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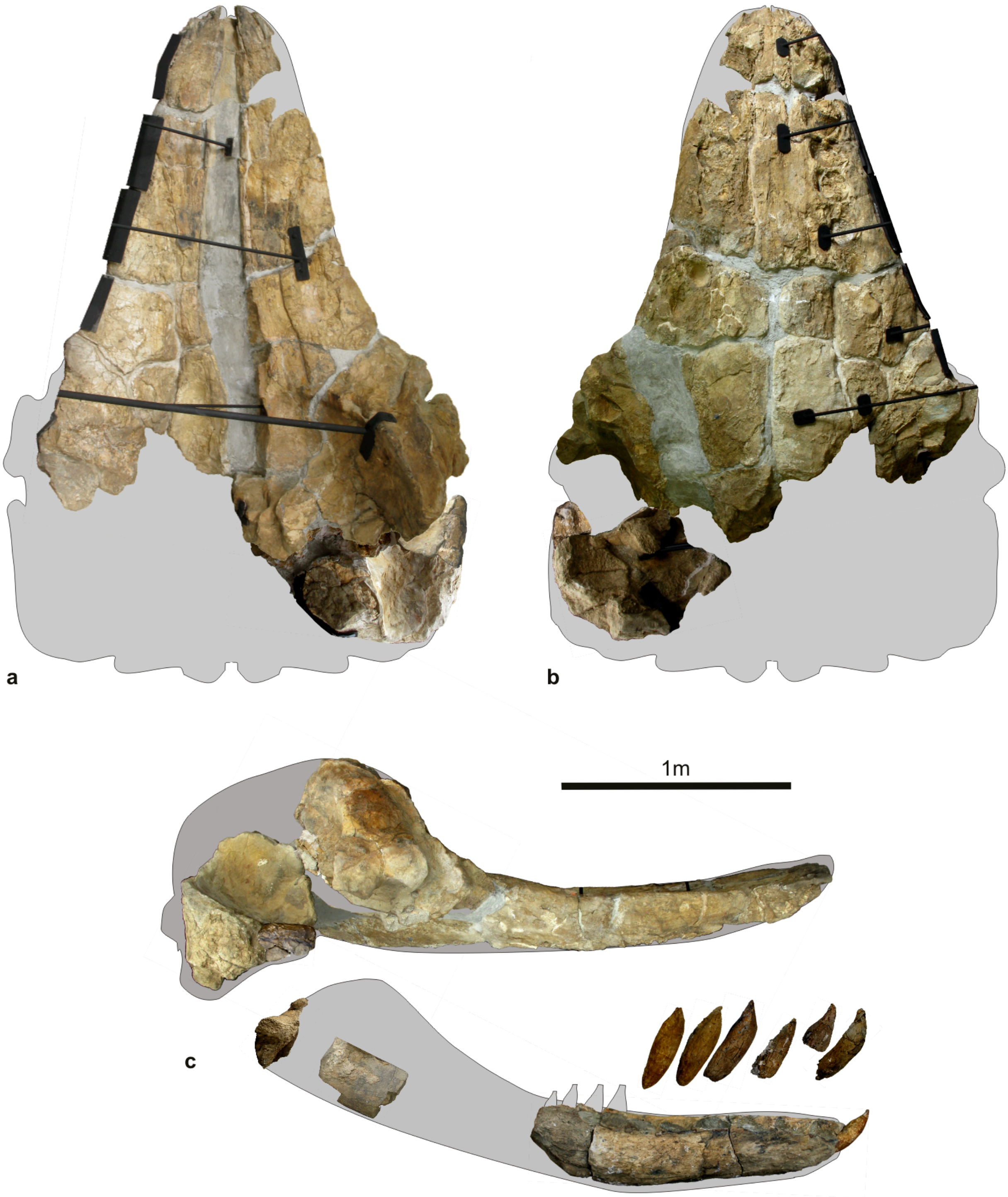
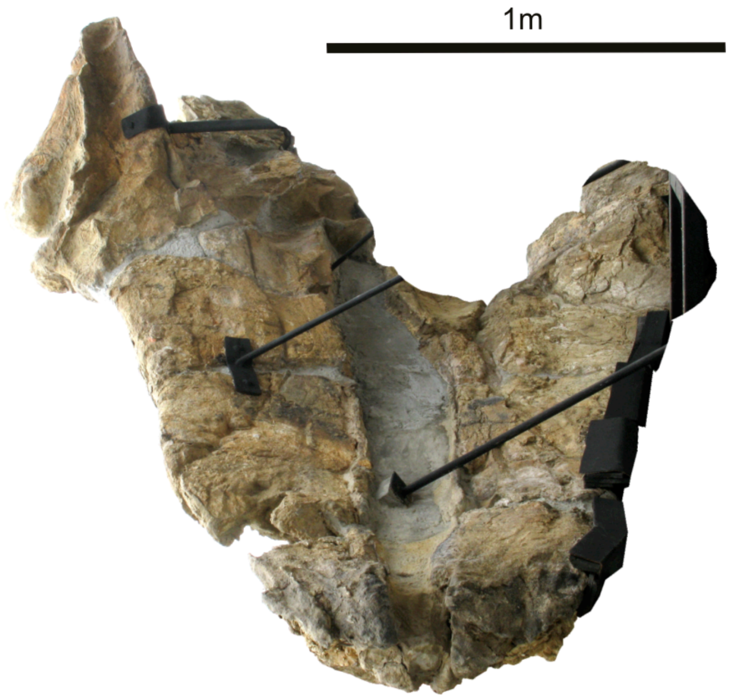
Part 1. Locality and stratigraphy

The holotype of *Leviathan melvillei* gen.et sp. nov. was found at Cerro Colorado, a locality 35 km SSW of the city of Ica (Peru), in the lowest levels of the Pisco Formation, several meters above the unconformity with the underlying Chilcatay Formation. The fine-grained clastic and diatomitic sediments of the Pisco Formation were deposited in shallow lagoonal waters in Andean forearc basins. The basal deposits are correlated to the Middle Miocene (Serravallian Stage[31], 12-14 Ma)[32-34], which date is corroborated by the discovery in the same strata of a rich mollusc level containing the bivalve *Anadara sechurana* Olsson, 1932, only found in the basal Pisco Fm and in the Middle Miocene Montera Formation in northern Peru[32,33]. Besides *Leviathan*, the small area around Cerro Colorado furnished eight specimens of the beaked whale *Messapicetus gregarius*, other odontocete remains including the pontoporiid *Brachydelphis mazeasi*, mysticete remains, a pinniped, marine turtles, bony fishes, sharks (*Cosmopolitodus hastalis* and *Carcharocles megalodon*), and seabirds[35].

