SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 68, NUMBER 9

A NEW RIVER-DOLPHIN FROM CHINA

(With 13 Plates)

BY
GERRIT S. MILLER, JR.

(Publication 2486)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
MARCH 30, 1918

The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

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(With 13 Plates)

The skull and cervical vertebræ of a river-dolphin killed in Tung Ting Lake, about 600 miles up the Yangtze River, China, have recently been obtained by the National Museum from Mr. Charles M. Hoy. The following account of the animal has been given by Mr. Hoy in letters and in conversation: "Although I lived in China for several years I never saw this animal except in Tung Ting Lake and around its mouth. The natives give it the name *Peh Ch'i,* which they tell me means 'white flag', because the dorsal fin, which they liken to a flag, is so prominent when the animal comes to the surface to breathe. The sudden appearance of a school of these whitish dolphins close to a small boat is very startling. To the best of my knowledge this animal is found in large numbers only around the mouth of the Tung Ting Lake. In winter when the water of the lake is so low that there is scarcely more than the river channel left they are easily seen and are found in great numbers in bunches usually of three or four, but occasionally of as many as 10 or 12 individuals. They are often seen in shallow water working up the mud in their search for fish. The one I killed had about two quarts of catfish in its stomach. When shot it gave a cry like that of a water-buffalo calf. In summer the water rises to a height of 48 feet above its winter level. The mountain streams feeding the lake are then full, and the dolphins disappear. The natives say that in the late spring when the lake is rising the dolphins make their way up the small, clear rivers, and that these are their breeding grounds."

Contrary to what might have been anticipated this cetacean is not *Sotalia chinensis.* It is one of the "anomalous" porpoises of the family *Iniidæ.*[1] Well represented and widely distributed in the Miocene and Pliocene this group is now so nearly extinct that only two living remnants are known: *Inia geoffrensis* in the Amazon and

[1] See True, Proc. Amer. Philos. Soc., Vol. 47, p. 391, 1908.

Orinoco and the present animal in the Yangtze. The Chinese river-dolphin may be named and described as follows:

LIPOTES, gen. nov. (Iniidæ)

Type.—Lipotes vexillifer, sp. nov.

Diagnosis.—General structure of skull as in *Inia,* but beak bowed upward, basicranial axis not conspicuously bent downward from axis of beak, proximal extremity of intermaxillary thin and plate-like, not forming a raised anterior border to narial aperture, mandibular symphysis barely equal to free portion of ramus; teeth about 130, essentially uniform throughout the toothrow, the form of the crown and character of the enamel-wrinkling much as in the median teeth of *Inia,* but root not thickened, the entire tooth resembling that of the Miocene North American "*Schizodelphis*"; dorsal fin large, triangular.

Skull.—While the skull (plates 2, 4, 6, 8, 9) presents more features of likeness to that of *Inia* (plates 3, 5, 7, 8, 10) than to that of any other known cetacean, there are obvious differences between the South American and Chinese river-dolphins in all the details of cranial structure. The more important of these have been mentioned. Among the others the following seem worthy of note:

Dorsal Aspect

(Plates 2 and 3)

Lipotes	*Inia*
Narial aperture slit-like in front.	Narial aperture broadly rounded in front.
Maxillary crest nearly horizontal over temporal fossa, strongly bent upward over orbit.	Maxillary crest essentially in one plane throughout.
Area between lambdoid crests wider than high.	Area between lambdoid crests higher than wide.
Breadth across maxillary crests through posterior border of narial opening slightly greater than interorbital breadth.	Breadth across maxillary crests through posterior border of narial opening much less than interorbital breadth.
Region between crest and nares slightly concave.	Region between crest and nares deeply concave.
Intermaxillary convex laterally in front, concave behind toothrow.	Intermaxillary convex laterally throughout.
Protuberance behind nares smaller than narial openings.	Protuberance behind nares larger than narial openings.
Nasals broader than high, not overhung by frontals.	Nasals higher than broad, overhung by frontals.
Entire condyles visible when skull is viewed from directly above.	Condyles hidden when skull is viewed from directly above.

Lateral Aspect
(Plates 4 and 5)

Lipotes	*Inia*
Crest turned abruptly upward over orbit.	Crest not turned abruptly upward over orbit.
Length of orbit nearly half that of temporal fossa.	Length of orbit scarcely one-fifth that of temporal fossa.
Glenoid process strongly curved forward.	Glenoid process not strongly curved forward.
Squamosal tapering anteriorly.	Squamosal enlarged anteriorly.
Lateral groove on beak well defined, but wide and shallow.	Lateral groove on beak narrow, ill defined.

Ventral Aspect
(Plates 6 and 7)

Distance from last tooth to maxillary notch much greater than width of beak at last tooth.	Distance from last tooth to maxillary notch less than width of beak at last tooth.
Beak narrowed between toothrow and maxillary notch as in *Pontistes*.	Beak not narrowed betwen toothrow and maxillary notch.
Keel flattening out at level 45 mm. behind last tooth.	Keel flattening out at level of last tooth.
Edge of basal wing deeply notched so that pterygoid is nearly or quite cut off from contact with basisphenoid.	Edge of basal wing entire; pterygoid broadly in contact with basisphenoid.
Depression on squamosal at inner side of glenoid area sharply defined, narrowed in front.	Depression on squamosal at inner side of glenoid area ill defined, wider in front than behind.

Occipital Aspect
(Plate 8)

Supraoccipital area wider than high, essentially flat; a distinct median ridge extending from lambdoid crest nearly to foramen magnum.	Supraoccipital area higher than wide, each bone noticeably convex both vertically and laterally; a median furrow extending from near foramen magnum to above middle.
Area of foramen magnum about half that of one supraoccipital.	Area of foramen magnum about one-fourth that of one supraoccipital.
Two deep furrows in region between paroccipital process and glenoid process (clearly shown on right-hand side of figure).	Only one deep furrow in region between paroccipital process and glenoid process.

MANDIBLE

(Plates 4, 5, 9 and 10)

Lipotes	*Inia*
Anterior edge of dental foramen about 45 mm. behind last tooth.	Anterior edge of dental foramen about 20 mm. behind last tooth.
Distance from symphysis to last tooth much greater than distance between last tooth of opposite rows.	Distance from symphysis to last tooth equal to distance between last tooth of opposite rows.
Height through coronoid equal to about one-third length of free portion of mandible.	Height through coronoid equal to about half length of free portion of mandible.
Coronoid abruptly rounded.	Coronoid broadly rounded.
Angular process with broadly rounded projection.	Angular process with sharp, narrow projection.
A conspicuous median groove between toothrows.	No median longitudinal groove between toothrows.

The pterygoids have probably been injured in the narial region. It is therefore impossible to be certain whether their entire structure is exactly the same as in *Inia*. At base it is undoubtedly similar to that in the South American animal. The backward-turned portion which fits against the vomer in *Inia* is not present, though traces of the ridge against which it probably was applied can be distinctly seen. The structure actually present in the Chinese animal could be made from that of *Inia* by breaking away the bones to the level of the edge of the internarial septum. This is clearly seen on comparing plate 6 with Abel's figure of a skull of *Inia* in which such mutilation has actually taken place (Mém. Mus. roy. Hist. Nat. Belg., Vol. 1, pl. 3, fig. 3, 1901). The outer plate associated with the pterygoid in the narial region appears to be nearly perfect. It is like that of *Inia* except that it is shorter and without fenestration. Posteriorly the pterygoids are much narrowed by the development of a broad notch in the margin of the basal wing. The presence of this notch together with a widening of the expanded posterior portion of the vomer nearly or quite excludes the pterygoids from contact with the basisphenoids.

