

BOOK REVIEWS

EDITED BY WILLIAM E. SOUTHERN

Migrant birds in the Neotropics: ecology, behavior, distribution, and conservation.—Allen Keast and Eugene S. Morton (Eds.). 1980. Washington, D.C., Smithsonian Institution Press. 576 pp., figures, tables. \$35.00 (cloth), \$17.50 (paper).—In 1961 I attended the annual meeting of the Swiss Society of Zoology in Neuchâtel, where the keynote speaker, Professor François Bourlière of Paris University, gave an outstanding address on the impact of Palearctic migrants on the resident species of tropical Africa (subsequently published in *Revue Suisse de Zoologie* 62: 139, 1961). Shortly thereafter Morel and Bourlière published their classic paper, "Relations écologiques des avifaunes sédentaire et migratrice dans une savane sahélienne du Bas Sénégal" (*La Terre et la Vie* 109: 371, 1962). This quantitative study had been preceded by Dorst's qualitative analysis of wintering versus resident ducks and waders in tropical Africa (*La Terre et la Vie* 109: 183, 1962). The problems that Morel and Bourlière attempted to solve 20 years ago are much the same as the ones that the editors of the book here under review singled out as the themes for a symposium held at the National Zoological Park of the Smithsonian Institution in October 1977.

In their introduction, Morel and Bourlière stated that "unless residents and migrants had totally different diets, which seems to be unlikely, it is hard to understand *a priori* how these two kinds of birds could avoid competing with each other during the boreal winter." They added that several theoretical solutions were possible, for instance if there was "an alternation of population maxima, such that the sedentary species reproduce at a different time than when the migrants are abundant"; or "if the two populations, resident and migrant, overlap in time, but the migrants benefit from a food surplus left unused by the residents." If the second case were true, Morel and Bourlière noted that "one would still have to explain why birds spending their entire life in tropical savannas did not saturate their environment, instead of leaving unexploited resources." Moreau (*The Bird Faunas of Africa and its Islands*, New York, Academic Press, 1966: 268) summarized Morel and Bourlière's study, which he called "an important pioneer contribution to the problem," noting that "it does . . . definitely emerge that the greatest density of African birds (up to 8 per ha) is attained about the end of the rains, September-October, which is the season when the Palearctic birds, newly arrived, also are most numerous (around 2 or 3 per ha)." Since the Morel and Bourlière paper, many other studies have been published on the topic of resident versus migrant species in the Old World tropics, especially Africa. Moreau himself, after writing a chapter on "The Immigrant Palearctic Avifauna" and

one on "Migrants within the Ethiopian Region" in his book on African Faunas (1966), devoted a whole other book to "The Palearctic-African Bird Migration Systems" (Academic Press, 1972). The main problem to be solved was "how Africa can accommodate thousands of millions of Palearctic birds for the winter" (p. ix).

The editors and authors of chapters in "Migrant birds in the Neotropics" are all clearly indebted to the approach heralded earlier by Morel and Bourlière and Moreau. In their introduction, Keast and Morton (p. 17) state some of the main questions to which they sought answers: "Where do the different northern migrants winter, what are their spatial utilization patterns in the wintering grounds, how is competition between congeners minimized? Are the adaptations of migrants different in any way from tropical residents; do they exclude each other from certain habitats? What collective devices might be operative to minimize interspecific competition for limited resources?" These questions are precisely the ones that preoccupied Morel, Bourlière, and Moreau in the sixties, but the reader will note that they are couched now in the terms of what may be called MacArthurian competition and niche theory, the stress being placed on how competition is *minimized* (no longer on how competition *may be avoided*), between migrants and residents in tropical latitudes. This difference in emphasis aside, and whatever the theoretical mold in which the chapters were framed by their authors, the Keast-Morton book is more than simply a worthy intellectual successor to the legacy left by Moreau and other authors: I believe that it is a landmark in both migration and ecological studies.

Having said this, I will nevertheless and immediately add the negative comment that it is a frustrating landmark for the general reader as well as for the student of migration or of ecology. Written by a total of 40 authors, and containing 40 chapters, the Keast-Morton book is more heterogeneous, I think, than the average "multi-author" book. Normal as some of this heterogeneity may be, it could have been curbed by more editing. The book is also unnecessarily long, and could have benefited from much cutting. Some of my specific criticisms include the following points. Many of the chapters' introductions are the same or similar, and repeat almost as a litany the theme of the impact of the influx of temperate migrants on the tropical residents. Some of the chapters are absolutely useless in the context of the book's theme or themes. They are either too short to be of much value or so poor as to be of no interest (the worst is Janzen's). The first chapter in the book should probably be Karr's (number 37), and Keast's "Synthesis" (number 40, last chapter) should probably also be in an introductory section. As it is,

the book has no good introductory section. For a volume as long as this one (576 pages), the lack of indexes (to subject matters, taxa, localities, or authors) is very annoying. So is also the lack of a few good maps showing the areas considered (perhaps as end-papers?). Many terms are used in many chapters, with almost as many meanings (e.g. "niche," "habitat," "microhabitat," as well as the all-important words "resident" and "migrant"). Surely the editors could have attempted either to regulate this diversity or to provide the reader with a glossary of the most important terms. And why do only some chapters contain Spanish abstracts?

The book also lacks information obtained from banding returns (other than local, short-term color banding). It is as if no banding had ever been undertaken in North America of species that migrate to and winter in the Neotropics. Furthermore, nothing or next to nothing is said of the banding efforts made in some Latin American countries (Argentina, for instance, where some returns are of interest in this book's context). To a European-trained ornithologist this absence of banding data is surprising.

Although some authors have done their homework well (e.g. Myers in his chapter on migrant shorebirds), others have not and write as if nothing or virtually nothing had been published on migration in South America prior to their own efforts. With the exception of Schwartz's work on waterthrushes in Venezuela, which is often cited, the papers of pioneers or of Latin American ornithologists who wrote long ago or even more recently on migration in the Neotropics are not mentioned (e.g. Beebe, Bullock, Davis, Dennler de la Tour, Johansen, Koepcke, Naumburg, Olivares, Olog, Sick, Wallace, Zimmer). Even though their work is outdated, there is no reason to ignore it. And speaking of reference citation, I noted that the same papers are often cited in chapter after chapter: why not have compiled a single bibliography at the end of the volume? Last, and least, of my criticisms of form, typos are irritatingly numerous.

Having gotten minor criticisms out of the way, I will proceed with the analysis of the book's content. The first part, entitled Conservation (pages 21-34), contains two chapters, but only the first deals with conservation of migrants in the Neotropics. In it Terborgh surveys human destruction of natural landscapes in Latin America and concludes: "My own assessment of the situation is that continued deforestation in the near neotropics will result in major reductions in the numbers of many forest-dwelling migrants. We are, in effect, about to play observers in a massive experiment in which there will be dramatic alterations in the relative population sizes of numerous common species. No one can say yet which species will be most affected, or what all the consequences will be" (p. 29). This pessimistic view appears justified. Conservation of migrants in the Neotropics certainly means conservation of habitats,

and this in turn means conservation of resident species as well, in other words of the entire avian communities (residents and migrants together). It would have been instructive, however, if Terborgh had looked at some of the data on the decline of several western European species (for instance *Sylvia* warblers) that winter in tropical Africa. Whether population size of northern hemisphere migrants is regulated on the summer versus the winter grounds is difficult to study. I do not think that this problem has been sufficiently addressed in this book, at least from the point of view of conservation. Morse's chapter (number 35), although not devoted to conservation, does take some of the European-African data into account, and compares them with the North American-Neotropical ones. He concludes that limitation takes place on both wintering and summer grounds, pointing out that habitats "on both breeding and wintering grounds have been constantly changing for a considerable period of time" (p. 507), by which he means since pre-Spanish conquest times.

The second part of the book (pages 37-130), Migration of taxonomic groups, deals with shorebirds in the pampas, hawks and vultures in Panama, tyrant flycatchers, vireos, and warblers. All these chapters are instructive and a couple are quite stimulating (Myers', Smith's). But it is a pity that this section does not contain another chapter telling the reader that other North American migrants in the Neotropics include cuckoos, nighthawks, swallows, thrushes, and orioles, not to mention terns and swifts. Nowhere in the book is there a list of all species of migrants. The reader has to wait to page 541 (in Karr's chapter) to obtain an overview of migrant taxa in the Neotropics and to be given a list (down only to the family level), or to pages 276-278 to have a list of species for Amazonia (in Pearson's chapter), or to page 562 for another list of families (in Keast's chapter). It is clear that migration between North America and tropical America is a complex business when looked at from a taxonomic perspective. The chapters in this section of the book offer a glimpse of some of the existing patterns, but readers, especially students, will have to turn elsewhere or do their own research to get a more complete picture.

Regional studies (pages 133-453 and 23 chapters long) is by far the longest part of the book. The West Indies and Bahamas, various parts of Mexico, Costa Rica, Panama, Colombia, and Amazonia are covered. Several chapters are restricted to a taxon (e.g. a single species of warbler, or the family of hummingbirds), whereas others deal with the entire bird community of residents and migrants. In general, interesting as some of the papers in this section are, they suffer from a common drawback: censusing bird populations in the tropics is exceedingly difficult, and the sampling problems that arise in the course of field work are not satisfactorily resolved. This fact, combined with the relatively short-term nature of most

field studies, may suggest to a critical reader that in spite of their being couched in quantitative terms, the results of many studies are still qualitative. Exceptions are found in several chapters, for example, in Willis' chapter on migrants and residents on Barro Colorado Island. The area involved is discrete and relatively small, and the island has been studied over many years by many people, including Willis himself. Thus Willis' conclusion that "competition between migrants and residents is usually less important than over swarms of army ants or at fruiting trees" (p. 216) is significant, in spite of his own caveat that Barro Colorado Island "is, of course, not a representative tropical forest in several aspects" (p. 217). He is right about that, but then most of the other areas and regions sampled in the chapters of this section are also unrepresentative of some habitat. What differs here is the better knowledge we have of Barro Colorado Island and its avifauna.

Hutto, in a chapter on migrant warblers in western Mexico, reaches two conclusions of interest that bear on the question of migrant-resident competitive relationships and that show the multifaceted nature of the probable answers. "Since migrants and residents belonging to the warbler guild are approximately the same size, the proportions of migrants by individuals may be a reasonable estimate of the proportion of food which is lost to the winter residents. This leads to the striking conclusion that, on average, lowland migrants take 95 percent of the food harvested by small foliage-gleaners, and in four sites 100 percent of the food potentially available to this guild is utilized by the migratory segment" (page 195). The second conclusion is as follows: ". . . the presence of habitat shifts by resident birds after the migrants leave would seem to argue more strongly that immediate competition is the major force restricting the residents in winter. Lack and Lack (1972) describe such shifts by Mangrove Warblers on Jamaica in the absence of migrants. I recognize no such shifts with the west Mexican residents and conclude that the impact of migrants on residents is probably minimal but difficult to assess . . ." (page 199). Two papers (Johnson's, pages 239-247, and Hilty's, pages 265-271) present data that suggest that in some areas of Colombia, migrants are socially subordinate to residents.

Rappole and Warner's chapter (pages 353-393) is the most intriguing in the section on Regional Studies. Although the data are not as voluminous as one would wish, they are clearly presented. The data thus do not seem to be as "quantitative" as those in other chapters, but at least no padding appears here. The results are tentative, but among the many interesting items suggested are the territorial behavior versus the behavior of "floaters" among migrant individuals, the different habitat and food niche utilization by migrants when compared to permanent residents, the compromise in adaptations of migrants to each of several different areas in their total

range, and the relative importance of habitat heterogeneity in spatial distribution of migrants in some kinds of tropical forests. Morton's chapter (pages 437-453) addresses itself to the topic of whether seasonal variation in migrants' behavior is correlated to seasonal variation in their environments. Interpretation of his observations is at times obscure, as for instance in the following sentence, relative to the aggressive behavior of Bay-breasted Warblers: "I suspect this aggressive behavior is related to the unusual nectar feeding: this bird's [Bay-breasted Warbler] assessment of resource defensibility and availability was upset by the nectar's energy such that its social tolerance was lowered" (page 449). As Larry Slobodkin once wrote in a review of a book by Ramón Margalef: it all sounds fascinating, but what does it mean? I would add, and how does Morton know?

