ORNITHOLOGICAL LITERATURE

EVOLUTION OF THE RAILS OF THE SOUTH ATLANTIC ISLANDS (AVES: RALLIDAE). By Storrs L. Olson. Smithsonian Contributions to Zoology, No. 152, Smithsonian Institution Press, 1973:iv + 53 pp., 11 pl., 8 text figs. Paper cover. $0.95. (Obtainable from Superintendent of Documents, U. S. Govt. Printing Office, Washington, D.C.).—Storrs Olson has spent a number of years studying rails, and this paper presents the results of his Ph.D. thesis. He summarizes and extends our knowledge about the rails of Ascension, St. Helena, Tristan da Cunha, and Gough Islands. People interested in the distribution of rails and in the evolution of flightlessness on islands will find this paper informative and necessary reading.

A new species of flightless extinct rail is described from Ascension and placed in the genus *Atlantisia*, previously containing only a rail from Inaccessible Island. Olson also adds another species to *Atlantisia*, as he synonomizes *Aphanocrex*, a monotypic genus from St. Helena. Thus, the expanded *Atlantisia* is now considered to be composed of three species of flightless rails on as many separated South Atlantic Islands. Olson believes *Atlantisia* is related to the "*Rallus* assemblage," although other than saying that there are skeletal similarities among these birds, he presents no strong evidence for this conclusion. He envisions *Atlantisia* having been derived from a single species that was given to wandering or from two closely related species. It would appear that the only recourse to these speculations is to determine the phylogenetic relationships of the recent species of rails and then fit *Atlantisia* into this scheme.

Olson also describes as new an extinct species of *Porzana*, *P. astrictocarpus*, from St. Helena. This rail was also flightless, having a greatly reduced coracoid and scapula but with a normally developed wing skeleton.

Olson takes up the problem of why some species appear to be good colonizers whereas others do not. *Porphyrula*, for example, has reached various South Atlantic islands, but it has neither colonized nor differentiated. *Gallinula*, on the other hand, has colonized and evolved flightless forms. Skeletal measurements suggest greater variability in *Gallinula*, and Olson postulates that a greater genetic plasticity has enabled *Gallinula* to adapt itself to variable environments more easily than *Porphyrula*. Olson extends this same type of argument to the Rallidae as a whole, claiming their "generalized nature" has permitted this family to successfully colonize islands. Perhaps this is so. The variability-colonizing hypothesis is an old one, and now that we are beginnng to study genetic variability in natural populations through electrophoretic techniques, supportive evidence may be forthcoming.

Olson closes his paper with a discussion on the evolution of flightlessness in rails. He argues that flightlessness is an adaptation, in that a reduction of the pectoral musculature would permit a saving in energy that could be redirected to reproduction. Again, this is an old argument, perhaps reasonable—although probably not the whole story. This hypothesis is amenable to some testing, and it would be most instructive to compare the physiology and energy budgets of flightless *Gallinula* with their flying counterparts.

Perhaps the most interesting part of this paper is the discussion of how, morphogenetically, flightlessness develop. Young individuals, presumably of most species of rails, exhibit the same skeletal proportions as do the adults of flightless species. Thus, it is easy to see that if proportions of young birds were maintained through the growth process, the adults would be flightless. Various factors of the growth process might

also explain why rails more than other groups of birds frequently become flightless. In most birds that have been studied, the sternum is partially ossified at hatching or relatively soon thereafter, but in rails it apparently does not ossify until well after hatching. Much more comparative developmental data are needed, but as Olson notes, these differences in rates of ossification very possibly "preadapt" groups such as rails to flightlessness. Olson suggests that these ontogenetic changes would require little genetic modification. This may be true, but so might be the opposite speculation; I doubt whether there is evidence for either viewpoint. In any case, the degree of genetic modification does not bear on the phylogenetic usefulness of flightlessness, as he supposes. All features are of potential value in discerning monophyletic groups and cannot be rejected prior to a comparative analysis. Only after study of one or more other features that suggest alternative relationships can we say that any particular feature does or does not appear to be phylogenetically useful.

In summary, Olson has written a stimulating paper on some interesting birds and problems, and ornithologists of varying persuasions will find it worthwhile reading.—JOEL CRACRAFT.

INTRA-ISLAND VARIATION IN THE MASCARENE WHITE-EYE *ZOSTEROPS BORBONICA*. By Frank B. Gill. Ornithological Monographs No. 12, American Ornithologists' Union, 1973:66 pp., maps, charts, drawings, photographs, color plate by W. A. Lunk. Paper cover. $2.00 ($1.60 to A.O.U. members). (Obtainable from Burt L. Monroe, Jr., Treasurer, A.O.U., Box 23447, Anchorage, Ky. 40223).—In 1964, Robert Storer and Frank Gill visited Reunion Island (500 miles east of Madagascar) and discovered that the endemic *Zosterops borbonica* was remarkably variable in certain plumage characteristics. They decided to recognize a record-breaking four races of the species on this single island (Storer, R. W. and F. B. Gill, Occ. Pap. Mus. Zool. Univ. Michigan No. 648, 1966), a bold decision in this age of lumpers. Gill returned to the island in 1967 for nine months, in order to gather detailed information on geographical distribution of the phenotypes and to answer the question—why, on an island so small (about 1000 square miles in area) is variation so great?

