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A SPECIMEN OF A LONG-NOSED DOLPHIN FROM THE BONE VALLEY GRAVELS OF POLK COUNTY, FLORIDA

BY
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(*Continued on inside of back cover*)

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A SPECIMEN OF A LONG-NOSED DOLPHIN FROM THE BONE VALLEY GRAVELS OF POLK COUNTY, FLORIDA

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THERE has come into the possession of the Museum of Paleontology of the University of Michigan a specimen of a long-nosed dolphin which presents many interesting characters hitherto unknown. The specimen, No. 15117 in the Museum of Paleontology collection, was obtained by Mr. M. L. Bobeng in the excavations of the International Agricultural Corporation at Mulberry, Polk County, Florida, in December, 1932. It consists of a skull with the lower jaws found in place. The upper part of the skull has been destroyed by decay, but the palatal surface is complete; a small part of the anterior end of the rostrum and lower jaws has been lost by decay, but this cannot exceed five or six centimeters; otherwise both parts are complete to the posterior end. There are several teeth preserved in both the upper and the lower jaws. The specimen was found in loose water-soaked sand; the bones were very soft and spongy and required the utmost care in collection and preparation.

The taxonomy of the late Miocene Delphinidae is confused by the fact that many names and descriptions have been based on incomplete and, in numerous cases, noncomparable material. *Priscodelphinus* was founded upon vertebrae and *Schizodelphis* upon very imperfect skull material. Kellogg [1] (1928) and Hay [2] (1929) now place the forms described as *Schizodelphis* in the genus

[1] Kellogg, Remington, "The History of Whales, Their Adaptation to Life in the Water," *Quart. Rev. Biol.*, Vol. 3, Nos. 2 and 3, 1928.

[2] Hay, O. P., *Second Bibliography and Catalogue of the Fossil Vertebrates of North America.* Publ. 390, Carnegie Institution of Washington, 1929.

Cyrtodelphis Gervais. The specimen described here corresponds closely with the form described by Allen [3] (1921) as *Schizodelphis depressus*, from the same horizon and general locality, but Dr. Remington Kellogg, who has most kindly helped the author with advice and criticism, believes that it is a new species, for which the name *Schizodelphis bobengi* is here proposed. Dr. Kellogg also suggests that the fragment described by Sellards [4] (1915) must be referred to this species.

The lower jaw, Plate I, Figure 1, measures 895 mm.; if to this is added 50 mm. for the missing extremity, the total probable length was 945 mm. The symphysis measures 550 mm. on the upper surface and 570 mm. on the lower; if to this is added 50 mm., the greatest total, 620 mm., is so close to two thirds of the length of the jaw as to warrant placing the animal in the groups typified by *Cyrtodelphis*. The inner edges of the free rami are curved, not straight, and the angle of union of the two rami is large and rather rounded. The blades of the free rami were thin and have been somewhat crushed, but were at least 100 mm. high; the condyle was terminal and faced directly backward.

Both the upper and lower parts of the symphysis were slightly rounded, except at the anterior end, where they became flattened. The lower surface is marked by two deep grooves, which extend to the broken extremity.

There are thirty-two sockets on each side. Two of the anterior teeth of the right side are preserved; these are very prominent and were evidently supported in part by an alveolar cartilage. The first tooth measures 17 mm. from the alveolar edge, of which only 11 mm. is the enamel-covered crown. The teeth are conical and incurved, and the crown passes smoothly into the root, without swelling or irregularity. The enamel is marked with silky striations. The exposed parts of the teeth are at right angles to the alveolar edge, but the sockets are incurved slightly to the rear. The alveolar edge is inclined to the plane of the jaw, so

[3] Allen, Glover M., "Fossil Cetaceans from the Florida Phosphate Beds," *Journ. Mammal.*, Vol. 2, No. 3, 1921.

[4] Sellards, E. H., "The Pebble Phosphates of Florida," *Seventh Ann. Rep. Florida Geol. Surv.*, fig. 32 and description, p. 102, 1915.

that the sockets are visible from the side, and the teeth are inclined outward, indicating an interlocking of the teeth of the upper and lower jaws when the mouth was closed.

Five teeth near the middle of the jaw resemble those of the anterior end except that they are smaller. It is noticeable that the seventh and eighth teeth, on both sides, are only 13 mm. apart and that this condition is matched by the tenth and eleventh teeth of the upper jaw, which are only 11 mm. apart. Since the count is from the broken anterior ends, the closely set pairs may have been opposed, or this relation may be purely accidental.

The posterior teeth are much closer together and much smaller, and the sockets show that the teeth were directed straight upward.