A very noticeable feature of the skull is the position of the nares. (Compare pls. 2 and 3.) The anterior margin of the aperture is at about the middle of the cranium in *Lipotes,* decidedly in front of the middle in *Inia*. Yet when the anterior margin of the nares is compared with the temporal fossa these conditions appear to be reversed. Probably the backward bulge to the occipital region in *Inia* accounts for the first peculiarity, and a difference in the form of the frontal explains the second.

Cervical vertebræ.—The cervical vertebræ (pls. 11 and 12) while agreeing with those of *Inia* (pls. 11 and 13) in the complete separation of all the bones of the series differ from those of the South American dolphin in so many details of form, some of which may prove to be subject to individual variation, that a complete enumeration of the peculiarities will not be undertaken. The more general differences, among those which appear to be of importance, are as follows: In *Inia* the lateral canal is open behind the third vertebra; in *Lipotes* it is essentially closed throughout. In *Inia* the centra and the neural openings tend to be higher than wide; in *Lipotes* wider than high. In *Inia* the neural spine is large and high in both second and seventh vertebra; in *Lipotes* it is broad and low in the second, scarcely developed in the seventh. In *Inia* the lower transverse process of the fourth vertebra is enlarged and curved forward; in *Lipotes* it is reduced and curved backward. In *Inia* the lower transverse process of the fifth vertebra is straight and greatly enlarged; in *Lipotes* it is curved forward and slightly enlarged. In *Inia* the lower transverse process of the sixth vertebra is reduced; in *Lipotes* it is the largest of the series. In *Inia* the seventh vertebra has no lower transverse process; in *Lipotes* the lower transverse process is fully developed, its extremity joined to the upper process. Further comparison will be found below:

First Cervical

Lipotes	*Inia*
Basal process slightly developed, its length not equal to longitudinal diameter of centrum.	Basal process large, its length about twice as great as longitudinal diameter of centrum.
Upper transverse process an inconspicuous ridge on base of pedicle.	Upper transverse process a conspicuous knob below base of pedicle.

Second Cervical

Spinous process with upper-anterior margin sloping gradually and in approximately the same line as that of first cervical.	Spinous process with anterior margin sloping very abruptly and forming a conspicuous angle with that of first cervical.
Transverse process narrow and long, partly or completely perforate.	Transverse process broad and short, imperforate.

Third Cervical

Neural arch open above.	Neural arch closed above.
Transverse processes long, united, their extremities nearly at level of lower border of centrum; lateral canal relatively small.	Transverse processes short, separate or nearly so, their extremities about at level of centrum; lateral canal relatively large.

Fourth Cervical

Lipotes	*Inia*
General outline about as wide as high.	General outline higher than wide.
Transverse processes united, not very different from those of third cervical, but more slender.	Transverse processes separate, conspicuously different from those of third cervical, the lower greatly broadened and curved forward under transverse process of third cervical.

Fifth Cervical

Transverse processes separate, the lower with a distinct projection indicating the outline of the lateral canal; extremity of lower process thickened and curved forward under transverse process of fourth cervical.	Transverse processes separate, the outline of the canal not indicated; lower process enlarged, straight, the extremity much thickened.

Sixth Cervical

No definite neural spine.	A small neural spine.
Lower transverse process with small projection indicating boundary of lateral canal; extremity of lower process greatly expanded into an oblique, plate-like mass which extends slightly beyond level of anterior face of centrum and decidedly beyond level of posterior face as well as beyond level of lower border.	No indication of boundary of canal; lower transverse process small, not extending beyond level of anterior and posterior faces of centrum or below level of its lower border.

Seventh Cervical

Neural spine slightly developed, its height less than half that of neural canal.	Neural spine greatly developed, its height about twice that of neural canal.
Transverse processes united, completely closing the lateral canal.	Upper transverse process alone present, the position of the base of lower process indicated by a faint thickening on edge of centrum.

Teeth.—The teeth are probably more numerous than is usual in *Inia,* they are smaller relatively to the width of the palate, and they project more at the sides of both beak and lower jaw. These general peculiarities are well shown by the plates. The form of the exposed portion of all the teeth is essentially like that of the median teeth in the South American animal. The rugosity of the enamel is nearly as evident as in *Inia,* it differs from that of *Inia* in a structure which may perhaps be best described as more reticulate and less nodular.

The form of an entire tooth from near middle of toothrow (fig. 1, *a, b*) is strikingly different from that of a corresponding tooth of *Inia* (fig. 1, *c, d*). It more nearly resembles that of the teeth from the Miocene of Maryland figured by Cope (Amer. Nat., Vol. 24, p. 607, July, 1890) as those of *Rhabdosteus* but later referred by True (Proc. Acad. Nat. Sci., Philadelphia, 1908, p. 29, April 22, 1908) to *Schizodelphis*. The root through the greater part of its extent is not conspicuously wider than the crown. It is compressed laterally, while the crown is compressed antero-posteriorly. Between the root and crown there is a distinctly indicated neck, but this constriction is

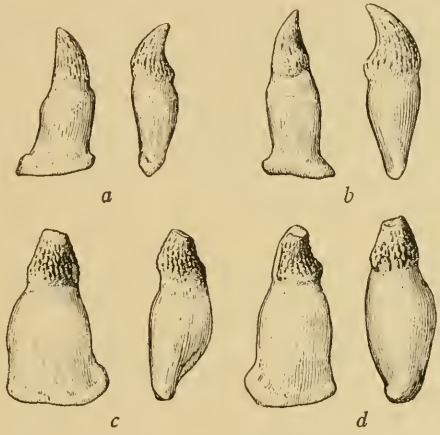


FIG. 1.—*a. Lipotes vexillifer,* 16th maxillary tooth. *b. Lipotes vexillifer,* 16th mandibular tooth. *c. Inia geoffrensis,* 15th maxillary tooth. *d. Inia geoffrensis,* 13th mandibular tooth. All figures natural size. View at left of each pair is from inner side, that at right is from behind. The teeth of *Inia* are worn away at tip.

neither so long nor so well developed as in the Maryland *Schizodelphis*.[1] At base, the most compressed region, the root abruptly widens to form a sharply defined anterior and posterior projection, the combined function of which is to anchor the tooth firmly in the alveolus. At first sight these projections suggest the final remnants of two fangs completely joined through the greater part of the root, but sections of that part of the tooth fail to reveal any traces of

[1] It seems very doubtful whether these teeth should be referred to the same genus as those figured by Probst (Jahreshefte Ver. vaterländ. Naturk. Württemberg, Vol. 48, pl. 3, figs. 11-14, 1886) from Württemberg, Germany.

internal structures to support this view. In the teeth at the extremities of the toothrows the anterior projection is less developed. The resulting form suggests that of some of the teeth from the upper Miocene of northern Italy figured by Dal Piaz under the name *Cyrtodelphis sulcatus* (Palæont. Ital., Vol. 9, pl. 31, 1903). In the median teeth of *Inia* (fig. 1, *c, d*) the root is expanded to about double the diameter of the crown. The basal projections, though present and efficient in retaining the teeth in the socket, are masked by the general widening.

