

(p. 324) that population viability analysis "can be viewed as a heuristic tool to explore the dynamics of an endangered population but not as a predictive tool." He offers the intriguing suggestion to use well-known species, possibly game species, as surrogates for species too uncommon to provide useful estimates of critical parameters. He does not recommend using actual *rates* of survival and recruitment as surrogates, but rather the temporal and spatial *patterns of variation* in those rates. As with some other chapters, lessons here apply beyond just the topic of the chapter.

In Chapter 10, David W. Macdonald, Paul D. Stewart, Pavel Stopka, and Nobuyuki Yamaguchi describe how dynamics of mammalian societies can be measured. Here "dynamics" refers to social life, not populations. The authors define a social dynamic to be "the change in social interaction or relationship under the influence of extrinsic or intrinsic factors." I found their discussion of various methods for sampling and measuring behavior to be a useful introduction to that topic. I could not agree with their comment on page 375 that if events in a sequence occur independently, then the distribution of bout lengths will be exponential. That statement is correct, however, if the events are random and have a Poisson distribution.

The final chapter, by Fabio Corsi, Jan de Leeuw, and Andrew Skidmore, discusses the use of geographical information systems for modeling species distributions. In contrast with many of the other chapters that deal with population dynamics, this one argues that conservation is concerned mostly with the fragmentation and reduction of distributions of organisms. My impression is that the authors are on shaky ground when they present statistical concepts. For example, the variety of topics encompassed by ANOVA, rank correlation, and Bonferroni are all termed "univariate statistics." The authors mention one statistic that ranges in value from 0 to 1, but note that it can also be negative. And they seem to view the ability of GIS to handle large numbers of variables as an unmitigated blessing, failing to consider the possibility of spurious results arising from attempts to relate large numbers of variables (e.g., Armstrong 1967, Rexstad et al. 1998). Despite these shortcomings, the chapter provides good insight to some of the issues associated with modeling distributions of plants and animals—a very timely topic.

This book does an excellent job of gathering and synthesizing a huge amount of information

about several important techniques in animal ecology. It generally provides a more conceptual treatment of topics, in contrast to the wildlife techniques manual (Bookhout 1994), which treats many of the same techniques but in a more "how-to" fashion. As in any edited volume, some chapters in Boitani and Fuller are better than others. Some minor inconsistencies in style exist among the chapters; for example, lists of references are arranged alphabetically in some chapters and by date in others. The editors and authors are to be commended for the effort they have put forth and for the valuable product they have provided. I would encourage anyone planning to use any technique presented in this volume to read the pertinent chapter.

LITERATURE CITED

- ARMSTRONG, J. S. 1967. Derivation of theory by means of factor analysis, or Tom Swift and his electric factor analysis machine. *American Statistician* 21:17–21.
- BOOKHOUT, T. A., editor. 1994. Research and management techniques for wildlife and habitats. The Wildlife Society, Bethesda, Maryland, USA.
- JOHNSON, D. H., AND D. L. LARSON. 1994. Amphibian declines: real or perceived? *Proceedings of the North Dakota Academy of Science* 48:15.
- REXSTAD, E. A., D. D. MILLER, C. H. FLATHER, E. M. ANDERSON, J. W. HUPP, AND D. R. ANDERSON. 1988. Questionable multivariate statistical inference in wildlife habitat and community studies. *Journal of Wildlife Management* 52:794–798.

—Douglas H. Johnson, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, ND 58401, USA.

Behaviour and Conservation. Edited by L. Morris Gosling and William J. Sutherland. Cambridge University Press, Cambridge, United Kingdom. 2000. 438 pp. \$39.95, ISBN 0-521-66230-3 (paper); \$110.00, ISBN 0-521-66539-6 (hardback).

Many behavioral biologists are secretly frustrated. They think that population biologists and geneticists have a disproportionately strong impact on conservation biology, and that contributions of behavioral biologists have been trivialized to solving "behavioral problems." Gosling and Sutherland's edited book is the latest publication devoted to showing how knowledge of behavior should be of use to conservation biologists and how conservation and management strategies may be enlightened by incorporating behavior. The book results from a highly successful

conference sponsored by the British Association for the Study of Animal Behaviour and the Zoological Society of London, and most contributors (35 of 40) are from Europe. It thus offers a European perspective on the current field of conservation behavior.

So why should conservation biologists be interested in animal behavior and what is the European perspective? Contemporary behavioral ecology is the study of adaptations that maximize an individual's reproductive success. A major goal of this study is to understand the decisions animals make about where to live and forage, with whom to mate, and how to prevent starving and death by a predator. The net effect of the decisions of individuals increases or decreases a species' population size. Many conservation biologists have ignored behavior; however, behavior provides a mechanism for understanding population dynamics.

The solution to this puzzle may lie in the potentially intimidating vocabulary of modern behavioral biology. For instance, authors of this book write about ideal free distribution models, use stochastic dynamic programming, talk about learned taste aversion, calculate independent contrasts, and employ game theory models to understand behavior's impact on population persistence and conservation.

This book should facilitate communication between conservation and behavioral biologists because it illustrates, through example, how each can benefit from the other's skills. The book presents many varied perspectives on this rapidly growing synthetic field, which are encapsulated in this review. It also provides references and introductions to the key techniques and literature. The book is organized into 4 main sections: conservation impact of people; habitat loss and fragmentation; sexual selection, threats, and population viability; and conservation applications of behavior.

Behavioral ecology has been defined as the economic analysis of animal behavior, and behavioral ecologists have borrowed heavily from the human economist's toolkit. Ironically, anthropologists are now borrowing from the behavioral ecologist's toolkit to understand the conservation consequences of individual decisions.

