

Article IV.—NOTE ON THE PRINCIPAL TYPE SPECIMEN OF *MOSASAURUS MAXIMUS* COPE, WITH ILLUSTRATIONS.

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PLATES IV AND V.

In the 'Transactions' of the American Philosophical Society for 1871, new series, page 189, Prof. E. D. Cope described and published *Mosasaurus maximus*, basing it on specimens found in New Jersey. The most important of these was from the farm of Geo. W. Crawford, at a place called Nut Swamp, and at the time in the possession of Dr. G. J. Fisher, then in Sing Sing, N. Y. In 1892 the American Museum of Natural History obtained this specimen with a number of vertebræ from Dr. Fisher, and the specimen was brought to the Museum and the fragments placed together in their true relations. In doing this, it was found that instead of being a single ramus of a lower jaw as had been supposed, it really consisted of parts of both lower rami extending back to the articulation of the rami, each side having eleven teeth or sockets, some of which are in fair condition of preservation. In Prof. Cope's description he intimates that there were twenty more or less perfect teeth. When the parts of the specimen were put together it was found that there were eleven teeth or tooth sockets on each ramus, and that several of them contained the successional teeth at the base of the present teeth or in the sockets.

The following is taken from Prof. Cope's description and remarks¹ on this extraordinary specimen :

"The remains of a still more gigantic individual of this species were submitted to me by Dr. G. J. Fisher, of Sing Sing, New York, in whose possession they now are.

"The bones were obtained through the efforts of P. R. Brinckehoff, of Westchester County, N. Y., in the latter part of the month of April, 1860. They were found on the farm of Geo. W.

¹ 'Synopsis of the Extinct Batrachia, Reptilia and Aves of North America.' By Edward D. Cope. Trans. Am. Phil. Soc., XIV, N. S., 1871, pp. 1-252, pll. 1-14. The extract is from pp. 190-102.

Crawford, at a place called Nut Swamp, three miles south of Middletown, Monmouth County, N. J. They were first discovered on opening a ditch through a meadow in Nut Swamp; G. W. Crawford, being an intelligent farmer, took immediate measures to prevent their disturbance or injury, by having them protected until he could inform P. R. Brinckerhoff.

"Accordingly, on the last week of April, P. R. Brinckerhoff succeeded in obtaining from this locality the portions of bones described.

"They were all found at a depth of about four feet below the surface, and within an area of a few square feet. The bones were imbedded in wet marl, which contained an abundance of most of the fossils peculiar to the formation, as *Gryphæa*, *Exogyra*, *Terebratula*, *Belemnites*, etc. Near this spot, about fifteen years ago, considerable portions of bones, but more particularly the vertebræ of the *Mosasaurus*, were found by J. M. Smith and Lyell Conover.

"The portions found were so detached and diffused, as to afford no hope of obtaining much more of the skeleton without very extensive and expensive excavations, and it was with extreme difficulty that P. R. Brinckerhoff, by the aid of one or two men, and by one-and-a-half days' labor, succeeded in procuring the present specimens. There was a constant influx of water into the trenches, and the bones were very fragile.

"The bones obtained, consist of large portions of the inferior maxillaries, with twenty, more or less, perfect specimens of full-grown teeth, and several successional teeth,—with a posterior dorsal vertebra.

"Drawings were made directly from the specimens.

"The largest fragment found is a portion of the left inferior maxilla. It measures twenty and three-fourths inches in length; at the broadest extremity it is about seven inches deep, at the small extremity it is five inches; the upper or alveolar portion of the jaw is generally about three and one-quarter inches thick; the lower margin is quite uniformly two inches thick. This mass was considerably fractured in removing it from its bed, as is seen in the plate.

"It contains the roots of three teeth, two of which have most of their enamelled crowns attached. The space between the first and second tooth is three inches. The space between the second and third teeth is two and three-fourths inches.

"The roots of all the teeth are somewhat compressed laterally; the longest diameter of the root of the first tooth is two inches; of the second, two and one-fourth; of the third, two inches.

"The lateral plates in the dentary bone come in contact a few inches behind the first tooth.

"In another fragment of the jaw, containing five or six teeth, we find the roots placed in actual contact throughout; and

knowing the law of their arrangement, we can readily estimate the length of the jaw.

“The combined length of all of the fragments collected of the lower jaw, measures four feet, and includes fourteen teeth, which is the full number said to belong to each side in *M. giganteus*. The series completed would no doubt contain eighteen teeth. As the coronoid and angular processes and the distal extremity are not included in the above measurements, it would be safe to calculate the lower jaw of this specimen to have been six feet and a half long. The cranium measured nearly the same, and would indicate a larger animal than any *Mosasaurus* yet discovered.

