

# Earliest animals lived in a lake environment, research shows

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Researchers study exposures of the Doushanto Formation along a creek in the Yangtze Gorges area, South China. Credit: M. Kennedy, UC Riverside

Evidence for life on Earth stretches back billions of years, with simple single-celled organisms like bacteria dominating the record. When multi-celled animal life appeared on the planet after 3 billion years of single cell organisms, animals diversified rapidly.

Conventional wisdom has it that animal evolution began in the ocean, with animal life adapting much later in Earth history to terrestrial environments.

Now a UC Riverside-led team of researchers studying ancient rock samples in South China has found that the first animal fossils in the

paleontological record are preserved in ancient lake deposits, not marine sediments as commonly assumed.

"We know that life in the oceans is very different from life in lakes, and, at least in the modern world, the oceans are far more stable and consistent environments compared to lakes which tend to be short-lived features relative to, say, rates of evolution," said Martin Kennedy, a professor of geology in the Department of Earth Sciences who participated in the research. "Thus it is surprising that the first evidence of animals we find is associated with lakes, a far more variable environment than the ocean."

The study, published in the July 27-31 online edition of the [Proceedings of the National Academy of Sciences](#), raises questions such as what aspects of the Earth's environment changed to enable animal evolution.

In their research, the authors focused on South China's Doushantuo Formation, one of the oldest fossil beds that houses highly preserved fossils dated to about 600 million years ago. These beds have no adult fossils. Instead, many of the fossils appear as bundles of cells interpreted to be animal embryos.

"Our first unusual finding in this region was the abundance of a clay mineral called smectite," said lead author Tom Bristow, who worked in Kennedy's lab. "In rocks of this age, smectite is normally transformed into other types of clay. The smectite in these South China rocks, however, underwent no such transformation and have a special chemistry that, for the smectite to form, requires specific conditions in the water - conditions commonly found in salty, alkaline lakes."

The researchers' work involved collecting hundreds of rock samples from several localities in South China, carrying out mineralogical analysis using X-ray diffraction, and collecting and analyzing other types

of geochemical data.

"All our analyses show that the rocks' minerals and geochemistry are not compatible with deposition in seawater," Bristow said. "Moreover, we found smectite in only some locations in South China, and not uniformly as one would expect for marine deposits. This was an important indicator that the rocks hosting the fossils were not marine in origin. Taken together, several lines of evidence indicated to us that these early animals lived in a lake environment."

Bristow noted that the new research gives scientists a glimpse into where some of the early animals lived and what the environmental conditions were like for them - important information for addressing the broader questions of how and why animals appeared when they did.

"It is most unexpected that these first fossils do not come from marine sediments," Kennedy said. "It is possible, too, that similarly aged or older organisms also existed in marine environments and we have not found them. But at the very least our work shows that the range of early animal habitats was far more expansive than presently assumed and raises the exciting possibility that animal evolution first occurred in lakes and is tied to some environmental aspect unique to lake environments. Furthermore, because lakes are of limited size and not connected to each other, there may have been significant parallel evolution of organisms. Now we must wait and see if similar fossils are found in marine sediments."

Source: University of California - Riverside ([news](#) : [web](#))

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