

BOOK REVIEWS

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RECENT ADVANCES IN BIRD MIGRATION RESEARCH

Bird Migration. Physiology and Ecophysiology.—E. Gwinner [ed.]. 1990. Springer-Verlag, New York. 435 pp. \$122 (cloth). ISBN 0-387-50855-4.

This volume is the proceedings of a conference at the Evangelische Akademie in Tutzing, West Germany on 18–20 October 1988. Reviewing in 1995 a book of proceedings published in 1990 would hardly seem worthwhile were it not for the importance of the review papers contained in this volume. Although there has been considerable research on bird migration throughout the world since the conference, the contributions in this volume are essential reading for anyone interested in the science of bird migration. Graduate students, in particular, will find the papers quite useful as they develop a background to work in this field. Not all aspects of bird migration are covered. The book contains 26 papers organized into five "chapters": patterns of migration (six papers), ecological and behavioral aspects (five papers), physiological adaptations (six papers), avian flight (three papers), and strategies and tactics of migration (six papers). Each contributor was asked to review their field of expertise, assess the present state of knowledge, and outline the most promising direction of future research. Overall these objectives were achieved.

The patterns of migration chapter includes reviews of migration across the oceans of the world, movements to and from the Arctic, palearctic passerines in Kenya and Uganda, migration across the Alps, weather and the timing of migration, and molt migration. The information about Arctic migration (Johnson and Herter) is particularly welcomed, as little has been summarized for this interesting part of the globe. Their paper is well organized, written, and documented (a little over seven pages of citations).

The chapter on ecological and behavioral aspects covers topics on site attachment and fidelity, ecophysiology of movements in winter quarters, control of partial migration, habitat selection by wintering migrants, and life history ecology of migrants and residents. The review of experimental field and laboratory investigations of site attachment and site fidelity (Ketterson and Nolan) is thought provoking in that it also examines the neural bases of behavior (filial imprinting, caching, and orientation and homing) thought to be analogous to site fidelity. The authors emphasize the need to find a study system that will allow the dismantling of neural and behavioral components of site attachment and site fidelity.

Chapter 3 includes discussions of the visual problems of nocturnal migration, food selection and nutrition, fat storage and fat metabolism, endocrine mechanisms, circannual rhythms, and the genetics of migration. I found the reviews on food and nutrition (Bairlein) and lipid storage and metabolism (Ramen-

ofsky) the most informative. The first provides evidence that the specific nutrient requirements of migrants depositing lipid stores may influence significantly their foraging decisions, and the second review provides information on the basic processes of digestion of dietary lipids, lipogenesis, deposition, mobilization, and use of fat.

Reviews on the mechanics of flight (Rayner), the physiology of flight (Butler and Woakes), and energetics and water economy during extended flight (Nachtigall) make up Chapter 4. Although Rayner's contribution on the mechanical energy costs in flight is excellent, there is little more than what appeared in his review in *Current Ornithology* (1988 5:1–77). The information gained from wind tunnel studies is emphasized in the two remaining papers. Much of the newer data are from experiments with pigeons—one of the few avian species suitable for wind tunnel experiments. Although similar studies with migrants are possible, little work has been done. As one would expect, the influence of altitude of flight is more difficult to manage in wind tunnel experiments, and no study of the energetics of migratory flight will be complete until this aspect is thoroughly addressed.

The final chapter of the book contains papers devoted to strategies and tactics of migration. The first paper (Alerstam and Lindstrom) predicts different migratory adaptations (fat deposition strategies, flight behavior, habitat selection) depending on whether time, energy, or predation avoidance is optimized. Additional papers emphasize strategies for overcoming the ecophysiological problems of desert crossings (Sahara), the pattern and energetics of nighttime and daytime migration in the deserts and mountains of central Asia, the migration strategies and tactics of arctic and north temperate breeding waders, and the energetics of leapfrog migration in arctic breeding waders. The last paper in the volume (Walsberg) reviews problems inhibiting energetic analyses of migration and sounds a cautionary note. The difficulty of measuring accurately power consumption in flight is the primary factor restricting analyses of the energetics of migration. Although equations based on empirical measurements of birds not confined in wind tunnels may account for 84% of the variance in measured power consumption, the equations do not account for the effects of some critically important variables (e.g., flight speed and fat load).

