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A NEW SPECIES OF BEAKED WHALE *MESOPLODON PERUVIANUS* SP. N. (CETACEA: ZIPHIIDAE) FROM PERU

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ABSTRACT

Mesoplodon peruvianus, a new species of beaked whale, is described on the basis of ten specimens which have either stranded or been captured between 11°12'S and 15°19'S latitude along the coasts of the provinces of Lima and Ica, south central Peru. This is the thirteenth living species of *Mesoplodon* recognized in the world's oceans. The animals that were examined were uniformly gray above, shading to lighter gray below. This whale is the smallest species of *Mesoplodon* (maximum body length 3.72 m) and is characterized by its teeth, which are small (31 to 65 mm long), ovate in cross section, and positioned 2.5% to 8.4% of the mandibular length from the anterior extremity, and posterior to the mandibular symphysis.

Key words: Ziphiidae, *Mesoplodon peruvianus,* systematics, osteology, distribution, natural history, external appearance, growth, food habits, reproduction.

Beaked whales of the genus *Mesoplodon* Gervais 1850 have been recorded very few times in the eastern South Pacific. Bini (1951) reported one specimen caught by fishermen off Iquique, Chile, in 1949. Hershkovitz (1966) included this animal in his account of *Mesoplodon grayi* Haast 1876. Because a voucher specimen was not collected, the identity of this whale remains uncertain. Photographs in the files of the Division of Mammals, Smithsonian Institution, of a

Mesoplodon that stranded at Paracas in 1955 show what is probably an adult male of *Mesoplodon bowdoini* Andrews 1908. Two sightings of an unidentified species of *Mesoplodon* off the northern coast of Peru were reported by Pitman et al. (1987). Recently a female Gray's beaked whale *M. grayi* stranded at Paracas Bay, Peru (Reyes 1988).

In the present paper we document the occurrence of a previously undescribed species of beaked whale of the genus *Mesoplodon*. Ten specimens of this species have been collected off the central and southern Peruvian coasts. Six of these animals were captured incidentally in drift gill nets set for sharks, another was probably captured in the same way, and three were the result of strandings. Most of the specimens were collected during an ongoing study of the Peruvian small cetacean fishery (Read *et al.* 1988).

The whales belong in the family Ziphiidae based on the absence of a fluke notch, presence of throat grooves, enlarged apical teeth, enlarged pterygoid hamuli, and a elevated cranial vertex. They belong in the genus *Mesoplodon* based on the external shape of the melon, number and position of teeth, structure of the cranial vertex, and the greatest length of the largest maxillary foramen not exceeding the least distance between the paired premaxillary foramina.

Materials and Methods

Museums housing specimens of the new species include: Museo de Historia Natural "Javier Prado", Lima, (MHNJP); United States National Museum of Natural History (USNM); Institut royal de Sciences Naturelles de Belgique (ISNB). Specimens not designated by a museum catalog number are in Reyes' personal collection in Lima, Peru, and are designated by field numbers.

We examined ten specimens of the undescribed species from Peru (Table 1) and compared them with specimens described in the scientific literature and with notes and photographs of museum specimens in the files of the authors. Direct comparisons were made of MHNJP 708, 709, USNM 504332, 571257 and 571258 with skulls in the collection of the United States National Museum: *M. bidens* (Sowerby 1804) = 3, *M. carlhubbsi* Moore 1963 = 3, *M. densirostris* (Blainville 1817) = 6, *M. europaeus* (Gervais 1855) = 19, *M. ginkgodens* Nishiwaki and Kamiya 1958 = 1, *M. grayi* Haast 1876 = 2, *M. hectori* (Gray 1871) = 2, *M. layardii* (Gray 1865) = 1, *M. mirus* True 1913 = 5, *M. stejnegeri* True 1885 = 12. Skulls of two species were not available for direct comparison: *M. bowdoini* and *M. pacificus* Longman 1926 [= *Indopacetus pacificus* Moore 1968].

The history of our recognition of this new species based on the Peruvian specimens is as follows:

(1). On 2 February 1976, Mead found a partial cranium and lumbar vertebra of a *Mesoplodon* close to the fish market in San Andres, Peru (13°47'S). Local fishermen told him that the cranium belonged to a "cachalote" that they had captured a year before. Based on a linear regression of total length on zygomatic width of the six specimens of this species that have been measured, the total length of this animal is estimated at 356 cm [JGM 156, USNM 504332].

Table 1. Specimens of *Mesoplodon peruvianus,* in order by date (e = estimated total length, r = reconstructed total length).

Date	Locality	South latitude	Total length	Sex	Field number	Museum number
1976 Feb 2	San Andres	13°47′	356e	?	JGM 156	USNM 504332
1985 May 1	Pucusana	12°31′	159	F	JCR 270	—
1985 Aug 3	Pucusana	12°31′	248e	F	JCR 304	—
1985 Dec 26	Pucusana	12°31′	286	?	JCR 663	USNM 571257
1986 Apr 20	Cerro Azul	13°00′	326	M	KVW 346	MHNJP 709
1986 Nov 20	Cerro Azul	13°00′	271	M	KVW 506	ISNB 4036
1987 Jul –	San Juan de Marcona	15°19′	327r	?	JCR 920	MHNJP 708
1988 Jan 11	Pucusana	12°31′	—	?	JCR 1331	USNM 571258
1988 Nov 23	Playa Paraíso	11°12′	372	M	BAL 580	MHNJP 1146
1989 Jun 7	Pucusana	12°31′	322	F	JCR 1512	—

(2). On 1 May 1985, a female calf, 159 cm long, was caught by fishermen about 30 nautical miles off Pucusana, Peru (12°30′S). The specimen was purchased by Reyes, who collected the complete skeleton along with stomach, gonads, dorsal fin and one kidney. A drawing was made and measurements taken [JCR 270].

(3). On 3 August 1985 an immature female (estimated total length 248 cm) stranded live alongside the dock at Pucusana. The head and gonads were collected. The posterior portion of the vertebral column, dorsal fin and flippers were found in one of the local dumps where they were photographed. Unfortunately these latter remains were lost [JCR 304].

(4). On 26 December 1985, the remains of another immature specimen, 286 cm long, were found by Reyes among fish offal in Pucusana's fish market. The skull, eyes, nasal sacs and larynx were collected and photographs taken. Unfortunately the gonads were lost, so the sex could not be determined [JCR 663, USNM 571257, formerly MHNJP 711].

(5). On 20 April 1986, a male, 326 cm long, was landed by fishermen in Cerro Azul, Peru (13°00′S). The specimen was examined by Van Waerebeek and Andrew Read. The skull, vertebral column, one gonad, stomach contents and parasites were collected. Photographs and notes of the pigmentation were taken. The teeth were unerupted [KVW 346, MHNJP 709].

(6). The vertebral column of an immature male, 271 cm long, was found by Van Waerebeek at the fish market in Cerro Azul, Peru, on 20 November 1986. The whale had just been butchered and the remains thrown into the water. The head, digestive tract and pieces of blubber were recovered from the surf. The integument was reconstructed from blubber sections and photographs were taken. The skull was collected and is deposited in the Institut royal de Sciences Naturelles de Belgique, Bruxelles [KVW 506, ISNB 4036].

(7). An adult animal of unknown sex stranded on Playa Cenicero, San Juan de Marcona, Peru (15°19′S) in mid-July, 1987. The skull was collected by Pedro Llerena, a local resident. On 7 August Mr. Llerena and Reyes recovered

the nearly complete skeleton, missing only some ribs and chevrons. The total body length of this specimen was estimated to have been 327 cm by reassembling the skeleton [JCR 920, MHNJP 708].

(8). The head of an immature specimen was found by Reyes and Mark Chandler in the Pucusana fish dump on 11 January 1988. Data on the catches at Pucusana revealed that this specimen was landed by fishermen on 20 November 1987 (Van Waerebeek and Reyes in press). It was impossible to determine the sex or length of this animal [JCR 1330, USNM 571258, formerly MHNJP 710].

