

Cool oasis for Cretaceous feathered dinosaurs

October 4 2021, by B. Dzombak



Caudipteryx zoui, feathered dinosaur plate, Early Cretaceous, Yixian Formation, Liaoning, China in the Houston Museum of Natural Science, Houston, Texas, USA. Photography was permitted in the museum without restriction. Credit: Daderot/Wikimedia Commons CC0 1.0

The Jehol Biota, an ancient ecosystem in Liaoning province in northeastern China, includes a dense and diverse array of Cretaceous flora and fauna and is a hot spot of feathered dinosaur fossils. A new study reconstructs a cool climate and high elevation at the site, providing critical environmental context for the wide array of dinosaurs preserved there.

Paleobiologists do not think that feathers, which evolved during the Jurassic, were originally used for flying because early examples were too small and stubby to support flight. Instead, like feathers on [modern birds](#), dinosaurs' feathers likely served other purposes, including insulation.

Lead study author Laiming Zhang, a paleoclimatologist at the China University of Geosciences Beijing, estimated what the air temperatures and elevation of the Jehol Biota were around 125 million years ago by using the isotopic composition of carbonate minerals that formed in soils. He found low springtime temperatures, around 6°C, suggesting a cool [climate](#).

"Conventional thinking is that temperatures in the Early Cretaceous were high," Zhang said. Other studies based on ocean temperatures in the region estimated 15°C–35°C, consistent with a greenhouse climate. "So we thought this was a special phenomenon and wanted to find out what could have caused this low temperature."

While much of the Cretaceous world was hot, cooler ecosystems could

have thrived in [higher elevations](#). To see whether elevation could reasonably explain the cool temperatures, Zhang used the temperature difference between his land reconstructions and those from nearby ocean records to estimate how high the land might have been.

Zhang et al. found that the altitude was likely 3–4 kilometers (about 10,000–13,000 feet) at the site of the Jehol Biota during the Cretaceous. The paleoelevation estimate is supported by two additional lines of evidence. During the Early Cretaceous, northeastern China was undergoing dramatic tectonic changes associated with the Yanshanian orogeny. Biology reflects a colder climate, too, with remains of plants known to live in cool ecosystems found nearby.

"We not only have results from the carbonate data, which are consistent with previous studies, but we also have the biota—insects and plants—that suggest a low [temperature](#) and a [high elevation](#)," said Zhang.

With these pieces in place, Zhang thought it reasonable that dinosaurs in this region would have benefited from insulation. With previous evidence from eggshells and bones that the dinosaurs' body temperatures were much higher than the cool [air temperatures](#) this study estimated, Zhang reasoned that the dinosaurs may have needed feathers' help to stay warm.

"It's long been thought that feathers helped dinosaurs with insulation, as well as for display," said Sarah Davis, an evolutionary paleobiologist at the University of Texas at Austin. "The idea that feathers and feather-like structures are prevalent in this community of dinosaurs, in part because of the climate, makes sense. Feathered dinosaurs could have done well at this locality because of their insulation."

The new context of climate and elevation provides useful background

for studying one of the world's best sites for fossils of feathered [dinosaurs](#).

More information: Laiming Zhang et al, High-Altitude and Cold Habitat for the Early Cretaceous Feathered Dinosaurs at Sihetun, Western Liaoning, China, *Geophysical Research Letters* (2021). [DOI: 10.1029/2021GL094370](#)

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