Beetle study finds diversity in the sub-Antarctic linked to global cooling

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Lead author Dr Helena Baird collects beetles on an island in the middle of the Southern Ocean. Credit: Monash University

An international research team led by Monash University has demonstrated that cooling temperatures and glacial cycles over the past 15 million years were essential for an explosion in terrestrial animal diversity throughout the Antarctic region.

Often considered inhospitable, the Antarctic boasts surprising species diversity within many animal groups. Until now, this has been mostly reported for marine life, with a legacy of extinction the prevailing narrative for Antarctic terrestrial animals.

Challenging this, the new study published in the *Proceedings of the National Academy of Sciences* uses cutting-edge genomic techniques to show that beetles on islands surrounding the Antarctic diversified in remarkable synchrony with the surrounding marine life, specifically as the climate cooled.

"Using next-generation sequencing, we studied the DNA from more than 520 genes across a group of sub-Antarctic beetles, which allowed us to look back in time at their evolution," said lead study author Dr. Helena Baird, a postdoctoral fellow at the Monash University School of Biological Sciences.

"We discovered that they colonized remote islands throughout the Antarctic at least 50 million years ago—from Africa, amazingly—but their speciation rates dramatically increased when global temperatures plummeted, 15 million years ago," Dr. Baird said.

"The very same pattern has been observed in many marine species, from penguins to icefish."

Since then, the Antarctic continued to cool, and the beetles in turn speciated ever faster. Over this time, the islands they inhabit were periodically fragmented by ice sheets, which likely promoted speciation by physically separating populations—the same process proposed to drive speciation on the seafloor.

"This changes the whole notion of Antarctica being considered a harsh place for life to evolve," Dr. Baird said.

"On the contrary: the colder it got, the more beetle species evolved. A similar history is likely to be uncovered for other plants and animals across the region if we look deeper."

Monash University's Professor Steven Chown, also involved in the research, added that the study "demonstrates the power of genomics as an innovative way to explore the history of climatic change and its effect on biodiversity in this isolated and frigid region."

More information: Helena P. Baird et al, Fifty million years of beetle evolution along the Antarctic Polar Front, *Proceedings of the National Academy of Sciences* (2021). DOI: 10.1073/pnas.2017384118

Provided by Monash University