On the fossil remains of two new species of mastodon, and of other vertebrated animals, found of the left bank of the Irawadi / by William Clift.

XXIV.—*On the Fossil Remains of two New Species of Mastodon, and of other vertebrated Animals, found on the left Bank of the Irawadi.*

By WILLIAM CLIFT, Esq., F.G.S. F.R.S. &c.

CONSERVATOR OF THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.

[Read April 18th, 1828.]

IN describing the fossil remains collected by Mr. Crawfurd during his mission to the Burman Empire, and which his liberality has placed in the Museum of the Geological Society, I conceive that I shall best execute the task intrusted to me, by a strict adherence to zoological and anatomical detail; leaving all geological inferences to Dr. Buckland, who has undertaken that department, and who is so well qualified to do ample justice to it.

But before I proceed to my descriptions, it is necessary to express my great obligations to Mr. Broderip, the Secretary of this Society, for the very valuable assistance which he has afforded me on several important points connected with the subject.

In the arrangement of the materials before me, the system of Cuvier is followed, according to which I have first to treat of the

PACHYDERMATA.

Mastodon.

Fossil species of this genus have already been found in America and in Europe, and are so well known at the present day, that it would be superfluous to enumerate the various accounts which have been given of them. But I cannot pass over the "*Ossemens Fossiles*" of M. Cuvier, who has entered so luminously into the history of these extinct animals; more especially as he has, after describing M. giganteum and M. angustidens, given a chapter on certain teeth belonging to the genus Mastodon, which appear to him to indicate the existence of species different from those two which he had already recorded*. The teeth, according to the figures given, which come

* Ossem. Foss. tom. i. p. 266.

nearest to our specimen, are those figured as the teeth of "divers Mastodontes* ;" and of these, the last figure referred to in the note forms the nearest approach to the first species which I have to describe. The teeth from which these figures were taken must have been much worn, and the last-mentioned figure, though at first sight it has the appearance of part of a tooth of our M. latidens, will be found nevertheless very different from it on a close examination, not only in the surface presented, but also in its comparative narrowness in proportion to its length. The teeth figured by Soemmerring are also deserving of notice†.

It was, however, reserved for Mr. Crawfurd to make us acquainted with the fact, that the remains of these extinct animals occur in Asia. To add to the interest of this discovery, the two species now about to be recorded are new, differing materially from every species of Mastodon hitherto described. On an examination of the structure of the teeth, this discovery will be found to have still greater claims to attention; for it illustrates very beautifully the gradual shades of difference by which Nature passes almost imperceptibly from one form to another, and helps to fill up the interval which has hitherto separated the Mastodon from the Elephant.

On comparing the teeth of our Mastodon latidens with those of the Mastodon of the Ohio (M. giganteum), we shall find the elevated points or ridges in the tooth of the former more numerous, less distant, and the interstices less deep than in those of the latter: in short, we shall observe that the teeth begin to assume the appearance of those of the elephant. On advancing to Mastodon elephantoides, we shall find all these features of similarity more strongly developed:—the points and ridges are still more numerous, and the structure, were it not for the absence of crusta petrosa, becomes almost that of the tooth of the elephant. In both, though the teeth are formed upon the principle by

* Ossem. Foss. Pl. 2. fig. 5. Pl. 3. fig. 2. and Pl. 4. fig. 4.

† Bemerkungen über einige in der Naturaliensammlung der k. Akademie d. W. befindliche fossile Zähne von Elephanten, Mastodonten, Rhinoceros'n und'einem Tapire. Vorgelesen am 10. Januar. 1818. von Samuel Thomas von Soemmerring. Tab. 1. 2.

M. Schintz, M.D. in giving to the Helvetic Society of Natural Science (August 1827) an account of the remains of Mammifera discovered in the coal mines of the Canton of Zurich, mentions "two kinds of teeth of the narrow-toothed mastodon" among those remains; and that "In the coal mine of Elgg, which has been worked about forty years, and of which the gallery is about 300 fathoms long, there have been found fragments of another species of mastodon which does not correspond to any of those described by Cuvier, and which has only a distant resemblance in form to the great mastodon."—"The large teeth," it is stated, "have always three rows of tubercles, the small two." "—a jaw and some bones of an undetermined species of mastodon taken from a colliery near Buchberg" are also mentioned. See the Edinburgh New Philosophical Journal, conducted by Professor Jameson, for Sept. 1828, p. 273, et seq.

which the tooth of the mastodon is distinguished from that of the elephant, the crown of the tooth wears away more like the tooth of the elephant than that of the other mastodons; and when worn, exhibits a surface not unlike that presented by the worn tooth of an Asiatic elephant.

These observations will not, it is hoped, be deemed out of place; for many a link in the chain which the zoologist who confines himself to the study of living animals only seeks in vain, may be found in the relics of a former state of animal life.

I now proceed to a description of the species, and shall begin with the character of

Mastodon latidens.—M. dentibus molaribus latissimis, denticulis rotundatis, elevatis; palato valde angusto.

Dentition.—Each tooth of the lower jaw consists of seven denticules, which are elevated, rounded, and mammillated: the mammillæ being from three to four in number. The dentition both in this species and in M. elephantoides, very much resembles that of the elephant. We have the molar tooth gradually protruded forward, and rising as the fangs are added, according to the demand made by the abrasion of the exposed crown, and the consequent absorption of the anterior fang; the posterior part of the tooth not having cut the gum, while the anterior portion is completely worn away. The relics of the preceding tooth, the place of which the tooth in use was progressively supplying, are plainly to be seen *.

The exposed grinding surface is considerably larger than that of the molar tooth of any elephant which I have seen, especially in breadth; and the enamel of the tooth is not so thick as it is in M. giganteum. And here we cannot fail to be struck with the similarity which the worn surface bears to the worn surface of an elephant's tooth.—The denticules are less elevated than those of other mastodons, and the whole form indicates an approach to the structure of the teeth of the elephant. The lower jaw too, in this species, is deeper and less angular than it is in M. giganteum; and approaches in its contour to the form of the lower jaw of the elephant. But on examining the cranium we shall find still stronger indications of an approach to the elephant; for the palate is so very narrow when compared with the palate of M. giganteum, as to strike the most casual observer †.

The tusks, judging from the alveoli, must have been of equal volume with the tusks of the largest living elephant. The portions of fossil ivory, however,

* See Plate XXXVII. fig. 1. Plate XXXVIII. fig. 2.

† See Plate XXXVI. and Plate XXXVII. fig. 1.

found with these remains, do not appear to have belonged to the individual which furnishes this description *.

Among the teeth of mastodons in the British Museum there are two or three which bear a strong resemblance to those of M. latidens; particularly one large molar tooth in a portion of the lower jaw. The anterior denticules of the tooth are worn away in precisely the same manner, and the worn surfaces are incrusted with the same kind of mineral cement as that adhering to many of the specimens brought home by Mr. Crawfurd. Its locality is unknown; its extreme length is nine inches, breadth three inches and five eighths; and it is composed of five denticules and the spur.

The only other remains which can satisfactorily be identified as belonging to this species, are fragments of two femora, of a tibia, a scapula, and a pelvis. The circumference of the lower extremity of the right femur round the condyles is two feet four inches.

