



EDITED BY CARL D. MARTI

*The following critiques express the opinions of the individual evaluators regarding the strengths, weaknesses, and value of the books they review. As such, the appraisals are subjective assessments and do not necessarily reflect the opinions of the editors or any official policy of the American Ornithologists' Union.*

*The Auk* 114(4):802–803, 1997

**Molecular Systematics.**—David M. Hillis, Craig Moritz, and Barbara K. Mable (Eds.). 1996. Sinauer Associates, Sunderland, Massachusetts. 655 pp., 156 figures. ISBN 0-87893-282-8. Paper, \$49.95.—The extensive field encompassed by this book is evolving at an astonishing rate. This edition follows only six years behind its predecessor (see Zink and Weller, *Auk* 108:452–455, 1991), yet researchers throughout the world have been anticipating this revision. The basic structure is the same in the new edition, with an introductory chapter followed by three divisions: Sampling (Chapters 2 and 3), Molecular Techniques (Chapters 4 to 9), and Analysis (Chapters 10 to 12). All chapters are written by well-respected authorities (none, however, is an ornithologist). Changes in the composition of chapters reflect how techniques are being employed by the molecular systematics community. Thus, this edition no longer has a chapter on immunological techniques (one will have to consult the first edition to learn about this field). The loss of this chapter makes way for expansion of chapters on DNA techniques to include those for studying hypervariable DNA such as RAPDs, minisatellites, microsatellites, denaturing gradient gel electrophoresis, and automated sequencing. These techniques, some of which have gained widespread usage, were not covered in the first edition. It is tempting to guess what techniques will be dropped in the third edition (allozymes probably top the list).

The two chapters in the Sampling section have changed little from the first edition. We found the chapter on collection and storage of tissues somewhat disappointing because many new techniques and important issues are barely discussed. Significant advances in storage buffers for tissue/blood samples and the isolation of DNA from museum specimens have been developed. Processes that are incompatible with the best methods of tissue preservation (formalin fixation, for example) are barely mentioned. Neither are controversies regarding USDA permits, CITES, endangered species, and the regulation of DNA samples and PCR products. A po-

tentially useful addition to the frozen-tissue chapter is a list of 60 frozen-tissue collections from throughout the world. Eighteen of these collections have bird specimens. However, a number of bird-tissue collections are not listed, including (with contact people): The Field Museum, Chicago (J. Bates, S. Hackett); the Zoological Museum, Copenhagen, Denmark (J. Fjeldså, P. Arctander); Burke Museum, University of Washington (S. Edwards); Museum of Natural History, University of Kansas (A. T. Peterson); and Department of Biology, Illinois State University, Normal (A. Capparella), to name a few.

Palumbi's PCR chapter is the best summary of PCR methodology we know of and includes information relevant to both experienced and beginning PCR users. The sequencing and cloning chapter includes some information on automated sequencing techniques. As we were reading the chapters on techniques, we were struck once again with the speed with which these techniques change. It is tempting to envision future updates of this book to be available on the World Wide Web so that information can be presented in a more timely manner. For instance, Palumbi provides figures detailing primer sites for many genes throughout the tree of life, but thousands of new primers are being developed every year. A web-site format may be the only way to keep current. In future editions to the book, web addresses could be given for the myriad sites discussing automated sequencing and PCR.

Weir's chapter (Chapter 10) on intraspecific differentiation has changed little from the first edition. Although well written and very useful for the aspects it covers, analysis of intraspecific data is evolving at a rate equal to analysis of higher-level phylogenetic data, yet a reader interested in coalescent theory will have to look elsewhere. Swofford et al.'s chapter (Chapter 11) on phylogeny inference is still the longest in the book. It contains many additions, the most substantial involving background and discussion of maximum-likelihood techniques for phylogenetic inference. This chapter is an extremely useful teaching tool. Here, one can learn about some of the newest methods for analyzing DNA sequence data, from LogDet distances to Hadamard conjugation. We appreciate Swofford et al.'s

concern that phylogenetic analysis not be considered "black box," but we also urge researchers to be equally concerned with the quality of the data that go into phylogenetic analyses.

Out of curiosity, we looked back through volumes 110 to 113 of *The Auk* to determine how often chapters from the first edition were cited in avian molecular papers. Of the 28 papers presenting original allozyme or DNA data (not including hypervariable fragment data), only six (25%) cited one or more chapters. Five citations occurred for the Swofford and Olson chapter, two of the Werman et al. chapter on DNA hybridization, and two for the Dowling et al. chapter. We found a similar frequency of citations in recent volumes of *Molecular Ecology* and *Molecular Phylogenetics and Evolution*; thus, ornithologists are not using the book differently than other groups. This may be an inappropriate way to judge how much this book is used by the community. After all, the strength of the book is that it provides access to the primary literature on the techniques and the latest thinking about appropriate ways to analyze data. However, it does suggest that some chapters generally have been more useful than others.

Molecular systematists who use their first editions will certainly want to buy this edition, and all libraries should have a copy. The book is well priced considering the immense amount of information it contains. Despite the detailed information in this book regarding laboratory techniques and equipment, the best approach to learning new molecular techniques still is to visit labs that have already worked out their protocols. That said, this book provides detailed background information necessary to successfully gather and analyze most kinds of molecular systematics data.—SHANNON J. HACKETT AND JOHN M. BATES, *Zoology Department, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605, USA.*

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**Avian Energetics and Nutritional Ecology.**—Cynthia Carey (Ed.). 1996. Chapman and Hall, New York. xiv + 543 pp. ISBN 0-412-03701-7. Cloth, \$98.95.—This book is a synopsis of current research on the energetics and nutrition of birds, and represents an updated version of Raymond Paynter's *Avian Energetics* (1974). As with Paynter's book, Carey's edition synthesizes what is currently known about avian energetics and sparks continued interest and research in this growing field.

*Avian Energetics and Nutritional Ecology* includes a comprehensive array of topics. The goals of the book, as specified in the preface, are to summarize current knowledge in the field of avian energetics and to inte-

grate avian physiology with ecological and evolutionary theories. The compilation of 14 chapters from 16 authors is impressive and thoroughly accomplishes these goals. R. Ricklefs' lead chapter "Avian Energetics, Ecology, and Evolution," sets the stage for the book. Topics include nutrition and metabolism (M. Murphy), the energetics of digestion (W. Karasov), thermoregulation (W. Dawson and T. O'Connor), hypothermia (R. Reinertsen), molt (M. Murphy), flight (U. Norberg), foraging (B. Maurer), migration (H. Biebach), reproduction (C. Carey), incubation (J. Williams), growth (C. Vleck and D. Vleck, W. Weathers), and populations and communities (J. Wiens and A. Farmer). Carey's book is a testament to the growth of the field of avian energetics over the last two decades, as evidenced by the expanded amount of information available and increased number of topics included since Paynter's edition.

Most of the chapters are very well written and offer the reader excellent overviews of their respective topics. For example, Murphy's ebullient and colorful prose makes both of her chapters fun to read and evokes flashes of insight into familiar and novel subjects. Most chapters also emphasize future areas of fruitful research, which should be useful to the prospective avian biologist. For example, Carey's chapter "Female Reproductive Energetics" contains the seeds for several potential research projects. Some chapters provide exhaustive reviews of their topic, e.g. Norberg's "Energetics of Flight." All chapters include extensive bibliographies, providing the most up-to-date literature summary on each topic.

Some chapters quickly stray from the energetics and nutritional ecology emphases of the book, and thus seem out of place. They focus narrowly on theory, modeling, or other peripheral issues and offer minimal integration of the topics with energetics and nutrition. This results in some oversimplifications and unfounded statements.

