



# MARINE MAMMALS

Fisheries, Tourism and Management Issues

Nick Gales, Mark Hindell and Roger Kirkwood (Editors)

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#### **Front cover, from left**

Bottlenose dolphins (*Tursiops truncatus*) bow-riding at Port Stephens, NSW, Australia.

Photo: Simon Allen.

Cape fur seals (*Arctocephalus pusillus pusillus*) swimming inside a pelagic purse seine as it is pursed on the surface and eating the catch (sardines). Photo: Fritz Schulein.

Australian fur seal (*Arctocephalus pusillus doriferus*) entangled in trawl net. Photo: Nature Conservation Branch, Department of Primary Industries, Water and Environment.

#### **Spine**

Juvenile Australian sea lion (*Neophoca cinerea*). Photo: Nick Gales.

#### **Back cover, from top**

Dugong (*Dugong dugon*) and calf in Shark Bay, Western Australia. Photo: Nick Gales.

Killer whale (*Orcinus orca*) being watched by tourists at the Falkland Islands. Photo: Nick Gales.

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# CONTENTS

Preface	vii
Acknowledgments	ix
Contributors	x

1 Strategies for conserving marine mammals	1
<i>H. Marsh, P. Arnold, M. Freeman, D. Haynes, D. Laist, A. Read, J. Reynolds and T. Kasuya</i>	

## Part I Marine Mammals and Fisheries

2 Marine mammals and fisheries: The role of science in the culling debate	31
<i>D. Lavigne</i>	
3 Ecological consequences of Southern Ocean harvesting	48
<i>S. Nicol and G. Robertson</i>	
4 Trophic interactions between marine mammals and Australian fisheries: An ecosystem approach	62
<i>S. Goldsworthy, C. Bulman, X. He, J. Larcome and C. Littnan</i>	
5 Interactions between marine mammals and High Seas fisheries in Patagonia: An integrated approach	100
<i>S. Dans, M. Alonso, E. Crespo, S. Pedraza and N. García</i>	
6 Management of Cape fur seals and fisheries in South Africa	116
<i>J. David and P. Wickens</i>	
7 Pinnipeds, cetaceans and fisheries in Australia: A review of operational interactions	136
<i>P. Shaughnessy, R. Kirkwood, M. Cawthorn, C. Kemper and D. Pemberton</i>	
8 Hector's dolphins and fisheries in New Zealand: A species at risk	153
<i>F. Pichler, E. Slooten and S. Dawson</i>	
9 Effects of fishing bycatch and the conservation status of the franciscana dolphin, <i>Pontoporia blainvillei</i>	174
<i>E. Secchi, P. Ott and D. Danilewicz</i>	
10 New Zealand sea lions and squid: Managing fisheries impacts on a threatened marine mammal	192
<i>I. Wilkinson, J. Burgess and M. Cawthorn</i>	
11 Aquaculture and marine mammals: Co-existence or conflict?	208
<i>C. Kemper, D. Pemberton, M. Cawthorn, S. Heinrich, J. Mann, B. Wursig, P. Shaughnessy and R. Gales</i>	

## Part II Marine Mammals and Tourism

12 Evaluating the effects of nature-based tourism on cetaceans	229
<i>L. Bejder and A. Samuels</i>	

13	<b>Pinniped-focused tourism in the Southern Hemisphere: A review of the industry</b>	257
	<i>R. Kirkwood, L. Boren, P. Shaughnessy, D. Szteren, P. Mawson, L. Hückstädt, G. Hofmeyr, H. Oosthuizen, A. Schiavini, C. Campagna and M. Berris</i>	
14	<b>Swimming with wild cetaceans, with a special focus on the Southern Hemisphere</b>	277
	<i>A. Samuels, L. Bejder, R. Constantine and S. Heinrich</i>	
15	<b>The effects of provisioning on maternal care in wild bottlenose dolphins, Shark Bay, Australia</b>	304
	<i>J. Mann and C. Kemps</i>	

### **Part III      Management Issues**

16	<b>Ethics and marine mammal research</b>	321
	<i>N. Gales, A. Brennan and R. Baker</i>	
17	<b>Ecosystem monitoring: Are seals a potential tool for monitoring change in marine systems?</b>	330
	<i>M. Hindell, C. Bradshaw, R. Harcourt and C. Guinet</i>	
18	<b>Acoustics and marine mammals: Introduction, importance, threats and potential as a research tool</b>	344
	<i>R. McCauley and D. Cato</i>	
19	<b>DNA surveys and surveillance of marine mammals: Species identification, discovery and management</b>	366
	<i>C. S. Baker, G. Lento, M. Dalebout and F. Pichler</i>	
20	<b>A future for the dugong?</b>	383
	<i>H. Marsh, H. Penrose and C. Eros</i>	
21	<b>Pollution and marine mammals in the Southern Hemisphere: Potential or present threat?</b>	400
	<i>K. Evans</i>	

# PREFACE

The relationship between humans and marine mammals is a special, but sometimes controversial one. It is culturally diverse and politically influential, and is based on attitudes ranging from spiritual reverence to fondness of taste. Our relationship with whales and seals in particular has profoundly influenced recent human history. The quest to share in the riches of whaling and sealing during the eighteenth, nineteenth and early twentieth centuries helped the global spread of European influence which has shaped much of today's cultural and political world, particularly in the Southern Hemisphere. Vast populations of marine mammals, such as fur seals, elephant seals and baleen whales, were efficiently extirpated, leading to a period of decades, and even centuries, during which these fauna were reduced to a minor component of many oceans.