His conclusion contained in this monograph, was arrived at from an analysis of the plumage and size variation in relation to altitude and rainfall of 759 specimens collected at 76 localities; this is supplemented by information on courtship, feeding, movements, activity, etc. of banded birds. Gill recognized three categories of plumage variation. First were birds with gray, brown, or intermediately colored backs. As only 42 adult specimens fell into the intermediate class, and as brown and gray birds are extensively sympatric, interbreed, and produce viable offspring, this he considered an example of genetic polymorphism. Second were brown birds only, varying in head color from fully brown to fully gray, through several intermediates. Although fully brown and fully gray heads predominate, intermediates are more frequent than in the case with back color, hence this is not treated as a genetic polymorphism. Third were birds whose underpart coloration varies from nearly pure white to lead gray, with various amounts of brown in some specimens (confined to the breast and flanks). The predominance of browns and grays in the plumage, by the way, is highly ususual in the white-eye family.

What does this plumage variation mean? It turns out that there are clear and interesting geographical patterns of distribution of the phenotypes. Lowland populations are 100

percent of the brown back color morph. The proportion of brown morphs decreases gradually with altitude, and gray morphs predominate at the highest altitude. Within the brown morph, gray-headed birds are found in the wet northern and eastern lowlands (below 1380 m), while brown-headed birds are found on the dry western slopes (above 1400 m). The transition between these two types on the eastern slopes is continuous and steeply clinal, but it is abrupt in the lowlands on each side of rivers and recent lava flows. Variation of underpart color is related to altitude, as shown by regression analysis, and rainfall is additionally correlated in each of the three brown morphs but not the gray morph. In other words, some of the geographical patterns are continuous, others are discontinuous. Gill considers these patterns to indicate adaptation, possibly in relation to thermoregulation but not to predation.

The analysis of variation in wing, tarsus, and bill lengths yields a couple of surprises. Wing and tarsus lengths increase with altitude in the brown morphs but not in the gray morphs. Bill length, in contrast, bears a non-significant positive relationship to altitude in the brown-headed (brown) form, yet a significantly negative relationship to altitude exists in the gray morphs. Thus there is the interesting possibility that the two morphs respond differently to the same set of environmental factors, possibly food supply. The gray-headed brown birds show a hint of a positive relationship at low altitudes, as in the brown-headed brown birds, and a negative relationship exists at higher altitudes, as in the gray morphs. Part of these findings may be a correlated effect of body size variation, but whether we should be looking at body size, bill size, or both, the situation has greater fascination and bearing on the evolutionary history of the species than is indicated by Gill's discussion.

These are the skeletal facts of the variation, and in amassing and presenting them, Gill has done a thorough job. One may quibble with small points: coefficients of determination are woefully small; Fisher's exact test would have been more appropriate than χ^2 for the analysis of data given in Table 6; plumage might have been studied colorimetrically; multivariate statistics might have been used for unravelling the complicated co-variation of plumage and dimensions, and so on. Regardless, I doubt that the results of the descriptive study would be altered much.

In the final section, Gill attempts to reconstruct a probable evolutionary history of the species and discusses its variation, adaptation, and taxonomy. He postulates that limited primeval forest-edge habitat suitable for the species originally existed, this dissected into partially isolated patches. After the ancestral species arrived on Reunion, it lost its plumage carotenoids and the eye-ring, changes which facilitated coexistence with the aggressive and already established *Z. olivacea*. Gill supposes that *Z. borbonica* would, at that time, have resembled the present, gray *Z. b. mauritiana* on Mauritius Island (rather than being of the brown morph), because extensive phaeomelanin (brown) pigments are rare in the Zosteropidae. Next, a phaeomelanic morph may have arisen by mutation in the Reunion lowlands, where it enjoyed some unspecified selective advantage over the gray morph. There the mutant quickly spread. In response, the gray morph became better adapted to the cold temperatures and scrub vegetation of high altitudes, to which it was increasingly restricted, while the brown morph differentiated in the semi-isolated pockets of lowland habitat into the several head-color forms. The advent of man in 1663, with his subsequent habitat destruction and creation of edges, broke down the isolation. This enabled the lowland birds to increase in numbers and expand upwards and outwards, making more contacts with the gray morph. All this resulted in the pattern of distribution which is found today.

Plausible as this outline is, Gill presents it as an opinion without discussing alterna-

tives. This could have been the most interesting part of the monograph, but for me it was the most disappointing. Can it be that author or editor decided any more speculation in this section would be unwarranted?

Perhaps the original morph was brown, and it was the gray morph that arose in situ. Or, maybe the gray morph invaded from Mauritius, as we are told (p. 2) that "judging from the similarity of the faunas, interchange between Mauritius and Reunion islands (only 90 miles apart) must have occurred quite frequently." There may be easy ways of disposing of these possibilities, but such arguments are not given. The reader is thus left to guess why Gill chose this particular reconstruction from among the several possibilities.

