The Selborne Pioneer: Gilbert White as Naturalist and Scientist, a Re-examination

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Reviews

Edited by R. Todd Engstrom

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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A Red Bird in a Brown Bag: The Function and Evolution of Colorful Plumage in the House Finch.—Geoffrey E. Hill. 2002. Oxford University Press, New York. xiv + 318 pp. ISBN 0-19-5148487. Cloth, $65.00.—Why are star-forming galaxies red? Because enormous dust clouds absorb light of shorter wavelengths that is then re-radiated at longer wavelengths. By analyzing that phenomenon, one can learn about the origin and behavior of stars and galaxies and, ultimately, the universe. Why are male House Finches (*Carpodacus mexicanus*) red? Because carotenoid pigments, acquired through the diet and deposited in the feathers, absorb the shorter wavelengths of the white daylight, whereas longer wavelengths are reflected. By analyzing that phenomenon, one can learn about the origin and behavior of birds and other living creatures including, ultimately, ourselves.

There are people (and funding agencies) that find the first of those questions fascinating and worth the enormous cost of a VLT (Very Large Telescope), while considering the second question uninteresting, even at the minor expense of RFB (Regular Field Binoculars). But there are also many people that, like me, would argue that the red forehead of a backyard bird has more interesting things to teach us than does 10-billion-year-old starlight.

I start this review in a somewhat confrontational way because the title of Geoffrey Hill's book, *A Red Bird in a Brown Bag*, implies the almost apologetic attitude that many behavioral ecologists have towards their study topics as compared to "real science" like astronomy or biochemistry (try to imagine an astrophysics book entitled *A Red Dot in a Huge Telescope*…). Luckily, there is nothing apologetic inside this tribute to the fascinating puzzle of evolutionary biology in general, and animal coloration in particular. Let us just hope that, despite its title, this book reaches the broad readership it deserves.

Geoffrey Hill takes us on an enjoyable personal and scientific journey, from how he first decided on House Finch plumage coloration as a Ph.D. project 16 years ago, through the many aspects of this problem that he and his students have tackled over the years, to the current frontiers in the study of avian plumage coloration. As a matter of fact, the House Finch *is* the frontier in many ways: Looking back at all the mechanisms of avian color signaling for which these little birds, in the hands of Hill and his collaborators, have been the first (and quite often the only) model system, it is no exaggeration to say that the field would be seriously set back if the House Finch proves to be an exception rather than a general example. Then again, even if the House Finch turns out to be one of a kind in some features, it has still provided a large number of novel hypotheses and testable predictions.

Personal memories and stories make great spices in scientific monographs, but there is always a risk of diluting or even concealing the scientific message. Hill has solved this nicely by keeping the ingredients apart, starting each chapter with a short, amusing anecdote (I especially liked the one about the merciless Terminator working undercover as a suburban dentist), before switching to focused and nicely illustrated accounts of the chapter topics—from pigment physiology and nutrition to sexual and social behavior, ending with comparative tests of sexual selection theory in the chapter, "Why red?". The book is a pleasure to read from start to finish, but it also has enough repetitions of results and conclusions between chapters to allow readers with a more narrow interest to dive straight into the section of their choice.

The first chapter, on Darwinism and "Wallacism," describes how the views of dazzling bird colors have changed from divine creation (a "part of God's plan," as young Geoffrey was told by his mother) to the current models of sexual selection and visual signaling. The important contribution of Alfred Russell Wallace is emphasized. Although he rejected, almost ridiculed, Darwin's idea of female mate choice, he identified several of the other currently discussed adaptive significances of plumage coloration. Ironically, Wallace was also the first to suggest the link between color intensity and vigor that is now a central assumption of the sexual selection theory he dismissed.

After a chapter on general "housefinchology" and methods, filling in useful details for which there has been no or too little space in journal papers, the third chapter is devoted to color vision and color quantification. This is an important foundation for the chapters to come, not least to make sure that younger students, brought up in the age of portable spectrometers, do not dismiss the early House Finch research as flawed by its subjective color scoring. Hill makes a good case for the relevance and repeatability of his use of human color space, in the first years with color charts and more recently via tri-stimulus values measured with a miniature and rather low-resolution (10 nm segments) spectrophotometer, the Colortron. However, in my opinion (colored, of course), this chapter could have been a few pages longer and even more convincing. Why not use reflectance analyses directly to demonstrate in what way and how well the human color scoring captures objectively measured and computed parameters. Researchers familiar with spectrometry and colorimetry will know this, but there might be many readers (not to mention reviewers and editors) that dogmatically reject any animal color study without reflectance. (Somewhat reminiscent of how every comparative result without phylogenetic control was treated 10 years ago.)

