

BOOK REVIEWS

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DE SILVA, SENA S. [ED.]. 1998. **Tropical mariculture**. Academic Press. viii+487 p. \$99.00. ISBN 0-12-210845-0.

Mariculture has a long and diverse history in the tropics. It is extensively practiced in Asia, Latin America, Indonesia, and the Pacific Islands and contributes significantly both as a producer of food for the local populace and export for capital in those places. *Tropical Mariculture* is the first text that, by its title at least, accepts the challenging task of treating the enormous breadth of this field.

The book is a collection of articles written by different authors on a variety of topics germane to tropical mariculture. It begins with a brief overview of the current status and prospects in tropical mariculture. Five chapters deal with tropical finfish topics: culture through early life history, aquaculture technologies for numerous finfish species, culture techniques of the groupers (*Epinephelus* spp.) and seabass (*Lates* spp.) specifically, and a summary of milkfish (*Chanos* sp.) farming in the Philippines. The next two chapters address environmental issues related to historical aquaculture practices in the region. A chapter follows these on mussel (*Mytilus* spp.) and oyster (*Ostrea* spp. and *Crassostrea* spp.) culture in the tropics, and another that deals with the biology and culture of the sea cucumber (*Holothuria* sp. and *Stichopus* sp.) from the Japanese experience. The final four chapters are of very broad scope, dealing with perspectives for artificial diets for larval fish, genetic opportunities for finfish, challenges to formulated feed development for marine species, and pathogens of marine organisms.

Absent are comprehensive treatments of shrimp and seaweed aquaculture, which are the largest two segments in the region. The editor states that these omissions were intentional because these topics are dealt with extensively elsewhere but then fails to direct the reader to those sources, and several chapters in this book address these subjects in whole or in part. I felt that a more stringent editorial focus around a prevailing theme or two, both in the selection of topics and the content of individual chapters, would have strengthened the value of the text. Several chapters seemed to have been prepared for other applications and audiences, and were included in this volume without diligent modification to conform to the tropical focus espoused by the title. By-country summaries of production, practices, problems, and perspectives for all the species groups would also have augmented the text's reference value.

Tropical aquaculture is a very broad topic, the treatment of which is made difficult by the linguistic and cultural diversity of the region, and the prevalence of aquaculture information in the "gray" as well as hard literature. *Tropical Mariculture* contains several chapters that provide good overviews of their subject matter. Everything considered, this heterogeneous collection of papers is a serviceable introduction to aquaculture practices in the tropics.

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MEDWIN, HERMAN, AND CLARENCE S. CLAY. 1997. **Fundamentals of acoustical oceanography**. Academic Press, San Diego. 712 p. US\$75. ISBN 0-12-487570-X.

Our knowledge of aquatic ecosystems will always be limited by our inability to directly observe underwater habitats on scales in time and space that directly impact most aquatic organisms. Constant improvement of underwater observation tools—especially in relation to defining the structure of the biological and physical environment—is consequently an essential preoccupation of marine scientists. This new book by Medwin and Clay explaining the principles and methods of underwater acoustics makes an important contribution to this unending quest.

Acoustics is one of the oldest disciplines in physics. An explosive growth of information about underwater acoustics began just after WW II and continued through the 1980s, largely in response to the threat that submarine warfare posed to shipping. With the easing of Cold War tensions, ocean acousticians began to adapt their science to peaceful uses. They found that many biological and physical phenomena modify the propagation and scattering of sound in the sea and at its boundaries, and that such signals can be used to quantify these phenomena. (This is called the "inverse problem" in acoustics; it is distinct from the "forward problem", which involves calculating acoustical parameters—reverberation, ambient noise spectra, and propagation loss—based on what we know of aquatic processes.)

Acoustical oceanographers use sound waves to study bodies of salt and fresh water, their boundaries, and the things that they contain. On the large scale, sound has been used to investigate internal waves, turbulence, the characterization of water masses and their boundaries, mesoscale, gyre and basin scale dynamics, seafloor roughness, and the characteristics of sediments. On the small scale, it has been used to elucidate the characteristics of thin plankton layers, and gas exchange between the ocean and atmosphere due to individual breaking waves.

Previous books in underwater acoustics (e.g., the classic textbook by Bob Urick, the bound collection of benchmark papers by Vern Albers, the book on transducer calibration by Robert Bobber, the book on signal processing by Claude Horton, and an earlier book by Clay and Medwin) all share a common characteristic: they are organized and written with an engineering "flavor." This new book by Medwin and Clay is a physics book. Its use of physics and mathematics flow smoothly from very elementary and easy to comprehend to very complex and demanding. The first ten chapters are ideal for an undergraduate course. These same chapters, taken at a more advanced rate, and supplemented with the more complex material in later chapters on waveguides, Biot-Tolstoy theory, and scattering and transmission at rough surfaces are appropriate for a graduate course.

This book will be an invaluable reference for acoustical oceanographers. It also will be used extensively by fisheries and biological oceanographers as they try to understand and develop new ways to use acoustics to study the physical and biological processes that lead to ever varying distributions and abundances of organisms ranging from phytoplankton to marine mammals. Geophysicists will also find interesting material here that can aid their studies of the seabed and the structure of the underlying strata.

