

Marine Mammal Collections in Australia

Tadasu K. Yamada¹, Catherine Kemper², Yuko Tajima³, Ayako Umetani⁴,
Heather Janetzki⁵ and David Pemberton⁶

¹Department of Zoology, National Science Museum
(e-mail: yamada@kahaku.go.jp)

²Vertebrates Department, South Australian Museum
(e-mail: Kemper.Catherine@saugov.sa.gov.au)

³University of Texas, Medical Branch
(e-mail: yukotajitaji@mac.com)

⁴Graduate School of Veterinary Science, Azabu University
(e-mail: kaze_aykum@hotmail.com)

⁵Section of Vertebrates, Queensland Museum
(e-mail: heatherj@qm.qld.gov.au)

⁶Department of Vertebrate Zoology, Tasmanian Museum and Art Gallery
(e-mail: dpemberton@tmag.tas.gov.au)

with assistance in compiling museum collections from:

Wayne Longmore, National Museum of Victoria

Sandy Ingleby, Australian Museum

Norah Cooper, Western Australian Museum

Brian Smith, Queen Victoria Museum

Gavin Dally, Museum and Art Gallery of the Northern Territory

Robert Palmer, National Wildlife Collection (CSIRO)

Abstract Museums in Australia house over 5500 marine mammal specimens in nine major institutions. These collections are here summarized with a view to making them more accessible to researchers throughout the world. Fifty-eight species of marine mammal are known from Australian waters. These and many more from elsewhere are represented in the collections. Australian museums are an important source of material for wide-ranging studies on marine mammals, including refining the taxonomy of difficult and cosmopolitan genera such as *Tursiops* and *Delphinus*, and species such as beaked whales that are rare in world collections.

Key words: skeletons, museum, marine mammals, specimen, Australia

Introduction

Australia's extensive coastline provides a wide range of marine habitats. Consequently, published sources list 43 cetaceans (Bannister *et al.*, 1996), 1 sirenian (Marsh, 1988) and 10 pinnipeds (Shaughnessy, 1999) from Australian waters. However, re-evaluation of the taxonomy of some taxa has resulted in additional or renamed species of cetaceans in the region. These are: *Tursiops aduncus* (Moller and Beheregaray, 2001; Kemper 2004), a dwarf but undescribed form of *Balaenoptera acutorostrata* (Arnold *et al.*, 1987), *Orcaella heinsohni* (Beasley *et al.*, 2005) and *Balaenoptera omurai* (Wada *et al.*, 2003). This brings the total species of cetaceans to 47.

The purpose of this paper is to summarize the marine mammal collections in Australia, including their strengths and species of particular interest. The paper also reports on some of the findings during visits to four of the museums in late 2004 by TKY, YT and AU.

Major Marine Mammal Collections in Australia

We examined the cetacean collections in four museums (National Museum of Victoria, Queensland Museum, Tasmanian Museum and Art Gallery and South Australian Museum) during late 2004, primarily studying the Balaenopteridae and Ziphiidae but also noting the strengths of each collection visited. Significant marine mammal collections are found in six of the nine museums (Table 1 and 2). Below, we report on the four museums visited.

South Australian Museum

The marine mammal specimen collection at the South Australian Museum consisted of more than 1600 specimens, which is the largest in Australia, and is expanding rapidly as a result of an active stranded-carcass collection programme. Species of importance in the collection are *Caperea marginata*, *Kogia* spp., *Physeter macrocephalus*, *Mesoplodon layardii*, *Tursiops* spp., *Delphinus delphis*, *Globicephala* spp., *Arctocephalus* spp., and *Neophoca cinerea*. Two subspecies of *Balaenoptera musculus* are also worthy of note, although number of the specimens is not large. Some of them are important because of their limited distribution and others because they will contribute to our understanding of cosmopolitan species. Substantial specimen numbers of *Tursiops* spp, *Delphinus delphis*, *Kogia* spp., and *Mesoplodon layardii* in this museum will play an important role in the near future. One of the important results of the present survey was the recognition of *Balaenoptera omurai* (Wada *et al.*, 2003), a specimen at the southern end of presently recognized range of the species and the only known record for Australia (Fig. 1).

