Limnol. Oceanogr., 44(6), 1999, 1597

TOLLRIAN, RALPH, AND C. DREW HARVELL [eds]. 1999. **The ecology and evolution of inducible defenses.** Princeton University Press. xi + 383 p. US$29.95. ISBN 0-691-00494-3.

This book is a collection of original papers about inducible defenses of plants and animals from terrestrial, marine, and freshwater habitats. Because a knowledge of jargon terms (e.g., kairomone: a chemical signal produced by a predator that affects the behavior, development, or life history of a prey species) is assumed, newcomers to the field will probably have to do some background reading (I recommend the series of papers in BioScience **39**(7), 1989). But for those who are ready, this delightful book provides a wealth of stimulating information.

I particularly liked the thoughtful introduction, where the editors give an overview of common themes that are developed in virtually every paper. These include:

- The conditions that favor the evolution of adaptive, phenotypically variable responses to biotic agents. This is the area that students of induction feel they understand best, and it is interesting to compare the lists of necessary conditions from different habitats.
- The chemical structures of kairomones, and how this knowledge leads to breakthroughs in understanding the genetics and physiology of inducible defenses. Several chapters show how chemical identification permits new experimental techniques to be used to study the adaptive significance of inducible defenses. This is an area of active research and important contributions have appeared since the publication of this book (Kusch 1999; Boriss et al. 1999).
- The costs that constrain the expression and evolution of inducible defenses.
- How induced defenses against multiple predator types are integrated into an optimal response. Pair-wise experiments have shown that prey species having multiple predators respond in different ways to different predators. The next step is to determine how these responses are integrated in time and space.
- Coevolution of induced responses, i.e., the evolution of induced prey defenses that benefit the predator as well as the prey.

A great strength of the book is its breadth. The contributions are organized into three main sections: plants, animals, and theoretical approaches. The chapters on induction in plants, intertidal organisms, and zooplankton were a given because work on these groups established inducible defenses as an area of research. Those on algae, fish, and protists describe anticipated extensions of this well-established body of knowledge to these groups. The single chapter on the induction of immune responses in vertebrates was totally new to me.

Everyone doing research in any area of inducible defenses must read this book. Its wide taxonomic scope would also make it ideal material for a general ecology graduate seminar. All chapters are comprehensive, well written, and highly polished. It is clear that the authors (of whom I am one; but the editor assures me it is OK for me to also review it) took their work seriously, and the editors did an outstanding job of combining, synthesizing, and focusing.

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OREN, AHRON [ED.]. 1999. **Microbiology and biogeochemistry of hypersaline environments.** CRC Press. 359 p. ISBN 0-8493-8363-3.

This book provides an up-to-date summary of how halophilic microbes live at high salt concentrations. Hypersaline environments include inland waters on all continents, as well as certain soils, mineral deposits, and salt-preserved foods. Halophilic microbes perform critical ecological and biogeochemical functions in all these environments. In recent years, microbiologists employing modern molecular techniques have made significant advances in studies of hypersaline environments. Basic and applied research have blended together quite successfully in this work, and information about the peculiar biochemistry of halophilic organisms has led to several biotechnological applications.

Unfortunately, limnologists have been slow to adapt the new molecular tools to saline lakes. Traditional limnological techniques have given but a glimpse of the fascinating adaptations that allow microbes to proliferate in these extreme aqueous environments. To advance, we must broaden our perspective. The information summarized in this book will help us do so.

The book is subdivided into sections on taxonomy and ecology, biogeochemistry, the Dead Sea, ion metabolism and osmotic regulation, biochemistry and molecular biology, and genetics and genomics. Most chapters are reviews and therefore lack methods or results per se, but they often provide excellent references to relevant work. The quality of the writing is quite satisfactory, and, given the multilingual list of contributors, is a credit to the editor.

About half of the book is devoted to biochemistry and genetics. These 15 papers offer a rich assortment of information on osmotic regulation, enzyme activities, gas vesicle formation, production of bacteriocins, and genetic systems. This material is likely to be tough sledding for ecologists, and limnologists who are interested in exploring ecosystem processes in saline lakes would be well advised to collaborate with microbiologists or molecular biologists.

Molecular biology has revealed considerable taxonomic diversity among halophilic microbes and makes it possible to trace phylogenetic relationships. This increased taxonomic complexity multiplies the challenges that ecologists face. Data on the distribution and changes in abundance of the many aquatic halophiles is scanty, and the considerable range of concentrations and chemical compositions of inland saline environments make it clear that a concerted effort will be needed to decipher the ecological role and interactions of microbes in these habitats.

Pelagic and benthic microbes play critical roles in biogeochemical cycles in saline lakes, but unfortunately, biogeochemistry receives little attention in this book. Much of what is presented comes from the Dead Sea, where pelagic and benthic microbes have been studied. One especially provocative suggestion, derived from work on *Dunaliella,* is that nutrient availability is reduced under high salinity. More generally, this work shows that salinity is just one of several factors that require adaptation in hypersaline lakes.

Although targeted for a specialized readership, the book provides a valuable summary of information derived from a variety of disciplines that is available for microorganisms adapted to high salt concentrations. That living things can flourish in such physiologically demanding places is a vivid reminder of how adaptable life is and makes it seem likely that there is life elsewhere in the universe.

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