Books

MARINE MAMMAL SCIENCE, 17(1):200–201 (January 2001)

Reviews

MARINE MAMMALS: EVOLUTIONARY BIOLOGY. Annalisa Berta and James L. Sumich. ISBN 0-12-093225-3. Academic Press, San Diego. 1999. 494 pp. $59.95.

As the study of marine mammals exploded in the last few decades, university courses devoted to the subject have become increasingly popular. In the 1970s, Ken Norris had us read Richard Harrison's and Judith King's *Marine Mammals* and a selection of readings from the primary literature. By the time we assumed the other side of the lectern, however, Harrison's and King's useful but slender volume was outdated and there was no textbook available on mammals adapted to the marine environment. For years, we were obliged to compile course readers of primary literature, a heuristically valuable approach, but one requiring a lot of effort, beginning with obtaining copyright permissions. Thus, we were happy to see the first of several new textbooks on marine mammals come into print.

In our most recent offering of an undergraduate course in Marine Mammalogy, we chose Berta's and Sumich's volume for two reasons. We believed their evolutionary approach was an appropriate way to teach the subject, and we felt that the consistency of authorship would be preferable for undergraduates. Reynold's and Rommel's edited volume, *Biology of Marine Mammals* (1999), looked promising, but we feared the variation in styles between authors of individual chapters might confound undergraduate students.

Berta and Sumich intended their book as a university textbook and as "a source book for marine mammal scientists." We were especially interested in its utility in the former case, and we test drove it as a text for an upper division, undergraduate university course. We should confess that we have serious misgivings about the utility of a course in marine mammalogy at the undergraduate level. Nonetheless, such an offering is popular with students and administrators, and we reconcile the conflict by using the course as an opportunity to reinforce and integrate students' knowledge of physiology, anatomy, genetics, systematics, evolution, and ecology. Berta's and Sumich's book proved a great aid in that endeavor. The book describes anatomical, physiological, and behavioral traits of marine mammals in detail and relates those traits to the evolution of each group. Thus, the readers are compelled to consider their interests in marine mammals in terms of modern evolutionary theory. Numerous cladograms are presented, although their usefulness to neophytes is lessened by inadequate explanation of who the terminal organisms were. Few readers will have any idea who is referenced by *Imagotaria, Pontolis,* or *Gomphotaria.*

A disadvantage of one or two authors attempting to cover such diverse material (as opposed to an edited, multiauthor volume) is that inaccurate and misleading oversimplifications of the primary literature are hard to avoid. For example, figure 12.8 purports to show exclusive breeding habitats (land, fast ice, and pack ice) mapped on to pinniped phylogeny. Ignored is the fact that at least three of the species depicted breed on both fast ice and pack ice. Feeding strategies of baleen whales are described as though they were absolute, and bowhead whales are said to feed by skimming the

surface of the water. That is indeed one, but only one, feeding strategy employed by that species.

The "Basic Terminology and Concepts" section in the second chapter provides excellent background for understanding systematics and classification, and it helps to lay the framework for Berta's and Sumich's evolutionary approach. To obtain the most from courses based on this text, we recommend that introductory genetics be a prerequisite. However, if students lack such background, supplemental instruction during the course will improve the utility of the textbook.

The overview of cetacean evolution presents the history, as well as current research, in that dynamic scientific debate—an effective approach much preferred to distilling topics into only the most recent or popular view. Berta and Sumich effectively tackle other summaries of the literature for this text, and they generally present balanced or appropriately open-ended reviews. The use of primary literature, instead of secondary references, in summary tables (*e.g.,* 13.2, 14.1 and 2) would be more helpful to professionals, and it sets a better example for students.

The writing, for the most part, is clear, although at times the detail is more similar to what we would expect in a professional review article than in an overview suitable as an introduction to the field for students. In that regard, Berta and Sumich may be more successful reaching their fellow marine mammal scientists than undergraduate students. The graphics are somewhat disappointing. Many include captions that poorly explain what is being presented, and others are minimally informative. For example, a figure showing a variety of *Cyamus* species hints at infection patterns significant in the phylogeny of whales, but no explanation is provided. Figures 4.27 and 4.28 refer to dorsal views of cetacean skulls while only lateral views are provided. Some of the figures depicting anatomical structures (*e.g.,* the larynx, tympanic bullae, and tympanoperiotic complex) lack enough detail by which readers could readily place the structures in the correct anatomical context.