Another major strength of the collection at the South Australian Museum is that it includes organs, frozen tissues for genetic and toxicological studies, baleen, stomach contents for diet research and parasites. It is also very accessible and well-curated.

Tasmanian Museum and Art Gallery

Guiler (1978) summarized more than 30 years of marine mammal strandings and many of the specimens listed are preserved in this museum. Major species of interests are: *Arctocephalus* spp., *Caperea marginata*, *Tursiops* spp., *Delphinus delphis*, *Physeter macrocephalus* and *Globicephala melas*. Although the collection is not large, it is important both by its geographical position, quality and it is likely to grow much more.

National Museum of Victoria

This museum has the second largest marine mammal collection in Australia, having about 1200 specimens, most of which are pinnipeds. Species with substantial specimens are *Arctocephalus* spp., *Tursiops* spp., *Delphinus delphis*, and *Globicephala melas*.

Queensland Museum

Queensland Museum has nearly 500 marine mammal specimens including several significant specimens such as the type specimen of *Indopacetus pacificus* (Longman, 1926; Moore, 1968) and newly defined *Orcaella heinsohni* (Beasley *et al.*, 2005). The museum has played a leading role in Australian marine mammal studies, such as extensive inventory compilations (Paterson,

Table 1. Summary of characteristics for marine mammal collections in Australia.

	WAM	SAM	MAGNT	NMV	TMAG	QVM	AM	ANWC	QM
Provenance	Mostly Western Australia, some northern Australia	Mostly South Australian, some subantarctic seals	Mostly northern Australia	Mostly Victoria	Tasmania and subantarctic islands	Mostly Tasmania	Australian region, Northern hemisphere	Southeastern Australia	Species from tropical and sub tropical waters
History	Oldest specimen from 1890s	Oldest specimens from 1880s	Oldest record from 1960s	Oldest specimens from 1860s	Oldest specimens from late 1800s				Oldest specimens from 1910–1915
Strengths	Mass strandings, beaked whales	Comprehensive material from specimens, baleen from many animals, <i>Capevrea</i>	Tropical dolphins, dugongs	Australian and Antarctic pinnipeds	Toxicology tissues, wild hybridised <i>Arctocephalus</i> , mass strandings		Tropical and non-Australian species	nil	Large dugong collection, estuarine dolphins
Other material	Genetics tissues, photos	organs, genetics tissues, skins, live sightings database	photos	photos	Genetics, photos	Photos	Genetics, organs	nil	Some genetics tissues, photos
Contact Person	Norah Cooper (Registrar)	Catherine Kemper (Curator), David Stemmer (Collection Manager)	Gavin Dally (Collection Manager)	Wayne Longmore, Rory O'Brien (Collection Managers)	David Pemberton (Curator), Kathryn Medlock (Collection Manager)	Brian Smith (Curator)	Sandy Ingleby (Collection Manager)	Robert Palmer (Collection Manager)	Steve Van Dyck (Curator), Heather Janetzki (Collection Manager)
Holotypes				<i>Physalus grayi</i>					<i>Indopacetus</i> <i>Euphysetes macleanyi</i> , <i>pacificus</i> <i>Catodon australis</i> , <i>Orcella</i> <i>Catodon kraeffii</i> , <i>heinsohni</i> <i>Grampiodelphis exilis</i>
Record availability and Faunabase	Electronic/OZCAM	Electronic/OZCAM	Electronic/OZCAM	Electronic/OZCAM		Electronic (editing needed)	Electronic/OZCAM	Electronic	Electronic Faunabase

WAM= Western Australian Museum, SAM=South Australian Museum, MAGNT=Museum and Art Gallery of the Northern Territory, NMV=National Museum of Victoria, TMAG=Tasmanian Museum and Art Gallery, QVM=Queen Victoria Museum, AM=Australian Museum, ANWC=Australian National Wild Life Collection, QM=Queensland Museum.

