

broad ridge tops or raised patches of ground in swamp forests). Even the best of field guides can benefit from improvements. I would like to have seen even more of these natural history sketches as well as information on seasonal breeding and litter sizes; illustrations of natural spacing patterns of bats in their roosts (*Eonycteris* compared with certain species of *Hipposiderus* or *Taphazous*), for example; more comments on behavior that may assist identifications and appreciation of such beauties as tarsiers, pen-tail shrews, squirrels, and tree shrews; some photographs of animals involved in natural behaviors, such as bats feeding on flowers, elephants in a herd with young, or an otter fishing. A better geographic map and a good vegetation map would have helped. I would also like to have seen more details and photos of the star species that symbolize conservation efforts in Borneo (that is, rhino, orangutan, proboscis monkey) along with an edition in the Malay language. The people of Borneo should be the most important audience for this book, which should be sold widely in Borneo book stores; it was not there in 1986.

This field guide sets a new standard for future field guides of tropical species wherever conservation is a primary concern for responsible mammalogists. The price is right; the binding on my soft cover copy seems to hold up better than that of the hard cover edition. This guide is an excellent buy for any mammalogist interested in tropical species.—EDWIN GOULD, *National Zoological Park, Washington, DC 20008*.

*J. Mamm.*, 69(3):657–658, 1988

**Fenton, M. B., P. Racey, and J. M. V. Rayner (eds.).** RECENT ADVANCES IN THE STUDY OF BATS. Cambridge Univ. Press, xii + 470 pp., illustrated, 1987. Price (hardbound), \$69.50.

This volume contains selected contributions from three symposia at the Seventh International Bat Research Conference and the Third European Symposium on Bat Research, jointly held at the University of Aberdeen, Scotland, in August 1985. Chapters are organized into three units (Flight, Echolocation, and Social and Reproductive Biology), each corresponding to one of the conference symposia. Each unit is introduced by a short summary by the convenors of the corresponding symposium. The remaining 21 contributions are more or less equally divided among the three units, and summarize the "state of the art" in their respective research areas. In addition to the usual subject index, a useful taxonomic index also is provided at the end of the book.

The unit on flight comprises seven chapters and primarily focuses on the form and function of bat wings and associated structures (see chapters by Norberg, Baagoe, and Altenbach and Hermanson). Other chapters examine the cardiovascular correlates of flight (Thomas) as well as the origin and phylogeny of flight adaptations (Padian).

The unit on echolocation contains eight chapters and emphasizes biophysical or physiological attributes of chiropteran echolocation (see chapters by Suthers and Wenstrup, Rovarund, O'Neill and Vater). Incisive chapters by Schnitzler and Fullard examine the interactions between insect prey and echolocating bats from ecological and behavioral perspectives. The short introductory (Fenton) and summary (Neuweiler) chapters each provide integration to the unit by placing constituent chapters into a larger historical context.

Contributions on social and reproductive biology compose the largest unit of the volume and include nine chapters. It contains a more heterogeneous selection of papers and covers a larger range of topics than do either of the other units. Those papers concerning social behavior are particularly well integrated and fill a glaring void in bat population biology. The chapter by McCracken provides a synopsis of the genetic structure of chiropteran social groups and concludes that, although polygamy and skewed sex ratios do result in reduced effective population size, the expected genetic consequence of increased homozygosity does not obtain, perhaps because of kin recognition and inbreeding avoidance. The existence of altruistic or cooperative behavior, along with possible hypotheses accounting for those behaviors in four phyllostomid species is nicely presented in the chapter by Wilkinson; average increased relatedness among group members or increased temporal stability of those groups seems to be associated with the evolution of high cost behavior such as communal nursing and provisioning. Adaptive response to seasonality is the leit motif of McWilliam's detailed overview of the ecology and sociobiology of the African emballonurid, *Coleura afro*; it is clearly a benchmark contribution in mammalogy. Comprehensive long-term studies of this type are critical to the development of functional hypotheses in chiropteran population biology. Sperm storage in hibernating bats (Uchida and Mori), the energetics of reproduction in *Plecotus auritus* (Speakman and Racey), energetics and post natal growth (Kunz), hypothalamic and hypophyseal regulation of reproductive cycles (Anthony), and physiochemical correlates of asynchronous reproduction patterns in male bats (Gustafson and Damassa), are the subjects of the last four chapters of the book. They provide an eclectic, yet insightful collection of papers on reproductive biology.

In summary, this is an attractive and informative collection of papers on bat biology that many chiropteran biologists will want to purchase. However, the diverse selection of topics and relatively high cost will prevent most students from including it in their personal libraries. Nonetheless, I am confident that it will remain as a point of departure for those conducting research on bats.—MICHAEL R. WILLIG, *Department of Biological Sciences and The Museum, Texas Tech University, Lubbock, TX 79409.*