CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY
(*Continuation of Contributions from the Museum of Geology*)
UNIVERSITY OF MICHIGAN

VOL. IV, No. 3, pp. 81–91 (11 text figs.) DECEMBER 1, 1932

ON THE CAUDAL REGION OF *COELOPHYSIS SP.* AND ON SOME NEW OR LITTLE KNOWN FORMS FROM THE UPPER TRIASSIC OF WESTERN TEXAS

BY
E. C. CASE

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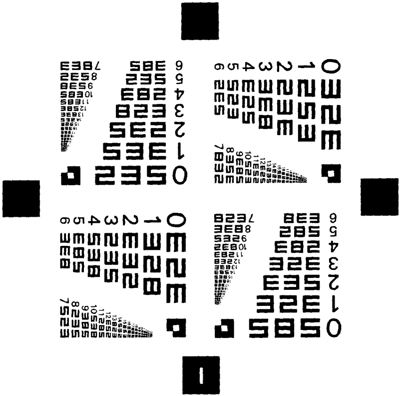

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(*Continuation of Contributions from the Museum of Geology*)

UNIVERSITY OF MICHIGAN

Editor: EUGENE S. MCCARTNEY

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ON THE CAUDAL REGION OF *COELOPHYSIS SP.* AND ON SOME NEW OR LITTLE KNOWN FORMS FROM THE UPPER TRIASSIC OF WESTERN TEXAS

By E. C. CASE

IN A previous paper the author [1] has described a portion of the vertebral column of a small dinosaur from Crosby County, Texas. In the summer of 1931 the expedition from the Museum of Paleontology of the University of Michigan recovered from the Upper Triassic beds of Potter County, Texas, a large portion of the tail of a small dinosaur, which is referred to the same genus. The specimen, number 13670 U.M., was found in practically undisturbed position on a small slope of purple clay filled with coprolites, teeth, and fragments of bone. A small rill channel had displaced a few vertebrae in the middle of the series, and the anterior end was buried in the clay; the posterior end was exposed, and a few of the vertebrae had disappeared.

The series consists of thirty-one complete vertebrae and three half-vertebrae, with the certainty of a few lacking at the posterior end (see Fig. 1). The anterior vertebra, represented by the posterior half, is either the first postsacral or very nearly so. To judge from isolated caudal vertebrae in the collection of the Museum of Paleontology, the posterior extremity lacks from six to twelve vertebrae. The series laid out in a straight line measures 111 centimeters. All the vertebrae are shallow-amphicoelous and fit closely together, leaving no facets or any obvious space for the articulations of chevrons, though the presence

[1] Case, E. C., "The Vertebral Column of *Coelophysis* Cope," *Contrib. Mus. Geol.*, Univ. Mich. Publ., Vol. II, No. 10, pp. 209–222, 1927.

of such elements would most certainly be expected. The elongate centra were mostly broken across in the median region and show the large central cavity and the thin walls characteristic of the *Coelosauria*. The central cavity is less well developed in the most anterior centra. The lower face of the centrum is rounded transversely throughout the series, with no trace of the longitudinal groove so prominently developed in the posterior caudals of the phytosaurs.

The most anterior vertebra, the thirty-fourth from the posterior end, represented by the posterior half, has well-developed transverse processes attached to the neural arch. The processes are thin, but of considerable antero-posterior extent, nearly equal to the whole length of the neural arch. The posterior zygapophyses are elevated some distance above the edge of the centrum and have well-developed articular faces. The neural spine is lost, but was attached to the full extent of the arch and was evidently quite high, as shown by the thirty-second vertebra.

The next vertebra, the thirty-third from the posterior end, is very similar to the thirty-fourth, but the attachment of the transverse process is shorter. The neural spine is lost.

The thirty-second vertebra is nearly complete; the posterior edge of the neural spine rises almost straight upward from the posterior zygapophyses and descends obliquely to the anterior zygapophyses; the transverse process is still prominent, but the attachment is short, not extending anterior to the middle of the arch. The edges of the centra come into close contact with those of the next vertebra. The centrum is beginning to be elongate.

