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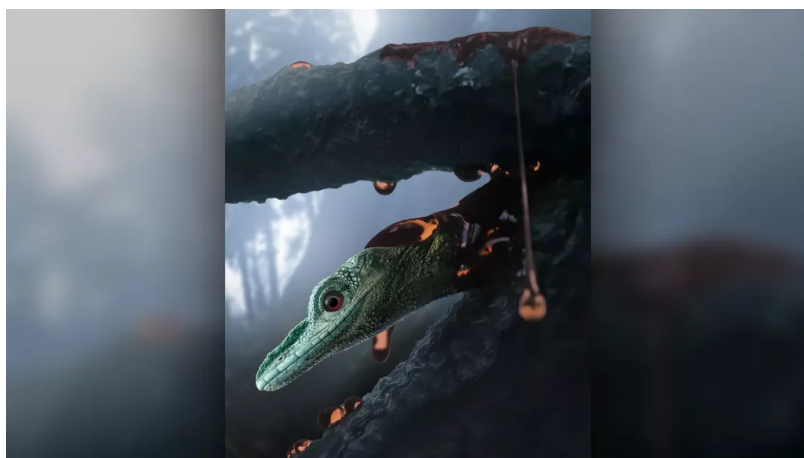
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'Strange beast' in amber is a very weird lizard

By [Mindy Weisberger](#) June 15, 2021

Oculudentavis lived about 99 million years ago in what is now Myanmar.



Oculudentavis naga, as depicted in this artist's reconstruction, was a bizarre lizard that researchers initially struggled to categorize. They are still unsure of its exact position in the lizard family tree. (Image credit: Stephanie Abramowicz/Peretti Museum Foundation/Current Biology)

A fossil locked in a piece of amber dating to about 99 million years ago belongs to a newfound and highly bizarre species of extinct lizard. The [fossil](#) also helped scientists revise the lineage of another amber-locked discovery, also dating to that part of the [Cretaceous period](#) (145.5 million to 65.5 million years ago), that was originally thought to be the smallest known ancient bird.

When researchers described the hummingbird-size *Oculudentavis khaungraae* in March 2020, it was hailed as the tiniest dinosaur ever found (birds are a lineage of dinosaurs that survive to the present). But the specimen had a number of features that hinted it might be a lizard, and the journal retracted the study in July 2020, Live Science [previously reported](#).

The new find, dubbed *Oculudentavis naga*, is a more complete specimen than *O. khaungraae*, having an intact skull and part of its spine and shoulders. After analyzing *O. naga* bone by bone, scientists determined that despite having some birdlike features it was a lizard — albeit a very strange lizard — and so was its "bird" cousin, according to a new study.

Related: [In photos: Amber preserves Cretaceous lizards](#)


Amber fossils form after an animal or plant becomes trapped in sticky resin from a coniferous tree. Over time, as the resin hardens into amber around the organic matter, it seals the organism away from [oxygen](#) and [bacteria](#), and protects it from decay and environmental wear, according to the [University of California Museum of Paleontology](#) in Berkeley.

These fossils often retain soft tissue, such as the [feathered wings](#) torn from a bird, a [feathered dinosaur's tail](#) and an [ancient lizard's tongue](#). Amber can also preserve rare instances of animal behavior — a 41 million-year-old [insect sex romp](#), for instance.

Many amber fossils dating to the Cretaceous come from Kachin province in Myanmar — both *Oculudentavis* specimens came from the province's Aung Bar mine, according to the new study. Indigenous people there managed the amber deposits and mining prior to 2017, but after the Myanmar military seized control of the mines, their operations displaced thousands and are linked to human rights abuses, [New Scientist reported](#) in 2019.


However, the *O. naga* amber specimen was acquired legally and exported from Myanmar prior to 2017 by study co-author Adolf Peretti, a gemologist with GRS Gemresearch Swisslab, the scientists reported.

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Amber can exquisitely preserve small forest animals that would have otherwise decomposed. CT scans of this fossilized *Oculudentavis naga* showcase the specimen's scales, skin and soft tissue. (Image credit: Adolf Peretti/Peretti Museum Foundation/Current Biology)

Birdlike lizard or lizardlike bird?

O. naga's skull measures just 0.6 inches (14.2 millimeters) in length, and its long, tapering snout tipped with elongated nostrils is more like a bird's beak than a lizard's nose, according to the study published Monday (June 14) in the journal [Current Biology](#).

