II. *On some Indian* Cetacea *collected by* Walter Elliot, Esq. *By* Professor Owen, *F.R.S.*, *F.Z.S.*, *&c.*

Read June 26th, 1865.

[Plates III—XIV.]

CONTRIBUTIONS to our knowledge of the singular and interesting order of Cetacean mammals (*Cetacea vera*, Cuv.) are so desirable, and acquisitions of evidences of exotic kinds are so few and far between, that I am induced to think the following may be deemed acceptable and worthy of publication by the Zoological Society.

The materials chiefly consist of coloured drawings and skulls of species captured or cast ashore on the east coast of the Indian peninsula, in the vicinity of the harbour of Vizagapatam, in the northern circars of the Madras Presidency.

Special care was taken by Walter Elliot, Esq., of Wolfelee[1], when resident at that locality, to have all such "stray waifs" from the whale-family brought directly to his cognizance; and he availed himself of the skill of a native artist, for whose accuracy he vouches, to make drawings of the specimens while recent; and these, for the most part, were executed under Mr. Elliot's own eyes. A selection from the drawings and some skulls of the Vizagapatam Cetacea have been confided to me by my friend for comparison and description; and the results of this labour, as respects what seemed "new to science," I have now the pleasure to communicate.

Family DELPHINIDÆ.

Genus Delphinus, *Cuvier.*

Delphinus (subgenus Steno, *Gray*) gadamu, *Owen.*

The "Gadamu" Dolphin. (Pl. III. figs. 1 & 2.)

This species is known to the Vizagapatam fishermen by the name of "Gadamu." It averages about 7 feet in length. The specimen figured is a female of 6 feet 10 inches in length.

The body is fusiform, gaining its greatest diameter at the fore part of the dorsal fin, where the girth is 3 feet 9 inches. From this point the body decreases forward to the head, by straight converging lines laterally (fig. 2), and with a gentle convex curve superiorly (fig. 3), to the eyes and blow-hole; thence the sides of the head converge more acutely to the

[1] Now Sir Walter Elliot, K.C.S.I.

base of the snout, while the forehead descends with a bold convex curve to the same part. The snout, which is divided from the forehead by a transverse groove, extending almost horizontally nearly to the angles of the mouth, equals in length the distance from its base to the eyes, which is five inches and a half. Its vertical diameter at the base rather exceeds the transverse diameter: it gradually decreases to an obtuse apex. The lower jaw projects a little beyond the upper: the "rictus oris" extends backward to very near the eye. This opens at the junction of the lower with the middle third of the vertical diameter of that part of the head. The "blow-hole" is on the same transverse line with the eyes, symmetrically situated on the middle of the vertex, of a crescentic form, with the cresses bent forward (fig. 2, *b*). The pectoral and dorsal fins are falcate, of nearly similar size. The pectorals commence at the beginning of the second fourth part of the entire body: the extent of their base (*i. e.* from the attached fore part to the angle at which the concave hind border begins) is about 9 inches; their length, following the anterior marginal curve, is 1 foot 6 inches: they are attached low down.

The dorsal fin commences 3 feet from the end of the snout (in a straight line): the extent of the attached base is 13 inches; that of the convex anterior border, following the curve, is 1 foot 4 inches.

From the dorsal fin the trunk diminishes in size to the root of the tail-fin, more rapidly laterally than vertically; from the dorsal to the end of the caudal measures 24 inches. The antero-posterior extent of the middle of the tail-fin is 7 inches; the extreme breadth of the fin is 1 foot 10 inches; the circumference of the base or pedicle of the tail-fin is 10 inches. The vent is situated on the mid line below, in the interval between the vertical parallels of the dorsal and caudal fins, and nearer the dorsal, being 2 feet 6 inches from the hind border of the caudal fin: about 2 inches in advance of the vent is the vulva.

The colour of the body is a dark plumbeous grey, almost black upon the fins, especially at their fore part, becoming very gradually lighter to the longitudinal parallel of the attachment of the pectorals, below which the body, from beneath the base of the snout and eye to below the base of the tail, is of a pinkish ashy-grey tint, with a few small irregular blotches of light plumbeous grey. The length of the snout, from the frontal groove, is 5 inches 6 lines; that of the "rictus oris," in a straight line lengthwise, is 11 lines; the eye is about equidistant from the end of the snout and the beginning of the pectoral fin. The greatest vertical diameter of the body is 1 foot 5 inches; the greatest transverse diameter is the same; the greatest girth is 3 feet 10 inches; the vertical diameter of the base of the snout is 3 inches, the transverse diameter 2 inches 6 lines. The number of teeth, as noted by Mr. Elliot in one specimen, was $\frac{27-27}{27-27}=108$; in a second specimen, $\frac{24-24}{24-24}=96$; in the skull transmitted, $\frac{23-23}{27-28}=101$.

This Dolphin would probably belong to that section which Dr. Gray has characterized, under the name of *Steno*, as having the symphysis of the lower jaw "elongate, about $\frac{1}{4}$ the length"[1]; but the definition of the term of comparison being omitted, whether it may be "length of the dental series," "of the mandibular ramus," or "of the entire skull," detracts from my means of testing this osteological character, whatever may be its value in regard to the variation in length of the "symphysis mandibulæ" of the restricted *Delphini* of Cuvier's system.

In the skull, no. 423, of the "Gadamu" (Pl. IV.), the symphysis mandibulæ (figs. 3 & 4, 5, 5) is more than $\frac{1}{4}$th the length of the entire dental series, and about $\frac{1}{5}$th the length of the entire ramus.

Assuming, however, the section or subgenus of the present Dolphin to be *Steno*, it then belongs to that subsection which is characterized as having the "** *Beak separated from the forehead by a cross groove*"[2].

In this section the present species differs from the *Delphinus* (*Steno*) *malayanus* in colour, in number of teeth, and perhaps also in size. The *D. malayanus* is "greyish above and below;" the dental formula $\frac{36-36}{36-36}=144$. From the *Delphinus* (*Steno*) *frontatus* of the Indian Ocean, with teeth $\frac{21-21}{22-22}=86$ or $\frac{21-21}{21-21}=84$, *D. gadamu* differs in the greater number of teeth. From *Delphinus* (*Steno*) *compressus* the present species differs in the minor compression of the head, the shorter and less attenuated snout. The *D.* (*Steno*) *attenuatus*, Gray, departs still further from *D. gadamu* in the length and slenderness of the snout and the more numerous teeth, the formula being $\frac{40-40}{40-40}$ $=160$.

In the skull of *D.* (*Steno*) *gadamu* (Pl. IV.) the maxillo-premaxillary part of the rostrum is broader and lower than in *D.* (*Steno*) *frontatus*, the premaxillaries rise above the maxillaries, at the middle of the rostrum, with a more abrupt transverse convexity, and the maxillaries slope therefrom outward and less steeply downward to the alveolar border. Behind the dental series the bony palate, there formed by the back part of the maxillaries, by the palatines, and pterygoids, forms a longitudinal bar convex across and increasing in depth as it recedes; the sides of the bar are continued into channels of the same length, concave transversely, and impressing the sides of the posterior palatal surface of the maxillaries. This undulating disposition of the bony palate subsides opposite the penultimate or antepenultimate teeth, in advance of which the bony palate is nearly flat, with a strip, 2 inches long, of the vomer at the mid line, and in advance of this is slightly hollow transversely, or canaliculate.

The sockets of the teeth are in contact, about 4 lines in diameter. In the skull transmitted, and here noticed and figured (Pl. IV.), I count 23—23 in the upper jaw, and 27—28 in the lower jaw. The teeth have a long and large rounded base and a short enamelled crown, slightly incurved, not very sharply pointed; about ten anterior alveoli are coextensive with the symphysis.

[1] Zoology of the Voyage of H.M.S. Erebus and Terror: "Cetacea." 4to. 1844, p. 43. Not any of the figures of the skulls of *Steno*, Gray, illustrate the symphysial character in question. In a specimen of *Steno frontatus* in the British Museum the mandibular symphysis is about one-fourth of the entire length of the skull.

[2] Ibid.

The specimen of the Gadamu Dolphin here figured was taken on the 20th March, 1853, at Waltair, the civil station at Vizagapatam; the posterior margin of the dorsal fin had been accidentally slit.

DELPHINUS (STENO?) LENTIGINOSUS, *Owen*.

Freckled Dolphin. (Pl. V. figs. 2 & 3.)

By the same general fusiform character of the body, diminishing to the ends from the greatest girth at the fore part of the dorsal fin, and by the small size of this fin and especially of the pectorals, I am induced to place this Dolphin in the same section with the preceding. From the Gadamu it differs, not only in colour, but in the size of the fins, the pectorals and dorsals being relatively smaller, the caudal fin larger. The body is narrower, being subcompressed; the vertical diameter at the deepest part (fig. 2) exceeds the transverse (fig. 3). The back is rounded in front of the dorsal fin, but is sharp, or keeled, behind it for about half the distance to the caudal, where it again becomes convex until near the root of the tail-fin, which is compressed and sharp above. The forehead is higher and more convex than in *D. fusiformis* (Pl. V. fig. 1), but is continued by an alteration of curve more directly into the rostrum than it is in *D. gadamu* (Pl. III. fig. 1). The transverse groove, as indicated in the drawing (Pl. V. fig. 6, *c*), is defined at the sides of the base of the beak, but above it is less deep or definite than in the two above-named species. The contour-line from the dorsal fin to the forehead is nearly straight, very slightly undulated, not convexly curved as in *D. gadamu.*

The specimen figured (Pl. V. figs. 2, 3) was a female, captured at Waltair, September 18, 1854. She measured 7 feet 10 inches in length, and 4 feet in greatest circumference, being probably pregnant. The colour is pretty uniformly bluish cinereous, or slaty, freckled with irregular small spots or streaks of brown or plumbeous pigment, the streaks longitudinal and flecked with white; the under surface is a shade lighter than the rest of the body. The snout is 6 inches in length, $3\frac{2}{3}$ inches in depth at the base, and 3 inches there across; the skull shows better the predominance of the vertical over the transverse diameter of the rostral production of the jaws. The "rictus oris," 1 foot in length, bends gently upward from the base of the snout to within 2 inches of the eye. This is situated just above the middle of the vertical line crossing that part of the head. From the end of the snout to the eye is $14\frac{1}{2}$ inches. The blow-hole, median in position and shaped as in the foregoing species, is a little in advance of the vertical parallel of the eyes; in the male specimen it was on the same parallel. From the end of the snout to the pectoral fin is 2 feet; the attachment of this fin is subpedunculate, the antero-posterior extent of the peduncle being only 3 inches, while the breadth of the fin, at the posterior basal angle, is 5 inches; the length of the anterior margin, following its very slight convex curve, is 12 inches. The dorsal fin is relatively lower than in *D. fusiformis*, much more so than in *D. gadamu*; the hind border slopes away gradually to an extensive base of attachment, which is continued as a ridge halfway between the dorsal and caudal fins: the length of the dorsal at its front margin is 1 foot 1 inch; from the end of the snout to the dorsal fin is 3 feet 4 inches; from the front border of the fin's base to the mid fissure of the tail-fin is 4 feet 2 inches; the fin is rather more posterior in position than in *D. fusiformis*, and is more obtusely terminated than in that species or in *D. gadamu*, From the hind border of the caudal fin to the vent is 2 feet 5 inches: the vulva is $2\frac{1}{2}$ inches in advance of the vent. The upper part of the pedicle of the caudal fin is obtusely ridged; the middle of the posterior margin of the fin is notched, as in the two foregoing species; the antero-posterior breadth of the fin, near the notch, is 7 inches 6 lines; the transverse breadth of the entire fin is 1 foot 9 lines.

A profile-view of the head and pectoral fin of a male *D. lentiginosus*, taken also at Waltair, which was of a rather darker bluish slate-colour than the female, shows the feeble indication of the fronto-rostral groove beyond the lateral indentations; the interruption of the convex curve of the forehead, before reaching the snout, is rather more marked. The mouth is represented a little open, indicating the relative size of the teeth so exposed; they were $\frac{32-32}{32-33}=129$. As in the female specimen, the pectoral fin is not falciform, but has rather the shape of a scalene triangle, the two shorter sides straight.

The skull of *Delphinus* (*Steno*) *lentiginosus* is rather narrower in proportion to its length than in *D. gadamu*; the occipital condyles are larger, the superoccipital surface is narrower, the temporal fossæ more squared above; the premaxillaries do not rise to form a distinct convexity at the upper part of the rostrum, as in *D. gadamu*, but continue upwards the roof-like slope, begun by the maxillaries, which gives a triangular transverse section to the middle and fore part of the rostrum. The breadth of the rostrum at the antorbital notches is the same in both species, viz. 4 inches; the length of the rostrum, from the notches, is $10\frac{1}{2}$ inches in *D. gadamu*, 11 inches in *D. lentiginosus*. But the chief distinction is in the number of the teeth: in the skull here noticed and figured there are, in the upper jaw, 33—33, in the lower jaw, 32—32 =130, and the teeth are smaller. The extent of the dental series of the upper jaw in *D. lentiginosus* is 9 inches 9 lines, but is not more than 8 inches 6 lines in *D. gadamu*.

The *D. lentiginosus* is known to the Waltair and Vizagapatam fishermen by the Telugu name of "Bolla Gadimi."

DELPHINUS (STENO?) MACULIVENTER.

Spot-bellied Dolphin. (Pl. VI. figs. 1 & 2.)

In the degree of convexity of the forehead the present species resembles the *D. fusiformis* (Pl. V. fig. 1); but the head is relatively larger, and the body is deeper in proportion to its length, than in either *D. fusiformis* or *D. gadamu*.

In colour it presents a well-marked distinctive character from all the Vizagapatam species; it is of a deep, shining, plumbeous black on the upper part, becoming paler near the belly, which, from the under part of the jaw to the perineum, is ashy grey, with irregular spots or blotches, whence the specific name *maculiventer*. The specimen from which figs. 1 and 2 were taken was a female, 6 feet 11 inches in length, found at Waltair, 26th April, 1854. It is called by the fishermen "Suvva."

The fronto-rostral groove is well marked, but short; the "rictus oris" slightly rises as it extends back, to about 3 inches below the fore part of the eye; the under jaw extends beyond the upper, and chiefly forms the obtuse end of the rostrum; this is 5 inches in length, and higher at its base than it is broad. The blow-hole resembles in position and shape that of the previously described species. Both pectoral and dorsal are falcate, but small; the length of the front border of the pectoral, following the curve, is 1 foot 3 inches; from the end of the snout to the setting-on of this fin measures 1 foot 9 inches. The greatest circumference of the body is just in advance of the dorsal fin; the height of this fin is 8 inches, the extent of its basal attachment 18 inches; to the fore part of the dorsal from the end of the snout, in a straight line, is 3 feet 4 inches; from the back part of the dorsal to the hind border of the base of the caudal fin is 3 feet. The body is more compressed than in *D. lentiginosus* (Pl. V. fig. 3). The girth of the pedicle of the caudal fin is 1 foot 2 inches; the fore-and-aft diameter of the fin is 7 inches, the extreme breadth is 1 foot 8 inches; from the median notch of the caudal to the vent is 2 feet 3 inches; extent of perineum (or between the vent and vulva) 3 inches.

The dentition of this species is $\frac{27-27}{30-30}=114$. It appears not to be rare. Specimens were taken in March 1853 and April 1854, all showing the character of colour given in the female figured in Pl. VI. figs. 1 & 2.

DELPHINUS (LAGENORHYNCHUS) FUSIFORMIS, *Owen*.

Spindle-shaped Dolphin. (Plate V. fig. 1.)

The present species is more slender in proportion to its length, has a less elevated and less convex forehead, a proportionally thicker, broader, and more obtusely terminated snout, a deeper mandible or under jaw, especially posteriorly, and smaller dorsal and pectoral fins, especially the latter, than in the foregoing species of *Delphinus*. It appears, likewise, to be a smaller species. The specimen figured, which was the largest taken (at Waltair, on the 23rd August, 1853), was a female, 6 feet in length: the dentition $\frac{22-22}{21-21}=86$. The greatest girth of the body is at the fore part of the dorsal fin; from this the body tapers to both ends, and, through the lower forehead and thicker snout, more regularly than in *D. gadamu*, and presenting a truer spindle-shape of the whole animal, whence the specific name. The "rictus oris" bends upward as it recedes, and does not approach so near the eye as in *D. gadamu*. Both the angle of the mouth and the eye are more elevated in position; the blow-hole is medial, symmetrical, on the same vertical parallel with the eyes; crescentic, with the angles bent forward. The length of the snout is 6 inches, of the "rictus oris" 10 inches; from the end of the snout to the eye 1 foot; from the same to the setting-on of the pectoral fin 1 foot $7\frac{1}{2}$ inches; from the same to the setting-on of the dorsal fin 2 feet 7 inches; from the hind part of the base of the dorsal fin to the hind border of the caudal fin 2 feet 8 inches. The pectoral fin measures 5 inches across the broadest part of its base, and is 1 foot in length, following the curve of the front border, which curve is much less than in the Gadamu. The dorsal fin is lower in proportion to the length of its base; its anterior border also shows a minor degree of convexity; the extent, following the curve, is 10 inches; the line of attachment measures 11 inches. The fore-and-aft extent of the mid part of the caudal fin is 5 inches; the extreme breadth of the fin is 1 foot 4 inches. The vent is 1 foot 9 inches in advance of the mid notch of the caudal fin; the vulva is 5 inches in advance of the vent, the interspace being relatively greater than in the Gadamu.

