

REVIEWS

EDITED BY WALTER BOCK

The number of species and genera of Recent birds: a contribution to comparative systematics.—Walter J. Bock and John Farrand, Jr. 1980. American Museum Novitates No. 2703: 1–29. 1 figure, 5 tables. \$2.10.—How many species and genera of birds are there? For more than a century the answer has depended upon the criteria used to define these categories rather than upon the discovery of previously unknown taxa. In the 1870's, Richard Bowdler Sharpe adopted a strictly binomial species concept for the Catalogue of the birds in the British Museum and thereby recognized 18,939 species in 2,810 genera. A similar approach caused Reichenow to estimate 20,000 species in 1913, but the application of trinomials reduced these numbers by half, and during the past 50 years the estimates have ranged between 8,000 and 10,000 species with approximately 30,000 subspecies. In 1951 Mayr and Amadon suggested the oft-quoted figure of 8,600 species \pm 2%.

Bock and Farrand used the "Reference List of Birds of the World" (Morony, Bock, and Farrand 1975, Amer. Mus. Nat. Hist.) as the principal basis for their counts of 9,021 living and recently extinct species in 2,045 genera. Of these, 3,747 species in 941 genera are nonpasserines and 5,274 species in 1,104 genera are passerines. The species-per-genus ratio for nonpasserines is 3.983, that for passerines 4.776. For all birds the ratio is 4.411.

These statistics (and there are many more) make fascinating reading for any ornithologist interested in the systematics and diversity of the birds of the world, but Bock and Farrand also have loftier objectives. The counts, and the calculations based upon them, provide the authors with the data for several excursions into the "comparative systematics" of the title. One of their goals is "to show how these data may be used to test various evolutionary theories and different approaches to classification." This is accomplished via comparative systematics, "a new area of inquiry within taxonomy," which utilizes "the analysis of the structure and composition of taxa (i.e. the number of component subgroups in each taxon and their nature) and of their evolutionary history." As an example, the authors cite the study by Mayr and Short (1970, Publ. Nuttall Ornithol. Club No. 9).

Comparisons among different lists published during the past 50 years reveal changes in the taxonomic concepts of the species. The extreme splitting of Sharpe and Reichenow produced a reaction favoring large polytypic species, including the mergence of allopatric forms with disjunct ranges. During the past decade, however, a small reverse trend has occurred in which disjunct but closely related forms are again recognized as species. However, when several geographically replacing species of such genera as *Anhinga*, *Morus*, and *Botaurus* are recognized the picture is again distorted. Bock and Farrand suggest that two measures are needed to reflect biological diversity, one in terms of reproductive units and the other in ecological units. From this they develop an argument in favor of three species concepts: 1) the biological species, based upon the lack of gene flow; 2) the superspecies, defined as monophyletic groups of biological species that replace each other geographically ("allospecies"); and 3) zoogeographical species, which are species that have completed the speciation process, permitting them to exist in sympatry with other such species. The zoogeographical species represents an ecological unit just as the biological species represents a reproductive unit. Zoogeographical species may include both monotypic and polytypic superspecies.

Thus a list of biological species is a measure of reproductive diversity, and a list of zoogeographical species is a measure of ecological diversity. The two lists together provide an estimate of total diversity. The species-per-genus ratio depends upon which of the two lists is used as the basis for the calculation. The 9,021 biological species recognized by Bock and Farrand probably include between 5,000 and 7,500 zoogeographical species.

The problem of generic limits is examined in some detail. In recent years the number of avian genera recognized by different authors has ranged widely, from 1,800 (Mayr 1946, Auk 63: 64) to an unspecified but much larger number employed by Wolters in his cladistic classification of the birds of the world (1975–1980, Die Vogelarten der Erde, Berlin, Paul Parey). Clearly, there is no consensus concerning the definition of the avian genus. Most recent revisions have tended to use large genera, a trend that, if carried too far, will reduce the usefulness of the genus. Bock and Farrand suggest that the number of avian genera will probably stabilize between 1,000 and 1,250, approximately half of the 2,045 they recognized in the "Reference List."

Bock and Farrand consider the distribution of genera in different size categories, with many interesting calculations and speculations. In the Morony, Bock, and Farrand "Reference List" there are 910 monotypic genera, 328 with two species, 178 with three species, etc., and one genus (*Nectarinia*) containing 75 species. Wolters (1977, Bonn. Zool. Beitr. 28: 82) used 24 genera for the 117 species of nectariniids; Morony, Bock, and Farrand placed the same species in five genera.

The distribution of genera of different sizes is plotted for all birds and selected subgroups. This frequency distribution has a hollow-curve shape, indicating that most genera contain few species. Of the avian genera, 60.5% contain only one or two species, and those with 10 or fewer species include 4,732 species, or 52.5% of the total of 9,021. The 39 largest genera comprise only 1.9% of all genera but contain 17.8% (1,607) of all species.

Why are some genera so large? Each represents a radiation of species, but the adaptive changes in morphology must have been small so that their close relationship is easily recognized from museum specimens. Bock and Farrand offer several reasons for large genera, viz. 1) the taxon is actually polyphyletic; 2) monophyletic, but artificially large; 3) contains many insular species; 4) speciation occurred in many refugia during recent climatic cycles; 5) radiation has occurred in many separate areas without extreme divergence; or 6) widespread genera have speciated without evolving sympatric species. Some of these explanations overlap and some examples are due to more than one process.

