

TOP PREDATORS IN MARINE ECOSYSTEMS: THEIR ROLE IN MONITORING AND MANAGEMENT

Boyd, I., Wanless, S. & Camphuysen, C.J. (Eds). 2006. Cambridge, UK: Cambridge University Press. 378 pp. Paperback. ISBN 0-521-61256-X. US\$75.

Top Predators in Marine Ecosystems took root in 1999, when the British Antarctic Survey began a new research program on the management of the krill-based ecosystem around South Georgia. The book then grew from a symposium held in 2004, bringing together that and another major research program from the North Sea to address growing concerns about the effects of human activities on marine ecosystems. In a collection of 24 chapters by more than 50 contributors, the book explores the hypothesis that top predators can provide information for the management of marine ecosystems and, in some situations, specific resources. Using case studies, the book synthesizes current understanding of top predators as indicators of marine processes. Its intent, it says, is "to provide managers, and those with interests in marine-resource management, with the materials necessary to understand what has been achieved to date."

The idea that upper trophic level predators can provide information that can be used to manage species at multiple scales is appealing, because alternatives such as vessel-based research and monitoring are often more difficult or expensive to conduct. Most of the book (13 of the 24 chapters) is therefore focused on establishing links among top marine predators, their prey and the physical environment.

The top predators most discussed are seabirds and pinnipeds, although one chapter examines whether the polar bear could be considered a useful indicator of ecosystem change. The editors discuss this bias in the introduction, suggesting that the focus of interest reflects the fact that seabirds and pinnipeds have terrestrial breeding sites and constrained foraging ranges, and are thus more accessible to researchers. The studies are also largely reflective of the North Sea and Southern Ocean, but data from the Canadian Arctic, the Northwest Atlantic, Western Alaska, and the Barents Sea are also included. Again, the editors acknowledge the exclusion of tropical marine systems. Is the title of the book perhaps too broad? I question whether there is enough generality in the findings from cold-water systems to make them applicable to managers working elsewhere.

Chapters near the end of the book directly address how information gained from predators can be applied to management. For example, in Chapter 14, the author uses what is known about predator ecology to estimate biomass limits required for specific fish stocks. Using information about predation and natural mortality, the outcomes of a number of management scenarios are compared in Chapter 21. How predator information might be incorporated when establishing specific management goals is discussed in Chapters 22 and 24. Scattered throughout the text, several authors discuss how information from their predator studies could be incorporated into management actions; however, most conclude that a better understanding of the system is still required for sustainable resource use.

Although long-term monitoring programs are often difficult to justify as "serious science," this collection includes numerous research programs that span decades, demonstrating unequivocally the value

of such datasets to ecology and conservation alike. Sophisticated technologies and techniques have been introduced to answer more specific questions. Examples include data-logging devices on fur seals and penguins to provide insight into dispersion patterns of krill (Chapter 9), satellite transmitters on Northern Gannets to monitor fish stocks in the northeast Atlantic (Chapter 16), and quantitative fatty acid signature analysis to sample polar bear diet at times of the year not normally sampled (Chapter 7). This combination of monitoring and directed research is used to reveal some of the complexities associated with marine systems. Several authors argue convincingly that what is really needed is a multidisciplinary, whole-system approach to determine the functional links among predators, their prey and habitat (Chapters 6, 8, 12, and 18). Their challenge then becomes incorporating this information into something that is useful for management.

Each chapter is written more or less in scientific paper format, beginning with a summary of the chapter's major objectives and conclusions, akin to an abstract. The authors use "boxes" to provide details on the natural history of particular species, to define terms, to outline statistical and survey methods, and to provide background information on related research. For example, in Chapter 3, details of the relationships between large-scale physical processes and the reproductive performance of predators breeding in South Georgia are compartmentalized into boxes, and the interpretation of the significance of those details is discussed in the text. In Chapter 10, the author uses boxes to summarize what is known about the population expansion of fulmars and to provide a historical perspective for the causes underlying the expansion. This format allows the reader to gain a comprehensive understanding of the topic without necessarily having to be an expert in the field; it also ensures that the main text within each chapter flows easily. Maps, tables and figures help to illustrate the data and theories presented throughout, and a long list of references at the end of each chapter includes both recent and historic papers for the interested reader to pursue. My only criticism of the book's layout is that it fails to organize the chapters into any thematic sections, which makes it difficult to find the links between the various papers. A final chapter to synthesize the information presented would have helped in this regard.

Top Predators in Marine Ecosystems does an excellent job of establishing the roles of top predators in marine ecosystem monitoring. The overview of the subject will be a great resource for seabird biologists and readers interested in marine ecology. This collection of studies demonstrates responses by top predators to changes in their environment and that the possibilities of measuring those responses. How this information could be used to make the predictions necessary for management is less clear and will continue to challenge marine biologists and managers into the future.

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