Part 2. Additional photographs of *Leviathan melvillei* MUSM 1676 (holotype)

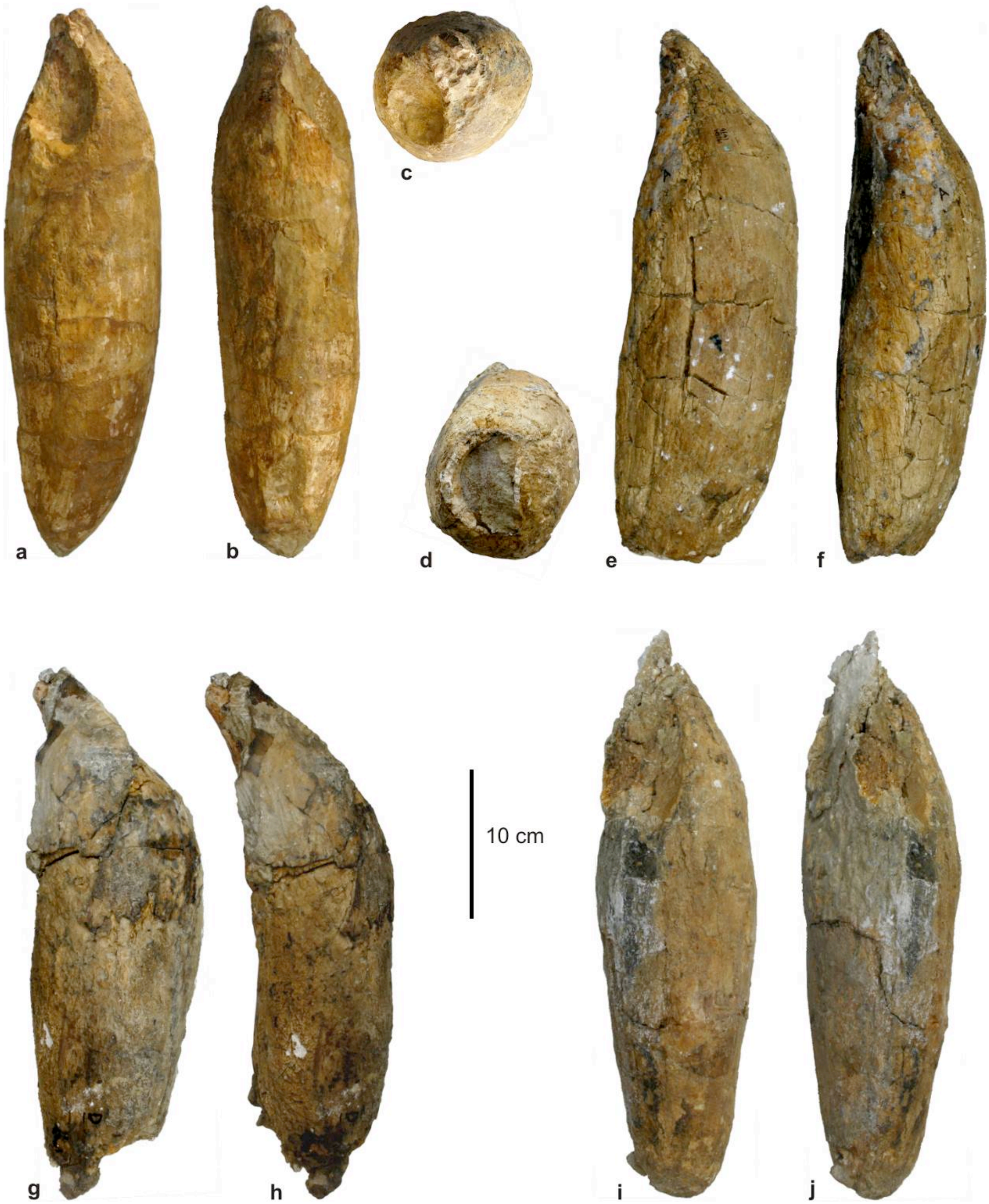


Supplementary Figure 1. a, skull, dorsal view; **b**, skull, ventral view; **c**, skull, mandible and lower teeth, right lateral view. Grey indicates missing parts.



Supplementary Figure 2. Skull, anterodorsal view.

Supplementary Figure 3. Mandible. **a**, incomplete right and left dentaries, dorsal view; **b**, right dentary with apical tooth in place, lateral view; **c**, left dentary, lateral view.



Supplementary Figure 4. Lower teeth. **a**, **b**, **c**, tooth C (right 7); **d**, **e**, **f**, tooth A (right 5); **g**, **h**, tooth D (right 2); **i**, **j**, tooth B (right 6). a, e, g, i, labial views; b, f, h, j, distal views; c, occlusal view; d, ventral view.

Supplementary Figure 5. Lower teeth. **a**, **b**, **c**, tooth E (right 1); **d**, **e**, tooth H (left 2 or 3); **f**, **g**, **h**, tooth I (left ?); **j**, **k**, tooth F (right 3). a, d, f, j, labial views; b, e, g, k, distal views; c, h, occlusal views.