Another reason for variation in the size of genera, not mentioned by the authors, derives from the fact that the external structures and colors upon which most avian genera are based are usually evaluated only by the human sense of vision. Birds that rely mainly upon vision to identify conspecifics tend to evolve distinctive species-specific secondary sexual characters, usually in the males. Such groups (e.g. hummingbirds, birds of paradise) tend to be oversplit because the taxonomist is impressed by the visible differences among the males. Females in such groups are often much alike. Conversely, species that rely mainly upon vocal signals (e.g. some tyrannids, owls, nightjars) tend to look more alike, and hence are considered closely related and therefore congeneric (Sibley 1957, *Condor* 59: 166).

Bock and Farrand based their counts on an "evolutionary" classification in which the 9,021 species are arranged in 2,045 genera, 36 tribes, 115 subfamilies, 159 families, and 28 orders; thus 2,383 supraspecific taxa are needed to classify the 9,021 species, for a total of 11,424 names in their admittedly oversplit classification. However, a dichotomous "cladistic" classification would require 18,041 names to classify the same 9,021 species in 14 categorical ranks.

The authors suggest that the generic concept and its application still have many problems but that it is important "to maintain a consistent evolutionary meaning for the genus . . . by setting the limits of the genus so that the members display approximately the same amount of diversity." This is an admirable goal, but as long as external morphology remains the principal basis for generic clustering the genus will reflect the limitations of human sensory physiology at least as much as it encompasses similar amounts of evolutionary diversity.

Bock and Farrand conclude that most avian genera contain only one or two ecological units and that "the genus, as currently used in avian classification, contains very little ecological and presumably little morphological diversity. This supports the oft-repeated statements that avian genera are too finely divided and that the genus . . . has limited meaning in avian classification."

The paper includes a useful appendix correcting and updating the "Reference List" with references to revisions and other taxonomic publications to 1979. This is a thoughtful and timely analysis that combines morphological and ecological concepts in a critical review of the taxonomic value and practical application of the avian genus.

In conclusion, I might offer a personal comment. Bock and Farrand note that the problems that afflict the generic level are also present at the familial and ordinal levels in avian systematics. These problems derive, in part, from our limited ability to interpret the complex information in morphological structures. Convergent evolution produces false similarities and adaptive radiation conceals actual close relationships. Together they sometimes garble our interpretations of the taxonomic significance of morphological characters.

In spite of these problems, morphological studies have produced a classification of birds that is at least a first approximation of the phylogeny of the group. Because we know that the image is not perfect we continue to try to improve it. To do so we must utilize new sources of data as well as better methods for the analysis of traditional morphological characters. Recent developments in biochemistry and molecular biology have made it possible to obtain quantitative comparisons of proteins and nucleic acids that can evade some of the problems presented by gross morphology. Readers of *The Auk* will have seen examples of such studies that addressed problems at the specific and generic levels (e.g. Barrowclough and Corbin 1978, 95: 691; Avise et al. 1980, 97: 135; Barrowclough 1980, 97: 655). During the next few years similar studies will be extended to many groups and joined by other techniques that reflect the phylogenetic information encoded in relatively simple form in the sequences of the structural subunits of proteins and nucleic acids. Whether such techniques will produce phylogenies and classifications based upon objective measurements is not yet certain, but they have the potential to do so, at least in theory.—CHARLES G. SIBLEY.

Seabirds—their biology and ecology.—Bryan Nelson. 1979. New York, A & W Publishers Inc. 219 pp. + 36 color plates, 40 black-and-white photos, 60 maps, diagrams, and drawings (by John Busby). \$14.95.—Contrary to the summary on the dust jacket, this book is neither authoritative, nor should it be read by the interested birdwatcher or serious student. Except for the elegant color photos, the text and figures are fraught with unfounded opinions, omissions, and inaccurate statements. Any strength in the text lies within discussions dealing with the breeding biology of gannets, to a lesser extent other sulids, and to a still lesser extent other pelecaniforms. Nelson has contributed to ornithology much fine information on the breeding biology of sulids, specifically gannets, but why he in this book branched into other subjects and other seabird species, thereby exposing an acute case of tunnel vision and tainting his image as a seabird expert, is beyond my comprehension. It is possible to write a book summarizing the biology and ecology of seabirds, but for a specialist such as Nelson to do so would require a peer review prior to publication and far more time and homework than went into the present book.

Very annoying are the countless sweeping and glib statements that are not substantiated, are probably untestable, and in many cases are incorrect. To name a few: (p. 8) "Broadly speaking, the same general [seabird] types, in terms of size, shape, mode of feeding, etc., are represented in each of the major ocean zones . . ."; (p. 11) "The distinctive tube-nose of [procellariiforms] may be partly for gauging the strength of air flow . . ."; (p. 19) "The Antarctic Skua is divisible into clearly different ecological forms, one feeding at sea, mainly on fish, and the other a scavenger and predator."; (p. 20) "The Arctic Tern nests as far north as land goes, and, in the form of the Antarctic Tern, almost as far south, too."; (p. 44) "The Cape Pigeon paddles vigorously to bring plankton to the surface."; (p. 65) "Two of the most important and often difficult things a seabird does in its lifetime are to acquire a breeding place and mate."; (p. 112) "[The oil gland] is probably best developed in the Procellariiformes and Pelecaniformes."; (p. 180) "Most movement of seabirds at sea is concerned with foraging. . . ."