Table 2. (Continued).

Order	Suborder	Family	Genus	Species	Subspecies	WAM	SAM	MAGNT	NMV	TMAG	QVM	AM	ANWC	QM				
Cetacea	Mysticeti	Balaenopteridae	<i>Balaenoptera</i>	<i>bonaerensis</i>		3	17						1	1	2			
				<i>edenti</i>		7	13			3								
				<i>omurai</i>		1	1											
				<i>borealis</i>		1	1					1					1	
				<i>physalus</i>		1	3				1	3						
				<i>musculus</i>							5							
								<i>brevicauda</i>		3	2					1		1
								<i>intermedia</i>		2	11		1					1
							<i>novaeangliae</i>		2	9		7	1			27		24
							<i>macrocephalus</i>		35	45	1	39	101	6		39		25
	Odontoceti	Physeteridae Kogiidae	<i>Megaptera</i> <i>Physeter</i> <i>Kogia</i>	<i>sima</i>		2	2							1				
				<i>breviceps</i>		6	31			12	4			30		1	13	
				<i>cavirostris</i>		6	3	1			4	5			5		4	
				<i>armuxii</i>		1	1						1					
				<i>shepherdi</i>		1	1											
				<i>tasmacetus</i>														
				<i>indopaceticus</i>														
				<i>hyperoodon</i>														
				<i>mesoplodon</i>														
								<i>hectori</i>		2	7		1	1		1		1
				<i>mirus</i>		2	2			4								
				<i>grayi</i>		5			1									
				<i>bowdoini</i>		16	13		6	6		9		1				
				<i>ginkgodens</i>		6	4		2	2				2				
				<i>layardi</i>		1	1		1			1						
				<i>densirostris</i>		6	47		8	8	2	15		5				
				<i>gangesica</i>		4	1		2	1		6		1				
				<i>blainvilliei</i>								2						
				<i>leucas</i>								2						
				<i>monoceros</i>								2						
				<i>hectori</i>					1				1					
				<i>breidamensis</i>		7	1					9						
				<i>chinensis</i>		7		5				1		22				
				<i>aduncus</i>		10	190											
				<i>truncatus</i>		54	46	36*	58*	24*	1	32*	1*	28*				
				<i>attenuata</i>		8	8	2	1			127		3				

Table 2. (Continued).

Order	Suborder	Family	Genus	Species	Subspecies	WAM	SAM	MAGNT	NMV	TMAG	QVM	AM	ANWC	QM			
Cetacea	Odontoceti	Delphinidae	<i>Stenella</i>	<i>longirostris</i>		27	3	18	2			11		2			
				<i>coeruleodolba</i>		27			1				11	1	2		
				<i>Delphinus</i>	<i>delphis</i>		27	253		46	31	4	71			4	
				<i>Lagenodelphis</i>	<i>hosei</i>		3			3			6			1	
				<i>Lagenorhynchus</i>	<i>obscurus</i>						2						
					<i>cruciger</i>		1					1					
					<i>peronii</i>		1				2						
					<i>Grampus</i>	<i>griseus</i>		4	3		3	1		15			3
					<i>Peponocephala</i>	<i>electra</i>		3		1				9			20
					<i>Feresa</i>	<i>attenuata</i>								1			1
					<i>Pseudorca</i>	<i>crassidens</i>		59	4	2	12	7	7	21			5
					<i>Orcinus</i>	<i>orca</i>		6	8		7	4	1	24			
					<i>Globicephala</i>	<i>melas</i>		24	23		25	67	3	18			3
						<i>macrorhynchus</i>		48	16				1	1			5
					<i>Orcaella</i>	<i>heinsohni</i>		5		3				2			3
Sirenia		Phocoenidae	<i>Phocoena</i>	<i>phocoena</i>			1		2			3					
				<i>dioptrica</i>				1	1	1	1						
				<i>manatus</i>			1										
	Trichechidae	<i>Trichechus</i>	<i>senegalensis</i>					1			4						
		<i>dugong</i>						15		1	34	6	214				
	Dugongidae	<i>Dugong</i>			63	20	17										
Total Cetaceans						461	846	70	220	302	33	525	7	223			
Total Pinnipeds						114	750	0	1015	149	42	421	16	23			
Total Sirenians						63	21	17	16	0	1	38	6	214			
Total Marine Mammals						638	1617	87	1251	451	76	984	29	460			

