

Paleontologists Find New Fossil Link in Bird Evolution

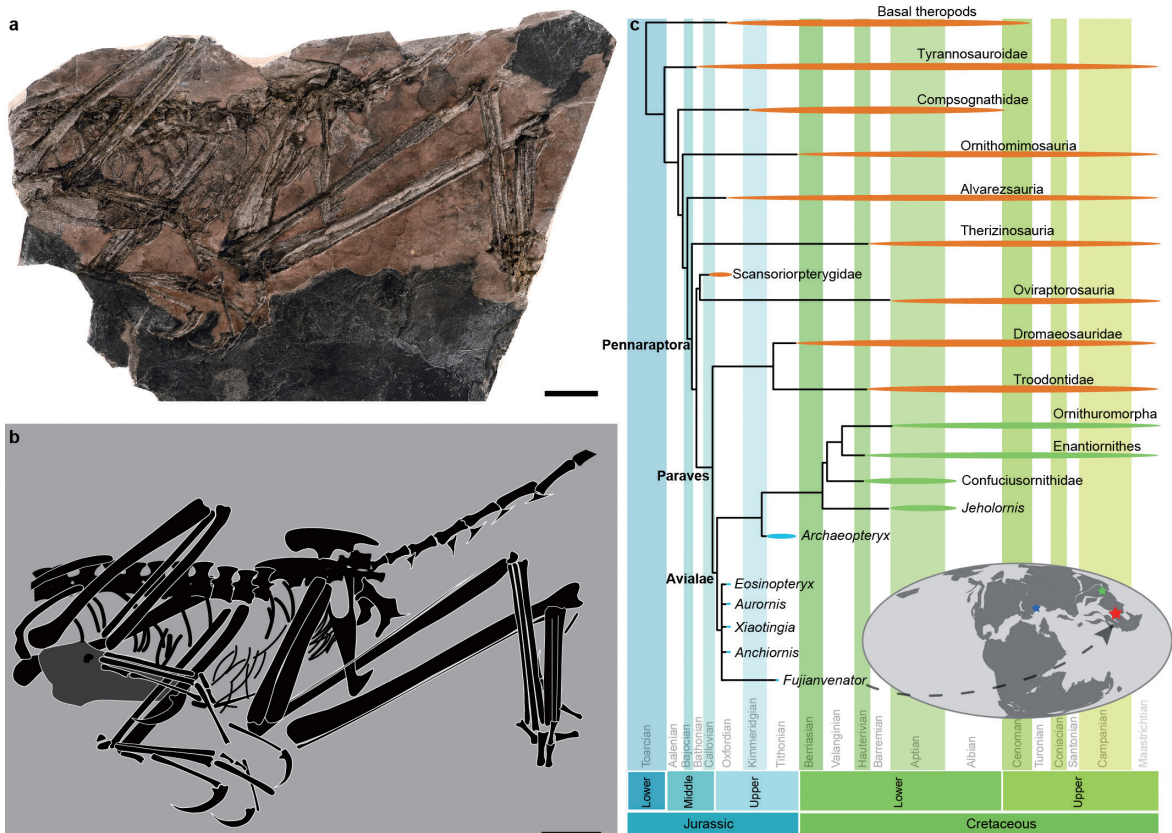
Birds descended from theropod dinosaurs by the Late Jurassic, but our understanding of the earliest evolution of the Avialae, the clade comprising all modern birds but not *Deinonychus* or *Troodon*, has been hampered by a limited diversity of fossils from the Jurassic.

As of now, no definitive avialans have been reported except from the Middle–Late Jurassic Yanliao Biota in northeast China (166–159 million years ago; Ma) and the slightly younger German Solnhofen Limestones, which preserve *Archaeopteryx*. Consequently, there is a gap of about 30 million years before the oldest known record