A glossary defining over 250 words that appear in bold type within the text is especially useful to students. Its usefulness could be improved by inclusion of more significant biological terms (*e.g.,* "azygous vein" or "coronoid process") and exclusion of some of the topical terms peculiar to recent issues of Marine Mammal Science (*e.g.,* "Acoustic Thermometry of Ocean Climate Program" or "Geographic location dive time and depth recorders").

The book's layout is both logical and pleasing to the eye. The plates are all in black and white but almost all are well composed and of high resolution. The editing of the text, unfortunately, shows less attention to detail. There are numerous errors and misprints that should be corrected for future editions. Some are of little consequence, others more unfortunate. This first edition has removed the dorsal fin from *Phocoena,* added an extra "c" to the genus *Histriophoca* (spelled correctly once, but more often as "*Histricophoca*"), and increased the pinniped spleen to 45% of body weight.

We encourage our colleagues, however, to send their corrections to the authors as we have done for, overall, Berta and Sumich have done us a great turn in producing a much-needed comprehensive textbook. We look forward to a second edition as we intend to keep using the book in our courses. Its up-to-date bibliography is a tremendous contribution, and indeed the book will also succeed nicely as "a source book" for professionals in the field.

Literature Cited

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BIOLOGY OF MARINE MAMMALS. J. E. Reynolds III and S. A. Rommel, eds. ISBN 1 56098 375 2. Smithsonian Institution Press, Washington and London. 1999. 578 pp. $75.00.

A problem common to all who offer courses in marine mammalogy at the university level is the paucity of texts in the field. My courses in marine mammalogy, offered at the University of Washington (Seattle) and Washington State University (Pullman) are designed for third- and fourth-year undergraduates, and entry-level graduate students. In the absence of a unified text, I have struggled to design a package of directed reading in the primary literature that effectively complements lecture presentations and writing assignments. The difficulty has been to locate enough primary literature written in a fashion that is capable of informing and stimulating developing students without the intimidation and confusion often associated with their first exposure to the technical dialectic. In the preface to this volume, the editors offer a similar lament as their primary motivation for producing their book. With permission of the publisher, I used the page proofs for *Biology of Marine Mammals* as the required text for my 1999 marine mammalogy courses at UW (48 students) and WSU and the University of Idaho (17 students) and in 2000 we used the published book in courses at UW (52 students), taught jointly with P. R. Wade of the US National Marine Fisheries Service and UW. This review reflects both my own reactions to reading and using the book for teaching as well as extensive verbal and written evaluations from 117 students (90% undergraduate) that have used the book in my courses.

Biology of Marine Mammals comprises ten chapters contributed by twenty recognized experts in subdisciplines of marine mammal science. In some, specific sections are identified as having been written by one of the individual co-authors. Chapter subjects are: marine mammals of the world, functional morphology, physiological challenges of life at sea, sensory systems, energetics, reproduction, communication and cognition, behavior, a single chapter covering distribution, population biology, and feeding ecology, and a final chapter on environmental contaminants. With the exception of the concluding chapter, the book generally focuses on basic biology. Conservation and management issues are treated separately in a companion volume (Twiss and Reeves 1999) (see review in Marine Mammal Science 16(4)).

Although format varies among chapters, the general approach is to present current information on relevant concepts across the recognized marine mammal taxa (cetaceans, sirenians, pinnipeds, marine otters, and polar bears). Most chapters include case studies of concepts, describe the current state of knowledge, and highlight areas of dispute among experts, as well as issues that would benefit from additional creative study. Most authors adopt a conservative perspective and refrain from overt expressions of opinion, although there are interesting exceptions. Primary literature is extensively cited in all chapters, and lengthy bibliographies follow each. The type is set double-column in a font small enough that I found it necessary to update my optical prescription. Illustrations are line drawings and black and white photographs.

With some exceptions (noted below), the chapters are comprehensive, exquisitely detailed reviews of the subject matter. Thus, the book is best viewed as a collection of reviews of the specified subdisciplines. I learned a wealth of new material that will be of benefit both in teaching and research contexts, and encountered many ideas of great interest to me and my students. Without question, the volume meets my criteria for success as a collection of high-quality reviews of the fundamentals of marine mammal biology. Despite this, some significant difficulties remain in using the book as a text for university instruction. For example, I found frequent repetition of material both within and among chapters, and little indication of substantial integration among chapters. Some of the conceptual treatments show taxonomic biases clearly traceable to authors' interests rather than reflecting the availability of data. The level of conceptual difficulty, in an instructional context, also varies widely among chapters. The book is also underillustrated which significantly reduces the ease with which some of the

concepts can be understood by persons new to the subject matter. Although some authors provided definitions of terms, the profligate use of jargon in many chapters requires a comprehensive glossary. None is present. In my opinion, only the first two chapters approach the synthetic, reader-friendly style necessary to engage university students in the natural sciences or the informed lay public.

