

NEW SPECIES OF BIZARRE, EXTINCT LIZARDS – SO STRANGE THAT THEY HAVE BEEN MISTAKENLY IDENTIFIED AS DINOSAURS THE SIZE OF A HUMMINGBIRD

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Oculudentavis naga, as depicted in this artist's reconstruction, was a bizarre lizard that researchers initially found it difficult to classify. You're still not sure what exact position it is in the lizard tree. Source: Stephanie Abramowicz / Peretti Museum Foundation / *Current Biology*

An international research team has described a new species of *Oculudentavis*, providing further evidence that the animal first identified as a hummingbird-sized dinosaur was actually a lizard.

The new species, named *Oculudentavis naga* in honor of the Naga in Myanmar and India, is represented by a partial skeleton containing a full skull exquisitely preserved in amber with scales and soft tissues visible. The specimen belongs to the same genus as *Oculudentavis khaungraae*, whose original description as the smallest known bird was withdrawn last year. The two fossils were found in the same area and are approximately 99 million years old.

Researchers published their results in *Current biology* today (June 14, 2021).

The team, led by Arnau Bolet from the Institut Català de Paleontologia Miquel Crusafont in Barcelona, used CT scans to digitally separate, analyze and compare each bone of the two species, revealing a range of physical characteristics that the small animals considered Flag lizards. *Oculudentavis* is so strange that it was difficult to categorize without carefully studying its characteristics, Bolet said.

“The specimen puzzled us all at first because if it was a lizard it was a very unusual one,” he said in an institutional press release.

Bolet and other lizard experts from around the world first noticed the specimen when they were examining a collection of amber fossils acquired by gemologist Adolf Peretti from Myanmar. (Note: The mining and sale of Burmese amber is often linked to human rights abuses. Peretti legally bought the fossil before the conflict in 2017. For more details, see an ethics statement at the end of this story).

Oculudentavis naga, above, belongs to the same genus as Oculudentavis khaungraae, below, a specimen whose controversial early bird identification was withdrawn last year. The skulls of both specimens deformed during preservation, emphasizing lizard-like features in one and bird-like features in the other. Source: Edward Stanley of the Florida Museum of Natural History / Peretti Museum Foundation / Current Biology

Herpetologist Juan Diego Daza examined the small, unusual skull that was preserved with a short part of the spine and shoulder bones. He, too, was confused by the strange features: Could it be some kind of pterodactyl or possibly an ancient relative of the monitor lizards?

“From the moment we uploaded the first CT scan, everyone started thinking about what it could be,” said Daza, assistant professor of biological sciences at Sam Houston State University. “Ultimately, a closer look

and our analyzes help us to clarify the position.”

One of the main clues that the mysterious animal was a lizard was the presence of scales; Teeth attached directly to his jawbone instead of embedded in cavities like dinosaur teeth; lizard-like eye structures and shoulder bones; and a hockey stick-shaped skull bone commonly shared by scaly reptiles, also known as squamates.

The team also found that the skulls of both species had deformed during preservation. *Oculudentavis khaungraae*'s snout has been squeezed into a narrower, more beak-like profile, while *O. naga*'s brain covering – the part of the skull that encloses the brain – has been compressed. The distortions highlighted bird-like features in one skull and lizard-like features in the other, said study co-author Edward Stanley, director of the Florida Museum of Natural History's Digital Discovery and Dissemination Laboratory.

Amber is excellent at preserving small forest animals that would otherwise have decomposed. CT scans of these fossilized oculudentavis naga show the specimen 's scales, skin, and soft tissues. Credit: Adolf Peretti / Peretti Museum Foundation / Current Biology

“Imagine you take a lizard and push its nose into a triangular shape,” said Stanley. “It would look a lot more like a bird.”

However, *Oculudentavis*' bird-like skull proportions do not suggest it was related to birds, said study co-author Susan Evans, professor of vertebrate morphology and paleontology at University College London.

“Although it has a domed skull and a long and tapering muzzle, it does not offer any meaningful physical traits that can be used to maintain close relationships with birds, and all of its features indicate that it is a lizard “, she said.

While the skulls of the two species don't look very similar at first glance, their common features became more apparent when the researchers digitally isolated and compared each bone. The differences were minimized when the original shape of both fossils was reconstructed through a careful process known as retrodeformation performed by Marta Vidal-García of the University of Calgary in Canada.

“We concluded that both specimens are similar enough to belong to the same genus, *Oculudentavis*, but a number of differences suggest that they represent different species,” Bolet said. ^

On the better-preserved *O. naga* specimen, the team was also able to identify a raised crest that runs down the top of the snout and a flap of loose skin under the chin that may have been puffed up at the exhibit, Evans said. However, the researchers failed in their attempts to find the exact location of *Oculudentavis* in the lizard family tree.

“It’s a really strange animal. It is different from all the other lizards we have today,” said Daza. “We think it’s a group of Squamates that we didn’t know about.”

The Cretaceous Period 145.5 to 66 million years ago spawned many groups of lizards and snakes on the planet today, but tracing fossils from that period to their closest living relatives can be difficult, Daza said.

“We estimate that many lizards emerged during this period but haven’t developed their modern look yet,” he said. “That’s why they can deceive us. They may have characteristics of this or that group, but in reality they do not fit together perfectly. ”


The majority of the study was performed using CT data created at the Australian Center for Neutron Scattering and the High-Resolution X-ray Computed Tomography Facility at the University of Texas at Austin. *O. naga* is now digitally available to anyone with internet access, allowing the team to reassess their findings and opening up the possibility of new discoveries, Stanley said.

“In paleontology, you often have a specimen of a species to work with, which makes that individual very important. So researchers can be pretty protective, but our mindset is ‘let’s get it out there,’ ” Stanley said. “It is important that the research is done, not necessarily that we do the research. We are of the opinion that it should be like that. ”

While Myanmar’s amber deposits are a treasure trove for fossil lizards not found anywhere else in the world, Daza said paleontologists agree that acquiring Burmese amber is becoming increasingly difficult ethically, especially after the military took control in February.

“As scientists, we see it as our job to uncover these priceless traces of life so that the whole world can learn more about the past. But we have to be extremely careful not to benefit a group of people who are committing crimes against humanity during the trial,” he said. “In the end, the credit should go to the miners who risk their lives to find these amazing amber fossils.”

Other co-authors on the study are J. Salvador Arias of the National Scientific and Technical Research Council of Argentina (CONICET – Miguel Lillo Foundation); Andrej Cernansky from Comenius University in Bratislava, Slovakia; Aaron Bauer from Villanova University; Joseph Bevitt of the Australian Nuclear Science and Technology Organization; and Adolf Peretti from the Peretti Museum Foundation in Switzerland.

A 3D digitized copy of *O. naga* is available online through MorphoSource. The *O. naga* fossil is in the Peretti Museum Foundation in Switzerland and the *O. khaungraae* specimen is in the Hupoge Amber Museum in China. 

The sample was purchased from the Society for Vertebrate Paleontology in accordance with the Ethical Guidelines for the Use of Burmese Amber. The copy was purchased from authorized companies that are independent from military groups. These companies legally export pieces of amber from Myanmar, following a code of ethics that ensures that no human rights abuses have been committed during mining and commercialization, and that the money from the sale does not support armed conflict. The fossil has an authenticated paper trail, including export permits from Myanmar. All documents are available on request from the Peretti Museum Foundation.

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