

New paper suggests High Tibet was cradle of evolution for cold-adapted mammals

June 10 2014



This is an artist's reconstruction of the Zanda fauna from the Pliocene about 5-2.5 million years ago. (artist: Julie Selan) Credit: Natural History Museum of Los Angeles County

For the last 2.5 million years, our planet has experienced cold and warm, millennia-long cycles that collectively have become known as the Ice Age. During cold periods, continental-scale ice sheets blanketed large tracts of the northern hemisphere. As the climate warmed up, these

colossal glaciers receded, leaving Yosemite-like valleys and other majestic geologic features behind. The advance and retreat of the ice sheets also had a profound influence in the evolution and geographic distribution of many animals, including those that live today in the Arctic regions.

A new study published in the *Proceedings of the Royal Society B: Biological Sciences* identifies a newly discovered 3- to 5-million-year-old Tibetan fox from the Himalayan Mountains, *Vulpes qiuzhudingi*, as the likely ancestor of the living Arctic fox (*Vulpes lagopus*), lending support to the idea that the evolution of present-day animals of the Arctic region is intimately connected to ancestors that first became adapted for life in cold regions in the high altitude environments of the Tibetan Plateau.

The paper's lead author is Xiaoming Wang, of the Natural History Museum of Los Angeles County (NHM). Co-authors are Zhijie Jack Tseng (University of Southern California), Qiang Li (Chinese Academy of Sciences), Gary T. Takeuchi (Page Museum at the La Brea Tar Pits), and Guangpu Xie (Gansu Provincial Museum). These writers, on a team with other geologists and paleontologists and led by Wang, uncovered the fossil specimens in the Zanda Basin in southern Tibet in 2010.

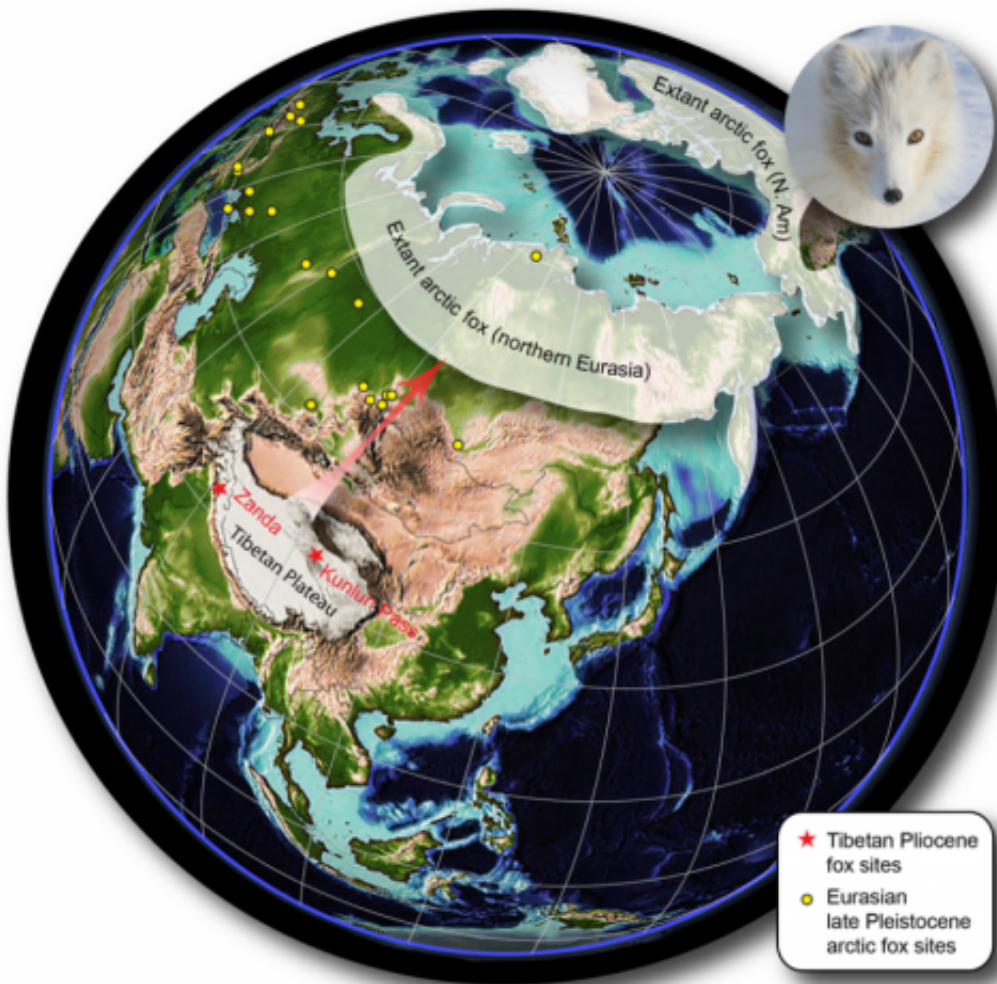
In addition to the arctic fox, the team also uncovered extinct species of a woolly rhino, three-toed horse, Tibetan bharal (also known as blue sheep), chiru (Tibetan antelope), snow leopard, badger, as well as 23 other mammals.



Rich and well-preserved vertebrate fossils have been found recently in these Tibetan exposures. Photo by Xiaoming Wang Credit: Natural History Museum of Los Angeles County

The origin of the cold-adapted Pleistocene [megafauna](#) has usually been sought either in the arctic tundra or in the cool steppes elsewhere. But the team's new fossil assemblage boosts an alternative scenario, which the authors call the "out of Tibet" hypothesis. It argues that some of the Ice Age megafauna (which in North America include the woolly mammoth, saber-toothed cat, giant sloths, and others) used ancient Tibet as a "training ground" for developing adaptations that allowed them to cope with the severe climatic conditions. These Tibetan ancestors were thus pre-adapted to cold climates during the Ice Age (2.6-.01 million years ago).

Tibet, according to Wang, is a rich but grueling location for paleontological fieldwork. Fifteen summer seasons, and a good deal of luck, have honed his team's success. The expeditions involve a one-week journey to Lhasa, then a four-day drive into the remote "layer cake" sediments of the Zanda Basin—a drive made in old model Land Cruisers known to get stuck in streams.



This is a map of Pliocene Tibetan fox localities (red stars), Ice Age (late Pleistocene) arctic fox localities (yellow circles), and extant arctic fox (*Vulpes lagopus*) distribution, showing the connection between these two regions (red arrow), probably during the Ice Age. Credit: Natural History Museum of Los Angeles County

At more than 14,000-foot elevation, it's difficult to breathe, water freezes overnight in camps, and the team members disband every morning to walk alone in search of fossils. Wang and his team have trained their eyes to search for ancient lake margins, where the megafauna they're interested in are often found. They alternate camp nights with nights in town, so they keep their strength up for a couple of weeks. "There are a lot of challenges," Wang said, "but in paleontological terms, it is a relatively unexplored environment. Our efforts are rewriting a significant chapter of our planet's recent geological history."

More information: Paper: From "Third Pole" to North Pole: a Himalayan origin for the arctic fox, [rspb.royalsocietypublishing.org1098/rspb.2014.0893](https://rspb.royalsocietypublishing.org/doi/10.1098/rspb.2014.0893)

Provided by Natural History Museum of Los Angeles County

Citation: New paper suggests High Tibet was cradle of evolution for cold-adapted mammals (2014, June 10) retrieved 31 March 2023 from <https://phys.org/news/2014-06-paper-high-tibet-cradle-evolution.html>

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