

Primordial fish had rudimentary fingers

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Tetrapods, the first four-legged land animals, are regarded as the first organisms that had fingers and toes. Now researchers at Uppsala University can show that this is wrong. Using medical x-rays, they found rudiments of fingers in the fins in fossil *Panderichthys*, the “transitional animal,” which indicates that rudimentary fingers developed considerably earlier than was previously thought.

Our fish ancestors evolved into the first four-legged animals, tetrapods, 380 million years ago. They are the forerunners of all birds, mammals, crustaceans, and batrachians. Since limbs and their fingers are so important to evolution, researchers have long wondered whether they appeared for the first time in tetrapods, or whether they had evolved from elements that already existed in their fish ancestors.

When they examined genes that are necessary for the evolution of fins in zebrafish (a ray-finned fish that is a distant relative of coelacanth fishes) and compared them with the gene that regulates the development of limbs in mice, researchers found that zebrafish lacked the genetic mechanisms that are necessary for the development of fingers. It was therefore concluded that fingers appeared for the first time in tetrapods. This reading was supported by the circumstance that the fossil *Panderichthys*, a “transitional animal” between fish and tetrapod, appeared to lack finger rudiments in their fins.

In the present study, to be published in *Nature*, medical x-rays (CT scans) were used to reconstruct a three-dimensional image of *Panderichthys* fins. The results show hitherto undiscovered elements that

constitute rudiments of fingers in the fins. Similar rudiments have been demonstrated once in the past, two years ago in Tiktaalik, which is a more tetrapod-like group. Together with information about fin development in sharks, paddlefish, and Australian lungfish, the scientists can now definitively conclude that fingers were not something new in tetrapods.

“This was the key piece of the puzzle that confirms that rudimentary fingers were already present in ancestors of tetrapods,” says Catherine Boisvert.

Source: Uppsala University

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