For example, ultraviolet (UV) vision is waved off as insignificant in this system because House Finch plumage reflects very little in UV. This is illustrated with a reflectance figure (the only one in the book), showing spectra from one red and one orange male that indeed are less intense in the UV. But what counts in color perception are relative differences, and here I would have liked to see reflectance variation with averages and standard errors, just as we demand of biometrical data. Supposedly, there would be a reassuringly small variation in UV compared to the variation in position ("hue") or steepness ("saturation") of the "red" slope. Furthermore, correlations between such variables and the human-subjective measures reported throughout the book would better back up their biological relevance. Yet, those are minor problems for the simple reason that most results are positive—even conservative—in the sense that, for example, mating preferences, effects of diet supplementation, parasites, and so on, have emerged despite (not because of) the human-subjective color scoring. The more overarching risk of Type-II errors seldom applies, and I can not help but envy the striking plumage variation in this species, from drab yellow to bright red, clearly visible to man and bird alike.

The second part introduces the central theme: the proximate control and signal function of carotenoid pigmentation. Although the dietary origin and physiological importance of carotenoids was known several decades ago, and their potentials as quality advertisements had been shown by John Endler, it was Geoffrey Hill that profoundly introduced those red-hot ideas to behavioral ecology. In chapter 4, he explains what carotenoids are and how they are acquired, metabolized, and deposited in the plumage. In the preface, readers without interest in such proximate details are advised to skip over this 'technically challenging' chapter, but I would encourage everyone seriously interested in animal color signaling to read this chapter carefully. Apart from a minor error in a figure (should be only one hydroxyl group on beta-cryptoxanthin) and maybe too-sweeping conclusions about metabolism and storage, this is a uniquely accessible introduction to the biochemical basis of avian carotenoid signaling in the wild, with the House Finch in focus. Its red color results from a mixture of 13 different carotenoids, some direct-deposited and some metabolically modified. A "red" pigment (3-hydroxy-echinenone), produced from a dietary "orange" pigment (beta-cryptoxanthin), is shown to be the main determinant of plumage redness ("hue"), thereby linking a particular carotenoid to the sexually selected color variation. This is the obvious way forward to better understanding of selection and constraints on carotenoid signaling. Better, that is, than the already amazingly complete picture of the House Finch system.

The rest of Part Two is a welcome review of how this picture has been painted, step by step, by feeding experiments to identify the nutritional and physiological control of coloration mentioned above, and by mate-choice trials and correlates of pairing status in the wild that point to mate attraction as the main advantage of being red. It is pleasing to have the many carotenoid supplementation experiments, with and without the influence of parasites or food stress, strung up on one line to show how several mechanisms interact to make the red pigmentation an honest ("uncheatable") signal of health and condition. At the end, Hill reviews the recent ideas of direct tradeoffs between the antioxidant and coloring functions of carotenoids. He finds this unlikely to be important, as judged from the often excessive levels of carotenoids in bird blood, and from the lack of effects of carotenoid supplementation on immune responses in a experiment on goldfinches. A recent study of Zebra Finches (*Taeniopygia guttata*), however, found the opposite to be true, so this debate has only just begun.

As regards sexual selection and fitness consequences in the wild, the results are fewer and more incomplete, but served together, and with additional, unpublished data, the story is convincing. Over several years, successfully paired House Finch males had redder color and (when measured) larger and more symmetrical color patches. A positive correlation between male redness and offspring production also corroborates the indications that colorful males pair earlier, with higher quality females, and feed their young more, in addition to the famous initial relationship with food provisioning to the incubating female.

