REVIEWS

EDITED BY WALTER BOCK

Avifauna of the Eastern Highlands of New Guinea.—Jared M. Diamond. 1972. Publ. Nuttall Ornithol. Club No. 12. vii + 438 pp., 42 figs., 19 tables, 4 maps. Cloth. $15.00. Order from Nuttall Ornithological Club, c/o Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138.—Despite its modest title, this is a very thorough, innovative, and readable account of the ecology and distribution of the avifauna of a large area of New Guinea, as well as a systematic study of its birds. The Eastern Highlands stretch, virtually unbroken below 5,000 feet, for some 200 miles east and west along the 1,000 mile central mountainous backbone of New Guinea. The highlands produce a north-south separation of midmontane and lower altitude birds and an isolation of those confined to higher altitudes. This general effect of the mountains combines with the special geographical and ecological situations that make each mountain unique to form the complex background on which this study is based.

A meticulous survey by Diamond of Mt. Karimui between 1,350 feet and the summit at 8,165 feet provides the basis for his analysis of the altitudinal distribution of 166 forest species. He found that a rapid change takes place in species composition between 3,650 and 6,000 feet, with only 12 species occurring at both altitudes. This change is particularly apparent in the field because some common and conspicuous species drop out and are replaced by others, although it proved to be more gradual when all of the data were analyzed. Even so the shift is abrupt, and Diamond thinks it might be sharper here than on other New Guinea peaks because of Mt. Karimui's unique configuration.

On the basis of his analysis Diamond concludes that altitudinal segregation is the single most important sorting mechanism operating on New Guinea bird populations. More generally he concludes that speciation in the Eastern Highlands involves east-west separation and isolation, followed by recontact with altitudinal displacement, and then an eventual spreading over all New Guinea with mutually exclusive altitudinal ranges. If these altitudinal representatives continue to diverge, one may be able to reinvade the altitudinal range of the other, with eventual complete sympatry a possibility. The many carefully documented cases of congeneric altitudinal representatives on Mt. Karimui, as well as those from other areas discussed by previous workers, suggest that this model is sufficient to explain much of the diversity in the central mountain chain of New Guinea.

In several instances Diamond has shown that competitive exclusion among congeners is apparently responsible for the altitudinal ranges of the species. For example, where one species in a series (usually a middle one) is not present in a particular locality, the others broaden their altitudinal ranges; or where two congeners, allopatric over most of their ranges, overlap at some point, displacement and narrowing of altitudinal range occurs in the zone of overlap. It seems to me that competitive exclusion would apply mainly to species that remain very similar in their ecological requirements as reproductive isolation develops. Should sufficient morphological changes and/or niche shifts arise during the initial period of east-west isolation, altitudinal segregation may not occur with recontact. Instead coexistence may be effected at the outset.

Diamond approaches the problem of just how east-west isolation may have arisen in the midmountain areas where no obvious barriers exist. After examining the patchy distribution of some species, he proposed the concept of *dropout*

phenomena to explain these interrupted ranges. This involves first local extinction within a continuously distributed species to produce a gap in the range. The low dispersal rate in sedentary forest birds then provides the isolation needed to accumulate the genetic differences necessary for species formation.

To me dropout seems too unstable a mechanism to provide long-term isolation for speciation, particularly in view of the many cases of altitudinal segregation of congeners that one finds in New Guinea. Gilliard (1969, Birds of paradise and bower birds, New York, Natural History Press) suggested that periods of glaciation may have served to isolate populations and allow speciation, and I agree. Glaciation not only supplies the isolation necessary for speciation but the retreat of the glaciers allows the formation of new habitat into which the newly speciated forms can move.

Diamond discusses, more or less fully, a number of other subjects bearing on present bird distribution: breeding seasons, migration, niche width at lower and higher altitudes, altitudinal tolerances, and factors that serve to allow congeners to coexist at the same altitude. He also analyzes the zoogeographical affinities of the avifauna of the entire Eastern Highlands area, extending a previous analysis by Mayr and Gilliard (1954, Bull. Amer. Mus. Nat. Hist. 103: 328), and discusses the breeding avifauna of nonforested areas and the colonization of man-made mid-mountain grasslands.

Diamond also makes important systematic contributions, including a model review of the difficult *Meliphaga analoga* complex and a long-overdue generic revision of the Paradisaeidae. In the latter he reduces the number of genera from 20 to 10, only 5 of which are monotypic. His conclusions are based on female morphology, anatomical studies by Bock (1963, Condor 65: 91–125) and Stonor (1938, Proc. Zool. Soc. London, Ser. B, 108: 417–481), behavior (including voice and displays), distribution (both altitudinal and geographical), hybridization, and adult male similarities (rather than differences). The revision is generally quite good, but he should have cleared up nomenclatural problems brought about by generic lumping. I feel that perhaps *Ptiloris* and *Seleucidis* are more closely related than he indicates, and I have reservations about the large genus *Lophorina*—as did Diamond, but can offer no satisfactory alternative.

In several cases Diamond has departed from the generic classification used by Rand and Gilliard (1967, Handbook of New Guniea birds, New York, Natural History Press). He notes these changes but does not always cite the published source. In general they are easily followed and are long overdue, but I question the inclusion of *Gymnocorvus* in *Corvus* and would retain it as a separate genus as suggested by Schodde (1964, Emu 64: 73).

The various systematic findings are included in the species account section, which covers all of the species recorded from the Eastern Highlands. Only Diamond's own material is treated in detail unless specimens from other places are of particular interest; hitherto unpublished records by R. Bulmer and a few by others are included. The inclusion of stomach content data from birds Diamond collected on Mt. Albert Edward in southeastern New Guinea is potentially misleading if populations differ in feeding habits.

Diamond gives great care to noting and diagramming songs and calls; in particular his comparison of nonmusical sounds to everyday noises gives a clearer idea of these vocalizations. Local native names are often onomatopoetic renderings of the birds' voices, and the care with which Diamond records these names reflects his continuing interest in native classificatory systems.

The book is reasonably free of typographical errors, but a frustrating oversight is the omission of page numbers for a good percentage of the cross references, where instead one finds the galley reference (00). Overall this is a solid contribution that should stimulate much further work in New Guinea and elsewhere. It is a fitting tribute to the late Robert MacArthur, to whom it is dedicated.—MARY LECROY.

A check list of the birds of Cyprus.—P. F. Stewart and S. J. Christensen. 1971. Published privately (cyclostyled) for the Cyprus Ornithological Society. 92 pp. (printed on one side only). Order from Sgt. Stewart, 20 A. M. Q., R. A. F., Mount Batten, Plymouth, Devon, England. £ .75.—This work treats 362 species in the main text, which is preceded by a short introduction and followed by an index of common and scientific names. For most of the 336 accepted species are details on seasonal status, abundance, local distribution, and, where appropriate, information on breeding, passage, and subspecies. For rarer, introduced, and rejected species specific records are generally listed, giving at least numbers, dates, and localities. Subspecies names are based on the literature and determinations supplied by several museums, and the information is both a useful summary and perhaps a stimulus toward the resolution of problem groups.