The un-regulated harvest, to near-extinction, of fur seals and elephant seals in the Southern Hemisphere occurred in the eighteenth and nineteenth centuries, when such practice drew little public concern or comment. In contrast, the highly efficient modern whaling era occurred in the first half of the twentieth century, and public knowledge of, and concerns for, the dwindling whale stocks took form in the 'save the whale' campaign, an important early component of the modern day conservation movement.

Attitudes towards marine mammals have diversified, particularly in western countries, from a purely economic, or utilitarian, view to include those that place values on the conservation and/or protection of populations and individuals. Changes to national and international legislation and agreements have accompanied the changing attitudes. These changes have been accompanied by a high level of polarised debate, with perhaps the most controversial agreement being the moratorium on commercial whaling established in 1986. The moratorium remains in place today, despite continued and rising pressures to remove it.

Protected from unrestricted hunting, many populations of marine mammals are now recovering. This brings with it an interesting mix of challenges for the way we use marine habitats and resources. Firstly, non-consumptive marine mammal industries such as whale-watching have evolved rapidly and, in 1998, were estimated to have an economic worth in excess of US\$1 billion.

The manner in which this industry grew and operated has been unregulated in many countries, and concerns about impacts have given rise to a suite of national legislative requirements and guidelines. Secondly, there are increasing interactions with many marine industries including fishing, aquaculture, shipping, and mineral and oil exploration and extraction. For the fishing industry, the seals and whales can directly damage the catch or equipment (operational interactions), or may compete for a shared resource (trophic or biological interactions). Where increasing marine mammal populations are perceived to limit commercial fishing, calls for culls are frequent. The development of policies and approaches to manage, mitigate or ameliorate these types of interactions remains a high-priority international need.

Not all marine mammal populations have been able to recover or sustain current levels of human pressure. Some species, whether harvested or simply occurring in low numbers, are declining. A large proportion of marine mammal species fit into the conservation status categories of 'endangered', 'threatened', 'near-extinct' or 'insufficient data'. Processes, additional to fisheries, such as habitat degradation, and acoustic and chemical pollution, require effective management if these populations are to be viable.

Advances in marine mammal research techniques, thanks largely to advances in technology, have enabled scientists to improve the quality of data that informs these debates, but our understanding of the complex dynamics of ecosystems remains rudimentary. Each type of interaction brings with it a suite of unique circumstances, specific to the species, the industry and the legislation and culture of the responsible nation. In many cases interactions cross, or are beyond, national boundaries, making management additionally complex.

Humans and marine mammals interact in almost all marine ecosystems, but examples of interactions and research have been dominated by those in the Northern Hemisphere. This predominantly Northern Hemisphere focus is attributable to the greater and wealthier human populations there, compared with those in the Southern Hemisphere, rather than being related to marine mammal densities. Among marine mammals – the Orders Cetacea (whales, dolphins and porpoises), Sirenia (manatees and dugongs) and Carnivora (suborder Pinnipedia) (seals, sea lions,



fur seals and walrus) – about 37% of species occur in both hemispheres, 32% live only in northern latitudes and 31% are restricted to southern latitudes. There is a need to focus attention on southern latitudes, where ecosystems and their interactions with humans are perhaps less understood, but no less relevant to sustainable, global management. In the south, issues are similar, but the field is different, with different species and human economies, and the oceans comprise a greater and less politically regulated area.

In May 2001, we organised The Southern Hemisphere Marine Mammal Conference 2001 on Philip Island in Victoria, Australia. The theme of the meeting was marine mammal and human interactions, and almost 200 leading marine mammal researchers, managers and industry representatives attended. Many of the papers from this meeting have been published in a special issue of *Australian Mammalogy* (Volume 24, 2002). We structured the conference around the two key themes of fisheries and tourism and included a third section that dealt more broadly with management and other issues. Within each section, we determined the main range of topics that we wished to cover, many with a practical focus on interactions in the Southern Hemisphere, but addressing issues of global relevance. We invited leading scientists to present and write papers on these selected topics, and compiled and reviewed these to produce this book.

The book opens with a contemporary review of ‘Strategies for conserving marine mammals’ by Helene Marsh and colleagues (Chapter 1). In this chapter, the threatening processes affecting marine mammal populations worldwide are placed in an historical context and the authors discuss the marine mammal conservation problems that have developed in response to expanding, coastal-dwelling human populations. They conclude that under current circumstances, the future looks bleak, and that by the end of the twenty-first century the number of extant populations and species of marine mammals will be much less than now. They also conclude that this decline will be greater for coastal than for non-coastal taxa.