Sexual selection also operates through direct competition among males for access to females or resources that attract females. Status signaling can thus be an alternative or additional function of a sexual "ornament." The House Finch is unusual in that the two processes seem to oppose each other (i.e. brown males are subordinate to red males, at least in aggressive competition over food). Chapter 9 reviews the work that shows that brown plumage is not a status signal in itself and that no simple explanation can be found in testosterone levels; despite positive effects on dominance and negative effects on coloration in captive flocks, testosterone levels were higher in red than in drab males in the wild.

The third part takes on the ultimate goal of evolutionary biology, to explain organic diversity—in this case, the variation in ornamental coloration among populations and subspecies. A historical account of House Finch taxonomy and biogeography is given as background to 12 geographical populations that are analyzed with respect to color and extent of pigmentation. In the last chapter, Hill describes the current runaway and indicator models of sexual selection together with his own "combo" model of honest signaling and stasis interrupted by periods of cheating and runaway elaboration. By mapping patch sizes and female preferences (established in captivity) onto a tentative phylogeny, he then attempts to distinguish between those processes in trait elaboration. Although some readers may not agree with some of the predictions or interpretations, this is an inspiring and thought-provoking concluding chapter. Concluding the book, that is, not the research project. No way. Not even a sign that it was slowed down by this book project.

In the epilogue, Hill describes the exciting new directions that the study of this and other colorful birds is now taking, in particular the refined analyses of selection on multiple signal components, and of carotenoid biochemistry and nutrition. Finally, Hill expresses the standard wish that "this book will serve as a starting point for future research," and it certainly will. Just follow that taxi.—Staffan Andersson, *Department of Zoology, Göteborg University, Sweden. E-mail: staffan.andersson@gu.se*

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Geographic Variation in Size and Shape of Savannah Sparrows (*Passerculus sandwichensis*).— James D. Rising. 2001. Studies in Avian Biology No. 23, Cooper Ornithological Society, Allen Press, Lawrence, Kansas. 65 pp., 11 tables, 21 figures, including 1 map and 2 appendices. ISBN 1-891278-28-X. Paper, $7.00.— James D. Rising, author of two other major papers on the morphometrics of Savannah Sparrows (*Passerculus sandwichensis*) (Rising 1987, 1988), coauthor of the Savannah Sparrow species account for the Birds of North America (Wheelwright and Rising 1993), and author of a field guide to the sparrows of the United States and Canada (Rising 1996), has now written a monograph on geographic variation in the size and shape of Savannah Sparrows. The work is based on the remarkable collection of more than 2,200 skeletons that he has amassed at the Royal Ontario Museum in Toronto. The 65 localities for those specimens span large areas of North America, from northern Canada and Alaska to the northeastern United States, through the central Great Plains and the highlands of the western United States, along the Pacific coast into Mexico, and south to central Mexico. The appendices give summary statistics by sex and locality for 24 skeletal measurements of birds from 45 localities. The availability of this extensive data set is an important contribution to ornithology in North America.

Rising's approach to data analysis, as in his previous papers, is almost entirely multivariate. After performing a principal-components analysis (PCA) on the correlation matrix among the measurements of the bones, he plotted the average scores for each locality in a graph, interpreting PC1 as a general size variable and PC2 as a general shape variable. That graph shows his main result. Savannah Sparrows are exceptionally large on Sable Island, Nova Scotia (the home of the subspecies *P. s. princeps*), on Umnak Island in Alaska, in the Aleutian Islands generally, and out on the Aleutian Peninsula. Along the Pacific Coast, the size of Savannah Sparrows increases southward. Those resident Savannah Sparrows have proportionately shorter wings than birds elsewhere. Their bills are especially large in the salt marshes of Sonora and Sinaloa in Mexico. In comparison, Savannah Sparrows across the interior of North America show very little geographic variation in size. The larger birds in Nova Scotia and the smaller ones in Utah differ by only 2 mm in average length of the tibiotarsus, a good univariate indicator of size. Using a reduced set of variables and localities, Rising performed a discriminant-function analysis of non-salt-marsh populations and a stepwise discriminant function analysis of salt-marsh populations. Then, to look for covariation between morphology and climate, geography, and the number of potentially competing species, he calculated correlations and multiple regressions. In those cases, for morphology he used the derived multivariate scores for his size axes (PC1, DF1) and shape axes (PC2, DF2). Finally, he calculated principal components for a set of environmental data for the same localities and correlated environmental and phenotypic PC scores, ran a canonical correlation between the two matrices, and performed a Procrustean analysis. He concluded that Savannah Sparrows are smallest in dry areas where maximum summer temperatures are highest (which turns out to be at high elevations in the west) and largest on cool moist islands. The birds tend to be small where more species of potentially competing sparrow-like birds are present. A further conclusion is that only *P. s. sandwichensis* and *P. s. princeps* should be retained as subspecies of non-salt-marsh populations. Evaluation of relationships among the nine subspecies of Savannah Sparrows in the western salt marshes awaits the results of ongoing biochemical studies being conducted in collaboration with Robert Zink.

