cluding 27 additional authors from the United States, United Kingdom, Canada, Australia, Israel, and The Netherlands. Following an introduction on the evolution of incubation (Deeming), the chapters fit nicely into five topics, the first dealing with structural aspects of incubation and including incubation sites (M. H. Hansell and Deeming), egg characteristics (Deeming), and use of egg components by the developing embryo (Deeming). Chapters on behavioral aspects of incubation include hormonal control (C. M. Vleck), incubation rhythms (Deeming), and parent–embryo interactions (R. B. Brua). Heat is the central theme of the book, and it is covered in chapters on the brood patch (R. W. Lea and H. Klandorf), egg temperature (J. S. Turner), nest microclimate (A. Ar and Y. Sidis), and egg turning (Deeming). Many special situations concerning incubation are dealt with in chapters on the effects of nest microbes on incubation (G. K. Baggott and K. Graeme-Cook), the underground nests of megapodes (D. T. Booth and D. N. Jones), the smallest incubators, the hummingbirds (W. A. Calder III), models of intermittent incubation (F. R. Hainsworth and M. A. Voss), incubation in extreme environments (C. Carey), and the tactics of brood parasites (S. G. Sealey, D. G. McMaster, and B. D. Peer). Finally, ecological and life-history aspects of incubation are treated in chapters on the initiation of incubation behavior and hatching synchrony (P. N. Hébert), egg coloration (T. J. Underwood and S. G. Sealy), energetics of incubation (J. M. Tinbergen and J. B. Williams), and the incubation costs of reproduction (J. M. Reid, P. Monaghan, and R. G. Nager). A brief chapter by D. C. Deeming on areas for future research concludes the book.

The eggs of birds have long been a focus of research, from early studies of vertebrate embryology, summarized decades ago by Alexis Romanoff, to more recent work on physical gas exchange across the eggshell by the late Hermann Rahn and his associates. There has also been the considerable practical matter of maximizing the hatchability of the eggs of domestic fowl in convection incubators, the tradition from which the editor of this book has come. Regardless of how wonderfully convenient the avian egg has been for many areas of biological research, it nonetheless challenges the parent bird to keep the embryo inside at an optimal temperature. That requires a suitable combination of incubation site, nest construction, and application of heat, keeping in mind such constraints as safety of the nest and the parent's own maintenance. *Avian Incubation* admirably brings together highly readable and well-illustrated accounts of those issues, covering research on both domesticated birds and a wide variety of wild birds. It should serve as the starting point for all future studies of incubation, and the sections on ''future research'' at the end of most of the chapters emphasize that there is much more to learn.

From my perspective as an ecologist and evolutionary biologist, I am interested in the extent to which variation in incubation period is determined by the incubating behavior of parents as opposed to intrinsic attributes of embryos, and the fitness consequences of variation in incubation behavior and embryo development. By its nature, an edited book such as *Avian Incubation* has less synthesis between chapters to address such questions than I would have liked. Nonetheless, the overall coverage is broad and thoughtful, and several of the chapters explicitly integrate aspects of incubation through modeling. What impresses me most from reading this book is that the answers to many questions about incubation as a component of life histories demand an understanding of the complexities of the incubation process. For example, unlike a convection incubator, which warms eggs evenly, contact incubation establishes sharp gradients of temperature within the egg, which are greater across large eggs than small eggs. As a consequence, when the parent leaves the nest the initial phase of cooling is dominated by redistribution of heat within the egg rather than loss through the egg surface (Turner). That has implications for the maintenance of embryo temperature and the rhythm of incubation by adults (Hainsworth and Voss), and may explain why recess length increases as only the 0.4 power of egg or clutch mass rather than the expected two-thirds surface rule (Deeming). Also, I was intrigued to learn that gas conductance of Mandarin duck eggs increases during the incubation period as colonies of *Bacillus* bacteria break down the outer egg cuticle (Baggott and Graeme-Cook). What if birds use microbes to help adjust gas conductance (Carey) in parallel with the oxygen uptake and carbon dioxide production of the developing embryo? It would be a nice example of biological engineering!