The habits of this animal must have borne a close relation to those of the elephant. The proboscis must have been an organ of equal power with that of the elephant, for collecting the food to be subjected to the action of the powerful grinders; and this food (judging from the general structure of the teeth, and the more compact jaw bone,) probably consisted of harder vegetable matters than those which the slighter structure of the elephant's jaw usually encounters.

The size of M. latidens appears to have equalled, if it did not surpass, that of the largest living elephant. A string passed round the lower jaw, over the anterior part of the grinder where it is worn, measured two feet four inches; while a string passed round the lower jaw of the largest Asiatic elephant in the museum of the College, at the same point, gave two feet three inches; and the cranium of this elephant has always been considered a very large one.

Mastodon elephantoides.—M. dentibus molaribus latis, denticulis numerosis, compressis.

This species must have been smaller than the last; and though we have one fine example of the lower jaw, showing the tooth in the highest degree of perfection, that is the only portion of the animal from which we can safely draw any inference as to its structure and habits. The tooth, which is eleven inches long and three inches and a half broad, has no less than ten denticules, and each of these denticules is mammillated with small points; five being the smallest number, and eight the greatest on any one denticule. In front of this beautiful tooth we have a remnant of the preceding one, nearly worn down

* See Plate XXXIX. fig. 4.

and disappearing; and behind it, we have the cavity in which the young tooth which was intended as a successor to that in existence, must have been in the course of formation *.

The denticules of the tooth are much more compressed than those in the species last described; they are closer together †, and the enamel appears to be not so thick. They form a series of plates mucronated with small points. There is no apparent commissure, neither is there any central depression: on the contrary, the plates rather rise in the middle.

This tooth approaches still more nearly to that of the elephant, and the contour of the jaw is in unison with the appearance of the tooth. Perhaps we should not be far from the truth, if we were to conclude that the species to which this tooth belonged, formed the passage from the Mastodon to the Elephant. It is not impossible, however, that there may yet be a link wanting, which might be supplied by an animal having a tooth composed of a greater number of denticules, increasing in depth, and having the rudiments of crusta petrosa,—that necessary ingredient in the tooth of the elephant,—(for it is the animal mortar, as it were, by which the plates or denticules are cemented together)—the entire absence of which, distinguishes the tooth of the mastodon.

The habits of this species must have been nearly allied to those of the last. —But we must now leave this more interesting part of our subject, to consider the more common forms of the order now before us.

In this group we have remains of the genera Hippopotamus, Sus, Rhinoceros, and Tapir.

Hippopotamus.—Of this genus there are but few fragments, nor are they sufficiently characteristic to enable us to pronounce on the species, though there is no doubt as to the genus. The animal to which these remains belonged, must have been smaller than the recent species ‡.

Sus.—Of this genus there is only a single specimen, consisting of a small portion of the lower jaw, containing one molar tooth and the fragment of another. This species could not have been large §.

Rhinoceros.—Of this genus, we have, among other remains, a small portion of the upper jaw, containing two molar teeth; the remnant of the jaw is only just sufficient to hold the teeth together. There is likewise a single

* See Plate XXXVIII. fig. 2.

† Eight denticules of M. elephantoides occupy the same space as five denticules of M. latidens.

‡ See Plate XL. fig. 3. 4; and Plate XLI. fig. 19. 20. § See Plate XL. fig. 5.

molar tooth from the upper jaw: and there are also portions of the lower jaw containing molares, which seem to approach nearer to the rhinoceros of Java than to those of any other recent species *.

Tapir.—A fragment of the lower jaw, consisting of the symphysis, is the only remnant which can be safely attributed to this genus †.

RUMINANTIA.

The only fragments of ruminating animals in the collection, which can, in my opinion, be safely identified, are the portion of a lower jaw, and two or three separate molar teeth. They apparently belonged to an ox of ordinary size. There are other fragments, which are not sufficiently large and definite to warrant me in pronouncing upon the genera to which they belonged. There are teeth, fragments of cylindrical bones, and the bony cores of horns. The former may have appertained to a species of deer, and the latter have certainly the form of those of antelopes ‡.

Class *REPTILIA.*

CHELONIA.

Trionyx.—Both in the old and new world we have living specimens of this genus. In the rivers of South Carolina, Georgia, Florida, and Guiana, the Trionyx ferox lies in wait for birds and reptiles. It is called in some of the places where it abounds, the Duck-killer, from the ravages which it makes among those birds; while in others it is named the Alligator-turtle, from its predacious habits.

In Egypt, the Trionyx Ægyptiacus, which is about three feet in length, destroys multitudes of the brood of the crocodile at the moment of their birth.

But the largest recent species is said to be the Trionyx Javanicus. Individuals of a very large species, supposed to weigh between two and three hundred pounds, are said to have been seen in the Jumna and the Ganges.

No fossil trionyx has yet, it is believed, been found in North America; but the remains of a fossil species occur in abundance in the Hastings-sand and other localities in England, and in the Paris basin; and some are said to have been found in the diluvium of the South of France, accompanied by the remains of large tapirs. Fragments of trionyx in a fossil state are also found in other parts of Asia besides Ava.

The specimens from Ava leave no doubt as to the genus, but are not suffi-

* See Plate XL. fig. 1. 2; and Pl. XLI. fig. 16. 17. 18. 26, for other bones of this animal.

† See Plate XXXIX. fig. 5. and 5*.

‡ See Plate XL. fig. 6. 7. 8; and Plate XLI. fig. 27. to 33, and 21. to 25.

ciently defined to enable us to characterize the different species, which however must have been very large, and appear to have been not less than three.

Emys.—There are some fragments of a species, apparently of this genus. One, which is part of the sternum, indicates an animal of enormous size*.

SAURIA.

Fam. Crocodilidæ.

Of this family we have the remains of two genera; a Leptorhynchus, allied to, if not identical with, the great gavial (Lacerta Gangetica *Gm.*), and a crocodile resembling Crocodilus vulgaris. Of the former we have portions of the lower jaw, and several vertebræ. Of the latter we have vertebræ, and the anterior termination of the lower jaw, which must have belonged to a very large individual†.

It is worthy of remark, that most of the bones do not appear to have undergone any mineral change, with the exception of being abundantly penetrated with hydrate of iron, and that they are very brittle. This last circumstance, arising from the loss of their animal gluten, indicates that they are of great antiquity, and that they have not been imbedded in any very compact soil.

The teeth of the mastodon from the banks of the Ohio, which lie in a strong blue clay, have almost as much animal matter as we should expect to find in a recent tooth.

The bones which form the subject of this memoir are almost in every instance fractured; and the fracture,—from its direction and cleanness, the sharpness of its edges, and the firm texture of some of the bones,—appears to have been produced by a very great power operating with sudden violence.

It may not be deemed irrelevant, in closing this imperfect catalogue, to observe, that the remains before us indicate the existence of animals which could only have found subsistence in vast forests or widely extended plains, —in marshes, or deep and broad rivers. But the writer of this memoir feels it necessary only to advert to this subject, leaving the state of the globe at the time of their existence, and the period and cause of their destruction, to be discussed by those who are more competent to pursue so interesting an inquiry.