Numbers are total specimens/skulls or part skulls/postcranials. Only specimens identified to species level included. * = taxonomy and/or reidentifications not yet updated. WAM = Western Australian Museum, SAM = South Australian Museum, MAGNT = Museum and Art Gallery of the Northern Territory, NMV = National Museum of Victoria, TMAG = Tasmanian Museum and Art Gallery, QVM = Queen Victoria Museum, AM = Australian Museum, ANWC = Australian National Wildlife Collection, QM = Queensland Museum.

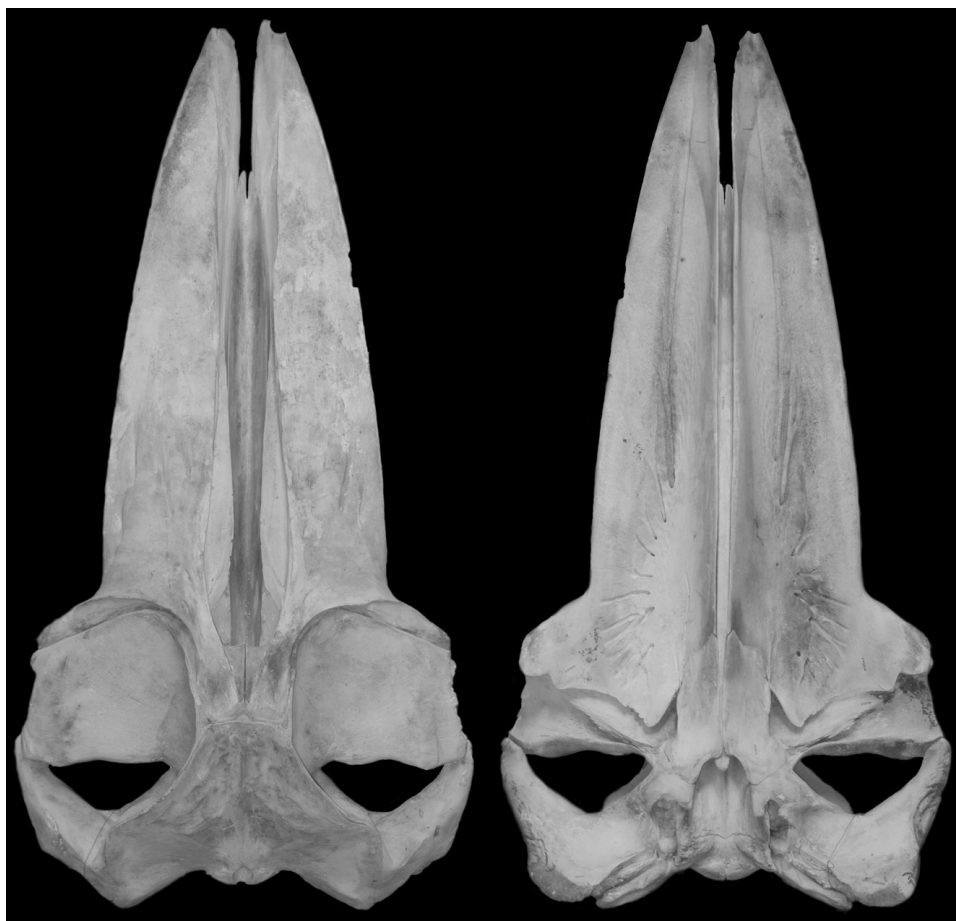


Fig. 1. Skull of *Balaenoptera omurai* SAM M21245.