The lower surface of the jaws is marked by two sharply incised grooves, which maintain their relative position to the outer edge and gradually draw closer together with the narrowing of the symphyseal region. They maintain their depth and sharpness to the broken anterior extremity.

The rostrum, Plate I, Figure 2, carries thirty-two teeth and sockets on each side. The palatal surface is gently convex to near the anterior end, where it becomes flattened. A shallow V-shaped groove is traceable as far forward as the fourth tooth. There are six teeth preserved near the anterior end, which have the same character and spacing as those of the lower jaw. The alveolar edge is not so steeply beveled as in the lower jaw, and the sockets are hardly visible from the side. The position of the teeth was, apparently, with their axes directed nearly straight downward, but some on the left side are pointed outward owing to posthumous displacement.

The posterior sockets are notably inclined to the rear and this reached an extreme in the very small most posterior teeth, which must have pointed almost directly forward.

The alveolar edge curves sharply outward on the left side near its posterior end in correspondence with a similar curve in the lower jaw; this is due either to a natural asymmetry or to distortion in preservation, since the upper and lower jaws were locked in position. The premaxillaries do not appear on the palatal surface, but can be traced to within a few centimeters of the

broken anterior end, where their extremities have been lost. The palatal surface of the skull is little crushed, but the spongy nature of the bone and, possibly, the age of the specimen render the tracing of the sutures difficult. The arrangement is much like that of *Zarhachis flagellator* Cope.[5] As much as can be determined is shown in Plate I, Figure 3. The pterygoid reduplication is clearly shown with the inclosed anterior sinus, but the relations of the anterior parts of the pterygoids, vomer, and palatines are obscure. The palatine, so far as can be made out, does not appear on the palatal surface. The vomer has the position and relations shown in *Zarhachis*. The suture between the internal pterygoid and the basioccipital runs outward and backward. The point where this suture separates the edge of the internal pterygoid from the falcate process of the basioccipital is marked on both sides by a decided notch owing to the greater prominence of the pterygoid. A similar notch appears on *Zarhachis*, but farther forward and entirely within the borders of the pterygoid.

There are indications of a very small exposure of the basisphenoid. The sutures of the anterior part are entirely within the posterior extension of the vomer; the posterior edge is obscured by a break and a slight displacement of the bone.

The external pterygoid is overlapped by the maxillary anteriorly, with the suture running back and upward to terminate on the broken edge of the specimen opposite the opening of choanae. The lower edge of the external pterygoid joins the squamosal just posterior to the anterior edge of the tympanoperiotic recess; from this point the suture between the two bones must have run forward and upward to the foramen ovale, which is clearly indicated at a point directly opposite the posterior edge of the vomer. From the foramen the suture runs backward and upward to the broken edge of the specimen just above the posterior origin of the dorsal edge of the zygoma.

Because of the condition of the bone it is impossible to determine the limits of the alisphenoid. The author cannot detect any

[5] Kellogg, Remington, "Supplementary Observations on the Skull of the Fossil Porpoise *Zarhachis flagellator* Cope, *Proc. U. S. Nat. Mus.*, Vol. 67, Art. 28, p. 11 and Pl. 3, 1926.

