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ART. XLI.—*Two New Ceratopsia from the Laramie of Converse County, Wyoming*; by J. B. HATCHER. (With Plates XII, XIII.)

[From a Monograph on the Ceratopsia by J. B. Hatcher. Published by permission of the Director of the U. S. Geological Survey.]

*Editorial note.*—In the course of his extensive study of the Laramie Ceratopsia contained in the U. S. National Museum and in that of Yale University, Mr. Hatcher discovered two forms which were new to science. These he described in the above mentioned monograph, giving to the first, an undoubted Triceratops, a new specific name, while for the second specimen, which represents a new genus as well as species, no name was suggested by the author. The duty of naming this form devolves therefore upon the editor. The generic name *Dicera-tops* is suggested by the lack of a nasal horn, while the specific name *hatcheri* will serve to commemorate Mr. Hatcher's work in connection with this remarkable type.

In view of the recent discoveries among these most interesting forms, it has been deemed advisable to publish these descriptions at the present time without waiting for the publication of the monograph.—RICHARD S. LULL.

*Triceratops brevicornus* sp. nov.

Plate XII, Figures 1 and 2.

*Type* No. 1834, Yale Museum.

*Char. Specific.* Supraorbital horn cores short and stout, not much compressed, nearly circular in cross-section. Nasal horn core short and stout with the anterior border vertical instead of being directed upward and forward at an angle of 30 degrees. Vertical and longitudinal diameters of lateral temporal foramen nearly equal. Orbit irregularly elliptical in outline with the longer axis running from above downward and forward. Postfrontal fontanelle open even in old individuals.

*The type*, No. 1834, Yale Museum, of the present species consists of a nearly perfect skull with lower jaw and a com-

plete series of presacral vertebræ, together with a number of ribs more or less complete, and portions of the pelvis, including a portion of the right ilium and a nearly complete pubis. The vertebral series lay in position with the vertebræ interlocked by their zygapophyses from the axis to the last dorsal, though portions of some of the vertebræ had weathered away when found. Behind the posterior dorsal, impressions of the centra of the first two sacrals were preserved in the hard sandstone in which the skeleton was imbedded.

*Locality.*—The skeleton was discovered by Mr. W. H. Utterback, and the exact locality was some three miles above the mouth of Lightning Creek and about one and a half miles south of that stream, in Converse County, Wyoming. The horizon was near the summit of the Laramie, and the specimen was collected by the present writer assisted by Messrs. W. H. Utterback, A. L. Sullins, and T. A. Bostwick. When discovered the skeleton lay imbedded in a hard sandstone concretion and was much shattered and weathered about the pelvic region. None of the limb bones and no part of the tail were recovered.

#### *The Skull.*

The extremely rugose nature of the skull together with the closed condition of the sutures, many of which are almost or entirely obliterated, make it certain that the type of the present species pertained to an old individual.

*The Cranium.*—The chief distinctive features of the cranium are as follows: The supraorbital horn cores are unusually short and stout, especially at the base. They are less compressed and more nearly circular in cross-section than in most other species. The nasal horn is short and very stout with the antero-posterior diameter much exceeding the transverse. Its anterior border is directed upward in a line perpendicular with the longer axis of the skull instead of forward and upward at an angle of about thirty degrees to that axis as in the type of *T. prorsus*. The lachrymal foramen, as in *T. serratus*, lies between the maxillary and the nasal, but in the present species its anterior half is entirely enclosed by the maxillary, that bone sending upward a short process alongside the premaxillary process and forming the anterior one-half of the superior border of the foramen. The orbit is elliptical in outline with the longer diameter inclined backward from the perpendicular at an angle of about ten degrees. The lateral temporal fossa is triangular in outline, its respective borders describing nearly an equilateral triangle, the fore and aft diameter only slightly exceeding the vertical. The rostral bone is heavy and very deeply excavated beneath. The epijugal is rather