From the thirty-first vertebra posteriorly the spines are broken away; they gradually diminished in size until the last trace is visible on the twenty-third or twenty-fourth. The transverse process gradually diminished with the spines, and the last trace is found on the same vertebra. The change in the series from the thirty-first to the twenty-fifth is equally gradual in all characters; the last trace of a possible chevron attachment disappears with the spines and the transverse processes. From the twenty-fifth backward the centra are almost cylindrical, with only slight rugosities indicating the position of the spines and transverse

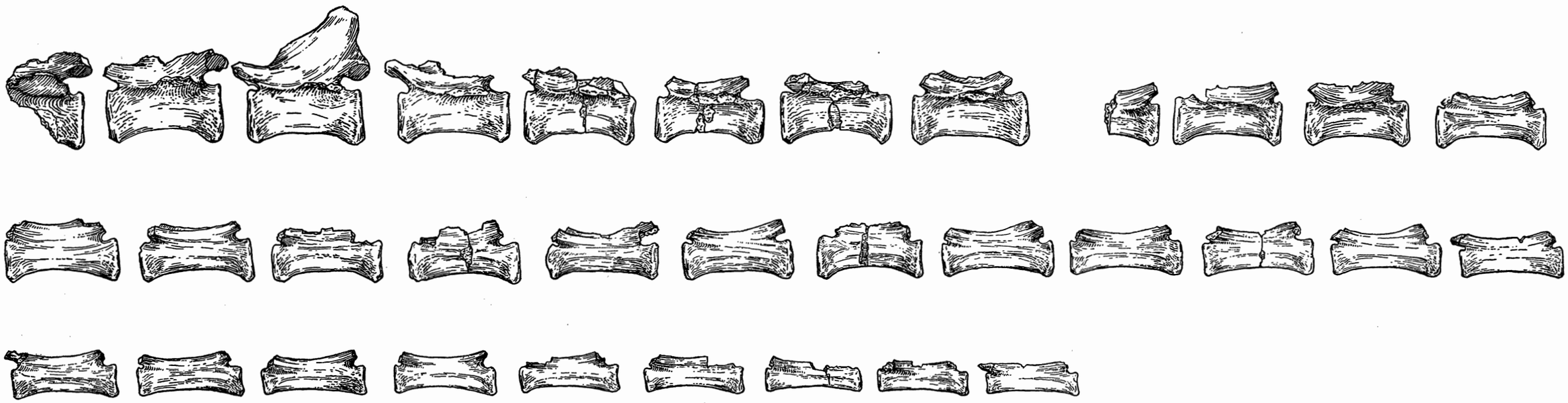


FIG. 1. Series of caudal vertebrae of *Coelophysis sp.* from the first (?) postsacral to near the extremity of the tail, number 13670. × ⅔

processes. The lower face of the centrum is round, without a trace of ridge or groove. The zygapophyses were continuous throughout the series and engaged between the vertebrae even

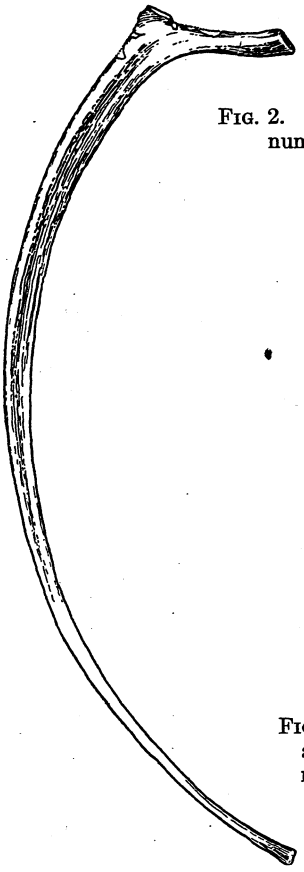


FIG. 2. Complete thoracic rib, number 13670. × ⅔

FIG. 3. Proximal half of a more posterior rib, number 13670. × ⅔

in the most posterior of the series, near the extremity of the tail. In the last vertebra preserved the left anterior zygapophysis is complete and stands well forward of the anterior end of the centrum.

There are three ribs present. One, a mid-thoracic or anterior thoracic, is very nearly perfect (see Figs. 2–3). This rib is very

slender, with an expanded proximal end and the capitulum borne on a long process. The other ribs are fragmentary, but show the definite separation of the tuberculum and capitulum. The nearly complete rib gives some idea of the shape and size of the thoracic cavity.