Notable omissions from the work are a map of Cyprus and a bibliography, and welcomed would have been greater citation of published sources and greater detail for unusual records. The absence of a bibliography is puzzling, in that some references are given that call for one, e.g. "Payn (1938)" on p. 53. Greater use of citations and presentation of detail would have been possible just by using wasted blank areas and by eliminating unnecessary headings for genera and subfamilies. Typographical errors are not numerous but most could have been eliminated by proofing against a good list of scientific names.

Although victim of a few flaws, this work is overall a very useful summary—essential to students of Cyprus birds and of interest to many others. It is a worthy successor to Bourne's list (1963, Cyprus Ornithol. Soc. Bull.) and it provides a great deal of updated information for the Bannermans' recent book on Cyprus birds, reviewed in Auk 89: 908–910, 1972. (Incidentally, in that review I wrongly criticized the lack of acknowledgment in use of data that I mistaken believed to be unpublished.)—JOHN P. HUBBARD.

The birds of the Republic of Panama.—Part 3, Passeriformes: Denrocolaptidae (Woodcreepers) to Oxyruncidae (Sharpbills).—Alexander Wetmore. 1972. Washington, D. C., Smithsonian Misc. Coll. 150. iv + 631 pp., 1 col. pl. numerous line drawings. Cloth. $15.00—This is the third part in a series treating the birds of Panama and the first involving passerines, covering the suboscine families Dendrocolaptidae, Furnariidae, Rhinocryptidae, Cotingidae, Pipridae, Tyrannidae, and Oxyruncidae. The format is the same as that for parts one and two, previously reviewed by Howell (1968, Auk 85: 150) and myself (1969, Auk 86: 574–575) respectively. General family accounts (including keys) are followed by accounts of species and subspecies. A detailed description appears for each of the 196 species, while a brief section on "characters" suffices for each subspecies; the section on "measurements" appears under the subspecies or, where monotypic species are involved or but a single subspecies of a polytypic species occurs in Panama, under the species. Ranges are given for both species and subspecies, as well as material on life history, taxonomy, and other pertinent topics.

Usage is once again standard and conservative; I find but two variations from the usual treatment of recent years, and those involve well-documented cases. *Grallaria fulviventris* and *G. perspicillata* have been transferred to the genus *Hylopezus* (on the basis of several independent studies), and the Traill's Flycatcher complex is treated in the light of modern concepts (two species, *Empidonax alnorum* and *E. traillii*). While I do not agree that specimens of the latter two species can be assuredly assigned on the basis of "details of dorsal coloration" (p. 475) or other morphological criteria, Wetmore's assessment of the situation relative to the two species in Panama is undoubtedly correct (but subspecific assignment of specimens of *E. traillii* may be premature at this time). Other taxonomic changes proposed in recent years, most of which remain controversial, have been rejected, with taxa retained in the traditional sense (e.g. *Muscivora* and *Tyrannus* are recognized as distinct genera).

Although the flyleaf of the cover still indicates that Part 4 will be the final volume, it is clear that such will not be the case if current size is maintained. About two-fifths of the species remain to be treated, as well as an avifaunal discussion, the gazeteer, and the bibliography.

Once again the work is thorough, almost errorless typographically, and well-organized. The series is an absolute must for any student of tropical American ornithology.—BURT L. MONROE, JR.

Vogelzug.—Finn Salomonsen. 1969. Munich, BLV Verlagsgesellschaft. 210 pp., illustrated. Price DM 22.—**Fugletraekket og dets gader** (Bird migration and its riddles).—Finn Salomonsen. 1972. Copenhagen, Munksgaard. 326 pp., illustrated. Price 77.15 kroner.—After two earlier editions (see Auk 71: 214, 1954; 87: 389, 1970), there now appear the above German and revised and enlarged Danish editions of this notable book. To put it in perspective, one may examine what has been published in the field of bird migration in Europe in the last 25 years. There have been nine such books printed in Germany, six in England, two in Holland, and at least one each in Sweden, Belgium, France, and Spain. Thus, Denmark offers a significant contribution with the three Danish editions of Salomonsen's book, proof of the great interest in birds among the public of that small country—through which a great part of the avifauna of northern Europe passes in migration.

Those of us able to read either of the new versions of Salomonsen's book will enjoy his factual but flowing style. Emphasis is on the general and essential, with mainly Danish and Euro-African examples. The literature coverage is selective, and consequently the scrutinizing critic misses several important sources (e.g., several works by A. H. Miller, and R. H. MacArthur 1959, Auk 76: 318). In spite of this, one finds upon reading the text that the *ideas* or *results* of such works are indeed incorporated in the book. In addition, the new editions are amended with such recent items of migrational research as telemetric methods, magnetic orientation, energetics physiology, invasion migrants, etc. The account of molt migration is still unique, and appears in much greater detail than in the recent paper by Salomonsen (1968, Wildfowl 19: 5). The specific account of migration in Danish birds is omitted in the German edition, but somewhat enlarged in the Danish.

When do we see the next edition, this time in English, Dr. Salomonsen?—MIKLOS D. F. UDVARDY.

Reproductive behavior in Tetraonidae, with special reference to males.—Ingemar Hjorth. 1970. Viltrevy (Swedish Wildlife) 7 (4): 183–596, 158 figs. (4 in color), 5 tables. Price 40 kr.—Dr. Hjorth has published several valuable contributions to the biology of the Black Grouse and the Tetraonidae in general. The present monograph summarizes much of his work done in Sweden in 1958–69 and during two field seasons in North America. This is a very impressive volume, with over 400 pages devoted mainly to territorial and mating displays and other behavior of the males of 13 species of grouse. While Hjorth has no personal experience with ptarmigan, they are discussed rather superficially from the literature sources. The only member of the subfamily not treated is the as yet unstudied Severtsov's Hazel Grouse (*Tetrastes sewerzowi* Przhevalski).

The book is organized in four parts. In the first, and longest, are species-by-species descriptions of the location, organization, and rhythm of display activities, characteristics of motor patterns and vocalizations, and the display or signal organs. The second part deals with aspects of pair bond and mating systems and with morphology and environment of ancestral grouse, and Hjorth discusses speciation on the basis of these considerations. The third part classifies grouse displays according to their function and significance. The final part attempts the phylogeny of display postures, movements, and vocalizations together with the signal organs that serve them.

The methods employed in field work were observation, filming, and sound recording; the last was analyzed mainly by *melograms* produced by a new instrument which, according to the author (1970, J. Theoret. Biol. 26: 1), displays qualities of the fundamental frequencies of monotonous music better than the sonograph.

The first part of the book is a gold mine of details for the grouse behaviorist, especially as the rich literature is utilized exhaustively. This chapter alone contains 140 illustrations, four of them in color, most of them composite or depicting various behavior or vocalizations in series. A great number of the display illustrations were drawn from film sequences, and where necessary arrows and symbols indicate movement patterns of the various display organs. The black-and-white line drawings of posture and the habitat photographs are excellent, the rendering of vocalizations clear, and the maps satisfactory.

