XXI.—*Notice on the Megalosaurus or great Fossil Lizard of Stonesfield.*

By the Rev. WILLIAM BUCKLAND, F.R.S. F.L.S.

PRESIDENT OF THE GEOLOGICAL SOCIETY, AND PROFESSOR OF MINERALOGY AND GEOLOGY IN THE UNIVERSITY OF OXFORD, ETC.

[Read February 20th, 1824.]

I AM induced to lay before the Geological Society the annexed representations of parts of the skeleton of an enormous fossil animal, found at Stonesfield near Woodstock, about twelve miles to the N. W. of Oxford; in the hope that, imperfect as are the present materials, their communication to the public may induce those who possess other parts of the same reptile, to transmit to the Society such further information as may lead to a more complete elucidation of its osteology.

The specimens here engraved are all preserved in the Oxford Museum. Nothing approaching to an entire skeleton has yet been found, nor have any two bones been discovered in actual apposition, excepting the vertebræ engraved at Pl. XLII., and a similar series of equal magnitude presented to the Geological Society by Henry Warburton, Esq.

The detached bones here represented must have belonged to several individuals of various ages and sizes; there are others in the Oxford Museum which are derived from a very young animal; in the same stratum with them there occur also fragments of large bones, of similar structure, which have been rolled to the state of pebbles. Although the known parts of the skeleton are at present very limited, they are yet sufficient to determine the place of the animal in the zoological system. Whilst the vertebral column and extremities much resemble those of quadrupeds, the teeth show the creature to have been oviparous, and to have belonged to the order of Saurians or Lizards. The largest thigh-bone of this animal in the Museum at Oxford is two feet nine inches long, and nearly ten inches in circumference at its central or smallest part. [See Pl. XLIV. fig. 1 and 2.] From these dimensions as compared with the ordinary standard of the lizard family, a length exceeding 40 feet and a bulk equal to that of an elephant seven

feet high have been assigned by Cuvier to the individual to which this bone belonged; and although we cannot safely attribute exactly the same proportions to recent and extinct species, yet we may with certainty ascribe to it a magnitude very far exceeding that of any living lacerta. Large as are the proportions of this individual, they fall very short of those which we cannot but deduce from a thigh-bone of another of the same species, which has been discovered in the ferruginous sandstone of Tilgate Forest near Cuckfield, in Sussex, and is preserved in the valuable collection of Gideon Mantell, Esq. of Lewes, together with many other bones belonging to the same species, and of the same size with those from Stonesfield.

*The femur in question, which has lost its head and lower extremity, measures in its smallest part, at the distance of two feet from the upper extremity, more than twenty inches in circumference, and therefore, when entire, must have equalled in magnitude the femur of the largest living elephant.

To judge from the dimensions of this thigh-bone, its former possessor must have been twice as great as that to which the similar bone in the Oxford Museum belonged; and if the total length and height of animals were in proportion to the linear dimensions of their extremities, the beast in question would have equalled in height our largest elephants, and in length fallen but little short of the largest whales; but as the longitudinal growth of animals is not in so high a ratio, after making some deduction, we may calculate the length of this reptile from Cuckfield at from sixty to seventy feet. In consideration therefore of the enormous magnitude which this saurian attains, I have ventured, in concurrence with my friend and fellow-labourer, the Rev. W. Conybeare, to assign to it the name of *Megalosaurus*.

The other animals that are found at Stonesfield are not less extraordinary than the megalosaurus itself. Among the most remarkable are two portions of the jaw of the didelphys or opossum, being of the size of a small kangaroo rat; and belonging to a family which now exists chiefly in America, Southern Asia, and New Holland. I refer the fossil in question to this family on the authority of M. Cuvier, who has examined it; and without the highest sanction, I should have hesitated to announce such a fact, as it forms a case hitherto unique in the discoveries of geology; viz. that of the remains of a land quadruped being found in a formation subjacent to chalk.

* Mr. Mantell in his Geology of Sussex, p. 53, speaking of this bone and others in his collection, says, "Some fragments of a cylindrical bone, probably the femur, indicate an animal of gigantic magnitude. I have specimens from ten to twenty-seven inches long, and from eleven to twenty-five inches in circumference, the substance of the bone being more than two inches thick. Some examples have large *foramina* for the passage of blood vessels."

The bones of long-legged birds, apparently allied to the order Grallæ, which frequent the shores and shallow fords of seas or lakes, are found also imbedded in the same stratum, and afford, I believe, the most ancient example yet discovered of the occurrence of fossil birds, which, like the terrestrial quadrupeds, have hitherto (with one exception mentioned in the sequel) been noticed only in strata above the chalk.

The elytrons also (or exterior sheath of the wings) of more than one species of beetle occur in the same slate, and, excepting in this instance and in the shale of the Danby coal-pits of the oolite formation in Yorkshire, (see page 2 of Contents of the Geological Survey of the eastern Part of Yorkshire, by Messrs. Bird and Young,) have not hitherto been discovered, I believe, in any stratum below the chalk.

The megalosaurus itself was probably an amphibious animal, and we might therefore expect (as is actually the case) to find it associated with the remains of other amphibia, e. g. the scales and teeth of crocodiles and scales of tortoises. There are also teeth which appear to belong to the plesiosaurus.

