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A FOSSIL PORPOISE FROM CALIFORNIA

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Mr. Charles H. Sternberg has submitted for determination a fragment of a small cetacean rostrum found in a formation said to be of Pleistocene age at San Diego, California. The specimen is of interest on several counts. First, it tends to confirm the former existence in California of a member of the subfamily Stenodelphininae, already suspected by Glover M. Allen¹ on the evidence of some fragmentary remains, chiefly of the posterior part of the rostrum. Secondly, this subfamily (as understood by Miller²) may have formerly had a rather wide distribution, members of it having been recorded from (a) the Parana Pliocene formation of the Argentine Republic (*Pontistes.rectifrons* Burmeister and *Pontivaga fischeri* Ameghino); (b) the Merced Pliocene of California (*Lonchodelphis occiduus* (Leidy)); and (c) the supposedly Pleistocene specimen hereinafter described. The still existing member of the subfamily (*Stenodelphis blainvilliei*) survives in some of the fresh-water streams of Argentina, Uruguay, and Brazil, from the Rio de la Plata on the south to the Rio Grande do Sul on the north. Thirdly, the specimen under consideration reveals a very specialized and peculiar dentition which is similar in many respects to that of the living *Stenodelphis*.

***Stenodelphis sternbergi*, new species**

TYPE.—Amer. Mus. No. 21905. A rostral fragment 127.5 mm. in length, bearing 24 teeth and with 3 vacant alveoli.

LOCALITY.—India Street at West Walnut, about 2 miles from the Plaza, in the city of San Diego, California. Collector, John Reiland.

HORIZON.—Specimen was found in recent earth, having been washed out of its original horizon. It lay immediately above a heavy layer of infusorial earth of Pleistocene age, and as all formations above and below are of Pleistocene age, Mr. Sternberg is of the opinion that specimens might wash out very rapidly.

The most striking feature of Mr. Sternberg's specimen is the relatively good state of preservation and very remarkable form of the teeth. Each maxillary tooth ends in a slender anteroposteriorly compressed

¹Allen, G. M. 1904. 'The *Delphinus occiduus* of Leidy,' Journ. Mam., V, No. 3, August, pp. 194-195.

²Miller, G. S., Jr. 1923. 'The Telescoping of the Cetacean Skull.' Smithson. Misc. Coll., LXXVI, Pub. 2720, August 31, pp. 34, 50-51.

