



[http://app.pan.pl/SOM/app60-Boessenecker\\_etal\\_SOM.pdf](http://app.pan.pl/SOM/app60-Boessenecker_etal_SOM.pdf)

SUPPLEMENTARY ONLINE MATERIAL FOR

**Globicephaline whales from the Mio-Pliocene  
Purisima Formation of central California, USA**

Robert W. Boessenecker, Frank A. Perry, and Jonathan H. Geisler

Published in *Acta Palaeontologica Polonica* 2015 60 (1): 113-122.  
<http://dx.doi.org/10.4202/app.2013.0019>

**Supplementary Online Material**

**Table S1.** Measurements of promontorium length and bony nares width of modern and fossil delphinidans.

**Table S2.** List of globicephaline fossil records.

**References**

**Table S1.** Measurements of promontorium length and bony nares width of modern and fossil delphinidans (in mm). Abbreviations: AMNH, American Museum of Natural History, NY, USA; CMM, Calvert Marine Museum, MD, USA; HMNH, Haboro Museum of Natural History, Japan; LACM, Natural History Museum of Los Angeles County, Los Angeles, CA, USA; MB, Museo Giovanni Capellini, Bologna, Italy; MNHN, Museum National d'Histoire Naturelle, Paris, France; UCR, University of California at Riverside, CA, USA; USNM, US National Museum, Washington D.C., USA.

Taxon	Museum	Number	Side	Promontorium length	Nares width
<i>Albireo whistleri</i>	UCR	1489	left	12.75	59.31
<i>Atocetus iquensis</i>	MNHN	PPI 113	both	10.75	38.3
<i>Atocetus nasalis</i>	LACM	30093	left	11.4	35.2
<i>Brachydelphis mazeasi</i>	MNHN	PPI 121	both	11	24.7
<i>Cephalorhynchus commersoni</i>	USNM	550449	right	10.51	33.9
<i>Delphinodon dividium</i>	USNM	7278	left	11.86	32.93
<i>Delphinus delphis</i>	AMNH	239137	both	11.455	43.7
<i>Delphinus delphis</i>	AMNH	100127	both	12.845	40.5
<i>Feresa attenuata</i>	USNM	504916	right	13.8	49.7
<i>Feresa attenuata</i>	USNM	504917	both	12.5	49.4
<i>Feresa attenuata</i>	USNM	395177	right	14.3	48.5
<i>Globicephala macrorhynchus</i>	USNM	22571	both	16.1	84.1
<i>Globicephala melas</i>	AMNH	34934	left	16.28	89.4
<i>Grampus griseus</i>	USNM	550393	right	15.13	66.2
<i>Grampus griseus</i>	USNM	550437	right	14.23	61
<i>Haborophocoena toyoshimai</i>	HMNH	110-1	left	12.89	49.35
<i>Inia geoffrensis</i>	AMNH	209104	both	15.255	27.9
<i>Inia geoffrensis</i>	AMNH	209102	both	15.4	28.8
<i>Inia geoffrensis</i>	AMNH	209101	left	15.61	25.4
<i>Kentriodon pernix</i>	USNM	8060	both	10.62	17.81
<i>Lagenorhynchus obliquidens</i>	USNM	504413	right	12.4	58.1
<i>Lagenorhynchus obliquidens</i>	USNM	550497	right	11.5	55.2
<i>Lagenorhynchus albirostris</i>	USNM	504659	right	13.5	73
<i>Lagenorhynchus albirostris</i>	USNM	550208	right	12.4	73.2
<i>Leucopleurus acutus</i>	USNM	14279	right	12.58	57.47
<i>Leucopleurus acutus</i>	USNM	504196	left	11.7	57.7
<i>Liolithax pappus</i>	USNM	15985	left	11.64	35.23
<i>Lipotes vexillifer</i>	AMNH	57333	both	17.2	40.26

