

## Pennsylvanian Sharks from Kentucky

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### ABSTRACT

There are published records of 2 Pennsylvanian sharks from Kentucky that have been identified to species. *Edestus minor* Newberry, 1866 occurs in the Carbondale Formation of Muhlenberg County and *Symmorium reniforme* Cope, 1893 is known from the Kendrick Shale of Floyd County. This report adds a third record. *Edestus heinrichii* Newberry and Worthen, 1870 is reported from the Carbondale Formation of Union County.

### INTRODUCTION

Part of the lower jaw of a shark, with 7 teeth in place, was found during mining in the Hamilton #2 mine of the Island Creek Coal Company, near Uniontown, Union County, Kentucky (Fig. 1). It occurred, at a depth of 350 feet, on a bedding plane that separates the Number 9 Coal from an overlying shale horizon within the Carbondale Formation of the Allegheny Series. The jaw fell from the mine roof while a crew was working on shaft maintenance. Because it fell, some teeth are chipped. Breakage does not obscure basic morphology.

The discovery was made in the fall of 1991. Some 2 years later the fossil was taken to the Evansville Museum of Arts and Sciences. At present the specimen belongs to the miner who made the find, Mr. Thomas Nass. He may donate it to the museum. For access to this specimen, I am indebted to Mr. Nass and to Mitchell Lumen, Curator of Collections in the Evansville museum.

### *Edestid Dentition and Classification*

The arched tooth row, the morphology of teeth, and the appearance of the preserved cartilage identify this Union County fossil as part of the lower dentition of an edestid shark. Sharks of the Order Edestida are reasonably well-known (1). In life, the teeth of the lower jaw were supported by a massive cartilage complex formed by a fusion of the left and right mandibles (2). Mandibles fuse at the symphysis, the zone of juncture between the halves of the jaw. As the shark grew, the symphysis was produced into a long tooth-bearing rod. Curvature of this cartilaginous support is almost universal in edestids.

The symphysial dental battery of the lower jaw matched a comparable zone, the rostrum, in the upper jaw. The rostrum also bore teeth, occluding with those in the lower jaw. The skeletal support for rostral teeth was not sturdy. Other portions of the skeleton are little mineralized. Thus, edestid species are primarily known from symphysial teeth.

Shape, size, and dental sculpture place the specimen illustrated in Figure 1 within the genus *Edestus* Leidy. *Edestus* ranges from Mississippian to Pennsylvanian (1) and occurs throughout the world. Branson (3) clarified the distribution and synonymy of the type species. He also evaluated related genera and provided an inventory of species. About 6 valid species of Pennsylvanian *Edestus* are known from North America. Symphysial dentition is an adequate base for recognizing species.

### *Kentucky Shark Species*

The shark shown in Figure 1 is *Edestus heinrichii* Newberry and Worthen (1870). In the plate explanation which was part of the original description, the name was given as *E. henreichsii*. This incorrect spelling is just a slip of the pen. It has never caused confusion. When the species was redescribed by Newberry (4), only the name *E. heinrichii* was used. The name honors a coal mine owner, John P. Heinrich. The type specimen came from his mine in the Pennsylvanian of Bellville, Illinois. The original description and the redescription were influenced by other specimens, collected in Illinois and Indiana.

The only prior record of *Edestus* in Kentucky is from a coal mine near Beech Creek, Muhlenberg County. Jillson (5) provides a well-illustrated, lengthy discussion. The species is *Edestus minor* Newberry, 1866.