1986; Paterson, 1992), organizing international symposia on cetacean species (Jell and Paterson, 1991; Jell, 2001) and active research on minke whales and humpback whales.

We did not visit and examine the specimens in other major museums where marine mammal specimens are housed: ie. Western Australian Museum, Museum and Art Gallery of the Northern Territory, Queen Victoria Museum, and Australian Museum.

Many of the collections are databased using KE EMu and basic data for each specimen is made accessible by Online Zoological Collections of Australian Museums (OZCAM) at (<http://www.ozcam.gov.au/index.php>).

Major Species in the Collections in Australia

Summarizing the above data and Table 1 and 2, it is clear that among the marine mammal species collected from the seas around Australia *Arctocephalus pusillus doriferus*, *Neophoca cinerea*, *Arctocephalus forsteri*, *Tursiops* spp., *Delphinus delphis*, *Physeter macrocephalus*, and *Dugong dugon* represent more than 10% of the total specimen number for each order. Here we discuss two major cetacean genera, *Tursiops* and *Delphinus* which coincidentally are two genera that are subject of considerable taxonomic debate.

***Tursiops* spp.**

Family Delphinidae Gray, 1821

Genus *Tursiops* Gervais, 1855

Although there have been numerous species defined within the genus. Hershkovitz (1966) listed two species *Tursiops truncatus* (Montagu, 1821) and *Tursiops gilli* Dall, 1873. He also listed two subspecies, namely *Tursiops truncatus aduncus* Ehrenberg, 1832, and *Tursiops truncatus truncatus* (Montagu, 1821), however, for a few decades the genus was treated as monospecific (Rice, 1977). Ross (1977) was one of the earliest to suggest the validity of *Tursiops aduncus* as a separate species in the recent context. It is now clear that there are at least two types of dolphins in what is called the ‘bottlenose dolphin’. One is the real bottlenose dolphin which is usually larger and stocky with a blunt beak. The other one is slender and smaller with an often up turned long beak. Taxonomic re-evaluation of *Tursiops* spp. has been made in Southeast Asia (Wang *et al.*, 1999; Wang *et al.*, 2000A; Wang *et al.*, 2000B), in Japan (Kakuda *et al.*, 2002) and in Australia (Moller and Beheregarah, 2001; Kemper, 2004). Because of the uncertainty of the existence of the type specimen, however, definition of *Tursiops aduncus* is not clearly understood. Since the species was defined based on characters of the type specimen, species identification should be made by exact comparison with the type. Kakuda *et al.* (2002) stated that two resident ‘bottlenose dolphins’ of Mikura island were identical in several morphological characters and molecular evidence, with ‘*Tursiops aduncus*’ of Wang *et al.* (1999; 2000A; 2000B). The species identification of these dolphins can be only valid when exact comparison with the type specimen has been made. Kakuda *et al.* (2002) concluded that this dolphin in Japan be known as the ‘*aduncus*-type bottlenose dolphin’.

***Delphinus* spp.**Genus *Delphinus* Linnaeus, 1758

The number of species assigned to genus *Delphinus* has also been plentiful. Rice (1998) listed three species, *Delphinus delphis* Linnaeus, 1758, *Delphinus capensis* Gray, 1828 and *Delphinus tropicalis* van Bree 1971. There have been re-evaluations on the relationships of these species in several geographical areas (Heyning and Perrin, 1994; Rosel *et al.*, 1994; Bell *et al.*, 2002). This genus also needs to be reviewed at least both from morphological and molecular biological aspects, including examination of the type specimens. Abundant specimens of the genus *Delphinus* in Australia would be a very important resource for the global assessment of the genus.