Overall the volume is well produced and edited, but a few typographical errors were noted (e.g., p. 2 "Keast and Murton 1980 instead of Keast and Morton). I found the treatment of the pertinent research literature on waterfowl and raptor migration in the volume disappointing. In contrast, the coverage of the literature on wader and passerine migration was excellent. Of the new books on bird migration published since the beginning of this decade (Gwinner's *Bird Migration. Physiology and Ecophysiology* [1990], Alerstam's *Bird Migration* [1991]; Berthold's *Bird Migration. A Gen-*

eral Survey [1993]), the Gwinner volume contains detailed review material not included in the other two more recent volumes. However, by design, the Gwinner volume does not include review papers on the orientation and navigation of migratory birds. Readers interested in this topic should consult *Orientation in Birds* (1991) edited by Berthold. This compilation of review papers by experts provides excellent coverage of the orientation and navigation literature, but the cost of the volume is prohibitive (\$174). The cost of the Gwinner volume is also relatively high but typical for this publisher. Both volumes could have cost considerably less had the publishers produced them in soft cover.—SIDNEY A. GAUTHREAUX, JR., Department of Biological Sciences, Clemson University, Clemson, SC 29634-1903.

ADAPTIVE MATE CHOICE BY FEMALE SWALLOWS

Sexual Selection and the Barn Swallow.—Anders Pape Møller. 1994. Oxford University Press, Oxford. x + 365 pp. ISBN 0-19-854029-9 HB—\$49.95, 0-19-854028-0 PB—\$24.95.

Anders Pape Møller is one of the most prolific behavioral ecologists in recent years. In particular, his interest has been sexual selection in a single European population of the Barn Swallow *Hirundo rustica*. Now, the results in his many exciting papers and more have been brought together by Møller in this intriguing book. The most recent title to appear in the "Oxford Series in Ecology and Evolution," this book is exciting because a wide variety of interesting hypotheses, tests of these hypotheses with field data, and other ideas are coalesced into a single, coherent package.

In his preface, Møller states two primary aims. The first is "to demonstrate the importance of sexual selection for almost every aspect of the life of animals." The second is "to make a detailed comprehensive empirical study of all aspects of sexual selection." He succeeds admirably in both goals, setting the standard for those who will follow.

Møller first provides what are essentially introductory chapters to the concept of sexual selection, some of the well-known models for the mechanism of sexual selection, and the natural history of Barn Swallows. He then discusses male mating advantage, benefits of female mate choice, and determinants of the male's primary sexual ornament, long outer tail rectrices. Next, he discusses advantages of early arrival to the breeding grounds from the African wintering quarters and options for unmated males. There is then a long chapter on parasites and sexual selection, clearly one of Møller's main interests. This is followed by discussions of paternal care and male ornamentation, sperm competition and sexual selection, sexual size dimorphism and the intriguing topic of female ornaments, and geographic variation in ornament size. Finally, Møller provides a short synthesis.

The structure of each chapter follows the same format. The author introduces the topic, noting the logical

sequence in which aspects of the topic will be discussed. The text is peppered with figures and tables, and a summary ends the chapter. Beyond descriptive statistics, analyses of data are usually given at the end of each chapter. The editors of the series, Robert May and Paul Harvey, apparently have recommended this format (it appears in some other recent titles) to favor readability, as the text is unbroken by summary results of statistical analyses.

Choices of parametric versus nonparametric tests appear appropriate, although there are a few cases where quite small sample sizes are treated parametrically without justification. Presumably also in an attempt to keep the text flowing, details of methods are not always given. The only problem with this omission is that it requires the reader's return to the original papers to determine if, say, observational methods were adequate in amassing some of the notably large samples of birds.

