successional forest stages.

In eastern Kentucky it is common at all elevations on Black Mountain, in Harlan and Letcher counties, where it occurs in slashings and small openings and at the edges of mixed mesophytic climax; it is more locally distributed in the adjoining and generally drier forests of Pine Mountain, where I have found it variously in Bell, Letcher, and Pike counties (see also Murray, 1938:3). On the Cumberland Plateau it is also somewhat local, but in some areas, as in Powell and Wolfe counties, fairly common, occurring in these and similar areas mainly in willows and sycamores along streams (see also Barbour, 1951a:37; 1956:10).

Far to the west, the species is again common, but in different habitats, here occupying the edges and openings of mature floodplain forests and riparian willow-cottonwood communities. In such situations it is common throughout the Purchase, up the Ohio River valley at least to Henderson, and across the southern tier of counties, into the Pennyroyal at least as far as Logan County.

While it is regular in parts of the Western Highlands (notably at Mammoth Cave), where fairly extensive remnants of mixed mesophytic forests occur, the redstart is very rare to uncommon in most of central Kentucky, especially in the Bluegrass, most of the Pennyroyal, and the poorer sections of the Knobs, where neither well-developed mixed mesophytic forests nor extensive floodplain forests are found. It is not definitely known whether the few summer records from these areas represent a small breeding population or wanderers and early transients. Monroe had only a few summer records for the Louisville area, 1934-1952 (June 9-11, 22, July 8), most of them made in willow growth in the Ohio River bottom lands. Goodpaster (1941:32) doubted that the species bred in the Cincinnati area. Except for records from Bardstown (Blincoe, 1925:417; Beckham, 1885:20), it is not recorded in summer from the Bluegrass.

Molt apparently takes place early. Adults (U.M.M.Z.) taken in Powell County on June 26 and July 3, 1949, were in advanced stages of molt of the body and tail. An immature bird taken in Harlan County on July 2, 1951, was barely full grown and was completing postjuvinal molt.

Fall.—The main migration seems to occur from early to mid-September; redstarts become less numerous in late September and are rare by early October. Late records: October 1 (1938), in Rockcastle County (Wetmore, 1940:561); October 6 (1946), in Whitley County (Wilson and Browning, 1946); October 12, and October 25 (1959), at Louisville (Monroe); September 30, in Warren County (Wilson, 1922:242); October 4 (1947), in Trigg County (Lovell, 1947c:67). In 1951, I recorded 3 redstarts near Louisville on October 1, and in eight days of intensive field work in Laurel County, October 3-10, only 2, seen on October 3.

Geographic variation.—The breeding subspecies of the state, for present purposes, may be regarded as *Setophaga ruticilla ruticilla* (Linnaeus). I have refrained from subspecific "identification" of the transient or possibly transient Kentucky material I have seen. The American Ornithologists' Union Check-List Committee (1949: 284; 1957:519) has recognized a northern subspecies of the American Redstart (*Setophaga ruticilla tricolora* Müller), as recommended by Burleigh and Peters (1948:121) in emending a proposal originally made by Oberholser (1938:572-573). As late as 1940, however, Wetmore (1940:562) was unable to recognize two subspecies, and no thorough modern study of the species has yet been made. In the event, of course, that a widespread northern form of appreciable differentiation exists, it would be reasonable to expect migrants thereof in Kentucky. At present, Kentucky material in good plumage, although displaying considerable variation in size and other characters, is insufficient to make possible a meaningful study of series. Wings of males seen range from 61 to 66 mm. in length, equalling the extremes found in 46 males from the entire continent examined by Wetmore.

Specimens examined.—Total, 42. M.S.C.—1 male, 1 female, Rowan County (May 4); R.W.B.—1 female, Harlan County (July 16); U.K.—1 female, Lincoln County (May 16);

C.W.B.—8 males, 2 females, Nelson County (April 25, May 2, 12, July 23, Aug. 4, Sept. 7, 7, 14; May 12, 27); B.L.M.—1 male, 1 unsexed, Harlan County (July 8; July 7); 2 males, Jefferson County (July 8; July 7); 2 males, Jefferson County (May 5, 21); 1 male, Henderson County (June 15); J.D.F.—3 females, Marshall County (Aug. 18, Sept. 12, 12); U.S.N.M. (see Wetmore, 1940:561)—11 specimens from Harlan, Bell, Lewis, Rockcastle, Wayne, Nelson, Union, and Fulton counties (April 24–Oct. 1); U.M.M.Z.—1 male (postjuvinal molt), 1 unsexed (nestling), Harlan County (July 2; July 6); 1 male, 2 females (weights, 8.7, 7.5 gm.), Powell County (June 26; June 26, July 3); 1 female, Campbell County (Sept. 10); 1 adult male (8.1 gm., moderately fat), Jefferson County (Sept. 19); 1 immature female (7.1 gm., moderately fat), Henderson County (Sept. 8); 1 male (yellow; 7.2 gm.; testes enlarged), Fulton County (May 17).

FAMILY PLOCEIDAE: WEAVER FINCHES

**Passer domesticus* (Linnaeus): HOUSE SPARROW

Status.—Common to abundant permanent resident; introduced in North America, the first being released in Kentucky approximately 1865–1870, the species becoming common around 1890.

Spring.—Breeding activities are begun quite early. As is often the case with very common birds, few exact data are available.

Breeding records.—Although the actual breeding season is probably considerably longer, 17 dated observations indicate completion of clutches March 21–31 to July 21–31, with at least one peak, April 21–31. The little detailed information at hand is as follows (undocumented records are my own): April 23, 1949, female carrying nesting material in Powell County; April 26, 1949, young in nest in hollow of a porch roof, Slade, Powell County; April 30, 1949, 3 pairs nesting in woodpecker holes in a woodlot just south of London, Laurel County; April 30, 1917, 4 fresh eggs, nest in bird box at Louisville (Monroe); May 5, 1941, 5 heavily incubated eggs in martin house, Oldham County (Monroe); May 13, 1941, 4 fresh eggs in a shed at Anchorage, Jefferson County (Monroe); May 30, 1941, 5 fresh eggs, nest in Barn Swallow nest in barn, Worthington, Oldham County (Monroe; last three sets collected—B.L.M.); June 5, 1949, two bulky nests in open, 15 feet up in a maple and built of leaves, junk, and chicken feathers (one with 1 egg, 1 naked, newly hatched young; one with 1 egg and 4 medium-sized young in pin feathers), 4 miles north of Clinton, Hickman County; June 30, 1952, young of unknown size in cavity under roof of a gas station in London, Laurel County (an earlier brood said to have left this nest by June 10); July 16, 1952, nest under construction in gutter of a house in Madisonville, Hopkins County. In Mercer County, Van Arsdall (1949:28) recorded more than 50 eggs laid, apparently by 3 females, in one spring when nests and eggs were regularly removed. Nests were recorded from Otter Creek, Meade County, without detail, by Lovell (1949b:70). A case of cowbird parasitism was observed by Stamm (notes), in Harlan County.

Breeding distribution.—Statewide, more numerous in agricultural areas. The species is found wherever human habitations occur, as well as in open farm country, in woodlots, and even open woodland. In heavily forested portions of eastern Kentucky, it occurs only about farm clearings and in towns. Few observers have troubled to report nesting localities, and the species has been omitted altogether from some local lists. There is a general feeling that it is somewhat less numerous in the cities since the passing of horse-drawn transportation.

History.—Relatively little is known of the spread of the House Sparrow through Kentucky, which began with the introduction of an unknown number at Louisville between 1865 and 1870 (Barrows, 1889, Table II, p. 20). At about the same time 66 pairs were introduced at nearby Cincinnati, Ohio (1869), 2 pairs at Portsmouth, Ohio, across from Lewis County (1874), 4 pairs at Knoxville, Tennessee (1874), and birds at Evansville, Indiana, across from Henderson, in 1873 (Barrows, *loc. cit.*). The species spread rapidly and appeared at Bloomfield between 1868–1869

and Lexington, 1868–1871 (Barrows, 1889, Table III, p. 21). Beckham (1885:25) wrote that it appeared at Bardstown, Nelson County, about 1879, increasing rapidly, and invading the surrounding countryside by 1885. A decade later, Garman (1894:19) wrote that it was "common everywhere."

Fall and winter.—The House Sparrow seems to be sedentary in Kentucky, and is common throughout the year.

Note.—Notes on an albinistic family, in Crittenden County, were given by Semple (1946:56; 1947:54).

Geographic variation.—The subspecies introduced into North America was *Passer domesticus domesticus* (Linnaeus).

Specimens examined.—Several. Oddly enough, there appear to be no extant, preserved specimens from the state (unless some have been taken since my survey of specimens was concluded). In the past I have handled numerous locally collected specimens while practicing preparation of bird skins.

FAMILY ICTERIDAE: MEADOWLARKS, BLACKBIRDS, AND ORIOLES

Dolichonyx oryzivorus (Linnaeus): BOBOLINK

Status.—Transient; fairly common to common in spring, very rare in fall.

Spring.—Records range from April 16 to May 28, the peak of migration being in early May. The Bobolink is a species of open country, especially meadows and grassy fields—particularly alfalfa and clover (see Wilson, 1947b:61, for notes on habitat in Warren County). It has been recorded throughout the state but is less numerous in eastern Kentucky, where ideal habitat is scarce. Oberholser (1920:214) gave average date of arrival for 5 years at Versailles as May 1. Representative records: April 28–May 24, in Rowan County (Barbour, 1952:28); April 22–May 27, in Nelson County (Blincoe, 1925:412); April 27–May 17, in Warren County (Wilson, 1922:237); April 16 (1955)–May 28, at Louisville (Monroe); both Wilson and Blincoe commented on the presence of unusual numbers in 1917. Afield in 1949, I recorded the species first in Madison County on April 26 (Horsey, 1922:81 gave a record for nearby Clark County, May 13, 1920) and last in Fulton County on May 20, with many records in the interim, mainly made in fescue meadows in Warren County. I recorded a few birds in Boone County on April 23, 1952. Not far from there, Goodpaster (1941:32) has found the species "occasionally" at Cincinnati, Ohio.

Note.—Recently recorded breeding in Hamilton County, Ohio (Kemsies and Randle, 1953:49), the species should be watched for in summer in northern Kentucky.

Fall.—The Bobolink is rare in autumn, most transients evidently passing to the east of Kentucky. Goodpaster (1941:32) gave a single record for the Cincinnati, Ohio, area, September 12, 1931. Definite autumn records are scarce. Without special comment Blincoe (1925:412) listed the species as recorded in Nelson County August 18–September 28. Horsey (1922:81) recorded 4 Bobolinks seen in Madison County, September 16, 1920. Three miles west of Henderson, Henderson County, Tordoff and I recorded about 30 on September 5, 1949, and more than 150 the next day (4 specimens, U.M.M.Z.). These birds were found in dense growth (ragweed, goldenrod, soybeans, corn stubble) of a fallow field, where they were associating with many Dickcissels and Red-wings. At Louisville there are few fall records (Monroe): September 3 (1953), September 21 (1947); Stamm and Croft noted 40 birds on September 2, 1956 (Stamm, 1957a:41), with stragglers to October 10.

Specimens examined.—Total, 20. M.S.C.—2 males, 2 females, Rowan County (April 30, 30; May 6, 16); C.W.B.—4 males, Nelson County (May 1, 9); B.L.M.—2 males, Jefferson County (April 26, May 4); 1 female, Oldham County (May 17); 1 male, Hardin County (May 2);

Bernheim Coll.—1 unsexed female in fall plumage, Kentucky (coll. J. D. Figgins); C.U.—1 male, Logan County (April 21); U.M.M.Z.—1 adult male (weight, 49.5 gm., extremely fat), 2 adult females (37.1 gm., 41.0 gm., extremely fat), 1 immature female (31.6 gm., moderately fat), Henderson County (Sept. 5, 6); 2 males (33.8 gm., 36.1 gm., moderately fat), Warren County (May 3).

Sturnella magna (Linnaeus): EASTERN MEADOWLARK

Status.—Fairly common to common resident, usually somewhat less numerous in winter.

Spring.—Eastern Meadowlarks sometimes appear to be more numerous in spring than in winter or summer, but this may be the result only of greater conspicuousness. Singing is begun very early, even in late winter, especially on clear days. I heard many singing in Laurel County on February 4, 1950.

Breeding records.—Clutches are completed from April 21–30 to July 21–31, as shown by 26 dated breeding observations, with a peak (first nestings) May 1–10, and possibly another (second nestings?) June 21–30. Records are from Rowan (Barbour, 1951a:38), Madison (Gailey, *vide* Lovell, 1951b:61), Grant (King, 1940:11), Boyle (Van Hook, 1943:15), Owen (Mengel, notes), Nelson (Blincoe, *vide* Funkhouser, 1925:240), Oldham (Monroe, notes), Jefferson (Stamm, notes; Monroe, Mengel, notes; Krull and Krull, *vide* Hays, 1957:6), Warren (Mengel, notes), Hopkins (Hancock, 1954:44), and Fulton (Mengel, notes) counties. Egg dates range from April 22 (1951), in Madison County, and April 27, in Rowan County, to July 31 (1960), in Jefferson County (Stamm). The average complement of 16 clutches (chiefly) or broods thought complete is 4.2 ± 0.19 (3–5). Nests, usually partly and sometimes fully domed, are placed in open fields in cover of variable density, often close to a sheltering shrub, forb, clump of vegetation, or other object. One that I found in Fulton County on June 2, 1949, contained 5 fresh eggs and was situated on practically bare ground at the base of a small bush in an overgrazed pasture; another, well-domed, found by me in Jefferson County received the last of 5 eggs on or about May 24, 1937, and was situated in very thick cover in a bluegrass meadow. Monroe's files contain notes on eggs noted in Oldham County (5, fresh, May 4, 1941) and Jefferson County (4, slightly incubated, May 14, 1936). I noted prolonged and intense injury-feigning by a female in a rich meadow in Owen County, July 5, 1950, and saw a bird carrying nesting material in Warren County on May 5, 1949.

Breeding distribution.—Essentially statewide. The species is common in most areas where suitable habitat occurs but is local in extensively forested parts of eastern Kentucky. Characteristically occupying meadows and edges in cultivated areas, it is found in fields and old pasture land for a number of years after the cessation of use, but eventually departs when shrubby growth becomes dense (see Lovell, 1949b:70, Otter Creek Park). It is rare and local in the mountains of the southeastern tier of counties. I recorded none in open areas along Pine Mountain ridge in Pike County (June 20–26, 1951) and none in work on Black Mountain, Harlan County, in 1946, 1951, and 1952. A few formerly occurred on open areas at the top of the mountain, where Barbour (1941a) recorded at least two pairs in the summer of 1939 (parts of the summit were then under cultivation). I recorded a few in Harlan and Bell counties on June 8, 1952, in the valley of the Poor Fork of Cumberland River between Harlan and Pineville. In open areas throughout the Cumberland Plateau the species is more or less numerous, and it is widespread and common in central and western Kentucky.

Fall.—A few observers have mentioned an increase in fall. At this season the species has a tendency to concentrate in favored areas, such as thick, fallow fields, giving the impression of great abundance locally. A young male (U.M.M.Z.) which I took at Henderson on September 6, 1949, was just finishing complete postjuvinal

molt. The species sings very late in fall, frequently in November and occasionally through December.

Winter.—Numbers fluctuate somewhat. In some winters meadowlarks are probably little less numerous, if any, than during the rest of the year, but they are decidedly less numerous in others, especially when severe weather is prolonged. I have, however, seen flocks of 50 to 100 during December and January snowstorms. In eastern Kentucky, I found the species common in Laurel County on February 3 and 4, 1950, and noted many meadowlarks in the Purchase region, December 24, 1950–January 5, 1951. Observers commenting on decreased numbers in winter include Blincoe (1925:412) in Nelson County, Goodpaster (1941:32) at Cincinnati, Ohio, Garman (1894:25), in general, and Van Arsdall (1949:28) in Mercer County.

Geographic variation.—Several species of birds in eastern North America display general trends in size and coloration from large and pale in the north to small and dark in the south, geographic variability which, although it now appears to be largely clinal, and indeed perhaps wholly so in some cases, has led to the recognition of a number of northern and southern subspecies. The Eastern Meadowlark is among these birds and is represented by the northern *Sturnella magna magna* and the southern *S. m. argutula*, both of which, as already noted by Wetmore (1940:562–563), appear to breed in Kentucky. Analysis of locally collected series somewhat more extensive than those earlier available permits a more detailed summary of the situation.

Although meadowlarks from the far south, especially Florida, are a deeper, richer yellow below and noticeably darker above than series taken in the northern states, color is a difficult character to use in systematic work, since the species, in common with other ground-inhabiting, open-country birds, is especially subject to abrasion and fading of plumage. Large series of known breeding material in comparable and comparatively unworn plumage are essential for meaningful color comparisons, and although Wetmore (1939:229; 1940:562–563) has used color characters in identification of birds from this area, it is my opinion, as it was Ridgway's (1902:360, footnote), that they are of slight value at the local level. The following analysis, consequently, is limited to "size" (length of wing) alone.

Males and females differ materially in the last respect, and so were separated; badly worn specimens were discarded and winter-taken birds (December 1–February 28) were eliminated from consideration with the hope of disposing of the majority of migrants. Thus refined, a series from eastern and northern Kentucky and one from the southern and western parts of the state display the following characteristics of wing length (Fig. 37).

Cumberland Mountains and Plateau, Bluegrass, and immediately adjacent areas, 12 males average 121.5 mm. \pm 0.3 (119–123); σ , 1.2; V, 1.0 (7 females average 107.7, range 104–111 mm.).

Western Kentucky (10) including the Purchase region, western Pennyroyal, Western Highlands, and the lower Ohio River valley to Union County; extreme southern Illinois (8); southwestern Indiana (2); and northwestern Tennessee (1); 21 males average 116.4 \pm 0.7 (110–122); σ , 3.4; V, 2.9 (4 females average 103.3, range 100–106).

It is evident at once that the two samples just described are significantly different in wing length; more interesting still, the difference is greater than any found between comparable populations of other variable species in this area (*cf.* Yellow-shafted Flicker, Downy Woodpecker, Hairy Woodpecker, White-breasted Nuthatch, Blue Jay), all of which, incidentally, are unlike the present in being, more or less, forest species. Indeed, the difference indicated by the meadowlark samples more than satisfies one popular criterion for recognition of subspecies, *i.e.*, 84 per cent separable from 84 per cent.

It is probable that accidents of sampling are responsible to some extent for the remarkable apparent uniformity of the first, *e.g.*, eastern and northern, population, but if the *difference* in variability, not to mention the amount of this difference, is

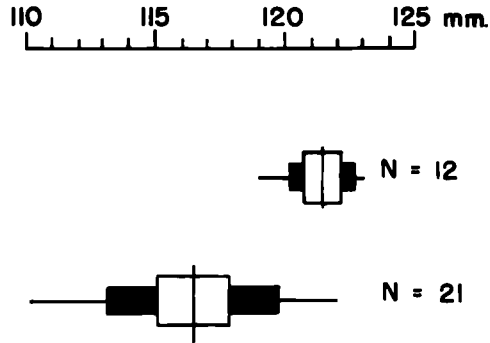


Fig. 37. Statistical characteristics (of wing length) in Eastern Meadowlarks in Kentucky. Upper figure, a sample from eastern and central Kentucky; lower figure, a sample from western Kentucky. For actual values see text. For meaning of the diagrams see legend of Fig. 18 (p. 292).

significant, as it appears to be,¹ it is a matter of some interest. This is because, besides the fact that here the present species (in marked contradistinction to the others just mentioned) appears to display a definite step in the size-cline, the greater variability of the southwestern birds suggests the condition to be expected in a true zone of intermediacy. Since the Eastern Meadowlark is an open-country species occurring, in Kentucky, in an area once almost wholly forested, it seems not unlikely that this zone of intergradation, if real, is of the type called by Mayr (1941:99) secondary, that is, a recombination of populations once separate in space. In any event, it seems proper to draw the line between the subspecies across western Kentucky and southern Illinois just as Ridgway did (1902:360) long ago.

Sturnella magna magna (Linnaeus)

The subspecies breeding in northern and eastern Kentucky (Cumberland Mountains and Cumberland Plateau; Bluegrass; Knobs; most of Western Highlands). Eastern Meadowlarks from this area are uniformly rather large, with a mean wing length near 121 mm., although occasional birds within the size limits of *argutula* are to be expected. There is, however, no reason to call such birds *argutula* unless they are so small that it would be impossible to conceive that they were *magna*. I know of no such specimens.

Sturnella magna argutula Bangs

Although somewhat intermediate in size and varying from the above little if at all in color (see above), the meadowlarks of the Purchase Region of Kentucky, the lower Ohio Valley, and probably most of the Pennyroyal, are best referred here. They average significantly smaller (wing length about 116 mm.) than the birds of the rest of the state. Probably true examples of *magna* invade this area in winter, but identification of individual specimens as *magna* is meaningless unless they are extremely large. A male I took in Fulton County on November 8, 1948, with the rather large wing measurement of 125 mm., is probably *magna*, falling over two (but not three) standard deviations above the mean of the series from that area.

Specimens examined.—Total, 40 from Kentucky, 56 in all (the specimens from Indiana, Illinois, and Tennessee are all regarded as *S. m. argutula*; Kentucky specimens from Wayne, Union, Hopkins, Trigg, and Fulton counties are likewise referred to *argutula*; the remainder

¹ The standard errors of the coefficients of variation of the two series are 0.2 and 0.45, respectively. Therefore, with 99.7 per cent certainty, the value of V in the first is less than 1.6 and in the second, with equal certainty, more than 1.5. The chance of their overlap appears negligible.

are considered to be *S. m. magna*; I regard the determination of individual winter specimens here as unwise). *Kentucky* (40). M.S.C.—5 males, Rowan County (March 1, 1, April 27, June 30, Oct. 21); R.W.B.—1 female, Harlan County (Aug. 1); 1 male, Rowan County (Oct. 21); U.K.—1 male, Fayette County (April 5); 1 male, Woodford County (Oct. 3); 2 males, Union County (April 21); B.L.M.—1 female, Wayne County (July 12); 2 males, Jefferson County (June 17, 20); 1 male, Union County (June 27); 1 male, Fulton County (June 29); W. Ky. State Coll.—1 female, Warren County ("Spring"); U.S.N.M. (see Wetmore, 1940: 562-563)—1 female, Bell County (Sept. 29); 1 female, Rockcastle County (Oct. 5); 1 male, Wayne County (June 16); 1 male, Nelson County (April 14); 1 male, Meade County (April 30); 1 male, Edmonson County (Nov. 11); 1 male, 1 female, Henderson County (May 14); 1 male, Hopkins County (Oct. 21); 2 males, Trigg County (Nov. 2, 3); 2 males, Fulton County (May 30, June 1); U.M.M.Z.—2 males, 1 female, Oldham County (April 3, 10; April 10); 1 immature male (weight 120.0 gm., not fat—remaining specimens all with little fat), Henderson County (Sept. 6); 1 male (117.9 gm.), Calloway County (April 12); 5 males (109.5, 112.5, 120.0, 113.2, 123.5 gm.), Fulton County (May 25, 26, June 2, Nov. 8, 10). *Indiana* (3). U.S.N.M.—2 males, 1 female, Knox County (May 5, 25; May 5). *Illinois* (10). U.S.N.M.—2 males, Wabash County (March 29, Oct. 15); 7 males, 1 female, Richland County (June 2, 3, 3, 7, 7, no date [2]; May 18). *Tennessee* (3). U.S.N.M.—1 male, 1 female, Obion County (May 4; May 6); 1 male, Lake County (Oct. 22).

Sturnella neglecta Audubon: WESTERN MEADOWLARK

Status.—Rare transient and winter resident.

Spring.—On May 4, 1949, I took a singing male (U.M.M.Z.) in meadows 6 miles south of Bowling Green, Warren County. The testes measured 15 × 7 and 10 × 6 mm., being submaximal in development. The right foot had been injured, lacking the central toe and the claws of two others, and was moderately swollen; but although somewhat underweight (102.2 gm.) the bird was not emaciated. Singing birds have since been recorded in the Louisville area (Monroe), by Croft, on May 11-18, 1957, and by Stamm on March 30, 1958. Hancock (1954a:47) has recorded at least 1 singing bird in Hopkins County, on March 24 and April 18, 1954. It is not improbable that a few will ultimately be found breeding in Kentucky.

Fall and winter.—As yet none has been recorded in autumn proper. The first record was made on December 31, 1946, in a light snowstorm, when I took a female (B.L.M.) in Jefferson County, 6 miles south of Louisville, as it fed in an open field with about 15 Eastern Meadowlarks from which its paler plumage at once distinguished it. Subsequently Monroe Jr. (1959; see also for notes on identification and other recent southeastern records) and Monroe Sr. have recorded additional birds near Louisville, 3 in Jefferson County December 22-25, 1956 (1 taken on the last date) and 1 in Oldham County, December 20 and 21, 1958. Also Wilson (1957a:58) recorded a singing bird in Warren County, February 14, 1957, at the same locality where I took the specimen noted under spring.

Geographic variation.—The specimens belong, as is to be expected, with the widespread subspecies *Sturnella neglecta neglecta* Audubon.

Specimens examined.—Total, 2. B.L.M.—1 female, Jefferson County (Dec. 31, 1946); U.M.M.Z.—1 male, Warren County (May 4, 1949).

*****Xanthocephalus xanthocephalus* (Bonaparte): YELLOW-HEADED BLACKBIRD**

Status.—Casual transient. Three records.

Records.—W. A. Welter, a Minnesotan familiar with the present species, observed a flock of unstated size near Clearfield, Rowan County, on April 12, 1933 (Barbour, 1952:28). Brecher (1940:27) recorded an adult male on April 19, 1940, one-half mile from Harrod's Creek, Jefferson County. This bird was with a flock of Red-winged Blackbirds in a flooded corn field near the Ohio River and was seen under good conditions by Brecher, Virgil King, Mabel Slack, Esther Mason, and Alice Moore. Also in Jefferson County, Anne Stamm (1952) and F. W. Stamm clearly observed a male in fall plumage within the city limits of Louisville on October 13,

1952. Stamm misquoted the date of Welter's observation as "April 12, 1932" and Figgins (1945:296) misquoted the date and locality of Brecher's record.

On several occasions the late R. C. Soaper, federal conservation officer based at Henderson, saw Yellow-headed Blackbirds at Horseshoe Lake National Wildlife Refuge, Illinois, only a few miles from southwestern Kentucky (verbal com.). The species should occur rarely, perhaps regularly, in western Kentucky on migration. Although no specimen has been taken, males are virtually unmistakable and the sight records above seem to justify placing the species in the main list.

Agelaius phoeniceus (Linnaeus): RED-WINGED BLACKBIRD

Status.—resident, breeding throughout the state; in summer and in migration periods common to abundant, except along the mountainous southeastern border, where rare and local; in winter usually rare in eastern and central Kentucky, occasionally common locally, regular and common in western Kentucky.

Spring.—The species is not usually conspicuous in winter in most of Kentucky. Ordinarily it is first noted in central and eastern areas in early March, and becomes numerous by the end of the month. Early records: February 27, in Rowan County (Barbour, 1951a:38); February 24 (1914), at Lexington (Rogers, 1914:183); February 28, in Nelson County (Blincoe, 1925:412); March 1, in Rowan County (Wilson, 1922:238).

Breeding records.—Clutches are completed from April 11–20 to July 11–20, suggesting that two broods are regularly reared and perhaps sometimes three. The species is semicolonial so that 107 more or less definitely dated breeding observations tend to be clumped; these show a peak of clutch completion (first broods) May 21–31. Second clutches may well reach a peak approximately June 21–30, but this is not clearly shown by the data. Records are from Rowan (Barbour, 1951a:38), Laurel and Whitley (Mengel, notes), Madison (Patten, 1946:30; Lovell, 1951b:61), Clinton (Ganier, 1935), Carroll (Webster, 1951:21; Lovell, 1951b:61), Nelson (Blincoe, *vide* Funkhouser, 1925:239), Jefferson (Hobson, 1935; see also *Kentucky Warbler*, 22:40, 1946; Monroe, Mengel, notes), Hardin (Monroe, notes), Meade (Lovell, 1949b:70), Logan (Ganier, 1942:16), Hopkins (Hancock, 1950:25; 1954:44), Crittenden (Howell, 1910:297), and Marshall and Fulton (Mengel, notes) counties. While actual egg-dates range from April 24 (1922) to July 9 (1948), both extremes in Hopkins County, I noted small young in a nest in Laurel County on the early date of April 30, 1949, and Ganier (1942) noted active nests in Logan County on July 28, 1940. The average complement of 29 clutches (chiefly) and broods, some of which may not have been quite complete, is 3.2 ± 0.11 (2–4). Nests are commonly found in marshes or marshy places, in the larger of which as many as 30–35 have sometimes been noted at once in rather limited areas. In such places many nests have been anchored in cattails (*Typha*), reeds (*Scirpus*), sedges (*Carex*), and arrowheads (*Sagittaria*), the choice in many cases probably being dictated by availability. Other nests have been found variously in buttonbushes, willows, and alders. The height above ground or water of 16 nests averages 2.4 feet (0.5–3.5). Although no nests have as yet been reported in upland situations, there is little doubt that many Red-winged Blackbirds nest, probably on or near the ground, in meadows, where numbers are seen regularly through the breeding season.

Breeding distribution.—Essentially statewide. The species is common nearly everywhere that more or less open country is present, particularly about ponds and marshes, but also in upland meadows (see Van Arsdall, 1949:28). In the mountainous, extensively forested southeastern tier of counties, however, Red-wings are rare and local. I found none along Pine Mountain in Pike, Harlan, and Bell counties in summer work of 1951 and 1952, and none in the valley below Black Mountain, Harlan County. I recorded a few in 1952 in the broad, cultivated

valleys below Black Mountain on the Virginia side. The Red-wing does not occur in numbers except in areas extensively cleared of original forest.

Fall.—In autumn the Red-wing is increasingly numerous as one moves westward. In central and western Kentucky it is at times abundant in fall migration, large and small flocks occurring everywhere in the countryside, feeding in the corn and milo fields and weedy areas, and roosting in the woods. In the Purchase these roving, restless bands of blackbirds, often including Starlings, grackles, and cowbirds, are a characteristic feature of the landscape in October and November. In eastern and central Kentucky Red-wings usually become rare in late fall, some late records from these areas being December 1 (1936), in Rowan County (specimens, M.S.C.); October 29, in Nelson County (Blincoe, 1925:412); and November 10, in Warren County (Wilson, 1922:238). These records indicate a marked decrease rather than total disappearance, since there are numerous winter records for central Kentucky, and the species will almost certainly be found wintering in the east as well. Occasionally, at least in recent years, very large numbers have wintered in central Kentucky (see below).

Winter.—I can find no definite winter records for the Cumberland Plateau (eastern Kentucky). In central Kentucky the Red-wing is usually rare and local in winter, occurring in small flocks, which are usually found in or near the dense cover of marshy areas about lowland forest. In the Louisville area, 1934–1953, Monroe accumulated numerous records, scattered through January and February. More recently, in the winter of 1956–1957, a huge roost of mixed blackbirds was established, a phenomenon repeated in subsequent winters (Stamm and Lovell, 1957; Monroe, 1958; Stamm and Lovell, 1958; see also *Kentucky Warbler*, 35:7, 1959, 36:15, 1960). Varying slightly in location and composition (important species are Red-wings, grackles, Starlings, and cowbirds, with a few Rusty and Brewer's blackbirds), this roost has been estimated at 1,500,000 to 5,000,000 birds in different winters. In Warren County, south-central Kentucky, Wilson has generally found the species uncommon in winter (see Wilson, 1939c:34), but recorded many in 1922–1923 (Wilson, 1923a:118). Farther west, in the Purchase region, the species is common and regular and doubtless has been so for many years (see Pindar, 1889b:314). Many of the Red-wings which feed daily in the Purchase counties probably return at night to Reelfoot Lake, Tennessee, to vast roosts which have been known for years (see Ganier, 1916:29). There the species roosts with other blackbirds in the cutgrass (*Zizanopsis miliacea*) marshes at the edges of the lake (Cypert, 1949:8). Undoubtedly some of the birds in this area roost in Kentucky also, since I have found them near dark in areas far from Reelfoot Lake. From December 24, 1950, to January 5, 1951, I found Red-wings common in Fulton, Hickman, Graves, and Ballard counties. On December 24, 2 miles south of Cayce, Fulton County, I noted a flock of Red-wings and grackles numbering perhaps 10,000 birds feeding in wheat fields. Females did not constitute more than five per cent of the number of Red-wings seen.

Geographic variation.—The Red-winged Blackbird is highly variable, both individually and geographically, and is migratory at least in the northern part of its range. Identification of subspecies, away from their breeding grounds, is hazardous for these reasons in the cases of all but typical or extreme specimens. While more material will have to be assembled before the precise extent and meaning of the variation observable in Kentucky are thoroughly understood, a few tentative remarks are justified by that now at hand.

There is, first, some evidence that the wintering Red-wings of Kentucky, as a group, are larger in average measurements than the breeding population. A series of 9 females taken in winter (November through February) has an average wing length of 103.1 mm. (103.1 ± 1.0 ; σ , 3.0; V, 2.9), as opposed to an average measurement of 99.6 ± 0.7 (σ , 1.8; V, 1.8) for 7 summer females (March–October). In males the difference is less marked. Of winter males, 9 average 122.7 ± 1.3 (σ , 4.1;

V, 3.3), as against 122.1 ± 1.2 (σ , 2.9; V, 2.4) for 6 summer males.¹ The combination of greater size and greater variability in the wintering population suggests a contribution thereto by birds, especially females, from larger northern stocks, and I think the admission of three subspecies to the Kentucky list best represents the facts now at hand. (It would, indeed, be quite surprising if two or more subspecies did not occur among the millions of Red-wings migrating through or wintering in Kentucky.)

Agelaius phoeniceus phoeniceus (Linnaeus)

The breeding Red-wing of Kentucky. All remarks preceding those on geographic variation are safely applicable to this subspecies, and specimens examined have been assigned to *phoeniceus* unless otherwise indicated. Variation in dorsal coloration of females is considerable in this subspecies, both in general and in the series examined. Among transients taken in Kentucky, there seems to be some correlation between dark dorsal color and short wing. Wing measurements are given under specimens examined.

Agelaius phoeniceus arctolegus Oberholser

Wetmore (1937:433; 1939:229) has reported this subspecies from West Virginia and Tennessee. It seems reasonably certain also that large Red-wings of northern origin occur in Kentucky in winter; the problem lies in separating this subspecies (which breeds from northern Michigan westward to Montana and well to the northward) from the more southerly-ranging *A. p. fortis* of the Great Plains. This seems to be possible in the cases of some females, distinguishable by extreme color differences, but it is virtually impossible with adult males. The problem is further complicated because *arctolegus* intergrades with *fortis* in Minnesota and elsewhere, and such intergrades may be expected among Mississippi Valley migrants. The subspecies is included here on the basis of 4 specimens: 3 females (2 from Ballard County, January 4, 1951; wings 107 and 105 mm.; weights 53.6 gm., moderately fat, 49.2 gm., very fat; 1 from Fulton County, November 10, 1948; wing 108; weight 45.4, not fat) and 1 adult male (Fulton County, December 24, 1950; wing 130, tail 95; weight 82.2, very fat). Two other adult males from Fulton County are rather large and may belong here (wings 126, 124; weights 74.5, 69.4, both moderately fat), but are tentatively identified as *phoeniceus*, as are a few other birds of rather large size from elsewhere in the state. The male may as easily be *fortis* as *arctolegus*, but of the females, the 2 from Ballard County agree perfectly with a series of winter specimens of *arctolegus* from Michigan, being slightly paler above and below than the average of *phoeniceus*. Wetmore (1939:229) refers to *arctolegus* as a darker form than *phoeniceus*, but in his original description (1907:333) Oberholser considered it lighter, as are the several series I have seen. The female from Fulton County is a shade darker and more clearly striped than are the others. Taken individually, no one of the specimens cited above might be sufficient to justify inclusion of the subspecies, but all together, they provide a basis for doing so. A surprisingly large percentage of the migrant specimens I have seen from western Kentucky is large.

Agelaius phoeniceus fortis Ridgway

According to the A.O.U. Check-List (1957:528) this large, pale, Great Plains subspecies occurs sparingly east to Arkansas, Tennessee, and Louisiana, and might therefore be expected to occur casually in western Kentucky. In the paleness of their coloration 2 specimens at hand seem quite beyond the extremes of pale coloration.

¹ The average of the small summer series of males has been raised from 120.9 by the inclusion of a single extremely large specimen (wing, 128; tail, 89) taken in Marshall County on April 16, 1950 (U.M.M.Z.). From all indications of plumage, behavior, and size of gonads this was a breeding bird, and it would be inadvisable to call it anything but *A. p. phoeniceus*. It is, however, the largest of that subspecies I can recall measuring or reading of (cf. Oberholser, 1907:334; Ridgway, 1902:331) and suggests the hazards of "identifying" individual specimens.

tion which I have previously observed in either *phoeniceus* or *arctolegus*. Since both are large, they are assigned here. A female from Fulton County, November 7, 1948 (weight 41.5 gm., not fat; wing 102) stands out strikingly from the whole series in the paleness and buffiness of its coloration, and agrees perfectly with average (or slightly paler than average) females of *fortis*, a conclusion reached in agreement with Allan R. Phillips. Also assigned here is an immature male taken November 10, 1948, in Fulton County (63.2 gm., little fat; wing 124). In the paleness and buffiness of the light edgings of its dorsal feathers this bird is quite different from other immature males in the series. The behavior of the female taken November 7 was of interest. With another female, which I was unable to obtain, she sat quietly, even sluggishly, in the top of a large cottonwood while I shot three times (the tree was very high). At each shot the two birds flew a few feet, as though reluctant to move. In distinct contrast, other Red-wings in the area were alert and wary, moving about in restless, noisy bands. The two birds in question in fact behaved in a manner seemingly befitting newly-arrived "strangers."

Specimens examined.—Total, 47. Available weights and wing measurements for specimens considered *A. p. phoeniceus* are given below. Measurements and weights of birds identified as *A. p. arctolegus* and *A. p. fortis* are given under geographic variation. *A. p. phoeniceus*: M.S.C.—3 males (wings 123, —, 120), 3 females (wings 97, 102, 102), Rowan County (March 30, 30, April 27; May 13, Dec. 1, 1); R.W.B.—1 female (wing 102), Rowan County (Oct. 21); U.K.—1 male, Union County (April 21); C.W.B.—2 females (wings 100, 98), Nelson County (May 15, Nov. 4); B.L.M.—4 males (wings 120, 121, 117, 126), 1 female, Jefferson County (♂♂ March 7, Oct. 28, Nov. 17, 22; ♀ June 26); 1 female (wing 101), Oldham County (March 30); U.S.N.M. (see Wetmore, 1940:563–564)—12 specimens from Lewis, Rockcastle, Boone, Meade, Butler, Union, and Fulton counties (April 25–Nov. 12); U.M.M.Z.—1 immature male (weight 57.5 gm., not fat; wing in molt), 1 immature female (44.0 gm., not fat; wing 97), Laurel County (Oct. 9); 2 adult females (weights, —, 44.1 gm., moderately fat; wings 101, 99), Jefferson County (April 4, Sept. 30); 2 males (wings 120, 128), Marshall County (April 16); 1 female (51.0 gm., very fat; wing 100), Ballard County (Jan. 4); 2 adult males (69.4 gm., 74.5 gm.; moderately fat; wings 124, 126), 3 immature males (66.0 gm., very fat; 67.3 gm., moderately fat; 72.9 gm., very fat; wings 120, 119, 118), 1 female (47.3 gm., moderately fat; wing 103), Fulton County (ad. ♂♂ Nov. 7, 11; im. ♂♂ Nov. 7, 10, 10; ♀ Nov. 10). *A. p. arctolegus*: 2 females, Ballard County (Jan. 4); 1 adult male, 1 female, Fulton County (Dec. 24; Nov. 10). *A. p. fortis*: 1 immature male, 1 female, Fulton County (Nov. 10; Nov. 7).

Icterus spurius (Linnaeus): ORCHARD ORIOLE

Status.—Common summer resident.

Spring.—Usually appears in late April; common by early May. Early records: April 25, in Rowan County (Barbour, 1951a:38); April 18 (1893), in Pulaski County, average of 12 years April 22 (Oberholser, 1923:119); May 2 (1936), at Cincinnati, Ohio (Goodpaster, 1941:33); April 19, in Nelson County (Blincoe, 1925:412); April 18 (1947), at Louisville (Monroe); April 17, in Warren County (Wilson, 1922:238).

Breeding records.—Clutches are completed from May 11–20 to June 21–30, as indicated by 25 dated breeding observations (peak May 21–31). Probably single-brooded. Data are from Laurel (Mengel, notes), Owen (Stamm, *vide* Hays, 1957:7), Nelson (C.W.B., specimens; Blincoe, 1917, and *vide* Funkhouser, 1925:241), Jefferson (Stamm, 1951a; Stamm, *vide* Lovell, 1951b:61; Stamm, notes; Krull and Krull, *vide* Hays, 1957:7), Meade (Lovell, 1949b:70), Hopkins (Suthard, *vide* Hancock, 1954:44), and Calloway, Ballard, and Hickman (Mengel) counties. Construction of nests has been noted on May 6 (1956), in Jefferson County (Krull and Krull) and May 8 (1922), in Hopkins County (Suthard), and a nest with young nearly ready to leave was found, July 16 (1951), in Ballard County (Mengel). Blincoe (1917) recorded a complete clutch of 2 eggs, in Nelson County, May 30, 1916, with the male of the pair in green first-year plumage. This and 5 additional clutches and broods reported have an average complement of 3.3 ± 0.33 eggs or young (2–4). Nests have been noted in maple, flowering dogwood, scarlet and white oak, sycamore,

more, elm, hackberry, and osage orange, the trees usually standing in rather open situations. Eleven nests average 29 feet above ground (10–60). In Hickman County, 4 miles north of Clinton, I found a nest containing 1 egg and 2 newly hatched young tightly woven into the top of a small, closely pruned osage orange, 10 feet up, on June 5, 1949. Another nest, in Ballard County, was 20 feet up in a fork near the end of a white oak branch in a farmyard, July 16, 1951 (3 young ready to leave). Krull and Krull noted 4 young in a nest 50 feet up in a scarlet oak, at Louisville, on June 15, 1956; these fell from the nest in a severe storm. I noted young not long from the nest in Laurel County on June 29, 1952, and in Calloway County on June 11, 1949.

Breeding distribution.—Statewide. The species is common over most of the state but is rather local and somewhat less numerous in heavily forested eastern Kentucky, and seems to be nearly lacking from the scattered clearings occurring in the Cumberland Mountains in much of Bell, Harlan, Letcher, and Pike counties. I recorded none in these counties in considerable field work, including continuous observation near the Breaks of the Sandy River, above Elkhorn City, Pike County, June 20–27, 1951. Murray (1938:3), however, found the species fairly common at lower elevations a few miles west of Pine Mountain in Letcher County, and although I recorded none in much work on and below Black Mountain in Harlan County, I regularly noted a few birds around Big Stone Gap in the broad valley on the Virginia side of the mountain. The species is characteristic of farmyards, forest edge, shaded roadsides, brushy slopes, and open woodland, especially among groves of trees in or adjoining open fields.

Fall.—The Orchard Oriole seems to become rare or very rare by the end of August. This apparent disappearance of the species in late summer is something of a mystery, and the actual time of departure is not certain. Some birds surely migrate early, since I have found them in numbers in Veracruz, Mexico, in mid-July. Careful watch should be kept in August to determine when the species can truly no longer be found. Late records: August 23 (1919), in Nelson County (Blincoe, *vide* Funkhouser, 1925:241); August 13 (1958), at Louisville (Monroe); July 21 (1951), in Ballard County (Mengel; still singing); August 24, in Warren County (Wilson, 1922:238).

