

Intertidal and Littoral Ecosystems, edited by A.C. Mathieson and P.H. Nienhuis, 1991. Elsevier, Amsterdam-London-New York-Tokyo, 564p., ISBN 0-444-87409-7 (vol. 24, *Ecosystems of the World*). Price: US \$195.-; Dutch Fl 380. .

The series *Ecosystems of the World* (in 29 volumes) was conceived by Bostwick H. Ketchum of Woods Hole Oceanographic Institution who died on July 14, 1982, but is being nobly carried on by David W. Goodall of the C.S.I.R.O. in Midland, Western Australia. The volumes do not appear in sequence. This one, volume 24, edited by Mathieson (University of New Hampshire, Durham, N.H.) and Nienhuis (Delta Institute for Hydrobiological Research, Yerseke, The Netherlands), is an outstanding contribution and should be a required purchase for any coastal institute, though the high price may keep it, regrettably, off the shelves of specialists.

Although the content is intended mainly for biologists, there is much of value for physical geographers, geomorphologists and indeed any coastal scientist. The volume is multi-authored, divided into 18 chapters, and carries no fewer than five indexes, so that as a future research tool it will be invaluable. The indexes are: list of genera, authors, systematics, geographic, and subject. The first four chapters deal with general-type reviews: 1. Introduction (by the editors); 2. Marine plant ecosystems (Lüning and Asmus); 3. Chemical Characteristics (Schramm); 4. Vertical Distribution, Zones (Russell). The rest of the volume is devoted to regional topics, which, although global in principle, leave vast gaps, thus: 5. Iceland, especially algae (Munda); 6. Baltic (Wallentinus); 7. Canadian Maritimes and Maine, rocky shores (Mathieson, Penniman and Harris); 8. U.S. Mid-Atlantic, sandy shores (Orth, Heck and Diaz); 9. Caribbean and tropical W. Atlantic (Dawes, McCoy, Heck); 10. N.E. Pacific: Aleutians to Baja California (Foster, de Vagelaere, Oliver, Pearse, Harrold); 11. Southern California: rocky coasts (Littler, Murray, Seapy); 12. Tropical West Africa (John and Lawson); 13. Southern Africa (Field and Griffiths); 14. Chile (Santelices); 15. Indonesia and New Guinea: seagrass communities (Brouns, Heijs); 16. Red Sea and Gulf of Aden (Lipkin); 17. S.E. Australia (King, Hutchings, Larkum, West); 18. Near-shore benthic environment: remote sensing (Kelly).

Impressive as this rich menu appears (the end-paper maps mark the areas), one cannot help but regret the absence of any consideration of the Arctic (Canadian Arctic, Greenland, Spitzbergen, Russian Arctic), western Europe, eastern South America, east Asia, oceanic islands in general, the entire Indian Ocean, and the Antarctic. It should be noted, however, that other volumes in this series treat *Coral Reefs* (vol. 25), and *Estuaries and Enclosed Seas* (vol. 26); the latter which appeared in 1983 embraces the Baltic, Mediterranean, Black Sea, Persian Gulf, Bay of Bengal, South China Sea, Japan Sea, Bering Sea, the Gulf of California, and the Gulf of St. Lawrence. Thus, some of the "gaps" are partially covered already.

Coastal specialists of all categories might spare a few moments to consider the discussions on human impacts on the coastal ecology, notably in southern California (collecting, foraging, trampling, oil spills, sewage disposal, etc.), eutrophication in the Baltic, to name only two areas in what is really a global problem. The chemical survey in chapter 3 (Schramm) is particularly interesting in this context.

Leafing through the various chapters, it is particularly reassuring to learn the classic papers on shore ecology are still acknowledged and revolutionary rejections are not proposed. The standard zonation patterns recognized since the early 19th century still appear to stand up to global surveys, and their systemization by the Stephensons and Lewis in the present century is very much "alive".