The next, or fourth section, Implications of overwintering in the tropics (pages 457-552), contains eight chapters that are more or less unconnected with each other. Keast's and Karr's papers could have been included in the introductory section, as already suggested, since they treat rather general aspects of neotropical migrants or of temperate-tropical migration patterns. Keast's chapter is stimulating, but his specific conclusions are based on such small sample sizes that they are hardly credible (even if plausible). The general view that migrants are somehow more plastic than residents ("capacity to live at different latitudes, change habitats seasonally, compete with different backgrounds of 'competitor' species, physiological adaptations for migration, and larger clutch size," page 474) seems like a truism, however. Morse and Fretwell each write about breeding versus wintering grounds limitation, and both emphasize the great interspecific diversity in how such limitations occur or are thought to occur. Karr's paper compares migrants in two ways, at the continental level and at the level of "small regions" (in both Old and New Worlds). Whereas the first comparison is instructive, the second appears spurious because the "small areas" seem hardly comparable (or if they are, Karr did not convince me of it).

The last section of the book (Integration, pages 555-576) contains a short chapter by Morton and a longer one by Keast, in which the relative "tropicalness" of migrants is discussed, the relative degrees of ecological plasticity shown by residents and migrants are compared, the relative competitive abilities of residents and migrants on the latter's wintering grounds are evaluated, and the question of the tropical versus temperate origin of migrants is assessed.

Most of the questions asked by Keast and Morton in their introduction to this volume (see earlier the quote from page 17) are answered collectively by the different authors, at least with reference to a specific taxon, usually one or a few species, or a "guild" of small land birds (e.g. parulid warblers). After having

studied this book, the reader will know a lot about where some of the different northern migrants winter, what their spatial utilization patterns are on the wintering grounds, and how different their adaptations are from the year-round tropical residents. Answers to questions about competition are far less clear, and on this topic the reader, I am afraid, will not be much better informed after reading this book. Thus it is not evident how competition is minimized (except if one is satisfied to know that several kinds of ecological segregation exist between residents and migrants), mostly because the resources that might be limiting in real or potential competitive situations are not studied, but only inferred. I believe that the relative short-term nature of the field studies undertaken as a basis for several of the chapters in this book prevented their authors from obtaining sufficient information about "resources." Furthermore, in most cases, these resources were not truly studied as such. If this book represents the state of our knowledge of the ecology of migrant-resident interactions in the Neotropics, it is clearly only the first stage. We know rather well where migrants go, in what relative numbers, and in what sorts of broad habitat categories they winter. We do not know in precise terms any of these things yet, however, nor do we know clearly what resources are or whether they are limiting and how, and hence we cannot answer basic questions about competition. In the next phase of studies, detailed, long-term work on selected migrant species will have to be undertaken in the Neotropics. In their future research program, students of migrant-resident ecology and evolution in the Neotropics will have to study this unique book because it makes available so much information and because it shows (although somewhat indirectly) what remains to be done. Keast and Morton are to be congratulated for a substantial contribution to migration studies and to ecological thought.—FRANÇOIS VUILLEUMIER.

Ecology and evolution of lek mating behavior in the Long-tailed Hermit Hummingbird.—F. Gary Stiles and Larry L. Wolf. 1979. Washington, D.C., The American Ornithologists' Union. Ornithological Monographs No. 27, vii + 78 pp., \$8.50.—This monograph represents a significant part of the authors' productive program of collaboration focussing broadly on the behavioral and feeding ecology of neotropical hummingbirds. Over some 10 years and by 1979, this was one (and the longest) of an impressive series of papers that they published individually, together, or with colleagues on the basis of fieldwork in Central America and Caribbean islands. All this amounts to a quantum leap in our knowledge and understanding of hummer biology in the tropics.

In this monograph, the target is a Costa Rican,

Caribbean lowland population of the Long-tailed Hermit, *Phaethornis superciliosus*, and, more particularly, the phenomenon of lekking and its behavioral and ecological correlates in this and other hummer species. It is not only the most intensive study to date (spreading over 6 years, 1969–1974; over 500 individuals color-marked), but it is more strongly comparative, concept-oriented, and problem-probing than any prior work on lekking hummers. As such, it takes an important place in the growing literature on lekking, a puzzling mating system among animals because, while it occurs relatively uncommonly, it does so in a wide range of taxa, both invertebrate and vertebrate, and in a wide range of environments, both aquatic and terrestrial, and in the latter from tundra to tropics.

The monograph offers some 50 pages of descriptive and quantitative detail, critically selected and reduced, most of it well-digested. The main topics are spacing (lek occurrence, size and site characteristics, intra-lek territoriality), male behavior (vocalizations, displays, mating, within-lek male : male interactions), temporal changes in lek activity (daily, seasonal), and demographic features (seasonal changes in lek composition, turnover in lek membership, between- and within-lek movements). Another main section deals with food plants (flower characteristics, blooming schedule, nectar production) and foraging pattern (flower exploitation, nectar vs. insects, interspecies relations at food plants). This section is a particularly significant part of the text because, as the authors rightly point out, "pattern of resource exploitation [here meaning real data, not just ad hoc explanations] . . . rarely has been integrated into any analysis of lek behavior." A terminal discussion synthesizes the authors' results and views on lek evolution. Comparisons are made with other lekking hummers to the extent the literature permits; those with *Phaethornis guy*, studied by Barbara Snow in Trinidad (1974 *Ibis*, 116: 278), are especially provocative because "it is the only other study of lek behavior in hummingbirds that deals with such parameters as survival, recruitment, molt and foraging of lek residents . . ." The last two pages of the discussion examine the facts from the standpoint of lek social systems more broadly, though too briefly.

Whatever else this paper does, it defines a minimum data package appropriate for other studies of lekking hummers. This includes acknowledged gaps an investigator can add to the table of contents for a more complete agenda. What were the serious problems? First, this is a forest-dwelling hummer, the males defending perches in the understory, "in the densest part of a very dense habitat, . . . rarely in visual contact"; thus, interactions at territory stations are at times difficult to observe, and those between neighbors impossible to follow completely with routine observational methods. Mist-net trapping

results partly offset the latter problem. Second, few copulations were observed, and male success was difficult to measure. Third, females come and go, but only rarely, and the what, when, where, or why of their activities is unavoidably bypassed here as an impossible monitoring problem. This becomes a serious disadvantage if you espouse Bradbury's hypothesis of the role of female home ranges in the evolution of lekking behavior (1981, pp. 138-169 in R. D. Alexander and D. W. Tinkle, "Natural Selection and Social Behavior," New York, Chiron Press). More on this below. Finally, unlike classical avian lekkers, sex dimorphism in the Long-tailed Hermit is nil in plumage and very weak in size (females 4.0-4.7% smaller than males in weight, bill length and flat-wing chord).

Now, turning to the many fascinating, positive aspects of this work: "In all essentials the functional characteristics of *P. superciliosus* territories agree with those of 'classical' lek territories . . ." This conformity is so even in the absence of dimorphism already mentioned. But there are other departures: Copulations can occur away from a lek even though mating sequences are always initiated there; i.e. males will desert their territories if necessary (exacerbating the problem of measuring male success). Lek sites appear to be permanent (about 1 km apart, four studied intensively), but they vary from dispersed and/or with disjunct subclusters to relatively compact clusters of territories (minimally about 10 m between stationed males, judging by maps; I found no definite figure). This variation occurs partly because of natural or man-induced changes in vegetational configuration. The dominance hierarchy on a *P. superciliosus* lek appears less rigidly structured spatially than on classical grouse leks, which means that peripheral male hummers have a higher relative fitness. The habitat being closed, vocal stimuli take precedence over visual, and an intriguing feature of *P. superciliosus* leks is that different sectors of a lek can have different songs, with young males already having acquired a song pattern tending to settle among older males having the same song. Little more is said about this, and a "Wolf and Stiles MS" is promised. Unlike leks at higher latitudes, young males of the year attach themselves to lek peripheries late in the long breeding season (9 months, nesting recorded in all months) and are said to have a "slight" chance of mating, but whether they are definitely fecund is not made clear. Also, the age at which males attain fully adult plumage is left unclear, there being a difference of opinion about this between the authors (2 years) and Snow (4 years). The former opinion has the strength of being based on marked birds. Such a difference seems unlikely in two tropical, ecologically similar congeners.

This summary of departures from classical lekking and related points is here necessarily incomplete, but serves to fortify my next point, which is that the

authors could have made their contribution more useful if they had included a comprehensive table itemizing features of lek organization and behavior and comparing the facts for *P. superciliosus* with 'classical' lekkers. Any difficulties would have made the exercise all the more interesting and the heuristic power of their contribution all the more potent. More generally, the discussion either slights or omits a number of points that deserved mention there. As it is now, anyone seriously mining this paper has to yo-yo frustratingly between the 13-page discussion and the 58 pages of basic information. In other words, I think they could have done more with the results; here's where the reviewers and editor could have been usefully insistent, even given that what they read was already a welcome contribution.

Finally, of special interest in this study are the authors' views regarding evolution of leks. For *P. superciliosus*, they dismiss the notion that "leks evolved as an antipredator device," chiefly because of the closed character of the habitat. Instead, they emphasize food base and the competitive structuring of a hummer community: "Whether a male can hold a breeding-feeding [or a lek] territory depends on the abundance and dispersion of suitable flowers, the number of competing hummingbirds [his own and other species], the male's dominance status among his conspecifics, and the position of his species in the interspecific dominance hierarchy . . . When it is consistently impossible for males of a given species to hold . . . rich breeding-feeding territories, selection may favor the evolution of lek systems . . . Individual *P. superciliosus* [visit] . . . small, nondefensible clumps of flowers, apparently along a regular foraging route, . . . mostly within 200-500 m of the lek, depending on distribution of suitable flowers." The four factors influencing form of territoriality here emphasized make it clear that a geometric model of home-range relations between the two sexes, such as Bradbury's, probably oversimplifies the problem of lek evolution. Thus, according to Stiles and Wolf, lek-forming hummers are either subordinate species excluded from most rich nectar sources, or they exploit sources patchy in space and time, or both. This makes sense, at least for hummers, even though my own belief is that lekking can evolve by several different paths.

It seems clear already that the family Trochilidae may turn out to have more lekking species than any other New World family of birds, and considering the documentable nature of their food base along with the richness of the hummingbird fauna, we may get farther faster with that group than with others in the continuing search for evolutionary insights about lekking. Regrettably, in the dwindling tropics and with shrinking grant supports, the times do not bode well for that prospect!

There is more in this monograph than this review conveys, and it should be clear that any student of

lekking or, more broadly, the evolution of non-monogamous systems, will want to read it. For me, though, the monograph has a special significance: A review on hummer territoriality I wrote 40 years ago triggered a persistent curiosity about male "singing assemblies" in tropical hummers, and I thank the authors (as well as Barbara Snow) for having at last rewarded my patience!—FRANK A. PITELKA.

Distributional checklist of Chinese birds. Second Edition.—Cheng Tso-Hsin 1976. Peking, China, Science Press, Academia Sinica. Text in Chinese. Pp. vii + 1,218, 829 maps. ¥10.60 and ¥7.10 Renminbi Yuan for clothbound glazed paper and paperbound newsprint respectively (about \$6.09 and \$4.08 U.S.). [This sturdily bound checklist is presently in short supply (Cheng pers. comm.) but a few copies may be available through Guoji Shudian, China Publications Center, P.O. Box 399, Beijing, China].—According to the summary of contents on the copyright page, the first edition of this checklist was published in two volumes, the first volume (non-Passeriformes) in May 1955 and the second volume (Passeriformes) in August 1958. The present edition of the checklist combines both volumes into one and brings the contents up to date with new information collected in the past 20 years.