Specimens examined.—Total, 11. M.S.C.—1 male, Montgomery County (May 2); 1 male, Woodford County (May 15); C.W.B.—2 (1 female, 1 unsexed) in juvenal plumage, Nelson County (June 21, 28); B.L.M.—1 male, Oldham County (June 12); 1 male (1st year), Jefferson County (May 18); U.S.N.M.—1 male, McCreary County (June 16); U.M.M.Z.—1 male (weight, 23.8 gm.; skeleton), Laurel County (April 27); 1 male (20.9 gm.), Warren County (June 18); 1 female (skeleton), Ballard County (July 16); 1 male (21.3 gm., skeleton), Fulton County (June 4).

Icterus galbula (Linnaeus): BALTIMORE ORIOLE

Status.—Summer resident, local and rare to uncommon, formerly more numerous; fairly common transient in spring, rare in fall.

Spring.—Arrives rarely in mid-April, usually late in the month; peak of migration in early May. Early records: April 29, in Rowan County (Barbour, 1951a:38); April 21 (1906), at Lexington, average of 6 years April 25 (Oberholser, 1922:340); April 18 (1884), in Jessamine County (Merriam, 1885:59); April 14, in Nelson County (Blincoe, 1925:412); April 17, at Louisville (Monroe); April 12, in Warren County (Wilson, 1922:238); April 19 (1886), in Fulton County (Pindar, 1887a:84). In the spring of 1949, I recorded a few birds in Warren County, May 3–6, and others at various localities in Fulton County, May 14–23.

Breeding records.—Comparatively little is known of breeding. As indicated by 14 rather indefinitely dated observations (10 of them refer to construction, or presumed construction, of nests) clutches are completed May 1–10 to May 21–31 (peak

May 11–20). The majority (11) of these observations are from Stamm's notes made in suburban Louisville, Jefferson County. Also at Louisville, Monroe observed 2 nests, in elms, in residential areas on June 19 and 20, 1917, when both contained young, and Stamm observed young able to fly on June 15, 1956 (*vide* Hays, 1957:7), and July 1, 1951 (*vide* Lovell, 1951b:61). Blincoe (*vide* Funkhouser, 1925:243) recorded nest-building in Nelson County on May 9, 1920. In addition to a number in Jefferson County, old nests have been seen in Meade County (Lovell, 1949b:71), Edmonson County (Bailey, 1933:177), and Hopkins County (Suthard, *vide* Hancock, 1954:44). Stamm's most precise observations concern construction of a nest 25 feet up in an elm on May 2, 1938, and young nearly ready to leave in another, 30 feet up in an elm, on June 13, 1947. Most nests seem to be between 25 and 40 feet up; in addition to elms, they have been noted in sycamores and large willows.

Breeding distribution.—Essentially statewide, so far as can be told from scattered summer records. The species prefers rather open areas containing large trees. Although a few statements in the literature (see Wilson, 1942:24; Stamm, 1947:45; Funkhouser, 1925:243) give a somewhat misleading idea of the present status of the Baltimore Oriole, continued observation in many parts of the state has led me to conclude that, at least in the last few decades, it is extremely local in distribution and is at best uncommon. It has, however, been recorded from many points, from Letcher County (Murray, 1938:3), in the extreme east to Fulton County (Pindar, 1889b:314) in the west. I was surprised to see 1 on Big Black Mountain, in heavy forest at 2,800 feet elevation on the Virginia side, on July 9, 1951. I also recorded 2 singing males in large shade trees at Fulton, Fulton County, on June 2 and 6, 1949, and 2 males and 1 female in a small area in Oldham County, near Prospect, on June 16, 1948 (a male taken at this time had rather small testes). For other summer records see Howall (1910:297, Ohio County), Goodpaster (1941:33, Cincinnati, Ohio), Van Arsdall (1949:28, Mercer and Woodford counties), and Nelson (1877:55, Ballard County).

History.—There is evidence that the species was more numerous in the last century, and perhaps into the early 1900's. Ridgway (1915:197) commented on its marked decrease in extreme southern Illinois, where it was very common in the 1860's and much reduced by 1912–1915, with one pair to a dozen or more of Orchard Orioles. (One pair to 50 Orchard Orioles would be surprising in Kentucky today.) In Nelson County, Beckham (1885:31) considered it common, as did Pindar (1889b:314) in Fulton County. Garman (1894:20) called it only "moderately common," but more numerous than the Orchard Oriole—a conclusion that would be impossible to reach today, even with full allowance for the greater conspicuousness of the Baltimore. Wilson (1922:238; 1923c:133) wrote that it was common in both Warren and Calloway counties, but by 1942 (1942:24) had reduced the estimate for the former to fairly common, and still later (Wilson, 1959a:53–54) remarked on its decided rarity. A similar decrease has been noted in Hopkins County (Hancock, 1954:44).

Fall.—A beautiful male (B.L.M.), which I took at Glenview, Jefferson County, on August 4, 1942, was already in completely fresh plumage and may have been a transient. The migration is not well recorded, occurring, apparently, in late August, through September, and perhaps later. Late records: September 3 (1905), at Lexington, average of 3 years August 29 (Oberholser, 1922:341); August 18, in Nelson County (Blincoe, 1925:412); September 17, in Warren County (Wilson, 1922:238), and September 15 (1943; Wilson, 1944). Tordoff and I recorded a few Baltimore Orioles, singing occasionally, at Henderson, September 8–9, 1949. The latest dates for the state, not counting the aberrant winter record below, were recorded at Louisville by Brecher (notes) on October 19, 1946, and October 26, 1945 (both adult males).

Winter.—For several days an immature female visited a feeding tray in Louisville. Suspected of being a vagrant Bullock's Oriole (*Icterus bullockii*), it was taken by

Monroe on January 2, 1953 (B.L.M.), and proved to belong to the present species (wing, 88 mm.; tail, 68). No injuries were noted when Monroe prepared the specimen.

Specimens examined.—Total, 6. M.S.C.—1 female, Rowan County (May 16); R.W.B.—1 male (mis-sexed female), Rowan County (May 11); C.W.B.—1 male, Nelson County (April 26); B.L.M.—1 adult male, 1 immature female, Jefferson County (Aug. 4; Jan. 2); U.M.M.Z.—1 male, Oldham County (June 16).

Euphagus carolinus (Müller): RUSTY BLACKBIRD

Status.—Uncommon transient; generally rare winter resident, but sometimes occurring in large concentrations.

Spring.—The Rusty Blackbird is an early migrant, but some early spring records may represent wintering birds. The species has been recorded in small numbers at many localities, some of them as follows (see also "specimens examined"): March 24–April 9, in Rowan County (Barbour, 1952:28); March 3 (1940), at Cincinnati, Ohio (Goodpaster, 1941:33); February 15 (Beckham, 1885:31), and March 12 (1920), in Nelson County (Blincoe, 1925:412); March 4–May 5, at Louisville (Monroe); April 3–23, in Warren County (Wilson, 1922:238); March 7 (1940), several in a mixed flock of blackbirds at Kentucky Woodlands National Wildlife Refuge, Trigg County (Cypert, Refuge files). I recorded a flock of 5 males and 5 females in dense alder scrub in a marshy meadow 2 miles south of London, Laurel County, on April 11, 1951. Most birds are seen in small flocks, either in fairly open country, often about farm buildings, when they are feeding, or inhabiting dense cover, often in marshy or swampy areas. The species may once have been more numerous, since Beckham (1885:31) wrote that it was common in Nelson County, occurring as early as mid-February, and Langdon (1879:176) considered it abundant at Cincinnati, Ohio, in March and November.

Fall.—A late migrant, rarely, if ever, seen before the last half of October. Wilson's (1922:238) early and undetailed reference to records in Warren County, August 17–December 7, seems open to some question. At Bardstown, Nelson County, Beckham (1885:31) had records only as late as November 4; Blincoe (1925:412) added records for December 10 and 12, 1917. Monroe's records (see also "winter") are of single birds and small flocks recorded from October 21 (1954) on throughout November (many of these seen in brushy cover along the Ohio River on duck hunting trips). Other records are from Roundhill, Butler County, November 11, 1938 (Wetmore, 1940:564), and near Cincinnati, Ohio (Goodpaster, 1941:33), October 26 (1938)–November 15 (1931). Just south of the state line, I recorded 2 bright, rusty birds in Tiptonville, Lake County, Tennessee, on November 9, 1948, as they were feeding on a lawn with 3 Starlings and 12 grackles.

Winter.—Recorded, without detailed records, as wintering in Fulton County (Pindar, 1889b:314—"common"), at Mammoth Cave (Wilson, 1946:20—"rare"), and in southern Indiana (Butler, 1897:905). Wilson (1939c:34) summarized a number of December records for Warren County, 1929–1935 (flocks of 6 to 90). Near Louisville, 1934–1952, Monroe recorded the species, in thick cover along the Ohio River, on December 24 (2 records: 4 birds in 1945, 3 in 1950), 29 (1), and January 5, 26, and 29 (single birds). More recently, a comparatively small but absolutely large number (up to 50,000, estimated) of Rusty Blackbirds has wintered with other species in a huge roost extant near Louisville each winter from 1956–1957 on (Monroe, notes; Stamm and Lovell, 1957; 1958).

Geographic variation.—The subspecies occurring in Kentucky, so far as known, is *Euphagus carolinus carolinus* (Müller).

Specimens examined.—Total, 9. M.S.C.—1 female, Rowan County (April 15, 1933); C.W.B.—1 female, Nelson County (April 27, 1882); B.L.M.—3 males, Jefferson County (Jan. 29, 1939; Nov. 11, 1936; Nov. 20, 1938); Bernheim Coll.—1 male, "Kentucky" (no date); C.U.—1 male, Logan County (March 11, 1905); U.S.N.M.—1 male, Butler County (Nov. 11, 1938); U.M.M.Z.—1 female (weight, 57.1 gm., not fat), Laurel County (April 11, 1951).

Euphagus cyanocephalus (Wagler) : BREWER'S BLACKBIRD

Status.—In recent years, at least, a rare but probably regular transient, occasionally recorded in winter.

Spring.—On March 28, 1948, Monroe Sr. and Monroe Jr. (1949a) took a male and a female in the adjoining counties of Oldham and Jefferson, respectively (B.L.M.). The male was with 7 other male Brewer's Blackbirds and 4 Brown-headed Cowbirds, feeding in a marshy field near Brownsboro. The female was with 2 male and another female Brewer's Blackbirds and some Common Grackles, near Worthington, where they were feeding around a wet-weather pond in open fields. The two flocks were 6 miles apart. These observations provided the first perfectly satisfactory records for the state (Monroe recorded the species again on March 15, 1958). An earlier record, more recently reported (Barbour, 1952:28), is based on an unsatisfactorily vague observation by Welter at Morehead, Rowan County, on April 9, 1934. Also, Figgins (1945:300) reported a male identified by him under conditions said to be good, in Woodford County on May 12, 1938.

Fall.—Monroe carefully identified a female in Jefferson County, under good conditions, on October 16, 1950. Since then he has recorded a few in mid-autumn, in various years, and small numbers later. The species evidently arrives rather early; Stamm (1957a:41) noted 2 Brewer's Blackbirds in her yard at Louisville on September 17, 1956, with numbers up to 5 on succeeding days. Still earlier, on September 4, 1949, in Henderson County, Tordoff and I saw a male bird which we were fairly sure was a Brewer's Blackbird, shortly after our arrival from Minnesota, where we had just observed many. Although the observations were not made under the ideal conditions attending some of Monroe's, I saw other birds thought to be Brewer's Blackbirds in Meade County, October 22, 1948, and in Hickman County on November 12 of the same year.

Winter.—Since the establishment, in 1956–1957 and subsequent winters, of a huge (estimated at 1.5 to 5 million) roost of mixed blackbirds in the Louisville area, Brewer's Blackbirds have been noted and carefully identified from time to time in December and early January (see Monroe, 1958:6; Stamm and Lovell, 1958:47; also *Kentucky Warbler*, 34:14, 1958, and 35:7, 1959), and at least a few have probably been wintering in the area.

Note.—While the species may have occurred in Kentucky for some time prior to its discovery, the recent eastward movement that has established it as a fairly important breeding bird in several states more or less directly to the north (see Mumford, 1954; summary of Indiana nestings) has probably contributed to a real increase of transients in Kentucky.

Specimens examined.—Total, 2. B.L.M.—1 male, Oldham County (March 28, 1948); 1 female, Jefferson County (March 28, 1948).

Quiscalus quiscula (Linnaeus) : COMMON GRACKLE

Status.—Resident, common in summer through most of the state; common to abundant transient; rare (east) to common (west) in winter; local and rare to uncommon at any season in mountainous southeastern Kentucky.

Spring.—In eastern and central Kentucky, where the species is rare, and perhaps sometimes absent, in winter, Common Grackles begin to appear in middle or late February, becoming generally common by early March. Early records for various areas were published, in the years before the species was known to winter, by Langdon (1879:177), February 20, in Cincinnati, Ohio; Blincoc (1925:412), February 12, in Nelson County; and Wilson (1923a:119), January 21 (1922), February 4 (1921), and February 22 (1920), in Warren County (wintered, 1922–1923). Fair-sized flocks are seen through the spring; in 1949 I saw flocks of several hundred in Fulton County, as late as May 25.

Breeding records.—There are surprisingly few precise records. Clutches are com-

pleted from April 11–20 to May 21–31, as indicated by 19 dated observations (peak April 21–30). If the species is two-brooded in Kentucky, there is at present no evidence to this effect. Records are from Wise County, Virginia (Mengel; across Big Black Mountain from Harlan County), and from Rowan (Barbour, 1951a:38), Boone (Mengel, notes), Mercer (Van Arsdall, 1949:28), Owen (Mengel), Jefferson (Stamm, *et al.*, *vide* Hays, 1957:7; Monroe, notes), Bullitt (Stamm, notes; Monroe, notes), Hopkins (Suthard, *vide* Hancock, 1954:44), and Fulton (Mengel, notes) counties, Kentucky. The 6 clutches reported average 4.5 ± 0.35 (3–5). The bulky nests, of twigs and (often) much dried grass, have been noted both in trees (reported in haw, maples, red cedars, and pines) and in artificial situations (bridge supports and girders), 6 averaging 20 feet above ground (15–30). Nests are sometimes single, sometimes in colonies; colonial nesting has been reported (see also below) from Jessamine (Figgins, 1945:304), Nelson (Beckham, 1885:31; perennial colony in tall pines), and Warren (Wilson, 1921a:286; 75 nests in red cedars) counties. On June 1, 1935, and April 18, 1937, Monroe took sets of 5, and 4 and 5 eggs, respectively, from nests in a colony of approximately 25 pairs nesting on girders and other supports under a bridge at Cox's Creek, Bullitt County. Monroe also noted young in a nest 25 feet up in a maple on a suburban lawn at Louisville, June 20, 1917. I saw a nest under construction in a similar situation, 30 feet up in a farmyard maple near Walton, Boone County, April 23, 1952; and recorded young not long out of the nest at Big Stone Gap (Wise County), Virginia, June 7, 1952; near Worthville, Owen County, July 7, 1950; and in Fulton County on June 2, 1949.

Breeding distribution.—While most breeding records are somewhat vague in detail and observations from the Cumberland Plateau are desirable, there is little question that the species breeds throughout the state, at least locally. It is especially rare in the mountains along the southeastern border; I failed to find any in the Cumberland ridges above Elkhorn City, Pike County, June 20–27, 1951, or in considerable work on Black Mountain, Harlan County, in 1951 and 1952. Common Grackles have been recorded from Harlan County, however, by Barbour (*vide* Wilson, 1942:24) and Stone (1921:465). Rare and local in extensively forested areas everywhere, the species is increasingly numerous westward, as forest tracts diminish in size and frequency, and is represented by a host of summer records. As soon as the breeding season is over, large flocks begin to form and these often become conspicuous, especially in open agricultural country, as early as mid-July.

Fall and winter.—The flocks of late summer sometimes become impressive in size by late August (see Garman, 1894:20; Clagett, 1955:19), forming large nightly roosts. Increasing in size with the season, large roosts, sometimes numbering tens of thousands and occasionally millions, are maintained through fall and winter, tending to shift in distribution to the westward and southward with the onset of colder weather. The volume of sound made by the immense swarms of grackles assembling at a major roost is truly impressive. Major and minor roosts have been reported from a number of localities in central and western Kentucky (see Howell, 1910; McAtee, 1926; Lancaster, 1927; Bailey, 1933:179; Loefer and Patten, 1941; Lovell and Kirkpatrick, 1946; Clagett, 1955; Stamm and Lovell, 1957, 1958; Monroe, 1958). Usually other blackbirds are associated with the grackles in these roosts, especially Red-wings, and cowbirds, and sometimes unrelated species, particularly Starlings and sometimes Robins and others. The gigantic roosts of mixed blackbirds at Reelfoot Lake, Tennessee, have long been a spectacular feature of that area. In 1948, I recorded large flocks of grackles in Meade County (estimated at 4,000–5,000) on October 22, in Oldham County on October 29, and near Hornbeak (Obion County, Tennessee) on November 9. On December 24, 1950, I saw a flock of perhaps 10,000 grackles and Red-wings (perhaps one-third grackles) near Cayce, Fulton County, and many flocks not much smaller in nearby counties in the next few days. At these times the species feeds for the most part in open fields, on grain, seeds, and (when available) insects. Although large flocks may at times be injurious to crops, it is

evident that they possess enormous insect-destroying capacity. Feeding of large numbers on beech nuts was described by Mason (1946) and Brecher (1948).

In most winters grackles become rare in eastern and central Kentucky, and by midwinter large flocks are unusual outside of the Purchase. Wintering of numbers at Bowling Green, Warren County, has been infrequent and occasioned some comment when it occurred (Lancaster, 1925, 1927; Wilson, 1923a:119, 1939c:34). Farther north and east, on the average, grackles are still less numerous in midwinter; they are "occasional," at Cincinnati, Ohio (Goodpaster, 1941:33); rare, in Nelson County (Blincoe, 1925:412); and, until recently, represented only by scattered December, January, and February records at Louisville (Monroe). Recently, however, a huge roost was established at Louisville, in the winter of 1956-1957 and subsequently, with millions of birds, including Red-wings, cowbirds, Starlings, and Rusty Blackbirds (Monroe, 1958; Stamm and Lovell, 1957, 1958). Wintering on the Cumberland Plateau is still not well documented; I recorded 2 birds, which may have been wintering, near London, Laurel County, on February 3, 1950.

A few returns (see, for example, Coffee, 1938; Perkins, 1929) of birds banded in Tennessee and Indiana and taken in Kentucky indicate that considerable wandering and/or migration occurs in this general area.

Geographic variation.—The rapid accumulation of knowledge concerning the facts of geographic variation in the present species (Chapman, 1892, 1935, 1936, 1940; Wetmore, 1939:230-242, 1940:564; Huntington, 1952) has been accompanied by a series of changes in the nomenclature which has doubtless proved confusing to lay ornithologists in Kentucky and elsewhere. We may hope that stabilization has been achieved. In any event, the Common Grackles of Kentucky are decidedly uniform in characters (bronze or brassy green above and below, without iridescent bars except at the nape) and are typical of the widely distributed northern and western subspecies (for distribution of the forms see A.O.U. Check-List, 1957:539-540) now known as *Quiscalus quiscula versicolor* Vieillot (earlier name for *Q. q. aeneus* Ridgway, for many years the "Bronzed Grackle" of literature), and thought at one time or another by both Chapman (1935, 1936) and Wetmore (1939, 1940) to be a distinct species (see also A.O.U., 1944:460). This well-marked subspecies intergrades along a long, comparatively narrow belt with the eastern subspecies, now known as *Quiscalus quiscula stonei* Chapman (new name for the old "Purple Grackle" of literature, long known as *Q. q. quiscula*), and with the southern subspecies *Quiscalus quiscula quiscula* (Linnaeus) (earlier name for *Q. q. aglaeus* Baird, the one-time "Florida Grackle"). The somewhat variable types resulting from this intergradation were known for some time, perhaps more for convenience than through acceptable taxonomic practice, as *Quiscalus quiscula ridgwayi* Oberholser, no longer recognized.

Although *Quiscalus quiscula stonei* has not been taken in Kentucky, the western limit of its known range lies just to the east, following the valley of east Tennessee and the Holston River to the valley of western Virginia, and separated from Kentucky by the Cumberland Mountains, in which, if grackles bred at all, they are rare and local. (This mountain barrier, incidentally, seems likely to have played a part in limiting the distribution of other birds, e.g., Black Vulture, Blue Grosbeak.) Further collecting should be done in the mountainous southeastern counties to determine the affinities of the few grackles occurring there. It would not be surprising if many of these were intergrades of the "ridgwayi" type. Only one of three such birds so far examined, however, is from southeastern Kentucky, where Howell (1910:297) took a male reported as "*Quiscalus quiscula*. Purple Grackle" at Barbourville, Knox County, on August 12, 1908 (U.S.B.S.). The others were a male taken by Figgins (1945:304-305) in Jessamine County, March 10, 1942 (U.S.N.M.), and referred to this type by Wetmore, and an adult female, molting the tail, taken by Beckham in Nelson County on September 18, 1885, and identified by me (blue-bronze below, rather than brassy green; head greenish; wings very purple; upper and central back with blue and purple iridescence on tips of feathers;

rump evenly bronze-green). Whether these specimens are wanderers or variants of the local population is unknown.

References to "Purple Grackles" (meaning the present *Q. q. stonei*) in the Kentucky literature are based on an erroneous presumption ("*Quiscalus quiscula*" Pindar, 1889b:314, in Fulton County—"Both . . . subspecies . . . breed here [!];" "*Quiscalus quiscula quiscula*" Pindar, 1925a:88—further comment; "Purple Grackle" Wilson, 1942:24—fairly common breeding at Berea, rare in Harlan County; "*Quiscalus quiscula quiscula*" Figgins, 1945:302–303—based on Pindar and Howell, as cited above).

Specimens examined.—Total, more than 48 (typical except as noted). M.S.C.—2 males, Rowan County (April 21, May 13); U.K.—6 males, 2 females, Fayette County (♂♂ April 17, Oct. 27 [3], Nov. 10 [2]; ♀♀ April 17, Oct. 27); C.W.B.—several summer specimens of *versicolor*, and a female *versicolor* taken Feb. 19, 1882; also 1 female = "*ridgwayi*," taken Sept. 18, 1885 (tail in molt); all Nelson County; B.L.M.—1 male, Garrard County (March 28); 4 males, Jefferson County (April 25, June 20, Oct. 21, 21); 1 female, Oldham County (June 23); Bernheim Coll.—1 male, 1 unsexed, Fayette County (March 6; March 8); 2 males, "Kentucky" (April 6, Nov. 7); J.D.F.—8 males, 3 females, Jessamine County (♂♂ April 10 [5], 12 [1], 17 [2]; ♀♀ April 13, 17 [2]); 2 females, Woodford County (March 20); U.S.N.M. (see Wetmore, 1940:564)—7 specimens from Lewis, Butler, Union, and Fulton counties (May 12–Nov. 12), and 1 male, Jessamine County, March 10 (= "*ridgwayi*"); U.S.B.S.—1 male, Knox County (August 12, 1908; = "*ridgwayi*"); U.M.M.Z.—2 females (weights 88.1 gm., not fat; 93.3 gm., moderately fat), Meade County (Oct. 22); 1 adult female (93.4 gm., not fat), Henderson County (Sept. 8); 1 male (115.1 gm., not fat), Calloway County (April 12).

Molothrus ater (Boddaert): BROWN-HEADED COWBIRD

Status.—Resident; in summer common west of the Cumberland Plateau but uncommon on the Plateau and unknown in the higher Cumberland Mountains along the southeastern border; in winter generally much less numerous, sometimes disappearing entirely from eastern and central Kentucky, at other times ranging from rare to common through much of the state, increasingly numerous westward.

Spring.—Although the cowbird winters irregularly and in varying numbers through much of Kentucky, it does not, as a rule, become numerous and generally conspicuous until some time in March. Some years ago knowledge of wintering cowbirds was very limited; early records from that period may well give an indication of the time transients usually begin to appear: March 2, at Louisville (Monroe; next records, 1934–1952, March 11, 15); March 5, in Warren County (Wilson, 1922:238). I saw elaborate courtship performances in Calloway and Marshall counties, April 10–16, 1950, and in Laurel County, April 11, 1951, the birds still being in small to fair-sized flocks. Flocks of 110 seen in Laurel County (males and females in equal numbers), April 11, 1951, and about 400 in Wayne County (females, 4 to 1) on April 12, 1951, may have been composed largely of transients.

Breeding records.—Egg laying from April 11–20 to July 1–10 (and possibly later) is indicated by 111 dated breeding observations (each egg or young cowbird counted as one), with peak of laying May 1–10 or May 11–20.¹ Extreme egg dates: Louisville, April 25, 1941 (Monroe; 2 eggs in nest containing 4 of the Chipping Sparrow); July 16, 1945 (Lovell, 1949b:68, 1 egg in nest containing 2 eggs of Wood Thrush)—in Owen County, in a seemingly abandoned Field Sparrow nest, Stamm (notes) recorded 1 cowbird egg on July 27, 1954. Data² are from Harlan (Stamm, notes²⁸), Rowan (Barbour, 1950a:34;¹ 1951a:38²), Powell (Stamm, notes²⁸), Laurel (Mengel, notes³), Whitley (Lovell, 1947b:45⁴—see also Lovell, 1948:17; Mengel, notes³), Mason (Keith, 1944⁵), Boone (A.H., 1886⁶), Owen (Lovell, Stamm, and Pierce,

¹ Other things being equal, the peak of egg laying in the Brown-headed Cowbird should be a fairly accurate indication of the over-all peak of clutch completion of the passerines of Kentucky, at least those commonly parasitized.

² The superscript numbers immediately following identify the sources for subsequent reference in the table of host species.

1955:5-9;⁷ Stamm, 1956:20;⁸ Stamm, *vide* Hays, 1957:6-7;⁹ Stamm, notes²⁸), Oldham (W. Shackleton, 1948:1;¹⁰ Shackleton and Shackleton, 1950a:47;¹¹ Shackleton, *vide* Lovell, 1951b:60;¹² Stamm, Shackleton, and Slack, 1953:27, 30;¹³ Stamm, notes²⁸), Jefferson (Monroe, 1938:47;¹⁴ Stamm, 1943:35;¹⁵ Thacher, 1946:22;¹⁶ Lovell, *vide* Hancock, 1947a:31;¹⁷ Lovell, *vide* Hays, 1957:7;⁹ Monroe, notes;¹⁸ Mengel, notes³), Bullitt (Hays, 1957:6⁹), Meade (Lovell, 1949b:68;¹⁹ Cornett, *vide* Lovell, 1951b:61¹²), Nelson (Blincoe, 1921a:100;²⁰ Blincoe, *vide* Funkhouser, 1925:260²¹), Daviess (Powell, 1951a:64;²² 1953:60²³), Warren (Mengel, notes³), Hopkins (Hancock, 1947a:31,¹⁷ 1951:9,²⁴ 1953:42,²⁵ 1954:41-45;²⁶ Bacon, notes²⁷); and Carlisle and Fulton (Mengel, notes³) counties. Of these, the following published notes are devoted specifically to cowbird parasitism and contain more or less detail concerning various affected nests: Monroe, 1938 (Prothonotary Warbler); Thacher, 1946 (Wood Thrush); W. Shackleton, 1948 (Wood Thrush, Blue-gray Gnatcatcher, Red-eyed Vireo); Lovell, 1947b (Ovenbird); Hancock, 1947a (Rufous-sided Towhee), and Hancock, 1953 (Indigo Bunting); Shackleton and Shackleton, 1950a, and Stamm, 1956 (Summer Tanager). Data concerning parasitism of 2 to many nests are found, additionally, in Lovell (1949b and 1951b), Hancock (1954), Lovell, Stamm, and Pierce (1955), Hays (1957), and in Monroe's and my notes; the remaining observations, for the most part, are scattered and incidental.

While the Brown-headed Cowbird, judging from the record at large (see summaries of Friedmann, 1929, 1931, 1933, 1924, 1938, 1943, 1949) may be expected to parasitize the nests (although with highly variable success) of nearly every passerine species breeding in the state, the list of hosts so far recorded in Kentucky numbers 25 species (Table 2), which may be assumed to include many, if not most, of the hosts especially important locally.

Virtually all of the available data concerning incidence of parasitism may be comprehended from the table and need not be discussed at great length. The over-all average (1.54) of eggs per parasitized nest is probably not significantly different from the 1.4 noted by R. F. Johnston (MS) in Kansas, or from an average implied (but not stated) by Friedmann (1929:178), on the basis of more general observations. Also, the percentage of parasitized nests which received more than 1 cowbird egg (27.9) agrees fairly well with Friedmann's statement (*loc. cit.*), based on much larger samples, of "about one-third."

Of the hosts here listed, Friedmann (as cited immediately) regarded the Carolina Wren¹ (1929:254), Prairie Warbler (1949:246), Summer Tanager (1929:232; 1949:160), and Bachman's Sparrow (1929:225; 1943:356) as infrequent. While nests of Carolina Wrens are probably often inaccessible to cowbirds, those of Bachman's Sparrow are seldom recorded and may be parasitized more often than we know. The data presented herewith, in any event, suggest reevaluation of the importance as hosts of the Prairie Warbler and, especially, the Summer Tanager, in regions, such as the present, where those species are common.

Some general observations concerning incidence of parasitism emerge from the table. Of 512 examined nests of those species in which parasitism has been noted, 87, or 16.9 per cent, were parasitized, containing an average 0.24 cowbird eggs or young each. If we consider approximately 500 additional nests examined, of passerine species in which parasitism has not as yet been noted here, we find that about 9 per cent of all passerine nests examined in Kentucky have contained 1 or more cowbird eggs or young. It is further evident, from critical inspection of the figures, that if 2,500 nests (100 each) of the 25 parasitized species were examined at random, 600 cowbird eggs or young would be expected, and approximately half of these would probably be found in the nests of about 10 species.

Almost needless to say, much more about nesting success (which, in the cowbird, seems generally poor in comparison with non-parasitic species) and many other factors needs to be known before valid conclusions can be reached concerning the

¹ Record based on an adult feeding 3 young wrens and a cowbird out of the nest, in Warren County on June 18, 1949 (Mengel).

TABLE 22
HOST SELECTION BY THE BROWN-HEADED COWBIRD IN KENTUCKY

Species	Total number of nests examined ²	Number of nests parasitized	Total cowbird eggs or young	Per cent of nests parasitized	Number of eggs per nest (based on all nests)	Total number of recorded instances of parasitism	Multiple complete-ments of cowbird eggs or young	Known cases of cowbird young successfully fledged	Sources
1. Summer Tanager (1) ¹	17	7	14	41.2	0.82	7	6	0	8, 11, 18, 26, 28
2. Red-eyed Vireo (2)	11	4	8	36.3	0.73	5	4	4	3, 7, 9, 10, 18, 19, 26, 28
3. Indigo Bunting (6)	40	13	16	32.5	0.40	13	1	1	3, 9, 18, 21, 25, 26, 28
4. Wood Thrush (4)	39	11	19	28.2	0.49	11	4	0	9, 10, 16, 18, 19, 28
5. White-eyed Vireo (8)	8	2	2	25.0	0.25	2	0	0	3, 26
6. Field Sparrow (7)	49	11	13	22.4	0.27	11	1	0	7, 9, 18, 23, 26, 28
7. Acadian Flycatcher (9)	16	3	3	18.7	0.19	3	0	0	1, 12, 28
8. Kentucky Warbler (3)	11	2	7	18.1	0.63	2	2	0	13, 18, 28
9. Prairie Warbler (11)	18	3	3	16.6	0.17	3	0	0	7, 9, 12
10. Blue-gray Gnatcatcher (12)	6	1	1	16.6	0.17	1	0	0	3, 28
11. Prothonotary Warbler (5)	12	2	5	16.6	0.42	2	1	1	3, 14
12. Ovenbird (19)	6	1	1	16.6	0.17	1	0	0	4
13. Cardinal (13)	70	10	12	14.3	0.17	7	1	1	3, 12, 13, 15, 26, 28
14. Yellow-breasted Chat (10)	31	4	6	12.9	0.19	4	2	0	18, 24, 28
15. Bachman's Sparrow (16)	8	1	1	12.5	0.13	1	0	0	20
16. Rufous-sided Towhee (15)	20	2	3	10.0	0.15	4	1	0	1, 2, 17, 26
17. Phoebe (17)	32	3	3	9.4	0.09	3	0	0	1, 3, 7
18. Song Sparrow (19)	25	2	2	8.0	0.08	2	0	0	16
19. Chipping Sparrow (18)	24	1	2	4.2	0.08	2	1	0	1, 18, 22
20. Brown Thrasher (20)	31	1	1	3.2	0.03	1	0	0	6
Yellowthroat	5	1	?	20.0	?	1	0	0	10
Scarlet Tanager	3	1	1	33.3	0.33	1	0	0	27
Yellow-throated Vireo	1	1	1	100.0	1.00	3	0	2	7, 27, 28
Carolina Wren	20	0	0	0	0	1	0	1	1, 3
House Sparrow	9	0	0	0	0	1	0	1	28
Totals	512	87	124	16.99	0.24	92	24	11	28

¹ The numbers to the left show rank according to column 4 (rank according to column 5 is given in parentheses after species' names). Samples of 5 or less and species (i.e., Carolina Wren, House Sparrow) of which no parasitized nests were found not ranked.

² Of which examination was deemed adequate to disclose presence, at the time, of cowbird eggs or young; and exclusive of nests outside the cowbird's breeding range.

true order of importance of hosts. The value of the host to the cowbird must be a function of vulnerability \times numbers \times per cent of success as a foster parent. In the table above two measures of vulnerability are provided: the average number of cowbird eggs or young per examined (not per parasitized) nest and, more simply, the percentage of nests parasitized. Assuming 100 per cent success of cowbird eggs, the former, of course, would be the critical figure; if, however, the average passerine parents are capable of very limited capacity to rear more than one young cowbird, the second figure might be more meaningful. Ranking by both criteria is indicated in the table, the sequences being, of course, purely tentative (with probable distortions indicated) and representing only vulnerability. It scarcely seems necessary to emphasize the shortcomings of the type of data compiled (where many contributing nests were examined but once), and the variable size and assurance of accuracy of the samples.

I shall venture a guess that among the most important hosts in Kentucky, considering moderate to high indicated vulnerability combined with large numbers and probable or demonstrated readiness and capacity to rear cowbirds, are the Red-eyed Vireo, Indigo Bunting, Summer Tanager, Wood Thrush, Cardinal, and Field Sparrow; additional species (I should pick the Kentucky Warbler as one) seem likely to prove of considerable importance.

A few particularly interesting observations remain to be mentioned. While Friedmann (1929:178) gives two somewhat similar records of his own (but both involving old nests), the present carefully made observation of the late Walter Shackleton (1948:1) is of some interest when viewed in connection with theories concerning the evolution of nest parasitism (see Van Tyne and Berger, 1959:318). The following is nearly an exact quotation paraphrased for brevity:

On May 4, 1947, I observed a pair of Wood Thrushes carrying nesting material in Oldham County. Between visits of the Wood Thrushes a female cowbird was observed going to the nest and sitting down in it as if shaping it, much as a bird building a nest often does. On May 13 there were 4 cowbird eggs but still only 1 thrush egg. If other thrush eggs had been laid, they must have been removed by the cowbird.

Destruction of host eggs by cowbirds and removal or probable removal of eggs have been noted several times, and are further suggested by the general depression of clutch and brood size in parasitized nests; these are matters which are now too well known to require extensive comment.

But one instance was known to Friedmann (1929:186)—and I have not exhausted the subsequent literature in search of more—of a cowbird egg laid in a nest containing young. This I observed at a Cardinal's nest found in Warren County, 2 miles south of Bowling Green, on May 5, 1949, and then containing 2 newly hatched Cardinals and 1 Cardinal egg. On May 6 this egg had disappeared and on May 7 had been replaced by a cowbird's egg.

An interesting nest demonstrating severe impact of cowbird upon host was that of a Prothonotary Warbler in an open cypress stump at Fish Lake, Carlisle County, which when I found it on June 5, 1949, contained 1 egg of the warbler, 1 of the cowbird, and 3 young cowbirds approximately 5-6 days old! It would appear that some of these cowbird eggs may have been laid before some or all of the host's eggs. (Monroe, incidentally [1938], could not account for the presence of a cowbird's egg in another nest of the Prothonotary Warbler, in Jefferson County, where the size of the opening seemed to preclude the entrance of a cowbird; this calls to mind some of the remarkable accomplishments of the Old World cuckoos.) Another case of severe parasitism was observed at the nest of an Indigo Bunting which I noted in Laurel County on June 29, 1952. The only contents of this nest were 2 cowbird eggs and 2 young cowbirds estimated to be 4-6 days old, both freshly dead (either as a result of an extremely hot period then in progress, or, possibly, death of the female bunting which, though the male was much in evidence, was never seen). This nest may provide another instance of laying in a nest containing young, since one egg proved to contain an advanced, though rotten, embryo, while the other was

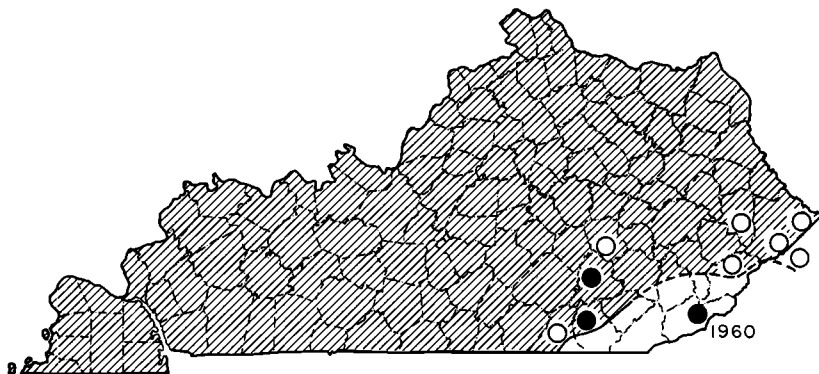


Fig. 38. Breeding distribution of the Brown-headed Cowbird in Kentucky. Hatched area, fairly common to common (increasing westward); dark circles, marginal breeding records; open circles, marginal breeding-season records.

fresh. Several other nests incorporated in the data above have contained only cowbird eggs or young; among these was a Phoebe's (Mengel, Laurel County, June 18, 1952), containing a large young cowbird ready to leave; 2 were Cardinal's, containing 1 egg each, at least one of which was abandoned (Mengel, Laurel County, June, 1949); and 4 belonged to Indigo Buntings and Field Sparrows, in Owen County (Lovell, Stamm, and Pierce, 1955; Stamm, notes), and were abandoned. These and other reported cases of desertion may have resulted from parasitism, but this is unproved.

Breeding distribution.—While the cowbird is a common breeding bird in western and central Kentucky, it is considerably less numerous on the Cumberland Plateau, where I have noted it only sparingly in Powell, Wolfe, Pulaski, Laurel, Whitley, Wayne, and McCreary counties (see also Barbour, 1956:10, Breathitt County). Save for one, the southeasternmost breeding records are for Laurel and Whitley counties, as noted above (Fig. 38). The rarity of the species on the Plateau is shown by the scarcity of parasitized nests, as well as by direct observation. In Rowan County in May, 1935, only 1 of 41 nests studied by Barbour (1950a) was parasitized (Acadian Flycatcher). The species has been reported from Belfry, Pike County (Wetmore, 1940:564), and Blackey, Letcher County (Murray, 1938:3) but is not numerous; I recorded only 1 cowbird, June 20–26, 1951, in cleared land on uplands above Elkhorn City, Pike County. These seem to be the easternmost records. The species is represented by only one record from Harlan County and none from Bell County. None of 31 active nests I found on Black Mountain, Harlan County, in 1946, 1951, and 1952 was parasitized, nor were any of the dozen or more reported from the mountain by Lovell (1950c) and other workers. However, on July 6, 1960, Stamm (notes) saw a House Sparrow feeding a young cowbird in Harlan County. On July 8, 1951, I recorded a few cowbirds in open valleys of Lee County, Virginia, but I found none in 1951 and 1952 in the valley at Big Stone Gap, Wise County, Virginia. Friedmann's map of the range (1929:146), from which extreme southeastern Kentucky is excluded, was drawn with remarkable accuracy for a general work compiled 30 years ago. With the recent, apparent extension southeastward of the species' range (Webb and Wetherbee, 1960), all of Kentucky may ultimately be occupied.

Summer and fall.—In the Bluegrass country of northern Kentucky, in 1950, I recorded male cowbirds singing and displaying as late as July 12. Wetmore (1940:564) noted postjuvinal molt of a male nearly completed on July 13, 1938. By mid-July, cowbirds begin to form flocks of considerable size, composed largely of young

birds, and these are often conspicuous in open agricultural areas. Flocks become larger and more frequent in early fall. Flocks of 2,000 to 5,000 were noted in Seneca Park, Louisville, on October 4 and 5, 1956 (Stamm, 1957a:41). Although they tend more than the other blackbirds to remain in pure flocks, at these times cowbirds associate to some extent with Red-winged Blackbirds and grackles. Cowbirds become rare in most of eastern and central Kentucky by October and November. I recorded none in Laurel County, October 3–10, 1951. Published "late" records indicate only the time by which most birds have departed: October 16, in Warren County (Wilson, 1922:238); "about November 20th," in Nelson County (Beckham, 1885:30); Monroe has found cowbirds fairly regularly at Louisville until about October 30, with only scattered records for early November. In the Purchase I found the species fairly common, November 4–12, 1948.

Winter.—The Brown-headed Cowbird winters throughout Kentucky, but the total numbers present in most years are only a fraction of those in the breeding season. From eastern Kentucky, where it is least numerous, it has been reported from Morehead (Barbour, 1951a:38) and Floyd County (Patten, 1937:20). In Laurel County, 5 miles southwest of London, I noted a flock of 13 in a farmyard on February 3, 1950. In central Kentucky, Monroe had records (1934–1952) only for December 22–27 and January 6 (next record, March 2), but Blincoe (1925:412) wrote, in Nelson County, that it was frequently seen in winter and sometimes regular in large flocks. Its distribution at this season is evidently rather local and dependent upon the location of large blackbird roosts. Cowbirds have been noted in such roosts in central Kentucky by Lovell and Kirkpatrick (1946:19) in Meade County, Loefer and Patten (1941:585) in Fayette County, and Clagett (1955:20) in Hardin County. Quite recently (1956–1957 and subsequently) large numbers have wintered in the great roost of blackbirds newly established in Jefferson County (Stamm and Lovell, 1957; Monroe, 1958). In Warren County, where the species is usually rare in winter (see Wilson, 1939c:34), large flocks were seen in 1931, and Lancaster (1937) noted others in December, 1926. Farther west, in the Purchase region, cowbirds are regular and probably often common through the winter as a component of the great blackbird roosts perennial at nearby Reelfoot Lake, Tennessee. The species may be hard to find at given times, however; I recorded only one (a female seen on December 28 near Cayce, Fulton County) in the Purchase from December 24, 1950 to January 4, 1951.

Geographic variation.—The subspecies occurring in Kentucky is the eastern *Molothrus ater ater* (Boddaert).

Specimens examined.—Total, 17. M.S.C.—2 males, 1 female, Rowan County (March and May); U.K.—1 male, 1 female, Woodford County (May 3; May 8); 1 female, Fayette County (Oct. 31); B.L.M.—2 males, 1 female, Jefferson County (April 7, 13; March 30); U.S.N.M. (see Wetmore, 1940:564)—6 specimens from Pike, Lewis, Meade, Union, and Fulton counties (April 26–July 13); U.M.M.Z.—1 male, Hickman County (Nov. 12); 1 female (nestling; from Prothonotary Warbler's nest), Carlisle County (June 5).