(9). Mr. B. A. Luscombe found a specimen stranded at Playa Paraíso (11°12'S) on 23 November 1988. This animal was a physically mature male, 372 cm long. The specimen had been butchered. The skull was collected on the same day, and the vertebral column was recovered some weeks later by Luscombe and JCR [BAL 580, MHNJP 1146].

(10). A specimen was taken by fishermen in Pucusana on 7 June 1989. This was a sexually immature female, 322 cm long. Reyes examined the specimen and collected the skull, ovaries, stomachs, parasites and tissues [JCR 1512].

Comparisons of external characters, such as the shape of the head and dorsal fin, as well as a study of cranial features, led us to believe that all the specimens listed above belonged to the same species. It also became evident that they were different from all the previously known species of the genus *Mesoplodon*.

Systematics

Mesoplodon peruvianus, new species

Diagnosis of Species

This diagnosis is based on skull characters which are documented in Tables 2 to 6.

1. Tooth size and shape—The teeth are relatively small for a species of *Mesoplodon*, 31 to 65 mm long, 14 to 21 mm wide and 6 to 12 mm deep (Table 5; Fig. 1B). The upper range of the measurements represents the teeth of the adult male. The size and the shape of the teeth can be confused only with *M. mirus* or potentially *M. pacificus*. In *M. mirus*, the teeth are sub-circular in cross section, whereas the teeth of *M. peruvianus* are ovate in cross section.

Tooth position—The teeth in *M. peruvianus* are situated posterior to the symphysis by 12 to 40 mm (2.5 to 8.4% of mandibular length; Fig. 2F) in the sample of 8 specimens that were examined. *M. bidens, M. carlhubbsi, M. europaeus, M. grayi, M. hectori, M. layardii* and *M. mirus* have at least the anterior portion of the alveolus anterior to the posterior edge of the symphysis. The only species that have the alveolus entirely posterior to the symphysis are *M. bowdoini, M. densirostris* and *M. stejnegeri*. The teeth in these species are situated 3 mm posterior to the symphysis (0.48% of the mandibular length) in American Museum of Natural History 35027, the type of *M. bowdoini*; 14 to 41 mm (2.2 to 6.4% of mandibular length) in a sample of 7 *M. densirostris* (total length 397 to 415 cm) in the USNM; 30 to 85 mm (4.6 to 13.2% of

mandibular length) in a sample of 6 *M. stejnegeri* (total length 389 to 489 cm) in the USNM. Although the latter two species overlap in tooth position with *M. peruvianus,* they can be readily differentiated by tooth shape and tooth size. In addition the teeth in adult males of *M. peruvianus* are situated on an elevated section of the mandible. The only other species that has this character is *M. densirostris.*

Tooth orientation—There is striking ontogenetic change in the orientation of the teeth in this species. In all the immature animals (6) and one mature but unsexed specimen [MHNJP 708] the teeth are oriented strongly forward at an angle of 20° to 40° relative to the long axis of the mandible. In the adult male [MHNJP 1146] however, the long axis of each tooth is almost perpendicular to the long axis of the mandible. This feature differentiates it from all species.

2. *Skull width*—*Mesoplodon peruvianus* has the narrowest known adult skull (zygomatic width = 243 to 280 mm). The narrowest previously known *Mesoplodon* species was *M. hectori,* which has adult zygomatic widths of 271 to 301 mm. The ranges of condylobasal length overlap in the two species (*M. peruvianus* adults = 579 to 621 mm and *M. hectori* adults = 561 to 667 mm). Skull width differentiates *M. peruvianus* from all species but *M. hectori* whose range of both parameters overlaps slightly with *M. peruvianus.*

3. *Premaxillary crest breadth*—The greatest breadth of premaxillary crest equals or is less than the width of the premaxillae at the level of the anterior edge of the superior nares. This feature differentiates it from all species but some specimens of *M. hectori.*

4. *Spiracular surface of the vertex*—In lateral view the antero-dorsal face of the premaxillae (spiracular surface of the vertex), just postero-dorsal to the superior nares, is seen to turn anteriorly up to 90°. This feature is more conspicuous on the right side, where it approaches the "premaxillary brow crease" as described by Moore (1963) for *M. stejnegeri.* This feature differentiates it from all species but *M. stejnegeri* and some specimens of *M. hectori.*

5. *Extent of right premaxillae*—On the vertex the right premaxilla extends posterior to the right nasal a distance exceeding 70% of the length of the dorsal surface of the right nasal bone. This feature differentiates it from all species but *M. densirostris* and *M. stejnegeri.*

6. *Maxillary ridges*—Maxillary ridges are absent. This feature differentiates it from *M. bowdoini, M. carlhubbsi, M. europaeus, M. layardii, M. mirus, M. pacificus* and some specimens of *M. bidens, M. densirostris, M. europaeus, M. ginkgodens, M. hectori* and *M. stejnegeri.*

7. *Amount of vomer visible*—The amount of the vomer that is visible on the palate ranges from 90 to 171 mm. This feature differentiates it from *M. carlhubbsi, M. layardii* and *M. pacificus* which are larger, *M. europaeus,* which is smaller and some specimens of *M. densirostris, M. grayi, M. hectori, M. mirus* and *M. stejnegeri.*

8. *Basirostral groove*—The basirostral groove, as described by Flower (1878), is absent. This feature differentiates it from *M. densirostris, M. grayi, M. layardii* and some specimens of *M. hectori.*

9. *Pterygoid sinus*—The pterygoid sinus extends far anteriorly to the trans-

Table 2. Cranial data for *Mesoplodon peruvianus* in mm. Methods of taking measurements follows Moore (1963), taken on right side if possible.

Measurement number	Catalog number					
	MHN 1146	USNM 504332	MHN 708	MHN 709	USNM 571258	USNM 571257
1	621	—	579	575	480	478
2	566	—	525	531	417	436
3	439	—	413	398	313	318
4	479	—	429	430	340	348
5	497	—	464	445	359	369
6	582	—	534	538	437	440
7	388	—	362	350	277	278
8	265	—	232	241	213	203
9	279	—	243	249	—	215
10	280	264	243	248	219	220
11	198	172	175	173	170	165
12	229	225	198	243	195	191
13	104	95	92	92	87	85
14	34	35	27	30	28	29
15	58	63	53	57	52	52
16	43	39	42	39	40	35
17	20	—	19	18	22	22
18	29	—	39	40	36	34
19	15	30	20	20	16	28
20	27	—	31	29	29	37
21	14	—	25	15	23	22
22	91	—	83	90	83	75
23	45	—	43	42	40	34
24	87	—	80	87	86	76
25	91	—	86	93	89	80
26	160	—	137	142	122	115
27	—	—	—	—	—	—
28	58	—	59	60	59	41
29	30	—	29	28	22	20
30	52	—	—	—	—	—
31	37	—	39	38	36	37
32	25	—	25	19	23	21
33	42	—	37	32	26	29
34	248	180	215	225	204	197
35	—	—	170	182	165	167
36	72	85	75	87	61	68
37	38	57	40	45	45	40
38	81	—	91	78	70	76
39	380	—	374	357	278	271
40	344	—	343	305	253	250
41	301	—	278	264	218	202
42	497	—	456	428	356	358
43	523	—	480	454	365	—
44	161	—	160	165	131	99
45	72	—	65	66	58	60
46	107	—	75	0	0	0

Definitions of skull measurements (numbers in parentheses refer to Moore 1963): 1 = Condylobasal length (1), 2 = tip rostrum to posterior extension maxillary plate (7), 3 =

verse plane perpendicular to the long axis of the skull which passes through the antorbital notches. This feature differentiates it from *M. stejnegeri.*

Data for the diagnoses were derived from comparisons with specimens in the USNM collection. Data for the species that were not represented in that collection were taken from Andrews 1908, Moore 1963 (*M. bowdoini*); Longman 1926, Azzaroli 1968, Moore 1972 (*M. pacificus*). Graham Ross (personal communication) provided us with measurements of *M. bowdoini* in Australian museums. Table 7 gives a summary of diagnostic characters.