Remarks.—The genus *Lipotes* differs too widely from its only known living relative, *Inia,* to require special comparisons beyond those which have already been made. Externally its most conspicuous peculiarity is the presence of the large triangular dorsal fin. In the skull many of the differences between the two animals are correlated with the opposite curvature of the beaks. Opposite tendencies are also to be observed in the teeth, those of *Inia* having specialized on strength and robustness, those of *Lipotes* on wideness of grasp (compare especially the palatal aspect of skull shown in plates 6 and 7).

Among the described fossil dolphins there appears to be no genus whose relation to *Lipotes* is especially intimate. Reference has already been made to the likeness of the teeth to those of the American *Schizodelphis.* There is also a noticeable similarity between the base of the beak and that of *Pontistes* as figured by Burmeister, but this is obviously a chance resemblance as *Pontistes* is no longer regarded as one of the *Iniidæ.*

LIPOTES VEXILLIFER, sp. nov.

Type.—Skull and cervical vertebræ of adult male, No. 218293, U. S. National Museum. Collected in Tung Ting Lake, China, February 18, 1916, by Charles M. Hoy.

Diagnosis.—A porpoise about two and one-half meters in length, greatest length of skull about 500 mm.; color pale blue-gray above, white below.

Measurements.—Cranial measurements of type. Condylobasal length, 514 (526)[1]; basal length, 510 (515); from middle of supraoccipital to tip of beak, 481 (497); rostrum, 350 (352); distance from tip of beak to nares, 390 (403); distance from last tooth to apex of

[1] Measurements in parentheses are those of a somewhat older skull of *Inia geoffrensis,* No. 49582, U. S. National Museum.

maxillary notch, 77 (48) ; breadth of beak between maxillary notches, 96 (110) ; breadth of beak half way between last tooth and apex of maxillary notch, 55 (77) ; breadth of beak at last tooth, 60 (62) ; breadth of beak at middle, 37 (35) ; breadth of intermaxillaries at middle, 21 (27) ; greatest breadth of intermaxillaries proximally, 62 (64) ; interorbital breadth, 128 (144) ; breadth across maxillary crests at level of posterior border of nares, 137 (96) ; glenoid breadth, 199 (223) ; median depth of braincase through prominence behind nares, 125 (158) ; occipital depth, 114 (142) ; depth of rostrum at level of last tooth, 34 (44) ; depth of rostrum at middle of toothrow, 21 (37) ; length of temporal fossa, 110 (153) ; depth of temporal fossa, 80 (89) ; length of orbit, 45 (30) ; mandible, 471 (465) ; mandibular symphysis, 225 (268) ; coronoid-angular depth, 88 (113) ; depth of mandible at level of last tooth, 35 (47) ; depth of mandible at middle of toothrow, 24 (32) ; upper toothrow, 278 (312) ; lower toothrow, 285 (315) ; largest upper teeth, height from base of enamel, 8.6 (-), diameter at base of enamel, 5 x 7 (7.6 x 10.9) ; largest lower teeth, height from base of enamel, 9 (-), diameter at base of enamel, 5 x 7 (8 x 11).

Cervical vertebræ of type.—Atlas: greatest breadth, 81.5 (84.1) ; greatest median depth, 70.8 (67.5) ; breadth of spinal canal, 34.6 (28.9) ; median depth of spinal canal, 41.0 (39.5) ; depth of centrum, 15.8 (15.1) ; thickness of centrum, 17.3 (19) ; articular surface for condyle, height 40.3 (41.8), width, 32.0 (39.2). Axis: greatest breadth, 93.3 (88.5) ; greatest median depth, 68.8 (76.5) ; breadth of spinal canal, 27.6 (25.5) ; median depth of spinal canal, 24.6 (22.1) ; breadth of centrum, 39.3 (42.6) ; depth of centrum, 26.1 (34.6) ; thickness of centrum, 18.7 (22.8). Third cervical: greatest breadth, 76.8 (75.6) ; greatest median depth, 57.0 (62.0) ; breadth of spinal canal, 26.1 (21.1) ; median depth of spinal canal, 26.3 (22.6) ; breadth of centrum, 36.2 (40.3) ; depth of centrum, 29.8 (21.7) ; thickness of centrum, 12.0 (11.0) ; breadth of lateral canal, 9.0 (8.6) ; depth of lateral canal, 7.2 (7.2). Fourth cervical: greatest breadth, 69.3 (67.5) ; greatest median depth, 51.6 (61.7) ; breadth of spinal canal, 25.9 (22.0) ; median depth of spinal canal, 18.5 (19.8) ; breadth of centrum, 32.5 (36.8) ; depth of centrum, 30.0 (37.8) ; thickness of centrum, 10.1 (11.6) ; breadth of lateral canal, 9.6 (-) ; depth of lateral canal, 8.0 (10.7). Fifth cervical: greatest breadth, 61.4 (73.9) ; greatest median depth, 50.6 (61.6) ; breadth of spinal canal, 30.6 (26.6) ; depth of spinal canal, 17.5 (17.6) ; breadth of centrum, 32.7 (36.8) ; depth of centrum, 31.5 (37.5) ; thickness

of centrum, 11.0 (12.5); depth of lateral canal, 12.6 (-). Sixth cervical: greatest breadth, 69.6 (72.4); greatest median depth, 54.2 (66.7); breadth of spinal canal, 33.0 (29.6); median depth of spinal canal, 17.6 (17.8); breadth of centrum, 34.7 (36.2); depth of centrum, 31.5 (40.0); thickness of centrum, 12.4 (14.2); depth of lateral canal. 13.7 (-). Seventh cervical: greatest breadth. 109.5 (109.8); greatest median depth, 63.2 (106.7); breadth of spinal canal, 33.6 (29.5); median depth of spinal canal, 20.2 (20.2); breadth of centrum, 32.6 (41.2); depth of centrum, 31.8 (37.6); thickness of centrum, 15.5 (16.2); breadth of lateral canal, 27.3 (-); depth of lateral canal, 12.0 (-).

Remarks.—The general form of *Lipotes vexillifer* is sufficiently well indicated by the photograph and tracing in plate 1. A few details concerning the external characters are, however, not entirely clear. In the photograph reproduced the posterior border of the flipper appears to be entire, while in the one from which the tracing was made it is evidently notched and angled at the distal extremity. There is a similar doubt as to the exact outline of the flukes.

With the specimen and photographs Mr. Hoy sent these notes on the freshly killed animal: "Length, 7 ft. 6 in.; girth, several inches in front of dorsal fin, 4 ft. 6 in.; total number of vertebræ, 45; color, back blue-gray, belly white; eyes very small; ears like pin pricks; blowhole rectangular, at depth of one inch it divides into two passages".

In the type the dental formula is $\frac{33-32}{33-31}=129$. The individual variation in the number of teeth may eventually be found to be as great as in *Inia,* where the range, according to Flower, is from 104 to 132 (Trans. Zool. Soc. London, Vol. 6, p. 95, 1867). The smaller size of the teeth and the apparent specialization of the entire dentition for seizing and grasping rather than for strength make it appear probable that the average number will prove to be greater than in the South American animal. Further material will be required to show whether such is actually the case.

EXPLANATION OF PLATES

PLATE 1

Lower figure, *Lipotes vexillifer.* Photograph of freshly killed animal by Charles M. Hoy.
Upper figure, tracing from another photograph by Mr. Hoy.

PLATE 2

Lipotes vexillifer, type. Dorsal view of skull (about × .30).

PLATE 3

Inia geoffrensis, No. 49582, U. S. Nat. Mus. Dorsal view of skull (about × .30).

