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978-0-521-88828-8 - Ecology and Conservation of the Sirenia: Dugongs and Manatees

Helene Marsh, Thomas J. O'Shea and John E. Reynolds III

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## Ecology and Conservation of the Sirenia

### Dugongs and Manatees

Dugongs and manatees, the only fully aquatic herbivorous mammals, live in the coastal waters, rivers and lakes of more than 80 subtropical and tropical countries and territories. Symbols of fierce conservation battles, sirenian populations are threatened by multiple global problems.

Providing comparative information on all four surviving species, this book synthesises the ecological and related knowledge pertinent to understanding the biology and conservation of the Sirenia. It presents detailed scientific summaries, covering sirenian feeding biology; reproduction and population dynamics; behavioural ecology; habitat requirements and threats to their continued existence.

Outlining the current conservation status of the sirenian taxa, this unique study will equip researchers and professionals with the scientific knowledge required to develop proactive, precautionary and achievable strategies to conserve dugongs and manatees.

Supplementary material is available online at: [www.cambridge.org/9780521888288](http://www.cambridge.org/9780521888288).

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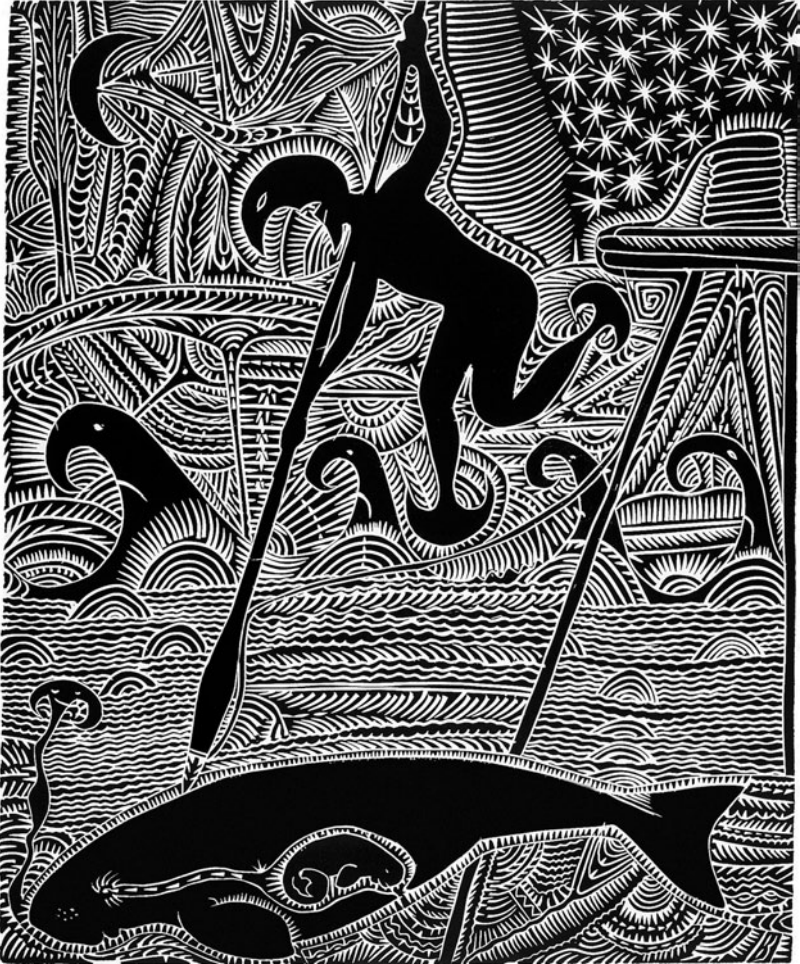
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**Frontispiece.** One of the traditional ways of hunting dugongs in Torres Strait was by building a platform over the mud flats at low tide. A skilled hunter could tell, by looking for feeding trails, where a dugong would return over the next few nights and constructed a platform (nath) over this site with much magic and ritual. The rope was coiled up on the platform and then let out, running across to the shoreline where other villagers secured it, awaiting the kill. When a dugong came close, the hunter saw the phosphorescent glow in the water and aimed his harpoon slightly in front of it. The hunter is depicted in the form of a spirit with a moon-shaped head and feet for flying through the air. Nath (State II). Linocut – Kaidaral. Copyright © Dennis Nona. Reproduced with permission with slight modification for reproduction in black and white.