The importance of the second part exceeds the interest of the ethologist, as here a phylogeny is given—not of the taxa, but of the various ecological groups of grouse that show parallel or homologous features in behavior and signal organs. Dr. Hjorth plans a separate paper on grouse phylogeny, which may explain the fact that the eco-ethological phylogenetic scheme is not emphasized forcefully. In my opinion it is nonetheless a main and extremely important conclusion, even presented as a tentative scheme, and it amalgamates elements of theories put forward by J. Huxley, C. G. Sibley, R. K. Selander, and D. W. Snow.

Hjorth tabulates the studied tetraonids in progressive series according to mating system and display organization, i.e. monogamy, with solitary displaying (*Tetrastes, Lagopus*); promiscuity, with solitary displaying (*Bonasa, Canachites, Falcipennis, Dendragapus*); promiscuity, with less well-organized collective displaying (*Tetrao, Lyrurus mlokosiewiczi*); and promiscuity with well-organized gatherings on leks, or arenas (*Lyrurus tetrix, Pediocetes, Tympanuchus, Centrocercus*). Starting from a territorial, forest dwelling prototype, Hjorth assumes ancestral sexual dimorphism, adaptive in that conspicuous cock plumage may have promoted sexual recognition and mating and perhaps decreased predation from the less conspicuous hen. Predation may also have figured in the evolution of mating "courts" away from the

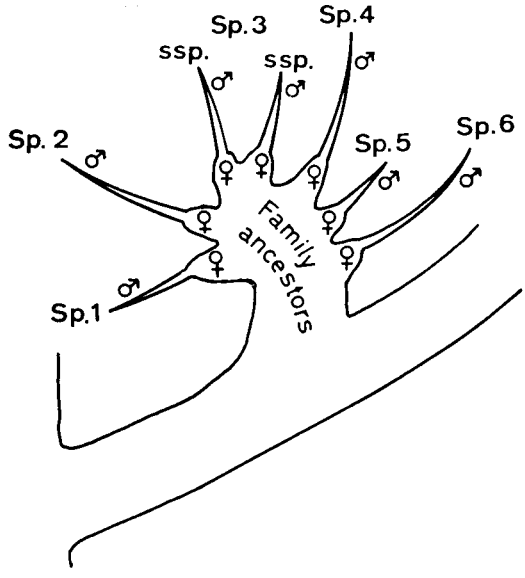

Figure 1. A suggestion on the evolution of sexual dimorphism in Tetraonidae, based on five mono- and one polytypic species (Sp. 1–6; Sp. 3 with 2 ssp.). Female divergence from the common "stem"—family ancestors—is minimal and does not prevent hybridization. Males have differentiated remarkably, making the group appear much more diversified than it really is. Owing to the great morphological diversity of the males, in the past the different species have been put into different genera. This process of differential divergence between female and male is defined as *sexuation* (from Hjorth 1970).

nest site and the hen. Hjorth suggests that the display courts of neighboring territorial cocks may have become aggregated through provision of better predator detection: a displaying group of cocks is as wary as the wariest individual.

The lek behavior, with ensuing promiscuity, promotes the evolution of elaborate displays and signal organs through sexual selection (and, as it becomes clear from Part IV, through evolution of ritualizations and convention display postures and activities that allow close proximity among competing cocks). At this stage the cocks of lek species have evolved drastic size and other morphological differences from the hens. As their contact with the hen is restricted to the mating season, all-year sexual segregation ensues, followed or paralleled by the evolution of differential niche utilization.

The above scheme is based on the evolution of ethological and morphological characteristics in males. The characters of the females in this scheme would not change rapidly, especially as the evolution of male characters negatively influences possible similar changes in female characters. If we consider, with Hjorth, the morphology of female grouse, we find that they are very close to one another in the 13 species treated. Clearly the strong differentiation that delimits the 11 genera is primarily among the cocks. Hjorth's term for this type of evolution is *sexuation*, "in which general (morphological and behavioural) characters of the one sex are so poorly differentiated that their divergence from the general "stem" (family

ancestors) is minimal and does not restrict hybridization" (p. 475). Hjorth's diagram (Figure 1) illustrates this in the Tetraonidae. The corollary theoretical reasoning is that in this system, although the cocks are highly specialized and the role of mate selection falls upon the hen, extensive hybridization is largely prevented by the habitat segregation that is found in the group (cf. Pitelka 1941, Amer. Midl. Naturalist, 25: 113).

Part III is a minute "comparative anatomy" analysis of the male displays in grouse, including advertising, threat, and avoidance (toward other cocks) or appeasement (toward the hen). Part IV discusses the possible origin of the displays, and Hjorth is able to derive most from different elements of attack leap and flight, pecking, and defense movements. He suggests in many cases the role of the habitat in steering the course of display evolution in grouse. Especially important are his numerous attempts to show the sequence of behavioral differentiation, first under habitat influence, followed by signal organ evolution, and then by further differentiation of behavior and morphology.

A grouse specialist would very likely be able to find debatable or incomplete details in Dr. Hjorth's book; no publication lacks these. Even so, this may stimulate others to fill the hiatus or complete the results presented here. For the nonspecialist, this is an admirable monograph, comparable to and in the details certainly surpassing, Konrad Lorenz' pioneering monograph of anatid behavior. Its methods of approach, exemplary organization, and general and evolutionary conclusions will certainly stimulate ornithologists and turn attention toward comparative evolutionary ethology of birds.—MIKLOS D. F. UDVARDY.

Hawaiian birdlife.—Andrew J. Berger. 1973. Honolulu, Univ. Press of Hawaii. xiii + 270 pp., 59 color pls., 126 black-and-white figs., 2 tables, 3 appendices. $15.00.—This is the definitive work on Hawaiian birds. It is no ordinary state bird book because Hawaii is no ordinary state. The avifauna is the product of a unique evolutionary history and has suffered greater depredations at the hands of mankind than that of any other part of the country. Therefore it is entirely appropriate that in addition to the usual species accounts and distribution records, Berger has woven throughout the text the story of the disastrous effects of civilization on the birds of Hawaii.

The book opens with a general introduction to the history and physiography of the Hawaiian islands. Total isolation from contact with other land areas throughout their life of 10 to 20 million years set the stage for their role as a natural laboratory of evolution. A variety of habitats developed through the interaction of climate and geology. The islands today range in altitude from sea level to 13,796 feet, and annual rainfall varies from 7 to 600 inches. Evolution over millions of years produced a diverse avifauna from an estimated 15 founding species, but in the past two centuries wholesale extinction has accompanied human activities in the islands. Berger chronicles the sad tale of continuing habitat destruction through the clearing of native forests, overgrazing, and the drainage of wetlands. Predatory mammals and introduced birds and their diseases have further affected the native avifauna. Feather hunters slaughtered seabirds and introduced rabbits and rodents to the leeward islands. The saddest part of the story is that the destruction still continues. What previously occurred haphazardly in a young and developing society, today proceeds under the insensitive authority of state and federal forestry, game, and military bureaucracies. The chapter ends with a brief discussion of avian evolution and extinction, and a pessimistic assessment of the future of the native Hawaiian avifauna.

