Sabertooth cat skull newly discovered in Iowa reveals details about this Ice Age predator

April 5 2023, by Matthew G. Hill

The recent sabertooth find is a complete cranium, albeit missing one of its namesake sabers. Credit: Chris Gannon, ISU News Service

The sabertooth cat is an Ice Age icon and emblem of strength, tenacity

and intelligence. These animals shared the North American landscape with other large carnivores, including short-faced bears, dire wolves and the American lion, as well as megaherbivores including mammoths, mastodons, muskoxen and long-horned bison. Then at the end of the Pleistocene, between 50,000 and 10,000 years ago, they all vanished. The only place to see them now is in the fossil record.

Carnivore fossils are extremely rare, though, in comparison to those of their prey. Prey are always more abundant than predators in a healthy ecosystem. So the probability of burial, storage and discovery of carnivore bones and teeth is therefore slim compared to those belonging to herbivores.

Scientists have a relatively small and scattered inventory of sabertooth fossils. The exception comes from Rancho La Brea in downtown Los Angeles, where over 1,000 individual sabertooths were mired in tar-seep death traps.

That's why the recent discovery of an exquisite sabertooth cat skull in southwestern Iowa is so exciting. The Smilodon fatalis skull was collected from late Pleistocene sand and gravel exposed along the East Nishnabotna River. My colleague, biologist David A. Easterla, and I are studying this specimen to learn more about the life history, prey selection and eventual extinction of this ancient predator.

Clues from a cranium

The animal's common name—sabertooth cat—comes from its highly distinctive, saberlike canine teeth that poke out of the mouth as much as 5 or 6 inches (13 to 15 centimeters).

Sabertooths are sexually dimorphic, with males generally larger than females. The Iowa skull is larger than those of many adult males from

Rancho La Brea. Several bones of the skull have not sealed together and the teeth are basically unworn, leading us to believe this individual was almost certainly a young male between 2 and 3 years old that was still growing.

We estimate he weighed 550 pounds (250 kilograms). That's upwards of 110 pounds (50 kilograms) greater than the average adult male African lion. Given a few years to mature and fill up loose skin, he might have tipped the scale at 650 pounds (300 kilograms).

Observations of the life cycles of modern lions and tigers suggest this sabertooth was newly independent or on the cusp of independent living.

However, whether sabertooths stuck together in groups or were loners is hotly debated. Disagreement revolves around just how much of a size difference there is between males and females. In many living animals, males are typically larger than females in male-dominated harems, as in modern lions. In the case of sabertooths, some scholars identify this pronounced sexual dimophisim between the sexes and contend these ancient cats lived in groups, akin to today's lions. Other researchers see only minimal size differences and view sabertooth cats generally as solitary predators, perhaps more like tigers and all other felines.

One of this cat's distinctive sabers was broken off before it died. Credit: Chris Gannon, ISU News Service

Whatever the case, at two or three years old, the cat obviously possessed the weaponry—jaws and paws—and heft to take down large prey alone.

He likely garnered experience hunting by first watching his mother locate, stalk, ambush and kill prey and defend the carcasses, then perhaps with her help, and finally, alone. His learning curve was probably a lot like lions and tigers as they mature physically and behaviorally.

Hunting for survival is high stakes. Repeated failure means death from starvation. And attacking large prey equipped with defensive gear like horns, antlers, hooves and trunks is always dangerous and sometimes lethal. For instance, a recent study of 166 modern lion skulls from Zambia revealed that 68 had healed or partially healed injuries associated with taking down prey. Put another way, 40% had survived major head trauma to hunt another day.

One saber in the Iowa skull is broken off where the canine tooth emerges from the roof of the mouth. Morphological details of the fracture edges indicate the damage happened around this animal's time of death. It's possible the break may relate to a defense wound thanks to a prey animal's well-placed hoof, antler, horn or swat. Since the stub is not worn, the encounter may have even caused the cat's death.

Additional technical analysis yields more info

A technique called stable isotope analysis allows researchers to figure out what an animal ate and even where it lived based on ratios of isotopes in its teeth or bones.

Andrew Somerville, a specialist in isotopic biogeochemistry, is leading this effort with the Iowa sabertooth. Our team suspects that sabertooth cats in this area would have focused their hunting on the Jefferson's ground sloth, a massive, lumbering and solitary browser. With adults weighing around a ton, its size was probably a major deterrent to other predators—but not necessarily to sabertooths. Sharp sabers to the neck

could have killed the sloth, size be damned.

My colleagues and I are also developing what natural science researchers call diet-breadth mixing models. Using stable isotopes of carbon and nitrogen preserved in Ice Age carnivore, herbivore and omnivore bones from southwest Iowa, our models should tell us if sabertooths, short-faced bears and dire wolves competed for the same prey, the habitats they searched for prey and, possibly, how these food-web connections collapsed at the end of the Ice Age.

Radiocarbon dating indicates this Iowa sabertooth lived between 13,605 and 13,455 years ago, making it among the last of its kind to walk the Western Hemisphere. Slightly younger dates—but not by much—come from Rancho La Brea, eastern Brazil and far southern Chile.

These dates mean sabertooths and the first people to infiltrate these places—Clovis foragers in North America and Fishtail foragers in South America—shared the landscape for a short period of time. People probably chanced upon sabertooth tracks, scat and kills now and again. Maybe a few lucky people observed the magnificent animal going about its life. But neither knew what the future had in store.

The big cat vanished from both continents shortly after people arrived. The ultimate cause of the die-off is difficult to pinpoint, and multiple factors were certainly at play. However, at least with sabertooths, we can say extinction was a hemisphere-wide synchronous event that transpired in a geological instant, perhaps over just 1,000 or 2,000 years, which makes it difficult to directly or indirectly tie people to the die-off.

The Iowa skull, combined with other fossil evidence from the region and observations of modern large carnivores, has cast new light on the life history and behavior of sabertooth cats. Ongoing research promises to provide additional clues about the diet and ecology of this iconic

predator.

Provided by The Conversation