FAMILY THRAUPIDAE: TANAGERS

Piranga olivacea (Gmelin): SCARLET TANAGER

Status.—Summer resident, fairly common to common in eastern Kentucky, increasingly rare and local westward; more numerous in migration periods, especially in central and western Kentucky.

Spring.—Scarlet Tanagers are occasionally noted by mid-April, usually about April 20. Early records: April 20, in Rowan County (Barbour, 1951a:38); April 14 (1890), in Pulaski County, average of 9 years April 18 (Oberholser, 1918:16); April 18 (1937), at Cincinnati, Ohio (Goodpaster, 1941:33); April 21 (1938), in Meade County (Wetmore, 1940:564); April 16 (1955), at Louisville (Monroe); April 18, in Warren County (Wilson, 1922:239). On April 17, 1950, Handley and

I noted the apparent arrival of the species in Lyon County. In 1949, I noted the first in eastern Kentucky (Wolfe County) on April 25 and found the species regularly thereafter in counties to the south and west; in extreme southwestern Kentucky (Fulton County) I noted the last of the season on May 15.

Breeding records.—Only 5 records indicate completion of clutches from May 1–10 to July 11–20, suggesting the possibility that some pairs rear two broods. Egg dates range from May 12 to July 27, and 3 clutches average 3.7 eggs. Records as follows: nest 8 feet up in “ironweed” [?] over a creek in Martin County, May 4 or 5, 1957 (Green, 1957:56); nest with 5 eggs, Carter Caves, Carter County, May 12 (Barbour, 1951a:38); nest containing young on June 1, 1946, 27 feet up on a horizontal branch 5 feet from main trunk of a tulip tree in mixed second-growth forest at Mammoth Cave, Edmonson County (Brecher, 1946:46); incubation in progress July 27, 1934, at a nest in a sycamore in lowland forest in Hopkins County (Hancock, 1954:44), where two sets of 3 eggs, one containing also a cowbird’s egg, were taken by Bacon (Bacon collection; nests found in upland oak-hickory woodlands). Also, females taken by me (U.M.M.Z.) in Powell County on June 24, 1948, and by Barbour (R.W.B.), at 4,000 feet elevation on Black Mountain, Harlan County, on July 20, 1939, possessed well-defined brood patches. Stamm (notes) recorded young in a nest in a sycamore in Bullitt County on July 8, 1953, and saw 3 young not long from the nest in Letcher County on July 6, 1960 (male in attendance).

Breeding distribution.—The center of the Scarlet Tanager’s breeding range lies to the north of Kentucky, and although the species breeds more or less throughout the state, it becomes progressively and markedly less numerous from the eastern highlands to the western lowlands, being somewhat correlated in distribution and numbers with forest type and topography. The species is common throughout eastern Kentucky, occurring at all elevations on Black Mountain, Harlan County, along Pine Mountain from Bell County to Pike County, and in equal numbers in the lower, Cumberland Plateau counties and immediately adjacent Knobs to the westward. In these areas it appears to favor moderately open forest, especially combinations of pine, oak, and hickory (often with more mesic intrusions), and oak-hickory and oak-chestnut types, and to avoid the most mesic types of mature mixed mesophytic forest. On the Cumberland Plateau the Summer Tanager (which is much more numerous than the Scarlet to the westward) and the present species seem to be about equally numerous, but the Summer Tanager displays a somewhat broader choice of habitats, occurring in nearly all forest types (it seems to outnumber the Scarlet Tanager in oak-hickory forest), as well as in farmyards, towns, and similar disturbed areas shunned by the present species. In the higher mountains the Scarlet Tanager clearly outnumbers the Summer, the reverse apparently being the case (*cf.* Patten, 1946:32) in the easternmost Knobs.

In the Knobs as they break away from the Plateau, and on adjacent portions of Muldraugh’s Hill just to the south, the Scarlet Tanager becomes somewhat less numerous; it has been recorded in summer from southern Jefferson County and Bullitt County (Monroe, Mengel; notes), and from Meade County (Wetmore, 1940:564; Lovell, 1949b:71); in the Western Highlands the species is fairly common locally, mainly in upland situations, as noted by various observers near Mammoth Cave, Edmonson County (Howell, 1910:298; Bailey, 1933:181; Hibbard, 1935; Wilson, 1946:20) and in Hopkins County (Hancock, 1954:44; Bacon, verbal com.). Elsewhere (Bluegrass, Pennyroyal, Purchase) the species ranges from very rare to virtually absent. I can find no summer records from the Bluegrass proper; in the Pennyroyal it occurs locally in the eastern portion, where habitats rather like those on the adjacent plateau are found; farther west, in Warren County, Wilson (1947b: 63) has found it only in “original woods.” Pindar (1887a:85; 1889b:315; 1925a: 164) reported a few summer observations made many years ago; I have never been able to find the species summering in the Purchase (nearby, however, Cypert, as recorded in Refuge files, has noted a few males in July, in the mature forests remaining in Kentucky Woodlands National Wildlife Refuge between the Cumber-

land and Tennessee rivers). Admittedly limited evidence suggests that in these western areas the species tends to occur in the most mesic forest types available, especially mixed mesophytic associations resembling those on the Cumberland Plateau. In this respect it resembles a number of other forest species (see pp. 88-89).

Much more detailed evidence of the species' breeding distribution and density, in those areas where it is rare and little known, is needed to confirm or refute the various statements incorporated in Wilson's (1942:24) brief survey of its distribution.

Fall.—Vigorous singing continues at least into late July. The molt of resident birds is begun in July and probably completed in most individuals by mid-September. I saw several "pied" males in postnuptial molt in Bell County on July 18, 1949. An adult female (R.W.B.) taken by Barbour in Harlan County on July 20, 1939, was replacing all of its rectrices. Just completing postnuptial molt was a male tanager (U.M.M.Z.) taken by Monroe at Anchorage, Jefferson County, on September 18, 1951. This specimen (Mengel, 1963), is probably a hybrid between the Scarlet Tanager and the Western Tanager (*Piranga ludoviciana*). Probably partly because of the greatly decreased conspicuousness of males, in which green body plumage is assumed in the fall molt, it is uncertain just when the species becomes rare in autumn. A few observers have noted many in September, some of them probably transients (see Beckham, 1885:23; Goodpaster, 1941:33). Beckham took specimens (C.W.B.), perhaps early transients, in Nelson County on August 8, 1885, and August 10, 1886. Peak of migration probably in early September. Late records: September 22 (1886), in Pulaski County, average of 4 years September 16 (Oberholser, 1918:18); October 19 (1957), October 15 (1955), and October 7 (1951), at Louisville (Croft, 1958a:46; Stamm, 1956b:31; Lovell, 1952:6); September 30, in Warren County (Wilson, 1922:239); October 2 (1888), in Fulton County (Pindar, 1889b:315, a female killed). On October 8, 1951, I saw a female at close range in upland pine-oak forest 10 miles southwest of London, Laurel County, and the same year I took a female at Louisville on September 28.

Specimens examined.—Total, 29. M.S.C.—3 males, 2 females, Rowan County (May 9, 14, 15; April 29, May 14); R.W.B.—1 female, Harlan County (July 20); U.K.—2 males, Woodford County (May 3); C.W.B.—5 males, 1 female, Nelson County (May), also 1 immature male, 1 immature female, Nelson County (Aug. 10; Aug. 8); B.L.M.—1 male, Harlan County (July 9); 1 male, Laurel County (July 7); 1 male, 1 female, Jefferson County (June 13; May 4); Bernheim Coll.—1 male, "Kentucky" (=fall); U.S.N.M. (see Wetmore, 1940:564)—4 specimens from Harlan, Bell, Nelson, and Union counties (May 7-Sept. 17); U.M.M.Z.—1 female (weight, 31.5 gm.), Powell County (June 24); 1 male, Laurel County (July 7); [1 adult male (weight, 31.7 gm., moderately fat, = hybrid × *Piranga ludoviciana*, see above), 1 immature female, Jefferson County (Sept. 18; Sept. 28); 1 male, Logan County (May 9)].

Piranga rubra (Linnaeus): SUMMER TANAGER

Status.—Fairly common to common summer resident.

Spring.—The first are usually seen around April 20, shortly after which the species becomes numerous; a few arrive earlier, at least occasionally. Early records: April 15 (1891), in Pulaski County, average of 10 years April 19 (Oberholser, 1918a:146); April 17 (1938), at Cincinnati (Goodpaster, 1941:33); April 16, in Nelson County (Blincoe, 1925:414); April 12 (1945), at Louisville (Monroe); April 14 (1906), in Logan County (C.U.). The extremely early date of April 2 for Warren County, given by Wilson (1922:239), is perhaps questionable without further evidence.

Breeding records.—Clutches are completed from May 1-10 to July 21-31, with a peak (first nestings) May 21-31, as indicated by 40 dated breeding observations; no later peak is evident, but the duration of the season suggests that some pairs rear two broods (see also below). Data are from Bell (Lovell, 1948:36); Letcher

(Murray, 1938:3); Powell (Lovell, 1948:16); Laurel (Mengel, notes); Wayne (Altscheler, 1955a:68); Mercer (Van Arsdall, 1949:28); Fayette (Garman, *vide* Funkhouser, 1925:262); Owen (Stamm, 1956:20; *vide* Hays, 1957:7; and notes); Oldham (Shackleton and Shackleton, 1950:47; Stamm, Shackleton, and Slack, 1953:27; Stamm, notes); Jefferson (Stamm, notes; Monroe, Mengel; notes); Nelson (Beckham, 1885:23, 1886a:487; Blincoe, *vide* Funkhouser, 1925:262); Meade (Lovell, 1949b:71); Marion (Croft, *vide* Hays, 1957:7); Hopkins (Bacon, *vide* Lovell, 1951b:62; Hancock, 1954:44-45); and Marshall (Fuller, *vide* Lovell, 1951b:62) counties. Egg dates range from May 15, in Fayette (Garman) and Nelson (Beckham) counties, to June 30 (1952), incubation begun, in Laurel County (Mengel; see below). An early nesting is also indicated by a young bird out of the nest in Hopkins County on June 1, 1953 (Hancock), and later nestings by construction of nests noted in Laurel County on July 2, 1952 (Mengel), in Marshall County on July 12, 1951 (Fuller), and in Jefferson County on July 25, 1948 (Stamm). Fourteen recorded clutches (chiefly) and broods have an average complement of 3.2 ± 0.16 eggs or young (2-4). This average may be a little low, but it seems probable that in Kentucky 3 eggs is more nearly average than the 4 reported, in general, by Bent (1958:499). One of the two clutches of 4 eggs found locally was noted by Monroe, 30 feet up in a pin oak in Jefferson County on May 25, 1941, and contained in addition 3 eggs of the Brown-headed Cowbird (for other instances of cowbird parasitism upon the present species see Stamm, 1956, also notes; Hancock, 1954:45; Shackleton and Shackleton, 1950; and this work, Table 22). The rather flimsy nests have nearly all been found in forest edge or open woodland, often over open spaces such as roads, lawns, or clearings, and all reported have been near the ends of horizontal branches. Oaks of several species have figured prominently among the trees selected, with nests reported also from black walnut, hickory, slippery elm, hackberry, peach, sycamore, ornamental cedars, and Virginia pine, the mean height above ground of 25 nests being 17.5 feet (5-45; median, 12). In three cases where details of construction were noted, the female only was seen working on the nest (and, later, incubating); at 6 nests with young, both sexes were observed feeding them. A nest found by the Shackletons in Oldham County was evidently completed by May 13 (1949) but received its first egg on May 17, the second and third eggs being laid on May 18 and 19. Cowbird eggs (2) were laid in the nest on May 19 and 20. On June 22, 1952, I saw a female begin construction of a nest 35 feet up in a large red oak in Levi Jackson State Park near London, Laurel County; she began the nest with a piece of white cleansing tissue, and several more of these were incorporated before the nest was completed on June 26. Incubation began on June 30 (3 or 4 eggs probably having been laid in the interim), and on this date one of the eggs was thrown unbroken to the ground in a severe storm. Incubation was still in progress when I left on July 2. It is not explicitly stated by Bent (1958) that the species is single-brooded, but this is implied. It is therefore of interest that a male which showed every indication of being the mate of the female just discussed was feeding grown young in the territory on June 24, strongly suggesting that two nestings were undertaken by this pair. Nearby, another female was constructing an even later nest, one-third completed on July 2, 25 feet up in a white oak. A late nest at Glenview, Jefferson County, which 3 young left on July 21, 1952, was 10 feet up at the tip of a black walnut branch over a driveway; 30 feet from this nest was a well-preserved but empty nest of the species, 7 feet up in an ornamental cedar. I noted other young just from the nest in Laurel County on June 30, 1952; a young bird shortly out of the nest, taken in Nelson County on June 21, 1886, by Beckham (1886a; C.W.B.), served as the basis for his original description of the first (juvinal) plumage of the species.

Breeding distribution.—Statewide. The Summer Tanager occurs in forest and woodland of many types, including upland pine-oak communities in the Cumberland Plateau and Mountains. Moderately open forest is preferred and, unlike the Scarlet, the Summer Tanager is often found in cities, parks, and suburban areas.

Along the mountain ridges of southeastern Kentucky the species is less numerous than the Scarlet Tanager, elsewhere being approximately as numerous as the other species (Cumberland Plateau) or more so (rest of state). At high elevations on Black Mountain, Harlan County, it is rare and has seemingly not been recorded at the top; I saw 2 singing males at 3,800 feet on June 30, 1951, and 1 at 2,800 feet on July 5, 1951. Even at the base of the mountain, at about 1,800 feet, the species is not very numerous.

Summer and fall.—Singing continues at least to the end of July and the molt occurs in August and early September. An adult male (U.M.M.Z.) taken at Henderson on September 9, 1949, was just completing the molt, the rectrices and primaries being less than full grown. An adult female from Marshall County, taken by Figgins on September 4, 1941, is in a less advanced stage of molt. The species decreases noticeably by mid-September but is fairly often recorded into early October; rare by mid-October. Late records: October 1 (1938), in Rockcastle County (Wetmore, 1940:565); October 3–7 (1951), in Laurel and Pulaski counties (Mengel); October 10 (1890), in Pulaski County, average of 6 years, September 24 (Oberholser, 1918a:146); October 6, in Nelson County (Blincoe, 1925:414); November 10 (1936), at Cincinnati, Ohio (Goodpaster, 1941:33); October 23 (1948), at Louisville (Monroe; others noted October 20, 1946 and 1948, and October 9, 1948; recorded on many dates September 15–30); September 26, in Warren County (Wilson, 1922:239).

Geographic variation.—The subspecies occurring is the eastern *Piranga rubra rubra* (Linnaeus).

Specimens examined.—Total, more than the 27 here listed (time did not permit detailed listing of all Beckham [C.W.B.] specimens). M.S.C.—2 males, Rowan County (May 9, 14); U.K.—1 male, Lincoln County (May 16); C.W.B. (part)—1 juvenal-plumaged male, Nelson County (June 21); B.L.M.—1 male, Laurel County (July 7); 1 [=female], Bullitt County (July 4); 1 male, Jefferson County (June 13); C.U.—1 male, Breathitt County (Aug. 3); 3 males, 1 female, Logan County (April 14, 27, May 1; May 3); J.D.F.—1 adult male, 4 females, Marshall County (Sept. 10; Aug. 19, Sept. 4, 20, 24); U.S.N.M. (see also Wetmore, 1940:565)—5 specimens from Pike, Wayne, Nelson, Meade, and Fulton counties (May 3–July 8); U.M.M.Z.—1 female (weight, 29.1 gm.), Wolfe County (April 24); 1 male (28.9 gm.), Estill County (June 27); 1 male (29.3 gm.), McCreary County (July 12); 1 immature female (26.9 gm., not fat), Jefferson County (Sept. 19); 1 adult male (31.1 gm., not fat, molting), Henderson County (Sept. 9).

FAMILY FRINGILLIDAE: GROSBEAKS, FINCHES, SPARROWS, AND BUNTINGS

Richmondena cardinalis (Linnaeus): CARDINAL

Status.—Common resident.

Spring.—Song is sometimes heard on pleasant days in midwinter, and is regular by late winter. Breeding territories are regularly occupied by many males in March.

Breeding records.—As indicated by 87 dated observations, clutches are completed from April 1–10 to August 21–31, with no marked peaks evident. Most pairs are probably two- if not three-brooded. Data are from Rowan (Barbour, 1950a:34; 1951a:38); Laurel (Mengel, notes); Madison (Gailey, *vide* Lovell, 1951b:62); Owen (Lovell, Stamm, and Pierce, 1955:8; Stamm, notes); Oldham (Lovell, 1951b:62; Stamm, Shackleton, and Slack, 1953:27; Stamm, notes; Mengel, notes); Jefferson (Stamm, 1943:35, 1955:28, and notes; Wright, 1945:50—see also *Kentucky Warbler*, 22:40, 1946; Lovell, 1951b:62; Young, 1955:16; Hays, 1957:7; Monroe, Mengel, notes); Meade (Lovell, 1949b:71); Marion (Lillard, 1889:209; Monroe, notes); Nelson (Beckham, 1885:29; Blincoe, *vide* Funkhouser, 1925:258–259); Henderson, Warren, and Logan (Mengel, notes); Hopkins (Hancock, 1954:45); and Fulton and Ballard (Mengel, notes) counties. Of the above-cited observers, Beckham,

Lovell (1949*b*), Stamm, Shackleton, and Slack, Lillard, and Hancock have briefly commented upon or summarized nesting habits in particular localities.

Egg dates range from April 14 (1935), set of 4 in Hopkins County (Hancock) to September 2 (1960), in Jefferson County, clutch of 2 hatching (Stamm, notes). Other early nestings have been noted March 31 (1953), 1 egg in Jefferson County (Stamm, notes), and April 17 (1936), 3 eggs in Jefferson County (Monroe); other late nestings are represented by clutches of 2 and 3 eggs completed in Jefferson County, July 29 and August 1, 1951 (Mengel), 3 young in a nest in Hopkins County, August 25, 1933 (Hancock), and 2 young just from the nest taken (U.M.M.Z.) by Tordoff and me in Henderson County on September 7, 1949.

The average complement of 63 clutches (chiefly) or broods is 2.8 ± 0.08 eggs or young (1 nest with 1, known complete; 15 with 2, several known complete; 41 with 3; 6 with 4). A remarkable nest observed by Stamm (notes) at Louisville, May 10-14, 1961, contained 6 eggs, the product of 2 females, both of which incubated (but one male was observed). Of these eggs, 2 hatched on May 11 and 4 on May 13. A decrease in productivity late in the season is suggested by the difference between the averages of 38 clutches completed approximately April 1-June 10 (3.0) and 15 completed approximately June 20-August 21 (2.3). The heights above ground reported for 58 of the loosely constructed, cup-shaped nests range from 2 to 20 feet (average, 5.5). Nests are found for the most part either in shrubbery about dwellings or in open woodland and forest edge (I have, however, also found them in canebrakes in deep swamp forests of western Kentucky, and in laurel thickets in dark, hemlock-forested ravines on the Cumberland Plateau) and are situated in a very wide variety of deciduous plants, including shrubs, small trees, and vines, often also in red cedars, less frequently in holly and pine, when available, and occasionally (see Stamm, Shackleton, and Slack, 1953:27) in odd locations as on drain-pipes and in outbuildings.

For several days on and after July 20, 1952, at Glenview, Jefferson County, I observed a female incubating an apparently complete clutch of 1 egg. I have seen only females incubating, and no records of males assisting with incubation are at hand. Semple (1947) noted a male feeding his mate on the nest, and the same author recorded a nestling period of 10 days. I suspect that a new nest is usually built for second or later broods, since in a considerable number of cases late nests have been situated very near empty but fairly new nests of the same species. In several cases I noted that incubation did not begin until the last egg was deposited, but a female at Glenview, Jefferson County, began incubation on July 31, 1951, with the second of her 3 eggs (the last was laid on August 1, and incubation was still in progress on August 11). Incubation periods of approximately 12 days were noted by Stamm (1955) and Young (1955).

An interesting case of parasitism on the present species by the Brown-headed Cowbird is described under that species (p. 455), where other instances of parasitism are also listed. Space limitations seem properly to preclude detailed description of many nests discovered by Monroe and me at localities indicated above; the data are incorporated in the present summary.

On June 26, 1949, I noted a large blacksnake (sp.) at a nest 5 feet up in a hedge at Glenview, Jefferson County, with the Cardinals nearby and greatly agitated. The snake withdrew and the nest, when examined immediately thereafter, was empty.

Breeding distribution.—The ubiquitous Cardinal is one of the most numerous and conspicuous Kentucky species. Save locally in very dense forest, it is found everywhere in the state, with the exception of the highest parts of the Cumberland Mountain ridges. On Big Black Mountain, Harlan County, it is very rare above 2,500 feet, to which elevation Howell (1910:298) recorded it in July, 1908. I noted a singing male in brushy growth in the cleared lane along a high-wire line, at 3,600 feet on a southeast slope on June 26, 1951, this being the highest record known to me.

The species is characteristic of brushy successional stages of vegetation, being perhaps most numerous in weedy and shrub-grown fields and in forest edge. It occurs also in the understory of open forest and wherever small openings occur in denser growth. Breeding bird counts that I made in 1951 and 1952 in several forest types in eastern Kentucky showed densities ranging from 8 singing males per 100 acres in mixed mesophytic forest on Pine Mountain in Pike County, at an elevation of 2,700 feet, to 15 singing males per 100 acres in oak-hickory forest in Levi Jackson State Park, Laurel County. Approximately 10 males per 100 acres were noted in upland pine-oak forest on the Cumberland Plateau in western Laurel County. Censusing of extensive areas of earlier successional stages of vegetation would certainly have resulted in much higher counts.

Fall and winter.—Common and conspicuous as always, indeed perhaps more so, Cardinals are somewhat gregarious in the winter months, congregating in loose flocks—there may at times be 100 birds in an acre or two—often with towhees, juncos, chickadees, and other small birds in such typical situations as standing corn, brushy woods edges, and hedgerows. It is possible that some of the wintering population comes from farther north; although the species is regarded as rather sedentary, occasional banding returns indicate considerable dispersal of individuals. Stamm (1953:44) reported a bird banded by her at Louisville and taken only a few days later near Nashville, Tennessee. Other banding notes have been reported by Young (1937:23; 1941:197–198), Lovell (1948a:71–72), and Bacon (1953:29), the last noting a female at Madisonville known to be nearly 9 years old.

Note.—Albinistic individuals have been noted by Wilson (1953a:46) in Warren County and Semple (1946:56) in Crittenden County.

Geographic variation.—The subspecies occurring in Kentucky is the eastern *Richmondena cardinalis cardinalis* (Linnaeus).

Specimens examined.—Total, more than the 39 here listed (time did not permit listing of Beckham specimens—C.W.B.). M.S.C.—3 males, 1 female, Rowan County (May and Dec.); R.W.B.—1 full-grown juvenal-plumaged female, Harlan County (July 25); U.K.—1 [= male], Fayette County (Feb. 28); 1 male, 1 female, Woodford County (April 24); B.L.M.—2 males, 1 female, 1 full-grown, unsexed, juvenal-plumaged bird, Jefferson County (Jan. 11, July 3; Feb. 10; June 3); C.U.—1 male, 1 female, Logan County (April 26); U.S.N.M. (see Wetmore, 1940:565)—20 specimens from Pike, Bell, Lewis, Rockcastle, Wayne, Boone, Meade, Muhlenberg, Butler, Union, Hopkins, Trigg, and Fulton counties (April 20–Nov. 11); U.M.M.Z.—2 immatures just from nest (♂ and ♀), Henderson County (Sept. 7); 1 female (weight, 43.6 gm., not fat), Carlisle County (Nov. 12); 1 male (49.6 gm., not fat), 1 female (37.9 gm., not fat), Fulton County (Nov. 11; Nov. 10).

Phœucticus ludovicianus (Linnaeus): ROSE-BREADED GROSBEAK

Status.—Transient; uncommon in spring, fairly common in fall; fairly common summer resident on Black Mountain in Harlan and Letcher counties, mainly above 3,000 feet.

Spring.—The migration period is apparently rather short; transients are rarely recorded before late April or after mid-May; peak of migration in early May. Among the few series of observations made at given localities, Monroe's near Louisville, for April 8, and April 25 (1953)—May 19, and Wilson's (1922:239) in Warren County, for April 20–May 15, are most comprehensive. Cooke (1912b:160) gave an early date at Lexington as April 24 (1904), average of 4 years April 27. The species has been recorded at numerous localities through the state, most observers considering it uncommon or fairly common (in any event, it seems less numerous than in autumn). In 1949, I recorded Rose-breasted Grosbeaks in Warren County on May 3 and 8, a brilliantly singing male on the latter date.

Breeding records and distribution.—Egg laying occurs in May and June. Definite evidence of breeding is all from Harlan County, where the species is fairly common in summer on Big Black Mountain, mainly at elevations above 3,000 feet. It was first recorded there by Howell (1910:298), who took a full-grown young bird on

July 24, 1908, near the base of the mountain at only 2,500 feet. Noted by numerous subsequent observers, it occurs also on the extension of the mountain in Letcher County (Lovell, 1950c:63). Lovell (*loc. cit.*) observed a male carrying nesting material on June 16, 1950, near the top of the mountain in Harlan County. Here in 1951 and 1952, I found nests (all within a half mile of one another) as follows: (1) complete when discovered May 17, 1952; 20 feet above ground, in a fork of an ascending branch near the top of a witch hazel sapling (3 inches diameter at 4 feet) in second-growth deciduous forest on a steep north-facing slope at 4,000 feet; female incubating May 21-24; abandoned by May 28, when it contained feathers and dried blood of the female and fragments of eggshell; (2) one-half completed on May 17, 1952; 20 feet above ground and 8 feet out from the trunk of a small yellow birch standing in a brushy clearing in climax mixed mesophytic forest at 4,000 feet; complete on May 19; male visited nest and looked in on May 21; subsequently abandoned; (3) complete when found on May 19, 1952; 30 feet above ground of steep slope (15 feet above base of tree) in a small witch hazel in second growth near a road; female incubating May 21-28; on June 6 (a very hot day) she was sitting high on the nest as though sheltering young; (4) inactive when found on June 30, 1951, but certainly of this species; 9 feet up in crotch of a thin red oak sapling in shaded understory of disturbed mixed mesophytic climax (the main dominants here and near other nests were sugar maple, basswood, yellow birch, hickories, and red oaks); like the other nests, it was loosely constructed of fine twigs, rootlets, plant fibers, and grape tendrils, with no special lining, and measured 9 × 12 inches outside with cup 3 inches deep inside; it contained clotted masses of grape seeds. Pairs and family groups are frequently seen in June and July, most often about groves of very large old trees standing somewhat apart from unbroken forest.

It is not wholly unlikely that this grosbeak will be found nesting elsewhere in Kentucky, probably along the northern boundary, since it nests rarely southward to points near the Ohio River. Audubon (1834:167) found a nest containing 3 young near Cincinnati, Ohio, near the end of July. I am not inclined, however, to accept fully Pindar's undocumented reference (1925a:164) to the species as a "rare summer habitant" in Fulton County in 1892-1893.

Fall.—A regular and fairly common transient throughout the state, chiefly inhabiting mature forest and best located by its peculiar, metallic call note. First arrivals are usually recorded in early or mid-September, and the peak of migration is seemingly from mid to late September; rare by early October. Few extensive series of local observations have been compiled. At Louisville, Monroe has records September 3-October 10, and in Warren County Wilson (1922:239) accumulated records September 19-October 13. The species has been reported from many localities, and a number of specimens have been taken in early October. I recorded small numbers at Henderson, September 8 and 9, 1949 (a second-year male taken on the latter date was undergoing complete molt so extensive that it was remarkable that the bird could fly); in Hopkins County near Madisonville, September 19, 1951; in Jefferson County, September 13-20, 1950, and September 28-October 1, 1951; and in Laurel County, October 3-9, 1951. In the last I recorded more than 25 in willows and alders of a small marsh 2 miles south of London on October 3; a few were seen in the marsh, as well as in pine-oak upland woodland in the nearby Cumberland National Forest, until October 9. Wetmore (1940:565) recorded the species in nearby Rockcastle County, October 4, 1938. Hancock (1958:26) noted 1 bird singing in Hopkins County on September 14, 1957.

Specimens examined.—Total, 28. M.S.C.—1 female, Morgan County (Oct. 2); R.W.B.—1 male, 1 female, Morgan County (Oct. 1); U.K.—1 immature male, Fayette County (Sept. 26); 1 female, Woodford County (May 6); C.W.B.—3 males, 4 females, Nelson County (May 2, 7, Sept. 18; May 2, Sept. 16, 18, 26); B.L.M.—1 female, Harlan County (July 9); 2 males, Jefferson County (May 4, 11); Bernheim Coll.—1 male [spring plumage], "Kentucky" (no date); U.S.N.M. (see Wetmore, 1940:565)—7 specimens from Harlan, Bell, Rockcastle, Meade, and Union counties (April 30-Oct. 4); U.M.M.Z.—1 male, 2 females,

Harlan County (July 1; June 30, July 7); 1 immature male (weight, 42.9 gm., not fat), 1 second-year male (47.2 gm., not fat; in heavy molt), Henderson County (Sept. 8, 9).

*****Guiraca caerulea* (Linnaeus): BLUE GROSBEAK**

Status.—Poorly known; seemingly a very rare transient and casual summer resident, at least in western Kentucky.

Spring.—The following sight records are probably valid individually, and, taken collectively, provide impressive evidence for the presence of the species as a transient: April 25, 1949, a small flock ("at least a dozen birds, both females and males, in a pignut hickory") seen just north of the Murray State College campus (Wyatt, 1949:55); April 30, 1950, 1 bird seen near Clark's River (see also below), Marshall County, by Mrs. Eugene Cypert (Eugene Cypert, letter: June 19, 1950; Wyatt, letter: May 5, 1950); April 25, 1958, and again April 28–29, 1959, a male seen at Bowling Green, Warren County, by Dr. Jesse Funk (*vide* Wilson, 1959a:54); April 28, 1959, an adult male in Mammoth Cave National Park, Edmonson County (G. McKinley, 1959:55); May 7, 1960, 1 bird at Louisville (Sommers, *vide* Monroe). All of the above appear to have been carefully identified and watched at some length. The close approximation of dates is interesting, though perhaps coincidental. Earlier sight records were taken lightly for some years by myself and others but may be wholly or partly authentic: Warren County, "two seen in a shrub in [Bowling Green], April, 1912" (Wilson, 1922:239); Princeton, Caldwell County, 2 reported by Counce (1954:14) as seen April 3, 1953, if valid an extremely early date; and Cynthiana, Harrison County, first recorded May 2, 1932, seen in each of five following springs, last on May 18, 1937 (Mayer, 1941:14). Near Knoxville, Tennessee (about 35 miles south of Bell and Whitley counties, Kentucky), where in recent years the species has regularly occurred, Joseph C. Howell and I saw 5, seemingly breeding birds on territories, on May 5, 1952.

Summer.—John Pennington and Grace Wyatt noted a pair near Clark's River (Marshall County?) on May 20, 1950 (Wyatt, 1950:49—reference is made also to 1 seen at an undisclosed date by Mrs. John Delime, in Kentucky Woodlands National Wildlife Refuge). More recently, on June 15, 1955, a singing male was noted 3 miles southwest of Madisonville, Hopkins County, by Hancock (1956:39, and letter: December 29, 1955) and observed and reported with his customary care and thoroughness. He was unable to locate the bird on subsequent trips to the site. There seem to be no autumn records.

Note.—Save for one, provided by a detailed drawing (now in the library of the Missouri Botanical Gardens at St. Louis) made by Sarah Price and presumably based on a specimen obtained many years ago in Warren County (Lovell, 1959:28), the older records, which are few, are inexplicit: "Not a common bird [in Kentucky]. I have seen but one specimen" (Garman, 1894:17). "Very rare summer visitant [habitant]" in Fulton County (Pindar, 1889b:315; 1925a:164). Although the species has long been known from nearby surrounding areas (Ridgway, 1914a:418, southern Illinois; Hicks, 1945:314, Adams County, Ohio; Seeber and Edeburn, 1952: species no. 276, southwestern West Virginia; and, as noted, Knoxville, Tennessee), it seems to be extremely rare in Kentucky. Having familiarized myself, in advance, with the species and its habitat in other areas, cultivating at some pains the ability to recognize its song almost at the limit of hearing range, I was nonetheless unable to locate a single bird in several years of intermittent field work throughout Kentucky, despite considerable conscious search. I think it is safe to say that the breeding population, if any, is of negligible proportions and importance. Nowhere very numerous in the eastern United States, in comparison with the south-central and southwestern portions of the country, the Blue Grosbeak appears to migrate in small numbers across Kentucky to areas just to the north, many of which are in or near the old "prairie peninsula," and to inhabit also the valleys of east Tennessee and western Virginia to the south and east, separated from Kentucky by

the massive, forested ridges of the Cumberland Mountains which may pose a barrier in this area.

Geographic variation.—The subspecies to be expected in Kentucky is the eastern *Guiraca caerulea caerulea* (Linnaeus).

Passerina cyanea (Linnaeus): INDIGO BUNTING

Status.—Very common summer resident; casual in winter.

Spring.—Arrives in late April; common by early May. Early records: April 20 (1894), average of 11 years April 25, in Pulaski County; April 23 (1904), average of 4 years April 28, at Lexington (Cooke, 1911a:200); April 29 (1936), at Cincinnati, Ohio (Goodpaster, 1941:34); April 20 (Beckham, 1885:29) and April 26 (Blincoe, 1925:414), in Nelson County; April 20 (1957), at Louisville (Monroe); April 21, in Warren County (Wilson, 1922:239). The species begins breeding activities soon after arrival.

Breeding records.—Clutches, as indicated by 47 dated observations, are completed from May 11–20 to July 21–31, with peaks indicated at May 21–31 (9 records) or June 1–10 (10 records), for first nestings, and July 1–10 (9 records), for second nestings. Data are from Letcher (Murray, 1938:3); Bell (Mengel, notes); Rowan (Barbour, 1951a:38); Laurel (Mengel, notes); Grant (King, 1940:11); Boyle (Cheek, *vide* Lovell, 1951b:62); Owen (Lovell, Stamm, and Pierce, 1955:5–6; Stamm, *vide* Hays, 1957:7; Stamm, notes); Oldham (Stamm, Shackleton, and Slack, 1953:28; Monroe, notes); Jefferson (Monroe, notes; Stamm, notes; Hays, 1957:7); Meade (Lovell, 1949b:71–72); Nelson (Beckham, 1885:29–30; Blincoe, *vide* Funkhouser, 1925:260); Logan (Mengel, notes); and Hopkins (Hancock, 1953:42; 1954:45) counties. Egg dates range from May 24 (1948), a set of 3, plus 1 cowbird's egg, in Hopkins County (Hancock, 1954), to July 15 (1945), 3 eggs in Meade County (Lovell), and August 6 (1954), 3 eggs hatching in Owen County (Lovell, Stamm, and Pierce), with "eggs" also noted in Nelson County, August 3, 1920 (Blincoe). The average complement of 30 nests was 2.9 ± 0.10 eggs (chiefly) or young (2–4). Nests are characteristically placed in low shrubs, dense vines, or small saplings in forest openings, forest edge, or shrub-grown old fields (reported from locusts, blackberries, spicebush, wild hydrangea, and small elms, oaks, box elders, flowering dogwood, and ash), the average distance above ground of 32 nests being 2.8 feet (2 inches–6 feet, 15 feet). An unusual nest noted by Monroe in Oldham County was 15 feet up in the crotch of a horizontal branch of a sycamore, above a road. It contained young on August 11, 1946. Monroe noted other nests, in Jefferson County, on June 6, 1929 (3 eggs, in low bush), July 15, 1934 (young; 2 feet up in unidentified weeds), and June 5, 1941 (3 fresh eggs—1 egg of a cowbird; 4½ feet up in crotch of sapling). I have found nests as follows: on May 12, 1949, 10 miles north of Russellville, Logan County (12 inches up in elm sapling at edge of a grassy clearing in swampy woods; female working on nest ¾ complete); on June 29, 1952, 2 miles south of London, Laurel County (a nest 2½ feet up in flowering dogwood sprout choked with Japanese honeysuckle at edge of an open, second-growth stand of oak, hickory, and tulip tree, containing 2 dead cowbird young and 2 cowbird eggs); on June 29, 1952, another at the same locality (3 feet up in dense blackberries at edge between oak-hickory forest and clover field, 3 feet from a farm road; 2 newly hatched young and 1 pipped egg; female on nest); and on July 19, 1949, at 2,800 feet near summit of Pinnacle Mountain above Middlesboro, Bell County (15 inches up in blackberry vines in a clearing near edge of dense, second-growth oak-hickory forest; 3 small young). A typical nest was cup-shaped and neatly constructed of dried leaves, grasses, spiderwebs, and lined with fine grasses; it measured $2\frac{3}{4} \times 2\frac{1}{4}$ inches (outside), $2\frac{1}{4} \times 1\frac{3}{4}$ (inside), and 3 inches (cup depth). The species is rather heavily parasitized by the Brown-headed Cowbird, Beckham (1885:30) having noted that at least one-third of many nests found in Nelson County contained cowbird eggs. More recent records of parasitism are summarized under the account of the parasite (p. 452 ff., and Table 22).

Breeding distribution.—The Indigo Bunting is one of the most, if not the most, widespread of Kentucky breeding birds. Occurring in a wide variety of open and semi-open situations—in fact, in virtually all terrestrial habitats except cultivated or closely grazed fields devoid of cover, and dense forest—in point of absolute numbers it is probably one of the two or three most important breeding birds of the state. It occurs at the top of Black Mountain, Harlan County, where it is fairly numerous in shrub-dotted meadows. There is little doubt that it is more numerous today than in early times before widespread clearance of forest.

Fall.—The species becomes perceptibly less numerous in late September, rare by mid-October, and seems to vanish abruptly at about that time. Indigo Buntings are often fairly common everywhere in the first week of October, in weedy fields and dense brush; in 1951 I found them numerous in Jefferson and Laurel counties, October 1–9. On October 8, near London, I noted a fully molted, partially blue male singing a whisper song. Late records: October 9 (1951), in Laurel County (Mengel); October 5 (Blincoe, 1925:414) and October 18 (Beckham, 1885:30), in Nelson County; October 14 (1950), at Louisville (Monroe); October 16, in Warren County (Wilson, 1922:239).

Winter.—The species winters, essentially, south of the United States and is thought to be only casual in winter in our southernmost states (A.O.U. Check-List, 1957:552). For a time, a record provided by a male (B.L.M.) taken by Monroe in Oldham County on December 14, 1946, was unique. Seemingly in good condition and showing no sign of recent injury, this bird was nevertheless thought to have been subject to some handicap at the time when it should have migrated. Subsequent events have thrown some doubt on this theory, however, since another Indigo Bunting was taken alive at Owensboro on January 21, 1956 (M. Sutton, 1956:31), and in 1958–1959, 3 wintering birds were recorded in a dense sorghum field in Jefferson County from December 13 to January 18 (Monroe and Monroe, notes; see also *Kentucky Warbler*, 35:7, 1959). It may prove that a few individuals normally winter to the north of the range currently outlined.

Note.—A thorough description of “anting” by this species, in Oldham County, was given by Shackleton and Shackleton (1947).

Specimens examined.—Total, 24. M.S.C.—2 males, Rowan County (May 7, 12); R.W.B.—1 [= ♂], 1 female, Harlan County (July 20; July 25); U.K.—1 male, Lincoln County (May 16); B.L.M.—2 males, Oldham County (June 12; December 14, 1946); J.D.F.—1 immature male, 1 immature female, Marshall County (Sept. 19; Aug. 16); U.S.N.M. (see Wetmore, 1940:565)—10 specimens from Letcher, Lewis, Rockcastle, Wayne, Meade, Union, and Fulton counties (April 29–Oct. 4); U.M.M.Z.—1 male, Wolfe County (June 21); 1 male (weight, 14.0 gm.), 1 female, Laurel County (July 6; July 7); 1 male (12.5 gm.), Warren County (May 7); 1 immature female (13.0 gm., not fat), Henderson County (Sept. 5).

Spiza americana (Gmelin): DICKCISSEL

Status.—Summer resident, chiefly west of the Cumberland Plateau, uncommon and locally distributed in central Kentucky, to common and general in western Kentucky.

Spring.—The species is generally present by early May; data suggesting time of arrival are few and perhaps somewhat misleading. The few early records (May 1, in Nelson County [Blincoe, 1925:414]; April 24 [1955], at Louisville [Monroe; next record April 30, 1949]; April 29, in Warren County [Wilson, 1922:239]) seem surprisingly late, especially when compared with northeastern Kansas, where phenological events average at least 10 days later than in Kentucky, but where Dickcissels regularly arrive in late April. I have there noticed that they are usually present for a week or more before song is heard, which may account for the lag in Kentucky records. By this criterion, 7 or 8 singing males which I recorded just north of Bowling Green on May 1, 1949, must have been present for some time.

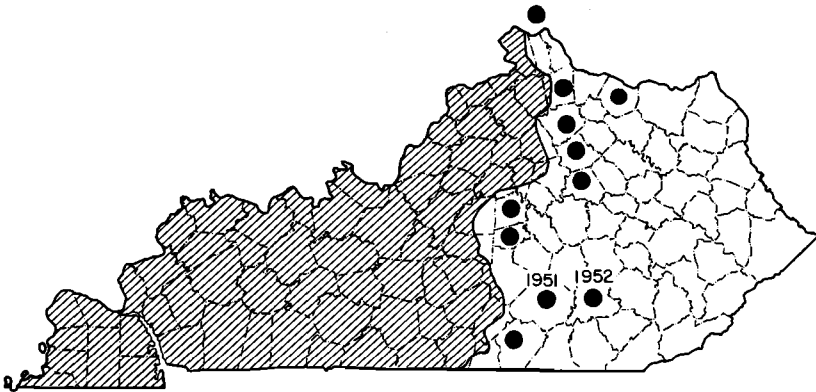


Fig. 39. Breeding distribution of the Dickcissel in Kentucky. Hatched area, uncommon to common (increasing westward); dark circles, marginal breeding-season records. Note: this map would virtually serve for the Chuck-will's-widow.

Breeding records.—Clutches, as indicated by 20 dated observations, are completed from May 11–20 to June 21–30, with a peak May 21–31. Without definite observations to this effect, I am inclined, from the late molt of females and the general remarks of Gross (1921:167), to suppose that some pairs rear two broods. Records are from Jefferson (Slack and Stamm, 1949:31; Stamm, *vide* Lovell, 1951b:62; Stamm, notes); Nelson (Blincoe, *vide* Funkhouser, 1925:260); Warren (Pace, 1958:44); Hopkins (Bacon collection); and Fulton (Mengel, notes) counties. The earliest egg date is provided by a clutch of 5 fresh eggs noted in Jefferson County by Stamm (notes) on May 18, 1950, and the latest date of clutch completion seems to be indicated by a young bird just from the nest that I saw in Fulton County on July 21, 1951. Nests are situated in or at the very edges of open areas, having been noted in various combinations of grasses and red clover, blackberries and poison ivy, fleabane, and “hedge-rows,” near the ground (9 averaged 8.8 inches above ground; range 2–20 inches). Ten clutches or broods (8 of the former, 2 of the latter) possessed an average complement of 4.4 ± 0.22 eggs or young (3–5). Observations at one nest by Slack and Stamm (1949) suggested that incubation began before the clutch was complete. They gave the measurements of a nest as $5\frac{1}{4}$ inches (height) by $4\frac{1}{2}$ inches (diameter), with cup 2 inches (depth) by $2\frac{1}{4}$ (diameter): the nest was “bulky, made of weed stalks, grasses, and leaves . . . ornamented with loosely-woven fruiting stalks of dried shepherd’s purse, veronica, and hoary plantain . . . lined with a thick layer of fine rootlets.” The majority of nests has been found by Stamm, near Louisville, including 2 nests only 15 yards apart, on May 24, 1948 (Slack and Stamm, 1949:32).