The colour of the "Spindle-shaped Dolphin" is less darkly plumbeous than in the Gadamu, and becomes more gradually lighter towards the belly; the dorsal fin, the fore part of the pectoral and caudal fins, and the snout have the darkest pigment; the light ashy-grey belly shows no spots.

The difference from any of the three preceding species is still more marked in the skull (Pl. VII.), which presents the general characters of that section of *Delphinidæ* to which the term "*Lagenorhynchus*" has been attached. It resembles in size and general characters the skull of *Lagenorhynchus electra*, Gray; but the occipital condyles are more approximate below the foramen magnum, the presphenoid is narrower, the longitudinal channel formed by it and the pterygoid is deeper and narrower: the rostrum is of equal length in the two species, viz. 9 inches 8 lines from the antorbital notches (*k*); but the breadth there is $5\frac{1}{2}$ inches in *Lagenorhynchus electra* and 5 inches in *Lagenorhynchus fusiformis*. In this species a narrow slip of the vomer (fig. 4, 13), about an inch in length, appears on the bony palate, 3 inches from the anterior end.

In *Lagenorhynchus* (Pl. VII.) the skull is broader in proportion to its length, and the mandibular symphysis shorter, than in *Steno* (Pl. IV.); the transverse undulation of the hind part of the palate is less marked, the middle convex tract being broader and lower, and the lateral channels wider and shallower.

DELPHINUS POMEEGRA, *Owen*.

The Pomeegra Dolphin. (Pl. VI. fig. 3.)

This species belongs to the same section of *Delphinus* as the Black Dolphin of the Cape and Ceylon (*Delphinus longirostris*, Gray[1]) and the *Delphinus forsteri*[2] of the Pacific.

[1] Schlegel. Mr. Blyth has inserted a note on this species in the 'Journal of the Asiatic Society of Bengal,' 1848, pp. 249, 250.

[2] Forster, "Descriptio Animalium," drawing no. 24 (copied by Dr. Gray, in the 'Zoology of the Erebus and Terror,' "Cetacea," 4to. 1845, plate 24).

It was taken off the coast of Madras, and is known to the fishermen there as the "Pomeegra." It is of a very deep plumbeous shining colour, almost black, with a rather lighter shade at the under part of the belly. Mr. Elliot, who was indebted to Mr. Blyth for the specimen, notes it as "a small Cetaceous species;" but the length is not given. The proportions of the snout, of the rictus oris, of the fins, and the form of the forehead (which rises from the base of the snout with a low convexity) are characters in which the *D. pomeegra* resembles the *D. longirostris*, Gray. It chiefly differs in the larger proportional size and smaller number of the teeth, viz. $\frac{41-41}{45-46}=173$. The blow-hole is crescentic, and on the same vertical parallel as the eye. The body enlarges more gradually to the origin of the dorsal fin than in *D. forsteri*, the greatest circumference being at the fore part of that fin. It is more slender in proportion to its length than any of the above-described fusiform Dolphins belonging to the subsection *Steno*, Gray. The symphysis mandibulæ (Pl. VIII. fig. 4) is less than $\frac{1}{6}$th the entire length of the ramus. The hinder half of the palate (ib. fig. 2), is widely and deeply channelled on each side. This is, however, but an extension of the modification already pointed out in the hind part of the palate of *D. gadamu* (Pl. IV.), and it is subject to varieties in species which, from the brevity of the mandibular symphysis, the great number and small size of the teeth, and the transversely convex rising of the premaxillaries along a considerable part of the rostrum, would be retained among the *Delphini* as restricted by Dr. Gray. In *Delphinus euphrosyne*, e. g. (Pl. VIII. fig. 5: no. 15, p. 251, 'Catalogue of Cetacea in the Br. Mus.'), the hinder middle tract of the bony palate is not longer, deeper, nor more convex transversely than in *Steno* and *Lagenorhynchus*, and the lateral channels show the same proportions as in the latter subgenus. The prominent mid tract of the palate is too broad and obtusely convex to be regarded as a "ridge," in any species of *Delphinus* proper that has come under my observation.

Sp. dub. DELPHINAPTERUS MOLAGAN, *Owen*.

Mr. Elliot writes, "I have (or rather 'had,' for I cannot find it) a drawing of a small Cetacean, copied from one made in the Chief Engineer's Office at Madras for Col. Monteith, which was taken from an individual, 32 inches long, of a uniform black colour, with a rounded obtuse head, small mouth, and *no dorsal*. The Tamil fishermen called it 'Molagan.'"

Genus PHOCÆNA, *Cuvier*.

PHOCÆNA (ORCA, *Gray*, *Reinhardt*) BREVIROSTRIS, *Owen*.

Short-snouted Porpoise (skull). (Pl. IX. figs. 1, 2, 3.)

Of this Cetacean I possess only the cranium; but, as it presents the characters of maturity, it is too small for the species represented by the drawings already described, if even the proportions of the rostral part of the skull (Pl. IX. fig. 1, 21' 22) did not show that it belongs to a different section of *Delphinidæ*[1]. The present part of a Cetacean skeleton, as the skulls of those species, figured in Pls. IV. VII. VIII. demonstrate, affords better grounds for comparison and specific determination than do coloured drawings of the entire animal, however accurate,—the number of skulls of ascertained species in home-museums, or otherwise accessible, being much greater than entire and stuffed specimens of the Cetacea, which rarely give the natural contour of head or body.

The animal from which this skull was taken was thrown ashore in the harbour of Vizagapatam in too decayed a state to be figured, and was noted as a "small kind of Porpoise" by Mr. Elliot, who fortunately secured the present evidence of the species, which is now preserved in the British Museum.

The following are the dimensions of the skull:—

	inches.	lines.
Length	11	0
Breadth, greatest, across zygomata	7	4
From the back of occipital condyle to antorbital process of malar bone	7	6
From the antorbital process of malar to anterior end of premaxillary	4	8
From the back part of nostrils to do. do.	7	6

These dimensions show that in the shortness of the "facial" as compared with the "cranial" part of the skull the species agrees with the section of *Delphinidæ*, including the Grampuses and Porpoises, for which Cuvier proposed the subgeneric name *Phocæna*[2], and which, in his 'Ossemens Fossiles,' tome v. part i. (1823), he distinguished as "§ 2. Les Dauphins à tête obtuse" (p. 280), from "§ 1. Les Dauphins à bec" (p. 275) (*Delphinus*, proper)[3].

The number of *Delphinidæ* with obtuse heads or short jaws, which have since been observed, have manifested so many minor modifications in the relative size, shape, and number of the teeth, in the relative size and length of the jaws, in the formation of the bony palate, in the extent of anchylosis, and the forms of processes, &c., of the cervical vertebræ, that numerous subgenera have been founded on these characters. Nevertheless, as each additional kind of blunt-headed Dolphin tends to exemplify the gradational tendency of these modifications, the benefit to zoology of the additional *quasi*-generic names is doubtful; and I shall refer the present skull, which appears to me to belong to an undescribed species, to the *Phocæna brevirostris*, as a member of the section of Cuvier's *Phocænæ*, characterized by conical teeth, in which its nearest alliance appears to be with the *Phocæna globiceps*, Cuv.[4]

[1] The following is Mr. Elliot's note respecting this specimen:—"August 1852. Got the skull of a porpoise which one of the fishermen found dead at the mouth of the Vizagapatam river. He called it 'Ganumu,' and described it as having a rounded head, without beak, colour black or dark above, white below; perhaps a *Phocæna* or *Globicephalus*."

[2] Règne Anim. tome i. p. 290 (1829). [3] Ibid. p. 287.

[4] Ibid. p. 290; Annales du Muséum, tome xix.; Ossem. Foss. tome v. part i. p. 290, tab. 21. pls. 1, 2, 3, figs. 11, 12, 13.

The elements of the occipital have coalesced. The basioccipital (Pl. IX. fig. 3, 1) forms the lower fifth of the foramen magnum, intervening for an extent, measured in a straight line, of $10\frac{1}{2}$ lines between the lower ends of the occipital condyles (ib. 2′): it is here thick and concave transversely: it becomes thinner vertically and expanded laterally as it advances to join the basisphenoid (ib. 5), with which it has coalesced: a slight median longitudinal obtuse rising divides two large shallow concavities, from the sides of which the aliform expansions of the basisphenoid extend, which bend slightly downward to form the lower and inner or mesial wall of the otocrane (ib. *or*). The occipital condyles (figs. 1 & 3, 2′, 2′) are narrow, vertically elongate, oval convexities, wider at their lower half, with the mesial margin gently convex, the lateral or outer margin sinuous, through a slight concavity marking off the upper third of the condyle: the length of the condyle in a straight line is 2″ 1‴, the greatest breadth 1″ 11‴: the upper ends of the condyles are 1″ 3‴ apart; they are low and sessile. The foramen magnum is vertically oval, widest above, and notched at the middle of the upper border; its length, to the end of the last notch, is 2″, its breadth 1″ 3‴; the breadth across the broadest parts of both condyles is 2″ 9‴. The paroccipital (figs. 1 & 3, 4) an exogenous growth of the exoccipital, forms the back part of the otocrane, towards which it is sinuous or slightly concave, and terminates below in a thick rough border, 4‴ across the thickest part (figs. 3, 4‴); this border is divided by a notch from the otocranial plate (5′) of the basisphenoid, and just within the bottom of that notch opens the canal for the nervus vagus. The superoccipital (figs. 1, 2, 3) rises and expands, as in other *Delphinidæ*, into a broad and lofty convex plate reaching the vertex, and there articulating with the parietals (7) and interparietal (7*); a low median ridge (fig. 2, 3′) divides vertically the upper half of the superoccipital. On the inner surface, 1″ 6‴ above the foramen magnum, a vertical triangular plate of bone descends into the falx; it is thickest behind, where its base is grooved transversely by the lateral sinus.

The alisphenoids (Pl. IX. figs. 1, 3, 6) coalesce with the fore part of the lateral borders of the basisphenoid, in advance of the otocrane (fig. 3, *or*), of which it forms the anterior wall or boundary: the base of the alisphenoid is notched posteriorly for the third, and anteriorly for the second, division of the trigeminal; it expands as it passes outward, slightly rising (fig. 1, 6) to join the parietal (7), and frontal (11), and to overlap the process of the squamosal (fig. 3, 27′), continued, mesiad, from the glenoid cavity (*g*). The suture between the interparietal (fig. 2, 7*) and superoccipital (3) is obliterated, and that with the parietals is partially so. The suture between the parietal and superoccipital remains at its lower half (fig. 1, 7), showing that a narrow strip of the parietal appears on the external surface of the cranium, extending backward, between the squamosal (27) and superoccipital (3) to the exoccipital (2), and slightly expanding at its junction therewith.

The presphenoid (ib. fig. 3, 9) is distinct from the basisphenoid (5), and extends in the form of a compressed rostrum forward, contracting, to be enclosed by the posterior sheath-shaped part of the vomer (13). The orbitosphenoids (ibid. 10) extend outward, overlapping the pterygoids (24), contract where they form the fore part of the foramen lacerum anterius and the optic foramina, beyond which they expand to support the orbital plate (fig. 3, 11′) of the frontal.

The frontals (Pl. IX. figs. 1 & 2, 11, 11′), in great part overlapped, as in other Cetacea, by the maxillaries (21), show at their narrow exposed strip, extending transversely across the summit of the cranium, the persistant frontal suture, half an inch in length; from this suture the strip curves outward and backward, expanding beyond the interparietal (7*), and then downward and forward, contracting and again expanding, to form the post-orbital process (figs. 1, 2, 12): this is triangular and three-sided, one facet being a continuation of the exposed strip, a second contributing to the temporal fossa, and a third to the orbit (*or*). In the temporal fossa, the frontal (fig. 1, 11) articulates with the parietal (7) and alisphenoid (6); in the orbit (ib. *or*), with the orbito-sphenoid (fig. 3, 10) and malar (26′); then, arching forward from the postorbital process, the frontal forms the superorbital ridge (fig. 1, 11), and articulates anteriorly by a kind of gomphosis with the malar (26′); it is overlapped here, as on the cranium, by the maxillary (21″). The medial parts of the frontals (fig. 2, 11) are united posteriorly with the interparietal (7*), anteriorly with the nasals (15).

The vomer (ib. fig. 3, 13) extends forward to within an inch and a half of the end of the premaxillaries, and behind these it intervenes upon the bony palate between the maxillaries, along a strip of two inches extent and three lines across the broadest part. This palatal part of the vomer (13) is the lower convexity of the canal formed by the spout-shaped bone; the hollow of the canal is exposed at the upper interspace of the premaxillaries. Here, also, is seen, two inches behind the fore end of the vomer, the rough thick anterior border of the coalesced prefrontals (fig. 2, 14), which contracts as it passes into their upper border, forming the septum of the nostrils, expanding below and behind to form the back wall of the nasal passages (14′). At this part a trace of the suture between these foremost neurapophyses of the skull remains. Their bifid spine —the small transversely extended subquadrate nasals (15)—intervenes between the frontals (11) and prefrontals (14′). The palatine bones appear on the palate as narrow strips (fig. 3, 20) wedged between the maxillaries, (21) and pterygoids (24), and united together beneath the vomer by a longitudinal suture of 3‴ extent: then, passing outward and forward, after a brief contraction they suddenly expand and bend upward to line or form the mesial wall of the orbit, and again contract to articulate with the frontal at the superorbital fossa; the mesial borders of the palatines articulate with the vomer and prefrontals; and between the pterygoids and the vomer the palatines form the fore part of the lower half of the nasal passages. The orbital plate of the palatine sends off an outer thin lamina, which terminates by a free margin at the back of the orbit. The palatine plates of the maxillaries (21) unite together for about an inch in front of the palatines, then slightly diverge to give place to the vomer (33), which, however, does not sink to their level; in advance of the vomer the plates slightly diverge to their anterior ends, giving place to the premaxillaries (22′), which form the apex of the muzzle: the rest of the disposition of the maxillaries accords with Cuvier's account in *Phocæna globiceps*; the superorbital plate (fig. 1, 21*) is divided by a notch from the rostral part (21) of the maxillary, and forms a tuberosity articulated with the underlying malar (26′). The premaxillaries (22) accord equally with those in *P. globiceps*, save in their shorter proportions concomitantly with the shorter muzzle. They are perforated near the outer margin, between the posterior and middle third, the canal leading forward and inward. The three perforations (fig. 2, *a*, *b*, *c*) in the maxillary external to the nasal portions of the premaxillary (22′), are the upper outlets of canals which converge to open into an oblong fossa (fig. 3, 26) beneath the fore part of the roof of the orbit.

The pterygoid (fig. 3, 24, 24′) is a large sinuous plate folded upon itself from within, upward, outward, and backward; the thick fore part (24) articulates with the palatine, whence it continues the bony roof of the mouth backward for the extent of 1″ 8‴, with a convex surface, divided from its fellow by a vacancy of 8‴ breadth, exposing the presphenoid and vomer; the inner plate of the pterygoid forms the outer wall of the lower part of the nasal passage, and continues that passage obliquely backward, as an open canal (24′), beneath the base of the alisphenoid (6), as far as the otocranial plate of the basisphenoid (5′). This posterior production of the pterygoid is three-sided; the inner or narial one is concave; the outer one is also concave, forming a channel leading upward and forward to the orbit; the upper facet is sutural, and articulated with the basi-, pre-, ali-, and orbito-sphenoids. The anterior external lamina of the pterygoid bends outward and upward to articulate with the corresponding free lamina of the palatine, bounding the narrow and deep sinuous fissure between the outer and inner portions of both bones.

