Bird Migration and Global Change

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every type of data that can be applied to determining phylogeny, and also includes a highly unusual data type: body odor. Endemic to the Hawaiian islands, the rapid morphological diversification of the "dreps" into multiple morphotypes that encompass much of the range of variation among families of passerines is one of the planet's great examples of adaptive radiation. Bark-rippers, branch-probers, snail-eaters, and professional flower-pollinators have all emerged within 5 million years from the inoculation of these islands by a cardueline finch prototype. Pratt's beautiful illustrations facilitate the appreciation of this radiation. Tragically, virtually every species in the surviving members of the family is currently of conservation concern if not critically endangered.

As Pratt notes, any summary of the biology of this lineage is severely handicapped by the high percentage of extinct species. At least 16 species are known to have gone extinct since 1600, and it is unlikely the true scope of extinctions will ever be known because the lowlands were nearly completely deforested by native Hawaiian people before first contact with Europeans (and lowland forests typically contain the richest avifaunas of a region). The arrival of Europeans catalyzed a new wave of extinctions caused by introduced diseases, plants, predators, and herbivores that eliminated native vegetation. Pratt succinctly summarizes this depressing history.

An appropriately brief chapter on the monospecific Peucedramidae by J. Curson is highlighted by the history of classification of the Olive Warbler (*Peucedramus taeniatus*). At one time comfortably included in *Dendroica* in the Parulidae, its lack of clear relationship to any New World family was demonstrated by a variety of evidence first gathered by W. George. Genetic data have yet to firmly establish a sister relationship to any other family, but the Prunellidae is a leading candidate. In any case, the Olive Warbler is the only member of a lineage long isolated from other passerines and represents a dramatic example of morphological conservatism despite this independent history.

The last family in this volume, the Parulidae (called "New Word warblers" in HBW), is reviewed by J. Curson, who was the lead author on the 1994 Helm identification guide for the family. Curson was constrained to follow predetermined, somewhat traditional family limits, so the Parulidae here include several genera that, as Curson notes, are definitely not part of this lineage: *Granatellus*, *Icteria*, *Zeledonia*, *Microligea*, *Teretistris*, and *Xenoligea*. Inclusion of these taxa complicates summaries of the biology of the family. Further, the recent comprehensive revision of the family by I. Lovette and colleagues indicates that most traditional genera are not monophyletic; thus, any summaries using traditional generic boundaries are compromised. Fortunately, Curson was savvy to most of this new information and included it in the Systematics section; however, in several instances, he notes that a feature is unusual for the family when the taxon showing this feature is, in fact, not part of the family (e.g., use of feet in holding food by the Yellow-breasted Chat [*Icteria virens*] and the mossy ball nest of the Wrenthrush [*Zeledonia coronata*]).

Because *Auk* readers are likely more familiar with this family than any other in the volume, my penchant for highlighting oddballs is muted because most are familiar with nuggets such as the migration route of the Blackpoll Warbler (*Dendroica striata*) and the bark-foraging specialization of the Black-and-white Warbler (*Mniotilta varia*). Even so, the parulids are a relatively homogeneous group in most aspects of their biology. From the global perspective, their primary highlight in my view is the explosive (and recent) diversification in plumage color and patterns in the *Dendroica–Setophaga* group. So, here I digress to whining and quibbling. Curson implies that fallouts of migrating warblers are restricted to the Texas coast, when in fact they are a feature of the entire Gulf Coast and are at least as spectacular in my home state Louisiana as in Texas. Curiously, Curson also calls them "falls" rather than the long-established and evocative term "fallout." Although the autumn vagrancy of eastern warblers to the Pacific Coast of North America is emphasized, the spring pulse of vagrant warblers to the region is not; the latter, however, is biologically more intriguing because its peak is in June, long past typical migration periods. The 1992 influx of southeastern warblers in the western United States is mentioned, but evidently overlooked was Patten and Marantz's *Auk* paper that documented more than "several" records of Hooded Warblers and Northern Parulas (i.e., 76 and 138 records, respectively, including successful nesting records for both). Although coverage of migration routes and vagrancy is extensive, with almost an entire page devoted to records of vagrants in Bermuda and Europe, the Movements section largely neglects two decades of important research by P. Marra, S. Sillett, T. Sherry, R. Holmes, and collaborators that focuses on linking migration biology to events on the wintering and breeding areas; wood-warblers have been the workhorses of studies of connectivity. In general, the family chapter would have been improved greatly by collaboration with an active researcher based in North America.

