

**Article XXXVI.—*LEPTOCERATOPS*, A NEW GENUS OF
CERATOPSIA FROM THE EDMONTON CRETACEOUS
OF ALBERTA.**

BY BARNUM BROWN.

PLATE XLII.

In the collection of fossils secured by the American Museum Expedition of 1910 there are two specimens that represent a diminutive Ceratopsian, about the size of *Brachyceratops montanensis* Gilmore (Smithsonian Miscellaneous Collections, Vol. LXIII, No. 3, pp. 1-10, 1914) from somewhat older beds.

Two individuals are represented by fragmentary skeletons found together with no other bones commingled so that the association is positive. One specimen is slightly larger than the other and parts of the fore limbs are duplicated. Unfortunately the greater part of both skeletons had long been weathered out in an old cow-trail and many of the large pieces of skull and pelvis so fractured that they cannot be pieced together. One specimen includes a part of the skull, the right fore limb complete, and a long series of caudal vertebræ articulated.

This is a primitive, aberrant type related to *Brachyceratops* and markedly divergent from *Triceratops* which is typical of the Ceratopsidæ. The complete skeleton will probably show characters sufficiently diverse to warrant founding a new family to include *Leptoceratops* and *Brachyceratops*.

The animal would have been not more than four feet in height, and the body was correspondingly short, with tail relatively longer than in any described genus. The skull was short, without even a vestigial nasal horn, and the lower jaws are extremely short and deep.

***Leptoceratops gracilis* gen. et sp. nov.**

Type of genus and species, No. 5205, parts of skull and jaws, including nasals, maxillaries, portions of the orbital border, back part of crest, dentary, prementary and splenial. A series of articulated caudal vertebræ. A complete fore limb and parts of hind limbs.

Horizon and locality. Edmonton Cretaceous, Red Deer River, Alberta. Three miles above Tolman Ferry. About four hundred feet above the Pierre.

Generic and specific characters. Skeleton small. Skull short and deep, without nasal horn. Crest with a high thin sagittal ridge, posterior border of crest smooth; squamosal extending to extreme posterior border of crest. Teeth single-rooted.

Dentary massive, short and deep, with less than fifteen rows of teeth; splenial large extending to symphysis. Predentary long and narrow. Manus with digits I, II and III terminating in hoofs; carpals ossified, ulnare and radiale large. Femur straight, with fourth trochanter comparatively large. Tail long and deep, with high slender spines and long chevrons.

The various skull bones are so different from those of related genera that, in view of their fragmentary nature, it seems unwise to even sketch an outline of the skull. In all the material there is no part of a horn core nor do the adjacent parts suggest the presence of supraorbital or nasal horns.

The nasals (Fig. 1) are united by continuous deep tongue and groove suture. They are not perfectly symmetrical and are strikingly different

from those of any described member of the Ceratopsia. The right nasal, which is best preserved, is contracted anteriorly and the extreme anterior end is broken but a portion of the superior border of the nares is preserved, enough to show the narial opening to have been small and far forward, as it is in the Monocloniid Ceratopsia. The position and extent of the ascending process of the premaxillary is shown just in front of the nasal suture and this contact shows the process to have been long, thin, and deep. The full length of the sutural union of the nasals is preserved, measuring 168 millimeters.

The external surface of each nasal is roughened by fine rugose lines but there is not the slightest indication of an incipient horn. The internal surface is smooth with prominent longitudinal ridges marking the course of the nares superiorly. The posterior end is expanded much wider than the anterior end and a part of three

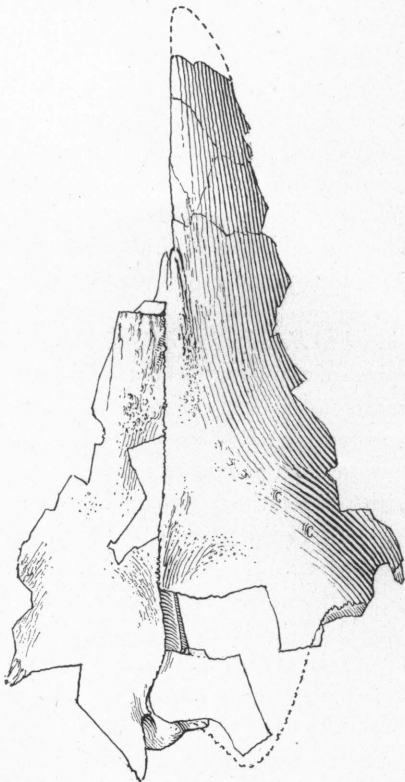


Fig. 1. Nasals, top view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

sutural contacts are preserved, those of the frontal, prefrontal, and lachrymal.

