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A NEW FOSSIL TOOTHED WHALE FROM FLORIDA

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Through Dr. W. D. Matthew, the American Museum of Natural History received from the American Cyanamid Company, Brewster, Florida, a portion of the conjoined lower jaws of an extinct toothed whale. Hydraulic power is used by this company in working their pit and most of the cetacean material unearthed is unavoidably damaged by this method of operation. Some of the specimens crumble when the stream of water strikes them and others break up when they fall to the bottom of the pit. Although it is impossible to obtain undamaged specimens, many of those obtained from these deposits are of unusual interest. It is fortunate that some of the officials recognize the importance of such specimens and place those that are recovered in institutions where they will be preserved. These pits are excavated in what are known as the land pebble phosphate deposits. According to Dr. E. H. Sellards,[1] this pebble conglomerate may have accumulated under either marine or estuarine conditions, probably during late Miocene or early Pliocene time. Considerable uncertainty exists as to the precise age of these deposits, and this is due mainly to the curious mixture of land mammals, which are held to be of Lower Pliocene age by Dr. Matthew, and pelagic mammals, which occur elsewhere in deposits of Miocene age. One explanation of this occurrence would be that a marine deposit of Miocene age was reworked during Pliocene time, and remains of Miocene pelagic mammals were redeposited along with remains of contemporary Pliocene land mammals. This explanation hardly suffices, for I have been informed by Barnum Brown that he personally witnessed the excavation of an entire skeleton of a sirenian, possibly *Metaxytherium*, in one of these pits, but before the hydraulic apparatus could be shut off the entire specimen crumbled and broke when it fell. It is barely possible that this sirenian may have belonged to the Pliocene *Felsinotherium*, but no remains of this animal have ever been reported from these deposits. One would hardly expect to find complete skeletons of Miocene pelagic mammals in reworked deposits of Pliocene age. Of the three known genera of extinct

[1] E. H. Sellards, 1915. The pebble phosphates of Florida. 7th Ann. Rept. Florida State Geological Survey, pp. 58, 63.

porpoises found in these deposits, *Cyrtodelphis* [=*Schizodelphis*] has a geological range in Europe from the Lower to the Upper Miocene. *Pomatodelphis* occurs in the Middle Miocene of France, while the physeteroid hereinafter described is either unknown or not as yet recognized elsewhere. The sirenian, *Metaxytherium*, occurs in European deposits of Lower and Middle Miocene age. In so far as the pelagic mammals are concerned, no subsequent finds have been reported which would modify the writer's statement[1] published in 1924. For the privilege of making a study of this specimen I am indebted to Dr. George Gaylord Simpson.

Kogiopsis, new genus[2]

DIAGNOSIS.—Skull unknown. Mandible incomplete, but symphysis estimated to comprise one-third of its length. In general conformation similar to corresponding portions of mandibles of *Kogia*, but differs in having broader symphysis, six instead of eight teeth on symphysial portion of ramus, alveoli not extending over so far on lateral surface of ramus, and in addition is much larger. Rami firmly ankylosed in region of symphysis; dorsal surface of symphysis rather broad and flat; lateral surfaces of rami slope to mid-line of ventral face of symphysis. Large alveoli located on upper outer edge or angle of mandible. Ten teeth in each mandible, of which six are lodged in symphysis. Teeth long (3 to 4 inches in length), somewhat curved, with small crowns, without distinct neck, and rather closely spaced. Outer surface of cement wrinkled and ornamented with coarse longitudinal grooves. Outer surface of internal cone of dentine encircled by fine ridges.

Kogiopsis floridana, new species

TYPE.—Amer. Mus. No. 20470. Symphysial portion of lower jaws, with eleven teeth in place. Collected by W. D. Matthew in 1924.

HORIZON AND LOCALITY.—Land pebble phosphate deposits. American Cyanamid Company pit at Brewster, Polk County, Florida.