*Avian Energetics and Nutritional Ecology* targets an audience of avian physiologists and physiological ecologists. However, aspects of this book may appeal to a broader audience. Some chapters are written in very technical style, whereas others can be read easily by the nonspecialist. All chapters make noteworthy points, which the physiologist, ecologist, or evolutionary biologist may find useful. This book should be part of college and university libraries and would be a valuable addition to the personal libraries of vertebrate physiologists and ecologists. At the very least, it is effective at inciting interesting discussions in a graduate seminar. In fact, this review was generated by the participants in a seminar on Environmental Physiology at UCLA.—C. Y. INOUE, I. GIRARD, T. K. BROWN, D. HAYSE, F. HERTEL, AND K. A. NAGY, *Department of Biology, University of California, Los Angeles, California 90095, USA.*

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**Ecology and Evolution of Acoustic Communication in Birds.**—Donald E. Kroodsma and Edward H. Miller (Eds.). 1996. Cornell University Press, Ithaca, New York. xx + 587 pp. ISBN 0-8014-3049-6. Cloth, \$75.00.—As did *Acoustic Communication in Birds*, the two-volume set edited by Kroodsma and Miller (1981), this new compendium summarizes and reviews progress on major topics related to birds' use of sounds. The amount of progress in the field is reflected by the fact that the 1996 volume uses approximately the same number of pages as the two-volume 1981 set to cover half of the topics in the previous work, and this more circumscribed choice of topics is reflected by the addition of the words "Ecology and Evolution" to the title.

Twenty-six chapters are divided thematically into five groups that deal with broad areas of vocal behavior: development, repertoires, variation, control and recognition, and communication. However, I found other themes, though they were not always explicitly defined, to emerge with equal or even stronger clarity from the assembled chapters. The first is defined by Peter Marler. Although none of the chapters is written by Marler or by anyone who has worked with him more recently than the early 1980s, his presence is strongly felt throughout the book. Several chapters, including those by Beecher and Baptista, react to or build upon the canon that derives from Marler's research on song development and dialects.

A second theme is that of the importance of comparative work, which emerges even though most of what is known about avian communication comes from studies that focus upon one of a few temperate songbird species (and, in the lab, from an even more restricted group that includes the Budgerigar [*Melopsittacus undulatus*], covered in a chapter by Faraugh and Dooling). Kroodsma, in the three chapters that he wrote or coauthored, is the primary proponent of the importance of the comparative approach, and he points out that many hypotheses about learning and repertoire size can be addressed only by comparative studies. Brenowitz's neuroethological studies of tropical wrens and duetting, as well as Martens' work on parid "regiolects," or vocalizations that are intelligible over wide distances, also demonstrate the importance and potential of well-focused comparative studies. Two chapters on taxa that do not learn to sing, by Miller and Bretagnolle, point out the value of contrasting these outgroups with studies of learned song, and Smith's chapter on the use of song types during interactions brings to light some "rules" that appear to apply across many groups.

A third theme deals with the tropics. Most species of songbirds are not temperate-zone inhabitants, and

most temperate-zone songbirds spend a portion of the year in the tropics. Yet, most research on vocalizations either takes place in the temperate zone or is done in the tropics by people from the temperate zone. The importance of the study of avian sounds for both biodiversity and research reasons is underlined by the chapters on tropical birds by Kroodsma, Morton, and Brenowitz, and an appendix provides guidance for those who take up this call to arms.

Perhaps because I am seduced by the idea of hypertext, I found myself wishing for an organization that would allow me to more easily make links between chapters in different sections. I found myself referring back and forth between chapters related by taxa, such as those by Martens, Hailman and Ficken, and Lambrechts (each of which dealt with parids), or between chapters that dealt with a particular behavior, such as song matching, which is covered in different contexts by Torben and Dabelsteen (interactive playback), Horn and Falls (song categorization), and Todt and Hultsch (the organization of repertoires). A certain lack of unity of organization and style is, of course, the price one pays in an edited volume in order to the gain the benefits of the focused and individually distinct views of individuals immersed in the field. In some sequences of chapters, such as the review chapter by Lynch on cultural evolution of song that is followed by Payne's chapter on song traditions in Indigo Buntings (*Passerina cyanea*), the distinct viewpoints and approaches and the different model organisms allow the reader to make the explicit and implicit links easily.

Some chapters stand well on their own as critical reviews of specific topics, such as those by Searcy and Yasukawa on female choice; Staicer, Spector and Horn on the dawn chorus; and Ratcliffe and Otter on sex differences. Another group of chapters can be described as instructional or cautionary, describing the difficulties inherent in designing experiments to test specific classes of hypotheses, and the caveats that one must be aware of in attempting to interpret results. King and West's chapter on development is especially forceful in pointing out the importance of social and physiological context and individual variation in studies of learning.

Rather than presenting data, many of the authors reflect upon previous results and use relatively few figures, although some chapters, such as Ratcliffe and Otter's on sex differences in song recognition, effectively combine reviews with illustrations of the major points that use graphs and sonograms. Because the book presupposes a familiarity with much of the basic literature and general background of research on avian vocalizations, it will be more accessible to those who have followed the field. For the reader who wishes for a good introduction to avian vocalizations, the book of choice is Catchpole and Slater's *Bird Song*. For those who wish to go beyond that level, or to find summaries of how work in the

field illuminates more general topics, this new volume by Kroodsmma and Miller will be invaluable. The two books together are essential for every library or individual with an interest in how birds use sound to communicate.—HEATHER WILLIAMS, *Biology Department, Williams College, Williamstown, Massachusetts 01267, USA.*

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**Red-winged Blackbirds: Decision-making and Reproductive Success.**—Les D. Beletsky and Gordon H. Orians. 1996. University of Chicago Press, Chicago. xxii + 294 pp., 37 text figures. ISBN 0-226-04186-7. Cloth, \$65.00; Paper \$21.95.—The Red-winged Blackbird (*Agelaius phoeniceus*) is a popular study organism for many reasons, including high nesting densities, polygyny, a large geographic breeding range, and universal esthetic appeal. A recent outcome of this popularity is three new Red-winged Blackbird books. I have not read Beletsky (1996), but I can tell you that Searcy and Yasukawa (1995) is more of a species-level review, whereas the current volume is more of a population-level review. Beletsky and Orians' book is largely an empirical work. Because of a growing emphasis on experimentation, we often forget that empirical data provide the template against which experiments are designed. One strength of this book is the number of unexpected patterns revealed by the empirical data. Moreover, this book presents much new information that will be of wide interest to evolutionary biologists and behavioral ecologists, and essential to Red-winged Blackbird biologists.

In the first two chapters, Beletsky and Orians described their methods and the particulars of their Washington State population. Some interesting particulars emerged from four papers in Elizabeth Gray's thesis on DNA fingerprinting. For example, on average, males gained as much as they lost from extrapair fertilizations (EPFs), and EPFs did not increase variation in male mating success. Hence, Beletsky and Orians assumed that territorial males had 100% paternity for the clutches laid on their territories. This assumption may hold at the population level, but it overlooks variation in individual reproductive success that arises from EPFs.

In the third chapter, Beletsky and Orians considered when in the year a female should begin laying. Nesting and fledging success were higher in the first three weeks of the 13-week nesting season; this could have been partially due to larger clutch sizes being laid in the first three weeks. Early nesting may be constrained by weather, and the authors reported a

negative correlation between temperature and nest-initiation date, contrary to their expectation. Presumably, their wording was mistaken, because a negative correlation should have been expected; i.e. high temperatures should be associated with earlier nest initiations. Beletsky and Orians found that a higher proportion of early than late nests never got eggs. Early nests apparently were abandoned if weather delayed laying; females then laid in new nests. The authors offered no explanation for why females built anew rather than used their original nests.