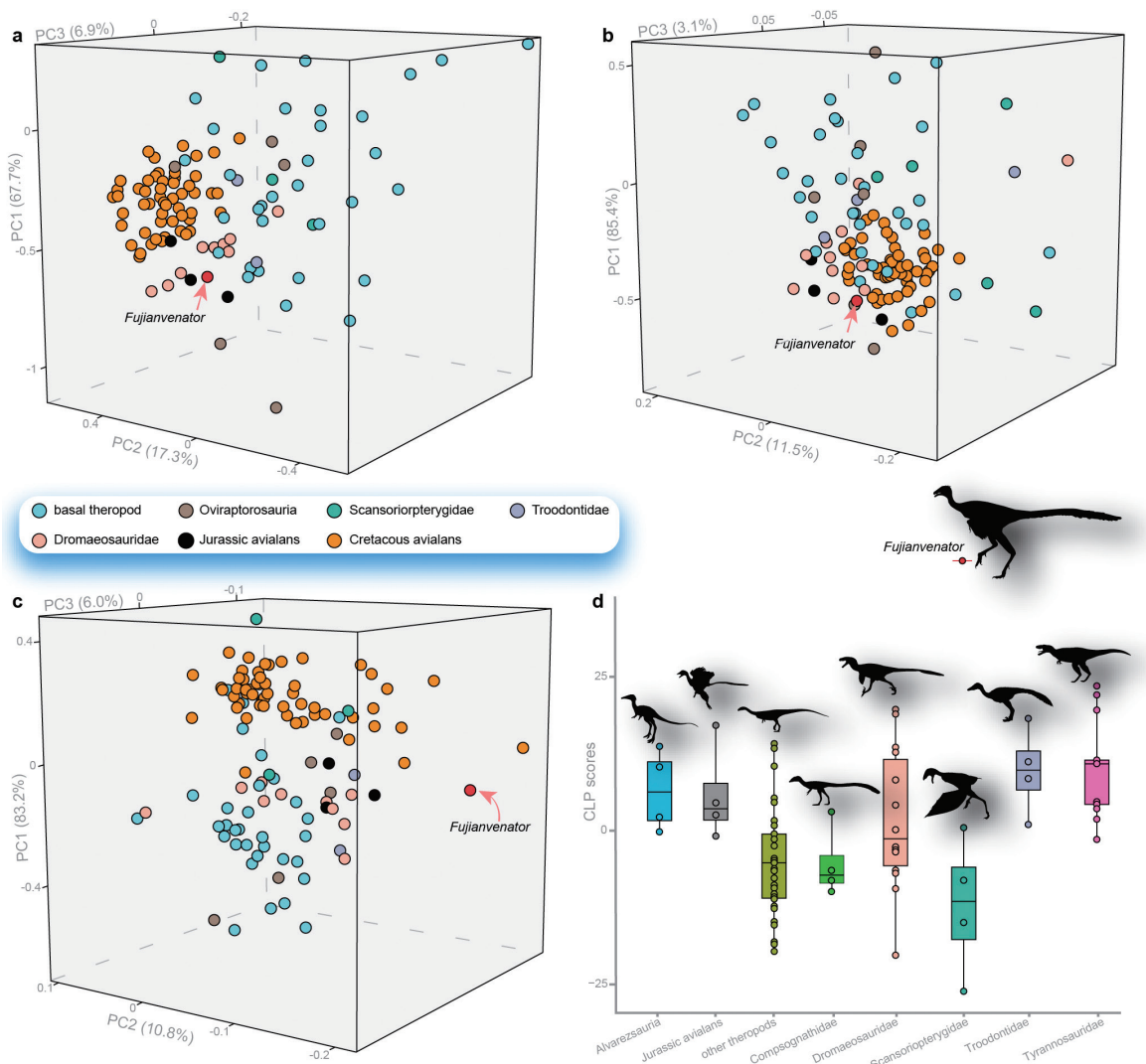
of Cretaceous birds. However, the Jurassic avialans are key to deciphering the evolutionary origin of the characteristic avialan body plan. More importantly, they are key to reconciling the phylogenetic controversy about the origin of birds.

A joint research team from the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) of the Chinese Academy of Sciences in Beijing and the Fujian Institute of Geological Survey (FIGS) described and analyzed a new 150-million-year-old avialan theropod from Zhenghe County, Fujian Province.

The findings were published in *Nature* on September 6.



