

REVIEWS

EDITED BY WILLIAM E. SOUTHERN

The following reviews express the opinions of the individual reviewers regarding the strengths, weaknesses, and value of the books they review. As such, they are subjective evaluations and do not necessarily reflect the opinions of the editors or any official policy of the A.O.U.—Eds.

The growth of biological thought. Diversity, evolution, and inheritance.—Ernst Mayr. 1982. Cambridge, Massachusetts, Belknap Press of Harvard University Press. ix + 974 pp. \$30.00.—Although contemporary biologists accept, at least *pro forma*, "organic evolution" as the major unifying concept of our science, surprisingly few can articulate the five theories of Charles Darwin (pp. 505–510); even fewer can readily muster the supporting evidence for and the fallibilities of each, real or alleged. Few of us have a clear perception of the scientific, philosophic, and social milieus of the mid-nineteenth century when the historic pronouncements of A. R. Wallace and Darwin severely rattled the intellectual scaffold of Western culture. Only somewhat better appreciated is the enormous post-Darwinian schism that emerged with the rediscovery of Mendel's laws. This schism, fostered by seemingly irreconcilable philosophic and methodologic differences and unnecessarily and fecklessly vituperative communications, persisted for almost a half century. The elimination of this schism by eclectic synthesis, in which Ernst Mayr played a major role, has resulted in a unity of biology that has not heretofore existed. This participation in the closure of the schism and his almost incredible knowledge of the entire history of Western biology and the ever-shifting intellectual milieus in which it evolved places Mayr in a unique position to produce "the growth of biological thought." A synthetic treatise of this magnitude could be undertaken only by a courageous genius or a fool. The author is clearly not a fool!

Deviating from conventionality in reviews, a word of explanation is in order concerning its preparation by a "non"-evolutionary biologist *sensu stricto*. When I departed from the University last summer for a 5-week visit in the USSR, I asked my former secretary to respond to incoming post, either transmitting requested information in consultation with persons in my laboratory or by simple acknowledgments saying that I would respond in September. By accepting the invitation for me to review this book she unwittingly, but hopefully, may have provided a small bit of cement for the contemporary unity of biology proclaimed within its pages. I first resorted to an attempt to read this book as a spare-time effort. It was ineffective. I even attempted to read it during a sojourn in hospital but its physical weight proved to be incompatible with my intravenous glucose-saline drip tube! I switched to reading physically and intellec-

tually lighter numbers of *Nebelspalter*! I then decided that I must use "prime time," for me, 5–9 AM. This I did at first with reluctance, knowing that it would slow the productivity of my laboratory in the currency of the contemporary realm of biosciences—the (usually short) research paper—and possibly thereby constrict its cash flow. However, the more I read, the easier I found it to rationalize away these ominous thoughts. Only time will tell if my rationalization was a grave overshoot. I doubt that it was!

This historic book can be characterized in many ways. Depending on aspect, it is compendious, analytical, and synthetic. The reader will soon recognize that it is in places selective, pontifical, and opinionated. But to avoid these characteristics of decisiveness, for which the author is well known, would require three times as many pages. The text is also repetitious. But the history of biology is one of histories of many inter-related ideas which have been temporally asynchronous and intermittent, often, for various reasons, evolving in mutual isolation. Thus, in a treatise of this magnitude repetition becomes both essential and inevitable.

Mayr expresses repeatedly the historically deleterious influence of physics *sensu lato* (i.e. physical sciences) on the development of biology, *sensu stricto* that of the naturalists or, more recently, the evolutionary biologists. It is true that physicists long assumed that natural science is physics and that other "natural-science" disciplines are "acceptable" in the order of adherence to the philosophy and methodologies of physicists. This stems in part from the simplistic belief that life should somehow be explainable in terms of conventional laws of physics and a failure to contend with the "programmed" history of both phylogeny and the development of the individual. On the other hand, the conflict has been unwittingly abetted, first by naturalists and later by evolutionary biologists (but not by molecular biologists, physiologists, and many ecologists), by a failure to recognize that organisms are not exemptions to the laws of physics. Nevertheless, in principle, I agree with Mayr that "... the last twenty-five years have also seen the final emancipation of biology from the physical sciences," and with his assertion of the centrality of biology among the natural sciences. Unfortunately, these conclusions have yet to be recognized by either university administrations in allocation of resources or by the federal bureaucracy in the selection of scientific advisory bodies!

From time to time Mayr discusses an isolating gap, first between "the herbalist-naturalists" and "physician-physiologists" of the sixteenth century, then between the "naturalists" and "physiologists" of the nineteenth century, and then later between "evolutionary biology" and "functional biology." Clearly this gap or, more properly, series of gaps, persists today. It is my assessment, however, that Mayr has both overly simplified and indeed caricatured these gaps. To characterize functional biologists as concerned only with proximate factors blurs the picture. An examination of the pages of *Zeitschrift für vergleichende Physiologie*, *Journal of Experimental Biology*, *Physical Zoology*, and, more recently, of the *American Journal of Physiology*, *Journal für Ornithologie*, *Zoologicheskii Zhurnal*, *Auk*, *Condor*, and many other periodicals, reveals a significant number of contributions that overtly take into account and provide information that contributes to an understanding of ultimate factors; in many more the contributions are implicit. Comparative renal studies of vertebrates, which have their roots in the nineteenth century, have made significant contributions to an understanding of both proximate and ultimate factors. I would suggest rather sharply that, rather than a gap, the difference between evolutionary biology and functional biology has been one of a unidirectional valve! It is true that, in contrast with most evolutionary biologists, functional biologists are generally reductionists to varying extents. But, unless it is the overriding goal, as is sometimes the case, reduction contributes to the unifying concept of evolution by revelation of commonness in structural and functional elements and of the machinery of inheritance, including the mechanisms of expression of inherited information. What would be the contemporary status of our knowledge of evolution without the results of the reductionist efforts of cytogenetics, electron microscopy of chromosomes, and molecular biology? Because of Mayr's expression of contemporary unity in biology, this paragraph is in no sense a criticism of his perception of biology as it is today. Rather it argues somewhat concerning the routes by which the unity has emerged—especially during the past century.

Mayr employs relatively few examples of biological functions in the development of his arguments and ideas. Since he is a preeminent ornithologist I am unable to resist chiding him for one of them. In clarifying the difference between proximate and ultimate causes he asks why "... a certain warbler individual ... starts its southward migration in the night of August 15" and then attributes it to the decrease of daylength "to a certain threshold." I actually know of no investigation of the proximate causes of southward migration in the Parulidae. Furthermore, in the species in which daylength has the role of a "driver," the autumnal events are primarily "delayed" or "remote" effects of the long days of

spring and early summer. For those in which the annual cycle in daylength functions as a *Zeitgeber* for an endogenous circannual rhythm, there is also no evidence that decreasing daylength induces the autumnal events of the annual cycle. Although I respect the intuition of the author, a much sounder example could have been selected.

It is, in a sense, cruel harassment to fret about omissions in an otherwise masterful compendium. Nevertheless, unfortunate is the omission of the emergence of the concept of the temporal organization of life, including endogenous rhythms entrainable by temporal cycles in the physical environment. The inception of this important development is at least as early as the pioneer experiment of de Mairan early in the eighteenth century. Circadian rhythms, characteristic of most eukaryotes and entrained by the physical 24-h cycle of day and night, provide a basis for chronometry and prediction of a type not included in the multiple aspects of the term discussed by the author (pp. 56–57). It is indeed unfortunate that the author fails to include the contributions of chronobiology to the unity of contemporary biology that he so eloquently proclaims.

These are times in which the fairness of honest, well-meaning, but modestly informed laymen are exploited by insidious but cunningly fabricated pleas of "creation scientists" for "equal time" with biologists in instruction on the origin and diversity of life on this planet. Despite recent decisions in lower courts, the zeal and adroitness of "creation scientists" will sustain the enthusiasm of some religiously-oriented groups that will recruit the support of fair-minded but uninformed laymen. This perilous influence could outlive the youngest readers of the readers of this review. An especially devastating corollary of disbelief in evolution is the increasingly effective effort to suppress the use of certain species of animals (but curiously, or perhaps strategically, not yet plants, "lower animals," protists, and monerans) as experimental subjects. It behooves biologists, especially those who teach in the schools, colleges, and universities, but also those in applied biological professions such as health, agriculture, forestry, fisheries, and others, to maximize their understanding of the historical and contemporary rationale of evolution as the glue that unifies biology. There is clearly no better way to do this than by a study of this book, long and sometimes ponderous as it may be. I am certain that many of my colleagues will appreciate, as have I, the fresh re-examination of the positive contributions of Lamarck, Linnaeus, and others to pre-Darwinian evolution; the more rigid analysis of the relationships between Lyell and Darwin; the analysis of the seminal contributions of Aristotle and many of my "favorites," Buffon, Hume, von Baer, Unger, and others, to the development of biological science.

Despite my quibbles, some of which may well

spring from naïveté, this is a landmark volume that will not soon, if ever, be superseded.—DONALD S. FARNER.

Avian biology. Volume VI.—Donald S. Farner, James R. King, and Kenneth C. Parkes (Eds.). 1982. New York, Academic Press. xxiv + 490 pp. \$65.00.—Volume 1 of *Avian Biology*, the seminal review series in ornithology, first appeared in 1971. Four more volumes followed in successive years. The hiatus since 1975 has now been filled with Volume VI. The only major change is elevation of Kenneth C. Parkes to third editor, from taxonomic editor. This volume contains eight diverse chapters by nine authors and continues the earlier excellent quality and importance. Several of these chapters are far from my area of interest, but I have benefited from a careful reading of the whole book. I certainly have enjoyed preparing these comments.

Lewis W. Oring (*Avian mating systems*, Chapter 1, 92 pp.) provides a clear outline of specifically defined, ecologically oriented classification of mating systems (monogamy, polygyny, polygamy, and polyandry) in various situations. The use of examples is especially effective and the whole topic is well interwoven. The somewhat brief conclusion is excellent. Areas for further research are clearly pointed out. This review will be especially useful to those who are interested in mating systems but are on the periphery of the actual research. It should also be useful to the active researcher and will serve well for students just getting started or teachers who need to prepare lectures on mating systems and sociobiology. The recent surge of interest in mating systems and especially their evolution clearly merits a summary of ideas and data, and this chapter certainly has accomplished that purpose, at least for me.

Definitions are clearly stated where needed. It is somewhat disconcerting to have terms defined (pp. 3–4) and then not find them used until 58 pages later, and then by initials (OSR = operational sex ratio). To those not familiar with the terms or their codes, this requires retracing to remember. I find it somewhat bothersome that Oring considers reproductive success as accrued at the fledgling stage (p. 2). This definition is used because we can measure it relatively easily. I believe the proper measure of reproductive success, however, is the offspring returning to actually reproduce themselves—something that probably can rarely be measured. Would that more studies of birds could last long enough with enough marked individuals so that we could get reasonably close to the truth . . . and would that ornithologists were not “forced” to publish their data prematurely!

This chapter is heavy on Oring's and his students' data and interpretation. That is entirely appropriate, and his summaries, integration, and critical evaluation of the extensive literature (350± citations) is ex-

emplary. I especially appreciate the author pointing out which data are “weak” and which topics/species are “well studied” (p. 46). This type of statement is well worth making.

Sidney A. Gauthreaux, Jr. provides an excellent primer in Chapter 2, “The ecology and evolution of avian migration systems” (pp. 93–168). This clear exposition stresses the ultimate causes of migration in birds, placing them well in the context of migration patterns of other animals. The “move, adapt, or die” concept is eloquently stated and discussed. Gauthreaux discusses movements in response to environmental changes, clearly presenting the idea that every organism occupies a “window” in the physical and biotic environment. Movement patterns in time and space are then discussed, and this excellent section gives the reader a clear general understanding of the periodicities of avian temporal changes. I found the presentation of theories of bird migration by time frame (1897–1943, 1948–present), in which just the facts and numerous authors' ideas are presented without comment, followed by the strong integration of hypotheses, a very useful method of presenting a difficult evolutionary development. Then follows a section on the diversity of patterns in which dispersal, partial migration, irruptive and invasive movements, short- and long-distance migration, and site fidelity and nomadism are clearly defined and illustrated. Future writers on such subjects must either use these definitions or clearly and completely discuss why variations are presented. The final overview of strategies of avian migration provides a concise summary of the whole subject of migration. Along with Stephen Emlen's chapter “Migration: orientation and navigation” and Peter Berthold's “Migration: control and metabolic physiology” in Volume V (1975) and Kenneth Able's “Mechanisms of orientation, navigation and homing” in Gauthreaux (*Animal orientation, navigation and homing*, 1980, New York, Academic Press), the topic of migration has been thoroughly summarized. The balance in this chapter between studies in the New and Old Worlds is excellent and all types of birds are discussed. I find some grammatical constructions difficult: “according to Gauthreaux 1978” (p. 117). Authors should refer to their own work in the first person. “Hopefully” is misused on page 101; and I believe that “individuals . . . move or face mortality” is improper use of mortality. This chapter provides a foundation for all further studies of the origin and ecological aspects of avian migration. The almost 500 references on migration are worth the price of the whole book.

Chapter 3, “Social organization in the nonreproductive season,” by H. Ronald Pulliam and George C. Millikan (pp. 169–197) is a brief but valuable companion summary to Oring's chapter. Pulliam and Millikan succinctly discuss how gregariousness influences the probabilities of surviving starvation and predation, and the costs and benefits of territorial

aggression, stressing the relationship between social foraging and the risk of starvation. This chapter contains considerable speculation and clearly points out not only the difficulty of forming testable models but the almost complete lack of data concerning what birds do and how they manage during the nonbreeding season. Sections are summarized very usefully and models (which even I can understand) are presented in hopes of stimulating data collection and analysis. I find the concluding "prospect" a valuable caution about the validity of cost-benefit models to social behavior studies. This chapter seemed to end before I was satisfied, but I suspect that was the authors' intent.

Chapter 4 begins the second section of the book, which reflects the editors' wide knowledge of and good relations with our European colleagues, physiologists and anatomists in particular.

Jürgen Jacob and Vincent Ziswiler tell us all the general ornithologist wants to know about "The uropygial gland" (pp. 199–324, Chapter 4). A brief historical summary of work done to date opens the chapter, providing an excellent update of the studies by Lucas and Stettenheim (1972, Handbook "Avian Anatomy" Integument) and of Jacob's late 1970s and 1980 papers. The authors thoroughly review the literature and provide data from dissections of 150 new species, with emphasis on the Psittaciformes. The chapter is divided into major sections on Structure and Secretions. Many examples are used to discuss the phylogenetic and ecological aspects of external morphology (size, shape, ducts, feathers, vascular supply, external musculature, innervation, and embedment and anchorage), internal and microscopic anatomy, embryology and posthatching development, functional considerations (production, transport, storage, and extraction of the secretions), and phylogenetic and taxonomic considerations. All birds either have a uropygial gland or have secondarily lost it. The gland apparently only evolved once in avian phylogeny.

The section on secretions includes discussions of qualitative composition of lipids (which vary at ordinal and even family levels), types of lipids, ordinal differences in chemical composition (a useful taxonomic/systematic discussion even if you do not know anything about the chemicals involved), biosynthesis of secretions, histochemical investigations, functions of secretions (complex: feather flexibility, plumage hygiene, vitamin synthesis?, communication, but not water repellency), and chemotaxonomic aspects of secretions. Large amounts of data are contained in several tables. The reference to Fig. 7 on page 200 must be to Fig. 1. All ornithologists, budding and mature, and especially those who write textbooks, *must* read pp. 253–255 and 305–314 as a minimum. This chapter answers all the questions about this gland that I have and yet poses many areas for further research. It is a pleasure to read and will

serve as a starting point for much fascinating further study.

"Stomach oils" (Chapter 5, pp. 325–340) by Jürgen Jacob is a restatement of John Warham's 1977 paper (Proc. N.Z. Ecol. Soc. 24: 84), stressing the chemical composition of the oils. Stomach oils are found exclusively in the proventriculus of the Procellariidae, Hydrobatidae, and Diomedidae but not in the Pelicanoididae of the Procellariiformes. It is interesting to know what the specific gravity of oil is (0.88 g/ml), but what is the relationship to other substances? A table summarizes the known composition in species that have been studied. Those people familiar with chemical composition of waxes and oils will find this section most interesting. Jacob briefly discusses the dietary origin of oils and presents effective arguments for this conclusion. The section on functions is least satisfactory to me, partially because the most important sentences (p. 336, next to last and last in paragraph A) are difficult to understand. It is useful to have a complete summary of this interesting substance in one place. The paper adds little to Warham's work, however, especially concerning functions.

Louis D. De Gennaro provides the first summary of the "Glycogen body" (Chapter 6, pp. 341–371) to have been published. This oval-shaped mass of glycogen-filled cells is wedged between the dorsal funiculi of the spinal nerve cord in the region of the lumbo-sacral plexus. While discussing the contents of this volume with several ornithologists in Los Angeles, their universal response to this chapter title was "What's that?" I presume that this chapter tells us all that is known. All ornithologists should read it thoroughly, or at least read the introduction, historical perspective, and pp. 360–367 on functional significance and concluding remarks. Sections on development, biochemistry and development, and structure (morphology and histology, including excellent illustrations) could be scanned. For some undefined reason, I found this chapter fascinating. The functional significance of this "organ" remains unknown, but the speculation provided by De Gennaro is useful. We now have a new structure besides feathers that defines birds. Studies must now be extended to nonchicken birds.

We are presented a fascinating history lesson by Roland Sossinka in Chapter 7, "Domestication in birds" (pp. 373–403). Definitions and the environmental and genetic bases of domestication begin the lesson, and they lead to a discussion of the characteristics of birds that make them adaptable to being used by man. The genetic and environmental effects (food supply and rearing conditions) on morphology, physiology, and behavior are discussed. Many examples are used to point out the variation that occurs based on the "nature, heterozygosity, and ecological adaptability of ancestral wild birds." Sossinka shows the nonuniformity of the process of producing

a domestic breed by using the Zebra Finch (*Peophila guttata castanotis*) as a case history. Derivatives from wild stocks are discussed relative to either reduced natural selection or the appearance of new, anthropically imposed selection. The conclusions section focuses on the ultimate and proximate causes of change in characteristics and is an interesting but short discussion of "is domestication evolution?". This chapter relies heavily on non-English literature. Wordings are sometimes awkward and germanic, but this chapter clearly describes the huge experiment man has carried out with birds, an experiment that is critical to our present "civilization." Ornithologists could well pay more attention to the subject.

The eighth and final chapter of the book is by Peter Scheid: "Respiration and control of breathing" (pp. 405-453), an update and complement to Lasiewski's "Respiratory function in birds" (Chapter 5, Volume II, 1972). Clearly defined sections are used: "Ventilation of the respiratory tract" is the most lucid description of the air-sac parabronchial lung air-movement pattern that I have seen. The significance of this system is discussed. In this and all areas of breathing in birds, considerable discussion occurs between the experts. These differences of opinion and technique are pointed out factually, with the author presenting his own, of course. In "Gas transport properties of blood," Scheid discusses the chemical properties of oxygenation. In "Basic concepts for parabronchial gas exchange," he discusses convection, diffusion, and the structural arrangement between airflow and blood flow in the system and presents his model, which is discussed more fully in "Cross-current model and the real lung," where Scheid tells us he is satisfied that his model represents real life. "Respiration and gas exchange at rest" tells about ventilatory, blood gases, and diffusion capacity of the system, and this leads to "Respiration and gas exchange at specialized activities," a discussion of elevated metabolism and heat exchange. The chemical and neural factors involved are elucidated in "Control of breathing." The final, longest section deals with "Respiration of the avian embryo," in which Scheid discusses the structure (egg shell and membranes), mechanism of gas exchange across the shell, chorioallantoic gas exchange, metabolism and gas exchange during development, and gas exchange during various environmental conditions. Having discussed all this, the chapter ends rather abruptly. One of two typos I found in the book is that there are not 86,000 species of birds (p. 424). The references are extensive, and I learned a great deal from this clearly presented exposition.

An index to authors, bird names, and subjects completes the publication, which is well produced. An amazing feature of this book, beyond its vast scientific merit, is the relatively low price. While \$65.00 is a considerable amount for a book, it is less than for Volume V, for virtually the same number of

pages, and is only three times the original price of Volume I in 1971! The price of Volume VI is also less than the earlier volumes are presently selling for. I encourage all ornithologists to take advantage of this major publishing event. The breadth of information and level of stimulation in this volume is enormous.—RALPH W. SCHREIBER.

Woodpeckers of the world.—Lester L. Short. 1982. Greenville, Delaware, Delaware Museum of Natural History. Monograph Series No. 4. xviii + 676 pp. \$99.95.—Lester Short has been interested in woodpeckers for over 20 years, studying them in 60 countries and all continents except Antarctica. He is known particularly for his work in elucidating the taxonomy and evolution of woodpeckers. One does not have to be an expert to appreciate the value of this semi-technical handbook that contains so much useful information. The Introduction makes sure that the reader is acquainted with certain basic terms. Among them is the superspecies, defined as a group of two or more closely related species that are usually allopatric. The members of a superspecies are termed allospecies. As will be seen later, this concept has played a prominent role in Short's system of classification.

Part One, pages 1-56, contains basic information on Plumage and Structure, Behavior, Zoogeography, Evolution, and Systematics. Among points covered are that the primarily zygodactyl toe arrangement (two toes facing forward, two backward) is so specialized in some species that all four toes can be directed anteriorly, while in others, so unimportant is the hallux (first, inner rear) that it has been lost, as in *Picoides*. Another adaptation of woodpeckers is their general "toughness." All those who have skinned woodpeckers know how thick and tough their skin is, a trait shared with the Indicatoridae (honeyguides). The sections on color patterns and sexual dichromatism I found of particular interest. The very complexity of picid plumage patterns, Short has found, makes them useful in determining phylogeny. The degree of complexity is one unlikely to arise from convergence. Complex patterns, with many variations possible, may facilitate individual recognition. This is something that I have noted in the field for many years in *Picoides pubescens* and *P. villosus*. Why this situation should have arisen in *Picoides* but not in many other genera would be interesting to learn.

A remarkable phenomenon among woodpeckers is that of convergence in appearance, described by Cody (1969, *Condor* 71: 222), in which members of genera of what he calls the "ivory-bill" group have come to resemble species of a "log-cock" or pileated group in various parts of the world where they occupy the same habitat. The selection pressure behind this similarity, in Cody's view, is to promote interspecific territoriality. Having studied two "look-alike" species

that were sympatric in Panama, the Crimson-crested (*Campephilus melanoleucos*) and the Lineated (*Dryocopus lineatus*), and found no evidence for Cody's theory, I was surprised to find Short seeming to endorse it (page 9). Yet, on continuing to page 33, Short seems to reverse himself, backing Murray's (1976, *Condor* 88:518) critique of Cody's hypothesis. (The citation of Murray is 1977 when it should be 1976.)

Short states that he "emphasizes behavior throughout the book." Due to this emphasis, it is worth going over his ideas, as expressed in the section entitled "Aggressiveness and the pair bond" (pp. 23-24). From the start, he regards woodpeckers as being aggressive birds. "Not only do encounters occur with considerable frequency within picid species," he writes, "but interspecific encounters, especially with other woodpeckers, also are frequent." What species of woodpeckers is he referring to and in what times of year? In 25 years of studying the woodpeckers of eastern North America, following most of them through the year, I have encountered no such degrees of aggressiveness. During these times I have always regarded a conflict as a special event that did not happen very often. Conflicts that I watched occurred most frequently when territorial boundaries were being established in early spring, then fell off markedly. This seems inevitable because most woodpeckers are widely spaced territorially. The only times that I have encountered anything approaching Short's description was for a number of weeks in South Carolina. There numbers of pairs of *Melanerpes erythrocephalus* were crowded into a relatively small area, competing for nest stubs that were scarce elsewhere. Their conflicts represented what Wilson (1975, *Sociobiology*. Cambridge, Massachusetts, Harvard Univ. Press) has termed behavioral scaling.

