Aquatic Mammals 2002, **28.1**, 32–37

Northernmost records of the spectacled porpoise, Layard's beaked whale, Commerson's dolphin, and Peale's dolphin in the southwestern Atlantic Ocean

Maria C. Pinedo[1], André S. Barreto[2], Maurício P. Lammardo[1], Ana L. V. Andrade[3], and Laura Geracitano[4]

[1]*Depto. Oceanografia, Fundação Universidade Federal do Rio Grande (FURG), C.P. 474, 96201-900, Rio Grande, RS, Brazil*
[2]*Centro de Ciências Tecnológicas da Terra e do Mar, Universidade do Vale do Itajaí (UNIVALI), C.P. 360, CEP 88302-202, Itajaí, SC, Brazil*
[3]*Depto. de Morfologia, Universidade Federal de Pelotas (UFPel), 96200-000, Pelotas, RS, Brazil*
[4]*Depto. de Ciências Fisiológicas, Fundação Universidade Federal do Rio Grande (FURG), C.P. 474, 96201-900, Rio Grande, RS, Brazil*

Abstract

The northernmost records of four cold-water cetacean species in the southwestern Atlantic are presented: the spectacled porpoise (*Phocoena dioptrica*), Layard's beaked whale (*Mesoplodon layardii*), Commerson's dolphin (*Cephalorhynchus commersonii*), and Peale's dolphin (*Lagenorhynchus australis*). These records were represented by four strandings along the southern Brazilian coast (31° to 32°S) from 1994 to 1999. Previous northernmost records were for Uruguay and Argentina. External and skull measurements, together with information on ingested food and gastrointestinal parasites are provided.

Key words: *Phocoena dioptrica*, *Mesoplodon layardii*, *Cephalorhynchus commersonii*, *Lagenorhynchus australis*, northernmost records, southern Brazil, southwestern Atlantic.

Introduction

Since 1976, the coast of Rio Grande do Sul (29°20′S 49°44′W to 33°45′S 53°22′W) has been surveyed as part of a long-term beach-monitoring program conducted by the Laboratório de Mamíferos Marinhos e Tartarugas Marinhas, Departmento de Oceanografia, Fundação Universidade Federal do Rio Grande (FURG). This coast is a continuous beach with the exception of a major break at the entrance of the Patos Lagoon and a smaller break at Peixe Lagoon. The marine mammal fauna in the area has been documented during this time (e.g., Pinedo, 1997). For Brazilian waters a total of 37 cetacean species have been recorded (IBAMA, 1997).

Materials and Methods

On July 26, 1994, a 210-cm dead male spectacled porpoise, *Phocoena dioptrica*, was found 121.5 km south of the western jetty at the entrance of the Patos Lagoon Estuary (*ca.* 33°05′S, 52°36′W) (Fig. 1). The species identification was first based on the large triangular dorsal fin, and later confirmed by the skull features cited by Barnes (1985). The specimen was considered sexually mature based on the external measurements provided by Goodall & Schiavini (1995).

On April 9, 1996, a 504-cm dead male Layard's beaked whale, *Mesoplodon layardii*, was found stranded 11.9 km north of the eastern jetty at the entrance of Patos Lagoon Estuary (32°04′S, 52°00′W) (Fig.1). The dry and decomposed dark grey skin was peeling-off, but linear scars of light grey could still be seen. The melon was well-delimited, large, 'squarish', and the throat had the two V-shaped grooves typical of ziphiids. Even though the two backward-oriented teeth had been cut-off close to the lower jaw line before we found the carcass, their remains and position in the jaw allowed positive identification as a *Mesoplodon layardii*, following Mead (1989). The specimen was considered cranially an adult since the mesorostral 'gutter' in the skull was filled in by a bony proliferation of the vomer and fused to rostral bones (Mead, 1989) and the thyrohyals were fused to the basihyals.