As will be observed from the photographs, this specimen exhibits some unusual features for a physeteroid whale. Contrasted with other known fossil sperm whales, the lower jaws seem to be unusually short. No characters are known which will with certainty distinguish mandibles of sperm whales of the family Physeteridæ from those belonging to the family Kogiidæ. The recent genus *Kogia* has a mandible with large alveoli placed on the upper outer angle of the ramus, and the intervening septa are either reduced or composed of spongy bone; the teeth are directed outward and forward. On the mandible of *Physeter*, the upper outer angle or edge is not disrupted by the alveoli, and the teeth are directed upward, although their apices may curve backward. This

[1] R. Kellogg, 1924. 'Tertiary pelagic mammals of eastern North America.' Bull. Geol. Soc. America, XXXV, p. 765. Dec. 30.

[2] *Kogia*: ὄψις—aspect; in allusion to the resemblance of these fragmentary remains to the mandibles of *Kogia*.

method of implantation of the teeth occurs in the mandibles of three genera of fossil Physeteridæ, but it is nevertheless true that the lower jaws of most of the recognized fossil genera are unknown. In this one feature, which may be of no consequence, the Florida specimen does

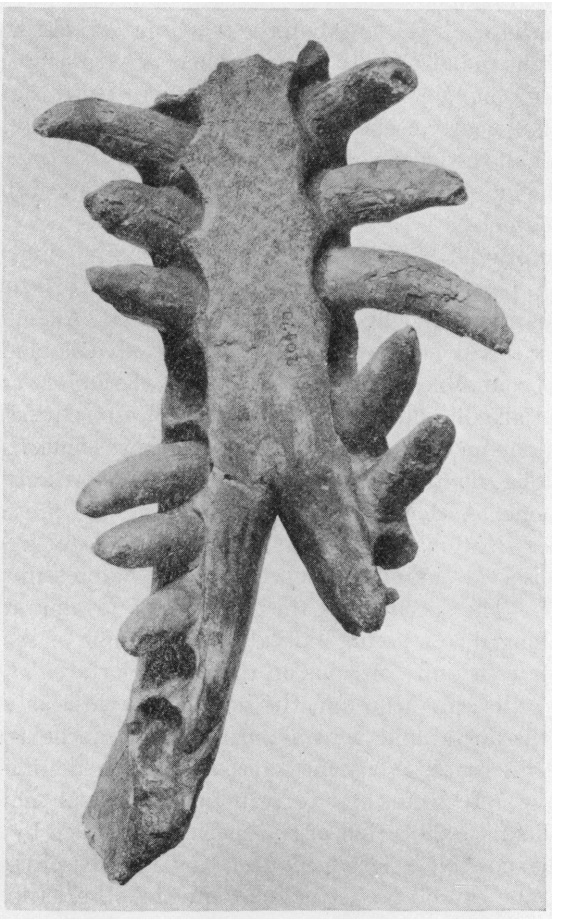

Fig. 1. *Kogiopsis floridana*, new genus and species. Type, A. M. No. 20470. Dorsal view of lower jaws.

agree with the recent genus *Kogia*. Whether or not this peculiarity is of sufficient importance to warrant a family allocation is uncertain, and for this reason this fossil cetacean is tentatively referred to the Kogiidæ. Structurally these lower jaws do resemble those of *Kogia*, and this whale

undoubtedly is a relative of members of one or the other of these two families of cetaceans.

In contrasting the relative peculiarities of these two families, it will be seen that *Kogia* has 12 or 13 and sometimes as many as 15 teeth in each mandible, of which 8 are lodged in the symphysis; the symphysis is slightly more than half the length of the toothrow and less than one third the length of the mandible. In *Physeter* there are from 19 to 27 teeth in each mandible, younger individuals having more teeth than old adults; the symphysis is nearly coextensive with the tooth row and is equivalent to more than half the length of the mandible. In both *Kogia* and *Physeter* the apex of the internal cone of dentine forms the crown of the tooth, and there is no enamel.

The symphysial region of these lower jaws differs from the corresponding portion of another cetacean from this same locality, which was described and figured by Dr. Glover M. Allen,[1] in having a much wider interval between the tooth rows, alveoli placed on outer lateral edge of mandibles, teeth directed outward and forward, large and closely spaced alveoli and coordinate instead of alternating teeth. The referred specimen mentioned by Dr. Allen, which was figured by Sellards,[2] belongs to a long snouted porpoise. This specimen formerly belonged to the International Agricultural Corporation, and was presented to the United States National Museum through the late Ned Hollister. Additional observations on this specimen will be presented in a forthcoming paper. The specimen in the Museum of Comparative Zoology may have belonged to a young individual, as the line of the symphysial union of the jaws is quite obvious on the dorsal surface. On the specimen in the American Museum, the line of ankylosis is well nigh obliterated on the dorsal and ventral surfaces, but can be traced. It is possible that differences in age may account for the dissimilarities enumerated above. It seems best to wait for additional material before making any definite allocation of the specimen handled by Dr. Allen.