Incubation and its place in the life history of birds is highly amenable to theoretical, experimental, and comparative analysis, as this book makes abundantly clear. I hope that *Avian Incubation* will inspire young investigators to continue the wonderful tradition of egg and incubation research.—ROBERT E. RICKLEFS, *Department of Biology, University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, Missouri 63121-4499, USA. E-mail: ricklefs@umsl.edu*

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*The Auk* 119(4):1211–1213, 2002

**Who Killed the Great Auk?**—Jeremy Gaskell. 2000. Oxford University Press, Oxford, U.K. xi + 227 pp., 1 color plate, 48 text figures. ISBN 0-19-856478-

3. Hard cover, $40.00.—A quirky title on a magnificent jacket cover and for the most part an interesting read shape the dimensions of *Who Killed the Great Auk?* The poignant, ethereal images of the penguins of the North Atlantic on the jacket crafted by Errol Fuller, artist and author of *The Great Auk* (1999), almost compel one to cradle this book. Using the Great Auk (*Pinguinus impennis*) as the medium, Gaskell weaves lore, legend, and human involvement with the species' fate into an historical and geographic essay with implications for extinction, conservation, ignorance, over-harvesting, ethics, environmental responsibility, and legislation to mention some.

While at times a bit ponderous and tangential, Gaskell demonstrates that the hind-casting of historical exploration and analysis like that of archaeology and paleontology often reward the researcher with new perspectives and on occasion deep understanding—lessons for the present. Such exercises hone the wit of skepticism and heighten motivation to uncover unknown clues and ignored, overlooked, and even unappreciated writings of those who worked during previous centuries. Gaskell does a fair bit of uncovering.

Gaskell squarely blames the Great Auk's extinction on the feather collecting crews in Newfoundland who wantonly slaughtered the flightless birds and others in the absence of effective and enforced legislation. As human conditions change, traditions and codes of conduct change with them. So do attitudes and perspectives. As might been the case for European settlers during the 1700s, Gaskell compares an extended stay on Funk Island with a prison sentence. Such situations might well have created circumstances where the most basic instincts for survival came into play. Gaskell's titling of a chapter on Newfoundland—''Uncouth Regions''—is both inappropriate and uncouth. As pointed out, the devastation of seabirds and other avifauna during the eighteenth and nineteenth centuries was a widespread North American and European activity. It is historically surprising that so little is known about the Great Auk in Europe and in the Northeast Atlantic in general (see Lyngs 1994). There are many discoveries yet to be made.

For centuries and millennia before European incursions, aboriginal peoples also killed Great Auks on Funk Island and elsewhere in eastern North America (Montevecchi and Tuck 1987) and Greenland (Melgaard 1988). Their values were likely different. Today, a research visit to Funk Island is a privileged luxury afforded to but a few (Montevecchi 1994).

As have others, Gaskell uses comparative studies of Razorbills (*Alca torda*) and other alcids to speculate about the behavioral ecology of Great Auks. However, compelling comparisons that can also be made with similarly sized and highly social Adelie (*Pygoscelis adeliae*) and Gentoo (*P. papua*) penguins were not grasped.

The ultimate finality associated with the killing of ''last known'' pair of Great Auks on Eldey Island in 1844 pales in comparison to the act's irrelevance in the species' extinction. Once the population of those very social, highly aggregative, colonially breeding animals was pushed below minimum viable levels, likely before 1800 (Montevecchi and Kirk 1996), the species' fate was sealed. Clearly, the killing of Great Auks cascaded them into the inevitable extinction that followed. As numbers diminished, Great Auks essentially took on the role of highly prized trophy birds for museum curators and for private collectors. Monetary rewards fueled the search for trophies and ensured a relentless pursuit of the remaining individuals of the once robust population. Although the auk's final ignominious eradication was played out through the hands of Icelandic fishermen and the finances of Danish Museum men, some lost and lonely surviving individuals wandered North Atlantic waters well after 1844.

Tragedy often sows the seeds of affirmation. As Gaskell details, the Great Auk's extinction catalyzed in Newfoundland the first conservation legislation in North America and more widely in the British Empire in 1845 (*An Act for the Protection of the Breeding Wild Fowl in this Colony*).

This book is a good read for those with interests in history, ornithology, geography, and their interplay through changing human understanding and misunderstanding. The book will likely find a wide readership in public and university libraries.