The remains of land animals and amphibia are small in number, however, in comparison of the marine exuviæ with which this stratum is crowded; besides an immense number of species of shells decidedly marine, e. g. nautili, ammonites, trigoniæ, and belemnites, there occur abundantly the teeth of sharks, and the teeth, palates, scales, spines, and bones of many unknown species of fish, together with the remains of two or three species of small crustaceous animals of the crab and lobster kind. In the nearly adjacent quarries of cornbrash limestone, at a place called Gibraltar, near Enslow Bridge on the east of Woodstock, the bones of large cetaceous animals are accompanied by the scales, teeth, and bones of a species of crocodile nearly resembling the modern gavial or crocodile of the Ganges, and by numerous marine shells. This cornbrash is the same with that which at Stonesfield is immediately incumbent on the bed that is worked for slate.

Of the vegetable kingdom also, the remains which occur at Stonesfield are very numerous, and present a no less curious assemblage of genera than the animals. We find an abundance of plants decidedly terrestrial, e. g. fragments of trees and ferns; several species of seeds and fruits; and branches and leaves which nearly resemble the Thuia and the ginger plant of modern botany. There are others, apparently lacustrine or fluviatile, e. g. gigantic reeds and grasses; and others again decidedly marine, e. g. algæ, fuci, &c. All these vegetable fragments are dispersed in the same irregular manner, and are mixed up with the wreck of the marine, amphibious, and terrestrial animals above enumerated.

The whole of these remains are found in a bed of calcareous, sandy slate, the greatest thickness of which does not exceed 6 feet, and which lies in the upper part of the third, or lowest division of the oolitic rocks; being nearly connected with the forest marble, and interposed between the superstratum of cornbrash and substratum of the great oolite of Bath. Its place among the continental equivalent formations, is between the central and lowest strata of the Jura limestone.

In working the quarries at Stonesfield, they descend by vertical shafts through a solid rock of cornbrash and stratified clay, more than 40 feet thick, to the slaty stratum containing these remains: it is important to notice this circumstance, because it has been supposed by many persons who have never visited the quarries, that the remains are lodged either in fissures and cavities, or in a superficial and merely local deposit. This is decidedly not the case. They are absolutely imbedded in a deeply-situated regular stratum of the rock itself, which is known to extend across England, from Coly-Weston near Stamford in Lincolnshire, to Hinton near Bath, and is in many places extensively quarried for coarse oolitic slate used for covering houses. Many of these quarries abound in marine and vegetable remains; but the megalosaurus, opossum, birds, and coleopterous insects, have, I believe, as yet been observed in it only at Stonesfield.

Mr. Mantell possesses, in his rich and highly valuable collection at Lewes, a small vertebra of megalosaurus, which he purchased in London, having a label on it denoting that it came from Bath; its matrix appears to be the Bath oolite. In the Oxford Museum there is a rib of this animal, labelled Stonesfield, and imbedded also in a mass of Bath oolite or cornbrash. The cornbrash and Bath oolite are the beds, the former immediately above, the latter immediately below, the Stonesfield slate. As the megalosaurus occurs also in the ferruginous sand of Tilgate Forest, it is clear that the range of this animal extends downwards from this formation to the Bath oolite, and it is probable that its bones will hereafter be found in all the intermediate formations. It has never yet been noticed in chalk. It is totally distinct from the gigantic monitor of Maestricht, of which Mr. Mantell has also discovered some vertebræ in the chalk near Lewes, and at Steyning, being, I believe, the only traces of this animal yet noticed in England.

It appears from the collection of Mr. Mantell, that the bones of megalosaurus are not less abundant in the ferruginous sand near Cuckfield in Sussex, than they are in the oolitic slate near Oxford. He has numerous bones of many individuals of various sizes and ages; most of them broken, and some rolled, as at Stonesfield, to the state of pebbles. He has also many small teeth of this animal.

In the same quarries at Cuckfield, he has discovered also the remains of birds, being, with the exception of Stonesfield, the only instance of the kind that I know of in strata beneath the chalk.

He has also established many other remarkable analogies between the animal remains of the Tilgate Forest beds, and those of Stonesfield, which may be most briefly stated in the subjoined tabular form :

Fossil Remains of Stonefield Slate.	Fossil Remains of Iron Sand of Tilgate Forest.
Birds.	Birds.
Megalosaurus.	Megalosaurus.
Plesiosaurus.	Plesiosaurus.
Crocodile scales, teeth, and bones.	Crocodile scales, teeth, and bones.
Whale, humerus and ribs.	Whale, humerus, ribs, and vertebræ.
Tortoise scales.	Tortoise scales and bones.
Sharks' teeth, many varieties with striated surfaces, all differing from those in chalk, of which the surfaces are smooth.	Sharks' teeth, many varieties with striated surfaces, all differing from those in chalk, of which the surfaces are smooth.
Spines of balistes.	Spines of balistes.
Palates of sea wolf and other fishes.	Palates of sea wolf and other fishes.
Scales, teeth and bones of fishes.	Scales, teeth and bones of fishes.
Fossil wood.	Fossil wood.
Ferns and reeds.	Ferns and reeds.
Small leaves converted to coal.	Small leaves converted to coal.
Quartz pebbles, rarely.	Quartz pebbles, rarely.

The above analogies are very striking; and though they show that the condition of the earth was nearly the same at the time when both these formations were deposited, yet the numerous and thick strata of oolite interposed between the two, forbid us, even for a moment, to suspect their identity. The same conclusion also follows from a considerable variation between their fossil plants, and from an almost total discrepancy between their fossil shells.

