ADDITIONAL OBSERVATIONS

ON

A NEW LIVING SPECIES

OF

HIPPOPOTAMUS,

OF

WESTERN AFRICA,

(HIPPOPOTAMUS LIBERIENSIS.)

BY

SAMUEL GEORGE MORTON, M. D., PENN. & EDINB.

VICE-PRESIDENT OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, &C. &C.

[From the Journal of the Academy of Natural Sciences of Philadelphia, Vol. I. Second Series.]

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A NEW LIVING SPECIES OF HIPPOPOTAMUS.

In the year 1840 I met with a man who had travelled extensively through the colony of Liberia, and beyond the limits of that province into the Dey and Bassa countries on the western coast of Africa. Among a variety of statements made by this person, was one to the effect that he had repeatedly seen, in the rivers of this interior region, a small Hippopotamus, not longer in the body than a middle-sized heifer, though possessing the relative proportions of the common Hippopotamus, to which it bore in all respects an epitomized resemblance. He further stated that the natives hunted this animal for food, and that he had himself seen it killed and eaten. This person's account, and his replies to my questions, were clear and consistent throughout; but some subsequent circumstances tended to cast a doubt upon his veracity, and satisfied me that his statements required confirmation from other sources.

In the summer of 1843, however, I received from my friend Dr. Goheen an extensive series of skulls of the mammiferous animals of Western Africa. They had been obtained by him during a residence of several years at Monrovia, in Liberia, where he had officiated as Colonial Physician; a situation that gave him great facilities for procuring the natural productions of that region. Among these crania were two of a small Hippopotamus from the river St. Paul's; a stream that rises in the mountains of Guinea, and passing through the Dey country and Liberia, empties into the Atlantic to the north of Cape Messurado.

Although nothing could be more manifest than the difference, both in size and conformation, between the head of this animal and that of the common Hippopotamus, I for some time hesitated to publish it, under the impression that so remarkable a species could not have wholly escaped the attention of zoologists. Having, however, carefully examined the latest European works on Zoology without finding any notice of it, I at length published a description, accompanied with two wood engravings, in the Academy's Proceedings for the month of February, 1844; and inasmuch as all subsequent investigation, both in Europe and this country, has confirmed the entire

novelty of this species, I now republish it with some corrections, and much larger and more accurate illustrations.

I first announced this animal by the name of *Hippopotamus minor;* not knowing at the time that Cuvier had already given this specific designation to a fossil species. It therefore becomes necessary to change it, which I do by placing this species in the zoological system by the name of

HIPPOPOTAMUS (TETRAPROTODON) LIBERIENSIS.

The Little or Liberian Hippopotamus.

Dental Formula.

Incisors, $\frac{4}{2}$ or, $\frac{2—2}{1—1}$

Canines, $\frac{1—1}{1—1}$

False molars, $\frac{4—4}{4—4}$

Molars, $\frac{3—3}{3—3}$

Of the two skulls in my possession, one is that of a very old individual, in which the teeth are much worn down, and the incisors, canines, and two first false molars on each side have been lost. This head is entire, excepting a small part of the nasal and maxillary bones of one side. The lower jaw is wanting. Pl. 34, fig. 5.

The other head is of the same size and proportions, but has pertained to a younger animal. It retains all the teeth, and for this reason I have used it exclusively in the following dental observations. It also retains the lower jaw; but the occiput, orbit and zygomæ have been fractured, and parts of the bones lost. There are also three slug or bullet wounds through the nasal region. Pl. 32.

Upper Jaw.—The *central incisors* are slightly flattened, and about a quarter of an inch in diameter at the alveolar margin. The lateral incisors are less flattened and more conical. All these teeth are slightly curved and nearly vertical. Pl. 33, fig. 3, and plate 34, fig. 3.

The *canines* are about an inch in the longest diameter, and remarkable for a deep posterior groove or furrow, extending about half the depth of the tooth, and giving its cross section (and consequently the corresponding alveolus) a reniform outline. Pl. 34, fig. 2. These teeth are much worn by attrition.

False molars.—The first of this set is little more than an inch in length, slightly curved, and has but a single fang and point. Pl. 33, fig. 5. The second and third false molars are very much larger than the first, with two fangs. They run to an

irregular conical point, with a second rudimentary point on the posterior margin. The fourth false molar is less in size than the second and third, and is only partially protruded above the jaw. It is capped on each side by the mere shell of the corresponding deciduous molar. The latter has been removed in Pl. 33, fig. 2, in order to show the protruding permanent tooth.

The molars.—Of the three molar teeth the middle appears to be the largest; but the posterior one is so partially protruded as to render comparison imperfect. The crown of each, before it becomes worn by attrition, presents a double cone, divided into four points by a longitudinal fissure. The roots of the first two molar teeth are four in number, but the last has five.

Lower Jaw.—In the lower maxilla dentition is complete, there being no remains of the deciduous teeth, and all the teeth are perfect, excepting only in their molar fangs.

The incisors.—These two teeth are much longer and more robust than those of the upper jaw. They protrude nearly on a line with the alveolar margin, and are much worn away by attrition. Pl. 33, fig. 4.

The *canines* differ from those of the upper jaw in being much longer, and in wanting the grooved or fluted character on their posterior surface. Pl. 34, fig. 1.

False molars.—The first of these is smaller than the upper one. Pl. 33, fig. 6. The second and third are more compressed than their fellows, and run up with smooth sides to a flattened cone. Pl. 33, fig. 7. The fourth false molar is a little smaller than those that precede it, and, like the corresponding teeth of the upper jaw, shows some resemblance to a true molar in its irregular crown and rudimentary points. Pl. 33, fig. 8.