Rising's general conclusions from skeletal data support previous descriptive work on the basis of study skins but not carried out at such a comprehensive scale. Had he included his data from the study skins of those same specimens, he could have added analyses of geographic variation in the external morphology of the wing, tail, and bill, each of which is likely to have important ecological relevance. Two weak aspects of this work are its omission of any discussion of allometry, the covariation of size and shape, and the neglect of the likelihood that a substantial fraction of the shape variation in a morphological data set is included in the first principal component. Also, because he uses correlations between component scores and values of the original measurements to interpret principal components, rather than the coefficients of the PC equation, Rising's interpretations of principal components reduce to univariate relationships (Rencher 2002).

After the discriminant analysis and comparisons with environmental variation, Rising interprets his results as not following Bergmann's Rule, which he defines, in the way so many others do, as a relationship between size and latitude rather than a relationship between size and gradients in the temperature–moisture regime, which may well be independent of latitude (James 2001). His multivariate results find the smallest birds to be in high dry sites in the west. Even so, others have concluded that the smallest Savannah Sparrows are along the humid coast between Vancouver Island and northwestern California (Peters and Griscom 1938), and Rising's own sample of females from Hoquiam, on the Washington coast, have the smallest femurs and tibiotarsi of any of his samples. The data from coastal prairies and marshes seem to contradict the argument, made for other populations, that size increases with cooler and more humid environments.

The general pattern of geographic variation in Savannah Sparrows rangewide looks like three separate systems of covariation: the larger-on-cool-moist-islands system, the west-coast prairies and salt marshes system, and the system across most of the North American continent. By interpreting those three, perhaps separate, phenomena in one graphic space, Rising may be confounding some interesting within-system allometric phenomena. For example, in the salt-marsh populations, which tend to have slender bills, the bills become even more slender as the birds get larger along the southwestern Mexican coast. Those shape differences are hidden within Rising's first principal components and his first discriminant functions.

This publication is an important step toward characterizing intraspecific geographic variation in a widespread species. Unfortunately, even more samples and further analyses may be necessary before geographic variation in the size and shape of the Savannah Sparrow can be fully characterized and fully reliable inferences made about its environmental correlates.—Frances C. James and Jason G. Mezey, *Department of Biological Science, Florida State University, Tallahassee, Florida 32306-1100, USA. E-mail: james@bio.fsu.edu*

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The Selborne Pioneer: Gilbert White as Naturalist and Scientist, a Re-examination.—Ted Dadswell. 2003. Ashgate Publishing, Hants, England, and Suite 420, 101 Cherry Street, Burlington, Vermont

05401-4405. xviii + 238 pp., 13 black-and-white plates. ISBN 0-7546-0749-6. Cloth, $79.95.—Gilbert White lived (1720–1793) in the agricultural village of Selborne, England, where "the human ecology was continuous with the non-human." The eldest of seven surviving children, his fishing and hunting as a young man "paved the way" for natural history, while gardening "gave him his naturalists' apprenticeship." He was also an Anglican cleric, a poet, and as Dadswell makes clear in this book, a remarkable pioneering naturalist and clear-headed scientist.

White has been known primarily for the literary achievement of his *Natural History of Selborne*. Ironically, that work has enjoyed a worldwide readership over the centuries primarily because it was thought to be unscientific. Now, after the blossoming of ethology and behavioral biology of animals in the wild, it seems instead to have presaged those disciplines.