In an argument that Gill could have presented, I would suggest that a monomorphic, brown-backed Reunion population was successfully invaded by a reproductively compatible, gray morph from Mauritius, which introduced genes for gray color in the head and underparts. This invasion could have happened after the beginning of habitat destruction by man, and the distribution of phenotypes and adjustments of the gray morph may not yet have reached equilibrium. This would account for the clines that exist in the dimensions of brown morphs but not the gray. The predominance of the gray-headed brown morph in the northeast may have an historical explanation, at least in part: that may be the region where the gray morph originally invaded and introduced gray-head genes into Reunion. The relationship between bill length and altitude in the gray morph may indicate that selection has operated more intensely in this dimension (for its food gathering function?) than on wing and tarsus. My invasion hypothesis would have to and could be expanded to explain why bill length decreases with altitude in the gray morph (rather than increases) and why a lowland (Mauritius) gray morph would predominate in the highlands of the much higher Reunion.

Gill's answer to the original question is disappointingly undramatic: "The highly localized differentiation of populations of *Z. borbonica* appears to have been the inevitable result of several factors, e.g., its social and sedentary habits, . . . its ties to disturbed and edge habitats, the climatic diversity of Reunion Island, and perhaps increased adaptive flexibility resulting from release from some selective agents usually present on continents, such as visual predators. In themselves each of these factors is not very unusual but they are rarely found in combination within the confines of a small oceanic island." He may be right, but even on larger islands where all these factors prevail, this degree of variation is rare. This discussion lacks depth.

Despite these few disappointments, the study is satisfyingly thorough and a welcome addition to this excellently edited and produced monograph series. Incidentally, as a result of Gill's work, the four new subspecies are reduced to the original one.—PETER R. GRANT.

EVOLUTIONARY TRENDS IN THE NEOTROPICAL OVENBIRDS AND WOODHEWERS. By Alan Feduccia. Ornithological Monographs No. 13, American Ornithologists' Union, 1973:69 pp., drawings, diagrams, photographs. Paper cover. $2.00 ($1.60 to A.O.U. members). (Obtainable from Burt L. Monroe, Jr., Treasurer, A.O.U., Box 23447, Anchorage, Ky. 40223.)—Fundamentalists claim that morphologists do not find missing links, that they just arrange animals like books on a shelf. I wonder how fundamentalists would react to clambering ovenbirds (Furnariidae) and scansorial woodhewers or woodcreepers (Dendrocolaptidae), groups between which there seem to be almost too many possible links.

The evolutionary relationships between these two groups are the substance of this short monograph, but despite its title, there is little on evolution within the ovenbirds. Feduccia concludes that several "intermediate" woodcreepers (*Dendrocincla, Deconychura, Sittasomus, Glyphorhynchus*) are anatomically so close to several ovenbirds (Philydorinae) that woodcreepers are best considered a tribe of the Furnariidae. (Technically, "Dendrocolaptidae" has priority.) Either dendrocinclas and "strong-billed" typical woodcreepers arose as separate lines from philydorines, or dendrocinclas are primitive woodcreepers that advanced little.

Combining woodcreepers with ovenbirds is not a startling idea, for there are even possible intermediates other than those Feduccia was able to study, such as *Berlepschia rikeri*. With Mayrian glasses, one can foresee that the Cotingidae-Pipridae-Tyrannidae are next. However, woodcreepers do differ from ovenbirds in pterylosis (Mary Heimerdinger Clench, pers. comm.), in having toes modified for climbing, and to a lesser extent in other characters. Intermediates do not make lumping two groups necessary, so long as there is one adaptive character that arose monophyletically in one group. Feduccia's case would be stronger if he could say that woodcreepers arose polyphyletically.

In discussing relationships, Feduccia could have used more anatomical, biochemical, and behavioral information. The hemoglobin and the anatomy of dendrocinclas may be found to have remained like those of philydorines or to have converged with them for functional reasons, e.g., the fact that neither climbs much. Contrary to Feduccia, I have observed that dendrocinclas normally do not clamber about like philydorines, but wait vertically and sally out for exposed prey or that flushed by army ants. Dendrocinclas do not flake bark or rummage, so there is little reason for them to have evolved to a strong-billed state. Lack of a pair bond may occur in *Sittasomus griseicapillus*, a fast-climbing, tiny species that pecks prey off exposed limbs in dry forests. *Deconychura longicauda* looks like a dendrocincla but climbs more; *D. strictolaema* links it to *Glyphorhynchus*.

Could dendrocinclas have arisen from leafscrapers (Sclerurinae) rather than philydorines? Leafscrapers, despite ovenbird-like slit nostrils, look and behave remarkably like dendrocinclas when clinging alarmed to the base of a tree trunk. I have found that they rarely probe mud, again in contrast to Feduccia's observation.

Could woodcreeping behavior have arisen among ant-following philydorines, as Feduccia suggests? Here he confuses the ant-following flocks, which dendrocinclas join, with the mixed wandering flocks, which philydorines join. Neither leafscrapers nor philydorines follow ants much at the present time. Perhaps earlier, before antbirds evolved so many forms, there may have been more philydorine-sclerurine intermediates low in the undergrowth, and they may have moved from searching leaf litter to letting ants do the searching. Such behavior now seems impossible. *Xenerpestes* and *Xenops* suggest remnants of an ovenbird radiation toward the understory. Modern philydorines normally forage high or intently; they do not even notice ants, unless other birds are present.