acutely pointed and regularly triangular in cross-section. The infratemporal arch, as in *T. serratus*, is formed by the quadrate with overlapping processes from the jugal and squamosal, that from the latter element occupying a slightly more elevated position in the type of the present species than in that of *T. serratus*. The exoccipital process extends distally beyond the quadrate and projects as a small angular process. There are six exoccipitals, borne wholly on the squamosal, and at least three more between the last of these and the single median one situated at the median parietal region. Though the frill is not sufficiently perfect in this region to determine the number of epoccipitals with accuracy, there cannot be fewer than nineteen. The postfrontal fontanelle is large and circular in outline. The median longitudinal crest of the parietals is well defined and bears the usual rugosities. Near the apex the right horn core has been worn into a peculiar form by the action of wind, sand and water while it protruded from the sandstone concretion in which it was found prior to its discovery. The palatial view shows no characters essentially different from those of other species of this genus. In the region of the supraoccipitals and parietals the sutures are so obliterated by age and obscured by distortion and crushing that it is quite impossible to determine their nature.

*The Lower Jaw.*—The lower jaws with the predentary were in position and in a splendid state of preservation. The predentary is rather longer than is common. On the superior surface of the mandibular fossa near the anterior end two large foramina pierce the wall and pass upward toward the dental chamber. The splenial is very broad posteriorly and entirely encloses the mandibular fossa, except at the opening of the internal mandibular foramen. The coronoid process is low and stout and superiorly it is produced forward into a broad and somewhat decurved projection. At its greatest expansion the superior border of the splenial covers over for a short distance the series of dental foramina on the inner side of the dentary. The principal characters of the skull are well shown in Plate XII, figures 1 and 2.

*The Vertebrae.*—The vertebrae will be fully described in that portion of the monograph relating to the osteology of the genus *Triceratops*.

*Principal Measurements of Type of T. brevicornus (No. 1834, Y. M.).*

Greatest length of skull .....	1652 <sup>mm</sup>
Greatest breadth of frill .....	1120
Expanse of jugal .....	660

Expanse of frontal region at anterior border of orbits . . .	357 <sup>mm</sup>
Greatest diameter of orbit . . . . .	168
Least " " " " . . . . .	120
Fore and aft diameter of lateral temporal fossa . . . . .	105
Vertical " " " " " " . . . . .	85
Distance from posterior border of orbit to posterior border of frill . . . . .	840
Thickness of postfrontal behind orbit . . . . .	130
Least antero-posterior diameter of horn core immediately above orbit . . . . .	175
Antero-posterior diameter of horn core, six inches above orbit . . . . .	117
Transverse diameter of horn core immediately above orbit	140
Transverse diameter of horn core, six inches above orbit	97
Greatest length of squamosal . . . . .	870
" breadth of " . . . . .	433
Length of parietals along median line . . . . .	712
Distance between squamosal sutures at posterior border of frill . . . . .	874
Distance between squamosal sutures at junction with post- frontals . . . . .	330
Distance from anterior border of orbit to posterior border of nasal opening . . . . .	228
Distance between orbit and lateral temporal foramen . . .	142
Distance between lateral and supra-temporal foramina . .	285
Distance from lateral temporal foramen to posterior border of squamosal . . . . .	705
Distance from occipital condyle to posterior margin of crest . . . . .	650
Distance from occipital condyle to interior border of ros- tral . . . . .	975
Distance from posterior border of anterior nares to ante- rior border of rostral . . . . .	525
Distance from postfrontal foramen to extremity of nasal horn . . . . .	750
Greatest expanse of exoccipital processes . . . . .	550
Distance from inferior border of orbit to bottom of jugal	343
Diameter of occipital condyle . . . . .	88
Distance from mid-frontal region to apex of supraorbital horn . . . . .	500
Length of splenial . . . . .	503
" " predentary . . . . .	255
Greatest breadth of predentary . . . . .	142
Combined length of dentary and predentary . . . . .	681
" " " " " articular . . . . .	620
Total length of presacral vertebral series . . . . .	2290
" " " dorsal series . . . . .	1490

*Diceratops hatcheri* Lull, gen. et sp. nov.

