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### The Biology of Sea Turtles, volume III

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coastal benthic ecosystems. Some are potential pests and have an economic impact on the productivity of mollusc fisheries and farms. The book analyses the ecological significance of several species sampled from varied oceans and climates: *Heliaster helianthus* (Lamarck, 1816), *Pisaster ochraceus* (Brandt, 1835), *Asterias amurensis* Lütken, 1871, *Leptasterias polaris* (Müller & Troschel, 1842), *Coscinasterias* spp. Among the described cases, that of *A. amurensis* illustrates an example of an invasive species with a strong impact on the composition of benthic ecosystems that potentially can threaten a species of handfish, endemic to Australia.

The other four taxa are: the Antarctic species *Odontaster validus* Koehler, 1906, the widespread *Echinaster*, and the cosmopolitan *Astropecten* and *Luidia* that are major predators on sandy substrates and contribute to the regulation of mollusc populations.

The content of the chapters, all written by leading experts in their field, ensures the book is of a high scientific quality. It is richly illustrated with numerous black and white figures, and a central inset of eight colour plates. The reference list occupies 45 printed pages, which is definitively useful for a comprehensive synthesis. This kind of book is so rare that specialists would expect an exhaustive coverage of the science conducted on starfishes. The content is marked by strong editorial choices. It is definitively frustrating not to find at least two additional chapters: one on biodiversity patterns and a second on the deep sea forms. The spatial distribution of starfish species is strongly shaped by historical and ecological constraint. The investigation of phylogeographical and biodiversity gradients has already produced valuable results. Echinoderms are key taxa of the bathyal and abyssal environments, both in terms of biomass and diversity. Several groups of starfishes live preferentially in the deep sea, where they are key ecological taxa and develop outstanding adaptations. One can only regret that brisingids, porcelanasterids, pterasterids or goniasterids are only marginally mentioned in the book.

## Reference

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## The Biology of Sea Turtles, volume III

**Edited by Jeanette Wyneken, Kenneth J. Lohmann & John A. Musick**

Boca Raton: CRC Press, 2013, 447 pages.

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It's getting better! This is not surprising considering the highly skilled team of editors and authors; the third volume of Biology of Sea Turtles should be on the shelf of every sea turtle biologist. The book is presented in 16 chapters, covering many aspects, from morphology to physiology and genetics, to organic pollutants and fisheries bycatch mitigation. Previous volumes have inspired many sea turtle scientists and conservation practitioners, myself included. When reviewing the third volume my first steps in sea turtle ecology came to mind, back to 1997 while still an undergraduate student, reading the recently released inaugural volume (Lutz & Musick 1997). At that time I was enthusiastic while reading the landmark chapter 8, by Bjørndal (1997) on foraging ecology and nutrition of sea turtles, which guided my earlier career on the dietary studies of sea turtles). Chapter 15 (Lutcavage et al. 1997) on human impacts, had a similar effect as it was also a reference point for my earlier studies on pollution and turtles. With similar enthusiasm, researchers have now updated several of these topics in the third volume, for instance Jones & Seminoff revise feeding biology in Chapter 9, and Heithaus in Chapter 10 deals with a different perspective of a similar subject: sea turtles as prey, consumers, and their ecological role in marine ecosystems.

The number and range of global locations of researchers studying sea turtles is vast, resulting in an immense and diverse body of knowledge having been produced from 1996 to 2013, the period between volumes I and III. As a consequence, important new findings are included in this latest volume, several based on methodologies only used intensively on sea turtle ecology in recent times, such as stable isotopes and trace elements. The growing use of remote sensing devices for tracking and collecting behavioural data, such as diving and general activity patterns, despite not being treated in a separate chapter, permeate many chapters. Such methods have been instrumental in clarifying poorly known aspects, such as the "lost years". The current volume reports for the first time on marine tracking of neonates and early stages up to 7 months, providing some answers for very old questions (Mansfield & Putman, Chapter 8).

Topics that had received much attention from researchers in recent years, such as skeletochronology (Chapter 5), fisheries bycatch (Chapter 12), natal homing and imprinting (Chapter 3), sea turtle health (Chapter 14), and genetics (Chapter 6), treated briefly or with different perspectives in volumes I and II, having been updated in the current volume. Some other hot topics such as climate change are now covered, while traditional research areas, such as epibionts (Chapter 15) and parasites (Chapter 16), had to wait until volume III to receive specialized attention, with in-depth revisions. In addition, several chapters are richly illustrated with color figures, of note is Chapter 16 with illustrations of parasites, and Chapters 7 and 8, both with nice maps depicting tracking and oceanic habitats of leatherback *Dermochelys coriacea* (Vandelli, 1761), and loggerhead *Caretta caretta* Linnaeus, 1758, respectively.

Looking at the three volume series of Biology of Sea Turtles, clear developments in the field can be seen, with a range of paradigms being revisited and revised in the last volume, for instance ontogeny and individual specialization. The understanding of diet, once regarded as strictly defined for each species, has changed: now we know that adult green sea turtles, *Chelonia mydas* (Linnaeus, 1758), are not strictly herbivorous, hawksbill sea turtles, *Eretmochelys imbricata* (Linnaeus, 1766), are not strictly spongivores, with some populations relying heavily on algae (Chapter 9, see also Bell 2013). Similarly, the generalized concept of the life-cycle, with the supposedly iconic change from offshore to neritic habitats, is now recognized to be much more variable, with considerable diversity among and within populations in the oceanic-coastal paradigm; for example, some individual adult and large sub-adult green and loggerhead sea turtles commute between these major marine environments. Additionally, adult leatherbacks frequently inhabit continental shelf waters off eastern Canada as well as eastern and western USA, instead of remaining exclusively in pelagic habitats, as was once thought. Although it is still useful to classify individuals or populations as inhabiting certain categories of marine environments, individual specialization and differences in habitat use are significant variants from the conventional paradigm (e.g. Mansfield & Putman, Chapter 8; Saba, Chapter 7).

The nationalities of the 33 authors, are strongly biased with 31 (94%) from the USA or Australia; only one author is from Europe and another one (or two, labeled with both Europe and South America affiliation) from South America. Despite the fact that many sea turtle researchers usually carry out studies

in several countries during their careers, it is not surprising that study cases and bibliography are strongly skewed towards colleagues from the same country as authors and the editors. A broader geographic representation in authors would certainly benefit future publications of this nature, perhaps by including co-authorship from different places, which would facilitate including different points of view. There are very few minor mistakes, but a few that warrant mention are some references quoted in text, but lacking in bibliographic lists (e.g. Chapter 9), format problems such as table alignment (e.g. bottom of Table 9.3), and conceptual mistakes, e.g. in Table 9.2 "...Xeric (i.e., wet [*sic*]) habitats... mesic (i.e. dry [*sic*]) habitats".

All three volumes, and the third in particular, end with recommendations for further research, the need for methodology improvements and key questions to be addressed. This is a valuable approach, and it makes the current volume a valuable guide, as well as an inspiration, for the current and next generation of sea turtle scientists.

Overall, in my opinion the current book should be compulsory reading for researchers, managers and conservationists who deal with marine turtles and their habitats. I cannot wait until vol. IV is available! Maybe in the future, among other new topics, or old ones still not fully covered in previous volumes, we will learn that "lost years" are no longer a black box, and hopefully we will read a chapter consolidating cases for encouraging upward trends in abundance of sea turtles, as already seen for some populations.

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