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From the Selected Works of Frank Howe

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Book Review: Colorado Breeding Bird Atlas by Hugh E. Kingery

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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.

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Ornithologen-Briefe des 20 Jahrhunderts.—Jürgen Haffer (with contributions by Ernst Mayr). 1997. *Ökologie der Vögel*, vol. 19. 980 pp., 76 text figures. ISSN 0173-0711. 120 DM (available from Jochen Hölzinger, Auf der Schanz 23/2, D-71640 Ludwigsburg, Germany).—This massive tome of nearly 1,000 pages is a huge and sweeping saga of ornithology spanning more than 100 years and two world wars. Two main historical themes are stressed (1) the development of systematics and the species concept within ornithology, and (2) the rise of fresh approaches in ornithology—the new avian biology. Haffer's analysis is based on letters and other documents in the large Stresemann archives in Berlin, as well as other collections of ornithological documents, and on his earlier analyses of the history of systematics and the species concept in ornithology. Almost all of the discussions are in English, but the letters are reproduced in the language in which they were written (mostly German). *Ornithologen-Briefe* is not only an excellent history of an important aspect of ornithology during the past 100 years, it is a major source for additional research because the letters contain extensive material not used by Haffer for his analyses.

Ornithologen-Briefe is so vast that it is difficult to know where to start, but as usual, it is best to start at the beginning, which is the history of avian systematics and the species concept. This section may be surprising to some because it commences with two systematists who are little known to ornithologists and completely unknown to historians of science, namely Henry Seebohm of the United Kingdom and Count Hans Berlepsch of Germany.

Seebohm, a wealthy amateur ornithologist who assembled and studied a large collection of birds, was influenced in the 1870s by Darwin and by the trinomial nomenclature of the North American school of Baird, Coues, and others. He described geographic variation in avian species as subspecies in strong opposition to the binomial approach adopted by almost all British ornithologists at that time. His 1887 mono-

graph of the Charadriidae was an early analysis of the evolutionary history of an avian family based on the idea of geographic speciation. Seebohm was clearly one of the major founders of the new approach to avian systematics in Europe, which Haffer designated as the Seebohm-Hartert School.

Berlepsch amassed the most important private collection of birds in Germany and was an active systematic ornithologist, but he was far more important as a mentor of Ernst Hartert, Karl Jordan, Charles Hellmayr, and Otto Kleinschmidt. Berlepsch was instrumental in obtaining positions for Hartert and Jordan at the Tring Museum, thereby establishing the important "Tring triumvirate" of Lord Rothschild, Hartert, and Jordan. Furthermore, he assisted Hellmayr in obtaining his position at the Zoologische Staatssammlung in Munich. Interestingly, in his early work Berlepsch adopted the subspecies concept and trinomial nomenclature, but he abandoned this approach in about 1895 under the influence of Anton Reichenow and became a strong opponent of the systematic ideas of the several workers he assisted early in their careers.

Ernst Hartert, a self-trained naturalist and systematist, was appointed in 1892 by Lord Rothschild as director of his private museum in Tring. He oversaw the great increase in the bird collection that reached about 280,000 specimens (the largest and most important private collection ever assembled) by the time he retired in 1930. Hartert was largely responsible for decisions as to where Rothschild's collectors were sent. He studied most of these collections, finally describing more than 1,000 species and subspecies of birds. Yet, Hartert is best known for his three-volume *Die Vögel der paläarktischen Fauna*. Hartert worked within a Darwinian perspective and was largely responsible for convincing avian systematists to use the subspecies concept and trinomial nomenclature. Clearly, Hartert was the second founder of the "Seebohm-Hartert School" and was a central figure in the development of modern avian systematics.

Haffer details the interwoven lineage of a group of ornithologists belonging to the Seebohm-Hartert School. Carl E. Hellmayr was the mentor of Erwin Stresemann in his early training around 1910 before Hellmayr left for Chicago in 1922. Stresemann held the leading position in ornithology for much of the first half of the 20th century as curator of birds in Berlin (replacing Anton Reichenow), as the author of the *Aves* volume in the *Handbuch der Zoologie* edited by W. Küenthal and T. Krumbach, as long-time editor of the *Journal für Ornithologie* (1922 to 1961), and as Secretary-General/President of the Deutschen Ornithologen-Gesellschaft. He was also the teacher and/or mentor of Bernhard Rensch and Ernst Mayr, two of the younger members of this school, during their tenure at the Zoological Museum Berlin. Rensch left Berlin for the Universität Münster in 1937, and Mayr left Berlin for the American Museum of Natural History in January 1931. Stresemann first corresponded with Hartert in 1910 and soon became a close personal friend and great admirer of Hartert (the most interesting fact in this book is that Stresemann, by his own wish, is buried in the same grave with Hartert in the Berlin-Dahlem Waldfriedhof, with both names inscribed on the tombstone). A falcon drawn by O. Kleinschmidt is etched on this tombstone. All of these workers remained close friends and colleagues throughout their lives. This circle of friends also included Lord Rothschild and Leonard C. Sanford, the latter a long-time trustee of the American Museum of Natural History and one who was largely responsible for the development of the museum's Department of Ornithology to its preeminent position. Otto Kleinschmidt was the last member of the earlier non-evolutionary, essentialistic "Pallas-Schlegel School" and is included in Haffer's volume because of his great systematic activity during the early part of this century and to clarify his role in the development of ideas relating to systematics and the species concept, which are very different from those of the Seebohm-Hartert School.

Ornithologen-Briefe has three main sections. In the first, Haffer discusses the Seebohm-Hartert School and describes how its members interacted closely during the period of about 1880 to 1950 to develop avian systematics and the species concept that had major influences well beyond the bounds of ornithology. Although Hartert and Stresemann were the central persons holding this school together for most of this period, Rensch and Mayr were the major theorists.

The second part, which forms the bulk of the volume, contains the correspondence (mainly in German) between Stresemann and Hartert, Kleinschmidt, Hellmayr, and Mayr. Haffer presents an overview to each set of letters so that the non-German reader can obtain a good summary of the letters. Not all letters between these workers were pub-

lished, and strictly personal matters and ephemeral material may have been left out of some published letters. However, the published letters do not contain only scientific discussions, but also numerous comments on family life and remarks on current political matters that provide a view into the lives of these people. This is especially interesting for the period 1935 to 1950, such as the letter from Stresemann to Mayr dated 12 April 1934 and mailed from Italy in which he commented on the developments of the "[national]-s[ozialistische] Programm" in Germany, stating clearly that he did not feel free to write these comments from Germany because of "Der scharfen Zensur. . ." and the long series of letters between Stresemann and Mayr on conditions in Germany after World War II and the AOU program of sending care packages to European ornithologists. A letter from Stresemann to Mayr on 5 February 1939 stated that Fritz Frank, a doctoral student, had obtained the first electron micrographs of feathers. The electron micrograph published by Frank (*Journal für Ornithologie* 87:426-423, 1939) almost certainly is the first such illustration of biological material.

