

Tiktaalik:

Tetrapod Testimony

IMAGINE a creature that looks like a crocodile with a neck but which also has gills like a fish! The stuff of nightmares, did you say? But it is just *Tiktaalik roseae* – a fish-like fossil that was introduced to the world on April 2006 by a team of researchers led by Neil Shubin, Edward Daeschler and Farish Jenkins, who uncovered this bizarre specimen. It has been hailed as being the species that blurs the boundary between fish and the four-legged tetrapods.

Tiktaalik was found on Ellesmere Island, Canada, not too far from the North Pole in the Arctic Circle. It has been described as, “a cross between a fish and a crocodile.” It lived in the Devonian era lasting from 417m to 354m years ago. The name *Tiktaalik* is the Inuktitut word for the freshwater fish burbot (*Lota lota*). The name was suggested by Inuit elders of the area where the fossil was discovered. The specific name *roseae* holds the clue to the name of an anonymous donor and is a tribute to the person.

Tiktaalik was a fish no doubt but a special one. Its “fins” have fin rays, like fishes do even today, but it also has bones that would have allowed it to “prop” itself up and use its limbs like contemporary four-legged animals. It has strong wrist bones, neck, shoulders, and thick ribs in addition to scales, and gills. *Tiktaalik*'s skull shows a mix of traits that resemble fish in some ways and land dwelling, four-legged animals or tetrapods in others. It is pretty well accepted in scientific circles that modern tetrapods evolved from a fish ancestor.

Interestingly, scrutiny of the fossil bones shows that some bones of the head had disappeared. This means that *Tiktaalik* had a relatively mobile neck. The advantage of a mobile neck could have translated to better hunting powers as it could have rested its body on the bottom of a shallow pool and yet swiftly moved its head to snap up food.

Tiktaalik was vociferously welcomed to the world of paleontologists because it was a huge find by any reckoning. However, what was missing was the element of surprise or serendipity that often guides the pickaxes of those unearthing fossils. Shubin and the others had actually gone looking for *Tiktaalik*. How did they know where to find it and why were they looking for it, did you ask? Good questions, both.

Shubin and his team knew that the first vertebrates had crawled onto land about 375 million years ago, perhaps from an ancient and long dead river. So, they targeted fossils from riverine ecosystems in 375 million



Tiktaalik fossil at right and reconstructed at left



Fossil site

year old rocks. They had a pretty clear idea about what sort of animal they were looking for. However, success was not immediate. It took them five separate expeditions to Canada before they raised the *Tiktaalik*.

Tiktaalik was dubbed a “fishapod” by Daeschler. The media called it a “missing link” between fish and the four-legged tetrapods. Scientists studying it differed. They pointed out that it was merely the long-predicted transitional form. They explained: “*Transitional forms help show the evolutionary steps leading from one lineage to another by displaying characteristics of both the ancestral and the new lineage.... A whole series of transitional forms tie fish to four-legged vertebrates — not the single, key organism suggested by the phrase, ‘the missing link.’*”

Other extinct transitional animals had been studied earlier. These included *Eusthenopteron* and *Acanthostega*, and from the studies, scientists had drawn valuable inferences about how and when the first vertebrates colonized land. *Tiktaalik* was a handy species that vindicated their beliefs; it was therefore special indeed, but not unique. However, following the discovery of *Tiktaalik*, scientists are on firmer ground as they theorize about the nitty-gritty's of vertebrate colonization of land.

In January 2010 a group of Polish and Swedish paleontologists announced that they had found fossil footprints of what appeared to be a nearly 400 million-year-old fully formed tetrapod. If this is the case, then the earliest tetrapods must predate the 400 million year old specimen. *Tiktaalik*'s fossil then, may be younger than the first tetrapods. However, *Tiktaalik*'s importance as a transitional form is not challenged in any way by this find. It will always remain a fossil species with all the traits that help us understand how tetrapods evolved.

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