Short sees two factors as promoting the aggressiveness that, in his view, characterizes woodpeckers. First, he states, ". . . inter-specific aggression is accounted for to some degree by the specialization of woodpeckers generally, and thus the similar requirements of different sympatric woodpecker species, especially those similar in size." I find this statement puzzling. Gause's principle is that "no two species can coexist in the same locality if they have identical ecological requirements" (Mayr 1963, *Animal species and their evolution*. Cambridge, Massachusetts, Harvard Univ. Press). Yet in Short's view, as I read his sentence, they do, and this leads to frequent conflicts. Short goes on to state next that woodpeckers have become aggressive because they have to defend roosting and nesting holes. But do not all territorial species have to defend what is their own? I find it difficult here, again, to see that woodpeckers are that much different from a host of other avian species. Skutch (1969, *Pacific Coast Avif*. No. 35: 560), indeed, goes so far as to conclude that "woodpeckers are, on the whole, unaggressive birds

and often relinquish their holes without much resistance; in Europe, Black Woodpeckers (Sielmann, 1958. *Das Jahr mit dem Spechten*. Ullstein Verlag, Berlin, p. 41) abandon their chambers to Jackdaws as meekly as tropical American woodpeckers of the genus *Tripurus* give theirs up to Tityras." Having watched *Campephilus melanoleucos* and *C. guatemalensis* give up freshly excavated holes to Collared Aracaris (*Pteroglossus torquatus*) in Central America, I am inclined to agree with Skutch.

Although this section of the book is entitled "Aggression and the pair bond," Short has little to say about the latter. "Pair formation activities in woodpeckers," he writes, "are very difficult to distinguish from normal aggressive interactions." Here again views differ. My feeling is that an aim of any student wanting to understand a species should be to learn to distinguish signals given in courtship from those given in aggression. This assuredly takes time. But here selection has moved in the direction of getting rid of ambiguities and this, coincidentally, can aid the observer as well as the bird. Signals, whether in courtship or conflict, must be clear and distinct. Otherwise how can one bird know what a conspecific is about to do? Ambiguity would work against reproductive success. Yet Short appears to think otherwise when he states that "the display repertoire, including vocalizations, seems unduly large for the needs of these territorial birds. One wonders if perhaps the ancestral woodpecker was a social or semi-social species requiring these nuances; hence, part of what we see in woodpeckers may be a carry-over from a social past." I find it hard to imagine, let us say, congeneric species giving vocalizations and displays that are vacuous and no longer have meaning. Would not this curtail mechanisms designed to prevent hybridization? Would not selection soon remove deleterious signals retained from an ancient past? "Differences from related species," wrote Willis (1972, *Ornithol. Monogr.* 10: 73), "will be selected for, whether differences in plumage or displays. Displays are probably easier to select for, since changes in morphology inevitably compromise other adaptations, such as those for avoiding predators or getting food, while displays can be turned on and off." I have long felt that everything about a bird that one can see or hear is there because it is needed, in some way, for survival and/or reproductive success. On this basis, in my view, if one does not understand the meaning of a vocalization or other signal, the thing to do is to keep on watching until one does. But others may find this view extreme.

One more opinion, before winding down, relates to Short's experience that "courtship displays, other than a few special flight and nest demonstrations, are rare." It is strange, again, what different experiences two observers can have. I have long found courtship one of the most attractive features of woodpeckers. As I have seen them, they do not take

their pair bonds for granted, but maintain them with exchanges of small notes and displays. With a few, such as *D. pileatus*, that are mated the year around, one observes some degree of courtship in all seasons, especially in the first half-hour of a day. At the height of the breeding season, woodpeckers have lively courtship displays that are, with many, repeated many times over. An understanding of courtship is basic to understanding a woodpecker's vocalizations and displays.

Although I have felt the need of expressing these divergences of opinion (or, as some readers may think, prejudices), I have, paradoxically, found the author's "Aggressiveness and the pair bond" a stimulating section of his book. Disagreement and controversy, it has been said, have a positive function, for how can one know what he thinks and believes unless there are others who think and believe differently?

Part Two, containing accounts of the species (198), constitutes the largest part of the book. Each woodpecker is dealt with in a uniform manner and has, in Part Three, a color portrayal to go with it. Divisions include Range Summary and Diagnostic Features (both brief) and a lengthy Description. After Distribution and Habitat come Foraging Habits, Voice, Displays, Interspecific Interactions, and Breeding. While well-known species such as *Picoides villosus* in America and *P. major* in Europe have 4-6 pages devoted to their behavior, a large number of woodpeckers living in remoter parts of the world have been so little studied that there is little to say. A discussion of taxonomy and a list of references follow each species account. For the much-studied *Melanerpes formicivorus* there are only three references and for *P. major* only two. A few additional references are put in the main list at the end of the book. It would have been simpler, I should think, to have all of the references in one place. Even so, I feel that the references are too few. Had the author used two to three times as many, he could have rounded out his behavior accounts to advantage. With a general tightening up, particularly of the discussions of voice and displays, there might have been room without use of additional space. References are what many students go to a handbook to find.

Putting smaller matters aside, it is a great accomplishment to have brought accounts of all of the world's woodpeckers together in one place. I have been studying woodpeckers and writing about them for 25 years and, in retrospect, wish that I could have had such a book as "Woodpeckers of the world" on hand for reference. This is from a conviction that no matter what bird one is studying, from whatever point of view, it is helpful to know what other species are most closely related. Comparisons are a fruitful way of stimulating ideas. Take, as an example, the Pileated Woodpecker, *Dryocopus pileatus*. In Short's classification it becomes (*D. [pileatus] pileatus*), the

name between the genus and the species being that of the superspecies to which it belongs. The other two members are the Lineated (*D. [pileatus] lineatus*) and the Black-bodied (*D. [pileatus] schultzi*). It is surprising, in turning to the Table of Contents, to see how many of the world's woodpeckers are groupable into superspecies. From having studied *D. lineatus* in Central America and finding it close to *D. pileatus* in aspects of its behavior, the superspecies concept has seemed useful to me. Under Behavior, in the account of *D. [pileatus] schultzi*, is the comment, "essentially unknown." What an opportunity! I feel that this is an additional value of Short's book. It reveals species that open almost virgin fields for research. The Black Woodpecker (*D. martius*) of Europe, that I have never found much like the Pileated, is not included in any superspecies.

In studying *D. lineatus* in Central America, I found it sympatric with a woodpecker of the same approximate size that, due to convergence or parallelism, looks at first glance surprisingly similar. This was the Crimson-crested (*Campephilus [melanoleucos] melanoleucos*). Much of its breeding behavior seemed close to what I have read of the Ivory-billed Woodpecker (*C. [principalis] principalis*), but as can be seen at a glance, the two are not allospecies. A question in my mind was how close are *Dryocopus* and *Campephilus*. It is easy to find in the book that both are members of the tribe Campephilini. For a discussion of this, or any other tribe, one has to turn back to a section on Relationships and Classification in Part One. Here Short points out that there is no other New World group close to *Campephilus* except *Dryocopus*. One species of *Dryocopus*, *D. galeatus*, is a perfect intermediate between *Celeus* and *Dryocopus*, indicating the derivation of the Campephilini. Although my account may, by this time, seem wandering, turning back and forth through the pages of this book is the way to run down information. It is hardly a book that one can read straight through.

To take another common species, *Picoides villosus*, it does not belong to any superspecies. It is most closely related to Strickland's (*P. stricklandi*) and to the Three-toed (*P. tridactylus*), but not to the Downy (*D. pubescens*) Woodpecker with which it is broadly sympatric. *P. villosus* brings us to a consideration of subspecies. *D. pileatus* has no clearly defined races, but *P. villosus* has a number. These, as in all species accounts, are dealt with in an accompanying section on Taxonomy. Writing purely as one interested in behavior in the field, I find the concept of subspecies, like that of superspecies, to be of heuristic value. What first brought this to my attention were encounters with the relatively little-studied southern Hairy Woodpecker (*P. v. audubonii*), which, in my experience, differs behaviorally from the northern race *P. v. villosus*. Here again, taxonomy is of value in helping to delineate a problem for research.

Short's work, carried out over many years in as-

sociation with his colleagues Walter Bock and Hans Winkler, has done much to clarify and simplify the systematics of woodpeckers. In no place has this been more evident, for an American student, than in combining the former genera *Tripsurus*, *Asyndesmus*, *Centurus*, and others into the greatly enlarged *Melanerpes*. This makes sense behaviorally. It is surprising, for example, if one has observed the two species in the field, to note how similar the breeding behavior of the Red-headed (*M. erythrocephalus*) is to that of the Red-bellied (*M. carolinus*, formerly *Centurus*) Woodpecker. Also useful is emphasis on the relation of *Sphyrapicus* to *Melanerpes*. This is brought out by placement of both in the tribe Melanerpini. That the four species of sapsuckers (*S. varius*, *S. nuchalis*, *S. ruber*, and *S. thyroideus*) are derivatives of *Melanerpes* is shown by their skeletal structure as well as patterns of coloration of adults (e.g. *S. thyroideus* and *S. ruber* with *M. formicivorus* and *erythrocephalus*).

Part Three comprises 101 color plates by George Sandström. While these pictures, lacking in all background material, cannot be ranked with the portrayals of some other modern bird artists, they are certainly adequate. Considering the amount of material, the volume under discussion is lighter in weight than many modern technical books, and the paper, of a dull finish, is pleasingly free of glare. One wishes that a little more thought had gone into its appearance. The covers are patterned to resemble wood veneer and the title page has "Woodpeckers of the World" in letters made to look like sticks, such as one might see in a pamphlet on woodcraft. But these are minor matters. There is no doubt that this book is a must for libraries connected with departments where research and teaching in ornithology are going on, whether in museums, universities, or special institutes. As a reference book it should do much to give students a wider orientation. As for private ownership, one hundred dollars or close to it will seem a bit steep to many. It is a nice book to own, nonetheless, and readers will, I think, agree that Short has made a notable contribution.—LAWRENCE KILHAM.

Population ecology: a unified study of animals and plants.—Michael Begon and Martin Mortimer. 1981. Oxford, Blackwell Scientific Publications. Distributed by Sinauer Associates, Sunderland, Massachusetts. vii + 200 pp. \$33.00 (cloth), \$16.95 (paper).—This new text in population ecology by two British ecologists is a welcomed addition that should be well received. The book's main asset is its balanced treatment of mathematical and empirical-experimental population ecology of both plants and animals. It is organized logically into three sections: Single-Species Populations, Interspecific Interactions, and Synthesis. The authors employ a novel approach that differs

from other population ecology texts: the details of mathematical models of population growth, interspecific competition, and predation are found at the end of the respective section or chapter in which the topic is discussed. By this arrangement the authors hope to present a discussion of the important aspects of these concepts before the mathematical details or underpinnings. For students who are being exposed to mathematics for the first time since introductory calculus, this may be an advantageous approach.

The three chapters in the first section are Describing Populations, Intraspecific Competition, and Models of Single-species Populations. Chapter 1 introduces life-tables using diagrammatic life-tables that display the life-cycle in the form of a flow chart. The students in my class found this format especially helpful in understanding life-cycles. "k-values," which are used in key-factor analysis in a later chapter, are introduced in the preliminary discussion of the calculations of life-tables. Because American ecologists have had little exposure to this method of assessing the magnitude of sources of mortality in a population, I am glad the authors have included it in their presentation. The concepts of scramble and contest competition are introduced in detail in Chapter 2. These terms are used commonly in British ecological literature, but rarely in American presentations of competition. A discussion of these concepts as well as devotion of a whole chapter to intraspecific competition is especially worthwhile for American students because of the scant treatment that these topics usually receive in American texts.

The mathematics of population growth are introduced in Chapter 2. In contrast to most population ecology texts, mathematical models using difference equations rather than differential equations are used throughout most of the text. Besides being more realistic biologically in many cases, difference equations seem to enable students to translate more easily from the ecological situation to the mathematical equation. Furthermore, difference equations are much easier than differential equations to simulate on a computer, or even a hand calculator. In their discussion of age-structured models, the authors include a concise introduction to matrix multiplication sufficient for an understanding of the Leslie matrix.

Chapters on interspecific competition and predation comprise the second section of the book. Competition is introduced with a thorough discussion of experimental investigations of ant-rodent and ant-ant competition in desert habitats. This is followed by an explanation of the experimental investigation of plant competition, using de Wit replacement diagrams and ratio diagrams. Following a rather brief discussion of the niche concept, examples of competitive exclusion in the field, competitive release, coexistence and resource partitioning, and character displacement are presented. These topics are summarized in a discussion of the problems of demon-

strating that competition in the past has produced the patterns of resource partitioning in a group of coexisting species, ending with the caveat that mere differences in coexisting species are not sufficient evidence for demonstrating interspecific competition.

In the discussion of the mathematics of competition, the Lotka-Volterra competition equations are presented, followed by Ayala's modification for modeling *Drosophila* competition. Then the mathematical basis of de Wit diagrams in plant competition is discussed. The only weakness of this chapter is the terseness of the discussion of the relationship between niche overlap, competition, and species packing based on the theoretical work of MacArthur, May, and others. Although these topics are not as common in the current literature as a decade ago, they remain an important aspect of theoretical population ecology of which students should be apprised.

In Chapter 5 Begon and Mortimer follow Holling's approach of examining the components of predator-prey interactions. First, these components are discussed individually in light of empirical evidence of their importance in predator-prey dynamics. Then, in the section on mathematical models, the authors examine the interaction of some of these components in difference equation host-parasitoid models, in particular reviewing Hassell's work that has built on the Nicholson-Bailey model. In the remainder of the chapter they discuss Noy-Meir's grazing model and the dynamics of harvested populations. Optimal foraging is discussed in this chapter, but the treatment is insufficient. Considering the amount of work being done in this area, the theoretical models and the empirical evidence deserve a more thorough discussion.

I particularly like this book because the sequence of presentation of topics is logical. In the last section, Synthesis, are chapters on Life-history Strategies, Population Regulation, and Community Structure. Having discussed individually the major population processes (population growth and intraspecific competition, interspecific competition, and predation), the authors then discuss those topics in which more than one of the above processes may be operating or may have been an important selective force, as in the evolution of life cycles in the case of Life-history Strategies. In Life-history Strategies (Chapter 6), empirical differences in life-histories are reviewed, followed by an extensive discussion of r- and K-selection. I would have preferred a shortening of the discussion of the latter, in lieu of a presentation of some of the other models of life-history evolution. In Population Regulation, the historical controversy of this topic is reviewed and k-factor analysis presented. Finally, the importance of competition, predation and disturbance in structuring communities is discussed in the concluding chapter.

I recommend this book as a text in a Population

Ecology course for advanced undergraduate or graduate students. The references are current. The text is clearly written in a straight-forward style. Figures and tables are used extensively throughout, which enables students to draw their own conclusions from the data and compare their interpretation with that of the authors. The paperback edition is sturdily constructed and reasonably priced.—CARL N. VON ENDE.

Thomas Bewick's birds (watercolors and engravings).—1982. Cambridge, Massachusetts, MIT Press, 58 pp., 52 plates (26 in color). \$8.95.—When I opened the review copy of this little book a name card from a Publicity Manager at MIT Press dropped out. A handwritten statement on it had the following message: "This is the most charming book we've ever published.—I hope your readers like it as much as we do." I agree. It is a charming little book.

Thomas Bewick (1753–1828) is one of the better known early naturalists; best known are his wood- engravings of birds and other animals but also country scenes. Not nearly so well known are around 400 of his watercolors, which long ago were used to produce his famous engravings by means of a simple but clever process described in detail by the publishers. The engravings were so popular in his time that evidently they overshadowed the watercolors. Somehow the watercolors remained virtually unnoticed until they appeared recently in Iain Bain's "The watercolors and drawings of Thomas Bewick and his workshop apprentices," which is the parent of this book and published first in 1981 by The Gordon Fraser Gallery Ltd., London and Bedford.

"Thomas Bewick's birds" contains a selection of watercolors and engravings from Iain Bain's compilation. Nearly all of the 52 selections were made by Bewick, except for a few produced by his apprentices. One by his son, Robert, depicts Bewick's Swan (p. 16)—a bird named in honor of his father. The species portrayed are mostly of common British birds of garden, field, and woodlot, but the reader will find among them such vagrants as the American Redstart (p. 9), which evidently has only been recorded twice in the British Isles. Also hardly common in Britain these days is the Great Bustard (p. 51). Bewick's engraving of this bird has long been a favorite of mine, but it is also nice to learn that an attempt is now being made to reintroduce the species in the United Kingdom after a 150-yr absence. Too late to reintroduce the Great Auk (p. 22) anywhere, but the reader will delight in seeing the head colors of this long-extinct bird marvelously preserved by the brushes and paints of the Master. All illustrations have 1–3 written paragraphs that succinctly but appropriately describe each species' current status, behaviors, habitats, or distinctive characters. Because the birds were not drawn to life size and the plates

all reproduced in their original small sizes, the length (in inches) is also given for each species.

One can easily read this book in an hour's time. One will, however, pick this book up many times simply to muse over the illustrations, not only because of artistic or aesthetic reasons, but also because the connection between Bewick's watercolors and engravings is so intriguing. It's a small book (5 × 7 inches) and bargain priced. A perfect gift to slip into a friend's Christmas stocking.—DAVID F. PARMELEE.

Common ground, a naturalist's Cape Cod.—R. Finch. 1981. Boston, David R. Godine Publishers. xi + 142 pp. \$12.95.—This series of essays describes scenes, experiences, and images of plants and animals encountered on Cape Cod. They represent a personal view of the dynamic aspect of nature on the Cape. The 32 essays cover such diverse creatures as cormorants, juncos, owls, gannets, whales, moths, and foxes, and describe the typical habitats such as marshes, woods, and the open beaches.

Scientifically, the facts are generally correct. But more importantly, his inferences and musings accurately reflect nature. Descriptions of the plumage patterns of birds, the behavior of owls disturbed by humans, and the life cycles of various animals are correct. His knowledge is far-ranging, from references to loon fossils to descriptions of the population cycles of lemmings in the far north. In describing plants, animals, and the environment, he discusses several rather sophisticated concepts, such as population dynamics, relationships of predators and prey, effects of man on population numbers, tide cycles, erosion, and shore-line dynamics. He handles such topics well, mixing fact with impressions to make these topics understandable and interesting. The author usually avoids being anthropomorphic, although his description of ants seeking a solution to their plight of being caught on a burning log in his fireplace (pp. 89–90) is both anthropomorphic and a bit sadistic (or, at the least, too realistic).

Several species and themes run throughout the book. Gulls and terns recur in several essays, although they are not the main topic of any one essay. Man's significant effect on specific organisms and man's insignificant effect on the nature of the Cape itself are frequently intermingled in the same essay. In his essay on foxes preying on terns, Finch discusses the value of both animals, stressing the pleasures of seeing a family of foxes among the dunes. He asks the question, How many terns is it worth to see a family of foxes? This is a question managers frequently ask, and one that requires an answer. Throughout the book Finch clearly describes his own sense of insignificance against the cold, wind, and starkness of the Cape. Some essays seem to confirm the universality of our feelings toward the unrelenting nature of Cape Cod.

From my perspective, the book would be more enjoyable with detailed maps of the Cape and the places Finch describes. It is not possible for a casual visitor to the Cape to locate the places that Finch describes. This series of essays would be particularly enjoyable for anyone who has spent any time along the coast and is familiar with marine and estuarine organisms. But I suspect it would also be useful for any naturalist. It is well written and easy to understand, and is thus suitable for any age group. It is not written for professional ornithologists, but for naturalists. I found it fun to compare my impressions with his. Thus I would recommend it as pleasant reading for cold, winter evenings.—J. BURGER.

Yellowlegs.—John Janovy, Jr. 1980. New York, St. Martin's Press. 192 pp. \$9.95.—Don't be misled into expecting a treatise on yellowlegs, *Tringa flavipes*, of this book. It is not. What it is is a rambling account of Janovy's personal odyssey to become an "ecologist." The yellowlegs serves primarily as a vehicle for Janovy's musings about himself, the Great Plains states and their societies, old Fords, the wonders of parasitology, the life of an academic and professional scientist, and the prairies. Throughout the book, Janovy again and again turns his thoughts to the generally inelegant machines produced by human technology and their contrasts with natural "machines" such as the biosphere or, for that matter, the individual yellowlegs. Sometimes his comments are thought-provoking, but often they are rambling and obtuse. In fact, the entire book is a mixture of really eloquent and moving passages, such as his portrayal of the feeling one gets for the open spaces of the prairies or his soliloquy on the scientist as a romantic, and obscure prose riddled with strained imagery. I liked some of the book, partly because it dealt with places and people and feelings familiar to me, but it left me with a confused feeling: Was Janovy trying to tell me about his own personal growth, about some natural philosophy, about the biology of the yellowlegs, about technology versus Nature in the Great Plains, or something else? The book is rambling and disorganized, so in the end one isn't sure what the take-home message (if any) is.

Overall, Janovy's book bears a close resemblance to Peter Matthiessen's "The Snow Leopard," but it is not so deep and profound or as elegantly written, and is not in the same class. Just as a mammalogist would not read Matthiessen's book to find out about the biology of the snow leopard, Janovy's book should not be regarded as a source of information about yellowlegs. Such was not the intention of either author, of course. But where Matthiessen succeeds in conveying a spiritual feeling for life through his personal odyssey, Janovy hits the mark only occasionally, and much of the book serves only to obscure the few really moving accounts. Janovy has much to

tell us, I think, but he has yet to write the book that does it successfully.—JOHN A. WIENS.

The birds of Nigeria.—J. H. Elgood. 1982. B.O.U. Check-list No. 4, British Ornithologists' Union, London. 246 pp. £14 (£10 to B.O.U. members).—The B.O.U. Check-lists are becoming a welcome feature of the ornithological literature, especially so in Africa. Elgood's "The birds of Nigeria" follows a fairly standard pattern in its soft covers, with an editor's foreword and an author's preface followed by a detailed 40-page introduction, the Systematic List (which forms the bulk of the book), appendices, a gazetteer, references, and indices. The introduction includes maps showing places, vegetation zones, climate and so on; most are useful, but would have been more so if they had been given a scale. The map of place names (Fig. 2) is fairly hopeless because it shows far too few places and is badly drawn. The sections on climate and vegetation are well done; photographs of habitats would have added considerably to the value of the latter. Migration is less well treated, which is a pity, since Nigeria is an ideal study area for both Palaearctic and intra-African migrants. The diagram of numbers of different types of migrants (Fig. 6) is confusing, since no scale of numbers is given and the shape of the kite diagrams does not accord exactly with the vegetation zones on the map.

The section on breeding, as well as the subheading dealing with breeding in the species accounts in the Systematic List, shows clearly how little is known of breeding in Nigerian birds—far less, it would seem, than in birds of several other West African countries like Senegal, Cameroun, and The Gambia. Why this should be is not clear. About 650 species of birds breed in Nigeria, yet the breeding of even quite common resident species is poorly documented. What have all the expatriate ornithologists and birdwatchers been doing in Nigeria all these years?

The order of major taxa in the Systematic List follows that of the Peters checklists, augmented where necessary by that of Morony, Bock and Farrand (1975). The scientific nomenclature is that of White's checklists (1960–1965), which makes it rather dated. No cognizance is taken of more recent systematic work in Africa (especially southern Africa) or elsewhere, but the arrangement of subfamilies and tribes is satisfactorily up-to-date. It is unfortunate to see in a systematic work of the 1980s genera like *Podiceps* (= *Tachybaptus*) *ruficollis*, *Ibis* (= *Mycteria*) *ibis*, and *Remiz* (= *Anthoscopus*) which have been disused for years. A number of species currently considered separate are regarded as subspecies, like *Gyps bengalensis africanus*, *Cuculus canorus gularis*, and *Motacilla alba aguimp*, although Elgood recognizes their distinctness and merely follows White for consistency, perhaps not altogether wisely.

The species accounts follow a standard concise form

giving status, distribution, habitat preferences, social organization (where relevant), and breeding data. The information might have been more easily assimilable with more in-text italicized subheadings like *Status*, *Habitat*, and *Distribution*. At present only *Breeding* is subheaded. English names are those of Mackworth-Praed and Grant (1970, 1973), which is sometimes an unhappy choice, since some of their names are clumsy (e.g. Red-tailed Lavender Waxbill, Dybowski's Dusky Twinspot), while others reflect an outdated British tendency to name some familiar species without an adjective (e.g. Finfoot, Coot, Pratincole, Oyster-catcher, Waxbill) as if they were the sole representatives of their taxon. The old-fashioned spellings of Oyster-catcher, Sand-plover and Guinea-Fowl and the inconsistent use of capital letters add little to the appeal of the English bird names. The name "lapwing" for the vanelline plovers is inconsistently applied. The use of the English "Fernando Po Swift" for the widespread Afrotropical *Apus barbatus* (elsewhere known as the Black Swift) is absurd; "Black Swift" on the other hand is inappropriately applied to *Apus batesi*, otherwise known as Bates's Swift. These irritations could have been eliminated by judicious amendment, selection, and application where necessary, and would have gone a long way toward standardizing the confusing array of English names for African birds. Other English usage is sometimes strange, like "stationary" instead of the more usual sedentary, or even incorrect, like the consistent use of the word "data" in the singular.