* Plate XLII. See the recent species of these genera described by Geoffroy, Ann. du Museum, tom. xiv. p.11—20; and their habits by Cuvier, Règne Animal, tom. ii. p. 10. 15. For the fossil species, see Cuvier, Ossem. Foss. tom. iii. p. 329; and tom. v. p. 322. † See Plate XLIII.

EXPLANATION OF THE PLATES.

PLATES XXXVI. XXXVII. XXXVIII. XXXIX. XL. XLI. XLII. XLIII. XLIV.

Illustrate Mr. Clift's paper on the Fossil Remains of two new species of Mastodon and of other Vertebrated animals, found on the left bank of the Irawadi: and Professor Buckland's Geological Account of the Animal and Vegetable Remains there found.

Plate XXXVI.

Upper jaw of Mastodon latidens (adult), showing the palate and anterior molar teeth *in situ*. Parts of the broken posterior molar teeth are seen below the anterior molar teeth on either side. The plate is on the scale of half an inch to an inch.

Measurement.	Ft.	In.
Extreme length of the portion of skull	1	8
Extreme breadth of the same	1	3
Circumference of the alveolar cavity of the tusk, calculated from the remains of the cavity	1	6
Extreme length of right anterior grinder (six denticuli and the spur)	0	$8\frac{1}{4}$
Extreme breadth (at the third denticulus)	0	4
Breadth of the palate (about the middle)	0	$2\frac{6}{8}$

Plate XXXVII.

Fig. 1. The palate, and molar teeth of the right side of Mastodon latidens (a younger animal than the last). The anterior tooth is very much worn. The anterior part of the posterior tooth appears to have been just brought into use. This figure is of the natural size.

Figs. 2 to 4. Fragments of molar teeth of Mastodon latidens, showing the surfaces according to the effects of mastication; on a scale of half an inch to an inch.

Plate XXXVIII.

Fig. 1. Fragment of the anterior part of the right side of the lower jaw of Mastodon latidens seen from above. A string passed round this fragment, over the anterior part of the grinder where it is worn, measured two feet four inches. Extreme length of the tooth eleven inches and three quarters. Extreme breadth four inches and a half.

Fig. 2. Left side of the lower jaw of Mastodon elephantoides. The remains of the anterior molar tooth are seen, and behind it, the posterior tooth which was advancing, and which, in consequence of the jaw-bone being broken away, is seen

through its whole length. This tooth is eleven inches long and three and a half broad. These two figures are on a scale of half an inch to an inch *.

Plate XXXIX.

Fig. 1. Molar milk-tooth of a Mastodon, seen from beneath.

Fig. 2. The same seen from above.

Fig. 3. A side view of the same.

Fig. 4. Part of the tusk of a Mastodon fractured transversely, showing its intersected appearance like the engine-turning of a watch-case.

Fig. 5. Symphysis of the lower jaw of a small Tapir.

Fig. 5*. End of the same, showing fragments of incisors.

Fig. 6. Upper molar tooth of Mastodon elephantoides.

All these figures are of the natural size.

* It may not be uninteresting to give the measurement of the molar teeth of some recent and fossil Elephants in the Museum of the College of Surgeons by way of comparison.

Recent.

	Ft.	In.
African elephant. Longest grinding surface (lower jaw)	0	9
Breadth of the same	0	3
Asiatic (an old animal). Longest grinding surface (upper jaw)	0	7½
Breadth	0	3½
Lower jaw. Length	0	8
Breadth	0	3½
Another Asiatic (Mooknah). Length (upper jaw)	0	8¼
Breadth	0	3½
Compass of one side of lower jaw of the same	2	3¼
Compass of one side of lower jaw of another large elephant (Dauntelah)	1	9½

Fossil.

Grinding surface of fossil elephant's tooth (Bridport). Length	0	8
Breadth	0	3½
Another, formerly in the Museum of Parkinson. Length	0	9
Breadth	0	2⅝
One from Ohio. Length	0	8
Breadth	0	3½
One from Siberia. Length	0	8
Breadth	0	3½

EXPLANATION OF THE PLATES.

Plate XL.

Fig. 1. Two molar teeth of the upper jaw of a Rhinoceros.

Fig. 2. Fragment of the lower jaw of the same animal (about the centre). Three molar teeth are shown much worn.

Fig. 3. Inside view of the posterior part of the left side of the lower jaw of a Hippopotamus.

Fig. 4. Molar teeth of the same, broken on the outside edge, seen from above.

Fig. 5. Fragment of the lower jaw of a Hog.

Figs. 6 & 7. Molar teeth of an Ox.

Fig. 8. Molar teeth of a Deer?

All these figures are of the natural size.

Plate XLI.

Fig. 1. Lower extremity of right femur of Mastodon latidens?

	Ft.	In.
Circumference above the condyles	2	2
Circumference round the condyles	2	4
Length of the fragment	1	2

Fig. 2. Lower extremity of left femur of M. elephantoides?

Fig. 3. Condyles of the knee-joint of the same.

Fig. 4. A corresponding view of fig. 1.

Fig. 5. Upper extremity of tibia of M. latidens?

Fig. 6. Articulating surface of the same.

Fig. 7. Upper extremity of right tibia of M. elephantoides?

Fig. 8. Articulating surface of the same.

Fig. 9. Lower extremity of tibia of M. elephantoides?

Fig. 10. Articulating surface of the same.

Fig. 11. Lower extremity of fibula of Mastodon.

Fig. 12. Fragment of scapula of Mastodon latidens? showing part of the external surface.

Fig. 13. External surface of patella of Mastodon.

Fig. 14. Internal surface of the same.

Fig. 15. Lower extremity of a metatarsal or metacarpal bone of Mastodon.

Fig. 16. External surface of patella of Rhinoceros.

Fig. 17. Internal surface of the same.

Fig. 18. Upper extremity of tibia of Rhinoceros.

Figs. 19 & 20. Anterior extremity of the lower jaw of Hippopotamus (a young animal)

Figs. 21, 22, & 23. Lateral view and transverse section of the core of the horn of a large Antelope.

Figs. 24 & 25. Lateral view and transverse section of the core of the horn of a smaller animal of the same genus.

Fig. 26. Lower extremity of femur (articulating surface), Rhinoceros.

The following figures all represent the bones of Ruminants.

Fig. 27. Lower extremity of femur (articulating surface), Ox ?

Fig. 28. Lower extremity of femur (articulating surface), Ox ?

Fig. 29. Lower extremity of femur, articulating surface.

Figs. 30 & 31. Upper extremities of tibiæ.

Figs. 32 & 33. Portions of scapula, the base of the bone.—The figures in this plate are reduced one-fifth.

Plate XLII.

Represents remains of the genera Emys and Trionyx.

Figs. 1 & 2. Posterior portion of the right side of the lower jaw—Trionyx ?

Fig. 3. Internal view of a fragment of the back of a Trionyx.

Fig. 4. External view of the same.

Fig. 5. Internal view of the anterior portion of the sternum—Emys ?

Fig. 6. External view of the same.

Fig. 7. External view of a portion of the back of a Trionyx.

Fig. 8. Internal view of the same, showing the rib.

Fig. 9. External view of a portion of the back of a Trionyx.

Fig. 10. Internal view of the same.

Fig. 11. External view of a portion of the back of a Trionyx.

Fig. 12. Internal view of the same.

Fig. 13. Part of sternum of an Emys.