So-called Bryde’s Whales

Since the late 1990’s, there has been a series of discussions on the taxonomy of medium sized mysticetes of the genus *Balaenoptera* (Wada and Numachi, 1991; LeDuc and Dizon, 2002). These discussions originated partly because of the controversial work of Junge (1950) who concluded *Balaenoptera brydei* as a junior synonym of *Balaenoptera edeni*. Wada *et al.* (2003) clearly stated that *Balaenoptera brydei* and *Balaenoptera edeni* are both valid species and added another species of *Balaenoptera omurai*. During our survey through the collections, we confirmed one specimen of *Balaenoptera omurai* in South Australian Museum (Fig. 1). We believe in many of the Bryde’s whale specimens in Australian museums are *Balaenoptera brydei*. Further considerations based on detailed examinations of both new acquisitions and preserved specimens in museums will be necessary to properly summarize these species.

Conclusion

Australian museums hold over 5500 valuable marine mammal specimens that are for the most part in a very good condition and well curated. Rich resources of these specimens have and will provide excellent opportunities for the marine mammalogists. As to the species list of the cetaceans known from Australian waters we should add *Balaenoptera bonaerensis*, *Balaenoptera brydei*, *Balaenoptera omurai* and *Orcaella heinsohni*. Further investigations will clarify the complicated taxonomic issues of the genera, *Tursiops*, *Delphinus* and others.

Acknowledgements

We are grateful to the Queensland Museum, Tasmanian Museum and Art Gallery, National Museum of Victoria and South Australian Museum for access to their collections during 2004. We also thank all people involved in caring for collections and providing information for this paper, especially Debbie Robertson, Andrew Rozefelds and Kathryn Medlock (Tasmanian Museum and Art Gallery), Steve Van Dyck (Queensland Museum), Paul Horner (Museum and Art Gallery of the Northern Territory), Peter Arnold (Museum of Tropical Queensland), Terry Chesser (CSIRO) and David Stemmer (South Australian Museum).

References

- Bannister, J. L., C. M. Kemper & R. M. Warneke, 1996. The Action Plan for Australian Cetaceans. Australian Nature Conservation Agency, Canberra, 242pp.
- Beasley, I. L., K. Robertson & P. Arnold, 2005. Description of a new dolphin, the Australian Snubfin Dolphin *Orcaella heinsohni* Sp. N. (Cetacea, Delphinidae). *Marine Mammal Science*, **21**: 365–400.
- Bell, C. H., C. M. Kemper & J. Conran, 2002. Common dolphins *Delphinus delphis* in southern Australia: a morphometric study. *Australian Mammalogy*, **24**: 1–10.
- Guiler, E. R., 1978. Whale strandings in Tasmania since 1945 with notes on soome seal reports. *Papers and Proceedings of the Royal Society of Tasmania*, **112**: 189–213.
- Hershkovitz, P., 1966. Catalog of Living Whales. *United States National Museum Bulletin*, **246**: 259pp.
- Heyning, J. E. & W. F. Perrin, 1994. Evidence for two species of common dolphins (Genus *Delphinus*) from the eastern north Pacific. *Contribution in Science*, **442**: 1–35.
- Jell, P. A. & R. A. Paterson, ed. 1991. Humpback Whale Conference, *Memoirs of the Queensland Museum*, **30**, Queensland Museum, Brisbane.
- Jell, P. A. (eds.), 2001. Second International Humpback Whale Conference. *Memoirs of the Queensland Museum*, **40**, Queensland Museum, Brisbane.
- Junge, G. C. A., 1950. On a specimen of the rare fin whale, *Balaenoptera edeni* Anderson, stranded on Pulu Sugi Near Singapore. *Zoologische Verhandelingen*, **9**: 1–26.
- Kakuda, T., Y. Tajima, K. Arai, K. Kogi, A. Hishii & T. K. Yamada, 2002. On the resident “bottlenose dolphins” from Mikura water. *Memoirs of National Science Museum Tokyo*, **38**: 256–272.
- Kemper, C. M., 2004. Osteological variation and taxonomic affinities of bottlenose dolphins, *Tursiops* spp., from South Australia. *Australian Journal of Zoology*, **52**: 29–48.
- LeDuc, R. G. & A. E. Dizon, 2002. Reconstructing the rorqual phylogeny, with comments on the use of molecular and morphological data for systematic study. In: Pfeiffer, C. J. (ed), *Molecular and Cell Biology of Marine Mammals*. pp. 100–110, Krieger Publishing Company, Malabar, Florida.
- Longman, H. A., 1926. New records of cetacea, with a list of Queensland species. *Memoirs of the Queensland Museum*, **8**: 266–278.
- Marsh, H., 1988. An ecological basis for Dugong conservation in Australia. In Augee, M. L. (ed.) *Marine Mammals of Australasia, Field Biology and Captive Management*. pp. 9–21, Royal Society of Australia, Sydney.
- Moller, L. M. & L. B. Beheregaray, 2000. Coastal bottlenose dolphins from southeastern Australia are *Tursiops aduncus* according to sequences of the mitochondrial DNA control region. *Marine Mammal Science*, **17**: 249–263.