Some identification problems are raised in connection with possible confusion of sight records in the field, notably between the three thicknees *Burhinus oedicephalus*, *B. senegalensis*, and *B. vermiculatus*, and between the three swifts *Apus horus*, *A. caffer*, and *A. affinis*, yet in fact these species should not be confused by competent field observers. Of course the lack of a good field guide for West Africa is an aggravating factor, since even the one by Serle, Morel and Hartwig (1977) has its shortcomings, not the least of which is the absence of many species from the plates.

Errors are generally few. One that particularly caught my eye was the inconsistent spelling of Malamfatore in the text and Mallam Fatori in the map in Fig. 2. Another unfortunate one was calling the Baga Peninsula of Lake Chad a "sand pit" instead of a sand spit. More serious is the omission of the Grey-headed Gull (*Larus cirrocephalus*) from the Systematic List, yet it is referred to in the account for *Larus ridibundus* and in the introductory section on Aquatic Environments on p. 30.

For all these shortcomings (most of which are individually small), "The birds of Nigeria" is a necessary addition to every Afrotropical ornithological library because it covers a large country in an important part of the African continent, with over 800 bird species. The text reflects the author's long association

with Nigeria and is especially timely because of the country's rapid growth and the consequent loss and degradation of important habitats, especially the forests. The British Ornithologists' Union is to be commended on its far-sighted checklist project, of which this book is a worthy part, and not too highly priced.—GORDON L. MACLEAN.

Birds in southeastern Arizona.—William A. Davis and Stephen M. Russell. 1979. Tucson, Tucson Audubon Society. vii + 126 pp. 33 black-and-white figures. **Annotated checklist of the birds of Arizona.**—Gale Monson and Allan R. Phillips. 1981. Second Edition/Revised and Expanded. Tucson, University of Arizona Press. xxxi + 230 pp. + index. \$5.95.—“Birds in southeastern Arizona” is a three-part paperback, with about 10 pages of climate and avian habitats, about 65 pages of an annotated list of the birds in the area including tables of relative abundances for the annual cycle, and about 30 pages dealing with how to get to those areas having the greatest probability of finding birds one might want to see. With the very abbreviated annotated section on birds, this book provides little for the serious student of ornithology, as compared to the second book in this review, but it would be a very worthwhile investment for those wishing to play “avian golf” in southeastern Arizona or for those wishing to see selected species of birds. Other books provide similar information, but Davis and Russell have put together a helpful edition that clearly guides interested bird watchers to the most productive areas for seeing some of these localized species. They admonish the user on the ethics of bird watching, the need to respect land ownership, and the importance of not destroying the fragile habitat in the process of “nonconsumptive use.” The book will prove invaluable to those interested in coming to Arizona to bird watch, by aiding them in planning trip dates and then in actually getting to the best localities so that their time is spent most efficiently.

Monson and Phillips have produced a second edition of an annotated checklist of Arizona birds that has been revised and expanded from their 1964 publications dealing with “The birds of Arizona” (with J. T. Marshall) and an annotated checklist. Much new information has been added since their earlier work in 1964, and Gale Monson has religiously amalgamated records and judiciously separated bird sightings relative to fact versus fiction. Phillips has continued to examine museum specimens in his quest to bring more organization and understanding into the distribution and racial affinities of Arizona birds.

The section in the Introduction (pp. xv–xxiii) dealing with the need to collect specimens is classic and should be assigned reading to all developing students in ornithology. It is a paradox to me to see an “avian biologist” become upset from witnessing or

hearing about a specimen being collected and incensed if directed to procure a specimen, and then to see that same person sit by unalarmed when a land management agency threatens to desecrate a parcel of invaluable riparian habitat or allows severe overgrazing of a riparian habitat to the point where there is no longer any regeneration by woody species. The same double standard operates in the bird watcher who attempts to block scientific collection but immediately grabs an annotated checklist or book for information on avian distribution, period of occurrence, or racial affinities. If a treatise is to be factual, it must be based on fact, and if informative, it must contain creditable information.

Life zones are briefly covered in the Introduction and will help the naive biologist to appreciate the vertical complexity of the vegetation and types of avian habitats present in Arizona. A short but special section on riparian habitats, their importance to birds, their demise to the present, and their threatened future should induce a posture of “We cannot afford to lose any more” among bird students in Arizona and in the West as a whole.

Taxonomic nomenclature deviates from that of the A.O.U. checklist, so one has to be careful with regard to this problem. This minor distraction does not reduce the value of the tome and can be instructive.

The annotated checklist is replete with information regarding the present status of the birds of Arizona. Few can appreciate the effort required to compile such a detailed treatise of records for our use. I did find one glaring error as I perused my favorite species in the checklist. With reference to the Cassin's Sparrow (*Aimophila cassinii*), they state “nesting . . . not confirmed by specimen or photo,” which is incorrect, since I collected a fledged specimen of a few days and the skin resides in the University of Arizona collection. These types of errors are almost impossible to avoid and only with constant attention to detail can they be eliminated. This should not detract from the value of the book as a reference because it is by far one of the best annotated checklists available. It is a must for those pursuing Arizona bird studies, biogeographers, and anyone else interested in western bird distribution and migration.—ROBERT D. OHMART.

De danske ynglefugles utbredelse.—Tommy Dybbro. 1976. Copenhagen, Dansk Ornithologisk Forening. 293 pp. 111.30 Danish kroner. **Bird distribution in New Zealand. A provisional atlas 1969–1976.**—P. C. Bull, P. D. Gaze, and C. J. R. Robertson. 1978. Wellington, Ornithological Society of New Zealand. 263 pp. No price given. **Atlas van de nederlandse broedvogels.**—'s-Graveland, Vereniging tot Behoud van Natuurmonumenten in Nederland. 431 pp. No price given. **Arbeitsatlas der Brutvögel Bayerns.**—E. Bezzel, F. Lechner, and H. Ranftl. 1980.

Greven, Kilda Vg. 200 pp. No price given.—The British Floral Survey (1950–1954), which resulted in the "Atlas of the British flora" (1962), prompted a series of atlas projects emanating from the British Isles (Sharrock 1976, The Atlas of the breeding birds in Britain and Ireland) and Belgium (the European Invertebrate Survey). Following publication of the French, Swiss, and Natal atlases (reviewed in previous issues of *The Auk*) we have now the above four atlases available.

The Danish (1971–1974) and Dutch (1973–1977) projects followed quite closely the pattern of the British bird atlas. Because of the small size of these countries and the large number of collaborators, both projects worked on the 5-km² grid: Denmark having 2,160 such squares, the Netherlands, 1,671 squares. The Danes sent about 400 field workers to the squares yearly; the Dutch atlas does not give numbers, but lists all the many hundreds of participants. The breeding avifaunas were the subject of the surveys; these avifaunas are closely related in these two almost-neighboring countries (the atlas project found 189 breeding species in Denmark and 195 in the Netherlands).

Both books begin with very detailed descriptions of the survey methods, correction factors, square coverage, and the complete history of the field undertakings. Beyond documenting the breeding distribution of the avifauna, both surveys yielded quantitative results. This applies, first of all, to the rare breeders, for their numbers were directly registered by the atlas observers. Thus, Dybbro estimates the breeding Buzzard population of Denmark to be 1,900–2,400 pairs (after having applied certain correction factors), that of the Goshawk, 150–200 pairs. Corresponding estimates in Holland are 1,650 pairs of *Buteo buteo* and a minimum of 320 pairs of *Accipiter gentilis*. It is worth noting that the distribution map of the Goshawk in both atlases, and of the Buzzard in the Dutch work, does not show the true location of the squares with nests of these vulnerable raptors, in order to prevent abuse by reckless nest-plunderers.

Another indirect way to arrive at population estimates concerns the commonest bird species: percentage occurrence in the squares surveyed gives an index of relative abundance. The Danish atlas deals with these indices in a separate chapter. The Dutch workers were asked to give an estimate of the breeding pairs in their squares on a simple, logarithmic scale (1–10, 11–100, 101–1,000, etc.), but many were able to census the entire population of many species in their squares. These data were sifted and compiled by Teixeira and his numerous co-workers, and the results are discussed in the species accounts.

The format of the species accounts follows the general pattern used in Sharrock's British atlas. Each species' general distribution and habitat preference are described (much more detailed in the Dutch than

in the Danish atlas), then its distributional history in the country, population fluctuations, and the present situation during the atlas years are described. The distribution map that accompanies each species is more detailed in the Dutch than in the Danish work, but the line drawings of birds are equally good in both. Literature references follow each species account. The Dutch book gives soil and vegetation maps that are useful when comparing distributions of birds by habitat. Altogether, both of these books are exemplary in their methods, organization, and treatment of the material. It is a pity for us that they are written in the national language (although the Dutch atlas has a 1/2-page English summary), because the atlas projects that recently have developed in North America could learn a lot from their Danish and Dutch colleagues.

The New Zealand and Bavaria atlases are both provisional works. Leclercq (1967) emphasized that no matter how spotty the data, a provisional atlas puts the *status quo* on record, and immediately spurs further atlas work, aimed at completing the picture that the provisional work presented to the workers in the field, who generally were not aware of how much was already known. Therefore, it is laudable that the New Zealanders printed the results of 8 years of fieldwork and all previously available information in the form of a pocket-sized, spiral-backed, handy atlas. There is no text, but only a map of the North and South islands for each species with only one kind of symbol used to denote documented occurrence (irrespective of breeding status). The basis of the atlas work consists of 3,675 squares, each 100 km². The 10-km² grid that covers New Zealand is akin to the UTM ("military") grid that the various European atlas and other faunal surveys use; it is fitted to the islands without the needs of distorted squares (owing to the curvature of the earth), since the islands are roughly NW–SE and SW–NE oriented. By 1976, only 85% of the squares were covered; thus the provisional nature of this atlas. The avifauna (236 species censused) is about the same size as in the Danish and Dutch atlas areas, but the area of New Zealand is almost seven times greater, while the population (and thus the magnitude of the census effort) is much smaller. As the habitat maps show, there is much rugged, inhospitable alpine country, especially on the South Island. Yet the New Zealand ornithologists, backed by the Ecology Division of their national research bureau (DSIR) and the Wildlife Service, hoped to complete the coverage by 1980.

Bavaria is the southernmost, mountainous province of western Germany. It is covered by about 700 squares of the international UTM grid, but only about 330 of these had complete coverage. The data-pool comprises the results of the program "census of birds in agricultural land," of censuses in other habitats, and other recent material. The aim is to show the weakest points in coverage, where additional inten-

sified field research is needed. It also furnishes data, where the squares are completely covered, for the Europe-wide census undertaking. This small-sized (21 × 4.5 cm) paperback atlas does not have any illustrations; it treats two species per page, giving the percentage of coverage, the estimated number of breeding pairs in Bavaria, the geographical distribution and distributional history (mostly of this century), and conservation needs (when it concerns a rare species). The symbols of the distribution map show for each square one of seven symbols, detailing the breeding occurrence during the census years 1968–1973, and 1974 to 1980. The authors of this undertaking give special recommendations for a future, systematically organized, breeding bird atlas, as follows. Instead of few workers over a longer time period, they recommend intensive fieldwork during 3 years (but not more than 5 years) with a smaller grid size than 10 km². Evaluation of results should occur as soon as possible, and not at the end of the fieldwork. This way gaps that become apparent could quickly be filled. A short-term project would also secure more steady workers. The preparation of the final atlas should be accomplished very soon after the fieldwork for the results to be used in conservation and management arenas.

The Bavarian undertaking comes from an "Institute for Ornithology" as part of the state laboratories for soil science and agriculture—an indication that ornithology there, as in many other countries of Europe, long ago became an important applied science based on the beneficial role of birds in agriculture and horticulture. The census and atlas projects of the last few years (especially since the last recent overview of atlas projects, Udvardy 1981, *Studies in Avian Biology* No. 6: 103) tend to be supported by responsible state departments of agriculture, environment, or wildlife, be it in any political system (e.g. Polish, Estonian, Dutch, Ontario, British Columbia, New York, Colorado atlas or census projects) or political entity. Atlasing of the 1980s is neither purely a birdwatcher's pastime nor a zoogeographer's academic pursuit, but a taxpayer-supported, legitimate public effort to create a data base on which the fate and management of our precious avifaunas and their avian habitats depend.—Miklos D. F. UDVARDY.

Songs of the vireos and their allies. Family Vireonidae: vireos, peppershrikes, shrike-vireos, and greenlets.—Jon C. Barlow. 1981. Gainesville, Florida, ARA Records #7, 2 records in 1 jacket. No price given.—These records contain "known or presumed primary songs" of 39 of the 43 species in the family Vireonidae. For polytypic species, songs of different races are also illustrated. There is particularly good coverage of *Cyclarhis gujanensis* (4 races), *Vireo huttoni* (5), *V. solitarius* (6), *V. olivaceus* (5), and *V. alti-*

loquus (4). Birders will enjoy studying the different song dialects in these and other species, such as the Warbling Vireo (*V. gilvus*), and beyond simple enjoyment, questions will be raised about vocal limits of species. The harsh chatter that appears to constitute the song of *V. crassirostris approximans* on Old Providence Island is so different from the White-eyed Vireo-type song of the nominate race on Grand Cayman and elsewhere that one wonders if it can come from the same species.

This record doesn't have the same aesthetic appeal as Hardy's one on the Wrens (ARA #2), which would be hard to top, nor is that its purpose. Vireos as a group have rather dull, monotonous voices, although there are some surprises. The first time I heard the Green Shrike-Vireo (*Vireolanus pulchellus*) in the Canal Zone, I wondered if I had the first record of Tufted Titmouse (*Parus bicolor*) for Panama. Bell's Vireo (*V. bellii*) has a squeaky little jingle unique in the family, which may remind Europeans of warblers in the genus *Sylvia*; and the Warbling Vireo sounds more like a House Finch (*Carpodacus mexicanus*) than a Red-eyed Vireo (*V. olivaceus*). By and large, though, they're a pretty dull lot, but that's hardly Barlow's fault. His object is to compile and instruct, and he has succeeded at both. He is especially to be congratulated as a compiler. To have brought together in one album the songs of nearly all members of so widespread a family is a great achievement (only four local *Hylophilus* spp. are missing). I particularly appreciated the coverage of *Hylophilus*. Many of these cause problems for birders in the Neotropics. The common Scrub Greenlet (*H. flavipes*), which forages at low and middle levels, is easy, but many others are canopy feeders, providing an underside-only view which, combined with small size, often renders them unidentifiable. They are persistent singers, however, and I have often longed for a tape to identify the tiny mite singing 40 m above me.

Barlow is not just a museum (or laboratory) compiler. He recorded over half the species himself, which involved a lot of travel. Of the numerous other contributing recordists, the most prolific is Ross D. James, who accompanied Barlow on some of his trips. The recordings in general are of high quality, and if a few are what the late Myles North used to call "IPO" (identification purposes only), meaning not of disc quality, no matter, they are clear enough for identification. Special credit is also due to J. W. Hardy, who did a fine job of production.

The printed matter accompanying these records is all squeezed onto the back of the jacket. While this makes for convenience, the print is so small you can get eyestrain reading it. A detailed commentary is provided for the recordings, a standard feature of most records, but with a new twist—representative weights have been provided for each species. The stated purpose of this is "as a measure of size," but since there is no attempt to correlate weight with

vocalization, one wonders what the point was. (As a source for weights, which are often hard to come by, it is excellent!) Nearly half the printed matter is a detailed table of contents. For each of the 68 cuts, English and scientific names, date and locality of recording, and name of recordist are given. Fine—except that this same information is repeated verbatim on the records themselves. Certainly each cut needs to be identified, but since they are numbered, it would only have been necessary to announce "Cut 49: *Vireo olivaceus flavoviridis*," not the whole thing. I calculated that ca. 10 min of listening time was wasted in this way, time in which additional recordings could have been presented. The announcements produce in the listener a sense of boredom, relieved only by the mispronunciations (BOWLivar for Bolívar; HuanOOco for Huánuco).

Overall, this is an excellent work, and a major contribution to our knowledge of the vocalizations of the Vireonidae. With the productions put out by his company, ARA Records, Hardy is providing a major service to the ornithological community. I strongly urge him to continue the good work, and look forward to record #8, whatever it may be.—STUART KEITH.

Naturalist's color guide part III.—Frank B. Smithe. 1981. American Museum of Natural History. 37 pp., 9 color charts. \$8.00.—Part III of the "Naturalist's color guide" is an important addition and improvement of Frank Smithe's 1975 work, which was published in two parts. Part I, the "Color guide," contained 86 color swatches, and Part II, the "Color guide supplement," described these colors in detail. Part III is used in conjunction with Parts I and II (total cost \$17.50). Evidently, when writing his book on "The birds of Tikal," Smithe undertook an exhaustive study of Robert Ridgway's classic color guides published in 1886 and 1912. The latter, called "Color standards and color nomenclature," was, according to Smithe, an ambitious compendium of colors; it contained far too many color swatches and names for efficient usage by field workers. A simplified field guide was needed. He set out to make one, and naturally he used Ridgway as a standard.

Smithe not only explored the methods and techniques used by Ridgway, but he also carefully examined series of bird species that had been used previously as models. Only then did he make his final selection of colors, 86 in all, which was a notable reduction from the Ridgway array of colors and names that numbered well over a thousand. The cut proved too drastic: Parts I and II came under criticism by the professionals, among them his closest associates.

Part III deals openly and frankly with these criticisms. The organizational skill of Smithe becomes apparent when one realizes that he put his critics to work in improving the guide. The reader, therefore,

should not overlook the peripheral talent that contributes to the guide's success. Users will feel comfortable with the guide's reliability and credibility, for the author neglects no detail in striving for color perfection. According to the publishers, each color was measured spectrophotometrically before and after deposition; each was deposited in a long-lasting lacquer.

The additions most apparent in Part III are the nine new color charts with 96 new swatches. I find these additions a great help, mostly because they include colors missing in Part I that are indispensable. Buff, for example, is a color that I frequently use. What a shock it was to suddenly discover that the Buff (Color 24) in Part I of Smithe was strikingly different from the one I had visualized and used for years. And what a relief to see my special kind of Buff (Color 124) as part of the new addition in Part III. This color and others I no longer find disturbing, but users of the guide for the first time will do well to review its introductions and guidelines.

"The naturalist's color guide" is not easy reading. Although one's eyes flow smoothly over the many color swatches, one is forced to study, not merely read, the text in order to comprehend the methods employed by the author—unless you are among those familiar with chromatics, spectrophotometers, tristimulus values, etc. Munsell notations are especially important ingredients of the guide. Although each swatch is identified by a color number and a color name, often in agreement with names used by Ridgway, each color is also identified by a Munsell notation defined by the author in terms of its hue, value, and chroma. Smithe gives a simplified explanation of the Munsell system of color notations. Serious users of the guide will agree that the system is a very useful tool.

Much of the writing in Parts II and III of the color guide is devoted to descriptions and historical citations for the many colors. These accounts are interesting, useful references. For example, the color Olive, according to Smithe, is the ornithologist's most important, most used, and perhaps most abused color. One finds several dozen "olivaceous" colors in Ridgway's "Color standards," but Smithe reduces them substantially in his guide, explaining his choice and notation for Olive and listing no less than 54 citations. Many of the citations refer to flycatchers, but one (Ridgway, Bull. 50, Vol. 1, p. 39) that caught my attention stated that the "olive" on male Evening Grosbeaks (*Hesperiphona v. vespertina*) is limited to the nape and back. Since I had never associated my brand of olive with this species, I dashed off to test a grosbeak specimen with Smithe's guide in hand. According to the Smithe guide, the color is more brownish than olive, coming close to Olive Brown (Color 28), perhaps closest to Dark Olive Brown (Color 129). In its purest appearance it is best seen on the cheeks of the grosbeaks; on the nape and back

the feathers are more or less yellowish at the base tipped with Dark Olive Brown, producing a slightly mottled effect difficult to assign to any one color.

Only through usage can one appreciate the fine attributes of any guide. Smithe's guide may be used in various ways for both profit and fun. It works well in quickly identifying a bird's soft or fleshy colors that fade rapidly after death. It works equally well in diagnosing the colors of intricate bird nests and associated vegetative structures as well as the birds themselves. The guide's title, "Naturalist's color guide," is highly appropriate because it clearly suggests broad usage. Field workers in many disciplines will put the guide to good use.

Every guide has its shortcomings, and although this one in its completed package has few, it is only fair to point out that with the addition of 96 new colors to the original 86, the numbering system and swatch arrangements have become a bit confusing. One might ask why a complete revision was not undertaken to avoid this problem. To have done so would have put an unnecessary financial burden on those who purchased Parts I and II before Part III was available. The 182 color swatches of Parts I and III clip into a handy sized ($5\frac{1}{2} \times 8\frac{1}{2}$ "'), light, flexible, very durable six-ringed binder with its equally durable loose-leaf color charts. So suitable for the field is this arrangement that one wonders why the publishers fell short of these high standards when producing an accompanying flimsy paper mask to be used frequently in blocking out all but one swatch on a color chart in order to minimize visual confusion.

All in all, Smithe and his publishers have produced a very fine, practical, and modestly priced color guide that will prove a boon to field-oriented individuals.—DAVID F. PARMELEE.

The environmental decade in court.—Lettie M. Wenner. 1982. Bloomington, Indiana, Indiana University Press. 211 pp. No price given.—It is widely recognized that the passage of the National Environmental Policy Act (NEPA) on 1 January 1970 ushered in a new era for the United States. The law was formal recognition that man is as much dependent upon his physical and biological environment as any other species is; that the environment upon which our existence depends is finite; and that we have a responsibility to protect the environment for future generations. The law declares in concise terms that it is the policy of the Federal government to create and maintain conditions under which man and nature can exist in productive harmony. The NEPA began what is often considered the environmental decade.

With the passage of the NEPA, environmentalists were able to switch their focus from that of establishing policy to that of implementing policy. Following the NEPA many new and revised environ-

mental laws were passed and administrative agencies began issuing regulations designed to implement the new laws. Of course government, environmental interest groups, and industry all had differing opinions regarding the implementation of the environmental laws, and their arguments were brought into the courts for interpretation. How the Federal courts have interpreted environmental law during the 1970s is the subject of Lettie M. Wenner's book, "The environmental decade in court." It is an examination of how the Federal courts responded to the arguments of government, environmentalists, and industry in the new era of environmental regulation.

The subject matter is surprisingly readable, even for those of us not schooled in the field of law. There is little, if any, legal jargon used in the book, except for those terms used in the profession that are part of everyday language now. The organization of the text also is easy to follow. The first two chapters set the stage for the remainder of the book by discussing the development of environmental policy and the numerous environmental laws. The next five chapters examine, by various methods, how different interest groups used environmental laws in the courts and how the courts responded. The final chapter questions whether or not the courts influenced environmental policy.

As pointed out by the author (and rightfully so), it is difficult to describe environmental cases as having only environmental issues in them, even though a case may have been brought to the courts because of the Clean Air Act, Clean Water Act, the NEPA, or some other environmental law. Many cases, while being environmental cases, also involved issues such as states' rights, civil rights, interstate commerce, constitutionality, and others. Consequently, a court's position on an environmental case was often indistinguishable from a court's position on other important policy issues of the 1970s. Decisions were often made in favor of another issue and not necessarily against the environment. Another complicating factor was that many cases involved more than one environmental law. To minimize problems with describing and analyzing the 1,900 environmental cases researched for the book, the author developed a coding system and subjected the data to statistical testing. This method of analyzing such a large amount of information proved quite successful, and the result is the discovery of several interesting trends in the Federal courts in the 1970s.

Several chapters are devoted to an analysis of who brought cases to the courts, what kind of cases were brought, who won, and why they won. It is revealed that in the early years of the environmental era, most cases were brought to the courts by environmental interest groups. The latter years saw more cases being brought to the courts by government and industry, the former enforcing compliance with air and water standards and the latter arguing that the standards

were too strict. By far the most common cases brought before the courts were brought by environmental interest groups against the government. The interest groups argued that government did not sufficiently administer environmental laws or the government itself degraded the environment by the construction of public works projects. The latter is evidenced by the fact that, out of a total of 1,900 environmental cases studied for the years 1970 through 1979, a preponderance (759) of cases were brought to the courts using the NEPA as the primary law. Another analysis reveals that Federal district and appellate courts' decisions in the southern and western circuits were generally less favorable for the environment than decisions made in the northcentral and northeastern circuits. Appellate courts tended to have a moderating effect on district courts, meaning an exceptionally pro-environmental district court often had its decisions overturned by the appellate court and exceptionally anti-environmental district courts had decisions reversed as well. The Supreme Court tended to support the environment less than any other Federal court. Overall, however, the environment seems to have won as often as it lost in the courts during the environmental decade.