There are in the collection of the Museum of Paleontology many small, elongate, posterior caudal centra which have all been regarded as probably belonging to the same form of small dinosaur, but they are clearly separable into two groups by the presence of a definitely marked antero-posterior groove on the lower face of the centra in some and its total absence in others. Such different vertebrae were originally assigned to different parts of the tail, but specimen 13670 shows the absence of the groove throughout the series. The discovery of a considerable portion of the caudal series of vertebrae in association with the pelvis and armor of a phytosaur, specimen 13950, shows that the caudal centra with a groove on the lower surface and well-developed chevron facets belong to the phytosaurs and not to some dinosaur, as previously supposed.

DINOSAUR TEETH

There are numerous dinosaur teeth in the collection, gathered from all the localities investigated in Texas. They are characteristically thin transversely, with an almost perfectly narrow-oval section, which distinguishes them readily from the teeth of phytosaurs. They are all slightly recurved, with serrations on the anterior and posterior edges of the mature teeth. In the smaller teeth there are no serrations on the anterior face, or else they are very imperfect ones. The teeth range in size from a crown length of less than a centimeter to 6.5 centimeters; an imperfect tooth indicates a length of 7–8 centimeters when entire (Fig. 5). The smaller teeth frequently show a coarse wavy surface so feebly developed that it can be seen only when the tooth is held so that the light is reflected at the proper angle. This is very persistent and is, perhaps, a feature of immaturity, since it is very slightly developed or absent on the larger teeth. Figure 4 of specimen 13766 shows this wavy appearance. In this tooth the

serrations on the anterior edge are very feeble and near the tip; the serrations on the posterior, concave, edge are oblique to the axis of the tooth, and are of unequal size. This may also be a feature of immaturity.

A large tooth, Figure 5 of specimen 13765, shows faint traces of the wavy marks near the base of the crown; the serrations are equally developed on the anterior and posterior sides and are all of equal size and arranged at right angles to the axis of the tooth.

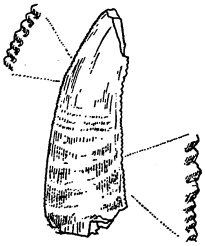


FIG. 4

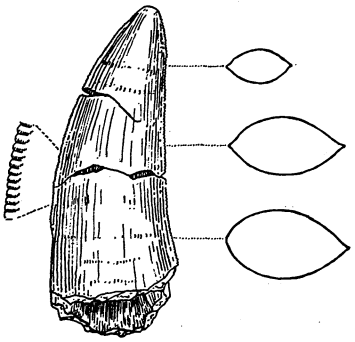


FIG. 5

FIG. 4. A small dinosaur tooth, showing wavy surface and crenulation of the edges enlarged, number 13766. × 2

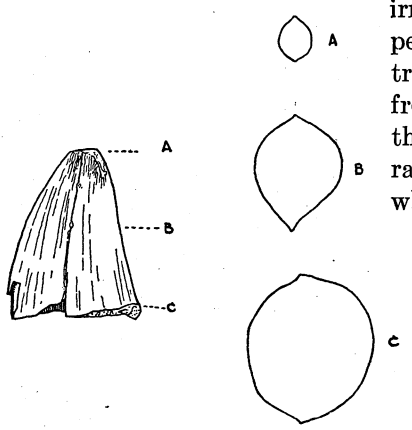
FIG. 5. A large dinosaur tooth with cross-sections, and crenulation of the edges enlarged, number 13765. × ⅔

There are four specimens in the collection which definitely indicate new forms that cannot be referred with certainty to any taxonomic position. They are here described and figured in the hope that other workers may be able to add something to our knowledge of them. These specimens, with several others, less well preserved, indicate the existence of numerous small forms which await discovery and description. Because of the uncertainty of their relations they are described under their catalog numbers.

Specimen 14327 U.M. — This is the crown of a large tooth, Figures 6–7, resembling the posterior teeth of the phytosaurs, but much heavier and blunter than any previously seen. It was presented to the Museum of Paleontology by Mr. Floyd V. Studer,

of Amarillo, Texas, and reported by him to have been obtained from the red beds of Donley County, Texas, by a friend. This, with the inherent evidence of the specimen, makes the Triassic age very certain.

