What's so great about *Tiktaalik*?

John Curtis

Tiktaalik roseae was a fossil find that received a great deal of media attention in 2006. It was widely hailed as a 'missing link' between fish and tetrapods. It seemed to show some features in common with fish, others with tetrapods, and a few that seemed somewhat intermediate between fish and tetrapods. However, subsequent analysis and research has shown that many of these claims were unsupported. Evolutionists themselves disagree on how 'transitional' aspects of its anatomy really are. Tetrapod trackways discovered in Poland in 2010 were dated 14 million years older than the earliest tetrapod fossils and 5 million years older than all known elpistostegid body fossils. This calls into question the transitional nature of not just *Tiktaalik*, but of all known elpistostegids. Finally, statistical baraminology (a creationist research enterprise aimed at detecting discontinuity between different taxa) showed no statistically significant correlation between *Tiktaalik* and tetrapods, which is consistent with them being separate biblical kinds. Further research has shown that *Tiktaalik* is much friendlier to biblical creation than first expected.

Background on *Tiktaalik*

It has been 15 years since University of Chicago researchers led by Neil Shubin discovered the *Tiktaalik roseae* fossils. Is it still "the perfect missing link"[1] as Richard Dawkins extolled?

Shubin and Daeschler first published their discovery of *Tiktaalik* in the 6 April 2006 edition of *Nature*. Several specimens were unearthed in the Canadian Arctic in 2004, some as long as 2.7 m (9 ft) (figure 1).

Tiktaalik's discovery came in the context of paleontologists seeking to fill the supposed evolutionary gaps between fish and tetrapods. Late Devonian lobe-finned fish called elpistostegids (which includes *Tiktaalik*) allegedly fill that gap. Both Ahlberg[3] and Garner[4] provide helpful discussions of how evolutionists have so far sought to explain the supposed fish-to-tetrapod transition through that timeframe.

Tiktaalik allegedly contributed to this because it reportedly had more tetrapod-like features than other elpistostegids like *Panderichthys* (figure 2):

> "Like *Panderichthys*, *Tiktaalik* has paired fins and a dorsal surface covered with overlapping rhombic scales. However, the snout is even more elongated, the spiracle is even larger and there is no bony opercular cover. Furthermore, *Tiktaalik* is distinguished from other tetrapodomorph fishes by possession of imbricate ribs, and a pectoral girdle with enlarged scapular and coracoid elements and highly mobile elbow-like and wrist-like joints. The head is also detached from the shoulder girdle, allowing flexure in the neck region. These features would have allowed the animal to support itself on a substrate using its pectoral fins in a limb-like manner."[7]

Ahlberg notes:

> "*Tiktaalik* and *Panderichthys* are straightforward fishes: they have small pelvic fins, retain fin rays in their paired appendages and have well-developed gill arches, suggesting that both animals remained mostly aquatic. In other regards, *Tiktaalik* is more tetrapod-like than *Panderichthys*. The bony gill cover has disappeared, and the skull has a longer snout."[8]

Daeschler heralded *Tiktaalik* as:

> "… a well-preserved species of fossil sarcopterygian fish from the Late Devonian of Arctic Canada that represents an intermediate between fish with fins and tetrapods with limbs, and provides unique insights into how and in what order important tetrapod characters arose."[9]

Shubin's 2006 paper highlighted *Tiktaalik* as having four tetrapod-like pectoral appendages that were "morphologically and functionally transitional between a fin and a limb".[10] Much fanfare followed these first papers on *Tiktaalik*, with many commentaries extolling how the body features of *Tiktaalik* show it was the 'missing link' between fish and tetrapods. Models were built showing it standing up on its fins out of the water, and Shubin wrote a book titled *Your Inner Fish*[11] (which spawned both a PBS television series and even a song titled "Tik-tik-tik-tik-tiktaalik"[12]).

Details, details

In spite of this fanfare, the details provide a much different story. Other researchers soon began to temper the initial hype surrounding *Tiktaalik*. In 2008 Boisvert noted that:

> "Given that recent phylogenies consistently place *Panderichthys* below *Tiktaalik* in the tetrapod stem group, it is surprising to discover that its pectoral fin skeleton is more limb-like than that of its supposedly more derived relative. … It is difficult to say whether this character distribution implies that *Tiktaalik* is autapomorphic, that *Panderichthys* and tetrapods are

convergent, or that *Panderichthys* is closer to tetrapods than *Tiktaalik*."[13]