The third part contains biographical notes of 12 people, including all of the central figures in this history, except for Henry Seebohm and Walter Rothschild. An excellent biography of the latter can be found in Miriam Rothschild's *Dear Lord Rothschild*, but a good historical analysis still does not exist for Henry Seebohm, who has not received the recognition he deserves. A brief biography is given for Carl Hellmayr, who was another key person in the Seebohm-Hartert School and an important avian systematist during the first four decades of this century, but is still almost unknown to most European and North American ornithologists. A biography is also provided for Otto Kleinschmidt, who is widely known for his *Formenkreis* concept, although most systematists do not realize that he was a non-evolutionary, essentialistic typologist and contributed little to the development of systematic theory. A two-page reminiscence of Leonard Sanford was written by Mayr. However, a more complete biography is still needed of this remarkable man. The biography of Erwin Stresemann should be read in conjunction with the tribute to Stresemann (*Journal für Ornithologie*, 114:455-500, 1973).

The fourth and last part of Haffer's volume contains appendices, and although many readers might overlook this section, it contains some very interesting gems such as a previously unpublished account of Stresemann's expedition of 1910-1912 to the Moluccas in Indonesia. The letter from Professor Otto Koehler to Professor Stubbe relates to a fracas that arose in the Berlin Academy of Science because of a review published by Stresemann of a *Festschrift* for Otto Kleinschmidt in which Stresemann stated quite correctly that Kleinschmidt was a typological essentialist. More interesting is a let-

ter from Stresemann to Professor Clara, Universität Leipzig, dated 28 May 1940, in which he strongly recommended Ernst Mayr, then in the United States, for the position as Director of the Museum für Tierkunde in Dresden (Mayr's hometown since 1917 until leaving for the U.S.), including the suggestion that Mayr could travel to Germany via Japan. Although the prewar correspondence between Stresemann and Mayr lasted until fall 1941, there is no comment about Stresemann's recommendation in any of their letters.

Haffer traces the history of another important ornithological development in this book, namely the rise of the "New Avian Biology." In August 1914, Professor W. Kükenenthal invited Erwin Stresemann, then at the age of 25 and well before he received his Ph.D., to prepare the *Aves* volume for the *Handbuch der Zoologie*. This volume (1927–1934) was clearly Stresemann's opus magnum and is the most important single-volume compilation of ornithology ever published. In a letter to Hartert, a discouraged Stresemann expressed the belief that his *Aves* volume probably would never be published because of the recent death of Kükenenthal. In 1920, Stresemann had delivered the first installment of his manuscript to Kükenenthal, by now director of the Berlin Museum, who was so impressed with it that he offered Stresemann the just-vacated position of curator of birds. Hence, the fortunate invitation to prepare the *Aves* volume and his excellent first installment were central to the development of Stresemann's career as discussed earlier by Haffer. But there was another significant outcome of this invitation, as pointed out by Haffer, in that Stresemann became convinced in the 1910s that the future of ornithology lay in the development of functional studies, the new avian biology. His belief was expressed in the coverage of materials in the *Aves* volume and in the assignment of dissertation topics to his students during the 1920s and 1930s. Many of these doctoral theses were published in the *Journal für Ornithologie*, making it the most respected ornithological journal prior to World War II. But there is still the interesting question of how Stresemann's ideas about the new avian biology spread to other ornithologists around the world. Haffer speaks of "The Stresemann School," but I would contend that although many of Stresemann's students completed excellent theses, they did not constitute a school in the usual sense of the term. Perhaps the better term is "the Stresemann circle." Stresemann, being at the Berlin Museum, was not able to develop laboratory facilities, did no actual functional studies himself, and was not able to be the primary or formal supervisor of his students. Moreover, because of the traditions of German academia, it was not possible for him to obtain positions for his students in universities. Hence, if one examines the careers of Stresemann's students in Germany, they were restricted to posi-

tions in museums, zoological gardens, Gymnasias, etc., and they did not continue research in the speciality of their doctoral theses. Although everyone knows about the *Aves* volume, the distribution of Stresemann's volume was limited. Haffer states that 536 copies of the 2,200 printed were sold by 1934, and that 156 additional copies were sold by 1944 when the remainder were destroyed by fire at the printer's in Leipzig. A total of only 692 copies was sold. Moreover, I suspect that outside of German-speaking areas, this volume is more often looked at and cited than actually read. I surmise that the spread of Stresemann's ideas on the new avian biology outside of Germany was largely a vague osmosis by way of a knowledge about the *Aves* volume, an appreciation of the theses of his students published in the *Journal für Ornithologie*, and the comments of a few of his students, mainly Ernst Mayr, who worked outside of Germany. Indeed, an interesting topic in the history of ornithology would be the origins of ideas about the new avian biology and their development up to the two-volume *Biology and Comparative Physiology of Birds* (1960–1961) edited by A. J. Marshall, and the nine-volume *Avian Biology* (1975–1993) edited by D.S. Farner and J.R. King.

Ornithologen-Briefe is well illustrated with photographs, many not previously published. The best one, in my opinion, is the young Ernst Mayr in 1924, as a medical student, hovering over a well-dissected cadaver with a colleague. Unfortunately, the book lacks a list of illustrations so that it is often difficult to find again a figure previously seen.

Anyone with the slightest interest in the history of ornithology will find *Ornithologen-Briefe* a most valuable book—a delight to read for the first time and a gem to come back to time and time again. Each reading uncovers new and interesting bits of information that add to the understanding of the historical development of ornithology during the first two-thirds of this century. Jürgen Haffer is to be congratulated by ornithologists and historians alike for the long and painstaking efforts that he put into this volume. Similar congratulations and thanks should go to J. Hölzinger, editor of *Ökologie der Vögel*, and all others involved in making documents and photographs available and in the successful publication of this volume. *Ornithologen-Briefe* is a book that I enjoyed thoroughly and one that I can recommend strongly to all ornithologists and historians of science.