As every reviewer of HBW has noted, these volumes represent a monumental achievement in ornithology. Although relatively expensive, they are in fact an amazing bargain. For a researcher, the family chapters and species accounts, backed by an immense bibliography, provide a valuable entry-level resource. For bird enthusiasts, the stunning photos, the outstanding "field guide" plates, the range maps, and the synopses of habitat, behavior, and voice all make these volumes valuable bookshelf references. Considering the number of pages, the volume of color photos and plates, the expertise of the authors, and the sheer volume of information, HBW volumes provide more bang-for-buck than any bird books with which I am familiar. Joining the global bandwagon chorus of praise, I congratulate the editors and staff of HBW. These volumes, including the current one, illuminate and celebrate the diversity of birds.—J. V. Remsen, Jr., *Museum of Natural Science and Department of Biological Sciences, Louisiana State University, Baton Rouge, Louisiana 70803, USA. E-mail: najames@LSU.edu.*

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Bird Migration and Global Change.—George W. Cox. 2010. Island Press, Washington, D.C. x + 291 pp., 9 text figures. ISBN 9781597266888 (paper); 9781597266871 (cloth). $45.00 (paper), $90.00 (cloth).

Effects of Climate Change on Birds.—Anders Pape Møller, Wolfgang Fielder, and Peter Berthold, Eds. 2010. Oxford University Press, New York. x + 321 pp., 9 color plates, 71 text figures.

ISBN 9780199569755 (paper), 978-0-19-956974-8 (hardback). $117.00 (hardback), $62.95 (paper).—I love a decisive experiment to help understand how nature works, and we humans are conducting a decisive, if unplanned, experiment on the consequences of heating our planet rapidly using vast quantities of greenhouse gases. We have already learned much from this experiment, but unfortunately it is so complex and messy (poorly controlled scientifically) as to render the results difficult to comprehend, let alone forecast. Moreover, we're committed to this experiment for at least another 50 years, given lags in global greenhouse-gas dynamics—no matter how catastrophic the results. Both these new books address how this experiment has already affected birds, and Møller et al. set the stage to accelerate figuring out what's in store.

Both books are timely and valuable contributions to the proliferating literature on climate change (for reviews of multiple books on climate issues in general, see Kitcher 2010, Trenberth 2010). Møller et al. have published an earlier book on birds and climate change (Møller et al. 2004), but their new book 6 years later builds on new literature and new ideas. They state that "No other field of scientific inquiry into the biological sciences is currently of greater significance than an understanding of the consequences of climate change for all living beings, including humans" (p. 4). Both books justify the focus on birds in terms of existing knowledge, diverse data sets, and tractability of a charismatic taxon. Both books are clearly written and organized, well indexed, and referenced by chapter; both conclude, among other things, that long-distance migratory birds, in particular, are vulnerable to present and future effects of global warming; and both acknowledge explicitly the importance of interactions between global warming and other global change phenomena in threatening mass extinctions involving birds. This is where the resemblances end.

As a single-authored book, Cox's is the more cohesive and consistent in structure and content, and it is by far the more accessible by targeting a general audience such as bird watchers (land managers and conservationists too, in my opinion). Cox's consistently succinct chapter summaries are helpful, as are the many well-designed tables and an appendix of common and scientific names of all species mentioned in the text. I understand Cox's choice to include just a list of references for each chapter without specific literature citations, given his audience, but I found it frustrating to link some assertions with their sources.