In a future communication, I propose to give a description with plates of the other most remarkable remains that occur at Stonesfield. My present object is to confine myself to the megalosaurus ; and as we are yet in possession only of dislocated fragments of this animal, the best method I can adopt is to subjoin the following description, imperfect as it is, of the plates annexed to this notice.

Head.—No part of the head of the megalosaurus has yet been discovered,

excepting many single teeth and a fragment of the lower jaw. See Plates XL. and XLI.

Mode of Dentition: see Plates XL. and XLI., figs. 1, 2.—The teeth are lodged in distinct alveoli, but do not adhere, as in the monitors, by any incorporation of the root or sides with the substance of the jaw; the young teeth are hollow at the base, and, as usual, become filled as they grow older.

The new teeth are formed in distinct cavities by the side of the old ones towards the interior surface of the jaw, and probably expel the old teeth by the usual process of pressure and absorption, and insinuate themselves into the cavities thus left vacant. The teeth are flattened laterally, and recurved backwards, being serrated on the posterior edge along the whole extent of their enamel, and also on the anterior edge when young; this edge is thicker, and, like the back of a knife, is more solid than the posterior or cutting edge.

The outer rim of the jaw rises almost an inch above the inner rim, and forms a continuous lateral parapet supporting the teeth externally; whilst the inner rim throws up a series of triangular plates of bone forming a zigzag buttress along the interior of the alveoli. From the centre of each triangular plate, a bony septum crosses to the outer parapet, thus completing the alveolus.

The new teeth rise in the angle between each triangular plate. The exterior surface of the jaw (Plate XLI. fig. 2.) presents several distinct and rugose cavities for the passage of the exterior branches of the inferior maxillary blood-vessels and nerves. This character agrees, not with the crocodiles, but with the other members of the saurian family.

From the absence of any curvature in this fragment of the anterior extremity, (which is nearly one foot in length,) it is obvious that the lower jaw must have terminated in a flat, straight, and very narrow snout.

The exuberant provision in this animal for a rapid succession of young teeth, to supply the place of those which might be shed or broken, is very remarkable; it seems also, that a small number of teeth only were in use at the same time.

Vertebræ.—The bones that we have as yet discovered of the vertebral column, are confined to five anchylosed joints, including the two sacral, and two others which are probably referable to the lumbar and caudal vertebræ. They are all much contracted in the middle, and have a deep fossa immediately beneath the annular part. See Plate XLII.

Although we are without any dorsal vertebræ, we fortunately possess ribs (see Plate XLIII. figs. 1. 2.) which have a double articulation at their head, as in the crocodile.

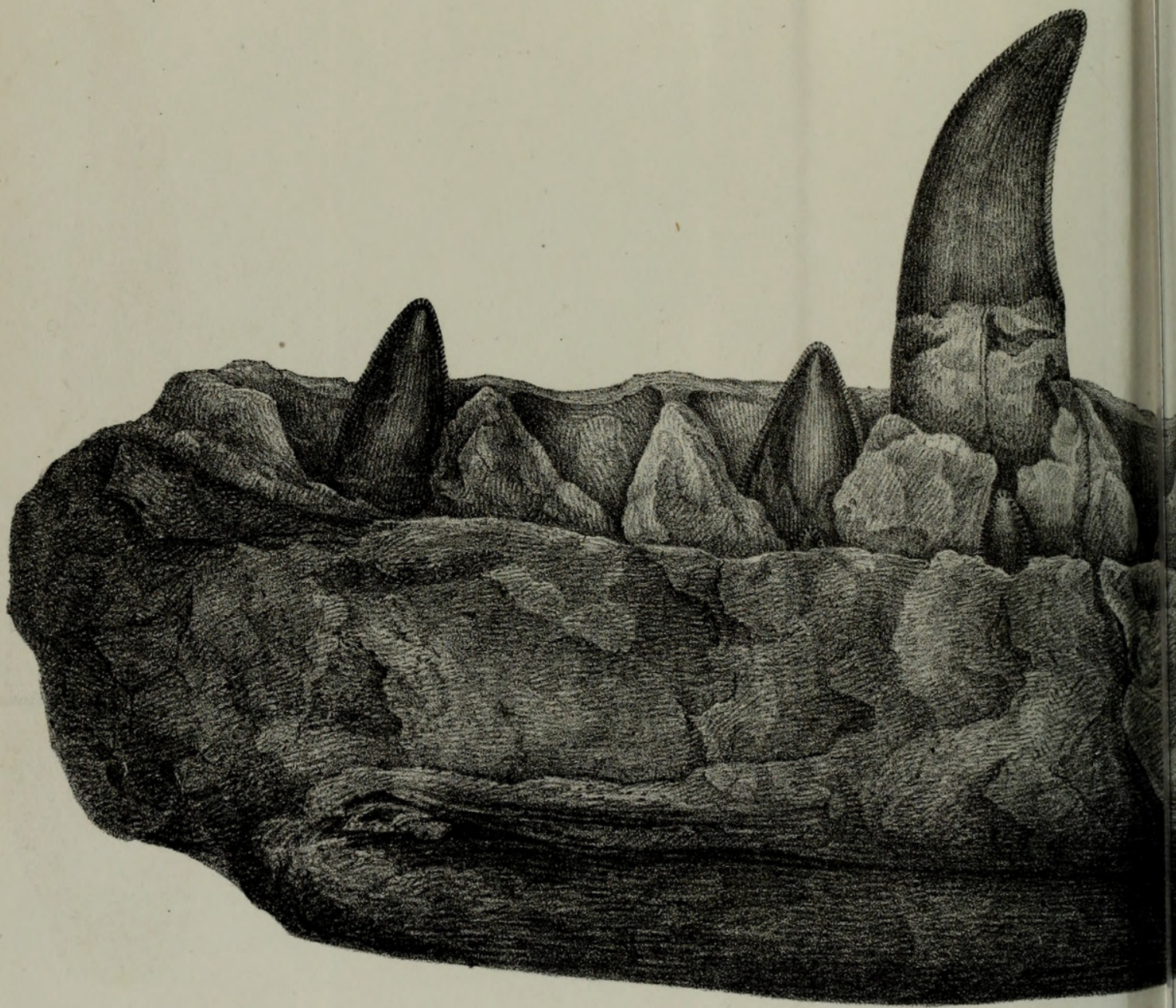
The articulating faces of the body of the vertebræ are nearly flat surfaces, as in most of the fossil crocodiles, and in the plesiosaurus; their proportions will be at once seen by reference to the Plate XLII., in which fig. 1. represents a portion near the sacrum, figs. 2. and 3. the supposed lumbar and caudal vertebræ.