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# Ecology and Conservation of the Sirenia

## Dugongs and Manatees

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## *Foreword*

On the surface of it, it seems preposterous to confuse mermaids and sirens with a 500 kg marine mammal with a face that only another sirenian might love. But knowledge and information have their own imperatives, and the more we know, the more fascinating these creatures become, and the more we are driven to protect them.

Knowledge itself is one of the tools that we can use to do that. Despite the difficulties associated with studying manatees and dugongs – they are inhabitants of turbid water, surface unpredictably and lie quietly on the bottom for long periods – researchers have pieced together much of their basic biology. Puzzles remain, however: Why do male dugongs have tusks? Is reproductive behaviour in sirenians characterised by scramble competition among males, or might they actually form mating leks? However, a rich understanding of these creatures has emerged from careful science.

Sirenians are biologically more different than most. They are the only herbivorous mammals that are fully aquatic. Their evolutionary affinity with elephants and hyraxes is intriguing. Even with only four extant species, there is wonderful variety: the Amazonian manatee lives in freshwater rivers and lakes, while the dugong is marine. Dugongs specialise on sea-grasses, while manatees are much more eclectic. Long-term social bonds seem to be restricted to mother–offspring relations, but sirenians can gather comfortably in aggregations of hundreds.

Manatees and dugongs live in rivers, lakes and coastal areas, which brings them together with our species. Throughout history, sirenians have inspired cultural responses, provided people with meat, hides and oils, and stimulated myths and stories. But today, artisanal fisheries, direct hunting, declines in sea-grasses, recreational boating and pollution are unrelenting pressures on sirenian populations.

Knowledge is necessary for effective conservation action, and information informs action. It is not coincidence that the populations for which we have the most scientific data – Florida manatees and Australian

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dugongs – have the strongest management programmes and are the most likely to persist. This justifies further efforts, especially research to understand the interaction with people and the effectiveness of different management regimes on wild populations. But knowledge by itself is not sufficient; governmental agencies ultimately must use that knowledge to forge policies, and people must implement the practices that will allow us to co-exist with these wonderful animals.

John G. Robinson  
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## *Preface*

This book was born out of passion, frustration, excitement and hope. Readers will perceive all these emotions throughout the following pages. If the hard-won lessons recounted here lead to improved conservation of some remarkable species and their ecosystems, we will have fulfilled our aim.

We have cumulatively spent well over a century studying the various members of the Order Sirenia. Our passions include learning about and trying to conserve manatees and dugongs. The word 'unique' has lost its force through inaccuracy and over-use, but we want to reclaim its original meaning here. The sirenians possess suites of morphological, ecological and physiological adaptations that allow them, truly, to hold a unique place in the animal kingdom. Although once a more diverse group, the sirenians are limited now to only four species, albeit with remarkably wide geographic ranges (especially the dugong). Reduced in numbers through much of that range, and with myriad threats to their long-term survival, the sirenians have nonetheless demonstrated tenacity and resilience, hopeful signs that they will persist, if given a chance.

We hope that this book will stir the passion of those best placed to achieve the survival of the four sirenian species, particularly the rising generation of scholars and conservationists. We have all had the privilege of spending some of our professional lives working with research students. We are proud of the fact that these young scholars have the tools and insights to conserve sirenians and other wildlife species and their habitats.

If passion has driven us, frustration has tempered us. The world has many gifted and enthusiastic people trying to achieve a better balance between human activities and conservation of wild, living resources. All too often, human values and actions have led to the loss of wildlife species and natural ecosystems. Some species of marine mammals have become extinct at the hands of people in the past 60 years. Sadly, all of these extinctions were preventable.

