

BOOK REVIEWS

Mapping the Diversity of Nature.—Ronald I. Miller, ed. 1994. Chapman & Hall, London. xvii + 218 pp., 9 color plates. ISBN 0-412-45510-2. \$59.95 (cloth only).

One of the most significant barriers to the overall conservation of biological diversity has been an adequate accounting, or inventory, of the stock. Because these resources occur over the surface of Earth, mapping their distributions is an essential part of the stock-taking. Yet, only within the past five or six years have the conceptual, technical, and institutional capabilities needed to adequately map the diversity of nature been implemented at appropriate scales. Analysis of these types of spatial data is still at an infant stage. In the past few years aspects of nature mapping have developed, and continue to develop, at a breathless rate, so much so that just two years after its publication some of the material in *Mapping the Diversity of Nature* seems a bit primordial. Even so, for those interested in these developments this book is a good anthology.

Mapping the Diversity of Nature catalogs some modern mapping and spatial analysis technology applications to conservation problems. The collection of chapters offers a wide range of examples—from the tropical habitat of the Wood Thrush (*Hylocichla ustulata*) to African elephants, pandas, coral reef fishes and more—making it a useful reader across the different fields of biology.

The introduction to the book and the subject is unfortunately beset with jargon and an uneven writing style. Readers may want to skip directly to chapters of interest or work their way through this first chapter, risking confusion over some central but poorly explained concepts. On page 11, a discussion of “classification” begins with thematic categorization and ends with spectral pattern delineation with no discussion of the difference. Confusion between thematic and spectral classification has long been a problem for non-specialists.

Of real value to ornithologists with an interest in biogeography and mapping species occurrences will be the chapter by Rappole, Powell and Sader, “Remote-sensing assessment of tropical habitat availability for a Nearctic migrant: the Wood Thrush.” This clearly written account gets right to the heart of the subject with a pragmatic approach to the very difficult issue of mapping the wintering distribution of an avian species over a large area of the American tropics. Of greatest importance is that the authors develop density indices for the thrush relative to different tropical habitat types, then they test the techniques in different parts of the bird’s winter range.

Rappole et al. lay out the issue of population declines in Neotropical migrants and the alternate hypotheses about where declines occur and the nature of their causes. They frame two competing hypotheses: (1) that the loss of certain wintering habitats is unlikely to be the cause of population decline because many migratory species use a wide range of winter habitats, exhibiting the behavior of niche generalists, and (2)

that migratory species are dependent on different specific habitats over their full range, and the loss of any one of these could be the cause of declines. They then used satellite images to map thrush habitat in northeastern Costa Rica, southern Belize, and southeastern Mexico, tying these maps to ground data by field sampling vegetation types, mist-netting, and audio-visual sampling. One result is a good example of the integration of remote-sensing and geographic information systems technology with classical field naturalist methods. From this work the authors conclude that “the wood thrush lacks sufficient ‘plasticity’ for it to survive continued extensive alterations to its preferred winter habitats.” This is an important piece of work, and it is clear that it badly needs to be replicated for each species right away.

Two other chapters that are a must are “Hierarchical representations of species distributions using maps, images and sighting data” by Hollander, Davis and Stoms, and “Modeling vertebrate distributions for Gap Analysis” by Butterfield, Csuti and Scott. Hollander et al. provide one of the best insights to issues of geographic scale versus thematic hierarchies, as well as data types and data type integration, which many biologists accustomed only to plot and transect data, have a terrible time understanding. The chapter focuses on the design of databases for predicting species distributions. The approach is predicated on the assumptions that biodiversity data are naturally organized by theme, spatial extent, spatial grain, temporal extent, and temporal grain. The authors argue convincingly that this approach is necessary because while current ecological and biogeographical theories explain the distribution patterns of species and the processes responsible for them, they do not address the spatial patterns and processes that emerge at the different levels of aggregation—from individuals to populations to subspecies and species. Although they were correct at the time of writing (early 1990’s) in stating that “We lack even rudimentary data on distribution and habitat requirements for most species,” much progress has been made since then and this information gap is being reduced. They describe a future vision for species mapping “. . . where the researcher no longer struggles to produce a single map, but produces suites of them at will. Data integration is one component to this, but so are the flexibility and clarity of the underlying models—the multiple images thereby creating a better representation of the complex reality underlying diverse data sources.” This is an exciting and realistic vision that is not far away.

