

# Warmer climate may make new mutations more harmful

February 2 2021

---



One species studied in detail by the researchers is an insect pest known as the cowpea seed beetle (*Callosobruchus maculatus*). The female pictured is laying eggs on a bean that the larvae then feed on. Credit: Mareike Koppik

A warmer global climate can cause mutations to have more severe

consequences for the health of organisms through their detrimental effect on protein function. This may have major repercussions on organisms' ability to adapt to, and survive in, the altered habitats of the future. This is shown in a new Uppsala University research study now published in the scientific journal *Proceedings of the Royal Society B*.

Natural environments are being transformed at an ever faster rate, owing to ongoing climate change. This is bringing new life conditions for many species.

"In the long run, organisms will have to adapt genetically to these rapid environmental changes: otherwise, they might die out. This adaptation can take place by mutations that cause changes in the genome that are advantageous in the new surroundings. But very often mutations have negative consequences for the individual that carries them," says David Berger at Uppsala University's Department of Ecology and Genetics.

In the study, which is a collaboration with researchers at Lund University, [theoretical models](#) of how proteins function were combined with results from experiments comparing the effects of mutations across different forms of life in various habitats. The researchers experimented on beetles carrying new mutations, but also analyzed results from previous, similar studies examining both unicellular microorganisms, such as yeasts, bacteria and viruses, and multicellular life forms such as thale cress (*Arabidopsis thaliana*), fruit fly (*Drosophila melanogaster*) and roundworm (*Caenorhabditis elegans*).

By combining all this information, the researchers were able to clarify how the organisms fared in various environments before and after the mutations were produced. Above all, the aim was to find out whether environmental conditions that imposed some kind of stress on the individual caused the mutations' detrimental effects to be expressed more or less. They manipulated the temperature to find out what effect

this had.

"Individuals with and without mutations suffered just as much from the stressful environment. But when we looked at the studies where temperatures had been manipulated we found that, with higher temperatures, the effects in individuals carrying new mutations were worse than in those that lacked them," Berger says.

The study indicates that if calculations by the Intergovernmental Panel on Climate Change (IPCC) of [global warming](#) by 2-4°C in the century ahead become a reality, the result may be a doubling of the harmful effects of new mutations in tropical species.

"Since [mutations](#) are inherited and also arise in every new generation, a marked increase in their damaging effects would have major implications both for organisms' adaptability and for the types of adaptations we can expect to see in them if global temperatures keep rising. Our results may therefore be important for understanding how future global warming may affect biodiversity," Berger says.

**More information:** Elevated temperature increases genome-wide selection on de novo mutations, *Proceedings of the Royal Society B* (2021). [DOI: 10.1098/rspb.2020.3094](https://doi.org/10.1098/rspb.2020.3094)

Provided by Uppsala University

Citation: Warmer climate may make new mutations more harmful (2021, February 2) retrieved 20 April 2024 from <https://phys.org/news/2021-02-warmer-climate-mutations.html>

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.