

**Article XXX.**— ADDITIONAL DESCRIPTION OF THE GENUS  
*ZATRACHYS* COPE.

BY E. C. CASE.

During the past summer, 1906, the author collected in the upper portion of the Clear Fork division of the Permian, in Willbarger County, Texas, the anterior portion of the skeleton of a small amphibian, referable to the genus *Zatrachys* Cope, and doubtfully to the species *apicalis*. This specimen, No. 4736, consists of the shoulder-girdle, ten anterior dorsal vertebræ with ribs and overlying dermal plates, other ribs, and the forelegs and foot of a small adult amphibian not exceeding two feet in length. The exact horizon is unknown as the specimen was found in the bottom of a small wash, but it evidently came from the upper part of the Clear Fork beds, above the Wichita Conglomerate.

The genus *Zatrachys* was described by Cope in 1878<sup>1</sup> from the characters of the skull alone. Of the four species of this genus distinguished by Cope, *serratus*, *apicalis*, *conchigerus* and *micropthalmus*, *apicalis* is the only one in which the vertebræ or other portions than the skull were known or considered. This species was described in 1881,<sup>2</sup> as follows: "The summits of the neural spines are expanded and the superior faces of the expansion are tubercular and have a median prominence. The expansions are sometimes large, resembling the dermal bones of the crocodiles, and in that case the median prominence is a keel. On the smaller expansions the latter is a mere apex. There are narrow flat bones which I suppose to be neural spines which are ornamented with inosculating ridges. A capitular head of the diapophysis is compressed. The intercentra are well ossified, those preserved with a lateral notch. Inferior surface with crowded small fossæ, giving a delicate reticulate relief."



Fig. 1. Apex of neural spine of *Zatrachys apicalis*. Half natural size.



Fig. 2. Neural spine of *Zatrachys crucifer*. Half natural size.

In 1905<sup>3</sup> the author described a fragment of a dorsal spine from Texas under the name *Z. crucifer*. This consisted of a nearly perfect neural spine 54 mm. in height with the sides of the apex extended in cross arms (see Fig. 2). The upper surface of the spine is very coarsely rugose, with deep pits.

From the above it is evident that the genus *Zatrachys* is a very uncertain

<sup>1</sup> Proc. Am. Phil. Soc., Vol. XVII, p. 523.

<sup>2</sup> Am. Nat., Vol. XV, p. 1020.

<sup>3</sup> Journ. Geol., Vol. XI, p. 399.

assemblage but it seems better to hold the specimens together under this name than to disperse them under different generic names on uncertain grounds.

*Zatrachys* was one of the armored amphibians which developed during the Permian in the North American continent. Two others now known developed the same character. Of these *Dissorophus* was very perfectly protected, the whole back being covered by a series of dermal plates corresponding in number to the ribs and covering the animal as the plates of an armadillo cover that mammal. The other, *Trimerorhachis*, was supplied with numerous strong dermal plates but as yet the plates have not been discovered in position, so that neither their arrangement nor extent is known.

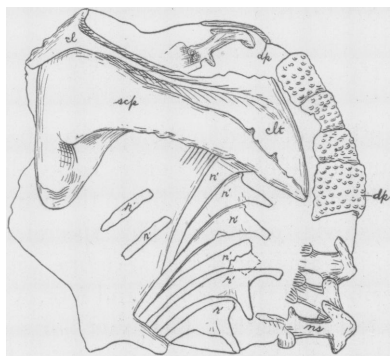


Fig. 3. Outline drawing showing the bones of left side of *Zatrachys apicalis* (?) in No. 4736. *Cl.*, clavicle; *clt.*, cleithrum; *scp.*, scapula; *dp.*, dermal plate; *ns.*, neuraspine; *r.*, ribs of the anterior dorsal region. Half natural size.

*Description of the specimen.*—The shoulder-girdle is complete but the bones of the right side are in part covered by the bones of the right leg and foot which have been thrown up and back in process of fossilizing.

The scapula resembles that of *Eryops*; the shaft is elongate and slightly broadened at the distal end. There is a deep and well formed cotylus but there is no trace of separate coracoid, procoracoid or epicoracoid.

The interclavicle is roundly shield-shaped, without any posterior prolongation. On the center of the lower face there is a prominence with articular edges for the inner edges of the clavicles.

The clavicles have the anterior end flat and roughly diamond-shaped with thin edges. The lower part of the inner edge articulates with the prominence on the lower face of the interclavicle and the upper part of the edges meet above the articulation with the interclavicle. The shaft is bent at an angle of about 45° to the anterior end. The section of the clavicle is like a capital L turned on its side. The long part of the L lies horizontally and the short part is turned downward and covers the outer edge of the cleithrum. The distal end reaches nearly to the posterior end of the scapula.



Fig. 4. Interclavicle, lower side. Half natural size.

The cleithrum. The posterior end is thin, wide, and closely applied to the surface of the scapula; it quickly contracts to a narrow shaft, at the same time gaining thickness until it stands as a narrow and high ridge on the surface of the scapula near the upper edge. The anterior end extends as far forward as the cotylus of the scapula.