Clack similarly notes that *Panderichthys* is in many respects closer to tetrapods than *Tiktaalik*.[14] One is left to wonder if *Tiktaalik* had fins that de-evolved before they supposedly re-evolved to a more advanced form. This is in fact what Ahlberg stated in a *National Geographic* news article:

> "Curiously, the radial bones of *Panderichthys* are more finger-like than those of *Tiktaalik*, a fish with stubby leg-like limbs that lived about five million years later. Many scientists regard *Tiktaalik* as a 'missing link': the crucial transitional animal between fish and the first tetrapods. One possibility, Ahlberg said, is that finger development took a step backward with *Tiktaalik*, and that *Tiktaalik's* fins represented an evolutionary return to a more primitive form."[15]

Ahlberg later states with Clack that *Tiktaalik's* fin is actually far removed from the functional architecture of a tetrapod arm:

> "Although these small distal bones bear some resemblance to tetrapod digits in terms of their function and range of movement, they are still very much components of a fin. There remains a large morphological gap between them and digits as seen in, for example, *Acanthostega*: if the digits evolved from these distal bones, the process must have involved considerable developmental repatterning."[16]

Ahlberg also raised doubts about Shubin's claim that the lepidotrichial fin webs of *Tiktaalik* were substantially smaller (i.e. more tetrapod-like) than those of *Panderichthys*. He pointed out they are actually about the same length.[17] With respect to *Tiktaalik's* jaw, Ahlberg noted how *Livoniana* (contemporary with *Panderichthys*) fossils have a lower-jaw morphology more tetrapod-like than that of *Tiktaalik*.[18]

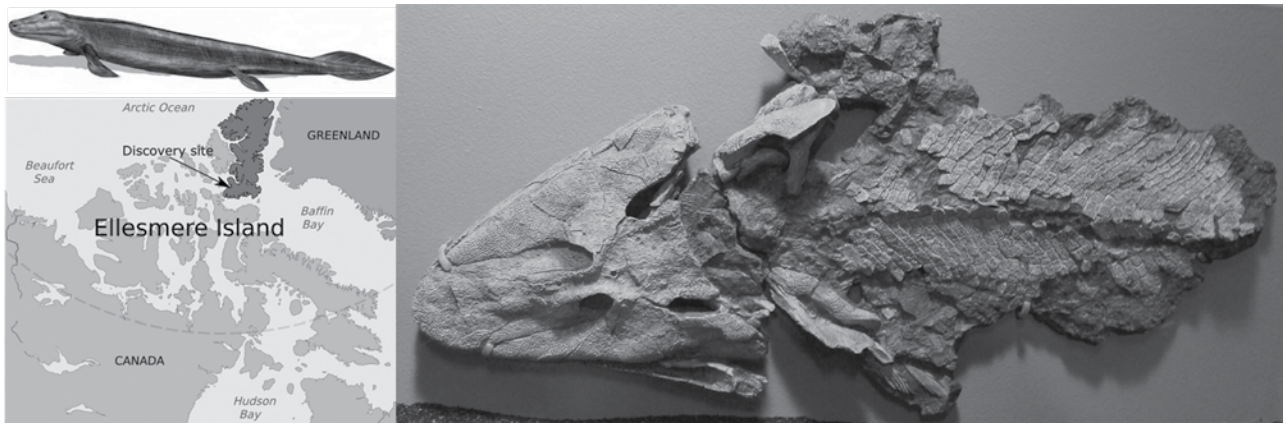
Woodmorappe wrote that creationists have a working definition of what would constitute a bone fide transitional fossil as being one in a series of fossils which show "a series of ever-more-primitive sister groups, each of which is discontinuity-free, towards both its stemward and the crownward forms, none of which has any specializations."[19] Clearly, *Tiktaalik* fails to meet this criterion. One could not then logically or scientifically deduce *Tiktaalik* is an unequivocal transitional fossil when it has 'more primitive' features than its proposed stemward forms, unless one proposes undocumented and unsupported evolutionary events, such as taking 'a step backward'. Comments like 'a step backward' are nothing more than evolutionary just-so stories.

On this point Ahlberg relates that "we should be mindful that evolution has no overall aim and that small-scale reversals and parallelisms are commonplace phenomena."[20] In other words, evolutionists believe their theory does not require that traits evolve at constant rates in different lineages, or that there must be a neat and unidirectional progression in the fossil record from 'more primitive' to 'more derived'. As such, 'geologically instantaneous developmental repatternings' such as those found in *Acanthostega* are standard. This however is a retreat forced by the evidence from classic evolutionary constructs of creatures undergoing simple-to-complex development over much time to much less falsifiable constructs like 'mosaic evolution'.[21] Indeed, since this effectively turns *any* fossil into a potential 'transitional fossil', how can evolutionists know what then constitutes a true transitional fossil?