One reason Møller's research is admired is that he conducts experiments in the field, producing results from large samples that can be used to test alternative hypotheses. Following the lead of Malte Andersson, Møller was one of the first workers to alter tail length (and, later, symmetry) by cutting and gluing rectrices and then document the consequences for reproductive success of males. He found that females actively choose males with relatively long outer tail feathers and a high degree of symmetry in tail shape. Females and their nestlings benefit directly because naturally long-tailed males are less frequently parasitized by a contagious hematophagous mite than are short-tailed males. However, these same females expend disproportionate parental effort in feeding nestlings when mated to highly ornamented males. Attractive, long-tailed males benefit both by being mated to hard-working females (seasonal production of fledglings is high) and by being favored in extrapair copulations (EPCs) by neighboring females in the nesting colony, as verified by DNA fingerprints. At the same time, less well-endowed males disproportionately suffer foraging, survival, and mating costs if given longer tails than they themselves grow. Tail length thus indeed appears to be a conditional-dependent handicap.

Workers have recently been drawn to the study of sexual selection in monogamous species of birds such as Barn Swallows. Males in many of these (and females in some) display ornamentation, and that so many of these species are biparental presents the possibility that ornaments are indicators of quality of parental care. This is the case here: long tails indicate what will be reduced paternal effort in raising nestlings, as predicted by Nancy Burley's "differential allocation" hypothesis. As Burley suggested, the most ornamented males are mated to females that provide disproportionate maternal effort in caring for nestlings. These males appear to allocate their reproductive effort between parenting and additional mating effort.

This question of paternal care indicators remains open. Work on House Finches, Red-winged Blackbirds, Great Tits, and Stonechats has supported the alternate, "good parent" hypothesis. Resolution of these differences almost certainly will relate to choices made by females in different species regarding their involvement in EPCs. Males should be relatively poor fathers

only when they can spend their time and effort better in other activities. Our focus then should be on females.

Are there indirect benefits to female swallows in mate choice, in addition to the direct benefits of avoiding parasitized males? Indirect benefits would include attractiveness and "good" genes. Do long-tailed fathers produce long-tailed sons or sons with genes conferring, for example, parasite resistance? Møller estimates heritability to answer the first question and a correlation between a father's tail length and a son's parasite load to answer the second, additionally employing cross-fostering as a control. Estimates of heritability of traits in naturally occurring populations are notorious for the simplifications necessary to yield them. With this caveat noted, Møller demonstrates high heritability of tail length and a significant correlation between the father's tail length and parasite resistance in sons.

Møller has been innovative in his research and novel approaches attract attention. Perhaps the most fascinating of his activities relates to "biased mutations." Møller states that mutations influencing male secondary sexual traits are probably non-random in their effects. Exaggerated ornamental traits are so elaborate that any random change is much more likely to decrease the quality of the ornament than to increase its quality. The concept of biased mutations has been important to recent formulations of the Fisherian process of sexual selection with a costly mate preference.

How might one test the proposed effects of biased mutations on sexual ornaments? Surely, normal mutation rates are so low as to make any search fruitless. An experiment is required that dramatically increases mutation rates, preferably in a natural population. As a byproduct of glasnost, Møller went into areas in Ukraine that received radioactive contamination from the 1986 Chernobyl reactor meltdown. Remarkably, results from samples of male Barn Swallows were as predicted, with both the appearance of tail feather deformities and an increase in tail asymmetry, while other morphological traits were not so affected.

One strength of Møller's book is the recognition of alternate hypotheses in addressing aspects of sexual selection. However, the uneven treatment alternate hypotheses receive may be viewed by some as a weakness. Møller clearly has favorites (don't we all?) and succumbs to the tendency to accentuate these over others. Apparently enamored of Hamilton and Zuk's parasite hypothesis, in addition to direct costs of parasitism, Møller spends many pages exploring these topics. While interesting reading, such depth of discussion contrasts with that of hypotheses dismissed in a paragraph or two. For example, we would like to know with certainty the fates of birds that disappear from study populations. Yet, Møller simply considers missing Barn Swallows to be dead. Almost unconsidered is the possibility that birds not seen again dispersed rather than died (p. 82), even though the true fates of missing individuals are critical to particular analyses.