Ribs and supposed Parts of the Pelvis.—Both of the ribs figured at Plate XLIII. figs. 1. and 2. have a double articulation with their respective vertebræ; the smaller one, fig. 2., is apparently one of the anterior false ribs; two transverse sections of the larger one at *a*. and *b*. show its proportions at the points of fracture.

The bone represented in fig. 3. is the outside view of the ilium, slightly concave. The inner surface is slightly convex, and shows marks of its articulation with the sacrum.

With regard to the os pubis, I am inclined to consider the specimen fig. 4. as forming this bone, but speak with hesitation, as it may be the coracoid process of the scapula: fig. 5. appears to be the ischium; it is very strong and solid, being nearly three inches thick throughout: fig. 6. appears to be a fragment of a scapula; it is from an inch and a half to two inches thick.

Extremities.—These will best be understood by reference to Plate. XLIV. in which figs. 3. and 4. are two views of the same bone, apparently a clavicle; figs. 1. and 2. are two opposite views of the same bone, viz. the largest femur I have from Stonesfield. The medullary cavity of this bone is very large, and is frequently filled with a mass of white calcareous spar; the substance of the bone is extremely compact and brittle. Fig. 5. is apparently a fibula; and fig. 6. a portion of a large bone of the metatarsus or metacarpus.



