

ORNITHOLOGICAL LITERATURE

SPECIAL REVIEW

OLD BIRDS AND NEW IDEAS: PROGRESS AND CONTROVERSY IN PALEORNITHOLOGY

PAPERS IN AVIAN PALEONTOLOGY HONORING HILDEGARDE HOWARD. By Kenneth E. Campbell, Jr. (ed.). Contributions in Science, Natural History Museum of Los Angeles County, No. 330, 1980:xxxviii + 260 pp., numerous tables, line drawings and black-and-white photographs. \$20.00 + \$1.25 shipping charge. Order from the Museum Bookshop, Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, California 90007. RELATIONSHIPS AND EVOLUTION OF FLAMINGOS (AVES: PHOENICOPTERIDAE). By Storrs L. Olson and Alan Feduccia. Smithsonian Contributions to Zoology, No. 316. Smithsonian Institution Press, Washington, D.C., 1980:73 pp., 40 figs., 2 tables. Price not given. *Presbyornis* AND THE ORIGIN OF THE ANSERIFORMES (AVES: CHARADRIOMORPHAE). By Storrs L. Olson and Alan Feduccia. Smithsonian Contributions to Zoology, No. 323. Smithsonian Institution Press, Washington, D.C., 1980:24 pp., 15 figs. Price not given. THE AGE OF BIRDS. By Alan Feduccia. Harvard University Press, Cambridge, Massachusetts, 1980:196 pp., numerous black-and-white illustrations. \$20.00.—The publication in one year of several major works in avian paleontology provides an opportunity to assess the current situation in this important subject. Included in this survey is a Festschrift volume honoring one of the field's leaders, 2 monographs that analyze both extant and fossil birds to develop provocative new phylogenetic theories and a popular volume that aims to explain the history of birds and the methods of its study to a nonspecialist audience.

Dr. Hildegarde Howard has spent over half a century studying fossil birds at the Natural History Museum of Los Angeles County. The volume edited by Kenneth E. Campbell, Jr. is a tribute to her immense contributions to the discipline and to the inspiration that she has provided to other workers. It includes "appreciations" by several colleagues and a review of her work by Campbell, who notes among Howard's major contributions her studies on the Emeryville shellmound, the asphalt deposits of Rancho La Brea, the tertiary marine birds of southern California, and the use of trinomials to designate chronoclinal variation. Her work has included not only the description of many new forms, but also extensive paleoavifaunal analyses and important reviews. Campbell emphasizes the "caution, restraint, and thoroughness in methodology" that characterizes Howard's work. A bibliography of her 140 titles from 1923-1979 is included. Also reprinted here are the detailed drawings of avian bones that first appeared in Howard's 1929 paper on the Emeryville shellmound, and which have long served as a basis for avian osteological nomenclature.

The volume contains 19 contributed papers on various aspects of paleornithology, including faunal studies, reviews of specific groups, descriptions of new forms, archeological studies, and theoretical aspects. The paper likely to cause the most comment is Joel Cracraft's critique of the application of phylogenetic theory and method in avian paleontology. Cracraft argues that the use of cladistic methods will improve systematic practices in the field; this is not a new idea. Hopson and Radinsky (*Paleobiol.* 6:250-270, 1980) discuss the impact of this approach on vertebrate paleontology, noting its gradual spread into the field as well as the resistance to it in some quarters. This characterizes avian paleontology as well. Some paleontologists have especially resisted the argument that fossils cannot be designated un-

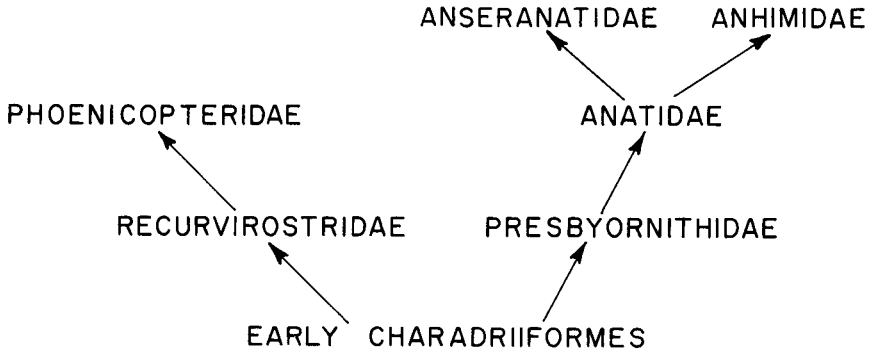


FIG. 1. An attempted reconstruction of Olson and Feduccia's theory of phylogenetic relationships in several groups of birds.

equivocally as direct ancestors of later forms. Storrs L. Olson in one paper rails against simplistic applications of cladistics, while other contributors are uncomfortable and apologetic about their continued use of phenetic methods. In my opinion, many paleontologists are overly sensitive to criticisms of their methods, but we must recognize that their data are by their nature often fragmentary, both in terms of individual specimens and of the fossil record as a whole. Part of the problem arises from incomplete fossils that lack sufficient information to allow unambiguous classification, let alone the construction of phylogenies. Much of the older literature contains taxonomic decisions that are simply not justified by the available data, which is why so much of the literature involves the reallocation of fossils to new taxa. Olson has done a major job in this area lately.

The goal of higher-level systematics is to work out the relationships between the major groups. The highest level at which presumably "natural" (monophyletic) avian groups are usually classified is the order. The problem is to work out the relationships between these orders, and this essentially must begin by determining pairs of orders that are related either as sister groups, or by having one derived from some group within another. The 2 Smithsonian Contributions by Olson and Feduccia represent major efforts in this direction involving comparative studies of both fossil and extant birds. In the first paper, the authors argue that the flamingos (Phoenicopteridae) are not related to either the Ciconiiformes or the Anseriformes as previous authors have suggested, but that they evolved from the family Recurvirostridae (stilts and avocets) of the order Charadriiformes. In the second, they argue that the Anseriformes are not closely related to the Galliformes as often stated, but have evolved from the Charadriiformes via an extinct, intermediate family Presbyornithidae. In both papers they marshal impressive arrays of data with which they evaluate alternative hypotheses. Both papers are so poorly organized, however, that it is often difficult to follow an argument through various digressions, and worst of all, there are no dendrograms summarizing the phylogenetic hypotheses being proposed; indeed these hypotheses are not clearly articulated in either paper. In the accompanying figure I have reconstructed from their texts what I believe to be Olson and Feduccia's combined hypotheses.

One problem with these papers is their confusing mixture of methods. The studies themselves are like those intermediate fossils that the authors analyze, that is, mosaics of primitive (phenetic) and advanced (cladistic) clustering techniques. The application of cladistic methods here is uncertain, however, because there is usually no explanation offered of how the

characters were determined to be derived. The connection of the Presbyornithidae to the Anseriformes is proposed on the basis of a complex shared derived cranial morphology, and appears to be well founded. However, the critical connection between the Presbyornithidae and the Charadriiformes is supported only weakly at best. Some skull characters are listed (pp. 14–15) as similarities between *Presbyornis* and Charadriiformes, but these appear to be mainly primitive avian characters from which the Anseriformes alone diverge. Thus, they do not link the Presbyornithidae to the Charadriiformes any more than to any other group of birds. The supposed charadriiform connection is also based on characters of the postcranial skeleton. These are listed on pp. 12–13, but are not discussed in detail, reference being made to 2 earlier papers by Feduccia. One (*Am. Scientist* 66:298–304, 1978) is a semipopular account with no real data; the basis for the connection evidently lies in the other (*Auk* 93:587–601, 1976). This paper simply does not provide the needed documentation for such an important hypothesis. For one thing, Feduccia claims to accept the superiority of cladistic methods over phenetic clustering, but confesses that he cannot analyze his data cladistically with much confidence (p. 599). There are few data to analyze anyway. The reader cannot determine what data were actually used; the paper has no methods section nor any list of species or numbers of specimens examined. The text refers vaguely to “recurvirostrids,” “shorebirds” (=Charadrii?) and “charadriiformes,” but only 1 charadriiform species (*Recurvirostra americana*) is really analyzed. There is no indication that any comparative analysis of the Charadriiformes was made. (Indeed, in this 1976 paper Feduccia had used these same few data to support a different hypothesis, namely that *Presbyornis* is ancestral to both Anseriformes and flamingos, which are sister groups in a lineage separate from that containing recurvirostrids and “shorebirds.”) Ultimately, the proposed relationship between *Presbyornis* and the Charadriiformes appears to be based on some intuitive notion of general similarity, and is hardly documented in these papers. What is needed are: (1) derived characters shared by the Charadriiformes, Presbyornithidae and Anseriformes, plus, (2) additional derived states shared by the latter 2 groups. The second requirement is well met, but the first is not.

There are other difficulties. The hypothesis that Anseriformes are derived from Charadriiformes means that the often-claimed connection between the Anhimidae (screamers) and the Galliformes must be incorrect. The authors note a resemblance between screamers and the Magpie Goose (*Anseranas semipalmata*), which ties the screamers to the Anatidae. They report the discovery of a series of minute ridges in the ramphotheca of screamers; these resemble poorly-developed lamellae, and are considered homologous with those of the Anatidae. Olson and Feduccia claim that these are vestigial lamellae, and that screamers evolved from fully lamellate ancestors, with *Anseranas* being close to an intermediate stage in this trend. Here they have introduced a revolutionary view of the history of the waterfowl. Traditionally, screamers were regarded as very primitive, *Anseranas* as more advanced and the Anatidae as most advanced. Olson and Feduccia suggest instead that *Anseranas* and screamers are highly derived. This provocative thesis poses some problems. It suggests that major anatid specializations, including a spatulate bill, lamellae and simultaneous wing molt, were secondarily lost in screamers. As an argument that the feeble lamellae of screamers are vestigial (reduced) rather than primitively rudimentary, they argue that screamers are not filter feeders. Interestingly, in the flamingo paper they have provided an alternative hypothesis in another context. In discussing the evolution of bill lamellae in *Pachyptila* (Procellariidae), where different species show different degrees of development, they suggest that “the rudimentary lamellae in the less specialized filter-feeding petrels provide gaps for the expulsion of water while the prey is held in place with the tongue.” Perhaps the lamellae in screamers serve similarly. Even though they are not filter feeders, they do feed on marsh plants and might have use for such drainage. Olson and Feduccia’s hypothesis requires the

re-evolution of a set of primitive characters. In the flamingo paper (p. 67), they consider such a process in the *Recurvirostridae* to be unlikely. Should they not apply the same caution here? Another possibility is that the screamers are the sister group of the *Anseranatidae* + *Anatidae*. This would require fewer evolutionary reversals. I am not arguing one hypothesis over another here, but merely pointing out that alternative hypotheses of this sort can best be evaluated with cladograms showing the distribution of characters among taxa.

The papers by Olson and Feduccia are powerful efforts to synthesize paleontological and neobiological data so as to analyze relationships between major higher taxa. The flamingo paper is especially well argued, as it includes new fossil forms that reasonably bridge the gap between hypothesized ancestors and descendants, as well as an excellent functional interpretation of the flamingo feeding mechanism. The strengths of these papers lie in the detailed descriptive comparisons between numerous fossil and extant forms, and in their uninhibited speculations in a context of stratigraphic and functional considerations. Their weaknesses lie in their indecisive mixtures of phenetic and often poorly-argued cladistic methods, and in their failure to present their phylogenetic hypotheses in the form of dendrograms showing the proposed relationships and the characters on which they are based. In this way they could also show whether their data really allow a particular fossil form to be hypothesized as the direct ancestor of later groups; that is, whether it possesses all and only those derived characters that such an ancestor must exhibit. As noted, the designation of fossils as ancestors is a point of contention between many paleontologists and some of their critics; ultimately, it is a matter of character distribution, which can be displayed unambiguously by a cladogram. An example of the splendid work that can result from the application of rigorous analytical methods to a good fossil record is the study of the *Dromornithidae* by Pat Vickers Rich in the Howard Festschrift volume. Here the hypothesis is set forth precisely in a cladogram with the characters defining each node shown in the diagram and discussed in the text. This paper sets a standard to be followed in studies of this sort.

In *The Age of Birds* Alan Feduccia presents an account of avian evolution for the nonspecialist. He wisely chose to discuss highlights of avian history rather than getting bogged down in endless details or argument. The result is a readable introduction to the subject with a lot of familiar stories adequately retold, some interesting new material, and several irksome shortcomings. Chapter 1, "The feathered reptile," is a retelling of the *Archeopteryx* story. The point of the title is that *Archeopteryx* is a true evolutionary intermediate showing that birds evolved from "reptiles." I must insist that it is not a "missing link," however, because it is not missing. It is just a link. It is not a "reptile" either, it is a bird because it has feathers, a derived condition that defines Aves as monophyletic. Of special value is the review of the more recently discovered fossils, the Maxberg, Teyler and Eichstätt specimens. The photographs are also worthwhile; some are of the familiar London and Berlin specimens, but the newer specimens have not previously been shown in any popular account that I know of.