Another bias apparent in Møller's book is the nearly exclusive focus on males. Perhaps, the author would defend this bias by saying that he is most interested in the evolution of the tail ornament in Barn Swallows. In any case, the impression is presented that all of the action is with the most ornamented males. They swagger, show off their tails, and engage in EPCs. Females

are portrayed as good egg-producing machines, performing their duties satisfactorily as the long-tailed males service them. For example, males are the single focus in a flow diagram that provides sexual selection episodes in a hypothetical animal (p. 89). Every event in the diagram flows toward male fitness, while females provide their contribution as "fecundity per mate." Similarly, in the chapter on sexual size dimorphism and female ornaments, the subject of female ornaments receives about three pages of discussion in this book of more than 300 pages. The complete story for female Barn Swallows is yet to be told.

Møller provides extensive background in sexual selection theory in addition to his empirical results with Barn Swallows. Consequently, it should not be surprising that parts of his book are more readable than others. He is, of course, trying to make theory clear to an audience that may be largely more conversant with empirical studies than with theoretical models. The second chapter ("Models of sexual selection and monogamy") is where most problems of presentation arise. Møller's prose thickens in his discussion of models of mate choice, from those of Fisher and Zahavi to the mathematical genetic models of Kirkpatrick, Lande, and Pomiankowski. In defense of Møller, some of these models are non-intuitive to many of us, and he should be given credit for trying to elucidate the results of these modelling efforts. However, the reader may well benefit from reading Malte Andersson's *Sexual Selection* (Princeton Univ. Pr., 1994) for another, more successful attempt to explain these same models.

Although most research by others is appropriately cited by Møller, such is not always the case. Møller's discussion of work by the Queen's University group on the Barn Swallow is an example. Their results from a tail manipulation experiment differed from Møller's own experiments, but the discussion contained here (p. 100) involves statements in disagreement with the original paper.

There are only a few production errors, admirable in a book of this length. They include a handful of minor typographical errors. A minor omission involves incomplete labelling of a figure (Fig. 3.2), although the missing labels can be deduced (I think) from nearby text. Another error is more important, for it involves efforts by both Darwin and Fisher. Darwin proposed that sexual selection can operate in monogamous species of birds (and yield male ornaments) if correlations exist between the congenital earliness of female readiness to breed and numbers of offspring raised, both of these being associated with a female's non-heritable nutritional condition. Males chosen by earlier nesting females will raise larger numbers of offspring. In *The Genetical Theory of Natural Selection*, Fisher provided a simple pictorial model (with numbers included) to support Darwin's claim. Unfortunately, Fisher made two numerical errors in his hand-drawn figure, the "diamond of monogamy." Møller gives us a newly-constructed diamond in which he repeats both of Fisher's errors and adds two transcriptional errors of his own. So a reader interested enough to work through the numbers in Møller's rendition of Fisher's figure (a useful exercise) will encounter difficulties and should turn instead to the original.

These criticisms should be taken in a greater context.

Møller's book is full of ideas, making it ideal for graduate seminars. It will be particularly useful for students about to embark on research in sexual selection, especially if subjects are birds. It is also worthwhile reading for any student in behavioral ecology because it demonstrates the strength in approaching a subject from a variety of viewpoints and gives one hope that important hypotheses can indeed be addressed in natural populations. I highly recommend it for the personal libraries of all students of avian behavioral ecology and all university libraries.

I thank Jeff Biessman, Bob Brua, and Sue Linville for our weekly discussions of sexual selection, Barn Swallows, Northern Cardinals, and Ruddy Ducks.—RANDALL BREITWISCH, Department of Biology, University of Dayton, Dayton, OH 45469-2320.