Part 3. Measurements of *Leviathan melvillei* MUSM 1676 (holotype)

All measurements in centimeters.
Abbreviations: e, estimate; -, too fragmentary for this measurement; r, right dentary; l, left dentary; +, tooth not complete.

Total length of skull as preserved	270
Condylobasal length	e294
Rostrum length	169
Width of rostrum at mid-length	85
Maximum width of rostrum at base	137
Width of rostrum at antorbital notches	e123
Length of antorbital notch	28
Maximum width of premaxillae on rostrum	69.5
Minimum width of premaxillae on rostrum	e46
Maximum width of mesorostral groove	23
Depth of supracranial basin at mid-length of rostrum	7.5
Length of right upper alveolar row	134
Length of left upper alveolar row	135
Distance between upper right and left first anterior alveoli	17
Distance between upper right and left last posterior alveoli	71
Distance between upper right last posterior alveolus and lateral margin of rostrum	13
Postorbital width of skull	190
Distance from rostrum tip to left premaxillary foramen	150
Distance from rostrum tip to right bony naris	220.5
Depth of supracranial basin on cranium between highest margin of maxilla and lowest part of right premaxilla	56
Distance between anterior margin of preorbital process of maxilla and preserved posterior margin of postorbital process of frontal	50.5
Length of temporal fossa	e66.5
Height of temporal fossa	e64
Bizygomatic width (width across zygomatic processes of squamosals)	e197

Supplementary Table 1. Skull.

Alveolus	Right	Left
1	e15	e14.5
2	-	-
3	16	-
4	19.7	19.5
5	16.3	18
6	14.9	16
7	-	12
8	10	-
9	e7.4	6.5

Supplementary Table 2. Transverse diameter of right/left maxillary alveoli.

Alveolus	Right	Left
1	10	9.3
2	-	11.1
3	-	-
4	12.1	11.5
5	11.5	12.2
6	11.5	10.8
7	-	9.6
8	-	-
9	-	-

Supplementary Table 3. Maximum preserved diameter of upper right/left teeth.

Tooth	Proposed position in lower tooth row	Maximum length	Crown length	Maximum diameter of crown	Maximum diameter of root	Diameter of root perp. to maximum diameter	Maximum circum-ference of root	Height occlusion groove from apex of tooth
E	r1	+31.5	3.1	2.4	8.1	7.1	25	-
D	r2	+32.5	+2.5	2.5	10.7	8.5	31	-
F	r3	-	-	-	11.1	-	-	-
G	r4	-	-	-	+10.4	-	-	-
A	r5	+35.7	-	-	11.1	9.5	33.5	-
B	r6	+36	-	-	11.1	10.0	33.3	+12.5
C	r7	+36.1	-	-	10.2	9.4	31.6	+11.3
H	l2-3	+36.2	-	-	10.6	8.2	31.9	-
I	l?	+32	-	-	+10.2	-	-	+9.6

Supplementary Table 4. Lower teeth.

Length of lower alveolar groove as preserved: distance between anterior border of right alveolus 2 and posterior border of right alveolus 11	123.0
Maximum height of right dentary (level alveolus 8)	+30.6
Maximum height of left dentary (level alveolus 7)	+36.0
Maximum width of right dentary (level alveolus 5)	+19.3
Maximum width of left dentary (level alveolus 3)	+20.5

Supplementary Table 5. Mandible.

Alveolus	Right	Left
1	-	-
2	12.2	-
3	13.4	12.8
4	13.1	13.1
5	13.4	13.6
6	12.4	13.1
7	12.0	12.1
8	11.5	e12.5
9	11.3	e11.8
10	8.4	+60
11	5.3	-

Supplementary Table 6. Transverse diameter of right/left dentary alveoli

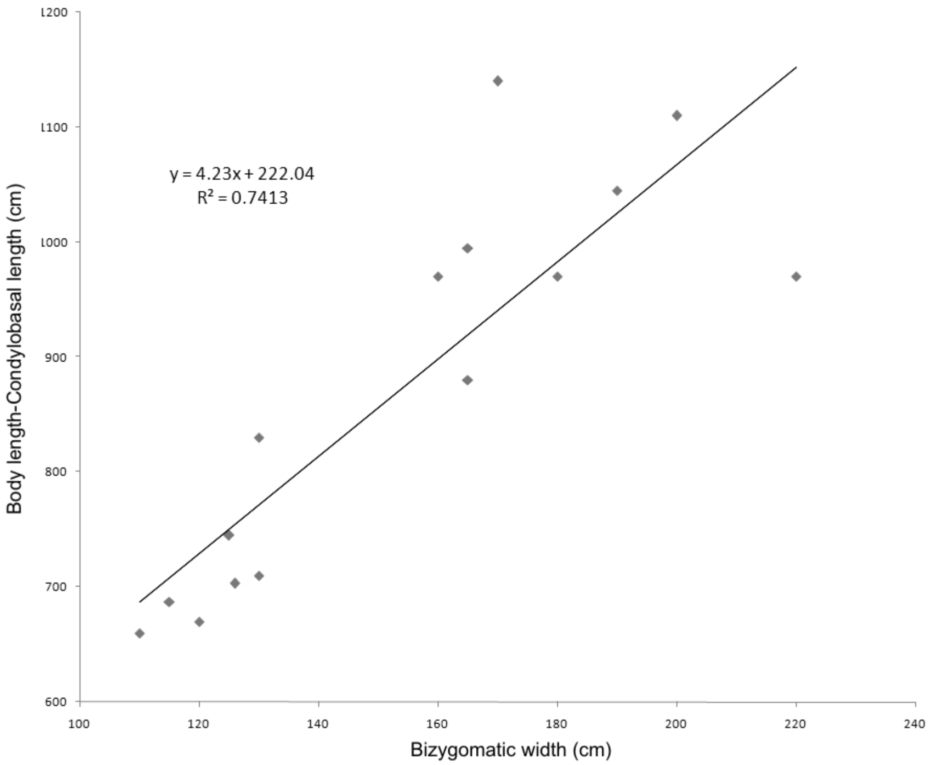
Part 4. Body length estimates for *Leviathan melvillei*

Abbreviations: BL, body length; CBL, condylobasal length of the skull; BZW, bizygomatic width of the skull; F, female; M, male.