Photograph and interpretive line drawing of the 150-million-year-old avialan theropod *Fujianvenator prodigiosus*, with a phylogeny and paleomap showing the locality of the Zhenghe Fauna (red star). (Image by WANG Min)



Morphometric space of body plan and cursoriality of *Fujianvenator prodigiosus*, compared with other Mesozoic theropods. (Image by WANG Min)

The new species, named *Fujianvenator prodigiosus*, exhibits a bizarre assembly of morphologies that are shared with other avialans, troodontids, and dromaeosaurids, showing the impact of evolutionary mosaicism in early bird evolution.

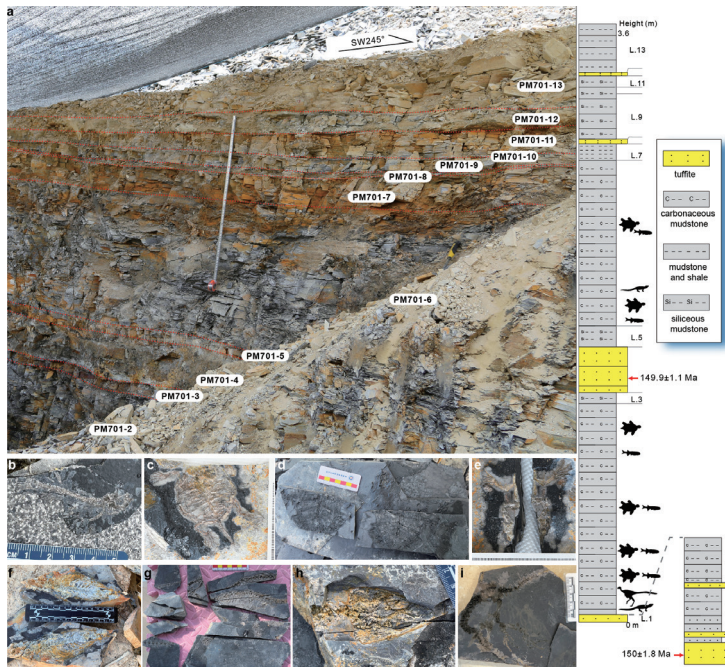
“Our comparative analyses show that marked changes in body plan occurred along the early avialan line, which is largely driven by the forelimb, eventually giving rise to the typical bird limb proportion,” said Dr. WANG Min from IVPP, lead and corresponding author of the study. “However, *Fujianvenator* is an odd species that diverged from this main trajectory and evolved bizarre hindlimb architecture.”

The surprisingly elongate lower leg and other

morphologies, in combination with other geological observations, suggest that *Fujianvenator* lived in a swamp-like environment and was a high-speed runner or a long-legged wader, representing a previously unknown ecology for early avialans.

“Besides *Fujianvenator*, we have found abundant other vertebrates, including teleosts, testudines and choristoderes,” said XU Liming from FIGS, lead author of the study.

During the Late Jurassic–Early Cretaceous, southeastern China underwent intensive tectonic activities due to subduction of the paleo-Pacific plate, resulting in widespread magmatism and coeval fault-depression basins, where *Fujianvenator* was found. This



Stratigraphic log and vertebrate fossil assemblage discovered in the Late Jurassic Zhenghe Fauna. (Image by WANG Min)



Life reconstruction of the 150-million-year-old avialan theropod *Fujianvenator prodigiosus*. (Image by ZHAO Chuang)

geological background is essentially the same as in the Late Jurassic in north and northeastern China, where the older Yanliao Biota is preserved.

“The extraordinary diversity, unique vertebrate composition, and paleoenvironment strongly indicate that this locality documents a terrestrial fauna, which we named the Zhenghe Fauna,” said Dr. ZHOU Zhonghe from IVPP, co-author of the study. *In-situ* radioisotopic dating and stratigraphic surveys constrain the Zhenghe

Fauna to the period from 150 to 148 Ma. Therefore, *Fujianvenator* documents one of the stratigraphically youngest and geographically southernmost members of the Jurassic avialans.

The discovery of the Zhenghe Fauna opens a new window into the Late Jurassic terrestrial ecosystem of the planet, and the joint research team from IVPP and FIGS plan to continue their exploration of Zhenghe and nearby areas.

(IVPP)