In the light of the present anthropogenic rise in atmospheric CO₂ and the on-going "global warming" debate, it has been interesting to review the chapters for evidence of secular change. For the U.S. mid-Atlantic sector, for instance, an illustration from Orth (1977) shows water temperatures for seven selected sites for the warmest and cold months in series that go back to 1900. Although there have been distinctive interannual fluctuations (largest in winter), there is no significant trend. There is some indication of the 18.6 yr lunar nodal period which causes tidal upwelling of cold water. This effect can be important near sensitive ecologic boundary zones as in the Gulf of St. Lawrence (see p. 114). Tides in general play a vital role in shoreline ecology and are discussed in almost every chapter. The Asiatic monsoon is also very significant, but the affected coasts are not included in this volume; however, the West African monsoon, although less powerful, is brief-

ly discussed (p. 300). In the N.E. Pacific, the role of El Niño gets little more than a mention.

Rhodes W. Fairbridge
Columbia University
New York, NY

Environment and Aquaculture in Developing Countries, R.S.V. Pullin, H. Rosenthal, and J.L. Maclean, 1993. International Center for Living Aquatic Resources Management, Manila, and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn, Federal Republic of Germany, 359p., ISBN 971-8709-05-3.

By the mid-1970's it became apparent that world capture fishery production would peak somewhere near 100 million tons annually, while it was also apparent that demand would continue to increase in response to exponential growth of the human population. Aquaculture, the controlled rearing of aquatic organisms, was seen as the solution to meeting an increasing demand for seafood in the face of a stable or diminishing contribution from capture fisheries. Rosy projections for aquaculture expansion were heard through the 1970's and well into the 1980's. Aquaculture was generally viewed as being environmentally benign. That view is no longer widely held.

Criticism of aquaculture in the United States began to develop perhaps a decade ago, and for at least a few years was largely ignored by the aquaculture community, but not by regulatory agencies. As stringent effluent controls began to be implemented in various states, and as the federal government actually reduced the number of drugs and chemicals approved for use in conjunction with aquatic food animal production, U.S. aquaculture expansion became increasingly constrained. Those constraints were accompanied by growing criticisms concerning potential problems resulting from the use of exotic species, the release of antibiotics into the natural environment, and the potential alteration of natural genetic diversity as a result of the interbreeding of hatchery and wild fish, to name but a few. At the same time it was becoming increasingly apparent that even without regulation, appropriate sites for aquaculture in the United States were becoming increasingly difficult to find, due to competition for space and water. In the meantime, aquaculture

continued to expand at a phenomenal rate in the developing countries of the world where there were few, if any regulations.

If asked, it is unlikely that many aquaculturists would have predicted anything but continued expansion of the industry in developing countries; that is, until now. *Environment and Aquaculture in Developing Countries* is the product of an international conference at which environmental issues associated with aquaculture in the developing world were scrutinized in great detail. All of the issues that aquaculturists in the developed nations of the world have been struggling with, along with some additional ones, are detailed in this volume and recommendations are provided for dealing with each of them.

The book encompasses both freshwater and marine aquaculture and looks not only at environmental issues but also at the socioeconomic framework in which aquaculture is conducted in the developing world. In depth treatments by renowned authorities are provided, which have regional (Africa, Asia, Latin America) and topical (e.g., use of wastewater, conservation of genetic diversity, disease transmission, effects of harmful algal blooms), and even organism-specific (Latin American shrimp culture) foci. Each of the papers in the conference proceedings provides a good deal of background information and is well documented with literature citations. Many of them contain compilations of data in tabular form or in figures. The book pulls together a considerable amount of demographic and production information that may not be otherwise readily available to scientists, policymakers, or aquaculture practitioners.

At the end of most of the papers in the volume is a transcript of the discussion that was held during the conference. By reading the discussions, one can develop an appreciation for the dilemmas surrounding some aquacultural practices. For example, organic fertilizers have been widely employed in conjunction with finfish culture in developing nations. Animal manure and nightsoil are often used as fertilizers. Such nutrient sources may also transmit pathogens that become resident in the cultured fish and pose a health threat to those who handle and eat those fish. A logical solution is to employ only treated sewage effluent in aquaculture, but the cost of doing so is often prohibitive. Problems associated with high levels of trace metals, biocides, and other contaminants in wastewater are another topic that is discussed.