4.1. Estimate based on the extant physeterid *Physeter macrocephalus*

Sex	BL	CBL	BL-CBL	BZW
M	1630	490	1140	170
M	1440	470	970	220
M	1560	450	1110	200
M	1460	415	1045	190
M	1000	255	745	125
M	1400	430	970	180
M	1280	310	970	160
M	1150	320	830	130
M	1360	365	995	165
M	1220	340	880	165
F	970	260	710	130
F	890	230	660	110
F	950	247	703	126
F	930	243	687	115
F	880	210	670	120

Supplementary Table 7. Body measurements (in cm) for *Physeter macrocephalus*, Southeast Pacific, taken from Clarke & Paliza[36].



Supplementary Figure 6. Scatterplot with regression line and related equation of BL-CBL against BZW in extant *Physeter macrocephalus* (data from Supp.Table 7). BZW was preferred to CBL, the latter depending on the variable rostrum length (adult males of *P. macrocephalus* have a more elongated rostrum than females, and *Leviathan melvillei* has a proportionally shorter rostrum than *P. macrocephalus*). For the same reason CBL was subtracted from BL for the calculation of the regression line.

Estimated body length of *Leviathan melvillei*:

BL = (4,23xBZW + 222.04) + CBL = (4.23x197 + 222.04) + 294 = **1349.35 cm**

4.2. Estimate based on the fossil physeteroid *Zygophyseter varolai*

Body length of *Zygophyseter varolai* is estimated between 650 to 700 cm[4], on the basis of the preserved skeleton of the holotype (complete skull with mandible and significant portion of postcranial skeleton, including 29 vertebrae). Thanks to the good relation between BL –CBL and BZW evidenced in the extant *Physeter macrocephalus* (see Supplementary Fig. 7), we used the ratio of these measurements in *Z. varolai* to obtain an estimation of the body size of *Leviathan melvillei*.

Considering the smallest estimation of *Z. varolai* BL (650 cm):

BL–CLB = 650 cm – 148 cm = 502 cm
(BL –CBL)/BZW = 502/74.5 = 6.738

Estimated body length of *L. melvillei*:

BL = 6.738 (BZW) + CBL = 6.738x197 cm + 294 cm = **1621 cm**

Considering the largest estimation of *Z. varolai* BL (700 cm):

BL–CLB = 700 cm – 148 cm = 552 cm
(BL –CBL)/BZW = 552/74.5 = 7.41

Estimated body length of *L. melvillei*:

BL = 7.41 (BZW) + CBL = 7.41x197 cm + 294 cm = **1753 cm**

Part 5. Phylogeny

5.1. Methods

The cladistic analysis was undertaken based on a list of 41 morphological characters, most of them taken or modified from previous analyses[4,5,37-39]. The dorudontine *Zygorhiza* and the stem odontocete *Agorophius* were considered as outgroups. 13 fossil and the two modern physeteroid genera were included in the analysis. Based on this selection, 36 characters were parsimony-informative. The analysis was executed with the software PAUP, version 4.0b10[40], using the Branch-and-bound algorithm. Character-state distribution was examined using acctran optimization. A part of the characters were considered as ordered (see list), and the homoplastic characters were down-weighted using the default value of 3 for the constant k of the Goloboff method[41].

5.2. List of characters

1. Rostrum length (ordered): **0**, rostrum elongated, ratio between rostrum length and skull width > 1.2; **1**, ratio ≤ 1.2 and ≥ 0.95; **2**, short rostrum, ratio < 0.95.
2. Maxillae, premaxillae and vomer, all reaching the tip of the rostrum which is not formed only by the premaxillae: **0**, absent; **1**, present.
3. Supracranial basin of the skull (ordered): **0**, absent; **1**, present; **2**, extended onto the whole dorsal surface of the rostrum.
4. Dorsal exposure of the maxilla on the rostrum (ordered): **0**, exposure limited to less than half the rostrum length; **1**, maxilla exposed on more than half the length of the rostrum, narrower than the premaxilla at some levels; **2**, wider than the premaxilla all along.
5. Constriction of premaxilla anterior to antorbital notch followed by anterior expansion: **0**, absent, suture maxilla-premaxilla on the rostrum roughly anteriorly directed; **1**, present, suture maxilla-premaxilla distinctly anterolaterally directed.
6. Upper tooth row: **0**, deep alveoli; **1**, alveoli shallow or absent.
7. Premaxillary teeth: **0**, present; **1**, absent. This character cannot be coded for taxa lacking distinct upper alveoli.
8. Maximum width of skull (postorbital or bizygomatic width) (ordered): **0**, < 40 cm; **1**, ≥ 40 and < 60 cm; **2**, ≥ 60 and < 100 cm; **3**, ≥ 100 cm.
9. Antorbital notch (ordered): **0**, absent; **1**, present; **2**, transformed into a very narrow slit.
10. Antorbital notch: **0**, outside the supracranial basin; **1**, inside the supracranial basin.
11. Number and size of dorsal infraorbital foramina, in the area of the right antorbital notch and posteriorly (ordered): **0**, small to moderate size foramina, at least three-four; **1**, three large foramina; **2**, two large foramina; **3**, one large foramen (maxillary incisure).
12. Right premaxilla: **0**, posteriorly extended as the left premaxilla; **1**, more posteriorly extended than the left premaxilla.
13. Right premaxilla: **0**, not widened posteriorly; **1**, posterior extremity of the right premaxilla laterally widened, occupying at least one third of the width of the supracranial basin.
14. Presence of a sagittal crest: **0**, absent; **1**, present as a shelf covered by the pointed right premaxilla.
15. Left premaxillary foramen very small or absent: **0**, absent; **1**, present.