The premaxillaries are not preserved but the opposing surface of the prementary shows that they were short as in *Brachyceratops*.

The maxillaries are incomplete but appear to have been shorter than in *Brachyceratops*, with less than 20 rows of teeth. In each maxillary there are several complete teeth (Fig. 2) slightly smaller than those of *Triceratops* and of similar form but the root is single whereas in other known *Ceratopsian* genera the roots of both maxillary and dentary teeth are bifid.

Bones of the orbital region, the palate, the jugal, and the quadrato-jugal are so broken that little can be determined of their complete form or relation to adjacent parts.

The central part of the crest or frill is strikingly different from any described form. The posterior half (Fig. 3) is a thin, comparatively flat plate with a high, central ridge on the dorsal surface. It is narrower transversely than in *Brachyceratops* and there is no indication of lateral fontanelles. The posterior border is smooth and forms a straight line at right angles to the median dorsal ridge. The more complete left half shows a part of the sutural surface for the squamosal which extended back to the extreme end of the crest. The squamosal was probably more extensive than in *Brachyceratops*.

The dentary, prementary and splenial of the right lower jaw are preserved and they differ materially from the same elements of allied genera. The jaw is shorter and deeper than in *Brachyceratops* and when oriented with the opposite side formed in cross-section a narrow V.

The prementary (Fig. 4B) shows the usual *Ceratopsian* form but it is relatively longer and comparatively heavier than in any described genus. The surface that opposed the premaxillary is short and narrow and the posterior process that overlapped the dentary extends back to the symphysis which is the deepest point of the jaw, under the middle of the dental series.

The dentary (Figs. 4A and 5) is unusually short and deep with a high coronoid process. The symphysis instead of reaching the end of the dentary as in *Triceratops* is confined to a narrow area below the middle of the dental series and the jaws were united chiefly by the powerful prementary. The sutural surface shows that the splenial extended as far forward as the symphysis. The broken borders of eleven alveoli are preserved and probably two more have been entirely broken off. The mandibular teeth (Fig. 6) like those of the maxillary are single-rooted. On the enamel surface there is a high median ridge and several weaker parallel ridges that corresponded to the denticles on the border of the unworn tooth.

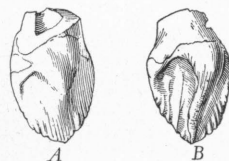


Fig. 2. Upper tooth, unworn. A, outer surface; B, inner surface. *Leptoceratops gracilis*, type, No. 5205, nat. size.

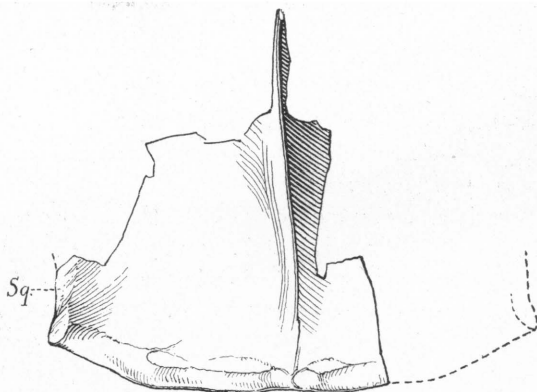


Fig. 3.