PLATE I

FIG. 1. Upper surface of lower jaws. about $\times \frac{1}{5}$

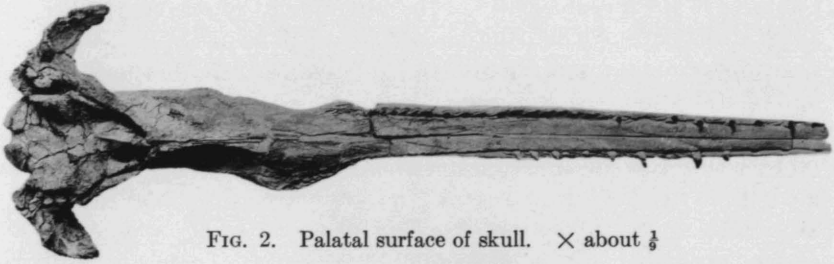

FIG. 2. Palatal surface of skull. $\times$ about $\frac{1}{5}$

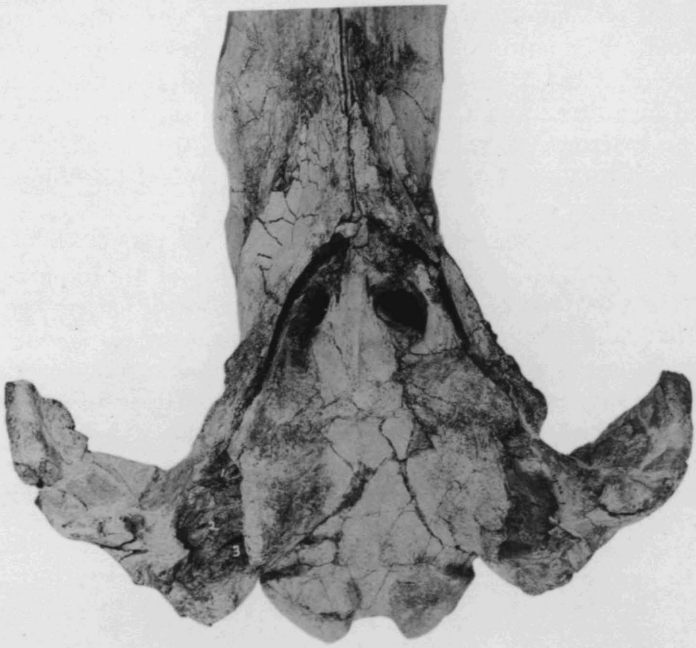

FIG. 3. Palatal surface of cranial region. $\times$ about $\frac{1}{3}$

S. BOBENGI

PLATE II

FIG. 1. Ventral or tympanic view of right periotic. × about $\frac{1}{3}$

FIG. 3. Ventral or tympanic view of left periotic

FIG. 2. Internal or cerebral view of right periotic

FIG. 4. Internal or cerebral view of left periotic

S. BOBENGI

(For identification of parts see Figures 6 and 7 in R. Kellogg's "*Kentriodon pernix*, a Miocene Porpoise from Maryland," *Proc. U. S. Nat. Mus.*, Vol. 69, Art. 19, pp. 24, 26, 1927.)

suggestion of its appearance on the wall of the temporal fossa, and the surface of the roof of the tympano-periotic recess is partly destroyed. The openings marked as follows by Kellogg in Zarhachis (Pl. V of his paper) are preserved and are in nearly the same position as in his figure: (1) passage for mandibular branch of the trigeminal nerve in a cleft on the posterior border of the alisphenoid; (2) foramen in alisphenoid above anterior process of the periotic; (3) *foramen lacerum posterius*, compartment for vein. (See Plate I, Fig. 3.)

The periotic bones are preserved perfectly and are in place, but no trace of the tympanics was found (see Plate II, Figs. 1–4). The following description has been furnished by Dr. Kellogg:

Small entrance to Fallopian aqueduct is within cerebral rim of subpyriform internal acoustic meatus and is very slightly larger than *foramen singulare*. *Foramen singulare* located at outer end of low and broad osseous septum, which rises about halfway to level of cerebral rim of internal acoustic meatus, separating the *tractus spiralis foraminosus* from Fallopian aqueduct. Fundus of internal acoustic meatus much smaller in area than meatus at level of cerebral rim. Spiral tract makes at least one and a half turns and ends in minute *foramen centrale*. Inner and anterior walls of internal acoustic meatus very steep, hinder wall oblique, entire rim raised. *Aquaeductus vestibuli* opens into a deep slitlike fossa, 2 mm. behind cerebral rim of meatus. Cerebral orifice of *aquaeductus cochleae* 2.8 mm. behind cerebral rim of meatus and situated on slight protuberance.

Fenestra rotunda nearly circular, slightly larger than *fenestra ovalis*. Judging from rim of *fenestra ovalis*, the footplate of the stapes is firmly lodged. Minute orifice of semicircular canal within vestibule located in elliptical depression at antero-external angle. *Ductus endolymphaticus* rather large where it enters the vestibule. Epitympanic orifice of Fallopian aqueduct quite small, and opens on roof of *recessus epitympanicus* into the narrow groove for the facial nerve, which leads backward and downward to ventro-internal border of the posterior process, thence backward along the same, and curves outward along its hinder face.

Large elongated fossa for stapedial muscle rather shallow, located behind the level of *fenestra ovalis*, above and internal to groove for facial nerve, and extended downward on external face of *pars labyrinthica*.

Fossa incudis for *crus breve* of incus unusually large, stirrup-shaped in outline, in area almost as large as *fenestra ovalis*, relatively flat, with free edge or rim projecting for 1 mm. or more internally below groove for facial nerve, and with antero-internal angle of posterior process rising abruptly from its hinder border. The large elliptical shallow fossa for reception of head of malleus placed obliquely on very large protuberance, which for the most part lies anterior to epitympanic orifice of Fallopian aqueduct. *Hiatus epitympanicus* rather deeply excavated and narrow, bounded by posterior process behind and

by protuberance for malleus in front. Anterior process somewhat compressed dorso-ventrally, with lateral faces irregularly flattened, with rather squarely truncated anterior end; anterior process as a whole directed obliquely inward and forward.