Diagnostic Summary

The character that separates the specimens of *M. peruvianus* from all other species of the genus is number 1, the combination of size, shape and position of the teeth. However, since mandibles are not available for many specimens of *Mesoplodon,* means are given to distinguish the new species from its congeners by the use of cranial characters. *M. peruvianus* is distinguished from *M. bidens* by 1, 2, 3, 4, 5, sometimes 6; from *M. bowdoini* by 1, 2, 3, 4, 5, 6; from *M. carlhubbsi* by 1, 2, 3, 4, 5, 6, 7; from *M. densirostris* by 1, 2, 3, 4, 8, 9, sometimes 6, 7; from *M. europaeus* by 1, 2, 3, 4, 5, 7, sometimes 6; from *M. ginkgodens* by 1, 2, 3, 4, 5, sometimes 6; from *M. grayi* by 1, 2, 3, 4, 5, 8, sometimes 7; from *M. hectori* by 1, 5, sometimes 2, 4, 6, 7, 8; from *M. layardii*

←
tip rostrum to anterior margin superior nares (8), 4 = tip rostrum to anterior point premaxillary crest (9), 5 = tip rostrum to posterior extension premaxillae and lateral tip right premaxillary crest (11), 6 = tip rostrum to posterior extension temporal fossa (10), 7 = length of rostrum (2), 8 = breadth skull across orbital centers (19), 9 = breadth of skull across postorbital process frontals (17), 10 = breadth skull across zygomatic process squamosals (18), 11 = least breadth skull across posterior margins temporal fossae (20), 12 = greatest breadth skull across exoccipitals (25), 13 = greatest span of occipital condyles (21), 14 = greatest width of *an* occipital condyle (22), 15 = greatest length of *an* occipital condyle (23), 16 = greatest breadth foramen magnum (24), 17 = greatest length right nasal on vertex (15), 18 = length nasal suture (16), 19 = extension right premaxilla posterior to right nasal on vertex (28), 20 = greatest breadth nasal on vertex (26), 21 = least distance between anterior prominences of synvertex (27), 22 = greatest span premaxillary crests on synvertex (29), 23 = greatest transverse width superior nares (37), 24 = least width premaxillae where they narrow opposite superior nares (30), 25 = greatest width premaxillae anterior to above (31), 26 = width rostrum in apices antorbital notches (33), 27 = width rostrum in apices of prominential notches (34), 28 = least distance between main maxillary foramina (41), 29 = least distance between premaxillary foramina (42), 30 = distance from posterior margin left maxillary foramen to most anterior point maxillary prominence (43), 31 = width rostrum at midlength rostrum (35), 32 = width premaxillae at midlength rostrum (32), 33 = depth rostrum at midlength rostrum (36), 34 = height skull (39), 35 = external cranial height, 36 = greatest length temporal fossa (13), 37 = width temporal fossa (40), 38 = length orbit on frontals (14), 39 = tip rostrum to posterior extension maxillae between pterygoids (6), 40 = tip rostrum to anterior extension pterygoid sinus (12), 41 = tip rostrum to most anterior extension pterygoids (5), 42 = tip rostrum to posterior margin pterygoid in midline (3), 43 = tip rostrum to posterior extension wing pterygoid (4), 44 = length of vomer visible on palatal surface (44), 45 = width between pterygoid notches (38), 46 = amount added to rostrum because of breakage (45).

Table 3. Cranial measurements of *Mesoplodon peruvianus* relative to condylobasal length, methods follow Moore (1963). Measurements taken on right side if possible. See Table 2 for definitions of measurements.

Measurement number	Catalog number					
	MHN 1146	USNM 504332	MHN 708	MHN 709	USNM 571258	USNM 571257
1	1.000	—	1.000	1.000	1.000	1.000
2	0.911	—	0.907	0.923	0.869	0.912
3	0.707	—	0.713	0.692	0.652	0.665
4	0.771	—	0.741	0.748	0.708	0.728
5	0.800	—	0.801	0.774	0.748	0.772
6	0.937	—	0.922	0.936	0.910	0.921
7	0.625	—	0.625	0.609	0.577	0.582
8	0.427	—	0.401	0.419	0.444	0.425
9	0.449	—	0.420	0.433	—	0.450
10	0.451	—	0.420	0.431	0.456	0.460
11	0.319	—	0.302	0.301	0.354	0.345
12	0.369	—	0.342	0.423	0.406	0.400
13	0.167	—	0.159	0.160	0.181	0.178
14	0.055	—	0.047	0.052	0.058	0.061
15	0.093	—	0.092	0.099	0.108	0.109
16	0.069	—	0.073	0.068	0.083	0.073
17	0.032	—	0.033	0.031	0.046	0.046
18	0.047	—	0.067	0.070	0.075	0.071
19	0.024	—	0.035	0.035	0.033	0.059
20	0.043	—	0.054	0.050	0.060	0.077
21	0.023	—	0.043	0.026	0.048	0.046
22	0.147	—	0.143	0.157	0.173	0.157
23	0.072	—	0.074	0.073	0.083	0.071
24	0.140	—	0.138	0.151	0.179	0.159
25	0.147	—	0.149	0.162	0.185	0.167
26	0.258	—	0.237	0.247	0.254	0.241
27	—	—	—	—	—	—
28	0.093	—	0.102	0.104	0.123	0.086
29	0.048	—	0.050	0.049	0.046	0.042
30	0.084	—	—	—	—	—
31	0.060	—	0.067	0.066	0.075	0.077
32	0.040	—	0.043	0.033	0.048	0.044
33	0.068	—	0.064	0.056	0.054	0.061
34	0.399	—	0.371	0.391	0.425	0.412
35	—	—	0.294	0.317	0.344	0.349
36	0.116	—	0.130	0.151	0.127	0.142
37	0.061	—	0.069	0.078	0.094	0.084
38	0.130	—	0.157	0.136	0.146	0.159
39	0.612	—	0.646	0.621	0.579	0.567
40	0.554	—	0.592	0.530	0.527	0.523
41	0.485	—	0.480	0.459	0.454	0.423
42	0.800	—	0.788	0.744	0.742	0.749
43	0.842	—	0.829	0.790	0.760	—
44	0.259	—	0.276	0.287	0.273	0.207
45	0.116	—	0.112	0.115	0.121	0.126
46	0.172	—	0.130	—	—	—

Table 4. Cranial measurements for *Mesoplodon peruvianus*. Measurements relative to zygomatic width, follow methods of Moore (1963), taken on right side if possible. See Table 2 for definitions of measurements.