“The greater portion of the coronoid element of the left inferior maxilla, is nine inches in length; in the broadest part it measures four and three-fourths inches in width. The border is concave and regularly rounded. This border is quite uniformly two inches thick, while the remaining portion of the fragment is thinner. Another portion of the left lower jaw contains the roots of three teeth placed in contiguity. The crowns or apices of the teeth have been broken away. This fragment is seven inches long, four and one-quarter inches deep, and three and one-quarter thick.

“Three large foramina are seen on the external surface, which communicate with the dental canal.

“This portion of the jaw is well preserved, and like all the fragments found, is entirely black, and extremely heavy; the high specific gravity, as well as the color, is due to their impregnation with iron; the pulp cavities of the teeth, as well as the concentric laminæ of the apices, are incrustated with deposit of exceedingly minute crystals of iron pyrites. In other portions of the bones a deposit of vivianite is occasionally seen.

“In the teeth belonging to this species of *Mosasaurus*, the root is large, the lower extremity inclining backwards; it contains a minute cavity, being nearly solid, and apparently composed of simple osseous tissue. The apex or crown of the tooth arises from a somewhat conical base, which corresponds with the margin of the alveolar cavity; it tapers rapidly to a point; the teeth are recurved and divided into two faces, one looking forwards and outwards, the other presenting backward and inward; the dividing line between the anterior and posterior faces is very distinct, consisting of a sharp unserrated or simple cutting edge. These acute edges or carinæ separate faces, of which the posterior is more convex. The crowns of these teeth were measured by Dr. Fisher, as follows:

	<i>Inches.</i>		<i>Inches.</i>
First, anterior face.....	1 4-8	posterior.....	1 7-8
Second, “ “	1 3-8	“	2
Third, “ “	1 2-8	“	2 2-8

“The pulp cavity extends about as far into the root as the crown, excepting its entrant foramen in the former.

“The mode of succession of the teeth is well seen in this specimen, and illustrates the process as indicated by Leidy (*Cretac. Rept.*, p. 51). The fang-like basis of the functional tooth undergoes extensive excavation by absorption to furnish space for its successor, the remaining portion in some places being reduced almost to a shell, yet remaining firmly adherent to the alveolar walls, without the slightest evidence of displacement. This and other specimens examined, prove that the old tooth is not removed till the process of absorption has extended to the alveolar margin, when the crown is easily detached.

“The splenial bones present the usual remarkable character. At the posterior extremity of each, the articulating cavity is narrow ovoid in form, subacuminate below, and not so broadly rounded as in the *M. dekayi*.

	<i>Inches.</i>
Long diameter.....	3.25
Transverse.....	1.75
Total depth of splenial at extremity.....	4.5
Of rounded face below dentary plate.....	2.25

“The surface appears to be adapted for motion in two directions.

“The vertebra which accompanied the jaw measures as follows :

	<i>Inches.</i>
Length centrum.....	4.7
Width anterior articular face.....	4.55
Depth “ “ “.....	4.65

“It is a dorsal with diapophyses below the middle ; between it and the neural arch, near the articular extremities, the surface is marked with sub-longitudinal rugæ.

“This Mosasaur could not have been less than eighty feet in length.”

On both parts of the specimen there are new teeth showing on the inner posterior side of the old teeth. These are of different sizes and ages, as if there were no special rule as to the age at which new teeth replaced the old ones, and the base of the older one is excavated or absorbed around the young tooth, leaving a large open space.

Views of the jaws are given on the plates, also of two of the teeth showing the new teeth at the bases. The figures are all from

photographs. Prof. Cope speaks, in the article cited, of "drawings" of the specimen. But none is given on any of the plates in his article, hence the necessity of this notice and accompanying illustrations.

The coronoid bone mentioned on p. 191 is also in possession of the Museum. It measures, as Prof. Cope says, nine inches in length by four and a half in width. The figure of this bone is reduced to one-half the natural size, and a view given on the same scale of the corresponding bone from a specimen of the Mosasauroid *Tylosaurus proriger* Cope, from the Niobrara chalk beds of western Kansas.

Prof. Cope appears to have considered this bone as the left coronoid, but on close examination and comparison with that of other species, it proves to be a right instead of a left.

From the lower marl bed of the Upper Cretaceous, from three miles south of Middletown, Monmouth County, New Jersey.

