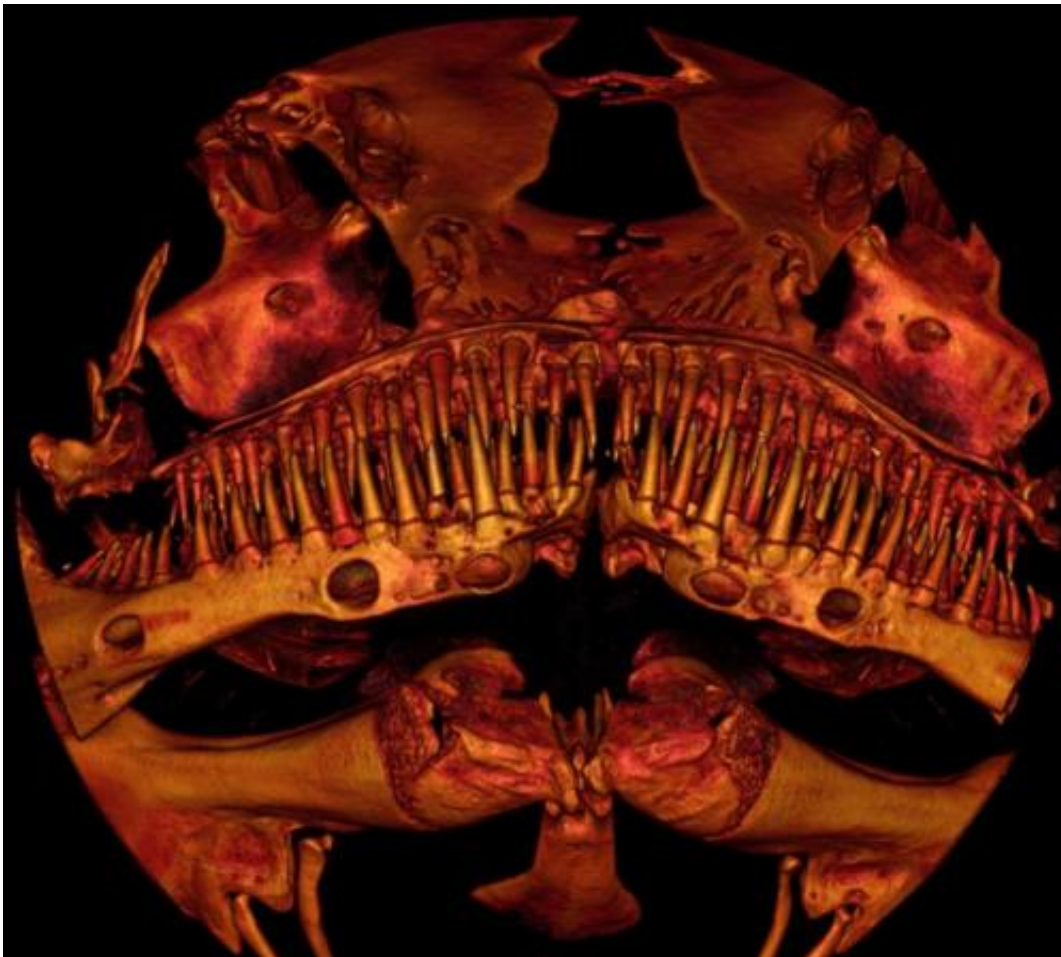


A tiny, toothy catfish with bulldog snout defies classification

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A close-up scanned image of the bony structures in the face of *Kryptoglanis shajii* -- somewhat resembling the creature from the movie *Alien* -- was a surprise to researchers at the Academy of Natural Sciences of Drexel University. *Kryptoglanis* has four rows of sharp, conical teeth on a compressed snout. Credit: Academy of Natural Sciences of Drexel University

Kryptoglanis shajii is a strange fish – and the closer scientists look, the stranger it gets. This small subterranean catfish sees the light of day and human observers only rarely, when it turns up in springs, wells and flooded rice paddies in the Western Ghats mountain region of Kerala, India. It was first described as a new species in 2011.

Soon after that, John Lundberg, PhD, one of the world's leading authorities on catfishes, started taking a closer look at several specimens.

"The more we looked at the skeleton, the stranger it got," said Lundberg, emeritus curator of Ichthyology at the Academy of Natural Sciences of Drexel University and emeritus professor at Drexel in the College of Arts and Sciences. His team's study describing the detailed bone structure of *Kryptoglanis* is now published in the 2014 issue of the *Proceedings of the Academy of Natural Sciences of Philadelphia*.

"The characteristics of this animal are just so different that we have a hard time fitting it into the family tree of catfishes," said Lundberg. From the outside, *Kryptoglanis* does not look particularly unusual for a catfish. But when Lundberg and his colleagues looked at its bones using digital radiography and high-definition CAT scans, they found some surprises.

Kryptoglanis was missing several bony elements – a characteristic fairly common for subterranean fish. But there were also changes in the shapes of certain bones, changes so strange that Lundberg described them as "completely unique among catfishes and all fishes as far as I know." Numerous individual bones were modified in the face, giving the fish a compressed front end with a jutting lower jaw – like a bulldog's snout, if a bulldog also had four rows of conical, sharp-tipped teeth.



This is a collected, preserved specimen of the subterranean catfish *Kryptoglanis shajii*, shown in a man's hand for scale. Credit: Academy of Natural Sciences of Drexel University

Multiple changes piled up in one part of the body could mean there is a functional purpose for those changes. "In dogs that was the result of selective breeding. In *Kryptoglanis*, we don't know yet what in their natural evolution would have led to this modified shape," Lundberg said. Based on its teeth and subterranean home, Lundberg said that *Kryptoglanis* most likely eats meat, in the form of small invertebrates and insect larvae – whatever might be found in the groundwater and could be captured by the fish, which at less than ten centimeters is smaller than an adult human's pinkie finger. The fish can move swiftly in its environment, as evidenced by video footage of collected fish darting through water to grab food.

But why *Kryptoglanis* is so different, and what its closest relatives are, remains a mystery.

Lundberg's team wasn't alone in asking the question. Lundberg's team

examined three specimens of *Kryptoglanis* using digital radiography, and one of these specimens using high-resolution X-ray computed tomography – resulting in detailed, three-dimensional CAT scan images after careful preparation and analysis by Lundberg's colleague and co-author, Kyle Luckenbill, interim collection manager and a research assistant at the Academy.

At the same time, a separate team led by Ralf Britz at the Natural History Museum of London independently examined the [bone structure](#) of *Kryptoglanis* using a technique of visualizing the skeleton called clearing and staining – a chemical method in which the fish's soft tissues are rendered as clear as glass and bones and cartilage are stained in contrasting colors. This team's description of the structures was published in the March 2014 issue of the journal *Ichthyological Exploration of Freshwaters*.

"There was an amazing congruence between the results," Lundberg said. "Neither of us was way out."

Neither could figure out which other catfishes *Kryptoglanis* was most closely related to, although Britz's team chose to assign it to its own new taxonomic family within the order of catfishes.

This fish just one of many unresolved branches on the catfish [family tree](#), in a section where even DNA evidence has thus far proven unhelpful. Subterranean species like *Kryptoglanis* tend to have dramatically different DNA sequences from one another and from their open-water relatives, making it difficult to identify their evolutionary histories.

"It continues to be a puzzle," Lundberg said.

More information: Paper: www.bioone.org/doi/full/10.1635/053.163.0101

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