In chapter 2, *The Ancestry of Birds*, Feduccia reviews the various theories of avian origins. There is a brief mention of recent challenges to John Ostrom's popular view of dinosaurian ancestry, but nothing new is added. Chapter 3, *The Evolution of Flight*, carries us through a familiar tale of hypothetical behavioral stages (jumping, falling, parachuting, etc.) and organisms (Nopsca's and Heilmann's proavian dreams, Ostrom's flyswatters, baby hoatzins). As usual much of the discussion centers on the flying abilities of *Archeopteryx*, and some recent anatomical interpretations are mentioned. However, certain provocative new theories published in recent issues of the *Auklet* are inexplicably ignored. The topics of chapters 2 and 3 are hardly mentioned in the contributions to the Howard Festschrift, most of which have a satisfyingly high ratio of data to speculation. Chapter 4, *Toothed Birds and Divers*,

is mostly standard stuff (*Hesperornis*, *Ichthyornis*) with brief mention of more recent work on wing-propelled divers by Hildegard Howard (auks) and Storrs Olson (plotopterids). Campbell gives an account of Howard's studies of both groups in the Festschrift, where Olson also has a paper on the plotopterids.

Chapter 5 is mostly devoted to an account of Olson and Feduccia's theory of relationships between flamingos, Anseriformes, Charadriiformes and *Presbyornis*, which I discussed above. Although stronger in assertion than documentation, it does provide a sort of phylogeny (p. 95) outlining some of the relationships proposed in the 2 Olson and Feduccia papers, where no such representation was given. A problem becomes apparent here that did not surface in the other papers. In earlier works Feduccia made a point that in *Presbyornis* the nasal-frontal bones are arranged in a V-shaped conformation otherwise found only in flamingos. This seemed important while he was advocating a *Presbyornis*-flamingo connection. In *The Age of Birds* (p. 92), Feduccia merely notes that "the flamingolike nasal-frontal region may still link *Presbyornis* and the flamingos, although their divergence was surely an ancient one." What does this mean? Is this one of those mysterious primitive charadriiform characters often mentioned but seldom documented in these works? This example illustrates the vagueness that results from the lack of a proper character analysis.

Chapter 6, *The Evolution of Flightlessness*, is the best part of *The Age of Birds*, and is the best discussion of the subject in the recent literature, analyzing both familiar examples like the ratites, and illustrating some remarkable new fossils of flightless forms, such as an extinct flightless goose from Hawaii. There is a good discussion of how flightlessness has evolved repeatedly in birds through neoteny. This is based particularly on Storrs Olson's analysis of the flightless rails (Smithson. Contrib. Zool., No. 152, 1973), an outstanding example of the use of fossils to interpret the epigenetic processes by which evolutionary change occurs. There is also a chapter on birds of prey.

The final chapter of Feduccia's book deals with the rise of land birds. This is a long and rambling survey of the major bird groups not previously covered. The fossil record does not provide clearcut evidence for relationships between major groups, and most groups are described more than analyzed. In developing a history of major groups an excessive reliance is placed on the relatively few important fossils. The chapter is characterized by unsupported statements like "Lyrebirds and scrub-birds are clearly the most primitive of the oscines." This statement has a precise meaning, namely that all oscines other than scrub-birds and lyrebirds are clustered by the possession of some derived character(s) for which the latter are primitive. Perhaps they are, but if so we should be told at this point what the characters are.

The book ends with an illustration that purports to show relationships between the Passeriformes, Coraciiformes and Piciformes. Methods now exist, through cladistic analysis, to produce precise and information-rich graphic representations of genealogy. Feduccia claims to accept the validity of this approach (e.g., pp. 151-152), and so it is difficult to understand why he would present the virtually meaningless diagram on p. 180. Most of the groups shown represent lineages that do not connect with other lineages in the diagram. Some end blindly as solid lines, others fade into dashed lines before ending in open space. The entire assemblage is clustered by 2 plesiomorphic conditions, the primitive stapes and anisodactyly, which will not even define the class Aves. The "Alcediniformes" and Trogonidae are shown as sister groups, clustered by an unusual stapes, a character discovered by Feduccia and considered derived within birds. This proves that he knows how to do it right. The suboscines and oscines are shown as sister groups, but only with dotted lines, whose meaning is not mentioned, and no characters clustering them are given (though a couple are mentioned in the text). Four other groups are shown without connections, except that they approach each other at various angles and distances, which may be intended to hint at some suspected

relationship. Some groups have no characters, others have various kinds of different value. For instance, the oscines have "derived syrinx morphology," which is good, "advanced 'passerine' morphology," which is vague, and "double fossa of humerus in advanced lines," which is irrelevant. In this example, *The Age of Birds* does not provide the reader with a coherent account of contemporary methods of phylogenetic analysis.

In recent years, paleontologists have turned strongly toward the use of analytical methods that place their fossils in the context of biology generally, hence the increasing use of the term paleobiology. A major debate now rages dealing with the methods of interpreting fossils in systematic studies. Partly this involves the uses to which the stratigraphic information about fossils can be put. At one extreme are those who argue that the age of known fossils cannot give reliable information about the direction of evolutionary change because the fragmentary nature of the record makes it unlikely that correct temporal sequences will be preserved and discovered, and therefore that fossils should not be designated as direct ancestors of later forms. Instead, it is suggested that all forms should be treated as terminal groups in cladograms. At another extreme is the traditional paleontological habit of linking together many or all fossils, however imperfect, into ancestor-descendent sequences. The heart of the matter is the need for rigorous character analysis, recognition of specimen limitations, and an amiable consideration of other viewpoints. The continuing discovery of new and often remarkable fossil birds is intriguing, but in my opinion it is the controversy over methodology that makes paleornithology the exasperating field that it is today.—ROBERT J. RAIKOW.

CHARACTER VARIATION AND EVOLUTION OF SIBLING SPECIES IN THE *Empidonax difficilis-flavescens* COMPLEX (AVES: TYRANNIDAE). By Ned K. Johnson. Univ. Calif. Publ. Zool., Berkeley, California, Vol. 112, 1980:x + 151 pp., 3 black-and-white plates, 39 figs., 15 tables, 2 appendices. \$9.50.—Someday in the distant future of avian systematics, every complex of geographically variable species and species-groups should be treated by a monograph such as this one, precisely describing the nature and extent of character variation throughout the ranges of its component taxa. Degrees of geographic concordance between variable characters should be analyzed, clines and discontinuities identified statistically and trinomially defended on precisely stated, objective grounds. Areas of uncertainty, and the role of human judgement, should be clearly defined whenever they appear. Behavior should be analyzed along with morphology.

This is not just an idle pipe-dream wafting out of forgotten museum corridors. Phenotypic variation is the grist upon which natural selection operates to produce genetic change and evolution. Careful analyses of patterns of variation thus represent one of the best tools we have for examining the ongoing processes of adaptation and speciation. Furthermore, birds are among the few animal groups in which such analyses are relatively easy to perform, and their rapid responses to differing selection pressures make them especially informative in this respect.

Although we still lack even a single example of a truly complete statistical evaluation of character variation, Johnson's newest contribution to the biosystematics of the genus *Empidonax* is within striking distance of the ideal model. Johnson examines patterns of variation in external morphology, color, and voice within a two-species complex distributed from British Columbia to Panama. He uses a wealth of data, and modern statistical procedures, to focus on critical questions regarding biogeographic, ecological and evolutionary implications of character variation within the superspecies. He concludes with a well-defended taxonomic treatment in which the Yellowish Flycatcher (*E. flavescens*) is recognized at the

specific level, and several confusing forms with uncertain breeding distributions are synonymized into 5 well-defined subspecies of Western Flycatcher (*E. difficilis*). His treatment was adopted in the recent volume 8 of Peters' Checklist of Birds of the World.

The data base of this monograph consists of external measurements and quantitative color indices from 1284 specimens known to have been taken on breeding grounds and sound recordings made from 208 individual flycatchers in the field. For the first time, vocal characters are analyzed with nearly the same rigor as are classical morphological characters. (However, levels of individual and contextual variation in voice are not examined carefully, thereby weakening the conclusions in some cases.) The data presentation and conclusions are based on 3 statistical procedures. Two of these—principal components and phenogram analyses—are widely used multivariate approaches for clustering populations hierarchically according to degrees of numerical similarity between them. Strictly a phenetic study, this report includes no discussion of primitive-derived sequences or directions of evolution, outside of a few generalized hypothetical scenarios near the conclusion. The advantages and drawbacks of this phenetic approach at the species, subspecies and population level of analysis are abundantly discussed elsewhere, and will not be addressed here. Johnson's stated intent was to statistically assess the nature and geography of variation within the entire complex, and to draw evolutionary inferences from the observed patterns. For the most part, his assumptions are stated or clearly implied.

The third statistical approach still is relatively little-used in ornithology, although mammalogists have begun using it extensively. Under the alliterative but uninformative term "Sum of Squares Simultaneous Test Procedure" (SS-STP), this univariate, multiple range analysis ranks populations into statistically homogeneous subsets within the total variation represented in a single character, without regard to locality. For graphical purposes, Johnson arbitrarily splits the total variation in each character into 5 equal parts, then plots each population on a map using a symbol that displays the population's position in the 5-part ranking with respect to the character being analyzed. The procedure has several advantages and disadvantages. On the one hand, it condenses onto 1 figure a tremendous amount of information regarding gross similarities between sites. A separate figure is shown for each character analyzed, and these can be compared easily by eye. Regions bearing relatively little geographic variation, zones of abrupt character change and widely separated areas of convergence or parallelism all emerge clearly. Each figure displays the statistical significance of between-site variations by its identification of homogeneous subsets. On the other hand, the procedure is not sensitive to differing degrees of character variation between localities. Much quantitative information is lost in the mapping procedure whenever a character shows pronounced divergence in any of the populations (e.g., tail length, Fig. 13). Furthermore, in all cases the maps and accompanying graphs of statistical data require long and careful scrutiny before their full meaning, and the overall picture, can be grasped. Sometimes, scrutiny reveals no statistical difference between populations that bear different symbols on the map. It is not clear how this procedure improves upon the highly informative approach used by Crowe (Ann. South African Mus. 76:43-136, 1978), Christman (Bull. Florida State Mus., Biol. Sci. 25:157-256, 1980) and others for mapping univariate character variation using isoclines. Johnson does not address in any detail the relative advantages and drawbacks of the SS-STP technique.

A variety of novel and intriguing results are presented. Perhaps the most intriguing begins with abundant evidence that zones of abrupt character change are interspersed with broad "adaptive plateaus" in which relatively little change occurs over large areas. The importance of this is magnified by the fact that the areas of sharp change are concordant between characters, including certain aspects of color and voice, as well as various physical structures. This pattern probably typifies species with localized, highly differentiated races at

upper elevation in mountainous areas (e.g., the Andes). However, Johnson's results apply to widespread, low altitude forms showing suites of character changes across relatively tiny geographic distances. The broad picture suggests to Johnson that step-wise colonization of new areas gave rise to the modern forms. Each area represents a relatively unvarying adaptive zone, but differences are pronounced between areas. He uses this as a paradigm of evolution within the genus as a whole, and cites a zone of apparently recent contact between 2 well differentiated races in northern California as a case in which divergence, especially in voice, is just short of species-level. I would have appreciated even more elaboration on why this interpretation was favored over a vicariance model, which is the major alternative to the one presented.

Among other informative conclusions, Johnson shows a possible reversal of the "Kluge-Kerfoot" phenomenon within *Empidonax*. Intrapopulational variation appears to be inversely correlated to that between populations, when polytypic *E. difficilis* was compared to the widespread and monotypic *E. hammondi*. A detailed examination of this question would be enlightening within such a remarkably homogeneous genus.

Johnson maintains that *difficilis* shows less sexual dimorphism than does its allopecies, a potentially exciting result. However, in the one character he chose to document with tables, a glaring error is revealed in the summary table (Table 2, eighth entry in right column) and the conclusion is not supported. Together with the miniscule scale of those differences he does show, this defect (the only major one I found) left me skeptical of the overall conclusion.

I was disappointed by Johnson's cursory treatment of the cause of divergence in vocal characters during allopatry, although he neatly shows that the phenomenon frequently occurs. Clearly this is an important issue in this and other tyrannid genera. Nevertheless, Johnson skirts the question in one sentence by invoking either pleiotropy between features of song and morphology, or random differences in the auditory environments between populations. In his conclusionary, "founder-by-dispersal" model for sibling-species evolution, Johnson allows vocal characters to differentiate, albeit more slowly, along exactly the same monotonic, gradual path toward full reproductive isolation as do his morphological characters. However, his vocal data do not support this; degrees of morphological and vocal differentiation are not well correlated with one another, at least when examined carefully by eye. This complicated but critical problem remains unsolved, and, in my opinion, it remains the problem in most need of detailed study with respect to *Empidonax* evolution.

