

Ice age vertebrates had mixed responses to climate change

December 6 2016



A coluber constrictor, one of the vertebrates included in the study. Credit: © AMNH/F. Burbrink

New research examines how vertebrate species in the eastern United States ranging from snakes to mammals to birds responded to climate change over the last 500,000 years. The study, recently published in the journal *Ecology Letters*, reveals that contrary to expectation, the massive glaciers that expanded and contracted across the region affected animal populations in different ways at different times. The analysis provides a window into how animals might react to any kind of climate change, whether glacial cycles or global warming.

"A big glacier should have affected everybody. It doesn't matter if you're a snake or a bird, it probably makes it hard to live there," said Frank Burbrink, an associate curator in the American Museum of Natural History's Department of Herpetology and lead author of the study. "So did these communities all change together as if they were one unit? There's never been a study that has comprehensively analyzed whether vertebrate communities responded to the [glacial cycles](#) in a uniform way."

The most recent, rapid, and significant effect of [global climate change](#) occurred about 2.5 million years ago in the Quaternary period, when ice sheets expanded and contracted, altering both the environment and available land. In the area known as the Eastern Nearctic—defined as the forested and coastal regions of the eastern United States—glaciers extended as far south in the east to New York City and in the Midwest to south central Illinois. Temperature changed rapidly, in some cases at the rate of 5 to 10 degrees Celsius (about 40 to 50 degrees Fahrenheit) within several decades.

To analyze the impact of this climate change, multidisciplinary researchers from the Museum, the 'Iolani School in Honolulu, the City University of New York's College of Staten Island, and Louisiana State University focused on the historical [population](#) sizes of tetrapods—snakes, lizards, mammals, birds, turtles, salamanders, and

frogs—in the Eastern Nearctic over the last 500,000 years. They did this by looking at the animals' genomes and modeling the likelihood of their populations growing or shrinking.

"When a glacier retreats, all of the organisms that were pushed south move back into that space and the signal of those changing populations gets imprinted in the genome," Burbrink said. "If you look at any individual species, you can see what its population has been doing over time based on how many changes they have in their genome. When populations expand, they have more genetic differences. And when populations are small, they have fewer."

The longstanding scientific thought is that as a glacier recedes, local populations will expand "synchronously," or all at the same time. But the researchers did not find a uniform response to [climate change](#) within the tetrapod community. About 75 percent of the animals went through a population expansion, with only about 50 percent of those lineages expanding together. And 25 percent of the populations contracted. The results imply that there are additional layers of complexity involved in this problem.

"In some ways, the old idea that the glacier receding would have a single effect on everything in the community is naïve," Burbrink said.

And what do the results mean for the global warming the Earth is currently facing?

"We need to move beyond viewing communities as single units," said co-author Brian T. Smith, an assistant curator in the Museum's Department of Ornithology. "Some species will respond in one way and others will respond in other ways. And there are many external historical, biological, and stochastic factors that will influence how populations respond to [global warming](#)."

More information: Frank T. Burbrink et al, Asynchronous demographic responses to Pleistocene climate change in Eastern Nearctic vertebrates, *Ecology Letters* (2016). [DOI: 10.1111/ele.12695](https://doi.org/10.1111/ele.12695)

Provided by American Museum of Natural History

Citation: Ice age vertebrates had mixed responses to climate change (2016, December 6)
retrieved 9 April 2024 from
<https://phys.org/news/2016-12-ice-age-vertebrates-responses-climate.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--