Plate XIII, Figures 3 and 4.

Mr. Hatcher's description is as follows :

“*Char. Generic:* Nasal horn core absent. Squamosal bones pierced by large fenestræ, while smaller ones penetrate the parietals. The inferior border of the squamosal lacks a quadrate notch.

Type No. 2412, U. S. National Museum.

“*Char. Specific:* Supraorbital horn cores short, robust, and nearly circular in cross-section at base, erect and but slightly curved. Orbits project in front of the horns, the frontal region lying between the horns being concave. Exoccipital processes slender and widely expanded.

“*The type*, No. 2412, of the U. S. National Museum, consists of a skull without the lower jaw. The posterior portion of the frill is somewhat weathered but the specimen appears to have suffered comparatively little from crushing.

“*Locality:* The specimen was found in a hard sandstone concretion about three miles southwest of the mouth of Lightning Creek, Converse County, Wyoming. When found the concretion in which the shell was imbedded had entirely weathered out of the surrounding sandstone and stood at an altitude of five or six feet above the ground, firmly attached beneath to another concretion. The skull stood on its nose with the frill pointing upward.

“*The Skull:* The chief distinctive features of the skull are as follows: The supraorbital horn cores are comparatively short, robust, and nearly circular in cross-section at the base instead of compressed, as in most other species. They rise more directly upward than in other species and are only slightly curved. The orbits also occupy a position more anterior than that seen in other species; the anterior borders of the horn cores rise from about the middle of the superior borders of the orbits so that the orbits project well in front of the horns. The frontal region between the orbits is concave. The exoccipital processes are rather slender and widely expanded.

“The nasals terminate anteriorly in a rounded rugosity not developed into anything approaching a nasal horn and resembling that of the type of *Triceratops obtusus*. The rostral bone is small and firmly coössified with the premaxillaries. The latter are elongate but not deep. The maxillaries are massive and the lachrymal foramen is elongate and below and considerably forward of the orbit. The jugal is broad distally and firmly coössified with the epijugal. The lateral temporal fossa is nearly as deep vertically as longitudinally. The squa-

mosal is elongate, and just posterior to the quadrate groove it is pierced by a large fenestra. The antero-inferior angle is little produced and there is no quadrate notch, the inferior border in this region describing widely an open concavity. The parietals are broad and thin and, on either side of the median line about 235<sup>mm</sup> in front of the posterior border, there is an elongated fenestra with a longitudinal diameter of 150<sup>mm</sup> and a greatest transverse diameter of 52<sup>mm</sup>. This fenestra is completely enclosed on the right side, but on the left the parietal is injured in this region. In the drawings it has been restored from the right side. The supra-temporal fossa is elongate. There is a single median postfrontal fontanelle as in *Triceratops*, but posteriorly this gives origin to two deep channels, one on either side. These run backward along the surface of the parietal and terminate in two small circular fontanelles, conditions very similar to those which obtain in *Torosaurus*.

*Measurements of the type.*

“ Distance from anterior end of rostral to posterior of squamosal .....	1990 <sup>mm</sup>
Distance from anterior end of rostral to anterior of orbits .....	845
“ “ inferior border of orbit to lower end of jugal .....	363
“ “ posterior border of nasal opening to extremity of beak .....	614
Distance from posterior border of orbit to posterior surface of horn core .....	175
Distance between anterior borders of orbits .....	340
Circumference of supraorbital horn cores at base .....	610
“ “ “ “ mm. above orbit .....	340
Vertical diameter of orbits .....	165
Antero-posterior diameter of orbits .....	125”

[*Note.*—This genus is most nearly allied to *Triceratops* and is distinguished therefrom mainly by the much smaller rostral bone; by the absence of a nasal horn, which in all species save *T. obtusus* is fairly well developed; by the very erect, short, robust, supraorbital horn cores which seem to take their origin much further back with relation to the orbit; by the concavity of the frontal region between the orbits and by the peculiar form of the postfrontal fontanelle. The general proportions of the skull resemble *Triceratops* rather than the contemporary genus *Torosaurus*, in which the great frill so preponderates over the comparatively abbreviated facial region. The parietals resemble those of *Triceratops* except for the presence of the small fenestræ on either side of the median line.