PLATE 4

Lipotes vexillifer, type. Lateral view of skull (about × .30).

PLATE 5

Inia geoffrensis, No. 49582, U. S. Nat. Mus. Laetral view of skull (about × .30).

PLATE 6

Lipotes vexillifer, type. Palatal view of skull (about × .30).

PLATE 7

Inia geoffrensis, No. 49582, U. S. Nat. Mus. Palatal view of skull (about × .30).

PLATE 8

Upper figure, *Lipotes vexillifer,* type. Occipital view of skull (about × .30).
Lower figure, *Inia geoffrensis,* No. 49582, U. S. Nat. Mus. Occipital view of skull (about × .30). Tilted slightly forward; the extremity of the frontal should just clear the squamosal.

PLATE 9

Lipotes vexillifer, type. Mandible (about × .30).

PLATE 10

Inia geoffrensis, No. 49582, U. S. Nat. Mus. Mandible (about × .30).

PLATE 11

Upper figure, *Lipotes vexillifer,* type. Cervical vertebræ from the left side (about × .57).

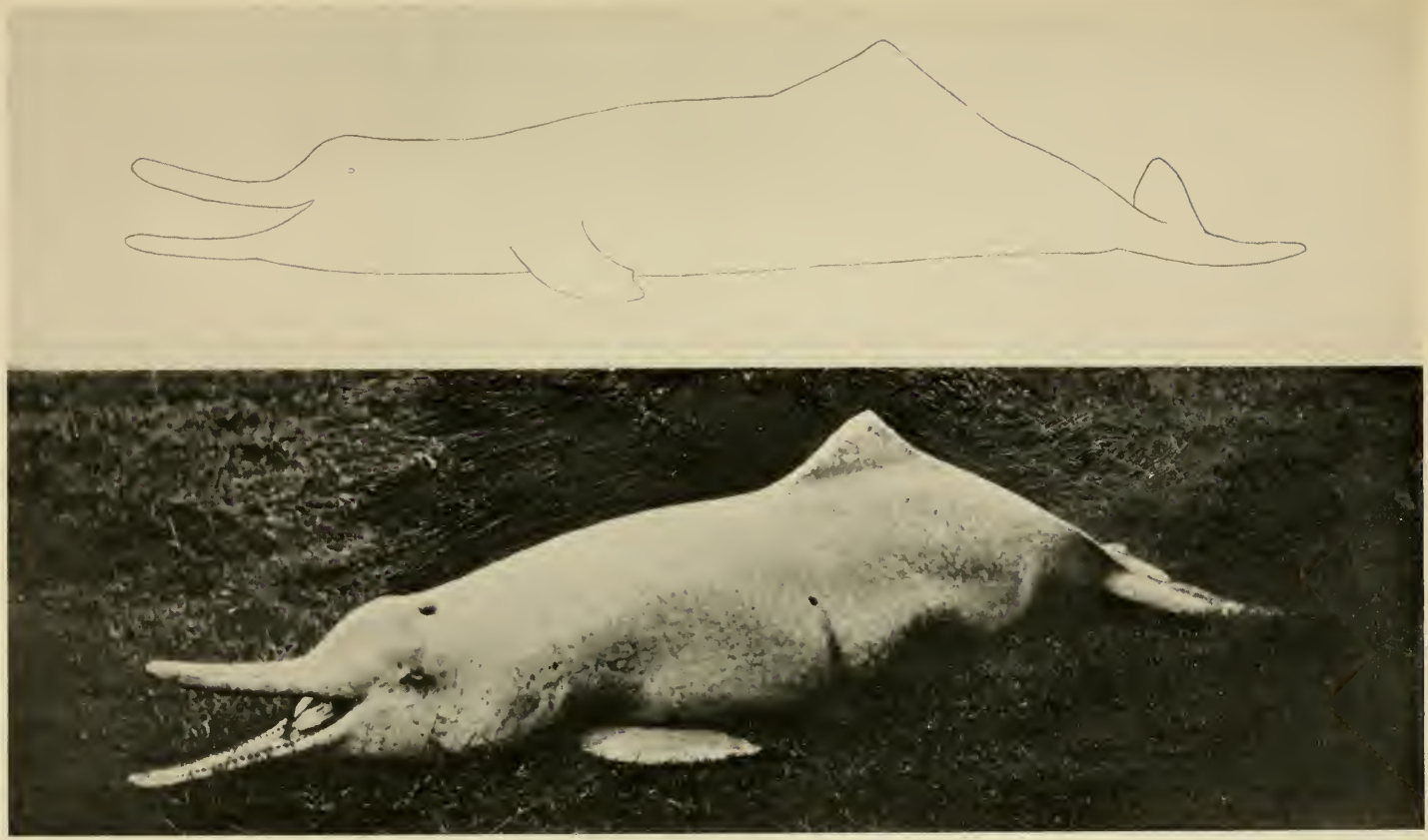
Lower figure, *Inia geoffrensis,* No. 49852, U. S. Nat. Mus. Cervical vertebræ from left side (about × .57).

PLATE 12

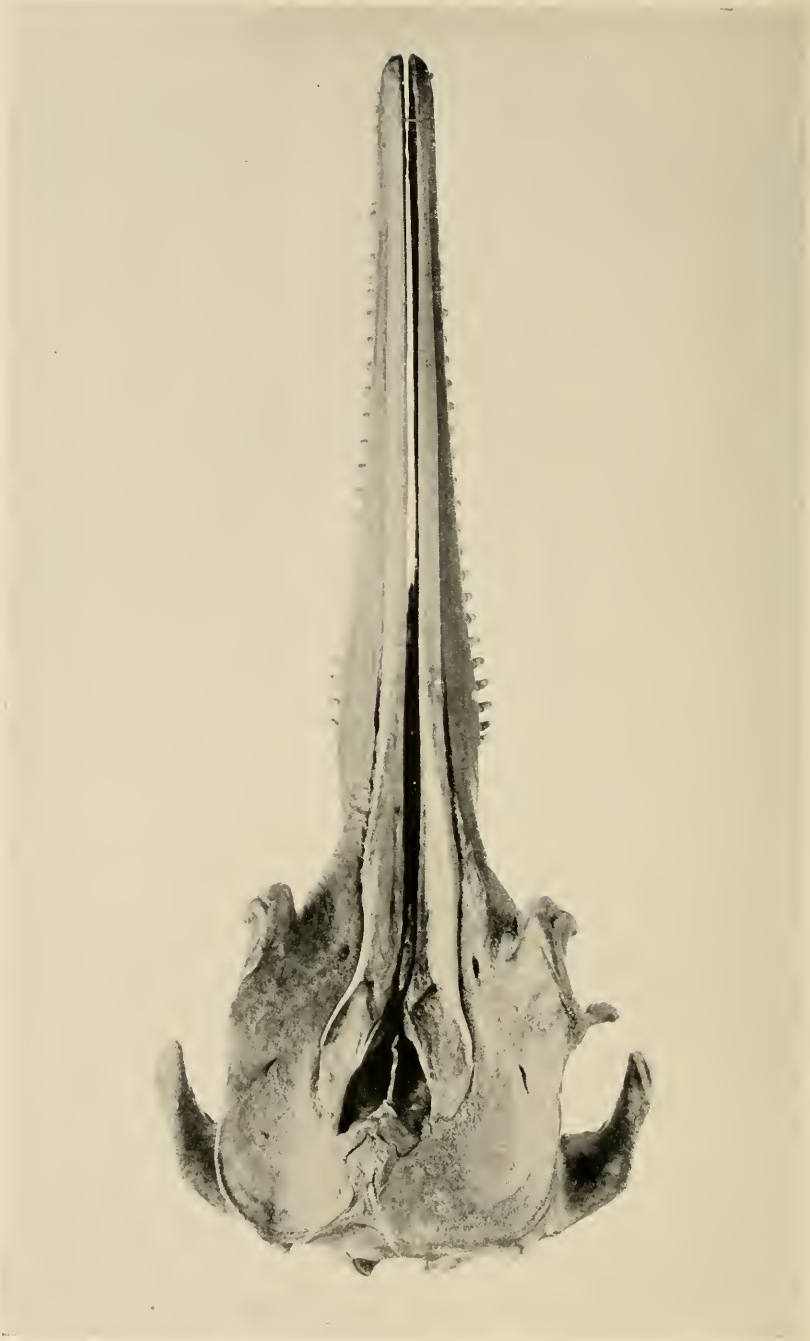
Lipotes vexillifer, type. Cervical vertebræ, anterior surface (about × .63).