Although the book is an examination of environmental law in the Federal courts during the 1970s, and is therefore aimed more toward students of environmental law than anyone else, the subject should prove interesting to almost everyone interested in environmental protection, regardless of discipline. For students of environmental law as well as nonlegal environmental professionals, knowing what trends there have been in environmental litigation is invaluable information. The author has succeeded in reducing a large amount of environmental case history into a useful and useable format. In the present atmosphere of deregulation and budget cutting, there will be less government control over and support for environmental protection and preservation of our natural resources, leaving these efforts to individuals and environmental groups. Many disputes will be brought before the courts, and knowing how the courts have treated environmental issues is important knowledge. Wenner's "The environmental decade in court" has provided this information, and it should become an increasingly important reference as the environmental era passes through its second decade.—JAMES P. HOOPER.

Analysis of vertebrate structure.—Milton Hildebrand. 1982 (Second edition). New York, John Wiley & Sons. xvi + 654 pp. Price not given.—This is the second edition of a well-known university textbook on comparative anatomy. Although some new material has been added, the outline and content are essentially the same as in the first edition.

One can approach comparative anatomy from two

perspectives, historical and functional. To my way of thinking both must be included and done well if a course (or book) on comparative anatomy is to be successful. Hildebrand's approach emphasizes both, but he tends to favor the functional as being more in line with research trends. Unfortunately, the discussion of the role of comparative anatomy in deciphering life's history and our current knowledge of that history is so outdated and frequently patently incorrect that the book would be difficult to adopt for any course that has a historical thrust to it. Discussion of how we use comparison to reconstruct history is nonexistent. No effort is made to incorporate any advances in our understanding of chordate relationships over the last 15 years—and they have been major. We are left instead with an archaic Romerian parade through the vertebrates, in which nonexistent taxa such as the "Agnatha" or "Reptilia" are treated as if they had some ontological status rather than as the artifacts of man's mind that they are. Hildebrand asks of the "Reptilia" (p. 60): "Why, one may ask, does this class have so few distinctive characters?" The answer is simple: one cannot expect much congruence in character distribution when the taxon one is examining is artificial and not real.

Because the book lacks a good introduction to the principles of comparison and an up-to-date assessment of chordate relationships, the second section of the book—"The phylogeny of structure"—cannot hope to succeed. This section purports to review the structural evidence for vertebrate interrelationships, but its main concern seems to be to interpret character transformations within a "scala naturae" of the vertebrate "classes." This is not to say that anatomical detail is lacking, only that its evolutionary interpretation is simplistic at best.

The final section—"Structural adaptation"—is in many ways the strength of the book. Nevertheless, I would have preferred to see function presented just as that—how animals work—rather than as examples of "adaptations," which, as Hildebrand uses the concept, is purely axiomatic and not susceptible to rigorous scientific investigation.—JOEL CRACRAFT.

The birds of Brevard County, Florida.—Allan D. Cruickshank; with added records (1974–1978) by Robert D. Barber. Edited by Helen G. Cruickshank. 1980. Orlando, Florida, Florida Press, Inc. xv + 200 pp. \$12.00. (Available from Indian River Audubon Society, 911 Bali Road, Cocoa Beach, Florida 32932.)—In 1953 Allan Cruickshank moved to Rockledge, Brevard County, on Florida's Atlantic coast midway between Jacksonville and Miami, and for the next 21 years of his life he kept close tabs on the occurrence and distribution of birds in Brevard County. Allan was afield when the human population of Brevard County increased rapidly due to the development of the U.S. space exploration program at Cape Canav-

eral and he recorded the effects of all this on the county's birdlife. Despite his untimely death, we still can reap the benefit of his work due to the major effort of his wife, Helen, in editing Allan's records, and, along with the addition of Robert D. Barber's records (1974-1978), in publishing this valuable book.

The work treats 395 species, including 104 breeders, and each species' account may include information on period of occurrence, abundance, habitat preference, status, and egg dates. The book includes a map of Brevard County, a useful introduction by Helen Cruickshank that gives the genesis of the book and a history of Christmas bird counts in the county including the world-famous Cocoa count, and a biographical sketch of Allan.

This is essentially an annotated list with no overall tabulation or analysis. Nevertheless, students of the distribution of birds in southeastern United States will find this book an important source of information because it contains the detailed record of an avifauna situated in the transition area between the temperate and subtropical zones.—FRED E. LOHRER.

Acta XVII Congressus Internationalis Ornithologici.—Rölf Nohring (Ed.). 1980. Berlin Deutsche Ornithologen-Gesellschaft. 2 volumes, 1,463 pp., 289.60 D.M.—These two volumes contain the proceedings of the 1978 I.O.C., held in West Berlin. Volume 1 includes 68 pages devoted to information on congress business, the International Ornithological Committee's decisions, members' list and statutes, and reports of the standing committees on nomenclature and seabird research. The next 100 pages are devoted to the six major lectures that were given by D. S. Farner, K. Lorenz, E. Mayr, J. Aschoff, W. T. Keeton, and C. M. Perrins. The bulk of both volumes consists of 183 short papers (4-8 pp.) grouped into 36 symposia that cover a wide range of topics. The volumes conclude with abstracts of 19 special interest group discussions, the 137 poster and 76 film presentations, the program outline, and indices to authors and bird genera and species mentioned.

The 320-plus presentations at Berlin constitute a 50% increase over the preceding two Congresses. Poster sessions allowed for this. I heartily endorse their use, *provided* they are given proper facilities and some prime time. I also support the organization of all verbal presentations into invited symposia. Persons given the *honor* of organizing Congress symposia also have the *responsibility* of obtaining international representation among the speakers and of avoiding the pettiness, cronyism, and nepotism that I experienced and witnessed at this and the most recent Congress.

The plenary sessions were an excellent lot. Farner summarized current knowledge of regulation of the annual cycle in *Zonotrichia*. Ergonomically expensive functions are temporally separated so that daily energy

expenditure varies little. Fat reserves permit temporarily high rates. Day length is the primary information source to the control system. How nonphotonperiodic environmental information alters the basic pattern of endocrine control remains a mystery.

Lorenz pays tribute to Oskar Heinroth, "the father of ethology," in his presentation, which is printed in German. Limited knowledge of this language prevents me from making extensive comment, but the essence of the presentation is that Heinroth established the field of ethology based on an extremely extensive knowledge of zoo animals. The contributions of numerous of his contemporaries and students are given perspective by Lorenz.

After acknowledging the numerous contributions to avian classification made by Erwin Stresemann, Mayr reviews current activities pertaining to species categories, microtaxonomy, and higher categories, macrotaxonomy. A quiet revolution has occurred within microtaxonomy through the application of the superspecies concept. The arrangements of species that result from using this concept are especially useful to biogeographers. Most of Mayr's presentation pertains to the current status of the problem of avian classification. He discusses characters (fossils, behavior, morphology, macromolecules) and philosophies (phenetics, cladistics, divergence). Mayr is optimistic that in the near future important insight will be gained into the relationships of bird families and orders.

Jürgen Aschoff delivered "Biological clocks in birds," in which he presents evidence for circannual as well as circadian self-sustaining oscillations. The existence of freerunning rhythms, which when exposed to a periodically changing environment give evidence of entrainment, supports the proposed existence of circannual clocks. Through evolution, proximate factors of an endogenous rhythm and entraining zeitgebers sometimes have replaced ultimate causes.

William T. Keeton, another superb lecturer, presented "Avian orientation and navigation: new developments in an old mystery," and, indeed, much new is known about the subject. First Keeton reviews celestial cues. Although the ways in which they are used are fundamentally different, apparently the sun and the stars function only as a simple compass, and a compass alone cannot determine a bird's position or the direction it should fly to reach its destination. Other cues must exist. Use of familiar visual landmarks seems of only minor importance, and no evidence supports the existence of an inertial guidance system. However, recent experiments do support the ability of certain birds to find their way by using the earth's magnetic field, gravity, barometric pressure, infrasound, polarized light, ultraviolet light, and (questionably) olfaction. The evidence for each is briefly and nicely summarized. It appears that birds can use many different orienta-

tional cues, some of which are redundant. Hence, current research is attempting to learn how different cues are integrated. Manipulating the environment during a bird's development is a major approach. Altering physiological condition is another. It is easy to agree with the late Bill Keeton's statement that this field is an extremely active facet of ornithology.

C. M. Perrins presented an information-packed lecture entitled "Survival of young Great Tits, *Parus major*," in which he emphasizes factors affecting population size. The proportion of young that survive to autumn, which varies greatly through unknown causes, is the most important factor influencing population change. High juvenile survival leads to dense breeding populations in small territories. Territoriality excludes some tits from breeding, but the proportion excluded and under what conditions remains unknown. At different times in the annual cycle, large or small body sizes confer advantages on individuals. This long-term study (over 30 yr) demonstrates the value of basing population predictions on a broad base of data. I urge the arm-chair population modellers to make models based on some of the information available from the 30-plus-year study of the Great Tit, and then check their results against the additional information. This approach should point to the assumptions (usually wrong) that have been made in producing the model, which in turn should allow for an assessment of their overall value.

It is unfortunate that these proceedings did not appear until 3 yr after the Congress was held (1978). Because of the great variety of topics covered and the quality of the information, however, I consider them important references that should be in large institutional and private libraries. In addition to containing information pertinent to specific projects, these volumes give a good overview of the status of ornithology in the 1970s.—GLEN E. WOOLFENDEN.

Mountain islands and desert seas—A natural history of the U.S.-Mexican borderlands.—Frederick R. Gehlbach. 1981. College Station, Texas, Texas A&M University Press. 298 pp. + 65 color photographs, 3 maps, 36 black-and-white illustrations. \$19.95.—The second half of the 19th century was a time of description for the U.S.-Mexican boundary area. Government surveys, some extending over several years, were well documented by J. R. Bartlett, W. H. Emory, E. A. Mearns, and others. Now, Frederick Gehlbach reports upon impressions registered during his field studies along the border. He studied the early references, revisited many of the same sites, conducted his own research, and has produced a modern synthesis of the features characterizing the area's natural history. The book is written for "serious amateur naturalists as well as professionals in many areas of biology, especially ecology and resource

management." It is written in a style that will entertain any reader and inform and challenge naturalists of every background.

The mountains of the borderlands often rise as islands in a sea of arid landscapes. The mountains vary in size and elevation and form and latitude. The deserts are vast and often uniform in appearance to the eye of the non-naturalist. In 15 chapters, Gehlbach treats features of the area in an effort to understand the forces responsible for their present-day attributes. Coverage begins at the Gulf of Mexico and proceeds westward to the deserts of the Colorado River valley. Birds are not the only subject, but the natural and unnatural (as Gehlbach often refers to the effects of man) forces that have influenced other forms of life also have affected birds. The book will thus be of interest to ornithologists and bird observers. There are lots of facts presented in the book, but often only as a means of introducing a subject for discussion; Gehlbach has sought "explanations of repeated patterns" and has found many.

The initial chapter is an excellent overview of the topography and vegetational communities of the boundary area. The author defines his terms and describes probable climatic and geologic events of the last few million years. References are cited in annotated footnotes and there is no final "Literature Cited" section—effective and instructive for the reader but an inconvenience for one who seeks a single list of references. Footnotes are often used to present statistical results and generally greatly enhance the text.

"Valley Jungles" is typical of other chapters in its provocative choice of topics. In it, Gehlbach describes the Lower Rio Grande valley as it now is and as it was before man's interference. He considers not only the demise of palms as native trees but also the significance of their fronds to various organisms. He presents evidence that the decline of Hooded and Black-headed orioles is due to an increase of Alta Mira Orioles and not to an increase in the number of cowbirds. His analysis of the species composition of the birds in the valley indicates that 14 species at the northern edge of their range show great variability in population numbers over a period of years. He tests the concept that the valley is subtropical and concludes it is "in and of the temperate zone." Everyone who has speculated about the dollar value of birds will be intrigued by his analysis of the value of the valley's Hook-billed Kites; park and refuge managers should be especially attentive. The house mouse did not survive the flooding of the 1971 hurricane, whereas native species did. Gehlbach proposes that flood control beginning with the Falcon Dam in 1953 led to the downfall of native floodplain woodlands and the sharp increase in house mouse populations. He proposes managed flooding to preserve the riparian community. His curiosity about all of the areas's creatures led him to a trap, mark, and recapture study of lesser sirens, a nearly legless

aquatic burrowing salamander. The author presents the argument that flood control effects of the Falcon Dam led to the reduction in bald cypress but may also have led to the increase in Ringed Kingfishers. And he relates the northward spread of the armadillo to man's disturbance of the native landscape.

Each of the following 12 chapters contains similar thought-provoking descriptions and analyses. All is easy reading, but most serious readers will move slowly through the book, pausing to digest, question, and apply Gehlbach's conclusions.

A chapter titled "Poison, Poison" describes the distribution of pesticides through the Presidio area; even lizards 9 mi from use areas were contaminated. Even more startling was the finding of high pesticide levels in remote campgrounds and the explanation of their source in campers' spray cans. The way that natural wet-dry precipitation cycles alter lizard community composition is explored. Trampling by people and horses is treated as a poison in its effects upon trailside vegetation. Even trogon watchers in the Chiricahua Mountains of Arizona contribute to the reduction of or disappearance of certain plant species along well-used trails. Gehlbach ponders the problems of the carrying capacity of humans in natural areas and the challenge in man's management of man.

Chapter 4 deals mostly with fish distributions and probes their diversity, species-segregating factors, and man's role in re-establishing some species. The author digresses to discuss mud turtles and screech owls, and presents his evidence for the occurrence of two rarely interbreeding owl species in the Big Bend region.

The chapter "The Arch Predator" explores man's role as a predator on such large animals as bears, coyotes, wolves, jaguars, and the extinct giant bison. He describes how man may be selecting for intelligence in coyotes, delves into jaguar population dynamics, and wonders if black bears will fill grizzly bear habitat.

The Guadalupe Mountains, the highest range in Texas, provide the setting for an essay on bighorn sheep extirpation, a discussion of lizard community ecology (especially its usefulness in keying woodland types), and speculation on the evolution of ring-necked snakes. Bird species diversity in the isolated ranges supporting coniferous forests is summarized, but further explanations are still needed.

The demise of grasslands is the main topic considered in Chapter 7. Cattle were first brought to New Mexico from Chihuahua in 1598, but the range did not deteriorate until late in the 19th century, primarily due to overgrazing, according to Gehlbach. He then considers the adaptations of birds to deserts and species diversity in different desert habitats. Arguments that interspecific territoriality may cause a reduction in territory size in a desert bird community are not convincing. Rodent and lizard occupa-

tion of the black-and-white substrates of New Mexico's Tularosa Valley are thoroughly discussed, as is the problem of desert pupfish existence and extinction.

In Chapter 8, Gehlbach reflects on the presence of 19 species of bats in the high mountains of southwestern New Mexico and how they may divide up their resources. Some considerations of hummingbird energetics are treated here—not original materials, but food for thought. The author analyzes dispersal records of several bird species that have moved northward in recent years through the borderlands and finds an average northward spread of 6 mi/yr that is positively correlated with average size of the species. He presents original data to support the claim that Great-tailed Grackles have evolved greater size (+5 g) and dimensions (bill and tarsus length) since the 1950's. In a brief discussion, the author considers urban bird diversity and finds that it parallels simultaneous changes in plant-species diversity. He notes that as urban species diversity increases there is a decreased density of introduced and edificial species. Gehlbach concludes that culturally defined succession follows the rules of natural succession, as opposed to something that might be called "man's rules."

Gehlbach devotes a chapter ("Landscape Maze") to a consideration of plant and animal distributions on either side of the continental divide. Whiptail lizards and other grassland dwellers have their story told. If one is interested in a summary of dispersal routes and degree of subspecific evolution, this is an intriguing chapter. The author indicates that Apache squirrels and black-eared mice in the Chiricahua Mountains are less variable in body size than populations farther south, and he relates this to reduced genetic diversity. This is a particularly good chapter for bird students, who will be interested in the analysis of flycatcher competition in riparian communities and a comparison of data from pine-oak woodlands (Marshall 1957. *Pacific Coast Avifauna* 32) with the author's findings at the same sites 20 yr later. There were few changes; the 10 most abundant species were still the same.

"Mountain Islands" deals specifically with the high mountains of the Southwest. Gehlbach looks first at distribution patterns along their canyons. He finds 5,000 ft to be the altitudinal gradient on the mountain slopes dividing plant and bird communities. The bird communities are more diverse in the higher gradient but have twice the biomass in the lower one. Gehlbach wonders if lowland riparian bird associations are the consequence of periodic severe flooding with its resultant unstable and immature communities. He notes that lower temperatures at the higher elevations may favor larger birds (they are 1.3 times as large) but suggests that correspondingly larger territories mean fewer individuals. The author analyzes Marshall's data from different mountain ranges to

test the idea that more southerly ranges should have more bird species (because there are more species in the tropics). He finds that latitude has little bearing on bird diversity; variation is due to plant-species richness. Plant-species diversity is, in turn, related to the extent of the woodland area, mean distance from other mountains, latitude, and other factors. The chapter includes some excellent natural history of the coati and Elegant Trogon at the northern edge of their ranges. Coatis, he suggests, may be limited northward by cold and by a decline in the number of prey species. His analysis of the diversity of small terrestrial vertebrates indicates that, unlike birds, most of their mountain-to-mountain change in diversity is explained by latitude. Woodlands north of the border have been protected from fires to a much greater extent than those in Mexico, resulting in their "degeneration," as described by Gehlbach. After analysis, however, he concludes that fire is "neither beneficial nor harmful to avifaunal richness."

Naturalists may pick and choose what they wish to write about. In "And Canyon Trails," Gehlbach wonders about the changes in coloration and patterning in certain snakes as they mature. He suggests that Mojave rattlesnakes are invading areas formerly occupied by diamondback rattlesnakes as desertification increases. He writes much on tree-species diversity in canyons and finds variation in structural diversity primarily attributable to conifers. He compares incidence of ground-, foliage-, and cavity-nesting birds in various canyons and finds changes with elevation related mainly to distribution of broad-leaf evergreens (mostly oaks) that provide long-lasting cavities. Gehlbach is one of few persons who has noted the similarity of the paced primary songs of the Whiskered and Western screech owls. He wonders if this may "enhance their division of resources." He finds the niche of the Whiskered to be 1.2 times broader than that of the Screech Owl and suggests that the Screech Owl may be displaced downward in elevation through competition with the smaller Whiskered Owl. Other topics include reflections on the eye contact made by many snakes with humans and the finding of Ditmar's Horned Lizard. He uses principal components analysis to compare the reproductive characteristics of lizards and birds and finds that both cluster into three main groups bearing a similar relation to each other; he concludes that their reproductive modes are similar. There is much thought-provoking material here. Statements are frequently supported by statistics (multiple stepwise regressions are his basic analysis) in footnotes but the nonstatistically oriented reader will have no trouble with the text.

Gehlbach's description of events during the summer rainy season in the grasslands of southeastern Arizona is especially vivid. He reflects on the grazing of cattle in the area and moves on to an elaborate description of the distribution of native fishes and

their extinctions. Fish common names are not especially well known to most readers and scientific names are not provided in the text, but one can get the scientific names from the entry for the common name in the index. The fish story is thorough, but the reader will work in following it. A comparison is made of the avifaunas of lowland riparian communities, and the conclusion is reached that avifaunas of eastern and western United States are basically similar and have fewer species and lower densities in their northern areas.

In "A Walk in Time," Gehlbach compares photographs he made of border monuments with photographs of 1892-94. He found that the western borderlands had become much brushier, with mesquite making a major contribution. The author suggests that man's influence and climate have been major forces on the changing aspect of the vegetation. Man's effects have been generally unidirectional. Desertification may be self-perpetuating; once the ground has become compacted and there is more runoff from the soil, there are fewer plants, lower humidity, and less rain. More drought-resistant plants grow, resulting in lower humidity and even less rain, again influencing climate.

"El Gran Desierto" is descriptive of the most arid portions of the boundary region. There is much about the community ecology of heteromyid rodent assemblages and competing cricetid strategies. An analysis of nine species of lizards for their activity times, body temperature, and group affiliation identifies patterns in their use of energy. Gehlbach speculates on the evolution of tail waving and color mimicry in snakes and the success of spadefoot toads in the desert.

The final chapter is titled "The Lessons." In it, Gehlbach concludes that water is the ultimate limiting resource of the borderlands region. Most of the book has been a consideration of the ways that plants and animals have responded to limited water. Man's influence has greatly complicated an already delicate balance. Gehlbach advocates large natural reserves connected to each other by wild corridors in order to preserve the genetic diversity necessary to provide stock for future evolution. He develops a model to predict the size of such preserves, and proceeds to compare the model's figures with the extent of remaining undeveloped areas. He then establishes a priority scale for the various natural communities, with woodlands, forests, and plains grassland being most in need of representation. Much of the chapter is devoted to specifics of the location and extent of the preserves he recommends, without the constraints of political and economic realities. Only this final chapter strays from good solid natural history, but in it the author presents what he visualizes as essential action.

This book is well documented, thoughtfully prepared, and relatively free of typographical errors. The black-and-white historical sketches add substantially

to the book's content, as does the selection of color photographs by the author. Maps are adequate, but not every locality in the text appears on them. I found the method of citing references in footnotes to be an annoying aspect of the book only because it is difficult to find the first appearance of an often-cited work.

Mountain Islands and Desert Seas should be in every institutional library having a selection of natural history writings. The book has much to offer anyone with an interest in ecology and natural history. Most important, readers will think of their own experiences and observations and search for explanations. Students of birds, especially those with an interest in the U.S.-Mexico border area, will find the book stimulating but wish that it contained more about birds. I think the book is among the best of natural history accounts.—STEPHEN M. RUSSELL.

An atlas of the birds of the Western Palaearctic.—Colin Harrison. 1982. Princeton, New Jersey, Princeton University Press. 322 pp., 810 drawings, 693 maps. \$25.00.—Very few atlas works have been published in the past 25 years. Are they outdated in today's ornithology? Practically all modern field guides and regional handbooks contain reasonably accurate and interpretable maps of all or more species. The large urban and regional networks of record-keeping bird-watchers are aware of any out-of-the-ordinary occurrence and breeding of our North American and European bird species. So, why a new bird atlas of the Western Palaearctic, a region that enjoys a veritable library of guides to birds and their seasonal whereabouts?

Harrison provides two answers for us in his brief introduction. First, he wishes to update the information existing in the major field guides. In my opinion this is not a valid reason, because some of the best-selling field guides of Europe have been updated every 5 yr or so with respect to text and map information content. Secondly, Harrison is intrigued by both the existence of European endemics as well as by the many species with wide Palaearctic and Holarctic distributions. He wants to know whether there are "ecological counterparts" in other parts of Eurasia, and to what extent congeneric relatives complement each other in their respective distributions. This is a good reason, because most bird-watchers develop a similar curiosity and do not receive any answers from their standard field guides. For the serious bird student, a better justification for this atlas lies, however, in its potential as a data base for historical biogeography. How many of us really know something about the Siberian and Tibetan species that are so closely related to some of our most familiar Nearctic or European woodpeckers, chickadees, finches, or flycatchers? This atlas contains case study after case study of 13 × 6 cm composite maps

of the whole Palaearctic showing the individual breeding area of up to eight congeneric species. These maps could become fertile testing grounds for the hotly debated dispersal and vicariance hypotheses in evolutionary biology.

After a general introduction, the atlas follows a standard format: 40–150 words of text per species (resident or migrant bird, occurrence in vegetation formations throughout the area, habitat description, and how it differs in these characteristics from related forms); a 6 × 6 cm map of the Western Palaearctic with the annual dispersion pattern (in brown, orange, and blue color for year-round, breeding, and nonbreeding season area; hatched blue for additional geographic space covered during migration); and, finally, a little sketch at the bottom of the page. All families, many genera, and certain species groups receive a succinct zoogeographical interpretation that places the Western Palaearctic species in a comparative setting including all Palaearctic (sometimes even Nearctic and tropical) relatives. This instructive, though at times tentative and speculative, approach is accompanied by composite maps (in black and red) with the area overlays of between two and eight species. The map projection used is Mercator's: beware of distance comparisons at different latitudes!