Breeding distribution.—The Dickcissel in Kentucky is invariably restricted to rather extensively cleared land. Considerable open space seems to be a requirement, but granted this, habitats are somewhat variable. They may be rolling or level, nearly clear, with grassy growth only, or quite heavily, though spottily, grown up with shrubs and small trees. Meadows, crop-grasses, old fields, and pastures are all utilized, approximately in the order named. Locally fields of alfalfa, clover, and orchard grass seem to provide excellent habitats, wheat, oats, and rye are fair and meadows, composed variously of mixed bluegrass, timothy, cheatgrass, and other species are also good. Essentially a prairie species, the Dickcissel is irregularly distributed in Kentucky, mainly west of the still heavily forested Cumberland Plateau (Fig. 39), and appears in some areas to be rather irregular in numbers. Notes on habitat and fluctuations in numbers have been contributed by a number of ob-

servers, among them Blincoe (1925:414) in Nelson County; Van Arsdall (1949:28) in Mercer County; Wilson (1922:239; 1950:20) in Warren and Edmonson counties (see also brief survey of distribution, Wilson, 1942:24); and T. Semple (1947) in Webster County. The details of distribution are essentially as follows.

In the Bluegrass, parts of the Pennyroyal, cleared areas in the Knobs, and much of the Western Highlands, the Dickcissel is locally distributed and colonies may be few and far between. However, the species is sometimes reported as common, probably on the basis of repeated observations in limited areas. In July, 1950, surveying a number of northern Bluegrass counties, I found Dickcissels widely scattered in Owen, Pendleton, Boone, Harrison, and Bourbon counties, and recorded none in Gallatin, Carroll, Grant, and one or two adjacent counties. They were uncommon in these areas, as they are near Louisville, in Jefferson, Oldham, Shelby, and Bullitt counties. Stamm's notes contain breeding season records also for Carroll, Hardin, Mason, Franklin, and Scott counties.

Although the Dickcissel is rare in the eastern Pennyroyal (I have recorded it to the very base of the Cumberland Plateau, in Wayne County), throughout the western part of that region, as well as in the more open parts of the Western Highlands, and over most of the Purchase, it is a common and characteristic open-country bird, being in many areas one of the most numerous species. In some limited areas so many occur that the birds appear to be almost colonial. At one locality, in Lake County, Tennessee, just south of Fulton County, Kentucky, on May 15, 1949, I noted 6 singing males and 2 females within 75 yards of one point (note mention above of 2 nests 15 yards apart), and again, on May 13, 1949, in western Logan County, I counted 6 singing males on wires along one-half mile of roadside (or 1 every 440 feet).

For years, so far as I know, the western edge of the Cumberland Plateau, with its nearly unbroken front of precipitous, heavily forested terrain, formed an effective barrier to the Dickcissel, the distribution of the species in respect to this obstacle resembling those of the Black Vulture, Chuck-will's-widow, and Loggerhead Shrike. Prior to 1952, I had obtained only one record within the boundary of the Plateau, in Pulaski County just east of Somerset, where I recorded 3 singing males in overgrown fields on July 11, 1951. The transition here between the Plateau and the area of Waverly Limestones to the west is gradual, and no sharp barriers of wooded hills, such as the Knobs farther north and the steeper scarps farther south, arise. In Laurel County, some 30 miles farther east, I first recorded Dickcissels on June 11, 1952, and between June 11 and 28 I found at least 7 singing males in three distinct areas, each several miles from the others, and all near London. All territories were in overgrown meadows containing oak, hickory, and sweet gum reproduction, or in fields of mixed clover, bluegrass, and timothy. Many days of field work in previous seasons had produced no records of Dickcissels in Laurel County, and while I may have overlooked the species for a time, I am sure that a recent increase, amounting to an invasion, has occurred in this (the most extensively cleared) part of the Plateau. It is interesting that in the same year and area I first recorded the Chuck-will's-widow on the Plateau. Throughout much of its range the Dickcissel has been known as an erratic bird (see Rhoads, 1903; Trautman, 1940:400), and possibly marked fluctuations are the rule in all areas marginal to the main range of the species.

The Dickcissel has undoubtedly increased in Kentucky since the widespread clearing of the original forests, but its increase, in the main, seems to have occurred long ago. Audubon (1838:579) considered it "scarce" in Kentucky, and in his time it was probably confined largely to the original prairies. Little more than half a century later, both Beckham (1885:30) in Nelson County and Langdon (1879:176) at Cincinnati, Ohio, considered it "very common," a status it no longer enjoys in either area (*cf.* Blincoe, 1925:414, and Goodpaster, 1941:34). Oddly, in Fulton County, where it might be expected to have become numerous early, Pindar (1889*b*: 315) considered it only a "very rare migrant," adding (1925*a*:164) that it was a "rare summer habitant in 1892-3." Though faulty observation may have con-

tributed to Pindar's estimates, it would be impossible for anyone familiar with the species to consider it rare in Fulton County today.

Fall.—About the end of July or the first week of August, the Dickcissel virtually disappears. Males cease singing and the birds no longer perch conspicuously on wires and fences. This has led some authors (see Blincoe, 1925:414; Ganier, 1949: 52–53; Wilson, 1922:239, 1951b:40) to infer or state that departure occurs very early, in July or August, though adequate evidence was available from other states (see Gross, 1921:13) that some Dickcissels remain on the breeding grounds at least until early October. Actually the species remains quite numerous through part of September, congregating in heavy growths of standing corn and dense, weedy fields while the annual molt takes place. This seems to occur earlier in adult males than in adult females. On September 5–6, 1949, Tordoff and I found Dickcissels common in a dense fallow field of ragweed, goldenrod, soybeans, and old corn stubble, two miles south of Henderson. Birds in every stage of molt were present, but the two adult males taken were in almost complete new plumage, while several females either had not commenced molt or were in the midst of it—a few of them being nearly flightless. Immature birds collected were in fresh plumage, save for one female half through postjuvinal molt. There were probably hundreds of Dickcissels in this field of a few acres. It is true that Dickcissels arrive very early (July) on the wintering grounds in Mexico (Richard R. Graber, verbal com.), and it would be interesting to learn if these birds are not (as I suspect) nearly all immatures and adult males. Large samples killed in early October, 1954, at Topeka, Kansas, by striking a television tower were largely adult females (Tordoff and Mengel, 1956:22). It is also interesting to note that no Dickcissels were involved in accidental kills of birds at Nashville (September 10–11, 1948, Spofford, 1949; October 7–8, 1951, Laskey, 1951) and Knoxville (October 7–8, 1951, Howell and Tanner, 1951), Tennessee, although none of these dates is too late for the species. It appears possible that the migration in this general area is primarily westward, avoiding the central plateau and Appalachian highlands.

The late records at hand are probably not representative of departure dates: September 18 (1936), at Cincinnati, Ohio (Goodpaster, 1941:34); September 19 (1950), when I collected an adult female from a hedge row 6 miles south of Louisville, Jefferson County; September 6 (1949), at Henderson (Mengel); September 2 (1950), in Warren County (Wilson, 1951b:40); September 12 (1886), in Fulton County (Pindar, 1887a:85).

Specimens examined.—Total, 25. U.K.—1 male, Woodford County (May 8); C.W.B.—1 immature female (freshly molted), Nelson County (July 12); B.L.M.—1 male, 1 female, Oldham County (June 12); 1 male, 1 female, Jefferson County (July 16; July 13); J.D.F.—1 male, Fayette County (May 23); U.S.N.M. (see Wetmore, 1940:566)—7 specimens from Union and Fulton counties (May 6–31); U.M.M.Z.—1 male (skeleton), Boone County (July 10); 1 male, Oldham County (June 16); 1 immature male (28.2 gm., not fat), Jefferson County (Sept. 19); 1 male (28.3 gm.), Warren County (May 6); 1 adult male (27.2 gm., not fat), 1 immature [= female] (22.8 gm., not fat), Henderson County (Sept. 5); also (skeletons), 2 males (not fat; weights, adult, 29.0 gm.; immature, 25.5 gm.), 3 adult females (not fat; 24.5 gm., 24.1 gm., 21.0 gm.), Henderson County (all Sept. 5, 6).

Hesperiphona vespertina (Cooper): EVENING GROSBEEK

Status.—Casual winter visitant.

Records.—Probably some Evening Grosbeaks reach Kentucky in each major invasion year (at more or less irregular intervals these birds appear in the eastern United States in winter in numbers much greater than usual), but records are few. The majority, if not all, of existing Kentucky records have been made in such years: in 1886–1887 (see Butler, 1892:241–242), in 1945–1946 (see *Auk*, 64:120, 1947), and in 1951–1952 (scattered records).

Pindar (1887b:257) reported a flock or flocks seen at Hickman, Fulton County, between March 18 and 25, 1887. At least 10 birds were present, as 7 were seen at

one time after 3 had been killed or found dead. On February 24, 1946, Monroe and I (1946:116) took a lone adult male (B.L.M.) at Anchorage, Jefferson County. This bird was feeding on box elder seeds. Other records were made in 1951-1952 (Monroe, 1952:58-60; and letter: January 4, 1952), when the species was reported from Oldham County (1 female, December 23, 1951; Steilberg and J. Smith), Meade County (a small flock December 30, 1951; Cole and Lovell), and Bullitt County. In the last, a flock varying from 18 to 20 or more birds (5 to 7 males) was observed near the headquarters building of the Bernheim Foundation wildlife refuge from December 30, 1951, to January 20, 1952, by Monroe, Thomas Fuller, and others. Monroe took a female (B.L.M.) from this flock on December 30. The birds were feeding on juniper berries. In the same winter, flocks of 20 to 50 were reported from Cincinnati, Ohio (where records of a single small flock were made between March 6 and June 8, 1911; see Goodpaster, 1941:34), and Portsmouth, Scioto County, Ohio, both localities just north of the Ohio River (Kemsies and Randle, 1953:52). Three birds were seen at Cincinnati (Kemsies and Randle, *loc. cit.*) on January 18, 1953 (Austing). A female was seen feeding in a box elder in Owen County on January 8, 1955 (Pierce and Stamm, 1955:18).

Geographic variation.—The specimens taken are referable, as expected, to the eastern subspecies *Hesperiphona vespertina vespertina* (Cooper).

Specimens examined.—Total, 2. B.L.M.—1 male, Jefferson County (Feb. 24, 1946); 1 female, Bullitt County (Dec. 30, 1951).

Carpodacus purpureus (Gmelin): PURPLE FINCH

Status.—Transient, uncommon to common; winter resident, uncommon to fairly common.

Spring.—The species winters in moderate numbers, and arrival dates of transients are unknown. There seems to be an increase in late March and early April; rare by late April or early May. Late records: May 2, in Nelson County (Blincoe, 1925:412); May 6 (1950 and 1959), at Louisville (Monroe); May 8, in Warren County (Wilson, 1922:238). Purple Finches have been recorded throughout the state. On April 13, 1951, I noted 7 feeding on sycamore balls in Wayne County. I recorded a singing male in Laurel County, near London, on April 27, 1949, others in Jefferson County, April 11-20, 1949, and found Purple Finches common in Lyon, Trigg, and Marshall counties, April 9-16, 1950 (many males singing). In spring the species often feeds quietly on buds high in the treetops of deciduous forest.

Fall.—Less conspicuous than in spring. A few seem to arrive in early October, but the species does not appear in numbers until the end of October or early November. Migration is probably at its peak in November. The usually reliable records given for Eubank, Pulaski County, by Cooke (1914a:23; based presumably on reports of John B. Lewis) are surprisingly early for this species and must be regarded at present with some doubt: average of 4 years, September 13, earliest September 7 (1892). Over a number of years' intensive observation at Buckeye Lake, Ohio, Trautman (1940:401) did not record the species before September 24. Other early records: September 26 (1937), at Cincinnati, Ohio (Goodpaster, 1941:34—specimen); October 22, in Nelson County (Blincoe, 1925:412); October 9, at Louisville (Monroe); October 16, in Warren County (Wilson, 1922:238). In 1948 I recorded 2 Purple Finches in Fulton County on November 7 and 8, and a male in Shelby County, November 20. As in winter, the favored habitats are dense, weedy fields, hedgerows, cedar thickets, and tangled undergrowth in open woodland.

Winter.—The species seems to be somewhat erratic in numbers and has been considered rare by some local observers (*e.g.*, Blincoe, 1925:412; Wilson, 1922:238). It occurs more or less throughout the state in winter, however, the easternmost records being Barbour's (1952:28) from Rowan County, and is probably fairly common in most winters, at least in areas affording optimal habitats. It is usually found in small flocks, as in Jefferson and Oldham counties, where Monroe has regularly recorded small to moderate numbers wintering in old fields and brushy

pastures. The species is sometimes a member of winter roosts of birds in cedar thickets and other dense cover (Wilson, 1921:285-286; Semple, 1947:7). On January 4 and 5, 1951, I recorded several small flocks in the Ohio River bottom lands near Barlow, Ballard County, where they were inhabiting grape tangles at the edges of lowland forest.

Note.—Observations on feeding habits were contributed by Blincoe (1923:66-68), in Nelson County (juniper berries, various seeds, elm buds, smooth sumac berries), and Wilson (1957:72), in Warren County (ash seeds).

Geographic variation.—The subspecies occurring is the eastern *Carpodacus purpureus purpureus* (Gmelin).

Specimens examined.—Total, 11. R.W.B.—2 males, 1 female, Rowan County (Feb. 18, April 12; April 12); B.L.M.—1 male, Bullitt County (April 11); 1 male, 2 females, Jefferson County (March 24; March 9, 10); U.S.N.M. (see Wetmore, 1940:566)—4 specimens from Nelson (April 11) and Butler (Nov. 7, 12) counties.

Acanthis flammea (Linnaeus) : COMMON REDPOLL

Status.—Casual winter visitant.

Records.—On December 26, 1955, Burt L. Monroe, Jr. (Monroe, Jr., 1956:31), took a female Common Redpoll (B.L.M.) from a clump of weeds in an open field 3 miles north of Prospect, Oldham County. The bird was apparently alone. In the same period, a flock of 25 or 30 was reported from 7 miles north of Carlisle, Nicholas County, by O. S. Green on December 17 and 18, 1955 (*Kentucky Warbler*, 32:18, 1956). There are a few older records. Pindar (1887a:84) referred to 10 or 11 seen in Fulton County on December 10, 1886, and large flocks the next day. Later (1889b:314; 1925a:163) he remarked that the species was common there in the coldest weather every winter, roughly 1885-1893. The large number said to have been seen has caused me to question the validity of these records, since Pindar's active and competent contemporaries, Charles Dury and F. W. Langdon at Cincinnati, Ohio, seem to have recorded only 2 specimens, these taken by Dury in December, 1868 and 1869 (see also Maslowski and Ralph Dury, 1931:102). More recently, others have been reported near Cincinnati, by Maslowski on February 14, 1931 (Goodpaster, 1941:34), and by Bunnell in late November, 1952 (Kemsies and Randle, 1953:53). In the collection of the University of Kentucky, I examined a specimen marked only "N1. [meaning undeciphered] Dec. 29/82 H[arrison?]. G[arman?]." Garman (1894) did not list the species in his account of Kentucky birds, and the specimen may have come from elsewhere. An unpublished MS in my possession, written by Pindar around 1925, makes reference to "several stragglers" seen in Franklin and Woodford counties in February, 1899.

Geographic variation.—The single specimen was determined by J. Van Tyne to be referable to *Acanthis flammea flammea* (Linnaeus), to which most stragglers to Kentucky would presumably belong.

Specimens examined.—Total, 1. B.L.M.—1 female, Oldham County (Dec. 26, 1955).

Spinus pinus (Wilson) : PINE SISKIN

Status.—Winter resident, irregular in occurrence; seldom recorded before 1940, but in recent years rare to fairly common, at least locally.

Spring.—Spring records were nearly or quite lacking before 1940. Since a notable apparent increase of the species in recent years, many records have been obtained, chiefly in March and April, near Louisville, Bowling Green, and Mammoth Cave. In years when appreciable numbers wintered, a few birds have remained into early May. Late records: May 14 (1960), near Louisville (Monroe); May 8 (1953) and May 14 (1954), a flock of 20 on the latter date, at Bowling Green, Warren County, and May 7 (1954), a flock of 8, at Mammoth Cave, Edmonson County (Wilson, 1953:45; 1955:31). At all seasons the birds are usually found with goldfinches, and in spring they often feed high in the trees on newly opened buds.

Fall and winter.—Siskins may appear as early as mid-October but sometimes are not noted until late fall, winter, or even early spring, if at all. Early records: October 12 (1953), near Louisville (Monroe); October 21 (1912), a flock of 15 in Nelson County (Blincoe, 1925:412; one record only, 1913–1921); October 27 (1938), in Muhlenberg County (Wetmore, 1940:566). Others reported by Wetmore were seen near Brownsville, Edmonson County, on November 12, 1938. In November, 1924, and October, 1925, large numbers of siskins were recorded at Bowling Green (Wilson, 1925:[3]; 1926:[3]). Previously little known, the species has been recorded with increasing frequency since 1940. Since December 27, 1941, when he recorded 3 birds, Monroe has noted flocks in his yard at Anchorage, Jefferson County, on October 22, 1946 (50 or more), November 22, 1947 (small flock), December 1, 1949 (6), and January 30, 1950 (more than 100), and has several observations of smaller numbers, December–February. In the winter of 1952–1953, fair numbers were seen at Louisville (109 recorded on Christmas bird count of December 21; *Kentucky Warbler*, 28:11, 1953), and in the winter of 1954–1955 the species was seen there in some numbers, especially at Cave Hill Cemetery, remaining through March (Slack and Stamm, 1955:29). In the same period, the species has varied from rare to fairly common in Warren County, and near Mammoth Cave, Edmonson County (Wilson, 1953:45; 1955:31). Hundreds wintered within the city limits of Bowling Green in 1952–1953. A few casually reported records have been made since 1940 in other parts of the state. Monroe saw a small flock near Milton, Trimble County, on February 15, 1947.

History.—Like crossbills and other carduelines, the Pine Siskin is given to erratic comings and goings and periodic changes of status. Evidence of a few earlier invasions of note is on record, although fragmentary. At Cincinnati, Ohio, Charles Dury found the species numerous in 1868–1869 (*vide* Langdon, 1879:175), but it was not recorded again until 1947 (Kemsies, 1948a:146), and has since been recorded frequently (Kemsies and Randle, 1953:53). Pindar (1889b:314) called the species a “common winter visitant” in Fulton County, as it may well have been at that time. A considerable invasion occurred at Bowling Green in the winter of 1924–1925, when as many as 1,500 birds were estimated to be roosting in maples in a city park (Wilson, 1925a:44). After 1925, Wilson obtained few, if any, records until recent years. The remainder of the earlier record is of widely separated occurrences of small numbers of birds (see Beckham, 1885:24, and Blincoe, 1925:412, in Nelson County; Barbour, 1952:29, in Rowan County). The species seems definitely to have been very rare or absent over long periods. I never saw a Pine Siskin in Kentucky until February 28, 1946, when I took a female from a flock of 10 at Glenview, Jefferson County (Mengel, 1948:52). As the number of observers increases, it will probably be found that the species is a regular winter visitant in markedly varying numbers.

Geographic variation.—The subspecies occurring in Kentucky, as to be expected, is the widespread *Spinus pinus pinus* (Wilson).

Specimens examined.—Total, 6. C.W.B.—1 unsexed, Nelson County (Nov. 14, 1882); B.L.M.—1 female, Trimble County (Feb. 15, 1947); 1 male, 1 female, Jefferson County (October 20, 1946; Feb. 28, 1946); U.S.N.M.—2 specimens, Muhlenberg County (Oct. 27, 1938).

Spinus tristis (Linnaeus): AMERICAN GOLDFINCH

Status.—Resident, fairly common to common; more numerous in spring and fall.

Spring.—As do the crossbills, Purple Finches, and siskins, goldfinches spend much time in spring feeding on newly opened buds in deciduous forest and woodland. The observation by many observers of greater numbers in spring suggests that transients add to the number present at this time, although greater conspicuousness of the yellowing birds may figure in this impression. Singing begins in late March or April and is heard throughout spring, although the birds remain in flocks. Monroe took a male molting into breeding plumage at Anchorage, Jefferson County, on

April 5, 1946 (B.L.M.), and other specimens molting from winter into breeding plumage were taken in Meade County, April 23 and May 3, and Union County, May 6, 1938 (Wetmore, 1940:566). A singing male, in full breeding plumage, which I took at 3,800 feet elevation on Black Mountain, Harlan County, on May 14, 1952, had very small testes.

Breeding records.—The breeding season, typically, is very late, clutches, as indicated by 16 dated observations, being completed from July 21–31 to September 1–10, with a peak (not clearly defined) probably August 1–10. Records are from Bell (Wetmore, 1940:566); Rowan (specimen, M.S.C.; also Barbour, 1951a:38); Madison (Gailey, 1954:64); Boyle (Cheek, *vide* Lovell, 1951b:62); Owen (Lovell, Stamm, and Pierce, 1955:6; Stamm, notes); Jefferson (Stamm, notes); and Hopkins (Hancock, 1954:45) counties. In the last, James Suthard took a set of 6 fresh eggs on July 27, 1925, and 2 sets of 5 fresh eggs on July 30, 1927. Stamm noted 2 eggs in a nest in Owen County on July 30, 1955 (set not complete), and a set of 5 completed in a nest in Jefferson County on July 28, 1960. Other observations all refer to freshly completed but empty nests, or to young recently out of the nest. Perhaps the latest nesting (clutch probably complete September 1–10) is indicated by a half-grown young bird noted in Madison County on October 12, 1954 (Gailey, 1954). Six nests averaged 9.5 feet above ground (3–25), the highest in a shagbark hickory, the lowest in a blackberry bush. Suthard found most nests in Hopkins County “in the tops of persimmon or sassafras bushes, where they formed the scattered second growth in old fields.” In Owen County, Lovell, Stamm, and Pierce (1955:6) noted that breeding pairs “occupied the more open areas where the ground cover included goldenrod and blazing star but thistles were scarce.”

Summer.—During late spring and early summer, while other passerines are nesting, the American Goldfinch remains in small flocks and, although the birds sing vigorously and are in breeding plumage, there is little evidence of breeding activity. I have seen single goldfinches and pairs in early July, but small flocks may still be seen as late as the end of July. I noted paired birds acting as though they were seeking nest sites on Black Mountain, Harlan County, on July 9, 1951.

Fall and winter.—Young birds in postjuvencal molt were taken at Burlington, Boone County, on October 11, 1938 (Wetmore, 1940:566). Most birds seen in October are in full winter plumage. The species is very numerous in fall, probably due to an increment of transients from farther north, and small to large flocks inhabit weedy fields and woodland edges throughout the state. On November 22, 1948, I saw a flock of more than 300 in a cleared area of the Cumberland Plateau near Frenchburg, Menifee County. Throughout winter goldfinches remain common in all parts of the state, although the numbers present seem to differ somewhat from year to year.

Geographic variation.—The subspecies occurring is the widespread *Spinus tristis tristis* (Linnaeus).

Specimens examined.—Total, 24. M.S.C.—2 males (no data), 1 immature female (not full grown), Rowan County (—; Oct. 12); R.W.B.—1 male, Harlan County (Aug. 9); U.K.—1 [=male], Lincoln County (May 8); B.L.M.—2 males, Jefferson County (April 5, May 27); U.S.N.M. (see Wetmore, 1940:566)—16 specimens from Harlan, Bell, Lewis, Wayne, Boone, Fayette, Meade, Union, Butler, and Muhlenberg counties (April 23–Nov. 17); U.M.M.Z.—1 male (weight, 12.4 gm.), Harlan County, 3,800 feet elevation on Black Mountain (May 14).

Loxia curvirostra Linnaeus: RED CROSSBILL

Status.—Casual winter visitant.

Records.—At Bardstown, Nelson County, Beckham (1885:24) saw a flock of 6 or 8 Red Crossbills in pines on November 18, 1882, and collected 8 of about 20 seen there on March 17, 1883. Several flocks were reported to Beckham at this time. This was a major “flight year” (see Griscom, 1937:85). It is interesting that cross-

bills were not noted in New England until November 22 (Griscom, *loc. cit.*), 4 days after Beckham's first observation in Kentucky. Cooke (1912:46) reported a record for Lexington, Fayette County, for October 25, 1903 (another flight year; Griscom, 1937:86). Wilson (1920a:221-222; 1922:238) reported 3 seen and many others heard at Bowling Green, Warren County, on January 19, 1920 (a flight year; Griscom, 1937:94). Crawford (1924:30) wrote that the species (number unspecified) was recorded "at close range" between Tompkinsville and Gamaliel (Monroe County) on February 2, 1924. Again at Bowling Green, Wilson (1951a:24) recorded 1 bird on November 15 and 16, 1950 (a flight year; *Audubon Field Notes*, 1951:192). Stamm (notes) closely observed 2 birds in a sycamore tree on the eastern edge of Louisville on May 7, 1940. At Cincinnati, Ohio, a large flight of both White-winged and Red crossbills occurred in the winter of 1868-1869, with a few birds in 1874-1875 (Langdon, 1879:175; 1889:61), both flight years (Griscom, 1937:85).

Careful watch should be kept for the species in groves of cone-bearing trees, especially in invasion years.

Geographic variation.—Several well-marked subspecies are recognized, and these irregularly invade areas far from their normal breeding ranges, usually, but not always, in winter. The only Kentucky specimens are the 8 collected in Nelson County by Beckham, on March 17, 1883. Of these, 1 male is now in the U. S. National Museum, while 4 males and 3 females were in the C. W. Beckham Collection in the Louisville Public Library, when I examined them (without comparative material) on June 28-30, 1950. Both Griscom (1937:156) and Wetmore (1940:566) wrote that the National Museum's specimen agrees with *L. c. neogaea* Griscom [= *L. c. minor* (Brehm) of the A.O.U. Check-List, 1957:574, 5th edit.]. Of the remaining birds, 1 male in yellowish plumage (wing, 91 mm.; culmen from base, 19 mm.) and 2 females (wings, 85, 87; culmens 18, 18) also belong with *minor*, but 3 additional males and 1 female cannot be assigned to *minor*, since they are far too large for that subspecies according to measurements given by Griscom and others (wings: ♂♂, 97, 97, 94; ♀, 92; culmens: ♂♂, 20, 18, 19; ♀, 19). Wings and bills of this length are possessed only by two subspecies to which these birds can belong with reasonable likelihood (their slender bills, plus general improbability, disqualify the large *L. c. stricklandi* Ridgway of the southwest): these are *L. c. benti* Griscom, of the eastern Rocky Mountains, and *L. c. pusilla* Gloger (= *L. c. percna* Bent of the A.O.U. Check-List, 1931, 4th edit.), of Newfoundland and vicinity. So far as I could tell without comparative material, these larger specimens are typical of *pusilla*, the red males being a dull red (2) or brick red (1), quite unlike the rosy hue of *benti*, of which I have examined a large series elsewhere. There is nothing particularly surprising about the occurrence of *L. c. pusilla* in Kentucky in 1883, since during a long period, 1870-1910, none found their way into eastern collections, while many were being taken in the central states—indication, seemingly, of a prolonged change in migratory habits (Griscom, 1937:117-118). Neither is it unusual for *minor* and *pusilla* to occur in the same flock (Griscom, 1937:119).

A male and female from Hamilton County, Ohio, collected by Charles Dury in the winter of 1868-1869 (C.M.N.H.) are small, and referable to *minor* (♂, wing 89, culmen, 19; ♀, wing 86, culmen, 17).

In accordance with the above, two subspecies are admitted to the Kentucky List:

Loxia curvirostra pusilla Gloger

Records given above. This Newfoundland subspecies has not previously been reported from Kentucky and is not to be expected with any regularity.

Loxia curvirostra minor (Brehm)

Recorded as noted above. This is the Red Crossbill of central northern North America, as defined by Griscom (1937:110-111) and renamed by him *L. c. neogaea*

(objections to this renaming being made by Peters, 1943:98-99, and Parkes, 1954:170, and sustained by the A.O.U. Check-List, 1957:574).

Specimens examined.—Total, 8 (see above for details). U.S.N.M., 1; C.W.B., 7, all Nelson County, March 17, 1883.

*****Loxia leucoptera* Gmelin: WHITE-WINGED CROSSBILL**

Status.—Casual winter visitant.

Records.—A flock of 2 males and 3 females was repeatedly seen by numerous observers, in Cave Hill Cemetery, Louisville, between November 27, 1937, and February 6, 1938 (Monroe), and the details up to January 25 reported by Slack (1938), who discovered the birds. I saw them on December 17, 1937, and Monroe spent many hours watching them. They could be seen almost any day feeding on the pendant fruits of a grove of sweet gum trees (*Liquidambar styraciflua*). Their haunts, when not in this grove, were never learned.

The next and only other known visitation of the species was recorded in the same area in the winter of 1954-1955 (an invasion year; see *Audubon Field Notes*, 1955:262), when the birds were first noted on December 23 (Slack and Stamm, 1955:17) and remained until February 17 (Slack and Stamm, 1955a:29). The highest single count was 23 birds, and as many as 10 males were seen at once. Feeding again in sweet gums, the birds were also frequently seen utilizing the cones of hemlock, and occasionally feeding in larch and spruce. They were viewed by many observers, including Monroe, but permission to collect, or even to trap and band, the birds was refused by the cemetery authorities.

White-winged Crossbills, with Red Crossbills, appeared at Cincinnati, Ohio, in 1868-1869, and were observed feeding on ragweed (Dury, *vide* Langdon, 1879:175; 1889:61).

Geographic variation.—The birds noted in Kentucky presumably represented *Loxia leucoptera leucoptera* Gmelin, the only subspecies known from North America.

***Pipilo erythrophthalmus* (Linnaeus): RUFOSIDED TOWHEE**

Status.—Resident, generally common, but at times rare to uncommon in some areas.

Spring.—Few notes of special pertinence. "Arrival" dates given by Cooke (1912c:288) are of no significance, since the species winters in numbers. I have heard singing in late March, and it is regularly heard in April. In Marshall and nearby counties, I noted courtship and frequent territorial disputes, April 10-15, 1950.

Breeding records.—Clutches, as evidenced by 25 dated observations, are completed from April 1-10 to August 1-10 (peaks, not well defined, April 11-20 [?] and May 21-31), a duration suggesting that two broods are regularly reared. Data are from Letcher (Wetmore, 1940:567); Harlan (Mengel, notes; specimen, R.W.B.); Rowan (Barbour, 1950a:34-35; 1951a:38); Laurel (Mengel, notes); Madison (Gailey, *vide* Lovell, 1951b:62); Jefferson (Mengel, notes; see also Hancock, 1947a:31); Bullitt (Hays, 1957:7); Meade (Lovell, 1949b:72); Edmonson (Browning, 1946:42); Henderson (Mengel, notes); Hopkins (Hancock, 1947a:31; 1948a:40; 1954:45; and *vide* Hays, 1957:7); and Marshall (specimen, J.D.F.) counties. Egg dates range from April 21 (1946), a set of 4 eggs in Meade County (Lovell) and April 23 (1934), 4 eggs in Hopkins County (Hancock, 1954:45) to July 30 (1947), 3 eggs in the last (Hancock, 1948a). Perhaps the earliest nesting is indicated by a young bird out of the nest (age estimated at 10 days) in Rowan County on May 1 (Barbour, 1951a), and the latest by young birds not long from the nest (tails one-third grown) taken by Figgins (J.D.F.) in Marshall County on September 24, 1941. The average complement of 20 clutches (chiefly) or broods thought to be complete is 3.5 ± 0.11 eggs or young (3-4). A decrease in productivity with the advance of the season is suggested by the fact that 8 clutches completed approximately April 11-

May 20 contained an average 3.8 ± 0.17 eggs, while 8 completed May 21–July 31 averaged 3.4 ± 0.20 eggs.

Nests are usually placed in shrubby situations at forest edges, or in fairly open woodland, and may be on the ground or supported in vines, low shrubs, and saplings. Of 19 nests reported in appropriate detail, 10 were on the ground variously concealed in dense poison ivy, under dewberry vines, in clumps of grass at the bases of small trees, in loose oak-leaf litter, and in thick growths of Japanese honeysuckle (in such situations in Jefferson County, years ago, I found numerous nests). Elevated nests have been noted in red cedars, vine-choked deciduous saplings, young elms, oaks, and chestnuts, apple trees, and, perhaps unusually, in buttonbush (*Cephalanthus*) and cane (*Arundinaria*), 9 nests ranging from 2 to 6 feet above ground (average, 3.8). Earlier nestings appear to be predominantly on the ground, later ones frequently above it (elevated nests were regarded as unusual as recently as 1938, by Walkinshaw, 1938:287), as noted in western Pennsylvania by Ruth Trimble (in Todd, 1940:625), who suggested that ground sites offered better concealment early in the season. The species may have a greater tendency to build elevated nests in the south (see Howell, 1932:449, in regard to the southern subspecies, in Florida). Of the nests here considered, 7 of 11 (64 per cent) which received their clutches prior to approximately May 31, and all in which clutches were completed before approximately May 21, were on the ground, while only 3 of 7 (43 per cent) which received their complements after June 1 were so located and no ground nest was utilized after approximately June 10.

Parasitism of the Brown-headed Cowbird upon the present species has been noted in four cases and is discussed under the parasite. Development in the nest, in Rowan County, of several young towhees, was described by Barbour (1950*b*); they left the nest very early, 7 days after hatching.

My field notes (cited above) refer to a nest containing 3 eggs on May 31, 1952, 4 feet up in a chestnut sprout in moderately disturbed mixed mesophytic forest in an elevation of 4,000 feet on Black Mountain, Harlan County. The bulky nest was built of grasses, herbaceous twigs, and ferns, and was much like those of the Veeries nesting nearby. A nest containing 4 eggs, which I found in Laurel County on June 12, 1952, 6 feet up in a grape-choked sapling in open pine-oak-hickory forest was constructed of coarse grass and small twigs, and lined with fine grasses (other nests were described by Hancock, 1947*a* and 1948*a*). Females were incubating at both of these nests. A late breeding record was established when Tordoff and I took a young bird in postjuvinal molt (tail approximately one-half grown) near Henderson on September 5, 1949.

Breeding distribution.—The species breeds throughout the state, varying from uncommon to common, but the exact details of its regional abundance are not thoroughly known. I think it is most numerous, and might well be described as very common, in the more open areas on oak- and pine-covered ridges of the Cumberland Mountains and Plateau, being there one of the most characteristic breeding birds, especially in open groves where the principal understory is *Vaccinium*. In singing male censuses, 1951–1952, I recorded densities of around 8 males per 100 acres in such habitats. The towhee is common also in shrub-grown (*Azalea* spp., *Rhamnus*, etc.) meadows at the top of Black Mountain, Harlan County, but is much less numerous in forested areas there, except on the drier, oak-covered ridges. Elsewhere in the state it varies in numbers, occupying a diverse array of brushy habitats, especially once-cultivated slopes now reverting to forest, the edges of woodland, and the lower growth of open or cut-over forest. Coffee (1941, 1943) has described a hiatus in the breeding range of the species, extending along the Mississippi River from Reelfoot Lake in northwestern Tennessee south to Vicksburg, Mississippi. Just north of Reelfoot Lake, however, in the Purchase region of Kentucky, the towhee is common or fairly common, so that the described hiatus must end abruptly. However, in Fulton County, Pindar (1887*a*:85) did not know that the species summered until after several years of observation, when he wrote

(1889b:315) that a few did so. Possibly some change in numbers and distribution has occurred in that area.

Fall and winter.—At these seasons towhees occur singly or in small, loose flocks, often associated with Cardinals, juncos, Song and White-throated sparrows, and other species, in brushy habitats at the edges of old fields, and in sheltered woodlands. A number of observers (Blincoe, 1925:414, Nelson County; Goodpaster, 1941:35, Cincinnati, Ohio; Van Arsdall, 1949:28, Mercer County; Wilson, 1922:239, Warren County) have mentioned a decrease in winter. This may at times be true, especially in northern Kentucky, but it might be safer to regard the species as erratic and sometimes local. On several occasions I have noticed an unexpected scarcity of towhees. In good habitat in several Purchase counties (Fulton, Hickman, Carlisle) I noted only 3, November 6–13, 1948, and the species was seemingly uncommon in Laurel County, where it is common in summer, October 3–11, 1951. In the Purchase, again, it was common during my work of December 24, 1950, to January 5, 1951, and in Laurel County I saw a flock of 20, predominantly males, in an alder marsh near London on February 3, 1950. Possibly resident towhees move out of some areas in early fall to be replaced a little later by individuals from farther north (they begin to arrive in Coffee's "hiatus"—see above—about mid-October). An account of winter habits and habitat in Rowan County, where loose flocks of 8 to 27 birds occurred in restricted areas of mixed cover near watercourses, was given by Barbour (1941b).

Geographic variation.—The Rufous-sided Towhees of Kentucky are referable to the northeastern subspecies *Pipilo erythrophthalmus erythrophthalmus* (Linnaeus). Wetmore (1940:567) noted a slight approach in the towhees of southeastern Kentucky to *Pipilo erythrophthalmus canaster* Howell. I have seen no additional material of value in this connection.

Specimens examined.—Total, 28. M.S.C.—1 male, 1 female, Rowan County (Dec. 3; April 30); R.W.B.—1 male (juvenal plumage), Harlan County (July 20); 1 unsexed, Rowan County (April 10); U.K.—1 male, Lincoln County (Feb. 2); 1 female, Union County (April 21); B.L.M.—1 male, Harlan County (July 8); C.U.—1 male, Logan County (April 2); J.D.F.—2 unsexed (juvenal plumage), Marshall County (Sept. 24); U.S.N.M. (see Wetmore, 1940:566–567)—16 specimens from Harlan, Letcher, Bell, Rowan, Rockcastle, Carroll, Meade, Butler, Union, Hopkins, and Trigg counties (April 22–Oct. 31); U.M.M.Z.—1 male (weight, 41.2 gm., not fat), Logan County (May 11); 1 female (37.9 gm.; juvenal plumage, tail one-third grown), Henderson County (Sept. 5).

Passerculus sandwichensis (Gmelin): SAVANNAH SPARROW

Status.—Common transient; casual summer resident and probably casual in winter.

Spring.—Savannah Sparrows appear in the state in late February (very rarely) or March, remaining until mid-May. Usually the first are noted about the middle of March, with the birds common through April and rare by early May. Most early transients seem to belong to different subspecies than do the majority of later ones. Extreme records: (early) February 29 (1936), in Rowan County (specimen, M.S.C.); March 12 (1939), at Cincinnati, Ohio (Goodpaster, 1941:35); March 3 (2 records), in Nelson County (Blincoe, 1925:412; Wetmore, 1940:568); February 22, at Louisville (Monroe); (late) May 13 (1920), in Clark County (Horsey, 1922:81); May 14 (1949), in Fayette County (Edwards); May 12, at Cincinnati, Ohio (Goodpaster, 1941:35); May 12 (1946), at Louisville (Monroe); May 9 (1949), in Logan County (Mengel). Savannah Sparrows inhabit open country, occurring in grazed pastures and bare areas, especially if near water, and perhaps more typically in weedy grown-up fields, corn stubble, and meadows of various composition. Large numbers may sometimes be found in a single field. Transients seem to sing only rarely; I heard 1 in a marshy field near London, Laurel County, on April 30, 1949. In April, many transients are molting heavily on the head and neck.

Note.—Savannah Sparrows probably breed on occasion in northern Kentucky, since they have recently been taken in the breeding season as far south as Hamilton

County, Ohio, just across the Ohio River from Kentucky (Kemsies and Randle, 1953:55).¹ When I examined Bacon's collection at Madisonville, Hopkins County, it contained 2 badly worn specimens, probably taken by Suthard, accompanied by a single label dated July 12, 1932. This label was not attached to either specimen, however, and these birds seem not to establish an acceptable summer record.

Fall.—Peak of migration probably in the last half of October. While the species may in fact be more numerous than in spring, records are fewer (possibly owing to decreased field activity of local observers), and indications of the times of arrival and departure are especially scarce. Spofford (1949:88) reported 1 killed at Nashville, Tennessee, the night of September 9–10, 1948, showing an earlier beginning of migration than I would otherwise have suspected. Monroe took a specimen in a corn field in Larue County on September 29, 1940; the earliest record (Monroe) for the Louisville area is for September 12 (1959). The species is numerous by mid-October and certainly rare by mid-November. Various records are given under "geographic variation." The tendency evident in spring, for some subspecies to migrate at different times from others, is not revealed by the records at hand. Typical habitats in autumn are weedy old fields, marshes, standing corn and stubble, the cover being, on the average, denser than that frequented in spring.

Winter.—Records from Ohio and Indiana (Trautman, 1940:408; Butler, 1897:940) suggest the likelihood of a few individuals wintering in Kentucky, at least at times, and a few local students have in fact referred to wintering, though casually and without detail (e.g., Barbour, 1952:29; Wilson, 1946:21). The species is occasionally reported on Christmas bird counts scattered through *The Kentucky Warbler* (see also Wilson, 1939c:34), but I am aware of no midwinter records by experienced observers and there are no specimen records later than November 12.

Geographic variation.—The geographic variation of the species has been studied by Peters and Griscom (1938) and the several eastern subspecies further by Aldrich (1940) and Wetmore (1940:567–569). Several subspecies of fair differentiation (at least at the centers of their ranges) occur east of the 100th meridian, but although the characteristics of the breeding populations are reasonably well known, knowledge of their winter plumages is still based largely upon inference. While typical or extreme transient examples of the eastern subspecies are probably identifiable with fair accuracy away from their breeding grounds, I think that many specimens, statements in literature notwithstanding, are not (as noted also by Norris and Hight, 1957:51). To be sure, however, all individuals can be named, and while there is sometimes little assurance that the names are actually those of the populations from which the birds originated, certain practical advantages can accrue from this if large series are examined with reference to the distribution (whether chronological, geographical, ecological) of various character-combinations which, in the breeding season, are somewhat localized. With these considerations in mind, I have compared most of the Kentucky specimens available with birds in the U. S. National Museum named by Aldrich or Wetmore, and with various specimens identified by Peters and Griscom also at hand. This material strongly suggests that true examples of the subspecies *labradorius*, *savanna*, *oblitus*, and *nevadensis* in fact occur in Kentucky. In spring there is an early migration primarily composed of pale, dull, presumably southern breeding birds (*savanna*), and a somewhat later flight mainly of richly colored, contrastingly marked, presumably northern breeding birds (*labradorius*, *oblitus*), suggesting a correlation of migration time with moderation of climate on the breeding grounds. This differential migration, noted earlier by Aldrich (1940:8) has not so far become evident in autumn. Records of subspecies are as follows.

¹ Since these words were written, Monroe and Monroe, Jr. (notes), have recorded a singing male Savannah Sparrow, evidently on a territory, near Anchorage, Jefferson County, on four occasions: June 19, June 27, July 3, and July 16, 1960. The bird or birds (possibly more than one was involved) were with Henslow's and Grasshopper sparrows in a field largely of orchard grass.