Then there are the many plain inaccuracies or blatant omissions. For example, Nelson says that (p. 12) Sooty and Short-tailed shearwaters show dark and light phases but otherwise shearwaters do not occur in different color forms; he fails (p. 12) to include two genera (*Pelagodroma* and *Halobaena*) in his listing of petrels and *Cerorhinca* (p. 22) from his listing of alcid species; depicts storm-petrels and small shearwaters as feeding on *phytoplankton* (fig. p. 54); says that the Shy Albatross is the largest albatross in New Zealand (fig. p. 181); and through his entire chapter on population biology, implies by example and omission that the natural state of seabird populations is one of stability, and that only the activities of man can cause them to increase or decrease.

There are more subtle disappointments as well. The Foreword states how, after accumulating information over many years, we are now beginning to understand seabirds. Yet many if not most of the ideas summarized are out of the 1950's and early to mid-1960's, though much work *has* been done since. For example, the framework to which discussions of social behavior are restricted is the totally mechanistic 1950's motivational approach, with little mention of the substantial work on behavioral ecology or communication done since; e.g. (p. 109) "Adults feed their young because they are wired, as it were, to need to feed them. Despite the absence of a pleasurable sensation comparable to that of the female mammal suckling her young, the act of feeding is a reward." How any of that interpretation can be deduced, except perhaps suckling in humans, is difficult to imagine.

Another example is the reduction of discussions on population regulation to a review of the confrontations of Lack, Wynne-Edwards, and Andrewartha and Birch in the early 1950's. Those contributions could be a foundation of discussion, but surely much has since been said about the behavioral ecology and demography of seabirds that would liven things considerably.

Other discussions sometimes tend to be confusing, although not perhaps to readers having no knowledge of seabird biology. For example, Nelson makes a large point about the supposed communal feeding by gannets and even goes into how their conspicuous plumage is an adaptation to enhance this behavior. Perhaps so, but at the discussion's end, almost in passing, he does mention that Masked Boobies have very similar plumage but do not feed communally, and he does not mention the fact that Piqueros (Peruvian Boobies) possess totally different plumage from these other two sulids but feed in flocks that are spectacular for their size, density, and seeming coordination. Another example resides in his discussions of how breeding adaptations are determined by feeding ecology. On Ascension Island the Brown Booby can find little food, so although it lays two eggs, only one chick has any chance for fledging (one kills the other), and even then its parents care for it for another 37 weeks. This is in contrast to the Piquero, which raises four chicks to fledging in a short time with no trouble. The example, as a discussion of adaptation, is weak in that it compares a widely spread species where it resides in a relatively unrepresentative (possibly marginal?) habitat—a tropical, oceanic island in a presently rather food-poor part of the ocean—with another species that is endemic to a region almost unique in its high productivity.

How about Brown Boobies that nest in coastal areas; does one chick still kill the other and does it still require 37 weeks to reach independence? Again, a mechanistic view of biology creeps into Nelson's remarks. The example is especially confusing, though, because according to Nelson, Brown Boobies on Ascension breed every 8 months, and if so, through some simple arithmetic, after 37 weeks a parent should be tending two chicks! So where does that leave us in the comparison with other boobies? Should the unwary really read this book?—D. G. AINLEY.

The age of birds.—Alan Feduccia. 1980. Cambridge, Massachusetts, Harvard University Press. Pp. ix + 196, numerous illustrations. \$20.00.— This volume provides a popular account of some fascinating aspects of the evolutionary history of birds. This kind of book may well capture the imagination of inquisitive high school or college students and perhaps stimulate the development of a new generation of paleornithologists; general readers should also find much of interest. Major topics include the reptilian ancestors of birds, *Archaeopteryx*, the origin of flight and feathers, the Cretaceous toothed birds, the evolution of specialized divers, *Presbyornis* and the origin of flamingos and ducks, the evolution of flightlessness, the evolution of raptors, and the phylogenetic interpretation of middle ear bones. Readers of Feduccia's journal publications will find much here that is familiar. A thorough and current enumeration of the major avian fossils is presented together with some of the history of paleornithological studies and a smörgasbord of information on the structure and habits of living birds. The pleasant hard-cover format is reminiscent of the coffee table trade, though here not so lavish as many. The unnumbered illustrations, all in black and white, vary widely in quality and include representations of an extensive array of fossil skeletons and reconstructions of extinct birds. Another title for the book might have been preferable; Feduccia (p. 103), like others, terms the Cenozoic the Age of Birds, yet this volume contains much on the Mesozoic.