The birds are discussed in three long chapters according to whether they are indigenous, endemic, or introduced. Most indigenous forms are seabirds, which range widely over the ocean but breed in the islands. Species accounts cover each bird's appearance, feeding habits, and breeding biology. The current status of endangered species is also discussed. The seabirds include two species of albatross, three shearwaters, three petrels, two storm petrels, two tropicbirds, three boobies, a frigatebird, and six species of terns. The only indigenous land bird is the Black-crowned Night Heron (*Nycticorax nycticorax*). Migratory species that do not breed in Hawaii are listed in an appendix.

The longest chapter in the book deals with endemic birds. The Hawaiian Goose (*Branta sandvicensis*) inhabits rugged upland lava fields far from open water. Its population fell from an estimated 25,000 in the late 18th century to fewer than 30 birds in the early 1950s, because of hunting and introduced predators. A program of breeding the birds in captivity was started at that time. Several hundred birds have been released and some breeding has occurred in the wild, but it is too soon to tell whether the species will be maintained in nature. At least it has been saved from total extinction. Other endemic Anatidae are the Hawaiian Duck (*Anas wyvilliana*) and the Laysan Duck (*A. laysanensis*). Both are being propagated in captivity, but their future as wild species is precarious.

Hawaii has two endemic birds of prey, the Hawaiian Hawk (*Buteo solitarius*) and the local race of the Short-eared Owl (*Asio flammeus sandwichensis*). Little is known of their habits. Both feed extensively on introduced rodents. The question of what they ate before man arrived is not discussed.

Of the four endemic Rallidae, the Laysan Rail (*Porzanula palmeri*) and the Hawaiian Rail (*Pennula sandwichensis*) are now extinct. The Hawaiian races of the Common Gallinule (*Gallinula chloropus sandvicensis*) and American Coot (*Fulica americana alai*) still persist, but are threatened by drainage projects, as is the only endemic shorebird, the local race of Black-necked Stilt (*Himantopus himantopus knudseni*).

For some unexplained reason the Red Jungle Fowl (*Gallus gallus*), which the Polynesians brought to the islands, is included in the chapter on endemic birds rather than that on introduced birds.

Endemism reaches its peak in the passerines. The Hawaiian Crow (*Corvus tropicus*) is near extinction. Two endemic thrushes (*Phaeornis*) occur, but some races of one species are extinct. The Laysan Millerbird, *Acrocephalus familiaris familiaris* (Sylviidae) disappeared when rabbits denuded the island of vegetation. The Nihoa Millerbird (*A. familiaris kingi*) persists on Nihoa island; its total range thus encompasses only 156 acres. *Chasiempis sandwichensis* is an endemic muscicapid with distinct races on three islands. It is still fairly plentiful and seems to have adapted to environmental changes better than most native species. The Old World Honeyeaters (Meliphagidae) were represented by 2 genera with 5 species, of which 4 are now extinct.

The most fascinating segment of Hawaii's avifauna is the endemic family Drepanididae, the Hawaiian Honeycreepers. Berger follows Amadon's classification, with 2 subfamilies, 9 genera, 22 species, and 24 subspecies. The family evolved from one or two founding species of unknown affinities. The various theories of their origin are reviewed briefly, but no definite opinion is expressed. This section brings together in one place most of what is known about the biology of these unique birds. Much of the information is new, resulting from recent studies by

Berger and C. Robert Eddinger. Of the known species of Hawaiian Honeycreepers 40% are now extinct, and the survival of many of the remainder is seriously threatened. One extinct species is known from only five specimens. One wonders how many species disappeared in the last 2 centuries without ever becoming known.

More than 150 species of foreign cage birds and nearly 80 forms of potential game birds have been released in Hawaii, but most did not become established. Exotic birds may compete directly with native forms, and also introduce diseases and parasites. These factors undoubtedly played a role in the decimation of the native birds. Introduced birds may also carry human diseases. Berger discusses these problems in some detail, and argues convincingly for a ban on the introduction of *any* animals except under the most rigorous controls.

There follow discussions of the introduced birds other than game birds, those being merely listed in an appendix. Most of these descriptions are brief because few studies have been done on introduced birds. The forms discussed include the Cattle Egret, 3 species of Columbidae, the Barn Owl, a swift, and 26 species of passerines. In this list are virtually all the birds that the average visitor or resident will see in the cities and towns, parks, and ranches of Hawaii. The surviving native species are mostly restricted to relatively inaccessible places where few people go. Thus for most people the introduced birds *are* the birds of Hawaii, and the native birds are largely unknown. Perhaps this is a factor in the general public indifference to their fate.

The book is extensively illustrated, but the illustrations vary in quality. Many of the numerous black-and-white photographs of habitats, birds, nests, and eggs are printed so darkly as to obscure detail, but the 59 color plates are excellently printed. Many of the bird paintings, while technically accurate, lack a certain vitality. Often the birds look less like living creatures than like the stuffed skins from which they were painted. The Iiwi in plate 45 appears to have its right foot on backwards.

"Hawaiian birdlife" ably summarizes the present state of knowledge of its subject, and points out clearly how little is really known about many species. It should therefore stimulate a good deal of new research in Hawaiian ornithology. It replaces Munro's "Birds of Hawaii" as the standard work on the subject. Happily, it is reasonably priced for a book of its kind. This should place it within reach of the general public, in whose hands the future of Hawaiian birdlife ultimately rests.—ROBERT J. RAIKOW.

Systematics and behavior of South American flickers (Aves, *Colaptes*).—Lester L. Short. 1972. Bull. Amer. Mus. Nat. Hist. 149 (1). Pp. 1–110, 24 figs., 24 tables. Paper. $4.00.—This volume is the logical, if not genetic, sibling of Short's monograph on the flickers of North America (1965, Bull. Amer. Mus. Nat. Hist. 129 (4): 307–428). In it the author includes the three South American species in the genus *Colaptes* recognized by Peters (1948, Check-list of birds of the world, vol. 6, Cambridge, Massachusetts, Harvard Univ. Press), i.e. *rupicola, pitius, campestris*, plus the three species recognized by Peters in the genus *Chrysoptilus*, i.e. *melanochloros, punctigula, atricollis*. Some reasons for merging these genera are discussed briefly, but the author would have us believe that this discussion is after the fact (p. 9): "The genus *Chrysoptilus* had not been merged in *Colaptes* prior to my determination (1965a) that it is congeneric with the other flickers." The reference is to Short's monograph on North American flickers

in which he sinks *Chrysoptilus* by simply saying (p. 313): "I favor broadening of the genus to include the 'genera' *Chrysoptilus* and *Nesoceleus*." And the authority cited in 1965 for the synonymy? The four years elusive "Bock and Short, MS."

The major part of this monograph is a discussion of morphological variation and hybridization within *C. melanochloros*, *C. rupicola*, and *C. campestris*. In discussing the subspecies groups of *C. melanochloros*, Short gives the concept of hybridization a new twist (p. 52): "These morphologically distinct groups are convergent in their features wherever their ranges meet, that is, they hybridize."