In sum, this is far more than a taxonomic work. Indeed, the well-argued taxonomic summary emerges merely as a logical and convenient byproduct of a long term study whose principal intent was to make biological sense out of a variegated pattern of physical and behavioral variation in a complex taxon. As such, in ornithology at least, Johnson's work represents a new state of the art.—JOHN W. FITZPATRICK.

ECOLOGY AND EVOLUTION OF LEK MATING BEHAVIOR IN THE LONG-TAILED HERMIT HUMMINGBIRD. By F. Gary Stiles and Larry L. Wolf. Ornithological Monographs No. 27, American Ornithologists' Union, 1979:viii + 78 pp., 15 tables, 26 figs. \$8.50 (\$7.50 to AOU members).—This monograph presents the results of a 4-year study of lek behavior in *Phaethornis superciliosus* in primary wet forest and second growth at Finca La Selva, Costa Rica. The social systems of the hermit hummingbirds (Phaethorninae) are poorly known, although the work on 3 species in Trinidad by D. Snow and B. Snow is an outstanding exception. This deficiency is understandable, for most species are small, drab-colored, fast moving, and therefore difficult to observe in the poor light of the dense forest understory. Stiles and Wolf studied the social organization of 4 leks on which they captured and color-marked most resident individuals. They provide a detailed description of visual and vocal display behavior

(but unfortunately no sonograms) and compare it with that of other hermits. As in other studies of hermit leks few matings were seen, probably because the frequency is low, but possibly because many occur away from leks. Homosexual copulation and "false" matings with leaves were common, and an analogy is drawn between the latter and mammalian masturbation. Seasonal and daily patterning of lek activity is described in detail and correlated persuasively with the temporal availability of nectar. The characteristics of lek sites and of male territories are also documented.

The most important sections of this paper deal with foraging ecology and the dynamics of male relationships. It is here that the authors make their two most significant contributions to our understanding of lek evolution. Previous workers have argued that the evolution of avian lek behavior is linked to the abundance and spatio-temporal dispersion of food, but few lek studies have incorporated a systematic examination of the pattern of resource distribution and exploitation. The energetically optimal male strategy in many hummingbird species is to defend a food-centered territory, which females must enter for feeding and copulation. Male Long-tailed Hermits are prevented from using this strategy because other hummingbird species aggressively exclude them from most economically defensible clumps of flowers, including the larger clusters of *Heliconia pogonantha*, which is adapted for hermit pollination and is one of the main nectar sources for *P. superciliosus*. Instead, they commute from a non-food-centered lek territory to a series of regularly-patrolled, undefendable nectar sources scattered along a "trapline." Thus, interspecific competition for food appears to have been a key influence on the evolution of the mating system in this species.

Why do males congregate in leks rather than display more solitarily? The authors reject enhanced predator detection as a significant factor, arguing that such an advantage should be restricted mainly to open habitats where several lek residents can simultaneously observe approaching predators. But the advantage could be even greater in dense forest where predator detection is more difficult, although presumably a comparable reduction in individual surveillance levels to that observed in more open habitats would be impossible.

Stiles and Wolf discovered a "dominance gradient" in *P. superciliosus* leks. The most dominant males occupied stable central territories while subordinate males held less stable peripheral ones. By analogy with other lekking species it is argued that most mating probably occurs centrally, and that the proximate cues used by females in mate selection are differential male activity levels. Central males were more closely spaced and sang more than peripheral ones. The authors postulate that hermit lek systems offer females an index of male dominance (a term they use rather loosely). But while such "information" would clearly be important in an established lek system where intermale relationships affected male mating success, I am less persuaded that it could be an important selective force favoring communal over solitary display unless it also indexed performance in some vital off-lek behavior. If the authors are correct in viewing this as a major factor in lek evolution in the Long-tailed Hermit, ancestral prerequisites must have included both a potent influence of stimulus pooling on females and a shallow dominance gradient, as indeed is currently the case.

The few sexually monomorphic lekking species are vital links in developing our understanding of lek evolution, but they have been little studied. This monograph does not really elucidate the significance of monomorphism in *P. superciliosus*, but it does establish a convincing link between surprisingly high adult male annual mortality levels, the absence of sexual bimaturism, and the relative shallowness and less strictly age-graded nature of the dominance gradient compared with those of other lekking birds. Food shortage in the non-lekking season is suggested as the principal source of mortality, but one cannot help wondering about the role of predation, even though males' survivorship during the lekking season when they are most conspicuous is better than that between seasons.

This monograph is well-written and contains few typographical errors. A number of im-

portant statements and conclusions are not backed by any quantitative evidence, and statistical tests of significance are used rather sparingly. Nonetheless, this is a very valuable contribution to the avian polygamy literature. The forest-dwelling lek hummingbirds are notoriously difficult to study, and the authors are to be congratulated on the depth and range of their investigation.—ALAN LILL.

FORM AND FUNCTION IN BIRDS, VOL. 1. By A. S. King and J. McLelland (eds.). Academic Press, New York, New York, 1979:xi + 459 pp. \$64.50.—The first part of a 3-volume, multi-author treatise, this book contains 7 chapters on a diversity of topics. The intent of the series is to provide fairly lengthy and detailed accounts of the functional anatomy of birds. As nearly as I can determine the meaning of “functional anatomy” in this context, it is what used to be called physiology before the latter became indistinguishable from biochemistry. The format of this work, then, is a combination of thorough descriptive anatomy with basically nonchemical interpretations of function. The latter often includes material dealing with evolutionary, comparative and adaptational aspects of form and function. Although a disproportionate amount of experimental work is still limited to a few species, especially the domestic chicken, the book definitely lies in the realm of zoology rather than poultry science.

The first chapter is a general review of principles of avian morphology by A. S. King and D. Z. King. This provides an overview of the subject as a context for the specific topics of subsequent chapters, but it is not a superficial summary of avian anatomy. Instead, the authors chose to examine the way in which the most general specializations of birds, endothermy and flight, have influenced the various organ systems. The chapter also includes an excellent review of recent controversies in avian evolution. Rather than taking sides, King and King review the pros and cons of various theories on the reptilian ancestors of birds, and the evolution of endothermy, feathers and flight.

The remainder of the book is devoted to chapters with no particular logical relationship. The editors note that the chapter sequence was unfortunately determined by the various authors' writing schedules.

Hans-Rainer Duncker provides a review of the little-studied avian coelomic cavities. An understanding of the subdivisions of the body cavity is achieved by a study of their embryonic development, their arrangement as compared to various reptilian and mammalian groups and their functional significance, especially in relation to the respiratory system. The digestive system is discussed by John McLelland. His extensively comparative account includes the oral cavity and pharynx, esophagus, stomach, intestines, pancreas and liver. The digestive system is broadly defined here to include such feeding structures as the tongue and bill as well as the alimentary canal and its glands. There is a strong emphasis throughout on adaptive variations as related to different methods of feeding and types of food.

The urinary organs are reviewed by Oscar W. Johnson. Gross and microscopic anatomy of the kidney and associated organs is analyzed in relation to function. The renal blood supply is examined in detail, including the complex renal portal system with its capability for varying patterns of blood flow through the kidney. A. B. Gilbert's long chapter on the female genital organs includes a detailed account of the avian egg as well as the reproductive organs themselves. This account is especially dependent on the domestic fowl owing to the relative lack of comparative information. The same is true for the brief chapter on the blood cells by R. D. Hodges. In the final chapter on the autonomic system, A. R. Akester emphasizes that the neural systems regulating visceral and somatic functions are not so independent as tradition and the term “autonomic” might suggest.

A high level of scholarship and thoroughness is evident throughout this book. All of the chapters are more than adequately illustrated with line drawings and photographs. Although

the chapter topics are not always closely related, some integration is provided by a comprehensive index. This valuable work is too expensive for most individual purchasers, but institutional libraries should obtain the series.—ROBERT J. RAIKOW.

EVOLUTION OF THE VERTEBRATES, THIRD EDITION. By Edwin H. Colbert. John Wiley & Sons, New York, New York, 1980:510 pp., 160 line drawings. \$25.00.—First published in 1955 and revised in 1969, this standard textbook of vertebrate paleontology has now been revised again to incorporate new fossil discoveries, reinterpretations and the implications of the theory of continental drift. As a relatively nontechnical survey of vertebrate history it is an excellent college-level textbook. For the purposes of this journal I will limit further comments to the book's coverage of birds. Here it is disappointing because the subject is treated so briefly, about 7 pages as compared to over 200 for the mammals. Colbert justifies this on the basis that birds have relatively little diversity, especially in the parts that fossilize; there is much truth in this. Nevertheless, there are many fascinating forms that should merit additional discussion, such as the Cretaceous toothed birds, the great flightless land birds of the early Cenozoic, the pseudo-toothed *Osteodontornis* and the extensive Pleistocene avifauna from the California tar pits. Likewise, matters of controversy such as the reptilian group ancestral to birds, the locomotor habits of *Archeopteryx* and the various theories on the origin of flight deserve more than the passing mention that they receive.—ROBERT J. RAIKOW.

THE HAWAIIAN GOOSE: AN EXPERIMENT IN CONSERVATION. By Janet Kear and Andrew J. Berger. Buteo Books, Vermillion, South Dakota, 1980:154 pp., 1 color plate, 24 black-and-white photographs, numerous drawings, 37 figs., 2 tables, 8 appendices. \$30.00.—The Nene, or Hawaiian Goose (*Branta sandvicensis*), has become one of man's few success stories in attempting to bring back a species from the brink of extinction, and it is fitting that a monograph be done to document these efforts. This book is a historical account of the joint effort of Hawaiian and British workers to save the Hawaiian Goose, and is broken down into 3 major sections: chapters 1 and 2 give a historical background of the Nene; chapters 3 and 4 document the captive breeding efforts in Hawaii and England; and chapters 5 and 6 deal with the release program in Hawaii and prospects for the continued existence of the species.

The book starts with a historical background on Hawaii and the avifauna beginning with the discovery of the islands in 1778 by Captain Cook. I imagine that no one who purchases this book will be without Berger's Hawaiian Birdlife (University Press, Hawaii, 1972), and much of this section, including figures, seems redundant to that effort. It is not until p. 21 that the Nene is introduced, and thereafter follows a very complete historical background on the bird. The work of Baldwin (Condor 47:27-37, 1945) is heavily relied upon as a base from which to compare population declines. The authors conclude that shooting by man and the impact of introduced ground predators have probably been the major contributing factors affecting the Nene decline.

Chapter 2 deals with the morphological, behavioral and ecological background on the Nene, covering voice, size, structural adaptations, habitat, food selection and reproduction of the bird in the wild. Sonograms of the Nene are scattered throughout this chapter as are good line drawings of the trachea, skull and feet by Tim Halliday. All habitats in which Nene have been found are described, as are food items which the birds have been known to eat. The reader is sometimes confused in this section because of the authors' ambiguity in dealing with the question of food limitation. For example, on p. 43 they say: "At present, food resources at the higher altitudes where Nene are found, are not considered to be the factor

limiting their numbers," yet on p. 52 they write: ". . . and a shortage of high-protein and high-calcium food might make a second clutch unusual in the wild," and on p. 102 ". . . the introduced wild turkeys (*Meleagris gallopavo*) might be significant competitors for the berries." They also state that the "stones" (seeds) of the pukiawe are passed through the bird undigested, and this may be, but I know of no study to date which has shown this to be true. The small amount of data presented by the authors on reproduction in the wild points up the fact that very little is still known about this bird outside of information available from captive breeding. The behavioral aspects of reproduction are well covered and are supplemented by black-and-white plates depicting various threat displays.

The next 2 chapters are the meat of the book and deal with the captive rearing programs at Slimbridge, England and Pohakuloa, Hawaii. Chapter 5 is devoted to the Hawaii program and follows it from the inception in 1927 through the present. It is evident throughout this chapter that little data were made available to the authors other than summary information, because the overwhelming amount of new information contained within the book is from the Slimbridge project. The comparison of the 2 breeding programs shows some striking differences (e.g., egg weights) but is hampered by the small sample size or lack of data from the Hawaii project. Hopefully, some day all of the information from the Pohakuloa project will be published so that a complete comparison of the 2 programs can be made.

The captive rearing program at Slimbridge is very well covered in chapter 6. More often than not avicultural efforts such as this are left unpublished, and this synthesis of the Nene program at Slimbridge is the major ornithological contribution of the book. The topics of husbandry, pairing, breeding season, fertility, clutch and egg size, hatching and growth, mortality, and a comparison with the Hawaii program are made. There is a wealth of information presented in this chapter, but instead of being synthesized into a format useable to scientists, the data are presented in raw form (often percentages), and principally in appendices. Many superficial comparisons of the data are made, but the reader is often left wondering what statistical analysis was employed. This is compounded by the fact that the variances associated with much of the data are usually quite large. In some figures, lines of best fit are "eye-balled" through the data (e.g., Figs. 35 and 36), and major "trends" are discussed, which in one instance is the result of an aberrant point with a sample size of one (Fig. 35). However, the raw data are available in the book, and interested persons could pursue it if they so desired.