The *humerus* has the form common to the amphibia of the Permian; the distal and proximal ends stand at an angle of about  $45^{\circ}$  to each other, and a strong deltoid process and ridge reach nearly to the middle of the shaft. There are well developed ect- and entepicondylar processes but no entepicondylar foramen.

The *radius* and *ulna* are well developed but the articular ends do not show particular characters. The proximal and distal ends of both bones are rather widely expanded.

The *foot*. There are six of the carpal elements preserved, seemingly in position. Between the distal ends of the bones is a small intermedium; at the distal end of each is a larger element in the position of the radiale and ulnare. The foot is somewhat turned so that the bone which lies at the end of the ulna may be either the ulnare or the centrale 2. Below the intermedium is a good sized bone, the centrale 1. The radial digit is relatively long, and there is a stout metacarpal and three phalanges. It is not certain that the last phalanx is the terminal one as the end of the digit is obscured by matrix. The other digits cannot be exposed without injuring the specimen.



Fig. 6. Anterior view of the neural spine of an anterior dorsal vertebra with section of overlying dorsal plate in position. Half natural size.

The *vertebral column*. There are 10 anterior dorsal vertebrae preserved. The anterior six have the dermal plates preserved in position, the posterior four have lost them. The centra of the vertebrae cannot be made out but the neural arches are all free and there is little doubt that the general form is similar to that of *Trimerorhachis*. There are well developed anterior and posterior zygapophyses and from the base of the posterior one a narrow, winglike process extends downward and outward for the head of the rib. This process was attached solely to the neural arch. The neural spines are stout and strong with the apex expanded and rugose. The expansion of the apex of the spine in the posterior vertebrae is more nearly circular, but even here the lateral edges are more extended than in the fore and aft edges. In the anterior vertebrae the sides become widely expanded, the projections extending outward and downward and meeting above in an angle, like an inverted V.

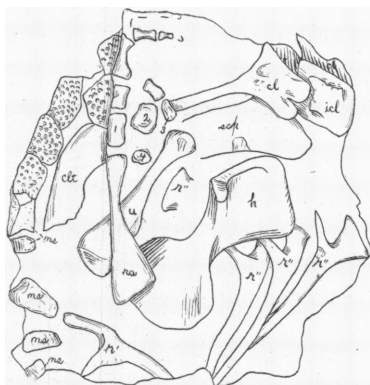


Fig. 5. Outline drawing showing the bones of the right side of *Zatrachys apicalis* (?). *Cl.*, clavicle; *icl.*, interclavicle; *clt.*, cleithrum; *scp.*, scapula; *h.*, humerus; *ra.*, radius; *u.*, ulna; *ns.*, neural spine; *r'*, rib of the anterior dorsal region; *r''*, ribs of the posterior dorsal region. Half natural size.

Each of the anterior six vertebræ has the neural spine overlain by a single dermal plate in the form of an inverted V closely conforming to the apex of the spine and closely applied to it. The two sides of the plate meet in an angle of  $120^{\circ}$  to  $130^{\circ}$  but there is no median ridge nor any trace of a suture to indicate that the plates were originally separate. The plates overlap each other from before backward and did not extend laterally far beyond the extension of the neural spine; the upper surface is rugose with deep pittings. There is no trace of any lateral plates overlying the ribs, and the condition of the specimen is such that if plates had existed they would very likely have been preserved. The distal ends of the scapula and the cleithrum lie under the edges of the dermal plates, and it is likely that in life they nearly touched the edges of the neural spines.

The *ribs* attached to the vertebræ have a slender single head but about a centimeter below the proximal end there is developed a thin triangular process which extends backward over the next following rib, and the point even reaches nearly to the second rib following. Below this process the ribs are flattened for some distance but gradually assume the rounded form again. In more posterior ribs, perhaps posterior dorsals, the head of the rib is widely expanded and thin; it contracts rapidly, and about a centimeter below the head there is given off a process to the rear as in the anterior ribs, but now the process is very slender and slants inward as well as backward. The rib is flattened proximally, more rounded distally.

Measurements.		mm.
Length of the humerus .....		54
Length of the radius .....		41
Length of the scapula (approximate) .....		60
Length of an anterior dorsal rib .....		45
Length of a posterior dorsal rib .....		35

This animal shows a simple phase of the armor assumed by the amphibians, probably in correlation with the development of the powerful dentition of the Dimetrodons. The position of the plates in *Trimerorhachis* is unknown, but they were large and probably lateral in position; *Dissorophus* well deserved Cope's name of a "batrachian armadillo"; in *Zatrachys* the armor was just beginning, perhaps, and was limited to the mid-dorsal line, the development of processes on the ribs, and the flattening of the ribs themselves must have been something of an element of defense. In neither *Z. apicalis* nor *Z. crucifer* are the dermal plates known; their existence is inferred from the condition of the neural spines which are sculptured with the same sort of pittings as occur in the specimen here described. It may be that the spines were unprotected by plates, in which case it will be necessary to give this form a new generic name.