On 19 November, 1998, a decomposed 123-cm delphinid was found stranded 17.9 km north of

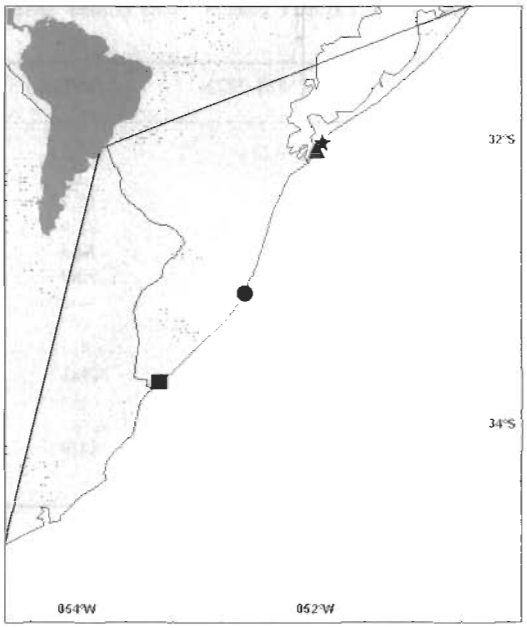

Figure 1. Map of the stranded records. Spectacled porpoise (circle), Layard's beaked whale (triangle), Commerson's dolphin (star), and Peale's dolphin (square).

the eastern jetty at the entrance of Patos Lagoon Estuary (32°01′S, 51°57′W) (Fig.1). The tip of the maxillary was broken and the flippers were partially cut-off. Based on the skull description by Harmer (1922), such as the large posterior lobes of maxillae, flattened floor of the depressed premaxillae triangle, width of the subquadrangular nasals much less than twice the length, and pterygoids separated by an U-shaped interval, the specimen was identified as a Commerson's dolphin, *Cephalorhynchus commersonii*.

On 25 May, 1999, a dead 193.6-cm dolphin was found stranded 224.5 km south of the eastern jetty at the entrance of the Patos Lagoon Estuary (33°42′S, 53°19′W) (Fig.1). Due to the decomposition process the sex could not be determined nor the gastrointestinal tract inspected for food and parasites. Based on the skull characters described by Kellogg (1941), mainly the swollen and elevated premaxillaries above the orbital plates of maxillaries, absence of premaxillaries depression infront of premaxillary foramina, and the exposed portions of frontals on the vertex, separating the nasals from the prominent knob-like anterior quadrangular process of supraoccipital, the specimen was identified as a Peale's dolphin, *Lagenorhynchus australis*. The crowns of the teeth were worn and the pulp cavities occluded. The basihyal was fused to the thyrohyals.

External measurements were taken in a straight-line, point-to-point with a caliper to the nearest millimetre or, if above 210 cm, in axial projections with a measuring tape to the nearest centimetre. Skull measurements were taken with a caliper to the nearest millimetre.

The stomach and complete intestines of the spectacled porpoise and of the Layard's beaked whale were washed on a sieve (mesh 150 µm) and examined under sterioscopy microscope (20X). Parasites identification was based on Davey (1971) and prepared according to Dailey (1978). The stomach of the Commerson's dolphin was only macroscopically inspected for helminths.

Results and Discussion

External and skull measurements from the present specimens are given in Table 1 and Table 2, respectively. The following biological material were collected and deposited at the collection of Laboratório de Mamíferos Marinhos e Tartarugas Marinhas, of Departamento de Oceanografia, Fundação Universidade Federal do Rio Grande (FURG): skull and parasites of the spectacled porpoise (MORG 1514); skull and stomach contents of the Layard's beaked whale (LMM 1852), skull, and stomach contents samples of the Commerson's dolphin (LMM 2172) and the skull of the Peale's dolphin (LMM 2266). Skin and muscle sample of the Commerson's dolphin (LMM 2172) was deposited at the collection of Centro de Ciências Tecnológicas da Terra e do Mar, Universidade do Vale do Itajaí (UNIVALI).

Fragments of 11 *Anisakis simplex* (Nematoda: Anisakidae) were found in the main stomach of the spectacled porpoise, together with remains of Ascidiacea (Tunicata). No helminths were found in the gastrointestinal tract of the Layard's beaked whale. A single inferior beak of *Histiotheutis* sp. was found in the stomach. Mantle length was estimated from a regression relating rostral length with dorsal mantle length (Santos & Haimovici, 2001). The minimum mantle length was 71.4 mm, and the minimum total weight 107.5 g. However, since the beak was damaged, both values could have been underestimated. The small and large intestines measured 22.05 m and 1.23 m, respectively.

No macroscopic helminths were found in the stomach of the Commerson's dolphin. The stomach contained many cephalopod beaks: five upper and seven lower beaks of *Loligo plei* and 130 upper and 137 lower beaks of *Loligo sanpaulensis*. Measurements were taken on seven and 90 lower beaks, respectively. Mantle lengths were estimated from regressions relating rostral length with dorsal mantle length (Santos & Haimovici, 2001). The

Table 1. External measurements (cm) of spectacled porpoise (MORG 1514), Layard's beaked whale (LMM 1852), Commerson's dolphin (LMM 2172), and Peale's dolphin (LMM 2266).