Figs. 14 & 15. Part of scapula of an Emys ?

Fig. 16. Part of scapula of an Emys ?

Of the bones here figured, those represented by figs. 5, 6, 14, 15, 16 have characters which justify the supposition that they belonged to the genus Emys ; but the mutilated state of the specimens prevents a satisfactory conclusion on

this point. Those represented by figs. 5, 6, 16 probably belonged to the same animal, which must have been of gigantic size.

The bones represented by figs. 3, 4, 7, 8, 11, 12 evidently belonged to at least three distinct species of Trionyx. Figs. 3, 4, 7, 8 represent portions which probably belonged to the same species. In the specimen represented at fig. 11, the rugosities are unusually prominent, and distributed with very little regularity.

Plate XLIII.

Represents the remains of Crocodilidæ.

Fig. 1. Occiput of a Crocodile.

Fig. 2. Anterior part of the lower jaw of a Crocodile.

Fig. 3. Anterior part of the right side of the lower jaw of a Crocodile.

Fig. 4. Symphysis of the lower jaw of a Leptorhynchus.

Fig. 5. Portion of the lower jaw of a Leptorhynchus.

Fig. 6. Articulation of the right side of the lower jaw of a Crocodile.

Fig. 7. Articulation of the right side of the lower jaw of a Crocodile.

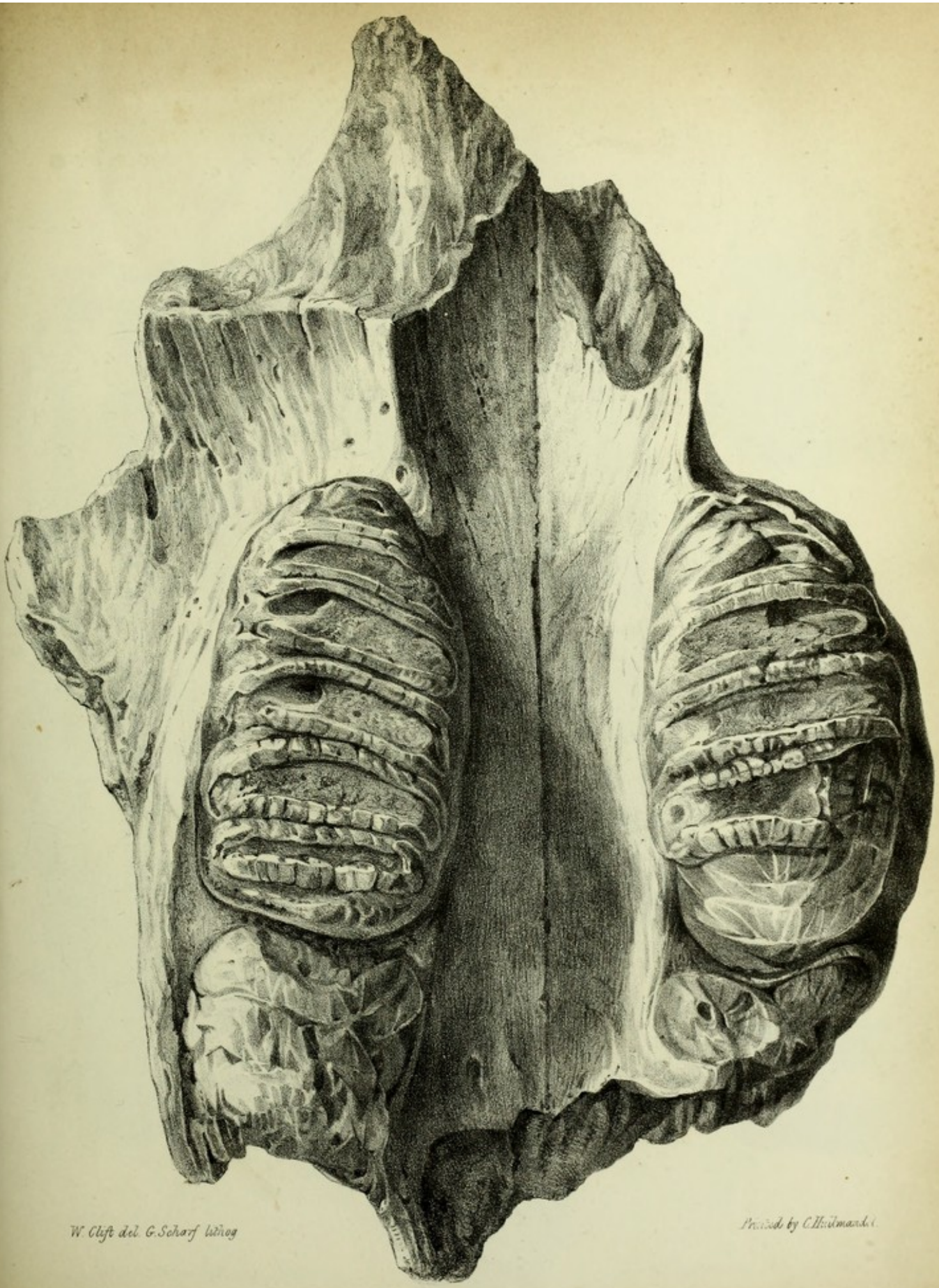
Fig. 8. Osseous plate of a Crocodile, corresponding in character with those from the side of the neck in the recent Alligator. This must have belonged to an animal of enormous size.

Figs. 9, 10 & 11. Dorsal vertebræ of a Crocodile.

Fig. 12. Lower extremity of femur of a Crocodile :—from a very large animal.

PLATE XLIV.

Is a Map of that part of the Burman Empire where the remains described in the papers of Dr. Buckland and Mr. Clift, and, for the most part, figured in the foregoing plates,—were found.