<i>Lissodelphis borealis</i>	USNM	286872	right	12.06	52.25
<i>Lissodelphis borealis</i>	USNM	290625	left	11.99	54.06
<i>Lissodelphis borealis</i>	USNM	290626	both	12.02	53.13
<i>Lophocetus calvertensis</i>	USNM	16314	both	14.84	45.63
<i>Macrokentriodon morani</i>	CMM	V-15	right	12.9	60.3
<i>Monodon monoceras</i>	AMNH	19318	left	17.54	56.1
<i>Monodon monoceras</i>	AMNH	16733	right	17.09	61.4
<i>Monodon monoceras</i>	AMNH	19314	right	16.96	51.9
<i>Monodon monoceras</i>	AMNH	19318	right	17.13	56.1
<i>Orcaella brevirostris</i>	USNM	199743	right	12.78	48.2
<i>Orcinus orca</i>	AMNH	80294	both	25.5	144.4
<i>Peponocephala electra</i>	USNM	504505	both	12.7	56.1
<i>Peponocephala electra</i>	USNM	550399	both	11.9	58.3
<i>Piscolithax longirostris</i>	MNHN	SAS 934	both	11.95	46.7
<i>Pliopontos littoralis</i>	MNHN	SAS 953	right	10.1	26.5
<i>Pontoporia blainvillei</i>	AMNH	254560	right	11.47	20.6
<i>Pontoporia blainvillei</i>	AMNH	254554	right	11.5	24
<i>Pontoporia blainvillei</i>	AMNH	254557	both	10.07	22.1
<i>Pontoporia blainvillei</i>	AMNH	254556	both	10.905	20.9
<i>Pontoporia blainvillei</i>	AMNH	254558	both	11.235	21.8
<i>Pontoporia blainvillei</i>	AMNH	254559	both	9.82	23
<i>Pontoporia blainvillei</i>	AMNH	254553	both	10.53	22.4
<i>Pontoporia blainvillei</i>	AMNH	254555	left	11.05	20.5
<i>Pseudorca crassidens</i>	USNM	11320	right	19.4	88.6
<i>Pseudorca crassidens</i>	USNM	501200	right	16.2	77.6
<i>Sotalia fluviatilis</i>	USNM	253476	both	12.195	34.9
<i>Stenella clymene</i>	AMNH	239115	left	12.52	45.51
<i>Tursiops osenae</i>	MB	8561	right	12	59
<i>Tursiops truncatus</i>	AMNH	35428	both	13.925	52.2
<i>Tursiops truncatus</i>	AMNH	212554	left	14.12	54.8
<i>Tursiops truncatus</i>	AMNH	217686	right	14.68	54.6
<i>Tursiops truncatus</i>	AMNH	22989	both	14.72	56.1
<i>Tursiops truncatus</i>	AMNH	180808	left	12.71	54.3
Unnamed delphinidan	LACM	52147	both	12.2	49.4

