

By [Stefano](#) 2007 Science Editor

[The Oldest Fossil Russian Doll: 290 Million Years Old](#)

Fish inside amphibian inside shark

This is a 290 million years old Russian doll, on a pattern shark-amphibian-fish. An extraordinary fossil preserved both the predator's last meal, and also the last meal of the prey, in a period long before the emergence of the dinosaurs, being the oldest snapshot of a vertebrate food chain, described in a new research published online last month in the journal *Proceedings of the Royal Society B*. Usually, the last meal is hard to preserve, as digestive acids rapidly decompose the prey in the stomach, but in the case of this fossil, "the shark didn't just die and sink down and decompose. It was probably still alive when it got trapped under a rapid influx of sediment from surrounding hills," said co-author Jürgen Kriwet, a paleontologist from Berlin's Museum of Natural History. The fossilized trio inhabited during the Permian period a shallow freshwater lake in the Saar-Nahe Basin (southwestern Germany). The shark was just 19 in (50 cm) long and swallowed its prey, the amphibian, whole. "The fossilized amphibian is also in exactly the right position to suggest it had been eaten-it was lying tail-first along the shark's digestive tract. Also, the fish remains are fully enclosed within the amphibian's outer covering of scales," he added, pointing to the fact that the fish had been eaten by the amphibian, not the shark. The fish was from the primitive group of acanthodians (more basal even than the sharks), characterized by dorsal bony spines. "The fish was swallowed side on, otherwise the spines could have got stuck in the amphibian's mouth or throat," Kriwet said. "The fish is situated in quite the correct area of digestive tract of the amphibian," said study co-author Ulriche Heidtke, a paleontologist from the National History Museum of the Palatinate in Bad Dürkheim, Germany. "It clearly shows the hallmarks of digestion, [such as] disintegration. If the shark had eaten the fish first and then the amphibian, they would be placed one after the other in the shark's stomach," he explained.

"Well-documented examples of predator-prey relationships such as this are very rare. Such fossils allow scientists to reconstruct parts of extinct food chains. Three tiers are exceptional-if [only] we could find a four-tier example.", said John Maisey, a curator of paleontology at the American Museum of Natural History in New York, not involved in this study. Today, there is no shark fully adapted to the life in fresh water. "Today we find some rays and skates-close relatives of sharks-living in fresh water, but sharks invade lakes and rivers only for a short time," said Kriwet. And none of the modern day sharks entering freshwater consumes amphibians (sharks entering freshwater are for example the bull shark, which presents populations living in the lakes of Nicaragua and penetrating deep into the Amazon and Zambezi rivers and the river sharks of the genus *Glyphis* entering rivers from south Asia (Gange, Indus, Irrawaddy), Borneo and New Guinea). "There are no reports of sharks eating amphibians, even in the tropics, where there are large amphibians living close to the lakes and rivers that sharks temporarily enter," said Kriwet. The ancient amphibian belonged to a group called temnospondyls, physically resembling crocodiles, about 100 million years before the first crocodiles appeared, some being over 4 m (13 ft) long. "These amphibians had a short legs, long snouts, big teeth, and a long tail that they used as a rudder, much like crocodiles today. Before the Permian extinction event, amphibians and sharks were the main top predators," said Kriwet. The Permian extinction, the most severe in Earth's history, took place 251 million years ago. "But by the end of the Triassic (200 million years ago), there was a shift to crocodiles and bony fish being the top predators (in fresh water).", said Kriwet. And to dinosaurs on ground, we could add.