An ant-following woodcreeper could have given rise to climbing types of woodcreepers, lured to the "carrot" of food on the bare tree trunks of lowland forests and driven by the "stick" of competition from evolving antbirds. Another evolutionary route is possible, however; this could have been through small clambering ovenbirds of mixed wandering flocks (*Xenops*, etc.) to small woodcreepers like *Deconychura strictolaema*, then to strong-billed forms on one hand and through *D. longicauda* or *Sittasomus* to dendrocinclas on the other hand. Many woodcreepers follow either mixed flocks or army ants, making evolution of an ant-following woodcreeper from woodcreepers seem more likely than from ovenbirds. This would have required some convergence of dendrocinclas and

large ovenbirds. Otherwise, either clinging would have to have developed after ant-following, or the evolutionary sequence started with a very large and unwieldly trunk-climber. *Berlepschia*, however, shows that even the last suggestion is not impossible.

There are just too many possible intermediates! I wish that Feduccia and others might visit Reserva Ducke near Manaus, Brazil, where all the intermediate woodcreeper genera and several strong-billed ones—13 or more species in all—occur with a few leaf-scrapers and philydorines and nine or so species of woodpeckers. Surely guilds of trunk-climbers like these occur only in Amazonia!—EDWIN O. WILLIS.

FUNCTIONAL ANATOMY AND ADAPTIVE EVOLUTION OF THE FEEDING APPARATUS IN THE HAWAIIAN HONEYCREEPER GENUS *LOXOPS* (DREPANIDIDAE). By Lawrence P. Richards and Walter J. Bock. Ornithological Monographs No. 15, American Ornithologists' Union, 1973:x + 173 pp., 14 figs., 26 pls. Paper cover. $6.00 ($4.75 to A.O.U. members). (Obtainable from Burt L. Monroe, Jr., Treasurer, A.O.U., Box 23447, Anchorage, Ky. 40223). —This interesting volume has an unusual history in that it is an elaboration and refinement of the unpublished Ph.D. thesis of Lawrence P. Richards, completed in 1967. In 1968 the two authors "decided to work together on the final preparation of this study for publication, so as to bring together the special knowledge of Richards on the natural history and morphology of the Hawaiian Honeycreepers and the special knowledge of Bock on the functional morphology of the passerine jaw and tongue apparatuses." Consequently, the authors "look upon this paper as a truly cooperative undertaking in spite of the separate origins of the information and ideas used in reaching the interpretations and conclusions presented herein."

The following subjects are discussed: types of food and feeding methods, rhamphothecae of the beak, cranial osteology, jaw musculature, and the tongue apparatus. Osteology and myology are discussed in great detail, and they are illustrated by many fine drawings. The discussion of the skull of *Loxops* is undoubtedly the most complete description ever given of a passerine skull. Unfortunately, the authors use a telegraphic set of abbreviations for names, which increases greatly the task of the reader in understanding the labelled drawings. Although an appendix lists the abbreviations and full names for bones and muscles, it is much easier for the reader if complete names are included on the drawings.

Most authors have adopted the proposal of Hans Gadow that the Hawaiian Honeycreepers are related to the New World nine-primaried oscines, and specifically to the "Coerebidae." Richards and Bock, however, propose tentatively to follow the suggestion first made by P. P. Sushkin in 1929 that the honeycreepers evolved from cardueline finches. Moreover, they suggest that the extinct *Ciridops anna* "may well be the closest present-day representative of the primitive stock of the Drepanididae." This differs from the interpretation reached by Dean Amadon that *Ciridops* was an advanced member of the subfamily Drepanidinae. Richards and Bock also propose that *Loxops virens* "is probably closer to the ancestral stock of the genus *Loxops* than the other known members of the genus."

There are two chief values of the monograph by Richards and Bock. The first consists of the detailed descriptions of the osteology and myology of the skull (including the tongue) and the equally detailed figures that illustrate these features. The second is the emphasis placed on the great need for thorough studies of both the anatomy and the

biology of all species of Hawaiian honeycreepers in the field before it is too late (see Wilson Bull. 84:212–222, 1972).

This reviewer was surprised at the large number of guarded and qualified statements about functional interpretations of relatively minor anatomical differences found among the four species studied and of the possible evolutionary pattern in the honeycreepers, as well as at the amount and kind of data used. For example, "an initial working hypothesis was made that muscle size is, in general, a rough index of muscle strength among homologous muscles." The authors point out (p. 14), however, that "the initial assumption used in this comparison is not valid for all comparisons of skeletal muscles as pointed out by Gans and Bock (1965). Rather one should measure the total cross-sectional area of the muscle fibers as an index to force production, the length of the fibers as an index to displacement abilities, and the angle of pinnateness as an index to the force and displacement component along the vector direction of the muscle pull. Unfortunately, these factors are more easily discussed than measured, and we realize fully the shortcomings of our comparisons in not undertaking these measurements. . . . the conclusions reached on the basis of these comparisons are relatively rough ones that do not go beyond the assumptions employed." In their comparison of the relative size of jaw muscles (pp. 74–76), the authors remark that "the muscles are ranked only in relative size with the largest muscle given the rank of '1'; no quantitative values are assigned to the differences in any of these rankings. Larger muscles are assumed to be stronger, i.e., develop a greater maximum force. The only valid comparisons that can be made in these tables are horizontal ones within the homologous muscle or possibly within a set of muscles in the several taxa. Comparisons *must not* be made vertically along the columns between different muscles or different sets of muscles because the same rank, e.g., 1, in several different muscles does not imply equal size or force development."