White became known for his seemingly pedantic measuring to exact detail and his unconventional approach to problems. Much was said of his shouting through a megaphone at his pet tortoise, Timothy, and several writers have (incorrectly) extrapolated that he "played the trumpet" to his bees. He measured the size of hailstones to document what he meant by "large." Perhaps equally bizarre to 18th-century contemporaries was his detailed record-keeping of several species of crickets and the swallows of his district. His primary contribution was his combining of original field observations of birds with a scientific experimental approach to problems. However, a mythology of White evolved, in which his reputation grew as a quaint childlike observer of local trivia. He was said to be contented and a "bit lazy," with "no philosophical ambitions" and "never a victim of introspection."

Classification and physiological research dominated the zoological and botanical sciences in his time. Specimens were collected, described exactly, and named, and they were cut apart, often while still alive. White was little interested in those endeavors and he was the first to concentrate on the life and manners of animals, especially of birds, in the field. Despite his avowed disinterest in the then predominant scientific fashion of nomenclature, he nevertheless identified 440 wild plants and 120 species of birds in his immediate neighborhood. He added the noctule bat and the harvest mouse to the list of British mammals, and he was the first to distinguish the three morphologically similar "leaf warblers," now called the chiff-chaff, willow warbler, and wood warbler, by their songs and habits.

He may or may not have influenced ornithologists in the two centuries after him, but there is no question that he preceded them in trying to solve problems that concerned us not until the first half of the 20th century, and occupy us even now. To him, the annual disappearance of the swallows was a burning problem, though it was no problem at all to his contemporaries who were convinced they hibernate under the mud of local ponds. Aside from his long-standing studies of bird migration, other problems that occupied him include the function of winter flocks of finches, parasitic habits of the cuckoo, bird song dialects, "dispersion" or territoriality, gregariousness and fighting (in rooks), seed dispersion (jays and magpies), instinct and its functionality, and courtship feeding. Through his quantifying and questioning, he maintained patience and a restraint from making generalizations and coming to conclusions where the evidence did not warrant. He warned against the pitfalls of analogy (as Lorenz would do as well) and he challenged the authority of reason, appealing to thorough empirical observations.

His reliance on and presentation of empirical observations presented in detail, though perhaps pedantic then, make his work timeless now. His measuring of the number, kinds, and probable ages of trees in a small woodlot seem modern, as are his description of bird densities in his time (starlings, common now, were scarce then, whereas stone curlews, now rare, were common). The chiff-chaffs arrived punctually almost to the day (20–23 March). Do they still?

Given his many-faceted and seemingly contradictory life and science—only now becoming clearer through the lens of modern biology—it is perhaps not surprising that many myths and misconceptions have attached themselves to Gilbert White. Dadswell cites a recent example concerning earthworms. In 1984 a broadcaster remarked on the air that: "the old naturalist Gilbert White hated earthworms and wanted to get rid of them, unlike Charles Darwin who wrote a book in their defense." The truth is quite different. A century before Darwin's work on earthworms, White had elaborated on their importance. He described them as "a link in the chain of nature [who] if lost, would make a lamentable chasm" because they are "food for half the birds and some quadrupeds," and they "turn soil" and "by their ceaseless boring, contribute greatly to its [soil] drainage and aeration." Furthermore, "they draw leaves and grass into their holes, and manure the soil having eaten this vegetable material. Humble but innumerable, worms are the greatest promoters of vegetation, which would proceed but lamely without them."

White watched earthworms at night with candlelight as they pulled vegetation into their burrows. He was the first to discover their hermaphrodism. At the end of his paper on worms he says: "A good monograph on worms would offer much entertainment and information at the same time, and would open up a large new field in natural history."

Darwin read Gilbert White with pleasure, but when his book on worms came out a century later (and largely mirrored what White had written) there was only a brief, dismissive mention of his predecessor.

Gilbert White has not been dismissed over the past 200 years. *The Natural History of Selborne* (1789) has appeared in 200 editions and been translated into more than a dozen languages. He has been repeatedly resurrected in our cultural archives. However, the point of Dadswell's book on White is to make the case that White was not the "naïve" and "childlike" or "childish" man he has been portrayed as. Instead, Dadswell insists: "to describe White as less than a rigorous and highly original naturalist is to quite misrepresent both the man and his work."