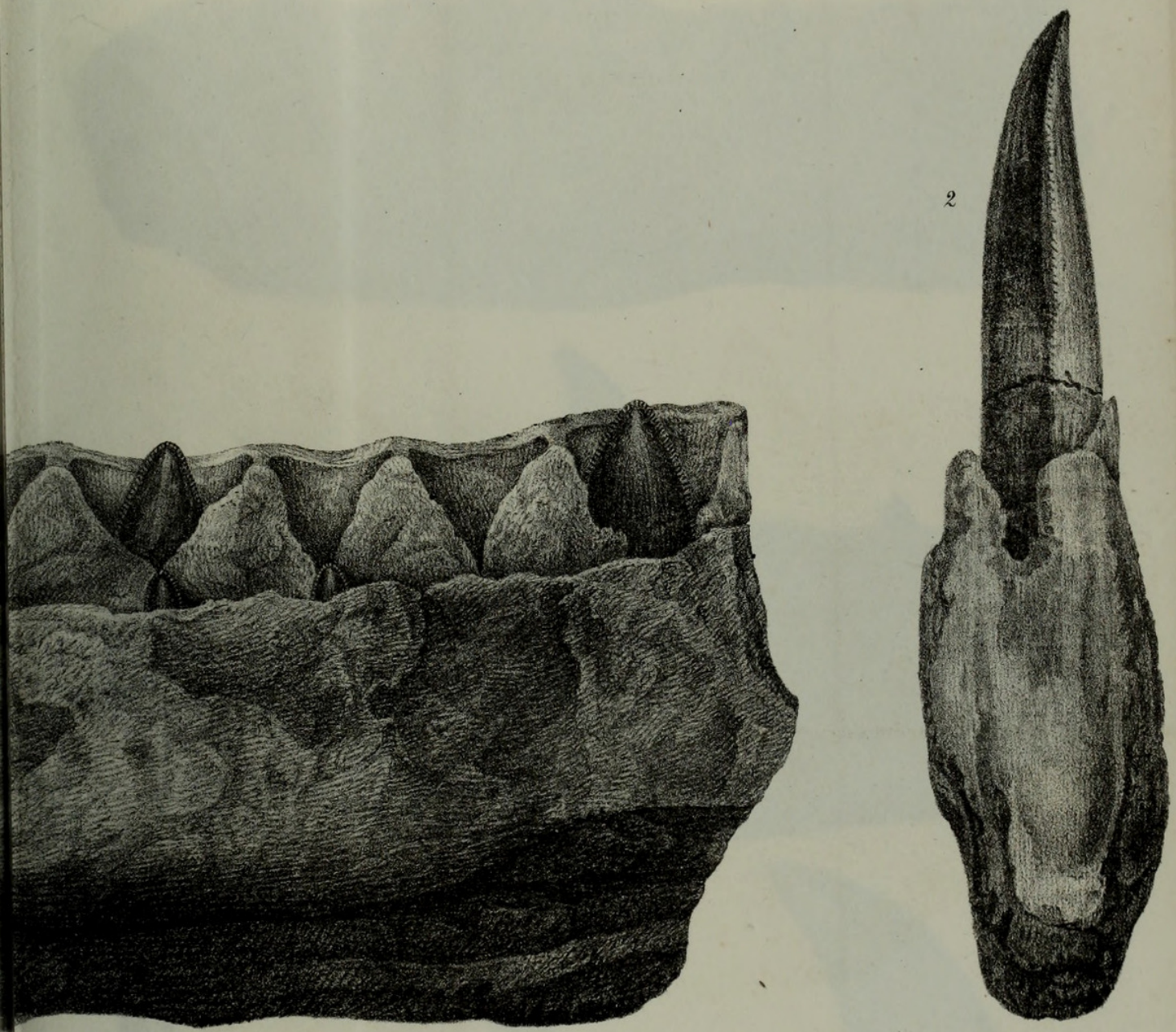
ANTERIOR EXTREMITY OF THE RIGHT

FROM STONESFIELD

1 2 3 4 5 6

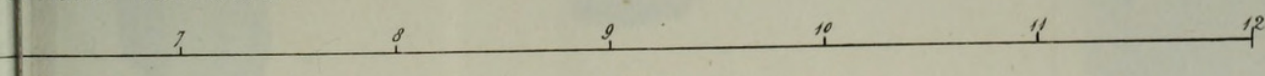
Scale of

Drawn by M. Morland, & on Stone by Henry Perry



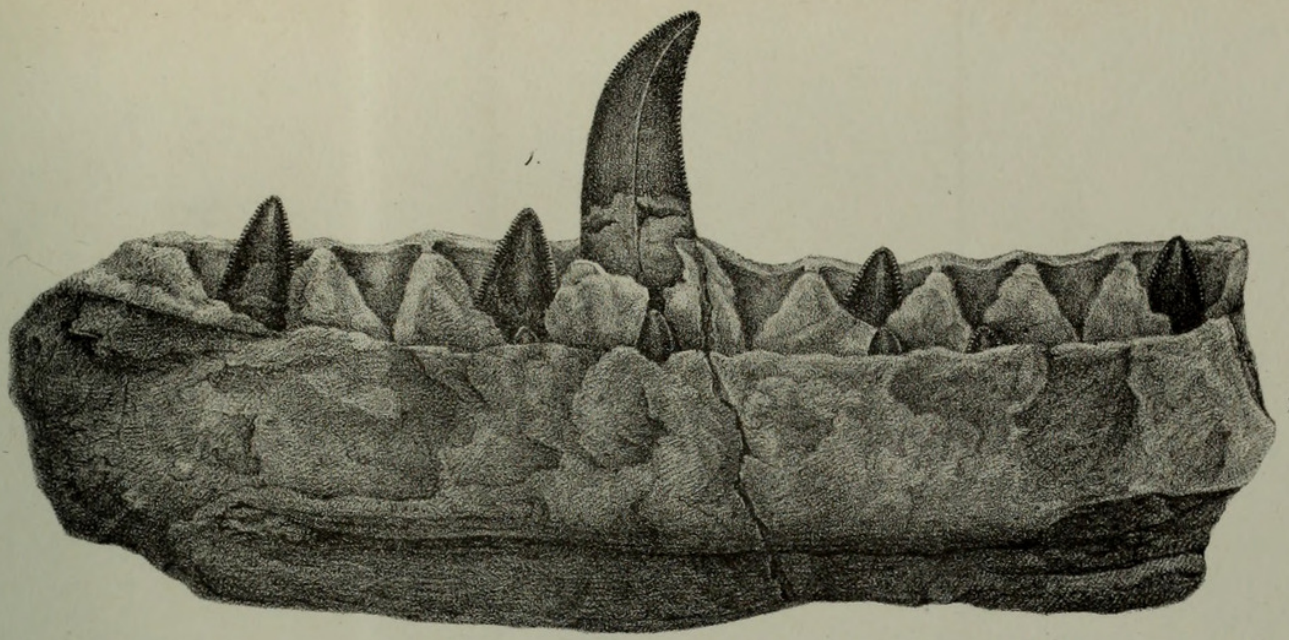
LOWER JAW OF THE MEGALOSAURUS.