The malar, as in other *Delphinidæ*, consists of the antorbital (Pl. IX. fig. 1, 26′) and styliform (26) portions. The former (26′) is a narrow triangle, with the base thick, convex, turned forward, underpropping the fore part of the superorbital plate of the maxillary (21*), and articulating with the same part of the frontal; the apex extends backward, and is wedged into the roof of the orbit between the frontal and maxillary. The styliform portion (26) is given off by a process extending inward (mesiad), at right angles to the antorbital portion (fig. 3), and a few lines behind its fore part; it suddenly contracts and extends backward, with a slight bend, to the squamosal, articulating by a concave, oblique, terminal facet to a tubercle at the fore and under part of the zygomatic process of the squamosal (fig. 1, 27). The length of this part of the malar is 3″; its thickness throughout the greater extent is $1\frac{1}{2}$‴ by 1‴; its squamosal articulation is 4‴ across. The form of the orbit (ib. *or*) so defined below is longitudinally oblong, more arched above than below, 2″ 2‴ in fore-and-aft diameter, 1″ 2‴ in greatest vertical diameter; the chamber communicates, of course, largely with the temporal fossa, and continues into the deep, ascending orbital fossa and the small autorbital fossa (*d*), external to which is the rough malomaxillary fossa (*e*).

The squamosal consists chiefly of its articular or zygomatic part (Pl. IX. figs. 1 & 3, 27), which is deep in proportion to its length, truncate, and three-sided; the outer side is slightly convex and rather rough, 1″ 5‴ in depth posteriorly; the inner side is divided between the articular cavity (fig. 3, *g*), rough for syndesmosis with the mandible, and the smoother surface internal to it, which extends mesiad in a triangular depressed form (27′) beneath the back part of the alisphenoid (6), but without joining it: the upper surface, of an inequilateral shape, contributes a lower wall to the temporal fossa. The squamous portion (fig. 1), continued upward from this facet, is triangular, with a rounded apex, about an inch in length, and rather more in height; it is applied against the alisphenoid (6) and parietal (7). The rough posterior tract articulating with the parietal (7) and exoccipital (2), and contributing to the outer wall of the otocrane (fig. 3, *or*), I consider to be the "mastoid" confluent with the squamosal, together forming the bone which should be termed "squamo-mastoid." The mastoid part terminates below in a rough, flattened, triangular surface (fig. 3, 8), 5″ 7‴ in diameter, which is divided from the zygomatic or articular process of the squamosal (*g*) by a deep fissure. On the inner side of the base or back part of the mastoid, in the line of its suture with the parietal, is the (stylomastoid?) fossa. The squamosal forms no part of the inner or proper wall of the cranial cavity. The glenoid or mandibul-articular surface (*g*) is longitudinally oblong, 1″ 5‴ by 8‴ in diameter, moderately concave, least so transversely, and looking inward, downward, and with a slight inclination forward. The mandible offers no notable peculiarity, save that which relates to shortness in proportion to the entire skull, concurrently with the same specific character of the upper jaw. The depth of the ramus at the coronoid process is relatively as great as in the longer-jawed species, and consequently bears a greater ratio to the length of the entire ramus: this in the present skull is 7″, the greatest vertical extent of the ramus being 2″ 6‴; the shallowest part of the ramus is where it supports the teeth; it deepens a little at the short symphysis. There are fourteen alveoli approximated in a common groove in each mandible, extending along 3″ 3‴ from the symphysis. The corresponding groove of the upper jaw (fig. 3) shows seventeen alveoli, along an extent of 3″ 6‴. The deeper part of the alveolus is distinct in the anterior teeth; but, as they recede, the sockets are indicated by depressions merely in the common groove. The teeth are slender ones: the anterior ones in the upper jaw average a length of 8‴, two-thirds of the irregular cement-covered, thickened, and solid base being implanted, the exposed third forming a smooth, partially enamelled, pointed crown, with a circular transverse section and in most a slight incurvation; the length of crown is from 3‴ to 4‴, the diameter of its base 1‴, that of the inserted root 2‴.

As in other *Delphinidæ*, the bony palate is entire, save at the slight median divarication of the maxillaries and premaxillaries, and the major part of this median fissure is closed by the vomer. A pair of small (neuro-vascular) foramina is situated near the maxillo-palatine suture, and one or two others obliquely groove and pierce the palatine plate of the maxillary.

The optic foramen communicates or is blended with a larger vacuity or fissure between the orbitosphenoid, frontal and pterygoid, which might be termed the spheno-frontal fissure. The foramen rotundum, in like manner, is blended with a larger vacuity between the ali- and orbito-sphenoids, answering to the "fissura lacera anterior" of anthropotomy, and which may be called the "intersphenal fissure"[1].

The removal of the loosely attached petrotympanic exposes the wide otocranial vacuity (Pl. IX. fig. 3, *or*) in the basal walls of the cranium, which is a characteristic feature of the Delphinoid as compared with the Physeteroid skull (Pl. XIII. fig. 2), where the otocranial is walled off from the cranial cavity. The otocrane, in both, is bounded by the paroccipital, basisphenoid, alisphenoid, and squamo-mastoid: in the present species of *Phocœna* it presents a subquadrate form, 1″ 4‴ in diameter, with the angles rounded off, notched anteriorly by the third division of the fifth, whereby the "foramen ovale" blends with this great vacuity.

The entocarotid foramen pierces the outer and fore part of the base of the otocranial plate of the basisphenoid, close to, perhaps at, the line of confluence of the alisphenoid. There are neither olfactory nor lacrymal foramina. The absence of the rhinal capsules simplifies the condition of the prefrontals, and facilitates the comprehension of both the special and general homologies of these interesting bones. A pair of minute foramina lead from the cranial cavity to the narial ones piercing the prefontals; but they do not give passage to olfactory nerves in the *Delphinidœ.*

The departure from symmetry in the present Delphinoid skull is slight: it is seen in the greater backward extension of the nasal plate of the right premaxillary (fig. 2, 22″), in the larger size of the prenarial plate of the right maxillary, and in a feeble inclination of the upper margin of the septum narium to the left.

Family PHYSETERIDÆ (Cachalots or Sperm-Whales).

Genus EUPHYSETES, *Macleay.*

PHYSETER (EUPHYSETES) SIMUS, *Owen.*

The Snub-nosed Cachalot. (Plates X.–XIV.)

The Cetacean which I have next to describe is represented by drawings of the adult male (side view, Pl. XI. to scale) and female (side view, Pl. X. fig. 1; upper view, fig. 2; to scale). It is noted as "a kind of Porpoise" in Mr. Elliot's MS., and is known to the Telugu fishermen of the coast by the name of "Wonga." The male, measuring 6 feet 8 inches in length, was taken at Waltair, February 28, 1853. The female was taken on the 1st of March, 1853, at the same part of the coast; she measured 6 feet in length.

[1] It is noticed as "le trou sphéno-orbitaire," by Cuvier, 'Oss. Foss.' tom. cit. p. 294.

The resemblance to the Porpoise was suggested by the shortness of the snout; but this is more obtuse, and is not marked off from the rest of the head by any sudden narrowing. More important differential characters suggest the affinity of the "Wonga" to a family of toothed Whales, distinct from the *Delphinidæ*.

The first and most important of these is the inferior position of the mouth, beyond the small opening of which the blunt rostrum extends forward from 4 to 6 inches. The blow-hole (Pl. X. fig. 2) is single, but is not medial in position or symmetrical in shape; it is in advance of the eye, opens to the left of the mesial plane, is proportionally larger than in the Porpoise, and is crescentic, but curves obliquely from the mid line outward and backward, with the convexity turned forward and to the left, and the angles or "cresses" directed backward and to the right. The anterior angle is 5 inches from the end of the snout. The eye is small; the palpebral orifice is between 7 and 8 inches from the end of the snout, and opens in the upper half of the head, seen in profile, near the boundary dividing it from the lower half. From the vertical line bisecting the eye to the end of the muzzle the head forms a cone with a blunt apex, less obtuse when viewed from above (fig. 1) than from the side (fig. 2), where the lower slope is interrupted by the small "rictus oris:" this is formed by a kind of semicircular excavation of the under part of the snout, into which the short dentigerous part of the lower jaw fits, like a box in its lid. The length of the "rictus" in a side view, straight line, is $2\frac{1}{2}$ inches in the male, 2 inches in the female. From the the parallel of the eye, the head, as it recedes, enlarges less rapidly; and the trunk continues gradually to expand to about midway between the end of the snout and the base of the tail. The widest part of the trunk is a little more forward in the male than in the female.

According to the figures, the pectoral fin becomes free 1 foot 1 inch behind the snout in the male, and 1 foot 4 inches in the female; but there may be some inaccuracy here. The length of the fin in both is 1 foot; its extreme breadth is $4\frac{1}{2}$ inches in the male, 4 inches in the female: its line of attachment is in the lower third of the trunk, as seen in profile. The dorsal fin is well developed, subfalcate in shape; its anterior border is halfway between the snout and the base of the tail. The length of the base of the fin is 10 inches in the male, 9 inches in the female: the height of the fin, vertically at its back part, where the apex curves back a little beyond the basal attachment, is 7 inches in both. The anterior border of the fin is slightly convex; its length, in a straight line, is 1 foot.

The body, as has been said, gradually expands to near the origin of the dorsal fin, and thence contracts to the setting-on of the caudal fin: here the tail, or tail-end of the trunk, measures $3\frac{1}{2}$ to 4 inches in vertical and nearly 2 inches in transverse diameter.

The expansion of the trunk is pretty equal in every direction towards the dorsal fin, and the upper surface gives the appearance of the fore part being subdepressed: the diminution beyond the dorsal is more rapid from side to side than from above downward. The greatest vertical diameter of the trunk is, in the male, 1 foot $6\frac{1}{2}$ inches, in the female 1 foot $4\frac{1}{2}$ inches: the greatest transverse diameter of the trunk in the female is 1 foot 2 inches.

The caudal fin, the shape of which is given in fig. 2, Pl. X., measures, in the female, 1 foot 7 inches in extreme breadth, and 7 inches across the base of each lateral lobe. Between the dorsal and caudal fins, and nearer the latter, the mid line of tegument is raised into a longish, very low and obtuse ridge. The vent opens 1 foot 10 inches in advance of the posterior cleft of the tail-fin in the male, and 1 foot 7 inches from the same part in the female. It is 10 inches behind the vertical line dropped from the back border of the dorsal fin, in the male, and 8 inches behind the same part in the female. The vulva is three inches in advance of the vent; the prepuce of the male is 9 inches in advance.

The note, as to colour, accompanying the drawings is—" Above shining black, smooth; beneath paler, pinkish, but in one discoloured with blood." The dentition is $\frac{1-1}{9-9}=20$. (Pl. XII. fig. 1, *x*, 32).

The *Physeteridæ* (Cachalots or Sperm-Whales) are characterized by having the opening of the mouth inferior in position, not terminal. The largest known species (*Physeter macrocephalus*, Linn.) has a reduced or boss-like representative of the dorsal tegumentary fin, and a dorsal longitudinal ridge has been attributed to it near the base of the tail. The soft parts of the head, which project in advance of the jaws or opening of the mouth, form a large obtuse truncate mass. The external blow-hole is reduced by its operculum or flap to a single sigmoid fissure on the left side of the upper and fore part of the head, *i. e.* at or near to the summit of the truncate end of the snout. The functional teeth are limited to the lower jaw, and chiefly to the long symphysial part; those of the upper jaw, when present, are minute and concealed in the thick gum, in fossæ which receive the summits of the larger lower teeth when the mouth is closed. The maxillary bones are so developed as to bound a large concavity, or chamber, for the " spermaceti," at the upper part of the skull in advance of the short brain-case (Pl. XIV. fig. 2, 21′).

The question put by Cuvier[1], whether any large Sperm-Whale may exist, characterized as above, but with a high dorsal fin, with the blow-hole near the forehead on the middle of the head, and with the mandibular rami not united at a long dentigerous symphysis, still waits a reply from a direct and good observer of such problematic Cachalot.

The Sperm-Whale towed ashore in the harbour of Port Jackson, New South Wales, December 1849, and referred by Macleay to the species " *Catodon australis*"[2], had the blow-hole situated at the upper termination of the snout, as in the true Sperm-Whale[3]; and the dentigerous symphysis of the mandible was more than half the entire

[1] Ossemens Fossiles, 4to. vol. v. pt. i. p. 340.

[2] 'History and Description of the Skeleton of a new Sperm-Whale, lately set up in the Australian Museum,' by Wm. S. Wall, Curator. 8vo. Sydney, 1851.

[3] Ib. p. 11.

length of the ramus (48 inches to 92 inches)[1]. The blubber-portion of the carcase having been removed previously to the articulator's arrival on the spot[2], no observa on the condition of the dorsal fin or hump was made.

Cuvier characterizes the "Cachalot macrocéphale" (*Catodon macrocephalus*, Art., *Physeter macrocephalus*, Linn.) as having the back provided with a slightly raised prominence, which some have called "fin," others "longitudinal ridge", others "hump" or "tubercle" (*loc. cit.* p. 338): "Il a une dorsale très-peu saillante vers l'arrière du dos, quelquefois réduite à une protubérance, ou à deux ou trois" (ib. p. 339). In the 'Règne Animal,' Cuvier says, "Il n'a qu'une éminence calleuse au lieu de nageoire dorsale" (tom. i. p. 294, ed. 1829). In the judicious criticism on the alleged or nominal species of Sperm-Whales, in the 'Ossemens Fossiles,' Cuvier asks, "Existe-t-il en outre des Cachalots à haute dorsale? en existe-t-il dont l'évent soit percé près du front sur le milieu de la tête? en existe-t-il où les branches de la mâchoire inférieure ne soient pas réunies sur la plus grande partie de leur longueur en une symphyse cylindrique? Voila ce qui reste à chercher, ce qui reste à prouver autrement que par des figures tracées par des matelots. Ce n'est qu'après que des hommes éclairés auront observé ces êtres avec soin, et en auront déposé les parties osseuses dans des collections où elles puissent être vérifiées par des naturalistes, qu'il sera possible à la critique de les admettre dans le catalogue des animaux" (*tom. cit.* p. 340).

As regards large Cachalots these questions, as I have remarked, still wait their solution. In the small Cetacean called "Wonga," of the seas washing the eastern coast of the Indian peninsula, we have, however, a satisfactory reply to them.

In it we possess a member of the *Physeteridæ*—a Cachalot in fact—though small, in which the dorsal is lofty, with the usual shape of such well-developed fin in Cetacea, in which the blow-hole is not terminal but near the forehead, and in which, as will presently be shown, the mandibular rami are united by a symphysis of less than half the length of the "rami." The inferior mouth, unsymmetrical blow-hole, and the second tegumentary production in form of the dorsal ridge, shown in the careful drawings by the native artist, significantly indicated the family affinities of the "Wonga:" the enlightened attention and care bestowed by Mr. Elliot on this seldom-studied branch of zoology has enabled me to place this conclusion on unequivocal grounds, through his transmission, with the drawings, of the skull of one of the individuals figured.

To the study and comparison of this precious evidence I have devoted full attention: it is figured, half the natural size, in Plates XII., XIII., & XIV. fig. 1. Its peculiarity of form is extreme: perhaps no other Cetacean skull has yet been observed in which the cranial so greatly preponderates over the rostral part. In the degree in which this proportion prevails in the skull first made known by De Blainville as of the Cachalot which he called *Physeter breviceps*[3], and in that subsequently described by Macleay[4] under

[1] *Op. cit.* p. 9.

[2] *Op. cit.* p. 4.

[3] Annales Françaises et Etrangères d'Anatomie et de Physiologie, tom. ii. (8vo, 1838) p. 335: "Sur les Cachalots."

[4] *Op. cit.*

the name *Euphysetes grayi*, may be discerned at a glance the more immediate affinities of the present species, which I propose to call *Physeter* (*Euphysetes*) *simus*, in reference to its peculiarly short obtuse muzzle.

Description of the Skull.

(Pls. XII., XIII., & XIV. fig. 1.)

Short as is the upper jaw in proportion to the skull in *Phocæna brevirostris* (Pl. IX.), it is shorter in the subgenus or section of *Physeteridæ* represented by the *Physeter breviceps*, De Bl. (Pl. XIV. fig. 3), and shortest of all in the present species (ib. fig. 1).

In the following Table of admeasurements are given those of the *Physeter* (*Euphysetes*) *grayi*, Macleay (the larger species which was stranded on the Maroobrah beach, near Sydney, New South Wales, and the skeleton of which is now in the Australian Museum of that city), with the few admeasurements appended by De Blainville to his notice of *Physeter breviceps*, from the Cape of Good Hope[1].