No total sample sizes of specimens are presented for each species examined, but figures given in various tables indicate that the author examined approximately 700 specimens of *C. melanochloros*, 60 of *C. rupicola*, and 275 of *C. campestris*. Reference to variation in the remaining three species (*C. atricollis, C. punctigula, C. pitius*) is primarily verbal description with no indication of the numbers of specimens examined. The statement in the introduction that the author (p. 6) "examined more than 5000 specimens of the various species discussed" apparently includes all of the North American and Cuban specimens examined for previous studies.

As a result of the examination of his data, the author conservatively disposes of several previously recognized taxa. Short lumps *Chrysoptilus melanolaimus* Traylor (1951, Fieldiana-Zoology 31: 421–437) with *Colaptes melanochloros*, recognizing the two as groups within the species. He reduces the taxonomic complexity of that species by retaining only two of five subspecies within the *melanochloros* group (*C. m. melanochloros, C. m. nattereri*) and three of five subspecies within the *Melanolaimus* group (*C. m. melanolaimus, C. m. nigroviridis, C. m. leucofrenatus*). The author also recognizes *C. pitius* as a monotypic species, and reduces the number of subspecies of *C. punctigula* to eight by synonymizing *C. p. lutescens* and *C. p. notatus* with *C. p. punctipectus*. In each case, the synonymy of taxa resulted from the examination of specimens unavailable to previous workers, specimens that suggest that variation between former taxa is smoothly clinal and that the subspecies boundaries were artificialities based on inadequate geographic representation of material. Considering the samples Short examined, it seems likely that more subspecies will be synonymized in the future as the species become better represented in collections.

Unfortunately the author's use of statistics is primarily limited to establishing means and standard errors for locality samples in some of the characters used. No effort is made to compare statistically data from the various sample sets. Rather, Short's "Analysis of geographic variation" represents a subjective "eyeballing" of the data. Considering the quantity of data and the effort obviously made to collect it, the lack of statistical analysis is lamentable.

The last third of this monograph deals with the general ecology, vocalizations, and displays of the six species. While the author presents new and worthwhile information, the data sets for the various species are generally not complete enough to allow meaningful comparisons. Apparently Short spent something less than 7 months studying these species in the field: from September to December 1967, and from July to September 1968. Most of this time was spent studying *C. melanochloros* and *C. campestris*. To compensate for the incomplete data on the South American species, the author describes the vocalizations and displays of *C. auratus* and uses these to form the framework for his discussion. Short recognizes the deficiencies and points them out to encourage others to fill in the gaps. His categorization and discussion of vocalizations and displays are well done and should facilitate future work in this area.

In concluding the section on behavior, the author discusses pair formation and the importance of interspecific differences in sexual dimorphism as possible isolating mechanisms. One typographical error (p. 102) adds a humorous twist: "the predominance of agnostic behavior in the social life of woodpeckers."

In a convincing phylogeny of flickers at the end of the monograph, the author points out the arboreal adaptations of flickers to dispel any notion that they are primitive woodpeckers. He postulates that the ancestral flicker was small, similar to modern species of *Piculus*, and that the development of more terrestrial habits was accompanied by an increase in size. *Colaptes punctigula* and *C. melanochloros* are considered as possibly representing a superspecies.

Technically this monograph could have benefitted from more rigorous editing to reduce its length. The maps and several photographs are excellent. The four figures of several spectrograms each are confusing, as the sequence of figures and their sub-parts, though properly referred to, bear no relationship to the sequence of discussion in the text.

This work provides a base on which future work on the genus *Colaptes* can build. It also provides provocative material for the avian zoogeographer and evolutionary biologist. For others, it is probably too expensive.—JEROME A. JACKSON.

Finches.—I(an) Newton. 1972. London. Collins (The New Naturalist series). 288 pp., 4 col. pls., 24 black-and-white pls., 64 text figs., 18 tables, 18 appendices. £3.00.—This is a fine book on the ecology and behavior of the European finches, specifically the carduelines plus the Chaffinch and Brambling. Ian Newton's own superb field studies deal mainly with British species, but he draws on the worldwide literature of the 18 species to provide a comprehensive treatment. The species included are *Fringilla coelebs, F. montifringilla, Coccothraustes coccothraustes, Carduelis chloris, C. carduelis, C. spinus, Acanthis cannabina, A. flavirostris, A. flammea, A. hornemanni, Serinus serinus, S. citrinella, Loxia curvirostra, L. pytyopsittacus, L. leucoptera, Carpodacus erythrinus, Pinicola enucleator, Pyrrhula pyrrhula.*

An introductory chapter provides a general description of the Chaffinch and Brambling, their plumages, general distribution, life histories, and general ecology. Similar treatment is given to the carduelines, subdivided into the goldfinchlike birds, linnets, and serins, and the "less typical carduelines," including the Hawfinch, Bullfinch, Pine Grosbeak, rosefinches, and crossbills.

Distribution, habitats, and history are treated in an excellent chapter that provides revealing insight into the relationships of the finches to natural habitats and the profound effects that man has had on the native vegetation and thus on the distribution, abundance, and behavior of the birds. This chapter and the chapter on feeding ecology well illustrate the great value of the comparative approach. Newton discusses sizes and types of seeds used; bill size, shape, and musculature; feeding sites; leg length and body size; and feeding techniques, including learning and food traditions. Newton's own research is the foundation for this discussion. His unsurprising conclusion is that no two species of European finches have the same feeding habits; the great value of his discussion lies in the careful documentation of detailed feeding strategies for each species. Newton notes some fundamental differences between the carduelines and the two *Fringilla* species in feeding techniques; these and other differencs he sees as evidence of a distinct phylogenetic gap between the two groups.

Bullfinches are serious agricultural pests in Britain. They eat buds of fruit

trees. The damage is indisputable. An American reaction to this damage would probably have been a crash program developing and using chemical repellants and poisons, with the likely end result of affecting innocent species and creating serious new environmental problems. The Bullfinch problem was approached more sensibly. Recognizing that early attempts to control the damage were inadequate, Newton understook a 6-year study of the biology of Bullfinches. As a result, the feeding habits of this bird are perhaps the best known of any wild passerine. Newton discovered a key inverse relationship between annual variation in availability of ash seeds and bud damage to fruit trees. This knowledge has made it possible to predict damage and to minimize it by efficient trapping of the Bullfinches at the right time. The control program is highly effective, biologically sound, economical, and poses no threat to other species or to Bullfinch populations away from orchards. Why is it so difficult for us to accept the lesson that sound biological knowledge should precede control campaigns for pest species?

Other topics dealt with in detail are flocking and roosting, breeding behavior, breeding ecology, breeding seasons, molt, migration, irruptions, a special chapter on movements of crossbills, and weights and body composition.

Although Newton is a field biologist, his studies have led him to taxonomic conclusions that the field data support convincingly. He thinks that Carduelinae and Fringillinae (*Fringilla* only) should stand as the only two subfamilies in the family Fringillidae. Within the European carduelines the Hawfinch and the Bullfinch are most divergent, and these have obvious close relatives in the Evening Grosbeak and allies for the Hawfinch, and in the Pine Grosbeak for the Bullfinch.

The book is well-illustrated. Newton's writing is clear and straightforward. He gives a dynamic picture of the finches as parts of a living environment. Newton has produced a book of great popular appeal and scientific value.—HARRISON B. TORDOFF.

