

have improved the connectivity of the nine chapters on consumer-prey interactions. Second, the chapters themselves are often organized around model organisms (e.g., invertebrates vs. fish). I don't argue against the value of selecting model organisms but rather that caution should be emphasized when using models to predict the behaviors of non-model organisms, especially when they differ in important ways (such as mobility of foragers as noted by Weissburg). The organization of chapters around model organisms needed to better emphasize this limitation.

The bulk of the text is accurate with two minor exceptions. First, chemical defenses are sometimes assumed to be toxic. This assumption ignores evidence to the contrary—unpalatable chemicals do not always negatively influence consumer performance and fitness. Second, defenses of field-collected organisms are assumed to be constitutive. This assumption is

unwarranted given that previous studies rarely know the history of the prey prior to experimentation and extraction.

Chemical ecology in aquatic systems provides clear insight into our current understanding and needed experiments in this field. Despite the limited comparisons of interactions in freshwater vs. marine habitats, this book represents an important first step in bringing together scientists across the salinity divide to develop more general hypotheses and predictions.

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Ecology, 94(9), 2013, pp. 2113–2114
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Boreal owl: A 40-year study of predator and prey

Korpimäki, Erkki, and Harri Hakkarainen. 2012. **The boreal owl: ecology, behaviour and conservation of a forest-dwelling predator**. Cambridge University Press, New York. xiv + 359 p. \$95.00, ISBN: 978-0-521-11371-7.

Key words: *Aegolius funereus*; *boreal owl*; *Microtus*; *population dynamics*; *predator-prey*.

One of the most-studied puzzles in ecology focuses on relationships between predator and prey. Many ecologists have spent their entire careers attempting to unravel the complex population dynamics that result from these relationships. Perhaps the most complex patterns arise from prey whose abundance is extremely cyclical. Understanding the key factors that govern these populations has eluded ecologists. This book, written by two prominent Finnish scientists, describes a 40-year study of the boreal owl (*Aegolius funereus*) and their cyclic prey, microtine voles.

The book includes 15 chapters, including a four-page introduction and an almost equally brief concluding chapter on conservation of boreal owls. The authors' stated audience is broad: general readers interested in nature, ecology students, professional ecologists, and specialists in population dynamics, behavior, and other ecological fields. I suspect no book can satisfy the appetite of such a broad audience. In my opinion, the book will be most interesting and useful to ecologists with a fascination for owls and population ecologists conducting long-term research on predator-prey relationships.

There are essentially three themes in the book, with chapters not always arranged in an order that made sense to me. The first theme covers the natural history of boreal owls throughout their range in North America and Europe. These chapters include detailed descriptions of temporal and spatial variation of the owls' ecology across numerous study areas. There is a comprehensive table of perhaps every study conducted of boreal owl populations throughout Europe and North America, providing geographic coordinates, duration of study, and number of nest boxes and nests. Readers interested in comparing their own results to previously published studies

will find these data tables particularly useful, whereas those interested in the more general question of predator-prey dynamics will likely find the quantity of raw data distracting. I would have preferred to see raw data tables as an appendix so they are available for comparative analyses but do not distract from the primary arguments in the book.

The next theme, beginning with Chapter 5, addresses what I see as the most valuable aspect of the book: insights gained from a 40-year field study of predator and prey. The authors present substantial evidence in support of their argument that behavioral and demographic traits of boreal owls have evolved in response to their highly cyclic prey species, the field vole (*Microtus agrestis*) and sibling vole (*M. rossiaemeridionalis*). Throughout these chapters, the authors investigate how the ecology of boreal owls has been shaped by *Microtus* population cycles, including morphological characteristics of the owl (Chapter 6), mating and parental care (Chapter 7), reproduction (Chapter 8), dispersal (Chapter 9), survival (Chapter 10 and 11), and patterns of abundance (Chapter 13 and 14). In most of these chapters, I was disappointed not to see a greater level of synthesis given the comprehensive data the authors provide. For example, in a detailed table, the authors report mean laying dates and other reproductive parameters for over 30 years of the study, yet few patterns from these data are discussed.