	P. simus.		*P. grayi.*		*P. breviceps.*	
	inches.	lines.	inches.	lines.	inches.	lines.
Length from the back of occipital condyles to end of snout....	10	5	16	6	15	5
Breadth across postorbital processes	9	5	14	0		
Breadth across the beginning of malo-maxillary fissure	7	10	9	6		
From the back of occipital condyle to antorbital process of malar	7	7				
From the antorbital process of malar to end of snout	4	3				
From the back of occipital coudyles to posterior wall of left nostril	4	10	6	0		
From the bottom of malo-maxillary fissure to end of snout....	5	0	7	0		
From the beginning of malo-maxillary fissure to end of snout..	4	2	5	8		
Breadth of snout between the fore part of the antorbital notches of maxillary	4	9	8	0		
Breadth of snout at its extremity	1	4	2	0		
Breadth of premaxillaries at the malo-maxillary fissure	2	3	3	9		
Breadth between anterior ends of premaxillaries	0	4	1	3		
Antero-posterior diameter of left nostril	1	5	2	0		
Transverse diameter of left nostril....................	1	0	2	$1\frac{1}{2}$		
Antero-posterior diameter of right nostril..................	0	$3\frac{1}{2}$	0	6		
Transverse diameter of right nostril	0	4	1	0		
Length of interfrontal crest, straight line..................	3	6	6	2		
Width of occipital foramen	1	3	1	6		
Vertical diameter of foramen	1	8	2	4		
Between outer edges of occipital condyles..................	2	9	4	0		
Breadth between paroccipitals	6	2	11	0		
From the lower border of basioccipital to vertex	5	6	11	0		
Length of mandible, in a straight line	8	6	13	3	13	10
Length of alveolar series	2	9	5	3		
Height of mandible at coronoid ridge	2	1	4	3		

In the skull of the *Physeter simus* the occipital elements have coalesced with each other and with the surrounding bones. The vertical diameter of the basioccipital

[1] Annales Françaises et Etrangères d'Anatomie et de Physiologie, tom. ii. tab. x. (the admeasurements are given in French inches), viz. :—“ Longueur du crâne 14 pouces et demi,” =15″ 5‴, Engl. “ Longueur de la mâchoire inférieure 13 pouces,” =13″ 10‴, Engl. Ecartement de ses condyles 12 pouces,” =12″ 9‴ Engl.

(Pls. XII., XIII., & XIV. fig. 2, 1) beneath the foramen magnum (ib. *o*) is 8 lines: it is here convex vertically, and concave transversely, showing a width between the lower end of the occipital condyles (to which it probably contributed) of only 4 lines. These (Pl. XII. fig. 2, 2′) are more sessile than in *Phocœna brevirostris*, being raised only by a linear border from the contiguous bone, except at their lower ends, which are rather more prominent: the long diameter of the condyle is 2″ 2‴, the greatest breadth 1″: they are terminal, diverge as they ascend the sides of the foramen magnum, which is widest opposite their upper ends: the outer border of the condyle is more convex than the inner one. The foramen magnum is oval, with the larger end upward and not notched: the aspect of the plane of the aperture is backward and a little upward: in *Physeter macrocephalus* (Pl. XIV. fig. 2, *o*) it is more upward than backward. The ex- (2) and superoccipital (3, 3′) plate inclines from below, upward, outward, and forward, with a moderate convexity or indication of a pair of such. The exoccipital portion (Pl. XII. 2) extends outward and slightly downward, expanding a little vertically, and thickening to form the paroccipital (4); this expanse is moderately concave transversely, convex vertically. The border of the paroccipital is thick and rugged: it is concave toward the otocrane (Pl. XII. fig. 1, and Pl. XIII. fig. 2, *e*), of which it forms the posterior half of the upper, and part of the posterior wall: it is divided below by a fissure (Pls. XII. & XIII. fig. 2, *l*) from the otocranial plate of the basioccipito-sphenoid (Pl. XII. fig. 1, and Pl. XIII. fig. 2, 5′): this plate arches outward and downward, with a slight obliquity backward, and is overlapped anteriorly by the pterygoid (ib. 24′), which seems to form an anterior continuation thereof, converging towards its fellow: but the free border of the basisphenoidal otocranial plate (5′) is more obtuse and thicker than that of its pterygoid prolongation (24). A trace of the suture between the exoccipital (Pl. XII. fig. 1, 2) and squamosal (ib. 27) remains. The ridge across the vertex (Pls. XII. & XIII. fig. 1, 7, 11, 3) is obtuse, but well marked: the proportions contributed by the superoccipital (3), parietal (7), and interparietal (if any) cannot be determined; and the frontal (11), as it ascends, contracting from the superorbital roof, is also blended with those constituents of the ridge[1]. The instructive harmonia between basi- (Pls. XIII. & XIV. fig. 1, 5) and presphenoid (ib. 9) remains.

The alisphenoid (Pl. XIII. fig. 2, 6), coalesced with the basisphenoid, where it is underlapped by the pterygoid (24′), is horizontal; it extends to the lower border of

[1] To afford a comparison with *Physeter macrocephalus*, I propose to append, in the present note, descriptions of the homologous cranial bones of a fœtus of that species described, in my 'Catalogue of the Osteological Series in the Museum of the Royal College of Surgeons,' 4to. 1853:—" The elements of the occipital neural arch are unanchylosed. The lateral margins of the anterior half of the basioccipital are produced and bent obliquely downward. The exoccipitals are much produced and expanded laterally: they are deeply notched below. The superoccipital contributes the upper ends of both condyles: it is in the form of a vertical plate, convex from side to side: a strong internal vertical crest is produced forwards: it is overlapped at its lower and lateral angles by the exoccipitals, anterior to which it reaches the alisphenoids, and is notched externally for the reception of the upper angle of the squamosal" (*op. cit.* p. 442).

F 2

the temporal fossa (ib. *t*), underlapping the squamosal (ib. 27), and thinning-off to its outer margin: its anterior border is notched by the intersphenal fossa (*tr*): there is no distinct foramen ovale. It supports the natiform protuberance of the cerebrum, and is divided from the orbitosphenoid (ib. 10) by the intersphenal fissure (*tr*), from which two channels lead toward the back part of the orbital roof (*or*), blending together and widening as they grow shallow[1]. The temporal fossa (Pl. XII. & Pl. XIII. fig. 2, *t*) is 1″ 1‴ in antero-posterior, and 2″ in transverse extent, has its marginal boundary almost completed by the approximation of the postfrontal (ib. 12) to the zygomatic part of the squamosal (ib. 27), the distance between their free ends being but 6‴; but the zygoma terminates on a lower level (Pl. XII. fig. 1, 27).

The presphenoid (Pls. XIII. & XIV. fig. 2, 9) retains its distinction from the basisphenoid (5), but has coalesced with the orbitosphenoids (10), as have these with the alisphenoids (6).

The orbitosphenoid (ib. 10) has its posterior boundary partially defined by the intersphenal fissure, at the fore part of which the optic canal is marked off by an intercranial process arching over the same downward and backward (Pl. XIV. fig. 2, *n*): the orbitosphenoids expand and ascend to form with the coalesced frontals the anterior wall of the cranial cavity; the optic channel extends forward and outward from the intersphenal fissure, and, blending with the trigeminal one (Pl. XIII. fig. 2, *tr*), is lost on the roof of the orbit (ib. *or*)[2]. The fossa (ib. *d*), into which the foramina on the frontal or nasal plate of the maxillary opens, is in advance of the optic channel (ib. 10). There is no intraorbital fossa answering to that in *Phocœna brevirostris*. The roof of the orbit is unbroken, gently concave from before backward, formed chiefly by the frontal (Pl. XII. fig. 1, 11, 11′), which is notched near the middle of the superorbital ridge: this is thick, obtuse, and produced backward and downward into a postfrontal or postorbital process (ib. 12). Above the ridge, the frontal (ib. 11′) contracts; its surface is here free from the maxillary (21′), is slightly concave vertically, before it is reduced by the overlapping of the parietal (7) and superoccipital (3) behind, and of the maxillary (21′) in front, to the narrow strip (11), which rises, bending convexly, to the vertex. The fore part of the superorbital ridge (11′) is obtuse, and thickens to join the malar (26), from which it is partly divided by a notch[3].

[1] "The basisphenoid, or thick hexagonal bone, concave from side to side below, nearly flat above, is anchylosed to the alisphenoids: these are perforated near the middle of their base by the foramina ovalia and rotunda, have a thick quadrate plate on their inner side, forming their entocranial surface: they extend into a point anteriorly, and articulate both with the frontal and with the parietal angle of the superoccipital. The squamosal receives the alisphenoid in a groove anteriorly."—*Physeter macrocephalus*, op. cit. p. 442.

[2] "The presphenoid and the anchylosed orbitosphenoids form the anterior wall of the cranial cavity, and are perforated by the optic foramina: they articulate anteriorly with the frontal, sending up a small process into the interspace at the beginning of the frontal suture, which process is impressed by a fossa in each of its sides: the posterior and lateral parts of the orbitosphenoids unite with the great alæ; the under and anterior part is overlapped by the vomer."—*Physeter macrocephalus*, op. cit. p. 447.

[3] "The frontals are large triangular plates, concave externally, with the outer and fore angle produced into

The vomer (Pl. XIII. figs. 1 & 2, 13, 13′) has partially coalesced with the presphenoid (ib. fig. 2, 9) and underlaps the prefrontals (Pl. XIV. fig. 1, 14): it appears upon the palate, about an inch in advance of the posterior fissure (Pl. XIII. fig. 2, *w*), expands to a breadth of 6 lines (13′), and is continued to the anterior end of the upper jaw, which it forms, contracting there to a breadth of 3 lines. Its under surface is flat; its upper surface (fig. 1, 13), which is similarly exposed on that aspect of the muzzle, is smoothly and widely canaliculate: the groove lodges the cartilage in the fissure separating the premaxillaries (ib. 22), which cartilage terminates anteriorly the series of vertebral centrums, of which the vomer is the inferior or cortical ossification. The fore margin of the confluent prefrontals (ib. 14) is at 3 inches distance from the fore end of the vomer. The prefrontal, losing breadth and gaining depth, recedes with a slight bend to the left, forming the inner boundary of the large left nostril (ib. *ol*) and the corresponding wall of the small right nostril (Pl. XIV. fig. 1, *ol′*). The nasal bones are confluent with that osseous mass (Pl. XIII. fig. 1, 15) which rises from the back of the septum narium and extends in a sinuous course, first convex to the left and then concave before subsiding at the vertex (15′): this ridge also sends off a kind of "spur" (15) from its right side, in the form of a short ridge, inclining to the right, with a convex border, thick and obtuse like that of the main ridge: the intervening space (ib. *y*) between these ridges expands as it extends forward, with a smooth sinuous surface concave across slightly contracting again as it ends behind the right nostril[1].

A trace of the suture of the palatines (Pl. XIII. fig. 2, 20) shows that they entered into the formation of the bony palate for half an inch at the postpalatal end of the vomer (13′), almost meeting each other behind that part: as they extend outward, they expand to a fore-and-aft breadth of 10‴, with a convex surface, most so in their direction from within, outward and backward, contracting to terminate mesiad of the fossa (*d*): they develope no outer or free lamella in *Euphysetes*.

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a long superorbital process, the channel on the under part of which contracts, as it approaches the cranium, into a long, deep, and narrow groove. The median anterior part of the bone unites with both orbito- and alisphenoid, and external to this is the broad sutural surface for the squamosal. The straight median margins of the frontals are thinned off and joined by a squamous frontal suture, the right overlapping the left. The whole posterior and lateral border of the frontals, as far as the junction with the squamosal, presents a broad oblique sutural surface, which joins, by overlapping, the contiguous border of the occipital. The smooth cerebral surface of the frontal is flat at the middle, arched at the sides, and not impressed by any convolutions."—*Physeter macrocephalus*, op. cit. p. 442.

[1] M. de Blainville figures, but makes no mention of this bony ridge bisecting the "postnarial" cavity. Dr. Gray, in appending the term *Kogia* to the *Physeter breviceps*, De Blainv. (Zoology of the Erebus and Terror, "Cetacea," 4to. 1846, p. 22), is equally silent—indeed, adds nothing to De Blainville's meagre sketch of so remarkable a cranium, and quotes his admeasurements as in English inches and lines, without correction for the difference of the French "foot." Macleay was the first who pointed out the heavy ridge of bone that longitudinally divides the spermacetic cavity into two unequal parts (*op. cit.* p. 47) as subgenerically distinguishing his *Euphysetes* from *Physeter* or *Catodon*.

The maxillary (Pl. XII. fig. 1, Pl. XIII. figs. 1 and 2, 21) forms the major part of the bony roof of the mouth: a small triangular strip of the premaxillary (Pl. XIII. fig. 2, 22) is wedged into the short anterior interspace between the maxillary (*x*) and vomer (13′). The palatal surface (21*) is moderately convex transversely, straight lengthwise, and is impressed by an alveolar groove (*al*) retaining one socket and tooth (Pl. XII. fig. 1, *x*) at the fore end and continued in a straight line backward for 3 inches (rather more on the left, rather less on the right side) without indications of alveoli, and in a line not parallel with the outer margin of the bone, but receding to a distance of 1 inch from it, posteriorly; so that the teeth, if developed there, would be rather palatal than marginal in position. The outer border of the maxillary thickens near the malo-maxillary fissure (21, *k*), with a smooth convex exterior. That fissure dilates, as it sinks obliquely backward and inward, to a breadth of from 3 lines to 4 lines, its depth being 1 inch 6 lines (*k*). These fissures mark off the rostral portion of the skull, which is here an equilateral triangle, including above (Pl. XIII. fig. 1) parts of the vomer (13), prefrontal (14), premaxillaries (22), and maxillaries (21): the surface so formed is concave transversely at its posterior three-fourths, almost straight longitudinally. The maxillary, expanding backward beyond the rostrum, bends (at *k*, fig. 1) round the upper and back part of the malo-maxillary fissure; and in close conjunction (here partial confluence) with the malar (26), it forms the large smooth tuberosity (21, 26) external to the fissure: from the tuberosity the convex raised border of the posterior expanded plate of the maxillary comes into connexion with the frontal (11), whence it subsides to form a deep hollow as it sweeps inward to rise again upon the bifurcate sinuous ridge (ib. 15, 15″) which divides this singular postnarial tract, or spermacetic cavity, of the upper surface of the cranium. The total breadth of this cavity is 6 inches 4 lines, the posterior three-fourths of its circumference, so bounded by the maxillaries and describing as much of a circle, being a little produced backward, subangularly, at the hindmost part: the open anterior fourth is continued upon the more shallow concavity of the triangular rostrum. The right maxillary is vertically pierced by two foramina (Pl. XIII. fig. 1, *a*, *b*), which converge to the common inferior outlet (ib. fig. 2, *d*). The upper fissure between the maxillary and premaxillary widens and deepens as it extends backward, and terminates in the canal (fig. 1, *c*), also conducting to the fossa (fig. 2, *d*), which, as it transmits maxillary branches of the fifth pair from the orbit to the exterior of the skull, is homologous with the antorbital foramen of other mammals: the altered position of the outlet, as regards the orbit itself, is the result of the reflection, so to speak, of the facial surface and nasal plates of the maxillaries upon the forehead above and behind the orbits.

The pterygoids (Pl. XIII. fig. 2, 24) meet at the midsurface of the roof of the mouth, and extend the palatine suture (*pl*) backward beyond the palatine bones (20). From this line each pterygoid extends outward and backward, and divides into an internal and external pterygoid plate: the former terminates in a short triedral process, representing the "hamular" one; the outer portion, partly marked off by a ridge from the palatine plate of the inner portion, bends outward and backward with a convexity toward the palate, then slightly inward, as if twisted on itself, and, expanding at its upper attachments to the pre-, orbito-, ali-, and basi-sphenoids, terminates by developing the deep and broad plate (ib. 24′) which appears to continue forward the otocranial plate (5′) of the basioccipito-sphenoid. The inner surface of the outer part of the pterygoid is vertically concave to its posterior lamella, which is so bent as to make that surface somewhat convex: the concave channel prolongs backward the nasal passage (*w*) beyond the septum. A semicircular emargination divides the posterior subvertical plate from the palatine portion (24) of the pterygoid. The total length of the pterygoid is 4 inches 8 lines; the breadth of the pair of bones posteriorly is 5 inches; the sutural union of the pterygoid with surrounding bones persists[1].

The malar bone (Pl. XII. fig. 1, Pl. XIII. figs. 1, 2, 26) is represented in the present skull by the portion of that in *Delphinidæ* (Pl. IX. figs. 1, 3, 26′) which is wedged like a lacrymal[2] between the frontal (11′) and maxillary (21″) at the upper and fore part of the orbit (*or*): it is here of a subtriedral conical shape, with its base notched for a wedged union with the maxillary above, and concave where it joins the frontal behind: the inner angle of the base curves forward, with a slight twist, to unite again with the maxillary at the inner side of the malo-maxillary fissure (*k*). The outer facet of the malar is slightly concave vertically, convex transversely: the antero-internal facet is concave in both directions, except where it curves anteriorly round the obtuse angle between it and the outer surface: the internal or orbital surface is the narrowest, and is conxex transversely, and straight vertically. The apex is subbifid, the outer part (Pl. XII. fig. 1, *z*) low and obtuse, the inner one longer, produced downward and rather backward, and terminating less obtusely; but there is no sign of any slender zygomatic style having been continued from this part, as in *Phocæna brevirostris* (Pl. IX. fig. 1, 26). It would seem, therefore, that the zygomatic processes of both malar and squamosal were short and free; they are separated by an interval of more than 2 inches in the present skull, which interval I found occupied by a ligament ("sclerous" state of malar) in a young Cachalot[3].