As to the possible relationships of this Florida physeteroid with *Orycterocetus*, one can do no better than cite the observations of Joseph Leidy,[3] who states that the genotype *O. quadratidens* was originally based on two teeth and small fragments of an upper jaw from the Miocene of Virginia. The lower jaws of this species as well as the other referred species either have never been found or never recognized among the many

[1]G. M. Allen. 1921. 'Fossil Cetaceans from the Florida Phosphate Beds.' Journ. Mammalogy, II, No. 3, pp. 154–157, Pl. XII, fig. 14, August.

[2]E. H. Sellards, *op. cit.*, p. 103, fig. 32.

[3]J. Leidy, 1869. Journ. Acad. Nat. Sci. Philadelphia, (2) VII, pp. 436–437, Pl. XXX, figs. 16–17.

remains of fossil cetaceans obtained from nearby Maryland and Virginia. Hence no direct comparisons can be made between corresponding portions of these two physeteroids. The fragment of the upper jaw accompanying the teeth was about eight inches long, with alveoli for as many teeth. "The alveoli were separated by thin partitions, and their bottom was separated from the dental canal by a thick layer of porous bone. Two alveoli, perfect at their outer parapet, are an inch and three-fourths deep by an inch in diameter." Leidy describes the teeth as being "long and conical, one nearly straight, the other strongly curved. Near the apex they are rather ovoidal in transverse section, but towards the base

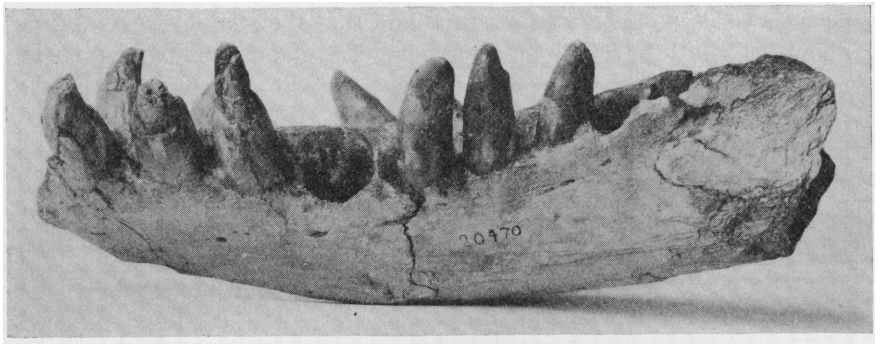

Fig. 2. *Kogiopsis floridana*, new genus and species. A M. No. 20470. Lateral view of left mandible.

assume a more quadrate character." The fine longitudinal ridges observed occur on the internal cone of ossified pulp and dentine of teeth of most fossil physeteroid whales, although these ridges can not be seen when the outer layer of cement is intact. In size these two teeth correspond rather closely with those of the Florida physeteroid. The available material, however, does not justify the allocation of the Florida physeteroid to the genus *Orycterocetus*.

Of the several genera of fossil European sperm whales, the teeth of *Physeterula dubusii* resemble most closely those of the Florida species, though the mandibles have a much longer symphysis. This sperm whale has a skull about 54 inches long, and according to Professor O. Abel[1] the mandible and maxillary are furnished with teeth. There are 20 teeth in each mandible, of which 12 are lodged in the symphysis. The tips of the teeth are compressed, and the septa between the alveoli are not less

[1]O. Abel. 1905. 'Les Odontocètes du Boldérien (Miocène supérieur) d'Anvers. Mém. Mus. roy. d'hist. nat. de Belgique, Bruxelles, III, pp. 74–82, figs. 11–12.

than 5 mm. The largest teeth are 130 mm. long, and the smallest are about half that length, or from 50 to 60 mm. The diameter of the root of a large tooth is 30 mm. The crown ends in a point, without enamel, and is formed solely of dentine. The apex of the tooth is encircled by a faint excrescence or swelling which marks the upper limit of the cement. The well worn ends of the teeth in the mandible point to the existence of functional teeth in the upper jaw. The wear is most marked on the posterior surfaces of these teeth. The basal half of the root is ornamented with ramifying deep longitudinal grooves. Peculiarities in the mandible and in the teeth distinguish the Florida specimen from *Physeterula*.