STATUS AND DISTRIBUTION OF CALIFORNIA BIRDS

California Birds: Their Status and Distribution.—Arnold Small. 1994. Ibis Publishing Co., 3420 Freda's Hill Road, Vista, CA 92084. xiv + 342 pp. HB \$55.00, + \$5.00 S/H. ISBN 0-934797-09-9.

California has a rich ornithological tradition, and its birds have been studied extensively compared to those of most other states. Even so, Grinnell and Miller (1944) were the last to provide an excellent, thorough state-wide compendium of California bird life. But as noted by Patten et al. (1995), although "Grinnell and Miller provided us with a sturdy foundation for the study of bird species and subspecies in California, now more than ever, given the massive and rapid changes in this state's environment, we need to update and refine our knowledge in all fields to build upon that foundation." Works by McCaskie et al. (1979, and its 1988 supplement) for northern California, and Garrett and Dunn (1981) for southern California, built upon that foundation admirably, but Arnold Small, with his *California Birds: Their Status and Distribution*, is the first to attempt to update Grinnell and Miller. For reasons provided below, I believe he fails in his goal.

The layout of Small's book is pleasing. It includes a lengthy introduction and several appendices, including a good explanation of the function of the California Bird Records Committee. The bulk of the book is devoted to species accounts. In these accounts, descriptions of distributions for regularly occurring species appear to be written accounts of range maps published by Grenfell and Laudenslayer (1983) and Zeiner et al. (1990), although neither of these sources was intended to provide fine enough scale for such a use. Among the potentially more helpful aspects of the species accounts are the "notes" included at the end of selected accounts, as they often suggest references for further reading or cite field identification papers. Nevertheless, these "notes" are only sporadically included, and many relevant, helpful citations are missing. The numerous photographs, all of which appear to be correctly identified, are excellent and often stunning.

But once beyond aesthetics and gloss, the book's

many flaws and limitations show. The preface suggests that birders rather than ornithologists are the target audience because it pejoratively and inaccurately states that ornithologists a century ago were interested merely in shooting birds and cataloging their skins, contrasted with "benign" (!) birders of recent times who are interested in the birds themselves and where and when they distribute themselves. Regardless of who is the target audience, this work suffers from a lack of timely information, incomplete species accounts, and errors too numerous to list.

The introductory material is rambling, unfocused, and unbalanced. Far more attention is devoted to vagrants than to migrants; regular breeders and wintering birds are barely mentioned. This format may have been deliberate if the target audience is indeed birders, many of whom find greater delight in "ticking" a rarity than in elucidating a breeding range. But even the discussion of vagrants often is inaccurate, with regular wintering species such as American Tree Sparrow (*Spizella arborea*) and regular migrants such as American Redstart (*Setophaga ruticilla*) classified as vagrants, whereas out-of-range species such as Eastern Phoebe (*Sayornis phoebe*) and Brown Thrasher (*Toxostoma rufum*), each of which are recorded fewer than ten times per year, are excluded from the list of vagrants as they are considered "borderline."

Small's definitions of relative abundance (status) categories are awkward, and are used inconsistently or incorrectly throughout the text. In particular, distinguishing between "rare," "very rare," "extremely rare," and "exceedingly rare" seems unjustified. Modifiers to other status categories (e.g., "moderately common") are used throughout, but never defined. My impression is that status categories, including their modifiers, were applied through intuition, not through careful analysis. Similarly, habitat descriptions and "life-zones" are undefined. No source is provided for the common names of plants, even though habitat descriptions based only on common names are bound to lead to misunderstandings; in addition, names of bioregions mentioned in the text are dated as Small uses Hinds (1952) rather than a more recent text (e.g., Hickman 1993).