Supplement to The birds of Chile and adjacent regions of Argentina, Bolivia and Peru.—A. W. Johnson. 1972. [1973]. Buenos Aires, published by the author (order in U. S. from Pierce Book Co., Winthrop, Iowa, or Mrs. W. H. Nichols, 4711 Howard St., Muskogee, Oklahoma; in South America from author, Casilla 327, Santiago, Chile). 116 pp., several pls. (including 7 in color). Paper. $10.00.—This work contains information supplementing the two volumes published in 1965 and 1967 (see 1966, Auk 83: 490; 1968, Auk 85: 524) and deals chiefly with Chilean and Peruvian birds. Included is the description of a new species of conebill, *Conirostrum tamarugensis*—with a color painting by W. R. Millie—from Tarapacá, Chile (reprints available from the author). The new species is allied to the apparently sympatric *C. cinereum littorale*.

Species new to Chilean territory, including Easter Island, and "adjacent" southwestern Peru (redefined as the departments of Tacna, Moquegua, and Arequipa) are reported; among these are Chilean records of *Chaetura pelagica* and *Piranga rubra*. The life zones of this part of Peru are discussed (by R. A. Hughes) with a map and tables treating the avifauna. Corrected are certain earlier identifications of seabirds breeding on Easter Island, and new or additional information and photographs are supplied on four little known species, including *Phegornis mitchelli*. Among the other information are extensions of Chilean and Peruvian ranges, summaries of banding recoveries, and additional corrigenda.

One notes with regret Mr. Johnson's statement that this is his "last publication on the birds of this part of the world," for, as a businessman with an avocation

of ornithology, he has contributed in a distinguished manner to neotropical bird study and has provided a sound foundation to those who follow him in Chile.—E. EISENMANN.

Supplementary remarks to the foregoing review of **Supplement to The birds of Chile and adjacent regions of Argentina, Bolivia and Peru.**—Eisemann's scholarly and technical review of this slim book and his reviews of volumes 1 and 2 (1966, Auk 83: 490; 1968, Auk 85: 524) do not touch on several aspects of these fine works that are of great interest to much of the A.O.U. membership, particularly those many associate members who are not professional ornithologists. These books are not only technically fine but are very well-written—the accounts of each species are entertaining and beautifully describe the birds, their activities, and their habitats.

The illustrations—paintings, drawings, and photographs—although done by amateurs, are more than adequate for identification of species and show some dramatic contrasts of countryside and shore. The frontispiece in the "Supplement" picturing a new species, the Tamarugo Conebill, is, I believe, a reproduction of a wax crayon drawing, a most unusual medium for a modern artist, amateur or professional. It is reminiscent of and has the charm of the illustrations in early 19th century German children's books.

The most noteworthy chapter of the "Supplement" is of course that describing the new species of conebill. The contents of the entire little book are almost equally noteworthy—the birds of Easter Island, including the first ornithological discussion of its "Bird Cult," the delightful description of the breeding of the Chilean Torrent Duck, and the fascinating breeding of the Grey Gull in the torrid desert wastes. When I read my review copy of the supplement, only one facet of the work displeased me. Why, oh why, is so much of it a "Twice-told tale"? The Easter Island story appeared in Ibis in 1970 and the information in another chapter has seen the light of day in the Living Bird and National Geographic.

In spite of spilling the cream of their new material before the "Supplement" appeared, Johnson and his colleagues have done ornithology and bird watchers a great service. As the world grows smaller and tourists replace explorers as travelers to such world outposts as Easter Island, the Galápagos, Juan Fernandez, Tierra del Fuego, and Antarctica, I expect to see them carrying guidebooks quoting the words of A. W. Johnson and colleagues even as learned scientists do.—ELIZABETH S. AUSTIN.

Populations in a seasonal environment.—Stephen D. Fretwell. 1972. Monogr. Population Biol., No. 5, Princeton, New Jersey, Princeton Univ. Press. Pp. xxiii + 217, 64 figs. Cloth, $12.50; paper, $4.95.—Bird students have classically carried on population and community studies during the breeding season. They have believed, I suppose, that at this season, when offspring are being produced, determinants of fitness should be most clear-cut, resource competition most intense, and evolutionary adaptations most apparent. Studies have often been conducted, and theories formulated, as if winter never came. In this monograph, the fifth in the illustrious series established and edited by the late Robert MacArthur, Stephen Fretwell considers the effects of resource seasonality on the density and habitat distribution of populations, bird populations in particular. The moral of his story is that what

happens in winter *does* matter, and may have a wide variety of interesting consequences.

The book is divided into two major sections. In the first, Fretwell considers models of the effects of seasonality on the establishment of equilibrium population densities in both long-generation organisms, such as birds, and short-generation forms (e.g. insects). In the long-generation model, the year is divided into breeding (population growth positive) and nonbreeding (growth negative) seasons. It is assumed that recruitment rate over the breeding season is a density-dependent function of the spring population density, winter death rate a density-dependent function of fall population density; then, if the population is stable on an annual basis, these rates will, on the average, be equal. By expressing recruitment rate in what Fretwell calls a "transformation curve" (which is never clearly explained), as a function of fall rather than spring density, the model predicts the equilibrium spring and fall population sizes. When this curve "folds back," that is, when there is a zone of population sizes within which the recruitment or death rates are *strongly* density-dependent, interesting things happen. Most interesting, for Fretwell's argument, is what occurs when breeding or wintering season resources are increased. If, for example, the death rate curve "folds back," then an increase in breeding habitat has the initial effect of reducing breeding density, thus increasing recruitment, thus increasing fall population size. But because of the extreme density-dependence of the death rate, winter mortality increases sharply, with the result that population size the next spring is reduced. At equilibrium, then, the effect of increasing breeding resources in this situation is to *reduce* spring population size; further, as fall population sizes increase under these conditions, one concludes that "winter population size is at least partly limited by breeding habitat" (p. 12). A converse argument applies if recruitment rate is sharply density-dependent and winter habitat increases.

This model, and the several extensions of it that Fretwell offers, produce some interesting suggestions. For example, if winter food *is* limiting to a population in a density-dependent fashion, then we should expect resource competition during the breeding season to be largely absent. Further, resource-related adaptations should be expected to be most closely attuned to the more limiting season, and species limited by different seasons should thus exhibit different complexes of adaptations. These are important ideas in view of the general preoccupation of avian ecologists with breeding season-based explanations.

Many such ideas are offered, but for most it is difficult to determine how they are related to the models in any but an intuitive sense. This stems, I think, from the confusing and inadequate descriptions of the models themselves. The text is frequently disorganized, and is riddled with phrases whose meaning eludes easy comprehension; the graphs usually include many unlabelled lines with little accompanying explanation. Rigorous interpretation and evaluation of the models is thus a real challenge.