Teachers and researchers not specializing in evolutionary history may wish to use this book to review the current status of phylogenetic studies but should be cautioned that Feduccia's conclusions are in some cases much more controversial than he indicates. For example, Feduccia favors a polyphyletic origin of the ratites in contrast to the monophyletic interpretations offered in most studies of these birds since 1963. Although Feduccia cites papers by Cracraft and Raikow employing cladistic methods, at no point does he mention either the term cladistics or many ideas now stridently defended by the cladistic school of phylogenetic analysis. Feduccia does suggest that recognition of shared, evolutionarily derived characters is a desirable basis for drawing phylogenetic conclusions (pp. 8, 152), yet he does not appear to adhere strongly to the use of such characters. In the case of the ratites, for example, he argues for polyphyly largely on the basis of their differences such as in the pelvis and feather structure. In my opinion his discussion of those characters that others have interpreted as uniting the ratites is insufficient. He does not discuss in detail Cracraft's cladistic study of ratite structure and does not even mention any of the biochemical analyses. In discussing the shared rhamphothecal groove pattern of ratites and tinamous, Feduccia notes that patterns occur also in Procellariiformes and Pelecaniformes but fails to mention the differences from the ratites and tinamous. Other examples of controversial conclusions offered by Feduccia with varied amounts of evidence include a pseudosuchian origin of birds, derivation of the grebes from a gruiform stock, division of the Coraciiformes into two orders, the origins of flamingos, ducks, and sandgrouse from different groups of Charadriiformes, sandgrouse giving rise to doves and pigeons, and parrots originating from tooth-billed pigeons. Such ideas are best considered as hypotheses to be tested with further evidence, but in a number of cases Feduccia states such interpretations more definitely than present evidence would seem to justify. In an admittedly highly speculative suggestion, he raises in passing the remarkable possibility that the aquatic *Hesperornis* gave birth to live young.

Feduccia's accounts of descriptive anatomy and natural history are usually accurate, though his conciseness on certain peripheral matters leads occasionally to questionable statements. For example, his remark (p. 128) that "cassowaries . . . have often killed humans" is apparently an extrapolation of E. T. Gilliard's report of one death and two cases of severe injury inflicted by captive birds in New Guinea. It would be misleading to emphasize here the relatively few deficiencies of this kind, for on the whole this is a good book. I recommend its acquisition for libraries, including those of high schools and colleges as well as those with comprehensive ornithological holdings. Many ornithologists may want to have a personal copy.—GEORGE A. CLARK, JR.

Observations of wildlife.—Peter Scott. 1980. Oxford, Phaidon Press Limited. Distributed in U.S.A. by Cornell University Press. 112 p., over 60 monochrome and 39 color plates by the author. \$19.95. (A

deluxe edition is available in the U.K. for £41.)—Nearly everybody has a childhood hero, but only rarely do those heroes survive the test of time to stand even taller in the mind's eye when approaching a half-century of one's own lifetime. Sir Peter Scott is a man of such stuff; his enormous artistic abilities and capacity for converting those talents into the environmental education of several generations of Britons, and toward the conservation of the earth's natural resources, cause him to stand uniquely alone in the international environmental scene. His book is an informal retrospective look at his own life, his artwork, and his concerns for conservation and biology. It is also a perfect vehicle for his drawings and paintings, which range from quick pen sketches in his field diary (which must be the most beautiful scientific notebook in existence) to reproductions of formal oil paintings as large as 3 m across. It is this lagniappe of illustrations that catches the eye initially, and will be the reason for many to buy the book. Nevertheless, the text should not be ignored while savoring the beauty of the plates.

There are more than 100 of Scott's illustrations, and they cover an artistic period of more than 40 years. The vast majority (all but eight of the color plates) are of waterfowl, and it is a special attribute of Scott's paintings that the viewer not only can perceive the relative position of the sun, but usually also is aware of the way the wind is blowing and how strong it is. Thus, each bird is not simply artistically suspended in vacant space, but rather is skillfully maneuvering with its flockmates through an ocean of air. Scott does not dwell long on his distinctive painting style, or on his philosophy of bird art. Yet a few of his paintings show the influence of impressionism, such as his charming "wigeon in a popple," and many of his back-lighted swan paintings have an ethereal quality that approaches mysticism.

It would have been easy for Scott to live a private life, retiring early from the public scene as a naval hero and television personality, to spend the rest of his days comfortably, gathering around him a collection of geese to sketch and paint. Instead, immediately after World War II he almost single-handedly established the Wildfowl Trust, which from its humble beginnings has become an international mecca for waterfowl biologists and the nerve center for research on wildfowl and wetlands for all of western Europe. There the Hawaiian Goose was saved from virtual extinction, and a major pioneering effort was later undertaken in reestablishing this species in the wild. He also helped obtain and develop several subsequent wildfowl centers, was instrumental in organizing the World Wildlife Fund, has been chairman of the Fauna Preservation Society, and has been active in the International Union for Conservation of Nature. The book recounts many of these activities and glosses over his associated innumerable honors, somehow never making much of the fact that even one of these accomplishments would have been enough to satisfy the ambitions of almost any other person.—PAUL A. JOHNSGARD.

The island waterfowl.—Milton W. Weller. 1980. Ames, Iowa State University Press. x + 121 pp. \$10.95; **The Hawaiian Goose.**—Janet Kear and A. J. Berger. 1980. Vermillion, South Dakota, Buteo Books. 154 pp. \$30.00.—In these two volumes we have texts, although of different scope, that separately merge into a common message heralding the often precarious status of insular waterfowl. "The island waterfowl" is a nice mix of ecology and biogeography of ducks largely limited to some of the more remote landforms of the Southern Hemisphere. Among other sites, Weller takes us to South Georgia Island and the Falklands, as well as to equally small landforms isolated in the Pacific and Indian oceans. In "The Hawaiian Goose," Kear and Berger comprehensively describe the struggles (of birds and people alike) to restore the once-pitifully diminished population of Hawaiian Geese. In the process, they not only present an historical overview of the species' plight but also record much of what is known about its biology and ecology.