PLATE 13

Inia geoffrensis, No. 49582, U. S. Nat. Mus. Cervical vertebræ, anterior surface (about × .63).

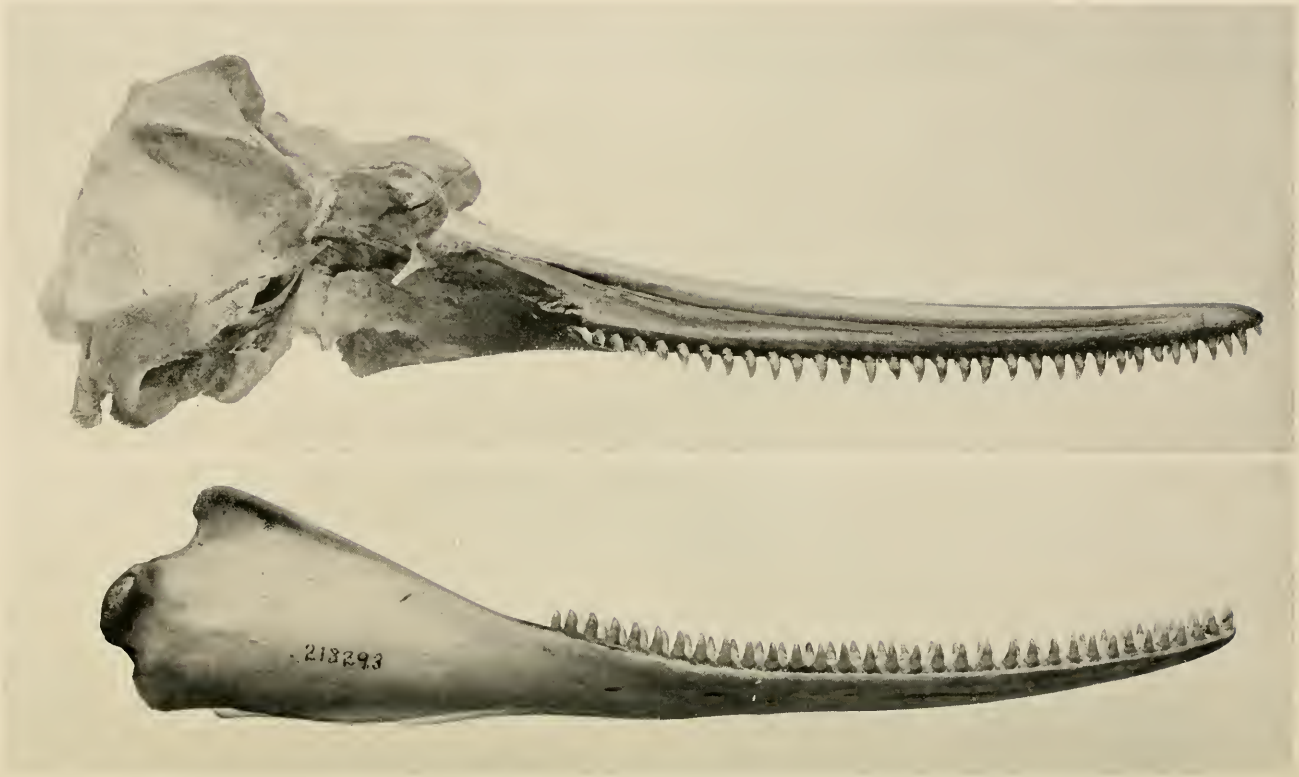


LIPOTES VEXILLIFER
(Greatly reduced)



LIPOTES VEXILLIFER
(About ×.30)

INIA GEOFFRENSIS
(About ×.30)



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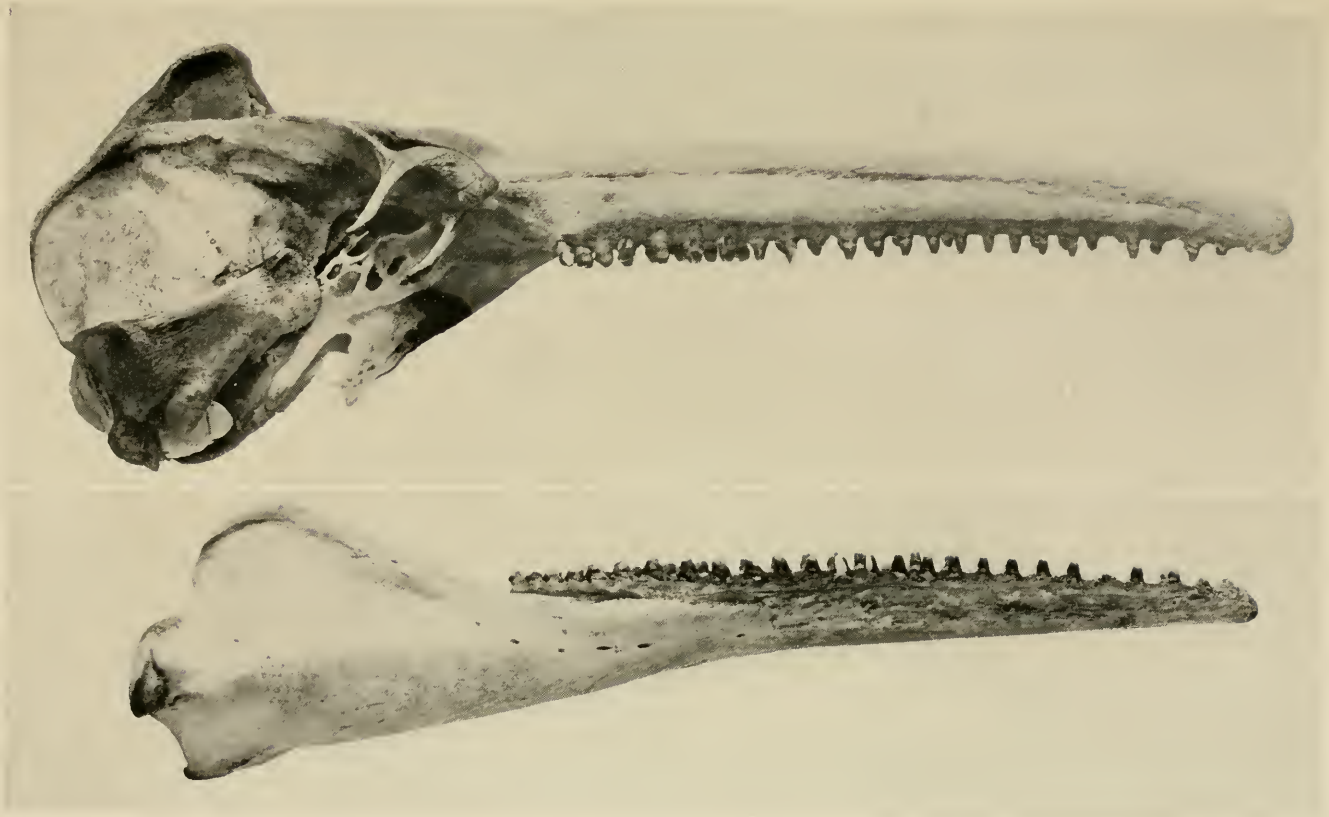

