

tributed across vast areas with few people remains an open question. This volume shows that these surveys can be done, and that we can learn much from them. Crucially, though, costs are mentioned only in passing, and largely in the context of comparing breeding-season options. Monitoring via demographic parameters is convincingly dismissed as an unworkable substitute, and the challenges of monitoring at migration sites are described. Counts during the northern winter—an approach widely used to monitor shorebirds elsewhere in the world and the most viable alternative—are barely addressed. Such surveys present substantial challenges, but their pros and cons warrant quantification. Given funding limitations, formally addressing the costs and benefits of alternative strategies remains the biggest challenge for the next 10 years of shorebird monitoring research.

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#### A NATURAL HISTORY OF AUSTRALIAN BATS: WORKING THE NIGHT SHIFT.

By Greg Richards and Les Hall; principal photographer: Steve Parish. Collingwood (Australia): CSIRO Publishing. AU \$79.95. viii + 184 p.; ill.; index. ISBN: 978-0-643-10374-0. 2012.

The authors are to be congratulated for their excellent book about bats in Australia. In eight chapters, the volume covers everything from behavior to echolocation. A travelogue approach indicates what bats occur in what regions of the country. A final chapter provides, for each species, a photograph, a range map, and some specifics. The delicate subject of bats and people is treated effectively, informing readers about the range of public health issues associated with bats in Australia (e.g., Australian bat lyssavirus, Hendra, Menangle, and Corona viruses).

The book is richly illustrated with excellent photographs of bats. Most species are presented in several photographs, giving readers a better impression of just how the animals appear. The different views are instructive. I spent some time looking at the picture of the east coast free-tailed bat on page 31, thinking perhaps the label was incorrect. Another picture of this species (p. 176) gives a more traditional view. Richards and Hall have included several pictures of rock paintings that depict bats with accompanying text that puts the pictures in context.

The photographs, combined with text, also introduce readers to the range of situations in which bats roost, as well as various details of morphology. My favorite is the shot into the open mouth of a flying fox (p. 53). The wealth of illustrations and the readable text combine to bring readers into the world of bats. True to its title, the volume is very focused on

bats in Australia, from the selection of species to the sources that are provided.

The book seems to be intended for a general audience—people interested in natural history and biology. I suspect, however, that bat biologists the world over will be quick to add it to their libraries because of the way it presents the bats and details about them.

Apart from some information about fossil bats found in Australia, the authors are silent on the topic of bat evolution and dramatic changes in their classification. There are a few matters that could be improved upon. For example, Richards and Hall tell us that the echolocation calls of white-striped free-tailed bats are audible to people. This does not match with the assertion that bat echolocation calls are ultrasonic (defined as being above the range of human hearing). The index is not particularly user-friendly; for example, try looking up Hendra (which also does not appear in the glossary). However, these wrinkles do not detract from this excellent book. I highly recommend it to anyone interested in bats.

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#### POPULATION FLUCTUATIONS IN RODENTS.

By Charles J. Krebs. Chicago (Illinois): University of Chicago Press. \$55.00. x + 306 p.; ill.; index. ISBN: 978-0-226-01035-9 (hc); 978-0-226-01049-6 (eb). 2013.

The population cycles of small rodents have been a focus of research for the past 60 years. This book counters the widespread belief that we know how rodent populations are controlled. The purpose of this volume is to define the problem and identify the missing links that must be discovered if a general theory of population fluctuations is to be achieved.

Not all rodent species are treated; population fluctuations of voles and lemmings are central. The selective literature was chosen to illustrate the topics covered in the text. The emphasis is on field studies but enclosure studies are reviewed skeptically; it is not clear how such studies relate to free-ranging populations. The analysis presents critical data to clarify issues of methodology and the formation and testing of hypotheses; experimentation to test the predictions of well-formed hypotheses and the need for long-term research are emphasized.

