

**Article XXVI.**—NOTES ON THE SKULL OF *LYSOROPHUS*  
*TRICARINATUS* COPE.

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The genus *Lysorophus* was first described by Cope from several vertebræ from the bone bed of eastern Illinois (Cope, '77). Later Case gave a more detailed account of the vertebral column (Case, '00 and '02). Finally Broili, from very full material, supplemented the description of the vertebræ and gave an account of the skull. He came to the conclusion that *Lysorophus* was entirely limbless and a member of an extremely primitive family of reptiles to which he gave the name Paterosauridæ (Broili, '04 and '04). This family he regarded as one of the original groups of reptiles, assigning to the reptiles a diphyletic origin. He says ('04): "Wir müssen also für die Reptilien eine diphyletische Entwicklung annehmen, deren eine Wurzel bei den amphibischen Stegocephalen zu finden, deren andere, aller Wahrscheinlichkeit nach, bei den Fischen zu suchen ist."

A series of five skulls in the collection of the American Museum, collected by the author in Texas in the summer of 1906, permits some addition to Broili's description of the skull. In one the palate is exposed and a careful preparation has revealed something of the interorbital structure. The bones of the upper surface show a practical agreement with the description given by Broili. The bone described by him as the postfrontal extends forward to the nostril and forms a portion of its border, it having the position usually occupied in the reptiles by the postfrontal, prefrontal and the lachrymal. The posterior angles of the skull and the region of the nostrils are wider than figured by Broili, but these may well be specific differences (Fig. 1, C).

The palate is distinctly amphibian. The posterior surface is formed by a large flat bone, undoubtedly a parasphenoid; in two specimens which show this bone there is a line dividing it into anterior and posterior portions, but it is impossible to say whether this is a simple break or a break following the line of a suture. In one specimen the posterior portion is directly continued into the occipital region forming a portion of the articulation; it is impossible to tell whether this occipital portion is a separate element or is continuous with the large plate. I take the large plate to be the parasphenoid plus the basisphenoid, with the basioccipital cartilaginous. It seems certain that Broili's assumption, that there was a basioccipital with

a single, reptilian condyle and that it has been lost, is wrong. The articulation of the skull to the vertebral column was by two exoccipital (?) condyles.

Anterior to the parasphenoid it is impossible to determine the separate elements. There are two nearly concentric rows of sharp, even teeth. The maxillary-premaxillary series is nearly semicircular and extends back nearly as far as the anterior end of the parasphenoid. The inner, vomerine series is shorter but has nearly the same form as the outer. Between the inner rows of teeth and the plates which support them there is a deep vacuity extending to the upper surface of the skull; this region was excavated with the greatest care and not the slightest trace of any roof to this portion of the

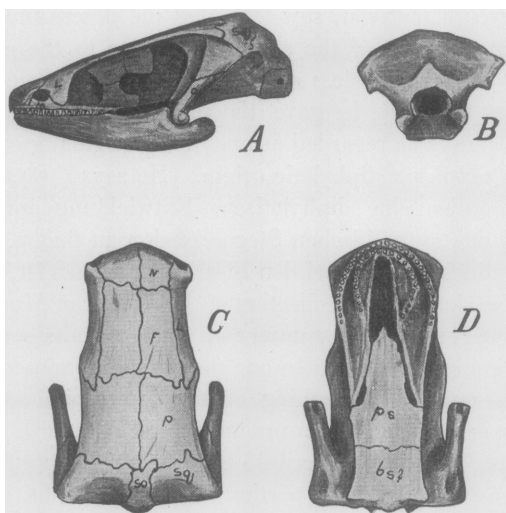


Fig. 1. *Lysorophus tricarinatus* Cope. Figures  $\times 2$ . A, lateral view of skull; B, posterior view of skull; C, upper view of skull; D, palatal view of skull.

mouth was encountered. It probably represents the large posterior openings of the nares (Fig. 1, D).

The lateral view of the skull shows the large orbital cavity. Broili considers that this must have been divided by a slender bar into temporal and orbital cavities, but in several perfect specimens of this region I find no trace of such a bar. The interorbital septum is composed, in the specimen, of three pieces but these may be fractured portions of an originally solid plate. In the posterior portion of the cavity a vertical plate appears just beneath the anterior edge of the quadrate; this may be the epipterygoid or the anterior edge of the brain case, more probably the latter (Fig. 1, A).

The articulation with the vertebral column was by two condyles formed

by distinct, exoccipital elements (Fig. 1, *B*). In two specimens there are paired pre-atlantal elements between the skull and the first vertebra.

The evidence furnished by the palate emphasizes the extremely primitive character, as determined by Broili. The complete ossification of the vertebrae, the intra-vertebral position of the ribs (some of which are distinctly two-headed), and the well developed quadrate speak for the reptilian character of the animal; but the presence of the parasphenoid and the double articular condyles seem to render its amphibian nature unquestionable. Were it not for the extreme specialization of this limbless, Gymnophiona-like form it would occupy almost exactly the transitional position between the amphibians and reptiles. This evidence of its amphibian nature negatives the conclusion of Broili, drawn from the presence of jugular plates, that the reptiles may have had a diphyletic origin and have sprung from the fish as well as from the amphibians.

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