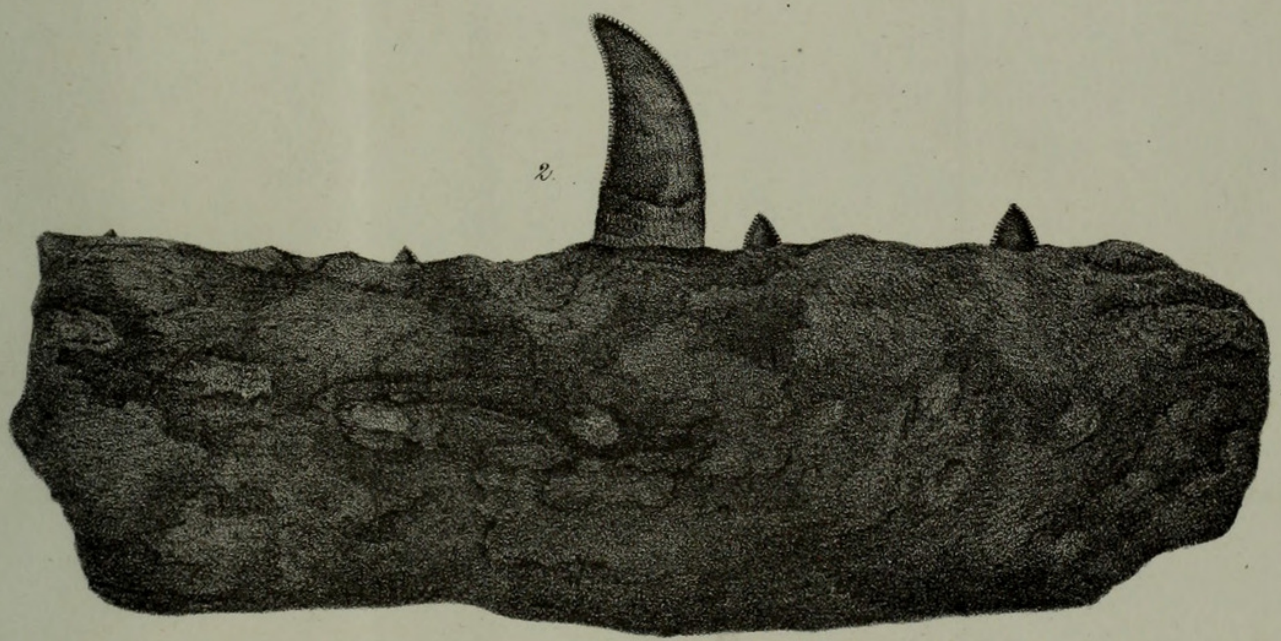
NEAR OXFORD.

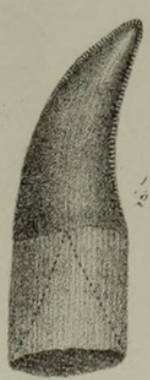


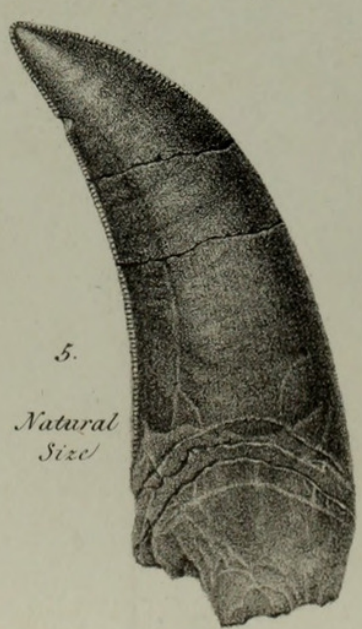
Inches

Printed by C. Hullmandel.









UNDER JAW AND TEETH OF MEGALOSAURUS.

