

# The Whorl-Toothed “Sharks”: Eugeneodontida Explanatory/Bibliography

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Nicole Blanchard, Angel Lin, Nandini Persaud, Steven Rose

## Basic Ecology/Habitat

In the Early Permian, all Eugeneodontida lived in the oceans. In general, Eugeneodontida were carnivorous. Due to their array of teeth, they may have hunted by vertically thrashing, incapacitating, and then swallowing its prey. One kind of Eugeneodontida, *Helicoprion*, lived in the deep sea and only occasionally approached the coast. *Helicoprion* jaws were too narrow to suction feed so they had to chomp their food.[1] This “buzzsaw shark” most likely ate soft-tissue prey such as squid, cephalopods and small fish rather than organisms with hard shells.[2] During its time, it was the largest marine animal and one of the top predators. One adaptation of *Helicoprion* was lateral cartilage for its tooth whorl, which allowed for the addition and retention of its teeth.[3]

## Geologic Range

Eugeneodontida were a diverse group of cartilaginous fish that existed from the Carboniferous Period in the Permian through to the Olenekian of the early Triassic (~359-247 Ma). They are more closely related to modern ratfish and chimaera than sharks. Some genus includes *Helicoprion* “buzzsaw shark” [5] named by Alexander Karpinsky in 1899, and *Edestus* “scissor-tooth shark” a younger relative of *Helicoprion*. [6] *Helicoprion* species greatly increased in number during the early Permian and *Edestus* lived throughout the world's oceans from the Late Devonian to the late Carboniferous period.

## Taxon & Distinctive Features

Eugeneodontia are best known for their unusual dentition, generally their teeth the only part of them preserved as fossils. Most of these fish possessed whorls of serrated teeth specialized for piercing and slicing soft bodied prey. The juvenile hook shaped tooth was the youngest tooth present on many different taxon of Eugeneodontia and would spiral into an adult crown over time. [8] *Edestus* had tooth whorls on its upper and lower jaws, *Helicoprion* only had one whorl in its lower jaw. Size estimates based on the largest tooth whorls show *Helicoprion* was likely the largest animal species on the planet during its time at about 25 ft in length. [5]

## Geographic Range

The “whorl-toothed sharks” were found across modern day Eastern Asia, Australia, and the midwest of the continental United States (when this section of the world was covered in water) notably modern day Kansas, Missouri, Wyoming and Iowa. Specifically, the Turtle Creek Spillway in Kansas has produced some great fossils of this species which has greatly helped in understanding Eugeneodontia. With time, the species of Eugeneodontia which colonized this section of the ocean varied, as Eugeneodontia adapted to its environment.[3,4]

## Map [7]

Early Permian paleogeography of *Helicoprion* specimens. Phosphoria Sea: 1, Idaho, Utah, Wyoming, U.S.A.; Eastern Panthalassia: 2, Alberta–British Columbia, Canada; 3, Nevada–California, U.S.A; 4, Texas, USA; 5, Mexico; Laurussian epeiric sea: 6, Melville Island, Canada; 7, Ellesmere Island, Canada; 8, Spitsbergen, Norway; 9, middle Urals, Russia; Paleotethys: 10, southern Urals, Kazakhstan; 11, Hubei, China; 12, Laos; 13, Japan; Neotethys: 14, Western Australia. More than 50 percent of *Helicoprion* specimens come from 1 (diamond), and 25 percent from 9 (square). All other locations (circle) have produced five or fewer specimens. Paleogeographic base map modified after Ron Blakey, NAU Geology (Blakey, 2012).

## Bibliography

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