INIA GEOFFRENSIS
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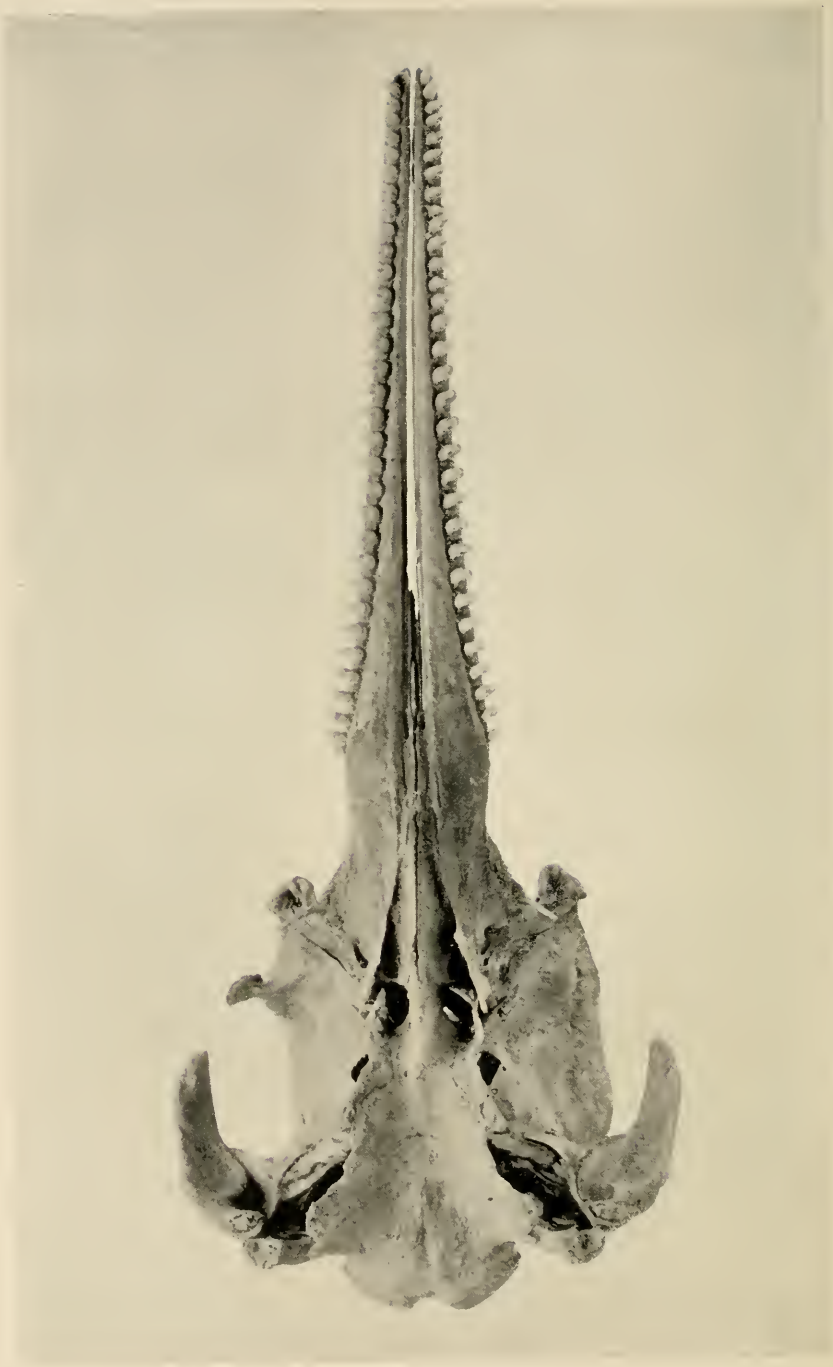

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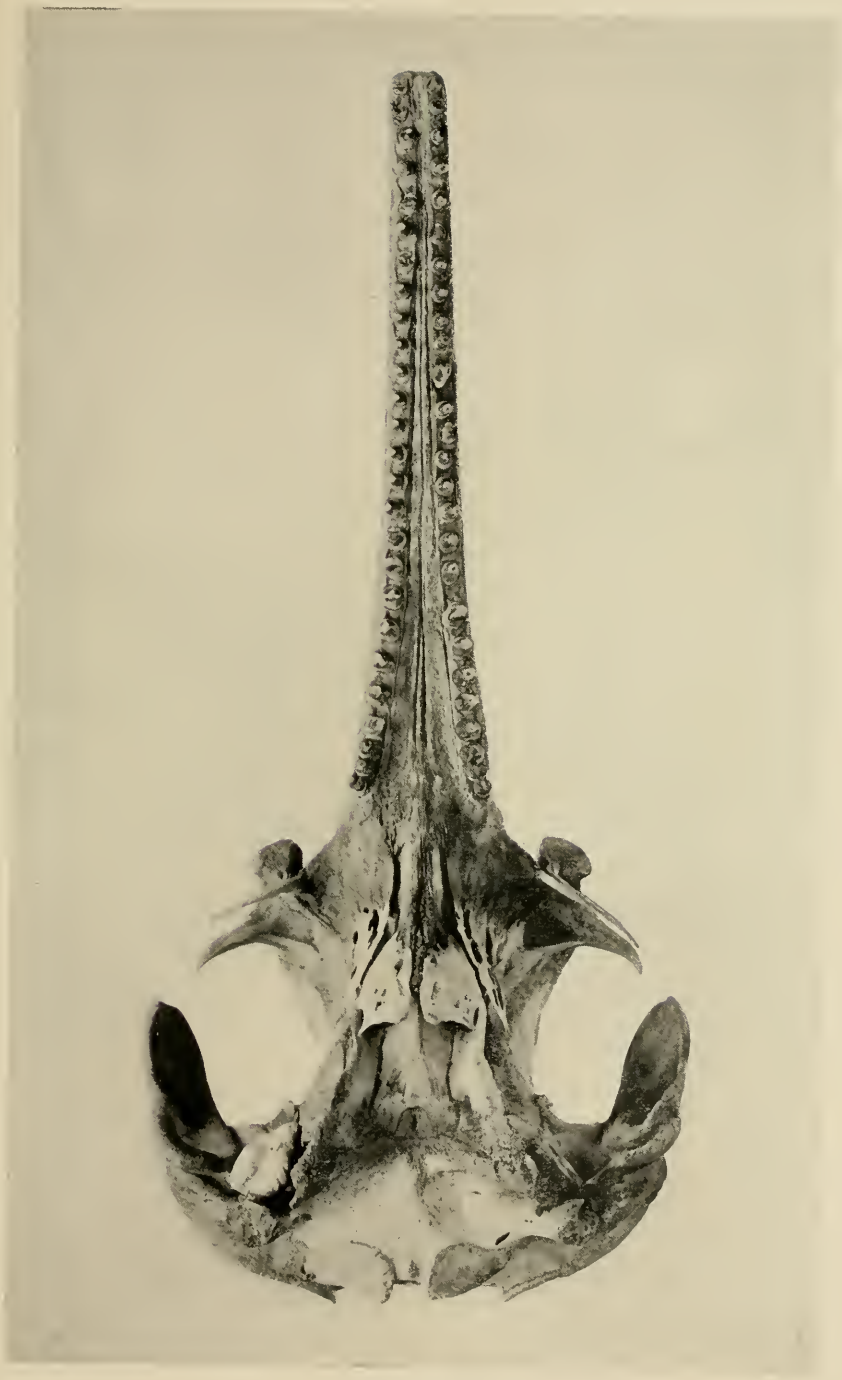