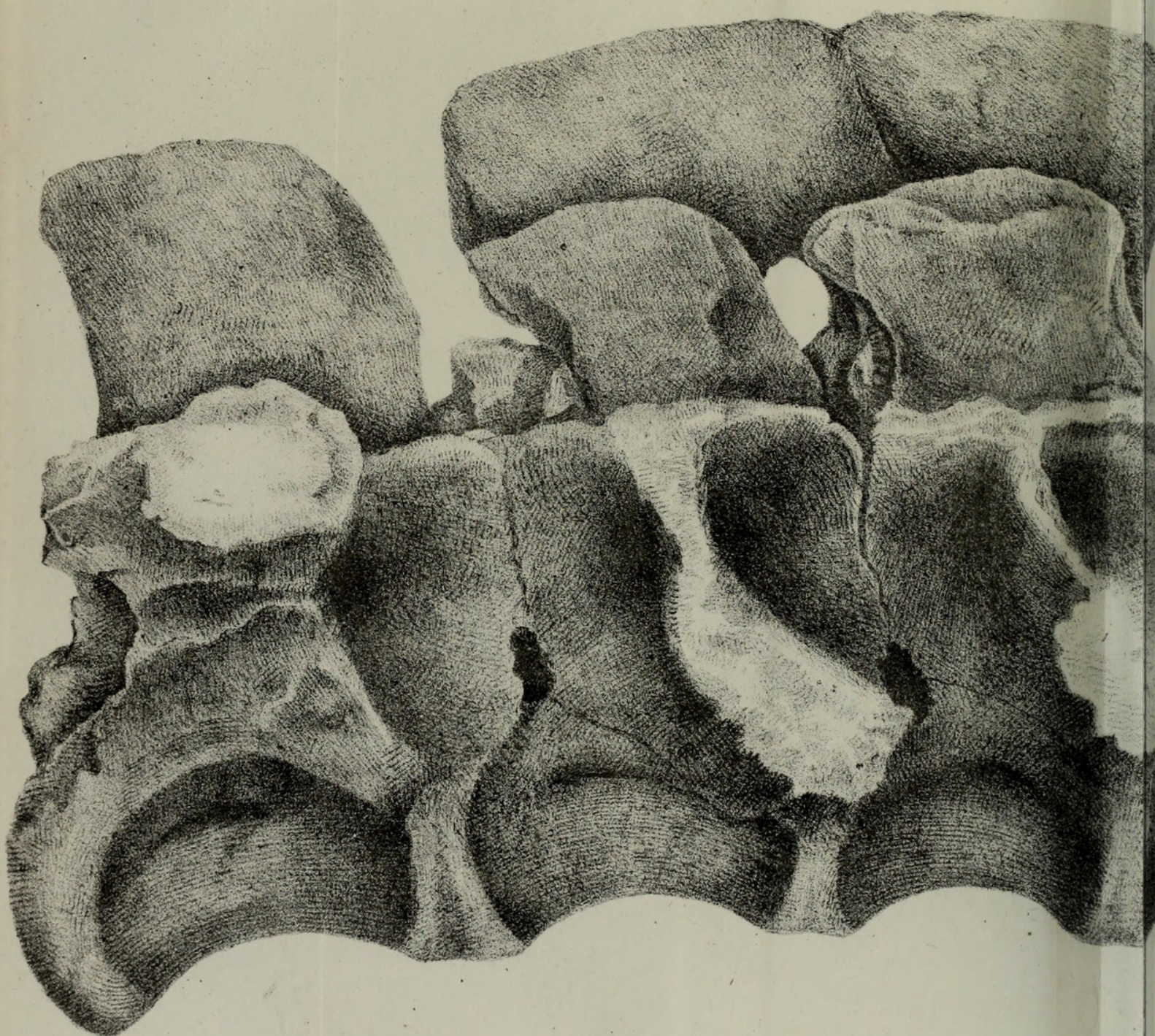
0 3 6 9 12

Scale ½ Inch to One Inch.

Drawn by M. Merland & on Stone by Henry Perry.

Printed by C. Hullmandel

1.

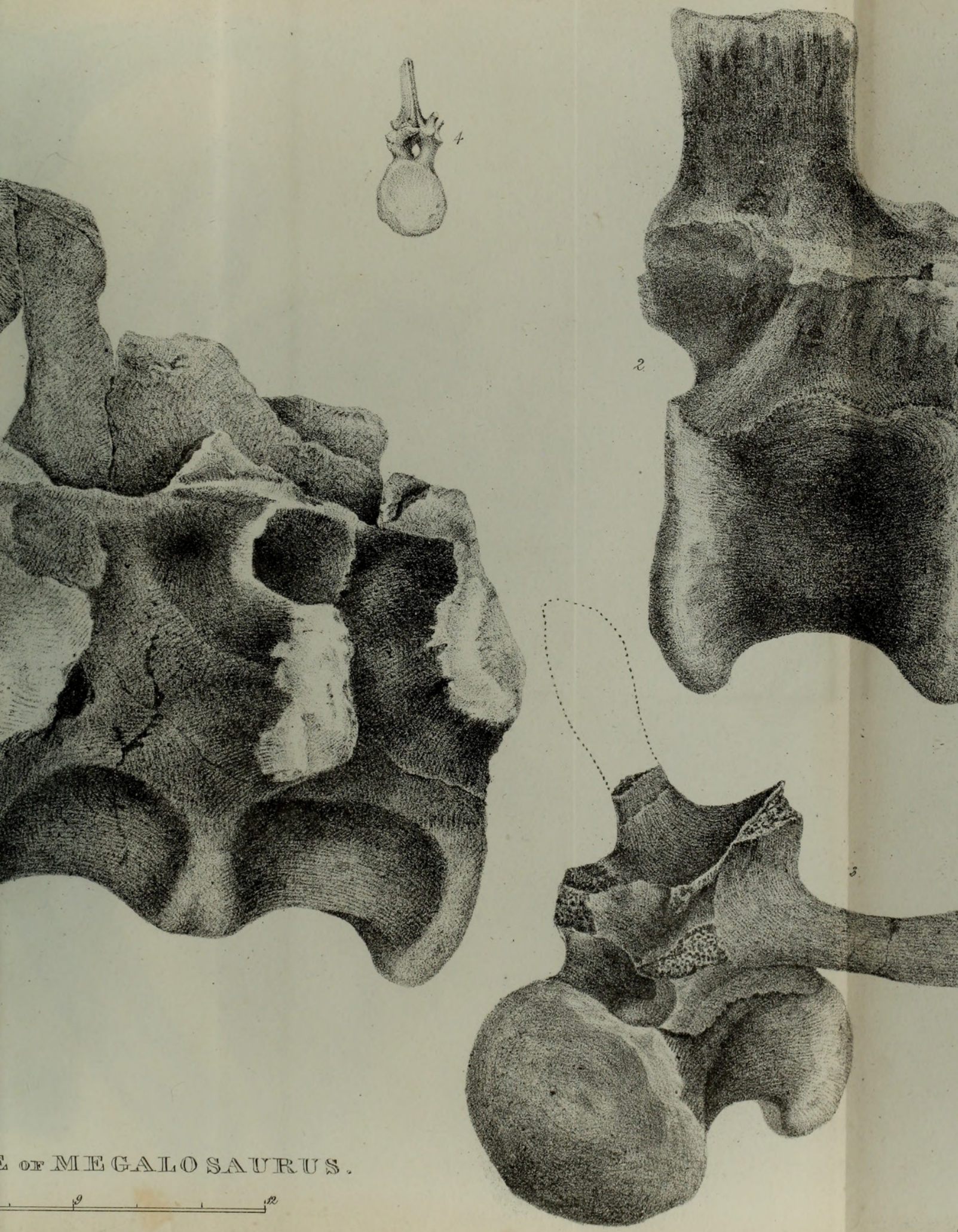


SACRAL LUMBAR & CAUDAL VERTEBR

Drawn by M. Morland. & on Stone by Henry Perry.