Passerculus sandwichensis labradorius Howe

Including 1 from Cincinnati, Ohio, I have examined 6 local specimens of this subspecies, taken from April 14 to May 12, all very dark, richly colored birds evidently typical of the race. Fall specimens, similarly typical, number 8 and were taken from September 29 to November 1 (some reported already by Wetmore, 1940:569). Some years ago the number of specimens assigned here would have been surprising. It now seems likely, as suggested almost simultaneously by Aldrich (1940:6) and Wetmore (1940:569), that in the far north the range of *labradorius* extends farther to the west and over a larger area than was originally thought. Possibly the type locality of *oblitus*, at Churchill, Manitoba, is very near the eastern edge of the range of that subspecies.

Passerculus sandwichensis savanna (Wilson)

The name *savanna*, perhaps to eastern ornithologists the best known in general use, paradoxically now stands for one of the less satisfactory subspecies. As currently understood, *savanna* (including *mediogriseus* Aldrich) is the breeding Savannah Sparrow of the Atlantic slope from Nova Scotia southward, and thence westward across the north-central states just south of the Great Lakes, approximately to Minnesota. The population so delimited intergrades in the west with the grayish *P. s. nevadensis*, in the north (Michigan, Ohio, Ontario) with the dark *P. s. oblitus*, and in the northeast the birds show an approach, in increasing richness of coloration, to *P. s. labradorius*. The result is a peculiar color gradient (see Aldrich, 1940:2) from pale gray in the west (*nevadensis* influence) to darker gray in the middle (*oblitus* influence) to paler gray in New England to pale brown (*labradorius* influence) in Nova Scotia. As a group, these birds are duller, paler, and less distinctly marked than the subspecies to the north, but it is not clear that there exists anywhere in this range a large, uniform population with a complex of characters uniquely its own. Aldrich (1940:4-6) met this dilemma by describing the gray part of this heterogeneous southern population as *P. s. mediogriseus*, and by this action restricting "typical" *savanna* ("a comparatively pale, brownish bird") to Nova Scotia and the Magdalen Islands. If the percentages of specimens in museum drawers are a guide, this area, despite its small size, is adequate to supply fair numbers of Savannah Sparrows to most of the eastern United States! As in the A.O.U. Check-List (1957:586), *savanna* here includes *mediogriseus*.

Counting 3 from near Cincinnati, Ohio, I have referred to *savanna* 21 specimens taken between March 3 and April 14. A number of these show a slight approach to *oblitus*, especially 1 or 2 of a series of 5 taken in Marshall and Calloway counties April 11-14, 1950, but all are considered closer to *savanna*. Compared with specimens taken later in spring (see below), they average duller in general color and have less contrasting dorsal and lighter ventral markings. The fall specimens of *savanna* that I have seen number 10, taken from October 4 to November 12; several of these were reported by Wetmore (1940:568).

Passerculus sandwichensis oblitus Peters and Griscom

Specimens which seem certainly referable to this northern subspecies are surprisingly few. I have seen only 3 spring birds from Kentucky which are typical in their darkness of color, contrasting dorsal markings, and relative absence of warm (brown) coloration. These are a male from Logan County, taken by G. C. Embody on April 21, 1906 (C.U.), and a male (Warren County, May 2, 1949) and female (Oldham County, April 9, 1948) taken by me (U.M.M.Z.). In addition, 4 specimens from near Cincinnati, Ohio (March 26-May 12) have been referred here by Aldrich (1940:7). The over-all migration dates for the general area range from March 26 to May 12. The only fall specimen from the area so far referred to *oblitus*, to my knowledge, is a bird from Clermont County, Ohio, taken October 27, 1935 (C.M.N.H.; see Aldrich, 1940:7). Specimens of *P. s. oblitus* seem not to have been reported from Kentucky.

Passerculus sandwichensis nevadensis Grinnell

The range of this subspecies, as currently understood, was outlined by Peters and Griscom (1938:468-470). A few small-billed, pale, clay-colored, lightly marked Savannah Sparrows, almost or quite lacking yellow in their superciliary stripes, seem almost certainly to be migrants from farther west and are more like this subspecies than anything else. Wetmore (1940:569) has already reported 1, an immature male taken in Muhlenberg County, October 22, 1938 (U.S.N.M.). Others examined are 2 males I took, respectively, in Fulton County on November 8, 1948, and in Laurel County on October 8, 1951. Also, 3 males I collected in Marshall and Calloway counties, April 12-16, 1950, appear to be intermediate between *oblitus* and *nevadensis* but are considered closer to the latter. These suggest a type of intergrade mentioned by Peters and Griscom (1938:457), being "thick-billed birds with the paler coloration of *nevadensis*," but more heavily marked than the average of that subspecies. Three specimens (March 19, April 10, 14) from Clermont County, Ohio, have been identified as *nevadensis* by Aldrich (1940:7).

Specimens examined.—Total, 59 (including 5 extralimital). For convenience of reference specimens are listed under the subspecies to which I have assigned them. In the cases of U.S.N.M. and C.M.N.H. specimens, these assignments agree in every case with Aldrich's determinations, considering his *mediogriseus* = *savanna*. One or two dissenting opinions are indicated in parentheses. Specimens from the remaining collections were determined by me alone. *P. s. savanna* (total, 31; including 3 extralimital): B.L.M.—3 males, Jefferson County (March 9, 23, 23); 1 male, 1 female, Oldham County (March 16, March 23); C.U.—1 male, Logan County (April 14); U.S.N.M. (see Wetmore, 1940:568)—1 female and 1 unsexed, Madison County (Oct. 6; Oct. 4); 1 male, Jessamine County (March 29); 1 (sex?), Nelson County (March 3); 2 males, 1 female, Muhlenberg County (Oct. 25, 25; Oct. 24); 1 unsexed, Butler County (Nov. 12); 2 males, Hopkins County (Oct. 24); 1 male, 1 female, Trigg County (Nov. 2; Nov. 5); U.M.M.Z.—1 female, Jefferson County (April 4); 3 males, 1 female, Oldham County (April 9, 10, 10; April 3); 3 males (*savanna* > *oblitus*; weights, 20.8 gm., 20.4, 21.6 gm.; not fat), 1 female (17.6 gm., moderately fat), Marshall County (April 11, 11, 14; April 11); 1 female (18.0 gm., not fat), Calloway County (April 12); C.M.N.H. (extralimital)—1 male, Hamilton County, Ohio (April 9); 1 male, 1 female, Clermont County, Ohio (March 29; April 5). *P. s. labradorius* (total 14; including 1 extralimital): C.W.B.—1 female, Nelson County (May 12); B.L.M.—1 female, Jefferson County (May 12); 1 male, Larue County (Sept. 29); U.S.N.M.—2 females, Rockcastle County (Oct. 3, 6); 1 female, Madison County (Oct. 6); 1 male, Meade County (May 3); 3 females (1 marked *savanna* A.W.), Muhlenberg County (Oct. 18, 22, 27); 1 male, Trigg County (Nov. 1); U.M.M.Z.—2 males (20.0 gm., 19.6 gm.; moderately fat), Warren County (May 2, 4); C.M.N.H. (extralimital)—1 male, Hamilton County, Ohio (April 14). *P. s. oblitus* (total, 4; including 1 extralimital): C.U.—1 male, Logan County (April 21); U.M.M.Z.—1 female, Oldham County (April 9); 1 male (21.1 gm.; moderately fat), Warren County (May 2)—see also intermediate specimens listed under *P. s. savanna* and *P. s. nevadensis*; C.M.N.H. (extralimital)—1 male, Clermont County, Ohio (Oct. 27). *P. s. nevadensis* (total, 6; including 3 not typical): U.S.N.M.—1 male, Muhlenberg County (Oct. 22); U.M.M.Z.—1 adult male (19.2 gm., very fat), Laurel County (Oct. 8); 2 males (*nevadensis* > *oblitus*; 18.9, 19.9 gm.; moderately fat), Calloway County (April 12); 1 male (*nevadensis* > *oblitus*), Marshall County (April 16); 1 male (18.0 gm., moderately fat), Fulton County (Nov. 8). *Unidentified* (total, 4). M.S.C.—4 unsexed specimens, Rowan County (Feb. 29, 1936, March 28 [3]). Additionally, a number of March and April specimens in the Beckham Collection (C.W.B.) could not be identified or listed in detail.

Ammodramus savannarum (Gmelin): GRASSHOPPER SPARROW

Status.—Summer resident, fairly common to common, less numerous in eastern Kentucky, where habitat is sharply restricted.

Spring.—First noted, rarely, in late March, more often in early April; usually numerous and conspicuous by late April. Early records: April 1, in Rowan County (Barbour, 1951a:38); April 12 (1952), near Cincinnati, Ohio (Kemsies and Randle, 1953:55); March 26, in Nelson County (Blincoe, 1925:412); April 14 (1904), in Fayette County, average of 3 years April 18 (Cooke, 1910a:13); March 31, near Louisville (Monroe); March 26, in Warren County (Wilson, 1922:238).

In 1948, I found the species fairly common and singing sporadically in short-grass upland fields and wheat stubble in Oldham County, April 7-10. Singing is heard regularly from mid-April onward.

Breeding records.—Completion of clutches from May 11-20 to August 1-10 is indicated by 14 dated observations, with a peak May 21-31. The species is probably two-brooded. Data are from Wayne (Wetmore, 1940:570), Grant (King, 1940:11), Boone (Mengel, notes), Jefferson (Stamm and Slack, 1955:53-54), Hardin (Mengel, notes), Nelson (Blincoe, *vide* Funkhouser, 1925:249; Beckham, 1885:25, and specimen, C.W.B.), Hopkins (Suthard, *vide* Hancock, 1954:45), and Fulton (Mengel, notes) counties. But 8 nests appear to have been found and certainly identified. Three found in Jefferson County, described in some detail by Stamm and Slack (1955), were composed mainly of dried grasses and weed stalks, two of them slightly domed, and were situated near fences in grassy areas (1) in a lane next to a rye field, 5 eggs on May 23, 1948, (2) at the base of a clump of clover in a pasture, 5 eggs on May 26, 1949, and (3) tucked into a crevice of a grassy bank, 5 small young on June 8, 1950. A nest found by King (1940) in Grant County contained 5 eggs on May 29, 1937; 4 of these had hatched on June 10, the fifth being infertile. Suthard (*vide* Hancock, 1954) noted 4 young in a nest in Hopkins County on June 8, 1924 (average complement of 5 nests, 4.8 eggs or young). Blincoe (*vide* Funkhouser, 1925) found 3 nests in Nelson County, one (the earliest egg date) with eggs "one-half incubated" on May 19, 1921, and one (a late nest) containing young on August 14, 1917. Perhaps the latest clutch is indicated by a barely grown young bird taken in the same county by Beckham (C.W.B.) on September 10, 1885. Other data pertain to young out of the nest. Near Walton, in Kenton County, I took a newly fledged young bird on July 10, 1950 (U.M.M.Z.), and I saw another in Hardin County on July 27, 1949. A female which I took in Fulton County on June 12, 1949, contained very large ova in the ovary and was obviously laying. Two sets of white, wholly unspotted eggs taken near Richmond, Madison County (Witherspoon, 1894:313), and attributed to this species, seem more probably to have belonged to Bachman's Sparrows.

Breeding distribution.—Essentially statewide. The species is common or fairly common everywhere that suitable habitat is found, namely where forest clearance has provided openings of considerable size. In the heavily forested parts of the Cumberland Plateau and Mountains it is locally distributed, and it does not seem to occur at all in the comparatively small clearings of the higher Cumberlands. On the Cumberland Plateau the Grasshopper Sparrow has been recorded at numerous localities, in at least Clark, Jackson, Laurel, and Whitley counties (Mengel, notes), Wayne, Lewis, and Greenup counties (Wetmore, 1940:570), Rowan County (Barbour, 1951a:38), and Knox County (Howell, 1910:297). West of the Plateau it is rather generally distributed. Habitats are always in open areas, but otherwise rather variable; they may include pastures, crop-grass fields, old fields where woody vegetation is scattered and not far advanced, and meadows of various composition. While the species may be local in some parts of the Purchase region in the extreme west, unless there has been a change of status more recently than seems likely, there can be no explanation other than deficient observation for Pindar's failure to report it from Fulton County until 1925 (Pindar, 1925a:163), when he wrote that it was "possibly a summer habitant" in the early 1890's.

Fall.—Grasshopper Sparrows cease singing some time in August and are very inconspicuous thereafter, probably accounting for the fact that records appearing to give an accurate idea of the time of mass departure are scarce. Late records: November 3 (1935), at Cincinnati, Ohio (Goodpaster, 1941:35); November 7 and October 26, in Nelson County (Blincoe, 1925:412; Beckham, 1885:25); October 23 (1954), at Louisville (Stamm, *vide* Monroe). Two were recorded killed at Nashville, Tennessee, on the night of October 7-8, 1951 (Laskey, 1951:60), and the lateness of migration is further evidenced by 18 birds killed at night at a television tower at Topeka, Kansas, October 1-23, 1954 (Tordoff and Mengel, 1956:10).

Scattered records from states to the north suggest that a few may ultimately be found wintering in Kentucky. In fall the species inhabits very dense cover and is hard to flush and identify.

Geographic variation.—The Grasshopper Sparrows of much of the eastern United States average slightly smaller (shorter of wing and tail), and more intensely colored (browns and grays deeper; blacks more extensive; buffy areas restricted and deeper in tone) than those of the great area west of the Mississippi River. The differences, however, are slight and subtle, and the relatively small amount of material available from Kentucky, from which critical, fresh-plumaged early autumn material is lacking, adds little to our knowledge of the details of intergradation. Present indications are that the breeding population of Kentucky consists of large birds, typical in average size of the western populations, but that in coloration, as well as can be told from the variously worn and faded specimens, these birds average darker than those farther west, and perhaps as dark as most eastern populations. For the time being, with the reservations noted below, two subspecies may be recognized as occurring in Kentucky.

Ammodramus savannarum pratensis (Vieillot)

The subspecies of eastern North America, north of Florida, to which, while not typical, the breeding population of Kentucky may be tentatively referred. As noted above, this population appears to average as large as the western subspecies (conceivably a few transients are included in the series examined): of 25 specimens from more or less throughout the state, 17 males average 63.2 mm. in wing length (61–65) and 8 females average 61.9 (60–64) (*cf.* measurements of western birds given by Ridgway, 1901:210). No significant average differences in size were noted between specimens from eastern and western Kentucky. In coloration, the birds average dark, most being close to or typical of *pratensis* and are assigned here for this reason. Possibly *pratensis* in its most distinct form is restricted to the area east of the Appalachians (a situation which would somewhat parallel the variation in a number of other open-country sparrows). Certainly Grasshopper Sparrows must have been rare in the eastern deciduous forest as it existed in primeval times, and it seems quite possible that western ancestors have contributed importantly if not chiefly to the present population breeding west of the Appalachians.

Ammodramus savannarum perpallidus (Coues)

Probably an uncommon transient in Kentucky. In any event, certain possibly transient specimens are indistinguishable from *perpallidus* and may be true examples thereof. Among these are a specimen (U.S.N.M.) taken in Meade County on April 30, 1938, and identified as *perpallidus* by Wetmore (1940:570). Similar to this bird, and certainly distinguishable among the other specimens, are 2 males (C.U.) taken in Logan County by G. C. Embury on April 14, 1906, and April 24, 1905, both earlier identified as *perpallidus* by Allan R. Phillips. There is no evidence that the breeding population of any part of Kentucky is referable to this subspecies, although all birds, as noted above, resemble it in size. Four breeding birds (June 12) from Fulton County, in the extreme west, are dark enough, as nearly as can be told from their worn plumage, for *pratensis*, and are so identified. Size of bill, often mentioned as a subspecific character in the species, seems to be so variable that it has been of little use in the present work, and is virtually valueless in dealing with individual specimens and small series.

Specimens examined.—Total, 37 (all atypical *A. s. pratensis* except, perhaps, as noted just above). M.S.C.—1 male, Rowan County (April 28); C.W.B.—3 males, 4 females, 1 unsexed (juvinal plumage), Nelson County (May 5, 5, 26; May 21, June 19, 29, July 7; Sept. 10); B.L.M.—3 males, 2 females, Jefferson County (May 11, June 11, 11; May 5, 7); 1 unsexed (juvinal plumage), Oldham County (July 6); C.U.—2 males, Logan County (April 14, 24); J.D.F.—1 male, Fayette County (May 23); 1 male, Jessamine County (May 2); U.S.N.M.—1 male, Greenup County (July 12); 2 males, Lewis County (July 11); 2

adult males and 1 unsexed (juvinal plumage), Wayne County (June 11); 2 males, Meade County (April 27, 30); U.M.M.Z.—1 male (weight, 17.9 gm.), Laurel County (June 12); 1 male (juvinal plumage), Kenton County (July 10); 2 males, Oldham County (April 7, 9); 2 males (18.0, 17.0 gm.), Warren County (May 3, 4); 1 male, 3 females (19.4, 17.3, 16.5 gm.), Fulton County (June 12).

Passerherbulus caudacutus (Latham): LE CONTE'S SPARROW

Status.—Rare transient, recorded only from central and western Kentucky; sometimes briefly and locally common; perhaps winters in small numbers in extreme western Kentucky.

Spring.—The few records of this small, secretive sparrow are probably inadequate indication of the numbers actually occurring. Transients may prove to be present regularly from mid-March to early May. For years the only records were Embody's (1905:52, 54) from Logan County and Holstein's (1899) report of 1 allegedly killed near Lexington, Fayette County, on April 15, 1899. The disposition of Holstein's specimen is unknown and some doubt of its authenticity is raised by his further reference to 1 seen on July 16, 1899. Charles Dury (1907) took a male (see also Maslowski and Ralph Dury, 1931:104) near Cincinnati, Ohio, on April 5, 1880, evidently the first Ohio specimen. Strong presumptive evidence of the species' occurrence in nearby central Kentucky was provided when Goodpaster (1941:35) observed and collected birds in Clermont County, Ohio (C.M.N.H.), April 5-17, 1937. He had earlier taken a female there (C.M.N.H.) on the rather late date of May 23, 1936. A marked invasion of the species was recorded in Ohio in 1936-1937 (Trautman, 1940:410), but none was recorded in Kentucky, probably for lack of observation. In 1950, Handley and I found approximately 20 Le Conte's Sparrows in a 4- or 5-acre field of corn stubble and matted dead grass in Marshall County, April 11-16, and took 5 specimens in various stages of complete body molt (discussed by Tordoff and Mengel, 1951). The birds remained stubbornly in the field, creeping about like mice under the mats of grass, and were most difficult to flush. Occasionally, when flushed near the edge of the field, one would perch briefly in low bushes at the edge before returning to the ground cover. Many Savannah Sparrows and a few Henslow's Sparrows were with the Le Conte's Sparrows. In the same year and general area, others were reported by Wyatt (1950:49-50) at Murray, Calloway County, April 19 to May 3 (some song heard), and Cypert (letter: May 4, 1950) in Trigg County, April 29. Wilson (1945c:56, and verbal com.) has a few records for Warren County, one for March 31, 1945. A male (C.U.) taken in Logan County by G. C. Embody is dated March 13, 1904, and 1 was seen there on March 19, 1904 (Emboddy, 1905:52; Cooke, 1910a:15).

Fall.—Records scarce, as in spring. The species has been reported from mid-October to late December and may occasionally winter. In the "invasion" autumn of 1936, Goodpaster saw many Le Conte's Sparrows in a fallow field in Clermont County, Ohio, and took several specimens (C.M.N.H.), October 11-25. Wetmore (1940:570) reported 3 taken from a "small flock" in a *Lespedeza* field near South Carrollton, Muhlenberg County, on October 24, 1938 (U.S.N.M.). On November 8, 1948, in "Kentucky bend" of the Mississippi River, Fulton County, just south of New Madrid, Missouri, I flushed a male from dense, roadside grass into tall horseweeds where I succeeded in obtaining it (U.M.M.Z.). G. C. Emboddy (1905:54; see also Cooke, 1910a:15) reported a record from Logan County as December 28, 1904; either coincidentally or by error a male (C.U.) taken there by him is dated December 28, 1903 (Mengel, 1948:52). On January 8, 1945, Monroe (1944a:75-76) found Le Conte's Sparrows wintering in a thickly grown weedy field near Halls, Lauderdale County, Tennessee, not far south of the Kentucky line.

Specimens examined.—Total, 11. C.U.—2 males, Logan County (March 13, Dec. 28); U.S.N.M.—3 specimens from Muhlenberg County (Oct. 24); U.M.M.Z.—2 males (weights, 15.2 gm., moderately fat; 13.5 gm., not fat), 1 female (12.0 gm., not fat), Marshall County (April 15, 15; April 14); 1 male (12.0 gm., not fat), Fulton County (Nov. 8); also (skeletons), 1 male, 1 female, Marshall County (April 16).

Passerherbulus henslowii (Audubon): HENSLOW'S SPARROW

Status.—Rare or little known transient more or less throughout Kentucky; since (at the latest) 1946 summer resident locally, in widely varying numbers (rare to fairly common), mainly in north-central Kentucky, but with outlying records from the Cumberland Plateau, eastern Pennyroyal, and Knobs.

Spring.—Early records range from late March to mid-April. Only a handful of records of transients existed prior to the recent appearance of the species as a breeding bird, and it is still little known in areas where it seems not to breed. In 1950, Handley and I recorded a transient in Lyon County on April 9, in short grass of an open field in Kentucky Woodlands National Wildlife Refuge, and 2 in Marshall County, near Hardin, 1 flushed from short grass in a brushy area on April 10 and 1 taken (U.M.M.Z.) in grass and corn stubble on April 16. Two birds seen in a weedy field in southern Jefferson County on March 26, 1939 (Brecher, 1939:23) were probably transients, as may have been the birds leading to Wilson's (1922:238) description of the species as a fairly common migrant, April 23–May 16, in Warren County. At Louisville, since the discovery of Henslow's Sparrow as a breeding species, it has usually been recorded by late April, the earliest records being Monroe's for April 6 (1952) and mine for April 9 (1948). In 1948, I collected 4 males on April 9 and 10—females were possibly not yet present—and noted a few singing on both dates. In Laurel County, I recorded several singing birds and took 2 females (ovaries moderately enlarged) in a marshy meadow, largely of broom-sedge, adjacent to an alder marsh 2 miles south of London, April 30, 1949. I suspect that these were breeding birds; I have found nothing definite on the matter, but suspect that Henslow's Sparrow is generally a rather quiet transient.

Breeding records.—Definite records are all from Oldham County, where Monroe collected young birds just grown and fully in juvenal plumage near the crossroads store locally called Worthington on June 29, 1946, and July 4, 1948. Both were secured in fields of mixed orchard grass and alfalfa. After prolonged search in the same area Monroe and T. Smith found a nest in a clump of dense orchard grass in a broomsedge patch on June 17, 1950. The nest contained 3 small young and was tucked securely among the stems at the base of the grass. Monroe later collected the nest. In Clermont County, Ohio, Goodpaster (1941:36) located nests on June 26, 1940, and took a bird in juvenal plumage on the late date of September 12, 1937.

Breeding distribution and history.—Except for Audubon's (1831:360) capture of the type specimen in 1820, in or near Covington, the Henslow's Sparrow was unknown in Kentucky until Beckham (1885:26) obtained a female on October 30, 1884, in a clover field in Nelson County. The species was not again recorded, even as a transient, until comparatively recent years, although a specimen was taken near Cincinnati, Ohio, by Charles Dury, in August, 1891 (Maslowski and R. Dury, 1931:104), 3 years earlier than the "first" Ohio record given by Jones (1910:38) and Hyde (1939:10), but later than a specimen taken in 1872 (Trautman, 1940:412). At Cincinnati, the species was not again recorded until the spring of 1936, after which it was found to be fairly common locally in summer (Goodpaster, 1941:36); a general increase took place in Ohio in recent times (Hicks, 1935a:178). In Kentucky, Monroe and I searched for the species from 1939 on, interrupted by the war years, but Henslow's Sparrow was not detected until 1946, when it suddenly appeared in numbers and was found at 16 points in Jefferson and Oldham counties. The population there continued to increase for several seasons, reaching a peak in 1950, and has declined rather steadily since. Near Louisville, the species has been found exclusively in or near fields largely or wholly composed of the orchard grass (*Dactylis glomerata*) much raised locally as a crop, and has preferred the crop fields to patches of untended grass. Several favored fields have also harbored Short-billed Marsh Wrens. These dry, upland habitats contrast markedly with the moist lowlands and marshy meadow types elsewhere thought of as typical (Hyde, 1939:24) and are suggestive of the bluestem (*Andropogon furcatus*) prairies where the

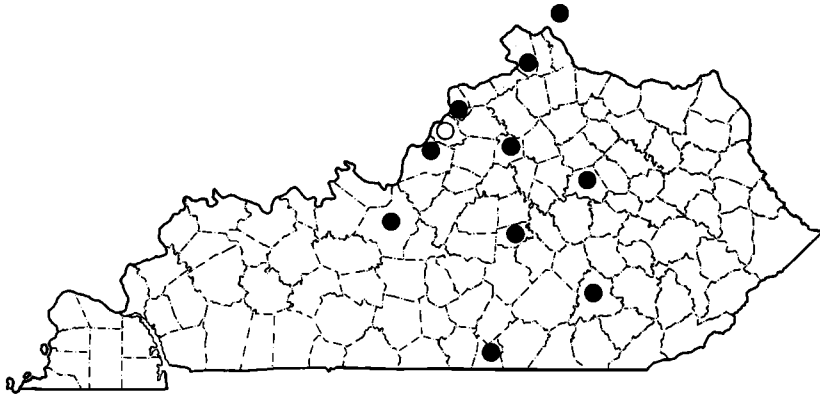


Fig. 40. Breeding distribution of the Henslow's Sparrow in Kentucky and vicinity. Dark circles represent breeding-season records (all post-1944); there is a definite breeding record from the area of the white circle.

species occurs locally in eastern Kansas. Since 1946 Henslow's Sparrow has been recorded from several additional localities in central and southeastern Kentucky (Fig. 40), indicating an invasion of considerable extent but unknown chronology. Outlying records: Boone County at Richwood, 1 of 3 singing males taken on July 10, 1950, on a hillside richly covered with timothy, cheatgrass, orchard grass, and blackberries (Mengel); Clark County, several birds singing on June 8, 1951, in an abandoned field of orchard grass, yellow sweet clover, wheat, alfalfa, red clover, and bluegrass (Monroe, Jr.); Boyle County, common in the summer of 1951, in "rough, grassy fields" (John Cheek, verbal com.); Laurel County, in addition to records under "spring," I recorded a bird on May 8, 1952, singing persistently, at dusk, in a dense growth of broomsedge, bluegrass, poverty grass, and mullein just above a small buttonbush marsh on the slope of a bowl-shaped valley reverting from farm land; Clinton County (the southernmost record), several singing in orchard grass crop fields in early August, 1949 (Monroe); Hardin County, 1 singing in late afternoon in an orchard grass field 10 miles west of Elizabethtown on July 29, 1949 (Mengel). How long the species will occupy this newly colonized area is conjectural; it has always been erratic in marginal situations (Hyde, 1939:8-9) and may presumably disappear at any time.

Fall.—So far as can be guessed from chiefly extralimital records, the main migration probably occurs in late September and much of October; Kentucky records are few. Goodpaster (1941:36) gave the latest Cincinnati area record as October 24 (1937). Wilson (1922:238) gave Warren County records as September 6–October 24. The species was reported in Harrison County, October 10, 1932 (Mayer, 1941:13). At least a few migrate quite late, as indicated by December records from Indiana and Ohio (see Fleetwood, 1934:388).

Geographic variation.—The series examined is referred to *Passerherbulus henslowii henslowii* (Audubon), being on the average a trifle paler and less intensely colored than the eastern *Passerherbulus henslowii susurrans* Brewster. (See, however, Worthington and Todd, 1926:218.)

Specimens examined.—Total, 21. C.W.B.—1 female, Nelson County (Oct. 30, 1884); B.L.M.—5 males, 1 female, Jefferson County (May 5, July 7 [3], Aug. 10; July 7—all 1946); 4 males, 2 unsexed specimens (juvenal plumage, tails full-grown), Oldham County (April 19, June 29, July 4, 7; June 29, July 4—all 1946); U.M.M.Z.—2 females (weights, 12.6, 12.7 gm., not fat to moderately fat), Laurel County (April 30, 1949); 1 male, Boone County (July 10, 1950); 4 males (moderately fat, testes slightly enlarged), Oldham County

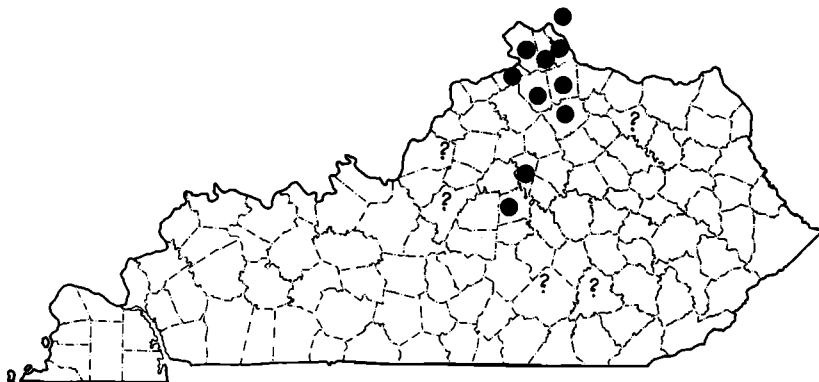


Fig. 41. Breeding distribution of the Vesper Sparrow in Kentucky. Dark circles represent breeding-season records. Question marks represent dubious breeding-season records.

(April 9, 10 [3], 1948); 1 male (very fat, testes slightly enlarged), Marshall County (April 16, 1950).

Poocetes gramineus (Gmelin): VESPER SPARROW

Status.—Transient, fairly common to common; uncommon summer resident in extreme north-central Kentucky, southward in decreasing numbers at least to Mercer County.

Spring.—The species is occasionally noted in late February, usually about the middle of March; peak of migration near early April; rare by early May in areas where none summer. Early records: March 21, in Rowan County (Barbour, 1952:29); February 23 (1891), in Pulaski County, average of 7 years March 20 (Cooke, 1911:87); March 12 (1939), at Cincinnati, Ohio (Goodpaster, 1941:36); "about middle of February" (Beckham, 1885:25; specimen February 17, 1882, C.W.B.) and March 8 (Blincoe, 1925:412), in Nelson County; March 9, at Louisville (Monroe); March 12, in Warren County (Wilson, 1922:238). Transients frequently sing. The Vesper Sparrow is an open-country bird, preferring habitats much like those frequented by the Savannah Sparrow but tending more than that species to occupy areas of sparse ground cover rather than the more densely grown weedy fields and hedge-rows. There are comparatively few late records based with reasonable certainty upon transients: April 20, in Nelson County (Blincoe, 1925:412); May 6 (1943), at Louisville (Monroe). On May 7 and 9, 1952, I recorded 1 singing regularly in seemingly suitable breeding habitat in a clearing of the Cumberland National Forest, 10 miles southwest of London, Laurel County. Later, June 9–15, I was unable to find this bird, which may have been a transient.

Breeding distribution.—The exact limits of the breeding range, past and present, are uncertain (Fig. 41), and the details and validity of many earlier records are obscure or unknown. Although a number of published reports had referred to the summering of the species in northern Kentucky, I was dubious of this until July, 1950, when an intensive search of the northern Bluegrass counties revealed that the species, although local and uncommon, is widely distributed and occurs in parts of Gallatin, Boone, Kenton, Campbell, Grant, Pendleton, and Harrison counties, in each of which I recorded 1 to several birds. All were found in hilly sections of the outer Bluegrass or in the so-called hills of the Bluegrass (the Eden shales belt of Fenneman). Of the many seemingly suitable habitats investigated, those in which the birds were found were remarkably similar. It is tempting to assume that the common characteristics of the areas occupied here, at the periphery of the breeding

range, are critical and those of the optimum habitat elsewhere. In any event, the breeding territory in northern Kentucky seems invariably to be open, on a moderate to steep slope, in a well-grazed pasture containing rocky outcrops or bare ground (resulting from trampling or erosion), near or including a small pond, and containing a few scattered trees or shrubs, usually black locust, American elm, and red cedar in various combinations. The habitat is often shared with Lark Sparrows and Horned Larks. The male Vesper Sparrows sing persistently, even at midday and in the hottest weather. The testes of 4 collected (Boone County, July 9; Kenton County, July 10; Grant County, July 13) were much enlarged and the plumage much worn. Although no nests or young have been found, this is clearly a breeding population. In all, I found 19 territories from July 9 to 16, and at one location, near Cherry Grove in Grant County, I found 4 males on July 13, 3 of which could be heard from one point. Within this area the species has also been reported, from Pendleton County, by King (*vide* Wilson, 1940:12) and also, just to the east, Granis (1944:51) thought she saw Vesper Sparrows in Fleming County in 1944. Just to the north, Goodpaster (1941:36) has found the species common near Cincinnati, Ohio, and (verbal com.) has found nests in habitats similar to those described above. From farther south, the only published records which I am satisfied are authentic are Van Arsdall's (1949:29) June observations in a pasture with rocky outcrops in western Mercer County, and Howell's (1910:297) records of singing birds at Midway, Woodford County, July 6-11, 1909. Unannotated references to summering in the same general area, in Harrison and Fayette counties (Wilson, 1942:24), may well be based on fact.

Outside of the area defined by the above records, I have never been able to find a Vesper Sparrow in summer, but there are indications that scattered pairs may occur, or have occurred over a larger area. For Pulaski County, on the Cumberland Plateau, probably on the authority of John B. Lewis, Cooke (1911:87-88) gave only spring arrival and autumn departure dates for the species, implying by default a summering status. My own early May observations (see under "spring") from neighboring Laurel County further suggest the possibility of breeding on the Plateau, as do records from various parts of the higher Appalachians just to the east of Kentucky (Wetmore, 1939:238; Murray, 1952:109). The possibility of changes in distribution is suggested by the statement of Beckham (1885:25), competent and consistently careful, that the species was a common summer resident, breeding, in Nelson County (he gave no details, unfortunately, and seems to have left no summer specimens), while Blincoe (1925:412), although aware of Beckham's statement and also a careful worker, was later unable to find the species summering there. Near Louisville, where no regular evidence of summering has been noted, Monroe has an old record for June 1.

Fall (and winter?).—Records indicative of the probable duration of migration are few. The peak evidently occurs near late October, and presumably a smaller number of birds are regularly present earlier and later. Extreme records: November 7 (1889), in Pulaski County (Cooke, 1911:88); September 12 to November 18, in Nelson County (Blincoe, 1925:412; specimen, November 15, 1881, C.W.B.); October 14 (1949) to November 9, at Louisville (Monroe); October 7-30, in Warren County (Wilson, 1922:238). I recorded a flock of 4 in Jefferson County on October 29, 1948, and 1 in Laurel County on October 10, 1951. As in spring, there are numerous records from many areas.

The Vesper Sparrow is rather frequently reported on Christmas bird counts at various localities. Near Louisville, the late Walter Shackleton reported 9 on December 21, 1947, and 2 on December 23, 1950 (Monroe, notes), and the species has been stated to winter occasionally at Cincinnati, Ohio (Maslowski, 1931:65; see also Goodpaster, 1941:36). The latest Kentucky specimen record, however, seems to be for November 15, and definite proof of wintering is still lacking.

Geographic variation.—All specimens examined seem to me to be representative of *Poocetes gramineus gramineus* (Gmelin), the subspecies of the eastern United

States. I have not seen enough material to have an opinion concerning the validity of *P. g. polius*, proposed by Braund and Aldrich (1941).

Specimens examined.—Total, 21. U.K.—1 unsexed, Fayette [?] County (Oct. 10); C.W.B.—3 males, 2 females, 1 unsexed, Nelson County (March 20, April 2, May 9; Feb. 17, Nov. 16; March 24); B.L.M.—1 male, Jefferson County (March 9); 2 males, Oldham County (March 16); J.D.F.—1 male, Woodford County (Oct. 26); U.S.N.M. (see Wetmore, 1940:570)—3 specimens, Boone and Trigg counties (Oct. 13–Nov. 4); U.M.M.Z.—1 male (weight, 27.8 gm.), Grant County (July 13); 2 males, Kenton County (July 10); 1 male, Boone County (July 9); 2 females, 1 unsexed (weight, 26.4 gm., very fat), Jefferson County (April 4, 4; Oct. 29).

Chondestes grammacus (Say): LARK SPARROW

Status.—Summer resident, irregularly distributed, rare to fairly common.

Spring.—So far as known, the Lark Sparrow is generally present by mid-April or shortly afterwards. Some of a few early records suggest that the average date of arrival may be somewhat earlier: April 15 (1891), at Eubank, Pulaski County, average of 4 years April 19 (Cooke, 1911:84); "about April 22" (Beckham, 1885:26), and April 11 (Blincoe, 1925:413), in Nelson County; April 20 (1960), near Louisville (Monroe); March 27, in Warren County (Wilson, 1922:238); April 2 (1906), in Logan County (specimen; C.U.).

Breeding records.—Little information is available. Egg-laying, as indicated by only 7 dated observations, appears to take place chiefly in May and June, with a peak of clutch completion possibly near June 1; some pairs may be two-brooded, as was specifically stated by Beckham (1885:26). Information concerning 5 reported nests is somewhat sketchy. In Nelson County, Blincoe (*vide* Funkhouser, 1925:250) recorded a nest containing eggs on June 14, 1920, and one with young 4 or 5 days old on May 24, 1916. Wilson (1923c:134) recalled finding a nest in Calloway County in the summer of 1911 or 1912. Similarly, Monroe remembers a nest containing eggs found by him near the edge of a pasture at Middletown, Jefferson County, probably about 1918. I saw a nest and 4 eggs, taken in Hopkins County, in Bacon's collection at Madisonville. Young out of the nest have been reported from Nelson County, "about June 25th" (Beckham, 1885:26); from Middletown, Jefferson County, on June 18, 1929, and July 21, 1946 (Monroe); and from Warren County, August 5, 1945 (Wilson, 1946c:9). I saw barely grown young accompanied by adults in a rocky pasture in Harrison County on July 13, 1950.

Breeding distribution.—Imperfectly known in detail, but probably statewide. In much of its range in the eastern United States the species is erratic and in some areas fluctuates markedly in numbers. Kentucky records are scarce and are from a fair number of scattered localities, the easternmost being Whitley County (Horsey, 1927:119). Other records have been given by Patten (1946:33), for Madison County; Wilson (1942:24) for Madison, Harrison, Fayette, and Crittenden counties; King (1940b:31) for Grant, Pendleton, and Meade counties; Van Arsdall (1949:29) for Mercer and Jessamine counties; Wyatt (1947:45), for Calloway County; and Pindar (1889b:314; 1925a:163), for Fulton County. In some localities the species occurs in fair numbers. At Bardstown, Beckham (1885:26–27) and Blincoe (1925:413) respectively reported it as "abundant" and "always common," and Beckham considered that it increased during his period of observation. Monroe has always been able to find a few on a farm near Middletown, Jefferson County; he and I recorded 2 in a rocky pasture at Solitude, Bullitt County on May 15, 1937, and another in Oldham County, July 16, 1939. In the summer of 1950, I recorded small numbers in Pendleton (July 9, 19), Campbell (July 9), Harrison (July 13—at least 7 in one pasture), and Robertson (July 19) counties. The species is evidently rare to fairly common in scattered areas throughout the Bluegrass. I recorded all the birds on hillsides and ridges in rocky or eroded pastures which usually contained a few small red cedars and black locusts. Grinnell and

Miller (1944:494) emphasized the importance to the species of open terrain and scattered perches.

The upper Ohio Valley, according to evidence marshalled by Brooks (1938a), has been invaded from the west by Lark Sparrows in comparatively recent times. Brooks (*op. cit.*, pp. 186, 193) was surprised that the birds "skip over the prairie portions of [Ohio], territories similar in many ways to their ancestral grass-lands farther west, and take up their abode in the rugged, wooded hills just west of the Ohio River [where they] have departed widely from the breeding homes and habitats of their ancestors. A rocky West Virginia hill pasture does not resemble an Iowa corn-field." The last is true enough, but if the Lark Sparrows of Iowa are like those I have known over much of the prairies and high plains, they are not typical of corn fields. Rather, the Lark Sparrow is a bird of rocky outcrops, sand-hills, erosion gullies, and other disturbance features providing sparse ground cover interspersed with bare soil or rock. Although in a broad sense it is a species of the grasslands, the bird's niche is not in the grassland proper. The eastern habitats I have seen, like those described by Brooks, seem to me to provide the nearest local approximation of the typical western habitat, and such areas are naturally more numerous in the cleared parts of the Appalachian Plateau, with its thin soils and strong erosive forces, than in the fertile, more level, and highly cultivated areas to the west.

Fall.—As in much of its eastern range, the species is here represented by few autumn records. Wilson (1922:238) recorded 1 on October 18, 1919, in Warren County. A record of 2 seen in Kentucky Woodlands National Wildlife Refuge, Trigg County, on December 15, 1946 (Wyatt, 1947:44), is convincingly related and difficult to disbelieve, despite the lateness of the date. Data from other states suggest that the migration occurs mainly in early October. Males (U.M.M.Z.) taken on July 9 and 13, 1950, were already in heavy body molt, and the second bird had commenced molt of the remiges (outer secondaries, inner primaries).

Geographic variation.—Occurring is the eastern *Chondestes grammacus grammacus* (Say).

Specimens examined.—Total, 15. C.W.B.—6 males, 2 females, Nelson County (April 24, May 1, 1, 29, June 26, July 3; May 5, June 18); B.L.M.—1 male, Oldham County (July 16); C.U.—3 males, Logan County (April 2, 19, 24); U.S.N.M.—1 male, Nelson County (April 25); U.M.M.Z.—1 male (weight, 29.9 gm.), Pendleton County (July 9); 1 male (29.4 gm.), Harrison County (July 13).

Aimophila aestivalis (Lichtenstein): BACHMAN'S SPARROW

Status.—Summer resident, locally distributed, uncommon to fairly common.

Spring.—The species is usually present by early April, sometimes in late March. Early records: March 20 (1889), in Pulaski County, average of 7 years April 6 (Cooke, 1914b:176); March 18, in Nelson County (Blincoe, 1925:413); March 13 (1948), and March 31 (1946), near Louisville (Slack and Stamm, *vide* Monroe; Monroe); March 26, in Warren County (Wilson, 1922:239). "Arrival" dates are usually based upon singing birds.