The sections on fertility and mortality of the Slimbridge flock are extremely well done, with the latter presenting detailed information on maladies, diseases and parasites of the Nene heretofore not recorded. Atherosclerosis was a very common cause of death in older birds, and other maladies included aspergillosis, avian tuberculosis and parasitic helminths. Although a number of the Nene in England had lesions indicative of avian pox, the virus was never isolated or positively identified. The authors initially qualified their diagnosis of this disease, but later in the book lapsed into assuming that avian pox was the pathogen (see Appendix 7 and Index).

Chapter 5 synthesizes much of what has been covered previously into the context of the release program in Hawaii. Separate sections deal with releases on state, private and National Park lands on Hawaii, and at Haleakala National Park on Maui to where the Slimbridge birds were returned. Reasons for the failures and successes of the releases are well documented. However, the problem of Nene band loss is mentioned only in the caption of Plate 5 and should have been dealt with at greater length. For a variety of reasons, band loss has been extensive in the wild Nene populations and has become a major problem in determining the success of the release programs.

The concluding chapter addresses the question of whether the over 1500 released birds have increased the breeding potential of the wild Hawaiian Goose and if the native population

will now be able to sustain itself indefinitely. The authors are well aware of the problems in attempting to answer these questions and write: "We still do not know, other than in general terms, what brought the species so low, and so cannot be sure that the hazards have been removed or are being effectively controlled." They continue: "Because of this inadequacy of information, it is impossible to be definite about the outcome of the reintroduction phase of the programme." However, their attempt to synthesize this problem into tentative, yet meaningful conclusions is admirable. They warn about the long-term effects of captivity on the genetic make-up, pathological conditions and the effects on behavior of the propagated birds. They further caution about the suitability of the habitat which will receive the reintroductions (e.g., predator levels, newly developed adverse factors), gradual settlement techniques and adequate follow-up surveys. They continually stress throughout the book the need for an intensive field study of the bird, and it can only be hoped that Nene managers in Hawaii will heed their suggestions. There is no question that the captive breeding program has saved the Nene from extinction, but when the authors expand their discussion to encompass other endangered species they recommend that only as a last resort should animals be taken into captivity, bred and released.

Overall, the book is well written and is easy to read. Outright errors are few, but some Hawaiian plant names are misspelled: "pukeawe" should be pukiawe; "mamani" should be mamane; "Mauna Silver Sword" should be Mauna Kea Silver Sword; the correct common name for *Melamprosops phaeosoma* is Po'o Uli not the "Black-faced Honeycreeper." There are 8 appendices of which numbers 1 and 8 add little to the book. The 143 references in the bibliography are as complete a list on the Nene as can be found. The 4-page index is adequate.

In summary, the authors should be commended for their job of tying together what is presently known about the Hawaiian Goose. They have not only provided a scholarly account of the bird, but have also successfully bridged the gap between aviculture and ornithology. Although the price of the book is quite high, even by today's inflated standards, those aviculturists who raise Nene, conservationists concerned with endangered species and ornithologists interested in the Hawaiian avifauna will find the book a good reference for their libraries.—CHARLES VAN RIPER III.

BIRD COMMUNITY DYNAMICS IN A PONDEROSA PINE FOREST. By Robert C. Szaro and Russell P. Balda. Cooper Ornithological Society, Studies in Avian Biology, No. 3, 1979:66 pp., 39 figs., 21 tables. \$6.50.—This monograph reports on the breeding-bird populations of 5 ponderosa pine plots in northern Arizona that were subjected to a variety of modifications: clear-cutting, uniform thinning, strip-cutting, silvicultural cutting and an undisturbed control. Some of these manipulations were apparently feasible as a result of studies by others on the role of timber management in modifying stream flow and wood production. This study's purpose was "to measure and evaluate (1) the effects on the diversity, density, and behavior patterns of the breeding birds of the ponderosa pine forest of such results of habitat manipulation as differing foliage volumes, foliage patterns, and densities of trees, and (2) the standing crop biomass, consuming biomass, and existence energy requirements of the breeding birds on each plot." I believe that the study accomplishes the task of measuring these variables well, but that its success in evaluating these results is less notable. To some degree the copious production of data may have compounded the problems of interpretation; at any rate, an appropriate synthesis is never really accomplished. One is exposed to large amounts of only moderately digested data, and is presented with one example after another in the text, rather than a concise synthesis of emerging principles. The data reduction in many of the 39 figures and 21 tables is often minimal, although a wide array of statistical tools exists

for attacking such problems. As a consequence, in its present form this paper may be of interest primarily to investigators who work on the birds of ponderosa pine forests. On the other hand, the raw data are published for others to use.

Much of the analysis attempted deals with such topics as bird species diversity, evenness, foliage height diversity, plant species diversity, etc. The problems with many of the standard techniques of analyzing these topics are now well-known, and have generally been responsible for their decrease in popularity. In fact, the study found no correlation between bird species diversity and measures of vegetational complexity, and the authors themselves note that the technique was not appropriate to find systematic differences in a study such as theirs.

Enough of what this report is not. There are several interesting points that emerge from the study. One is the regional differences from ponderosa pine forests in other areas—population densities are particularly low here, even in the undisturbed study area. Between-year differences were also quite marked in some plots, but not others (replicates would have been welcomed here, even though they probably would be infeasible in a study conducted on this scale). Specific attention to regional and yearly differences and their likely bases would have focused this paper profitably and would have spoken to subjects now being recognized as important and interesting ones in their own right. In this paper one has to glean through several sections to pick up what commentary is presented on the subject.

The differences in bird populations between ponderosa pine forests and eastern coniferous forests are stressed, which the authors relate to the low representation of parulid warblers in the western coniferous forests (7–20% of the avifauna vs 50% or more in some eastern forests). The basis for this disparity is unclear, although the authors emphasize Mengel's thesis of geographical accident. However, it should be noted that the appropriate comparisons here are to eastern hard-pine forests (e.g., pitch, jack, loblolly, or longleaf pine), rather than the eastern spruce-fir forests that are renowned for their high and varied warbler densities.

Some interesting apparent replacements (pairs of species) were noted, with examples of apparent ecological release from plot to plot (e.g., Yellow-rumped [*Dendroica coronata*] vs Grace's [*D. graciae*] warblers). However, although these examples are treated as consistent with competition theory, no further attempt is made to establish whether or not a causal relationship exists.

Thus, the authors have collected a sizeable data set on the breeding birds of ponderosa pine forests, but they have missed a number of opportunities in their analysis of it. One hopes that they have planned further papers to exploit this resource.—DOUGLASS H. MORSE.

CONSERVATION BIOLOGY: AN EVOLUTIONARY-ECOLOGICAL PERSPECTIVE. By Michael E. Soulé and Bruce A. Wilcox (eds.). Sinauer Associates, Inc., Sunderland, Massachusetts, 1980:395 pp. \$14.95.—This collection of reports is unique as a conservation book for several reasons, the most surprising of which is that most of the authors are "pure" scientists, and not applied biologists. The text is divided into 4 major sections: Ecological Principles of Conservation (4 chapters); the Consequences of Insularization (5 chapters); Captive Propagation and Conservation (5 chapters); and Exploitation and Preservation (4 chapters). In Part I, Larry Gilbert presents a holistic approach to conservation biology, noting in particular the complex construction and interdependence of tropical food webs. This chapter will orient the student or non-ecologist to the great complexity of species diversity patterns in the tropics and their dependence on ecological succession. Gilbert notes the importance of constructing preserves so that key species (those having an important effect in food web cohesion, etc.) are included in an area that is diverse enough to contain all plants and animals important to

their continued existence. John Eisenberg compares mammal biomass in New and Old World tropical areas. He suggests that large, hard-to-observe species (e.g., leopards, jaguars) should be studied to gauge the "health" of the environment to be preserved, because they are often sensitive to environmental degradation. Jared Diamond reviews the conservation aspects of island biogeography theory as applied to patchy habitats. He notes that patchy distributions pose difficult problems for preservationists intent on saving several species distributed in this manner, because one is often confronted with the choice of either making a single large preserve, which may contain only 1 or 2 species, or many small preserves, which may contain a large number of patchily-distributed species, but may not contain large populations of associated species. Throughout this volume it is suggested that large reserves are preferable to small ones. Robin Foster continues the discussion of heterogeneous environments, noting their importance to the maintenance of species diversity.

In Part 2, Bruce Wilcox reviews the well-known ideas of species equilibria and their importance to conservation strategy. John Terborgh and Blair Winter present a short essay on species extinction, and conclude that species should be kept from becoming rare if they are to persist, which is fairly self-evident. Ian Franklin presents an interesting review of the evolutionary changes that may take place in a small population. He suggests that populations must be kept above a minimal number of breeding individuals (anywhere from 50-500) if deleterious genetic effects are to be avoided. Michael Soulé continues the discussion of the genetic aspects of conservation and emphasizes the importance of maintaining high levels of heterogeneity if fitness is to remain high. Soulé uses the wolf as an illustration of how genetic considerations might require a wolf preserve to contain anywhere from 12,000-120,000 km² of habitat! Daniel Goodman presents a fine discussion on the application of demographic theory to conservation problems, illustrating the importance of understanding the demography of a species before attempting long-term game management practices.

Part 3 contains papers dealing with the propagation of captive animals. The various chapters by William Conway, John Senner, Kurt Benirschke et al., and Devra Kleiman point out the complex problems that must be solved in a successful propagation program. The captive species must be extremely well-studied, biologically speaking, if one wishes to propagate it so that ecological and genetic parameters are part of the propagation program. It is also an expensive endeavor. Sheldon Campbell provides a short chapter on problems of reintroducing animals to their original habitats. I would have preferred a much more detailed discussion of this topic because earlier chapters make it clear that zoos will not be a salvation for extinction-prone species.

In the final section (Part 4), Malcolm Coe reviews the status and history of wildlife conservation in Africa, while T. C. Whitmore discusses tropical rainforest conservation. R. M. Pyle presents a brief essay on nature preserve management. The final chapter by P. R. Ehrlich will be familiar to anyone who has kept up with the popular writings of this author. I feel that Ehrlich's analysis, which may appear pessimistic to some, is actually optimistic. He concludes that conservation is not a lost cause for 2 reasons: we can delay environmental destruction and then enjoy the diversity of nature that remains for the time being; and, we can possibly reach a point where it is understood, on a world-wide basis, that continued economic and population growth are antithetical to conservation. Few could argue with the first point, but realistically, who can expect the second?

This volume, like any multiauthored work, suffers from a lack of cohesion, from repetition and from a lack of continuity of style. It is not a textbook of conservation biology, but is more involved with the ethos of conservation, and should be read by everyone interested in the problem of environmental degradation. I was impressed by a single, overriding thread connecting each chapter. We need to know a lot more about the biology of species, communities and even ecosystems if we are to manage them effectively. In many cases, theory

has outstripped our empirical understanding of nature. Yet few people are engaged in aut-ecological studies, and funding for such research is slight. Applied biology is still looked down upon by the scientific establishment, yet each author implied a desperate need for just the kind of data that are no longer considered worthwhile or elegant.

Ehrlich likened the conservation strategy of ecologists to passengers on a plane. If we were going to fly in an airplane and the pilot began tossing out a few bolts here, a flap handle there, we would probably be apprehensive about the flight. He suggests that in nature, as in an airplane, we must save all the parts, for they form an integral whole. I will close this review by continuing the analogy. If you find yourself in a plane with an unconscious pilot, what should you do? You had better learn how to fly, and you had better learn fast. At the moment, conservationists are not sufficiently united, nor are most people sufficiently concerned, to devote any significant effort to conservation biology. The authors of this volume have tried, at least to the extent of writing a chapter, but how many of us are really willing to dedicate a significant effort to conservation biology, particularly when we are rewarded for more esoteric research? If we're going to learn how to fly that pilotless airplane, we had best get to practicing while we still have some altitude. Because when that's gone, it will be too late.—MICHAEL A. MARES.

ALLAN BROOKS: ARTIST NATURALIST. By Hamilton M. Laing. Special Publication No. 3, British Columbia Provincial Museum, Victoria, British Columbia, 1979:x + 249 pp., frontispiece (portrait), 8 color plates, 117 unnumbered text figs. \$10.00 (paper), \$16.00 (cloth).—Allan Brooks (1869–1946) was for more than 50 years a resident of southern British Columbia (Chilliwack, Sumas, Okanagan Landing, Comox). He early sustained himself by professional collecting as well as by trapping, market hunting and fishing. He assembled an important collection of more than 9000 well-made, copiously labelled bird skins now in the Museum of Vertebrate Zoology, University of California, Berkeley.

The bare facts of his life have been recorded by his wife M. Brooks (*Condor* 40:12–17, 1938) and H. M. Laing (*Auk* 64:430–444, 1947). See also appreciations by W. L. Dawson (*Condor* 15:69–76, 1913) and H. Harris (*Condor* 48:145–153, 1946).