When compared side-by-side with *O. khaungraae* (which measures 0.7 inches or 17.3 mm), the *O. naga* skull looks quite different: Its crown is flatter; it has a broader snout; and the eye opening, though large for a lizard, isn't quite as big as *O. khaungraae*'s. Yet the animals are more closely related than those preserved skull shapes suggest, and that relationship — and their identification as lizards — became clearer when researchers [X-ray](#) scanned the skulls, created digital 3D models and examined them one bone at a time, said study co-author Edward Stanley, an associate scientist at the Florida Museum of Natural History in Gainesville, and director of the museum's Digital Discovery and Dissemination (3D) imaging lab.

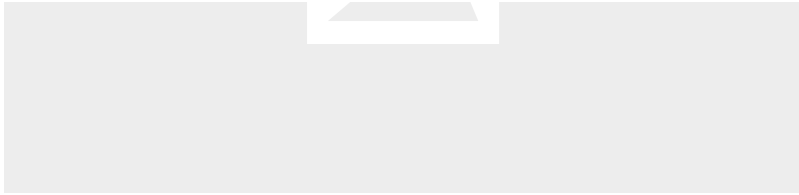
Both specimens had teeth with long roots that were attached to the jaw. Known as pleurodont dentition, these teeth are common in lizards and "don't look like dinosaur teeth," which are seated in sockets, Stanley told Live Science.

"There's a bone at the back of the jaw called a quadrate that attaches the lower jaw to the top of the skull and the braincase — that's also very lizardlike in both specimens," Stanley said. "The roof of the mouth, while unusual for a lizard, is much more lizardlike than birdlike," Stanley added. A skull bone that's shaped like a hockey stick, called a jugal, ticked yet another box on the lizard list of features for both animals, the scientists wrote in the study.

Yet *O. naga* and *O. khaungraae* also both had "a strange-looking bone" directly in front of the eye socket that was unlike anything seen in most lizards, Stanley said.

"The fact that a lizard skull — the first specimen, the holotype of *Oculudentavis khaungraae* — could be misidentified as a bird is a good indication that this reptile is a really unusual one," said lead study author Arnau Bolet, a research fellow at the Autonomous University of Barcelona's Miquel Crusafont Catalan Institute of Paleontology.





Oculudentavis naga, top, is in the same genus as *Oculudentavis khaungraae*, bottom, a specimen whose controversial identification as an early bird was retracted last year. Both specimens' skulls deformed during preservation, emphasizing lizardlike features in one and birdlike features in the other. (Image credit: Edward Stanley of the Florida Museum of Natural History/Peretti Museum Foundation/Current Biology)

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Deformed by time

One explanation for why the specimens look so different from each other — and why *O. khaungraae* had a more birdlike appearance, with a rounder skull and pointier snout — could be that the skulls were deformed by fossilization. As *O. naga* was a more complete specimen, it provided the scientists with a clearer picture of the bones. After scanning the skulls with [computed X-ray tomography \(CT\)](#), the researchers digitally reversed deformation in the models, revealing that the two species were more similar than they first appeared.

"We used CT data to try to isolate all the individual bones piece by piece, so we really broke it down into its component parts," Stanley said. "When you do that, it becomes a lot clearer: Not only is this thing a lizard, but these things are very closely-related weird lizards."

O. naga was less laterally deformed than *O. khaungraae*, making it "less prone to interpretation as a bird," Bolet told Live Science in an email. Nevertheless, the fossil "still shows that *Oculudentavis* deviates from the standard lizard morphology in some aspects, rendering it a highly interesting animal," Bolet added. "They show that there is much to be learned about the evolution of species in the past, and give us a glimpse of the way different groups — in this case, lizards — diversified to occupy different roles in the ecosystem."

While *Oculudentavis*' status as a bizarre lizard genus is now clearer, its exact position on the lizard family tree is still unknown, the scientists reported. But with all the CT data now available for free at [MorphoSource](#), an online repository for 3D scientific data, other researchers will have the opportunity to try to solve this intriguing [evolutionary](#) puzzle.

"You can 3D-print this model or use a computer simulation to test things like bite force, or jaw angle — that might tell a little more about what this animal was doing in life. You can isolate the inner [ear](#) of the specimen, that might tell you about the type of environment it lived in, whether it lived up in trees or on the ground," Stanley said. "We're keen to work on it, and we're keen for other people to work on it as well."

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Mindy Weisberger is a senior writer for Live Science covering general science topics, especially those relating to brains, bodies, and behaviors in humans and other animals — living and extinct. Mindy studied filmmaking at Columbia University; her videos about dinosaurs, biodiversity, human origins, evolution, and astrophysics appear in the American Museum of Natural History, on YouTube, and in museums and science centers worldwide. Follow Mindy on Twitter.

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