Cheng provides an overview of the checklist in the Foreword (pp. v–xiii). The known Chinese avifauna consists of 2,077 forms: 1,166 species and 911 subspecies, 392 genera, 81 families, and 21 orders. Unlike previous works (Gee et al. 1926. A tentative list of Chinese birds; Gee 1931. A revision of the tentative list of Chinese birds), only forms with well-substantiated records of occurrence within China are included in this volume. Furthermore, the large number of genera recognized by Gee has been reduced by 23% and the new arrangement is more consistent with current systematic treatments. In Table 1 (pp. viii–x) the numbers of taxa resulting from the classification scheme used by Gee is compared with that used by Cheng. Families that underwent the most drastic revision include Anatidae and Scolopacidae in the non-Passeriformes, and Pycnonotidae, Muscicapidae (Turdinae, Timaliinae, Sylviinae, Muscicapinae), Paridae, and Fringillidae in the Passeriformes. The total number of divisions at each level of the taxonomic hierarchy for non-Passeriformes and Passeriformes in Gee's classification is presented in Table 2 (p. xi), and the same information from Cheng's rearrangement is presented in Table 3 (p. xi). The Foreword also lists the major references used to establish species' ranges according to region; 26 regions are listed. An abbreviated version of the Foreword in English is included but is placed in the back of the book on pp. 1,121–1,122, between the Bibliography and the Index.

A glossary of transliterated place names and their

equivalent in Chinese characters (pp. xiv–xvi) is provided for a subset of the collection localities cited in the checklist. This glossary is awkwardly arranged since the transliterated place names are categorized and alphabetized by region (which are only given in Chinese); here, China is divided into eight regions. If the glossary is intended to help the Chinese ornithologist identify the Chinese equivalent of a transliterated name encountered in a foreign publication, then its purpose would be better served if all the place names were alphabetized as a group rather than by region.

The organization of the species accounts (pp. 1–967) on the other hand, readily expedites information retrieval. Scientific names and Chinese names appear in bold-face type, names of orders are set in largest bold-face type, and so on down. Orders and families are consecutively numbered, the former in Roman numerals and the latter in Arabic numerals. Species are numbered consecutively within each family (or subfamily) and are grouped by genera (which, however, are unnumbered); subspecies are similarly numbered within species. Besides the Chinese name, an English name (Wynne 1953–1955. Key-list of the Palearctic and Oriental passerine birds; Vaurie 1965. The birds of the Palearctic fauna, non-Passeriformes) is provided for each species in the species account; Russian names (Dementiev 1951–1954. Birds of the Soviet Union) are provided for most of the Palearctic forms as well. Numbers prefixed by "G" and/or "L" appearing after the species name are species numbers assigned by Gee (1931) and La Touche (1925–1934. A handbook of the birds of eastern China), respectively, and are included to permit easy cross-referencing between the present checklist and these earlier works. Synonyms and references for the genus, species, and subspecies are listed in small but easily legible type. The range of a particular species or subspecies is defined by the enumeration of localities where specimens have been collected. Wherever available, the status (breeding, winter resident, or migrant) of the bird is included parenthetically after the respective locality. This information is duplicated in the 828 distributional maps for most of the species and subspecies. Explanations of the symbols used in the distributional maps in the Checklist are explained in Chinese (p. xvii) and in English (p. 1,122). Collecting localities are marked by symbols, breeding ranges are delimited by bold lines (a broken line is used when a range is incompletely known), wintering ranges by slanted parallel lines, and the direction of migration is indicated by arrows.

The Distribution Table (pp. 969–1,070) that follows the species accounts is certainly a useful feature, since it reveals at a glance the distribution and status of any species or subspecies included in the checklist. Here, China is divided into 16 zoogeographic subregions (Table on p. 969) and the boundaries of

these regions are clearly shown on the accompanying map (p. 970). Subregions 1 through 9 are subdivisions of the Palearctic realm within China, while subregions 10 through 16 similarly subdivide the Oriental realm within China. The names of these subregions, which form column headings in the table, can be translated (or transliterated into Pinyin, the official transliteration system used by the People's Republic of China) as follows: 1. The greater Xing'an Mountains, 2. Mt. Zhangbai, 3. Huanghuai Plain, 4. Huangtu (Loess) Plateau, 5. Eastern Steppe, 6. Western Desert, 7. Mt. Tianshan, 8. Qiang-Tang Plateau, 9. Qinghai Province-Southern Tibet, 10. Southwest Mountain, 11. Eastern Hills-Plains, 12. Western Mountains-Plateau, 13. Fujian-Guanzhou Coastal, 14. Southern Yunnan Hills, 15. Hainan, and 16. Taiwan. If present, the status of a bird in a particular region is indicated by one of the following symbols: + = breeding bird (includes year-round resident and summer resident), - = migrant and winter resident, and o = rare or accidental. If a bird is absent from a region, the column is left empty.

The extensive list of Chinese and non-Chinese references in the Bibliography (pp. 1,071-1,120) is indicative of the great efforts that have gone into this monumental work—it must have been extremely difficult to obtain the pertinent Western references until fairly recent times. Although the index of English names (pp. 1,126-1,128) contains only the page reference to the species account, the Chinese (pp. 1,123-1,125) and Latin (pp. 1,129-1,218) indices contain both the page reference to the species account and the page reference of the species in the distribution table.

Of all the recent Chinese ornithological publications, the "Distributional Checklist of Chinese Birds" least requires a knowledge of Chinese in its use. The information contained in the distribution maps is self-explanatory and should satisfy most non-Chinese users. Of course, workers requiring exact localities of occurrence will find a translation of place names useful (The Curator of Birds at the Smithsonian Institution will provide, at duplication cost, a translated draft of the distributional information in the species accounts). There is no question, however, that the inclusion of a gazetteer (in Chinese and with transliterations in Pinyin) of the localities cited in the checklist would help to pinpoint unfamiliar localities as well as to standardize transliterated place names. At present, there is great confusion in the literature where several transliterated names (each based on a different phonetic system) are proposed in as many papers for the same locality (i.e. Chinghai, Qinghai, and Tsinghai are synonyms). The already large size of the second edition (1,218 pages), however, may preclude any further additions to the text; perhaps a gazetteer can be produced as a separate publication.

The expressed intent of this edition of the checklist

is to revise the systematic taxonomy and nomenclature of Chinese birds and bring up to date the status of subspecific forms in the Chinese avifauna (Dr. Cheng is responsible for the description of at least 10 of the new subspecies). There are minor organizational inconveniences (i.e. China is divided into 26, 8, and 16 regions in different parts of the checklist), but on the whole it is clear that Dr. Cheng has successfully achieved his objectives and has provided an important reference that will be useful to both Chinese ornithologists and ornithologists outside of China.—MARINA WONG.

Handbook of the birds of Europe, the Middle East and North Africa—The birds of the Western Palearctic.—Stanley Cramp (Chief Editor). 1977, 1980. Oxford, London, New York. Oxford University Press. Volume I—Ostrich to Ducks—722 pp. \$65.00; Volume II—Hawks to Bustards—695 pp. \$85.00.—The first two volumes of this series, which will comprise seven volumes upon completion, have appropriately been dedicated to the memory of H. F. Witherby, the distinguished editor of the "Handbook of British Birds" (1938-1941). The present work is very different and is much more than a revised edition of Witherby's work, which became established as a landmark in Palearctic ornithology.

A comprehensive introduction is provided in Volume I in which the editor has clearly enunciated the principles adopted throughout the work. The area covered by the Palearctic as defined here is described in one paragraph and some of the limitations to the boundaries are pointed out. It may not satisfy all biogeographers, but the reasons given by the editor support his choice and point out that all has not been said about defining the boundaries of that region. In spite of the "considerable differences of opinion and practice regarding the sequence of families, genera, and species," Voous' list has been followed and deviations from it will occur only in cases where recent research warrants such departures. The reader is cautioned that "these cases (if any) will be fully discussed and documented."

Species accounts are divided into sections under the responsibility of an editor; general guidelines concerning each one are discussed here to various extents.

Field characters (I. J. Ferguson-Lees) provide general information on means of identification in the field such as differences between sexes, ages, breeding and nonbreeding plumages, comparisons with other species, general dimensions, behavior, voice, and habits where appropriate. References are sometimes given under this heading.

Habitat (E. M. Nicholson) comprises a detailed description of the methodology to be used throughout the work and an extensive glossary of the terms used to describe habitats. It appears sufficiently thorough

but not technical, and appropriately points out the differences between North American and British usage where applicable.

Distribution and population (S. Cramp) gives a brief summary of the known breeding range or of the species' status throughout the area. For species known to breed in the region, maps of various projections and sizes show the breeding range in red and winter distribution in gray. Breeding population estimates are indicated where available and are necessarily sketchy. Less frequently, winter counts are included, and information on population trends, survival, "and the age of the oldest known wild-ringed bird" is often provided.

Movements (R. Hudson) encompass movements of all kinds within the range of a species throughout the area. This section deals with recoveries of banded birds as well as providing brief summaries of ranges outside the Palearctic region.

Food (P. J. S. Olney) summarizes the known information and can be extensive. In the introduction, a general list of references is given upon which the nomenclature of the food items is based.

Social pattern and behavior (K. E. L. Simmons) can be an extensive section and is in small print. It is divided into two main parts. In the first, the types of association and dispersion of the species are outlined in some detail, including bonds, breeding dispersion, and roosting. The second part describes the major aspects of interactions between conspecific individuals. Displays and various behavior features are often described in detail, and information about relations within family groups is sometimes given.

Voice (E. M. Nicholson) describes the vocal repertoire of a large proportion of the species found in these volumes. This section is extensive and covers theoretical as well as practical aspects. Particularly useful are the 11 requirements listed for an adequate treatment of bird voices. If they are followed, these can contribute to the integration of sound analyses with other areas of behavior studies. Sonograms and melograms (both are thoroughly defined and compared) appear where available along with phonetic renderings of the voice. An extensive glossary of the terminology is given in nontechnical language, which should help the nonspecialist to follow the text.

Breeding (M. A. Ogilvie) is concise, and the Annual Cycle Diagrams are particularly clear and contain all the information that one could require at a glance. Such items as season, site, nest, eggs, clutch, incubation, young, fledging period, breeding success, and some references appear in this section.

Plumages and related topics (J. Wattel) occupies several pages and includes two full pages describing the topography of a bird. An adequate glossary follows. As pointed out, this section is "intended for use with the bird in the hand"; notwithstanding this remark, it should have broader applications. Plumages

are described and a simple terminology such as juvenile, immature, adult, breeding, nonbreeding, etc. has been used in preference to the more complicated one proposed in North America. Bare parts are described based on specimen labels and other descriptions and on color photographs. Molts receive an adequate treatment.

Measurements given in millimetres for wing, tail, bill, tarsus, and middle toe are defined in the introduction. Statistical parameters accompany each and increase their usefulness. They are new and come from the most important European museums. Weights are given in grams in the same manner as linear measurements. Under "structure," a mass of useful information is listed, such as shape of wing, number of primaries and secondaries, wing formula, or other specific features. In addition, the standard practice of how to number primaries, secondaries, and rectrices is clearly outlined. Geographical variation covers briefly the general geographic variation in a species and points out the main differences between recognized subspecies. An extensive list of acknowledgements indicates the broadness of the base from which the editors were able to draw their information and the extensive support they have received.

In the second volume, two pages of introduction inform the reader about the changes that the editors have adopted and the departures from Volume I. These changes are not extensive and contribute to improve the clarity of the text and to eliminate some repetitions that could be found in Volume I, particularly under Field characters.

Orders are usually given a brief summary but monophyletic ones are covered under the family treatment. Subfamilies and families are given summaries that include the most recent references and vary in length. These are written in a very concise and clear style, which avoids confusion and provides a mass of information often otherwise time consuming to assemble.

For each species the scientific name and the English name stand out in the text. Also provided are names for most European languages (Dutch, French, German, Russian, Spanish, Swedish, and North American for Holarctic species) and the original name of the species along with the author and the date. A statement about the species' plasticity gives in a few lines a good deal of information. Also in this section the plate number and the page where the plate is to be found are shown in an unmistakable place.

Field characters are extensive and cover all the plumages. These are as (or more) accurate as any similar descriptions that I have seen, except in *Handbuch der Vögel Mitteleuropas* (U. N. Glutz von Blotzheim, K. M. Bauer, E. Bezzel, 1966-1980). This section tends to be long and some parts are repetitious. It contains, in addition to plumage descriptions, de-

tails about life habits, behavior, and habitat preferences. The species' habitat is usually covered in a paragraph and is thorough. It deals with all seasons, not only the breeding period, and contains very useful information.

The maps and the black-and-white illustrations are clear and well-reproduced. I found most of them useful, although the world distribution of certain species would have gained much if a larger scale had been used and in cropping it close around the range of the species. The text outlining distribution, although sketchy, is accurate, at least in the 35 species that I have checked.