Aside from the heavier and blunter form, the tooth corresponds to the posterior teeth of the phytosaurs in all respects; one side is slightly larger than the other; the anterior and posterior edges are drawn into a blunt but decided edge; and the posterior edge shows obscure crenulations. The surface of the tooth, especially near the apex, is marked with a fine, but very distinct, irregular sculpture giving the appearance of the rough bark of a tree. The difference of the tooth from all other known forms is in the very broad base and the rapid contraction to the apex, which has been slightly blunted,



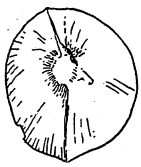


FIG. 6 FIG. 7

FIG. 6. Antero-posterior view of a large phytosaur tooth of a new form, with cross-sections, number 14327. × ⅔
FIG. 7. Upper view of the same tooth. × ⅔

apparently by wear. The discovery of this tooth suggests that the phytosaurs may have developed a stock of blunter-toothed forms adapted to an increasingly durophagous diet. This would not be at all surprising, since the development of such forms from more actively predacious forms has occurred repeatedly in the reptilia.

Specimen 14326 U.M. — In 1931 the author collected a small basioccipital bone from a patch of gray clay in beds of Cerita de la Cruz Creek in Potter County, Texas (Figs. 8–9). The clay was

one of the patches in which occur numerous coprolites, teeth, fragments of bone, and other débris indicative of the assemblage of thoroughly macerated material. The lower surface of the specimen shows a well-developed single condyle and is obscurely divided by a median ridge. The anterior portion of this surface is perforated by several minute foramina which cannot be traced into the bone. On either side of these are the broken bases of what were evidently rather strong descending processes.

The upper face is largely taken up by an irregular surface, evidently the site of cartilaginous attachment to the exoccipitals. The anterior one fourth is occupied by two clearly marked shallow pits with smooth surfaces. These are separated by a narrow roughened space, as if a cartilaginous septum had existed between the

FIG. 8. Lower view of a basioccipital of an unknown form, number 14326. × ⅔

FIG. 9. Upper view of the same bone. × ⅔

pits. At the posterior outer corner of each pit there is the opening of a canal or channel into the body of the bone. The openings are irregular in form, but symmetrical in position and outline on the two sides, indicating the presence of some definite and important structure.

The author has been unable to find any form comparable to this specimen in the proportional great length of the basioccipital or in the part it plays in the support of the brain. Nor can he find any form of brain which has structures which would be impressed upon the basioccipital, occupying the pits. Certain vague suggestions of a serpentiform body can be entertained as only hypothetical.

Specimen 13171 U.M. — This is an imperfect vertebra, shown in Figure 10. The obviously striking peculiarity is the procoelous character of the centrum. The height of the neural arch, the

decided slant of the centrum downward and to the rear, making the posterior face notably lower than the anterior, and the anterior position of the origin of the transverse process are indicative of a cervical position. The scarcity of vertebrae of the procoelous type in the Triassic makes of particular interest this specimen and those described below.

The author is aware of only a few occurrences of this type. Huene [2] has described two procoelous vertebrae of very similar character from the Muschelkalk of Germany, under the names *Chelyzoon latum* and *C. blezingeri*. A third specimen, from Bathurst Island, *Arctosaurus osborni* Adams, is tentatively placed with *Chelyzoon* by Huene in the same paper because of a probable procoelous condition, and it is suggested that all three may belong with the Chelonia. *Arctosaurus* has been considered by most authors to be a dinosaur and is placed by Hay in the family Anchisauridae. The specimen here described and figured resembles most closely Huene's *Chelyzoon*, but the author is very hesitant to follow Huene's tentative suggestion of chelonian affinities.

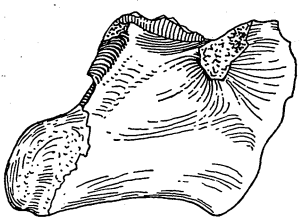


FIG. 10. Vertebra of an unknown form, number 13171. $\times \frac{4}{3}$

Specimen 14325 U.M. — Under this number are cataloged seven small vertebrae, three of which are shown in Figure 11. They are all deeply procoelous. The sides of the centra are nearly straight, with no trace of transverse process or rib. The neural spines rise from the posterior portion and do not extend over three quarters of the way to the anterior end. The upper edge of the spine is expanded into a narrow table, the upper surface of which is marked by a slight but definite rugosity. The lower surface of the centrum is taken up in its entire width by a shallow groove which extends the length of the centrum. There is no evidence of the presence of facets for a chevron on any of the centra. All the vertebrae, even the smallest, which is only 7.5 mm. in total

[2] Huene, F. von, "Übersicht über die Reptilien der Trias," *Geologische und Paleontologische Abhandlungen*, N. F., Band 6, Heft 1, pp. 50–51, 1902.

length, have well-formed zygapophyses, which were evidently functional.