**Table S2.** List of globicephaline fossil records. Asterisk denotes figured specimens.

Taxon	Element	Stratum	Age	Locality	Reference
" <i>Globicephala</i> -like"	not indicated	unknown (dredged)	middle Pliocene-early Pleistocene	Netherlands	Post and Kompanje 2010
" <i>Grampus</i> group"*	petrosals	unnamed unit	Pliocene	Italy	Bianucci 1996
" <i>Hemisyntrochelus</i> group"*	petrosals	unnamed unit	Pliocene	Italy	Bianucci 1996
" <i>Pseudorca yuanliensis</i> "	cranium and skeleton	unknown (dredged)	late Pleistocene	Taiwan	Chang and Cheng 1998
aff. <i>Globicephala</i>	not indicated	upper Capistrano Formation	late Pliocene	California, USA	Barnes 1977
<i>Arimidelphis sorbini</i> l*	cranium and skeleton	"Pliocene of Marecchia River"	middle-late Pliocene	Italy	Bianucci 2005
<i>Globicephala etrusiae</i> *	mandibles	unnamed unit	middle Pliocene	Italy	Pilleri 1987
<i>Globicephala macrorhynchus</i> *	cranium	unnamed unit	early Pleistocene	Florida, USA	Sellards 1916
<i>Globicephala macrorhynchus</i> *	cranium	unknown (dredged)	late Pleistocene	Taiwan	Chang 1996
<i>Globicephala melas</i> *	tooth	unnamed unit	late Pleistocene	Spain	Corchon et al. 2008
<i>Globicephala</i> sp.*	cranium	unknown (dredged)	early Pliocene	eastern South Pacific	Valenzuela and Brito 1994
<i>Globicephala</i> sp.*	cranium	Greta Siltstone	Neogene	New Zealand	King et al. 2009
<i>Globicephala</i> sp.*	petrosal	Red Crag	Plio-Pleistocene	United Kingdom	Lydekker 1887
<i>Globicephala</i> sp.*	petrosals, mandible	Yorktown Formation	early Pliocene	North Carolina, USA	Whitmore and Kaltenbach 2008
Globicephalinae indet.*	humerus	Pisco Formation	late Miocene	Peru	Muizon 1984
Globicephalinae indet.	partial crania	unknown (dredged)	unknown	Spain	Mijan 2007
Globicephalinae indet.	partial cranium, teeth	Nakatsu Formation	middle Pliocene	Japan	Oishi and Hasegawa 1995
Globicephalinae indet.	earbones	unknown (dredged)	unknown	eastern South Pacific, multiple locations	Turner 1880
Globicephalinae indet.*	earbones	unknown (dredged)	unknown	eastern South	Eastman 1906

				Pacific	
Globicephalinae indet. 1*	cranium	Purisima Formation	late Miocene- middle Pliocene	California, USA	Boessenecker et al. 2015
Globicephalinae indet. 2*	petrosals	Purisima Formation	early- middle Pliocene	California, USA	Boessenecker et al. 2015
Globicephalinae new genus	cranium and skeleton	unnamed unit	early Pleistocene	Italy	Bianucci et al. 2009
<i>Grampus griseus</i>	tooth	Ibaraki	early Pliocene	Japan	Oishi and Hasegawa 1995
<i>Hemisyntachelus cortesii</i> *	cranium and skeleton	unnamed unit	Pliocene	Italy	Bianucci 1996
<i>Hemisyntachelus oligodon</i> *	cranium and skeleton	Pisco Formation	late Miocene	Peru	Pilleri and Siber 1989
<i>Hemisyntachelus pisanus</i> *	cranium and skeleton	unnamed unit	Pliocene	Italy	Bianucci (1996)
<i>Hemisyntachelus</i> sp.	not indicated	Bahia Inglesa Formation	Pliocene	Chile	Bianucci et al. 2006
<i>Hemisyntachelus</i> sp.*	mandible	Westkapelle Ground Formation	late Pliocene	Netherlands	Post and Bosselaers 2005
<i>Orcinus citioniensis</i> *	cranium and skeleton	unnamed unit	middle Pliocene	Italy	Bianucci 1996
<i>Orcinus orca</i>	vertebra	unnamed unit	Pliocene	Japan	Oishi and Hasegawa 1995
<i>Orcinus</i> sp.*	tooth	Setana Formation	early Pleistocene	Japan	Kohno and Tomida 1993
<i>Orcinus</i> sp.*	petrosal	Red Crag	Plio- Pleistocene	United Kingdom	Lyddeker 1887
<i>Orcinus?</i> sp.	cranium	Greta Siltstone	late Pliocene- early Pleistocene	New Zealand	King et al. 2009
<i>Plataleorostrum hoekmani</i> *	cranium	unknown (dredged)	middle Pliocene- early Pleistocene	North Sea	Post and Kompanje 2010
<i>Protoglobicephal a mexicanus</i> *	Cranium, earbones, tooth	unnamed unit	middle Pliocene	Baja California, Mexico	Aguirre Fernandez et al. 2009
<i>Pseudorca crassidens</i> *	petrosal	unknown (dredged)	late Pleistocene	South Carolina, USA	Sanders 2002
<i>Pseudorca</i> sp.*	cranium, petrosals, teeth	Yorktown Formation	early Pliocene	North Carolina, USA	Whitmore and Kaltenbach 2008
<i>Pseudorca yokoyamai</i> *	mandible	Sanuki Formation	Pliocene	Japan	Matsumoto 1926

