

Can evolution outpace climate change?

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The tide pool copepod *Tigriopus californicus* is found from Alaska to Baja California -- but in a unique lab study at UC Davis, the animals showed little ability to evolve heat tolerance over 10 generations. Credit: Morgan Kelly, UC Davis

(PhysOrg.com) -- Animals and plants may not be able to evolve their way out of the threat posed by climate change, according to a UC Davis study of a tiny seashore animal. The work was published today (June 8) in the journal *Proceedings of the Royal Society B*.

The tide pool copepod *Tigriopus californicus* is found from [Alaska](#) to Baja California — but in a unique lab study, the animals showed little ability to evolve heat tolerance.

"This is a question a lot of scientists have been talking about," said study co-author Eric Sanford, an associate professor of evolution and ecology

at UC Davis and a researcher at the university's Bodega Marine Laboratory. "Do organisms have the ability to adapt to [climate change](#) on a timescale of decades?"

UC Davis graduate student Morgan Kelly, the first author of the paper, collected copepods from eight locations between Oregon and Baja California in Mexico. The tiny shrimplike animals, about a millimeter long, live in tide pools on rocky outcrops high in the splash zone.

Kelly grew the short-lived copepods in the lab for 10 generations, subjecting them to increased heat stress to select for more heat-tolerant animals.



The copepod *Tigriopus californicus* lives in pools like these at Punta Prieta in Baja California, Mexico, which are filled by wavesplash at high tide. Credit: Morgan Kelly, UC Davis

At the outset, copepods from different locations showed wide variability in heat tolerance. But within those populations, Kelly was able to coax only about a half-degree Celsius (about one degree Fahrenheit) of increased heat tolerance over 10 generations. And in most groups, the

increase in [heat tolerance](#) had hit a plateau before that point.

In the wild, these copepods can withstand a temperature swing of 20 degrees Celsius a day, Kelly said. But they may be living at the edge of their tolerance, she said.

Although the copepods are widespread geographically, individual populations are very isolated, confined to a single rocky outcrop where wave splash can carry them between pools. That means there is very little flow of new genes across the population as a whole.

"It's been assumed that widespread species have a lot of genetic capacity to work with, but this study shows that may not be so," said co-author Rick Grosberg, professor of evolution and ecology at UC Davis. Many other species of animals, birds and plants face stress from climate change, and their habitats have also been fragmented by human activity -- perhaps more than we realize, he said.

"The critical point is that many organisms are already at their environmental limits, and natural selection won't necessarily rescue them," Grosberg said.

Provided by University of California - Davis

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