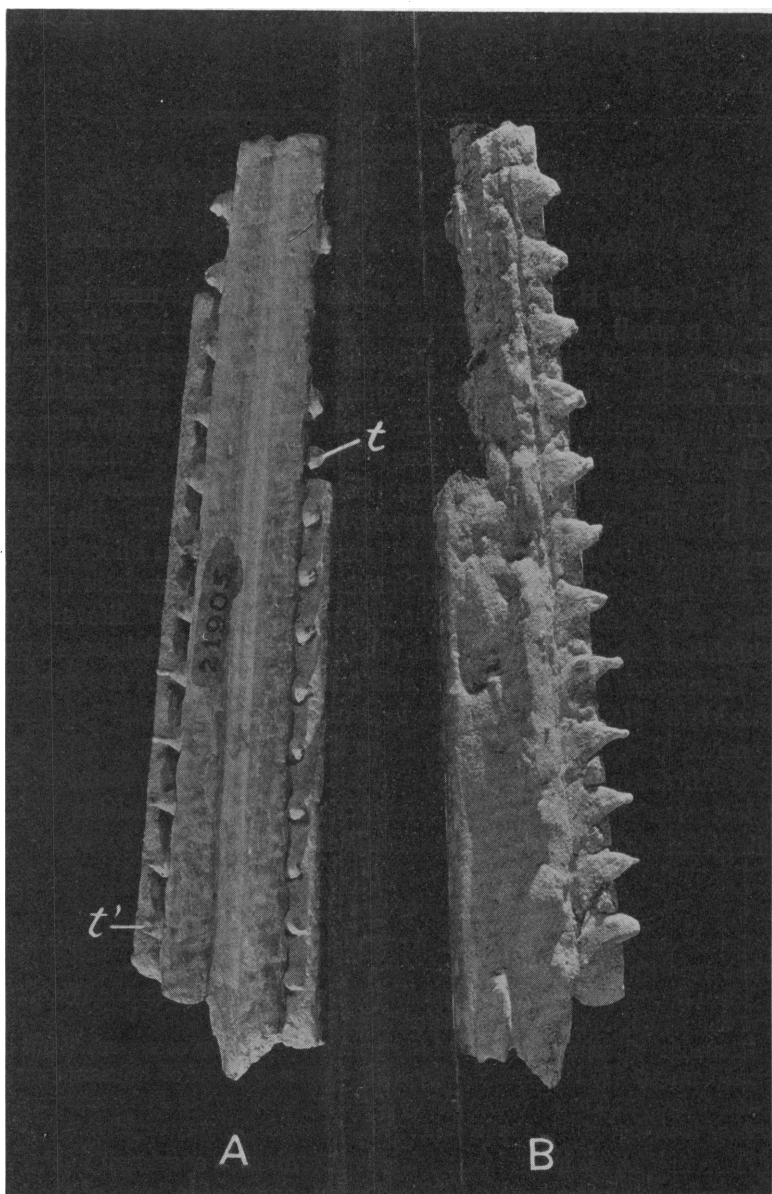


Fig. 1. *Stenodelphis sternbergi*. Type rostrum. A. M. No. 21905. $\times 1$.

A. Ventral view, showing the deep median groove and the alveolar channels with teeth in place; *t*, tooth shown in Fig. 3, *t'*, tooth shown in Fig. 2.
 B. Dorsal view, after removal, on the right side only, of the dorsal half of the alveolar portion of the maxilla, showing the flattened triangular teeth with widely extended bases.

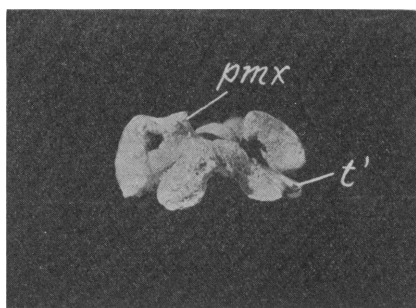
crown of no unusual appearance, but the portion embedded in the maxilla and representing the root is shaped somewhat like a heraldic battle axe. Each axe is deeply and firmly implanted in the maxilla with the blades directed fore and aft and the general plane of the tooth inclining gently downward and outward. The anterior border of the axe is relatively short and the blade is produced distally into a short tip, while the posterior border is longer and is produced distally into a longer posterior process which projects slightly beyond the anterior top of the succeeding tooth, the anterior edge of the root-blade thus being inclined gently to the mid-line. The alveoli where preserved are slightly oval in outline. They open into a deep longitudinal groove running the whole length of the rostrum so far as preserved, paralleling conditions in *Stenodelphis*. In life this groove was doubtless covered by the strong dental ligament which the conical crowns penetrated. A dental ligament of this sort is present on the *Stenodelphis* skull. The whole arrangement seems to afford a very secure implantation of the teeth during life; the teeth are arranged in only a single series, in contrast to the more loosely implanted teeth and multiple succession of many longirostrate reptiles and fishes.

There are 12 teeth in place on the right maxilla. On the left maxilla there are likewise 12 teeth and 3 vacant alveoli. The crowns of these teeth are compressed anteroposteriorly, while the roots are flattened transversely. The enamel crowns are missing on practically all of the teeth, but the third, fourth, and fifth on the right side, counting forward from the posterior end, exhibit portions of the original crown. The roots expand abruptly below the enamel crown, but there is no indication of an annular enlargement in the region of the neck. In contrast to *Stenodelphis* the teeth of the San Diego specimen are much less closely spaced, the 12 teeth in the right maxilla occupying the space of 33 in *Stenodelphis*.