Similarly, the attempted correlation of feeding habits with jaw morphology is based on minimal data. For the Hawaii Creeper (*Loxops maculata mana*), for example, we find (p. 21) that "out of twenty-five descriptions in my field notes twelve of these probings were at the bark of branches and trunks, seven were into hair-like lichens, two onto exposed twigs, two into moss on branches, one in rotten wood, and one underneath a flat lichen growing on a branch." Feeding habits of the Maui Creeper (*L. m. newtoni*) were observed in the field on only two days; this is one of the more common species in the Maui rain forests. Such limited observations of feeding behavior are surely inadequate for postulating elaborate analyses of bone and muscle mechanics and the possible evolutionary sequence within the genus.

Richards and Bock are well aware of the weaknesses in their presentation. In writing of the Hawaii Akepa (*Loxops c. coccinea*), they state (p. 23): "These crude data may aid in giving an idea of the food niche of this race." Of the functional interpretation of the horny covering of the bill (p. 30), they remark that "these correlations between the ramphothecal morphology and feeding observations are largely hypotheses to be tested by further observations, not proven facts." "All conclusions reached in this phase of the study [jaw musculature] are speculations and must be treated as hypotheses to be tested, not as demonstrated facts" (p. 53). In the functional interpretation of the skeletal and muscular mechanism of the jaws (p. 78): "We are clearly cognizant of the lack of essential information on the exact movements of the jaws during feeding, on the exact forces, musculature and otherwise, acting on the jaw apparatus, on the exact food preferences of each species and other equally important factors, so that these conclusions are offered only as hypotheses for further consideration and testing. In spite of their inadequate basis, these conclusions form a valuable basis for further study and we offer

them without apology." In their discussion of the correlation between feeding habits and skull morphology, they write (p. 111): "The disjointed nature of these summaries does not provide a sufficient basis for understanding the adaptation of the entire feeding apparatus for the feeding habits in each species of *Loxops*, and most importantly, for comprehending the adaptive history of the genus *Loxops*. The latter is essential for any future analysis of the evolution and classification of the Drepandididae, including its origin from some mainland group within the New World nine-primaried oscines." Similar qualifying statements are made on pp. 32, 84, 110, and 120.

In view of these apologetic statements, one cannot but question the justification for devoting so many pages to hypotheses, when the authors themselves acknowledge that the data are inadequate. It is important, therefore, that ornithologists study this work carefully, so that its hypotheses do not become stated facts in subsequent literature. A number of striking typographical errors are annoying.

I would point out that Richards and Paul H. Baldwin were "modern pioneers" in the study of the endemic Hawaiian forest birds. Their field work in the early 1950's ended a period of nearly 40 years during which virtually nothing was learned about the forest birds. Only someone who has worked in the Hawaiian rain forests can fully appreciate the difficulties faced by these men. I agree fully with the following statement (p. 128) made by Richards and Bock: "Hopefully the most significant result of this study of the adaptation in the feeding apparatus of *Loxops* is to provide a stimulus for additional studies on the comparative biology and evolution of the Hawaiian honeycreepers and the eventual understanding of the classical example of adaptive radiation they provide." —ANDREW J. BERGER.

DER ZUG EUROPÄISCHER SINGVÖGEL. EIN ATLAS DER WIEDERFUNDE BERINGTER VÖGEL. Part 1. By Gerhardt Zink. Vogelwarte Radolfzell am Max-Planck-Institut für Verhaltensphysiologie, Germany, 1973: loose leaf folio of 123 pp., including text, 4 figs., and 87 maps. Paper cover. DM 48.00. (Obtainable from Vogelwarte Radolfzell, D 7761 Schloss Möggingen, Germany.)—This first of three parts of an atlas on European passerine migrations contains banding and recovery data for 3,969 individuals of 30 species of the Turdidae and Sylviidae. The following species groups are included: wheatears (*Oenanthe*), chats (*Saxicola*), nightingales (*Luscinia*), grasshopper warblers (*Locustella*), reed warblers (*Acrocephalus*), Icterine and Melodious Warblers (*Hippolais*), bush warblers (*Sylvia*), leaf warblers (*Phylloscopus*), and the kinglets (*Regulus*).

About 100 passerine species will be covered when the third part of the atlas is completed. Dr. Zink, of the Vogelwarte Radolfzell, has compiled and edited this magnificent tome, resulting from European endeavors in bird-banding. It reflects enormous progress since the publication of the first such atlas by Schüz and Weigold in 1931, when all they had to rely upon where the recoveries of 27 banded birds. No ornithologist interested in bird migration and its analysis can afford to overlook this important new piece of work, but he must be cautioned, too.

The system of the atlas is plain cartography, the plotting of the banding and recovery sites of individual migrants. The author restricted his choice of species to those for which the banding and recovery data of individual birds could be plotted and read in book-size maps. An additional 25 species are mentioned only by lists of references in

small print. This is quite unsatisfactory, because it is from these latter species, such as the Barn Swallow (*Hirundo rustica*), that the banding stations have accumulated the largest samples of recovery data. These species have been disregarded simply because they no longer fit into the maps in the form of individual plottings. It is my opinion that they should have been used and analyzed in the first place as populational samples adequate for analyses with modern statistical methods. They could have yielded a new and much-needed understanding of the natural migration patterns of species, subspecies, and geographic populations.