<i>Pseudorca yokoyamai</i>	teeth	Nakazoto Formation	early Pleistocene	Japan	Oishi and Hasegawa 1995
<i>Pseudorca yokoyamai</i>	teeth	Umegase Formation	early Pleistocene	Japan	Oishi and Hasegawa 1995
<i>Pseudorca?</i> sp.	cranium	Te Aute Limestone	late Pliocene	New Zealand	King et al. 2009

## References

- Aguirre-Fernández, G., Barnes, L.G., Aranda-Manteca, F.J., and Fernández-Rivera, J.R. 2009. *Protoglobicephala mexicana*, a new genus and species of Pliocene fossil dolphin (Cetacea; Odontoceti; Delphinidae) from the Gulf of California, Mexico. *Boletín de la Sociedad Geológica Mexicana* 61: 245-265.
- Barnes, L.G. 1977. Outline of eastern North Pacific fossil cetacean assemblages. *Systematic Zoology* 25: 321-343.
- Bianucci, G. 1996. The Odontoceti (Mammalia, Cetacea) from Italian Pliocene systematics and phylogenesis of Delphinidae. *Palaeontographica Italica* 83: 73-167.
- Bianucci, G. 2005. *Arimidelphis sorbinii* a new small killer whale-like dolphin from the Pliocene of Marecchia River (Central eastern Italy) and a phylogenetic analysis of the Orcininae (Cetacea: Odontoceti). *Rivista Italiana di Paleontologia e Stratigrafia* 111: 329-344.
- Bianucci, G., Cherin, M., Tinelli, C., and Varola, A. 2009. A nearly complete skeleton of a new pilot whale-like dolphin from early Pleistocene of southern Italy. *Journal of Vertebrate Paleontology* 29 (3, supplement): 63A.
- Bianucci, G., Sorbi, S., Suarez, M.E., and Landini, W. 2006. The southernmost sirenian record in the eastern Pacific Ocean, from the Late Miocene of Chile. *Comptes Rendus Palevol* 5: 945-952.
- Boessenecker, R.W., Perry, F.A., and Geisler, J.H. 2015. Globicephaline whales from the Mio-Pliocene Purisima Formation of central California, USA. *Acta Palaeontologica Polonica* 60: 113-122.
- Chang, C.H. 1996. The first fossil record of a short-finned pilot whale (*Globicephala macrorhynchus*) from the Penghu Channel. *Bulletin of the National Museum of Science (Taichung)* 8: 73-80.
- Chang, C.H. and Cheng, Y.N. 1998. Extraordinary fossil records of Cetacea from Pleistocene in Taiwan. *The Ryukyu Islands Symposium* 26: 85.
- Corchon, M.S., Mateos, A., Fernandez, E.A., Penalver, E., Delclos, X., and Made, J. 2008. Ressources complémentaires et mobilité dans le Magdalénien cantabrique. Nouvelles données sur les mammifères marins, les crustacés, les mollusques et les roches organogènes de la Grotte de las Caldas (Astures, Espagne). *L'anthropologie* 112: 284-327.
- Eastman, C.R. 1906. Shark's teeth and cetacean bones. *Bulletin of the Museum of Comparative Zoology* 50: 75-98.
- King, C.M., Roberts, C.D., Bell, B.D., Fordyce, R.E., Nicoll, R.S., Worthy, T.H., Paulin, C.D., Hitchmough, R.A., Keyes, I.W., Baker, A.N., Stewart, A.L., Hiller, N., McDowall, R.M., Holdaway, R.N., McPhee, R.P., Schwarzshans, W.W., Tennyson, A.J.D., Rust, S., and Macadie, I. 2009. Phylum Chordata. Lancelets, fish, amphibians, reptiles, birds, and mammals. In: D.P. Gordon (ed.) *The New Zealand Inventory of Biodiversity: A Species 2000 Symposium Review*, 433-553. University of Canterbury Press, Christchurch.