Born in India to Northumberland parents (his father was a well-known amateur naturalist), and self-educated, Brooks (Fellow, AOU) was a modest but respectable contributor to the faunal and systematic literature. He is best remembered, however, as the illustrator of some 20 ornithological works. With Louis Agassiz Fuertes (1874–1927), he was one of the 2 principal American workers in this area for the first third of the twentieth century.

Although his painting had devoted admirers among ornithologists, as art I have long found it seriously wanting (even allowing for his self-training, for the devastating requirements of this form of illustration, and for the generally weak landscape of bird painters to the time). His vegetation is formularized, his water tritely faked, his palette limited and endlessly repetitive, running too much to baby blues and sentimental pinks. Worse, his birds seem conventionalized, sometimes almost as though traced around generic templates. There are too many surprised-looking hawks and sway-backed passerines. There is no strength of line and no subtlety; many flying birds are grotesquely misshapen. I am afraid that these responses once led me to suppose that the author of such pictures must be of weak character, a conclusion made impossible by other evidence.

Brooks was an inveterate, if taciturn, diarist and a tireless sketcher and it is here that the present, well-illustrated little book makes its principal contributions. Extensive selections from the diaries are effectively interwoven with letters and the reminiscences of veteran naturalist Laing and other friends. The picture emerges of an extraordinarily hardy, self-sufficient, hard-headed near-loner compulsively and narrowly addicted to wild creatures, the

outdoors and the practical and sporting uses of firearms for game both large and small. His marriage at the age of 57 understandably startled his friends but seems to have been successful.

Equally revealing, and more surprising, are the many previously unpublished sketches and informal studies which, if not master drawing, clearly suffer from none of the deficiencies noted above. Compare, for example, the graceful, well-appreciated, truly falconine Peregrine on p. 137 with the pop-eyed, squab-like travesty portrayed on p. 110 of J. B. May's *Hawks of North America* (Natl. Assoc. of Audubon Societies, 1935). Many of these sketches are charming, economical, forceful and alive with an authenticity that cannot be faked. I note especially the Spotted Owls (pp. 78, 95), magpie (p. 97), Bobolink (p. 195), Canada Goose (p. 225), Ruffed Grouse (p. 232) and Oldsquaws (p. 236).

How does one resolve the enigma of the uncommonly great gulf between sketch and finished illustration found here? As a working hypothesis, I think that this untrained and late-blooming artist (he did not achieve wide recognition until he was past 50), a man given to quick and firm convictions yet perhaps traumatized by the requirements of "finish," fell too easily into any stereotypy that worked. Once he learned "how" to do what he needed to, he saw no need for change. He never thought seriously of himself as an artist, listing his occupation as "illustrator."

As to his strength of character, if more evidence is required, Major Allan Brooks (DSO), at the age of 49, voluntarily far in advance of the British lines in February, 1918, in 2 days of furious action personally killed at least 20 enemy soldiers with his own rifle. His personal toll of the enemy, 1914-1918, was evidently far greater. He seems almost never to have spoken of this period later.

This book is slow reading at times but it is a significant document in the history of ornithology and bird painting, as well as of British Columbia. It will appeal also to those mature citizens who remember with nostalgia the Reed bird guides and the unrestricted collecting permit.

The book needs a map. Its many typographical errors may be forgiven an author who was 96 at press time. The editors, if any, are less immune to censure but overall, the harm was slight.—ROBERT M. MENGEL.

HAWK LADY. By Stellanie Ure. Doubleday and Co., Inc., Garden City, New York. 1980:216 pp., 14 black-and-white plates with captions. \$11.95.—Hawk Lady presents anecdotal accounts of the attempts of Mrs. Ure to rehabilitate raptors. She is not a professional ornithologist, but her diary-like vignettes are "down-right" honest and serve best by warning of what not to do when caring for raptors. Overcrowding birds, housing small with large species, using chicken wire on cage walls, and risking injury from mishandling are clearly examples of what not to do.

The book is aimed at a young audience, 11-13 year olds, with much biographical material about the Ure's personal lives, particularly the children's. This approach induces the author to personify nature, a common tendency in writing for children. Personification may allow insight, provided those selected attributes of nature are accurate and repeatable. If not, natural things and events are distorted. Mrs. Ure's naming of 2 Great Horned Owls (*Bubo virginianus*) after a rather base comedian team of Cheech and Chong, and symbolizing our national bird after Shakespeare's Romeo is misleading in educating the young about birds of prey.

Although the Common Flicker (*Colaptes cafer*) was incorrectly referred to as the Red-shafted Flicker, I was pleased to find the correct common name, American Kestrel (*Falco sparverius*), being used in most instances. However, the means for determining aging of

kestrels by the amount of spotting on the breast is unconfirmed. Another minor error is found in Mrs. Ure's descriptions of a Goshawk (*Accipiter gentilis*) "stooping" to its prey. The term stoop best refers to a specialized method of attacking prey by various species of falcons. This is also true of the term tercel, which designates male individuals of the Falconidae, not males of the Accipitridae as the text indicates in its reference to "tercel Cooper's Hawks" (*A. cooperii*). On the last page, under the listing of raptors, the scientific name of the Pigeon Hawk (*F. columbarius*) was misspelled.

While I cannot recommend the purchase of the book, I applaud the Ure family, especially their children, for being concerned with injured, diseased, or stranded birds of prey. I think, however, that the book reveals that we raptor biologists should provide better guidelines than presently available for the successful rehabilitation of raptors.—THOMAS G. BALGOO-YEN.

STRICTLY FOR THE CHICKENS. By Frances Hamerstrom. Iowa State University Press, Ames, Iowa, 1980:136 pp., 58 black-and-white photographs, 28 illustrations. \$11.95 (hard cover).—Since the mid-1930's, Fred and Frances Hamerstrom have spent the greater part of their lives in pursuit of information about the Greater Prairie Chickens (*Tympanuchus cupido*) of Wisconsin. The efforts of the Hamerstroms to understand the lives and needs of the prairie chickens have been largely responsible for saving this species from almost certain extinction in that region. By abandoning a life of comparative luxury and ease, and as biologists daring to live in more remote areas and in unconventional ways, the Hamerstroms have perhaps attracted more than their share of memorable experiences.

Strictly for the Chickens is a collection of stories about the lives of the Hamerstroms. Yet this book could scarcely be called a biography in the traditional sense. For we are not given a detailed series of interrelated chapters neatly following in chronological order. But rather, a series of "short stories" about events and experiences, perhaps roughly in chronological order, but which leave the reader to fill in by imagination much of what might have happened throughout their lives. Each chapter presents a light-hearted behind the scenes look at many of the problems, people and events through 50 years of wildlife studies in central Wisconsin.

The topics range from the struggle to survive on graduate stipends while living in formerly abandoned farmhouses, to coping with irate and incredulous neighbours who misinterpreted and exaggerated or refused to accept the well intentioned activities of wildlife biologists. Frozen water pumps and smoking wood stoves, the problems of trapping and marking prairie chickens, graduate student life, visits by federal inspectors, having and raising children, a visit to Germany, raptor banding 'on the sly,' visiting scientists and the varied antics of some 7000 observers who came to 'help' with the work have all provided moments of tension and frustration. Yet through the understanding of Frances Hamerstrom these and other events have been brought to life with warmth and humor. In the often too serious world of science, it is indeed a pleasure to be reminded of the equally important lighter moments, which help to put life back into proper perspective.

While perhaps somewhat frustrating for lack of more information about the author's life, the stories are a charming insight into the activities of 2 very interesting people. The book is easy to read and the style compels one to continue to the end of each chapter and indeed to start into another. The text is liberally sprinkled with a great deal of prairie chicken biology and the appropriate illustrations found throughout further enhance the appeal of the book. I would highly recommend this entertaining work to anyone with a desire to mix humor and biology.—ROSS D. JAMES.

THE IMPERATIVE CALL: A NATURALIST'S QUEST IN TEMPERATE AND TROPICAL AMERICA. By Alexander F. Skutch. University Presses of Florida, Gainesville, Florida, 1979:331 pp., photographs, endpaper maps, index. \$20.00.—When an individual achieves prominence in an area of scientific research, others often speculate as to how that person came to be in so enviable a circumstance. Alexander Skutch occupies such a place in the field of tropical biology; he also possesses the literary skills to satisfy our curiosity with an interesting story of his early, career-forming experiences. He shares his recollections of travels and study in a vivid, personal style that should appeal to the seasoned traveler and the tropical neophyte equally.

Chronologically, *The Imperative Call* predates his other biographical works, *A Naturalist in Costa Rica* and *A Bird Watcher's Adventures in Tropical America*, and describes the beginnings of Skutch's fascination with nature. From sketchy recountings of his boyhood spent in rural and suburban Maryland, Skutch moves on to describe his formal university training in botany. He ably recounts his first, awesome encounter with the neotropical forest, an experience that many temperate-zone trained biologists will empathize with. He relates how a chance observation of a nesting Rufous-tailed Hummingbird (*Amazilia tzacatl*) drew this serious student of botany into his dedicated study of the behavior of birds. Throughout the book, Skutch recounts his observations of birds, places and people. Mingled with these incidents are insights into his developing philosophical point of view.

The casual narrative style, moving around one incident, forward and back in time, sometimes becomes deeply involved in details of botanical or ornithological interest. Yet, for the general reader, the details should prove no deterrent to pleasure, and for those who, like Skutch, experience the "imperative call" of nature, these are gems.—GEORGE V. N. POWELL.

A FIELD GUIDE TO THE BIRDS, FOURTH EDITION. By Roger Tory Peterson. Houghton Mifflin Co., Boston, Massachusetts, 1980:384 pp., 136 color plates, range maps. \$15.00 (cloth), \$9.95 (paper).—Reviewing a Peterson Field Guide for eastern North America comes almost in the same category as reviewing *The Bible*, for to myriads of bird watchers this book, in its various editions, has become a veritable "holy writ" and the author at least a "major prophet." The new edition arrived in the fall of 1980 preceded by one of the most intensive selling campaigns for any recent book. Indeed, its publication was the event-of-the-year in bird books. By now there can scarcely be anyone interested in birds who has not at least examined a copy, and the sales have been so large that what is said in any review cannot influence them.

Now that the furor has subsided, perhaps we can look objectively at this edition. A new edition was long overdue since the previous one appeared in 1947. In the intervening 33 years there have been a number of changes in the world of popular bird study. For one thing, bird watching has become, to quote K. C. Parkes, "an organized cult," and the numbers of people engaged in the pastime is far greater than it was in 1947. I would hazard a guess, however, that today a smaller fraction of this total are interested in birds beyond the listing stage than was the case in the 1940's. The art of bird identification has improved markedly, so that today in the hands of some people it is a much more precise skill than it was years ago. To cite only 3 examples: the increased number of bird-banders, the recent popularity of pelagic trips and the intensive studies of the autumn raptor migration have raised birders' identification skill of the fall warblers, the seabirds and the raptors to levels not prevalent in the 1940's. Unfortunately, it would appear that Peterson has not kept up with these trends, and in most ways his identification guides are more or less the same as they were in the

1930's and 1940's when he first revolutionized this art form. For this reason, I feel that the book will be most successful in introducing the tyro to the birds, and will be less successful to the more advanced birder. Perhaps that is the main purpose of the book, and if so it should meet this objective handsomely.

The dust jacket proclaims that this edition is "Completely New" and indeed it is, except for the silhouettes on the inside covers which appear to be the same as those on the last edition. A major change is that all species are now figured in color, and the illustrations, as in other recent Peterson guides, are now more nearly portraits rather than the diagrammatic drawings of past editions. A few pictures of flight patterns of waterfowl and shorebirds are still in monochrome. The number of species on a given plate has been greatly reduced, making the pictures less crowded and somewhat larger than formerly. The textual material for each species is on the page opposite the portrait of that species, thus eliminating a minor source of irritation. But as a result of this, the amount of space devoted to each species in the text is somewhat reduced, and the convenience of having text and figure together is bought at the expense of less full descriptions and less helpful information on identification. Peterson has obviously catered to the "birder" rather than to the general ornithological community. The species are no longer listed in A.O.U. Checklist order, although this may have been deliberate since the forthcoming 1983 Checklist may give us quite a different order. The English names used are those of the recent A.B.A. Checklist, and some may be unfamiliar to those not acquainted with that list.

A welcome new feature is the inclusion of 390 range maps, which are grouped at the back of the book. These maps, which were researched by Mrs. Peterson, are large enough to show detail, and are far superior to the small maps in the principal competitor of this guide. Unfortunately, bird ranges are transitory things, subject to constant change, and in any compilation of range maps it is easy to find errors. The Petersons have shown considerable bravery in publishing these detailed maps. I counted 31 maps that had major errors in the range boundaries in the region with which I am most familiar—the southern Appalachians—and no doubt others in areas at range boundaries can find as many. This is partly the result of the shifting nature of the ranges, and partly because we locals have failed to publish some of the known changes. However, if one recognizes these deficiencies the maps should be quite useful.