I express my appreciation to Ernst Mayr, Dominique G. Homberger, Karl-L. Schuchmann, James L. Gullledge, and J. Haffer for discussions during the preparation of this review and comments on the manuscript.—WALTER J. BOCK, *Department of Biological Sciences, Columbia University, 1200 Amsterdam Avenue, New York, New York 10027, USA.*

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Avian Conservation: Research and Management.—Edited by John M. Marzluff and Rex Sallabanks. 1998. Island Press, Washington, D.C. x + 563 pp., 27 figures. ISBN 1-55-963-569. Cloth, \$55.00.—In 1977, Stan Temple convened the first major symposium on conservation of endangered birds (*Endangered Species: Management Techniques for Preserving Threatened Species*). In that symposium, 54 authors focused their attention on the reasons why species decline and sought to document the methods being applied to the task of species recovery. Nineteen years later, at a joint meeting of the American Ornithologists' Union and the Raptor Research Foundation in Boise, Idaho, John Marzluff and Rex Sallabanks brought together researchers and managers to review current research activities to conserve birds and "identify information gaps that need to be filled if we are to effectively conserve birds." Marzluff and Sallabanks chose to broaden the scope of their symposium well beyond that of Temple, who focused on saving species threatened with extinction. Marzluff and Sallabanks dealt with a much wider variety of species, and the collected papers put more emphasis on habitat-based management rather than the clinical focus so often found in the habitat-based management approach documented in Temple's classic work. *Avian Conservation* has 31 chapters and treats 450 species and 17 countries. Geographic coverage of North America is broad, from Maine to Hawaii and Quebec to British Columbia, but there is a decided western flavor with repeated references to western research strategies. No eastern and only four mid-western research strategies are discussed. Reflecting the recent emphasis on status of Neotropical migrants, more than 35 references in the index are to the Neotropical region and even more to Neotropical migrants.

The 31 chapters, about half of which were presented in Boise, are organized into seven groups: (1) an introduction in which the current status of avian conservation biology is reviewed, (2) techniques for conserving and monitoring birds, (3) approaches for conserving endangered and sensitive species, (4) conservation in forested landscapes, (5) conservation in non-forested and urban landscapes, (6) global variation in conservation needs, and (7) a management perspective entitled "Relevance of Conservation Research to Land Managers."

In the first chapter, Marzluff and Sallabanks provide an overview of past efforts to save species and suggest future directions in avian conservation. Their plea for more large-area, long-term studies is valid. They suggest that this could be accomplished by researchers stringing together a series of related

studies over a period of years. This task is not easy but can be accomplished and be extremely productive, as the work of Gordon Orians and his students on Red-winged Blackbirds (*Agelaius phoeniceus*), Russell Balda, and his colleagues and students on Pinyon Jays (*Gymnorhinus cyanocephalus*), and Glen Woolfenden and others on Florida Scrub-Jays (*Aphelocoma coerulescens*) has demonstrated. An alternative model is for an agency or other source of research funding to direct its attention toward a species or related group of species. Perhaps the best example of this approach is the U.S. Fish and Wildlife Service's 40-year research commitment to ducks and geese.

Fran James' cogent remarks in Chapter 2 on the growing pains of avian conservation biology caution us to stick to the facts. She points out the necessity, oftentimes ignored, of conducting bias-free science, free of special interest influences. But perhaps her most important admonition is about the danger of equating correlational studies with cause and effect. Her work should be read by everyone in the field.

The chapter by Villard and his coauthors on the contributions of spatial modeling to avian conservation points out the need for quality data and the value of a hierarchical approach to addressing research questions. More space could have been devoted to the need for accuracy assessment of our modeling efforts of long-term viability of bird populations, as well as to avian responses to habitat manipulations. Their point that driving forces operating at the site level may be inconsequential at the level of ecoregions cannot be emphasized enough. However, in seeking clues to needed recovery actions, a temporal perspective is also needed. Reasons for the historical decline of a species may not be the cause for current losses or weak recovery. Recent findings by James Estes and colleagues that current declines in a recovered population of sea otters (*Enhydra lutris*) were attributable to killer whales (*Orcinus orca*), a species for which there was no historical record of feeding on sea otters, is a well-documented case in point.

Martin Raphael and coauthors provide a nice example of the use of geographic information systems in modeling a spatially explicit population response of the Northern Spotted Owl (*Strix occidentalis caurina*) to different scenarios of timber harvest and growth. Retrospective analysis of recovery efforts for a species can be insightful, and the endangered Hawaiian avifauna provides a great opportunity for such studies. Villard and Maurere use the Palila (*Loxioides bailleui*) to illustrate the use of radio telemetry and the Akepa (*Loxops coccineus*) to document the usefulness of geographic information systems as a conservation tool. Black uses the Hawaiian Goose (*Branta sandvicensis*) to illustrate recent efforts to recover populations of duck and geese. What lessons might we have learned from a detailed retrospective analysis of the decline of the Hawaiian Crow (*Corvus*

hawaiiensis)? Valuable insights in species conservation are provided in the chapter by Scott Derrickson, Steve Beissinger, and Noel Snyder on directions in endangered species research. They provide a valuable review of research techniques for conserving species and examples of successes and failures. I would have liked to see this chapter expanded to include more species and a detailed discussion of the examples provided. Rodda et al.'s chapter on the avifauna of the Marianas Islands was instructive regarding the threats faced by island faunas and the speed at which populations can be lost.

The introductions to each of the seven groups of papers were helpful in that they provided transitions to as well as overviews of what was to come. In the groupings of papers on conservation in forested landscapes, the wide-ranging review of the effect of fragmentation was well presented. Haufler's presentation of a strategy for bird research in the western United States could have been complemented by similar chapters for southeastern, northeastern, and midwestern forests. However, the introductory discussion of future directions for avian conservation helped to make up for this lack of evenness in geographic coverage. The chapter "Conservation in Nonforested and Urban Landscapes" in Part V covered seabirds, shrubland, grassland, urban environments, and species nicely. A chapter on wetlands and their associated shorebird populations was badly needed. Given that wetland habitats are among the most threatened worldwide, it seems a major oversight, one of the few I found. I was delighted to see the group of papers on global variation in conservation needs.

All too frequently, North American editors of conference proceedings tend to be parochial in their choice of authors. However, Marzluff and Sallabanks did an excellent job of bringing in authors from around the world to provide a global perspective to avian conservation research and management. Such a perspective can only improve research and management efforts in the United States. Throughout this volume, authors repeatedly state the need for closer communication among researchers and managers, not only at the end of a project, but from its inception. Several point out that managers may provide perspectives that would make the questions we pose more relevant to management activities and thus should be involved from the start of a project. The group of papers on the relevance of conservation to land managers provides excellent insights on how relationships between researchers and managers can be strengthened. Unfortunately, all but one of the individuals writing these chapters were researchers or research administrators. Although they provide valuable insights, it has been my experience that managers often view things quite differently.