The weakness of the atlas itself lies in its cartography. The maps are not equidistant projections and do not show equal areas. The corresponding banding and recovery sites are connected by straight lines, which are not compass directions, great circle routes (which might be a good way to characterize the migratory pathways of many migrant species), or the actual flight paths of the birds on record. Nevertheless, the plots can be determined, with some inaccuracy, by using the scale and grid markings along the edges of the maps.

According to the author's plan, the atlas contains the data for only those birds that were recovered more than 100 km from their banding sites. Samples of short-distance recoveries, although mostly large and very informative, have been altogether excluded. They should have been used, for they provide a precise and biologically meaningful determination of the flight routes and their correlations with time, space, and other environmental factors. The grid presented by the long-distance recoveries is much too coarse to provide a means for extracting such desirable information from the atlas. Information on the total numbers of birds banded or the precentages of birds recovered is lacking. Birds banded as nestlings (places of their origin) and at other times of the annual cycle are distinguished by various cartographic symbols. Unusual migratory phenomena are shown in supplementary maps, e.g., Wheatears (*Oenanthe oenanthe*) banded and recovered in Iceland. This being an atlas, the texts accompanying the maps are very brief and are limited to notations on the relevant periods of the annual cycle (migrations, winter quarters), as well as references to the material used and pertinent literature. Zink presents few of the biological and ecological data that would interest banders and that are the spice of any research in banding and bird migration. His lists of literature on the migrations of the species treated are not complete.

What, then, is the value of this atlas, apart from its meticulous documentation of a very successful part of the European bird-banding programs? It is a stimulating guide and a tool for field ornithologists devoted to banding birds. It shows clearly that the migratory patterns of the majority of the migrant species are still not sufficiently known. Through its results and weaknesses, the atlas reveals needs for certain banding projects and research on migration under natural conditions aimed at a better understanding of bird migration.

Bird-banding stations, with their vast accumulations of data steadily increasing under the enthusiastic endeavors of dedicated field ornithologists, are storehouses of a wealth of scientific information. It is a great task, and a time-consuming one, to make this dormant information available to science. This atlas has accomplished one step in this direction, but the challenge remains for the development of specific and cooperative banding programs and an efficient analysis of the banding and recovery data. Neither modern biostatistical methods nor the biology and ecology of the migrant species can be ignored in the analysis of the ever-fascinating topic of bird migration.—E. G. FRANZ SAUER.

FINCHES. By Ian Newton. Taplinger Publishing Co., New York, 1973:288 pp., charts, maps, drawings, photos. $12.50.—North American readers may feel that this title is misleading, for the book itself is concerned almost entirely with the European fringillines and carduelines. It is, however, much more than an account of 18 European seed-eaters. As the behavior and ecology of several of the species are rather well-known, and as the birds are related species with geographical ranges that largely overlap, the author is able to provide a comparative treatment that exemplifies many basic biological problems. The book is thus to be recommended as an introduction to current problems in field ornithology, as well as for the data on the birds themselves.

The first three chapters are devoted to introducing the species. Ten of the remaining thirteen chapters are comparative, dealing with a variety of aspects of distribution, ecology, and behavior. In each of these, evidence is drawn from many of the species, and interspecific comparisons are used to give depth to the discussion. The author worked for many years with the late David Lack in the Edward Grey Institute at Oxford, and this experience must have been in part responsible for his ability to weave into coherent patterns material on breeding seasons, clutch size, aspects of ecology, and migration. The comparative material on feeding behavior, based largely on Newton's own work, is also of special interest. The descriptions of courtship behavior are necessarily condensed, but Newton's comparative approach enables him to convey a great deal of information in the space allowed.

The other chapters are concerned with what might be described as "special studies." One of these, on the breeding behavior of the Chaffinch, is largly distilled from Peter Marler's monograph on this species. The two others are both based on studies by Newton himself—one on the important economic problem which Bullfinches pose to fruit growers and the other on the movements of crossbills.

Indeed it is perhaps the author's own involvement in so much important research on finches that gives the book its special quality. The discussions are based on a detailed search of the literature (and there is a considerable bibliography), but this is tempered by the freshness which can come only with first-hand material. On top of this, Newton is a level-headed scientist, interpreting the field data in terms of evolutionary theory.

There are good color plates of the species, though the colors of some are not quite true; 24 excellent black-and-white plates, and 64 text figures. Only the tables have been printed in a somewhat less pleasing way than they could have been.—ROBERT A. HINDE.

AN EYE FOR A BIRD: THE AUTOBIOGRAPHY OF A BIRD PHOTOGRAPHER. By Eric Hosking, with Frank Lane. Paul S. Eriksson, Inc., New York, 1973:xviii + 302 pp., 16 color pls. and 124 black-and-white photos. $10.00.—The headmaster who told his fifteen year old student, "Hosking, you'll never make anything of your life," would have been a failure as a fortune teller. For today the Cockney, Eric Hosking, is unquestionably the most noted and respected bird photographer in the world. His autobiography is an intriguing distillation of the abundant life this man has led while filming birds and other wildlife on every continent except the Antipodes. Hosking has co-authored a dozen books, furnished illustrations for 700 more, and maintained a grueling lecture schedule for thirty-two years. In his time he has become warm friends with such notables as Lord Allenbroke, Prince Philip, and Roger Tory Peterson.