INIA GEOFFRENSIS
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LIPOTES VEXILLIFER
INIA GEOFFRENSIS
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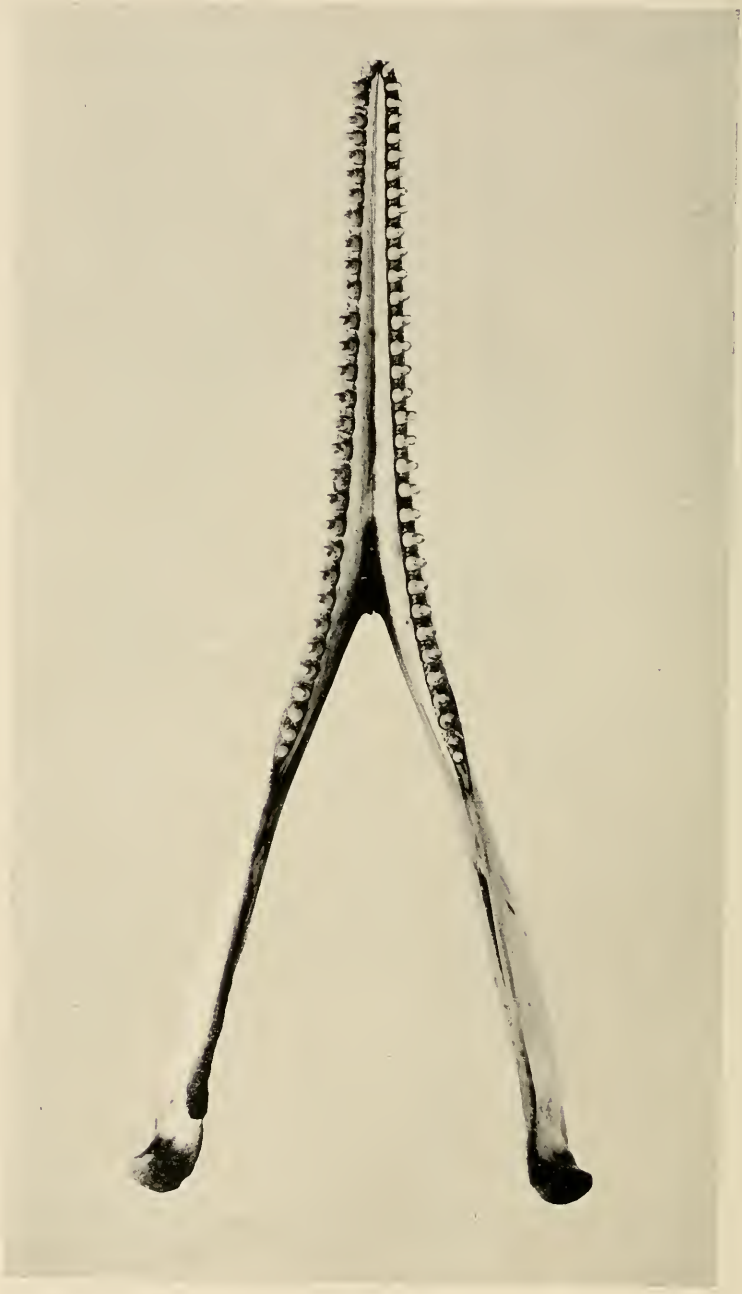

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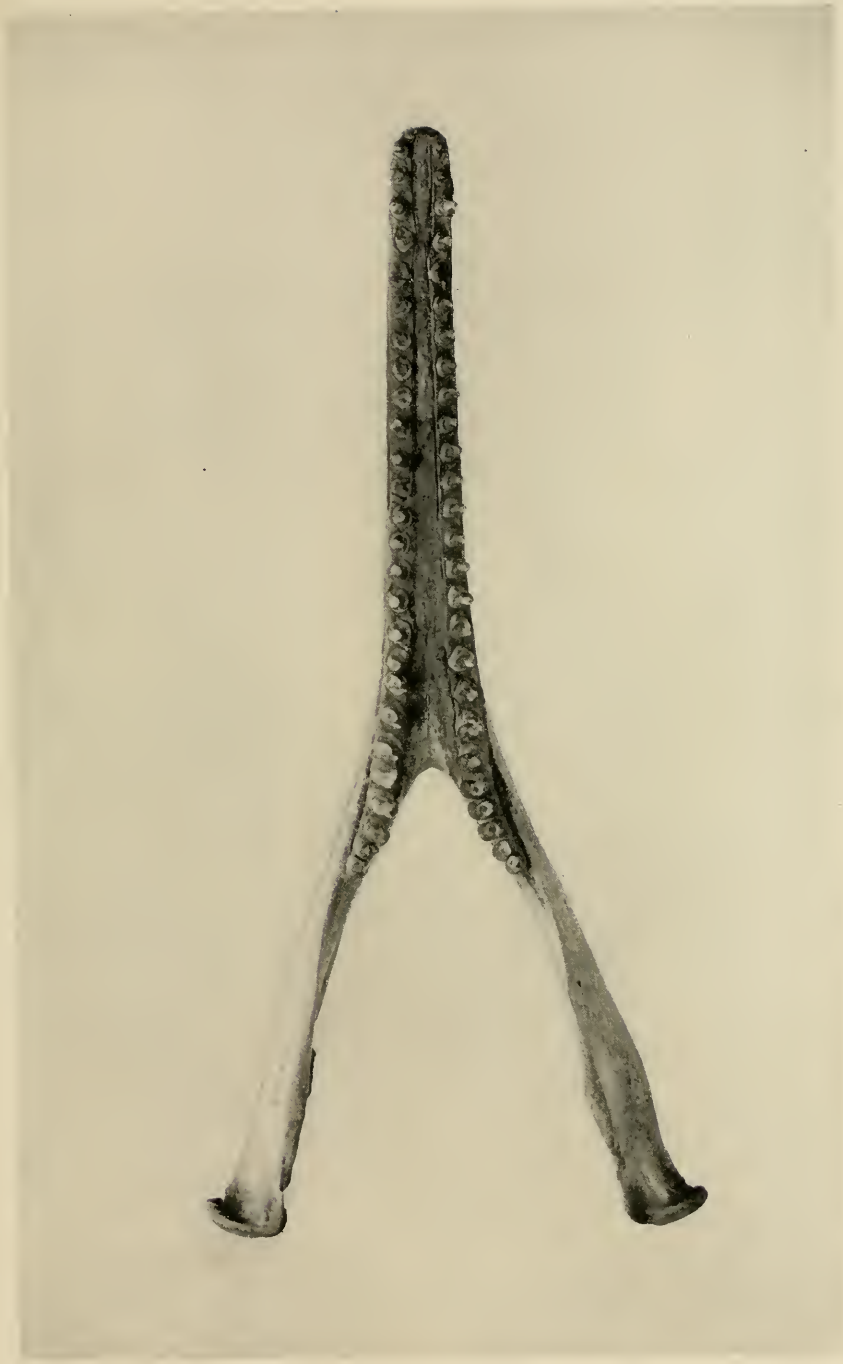