The chapter by Butterfield et al. describes the early approach to vertebrate species modeling used by the Gap Analysis Program, which seeks to map the distributions of each native vertebrate species. This is an excellent discussion of how to generate maps that predict species distributions (all maps are predictions) using point data from specimen collection records, generalized range maps, maps of vegetation types, and physical parameters such as temperature or proximity

to wetlands. These methods also have been much improved since the time of writing, and an updated version of modeling vertebrate species distributions for Gap Analysis is due out any day now (see the Gap Analysis Handbook on the World Wide Web, <http://www.gap.uidaho.edu> for the latest).

This book is not a textbook, but should be part of any college library collection. It is important for those interested in the now rapid integration of biology, ecology, geography, and computer science as applied to the conservation imperative. In addition to the few core chapters discussed above, a wide assortment of case studies are offered and I recommend reading these chapters selectively, depending upon one's interest.—MICHAEL D. JENNINGS, National Gap Analysis Program, 530 S. Asbury St., Suite 1, Moscow, ID 83843, jennings@uidaho.edu

Leks.—Jacob Höglund and Rauno V. Alatalo. 1995. Princeton University Press. Princeton, NJ. xii + 248 pp., 8 black and white illustrations, 64 text figures, 12 tables. ISBN 0-691-03727-0. \$55.00 (cloth). ISBN 0-691-03727-2. \$26.95 (paper).

Arena Birds: Sexual Selection and Behavior.—Paul A. Johnsgard. 1994. Smithsonian Institution Press. Washington, D.C. vii + 330 pp., 38 color plates (on 16 pages), 70 text figures, 13 tables. ISBN 1-56098-315-9. \$39.95 (cloth).

Lekking animals have received a disproportionate amount of attention in the past 20 years because (1) they have a spectacular array of bizarre male morphologies and behavior patterns, and (2) they appear to offer an opportunity to test the applicability of various models of sexual selection. The classical lekking paradigm posits that females visit aggregations of displaying males, choose mates on the basis of variation in male phenotype, obtain a male genetic contribution towards the next generation, but receive nothing further that might affect female fecundity or personal survivorship. Thus, in theory, leks offer an opportunity to watch spectacular social behavior while studying questions that differentiate general models of sexual selection: do traits used in mate choice reflect genetic variation among potential mates, do offspring differ in their survivorship as a function of mate choice, how does relevant genetic variation persist in the face of strong directional selection? True lek enthusiasts, *sensu stricto*, however, ask a different question, namely, why do competing males of certain species display right next to each other, rather than spreading out, scrambling for mates, or defending mates or groups of females? Male assemblages are uncommon, but evolved independently in diverse animal taxa and environments, including at least 19 times among extant birds. What, if any, commonalities are responsible for the evolution of lek behavior? Current interest in lekking animals, and publication of both these books, is a tribute to Jack Bradbury and coworkers' critical theoretical and empirical work in the early 1980's that sparked widespread interest in these questions.

Johnsgard's *Arena Birds* predominantly reflects the first reason people study lekking species. The book's strength is in its natural history: descriptions of what lekking birds look like and do. Synchronized duets of

Long-tailed Manakins (*Chiroxiphia linearis*), inverted displays of birds of paradise, towering bower constructions, lyrebird plumes, Kakapo (*Strigops habroptilus*) tunnel systems, tragopan postures and colors, hopping bustards, flutter-jumping Black Grouse (*Tetrao tetrix*), peacock plumes and peacock-pheasants, in sizes and shapes from Capercaille (*Tetrao urogallus*) to Little Hermit Hummingbirds (*Phaethornis longuemareus*), all the well-known superstars, plus the lesser-known supporting cast, are depicted, their behavior described, and referenced for those wanting even more detail. Descriptions of male-male and male-female behavior, color plates, and the author's pen-and-ink drawings which accompany every chapter continually provoke the reader to ponder why such diverse and extreme methods of competition among individuals to obtain and assess mates evolved. This emphasis on diversity is further reinforced by Johnsgard's consistent presentation of the multitude of ad hoc proximate and ultimate hypotheses proposed to account for aspects of lekking, male characteristics, and/or mate choice in particular species. In this hodgepodge of color, movement, and ideas, it is difficult to find any commonalities beyond the obvious.