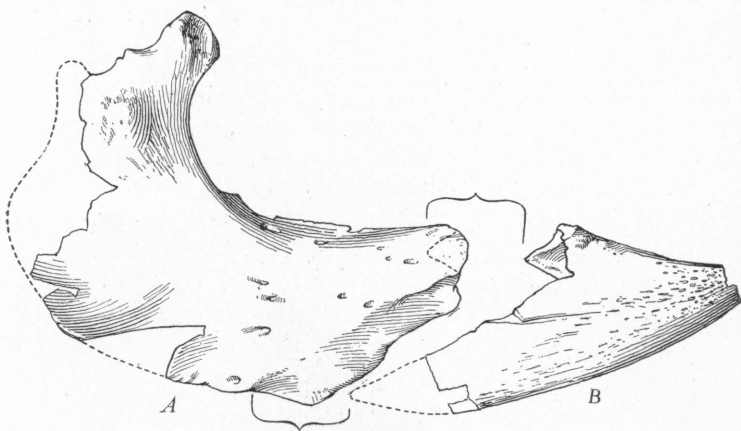


Fig. 4.

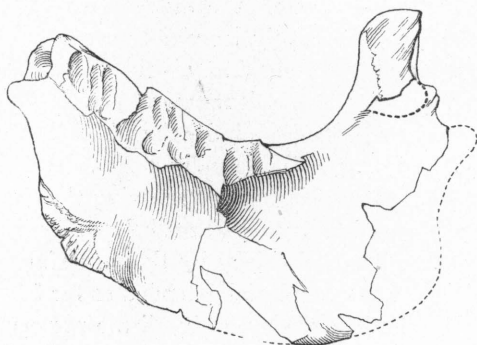


Fig. 5.

Fig. 3. Posterior end of crest; Sq., squamosal articulation. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 4. Right lower jaw. A, dentary; B, prementary. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 5. Right dentary, inside view. *Leptoceratops gracilis*, type, No. 5205, nat. size.



LEPTOCERATOPS GRACILIS. Type.

The splenial (Fig. 7) is much wider than in *Triceratops* or allied genera and extended up over a considerable part of the inner surface of the dentary.

Parts of the vertebral column are represented in both specimens, including four presacral centra, one caudal and three united sacral of the larger individual and twenty-six caudals of the smaller specimen, twenty-four of which are articulated.

The presacral centra (Fig. 8) are short antero-posteriorly, deeply excavated on the sides and the articular faces are almost circular. Large rib facetes are present, low down on the anterior borders.

The sacral centra, probably from the posterior end of the sacrum, are long, moderately constricted and the inferior surfaces are rounded as in *Monoclonius crassus*.

The caudal series (Figs. 9 and 10) are characterized by extremely high slender spines, proportionately higher than in any described *Ceratopsian*, and long chevrons. The articular faces of the centra are rounded and seven bear transverse processes. In both of these specimens the spines are not thoroughly coössified to the centra. Several anterior and posterior caudals are missing and the preserved series probably represents about half of the complete tail.

The fore limb (Plate XLII) is in general structure like that of *Triceratops* with similar muscular attachments but the individual bones differ somewhat in form and are more nearly comparable to those known in *Monoclonius*.

The scapula and coracoid (Fig. 11) are curved more than in *Triceratops* or *Monoclonius* and the blade of the scapula is less expanded, long and slender.

The humerus (Fig. 12) is comparatively slender, as in *Monoclonius*, but its proximal end is less expanded and the radial crest terminates above the middle of the shaft, which is round.

The ulna (Fig. 13) differs from *Triceratops* in having a shorter olecranon process.

The radius (Fig. 14) is a round rod with expanded ends and differs very little from that of *Triceratops*. The manus (Fig. 15) is complete and at present this is the only complete fore foot known in the *Ceratopsia*. The bones were found practically in the position in which they are assembled. The carpals are completely ossified and distributed in two rows, a large ulnare and radiale forming the proximal row and three small irregularly rounded bones in the distal row. The latter were not in the position indicated but close by. The metacarpals are more compact than in *Triceratops* and the ends (Fig. 16) present smooth articular surfaces allowing free movement of the phalanges. In *Triceratops* the ends of the metacarpals were padded with cartilage like the Saurapoda. Terminal hoofs are present only on digits I, II, and III, and they are narrow and pointed. The phalangeal formula is 2, 3, 4, 3, 1.