16. Increase in size of the right premaxillary foramen: **0**, absent, ratio between width of foramen and width of premaxilla at that level ≤ 0.20; **1**, present, ratio > 0.20.

17. Anteroposterior level of right premaxillary foramen (ordered): **0**, distinctly anterior to antorbital notch; **1**, slightly anterior to antorbital notch; **2**, same level or posterior to antorbital notch.

18. Asymmetry of the bony nares: **0**, absent or reduced; **1**, strong, left bony naris significantly larger than right naris.

19. Lack of nasals (ordered): **0**, both nasals present; **1**, one nasal absent; **2**, both nasals absent.

20. Widening of the supracranial basin on the right side: **0**, absent; **1**, present, basin overhangs the right orbit.

21. Right maxilla reaching the sagittal plane of the skull on the posterior wall of the supracranial basin: **0**, absent; **1**, present.

22. Fusion of lacrimal and jugal: **0**, absent; **1**, present.

23. Projection of the lacrimal-jugal between frontal and maxilla: **0**, short or absent; **1**, long.

24. Preorbital process considerably lower than the elevated dorsolateral margin of the rostrum base: **0**, absent; **1**, present.

25. Frontal-maxilla suture, with skull in lateral view (ordered): **0**, forming an angle < 15° from the axis of the rostrum; **1**, 15-35°; 2, > 35°.

26. Temporal fossa (ordered): **0**, anteroposteriorly longer than distance between preorbital process of the maxilla and anterior wall of temporal fossa; **1**, approximately same length; **2**, distinctly shorter.

27. Zygomatic process of squamosal in lateral view: **0**, 'L'-shaped with dorsal margin ventrally bending in its posterior portion; **1**, triangular, with dorsal margin dorsally bending in its posterior portion.

28. Postglenoid process of the squamosal: **0**, significantly ventrally longer than post-tympanic process; **1**, roughly same ventral extent as post-tympanic process.

29. In lateral view of the skull, wide notch posterior to the postglenoid process of the squamosal for the enlarged posterior process of the tympanic: **0**, absent; **1**, present.

30. Occipital shield (ordered): **0**, convex and forming an angle of about 40° from the axis of the rostrum; **1**, as state 0 with an angle of about 60°; **2**, flat or concave forming an angle of about 90°.

31. Long axis of the skull: **0**, roughly parallel to the long axis of the body (perpendicular to the surface of the occipital condyles); **1**, projected ventrally.

32. Falciform process of the squamosal (ordered): **0**, contacting the corresponding pterygoid; **1**, forming a thin plate not contacting the pterygoid; **2**, reduced to a simple peg or absent.

33. Anterior bullar facet of the periotic (ordered): **0**, very anteroposteriorly elongated; **1**, reduced; **2**, absent or very small.

34. Posterior extension of the posterior process of the periotic parallel to the general plane of the bone and not ventrally orientated: **0**, absent; **1**, present.

35. Accessory ossicle of the tympanic bulla (ordered): **0**, absent; **1**, present; **2** present and partially fused with the anterior process.

36. Involucrum of the tympanic bulla with an evident central concavity, visible in ventral and medial views, due to the marked pachyostosis of its anterior and posterior portion: **0**, absent; **1**, present.

37. Size of teeth (greatest transverse diameter of root expressed as percentage of the maximum width of skull): **0**, < 5%; **1**, > 5%. Considering the strong heterodonty in *Zygorhiza* this character is restricted to single-rooted teeth.

38. Loss of dental enamel: **0**, absent; **1**, present. It should be noted that enamel has been detected on foetal teeth of *Physeter*, later covered with cement[42].

39. Number of mandibular teeth (ordered): **0**, 11; **1**, 12-14; **2**, > 14.

40. Labiolingual compression of the posterior lower teeth (portion out of the alveolus): **0**, strong; **1**, weak or absent.

41. Ventral position of the mandibular condyle: **0**, absent, well developed angular process; **1**, present, angular process low or absent.