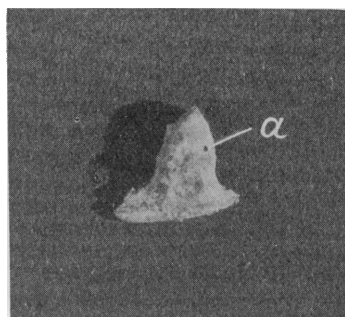
The teeth of *Stenodelphis* agree remarkably well with those of the San Diego specimen and are implanted in a deep longitudinal groove; the slender crowns are compressed anteroposteriorly and the roots transversely; the blade-like roots are relatively smaller than those of the San Diego specimen, but the general shape of the blade is the same. A relatively large annular enlargement or collar separates the enamel crown from the transversely compressed blade-like root. This annular enlargement is embedded in the dental ligament, and it may have no other functional significance than to prevent the teeth from being pulled out. In *Stenodelphis*, the crowns of the teeth are generally longer than the roots, while the San Diego specimen, judging from the taper of the basal portion of the crown, had teeth with roots much longer than the crowns.

Slender crowned teeth, with transversely compressed and antero-posteriorly expanded roots, are found in a number of unrelated fossil and living porpoises, but chiefly in the families Delphinidæ and Iniidæ. A specimen of the Calvert Miocene *Rhabdosteus latiradix* Cope in the United States National Museum has maxillary teeth of this type.

The portion of the San Diego rostrum preserved resembles in some respects that of the European Lower and Middle Miocene *Schizodelphis* (*Cyrtodelphis*) *sulcatus*¹ and the Maryland Calvert Miocene *Schizodelphis*



2



3

Fig. 2. Rear view of type maxilla. $\times 1$.

Shows the deep median groove, the lower and upper halves of the alveolar region, the oblique insertion of the teeth (t') and the dorsal concavity of the premaxilla. On the left, a bit of the premaxilla (pmx) lies dorsomedially to the hole.

Fig. 3. A single tooth of the "battle-axe" type. $\times 2$.

Dorsal surface of a tooth of the left maxilla (cf. Fig. 1, A, t); a , anterior border.

crassangulum (Case)², but is of course considerably smaller and differs also in some details of its construction. The teeth of the Italian Lower Miocene species have been studied critically by Dal Piaz³ and the illustrations which accompany his memoir are well selected for purposes of comparison. Professor Dal Piaz has suggested that the successive stages in the evolution of the dentition may be represented in the following toothed whales: (1) *Squalodon* with polyodont heterodont teeth; (2) *Saurodelphis* with polyodont pseudohomodont teeth; (3) *Schizodel-*

¹Abel, O. 1899. 'Untersuchungen über die Fossilen Platanistiden des Wiener Beckens,' Denkschrift Math. Naturw. Cl. K. Akad. Wiss., Bd. LXVIII, pp. 839-874, Pls. I-III.

Dal Piaz, G. 1901. 'Di alcuni resti di *Cyrtodelphis sulcatus* dell'arenaria miocenica di Belluno,' Palaeontographia Italica, VII, pp. 287-292, Pl. xxxiv; 1903, 'Sugli avanzi di *Cyrtodelphis sulcatus* dell'arenaria di Belluno,' Palaeontographia Italica, IX, pp. 187-220, Pls. xxviii-xxxii, text figs. 1-16.

²True, F. W. 1908. 'On the Occurrence of Remains of Fossil Cetaceans of the Genus *Schizodelphis* in the United States and on *Priscodelphinus* (?) *crassangulum* Case,' Smithsonian Misc. Coll., L, Pub. 1782, pp. 449-460, Pls. LIX-LX.

³Dal Piaz, G. 1903. Palaeontographia Italica, IX, pp. 211-219, Pl. xxi, text figs. 11-16.

phis (= *Cyrtodelphis*) with polyodont pseudoheterodont teeth; and (4) *Stenodelphis* (= *Pontoporia*) with polyodont homodont teeth.

