

Review: Estuarine Science: A Synthetic Approach to Research and Practice

John E. Hobbie (Ed.)

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John E. Hobbie (Ed.). *Estuarine Science: A Synthetic Approach to Research and Practice*. Washington, DC: Island Press, 2000. 540 pp. ISBN 1-55963-699-8 (cloth); 1-55963-700-5 (paper). US\$60 cloth; US\$30 paper. Recycled, acid-free paper.

"Slough," "inlet," "bay," -they are often really estuaries, areas where fresh water streams and rivers meet the waters of the ocean, creating areas of high primary productivity and rich biotic diversity. The fresh water floats on top of the salt water, creating a variety of dilution zones in which fish can compete. Estuaries exhibit a high degree of spatial and temporal variation in chemical and physical characteristics. Large numbers of fish and shellfish can be found there and they also provide a birthing place for many marine animals. Most estuarine research has been local or statewide, but efforts are being made to bring synthesis to these studies and to create a dialog between local scientists to create more cross-estuary studies. There has been a lack of interest in research and synthesis of data from estuarine research, with most marine researchers focusing on the ocean.

In 1995, with support from the U.S. Scientific Committee for Problems of the Environment (SCOPE), the National Science Foundation (NSF), and the National Oceanic and Atmospheric Administration (NOAA), 40 estuarine scientists gathered to put forth the argument for the synthesis of estuary research. The plenary talks from the conference comprise the majority of *Estuarine Science: A Synthetic Approach to Research and Practice*, edited by John E. Hobbie, co-director of the Ecosystems Center of the Marine Biological Laboratory at Woods Hole, Massachusetts.

As Hobbie contends, synthesis is needed for a number of reasons: "Estuarine research suffers from a lack of integration of knowledge that can be applied across sites. ... The results of most estuarine studies are not published in reviewed journals. ... The complex interaction of physical, chemical, and biological factors is essential to answering many questions about estuarine systems. ... [And] estuarine research must be able to predict the consequences of future changes in climate or land use in watersheds" (pp. 6-7).

As the authors deftly show, estuaries, which are less often studied than the

ocean, have been greatly affected by people. Some of the major effects that the rise in human population has had on estuarine ecosystems include nutrient increases causing algal blooms, dredging and filling of tidal habitats, alteration of seasonal patterns of fresh water inflow, overexploitation of natural resources, industrial pollution, and introduction of non-indigenous animals.

Five sections cover the scientific technical aspects: rainage basin synthetic studies, coupling of physics and ecology, linking biogeochemical processes and food webs, controls of estuarine habitats, and synthesis for estuarine management. Only the second to last of the 18 technical chapters explores closely the human element involved: "Integrated Ecological Economic Regional Modeling: Linking Consensus Building and Analysis for Synthesis and Adaptive Management."

The work points out that the factors leading to success have included the savvy of key individuals, the existence of lead agencies, institutional structures which included a range of stockholders, the collection of long-term scientific data for documentation, public recognition of problems, and eco-system level viewpoints. Long-term studies have improved our understanding of estuarine systems. Successes have been seen at The Great Lakes, Chesapeake Bay, San Francisco Bay (one of the best understood estuaries in the world), and Florida Bay.

One among many of this book's useful conclusions is that "great emphasis should be placed on coordination and cross-comparison of studies from the existing programs. This could be achieved essentially within the existing research framework through specific funding for comparative studies and synthesis efforts" (p. 518).

As the book contends, it is up to the scientists. Among the suggestions for the scientific community are the following: improve the definition and articulation of important issues; recognize the value of contributions to synthesis and application as legitimate forms of scholarship; develop more leadership at the interface between science and management; make more concerted efforts to promote dialog and collaboration within the estuarine, freshwater, and terrestrial environmental science communities; promote more effective use of synthetic knowledge about estuaries; and promote and lead the application of advanced communications technology for the use of synthetic scientific knowledge in estuarine management.

But it is also up to the educators, for whom this book may be a bit too technical. The term "bay" seems more oceanic than the term "estuary" (which is not widely used), allowing the public to forget the complicated

processes that are occurring in these variable waters.

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