Judging from the curvature of the rami, it would appear that a short-jawed type is here represented and that the symphysis comprises about one-third the length of either jaw. The symphysial portion of the conjoined lower jaws seems to be nearly complete, and more of the left jaw than of the right is preserved. Although the distal end of the symphysis is somewhat eroded, the direction and close approximation of the anterior pair of alveoli, as well as the abrupt oblique upward slope of the ventral surface, indicate that very little has been destroyed. The left ramus measures 356 mm. in a straight line from the median line of the anterior end of the symphysis to its posterior broken edge, while the right ramus measures 259 mm. in length. The anteroposterior diameter of the symphysis, as preserved, is 202.5 mm. At the proximal end the depth of the symphysis is 80 mm. and at the level of the ninth pair of teeth 58.5 mm. The breadth of the combined lower jaws at the proximal end of the symphysis is 104 mm. and at the distal end 84 mm. At the posterior end of the symphysis the rami diverge at an angle of forty degrees. The lower border of the left ramus commences to curve outward at the level of the third alveolus, and the ramus narrows transversely toward the rear. The symphysis is heavy and solidly ankylosed, but the rami are not unusually deep in this region.

Viewed from the side, the symphysial portion of the jaws curves upward from the posterior to the anterior end. The distal end of the symphysis is truncated obliquely in a dorsoventral direction. The dorsal surface of the symphysis is flat, rather wide, and there is a faint indication of a longitudinal groove along the line of contact of the rami. On the specimen figured by Dr. Allen, the interalveolar region is rather narrow and the line of contact of the rami is deeply impressed. There are several small mental foramina on the outer surfaces of the rami in the region of the symphysis which are continuous posteriorly with similar foramina 10 to 15 mm. below the level of the alveoli.

All of the teeth are loosely implanted in the alveoli, which have the appearance of being much too large. The alveoli range from 24 to 34 mm. in diameter, and are rather closely spaced. The alveolus for the sixth tooth on the left side is 44.8 mm. deep, while the corresponding one

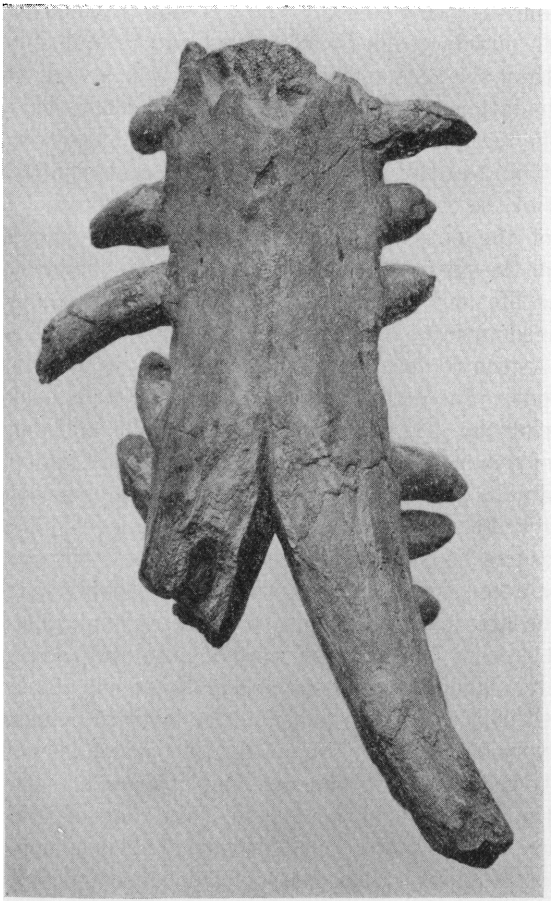

Fig. 3. *Kogiopsis floridana*, new genus and species. Type, A. M. No. 20470. Ventral view of lower jaws.

on the right side is 38.2 mm. deep. On the left ramus the first or proximal alveolus is 38 mm. deep and the second is 41.5 mm. deep. The third alveolus on the right side is 46 mm. deep. The large dental canal that extends through the mandible comes within 3 mm. of this alveolus.