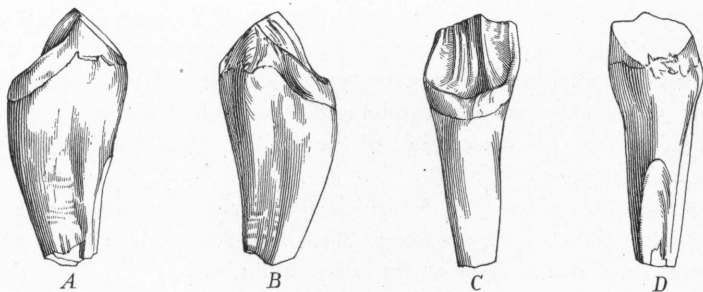


Fig. 6.

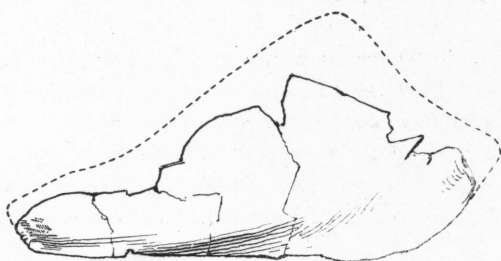


Fig. 7.

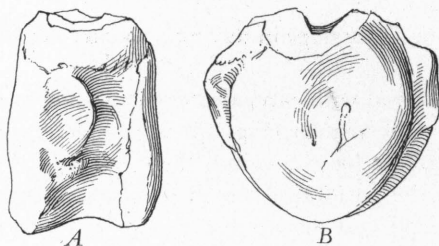


Fig. 8.

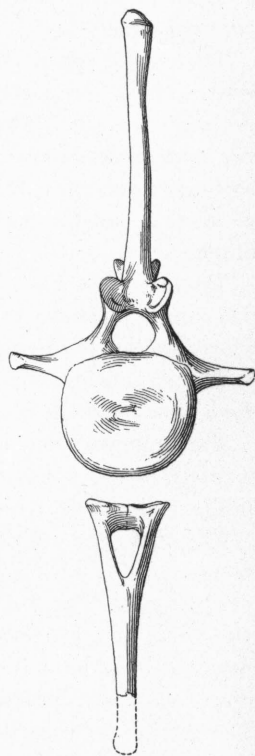


Fig. 9.

Fig. 6. Lower tooth, worn. A, anterior view; B, posterior view; C, outer view; D, inner view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 7. Splenial. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 8. Presacral centrum. A, left side; B, posterior end. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 9. Anterior caudal vertebra and chevron. *Leptoceratops gracilis*, type, No. 5205, nat. size.