5.3. Data matrix

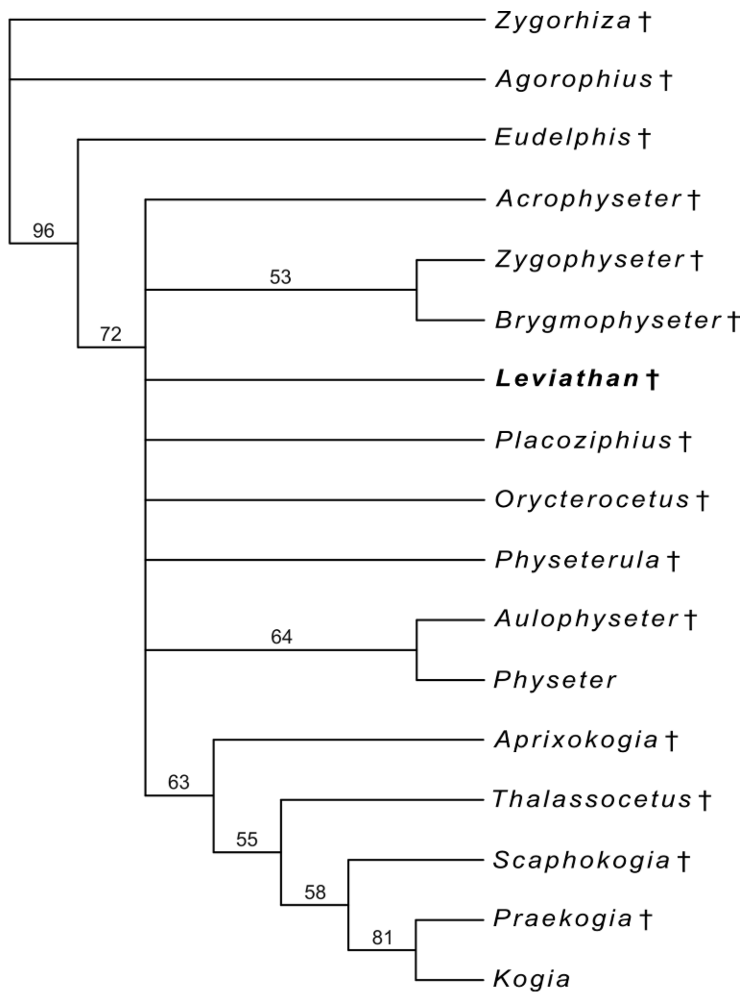
	5	10	15	20	25	30	35	40	
Zygorhiza	00000	0000-	-000-	--00-	-000?	00002	00000	00000	0
Agorophius	??010	0?01-	00000	0000-	0?000	00000	0????	?????	?
Eudelphis	101?0	0?110	01??0	1?1?0	?????	?100?	01???	?00??	?
Zygophyseter	10110	01210	21101	12111	?1001	0110?	012?2	11010	1
Brygmophyseter	??1??	0?210	21101	??1??	???01	01101	?????	?101?	1
Placoziphius	?0120	??110	?1101	11?10	??001	?110?	?2???	??0??	?
Orycterocetus	10110	00110	11101	01110	1?001	11102	02202	1002?	?
Physeterula	0?10?	0?210	21101	??1?0	0??01	?1102	?2???	?0?21	?
Aulophyseter	10100	1-210	21101	02110	01012	21102	??202	?0???	?
Physeter	a0221	1-310	31101	02110	01012	21102	12202	10121	a
Thalassocetus	?????	??010	1101?	???20	1??01	?1201	?????	?????	?
Scaphokogia	?1111	1-020	01011	02120	?1111	?????	1?212	??1??	?
Praekogia	?????	??021	0101?	???20	1?1?1	11011	12???	?????	?
Kogia	21220	1-021	01011	0b120	11102	2101b	12212	101c1	a
Leviathan	21211	01320	2?100	????0	01?02	01?0?	?2???	?1101	1
Acrophyseter	20110	001?0	3?100	111?1	???02	01101	0????	?1010	1
Aprixokogia	??2??	0?010	01111	021?0	?1111	01102	12???	??1??	?

Supplementary Table 8. Data matrix. 0, primitive state; 1, 2, 3, derived states; a, variable between 0 and 1; b, variable between 1 and 2; c, variable between 0 & 1 & 2; ?, missing character; -, taxon not coded for this character.

5.4. Bootstrap analysis

In order to quantify the support for the main nodes of the tree obtained, we performed a bootstrap analysis. In the fifty-percent-majority rule consensus bootstrap tree (Supplementary Fig. 8), nodes are generally weakly supported; only the monophyly of the superfamily Physeteroidea and the clade *Praekogia* + *Kogia* have a strong support. Two stem physeteroids, *Brygmophyseter* and *Zygophyseter*, group with a bootstrap value slightly higher than 50. The position of *Leviathan* is not consistently resolved, but this preliminary analysis suggests that it is placed outside the crown Physeteroidea

(Kogiidae + Physeteridae). The family Physeteridae, including *Aulophyseter*, *Physeter*, and *Physeterula* has a bootstrap value lower than 50, whereas the clade *Aulophyseter* + *Physeter* is more robust. The family Kogiidae, including *Aprixokogia*, *Kogia*, *Praekogia*, *Scaphokogia*, and *Thalassocetus*, is also somewhat better supported. Future analyses including more characters, especially from the ear and postcranial areas, will likely lead to better supported clades within stem Physeteroidea and Physeteridae.



Supplementary Figure 7. Boostrap 50% majority-rule consensus tree obtained with 100 full heuristic bootstrap replicates from the data matrix in Suppl. Table 8. Numbers associated with the branches are support values. † = fossil taxa.

Part 6. Evolution of mysticete diversity and size from Oligocene to present

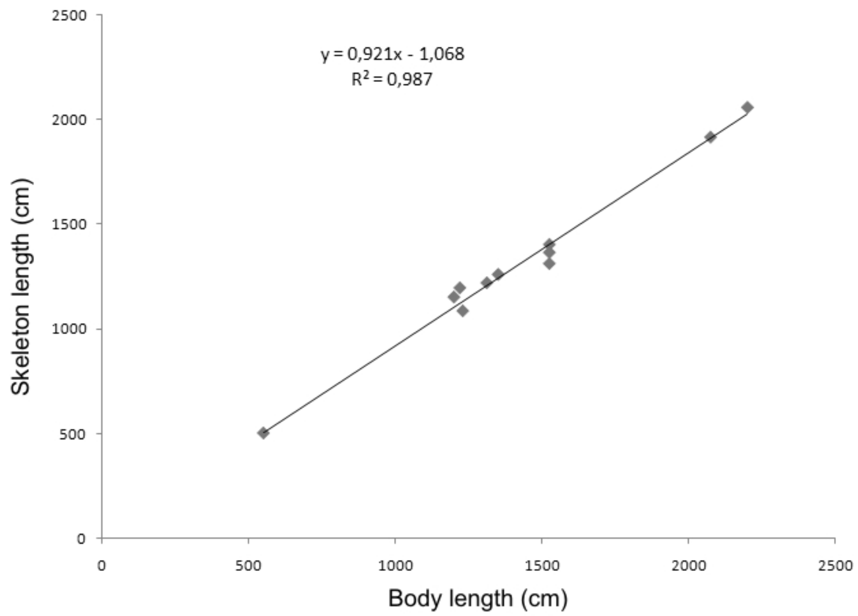
	Eocene	Oligocene		Miocene						Pliocene	Recent	Reference
	Priabonian	Rupelian	Chattian	Aquitanian	Burdigalian	Langhian	Serravallian	Tortonian	Messinian			
Aetiocetus cotylalveus			316									*43*
Aetiocetus polydentatus			272									*44*
Aetiocetus tomitai			240									*44*
Aetiocetus weltoni			287									*43*
Aglaocetus moreni				800								*45*
Aglaocetus patulus							760					*46*
Archaebalaenoptera castriarquati										970		*47*
Aulocetus latus								380				*48*
Balaena mysticetus											1700	*49*
Balaenella brachyrhynus										800		*50*
Baleanoptera acutorostrata											1200	*49*
Balaenoptera bonaeriensis											905	*51*
Balaenoptera davidsonii										850		*52*
Balaenoptera edeni											1665	*53*
Balaenoptera borealis											1490	*54*
Balaenoptera musculus											3100	*49*
Balaenoptera omurai											1450	*55*
Balaenoptera physalus											2440	*56*
Balaenoptera siberii									1110			*52*
Balaenoptera sp.1 from Peru									540			R.S.-G. pers. obs.
Balaenoptera sp. 2 from Peru									840			R.S.-G. pers. obs.
Balaenoptera sp. 3 from Peru									1040			R.S.-G. pers. obs.
Balaenoptera sp. 4 from Peru										1020		R.S.-G. pers. obs.
Balaenoptera sp. 5 from Peru										750		R.S.-G. pers. obs.
Balaenopteridae n. g. (*Balaenoptera cortesi* var. *portisi*)									750			*52*
?Balaenopteridae indet.									800			*57*
Balaenopteridae indet.										1640		O.L. pers. obs.
Balaenula astensis										750		*58*
Caperea marginata											730	O.L. pers. obs.
Cephalotropis nectus								456				*48*
Cethotheriopsis lintianus			505									*59*
Cetotheriophanes capellinii										884		G.B. pers. obs.
Cetotherium furlongi					545							*60*
Cethotheriidae indet.									660			*57*
Chonecetus goedortorum			212									*44*
Chonecetus sookensis			188									*44*
Cophocetus oregonensis				625	625							*61*
Diorocetus chichibuensis						696	696					*62*
Diorocetus hiatus						635	635					*63*
Diorocetus shobarensis						500						*64*
Eomysticetus carolinensis			510									*65*
Eomysticetus whitmorei			480									*65*