Breeding records.—Clutches are completed from April 21–30 to July 21–31, with a peak perhaps near June 1, as indicated by 10 dated breeding observations; there is no direct evidence, but it seems that some pairs may rear two broods. Records are from Madison (Witherspoon, 1894:313—see notes below), Kenton (Mengel, notes), Jefferson (Monroe and Mengel, 1943:3, and notes), Nelson (Blincoe, 1921a:100), and Hopkins (Bacon collection) counties, and slightly extralimital records are from Clermont County, Ohio (Goodpaster, 1941:37). The rather bulky nests of the species, constructed chiefly of coarse grasses, are placed on the ground, usually but not always in dense cover. Blincoe (*loc. cit.*) described the construction (by the female only) of a nest in the corner of a wheat field adjoining a pasture and a thicket near Bardstown, Nelson County, April 26–28, 1921. On May 2 and 3 the

nest received 2 Bachman's Sparrow eggs and 1 cowbird egg; it was later destroyed by an unknown agent. On May 21, 1921, nearby, Blincoc and Ganier found another nest, containing 4 young approximately 6 days old. The second nest was under brush which had been thrown in an erosion gully on a worn-out piece of land; neither nest had much sheltering vegetation. On June 26, 1939, Monroe (notes) found a nest (unlike the others described, slightly domed) containing 4 eggs, near the edge of an old field at Middletown, Jefferson County. He found another, containing 4 eggs with incubation advanced, well concealed in thick, grassy cover on a brushy, eroded ridge just east of Louisville on June 18, 1938 (detailed description and photo., Monroe and Mengel, 1943; date wrongly given as 1935). When I examined Bacon's collection at Madisonville, it contained a nest and set of 5 eggs taken in Hopkins County years ago. Two nests of the "Grasshopper Sparrow," each containing 5 *white, unmarked* eggs (characteristic of Bachman's Sparrow but abnormal for Grasshopper Sparrow) and found in "meadows" in Madison County on May 30, 1893, and June 15, 1894, by Witherspoon (1894) seem more probably to have belonged to the present species; Witherspoon shot a parent bird at one of the nests and noted yellow at the bend of the wing, a character of Bachman's as well as of the Grasshopper Sparrow. In Clermont County, Ohio, Goodpaster (1941) found a nest containing 4 piped eggs on June 12, 1932, and found another, newly completed, on July 23, 1932. The average complement of the 5 complete clutches or broods definitely of Bachman's Sparrow is 4.2 eggs or young; with Witherspoon's observations it becomes 4.5 ± 0.20 . Other breeding records are indicated by young birds in juvenal plumage, but beginning postjuvenal molt, which I took in Jefferson County (B.L.M.) on July 17, 1939, and in Kenton County (U.M.M.Z.) on July 12, 1950. The last is interesting because 2 rectrices and the inner primaries of one wing are sheathed, suggesting the possibility of a complete postjuvenal molt in this individual. Phillips (1951:325) described an atypical case of complete postjuvenal molt in *Aimophila carpalis*.

Breeding distribution, and history.—Bachman's Sparrow occurs throughout Kentucky, but its distribution is decidedly local, perhaps because of rather rigid habitat requirements. It is obscurely marked, inconspicuous when not singing, and tends at times to be somewhat crepuscular, all factors which have retarded the accumulation of knowledge concerning its distribution and numbers.

The species, indeed, was very little known during the nineteenth century in at least the northern half of its present range. It was first reported from Kentucky by Beckham (1881:339), who on April 28, 1877, took in Nelson County a male, identified on its label, in Robert Ridgway's hand, as "illinoensis" [*Peucaea illinoensis* Ridgway, *Bull. Nuttall Orn. Club*, 1879, p. 217 (Wabash County, Illinois) = *Aimophila aestivalis illinoensis* (Ridgway)]. This remained Beckham's only record, although later Blincoc (1925:413) was to consider the species fairly common in the same area. Except for vague remarks by Garman (1894:17), the species seems next to have been reported from this general area by Gano (1904:82), at Cincinnati, Ohio, as seen on April 25, 1901, and later dates, although her observations were in fact predated by rather vague records from Fulton County belatedly published by Pindar (1925a:164), and the more precise notes of John B. Lewis in Pulaski County, approximately 1890, published much later by Cooke (1914b:176-177). Embody took specimens in Logan County on April 14, 1906 (C.U.), and earlier (Embod, 1905:53-54) reported sight records for April 30 and August 25, 1904, 10 birds on the latter date! These were essentially all of the records until comparatively recent times. Both Brooks (1938:108) and Hicks (1935a:178) concluded that the species had expanded its range considerably towards the north and east in the half century prior to their writing. It must assuredly have been rare or absent in much of extensively forested primeval Kentucky, but I suspect it was established in many areas for years before it began to be recorded with any regularity, and even today workers familiar with the species may experience some difficulty in finding it in given areas.

The key to finding Bachman's Sparrow, of course, is a thorough understanding of its habitat. The excellent description by Hicks (*in* Brooks, 1938:95) of typical habitat in Ohio is equally applicable to Kentucky:

The choicest locations are about fifty to one hundred yards down from the ridge tops in old deserted fields. A typical territory is a circle 150 feet each way from an eroded gully which has healed and is now well covered with miscellaneous trees, shrubs, and particularly blackberry brambles. The territory is more attractive after about five per cent of the open grass lands adjacent to the gullies are dotted with blackberry briars. Usually the center of the territory is close to the upper end of the gully, and the abundant plants are the dry soil goldenrods and asters, wild oat grass (*Danthonia spicata*), and various other grasses, composites, and miscellaneous weeds typical of dry, eroded slopes.

Fairly recent published records are from a number of localities, the habitats, when described, agreeing well with the above. The species was listed from a number of localities by Wilson (1942:24), citing various local observers; from Mercer County by Van Arsdall (1949:29); Meade County by Lovell (1949b:72); and Warren and Edmonson counties by Wilson (1947b:62; 1959a:55). To these may be added various records of my own, which give further indication of the wide distribution and comparative numbers of the species: April 10, 1948, 4 males singing on a ridge just east of Louisville, where the species had occurred regularly since at least 1934; May 23, 1949, 1 singing in northern Lake County, Tennessee, just east of Reelfoot Lake and about a mile from the Kentucky line; June 18 and 22, 1949, 6 or 7 males singing in a typical ridge habitat in Warren County, 10 miles northwest of Bowling Green, with 1 indulging in a remarkable flight-song (Mengel, 1951:208); July 12, 1950, a singing male and a grown young bird (U.M.M.Z.) in Kenton County, 1 mile northeast of Walton; June 23 and 24, 1951, 3 birds singing on a steep slope near the Breaks of the Sandy River on the Virginia line in Pike County (elevation, 2,400 feet); July 15, 1951, 2 males on a gentle slope supporting much broomsedge and grown up with small sweet gums, 7 miles northwest of Mayfield, Graves County; July 17, 1951, 1 singing in an old orchard 5 miles west of Paducah, McCracken County; June 14-30, 1952, at least 8 singing birds located in more or less typical habitats within 7 miles (both east and west) of London, Laurel County (4 birds in one area; the rest small habitats with 1 singing male each). Additionally, Monroe, Jr. (notes) recorded Bachman's Sparrows singing in old fields near the top of Big Black Mountain (elevation, 4,150 feet), Harlan County, where I have never succeeded in finding the species, on June 6, 1951.

While most of the habitats were fairly similar to the typical one described above, a few deviated rather widely; aberrant territories were on flat ground in oak-scrub at the edge of a broomsedge field adjoining the cypress fringes of Reelfoot Lake; in a flat, poorly tended orchard encroached upon by dense grassy ground-cover, with no blackberries or erosion gullies, in McCracken County; in a small brushy area at the junction of fences where grazed and ungrazed fields adjoined, in Kenton County; and on a gentle slope along the brush-grown fence row between a cornfield and a meadow largely of timothy, in Laurel County.

Song is seemingly discontinued in late July or early August, but at least occasionally may be resumed later (see under "fall"). While the birds, as noted, tend to be active early and late in the day, in the hot part of summer sometimes verging on the crepuscular, I have several times been surprised by noonday songs on hot July days.

Fall.—For many years it was thought locally that the species departed very early in autumn; this is evidently not true, however, and at least some birds remain into October. At dawn on September 17, 1950, near Louisville, I took a brilliantly singing male, which was undergoing extensive molt of the body plumage. Molt of the wing and tail, except for renewal of the innermost secondaries, had not been commenced; however, a male recorded at the same place by Monroe, on October 1, 1950, was in such marked wing molt that it could not fly, and Monroe succeeded in

catching it! Dury (1910:57) gave a Cincinnati, Ohio, record for October 14, 1909 (misprinted 1809). Cooke (1914b:177) gave the latest record for Pulaski County as September 26 (1889) but had one for Mount Carmel, southern Illinois, for October 28. Blincoe (*vide* Funkhouser, 1925:254) recorded a singing bird at Bardstown on September 1, 1921.

Geographic variation.—After much consideration of the problem I think that all Kentucky specimens I have seen are properly referable at present to *Aimophila aestivalis bachmani* (Audubon). The general nature of the geographic variation in the species has been summarized by Wetmore (1939:238–239) and is reflected by the arrangement in the current (1957:602) A.O.U. Check-List. Briefly, there is a dark and intensely colored population with much dorsal black in peninsular Florida and the Georgia coastal plain (*Aimophila aestivalis aestivalis*); pale, brightly colored birds with little or no dorsal black streaking predominate in the northwestern and westernmost portions of the range, *i.e.*, Illinois to Texas (*Aimophila aestivalis illinoensis*); and the rather considerable area between is occupied by a population more or less intermediate between the two (*Aimophila aestivalis bachmani*). The matter is perplexing, and after study of some 80 specimens from various critical localities outside of Florida, I am convinced that satisfactory understanding must await the accumulation and assembly of considerably more fresh-plumaged specimens than now appear to exist. The only generalizations I could now make with confidence are two: (1) the Floridian population is far more uniform and more distinct from all the rest than any two populations to the north are from one another, and (2) there appears to be a trend, probably in essence clinal, toward paleness and diminution of dorsal black toward the north and, probably, the west. No one seems to know what percentage of unworn birds from the breeding range of *illinoensis* is in fact separable from all, or any designated percentage of, similar birds from the breeding range of *bachmani*. This being the case, it appears to me at present that the assurance of attaining meaningful results from assigning “degrees of intermediacy” to a few differentially worn Kentucky specimens, some of them possibly transients, is exceedingly slight. The matter is further complicated by the possibility, which Brooks (1938) has taken pains to suggest, that the Bachman’s Sparrows of a considerable part of the present range assigned to *bachmani* have entered the region within historic times from areas in the range assigned to *illinoensis*. My present opinion, by no means final, is that *illinoensis* is not sufficiently distinct to merit nomenclatural recognition.

Specimens examined.—Total, 15. C.W.B.—1 male, Nelson County (April 28, 1877); B.L.M.—1 male, 2 unsexed specimens (juvenal plumage), Jefferson County (April 13, 1946; July 17, 17, 1939); C.U.—2 males, Logan County (April 14, 1906); U.S.N.M.—1 male, Meade County (April 21, 1938); U.M.M.Z.—1 male (weight, 18.2 gm.), Laurel County (June 15, 1952); 1 male (juvenal plumage), Kenton County (July 12, 1950); 2 males (—, 17.8 gm.), Jefferson County (April 10, Sept. 17); 2 males (20.6, 19.8 gm.), Warren County (June 18, 1949); also (skeletons), 1 male (19.9 gm.), Warren County (June 22, 1949), 1 male, Graves County (July 15, 1951).

Junco hyemalis (Linnaeus): SLATE-COLORED JUNCO

Status.—Common to abundant transient and winter resident throughout Kentucky (*J. h. hyemalis*; *J. h. cismontanus* is casual); common summer resident above 3,600 feet on Black Mountain, Harlan County (*J. h. carolinensis*).

Spring.—A decrease in numbers is usually evident by March, continuing through April; a few juncos sometimes remain into early May. Late records: April 21 (1888), in Pulaski County, average of 7 years April 13 (Cooke, 1914c:440); May 12 (1909), in Woodford County (Cooke, *loc. cit.*); April 25, in Nelson County (Blincoe, 1925:413); May 9 (1953), at Louisville (Monroe); April 19, in Warren County (Wilson, 1922:239). In 1949, I recorded the last junco of the season in Wolfe County on April 24. I found the species fairly common in several western Kentucky counties April 10–16, 1950, and in Pulaski and nearby counties in the east, April

11-14, 1951. Many birds sing on fair days in late winter and through the spring. In April, juncos tend to inhabit forest and woodland (where they often move about high in the trees and can best be found by their nervous, chipping call-notes), rather than the fields and brushy areas more often occupied in fall and winter. Goodpaster (1941:37) reported a very late date for Cincinnati, May 31, 1931.

Breeding records.—All records are from near the top of Big Black Mountain, Harlan County, at elevations of approximately 3,800 to 4,150 feet, and apply to *Junco hyemalis carolinensis*. Judging from only 6 dated breeding observations, egg laying occurs chiefly in May and June, with a peak of clutch completion near June 1-10; the population may be single-brooded. Lovell (1950:107) found a nest containing 3 well-incubated eggs on June 17, 1947. The nest was tucked in a crevice on a steep bank just above a spring, under a large sugar maple and nearly devoid of cover. Lovell found another (1950c:64), empty but evidently new, on June 14, 1948, in a bank beside a logging road, and a third, well-concealed in a similar bank, contained 3 eggs on June 16, 1950. A fourth nest was found on the last date, by "Bob Cunningham . . . about eleven miles southwest" (Lovell, *loc. cit.*) of the highest summit. All nests were built of fine grasses and bits of moss, and lined with sporophytes of mosses. On June 30, 1951, I took a small young bird, obviously just from the nest, amid mossy rocks in deep forest, and I saw a bird of similar size being fed by adults at 4,000 feet on High Knob, Wise County, Virginia, 10 miles east of Black Mountain, on June 5, 1952. Full-grown young begging for food are commonly seen on Black Mountain from about the middle of June through July.

Juncos were first reported summering in Kentucky by Howell (1910:297), who found a few high on Big Black Mountain on July 24, 1908. The species is common there and has been recorded by all subsequent workers. It seems to be more closely restricted to the vicinity of the summit of the ridge than other northern species breeding there, rarely being found below 3,800 feet and apparently never below approximately 3,500. Barbour (1941a:47) wrote that it was "probably the commonest bird on the mountain," an estimate which may have been extreme, since in the singing male counts of 1951 and 1952 in optimum habitats (more or less disturbed climax forest containing small openings) I recorded a density of about 12 males to 100 acres, less than that of the Veery, Red-eyed Vireo, Black-throated Blue Warbler, and Canada Warbler. As soon as young are on the wing, juncos begin to congregate along the trails and roads and at the edges of the mountain meadows, giving the impression that they are very numerous.

Juncos were present at high elevations upon my arrival on May 13, 1952, but no song was heard until May 17. Males often sang from the very tops of tall dead trees. Territories are usually centered about tangled masses of fallen timber or steep, root-lined banks along narrow woodland trails and logging roads. No data on the time of departure of breeding birds appear to exist.

Fall and winter.—A few may appear in late September; throughout Kentucky juncos arrive in small numbers by early or mid-October and are common by early November at the latest. Early records: October 5 (1889), in Pulaski County, average of 4 years October 11 (Cooke, 1914c:441); September 30 (1904), in Fayette County (Cooke, *loc. cit.*); September 25 (1937), at Cincinnati, Ohio (Goodpaster, 1941:37); October 8, in Nelson County (Blincoe, 1925:413); September 27 (1955), near Louisville (Monroe); October 4, in Warren County (Wilson, 1922:239). In Laurel County, October 2-10, 1951, I recorded the first on October 7, immediately after the passage of a strong cold front. In late fall and through most winters, the species is common to abundant, occurring in small to large roving bands, sometimes of 100 birds or more. Flocks are usually associated with Field Sparrows, and sometimes with Tree Sparrows, White-throated Sparrows, titmice, Cardinals, towhees, and other species. They are characteristic of brushy fields, standing corn, dense hedge rows, and the tangled understory of open woodland. I have found juncos

numerous in the open pine-oak upland woods of Laurel County, and also in the grape-choked swampy forests of the Mississippi lowlands. They may occasionally be uncommon locally, although Pindar's (1923*b*:160) statement that they were rare or even absent in parts of the Bluegrass and elsewhere in the winters 1921-1923 seems unlikely.

Note.—A completely albino bird was seen by many observers, including me, in Cherokee Park, Louisville, in the winter of 1936-1937 (Schneider, 1937:7), and a partially albinistic bird was noted at Henderson, February 10, 1939 (Lett, 1959:67).

Geographic variation.—Three subspecies have been recorded in the state.

Junco hyemalis hyemalis (Linnaeus)

The common transient and wintering junco of Kentucky. Except as noted below, all specimens examined are referred here, and the general remarks above, other than those on breeding, doubtless apply almost entirely to this subspecies. Brownish or reddish birds in "retarded" plumage (see Miller, 1941:314) are often seen and sometimes incorrectly thought to be western birds. Identification of the latter is difficult and should not be attempted except in the hand and with adequate comparative material.

Junco hyemalis carolinensis Brewster

The breeding junco of the Appalachian region, and, although rather constant in its characters, not a particularly well-marked subspecies (see Miller, 1941:326-329). Individuals are difficult, and sometimes impossible, to separate from many *J. h. hyemalis*. Compared with average *hyemalis*, males of the series seen, all from Black Mountain, Harlan County, are quite uniform and rather pale gray, especially on the heads. Probably the breeding birds of the area winter near the base of Black Mountain, since no migration other than altitudinal has definitely been recorded for the subspecies.

Junco hyemalis cismontanus Dwight

This interesting subspecies was regarded by Miller (1941:329) as being probably of hybrid origin, but over a large area shows the stability characteristic of a typical subspecies. Away from the breeding grounds there is no way to tell whether individual specimens are true *J. h. cismontanus* or hybrids, *J. hyemalis* × *J. oregonus*. Such birds can only be called *cismontanus*, however, and they occur rather frequently in the east, especially in the Mississippi Valley. Two Kentucky specimens are here referred to *cismontanus*, which has not previously been reported from the state. These are a female (skull fully ossified) in moderately retarded plumage (see Miller, 1941:314) taken by me in Graves County on December 25, 1950, and agreeing perfectly with Miller-identified specimens (U.M.M.Z.) of typical *cismontanus* in comparable dress. The bird possesses pale, pinkish flanks (with only a moderate admixture of eumelanin in the feathers), which are clearly set off by the sharp posterior border of the light gray hood. The second specimen is an adult male I took at Anchorage, Jefferson County, on January 7, 1951, after examination of many juncos in Monroe's yard. This bird, although gray on the flanks and only moderately reddish dorsally, is extremely black-headed, and the black of the hood is sharply set off from the brownish gray of the back and the gray of the flanks, which lack the "*hyemalis* gradient" of Miller. I saw a full-plumaged, black-headed, red-backed male junco in Graves County on December 25, 1950. This bird may have been an example of the present form approaching *Junco oregonus* in characters, or true *J. oregonus*. A few sight records of such birds have been reported as "Oregon Juncos," one noted by Croft (1960:31) on April 13, 1958, near Louisville, and others reported casually, in Christmas bird counts and the like, in *The Kentucky Warbler*. Since it is ordinarily quite impossible to distinguish *Junco oregonus* from

J. hyemalis cismontanus in the field, such observations can be taken only as cumulative evidence of the occasional presence of western birds.

Specimens examined.—Total, 36 (all birds from Harlan County are *J. h. carolinensis*; the rest are *J. h. hyemalis* unless indicated as *cismontanus*). M.S.C.—1 male, Rowan County (Dec. 3); R.W.B.—3 males (1 immature), Harlan County (July 15, 20, 22); U.K.—1 female, Lincoln County (March 15); C.M.N.H.—1 unsexed, Bracken [?"Fosters"'] County (Nov. 12); B.L.M.—1 immature male, 1 female, Harlan County (July 8); 2 males, 1 female, Jefferson County (Dec. 4, 5; Nov. 7); C.U.—1 male, Logan County (Feb. 25); U.S.N.M. (see Wetmore, 1940:570–571)—4 males, 2 females, Harlan County (June 20–29); 5 specimens from Carroll, Hopkins, Trigg, and Butler counties (Oct. 14–Nov. 7); U.M.M.Z.—1 male, 1 juvenal-plumaged female, 1 small juvenal-plumaged male, Harlan County (July 1; June 28; June 30); 1 female (weight 16.9 gm., not fat), Laurel County (Feb. 3); 2 males (21.6, 21.4 gm., moderately fat), 1 female (23.3 gm., moderately fat), Jefferson County (Jan. 7); 1 male (*cismontanus*; 24.7 gm., very fat), Jefferson County (Jan. 7); 1 male (19.9 gm., moderately fat), Meade County (Oct. 30); 1 female (*cismontanus*; 19.6 gm., moderately fat), Graves County (Dec. 25); 1 female (18.4 gm., not fat), Hickman County (Dec. 24); 1 male (22.0 gm., moderately fat), 1 unsexed (18.2 gm., moderately fat), Fulton County (Dec. 29; Dec. 27).

Junco oreganus (Townsend): OREGON JUNCO

Status.—Casual winter resident or transient.

Records.—A female was taken at Anchorage, Jefferson County, by Monroe, on December 4, 1946. It is in retarded plumage (see Miller, 1941:314) and is very reddish dorsally, this coloration occurring also on the feather tips of the crown and nape. The bright, clear pink sides are sharply distinct from the blue-gray hood. Sight records of the species (see *Junco hyemalis cismontanus*) are not acceptable.

Geographic variation.—The single specimen agrees perfectly with examples of *Junco oreganus montanus* Ridgway (U.M.M.Z.) identified by A. H. Miller. A. R. Phillips identified the specimen with me in 1949, and I have subsequently rechecked the identification.

Specimens examined.—Total, 1. B.L.M.—1 female, Jefferson County (Dec. 4, 1946).

Spizella arborea (Wilson): TREE SPARROW

Status.—Fairly common to common winter resident.

Spring.—In some localities, according to report, no Tree Sparrows have been seen after late February or early March (see Wilson, 1922a:270, Warren County; Crook, 1935:73, Christian County). In most years and localities, however, at least some birds are present until mid-March, and a few sometimes linger later. Late records: March 29, in Rowan County (Barbour, 1952:29); March 31 (1950), in Fayette County (Edwards); March 21, in Nelson County (Blincoe, 1925:413); April 28, at Louisville (Monroe; next record April 10); March 12 (1920), in Warren County (Wilson, 1922:239; 1922a:270).

Fall and winter.—Sometimes appearing in late October, the species usually arrives in small numbers in early or mid-November, rarely becoming common before December. Early records: October 17 (1934), at Cincinnati, Ohio (Goodpaster, 1941:37); October 12 (Beckham, 1885:27), and December 22 (Blincoe, 1925:413), in Nelson County; October 15 (1955), near Louisville (Monroe); October 21, in Warren County (Wilson, 1922:239). In 1948, I recorded the first of the season (a single bird) in Fulton County on November 8. In northern Kentucky the species is regular and usually common, at least from November through February. In Nelson County, 40 or 50 miles south of Louisville, Beckham (1885:27) considered it common; Blincoe (1925:413), however, wrote that it was "rather common" there in the winter of 1911–1912 but was not seen again until the severe winter of 1917–1918, being common then and later. This corresponds with Wilson's observations (1922:239; 1922a:270) in Warren County, southern Kentucky, where the species was first recorded in 1917–1918 and was increasingly numerous in succeeding years

to 1922. In nearby Christian County, Crook (1935:73) noted arrival of the species after a storm on December 25, 1932. In Fulton County, Pindar (1887a:85) wrote of 1 secured from a large flock on January 30, 1886, but later (1889b:315; 1925a:164) considered the species uncommon. It seems probable that the numbers of the species are more variable in the southern counties than to the north, but Baumgartner's estimate (1939:143) of uncommon to rare in southern Kentucky would be more accurate, I think, emended to read uncommon to common. In Laurel County, southeastern Kentucky, I noted several Tree Sparrows on February 5, 1950, some of them singing. In extreme southwestern Kentucky, I found them common in Fulton, Hickman, Graves, and Ballard counties, December 24, 1950, to January 5, 1951. According to J. W. Hardy (verbal com.) the species is regular and common in southern Illinois just north of the Purchase region. The habits and habitat of the Tree Sparrow locally are much like those of the juncos with which the birds often associate in weedy fields, hedge rows, and the edges of woods. The Tree Sparrow, however, is more inclined than the junco to remain in open areas, where it is often associated with Field Sparrows and Cardinals. Loose flocks of 100 or more are frequently seen, and on clear late winter days the attractive, tinkling song is often heard.

Geographic variation.—All of the few specimens thus far examined are clearly representative of *Spizella arborea arborea* (Wilson). Collection of many specimens, especially in western Kentucky, may reveal that some portion of the wintering population consists of the paler, brighter western subspecies, *Spizella arborea ochracea* Brewster, which ranges east in some numbers to Missouri.

Specimens examined.—Total, 8. U.K.—1 male, Lincoln County (Feb. 2); C.W.B.—1 male, Nelson County (Feb. 14); B.L.M.—2 males, Jefferson County (Dec. 5, 28); J.D.F.—1 female, Woodford County (Jan. 25); U.M.M.Z.—1 female (weight, 17.7 gm., not fat), Hickman County (Dec. 24); 2 females (16.8, 19.1 gm.; not fat), Ballard County (Jan. 5).

Spizella passerina (Bechstein): CHIPPING SPARROW

Status.—Common summer resident.

Spring.—A few have been recorded in late February or early March; the species usually appears about mid-March, and full numbers are probably present by April 1. Early records: March 16, in Rowan County (Barbour, 1951a:38); March 3 (1893), in Pulaski County, average of 7 years March 13 (Cooke, 1909d:256); February 24, in Nelson County (Beckham, 1885:27); March 12, at Louisville (Monroe). Singing is begun upon arrival of the species in numbers. I noticed males fighting over territories in an apple grove in Powell County on April 22 and 23, 1949.

Breeding records.—The breeding season is long, as indicated by 43 dated observations, clutches being completed at least from April 11–20 to July 21–31, with peak (first broods) near May 1. Although two broods are probably reared by many pairs, no marked second peak is evident from the data in hand. Records are from Letcher (Murray, 1938:4); Rowan (Barbour, 1951a:38); Breathitt (Barbour, 1956:11); Wolfe and Laurel (Mengel, notes); Mercer (Van Arsdall, 1949:29); Owen (Lovell, Stamm, and Pierce, 1955:9; Stamm, notes); Gallatin (Mengel, notes); Oldham (Monroe, notes); Jefferson (Stamm, notes; Monroe, Mengel; notes); Meade (Lovell, 1949b:72); Marion (Monroe, notes); Nelson (Blincoe, *vide* Funkhouser, 1925:252); Daviess (Powell, 1951a:64, and *vide* Lovell, 1951b:62); Edmonson (Browning, 1946:42; Croft, *vide* Hays, 1957:7); and Hopkins (Hancock, 1954:46) counties. Monroe noted construction of a nest in Jefferson County on the early date of April 8 (1919), and I noted a nest under construction 2 feet up in a red cedar in Wolfe County on April 24, 1949. Egg dates range from April 25 (1941), 4 eggs slightly incubated and 2 eggs of the Brown-headed Cowbird, 3 feet up in an osage orange hedge in Jefferson County (Monroe), to July 12 (1935), 2 eggs in Hopkins County (Hancock, 1954). A late clutch is indicated by young just leaving the nest, which Stamm noted in Jefferson County on August 17, 1960. I noted full-grown young in the same county, being fed by adults on September 10, 1950. The

average complement of 23 clutches or broods known or thought to be complete is 3.5 ± 0.15 eggs or young (2-5).

The neat, delicately constructed nests, of grasses and frequently lined with horse-hair, are placed in shrubby old fields, hedge rows, and brushy forest edge, as well as in ornamental shrubs about dwellings. Evergreens, particularly small red cedars, are much favored as nest sites, and when deciduous shrubs are used they are often dense. Years ago I found many nests in barberry hedges in Louisville. The most exposed sites recorded have been Virginia pines, other nests being noted in rose vines on porch trellises; in apple, pear, and cedar trees; in osage orange, boxwood, and sycamore (an unusual site; see Barbour, 1956); and in small maples, elms, and other trees; 18 nests ranged from 2 to 15 feet above ground (average, 7.0). In addition to records above-mentioned, Monroe's files contain the following: nest with 2 eggs in Jefferson County, in rose vines, May 29, 1917; 4 eggs in a similar situation on June 17, 1917, also in Jefferson County; nest with 4 eggs 4 feet up in a red cedar in Marion County, May 5, 1929; nest with 5 eggs $3\frac{1}{2}$ feet up in a fallen red cedar in Oldham County, April 29, 1934. My own records include also a nest with 4 young, ready to leave, 10 feet up in a Virginia pine in the front yard of a country store in Laurel County, June 25, 1952; grown young out of the nest in the same area, June 14, 1952; and young just from the nest noted in Gallatin County on July 4, 1950.

Breeding distribution.—The Chipping Sparrow occurs throughout Kentucky, being common everywhere in suitable habitat, and in total numbers must rank high among the breeding birds of the state. It is a bird of successional stages of vegetation and disturbed or artificially planted areas, preferring brushy situations about dwellings and farm yards, old orchards, grazed slopes dotted with cedars, hedge-rows along roadsides, and open woodlands where the understory is sparse as a result of grazing, burning, or soil conditions. Chipping Sparrows are moderately numerous in open pine-oak upland forests (*Vaccinium* understory) on dry ridges of the Cumberland Plateau. In such situations in Laurel County, I found in 1952 that the density of singing males was close to 10 per 100 acres. In denser oak-hickory and mixed hardwood forest near London a few miles away the species was not recorded at all, although it frequented edges and fields in the area. In the Knobs in Madison County, Patten (1946:32) listed it sixteenth in abundance of 88 species recorded in June, 1941. It has not been recorded in recent years at high elevations on Black Mountain, Harlan County, but was found there by Howell (1910:297) in July, 1908, when there were farms at the top of the mountain. Throughout the farm country of central and western Kentucky the species is numerous.

Fall.—Common through September and most of October (though less frequently recorded about habitations than in summer), decreasing in November, and very rare by December. Many observers have been vague about last dates, and late records are few: October 26 (Blincoe, 1925:413), and December 27 (Beckham, 1885:27), in Nelson County; November 13 (1953), near Louisville (Monroe); November 4 (1938), in Trigg County (Wetmore, 1940:571). From October 3 to 10, 1951, I found the species common in Laurel County, mostly in small flocks along roadsides in farm country, and in old orchards, these types of habitat being much frequented generally in fall.

Winter.—Several authors (Pindar, 1889b:315; Wilson, 1922:239, 1923c:134; Patten, 1937) have referred casually to wintering of the species. Monroe's files contain an old Louisville record for January 26, and a more recent one for December 20 (1958). The species is fairly often reported, sometimes doubtless authentically, on Christmas bird counts. I suspect that a few individuals in fact occasionally, or even regularly, winter, but this remains to be established beyond doubt.

Geographic variation.—All specimens examined have been referred to the eastern subspecies, *Spizella passerina passerina* (Bechstein), although Wetmore (1940:571) remarked that a male (U.S.N.M.) from Boone County, taken October 13, 1938, somewhat resembles the western subspecies *Spizella passerina arizonae* Coues.

Specimens examined.—Total, 21. M.S.C.—1 unsexed, Rowan County (Oct. 5); R.W.B.—1 unsexed, Harlan County (Aug. 1); B.L.M.—1 male, Jefferson County (Oct. 19); J.D.F.—2 males, 1 unsexed, Marshall County (Oct. 26); U.S.N.M. (see Wetmore, 1940:571).—9 specimens from Bell, Wayne, Boone, Meade, and Trigg counties (April 23–Nov. 4); U.M.M.Z.—1 male, Wolfe County (July 1); 1 unsexed (weight, 11.9 gm., moderately fat), Laurel County (Oct. 7); 2 adult males (weights —, 12.9 gm., very fat), 1 juvenal-plumaged male, Jefferson County (April 7, Oct. 29; Sept. 10); 1 female, Logan County (May 9).

Spizella pusilla (Wilson): FIELD SPARROW

Status.—Common resident, somewhat less numerous in winter.

Spring.—Whatever decrease occurs in winter is made up by late March or early April. Spring "arrival" dates, such as those given by Cooke (1909d:258–259) are probably indications of deficient winter observation in the areas concerned. Regular singing begins in March.

Breeding records.—Clutches are completed, as shown by 62 dated observations, from April 11–20 to August 1–10, with a peak for first nestings May 11–20 or May 21–31; no peak of second nestings is clearly indicated. Records are from Harlan (Lovell, 1950c:65; Mengel, notes); Rowan (Barbour, 1951a:38); Madison (Gailey, *vide* Lovell, 1951b:62); Pendleton (Mengel, notes); Grant (King, 1940:11); Owen (Lovell, Stamm, and Pierce, 1955:6; Stamm, notes, and *vide* Hays, 1957:7); Oldham (Stamm, Monroe, Mengel; notes); Jefferson (Lovell, 1951b:62; Hays, 1957:7; Stamm, Monroe, notes); Bullitt and Marion (Monroe, notes); Meade (Lovell, 1949b: 72); Nelson (Blincoe, *vide* Funkhouser, 1925:252); Edmonson (Browning, 1946:42); Daviess (Powell, 1953:60); Hopkins (Hancock, 1954:46; and *vide* Hays, 1957:7); and Marshall (Figgins collection; Mengel, notes) counties. Egg dates range from April 26 (1941), 4 fresh eggs in Jefferson County (Monroe), and April 28 (1953), 3 eggs in Hopkins County (Hancock, 1954) to August 9 (1937), 3 eggs in Grant County (King, 1940). Other early and late clutches are represented by 5 young found in a nest in Rowan County on May 5 (Barbour, 1951a), and a half-grown young bird out of the nest taken by Figgins in Marshall County on August 28, 1941 (J.D.F.). The average complement of 51 clutches (chiefly) or broods known or thought to be complete is 3.6 ± 0.09 eggs or young (2–5). Productivity apparently decreases late in the season: 33 nests in which clutches were complete before June 10 contained an average 3.7 ± 0.11 eggs or young, while 14 which received their eggs after June 10 received an average of 3.1 ± 0.09 eggs. Several nests were parasitized by cowbirds (see that species for details). Nests are usually located in or at the edges of open fields which often contain scattered small trees and shrubs, preferred habitats being less shrubby than those favored by Chipping and Bachman's sparrows and more so than the habitats of Lark and Vesper sparrows. Nests are placed either on the ground, often at the bases of shrubs or small trees, or concealed in thick clumps of grass, or in any of a rather wide variety of small trees, shrubs, and forbs, especially favored being red cedars and black locusts. They have been noted also in blackberries, yarrow, goldenrod, greenbriar, broomsedge, coralberry, and hay-scented ferns, 32 elevated nests averaging 2.0 feet above ground (4 inches to 5.5 feet). As in the case of the Rufous-sided Towhee, there appears to be a tendency toward building nests on the ground early in the season. Of 46 dated nests the sites of which are known, 12 were on the ground; all but 1 of the latter received their clutches before May 31 and these 11 comprised 36.6 per cent of the 30 nests receiving their eggs by that date. The species nests to the top of Black Mountain, Harlan County (elevation 4,150 feet), where Warner and I found a nest containing 3 small young in the top of a small bush on July 9, 1946, and Lovell found one containing 3 eggs, in hay-scented ferns, on June 16, 1947. Flying young are commonly seen through June, July, and August. In Marshall County, I recorded full-grown young being fed by adults on June 15, 1949, and I took a young bird just from the nest (U.M.M.Z.) in Pendleton County on July 9, 1950.

Breeding distribution.—The Field Sparrow occurs in open areas and forest edge

situations throughout the state. Its requirements for open space are not great. Small clearings, fire lanes, and telephone lines in mature forest are adequate provided some grassy areas are present. In general, perfectly open meadows, and crop-fields, are avoided unless there is some shrubby vegetation in them. The species must have increased greatly since early times, being today one of the most numerous breeding birds of the state and surely the most numerous emberizine (being rivaled in the Fringillidae (*sensu* Wetmore) only by the Indigo Bunting and perhaps the Cardinal).

Fall and winter.—Near Louisville, I noted both freshly molted adults and birds still in juvenal plumage on September 17, 1950. An immature male (U.M.M.Z.) taken in Laurel County on October 7, 1951, was just completing postjuvenal molt. In autumn and winter, the Field Sparrow remains an open-country bird, inhabiting weedy fields, hedge rows, and similar cover, and often occurs in small, loose flocks associated with juncos, Tree Sparrows, Cardinals, and other species. Although various observers have reported a decrease in winter (marked at times at Cincinnati, Ohio, according to Goodpaster, 1941:37), there have frequently been seasons when, at least in central and southern Kentucky, no lessening of numbers was evident to me. However, so acute and active an observer as Beckham (1885:27) failed to record the species in winter at Bardstown, Nelson County, where several decades later Blincoe (1925:413) found it frequently. It seems possible that some change in winter status has occurred in northern Kentucky. In southwestern Kentucky, in Beckham's time, Pindar (1889b:315) considered the Field Sparrow a common resident in Fulton County.

Geographic variation.—Wetmore (1939:240–241) summarized the characters of the eastern and western subspecies of the Field Sparrow and their intergradation in the western Mississippi Valley. Field Sparrows from the Great Plains (*S. p. arenacea*) are slightly larger than eastern birds (*S. p. pusilla*) and definitely paler and grayer, with marked reduction of warm browns and buffs and narrowing of the black dorsal streakings. An intermediate population near and chiefly west of the Mississippi River seems to average small, nearer the eastern birds, but it is variable in color, some individuals approaching western birds in grayness. Nearly all of Kentucky lies within the range of the eastern subspecies in its typical form. However, when a series of 12 specimens from extreme western Kentucky is compared with specimens from the eastern and central parts of the state, the western series proves to average slightly but perceptibly grayer. The breeding range of *S. p. arenacea* does not reach Kentucky, but transients, as might be expected, occasionally reach the state.

Spizella pusilla pusilla (Wilson)

With three exceptions (see below) all specimens examined are referred to this subspecies. Most were taken at times when transients could have been present, and more known breeding material in comparatively fresh plumage is needed to work out the details of variation in the resident population. As noted above, among the specimens at hand, eastern and central Kentucky birds average a trifle browner and buffier than those from the west. All of the birds fall within the range of measurements to be expected for *pusilla*.

Spizella pusilla arenacea Chadbourne

Two females (U.M.M.Z.) from western Kentucky, taken in Marshall County, 7 miles west of Aurora, and Ballard County, 4 miles west of Barlow, respectively, on April 11, 1950, and January 5, 1951, and a female from central Kentucky taken by Figgins (J.D.F.) in Woodford County on April 13, 1942, seem to be referable to this subspecies. In their pale, gray coloration all are uniform with a series of typical *arenacea* from western Kansas. Their measurements (wings 62, 60, and 60 mm., respectively) are well within the range of *arenacea* but below average for that subspecies. I agree with Wetmore (1939:241) that color is the more useful character in distinguishing the two subspecies. In the Purchase region in the winter of 1950–

1951, I formed the impression that comparatively pale, gray Field Sparrows are present in winter in higher proportions than at other seasons. Further collecting may indicate that an influx of paler, western birds regularly occurs in winter, which is suggested additionally by Wetmore's identification (1939:240) of several presumably transient specimens from western Tennessee as *arenacea*. This subspecies has not previously been reported from Kentucky.

Specimens examined.—Total, 57. M.S.C.—3 males, Rowan County (March 1, May 10, Oct. 1); U.K.—1 male, Lincoln County (Feb. 2); B.L.M.—1 male, Jefferson County (March 30); 1 male, Oldham County (April 14); C.U.—1 unsexed specimen, Logan County (Jan. 21); J.D.F.—1 male, 2 females (1 of them *arenacea*), Woodford County (April 13); 1 female, 1 small immature female, Marshall County (Sept. 4; Aug. 28); U.S.N.M. (see Wetmore, 1940:571)—26 specimens from Pike, Harlan, Bell, Rockcastle, Wayne, Fayette, Boone, Carroll, Meade, Edmonson, Hopkins, Union, Trigg, and Fulton counties (April 20–Nov. 17); U.M.M.Z.—1 female (weight, 12.7 gm., not fat), Lewis County (Nov. 23); 1 male (14.5 gm.), Powell County (July 3); 1 male, Laurel County (Oct. 7); 1 juvenal-plumaged male (12.2 gm.), Pendleton County (July 9); 1 male (13.2 gm., moderately fat), Oldham County (Oct. 29); 1 male (13.5 gm., moderately fat), 1 female (12.7 gm., moderately fat), Meade County (Oct. 22); 1 male, Warren County (May 5); 2 males (12.7 gm., 12.3 gm.; not fat), 1 juvenal-plumaged male (11.1 gm.), 2 females (13.0 gm., *arenacea*; 12.2 gm.; not fat), Marshall County (April 11, 15; June 15; April 11, 14); 1 female (13.9 gm., moderately fat; *arenacea*), Ballard County (Jan. 5); 1 male (14.7 gm., moderately fat), Hickman County (Dec. 29); 3 males (14.0, 13.8, 13.7 gm.; moderately fat), 1 female (14.5 gm., moderately fat), Fulton County (Nov. 7, 7, 8; Nov. 8).

*****Zonotrichia querula* (Nuttall): HARRIS' SPARROW**

Status.—Casual (very rare?) transient and/or winter resident.

Records.—Although I searched hopefully for it for some years, Harris' Sparrow was not discovered in Kentucky until December 15, 1952, when Benson (1953:13) carefully observed 2 birds at a feeding station at Henderson, Henderson County. On December 21, he and Virginia Smith noted 4 more in a hilly woodlot in the same county, where still another record, of 3 birds, was made on December 26, 1953 (*Kentucky Warbler*, 30:9, 1954). Others were reported at nearby Evansville, Indiana, at about the same time. Since then, Harris' Sparrows have been noted as follows: 1 immature bird near Louisville, Jefferson County, December 9, 16, and 23, 1956 (Krull, 1957:57), with another bird on the last date seen by Monroe and Monroe (see *Kentucky Warbler*, 33:13, 1957); 1 adult in the same area, May 4, 1958, seen by Sommers (1958:45) and Stamm; and 1 adult at Frankfort, Franklin County, on December 14, 23, and 29, 1957 (H. Jones, 1958:45). The habitats and behavior of the various birds, as described, seem to have been similar to those characteristically chosen and displayed by the many Harris' Sparrows wintering in eastern Kansas. While increasing observation may account for the recent accumulation of records, there may also have been a recent, slightly eastward and perhaps temporary, shift in the pattern of migration. Specimens should be taken as a permanent record of the species' occurrence.

***Zonotrichia leucophrys* (Forster): WHITE-CROWNED SPARROW**

Status.—Fairly common to common winter resident.

Spring.—White-crowned Sparrows are still generally numerous in April, becoming uncommon by early May; a few sometimes remain until mid-May. Most late spring birds are in adult plumage, since the prenuptial molt generally occurs in March and April. I collected males in this molt in Oldham County on April 9, 1948, and in Calloway County on April 12, 1950. Song is regularly heard throughout the spring. Late records: May 12 (1937), in Rowan County (Barbour, 1952:29, and specimen, M.S.C.); May 12 (1919), in Boyd County, and May 13 (1920), in Clark County (Horsey, 1922:81); May 22 (1904), in Fayette County (Cooke, 1912a:99); May 16, in Nelson County (Blincoe, 1925:413); May 23 (1937), at Cincinnati, Ohio

(Goodpaster, 1941:38); May 24 (1943), at Louisville (Monroe); May 11, in Warren County (Wilson, 1922:238).

Fall and winter.—Individuals are occasionally noted in early October, or even in late September; White-crowns usually appear in mid-October, becoming common by early November at the latest. Early records: October 1, in Morgan County (specimen, R.W.B.); October 15 (1939), at Cincinnati, Ohio (Goodpaster, 1941:38); October 10 (1938), in Boone County (Wetmore, 1940:572); October 7 (1920), and October 8 (1912), in Nelson County (Blincoe, 1925:413); September 26 (1948), in Meade County (Monroe; 1 immature bird); October 11, at Louisville (Monroe); October 11, in Warren County (Wilson, 1922:238). I heard birds singing in Oldham County on October 29, 1948, and in Fulton County on November 9 and 11, 1948. As do other zonotrichias, white-crowns often sing in winter, especially on warm and bright days. The present species has narrower habitat preferences than the White-throated Sparrow, favoring brushy situations in fairly open country, especially thickets and rows of trees along country lanes, the edges of sparse woodland, osage-orange hedges, brush piles, and open groves of small trees and old orchards. In such situations it is often very numerous, occurring in loose flocks, and several hundred may sometimes be found along a mile or so of roadside thickets and hedges. In October, the ratio of immatures to adults seems higher than in mid-winter, suggesting that young birds tend to arrive somewhat earlier.

