Messages from an Owl. By Max R. Terman. Princeton University Press, Princeton, N.J., USA, 1996. 217pp., 26 chapters, 67 photographs, 1 appendix, index. $24.95 ISBN 0-691-01105-2 (cloth).

This book describes the fate of an orphaned great horned owl, Stripey, raised by humans and then released into the wild. With the aid of radiotelemetry, the owl was followed for five years while it perfected its hunting skills, courted a mate, and raised young of its own. The book thus offers a unique documentation that such wildlife rehabilitation can be successful—animals raised in captivity can survive and function normally in the wild. Wildlife rehabilitation has become a widely practiced adjunct of wildlife management, and rehabilitators who release orphaned animals raised by humans will find this story especially interesting because little is known about the survival of such animals and whether they are able to interact successfully with their own species. However, the sample size is one owl, and little information about variation among individuals is provided. Accordingly, the outcome of Stripey's life must be interpreted with great caution by wildlife rehabilitators.

Overall, I enjoyed reading the book but I was bothered by several things, most notably that the author could not decide how or when to end it. Chapters 1–18 (the chaps. are not numbered) document a continuous history of Stripey's early life in captivity, release into the wild, and initial experiences in the wild. A reading of chapters 19–26 makes one wonder if the editors stopped reading after chapter 18 (surprising because the book is published by Princeton Univ. Press). Chapter 19 interjects the brief history of another juvenile great horned owl the author kept for a short time. Besides breaking the continuity, the chapter, on the one hand, tells of big differences between the two owls, and on the other hand makes some sweeping generalities about how some things are similar among all great horned owls based on a sample size of two. Chapter 20 is back to the subject of Stripey, but chapter 21 titled "Of Owls and Science," digresses into a *potpourri* of tidbits loosely related to the book's subject. I found myself quoted in this chapter from a conversation that I had with the author at a scientific meeting. His recollection of that conversation bore only the slightest resemblance to what I had told him. Chapter 22 interjects material on a screech owl. Chapter 23 takes us back to Stripey, but yet another digression appears as chapter 24. Finally, in chapter 25, it is revealed that Stripey does raise young of her own in the wild (the author had thought that Stripey was a male until that time). But there is more—chapter 26 entitled "Postscript" documents the second breeding of Stripey that could have been a part of chapter 25, and the book ends without revealing the ultimate fate of the owl.

My minor complaints include: (1) the many black-and-white photographs are mostly of poor quality or irrelevant, (2) despite the author's own warning about the danger of attributing human characteristics to other animals, he does it himself (e.g., second paragraph on p. 70), (3) the use of the word autonomy (p. 89) when the correct term is autotomy, and (4) the misuse of the term niche in chapter 11.

Despite these problems, the book offers some valuable information and interesting reading, and wildlife rehabilitators and libraries may want to include it in their collections. Other individuals desiring to read it may prefer to check it out from a library.

—**Carl D. Marti,** Department of Zoology, Weber State University, Ogden, UT 84408-2505, USA.

Wild Otters, Predation and Populations. By Hans Kruuk. Oxford University Press, New York, N.Y., USA. 1995. xi + 290pp., 10 chapters, references, index. $55.00 IBSN 0-19-854070-1 (cloth).

Like most carnivores, otters are known more from myths and preconceptions than they are from facts. The reason, quite simply, is that these animals are rare and elusive, and thus difficult to study in nature. Hans Kruuk, through hard work and insight, has managed remarkable success in a lifetime of work on the carnivores, first through his well-known book on spotted hyenas (Kruuk 1972), followed by a compendium of research on European badgers (Kruuk 1989), and now with this volume—a synthesis and summary of work on Eurasian otters.

Wild Otters is a landmark contribution in that it exposes, in a very readable account, the behavior and ecology of otters in Scotland. It is written in a graceful and informal style, while at the same time conveying a substantial body of information on otters as well as Kruuk's sense of nature and feelings about the species and places he has studied. And while the results are impressive in scope and detail, the book is far more than a species account. It is based on years of work on populations living in coastal waters of the Shetland Islands and the rivers and streams of northeast Scotland. By comparing animals between these habitats, Kruuk achieved an understanding and perspective of the species that goes beyond what would have resulted from studies done and interpreted separately. Besides this unusual and interesting comparative perspective, Kruuk's interpretations are embedded in the broader conceptual framework of behavioral ecology, derived in part from his knowledge of other species and in part from the theoretical underpinnings of David Macdonald's (1983) resource dispersion hypothesis. While supporting data are necessarily sparse in places, owing to the secretive nature of otters, I found the arguments and interpretations to be mostly compelling and always interesting. *Wild Otters* is essential reading for those who study carnivores. It is also highly recommended for anyone with interests in wildlife biology, aquatic or marine mammals, and the behavioral ecology of vertebrates. In addition to providing numerous facts about otters and interpreting them in a broad and interesting way, this volume should serve as a model for how to successfully study and understand the ecology and natural history of animals.

The book is organized into 10 chapters, each preceded by a summary of the main findings and ideas, and begun with an introduction that presents essential background information for what follows. Collectively, these chapters comprise a comprehensive treatment of the topics one would expect to see in any species-level treatise on wildlife natural history. Chapter 1 be-

gins with a discussion of why otters are interesting. This is followed by a description of the study areas, the rationale for and goals of the research, a description of general study methods including their challenges and difficulties, and a review of relevant information about otters. Chapter 2 is a general account of the otter's spatial ecology that includes information on movements and home range, and how these vary between the sexes, among individuals, and between marine and freshwater habitats. I found this latter contrast to be especially intriguing. Chapter 3 builds on this background of spatial patterns to describe the species' social behavior, including mating systems and the relations and interactions of individuals within and between sexes and family groups. Particular attention is given to the significance of "sprainting"—fecal deposition for scent marking—which Kruuk argues is more related to resource use and availability that it is to previously presumed functions of reproduction or territoriality. This chapter includes a number of thoughtful interpretations and syntheses reflecting Kruuk's broad knowledge of other mammals, especially other carnivore species.