Any status and distribution work needs to meet three criteria: it must be timely, thorough, and accurate. It should incorporate the newest information and reflect the current status and distribution of the species treated. Small's species accounts meet this goal for many species, especially vagrants. However, examples abound where he failed to incorporate the current status of breeding, wintering, or transitory species. For example, Small states that Verdins (*Auriparus flaviceps*) are absent from Furnace Creek Ranch (in Death Valley National Park) and the Amargosa River drainage, which was true in the late 1970s. But this species recolonized the area in 1981, and now breeds regularly in numbers. More disturbing is Small's failure to use and cite recent important regional works such as Ainley and Boekelheide (1990) and Harris (1991). In the case of the former, Small relies upon information ten years older (DeSante and Ainley 1980) when discussing seabird breeding colonies on the Farallon Islands. More recent journal references also are neglected; for example, only Crase (1976) is cited in the discussion of Chestnut-

backed Chickadee (*Parus rufescens*) expansion into the Sierra Nevada, even though Brennan and Morrison (1991) provided a more recent account.

A cursory glance at the abundant text may give the casual reader a sense that Small is thorough, yet the lack of relevant citations and the absence of many significant published records, belies this notion. Two excellent sources of distribution information on California birds, *Western Birds* and *Condor*, seem to have been referenced fairly thoroughly, but apparently little else was checked. Many relevant records from *American Birds* are missing. Thus, Small's apparent attempt at a complete listing of Snowy Egret (*Egretta thula*) nesting colonies excludes many sites published in Garrett and Dunn (1981) and elsewhere. In the Common Nighthawk (*Chordeiles minor*) account, Small states that, in southern California, they are "only known . . . in the San Bernardino Mtns. and possibly . . . in the San Gabriels Mtns." Yet there are two records for San Jacintos Mountains (Garrett and Dunn 1981, *Am. Birds* 42:1341), suggesting a small population in that range. By contrast, other accounts give a false impression of completeness. For example, an unreferenced comment that Cassin's Kingbird (*Tyrannus vociferans*) is "absent from Salinas Valley [Monterey County]" implicitly suggests that this is the only valley within its range from which this species is absent as a breeder, but this is not the case.

Treatment of subspecies must rank as one of least thorough and most misleading aspects of the book. As with many (most?) avifaunal accounts now published, subspecies are discussed for only a select few species, usually those with field-identifiable forms. In some instances, Small's account nearly works, as with White-crowned Sparrows (*Zonotrichia leucophrys*), wherein his discussion of status and distribution is at least roughly accurate, and all recorded subspecies are mentioned by name. Even so, there are some errors or omissions, such as the statement that *Z. l. pugetensis* occurs south only to Orange County in winter (it has been recorded in San Diego County several times [Unitt 1984]), and his failing to mention recent White-crowned Sparrow nesting efforts on the Channel Islands. More seriously flawed accounts completely omit regularly occurring subspecies. For example, nominate Orange-crowned Warbler (*Vermivora c. celata*) occur during migration and in winter and *Dendroica coronata memorabilis* breeds in the White and Inyo Mountains (A.O.U. 1957). In still other accounts (e.g., Dark-eyed Junco, *Junco hyemalis*, and Song Sparrow, *Melospiza melodia*) subspecific treatments are nothing short of maddening, the worst being the Fox Sparrow (*Passerella iliaca*) in which not even group names (i.e., *iliaca*, *megarhyncha*, *schistacea*, and *unalaschcensis*) are used in the text, making the discussion extremely difficult, if not impossible, to follow. Indeed, as Small refers only to "rusty" birds, "browner" birds, and "gray-headed" birds, the *megarhyncha* and *schistacea* groups are not distinguished. His treatment is most frustrating when considered in light of recent work on species limits in the Fox Sparrow (Zink 1994) which suggests that the four groups may be separate species.

