BOOK REVIEWS

Limnol. Oceanogr., 44(7), 1999, 1843

LAMPERT, WINFRIED, AND ULRICH SOMMER. 1997. **Limnoecology: The ecology of lakes and streams.** Oxford University Press. 400 p. US$56. ISBN 0-19-509592-8.

This limnology textbook is unlike all others, which consider the ecosystem to be the fundamental object of interest. Instead, Lampert and Sommer focus relentlessly on the organisms that inhabit lakes and streams, showing how they are influenced by and are adapted to their environments, and how they interact. Originally published in 1993 in German, this book was expertly translated by J. F. Haney.

The explicit goal of the book is to show how and what limnology can contribute to general ecology. It is even organized like a general ecology text: Chapter 1 (Ecology and Evolution) deals with natural selection, fitness, and the proximate vs. ultimate factors that influence aquatic organisms. The next (Methods of Ecological Research) summarizes the scientific method, giving excellent verbal and pictorial descriptions of various approaches to experimental aquatic ecology (microcosms, bags, whole-lake experiments, etc.); I commend the authors for presenting this material and for discussing scale-related tradeoffs (e.g., reality vs. replication), but I think that students would benefit from the explicit recognition that all types of approaches are needed. This is followed by a chapter (Special Features of Aquatic Habitats) on the physical and chemical aspects of limnology; but, in keeping with the theme of the book, the focus continues to be on implications for organisms.

The book really shines in the next three chapters (The Individual in its Habitat; Populations; Interactions). This treatment of organismal biology, population ecology, and species interactions is extremely clear, thorough, and up-to-date, and far surpasses any other limnology text in these areas. The material on resource use and competition is particularly incisive, which is not surprising, given the authors' many important publications in these areas. The following two chapters (Communities; Ecosystem Perspectives) do not, unfortunately, reach similar heights; in particular, they are not as effective as the preceding three chapters in conveying the excitement of recent research. A final small chapter makes connections between general ecology and limnology and attempts to place ''limnoecology'' in a broader societal context.

In contrast to most limnology books, but in keeping with most general ecology books, topics regarding organisms and their interactions are organized conceptually rather than according to taxonomic or trophic level groupings. That is, where most limnology books have separate sections on phytoplankton, zooplankton, fish, etc., this book deals with all groups simultaneously. For example, the section on competition includes examples from plants and animals. I like this approach and plan to re-orient the species interactions section of my limnology course in accordance with it. One unfortunate characteristic that this book does share with other limnology texts is its nearly exclusive focus on planktonic organisms in stratified, glacial lakes of the temperate zone. There is relatively little information on fish, benthic organisms, streams, and non-glacial lakes. The authors also clearly prefer to deal with ''basic'' as opposed to ''applied'' subjects; this is disappointing, considering that this book will be many students' introduction to limnology.

In many ways this book illustrates that limnology is still struggling to define itself. As I mentioned at the outset, its emphasis on organisms, rather than lakes and streams as ecosystems, deviates from the general view emerging from the rest of the limnological community, which is that both teaching and research need to be more interdisciplinary and expansive. Indeed, the most recent publications (Naiman et al. 1995; National Research Council 1996) find that the ecosystem paradigm is even too limiting, and recommend that limnologists adopt a watershed perspective. To do this, limnology curricula would have to expand to include strong geological and hydrological components, in addition to the more traditional biology, chemistry, and physics. Because this text does not attempt to integrate the physical sciences as do other limnology texts (e.g., there is no mention of how lakes are formed and there is minimal coverage of hydrology and lake hydrodynamics) its use for a limnology course may be limited. Of course, such information could be provided from other sources, and, to be fair, the authors did not try to cover all aspects of limnology, choosing to focus on organisms and their interactions. Indeed, it may well be that it is no longer feasible for a limnology textbook that is both as up-to-date and fresh as this one to adequately treat all aspects of limnology. The fact that the most recent comprehensive limnology text (Wetzel 1983) has not been revised for 16 years is perhaps a sign the field has grown so large (or that aquatic scientists are being trained too narrowly) that only texts which focus on particular processes, groups (such as this book), or habitats (e.g., Allan 1995; Scheffer 1997) are feasible.

In summary, although this book is more narrowly focused than traditional limnology texts it is substantially more thorough in the subjects that it does treat. It also reaches out to general ecology in a manner unlike any other limnology book. I highly recommend it to students beginning in the field of aquatic sciences, as well as instructors and researchers looking for a comprehensive coverage of aquatic species interactions.

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