The molars.—The three true molars increase in size from first to last, and differ in no material respect from the upper set. The last of them, however, which has just attained its adult position, has four complete points on its crown, and a rudimentary one posteriorly. It has also five corresponding fangs, but these have not yet attained their full length. Pl. 33, fig. 9.

Measurements.

	Inches.
Basal length of the skull, measured from the margin of the notch between the occipital condyles to the anterior end of the maxillary bones,	12.3
From the last named point to posterior surface of the condyles,	12.8
Basal distance between the anterior margin of the upper maxilla to the end of the os palati,	8.4
Distance between the posterior molars,	1.2
Distance between the posterior false molars,	1.4
Distance between the canines,	2.7
Distance between the external incisors,	1.7
Distance between the internal or central incisors,	1.
Inter-zygomatic diameter,	12.3

	Inches.
Inter-parietal diameter,	3.5
Distance between the orbits over the surface of the cranium,	3 9
Vertical diameter of the orbit,	2.
Horizontal diameter of the orbit,	1.8
Vertical diameter of the occiput, measured from the lower margin of the foramen magnum	3.6
Lateral diameter of the foramen magnum,	1.3
Vertical diameter of foramen magnum,	1.1
From the centre of the orbit to the lateral margin of the occiput on the same plane,	5.1
From the centre of the orbit to the anterior end of the upper maxilla,	7.3
Length of the lower jaw,	10.2
From the angle of the lower jaw to the top of the coronoid process,	5.6
Depth of the lower jaw from the alveolar margin of the fourth false molar to the base,	2.2
Length of the symphysis, measured externally,	3.3
Distance between the outer margins of the angles of the lower jaw,	8.9
Distance between the outer alveolar margins of the canines of the lower jaw,	4.5

The preceding remarks and measurements, and the annexed drawings, almost preclude the necessity of further specifications on the cranial structure of this animal. It may be observed, however, that in the *H. Liberiensis* there is a slight but uniform convexity of the upper surface of the skull from orbit to orbit, and between the occipital and nasal bones; while, on the contrary, in the *H. amphibius* the orbits are remarkably elevated, and the intermediate surface is concave.

In my first description I committed an error in describing the orbit as nearly intermediate between the two extremes of the head. This mistake is corrected in the table of measurements. At the same time it is to be remarked, that the orbit is placed much nearer a central point than in the *H. amphibius*, as will be more particularly evident in the reduced vertical view, Pl. 34, fig. 5.

The lachrymal bone in this species is remarkable for its extreme tenuity as well as for its form. It rises with prominent convexity from the floor of the orbit for nearly an inch in length, and is marked by a slight, sub-central, vertical constriction, that gives it a bilobed shape.

Dr. Goheen, (who from the first of his seeing these bones, considered them indicative of a new species,) has obligingly favoured me with the following memorandum. "These animals abound in the river St. Paul's, and vary in weight from four hundred to seven hundred pounds.* They are slow and heavy in their motions, yet will sometimes stray two or three miles from the river, in which situation they are killed by the natives. They are extremely tenacious of life, and almost invulnerable excepting when shot or otherwise wounded in the heart. When injured they become irritable and dangerous, but are said by the natives never to attack them when in their canoes. The negroes are very fond of the flesh, which seems to be intermediate in flavor between beef and veal."

* Judging from the osteology of the animal, it can rarely attain this maximum weight.

In preparing to republish this animal, I had contemplated a review of the allied species both living and extinct; but before commencing the arrangement of my materials, I had the pleasure to receive a communication from Dr. Hugh Falconer, of London, the distinguished author of the *Fauna Sivalensis*. In this letter Dr. Falconer gives a clear and concise view of the present state of our knowledge of the several species, recent and fossil, of the genus *Hippopotamus*, and I trust I commit no infraction of the kindness and confidence of that gentlemen by inserting so much of his communication as refers to this subject.

"LONDON, BRITISH MUSEUM, OCTOBER 2d, 1847.

* * * * *

"I regard your species as one of the most interesting and remarkable discoveries that has been made in recent zoology during the present century. Cuvier, in the "Discours Preliminaire," has entered into an elaborate argument against the probability of any remarkable existing large species of land animal remaining to be discovered, after the search which has been made through the continents and great islands of the globe; but your discovery proves that the inference was premature.

The species as you have established it, is perfectly distinct from the *H. amphibius*. It differs more from the latter than *H. amphibius* does from *H. major* and *H. palæindicus*; the only two fossil species of the same subgenus of which the crania are known. The distinctive characters as you have given them, are very strongly marked, viz.: the length of cranium proper as compound with that of the face: the advanced position of the orbits: the convexity of the forehead, both from back to front, and across between the orbits: and the details of the dental character. The canine teeth of the upper jaw alone, without reference to the dimensions and other peculiarities, would establish the distinctness of the species. In *H. amphibius* and *H. major*, the internal vertical channel is shallow, while in your species it is so deeply grooved, as to yield a strongly marked reniform outline in the section. This character was of especial interest to me, as it is constant, and nearly to the same amount as in an Indian fossil species, of the subgenus *Hexaprotodon*, var. *Hipp.* (*Hex.*) *Sivalensis*.

Unluckily, Cuvier had preoccupied the specific name of *H. minor* for his small European fossil species, which he called both *H. minor* and *H. minutus*. The latter name is now generally applied to it; but to prevent confusion, the name which you mention in your letter to me would be the most suitable to your species, and in the notice which I intend taking of it, I shall mention it as *Hipp. Liberiensis*, (Morton.)

Enclosed I send you a synopsis of the results of my examination of the Hippopotamidæ, fossil and recent.

