

# New fossil shows four-legged fishapod that returned to the water while Tiktaalik ventured onto land

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Illustration of *Qikiqtania wakei* (center) in the water with its larger cousin, *Tiktaalik roseae*. Credit: Alex Boersma

A meme has been circulating online during the pandemic featuring

Tiktaalik roseae, the iconic, four-legged "fishapod" that first made the transition from water to land 375 million years ago. Most variations show Tiktaalik poking its head out of the water and ready to crawl ashore, while an out of frame hand threatens it with a rolled-up newspaper or a stick. The joke is that those of us exhausted by the modern world wish we could go back in time, shoo it back into the water, and stop evolution in its tracks, sparing ourselves the present day of war, pestilence, and internet memes.

As it turns out, one of Tiktaalik's close relatives did just that, opting to return to living in open water instead of venturing onto land. A new study from the laboratory of Neil Shubin, Ph.D., who co-discovered Tiktaalik in 2004, describes a [fossil species](#) that closely resembles Tiktaalik but has features that made it more suited to life in the water than its adventurous cousin. Qikiqtania wakei was small—just 30 inches long—compared to Tiktaalik, which could grow up to nine feet. The new fossil includes partial upper and lower jaws, portions of the neck, and scales. Mostly importantly, it also features a complete pectoral fin with a distinct humerus bone that lacks the ridges that would indicate where muscles and joints would be on a limb geared toward walking on land. Instead, Qikiqtania's upper arm was smooth and curved, more suited for a life paddling underwater. The uniqueness of the arm bones of Qikiqtania suggest that it returned to paddling the water after its ancestors began to use their appendages for walking.

"At first we thought it could be a juvenile Tiktaalik, because it was smaller and maybe some of those processes hadn't developed yet," Shubin said. "But the humerus is smooth and boomerang shaped, and it doesn't have the elements that would support it pushing up on land. It's remarkably different and suggests something new."

The paper, "A New Elpistostegalian from the Late Devonian of the Canadian Arctic and the diversity of stem tetrapods," was published July

20, 2022, in *Nature*.

## **A prehistoric pandemic project**

Shubin, who is the Robert R. Bensley Distinguished Service Professor of Organismal Biology and Anatomy at the University of Chicago, found the fossil days before Tiktaalik was discovered, at a site about one mile east on southern Ellesmere Island in the territory of Nunavut in northern Arctic Canada. The name Qikiatania comes from the Inuktitut word Qikiqtaaluk or Qikiqtani, the traditional name for the region where the fossil site is located. The species designation wakei is in memory of the late David Wake, an eminent evolutionary biologist from the University of California at Berkeley.

Shubin and his field partner, Ted Daeschler, Ph.D., from the Academy of Natural Sciences of Drexel University, collected the specimens from a quarry after spotting a few promising looking rocks with distinctive, white scales on the surface. But they sat in storage, mostly unexamined, while the team focused on preparing Tiktaalik.

Fifteen years later, the discovery of Qikiqtania became another pandemic story. Postdoctoral researchers Justin Lemberg, Ph.D., and Tom Stewart, Ph.D., CT-scanned one of the larger rock specimens in March 2020 and realized that it contained a pectoral fin. Unfortunately, it was too deep inside the rock to get a high-resolution image, and they couldn't do much more with it once the pandemic forced labs to close.

"We were trying to collect as much CT-data of the material as we could before the lockdown, and the very last piece we scanned was a large, unassuming block with only a few flecks of scales visible from the surface," said Lemberg, who is now doing cultural resource management fieldwork in Southern California. "We could hardly believe it when the first, grainy images of a pectoral fin came into view. We knew we could

collect a better scan of the block if we had the time, but that was March 13th, 2020, and the University shut down all non-essential operations the following week."

In the summer of 2020 when campus facilities reopened, they contacted Mark Webster, Ph.D., Associate Professor of Geophysical Sciences, who had access to a saw that could trim pieces off the specimen so that a CT scanner could get closer and produce a better image. Stewart and Lemberg carefully marked the boundaries on the block and arranged an exchange outside their lab in Culver Hall. The resulting images revealed a nearly complete pectoral fin and upper limb, including the distinctive humerus bone.

"That's what blew our minds," Shubin said. "This was by no means a fascinating block at first, but we realized during the COVID lockdown when we couldn't get in the lab that the original scan wasn't good enough and we needed to trim the block. And when we did, look at what happened. It gave us something exciting to work on during the pandemic. It's a fabulous story."

## **Glimpses into vertebrate history**

Qikiqtania is slightly older than Tiktaalik but not by much. The team's analysis of where it sits on the tree of life places it, like Tiktaalik, adjacent to the earliest creatures known to have finger-like digits. But even though Qikiqtania's distinct pectoral fin was more suited for swimming, it wasn't entirely fish-like either. Its curved paddle shape was a distinct adaptation, different from the jointed, muscled legs or fan-shaped fins we see in tetrapods and fish today.

We tend to think animals evolved in a [straight line](#) that connects their prehistoric forms to some living creature today, but Qikiqtania shows that some animals stayed on a different path that ultimately didn't work

out. Maybe that's a lesson for those wishing Tiktaalik had stayed in the water with it.

"Tiktaalik is often treated as a transitional animal because it's easy to see the stepwise pattern of changes from life in the water to life on land. But we know that in evolution things aren't always so simple," said Stewart, who will be joining the faculty at Penn State University this summer.

"We don't often get glimpses into this part of vertebrate history. Now we're starting to uncover that diversity and to get a sense of the ecology and unique adaptations of these animals. It's more than simple transformation with just a limited number of species."

**More information:** Thomas Stewart, A new elpistostegalian from the Late Devonian of the Canadian Arctic, *Nature* (2022). [DOI:](https://doi.org/10.1038/s41586-022-04990-w)

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