In the fourth chapter, Beletsky and Orians considered influences on where females placed nests. Among the factors considered were whether to nest near other females or choose an unpaired male so that high rank is obtained in a harem. I think that it would have been more useful to ask the questions together, because the options are not mutually exclusive. Otherwise, if copying was paramount, one male would have all females; if high rank was paramount, all males would have one female. Considering the questions together may have resolved the relative importance of each option. Lower-ranking females had higher reproductive success; Beletsky and Orians offered two explanations for this paradox. First, the analysis included some primary females on poor-quality territories that started laying eggs after the first three weeks of the season. Second, lower-ranking females usually nested within five to six days after primary females, and therefore also got benefits of early nesting (see above). Although these reasons may have reduced advantages to primary females, it remains unclear to me why, on average, primary females would ever have had lower reproductive success than that of lower-ranking females. Habitat quality also was discussed as an influence on where females nested. One-dimensional strip marshes had lower nesting success than two-dimensional pocket marshes. Although individual females did not necessarily disperse to better marshes, Beletsky and Orians noted that the population nested, adaptively, at higher densities on pocket marshes.

The fifth chapter considered female investment in reproduction. To test for costs of reproduction, Beletsky and Orians went to great pains to estimate the total energy each female invested each year. They found that returning females had invested more in the preceding year than females that did not return. Four analyses found that females with high reproductive investment in year  $x$  tended to nest earlier in year  $x + 1$ ; one result was significant. Finally, high reproductive effort in year  $x$  was associated with high reproductive effort in year  $x + 1$ , although none of the four analyses was significant. Beletsky and Orians rightly concluded that they had found no evidence for costs of reproduction. However, all of the evidence is consistent (albeit weakly) with a scenario of higher-quality females having consistently higher reproductive success (see Reznick 1985). A separate component

of total reproductive effort examined was the number of nesting attempts. Because late-hatched young usually have lower survival, the conventional explanation for why females cease nesting is that there is too little return for the effort. However, a surprising finding for Beletsky and Orians' population was that recruitment was higher for late-hatched offspring. Hence, the authors explore why females cease nesting. Beletsky and Orians convincingly eliminated food, predation rates, and female exhaustion as constraints, and suggested instead that females may need sufficient time to molt prior to migration.

Chapter 6 provided a theoretical background for subsequent tests of hypotheses about male territoriality. Floaters without territories are found in populations of many bird species, and DNA fingerprinting data from several populations confirm that floater Red-winged Blackbirds rarely get fertilizations; hence, a territory is essential for males. The intuitive explanation for the difference between owners and floaters is resource-holding potential (RHP), i.e. owners dominate floaters in contests. However, RHP can be overwhelmed if individuals, regardless of RHP, can become injured in escalated contests, as has been observed for this species. Hence, a second explanation for the difference between owners and floaters is that owners are willing to fight harder for a territory because they value it more than do contenders; this value asymmetry (VA) arises because of investments that owners have made in a territory (e.g. learning the location of food). A third alternative is that territory acquisition is determined by lottery (Eckert and Weatherhead 1987, Searcy and Yasukawa 1995). However, as Beletsky and Orians argue, lotteries cannot explain territory retention. I agree, but I think they too quickly dismissed an arbitrary asymmetry, "owner beats floater," that follows from a lottery and could explain territory retention.

Beletsky and Orians pointed out that hypotheses for territory acquisition and retention are not mutually exclusive, and presented a series of predictions to separate the influence of RHP, VA, and lotteries. For example, if RHP determined ownership, floaters should range only widely enough to find a weak owner that they can usurp. If VA was important, floaters should have had home ranges where they acquired experience and knowledge about specific territories. If a lottery was important, floaters should have ranged randomly until they found a vacancy. Beletsky and Orians reported that floater home ranges sometimes encompassed hundreds of territories, and concluded that this was consistent with VA. But, when is a home range so large that it is unlikely that VA is important? For populations of other species, floater home ranges are less than 10 territories (Shutler and Weatherhead 1994). Because we do not know male capacity for memory of territories, I think that interpretation of these results must remain speculative.

Chapter 7 dealt with territory acquisition. Because

a territory is essential for male reproductive success, there may be selection for acquisition early in life. This appears to be true once adult plumage is attained (when males are in their third year). However, second-year males rarely obtain territories. The authors found that second-year males that do acquire territories ended up with lower lifetime reproductive success than males that waited until their third year before beginning to breed. Beletsky and Orians also considered how territories were acquired. If weaponry is dangerous, passive acquisition may be a safer route. Indeed, not only did 69% of floaters in Beletsky and Orians' population appear to claim vacancies passively, those that acquired territories aggressively (by inserting themselves between neighboring owners) tended to have lower lifetime reproductive success. This could be interpreted to mean that floaters did better if they respected the arbitrary asymmetry.

Territory tenure, considered in Chapter 8, is an excellent predictor of male lifetime reproductive success. Duration of tenure is predicted to influence size of value asymmetries. Previously, Beletsky and Orians found support for the VA hypothesis from experiments where they removed owners and released them after varying intervals in captivity. However, the authors believed that these earlier experiments did not adequately control for replacement tenure, and so here they used double removals (removing the owner and his replacement) so that the second replacement's tenure was shorter than the original owner's absence. Whereas owners held captive for seven days in the initial experiments seldom reacquired their territories after release, owners in the new experiments had much higher success at reacquisition. Beletsky and Orians' explanation was that the population was at a lower density in the second set of experiments, which made it more likely that some replacements had low RHP. I was intrigued by the suggestion that population density influences the importance of VA and RHP; it also may influence the importance of arbitrary asymmetries. At any rate, factors separating territory owners from floaters remain ripe fields of investigation for this and many other species.

The last chapter was the longest in the book; part of it reiterated the major findings from the heart of the book, and the rest was speculative. A section speculates on why some behaviors are invariant, but it was not clear to me what influenced selection of the behaviors considered. For instance, Beletsky and Orians asked why males do not build nests, but they did not ask why females do not lay eggs in nests of other females. Similarly, a later section is entitled "Are Red-winged Blackbirds intelligence-limited?" Why not ask whether males are sperm-limited, or predator-limited? I think Beletsky and Orians could have used this chapter to speculate on why their population differs from those studied by others. For example, in contrast to Gray's results (see above), DNA fingerprinting data for an Ontario population (Weatherhead and Boag 1995) indicated that male

EPF success in one year to some extent predicted EPF success in successive years. Another difference was that in Washington females solicit EPFs, whereas in other populations they apparently acquiesce. These population differences are important to the generality of Beletsky and Orians' results and interpretations. At any rate, the presumed intent of this chapter was to stimulate interest in unresolved issues, but I think that Chapters 3 to 8 succeeded better at this.