Reviews and comments of students in my courses indicated concern about the issues described above, and several additional general aspects. A number of students took exception to the generally conservative production style, and particularly to the lack of color. One wrote, "I would be willing to pay extra for a little color." Another complained about the "monotonous text." Several found some individual chapters too long to assimilate, given the scope of the course and the problem of competing obligations. Several others described the index as inadequate. The students also praised a number of attributes of the book, among them the comprehensive content of the chapters, the resource value of extensive bibliographies, the open acknowledgment of data gaps by the authors, the suggestions for research needs, and the fascinating analogies and contrasts with terrestrial mammals. Given that students are intellectually, developmentally, and culturally diverse, some contradictions in evaluations are to be expected.

As noted, individual chapters generally provide excellent conceptual reviews, although problems of various kinds emerge in most cases. The introductory "Marine mammals of the world" (Reynolds, Odell, and Rommel) effectively establishes unifying features, taxonomic limits, and motivations for human interest in marine mammals. The major features of the primary marine mammal taxa are succinctly reviewed. However, I found the brief "Conclusions" section enigmatic. The iconic line drawing of the sea otter, used here and in subsequent chapters, looks to me much more like a highly motivated wallaby than a sea otter. Chapter 2, on functional morphology (Pabst, Rommel, and McLellan), provides an authoritative and smoothly written discourse on morphological solutions to the functional problems faced by mammals living at sea. The approach represented in this chapter is, in my experience, extremely effective and provocative in the university classroom. However, I did become distracted during frequent encounters with terminology used for apparently simple concepts such as "front" and "back." For example, the phrase "cranial-most caudal vertebrae," appearing on page 30, left me helpless. Morphologists must remind themselves that their audiences may include ecologists. Of all chapters in the book, chapter 2 drew the most diverse comments from students. Most offered unqualified praise, but a few found it confusing and too lengthy.

Elsner's chapter (3) on the physiological challenges of mammalian life at sea follows logically from chapter 2, and is generally informative and comprehensive. However, I found unnecessary the apologetic tone regarding the highly invasive laboratory experiments of decades past, and I was distracted often by repetitive material and the absence of support from illustrations. This chapter was more consistently praised than any other in the book by the students. Chapter 4, on sensory systems (Wartzok and Ketten), drew precisely the opposite response. Students were unanimous in criticizing the difficulty of the material, excessive use of undefined jargon, and lack of supporting illustration. One student wrote, "I was worse off after reading this chapter than before." Most students indicated that they did not finish the required reading of the chapter because they could not understand it. I found this chapter to be a thorough, rigorous, and valuable review, likely a significant resource for advanced graduate students and professionals in the field. However, I also found passages that I could not understand, and I am sympathetic to student sentiment. I was surprised by the absence of discussion of olfaction in sea otters, and of tactile sensory systems in sea otters and polar bears.

The chapter on energetics (5, Costa and Williams) is among the most effectively organized in the volume. The chapter is built on a unifying conceptual model that is clearly defined, and the prose is smooth and clear. The theory and case studies are comprehensive and authoritative. The chapter does contain distracting elements. For

example, many of the citations seem dated. A case in point is reference to a 1993 paper in a passage touting the research value of "current technology." My students tell me that 1993 was part of the Bronze Age. Overall student response to chapter 5 was neutral. Boyd, Lockyer, and Marsh's chapter (6) on reproduction is marvelous in scope and depth, and is destined to become a landmark reference in the subdiscipline. The authors provide fair warning to students that the material will be challenging, and in fact it is. Nevertheless there is extensive background material helpful to the naïve reader. I found Marsh's segment on sirenian reproduction to be particularly lucid and informative. Students generally viewed the chapter in positive terms and provided no strong criticisms.