The editors have packed a wealth of information about migration and the status of species in the region into the section on movements, distinguishing between the various populations where information is available. Maps are sometimes provided. The section on food is equally useful and condenses all the information available throughout the range—old and new—in a readable manner.

Behavior is treated extensively in small print, which makes it harder to read than the rest of the text. It is often abundantly illustrated with black-and-white line drawings. This section can be very extensive. I found these accounts to be complete and well done, although perhaps too lengthy in some instances. The authors have had to summarize extensive sources of information in those cases, however, and have succeeded remarkably well. The texts used to describe the voice are concise and to the point; they are often complemented with sound spectrograms or melograms, the quality of which is generally very good. The information on breeding is detailed and presented in a very concise and clear fashion. One wishes that more references had been given here to support some statements!

The sections on plumages and bare parts are very useful, not only when examining a bird in the hand. I found them complementary to the information given for field characters. My main criticism here is that it would have been much more useful if the authors had incorporated more information about the identification in the hand of some difficult species, in certain plumages. The section on molts is sufficiently complete to provide the reader with a full sequence of plumages in most species.

The measurements, including weights, are new and indicate a better sample size than most. This should prove to be a very useful part of the accounts. The data contained under structure have been carefully compiled, and also should be useful. I wish that the authors had incorporated here some of the differences used in distinguishing similar or difficult-to-identify species. The characteristics of accepted subspecies are briefly described in the section under geographical variation and should serve at best to recognize that geographic variation exists in many

species. The data given here are too scanty to be of real use. Fortunately, references are often provided.

These two volumes are abundantly illustrated in color by various artists, but all the black-and-white line drawings have been prepared by Robert Gillmor. The quality of the illustrations varies from good to excellent. Unfortunately, the artists have received little credit for their work, and one has to search carefully the introduction to find who they are. In my estimation, they should have been listed on the title page along with the other main contributors. They are Paul Barruel, C. J. F. Coombs, N. W. Cusa, Robert Gillmor, Peter Hayman, and Peter Scott.

In Volume I, 14 pages of references appear at the end of the book and over 16 in Volume II; needless to say, the literature review is very extensive. Illustrations of eggs of most species are given in both volumes, and photographs of nest down appear in Volume I. Indexes to scientific, English, French, and German names are found in the last pages of both volumes. The end maps outlining the limits of the region, which may or may not be acceptable to all, are clear and useful.

These two volumes are remarkably free of errors of all kinds and the editors deserve much credit. This work will stand for many years to come and will provide an excellent reference to the birds of the Palearctic equally useful to professionals and amateurs. In spite of their apparently high price, I highly recommend these quality volumes to all individuals interested in northern (Holarctic) birds and congratulate the editors for their remarkable achievement, and particularly for maintaining their production schedule. The other volumes are anxiously awaited.—HENRI OUELLET.

The Cuckoo.—Ian Wyllie. 1981. London, B. T. Botsford Ltd. 176 pp., 15 color photographs, 35 black-and-white photographs, 31 tables, 10 figures. £8.95.—The brood-parasitic habit of the European Cuckoo (*Cuculus canorus*) has captured the attention of people at least since the time of Aristotle, and the bird has been the subject of modern study, but in many respects it still remains a creature of mystery. This latest report on the Cuckoo in England is in the tradition of persistent dedicated study of the whole bird as distinct from the current scientific trend to focus on a single accessible problem.

Wyllie's interest in cuckoos was awakened as he assisted in the making of a British Broadcasting Company film, "The Private Life of the Cuckoo," which brought an award from the British Association for Science in 1976. He saw an opportunity to get at the Cuckoo through one of its common hosts, the Reed Warbler (*Acrocephalus scirpaceus*), and to this end over a period of 6 years he located 1,764 warbler nests, of which 170 were used by Cuckoos. As we

look at the excellent photographs of Cuckoos laying and removing eggs, we can imagine the long patient waits at Reed Warbler nests on the slim chance a Cuckoo will enter.

Original data are presented in chapters on migration, food, songs and calls, social system, egg-laying, eggs, and young. Although the emphasis is on Wyllie's own findings, he brings in comparative material on this and other parasitic species of birds throughout the text and in separate chapters on the cuckoo family, the European Cuckoo, and hosts.

This is a difficult bird to study. It moves about secretly, and except for its voice it is inconspicuous. In the breeding season it ranges over a considerable area, feeding and laying its eggs in places at least 4 km apart. Because its location and movements are unpredictable, it is not easy to catch in mist nets. Because of its shy behavior as well as its short and feathered tarsi, bands on the legs usually cannot be seen in the field. Doubtless, some of the uncertainties about this bird have persisted so long because no one else has worked with marked birds. Others have relied on the distinctive features of the eggs to identify individual females.

Wyllie banded or tagged 22 adult and 60 nestling Cuckoos, using colored patagial flags on some of them. In addition, he attached radio transmitters to three adult males and one adult female. Even with these markings, he was frustrated in solving some of the Cuckoo mysteries he set out to unravel. His candid account of his failures is in reassuring contrast with many scientific reports in which everything comes out so neatly as to arouse our suspicions. For example, he was not successful in discovering some crucial details about the mating system of these birds, and he was not able to find enough marked birds in subsequent years to show if egg patterns and host preferences are rigidly inherited or to calculate survival rates in the species. He suspects that the Cuckoo is promiscuous, and he doubts that either male or female defends an exclusive territory, although they generally adhere to a chosen area. The wing tag may be intolerable for long migration and perhaps even for local survival.

Most Americans will be interested in comparing the European Cuckoo with the Brown-headed Cowbird (*Molothrus ater*), although Wyllie alludes to the cowbird only sparingly. As might be expected when the parasitic habit evolved in different families, the differences are many. The Cuckoo actively ejects any other egg or young in the nest, ending up the sole occupant; the cowbird tolerates nest companions, eliminating them merely by crowding if at all. The female Cuckoo usually destroys all the contents of the host nest at the time she lays her egg, and she never lays twice in the same nest; the cowbird usually removes only one host egg at a visit, approaching the nest on a different occasion for this purpose, and she often lays more than one egg in a nest. The

Cuckoo usually lays in the afternoon; the cowbird, in the pre-dawn. The Cuckoo lays eggs in series or clutches with successive eggs spaced 2 days apart in each series; cowbird eggs are spaced only 1 day apart in a series. However, both species lay most of their eggs in close synchrony with those of the hosts. Except in mating, the Cuckoo tends to be solitary; the cowbird often moves about in flocks at all times of the year. While devastating to the brood victimized, the Cuckoo in England does not appear to impose a severe burden on any host species, parasitizing no more than 3% of the nests of any species, and even in local populations rarely approaching 20%; the cowbird often parasitizes 50% or more of the nests of preferred species in some localities. The Cuckoo at more than 100 g is far larger than its preferred hosts, many of whom weigh as little as 10 g; the cowbird is only a third as large as the Cuckoo while using many hosts in the 10–20 g range. Each female Cuckoo lays an egg of distinctive type and tends to lay these eggs, although not invariably, in the nest of a host whose eggs resemble the Cuckoo's; cowbirds produce a nondescript egg and lay these indiscriminately in the nests of all hosts, although showing strong preferences for certain hosts in each area.

This is a valuable addition to the literature on Cuckoos and brood parasitism. The text is clear and readable. The bibliography and index are useful. I ask myself if all the photographs are necessary, but they are of high quality and provide precise information never fully expressed in words. My criticisms are few and mild. I wish the captions on some of the tables and charts were more detailed, as I found it necessary to search the text to interpret some of the figures. Also, since this study focused on the relationship between the Cuckoo and a single host, I would have appreciated more background on the Reed Warbler.—HAROLD F. MAYFIELD.

Taxonomy and geographical distribution of the Furnariidae (Aves, Passeriformes).—Charles Vaurie. 1980. Bull. Amer. Mus. Nat. Hist. vol. 166, no. 1. 357 pp., 10 color plates, 55 maps, 22 tables. \$24.00.—Avian systematics is in a period of ferment and rapid evolution. Principal among the selection pressures for change is a growing demand that defensible and repeatable methodology replace the more traditional, artful approaches of earlier workers. Added to this is an ever-burgeoning repertoire of biochemical, statistical, and even old-fashioned dissecting techniques, all contributing so much new information about avian character states that we are witnessing a resurgence of taxonomic re-examinations at virtually every hierarchical level within the Class Aves. Moreover, travel opportunities and field conveniences finally are permitting ornithologists to study the living bird in its native condition, even where

the requisite species inhabit the most remote parts of the planet. This not only provides wholly new sets of information but, more important, it permits us to put into a living, ecological and evolutionary context the very characters that taxonomists have blindly counted, measured, and trusted for a century.

In the context of this exciting environment for systematists, Charles Vaurie's final, monolithic opus—treating one of the world's largest and most interesting bird families—stands out as monumentally anachronistic, at least upon initial examination. Frankly, the time and usefulness are past for large-scale revisions such as this one, based solely upon: (1) plumage patterns, foot and bill shapes, and feather morphology of specimens lying together in a museum tray; (2) measurements of wing and tail and bill, plus all manner of ratios thereof; and (3) anecdotes about birds' behavior and lifestyle in the absence of an author's experience that puts these into biological perspective. These, plus distribution maps, provide the bulk of Vaurie's raw data. They are assembled into a whole-scale revision through various intuitive processes that defy description. Included are no dissections, skeletal comparisons, vocal analyses, functional analyses of structures, or behavioral comparisons beyond gross habitat preferences and nest styles (where these were known to Vaurie). In modern terms, one could relatively easily dismiss the endeavor as a testament to systematic styles past. While it cannot help representing just such a testament, it nevertheless is also an enormous compendium of useful information. Furthermore, in the end, a certain holistic beauty does emerge from it upon careful scrutiny.

The monograph is a verbatim publication of an essentially complete manuscript that lacked only minor editing at the time of Vaurie's sudden death in 1975. The ornithological world owes a major debt of gratitude to François Vuilleumier for editing and annotating the manuscript, and for seeing it through to a product that fairly represents Vaurie's final words on the family he studied for 10 years. Vuilleumier fastidiously (and, for his own sake, wisely) divorced himself from entering any but the most minor editorial changes to Vaurie's own thoughts and sentences. Instead, he added, with the help of the late Eugene Eisenmann, 153 footnotes to provide supplemental information on numerous points, and in many cases to point out where Vaurie's logic or opinions contrasted strongly with his own. He also wrote an Introduction and compiled several useful Appendices based on notes left by Vaurie. To review Vuilleumier's valuable written contributions briefly, they add enormously to the total information content, but the important points of disagreement with Vaurie are hidden and so separate from the finished product that their importance is underemphasized. Vaurie's insight simply failed him in a few places. Frequently these were noticed and remarked upon by Vuille-

mier, and it is in some sense a shame that these outright errors of interpretation could not be corrected in the finished work.

Roughly two thirds of the monograph's bulk consists of species accounts covering all 214 species. The former 54 genera are reduced to 34. Each genus is discussed at length, followed by a key to its species, and then by the lengthy individual accounts, treating descriptions of adult and immature plumage, geographic range, and specimens examined, for each species. For each genus, an introductory, usually rambling and appallingly ill-organized section summarizes form, distribution, and nesting habits of the component species. Three subheaded treatments then follow, entitled "Morphological Variation" (range of bill forms, tail-wing ratios, etc. in the genus), "Phylogeny" (e.g. hypothesized species-groups), and "Geographical Variation" (usually a poorly organized summary of "trends" in selected species).

Distribution maps show the approximate geographic range of each species. These maps are useful at the introductory level, but frustratingly out of date. More important, they do not include plots of the actual localities, even for extremely rare species. At best, this is an inconvenience for any serious student of Neotropical biogeography, because much of the information about comparative distributions and range boundaries is lost. At worst, it frequently is misleading. Range maps of this type cannot help giving false impressions; for example, that *Berlepschia rikeri* has a vast and continuous distribution or that such species as *Sclerurus rufigularis*, *Xenops milleri*, and *Phylidor pyrrhodes* are equally common and well represented throughout their large ranges. In many cases the maps are substantially obsolete. New information on distributions has poured in over the past 15 years, especially as regards Amazonia and the highlands of Peru and Bolivia. I was disappointed that the maps were not at all updated, even in cases where Vuilleumier knew they were wrong. In at least one case (Map 44, p. 283), the key contains an error (labels for *Thripadectes ignobilis* and *T. virgaticeps* should be reversed).