Many of the chapters provide information on research and/or information needs. Despite the vari-

ety of species and habitats reviewed in this book, many of the research needs were the same. Frequently identified needs were (1) more information on habitat associations, (2) more information on limiting factors, and (3) when do you give up? The last is truly a tough question, and one that was not answered here. For example, is the mongoose (*Herpestes auro-punctatus*) so ubiquitous that we are incapable of eliminating it over the area occupied by the Hawaiian Goose? Thus, are we left with a continuation of our 50-year put-and-take program? Like so many questions of this type, we have yet to conduct the studies that would provide us with answers.

The discussions of how research can be made more effective for conservation should be instructive for managers and researchers alike. The comments throughout the text on the features of research and management have led to improvement in conservation efforts and should prove helpful to others whether they are engaged in single-species or ecosystem approaches to conservation. Rodda et al.'s discussions of the problems associated with obtaining replicable population estimates were instructive, but they failed to consider the issues of varying quality of observers, observer-training efforts (or lack thereof), and the variable use of passive and active sampling techniques by observers.

I found only limited cross referencing among chapters. It remains largely for the reader to look for common threads, a task made easier by the many similar section headings. In a similar vein, a book of this nature normally has a concluding chapter in which the assorted contributions are reviewed, synthesized, and future research guidelines provided. However, much of this was done in the individual chapters on past approaches and future directions for avian conservation biology and Fran James' contribution on the growing pains of avian conservation biology. The repeated appearance of the same section headings throughout the book, e.g. features of research that improved conservation and making research effective for conservation, linked the chapters and provided a sense of continuity to the book. Still, there could have been more extensive cross referencing of chapters.

Overall, I think the editors did an excellent job of putting together papers that provide us with guidance for future research and management on birds. The assembled group of authors was noteworthy in that only two had also participated in the 1977 symposium in Madison, Wisconsin. Also notable was the participation of forest industry scientists, something not observed at the Wisconsin meeting. Well organized, the book was a good review of selected management and conservation practices. The breadth of its taxonomic and geographic coverage was truly impressive. I recommend this book for scientists and managers working with birds and their habitats. It should be in all university libraries as well as those

of biological field stations and research stations worldwide.—J. MICHAEL SCOTT, *United States Geological Survey, Department of Fish and Wildlife Resources, University of Idaho, Moscow, Idaho 83844, USA.*

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Population Limitation in Birds.—Ian Newton. 1998. Academic Press, London. x + 597 pp., 19 black-and-white drawings, 109 figures, 61 tables. ISBN 0-12-517366-0. Paper, \$49.95.—Population limitation in birds has been a central focus of field ornithologists in the 20th century. David Lack brought attention to this endeavor in his classic text *Natural Regulation of Animal Numbers* (1954). Since that time, numerous debates have waxed and waned in ornithology. Through it all, field ornithologists have ploddingly stayed focused on the limits of bird population size. This doggedly empirical approach to understanding population regulation is the foundation of Newton's book.

The volume of research on bird population limits would make it easy, perhaps likely, for a compilation to become muddled in the contradictions and minutia that the literature represents. An impressive feature of this book is its organization and readability. The user-friendly style, however, does not result from diluted content. The text provides a rich array of detail and nuance that could only come from a lifetime of experience with detailed field studies. Typographical errors are rare and confusing sentences or presentations rarer still. Main themes are adhered to closely and examples are squarely on topic.

I had only two substantive complaints about the book. First, many of the concepts and interpretations are familiar. For the vast evidence it reports on population limitation, the book presents few new concepts and little novel interpretation of the data. In many instances, this conservative interpretation is probably to the author's credit. That is, the emphasis is on interpreting the accumulated evidence and not on inventing new terminology. Nonetheless, I found that it made reading some sections straight through a bit tedious. This problem is exacerbated in spots by the repeated use of a limited number of species as examples (e.g. Red Grouse [*Lagopus lagopus*], Eurasian Oystercatcher [*Haematopus ostralegus*], and Great Tit [*Parus major*]). Although these examples are relevant and certainly among the best available, I think that the repetition reduces their impact.

My second complaint is the lack of mathematical development for many of the conceptual models that underpin the data presented. Most models are presented graphically, which effectively demonstrates

the general concepts. In a number of cases, however, the interpretation and understanding would have been enhanced by an explicit mathematical presentation of the models. Some such models are logistic growth, predator-prey, and metapopulation models. It should be noted that the author addresses this complaint directly in the Preface and indicates that the mathematical treatments were intentionally omitted to increase the book's audience.

The book is comprised of a preface, 16 chapters divided into a preview chapter and three major parts (Behavior and Density Regulation, Natural Limiting Factors, and Human Impacts), a bibliography, and a substantial index. The preview chapter describes the focus of the book and the rationale for focusing on birds. For example, Newton argues "Because no population increases to infinity and species only rarely go extinct, regulation can be assumed to occur. . . ." Thus, readers should not expect the book to debate whether population regulation (and, by implication, density dependence) is of primary importance. Rather, the book is a search for empirical evidence of the prevalent mechanisms that regulate population numbers. Much of the theoretical and conceptual developments are of an equilibrium nature. This bias likely reflects the preponderance of equilibrium explanations in the literature as much as any bias of the author.

Part one of the book deals with behavior and density regulation and is comprised of 111 pages divided into Chapters 2 to 6. The first of these chapters, "Social Systems and Status," is relatively brief and explores how social rank influences reproduction and resource acquisition. Compared with later chapters, it has few examples from the literature. The main conclusions are that, generally, adults dominate juveniles and males dominate females for access to resources. The next chapter, "Habitat and Density Regulation," documents how habitat quality can set an upper bound to the number of individuals living in an area. The implication is that if population size exceeds that limit, then competitive interactions will decide which individuals will survive or breed in the area. The theoretical basis of the chapter is primarily the ideal-free model of habitat selection. There are also discussions of other factors that affect the relationship between habitat quality and density, such as territoriality, season, habitat loss, and synchronous versus sequential habitat use. Of these factors, the presentation of data on percent of adults that were nonterritorial and nonbreeding was particularly interesting (21 species from 24 studies). Estimates ranged from 0 to 72%, with most between 40 and 70%. That's a lot of nonbreeding birds!

The importance of the number of nonterritorial nonbreeders presented in Chapter 3 is immediately evident in the next chapter, "Territorial Behavior and Density Limitation" (and is another example of the thoughtful presentation of this book). Here, Newton

focuses primarily on empirical results of removal experiments (74 studies on 53 species). Separate discussions are provided for passerines, grouse, raptors, waterfowl, waders, and seabirds. These discussions clearly demonstrate that territoriality can limit breeding density but also that the relationships among habitat quality, territoriality, and density are complex. Chapter 5 focuses on the importance and detection of density dependence. The three main types of evidence examined are 63 life-table studies (particularly 22 that employ key-factor analysis), experimental manipulations of density, and studies that document spatial patterns in density. All three lines of evidence provide support for density dependence, but plenty of evidence also exists for density-independent effects. Newton's discussions of why density dependence may not be stabilizing where it is detected, and why density dependence may sometimes not be detected where it is important, also are interesting.