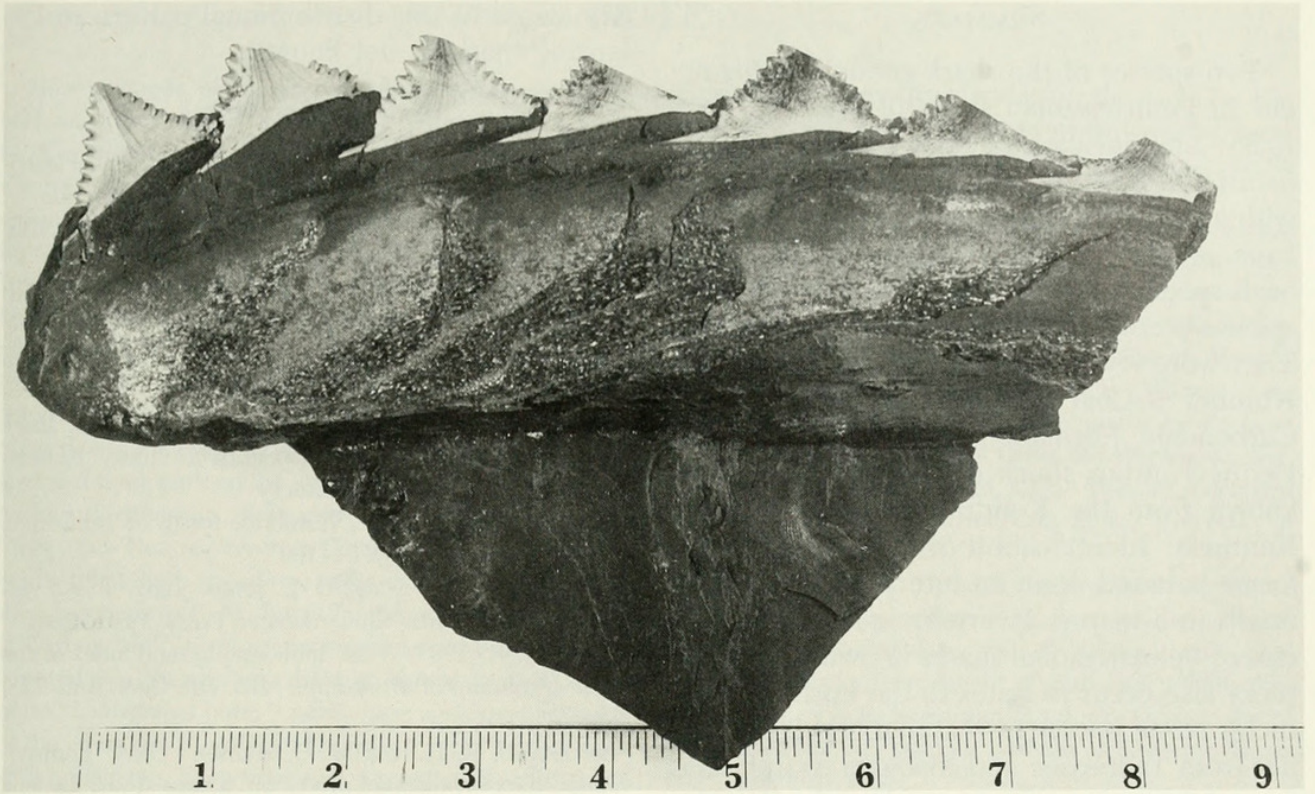


FIG. 1. *Edestus heinrichii* Newberry and Worton, 1870, from the Carbondale Formation at the 350-foot level within the Hamilton #2 Mine of the Island Creek Coal Company, near Uniontown, Union County, Kentucky. The specimen is 23.2 cm long, with a maximum height of 6.0 cm. Length of teeth at the junction with cartilage ranges from 3.5 to 4.5 cm. Well-preserved teeth have 11 anterior denticulations and exceeded 2.1 cm in height. Breakage prevents denticulation counts and height measurement for most teeth. The anterior direction is to the right. Massive tissue below the teeth is poorly preserved cartilage of the fused mandibles.

Kentucky occurrences of *E. heinrichii* and *E. minor* mark distributional limits. In the last century, Newberry (4) realized that no species of *Edestus* was known from Ohio, Pennsylvania, or areas to the east. He did not know why and did not comment on distribution to the south, probably because few Pennsylvanian sharks were known from the southern states.

More than a century later, there are still no records of edestiids from Ohio, the eastern United States, or adjoining Canadian provinces. Today, the southern distribution of Late Paleozoic vertebrates is better known. There is reasonable data on vertebrates from extensive Paleozoic outcrops in Tennessee and Alabama (6, 7). A few vertebrates are known from a relatively small region of Paleozoic outcrops in Mississippi. Those described during the Twentieth Century are well-known (8). Like Ohio and regions to the east, the area south of Kentucky seems to lack edestiids. As in Newberry's day, the absence remains unexplained.

There is one other record of a specifically identified Pennsylvanian shark from Kentucky. What is preserved is a series of punctures within the shell of a marine invertebrate, a nautiloid cephalopod. Punctures are clearly bite marks left by a large marine predator. Mapes and Hansen (9) attributed the marks to *Symmorium reniforme* Cope, 1893, a shark of the Order Cladodontida.

Through the work of Williams (10), the anatomy of this shark is almost singularly well-known. Thus species-level bite-mark identification seems reasonable. The cephalopod that preserves the marks of *S. reniforme* is from the Kendrick Shale of the Kanawha Series of Eastern Kentucky. It was collected near Ligon, Floyd County. The Kendrick Shale is slightly older than beds that yield *Edestus* in Western Kentucky. Like Kentucky species of *Edestus*, *S. reniforme* occurs in Illinois but not in states to the south. The eastern distribution of *S. reniforme* was not investigated in this study.



## SUMMARY

Two species of the shark genus *Edestus* occur in Pennsylvanian strata of Western Kentucky. Identification of both *E. minor* and *E. heinrichii* is based on symphyseal dentition with attached cartilage. Each species is known from a single specimen. By coincidence, in each specimen seven teeth are present. Both species occur in the same stratigraphic setting. They were found at the interface between the Number 9 Coal and overlying shales of the Carbondale Formation. One species of the Pennsylvanian shark genus *Symmorium* is known from the Kendrick Shale of Eastern Kentucky. Identification of *Symmorium reniforme* is based upon an interpretation of bite marks in a marine invertebrate shell. All species of Pennsylvanian sharks known from Kentucky also occur in states to the north of Kentucky. None occurs in reasonably diverse faunas from Tennessee and Alabama or in faunas from Mississippi that were described in the Twentieth Century. The eastern distribution of *Symmorium* was not examined in this study. Species of *Edestus* do not occur to the east.

The cause of this distributional pattern in Paleozoic sharks is not known.

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