Small's work suffers most, however, from inaccuracy rather than omission. I encountered only one account

(Little Bunting, *Emberiza pusilla*) that did not need corrections or clarifications. In some cases, errors presumably were made because no effort was made to verify claims. For example, in his Corrigenda and Addenda, Small claims that a Broad-billed Hummingbird (*Cyananthus latirostris*) from Humboldt County, rather than an undocumented record from Sacramento County, "is the northernmost record in North America." In reality, the northernmost record is from Ontario (*Am. Birds* 44:85). More significantly, Small's statement (in three separate sections) that Wrentits (*Chamaea fasciata*), like California Thrashers (*Toxostoma redivivum*), are nearly a California endemic shows gross ignorance. Any standard reference on the distribution of North American birds (e.g., A.O.U. 1983) makes it clear that Wrentits range northward to the Columbia River, unlike California Thrashers, which only rarely stray north of the California/Oregon border.

Many statements about status or distribution, often made without support, appear to be mere speculation. For example, Small claims that Sharp-shinned Hawks (*Accipiter striatus*) and Band-tailed Pigeons (*Columba fasciata*) breed in the White and/or Inyo Mountains, but neither species is mentioned in Johnson and Cicero's (1991) work on breeding birds of this region. Similarly, Cassin's Kingbirds are said to be rare in winter north of San Diego County, although they are equally common in neighboring Orange County, and inland to western Riverside and extreme southwestern San Bernardino counties (see Garrett and Dunn 1981).

Although Small states that he followed California Bird Records Committee decisions, he published many records the Committee rejected. The worst account reflecting such discrepancies is that for Band-rumped Storm-Petrel (*Oceanodroma castro*) in which he lists eleven records, ten of which were rejected by the Committee years ago. Furthermore, the only accepted record (from 1970) has engendered enough debate that the Committee is currently re-reviewing it, and probably will reject it. The Cerulean Warbler (*Dendroica cerulea*) record for Morongo Valley (shown on the Corrigenda and Addenda sheet) is an exercise in mistakes. Not only is the date range incomplete (the bird in question was present 26–30 October, not just 26 October) and the year incorrect (it was in 1991, not 1981), but the bird was in fact a Blackburnian Warbler (*D. fusca*)!

Errors of the sorts mentioned above are common, but errors involving incorrect dates, incomplete date spans, or incorrect locations are too frequent to mention. Even locality information is frequently botched. In the Baird's Sandpiper (*Calidris bairdii*) account, Crowley Lake Reservoir has migrated south from Mono County to Inyo County. The Solitary Vireo (*Vireo solitarius*) account erroneously places Santa Rosa Mountain in the San Jacinto Mountains rather than within the Santa Rosa Mountains. The low elevation record from Panamint Springs for Gray-crowned Rosy-Finch (*Leucosticte tephrocotis*) is said to be 600 feet above sea level, but this location sits at 1840 feet above sea level.

Worse yet are the citations, which are an absolute wreck. There is a multitude of errors of omission, where Small cites references that are not in the literature cited (the missing references occasionally surface in the

"Bibliography, Recommended References and Bird-finding Guides" section, so check there too). He also cites many references that lead to more than one source in the literature cited, and some that mismatch author and title (e.g., Pitelka 1985 and 1986 should be Pitman). Most amusing are citations that are complete non-sequiturs. I found a reference to Arctic Loon (*Gavia arctica*) identification in the Three-toed Woodpecker account, one for Cattle Egrets (*Bubulcus ibis*) reaching the west coast of North America in the Red-throated Pipit (*Anthus cervinus*) account, and one for California's first White-winged Crossbill (*Loxia leucoptera*) in the Terek Sandpiper (*Xenus cinereus*) account.

Small's best use of citations is probably for first California records of rarities as he often lists the correct first record, though not always (e.g., Least Flycatcher, *Empidonax minimus*), and he often cites the primary source, though not always (e.g., Rose-breasted Grosbeak, *Pheucticus ludovicianus*). However, it also is apparent that he did not bother to check many citations, as the titles are missing from many of them, presumably because they were gleaned from Grinnell and Miller (1944) who did not cite the titles of papers. For a number of species (e.g., Reddish Egret [*Egretta rufescens*], King Eider [*Somateria spectabilis*], Brown Thrasher), Small lists a sight record or lost specimen that was not generally accepted at the time (Grinnell and Miller 1944), and never has been accepted by the California Bird Records Committee. Surprising, in other cases sight records were ignored, as with Inca Dove (*Columbina inca*), which Small lists as first occurring in 1948, even though a 1928 record was considered "almost unassailable" by Grinnell and Miller (1944). For Brown-crested Flycatchers (*Myiarchus tyrannulus*), Small cites a non-existent December 1916 specimen as the first record, yet the only real winter record for western North America, from Orange County in December 1993 (Natl. Audubon Soc. Field Notes 48: 248), was omitted.

