

## LEAVING HOME

**Animal Dispersal: Small Mammals as a Model.** Nils C. Stenseth and William Z. Lidicker Jr., eds. Chapman & Hall, New York, 1992. 365 pp., illus. \$77.50 (ISBN 0-412-29330-7 cloth).

Dispersal, defined in this book as "movement from one home site to another" (p. 5), may be a universal phenomenon among multicellular organisms. Many organisms, such as sessile marine invertebrates, have life history stages specialized for dispersal, and almost everyone is familiar with the various contrivances by which seeds and fruits are moved about. Because of the near ubiquity of dispersal in the life histories of organisms, I was surprised to find no references to it in the index of a recent book on the evolution of life histories and only two references in a recent evolutionary ecology text. Although *Animal Dispersal* focuses on mammals, it provides an introduction to the problems and potential significance of other animals' dispersal that is missing in other books.

At the Fourth International Theoretical Congress in 1985, a successful symposium was held on small mammal dispersal. Emphasis was on reviews rather than reports of individual studies. Since then, the reviews, on which this book are based, have been updated, expanded, and additional chapters added to broaden the coverage, and authors were urged to comment on and refer to the other chapters. This process gives the book more unity and integration than most volumes based on symposia. References are up-to-date through 1990.

The chapters are grouped into seven parts. The first two chapters, by N. Stenseth and W. Lidicker, discuss broad conceptual issues, such as defining animal movements and discussing what animals are dispersers and why and when an animal should disperse. The third chapter, by N. Barton, discusses the genetic consequences of dispersal.

In part two, the roles of habitat heterogeneity and social behavior in dispersal are reviewed. C. Brandt points out that available data indicate that aggression may be important in limiting immigration but seems not to be the ultimate cause of dispersal. I



find it not surprising that there is no clear link between rates of aggression and dispersal; individual variability suggests that thresholds for dispersal may differ widely among individuals. Detailed studies of individual behavior and experimental studies are needed to relate social behavior to dispersal.

Part three discusses the role of dispersal in cyclic and stable populations. C. Krebs cogently analyzes the links between dispersal and demography and raises significant questions that need to be answered if these links are to be understood. He further points out a critical design problem in dispersal research: dispersers within study plots usually are not distinguished from residents, and dispersal within a population is not distinguished from dispersal among populations. J. Gliwicz states that "the proportion of emigrants that successfully settle after dispersal have never been measured adequately" (p. 153).

This statement emphasizes a major problem with the study of dispersal: How can we determine the fitness of dispersers or the demographic and genetic consequences of dispersal when we do not have the fundamental data on survivorship and reproductive success of dispersers? Resolving these problems is fundamental to understanding the evolutionary significance of dispersal.

Part four discusses the importance of dispersal in pest management and conservation. Perhaps the main message is that theoretical and applied ecology are part of a continuum and not separate disciplines.

Part five presents a synopsis of several models for analyzing possible mechanisms for the evolution of dispersal. It describes especially how those models apply to presaturation dispersal: dispersers that leave home before the habitat's carrying capacity is reached.

Part six consists of chapters on

dispersal in large mammals, primates, the red grouse, and insects. Essentially, these chapters describe similarities and differences between their subjects and small mammals. For example, A. Sinclair emphasizes differences in scale: small mammals experience habitats as coarse-grained, whereas large mammals experience them as fine-grained. A. Watson emphasizes that any species used in dispersal studies has advantages and disadvantages; for example, individual red grouse, but not individual voles, can be observed, and voles can be fenced in but grouse readily fly over fences. The insect chapter by G. Roderick and R. Caldwell illustrates a major problem in terminology: migration may be used to mean dispersal, but migration to many students refers to a round trip whereas dispersal is a one-way trip. The reader must be aware of how each author uses the terms.

Finally, part seven consists of three appendices on techniques. They address using radiotelemetry and radioisotopes for marking and locating individuals, design and use of trapping grids, and analysis of data obtained from these studies.