Concerning the popular portrayal of *Tiktaalik* being able to venture out on land, Shubin and others state:

> "Plesiomorphic features of *Tiktaalik* can be interpreted as highlighting a functional difference with limbed forms: the pelvic fin was not capable of bearing stresses and strains as significant as those of *Acanthostega* and *Ichthyostega*, nor was the musculature as well-developed for appendage retraction."[22]

The sacral rib connecting the pelvic girdle to the vertebral column is essential for tetrapods to be able to bear their weight on land,[23] so as Shubin admits, *Tiktaalik* could not have walked on land. This is quite odd considering the number of comments and pictures depicting *Tiktaalik* doing just that.[24]



Model image: Nobu Tamura/CC BY 2.5; Map image: Kennonv/ CC BY-SA 3.0; Fossil image: Eduard Solà/CC BY-SA 3.0

Figure 1. A model of *Tiktaalik roseae* (left) based on the fossil remains (right) which were unearthed in 2004 in the Canadian Arctic by University of Chicago researchers led by Neil Shubin.[2]

In stark contrast to Shubin's assertion: "New discoveries of transitional fossils such as *Tiktaalik* make the distinction between fish and the earliest tetrapods increasingly difficult to draw",[25] Ahlberg and Clack provide an astonishing observation:

> "Of course, there are *still major gaps* in the fossil record. In particular we have almost no information about the step between *Tiktaalik* and the earliest tetrapods, when the anatomy underwent the *most drastic changes*, or about what happened in the following Early Carboniferous period, after the end of the Devonian, when tetrapods became fully terrestrial [emphases added]."[16]

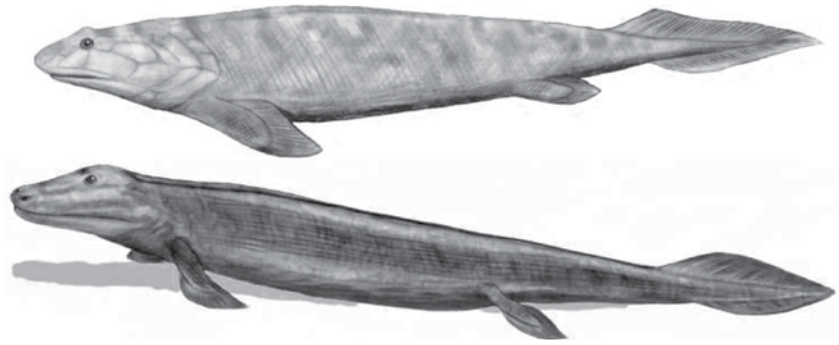


Image: Nobu Tamura/CC BY 2.5

Figure 2. *Panderichthys* (above), an Upper Devonian lobe-finned fish (from Clack[5]) compared to *Tiktaalik roseae* (below, from Shubin[6])

The evolutionists themselves have pointed out that *Tiktaalik* couldn't venture out on land as modern lungfish do; its lobe fins, jaw, and skeleton are more primitive than its supposed evolutionary predecessors; the most drastic changes between fish and tetrapod came after *Tiktaalik*; and major gaps still exist in the fossil record. This is a far cry from the initial hype surrounding *Tiktaalik* being "the perfect missing link".

Pulling the rug out

In 2010 fossilized footprints of a tetrapod were found in the Zachełmie Quarry in the Holy Cross Mountains of Poland. They were originally dated as being "18 million years older than the earliest tetrapod body fossils and 10 million years earlier than the oldest elpistostegids"[26] (figure 3). Narkiewicz and Narkiewicz later revised these dates in 2015 as predating the earliest tetrapod body fossils by 14 million years and the oldest elpistostegids by 5 million years.[27,28]

Tas Walker's paper in 2010 aptly described this issue and how many evolutionists were taken aback by this turn of events as it essentially meant the evolution of tetrapods was much earlier, and worst of all there were now no fossils to fill that void.[30] Eight years later, Ahlberg discussed this controversy and noted that early reactions to discredit these tracks have proved fruitless. He echoes exactly what Walker pointed out in 2010:[31] "Suffice it to say for now that the tetrapod identity of the Zachełmie, Valentia Island, Tarbat Ness and Genoa River tracks is upheld."[29]

Ahlberg also recounts how the Zachełmie Quarry tracks upended the previously tidy chronology of evolutionary development from Devonian fish to tetrapods, and that no resolution to understanding the evolutionary progression of fish to tetrapod is in sight:

> "And so here we are, in 2018, still locked in an impasse between two fundamentally incompatible timelines for the origin of tetrapods, each with its followers."[20]

Evaluation of the situation has led him to offer a hypothesis that tetrapods evolved much earlier than previously thought (by at least 14 million years) and were derived from lungfish ancestors. During that time, other creatures (such as *Tiktaalik*) branched off and evolved along separate lines and lived as contemporaries of tetrapods. He admits, however: "there is not a single piece of body fossil evidence to support [this hypothesis]."[32] Interestingly, the need for an earlier evolution of tetrapods was the same concept voiced in 2010 by Philippe Janvier from the National Museum of Natural History, Paris, France.[33] Furthermore, Ahlberg emphasizes:

> "The single most important take-home message from this survey of the evidence is that the fossil record of the fish–tetrapod transition is actually very poor and consists mostly of gaps."[32]

So what then becomes of *Tiktaalik*?

> "The idea of *Tiktaalik* as an immediate predecessor of tetrapods, which has been promulgated both in the scientific literature (Daeschler *et al.* 2006; Shubin *et al.* 2006) and in innumerable popular presentations, must thus be discarded if the footprint evidence is accepted; instead, *Tiktaalik* and *Elpistostege* are cast in the role of late survivors of the elpistostegid radiation."[32]

Unwilling to discard decades of comparative anatomy evaluation on multiple fossil forms, Ahlberg still tries to tie *Tiktaalik* and the other elpistostegids into an evolutionary cladogram of fish-to-tetrapod evolution. He maintains that these morphological intermediates can still be useful in illuminating the origin of tetrapods even though they are in no sense a temporal intermediate or ancestor.[34] Based on his previous comment that his hypothesis has absolutely zero body fossil evidence, this is only conjecture.

Appearances can be deceiving

What about the extensive commentary on comparative anatomy between fossil forms? It is one of the main things evolutionists use to argue for evolution. As noted above, Ahlberg still values the vast amount of existing comparative anatomy information in spite of the dating dilemma with *Tiktaalik* being much younger than true tetrapod tracks.

Also, in the nine years since the Zachełmie tracks have been found, Shubin appears to have authored only one paper on *Tiktaalik*; in it he only discusses the robustness of its hip (again, relying on comparative anatomy) as rationale for it being still considered an intermediate form.[35]

A curious fact emerges with using comparative anatomy to evaluate fish as having tetrapod-like features (or any alleged evolutionary development): one consistently 'sees' only creatures with fully formed systems. We don't see creatures whose systems are partially developed (as in the process of being evolved). As Garner notes:

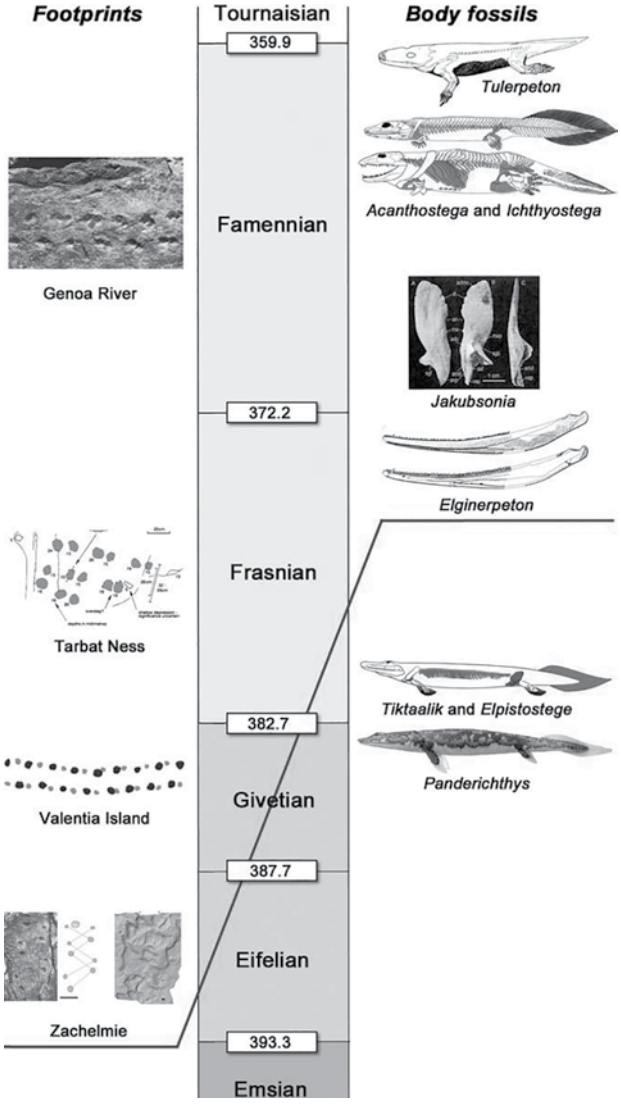


Figure 3. Timescale of the Middle and Late Devonian showing relative ages of salient tetrapod footprints (left) and body fossils (right). Numbers in the middle boxes denote stage boundaries using evolutionary-based ages (millions of years). The line connecting Zachelmie and *Elginerpeton* indicates the age of the earliest tetrapod footprints (left) and earliest tetrapod body fossils (right). The temporal mismatch between the Zachełmie footprints and *Tiktaalik* is evidenced. The ages of Tarbat Ness and Genoa River are approximate but all others are tightly constrained (from Ahlberg[29]).

> "Evolutionary theory might lead us to expect examples of intermediate structures, but there is nothing intermediate about, for example, the internal gills of *Acanthostega*, its lateral line system, or its limbs. They are fully developed and highly complex."[36]

When it comes to *Tiktaalik*, this issue is just as valid according to Ahlberg:

> "It is tempting to view elpistostegids simply as an intermediate step in a directional evolutionary progression, but of course they were nothing of the sort; like all organisms, they were adaptively optimized for their own lifestyle and not 'on their way' to anywhere."[32]

There is a lot missing from the fossil record contrary to what is predicted/required by the evolution model. Where are all the thousands of hypothesized creatures with systems undergoing evolutionary transition? The short answer is: they are missing.

Can one really infer phylogeny from comparative anatomy? Creationists maintain that such efforts are fruitless since Scripture states that God created living things according to their kinds, there should be defined gaps between these kinds of creatures. Common features are understood as being designed by a common Creator, who developed a range of biological structural concepts for the many kinds of creatures, and used similar structures within different kinds of creatures when they were to inhabit similar ecosystems or operate in a similar manner.

Baraminology is a recent study effort to quantify where those gaps exist. Instead of using comparative anatomy concepts to prove phylogeny, creationists are specifically expecting there are boundaries between kinds of creatures and developing means to quantify those boundaries (because there are structures that appear visually similar). Garner and Asher employed baraminic distance correlation (BDC) and three-dimensional MDS (multidimensional scaling) to determine if there are any morphological (that could also represent phylogenetic) discontinuities that exist between the various fossils (the Devonian tetrapods and the elpistostegids) in the fish-to-tetrapod 'transition'.[37] Seven sets of data were evaluated in their study, and in the end four showed no positive correlations between elpistostegids and tetrapods, with the other three showing negative correlations.[38] Garner and Asher conclude:

> "Our ability to detect discontinuity between the Devonian tetrapods and the elpistostegids is especially noteworthy, given that the Devonian tetrapods possess many fish-like characters and the elpistostegids possess many tetrapod-like characters. Theoretically, taxa that share characteristics of fish and tetrapods could have bridged the gap between these two groups, but our BDC and MDS analyses support separating them into distinct clusters even when such intermediate forms are included."[38]

This supports the claim creationists consistently make that these fossil forms have no common ancestry.

Conclusion

What is so great about *Tiktaalik*? It falls far short of all the hype and terms of an evolutionary icon, and is essentially dethroned.

Evolutionists themselves have described several critical problems with *Tiktaalik*:

- It has structures more primitive than its supposed evolutionary predecessors;
- It could not venture out on land as modern lungfish do;
- The most drastic changes between fish and tetrapod were not present in *Tiktaalik*;
- Tetrapods already existed millions of years before *Tiktaalik*, which obscures how *Tiktaalik* fits into an evolutionary transition, and;
- Major gaps still exist in the fossil record even with the discovery of *Tiktaalik*.

Comparative anatomy studies by evolutionists show that all fossils examined exhibit mature, fully functional structures, and that these creatures would be perfectly adapted (designed) for their environments. No fossil remains to date (including *Tiktaalik*) show structures that are 'in transition'. In terms of comparative anatomy, Mathematical BDC and MDS analysis confirms there are significant morphological gaps between tetrapods and elpistostegids (such as *Tiktaalik*), consistent with biblical creation. Evolutionists frankly admit that gaps in the evolutionary progression of tetrapods are the rule, not the exception.

So, the post-discovery history of *Tiktaalik* creates more problems than it solves for evolutionists. However, it fits well into a creationist understanding of diversity and the fossil record. *Tiktaalik* turns out to be a better witness to the truth of the Bible and the Creator God who designed it than it seemed from the early hype surrounding its original discovery.

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