Helicoprion: Scientists solve mysteries of ancient 'shark' with spiral-toothed jaw

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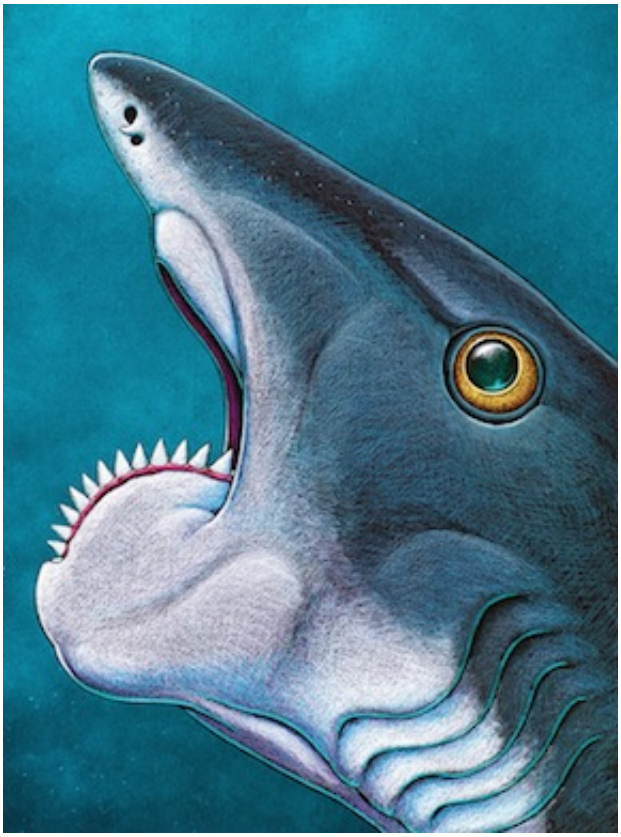

Artist conception of Helicoprion by illustrator and artist Ray Troll.

(Phys.org)—Using CAT scans and making 3-D virtual reconstructions of the jaws of the ancient fish Helicoprion, Idaho State University researchers have solved some of the mysteries surrounding large spiral fossils of this fish's teeth.

The ISU Museum of Natural History has the largest public collection of Helicoprion spiral-teeth fossils in the world. The fossils of this 270-million-year-old fish have long mystified scientists because, for the most part, the only remains of the fish are its teeth because its skeletal system was made of cartilage, which doesn't preserve well. No one could determine how these teeth – that look similar to a spiral saw blade – fit into a prehistoric fish with a poor fossil record, long assumed to be a species of a shark.

"New CT scans of a unique specimen from Idaho show the spiral of teeth within the jaws of the animal, giving new information on what the animal looked like, how it ate," said Leif Tapanila, principal investigator of the study, who is an ISU Associate Professor of Geosciences and Idaho Museum of Natural History division head and research curator.

The results of the study, "Jaws for a spiral tooth-whorl: CT images reveal novel adaptation and phylogeny in fossil Helicoprion," are being published in the Royal Society's journal, *Biology Letters*.

Leif Tapanila with two of the largest Helicoprion whorls in the world. Credit: Ray Troll

In the IMNH's Idaho Virtualization Laboratory Tapanila and his colleagues have virtual reconstructions of the Helicoprion's jaws, based on firm evidence, that clear up the biggest mystery surrounding these teeth.

"We were able to answer where the set of teeth fit in the animal," Tapanila said. "They fit in the back of the mouth, right next to the back joint of the jaw. We were able to refute that it might have been located at the front of the jaw."

Located in the back of the jaw, the teeth were "saw-like," with the jaw creating a rolling-back and slicing mechanism. The Helicoprion also

likely ate soft-tissued prey such as squid, rather that hunting creatures with hard shells.

Another major find was that this famous fish, presumed to be a shark, is more closely related to ratfish, than sharks. Both of these species are fish with cartilage for a skeletal structure, rather than bone, but they are classified differently.

"It was always assumed that the Helicoprion was a shark, but it is more closely related to ratfish, a Holocephalan," Tapanila said. "The main thing it has in common with sharks is the structure of its teeth, everything else is Holocephalan."

Based on the 3-D virtual reconstruction of the Helicoprian's jaw, the ISU researcher can infer other characteristics about the fish. Using this information, the Idaho Museum of Natural History is creating a full-bodied reconstruction of a modest-sized, 13-foot long Helicoprion, which probably grew as long as 25 feet. This model will be part of the IMNH's new Helicoprion exhibit that will open this summer, which includes artwork by Ray Troll, a well-regarded scientific illustrator as well as a fine arts artist.

The ISU team of researchers on this project included Tapanila, Jesse Pruitt, Alan Pradel, Cheryl D. Wilga, Jason B. Ramsay, Robert Schlader and Dominique Didier. Support for the project, which will include three more scientific studies on different aspects of the Helicoprion, was provided by the National Science Foundation, Idaho Museum of Natural History, American Museum of Natural History, University of Rhode Island and Millersville University.

More information: Jaws for a spiral-tooth whorl: CT images reveal novel adaptation and phylogeny in fossil Helicoprion, Published online February 27, 2013 doi: 10.1098/rsbl.2013.0057 ,

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