"The island waterfowl" is a six-chapter volume beginning with descriptions of island ducks. Plumages of Indian Ocean Pintails, Laysan Teal, and other insular waterfowl are given special emphasis, in keeping with Weller's long-standing interest in molting patterns among anatids. The descriptions are accompanied by general remarks on status (both taxonomic and populations), distributions (gross and ecological), and habits (nesting and feeding, if known). Chapter 1 thus is not unlike a useful gazetteer for some of the world's least-known waterfowl.

This done, Weller examines island colonization. Migrants and accidentals are cited as sources of the anatid avifauna. Statistical analyses of the size and remoteness of islands lead Weller to suggest that marine or freshwater birds are not greatly influenced by distance in their colonization of islands. Wind directions and forces in the "roaring forties" and "furious fifties" are mentioned along with the vicissitudes of island temperatures and their influences on open water for broods and invertebrate food availability.

Adaptations of anatids to island life follow, with subunits treating flightlessness (flight is reduced in most species and absent in a few, suggesting the trait ". . . may be a disadvantage on islands," in part for bioenergetic reasons), life-styles that often involve some dependence on marine habitats (among them

synchrony of feeding activities with tidal rhythms), predation, resource (mostly food) availability, nesting chronology, territoriality, brood care, reproductive rates, plumage, and body sizes. One interesting feature is the frequent occurrence of white eye-rings among insular endemics. This, in Weller's view, seems correlated with nocturnal and terrestrial feeding habits, perhaps giving species like Andaman Teal and Steamer Ducks ". . . important visual signals between members of a feeding pair or family." As with many other subjects touched upon in this study, this intriguing relationship remains speculative, and the author repeatedly calls here and elsewhere in his text for more research.

Chapter 4 deals with the development of island avifaunas. Subunits are headed with questions or statements, viz., "South Georgia once had one species and now has two; is there room for three?" Likely not on South Georgia, although species-packing was possible in larger-sized New Zealand where four exotic waterfowl now complement the seven native species (four of which are endemic, including the highly specialized Blue Mountain Duck). Insufficient and/or fully exploited resources (primarily food) of immature island systems in high latitudes seem to limit establishment of waterfowl that might otherwise successfully pioneer these habitats.

Weller's book concludes with brief chapters entitled "Conservation" and "Perspectives." In this material, the biological usefulness of islands as media for evolutionary theory, systematic concepts, and, more recently, biogeographic theory à la MacArthur, is outlined, accompanied by well-reasoned pleas for restoration and/or maintenance of insular environments. Measures for ridding remote islands of their too-frequent and damaging exotic interlopers are stressed, but it is the philosophical attitude of man that will ultimately determine the future of island biotas. Island waterfowl represent scientific uniqueness and useful indicators of environmental conditions and, as Weller correctly states, "If our civilization reaches the state where we must exhaust the resources or destroy the natural biota of even these tiny islands, is there any hope for the preservation of anything natural?" In "The island waterfowl!" we have a succinct statement of that challenge.

I enjoyed this book. It took me vicariously to places I may never visit, and aroused my curiosity for birds that I, among others, am unlikely to experience *in situ* (and certainly cannot in the case of the now-extinct Auckland Merganser). "The island waterfowl" is a useful overview, giving quantitative treatment in some instances. I doubt that the author intended to present voluminous data—and some certainly would be most difficult to gather—but one might have expected a relatively concise data set to accompany such statements as "Smaller bill lamellae found in island ducks . . ." (p. 106), or some further quantification of diets, and possibly bioenergetics, between insular forms and their continental relatives. I anticipated a somewhat more attractive volume, but that is largely a personal preference, since discouraged by the economic realities of printing costs. However, the illustrations are clear as are the photos (all halftones), and the text is remarkably free of obvious "typos." "Di-" and "monochromatic" enjoy proper usage for the most part but "monomorphic" occasionally crept in instead (e.g. p. 69), and "Tail No." might have been better stated as "No. rectrices" in Table 3.4 (pp. 75–77). To find additional fault with this book would require further nit-picking unbefitting Weller's laudable effort. Both its content and price make "The island waterfowl!" a good buy.

The regrettable fortunes befalling the Hawaiian Goose, or Nene, are carefully detailed by Kear and Berger in their appealing volume. From a grossly diminished remnant population of less than 50 birds (in 1949, with 13 of these in captivity), an oft-thwarted but nonetheless dedicated restoration program has today brought them back from the brink. "The Hawaiian Goose" is basically a chronicle of those events, beginning with a resumé dating to Cook's discovery of the islands. The book also summarizes virtually all that is known of the birds' biology—precious little, unfortunately, from field studies. There is much here for the aviculturist, too, and all is blended skillfully for an audience with varied interests.

In the first of six chapters, background material is presented: a history of the islands, the origins of Hawaiian birds, the Nene in Hawaiian culture (scant involvement, it seems), and the goose's decline. Although no single cause reduced the Hawaiian Goose population, all factors seem clearly associated with settlement by Western Man in the old story of habitat destruction, introduced livestock (and their overgrazing), predators, and plants, indiscriminate hunting, and likely, introduced diseases and/or disease vectors. Hawaiian Geese thus suffered unrelenting losses on their island home that even in pristine times was the most limited distribution of any anserine.