The teeth are long, oval in cross section, and some of them are rather strongly curved. Their apical ends curve backward and are somewhat compressed from side to side. No distinct neck or constriction below the assumed limits of the crown can be observed on any of these teeth. The seventh tooth on the right side projects 81 mm. beyond the level of the alveolus, while the third tooth of the left side projects 43.7 mm. The seventh tooth, judging from those in front and behind, it not inserted to the full depth of the socket. Since most of these alveoli are larger than the teeth, the latter may have been held in place by a ligamentous gum.

All of the teeth are imperfectly fossilized and the cement especially is rather soft and pithy. The teeth fracture and crumble very readily. The summit of the crown on all of these teeth is abraded, and the ornamentation of the enamel, if originally present, is not ascertainable. Judging from the present condition of the teeth, the crowns were worn down during life and their present condition is only partially due to imperfect preservation. The crowns apparently were relatively small in comparison to the roots. All of the teeth possess a rather thick outer coat of cement. The eighth tooth on the left side is broken below the crown, showing the internal cone of ossified pulp and dentine, and the outer layer of cement. The outer layer of cement is lighter in color than the dentine and its thickness is equivalent to about one-sixth of the transverse diameter of the tooth at the corresponding level. The cement coat actually measures 3.5 mm. in thickness on the outer surface. On many of the teeth the outer surface of the cement is noticeably wrinkled or ornamented with coarse longitudinal grooves varying in number and depth on the different teeth. The internal cone of pulp and dentine is built up from concentric layers, each about one millimeter in thickness. On the seventh tooth in the left ramus, the outer layer of cement is partially destroyed, exposing the inner cone of dentine, which is encircled by thin ridges usually referred to as annular lines of growth. The pulp cavity is closed on the distal ends of these teeth. The roots of all these teeth are very large and are thickest about half way of their length.

The most obvious distinction between these teeth and those of *Orycterocetus quadratidens* is the absence of fine longitudinal ridges on the outer surface of the internal cone of dentine.

MEASUREMENTS OF MANDIBLES (in millimeters)

	Right ramus	*Left ramus*
Greatest length of mandible	259	356
Antero-posterior diameter of proximal alveolus	x	29
" " " first interspace	x	3
" " " second alveolus	x	24
" " " second interspace	x	3
" " " third alveolus	24	28.5
" " " third interspace	4.5	3
" " " fourth alveolus	27.5	26
" " " fourth interspace	3	3
" " " fifth alveolus	32	34
" " " fifth interspace	1.5	3
" " " sixth alveolus	27.5	30.5
" " " sixth interspace	2.5	5
" " " seventh alveolus	36	33.5
" " " seventh interspace	3	3
" " " eighth alveolus	31	31
" " " eighth interspace	3.5	3
" " " ninth alveolus	35.5	30
" " " ninth interspace	4	4
" " " tenth alveolus	27	23.5
Proximal tooth projects beyond alveolus	x	x
Second " " " "	x	x
Third " " " "	x	43.7
Fourth " " " "	59	53
Fifth " " " "	67	59
Sixth " " " "	x	x
Seventh " " " "	81	62
Eighth " " " "	66.5	46.3+
Ninth " " " "	63	55.1+
Tenth " " " "	x	x
Anteroposterior diameter proximal tooth at level of alveolus	x	x
Anteroposterior diameter second tooth at level of alveolus	x	x
Anteroposterior diameter third tooth at level of alveolus	x	23
Anteroposterior diameter fourth tooth at level of alveolus	27	23.5
Anteroposterior diameter fifth tooth at level of alveolus	27	25
Anteroposterior diameter sixth tooth at level of alveolus	x	x
Anteroposterior diameter seventh tooth at level of alveolus	28	26.5

MEASUREMENTS OF MANDIBLES (in millimeters)
(continued)

	Right ramus	*Left ramus*
Anteroposterior diameter eighth tooth at level of alveolus	26.5	27
Anteroposterior diameter ninth tooth at level of alveolus	26.3	25.5
Anteroposterior diameter tenth tooth at level of alveolus	x	x