

## Book Review

SEA TURTLES: A COMPLETE GUIDE TO THEIR BIOLOGY, BEHAVIOR, AND CONSERVATION. James R. Spotila. Johns Hopkins University Press. 2004. ISBN 0-8018-8007-6, 228 pp., HB, Color.

One might ask why a book on a seemingly unrelated faunal group would interest researchers on aquatic mammals. Scores of reasons become readily apparent after inspecting this book. First, management lessons with marine species often resonate well across taxonomic, geopolitical, or disciplinary boundaries. Sea turtles represent a diverse marine faunal element in marine environments across latitudes from tropical to subpolar, from pelagic realms to the neritic coastal margins, and along favorable shorelines where turtles nest or bask. Also, many charismatic mega-fauna share life history attributes in common with long-lived marine vertebrates and, thus, are outstanding case studies for contemporary challenges in marine conservation ecology. Because turtle migrations can span ocean basins and take decades to complete the life cycle, marine protected areas (MPAs) cannot be a panacea for all species. The concept of place-based management creates a needed revision to marine ecosystems management, yet marine mammals and sea turtles are among marine vertebrates that challenge the concept, despite difficulties in grasping a shifting baseline of the past. Furthermore, marine vertebrates are prominent examples for which international policy must intersect with national, regional, and community-based conservation for efforts to become effective.

Many marine vertebrates face similar design challenges and constraints, and in response, share conservative life history strategies—that is, life in the slow lane. Pinnipeds that emerge on land to bask or reproduce share natural history facets with nesting female sea turtles, and the warm-blooded deep-diving leatherback is clearly within the same physiological milieu as marine mammals. Methods for study of distribution and abundance of mobile marine vertebrates are a common point of departure (aerial or shipboard transects, mark-recapture analysis, in-water surveys), as are genetic means of identifying population stock structure and technologies to track swimming behavior or migratory movement (data loggers, satellite, radio, or acoustic transmitters). Techniques of age estimation for marine vertebrates use similar methods in

chronobiology or skeletochronology as fishery labs. Cross-cutting issues that affect marine biodiversity include indiscriminant fishing practices such as by-catch. Contaminants and pollutants in the marine environment require an interdisciplinary focus. Health assessments or necropsies of marine vertebrates are likely to involve the same veterinary or medical expertise when mass susceptibility and emerging aquatic diseases remain poorly known. For example, red tides can affect manatees and sea turtles, though we are still learning about potential pathways and different levels of tolerance.

From the oceanographic perspective, upwellings and current boundaries are shifting points of food aggregation where pelagic animals aggregate, and potential exists there for fishery impact. As shifting global patterns manifest in sea surface temperature and current patterns, we can only speculate about change or disruption to established foraging areas, nursery zones, and migratory patterns used by marine vertebrates. Efforts to establish simulation ecosystem models of functional food webs feature marine vertebrates on multiple trophic levels, yet competition and predation effects are still pieced together by methods as basic as examination of stomach contents or as advanced as signatures of stable isotope ratios.

These are reasons enough, but beyond the compelling justifications, a more basic rationale exists. This is simply a great book: lucid, literate, and lavishly illustrated. Inspired pieces of science writing are framed that relate a respected senior scientist's insight and concerns to a nonscientific audience. This is the rare book that assembles the relevant factoids, has a succinct grasp of major issues and threats, explains scientific points clearly but without oversimplifying, develops personal anecdotes from selected researchers, and splashes plenty of eye candy images worthy of a coffee-table book. The book has gleaned multiple awards for nature writing because of its readily accessible format. It will hold a prominent place on a researcher's bookshelf as a handy reference. The book is logically divided into halves, linked throughout by an engaging conversational narrative that weaves a wealth of experience to enliven the factual details. Early chapters impart the common themes among all sea turtle life cycles while later chapters offer detailed accounts of the seven marine turtles.