The squamosal forms an articular surface (Pl. XIII. fig. 2, 27, *g*) for the mandible, look-

[1] "The pterygoid, which is double the size of the palatine, extends backward to the basioccipital, articulating in that course by its expanded upper border with the pre-, basi-, and ali-sphenoids; from this border the bone descends arching inward toward its fellow, which it joins along the anterior half of its extent: the remaining free border is divided from this by a deep notch, and circumscribes the posterior bony aperture of the nostril."—*Physeter macrocephalus*, op. cit. p. 443.

[2] If this be the homologue of a lacrymal, it is not merely confluent, but connate with the malar.

[3] "The malar is moderately long and slender, bent upon itself at an acute angle; the upper portion, wedged between the maxillary and frontal, is the thickest; the lower and more slender branch is bent downward and backward, circumscribing the orbit anteriorly and below, and is connected by ligament to the zygomatic process of the squamosal. There is no lacrymal bone."—*Physeter macrocephalus*, op. cit. p. 444.

ing downward and forward: the surface is rather convex at the anterior border from behind forward, and is very slightly concave in the rest of its extent; it is smooth and with an ill-defined circumference: the anterior boundary, which also forms the posterior one of the lower outlet of the temporal fossa, is concave: the wall (Pl. XII. fig. 1, 27') which the squamosal contributes to the posterior and internal part of the temporal fossa (*t*) expands as it bends forward to join the parietal (7) and frontal (11): the suture with the superoccipital (3) is close to the upper boundary of the fossa; that with the exoccipital (2) continues a short way beyond the squamosal, and indicates the extent of the exoccipital. On the outer part of the base of the zygomatic or articular process the bone is tuberous, and represents the mastoid (8); behind the articular surface it is roughly excavated (Pl. XIII. fig. 2, 8'), where it contributes, with the paroccipital (4), to the otocranial cavity[1].

In the interior of the cranium (Pl. XIV. fig. 1) the upper or epencephalic surface of the basioccipital is moderately concave, and is bounded laterally by a short, obtuse, longitudinal ridge, directed mesiad, which may be where the exoccipital suture ran: the outer or lateral beginning of the tentorium receives a short angular ossification, which forms the outer wall of the fossa (*v*), perforated by the vagal and acoustic foramina, both of which pass directly outward to that at the back part of the fundus of the otocranial cavity (Pl. XII. fig. 1, Pl. XIII. fig. 2, *e*). A small branch channel from the vagal one opens upon the outer surface of the exoccipital at the groove which runs to the cleft (Pl. XII. fig. 2, *l*) between the otocranial plates of the basisphenoid (5) and paroccipitals (4). At the fore part of the tentorial process (Pl. XIV. fig. 1, *v*) is the foramen of a canal which opens outwardly upon the alisphenoid: it is too small for the carotid, and may have given exit to a vein. I cannot discover any distinct entocarotid canal, any more than a distinct foramen ovale, foramen rotundum, or foramen opticum: they all seem here to be confounded in the intersphenal fissure (Pl. XIII. fig. 2, *tr*). From the extreme shortness of the jaws, the nerves of sensation to the face must have been very small. The "sella" (Pl. XIV. figs. 1 & 3), scarcely impresses the basisphenoid: its best antero-external boundaries are afforded by the superoptic processes of the orbitosphenoid (ib. *n*). There is no ossification of the falx[2], no trace of olfactory foramina. The greatest diameter of the cranial cavity is in the direction of breadth.

The lower jaw (Pl. XII. fig. 1, 29-32) is 7 inches 4 lines in a straight line from the back

[1] "The squamosal is a comparatively small, but strong and thick, triangular bone; the upper end represents the expanded squamous part in land mammals, and is articulated by broad, dentated sutural margins to the frontal and exoccipital: its anterior border is grooved for the reception of the alisphenoid: the lower angle is as it were truncated, and presents a rough surface for the attachment of the petro-tympanic: a short, obtuse anterior angle bends forward and represents the zygomatic process: the under surface presents a smooth shallow cavity for the condyle of the lower jaw: the inner border of the glenoid surface is produced downward into a slender process."—*Physeter macrocephalus,* op. cit. p. 444.

[2] In the Great Cachalot "a strong medial crest is produced forward from the inner surface of the superoccipital" (*loc. cit.* p. 442).

of the condyle to the fore end of the symphysis. Each ramus has a convex, almost semicircular posterior margin, curving upward and backward from below (30), where the angle normally exists in other mammals, and then forward to the seat of the coronoid process (29): at the hindmost part of this curve the border is thickened to form the sessile condyle, adapted to the glenoid surface of the squamosal. Here the border bends outward: as the ramus advances, converging to its fellow, it is slightly bent with the convexity outward, which again is changed to a concavity (lengthwise), where it joins the opposite ramus to form the elongate symphysis (32), which is continued straight forward to its termination. The symphysis here forms rather less than a third of the entire length of the mandible, being 2 inches 4 lines in extent. The greatest vertical diameter of the ramus is 2 inches 2 lines; that at the beginning of the symphysis is 8 lines[1]. In the alveolar groove are partially excavated sockets for nine teeth; the four middle intervals are severally equal to twice the basal diameter of the tooth: at the ends of the series, especially the anterior one, the alveolar intervals are less. The teeth (Pl. XII. fig. 1, and *A*) are small, straight, conical, obtuse, not exceeding 8 lines in length, of which the cylindrical base has a diameter of 2 lines, that of the crown a diameter of $1\frac{1}{2}$ line, with a length of $2\frac{1}{2}$ lines, diminishing to a subrecurved apex.

The loss of symmetry in this skull is hardly observable in the general contour, whether viewed from above (Pl. XIII. fig. 1) or below (fig. 2): it is chiefly, almost exclusively, confined to the nostrils and the bones concerned in the composition of those passages; and this is only conspicuous in the upper surface of the skull.

In *Euphysetes breviceps*, Bl., according to the figure of the side view of the skull (copied in Pl. XIV. fig. 3), the occipital condyle is more prominent than in *Euphysetes simus* (Pl. XII. fig. 1): the contour of the superoccipital is concave in *Euphysetes breviceps*, but is convex in *Euphysetes simus*—very feebly so, indeed, but as far as it departs from a straight line being in the direction of convexity. The most marked difference, however, is the greater proportional length of the rostral part of the, skull—measured, viz., from the malomaxillary fissure (ib. & Pl. XIII. *k*) to the end of the upper jaw (22, *x*): in *Euphysetes breviceps* it forms about two-fifths of the entire length of the skull, in *Euphysetes simus* about two-sevenths. The proportion of the maxillary, above the frontal and malar, on

[1] "The condyle of the mandible projects from the posterior part of the ascending ramus, which is compressed and produced into a low obtuse coronoid process above, and into a similar angle below: a wide excavation, beginning at the inner side of the ascending ramus, deepens and contracts into the dental canal which enters the substance of the horizontal ramus: a fissure is continued along the inner side of the ramus from this canal, and is the sole indication of a compound structure of the jaw. The vessels and nerves emerge from several foramina at the outer side of the ramus, where it is attached by its long symphysis to its fellow: the upper border of the symphysial part of the ramus is excavated by a continuous dentigerous groove, somewhat resembling, in the present fœtal state, that in the upper jaw. The length of the symphysis in this skull is three-fourths that of the rest of the ramus. In the adult male the disproportionate growth of this part of the jaw leads to more excessive length of the symphysial part beyond the rest of the ramus."—*Op. cit.* p. 444, fœtal *Physeter macrocephalus*.

the exterior of the skull is much greater in *Euphysetes breviceps* than in *Euphysetes simus*, especially in vertical extent: in the upper view of the skull the porportion of the postnarial cavity, especially in breadth, to the extent of the rostrum is less in *Euphysetes breviceps* than in *Euphysetes simus*. To these differences must be added the difference in the number and shape of the teeth. In *Euphysetes breviceps* there are fourteen or fifteen teeth, or sockets for as many, in each mandibular ramus: the entire tooth, figured by De Blainville (copied in Pl. XIV. fig 2. B), is 10 lines in length, and has a proportionally larger and more curved crown than in *Euphysetes simus*. De Blainville writes, "Il me paraît à peu près certain qu'il n'y avait pas de dents à la mâchoire supérieure" (*l. c.* p. 337); and these are equally absent in *Euphysetes grayi*: the first of the maxillary series remains exposed, as a functional tooth, in the quite adult skull of the smaller Indian species, *Euphysetes simus*. From *Euphysetes grayi* the present species differs not only in this dental character and its smaller size, but in its proportionally shorter muzzle, and in the minor number and wider disposition of the mandibular teeth. Thirteen teeth are found in each ramus of the lower jaw of the specimen of *Euphysetes grayi* in the Sydney Museum: they are divided by interspaces of less than their own basal diameter, and have relatively longer crowns than those of *E. simus*. There are twelve teeth in the right, and nine teeth in the left ramus of the mandible of *Euphysetes breviceps*, De Blainv.: they are as wide apart as in *Euphysetes simus*, but have crowns more slender and recurved.

In the figures of the mandible given by De Blainville (*loc. cit.* pl. 10), and by Macleay (*loc. cit.* pl. 2. fig. 5), the breadth between the outer parts of the condyles equals the length of the mandible in a straight line, that is, from the middle of the chord drawn between the condyles to the end of the symphysis. In *Euphysetes simus* the breadth exceeds the length so taken.

Among other differences between the present member of the *Physeteridæ* and the *Delphinidæ* (see *Phocæna brevirostris*, Pl. IX. fig. 1) is the non-production of the upper or hinder expansion (naso-frontal plate) of the maxillary (Pl. XII. fig. 1, 21*, 21″) over the orbital process of the frontal (11, 11′); which, therefore, in *Euphysetes simus* as in *Euphysetes breviceps*, stands out free (Pl. XII. fig. 1, 11′) from the upper and lateral parts of the cranium behind the maxillary (21′ 21″).

Bones of the Trunk and Fins. (Pl. XI. fig. 2.)

Having been favoured with photographs of these bones in *Euphysetes grayi* by the present able Curator (Mr. Kreffts) of the Australian Museum, I have thought it might be useful to add the following notes:—

Euphysetes (Pl. XI. fig. 2) has fifty vertebræ, viz. seven cervical, fourteen dorsal, twenty-nine lumbari-sacro-caudal: in the latter series the hæmapophysial arch first appears between the sixth and seventh (or between the twenty-seventh and twenty-eighth vertebræ counting from the skull): the hæmapophyses cease to be developed at the twentieth (or forty-first from the skull), leaving ten, perhaps eleven, terminal vertebræ represented by depressed centrums, gradually diminishing to the last. The seven cervicals are anchylosed: the diapophyses distinguish the atlas and axis, the former of which vertebræ does not retain, as in *Physeter*, its separate condition; the fifth, sixth, and seventh are lamelliform, from extreme anteroposterior compression. The dorsal spines progressively, but very gradually, gain in height to the last; beyond which they again, and more rapidly, shorten to the base of the tail, disappearing in the fortieth vertebra from the skull. The metapophysis begins to project above the prozygapophysis in the fifth dorsal, and supersedes that process in the articulation of the neural arches in the seventh or eighth dorsal. The four anterior pairs of ribs directly join the sternum, which consists of three sternebers, each more or less completely divided at the middle line into two bones. The first rib is broad, flat, and angularly bent, articulated by the tubercle to the first dorsal diapophysis, and by a ligament representing the head to the centrum of the seventh cervical: its connate sternal portion articulates with the antero-external angle of the manubrium. The second and six following ribs have both head and tubercle, the former abutting against the interspace of their own and antecedent centrums; the tubercle of the rib is attached to the diapophysis of its own vertebra: the second rib, less broad but one-fourth longer than the first, has a short, partly ossified cartilage, which joins the interspace between the first and second sternebers. The third, gaining length, losing breadth, and with more regular curvature, is articulated by its short hæmapophysis to the interspace between the second and third sternebers. The fourth rib is joined to the end of the third sterneber. After the seventh the ribs lose their heads, become shorter, more slender, less curved—gradually to the tenth, which is 9 inches in length—suddenly in the fourteenth, which is a straight style is hardly an inch long. There are two pairs of pelvic bone. The pectoral fins are relatively short and rather obtuse. The scapula is a flat triangular plate, with a convexly curved base, in extent equalling the fore-and-aft range of the five anterior dorsal spines. An obtuse rising near the anterior costa, at its humeral half, developes near the glenoid cavity a small coracoid directed forward. The acromion is much larger, and is produced from a greater extent of the anterior costa in the form of a parallelogram. The ulna developes scarcely any olecranon. There are five digits: the first and fifth are the shortest, each with a metacarpal and two phalanges; the second and third digits are the longest, with five and four phalanges respectively, besides the metacarpal; the fourth digit, intermediate in length between the third and fifth, has a metacarpal and four phalanges.

Conclusion.

The first remark that I am led to make on a review of the cetacean characters above-defined in connexion with those previously recorded is, that they are all gradational, and exemplify steps by which are gained the extreme modifications, especially in the skull and dentition.

Imperfect as may be the cetacean record, it yields several series of differential characters,—as, *e.g.*, in the proportion of the rostral to the cranial part of the skull, from *Physeter simus* to *Physeter macrocephalus* and *Platanista*—in the degree of expansion of the back part of the maxillaries, exemplified, step by step, in *Balæna*, *Delphinus*, *Phocæna*, *Ziphius*, *Euphysetes*, and *Physeter*, again culminating in *Platanista*—in the number of teeth, from zero (*Balæna* and old *Delphinapteri*), through *Monodon*, *Ziphius*, *Euphysetes*, to the multitude of teeth in *Delphinus*, Cuv.

The formation of germs of teeth in parts of the jaws of fœtal or young individuals of species which are edentulous in the full-grown individuals, the examples of which are too well known to need citation here, are, perhaps, amongst the most significant of the gradational modifications, above referred to, being due to deviations in offspring from the characters of parents.

Such departures or variations may have been slight in the first instance, few and far between in the members of a contemporary generation, and rare exceptions to the rule of hereditary likeness; but, occurring in the course of many generations, through long lapse of time, they might lead to "long-snouted" and "short-snouted" breeds, and to others exemplifying the various observed cranial and dental modifications of cetacean structures.

In such conjectural mutations of specific characters may be discerned a fore-ordained law of deviation from primitive type, through the operance of which the ocean has at length become peopled with so many strange modifications of the cetacean structure.

But such instances of exceptional freedom from the trammels of family likeness seem to be independent of external influences. The ocean has none of those diversities of condition which the dry land shows, and is exempt from the few which in fresh waters may be invoked to account for varieties in the species of fish. It is true that the trout (*Salmo fario*) of the mountain-streamlets is small, while that of the wide river or wider lake is large; but no such differences can be invoked to explain the origin of the dwarf *Euphysetes* or the giant *Physeter*: both have alike the unlimited seas for their range.

But the same river may have the pike, the carp, the salmon, the eel, &c.; these modifications of the piscine type exist in waters of the same temperature, same rate of flow, and same nature of bed. Where can we here discern selective influences equivalent to produce such changes of structure? The hypothesis is still less conceivable in regard to the ocean. The various Cetacea of the Indian seas exist in a medium of the same nature, exempt from any influence of the earth beneath them, or of aught that may there live and grow. The external influence or power that could "select" the maxillary wall of the circumnarial basin, *e.g.*, in *Hyperoodon*, *Ziphius*, *Euphysetes*, *Physeter*, *Platanista*, is inconceivable.

But the occasional departure from parental type, manifested by a so-called abnormal or monstrous proportion of the nasal or facial plate of the maxillary, may accord with the idea suggested by the observed steps in a gradation of such deviational developments.

So far the species thereby characterized may be held as evidences of orderly succession and progression due to inherent organic force, operating according to a natural law or "secondary cause," of the precise nature of which we are yet in ignorance. But we may feel assured that the Power which called into being the first cetacean type foreknew and planned, by predetermined degrees and kinds of departure from that type, all its subsequent modifications[1].

But much knowledge of the facts of organization is still needed for successfully grappling with these transcendent questions; and the progress of zoology has been slower in regard to the Cetaceans than to most other orders of animals.