The squamosals differ from those of *Triceratops* in the conformation of the lower border, which lacks the quadrate notch, and in the presence of the unique fenestræ.

Aside from the general proportions of the skull, *Diceratops* and *Torosaurus* differ in the presence in the former of separately ossified epoccipital bones around the margin of the frill. These ossicles are apparently entirely lacking in *Torosaurus*. The two genera agree in the possession of parietal fenestræ though these are evidently not homogenous. They also agree in the form of the postfrontal fontanelle.

While I believe *Diceratops* to be a valid genus, I am not inclined to lay the stress upon the parietal and squamosal fenestræ which Hatcher does, as they may possibly be pathologic. Those of the squamosal bones, which are found in no other form among Ceratopsia, are not of the same size, while only one is known in the parietals for the sufficient reason that the bone is broken away on the left side where the fenestra would come if present, and it is quite possible that it may never have existed.

There is preserved in the Museum at Yale University a *Clasaurus* scapula with a clean cut foramen through it with perfectly healed edges. This foramen is not present in the other scapula from the same individual and Professor Marsh used to say that the perforation was caused by a *Triceratops* horn. This certainly seems suggestive of the manner in which the *Diceratops* fenestræ may have arisen.

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#### DESCRIPTION OF PLATES.

##### PLATE XII.

Skull of the type specimen of *Triceratops brevicornis* Hatcher. No. 1834, Yale University Museum. One-sixteenth natural size.

FIGURE 1.—Lateral view. *ang*, angular; *art*, articular; *ep*, coronoid process; *D*, dentary; *ep*, epoccipital; *ju*, jugal; *lf*, lachrymal foramen; *mx*, maxillary; *no*, nasal opening; *nh*, nasal horn core; *o*, orbit; *pa*, parietal; *pd*, prementary; *pmx*, premaxillary; *qu*, quadrate; *r*, rostral bone; *sang*, surangular; *sq*, squamosal; *soh*, supraorbital horn core.

FIGURE 2.—Palatal view. *dc*, dental channel; *exo*, exoccipital; *ju*, jugal; *mx*, maxillary; *pa*, parietal; *pal*, palatine; *pmx*, premaxillary; *pt*, pterygoid; *qu*, quadrate; *r*, rostral bone; *sq*, squamosal; *BO*, basioccipital; *C*, occipital condyle.