I felt that Chapter 6, "Habitat Fragments and Metapopulations," was the lone disappointment in this book. My disappointment, in part, may reflect the proliferation of conceptual development in this field and a dearth of empirical evidence. The chapter seems out of place, but it is not clear where it would fit better. It perhaps should have been incorporated into another chapter. The majority of data presented are from populations that occur in habitat fragments. Specifically, most of the data address the issue of patch size and bird density. The formal treatment of metapopulations was slight. Metapopulation theory and models are described in the text, but the detailed graphical treatment of conceptual issues evident in the other chapters is noticeably absent. Also absent are the detailed literature summaries and case studies of the other chapters.

The second section focuses on natural limiting factors and is comprised of 230 pages in seven chapters (Chapters 7 to 13). The first chapter in this section, "Food Supply," covers a topic that may be the most obvious and well-studied factor affecting bird populations. Even though relationships between food supply and bird populations are well known, Newton does an admirable job of accumulating the evidence. For instance, this chapter contains reviews of the relationship between food supply and breeding performance (32 studies) and bird numbers (ca. 79 studies). Also included are reviews of the incidence of starvation (16 studies), causes of mortality (11 studies), and causes of population declines in European farmland birds (16 studies). The interpretation of these results will probably not reveal too many surprises, but the large number of studies compiled makes this chapter one of the most valuable in the book. In addition, the details and circumstances of case studies keep the text interesting.

In many ways Chapter 8, "Nest-sites," is the flip-side of the arguments made in Chapter 3. That is, if

habitat is augmented with the addition of nest sites, then breeding density increases. This conclusion is based largely on interpretation of the 36 studies where nest-cavity availability was experimentally manipulated. The next chapter, "Predation," includes brief discussions of numerical and functional response of predators, density-dependent and density-independent predation, and compensatory and additive mortality; the presentation of these topics is more conceptual than quantitative. This chapter contains some well-presented examples, notably Newton's own work on Eurasian Sparrowhawks (*Accipiter nisus*). In addition, experimental evidence from 27 studies is used to show increased breeding success, postbreeding survival, and subsequent breeding density as a result of predator exclusion.

Chapter 10, "Parasites and Pathogens," was my favorite chapter in this section, perhaps because I know the least about the topic. The chapter begins with a description of the most common microparasites, macroparasites, and brood parasites of birds. Of these, the brood parasite section seemed out of place with the rest of the chapter. The chapter's three main sections are effects of parasites on individual performance, effects of parasites on populations, and other conservation problems. Prior to reading it, I expected this chapter to be descriptive and fairly data-poor. To my surprise, however, it contains numerous case studies, a table of about 30 studies that examine the effects of parasites on breeding performance, and another table of equal size for studies that document large-scale disease outbreaks in full-grown birds. These studies provide a glimpse of the influence of parasites and pathogens on populations and their potential to cause future conservation problems.

The evidence presented on the effects of weather (Chapter 11) is not as strong as the experimental evidence in some other chapters. This difference undoubtedly stems from the difficulty of incorporating weather into an experimental design. Consequently, evidence for weather effects is comprised mostly of case studies where weather has been shown to cause declines in bird numbers. Despite the logistical difficulties associated with understanding the effects of weather, the numerous examples used make an effective case for its importance as a limit on bird populations. The chapter also provides some interesting examples of how weather can cause selective mortality within and among populations.

By comparison, more data are provided on interspecific competition (Chapter 12) than on any other topic in the book, with the possible exception of food supply. Commendably, the evidence for effects of competition is interpreted with careful reference to the design of the study and variables measured. Circumstantial evidence for competition is clearly distinguished from the far rarer experimental evidence. Newton provides a table of 29 studies that manipulated resources or food to study the effects of com-

petition on individuals. Attention is also drawn to other indirect biotic interactions that could erroneously result in apparent competition. This section on apparent competition is a clever segue to the topic of Chapter 13, "Interactions Between Different Limiting Factors." This chapter provides several interesting examples of the relationships among factors described in the previous six chapters. The main message of this chapter is cautionary. Most of the experiments reviewed in the book examined the effects of a single limiting factor. However, the magnitude of such effects may be strongly influenced by other factors that are rarely controlled or measured.

The final 101 pages of the book concentrate on human effects and are divided into three chapters. Chapter 14 focuses on hunting and pest control. The hunting portion contains a list of hunting strategies but focuses primarily on maximum sustained yield and studies that have tried to estimate it. Also, the importance of knowing what portion of hunting mortality is additive and what portion is compensatory is demonstrated. The section on pest control is primarily a list of pest-control strategies and examples of the use of some of them on Wood pigeons (*Columba palumbus*), Quelea (*Quelea quelea*), and raptors.

Because I have paid scant attention to recent work on pesticides and pollutants, I found the treatment of this topic in Chapter 15 particularly compelling. The subjects covered are diverse and range from organochlorine pesticides to oil spills to global warming. Newton does a fine job of explaining the different pesticide and pollutant issues that brings a sense of unity to these diverse topics. Tables summarize 16 studies that demonstrated mortality over large areas as a result of pesticide application and 9 that measured the immediate effects of pesticides on bird numbers. The examples are particularly memorable; e.g. it is hard to conceive of using pesticides to intentionally kill up to one billion Quelea a year. Even well-worn examples like eggshell thinning and DDT are insightful. In particular, I wonder what was so controversial about the ban on DDT given the clear evidence of its effects? Perhaps in 30 years I will be asking the same question about burning fossil fuels and the effects of global warming.

Chapter 16 is devoted to documenting the correlates of extinction in birds. The chapter contains a table of 127 species of birds that have gone extinct since 1600. Almost all were driven to extinction by human actions. Newton's conclusion in the ultimate chapter is that for most birds, the limits of their populations will be determined by human actions. The range of bird population sizes, from rarity to superabundance, will result from our own patterns of resource use. Although it is hard to argue with this assessment, it is an ironic conclusion given the effort we have expended on understanding other mechanisms of population limitation.