Arena Birds consists of two chapters introducing sexual selection and theories about why males form leks, followed by 10 chapters describing lekking behavior within various avian taxa, a glossary, references, and an author and species index. In addition to clearly recognized "lekking" species, Johnsgard also includes taxa such as certain waterfowl in which males compete in groups for access to females but subsequently form pair-bonds; thus mating skew, one measure of sexual selection, may be relatively weak. Johnsgard omits species in which females aggregate and compete for males, such as phalaropes and dotterel, on the grounds that none are yet known to exhibit "arena" behavior. We would argue that several of those species come as close as some of the waterfowl discussed (e.g., Owens et al. 1994, *Am. Nat.* 144:76–100), and that sexual selection may, in fact, operate more strongly in this excluded group than in some of the species considered. Their inclusion would have broadened a reader's thinking about *Sexual Selection and Behavior*, the book's subtitle.

Höglund and Alatalo's *Leks* is motivated by the second reason people study leks: testing theories of sexual selection. The book reflects the authors' main research interests and presents a more sophisticated view of sexual selection and lek theory than that in *Arena Birds*. There are 10 chapters. The first two consider attributes and taxonomic distribution of leks across all animals. Two chapters consider behavioral mechanisms of sexual selection, focusing on male characteristics and female choice. One chapter presents the authors' research on Black Grouse as a detailed case study. The next chapter provides a comparative analysis of the distribution of sexual dimorphism with respect to lekking and non-lekking taxa, and reviews earlier papers on this subject and presents further analysis. The authors then review various mechanisms proposed to account for lek formation, discuss intraspecific variation, and present a set of game theory models, based largely on William Sutherland's ideal free distribution

of unequal competitors, that explore aspects of lek formation under a range of environmental circumstances. A concluding chapter summarizes the authors' views and proposes agendas for future studies. While *Leks* considers all animals, the authors' primary field experience is with Black Grouse, Great Snipe (*Gallinago media*), and Ruffs (*Philomachus pugnax*), and studies on birds make up the majority of examples throughout the text.

The game theory models in *Leks* consider how individual decisions of males of differing quality may map onto their distribution among leks of different sizes and average success rate. In the unequal competitors model, the stable state of their ideal free distribution results in a preponderance of higher quality males obtaining higher mating success on larger leks at more female-rich sites, although exactly how this distribution is reached could be presented more clearly. Since the book's publication, alternative models have been presented, driven largely by considering the decreased ability of high quality males to monopolize matings at larger leks (Widemo and Owens 1995, *Nature* 373:148–151). These alternative models predict more mixing of males of different qualities among sites, with some higher quality males remaining at smaller sites at which they can better monopolize matings. Data to resolve applicability of either set of models, and more refined models, should be forthcoming.

The attractive features of both sets of models is that they decompose and incorporate elements of the "hotspot," "hotshot," and to a lesser degree "female choice" mechanisms proposed during the 1980's into synthetic, coherent views of how leks operate. These mechanisms never were mutually exclusive, and a growing consensus among lek researchers is that elements of all three can operate in concert with varying degrees of importance to produce leks in different systems. Whereas Höglund and Alatalo strive to elucidate complex processes that may be common among lekking species, the authors acknowledge the likelihood that processes responsible for lekking differ among taxa. Avian studies provide the strongest evidence that female preferences for mating at leks result in male clustering, although the benefits, if any, females may receive from this preference remain undocumented. Mammalian leks may involve greater male monopolization of areas used by females, and thereby represent something closer to resource defense systems, or systems in which protection against sexual harassment from other males plays a larger role.

The most important question least addressed by either of these reviews is why lekking, rather than an alternative breeding system, is the stable outcome for this diverse array of species. While we have made substantial progress developing and winnowing out theories about how leks work, we have made less progress accounting for the distribution of lekking among animals, where ideas presented 20 years ago (e.g., Emlen and Oring 1977, *Science* 197:215–223; Bradbury and Vehrencamp 1977, *Behav. Ecol. Sociobiol.* 2:1–17) remain largely unelaborated. It also is noteworthy that the basic questions about sexual selection listed at the outset of this review have, in fact, scarcely been ad-

ressed by field studies. More progress has been made using laboratory studies of more tractable systems.