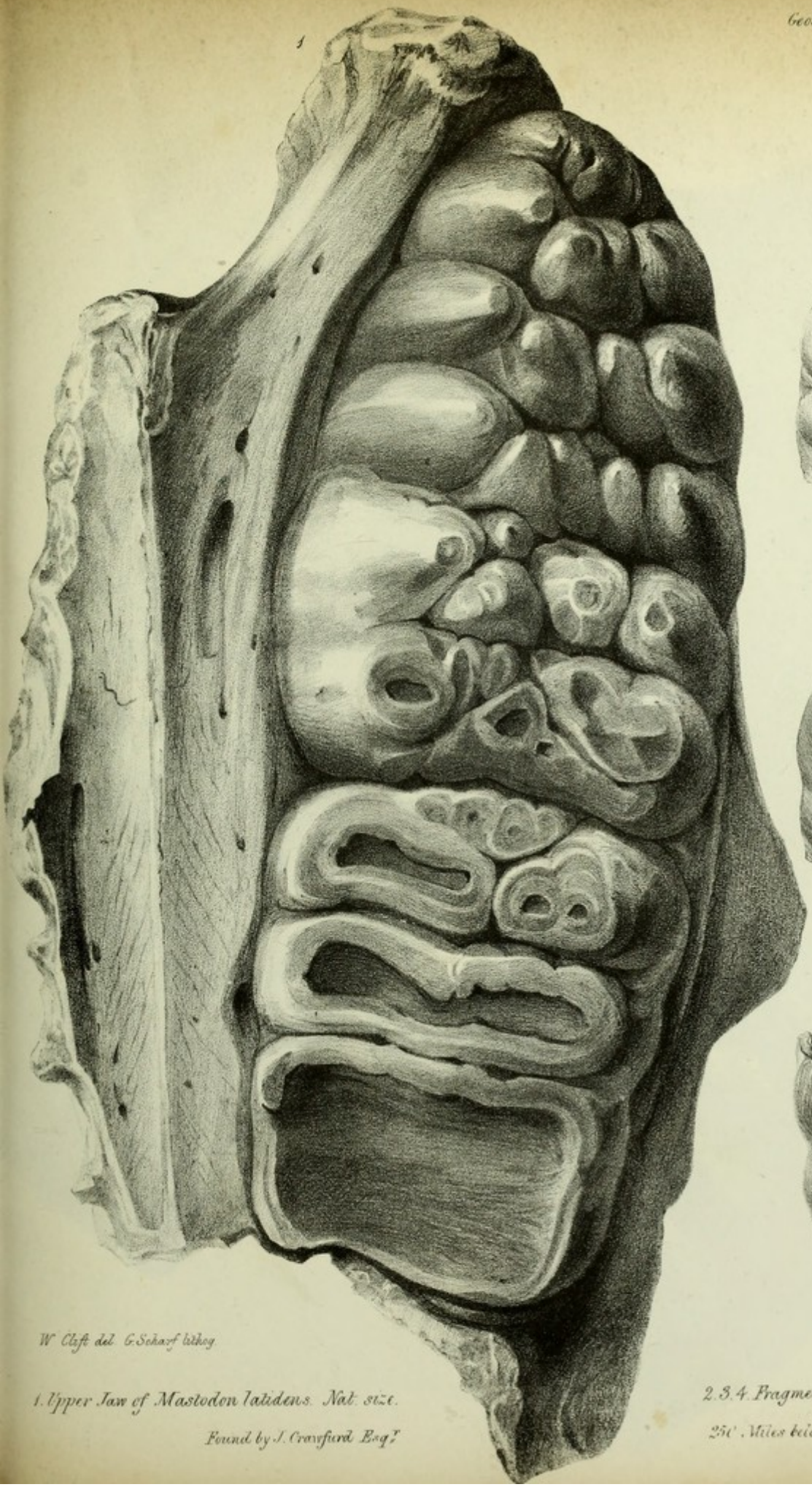


W. Clift del. G. Scharf lithog

Printed by C. Hullmandel

Upper Jaw of Mastodon latidens, found by J. Crawfurd Esq.r 250 Miles below Ava.

½ the Natural Size.



W. Clift del. G. Scharf lithog.

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1. Upper Jaw of Mastodon latidens. Nat. size.

Found by J. Crawfurd Esq.r

2. 3. 4. Fragments of Teeth of Mastodon latidens. ½ Nat. size.

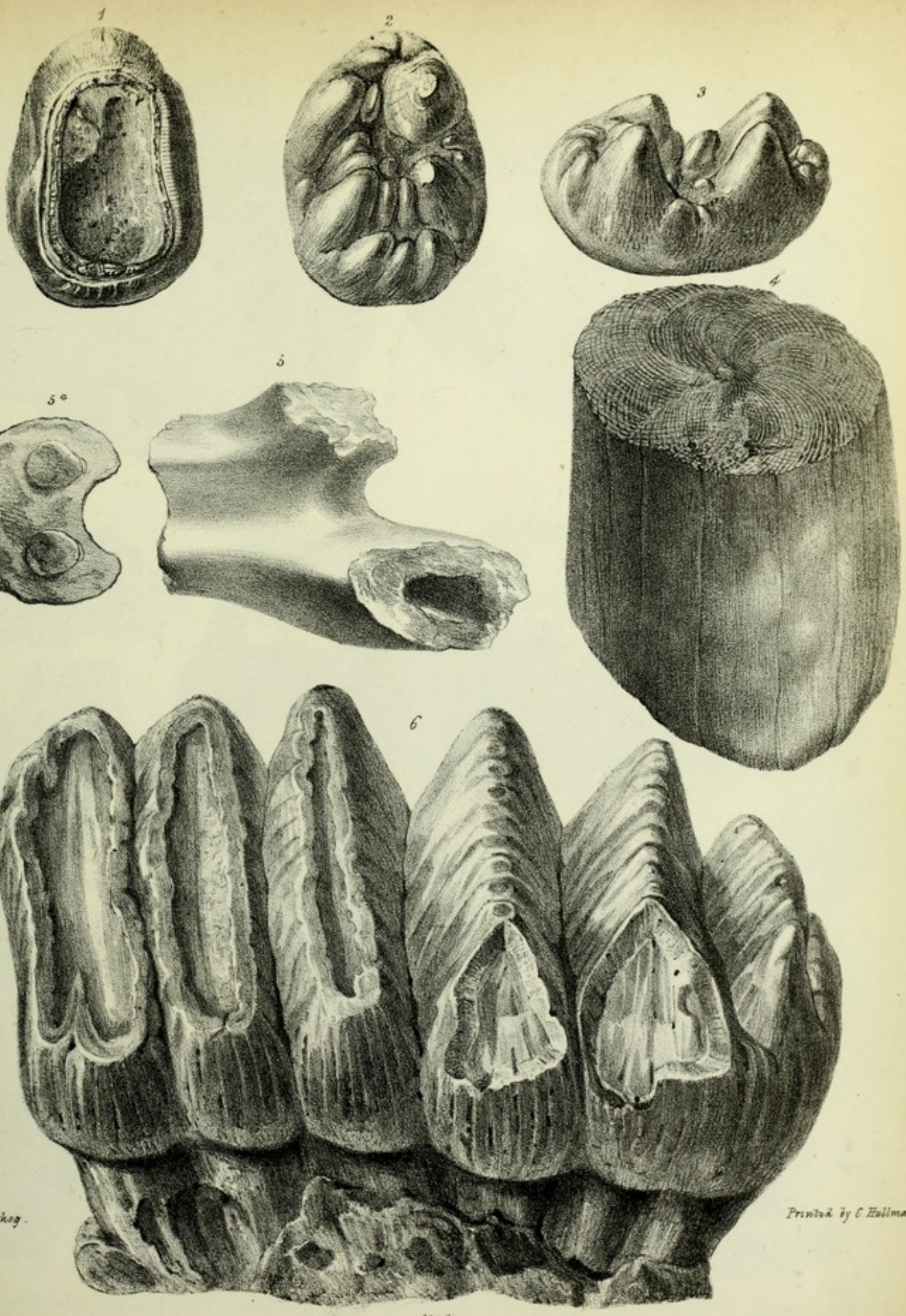
250 Miles below Ava.

R. Hyatt del. G. Scharf lithog.

Printed by C. Hullmandel.

1. Right Lower Jaw, Mastodon latidens. 2. Left Lower Jaw, Mastodon Elephantoides. ½ Nat. size.

Found by J. Crawfurd Esq.r 250 Miles below Ava.



Clift del. G. Scharf lithog.

