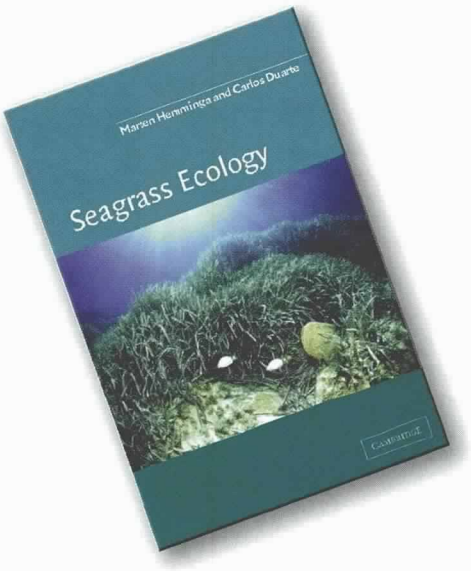
Book Reviews



Seagrass Ecology

By Martin A. Hemminga and Carlos M. Duarte, Cambridge University Press, ISBN 0 521 66184 6, 298 pages

Reviewed by:
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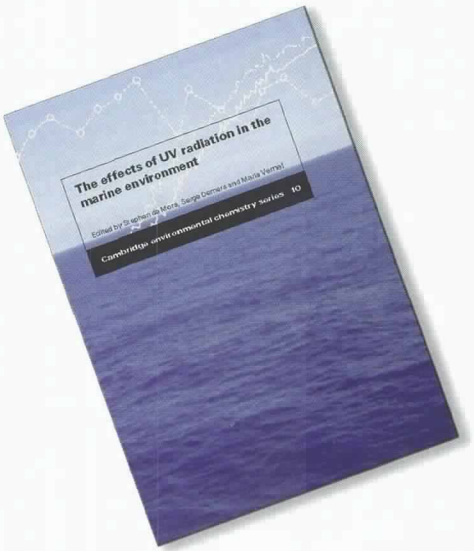
Seagrasses are an enigmatic, yet extremely important group of aquatic plants, and scientific interest in these valuable ecosystems has grown exponentially over the past 30 years. The last decade, in particular, has seen important advances in our understanding of how these important ecosystems function, their contributions to coastal biogeochemical cycles and their vulnerability to cultural modification of coastal environments. *Seagrass Ecology*, by Hemminga and Duarte, represents the most complete summary of our current understanding of seagrass biology in 25 years. This volume is unique in that it represents the unified view of the two authors, rather than an edited collection of reviews written by different authors. The result is a well-organized treatise that covers virtually every aspect of seagrass biology from systematics and morphology (Chapters 1 and 2) through populations (Chapter 3), physiology and biogeochemistry (Chapters 4 and 6), faunal communities (Chapter 6) and finally, relations to human culture (Chapter 7).

Chapter 1 (Taxonomy and distribution) discusses the origin and evolution of seagrasses, their biogeographic distributions, seagrass diversity, general habitat requirements and introduces concepts of global productivity. Chapter 2 (Seagrass architectural features) describes the modular nature of roots, rhizomes and leaves. It describes variations in the structures of fruits and flowers, and discusses theoretical aspects of allometry among tissues and clonal growth forms. Chapter 3 (Population and community dynamics) introduces fundamental concepts of seagrass growth histories, life spans, demographics, seedling recruitment and colonization of the submarine landscape. Chapter 4 (Light, carbon and nutrients) discusses light availability and photosynthesis, the impact of roots and rhizomes on whole plant carbon balance, the temporal dynamics of labile carbon reserves and the role of nutrient availability on seagrass productivity. Inorganic carbon acquisition receives justifiably more attention than found in most texts on aquatic ecology because notoriously low rates of photosynthesis can be linked directly to inefficient CO_2 concentrating mechanisms in these otherwise superbly adapted organisms. Chapter 5 (Elemental dynamics in seagrass systems) elaborates the roles of herbivory, benthic remineralization and sedimentary processes including anaerobic fermentation, denitrification, sulfate reduction, nitrogen fixation, and burial and export of organic matter. Chapter 6 (Fauna associated with seagrass systems) discusses the use of seagrass meadows for forage, refuge and nursery habitat by fishes, crustaceans, mollusks and vertebrates. It also examines the impacts of feeding by these organisms on seagrass populations. The final chapter (7: Seagrasses in the human environment) offers a compelling discussion of the cultural value of seagrass ecosystems, the global occurrence of major seagrass declines and their links to anthropogenic modification of coastal environments, and the potential for seagrass restoration. Rather than presenting encyclopedic reviews of the literature, each chapter provides a thoughtful synthesis of current understanding, accompanied by important citations to the primary literature. The figures and tables, mostly drawn from the primary literature, serve to reinforce the concepts presented in the text. The unity of prose that is provided by the single view of the two authors produces a continuity of presentation that makes for a pleasant and informative reading experience. The depth of their synthesis is both comprehensive and provocative. Experienced seagrass biologists will find many familiar papers among those cited in the chapters dealing with