Measurement number	Catalog number					
	MHN 1146	USNM 504332	MHN 708	MHN 709	USNM 571258	USNM 571257
1	2.218	—	2.383	2.319	2.192	2.173
2	2.021	—	2.160	2.141	1.904	1.982
3	1.568	—	1.700	1.605	1.429	1.445
4	1.711	—	1.765	1.734	1.553	1.582
5	1.775	—	1.909	1.794	1.639	1.677
6	2.079	—	2.198	2.169	1.995	2.000
7	1.386	—	1.490	1.411	1.265	1.264
8	0.946	—	0.955	0.972	0.973	0.923
9	0.996	—	1.000	1.004	—	0.977
10	1.000	1.000	1.000	1.000	1.000	1.000
11	0.707	0.652	0.720	0.698	0.776	0.750
12	0.818	0.852	0.815	0.980	0.890	0.868
13	0.371	0.360	0.379	0.371	0.397	0.386
14	0.121	0.133	0.111	0.121	0.128	0.132
15	0.207	0.239	0.218	0.230	0.237	0.236
16	0.154	0.148	0.173	0.157	0.183	0.159
17	0.071	—	0.078	0.073	0.100	0.100
18	0.104	—	0.160	0.161	0.164	0.155
19	0.054	0.114	0.082	0.081	0.073	0.127
20	0.096	—	0.128	0.117	0.132	0.168
21	0.050	—	0.103	0.060	0.105	0.100
22	0.325	—	0.342	0.363	0.379	0.341
23	0.161	—	0.177	0.169	0.183	0.155
24	0.311	—	0.329	0.351	0.393	0.345
25	0.325	—	0.354	0.375	0.406	0.364
26	0.571	—	0.564	0.573	0.557	0.523
27	—	—	—	—	—	—
28	0.207	—	0.243	0.242	0.269	0.186
29	0.107	—	0.119	0.113	0.100	0.091
30	0.186	—	—	—	—	—
31	0.132	—	0.160	0.153	0.164	0.168
32	0.089	—	0.103	0.077	0.105	0.095
33	0.150	—	0.152	0.129	0.119	0.132
34	0.886	0.682	0.885	0.907	0.932	0.895
35	—	—	0.700	0.734	0.753	0.759
36	0.257	0.322	0.309	0.351	0.279	0.309
37	0.136	0.216	0.165	0.181	0.205	0.182
38	0.289	—	0.374	0.315	0.320	0.345
39	1.357	—	1.539	1.440	1.269	1.232
40	1.229	—	1.412	1.230	1.155	1.136
41	1.075	—	1.144	1.065	0.995	0.918
42	1.775	—	1.877	1.726	1.626	1.627
43	1.868	—	1.975	1.831	1.667	—
44	0.575	—	0.658	0.665	0.598	0.450
45	0.257	—	0.267	0.266	0.265	0.273
46	0.382	—	0.309	—	—	—

Table 5. Mandibular data for *Mesoplodon peruvianus*. Measurements follow methods of Moore (1963), taken on right side if possible.

Measurement number	Catalog number					
	MHN 1146	USNM 504332	MHN 708	MHN 709	USNM 571258	USNM 571257
47	530	—	489	481	397	403
48	390	—	379	370	321	328
49	351	—	324	336	276	283
50	148	—	110	118	82	75
51	103	—	—	97	90	87
52	98	—	44	39	35	31
53	60	—	46	39	35	31
54	23	—	14	17	16	16
55	15	—	10	8	7	7
56	167	—	150	130	107	109
57	61	—	38	35	—	31
58	21	—	14	17	—	14
59	12	—	8	7	—	6
60	12	—	9	12	—	9
61	—	—	—	—	—	—

Definitions of mandibular measurements: 47 = mandibular length (1), 48 = length from posterior extension of symphysis to condyle (6), 49 = length from posterior margin alveolus to condyle (7), 50 = greatest length symphysis (2), 51 = greatest height mandible at coronoid process (3), 52 = outside height mandible at midlength alveolus (4), 53 = inside height mandible at midlength alveolus (5), 54 = length alveolus (8), 55 = width alveolus (9), 56 = tip mandible to alveolus (10), 57 = greatest tooth length (11), 58 = greatest tooth width (12), 59 = greatest tooth depth (13), 60 = crown height, 61 = tooth weight.

Table 6. Mandibular data for *Mesoplodon peruvianus*. Measurements relative to mandibular length, methods follow Moore (1963), taken on right side if possible. See Table 5 for definitions of measurements.

Measurement number	Catalog number					
	MHN 1146	USNM 504332	MHN 708	MHN 709	USNM 571258	USNM 571257
47	1.000	—	1.000	1.000	1.000	1.000
48	0.736	—	0.775	0.769	0.809	0.814
49	0.662	—	0.663	0.699	0.695	0.702
50	0.279	—	0.225	0.245	0.207	0.186
51	0.194	—	—	0.202	0.227	0.216
52	0.185	—	0.090	0.081	0.088	0.077
53	0.113	—	0.094	0.081	0.088	0.077
54	0.043	—	0.029	0.035	0.040	0.040
55	0.028	—	0.020	0.017	0.018	0.017
56	0.315	—	0.307	0.270	0.270	0.270
57	0.115	—	0.078	0.073	—	0.077
58	0.040	—	0.029	0.035	—	0.035
59	0.023	—	0.016	0.015	—	0.015
60	0.023	—	0.018	0.025	—	0.022
61	—	—	—	—	—	—

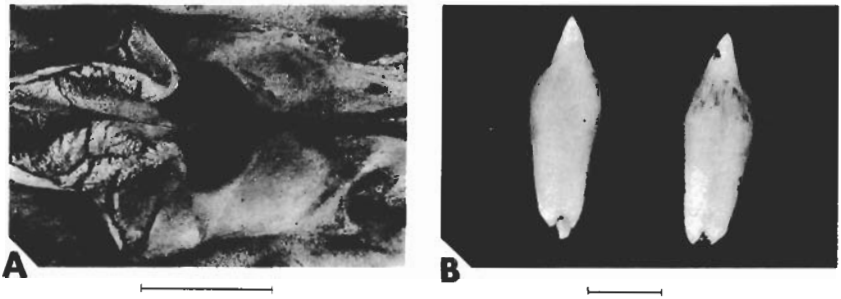


Figure 1. Holotype, MHNJP 1146, (A) = dorsal view of vertex, anterior is to the right, scale bar = 5 cm; (B) = teeth: tooth on the left is medial view of left tooth; on the right is lateral view of right tooth, scale bar = 2 cm.

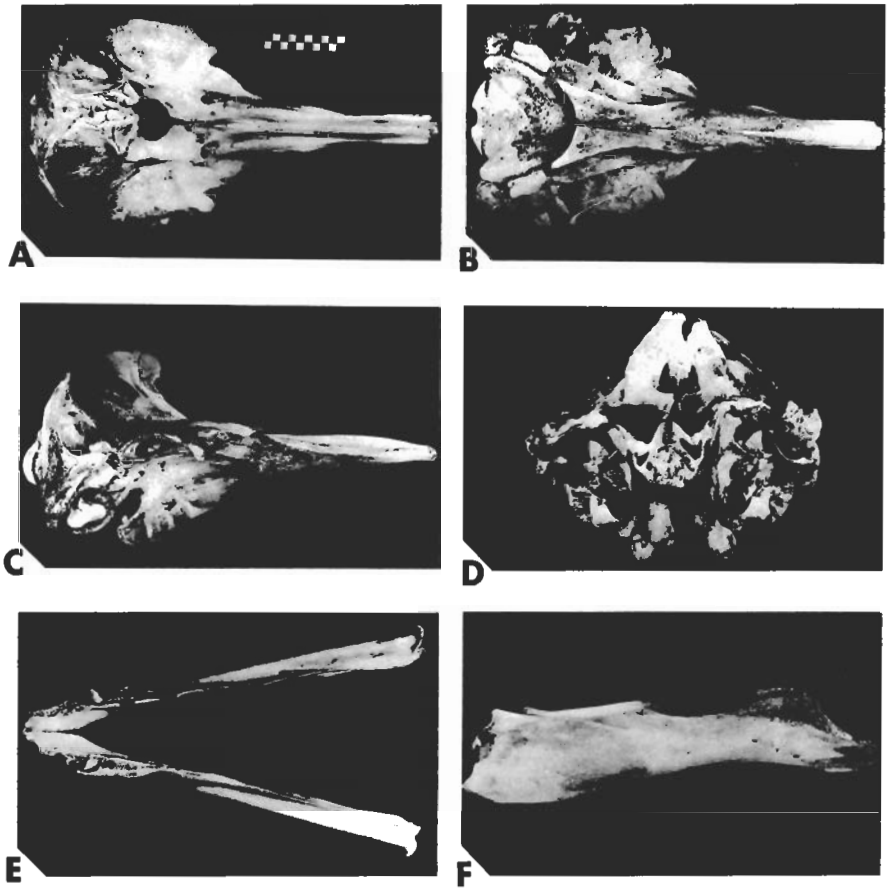


Figure 2. Skull photographs, MHNJP 1146, holotype: (A) = dorsal, (B) = ventral, (C) = lateral, (D) = anterior, (E) = mandible, dorsal, (F) = mandible, lateral. Scale pattern in A = 10 cm divided into 1 cm squares, pertains to all figures.

