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Scientists Discover Smallest Dinosaur on Record

International team finds tiny, tooth-filled skull of a predatorial bird preserved in 99 million year old Burmese amber

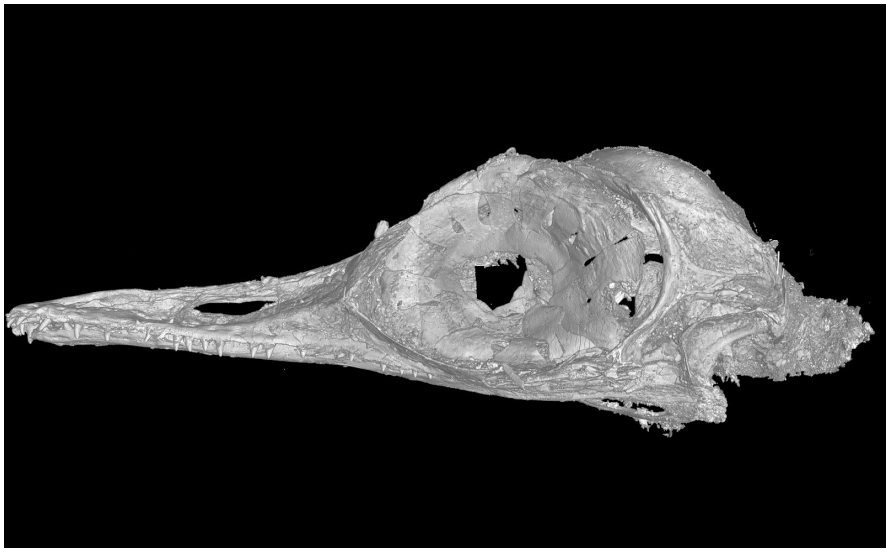
Los Angeles, CA (March 11, 2020) – Published today in *Nature*, an international team of scientists has discovered the skull of what appears to be the smallest dinosaur on record. The tiny bird was found preserved in Burmese amber from Myanmar, trapped around 99 million years ago. The delicate skull is smaller than that of a Bee Hummingbird, the smallest living bird, and it belongs to a new species, *Oculudentavis khaungraae*.

Researchers found that *Oculudentavis* had more teeth than any other fossil bird. The large number of teeth suggests that, despite its tiny size, *Oculudentavis* was a predator. The tooth row is longer than other birds', extending all the way under the eye, so the researchers gave the new dinosaur the name meaning "eye-tooth-bird." Its full name, *Oculudentavis khaungraae,* honors Mrs. Khaung Ra, who donated the specimen to the Hupoge Amber Museum. The tiny eyes of *Oculudentavis* were very large but with a pupil size that suggests it was diurnal.

Dr. Jingmai O'Connor, senior professor, Institute of Vertebrate Paleontology and Paleoanthropology of the Chinese Academy of Sciences, research associate at the Natural History Museum of Los Angeles County and a lead author on the study, described how the dinosaur's environment may have led to its

remarkable traits. “Animals that become very small have to deal with specific problems, like how to fit all sensory organs into a very small head, or how to maintain body heat,” she explained. “This process–called miniaturization–commonly occurs in isolated environments, most famously islands. It is no wonder that the 99 million year old Burmese amber is thought to have come from an ancient island arc,” O’Connor said. Miniaturization is commonly associated with traits like tooth loss and proportionately large eyes. However, since *Oculudentavis* has more teeth than usual, it shows that evolution doesn’t always follow the rules.

Dr. Luis Chiappe, senior vice president of research and collections at the Natural History Museums of Los Angeles County, expanded on that point. “This discovery highlights how ancient amber has the ability to provide information about organisms that are otherwise absent in the fossil record,” Chiappe said. “This is particularly the case for tiny animals that lived in trees.” He noted that technological innovation and the scientific process came together in this discovery. “By pairing cutting-edge technology with specimen examination, we’ve achieved exhilarating, detailed views of this tiny extinct being,” Chiappe said. “While a synchrotron, or particle accelerator, may be more known in quantum physics than in paleontology, this pairing of high tech and creative applications can enhance scientists’ ability to study and gain insights across fields. We have more tools at our fingertips than ever before, which has exciting implications for new discoveries.”