The natural history (food habits, habitat, etc.) and biology (clutch size, displays, etc.) of Hawaiian Geese are described in Chapter 2. Much of this information necessarily is based on data from captive birds; in fact, pleas for field studies repeatedly fell on the deaf ears of administrators holding budgets in tight rein. The available evidence indicates that Hawaiian Geese are most closely related to Canada Geese but, unlike other black-and-grey geese, they come into breeding season under a regime of decreasing daylength; nesting begins in November and may extend to April. This phenomenon caused understand-

able problems with the captive breeding program in England, where winter temperatures hindered the survival of goslings. The birds are structurally adapted in keeping with their semi-arid and/or island habitat, including reduced webbing and protective foot pads (for traversing lava flows) and reductions of about 16% in the musculature and bones of their wings.

Chapters 3 and 4 are devoted to the captive-rearing schemes in Hawaii and England, respectively. In the latter, especially, we witness the detail and long experience of The Wildfowl Trust, that mecca of waterfowl collections and research established by Sir Peter Scott. Not that the Trust's experience lacked some trial and error, as reported in these sections: inbreeding was a difficult but not unexpected problem with so few birds available, and aspergillosis proved a hazard in the straw huts initially provided for nesting birds. The meticulous records maintained by the Trust are in clear evidence in these (and other) sections; graphs and tabular data for egg weights, fertility, maladies, and other subjects are appropriately scattered in the text and in eight appendices. They are impeccable sources of information. The authors are not without humor in describing what were surely only a few of their delightful experiences with the captive flock. Two birds shipped from Hawaii to initiate the breeding program in England *both* laid eggs. A cable was promptly dispatched to the Islands for a much-needed male, and Kear and Berger dutifully report that the female geese were "delighted" when the gander arrived. Meanwhile, the infertile eggs were collected (to encourage a second clutch sired by the newly arrived gander) and blown, and Sir Peter feasted on an omelette from the then second-rarest bird on earth!

Releases of Hawaiian Geese are treated in Chapter 5; more than 1,700 birds were freed by 1978 on sanctuaries located on the islands of Hawaii ("the Big Island") and Maui. On Hawaii the releases were made within the previous range of the species, but there is only supposition that the species once occurred on Maui. Gentle release methods (i.e., gradual flight from holding pens) facilitated the birds' adjustment to their new surroundings, in some cases after a long overland trip on the packboards of Boy Scouts. Assessment of the releases' success is difficult because virtually no fieldwork was supported as a follow-up to the propagation program and because of the difficult terrain on Mauna Loa and other release sites. Nonetheless, in one sample of 80 closely observed birds, only 12 carried bands, thus indicating that the balance had hatched in the wild. On Maui the results are less certain; although nests were found, it seems possible that no more than two goslings reached adulthood in the decade 1962-72. Again, the authors temper these assessments with their call for a full-time, professional workforce directed to field surveys of nesting success, brood survival, and other matters affecting recruitment.

The concluding chapter is appropriately entitled, "The Experiment in Conservation," and frankly discusses the restoration program. In short, the authors ask if the propagation scheme for Hawaiian Geese is indeed the valid conservation legend that it seems to be. Certainly, they respond, more Nenes are alive now than in decades past, enough so that surpluses are currently sold to zoos and private collectors. Some 750 birds roam wild in Hawaii and another 1,250 remain in captivity. But is the restored population better able to sustain itself now than before? What of habitat restoration? Control of feral livestock and predators? Purchase of several large "Nene parks" in Hawaii? Identification of limiting factors? Would funds have been better employed with these approaches? The answers are clouded at best. Still, extinction was imminent in 1949, and action was taken to remedy the immediate situation. Perhaps other methods might have had even better results had more stock remained and had the proper funding been committed. Lacking either, a handful of dedicated biologists concluded that, "Only as a last resort, as with the Nene, should animals be taken in to captivity, bred and released." We are fortunate they did—with extraordinary results!

This is a well-produced and attractive book (no doubt fostering its hefty \$30 fare). Errors or inconsistencies I found are minor but include omission of legend symbols in Fig. 29 (p. 89), citation three times of sow thistle's Latin name *Sonchus oleraceus* (albeit once in a quote), a noun-verb disagreement (p. 75), omission of a plural (p. 111), and mention in the text of Fig. 34 before Fig. 33 (p. 94). Maps of the "Big Island" (Figs. 6 and 36, p. 29 and 101) are overly detailed, and a few of the otherwise excellently produced figures seem without tangible value to this work (e.g. a down plumule from a female Nene, p. 51, or the enlarged sperm, p. 88). Numerous uncaptioned drawings do add much to the format, however, as do 24 generally excellent black-and-white photographs in the book's midsection. Many lengthy quotes from unpublished reports supplement the authors' own writing, thus bringing forth useful material that might otherwise remain obscure. Indeed, Kear and Berger have done a fine and comprehensive job in their treatment. This is a chronicle of restoration, not only of the Hawaiian Goose but also of Mankind's often tardy conscience for things wild and beautiful.—ERIC G. BOLEN.