I had not read Gilbert White, and after reading this book I felt chastised: I should have read him. I felt I was reading about a kindred spirit, whom I would like to have known. He reaches across the seeming abyss of two centuries. Dadswell contrasts White with his contemporaries by presenting short passages of their own writing in five appendices. The first of those is Stephen Hale's account (1733) of "tying a middle sized dog down alive on a table, and having layed bare his windpipe" and proceeding from there on his "experiment" on breathing (I will spare the details). When "matters were preparing for (an) additional experiment," Hale continues, "the dog dyed." This account encapsulates the then grossly lacking understanding of and attitude toward animals, and gives me increased respect for White's supposedly "anti-experimental" approach, which was in fact precisely the opposite. He was the quintessential scientist who is aware of his subject. Although he made no great overt show about "controls" and did not even use that language, his use of controls through the comparative method to neutralize variables not tested is apparent in most of the questions he asked (although they occur so naturally as to appear accidental).

The second appendix, by Mark Catesby, is on "Bird Migration as a Fact?" (1748). It was published in *Gentleman's Magazine* (presumably even then not the premier ornithological journal). It seemed to me as being far beyond its contemporaries. Perhaps, not surprisingly, all of it is dismissed by the well-known indoor ornithologist Daines Barrington (who made significant experiments on bird song) in his "Report of Torpid Swallows" (1781). In this third appendix, Barrington uncritically supports the notion of swallows hibernating in the mud. This paper now sounds like pure drivel. I suspect it helps explain why Gilbert White was not recognized by his peers and showed no evidence of caring.

The fourth appendix, "The Sin of Cruelty" (1776 and 1992) by Humphrey Primatt, concerns the "proof of the goodness and providence of God" in providing us with the "brutes" (domestic animals) who are made to be dumb and senseless and strong so as to "be useful unto men." This essay is a chilling reminder of a (to us) scarcely conceivable imbecility, invoked in the service of a good cause, which White had to deal with in many cases of superstition (that he encountered and countered with ridicule).

Finally, the fifth short appendix, William Paley's (1803) "Design in Shell-Bearing Animals" gives a glimpse of the then-rampant condescending gibberish on the alternative to adaptation that White faced (and that we still face), but for which he offered no alternative. White's restraint is exemplary, because there was, then, simply no alternative: he did not know what we now know. He stuck to the facts, rather than speculating.

I personally found those five short (total seven pages) appendices the most potent reminder of what White faced, and hence what kind of a man he was, and what he achieved. They speak volumes. Although Dadswell alludes to the British 18th-century intellectual background, I felt more could have been said explicitly to make his case. As it is, White is presented almost as though he were a behavioral biologist of the 21st century. That is understandable, however, because he would easily have fit in with behavioral ecologists today.

Dadswell wrote his book because he felt that, given what we now know (especially from behavioral work on birds over the past 50 years), Gilbert White had been misrepresented. Dadswell concludes:

> White's recent successors may or may not have been aware of him—[but] they have re-run most of his inquiries and tried out most of his suggestions. In the process, they have shown him to be an extraordinary pioneer, and more than this, a largely justified one.

White helped pave the way for Darwin's insights on evolution (and earthworms) a century later, and for behavioral biology a century after that.

White considered his "the enlightened age," as perhaps does every age. I suspect that, a century from now, we will have progressed as far in the consciousness-versus-automata debate as White's hypothesis of migration has progressed against the (then much more reasonable) hibernation-in-the-mud hypothesis—to which he kept an open mind—in the centuries since his death.—Bernd Heinrich, *Department of Biology, University of Vermont, Burlington, Vermont 05405, USA. E-mail: bernd.heinrich@uvm.edu*

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Parasites and Diseases of Wild Birds in Florida.—Donald J. Forrester and Marilyn G. Spalding. 2003. University Press of Florida. Gainesville, Florida. 1,024 pp., 256 figures, 494 tables, 59 drawings, bibliographies, index. ISBN 0-8130-2560-5. Cloth, $125.00.—This book is fantastic at providing extensive information on the parasites and diseases of 311 of the 457 species of birds that occur in Florida or its offshore waters.