Table 7. Summary of diagnostic characters of *Mesoplodon peruvianus* (Y = character diagnostic, S = character sometimes diagnostic, N = character not diagnostic).

Species	Character								
	1	2	3	4	5	6	7	8	9
M. bidens	Y	Y	Y	Y	Y	S	N	N	N
M. bowdoini	Y	Y	Y	Y	Y	Y	N	N	N
M. carlhubbsi	Y	Y	Y	Y	Y	Y	Y	N	N
M. densirostris	Y	Y	Y	Y	N	S	S	Y	N
M. europaeus	Y	Y	Y	Y	Y	S	Y	N	N
M. ginkgodens	Y	Y	Y	Y	Y	S	N	N	N
M. grayi	Y	Y	Y	Y	Y	N	S	Y	N
M. hectori	Y	S	S	S	Y	S	S	S	N
M. layardii	Y	Y	Y	Y	Y	Y	Y	Y	N
M. mirus	Y	Y	Y	Y	Y	Y	S	N	N
M. pacificus	Y	Y	Y	Y	Y	Y	Y	N	N
M. stejnegeri	Y	Y	Y	N	N	S	S	N	Y

by 1, 2, 3, 4, 5, 6, 7, 8, 9; from *M. mirus* by 1, 2, 3, 4, 5, 6, and sometimes 7; from *M. pacificus* by 1, 2, 3, 4, 5, 6, 7; from *M. stejnegeri* by 1, 2, 3, 9, sometimes 6, 7.

Holotype

MHNJP 1146, skull and postcranial skeleton of a physically mature male. Skull collected by B. A. Luscombe on 23 November 1988, vertebral column collected later by Luscombe and JCR. Specimen deposited at the Museo de Historia Natural "Javier Prado" in Lima.

Type Locality

Playa Paraíso (11°12'S), Huacho, Lima, Peru.

Referred Specimens

MHNJP 708 (skeleton, sex?), 709 (skeleton, male); USNM 504332 (cranium, lumbar vertebra, sex ?), 571257 (skull, sex?), 571258 (skull, sex?); ISBN 4036 (KVW 506; skeleton, male); JCR 270 (skeleton, female), 304 (skull, female), 1512 (skull, female) (Table 1).

Etymology

The specific name, *peruvianus,* refers to the location where the species first became known to science. It does not imply that the distribution is restricted to Peruvian waters.

Osteology

Cranium—The small size of the cranium is its most striking character. The condylobasal length ranges from 334 to 621 mm, the zygomatic width from 243 to 280 mm. The next smallest species is *M. hectori,* whose condylobasal length ranges from 437 to 667 mm and zygomatic width 208 to 301 mm (W. F. Perrin, personal communication; Moore 1972).

The cranium in dorsal view (Fig. 2A) shows very slight development of maxillary prominences and prominential notches similar to those of *M. stejnegeri* and *M. hectori*. The development of the cranial vertex is also less than in most species of *Mesoplodon*. The premaxillary crests are no wider than the premaxillae just anterior to the superior nares. There is no development of a maxillary ridge. The rostrum is shaped like an acute triangle, tapering uniformly to a point.

The variability in the premaxillary foramina apparently indicates that they migrate ontogenetically from an anterior position relative to the maxillary foramina to a position posterior to them.

In ventral view (Fig. 2B), the jugals are relatively wide, forming the ventral wall of the antorbital notch without emerging onto the dorsal surface of the cranium. The palatines bear a variable relation to the pterygoid: in one specimen (MHNJP 709) the palatines completely surround the pterygoids in anterior and medial aspects; in another specimen (USNM 571258) the palatines end laterally and the pterygoid is in contact with the maxilla anteriorly and medially; and in another specimen the palatine appears laterally and medially but not anteriorly to the pterygoid. As is normal for a ziphiid, the pterygoid sinus is without development of the lateral wall (Fraser and Purves 1960). The tympanic bulla and periotic (Fig. 3) are relatively large in relationship to the small size of the cranium.

In lateral view (Fig. 2C) there is a moderate flange that is formed by a continuation onto the rostrum of the facial surface of the maxilla. This flange disappears at midlength on the rostrum. The development of this feature is less than that seen in *M. europaeus, M. mirus* or *M. pacificus,* the same as in *M. bowdoini, M. carlhubbsi, M. ginkgodens* and *M. stejnegeri,* and greater than found in *M. bidens, M. densirostris, M. grayi, M. hectori* or *M. layardii.*

There is no trace of a basirostral groove (at the base of the rostrum) but a shallow groove (*ca.* 2 mm deep) appears laterally on the maxilla, just ventral to the flange, about 5 cm anterior to the base. This groove extends onto the premaxilla and continues to the rostral tip.

In the adult male, the external (labial) border of dentary is elevated at the level of the alveoli. On the lingual side the alveolus is an open canal in which the tooth is positioned. In many ways, this extension of the external lip of the dentary is reminiscent of the condition in *M. ginkgodens*. The mandibular symphysis (Fig. 2E) is moderately long, extending from the anterior tip of the dentary posteriorly between 18% and 25% of the mandibular length (Table 5). The anterior border of the single alveolus lies 27% to 31% of the mandibular length posterior to the tip of the mandible. The teeth (Fig. 2B) of the known specimens are small (22 to 65 mm in length) and have a length/width ratio

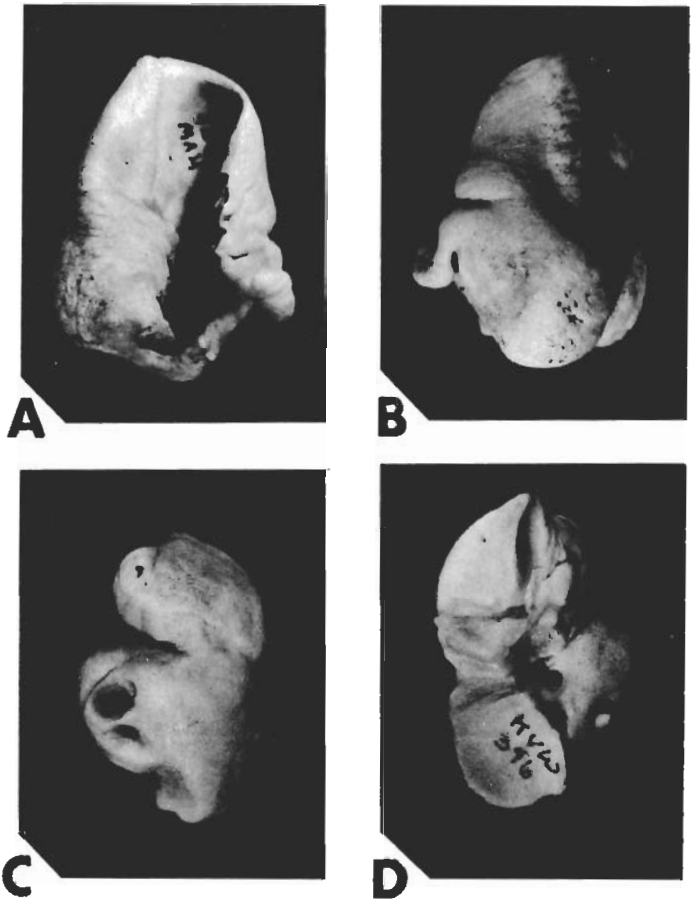


Figure 3. Photographs of right bulla (A, B) and periotic (C, D) of MHNJP 709. A, D = dorsal view, B, C = ventral view, scale bar = 5 cm.

of between 1.8 and 2.9. The teeth are curved in coronal section, with the curvature of the tooth concave laterally. When viewed laterally, the posterior margin is smoothly convex. The anterior margin has a protuberance on the root, making the tooth concave apically and convex basally.