Tyack's chapter (7, communication and cognition) was my favorite, in part because it is the most clearly written chapter in the book, and in part because Tyack took it upon himself to explain Machiavelli to the reader. This is an unexpected bonus in a marine mammalogy text, although not altogether unique in this volume (Wartzok and Ketten briefly discuss Marshall McLuhan in chapter 4). Tyack uses clear definitions, real-world examples, and engaging prose to provide a clear and useful review. Tyack's chapter seems to be the most overtly opinionated in the book, with frequent use of the phrase "I find it hard to believe . . ." (I suspect Tyack's own students hear that often). Comments from students on chapter 7 were neutral in tone. The behavior chapter (8) by Wells and colleagues is a remarkable collection of information, from which I learned an immense inventory of new material. The chapter provides clear definitions and is written in a conversational mode, with frequent effective use of historical progressions of discovery on various issues. I was particularly impressed by Boness's pinniped section, both for its clarity and for the depth of its bibliographic resources. In the sea otter section, Rathbun's effective use of questions in text could be usefully developed in possible future editions of the book, improving it as an instructional text. Wells' section on cetacean behavior also reads smoothly, but seemed at times excessively speculative. Unfortunately, most students will remember this chapter for its extraordinary length and frequent repetition of material. For example, the deep scattering layer is defined twice. Students reported that material in the chapter did not seem well integrated, and often appeared in a sequence not clearly logical. I was also troubled by the complete absence of material on polar bears.

I found chapter 9, by Bowen and Siniff, to be the most perplexing and disappointing in the book. I was surprised that such a diverse range of topics ("Distribution, population biology, and feeding ecology of marine mammals"), warranting at least two separate chapters if not more, are combined into a single chapter. It is not clear whether the approach was chosen by the editors or by the authors, but I recommend that the logic be revisited before production of a second edition. The most crucial consequence of the approach is the short shrift afforded certain key subdisciplines, most especially population dynamics. There are good general perspectives on the subject, but only limited connections beyond mammals in general to marine mammals specifically. Population sections also rely excessively on references to other more specialized texts, thereby preempting presentation of fundamental material that surely is among the most timely and central to any modern text in marine mammal science. My students and I searched in vain for well-illustrated examples of the kind of logistic or Leslie population models that underlie virtually all contemporary management issues for marine mammals. The chapter also reflects obvious biases by taxon and habitat. The distributional section includes nine pages on pinnipeds, three-plus on cetaceans, a half page on sirenians and polar bears (combined), and nothing on sea otters. Approximately 75% of the treatment of habitat (pp. 440–442) focuses on pack ice. Comments on the importance of "oceanographic conditions" are superficial and brief. Fortunately, the sections on trophic ecology are much better. The synopses of major methods for dietary study of marine mammals are clear and concise. The summaries of diet by major taxon, and the descriptions of major factors influencing diet, are complete and useful. However, the material on community ecological interactions of sea otters is incomplete, omitting

the significant published material on effects of sea otters in ecosystems other than kelp forests. In addition, published contrarian views of the sea otter—trophic cascade paradigm in kelp forests are not represented. Despite my own strong opinions, student comments on this chapter were neutral.

O'Shea's chapter on environmental contaminants is excellent. It is well written, provocative, integrative, and provides excellent reference material in the bibliography and the detailed tabular and appended material. My principal complaint about content is the lack of illustrations. I question the inclusion of this chapter in this volume. It seems much better suited for the companion volume (Twiss and Reeves 1999) noted above. For that reason this was the only chapter of the book not designated required reading for my students. Some students read the chapter voluntarily, and it received positive comments. Several students found it particularly useful as a bibliographic source for writing assignments in the courses.

Biology of Marine Mammals is a collection of comprehensive, contemporary reviews of many of the central aspects of modern marine mammal science. It will serve as a standard reference in the field for much of the coming decade. Thus, it belongs in the collections of all professional researchers and instructors in the field, as well as all involved in postgraduate study. The book is not yet an effective classroom text for the field of marine mammalogy, although it would serve superbly as the raw material for an excellent text. The central problem is that, overall, the text is still too much like the primary literature, and not effectively rewritten and integrated to facilitate easy intellectual access by entry-level students in a way that furthers subsequent inquiry and thought. A second edition will be necessary before the editors can reach their stated goal.

Most of the changes I would suggest for a second edition are obvious from the above discourse. In addition, I would encourage the reorganization of chapter 9 into three separate chapters: distribution and habitat, population assessment and dynamics, and trophic and community ecology. All three must be more effectively balanced by taxon and habitat. The distribution and habitat chapter should draw on the wealth of recent data linking oceanographic processes to marine mammal movements and distributions. The population chapter must greatly expand the treatment of introductory quantitative models, covering at the very least the essential thinking and formulae that underlie transect and mark-recapture methods, and logistic and Leslie population models, and their respective applications to marine mammal science. The suggested expansions will put ecological processes on a more equitable footing with anatomy, physiology, and behavior in the text. Coupled with other recommendations, such changes could well result in a general text superbly suited to student needs.

Literature Cited

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