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Article XVII.—NEW NOTES ON THE OSTEOLOGY OF
TRICERATOPS.

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PLATE XL.

Among the fossils secured by the American Museum expedition of 1902 in the Laramie formation of northern Montana was an incomplete skeleton of *Triceratops*. It was found on Hell Creek, 130 miles northwest of Miles City, in the Ceratops Clays, 240 feet above the Pierre shales.

This specimen (No. 971 of the American Museum Collection) includes a mandible, ilium, sacrum, seven vertebræ, twelve ribs, scapula, humerus, ulna, radius, pubis, and two sternal bones.

STERNUM.

Of special interest are the sternal bones (Fig. 1), for this is the first specimen of one of the Ceratopsia in which an ossified sternum has been found. No other bones were mingled with this individual, consequently the association is undoubted. The sternals are well preserved but where the thin spongy portions on the inner border were decayed they have been restored in plaster.

These plates are paired, elongate, and symmetrical except where distorted by crushing. One end terminates in a point which is restricted and enlarged with the rough portion most extensive on the visceral surface, and stands away from the body of the plate. The opposite end is thickened and rugose at the outer angle but thins rapidly toward the inner border which is very thin and nearly straight. The outer border is thickened, smooth and slightly concave. The ventral surface or outside of the plate is convex transversely while the dorsal or visceral surface is concave. Both are smooth. A deep incision on the visceral surface near the broad end of each plate may represent a foramen or a deep ligamentous attachment.

As I interpret these bones (Fig. 1) the pointed end extended forward with the enlarged point attached to the terminal curved portion of the coracoid. When placed thus with the thin inner borders meeting in the median line the width of the body cavity is determined at this point and the position of the coracoids is approximately fixed. Allowing an inch on each side of the sternals for cartilaginous union the coracoids would be separated in this

specimen by twenty-eight inches at the distal termination.

In the mounted skeleton of *Triceratops* in the National Museum at Washington the terminal points of the coracoids are thirty-three inches apart and at their nearest approach they are separated by



FIG. 1. Ventral view of the sternal plates of *Triceratops*.

twenty-three inches. A photograph of a front view of this specimen is here reproduced (Plate XL) through the courtesy of that institution. The measurements were kindly furnished by Mr. Charles W. Gilmore, preparator. It would seem from the above measurements that the legs approached nearer the median line than in the restoration of the Washington specimen.

In the Jurassic Dinosaurs, *Brontosaurus*, *Morosaurus* and *Diplodocus*, the sternal plates were firmly united in the median line by cartilage as indicated by the long straight rugose inner border. But *Triceratops* presents an entirely different type of sternum in which

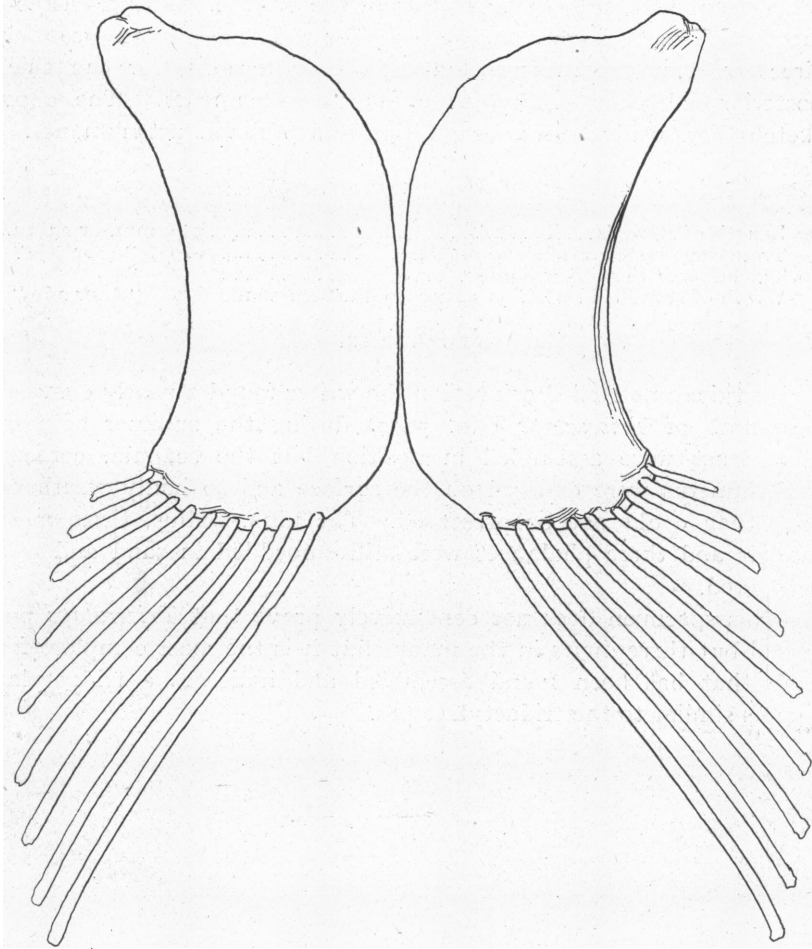


FIG. 2. Ventral view of the sternal plates of *Triceratops* with restoration of the cartilaginous ribs in outline.