In summary, this book is a well-written compilation of empirical evidence on factors that limit bird populations. Anyone interested in the determinants of bird numbers or population biology will find this book enjoyable and useful. Researchers and managers who work with bird populations will find it to be an invaluable source of many topics in bird population biology. All self-respecting university libraries need to have a copy. The book may hold the most value, however, for upper-division undergraduates and graduate students who can use it as an entryway to field ornithology.—JEFFREY F. KELLY, *United States Forest Service, Rocky Mountain Research Station, 2205 Columbia SE, Albuquerque, New Mexico 87106, USA.*

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Parrots: A Guide to Parrots of the World.—Tony Juniper and Mike Parr. 1998. Yale University Press, New Haven, Connecticut. 584 pp., 88 color plates, 352 maps. ISBN 0-300-07453-0. Cloth, \$55.00.—This volume seeks to provide customs agents, wildlife enforcement officials, and field observers with a comprehensive identification guide to the species and subspecies of parrots. The text provides range maps and descriptions designed to facilitate identification and summarizes the current state of knowledge on habitat, behavior, diet, reproductive biology, and conservation status of each of the 352 parrot species. The plates contain more than 1,300 color illustrations of all species and nearly every well-differentiated subspecies, both perched and in flight. Although the text does a good job of tackling its stated objectives, the contrasting styles of the five illustrators and the errors discussed below reduce the volume's utility as an identification guide and its aesthetic appeal.

The book begins with a 20-page introduction that summarizes taxonomic relationships, classification, natural history, conservation status, threats, and captive breeding. By design, this wide breadth of topics is not covered in much depth, but the introduction provides a well-written summary that contains many interesting examples. The sections on habitat loss and the live-bird trade realistically address these complex issues and nicely summarize the major difficulties faced by parrots and parrot conservationists. Given this, it is disappointing that the discussion on captive breeding ends with the odd and indefensible statement, "Once the wild birds are gone, so has the reason to conserve their habitat and once the habitat is gone, the birds can never be put back."

The worst transgression of this introductory section is that almost none of the supporting details can

be tracked to their original sources. Statements like ". . . *Brotogeris* parakeets of South America apparently show an association with trees in the Bombacaceae. . ." go unreferenced, leaving the reader to pick through the references at the end of each species account to find the original source. In addition, of the 12 references cited in the introductory sections, one-third of them are either not in the bibliography or are cited incorrectly.

The 1,300 illustrations in the plates represent the most comprehensive set of parrot images ever assembled. Unfortunately, the five artists made no attempt to standardize their styles. As a result, some illustrations are heavily shaded and show nearly every feather edge, whereas others appear two-dimensional and cartoon-like. This detracts from the volume's aesthetic appeal and may constrain its usefulness as an identification guide. In a worst-case scenario, inexperienced observers may use general feather texture as an important field mark and make grave errors. The art work by Franklin is well done. For instance, the plates covering the green-and-red *Aratinga* conures, both perched and in flight, should greatly aid identification of this very difficult group of species that are common in captivity and as escapees in the United States. The remaining four artists had great difficulty correctly capturing the shapes of parrots in flight. For one artist, this problem extended to the perched birds and resulted in the depiction of some rather oddly shaped parakeets and Amazon parrots. In addition, plates by at least two artists contain either unrefined field sketches or birds with white areas where the painting was not finished.

On a more serious note, some plates contain errors of varying magnitudes. Illustrations of birds in flight often have proportionally longer tails and different body-plumage colors than illustrations of the same species perched. Some of the specific errors include the bright blue cap on the flying Cobalt-winged Parakeet (*Brotogeris cyanopectus*), a mark that appears diagnostic on the illustration but is not particularly visible on flying birds; the depiction of Salmon-crested (*Cacatua moluccensis*) and White (*Cacatua alba*) cockatoos as equally white on the back, when nearly all individuals of the former are clearly pinker than the latter; the white and grayish facial skin of the Red-bellied Macaw (*Orthopsittacus [Ara] manilata*), whereas the text rightly states that the yellow facial skin separates this from all other small macaws; the solid blue tail and nape of the Blue-headed Macaw (*Propyrrhura [Ara] colini*), when the central tail feathers are mostly red and green and the nape is green; and the depiction of Gray-cheeked (*Brotogeris phrropterus*) and Plain-green (*B. tirica*) parakeets as having the same tail length, when the tail of Plain-green is twice the length of Gray-cheeked. Finally, the characteristics of the two subspecies of "Canary-winged Parakeets" (recently split into two species by

the AOU) have been confounded on the illustrations. An illustration showing a bird that has all the characteristics of Yellow-chevroned Parakeet (*Brotogeris [versicolurus] chiriri*) and the white flight feathers diagnostic of White-winged Parakeet (*B. [v] versicolurus*) is labeled *B. [v] versicolurus*, whereas a bird that looks like a White-winged except with no white in the flight feathers is labeled *B. [v] chiriri*. Because these species have just been split, and both birds occur in Florida and California, extensive hybridization between them might be taken as evidence that they are conspecific. Unfortunately, anyone relying on these illustrations would consider all of the birds to be hybrids, when in fact observations in Miami suggest that there is little or no hybridization (Bright-Smith 1999).

Each of the 352 species accounts includes the following sections: "Name," "Other Names," "Identification," "Voice," "Distribution and Status," "Ecology," "Sex / Age," "Measurements," "Geographical Variation," and a range map. For the English names it is not apparent what standard was used, because the names do not exactly match those of Forshaw (1989), Sibley and Monroe (1990), Clements (1991), del Hoyo et al. (1997), or AOU (1998). The odd mixture of names chosen, and the fact that the alternative English names and genera are not included in the index, makes finding species in this book more difficult than it has to be and adds to the confusion over parrot names.

The Identification section nicely summarizes the diagnostic features useful for separating similar species. The authors facilitate identification by presenting only diagnostic features here, saving full plumage descriptions for the Description section. This keeps the reader interested in making a quick identification from getting lost in unnecessary details.

The range maps show much refinement over those presented in Forshaw (1989) and apparently reflect much new work. These maps, useful as they are, could have been improved by shading to indicate the ranges of the different subspecies as presented in the text. This may have helped customs agents easily determine source nations for subspecies and alert them to re-exportation of subspecies from countries not in their native ranges.

Much work on the ecology, behavior, and conservation of parrots has been published in the last decade, and this new information is well represented in the text. New species, new nest descriptions, and the latest in conservation status and threats also are presented. This summary of new literature represents the most valuable ornithological contribution of the book. Unfortunately, the decision to group all references at the end of each species account makes it difficult to access the original sources.