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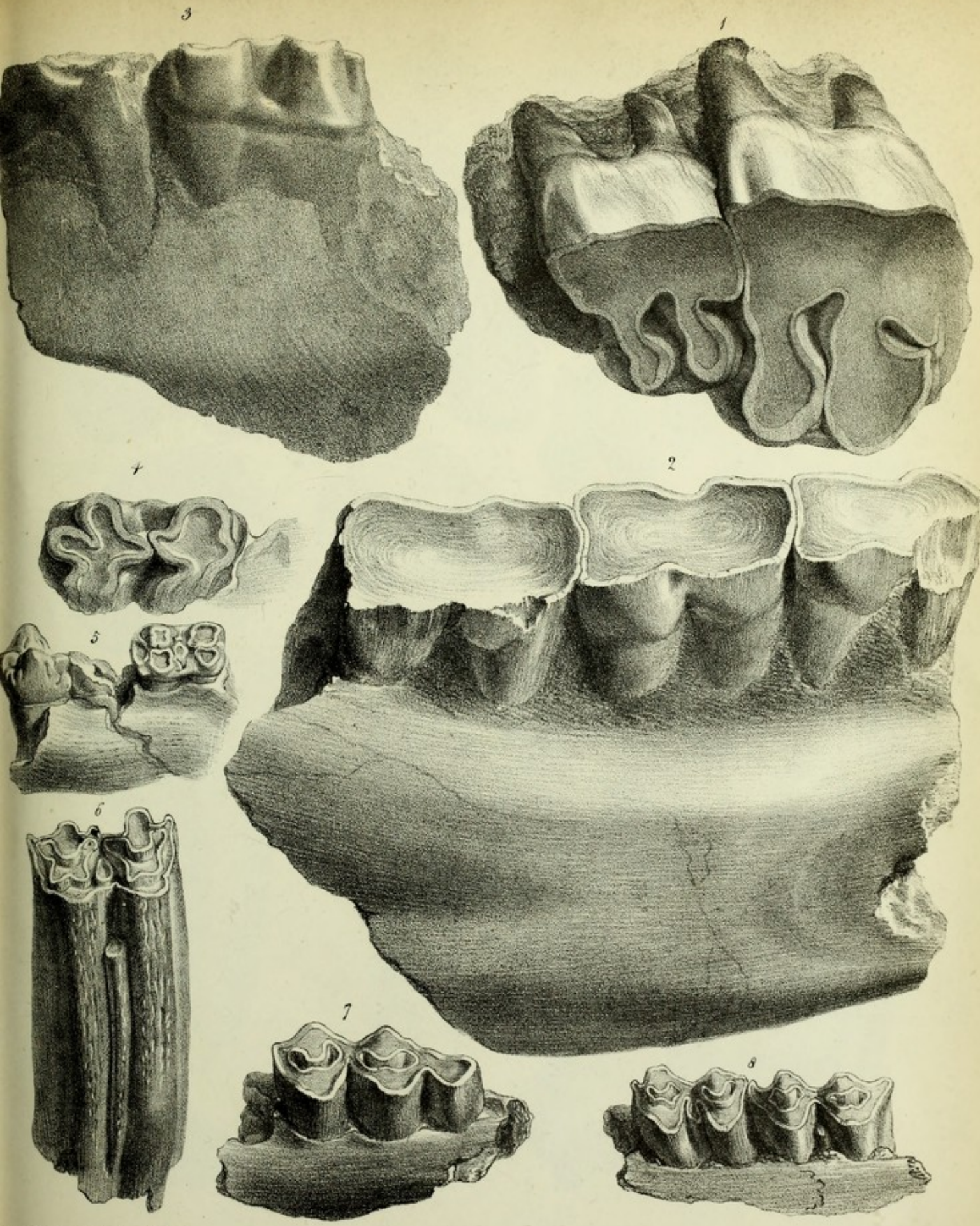
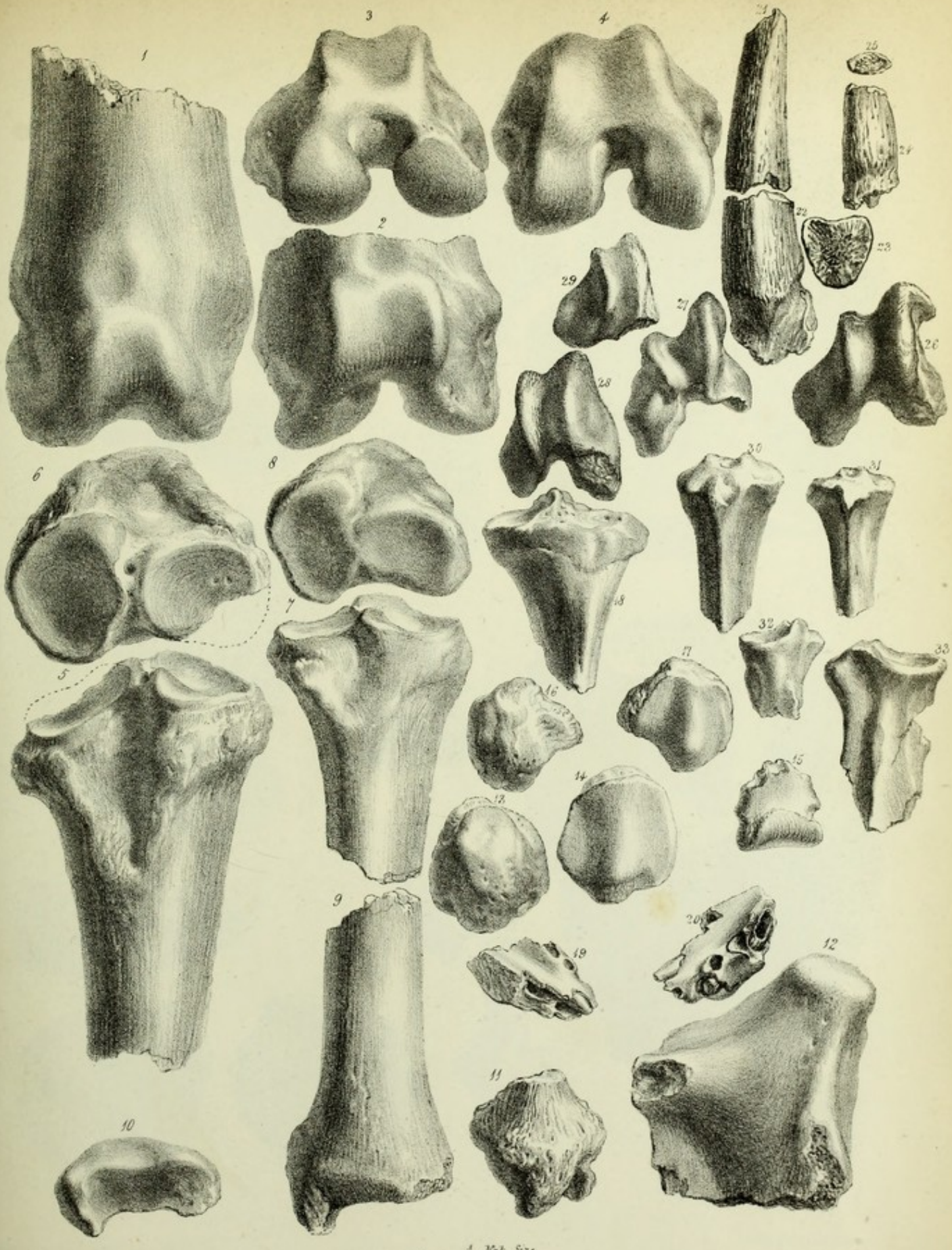
Vol. Sec.