the median borders of the sternals as well as the body of the plate are extremely thin and not coössified. This type resembles some of those forms of reptiles which are provided with an interclavicle and clavicle, and although these elements have not certainly been found among the Ceratopsia remains it seems not improbable that they may have

been present. Moreover, the deep anterior emargination of these plates indicates the presence of an interclavicle.

The external third of the plate is thick and formed its chief strength, while the uniformly smooth surface shows that there was no lateral attachment of cartilaginous ribs as in the *Ratitæ*. This rib attachment was clearly formed at the posterior end of the plate, probably direct without the intervention of a xiphisternum, for the thick posterior end seems subdivided as for rib attachments. The above sketch (Fig. 2) illustrates the position and probable attachments.

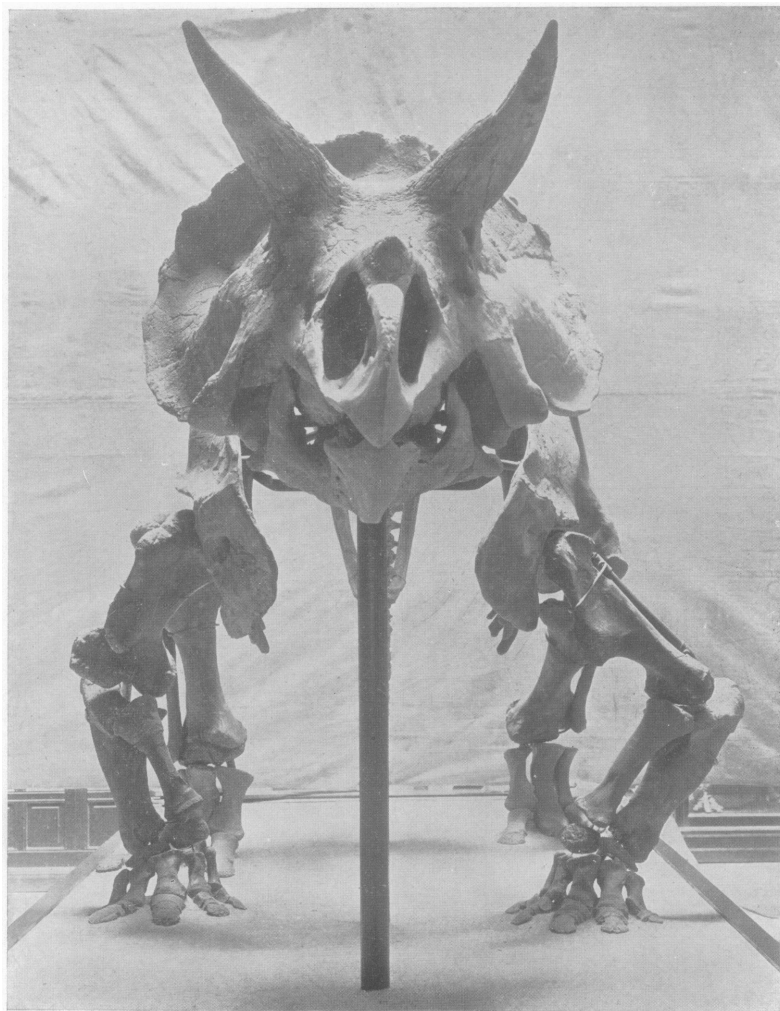
Measurements.

Length of sternals.....	580	mm. or 23	in.
Transverse width of plate in middle.....	220	"	or 8 $\frac{3}{4}$ "
Thickness of thin inner border.....	8	"	
Width of sternals in position at coracoid attachment	660	"	or 26 "

FORE LIMB.

In this same Hell Creek region the writer found a nearly complete fore limb of *Triceratops* (No. 5880) during the summer of 1905. The bones were assembled in position but the scapula, coracoid and humerus were exposed on the surface and so badly weathered that they could not be preserved. The ulna, radius, three metacarpals and three phalanges were still embedded in sand and were recovered.

This specimen does not conclusively prove that *Triceratops* possessed but three digits in the manus but it is the most complete fore limb that has been found assembled and indicates a tridactylate manus similar to the tridactylate pes.



TRICERATOPS PRORSUS.

Skeleton as mounted in the U. S. National Museum, front view.

Through the courtesy of C. W. Gilmore.