Some aspects of the book could have been improved. I would have preferred calendar dates on figure and table headings rather than Julian dates or week numbers, even though actual dates were provided in headings. Although most of the analyses that Beletsky and Orians used were suitable, and many were even creative, some appeared incomplete. For instance, Beletsky and Orians reported the curious finding that, following nest failure, second-year females renested sooner than did older females. Are second-year females in better shape because they have not experienced the costs of reproduction? Beletsky and Orians suggested instead that second-year females laid later in the year when environmental conditions were more favorable. Why, then, did they not repeat the analysis controlling for nest-initiation date? A second instance was where the authors reported higher return rates for late-hatched offspring. As the authors suggest, this assumes that dispersal was not influenced by hatching dates. So, I was disappointed that Beletsky and Orians did not test this assumption (late-hatching young of some parids disperse farther). Despite these caveats, the positives outweighed the negatives. First, even this proud nitpicker was rarely distracted by typos or awkward wording. Second, the citations were up-to-date. Third, this book was an easy read despite the complexity of some of the topics covered. Fourth, there were dozens of subjects covered in this volume that I do not have space to discuss. For example, there was more detailed consideration of the reproductive decisions of female Red-winged Blackbirds than I have seen anywhere else. Fifth, this book has an extraordinary wealth of data (16 years). Hence, despite low return rates of locally hatched birds, Beletsky and Orians could ask questions about factors influencing their survival.

In any field study, uncertainties exist about whether populations under study evolved under different or less human-influenced circumstances. A second set of uncertainties arises from dispersal, which usually means that we do not know the influence on breeding-season strategies of behaviors employed by nestlings, fledglings, and wintering individuals. Beletsky and Orians were frank about the potential importance of these gaps. Nonetheless, Beletsky and Orians' book reveals substantial progress (far more than I can convey here) in understanding Red-winged Blackbirds. Their contribution will be useful for those immersed in, and those that have not (yet)

leapt into, the Red-winged Blackbird sorority/fraternity.—DAVE SHUTLER, *Canadian Wildlife Service, 115 Perimeter Road, Saskatoon, Saskatchewan, S7N 0X4, Canada; and Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan, S7N 5E2, Canada.*

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**Cranes: Their Biology, Husbandry, and Conservation.**—David H. Ellis, George F. Gee, and Claire M. Mirande (Eds.). 1996. Hancock House, Blaine, Washington. 307 pp., 15 color plates, 118 black-and-white photographs, 182 figures, 31 tables, 16 maps. ISBN 0-88839-385-7. Cloth, \$49.95.—The Gruidae is one of the world's most endangered avian families, and few birds have received as much recent worldwide attention as have some members of this family. Habitat destruction and hunting have severely reduced a number of populations; presently 47% of the 15 crane species are listed as either endangered or threatened, and several of the 14 subspecies are at risk. Since 1970, two volumes have been published on crane biology (Walkinshaw, *Cranes of the World*, 1973; Johnsgard, *Cranes of the World*, 1983), as well as several books and numerous pages on single species and subspecies. In addition to the completion of many field studies, several crane research and propagation centers have been established, providing a wealth of both published and unpublished information. Be-

cause husbandry will perhaps play an important role in the survival of some family members, methods and procedures for captive propagation, as well as for subsequent releases into the wild, are sorely needed. *Cranes: Their Biology, Husbandry, and Conservation* provides this information in detail, based primarily on successes and failures at two of the world's leading propagation centers, Patuxent Wildlife Research Center in Maryland and the International Crane Foundation in Wisconsin. Though the title lists biology and conservation, only about 18% of the book is devoted to these topics; the remainder includes all aspects of crane husbandry from egg and semen production to genetic management. An extensive appendix lists essential equipment, suppliers, and addresses for obtaining this equipment.

The first chapter discusses crane biology, covering taxonomy, food habits, and plumage coloration, all under the general heading of natural history. Social behavior is briefly discussed, followed by a section on breeding biology from pair formation to nests and chicks. The chapter also includes a section on captive crane history and closes with crane status and conservation. Each of the 15 species is illustrated with excellent full-page color plates, by far the best I have seen in any crane monograph. An additional plate of a Demoiselle Crane (*Grus virgo*) captured in Pakistan that became a pet is somewhat distracting and disturbing; it does, however, illustrate vane-trimming, a method for rendering a crane flightless. A table lists the approximate numbers for all crane populations, but the 700,000 listed for Sandhill Crane (*Grus canadensis*) certainly is inflated, because in a later table the figure given is 520,000. Even the latter number may be overly optimistic, because the U. S. Fish and Wildlife Service estimates that 245,000 were killed by hunters in the Central Flyway alone between 1975 and 1994 (Haskins, *Analyses of Selected Mid-winter Waterfowl Survey Data 1955-1995*, U. S. Fish and Wildlife Service, 1995). Under plumage coloration, it is stated "Terrestrial predators are undoubtedly more a threat in forested wetlands than in open situations." This certainly does not apply to all locations, because extremely high terrestrial predation occurs on eggs and young of Greater Sandhill Cranes (*G. c. tabida*) on the large, open wetland complexes in the western United States.

General husbandry (Chapter 2) for captive cranes is thorough, discussing in detail topics pertaining to pen cleaning, disease prevention, general crane welfare, and ambient-temperature limitation. One of the important chapter segments is that on food formulas. Crane handling and transporting are discussed in every detail, including crate size, temperature extremes, and an excellent account on capturing, restraining, and releasing captives. I found the section on marking particularly useful, especially the procedures for constructing colored leg bands; field re-

searchers with intentions of color-marking wild cranes should review pages 41 and 42.

Egg and semen production are covered in Chapter 3, beginning with behavioral factors, and followed by a section detailing environmental influences on reproduction—photoperiod, light intensity, rainfall, latitude, temperature, open water, nest sites, and food are reviewed. Considering the climatic variability within the breeding range of such a widely dispersed family, this section should be of interest to aviculturists working with an array of species. For example, photoperiod extensions induced the first captive breedings of the far northern Hooded (*G. monacha*) and Siberian (*G. leucogeranus*) cranes, and artificial rain from sprinklers (to simulate the rainy season) stimulated the first captive breeding of Brolgas (*G. rubicunda*). Sexual maturity and reproductive life span are discussed, including facts such as 25% of Mississippi Sandhill Cranes (*G. c. pulla*) breed when 2 years old, and one male Siberian Crane was still producing sperm when 75 years old. Procedures for inducing captive females to lay larger numbers of eggs per season, multiple clutching consequences, and egg breakage are included here. The chapter ends with a table presenting breeding-season time and duration for 12 species of captive males at the International Crane Foundation.

For incubation and hatching, both natural and mechanical incubation procedures are detailed; incubation with natural parents, surrogate parents, and surrogate incubation using chickens are discussed. Mechanical incubation procedures, corrective measures, and warnings also are treated. A third section deals with fertility determination by candling or flotation. It is noted that the flotation method can be used to determine a fertile egg's age, but a figure illustrating egg flotation stages would have been helpful. In the section on problems and remedies, commonly encountered incubation problems are summarized, as are methods for correcting problems. Chapter 4 closes with procedures for transporting eggs.

Every aviculturist involved with chick rearing will no doubt find Chapter 5 highly valuable, because it addresses every aspect from hatching to fledgling. Beginning with chick-rearing facilities, the text proceeds to diets, water, chick handling, growth problems, and food rationing. A second section covers procedures and cautions pertaining to chick rearing by adult cranes. General requirements for hand and isolation rearing are very adequately presented. Information contained in this section will not only save aviculturists considerable time and costs, but may prevent the unnecessary losses of chicks as well. The last pages cover veterinary techniques for chick rearing in detail. Preventative health programs, nutritional support, eye injuries, orthopedic problems, parasites, and diseases are among the topics, but more importantly procedures and remedies to reduce or eliminate problems are stressed—even the

recipe for "Mother O'Malley's Crane Stew" is presented in a table. Because crane chicks are notorious for incurring injuries and contracting ailments, I suspect that this chapter will be consulted frequently.