Hippopotamus comprises two subgenera, HEXAPROTODON, with six incisors above

and below; and TETRAPROTODON, the species with reduced incisors, viz., four above and below. Your species, although it has but two in the lower jaw, belongs to the latter subgenus: the excessive reduction is probably only an individual case of variety, but if proved to be constant, the position of species in the genus will not be altered. The succession of the species in the table indicates the order of their affinities. No. 1, *H. major*, is the most divergent form, with short cranium, posterior orbits, great elevation of the sagittal and occipital crests, and excessive elevation of the upper margin of the orbits above the plane of the brow. Next follows *H. palæindicus*, (No. 2,) a true fossil Hippopotamus from India. Then comes *H. amphibius*, No. 3 in the series, of which the French naturalists make two species, *Capensis* and *Senegalensis*.

Duvernay, in a late memoir, (Comptes Rendus, October 1846,) maintains their distinctness, but I regard them as merely varieties. *H. annecteus*, No. 4, is an undescribed fossil species from the Nile above the Cataracts, which I lately observed in the Frankfort collections, (the Senckenberg Museum,) and brought to Europe by Dr. Rüppell in 1827. I have named it *H. annecteus* from its forming a link in size between *H. amphibius* and your species. The cranium is not known. Cuvier's *H. medius* has proved to be a species of Dugong, (*Halitherium* of authors.) Next follows Cuvier's *H. minor*, No. 5, which is a doubtful *Tetraprotodon*. I range your species last, from its close resemblance to the Indian *Hexaprotodons* in the form of the upper canines, No. 6.

Of HEXAPROTODON, we have three well-marked Indian fossil species. *H. Iravaticus*, No. 7, is a size larger than your *H. Liberiensis*. *H. sivalensis*, No. 8, is less than *H. amphibius*; and *H. namadicus*, No. 9, with other strongly marked characters, is larger than *H. amphibius*, or the *H. sivalensis*. We possess portions of every part of the skeleton, showing the closest resemblance to *Hippopotamus amphibius* throughout, but more slender in the proportions. *Merycopotamus* is a most interesting and well marked genus, connecting *Hippopotamus* with *Anthracotherium*. The molar teeth, as in the latter, are constructed on the ruminant plan; while the cranium, incisors and canines, together with the leafy expansion of the angle of the lower jaw, connect it with the former. It was nearly of the size of your *H. Liberiensis*.

SYNOPSIS OF THE HIPPOPOTAMIDÆ, FOSSIL AND RECENT.

GENUS 1. HIPPOPOTAMUS.

Subgenus 1. TETRAPROTODON.

1. H. (Tet.) MAJOR. Europe. Fossil.
2. H. (Tet.) PALÆINDICUS. India. Fossil.

3. H. (Tet.) AMPHIBIUS, *Linn.* Africa. Existing.
   H. SENEGALENSIS, " "
   H. CAPENSIS, *Auct.* " "
4. H. (Tet.) ANNECTEUS. Africa. Fossil.
5. H. (Tet.?) MINOR, *Cuv.* Europe. Fossil.
6. H. (Tet.) LIBERIENSIS, *Morton.* Western Africa. Existing.

Subgenus 2. HEXAPROTODON.

7. H. (Hex.) IRAVATICUS. India. Fossil.
8. H. (Hex.) SIVALENSIS. India. Fossil.
9. H. (Hex.) NAMADICUS. India. Fossil.

GENUS 2. MERYCOPOTAMUS.

M. DISSIMILIS. Fossil. India. H. F."

In addition to the preceding remarks of Dr. Falconer, I submit the following in further explanation.

The first attempt to divide the Hippopotamus amphibius of Linneus, was made by M. Desmoulins in Magendie's Journal de Physiologie for 1825. This able naturalist, after comparing the head and parts of the skeleton of the Hippopotamus of Senegal with that of the Cape, came to the conclusion that the two animals were specifically distinct. On this subject I shall only remark, that I possess two adult heads from the Cape, and the Academy's collections contain two others from Senegal; and that on comparing them, I find the Cape specimens to differ as much from each other as either of them does from those of the rivers of Senegal. If, however, they should prove distinct, the courtesies of science require that the specific name *amphibius* be retained for one of them, and to that of Senegal in preference, because it has been best known to naturalists, and has consequently served as the basis of most descriptions.

In D'Orbigny's Dictionnaire d'Historie Naturelle, M. Boitard has elaborately investigated this question. He details the two species proposed by M. Desmoulins, and adds that M. Lesson had proposed the name of *H. Abyssinius* for the animal inhabiting the upper Nile; but M. Boitard does not adopt these specific designations.

This department of science has yet more recently been investigated by M. Duvernay, whose facts and conclusions are published in the *Comptes Rendus* des Séances de l'Académie des Sciences, for October, 1846. It may suffice on the present occasion to observe, that M. Duvernay's observations are favourable to the specific distinctions proposed by M. Desmoulins; he regards the Abyssinian animal as of the same species with that of Senegal, but maintains the specific distinctness

of the Hippopotamus of the Cape. He further admits the *H. Liberiensis*, (minor,) to be perfectly distinct from either, and concludes his memoir by adopting three species of living Hippopotami. All this is very well; but we confess our surprise that M. Duvernay, after confirming the two species proposed twenty years before by M. Desmoulins, should, without note or explanation, give new names to them both. Thus, he calls the Senegal and Abyssinian animal *H. typus*, because it has been longest known to naturalists and others. The Cape species he designates *H. australis*.

Now we must be allowed to repeat, that this unnecessary change of names is contrary to the conventional usages of naturalists, and hostile to the utility and integrity of zoological nomenclature. For if M. Duvernay can be sustained in this innovation, the very next writer on the subject has an equal right to indulge his fancy or ambition in the same way, and may discard M. Duvernay's names for others of his own. Such practices tend to interminable confusion in science, which is already overburthened with synonyma.

In the present state of our knowledge, and awaiting the results of further observation and comparison, we can only admit of two living species of Hippopotamus as positively determined; viz. *H. amphibius* and *H. Liberiensis*.