Wing, tail, and bill measurements (with means and ranges) are presented for most species, in tables (sample sizes are excellent, but with no geographic breakdowns). Fully half of the species, and 33 of 34 genera, are nicely illustrated in 10 color plates painted by Francis Berille (8) and John C. Yzarry (2). These plates are extremely handy, not only as a representative introduction to the family, but even as a gross key for genus and species identification. Even though all depictions are rather wooden and some are grossly incorrect in posture, I found them among the monograph's top highlights.

It would be silly to criticize in detail Vaurie's method of classification. Yet his taxonomic conclusions within this important Neotropical family are in danger of becoming popularly accepted, so they

warrant more than just cursory comment. Systematists should be made aware that Vaurie's conclusions are made in the absence of data on a variety of anatomical and behavioral characters, and they are generated almost exclusively through intuition, itself used inconsistently. Nowhere does there appear any clearly organized character analysis upon which subfamilial, generic, specific, or subspecific distinctions can be based. The dedicated reader must wade through rambling and repetitive discussions of each genus to extract the intuitive logic behind Vaurie's groupings. In the main, the characters that weigh heavily in his classification are as follows: nest structure, number of rectrices, relative tail length, presence of stiffened rachi in the rectrices, contrastingly colored gular patch, general structure of the foot, distinctive plumage anomalies (e.g. tear-drop spots, streaked back, clear rufous patches at various sites), and "general coarseness" of the plumage. Yet every single character used to unite or separate groups is ignored in certain cases or discarded in others. This inconsistency is evident at every hierarchical level, and the following represent just a sampling of the numerous examples:

(1) *Subfamily*: The most important single character used by Vaurie to delineate his higher-order groupings is nest type, with the bulky, ovoid nest with side entrance apparently representing the most derived condition. This nest type is ubiquitous among Vaurie's Synallaxinae. It would be unique to that group, except that genus *Pseudoseisura*—a huge, crested version of *Synallaxis* and builder of a massive stick nest typical of many synallaxines—is placed in subfamily Philydorinae, apparently because it is "large and coarse" (a slip-up also noted by Vuilleumier).

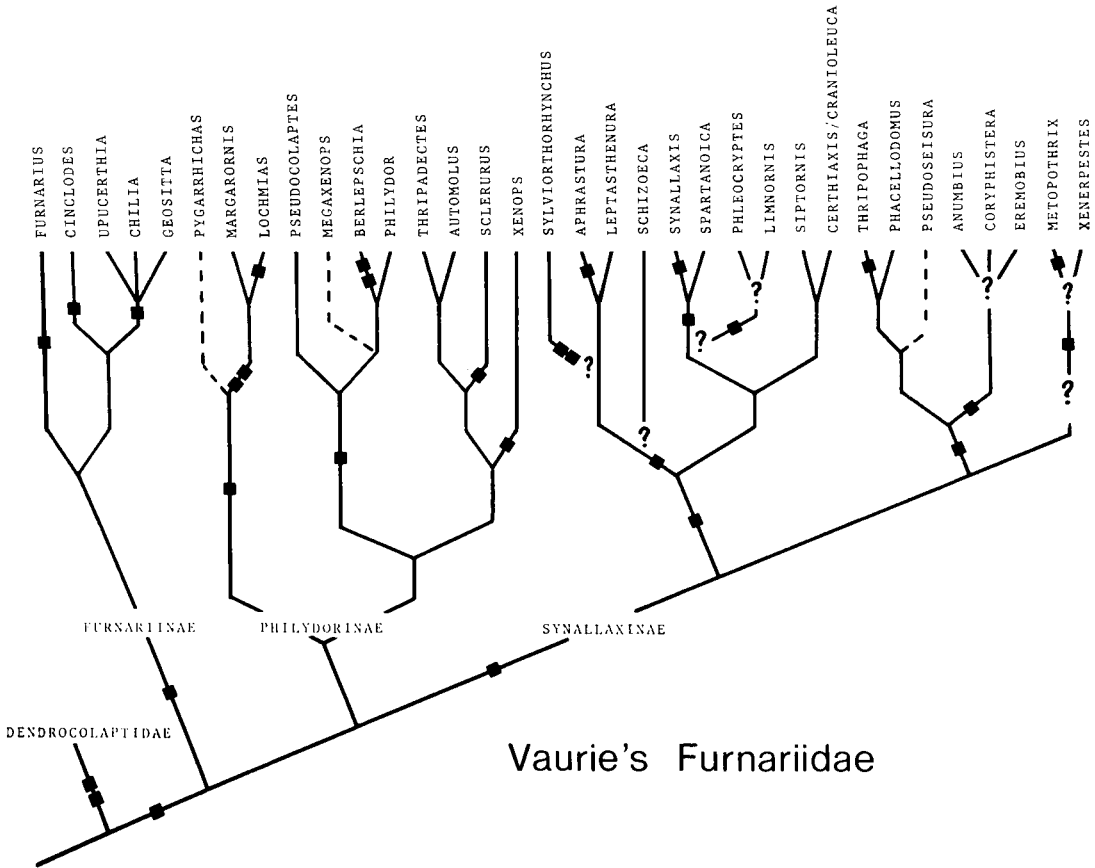
(2) *Genus*: Vaurie's most controversial actions undoubtedly lie in his synonymizing some 20 genera recognized by Meyer de Schauensee (1966). For the most part these involve uniting peculiar, small, or monotypic genera with larger groups. A few of these mergers are overdue and well defended (e.g., *Geobates* into *Geositta*; *Premnoplex*, *Premnornis*, and *Roraima* into *Margarornis*); others seem defensible but are not even discussed (e.g. *Anabacerthia* and *Cichocolaptes* into *Philydor*). In the main, however, they are premature at best. A few of the resulting genera—notably *Certhiaxis*, *Phacellodomus*, and *Philydor*—become suspiciously heterogeneous, especially in light of new, detailed data on their species' habits. In contrast to some whole-scale mergers, Vaurie maintains other genera (e.g. *Spartanoica*, *Chilia*, *Lochmias*, *Berlepschia*) despite their morphological distinctions being "no more than species differences" within other of his newly enlarged genera. Partly as a result of these inconsistencies, generic limits among the larger groups become even more fuzzy than they were (e.g. those between the expanded *Philydor*, *Thripadectes*, and *Automolus*).

Clearly, his rearrangement of many genera to their new positions is in large part a vast improvement over all previous classifications. But his lack of any coherent, consistent definition of a genus renders his nomenclatural changes at the generic level unacceptable to me. In each case, more detailed analyses of displays and internal structures are necessary, lest we bury a number of independent lineages into a few polyphyletic genera simply in the interest of following the newest available classification.

(3) *Species*: This is the taxonomic level at which Vaurie's painstaking examinations are most consistently sound, and in general they also are carefully defended. Many of the controversial species-level conclusions of Hellmayr, Peters, and Zimmer are shown rather conclusively to be wrong. In some cases, independent corroboration was supplied by the field studies of other investigators (notably the late Paul Schwartz). Yet even here Vaurie lapses into casual and inconsistent opinion. Why, for example, are "*Philydor*" (= *Simoxenops*) *ucayale* and *striatus* kept as separate species [contra Vaurie 1971, Classification of the ovenbirds (Furnariidae), London, Witherby], while other even more different allopatric populations are merged (e.g. the vastly polytypic "*Schizoeca fuliginosa*," or *Pseudocolaptes boisseneutii* and *P. laurencii*)? In many cases, Vuilleumier adds a footnote suggesting application of the superspecies concept. Indeed, most quibbles at this level are ones of semantics and not of systematic substance. Overall, Vaurie's species-level taxonomy appears biologically sound, and is satisfying to splitters and lumpers alike.

(4) *Subspecies*: Systematists interested in intraspecific geographic variation will find literally nothing of interest or use in Vaurie's disjointed discussions of this topic. Except in the most clearcut cases of well-differentiated, allopatric populations, Vaurie discards subspecies altogether. To him, even the steepest clines do not warrant names that could distinguish their extreme populations. In several cases (e.g. several species of "*Thripophaga*" = *Asthenes*, the genus *Furnarius*, *Synallaxis albescens*, *Philydor erythrocerus*) some interesting geographical patterns or "trends" are mentioned, but in no case are they plotted out or examined in any but the most general way. Perhaps most frustrating in this regard, Vaurie's discussions of intraspecific geographic variation are merged into single sections within each genus. This produces confusing and inconsistent comparisons. Worse, it eliminates all but passing references to subspecies within the individual species treatments. This taxonomic monograph therefore provides no cataloging of the subspecies names that have been applied to date. Vaurie simply and quite obviously was bored by variation below the species level.

Although he makes frequent mention of general ecological preferences, as gleaned from various sources, Vaurie's discussions of behavior are awkward and unrewarding. Sadly, he made no use of



Vaurie's Furnariidae

Fig. 1. Generic relationships within the Furnariidae. Black squares represent transitions to derived character states. Affinities and character state polarities are inferred from Vaurie's discussions. Dashed lines show affinities that differ from those implied by Vaurie; they are proposed by the reviewer as improvements upon his hypotheses. Otherwise, the generic list, left to right, follows Appendix 1 as prepared by Vuilleumier (pp. 326-331).

vocal or display characters in his taxonomic analyses. He repeatedly attempts to infer behavior patterns (e.g. creeping or climbing) based upon structural features—a form of reverse functional anatomy that accomplishes little. These continual inferences struck me as all the more feeble because the family is inherently so diverse and interesting in this regard. As the world's premier example of continental adaptive radiation, the Furnariidae still cries out for a detailed functional evaluation of its various evolutionary lineages and structural peculiarities.

At virtually every level of analysis, this monograph frustrated me. Yet, after a detailed study, then standing away from it a bit, I did perceive a major, underlying unification of a family that had up to now represented numerous, scattered and confusing lineages. This prompted me to go back through the text,

genus by genus, listing and organizing the characters as Vaurie perceived their taxonomic usefulness. From this outlandish jumble of conflicts and undefended decisions, along with my own application of basic phylogenetic analysis, I was indeed able to draw a cladogram that approximates Vaurie's perception of the family. Vaurie's classification, as organized in Vuilleumier's Appendix I and interpreted with modifications into two dimensions here (Fig. 1), is the first of its kind for the Furnariidae. Its gross structure is a sensible one, and to me stands as Vaurie's most important contribution to furnariid taxonomy. For now, it remains for modern systematists to test and amend, using all the tools and approaches with which Vaurie was never able to practice.—JOHN W. Fitzpatrick.

A primer of population genetics.—Daniel L. Hartl. 1981. Sunderland, Massachusetts, Sinauer Associates. x + 191 pp., Paper. \$8.00.—In 1971 E. O. Wilson and W. H. Bossert authored a small volume entitled "A primer of population biology." The work had a substantial impact, introducing students of ecology to the concept of mathematical modeling of biological processes and using a minimum of calculus. Hartl has now written an analogous introduction to population genetics, a field in which mathematics and modeling are at least as ubiquitous as in population ecology. Unfortunately, mathematics is not a strong point for many biologists, but the author is aware of the problem.

Hartl's primer is composed of three parts. The first section is an introduction to the nature and study of genetic variation within and among populations. Electrophoresis, heterozygosity, the Hardy-Weinberg law, inbreeding, and the genetic structure of populations are clearly described with a minimum number of equations. These topics appear with increasing frequency in ornithological and evolutionary journals; this treatment, with its simple examples and worked-out problems, should prove useful to persons interested in those papers but who have not had a recent course in genetics.

The second section of the volume is an introduction to some of the less esoteric areas of classical population genetics. The concepts of mutation, fitness, natural selection, gene flow, and random drift are developed briefly. A little probability theory and algebra slip into the descriptions of effective population sizes, F-statistics, and the selection equations. Nevertheless, the treatment will not be difficult for most readers.