Two particularly erroneous citations are in the Prairie Warbler (*Dendroica discolor*) account and in the introductory material. Small suggests that "The recent increase in sightings [of Prairie Warblers] may be due, in part, to a population upsurge (Böhning-Gaese et al. 1993)." Not only was this notion lifted from another source (Patten and Erickson 1994) which he does not credit, but it was applied to the wrong species. The population upsurge was for Pine (*D. pinus*) not Prairie Warblers as data presented by Böhning-Gaese et al. (1993) showed a dramatic increase in numbers of Pine Warblers in the eastern United States. Indeed, Prairie Warbler records in California, if anything, have decreased steadily over the past two decades, and Böhning-Gaese et al. show a dramatic decrease of Prairie Warblers in the eastern United States.

The second example is downright embarrassing. In the introduction, Small cites Jepson (1993). Twice in the back of the text, once in the bibliography and once in the literature cited, Small cites this reference as "Jepson, W. L. 1993. A manual of the flowering plants of California." Since Jepson passed away in 1946, publication of this work was no small feat on his part. Clearly, Small was referring to Hickman (1993), but as he has the title of Jepson's 1925 work in the literature

cited and he quotes from it in the introduction, stating that "Jepson (1993)" included but 4,000 species of plants from California (*The Jepson Manual* lists 5,800), I can conclude only that Small never saw a copy of Hickman. The Prairie Warbler and Jepson examples, and others, demonstrate that the author did not check many of the references he cited in the text.

Nothing good can be said about perpetuation of errors. While not common in Small's work, he does his fair share. For example, he cites the date range of Humboldt County Chuck-will's-widow (*Caprimulgus carolinensis*) as "during the period 12–16 December 1988," even though Harris and Hawkins (1990) corrected the date to 4 January 1989. More significant, Small lists two Black Rosy-Finches (*Leucosticte atrata*) collected in 1941 as California records, even though many years ago (McCaskie et al. 1979) the location was shown to be in Nevada.

The list of errors, omissions, and oversights I have provided above is a small fraction of the total, but it is representative. As a result, although Small doubtless will be cited extensively, I cannot recommend Small's book to any ornithologist, and I strongly feel that it should not be used as a primary reference. If all that is needed is a gross idea of bird distribution in California, maps in Grinnell and Miller (1994) and Zeiner et al. (1990) should suffice. If more detail on status and distribution is needed, I recommend McCaskie et al. (1979), with its supplement, and Garrett and Dunn (1981). If status on vagrant species is of interest, then Roberson (1980), although also fairly error-ridden (Erickson 1982), is more useful. Grinnell and Miller (1944) remains the standard for subspecific occurrence and distribution, and for concise descriptions of habitat associations. Granted these works are a bit dated but, in general, their content is reliable or, at the very least, they do not pretend to be thorough when they are not. Small's book may be useful to beginning students of birds, as the photographs are stunning and range and habitat description give a rough idea of a species' status and distribution in California. Even for the neophyte, however, I recommend checking specific references and using with caution anything other than the most basic information in the accounts.

Advanced copy for Small's *California Birds: Their Status and Distribution* refers to it as the first work on the entire state's avifauna in fifty years. Invariably, such statements invite comparison with Grinnell and Miller (1944) and, indeed, seem designed to do so. Small's work is fraught with errors, and is neither up-to-date nor complete in numerous instances. To suggest that this work supplants Grinnell and Miller is sadly inaccurate. California awaits a timely, thorough, and accurate compendium of its avifauna.

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