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Polar Bears 600,000 Years Old and More Vulnerable to Climate Change Than Previously Thought

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Polar bears, like this mother and cubs on one of the few remaining pieces drift ice in the Barents Sea in late July, underwent speciation 600,000 years ago, making them more susceptible to climate change. (Photo © Florian Schulz [1])

With melting sea ice, thawing permafrost [2], and disappearing glaciers, the Arctic is one of the most vulnerable regions to anthropogenic climate change. The area's [3] annual average temperature has increased at almost twice the rate of the rest of the world in the last few decades and, as the Arctic climate warms and snow cover shrinks, less heat is reflected back into the atmosphere, hastening the process. Arctic creatures [4] like the caribou, horned puffins, and the polar bear will have to adapt [5] to this widespread warming. While scientists previously believed polar bears were an example of a rapid adaptation to temperature changes, a new genetic analysis shows the species diverged from their closest relatives about 600,000 years ago — suggesting it will be more difficult for polar bears to adjust to climate change.

Looking at the nuclear genomes of 19 polar, 18 brown, and seven black bears around the world, scientists determined polar bears diverged from from a common ancestor of the brown

bear about 600,000 years ago.

“We found that, when looking at the nuclear genetic loci, polar bears were genetically much more distinct than previous studies had indicated,” explains lead author Frank Hailer. In previous genetic analysis of polar bears, scientists mainly looked at mitochondrial DNA data and determined that the species was only about 150,000 years old. But Hailer and his colleagues’ technique found polar bears were almost five times older than suggested by mtDNA, which is only inherited in the maternal line.

“Now, looking at single (short) pieces of DNA obviously cannot tell you the whole story — it's like reading only a few pages of a book,” Hailer says of the mtDNA analysis.

Polar bear walking on a frozen pond with blowing snow near Cape Churchill, Canada. (Photo courtesy of Hansruedi Weyrich [6])

Though the mtDNA studies showed the polar bears were younger, the authors of the new study, published in the April 20 issue of *Science*, explain this discrepancy with past hybridization [7] between polar and brown bears. After initial speciation, polar bears may have come into contact with brown bears again because of past climate fluctuations at some point in the late Pleistocene. But the nuclear genome, which Hailer and his colleagues studied, seems to be unaffected by hybridization. miochondrial DNA studied previously is inherited maternally, while nuclear loci are inherited from both the father and mother.

“Those nuclear markers are independently inherited, and thus yield independent information — stories, if you wish — about the evolutionary past,” he says.

The new “story” shows polar bears had more time to adapt to cold climates after diverging from their closest relatives. When polar and brown bears diverged into distinct species, global temperatures were at a long-term low, according to the Pleistocene climate record. Though this could be coincidental, Hailer and the study’s authors believe the evolutionary origin of the polar bear and the global climate cooling during the Pleistocene are linked.

“That idea, that polar bears were able to colonize and adapt to the arctic within about 150,000 years, would have rendered polar bears an exception among mammals,” Hailer says. The species’ new age appears to make more sense on an evolutionary timescale, though it is a troubling reminder that polar bears — and indeed other species — cannot adapt quickly to climate change.

But Hailer also adds polar bears also face other human-caused risks.

“Polar bears are thus losing their main habitat, sea ice,” Hailer says. “When polar bears then instead are reaching the land habitats, they encounter human settlements…and conflicts with humans imply that many polar bears are killed each year.” Likewise, increasing chemical pollution can negatively influence

polar bear reproduction.

“Should polar bears indeed go extinct this time, we would have to ask ourselves what our role in it was. We could not just simply blame the climate,” Hailer says.

Female polar bear with her cub on a frozen lake near Cape Churchill, Canada. (Photo courtesy of Hansruedi Weyrich [6])

See also:

- **- “** [8]Living With Polar Bears” [8]
- - “Polar Distress” [9]

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var gaJsHost = (("https:" == document.location.protocol) ? "https://ssl." : "http://www.");
document.write(unescape("%3Cscript src='" + gaJsHost + "google-analytics.com/ga.js' type='text/javascript'%3E%3C/script%3E")); var pageTracker = _gat._getTracker("UA-6149536-1"); pageTracker._trackPageview();

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[1] http://www.visionsofthewild.com
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[4] http://magblog.audubon.org/climate-change-greatly-affecting-arctic-species-study-says
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