their specialty. Readers looking for an introduction to seagrasses will discover an invaluable guide to the biology of these truly remarkable organisms, as well as a useful introduction to the most important recent publications. This book will be of great value as a primary text in courses intended for advanced undergraduates and graduate students as well as a useful reference for practitioners in the field. The authors should be commended for producing a timely and thoroughly readable synthesis of seagrass biology.



The Effects of UV Radiation in the Marine Environment

Edited by:
Stephen de Mora, Serge Demers, and Maria Vernet
Cambridge University Press,
ISBN 0521632188, 320 pages

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Interest in the effects of ultraviolet (UV) radiation on the marine environment surged after the Antarctic ozone hole was discovered in the mid 1980s. Much of the ensuing research has focused on quantifying the potential influence of stratospheric ozone depletion on primary productivity, the survival of marine organisms, food web processes and biogeochemical cycling. Generally, this problem is approached by using experiments to assess the wavelength-dependent biological or photochemical effects of UV radiation (280 - 400 nm), especially UV-B (280 - 320 nm). Properly quantified results can be used in models to estimate the impacts of UV in nature and how they would differ in response to enhanced UV-B associated with ozone depletion.

More than a decade of active research has put the ozone problem in better perspective. Ultraviolet radiation is now recognized as a potent environmental factor that significantly influences marine chemistry, water clarity, primary productivity, and probably pelagic food web structure. Ozone depletion has an incremental effect. Exposures of aquatic organisms to UV are a function of location and time, modulated by clouds, colored dissolved organic matter, vertical mixing of plankton and depth of benthic organisms. Ecological responses to these time-varying exposures can be strongly influenced by acclimation and altered food web dynamics. Consequently, physical, chemical and biological interactions with UV can have a strong influence on the marine environment. Owing to the complexity of these interactions and their demonstrated importance, assessing the effects of ozone depletion is no longer the prime motivation for studying UV in the marine environment. Simply, the effects of UV must be understood to describe the workings of the ocean.

This book comes at a good time in the development of UV radiation as an important topic for marine research. The field is diverse enough to require a multidisciplinary overview, and small enough to review effectively in one book. Providing a balanced mix of background information, elaboration of key principles, and reviews of major research areas, this volume is well suited for the target audience of researchers and graduate students in photochemistry, photobiology and environmental sciences. Its eleven chapters provide an appropriate foundation for anyone beginning serious study of the topic.

The presentation is well organized, beginning with a general, but comprehensive introduction by Whitehead, de Mora and Demers. A review of atmospheric and hydrologic optics, natural variability in UV, and instrumentation follows (Díaz et al.). Chronically underappreciated problems associated with UV research are highlighted, including the limitations of many radiometers and the pitfalls of working with artificial sources of irradiance.

Accurate measurements or models of spectral irradiance are necessary, but not sufficient, for describing the relationships between UV exposures and biological effects in nature. Spectral weighing functions (SWFs) and exposure-response curves are fundamental requirements for extrapolating experimental results to the real world. Neale explains the concepts, methodology, and application of SWFs in a thorough treatment which includes clear descriptions of the underlying principles of SWFs and exposure-response curves, direct comparisons of different weighting functions for UV effects, and some new work reconciling kinetic models. The emphasis is on inhibition of photosynthesis by UV; kinetic models are also discussed in the chapter on zooplankton and fish (Zagarese and Williamson).

In eight remaining chapters, important research