

ters, little or no mention is made about sustainability, and in others the word is used but gratuitously. However, a few chapters make a serious attempt to come to grips with the concept. Of the papers that really do deal with the central topic, one perceives the difficulty of settling upon a common definition of the term and then determining what to do with it in a practical sense.

As is characteristic of many symposia, the contributed papers vary enormously in scope, comprehensiveness, quality, and author attention to detail. The volume is full of useful information that any student of the southeastern U.S. coastal zone might want to have. Particularly valuable are the many references listed pertaining to this region. Several chapters are useful reviews of human-induced stresses on coastal ecosystems, e.g., the chapter by John E. Weinstein, "Anthropogenic impacts on salt marshes—a review," and the chapter by D. E. Hoss and D. W. Engel, "Sustainable development in the southeastern coastal zone: Environmental impacts on fisheries." These solid reviews merit the attention of a broader spectrum of readers. Other chapters provide details of methods, techniques, or case studies. The reader with specific interest in land use and demography in the southeastern coastal U.S.A. will find useful facts and figures pertaining to state and federal efforts to manage development and lengthy discussions of methods used to assess environmental quality or maintain GIS data. Unfortunately, not a single chapter appears to report particularly new or illuminating research.

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LONGHURST, A. 1998. **Ecological geography of the sea**. Academic Press, San Diego. 398 p. \$79.95. ISBN 0-12-455558-6.

A few years ago, I read Longhurst (1995), which in essence was the outline for the present book. For several days afterwards I wondered: Is there anything left for us to do?! Now, with this book, we have a monumental Ocean-Geography that is even more impressive. With complete global coverage for the surface waters, it puts the ecology of plankton (principally based on phytoplankton abundance data) into the context of regional meteorological-physical oceanography. On a monthly basis, it describes and hints at explanations for, the abundance and rate of change of plankton communities in 52 contiguous ocean compartments. It does so in a personal, in places almost colloquial, manner without losing conciseness, and is remarkably economical with figures.

Longhurst's point of departure is his conclusion that pelagic biogeography, when addressing the abundance or rate of seasonal change of bulk plankton, cannot presently be based on the distribution in space and time of data on individual species or recurrent groups and the communities formed by them. Instead, chlorophyll in the upper part of the photic zone, as sensed by satellites, is for the foreseeable future the only practical way to estimate monthly to interannual plankton concentrations on a global, fairly finely resolved geographical scale. In consequence, as in his cited paper, four primary oceanic divisions or biomes (analogous to the savanna or tundra) are recognized that differ in seasonal cycles of vertical stability, nutrient supply, and illumination; they are: the Westerlies, Trades, Polar, and Coastal biomes. These biomes are subdivided into 52 provinces based on chlorophyll distribution (as estimated from Coastal Zone Color Scanner (CZCS) satellite data), the derived sub-

surface pigment field, the mixed-layer depth (MLD), the Brunt-Väisälä frequency, the photic-zone depth, the surface nutrient field (all varying by month), and the Rossby radius of deformation. The author emphasizes that, aside from variable geographic knowledge (especially for the South Pacific and South Indian oceans), the positions of the borders between the provinces may shift with seasons and between years. Also, large-scale variability of climate, e.g., the El-Niño/Southern Oscillation or longer cycles (regime shifts), may temporarily rearrange the occurrence of provinces.

The heart of the book (265 pages) is the time-averaged delineation (from Longhurst 1995) and description of these provinces; each is organized by its extent, its continental shelf topography and tidal and shelf-edge fronts, the defining characteristics of its regional oceanography, its biological response and regional ecology, and a synopsis. For each province there is an illustration of the monthly changes over a 1.5 year period of MLD from temperature and sigma-t criteria, photic-zone depth, column pigment and calculated primary production (PP), calculated PP in the Deep Chlorophyll Maximum, and biomass of net-collected zooplankton (if known). Because the forcing functions principally affect phytoplankton physiology, the explanations of the seasonal cycles appear to focus on the timing of marked changes of chlorophyll concentrations. Longhurst notes that pigment may not track the seasonal trend of PP because even in a bloom only a very few percent of the cumulative PP appears as new algal biomass; most is lost to grazing. This was already quantified, month-by-month, for about half of the 52 provinces in Longhurst's cited paper (1995).

What is now left to do? Fortunately, lots and lots. For example, Longhurst himself wonders whether the series of Large Marine Ecosystems (LMEs; e.g., Sherman and Alexander, 1989) and their less rigorous diagnostic criteria may not be a better method of subdividing the Coastal Biome than the way chosen by him. I suggest, instead, that the main task before us is not to worry about the accuracy and temporal stability of Longhurst's borders and features; rather, it is to organize new field observations according to his framework, i.e., re-invigorate the comparative, geographic aspects of oceanography. The concern about problems like climate change has ultimately not to do with the how (the oceanology, if you will), but the where, when, and by-how-much.

This is the first book of its kind. Soviet colleagues may have attempted something similar in comprehensive books about individual oceans one or two decades ago, which still have not been translated. Judging from their pictures, however, Longhurst's approach is more consequent and geographically detailed, since he used the new satellite information to great advantage. This could well be the last book of its kind written by one author and, hence, being truly integrated and self-consistent. In a decade from now so much more information will be available that it will probably be beyond the capability of a single brain.

In conclusion, I agree with Martin Angel that this is "a book that all serious students of oceanography" [scholars, that is—we certainly do not have a textbook before us] "will have to possess, because not only they will constantly be referring to it, but also because any copy in their library will be instantly purloined" (pre-publication review, backside of the hard-cover edition).

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