The book's title is most appropriate, for Hosking lost an eye while attempting to film a Tawny Owl in 1937. A measure of this man's courage and compassion was the fact that two days after leaving the hospital he was back filming the owls and pleading with a gamekeeper not to shoot them!

An Eye for a Bird contains delightful morsels of interest to almost everyone, including historians, romantics, and women's libbers. Hosking tells us that Kites and Ravens served as the "dustmen," or garbage collectors, of London in the 17th century; that Princess Margaret, who later married a photographer, once labeled Hosking, who was on assignment at a haying party, as "a beastly old photographer"; and that a Bedouin assured him that a girl child counted as only half a person.

But it will be ornithologists and wildlife photographers who will derive the greatest pleasure from this volume, because it recounts numerous incidents that divulge hard facts about the avian world. It was Hosking's observations that established that the hen Marsh Harrier passes food to the male and that the species is polygamous. During the London blitz, he noticed that Starlings learned to imitate with frightening reality the whistling of falling bombs. Another discovery was that Ravens can count to at least four or five; in order to film the activity at a Raven's nest Hosking simply had a classroom of children escort him into his blind to deceive his subjects.

Hosking vividly describes the joys that a bird photographer may have while confined in a blind. While in a Hungarian marsh, for example, "A young moorhen came and fed just in front of my hide, a queer little thing with black body and bright red bill. Water rails belched all round, little crakes 'craked,' bearded tits pinged, Savi's warblers reeled, bitterns boomed and there was a procession of purple and gray herons flying by all the time. A dragonfly used the alley-way betwen the hide and the nest to fly backwards and forwards as though it was on guard duty."

Hosking's wife, who often worked closely with him, once wrote in her diary, "What a great element of chance there is in bird photography." This statement came after the Hoskings had examined—at great cost in time and energy—many Golden Eagle eyries and found none suitable for filming. Yet, wittingly or unwittingly Hosking offers a great deal of encouragement to wildlife photographers everywhere. For one thing, he proved that one does not have to specialize in exotic subjects in far-away lands to be successful in the profession. Indeed, for years he made his living from the subjects found in civilized England alone, and his most famous photograph (reproduced at least 1000 times) is of a Barn Owl, a common enough predator in more than a score of countries.

If, as Mrs. Hosking implied, luck does play a part in obtaining high quality wildlife pictures, especially those of birds, then Eric Hosking was born under a galaxy of lucky stars. This is evidenced by the dozens of superb black-and-white and color pictures scattered throughout the text.

This reviewer protests Mr. Hosking's claim that he initiated the use of pylons for bird photography in 1936. Dr. Francis Hobart Herrick built some tremendous towers of both wood and metal in order to photograph nesting Bald Eagles along the south shores of Lake Erie, as early as the 1920s.

From personal experience this reviewer suggests that when filming nesting owls it is possible to have the beam of a flashlight or even more powerful illumination on the scene at night, without causing a lessening of parental care of the young. Hosking writes of trying to trip his camera in darkness, just hoping the owls would be in the frame when the flashbulb fired.

Hosking conducted lengthy experiments with birds' defenses of their territory, and

his final paragraph on the subject might give us all pause. "In one way or another our experiments showed that a vital problem of the bird world finds its counterpart with man. A bird is at its fiercest when it thinks its living space is threatened. Is it too much to hope that man might learn something from this?"—KARL H. MASLOWSKI.

AMERICAN BIRDS. By Roland C. Clement. "Knowledge Through Color" series, no. 39. Bantam Books, New York, 1973: 159 pp., illus. Paper cover. $1.45.—Is any other field of natural history literature so plagued with pot-boilers as is that of bird books? Week after week we see the publication of poorly-conceived, hastily assembled products, whose sole justification for existence is somebody's hope for a fast buck. Publishers are experienced businessmen, who do not package a product without a reasonable assurance that there is a market for that product. If this is so, then we must reluctantly admit that *anything* about birds will sell, judging from what the publishers offer.

A recent case in point is this Bantam paperback. It is one of a series characterized as a "unique home reference library . . . perfect as source material for student papers . . . packed with hundreds of specially created *full-color* illustrations." All the photographs in this book are from the files of the National Audubon Society, and the text is by Roland Clement, vice president of the Society and a distinguished conservationist. The Society and Dr. Clement should be ashamed of themselves. All too many of the illustrations were "specially created" all right—by shoving captive birds into a staged background (viz. Bobwhite), by photographing cagebirds without bothering to conceal the cage (viz. American Goldfinch), or even by posing "stuffed" birds (viz. Ring-necked Pheasant). I noted only one misidentification (one too many): the female Wood Duck is actually a Mandarin Duck. Color reproduction is not bad for a cheap, mass-produced book, but a pink-billed, pink-footed Bald Eagle is a bit startling. I was not surprised when I found that all of the photographs about which I had any suspicions were taken by people I had never heard of, rather than by such naturalist-photographers as Roger Peterson, Sewall Pettingill, the Cruickshanks, or Karl Maslowski, all of whom are represented by the fine photographs of wild birds that we would expect of them.