- Kohno, N. and Tomida, Y. 1993. Marine mammal teeth (Otariidae and Delphinidae) from the early Pleistocene Setana Formation, Hokkaido, Japan. *Bulletin of the National Science Museum, Series C (Geology and Paleontology)* 19: 139-146.
- Lydekker, R. 1887. The Cetacea of the Suffolk Crag. *Quarterly Journal of the Geological Society of London* 43: 7-18.
- Matsumoto, H. 1926. On some fossil cetaceans of Japan. *Science Reports of the Tohoku Imperial University Second Series (Geology)* 10: 17-27.
- Mijan, I. 2007. Hallazgos de restos fósiles de *Hyperoodon* sp. (Cetacea, Ziphiidae) en las costas Gallegas (NO España). *Revista de Biología Marina y Oceanografía* 42: 253-360.
- Muizon, C. de 1984. Les vertébrés fossiles de la Formation Pisco (Pérou), Deuxieme partie: Les odontocètes (Cetacea, Mammalia) du Pliocène inférieur de Sud-Sacaco. *Travaux de l'Institut français d'Études Andines* 50: 1-188.
- Oishi, M., and Hasegawa, Y. 1995a. A list of fossil cetaceans in Japan. *The Island Arc* 3: 493-505.
- Pilleri, G. 1987. The Cetacea of the Italian Pliocene with a descriptive catalogue of the species in the Florence Museum of Paleontology. Vamalan Kirjapaino Oy, Vammala. 160 pp.
- Pilleri, G. and Siber, H.J. 1989. Neuer delphinid (Cetacea, Odontoceti) aus der Pisco-Formation Perus. In G. Pilleri (ed.), *Beiträge zur Paläontologie der Cetacean Perus*, 167-175. Hirnanatomisches Institut der Universität Bern, Ostermundigen.
- Post, K. and Bosselaers, M. 2005. Late Pliocene occurrence of *Hemisyntrachelus* (Odontoceti, Delphinidae) in the southern North Sea. *Deinsea* 11: 29-45.
- Post, K. and Kompanje, E.J.O. 2010. A new dolphin (Cetacea, Delphinidae) from the Plio-Pleistocene of the North Sea. *Deinsea* 14: 1-12.
- Sanders, A.E. 2002. Additions to the Pleistocene mammal faunas of South Carolina, North Carolina, and Georgia. *American Philosophical Society* 92: 1-152.
- Sellards, E.H. 1916. Fossil vertebrates from Florida: a new Miocene fauna, new Pliocene species; the Pleistocene fauna. *Florida State Geological Survey Annual Report* 8: 79-199.
- Turner, W. 1880. Report on the bones of Cetacea. *Scientific Results of the Voyage of the H.M.S. Challenger during the years of 1873-1876* 4: 1-37.
- Valenzuela, E., and Brito, J.L. 1994. Procedencia y datacion preliminar de un delfinido fosil del genero *Globicephala*. *Congreso Geologico Chileno* 7: 548-550.
- Whitmore, F.C., and Kaltenbach, J.A. 2008. Neogene Cetacea of the Lee Creek Phosphate Mine, North Carolina. *Virginia Museum of Natural History Special Publication* 14: 181-269.