Geographic variation.—The species breeds near the limit of trees. East of Hudson Bay most breeding White-crowned Sparrows have black lores (*Zonotrichia leucophrys leucophrys*), while those to the west of Hudson Bay usually have the feathers of the same area white (*Z. l. gambelii*). There are other slight, average differences, but a high degree of uniformity prevails in respect to this convenient character. Both subspecies occur in Kentucky, the former greatly in the majority.

Zonotrichia leucophrys leucophrys (Forster)

All general statements in the account above may be taken as applying to the present subspecies, to which all specimens examined are referable save 6. Occasional skins are seen which seem to approach *gambelii* on one side of the head only, an appearance which may result from loss of black feathers or from the "make" of the skin.

Zonotrichia leucophrys gambelii (Nuttall)

The first specimen from Kentucky was reported by Lovell (1943c:196), who banded it in his yard at Louisville, as an immature, on January 6, 1942. As an adult, the same bird returned, and was collected on December 21, 1942. More recently, I took 2 specimens of *gambelii* (U.M.M.Z.), both selected as such in the field, an immature 1 mile west of Oakton, Hickman County, on December 28, 1950, and an adult 4 miles west of Barlow, Ballard County, on January 4, 1951. These were unknown to Lovell (1951a:40) when he reported an adult male (B.L.M.) taken at Louisville on April 30, 1951, as the second record for Kentucky. Two immatures in the Bernheim Collection, without data but taken by Figgins presumably in Kentucky, seem also to be *gambelii*. The subspecies has been reported also from Cincinnati, Ohio, by Goodpaster (1941:38), and an hitherto unreported specimen from that area is in the Charles Dury collection at the Cincinnati Museum of Natural History, dated "April" (orig. no. 808, new number 897; see Maslowski and R. Dury, 1931:106, under *Z. l. leucophrys*). After study of many specimens I think immature *gambelii*, at least in the hand, can be identified as well as adults by loral characters, assuming these parts are perfectly intact. If seen under excellent conditions, the subspecies, particularly adults, can be identified in the field with some assurance by an experienced observer; I have examined a great many individuals in Kentucky and am convinced that the vast majority were not *gambelii*. The relatively high proportion of the subspecies among the specimens examined is almost certainly a result of selective collecting.

Specimens examined.—Total, 36 (including 4 *gambelii* as indicated; all others are *Z. l. leucophrys*). M.S.C.—2 males, 1 unsexed (all adults), Rowan County (April 28, May 12; Oct. 21); R.W.B.—1 immature female, Morgan County (Oct. 1); U.K.—2 males (immature, adult), Fayette County (Oct. 14, Nov. 11); C.W.B.—4 adult-plumaged males, Nelson County (May 2, 4, 5, 7); B.L.M.—1 immature male, Oldham County (Dec. 14); 1 adult male (*gambelii*), Jefferson County (April 30); J.D.F.—2 males (adult, immature), 1 immature female, Marshall County (Oct. 28); Harvey B. Lovell—1 unsexed adult (*gambelii*), Jefferson County (Dec. 21); U.S.N.M. (see Wetmore, 1940:572)—5 specimens from Boone, Carroll, Hopkins, and Trigg counties (Oct. 10–Nov. 2); U.M.M.Z.—1 immature male (coll. E. P. Edwards), Franklin County (Feb. 18); 1 immature female (weight, 33.2 gm., very fat), Jefferson County (Oct. 29); 5 males (3 immatures not weighed; adults, 28.0, 29.6 gm., not fat), Oldham County (April 6, 7, 9, Oct. 29, 29); 1 immature female (27.2 gm., moderately fat), Meade County (Oct. 22); 2 males (immature, 30.8 gm., not fat; adult, 31.7 gm., not fat), Calloway County (April 12); 1 immature female (*gambelii*; 34.5 gm., moderately fat), Hickman County (Dec. 28); 1 adult male (*gambelii*; 31.5 gm., not fat), Ballard County (Jan. 4); 1 immature male (29.5 gm., not fat), 2 females (immature, 30.0 gm., very fat; adult, 28.6 gm., moderately fat), Fulton County (Nov. 10; Nov. 7, Dec. 28).

Zonotrichia albicollis (Gmelin): WHITE-THROATED SPARROW

Status.—Winter resident, uncommon in northern and eastern Kentucky to common in western Kentucky; common transient everywhere.

Spring.—The species is numerous in April and early May, and a few often remain until mid-May or even later. Transients must make up a considerable portion of the numbers present in April at localities where large numbers do not ordinarily winter. The species sings regularly through the spring. Late records: May 12 (1920), in Clark County (Horsey, 1922:81); June 2 (1887), at Eubank, Pulaski County, average of 7 years May 10 (Cooke, 1912a:103); May 23 (1937), at Cincinnati, Ohio (Goodpaster, 1941:38); May 24, at Louisville (Monroe); May 17, in Warren County (Wilson, 1922:238).

Fall and winter.—Near the end of the early warbler migration, in late September or early October, White-throated Sparrows arrive with juncos, Myrtle Warblers, and Lincoln's Sparrows. Early records: October 2 (1938), in Rockcastle County (Wetmore, 1940:572); October 3 (1886), in Pulaski County, average of 7 years October 13 (Cooke, 1912a:104); September 25 (1938), at Cincinnati, Ohio (Goodpaster, 1941:38); September 23 (1954), at Louisville (Monroe); September 23, in Warren County (Wilson, 1922:238). Croft (*vide* Monroe) noted 1 near Louisville on the very early date of August 31, 1955. Through the fall of 1948, spent in the field in central and western Kentucky, I frequently heard White-throated Sparrows singing, most being young birds which sang a muted, wheezy song resembling the spring song only in tempo and pitch. The White-throat is perhaps the most numerous transient fringillid throughout Kentucky, and in the western part of the state it rivals the Song and Swamp sparrows as the most numerous wintering sparrow not breeding there. While it occurs in the open situations frequented by White-crowned Sparrows, and sometimes with them, it is more at home in open woodland, forest edge, or in brushy or weedy fields near wooded areas. At times, perhaps always, the species is extremely numerous in winter in swampy grape-tangled lowland forests in western Kentucky, where in dense, shaded areas one is often greeted by eruptions of dozens of White-throats from the ground, brush piles, and cane patches. In northern and eastern Kentucky the species is somewhat less numerous in midwinter. It is sometimes uncommon at Louisville in January, and perhaps at best fairly common. Records given by Goodpaster (1941:38) suggest that it is uncommon at Cincinnati, Ohio, and both Beckham (1885:27) and Blincoe (1925:413) recorded few in winter at Bardstown. I noted none in Laurel County, February 3–5, 1950. However, according to Barbour (1952:29) the species is a common [?] winter resident in Rowan County at the edge of the Cumberland Plateau, and it is recorded from time to time on Christmas bird counts from localities all over the state.

Specimens examined.—Total, 22. M.S.C.—1 male, 1 female, Rowan County (March 1; Oct. 21); 1 female, Calloway County (April 28); U.K.—1 female, Fayette County (Oct. 14); B.L.M.—1 male, 1 female, Jefferson County (Oct. 17; Feb. 10); J.D.F.—1 female, Jessamine County (May 2); 1 female, Marshall County (Oct. 28); U.S.N.M. (see Wetmore, 1940:572)—7 specimens from Rockcastle, Carroll, Meade, Edmonson, Hopkins, and Trigg counties (April 20–Nov. 8); U.M.M.Z.—1 male, Jefferson County (April 4); 1 immature male (weight, 27.1 gm., moderately fat), 1 unsexed (30.1 gm., very fat), Meade County (Oct. 22; Oct. 30); 1 immature male, Hickman County (Nov. 13); 1 immature male (30.1 gm., fat), 2 females (adult, 26.8 gm., moderately fat; immature, 22.9 gm., not fat), Fulton County (Nov. 6; Nov. 11, 7).

Passerella iliaca (Merrem): FOX SPARROW

Status.—Transient, uncommon to fairly common, occasionally common; uncommon winter resident.

Spring.—The Fox Sparrow departs for the north rather early, decreasing in numbers in early April; it is rarely recorded after mid-April. In early spring it is sometimes locally common. Near Louisville years ago, on occasions in March, I have seen dozens in open, sparsely understored woodlots. Beckham (1885:29) had perhaps noted similar waves of migrating Fox Sparrows, since he wrote that the species was "abundant in March" in Nelson County. Late records: April 18 (1957), at Louisville (Monroe); April 15 (1950), in Calloway County; and April 12 (1950), in Lyon County (Handley and Mengel).

Fall and winter.—Fox Sparrows arrive rather late. Although a few have been recorded in middle and late October, the species is not usually numerous before early November. Early records: October 23 (1904), in Fayette County (Cooke, 1913a:107); October 24 (1938), in Muhlenberg County (Wetmore, 1940:572); October 28, at Louisville (Monroe); October 20 and 21 (1948), in Meade County (Mengel); October 13, in Warren County (Wilson, 1922:239). Although it is regular in occurrence and can readily be found by observers familiar with its habits, the Fox Sparrow seems never to be present in numbers comparable to those of such species as the Swamp, Song, and White-throated sparrows. In Kentucky, transients may be found in a variety of forested and wooded situations, but the habitats most preferred are evidently the same as those favored in winter, typically dense stands of tall weeds and grasses such as horseweed, goldenrod, ironweed, and cane, or shrubby growth and tangled masses of grape at forest edges and often near water. In such habitats I found the species regularly, in small numbers, in the Purchase counties in November, 1948, and in December and January, 1950–1951. One that I took in eastern Kentucky, Lewis County, on November 23, 1948, was in a dense patch of giant ragweed (or horseweed) near the Kinniconick River. Fragments of the strikingly loud, clear song are often heard on fall and winter days. While the Fox Sparrow is probably more numerous in western Kentucky, it is fairly regular in winter as far north and east as Louisville. Beckham (1885:29) found it common in some winters at Bardstown. Farther north and east it may be less numerous, as suggested by the comments of Goodpaster (1941:38) at Cincinnati and Barbour (1952:29) in Rowan County.

Geographic variation.—Although it is possible that individuals from the ranges ascribed to certain northern and western subspecies may occasionally reach Kentucky, I have seen no birds among the few specimens examined that were not referable to the eastern subspecies, *Passerella iliaca iliaca* (Merrem).

Specimens examined.—Total, 16. M.S.C.—2 males, 1 unsexed, Rowan County (March 1, 28; March 26); U.K.—1 male, 1 female, Lincoln County (Feb. 2); B.L.M.—1 female, Jefferson County (March 9); Bernheim Collection—1 unsexed (and 6 specimens without data, not included in total), Woodford County (Nov. 16); U.S.N.M. (see Wetmore, 1940:572)—3 specimens from Muhlenberg County (Oct. 24), Trigg County (Nov. 5), and Butler County (Nov. 7); U.M.M.Z.—1 male, Lewis County (Nov. 23); 1 male (weight, 45.6 gm., very fat), 3 females (37.0 gm., moderately fat; 38.2 gm., not fat; 38.3 gm., moderately fat), Fulton County (Dec. 26; Nov. 6, 7, Dec. 26); 1 immature female (43.2 gm., very fat), Ballard County (Jan. 4).

Melospiza lincolni (Audubon): LINCOLN'S SPARROW

Status.—Uncommon to fairly common transient.

Spring.—Through the eastern United States, wherever it has been carefully studied, Lincoln's Sparrow has proved to be a late migrant. Since some observers have experienced difficulty in separating the secretive Lincoln's Sparrow from, particularly, immatures of the much more numerous and earlier-migrating Swamp Sparrow, it seems best in the absence of specimens to disregard all of the few records earlier than April 15. While the species may prove to be present in the state regularly from mid-April to mid-May, it is probably never numerous before the end of April. Monroe's earliest comparatively recent record is for April 18. In excellent habitats in Lyon, Trigg, Marshall, and Calloway counties, Handley and I searched persistently for Lincoln's Sparrows, April 11–16, 1950, finding none among the many Swamp and Song sparrows present. While by no means always so, Lincoln's Sparrows are sometimes fairly common in early May, inhabiting dense brush at the edges of woods, weedy fields, and marshy situations where willows and other thick, shrubby growth occurs. On May 5, 1949, in southern Warren County, I recorded 5 or 6 along a willow-bordered drainage ditch, where the birds were difficult to see and flush. Beckham (1885:28) considered the species "not uncommon in May" in Nelson County and took a specimen (C.W.B.) on the late date of May 26 (1882). Monroe's latest record at Louisville is for May 15. The latest record, reported in careful detail, is provided by Walker's observation (1938:32), from June 5 through 7, 1937, of a bird near Hopkinsville, Christian County. Transients frequently sing.

Fall.—While a few Lincoln's Sparrows arrive by middle or late September, the species is probably never numerous before October 1, remaining through the latter month and becoming rare by early or mid-November. Early records: October 4 (1938), in Rockcastle County (Wetmore, 1940:572); September 24 (1939), in Rowan County (specimen, M.S.C.); September 24 (1939), at Cincinnati, Ohio (Goodpaster, 1941:38); September 7 [?] (1905), in Fayette County (Cooke, 1913b:238); September 18 (1885), in Nelson County (specimen, C.W.B.); September 12 (1959), near Louisville (Monroe); September 20, in Warren County (Wilson, 1922:239). The species seems to be decidedly more numerous in fall. If anything more secretive than in spring, it is yet observed in greater numbers. I noted 1 in upland blackberry thickets in Meade County on October 20, 1948, and in thick giant ragweed on the Ohio River bank opposite the Falls of the Ohio River at Louisville, George M. Sutton and I "squeaked" up 3 or 4 on October 24, 1948. In Fulton County on November 6, 1948, I saw 2 and took 1 from dense grape tangles at the edge of a lowland forest near the Mississippi River, and I took 2 other specimens in Laurel County, October 8 and 9, 1951. At the last locality the birds were fairly common October 5 to 9, being observed in weedy fields near pine woods in the Cumberland National Forest, in fallow fields and forest edges adjoining deserted farm land east of London, and in an alder marsh just south of London. Dates of departure are difficult to determine from present evidence. Monroe has made numerous records near Louisville up to November 9. Later than this he has only two sight records, for the surprisingly late dates of December 5 and 21 (there is another, by Stamm, for December 23, 1956). The species is occasionally reported on Christmas bird counts, but I am not sure that all such records have been authentic. Specimens should be taken to document records made later than early November. Although it is possible that a few birds winter, there is at present no significant evidence to this effect, the A.O.U. Check-List (1957:628) notwithstanding.

Geographic variation.—The few specimens taken in Kentucky are all referable to the eastern subspecies *Melospiza lincolni lincolni* (Audubon).

Specimens examined.—Total, 12. M.S.C.—1 male, Rowan County (Sept. 24); R.W.B.—1 male, Rowan County (Oct. 21); C.W.B.—1 male, 3 females, Nelson County (May 8; May 15, 26, Sept. 18); B.L.M.—1 male, Jefferson County (May 11); C.U.—1 male, Logan

County (April 30); U.S.N.M.—1 specimen, Rockcastle County (Oct. 4); U.M.M.Z.—2 adult males (weights; —, 19.3 gm., very fat), Laurel County (Oct. 8, 9); 1 male (20.1 gm., very fat), Fulton County (Nov. 6).

Melospiza georgiana (Latham): SWAMP SPARROW

Status.—Fairly common to abundant transient; uncommon to common winter resident, increasingly numerous westward and southward.

Spring.—The peak of migration is probably in the first half of April, when Swamp Sparrows are considerably more numerous than in winter. The species may still be fairly common in early May, but decreases rapidly thereafter. In Lyon, Trigg, Marshall, and Calloway counties, Handley and I found this by far the most numerous sparrow, April 10–16, 1950, noting hundreds daily in all sorts of brushy habitats. We recorded a sharp decrease on April 14. Favored habitats are wet, lowland fields and forest edges, scrubby or brushy growth along streams and drainage ditches, and marshes, but Swamp Sparrows are also found far from water, in dry situations such as blackberry tangles in upland fields. The birds often sing on migration. The majority of specimens collected in April are molting on their heads and necks. In Warren County, I found Swamp Sparrows fairly common on May 5 and 6, 1949, and noted the last 3 birds of the spring in swampy woods in Fulton County on May 15. I noted several singing birds in a willow-cattail marsh in Laurel County on May 7 and 8, 1952. Late records: May 18, in Nelson County (Blincoe, 1925:413); May 19, at Louisville (Monroe); May 8, in Warren County (Wilson, 1922:239).

Fall.—The species is occasionally noted in late September and is probably present regularly by early October; peak of migration near late October. Early records: October 5 (1938), in Madison and Rockcastle counties (Wetmore, 1940:572); October 11 (1936), at Cincinnati, Ohio (Goodpaster, 1941:39); September 28 (1957), near Louisville (Monroe). In 1951, I recorded the apparent arrival of the species at two widely separated localities. In a marsh just east of Louisville extensive investigation revealed none on September 28, but on September 30, 3 were seen and an immature female taken. In Laurel County, work in several habitats disclosed no Swamp Sparrows on October 3 and 4. On October 5, 2 were noted in brush along a minute stream in a farm clearing on the uplands of the Cumberland National Forest, and on October 6 I saw 2 in an alder marsh south of London. On October 8, after passage of a cold front, some 20 were recorded in the clearing, with 20 in the marsh on the following day. On October 10 the species was common everywhere. Throughout the state the Swamp Sparrow is common, sometimes abundant, later in October and in November, occurring in much the same habitats as in spring. Although its inconspicuousness has resulted in wide discrepancies among estimates of its abundance, much information now available shows the Swamp Sparrow to be among the most numerous transient sparrows.

Winter.—In December there is a gradual decrease in numbers through most of the state. The species winters throughout Kentucky but is evidently not very numerous in midwinter in the north and east, being fairly common (Barbour, 1952:29) in Rowan County and rare at Cincinnati, Ohio (Goodpaster, 1941:39; Kemsies and Randle, 1953:58). On February 3, 1950, I succeeded in finding only 1 (with 12 Song Sparrows) in an hour of work in an alder marsh near London, Laurel County. At Louisville, the species is uncommon in midwinter; Monroe has records scattered through January and February, and careful search on any day in winter will usually reveal a few, often in small flocks, in dense cover along the Ohio River. The species is similarly uncommon in south-central Kentucky (Wilson, 1939:34), but in the extreme west it may be among the more numerous of wintering sparrows. This was true in the Purchase counties in late December, 1950, and early January, 1951, when I found it the most numerous sparrow in the area.

Geographic variation.—Long regarded with some reason as negligible, the geographic variation of the Swamp Sparrow received considerable attention between 1938 and 1951. For a time after its description by Oberholser (1938:675), *Me-*

lospiza georgiana ericrypta was regarded as a western subspecies, as it was thought to be when Wetmore (1940:572-573) identified Kentucky specimens in the U. S. National Museum, and when Griscom (1948) remarked that *ericrypta* was quite "good." Subsequently, examination of a large series of breeding specimens caused Godfrey (1949) to conclude what Griscom had suspected, that *ericrypta* is a northern (as well as western) subspecies, breeding in the east north of the range of *M. g. georgiana*. Assuming generally southward movement, individuals belonging to both subspecies are to be expected in Kentucky on migration; the occurrence in Kentucky of still another subspecies, *M. g. nigrescens*, described from Delaware and vicinity by Bond and Stewart (1951) seems less likely and is thus far unrecorded.

With all of the writing on the species, little has yet been made known of the range of variation within breeding populations, and the percentage of separability among them. We thus "identify" our specimens by comparing them with migrant and wintering birds previously "identified" by others under the same handicap, a procedure which doubtless results in considerable error! We may name extreme specimens, perhaps with some certainty of correctness, but we do not know whether "intermediates" are normal variants or intergrades, and in further work, alas, such birds sometimes disappear from "typical" series, thus obscuring the facts of variation.

With some misgivings, therefore, concerning the true identity of individual specimens, I admit two subspecies to the present list.

Melospiza georgiana ericrypta Oberholser

The northern and western subspecies. Six comparatively brightly colored specimens referred to this subspecies, all taken in 1938, were listed by Wetmore (1940:573), and were from Trigg (Oct. 31), Muhlenberg (Oct. 18, 24), Butler (Nov. 7, 11), and Meade (April 23) counties. To these may be added some of a series of 24 additional specimens now at hand, of which 9 are more or less distinguished by paler, grayer dorsal coloration and slightly greater breadth of light feather edgings. These are as follows: a male from Warren County, May 3, 1949; a male from Trigg County, April 14, 1950; a female from Lyon County, April 11, 1950; a female from Ballard County, January 4, 1951; a male from Hickman County, December 24, 1950; and 2 males from Fulton County, November 8 and 10, 1948, all collected for or by me. On the basis of present knowledge, it seems best to call these birds *ericrypta*, and it is probable that some of them really are. Given a large series of carefully aged and sexed autumn birds of comparable museum age, it should be possible to determine with assurance whether two distinct populations with different modes of coloration are actually present.

Melospiza georgiana georgiana (Latham)

The southern race of the Swamp Sparrow, chiefly west of the Atlantic slope. All specimens listed below which are not designated as *M. g. ericrypta* in the account immediately preceding are referred tentatively to the present subspecies, except specimens listed under M.S.C., U.K., B.L.M., and C.U. (10 in all), which were not determined because of lack of comparative material.

Specimens examined.—Total, 48 (for subspecific determination see above). M.S.C.—2 males, 1 female, 1 unsexed, Rowan County (April 26, 28; Oct. 23; Oct. 21); U.K.—1 male, Woodford County (April 9); B.L.M.—3 males, 1 female, Jefferson County (May 5, Nov. 13, 13; April 16); 1 male, Oldham County (April 20); C.U.—1 male, Logan County (April 30); J.D.F.—1 male, Woodford County (May 4); U.S.N.M.—13 specimens from Rockcastle, Madison, Boone, Meade, Muhlenberg, Butler, Hopkins, and Trigg counties (April 23–Nov. 11); U.M.M.Z.—2 females (weights, 17.3 gm., moderately fat; immature, 15.8 gm., very fat), Laurel County (April 30, Oct. 5); 2 females, Jefferson County (April 7, Sept. 30); 1 female, Oldham County (April 9); 1 male (18.2 gm., moderately fat), Meade County; 1 male (19.3 gm., moderately fat), 1 female (14.5 gm., moderately fat), Warren County (May 3; May 5); 2 males (19.0 gm., moderately fat; 16.6 gm., little fat), 1 female (17.2 gm., moderately fat), Lyon County (April 11, 14; April 11); 1 male (17.1 gm., not fat), Trigg County (April 14); 3 males (17.5 gm., not fat; 19.4 gm., fat; 17.6 gm., not fat), 1

female (16.5 gm., moderately fat), Marshall County (April 10 [3]; April 11); 1 female (22.2 gm., extremely fat), Ballard County (Jan. 4); 2 males (20.2 gm., fat; immature, 18.6 gm., moderately fat), Hickman County (Dec. 24); 3 males (18.2, 17.4, 17.1 gm.; moderately fat), 1 female (16.9 gm., moderately fat), Fulton County (Nov. 7, 8, 10; Nov. 7).

Melospiza melodia (Wilson): SONG SPARROW

Status.—Fairly common to common resident throughout Kentucky, except for the southwestern portion where absent in summer and common in winter; in the breeding season common and generally distributed in northern and eastern Kentucky, rare and local in a comparatively narrow strip along the southern and western edge of the breeding range (see Fig. 42), which has been materially expanded in the last 75 years.

Spring.—Song, heard occasionally throughout winter, becomes regular by March. Small, loose flocks of Song Sparrows inhabiting dense winter cover break up and the birds become more uniformly distributed. Some over-all decrease in numbers probably occurs, although departing birds from farther north are doubtless replaced to some extent by others returning from the south. In southwestern Kentucky, outside of the present breeding range, the departure of the winter population is evidently nearly completed by May 1. Late records: April 19 (1894), in Pulaski County (then evidently outside of breeding range), average of 5 years April 12 (Cooke, 1910b:69); May 6 (1949), in Warren County (Mengel); May 5 (1940), at Kentucky Woodlands National Wildlife Refuge, Trigg County (Cypert; Refuge files). In several southwestern counties outside the breeding range, Handley and I found the species uncommon, April 10–16, 1950, indicating that most birds had already departed.

Breeding records.—Clutches, as indicated by 41 dated breeding observations, may be completed from April 1–10 to August 11–20, with a peak (first nestings) near April 20; no later peak is clearly indicated by the data. Records are from Wise County, Virginia, adjoining Harlan County (Mengel, notes), and from Harlan and Bell (Stamm, notes), Rowan (Barbour, 1951a:38), Knott (Stamm, notes), Powell and Laurel (Mengel, notes), Scott (Lovell, 1951b:62), Franklin (Stamm, notes), Oldham (Stamm, Shackleton, and Slack, 1953:28), Jefferson (Lovell, 1945a:144; 1951b:62; Pieper, 1955:26; Hays, 1957:7; Shannon, 1957:59; Stamm, notes; Monroe, Mengel, notes), Daviess (Powell, 1951:9, 1953:60), Henderson (McKinney, 1951:63; Mengel, notes), Hopkins (Bacon), and Webster (Holt and Semple, 1949:66) counties, Kentucky. The earliest egg date (Stamm, notes) is provided by 2 eggs noted on April 3 (1947), in Jefferson County, and the latest (Stamm, notes) by a clutch of 3 completed about July 28 (1960), in the same. Later nestings are indicated, however, by young in the nest noted on August 19 (1934), in Jefferson County (Monroe), and young just out of the nest on September 6 (1949), in Henderson County (Mengel). The mean size of 27 clutches is 4.2 ± 0.17 eggs (3–5). Seventeen clutches completed between April 1 and May 31 average 4.3 eggs; eight completed between June 1 and July 10 average 4.0. Nests are usually placed in rather dense grassy or shrubby cover at the edges of open areas, either on the ground or in low shrubs and vines. Recorded among the latter are Japanese honeysuckle, ornamental spruce and arbor vitae, privet, and barberry (the last especially favored at some localities near Louisville). As is the case with the Rufous-sided Towhee and the Field Sparrow, more early than late nests may be placed on the ground, although the sample is not yet adequate (4 of 13, or 30.7 per cent, in which clutches were completed April 10–May 31; 2 of 7, or 28.5 per cent, with clutches completed June 1–July 10). The average height above ground of 16 elevated nests was 2.6 feet (0.5–5.0). Laying of 4 eggs on consecutive days, followed by incubation periods of 13 and nestling periods of 10 days were noted by both Holt and Semple (1949), in Webster County, and Pieper (1955), in Jefferson County. Use of the same nest in two consecutive seasons was recorded by Shannon (1957), in Jefferson

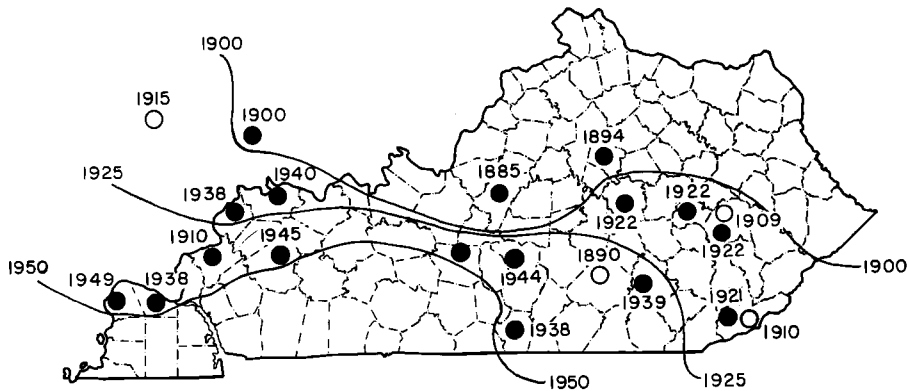


Fig. 42. Breeding distribution of the Song Sparrow in Kentucky, showing the apparent, gradual spread of the species. Dark circles represent definite records with dates; open circles represent localities where dated observations revealed no Song Sparrows. Dated lines represent approximate range limits at given dates.

County. There seems to be but one record of cowbird parasitism, a nest with 5 heavily incubated Song Sparrow eggs and 1 decayed cowbird egg, Jefferson County, May 7, 1938 (Monroe). Just outside the state, in Wise County, Virginia, I noted a nest in an unusual situation on May 24, 1952; containing 4 young ready to leave, the nest was situated in a pile of drift at the base of a small sycamore on a stream bank. On May 7, 1952, near London, Laurel County, I recorded 2 young just able to fly, one of which was being pursued by a large blacksnake (*Coluber constrictor*). I noted other young just able to fly at Louisville on July 30, 1951, and at Henderson (specimen, U.M.M.Z.) on September 6, 1949. In Powell County, I noted grown young being fed by adults on June 23, 1948. Monroe's rather numerous breeding records from Jefferson County have been included in the foregoing summaries but seem too extensive to list in detail. A set of 4 eggs, said to be from Hopkins County at the edge of the breeding range, was in Bacon's collection when I examined it at Madisonville. The species is rare and irregular there (Hancock, 1954:46).

Breeding distribution.—See Fig. 42. The Song Sparrow occupies all of eastern Kentucky and all of northern Kentucky north of Louisville. It occurs in summer south to the Tennessee line at the southeastern corner of Kentucky, and extends westward along this line at least as far as Cumberland County and probably to Monroe County. West of a north-south line drawn through Cumberland County, the summer range does not extend far south of the Ohio River. Marginal records are from Nelson County (Blincoe, 1925:413), Cumberland County (Walker, 1940:29; Wilson, 1945:16), and Taylor, Hart, and Hardin counties (Wilson, *loc. cit.*). Still farther west, the species is nearly restricted to the immediate vicinity of the Ohio River, along which it probably occurs, in decreasing density, in all counties west to Ballard. It is fairly common in parts of Daviess County (Powell, 1951a:64) and Henderson County (where Monroe and I found many in July, 1940), and also occurs in Union County (Wetmore, 1940:574). It is a rare summer resident in Hopkins (Hancock, 1947c:64, 1954:46), Crittenden, and Webster counties, increasing in the last two (Holt and Semple, 1949:66; Gilchrist, 1947:6), and in McCracken County (Pickens, 1940:12). The westernmost summer record seems to be provided by a single pair (female with brood-patch) which I found on the Ohio River bank near Barlow, Ballard County, on June 10, 1949. Where thoroughly established, the Song Sparrow frequents a wide variety of brushy situations at forest

edges, along shrub-bordered fence rows, and in yards and gardens about human habitations. In areas where it is rare, it should be looked for in canebrakes, dense weed patches, and thick brush close to streams. It occurs rarely at the top of Black Mountain, Harlan County, where I noted a few in July, 1946, and June and July, 1951, but none May 13–June 6, 1952.

History.—Although nests were found by Monroe in Jefferson County as long ago as May 31, 1917 (5 eggs), no breeding record seems to have been published before Lovell's first (1945a), and in the 1920's and 1930's there was much conjecture as to the extent of the breeding range in Kentucky. There is considerable evidence that this has been extensively expanded in the last 75 years, evidently as part of a general expansion of range in the southern United States (see Odum and Burleigh, 1946).

A number of positive and negative records dating from the period *ca.* 1880–1910 roughly suggests the boundaries of the breeding range one-half to three-quarters of a century ago. The species was then well established in the upper Ohio valley, being common at Cincinnati (Langdon, 1879:176), but was just making its appearance farther down, being first noted in the lower Wabash valley of Illinois about 1900 (Ridgway, 1915:198); a little to the south and east, it was apparently already established near the Ohio River, being uncommon in Nelson County (Beckham, 1885) and perhaps present—at least by inference present—at Lexington (Garman, 1894:17). In this period, however, it appears to have been absent from much, perhaps most, of the Cumberland Plateau, since around 1890 John B. Lewis, supplying records later published by Cooke (1910b:69), obviously regarded it as a migrant only, at Eubank, Pulaski County, and as late as 1909, Howell (1910:297) failed to note it at Jackson, Breathitt County. (At the latter date [Howell, *loc. cit.*] it had reached Hawesville, Breckinridge County, in the west, but, if present, was not noted near Mount Vernon, Indiana, just above the mouth of the Wabash.) The subsequent spread of the species over the Cumberland Plateau seems to have been quite rapid; in any event, it was present in Harlan County in 1921 (Stone, 1921), and at various points elsewhere on the plateau at about the same time (Horsey, 1922:82). By 1938, presumably spreading westward from the plateau down the Cumberland River, it was present at Burkesville, Cumberland County (Walker, 1940:29), and, as noted above, it has further expanded its range, no doubt gradually, down the Ohio River virtually to the Mississippi, arriving in Ballard County no later than 1949.

This pattern of expansion, if correctly surmised, has been at first sight a curious one, unrelated to the boundaries of the several physiographic and vegetational divisions of the state. While spreading over the Cumberland Plateau in the east and down the Ohio River in the west, the species has remained virtually static on the central portion of the "front," being found in Nelson County, for example, only in small numbers by both Beckham (1885) and Blincoe (1925:413), and it is still uncommon or absent south of the line connecting Bardstown, Elizabethtown, and Owensboro. An explanation may be found in the tendency of the species, noted by Ridgway (1915:198), to appear in new areas first in the stream valleys, perhaps finding riparian habitats more continuous, suitable, and easily colonized than upland situations. If this assumption is true, it may at once be noted that the Cumberland Plateau affords three important northward draining river systems (Big Sandy, Licking, Kentucky) providing avenues of colonization throughout eastern Kentucky, and access, once this was accomplished, to the headwaters of the southward- and thence westward-flowing upper Cumberland. Some distance to the westward, down the Ohio, the Salt River provides access, through the Knobs, to Nelson County, where Beckham's early observations were made. Downstream, no important streams drain north into the Ohio for a considerable distance, until the Green, Cumberland, and Tennessee rivers are reached, and if the current explanation is correct, continued expansion of the species may find it moving in time up

these streams (and down the Mississippi River itself) to invade, variously, the Western Highlands, Pennyroyal, and Purchase.

Fall and winter.—In mid-autumn the Song Sparrow becomes noticeably more numerous throughout Kentucky, being for a time one of the most numerous emberizines in all open and semi-open situations providing dense, brushy cover. It is retiring at this season, resembling the Lincoln's and Swamp sparrows in its actions. In winter it may become a little less numerous, but it is still a common species throughout the state. Song is often heard in fall, and, a little less frequently, throughout winter. Several specimens (U.M.M.Z.) taken between September 20 and October 10 were in late stages of molt. Probably no migratory influx of any consequence occurs before the first or second week of October. In Hopkins County, where the species is rare in summer, I noted none in good habitats, September 18 and 19, 1951, and Tordoff and I recorded only 2, probably breeding birds, at Henderson, September 3–6, 1949. Early records (outside breeding range): October 4 (1887), in Pulaski County—where it now breeds commonly (Cooke, 1910b:69); October 7, in Warren County (Wilson, 1922:239). By early November it is common throughout southwestern Kentucky.

Geographic variation.—The regional variation of the Song Sparrows breeding from the Great Plains eastward is, on the whole, decidedly less marked than that shown by the species in the western part of its wide range (for example, see Chapman, 1932, pl. VII). Although the eastern subspecies await modern systematic treatment at a revisionary level, I think for the present that recognition of the four currently (A.O.U. Check-List, 1957:630–632) in general use (*Melospiza melodia atlantica*, *M. m. melodia*, *M. m. euphonia*, *M. m. juddi*) is extending the trinomial system to the limits of its utility. Certainly the identification, off their breeding grounds, of individuals and small series can be a matter of considerable difficulty, since these birds display a good deal of what seems at first glance to be individual¹ variation in color,² to which may be added differential soiling, wear, changes due to museum age of specimens, and possibly—although I have not been able to detect any (see also Marshall, 1948:234)—differences correlated with age and sex. All of these factors tend for the moment to obscure the exact degree of the seemingly rather extensive overlap between the several eastern subspecies which, in turn, no doubt, are far from uniform throughout their ranges.³

Since (as noted below) the breeding Song Sparrows of Kentucky are all to be placed with *Melospiza melodia euphonia*, the immediate problem is determining whether more than one subspecies is represented in the state in migration and winter. While not dispelling all doubt as to the origins of individual specimens, analysis of a limited number (36) of unworn Kentucky specimens taken between September 24 and February 3 suggests that this is the case.

These birds were graded according to dorsal coloration in the non-black portions of their feathers. The criteria considered were grayness, or clay-color (as opposed to brownness), paleness (opposed to saturation of coloration), and contrast (broadness and brightness of light feather edgings). Since the three characters tend in the present series to be more or less correlated (that is, browner birds tend to be more saturated; grayer ones paler; and darker, browner, birds less contrasting), comparatively little difficulty was met with in placing most specimens. Where difficulty was experienced, dorsal contrast was given added weight and the "difficult" specimen, if more contrasting, placed in the paler and grayer of the two classes of choice.

¹ This may not be as great as it first seems. I have noted a tendency toward homogeneity in local breeding populations at several eastern localities, as might be expected (Miller, 1947:188) of in-breeding groups; these populations probably differ from each other in much the same ways, if not degrees, as the numerous more isolated populations about San Francisco Bay studied by Marshall (1948).

² Size—save possibly breadth of bill in one or two races—does not seem of much importance in separating eastern populations.

³ *M. m. atlantica* is clearly more distinct and more uniform than the other eastern races here discussed.

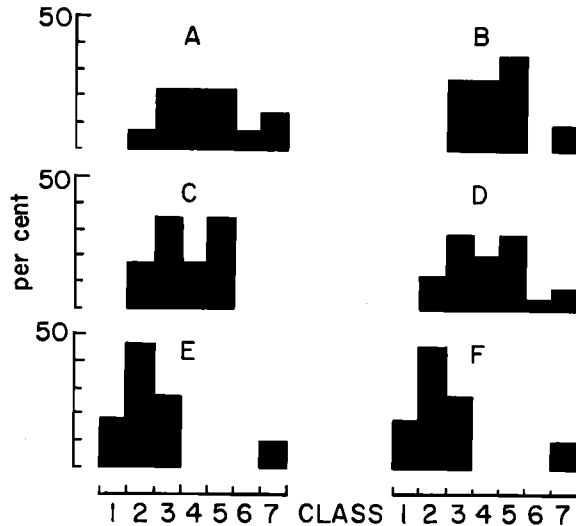


Fig. 43. Color characteristics of various populations of Song Sparrows in Kentucky. The specimens were graded according to dorsal coloration into seven classes. (See p. 511 for precise description of criteria.) In the histograms, the palest (grayest) birds are found in Class 1, grading to the darkest and most saturated (brownish) birds in Class 5, with more or less dark but increasingly reddish birds in Classes 6 and 7. The samples represented are: A. 13 specimens from eastern Kentucky, October 5–November 24 and February 3 (1); B. 11 specimens from eastern and central Kentucky and probably representing the breeding population, September 24–October 10 (these specimens contribute also, as appropriate, to A, C, and D); C. 12 specimens from central Kentucky, September 24–November 24; D (= A + C), 25 specimens from eastern and central Kentucky, September 24–November 24 and February 3 (1); E. 11 specimens from western Kentucky, November 7–January 5; F. E repeated for ready comparison with B and D.

The birds, so graded in classes 1 to 5, were ranged with the palest, grayest class to the left and the brownest and darkest to the right. Still left over were a few definitely reddish (rufescent, erythristic) specimens which did not fit well in any class. For these classes 6 and 7 were established, with the darker reddish birds in class 7. It may finally be noted that birds in classes 1 and 2 differ from all others in having uniformly pale gray (rather than brownish buffy) auricular patches, and in having the mid-crown streak and superciliary stripe paler and grayer (less buffy).

The differential occurrence of these classes in small samples representing various areas and seasons is shown by Fig. 43, from which it appears probable that (1) western Kentucky, where the species does not breed (Fig. 43, E) draws its wintering birds chiefly from populations distinct from those breeding in eastern and central Kentucky (Fig. 43, B), and (2) that the wintering population of central and eastern Kentucky (Fig. 43, D [= A + C]) is more variable either than breeding birds (B) or western wintering birds (E), as might be expected if it consists of a mixture of resident and migrant birds. Two subspecies, accordingly, are admitted to the list.

Melospiza melodia euphonia Wetmore

This is the breeding Song Sparrow of Kentucky and evidently the most numerous subspecies throughout the year. An Appalachian form, it resembles *Melospiza melodia melodia* of the northeast, but is darker, grayer, and more richly pigmented.

All Kentucky specimens examined and not otherwise discussed are here considered to represent *M. m. euphonia*. Particularly useful for comparison has been a series of 11 fresh-plumaged early fall specimens (September 20–October 10) just completing the autumn molt and thought to represent the breeding population. These came from Jefferson (2), Laurel (8), and Rowan (1) counties and, as pointed out by Wetmore in regard to other Kentucky specimens, are somewhat paler than typical *euphonia* of the higher Appalachians. When this series was compared, as noted above, with birds taken throughout the state a little later in fall, and in winter, it was evident that the latter are somewhat more variable and include, it seems, some *M. m. juddi* (see below). A few specimens (classes 6 and 7 of Fig. 43, above), especially a male and female taken respectively in Lewis County, November 23, 1948, and Laurel County, February 3, 1950, a male from Hickman County, November 13, 1948 (all U.M.M.Z.), a male (probably a breeding bird) from Rowan County, October 5, 1939 (U.S.N.M.), and an unsexed bird (not represented in Fig. 38) from Fayette County, April 24, 1940 (U.K.), are more or less reddish and resemble *M. m. melodia*. On close examination, however, these birds are rather dark for *melodia* and none has the strongly inflated bill possessed by many members of that subspecies. I think it improbable that true *melodia* often migrates to Kentucky and prefer to consider these birds variants of *euphonia*. A number of older specimens seen are also reddish, but this may be the result of foxing.

Melospiza melodia juddi Bishop

I have seen no Kentucky specimen typical of *juddi* as it appears in its most highly developed form on the Great Plains. The nearest approach is a male (U.M.M.Z.) taken in Fulton County on November 8, 1948 (RMM 731). This specimen equals many *juddi* (though not extremes) from western Kansas in its dorsal characters but is less heavily streaked below than most. While not typical of western *juddi*, the majority of Song Sparrows wintering in western Kentucky (and some birds from farther east) are slightly but uniformly different in appearance from the birds breeding farther east. Since virtually no Song Sparrows breed in extreme western Kentucky, the numerous birds wintering there have all come from somewhere else, for the most part probably from the northern Mississippi Valley and the eastern edge of the northern plains, both within the range assigned to *juddi*, though marginal. Birds from these areas, according to Wetmore (1936:2), are darker than typical *juddi* but lack the warm browns and buffs of *euphonia*. These are precisely the characters of a majority of western Kentucky fall and winter specimens. *Melospiza melodia beata* Bangs (based on wintering specimens from Florida) was evidently proposed for this type of Song Sparrow and is considered a synonym of *juddi* (Wetmore, *loc. cit.*), which is regarded as breeding east to northern Michigan (Van Tyne, 1938:43).

Somewhat arbitrarily, I have called the following specimens (classes 1 and 2 of Fig. 43) *juddi*: a series of 4 males (November 7 and 8 [3], 1948), 1 female (November 8, 1948), and 1 unsexed (December 28, 1950) from Fulton County; 1 immature male from Marshall County (December 25, 1950), 1 female (October 24, 1948) from Jefferson County, 1 male (November 24, 1948) from Powell County (all U.M.M.Z.); and 1 male from Carroll County, October 20, 1945 (B.L.M.). Three specimens in the U. S. National Museum, previously identified by Dr. Wetmore (1940:574) as *euphonia*, seemed to me to belong with the present somewhat equivocal series of *juddi* when compared, in 1952, with all of the material now at hand. These are: immature male, Trigg County, November 1, 1938 (U.S.N.M. no. 353304), immature female, Hopkins County, October 21, 1938 (U.S.N.M. no. 353288), immature male, Butler County, November 11, 1938 (U.S.N.M. no. 353296). The worn plumage of spring specimens makes them difficult to work with. Three specimens (U.M.M.Z.) from Marshall County (1 male, 2 females, April 11 and 16, 1950) and one from Hickman County (male, April 15, 1950) are of interest since their gonads were very small at a time when the summer resident population

farther east is beginning breeding activities. All of these birds may be *juddi* from northern breeding grounds still cold in April, but I have so labelled only 2, paler and more contrastingly marked than the others (male, Marshall County, April 11; female, April 16). In all, 15 specimens have been referred to *juddi*, 10 of them from the extreme western part of the state.