Chapters 4, 5, and 6 consider various aspects of prey availability, diet, and foraging behavior, and here again Kruuk successfully molds the routine details of data gathered from both spraint analyses and direct observations of foraging individuals into interpretations of predator-prey interactions that are creative, interesting, and usually compelling. The sections on diet are developed around a theme of specialization in the otters compared with other groups of carnivores, including a general synthesis of world-wide feeding patterns among various otter species. While extremely interesting, I felt this synthesis would have benefitted from an expanded perspective of the patterns and constraints of history and phylogeny, known from work by Radinsky (1968), Berta and Morgan (1986), and others. A critical role of food to the otter's behavior and population ecology emerges from these 3 chapters, thus leading to a detailed treatment in chapter 5 of the ecology and natural history of the otter's prey, which are mainly fish. This research, done mainly through SCUBA diving and aquarium studies, stands on its own as a useful account of the ecology of coastal marine fishes in the Shetland Islands. The behavior of boreal/subarctic marine fishes is poorly studied and I was intrigued by the finding that most of these species are more active at night than during the day. Kruuk uses this information to interpret diel foraging patterns in otters; I also was intrigued by the fact that these fishes behave differently from those that inhabit reefs of the warm temperate and tropical zones, which are generally most active during the day. While Kruuk's main perspective of the otter-fish food web is bottom up (i.e., how otters are influenced by their prey), he also considers top-down influences of otter predation by proposing a strategy he calls "patch fishing" in which fish are depleted from small habitat patches by foraging otters but then rapidly replenished via immigration. The final chapter in this section on predator-prey interactions includes a great deal of interesting information on the depth of dives by foraging otters, dive and surface times, sensory modality, prey capture strategy, foraging success, and the energetics of swimming and diving. Much of this information is collated with data on prey caloric values and assimilation efficiencies to develop a model relating minimum foraging time to prey capture rate. This relation, which is strongly nonlinear, was found generally to be consistent with information on prey availability and foraging times for different sites. Kruuk uses these findings to argue that the rivers and streams of northern Scotland are marginally suitable habitats for otters.

Chapter 7, which considers insulation and thermoregulation, is something of an outlier in that it takes a strongly physiological perspective. Nonetheless, Kruuk effectively develops the ecological relevance of this information by arguing that heat loss constrains both the time otters can spend feeding and the depths to which they can forage efficiently. Another major theme developed in this chapter is the marine-living otter's need for fresh water to maintain the water repellency and thus insulation of their fur. Thus the availability of fresh water is an essential determinant of otter distribution along the seashore. This view, which seems well-supported, raises the interesting question of how fully marine living species (such as the sea otter—*Enhydra lutris*) or marine living populations in arid regions (such as the chungungo—*Lutra felina*—in northern Chile and Peru) manage in the absence of fresh water.

Chapter 8, a treatment of the otter's population biology, includes methods for determining abundance and abundance estimates, population age structure, mortality, and reproduction. Mortality patterns (age, sex, and cause of death) were determined largely from carcass surveys and the information, while interesting, is subject to the usual difficulties of this approach. Similarly, the information on reproduction was derived mainly from observations of family groups after the young had left their natal dens. Despite these limitations, which Kruuk acknowledges, the findings are intriguing and generally consistent with population trends. Reported litter sizes were found to be significantly larger for otters living in freshwater than in marine habitats. While the data supporting this point are compelling, I was disappointed that Kruuk didn't discuss further either potential causality or the obvious implication for the evolution of marine living in mammals (all fully marine mammals have single young litters). Kruuk also develops an argument that otter population declines in Europe are not clearly and simply related to levels of PCB contaminants, which I found both compelling and surprising.

The final two chapters attempt to synthesize the empirical findings (chap. 9) and to relate basic ecology and natural history to otter conservation (chap. 10). The synthesis endeavors to connect the findings and ideas about otters with those from other species of carnivores. This treatment likely will be interesting to those familiar with the behavioral ecology of carnivores, but to the uninitiated it will be less informative. Chapter 10 challenges several established beliefs about otter conservation, namely that pollution and habitat destruction have been directly responsible for the Eurasian otter's demise. Here Kruuk draws from his earlier findings and interpretations to champion the view that food ultimately is the most important factor limiting otter populations.

In publishing *Wild Otters*, Hans Kruuk has sum-

marized and integrated the results of work heretofore available only in a number of scientific papers. The book is readable, scholarly, and remarkably free of errors. This is an important reference that should be on the bookshelf of any serious vertebrate ecologist.

BERTA, A., AND G. S. MORGAN. 1986. A new sea otter (Carnivora, Mustelidae) from the late Miocene and early Pliocene (Hemphilian) of North America. J. Paleontol. 59:809–819.

KRUUK, H. 1972. The spotted hyena, a study in predation and social behavior. Univ. Chicago Press, Chicago, Ill. 335pp.

———. 1989. The social badger. Oxford Univ. Press, New York, N.Y. 155pp.

MACDONALD, D. W. 1983. The ecology of carnivore social behaviour. Nature 301:379–384.

RADINSKY, L. B. 1968. Evolution of somatic sensory specialization in otter brains. J. Comp. Neurol. 134:495–506.

—James A. Estes, National Biological Service, A-316 Earth and Marine Sciences Building, University of California, Santa Cruz, CA 95064, USA.