By the cruel munificence of the Roman Emperors, the solitudes of Europe, Asia and Africa were annually taxed to furnish wild animals for the bloody sports of the amphitheatre. Of all the large quadrupeds, the Hippopotamus was the only one that escaped the sacrifice; not on account of his size, which would have been no obstacle, but from his amphibious habits, which prevented his being taken to Rome or exhibited in Europe. But the smaller species I now introduce to notice, is of so moderate a bulk, even in adult age, as to render his capture and transportation of comparatively easy accomplishment; and I feel confident that nothing more will be necessary to success, than an adequate reward to such of the inhabitants of Liberia as may be disposed to attempt so novel an enterprise. A half grown animal, if not really docile might at least prove tractable; and by a studious adaptation of his food and attention to his aquatic habits, we can see no great difficulty in introducing the Liberian Hippopotamus into the menageries of Europe and America. The skin and entire skeleton can no doubt be readily obtained, and would constitute most instructive additions to any collection of zoology or comparative anatomy.

I shall close this paper by stating the remarkable fact, that although this Hippopotamus is abundant within one hundred and fifty miles of the sea coast of Liberia, the only parts of him that are known tohave ever been sent from Africa, are the two skulls in my possession. I cannot find that any portion of the animal is yet co ntained in the museums of Europe.*

* I sent my specimens to London by the hands of Mr. (now Sir Charles) Lyell, that they might be examined by those distinguished comparative anatomists, Professor Owen, of the Royal College of Surgeons, and Dr. Hugh Falconer, author of the Fauna Sivalensis.

EXPLANATION OF THE PLATES.

PLATE XXXII.

Cranium of the younger of the two animals. The nasal region is pierced by two slugs, and the orbit, zygomatic process and terminal portion of the occiput, are fractured and the fragments lost.

PLATE XXXIII.

Parts of the same cranium.

Fig. 1. Right half of the lower jaw with its nine teeth.

Fig. 2. Right half of thc upper jaw with its ten teeth ; the first præmolar, (fig. 5,) having been removed for a separate drawing, was inadvertantly omitted in the present instance. The fourth and last premolar is of the permanent series, but not fully elevated above the bone. I removed the shell of the corresponding deciduous tooth in order to bring the permanent one into view. All the rest of the teeth in both jaws belong to the permanent set.

Fig. 3. Internal incisor of the upper jaw, natural size.

Fig. 4. Incisor of the lower jaw, natural size.

Fig. 5. First præmolar of the upper law, natural size.

Fig. 6. First præmolar of the lower jaw, natural size.

Fig. 7. Third præmolar of the lower jaw, natural size.

Fig. 8. Fourth præmolar of the lower jaw, natural size.

Fig. 9. Third or posterior molar of the lower jaw, natural size : the roots imperfectly developed.

PLATE XXXIV.

Fig. 1. Canine tooth of the lower jaw, natural size, with a transverse section.

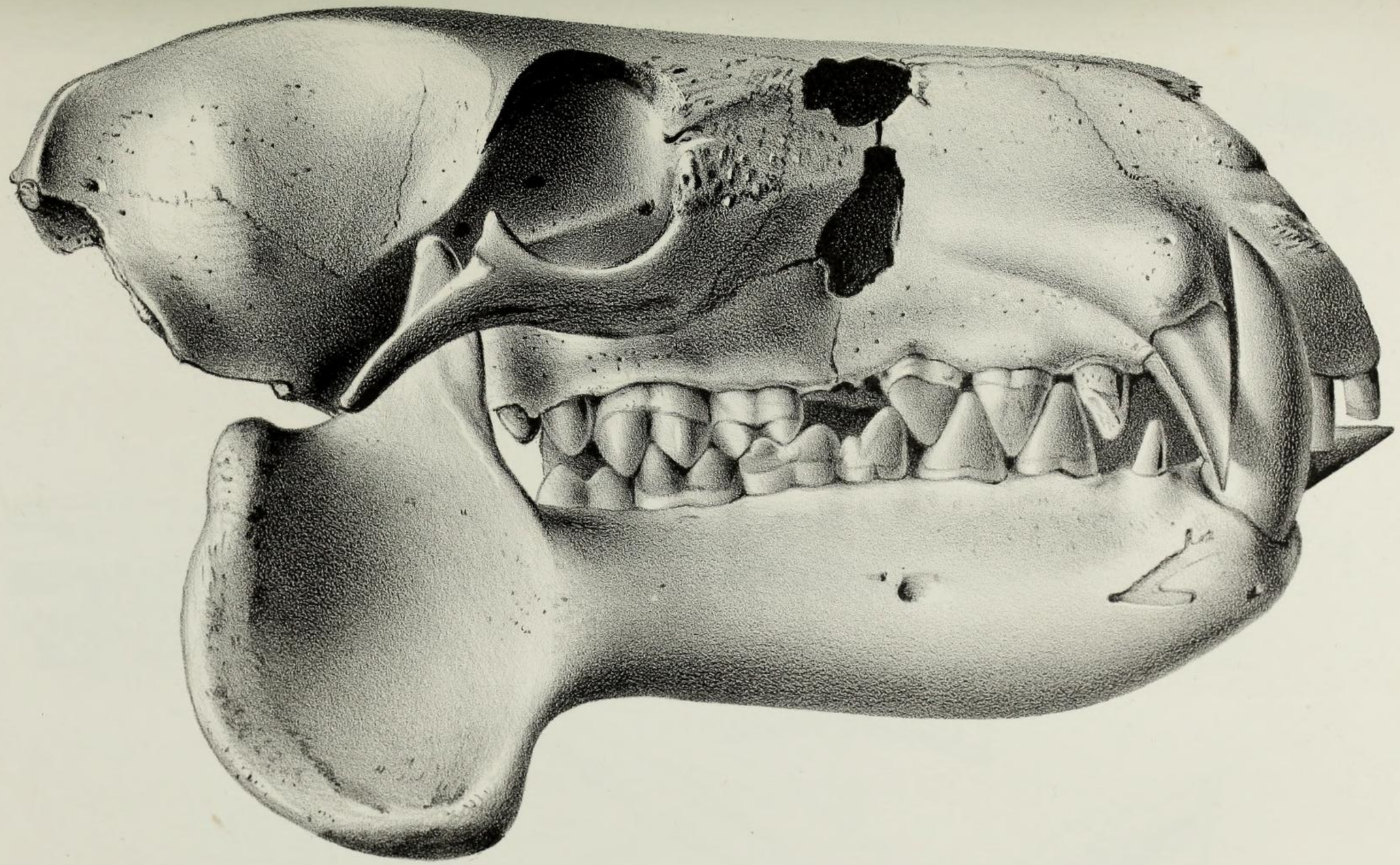
Fig. 2. Canine tooth of the upper jaw, natural size, with a transverse section.