I like Cox's fundamentally optimistic take—hopefully not misguided—"that many migratory birds exhibit a high degree of ecological and evolutionary adaptability and that many are now showing rapid adjustment to climate change" (p. ix), but he acknowledges that those species that cannot adjust are likely doomed (e.g., some long-distance migrants). His book treats migratory birds comprehensively, with many chapters organized geographically (all continents and both hemispheres) and taxonomically, including seabirds (three chapters), raptors, shorebirds, waterfowl, and tropical (e.g., elevational migrants) as well as high-latitude terrestrial migrants. He attempts where possible to link changes in birds' behavior and ecology (phenology, migration routes and ranges, population sizes) to what's known about climate fluctuations, including El Niño–Southern Oscillation (ENSO), the North Atlantic Oscillation (NAO), the Pacific Decadal Oscillation (PDO), and long-term changes ("regime shifts") in some of these climate patterns.

Cox's book includes treatment of the taxonomy of migration in birds, an overview of climate change patterns globally, as well as other global change threats to birds—also treated, albeit less thoroughly, by Møller et al. Cox is careful to include discussion of diverse effects of greenhouse gas emissions and global warming, including changes in rainfall (e.g., in the subtropics), extreme weather events, and even effects of CO_2 acidifying the oceans. The final four, more synthetic, chapters focus on evolutionary adaptability in land birds and water birds (chapters 17 and 18, respectively), the capacity for migratory birds to adjust to climate change (chapter 19), and conservation priorities (chapter 20). This final chapter (based on earlier chapters) highlights the current plight of seabirds (44% of the 311 endangered migrant species on the 2008 IUCN Red List) due to changing ocean conditions and prey base. About 8% of the endangered migrants are land and water birds, mostly in the Asia-Pacific region. Cox also calls attention to the plight of shorebirds (especially tundra breeders), nomadic species (of Asia, Africa, Australia), birds breeding on oceanic islands (due to sea level rise), and cloudforest migrants; but he also acknowledges the plight of the far more speciose resident, especially tropical birds. His conservation recommendations include expanding on existing monitoring programs (well described), enhancing corridors and stopover areas, anticipating with new preserves the geographic ranges to which migrant birds are shifting, developing an assisted range adjustment program for species that cannot keep apace with the geography of climate changes, and increasing protection of colonial birds' nesting and roosting areas (against human harvesting).

If Cox's book is the "lite" version, Møller et al.'s is anything but lite. Møller et al. bring together many of the most talented, active ecologists and evolutionary biologists in western Europe (77% of authors) and North America (the other 23%) to address the effects of climate change on birds in general, and this abundant talent helps account for this book's more complete and more recent references (many from 2008–2010) compared with Cox's book. Møller et al. capture the intellectual excitement of an explosively expanding field. The intended audience, appropriately targeted by most chapters, is scientists and graduate students, making this an ideal starting point for new avian–climate research programs. Considerable credit for the strengths of the book go to Møller—lead editor, author, or co-author of five chapters, conscientious reviewer of many chapters, and the contributor of many groundbreaking discoveries (and collaborations), many of these contributions based on his long-term studies of Danish Barn Swallows (*Hirundo rustica*). In addition, many chapters are state-of-the-art reviews of important methods and contributions the other authors are making to the field, and many chapters emphasize how important multiple, integrated, and novel modeling methods will be to this field (some chapters are technically challenging). Many authors recognize that understanding and predicting the future of such complex, global physical–biological systems that affect and are affected by bird populations and communities will require diverse new tools.

Møller et al.'s book is also a sobering account of just how much less we know about climate-change effects on birds than we thought, and how challenging it will be to improve our toolbox, our models, and the science. Lacking space to describe all the chapters—none are duds, and many emphasize the need to develop more biologically based, mechanistic models—I will highlight just a few. Hurrell and Trenberth (prominent climate

researchers) provide a fascinating review of some complexities of Earth's climate changes and fluctuations. Sheldon emphasizes how challenging it is to distinguish microevolutionary change from phenotypic plasticity, asserting that

> I am not aware of any study published [in birds] which has established that a change in the mean phenotype is due to evolution caused by climate change, although there are several that have demonstrated that marked phenotypic changes related to climate change are not explained by evolution…. (p. 159)