For persons with some exposure to simple genetics, the most valuable part of this primer will be the last section, an introduction to the analysis of quantitative genetic variation. This branch of population genetics has been, until recently, of concern almost exclusively to agricultural geneticists and a few psychologists. It deals with characteristics of organisms that are affected by many genes, for example size, shape, growth rates, or perhaps behavior. Of late, however, this once arcane subject has become of more general interest. For instance, detailed investigations of microevolution (e.g. the reanalysis of *Bumpus'* data by several authors, R. F. Johnston's studies of *Passer*, and P. R. Grant's studies of island populations) have led to interest in the heritability of morphological variation in natural populations. Additionally, the brilliant analyses of R. Lande have shown that problems such as speciation and macroevolutionary trends that are not tractable with the more traditional approaches of population genetics can be attacked successfully with the normal approximations and techniques of variance partitioning used in quantitative genetics. The classic text in this field, "Introduction to quantitative genetics" (D.

S. Falconer 1960. New York, Ronald Press), may be a bit heavy going for many readers; this primer definitely will ease one into the material. For example, a reading of this third section will make available to many ornithologists the important studies that have been appearing on ecological genetics of Great Tits (A. J. van Noordwijk, W. Scharloo, and their colleagues), and of Galapagos finches (P. R. Grant and colleagues). Nevertheless, this discipline is a quantitative one; an understanding of its deep structure will necessitate careful attention to assumptions and mathematics. More sophisticated methods than algebra are prerequisite for following the advances being made by Lande.

Population genetics has been criticized in the past for its seeming irrelevance to the investigation of actual evolutionary processes in natural populations and the analysis of data generated by field biologists. There has been an element of truth in this deprecation, but the situation seems to be changing rapidly; the gaps between theory and available data have disappeared in many areas. More importantly, quantitative results are necessitating the reassessment of earlier qualitative and subjective analyses of the roles and processes involved in adaptation, behavior, speciation, and macroevolution. Mathematics is, of course, nothing but a system of symbolic logic; its utility lies in part in the necessity of systematically detailing one's assumptions as a system of equations is adapted for the investigation of a particular situation. This itemization and modeling can be a useful exercise. Thus, we are now discovering that researchers in the areas listed above have developed narrative scenarios unaware of the specific assumptions about the population genetics of organisms that are inherent in their thinking. It has taken the work of Charnov, Endler, Lande, W. D. Hamilton, Slatkin, Maynard Smith, Templeton, Wade, D. S. Wilson, and others to establish the nature of these assumptions. Continued work will be required to test their validity. These developments deserve the attention of more evolutionary biologists. Consequently, one might expect some modest amount of interest in the genetics of natural populations; any work that succeeds in promoting interest or increased familiarity with the subject will be of value.

This book can help field biologists develop the beginnings of a knowledge of the rudiments of population genetics. It may allow researchers to skim papers and get the essence of important developments they might otherwise have ignored. I recommend the volume, and regard the third section as especially important. Clearly, though, it is not Hartl's intention that this primer stand alone as an introduction to a field as complex as the genetics of natural populations. It is best viewed as a prelude to some of the standard "introductory treatments"; in this regard it will be useful to persons with minimal backgrounds, or whose only course in genetics was taken years

ago. It might be used as supplementary reading in courses on evolution, ecology, and systematics. Most institutional libraries ought to have copies for reference.—GEORGE F. BARROWCLOUGH.

The falcons of the World.—Tom J. Cade, paintings by R. David Digby. 1982. Ithaca, New York, Cornell University Press. 192 pp. + 44 color plates, 30 maps, black-and-white drawings. \$38.50.—Professor Cade has once again produced a work typical of his eloquent writing style; easily understood by the lay person yet simultaneously worthy of the steel of professionals. He has a manner with his straightforward syntax that is truly delightful. There is no doubt where his allegiances lie regarding issues such as conservation and falconry—he is strongly in favor of both. While the volume is really Cade's work, the book requires two evaluations, one of the art and one of the text. The book is 9 × 12 inches in size, almost "coffee table-like" in its appearance. It has a two-part format, the first part on the biology, evolution, and taxonomy of *Falco* (he treats only that genus), the second part giving species accounts of each, with a color plate, followed by a series of range maps showing breeding distribution. Although the first part contains only 20% of the text, much of the meat of the book is in the multiple topics therein. It is in this section that Cade speculates on interesting theories and introduces new concepts with insightful perception. There are 10 different topics discussed. The second section contains rather straightforward species accounts and descriptions, but there is unequal treatment for each species, perhaps consistent with the amount of data available. The Peregrine (*F. peregrinus*) covers 10 pages, the Gyrfalcon (*rusticolus*) 5 pages, some of the better-known hobbies and kestrels 3 pages, and 24 of the total 39 "species" are on 1 or 2 pages.

What are falcons? How do they depart from other raptors? These are questions addressed in the leadoff discussion. While not an exhaustive list of traits of *Falco*, Cade describes interesting ones, such as the molt, egg color, nasal glands, etc. Since he compares such traits with other falconiformes, it might also have been informative to compare them with the Tytonidae, often suggested as closer relatives to falcons than are other falconiformes. I enjoyed his speculation about the African hominid "Lucy" and the temporal similarity in the evolution of falcons and man, both having appeared about the same time and perhaps on the same continent. While I take no exception to his classification scheme, it is a departure from the most recent arrangement in Mayr and Cottrell, "Check-list of Birds of the World" Vol. 1 (2nd ed.). For example, he removes the Teita Falcon (*fasciinucha*) from within or near to the subgenus Rhynchodon (peregrine-like falcons) and places it with the hobbies (subgenus Hypotriorchis), and within Rhynchodon he considers the Peregrine and Barbary

Falcon (*pelegrinoides*) as separate species. I wholeheartedly approve of placing the Black (*subniger*) and Gray (*hypoleucus*) falcons with other "Great or Desert Falcons" in the subgenus Hierofalco rather than with the hobbies, as is sometimes done. His postulated phylogeny might have been arranged better. He suggests that members of the subgenus Rhynchodon are as equally related to those in Nesierax (*dieroleucus*, *rufigularis*, etc.) as to Hierofalco (*rusticolus*, *cherrug*, etc.) but then places them at the front of a linear sequence with Nesierax behind Hierofalco. He might have illustrated the point better by erecting an hierarchical arrangement.

Cade notes with interest that there are no hobbies in the Nearctic nor colonial species, such as the Lesser Kestrel (*naumanni*), in the western hemisphere. The reasons are not easily determined, but he suggests that perhaps they have just never dispersed from the Old World in sufficient numbers to become established. The numbers of endemic kestrels on Indian Ocean islands is mentioned by Cade and, after following his discussion, one wonders why there are no endemic kestrels on the Maldives, Andaman, or even Cape Verde Islands, since such birds have been able to occupy such small islands as the Seychelles. Would that he had speculated on this! Perhaps it is just an historical accident, or perhaps the physiography of the islands is important. He has an effective discussion on how many species breed in a given region and has rightly pointed out that seldom more than one member of the subgenera Rhynchodon (3 species), Hierofalco (7 species) or Hypotriorchis (9 species) breed sympatrically, although single species from five or more subgenera may coinhabit the same area. The feeding adaptations of falcons are highly specialized, and Cade has divided those with sufficient data to analyze into Aerial Bird Specialists (peregrine-like birds, 3 species), Great Falcons (gyrfalcon-like birds, 4 species), Accipiter-like Falcons (merlin-like birds, 3 species), Aerial Insect and Bird Feeders (hobby-like birds, 5 species), Ground-hunting Kestrels (3 species), and a single Ground-hunting Generalist (Brown Falcon, *berigora*). In the first group, the middle toe is nearly as long as the tarsus, while in the latter species it is only slightly over half as long. These differences result not only from an absolutely longer or shorter toe, but also from tarsal length changes. It is of interest to note that in the largest geographic race of Peregrine (*F. p. pealei*), which mainly catches a uniformly sized and relatively small prey (small alcide and petrels), the toe is also smaller relative to the tarsus than one would predict based on the falcon's size compared to other races of Peregrines. In the same section, a page-and-a-half is devoted to food caching; while not arriving at any specific conclusions on the factors producing the trait, the energetic advantages gained by falcons in various habitats or climatic conditions are indicated.

In the sixth section, he discusses size and flying performance and tabulates information on wing loading. Gyrfalcons and Peregrines have the heaviest wing-loading, while males of the American Kestrel (*sparverius*) and Lesser Kestrel and females of the American Kestrel and Red-footed Falcon (*vespertinus*) the lightest. Females are heavier wing-loaded than males except in American and Australian (*cenchrroides*) kestrels. Gyrfalcons have the greatest sex difference, while in the Black Falcon and American Kestrel the sexes are essentially the same. From these and related data, he discusses differences between the so-called "searchers," such as *vespertinus* and *naumanni*, and "attackers," such as *peregrinus*, and relates it back to prey-carrying ability. The mechanics and shape of the wing are discussed in light of these differences. It is pointed out that some of the fastest flying and highly maneuverable species with short tails, such as *faciinucha* and the Bat Falcon (*ruficularis*), have extremely stiff flight feathers, almost swift-like in texture. The Brown Falcon (*berigora*), on the other hand, which even takes food by walking around on the ground (the Ground-hunting Specialist of above), is long-tailed and has soft plumage that, to me, is almost like that of a harrier (*Circus* sp.). Cade's tabulations reconfirm that tail length relative to wing is correlated with flying performance—generally the shorter the tail, the faster the flight. He presents some of his own unpublished data from captive-bred Peregrines that were released into the wild to show hunting success. One of his males had a 93% success rate, while the overall percent success for the available data varied from that male to a low of 5% for some species on autumn migration. I particularly enjoyed his discussion of foraging efficiency, where he points out that many theoretical discussions of the topic may be altogether irrelevant because sufficient performance is the only demand that natural selection places on an organism; it can be a relatively efficient or inefficient user of energy so long as it gains a competitive advantage in the way it uses that energy.

Another of his insightful discussions deals with reversed sexual dimorphism. He presents a masterful review of the already voluminous discussions on the topic (which are approaching literature overkill). He concludes that social dominance probably has the greatest weight of evidence in its favor for producing the larger female. As a corollary to sexual dimorphism, Cade discusses social behavior, describing courtship posture and displays. Once again he draws in large part from a considerable store of knowledge acquired from Cornell's captive falcon breeding program. Many black-and-white drawings and sketches accompany this section. Parental care, fledging, sibling socialization, etc. are described in considerable detail.

As a final discussion in Part 1, Cade devotes six

pages to the relationship of falcons and man. The discussion centers on two topics: falconry, which is a very direct relationship, and the indirect impact of man through toxic chemicals. He concludes that falconry does not, in general, have a negative impact on falcons, especially in that it does not reduce the breeding populations. The second impact is so thoroughly documented elsewhere that only the very naive or the prejudiced person would deny the cause and effect relationship of toxic chemicals and population declines. Cade simply reviews the data. Aside from the two themes he treats, there are some other interesting falcon-man relationships. For example, the Aleuts encountered by Vitus Bering during the first exploration of the North Pacific-Bering Sea regions by Europeans in the 1700's used falcon skins (doubtless *peregrinus* rather than another Nearctic species) as either some type of peace token, religious symbols, or indicators of aggression. They received gifts from Bering's crew in open, dried falcon skins attached to spears.

The first section of the book taken care of, Cade then turns his attention to species descriptions. This is a rather straightforward section in which each species is discussed following a similar format: their dimensions, geographical range, plumage traits, food and nesting habits, interesting bits and pieces of their biology, and, finally, estimates of numbers of individuals. Numerous heretofore unpublished data gathered from colleagues doing fieldwork on little-known species are presented. A sample of the data from the descriptions is as follows. Cade draws attention to the fact that in the Greater Kestrel (*ruficoloides*) of the African mainland and Mauritius Kestrel (*punctatus*), an insular Indian Ocean endemic, there is essentially no sexual color dimorphism that results from the feminization of plumage in males. In another insular Indian Ocean endemic, the Seychelles Kestrel (*araea*), there is likewise only slight sexual color dimorphism, but in this case the female's plumage has become masculinized. The former case is typical of the general island phenomenon so widespread in waterfowl; not so the latter case. I would like to have seen Cade discuss his insights into the selective forces or adaptive value of the situation in the Seychelles Kestrel, as the masculinization of the female color is not only unique among kestrels but a departure from the general trend.