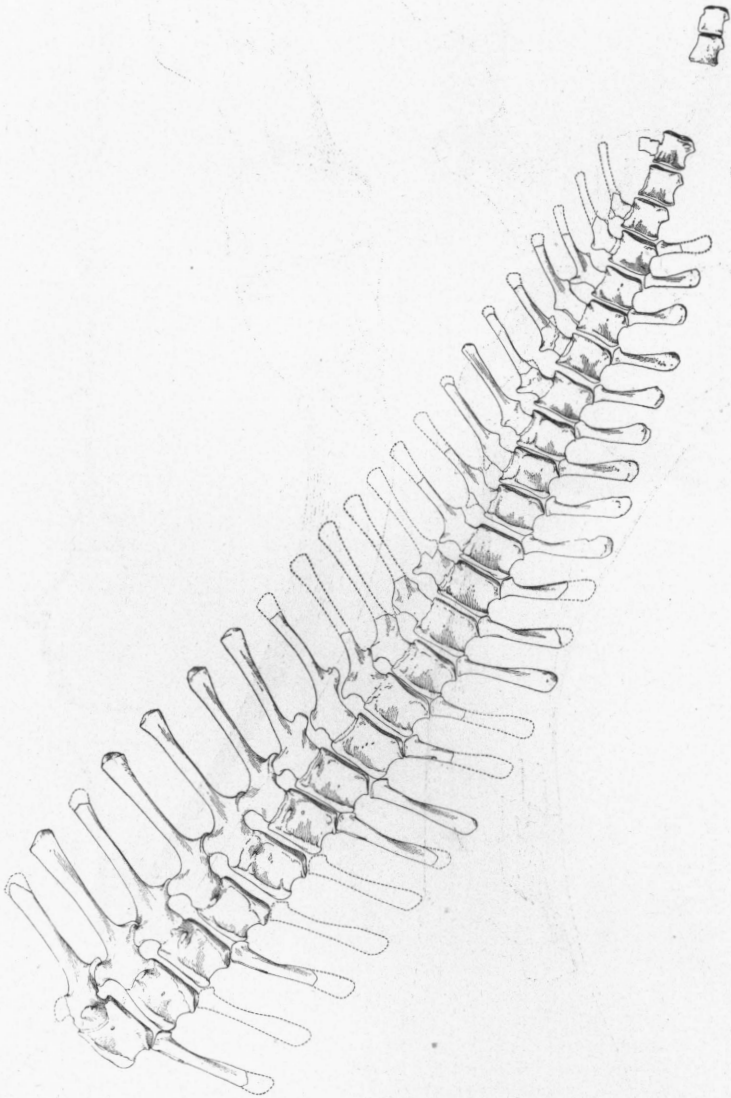


Fig. 10. Caudal series, 24 articulated. *Leptoceratops gracilis*, type, No. 5205, nat size.

