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Book Review

***Ecological and Behavioral Methods for the Study of Bats, 2nd edn.* Edited by T. H. Kunz & S. Parsons. Baltimore: Johns Hopkins University Press (2009). Pp. xvii + 901. Price \$100.00 hardcover.**

More than 20 years have passed since the first edition of Thomas Kunz's *Ecological and Behavioral Methods for the Study of Bats* was originally published (Kunz 1988). Until now, it has been the guide for anyone, academic or otherwise, working with bats and in need of practical advice for their capture, their care and on the methods best suited to studying many aspects of their biology. We both have well-worn copies, muddied and torn from use in the field, and agree that the first edition was a superlative resource: 29 contributed chapters (533 pages) all balancing scholarship and personal experience, many suffused with the do-it-yourself ethic necessary to solve bat-specific problems. The first edition was a Swiss Army knife in a book's cover.

Since then, our understanding of bats and the technologies used to study their behaviour and ecology have considerably improved and so for some years the international bat community has eagerly anticipated a second edition. We are happy to report that no one should be disappointed: bigger is not always better, but in this case it most certainly is. At just over 900 pages, Kunz and co-editor Stuart Parsons have put together a 43-chapter monster of a book that may not be as backpack-friendly because of its bulk, but is nevertheless an excellent and worthy successor to the now difficult-to-find first edition. Like its predecessor, this edition will undoubtedly stand for a decade or two as an invaluable resource and the only of its kind.

Both editors rank among the world's most respected bat biologists and are leaders in their respective fields. The quality of the 84 invited contributors (some from the first edition, some new) and proficiency with which chapter topics have been chosen and organized reflects Kunz & Parson's broad backgrounds and commitment not only to better understanding bats' behaviour and ecology, but to their care and protection over the course of scientific study.

Organized into 11 parts, a well-arranged table of contents, a short but effective index, and a good measure of internal cross-referencing, the book makes it easy to find what you are looking for and, happily, will often lead you to something else of use that you may have not otherwise thought of. A two-column text layout and individual chapter reference sections also add to the overall ease of use. Parts are ordered as follows: 'Monitoring and Tracking' (6 chapters), 'Methods for Assessing Colony Size, Population Size, and Relative Abundance of Bats' (5 chapters), 'Reproduction and Development' (4 chapters), 'Behavior of Bats in Captivity and in the Field' (3 chapters), 'Functional Morphology, Activity, and Movement' (4 chapters), 'Substance Analysis' (4 chapters); 'Diet and Nutrition' (3 chapters), 'Thermoregulation, Energetics, and Water Balance' (4 chapters); 'Genetics and Evolution' (4 chapters), 'Parasites and Disease' (4 chapters), and 'Conservation' (2 chapters).

For an edited text of its size, Kunz & Parsons is refreshingly consistent not only in the quality of its chapters, but also in their

organization. This helps unify a book that manages to encompass, under one cover, in-depth treatment of tried and true methods on the one hand and surveys of new technologies and their potential application on the other. Some chapters include lists of equipment suppliers (most from the North America and the U.K.), and others have contact information for bat monitoring and conservation groups. Much has changed since the first edition of this book; for example, now included are details of stable isotope analysis (for determining geographic range of migratory species or to document seasonal changes in diet selection in sedentary ones) and molecular techniques to identify foods consumed through DNA analysis of fecal material. Conversely, descriptions of how to use starved blood-sucking bugs to more humanely extract samples from smaller bats show that bat workers still have a trick or two up their sleeves, while identification keys for the insects that bats eat and the parasites they host impart traditional yet timeless appeal.

While we have no reservations about the book as a whole, a number of chapters would have benefitted from more illustrations, photographs or both. Also, a chapter on neuroethological methods for the study of echolocation would not have been out of place in Part IV, 'Behavior of Bats in Captivity and in the Field'. Last, the book opens with a very brief preface. An introductory chapter surveying bats' ecology and behaviour would have been welcome for introducing zoologists unfamiliar with bats but interested in their potential as study species.

All in all, *Ecological and Behavioral Methods for the Study of Bats* more than delivers on its promise to provide a practical guide for students, researchers, and wildlife biologists. It should be on the bookshelves of every bat biologist and required reading for other researchers interested in bats as study species for a wide variety of behavioural and ecological questions. As its title makes clear, this is a methods book about bats, but there are useful lessons that could be applied to other animal groups (e.g. birds, small mammals, and toothed-whales). The most appropriate place for the book, however, will be in the collections of persons and organizations directly concerned with the study or conservation of bats and, of course, on the shelves of college and university libraries. Providing a small army of top-notch bat researchers at one's fingertips, for both the experienced and newcomers alike, any combination of three relevant chapters will more than justify its purchase price.

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Reference

Kunz, T. H. 1988. *Ecological and Behavioral Methods for the Study of Bats*. Washington, D.C.: Smithsonian Institution Press.

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