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SUPPLEMENTARY ONLINE MATERIAL FOR

Out of the Pacific: a second fossil porpoise from the Pliocene of the North Sea Basin

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Supplementary Online Material

SOM 1. List of characters for the phylogenetic analysis.

SOM 2. Character-taxon matrix.

References

SOM 1. List of characters for the phylogenetic analysis

1. Rostrum length (Muizon 1988b): 0, rostrum longer than cranium; 1, rostrum has roughly the same length as the cranium; 2, rostrum shorter than cranium.
2. Antorbital notch (Fajardo-Mellor et al. 2006): 0, laterally limited by an anterior projection of the maxilla; 1, not laterally limited.
3. First anterior maxillary foramen (Ichishima and Kimura 2005): 0, anterior to or in line with antorbital notch; 1, posterior to antorbital notch.
4. Premaxillary eminence (Lambert 2008; modified from Fajardo-Mellor et al. 2006): 0, absent; 1, present, low; 2, present, high and overhanging maxilla laterally.
5. Posterior projection of the right premaxilla (Fajardo-Mellor et al. 2006): 0, extends posterior to bony nares; 1, does not extend posterior to bony nares, and posterior end of premaxilla is small and adjacent to bony nares.
6. Longitudinal sulcus through premaxillary eminence (Muizon 1984): 0, absent; 1, present. This additional sulcus is thought to be present in *Brabocetus*, at least on the right side.
7. Level of the anterior margin of bony nares (Lambert 2008): 0, at mid-length of orbit or anterior; 1, in line with postorbital process of frontal.
8. Nasal protuberances (Fajardo-Mellor et al. 2006): 0, absent or much reduced; 1, present.
9. Frontal boss (frontal protuberance on vertex; Lambert 2008; modified from Fajardo-Mellor et al. 2006): 0, absent; 1, present, small and anteriorly pointed; 2, present, large and anteriorly wide. The frontal boss is anteriorly long, but narrow in *Brabocetus*.
10. Projection of frontal over the maxilla (Fajardo-Mellor et al. 2006): 0, absent or nearly absent; 1, slight overhang of frontal over maxilla lateral to the vertex; 2, pronounced overhang of frontal over maxilla, extending along lateral edges of vertex.
11. Size of temporal fossa (Lambert, 2008; modified from Barnes 1984): 0, large and dorsally high, ratio between height of fossa and cranium length $\geq 0,30$; 1, small and rounded, ratio between height of fossa and cranium length $< 0,30$.
12. Anterior extension of pterygoid sinus fossae (Lambert 2008): 0, apices of right and left fossae for hamular lobes moderately or not separated, at level or anterior to antorbital notch; 1, apex of right and left fossae widely separated by flat surface and posterior to antorbital notch. In *Delphinodon*, the apices of the fossae are roughly medially joined, but posterior to the antorbital notch; whereas in *Brabocetus* they are widely separated, but at the level of the notch.
13. Dorsal extension of pterygoid sinus fossa between frontal and maxilla (Lambert 2008; modified from Fajardo-Mellor et al. 2006): 0, absent or poorly developed; 1, deep. The extension is in an intermediate state in *Brabocetus* and *Septemtriocetus*.
14. Foramen ovale (Muizon 1988a): 0, small; 1, included in a larger opening.
15. Number of teeth in each upper tooth row (Lambert 2008; modified from Fajardo-Mellor et al. 2006): 0, tooth counts > 35 ; 1, tooth counts between 35 and 30; 2, minimum tooth counts 18–24 and maximum tooth counts 26–29; 3, minimum tooth counts 8–17 and maximum tooth counts 20–25.
16. Shape of teeth (Barnes 1984): 0, not spatulate; 1, spatulate with or without accessory cusps.
17. Lateral groove of tympanic bulla (Fajardo-Mellor et al. 2006): 0, well developed; 1, weakly developed.
18. Fusion of cervical vertebrae (Fajardo-Mellor et al. 2006): 0, unfused; 1, C1–C3 or C1–C4 fused; 2, C1–C5 or C1–C6 fused; 3, C1–C7 fused.
19. Spinous process of axis (Fajardo-Mellor et al. 2006): 0, short, extends posteriorly only to about C4; 1, long, nearly contacts the spinous process of C7.
20. Transverse foramina (vertebrarterial canal) of C4 (Fajardo-Mellor et al. 2006): 0, complete; 1, incomplete or absent.
21. Transverse process of the axis (Lambert 2008; modified from Fajardo-Mellor et al. 2006): 0, well developed; 1, weakly developed or absent.
22. Metapophyses of the spinous processes (Fajardo-Mellor et al. 2006): 0, well developed; 1, absent or weakly developed.
23. Acromion and coracoid processes of the scapula (Fajardo-Mellor et al. 2006): 0, acromion longer than coracoid; 1, acromion shorter than coracoid.
24. Supraspinous fossa (Fajardo-Mellor et al. 2006): 0, broad; 1, narrow.
25. Apex of the flipper (Fajardo-Mellor et al. 2006): 0, sharply pointed; 1, rounded at tip.
26. Tubercles on dorsal fin (Fajardo-Mellor et al. 2006): 0, present; 1, absent.
27. Sexual dimorphism (Fajardo-Mellor et al. 2006): 0, males are larger than females; 1, females are larger than males.
28. Number of double-headed ribs (Murakami et al. 2012b): 0, ≤ 7 ; 1, 8; 2, ≥ 9 .
29. Location of premaxillary foramen on the premaxilla (Murakami et al. 2012b): 0, midpoint to lateral; 1, medial.
30. Number of lumbar vertebrae (Murakami et al. 2012b): 0, 13–15; 1, 16–19; 2, 20–25.
31. Fossa for posterior sinus in exoccipital (Murakami et al. 2012b): 0, absent or slightly concave; 1, moderately concave; 2, forming a deep sack-like structure.
32. Dorsal condyloid fossa (Murakami et al. 2012b): 0, present, situated anterodorsal to dorsal edge of condyle; 1, forming a deep pit.
33. Ventral edge of zygomatic process of squamosal in lateral view (Murakami et al. 2012b): 0, concave; 1, almost straight; 2, convex.
34. Frontals posterior to nasals and between premaxillae (Murakami et al. 2012b): 0, narrower than transverse width of nasals, maxillae expanded medially posterior to nasals; 1, same as transverse width of nasals; 2, wider than maximum transverse width across nasals.
35. Lateral lamina of palatine (Murakami et al. 2012b): 0, does not form a bony bridge over orbit; 1, forms a bony bridge over orbit.
36. Posterior process of periotic in lateral view (Murakami et al. 2012b): 0, ventrally bent; 1, in the same plane as the body of periotic.