Note.—A partial albino Song Sparrow seen in Hopkins County was described by Hancock (1947c:64).

Specimens examined.—Total, 97 (including both subspecies; see above for details). M.S.C.—1 male, 2 females, 4 unsexed, Rowan County (Oct. 5; Jan. 7, Feb. 17; Jan. 3, Feb. 17, Oct. 5, Nov. 2); R.W.B.—1 male, 1 unsexed, Harlan County (Aug. 17; July 17); 1 male, 1 unsexed, Rowan County (Oct. 22; Oct. 9); U.K.—2 unsexed, Fayette County (Oct. 10, 1891, Nov. 19, 1882); 1 male, 1 unsexed, Woodford County (Nov. 24; April 24); B.L.M.—1 male, Harlan County, 3,500 feet elevation on Black Mountain (July 9, 1946); 1 male, Carroll County (Oct. 20); Bernheim Collection—1 unsexed, Woodford County (April 24); U.S.N.M. (see above; see also Wetmore, 1940:574)—at least 37 specimens from Harlan, Bell, Lewis, Rockcastle, Fayette, Boone, Carroll, Nelson, Meade, Butler, Muhlenberg, Union, Hopkins, and Trigg counties (May 2–Nov. 17); U.M.M.Z.—2 males (weights, 22.0, 22.1 gm.; moderately fat), Lewis County (Nov. 23); 2 males (1 in juvenal plumage, 20.0 gm.; 1 unweighed), Powell County (June 23, Nov. 24); 3 males (18.7, 19.0, 21.6 gm.; not fat), 5 females (22.6, 19.9, 21.4 gm., moderately fat; 20.8, 20.5 gm., not fat), Laurel County (♂♂ Oct. 6, 10, 10; ♀♀ Feb. 3, Oct. 6, 10 [3]); 4 males (1 unweighed; 21.9 gm., not fat; 1 unweighed; 21.6 gm., fat), 2 females (20.8 gm., very fat; 19.2 gm., moderately fat), Jefferson County (♂♂ April 4, Sept. 20, 30, Oct. 24; ♀♀ Oct. 24, 24); 2 males (1 unweighed; 24.4 gm., very fat), 1 female, Oldham County (April 9, Oct. 29; April 9); 3 females (21.9, 18.8, 23.2 gm.; moderately fat), 1 unsexed (22.6 gm., moderately fat), Meade County (Oct. 20, 21, 30; Oct. 30); 1 small juvenal-plumaged male (18.1 gm.), Henderson County (Sept. 6, 1949); 2 males (22.8 gm., moderately fat; 25.3 gm., very fat), 2 females (23.9 gm., moderately fat; 1 unweighed), Marshall County (April 11, Dec. 25; April 11, 16); 2 females (24.0 gm., very fat; 20.2 gm.), Ballard County (Jan. 5, June 10, 1949); 2 males (23.9 gm., very fat; 22.3 gm., moderately fat), Hickman County (April 15, Nov. 13); 5 males (20.3 gm., moderately fat; 1 unweighed; 20.7 gm., not fat; 21.8, 23.1 gm., moderately fat), 2 females (18.9, 22.0 gm.; moderately fat), 1 unsexed (22.7 gm., not fat), Fulton County (♂♂ Nov. 7, 8 [3], 10; ♀♀ Nov. 8, Dec. 24; unsexed, Dec. 28).

Calcarius lapponicus (Linnaeus): LAPLAND LONGSPUR

Status.—Not well known; evidently rare to uncommon (but probably regular) winter resident, so far recorded only west of the Cumberland Plateau.

Spring.—No records technically fall within spring. Audubon (1838:472) recorded "immense flocks" on the grassy banks of the Ohio River at Henderson on February 15, 1819 (evidently the first record). On March 4, 1950, near Cincinnati, Ohio, and just outside Kentucky, Ronald Austing collected 1 bird from a flock of 15 which had wintered at Oxford Airport (Kemsies and Randle, 1953:58).

Fall and winter.—In Indiana, 60 miles north of Louisville, I recorded a flock of about 65 birds at a temporary airport at Walesboro, Bartholomew County, on November 13, 1943 (Mengel, 1944:46). Most records are for late December and later. The species has probably been overlooked for many years. Between Audubon's record of 1819 and recent observations at Louisville, there were no definite records except for Fleetwood's (1937:294) report of "hundreds" seen in Hopkins and McCracken counties in the winter of 1936–1937, and Pindar's (1925a:163) unannotated remark that the species was "rare and irregular" in Fulton County (in the 1890's). More recently a few observers have recorded the species with some regularity. On December 22, 1946, Monroe and Monroe (1948:29) saw 7 longspurs with many larks and collected a specimen in Oldham County. The same year, near Cincinnati, Ohio, Kemsies and others recorded the species, which has subsequently proved regular there in small numbers (Kemsies and Randle, 1953:58), although not earlier reported since Langdon's (1878:114) reference to a specimen (C.M.N.H.) taken December 11, 1877. Since 1946, Monroe has found longspurs at Louisville on numerous occasions in November (earliest record November 24, 1957), December,

and January, and on December 23, 1951, counted 39 in several small groups and took another specimen. On December 26 and 27, 1950, I discovered Lapland Longspurs with a flock of Horned Larks (mainly *Eremophila alpestris alpestris*) feeding in a mechanically harvested corn-stubble field 7 miles northwest of Fulton, Fulton County. On the first day there were approximately 25 longspurs with a maximum of 300 larks and on the second 10 longspurs and 150 larks. I took 4 specimens and noted that many of the longspurs seemed to be paired. They tended to remain in twos, and when two birds could be clearly seen in flight, one always looked smaller than the other. In one case I secured a female that remained, in a manner suggesting distress or concern, near a male I had just killed. There was no tendency for the longspurs to remain in separate flocks; when I had disturbed the combined flocks sufficiently, the longspurs flew about independently of other pairs and of the larks, giving a soft, single-noted whistled call. A buzzing note (lower and softer than that of the Snow Bunting) was given whenever a longspur opened its wings to fly, even though the "flight" was only a fluttering hop from one clod of dirt to another. Two weeks later, on the cold, snowy day of January 7, 1951, Monroe and I found a few longspurs with each of two distinct flocks of Horned Larks (estimated at 500 and 150) in fields of winter wheat in Jefferson and Oldham counties. Horned Larks collected from these flocks proved to be *Eremophila alpestris praticola*. Although Lapland Longspurs are sometimes found in pure flocks, perhaps characteristically so in eastern Kansas where they abound, in Kentucky they seem most often to be found with larks.

Geographic variation.—Examination of large series of specimens might reveal the occasional presence of *Calcarius lapponicus alascensis* Ridgway, the subspecies breeding in the western Arctic and recorded at least once as a migrant in Ohio (Wetmore, 1943a:132). All of the few specimens so far seen are dark, richly colored, and immediately referable to *Calcarius lapponicus lapponicus* (Linnaeus).

Specimens examined.—Total, 7 (including 1 extralimital).—C.M.N.H.—1 male, Hamilton County, Ohio (Dec. 11); B.L.M.—1 female, Oldham County (Dec. 22, 1946); 1 female, Jefferson County (Dec. 23, 1951); U.M.M.Z.—2 males (weights 30.0, 30.5 gm.; moderately fat); 2 females (26.9, 27.0 gm.; not fat and moderately fat), Fulton County (1950; Dec. 26, 27; Dec. 26, 27).

Plectrophenax nivalis (Linnaeus): SNOW BUNTING

Status.—Casual winter visitant.

Records.—The first completely acceptable recent record was made on November 19, 1952, when Maslowski and Goodpaster saw 4 Snow Buntings and secured a male (C.M.N.H.) on the Ohio River just below New Richmond, Clermont County, Ohio (Maslowski, letter: Nov. 26, 1952). The birds circled over the Ohio River on several occasions, thus entering Campbell County, Kentucky, and it is likely that the gravel bar upon which the male was taken is actually within Kentucky. Another Snow Bunting was seen there on November 22, by Sven Sjodahl and Victor Sloane (Maslowski, letter: Dec. 8, 1952). With reference to Ohio, these records were reported by Kemsies and Randle (1953:59). Bars and shoreline all along the Ohio River should be watched for the species in fall and winter. An earlier record for the Cincinnati area, of 12 birds seen on March 26, 1930, by Maslowski, was reported by Goodpaster (1941:39), and Langdon (1879:175) reported the species as an occasional winter visitant there (a male from Butler County, Ohio, January 12, 1879, is in the Cincinnati Museum of Natural History). Recent sight records involve also a single bird well seen on November 12, 1944, at Kentucky Lake (county unspecified), by Steenis (1948:56), and 1 or more reportedly seen near Ashland, Boyd County, on or about December 27, 1958 (see *Kentucky Warbler*, 35:9-10, 1959).¹

¹ Since this was written, 50 or 60 Snow Buntings were carefully observed in Marion County on December 22, 1960 (C. Webster, *Kentucky Warbler*, 37:18, 1961) and 1 bird in Jefferson County on January 20, 1961 (*ibid.*), by Mrs. S. F. Martin.

In early times, the Snow Bunting was evidently a regular winter visitant, at least in small numbers, judging from the account of Audubon (1834:516), who observed a few regularly on "some of the Barrens" (original prairies) and in small cleared areas between Louisville and the early village of Shippingport (the latter necessarily in the years around 1810).² Because of the much greater extent and continuity of forest in early times, concentration of Snow Buntings in available open areas and penetration farther south than today both seem likely possibilities, given a population of approximate equality.

A few other records in literature are vague and poorly documented. Wilson (1923c:134) recalled seeing about 25 Snow Buntings in an orchard in Calloway County in "Christmas week" of 1909. An unpublished MS in my possession (about 1925) by L. O. Pindar makes reference to a record by Mrs. Lucas Brodhead in Woodford County in the 1890's. An article in the *Detroit News* for July 25, 1948 (pictorial section, p. 3) mentions a "Snow Bunting" banded by Dr. Karl Christoferson of Sault Sainte Marie and recovered at "Hardensburgh" (Hardinsburgh), Kentucky, but A. J. Duvall obligingly checked on February 6, 1952, and informed me that the files of the U. S. Fish and Wildlife Service at Patuxent, Maryland, contained no record of such a return.

Geographic variation.—Occurring is the widespread Arctic subspecies *Plectrophenax nivalis nivalis* (Linnaeus).

Specimens examined.—Total, 1. C.M.N.H.—1 male, Clermont County, Ohio [and Campbell County, Kentucky] (Nov. 19, 1952).

HYPOTHETICAL LIST

Species listed under this heading are all represented by actual records and in no case appear because of high probability of occurrence alone. For one reason or another, they fail to meet the standards (see p. 1) for inclusion in the main list.

Plegadis sp.: GLOSSY AND/OR WHITE-FACED IBIS

Records.—Two, made by Wilson (1945b:48; 1956c:60), who flushed a bird obviously of this genus at McElroy Lake, 9 miles south of Bowling Green, Warren County, on April 21, 1945, and recorded another in the same area on May 12, 1956. He observed both birds well but was unable to give details that would certainly distinguish *Plegadis falcinellus* (Linnaeus) from *Plegadis chihi* (Vieillot). Vague mention of these birds by early authors (especially Imlay, 1793:242) is unconvincing and not certainly referable to Kentucky.

Porphyryla martinica (Linnaeus): PURPLE GALLINULE

Records.—The most convincing mention of the species is Beckham's (1885:49). This capable observer and collector clearly recalled a Purple Gallinule captured near Bardstown, Nelson County, and kept alive by him as a boy (somewhere near 1870). Reported in insufficient detail from Hopkins County, November 18, 1911 (Bacon, 1933); Warren County, 1 shot near Bowling Green in April, 1916 (Wilson, 1922:235); and Calloway County ("rare summer resident"; Wilson, 1923c:131). There are old records from Cincinnati, Ohio (Langdon, 1879:184). The species is known to breed at Reelfoot Lake, Tennessee, but the marshes there inhabited do not extend quite to the Kentucky line. While some or all of the above records may be valid, the details were improperly recorded and reported and, in any event, are now veiled by the mists of time.

² Audubon's mention (1929:8) of "thousands" seen on the Ohio River somewhere near Carrollton, October 18, 1820, may have resulted either from *lapsus*, fatigue, or excess enthusiasm.

Numenius americanus Bechstein: LONG-BILLED CURLEW

Records.—None entirely satisfactory. Audubon (1835:240–241) wrote: "I have shot some in Missouri, Indiana, Kentucky, Arkansas, and Mississippi; but the birds . . . were rare [and appear] at remote periods . . ." Sarah Price (1904a:167) referred to 1 shot near Bowling Green, Warren County, "a few years ago," and according to Lovell (1959:28) her original drawings of birds, all probably based on specimens obtained in Warren County (Library, Missouri Botanic Gardens, Saint Louis), include this species. The probability of some Long-billed Curlews occasionally reaching Kentucky is great. A final reference is Pindar's (1925a:83), quite possibly based on hearsay, describing the species as a rare migrant in Fulton County. Old Ohio and Indiana records were given by Langdon (1879:183) and Butler (1929:198).

Numenius borealis (Forster): ESKIMO CURLEW

Records.—Cooke (1888:98) wrote: "The most abundant of the three curlews. Migrates through the Mississippi Valley in immense numbers . . ." The only remaining indications of the former occurrence of this nearly extinct species in or near Kentucky (which it must have crossed in numbers) are a few vague and unsatisfactory references. Pindar (1925a:83) called it a very rare migrant in Fulton County (in the 1890's) but failed to mention it earlier (Pindar, 1887a, 1889b). Shorten (*vide* Langdon, 1879:183) mentioned a specimen taken "near Cincinnati [Ohio] in September, 1878." Three specimens, 2 from McClean County, Illinois, dated September, 1879, and April, 1878, and 1 female from Chalmers, Indiana, dated March 15, 1879, are in the Charles Dury collection at Cincinnati (C.M.N.H.).

Erolia maritima (Brünnich): PURPLE SANDPIPER

Records.—Summerfield (1950:27, and verbal com.) tentatively identified a sandpiper (with 2 Red-backed Sandpipers and 3 Pectoral Sandpipers) seen on rocks at the Falls of the Ohio River at Louisville, December 18, 1949, by himself and Lovell, as this species. "We observed the [bird] for a long time from a distance of only 20 to 25 feet. Subsequent study including the examination of skins of sandpipers in winter plumage has suggested that the unusual-looking bird was a Purple Sandpiper." I think it likely that the identification would have been confirmed had the observers' efforts to secure the specimen succeeded. The southernmost inland record seems to be Trautman's (1944) from Put-in-Bay, Ohio.

Limosa fedoa (Linnaeus): MARBLED GODWIT

Records.—Langdon (1879:182) referred, on authority of Charles Dury, to 33 Marbled Godwits shot "in one day near the mouth of the Little Miami [River], some years ago, by Charles Weeks, Esq." This is in Hamilton County, Ohio, where a specimen was taken in 1880, according to its label (Dury Collection, C.M.N.H.). The vagueness of localities leaves open the possibility that these records apply as well to Campbell County, Kentucky, as to Hamilton County, Ohio (especially if "near the mouth" applies, as seems likely, to the Ohio River shore). Probably authentic is a recent record of a bird seen at a distance, by Lovell and others (*Audubon Field Notes*, 5:19, February 1951; Lovell, verbal com.), at the Falls of the Ohio River at Louisville on August 9, 1950. This bird was described as uniformly buff-colored and distinctly larger than several nearby Willets.

Larus glaucoides Meyer: ICELAND GULL

Records.—For half an hour, under conditions excellent for observation, Monroe and Monroe (1953:13) watched an adult Iceland Gull, with a number of Herring and Ring-billed gulls, circling over fields in the Ohio River bottom lands near Harrod's Creek, Jefferson County, on February 9, 1952. The bird was distinctly smaller than the Herring Gulls but as large as or larger than the Ring-bills. Al-

though persistent efforts to secure the bird failed, the record seems as convincing as one sight record of the species could be, yet it appears best for the time being to retain the species in the hypothetical list. Iceland Gulls occurring in the interior are perhaps most likely to represent the subspecies *Larus glaucooides kumlieni* Brewster.

Rissa tridactyla (Linnaeus): BLACK-LEGGED KITTIWAKE

Records.—An immature gull carefully studied at the Falls of the Ohio River on November 6, 1960, by Haven Wiley, Jr. (letter: May 20, 1960), and Roderic Sommers was identified by them as a kittiwake. The bird was with 150 Ring-billed Gulls, 30 Franklin's Gulls, and 2 Bonaparte's Gulls, and judging from the description sent me I think it likely that identification was correctly made.

Muscivora forficata (Gmelin): SCISSOR-TAILED FLYCATCHER

Records.—The only observation was reported by Pindar (1925) who reported 1 seen within the city limits of Versailles, Woodford County, on August 27, 1924.

Corvus ossifragus Wilson: FISH CROW

Records.—Two Fish Crows were observed at Hickman, Fulton County, on May 24, 1959, by Coffee (1959:36), who has observed the species for years at Memphis, Tennessee, and, on a few occasions, farther up the Mississippi River, especially near Reelfoot Lake. I think these records are reliable and it should not be long before the species qualifies for the main list.

Anthus spragueii (Audubon): SPRAGUE'S PIPIT

Records.—There is a single sight record, of 1 bird seen in Jefferson County, near Louisville, on April 16, 1955, by Mabel Slack, Haven Wiley, and Joseph Croft (*vide* Monroe). It seems best to retain the species (which should be expected as a casual transient) on the hypothetical list, pending further observations and/or the taking of specimens.

Vireo bellii Audubon: BELL'S VIREO

Records.—Two reports (Pindar, 1889*b*:315; 1925*a*:165) refer to the same record, in Fulton County: "Very rare. Two seen and one of them secured, July 16, 1887." Since no trace has been found of this specimen, if preserved, re-evaluation of the record is impossible. On April 24, 1948 (Monroe, Sr.), May 1, 1949 (Monroe, Sr. and Jr.), and May 23, 1946 (Monroe, Jr.), the Monroes have thought they saw Bell's Vireos at Anchorage, Jefferson County, but obtained no specimens to substantiate the opinion. Breeding as it does in several nearby areas to the northward, the species should eventually be recorded at least as a transient. I sought it persistently but in vain in western Kentucky field work. The subspecies to be expected is *Vireo bellii bellii* (Audubon).

Dendroica nigrescens (Townsend): BLACK-THROATED GRAY WARBLER

Records.—Carpenter (1942*a*:17) reported a bird seen under good conditions in woodland near Louisville, Jefferson County, on May 3, 1941. The species has occurred accidentally in the eastern United States on several occasions.

Passerina ciris (Linnaeus): PAINTED BUNTING

Records.—Pindar (1925*a*:164) wrote that, in Fulton County, "one male was seen several times during a period of ten days in August, 1892." There is a possibility, perhaps negligible, that this was an escaped cage bird. The species has been reported at least once north of Kentucky (Wabash County, Illinois; Ridgway, 1874:7, 26, repaged version) and noted in recent decades in southeastern Missouri, only a few miles from Fulton County (Cunningham, 1937:307). It occurs regularly in

Arkansas and Tennessee, near Memphis, and only 70 miles or so from southwestern Kentucky. It should be watched for closely in the latter, in scrub and brushy edges like those preferred by the Indigo Bunting. *Passerina ciris ciris* should occur.

Pinicola enucleator (Linnaeus): PINE GROSBEAK

Records.—The single presumed occurrence of the species was reported by Pindar (1888:321; 1889b:314; 1925a:163) three times without essential change. Between February 7 and March 19, 1888, a flock (originally of 8 or 10 birds) was repeatedly observed about Hickman, Fulton County, 3 females and a male being shot on February 24 by one T. L. M'Cutchen and described by him to Pindar. Because of the then usual custom of putting everything in the passive voice, it is impossible to tell whether Pindar himself saw any of these birds, alive or dead. I tend personally to credit the record but see no proper course but to treat it as hypothetical. The species is ordinarily very rare south of central Michigan. Either *P. e. leucura* (Müller) or *P. e. eschatosus* Oberholser could reach Kentucky with reasonable probability.

Spinus magellanicus (Vieillot): MAGELLAN SISKIN

Records.—One, unique north of southeastern Brazil, and involving 5 males seen, 2 collected, and 1 figured and described by Audubon (1839:46; see also pl. 394, fig. 2, vol. IV, 1837, *Birds of America*). The observation occurred in December (year unstated, 1810 to 1818, probably) and is generally thought to have involved escaped cage birds. The record was entered under *Spinus notatus* (DuBus) in the hypothetical list of the A.O.U. Check-List (1931:374), until this was shown by Todd (1946, *vide* A.O.U. Check-List, 5th edit., 1957:650) to be an improper allocation. Todd called the Kentucky birds *Spinus magellanicus ictericus* (Lichtenstein), the Brazilian subspecies. That the occurrence was a natural one, whatever the birds may have been, seems extremely improbable. This account, indeed, might well have been placed in the following section of this work.

Ammospiza caudacuta (Gmelin): SHARP-TAILED SPARROW

Records.—Funkhouser (1925:249) reported 1 supposedly seen in Woodford County, November 15, 1910, by Mrs. Lucas Brodhead. According to Pindar (MS, about 1925, in my possession) the date should read November 17. Without evidence, this record is not satisfactory. Worthy of more serious consideration is the record of a bird (reported as *A. c. nelsoni*) studied at some length in a marshy area just east of Louisville, Jefferson County, on April 30, 1940, by Carpenter and Lovell (1940:48). At least 2 specimens have been taken near Cincinnati, Ohio (Goodpaster, 1941:36), the latest on May 23, 1939. The species is to be expected as a very rare transient; *A. c. nelsoni* (Allen) or *A. c. altera* Todd might be involved, more probably the former.

SPECIES RECORDED ON INADEQUATE GROUNDS

Included beyond are species which have been reported in literature as occurring or recorded in Kentucky, but which, in my opinion, are not at present entitled to a place either in the main or in the hypothetical list. Decisions have been made on the basis of my appraisal of the records themselves and not upon the probability of occurrence (although this has inevitably entered the considerations in some cases). A few are "moot" species, one or two of which are so bizarre or vaguely characterized that they appear never to have been recognized in any way by the A.O.U. Check-List, or synonymized with known forms.

Gavia arctica (Linnaeus). ARCTIC LOON.—Audubon (1838:346) wrote that he "once caught one . . . on the Ohio," most probably in Kentucky, and that that river was "well supplied" with the species. While Audubon distinguished *Gavia arctica* from *G. immer* by the time of writing, it is quite uncertain that he did so accurately in his early field work. The occurrence of accidentals is not out of the question, but the above-mentioned statements have found no support in subsequent observations.

Pelecanus occidentalis Linnaeus. BROWN PELICAN.—G.L.T. (1894:55-56)—"A frequent visitor in these parts" (Paducah); Figgins (1945:58)—no records or evidence. Audubon (1929:11, 25)—very shabby references (if to this species), Ohio River, November 1 and 13, 1820 (essentially refuted later; cf. Audubon, 1835:376). Brown Pelicans occasionally wander inland and their appearance in Kentucky is not out of the question.

Fregata magnificens Mathews. MAGNIFICENT FRIGATE-BIRD.—Figgins (1945:61)—no records or evidence.

Note.—Although it has been generally accepted as an accidental occurrence (see Cooke, 1913:50; A.O.U. Check-List, 1957:46), I have never been quite satisfied with Nelson's record (1877:60) of Reddish Egrets, *Dichromanassa rufescens* (Gmelin), in extreme southern Illinois, August 17-31, 1875. Kentucky was nowhere formally mentioned, but I feel compelled to state my views since the state was almost certainly involved in fact. Nelson was young at the time and far from the widely travelled and experienced zoologist of his later years.

Hydranassa tricolor (Müller). LOUISIANA HERON.—Figgins (1945:67) reported 1 supposedly seen in Marshall County in August, 1941. Butler (1897:663) reported the species as occurring in Knox County, Indiana, in 1894. There are one or two sight records, never formally published. Occasional late summer vagrants might reach Kentucky, but more detailed evidence would be necessary to establish this.

Eudocimus albus (Linnaeus). WHITE IBIS.—Reported by Figgins (1945:73) on the basis of vague references by Imlay (see Imlay, 1793:242) and Ashe (1808). The records are unacceptable and may not apply to Kentucky. Ridgway and William Brewster noted 7 or 8 White Ibises near Mount Carmel, Illinois, near May 8, 1878 (Ridgway, 1878:166; Butler, 1897:644-645).

Ajaja ajaja (Linnaeus). ROSEATE SPOONBILL.—Figgins (1945:74)—no records or evidence. The species may occasionally have wandered to Kentucky in precolonial times.

Branta bernicla (Linnaeus). BRANT.—Pindar (1925a:81) reported the species from Fulton County, without evidence, and the reference may result from the frequent designation, by hunters, of Wavies (= "blue" and "snow" geese) as "brant." *Branta bernicla* has been recorded inland and may occasionally occur in Kentucky. Also mentioned without comment by Cypert (1954:57) as occurring at Kentucky Lake.

Anas fulvigula Ridgway. MOTTLED DUCK.—Audubon (1838:15) reported *Anas obscura* (in his usage including *A. rubripes* and *A. fulvigula*) as breeding up the Mississippi River to its confluence with the Ohio River. The possibility of *A. fulvigula* having done so, while it cannot be wholly ruled out, seems slight. Figgins (1945:84) reported a Mottled Duck seen in Marshall County on August 16, 1941, an observation I find difficult to credit.

Bucephala islandica (Gmelin). BARROW'S GOLDENEYE.—Pindar (1925a:80)—Fulton County, "very rare and irregular." See also Roth (1927:8), sight record (possibly valid) near Portsmouth, Ohio, and near or possibly within Kentucky. Present evidence does not qualify the species for hypothetical status.

Buteo swainsoni Bonaparte. SWAINSON'S HAWK.—Pindar (1889b:313) considered this hawk a rare resident in Fulton County, later (1925a:85) modifying this evaluation to "very rare and irregular visitant." Nelson (1877:49-50) reported a pair

breeding in Richland County, Illinois, in the summer of 1875. The species may well be a casual vagrant in Kentucky.

Laterallus jamaicensis (Gmelin). BLACK RAIL.—Figgins (1945:135)—no records or evidence. Just outside Kentucky, on the outskirts of Cincinnati, Hamilton County, Ohio, several specimens were taken 1890–1893 (Dury and Kellogg, 1891:44; Maslowski and Dury, 1931:72; Goodpaster, 1941:14). It would not surprise me if this exceedingly furtive species were regular in Kentucky.

Rallus longirostris Boddaert. CLAPPER RAIL.—Dury and Kellogg (1891:44) referred to a specimen ("Clapper Rail. *Rallus crepitans* [Gm.]") captured alive on May 1, 1891, on a bridge over the Ohio River at Cincinnati, Ohio (hence in Kentucky). Disposition of the specimen was not stated, nor does there appear to be any trace of it in the Dury collection at the Cincinnati Museum of Natural History (see Maslowski and Dury, 1931:72). Charles Dury was a capable worker, but I feel that this record must be regarded as unsatisfactory in the absence of further details. It is hard to see why these salt marsh birds would wander inland, but an apparently authentic specimen was nonetheless captured in Logan County, Nebraska, on January 30, 1951 (Rapp and Rapp, 1951:38).

Charadrius wilsonia Ord. WILSON'S PLOVER.—Funkhouser (1925:188)—"Lexington, Apr. 20, 1917; May 12, 1918 (C. K. Morrell)." Records almost certainly erroneous; occurrence very unlikely.

Limosa haemastica (Linnaeus). HUDSONIAN GODWIT.—Figgins (1945:152)—no records or evidence. Wheaton (1882:481) reported specimens from the vicinity of Cincinnati, Ohio, but gave no convincing evidence. It is possible, even likely, that the species occurs occasionally.

Himantopus mexicanus (Müller). BLACK-NECKED STILT.—Funkhouser (1925:182)—reported from Woodford County, May 6 and 7, 1921, by Mrs. Lucas Brodhead. Also reported by Charles Dury (*vide* Langdon, 1879:182) from near Cincinnati, Ohio. Probability of occurrence slight.

Larus marinus Linnaeus. GREAT BLACK-BACKED GULL.—Langdon (1877:18) wrote "[I have seen] a gull that answered the description of this well-marked species" on the Ohio River at Cincinnati, and thus in Kentucky, but dropped the species from his revised list (Langdon, 1879:189), where it was mentioned among species of probable occurrence, "not yet identified." In his *Synopsis* (1839:330) Audubon listed the species, without detail, from the Ohio River. It may occur, like other northern gulls, as an occasional vagrant.

Larus atricilla Linnaeus. LAUGHING GULL.—Pindar (1889b:311; 1925a:78) reported the species "positively identified" in Fulton County, January 8, 1887. Wilson (1926:[7–8]) referred to 2 birds seen on the Ohio River at Owensboro, Daviess County, March 12, 1926. Neither record of this coastal species seems acceptable. Laughing Gulls have been authentically recorded from Tennessee at least three times, however, and may occasionally wander to Kentucky.

Gelochelidon nilotica (Gmelin). GULL-BILLED TERN.—Pindar (1889b:311; 1925a:79) described this species as a summer resident, not common, in Fulton County, without evidence.

Sterna dougallii Montagu. ROSEATE TERN.—Langdon (1879:187) reported a specimen taken by Charles Dury near Cincinnati, Ohio and "the mouth of the Little Miami" [River; hence probably in Kentucky] in September, 1878. The specimen seems to have vanished, and the probability of occurrence of this coastal species is slight.

Columbigallina passerina (Linnaeus). GROUND DOVE.—A vague reference by Imlay (1793:240) does not pertain certainly to Kentucky and might have passed unnoticed if not cited by Figgins (1945:169). Without stating authority Bennitt (1932:35) said the species has been reported from Kentucky.

Tyrannus verticalis Say. WESTERN KINGBIRD.—Reported by Figgins (1945:202).

For details see *Pitangus sulphuratus*, below. It is probable that eastward-straying Western Kingbirds occasionally occur in late summer. There is a Cincinnati, Ohio, record for August 13, 1938 (Goodpaster, 1941:21).

Pitangus sulphuratus (Linnaeus). KISKADEE FLYCATCHER.—According to Funkhouser (1925:230) one was recorded in Woodford County, September 4, 1906, by Mrs. Lucas Brodhead. Although the record would seem in itself highly questionable, it has received singular attentions. On his own initiative, Figgins (1945:202) decided that Mrs. Brodhead must really have seen a Western Kingbird, *Tyrannus verticalis*, and so reported (see above). Mrs. Brodhead, however, may have the final word. In an unpublished MS on Bluegrass birds (Pindar, ca. 1925) now in my possession, Mrs. Brodhead is quoted to the effect that: "Some one else [implicated is Funkhouser] applied the name of Derby [Kiskadee] Flycatcher. The bird I identified was the Sulphur-bellied Flycatcher" (*Myiodynastes luteiventris*)! It is difficult to refrain from further suggestion.

Aphelocoma coerulescens (Bosc). SCRUB JAY.—Garman (1894:21)—"Florida Jay (*Aphelocoma floridana*, Bartr.) . . . said to have been taken in Kentucky." Doubted by Garman; occurrence highly improbable.

Parus atricapillus (Linnaeus). BLACK-CAPPED CHICKADEE.—Audubon, *Synopsis* (1839:79)—"In Kentucky during winter." Pindar (1887a:85)—"common resident," later modified (1889b:316; 1925a:168) to "rare winter visitant," in Fulton County. Funkhouser (1925:298)—"Woodford Co. (Mrs. L. Brodhead)." Figgins (1945:222)—no records or evidence. Also various Christmas bird counts and other trivial lists in *Bird-Lore*, *The Kentucky Warbler*, etc. (some wrongly accepted by A.O.U. Check-List, 1957:383). The sharpness of Audubon's sense of species distinctions, resulting in the original discovery of the Carolina Chickadee, may lend some weight to his statement, especially in regard to early times, and, as noted by Wetmore (1940:546), it is still possible that migrant or wandering Black-capped Chickadees occasionally cross the Ohio River. This, however, is probably growing less likely, since in recent years the species has disappeared from much of the southern part of its original breeding range (Trautman, 1940:310). The species has been authentically recorded just north of Kentucky; in the Cincinnati Museum of Natural History (Kemsies and Randle, 1953:34) is a specimen (identified by A. J. Duvall) taken by Ralph Kellogg at Cincinnati, Ohio, on the remarkably early date of August 10, in 1891. A specimen would be necessary to establish safely the species on the Kentucky list.

Parus hudsonicus Forster. BOREAL CHICKADEE.—Figgins (1945:225)—one reported at a feeding station in Lexington by Mrs. Charles K. Morrell, January 5–7, 1938 (or 1939?). Unfortunately nothing seems to have been done about substantiating this record of an extremely improbable occurrence.

Sitta pusilla Latham. BROWN-HEADED NUTHATCH.—Figgins (1945:229)—no records or evidence. Occurrence somewhat improbable. For no known reason, these nuthatches seem not to range nearly so far north in the pines of the Cumberland Plateau as they do in those on the Piedmont and Coastal Plain, although the ecologically similar Red-cockaded Woodpecker makes little distinction.

Bombcilla garrulus (Linnaeus). BOHEMIAN WAXWING.—Funkhouser (1925:265; also Figgins, 1945:253)—"Woodford Co. (Miss B. Buck)." It is possible that occasional Bohemian Waxwings stray to Kentucky.

Dendroica kirtlandii (Baird). KIRTLAND'S WARBLER.—Wilson (1922:243)—Warren County, dates not specified but probably those given by Funkhouser (1925:281), as "May 7–19; Sept. 28 (G. Wilson)." Wilson (*loc. cit.*) placed the species in a special list implying hypothetical status. Figgins (1945:283)—no records or evidence. Just outside Kentucky, Charles Dury took 1 of 2 males seen at Cincinnati, Ohio, on May 4, 1872 (see Langdon, 1879:172). From what is known of their migration, there is little question that Kirtland's Warblers sometimes cross Kentucky.

Cassidix major (Vieillot). BOAT-TAILED GRACKLE (= *C. mexicanus major* of A.O.U. Check-List, 1957:538).—Figgins (1945:301) reported 1 (possibly 2) bird seen by him 9 miles east of Benton, Marshall County, on August 29, 1941, and at Benton on September 6 and several subsequent days. In the absence of specimens these records are unacceptable. The normal range of the species is far to the south and east (e.g., N. J.) of Kentucky.

Spizella pallida (Swainson). CLAY-COLORED SPARROW.—Figgins (1945:329) reported a female sparrow, identified by him as this species, taken in Woodford County, April 13, 1942. A bird so dated and sexed (J.D.F. orig. no. 239) and marked "pallida" in Figgins' hand is with the rest of his collection, which I have studied. Without reasonable doubt this is the specimen referred to, but it is in fact a Field Sparrow (*Spizella pusilla*), an unusually pale specimen which I have referred to the western subspecies *S. p. arenacea*. Burt L. Monroe, Jr., observed 4 birds that he thought might have been Clay-colored Sparrows at Anchorage, Jefferson County, on October 15, 1947, but failed to secure specimens. The species should migrate through Kentucky in small numbers, since it breeds east as far as Michigan and Ontario.

Dubious Species

Ardea phaioma Rafinesque.—Rafinesque (1820:4, *vide* Richmond, 1909:260)—"Missouri, Illinois, and west Kentucky." Probably based on the Least Bittern (*Ixobrychus exilis*), although the description fits no known species perfectly.

Milvus leucomelas Rafinesque.—Rafinesque (1820:4, *vide* Richmond, 1909:260)—"West Kentucky and Illinois." The description is probably based on the Swallow-tailed Kite, *Elanoides forficatus*, but cannot be applied certainly to any known species.

Falco Washingtonii Audubon. WASHINGTON EAGLE.—Audubon (1827:pl. 11; 1831:58–65)—reported as seen on several occasions on the lower Ohio River, as far upstream as Louisville, and once, nesting, on cliffs along Green River near Henderson. The last date of observation recorded by Audubon seems to be November 15, 1821 (probably = 1820; *cf.* Audubon, 1929:28).¹ Type and only specimen, fate unknown, taken at Henderson some years after Audubon's arrival there. The description may be based, as a whole, on both Bald and Golden eagles, but is evidently much colored by imagination. Objective appraisal of the description leads to the conclusion that *Falco Washingtonii* cannot be identified with any known eagle (Mengel, 1953).

Hirundo phenicephala Rafinesque.—Rafinesque (1820:4, *vide* Richmond, 1909:260)—"Head scarlet, back grey, belly white, bill and feet black.—A fine and rare swallow, seen only once by Mr. Audubon, near Hendersonville [now Henderson] in Kentucky. . . ." The most bizarre of a number of species Audubon is supposed to have described to a credulous Rafinesque upon the latter's well-known visit to Henderson.

Dendroica carbonata (Audubon). CARBONATED WARBLER.—Audubon (1829, pl. 60; 1831:308)—plate and brief account based on 2 males taken at Henderson in May, 1811. The birds in the plate are strikingly and distinctively marked. Nothing like them has since been seen by any ornithologist. Although Audubon suggests the contrary, the plate may have been based on memory, which in this instance served poorly (see A.O.U. Check-List, 1931:373). It has been suggested also that a hybrid, Blackpoll × Cape May Warbler, was perhaps involved.

Wilsonia (?) *microcephala* (Ridgway). SMALL-HEADED FLYCATCHER—Audubon (1838, pl. 434; 1839:291–292)—At least one specimen allegedly drawn at Louisville, prior to 1810; "very uncommon" in Kentucky. Ridgway's (see A.O.U. Check-

¹ Audubon was in Louisiana in November, 1821 (Herrick, 1917, I:xxx). The reference, however, refers to Kentucky, where according to Audubon's above-cited journal of 1820, he saw eagles on the date in question.

List, 1931:373; 1957:649) is a new name for Wilson's (*Amer. Orn.*, VI, 1812, p. 62 and pl. 50, fig. 5) *Muscicapa minuta*, from New Jersey, based, according to Audubon's accusations, on his own accounts and drawings which Wilson allegedly copied at Louisville. No subsequent evidence of the existence of such a bird has come to light.

Rimamphus citrinus Rafinesque (affinities unknown). CITRON OPEN-BILL.—Rafinesque (1818:41, *vide* Richmond, 1909:258)—one shot, allegedly, near the Falls of the Ohio River, in Indiana, in July; later attributed specifically to Kentucky (Rafinesque, 1819:418, *vide* Richmond, 1909:259). This "species," placed by Rafinesque in his family Leptoramphina, a diverse group consisting mainly of miscellaneous passerines (see Richmond, 1909:46) was said to be characterized by a remarkable, forceps-like bill, to be small, predominantly lemon-colored, and of fly-catching habits. It seems to be satisfactorily assignable to no known species or group and is probably one of several fabrications foisted by Audubon on the gullible Rafinesque (see Rafinesque, 1822:4, *vide* Rhoads, 1912:193, where it is stated: "first discovered in 1808 near Louisville by Mr. Audubon").

Note.—A final name which might be mentioned, although a nomen nudum, is *Symphemia melanura* [= *Ereunetes pusillus* Linnaeus?] Rafinesque (1819:418, *vide* Richmond, 1909:259), attributed to Kentucky. In the diagnosis of his genus *Symphemia* (a synonym of *Ereunetes* Illiger, 1811), Rafinesque wrote: "Différent du genre *Tringa* par bec cylindrique, doigts semi-palmés. Type *T. semi-palmata* que je nomme *S. atlantica* [!]. Il y en a une autre espèce en Kentucky qui peut se nommer *S. melanura*." *S. atlantica* appears to be an unwarranted new name for *Tringa semipalmata* Wilson = *Tringa pusilla* Linnaeus. His "autre espèce," *S. melanura*, may well be the same species (Semipalmated Sandpiper), in whose synonymy it was placed by Ridgway (1919:214), along with *S. atlantica*.

UNSUCCESSFUL INTRODUCTIONS

Several galliform game species have been introduced in Kentucky from time to time by the Kentucky Department of Fish and Wildlife Resources, and probably by other interested groups, but no record of all such releases seems to be extant. The emphasis recently, however, has been on Chukars, *Alectoris graeca* (Meisner), pheasants of the genus *Phasianus*, especially *P. colchicus* Linnaeus, and Old World migratory quail, *Coturnix coturnix* (Linnaeus), none of which has to this time resulted in the establishment of a self-sustaining population (Nelson, 1958:55). One or more breedings of each species in the wild state has been recorded in the course of the state's investigations (Nelson, *op. cit.*), and the Chukar, which has been noted in Daviess County (Powell, 1959:11) and Hopkins County (Hancock, 1956a:56) by independent observers, has been recorded nesting (10 eggs on August 5, 1958) in Bullitt County (Lovell, 1958:54). It seems probable that none of these species is adapted to conditions prevailing in Kentucky.

Another species recorded from the state, whether or not correctly, is the weaver finch *Passer montanus* (Linnaeus), which according to Pindar (1889b:316) used to appear occasionally in Fulton County, where he thought it arrived by steamboat from St. Louis! The species still occurs in the former area (A.O.U. Check-List, 1957:521; Jon C. Barlow, pers. com.).

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it has been necessary to cite titles which do not contain primary information¹ concerning the birds of Kentucky; some contain no information on birds, *viz.*, works on botany, other biotic elements, etc., which add to our understanding of the area. Works of these and related classes have been listed, for purposes of economy and convenience, in the same series with the titles strictly concerned with the birds of Kentucky, but the cognate titles are distinguished by an asterisk (*). Cross-references have been made to all cases of second authorship on the part of those authors contributing to knowledge of the birds of Kentucky as such, so that their full contributions will be more readily apparent. Combinations of authors have been treated as distinct, for example, contributions by Lovell and Stamm appear together after papers by Lovell. After the main entry for Stamm would appear the cross-reference "see also Lovell and"; no cross-reference under Lovell, to Lovell and Stamm has been thought necessary, since the latter follows immediately. No cross-references dealing with second authorship of peripheral works have been included. It should be understood that the months given after the citation of many articles in periodicals are those appearing on the issues concerned and may not represent accurately the date of publication (such, when given, providing also the day of the month).

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INDEX

This is primarily an index to the scientific names of species and subspecies, and to the names of persons noted in the historical account of Kentucky ornithology. The page references to the main, formal account of each form regarded as valid and as properly recorded from Kentucky appear *first*, in **boldface**; these numbers are followed by other references to the form in question, *in sequence*. With very few exceptions, scientific names have been indexed only as actually used; thus, since scientific names are rarely used save in formal accounts, the majority of secondary references to each species should be sought under its common name. The names of moot forms, dubious synonyms, hybrids, etc., appear in quotation marks.

Additionally, references have been made to a necessarily limited number of subject headings; some of these relate to matters treated in the introductory portion of the work and not immediately apparent from the table of contents. Others refer to diverse observations on avian biology, often trivial in themselves, and are included in the hope of making more readily available details of kinds likely to remain long buried in a generalized work; some of these observations are original with this paper; others have already been published in the major or (more often) minor literature, in which last, also, they might long remain obscure. The subjects here indexed, in the main, do not include references to the general distribution, movements, ecology, and breeding biology of species. Readers seeking information on such topics as clutch size, incubation period (where determined in Kentucky), peak of breeding season, nest site, and similar matters will be obliged to peruse the text. The index, therefore, should be regarded as an aid, and it should be kept in mind that it makes no pretense of completeness.

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