Among the extinct longirostrate dolphins, very few have any maxillary teeth preserved; the Lower Pliocene *Saurodelphis argentinus* from Parana, Argentine Republic, as figured by Burmeister,¹ shows one tooth of the battle-axe type, but with the blade less produced posteriorly than in the San Diego specimen; the latter also is perhaps only about half the size of Burmeister's specimen and the alveoli are relatively much smaller and more numerous, since there are 15 alveoli in a piece of the rostrum 127.5 mm. in length, whereas Burmeister's form has only 17 alveoli in an entire rostrum of 500 mm. length. Cabrera,² after a very careful study of the type specimen, has concluded that *Saurodelphis* belongs in the family Iniidae.

In so far as the roots of the teeth of the San Diego rostrum are concerned, they are similar to those of *Lipotes vexillifer*³ and *Inia geoffrensis*, but differ in having the enamel on the crown smooth instead of rugose, and the roots are much more compressed and with the blade much more anteroposteriorly expanded. Not improbably this battle-axe type of root may have been derived ultimately from a two-rooted compressed type such as is revealed in the Calvert Miocene *Eurhinodelphis bossi*⁴; it may prove to be either structurally ancestral to the more simple peg-like teeth of other living Odontoceti or an adaptive elaboration of a transversely compressed root.

*Pontistes rectifrons*⁵ is based on a cranium lacking the distal portion of the rostrum and the teeth, but otherwise quite complete, found in the Pliocene marine deposits on the banks of the Parana River near the town of Parana, Argentine Republic.

This skull shows a striking resemblance to *Stenodelphis*, but is twice as large in all its dimensions. Contrasted with *Stenodelphis*, the teeth of *Pontistes* were from two to three times as large in diameter and much less closely spaced, the four posterior teeth occupying the space of 13 in *Stenodelphis*. Burmeister estimated that the whole number of teeth in one side of the jaw in the former genus was probably about 40 to 42, while in *Stenodelphis* the number is from 53 to 59. Two detached teeth

¹Burmeister, H. 1892 (1891). Anal. Mus. Nac. Buenos Aires, III, Entr. 18, Pl. viii.

²Cabrera, A. 1926. 'Cetáceos Fósiles del Museo de la Plata,' Revista del Museo de La Plata, XXIX, pp. 396-403.

³Miller, G. S., Jr. 1918. 'A New River Dolphin from China,' Smithsonian. Misc. Coll., LXVIII, Pub. 2486, March 30, pp. 6-8, text fig. 1.

⁴Kellogg, R. 1925. 'On the Occurrence of Remains of Fossil Porpoises of the Genus *Eurhinodelphis* in North America,' Proc. U. S. Nat. Mus., LXVI, Pub. 2563, May 23, p. 20, text figs. 1-4.

⁵Burmeister, H. 1885. Anal. Mus. Nac. Buenos Aires, III, Entr. 14, pp. 138-144, Pl. ii, fig. 12. See also, Abel, O. 1901. 'Les Dauphins Longirostres du Boldérien (Miocène supérieur des environs d'Anvers),' Mém. Mus. Roy. d'Hist. Nat. de Belgique, I, Pl. i, fig. 4, and Pl. iii, fig. 1.

were figured by Burmeister in 1885 as belonging to the type skull of *Pontistes*, but on what evidence he does not state. Burmeister remarks that each of these teeth has a conical root, a little curved at the point, 18 mm. long and 5 mm. thick at the base. The teeth figured by Burmeister are quite different in form from those of *Stenodelphis* and the San Diego rostrum. The conformation of the Parana skull, on the other hand, agrees very closely with that of *Stenodelphis*.

*Pontivaga fischeri*¹ is known only from a portion of the symphysis of a mandible found in the Pliocene marine deposits near Parana. Notwithstanding the objections of Ameghino, both Burmeister and Cabrera have suggested that this mandibular fragment may belong to *Pontistes rectifrons*. The conformation of the mandible is such that one might expect some relationship with *Schizodelphis*. The teeth of *Pontivaga fischeri* are unknown or at least undescribed.