Such precaution is also evident in Newton's (2008) chapter on climate change in migratory birds, but not in Cox's book. Sheldon's and Both's chapters, among others, emphasize the different responses to climate even within species over short distances. Different authors help us appreciate how—rigorously—to identify avian population trends in relation to climate (Lindström and Forchhammer), recognize real changes in geographic range (Brommer and Møller) and migration timing (Lehikoinen and Sparks), and determine population consequences of climate forcing (Saether and Engen) such as how synchronously populations fluctuate spatially, and whether species belong to the "tub" or "tap" category. A chapter on host–parasite interactions (Merino and Møller) is one of several that acknowledge the need to include in our models the complexities of species interactions, in contrast to most habitat-suitability models and other single-species approaches (well reviewed by Thuiller and Münkemüller).

Møller et al.'s book suffers from a lot of typographical errors and considerable repetition among chapters (e.g., multiple references to the interaction of invasive malaria and warming threats to endemic Hawaiian birds). Taxonomic and regional biases of the authors are also fairly obvious: besides Barn Swallows, we hear much about Great Tits (*Parus major*), Blue Tits (*P. caeruleus*), and Pied Flycatchers (*Ficedula hypoleuca*).

Both books, but Møller et al.'s in particular, identify in every chapter numerous foci for future effort, and the latter's penultimate (conservation) chapter (Miller-Rushing, Primack, and Sekercioglu) is excellent. Sadly and ironically, despite the desperate need for further research toward understanding the effects of probably the most decisive experiment in human history, including the incredibly complex ways this experiment will affect birds and their ecosystems, funding for this kind of research is drying up because of budget crises and growing opposition to inconvenient science by a powerful political-industrial complex (especially in the United States; see Oreskes 2010, Sherry 2011). I hope that both these books will rouse diverse audiences to increase conservation of birds on the basis of improved scientific understanding of their responses to global change.—Thomas W. Sherry, *Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, Louisiana 70118, USA. E-mail: tsherry@tulane.edu*.

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Evolution and Taxonomy of White-cheeked Geese.—Bertin W. Anderson. 2010. AVVAR Books, Blyth, California. vi + 495 pages, many tables, graphs, and figures, and 23 colored plates of dorsal and ventral views of specimens. ISBN 0970850441. Paperback, $30.00.—A third shoe has fallen with the publication of Anderson's evaluation of H. C. Hanson's 193 subspecies of white-cheeked geese (i.e., Canada Geese [*Branta canadensis*]). The first two "shoes" were volumes written by Hanson and principally edited and privately published by Anderson (Hanson 2006, 2008). Hanson, working for the Illinois Natural History Survey and largely supported by the U.S. Fish and Wildlife Service, spent most of his life studying white-cheeked geese and worked toward a better taxonomic understanding that would be of aid in management of this morphologically complex species. A fourth volume is in the offing.

Chapter 1 of the current volume reviews the taxonomic history of white-cheeked geese, although many would question some of the authorities cited, and sets the goal of objectively determining whether a case can be made to support Hanson's major conclusions. Chapter 2 is essentially the methods section, describing the scoring system that Anderson used to quantify plumage color and patterns. For his analysis, Anderson used 16 plumage characters that were assigned values of "1 or =/> 3," although in table 2.1 where these are defined, they are given values of 1–3, 1–4, 1–5, and 1–8, with intermediate values used if needed for plumage characters. Standard measurements and a series of bill measurements were taken and ratios were used (particularly ratio of toe length to tarsus length—in three of Hanson's species of large geese these were >1.0, whereas in Arctic geese these were <1.0). He proposes six size classes (SC) from 1 (*minima*) to 6 (*maxima*). About two-thirds of specimens within a given SC were separable from those of an adjacent SC for any given measurement, and >80% could be distinguished with the use of several measurements. Chapters 3 through 6 discuss size-class variation within age and sex classes, the effects of sample size (a sample of <10 was virtually useless using his methodology), the reproducibility of plumage scores, and the taxonomic value of migrant specimens. He concluded that (contra opinion in the literature) migrants, who often formed the bulk of the specimens of a sample, are highly useful. He demonstrates, with ample statistical support, that current nomenclature does not accurately reflect the morphological variation found