The illustrations deserve the most comment. In the review copy many of the plates are far too dark, especially the sandpipers and hawks; The Red-tailed Hawk (*Buteo jamaicensis*) is as dark as any melanistic western race. A few plates are washed out and far too light, i.e., the jays on p. 209 and the cardueline finches on p. 271. I have examined several other copies and have found less variation in most, and truer colors in some. Perhaps this variation in reproduction is inevitable in a mass-produced book, but at the price charged it would appear that Houghton Mifflin Company should have been more interested in quality control.

However, the faults with the plates are not solely those of reproduction, since Peterson has not been all that careful in some of his depictions. I noted small inaccuracies in such things as soft-part colors, bill shapes, bodily proportions and other fine details. Such details were not evident on the diagrammatic sketches of earlier editions but become noticeable in the portraits of this edition. It is true however, that most of these inaccuracies will not interfere with the identification of birds at a distance, but we should not take the pictures to be definitive portraits.

A serious fault is the lack of a consistent scale on the individual plates. On the plate of spotted thrushes the large Wood Thrush (*Hylocichla mustelina*) is shown approximately the same size as the diminutive Hermit Thrush (*C. guttata*), and on another plate the chickadees are about the same size as the titmice. Body proportions are often out-of-true as when the

streamlined Scissor-tailed Flycatcher (*Muscivora forficata*) is shown to be about as chunky as a kingbird.

Perhaps the most regrettable portion of the book is the continued adherence to the myth that fall warblers are confusing. Many people now know how to identify the fall warblers, not only as to species, but as to sex and age class, with ease, although in some cases this does remain difficult. But Peterson has not availed himself of this expertise, which could have been forthcoming from many people. The 2 plates of fall warblers are not really very helpful, since the colors are rather muddy and dull in my copy. However, in this edition appears for the first time the admission that some (I would say many) fall Blackpoll Warblers may have dark tarsi, contrary to what earlier editions and other guides may say. It is implied that most immature males resemble females in the fall, and while this is true for some species for others it is not. Thus, contrary to the implication of Peterson, the male Black-throated Blue (*Dendroica caerulescens*) and Cape May (*D. tigrina*) warblers look alike in both age classes. This error is not going to cause any misidentifications but it is going to mislead people, and, in particular, the neophyte bander may put a bird in the wrong age class if he relies solely on this book.

The fact that many species show considerable variation in plumage is not really recognized in this book. It is regrettable that the author, who apparently had *carte blanche* from the publisher, did not take the opportunity to illustrate more of this variation. For example, the 2 oversized kingfishers (p. 187) could have been reduced to make room for a picture of the immature bird which has a single breast band which is both brown and blue. But in this connection one can only wonder what the extra unlabelled head of a male Hairy Woodpecker (*Picoides villosus*) is supposed to represent.

The harm in these admittedly minor inaccuracies and omissions comes precisely because so many people do consider a Peterson Field Guide to be the "Holy Writ." Some years ago Peterson wrote about the bird watcher who sees the bird through his binoculars, not as it really is, but as the Fuertes painting looks. Today, that tyro sees the Peterson painting, and in too many cases he is going to be misled and confused.

In summary, the book will meet its unstated purpose of teaching the tyro to identify the spring birds, particularly the males—always assuming that he doesn't have one of the copies with distorted colors. At other seasons and with some species the novice will encounter problems. Novice banders should be aware of some of the deficiencies and should not follow the age and sex criteria given therein blindly. I must admit to a great sense of disappointment in this book. I feel that the author passed up an opportunity to give us more useful information than he did. In many ways, the 1947 edition was superior to this one.—GEORGE A. HALL.

BIRDS OF THE WEST COAST, VOL. II. By J. F. Lansdowne. Houghton Mifflin Co., Boston, Massachusetts, 1980:167 pp., 48 color portraits, 47 pages of pencil sketches. \$40.00.—Being a painter of birds, I have never missed an opportunity to view, or scrutinize, almost any depiction of a bird. About 15 years ago, on one of my first visits to the home of a friend, I was captivated by paintings displayed in his dining room. The birds, a Turkey Vulture (*Cathartes aura*), a Brown Pelican (*Pelecanus occidentalis*), a Herring Gull (*Larus argentatus*) and a Sandhill Crane (*Grus canadensis*), were exceedingly well drawn and were painted in the manner in which I saw birds—with only a hint of feather detail. Upon closer inspection I found the works of art not to be by L. A. Fuertes, but by an "unknown" bird painter by the name of J. F. Lansdowne. I was tremendously impressed by these 4 works and spent a great deal of time looking at them. In the ensuing years I was, of course, to see a great deal of work by Lansdowne, but I became disappointed in his tremendous attention to detail—

detail that could be seen if a bird were sitting on the artist's table, but detail that was not evident in wild, living birds. I don't know if Lansdowne received criticism from his friends and colleagues concerning his overly-done attention to detail, but he has slowly backed away from it and his work is again "living" and beautiful. The work in the second volume of his *Birds of the West Coast* includes some of his finest. The first 2 paintings, Red-necked (*Podiceps grisegena*) and Eared (*P. caspicus*) Grebes, are no less than incredible; they are also rather loosely done and have a lovely softness to them. The Great Blue Heron (*Ardea herodias*) on p. 25 is one of the finest examples of Lansdowne's amazing ability to convey different textures, be they contour feathers, plumes, large secondaries, scutes on a leg or foot, or hard, dead wood, but the picture seems cramped as a vertical and would have been better as a horizontal. My favorite works are the ones featuring three Ruddy Ducks (*Oxyura jamaicensis*) on p. 45, a soft, beautifully designed picture in which the birds are superbly executed, and a rather "un-Lansdowne" painting of a Parasitic Jaeger (*Stercorarius parasiticus*) robbing a Common Tern (*Sterna hirundo*). The latter picture shows action of a sort rarely seen in Lansdowne's work—not only is the action well-conveyed, but the execution of the picture is outstanding.

Lansdowne seems to me to occasionally have some problems with proportions. The head on the Oldsquaw (*Clangula hyemalis*) on p. 40 is too small, as is that of the Golden Eagle (*Aquila chrysaetos*) on p. 51 (and featured on the dust jacket). In general, his passerine birds are not as well done as the nonpasserines. The bills and heads on the Golden-crowned Kinglets (*Regulus satrapa*) on p. 41 are too large, and the feet on the Winter Wren (*Troglodytes troglodytes*) on p. 91 appear to belong to a dried museum specimen rather than to a living bird. On the other hand, the Brown Towhee (*Pipilo fuscus*) on p. 107 is "alive" and exquisite, and the bushtits with nest on p. 87 are equally well-done and "alive."

The book is obviously made to be looked at; it is a collection of paintings. It does, however, have a page of text that accompanies each picture. The text is a combination of anecdotes and general information about the species under discussion, and is, as it should be, merely an interesting and informative adjunct to the paintings.

The inclusion of the drawings upon which the paintings were based is good. They are, to me, sometimes "better" than the final painting. I think the looseness with which they are rendered makes them very pleasing. I am not a rapid sketcher and thus, to me, it is wonderful how Lansdowne can often capture the very being of a bird with only a few simple lines.

It is impossible to mention each of the paintings, but all are beautiful and pleasant to look at. Anyone interested in birds would want to have this latest collection of Lansdowne's work. Despite any "nit-picking" criticism that I have levied, the works are outstanding and beautiful, and reproduction is good. At \$40.00 the price seems right.—JOHN P. O'NEILL.

THE AVIFAUNA OF THE SOUTH FARALLON ISLANDS, CALIFORNIA. By David F. DeSante and David G. Ainley. *Studies in Avian Biology* No. 4, Cooper Ornithological Society, 1980:vi + 104 pp., 13 tables, 2 figs., frontispiece. \$10.00.—Imagine that you direct an ornithological field station. Imagine that you have access to an island with abundant seabirds and visited by migratory birds surprising both in numbers and variety. How would you exploit these opportunities? The Directors of Point Reyes Bird Observatory (PRBO) had to answer these questions when they were granted access to South Farallon Island by the U.S. Coast Guard and the U.S. Fish and Wildlife Service in 1967. This publication summarizes that part of PRBO's first 8 years of fieldwork there, which was devoted to the obvious task of describing the avifauna. Results of prior investigations, some previously unpublished, are included along with a synopsis of PRBO's findings during the subsequent 42 months. Half of this publication is a heavily annotated checklist. A total of 346 species is reported from a flo-

ristically impoverished island less than 0.5 km² in area, and the list already has been extended! Only 15 of these species bred there while this study was conducted; 5 others have bred in earlier years.

The South Farallon Islands are now established as a site where the unexpected avian visitor is to be expected. Any treatment of such an outlandish avifauna demands great care in screening and documenting records. DeSante and Ainley clearly recognized this. Many new records are substantiated by specimens or photographs. However, details for a few species "new" to California are scanty. The mere mention of a specimen, given the chance for misidentification in even the best curated collections, is insufficient. In a very few instances, PRBO's staff released birds whose value as a specimen perhaps exceeded any potential value as a banding return. However, I recognize that this is a touchy subject for a project that depends on the contributions of amateurs. The only real alternative to collecting such birds is the "rarities committee." Many, but not all, records of extreme rarities have been reviewed by the California Bird Records Committee (see *Western Birds* 10:169–186, 1979 [1980 for the most recent report]). Hopefully, all such records will be so reviewed in the future. I was disturbed to see a still tentative identification included (p. 104) in a publication of this caliber, because such reports have an unfortunate tendency to become fact even if they are later rejected.

An avifauna with about 17 migrant species for every (potential) breeder is quite dynamic in composition. The list of species gives cumulative totals and peak numbers for each species broken down by season, but conveys no feeling for the day to day variations in the numbers of any, excepting those so rare that all reports are enumerated. The seabirds are treated in more detail in other publications by the staff of PRBO. Other than by its amazing variety, the landbird fauna remains obscure to me even after reading this monograph. How does the avifauna as a whole change seasonally and from year to year? What weather conditions ground migrants and what conditions allow them to leave? How do these birds fare in such an extreme environment? The reader will find no answers to such questions. It is only clear that once landbirds leave South Farallon Island, they effectively vanish. A variety of methods that convey these data concisely exist. I look forward to seeing them in future PRBO publications.

The second half of this monograph is mostly a traditional biogeographic analysis of the avifauna. I think that what this section addresses is: How does one explain the commonness or rarity of species in this avifauna? I also think it mostly misses the mark. If these patterns are just the result of random phenomena, then the question is essentially trivial and PRBO's efforts are better directed elsewhere. I share with authors the belief that these patterns are more significant. Unfortunately, the biogeographic analysis presented here only rearranges the basic data without providing additional insight as to what factors produce them. The near independence of species abundance in spring versus fall is striking, yet this observation is not further pursued. It is precisely this kind of observation, and the biogeographic affinities of the avifauna, that our hypothesis should explain. More than ever I think that explanations based on the degree of navigational error required to reach South Farallon Island ultimately will prove fruitful, and that other ecological data, such as overall species' abundance, only condition this basic hypothesis.

One might expect an avifauna with so few breeding landbirds to be poor material for an "island biogeographic" analysis. The authors' efforts are most effective and strongly substantiate some serious criticisms of prior attempts at this endeavor in other island systems. They especially emphasize the need for regular censusing and care in determining the reproductive status of birds observed.

As typical of Cooper Ornithological Society publications, the monograph is technically well produced. I would have appreciated a map of the island, although sources for that map

are cited. Misspellings are scarce. If I seem overly critical, let that be taken as a compliment to PRBO. The high quality of their publications, including this, gives one high expectations. If you have a deep interest in California's avifauna or in island biogeography, this publication is worth its price. Others should insist that their local library acquire a copy.—PAUL A. DEBENEDICTIS.

HANDBOOK OF THE BIRDS OF EUROPE, THE MIDDLE EAST, AND NORTH AFRICA. THE BIRDS OF THE WESTERN PALEARCTIC. Vol. 1, Ostrich to Ducks. Vol. 2, Hawks to Bustards. Stanley Cramp, Chief Ed., K. E. L. Simmons, Assoc. Ed. Authors for Vol. 1: I. J. Ferguson-Lees, Robert Gillmor, P. A. D. Hollom, Robert Hudson, E. M. Nicholson, M. A. Ogilvie, P. J. S. Olney, K. H. Voous and Jan Wattel. Authors for Vol. 2: Robert Gillmor, P. A. D. Hollom, Robert Hudson, E. M. Nicholson, M. A. Ogilvie, P. J. S. Olney, C. S. Roselaar, K. H. Voous, D. I. M. Wallace and Jan Wattel. Artists for Vol. 1: Paul Barruel, C. J. F. Coombs, N. W. Cusa, Robert Gillmor, Peter Hayman and Sir Peter Scott. Artists for Vol. 2: C. J. F. Coombs, Peter Hayman and Ian Willis. Oxford University Press, Oxford, England. Vol. 1, 1977:722 pp., 108 color plates, \$85.00. Vol. 2, 1980:695 pp., 96 color plates, \$85.00. Numerous range maps, black-and-white drawings, sonagrams and diagrams in each volume.—This work is fittingly dedicated to the memory of H. F. Witherby, editor of the Handbook of British Birds (1938–1941). This indicates the magnitude of the debt that Birds of the Western Palearctic (BWP) owes to its illustrious predecessor. It also indicates that BWP is in part intended as an updated version of "Witherby." But while this would have been a worthwhile project in itself, the authors decided on the more ambitious course of treating all the birds of the Western Palearctic. I applaud this decision, because while the birds of Britain and Ireland are already very well-known, those of other countries, especially in the eastern part of the region, are not. To have drawn together so much information from so many different countries and produced a synthesised account in a single work is one of the major contributions of BWP. The language problems must have been horrendous. How many of us can read papers in Polish or Bulgarian?