1.2.3. Milk Tooth of Mastodon. 4. Tusk of Mastodon. 5. Lower Jaw of Tapir. 5* Front view of the same. 6. Upper molar of M. Elephantoides.
Found by J. Crawfurd Esq.r 250 Miles below Ava.



Lithographed from Nature by G. Scharf. Nat. Size Printed by C. Hullmandel.

1 Upper Jaw of Rhinoceros. 2. Part of under Jaw of the same. 3. Under Jaw of Hippopotamus. 4. Tooth of ditto. 5. Jaw of Hog.
6. 7. Molar Teeth of Ox. 8. Molares of Deer. Found by J. Crawfurd Esq.r 250 Miles below Ava.

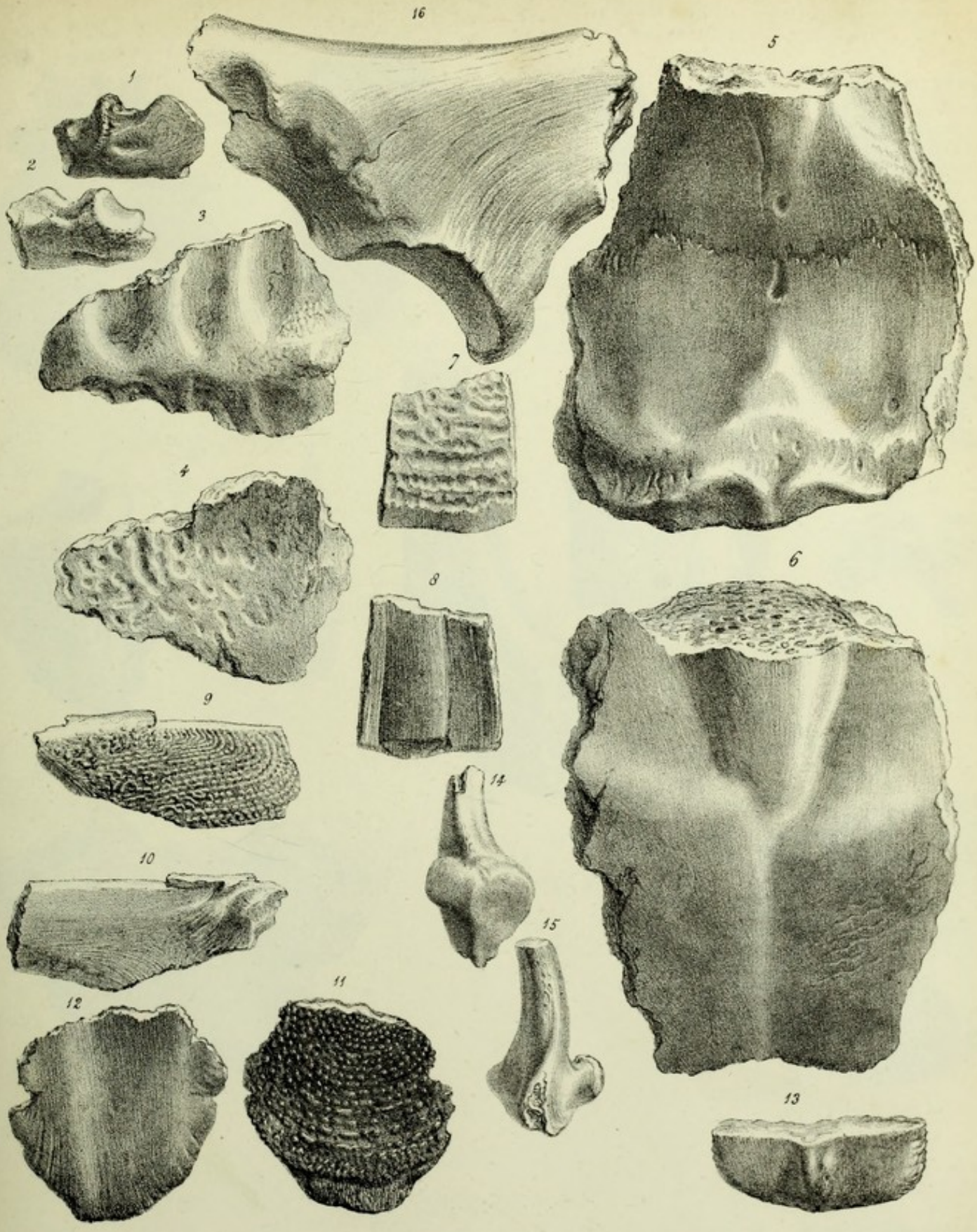


1/3 Nat. Size

Lithographed from Nature by G. Scharf.

Printed by C. Hullmandel.

1 to 15. Bones of Mastodon latidens & Mastodon Elephantoides. 16 17. 18. 26. Bones of Rhinoceros.
19. 20. Jaw of Hippopotamus. 21 to 25. Horns of Antelopes. 27 to 33. Bones of Ruminantia.