Measurement	MORG 1514	LMM 1852	LMM 2172	LMM 2266
Total length	210	504	123	193.6
Snout to base of melon		26.5		2.2
Snout to angle of mouth		39.8		15.9*
Blowhole to insertion of dorsal fin		249		71.4
Snout to centre of blowhole		78.3		24.5
Snout to base of dorsal fin		310		92.8
Snout to middle of genital slit	127.7	314	82.8	
Snout to centre of anus	151.7	357	96.5	
Dorsal fin height	22.6		9.8	
Dorsal fin base	41.9	50.5	21.2	28.1
Flipper length		50	18.8	
Flipper width		14.9		
Fluke width				11.9
Span of flukes			31.6	

*Open mouth.

minimum and maximum mantle lengths were estimated as 121.9 mm and 219 mm for the former species and 62.2 mm and 188.5 mm for the latter. The minimum total weight was 347 g for *L. plei* and 13,244 g for *L. sanpaulensis*. Bony fishes also were present in the stomach, including the remains of one *Paralonchurus brasiliensis*, one *Trichiurus lepturus* and one unidentified species. From the identified otoliths, fork lengths were estimated at 130 mm for both species.

The distribution of the spectacled porpoise appears to be circumpolar, occurring only in cold temperate waters. Their habitat is thought to be primarily oceanic (Brownell & Clapham, 1999). The Layard's beaked whale is distributed throughout the southern ocean in cold temperate waters and the majority of the records are from the South Pacific coasts of Australia and New Zealand (Mead, 1989). In the southwestern Atlantic, the northernmost records of both species were from Uruguay. The spectacled porpoise was represented by a male (*ca.* 200 cm) stranded on 28 October 1945 at Balneario Lagomar (34°48′S, 56°01′W) (Praderi & Palerm, 1971) and the Layard's beaked whale represented by a 608 cm, adult female stranded on 9 February 1971 at Balneario La Paloma (34°39′S, 54°08′W) (Praderi, 1972). There are two distinct populations of Commerson's dolphins separated by 130° (Goodall, 1994). According to this author, the northernmost reliably documented limit of the larger population, which inhabits the southwestern South Atlantic, is Rio Negro, Argentina, about 40°S. However, a skull of this species was also reported from Quilmes (34°48′S) near Buenos Aires (Brownell & Praderi, 1985; Goodall, 1994). Peale's dolphins are found mainly in the coastal waters of southern South America (Brownell *et al.*, 1999), normally from 44°S in the Atlantic to 38°S in the southeastern Pacific and exceptionally to 33°S in the southeastern Pacific to 38° in the southwestern Atlantic (Goodall *et al.* 1997). The northernmost record on the eastern coast of South America was from Miramar (38°15′S, 57°50′W), Argentina (Brownell, 1974 in Brownell *et al.* 1999; Goodall *et al.* 1997).

These are the first records for the Brazilian coast and the northernmost records of these four species for the southwestern Atlantic Ocean. These strandings in southern Brazil do not seem to be related to the presence of cooler waters in the area, since plots of the AVHRR Oceans Pathfinder data[1] did not show visual differences between the northern influence of the Malvinas Current in the stranding years and previous ones. Shifts in prey distribution could have been one possible explanation to these anomalous occurrences.

Acknowledgments

Thanks are given to Dr. A. S. F. Didati, University of São Paulo, for identifying food items of the spectacled dolphin and Dr. Roberta A. Santos, Laboratório de Recursos Demersais, Departmento de Oceanografia, Fundação Universidade Federal do Rio Grande (FURG), for identifying the beaks, and estimating size and weight of the squids. We would like to extend our thanks to Thammy Barreto and Tom Polacheck for helping us with the fieldwork.

[1]Obtained from the NASA Physical Oceanography Distributed Active Archive Center at the Jet Propulsion Laboratory, California Institute of Technology.

Table 2. Selected skull measurements (mm) based on: spectacled porpoise (MORG 1514) (Praderi & Palerm, 1971), Layard's beaked whale (LMM 1852) (Omura, 1972), Commerson's dolphin (LMM 2172) (Brownell & Praderi, 1985) and Peale's dolphin (LMM 2266) (Fraser & Noble, 1968). Bilateral measurements were taken at the left (L) side, unless otherwise stated.