All in all you get much more than Voous' classic *Atlas of European Birds* in this volume. The atlas contains 639 full species accounts and additional text and map information on another 139 so-called "extralimital" species. Colin Harrison is the text author, Crispin Fisher was responsible for design and cartography, and nine artists added more than 800 monochrome black-and-white bird sketches. Some of the drawings are not larger than the average postage stamp; they are attractive and useful nevertheless because they acquaint or remind the reader of the general appearance of each species. Compared to most zoogeographic atlas works this one is small, light, and downright cheap by today's college book standards.

Now, moving from the format to the substance: The general introduction deals with mapping problems and with the age-old question of drawing the boundary line for the Western Palaearctic. I was surprised to read: "If there is any real boundary to the western region of the Palaearctic it has become apparent from these maps that for birds it would lie somewhere to the east of the center, through the region of the Altai or Lake Baikal, Sinkiang, and the central Himalayas." Yet, this atlas' species distribution maps show an eastern boundary line that is placed at the 68°E longitude, between 1,500 and 2,500 km to the west of Harrison's "real" boundary. This means that the atlas places more emphasis on the typical European species that breed west of 68°E longitude and north of 20°N latitude. The more easterly breeding species receive only cursory attention.

After a brief and fairly meaningless description of

climatic, altitudinal, and vegetation zones we come to the most interesting portion of the general part, "Distribution and the Effects of Time." This is a useful summary of our current knowledge of the effects of at least six Pleistocene glaciation events in Eurasia on climate and vegetation, followed by the presentation of refuge and dispersal center models for the Palaearctic avifauna.

Loss of suitable habitat and extensive ice barriers between refuge-like lowland habitats are presumed to have caused many of the observed disjunct area patterns. Harrison detects distributions that are either pair, trio, or quadruple patterns. The pair pattern is most common in the Palaearctic, followed by a trio in which glacial advance appears to have created a western, an eastern (Manchuria), and a southern (Himalayas-India) population refuge. Examples for such a vicariance event are pond herons, small sparrowhawks, quails, partridges, rock doves, cuckoos, great reed warblers, treecreepers, greenfinches, and orioles. A quadruple pattern is seen in little bitterns, shrikes, rock thrushes, and starlings; in these cases the Chinese refuge appears to have been split into a northern and southern one during an earlier cold period. Four woodpecker groups are used to develop even more complex refuge and speciation patterns in the topographically diverse Himalayan region.

For the entire Palaearctic, Harrison maps out more than 20 southern and northern "potential" refuge areas during periods of glacial advance. Most of these coincide with the refugia described by the German zoogeographer De Lattin for mammals and butterflies. Pollen analysis throughout the region is strongly supportive of the presence of well-defined vegetation formation islands in certain southern lowland areas of the Palaearctic; Harrison uses this evidence to support his refuge and dispersal center concept. Because the taxonomy of Palaearctic birds is possibly the best known of all animals, historical biogeographers are advised to study the strong evidence for both repeated dispersal and vicariance events in the recent geological past of the Palaearctic. There are dozens of simple and complex areographic patterns that will test the talent and experience of professionals and amateurs alike.

The American edition of this atlas contains few typographical errors (*Phylloscopus collybita* is called a "Chiffchiff"), and the maps appear to be quite accurate, at least regarding Europe, North Africa, and the Middle East. A distinct disadvantage is the use of British names (divers, skuas, etc.) throughout the atlas. The bibliography is extremely skimpy (only 17 books listed on Palaearctic birds). I would also have liked to see a map of the global range of each species, but I realize that such a feature would have required much additional space. In sum, this is a most useful and stimulating book.—HARTMUT WALTER.

Population ecology of the Chaffinch (*Fringilla coelebs*).—V. R. Dolnik. 1982. Proc. of the Zoological Institute, Vol. 90, Leningrad, USSR. 301 pp. No price given.—This book summarizes, in chapters by different authors, the results of long-term studies on the Chaffinch, *Fringilla coelebs*. Beginning in 1958, the work was conducted by a succession of researchers based at the biological station on the Kurische Nehrung, a sand spit on the southeast edge of the Baltic Sea. Chaffinches breed commonly in the local woodlands but, more importantly, thousands of individuals pass through on migration each year, together with other birds. During the course of this work, some 317,000 Chaffinches were trapped and banded, 5,300 were retrapped locally, and 1,200 were recovered elsewhere. Physiological parameters were examined in more than 100,000 individuals, and nearly 2,300 nests were monitored in the local population. The resulting book deals with most aspects of Chaffinch biology, including population dynamics, ecology, and behavior, but is particularly strong on physiological aspects, including energy budgets, body composition, and fat cycles. As expected from a multiauthor volume, it covers a broader field than one would normally expect to find in a book devoted to a single species. Unlike the usual monograph, however, it gives little information on geographical variation, geographical range, and taxonomy. Nor does it quote at length from work in other regions, although this is referred to. The bibliography has eight pages of Soviet references and four of Western ones. The text of the book is in Russian, but each chapter has a full abstract in English, as do the captions to the many figures, tables, and photographs (although in a few cases these captions are not adequate to explain the contents of a table). The individual contributions fit together well under the able editorship of Victor Dolnik, well known for his research on avian physiology.

The ecology and behavior of the Chaffinch had already been well studied in western Europe, and to some extent the Russian work on these aspects duplicates previous findings, although in many cases it gives greater detail. Most of the physiological findings are quite new, however, at least for this species, and include some new approaches. Some of the work has been published in papers previously, but these are not readily available to the average Western reader.

Perhaps the best way to illustrate the kind of information given is to quote some examples, culled from the abstracts of individual chapters. Thus, as well as a detailed review of the diet through the year, the study of feeding behavior includes assessment of the availability of different food items in the environment, of food intake, of the duration of digestion, and of the digestive efficiency of different foods. There are data from killed individuals showing that

the intestine mass changes during the course of the day but follows different patterns at different seasons, reflecting different seasonal feeding routines, and that daily feeding rhythms are modified by ambient temperature.

The energy costs of various activities are calculated in detail. The basal metabolic rate (BMR) is estimated to vary seasonally between 9.9 kcal per day in the molting period to 7.7 kcal in the pre-molting period. The standard metabolic rate varies from 15.3 kcal per day (postmolting period) to 21.1 kcal (molting period). The energy cost of hopping and walking is estimated at 1.5 times the BMR and of flying at 12 BMR. Diagrams show seasonal variation in the energy metabolism of the species under different temperatures and photoperiods. The energy cost of nest-building activities is calculated at 0.72 kcal per day, or 11.6 kcal per completed nest. The nest volume decreases during the season, however, as ambient temperatures rise. The energy cost of forming each egg is estimated at 3.34 kcal and the energy content of each egg at 2.24 kcal. The cost of incubation is 2.6 kcal per day (calculated by Kendeigh's method). The average migratory fat deposition costs 4.14 kcal per day, and the Chaffinch uses 0.0744 kcal of energy per kilometer of migration. The annual weight cycle of the bird has four peaks, during spring migration, molt, autumn migration, and midwinter, respectively. The fat-free body weight is greatest during breeding and molt. Diurnal, sexual, seasonal, and age-related variations in weight and body composition are described.

The start of molt is accompanied by increases in the water content of the body, in protein catabolism, and in food intake, and by decreases in fat and protein content. The net energy cost of feather formation is estimated at 140 kcal for complete feather replacement (1.4 g of feathers). The total energy cost of molt (including the cost of extra energy lost for thermal regulation) is calculated at 240 kcal for postnuptial molt and at 147 kcal for postjuvenile molt.

Many details are given on migration, partly from observations and partly from banding recoveries. On average, males arrive on the breeding areas 10 days before females and adults about 5 days before juveniles. Different populations migrate different distances, but females average 178 km farther than males and migrate 13 km per day faster. The birds take a straighter, more direct route in spring than in autumn. Over any one area, the migration has a wave-like pattern, each wave lasting 1–7 days, followed by a pause of 1–8 days before the next wave. The energy required for migratory flight in the Chaffinch is estimated at 3.8 kcal per h, and the requirement for the entire migration averages 123 kcal.

Reproduction and demography are described from a 20-yr study. Details of clutch sizes and nest success, and of adult mortality, are given year by year. The

latter is estimated at 68–74% during the first year of life, at 55.5% during the second year, and in later life at 48.9% in males and 51.7% in females. Surprisingly, the annual mortality was higher in birds born in early broods and in seasons with early reproduction than in birds born in late broods and in seasons with late reproduction. The mean density of the breeding population was 218 pairs per km², and the mean size of individual territories was 1,350 m².

The activities of a pair during breeding are described in detail, and from this the costs of various activities are calculated. We are told that the average pair uses 28% of total productive energy for territory defense, 29% for sexual behavior, 25% for feeding nestlings, and 18% for nest building, egg formation, and incubation. After leaving the nest, young birds move equally in northern and southern directions, but later they mostly move in a southern direction, as they begin migration. The young Chaffinch imprints on the area of future nesting before the beginning of postfledging movement, aged 30–40 days.

The book ends with an assessment of energy flow through the population as a whole, in the style of IBP studies.

From what is given in English, it is hard to assess the validity of all the findings, yet all seem eminently reasonable from comparison with work on other birds. It is also hard to judge from abstracts what new ideas the work has generated, but there is a lot of new information, and the investigators have been thorough and innovative in their approach. They have measured and studied parameters that to my knowledge, have not been examined previously in Europe and North America. The book is crammed with facts, and few stones have been left unturned. The Chaffinch must easily rank as one of the most-studied and best-known birds in the world, and almost any ornithologist, whatever his field, would find something to interest him in this book. It is also of interest in giving a good example of high-quality ornithological research, as practiced in the Soviet Union.—I. NEWTON.

Vogelwelt Schleswig-Holsteins. Band 2: Greifvogel. (The birds of Schleswig-Holstein, Vol. 2. Diurnal birds of prey).—Volker Looft and Günther Busche (Eds.). 1981. Neumünster, Karl Wachholtz. 199 pp., numerous photographs, figures, and tables. DM 35 (about \$15.00).—This is a beautiful, unusual and remarkable book. Schleswig-Holstein, including the adjacent city-state of Hamburg, has only a population half-again as large as Connecticut and an area only one-fourth larger. There is no U.S. state that has produced a book on its birds which begins to resemble this volume. The book is lavishly illustrated with photographs, more than a few of them in color. Most state bird books give considerable infor-

mation on description and identification of birds; this has none. What it does have is much detailed information on the diurnal birds of prey of Schleswig-Holstein and, except for an occasional bit, all of the information presented was gathered in that state.

The first chapter deals with the persecution and protection of diurnal raptors, beginning with a statement of bounties paid in 1690, going through 10 tables which list the annual reported kill of raptors from 1738 through 1970, when protection was given to all birds of prey in the state. The activities of egg collectors and falconers are also presented in detail. Illegal kill of raptors since 1970 is documented insofar as possible, including gruesome photographs of dead birds, nests and young destroyed by shooting, mutilated live birds, etc. Two figures and one table show that the annual kill of small game by hunters generally increased after raptors were protected, and that there is no obvious relationship between raptor and small game populations. The development of raptor protection is traced to the late 19th century, and by the 1920's dedicated volunteers were guarding Peregrine nests from egg collectors, falconers, and sportsmen. The protection efforts for some species have become extreme, with continuous surveillance from blinds, day and night, microphones hidden at the nest, two-way radios, and elaborately constructed tangles of barbed wire that prevent approach to the base of nesting trees. For the Sea Eagle (*Haliaeetus albicilla*) it has been necessary to exclude over-zealous bird-watchers from the vicinity of the nest. The chapter ends on a plaintive note: the capture and kill of Goshawks (*Accipiter gentilis*) during the nonbreeding season was legalized in 1980 and 121 birds were reported killed (the 1980 breeding population was estimated to be 400 pairs).

There is a short chapter on pesticides with detailed information on the biocide levels in the raptors of Schleswig-Holstein.

The remainder of the book contains species accounts; I have chosen the Sea Eagle for comment. More than 11 pages are devoted to this species. There are 14 photographs, 5 of them in color; 6 show the habitat of the species, including 2 aerial photos and 3 pictures that include the nest, 1 of these includes the barbed wire-tangle at the base of the nest tree; 2 show dead eagles, 1 poisoned by bait set for crows and 1 mutilated by a trap set for foxes; 1 is a dramatic flash-photo of a youthful would-be egg collector "caught" on the nest at midnight; 1 photo shows rectrices of individual eagles from several consecutive molts; there are only 3 pictures of live eagles and one of these is to show a bird with a permanently missing primary.

Sea Eagles were once abundant in Schleswig-Holstein; an average of 40 bounties per year was paid between 1738 and 1848. Little information is available for the latter half of the 19th century, but it appears that Sea Eagles ceased to breed in the state well

before 1900. One pair nested in 1922–26 before the female was shot on the nest. The eagles did not really return in any numbers until World War II, with the first known nesting in 1947 and the first fledging of young in 1949. The breeding population reached eight pairs in the mid-1950's; there are now four pairs, with an additional pair on a territory straddling the border with East Germany. Production of fledglings declined from 0.7 per pair in 1949–53 to 0.3 in 1964–73, at first mainly because of egg collectors. In 1969 massive, volunteer protection efforts were organized but production of fledglings did not increase until 1974, presumably because of the effects of persistent pesticides. Production in 1979–80 was 1.0 fledglings per pair, or 1.3 if one includes the 2 young that were added to nests (the source of these young is not clearly stated). The greatest long-term threat to this small population is probably the lack of growing beech forests to replace the few very old stands in which they nest.

This miniscule population of the Sea Eagle has been studied meticulously, providing us with at least as much information as is available from all other sources, and a good summary of the data is presented in this book: nest height (27 m), height of nearby trees, etc., territory size (100–400 km²), breeding phenology, deliveries of nesting material through the season (a figure presents the data), changes in activities of the adults through the season (figure), roost sites and flight routes of a breeding pair (map), clutch size (1.7), incubation time (38 days), etc. The prey of breeding Sea Eagles in Schleswig-Holstein is only 37% fish, 3% mammals, and 60% birds, of which more than half are Coot (*Fulica atra*).

There is a special paragraph containing findings that conflict with other published accounts. Careful examination of the plumage and molt of breeding Sea Eagles revealed three individuals that bred in their third year, one of them successfully; other literature sources state that breeding does not begin until 5 or 6 years of age. Systematic collection of molted flight feathers revealed that there is considerable individual variation in the amount of white in the rectrices independent of age variation: there are dark-tailed as well as white-tailed adult eagles.

The chapters on the remaining species are similar to the account of the Sea Eagle: an unusual mixture of detailed scientific data gathered in Schleswig-Holstein and information, and a plea, for protection of the species. The production of the book was subsidized by the governments of Schleswig-Holstein, Hamburg, a number of local governments, and several private firms. The book's attractive format and low price should bring its conservation message into many homes in northern Germany. The book contains sufficiently unique information that it belongs on the shelf of anyone with a serious interest in European birds of prey.—HELMUT C. MUELLER.

The Barn Owl.—D. S. Bunn, A. B. Warburton, and R. D. S. Wilson. 1982. Vermillion, South Dakota, Buteo Books. 246 pp., 31 black-and-white photographs, 39 tables, 11 figures, three appendices. \$32.50.—The Barn Owl (*Tyto alba*) occupies more space in the ornithological literature than most owls, and a monograph on the species is welcome. Bunn, Warburton, and Wilson write enthusiastically from a combined total of 38 yr of experience (19 calendar years). All of their work, primarily observations of behavior, was done in Britain, and the best parts of the book are those that describe these studies. Outside of Britain they rely on the literature, and there are some significant omissions.

Chapter 1 contains a grab-bag of topics. The discussion of Barn Owl taxonomy includes widely accepted schemes as well as one considering tytonids to be nocturnal falcons. Left out was Cracraft's (1981. Auk 98: 681) classification, which, in fairness, appeared in print only 1 yr before this book. A comprehensive physical description of *T. a. alba*, the primary subject of this monograph, occupies 4½ somewhat rambling pages. Lesser coverage is given to *T. a. guttata*, which occurs accidentally in Britain. Thirty-three other subspecies are given scant coverage, although the authors correctly state that many of the races have received little attention from ornithologists. Two new subspecies proposed by Parkes and Phillips (1978. Ann. Carnegie Mus. 47: 479) are not included.

Under geographic distribution, the authors' statement that Barn Owls are basically sedentary and adverse to crossing large expanses of water is out of character with the widespread distribution of Barn Owls; included in the Barn Owl's range are islands 960 km from the mainland. Later, the authors propose that most island Barn Owls were endemic before the islands that they inhabit separated from the mainland. This ignores such evidence as the volcanic origin of the Galapagos Islands and the endemic race of Barn Owls that exists there. Brief synopses of other species in the family Tytonidae and of fossil *Tyto* end this section.

Next, we are given the Barn Owl's major specializations for a nocturnal predatory existence. Low-light vision is discussed but Dice's (1945. Amer. Natur. 79: 385) pioneering work is not cited. Nearly three pages are devoted to the anatomy and physiology of the eye but no references are given, even though it was previously stated by the authors that they were relying on the work of others. Anecdotal evidence from their own research is then presented to illustrate some weaknesses in Barn Owl vision. They are particularly interested in showing that Barn Owls do not perceive large unmoving objects, including humans, at night.

Several pages are devoted to Payne's important studies on auditory localization in Barn Owls but no mention is made of the numerous and more recent papers on the same subject by Konishi and his stu-

dents (e.g. 1973. Amer. Natur. 107: 775; 1979. J. Comp. Physiol. 133: 1). Konishi's first paper in this series is cited later, however, under food consumption (p. 100). This chapter ends with a short discourse on flight mechanics from the authors' observations.

Voice is covered in Chapter 2. By the authors' admission, verbal descriptions do not give a very good idea of the actual character of the calls. I agree. The vocalizations are difficult to describe. Seventeen acoustic signals are identified (15 vocal and two non-vocal) and the context and possible function of each is given. I could not recognize from their list of descriptions a call commonly heard in North America. This could be due to the difficulty in translating the call or it could indicate that some calls may not occur in all races. Sonograms, such as those that appear in the paper on Barn Owl vocalization by Bühler and Epple (1980. J. Ornith. 121: 36), would have been helpful here.

Chapter 3 deals with several behaviorisms and is based almost entirely on the authors' interesting anecdotal information. Here they attempt to convey the "personality" of the species. Roosting, reaction to danger, territoriality, time and methods of hunting, hunting efficiency, killing and eating of prey, reaction to other species, and maintenance behavior are the major topics considered. Reproductive behavior has a later chapter of its own.

We are told of the relative inactivity of Barn Owls—those that were observed in winter spent most of the night perched motionless with occasional bouts of preening and stretching and forays after food. However, no quantitative data (time budgets) are given to allow us to judge activity levels for ourselves. The authors over-generalize by stating that predators spend little time in finding food. Certainly, there is a broad range of variation even within one species under different conditions and prey densities.

The topic of territoriality in Barn Owls has not been resolved by previous workers. Indications from many areas of its distribution hint that the species is not strongly territorial or at least that territories are not occupied and defended in the way they are for many other raptors. Unfortunately, the observations in this book do little to elucidate this topic. A short section tells of territory defense but, overall, evidence was not convincing that territories are defended on a consistent and sustained basis. For example, in Fig. 4 (p. 62) "territories" of several owls are plotted that, in some cases, have considerable overlap. Incidentally, the Barn Owls whose territories are shown are called "forest" owls. I found this misleading because the owls hunted pastures and areas of very small, newly planted trees and did not use areas with large, dense trees. Thus, even though I suspect that the term "forest" owls was used only to identify the population, the implications are inaccurate.

Evidence is given for owls remaining on the same territories or leaving and reappearing at certain times of the year. Yet, nowhere in the book did I find an

indication that the owls studied were marked for individual identification. Instead, coloration, behavior, and/or size characteristics of the owls were used. Although this technique has some validity, much greater confidence would be possible with individually color-marked birds.

Barn Owls are known to be almost strictly nocturnal throughout their range. The authors mention this but use most of their space under "Time of hunting" to discuss diurnal hunting. Again, I found their use of a term misleading; inspection of the data in Table 1 indicates that much of this activity would be more correctly labeled crepuscular. Furthermore, we are not given information on cloud cover, which would affect light levels and might mask the time of sunset. Several theories are presented to explain why these owls were active in daylight. Apparently no information was available to the authors on prey densities, but the possibility that scarce prey might have increased the daily foraging time was not considered as an alternative.

Their access to a population of Barn Owls which hunted in daylight did give the authors an unusually good opportunity to observe hunting methods. The technique most frequently observed was long, slow flights over open areas. Less often, owls were seen to use perches as vantage points within prey habitat. Occasionally, the owls flushed roosting birds from bushes by beating against the bushes with their wings. Efficiency of hunting was noted chiefly by recording the number of prey brought to young in nests; most of the owls they observed were very efficient. For example, one male, feeding young, captured nine prey in 55 min.

Food is the subject of Chapter 4. Factors affecting pellet formation are covered first but no mention is given of the extensive studies by Duke and his students on this process (for example, 1976. *Comp. Biochem. Physiol.* 53A: 1; 1976. *Am. J. Physiol.* 231: 1824; 1977. *Comp. Biochem. Physiol.* 56A: 283.). A representative selection of studies from throughout the world is cited to support the conclusion that Barn Owls have no prey preferences as such; they prey on any animal small enough to be caught in open areas. The authors do emphasize the dietary dominance of microtine rodents wherever they occur with Barn Owls. They cite other papers to show the opportunism of Barn Owl hunting and the paucity of invertebrate prey in diets.

Several pages are devoted to a good coverage of experiments and factors affecting food consumption. Bunn et al. state that *T. a. alba* consumes 100–150 g daily. This is based on tenuous data, but it leads to the conclusion that *T. a. alba* consumes about the same amount of food per day that has been estimated for *T. a. pratincola*, a race averaging almost twice as heavy. It seems that more work is needed in this area.

This chapter ends with a statement on the usefulness of the feeding of Barn Owls. Thankfully, they

avoid the wornout "good guy/bad guy" labels once applied to birds of prey. While stating that some of the prey species eaten by Barn Owls are serious pests to humans, they also note that predator-prey relationships are two-way. Each side exerts selective pressure on the other, and Barn Owl populations are probably regulated by the available prey more than prey populations are by the owls.

Reproduction has Chapter 5 to itself, apparently because this is the authors' area of greatest interest. They emphasize the difficulties in studying a nocturnal species, but it is evident that their persistence has paid off. A summary of the flexibility of time of breeding by Barn Owls begins the chapter (although the information is from only three subspecies). The fact that fully 14 weeks is required from egg laying to independence of the young is an important factor. Courtship behavior is described in the following 6½ pages; for the most part, the descriptions are instructive. It was not clear to me, though, how they distinguished between territorial chases and vocalizations versus courtship chases and calls. I thought that a full page on wing-clapping was excessive, especially because they considered it to be a minor courtship behavior.

Another area of flexibility by breeding Barn Owls is in choosing nest sites. A comprehensive review of nest types used in Britain is given, but only a few notes are included on subspecies from two other parts of the world.

Little is made of the variability of clutch size, although Table 14 shows a range from 2 to 9 eggs/clutch in Britain. The only possible reasons listed for this variation are age of the female and latitude; both are dismissed. Brood size and fledging success are also given little coverage. Data from Britain are used to show that larger clutches seldom fledge all the young. No reasons are proposed, however, for the failure of some eggs in a clutch to hatch. Prey supply is linked to fledging success but this argument is not developed extensively. On the other hand, 17½ pages are devoted to the owlets' development and behavior from hatching to independence. This extensive section reflects the authors' long, careful observations made at nests.

One surprising behavior found on two occasions was that of older young feeding their siblings. This corroborates Epple's (1979. *J. Ornith.* 120: 226) observations (although his paper was not cited).

I question their interpretation of one behavior pattern in the young—that of scratching at the nest lining. Bunn et al. decided that this may serve as practice for later nest site preparation as adults. I believe it more likely that it serves as nest sanitation. I have seen it and evidence of it at many sites both in cliff crevices and nest boxes. The young face away from the opening and scratch vigorously. Much debris is removed in this way.

Another difference that I noted was in the behavior of adults toward young that fall out of the nest.

Bunn et al. state that these young are ignored by the adults and starve, but I have seen several examples of fallen young being fed by their parents. These differences could easily be related to the particular nest situation or to individual differences in adults.