The second section of the book presents models of the habitat distributions of breeding and wintering birds. This, to me, is the more satisfying and stimualting section of the book, particularly because Fretwell now takes greater care to explain his models and the underlying assumptions and their implications, and the graphs are generally readable and relevant to his discussion. Fretwell suggests that habitat occupancy in species that undertake at least some dispersal ought theoretically to be some function of the relative suitabilities of available habitat types, modified by the density of birds already present (i.e. potential individual reproductive success may be the same in a highly suitable habitat with a dense breeding popula-

tion, or in a less suitable habitat with a sparser population). If individuals are free to select habitats, they should select those that, given the suitability-density distribution at that time, offer the best prospects for reproductive success. This sort of habitat distribution may be modified in several ways, as through territorial or dominance behavior, which may force individuals away from the most suitable habitats. Given these patterns, Fretwell predicts that a "free" distribution should result in habitats supporting different breeding densities having similar individual success rates, while distributions effected by territorial behavior should be evidenced by higher success rates in the habitats with higher breeding densities. Beyond this, habitat occupancy patterns during the breeding seasons may be influenced by winter season population limitation, the similarity of breeding habitats to those wintering habitats that permitted relatively high overwinter survival, and the overall breeding community composition and densities. There are other predictions: "the number of breeding species in a habitat is positively related to the proportion of individuals that *in the winter* are not vegetarians and to the number that are large" (p. 152), or "we should expect more vegetarian, high density species to breed in successional habitats" (p. 154). The arguments have many intriguing qualities and suggest a variety of field tests.

Fretwell also offers some ideas relating to the adaptiveness of body sizes in sparrows. Individual body size is considered to be a function of the interactions of metabolic demands, digestive capacity, and food capture abilities. Again, the theory leads to a variety of predictions: for example, "if winter food is limiting, body size should tend to the minimum, if predation or weather is limiting, body size should tend to be at a productive optimum" (p. 174), or "given a choice of diet, larger items will be selected on warmer days and in the evening" (p. 180). The evidence offered in support of these ideas is sketchy and in many instances ambiguous. Particularly suspect are the observations and measurements offered in support of his idea that intraspecific morphological variation should be greatest among species of intermediate size, that feed upon a more abundant portion of the food size spectrum. His analysis indiscriminately mixes cardueline and emberizine finches, which exhibit quite different patterns of variability (p. 194), and he completely ignores the detailed and telling arguments offered against his earlier development of this theory by Banks (1970, Evolution 24: 829).

Elsewhere, too, Fretwell's ventures into the realm of hard data leave one with an uneasy feeling. In support of the long-generation population regulation model, for example, he offers analyses of the results of several studies, most notably the Great Tit investigations carried on at Oxford, and Errington's Bobwhite and muskrat studies. By plotting curves through birthrate and "mortality" (which apparently includes dispersal, although Fretwell never admits it) values for several years, Fretwell concludes that tit breeding populations are limited by winter (perhaps fall) resources. As he notes, this amounts to only a slight reworking of David Lack's intuitions, and several important studies that bear on this question (e.g., Perrins 1966, Brit. Birds 59: 419; Krebs 1970, J. Zool., London 162: 317) are not cited. Further, the agreement with the model predictions seems not so remarkable when one carefully views the way in which neat sigmoid curves are plotted through clouds of data points. Similar problems arise in the analysis of Errington's data, where the model predictions are ambiguous at best. Fretwell offers his explanations of these "failures" of the model, to which I would add the possibility that seasonality in resource levels for organisms that feed on similar resources throughout the year, such as muskrats (and to a lesser extent quail), may be much less important to population dynamics than resource seasonality in

creatures with more varied diets, such as tits. The plotting of lines through points for Errington's data requires even more imagination, and interpretation is not made any easier by the fact that the analyses for stream and marsh muskrats are plotted on vastly different scales, and thus can be compared only with difficulty.

This is really no place to evaluate the details of Fretwell's examples or to complain about his graphing techniques, or the general lack of statistical tests in his data treatments (despite his training as a biostatistician), or the frequently rambling text. The redeeming value of Fretwell's book is in the many really stimulating and challenging nuggets of thought and speculation he has put forth, not in the application of data to these ideas. In a sense, his is a rather dangerous form of theorizing, for by presenting real data along with the speculations without carefully relating the two, the ideas gain an aura of reality and respectability that they otherwise might lack. Because of this, Fretwell's book requires careful, discriminating reading, but it can repay such attention with a wealth of ideas. And, in the final analysis, the *correctness* of Fretwell's ideas may not really matter to much; their real value is in posing new directions for ecological investigations, into long neglected areas. As Fretwell himself observes, "I offer models not as my version of reality but as part (I hope) of the process that is ecological understanding."

This is an important book, deserving (and requiring) careful study.—JOHN A. WIENS.

Avian anatomy. Integument.—Alfred M. Lucas and Peter R. Stettenheim. 1972. Washington, D.C., U.S. Government Printing Office, Agr. Handbook 362. 2 parts, xii + 340, x + 341–750 pp., 422 figures. $13.00 per set.—Occasionally a book is published for which reviews are superfluous. This monograph on the avian integument is one such work. It can be described simply as magnificent and is recommended to all ornithologists. Moreover this quarto-sized book with numerous color figures represents the best "book-buy" of several decades. I urge any serious student of avian biology to order a set immediately (Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402) while they are still available.

This monograph was done under the auspices of the Avian Anatomy Project of the Agricultural Research Service and hence deals mainly with domestic birds. Emphasis was put on the chicken with detailed comparisons with the turkey, domestic duck, common coturnix, and common pigeon, and in less detail with one wild species, the Great Horned Owl; no reasons were given for choice of this species. The major topics covered are topographical anatomy, pterylosis, molts and plumages, feather structure, feather growth, coloration of feathers and skin, feather and apterial muscles, and histology of the skin and its derivatives. Emphasis in all sections is on detailed morphological description with extensive literature citation. All terms are carefully defined. Techniques are stressed. Considerably less attention is given to functions and biological roles of integumentary structures and general discussions are short. Relatively little is said about the possible evolution of these features. The rationale underlying the choice of topics and the emphases given is obvious because of the nature of this Avian Anatomy Project. It is unfair to expect extensive coverage of subject matter of primary interest to ornithologists, but of only secondary importance to poultry scientists. Avain biologists must appreciate the immense amount of general and comparative anatomical information of the avain integument that Lucas and Stettenheim were able to include in this practical publication.

The value of the contribution of the various parts of this monograph depends, in part, on the level of research activities during the last several decades. For some topics, such as pterylosis, molts, and feather color, this monograph presents a good summary and will serve as a solid basis for future studies. In other areas, such as feather structure, development and growth, feather muscles, and histology of the integument, this volume makes major advances and establishes the foundation for all future research in these areas. I recommend the chapter on "Feather and apterial muscles" to all ornithologists as an outstanding example of morphological research. If nothing else, the figures of feather muscles are superb.

A chapter on techniques is valuable as a guide to morphological and illustrative methods. Model numbers of equipment used and addresses of the manufactures are included, which enhances the value of this chapter. The section on "Anatomical illustration" is excellent and recommended to any ornithologists preparing drawings for their papers.

A 17-page list of Latin-English equivalents for anatomical terms used in their study (Appendix B) is not restricted to integumentary features, but of broad application.