This is due to their medium of existence, to the extreme latitudes at which some of the species have to be sought for, and to the vast bulk which certain species attain[2]. The latter characteristic precludes the preservation and exposition of the requisite specimens in private collections or even in those of associations of the cultivators of natural history willing to carry on the work of advancement of the science at their own cost and to the extent of their means and usually limited incomes.

The diversities of structure exemplifying specific characters in *Balæna*, *Balænoptera*, *Physeter*, *Hyperoodon*, &c., and those which have suggested as many subgeneric divisions and names of the Cuvierian genera of those gigantic animals, are best exemplified in their skeletons, both by modifications of particular bones, and by proportions of the several regions of the skeleton; but the framework of these animals, put together to exemplify their articulations and proportions, require for their exhibition the resources of a National Museum. There, and there only, can an intelligent public and the student of this branch of Mammalogy expect to find the means of contemplating and comparing the characters and structures of the strangest as well as hugest of animals—the most seldom seen, by reason of their ocean haunts—air-breathers, yet living in water—hot-blooded, though ever surrounded by a rapidly refrigerating medium—of man's own class by every essential of organization, but fishes in shape—a recent development of life-form on our planet, and the superseders of the great sea-lizards in their office in the ocean police.

Hitherto the expectations of both student and sightseer have been disappointed. Space (the first essential towards fulfilling this exigency) has been found too costly; at all events the guardians of the public purse have thought it not desirable, as yet, to vote the sums requisite for the galleries, however simple in structure, which are needed for the Cetaceous Department of a Zoological Museum[3].

[1] Owen, 'On the Nature of Limbs,' 1849, p. 86.

[2] I may also add, from aggravating experience, the conflicting claims to the legal ownership of such monsters of the deep when they happen to be cast upon any part of the shores of Great Britain.

[3] See Hansard, 'Debate on Museum of Natural History,' May 19th, 1862, p. 1928.

DESCRIPTION OF THE PLATES.

PLATE III.

Delphinus (Steno) gadamu: diminished to scale.

Fig. 1. Side view.
Fig. 2. Upper view: *b* blow-hole.

PLATE IV.

Delphinus gadamu.

Fig. 1. Side view of skull (wanting back part of cranium).
Fig. 2. Side view of mandible.
Fig. 3. Upper view of mandible: *ss* symphysis.
Fig. 4. Symphysial end, inner view of mandible.
Fig. 5. Bony palate.

All the figures are nearly half the natural size.

PLATE V.

Fig. 1. *Delphinus fusiformis*, side view (diminished to scale).
Fig. 2. *Delphinus lentiginosus*, side view (id.).
Fig. 3. The same, upper view.

PLATE VI.

Fig. 1. *Delphinus maculiventer* (to scale of Plate V.).
Fig. 2. The same, upper view.
Fig. 3. *Delphinus pomeegra* (id.).

PLATE VII.

Delphinus fusiformis.

Fig. 1. Side view of cranium and upper jaw.
Fig. 2. Side view of lower jaw.
Fig. 3. Upper view of cranium and upper jaw.
Fig. 4. Under view of ditto.
Fig. 5. Upper view of symphysis of lower jaw.

All the figures are nearly half the natural size.

PLATE VIII.

Fig. 1. Side view of cranium and upper jaw of *Delphinus pomeegra*.
Fig. 2. Under view of upper jaw of ditto.
Fig. 3. Side view of under jaw of ditto.

Fig. 4. Upper view of symphysis of under jaw.
Fig. 5. Under view of upper jaw of *Delphinus euphrosyne*.

All the figures are half the natural size.

PLATE IX.

Phocæna brevirostris.

Fig. 1. Side view of cranium and upper jaw.
Fig. 2. Upper view of ditto.
Fig. 3. Under view of ditto.

All the figures are nearly half the natural size.

PLATE X.

Euphysetes simus.

Fig. 1. Side view of female.
Fig. 2. Upper view of ditto (drawn to scale).

PLATE XI.

Euphysetes simus.

Fig. 1. Side view of male (to same scale as female, Pl. X.).
Fig. 2. Outline of ditto, with skeleton.

PLATE XII.

Euphysetes simus.

Fig. 1. Side view of skull.
Fig. 2. Back view of skull (rather more than half the natural size).

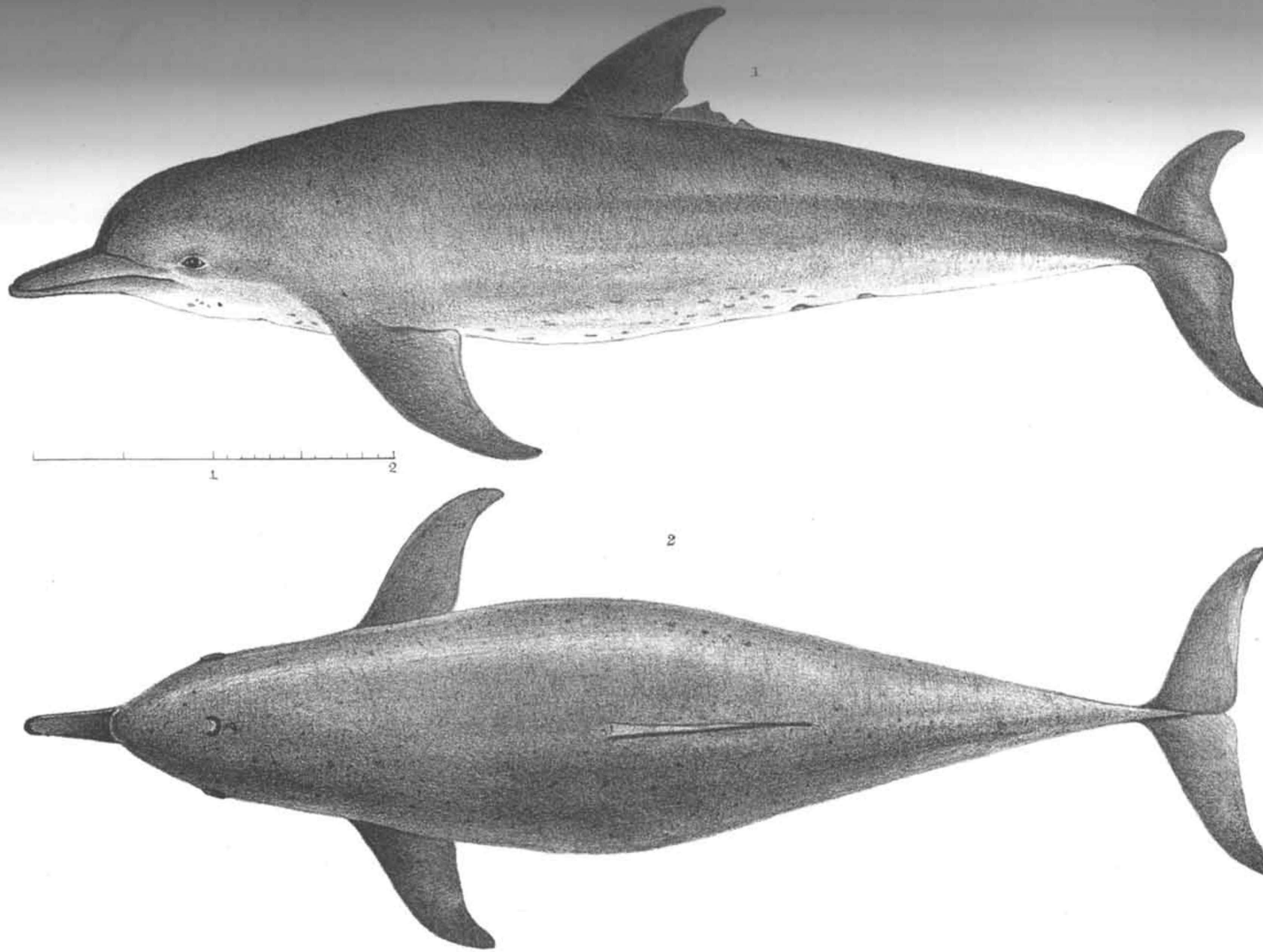
PLATE XIII.

Euphysetes simus.

Fig. 1. Upper view of skull.
Fig. 2. Under view of ditto (half the natural size).

PLATE XIV.

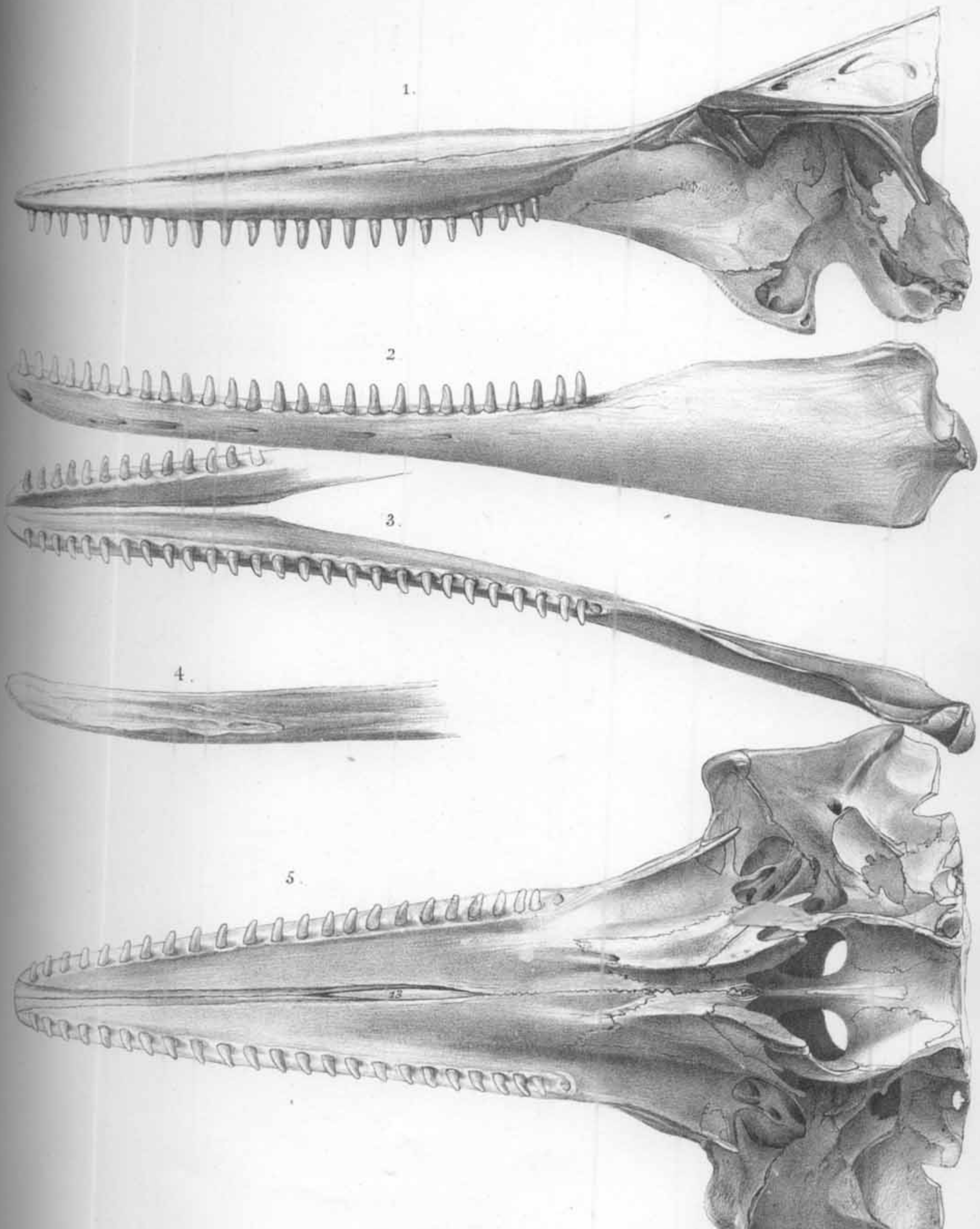
Fig. 1. Section of cranium of *Euphysetes simus.*
Fig. 2. Section of cranium of *Physeter macrocephalus.*
Fig. 3. *Euphysetes breviceps.*



Wilks del. et lith.

M. & N. Hanhart imp.

DELPHINUS GADAMU.

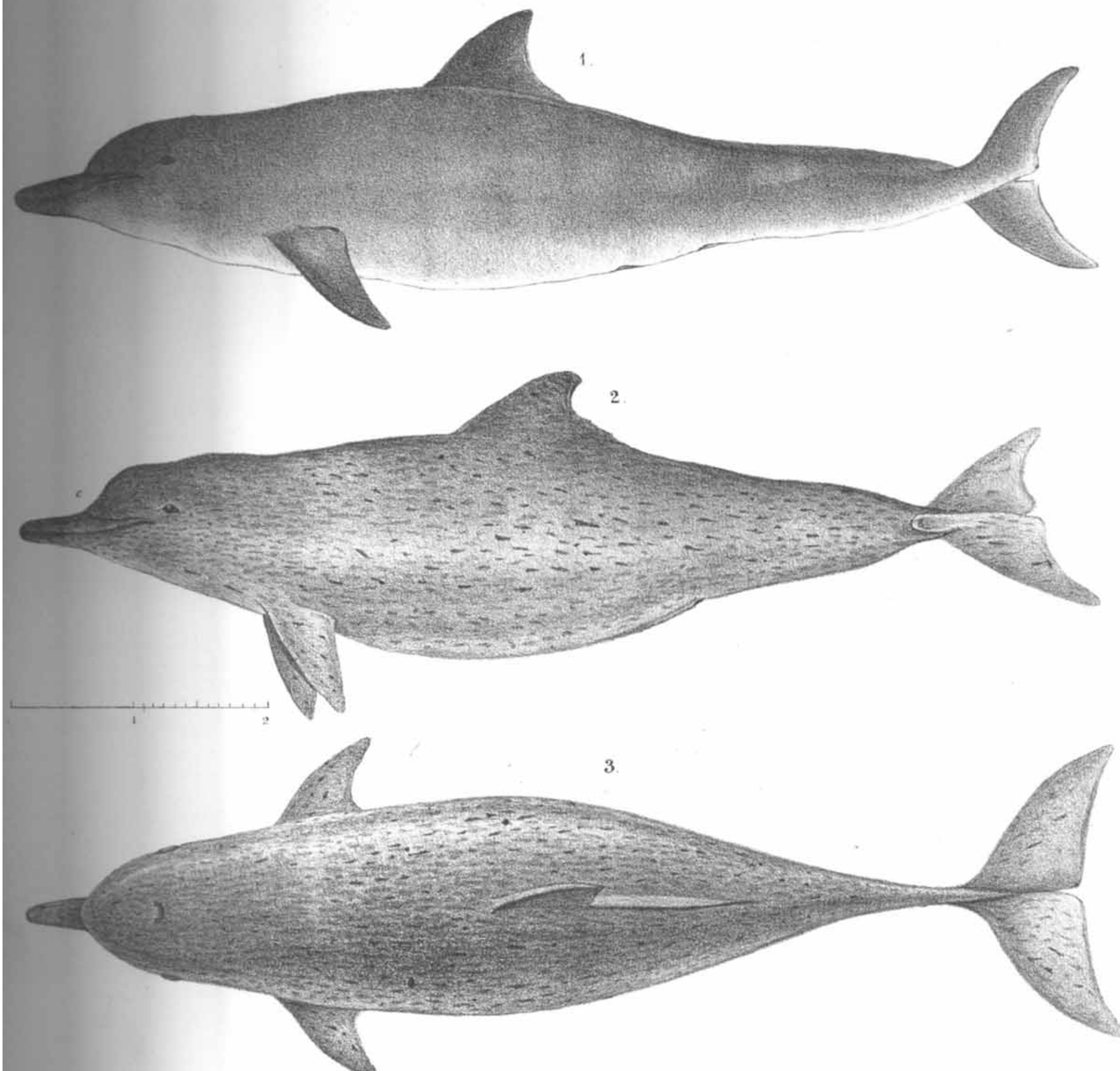


½ nat. size

From nat. on Stone by J. Erxleben.