While this book's 1.5" (3.8 cm) thick size obviously can not contain the wealth of information related to acoustical oceanography that is in the 36 linear feet (11 m) that the Journal of the Acoustical Society of America takes up on my office wall, it very effectively distills much of the relevant information in that journal into a format

that I can easily take to sea and consult as an authoritative reference. This book is not just an updated version of the Clay and Medwin predecessor—it is much more comprehensive, containing a good blend of theory and hard-won data from measurements made at sea and in the lab. The fact that its list price is less than the current price of the earlier book is an unexpected bonus! I strongly recommend it to acousticians, geophysicists, and physical and biological oceanographers.

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BLACK, K. S., D. M. PATERSON, AND A. CRAMP [EDS.]. 1998. **Sedimentary processes in the intertidal zone.** Geol. Soc. Spec. Pub. 139. The Geological Society of London. ix + 409 p. \$132.00. ISBN 1-86239-013-4.

In recent times, interest in the intertidal zone has grown sharply in response to two forces. The first is the development of ports, marine industries, and human habitations in coastal and estuarine areas dominated by tidal flats; prime examples are the economic development of the vast flats in China and Korea, especially those bordering the Yellow Sea. The second force is the desire to understand and preserve valuable ecosystems, especially those that characteristically have high primary productivity; given the continuing rise of sea level in urbanized coastal regions of the midlatitudes and increasing contamination resulting from the previously mentioned economic developments, this is a daunting task. Together, these disparate forces have generated an urgent need to increase our understanding of intertidal flat dynamics.

In response to this need, the United Kingdom and several other countries are devoting substantial resources to the study of tidal flat ecosystems. This volume summarizes the results of the Littoral Investigation of Sediment Properties (LISP-UK) project, a multiinstitutional study of the intertidal mud flats seaward of the village of Skeffling in the Humber Estuary, United Kingdom. The papers are based on a meeting held in London in 1997; participants included people who worked under the LISP umbrella as well as others whose studies were thematically related to the LISP objectives. The editors have divided the book into two parts: "LISP-UK Studies" and "Generic Studies"; both, however, relate to the same set of scientific topics, and it would have been equally logical to group the contributions according to these topics. I suspect that the editors settled on the present organization to demonstrate that LISP is meeting the needs of the National Environment Research Council of the United Kingdom, the principal funding agency for LISP studies.

Although a wide range of disciplines is covered in this volume (geophysics, chemistry, biology, soil science, and hydrodynamics), the overall focus is on erosion. This reflects both LISP-UK objectives and the personal interests of the editors. Significant new information about mud flat erosion processes is presented, including the results of several LISP-UK experiments conducted along the Humber as well as other field, laboratory, and analytical studies.

A noteworthy contribution is the inclusion of both biological and soil strength parameters in mud erosion formulas, particularly those for calculating the critical shear stress of erosion. Biology is given special prominence, perhaps rightly so because the United Kingdom is a good example of a region where biological processing of mud

flat sediments has wide-ranging effects. The significance of biological control in mud flat erosion depends on the fluid environment. In high-energy areas, including large parts of the Severn Estuary, physical forces dominate the erosion process. But in comparatively low-energy environments, the need to include the effect of biological parameters or their surrogates is demonstrated by the observed variability in the critical shear stress with these parameters.

Another noteworthy feature of the volume is that several papers allude to the role of rheology (the deformation and flow of matter) in governing erosion. An advantage of rheological measurements, especially if they can be done in situ, is that the effects of all parameters, organic and inorganic, are incorporated in the rheometric coefficients. If this approach succeeds, it could solve a long-standing problem in regard to erosion, namely, the need to account for the vast number of factors that influence the rate of erosion. I hope this will be the subject of a subsequent volume.

The editors have taken great pains to ensure a high-quality product, for which they as well as the Geological Society of London are to be congratulated. The fact that the process of collecting the papers and publishing the treatise was completed in just over a year is highly commendable.

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FORSBERG, C., AND K. PETERSSON [EDS.]. 1998. **Lake Erken: 50 years of limnological research.** Archiv für Hydrobiologie, Advances in Limnology 51. E Schweizerbart'sche Verlagsbuchhandlung. 222 p. + vi. DM 130. ISBN 3-510-47053-2.

Very few ecosystems receive long-term analyses of changes in biota and their productivities that are coupled with evaluations of the dominant physical, chemical, and biological properties that influence changes to or consistency of spatial and temporal patterns. Despite widespread proclivity and lip service to the importance of detailed long-term analyses of ecosystems, in reality, most "long-term" studies are incomplete examinations of specific ecosystem components (e.g., pelagic plankton). Ecosystem evaluations of long-term patterns gain further value when coupled with detailed experimental analyses of controlling mechanisms. The best of these experimental manipulations are performed within the ecosystem or immediately adjacent in experimental laboratory facilities.

A number of individual ecosystems have emerged as habitats for ecological and particularly limnological study. Such foci often resulted from fortuitous events, particularly the donation of adjacent land and properties to a university or the sustained interest of individual scientists in a specific environment. Study of the biota and dynamics of controlling environmental factors of individual ecosystems can be extensive. However, as changes in the interests and leadership or circumstances within sponsoring institutions occur, growth in understanding of the complexities of such ecosystems often wanes. To remain effective, such programs require sustained intellectual and physical subventions. These two essential ingredients came together in Sweden during the middle of this century, when Uppsala University provided the venue, and the late Wilhelm Rodhe (died August 1998) provided the leadership. The result was the world-recognized Institute of Limnology.

Much of the Uppsala program focused on Lake Erken, a 24-km² mesotrophic lake in eastern central Sweden, to which access was