So who killed the Great Auk? Lots of people did. The pressing problem as is clear with our interactions with marine ecosystems is that we are still doing so in other ways. Who will save this magnificent creature's legacy and protect the oceans where it once roamed? Jeremy Gaskell is making his contribution.—W. A. Montevecchi, *Biopsychology Programme, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X9, Canada. E-mail: mont@mun.ca*

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*The Auk* 119(4):1213–1214, 2002

**The Birds of the Cayman Islands: An Annotated Checklist.**—Patricia E. Bradley. 2000. British Ornithologists' Union Checklist No. 19, British Ornithologists' Union, Tring, United Kingdom. 253 pp., 71 color plates, 8 figures, 9 tables, 10 appendices. ISBN 0907446-23-X. Cloth, $65.00.—The three islands in the Cayman group–Grand Cayman, Cayman Brac, and Little Cayman—form a semi-isolated archipelago in the western Caribbean roughly equidistant from Cuba and Jamaica. Those low-lying islands together have an area of 263 km$^2$, and compared to their larger neighbors they support a correspondingly depauperate avifauna of 69 extant breeding species, including only 16 passerines. Many groups characteristic of the Greater Antilles such as the todies and *Saurothera* cuckoos are currently absent from the Cayman Islands, and most of the species that breed on the archipelago are widely distributed elsewhere in the West Indies, though a number are represented by subspecies endemic to one or more of the Cayman Islands.

Given the relatively small fauna of the Caymans, one might think that compiling a checklist of the avian species present would be a simple task. Instead, this sophisticated treatment of the Caymans' avian fauna surpasses the scope it its title to highlight the wealth of information now available for even comparatively simple island systems. The core of the book is 143 pages of comprehensive species accounts for all taxa that have been reported from the islands. Those accounts are more detailed than those in a typical annotated checklist, and include comprehensive information on the range, status, and abundance of each species on each of the three islands, including dates and locations of sightings and of breeding activity. For each species, specimens from the Cayman Islands housed in 16 major museum collections are also listed. This checklist summarizes information from all previous ornithological work on the islands and provides a valuable synopsis of information on topics such as habitat distributions, migration dates, and breeding phenologies that will be of interest to a wide ornithological audience.

The 56 page introduction is equally thorough, and provides informative synopses of the history of ornithological exploration and the natural history of the Cayman Islands. This introduction is divided into 12 sections, each of which is essentially a standalone chapter. One section discusses the likely biogeographic relationships among taxa resident on the Cayman Islands and allied populations elsewhere. The resident Cayman Islands species seem to have colonized the archipelago from a number of sources, of which Cuba is not surprisingly the most prevalent. Cayman taxa with particularly enigmatic distributions include the Caribbean Elaenia (*Elaenia martinica*), which is also found on offshore islands in the Yucatan and in the Lesser Antilles but which is absent from the other islands in the Greater Antilles; and the Vitelline Warbler (*Dendroica vitellina*), a species that closely resembles the Prairie Warbler (*D. discolor*) and which occurs only on the three Cayman Islands and on the tiny and highly isolated Swan Island off the eastern coast of Honduras.

Another section that I found particularly intriguing summarizes previous paleontological work on the islands and discusses changes in species composition associated with the increasingly mesic conditions of the early Holocene. Extinct Cayman Islands taxa include a robust-billed finch probably allied to the Cuban Bullfinch (*Melopyrha nigra*), as well as the endemic Cayman Thrush (*Turdus ravidus*) and an endemic subspecies of the Jamaican Oriole (*Icterus leucopteryx*) that persisted into the twentieth century. The combined evidence from the paleontological record and observations of species turnover during historical times suggests that those islands have had a high lability in land bird species composition. That pattern is somewhat difficult to reconcile with the large number (17) of land bird subspecies endemic to the Cayman islands, most of which presumably represent populations that have persisted long enough to differentiate morphologically from conspecific populations on other islands.

Additional sections discuss the conservation status of the Caymans' avifauna. Development pressure is high on all three islands, but especially on Grand Cayman, where much of the dry forest habitat has been degraded and much of the mangrove wetlands are slated for development. Habitat alteration on Grand Cayman presumably contributed to the extinction of the Cayman Thrush and Jamaican Oriole. Less habitat conversion has occurred on Little Cayman and on Cayman Brac, the latter of which supports both an endemic race of the Cuban Parrot (*Amazona leucocephala hesterna*) and colonies of several colonially breeding seabirds, including the largest Red-footed Booby (*Sula sula*) colony in the West Indies. The Cayman Islands were not occupied by humans during pre-Columbian times, and the two smaller islands currently have low population densities. Habitat preservation efforts targeting those