

tremendous variability they show. . . ." In this book, Rory Putman takes a functional approach, comparing and contrasting the several species of deer according to their habitat, social behavior, and evolutionary relationships. It is not an exhaustive academic account of the biology and natural history of the world's deer.

The eight chapters are subdivided into sections emphasizing specific topics. The first chapter is a brief introduction to the origins of deer, but curiously includes a major section on the ungulate digestive system. The second chapter on the various species of deer and their evolutionary relationships probably should have been combined with the preceding chapter. The following three chapters dealing with the ecology of resource use, social organization and behavior, and life histories and population dynamics clearly are the crux of the book. These chapters reflect the author's areas of primary interest and appear more thorough than some others. In the first two of these chapters, the New World deer are given cursory coverage with primary emphasis placed on red and fallow deer. Chapter 6 on the interactions with other species is a curious collection of diverse topics ranging from predation and competition to parasitism to the effects of grazing on vegetation. Each of these sections is rather brief. In particular, the sections on predation and parasitism clearly could have been expanded because they are (or were) important factors in the natural history of deer. Chapter 7 gives an account of one of the unique characteristics of cervids—antlers. The section on hummels is too long, especially in view of the brevity given to other topics. Finally, the last chapter deals with the relationships between deer and man.

The book is generously illustrated with line drawings, figures, and tables adapted from various sources. The 24 color plates provide good illustration of a number of the more common species of deer, although additional photographs of some of the rarer species would have been helpful. The most troubling feature of the book is the halting prose and the abundant use of parenthetical phrases, which at times combine to make the text difficult to read. Inclusion of subchapter titles in the table of contents also would have been helpful.

The author should be commended on his effort to synthesize current knowledge on deer biology and present it in a concise format. Students of cervid biology will be troubled by the omissions, overly simplified explanations, and selectivity of the references. However, this book was written for the enthusiastic naturalist and not for the academician. As such, this is a very useful and affordable book for introducing laypersons as well as beginning students to this fascinating family of ungulates. Additionally, despite the omissions, the professional also may be rewarded with a refreshing summary of several topics of cervid biology.—K. V. MILLER, *School of Forest Resources, University of Georgia, Athens, GA 30602.*

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**Fleming, T. H.** THE SHORT-TAILED FRUIT BAT: A STUDY IN PLANT-ANIMAL INTERACTIONS. Univ. Chicago Press, xvi + 365 pp., illustrated, 1988. Price (hardbound), \$49.95.

This book is an impressive accomplishment that summarizes our knowledge of the biology of *Carollia perspicillata* within the broader context of evolutionary ecology and behavior. After conducting research on neotropical bats for 15 years, I came to consider *Carollia* as one of the more mundane actors in the ecological theater and evolutionary play. Its ubiquity and commonness resulted in my habituation to its presence. Although *Carollia* is not as loathsome as *Centurio*, large as *Vampyrum*, nefarious as *Desmodus*, rare as *Neoplatymops*, or distinctive as *Diclidurus*, Fleming has succeeded in infecting the reader with a contagious enthusiasm and interest in *Carollia* that is reminiscent of the perspectives that return with a field ecologist from his first trip to the tropics. Moreover, *Carollia* is clearly a keystone species in tropical and subtropical ecosystems and Fleming presents a clear basis for that statement in fact rather than impression.

The book is divided into eleven chapters, followed by Literature Cited, Author Index, and Subject Index. Numerous figures and tables occur throughout the text and provide cogent summaries of data analysis or trends. An occasional photograph punctuates the text, but in general they are not sharp because of the nonglossy texture of the pages. The book encompasses both a monographic presentation of original research and a detailed summary of what is known about the ecology and evolution of *Carollia* in particular and of bats in general. Chapters 1 and 2 are an overview of the evolution and systematics of bats, and provide a context within which the biology of *Carollia* will be examined subsequently. Chapter 3 focuses on Santa Rosa National Park in Costa Rica, the study site for most of Fleming's work on *Carollia*. Various aspects of the demography of *Carollia* appear in chapter 4, including data on population density, sex ratio, age structure, survivorship and fecundity, reproductive patterns, and body size relationships. Chapter 5 details social spacing, dispersion patterns, intraspecific behavioral interactions, and mating systems of *Carollia* from a sociobiological

perspective. Foraging ecology is the theme of chapters 6 and 7; detailed information on diet, food preference, and nutrition, as well as the ecological parameters affecting foraging attributes (that is feeding area, movement patterns, search strategies), together suggest that *Carollia* has evolved to minimize predation risk while assuring the long-term reliability of its food resources. Data from doubly labeled water experiments and activity-time budgets are synthesized in chapter 8, and are considered from the perspective of foraging strategies. Competitive, predatory, and parasitic relationships that affect *Carollia* are presented in chapter 9, whereas the consequences of *Carollia*'s foraging behavior on seed dispersal and plant reproductive success are elucidated in chapter 10. Finally, a concise summary and overview of the previous 10 chapters are presented in chapter 11, wherein similarities and differences of the biology of *Carollia* with other New World and Old World bats are considered from the perspective of tropical forests in general.

This book is a benchmark in mammalogy and tropical ecology. The manner in which detailed information on the biology of *Carollia* is integrated with our understanding of contemporary population ecology and tropical biology makes this book an invaluable resource and a pleasure to read. It is of interest to, and should be included in, the libraries of beginning students as well as seasoned professional mammalogists and ecologists, regardless of their taxonomic specialty. *The short-tailed fruit bat* will remain a seminal work on the ecology of tropical mammals for years to come.—MICHAEL R. WILLIG, *Department of Biological Sciences and The Museum, Texas Tech University, Lubbock, Texas 79409-3131.*