Measurement	MORG 1514	LMM 1852	LMM 2172	LMM 2266
1. Condylobasal length	308	950	269*	351
2. Rostrum length	131	651	126*	172
3. Tip of rostrum to posterior margin of pterygoid	194	771(R)		
4. Tip of rostrum to most posterior extension of wing of pterygoid		805(R)		
5. Tip of rostrum to most anterior extension of pterygoid	146	511(R)		
6. Tip of rostrum to anterior margin of superior nares	164	745(R)	161*	217
7. Tip of rostrum to internal nares			143*	201
8. Tip of rostrum to anterior tip of nasals	205	775(R)/ 803(L)		
9. Tip of rostrum to most posterior extension of temporal fossa	274	902		
10. Tip of rostrum to most posterior extension of lateral tip of left premaxillary crest		824		
11. Pterygoid length			36	72(R)/ 71(L)
12. Greatest length of temporal fossa	52	119	58(R)/ 58(L)	80(R)/ 81(L)
13. Greatest length of orbit	57	105	45(R)/ 46(L)	54(R)/ 53(L)
14. Greatest length of right nasal on vertex of skull		61		
15. Length of nasal suture	20	40		
16. Antorbital process length			15(R)/ 16(L)	
17. Preorbital width			129	184
18. Parietal width			134	168
19. Greatest breadth of skull across postorbital processes of frontals	169	433	147	197
20. Greatest breadth of skull across zygomatic processes of squamosals	173	421	148	198
21. Greatest breadth of skull across centres of orbits	152	404	136	
22. Greatest span of occipital condyles	72	138		
23. Greatest width of an occipital condyle	31	47		
24. Greatest length of an occipital condyle	44	86		
25. Greatest breadth of foramen magnum	28	52		
26. Greatest breadth of nasals on vertex	43	71		
27. External nares width			36	56
28. Greatest span of premaxillary crests		158		
29. Premaxillae width at base			36	60
30. Width of premaxilae at midlength of rostrum	21	42	26*	36
31. Greatest width of premaxillaries			49	77
32. Width of rostrum in apices of antorbital notches	89	120		
33. Width of rostrum at base			70	112
34. Greatest width of rostrum at midlength	50	54	54	72
35. Width of rostrum $\frac{3}{4}$ length			42*	34
36. Greatest depth of rostrum at midlength	17	56		
37. Greatest transverse width of superior nares	37	62		
38. Greatest inside width of inferior nares, at apices of pterygoid notches	67	115	44	61
39. Height of skull, from midline of basisphenoid to highest point of vertex	112	298	105	114
40. Braincase length			109	127
41. Greatest width of temporal fossa approximately at right angle to greatest length	42	69	48(R)/ 46(L)	56(R)/ 52(L)

*Approximately 1 cm missing at tip.
**Approximately 0.5 cm missing at tip.

Table 2. *Continued.*

Measurement	MORG 1514	LMM 1852	LMM 2172	LMM 2266
42. Least distance between main or anterior maxillary foramina	44	103		
43. Least distance between premaxillary foramina		36		
44. Distance from posterior margin of left maxillary foramen to most anterior extension of left maxillary prominence		68		
45. Greatest length of vomer visible at surface of palate	70	231		
46. Greatest width of whole tooth	---	83		
47. Number of teeth in each upper jaw	18(R) 17(L)		*ca.* 29*(R) *ca.* 28* (L)	31(R)/31(L) 31(R)/ 31(L)
48. Number of teeth in each lower jaw	17(R) 19(L)	1	*ca.* 28*(R) *ca.* 27*(L)	30(R)/ 32(L)
49. Upper tooth row length			110*(R)/110*(L)	152(R)/151(L)
50. Lower tooth row length			101*(R)/106**(L)	149(R)/150(L)
51. Length of mandibular ramus	231	834(R)	201(R)/208**(L)	297(R)/295(L)
52. Coronoid height of mandibular ramus			52(R)/ 52(L)	71(R)/ 70(L)
53. Length of mandibular symphisis	36	242(R)		41
54. Length of mandibular fossa			89(R)/ 88(L)	117(R)/ 116(L)
55. Length of bulla			27	34(R)/ 33(L)
56. Length of periotic			29(R)/ 29(L)	31(R)/ 31(L)

*Approximately 1 cm missing at tip.
**Approximately 0.5 cm missing at tip.

