

New sabre-tooth predator precedes cats by millions of years

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Dr. Ashley Poust, a post-doctoral researcher at The Nat, has just described what is now the earliest known cat-like predator in North America, west of the Rocky Mountains. The fossil in his hand belonged to *Diegoaelurus*, a bobcat-sized carnivore that lived around 42 million years ago. *Diegoaelurus* was much smaller than the commonly known *Smilodon*, or sabre-tooth cat, seen in the background. *Smilodon* evolved roughly 40 million years after *Diegoaelurus* went extinct, but both animals were saber-toothed, hyper-carnivorous predators, meaning their diets consisted almost entirely of meat. *Diegoaelurus* and its few relatives, from

Wyoming and China, were the first predators to evolve sabre-teeth, though several other unrelated animals developed this adaptation much later in time. Credit: San Diego Natural History Museum.

The fossil, housed in the San Diego Natural History Museum's paleontology collection, offers a window into what the Earth was like during the Eocene Period, more than 40 million years ago. The specimen includes a lower jaw and well-preserved teeth, giving us new information about the behavior and evolution of some of the first mammals to have an exclusively meat-based diet.

"Today, the ability to eat an all-meat diet, also called hypercarnivory, isn't uncommon. Tigers do it, polar bears can do it. If you have a [house cat](#), you may even have a hypercarnivore at home. But 42 million years ago, mammals were only just figuring out how to survive on meat alone," said Dr. Ashley Poust, postdoctoral researcher at the San Diego Natural History Museum (The Nat). "One big advance was to evolve specialized teeth for slicing flesh—which is something we see in this newly described specimen."

This early meat-eating predator is part of a mysterious group of animals called Machaeroidines. Now completely extinct, they were not closely related to today's living carnivores. "We know so little about Machaeroidines, so every new discovery greatly expands our picture of them," said coauthor Dr. Shawn Zack of the University of Arizona College of Medicine. "This relatively complete, well-preserved *Diegoaelurus* fossil is especially useful because the teeth let us infer the diet and start to understand how Machaeroidines are related to each other," said Zack.

Zack, Poust, and their third coauthor Hugh Wagner, also from The Nat,

named the predator *Diegoaelurus vanvalkenburghae*. The name honors San Diego County where the specimen was found and scientist Blaire Van Valkenburgh, past president of the Society of Vertebrate Paleontology, whose foundational work on the evolution of carnivores influenced this research.



Diegoaelurus with fossil. All photos should be credited to San Diego Natural History Museum. Credit: San Diego Natural History Museum

About the discovery

D. vanvalkenburghae was about the size of a bobcat, but with a downturned bony chin to protect its long upper sabre teeth. It would have

been a powerful and relatively new kind of hunter.

"Nothing like this had existed in mammals before," said Poust. "A few mammal ancestors had long fangs, but *Diegoaelurus* and its few relatives represent the first cat-like approach to an all-meat diet, with sabre-teeth in front and slicing scissor teeth called carnassials in the back. It's a potent combination that several animal groups have independently evolved in the millions of years since."

This animal and its relatives represent a sort of evolutionary experiment, a first stab at hypercarnivory—a lifestyle that is followed today by true cats. With only a handful of fossil specimens from Wyoming and Asia, the machaeroidines are so poorly understood that scientists weren't even sure if there were multiple species living within the same time period.

"This fossil finding shows that machaeroidines were more diverse than we thought," says Zack. "We already knew there was a large form, *Apataelurus*, which lived in eastern Utah. Now we have this smaller form, and it lived at approximately the same time. It raises the possibility that there may more out there to find."

In addition to this overlapping existence, Poust points out they may have coexisted with other sabre-toothed animals. "*Diegoaelurus*, though old, is the most recent of these machaeroidine predators. That puts it within striking distance of the time that the next cat-like animals arrived in North America, the nimravids or sabre-tooth false-cats," he said. "Did these groups ever meet, or even compete for space and prey? We don't know yet, but San Diego is proving to be a surprisingly important place for carnivore evolution."



The *Diegoaelurus* jawbone fossil has been in The Nat's collection since 1988. It was recovered from a construction site in Oceanside by the museum's PaleoServices team. When this carnivorous animal was alive 42 million years ago, San Diego was covered in rainforests populated by many small, unusual rodents, marsupials, primates and hooved mammals. Credit: San Diego Natural History Museum

About the Santiago Formation

The fossil comes from San Diego County in southern California, at a location first discovered in the 1980s by a local 12-year-old boy. Since then, "Jeff's Discovery Site" has become an important fossil bed within a larger group of rocks called the Santiago Formation. Fossils of an entire ecosystem have been discovered in these 42 million-year-old rocks,

painting a picture of a very different San Diego than the one we know today. Though largely inaccessible, these important [fossil](#) beds are occasionally exposed by [construction projects](#) and road expansions, allowing scientists from The Nat to keep digging for evidence of California's ancient, tropical past.

"Not only was San Diego further south due to tectonic plate movements, but the Eocene was a wetter, warmer world," said Poust. "The Santiago Formation fossils show us a forested, wet California where tiny rhinos, early tapirs, and strange sheep-like, herbivorous oreodonts grazed under trees while unusual primates and marsupials clung to the canopy above. This richness of prey species would have been a smorgasbord for *Diegoaelurus*, allowing it to live the life of a specialized hunter before most other mammals."

The article, "*Diegoaelurus*, a new machaeroidine (Oxyaenidae) from the Santiago Formation (late Uintan) of southern California and the relationships of Machaeroidinae, the oldest group of sabertooth mammals," is published in *PeerJ*.

About the 3D model

The jaw of the newly named meat-eater is available to view in 3D for free on the San Diego Natural History Museum's website.

To access this 3D model and view in your browser, go to https://3dfiles.sdnhm.org/api/?specimen=38343&name=38343_Dentary_RT&extension=ctm

More information: Shawn P. Zack et al, *Diegoaelurus*, a new machaeroidine (Oxyaenidae) from the Santiago Formation (late Uintan) of southern California and the relationships of Machaeroidinae, the oldest group of sabertooth mammals, *PeerJ* (2022). [DOI](#):

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