



BOOK REVIEW

Oceanographic Processes of Coral Reefs: Physical and Biological Links in the Great Barrier Reef. Edited by Eric Wolanski. CRC Press, Boca Raton, London, New York, Washington, D.C. 356 p, companion CD-ROM.

The Great Barrier Reef (GBR) of Australia is arguably the most important coral reef system in the world. Chapter 1 provides a brief political history, noting that the GBR was inscribed on the World Heritage List in 1981. More importantly, Australia, with an area nearly as great as the continental United States, but a smaller population than the state of Texas, has wisely committed substantial resources to study and protect this national treasure. The driving force behind the establishment of James Cook University in the 1960's and the Australian Institute of Marine Science in the 1970's was recognition of the need for reef research. As a result, at a time when many of the world's reefs are critically threatened, the GBR is the most comprehensively studied and best protected, and the most likely to continue as a functioning coral reef system well into the 21st century.

The papers in this important book tend to be very local in focus. Yet they provide not only important information for local resource management, but also important case-studies and lessons for reef scientists and managers around the world. For example, while Chapter 3 "Landcover and Water Quality in River Catchments of the Great Barrier Reef Marine Park" by A.K.L. Johnson and others primarily examines the Herbert River, it informs land-use managers that riparian vegetation and coastal freshwater wetlands are critical to the protection of coastal marine ecosystems.

Joe Baker states in Chapter 1. "The Place of Science and Technology in the Wise Management of the Great Barrier Reef" (p. 1): "This book brings together many authoritative scientific and technological papers which demonstrate the way in which systematic studies can help decision-makers understand the linkages between land- and water-use practices and their impacts on coral reef processes and structure." That goal is optimistic. Although the chapters are generally well edited and readable by reef researchers and other scientists, much of the information will still require significant translation to effectively communicate scientific understanding of the interconnectivity of upland, coastal and reef ecosystems to local land-use planning councils, as well as state and national political leaders. Baker notes (p. 5) that "The Precautionary Principle has not been as strong as the Economic Rationalism, which is so contrary to the principles of Ecological Sustainable Development", and places responsibility for communication squarely on scientists and technologists.

The book consists of 20 chapters that examine physical, chemical and biological links ranging from river systems to

ocean currents to climate variability and global climate change. Eric Wolanski provides an overview in Chapter 2. "Physics-Biology Links in the Great Barrier Reef". Terrestrial sediments and nutrients, including the critical importance of intact coastal mangrove and seagrass ecosystems to coral reefs, are subjects covered in chapters 3 through 10. Chapter 11. Connectivity in the Great Barrier Reef World Heritage Area – An Overview of Pathways and Processes", by M. Cappel and R. Kelley, links Chapters 3–10, which deal with terrestrial-reef connectivity, with Chapters 12–16 which deal with oceanographic processes, currents, and fisheries issues in the GBR region. Chapters 17 and 18 deal relatively briefly with climate and bleaching. Chapter 17, by J.M. Lough, relates climate variability change to processes ranging from rainfall and river flow to coral bleaching. The relatively brief text leaves the reader wanting much more; fortunately it is supported by a multitude of informative figures and animations. Chapter 19. "The Challenges of Coral Reef Management in Indonesia", by I.M. Dutton and others, provides a stark contrast with the commitment to GBR research and preservation apparent in Chapters 1–18. Dutton and co-authors discuss the limited resources and understanding of the long-term value of reef resources in Indonesia, where degradation has occurred on 70% of the reefs that were formerly some of the most stunningly beautiful and valuable reef resources in the world.

The book utilizes technology in a way that many will find informative and innovative. Figures are not presented within the text of the chapters, but rather in small, black and white versions at the end of each chapter. A "Companion CD" is located in a clear, plastic pocket in the inside back cover of the book. The CD provides color graphics and animations, both video clips and computer simulations, to further illustrate issues presented in the text. Each figure and animation is provided in a variety of formats including HTML documents, GIF files, and JPEG's or video clips.

The influences of oceanographic processes and links on the geological function of reef ecosystems are all but ignored. E.A. Drew, in Chapter 16, does mention the critical role of carbonate sediment production and accretion in *Halimeda* bioherms but the implications of human impacts on the construction and structure of the GBR ecosystems are not given adequate consideration. This would not be such a serious omission if the purpose of the book was a purely scientific communication but with a stated goal of educating decision makers about the impacts of their policies on coral reef processes and structure, one might assume the book would provide some discussion of the implications of the decline of carbonate producing organisms and consequent reef-accretion potential.

The final chapter asks "Will the Great Barrier Reef Survive

Human Impact?" The author, F.K. Talbot, in a one paragraph section entitled "Time Scales", suggests that predictions beyond a human generation or two have little value. Yet the doubling of atmospheric CO₂ over pre-industrial concentrations in this century is not a prediction, but rather inevitable. How much and how quickly that doubling will influence global climate and sea level are indeed still predictions. Furthermore, the influence of doubling CO₂ concentrations on sea-surface aragonite saturation, perhaps the single greatest long-term threat to the future of the GBR and reefs worldwide, is not even mentioned. The minuscule climate-change section, which mentions global warming, concludes with the amazing understatement "Biodiversity would certainly be impacted by a major die-off of reefs." How about the GBR structure itself? How about the ability of the GBR to build, repair, and keep up with sea level rise? Geologic history provides insight into all of these issues that the author of this chapter and the book as a whole, ignores.

In fairness to the editor and chapter authors, the emphasis is principally on local to regional issues of land-use and coastal management; issues that can be addressed by local decision makers. And the authors accomplish that goal. Unfortunately, as reef managers in the Florida Keys, Belize, the

Bahamas, and elsewhere in the western Atlantic and Caribbean have experienced, local management is helpless when bleaching and new diseases apparently unrelated to water quality decimate coral populations in seemingly "well managed" parks and remote reefs. Inevitable questions can arise as to whether local management is worth the cost and effort. Thus, political leaders and the public must be educated that preserving reef ecosystems for future generations requires both effective local management and international commitment to reducing anthropogenic impacts on the atmosphere, oceans, and climate.

The strength of this book is its presentation of local to regional issues of land-use and coastal management and their influence on the Great Barrier Reef. Thus, it should be interesting reading for readers of the *Journal of Coastal Research*. More importantly, it is a "must read" for scientifically-trained reef-resource managers and for scientific advisors of political leaders in localities and countries with coral reef resources.

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