To open the fisheries interactions section, David Lavigne (Chapter 2) provides discussion of the role of science in the controversial debate to cull marine mammals to safeguard fisheries. Lavigne notes that contemporary calls for marine mammal culls come at a time when many of the world’s fisheries are fully or over-exploited. While science has been a part of the resolution of some debates about culling, Lavigne argues that science will have little influence on demands for culls made on the basis of using marine mammals as scapegoats for failures in fishery management, or simply as part of a political strategy to promote commercial consumptive use of seals and whales.

The next two chapters in the fisheries section explore relationships between marine mammals and humans at the scale of the ecosystem. Nicol and Robertson (Chapter 3) discuss interna-

tional collaboration in the management of fisheries in the Southern Ocean, while Goldsworthy and colleagues (Chapter 4) utilise ecosystem models to explore the relationships between seals and fisheries in south-eastern Australia. The next six chapters explore regional examples where marine mammals and fisheries interact in operational and/or biological ways. The authors describe a range of situations, including those where science has largely ensured that interactions are sustainable and well monitored (e.g. Chapter 10, Wilkinson *et al.*), to those where marine mammal populations are threatened with extinction if human fishing pressures are not decreased (e.g. Chapter 8, Pichler *et al.* and Chapter 9, Secci *et al.*). The diversity of the scale and nature of marine mammal and fishery interactions in the Southern Hemisphere, and the management responses to them, are further explored in the three chapters from each of our major continental land masses; South America (Chapter 5, Dans *et al.*), Africa (Chapter 6, David and Wickens) and Australia (Chapter 7, Shaughnessy *et al.*). The fisheries section concludes with a review of marine mammal–aquaculture interactions in the Southern Hemisphere (Chapter 11, Kemper *et al.*), and identifies avenues for research and management on that increasingly important issue.

The section on tourism is introduced with a review by Bejder and Samuels (Chapter 12) who evaluate our technical ability to measure the effects of nature-based tourism on cetaceans. Their conclusion, that the science in this area has lagged behind the development of the industry, is made with constructive suggestions for improving our power to measure and interpret the nature and extent of these interactions. Following this, Kirkwood and his colleagues (Chapter 13) provide an important first review of the evolving seal-watching industry. The final two chapters in this section examine some contemporary issues that arise from nature-based marine tourism; those of swimming with dolphins (Chapter 14, Samuels *et al.*) and feeding dolphins (Chapter 15, Mann and Kemps).

The last section in this book examines some broader, topics in contemporary marine mammal management. Gales *et al.* (Chapter 16) explore the way in which ethical considerations interact with those of marine mammal research. They conclude their discussion with practical suggestions for the development of ethical guidelines and standards in professional marine mammal research societies. Hindell *et al.* (Chapter 17) then examine how effectively marine mammals can be used to signal large scale, human-induced, ecological change. They consider the complexity of the mechanisms they seek to identify through the monitoring of changes in predator performance, and conclude that, under certain carefully defined circumstances, marine mammals can be used as sentinels for change. The level of sound in the world’s oceans has been recognised as a growing threat for marine organisms, and in their chapter, McCauley and Cato (Chapter 18) review this subject and provides a sum-

mary of how this threat might best be understood and managed. Our understanding of the genetic structure of organisms has increased enormously in the past decade, and this has had important implications in the conservation and management of marine mammals. Baker *et al.* (Chapter 19) review the basic principles underlying the molecular, phylogenetic identification of cetacean specimens, and demonstrate the utility of 'DNA surveillance' for monitoring the sale of cetacean products in retail markets. They also show that DNA surveys have been critical in defining units of evolutionary interest or management concern for marine mammals.

In the penultimate chapter, Marsh *et al.* (Chapter 20), consider the future prospects for a vulnerable, herbivorous, coastal marine mammal; the dugong. They examine its status using data derived from a wide ranging survey of stake-holders, and conclude that while this species is likely to be secure in most of its range in Australia, and possibly parts of the Red Sea, its survival

through the remainder of the northern Indian Ocean–southwest Pacific region is seriously compromised.

The book concludes with a review by Evans (Chapter 21), of the bio-accumulation of organochlorines and heavy metals in marine mammals in the Southern Hemisphere. This review, and its extensive appendices, provide an essential resource to help marine managers to determine global and Southern Hemisphere patterns of pollutant levels in high order predators.

Ultimately, the usefulness of this book relies upon the quality and experience of the contributing authors and the applied focus of the subjects they cover. The detailed treatments of interactions between humans and marine mammals provide a timely guide to the 'state of the art' of our science, and its' integration into policy and management. We hope that the book will represent an important reference for students, marine managers and policy makers, industry and science professionals.

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in the captions) who generously provided these. The Australian Antarctic Division contributed financially to the production of this book and we thank them for what we believe is a worthwhile investment. Finally we thank Nick Alexander of CSIRO Publishing who picked up the idea of publishing this book with trust and enthusiasm, and also Briana Elwood, of CSIRO Publishing, who made our role as painless and straightforward as it could be.

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# DEDICATION

We dedicate this book to Graham Chittleborough, whose pioneering work on humpback whales continues to provide us with a model of how good science should be used to inform management.