It is unlikely that the teeth are exposed very far above the level of the gums, even in the adult male. When the dentary is observed from the lateral view, the teeth emerge only about 1 mm, and because the alveoli are covered by skin, it is probable that the teeth would not be apparent in the living animal. However the lingual side of each tooth in MHNJP 1146 shows signs of wear indicating that they may be visible on the lingual side of the jaw for up to 14 mm, as confirmed by B. A. Luscombe (personal communication). In males of *M. ginkgodens* the teeth also barely erupt (Nishiwaki and Kamiya 1958).

Axial skeleton—The shapes of the vertebrae are typically ziphiid with tall,

wide spinous processes. In the sample available, the total vertebral count ranges from 47 to 48 (MHNJP 1146 = C7, T10, L10, CA 20; USNM 571257 = C7, T9, L12, CA20; MHNJP 709 = C7, T9, L12, CA20; JCR 920 = C7, T10, L11, CA 19; KVW 506 = C7, T9, L11, CA20; thoracic vertebrae are defined by the presence of a facet for rib articulation; the first caudal vertebra is defined as the first one bearing a facet for articulation with a chevron bone on its posterior margin). In addition, rib counts are as follows: MHNJP 1146 = 10 (7 double headed; USNM 571257 = 9 (7 double headed); MHNJP 709 = 9 (7 double headed); JCR 270 = 10 (7 double headed); KVW 506 = 9 (7 double headed).

Pectoral appendages—The humerus is typical for ziphiids in that it is relatively long compared to other cetaceans, being approximately equal in length to the radius. Table 8 gives the arrangement of the manus osteology in *M. peruvianus* as well as for other species of *Mesoplodon*. The condition in *M. peruvianus* is the same as in some specimens of *M. mirus* as described by Raven (1937:13). Mead (1989) has confirmed this condition in the specimens that Raven examined and found other specimens of *M. mirus* that had the usual *Mesoplodon* pattern. The phalangeal formula for MHNJP 708 was I1, II5, III5, IV3, V2, which is in the range of *Mesoplodon* given by Mead (1989).

Ontogeny

Aging of *Mesoplodon* specimens is still in a tentative state. Museum curators are hesitant to cut teeth of specimens that have only two teeth and in which the teeth are diagnostic characters. Our experience with *Mesoplodon* tooth sections has revealed problems in defining the growth layer groups (GLG's *sensu* Perrin and Myrick 1980). As a result of these factors, we have attempted to use several indicators of relative age.

Degree of development of physical maturity is determined in Cetacea as the vertebral epiphyses progressively fuse to the centra of the vertebrae, resulting in cessation of growth in total length. This fusion of the vertebral epiphyses begins at the caudal and cervical ends of the column and finishes with the mid-thoracics. The degree of filling of the mesorostral canal in Ziphiidae was correlated with relative age by Fraser (1942). Distal fusion of the premaxilla and maxilla in delphinids has been correlated with cessation of increase in condylobasal length and attainment of sexual maturity (Dailey and Perrin 1973, Mead and Potter 1990).

Table 9 presents age-related data for a sample of *M. europaeus* and *M. stejnegeri*. Fusion of the mandibular symphysis was noted in only one specimen, the oldest as judged by these relative osteological characters. By the time the level of mesorostral canal filling reaches the dorsal surface of the premaxillae the individuals are sexually and physically mature. It is interesting to note that the premaxilla–maxilla fusion takes place very early in species of *Mesoplodon*. Thus, MHNJP 708 is comparable in relative osteological age to those individuals of *M. europaeus* and *M. stejnegeri* that are certainly sexually mature and most of which are physically mature as well. The mesorostral canal is nearly completely

Table 8. Arrangement of the carpal elements in *Mesoplodon*.

Species	Radiale (scaphoid)	Intermedium (lunar)	Ulnare (cuneiform)	Pisiform
Some *M. mirus*	separate	separate	fused with carpal IV + V	separate
M. peruvianus	separate	separate	fused with carpal IV + V	separate
All other *Mesoplodon*	separate	separate	separate	separate

filled and the premaxillae are fused with the maxillae over the entire length of the rostrum. The mandibular symphysis has fused in this specimen, but the epiphyses are fused to the centra only in the last caudal vertebrae. The cranium from San Andres (USNM 504332) appears to be relatively mature, and exhibits premaxilla–maxilla fusion lateral to the nares. Its vertebral epiphyses are fused to the centrum in the single lumbar vertebra collected. MHNJP 709 has the premaxillae fused to the maxillae distally on the rostrum. The mandibular symphysis is not fused nor are the vertebral epiphyses. The characters of the skeleton of MHNJP 1146, an adult male, show that it is a physically mature specimen. The premaxilla–maxilla suture is completely obliterated. The ivory-like vomer (mesorostral ossification) fills the mesorostral canal except for a very short section of cartilage at the contact point of the mesethmoid and vomer. The mesorostral ossification extends slightly above the rims of the mesorostral canal, giving the rostrum a slightly arched profile in lateral view (Fig. 2C). The remaining animals are juveniles, including JCR 270, which was a nursing calf.

External Appearance

The description of the external appearance and the color are based primarily on two specimens (JCR 270 and MHNJP 709) which were seen as intact specimens, complemented with notes from the remaining specimens examined while still fresh. The body (Figs. 4E, 5, 6) has the typical spindle-shape of ziphiids, with the maximum girth midway between the axilla and the dorsal fin. The head features a small bulge in front of the blowhole, sloping to a relatively short beak. The mouth line curves upward toward the corner. Throat grooves are present and well developed. Flippers are 1/9 to 1/7 of the total length, and in JCR 270 they lay back in "flipper pockets" (*sensu* Mead *et al.* 1982: 6). The dorsal fin is small, triangular in shape, with a rounded tip and located nearly two-thirds of the way back from the tip of the snout. The leading edge of the dorsal fin is convex and the trailing edge smoothly concave. The tail stock is laterally compressed and prominently keeled. The flukes are broad, one fourth of the total length. There is a faint indication of a central notch in the flukes. External morphometrics are presented in Table 10.

The median proportional measurements of *Mesoplodon peruvianus* are com-

Table 8. Extended.

Distal carpal I (trapezium)	Distal carpal II (magnum)	Distal carpal III (trapezoid)	Distal carpal IV (unciform)	Metacarpal I
fused with meta-carpal I	fused with carpal III	fused with carpal II	fused with ulnare	fused with carpal I
fused with meta-carpal I	fused with carpal III	fused with carpal II	fused with ulnare	fused with carpal I
fused with meta-carpal I	fused with carpal III	fused with carpal II	separate	fused with carpal I

pared with the mean proportions and standard deviation of the figures for all other species (Mead 1989; Table 11). *Mesoplodon peruvianus* appears to have a slightly larger girth at the axilla and maximum width of flipper. The only measurement that differs markedly from the other species is the girth midway between the anus and the fluke notch. *M. peruvianus* has a much deeper caudal peduncle than the other species.

The color of the calf (JCR 270) was brown on the back and mid-sides, where it became grayish-white on the belly. On the head, the color of the lower sides extended posterior and dorsal to the eyes like "eyebrows". A brown eye patch was present, projecting to the top of the head as a short eye stripe. The beak was grayish-white with a brown tip; small brown patches were present near the angle of the mouth and between the throat grooves. The flippers were light gray on both sides. This seems to be a common pigmentation pattern for at least northern hemisphere *Mesoplodon* calves. The flukes were grayish-white below and brown above. After 10 h the color of the body turned deep gray on back and medium gray below.