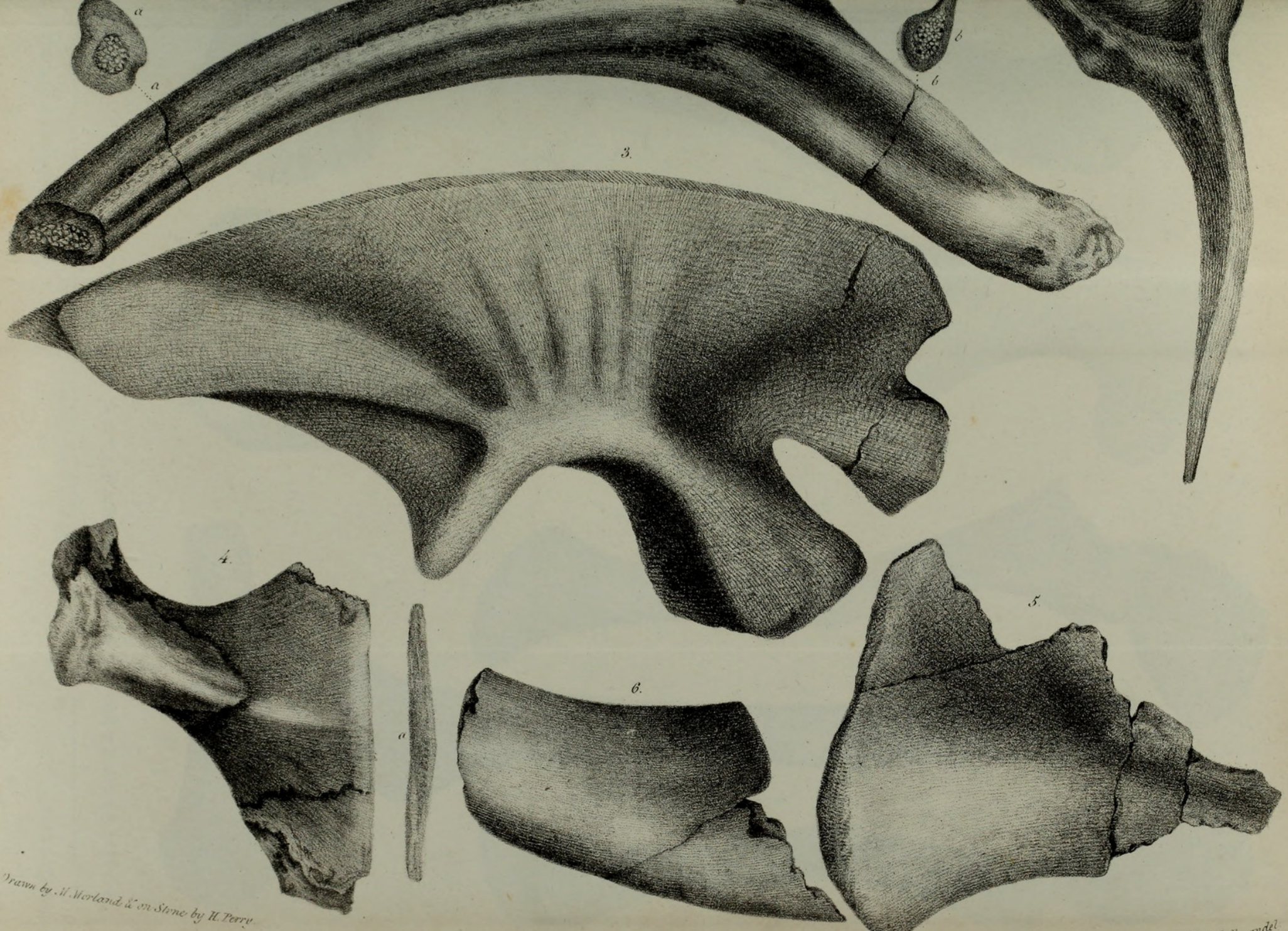
0 3 6

Scale ½ an Inch to an Inc



E OF MEGALOSAURUS.

Printed by



Drawn by W. Worland & on Stone by H. Perry.

Printed by C. Hullmandel.

RIBS & BONES OF THE PELVIS & SCAPULA OF MEGALOSAURUS.

Figs 1. 2. 4. Scale ½ Inch to One Inch.

Figs 3. 5. 6.

FEMUR CLAVICLE, FIBULA & METATARSAL BONE OF MEGALOSAURUS.

0 3 6 9 12 inc

Scale ¼ Inch to One Inch.

Drawn by M. Morland, & on Stone by Henry Perry

Printed by C. Hullmandel.

Buckland, William. 1824. "XXI.--Notice on the Megalosaurus or great Fossil Lizard of Stonesfield." *Transactions of the Geological Society* 1, 390–396. https://doi.org/10.1144/transgslb.1.2.390.

View This Item Online: https://www.biodiversitylibrary.org/item/111775
DOI: https://doi.org/10.1144/transgslb.1.2.390
Permalink: https://www.biodiversitylibrary.org/partpdf/91364

Holding Institution
California Academy of Sciences

Sponsored by
California Academy of Sciences Library

Copyright & Reuse
Copyright Status: Public domain. The BHL considers that this work is no longer under copyright protection.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.

This file was generated 16 April 2022 at 01:07 UTC