

# Australian lungfish has largest genome of any animal sequenced so far

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**The Australian lungfish has a very long genome**

Paulo Oliveira / Alamy

The Australian lungfish has the largest genome of any animal so far sequenced.

Siegfried Schloissnig at the Research Institute of Molecular Pathology in Austria and his colleagues have found that the lungfish's genome is 43 billion base pairs long, which is around 14 times larger than the [human genome](#).

Its genome is 30 per cent larger than that of the previous record holder: the [axolotl](#), a Mexican amphibian that the team sequenced in 2018.

The researchers used high-powered computer sequencers to piece together the lungfish genome.

To account for inherent errors that the sequencers introduce, they used multiple copies of the [genome](#), each fragmented into small pieces of DNA. After all the fragments were sequenced, the team used algorithms to reassemble the pieces into a complete genome.

The result took roughly 100,000 hours of computer [processing power](#), Schloissnig estimates.

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The Australian [lungfish](#) (*Neoceratodus forsteri*), native to south-east Queensland, has changed little in appearance since the time when animals began transitioning from a water-based to a terrestrial-based lifestyle, says Schloissnig.

The animal's fins are fleshy and flipper-like, and it has a single dorsal lung, which it can use to breathe air at the water's surface.

Previously, it was unclear whether [lungfish](#) or coelacanths – a group of archaic fish found in the Indian Ocean and around Indonesia – were more closely related to land-based vertebrates such as mammals and birds.

The new genomic analysis shows unequivocally that lungfish are more closely linked to the evolutionary line that gave rise to four-legged animals. Coelacanths diverged earlier, while lungfish branched off 420 million years ago.

“In order to get out of the water, you need to adapt towards a terrestrial lifestyle,” says Schloissnig. “You have to be able to breathe air, you have to be able to smell.”

The Australian lungfish is similar to amphibians when it comes to the raw number of genes associated with the development of lungs and articulated limbs, as well as the detection of air-borne smells.

“When you look at it from a genomic perspective, it is genomically halfway between a fish and a land-based vertebrate,” says Schloissnig.

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