My major criticism of this book is that dispersal is not discussed as a problem for individual fitness but as a population problem. Thus, dispersal models are population models and research protocols are designed to manipulate populations to quantify the costs and benefits of dispersal. I doubt that population approaches will ever permit us to learn why individuals choose to disperse. Presumably, individuals disperse to improve their fitness or as a consequence of some other individual improving its fitness. One cannot simply compare the fitness of dispersers and residents; the appropriate comparison is the fitness of a disperser with the fitness of that same individual as a resident. This comparison is not possible, but future work must focus on the choices made by individuals and the conditions that determine these choices.

In this context, the concept of presaturation dispersal is unnecessary. The prevalence of male-biased dispersal in mammalian species suggests that males disperse to increase mating opportunities. Because mates are not included in the resources that limit

carrying capacity, it is not surprising that many males, especially of polygynous species, disperse while populations are still growing. The emphasis on numerical density as the overriding determinant of dispersal seems misplaced. The argument is well put by A. Cockburn: "There seems little point in continuing to interpret dispersal against a background of population fluctuation, as the connections to both the proximate behavioural, and ultimate evolutionary, causes of dispersal are so diffuse as to be uninterpretable" (p. 88).

The chapters by Cockburn, Brandt, and Gliwicz emphasize the relationship of dispersal to social organization and kinship. Only Gliwicz makes much mention of Anderson's treatment of the adaptive value of dispersal (Anderson 1989). There is a tacit acceptance of the idea that dispersers are less fit than residents (but see my previous comment about the proper comparison), but what is usually overlooked is that dispersers are also offspring and that fitness requires that an individual produce reproductive offspring, regardless of whether they become residents or dispersers. Thus, the fitness of a disperser must be considered in the context of its effects on the fitness of its parents, and the fitness of a resident must be related to the way its fitness affects and is affected by other residents and dispersers. Because fitness effects differ between kin and nonkin, it is critical that future work identify parents and offspring.

This book is most valuable when considering the demographic correlations of dispersal and provides the best available treatment and synthesis of the extensive literature on mammalian dispersal. Any student of dispersal will want this book at hand, but for an overview of the fitness problems associated with dispersal, the student should also read Anderson's book.

KENNETH B. ARMITAGE  
*Department of Systematics  
and Ecology  
University of Kansas  
Lawrence, KS 66045-2106*

#### Reference cited

Anderson, P. 1989. *Dispersal in Rodents: A Resident Fitness Hypothesis*. American Society of Mammalogists Special Publ. 9.

## TWO OF A KIND

**Wildlife-Habitat Relationships: Concepts and Applications.** Michael L. Morrison, Bruce G. Marcot, and R. William Mannan. University of Wisconsin Press, Madison, WI. 1992. 343 pp., illus. \$26.95 (ISBN 0-299-13200 cloth).

**Wildlife Habitat Relationships in Forested Ecosystems.** David R. Patton. Timber Press, Portland, OR. 1992. 392 pp., illus. \$45.00 (ISBN 0-88192-202 cloth).

The similarity in the titles of these two books is paralleled by a similarity in the author's goals. Both books are aimed at advanced students with some background in the principles of wildlife biology and ecology. Morrison et al. look critically at the intellectual tools and models that are the stock-in-trade of wildlife biologists and forest managers, whereas Patton seems more intent on instructing would-be forest managers in the concepts and techniques he himself has used. Given Patton's 35 years of field experience, the advice and guidance he offers cannot be lightly dismissed. However, the weight of his experience may cause his book to sink, whereas the much less weighty comments in the competing book may allow it to rise.

Both books provide a concise historical introduction, but one is deftly and entertainingly constructed, and the other is a tedious array of quotations from the authorities of the past. In subsequent chapters, the divergence continues. Morrison et al. provide discussions of general principles from which sound wildlife management practices are to emerge, but Patton is more intent on instructing his readers