MHNJP 709, one of the biggest specimens, was deep gray on back and sides and gray ventrally (Fig. 6), especially posterior to the navel and on the underside of the beak, where darker spots and streaks were visible. At least two white linear scars were present on the right side. The three other fresh specimens were examined after they were flensed, but in general they were dark gray above and lighter below. Light gray color was also present on ventro-lateral parts of the head. Figure 5 represents an artist's conception of the pigmentation pattern of an adult male.

Comparisons

It became evident, in making the comparisons in the diagnosis section above, that the species that *M. peruvianus* most closely resembles are *M. hectori* and *M. stejnegeri*. The resemblances are particularly striking in the synvertex of the cranium. The three species share the "premaxillary brow crease" (Moore 1963). The lack of a well developed prominential notch is especially striking. Moreover resemblance of the crania of *M. peruvianus* and *M. hectori* to each other could lead to misidentifications, since both species have relatively narrow premaxillary

Table 9. Osteological characters that are useful in establishing relative age of individuals. Specimens are in the collection of the U. S. National Museum of Natural History (USNM) and are in order by degree of mesorostral filling followed by premaxilla-maxilla fusion. An asterisk represents animals that are comparable to *Mesoplodon peruvianus* (MHNJP 708) in that character. *Vertebral epiphyses* (physical maturity): 1 = open, 2 = closed, 3 = fused. Sexual maturity: 1 = immature, 2 = pubescent, 3 = mature. Mesorostral filling: 0 = no vomerine proliferation; 1 = trace of vomerine proliferation, vomer expanded dorsally, not appreciably thicker; 2 = vomer starts to thicken; 3 = vomerine proliferation even with the premaxillae; 4 = vomerine proliferation above the level of premaxillae. Premaxilla-maxilla fusion on rostrum: 0 = unfused; 1 = fused distally; 2 = fused midlength; 3 = fused proximally. Symphysis fusion: 0 = unfused; 1 = slight fusion; 2 = heavily fused.

Catalog number	Sex	Length	Vertebral epiphysis	Sexual maturity	Mesorostral filling	Pmx-max fusion	Symphysis fusion
Mesoplodon europaeus							
504738	M	456	3	3?	4	3*	2*
336328	F	?	?	?	4	3*	?
303836	M	?	?	?	4	3*	?
360854	M	?	?	?	4	3*	0
550105	M	437	?	2	4	3*	1
504473	?	452	3	?	4	3*	?
550853	F	460	3	2	4	3*	1
550451	M	424	?	2	4	2	0
306302	F	434	3	?	4	2	0
504256	F	473	3	?	3*	3*	1
504349	F	420	3	3	3*	3*	0
550390	F	447	?	3	3*	3*	1
550824	F	457	?	3	3*	3*	1
550069	F	420	3	3	3*	2	0
550362	F	371	0	1	2	2	0
023346	M	381	1	?	2	1	0
550404	M	386	0	1	2	1	0
550018	M	311	?	?	1	1	0
550483	M	265	?	1	1	0	0
Mesoplodon stejnegeri							
504731	M	499	3	?	4	3	?
504865	M	530	?	?	4	2	1
571033	F	513	?	?	3	2	0
550113	F	489	3	3	3	2	0
143132	M	?	?	?	3	2	0
504345	F	450 EST	?	3	2	2	0
504882	?	?	?	?	2	2	?
286826	?	442	1	?	0	2	?
550013	M	389	?	3	0	2	0
504329	M	448	1	?	0	2	0
504330	F	488	1	?	0	2	0
504331	M	457	1	?	0	2	0

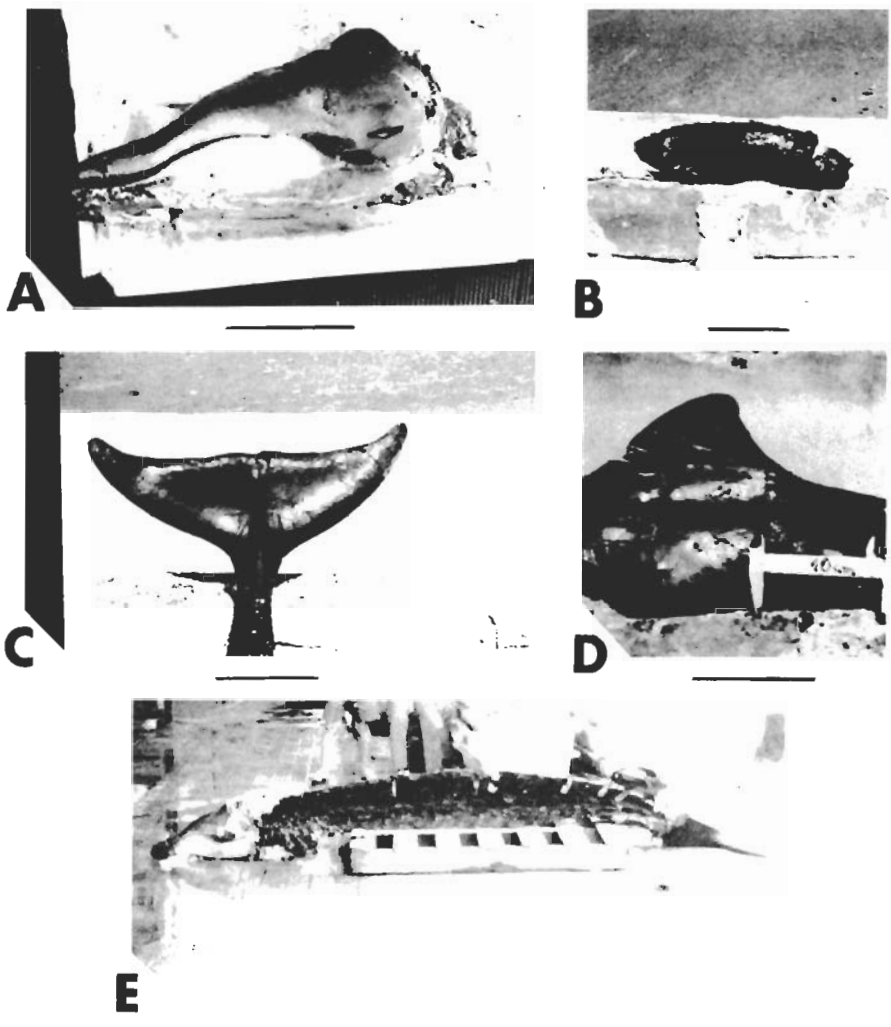


Figure 4. External photographs. (A) = lateral view of head, scale bar = 20 cm (JCR 304; (B) = dorsal(?) view of left(?) flipper, scale bar = 10 cm (JCR 304); (C) = dorsal view of flukes, scale bar = 20 cm (JCR 304); (D) = left lateral view of dorsal fin, scale bar = 10 cm (JCR 304); (E) = left lateral view of partly fleshed carcass, scale bar = 1 m (USNM 571257).

crests relative to the width of the premaxillae at the level of the anterior border of the superior nares, a feature pointed out as diagnostic of *M. hectori* by Ross (1970).

Natural History

Food Habits

Only two stomachs had contents. The stomach of JCR 270 was full of milk. MHNJP 709 had 47 otoliths of perciform fishes (*cf.* Nemipteridae), 54 otoliths



Figure 5. Composite drawing of the pigmentation pattern of an adult male of *Mesoplodon peruvianus.*

of myctophiform fishes (*cf.* Myctophidae; possibly referable to *Notoscopelus resplendens*) and 36 partly digested otoliths probably belonging to Ophidiiformes (Robert J. Lavenberg, personal communication), eye lenses and vertebrae of fishes in the main stomach, as well as a sheet of plastic in the esophagus. No squid beaks were found.

