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Review

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Review by: Joseph J. Torres

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mid-1995 since few references to Bjørndal's (1995) revised edition appear, even in her own chapter. Critical readers may object to the omission or inclusion of particular papers, but on the balance, each chapter covers most of the pertinent references (in particular, recent work) without attempting to be encyclopedic in scope.

A few errant typos appear (five by a casual count), but these do not impair the meaning of the associated text. When six colleagues were asked what they liked or disliked about the book, all were unanimous (and I agree) that the numbered style of citations diminished the utility of the volume. In fairness to the editors, I did not find out whether numbered citations were actually a publishers' decision or an editorial decision. Readers who are familiar with the literature will be annoyed by having to thumb back and forth to the numbered citations in checking references. An author-year citation style would have quickly conveyed information about the researcher(s) and how recent the research was. A change to an author-year citation style would be a welcomed improvement to any future revisions. In any case, the citation style is used inconsistently through the book. Apart from the initial chapter, the remainder of the book, including tables and figure captions, mostly uses numbered citations, but occasionally lapses toward author-year or occasionally number-author-year within the same chapter.

It would be difficult to choose between this book and its predecessors (National Research Council, 1985; Bjørndal, 1995) for coverage of conservation issues. However, its clear coverage of recent biology and inclusion of pertinent grey literature place it as the best single choice for workers on a limited budget. Even if you own the other two works, you will definitely want to add this to your library of turtle references.

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- ANTON D. TUCKER, *Queensland Department of Environment, Central Coast Region, PO Box 1735, Bundaberg, Queensland 4670, Australia. E-mail: Tony.Tucker@envu.qld.gov.au.*

DEEP-SEA FISHES. FISH PHYSIOLOGY. VOL. 16. 1997. David J. Randall and Anthony P. Farrell (eds.). Academic Press, San Diego, California; and London. ISBN 0-12-350440-6. 388 p. \$89.95 (hardcover).—Few subjects are as fascinating, mysterious, or bizarre as deep-sea fishes. Once initiated into the study of deep-sea fish biology, other once-interesting topics lose much of their luster in comparison. Nowhere is evolutionary creativity more in evidence than in the adaptations exhibited by deep-sea fishes. Thus, it was with some anticipation that I awaited the 16th volume of the *Fish Physiology* series for the new information it could provide on my two favorite subjects: physiology and deep-sea fishes. I was not disappointed. The book contained a suite of very nice reviews full of new information on a wide variety of deep-sea fish topics.

To put the book in perspective, it should be considered both as a volume in an august series and as a new treatment of a subject that has already been treated well by one of the best that has ever been in the business of studying fishes. The *Fish Physiology* series has set a very high standard of quality from its first volume published in 1969. *Deep-Sea Fishes*, a new subject for the series as well as the newest offering, maintains the high standards set by earlier efforts.

The stated purpose of *Deep-Sea Fishes* was to "bring together what we know of the physiology of deep-sea fishes and to describe in general terms the biotic and abiotic environments of the deep-sea and the techniques used to investigate deep-sea fishes." To accomplish this task, the book has nine chapters covering oceanography, systematics, ecology, feeding, buoyancy, biochemical adaptation, effects of pressure, sensory physiology, and lab and field techniques for studying deep-sea fishes. The book has a considerable amount of ground to cover and, in this regard, is really atypical of the latter volumes in the *Fish Physiology* series, which have become increasingly more focused in their subject treatments. Instead, the book is, as far as is possible, a primer on deep-sea fishes for the more advanced practitioner. After reading the entire book, the reader will have a good grasp of the deep-sea environment, the fishes that live there and their systematic position, their basic ecology, what they eat and how, their remarkable biochemical and physiological adaptations, and the techniques that are used to study them.

The most famous of the earlier books on deep-sea fishes are N. B. Marshall's *Aspects of Deep-Sea Biology* published in 1954, his 1971 *Explorations in the Life of Fishes*, and his 1979 *Devel-*

opments in Deep-Sea Biology. As an introduction to deep-sea fishes and deep-sea biology in general, the books by Marshall have no peer. In fact, the subjects treated in Marshall's books form the chapters in *Deep-Sea Fishes: Fish Physiology*. Another, more recent offering by Gage and Tyler (1991) also provides a very good overview of the deep benthos and benthopelagic realm with an eye toward teaching rather than review. In summary, for the basics, the reader is referred to Marshall's books and Gage and Tyler's book. Once digested, the reader will get the most out of *Deep-Sea Fishes: Fish Physiology*. It is an excellent addition to, but not a replacement for, Marshall's books.

As in any multiauthored volume, authors' prose styles and the quality of coverage differ from chapter to chapter. In the case of *Deep-Sea Fishes*, prose styles all convey the needed information but vary in crispness from the tight "Mark Twain" standard to the more wordy "James Fenimore Cooper" style. All are quite readable. Coverage for each topic is uniformly good, and the strategies employed by the authors in most chapters are stated up front so that the reader knows what to expect. For example, in the chapter on sensory physiology, the authors focus on sensory adaptations peculiar to the deep sea but do not try to walk the reader through basic sensory physiology. Instead, they tell the reader where to find the needed information. This typified one of the two strategies employed in the book, which were to either review the available literature if possible (e.g., feeding at depth) or to provide heavily referenced capsule summaries when it was not (e.g., sensory physiology). Whichever strategy was employed, the reviews were up-to-date and well researched; bibliographies were large and useful.

The book has only one main shortcoming. Because of its breadth of coverage and limitation of space, some of the chapters were really unable to realize the detail necessary for a complete coverage of the subject. In some chapters, more illustrations or increased tabulation would have been helpful. The chapter on systematics, which was nicely organized and clearly written, would have benefited from some illustrations. Similarly, the remarkably thorough coverage of feeding would have benefited from additional tabulation during the description of feeding patterns.

Two chapters covered topics that that have been reviewed extensively elsewhere, either in the past (pressure effects) or recently (biochemistry at depth). Both did an exemplary job of providing new information and insight. Pres-

sure research is not in vogue now as much as it was in the 70s, but a great deal of new information is now available and was treated well in this chapter. The chapter on biochemistry at depth is a jewel. It provides exceptional coverage of the field presented in a very clear writing style.

I detected few errors; most were typos that did not obscure meaning. There was one zinger in table II of chapter 1. A comparison of biophysics of oceans and continents had the table headings reversed so that, for example, the surface area of the continents had increased to 71% of the earth's surface! My guess is that the error will result less in confusion than in amusement. Chapter 1 is the best capsule treatment of oceanography that I have ever seen; it would take a great deal more than an erroneous table to really mar it.

Three chapters have not yet been specifically mentioned: those concerning ecology, buoyancy, and field and lab techniques. All three were informative and complete. The chapter on distribution and ecology was a nice overview of deep-sea basics as well as an introduction to newer thinking in the field. The chapter on buoyancy covered swimbladders as well as alternate means of generating static lift (e.g., lipids). Special emphasis was placed on the problems associated with living at great depth and those encountered by vertical migrators. The technology currently employed to perform in situ deep-sea investigations was well explained and well illustrated in the chapter on field and lab techniques.

Deep-Sea Fishes is a volume that is definitely worth having as an excellent, up-to-date reference. Whether you are teaching a course or otherwise researching a deep-sea topic, you'll find this a great place to begin your research. In most cases, you'll be able to find what you need; in others, you'll know where to look next.

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- JOSEPH J. TORRES, *Department of Marine Science, University of South Florida, 140 Seventh Avenue South, St. Petersburg, Florida 33701. E-Mail: jtorres@marine.usf.edu.*