SOM 2. Character-taxon matrix.

0, primitive state; 1, 2, 3, derived states; a, 0 and 1 or intermediate between 0 and 1; b, 1 and 2 or intermediate between 1 and 2; ?, missing data; -, not applicable.

<i>Kentriodon pernix</i>	00000-0000	0000000000	00?????00?	000000
<i>Delphinodon dividum</i>	10000-0000	?a0?20?00?	0000???????	???????
<i>Salumiphocaena stocktoni</i>	1102100120	10??10?0??	?????????1?	?1?11?
<i>Piscolithax tedfordi</i>	1012101112	011?1?10??	?0??????0?	??11?0
<i>Piscolithax boreios</i>	0002100122	010?0010??	?????????0?	?1?010
<i>Piscolithax longirostris</i>	0002100112	001a001010	00??????0?	2?11?0
<i>Lomacetus ginsburgi</i>	0102100120	00000?0???	??00?????0?	21?01?
<i>Australithax intermedia</i>	?102100120	0011???????	?????????0?	1110??
<i>Haborophocoena toyoshimai</i>	?011101?20	11?0?01???	?????????1?	110010
<i>Haborophocoena minutus</i>	?011101121	11?1???????	?????????1?	?1001?
<i>Brabocetus gigasei</i>	?1121a1?b1	0aa0???????	?????????1?	1000??
<i>Septemtriocetus bosselaersi</i>	?011101?20	01a1???????	?????????1?	1020??
<i>Pterophocaena nishinoi</i>	?000???????	0001??10??	?????????0?	110?00
<i>Archaeophocaena teshioensis</i>	???100?1??	?10???????	?????????1?	??0???
<i>Miophocaena nishinoi</i>	?011011?21	?10???????	?????????1?	???0??
<i>Semirostrum cerutti</i>	0012000011	11??0010??	?100???????	?1a0?0
<i>Phocoena sinus</i>	2002110121	011?311110	0110001000	101201
<i>Phocoena dioptrica</i>	200211012b	111131122a	0011a102a1	1a1201
<i>Phocoena phocoena</i>	20a2110a2a	11112111b1	1001a01001	211201
<i>Phocoenoides dalli</i>	21021a01bb	11112a1221	11001102a2	2aa201
<i>Neophocaena phocaenoides</i>	2012110a2b	11a1311111	00a0a00ba0	201201
<i>Phocoena spinipinnis</i>	2a02110121	0111311110	0100000100	1aa201

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