Eschrichtioides gastaldii										490		*66*
Eschrichtius robustus											1110	*49*
Eubalaena australis											2650	O.L. pers. obs.
Eubalaena belgica										1080		O.L. pers. obs.
Eubalaena glacialis											2502	*49*
Eubalaena japonica											1950	*67*
Herpetocetus transatlanticus										453		*68*
Isocetus depauwi						442	442	442				O.L. pers. obs.
Isanocetus laticephalus					494							*69*
Janjucetus hundei			312									*70*
Mammalodon colliveri			268									*71*
Megaptera novaeangliae											2410	*54*
"Megaptera " hubachi										850		*52*
"Megaptera" miocena								1270				*52*
Metopocetus durinasus							590					*72*
Metopocetus vandellii								465				*73*
Micromysticetus rothauseni		398										*59*
Micromistycetus tobieni			403									*59*
Mixocetus elysius								1000				*74*
Morawanocetus yabukii			290									*44*
Nannocetus eremus										248		*75*
Parabalaenoptera baulinensis									980			*76*
Parietobalaena palmeri						496	496					*77*
Parietobalaena yamaokai						430						*64*
***Parietobalaena* sp.**						386	386					*78*
Pelocetus calvertensis							945					*79*
***Pelocetus* sp.**						980						*64*
Pinocetus polonicus						706						*80*
Piscobalaena nana								432	432	432		*81*
Piscocetus sacaco										640		*57*
Plesiocetus dyticus				740								*82*
Praemegaptera paupanensis							1150					*83*
Protororqualus cuvieri										1140		*84*
Thinocetus arthritus							670					*85*
Tiphyocetus temblorensis						636						*86*
Titanocetus sammarinensis							720					*87*
Uranocetus gramensis								736				*88*
Willungacetus aldingensis		280										*89*

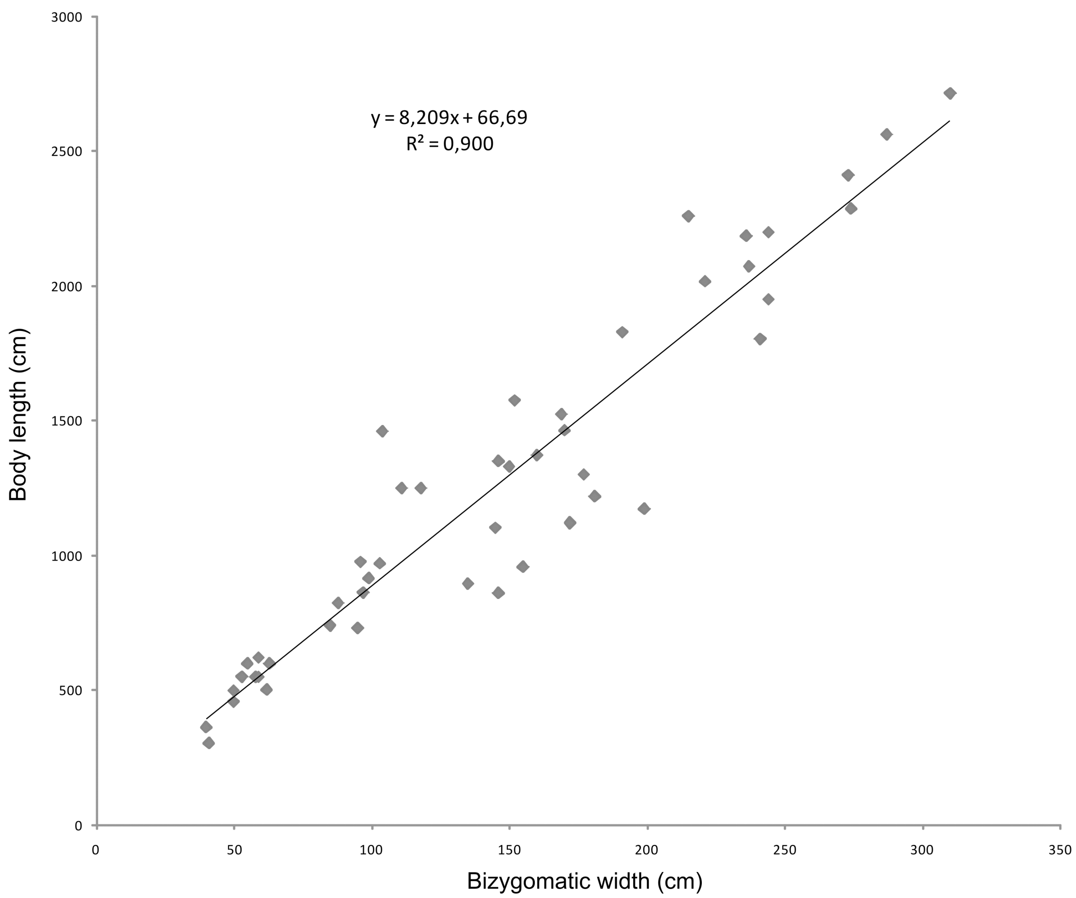
Supplementary Table 9. Bizygomatic width of the skull for fossil and extant mysticete species from different stages (international geologic time scale[31]), with the related bibliographical references. Except for the undescribed specimens from Peru, stratigraphical distribution of fossil species was downloaded from Paleobiology Database (http://www.paleodb.org) Online Systematics Archive 9 - Cetacea, compiled by M. D. Uhen. Data gathered here are used in Figure 4 of the main text.