Convincing evidence of siblings being killed and eaten in some broods that the authors had under study is given in a discussion of cannibalism. However, they indicated that relationships among siblings are generally peaceful. Food shortage is the factor implicated in cannibalism, but the authors are careful to suggest several alternatives that also may explain the disappearance of young from nests.

Barn Owls differ from most raptors in that multiple broods are not uncommon. The authors propose that the male's response—whether or not he provides enough food for the female—is the key to a second brood being produced.

Movements are the topic of Chapter 6. Data from banded owls in Britain and the Netherlands are used to document post-fledging dispersal. Movements in all compass directions were found, but major topographic features tended to channel most birds in certain directions. In some years more and longer movements were possibly caused by decreasing prey supplies. Owls banded as adults tended to move very little from the point of banding and no definite migratory movements were found in European Barn Owls.

Several widely divergent factors that may control Barn Owl populations are discussed in Chapter 7: enemies (predators, competitors, and parasites), pesticides, loss of habitat, shooting, and collisions. First, though, they discuss the high mortality of newly independent young, especially in their first winter. While noting that the lower fat reserves of Barn Owls make them more vulnerable to adverse winter conditions, they say that extreme cold in itself does not appear to cause mortality. That conclusion may be altered by the finding by Johnson (1974. The bioenergetics of the Barn Owl, *Tyto alba*. Unpublished M.S. thesis, Calif. State Univ., Long Beach) that Barn Owls have less efficient insulation than some other owls.

Winter mortality of Barn Owls has sometimes been significant in northern Europe, and literature on this is reviewed in detail in this section. A different form of weather-induced mortality is documented here, too. One breeding season in Britain, which began as the most successful on record, completely turned around when an extended drought in late summer greatly reduced rodent numbers and caused high mortality in Barn Owls.

Predation upon Barn Owls in Britain is covered, although it is not thought to be particularly important. Competition is not addressed except that from Tawny Owls (*Strix aluco*) for nest sites. The extensive recent literature on resource and interference competition is not referenced. Sections on shooting and

pesticides are not very informative, and no real conclusions can be drawn about the effects of these on Barn Owl populations.

It is interesting (and perhaps disheartening) to see that many of the same people-problems exist in Britain that occur in the United States: vandalism, lack of enforcement and punishment for wildlife offenses, and death of owls through collisions with automobiles. Habitat and nest site losses are also probably major reasons for declines in Barn Owl numbers in both areas.

Three means of protecting and conserving Barn Owls in Britain are presented next. The first is legal protection, which was thought by the authors to be largely ineffectual. Second was the use of nest boxes to supplement scarce nest sites. This technique has been tried in various parts of Britain and was given generally favorable review. Successful uses of nest boxes for Barn Owls in other countries were not documented (Berndt and Frantzen 1971. *Die Vogelewelt* 92: 112; Marti et al. 1979. *Wildl. Soc. Bull.* 7: 145.). The last technique presented was captive breeding and release of young owls to increase or re-establish breeding populations. They felt that this was also successful, based on reappearance of nesting pairs in an area in which young were released. Presumably, these new breeders were some of the birds released, although evidence was not given to document this. The chapter closes with a 1-page review of Barn Owl mortality outside Britain.

Chapter 8 consists of a detailed (34 pages) account of Barn Owl distribution and status in the British Isles. The authors believe that human agricultural changes in the country over the last 2,000 yr created more Barn Owl habitat than when heavy forests were widespread. Declines in the last 100 yr, however, may be due to a variety of the newer human changes covered in Chapter 7. This chapter will probably be of greatest interest to British residents, as it contains little of relevance to other geographic areas.

The final chapter covers folklore associated with Barn Owls. Despite the quantity of interesting information, I felt that this material was out of place in an otherwise scientific volume.

The first of the three appendices contains a list of scientific names used in the text. The second is a day-by-day account of the growth and development of Barn Owls from day 1 to 105. It is largely nonquantitative, however. The final appendix contains suggestions for observing wild Barn Owls.

I thoroughly enjoyed reading this book, largely because of the depth of experience that the authors have with this bird. The writing style is lively and punctuated with interesting observations. There are, however, some lapses into anthropomorphism. I noticed only one typographical and one grammatical error (i.e. data is, p. 73). The lack of quantification in several places was disturbing. For example, the reader is not told how many nests were observed,

how many hours were spent observing, and how many individuals were observed for many of the behavioral interpretations. I dislike the term "predating" to describe a predator killing its prey. Would not "depredating" or "preyed upon" be better? I also dislike the terms "hen" and "cock" instead of female and male. There was some inconsistency in citing references. Most were done in standard scientific style but there were lapses. For example, *The Atlas of Breeding Birds in Britain and Ireland* is cited in text but not listed in the bibliography.

I would recommend this book for all college and university libraries and for the personal collections of all who are interested in raptors. While not the last word on the Barn Owl, it is a stimulating book.—
CARL D. MARTI.

Waterfowl ecology and management: Selected readings.—J. T. Ratti, L. D. Flake, and W. A. Wentz (Compilers). 1982. Bethesda, Maryland, The Wildlife Society, Inc. 1,328 pp. Paperbound. \$20.00.—This book is a compilation of papers from the extensive and varied published literature on the ecology and management of waterfowl. The 125 technical papers reprinted in this book are arranged in eight major sections and are from 21 journals, government reports, several books, and proceedings of symposia and annual conferences. The most frequent sources of papers are *The Journal of Wildlife Management*, *The Auk*, *Transactions North American Wildlife and Natural Resources Conference*, and *Wildfowl*. These readings span the period from 1937 through 1981. A majority of the technical papers was published during the sixties and seventies, reflecting the expansion of waterfowl research during that period. The front cover and the introductory page of each section are illustrated with black-and-white drawings of North American waterfowl by D. R. Barrick.

In section I, the reader gains an historical perspective of some of the motivating factors responsible for the development of waterfowl research and management programs in North America. Section II, "Reproductive biology," contains 38 papers covering general biology, land use and habitat, broods, behavior, and drought. Under general biology, the primary emphasis is on factors regulating nesting activity, nest success, and brood survival. Most papers in the subsection on land use and habitat address dabbling duck production in the prairie pothole region of midcontinent North America. Certain papers that discuss effects of predator control and development of nesting islands on waterfowl production seem better suited to section V, on management and economics. The readings under land use and habitat indicate that, whereas some new habitat has been created for waterfowl in the northern great plains as a result of various developments, many species have been adversely affected by the growing intensification of agriculture. Habitat continues to be lost at a

rapid rate, in part because of ongoing efforts in the United States and Canada to maximize crop production and accommodate the resultant surpluses through expansion of foreign markets. The description and interpretation of waterfowl behavior have been major subjects for investigation in recent times. Brood behavior, pair formation, social behavior, and parasitism are among the behavioral topics covered in the readings. The section ends with three papers reflecting the varied responses of waterfowl to drought conditions on their breeding grounds.

Section III, "Population influences and characteristics," contains 34 papers that discuss the following topics: effects of hunting on waterfowl, population ecology, sex ratios, disease and environmental contaminants, and physiology and energetics. Much of the effort to manage North American waterfowl populations stems from the widespread support for maintaining populations at levels capable of sustaining sport hunting. In this setting, considerable emphasis has been placed on identifying and measuring the effects of hunting and other factors on selected populations. These subjects are discussed in the subsections on hunting and population ecology. The three papers that follow deal with factors influencing waterfowl sex ratios. Industrialization and clean farming have caused extensive destruction and degradation of the wetland habitats that support North American waterfowl populations. Among the impacts have been the growing susceptibility of ducks, geese, and swans to disease brought on by crowding and accumulation of toxic substances in the food chain. Eleven papers consider the impact of disease, parasites, and toxic substances in the environment on waterfowl. With expanded research has come a better understanding of intrinsic factors that limit waterfowl populations. Breeding stress and the contribution of nutrient reserves to reproduction are discussed under the subsection on physiology and energetics. Insight into the effect of numerous variables on waterfowl energetics and the energy requirements for growth is provided in separate papers.

Food habits and feeding ecology studies are the subject of 10 papers in section IV. Recognition of the importance of nutrition to successful reproduction and other stages of the life cycles of waterfowl and the need for more detailed information on how best to manage waterfowl habitats led to extensive research on feeding ecology during the sixties and seventies. Several papers describe the feeding ecology of breeding waterfowl. Other subjects discussed include feeding behavior, duckling food habits, and aquatic plant-invertebrate associations.

As knowledge of the requirements of waterfowl on the breeding grounds has increased, so have management options. Section V, on management and economics, considers several measures that can be taken to increase waterfowl production. Marsh man-

agement is considered first. Three papers in this subsection discuss ways of manipulating marsh habitats to improve their value to waterfowl. The limited treatment of this subject, although very useful, reflects the paucity of available information on this important facet of waterfowl management. A subsection on upland cover management and predator control would have been appropriate at this point in the book. Several papers describe the release of hand-reared birds to restore waterfowl populations that have been depleted despite the availability of breeding habitat. Artificial nesting structures have proven to be successful as a means of increasing production in some species where suitable nesting habitat has been a primary limiting factor. Five papers discuss the use of various types of artificial nesting structures to increase waterfowl production. The limited scope of the literature on management suggests that much remains to be learned concerning the potential for increasing waterfowl production on lands managed specifically for that purpose.

Economic considerations are now, and will continue to be, a dominant factor influencing the well-being of North American waterfowl populations. Waterfowl generate certain important economic benefits, primarily recreational, but also through subsistence hunting in some areas. Conversely, some private landowners have suffered monetary losses because of waterfowl depredation to unharvested crops. Both subjects are addressed in separate papers. The most serious long-term economic problem facing waterfowl is loss of habitat to alternate uses. This subject is not adequately addressed in the book, probably because of the lack of pertinent literature. Innovative measures are needed that will assure adequate compensation to private landowners for maintaining wetlands and suitable nesting habitat, or the long-term capacity of several species of waterfowl to sustain recreational benefits comparable to that of recent times will be diminished markedly.

Waterfowl are highly mobile yet possess a well-developed homing instinct. The seven papers presented on movements and migration, the subject of section VI, provide insight into these important characteristics that contribute much to man's widespread interest in waterfowl. Homing, mobility of breeding pairs and migrants, molt migration, migration corridors, and migration reversal are among the subjects discussed. The next section (VII) considers wintering waterfowl (six papers). This aspect of waterfowl research has grown markedly in recent times, with many of the findings yet to be published. Factors influencing winter distribution, stress, and condition are the primary subjects discussed in this section. Nine papers on evolution, hybridization, and speciation (section VIII) conclude the selected readings. Additional references of pertinent literature are presented at the end of each subsection. A selected list of books on waterfowl ecology and management is also provided at the end of the book.

Ornithologists will find this book most useful as a general reference on the scope and direction of waterfowl research in North America. A book of selected readings, however, has limitations. It will not fulfill the needs of specialists seeking an in-depth review of information in a particular field. Important papers are omitted because of length and other considerations. Beyond the constraint that the book is a collection of existing published material is the restriction of selections primarily to North American populations of ducks, geese, and swans.

Despite these limitations, the book fulfills the compilers' primary objectives. It is well-suited for introducing students to waterfowl ecology and management and as a professional reference book. The information covered by these readings provides an excellent overview useful to anyone seeking a working knowledge of the technical literature on North American waterfowl.—GARY L. KRAPU.

Gulls. A guide to identification.—P. J. Grant. 1982. Vermillion, South Dakota and Calton, Staffordshire, England; Buteo Books, T. & A. D. Poyser Ltd. 280 pp., 54 figures, 376 black-and-white photographs. \$32.50.—This book grew out of a five-paper series on gull identification in the western Palearctic published in *British Birds* between 1978 and 1981. To produce this book the text has been lightly edited, an introduction has been added, and many new photographs included. This may be the most complete reference available for identification of gulls in Europe, and it is relevant to birders in North America as well. Of the 23 species covered, 16 also occur in North America, and only 9 of the 25 species included in the 34th Supplement to the AOU Checklist are not treated.

The body of the text is divided into five sections, ostensibly covering groups of similar species where direct comparisons are useful. Actually, two of the groups contain heterogeneous collections of leftovers, and are holdovers from the decision to cover four to five species at a time in *British Birds*. Glaucous and Iceland gulls belong together, but no rational basis is apparent for including them (group five) with *Larus hemprichii* and *L. leucophthalmus*. Group four (Little, Ross's, Sabine's, and Ivory gulls; and Kittiwake) is also an assemblage of miscellaneous leftovers.

The book is saddled with obsolete and inappropriate British terminology for age, plumages, molts, and topography. The first plumage of contour feathers is called juvenile rather than juvenal, and is followed by "first-winter," "first-summer" (why is a bird in its second summer of life in "first-summer" plumage?), "second-winter," and so on. Molts are designated "post-juvenal," "spring," and "autumn." Plumages and molts of gulls fit very well into the Humphrey-Parkes system, which prevents a number of the standard absurdities (e.g. "autumn moult" of

the Ivory Gull begins in May, "summer plumage" of *L. cirrocephalus* may be attained at almost any time of the year). Primaries are numbered ascendently, which hardly is sensible in a group with invariably descendent molt. The plumage character named "carpal bar" (sometimes "carpal-bar") occurs not on the manus as might be expected, but rather on the upper secondary coverts. "Cubital bar" is more appropriate. The primary coverts are identified as such, but the secondary coverts are called by more general terms like "lesser coverts," "greater coverts," and "lesser underwing coverts." I do not relish the prospect of trying to communicate with birders using this book as their guide to gull topography: "a white tip on the third primary," "a second summer Herring Gull," and "brown greater coverts" will be ambiguous.

Most of the species are treated with accounts that include world range maps, drawings illustrating several plumages, usually in flight, and sections labeled "Identification," "Ageing Summary," and "Detailed Descriptions." The identification sections discuss size, shape, and diagnostic characters for various plumages of each species, and some contain comments on range, seasonality, and abundance as well. The ageing summaries provide characters to distinguish each recognized plumage from other plumages exhibited by the species. In the "detailed descriptions" sections the prominent features of each plumage are described and a brief statement is given on the timing of molts. These descriptions in no way replace those in Dwight's (1925) classic work (that was not intended). Less precise color terminology is used, and the descriptions are weighted toward plumage features useful in field identification.

The species accounts generally are quite adequate, although some omissions and inaccuracies are apparent. The range maps tend to misrepresent the North American (at least) breeding ranges. For example, Ring-billed Gulls breed on Lakes Erie, Michigan, and Superior, and also much farther south and west in the Pacific Northwest than indicated; Herring and Great Black-backed gulls breed farther south on the Atlantic coast. Obviously this volume should not be used as a source of information on breeding ranges.

In the identification sections the appropriate species comparisons generally are made, but a few omissions come to mind. In the photographs a resemblance of certain subadult plumages of *L. hemprichii* and *L. leucophthalmus* to some plumages of the Laughing Gull is apparent; this comparison is not mentioned. The possibility of confusion between second-year Ring-billed Gulls and *L. adouinii* also may deserve mention. The comments on Kumlein's and Thayer's gulls (neither is known to occur in Europe) are not very useful, nor even very accurate. In the discussion of geographical variation in Herring Gulls, the separation of immature *L. a. atlantis* and *L. a. michahellis* from *L. fuscus* may need more attention.

For most species the ageing sections are accurate and adequate. A warning is in order, however, for North American users of the book: the plumage sequences followed by European and North American races of some gulls may differ. In Alaska, many if not most Black-legged Kittiwakes in second alternate ("second-summer") plumage are quite distinguishable from the definitive alternate, but Grant indicates that these plumages are rarely separable in Europe.

The detailed descriptions also seem to be generally accurate. Once again, however, North American observers should be alert to differences between European and American populations of gulls. The juvenile tails and underparts of Mew Gulls (*L. canus brachyrhynchus*) differ enough from those of the Common Gull (*L. c. canus*) to cause problems. This may be particularly true in northeastern North America, where both races have occurred. In North America, Herring Gulls in first basic plumage often have much whiter heads than Grant illustrates for European birds. The Iceland Gulls wintering in temperate North America (the race *kumlieni*) differ substantially from Grant's descriptions of *glaucoides*, the race occurring in Europe.

Grant's drawings illustrate gull plumages quite accurately, and are a real asset to the book. Shapes of the birds are occasionally incorrect (e.g. wings seem too narrow, especially proximally, on the Glaucous Gulls—Fig. 47) but still they are much better than the standard field-guide representations. The drawings are, however, poorly reproduced. Particularly on the lower and right-hand sides of some figures the printing is so light that gaps appear in the birds' outlines and some stippling is lost. The same figures were reproduced more clearly in the *British Birds* articles.

The section of photographs is one of the major strong points of the book. Most photographs are good, and some are superb, but a few have been enlarged to the point of fuzziness. They demonstrate that color is quite unnecessary in illustrating gulls for identification. I did not detect any misidentifications of gulls, but I do disagree with the age assignments of a few of the gulls illustrated. The *L. ichthyaetus* in photo 248 appears to have replaced its juvenile wing-coverts, and thus would be older than the immatures in photos 246 and 247. The Herring Gull in photo 181 possibly is in second-summer (second alternate) plumage as stated, but it is not typical of that plumage. Too much dark pigment remains on the bill, and the mantle is too mottled.

I was disappointed by the choice of paper and the quality of the binding. Field guides should be sturdy and should be printed on paper more water-resistant than this. The cover of my copy is rather loosely attached and the signatures appear to be sewn loosely. The price of \$32.50 seems excessive, especially considering these inadequacies of construction, but anyone wishing to understand the plumages of gulls will find the book useful.—WAYNE HOFFMAN.

Perspectives on evolution.—Roger Milkman (Ed.). 1981. Sunderland, Massachusetts, Sinauer Associates Inc. 241 pp. \$27.50 (Paper \$14.95).—Evolutionary theory trembles like an expectant volcano. Once Mendelian genetics, Neodarwinian theory, Ernst Mayr's synthesis of museum systematics and *Drosophila* genetics, and George Williams' reassurances of the power of individual selection all prevailed comfortably in our minds. The internal consistencies of the logic and the evidence obscured occasional exceptions and minority viewpoints. Debates about the evolution of altruism, the neutrality of mutations, and the possibility of macroevolutionary events have been only minor perturbations of a tranquil state of academic unanimity.

A revitalization of evolutionary biology may now be upon us. As G. Ledyard Stebbins concludes in the opening essay of this stimulating collection, "evolutionists find themselves in one of the most exciting fields of expanding knowledge." Largely responsible is the recent emergence of the "new genetics." Our ability to decode complete nucleotide sequences and to unravel regulatory pathways between codon and character has now reduced Mendelian, particulate genetics to an elementary introduction to the intricate realities of modern molecular genetics. Evolutionary histories and phylogenetic relationships can be deciphered biochemically with extraordinary power—perhaps even with accuracy. We now can review critically the speciation process, the accuracy of archaic measures of biochemical similarity, and the primary features of the evolutionary process. Even Lamarck's and Goldschmidt's theories no longer meet immediate derision. Darwin didn't know about particulate inheritance, Lamarck didn't know about retroviruses, and Goldschmidt didn't know about regulation of gene activity. So it is time to put aside many of those dusty old biases from graduate school and to look at evolution afresh.

This volume offers a painless, indeed stimulating, refresher course for those of us who have not kept pace with a sprinting new field. For graduate students closer to the new molecular genetics, *Perspectives on evolution* provides an authoritative review as well as provocative perspectives of exciting possibilities just around the corner.

Each of the 11 chapters is authored by a different authority: Stebbins, Templeton, Selander, Ayala, Gould, Milkman, Bush, Plapp, Crawford et al., and Campbell; as editor, Milkman has assembled a formidable package of essays. Several authors address the need for understanding evolution in new terms of hierarchical structure of life; almost all touch on the recent developments of molecular genetics. I found four chapters of greatest interest.

From his towering, senior perspective, G. L. Stebbins offers four model themes to encompass the central features of evolutionary biology with the flexibility required to permit substantial biological variations and to reconcile polarized debates, such

as blending vs. particulate inheritance, adaptive vs. neutral enzyme polymorphisms, microevolution vs. macroevolution, and alternative modes of speciation.

R. K. Selander highlights the extraordinary impacts of molecular genetics on the quest for meaningful phylogenies. From relationships among major taxa of bacteria to the ages of the great apes, molecular genetics will provide paramount tools of the future; little of the potential has yet penetrated ornithological systematics.

S. J. Gould reviews the concepts and corollaries of "punctuated equilibria." He clarifies ambiguities, accommodates well-taken criticisms, and reviews interesting developments, all with soaring academic perspective, flowing prose, and a grace that should humble the tactless cladists about us.

G. Bush reiterates his iconoclastic views of the speciation process, appeals (again) for open-minded consideration of alternative models, and explores the implications of regulatory gene action to speciation via chromosomal rearrangements.

This book will be an enjoyable focus for lunch discussions. It should be required reading for graduate students preparing for their comprehensive exams, and also should be mandatory therapy for all ornithologists over 40 who profess to be evolutionary biologists.—FRANK B. GILL.

Management of migratory shore and upland game birds in North America.—Glen C. Sanderson (Ed.). 1977. Washington, D.C., International Association of Fish and Wildlife Agencies. 358 pp., numerous maps, drawings, and photographs. \$1.00 (out of print; reprinted 1980. Lincoln, Nebraska, University of Nebraska Press, Paper. \$10.95).—The title of this book is misleading, as it deals with research needs of a group of important game or former game birds rather than their management. Basically this book is the result of the first 7 yr of the Accelerated Research Program (ARP) on migratory birds other than waterfowl, perhaps better known as "webless migratory game birds" to game managers. Waterfowl have always received the bulk of research and management money in state game agencies as well as U.S. Fish and Wildlife Service budgets, in spite of more hunters hunting and harvesting more "webless gamebirds (doves) than waterfowl hunters do waterfowl. The ARP is an attempt to correct this imbalance.

This book contains 11 chapters, with nine chapters covering single species such as sandhill crane, woodcock, or mourning dove, while other chapters deal with several species such as rails and gallinules or shorebirds. The book opens with an introduction setting the scope of the publication. The final chapter summarizes the findings of the 10 chapters dealing with the species, their research, management, and funding suggestion needs.

Fifty-eight authors assisted with writing the various chapters with 2 to 12 individuals assisting on each chapter. In addition, various managers and re-

searchers across the United States and Canada contributed data and comments regarding status, harvest, hunting pressure, and needs. As with most publications written by committees, the treatment is somewhat uneven and may reflect uneven writing skills of contributors or, in some cases, a simple lack of information on a given species.

Each chapter starts out with a summary of the chapter and then includes a description of each species (including a list of recognized subspecies), life history, historical review, distribution and density (by populations or subspecies if known), census procedures and population trends, harvest, hunting pressure, potential harvest, needs (species, public, management, and research), and a section of recommendations. Not all chapters contain information on each of these subject headings, as for many of the species this information is lacking. One can question why a description of the species is included when the audience for this publication would be other managers and researchers working with these groups. The inclusion of nongame species such as Black and Yellow rails or shorebirds other than Woodcock and snipe is a pleasant surprise, since they are not game species although some were formerly hunted. Several tropical Columbidae species (Scaly-naped Pigeon, *Columba squamosa*; Zennida Dove, *Zenaida aurita*; White-crowned Pigeon, *Columba leucocephala*) were omitted even though they are classified as gamebirds and hunted in the Virgin Islands and Puerto Rico with seasons and bag limits regulated by the Department of Interior. Two nongame species of the southern United States (Ground Dove, *Colubina passerina*, and Inca Dove, *Scandeffella inca*) were also omitted.

The contributors also did an excellent job indicating the management and research needs of the species covered. The major problems and constant needs mentioned for every species are the lack of continental population trends data, a method to determine hunting effort, and annual harvest on a continental level. The authors suggest funding for these and other needs through a migratory gamebird stamp similar to the current "duck stamp."

The budget requirements for a 10-yr management plan for each species or group of species are included. These figures suffer from inflation, as the budgets are based upon mid-1970 dollars. Some budget projections may be unrealistic due to duplication of efforts for habitat acquisition or development and implantation of population census and harvest surveys.

The layout and illustrations accompanying each chapter add to the appearance and make this book an excellent choice for those working on such species.—ROBERT A. MONTGOMERY.