Mace begins the book with a chapter on the evolutionary ecology of human reproductive decisions. Using a stochastic dynamic model, she examines different processes that may cause fertility declines in a pastoral society. The high cost of having and raising children emerges as a key factor associated with fertility decline.

Borgerhoff Mulder and Ruttan examine the conditions under which humans will cooperate for a conservation outcome. They use game theory to focus on the payoffs to conservation from the actors and assume that cooperative behavior—in this case conservation—will occur only when individuals benefit. They find that conservation can emerge from such individual maximization, but that asymmetries in benefits among actors can lead to divergent effects.

Humans directly harvest species, but they also compete with and disturb them. Gill and Sutherland remind us that disturbance can have fitness consequences. Fundamentally, they seek to understand disturbance by focusing on the trade-offs animals make about where to feed while minimizing predation risk. They assert that a full understanding of population-level consequences of disturbance is only possible by identifying and quantifying the effects of density dependence. These are difficult challenges, but the authors maintain that this is where and how studies of human disturbance should be focused.

Goss-Custard and others add realism to human impact models by incorporating optimal foraging and ideal free distribution components to an oystercatcher population model. With this, they then examine the short- and long-term population-level consequences of various human oyster harvesting and disturbance regimes.

Thomas et al. argue that a fundamental element of understanding mobility relies on understanding how and why animals move. Their goal, unachieved at this point, is to understand movement in sufficient detail to manipulate it for conservation purposes. This chapter is a good outline of behavior and theory and should be of interest to many readers.

Piersma and Baker discuss the behavioral, life history, and natural history factors that make migrating shorebirds vulnerable around the world.

Woodroffe and Ginsberg focus on ranging behavior and home range size of carnivores to understand causes of endangerment and extinction. They use "modern comparative methods" and conclude that flagship species should be chosen carefully—choosing 1 with a relatively small home range could inadvertently fail to provide protection for other sympatric species.

Boswell et al. identify the keystone position of army ants in their rainforest community, and then employ various behaviorally enlightened models to understand ant population dynamics and effects of forest fragmentation.

Møller provides a concise review of the enormous sexual selection literature and notes some of the consequences sexual selection may have for conservation.

Durant incorporates behavioral traits into population viability analyses and illustrates their impact on persistence time in several species.

One common theme—and perhaps part of what defines the European perspective—is identifying the population consequences of individual decisions. Sutherland developed these ideas in a previous book (W. J. Sutherland. 1996. *From Individual Behavior to Population Ecology*. Oxford University Press, Oxford, United Kingdom). Pettifor et al. point out that such models are essential because individuals behave in ways that maximize their fitness and thus should behave dynamically. The way that individuals choose to do this includes incorporating game theoretic decisions (i.e., those that incorporate the benefits to an actor given the behavior of others) and those that are based on specific knowledge of the physiological needs of a species. Other ways are to include knowledge of the causes of sociality and dispersion.

Caro takes an explicit genetic assumption (extreme homozygosity has deleterious fitness consequences) and examines the consequences of reduced heterozygosity in cheetahs. He clearly explains that the problems of a cheetah in raising its young are ecological and behavioral, not genetic.

Reynolds and Jennings focus on marine systems and emphasize that a species' behavior may affect its ability to be exploited, or that harvesting may impact its life cycle. Behavior—acting through density-dependent mechanisms (another theme in the book)—may influence both mortality and population changes.

McGregor et al. highlight numerous ways that knowledge of animal communication may be used to help manage a species. For instance, individually specific vocalizations may help census a population; playbacks can be used to modify behavior and to allow animals to be counted; geographic variation within a signal may map onto genetic variation; and anthropogenic noise may affect behavior.

Cowan et al. review the ways in which predators can be taught to avoid specific species of prey—a management strategy that may be useful in some circumstances.

Wallace discusses some of the problems animals bred in captivity face when reintroduced to the wild.

Tuytens and Macdonald review recent research on the effects that population control may have on social behavior and how this knowledge may be useful for control but also may have unintended and potentially deleterious consequences.

By focusing on the individual, behavioral biologists may bring a unique perspective to debates about defining and understanding animal welfare. Bradshaw and Bateson review issues of conservation and welfare and then discuss their excellent, but controversial, study on the welfare effects of deer hunting. They provide a very useful graphic that can help evaluate the welfare costs of a conservation action.

In several places in this stimulating book I was struck by the need to evaluate the relative explanatory power of models with and without behavioral parameters. Some could be tested with retrospective analyses of long-term data sets. This should not be seen as a shortcoming, but rather as a logical extension of a growing field; we are, after all, still testing fundamental predictions of island biogeography and population genetics.

The book is a good entry into the conservation behavior literature, and I believe that it will make an excellent starting point for graduate seminars that include both conservation and behavioral biologists. I hope that it will also be read by wildlife managers not trained in behavior so that they may better understand the tools and questions that constitute contemporary behavioral biology. It is only through cooperation, and the innovative conservation strategies that emerge from such collaborations, that we can hope to conserve our dwindling biological heritage.

—**Daniel T. Blumstein**, Department of Organismic Biology, Ecology and Evolution, University of California, 621 Charles E. Young Drive, South, Los Angeles, CA 90095-1606, USA.

Common Names of Mammals of the World. By Don E. Wilson and F. Russell Cole. Smithsonian Institution Press, Washington, D.C., USA. 2000. xiv + 204 pp., indices. \$19.95, ISBN 1-56098-383-3 (paper).

Common, or vernacular, names in biology—used by undergraduates enrolled in any organismal diversity course while ignored by most instructors of such offerings—have lacked acceptance because of the lack of a supportable authority. The Checklist Committee of the American