The book commences with a definition of disease and a table of the fundamental categories of morbidity and mortality in wild birds and is followed by chapters based on individual species or groups of similar birds. Those categories are used to outline each chapter, which makes it very easy to find specific material throughout the book. A "Summary and Conclusion" at the end of every chapter puts the various diseases and parasites into perspective, giving the reader a concise picture of which diseases and parasites are most important for a species. Each chapter contains numerous tables, including (but not limited to): parasites reported, residue levels of various toxins, and infectious agents for a species. There are also numerous photographs depicting gross and microscopic lesions for the pathologically inclined. Although this book emphasizes wild birds in Florida, the scope is much broader than the title would imply. First, many of the birds discussed in this book occur outside of Florida, so it will be of interest to a much wider audience than just Floridians. Second, each chapter is extensively referenced with information gathered anywhere those birds occur and a wealth of unpublished data that cannot be found elsewhere. It is doubtful that such extensive information on so many species of birds can be found in any other text. This book will be a welcome addition to the personal library of anyone working with birds and is a must for all university libraries. Forrester and Spalding have created a masterpiece.—Elizabeth W. Howerth, *Department of Pathology, College of Veterinary Medicine, University of Georgia, Athens, Georgia 30602, USA. E-mail: ehowerth@vet.uga.edu*

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A Passion for Wildlife: The History of the Canadian Wildlife Service.—J. Alexander Burnett. 2003. UBC Press, Vancouver, British Columbia, Canada. xiii + 331 pp., 66 photos. ISBN 0-7748-0960-4, cloth. 0-7748-0961-2, paper. Cloth, Canadian $85.00. Paper, Canadian $27.95.—This intimate historical account was contracted in 1996 by Environment Canada to naturalist–writer Burnett, who interviewed more than 120 present and former Canadian Wildlife Service (CWS) employees of the 1947–1997 period. Each of the 10 chapters addresses a major topic, followed by a brief account of the chief activities of a five-year period. For example, chapter 1 is on "The Genesis of the Canadian Wildlife Service," followed by highlights of the 1947–1952 period: "Setting the Wildlife Agenda." The other nine chapters cover the history of enforcement; work with birds, mammals, and fish; habitats; education; toxicology; endangered species; and legislation.

I will discuss the bird chapter in detail. Ornithology "stood out as the pre-eminent scientific concern of the agency." We learn that Hoyes Lloyd, who had retired in 1943 as Supervisor of Wild Life Protection after 25 years of service, was serving as American Ornithologists' Union (AOU) President, 1945–1948, and that Fred Cooke (current AOU President) received the AOU's prestigious Brewster Award in 1990. The four men Lloyd had recruited as Chief Migratory Bird Officers—Robie Tufts, Jim Munro, Dewey Soper, and Harrison Lewis—were approaching retirement when CWS was formed, so the reins soon passed to a younger generation. After a discussion on avian and human interactions, such as crop damage by cranes, Prince Edward Island's Snowy Owl (*Bubo scandiacus*) bounty (paid on 1,092 birds), and hazards to aircraft, the bird chapter logically discusses research and management activities by major emphasis groups: waterfowl, seabirds, shorebirds, and landbirds.

Waterfowl dominated the CWS agenda for at least the first 20 years. Initially, the U.S. Fish and Wildlife Service conducted aerial breeding ground surveys in Canada while CWS provided the ground-truthing. Canada gradually assumed a greater role. After migratory-bird hunting permits were introduced in 1966, samples of hunters were asked to submit wings and to complete hunting-success questionnaires to permit accurate correlation of bag composition data with the number and distribution of hunters. Activities were many and varied (e.g. Myrtle Bateman put numbered neck collars on Canada Geese [*Branta canadensis*]; Gerry Parker used radiotelemetry to track Black Ducks [*Anas rubripes*]). Among the dozens of wildlife biologists mentioned, Graham Cooch, Fred Cooke, Tony Erskine, Bernie Gollop, George Hochbaum, and Alex Dzubin are singled out for their research accomplishments. Establishment of the Prairie Migratory Bird Research Centre at Saskatoon in 1967 was a major event. Another milestone was reached in 1975, when Lynda Maltby's Snow Goose (*Chen caerulescens*) banding team was the first all-female field party ever sent to the Arctic by the federal government.