Fig. 3. Face and front view of the head and lower jaw.

The three preceding figures were taken from the younger of the two animals ; the following figures are derived from the older skull.

Fig. 4. View of the occiput in its vertical position.

Fig. 5. Cranium, viewed from above, the sutures being obsolete from age, as stated in the text.



HIPPOPOTAMUS (TETRAPROTODON) LIBERIENSIS. *MORTON.*

From Nature by J.T. French

T. Sinclairs Lith. Philada.

Fig 1

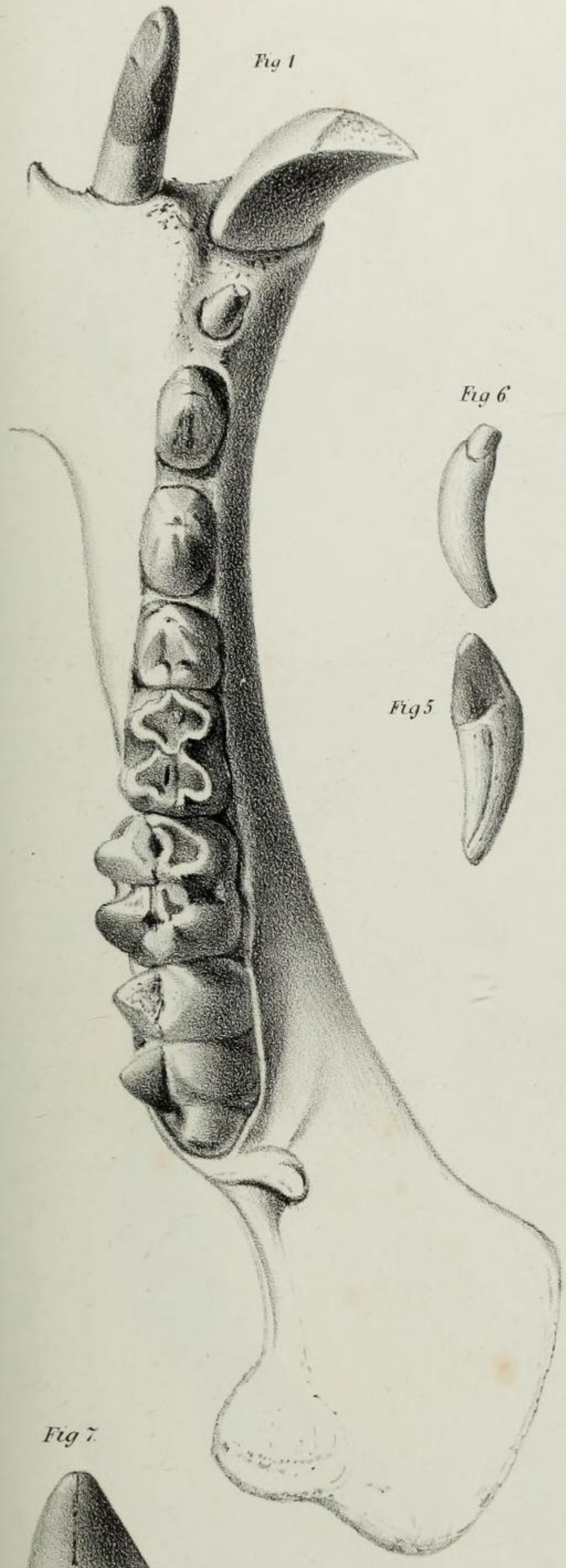


Fig 4

Fig 2

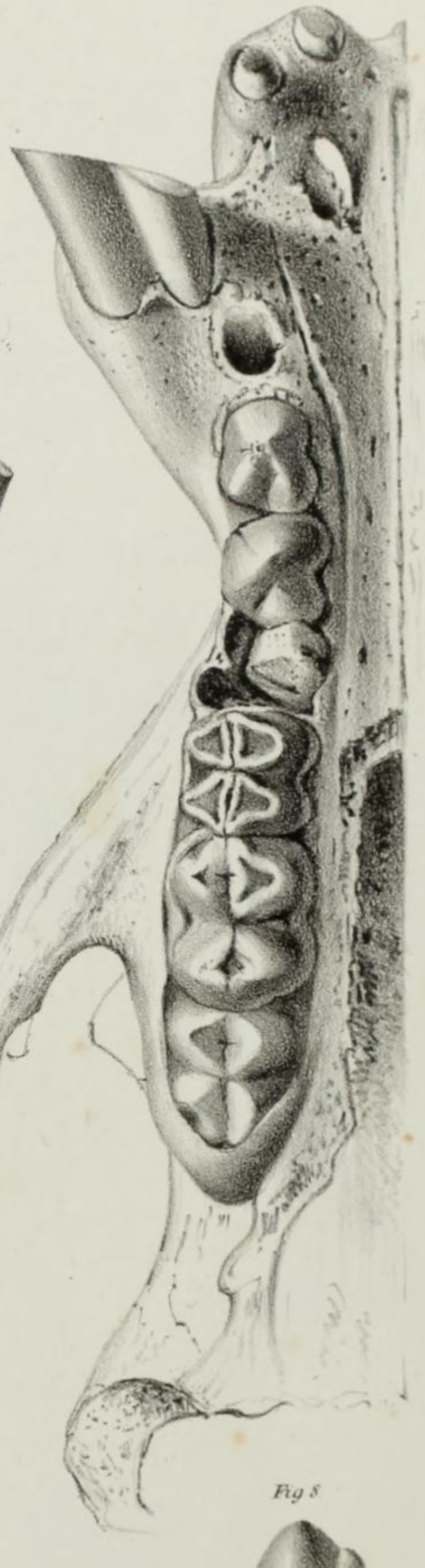


Fig 6

Fig 3

Fig 5

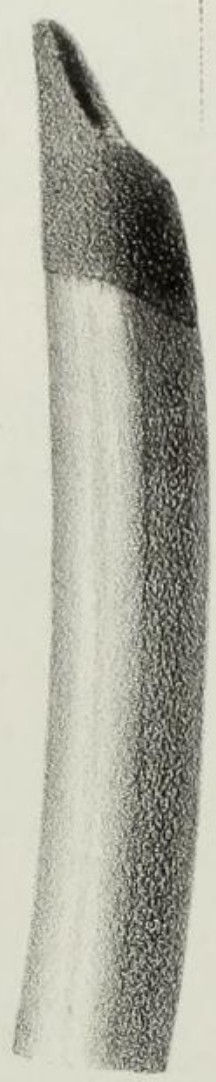


Fig 7.