In front of epitympanic orifice of Fallopian aqueduct, and between *pars labyrinthica* and protuberance (on which is located fossa for malleus), is a shallow, poorly defined, and rather broad groove, which may have been occupied by *tensor tympani* muscle.

Posterior process short, broad, and with rather smooth contact surface for posterior pedicle of tympanic bulla. A deep and rather large slitlike fossa extends deeply into antero-external portion of posterior process, giving it a somewhat bifurcated appearance (present on both periotics).

Ventral face of *pars labyrinthica* slightly convex from end to end, and sloping obliquely to cerebral rim (i.e. internal and anterior edges). No excavation above level of stapedial fossa on hinder face of periotic. External face of periotic with deep triangular excavation above level of *hiatus epitympanicus*. External face of periotic in front of this excavation with irregular curvature, resulting from pressure of small protuberances, pits, and grooves.

Cerebral face of *pars labyrinthica* relatively smooth.

Because of their similarity such comparative measurements as are obtainable are given in the following table of four other specimens which are referred to the genus *Schizodelphis*.

1. No. 10922 U. S. Nat. Mus. Described by Allen as *Diaphorocetus mediatlanticus* and recorded as lost. Referred to *S. bobengi, fide* Kellogg in correspondence.
   Sellards, E. H., *Seventh Ann. Rep., Florida Geol. Surv.*, fig. 32, 1915.
   Allen, G. M., *Journ. Mammal.*, Vol. 2, pp. 154–156, pl. 9, fig. 6, and pl. 12, fig. 13, 1921.
2. No. 828 Florida Geol. Surv. Five miles south of Barlow, Florida. *Schizodelphis depressus*.
   Sellards, *op. cit.*, fig. 31.
   Allen, *op. cit.*, p. 146, pl. 9, figs. 1–2.
3. No. 5358 U. S. Nat. Mus. Kingsford, Polk Co., Florida. Measurements by Kellogg. Referred to *S. bobengi, fide* Kellogg in correspondence.
4. No. 10308 U. S. Nat. Mus., Div. Vert. Pal. Calvert Co., Md. *Schizodelphis crassangulum* (Case).
   Case, E. C., *Maryland Geol. Surv., Miocene*, p. 12, pl. II, figs. 1–3, 1904.
   True, F. W., *Smithsonian Misc. Coll.*, Vol. 50, pt. 4, pp. 449–460, pls. 59–60, 1908.

TABLE I

MEASUREMENTS IN MILLIMETERS OF FOUR MANDIBLES OF SCHIZODELPHIS

	No. 10308 U. S. Nat. Mus. *S. crassangulum*	No. 5358 U. S. Nat. Mus. Referred to *S. bobengi*	No. 10922 U. S. Nat. Mus. Referred to *S. bobengi*	No. 15117 U. M. *S. bobengi*
Maximum length of right ramus, straight line	....	....	....	895
Maximum length of left ramus, straight line, incomplete	590	....	....	900
Length of symphysis of No. 15117; fragments of others	446	165.5	266	570
Transverse diameter of symphysis or fragment, posterior end	53	53.5	106 ±	111
Vertical diameter of symphysis or fragment, posterior end (crushed in No. 15117)	24	32	43	26
Transverse diameter of symphysis or fragment, anterior end	19 ±	48	66.5	43
Vertical diameter of symphysis or fragment, anterior end	7	29.5	36	20
Fifteen anterior teeth, right side, incomplete	....	....	....	355
Twelve teeth, right side, incomplete	....	....	225	.....
Ten teeth, left side, incomplete	....	....	119	.....
Six teeth, right side, incomplete	....	128	....	.....
Five teeth, left side, incomplete	....	100	....	.....
Nineteen alveoli, right side, incomplete	134	....	....	.....
Vertical height of crown of first tooth on right side	....	....	....	10.5
Antero-posterior diameter of base of crown, same tooth	....	....	....	7.5
Antero-posterior diameter of root, same tooth	....	....	....	11.5
Vertical height of crown of third and eighth teeth from anterior end	....	....	15.5	.....
	....	....	11	.....
Antero-posterior diameter of base of crown, same teeth	....	....	11.2	.....
	....	....	9.6	.....
Antero-posterior diameter of root, same teeth	....	....	15	.....
	....	....	13.8	.....
Separation of seven anterior teeth, center to center	....	....	....	30 − 28
Diameters of alveoli, same teeth	....	....	....	11 × 16
Separation from tenth to fifteenth teeth, center to center	....	....	....	24 − 21
Separation of posterior teeth	....	....	....	20 − 10
Diameters of anterior alveoli	....	13.2 × 8	....	.....
Diameters of posterior alveoli	....	10.8 × 7.8	....	.....