All but one of these vertebrae were found scattered over an area of a few square yards; several fragments of small elongate limb bones and indeterminate fragments of other bones were found on the same spot, but there is no certainty of any association of the various specimens.

The author has found nothing comparable to these vertebrae. The elongate form and total lack of transverse processes or ribs

FIG. 11. Three vertebrae of an unknown form, number 14325. × ⅔

would suggest that they are caudal vertebrae, but this is not in consonance with the exceptionally deeply procoelous centra, the well-formed zygapophyses, and the expanded tabular apices of the neural spines. Moreover, some indication of the presence of chevrons would be expected if they were caudal vertebrae.

A SECOND SPECIMEN OF *XENOGNATHUS OBSCURUS*

In 1922, and again in 1928, the writer [3] described as a new genus and species of fish (probably), under the name *Xenognathus obscurus*, a fragment of a lower jaw carrying a single tooth and the base of another. It came from the Dockum Triassic of Crosby County, Texas. Recently Mr. Wm. S. Strain, of Canyon, Texas, discovered a second specimen of this genus and species, which confirms most of the points of the original description and permits some addition. This specimen has been most generously donated to the Museum of Paleontology and carries the number 14356. It consists of a portion of the left lower jaw, with two teeth in

[3] Case, E. C., *New Reptiles and Stegocephalians from the Upper Triassic of Western Texas*, Publ. 321, Carnegie Institution of Washington, p. 84, Fig. 33E, 1922; *idem*, "Indications of a Cotylosaur and a New Form of Fish from the Triassic Beds of Texas, with Remarks on the Shinarump Conglomerate," *Contrib. Mus. Pal.*, Univ. Mich. Publ., Vol. 3, p. 6, Pl. I, Figs. 6–8, 1928.

place and a single, isolated, tooth, probably of the left upper jaw. The fragments were found close together on a slope in the Palo Dura Canyon.

The fragment of lower jaw has a larger posterior tooth, oval in section, with a swollen base fused to the jaw and with a chisel cutting edge beveled toward the outer side by wear. The upper part of the sides of the crown are marked by sharp ridges separating wider grooves, all slanting anteriorly as they rise on the crown. In this last character the tooth differs from the genoholotype, in which the crown is smooth.

Immediately in front of the large tooth there is a much smaller one, nearly conical, but with the base slightly oval and the whole

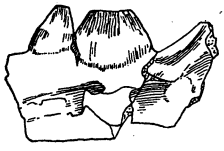


FIG. 12

FIG. 13

FIG. 14

FIG. 15

FIG. 12. Inner side of the left lower jaw, number 14356. × 1
FIG. 13. Upper view of the same bone. × 1
FIG. 14. Lateral view of upper tooth of number 14356. × 1
FIG. 15. Upper view of the same bone. × 1

slightly inclined to the rear. The position of this tooth is marked in the type by the broken, acrodont base. The apex is slightly worn and shows only a trace of the fluting on the outer side.

As in the type, there is no indication of other teeth, and if any were present it was after an interval and at the anterior end.

The ramus of the jaw was very thin laterally, not over half the thickness of the base of the tooth at its lower edge, but rather deep. The Meckelian cavity, shown on both specimens (Figs. 12–15), did not extend beyond the anterior end of the larger tooth. Immediately posterior to the larger tooth the jaw rose abruptly, but, unfortunately, only the beginning of this rising portion is preserved.

The supposed upper tooth is fused with a fragment of bone, which shows a straight outer side and a concave inner side, probably a portion of the roof of the mouth. The tooth is slightly

larger and heavier than the lower tooth, oval in section at the base and slightly broader posteriorly than anteriorly. The upper sides of the crown are marked by the same sharp flutings slanting anteriorly. The cutting edge is beveled inwardly by wear. The fragment is broken off sharply at the anterior edge of the tooth and gives no evidence of a second tooth, which was probably present.

The dimensions of the larger tooth in the lower jaw are almost exactly the same as those in the type.

Unfortunately, the second specimen gives us little additional information concerning the form or habits of this animal, one of the strangest that has come from the upper Triassic beds of North America. To the writer it still seems most probable that the fragments are parts of the skull of some durophagous fish, but this may be proved erroneous by later discoveries.

(*Continued from inside of front cover*)

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