Chicks, subadults, breeding adults, cranes on public display, and birds being propagated for release into the wild are detailed in the 30 pages on behavioral management. The description and discussion of various crane displays add to the chapter, and the line drawings illustrating these displays are excellent. Chick and subadult behavioral management is covered only briefly, whereas adults are discussed at length. Although the description of crane pairing closes with "... dancing is also associated with pairing and is believed to synchronize mates for successful copulation," supporting data are not provided. In fact, earlier it was stated that "Surprisingly in our walk-through study, we failed to find strong seasonal trends for such activities as Dancing. . ." In some wild Greater Sandhill Crane populations, dancing associated with pair formation or copulation has never been detected. Courtship dancing may occur in other sandhill populations, in other crane species, or perhaps dancing has nothing at all to do with pairing, courtship, or copulation. Chapter 6 ends with an informative and interesting three pages on crane imprinting, attachment, and behavioral development.

Reproductive physiology is presented in a concise and understandable manner in Chapter 7. Hormonal control of the annual reproductive cycle and hypothalamic and pituitary control of reproduction are presented in two figures. These figures conveniently and concisely present the integrated crane neuroendocrine system and its function, eliminating the need for a lengthy and complicated written account. Male and female reproductive systems and production of sperm and eggs are discussed and illustrated, followed by sections on endocrinology, incubation hormonal function, and though not discussed in relation to endocrine events, a short section on molt.

As stated at the beginning of Chapter 8, "Success in captive rearing and propagation of cranes is dependent on establishing appropriate health monitoring, disease prevention, and parasite control procedures." This chapter covers medicine and surgery in considerable detail, with sections on initial care, nutritional support, clinical pathology, radiology, infectious diseases, noninfectious diseases, orthopedics, anesthesia, and common surgical procedures presented in a thorough and understandable manner. Adding to the chapter are several tables, including one listing drug use, route of administration, dosage, and treatment schedule for antibiotics, corticosteroids, vitamins, injectable tranquilizers, anesthetics, and other medications. This will no doubt be another chapter frequently consulted.

Chapter 9 is devoted to methods for preserving genetic diversity, genetic and demographic manage-

ment, studbooks, cooperative management programs, and genetic research. Culling crane offspring by euthanasia seems somewhat harsh, as does the statement: "... we need to know how much the Mississippi Sandhill Crane differs from other sandhill subspecies to evaluate our investment in its preservation." Nineteen pages on procedures and examples for keeping accurate captive crane records are presented in Chapter 10. The majority of the chapter involves the extensive record-keeping system for captive Whooping (*G. americana*) and Sandhill cranes at Patuxent.

Chapter 11 is divided into six sections discussing special techniques: (A) artificial insemination, (B) cryopreservation, (C) sex determination, (D) reintroduction techniques, (E) flight restraint, and (F) predator and pest management. The brief descriptions of species-specific unison calls, accompanied by a figure, greatly enhance section C, as does the section on genetic sexing techniques. Important are the complications that may result from various sexing procedures. For example "Although the condition is very rare, cranes have died from excessive blood loss through a broken blood quill of a large feather" and "For birds in general about one bird in 250 dies during laparoscopy". Section D will be of value to those involved in crane propagation with intentions of releasing captive-reared birds into the wild. Methods, warnings, and results for flight restraints are discussed in detail in section E, which includes six photographs illustrating types of restraints. Section F presents an informative discussion on predator and pest management, beginning with an important summation of North American laws and regulations concerning such programs. Rarely does a publication stress techniques for removing predators alive, but this volume even recommends where to release captured organisms: "Once a bird is captured, it should be examined for injuries and then released at least 20 km from the trap-site. At Patuxent, we commonly transport owls at least 100 km from the kill site." I found this section informative, providing techniques and methods for predator and pest removal generally not presented elsewhere.

Crane-rearing facilities are the subject of Chapter 12. For a center considering a captive-rearing program, it would have been beneficial if estimated facility construction costs had been provided. The last chapter provides a summary of ecology, status, and conservation for all 15 crane species. Distribution (including 16 excellent maps), estimated population size, status, habitat threats, conservation efforts, and priority conservation needs are presented for each species and usually their subspecies. A table provides population estimates and trends, though total estimated population numbers do not always agree with total numbers presented in a previous table. It also should have been stated that management guidelines and plans were completed in the early



1980s for the Central Valley and Lower Colorado River Valley populations of Greater Sandhill Cranes and the Pacific Flyway population of Lesser Sandhill Cranes (*G. c. canadensis*), not just for the mid-continental and Rocky Mountain populations. The account on Sandhill Cranes only briefly points out that certain segments of the mid-continental population may be over hunted. Thus, a priority conservation measure would provide greater attention to the long-term effects of hunting. This is no doubt needed, considering that just in the past 20 years nearly 250,000 sandhills have been killed by hunters in this population. Perhaps similar attention should be given to the Rocky Mountain population of Greater Sandhill Cranes.

This is an attractive book with very few typographical and factual errors, maybe due to the eight years spent in writing and editing (the only typographical error I found was among the citations). *G. japonensis* is referred to both as the Japanese Crane and Red Crowned Crane, but properly should be the Red-crowned Crane.

The result of nearly three decades of captive crane propagation research at Patuxent Wildlife Research Center and the International Crane Foundation, this book will no doubt be an essential reference for every facility engaged in captive crane management. However, information contained in this publication should not be limited to captive programs alone, because every crane field researcher, and every natural resource agency that has breeding, staging, and/or wintering cranes, should acquire a copy. Because cranes continue to be one of the most endangered of avian families, this publication will serve as an important information source on methods and procedures for preventing further declines or possible extinctions of some species. Authors, editors, and the publisher are to be commended for developing and producing this excellent book.—CARROLL D. LITTLEFIELD, *HCR 4 Box 212, Muleshoe, Texas, 79347, USA.*

species green with envy. The first five chapters on the foraging ecology of this species are extremely impressive, and certainly suggest that the old adage "you are what you eat" is true for the Eurasian Oystercatcher. The book's seemingly awkward starting point at "Food and Feeding Behaviour" instead of the more usual and general descriptions of geographic range, method of study, or perhaps conservation status, becomes more understandable given that the literature on this large, visible bird that eats large food items is dominated by papers on its foraging ecology. The first five chapters (132 pages) cover diet, feeding behavior (including methods for detecting prey), prey-size selection and intake rate, the degree to which individuals specialize (not as much as originally believed), the thickness of shells of their molluscan prey, where oystercatchers feed, the dominance interactions in flocks and consequences thereof, handling and search time (among other variables), and a model predicting the distribution of oystercatchers among foraging sites of different quality and intake rates as a function of the competitive ability of the birds (Chapter 5).

In Chapter 6, the authors critically appraise the assumption, widely held for bird populations, that food shortage is an important factor that prevents some individuals from surviving the nonbreeding season. As such, it includes substantial information on the effects of winter weather on overwinter survival of this species. With this information, the Chapter 7 examines the relationship between winter weather, oystercatcher energy expenditure, timing of molt, and the decision to migrate—a synthesis of information that is extraordinarily interesting. Again, the amount of detail is truly impressive, particularly because the Europeans seem to work as a coordinated whole examining migration patterns and overwinter survivorship of this species.

Chapters 8 and 9 examine breeding biology including, again, quite remarkable data on how long the birds wait before breeding and why, the pattern of occupancy of breeding sites, the apparent hierarchy among nonbreeding birds, causes of mortality, divorce rates, who divorces whom (and in some instances why), as well as a wealth of other information. The chapter on rearing young to independence (Chapter 9) explores the origin of the relatively rare developmental mode of oystercatchers, one that straddles the basic dichotomy between precocial and altricial conditions: oystercatcher young are mobile but fed by their parents. The argument used is that this unique mode of development reaps the main benefits of rapid growth and minimal predation risk accrued to typical altricial and precocial young, respectively.