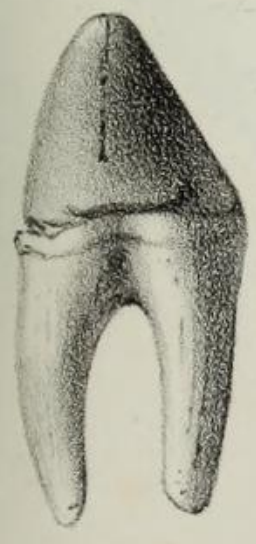


Fig 9

Fig 8

HIPPOPOTAMUS (TETRAPROTODON) LIBERIENSIS. *MORTON.*

T. Sinclairs Lith. Phila.

Fig. 4

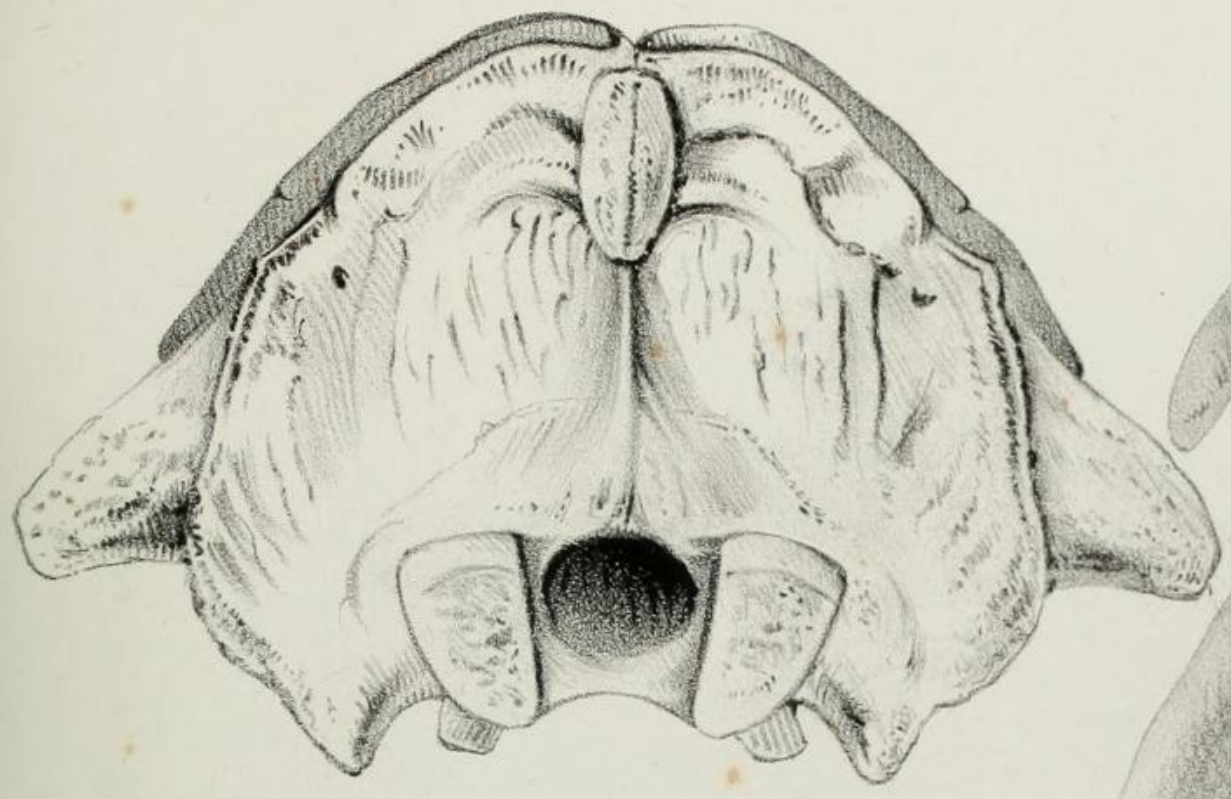


Fig. 3

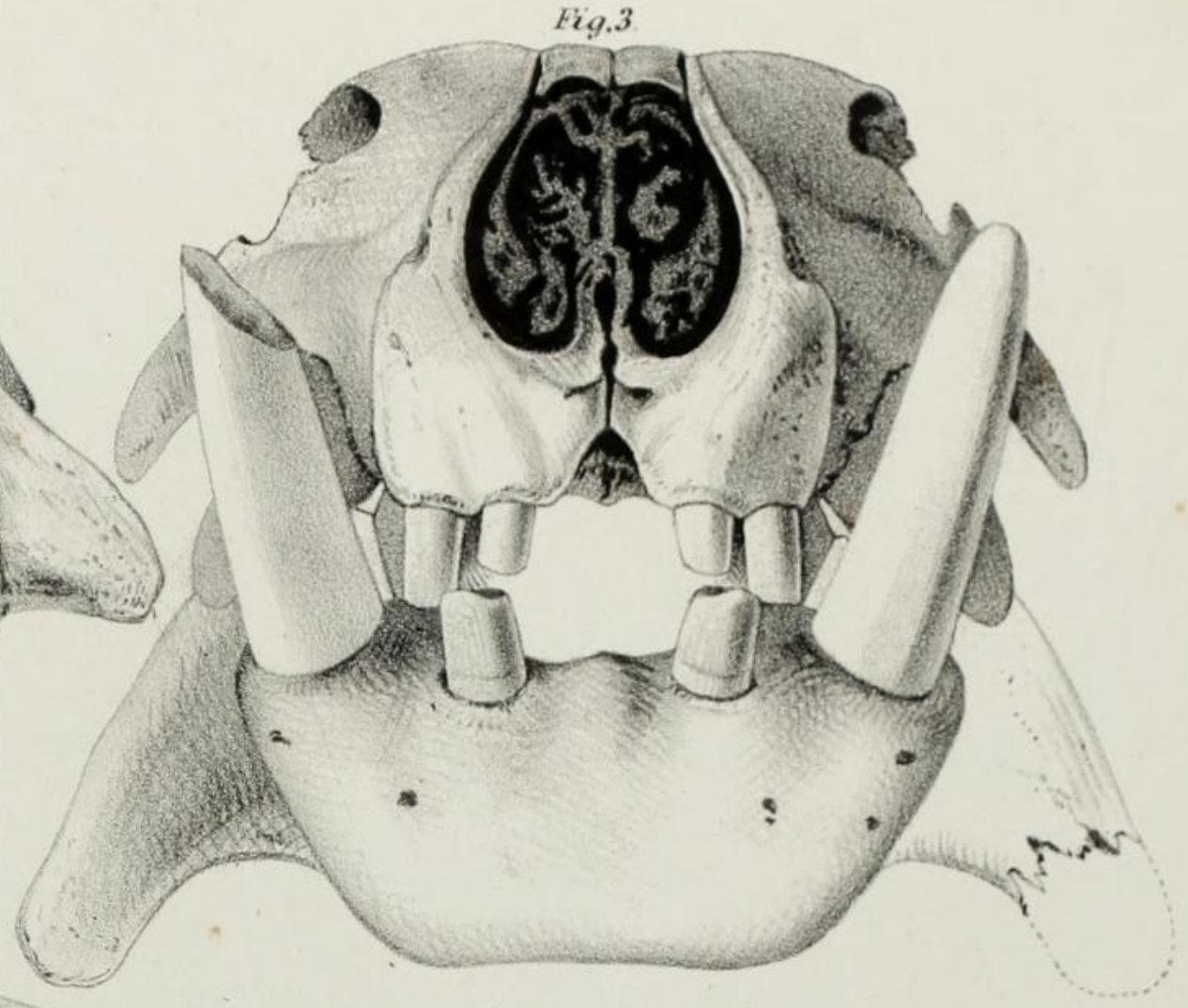


Fig. 1.