Parasites

Trematodes and anisakid nematodes were collected from the stomach of MHNJP 709. A single anisakid nematode was recovered from the stomach of KVW 506. The pterygoid sinuses of MHNJP 709 and JCR 1512 were infected with trematodes of the genus *Nasitrema.* This is the first record of *Nasitrema* and the first record of parasites in the ventral air sinus system in ziphiids (see Dailey and Brownell 1972, Gibson and Harris 1979).

Reproduction

Mesoplodon peruvianus is the smallest known species of the genus, in terms of total length at birth (159 cm) and maximum known adult total length (372 cm). The smallest previously known species of *Mesoplodon* is *M. hectori,* for which the smallest calf measured 190 cm in total length (Lichter 1986) and for which maximum known adult total length is 443 cm (Mead and Baker 1987).

No testes weights were recorded. A testis section of MHNJP 709 measured 27 by 15 mm. That sample was moderately autolyzed, but histological examination of the testis and epididymis, treated with Berg's stain (Berg 1963), revealed no trace of sperm or spermatids. The seminiferous tubules were well

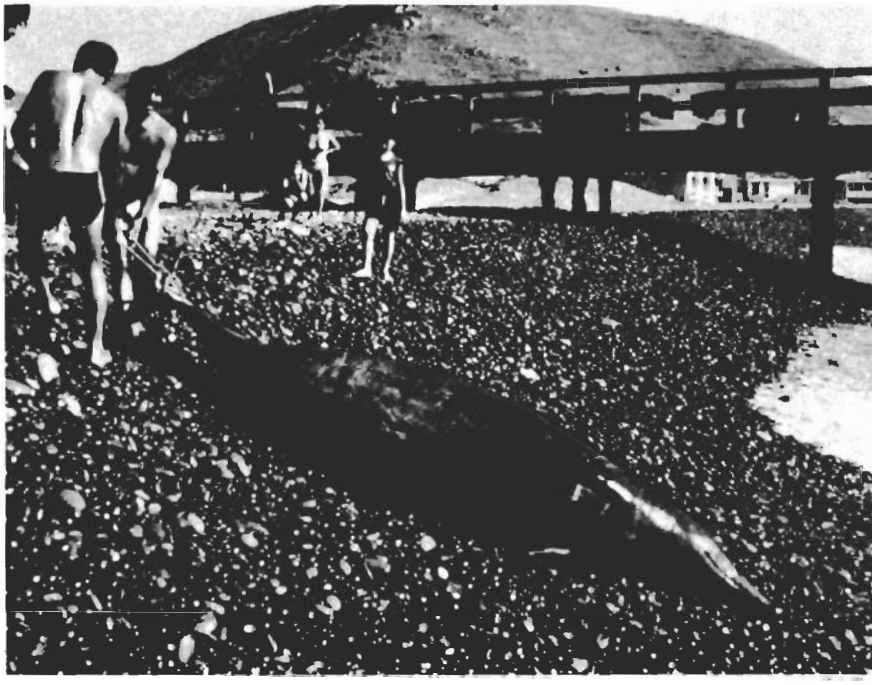


Figure 6. Ventral view of the carcass of MHNJP 709, 326-cm male, Cerro Azul, 20 April 1986.

developed. The mean of outside diameters of 10 randomly selected seminiferous tubules was 66 μm (range 56–85 μm). The ducts of the seminiferous tubules were about 20 μm in diameter.

Distribution

This species is known from 10 individuals which have either stranded or been captured along the Peruvian coast from Playa Paraíso (11°12'S) to San Juan de Marcona (15°19'S). Sightings of *Mesoplodon* which possibly could be attributed to this species were made off Peru by observers on board U.S. National Marine Fisheries Service research vessels and are listed in Table 11 (R. L. Pitman, in litt.). Due to the rapidly increasing knowledge of the distribution of cetaceans off western South America, we do not feel that this represents the actual limit of distribution of the species.

Acknowledgments

The authors wish to acknowledge Robert L. Brownell, Jr., for his help in the initial beach survey of Peru which resulted in the collection of the first specimen. Tony Luscombe (Asociación de Ecología y Conservación, Peru) collected the holotype. Moreover, he and Charles W. Potter have been ever helpful in arranging for shipment of specimens from Peru and in aiding the authors with logistical support. Andrew J. Read (University of

Table 10. External measurements of *Mesoplodon peruvianus*. Data for other species are from Mead 1989 (table 11) and represent combined means of all available data on all species. Measurements that are statistically significantly different are marked with an asterisk (*).

Field number:	JCR 270		JCR 304		571257		MHN 709		Mean	Other species	
Measurement:	cm	%	cm	%	cm	%	cm	%	%	Mean %	SD
Total length	159.0	100.0	248.0	100.0	286.0	100.0	325.5	100.0	—	—	—
Length of gape	15.5	9.7			24.5	8.6	23.5	7.2	8.5	8.2	1.5
Snout to center of eye	22.0	13.8			36.0	12.6	40.0	12.3	12.9	13.1	1.3
Snout to blowhole	20.0	12.6			31.0	10.8	38.0	11.7	12.6	12.3	1.2
Snout to ear	27.0	16.9			40.5	14.2	47.0	14.4	14.3	15.4	1.5
Snout to tip of dorsal fin	102.0	64.2					207.5	63.7	63.9	66.4	2.6
Snout to anterior insertion of flipper	38.0	23.9					71.0	21.8	22.9	23.1	2.0
Snout to umbilicus	79.0	49.7					155.0	47.6	47.6	48.0	3.6
Snout to genital slit (ant. end)	105.0	66.0					204.0	62.7	64.4	68.5	4.7
Snout to anus	118.0	74.2					242.0	74.3	74.3	72.6	4.9
Girth at eyes	59.0	37.1					97.0	29.8	33.5	30.1	5.1
Girth at axilla	84.5	53.1					168.0	51.6	52.4*	47.7	3.7
Maximum girth	92.5	58.2					198.0	60.8	59.5	54.9	5.0
Girth in front of dorsal fin	86.0	54.1					186.0	57.1	55.6	—	—
Girth behind dorsal fin	66.5	41.8					156.0	47.9	44.9	—	—
Girth at anus	56.0	35.2					118.0	36.3	35.7	33.4	3.1
Girth halfway anus to fluke notch	42.5	27.2					80.0	24.6	25.7*	18.5	1.5
Length of dorsal fin base	15.6	9.8	20.0	8.1			30.5	9.4	9.1	8.7	2.0
Height of dorsal fin	7.5	4.7	9.5	3.8			12.5	3.8	4.1	4.6	0.9
Flipper, maximum width	7.0	4.4	9.5	3.8			11.5	3.5	3.9*	3.1	0.4
Flipper, anterior length	22.0	13.8	25.0	10.1			36.5	11.2	11.7	10.7	1.4
Flipper, posterior length	16.0	10.1	18.5	7.4			24.0	7.4	8.3	7.9	1.1
Fluke length	30.0	18.9	37.0	14.9	36.0	12.5	52.0	15.9	15.6	—	—
Fluke depth	16.0	10.1	23.0	9.3	22.0	7.7	23.0	7.1	8.5	8.0	2.3
Fluke span	40.0	25.2	64.0	25.8	59.0	20.6	74.0	22.7	23.6	24.0	2.9

Table 11. Sightings of cetaceans possibly identifiable as *M. peruvianus* by observers on U. S. National Marine Fisheries Service research vessels. Observed diagnostic features include small size, overall dark, non-distinctive pigmentation, small and triangular dorsal fin with rounded top "very reminiscent of *Phocoena phocoena*" and near absence of body scarring (R. L. Pitman, in litt. 17 December 1988).

Location	Date	Number of animals	Water temperature (°C)
08°33'S 82°23'W	29 Oct 1988	2	18.2
08°38'S 82°32'W	29 Oct 1988	2	18.8
11°38'S 79°23'W	08 Nov 1988	3 (pair with calf)	18.5
11°13'S 80°43'W	08 Nov 1988	2	19.3

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