Book Review: Kunz, T. H. & Fenton, M. B. 2003: Bat Ecology. University of Chicago Press, Chicago. 779 pp., $55 (cloth bound). ISBN 0-226-46206-4.

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Article:

A broad review of bat ecology is timely because of advances over the past two decades in the technical approaches to the study of bats in an ecological and evolutionary framework. These advances include, but are not limited to, a range of ultrasonic detection methods, radio-telemetry, transponders, stable isotopes, bio-informatics, and molecular markers. Not surprisingly, since the publication of the Ecology of Bats (Kunz, 1982), our knowledge about the field of bat ecology has advanced. Bat Ecology attempts to summarize this advance through a mix of review and analytical chapters. Each chapter provides some historical perspective as well as highlights recent advances and suggests future directions. The editors divide the book into three main sections: Life History and Social Biology, Functional Ecology, and Macroecology. Within each of these sections are chapters written by authorities in the field.

There are very few topics within the realm of `bat ecology' that do not touch on the behavior of bats and therefore, almost every chapter of this book will be of interest to bat behaviorists and behavioral ecologists. A particularly relevant section is the Life History and Social Biology section with chapters on the ecology of roosting, sensory ecology and communication, sexual selection and sperm competition, migration, and life histories of bats. Highlights of this section include some relatively new perspectives on ecological and behavioral aspects of migration by Fleming and Eby that underscore our lack of knowledge about basic short- and long-range movement patterns of bats, and a comparative analysis of the unique life histories of bats by Barclay and Harder that suggests an evolutionary scenario whereby developmental constraints of flight coupled with limited resources resulted in a low reproductive effort that was offset by the low extrinsic mortality afforded by flight. Kunz and Lumsden present a comprehensive review of the behavior and ecology of cavity and foliage roosting bats, and also devote portions of their chapter to recent investigations on the interactions between roosting behavior and social organization as well as the function of night roosts in the foraging behavior of bats. An intriguing chapter by Altringham and Fenton discusses senses and communication specifically focusing on the multimodal nature (vision, acoustic, olfactory, thermoreception and touch) of communication in bats. Altringham and Fenton characterize the variation in senses and communication for seven species as well as suggest specific topics that deserve future study including navigation, variation in light sensitivity, and the interaction between sound and light. In an analysis of published data, Wilkinson and McCracken address sexual selection by sperm competition in bats by testing the hypotheses that mating system influences testes size in bats. They report a significant positive relationship between testes size and degree of promiscuity, and also an impressive range of allocation to testes mass in bats that exceeds that of any other mammalian order. Admittedly, after finishing this section and especially the chapter on sperm competition, I did wonder if it would not have been appropriate to include a chapter dedicated to characterizing the various breeding systems within bats.

The entire Functional Ecology section draws attention to the importance of morphology, physiology, and phylogeny on the behavior and ecology of bats. Through these chapters, the question of how body size, energetic costs and benefits, and shape can influence an individual bat’s behavior and ability to exploit its environment is explored. In a concise chapter by Jones and Rydell, the interactions of bats and insects are

discussed from perspectives of what types of insects get eaten, how bats detect insects, and what counter adaptations insects have to this predation pressure. In chapters by Swartz, Freeman, and Stockwell on ecomorphology, von Helverson and Winter on nectar feeding, Dumont on fruit feeding, and Speakman and Thomas on physiological ecology, we are reminded that behavior and ecology are impacted by a particular morphology and physiology that represents contemporary selective forces as well as evolutionary history. Especially interesting was the long-term perspective on the complimentary lab and field research of von Helverson and colleagues on glossophagine bats and the flowers that they pollinate. Especially illuminating was the discussion by Speakman and Thomas on the inconsistencies among studies of thermoregulatory behavior by bats and the distinction between laboratory studies that can demonstrate the thermoregulatory flexibility of bats and field studies that can demonstrate thermoregulatory patterns of bats.

The Macroecology section begins with a chapter on the evolution of ecological diversity where, by mapping the taxonomic distribution of character states on hypothesized phylogenies, Simmons and Conway reconstruct evolutionary patterns of change and test hypotheses about the evolution of foraging habits, diets, body size and biogeographic patterns. Two chapters by Patterson, Willig, and Stevens describe the variation among bats in foraging habits and diet in the context of niche partitioning, as well as variation in range size, body size, and species richness. A third chapter by Messenger, Rupprecht, and Smith reviews the disease ecology of bats. One of the most enlightening chapters in this book is, appropriately, at the end of the Macroecology section. The final chapter of the book is on the Conservation Ecology of Bats. In this chapter, Racey and Entwistle thoroughly review the recent studies, that much of this book is a testament to, which have implications for the conservation biology of bats. The authors succeed in simultaneously highlighting advances that have been made ranging from autecology to international policy while still acknowledging the lack of information on basic biology such as population size and structure as well as contemporary threats to bats. Almost every preceding chapter in this book has some implication for the conservation of bats and the list of additional research that is needed to develop and refine the conservation considerations for bats (p. 715) is worth revisiting.

This book will be a valuable resource for everyone from bat enthusiasts to bat researchers. This book is a must for new graduate students entering the field of bat behavior and ecology both because it serves as a starting point for understanding the current state of the field and because it is certain to stimulate ideas. For seasoned bat ecologists it will be a refreshing read with many reminders and several new perspectives.

Literature Cited

Kunz, T. H. 1982: Ecology of Bats. Plenum, New York.