Over 10 years ago I suggested that the Laggar (*jagger*) of the Indian subcontinent may be more closely related to the Black Falcon (*subniger*) of Australia, based in part on juvenile plumage similarity and structural features, than it is to the similarly colored adult Lanner Falcon (*biarmicus*), as is generally proposed. After watching Black Falcons and Lanners in the field and having Laggars and Lanners in captivity, I'm even more satisfied with that position. Although I may have been one of the first to recognize

and suggest such a departure from the general view, Cade has now articulated a similar view in this volume.

A significant proportion of his discussion of the Prairie Falcon (*mexicanus*) is concerned with efforts of the Bureau of Land Management in setting aside the Snake River Birds of Prey Natural Area in Idaho. As he points out, one of the largest concentrations of raptors in the world occurs along this river for a small area of about 300 linear km. In some years over 600 pairs of 15 species occur there, with as many as 200 pairs of Prairie Falcons. It is appropriate to indicate that along the Strezlecki Creek in South Australia densities rival those of the Snake River. Similarly, several years ago Cade and myself called attention to the concentrations of raptors along the Colville River on the north slope of Alaska by suggesting a special status for that river. While not of the magnitude of the Snake River or Strezlecki Creek in terms of raptor densities, it certainly is in order for the BLM to provide a status to the Colville River similar to that of the Snake River. The time is now ripe for that to happen, especially with the rapid exploration of the Arctic for petroleum. Let's hope that the opportunity for BLM to act on the Colville is not lost forever.

Along a similar line of thought, that of raptor densities, it is of value to contemplate data Cade generates on the Saker Falcon (*cherrug*). After considerable discussion of the use of that species for falconry by the Arab world, he concludes that, given the average density of about one pair per 500–1000 km² over its range, the numbers could equal 20,000 to 100,000 breeding pairs. Some 2,000 are trapped annually for falconry and a significant number of these are released back into the wild after 1 year. Given this scenario, less than 10% of the population is taken annually for this sport, even though the number may seem large.

The art work of Digby is for the most part particularly well done. It smacks of the style of D. M. Reid-Henry as it well should, as Digby was his student. The similarity is most evident in Digby's plates of the Gyrfalcon, African Hobby (*cuvieri*), and Australian Kestrel. To me his plates of the Teita Falcon and Bat Falcon are superior. The Teita is more accurate than anything done by Reid-Henry for that species. I suspect that Digby must have seen a living example or used a photograph of one. He has been particularly good in capturing the posture of many species (e.g. Eleonora's Falcon, *eleonorea*) and it is nice to have good color plates for each species in a standard reference. The predecessor of this book for the falcons, namely, "Eagles, Hawks and Falcons of the World" by Brown and Amadon (1968, McGraw Hill) unfortunately did not show some of the really exciting falcons, such as *zoniventris* and *subniger*, in color. While the quality of the work is good, plates are of

variable accuracy. Some examples of poorer ones are: The Gray Kestrel (*ardosiaceus*) has a massive bill and feet for a kestrel its size, similar to the Orange-breasted Falcon (*deiroleucus*) (see a representation of this in Brown 1976, "Birds of Prey, their Biology and Ecology" Hamlyn Publ., p. 131), while Digby makes the species look like any other kestrel; the Prairie Falcons (two plates) are too rich in color; the head (bill and cere in particular) of the Black Falcon looks like it was drawn from a captive that had damaged its head on cage wires; and the flying Gyrfalcon does not resemble that species and has poor proportions, especially by having such short narrow wings for its body size. Additionally, it would have been helpful to indicate the population to which the bird that was represented in the plate belonged. For example, Lanners from the Mediterranean region are more heavily marked and very different from the clear-breasted southern African Lanners. Similarly, as Cade points out that Ludlow Clark first determined that there are actually three color phases of the Eleonora's Falcon (normal, black and "dark") rather than the traditional two phases that are usually shown in color, it would have been helpful to show the differences in the degree of color between the black and "dark" phases.

While I can not be too laudatory for an excellent job, no review would be complete without sorting out some of the shortcomings, and in some cases obvious deletions, in the text. I could not find the reference to Manniche (1910) (from the Gyrfalcon account, page 78) in the bibliography. There are inconsistencies in citing references. For example, in the bibliography, S. Smith is given as *Oikos in press*; H. Walter is simply cited *in press* without a journal reference (it will appear in a journal from Oman); and the article of Falxa et al. given on page 102 as *in press* is not even listed in the bibliography. N. Fox is cited as a Ph.D. dissertation with a location of the thesis, while L. Clark, also a Ph.D. dissertation, is not cited in the bibliography even though mentioned in the same fashion as Fox in the text. A careful reading in the text will show that the dissertation of Clark is at Cornell University. Aside from such bibliographic inconsistencies, there are some literature deletions that I would think should have been referenced in a book of this comprehensive nature. The "Neue Brehm-Bucherei" series from the German Democratic Republic contains at least three excellent monographs on falcons: W. Fischer on the Peregrine (1968), G. P. Dementiew on the Gyrfalcon (1960), and W. Baumgart on the Saker (1976). Aside from single-species monographs, "The Birds of Prey of Southern Africa" by A. Kemp (1981) contains additional data, especially on African kestrels such as Dickinson's Kestrel (*dickinsoni*), that would have been helpful to the discussions of the biology of particular species. An unfortunate deletion was the Ph.D. dissertation of M. Kirvin (1976, Univ. of Colorado) on the biology

of the Bat Falcon. Because much of the material cited in the book for the Bat Falcon account was unpublished data and personal observations from persons Cade visited in Mexico that were working on the species, the Kirvin dissertation would clearly have added a dimension to the discussion of this species where so few data already exist. What is apparently a typographical error, of which there are few, is the misspelling of R. L. Garrett on page 93.

Lastly, the blue-colored breeding distribution maps at the end of the book require comment. Maps in general are difficult to deal with because species ranges are frequently not precisely defined, as maps tend to be general, with physiographic or political boundaries as reference points not delineated. At best, maps tend to be generalized overviews. Frequently one is content to copy maps from other references, and thus mistakes are perpetuated. Maps also are not always returned for proofing with galleys. With these limitations in mind, the following items, as examples, merit mention. Considering the precision Cade has used in dealing with the distribution of the Peregrine in Britain and eastern North America, the range map for this species surprisingly contains several errors. In Mexico, the known range extends only to about the southern edge of the Mexican Plateau rather than near the Yucatan, as shown. In South America, rather than having a range restricted to Tierra del Fuego, southern Chubut, southern Chile, and a couple of points in Ecuador and Peru as shown, Peregrines breed much more extensively throughout southern Argentina, north in the Buenos Aires province to about Bahia Blanca, in Cordova (central Argentina) (where they even nest on a church), and along the entire Chilean coast to at least near the Peruvian boundary. Peregrines are indicated for the Cape Verde Islands (where there is a distinct race) by a colored line around the islands, but are not indicated by color or lines around Fiji, the Solomons, the Philippines (at least the islands of Luzon and Negros), and the Aleutians. I cannot determine if the Bonin and Volcano Islands, which have their own distinct race, are colored, although they look like it. A line around them as done for Cape Verde would, however, have solved the problem. Lastly, in southern Africa Peregrines breed in Zambia and Zimbabwe at least north to roughly the same latitude as Lake Malawi rather than what I make to be about the southern Transvaal of South Africa, as shown on the map. The Gyrfalcon breeds considerably farther south, at least in the mountains, to about central British Columbia, rather than barely into British Columbia if at all, as shown. The Merlin (*columbarius*) is not shown to breed on the Kenai Peninsula and a large part of southeastern Alaska. They breed in the Anchorage area and onto the Kenai. I presume the western U.S. hiatus for Merlin migration represents the Great Basin because of its location on the map. In fact, significant numbers pass there, at least in

Utah and western Nevada, and are seen wherever there have been observers to record them. Many winter throughout this region, and perhaps in excess of 20 are trapped annually in Utah by falconers. The American Kestrel map is misleading as it shows a breeding hiatus for an overly excessive area of the Rocky Mountains from southern Alaska into Mexico. In Utah and Colorado, for example, they breed at 10,000–11,000 feet in the Rockies, nearly right across the mountains. Lord Howe Island should have been shown in color for the Australian Kestrel. Some of the kestrel maps are confusing. The Fox (*alopez*) and Greater Kestrels are shown on the same map, but it is not indicated which range belongs to whom. The map could have had a numeral by the ranges as was done for the Madagascar (*newtoni*), Mauritius, and Seychelles Kestrels (all of which are shown on one map) or with different symbols as for the Eleonora's and Sooty (*concolor*) falcons that are shown on the same map. The same confusion exists for the Dickinson's and Barred (*zoniventris*) kestrels (on the same map) and Moluccan (*moluccansis*) and Australian kestrels (on the same map). Overall, however, the maps are very useful and maps should be included in a work of this type rather than trying to describe ranges only in the text as is sometimes done.

By all modern standards, this is an excellent book done by a talented and articulate biologist with an extensive knowledge of *Falco*. It contains some of the better plates available for falcons. I can unhesitatingly recommend this book for a multitude of audiences from users of University libraries to the lay birder to the high school falconophile. The reasonable price by today's standards makes this an extremely attractive offer for the wealth of knowledge the book contains.—CLAYTON M. WHITE

An annotated checklist of Peruvian birds.—Theodore A. Parker III, Susan Allen Parker, and Manuel A. Plenge. 1982. Buteo Books, Vermillion, South Dakota. 108 pp., indexes, 3 maps, 27 figs. Price not given.—In 1978 the same three authors published privately "A checklist of Peruvian birds," an obvious precursor to the present book, in which Thomas Y. Butler is acknowledged for allowing them "to adapt the format of his Ecuador list" (Butler, T. Y. 1979, *The birds of Ecuador and the Galapagos Archipelago*, The Ramphastos Agency, Portsmouth, New Hampshire).

This book lists 1,678 species "recorded in Peru as of 31 December 1980." Next to its English and Latin names are boxes indicating in what life zone(s) and what kinds of habitat(s) each species occurs and in what relative abundance. The basic authority from which this list was compiled is Meyer de Schauensee (1966, *The species of birds of South America*, Livingston Publ. Co.), supplemented by several other sources. In the introductory section the symbols used in the list are explained. "C," for example, means

that a species is "Common; seen or heard daily in moderate to large numbers;" "S" means that the species occurs in the "south; the species is restricted to the southern third of the country." All of this is rather vague.

A series of "life zones" are described next, "adapted from those used by Chapman (1926) in his study of Ecuadorean birds." Parker et al.'s life zones thus unfortunately perpetuate the now defunct notion of "arid tropical," "humid temperate," and other zones lacking clear-cut bioclimatic definitions. It is incredible that ornithologists should so tenaciously hold onto a system of life zones that is not based on sound climatological or vegetational data. The "habitats" described (and illustrated with photographs) on pages 13-27 are more instructive than the life zones. They are not really habitats, however, but types of vegetation, inspired in their classification and delimitation by Tosi's monograph, based in turn on Holdridge's diagrams including annual mean temperature and potential evapotranspiration. I find neither the life zone nor the habitat system satisfactory, either by itself or when mixed together, as is done in this book. I wish that the authors had adopted a series of vegetation types based on climatically and botanically acceptable criteria. Instead of using potential evapotranspiration, plant ecogeographers have for many years made use of actual climatic data, including not only the mean annual temperature and mean annual rainfall but, more important in tropical latitudes, their relative distribution during the year. Heinrich Walter's books (for instance, 1964, *Die Vegetation der Erde*, vol. I: *Die tropischen und subtropischen Zonen*, 2nd edition, Fisher, Stuttgart, and 1973, *Vegetation of the earth*, Springer-Verlag, New York) ought to be mandatory reading for every student of tropical birds who attempts to place the species that he/she is studying into a scheme of "habitats" or "vegetation types." Other systems also exist, taking into account a combination of variables from floristic, physiognomic, and climatic sources, that could be borrowed by ornithologists. An example is Beard's classification (1944, *Ecology* 25: 127) which even contains a key for the recognition of the plant formations in the field; another is Sarmiento's system (1968, *Bol. Soc. Venez. Cienc. Nat. Caracas* 27: 454; see also Sarmiento, 1972, *J. Ecol.* 60: 367). Many vegetation schemes and their modes of analysis are reviewed by Mueller-Dombois and Ellenberg (1974, *Aims and methods of vegetation ecology*, Wiley, New York). In Peru, especially in the Andes, Weberbauer's well-known work is still useful and, I think, superior in practicality to Tosi's.