For the most part, the text achieves its goals of summarizing the current state of knowledge on parrots, but the disquieting mixture of artwork and the

illustration errors may limit its appeal and utility. The complete collection of flying parrot illustrations is potentially very useful, but these should be further checked for accuracy, especially for Old World and Australasian species with which I am less familiar. The summary of the last decade of literature on parrots, and the low price, will earn this book a place in the libraries of most colleges and parrot aficionados, but the difficulty of accessing the original sources may limit its utility for ornithologists. Because it is at the upper limit of what is comfortable to carry in the field, *Parrots* likely will be used at home or in the library, where it will face tough competition from the strong text and fine artwork of Forshaw (1989) and del Hoyo et al. (1997).—DONALD J. BRIGHT-SMITH, *Duke University, Department of Zoology, Durham, North Carolina 27708, USA.*

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Colorado Breeding Bird Atlas.—Edited by Hugh E. Kingery. 1998. Colorado Bird Atlas Project and Colorado Division of Wildlife, Distributed by Colorado Wildlife Heritage Foundation, Denver, Colorado. xi + 636 pp., 16 pp. of color photographs, numerous illustrations and maps. ISBN 0-9668506-0-2. Cloth, \$34.95.—This tome is a worthy reflection of the monumental effort entailed in collecting breeding-bird data in a 269,360-km² state centered on the Rocky Mountains. It is the culmination of more than a decade of organization, field work, and writing involving nearly 1,200 atlas workers and 30 authors.

The Colorado atlas will be an indispensable addition to the libraries of professional and amateur ornithologists alike. It is also an important work for western land and wildlife managers. The book features 252 two-page species accounts and 35 supplemental species accounts. It also contains chapters on Colorado's ecosystems and environment, changes in Colorado habitats since settlement, a history of ornithology in the state, and a synopsis of the Colorado bird atlas project methods and results. Appendices include block statistics (for the serious student of bird atlases), species abundances, and a summary of parasitism by Brown-headed Cowbirds (*Molothrus ater*).

The book begins with an overview of the methods and results of the atlas project. This chapter underscores the immense accomplishment of organization and dedication required to complete the field aspect of the project. It provides a clear discussion of methods and a forthright examination of biases and limitations. It also summarizes statewide results of avian abundance and distribution in a number of table figures and maps. What is the most common bird in Colorado? Which areas of the state have the greatest avian diversity? You will find the answers here.

The "Colorado Environment" familiarizes the reader with the state and its fascinating diversity of ecosystems and geographical systems. It features a colorful photographic folio of habitats, nests, and young birds. Each of the primary bird habitats of Colorado is described with concise and accurate notes on occurrence, dominant species, elevational ranges, and structural components. A brief list of representative birds is also provided for each habitat.

The chapter "Post-settlement Changes to Colorado Habitats" puts the atlas results in a historical perspective. It offers hypotheses on how some of the major systems have been affected by man and how these changes might have influenced Colorado's avifauna; e.g. the changes that might have led to the expansion of Blue Jays (*Cyanocitta cristata*), the decline of Mountain Plovers (*Charadrius montanus*), and the increase of Brown-headed Cowbirds. Although this section provides some thought-provoking perspectives, the accounts tend to be speculative and not well referenced.

The heart (and bulk) of the *Colorado Atlas* is its species accounts. These accounts generally are well researched and well presented. The narratives are written in an engaging and relatively jargon-free style, making them equally interesting to amateur birders and professional biologists. Thirty different authors contributed to these accounts, and Kingery's editing provides a smooth transition from one account to another. Occasionally, an author speculates beyond the data or takes some liberties with accepted taxonomy; however, as a rule the accounts are well written and carefully

documented. Each species account features subsections on habitat, breeding, and distribution as well as some historical perspectives. The inclusion of a habitat component in this atlas makes it an important tool for the management of breeding birds. The relative importance of various ecosystems and habitats is clearly graphed for most species. Habitat codes can be easily referenced on the inside back cover. Tables of breeding phenology are also provided for most species. These tables are useful, but because of the way the data were recorded (only the highest breeding code was recorded for each species in a block), they often provide confusing results. For example, in many of the tables courtship appears to occur after nesting. Tables of breeding evidence accompany distribution maps for most species. Although these maps are very informative, the shaded blocks obstruct county lines, making it difficult to determine geographic locations, especially for more widely distributed species. The state map on the inside front cover does, however, help with this problem.

This book, like any document of its size, has some errors, such as the number of Douglas-fir forest blocks listed as only seven. However, this type of error appears to be rare. Classic Colorado bird studies are used for comparison with the current data, and referenced works cover more than 100 years of accumulated knowledge. Unfortunately, some references that appear in the text are not in the list of citations, and a list of personal communications would have been a welcome addition.

The illustrations by Colorado artist Radeaux are excellent and add to the flavor of the book. The line drawings feature combinations of adults, nests, eggs, nestlings, and fledglings in the appropriate nesting habitat. Illustrations, particularly of the passerines and other smaller birds, are well proportioned and demonstrate attention to detail in form, habitat, and behavior.

Although the atlas is a snap-shot in time of Colorado breeding birds, what a picture it is! It provides data from more than 1,700 25-km² blocks (and what you do not find in the book, you will be able to find in the database archive available in spring 1999). The book reflects some of the fun of atlas-style birding and the importance of collecting atlas information, and, although the publication of the atlas is just the beginning, it marks a right-of-passage for Colorado ornithology and atlas projects in general. The *Colorado Breeding Bird Atlas* is a valuable work for ornithologists, land and wildlife managers, and amateur birders. It is a combination of form and function worthy of the fascinating bird life it portrays.—FRANK P. HOWE, *Utah Division of Wildlife Resources, 1594 West North Temple, Suite 2110, Salt Lake City, Utah 84114, USA.*

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Manual of Raptors, Pigeons and Waterfowl.—Edited by Peter A. Beynon. 1996. Iowa State University Press, Ames. 364 pp. ISBN 0-8138-2876-7. Paper, \$89.95.

Manual of Psittacine Birds.—Edited by Peter A. Beynon. 1996. Iowa State University Press, Ames. 239 pp. ISBN 0-8138-2349-8. Paper, \$72.95.—The scientific editors and many of the chapter authors for both manuals are credentialed members of the RCVS, and both manuals were published in Europe under the auspices of the British Small Animal Veterinary Association. However, other chapter authors are their counterparts in other countries, e.g. veterinary centers in The Netherlands and Germany, The Raptor Center in the United States, and other centers for international zoo medicine, The Wildlife and Wetlands Trust, and similar organizations. Many of them are veterinary surgeons, veterinary radiologists, and other clinicians.

Part 1 of the raptor manual consists of 12 chapters with a general presentation of the available data base from observations of the owners of birds conveyed to the clinician in the form of their field biology observations, and an assessment of these observations from the experience of avian veterinary clinicians. Their clinical assessment is clearly derived from the success/failure of therapeutic techniques that they have employed to restore sick and injured birds and their experience in handling and caring for otherwise wild birds in the artificial environment of a clinic.