The breeding seasons of East African birds.—L. H. Brown and P. L. Britton. 1980. Nairobi, Kenya, East Africa Natural History Society. vi + 164 pp. \$15.00 (\$12.00 to EANHS members).—The aim of this work is “to bring together all that is known of the breeding seasons of East African birds, and to relate these to the climatic factors (especially rainfall) controlling scarcity or abundance and seasonal changes of various foods.” The study includes 86,331 dated records for 861 of the 1,123 species accepted as East African residents, plus coverage of 5 additional species with vast numbers of records, like *Quelea quelea* and the 2 flamingos. The data were gathered from three main sources: the literature, the East African nest record card scheme, and individual contributors. As a background to the study, East Africa (Kenya, Uganda, and Tanzania) is divided into five climatic regions as described in the introduction and shown on two maps. Further information is given by histograms that show monthly rainfall at selected localities in these five regions. A table analyzes the breeding records by family. It breaks down the number of records into 10 categories (e.g. category 5, 6–10 records) and then shows the number of species in each family in each of these categories. The main body of the work consists of species accounts, in systematic order. The breeding records are listed by region, by months within each region, and by the number of occurrences in each month. This bare listing is frequently followed by some discussion, which may be lengthy (as in the large waterbirds), short, or even nonexistent (as in some forest bulbuls).

The authors were not content with bare presentation of raw data, although this would have been of value in itself. At the end of the work is a lengthy (46 pp.) discussion. First they compare their results with those from elsewhere in the world and conclude that “there is no clear, consistent pattern in the breeding of tropical birds, and that therefore any generalisations are at present unsound.” A persistent theme is that each case must be considered on its own merits, and “factors affecting breeding in East Africa . . . cannot be expected to conform to theories formulated in other parts of the world . . .” In East Africa, “the alternation between dry and wet seasons is the most important environmental factor affecting breeding seasons” (I never would have guessed it!). The discussion also covers proximate and ultimate factors affecting breeding seasons, proximate factors being endogenous rhythms, the *Zeitgeber* concept, photoperiod, and rainfall, and ultimate factors being food supply, competition, nesting condition, predation pressure, and climate. There is a section on seasonal availability of food supply (by habitat) and an analysis of the different factors affecting various groups, which are discussed separately (e.g. “forest insect-eaters” or “fish-eating waterbirds”).

While primarily of interest to African specialists, this work is by no means just a bare-bones list or data bank. It contains a good deal of meat and should certainly be owned by all students of avian breeding seasons. It has a sturdy cover and is attractively produced, and I certainly recommend its purchase by those whose special interests it covers.—STUART KEITH.

ALSO RECEIVED

Ernest Thompson Seton in Manitoba, 1882–1892.—Introduction by C. Stuart Houston. 1980. Winnipeg, Manitoba, Premium Ventures, Ltd. in cooperation with the Manitoba Naturalists' Society. Various pages. Frontispiece, maps, and line drawings. Paper. No price given.—This publication, which includes all of Seton's Manitoba nature notes on birds, mammals, fish, reptiles, and amphibians (many long unavailable in their original form), was issued to commemorate the annual meeting of the Canadian Nature Federation in Winnipeg, held in August 1980. The title is somewhat misleading, because although Seton lived in the province between 1882 and 1892, the articles first appeared at various times between 1887 and 1918. Each is reproduced from the original, retaining the original pagination. Some have been reduced in size. All of the reproductions are of excellent quality, save for one small portion of the “List of Fishes Known to Occur in Manitoba,” where the name of one of the forms listed is blurred. Introductions to each of the original publications are provided by Houston, Robert W. Nero, Kenneth H. Doan, and William B. Preston.

More than four-fifths of the book is given over to Seton's “Birds of Manitoba” (1890–91), his “Additions to the List of Manitoba Birds” (1893), and his “Recent Bird Records for Manitoba” (1908). Houston notes that Seton's identifications of birds “were remarkably accurate” for “a self taught novice.” He adds that the “Birds of Manitoba” when originally published unfortunately suffered from atrocious proofreading, “in contrast to Seton's other publications, which were remarkably free from typographical errors.” Confusion also arises from the fact that Seton used his own terminology in describing frequency of occurrence, and did not maintain consistency between his 1886 and 1891 lists. Problems with the paragraphing and

punctuation also lead the uninitiated reader to assume that Elliott Coues should receive a larger share of credit for observations reported than he is properly due.

It is good to see these earlier scientific writings of Seton's in such a useful format. Those familiar with his later multivolume works on North American mammals or his many nature stories may in some cases have overlooked the fact that he made notable contributions to ornithology as well.—KEIR B. STERLING.

Die Greifvögel der Welt (Birds of Prey of the World).—Friedhelm Weick in collaboration with L. H. Brown. 1980. Hamburg and Berlin, Verlag Paul Parey. 159 pp., 40 color plates (1,144 col. figs.), 160 line drawings. \$48.00.—Inspired by Peter Scott's illustrated key to the waterfowl, Herr Weick set out to produce one for the diurnal raptors (Falconiformes). Forty large color plates, some with 30 to 50 figures each, depict all the species, most sexual differences in color, and many of the subspecies and color phases. For the American Kestrel (*Falco sparverius*), for example, there are 17 figures showing 13 of the subspecies. It must be said at once that while most of the drawings are good in a diagrammatic field-guide style, the color is somewhat oversimplified, as a relatively inexpensive three-color process is used. Facing each plate and set in type that would test a falcon's vision are tables in facing German and English (as is the entire text), giving scientific names, German and English vernaculars, brief descriptions, ranges, and measurements. Even subspecies not figured are listed. Thus one has a condensed check-list of the raptors, the sequence only slightly modified here and there, to fit species of roughly the same sizes on a plate. The late Leslie Brown checked this aspect of the work and in general it follows the treatment of Brown and Amadon's "Eagles, Hawks and Falcons," but *Falco peregrinoides*, for example, is elevated to a species, while some changes Brown had adopted, such as combining some of the large Old World vultures into the genus *Aegypius*, were not. Mrs. Brown helped with the translation into English.