Only 120 species are figured. Choices thus had to be arbitrary to some extent, but are sometimes oddly balanced; the three Gruiformes shown are the American Coot and *both* American species of cranes. One might have expected that selection might have leaned a little more toward species of which *good* color photographs are available. The prestige of the National Audubon Society among the American public is such that the Society does itself a disservice, in my opinion, by maintaining such low standards in its photographic files (much less allowing these to be published and credited to the Society).

The text consists of about 13 pages of highly generalized introduction to birds and bird watching, illustrated by a crude diagrammatic map of five principal "Life Zones" (not Merriam's) of North America, and a set of nine ghastly drawings of "adaptations" (3 of bill, 2 of wing, 1 of tail, and 3 of foot). Each species is given a short paragraph, with an additional paragraph introducing each order. Although some western species are figured, there is a distinct eastern bias, especially in the text paragraphs (which often mention non-figured species). Thus the only chickadee shown is the Black-capped, and half of its text paragraph is devoted to the Carolina, but no western species is mentioned. Even in these brief paragraphs, errors or gross oversimplifications occur. In the last two

dozen or so species accounts in the book I found such items as the attribution of sexual dimorphism to the Lark Sparrow; designation of a call of the Evening Grosbeak as its "song"; characters to distinguish the Bobolink in fall from "other large sparrows"; the statement that the House Sparrow is not really a sparrow but an "African Weaver"; and attribution of the word *mariposa* as the *sole* "Latin American [!] name for the whole tribe of warblers." I hate to think of any student using this book as "source material" for a paper.

A critical review of a paperback may seem like overkill, but this book can serve as an example of the mediocrities being foisted on the birdbook-buying public by hungry publishers. At $1.45 it is not much of a bargain, which is a pity; its defects (except for color reproduction) are not a function of its cheapness, but of carelessness, undoubtedly haste, and an unconcern for the high standards we should expect from the author and the sponsoring organization.—KENNETH C. PARKES.

IN THE SHADOW OF THE FALCON. By Ewan Clarkson. E. P. Dutton & Co., Inc., New York. 1973: 186 pp., 7 drawings by David Stone. $6.95.—The Peregrine Falcon is one of the noblest, swiftest, and most romantic birds in the world. It has been the favorite hunting bird of falconers for thousands of years. Its world-wide population had remained stable until recently, when its numbers declined at an unprecedented rate. This decline coincided with widespread use of chlorinated hydrocarbons such as DDT.

"In the Shadow of the Falcon" is the story of a pair of Peregrines and their offspring. The book begins at the cliffside eyrie off the coast of Wales and goes through an entire life cycle. Clarkson's vivid, evocative prose portrays accurately, but without sentimentality, occurrences in the life of the Peregrine Falcon. One gains the insight of what it must be like to be a falcon. Clarkson must have studied both wild and trained Peregrines for many years, in order to be able to describe so accurately the behavior and feelings of these birds. I myself have been associated closely with Peregrines for over 30 years (wild, falconry, and captive breeding) and find that the author's insight and subtle innuendoes most truly give the correct feeling of "Peregrine."

In one incident, a Black-backed Gull was about to knock a young falcon off the nest ledge. "At a moment Frika [adult male falcon] hit him, and the force of the blow pinned him to the ledge, splintering one wing and tearing a great flap of skin from his neck. Larus tore himself free and launched himself into space, one wing frantically fanning the air as he spiraled down to the waves. Freya [adult female falcon] came up from below, hit him hard, and swooped past, turning to drop and hit him again. Larus was already dead, his head half-severed from his body."

A feeling of how young peregrines learn to hunt is well portrayed in the following sentences: "Chek [the young male falcon] killed several times in the days that followed, always in company with his parents. On two occasions the prey had already been hit and wounded before he made his strike, but whether this was by accident or design on the part of the older birds may never be known. The peregrines may have been teaching Chek how to hunt, or they may simply have come to regard him as a member of the team."

An insight into the humidity requirements of developing eggs is given in the following paragraph: "Refreshed and invigorated, she would then return to the eyrie, frequently with her underskirts still damp from her bath. This did no harm, and indeed

the eggs benefited from the moisture and steamy warmth. It helped prevent fluid loss from the egg and preserved the elasticity of the shell."

There are a few slight errors in the book. In chapter 3, Clarkson writes, "The next morning there was another, and on the following day a third [egg], slightly smaller than the others." Peregrines generally lay their eggs at 48, not 24 hour intervals. Later, he states that the tiercel (male) hatched from the smaller egg, the implication being that males—which are one-third smaller than the females when fully grown—develop in smaller eggs. There is no scientific evidence to corroborate this. The following quote (p. 77) may give readers a slight misconception of the Peregrine's digestive system: "the indigestible remains of bone and feather which their crops could not digest and which they threw up after each feed." The food actually goes from the crop to the stomach, where the digestion takes place. There are no digestive glands in the crop. Hawks and falcons are able to digest bones, and rarely is there even a small piece of bone in a hawk's pellet. This is quite different from owls, which do not have crops and cannot digest bones. Their pellets usually contain all the bones and skulls of their prey. In the diurnal birds of prey (Falconiformes) pellets are not regurgitated after each "feed." The material is accumulated, and when enough is in the stomach, regurgitation occurs—normally early in the morning, as no feeding has taken place during the night. In spite of these few faults, "In the Shadow of the Falcon" has echoes of meaning for all who are concerned about the future of the earth. At the same time it is an engrossing story that will remain long in the reader's memory.—HEINZ MENG.