Although the book's title clearly implies that the authors intended to emphasize conservation issues and solutions for the boreal owl, there are only occasional references to this important topic. The final chapter and what I see as the third theme of the book, "Conservation of boreal owl populations," discusses the decline of boreal owls throughout Europe in only about seven pages of text. In addition to this chapter, the authors evaluate the influence of older forests on the species' survival and reproductive success in Chapter 11. The authors argue, I think rather unpersuasively, that the reason for a long-term decline of boreal owls is harvest of older forests and the resulting dominance by stands of trees <80 years old in industrial forests. More rigorous analyses that provide scientific evidence that boreal owls are declining as a result of harvest of older forests would have strengthened their argument. It seems even more important to provide management guidance

necessary to promote conditions that will support viable populations of boreal owls and reverse the declines. Recognizing a potential cause of a decline is a key first step and the book fulfills that initial need. The authors provide recommendations for forest management, but given the breadth of their knowledge on this species and the forests they inhabit, I would have appreciated a much more extensive, synthetic, and scientifically supported argument.

One of the most valuable aspects of the book is the integration of 40 years of research that encompasses many different research questions focused on a single species. The literature cited section of the book highlights the research of the authors and the broad array of questions they have pursued during this long-term study. The references used throughout the book also provided me with much more appreciation of the work being conducted in Europe. Although the European literature was very well covered, I was surprised by the general lack of references to relevant research in North America. Although the authors undoubtedly covered the North American literature on boreal owls, the lack of representation for studies on other forest owl species and more generally predator-prey studies was surprising to me.

All in all, the book provides an outlet for documenting research on boreal owls over four decades, which clearly took tremendous effort and dedication; few other studies will match

this one in extent and duration. Overall, this book serves as a case study of long-term research on a predator and its prey. It should serve to inspire future investigations and I suspect will also serve as a reminder on how challenging it is to conduct such a study, and the difficulties in unraveling complex questions despite heroic efforts. No book can serve all purposes. Although the authors' goal to target the book to the general public as well as to specialists in various ecological fields is admirable, I think the book will be most appreciated by those studying forest owls and by researchers who will use the data in future comparative analyses on predator-prey relationships.

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Ecology, 94(9), 2013, pp. 2114–2115
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Food web stability, unapologetically

Moore, John C., and Peter C. de Ruiter. 2012. **Energetic food webs: an analysis of real and model ecosystems**. Oxford University Press, Oxford, United Kingdom. ix + 333 p. \$125.00 (cloth), ISBN: 978-0-19-856618-2; \$59.99 (paper), ISBN: 978-0-19-856619-9.

Key words: community ecology; detritus; ecosystem ecology; food webs; stability.

Ecological systems are characterized by astonishing complexity. Our planet is inhabited by millions of species, and a single ecosystem can contain tens of thousands. Populations interact in tangled ecological networks (e.g., consumption, mutualism, competition) and interface with the abiotic environment, responding to changes in a dynamic way. One could rightly say that ecological systems are the paradigmatic example of complex adaptive systems in nature.

This complexity is daunting and sometimes feels overwhelming: how are we to make sense of these systems, and how can we make predictions? The need for reliable predictions becomes more urgent every day, given that ecosystems around the globe face unparalleled challenges, and that our own welfare depends critically on the services they provide.

In the 1970s, ecologists started looking for answers in the realms of cybernetics and dynamical systems. The building blocks of ecosystems were components (assemblages of similar species belonging to the same “functional group”), connected by exchanges of energy. Fluxes of energy could be used to parameterize simple dynamical systems, and from those one could make predictions. This period was characterized by many new discoveries, notably the relationships among community

size, complexity, and asymptotic stability, i.e., the ability to buffer small perturbations.

The following two decades, however, brought a harsh critique of this research program, starting from its very foundations: coarse-grained components were shown to be inadequate descriptors of communities; the presence and strength of interaction between two populations was found to vary through time and space; and the same two populations would interact differently depending on the presence and density of other populations. Moreover, the stability paradigm, which was the centerpiece of the whole enterprise, was strongly criticized as unrealistic. Populations can persist in an eternal transient state, such that the asymptotic behavior characterized by stability analysis could have no ecological significance.

Given this state of affairs, the book of Moore and de Ruiter is truly surprising. The authors' ambitious goal is to reconcile the ecosystem-centered view (nutrient cycles, abiotic-biotic relations) with the community-centered perspective (focusing on species and populations). They want to unify these views through energetics, using nutrients as common currency and dynamical stability as a guiding principle. What is surprising is that their methods rely heavily on components, linear dynamical systems, and asymptotic stability, exactly the toolbox that has been criticized for several decades. Despite this apparent limitation, and in fact because of it, I found their approach to be bold, refreshing, and unapologetic. Another peculiarity of the book is that, although much of food web theory has been developed in aquatic systems, they take underground soil food webs as the prototypical model systems.

They guide the reader through the mathematical background necessary to understand the main results. Mathematical concepts are introduced in a very intuitive way, and the book never feels too “technical.” The material forms a very brief and