TABLE II

MEASUREMENTS IN MILLIMETERS OF FOUR SKULLS OF SCHIZODELPHIS

	No. 10308 U. S. Nat. Mus. *S. crassangulum*	No. V. 1928 Fla. Geol. Surv. *S. depressus*	No. 10922 U. S. Nat. Mus. Referred to *S. bobengi*	No. 15117 U.M. *S. bobengi*
Length of complete skull No. 15117 and fragments of others	698.5	282	288.5	910
Transverse diameter of rostrum				
Opposite first tooth	....	....	....	37
Opposite fourth tooth	....	37.5	....	....
Opposite third tooth	....	....	68	....
Mid length	25	....	....	....
Vertical diameter of rostrum				
Opposite first tooth	....	....	....	17.5
Opposite fourth tooth	....	24.5	....	....
Opposite third tooth	....	....	36.5	....
Mid length	16	....	....	....
Transverse diameter of rostrum				
Opposite eleventh tooth	....	....	....	61
Opposite eighteenth tooth	....	48	....	....
Opposite ninth tooth	....	....	79	....
Opposite last tooth	48	....	....	....
Vertical diameter of rostrum				
Opposite eleventh tooth	....	....	....	28
Opposite eighteenth tooth	....	30.5	....	....
Opposite ninth tooth	....	....	40	....
Opposite last tooth	33	....	....	....
Vertical diameter of crown of anterior tooth, right side; tip lost	....	....	....	12
Transverse diameter of base of crown of same tooth	....	....	....	7.5
Greatest diameter of root of same tooth	....	....	....	11
Vertical height of crown of fifth and eighth teeth from front	....	....	14 + 13.2	....
Antero-posterior diameter of crown of same teeth	....	....	11.7 9.2	....
Twelve anterior teeth, right side, incomplete	....	....	....	290
Twelve anterior teeth, left side, incomplete	....	....	....	310
Nineteen alveoli, incomplete	....	241	....	....
Nine alveoli, left side, incomplete	....	....	203	....
Ten alveoli, right side, incomplete	....	....	200.5	....
Eighteen alveoli, left side, anterior end, incomplete	134	....	....	....
Separation of anterior alveoli, center to center (first ten in No. 15117)	....	17.5	....	30 – 28
Diameters of alveoli of same	....	7 × 4.5	....	11 × 6
Separation of eleventh to sixteenth alveoli, center to center	....	....	....	25 – 21
Separation of posterior alveoli, center to center	....	7.5	....	20 – 10
Separation of first two anterior alveoli, left side	....	....	12.5	....
Separation of seventh and eighth alveoli, left side	....	....	3	....
Distance from posterior end of palatal exposure of vomer to anterior end of rostrum	567	....	....	700
Zygomatic breadth	....	....	....	290 ±
Transverse distance between outer margins of occipital condyles	....	....	....	89.5
Greatest oblique diameter, right condyle	....	....	....	60
Greatest transverse diameter, right condyle	29	....	....	40
Greatest vertical diameter, right condyle	46	....	....	42

TABLE III

MEASUREMENTS OF PERIOTIC OF No. 15117 U.M.

	Right	Left
Maximum transverse diameter, from external face opposite fossa for head of malleus to cerebral face of *pars labyrinthica*	26.2	26.2
Least transverse diameter at level of *fenestra ovalis*, from external face of *hiatus epitympanicus* to cerebral face of *pars labyrinthica*	22.5	22.4
Maximum length of periotic, tip of anterior process to tip of posterior process	40.6	40.7
Dorso-ventral depth of periotic, from level of most inflated part of *pars labyrinthica* and *hiatus epitympanicus* to most projecting point on cerebral face	13.2	13.2
Maximum dorso-ventral depth of periotic, from level of most inflated portion of *pars labyrinthica* and protuberance on which fossa for malleus is located to most projecting point on cerebral face	17.5	16
Distance from *fenestra rotunda* to anterior end of anterior process	28.8	29.2
Distance between *fenestra rotunda* and tip of posterior process	17	18.1
Distance between epitympanic orifice of *aquaeductus Fallopii* and tip of anterior process	20.3	20.5
Maximum antero-posterior diameter of *pars labyrinthica*	17	17
Transverse (including entrance to Fallopian aqueduct) and vertical diameters of internal acoustic meatus at cerebral rim	10.2 × 6	9.6 × 6

(*Continued from inside of front cover*)

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