'Exquisite' sabretooth skull offers clues about Ice Age predator

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Dave Easterla, left, Distinguished University Professor Emeritus of Biology at Northwest Missouri State University and Matthew Hill, associate professor of anthropology at Iowa State, with a fossilized complete skull from a sabertooth cat from southwest Iowa. Credit: Iowa State University

The recent discovery of a sabretooth cat skull in southwest Iowa is the

first evidence the prehistoric predator once inhabited the state.

The chance of finding any fossilized remains from a sabretooth cat are slim, said Matthew Hill, an associate professor of archaeology at Iowa State and expert on animal bones. The remarkably well-preserved skull found in Page County is even rarer, and its discovery offers clues about the iconic Ice Age species before its extinction roughly 12-13,000 years ago.

"The skull is a really big deal," said Hill. "Finds of this animal are widely scattered and usually represented by an isolated tooth or bone. This skull from the East Nishnabotna River is in near perfect condition. It's exquisite."

Hill analyzed the specimen in collaboration with David Easterla, Distinguished University Professor Emeritus of Biology at Northwest Missouri State University. Their findings are newly published in *Quaternary Science Reviews*.

The researchers used radiocarbon dating to determine the cat died at the end of the Ice Age between 13,605 and 13,460 years ago. Hill says it may have been one of the last sabretooths to walk the planet as glaciers receded and temperatures rose.

"We think southwest Iowa during this period was a parkland with patches of trees interspersed with grassy openings, somewhat similar to central Canada today," said Hill. "The cat would have lived alongside other extinct animals like dire wolf, giant short-faced bear, long-nosed peccary, flat-headed peccary, stag-moose, muskox, and giant ground sloth, and maybe a few bison and mammoth."

Determining age, gender

Hill and Easterla believe the skull belonged to a subadult (2-3 year old) male when it died. Gaps between the skull's boney plates indicate its head was still growing, and the permanent teeth don't show much wear from cutting and chewing. To figure out its sex, they compared its skull measurements with adult male and female sabretooth skulls from the Rancho La Brea tar pits in Los Angeles.

Hill explains sabretooths were sexually dimorphic, meaning males were larger than females. Since the Iowa skull is larger than many male skulls from the tar pits, the researchers argue it belonged to a male. They estimate the Iowa cat weighed about 550 pounds at death and may have approached 650 pounds as an adult in prime physical condition. In comparison, the average adult male African lion weighs about 400 pounds.

How the sabretooth cat died is not clear. But a broken canine might offer a clue. Hill and Easterla speculate the animal was seriously injured while attacking prey, which ultimately proved fatal within days of the trauma.

Small patches of worn-down bone on top of the skull indicate it slid along a river-bottom before coming to rest and then buried for thousands of years.

"We can learn a lot from these types of fossils. They hold clues about the ecology of the animals, and how they respond to dramatic climate change and the appearance of a new predator and competitor on the landscape, including people," said Hill. "Iowa is a fantastic laboratory to do research on extinct Ice Age animals and the people who were just beginning to share the landscape with them."

You are what you eat

Research opportunities with the sabretooth cat skull do not end with the

published analysis in *Quaternary Science Reviews*.

Hill suspects the cat's primary prey was Jefferson's giant ground sloth, which were common in Iowa during the Ice Age. They'd sit beside trees and bushes and pull in leaves and buds to eat. At 8-to-10 feet tall and over 2,200 pounds, giant ground sloths were massive. Hill believes only a large predator armed with "absolutely lethal jaws and claws" and legs designed for pouncing could hunt them regularly.

To test this, Hill is teaming up with his Iowa State colleague Andrew Somerville. The assistant professor of archaeology is an expert in dietary reconstruction using bone geochemistry. Together, they're developing a stable isotope mixing model with samples from the sabretooth cat, other carnivores, and herbivores (e.g., Jefferson's ground sloth, muskox, stag-moose.)

"You are what you eat, and it's locked in your bones," explained Hill.

Stable isotopes make it possible for researchers to know what plants herbivores eat and, in turn, what herbivores carnivores eat. They can piece together local food webs and how species filled ecological niches.

"So, maybe the sabretooth was primarily eating giant ground sloth, dire wolves primarily moose, and short-faced bears a little bit of everything. Andrew and I are going to figure it out," said Hill.

The researchers expect to publish their findings in the coming year.

More information: Matthew G. Hill et al, A complete sabertooth cat cranium from the Midcontinent of North America and its evolutionary and ecological context, *Quaternary Science Reviews* (2023). DOI: 10.1016/j.quascirev.2023.108045

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