The rostral fragment of the Merced Pliocene *Lonchodelphis occiduus* is quite unlike that of the San Diego specimen and unfortunately lacks teeth, but the alveoli are distinct and regularly spaced, and the longitudinal alveolar gutter is absent.

The rostral fragment found at San Diego belonged to a dolphin with a somewhat wider and possibly longer rostrum than that of *Stenodelphis*. The premaxillary bones are missing. On the ventral face the maxillary bones are in contact along the median line, and the axial ridge of the vomer is not visible. The median ventral sulcus or longitudinal groove is similar to that on the proximal portion of the *Stenodelphis* rostrum, although it is much deeper and narrower on the distal portion of the rostrum of the latter, and the maxillæ tend to pull away from each other on the distal half of the rostrum. This separation of the maxillæ along the median line of the *Stenodelphis* rostrum may be due to drying out, for a more pronounced splitting along the median line of the rostrum occurs in the living *Delphinus*. The maxillary bones of the San Diego rostrum are so closely approximated along the median line that the suture is for the most part obliterated. As viewed from the side, the maxilla does not decrease in depth anteriorly as rapidly as in *Stenodelphis*, and the lateral surface is rather strongly convex. On the rostrum of *Stenodelphis* there is a deep longitudinal lateral groove between the maxilla and premaxilla which is coextensive with the tooth row. This groove seems to have been absent on the San Diego rostrum.

¹Ameghino, F. 1891. Revista Argentina Hist. Nat., Buenos Aires, I, Entr. 3a, June 1, pp. 165-166, fig. 73.

As stated above, the maxillary alveoli, rostrum, and teeth of *Stenodelphis* strongly recall those of the San Diego specimen, so that it is not unlikely that it pertains to the same genus, which thus may have ranged in Pleistocene times along the Pacific coast of South and North America at least as far north as California, and that the living form of the rivers in eastern South America is the sole survivor of a group which at one time had a much more extensive distribution. Differences in respect to the relative dimensions of the rostrum and the extremities of the transversely flattened roots, as well as the apparent absence of the lateral longitudinal rostral groove, are about all that can be offered to show that it is specifically different from *Stenodelphis blainvillei*.

It is hoped that better remains of the California form may be secured so as to settle the question of its generic relationships to the South American Pliocene stenodelphinids. In the meantime it may be named *Stenodelphis sternbergi*, new species, for the great collector whose name will always be honored by American palæontologists.

MEASUREMENTS OF THE ROSTRUM (IN MILLIMETERS)

Total length of rostral fragment along the median line.....	127.5
Width of rostrum at level of 3d tooth counting forward from posterior margin on left side.....	25.3
Width of rostrum at level of 9th tooth counting forward from posterior margin on left side.....	22.8
Depth of left maxilla at level of last tooth (1st tooth counting forward from posterior margin).....	12.8
Depth of left maxilla at level of 9th tooth counting forward from posterior margin.....	11.5
Depth of right maxilla at level of 12th tooth counting forward from posterior margin.....	10.9
Distance between inner margins of maxillæ (from dorsal view) at level of 3d tooth on left side, counting forward from posterior margin.....	15
Distance between inner margins of maxillæ (from dorsal view) at level of 9th tooth on left side, counting forward from posterior margin.....	13
Width of median ventral maxillary sulcus at level of last tooth (1st tooth counting forward from posterior margin on left side).....	3.7
Depth of median ventral maxillary sulcus at level of last tooth (1st tooth counting forward from posterior margin on left side).....	2.8
Last tooth on right side (1st counting forward from posterior margin) measures 8.5 mm. at expanded extremity of root and 3.8 mm. at level of alveolar gutter, with transverse diameter of 2.2 mm. at the same point. Height (with crown missing) 8 mm.	
First tooth on left side (14th counting forward from posterior margin) measures 8.6 mm. at expanded extremity of root, and 4.1 mm. at level of alveolar gutter, with transverse diameter of 2.4 mm. at same level. Height (with crown missing) 4.8 mm.	