Both books present taxonomic lists of "lekking species" in early chapters, but one must search for information in different places about, for example, male characters preferred by female Sage Grouse (*Centrocercus urophasianus*). In the taxonomically organized *Arena Birds*, one looks under Sage Grouse, whereas information on this topic is grouped within one conceptual chapter in *Leks*. *Leks* contains species, subject, and author indices to help one find such information. The index in *Arena Birds* covers species and authors, but, unfortunately, not subjects. *Arena Birds*, which aims at a broader audience, also devotes 27 pages—10% of the text proper—to a glossary of technical terms. Johnsgard acknowledges that anyone needing to use the glossary might do well to skip his introductory chapters and just read the taxonomic accounts.

Arena Birds contains 451 references (21 pp.), virtually all on birds. David Snow wins the citation prize hands down, with 23 citations for work with hummingbirds, manakins and cotingas. *Leks* includes 603 references (29 pp., 14% of the text) with the authors' own works well represented, but only 8 of Snow's. This difference in citations summarizes the emphases of the two books. If you want information on the behavior or morphology of lekking birds other than Black Grouse, Ruff, or Great Snipe, Johnsgard's survey is an unparalleled starting point. If you want to consider why males of some species assemble, *Leks* is the logical choice. Together, these complementary books put a tremendous amount of natural history and current thought about a fascinating social system on anyone's bookshelf, and will provide further impetus for future research.—DAVID B. LANK, Department of Biological Sciences, Simon Fraser University, Burnaby, B.C., V5H 1S6, Canada, e-mail: dlank@sfu.ca and FRANK A. PITELKA, Museum of Vertebrate Zoology, University of California, Berkeley, CA, 94720, e-mail: pitelka@uclink2.berkeley.edu

Birds of Kenya and Northern Tanzania.—D. A. Zimmerman, D. A. Turner, and D. J. Pearson. Illustrated by D. A. Zimmerman, I. Willis, and H. D. Pratt. 1996. Princeton University Press, Princeton, NJ. 740 pp, 124 color plates. ISBN 0-691-02658-0. \$65 (cloth).

This is the first book with comprehensive illustrations and text of all the birds of East Africa. It sets a new standard of field ornithology for Africa, and it is the definitive field guide to birds of the region and a handbook of information on their distribution and biology. The authors have many years of field experience in East Africa and know their birds. This book is the best of its kind for any region in Africa.

Kenya has 1,080 species of birds; these and an additional 34 species are described and illustrated from the Usambara Mountains to Serengeti National Park in northern Tanzania. All but eight species are illustrated; the others are described in the text. Habitats are described and illustrated in photos. No African bird species has become extinct in historical times, but a few have disappeared from Kenya and others are getting scarce with the growing number of people and their development of the land. Family accounts highlight the

appearance, behavior, and relationships of each major group of birds in Africa. The Literature Cited section has 191 references, both classical and recent, and entries are mentioned in the species accounts. Appendices list the birds from Tanzania and Uganda that are not covered in the book. A gazetteer of about 500 localities allows a reader to place a locality on the map on page 6, which shows major towns, parks, and reserves.

The species accounts include description, voice, habitats, comparison with similar species, and details on status and distribution that elaborate on the general features of the range maps. The color plates show 90% of the 1,040 bird species recorded in Tanzania, and 85% of the 1,004 birds known in Uganda. The accounts are compact, authoritative and accurate, and I noted few errors (details of references). A few birds are included only on the basis of recent sightings, but nearly all are supported by museum specimens, photographs, or tape recordings. Three species of indigo-birds (*Vidua* spp.) are known in Kenya, one was first found in 1967, another found in 1988 is not shown but as an adult it looks like the others. A few field marks are questionable; African Cuckoo (*Cuculus gularis*) are said to have a brown iris, but adults have a yellow iris as do Common Cuckoo (*C. canorus*). The species accounts include new, previously unpublished information on local distribution, on downy young and plumage sequences (rails, gulls), and on behavior (song mimicry by Steel-blue Whydahs *Vidua hypocherina* of Red-cheeked Cordon-bleu *Uraeginthus bengalis*) (R. B. Payne, Bulletin African Bird Club, in press), behavior that suggests a brood parasite-host association with this finch as well as with Black-cheeked Waxbill (*Estrilda erythronotos*). Italics are used to distinguish similar species, and in word descriptions of the songs and calls, which are accurate and to the point. In a few cases, songs are known and would be useful but were not included (firefinches *Lagonosticta* and the twispots *Clytospiza* and *Hypargos*). The maps are clear, easy to read, and have symbols for outlying observations, breeding range and nonbreeding or seasonal range; the text gives the areas and localities in the region but not the species range outside the region.