The Western Palearctic, as defined here (and shown on an excellent map on the inside covers) includes the Atlantic islands down to the Cape Verdes, Northern Africa down to the central Sahara, the Middle East, including northern Saudi Arabia and Iraq but not Iran, and all of European Russia (i.e., east to the Urals). This expanded geographical scope has almost doubled the number of species covered (743+ vs 424 in Witherby). The 743 figure includes 601 breeding species, 11 "regular non-breeding migrants" and 131 accidentals that have occurred in the area since 1900. In addition, an unstated number of accidentals recorded before 1900, plus some doubtful records, are briefly treated in the text.

For sequence and scientific nomenclature the authors have followed Voous, List of Recent Holarctic Bird Species (Ibis 115:612–638, 1973; 119:223–250, 376–406, 1977). This is sensible, since Voous' list has won general acceptance. With regard to English vernacular names, however, they have evaded their responsibilities. It was the manifest duty of this new "bible" on European birds to bring needed change to these names, but as in all previous British checklists and field guides the authors have buried their heads in the sand, hoping that The Swallow would fly away. There is not a single sentence in the 36-page introduction dealing with the subject, and as we thumb through the text we meet once again our old, unmodified friends (The) Cormorant, (The) Bittern, (The) Wigeon, (The) Teal, (The) Eider, (The) Buzzard, (The) Partridge, (The) Quail and (The) Coot. We even find my old favorite, the Andalusian Hemipode, bless its little pink heart, though at least in this case someone has shamed the authors into providing an alternative name in parentheses (Little Button-Quail).

Before the species accounts there are summaries of each order and family. The orders are briefly treated, but the family summaries can run to 2 pages. They are nicely done and form

a miniature reference work by themselves. The species accounts are long and detailed. In Vol. 1, 158 species are covered in 662 pages, an average of about 4 pages per species. Accidentals receive cursory treatment while well-known birds have much lengthier accounts—the Grey Heron rates 10 pages. These are large pages (10" × 8") of fairly close-set type, and no space is wasted on broad margins.

The accounts are broken down into sections. Field Characters is fairly lengthy, about half a page, rather a misnomer if you are expecting a few Peterson-type italicised field marks. All plumages are described briefly, plus size, shape, notes on similar species, and habits and behavior if helpful for identification. For the ordinary birder this section is of inestimable value. The habitat section contains a complete list of habitats in different parts of the bird's range, also taking into account altitude, season, migration and other activities. As an indication of the thoroughness of this work, 5 pages of the introduction are devoted to a glossary defining the terms used in this section. Distribution for all breeding species and regular migrants is shown by 2 maps, a small scale one of the world range and a large scale one of the range in the Western Palearctic. The maps are large (large scale ones up to three-fourths of a page), and in contrasting colors, red for breeding range and gray for winter range. They are mostly easy to read, but a narrow strip of gray along a coastline can be difficult to see. In central Europe the boundaries of many small countries come close together, and it can be hard to tell if a bird occurs in, say, Switzerland or not. Regrettably, there is no text to turn to in these cases. The distribution section is short and only intended to supplement the maps with information on isolated occurrences and recent range extensions. The onus of providing distributional information thus lies entirely on the maps. While a full range description for each bird would have added to the bulk of the book, I have often been frustrated by "borderline" cases. Here is one field where Witherby still reigns supreme—its tremendous coverage of localities.

The section on population takes the place of what is usually called "status," though sometimes local status is indicated under "distribution." There is tremendous country-by-country detail of birds easily censused, like the Grey Heron (*Ardea cinerea*), but this section can be very short for birds not well-known, such as Velvet Scoter (*Melanitta fusca*). There seems to be a studious avoidance of such ill-defined terms as "common," "abundant," or "scarce" with reference to status in general, which is never clearly defined. Perhaps these terms are thought too "unprofessional" for a book like this, but it does mean one must do a lot of reading and draw inferences from population counts and distribution maps to determine if a given bird is commonly met with or not. A couple of lines giving a generalised status of each species would save a lot of eye-work. There are plenty of trees; what we want is a quick look at the forest. The section on movements includes not only regular migration but other things like dispersal, nomadism, irruptions and altitudinal migration. Under foods an exhaustive list of food items are provided and methods of feeding are also described.

Social pattern and behaviour covers such subjects as flocking, pair bonds, territoriality and roosting and deals with courtship displays, antagonistic behaviour, and other interactions. Displays are frequently illustrated by excellent drawings. Descriptions of displays and other activities are largely factual. The more difficult subject of interpretation has been avoided. A lengthy catalog of sounds, vocal and non-vocal, including calls of the young, liberally illustrated by sonagrams make up the voice section. An attempt has also been made to indicate the significance of vocal signals, in part by categorising them as, e.g., advertising calls, threat calls, alarm calls, alighting calls, greeting calls, etc. Not content with a simple catalog, the authors state that "every utterance has to be evaluated in relation to its role in behaviour, communication, and location. . . ." The lengthy (12-page) section on voice in the introduction is largely a dissertation on the problems of describing and interpreting avian vocalizations. Under breeding subjects treated include season, nest, eggs, clutch-size,

number of broods, incubation period, development of young, fledging period and breeding success. Finally, we come to a complete description of the bird, broken down into plumages, bare (not soft) parts, moults, measurements, weights and 'structure,' which includes shape, proportions, wing formulae, numbers of wing and tail feathers, etc. At the very end is a section on geographical variation. This is brief and to the point, not a lengthy discussion.

I have indicated in some detail what can be found between the covers of these volumes because that is their greatest asset—massive amounts of detailed information. One might retitile the work "Everything you've always wanted to know about European birds—but were afraid to ask." The same expansive treatment is given to the illustrations, which are present in abundance. The 743 principal species are all illustrated by color paintings said to show "every plumage which is identifiable in the field." I am sure this claim is for all practical purposes correct. The tremendous wealth of illustrations is one of the great features of this work. There are between 4 and 10 illustrations of most species, portraying breeding, non-breeding, immature, and juvenile plumages of both sexes, and downy young. Flight pictures are provided for most species; birds of prey are shown in flight from above as well as from below (a feature lacking in most field guides), and polymorphic species like Buzzards (*Buteo buteo*) and Honey Buzzards (*Pernis ptilorhynchus*) are given lavish treatment. Given the tremendous contribution made by the illustrations, I was surprised that more recognition was not given to the artists. Their names do not appear in the front of the book but are buried in the introduction. All of them deserve a great deal of credit; the plates are of very high quality.

One can find errors in any book if one looks hard enough. In this book I got no further than the Procellariiformes before I ran into trouble. Peter Hayman has done stalwart work elsewhere, but some of his seabirds are not too successful, particularly as to "jizz" or "gestalt." The flying Southern Giant Petrel (*Macronectes giganteus*) on Plate 14, with its narrow, bent and pointed wings, looks like a hybrid between that species and a Sooty Albatross (*Phoebastria* sp.). The Wandering Albatross (*Diomedea exulans*) should have a pink bill (shown here as off-white), and the text errs in referring to the bill as "appearing almost white," however likely that might seem. The bill always looks pink, even at some distance. Why are all the wanderers shown with the feet projecting beyond the tail? This is certainly not normal. The bill of an adult Black-browed Albatross (*D. melanophris*) is bright orange-yellow with a pink tip, not the washed-out brownish color shown on Plate 13. The juvenile black-brow (#8 on this plate) should have a dark bill with blackish tip, whereas it is shown with a bill like an adult. I would never have recognised the top left hand bird on Plate 16 as a Soft-plumaged Petrel (*Pterodroma mollis*), even though I have recently seen thousands of them. The shape is all wrong, and there is no hint of the dark band across the wings and rump, obvious in good light, which forms a typical *Pterodroma* 'W' pattern. The flight is described as "towering into sky." I have yet to see *mollis* tower; it flies close to the surface. The dark morph of *mollis* is stated to be "virtually indistinguishable in field from Kerguelen Petrel *P. brevirostris*." This is what I call a "museum skin remark." The Kerguelen Petrel is easily told from *mollis* and other petrels by its curious flight, long glides interspersed with a few, quick alcid-like wingbeats. It also towers, unlike *mollis*!

The above remarks are only intended to show that even a "bible" may make mistakes. By and large mistakes are few, and the work maintains a high level of excellence. Birds of the Western Palearctic is a must for every library, public or private. Even though the cost of acquiring all 7 volumes (5 more are planned) will be considerable, it is the best ornithological investment I know.—STUART KEITH.

MIGRANT BIRDS IN THE NEOTROPICS: ECOLOGY, BEHAVIOR, DISTRIBUTION, AND CONSERVATION. By A. Keast and E. S. Morton (eds.). Smithsonian Institution Press, Washington,

D.C., 1980:576 pp., 30 range maps, 169 numbered text figs., 138 tables, 33 black-and-white photos. \$27.50 (cloth), \$15.00 (paper).—This long overdue and highly anticipated volume is the proceedings of a symposium held 27–29 October 1977. Forty papers are unequally divided into 5 sections: Conservation (2 papers), Migration of Taxonomic Groups (5 papers), Regional Studies (23 papers), Implications of Overwintering in the Tropics (8 papers), Integrations (2 papers). Although most of the papers deal with passerine birds, shorebirds and raptors are treated, as are communities as a whole. Additional review papers deal with population biology, meteorological patterns, migration strategies, food supply, mixed foraging flocks and intercontinental comparisons.

This symposium is timely in view of the potential impact of widespread destruction of tropical habitats on north temperate birds wintering in tropical America. Terborgh, in his introductory paper, estimates that habitat suitable for migrants will be gone by the turn of the century. However, we know very little about the biology of the migrants once they leave their breeding grounds in the north. Where do they go? What habitats do they use? What food do they eat? Will the destruction of tropical forests lead to a decrease in temperate migrants? An earlier argument stated that moderate to heavy tropical forest destruction might be beneficial to some temperate migrants that prefer "second growth" habitats. Such thoughts, however, were laid to rest when Terborgh listed 55 species known to winter in mature tropical forests, although only a few of these were obligate forest interior users. He further states that we know of no temperate migrant species that use "fenced cattle pasture, canefield or rice paddy," yet this is what much of the forest tracts are becoming.

Regional studies suggest that the number of migrants present is inversely related to distance from the breeding grounds, i.e., Mexico has more migrants than Costa Rica, which in turn has more than Panama. As a result, ecological comparisons among sites are difficult; since factors relating to abundance, competition, food habits and behavior differ geographically no single explanation for the overall ecology of migrants in the tropics is satisfactory.

Migrants occupy a wide variety of habitats ranging from coastal dunes to lowland and highland forest. Two schools of thought exist as to why second growth sites are preferentially chosen by many migrants. Willis, Karr, Morse and others seem to support the irregularity principle, that migrants tend to use irregularly abundant resources while on the wintering grounds and choose marginal or "suboptimal" habitats avoided by residents in order to reduce intense competition for resources, presumably food. Since these habitats are suboptimal, residents will not use them when the migrants leave. The other view, presented by Schwartz and others states that these second growth habitats are not marginal, that they are "won" through competition over evolutionary time with "residents," that those habitats (niches?) are used by the migrants for up to 70% of the year and when they leave the sites are not used by residents, i.e., the residents know their place and stay there. There are problems with both views. There are no real data to support the claim that the second growth habitats are suboptimal and the fact that so many birds use them for at least half the year argues that they are not. However, if these sites are won by competition "at the expense of some tropical breeding residents" then one would expect that opportunistic residents temporarily would exploit the sites during the summer months. What is needed are more complete studies of the winter habitats used by migrants after they have left. Is it possible that researchers do not want to go into second growth sites because many of the "glamorous" tropical residents aren't there?

Unfortunately, the problem of what the migrants eat, especially with regards to what is available, is not answered by this symposium. This would seem, however, to be the fundamental question with regards to migrant ecology in the tropics, especially if adequate statements about their impact are to be made.