Oculudentavis eye traits surprised the scientists in more ways than one. Birds have a ring of bones, the scleral ring, that helps to support the eye. In most birds, the individual bones, called scleral ossicles, are simple and fairly square. But in *Oculudentavis*, they are spoon-shaped, a morphology previously only found in some living lizards. The bones of the eye would have formed a cone, like the eye bones in owls, indicating acute visual abilities. However, unlike owls, whose eyes face forward and are active at night, the eyes in *Oculudentavis* would have faced sideways and it would have been active during the day, as indicated by the small aperture of the eye bones (*the inner diameter of the ring*). The bone that supports the eye, the jugal, is bowed in such a way that suggests the eyes of *Oculudentavis* would have bulged out of its head sideways. This type of visual system is not utilized by any living animal, making it hard to understand exactly how the eyes of *Oculudentavis* may have functioned.

Because the new specimen consists of only a skull, understanding how it is related to other birds is unclear. Some features are like those of dinosaurs, some are like those of very advanced birds. Since there are no specific skull features that distinguish birds from non-avian dinosaurs or dinosaurs from other archosaurs, it is possible that the unusual skull is not a bird. However, currently a pointed rostrum and large orbit are only known to occur together in birds, thus supporting the team's identification. Analyses targeted at understanding the relationship between *Oculudentavis* and other fossil birds suggest that the new tiny bird is very primitive, placed between *Archaeopteryx*, the oldest (155-150 million years old) and most primitive bird, and *Jeholornis*, a long boney-tailed bird from 120 million year old deposits in China. This may suggest that like these two taxa, *Oculudentavis* had a long tail like that in non-avian dinosaurs.

"It's the weirdest fossil I've ever been lucky enough to study," O'Connor added. "I just love how natural selection ends up producing such bizarre forms. We are also super lucky this fossil survived to be discovered 99 million years later. Bivalves came very close to destroying the specimen - one of their drill holes goes right into the braincase. Just goes to show the extraordinary circumstances that all need to be just right for fossils to make it into human hands."

Chiappe added, "It's lucky this tiny creature was preserved in amber, as such small, fragile animals aren't common in the fossil record. This finding is exciting because it gives us a picture of the small animals that lived in a tropical forest during the Age of Dinosaurs."

Previously, eight specimens of ancient dinosaur birds have been found in amber, all smaller than what's been found in traditional fossils preserved in rock.

"Who knows what other small vertebrates will be found in amber in the future!" Chiappe concluded. "We have to keep searching, studying and discovering."

The international team behind the research and paper includes scientists from China, Canada and the United States. The team includes researchers from the following institutions: China University of Geosciences, Chinese Academy of Sciences, Natural History Museum of Los Angeles County, Claremont Colleges, Royal Saskatchewan Museum, and University of Regina. The full list of collaborators includes: Lida Xing, Jingmai K. O'Connor, Lars Schmitz, Luis M. Chiappe, Ryan C. McKellar, Qiru Yi, and Gang Li.

About the Natural History Museums of Los Angeles County
The Natural History Museums of Los Angeles County (NHMLAC) include the Natural History Museum in Exposition Park (NHM), La Brea Tar Pits, and the William S. Hart Museum. They operate under the collective vision to inspire wonder, discovery, and responsibility for our natural and cultural worlds. The museums hold one of the world's most extensive and valuable collections of natural and cultural history—more than 35 million objects. Using these collections for groundbreaking scientific and historic research, the museums also incorporate them into nature and culture exploration in L.A. neighborhoods, and a slate of community science programs—creating a natural history museum experience that explores the past, but increasingly addresses the present and the future. Visit nhm.org.

Images, videos, and interviews available upon request.

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