

Newly identified saber-toothed cat is one of largest in history

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The humerus bone excavated from north central Oregon, which is now on display in the University of Oregon Museum of Natural and Cultural History. Credit: John Orcutt

A giant saber-toothed cat lived in North America between 5 million and 9 million years ago, weighing up to 900 pounds and hunting prey that likely weighed 1,000 to 2,000 pounds, scientists reported today in a new study.

The researchers completed a painstaking comparison of seven uncategorized fossil specimens with previously identified fossils and bone samples from around the world to describe the [new species](#). Their finding makes a case for the use of the elbow portion of the humerus—in addition to teeth—to identify fossils of large saber-toothed cats whose massive forearms enabled them to subdue their prey.

The newly identified cat weighed an average of around 600 or so pounds and could have managed to kill prey weighing up to 6,000 pounds, the scientists estimate, suggesting that their findings provide evidence for another giant cat, one of the largest in Earth history.

"We believe these were animals that were routinely taking down bison-sized animals," said study co-author Jonathan Calede, an assistant professor of evolution, ecology and organismal biology at The Ohio State University's Marion campus. "This was by far the largest cat alive at that time."

Calede completed the study with John Orcutt, assistant professor of biology at Gonzaga University, who initiated the project. Orcutt found a

large upper arm bone specimen that had been labeled as a cat in the University of Oregon Museum of Natural and Cultural History collection when he was a graduate student, and collaborated with Calede on the years-long effort to figure out what kind of cat it could be.

They have determined that the new [species](#) is an ancient relative of the best-known saber-toothed cat *Smilodon*, the famous fossil found in the La Brea Tar Pits in California that went extinct about 10,000 years ago.

The Oregon specimen was excavated on the traditional lands of the Cayuse, a tribe joined with the Umatilla and Walla Walla in the Confederated Tribes of the Umatilla Indian Reservation. In recognition of its origin, Calede and Orcutt collaborated with the Tamástslikt Cultural Institute to name the new species *Machairodus lahayishupup*. *Machairodus* is a genus of large saber-toothed cats that lived in Africa, Eurasia and North America, and in the Old Cayuse language, Laháyis Húpup means "ancient wild cat."

The study is published today (May 3, 2021) in the *Journal of Mammalian Evolution*.

Orcutt and Calede found similar uncategorized upper arm fossil specimens at the Idaho Museum of Natural History, where a big cat forearm was accompanied by teeth—generally considered the gold standard for identifying new species—as well as at the University of California Museum of Paleontology and Texas Memorial Museum.

"One of the big stories of all of this is that we ended up uncovering specimen after specimen of this giant cat in museums in western North America," Orcutt said. "They were clearly big cats. We started with a few assumptions based on their age, in the 5 1/2 to 9 million-year-old range, and based on their size, because these things were huge.

"What we didn't have then, that we have now, is the test of whether the size and anatomy of those bones tells us anything—and it turns out that yes, they do."

The largest of the seven *Machairodus lahayishupup* humerus fossils available for the analysis was more than 18 inches long and 1.7 inches in diameter. By comparison, the average modern adult male lion's humerus is about 13 inches long.

The researchers hypothesized that if an isolated forearm bone were useful in telling species apart, that would be true among the big cat species alive today. Caledo and Orcutt visited numerous museums in the U.S., Canada and France to photograph forearm specimens of lions, pumas, panthers, jaguars and tigers, as well as fossils of previously identified extinct big cats.

Caledo used software to place landmark points on each digitized sample that, when drawn together, would create a model of each elbow.

"We found we could quantify the differences on a fairly fine scale," Caledo said. "This told us we could use the elbow shape to tell apart species of modern big cats.

"Then we took the tool to the fossil record—these giant elbows scattered in museums all had a characteristic in common. This told us they all belonged to the same species. Their unique shape and size told us they were also very different from everything that is already known. In other words, these bones belong to one species and that species is a new species."

The researchers calculated estimates of the new species' [body size](#) based on the association between humerus size and body mass in modern big cats, and speculated about the cat's prey based on its size and animals

known to have lived in the region at that time: rhinoceros were particularly abundant, as well as giant camels and giant ground sloths.

The teeth from the Idaho Museum of Natural History came from the lower part of the jaw and did not include the saber-shaped canines, but provided additional evidence that the fossil belonged to the *Machairodus* genus, which gave its name to the machairodontines—the technical name for a saber-toothed cat, Orcutt said.

"We're quite confident it's a saber-toothed cat and we're quite confident it's a new species of the *Machairodus* genus," he said. "The problem is, in part because we haven't necessarily had a clear image in the past of how many species were out there, our understanding of how all these saber-toothed cats are related to each other is a little fuzzy, particularly early in their evolution."

Establishing that the humerus alone can be analyzed to identify a fossil cat has important implications for the field—saber-toothed cats' "big, beefy" forearm bones are the most common specimens of fossil cats found in excavations, he said.

Only a reconstruction of the evolutionary history of saber-toothed cats can determine where this new species fits in, but Orcutt and Caledo believe *Machairodus lahayishupup* existed early in the evolution of the group.

A discovery that this giant cat in North America existed at the same time similar animals lived around the world also raises another evolutionary question, Caledo said.

"It's been known that there were giant cats in Europe, Asia and Africa, and now we have our own giant saber-toothed cat in North America during this period as well," he said. "There's a very interesting pattern of

either repeated independent evolution on every continent of this giant body size in what remains a pretty hyperspecialized way of hunting, or we have this ancestral giant saber-toothed cat that dispersed to all of those continents.

"It's an interesting paleontological question."

More information: John D. Orcutt et al. Quantitative Analyses of Feliform Humeri Reveal the Existence of a Very Large Cat in North America During the Miocene, *Journal of Mammalian Evolution* (2021). [DOI: 10.1007/s10914-021-09540-1](https://doi.org/10.1007/s10914-021-09540-1)

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