

the-art in conservation prioritization. Edited volumes often become a smorgasbord of contributions with little coherence between the individual contributions. The editors and authors of this volume manage remarkably well to avoid this trap by elaborating the linkages between the chapters. As outlined above, the book follows a clear and logical storyline, including problem definition, model building, concepts, and tools for problem solution, and current and future challenges. As a result, the book has the coherence of a monograph and at the same time includes the expertise of many leading experts. Equipped with instructive examples, boxes, figures, and tables, each chapter contributes to the main theme, provides a nice overview of the respective research field, and is even complete

enough to stand on its own. All this makes reading *Spatial conservation prioritization* a pleasure and benefit for scientists and practitioners, beginners and advanced.

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Marine macroecology explained

Witman, Jon D., and Kaustuv Roy, editors. 2009. **Marine macroecology**. University of Chicago Press, Chicago, Illinois. xv + 424 p. \$95.00 (cloth), ISBN: 978-0-226-90411-5; \$40.00 (paper), ISBN: 978-0-226-90412-2.

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The overarching goal of macroecology is to describe and understand the large-scale patterns in the distribution of life on Earth, and it is a discipline rooted in terrestrial ecology. Herein resides a fundamental problem and contradiction. The oceans cover 71% of the Earth's surface. Thus, we have no hope whatsoever of understanding the factors governing the distribution of life on Earth unless both marine and terrestrial life forms are considered. Unfortunately, however, macroecology as a discipline has only relatively recently begun to migrate from land into the sea. Thus, the timing of this book, with its goal to "provide an overview of our current knowledge of marine macroecology" and "also to set an agenda for future research," could not be better! As the editors define their audience as being "students as well as established researchers in a variety of subdisciplines, ranging from marine ecology and biogeography to paleontology and evolutionary biology," I (KR) asked one of my newest Ph.D. students (EAM), who is moving from a more traditional marine ecology background into macroecology, also to review the book. Thus, this "two for the price of one" review includes the combined impressions of a more seasoned warrior on the marine ecology battle ground as well as those of a relative newcomer.

We both agree that the book largely succeeds in its overall goal and can be recommended as a textbook for scientists with a marine background who are looking for a stronger foundation in macroecological principles and how they translate from terrestrial to marine environments. Such a text is long overdue and the authors succeed in making macroecological concepts accessible to the literate marine ecologist reader.

After the initial and overall kudos, however, we (in typical scientific reviewer fashion) identified a number of areas in which we think the book could have been improved. The volume is a compilation of separate chapters by different authors, apparently writing in isolation from one another. This, inevitably,

results in a good deal of overlap between chapters (we lost count of how many times the theory of latitudinal diversity gradient was explained). The part of the review team representing the older generation found this repetition irritating. The younger generation graciously argues that the repetition helped him identify the really important points, and those he knows he needs to remember—the moral here being that, also in the case of books on marine macroecology, beauty is in the eye of the beholder. Of course, a number of potential readers might be tempted to limit their reading to individual chapters, in which case, the repetition will not be a problem.

The book is divided into three main sections. We found the first to be the weakest. It is designed to provide an overview of what is currently known and, in particular, what is still lacking in our understanding of large-scale ecological patterns in the sea. Totally missing in this section, however, is a comparison of the differences between marine and terrestrial environments and a consideration of how these differences may influence the direct application of macroecological theory developed in a terrestrial context to the marine environment. There are fundamental differences between ecosystems on land and in the sea—one of the most notable being the fact that something on the order of 95% of the primary production occurring in the ocean is carried out by microscopic organisms and yet no mention of what these differences might mean when transferring methods developed for use in terrestrial environments to marine systems is made. This confounds interpretation of some of the cases presented in the book.

In the very first chapter, for example, several pages are devoted to comparing primary productivity in various ocean regimes with "diversity" in these regimes. This "case" frustrated the senior reviewer for two reasons: firstly, primary productivity is derived from one study and is based on estimates obtained from satellite measurements. No mention is made of the fact that much of primary production in many ocean domains takes place well below the surface layer observable by satellite-mounted sensors. To further complicate matters, there is no a priori reason to assume that the relative contribution of "sub-surface" primary production will be the same between regimes. Thus, serious questions can be raised as to the validity of these primary production determinations.

Secondly and more importantly, however, "diversity" is never defined. What organism groups were considered? On land, we would almost certainly include plants as well as the organisms that feed directly upon them in diversity determina-

tions relating to primary production but this is unlikely to have been the case in the analysis described given the paucity of (and lack of comparability between) phyto- and zooplankton data sets in the ocean regimes identified. Is it not a major constraint in comparing/contrasting patterns in the distribution of organisms in marine and terrestrial ecosystems that so much of nature in the ocean is too small to be observed by the (human) naked eye and, therefore, is not well sampled or understood? Is it really fair to apply theories or concepts developed in terrestrial systems on the basis of diversity studies carried out over many trophic levels to marine systems where many trophic levels remain undersampled and not even well described and where the number of trophic levels almost certainly varies in the ecosystems represented in the ocean regimes being considered? The undersampling problem comes up in several chapters but nowhere was there a focused discussion of how the relative sizes of, for example, the primary producers on land and in the sea might influence macroecological comparisons between the two environments.

Several authors use the undersampling argument as an explanation for why their attempts to find well-known macroecological patterns from the terrestrial world in the ocean are inconclusive. Given the fundamental differences between terrestrial and marine systems, we would have preferred to see a direct discussion of whether or not it is even reasonable to expect to find the same patterns in both domains, rather than the apparently tacit assumption that the same patterns exist but have yet to be documented. Several chapters either directly or indirectly imply that the "paradox" whereby the diversity of plankton and other organisms seems too great considering the homogeneity of the environment they inhabit is now, finally, solved by the revelation that the tiny organisms of the ocean, apparently, "see" many more niches to occupy than are immediately obvious to the human eye. This is not news to biological oceanographers and these sections could usefully have been supplemented with relevant references from that discipline.

The second part of the book, comprising six chapters, provides a thorough introduction to the processes underlying macroecological patterns in the oceans and does an excellent job of explaining macroecology as a science in a marine perspective. We actually discussed whether or not the book might have been improved if this section had come first, as some

of the general theory presented in the first section is more clearly presented in the second. Particularly valuable in the second section is the discussion of some of the statistical models currently in use. This section left the younger reviewer with a clearer perspective on marine macroecology and a larger toolbox as he begins to undertake the statistical studies that comprise the backbone of this discipline.

The third part of the book comprises only three chapters and presents the relatively newly emerging practice of using experiments within macroecology to help understand the processes leading to the patterns observed through statistical analyses. This is a thought-provoking section and left the senior reviewer reminded of how very much more there is to do and feeling eager to get into the field to do it! These chapters suggest that there is an overrepresentation (considering how little this region fills in the ocean as a whole) of intertidal/littoral zone studies that can be considered as examples of experimental marine macroecology. This emphasis is hardly surprising given the relatively easy access intertidal ecosystems and the similar traditions between littoral and terrestrial ecologists. Nevertheless, even the non-littoral ecologist can be inspired by the types of advances in understanding that intertidal/littoral ecologists have made by incorporating experiments into more traditional macroecological studies, as presented in these three chapters.

Thus, *Marine macroecology* provided both reviewers with valuable input with respect to marine macroecology as a discipline and we can warmly recommend it as an introductory text for students and scientists with a background in marine science and who are eager to expand their horizons.

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