

HOGARTH, P. J. 1999. The biology of mangroves. Oxford Univ. Press; Oxford, UK. ix + 228 p. ISBN 0-19-850222-2. Paperback. \$34.95.

Mangrove swamps (mangals) are not the cup of tea of most terrestrial biologists who probably abhor them because they are usually muddy, smelly and buggy. However, they are actually important habitats for many marine organisms, including my favorite insects, the sea-skaters. So, as soon as I received the review copy of this book I looked for *Halobates*, *Asclepios* and *Trochopus* in the index. Alas, none has been included, although they are some of the most prominent marine insects associated with tropical Pacific, Indian and Atlantic mangroves. They are often overlooked. When I visited the marine laboratory of the University of the South Pacific in Fiji some years ago, and asked about sea-skaters, Drs. X and Y, who had worked on mangrove communities for many years, told me that they were definitely absent from the mangroves around the laboratory. However, not wanting to be so easily discouraged, I took a bucket and a plastic scoop, marched off to the nearby mangrove swamp and returned some 15 minutes later with no less than 100 *Halobates*! One just has to know how to look for them.

This attractive book, 5th of a series on the Biology of Habitats has a preface, 8 chapters, a suggested list for further reading, an extensive bibliography (which also includes a list of websites on mangroves), a glossary, and a general index. Each chapter begins with a short general introduction followed by detailed discussions of the subject matter divided into short sections. There are many fine black-and white illustrations (figures, tables, graphs, photographs, and electron micrographs), most, but not all, with scales to indicate sizes of the animals or plants.

Chapter 1 (Mangroves) tells us what a mangrove is, where mangrove forests are found, how they cope with tidal water, salt and nutrients in their environment, and how they propagate. There is a nice discussion on vivipary, common among mangroves but rare in other higher plants.

Chapter 2 (The mangrove ecosystem) reviews the mangrove ecosystem, how it is divided spatially and what determines its general size and shape. Although with only few species compared with tropical forests, they show rather complex species zonation (e.g., Fig. 2.2). Biological features (propagule sorting by size, smaller ones being carried further up the shore) and physical factor (duration of inundation, salinity) as well as changes in the sea-level and sediment accumulation can all affect species zonation. Mangroves tend to trap or create mud, which provides a habitat for larvae of biting midges (Ceratopogonidae: *Culicoides*) and various other invertebrates. Decomposing leaf litter from mangroves is an important source of nutrients and a substrate for bacteria and fungi. As the author aptly says "a

mangrove habitat is a great deal more than mud which happens to have trees growing in it".

Chapters 3 and 4 (The mangrove community) discuss respectively the terrestrial and marine components of the mangrove community. The former is largely devoted to terrestrial vertebrates (amphibians, reptiles, birds and mammals), with a short section on insects (herbivores, ants, termites, biting flies and fireflies). [I was disappointed to note that there was no reference to Murphy's 1990 comprehensive review of about 100 insect herbivores on 21 species of mangrove trees in Singapore.] The marine chapter is largely devoted to crabs (*Brachyura*), the most dominant invertebrates in the mangrove, with detailed information on their biology, physiology, adaptations and behavior (especially that of fiddler crabs). There are also brief discussions on the algae, fauna on mangrove roots, snails, the meiofauna, and a slightly longer section on mudskippers.

Chapter 5 (Measuring and modelling) reviews the mangrove community as a whole and presents a food web or energy flux model (Fig. 5.7), with discussions on each component. Such quantitative approaches are particularly useful in the management of mangrove systems.

Chapter 6 (Comparisons and connections) compares mangroves, which are predominantly tropical, with salt marshes, their equivalents in the temperate region, and how they serve as important nurseries for various marine invertebrates, some of which may be of great economic value.

Chapter 7 (Biodiversity and biogeography) presents an interesting discussion on the biodiversity and origin of the mangroves. There are considerable differences in the distribution of various species, with a much greater abundance in the Indo-West Pacific (57 spp.) than in the Atlantic-Caribbean-East Pacific (15 spp.). South-east Asia, long considered the center of diversity for many tropical marine organisms, has also the greatest diversity of mangroves. Since fortunately we have some fossilized mangrove seeds, we are able to date their origins to sometime in the late Cretaceous or early Paleocene, around 69 myr ago. They then became widespread around the world throughout the entire pan-tropical zone (Fig. 7.6). Their present distribution is quite different and is largely a result of continental drift, leading to local extinction of some species and diversification of others. [For a more recent discussion on the origins of mangroves see Aaron et al. (1999).] Molecular genetics studies on a few genera will help in our understanding of the evolution and genetic diversity of mangroves. The chapter ends with discussions on 2 experimental studies, attempting to relate species richness with habitat area or productivity.

The final chapter (Impact) reviews uses of mangroves by humans as well as animals, and how they could be managed, protected or rehabilitated. Two case studies are presented, one in Malaysia, the other in Pakistan.

Although mangroves serve important functions in the lives of many people in the tropics and are of enormous economic potential, so far little effort has been made worldwide for their protection. This book should help us to appreciate their importance and encourage more sustainable management of these valuable resources.

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#### REFERENCES CITED

- AARON, M. E., E. J. FARNSWORTH, AND R. E. MERKT. 1999. Origins of mangrove ecosystems and the mangrove biodiversity anomaly. *Global Ecol. Biog.* 8: 95-115.
- MURPHY, D. H. 1990. The natural history of insect herbivory on mangrove trees in and near Singapore. *Raff. Bull. Zool.* 38: 119-203