Literature Cited

Barnes, L. G. (1985) Evolution, taxonomy and antitropical distributions of the porpoises (Phocoenidae, Mammalia). *Marine Mammal Science* **1,** 149 165.

Brownell, R. L. Jr. & R. Praderi (1985) Distribution of Commerson's dolphin, *Cephalorhynchus commersonii*, and the rediscovery of the type of *Lagerorhynchus floweri*. *The Scientific Reports of the Whales Research Institute*. **36,** 153 164.

Brownell, R. L. Jr. & P. J. Clapham (1999) Spectacled porpoise *Phocoena dioptrica* Lahille, 1912. In: S. H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals*. Vol. **6,** *The Second Book of Dolphins and Porpoises*. Pp. 379 391 Academic Press, London, UK.

Brownell, R. L. Jr., E. A. Crespo & M. A. Donahue (1999) Peale's dolphin *Lagenorhynchus australis* (Peale, 1848). In: S. H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals*. Vol. **6,** *The Second Book of Dolphins and Porpoises*. Pp. 105 120 Academic Press, London, UK.

Dailey, M. D. (1978) Preparation of parasites for identification and cataloging. *Journal Zoo. An. Med.* **9,** 13 15.

Davey, J. T. (1971) A revision of the genus *Anisakis* (Dujardin, 1845) (Nematoda: Ascaridata). *Journal of Helminthology* **45,** 51 72.

Fraser, F. C. & B. A. Noble (1968) Skull of *Lagenorhynchus cruciger* from Livingston Island, South Shetland Islands. *British Antarctic Survey Bulletin* **15,** 29 38.

Goodall, R. N. P. (1994) Commerson's dolphin *Cephalorhynchus commersonii* (Lacépède 1804). In: S. H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals*. Vol. **5,** *The First Book of Dolphins and Porpoises*. Pp. 241 267 Academic Press, London, UK.

Goodall, R. N. P. & A. C. M. Schiavini (1995) On the biology of the spectacled porpoise, *Australophocaena dioptrica*. *Report of the International Whaling Commission* (**Special Issue 16**). 411 453.

Goodall, R. N. P., J. C. de Haro, M. A. Iñiguez & K. S. Norris (1997). Sightings and behaviour of Peale's dolphins, *Lagerorhynchus australis*, with notes on dusky dolphins, *L. obscurus*, off southernmost South America. *Report of the International Whaling Commission* **47,** 757 775.

Harmer, S. F. (1922) On Commerson's dolphin and other species of *Cephalorhynchus*. *Proceedings of the Zoological Society of London* **43,** 627 638.

IBAMA (1997) Mamíferos Aquáticos do Brasil: Plano de Ação. Edições IBAMA, Ministério do Meio Ambiente, Brasília.

Kellogg, R. (1941) On the identity of the porpoise *Sagmatias amblodon*. *Field Museum of Natural History, Zoological Series* **27,** 293 311.

Mead, J. (1989) Beaked whales of the genus *Mesoplodon*. In: S. H. Ridgway & R. Harrison (eds.). *Handbook of Marine Mammals*. Vol. **4,** *River Dolphins and the Larger Toothed Whales*. Pp. 349 430 Academic Press, London, U.K.

Omura, H. (1972) An osteological study of the Cuvier's beaked whale, *Ziphius cavirostris*, in the northwest Pacific. *The Scientific Reports of the Whales Research Institute* **24,** 1 34.

Pinedo, M. C. (1997) Marine mammals and turtles. In: U. Seeliger, C. Odebrecht & J. P. Castello (eds.).

Subtropical Convergence Environments: the Coast and Sea in the southwestern Atlantic. Pp. 150–154 Springer-Verlag, Berlin.

Praderi, R. & E. Palerm (1971) Hallazgo de *Phocoena dioptrica* Lahille (Cetacea, Delphinidae), en la costa uruguaya. *Boletin Sociedad de Zoologia del Uruguay*. **1,** 19–21.

Praderi, R. (1972) Notas sobre un ejemplar de *Mesoplodon layardii* (Gray, 1865) (Cetacea, Hyperoodontidae), de la costa atlantica de Uruguay. *Comunicaciones Zoologicas del Museo de Historia Natural Montevideo*. **10,** 1–7.

Santos, R. A. & M. Haimovici (2001) Cephalopods in the diet of marine mammals stranded or incidentally caught along southeastern and southern Brazil (21° to 34°S). *Fisheries Research* **52,** 91–112.