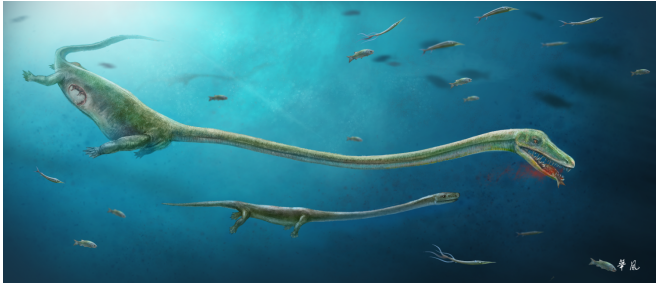


Fossil discovery rewrites understanding of reproductive evolution (Update)

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The pregnant Dinocephalosaurus biting a fish. Credit: Dinghua Yang & Jun Liu

A remarkable 250 million-year-old "terrible-headed lizard" fossil found in China shows an embryo inside the mother—clear evidence for live birth.

Head of The University of Queensland's School of Earth and Environmental Sciences and co-author Professor Jonathan Aitchison said the fossil unexpectedly provided the first evidence for live birth in an animal group previously thought to exclusively lay eggs.

"Live birth is well known in mammals, where the mother has a placenta to nourish the developing embryo," Professor Aitchison said.

"Live birth is also very common among lizards and snakes, where the babies sometimes 'hatch' inside their mother and emerge without a shelled egg."

Until recently it was thought the third major group of living land vertebrates, the crocodiles and birds (part of the wider group Archosauromorpha) only laid eggs.

"Indeed, egg-laying is the primitive state, seen at the base of reptiles, and in their ancestors such as amphibians and fishes," Professor Aitchison said.

He said the new fossil was an unusual, long-necked marine animal called an archosauromorph that flourished in shallow seas of South China in the Middle Triassic Period.

The creature was a fish-eater, snaking its long neck from side to side to snatch its prey.

Its fossil was one of many astonishingly well-preserved specimens from new "Luoping biota" locations in south-western China. There were no known fossils like this (marine vertebrates of this age) from Australia.

Lead author Professor Jun Liu from Hefei University of Technology China, said the researchers were "excited" when they first saw this embryonic specimen.

"We were not sure if the embryonic specimen was the mother's last lunch or its unborn baby," Professor Liu said.

"Upon further preparation and closer inspection, we discovered something unusual."

He said the embryo was inside the mother's rib cage, and it faced forward; swallowed animals generally face backward because the predator swallows its prey head-first to help it go down its throat.

Furthermore, the small reptile inside the mother was an example of the same species.

"Further evolutionary analysis revealed the first case of live birth in such a wide group containing birds, crocodilians, dinosaurs and pterosaurs among others, and pushes back evidence of reproductive biology in the group by 50 million years," Professor Liu said.

"Information on reproductive biology of archosauromorphs before the Jurassic Period was

not available until our discovery, despite a 260 million-year history of the group."

Professor Chris Organ from Montana State University said evolutionary analysis showed that this instance of live birth was also associated with genetic sex determination.

"Some reptiles today, such as crocodiles, determine the sex of their offspring by the temperature inside the nest," he said.

"We identified that *Dinocephalosaurus*, a distant ancestor of crocodiles, determined the sex of its babies genetically, like mammals and birds.

"This new specimen from China rewrites our understanding of the evolution of reproductive systems."

Professor Mike Benton of the University of Bristol said analysis of the evolutionary position of the new specimens showed no fundamental reason why archosauromorphs could not have evolved live birth.

"This combination of live birth and genotypic sex determination seems to have been necessary for animals such as *Dinocephalosaurus* to become aquatic," he said.

"It's great to see such an important step forward in our understanding of the evolution of a major group coming from a chance fossil find in a Chinese field."

The work is part of ongoing wider collaborations between palaeontologists in China, the United States, the UK and Australia.

The paper is published in the journal, *Nature Communications*.

More information: Live birth in an archosauromorph reptile, *Nature Communications*, [nature.com/articles/doi:10.1038/ncomms14445](https://doi.org/10.1038/ncomms14445)

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