INIA GEOFFRENSIS
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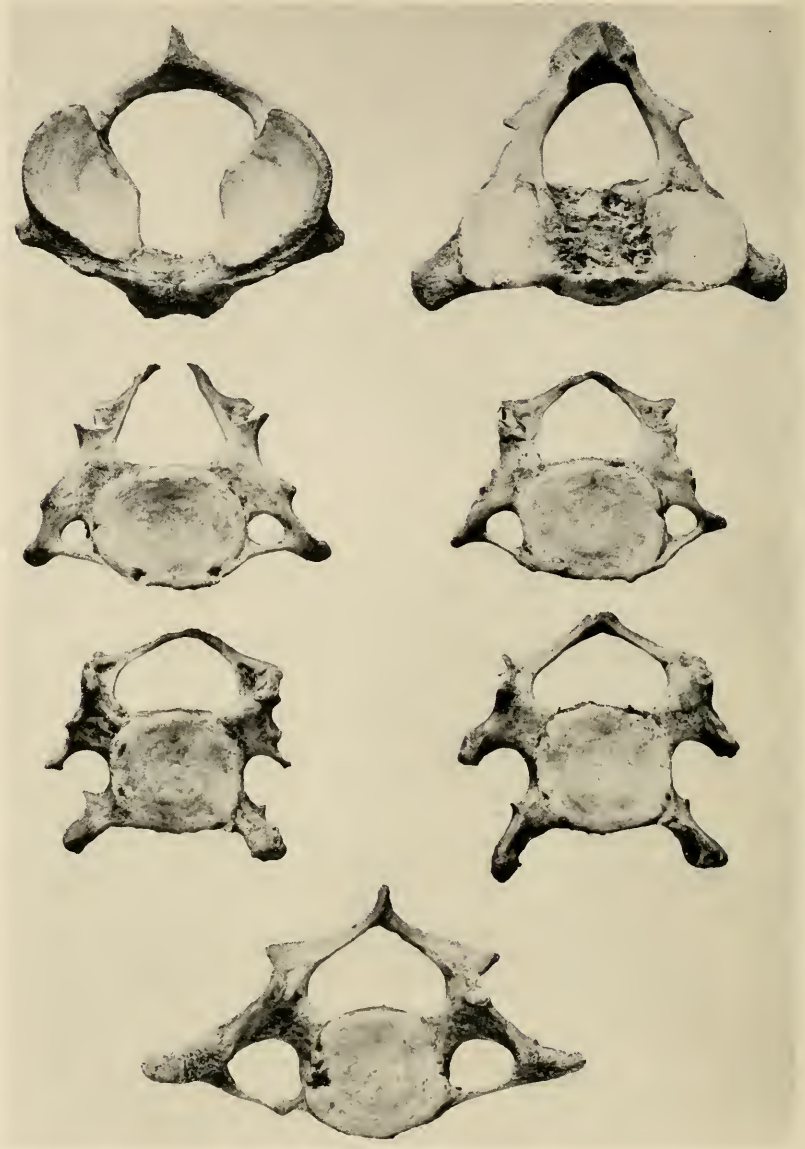
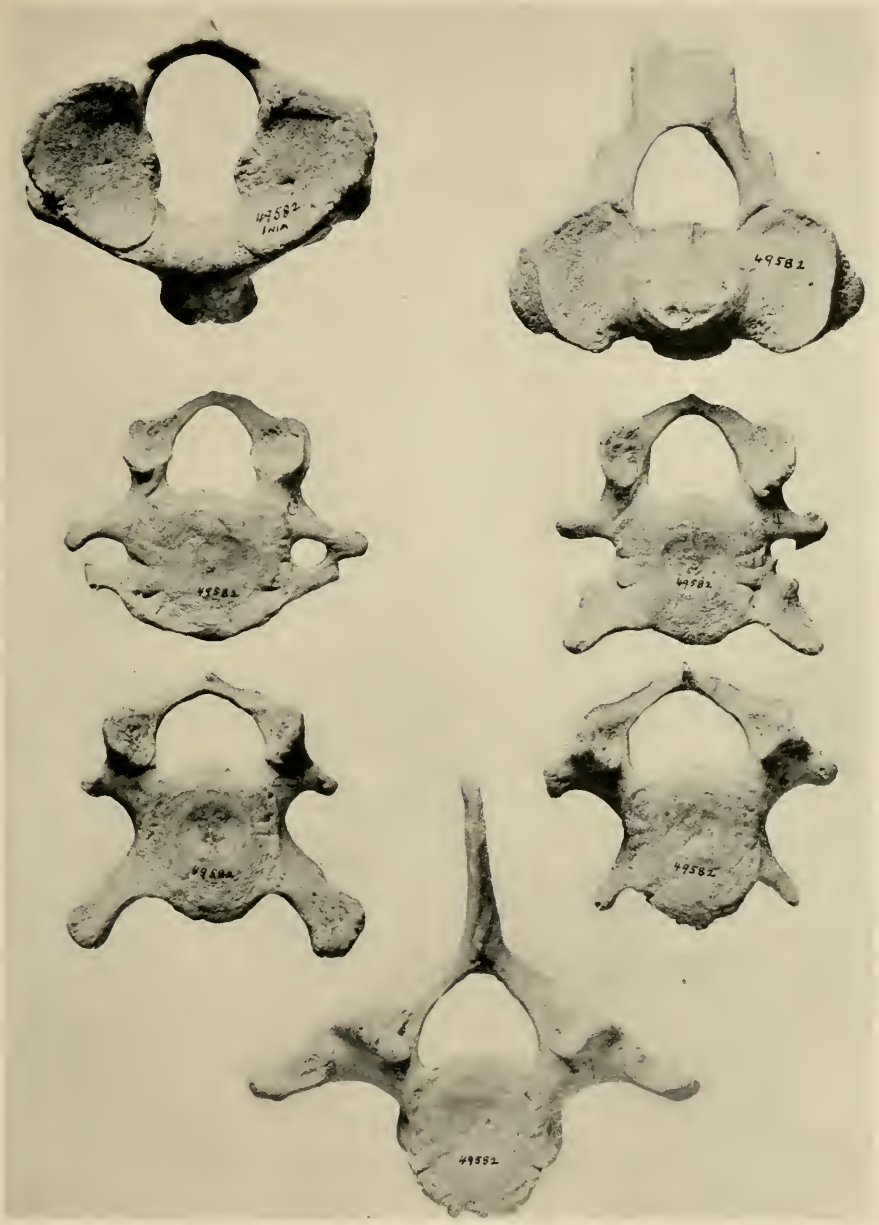
LIPOTES VEXILLIFER
INIA GEOFFRENSIS
(About ×.57)



LIPOTES VEXILLIFER
(About ×.63)



INIA GEOFFRENSIS
(About ×.63)