Some results of waterfowl ringing in Europe.—A. C. Perdeck and C. Clason. 1980. Slimbridge, England. The International Waterfowl Research Bureau,

Special Publ. No. 1. 21 pp., 75 maps, 15 figures. Price not given.—This, the first in a series of Special Publications from the International Waterfowl Research Bureau, would be more appropriately entitled "Distribution of recoveries of ducks and geese banded in the Netherlands." The goal of the authors is to fill gaps in knowledge of European waterfowl flyways, with emphasis on two goose and five common duck species. For reasons not stated, the work deals only with waterfowl ringed in the Netherlands (with the exception of one map of European Green-winged Teal ringed in five regions). To typify the locations of populations during the annual cycle the authors have provided recovery maps for four times of the year: nesting (May and June), autumn migration (September), wintering (January), and spring migration (March and April). All but three of the 16 analyses are based on birds shot and recovered. In addition to the four recovery maps, each recovery analysis also includes a map that plots the monthly median position of recoveries and a least squares straight line fitted to the data. A figure also depicts distance away from the yearly median position for each month of recovery.

On first examining the book one notices an apparent incongruence between the long history of banding records and the small number of ringed birds recovered. Surely one must question the value of a map depicting September recoveries of Green-winged Teal from 1911 to 1977 when five recoveries comprise the entire sample. Unfortunately, many of the analyses suffer from such small sample sizes (the average for all maps is about 100, and 15 maps are based on fewer than 25 recoveries) and potentially misleading historical biases (9 of the 16 data sets include recoveries from 1911–1977). Whereas the problem of sample sizes for recovery data can often be tempered by providing the reader with data on the total number of banded birds, the authors provide us with no such perspective in the present work. Moreover, one can only wonder how the many socioeconomic changes in Europe since 1911 have changed the forces affecting recoveries and the chaos resulting from pooling data for this entire time frame.

The maps on which recoveries are plotted are computer-printed facsimiles based on a dot matrix, and lack the detail present on line drawings. Although computer reproductions are necessary when providing large amounts of recovery data, fewer than a half-dozen different line drawing maps of various projections and scales could have provided welcome detail to these recovery records.

As a method to represent migration routes, a least squares straight line sacrifices detail for generality. During the month of April, for example, most waterfowl recoveries occurred well to the southeast of the migration line, suggesting a potentially important staging movement. One cannot help but imagine this point as an outlier in the data when viewed in a least squares context.

The authors note that further statistical treatments of ringing data are in preparation. Perhaps these later books will delve into the types of analyses for which the rich banding data of Europe would be so aptly suited: detailed studies of migration routes and habitats, historical changes in migration patterns, and determinations of survival rates using the latest statistical methodology. In the meantime, those persons interested in an extremely general overview of European waterfowl recovery records may find this work of interest, but should beware of its limitations. Museum and community libraries should hold out for less biased and more complete works. There apparently remain many gaps yet to fill in our knowledge of European waterfowl flyways.—JAMES K. RINGELMAN.

The significance of Egyptian wetlands for wintering waterbirds.—Peter L. Meininger and Wim C. Mullié. 1981. New York, The Holy Land Conservation Fund. 111 pp., 1 Appendix (I–XII). \$20.00. (Available from the Holy Land Conservation Fund, 150 E. 58th Street, New York, New York 10155.)—Egyptian wetlands are of considerable importance for wintering waterbirds (grebes, ducks, coots, waders, gulls, terns, and other waterbirds), as the following three quotations will make clear: (1) "The number of wintering waterfowl in Egypt is estimated at 500,000–650,000, which makes this country one of the most important wintering areas for waterfowl in the Black Sea/Eastern Mediterranean region" (p. 77); (2) "... the estimated number of 80,000–130,000 wintering waders in Egypt makes this country one of the most important wintering areas for waders in the Mediterranean region" (p. 78); (3) "The total numbers [of Whiskered Terns *Chlidonias hybrida*] counted in Egypt in the winters 1978/79 and 1979/80 were 24,500 and 25,000 respectively"; "A recent estimate of the breeding population of the species in Europe is of 18,000 pairs (Mees, 1979). The Nile Delta is probably one of the most important (if not the most important) wintering areas of the breeding populations of the Whiskered Tern of Europe and western Asia" (p. 75).

Such large numbers may come as a surprise to ornithologists who think of the Middle East as a dry or arid area where small numbers of landbirds, not waterbirds, are expected. But as the authors of this little book explain, "About one million hectares of natural or semi-natural wetlands still remain in the Mediterranean region (UNESCO, 1979), of which at least 280,000 hectares of coastal wetlands in lower Egypt and Sinai only (this study). This means that over 25% of all Mediterranean wetlands are situated along the Mediterranean coast of Egypt, which is a clear indication for Egypt's (and the world's!) responsibility for the conservation of these wetlands" (p. 15).

The main Egyptian wetlands are Lakes Maryut (less than 61 km²) and Idku (about 71 km²) near Alexandria, Lakes Manzala (about 1,200 km²) and El Malaha

near Port Said, and Lake Burullus (about 462 km²) in the Nile Delta. Other large wetlands include Wadi Natrun and Lake Qarun (about 200 km²), both in the desert west of Cairo, the Bay of Suez, and of course the Nile Valley, which possesses the huge, man-made Lake Nasser (over 5,200 km²). Of these, Lakes Burullus, El Malaha, Manzala, and Qarun appear to be the most significant for watering waterbirds, according to the data reported in this publication. Lake Nasser seems to have very few wintering waterbirds.

All these wetlands were visited in the winters of 1978/79 and 1979/80 by two "Netherlands Ornithological Expeditions to Egypt" sponsored by the International Waterfowl Research Bureau (I.W.R.B.), the Holy Land Conservation Fund, and other agencies in Europe and the United States. Substantial help was given by Egyptian authorities. Peter Meininger and Wim Mullié, who took part in both expeditions, supplemented their data with notes from the other observers in their party as well as other ornithologists who visited Egyptian wetlands independently. They wrote a very interesting account of their census results, but their book also includes fascinating information on the hunting and trapping of waterbirds in Egypt, an excellent chapter by Bertel Bruun on nature conservation in Egypt, and, in an appendix, the list of all species of birds recorded from Egypt (with their English, Latin, and Arabic names and, in abbreviated form, some information on their status), as well as an Arabic summary. The text is illustrated with a number of photographs of birds and wetlands, of modern and ancient bird market and trapping scenes, with maps of the wetland areas visited by the authors, and with attractive line drawings of a number of birds by the Egyptian artist Sherif Baha el Din. The line drawing on the covers is due to Arthur Singer.

A series of tables gives the counts of waterbirds for each area and Tables 28–33 summarize the authors' maximum counts and provide comparative data from other parts of the Palearctic and the Mediterranean that clearly demonstrate the great significance of Egyptian wetlands for wintering birds in the Middle East. A few figures extracted from this documentation will give some ideas of the numbers involved. For instance, about 35,000 Wigeon (*Anas penelope*), 53,000 Shoveler (*Anas clypeata*), and about 17,000 Whiskered Terns (*Chlidonia hybrida*) were counted on Lake Burullus in 1979/80. There were about 230 Sander-billed Gulls (*Larus genei*) on Lake Manzala in 1978/79, over 1,200 on Lake Qarun the same winter, while Lake Malaha had about 5,400 in the winter 1979/80. More than 6,400 Flamingos (*Phoenicopterus ruber*) were counted on Lake Malaha in 1979/80. About 10,000 Black-necked Grebes (*Podiceps nigricollis*) were censused on Lake Qarun in each winter.

Trapping and hunting of wintering waterfowl in Egypt takes place on a large scale today, as it undoubtedly has for millenia. On page 80 of this book are reproduced two scenes of waterfowl and duck

netting, one from the 12th dynasty (about 1250 B.C.) and the other from the 6th dynasty (about 2250 B.C.). According to Table 35, large numbers of some species are sold on bird markets today, especially Teal (*Anas crecca*), Moorhen (*Gallinula chloropus*), Purple Gallinule (*Porphyrio porphyrio*), Coot (*Fulica atra*), Avocet (*Recurvirostra avosetta*), Kentish Plover (*Charadrius alexandrinus*), Dunlin (*Calidris alpina*), and Little Stint (*Calidris minuta*). Aside from Lake Qarun, where Italian hunters slaughter all birds that can be shot, hunting and trapping elsewhere seems to be carried out by Egyptian fishermen. "When we compare the annual market sales (£E 60,000–100,000) for waterbirds in the Lake Manzala region with the sales from lake fisheries (£E 25,000,000 annually) we see that this is only 0.24–0.4 % of the sales from the lake fisheries. So the contribution of bird hunting activities on the regional economy is negligible" (p. 97). This hunting pressure is nevertheless intense and constitutes a threat to the status of the wintering waterbird fauna. This pressure, combined with the fact that wetlands are diminishing in area and suitability because of development and reclamation, makes it urgent to consider seriously measures to protect this resource. Bertel Bruun reviews what is being done to preserve nature in Egypt (Chapter 6) and concludes: "At the present time it appears that wildlife conservation in Egypt is off to a promising start although much, indeed most, work remains to be done. It is hoped that the present volume will further stimulate this development" (p. 106). I believe that it will.

This book is a very good contribution to our knowledge of Middle Eastern ornithology and to our understanding of the economic aspects of bird hunting in Egypt. Authors, sponsors, and publishers are all to be congratulated for a fine piece of work.—FRANÇOIS VUILLEUMIER.

A preliminary inventory of wetlands of international importance for waterfowl in west Europe and northwest Africa.—D. A. Scott. 1980. Slimbridge, England, The International Waterfowl Research Bureau. Special Publ. No. 2. 127 pp. Price not given.—Extensive cooperation and coordination among government agencies, professional ornithologists, and amateur birders is evident in this second publication from the International Waterfowl Research Bureau (IWRB). In preparing this reference work, the author made great strides toward the laudable goal of providing European governments and regional and local authorities with an inventory of wetlands valuable to waterfowl. Many of the data were derived from IWRB counts throughout Europe, supplemented with extant regional wetlands inventories and published literature. The survey is broad in scope, including 15 countries in western Europe and seven in northwest Africa.

Precisely what should be considered a wetland or waterfowl is the topic of a rather complex first sec-

tion. Despite elaborate groundrules for both classifications, inconsistencies exist in both cases. For example, although the conventional definition of wetlands as described in the Ramsar Convention is generally adhered to, other sites such as offshore islands and woodlands important for nesting herons are also included in the inventory. Waterfowl are considered in the broadest context as "birds ecologically dependent on wetlands," yet true seabirds have been ignored in the survey. Such minor inconsistencies are excusable and understandable, however, for an endeavor that addresses the habitat use of 125 species in 18 families in the western Palearctic.

Valuable information is found not only in the inventory itself, but also in species accounts preceding the inventory. These accounts describe species population sizes and movements at several times during the annual cycle. The sites selected for inclusion in the inventory are based on numerical criteria of waterfowl use. In general, a site is listed if it: (1) regularly supports 1% of the biogeographical or flyway population (nonbreeding periods) or breeding pairs (breeding period) of a species; (2) regularly supports either 10,000 ducks, geese, or swans, or 10,000 coots, or 20,000 waders; or (3) supports an appreciable number of endangered species of animals that have populations fewer than 10,000 birds or 2,500 breeding pairs. A listing of 544 sites is presented in the inventory, each listing describing the location, size, protection status, major habitat types present, and species and numbers of breeding, migratory, and wintering waterfowl.

Although admittedly incomplete, this work nevertheless provides valuable material and a framework onto which can be added supplemental inventory data. College and museum libraries will find in this book good reference materials on European and northwest African wetlands, and it is a must for all professional and serious amateurs interested in west Palearctic waterfowl.—JAMES K. RINGELMAN.

Oiseaux de la Réunion.—Nicolas Barré and Armand Barau. 1982. St. Denis, Imprimerie Arts Graphiques Modernes, 6-8 rue Monthyon. 196 pp. About \$10.00. (Can be obtained from the authors, Bois Rouge, Cambuston, Réunion).—In his preface to "Oiseaux de la Réunion," Christian Jouanin wrote: "The avifauna of Réunion is one of the most famous examples of havoc played in an insular fauna by the arrival of man and his suite of commensal and parasitic mammals." And on the last page of their book the authors reproduced the drawing of three dodos from Mauritius sketched by "Camille, six years old," adding: "Ridiculous silhouettes, these Mauritius dodos, symbols of a cohort of ghosts, now inhabit only the dreams of children. If only we could prevent what breathes, unique in the world and today in our hands, from increasing the sad saga of the dead. Will we be able to bequeath better things than shadows, myths

and dreams? The nature of Bourbon is still so beautiful, but so fragile." Between these opening and concluding statements, this wonderful little book offers a lot of information on the ecology of Réunion Island and on its past and present avifaunas before describing its birds in field-guide fashion.

The islands of Réunion (formerly called Mascarenne and Bourbon), Mauritius (Maurice, formerly Ile de France), and Rodriguez (Rodrigues) make up the Mascarene Archipelago, so named because the Portuguese traveler Dom Pedro de Mascarenhas is supposed to have been the first to visit the islands. Located about 660 km east of Madagascar, Réunion is an extremely mountainous and spectacularly beautiful volcanic island measuring about 70 × 50 km and slightly over 2,500 km² (roughly comparable to Trinidad or the Cape Verde Islands). High altitudes (the highest summit is over 3,000 m), steep and dissected topography, and variable exposure to dominant winds all contribute to differences in rainfall and consequently help produce different altitudinal zonation of the vegetation on the western and eastern sides of the island. Six color photographs illustrate the main vegetation types.

In a section entitled "Des Oiseaux et des hommes," Barré and Barau present what can be inferred about the avifauna of Réunion in the seventeenth and eighteenth centuries on the basis of reports from travelers. All these texts agree that birds were very diverse, extremely abundant, and unbelievably tame. For instance, Dubois wrote in 1672: "This whole island is filled with an infinity of game of which I describe a part. The birds of many species are present in great numbers and are so tame that they can be caught by hand. One thus needs neither gun, powder or lead when hunting. Occasionally one uses a small stick with which one massacres as many birds as one wishes." Dubois (spelled Du Bois by Berlioz in his *Oiseaux de la Réunion*, Librairie Larose, Paris, 1946) visited Réunion in about 1670. According to Berlioz, who published a complete transcription of Dubois's "Description de quelques oiseaux de l'Île Bourbon," Dubois was the only truly reliable author from whose writings "one could reconstitute somewhat the original fauna of Réunion." Barré and Barau reproduced Dubois's text and part of Berlioz's careful ornithological interpretations of the birds described by Dubois. This is very fortunate because Berlioz's important study on the birds of Réunion is not easy to obtain and to consult. (Incidentally, Milon's article in *La Terre et la Vie*, 1951, 98: 129–177, on the present-day fauna and Berlioz's monograph were the only papers dealing with the avifauna of Réunion as a whole prior to the publication of this book.)

Dubois wrote about flamingoes, geese, ducks, a bittern, a moorhen or coot, white and grey egrets, the solitaire, a large blue rallid, several pigeons and doves, several parrots, birds of prey, and many more species. Of all these birds only a small number could be identified by Berlioz, but it is clear that a large

number of avian groups present on Réunion in the seventeenth century have disappeared completely since. The most original of these extinct taxa was, of course, the Solitaire of Réunion, *Raphus solitarius* (Sélys-Longchamps), known only "by pictures and accounts of travelers of that time" (Greenway, *Extinct and Vanishing Birds of the World*, Dover, second revised edition, 1967). Dubois's account of the solitaire is brief: "Solitaires, these birds are so named because they are always alone, they are as large as a large goose and have black plumage at the wing and tail tips. On their tail are feathers similar to those of the Ostrich, they have a long neck and the beak like that of woodcocks but bigger, the leg and foot like hens from India. This bird is caught on the run for it flies but very little, it is one of the best games of the Island."

The first residents settled on Réunion in 1663; there were 309 inhabitants in 1689, over 8,000 in 1735, 35,000 in 1777, and 67,000 in 1800. This period in the ornithological history of the island is described on pp. 40–49. In 1863 "Maillard proposes a list [of species] already very close to the one that could be established at present." The last two species to become extinct, the parrot *Mascarinus mascarinus* (extinct in the second half of the 18th century) and the Mascarene Starling or Huppe de Bourbon, *Fregilupus varius* (extinct between about 1838 and 1858), are illustrated on color plates opposite pp. 32 and 33.

In a chapter called "L'avifaune actuelle," Barré and Barau describe the origin and the composition of the modern avifauna. They clearly show the importance of cyclones in the dispersal of birds to Réunion and discuss the processes of successful colonization and insular evolution. Table 1 (pp. 56–57) gives the list of native breeding species on Réunion and shows their status elsewhere or their nearest relative. Migrants are enumerated on pp. 61–62 and the cohort of introduced species pp. 62–64. Barré and Barau are prudent in their assessment of the role introduced species have played on the native ones, but in this section and elsewhere in the book (e.g. p. 77) they do suggest stricter regulation of introduction of exotic species, and even the destruction of *Pycnonotus jocosus* "even if this is a very beautiful bird." By the authors' accounting, today's avifauna of Réunion Island includes 21 native species, 13 regular migrants, at least 13 occasional visitors, and 16 introduced species (63 species, 37 of which breed).

A very useful chapter offers a thorough discussion of various factors, especially human (or factors indirectly related to human activities), that influence the survival of bird populations. The authors suggest a number of ways to permit the present avifauna to maintain itself in the future: setting up several reserves, limiting reforestation to certain appropriate areas, restricting hunting, and educating the general public about the island's natural treasures. They also suggest that the introduction to Réunion of species threatened on the other Mascarene islands might be

beneficial in the long term (for instance, *Foudia rubra* from Mauritius). The pros and cons of such introductions must be carefully studied and weighed before they are attempted, and the authors may be a little less critical here than they should be.

The rest of the book (pp. 79–182) is a field guide to the birds of Réunion. The text (identification, behavior, status, and distribution) is illustrated with color plates and numerous black-and-white drawings. All these illustrations are due to the talent of Nicolas Barré. I found some of the birds in his color plates a little stiff (unfortunately some plates are not as well reproduced as they should be, for example Plate VII), but the drawings are lovely. They show a variety of birds in small vignettes that add much life to the whole book.

In order to encourage the resident reader to go in the field the authors have appended a few blank pages for "notes" and have even begun these notes with sketches and observations of a species new to the island's list and not discussed in the text because it was recorded after the book was completed. The book ends with a bibliography (many of these documents are available in the library of the Natural History Museum in St. Denis), and indexes to French, Creole, and Latin names of birds.

Carefully researched and produced, pleasantly illustrated, and easy to read or consult, this pocket-sized book will be very useful to all ornithologists interested in the birds of the Indian Ocean islands and to those working on insular avifaunas generally because it gives a concise summary of past and present birds on Réunion. I think that "Oiseaux de la Réunion" should be mandatory reading for all school children of Réunion taking courses on the geography of their magnificent island.—FRANÇOIS VUILLEUMIER.

Birds of Fiji, Tonga, and Samoa.—Dick Watling. 1982. Wellington, New Zealand, Millwood Press. 176 pp., 15 color plates and numerous black-and-white drawings by Chloë Talbot-Kelly, numerous maps and colored and black-and-white photographs. \$39.95.—For ornithologists seeking an easily accessible, exquisitely beautiful site with an interesting but little-studied avifauna, Fiji is a good choice. There are daily direct flights from the U.S. west coast. The language is English, the people friendly, the scenery lovely, the road network good, and tourist facilities well-developed. Bird diversity is low enough to pose few identification problems, yet high enough to illustrate numerous biological phenomena. The largest island, Viti Levu, has only about 40 extant breeding native land bird species, of which one can easily see the great majority in a week without prior experience. This small avifauna still exhibits mixed-species foraging flocks, as well as numerous pairs of congeners segregating in interesting ways. The avifauna is still largely intact and native, in contrast to the

devastating changes that have befallen the avifaunas of Hawaii and Tahiti. The sole modern extinctions of native species on Fiji and the neighboring archipelagoes of Tonga and Samoa were of two rails plus local populations of two wide-ranging species. Introduced species are absent from mature forest, which they dominate in Hawaii. Finally, many of the most elementary things about Fijian birds remain unstudied.

The serious exploration of Fiji's birds began in 1838 with the U.S. Exploring Expedition. Fijian ornithology went through a colorful phase in the 1870's, when E. P. Ramsay discomfited his rivals and won priority races by describing new species in the daily Sydney Morning Herald, anticipating molecular biologists of the 1960's who announced new DNA codons in newspaper interviews. The Whitney Expedition collected on every important island of the region and discovered two new species. This largely completed the phase of discovering what birds occur on what islands.

The avifauna that was thus discovered derives partly from New Guinea, partly from Australia. Endemic genera consist of the extremely distinct Tooth-billed Pigeon (*Didunculus strigirostris*) and a mysterious passerine variously compared to birds of paradise and monarch flycatchers (*Lamprolia victoriae*), plus the marginally recognizable parrot genera *Phigys* and *Prosopeia* and meliphagid genus *Foulehaio*. In addition, there are about 33 endemic species or allospecies belonging to genera with extralimital representatives.

The available earlier books treating this avifauna are Mayr's *Birds of the Southwest Pacific* (1945, New York, Macmillan), covering the whole region from Micronesia and the Solomons to Samoa; duPont's *South Pacific Birds* (1976, Greenville, Delaware Museum of Natural History), covering the region from Fiji east through Polynesia to Pitcairn; and Mercer's booklet *A Field Guide to Fiji Birds* (1966, Suva, Government Press). In 1967 Dick Watling arrived in Fiji, and 15 yr later the result was the present book. It covers the birds of Fiji, Samoa, Tonga, and adjacent small islands (Niue, Rotuma, Wallis, and Hoorn). This region is entirely included in, but much smaller than, the coverage of Mayr's and duPont's books.

The book begins with introductory chapters describing the ornithological exploration of the region, the origin and habitat preferences of the avifauna, the patterns of ecological segregation between closely related species, breeding cycle patterns, bird conservation, and the region's geography (illustrated by irresistible color photographs). Next come good color plates, by Chloë Talbot-Kelly, depicting all but four of the region's bird species.

The heart of the book consists of accounts of all 128 recorded species, including seabirds, migrants, and introduced species as well as native resident land and fresh-water species. The native Fijian, Tongan, and Samoan names of most species are provided (but

beware: these names vary geographically in Fiji, and most residents today have poor knowledge of birds and their names). Description of plumage is kept brief, as the plates suffice and the avifauna presents few problems of identification anyway. Ranges are described generally in broad terms rather than island-by-island, and are illustrated by helpful range maps within the Fijian archipelago or unhelpful, coarse-scaled maps for the whole region. Subspecies and their ranges are briefly mentioned, but distinguishing characteristics are given only if visible in the field. Finally, available information about vocalizations, diet, flight, reproduction, habitat preference, foraging techniques, and other habits in life is summarized. This information is fullest for Fiji, where Watling was based, and is scanty for Samoa, reflecting our limited knowledge of Samoan birds in life. An appendix provides an ornithological bibliography of the region.

Much of the information about life habits is based on Watling's original observations. Thus, this book is not only a summary of an avifauna but also a capsule summary of years of field research. Among the many habits described for the first time are the duet of the warbler *Vitia ruficapilla*, the foraging technique of the flycatcher genus *Clytorhynchus*, the nests of numerous species, and behavioral differences among the region's species of *Ptilinopus* fruit-doves. Most species of the region occupy a wide range of habitats and altitudes. In some cases, comparison of these ecological ranges with those occupied by the same species in the ornithologically much richer archipelagoes to the west reveals dramatic niche expansions. For instance, the Reef Heron *Egretta sacra* is so named because throughout most of its range it is confined to the sea coast, leaving fresh-water habitats to numerous other heron species. In Fiji, Tonga, and Samoa, where the sole other heron, *Butorides striatus*, is confined to five Fijian islands, *Egretta sacra* occurs not only on reefs but also inland, even on small forest streams.