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Human population and consumption of natural resources expand every year. The profit motive generally trumps conservation. This situation frustrates those of us who champion the natural environment. Nonetheless, we sense a sea change in people's attitudes, prompting excitement and hope that a new generation of scientists and conservationists may reverse the trends of our own generation and achieve better preservation of wildlife and ecosystems.

This book will fail if it does not instil passion, frustration, excitement and hope for the Sirenia. However, our purpose was also to document and encourage the meticulous acquisition and use of scientific data to ensure that decisions are evidence based. Passion and hope are great motivators; but information, effective partnerships and respect for cultural differences are essential for conservation to succeed. This book is a scholarly synthesis that provides detailed, complete information and perspectives on the ecology and conservation of sirenians, and acknowledges gaps in our understanding. In reviewing the literature for the book, we were struck by the amount of new information about the Sirenia that has been published in a wide variety of outlets over the last decade. By synthesising and distilling this information we hope to help readers more effectively access the diverse primary literature.

As described in Chapter 1, the dugong is at the heart of an international political, economic, military, cultural and environmental conflict. These animals have added fuel to the controversy over the presence of a US military base on Japanese soil, in Okinawa. Indeed, as we note later, dugongs and manatees are increasingly being used as 'flagship species' to represent larger environmental causes.

Chapter 2 introduces frustration, as we describe the demise of the largest sirenian species ever; one of the largest creatures ever to inhabit our planet. The tragic loss of Steller's sea cow at the hands of Russian explorers and hunters only 27 years after its discovery by Europeans exemplifies the triumph of human greed over Nature. Sadly, Steller's sea cow is not an isolated example, as people persist in 'doing business' in a manner that jeopardises wildlife and the natural world.

Chapter 3 provides the evolutionary history of the Order Sirenia. That history is peppered with unusual beasts and considerable diversity. Many sirenian species co-existed throughout tropical and subtropical waters, but today that diversity is limited. We are concerned that factors such as human population growth, habitat deterioration, changes in fishing technology and even recreational pursuits make the accelerated extinction of the remaining

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species of sea cows more likely. Societies must develop better conservation values and people must adjust their behaviours to ensure that does not occur.

Chapters 4–6 provide a thorough review and synthesis of the scientific information about sirenian feeding and foraging; habitat use; behaviour; life history; and population dynamics. Optimal efforts to conserve species and their habitats take advantage of all that is known about the species' needs and capabilities. Our detailed review of the science of these three broad areas sets the scene for our closing chapters on threats, status and conservation opportunities.

Chapters 7–9 get to the heart of our concerns for the future of the sirenians. Chapter 7 provides an assessment of the threats to sirenian populations from environmental factors such as climate change and harmful algal blooms, and human-related factors such as habitat destruction, directed hunting and incidental fishing take. Understanding and mitigating threats are vital to conservation. Chapter 8 examines how we understand the 'status' of a species or population and addresses hard-to-study factors that would ideally be included in a status assessment, but which are often difficult or impossible to integrate because of lack of funds or logistic difficulties. We then provide details of the conservation status of sirenian populations around the world. Some populations are actually doing quite well, whereas others have been lost or greatly reduced and are likely to disappear in a matter of years.

Although Chapters 7 and 8 contain information that may discourage those who wish to promote conservation of sirenians and their environment, hope returns in Chapter 9. This chapter is titled 'Conservation Opportunities' because we believe that new approaches, new tools and new perceptions about science, values and partnerships will equip motivated people with what they need to make a difference. In part, the change has occurred because people and governments are increasingly acknowledging that traditional ways of doing science and conservation do not always work; this admission can be liberating, as it encourages people to seek novel ways of working together.

We do *not* consider that conservation has become formulaic, and that 'plugging in' particular components or steps will automatically lead to success. Nonetheless, we believe that the time is right for informed, passionate, dedicated people to prevail. We hope that the conservation opportunities we describe will be useful not only to people concerned with sirenians, but for all conservation efforts, especially in developing countries.

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There is much to be done to ensure that sirenians and their ecosystems are conserved. We trust that this book conveys both humility and urgency and provides a foundation for future successes.

Helene Marsh  
Tom O'Shea  
John Reynolds

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