M. & N. Hanhart. imp.

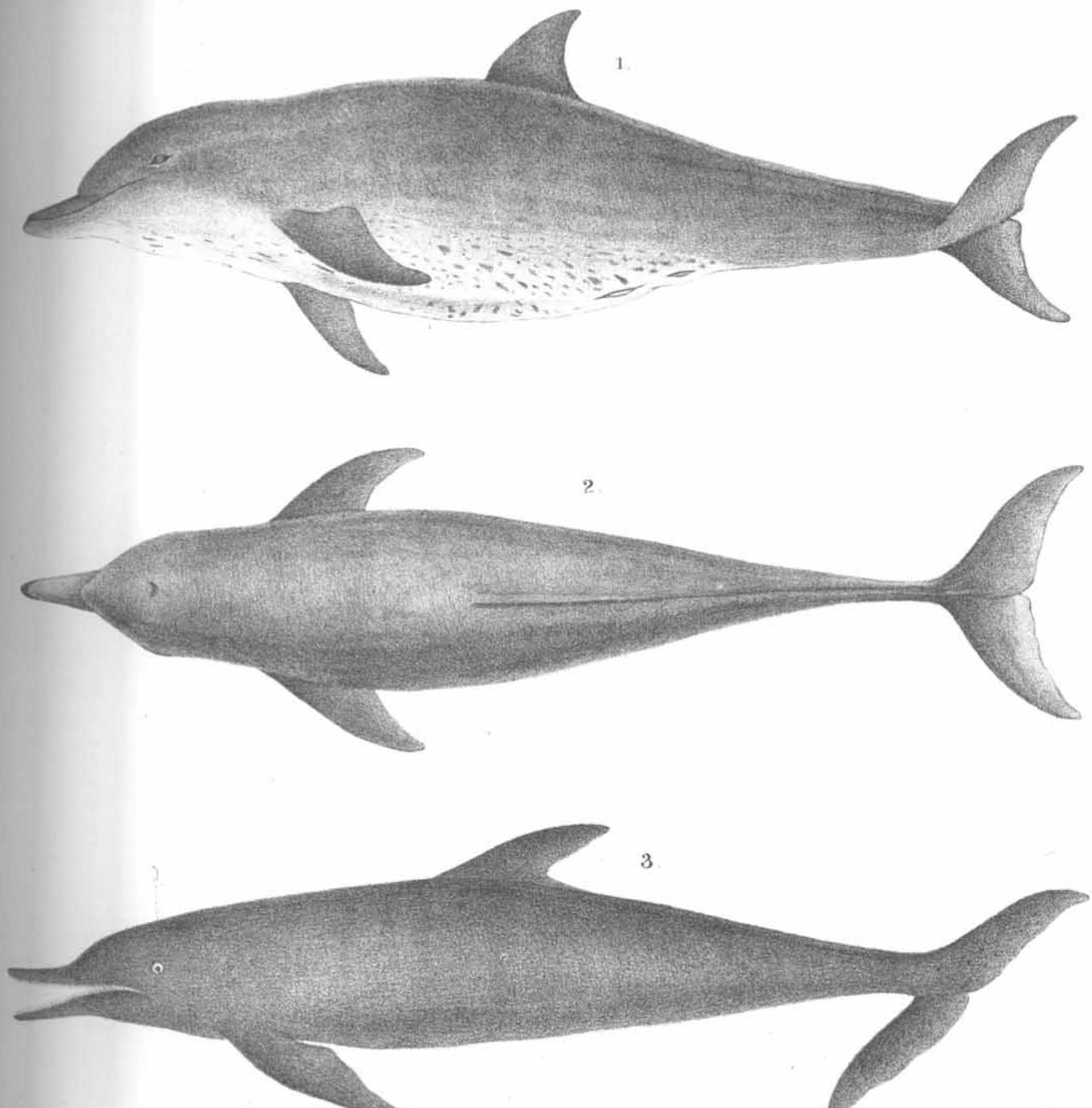
DELPHINUS GADAMU



Willis del. et lith.

M & N Hanhart imp.

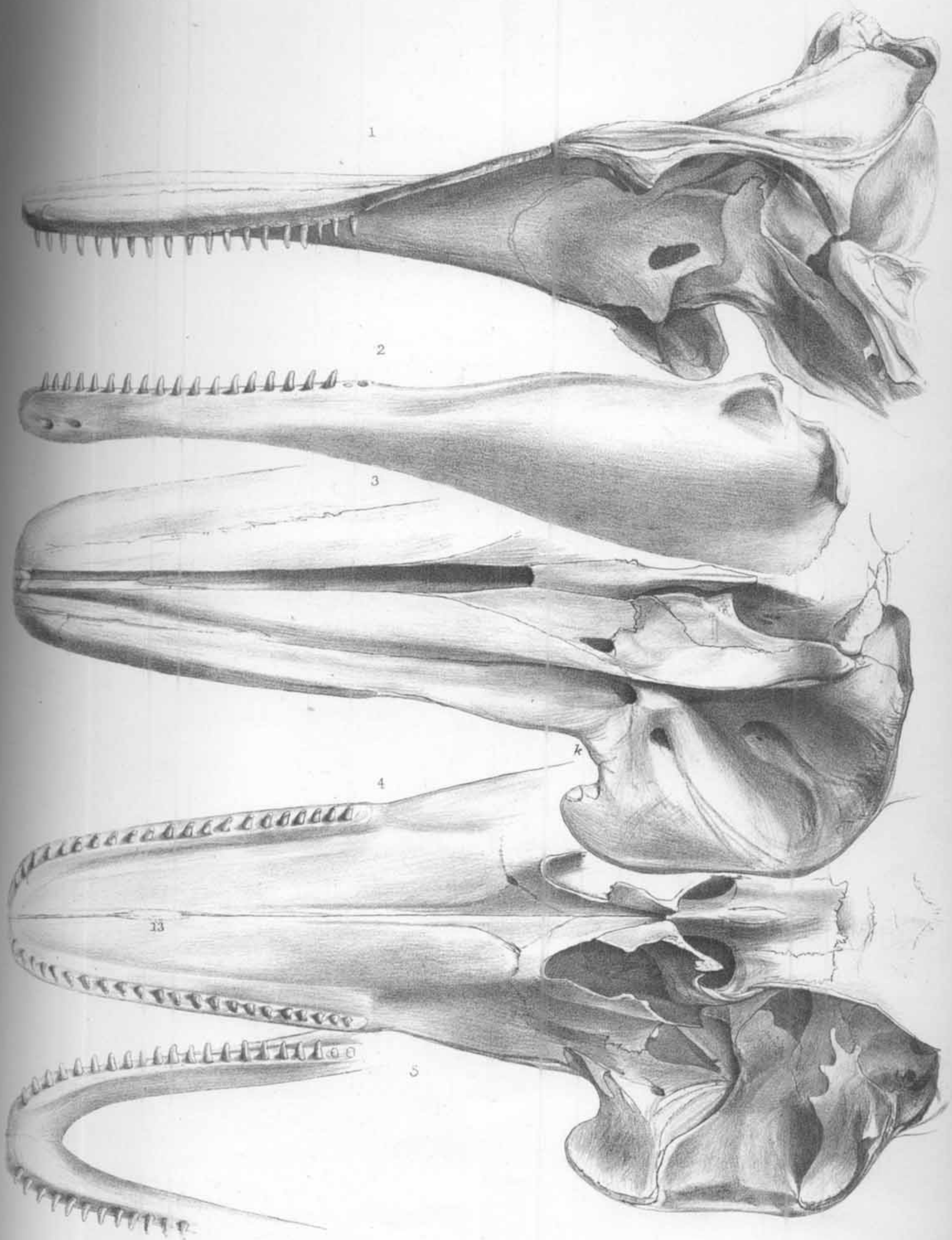
1. DELPHINUS FUSIFORMIS. 2. 3. DELPH. LENTIGINOSUS



Willis del. et lith.

M & N. Hanhart imp.

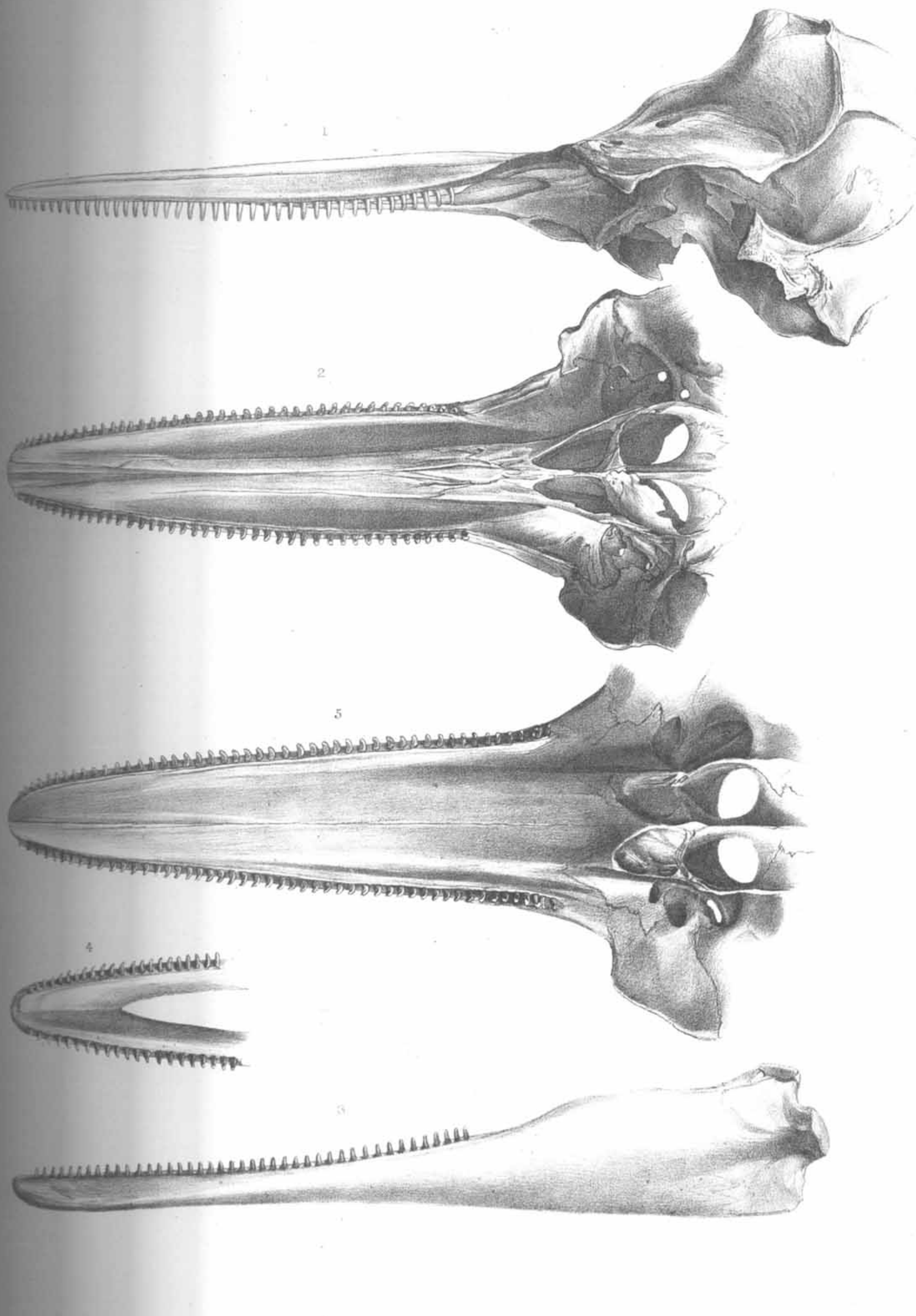
1. 2. DELPHINUS MACULIVENTER. 3 DELPH. POMEEGRA.



J. Erxleben, lith ad nat.

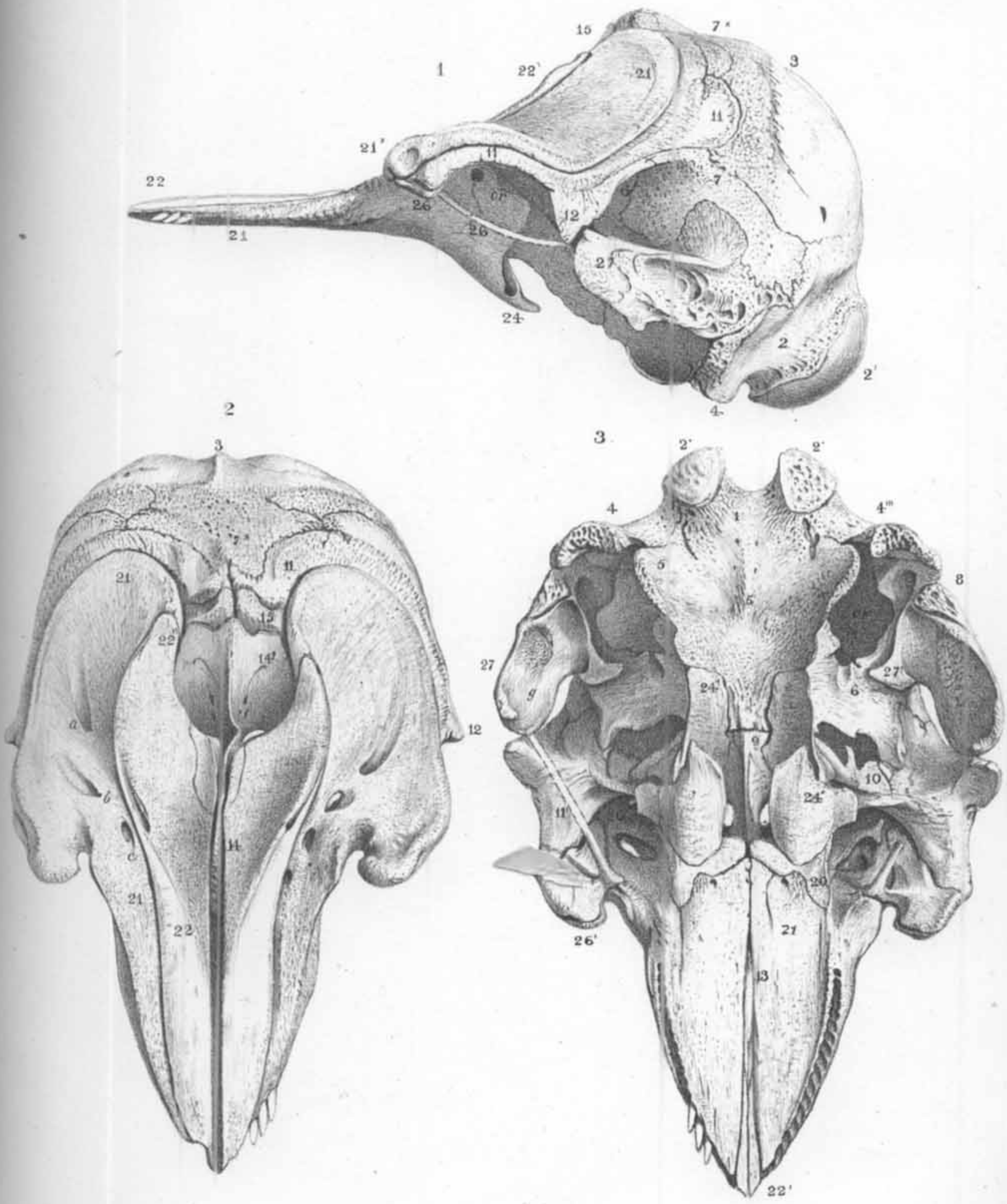
M & N Hanhart, Imp.

DELPHINUS (LAGENORHYNCHUS) FUSIFORMIS.



M & N Hanhart Imp.