Subspecies are mentioned, described and sometimes illustrated. The authors include a few forms usually not recognized in the field or in specimens, such as Jameson's Firefinch "*Lagonosticta rhodopareia taruensis*" rather than *L. r. jamesoni* and they leave out others that are recognizable in the field, such as the Melba Finch (*Pytilia melba percivali*) that is most likely to be seen by visitors in southwestern Kenya and the Serengeti. Where only one subspecies has been identified in the region, the subspecies name is included, and all subspecies are included separately in the index. This gives more emphasis on subspecies than most readers may want, although to the field ornithologist it is rewarding to recognize these geographic forms, and some may turn out to be good species.

This is a wonderful book with fine color plates by Zimmerman, who completed most of them as well as the informative pen and ink sketches of additional species that may occur (e.g., *Catharacta* skuas are seen off the coast, but it is uncertain which species), and

nests of weavers and other ploceids. The illustrations are particularly satisfying for larks, female *Euplectes* widows, and the greenbuls. The color plates by I. Willis and H. D. Pratt also are attractive and useful; some lack the feather detail of Zimmerman's songbirds. Egyptian-Plover (*Pluvianus aegyptius*) seen in the field are usually crouched, not erect as illustrated. Nightjars are shown with spread wings and tail, the plates and an identification key with measurements can be compared with road kills or birds in the hand, and the voice descriptions are useful to distinguish these night birds such as Mozambique Nightjar (*Caprimulgus fossii*) and Slender-tailed Nightjar (*C. clarus*). I like most of the finches, and would like more; the female Parasitic Weaver (*Anomalospiza imberbis*) is not shown and is not recognizable in the text either. Also, the male Melba Finch (*Pytilia melba*) has red lores like birds in northern Kenya (*P. m. soudanensis*), whereas the extent of red is more like the race *belli* which has gray lores; the Melba Finch in Kenya would better have been shown by the paler, yellowish *P. m. percivali*.

In comparison with the compact field guide of B. van Perlo (*Birds of Eastern Africa*, 1995, Collins), which covers a larger area including Ethiopia, *Birds of Kenya* has larger, more detailed and accurate illustrations and much more detail on identification, with female and immature plumage as well as breeding male plumage. Use Zimmerman for field studies and serious birding, and van Perlo for neighboring areas. The two books are complementary on a geographic basis.

Birds of Kenya is useful for college and museum libraries, and anyone interested in the birds in Africa. The book is compact enough to keep in the vehicle or room and even to carry at 1.89 kg. I recommend it to all who have an interest in African birds.—ROBERT B. PAYNE, Museum of Zoology, University of Michigan, Ann Arbor, MI 48109-1079, e-mail: rbpayne@umich.edu

A Birder's West Indies: An Island-by-Island Tour.—Roland H. Wauer. 1996. University of Texas Press, Austin, TX. The Corrie Herring Hooks Series No. 30. xiv + 238 pp., 19 color plates, 20 black-and-white drawings, 2 maps, 1 table. ISBN 0-292-79098-8 hardcover, ISBN 0-292-79101-1 paperback. \$40.00 (cloth), \$19.95 (paper).

I have had the pleasure of visiting at one time or another most of the islands described in this book. Unfortunately, this was long ago; since then, I have been doing "long-term monitoring," which lacks the romance and excitement of visiting out-of-the-way places for the first time. Ro Wauer does an excellent job of recreating this excitement for me. In many cases, his vivid descriptions of West Indian birding locations matched my mental images of these sites from the past, and his enthusiasm with the search for island endemics gushes forth from the pages of the text. His observations about the birds he pursues are often put into a decent scientific context with regard to island biogeographic principles, and there is a strong conservation tone to the whole book. This is accentuated in the foreword by Bradford C. Northrup of The Nature Conservancy and an afterword by Paul Butler of RARE in St. Lucia. Ro Wauer also endears himself to this or-

nithologist by noting some of the best meals and places to stay among the islands he has visited.