After the list proper (pages 29-79), a section on "Bird Finding in Peru" includes descriptions of various parts of Peru where birds can be observed by visitors to that country, how these areas can be

reached, and what birds can be expected there. The book ends with two bibliographies (Literature Cited, pp. 92-94, and Additional Reading, p. 95), an index to common names, and an index to genera.

This publication is evidently intended for bird "listers" and not for serious students of Peruvian or Neotropical ornithology. It is unbelievable that Zimmer's extensive work on Peruvian birds (especially his series of "Studies of Peruvian Birds," published as *American Museum Novitates* between 1931 and 1955) should not even be mentioned, and also that such works as Vaurie's (1972) excellent gazetteer or Chapman's (1921) paper on the Urubamba Valley avifauna should not be cited. There are other important omissions (e.g. the work of von Berlepsch, Hellmayr, Bond, Dorst in its entirety; Koepcke's "Corte ecológico . . ." or Zárate avifauna papers; the Koepckes' "Las Aves Silvestres de Importancia Económica del Perú") that will lead the amateur birder and the ornithologist alike to believe that Peruvian ornithology has had a very different history than the real one.

The authors state that ". . . there is still no comprehensive book on Peruvian birds." What about Taczanowski's "Ornithologie du Pérou"? This monumental work includes four volumes (I, 1884, 541 pages; II, 1884, 566 pages; III, 1886, 522 pages; and a volume called "Tables," 1886, 218 pages). For each species the author gave a synonymy, a description, some information on size, and data on habitat, nesting, voice or other ecological or biological details. Although obsolete in many regards, this nearly 100-year-old book is very much a comprehensive work on Peruvian birds, and one that is still useful today.

The title of this work is misleading. It is not an annotated checklist in the usual sense of the term (i.e. including taxonomic, distributional, and other information). I find it very difficult to imagine where the bird species live by looking at the boxes indicating life zone and habitat, and relative abundance. For some species that I know well I found myself in disagreement about their allocation and/or abundance status. For instance, *Geositta cunicularia* (p. 51) is stated to be common in the puna life zone and puna habitat only; but it also occurs more or less commonly but locally in lowland areas of southern Peru and along Andean slopes higher up. Birders may find the list of names useful if they want to tick them off for their life list. In the meantime, ornithologists are still lacking a reliable "annotated checklist of Peruvian birds." I find it a shame that, after so many years of ornithological collection and exploration in Peru by numerous parties from the Louisiana State Museum of Zoology, the only comprehensive list of Peruvian birds to be published by several of the members of these expeditions be done in such amateurish form.—FRANÇOIS VUILLEUMIER.

Birds of the North Solomons.—Don Hadden. 1981. Wau Ecology Institute Handbook no. 8. 109 pp., 1 map, 24 color plates. Available from Bishop Museum Press, P.O. Box 19000-A, Honolulu, Hawaii 96819, \$9.50 (American and European orders), or Wau Ecology Institute, P.O. Box 77, Wau, Papua New Guinea, 6.00 Kina (other orders).—From 1976 to 1980 Mr. Don Hadden, a school teacher, lived on the Solomon island of Bougainville and utilized his spare time to observe birds. In this small paperback book he summarizes available knowledge about the birds of Bougainville and Buka in the northern Solomons, and he reports his own discoveries.

The discoveries are remarkable, and all the important ones are documented by color photographs. In the mountains Mr. Hadden found a new and distinctive species of warbler, presently unnamed but illustrated by pictures of the bird itself and of its nest. It belongs to a group scattered over tropical islands of the southwest Pacific and including the genera *Cichlornis*, *Ortygocichla*, and possibly *Megalurulus* and others. Hadden's species will undoubtedly precipitate a generic revision, for it fills a geographic gap between *Cichlornis whitneyi* in the mountains of Espiritu Santo and Guadalcanal and *C. grosvenori* in the mountains of New Britain, and it resembles those species in plumage but it lacks the spiny tail by which the genus *Cichlornis* was diagnosed. A member of this group might remain to be discovered in the mountains of New Ireland.

Nearly as interesting, Hadden obtained strong evidence (not quite proof) that the mysterious Heinroth's Shearwater (*Puffinus heinrothi*), previously known only from two specimens taken at sea early in this century, breeds in Bougainville's interior. As far as I know, this constitutes the first breeding evidence for any species of petrel or shearwater in Northern Melanesia (i.e. the Solomon Islands plus the Bismarck Archipelago). One wonders whether the Solomons, like so many other oceanic islands, used to constitute a major breeding ground for petrels and shearwaters until the arrival of humans, in this case the arrival of Melanesians thousands of years ago.

Other discoveries of breeding species include the first Solomon records of the thrush *Zoothera talasea*, the estrildid finch *Lonchura melaena* (previously thought endemic to New Britain), and the heron *Ixobrychus sinensis*. The former two populations probably constitute new subspecies, undescribed at this moment. Hadden also obtained new records of 25 presumably nonbreeding species, including 16 waders.

The setting for Hadden's discoveries, the Solomon Archipelago, has played an important role in the development of ornithological thought. Our taxonomic knowledge of Solomon birds rests largely on the work of Ernst Hartert and later Ernst Mayr, whose understanding of geographic variation was crystallized by

the spectacular interisland variation in plumage of many Solomon species. The example of the yellow-bellied and white-bellied races *rendovae* and *tetiparia* of the white-eye *Zosterops rendovae*, separated by straits only a few miles wide between Rendova and Tetipari islands, has found its way into many textbooks of evolution. Solomon birds exhibit equally spectacular interisland variation in voice and ecology, but little of this information has been published.

Among Solomon islands Bougainville is the largest (3,317 square miles) and highest (8,500 feet), and ties Guadalcanal as the richest ornithologically (about 100 breeding land and fresh-water bird species). Bougainville has three endemic bird species (Hadden's new warbler, probably *Puffinus heinrothi*, and the honeyeater *Meliphaga bougainvillei*, all illustrated by the first published live photographs). It has three further species shared only with Guadalcanal (the kingfisher *Halcyon bougainvillei*, the fantail-flycatcher *Rhipidura drownei*, and the whistler *Pachycephala implicata*), part of a montane avifauna of 18 species. In addition, Buka, Bougainville, and the chain of Solomon islands south to Ngela (Florida) and probably Guadalcanal were joined at Pleistocene times of low sea-level into a single giant island. The modern fragments of this former land mass share seven other bird species found nowhere else (the hawk *Accipiter immitator*, rail *Nesoclopeus woodfordi*, owl *Nesasio solomonensis*, kingfisher *Halcyon leucopygia*, pitta *Pitta anerythra*, crow *Corvus meeki*—*C. woodfordi*, and white-eye *Zosterops metcalfei*). Though derived from ancestors that colonized overwater, all these species today (all of them except the rail being still physically capable of flight) refuse to cross any water gaps except the narrowest ones, so that they are stranded on Solomon land-bridge islands like the rhinoceroses, tigers, and elephants of the Sunda Shelf land-bridge islands.

It is the northern portion of this interesting avifauna for which Hadden provides the first complete treatment since the chapter in Mayr's "Birds of the Southwest Pacific" (1945). Quite a few observers have collected or studied birds on Bougainville, but Buka is ornithologically the least-studied major Solomon island: not even a bird list was previously available for Buka, and Hadden's observations there provide the sole published records other than those of the Whitney South Seas Expedition.

"Birds of the North Solomons" begins with some general sections: a brief account of geography and vegetation; lists of bird species found in particular habitats or at particular altitudes and lists of coastal birds, waders, and rare species; a history of the ornithological exploration of Buka and Bougainville; and sections on frequently seen birds and on where to find birds on Bougainville. This is followed by an account of all recorded species, with brief information about identification, voice, habitat, field habits, and worldwide distribution. Half of the species are

illustrated by color photographs varying in quality from undistinguished to splendid. While Hadden provides much previously unpublished material about breeding species of Buka and Bougainville, his own particular interest in waders enables him to give equal coverage to visiting waders, which had been sorely neglected in favor of resident birds by previous ornithologists working in the Solomons. The book concludes with a complete bibliography on Bougainville birds.

Bougainville is now easily reached by plane from Port Moresby, the capital of Papua New Guinea, of which Bougainville and Buka form a province. Ornithologists wishing acquaintance with the Solomon avifauna can readily observe half of Bougainville's resident species within a few days and fill in gaps in our knowledge at the same time. Every page of "Birds of the North Solomons" illustrates what remains to be learned about the field biology of Solomon bird species. Three examples will suffice:

The nest of Sanford's Eagle (*Haliaeetus sanfordi*), the endemic eagle of the Solomons, is unknown or at least undescribed.

Beck's Petrel (*Pterodroma becki*; possibly conspecific with *P. rostrata*) is known only from two specimens taken in 1928 at sea, one north and one south of Bougainville. Might it, like *Puffinus heinrothi*, breed in the mountains of Bougainville? In 1972 I visited the mountain village of Rotokas on the slopes of Bougainville's Mt. Balbi. Like many Melanesian villagers, the people of Rotokas were walking encyclopedias of local ornithology and described to me the habits of dozens of Bougainville birds, of which a few remain unidentified. One, the "kikariko," was described as a dark bird the size of a small duck, with duck-like bill and short duck-like legs, living in the mountains in burrows around which it keeps the ground clean, and giving a call like its name. Could this be *Pterodroma becki*, *Puffinus heinrothi*, or some other petrel or shearwater nesting on Mt. Balbi?

Both Hadden and I regularly heard in the mountains of Bougainville a beautiful whistled song whose author has escaped sight identification for the past 10 years since the song was discovered. It is known as the "odedi," "kopipi," and "kopia" to the villagers of the Crown Prince Range, Rotokas, and Namatoa, respectively. Hadden summarizes all that is known of this mystery bird on pages 93 and 94 of his book. Will it prove to be one of Bougainville's known species, or does another undescribed species live beside Hadden's warbler in the mountains of Bougainville?

Anyone interested in birds of the Solomons will want this book beside Mayr's "Birds of the Southwest Pacific." Because of shared or similar species it will also be useful to observers in the Bismarck Ar-

chipelago, for which there is no bird book at all, and in New Guinea. Publication was subsidized, and the price seems to me reasonable when one considers the number of colored plates and the difficulties in reconstructing the literature on Bougainville birds otherwise. The Wau Ecology Institute series of which this book is the latest deserves to be better known. It also includes the equally useful bargain "Guide to montane birds of Northeast New Guinea" by Bruce Beehler, as well as books on New Guinea frogs, beetles, and rodents, and on Solomon reptiles.—JARED DIAMOND.

Florida bird songs.—Donald J. Borror and Maurice L. Giltz. 1980. New York, Dover Publications. Twelve-inch 33 $\frac{1}{3}$ rpm monaural record with 32-page manual. \$4.50; **Sounds of Florida's birds.**—John William Hardy. 1978. A R A Records, 1615 NW 14th Ave., Gainesville, FL 32605. Twelve-inch 33 $\frac{1}{3}$ rpm record. \$7.00.—"Florida bird songs" presents recordings of the songs and/or calls of 59 species ". . . that occur commonly in at least some part of Florida." These are grouped in eight habitat categories. A brief account of the sounds of each species appears in the manual, with reference made to the 81 sound spectrograms that are included. The latter aid in understanding the sequencing of the sounds (e.g. Blue Jay, Rufous-sided Towhee). In a few instances the order of the spectrograms departs from that on the record. Several "examples," listed in the manual by the locality and month of recording, are included for each species, reflecting the range of variation to be expected. The selection of species represented augments those on other discs by Borror.

In "Sounds of Florida's birds" each of the 86 species is introduced by a brief, informal commentary that often includes details of distribution, status, and habits. These characterizations provide specific, easily assimilated information for the school children and beginning birders for whom the record was designed. Most of the passages are shorter than those in "Florida bird songs," usually representing but one individual. The selections appear in essentially field-guide order. A greater number of distinctively Floridan birds is included on the ARA record (e.g. Mangrove Cuckoo and Black-whiskered Vireo).

The technical quality of both records is good, although in a few instances distortion in high-frequency passages was bothersome to this reviewer. In occasional passages where the sounds of another species intrude, identification of the latter would have been helpful to the beginner. These records are enjoyable as well as instructive. Each package has distinctive features; birders in the southeastern United States should find both useful.—KEITH L. DIXON.