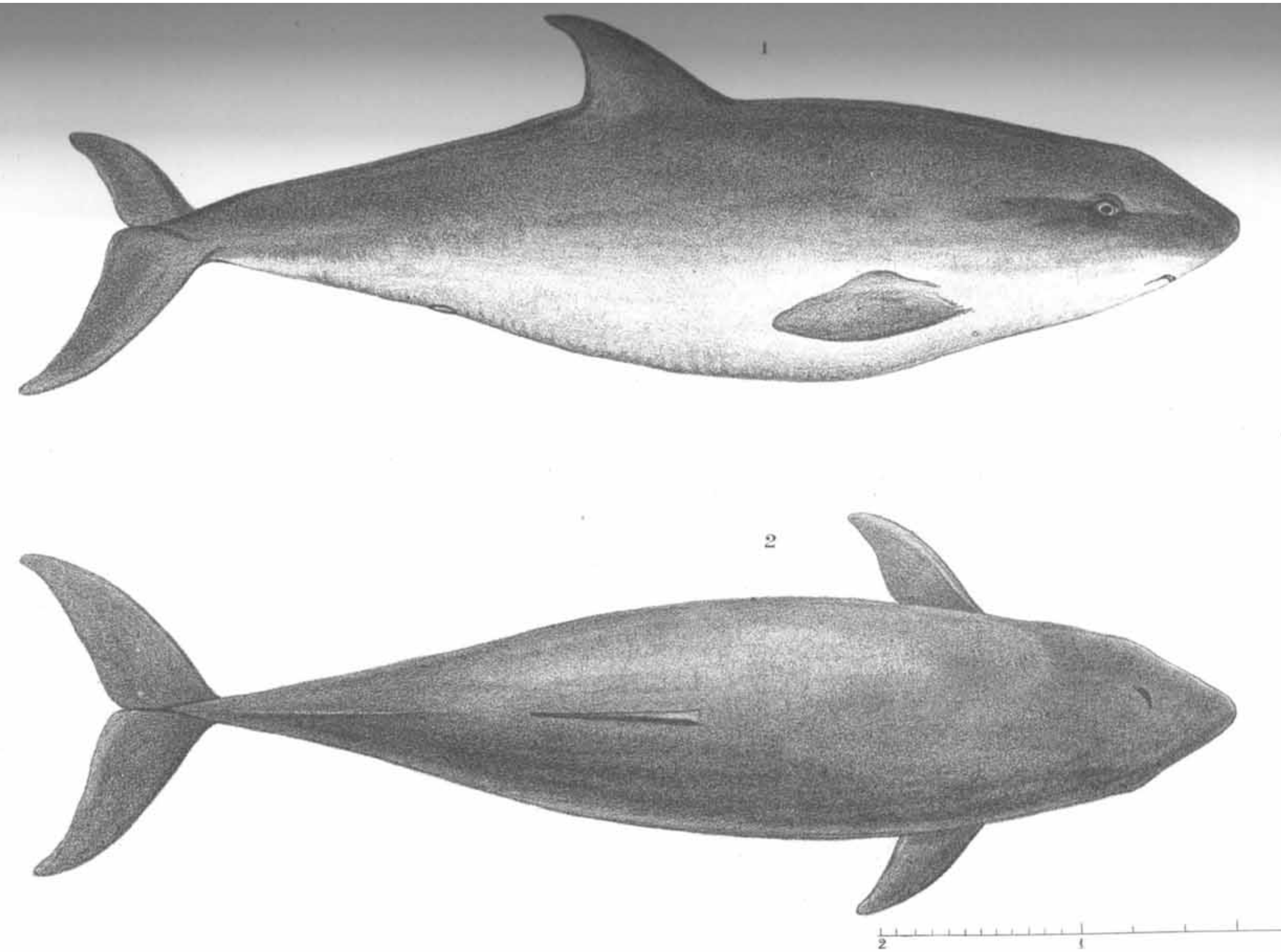
1.4. DELPHINUS POMEEGRA. 5. D. EUPHROSINE



Willis del et lith.

M & N. Hanhart, imp.

PHOCŒNA BREVIROSTRIS.

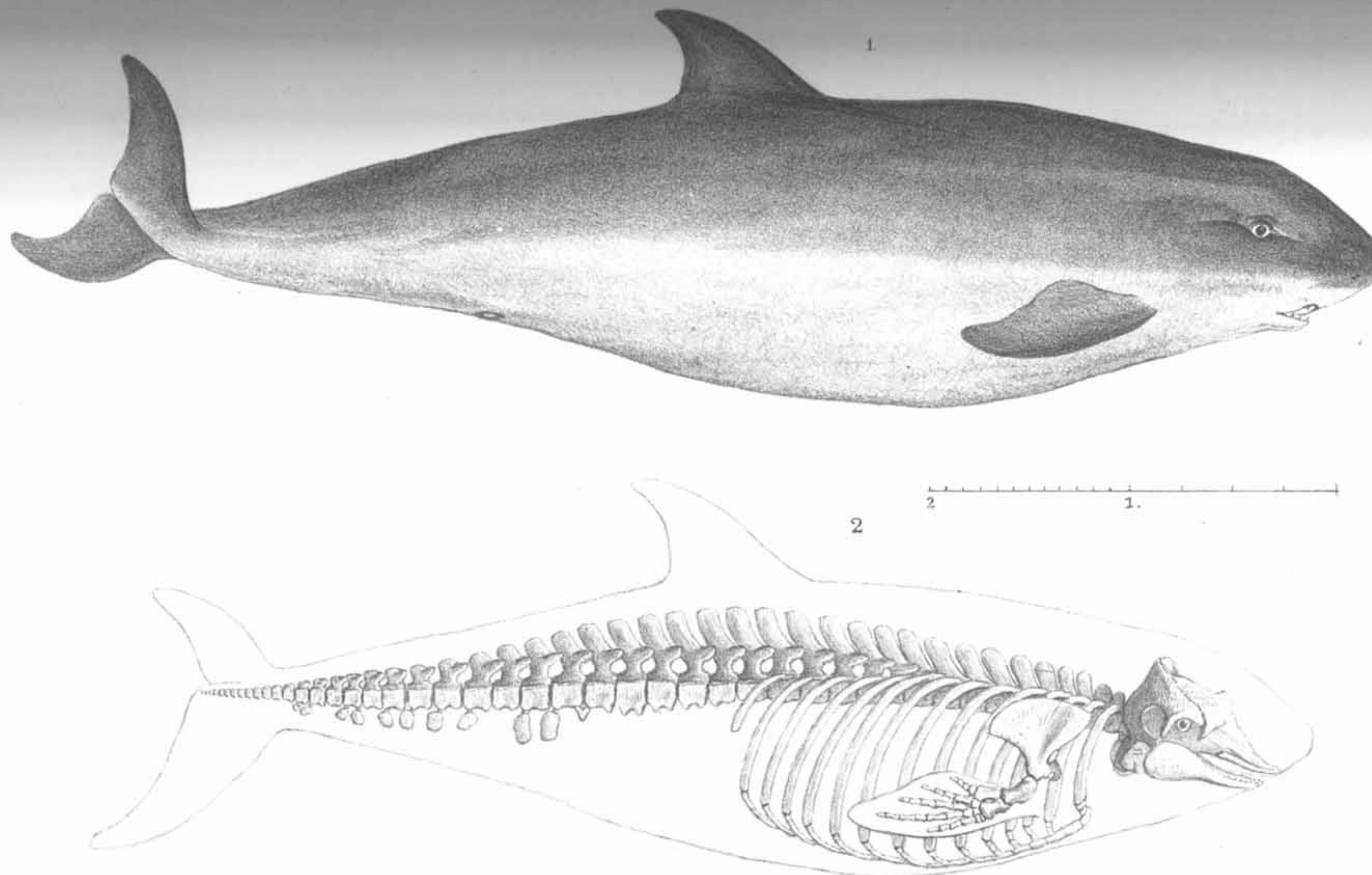


Willis del[t] et lith.

M & N Hanhart imp

PHYSETER SIMUS.

1



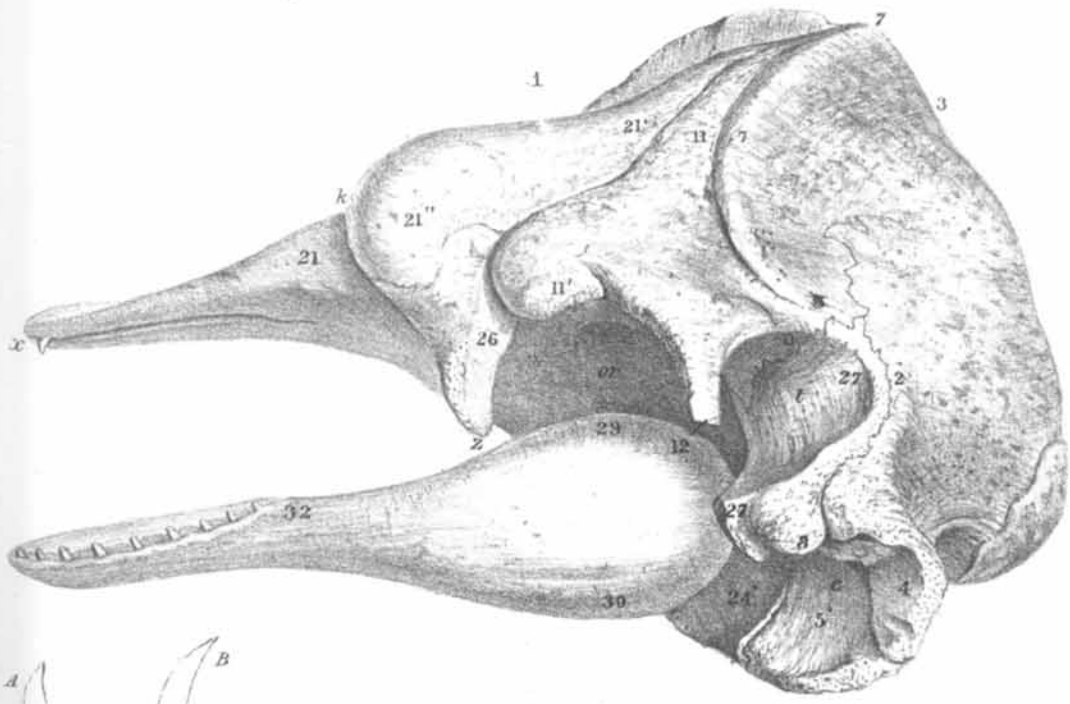
2

Willis del et lith

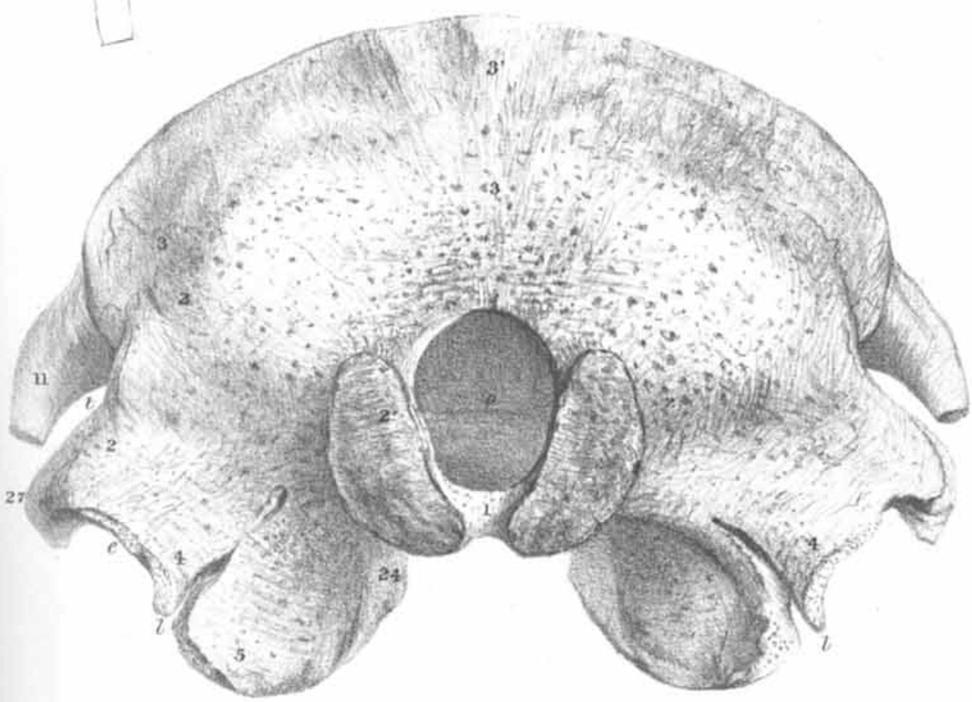
M. & N. Hanhart imp

PHYSETER SIMUS

1



2



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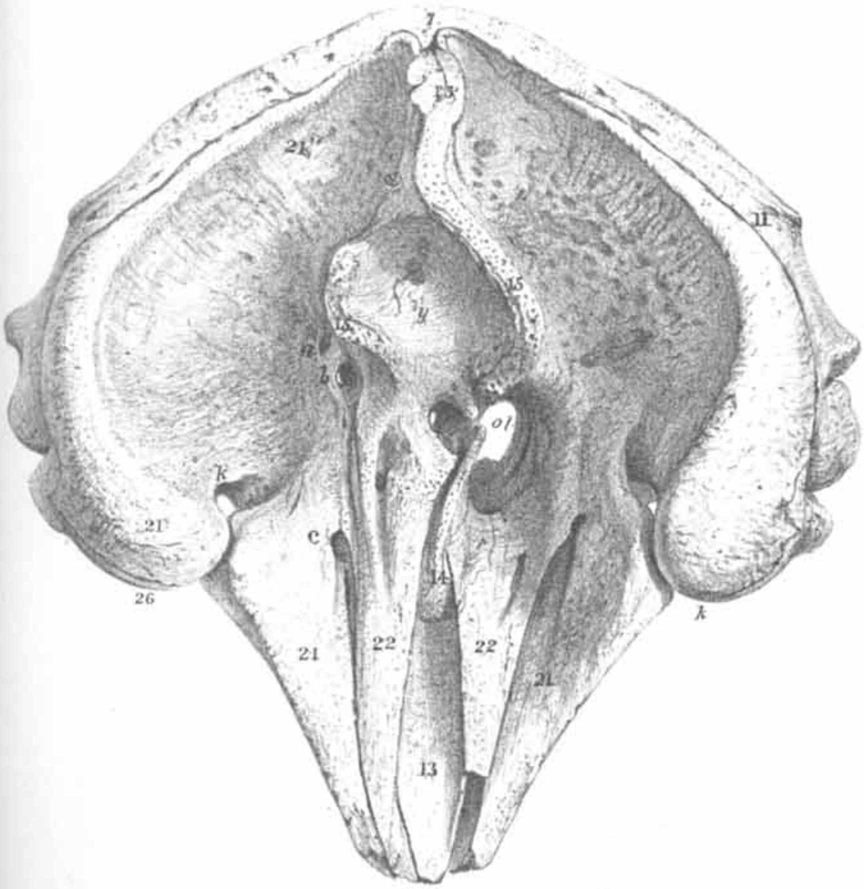
M. & N. Hanhart imp.

PHYSETER SIMUS

1.



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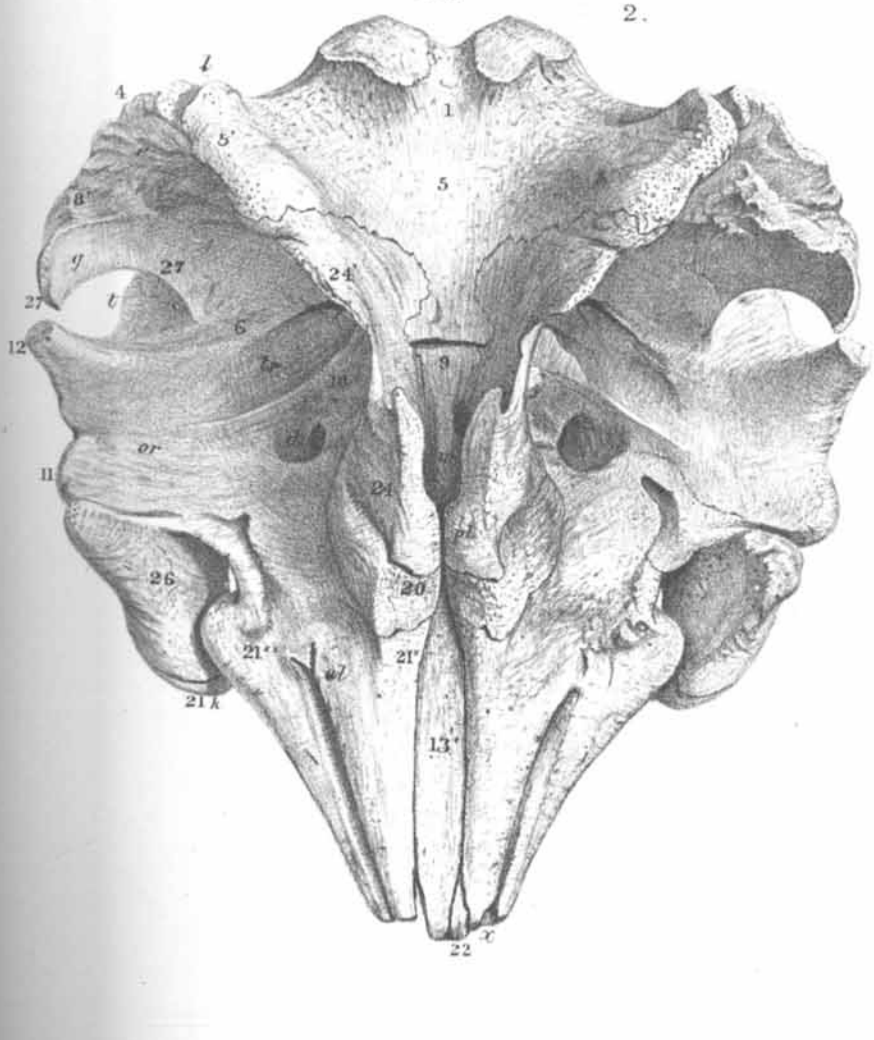

Willis del et lith.

M & N Hanhart imp

PHYSETER SIMUS.

R.Owen, del. on Stone by J. Erxleben
M. & N. Hanhart, imp.

1. PHYSETER SIMUS. 2. PHYSETER MACROCEPHALUS. 3. PHYSETER BREVICEPS.