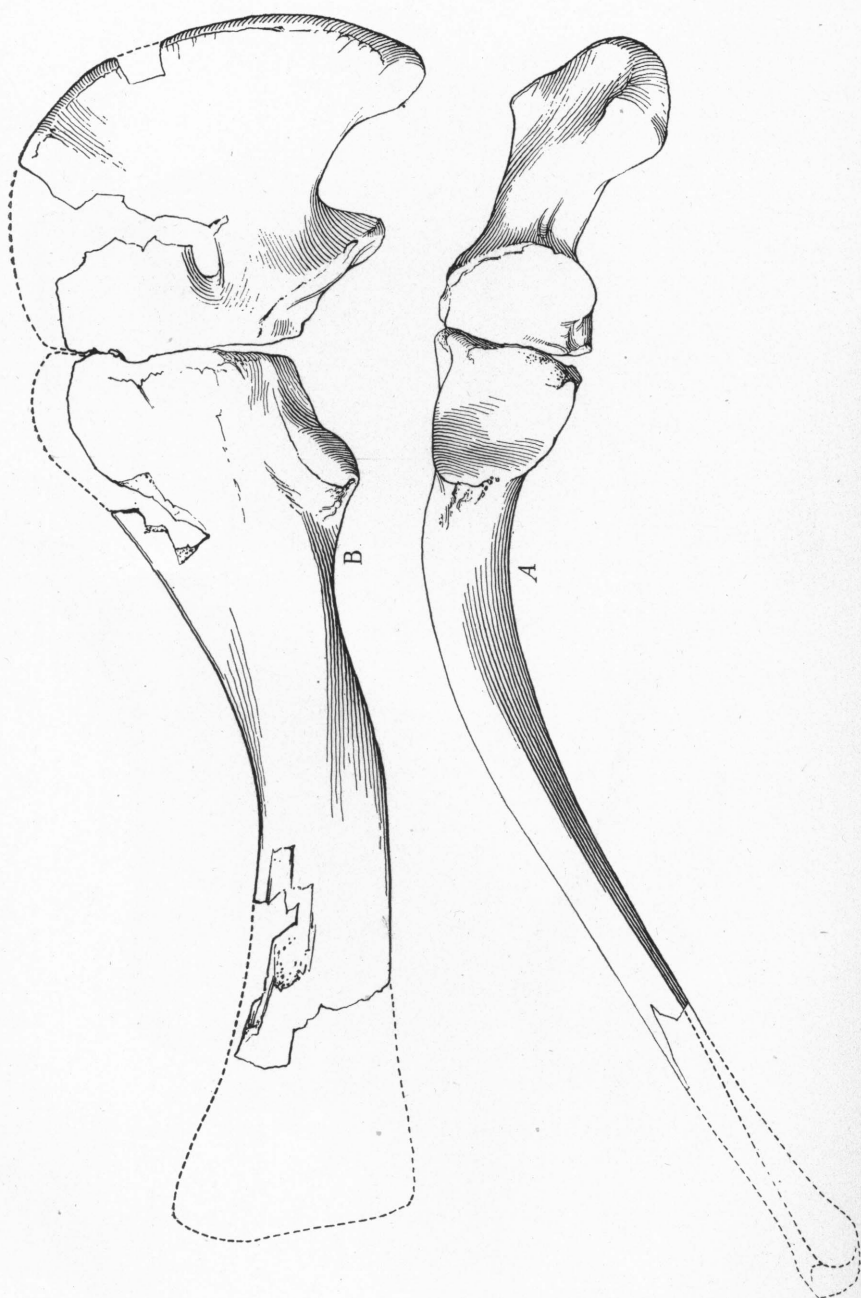


Fig. 11. Right scapula and coracoid. A, lower border; B, outer view. *Leploceratops gracilis*, type, No. 5205, nat. size.



Fig. 12. Right humerus. A, posterior view; B, anterior view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

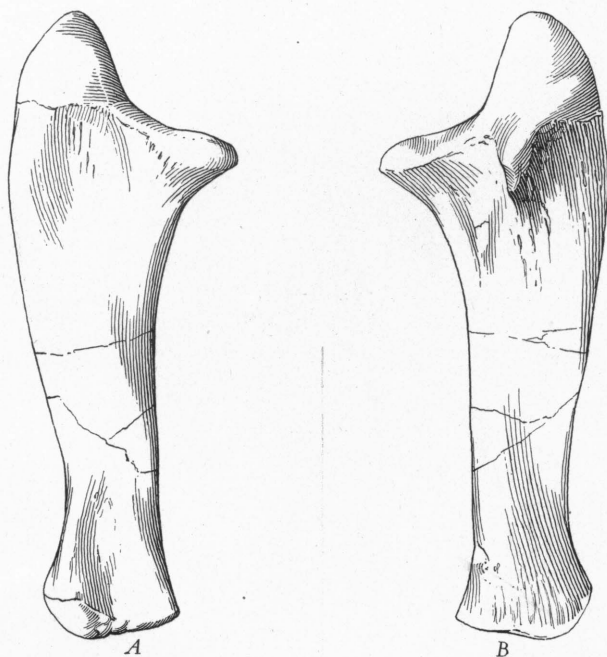


Fig. 13.

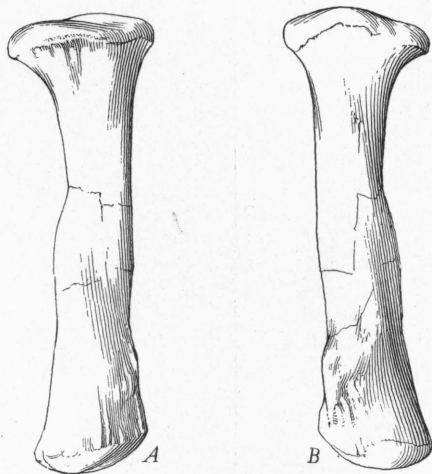


Fig. 14.

Fig. 13. Left ulna. A, posterior view; B, anterior view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 14. Left radius. A, outer view; B, inner view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

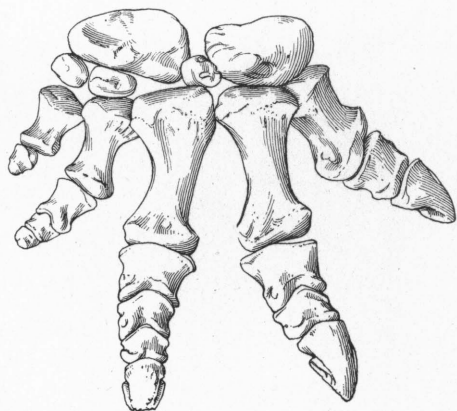


Fig. 15.