Although this was a pleasant and fairly informative read for me, I must point out what this book is not. Although it has many descriptions of plumage and song of island endemics, it definitely is not a field guide. Despite its focus on finding these endemics, it also is not a particularly good tour guide when it comes down to finding the exact birding location. While this may not be a problem on Dominica or St. Lucia, where the options are limited, the very vague descriptions of how to find sites on the larger islands could easily lead one astray. For example, in the southwestern Puerto Rican area where I am doing my long-term research, the author discusses Guanica Forest, one of the best birding sites on the island, but only states that Highway 334 takes you into the interior of this forest. Because of the absence of road signs and without any other help, my guess is that many birders will see lots more of the town of La Luna than is their goal. Later in the same chapter, the author is even more vague, as he states "Not far from Guanica is a place where one can watch endangered Yellow-shouldered Blackbirds as they return to their roosting sites in the coastal mangroves." There are no other clues as to where this place is.

Such brevity may have been necessary to cover 18 islands in a single book, but the end result is that each island is covered rather superficially. The large islands get more space (Jamaica has 13 pages, Cuba 19, the Dominican Republic 14, and Puerto Rico 12); the Lesser Antilles and Virgin Islands average only about 9 pages each. Given the chatty, almost diary-like nature of the text, there is not much room for the types of detail mentioned above.

Despite these flaws, I did find this a pleasant, informative book to read. It is not science, and professionals might enjoy it but will probably find it of fairly little use. For less serious ornithologists, though, it presents a real feel for the West Indian situation, particularly with regard to the many ornithological and other natural treasures out there and the problems they face. It gives clues on how to find many of these treasures, and certainly could excite and inform anyone considering a birding trip to the West Indies. If your vacation includes only a single island, though, you might want to borrow a copy through your library or a friend. If you have not chosen your next winter birding vacation, Ro Wauer's book will get you excited about lots of places.—JOHN FAABORG, Division of Biological Sciences, University of Missouri, Columbia, MO 65211, e-mail: faaborg@biosci.mbp.missouri.edu

The Wood Duck and the Mandarin.—Lawton L. Shurtleff and Christopher Savage. Subtitle: The Northern Wood Ducks. With a Foreword by Sir Peter Scott. 1996. University of California Press, Berkeley, CA. 232 pp. ISBN 0-520-20812-9. \$34.95 (cloth).

This is a remarkable book, as more than half the pages are filled with nearly 200 excellent illustrations, all in color. Most (dozens of them on full-sized pages) render the two duck species, their habitat, nest, eggs, flight, feeding behavior, mating, breeding, and more in great detail. I have not seen the life history of two bird

species so thoroughly documented by snapshots. A dozen illustrations picture the Mandarin Duck in oriental art, from Chinese jade carving and tapestry to Japanese screens, bronze artifacts and even to an artistic kimono! Thus, by all those features, it would qualify as a beautiful, well done coffee-table book.

But if we scrutinize the text, we understand why it merits a review in a scientific journal. Author Shurtleff studied the Wood Duck (*Aix sponsa*) for decades in its coastal California environment, along streams of the redwood forest. The hundreds of nest boxes he erected complemented the scarce woodpecker-made and other natural tree holes that the Wood Duck would have preferred for its nesting. This enabled him to observe (and document with photos) the intimate details of behavior. As he describes its natural history, he often makes comparisons with what the ornithological literature provides about the better-studied Mississippi Valley and other eastern North American populations. In a way, this compares, or even surpasses, Hochbaum's classic monograph on the Canvasback in the Canadian prairie marshes.

In the chapter on "The abundance, decline, and recovery" he draws on thoroughly researched historical sources, starting with Cabesa de Vaca who was first to cross the North American continent in 1527 and his report to the Spanish king emphasizing the Floridan "royal drake"—most likely the Wood Duck drake. We can read excerpts about this bird by early ornithological writers starting with Catesby and on to Wilson and Audubon. We then learn that the Wood Duck was mercilessly killed off by the market hunters, but after protective measures were taken, it is slowly coming back, helped by the popularity of providing nest boxes and also by utilizing the ponds created by the likewise increasing beaver.

Lately, the Wood Duck's Asian congener, the introduced Mandarin Duck (*Aix galericulata*), spread to Shurtleff's study area, and here he was able to make the most thorough comparison of the habits of the two species. I mention two pertinent and significant observations: the introduced Mandarin shows a preference to use nest boxes—and it breeds, *vide* Shurtleff, three to four weeks later than the Wood Duck in California. Shurtleff surmises that this timing and his observation that the Mandarin does not shun fast flowing and boulder-strewn streams, point to similar items in the natural history of its ancient Asian homeland.

