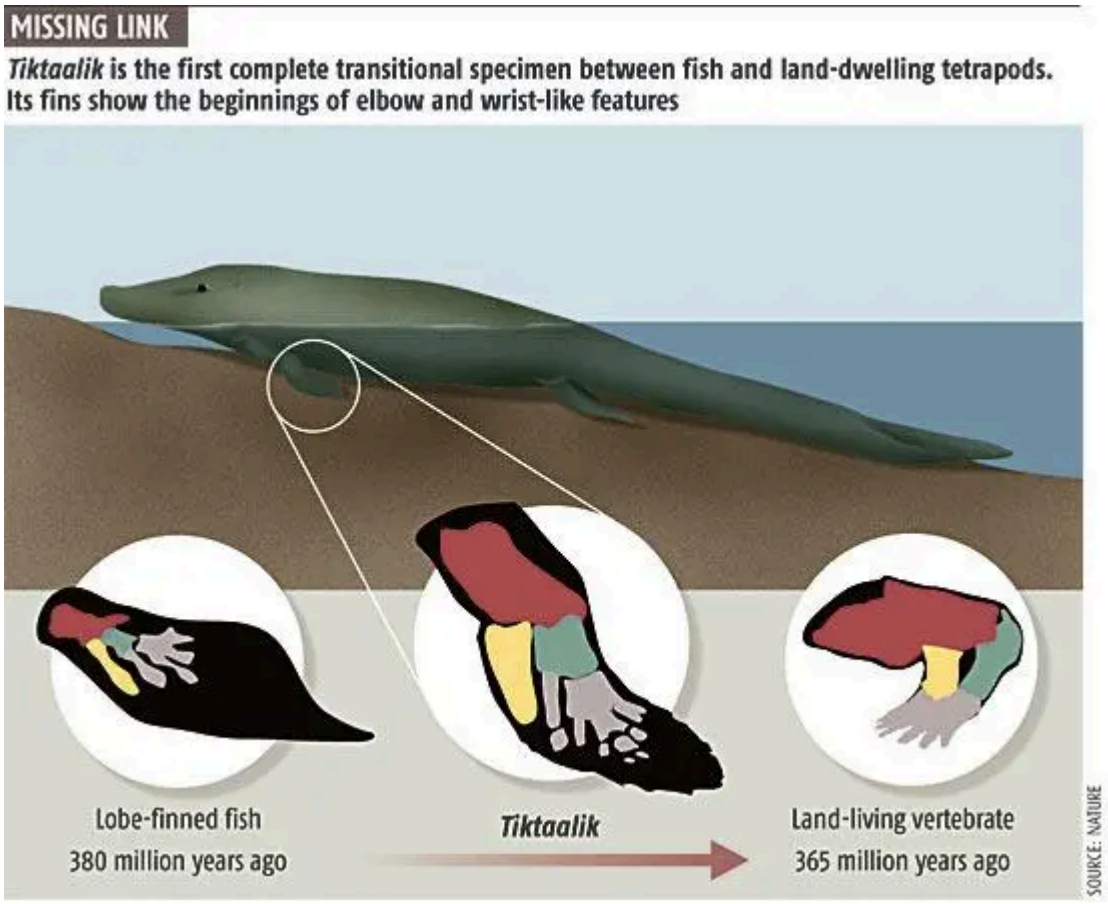
LIFE

First fossil of fish that crawled onto land discovered

A crucial fossil from the time when fish first crawled out of the oceans, 400 million years ago, has been found in the remote Arctic

By Bob Holmes

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Missing link

IT WAS one of the most important events of the last 400 million years: the moment our fishy ancestors began hauling themselves onto dry land. Now a fossil from the very beginning of that crucial transition has been found in the remote Arctic.

Palaeontologists didn't previously have a decent fossil representing the intermediate between finned fish and four-footed land animals, or tetrapods. The new animal has been named *Tiktaalik* after suggestions from Inuit elders in the northern Canadian territory of Nunavut, where the fossil was found. The name means "large freshwater fish", and before long could be as well known as that of another iconic transition fossil, the feathered dinosaur *Archaeopteryx*.

"We describe this as a 'fishopod': part fish, part tetrapod," says Neil Shubin, a palaeontologist at the University of Chicago, and a member of the team that discovered *Tiktaalik*.

Tetrapods evolved from lobe-finned fishes between 380 and 365 million years ago. Several fossil fragments show isolated body parts in the transition from fins to legs, or gill-breathing to air-breathing, but no one fossil offered a clear snapshot of a complete transitional form.

Hoping to understand this key period better, Shubin and his colleague Ted Daeschler of the Academy of Natural Sciences in Philadelphia, together with Farish Jenkins of Harvard, began searching for fossil-bearing sediments of the right age. After five years of digging on Ellesmere Island, in the far north of Nunavut, they hit pay dirt: a collection of several fish so beautifully preserved that their skeletons were still intact. As Shubin's team studied the species they saw to their excitement that it was exactly the missing intermediate they were looking for. "We found something that really split the difference right down the middle," says Daeschler.

Tiktaalik had a mobile neck and had lost the bony coverings of the gills that fish use to fan water to maximise their oxygen intake. These suggest that the fish may have been at least partly air-breathing, like modern tetrapods (*Nature*, vol 440, p 757 and p 764).

Tiktaalik's fins proved even more exciting. They were still clearly fins, with many of the same bones as earlier lobe-finned fishes. However, because the fossils are so well-preserved, Shubin and Daeschler were able to study in detail how the bones moved.

They found a wrist-like arrangement near the tip of the fin, so that the end could bend forward and provide vaguely foot-like support. “It could flex the elbow and extend the wrist so the tip of the fin could lie against the ground. It could do a push-up,” says Shubin. In other words, our ancestors’ limbs were probably co-opted to serve as support structures before they had evolved to look much like legs at all.

Tiktaalik‘s piecemeal collection of tetrapod-like features also suggests that adaptations to land did not arise in a single sudden burst of evolution. “*Tiktaalik* seems to be telling us no, there was a long-term, gradual acquiring of the tool kit that tetrapods use,” says Daeschler.

For all its tetrapod-like features, *Tiktaalik* is still clearly a fish. For example, its limbs lack the fingers and toes that mark true tetrapods. Shubin now plans to return to Ellesmere Island to search for a fossil even closer to the moment when vertebrates first stepped onto dry land.

In the meantime the new fish seems sure to take its place in textbooks beside the primitive bird *Archaeopteryx*, the link between reptiles and birds, as one of palaeontology’s classic transitional forms. “This creature does the same thing for the origin of tetrapods,” says Jennifer Clack, an expert on the origin of tetrapods at the University of Cambridge. “It’s one of those things you can point to and say, ‘I told you this would exist,’ and there it is.”