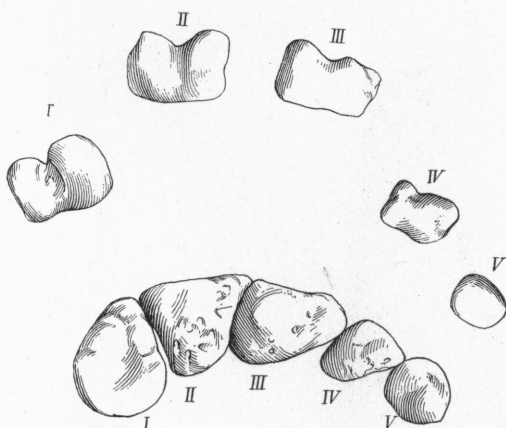


Fig. 16.

Fig. 15. Right manus. *Leptoceratops gracilis*, type, No. 5205, nat. size.

Fig. 16. Articular ends of right metacarpals. *Leptoceratops*, type, No. 5205, nat. size.

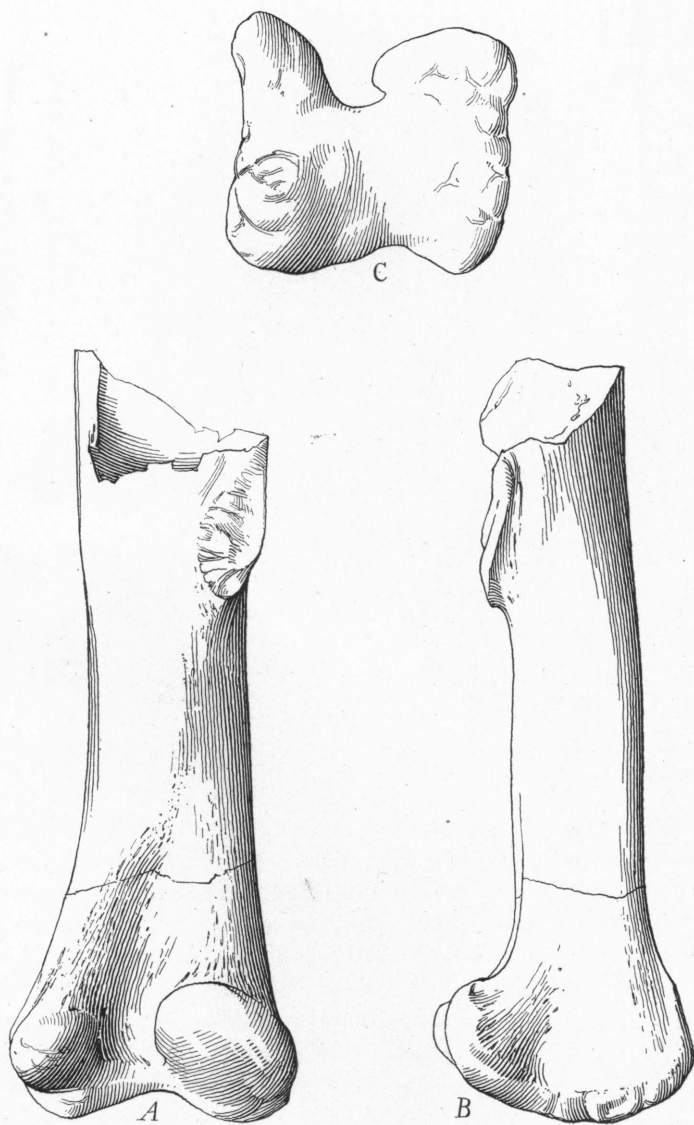


Fig. 17. Left femur. A, posterior face; B, inside; C, distal end. *Leptoceratops gracilis*, type, No. 5205, nat. size.