"Life Cycles" (Chapter 2) details embryological development within an egg, including details

of temperature-dependent sex determination. Hatchlings emerge and traverse a gauntlet of predators on the beach and coastal margin. The early development at sea or "lost years" diverges among the species, as does the developmental period to maturation. Reproductive similarities emerge again for the migration to a natal beach where the process of nest site selection and oviposition complete the life cycle. "Biology" (Chapter 3) features the anatomical similarities of all turtles and the specializations that marine turtles have evolved that enable them to cope with the physiological challenges of the oceans. Thermoregulatory abilities differ between the leatherback (*Dermochelyidae*) and other sea turtles (*Cheloniidae*). The disease of fibropapillomatosis in green turtles is given specific attention, and the physiological effects of salt loading and excretion, and diving abilities are given short, clear sections despite a large volume of published literature on these aspects. Short sections also delve into basking, the mechanics of swimming, and gaits used to crawl on land. Turtles perceive the Earth's magnetic forces as a means to orient and navigate. Vision, hearing, and olfaction are discussed, and the respiration of an incubating clutch is explained. Sex determination by conditions of incubation is covered from a mechanistic and theoretical perspective to pose questions related to what changing temperatures or climates might portend for turtle populations in the future.

"History" (Chapter 4) covers the sea turtle lineage based on the fossil record and phylogenetic studies. Shifting from paleontology to archeology, the interactions of humans and turtles within ancient cultures are reviewed. Within time frames of the past hundreds of years to the present, turtle harvests shifted from local take for meat by indigenous harvests to commercial harvests. Contemporary impacts now include incidental mortality of turtles as fisheries' by-catch. The extent of pristine turtle stocks and their documented decline sets the stage for recognition of the shifting baseline syndrome or a disconnect between the living memory of a present generation and the decline of historical population levels. "Conservation" (Chapter 5) rapidly brings a focus to the contemporary state of turtle stocks at the global scale, whether turtles are harvested intentionally for eggs, meat, or shell, or are impacted as by-catch in indiscriminant fishing in coastal or pelagic realms. Other conservation concerns include marine debris and pollution and on land, the loss of critical coastal habitats necessary for successful nesting.

Having established a context of general concerns, the book features each species in turn. Chapters 6 through 12, respectively, focus on the herbivorous green turtles; the sponge-eating

hawksbills; the olive ridleys and Kemp's ridleys with their aggregated nesting behavior; the loggerhead that forages on large crustaceans and shellfish; the flatback of northern Australia; and the unique leatherback, which many view as a "differently packaged" marine mammal. Space limitations here preclude a detailed accounting, but each chapter reviews the major status changes and threats, their drivers, unique consequences, and key solutions. It is likely that the species chapters will receive more detailed scrutiny by a technical reader than the general audience.

Earlier book reviews (in *Science*, *Nature*, *Conservation Biology*, and the *Marine Turtle Newsletter*) have evaluated its strong points and identified minor technical flaws with regards to factual errors, appropriate credit, and statements of opinion. Among the latter issues, the author's generalizations probably reflect a personal view on a particular contentious issue or statement that is a perennial debate topic among sea turtle biologists or conservationists. Healthy debate about generalizations develops a useful reference point for future work; however, I can agree with a previous reviewer that the author's subjective ranking of the ten best and ten worst countries in sea turtle conservation (p. 76) may be an unwarranted generalization. Be that as it may, such subjective choices can suggest where efforts should be focused effectively within "bad" countries.

By the same token, not all is ideal in countries that made it onto the "good" list. Recovery plans and national management strategies are steered by an uneven mix of peer-reviewed literature, technical reports, subjective expert opinion, and unpublished data not readily available to the public. Sea turtle specialists can find that literature, but the public may not have as ready access. Consequently, the book's great service is that it pre-digests for a public audience the wheres, whys, and how manys. Thus, the summary tables and maps with populations and trends develop a more transcendent overview than is usually scaled at a local community-based conservation effort.

The book portrays a big picture accurately, and it generally lives up to the subtitle so that general readers can easily overlook any minor discrepancies that a technical reviewer might identify. A brief closing chapter strikes an upward note of personal hope and optimism to remedy the crisis-driven discipline of conservation biology. The author believes in turtles and convinces us they can survive. A reader at this point will be well aware that the decisions now hinge on humans. The finale articulates clearly that the sociological dimensions involve choices to change the prevailing human behaviors and detrimental practices, which have often led to population declines.

As this book was filed to my reference shelf, I thought about a chronological span of 50 years between the inspired books by Dr. Archie Carr and Dr. James Spotila. I reflected that both were scientist/advocates who wrote with passion and wonder about the great unknowns in turtle biology during their day. Just as Carr's writing motivated the early generations of marine turtle specialists, Spotila's writing will certainly stir a similar affection and respect for sea turtles in new readers, biologists, and conservationists.

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