The author devotes even more space to seabirds than to waterfowl. Through research, education, and legislation, CWS biologists have been reducing the depredations of hunters and egg collectors at Canada's seabird colonies. The effectiveness of the bird sanctuaries established nearly a century ago by Percy Taverner and Harrison Lewis has been extended by the creation of national and provincial parks and wildlife reserves. The survey of seabird colonies on the north shore of the Gulf of St. Lawrence, started by Lewis in 1925, is one of the longest-running seabird databases in the world. Hugh Boyd, Regional Supervisor of Migratory Birds (Research) in Eastern and Northern Canada, is credited with the vision to expand CWS activities to birds other than waterfowl. Les Tuck in Newfoundland was the lone seabird researcher for CWS until publication of his book, *The Murres*, in 1961 laid the foundation for the CWS seabird research program. David Nettleship subsequently worked on puffins, developed standardized census techniques for seabird surveys, and coauthored *The Atlantic Alcidae*. Dick Brown studied seabirds at sea and published the *Atlas of Eastern Canadian Seabirds* and its supplement. Tony Lock did his doctoral research on gulls at Sable Island and became senior author of *Gazetteer of Marine Birds in Atlantic Canada*. In 1974, Kees Vermeer initiated CWS studies on the Pacific coast, where his team published some 55 papers on more than a dozen seabird species. Growing interest in oil, gas, and mineral exploration has provided even greater urgency for the seabird research. Inland, Hans Blokpoel focused on the distribution of colonial waterbirds in the Great Lakes, culminating in the five-volume *Atlas of Colonial Waterbirds Nesting on the Canadian Great Lakes, 1989–1991*.

Hugh Boyd enlisted Guy Morrison to initiate shorebird research in 1973. The Maritimes Shorebird Survey, involving volunteers, documented key concentration sites, and the use of colored dyes at a round-the-clock banding station at James Bay made it possible for observers from Canada to South America to track the migration. Morrison's banding efforts confirmed that shorebirds on northeastern Ellesmere Island winter in the British Isles and rely on resources in Iceland during their return journey in spring. Similarly, the upper Bay of Fundy is critical for southward migration of shorebirds that fly nonstop to South America. The CWS Latin American Program, coordinated first by Iola Price and later by Colleen Hyslop, provided funding for a study to locate important wintering and refueling areas in South America, resulting in Morrison and Ross's *Atlas of Nearctic Shorebirds on the Coast of South America.* As of 2000, 51 Western Hemisphere Shorebird Reserve Network sites have been established, 5 in Canada.

I like to think I was partly responsible for CWS finally hiring a National Coordinator of Non-Game Birds in the winter of 1967–1968. I had started the Breeding Bird Survey (BBS) in the eastern states and provinces in 1966, and extended it to the central states and provinces in 1967, and it would be continent wide in 1968. Canada needed a national coordinator for a landbird program of this magnitude. There was also a problem of how to deal with a growing collection of nest records "without having to export them to the United States." To my delight, David Munro nominated Tony Erskine for this Nongame position. Erskine, well known for his interest in census and atlas studies, also embarked on a project to census songbirds in boreal habitats across Canada, a project that resulted in publication in 1977 of *Birds in Boreal Canada*, the first major CWS publication on songbirds. Experienced BBS observers helped lay the foundations for a wide range of other landbird projects, especially for the various provincial atlas publications, and for Dan Welsh's volunteer-based Forest Bird Monitoring Program.

The book is nostalgic reading for those of us who have known the leaders in Canadian ornithology and conservation through the years. It is well illustrated with action photos, and the nearly 650 documentary footnotes are so inconspicuously referenced as to not distract from the easy flow of the text. The U.S. Fish and Wildlife Service has not yet published a similar historical document to chronicle its activities over the decades. The closest we have come is *Waterfowl Tomorrow* (Linduska 1964) and *Birds in Our Lives* (Stefferud 1966), both of which, though sponsored by the Service, are broader in scope.

A Passion for Wildlife should be required reading for students of wildlife research, management, and protection. It illustrates how dedicated and resourceful professionals generate their own success stories and influence the history of their organization. The abundant references in the footnotes make this volume a valuable tool for researchers. Those of the female persuasion will be distressed by the sexual bias that still persisted among field biologists in the 50th year.—Chandler S. Robbins, *U.S. Geological Survey Patuxent Wildlife Research Center, Laurel, Maryland 20708, USA. E-mail: chan_robbins@usgs.gov*

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