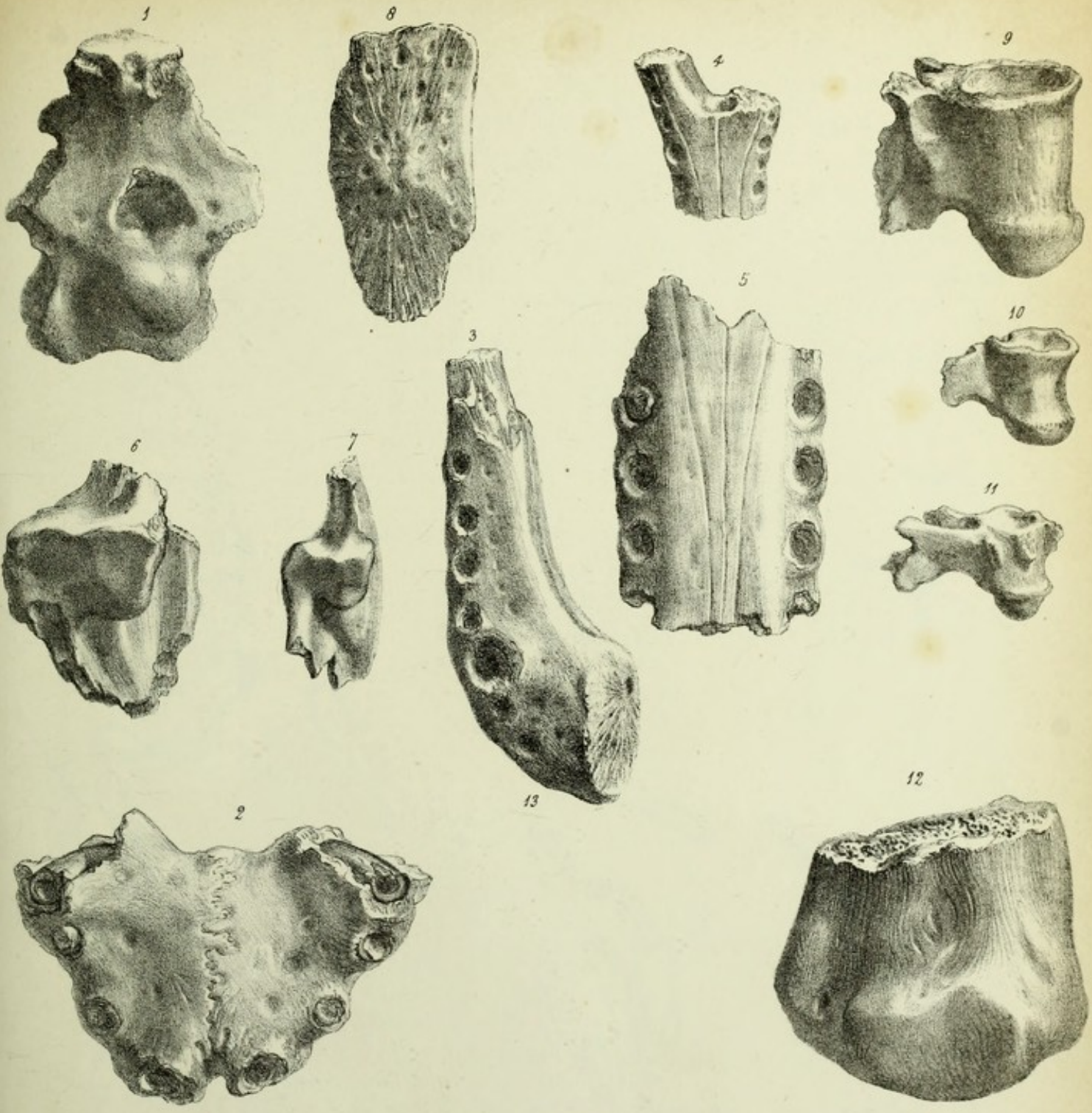


Lithographed from Nature by G. Scharf.

Printed by C. Hullmandel.

Remains of Emys & Trionyx found by J. Crawfurd Esq.r 250 Miles below Ava.

½ Natural Size

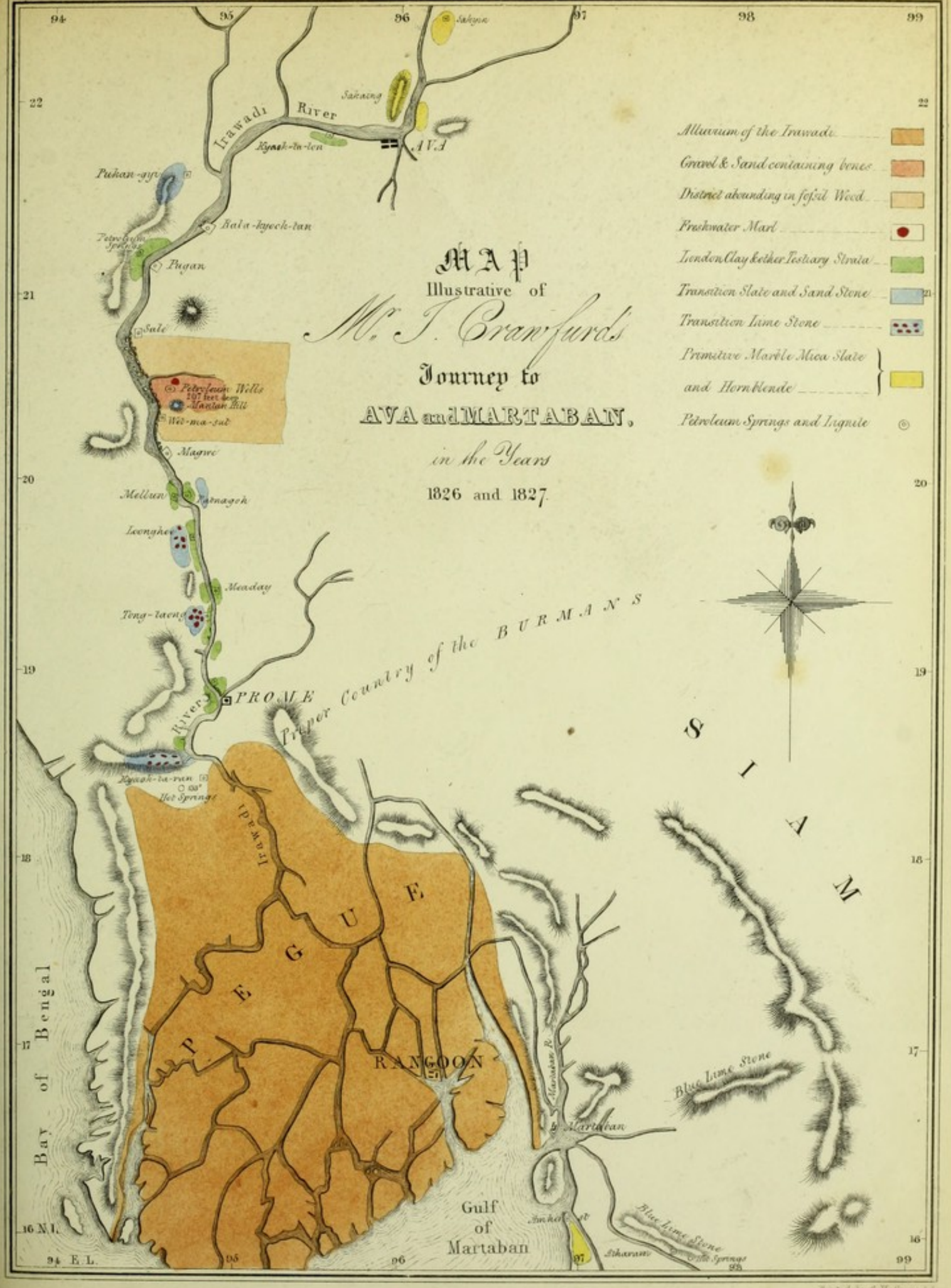


Lithographed from Nature by C. Scharf

Printed by C. Hullmandel

Remains of Crocodiles, found by J. Crawfurd Esq.r 250 miles below Ava.

½ the Natural Size.


MAP
Illustrative of
M.r T. Crawfurd's
Journey to
AVA and MARTABAN,
in the Years
1826 and 1827.
Alluvium of the Irawadi
Gravel & Sand containing bones
District abounding in fossil Wood
Freshwater Marl
London Clay & other Tertiary Strata
Transition Slate and Sand Stone
Transition Lime Stone
Primitive Marble Mica Slate and Hornblende
Petroleum Springs and Lignite
Irawadi River
Sakaing
AVA
Kyauk-ta-lon
Pahan-gyi
Bala-kyeck-tan
Petroleum Springs
Pugan
Salé
Petroleum Wells
207 feet deep
Mantan Hill
Wet-ma-gut
Magwe
Mellun
Yanagek
Leonghee
Meaday
Teng-tacng
PROME
River
Kyauk-ta-ran
Hot Springs
Irawadi
Upper Country of the BURMANS
SIAM
PEGU
RANGOON
Bay of Bengal
Martaban R.
Blue Lime Stone
Martaban
Gulf of Martaban
Amherst
Blue Lime Stone
Sitaroun
Hot Springs
94
95
96
97
98
99
22
21
20
19
18
17
16 N.L.
94 E.L.