Chapter 10 is an overview of what is known about the biology and systematics of the oystercatchers of the world, a long-overdue synthesis of this interesting, but relatively conservative family. The molecu-

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**The Oystercatcher: From Individuals to Populations.**—John D. Goss-Custard (Ed.). 1996. Oxford University Press, Oxford. x + 442 pp., 156 text figures. ISBN 0-19-854647-5. Cloth, \$115.00.—New in the excellent series of books on ornithology from Oxford University Press comes an edited volume, with 25 contributors, detailing what is known about the biology of the Eurasian Oystercatcher (*Haematopus ostralegus*). The reader will be quickly persuaded that a great deal indeed is known about this shorebird—enough to make most of the rest of us studying single

lar systematics data on this group, though, are conspicuously absent.

The final three chapters explore the population ecology of the oystercatcher, primarily through use of a game-theoretic approach. Chapter 11 reviews the large number of potential interactions between humans and oystercatchers in coastal environments. Interestingly, numbers of Eurasian Oystercatchers appear to be stable despite losses of up to 36% of the original wintering habitat. Habitat loss appears to result in greater overwinter losses during milder climatic conditions than those that triggered starvation prior to the loss of habitat. The last two chapters use a demographic approach toward modeling the carrying capacity of the local environment (Chapter 12) and the entire continental populations (Chapter 13). These chapters are highly ambitious and integrate population surveys, overwinter mortality data, and data from the breeding grounds to describe what is known about the importance of density-dependent and density-independent processes. Density-dependent processes are surprisingly scarce, despite increases in population size over recent decades, although the data from the breeding season incorporated into model parameters, are, unlike most in this book, not conclusive. The degree to which density-dependent processes operate on the wintering grounds depends on the quality of the habitat. The conclusion, derived from simulations, is that anthropogenic factors that change density-independent effects (e.g. pollution) could greatly affect population size because breeding-season density-dependent processes appear to be weak. The beauty of these chapters is that they draw on information from wintering and breeding grounds over a wide geographic area because both (and most) populations are monitored and known with some precision.

Only a small number of distractions came to mind in this otherwise exemplary book. In Chapter 2, on prey-size selection and intake rate, the authors conclude that a foraging model that assumes maximization of intake rates is inadequate; in Chapter 4, on feeding with other oystercatchers, maximization of intake rates is given as a basic assumption. The chapters in this volume are cited inconsistently; the most helpful approach would be to cite the paper as: (Author, Chapter X, this volume), but each author (or group of authors) appears to have chosen their own particular method. A chapter on general field methodology for trapping, measuring, observing, and counting oystercatchers would have been a welcome addition; its absence suggests that these impressive data can appear miraculously on the computer screen of any hopeful biologist. Despite these minor inconveniences, the figures and tables are exceptionally clear and nicely reproduced, including sharp black-and-white photographs and pen-and-ink drawings that greatly enhance the presentation of the text. This book is highly recommended for any

ornithologist studying any aspect of the biology of a single species. I also strongly recommend it for any university or museum library as a model for the student or researcher approaching any problem in the conservation and management of birds.—ERICA NOL, *Biology Department, Trent University, Peterborough, Ontario K9J 7B8, Canada.*

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**Monitoring Bird Populations by Point Counts.**—

C. John Ralph, John R. Sauer, and S. Droege (Tech. Eds.). 1995. U.S. Forest Service General Technical Report PSW-GTR-149, Pacific Southwest Research Station, Albany, California. iv + 187 pp. Available at no charge from PSW Distribution Center, 3825 East Mulberry, Fort Collins, Colorado 80524.—This volume contains 22 peer-reviewed technical papers, a conclusions section, and two appendices. Its objectives are to evaluate the point-count method of determining relative bird abundances and to standardize the procedure to enable collection of comparable data over a broad geographic area. The 22 papers, authored by 49 individuals, are reasonably well written and edited.

The volume considers practical aspects of developing point counts, on- versus off-road counts, statistical concerns, and standardized procedures. Most of the papers concerned with practical aspects of the technique consider duration of count periods (11 papers) or effective radius of counts (10 papers). Some aspect of accuracy of point counts (variance and comparison with spot-mapping) is considered in eight papers. Other topics such as the use of aural stimuli to increase detection, importance of time of day, analytical methods, sample-size relationships of design to census goals, and variation among observers are covered in from one to five papers each. These papers, in concert with the references cited, provide readers with information to choose the best protocol for work in a wide variety of habitats, and are the basis for development of a standardized procedure.

Data are from study areas including semi-evergreen vegetation in Quintana Roo, Mexico (Lynch); hardwoods in the Mississippi alluvial valley (Smith et al.), northern Wisconsin (Wolf et al.), the mid-Atlantic States (Dawson et al.), Indiana (Buskirk and McDonald) and Arkansas (Petit et al.); grasslands (Rotenberry and Kirk); croplands (Cyr et al. and Freemark and Rogers); and shrubsteppe (Rotenberry and Kirk).

On- and off-road results are discussed for shrubsteppe and grasslands (Rotenberry and Kirk), conifers (Hutto et al.), and hardwoods (Keller and Ful-

ler). On- and off-road sampling is important because if counts conducted along roads are valid, travel time between points is reduced, which permits an increase in count sample size. These papers conclude that road counts are probably as accurate as off-road counts if the roads are barely more than mere trails, and if certain species that have an affinity for roadside wires are discounted.

Six papers dealing with statistics consider what point-count data actually represent, the need for independence of counts, point-count modifications, detection probabilities, and experimental design. The last point is of major importance; it is crucial to understand precisely what the objectives of a study are so that the design for the field work is appropriate relative to the objectives.

Because all of the papers contain some statistical analyses, this subject is covered adequately. A broad range of statistical methodologies associated with analyzing point-count data is covered, and, in concert with the references cited, will lead those interested in considering the technique to a wide variety of analytical methods. The set of papers deals thoroughly (but not exhaustively) with this topic.

A series of statements by authors in this volume is strongly negative regarding point counts. For example, "Given realistic limitations on sampling effort, standardized point counts are clearly unsuitable for confirming even quite large relative differences in the occurrence rates of rare or cryptic species (Lynch, p. 6)." Further, "The desirability of standardizing point-count methodology across very different geographic regions, habitats, seasons, taxonomic and behavioral groups, and levels of abundance is problematic (Lynch p. 6)." Wolf et al. (p. 19) state that "... data from point counts can give only a crude picture of avian density." Similarly, it is concluded that "Variation in detection probabilities may result in false conclusions about population trends" (Dawson et al. p. 39).

Johnson (p. 119) points to objections others have had when he writes, "Burnham (1981) harshly criticized use of measurements such as point counts because they lacked a clear connection to biological parameters such as population density." Johnson also writes "We need to better understand the role of the detection probability if we are to draw inferences from the counts about bird populations" (p. 23). In my judgement, the book does not provide the data necessary for understanding this problem. Thus, this point should have been addressed somewhere in the concluding paper.

I was concerned about the large samples required to detect even a 25% change in population size (Smith et al. p. 10, Thompson and Schwalbach p. 45). Thompson and Schwalbach were able to obtain reasonably reliable data for only 13 of 21 of the most common species.