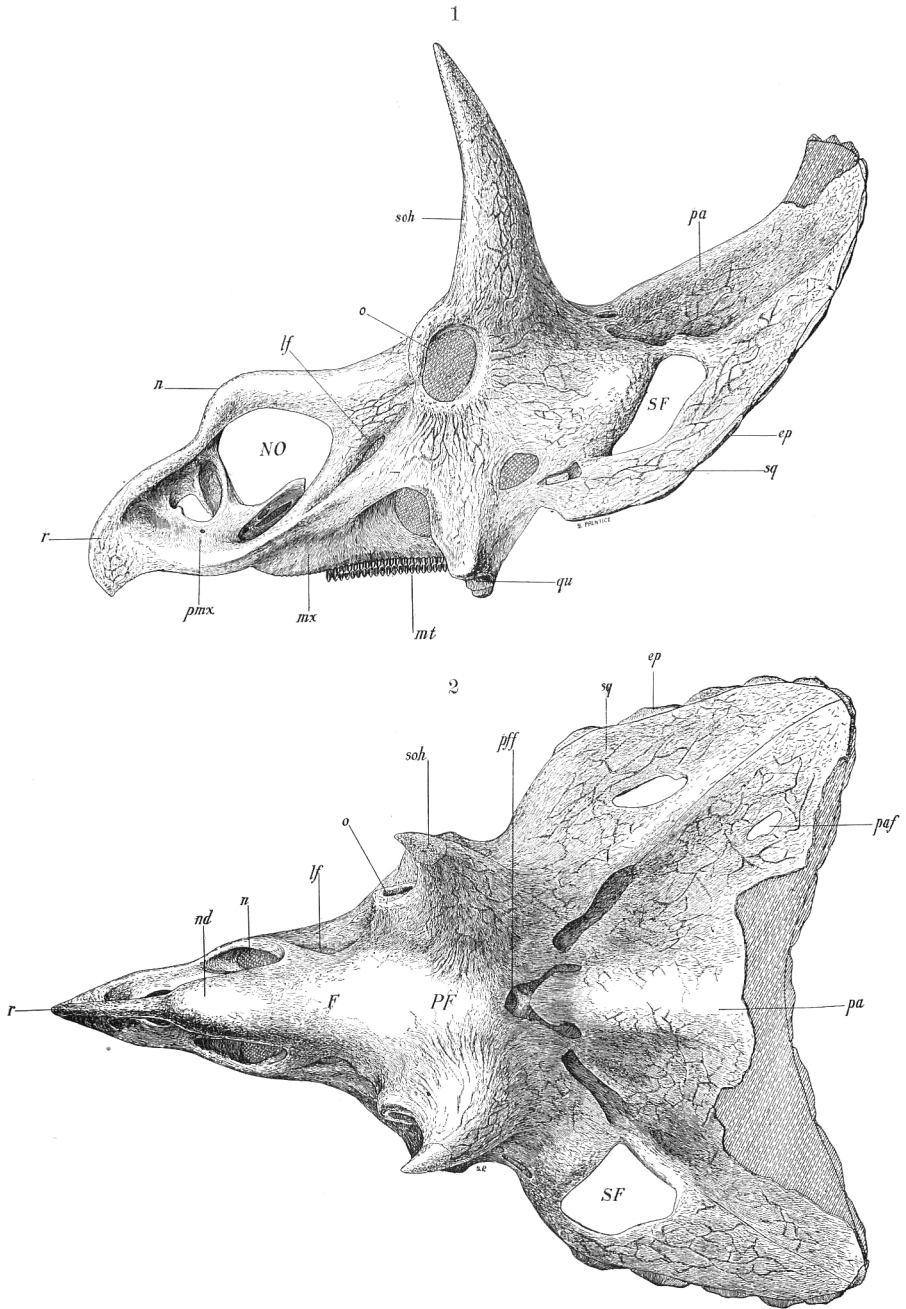
##### PLATE XIII.

Type skull of *Diceratops hatcheri* Lull. No. 2412, U. S. National Museum. One-sixteenth natural size.

FIGURE 1.—Lateral view. *ep*, epoccipital; *lf*, lachrymal foramen; *mt*, maxillary teeth; *mx*, maxillary; *n*, nasal; *NO*, nasal opening; *o*, orbit; *pa*, parietal; *pmx*, premaxillary; *qu*, quadrate; *r*, rostral bone; *SF*, squamosal fenestra; *soh*, supraorbital horn core.

FIGURE 2.—Dorsal view. *ep*, epoccipital; *lf*, lachrymal foramen; *n*, nasal opening; *o*, orbit; *pa*, parietal; *paf*, parietal fenestra; *pf*, postfrontal fontanelle; *r*, rostral bone; *SF*, squamosal fenestra; *sq*, squamosal; *soh*, supraorbital horn core.





*Diceratops hatcheri* Lull, one-sixteenth natural size.