This volume on the integument was to be the first of a series covering all aspects of gross anatomy of birds based on the major domestic breeds. Unfortunately the Department of Agriculture terminated the Avian Anatomy Project 2 years ago before further volumes could be completed. The value of this project to basic research in avian biology and to applied agricultural research cannot be overrated. The present volume will be the basic reference for virtually all research on the avian integument for many years.

Ornithologists, vertebrate morphologists, veterinarians, and poultry scientists are indebted to Drs. Lucas and Stettenheim and their co-workers for this magnificent volume on the avian integument; they are to be congratulated and thanked for their lasting contribution to avian biology.—WALTER J. BOCK.

A revision of the New World species of *Ricinus* (Mallophaga) occurring on Passeriformes (Aves).—Bernard C. Nelson. 1972. Univ. California Publ. Entomol. No. 68. Pp. v + 130, 43 pls. Paper. $6.00.—This entomological paper is of interest to ornithologists because of the use of mallophaga in avian classification. Although I cannot comment on Dr. Nelson's abilities as an entomological taxonomist, examination of the systematic section and reading the general sections suggest that his taxonomy is sound and can be used with assuredness by avian taxonomists interested in the application of parasite relationships to questions of avian classification.

I call attention to Nelson's general discussions on biology of *Ricinus*, species concept, phylogeny, and host-parasite evolution, which should be of interest to ornithologists in general. He inquires into questions as whether mallophaga found on different host species of birds are "geographically" isolated from one another and concludes that they are not strongly isolated because of the possibility of host transfer through the use of common dust baths, nesting sites, mixed species flocks, and other means. Of greatest interest is Nelson's discussion of host-parasite evolution in which he concludes that the use of host occurrence of *Ricinus* species on passerine birds as an aid in avian classification varies greatly and that each case must be studied carefully and independently of others. As an example, he shows that the *subangulatus* species group is found on the Vireonidae, Thraupidae and Fringillidae, but that the Parulidae are host to the quite different *marginatus* species group.

And species of mallophaga of the *marginatus* group occur on members of the Regulidae and Tyrannidae. Host transfer of mallophaga has occurred from *Sturnus vulgaris* to *Turdus migratorius* and from an icterid species to *Sturnus vulgaris*. Thus the occurrence of *Ricinus fringillae*, a species found on many emberizine finches, on *Passer domesticus* appears to have been the result of host transfer and not an indication of relationship between these finches. The host distribution list (pp. 112–115) and a phylogeny (plate 1) are especially helpful to ornithologists interested further analysis of Nelson's data. Ornithologists are indebted to Nelson for providing them with much useful taxonomical data. Hopefully he will continue his studies strengtheing the foundation for the use of parasite occurrence in avian classification.—WALTER J. BOCK.

Pathogenesis of the avian embryo.—A. L. Romanoff and A. J. Romanoff. 1972. New York, John Wiley & Sons. xiv + 476 pp., 192 figs., 21 tables. $22.50.—This is a compendium of information about the effects of various agents in producing developmental malformations and prenatal death in the avian embryo. The title is slightly misleading in that there is little of a comparative nature; most of the work reported here deals with the domestic fowl. This book is a compilation of results from more than 6,000 published reports. The avian embryo is useful for teratological studies because fertilized eggs are readily available in large numbers, and agents introduced into an egg will remain there throughout development. They will not be removed or otherwise affected by maternal physiology as is the case in mammals. Nevertheless the results of these studies are useful in the development of general principles applicable to mammals and other groups besides birds.

Following a short discussion of the dynamics of development, a series of chapters details individual types and causes of malformation. These include spontaneous malformations, genetic mutations, atmospheric changes, ionizing radiation, nutritional deficiency, chemical teratogenicity, hormonal derangement, pathogenic afflictions, traumatic disturbance, and aberrant twinning. This is not merely a literature review. The authors have integrated the results of many studies and summarized their findings in 21 tables, some of them quite long. For example, Table 12, listing the pathogenic effects of various organic compounds on the developing embryo, takes 30 pages. An appendix summarizes various maternal and egg characteristics in relation to development and mortality. A glossary defines more than 100 technical terms relating to developmental malformations. An extensive bibliography is provided for those who wish to consult the original literature. Unfortunately the references are given by author and journal citation only; the titles of the papers are not listed. The bibliography is therefore useless for scanning the literature, and can only be used to find references cited in the text.

This is essentially a reference work rather than a textbook. It will be an invaluable aid to workers studying abnormal development, and might be a useful addition to laboratories in experimental embryology. Because of its high price, however, many students will find it too expensive to add to their personal libraries.—ROBERT J. RAIKOW.

ALSO RECEIVED

Birds of the Big Bend National Park and vicinity.—Roland H. Wauer. 1973. Austin, Univ. Texas Press. Pp. xi + 223, 25 col. pls. Paper. $4.95.—Intended by the author to be primarily a guide to bird finding in the Big Bend National

Park, this small volume should prove a most useful aid to the visiting bird watcher. The complex topography and habitat of the Big Bend region causes a rather disjunctive distribution of the bird life. A guide to bird finding there has long been needed because of the large number of species thus far recorded in the park (385 species, a greater number of species than recorded for any other park in the United States, according to the author) and the consequently large number of bird watchers this attracts.

A good foldout map is part of the book. Although the author specifically states the book is not intended to serve as a field guide, it contains numerous colored plates by Howard Rollin and Anne Pulich. These bird plates, although nicely done, no doubt add substantially to the cost of publication but do not aid materially in fulfilling the primary function of the book as a guide to bird finding. Quality photographs of various aspects of the vegetation of the area effectively augment a brief discussion of the plant communities (of which the author lists five). Six pages are devoted to a history of ornithological studies in the Big Bend region.

The major portion of the book, the annotated list of species, has enough pertinent information to be of general ornithological interest. Of special note are the dates and occasional comments relating to nesting activities and arrivals and departures of migrant species.

The author, formerly Chief Park Naturalist of the Big Bend National Park, spent 6 years in residence at the park. From the standpoint of ornithology, the author's time was most effectively used.—J.J.M.

Annotated field list Birds of Maricopa County, Arizona.—Salome R. Demaree, Eleanor L. Radke, Janet L. Witzeman (Compilers). 1972. Maricopa Audubon Soc. (4619 East Arcadia Lane, Phoenix, Arizona 85018). 70 pp., 23 tables, 1 map. Paper. $2.95 + 25¢ postage and handling.—The compilers assembled data from published records, museum specimens, and the field notes of many contributors. Bar graphs indicate the seasonal distribution and relative abundance of 346 bird species and annotations provide a brief statement of habitat preference and nesting status. References are provided for records of species found only a very few times. A section of the book gives directions to outstanding birding spots and will be useful for visitors.

Maricopa County is in central Arizona and about the size of New Hampshire. It contains the state capitol, Phoenix, and much irrigated land, but it is primarily a land of desert scrub. Expressions of relative abundance of birds are always difficult to define, especially for a region including habitats over an altitudinal range from 700 to over 7,000 feet. Thus terms such as abundant, common, and fairly common in this book will be more meaningful to the person planning a day's bird-watching trip than to one attempting to determine population densities in a given habitat. The book will be appreciated by the bird watcher and the student of bird distribution.—S.M.R.