Species	Body length	Skeleton length	Bizygomatic width	References
Balaenoptera borealis	976		96	*49*
Balaenoptera borealis	1330		150	*49*
Balaenoptera borealis	1350	1259	146	*49*
Balaenoptera borealis	1372		160	*49*
Balaenoptera musculus	2017		221	*56*
Balaenoptera musculus	2287		274	*49*
Balaenoptera musculus	2562		287	*49*
Balaenoptera musculus	2412*	2220	273	*54*
Balaenoptera musculus	2716*	2500	310	*49*
Balaenoptera omurai	1103		145	*55*
Balaenoptera physalus	1250*	1150	118	*54*
Balaenoptera physalus	1576*	1450	152	*56*
Balaenoptera physalus	1463		170	*56*
Balaenoptera physalus	1524		169	*56*
Balaenoptera physalus	1829		191	*56*
Balaenoptera physalus	2073	1915	237	*56*
Balaenoptera physalus	2260*	2080	215	*54*
Balaenoptera physalus	2186*	2012	236	*56*
Balaenoptera physalus	2199	2057	244	*56*
Balaenoptera physalus	1950	1844	244	*90*
Baleanoptera acutorostrata	302		41	*56*
Baleanoptera acutorostrata	361		40	*49*
Baleanoptera acutorostrata	457		50	*49*
Baleanoptera acutorostrata	549		58	*56*
Baleanoptera acutorostrata	549		59	*56*
Baleanoptera acutorostrata	550	501	53	*49*
Baleanoptera acutorostrata	598*	550	55	*54*
Baleanoptera acutorostrata	620		59	*49*
Baleanoptera acutorostrata	740		85	*49*
Baleanoptera acutorostrata	823		88	*49*
Baleanoptera acutorostrata	863		97	*56*
Baleanoptera acutorostrata	914		99	*56*
Baleanoptera acutorostrata	970*	892	103	*54*
†Cophocetus oregonensis	501*	460	62	*61*
†Diorocetus hiatus	597*	549	63	*63*
Eschrichtius robustus	1250		111	*49*
Eschrichtius robustus	1461		104	*49*
Eubalaena australis	1565*	1440	263	*91*
Eubalaena glacialis	757		103	*56*
Eubalaena glacialis	1044		201	*56*
Eubalaena glacialis	1199	1151	163	*56*
Eubalaena glacialis	1229	1085	188	*56*
Eubalaena glacialis	1280		215	*56*
Eubalaena glacialis	1380*	1270	257	*54*
Eubalaena glacialis	1412		250	*56*
Eubalaena glacialis	1450		255	*56*
Eubalaena glacialis	1450		246	*56*
Eubalaena glacialis	1482*	1364	236	*56*
Eubalaena glacialis	1524	1364	255	*56*
Megaptera novaeangliae	860		146	*49*
Megaptera novaeangliae	895*	823	135	*56*
Megaptera novaeangliae	1121*	1031	172	*56*
Megaptera novaeangliae	1173*	1079	199	*56*
Megaptera novaeangliae	1219	1195	181	*56*
Megaptera novaeangliae	1300*	1196	177	*49*
Megaptera novaeangliae	1311	1219		*56*
Megaptera novaeangliae	957*	880	155	*91*
Megaptera novaeangliae	1804*	1660	241	*54*
†Parietobalaena palmeri	497*	457	50	*77*
†Plesiocetus calvertensis	730*	671	95	*79*

Supplementary Table 10. Measurements (in cm) of extant and fossil mysticetes and related bibliographical references. Asterisks indicate measurements estimated from skeleton length using the equation in Supplementary Fig. 8. † = fossil species.



Supplementary Figure 8. Scatterplot with regression line and related equation of skeleton length against body length in extant mysticetes (data from Supp. Table 10). The equation provides body length estimates based on skeleton length for several specimens in Supp. Table 10 (asterisks).



Supplementary Figure 9. Scatterplot with regression line and related equation of body length against bizygomatic width in extant and fossil mysticetes (data from Supp. Table 10). The equation provides maximum and minimum body length estimates for each time interval in Figure 4b of the main text.

Part 7. Life reconstruction of *Leviathan melvillei*

Supplementary Figure 10. Middle Miocene (12-13 MA) scene showing the sperm whale *Leviathan melvillei* preying upon a medium-size cetotheriid baleen whale (about 7 m long) on the continental shelf off the area now occupied by Peru. Anachronistic silhouette of modern scuba diver gives a scale for the size of the two whales.

Part 8. Supplementary references

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