

New species of *Eusthenodon* from the Catskill Formation of Pennsylvania

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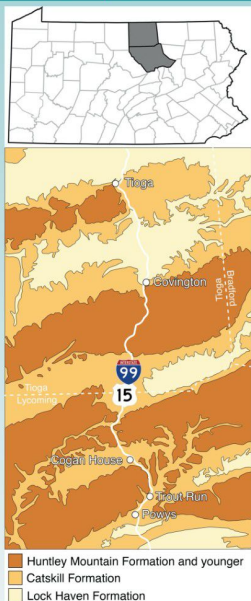
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Abstract

A new species of *Eusthenodon* from the Late Devonian Period was collected from Catskill Formation rocks in Lycoming County, Pennsylvania. The complete preservation of the material enables the comparative anatomical description of the skull anatomy that has yet to be represented in other described species of *Eusthenodon*. The new species is diagnosed by the combination of the lack of a posterior supraorbital process and less than half the lacrimal extending rostral to the orbit. The discovery of a new species in this clade is important to the phylogenetic development of the fin-to-limb transition in vertebrate evolution.

Figure 1. Devonian fossil localities of northcentral Pennsylvania



References

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Introduction

Clade Tristichopteridae includes lobe-finned, aquatic vertebrates, now extinct, from the Devonian Period (419–358 million years ago). Members of this clade thrived as large predators in brackish to freshwater ecosystems.

A new collection of tristichopterid fossils was discovered at a Catskill Formation (Duncannon Member) locality in Lycoming County, Pennsylvania, named Trout Run (Figure 1). The Duncannon Member of the Catskill Formation represents channel and floodplain deposits in a fluvial system feeding the Catskill Delta during the Acadian Orogeny.

Upon discovery, the Trout Run tristichopterid fossils were tentatively assigned to the group *Eusthenodon*, however it lacked complete taxonomic classification at the time. During our research, we did the taxonomic and descriptive work necessary to describe this collection as *Eusthenodon* and as a new species.

What is *Eusthenodon*?

Eusthenodon is a highly nested group of tristichopterids that are large-bodied and exhibit derived anatomical traits (Figure 2).

Eusthenodon has been previously discovered in Australia, Greenland, Russia, Belgium, South Africa, and U.S.A.

The Trout Run *Eusthenodon* is the second *Eusthenodon* species and the fifth tristichopterid species to be described from the Catskill Formation in Pennsylvania.

Diagnosis of *Eusthenodon*

Eusthenodon refers to a tristichopterid that exhibits the following combination of characteristics: a denticulated field of the parasphenoid that is recessed into the body of the bone, a squamosal that overlaps the maxilla, and a marginal tooth row of the dentary that does not reach the symphysis.

Why not *E. bourdoni*?

Exclusion of the jugal from the orbital margin

The contact between the lacrimal and the posterior supraorbital (absent in Figure 3) excludes the jugal from the orbital margin. This feature differs from the condition in *Eusthenodon bourdoni*. In *E. bourdoni*, the lack of contact between the posterior supraorbital and the lacrimal allows the jugal to contribute to the orbital margin.

Lack of contact between posterior supratemporal and intertemporal

In combination with the jugal contribution to the orbital margin, *E. bourdoni* also shows contact between the posterior supraorbital and intertemporal in dermal view (Figure 4). Though elongated, intertemporal does not reach rostrally enough to make contact with the posterior supraorbital.

Figure 3. Left cheek in visceral view

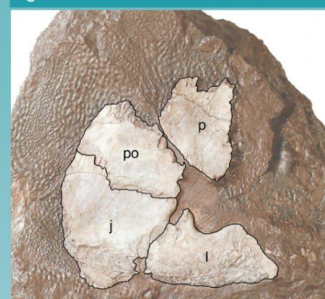
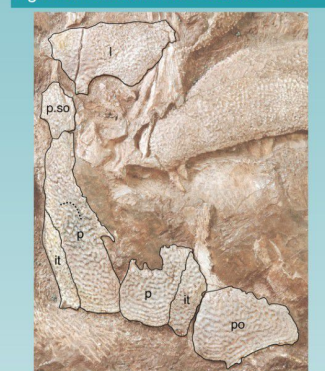


Figure 4. Parietal shield in dermal view



Diagnostic Features of New Species

There are two main differences that, in combination and among *Eusthenodon* species, are unique to these specimens and will be used as diagnostic features for a new species. 1) Less than half of the lacrimal is rostral to the orbit (Figure 3); 2) There is no posterior supraorbital caudal process (Figure 4). The combination of these two features offers a complete diagnosis of this new species.

Figure 2. Artist reconstruction of *Eusthenodon* sp. (Artist credit: DiBgd)

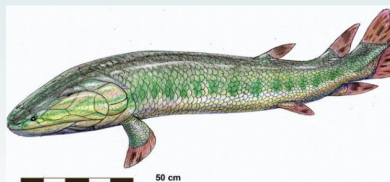
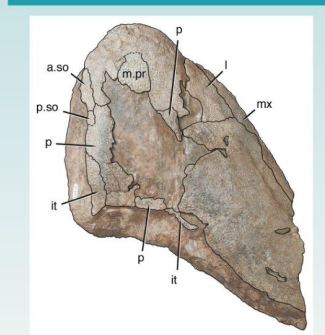


Figure 5. Skull roof and right cheek in dermal view



Abbreviation key

a.so, anterior supraorbital; it, intertemporal; j, jugal; l, lacrimal; m, maxilla; m.pr, median postrostral; p, parietal; po, postorbital; p.so, posterior supraorbital