The statement by Petit et al. (p. 56) that "no single

point-count technique is best for every type of research project" casts more doubt in my mind relative to the value of the procedure. Astoundingly, Howe et al. state that "only about half of species recorded at a given site have been recorded the next visit two years later" (p. 91). Perhaps the most stunning statements are from Baker and Sauer (p. 125), who say "The dominant feature of point counts is that they do not census birds, but instead provide incomplete counts of individuals present within a survey plot. Considering a single model for point count sampling, we demonstrate that use of these incomplete counts can bias estimators and testing procedures, leading to inappropriate conclusions." If I were to use this volume to choose a suitable count technique, the above statements would be sufficient for me to drop point counting as a valid procedure.

The problem is that bird species are neither equally detectable nor equally abundant. Assuming that problems associated with time of day, wind, rain, and so on can be overcome, researchers are faced with deciding on the duration of counts, bird detectability, and statistical independence of samples. The longer the count period the more thorough the count, but the greater the chances of recounting some birds and the smaller the number of plots that can be censused in the time available. Shorter count periods increase sample sizes, but the counts are less thorough. The smaller the study area the greater the problems associated with obtaining sufficient samples (count points) that remain statistically independent. Tradeoffs are inevitable, but they lead to more problems with the data. The ultimate question revolves around whether these errors are relatively small, or whether they are so large that the data set is seriously compromised.

In the concluding paper, an effort is made to standardize the procedure. I was bothered by some points in this paper. It seems that, desirable as it often is to compromise, compromise is the downfall of the standardized procedure. Too little attention is given to the powerful negative comments by authors of the papers in this volume. True, the editors did emphasize (p. iv) that real differences of opinion exist on the appropriateness of point counts, but no such admonishments exist in the concluding paper. The sum of strong negative statements leads inexorably to the conclusion that it is premature to standardize this technique. Yet, one does not get the impression from reading the concluding paper that the situation is so grim. Were the authors that expressed these concerns overstating small and relatively insignificant problems? I do not believe so. Did these authors outline acceptable methods for overcoming problems and provide data illustrating that these methods work? In my opinion, they did not. Had they done so, if only to their own satisfaction, they would not have made such strong negative comments in their papers.

The reader should be aware that the standardized point-count procedure will not necessarily lead to a pool of sound, or even scientifically acceptable data. These data may not be acceptable for sound management of most bird species. I am left with the feeling that compromises with the standardized approach or by any approach using point counts often will lead to data of a substandard quality.

Beyond the fact that the technique may be fatally flawed, I am concerned with the conclusion that "breeding season counts should make up 70% to 80% of the effort. . ." This conclusion is not supportable biologically and therefore represents biased opinion. If this conclusion was really the consensus of the group, a paper would have been written in its support. In fact "the breeding season" needs a far more complete definition and thorough discussion than occurs in this volume. The difficulties are brushed off lightly by stating (p. 166) "stable count periods can be in early May in more southern areas and may extend later in boreal zones" even though stable periods of detectability among species only partially overlap. On the Colorado River, the breeding season extends from February through August, with March through July being important for several species that are only partially overlapping within this five-month period. This illustrates the need for a more precise definition of "the breeding season" and for a discussion of how partially overlapping seasons affect the validity of data.

The recommended percentages of time to be devoted to counting during seasons other than the breeding season are equally nonsensical. Researchers should not be intimidated by these outrageous suggestions, and should devote whatever time they wish to whatever season they are most interested in.

A single reference is cited to support the notion that "habitat dependencies" occur during the breeding season while being nonspecific in the nonbreeding season. Although there may be some breeding-season, habitat-specific dependencies for some species, the same can be said for all times of the year (e.g. Rice et al., *Ecological Monographs* 53:263-290, 1983). But in-depth evaluations of the consequences of this step are lacking.

We are told (p. 165) that among-species abundances can be used for detection data made within 50 m of the observer because it is assumed that all birds within 50 m of the observer are detected. This assumption simply cannot be made for most habitats other than open water and bare ground. To think that all doves or individuals of almost any other species sitting on nests within 50 m of the observer will be detected is ludicrous. Perhaps this claim could be made for up to 15 m, but certainly not to 50 m.

In spite of the difficulties I see with the concluding paper, anyone wishing to monitor changes in bird abundances in a variety of habitats needs to consult this volume. Anyone with a research interest in bird

populations should obtain a copy, as should all university libraries.—BERTIN W. ANDERSON, 201 South Palm Drive, Blythe, California 92225, USA.

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**Handbook of Australian, New Zealand and Antarctic Birds. Volume 3, Snipe to Pigeons.**—Peter J. Higgins and S. J. J. F. Davies (Eds.). Illustrated by J. N. Davies, M. J. Bamford, N. Day, B. Jarrett, F. Knight, and P. Slater. 1996. Oxford University Press, Melbourne. 1,028 pp., 60 color plates, numerous text illustrations and range maps. ISBN 0-19-553070-5. Cloth, \$265.00.—Reviewing a volume from a formidable multivolume handbook is an unenviable task. Probably no one outside the editorial team, not even a reviewer, will ever read a 1,028-page volume cover to cover. The layout and typography of handbooks largely are a matter of taste, but the accessibility of the information for the reader/user is an aspect that may be judged critically by a reviewer. The completeness of the information included in the book can be evaluated only by experts, species by species or family by family. From our own expertise, we have concentrated our review on the Charadriiformes and have otherwise tried to complement the review of Les Christidis of Volume 2 of this work (*Auk* 112:536-538, 1995).

With several series of handbooks being published during the last three decades, we may expect that editors of new series pick up the very best ideas for their work. The accessibility of the information in the text, the use and layout of tables, the style of diagrams, maps, and sonograms, the way references are presented, the selection of plumages on color plates, the accuracy of these paintings, the style of text drawings, and various other aspects are important issues for editorial teams. We have compared format and style of this handbook with *The Birds of the Western Palearctic* (BWP), *The Handbook of the Birds of the World* (HBW), *Handbuch der Vögel Mitteleuropas* (HVM), and *Birds of North America* (BNA).

Volume 3 of *Handbook of Australian, New Zealand and Antarctic Birds* (HANZAB) covers part of the Charadriiformes (Scolopacidae, Glareolidae, Laridae; the latter encompassing skuas [jaegers], terns, and gulls) and the Columbiformes. It includes 129 species accounts. Common Southern Hemisphere species have up to 30 pages of text, whereas several Northern Hemisphere migrants are dealt with in one page or less. Brief introductions to families and subfamilies are well written, informative, and in some cases very up to date. These introductions offer much more than those in BWP. We were impressed by the erudite etymological explanations given for each species, although it is far beyond our

competence to evaluate their accuracy! Note that the variable taxonomy and nomenclature adopted by the different handbooks is quite confusing and calls for truly worldwide standardization.

The reproduction of most of the paintings is rather dark, resulting in subtle plumage characteristics becoming too bold. The quality of the paintings is variable (as usual in books with different painters), but quite high overall. The standing jaegers by F. Knight are fine and accurate, but the flying adult jaegers in nonbreeding plumage have exaggerated black-and-white striping and apparently were re-drawn from other paintings rather than from personal field experience. Both the skuas and jaegers in flight are very stiff and fail to illustrate the jizz. All species in HANZAB are much better than in BWP, but they do not meet the exceptional quality of the skua and jaeger paintings in HBW. Most gulls by J. N. Davies are well done (but dark) and can be readily identified from the paintings, which was certainly not the case with the finger-paintings in BWP. Most of the *Sterna* terns and pigeons by the same painter are equally good, and we expect that the exaggerated characteristics in some of the juvenal plumages are due to the very heavy print. Davies' paintings of the scolopacid waders have markedly matured in terms of postures, jizz, and relevant plumage details since his work in *Shorebirds in Australia* (Lane and Davies, Nelson, Melbourne, 1987).