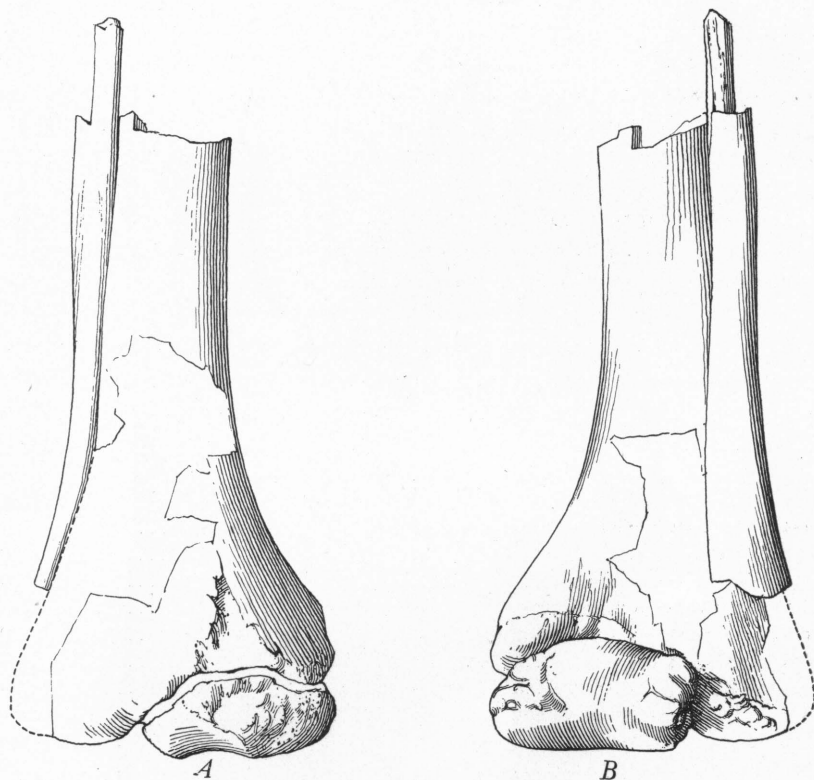


Fig. 18. Left tibia, fibula and astragalus. A, posterior view; B, anterior view. *Leptoceratops gracilis*, type, No. 5205, nat. size.

The femur (Fig. 17) presents several characters that distinguish it from any known in related genera. The shaft is practically straight, round in cross-section and the distal articular face is at right angles to the shaft with borders only slightly reflexed anteriorly and posteriorly. From this type of femur it is evident that the limb was normally carried straight. In outline the distal end is almost square with a deep intercondylar notch, the external about one half as wide as the internal condyle. The fourth trochanter is situated above the middle of the shaft and well developed. It is comparatively larger than in any described Ceratopsian and its large size is correlated with the long tail.



Fig. 19. Phalanges of the pes. *Leptoceratops gracilis*, type, No. 5205, nat. size.

The tibia and fibula (Fig. 18) are developed as in *Triceratops* but the

fibula is proportionately smaller and closer to the shaft of the tibia. Like all of the other limb bones in this specimen the shafts are round as in *Monoclonius*. Distally the tibia is expanded, with surface for attachment of the fibula less extensive than in *Triceratops* or *Monoclonius*. The astragalus is proportionately larger than in *Triceratops* and the calcaneum was evidently reduced in size.

The number of digits in the pes is not determinable. Several phalanges are preserved (Fig. 19), similar in form but larger than those of the manus. The terminal phalanges are long and narrow like those of *Monoclonius* and *Ceratops*.

Leptoceratops is related more closely to *Brachyceratops* than to other *Ceratopsia* and from the material now available the two genera appear to be distinguished from allied genera by characters of at least subfamily rank.

Measurements.

| | mm |
|--|-----|
| Crest, width between squamosals at posterior end | 196 |
| Dentary, extreme length | 235 |
| " depth at symphysis | 100 |
| " height of coronoid process above symphysis | 223 |
| Predentary, width at contact with dentary | 90 |
| Scapula and coracoid, length | 425 |
| Humerus, length | 290 |
| " width at proximal end | 124 |
| " " " distal " | 90 |
| Ulna, length | 224 |
| Radius, " | 167 |
| Femur, transverse width of distal end | 100 |
| " anteroposterior width of distal end | 94 |
| " distance from lower edge of trochanter to end | 187 |
| Tibia, width across distal end | 117 |