- Moore, J. C., 1968. Relationships among the living genera of beaked whales, with classification, diagnoses and keys. *Fieldiana Zoology*, **53**: 206–298.
- Paterson, R. A., 1986. A list of specimens of the order Cetacea in the Queensland Museum. *Memoirs of the Queensland Museum*, **22**: 309–311.
- Paterson, R. A., 1992. An annotated list of recent additions to the cetacean collection in the Queensland Museum. *Memoirs of the Queensland Museum*, **35**: 217–227.
- Paterson, R. A., H. A. Janetzki, & S. C. Williams 1997. Osteology of immature dark shoulder minke whale *Balaenoptera acutorostrata* from southern Queensland. *Memoirs of the Queensland Museum*, **42**: 315–325.
- Rice, D. W., 1977. A list of marine mammals of the world. (3rd. ed.). *NOAA Technical Report*, NMFS SSRF-711
- Rice, D. W., 1998. Marine Mammals of the World. Systematics and Distribution. Allen Press, Lawrence, 231pp.
- Rosel, P. E., E. A. E. Dizon & J. E. Heyning, 1994. Genetic analysis of sympatric morphotypes of common dolphins (genus *Delphinus*). *Marine Biology*, **119**: 159–167.
- Ross, G. J. B., 1977. The taxonomy of bottlenosed dolphins *Tursiops* species in South African waters, with notes on their biology. *Annals of the Cape Provincial Museums Natural History*, **11**: 135–194.
- Shaughnessy, P. D., 1999. *The Action Plan for Australian Seals*. Environment Australia, Canberra, 116 pp.
- Wada, S. & K. Numachi, 1991. Allozyme analyses of genetic differentiation among the populations and species of the *Balaenoptera*. *Report of the International Whaling Commission* (Special Issue), **13**: 125–154.
- Wada, S., M. Oishi & T. K. Yamada, 2003. A newly discovered species of living baleen whale. *Nature*, **426**: 278–281.
- Wang, J. Y., L.-S. Chou & B. N. White, 1999. Mitochondrial DNA analysis of sympatric morphotypes of bottlenose dolphins (genus: *Tursiops*) in Chinese waters. *Molecular Ecology*, **8**: 1603–1612.
- Wang, J. Y., L.-S. Chou & B. N. White, 2000A. Differences in the external morphology of two sympatric species of bottlenose dolphins (genus: *Tursiops*) in the waters of China. *Journal of Mammalogy*, **81**(4): 1157–1165.
- Wang, J. Y., L.-S. Chou & B. N. White, 2000B. Osteological differences between two sympatric forms of bottlenose dolphins (genus: *Tursiops*) in Chinese waters. *Journal of Zoology, London*, **252**: 147–162.