Part 2 of the raptor manual was particularly interesting because of the 11 chapters on medicine. For example, the author of the chapter on foot and leg problems, N. H. Harcourt-Brown, has had more than 20 years of experience in this field of raptor medicine. The subject of his recent fellowship in veterinary medicine was the basic and clinical anatomy of the foot in falcons (*Falco*) and hawks (*Accipiter*), based certainly in part on the numerous species that he has personally treated because his practice is centered in one of the most concentrated areas of falconry in England. He has also treated eagles, e.g. the Tawny Eagle (*Aquila rapax*), which apparently is in captivity in sufficient numbers to be brought to the attention of avian veterinarians. Owls are also considered, but not to the same extent as falcons, because they are not typically used in falconry (although apparently they are kept as pets by some falconers). A very well-presented glossary of falconry terms is included as Appendix 13.1.

Part 3 of the raptor manual considers pigeons (nine chapters), with at least some special reference

to specific domesticated types used as racing pigeons. Part 4 consists of eight chapters on waterfowl, which is essentially anseriform medicine, although there is a partial data base on flamingos, guillemots, and other aquatic birds. The psittacine manual, on the other hand, consists of 23 chapters, written by a few of the same authors, but also with several other specialists with experience in psittacine medicine.

The respective data base in each manual generally follows the same standard analysis and assessment of (1) the integument; (2) diseases of the head and eyes; (3) injury to the wing and leg, including injuries and infections derived from improper perches and cage habitats; and (4) various systemic diseases. The latter are considered relative to models (1) for the nutritional status and functional role(s) of the alimentary canal; (2) the respiratory apparatus, including infectious diseases and parasite infestations; (3) reproductive system, nesting, and neonatology; and (4) various physiological components and their dysfunctions, including dysphagia and its sequelae, such as chronic weight loss, vomiting, alimentary diarrhea, renal dysfunctions, and other important aspects of avian medicine most frequently assessed from the droppings. Also included is a good assessment of various neurosensory and neuromotor dysfunctions and their importance in avian behavioral patterns. Other information considers veterinary experience for individual birds following health-related, systemic (anatomical as well as physiological) environmental effects such as oil spills, but also something as individualized as health implications and zoonoses, i.e. infectious diseases naturally transmissible between vertebrates. The latter may be bird to human, but the authors also include their assessment of treatments for birds that have been adversely affected by humans, including such hazards as ingestion of a fish hook and behavioral imprinting and its implications for captive birds.

Very important assets in both manuals are the well-presented tables of data, with abundant relevant information for the clinician/specialist in avian veterinary medicine as well as the ornithologist. Both manuals include a formulary in an appendix of data on the pharmacological agents that may be prescribed for treatment, dosage and routes for therapeutic management, and general comments based on clinical experiences. One table that I found fascinating is an initial assessment of the avian patient in the form of an ornithological history and physical, generated in part by the bird and in part by its owner. The index is well organized and very complete in the raptor manual. I especially appreciated that several terms are individually cross referenced to the main body of the text, to an accompanying illustration, and to the three major avian groups, namely general/raptor, pigeon, and waterfowl.

Although some might consider the price of the manuals to be out of range in terms of their imme-

diate interest(s), I would add that both manuals include an abundant number of color photographs of the avian patients, as well as photographs of various clinical problems (anatomical as well as radiographic imaging studies) and clinically related laboratory data (cytology, parasitic infestations, and organ pathology). I highly recommend both manuals for laboratories in which birds may be held for experimental purposes. If you have avian pets in captivity, be certain that your veterinary contacts (veterinary schools as well as private clinicians) are familiar with these manuals. If you have a primary interest in birds as birds, ask your local library to obtain a copy so that you can enjoy these publications. They are excellent and well worth the investment.—JAMES C. VANDEN BERGE, *Northwest Center for Medical Education, Indiana University School of Medicine, 3400 Broadway, Gary, Indiana 46408, USA.*

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The Birder's Bug Book.—Gilbert Waldbauer. 1998. Harvard University Press, Cambridge, Massachusetts. 290 pp., 16 color plates, 61 figures. ISBN 0-674-07461-0. Cloth, \$27.95.—The alliteration in the title is pleasant, but more than one birder may wonder what a "bug book" is supposed to include. More than anything else, this book is about species interactions, as played out by various combinations of bug, bird, and human populations. Insect-bird interactions are only part of the text, and though a simplified identification key is present, it is not a naturalist's field guide. The most satisfied readers may be those birders who enjoy natural history stories and very lucid connections to the great ideas in biology. No doubt there will also be fans of Waldbauer's smooth style that can quote Robert Frost, an 11-year old grandson, or E. O. Wilson with equal panache. It is a book for curious, educated folks who may not be biologists, but might have considered a short course at a field station along the way. Subscribers to *The Auk* might find this book to be a good gift or a thoughtful provision in a summer guest room. By explaining myriad species connections, Waldbauer hopes to increase public appreciation for the players as well as the evolutionary play.

Readers will instantly notice a profiled bird sketched in the lower right corner of odd-numbered pages, which is cleverly animated as the corners are rolled. Sixty-one other text figures by Jim Nardi are large, purposeful, and crisply printed, and a center section features 38 color photographs that are striking but less informative. The text is mainly presented as a series of staged battles between various combi-

nations of bugs, birds, and people. Examples are drawn from around the world; Waldbauer's dedication to a good story is repeatedly proven by his enduring swarms of mosquitoes, blackflies, and no-see-ums. He recounts the interactions between Mormon crickets (*Anabrus simplex*), western settlers, and California Gulls (*Larus californicus*); insects, farmers, and Cattle Egrets (*Bubulcus ibis*); peppered moths (*Biston betularia*), industrialists, and birds; butterflies, milkweeds, and Blue Jays (*Cyanocitta cristata*); malaria, loggers, and the Iiwi (*Vestiaria coccinea*) on Hawaii, to name just a few. Along the way, we learn of European women who wore flea traps around their necks and that the number of insect families

north of Mexico approximates the number of bird species (613) and therefore is learnable. There is able detailing of natural selection, the Hamilton-Zuk hypothesis, mimicry, phoresy, anting, and bioaccumulation before the author concludes with an overview of Earth's sixth mass extinction, presently driven by human action. Waldbauer's plea for reducing this damage is utilitarian and familiar to many of us but sincerely expressed. If he draws us into this book based on affinities for birds, bugs, or biology, Waldbauer's final goal is enriching our view of one seamless web of life.—WILLIAM J. EHMANN, *Department of Biology, Drake University, Des Moines, Iowa 50311, USA.*