Another section gives brief diagnoses of all genera. The lengthy introductory key is intended to permit assigning any field observation or specimen to the correct plate and hopefully species. Not really a key, it sorts out genera according to various characteristics such as size and color; there are also some smaller, more specialized groupings such as genera with bare unfeathered heads, genera with very long legs, etc. Clearly there are instances in which one could have difficulties, but on a worldwide basis it should greatly simplify identification, whether of specimens or sight records.

Those who want an Order-wide purview of the Falconiformes, beyond a bare check-list with ranges (as in Peters, vol. 1, rev.), less bulky and expensive than Brown and Amadon or Grossman and Hamlet, will find this work useful, as will others who enjoy perusing extensive comparative charts of the world's diurnal raptors.—DEAN AMADON.

Voices of the Loon.—Written and produced by William Barklow. 1980. 33 $\frac{1}{3}$ rpm phonograph record album. Narrated by Robert J. Lurtsema. Published by North American Loon Fund and the National Audubon Society. \$9.00 plus \$1.50 postage and handling. (Available from North American Loon Fund, Meredith, N.H. 03253).—Few of us can forget our first experience of hearing the calls of the Common Loon. This record, a part of Barklow's Ph.D dissertation on loon communication, should renew interest in the study and enjoyment of this threatened species. Everything about the record is first-rate, from the quality of the sound to the instructive narration. Side one contains, along with narration, the six calls heard most often in nature that can aid professional and amateur alike in loon identification. Side two, without narration, contains calls given in different situations: wails during a thunderstorm, tremolos while running, and my favorite, coyote calls dubbed in with a loon chorus; these sounds are truly memorable. Sonagrams of the common calls are illustrated on the back of the album cover and allow the listener to become more familiar with loon vocalizations. Although the record is expensive, its price is tax-deductible and proceeds from its sale will be used to support research on the status and protection of the Common Loon. This is a record that will give great pleasure and information to its listeners, and it is a must for any bird record collection.—ERIK J. BITTERBAUM.

Avifauna de Menorca (birds of Minorca).—J. Muntaner and J. Congost. 1979. Barcelona, Spain, Treballs del Museu de Zoologia No. 1. 173 pp. Paper. No price given. (Available from Museo de Zoologia, Ap. de correus 593, Barcelona-3, Spain).—Minorca is a 657-km² island of the Balearics, in the western Mediterranean. This monograph (in Spanish) reports the findings of field studies conducted on

the island from 1971 to 1978. The primary emphasis is upon documenting the occurrence and breeding status of the species encountered during this period. Of the 245 species reliably recorded on the island, 58 are known to breed (only 43% of them passerines). The authors suggest that this avifauna is more diverse than that found on other islands of similar size in this region, perhaps because the environment is heterogeneous and because human influences, while considerable, are still less severe than on other islands in this group.—J.A.W.

Bird finding in Tennessee.—Michael Lee Bierly. 1980. Published by the author (3825 Bedford Ave., Nashville, Tennessee 37215). 255 pp. Paper. \$8.00.—Because of its considerable east-west expanse, stretching from the Appalachians to the Mississippi River, Tennessee contains a diverse array of habitats, and thus a variety of places in which to search for different bird species. Bierly's guide describes 112 "hot spots" in which birding is generally good, and indicates the species one might expect to find in each. Maps and detailed location descriptions are given for most spots, along with appropriate background information, where relevant. The book also contains short documentations of 342 species that have been recorded in Tennessee and a directory of individuals or clubs with which one may establish contacts in local areas.—J.A.W.

Indiana birds and their haunts.—C. E. Keller, S. A. Keller, and T. C. Keller. 1979. Bloomington, Indiana University Press. 214 pp. \$12.50 (\$6.95 paperback); **Enjoying Indiana birds.**—Alfred Starling. 1978. Bloomington, Indiana University Press. 308 pp. \$17.50.—These books are both about the birds of Indiana, but are quite different. The first volume is a guide to the status, distribution, and time of occurrence of birds in Indiana; the state is divided into three north-to-south zones for discussion of the distribution. Habitats are not given. The first 75 pages describe 63 birding areas in the state, located on a map and with description on where to go, birds found in the area, accommodations, and some references.

Starling's book is a series of short accounts, largely personal, of observations of the birds of Indiana arranged in sections by months. It presents a nice idea of the birds of the state and the pleasures one can have in watching them.—W.J.B.

An annotated check-list of the birds of Illinois.—H. David Bohlen. 1978. Springfield, Illinois State Museum. Popular Sci. Ser., vol. 9. viii + 156 pp. \$2.00 (+0.75 postage).—A guide to the status, distribution, habitat, and time of occurrence of birds in Illinois. The state is divided into three zones—north, central, and south—for purposes of describing the distribution.—W.J.B.

Birds of Pennsylvania.—Merrill Wood. 1979. Pennsylvania State University, University Park. 3rd edition. 133 pp.—A guide to the distribution of the birds of Pennsylvania giving their abundance, time of occurrence, and habitat in the state.—W.J.B.