The bulk of the second half of this book deals with the Asian Mandarin Duck. A large portion of the relevant chapters acquaint us with what the Russian, Chinese and Japanese authors wrote about the natural history of this bird, and also pointing out the deficiencies, especially in China, regarding its migratory habits. Author Savage had written an excellent, but long ago sold-out, book on the Mandarin Duck in 1952. This book was based on observing the introduced Mandarin population in England. Since then Savage has spent 10 years in the Japanese homeland of this duck, and was able here to give an up-to-date picture of the native Japanese birds and the introduced, and thriving, British population.

The last short, but not the least important, chapter is devoted to recent conservation efforts pertaining to

the vanishing Asian populations of the Mandarin Duck. Two technical appendices complete this monograph. One is a practical guide to a nestbox program, with good diagrammatic drawings. The other describes trapping and banding methods used in Japan.

I am glad to comply with the task of acquainting my fellow ornithologists with this well-written, edited and illustrated monograph. Although its style is not scientific but pleasantly narrative, nor do we find factual or tabulated data about the species treated, and although some of its wording is foreign or strange (e.g., brooding instead of nesting, habitat map instead of distribution map), I consider it a must for the library of everyone of us interested in anatids: scientist or game manager, duck hunter or wetland conservationist. Kudos also should go to the University of California Press for rendering such a beautiful book for a reasonable price.—M. D. F. UDVARDY, Department of Biological Sciences, California State University, Sacramento, CA 95819.

Hybrid Ducks: a Contribution Towards an Inventory.—Eric Gillham and Barry Gillham. 1996. B. L. Gillham, Wallington, Surrey, UK. 88 pp., 16 color plates, 3 text photographs. ISBN 0-9511556-0-2. £16.00 (paper).

Hybridization associated with species introductions, shifts in species distributions, or habitat alterations is an important issue for waterfowl conservationists in North America (e.g., Mallard [*Anas platyrhynchos*] × American Black Duck [*A. rubripes*]; Merendino et al. 1993, *J. Wildl. Manage.* 57:199-208) and elsewhere (e.g., New Zealand, Mallard × Grey Duck [*A. superciliosa*]; Caithness et al. 1991, *J. Wildl. Manage.* 55: 111-118). Publication of this book, *Hybrid Ducks: a Contribution Towards an Inventory*, is timely and represents the most extensive inventory of published and unpublished records of waterfowl hybrids attempted to date. *Hybrid Ducks* provides descriptions of 161 hybrid combinations that are based on approximately 1,000 records from captive and free-ranging ducks and

include information on suspected parentage (categories: proven [28%], probable [66%], and possible [6%]), number of records and hybrid types, sources of information, and availability of illustrations. The authors acknowledge that this inventory is incomplete, but they express the hope that their contribution will stimulate further research and result in publication of additional hybrid accounts. To this end, a list of data bases used in preparation of this summary would have been helpful for individuals wishing to expand upon this work. In addition, lack of a detailed table of contents and index made locating information on specific crosses or individual species difficult.

The authors expressed frustration with the paucity of descriptions and illustrations accompanying many published hybrid records. In *Hybrid Ducks*, plumage and soft parts (also behavior and vocalizations for some records) are described in relation to suspected parents and other crosses; color or black and white photographs are provided for 61 different hybrids. Unfortunately, information useful in interpreting descriptions (e.g., plumage type, molt status, age, and date, month, or season) and structural measurements were not provided. Recognition of hybrids is confounded by plumage type, stage of molting, sex and age of individual, and possibility of back crosses. Some treatment of these potential biases would have been appropriate in the introduction. Recommendations by the authors concerning steps contributing to better documentation and quantification of hybridization rates also would have been useful. Clearly, multidimensional approaches to the study of hybridization using morphometry, colorimetry, behavior, and allozyme variation are preferable to one-dimensional descriptions. However, until such time as those kinds of data are available for waterfowl, we will have to rely on inventories such as this one.

The book probably is most suitable for museum libraries. Authors of species accounts for waterfowl also will find this summary helpful.—WILLIAM L. HOHMAN, USGS/BRD, National Wetlands Research Center, 700 Cajundome Blvd., Lafayette, LA 70506-3152, e-mail: hohmanb@osprenwrc.gov