Each chapter begins with a series of key points followed by a thoughtful analysis and ends with a conclusion. There is some philosophical discussion and comparison of schools of thought; e.g., top-down versus bottom-up control and extrinsic versus intrinsic factors. First, rodent population changes are classified and followed by a chapter on the biogeography of population fluctuations. The next three chapters describe the demographic factors of repro-

ductive and mortality rates and immigration and emigration that increase or decrease population density. Chapter 6 considers the spatial dynamics of populations and the problem of the extent and control of population synchrony. The major question of what factors determine population changes is discussed in the context of the Chitty and Lidicker approaches; i.e., deduction versus induction. The brief discussion of these approaches and that of mathematical models helps clarify thinking about how to gather and interpret evidence. Then follows a systematic treatment of hypotheses for causes of fluctuations: food, predation, disease, self-regulation, and multifactor. A chapter on models for fluctuating rodent populations is followed by chapters that discuss what key studies are needed and present a synthesis of rodent population dynamics that clearly distinguishes two problems: what determines average density as contrasted with the control of population growth rate. Krebs states that the issue of whether for rodent population fluctuations we are searching for a general explanation or a specific explanation for a particular population in a specific area remains unresolved. Because many rodent species are not included, this issue is likely complex. It seems unlikely that the population dynamics of annual breeders and hibernators respond to the same factors as small rodents, except in the most general sense. Most large rodent species do not lend themselves to extensive experimentation such as predator removal or habitat modification. Krebs approaches this dilemma in his final chapter by briefly presenting some ideas that compare the population dynamics of small rodents with that of other mammals.

Anyone interested in the current status of small rodent research or who plans to study the population dynamics of any mammalian species should read this book. Readers are certain to benefit from its insights and clear exposition of where this research should go in the future.

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THE NINE-BANDED ARMADILLO: A NATURAL HISTORY. *Animal Natural History Series, Volume 11.*

By W. J. Loughry and Colleen M. McDonough. Norman (Oklahoma): University of Oklahoma Press. \$39.95. xvi + 323 p.; ill.; taxonomic and subject indexes. ISBN: 978-0-8061-4310-1. 2013.

This book is a recommended read for essentially anyone with an interest in the nine-banded armadillo. Because of the dearth of research on the species, the authors have succeeded in compiling a comprehensive summary of the current state of knowledge of virtually all aspects of the natural history of this elusive mammal. The contents are a goldmine for any scientist who wants a quick means of locating nearly every peer-reviewed article ever

written on the species. At the same time, this volume will be an enjoyable read for the average person searching for a better understanding of this curious animal's habits. The authors use a light, conversational tone throughout, making the book a consumable read even for those without extensive formal training in biology.

The most commendable aspects of this contribution are: the comprehensive coverage and the logical organization of such a large and varied body of material. This exhaustive summarization of formal literature into a single volume will help anyone unfamiliar with the species to quickly gain a fairly thorough understanding of the scope of previous research. This synopsis of published material may also be particularly valuable to scientists in developing countries with limited direct access to scientific journals. Material is organized into 11 chapters that range in emphasis from a focus on individual animals (i.e., anatomy and physiology, reproduction and development) to a focus on populations (i.e., ecology, population biology). Anyone with an interest in only a specific aspect of the species' natural history or biology rather than a desire to gain an overarching understanding will have an easy time locating the chapter most relevant to their pursuits.

Throughout the book, the authors distinguish between those aspects of the species biology that are well known and those aspects in need of additional investigation. Loughry and McDonough repeatedly call attention to whether they are relating accepted facts or making speculations based upon their expert knowledge. In doing so, they provide a great deal of fodder for readers who are searching for ideas on which aspects of armadillo biology to investigate next.

The authors are global experts on the species they write about. With over 30 publications in peer-reviewed journals on the nine-banded armadillo, no other scientists in the world comes close to matching this duo's depth of understanding of the species. Their enthusiasm for the species is contagious.

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