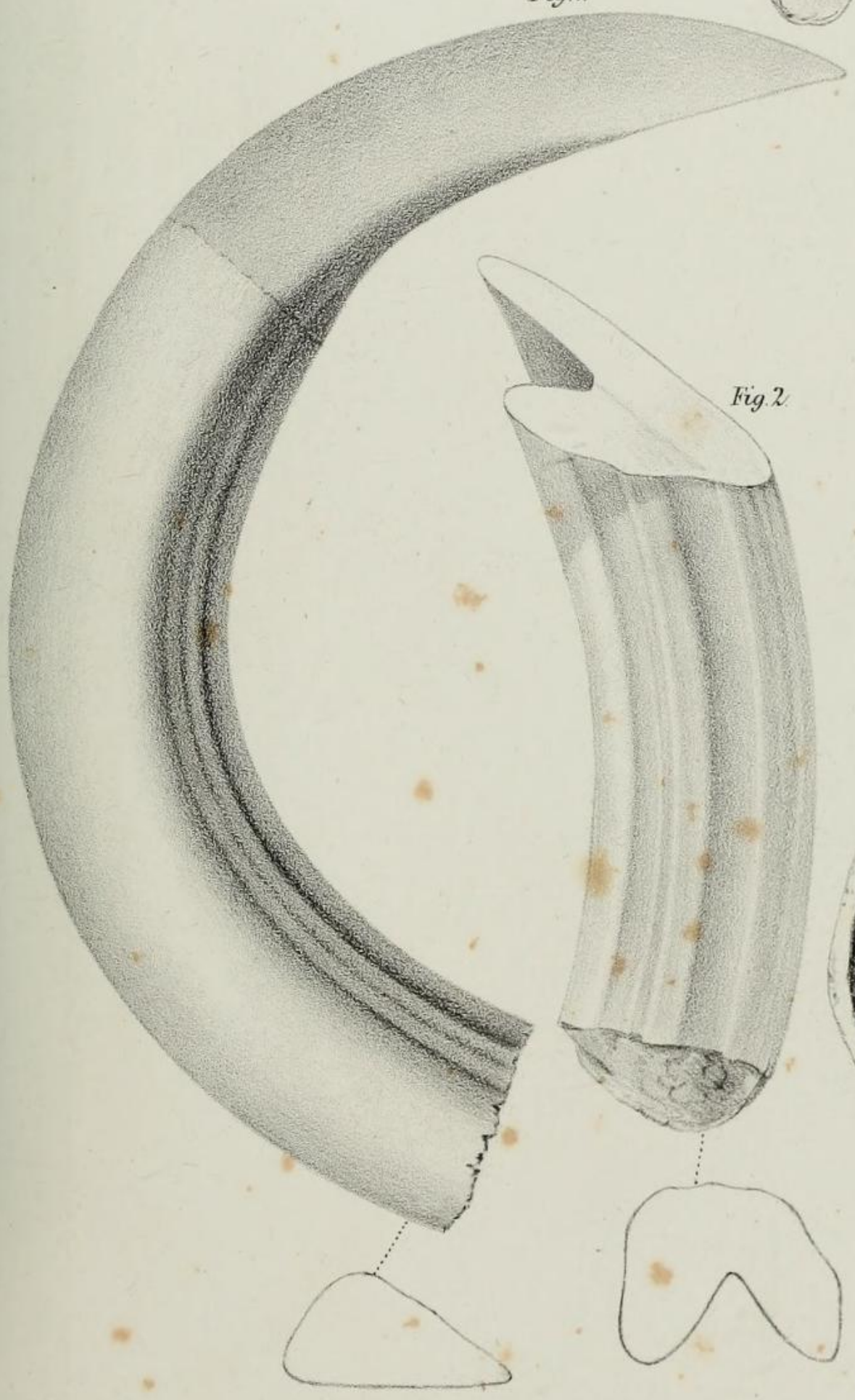
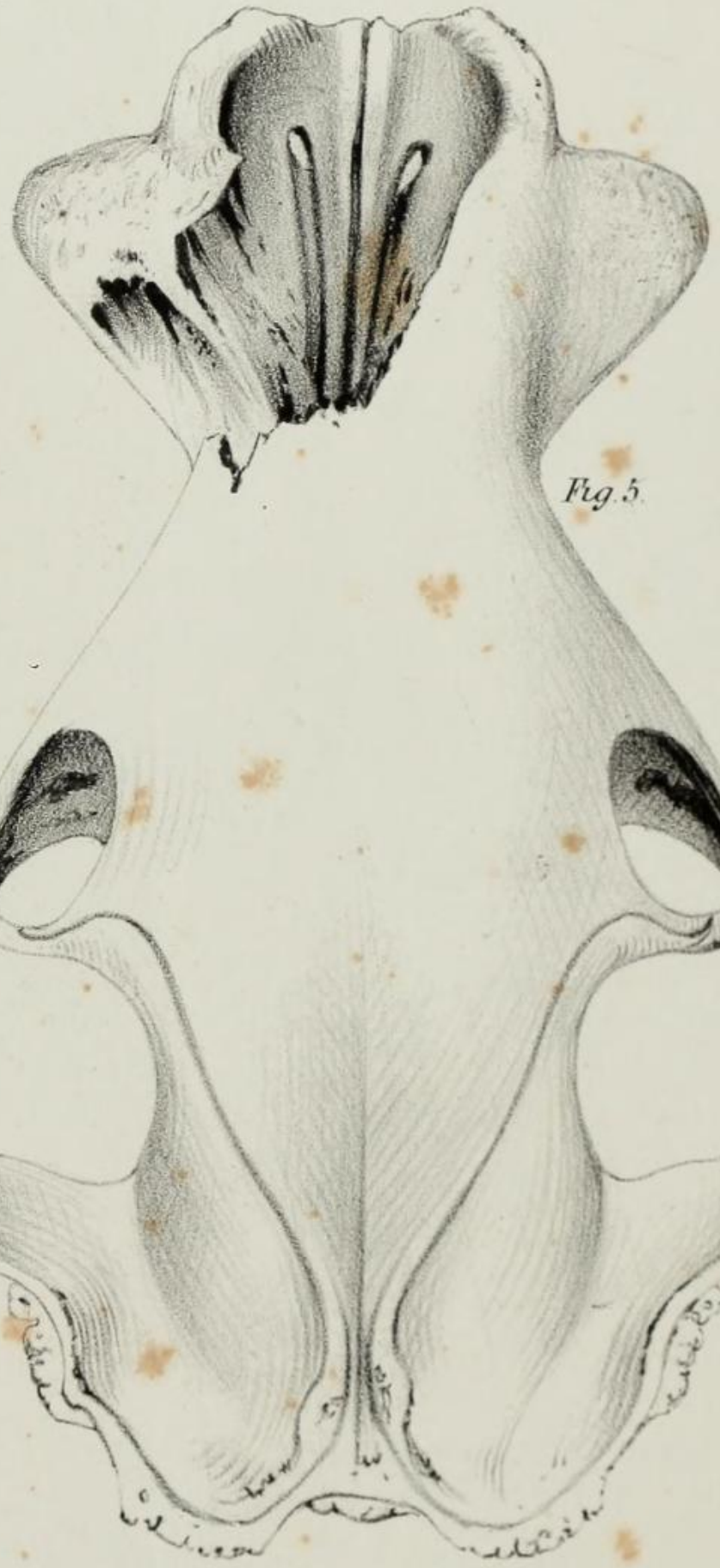


Fig. 2

Fig. 5.



HIPPOPOTAMUS (TETRAPROTODON) LIBERIENSIS *MORTON.*

T. Sinclairs lith. Phil.ª