It should be noted that Cox's long overlooked 1968 paper on "The role of competition in

the evolution of migration" (Evolution 22:180–192, 1968) has had a rebirth in this symposium. Although his original reasoning may be subject to question, the idea is interestingly supported by several of the symposium papers. Also, one should be aware that the "south ancestral home" theory of migration evolution is apparently alive and well, in that it is supported by at least 5 of the symposium papers.

Care should be taken in interpretation of bird census data presented in this symposium. By my count at least 17 different "censusing" techniques were used in the different studies. These ranged from Johnson's casual observance of "birds seen on the walk down the road," to Russell's "regularly surveyed" plots, to Willis' "scale of censused abundance," to Pearson's species lists, to Tramer and Kemp's 6 "visual/auditory counts." Both Hilty and Hespeneheide used "trail side censuses" while several walked modified Emlen transect lines or did strip censuses of varying (10, 20, 40 m) widths. The Waide, Emlen and Tramer study actually used 3 different methods on 21 sites (9 sites were censused by "counts of birds seen on repeated visits," 6 sites were censused using mist nets, 6 sites were censused using Emlen lines). The data for this paper were collected in different time periods (December–May) on different sites and yet all the data are pooled into one table with a special column labeled percent migrant individuals. So many sources of variation suggest caution in comparative interpretations such as those of Terborgh and Keast. Based on my experience in the tropics, it is even more remarkable to think that one can take walks through the forest or do trailside counts or other transect techniques and expect to accurately sample the avifauna. Given the nature of the terrain, structure of the habitat, the natural history of the birds and the limitations of the above methods it would seem impossible to detect even 25% of the existing individuals.

Except for a few minor flaws and a lot of typos, Keast and Morton have done a masterful job of editing. My only complaints with style are minor, dealing mostly with wasted space; e.g., in Smith's paper 5 pictures of hawk and vulture migrations over Panama when 2 or 3 would do, in Barlow's paper 12 full page vireo range maps when they all could have fit on 1 page and 13 poorly drawn bird illustrations in the Rappole and Warner paper (which the authors cite as excellent work in their acknowledgments section).

As far as the nuts and bolts of each individual paper are concerned most are excellent in content and superbly written. One, however, stands out like a sore thumb and I wish to make a few comments about it (which I guess is a reviewer's prerogative as well as duty). The Rappole and Warner paper proves the axiom that biggest (42 pages) is not best. The paper purports to show that individuals of 14 migrant species defend well-defined (0.2–0.5 ha) territories throughout the winter, that some territorial floaters persist in peripheral areas and that these data refute the irregularity principle. These arguments are less than convincing. Territoriality is inferred in 12 of the 14 species (Table 7). Yet 2 species showed no territorial defense, 5 had 1 observation and 3 had but 3 observations. Why are 2 species missing from the table? Although "territory" size data were only collected for Hooded Warblers (*Wilsonia citrina*) based on the territory flush technique (and 12 birds were, in fact, "mapped"), territory size data for 9 additional of the 14 species are given in Table 13. How were these data obtained? Since we have no data on the proportion of floaters to territory holders and since we have fitness data for neither, we have no way of knowing if the habit is adaptive. For example, if there were, in fact, 12 territorial Hooded Warblers and 1200 floaters and each type had 2 young per pair during the breeding season, well Not only is there an absence of hard data in the paper but much of the data given in tables refutes the text. For example, Worm-eating Warblers (*Helminthos vermivorus*) are said to respond "vigorously to playbacks of vocalizations and displayed to, and attacked, caged conspecifics," yet only 3 each caged conspecific and playback trials are listed; one is positive and 2 are negative in both cases (Table 7). Ovenbirds (*Seiurus aurocapillus*) are listed as territorial

(Table 10), but there were no responses to playback (Table 7). Moreover, in the text "this species does not respond strongly to introduced caged intruders," yet 5 of the 7 trials (Table 7) are positive but in Table 10 the species is given a negative in the response to caged conspecifics column. For the Yellow-bellied Flycatcher (*Empidonax flaviventris*) Table 10 presents a positive in both the response to playback and response to caged individual columns yet Table 7 shows only 1 trial for each. Many other statements are made throughout this paper with little or no supportive data. Sample sizes are not given and the tables often refute the text. Often the tables are so unclear that statements made in the text cannot be supported or refuted (e.g., Table 5 does not show that "some birds remained throughout the winter on the same territory and returned there the next winter," regardless of what the authors think). In sum, the Rappole and Warner paper, while potentially of major importance, is sadly lacking in credibility.

My overall impression of this symposium is that it is timely, well thought out, generally well written and much needed. There is still much to be learned and this symposium provides a foundation of information upon which to build future research. The volume asks more questions than it answers, making it a very valuable addition to the literature. It is obvious that something must be done now to preserve the tropics or, in the words of John Terborgh, the woods in North America "just won't sound the way it used to."—ROBERT C. WHITMORE.

THE BIRDS OF HACIENDA PALO VERDE, GUANACASTE, COSTA RICA. By Paul Slud. Smithsonian Contributions to Zoology No. 292, Smithsonian Institution Press, Washington, D.C., 1980:92 pp., frontispiece, 6 figs., 33 plates, 1 table. Price not given.—According to its author, this study represents "the first comprehensive report on the avifauna of any locality in the Central American arid Pacific lowlands" and "is intended to provide a point of reference for avifaunal or environmental comparisons among comparably known localities anywhere in tropical America." In the introduction, Dr. Slud discusses the biogeographic position of NW Costa Rica, comparing viewpoints of students of various groups, and finally endorsing the existing consensus that this area represents the southern terminus of the Central American Arid Pacific biota. There follows a detailed discussion of the climate, topography, and vegetation of the Guanacaste lowlands and Palo Verde, mostly abstracted from the work of Holdridge and his collaborators. The emphasis on vegetational heterogeneity within the tropical dry forest formation raises expectations that the avifauna will be treated in comparable detail. An account of the author's 3 months' fieldwork at Palo Verde follows, including notable aspects of each of his 4 visits between 1970 and 1975, two each in wet and dry seasons.

The next section, Remarks, contains the only quantitative analysis in the book; a comparison of the numbers of species seen on different visits, and species in common between visits. The general conclusion is that one might expect to see about the same number of species, and about the same proportion of species in common, in any two 2-week periods. However, landbirds were not distinguished from waterbirds in the analysis, time spent per habitat evidently was not standardized and quantitative censuses were not attempted. Moreover, another observer without Dr. Slud's skill at field identification might well come up with quite different results. The ecological relevance of these results is thus limited at best.

The rest of the text contains an annotated list of species recorded by Dr. Slud, supplemented by the observations of P. A. Opler and a few published citations. The abundance of each species is indicated, but terms like "abundant," "common," etc. are not explicitly defined, and alternate with still more vague or subjective designations as "seen daily" and "not so scarce as expected." A general indication of habitat is given (e.g., "inside woodland," "nonforest"), but no consistent attempt is made to relate habitat choice of the birds to the

information on vegetation given in the introduction, nor is the vegetation on the "study tracts" described in detail. Species recorded in adjacent areas but not at Palo Verde are included in this general list; space and coherence would have been saved by relegating them to an appendix, since for many of them the appropriate habitat simply does not exist at Palo Verde. There is a separate "hypothetical list" of other unrecorded species that occur within 30 km of Palo Verde, but again, because the habitats of many of these species are totally absent from Palo Verde, the list does not seem particularly useful. When comparing modern-day observations with those of turn-of-the-century observers like Nutting and Carriker, some attention might have been profitably paid to the possibility that the deforestation of well over 75% of Guanacaste since their observations might have had some effect on bird distributions. Finally, data on food habits, breeding, molt, etc. are given for very few species.

The 33 plates contain black-and-white photographs of habitats (mostly) in the Palo Verde area. There is much redundancy here, and of the 3 plant identifications essayed, 2 are incorrect (the "guanacaste" trees of plates 1 and 16 are saman and ceiba, respectively). In general, I lament the dearth of botanical information in the book: what fruits were eaten by birds? what flowers visited? Many plates are labeled simply "view in woodland;" however attractive, these serve little purpose without more details pointed out.

One might also question the study's comprehensiveness, as a considerable amount of information available on Palo Verde birds was evidently not consulted in its preparation. Numerous competent observers associated with the Organization for Tropical Studies have worked at Palo Verde since 1971; a detailed field checklist of Palo Verde birds based upon their observations and my own over an 8-year span has been available for a dollar from OTS for several years. More importantly, since 1976–1977 important ecological studies on Palo Verde birds have been carried out by Bio. Julio Sánchez and his team from the Costa Rican Fish and Wildlife Department. This information could have added 20–25 species to Dr. Slud's list, and affected the status of many others. Given the long delay between the author's fieldwork and publication, it is unfortunate that more effort was not devoted to keeping abreast of developments: the present report is far from an up-to-date summary of what is known of Palo Verde's avifauna.

The most appropriate audience for this book might well be the better modern birding tours, for it is they who should be most interested in which and how many species they could expect to see at Palo Verde, and about where to look for them. For the ecological ornithologist, the book should provide a useful general introduction to the area and its birds—but he or she should not expect quantitative data pertinent to current problems in avian ecology.—F. GARY STILES.

BIRDS OF AFRICA. By John Karmali. The Viking Press, New York, 1980:191 pp., 72 color plates, numerous black-and-white photographs. \$25.00.—This is definitely a picture book, and by no means as comprehensive as the title suggests. As the author states in his preface, these are 72 selected portraits of East African birds, his favorites among the thousands that he has taken. They are truly portraits in the sense that the pictures were taken with a wide open lens so that the bird stands sharp and clear against the blurred background. Somewhat less than half the 87 African families of birds are represented, the great majority being among the non-passerines.

There is a foreword by Roger Tory Peterson, a preface by the author giving his philosophy of bird photography, an introduction with an outline of the zoogeography of Africa, followed by the main text and plates. Each family represented is given a chapter of its own, with a general discussion of the family as a whole, and shorter paragraphs on the biology of each species on the plates. There are numerous black-and-white photos scattered through the

book, many of which give a livelier feel for the birds than the more formal portraits. The text is neither really good nor bad, but seems to have been done freehand, like the rivers in the facing relief and vegetation maps (pp. 14 and 15). The author gives a good general picture of the African continent and of the diversity of its birds, but details, such as the subdesert coast of Upper Guinea (vegetation map), should not be accepted uncritically. Following the plates is an enjoyable section, Notes on Colour Plates, which gives the circumstances under which each plate was made, and a bibliography and index.

As bird portraits, these plates are beautiful, and the color reproduction is superb. Both the birds themselves and the backgrounds are alive and natural, a tribute to the patience and eye of the photographer and the skill of the printer. At the comparatively modest price of \$25.00, these portraits are a bargain.—MELVIN A. TRAYLOR.

AFRICAN HANDBOOK OF BIRDS: SERIES ONE. BIRDS OF EASTERN AND NORTH EASTERN AFRICA. SECOND EDITION. By C. W. Mackworth-Praed and C. H. B. Grant. Longman Group Ltd., London, England. In U.S.A., Longman Inc., New York, New York. Vol. 1, 1980:836 pp., 53 color plates, 6 black-and-white photo plates, many line drawings and maps. \$60.00. Vol. 2, 1980:1177 pp., 43 color plates, 13 black-and-white photo plates, many line drawings and maps. \$75.00.—This is an unrevised reprint of the second edition (1957) of a work first published in 1952. The only changes are the addition of political maps of Africa in 1945 and 1979 so as to permit the recognition of old place names, and of brief biographies of the authors. Volume 1 treats the non-passerines and the suboscines, volume 2 the oscines. For each species the brief text covers distinguishing characters, distribution and habits. The margins contain range maps and sometimes small sketches of the birds. The color plates are somewhat faded but should serve their intended purpose adequately. These books are intended as field guides, but with coverage of nearly 1500 species even their concise organization limits their portability. For readers elsewhere these volumes should continue to serve as a good introduction to the avifauna of the area, even though the nomenclature has not been revised.—ROBERT J. RAIKOW.

A COMPLETE CHECKLIST OF THE BIRDS OF THE WORLD. By Richard Howard and Alick Moore. Oxford University Press, New York, New York, 1980:701 pp. \$49.50.—This is a 1-volume list of the birds of the world. It is similar in format and purpose to *The Complete Birds of the World* by Michael Walters, also published in 1980, but appears to be a more useful work. Unlike the latter book, this one contains no natural history information, but on the other hand it has several advantages. The layout and printing are superior. Walters' book lists only species, while the present work lists subspecies as well, along with their distributions. Most important, this book contains an index to the genera and species so that it is not necessary to hunt through the text for a particular form. Each species is also provided with an English name. As in other such undertakings the classification is eclectic, being based in considerable part on the Peters Check-List plus numerous more recent research papers. This literature is cited by family in a 40 page reference list, so that the book may also serve as a good introduction to the taxonomic literature of recent years. Altogether this promises to be a useful reference work for ornithologists.—ROBERT J. RAIKOW.