Like BWP, references in HANZAB do not include titles. This does not facilitate or stimulate further reading, particularly because rather trivial notes of regional importance are mixed with classics. A slightly smaller font size would have permitted listing full titles in the same space, as was done in HVM and HBW. Placement of references close to relevant text makes their use easier than in BWP. Completeness of literature coverage seems to vary a great deal from species to species and from subject area to subject area. For example, whereas some of the sandpiper reference lists are quite complete, references on jaegers appear to be sharply focused on the Southern Hemisphere.

The combination of dark red and pinkish red used on the maps is not an improvement compared with the use of red and grey shading in BWP. For several species that nest in arctic regions, the breeding range is very hard to separate from the wintering/migration range. In the Pomarine Jaeger (*Stercorarius pomarinus*), at least in our copies, much of the Pacific offshore area is (mis-)printed in the same red color as the breeding grounds. The use of very large pink arrows pointing at islands and islets is not very attractive, particularly when large numbers of these arrows are used. Some of the more dramatic maps are those for Great Crested Tern (*Sterna bergii*) and Sooty Tern (*Sterna fuscata*), with multiple arrows and very difficult to detect breeding sites (dark red dots) within the wintering range on the Australian, African, and Asian continents.

Although perhaps helpful as a data source, the ab-

stract lists of banding recoveries given for some of the waders are not very instructive to the general readership. Why bother to spend space on these, rather than compiling the information in tables or maps? The detailed compilations of sightings to describe migration routes of northern waders are perhaps just as hard to assimilate, but they provide accessible and accurate summaries of a widely scattered and inaccessible literature. These movements sections reminded us of similar exercises for European migrants in HVM. It was nice, however, to see much of the wealth of new field data on distribution, migration, and morphometrics of waders accumulated over the past decade through the efforts of the Australasian Wader Studies Group used in this handbook.

The sections on food, a subject notoriously hard to capture in digestible ways, are rather uneven. Little attempt has been made to distinguish important information from minor detail. For example, although it is well established that during the nonbreeding season Red Knots (*Calidris canutus*) rely almost exclusively on mollusks, the account in HANZAB calls them omnivorous, and all but makes the suggestion that worms and even kitchen scraps are equally important. The miscellaneous additions to the food section do not clarify the biology either. What does one learn from the statement that Bar-tailed Godwits (*Limosa lapponica*) in Holland are "seen taking on average three items/min"? Food-intake data, if given at all, are variously presented in "g wt" (wet weight?), "ash-free dry weight," "kcal or kJ per day," "per low-tide feeding period," or "per second." Also for the godwits, we are informed that they are calculated to have BMR (basal metabolic rate) of ca. 34.3 kcal/day, a figure taken from BWP that saw the light of day several years before the first empirical measurements of BMR of wader species other than godwits were published!

We regard the sections on plumages and molts as the highlights of this handbook. Very well standardized, detailed, instructive, and apparently based on much original museum work, at least for the Charadriiformes they will set a high standard for many years to come. With regard to molt terminology, the strengths and weaknesses of the European and American systems are conveniently summarized, and in the text both systems are used side by side—excellent training ground for the uninitiated!

We feel that HANZAB may not be as well balanced in terms of coverage, emphasis, and editorial consistency as is BWP and other handbooks. Even though some sections show significant maturation since the comparable volumes of HVM and BWP, others remain equally unsophisticated. Where the North Americans have adopted a system of species monographs to summarize the information on their avifauna (BNA), the Europeans (BWP, HBW) have developed the fully integrated handbook approach. The Australians and New Zealanders appear to occupy the middle ground, this handbook showing the slight unevenness of a series of species

monographs. At this point, we want to remind the reader that we have no argument about the enormous importance of this handbook, one that assembles so much ornithological information from such a large part of the world in such a competent way. The Royal Australasian Ornithologists Union and its sponsors can rightly be proud of another magnificent scholarly achievement.—KEES (C. J.) CAMPHUYSEN AND THEUNIS PIERSMA, *Netherlands Institute for Sea Research (NIOZ), P. O. Box 59, 1790 AB Den Burg, Texel, The Netherlands.*

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**Atlas of Saskatchewan Birds.**—Alan R. Smith. 1996. Saskatchewan Natural History Society, Special Publications No. 22, Manley Callin Series No. 4. 456 pp., 2 text figures, 3 overlays. ISBN 0-921104-32X9. Paper, \$45.00 Canadian. Available from Room 206, 1860 Lorne Street, Regina, Saskatchewan S4P 2L7, Canada.—This attractive volume is a substantial addition to the list of bird atlases that have appeared across southern Canada since 1987. More than a breeding bird atlas, it covers the four seasons and includes all species that have been recorded in that province. The author is able to include all seasons on one map by using readily recognizable symbols for each of the following categories: breeding, probable breeding, possible breeding, summer resident, spring transient, fall transient, and winter resident. The temporal limits of the seasons vary somewhat in accordance with the seasonal movements of the different species. Some 46,000 records were plotted on 357 maps representing 409 species. Each species with 10 or more records has a full one-page treatment consisting of a distribution map; a succinct species account; the scientific, English, and French names of the subject; and a small drawing of each bird by the author. All of the drawings are pleasing, but several are more decorative than didactic. An innovation is the use of "peripheral screens" to show the status of the species within an 80-km periphery of Saskatchewan in the contiguous province, state, or territory. Three overlays are provided to show, respectively, observation coverage, the biotic regions, and as an orientation index to the 1:50,000 map sheets. Species with 10 or fewer records are combined on one page with from one to three others of similar status.

Saskatchewan is a large thinly populated province. Much of its northern hinterlands lack access by road,

and little field work was done expressly for this project. Instead, data were compiled from recent (1966 to 1989) published and unpublished sources, a major task well done. Older (pre 1966) sources were used only for ancillary purposes as needed. For instance, for species having fewer than 25 records, for the sparsely worked wilderness areas above 55°N latitude, or to document changes between historic and recent periods. These older records are readily recognizable as such on the maps by the symbol system used. Because the usual methods for atlases were not used, some bias resulted from the clumping of records about large population centers (e.g. Regina, Saskatoon), and in leaving gaps on the maps that may or may not be real. It is hoped that readers will be stimulated to direct their birding activities to those areas for which little or nothing has yet been recorded.

In addition to the species accounts (357 pp.), the book contains a wealth of discussion and analysis of the data. In the introductory pages, terms, methods, and symbols are meticulously described. Six biotic regions and 14 subregions are recognized and described. An outstanding account of the influence of humans on the flora and fauna from the distant past, recent past, present, and by extrapolation into the future is included. The preface outlines some aspects of the surprisingly varied ecology of the province and points out some impressive facts concerning the great importance of its rich avifauna in relation to that of many other parts of North America.

Five appendices are included. The Breeding Bird Survey in Saskatchewan from 1968 to 1993 is thoroughly discussed, and the results statistically analyzed for population trends expressed as percent annual change. This and the summary of Christmas Bird Counts (1942 to 1993) will be of special interest to conservationists.

The book is well researched, clearly and thoughtfully written, and well edited. It documents well the richness of Saskatchewan's avifauna, its vast prolific breeding grounds, its hordes of migrants, and the consequent great importance of its bird life to other parts of the continent. Thus, the scope of its usefulness widely transcends the province of Saskatchewan. I highly recommend it to all serious students of avian distribution and conservation. It should be in the libraries of universities, natural science museums, and wildlife management establishments.—EARL GODFREY, 4 *Sioux Crescent, Ottawa, Ontario K2H 7E5, Canada.*

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