Watling's chapter on ecological segregation between related species is relevant to the current controversy over taxon cycles, a concept whose applicability to the West Indian avifauna has been supported by Ricklefs and Cox (1972, *Amer. Natur.* 106: 195; 1978, *Amer. Natur.* 112: 875) and contested by Pregill and Olson (1981, *Ann. Rev. Ecol. Syst.* 12: 75). In the Fiji-Tonga-Samoa region the facts are clearer and simpler than in the West Indies. The region has nine pairs of congeneric, sympatric, similar-sized species. Each consists of a distinct endemic species or allospecies (presumably the older invader), plus a little-differentiated representative of a species or superspecies that occurs extraliminally (presumably the more recent invader). In seven of the nine cases the older species is confined to forest on the larger islands, while the younger species occurs both inside and outside forest on many islands, large and small. For instance, the distinctive endemic

flycatcher *Myiagra azureocapilla* is confined to mature forest on the three largest Fijian islands, while *M. vanikorensis* occurs in almost any habitat on at least 62 Fijian islands of all sizes, also occurs 1,100 km to the west on Vanikoro, and belongs to a wide-ranging superspecies distributed from Micronesia and the Moluccas to Samoa. The endemic pigeon *Ducula latrans* occurs in forest on mainly the larger Fijian islands. Its congener *D. pacifica* ranges from the New Guinea region to Samoa, occurs in Fiji mainly in scrub and beach forest on small islands lacking *D. latrans*, and regularly wanders between islands, but occupies inland forest of the largest Samoan islands in the absence of *D. latrans*. A similar pattern (mentioning the more recent invader first in each case) is observed for the pigeons *Ptilinopus porphyraceus* and *P. perousii*, the trillers *Lalage maculosa* and *L. sharpei*, the white-eyes *Zosterops lateralis* and *Z. explorator*, and the estrildid finches *Erythrura cyaneovirens* and *E. kleinschmidti*. Of the other three cases, the pigeons *Ptilinopus perousii* and *P. [luteovirens]* fit the same pattern distributionally but not in habitat preference; the flycatchers *Clytorhynchus vitiensis* and *C. nigrogularis* fit except that it is unclear which taxon is the older invader; and the habitat differences between the widespread flycatcher *Mayrornis [lessoni]* and its endemic congener *M. versicolor* are unknown. Watling's observations suggest that invading species of broad habitat tolerance gradually concentrate on the region's main habitat type (forest), experience selection against overwater colonizing ability, and consequently become restricted to the larger islands as they evolve and differentiate.

Watling points out that there is not a single national park in the region, and that one goal of his book is to stimulate interest of local people in their own birds. Here I fear that he may not achieve his aim, although I would be delighted to be proved wrong. The book's perspective is basically that of someone operating within the western naturalist tradition and equipped with binoculars. My guess, from experience of Pacific islanders, is that Fijians, Tongans, and Samoans will find this perspective unnatural, and that a completely different book would be needed to enlist them. It would be a book deemphasizing what interests western naturalists, and emphasizing instead the role of each species in traditional lore and its gestalt, as perceived by an observer without binoculars.

For western naturalists like myself and most readers of this journal, how does this book compare with those by Mayr, duPont, and Mercer? Mercer omits Tonga and Samoa; duPont includes many archipelagoes besides Fiji, Tonga, and Samoa, and Mayr even more. Mayr and Mercer illustrate few species. DuPont and Watling both have good and virtually complete color plates; those in Watling's book are generally to a larger scale, and I found their proportions and postures more realistic. Watling has by far the most information on life habits, Mercer much less,

Mayr a few well chosen sentences, and duPont one or sometimes two sentences. For the taxonomist, only duPont provides distinguishing characteristics and literature citations for every subspecies, and for the biogeographer only duPont explicitly lists all islands of occurrence within the region. For anyone interested in habits or else in visiting the region to observe, Watling's is obviously the book of choice. It is not a pocket-sized field guide (actual size ca. 12 × 8½ inches), but one is unnecessary on these islands with small avifaunas and few problems of field identification.

Watling's book will serve as a starting point for further studies of innumerable interesting questions. Fiji and its neighbors are a region where significant contributions to ornithology can still be made in a short visit. Here are examples of such questions:

What is the function of the Tooth-billed Pigeon's extraordinary bill?

What are the habits and affinities of the Silktail *Lamprolia victoriae*, rightfully described by Mayr as "one of the most puzzling birds of the world"?

We know nothing whatsoever about the habits of the endemics *Zosterops samoensis* and *Mayrornis versicolor*, and almost nothing about Kadavu's endemics *Rhipidura personata* and *Xanthotis* (= *Foulehaio*) *provocator*. How do *Mayrornis lessoni* and *M. versicolor* segregate on the small island of Ongea Levu, to which the latter species is confined?

The interrelations of the sympatric *Philonopus* fruit-doves (*P. perousii*, *P. porphyraceus*, *P. [luteovirens]*) are complexly rewarding for study. *P. perousii* is a gregarious and aggressive canopy feeder, while the other two are solitary subcanopy feeders. Do these species differ in fruit preferred? Sexual dichromatism in the allospecies *P. luteovirens* and *P. victor* is extreme for a pigeon: male bright yellow or orange, female green. Does this suggest that males of these species, exceptionally among pigeons, are polygynous and do not help at the nest (W. Beckon 1982, *Notornis* 29: 1)?

The Golden Whistler *Pachycephala pectoralis* has been known to exhibit marked inter-island morphological variation in the Fiji region (E. Mayr 1932, *Amer. Mus. Novit.* 531; I. C. J. Galbraith 1956, *Bull. Br. Mus. (Nat. Hist.)* 4: 131). Watling now reports pronounced geographic variation in song. Are these two types of variation correlated, and do songs betray the postulated hybrid origin of some of the Fijian populations?

The principal wintering range of the New Zealand cuckoo *Eudynamis taitensis* includes Fiji, Tonga, and Samoa. The migrants cross 4,000 km of the open Pacific to hit small islands, where overshooting means death in the endless ocean beyond. Young of the year set out from New Zealand separated from the adults. This fascinating migration has been studied at the New Zealand end, but never at the tropical Pacific end. Will banding reveal that individuals return to the same wintering grounds? Will radio-tracking re-

veal that the autumn migrants fly high so as to spot islands from afar and avoid missing the target?

Watling mentions mixed flocks of at least four small insectivorous passerines (*Pachycephala pectoralis*, *Myiagra azureocapilla*, *Mayrornis lessoni*, and *Erythrura kleinschmidti*). The small size of the Fijian avifauna makes Fiji a favorable place to study the organization and selective advantages of mixed flocks.

Sixteen species of wintering waders have been recorded in the region, but all observers have neglected them in favor of the native species. To what extent is Fiji a terminus rather than a way-station for these waders?

Nothing has been published on avian paleontology of Fiji, Tonga, and Samoa. The first Polynesian colonists exterminated dozens of species on New Zealand, the Chathams, and (S. L. Olson and H. F. James. 1982. *Science* 217: 633) Hawaii, including New Zealand's flightless moas and Hawaii's flightless geese and ibises. What will paleontologists find on other Pacific islands? Especially suspicious is the absence of extant species restricted to Fiji's low-rainfall zone, whose original forest would have been easily destroyed by burning.—JARED DIAMOND.

Telemetric studies of vertebrates.—C. L. Cheeseman and R. B. Mitson (Eds.). 1982. *Symposia of the Zoological Society of London* No. 49. London, Academic Press. 352 pp., 104 black-and-white figures, 33 tables. \$54.00.—This volume follows by only 2 yr the publication of proceedings of a similar though larger symposium (Amlaner and MacDonald, *Handbook on biotelemetry and radio tracking*, New York, Pergamon Press, 1980), indicating the popularity of radiotelemetry and radiolocation as research tools. With these and the recent review by Cochran (*in Wildlife management techniques manual*, The Wildlife Society, 1980), the reader should have available up-to-date, handy information on this field. The Cheeseman and Mitson book has full literature citations, is somewhat better reproduced than the earlier proceedings volume, and is about the same price/page.

The first five chapters cover design of equipment for radio tracking and radiolocation studies; a chapter by Skiffins details United Kingdom regulations concerning radio transmitters. There follow chapters on fish (2), birds (4), bats (1), small mammals (4), and larger mammalian carnivores (5). Many readers interested in ornithology will turn to volumes such as this for examples of how to squeeze as much biologically meaningful data as possible from these time-consuming electronic aids. Such readers should not overlook the chapters on mammals; the ratio of behavioral and ecological insight to species- and habitat-specific description is often higher in the chapters on mammals. Sequestered in an article on gray squirrels (Kenward) are summaries of effects of radio tags upon their bearers, discussion of termi-

nology, and advice about acquiring the necessary field skills to make use of the techniques. ("... the lack of such skills can easily result in few useful data being collected during the first year of a project.") Also among the papers on mammals, one finds an instructive contrast between data on plentiful local animals in urban and suburban human-dominated habitats and animals in less disturbed, more complete ecosystems such as African grasslands and woodland. Both groups of papers illustrate how quantitative approaches to collection and analysis of radiotracking data have developed, but the studies in more natural habitats allow much broader biological insight.

Butler and Woakes describe telemetric studies on forcibly and spontaneously submerged ducks and human-imprinted flying Barnacle Geese; the somewhat controversial results indicate that much is still to be understood in these areas. Kenward et al. briefly describe two simple systems for modulating the interval between transmitter pulses on Woodcock and Goshawk. Strangely, not even sample data of the "unambiguous" flight signals provided by pulse interval modulation are given in this and following papers. Hiron and Owen describe studies on Woodcock, including physical effects of wearing transmitters fastened with harness, nocturnal flight (display) activity, and time spent in habitats of differing earthworm productivity. An article by Widen on Goshawks uses signal strength, not pulse interval modulation, to distinguish "activity" from "non-activity"; unfortunately, activity periods shorter than 48 s could not be classified, greatly weakening the conclusions.

Most of the papers appear to suffer from space limitations in the proceedings. As is typical of many symposium volumes, methods are described thoroughly enough to understand but not usually to allow replication. Data depend on authors' skill and attentiveness in the field, qualities that are likewise difficult to replicate. There may be emerging a need for more standardization of techniques and jargon to allow this most exciting field to take advantage of comparisons among species and across habitats.

The book will be an important addition to college and university libraries and to that of someone using or intending to use radio devices on vertebrates.—RONALD P. LARKIN.

A field guide to the birds of Taiwan.—James Wan-fu Chang. 1980. Environmental Research Center of Tunghai University (available from IR Publ. LTD., 150 E. 27th St., New York, New York 10016). 324 pp., 75 full-color plates, 390 monochrome illustrations and maps. Cloth/boxed \$38.00.—How gratifying to see a Taiwan field guide written by a Taiwanese! This book is the happy result of an increased environmental awareness only begun within the last

few decades. Preceding publications of Taiwan birds have been done by Japanese (Hachisuka and Udagawa, *Journal of the Taiwan Museum*, 1950 and 1951), and by Americans with Chinese assistance ("A guide to the birds of Taiwan," Kang and Alexander, 1970; "A new guide to the birds of Taiwan," Severinghaus and Blackshaw, 1976).

Common names of birds are given in Chinese, Japanese, and English. The text is principally in Chinese, with a sentence or two in English immediately following each description. For someone unable to read Chinese, the English portion of the text is plainly inadequate. Fortunately, the birds appear in reasonable taxonomic sequence, so flipping pages to find a bird is not difficult. Having the text appear on the same page as the illustration and range map is also helpful to occidentals. Necessary information about some birds was omitted in the English portion, but may be found in the Chinese text. For example, the white phase of the Reef Egret (*Egretta sacra*) is mentioned in Chinese, but nothing is said of this color morph in English. I also missed reading any behavioral notes, which can be so useful in locating and identifying a bird.

By Western standards the illustrations leave something to be desired. Many are copies from previous publications, with errors intact. The section on raptors and ducks has underwing illustrations, which is certainly a necessity for proper identification, but the principal illustration of most raptors is barely adequate. For the most part, colors seem overly bright, leading the reader to look for colors or field marks that do not exist.

The author appears to have a great deal of experience with mountain birds and most Taiwan endemics; this book probably reflects years of field work. However, the lowland birds and migrants clearly need more of his attention. I found the lack of new data frustrating. Some of the birds this writer first reported in 1974 and 1975 still stand as the only records to date. Surely there are more current observations to report; I would love to know about them.

"A field guide to the birds of Taiwan" is a good example of emerging concern for at least one segment of Taiwan's natural environment. It is a serious attempt to document Taiwan's ornithological heritage. So much has yet to be learned about Taiwan's birds, as evidenced by the fact that fully 20% of these 390 species are listed as vagrant, status unknown, or no recent records within the last 10 years. Hopefully this publication will serve to encourage new students and new field studies. The author and serious Taiwan ornithologists have the potential to contribute much new data to the scientific community. For Western readers, this book represents a continuing effort to research and publish new discoveries about Taiwan's rich and varied bird life.—SUSAN R. BLACKSHAW.

ALSO RECEIVED

Teton wildlife. Observations by a naturalist.—Paul A. Johnsgard. 1982. Boulder, Colorado, Colorado Associated University Press. xi + 128 pp. \$17.50.—The Grand Teton Mountains and Jackson Hole have cast their spell on many people. Consequently, numerous broad-brush books of varying quality on that area have been produced. Readers will be pleasantly surprised to find that Johnsgard's *Teton Wildlife* is not just another ordinary Teton-Jackson Hole book. In a small publication, he has successfully integrated a description of the area's physical characteristics and aesthetic qualities with a pleasantly readable, fascinating, and informative narrative on some of the locale's native wildlife. Johnsgard's descriptive portrayal of that unique area's seasonal qualities will generate many nostalgic recollections for past visitors and will whet the imagination of the uninitiated. At the same time, he subtly presents a wide variety of natural history information that provides the experienced as well as the inexperienced biologist with some intriguing insights on birds and mammals.

In his familiar lucid writing style, Johnsgard acquaints the reader with the location and traits of some of the prime and highly diverse Teton-Jackson Hole wildlife habitats. Simultaneously, the reader is provided an informative introduction to many of the local wildlife species and some of their most noteworthy features. Among the bird species receiving major coverage are the Trumpeter Swan, Sandhill Crane, Bald Eagle, Osprey, Great Blue Heron, Common Raven, Prairie Falcon, Calliope Hummingbird, and Dipper. Numerous other species of birds are discussed to a lesser degree as characteristic faunal components of the various habitats described.

A series of pleasing line drawings and black-and-white photographs is interspersed throughout the book. The reader will likely be disappointed with the reproduction quality of some of the black-and-white photographs. They are grainy and appeared related to the problems encountered when using color negatives to produce black-and-white prints. The four color photographs on the jacket and the three on the frontispiece of the book are more characteristic of the high photographic quality seen in other Johnsgard books.

Generally, this is a fun book for relaxing reading. Readers will share with the author many pleasurable memories and natural-history observations on a very special piece of the earth. As such, this book is a good candidate for personal, secondary school, college, and public library natural-history collections.—KENNETH L. DIEM.

Breeding biology of the Little Auk (*Plautus alle*) in Svalbard.—Magnar Norderhaug. 1980. Oslo, Norsk

Polarinstitutt. 45 pp. (Available in N. America from Columbia University Press, 562 W. 113 St., New York, New York 10025). \$7.50.—Considering that the Dovekie or Little Auk, *Alle (Plautus) alle*, is probably the most numerous seabird in the North Atlantic, it is remarkable how little was known until recently of its biology. This slim monograph makes a start toward rectifying the situation.

The book describes studies carried out in two seasons at a colony on the north side of Hornsund, on the west coast of Spitzbergen. Observations began only after the initiation of egg-laying and included the size of eggs, the timing of hatching, the growth and development of the chicks and their behavior at fledging, and diet and rates of provisioning for chicks. Observations of the rates at which chicks were fed proved to be of particular interest, showing that Dovekies at this colony fed most frequently in the middle of the day, in contrast to earlier suggestions that peak feeding occurred at night in response to the vertical movements of plankton.

In addition to presenting data on his own studies, the author attempts to put the biology of the Dovekie into a wider perspective by comparing the onset of thermoregulation, the length of the nestling period, and the rates at which the young were fed with studies on other alcids. These comparisons, however, are made with larger species and do not include any of the similar-sized Pacific alcids that might provide a more interesting contrast.

There is much in the book that was new at the time when the observations were made, in 1963–1965, but unfortunately subsequent research has mitigated its impact. We now have two other fairly detailed studies available, by P. G. H. Evans in Greenland and by L. Stempniewicz on another Spitzbergen colony. As a basic introduction to the breeding biology of the Dovekie, however, this remains a useful document.—A. J. GASTON.

Proceedings of the Northeastern breeding bird atlas conference.—Sarah B. Laughlin (Ed.). 1982. Woodstock, Vermont, Vermont Institute of Natural Science. 122 pp. (looseleaf in binder). \$10.00 (+\$2.00 postage).—The Northeastern Breeding Bird Atlas Conference was attended by 32 invited individuals representing 11 states and 4 agencies. Their goal was to share information relative to breeding bird atlas-ing and to establish standard procedures for states and provinces embarking upon atlas-ing projects.

Atlas-ing, in the context of this Conference, represents the efforts of field personnel to establish the breeding status of birds within well-defined areas. Atlas-ing, then, should not be confused with the U.S. Fish and Wildlife Service Breeding Bird Survey, which documents relative abundance of avifauna along se-

lected routes and is used to monitor population trends.

The Proceedings is a collection of invited speaker reports and, apparently, the results of collaborative efforts on the part of conference attendees. The quality and informative value of the reports varied as a result, and they were often repetitive. The format of material presented in the Proceedings could have been improved. Two well-written reports concerning the purpose of breeding bird atlases, which set the stage for the importance of atlases and the conference, should have followed the stated purpose of the conference rather than be inserted midway through the Proceedings.

The Proceedings adequately reflects the goals of the conference attendees. Various aspects of atlas (e.g. grid size and mapping scales together with area coverage, data analysis, and standardized breeding criteria) receive much attention. Other atlas topics (volunteer recruitment, records verification, financing, and publishing) are also presented. One important goal realized by the conference attendees was publication of standardized grid sizes and breeding criteria codes. These standards should prove useful for states and provinces about to embark upon atlas efforts and provide a better basis of comparison. Unfortunately, not all the states/provinces currently involved in atlas adhere to these standards (most of the differences lie with breeding criteria codes rather than grid size). The need for an exchange of information and agreed-upon atlas standards clearly has existed for some time.

A considerable portion of the Proceedings is allocated to the atlas efforts of 12 states/provinces. These accounts are often interesting, but the amount of useful information varied, depending largely upon the degree of completion of the atlas effort. A complete bibliography of national and international atlas efforts and a listing of personnel currently involved with an atlas project is provided in the Proceedings; this represents a useful beginning for either the serious student of atlas or for those contemplating an atlas project.

Most of us have attended conferences or meetings at which we've learned as much—if not more—from exchanging ideas with fellow participants than from the program. I judge this conference and the subsequent Proceedings to be similar in this regard. The high level of participation and exchange of ideas noted in the Proceedings undoubtedly made this conference useful and interesting for the attendees. Unfortunately, this element of participation has not (and probably could not have) been reflected in the Proceedings itself. Consequently, I can recommend this Proceedings only for those amateur or professional ornithologists interested specifically in or directly involved with planning and/or directing breeding bird atlases.—STEVEN M. BYERS.

Voices of Matsalu.—Fred Jussi. 1979. One 12-in. 33 $\frac{1}{3}$ rpm stereophonic phonodisc album. Melodia Records, produced by Radio Estonia.—This is a record of the voices of 25 species of birds that inhabit the area of Matsalu Bay near the Baltic Sea on the west coast of Estonia SSR. The Matsalu State Nature Reserve encompasses a wetlands environment of international significance. In its 48,643 ha 126 species of birds breed and 259 total species had been observed to 1979. Habitats include reed beds, wet meadows, seaside pastures, and islets of the bay itself. Bird species on the record are Spotted Crake, Bittern, Great Reed Warbler, Tufted Duck, Redshank, Reed Warbler, Sedge Warbler, Savi's Warbler, Reed Bunting, Black-headed Gull, Black Tern, Moorhen, Water Rail, Starling, Corncrake, Marsh Warbler, River Warbler, Barred Warbler, Blackbird, Thrush Nightingale, Black-tailed Godwit, Oystercatcher, Caspian Tern, Common Gull, Herring Gull, Greenfinch, Barnacle Goose, and Crane, in that order.

Recordist-producer Fred Jussi is a biologist employed to produce nature programs for Radio Estonia. I met Mr. Jussi at the International Ornithological Congress in Moscow in 1982. He speaks and writes fluent English and is anxious to communicate with nature sound recordists everywhere. Jussi was borne on the Island of Aruba in the Caribbean in the 1930's. His father took the family to Estonia just before World War II as an intermediate stop before a planned voyage to America to settle in California. The war broke out and no further moves have been possible. Jussi is an excellent sound recordist and has done a fine job of bringing us "sound pictures" of the rich bird life of this important reserve. One might write to Mr. Jussi at SU 200010 Tallinn, Tina 13-4, Estonia SSR to get information on obtaining this album.—J. W. HARDY.

Birds of the Soviet Union. A Sound Guide. Volumes 1-3.—Boris N. Viprentsev. 1982. Melodia Records, Soviet Union. Three 12-inch monaural 33 $\frac{1}{3}$ rpm, long play phonodisc albums. Price per volume: one ruble, four kopecks.—I obtained these records from the compiler-author Boris Viprentsev while attending the International Ornithological Congress in Moscow in August 1982. Melodia is a national record label of the USSR, and is issued from the Ministry of Culture. The three records are the first of a projected 25 (!) volume set covering the entire avifauna of the USSR. Volume 1 treats Gaviidae, Burhinidae, and Charadriidae; Volume 2 treats Haematopodidae, Recurvirostridae, and part of Scolopacidae (*Xenus*, *Tringa*, *Actitis*, *Lymnocyptes*, *Gallinago*, *Numenius*). Volume 3 concludes the Scolopacidae (*Limosa*, *Limnodromus*, *Phylomachus*, *Eurynorhynchus*, *Limicola*, *Calidris*) and also covers Phalaropidae (as part of Scolopacidae) and Glareolidae. In all, 63 species are

to be heard on these records. Most are given at least a minute of time, many 2-3 min, and a few (two loons and *Calidris canutus*, for example) over 4 min. Each species is announced on the record by its Russian common name and its scientific name. On the jacket, all text is in Russian except for the title and subtitle, which are in English. Following the timings there are descriptions of what calls are to be heard, their behavioral contexts, and circumstances of recording. The albums are first-class productions, the surfaces very quiet, and the sounds well recorded. The front cover of each album bears a charmingly artistic painting of a different shorebird species.

On how one obtains them in the USA I have no information. Perhaps a New York book and record dealer specializing in Russian publications could help.—J. W. HARDY.

Solitudes. Environmental Sound Experiences.

Volumes 1-3.—Dan Gibson. 1981. Three separate 12-inch, 33 $\frac{1}{3}$ rpm, stereophonic phonodisc albums. Dan Gibson Productions Ltd., P.O. Box 1200, Stn. Z, Toronto, Ontario M5N 2Z7. Price not given.—These beautifully produced recordings are termed by the author "acoustical environmental sound experiences composed of authentic natural sounds." They are that. Each of the six sides features a continuous program. In order they are: (Vol. 1) By Canoe to Loon Lake, Dawn by a Gentle Stream; (Vol. 2) The Sound of the Surf, Heavy Surf on Rocky Point, and Along a Sandy Spit and Ocean Surf in a Hidden Cove (with gulls); (Vol. 3) Among the Giant Trees of the Wild Pacific Coast, Spring Morning on the Prairies. Volumes 1 and 3 feature bird songs characteristics of the habitats portrayed. Volume 2 has some gull sounds. I should think these records would be especially interesting to urban nature lovers who are sick of traffic

noise, but believe me, regardless of where you live each of them is a wonderfully real and relaxing experience. The recordings are perfect, much work has gone into the editing and synthesizing of the programs, and the record surfaces are remarkably free of noise. This is necessary to the sense of reality the sounds convey. I found one tiny pop that repeated itself for about 20 s on one side (I may have put it there myself through carelessness). That pop shattered the illusion of being in a quiet forest. Thus, I suggest that if you buy these records you immediately tape record them and play the tapes to preserve the record surfaces. All the sounds were recorded in the wild by Mr. Gibson, who is famous for his parabolic microphones, used in making these recordings. Recommended.—J. W. HARDY.

The Peregrine Falcon in Greenland.—James T.

Harris. 1981. Columbia, University of Missouri Press. viii + 254 pp., black-and-white illustrations. Paper edition. Price not given.—In this narrative account of a summer spent observing Peregrine Falcons (*Falco peregrinus*), the author develops three themes. The first describes the search for eyries, the second elaborates on the fate of a falcon family observed from a blind, and the third is a humanistic account displaying an ethic so essential to conservation—development of an appreciation for the species under study. The perils of secondary poisoning by pesticides, population size, and information on breeding biology as well as other subjects are blended with accounts based on the author's experience with peregrines. Seven pages of cited literature indicate the sources for this supplemental material. This is a very readable account of the author's introduction to peregrine biology. The hard-bound edition was published in or about 1979.—W.E.S.