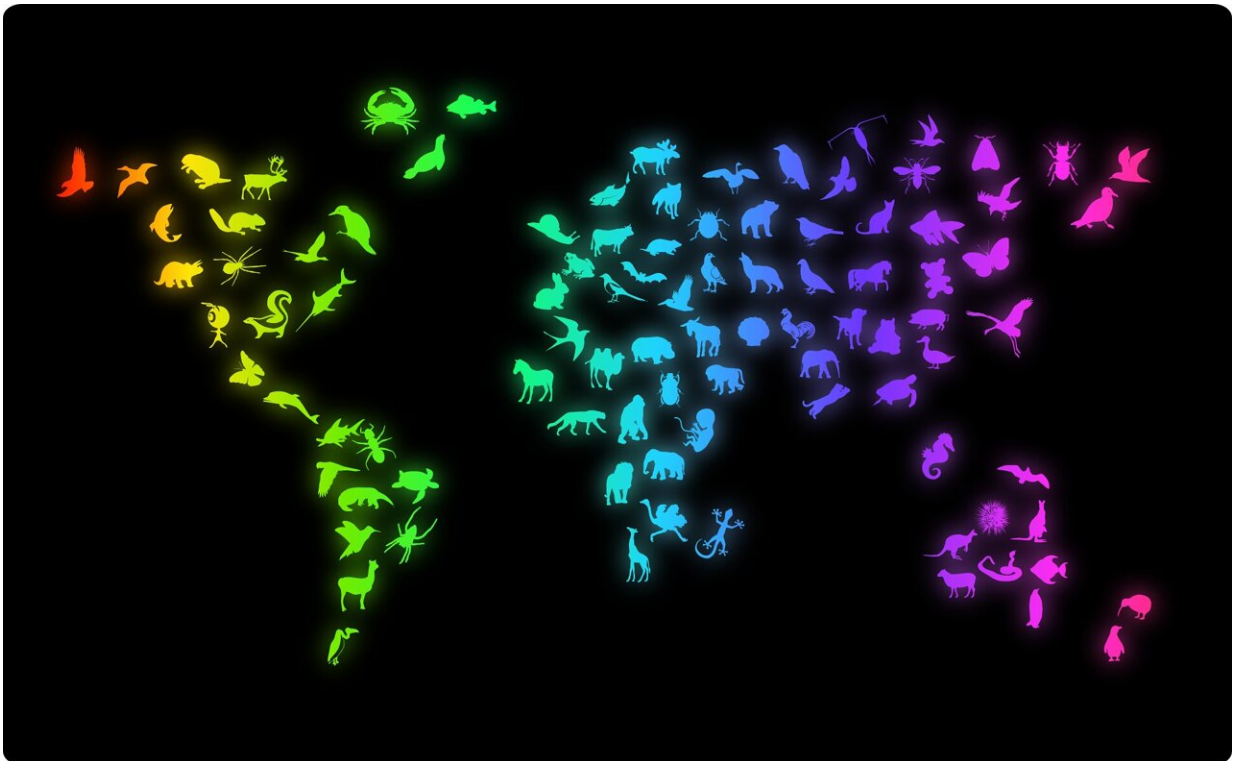


Climate change to push species over abrupt tipping points, finds study

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Climate change is likely to abruptly push species over tipping points as their geographic ranges reach unforeseen temperatures, finds a new study led by a UCL researcher.

The new *Nature Ecology & Evolution* study predicts when and where [climate change](#) is likely to expose [species](#) across the globe to potentially dangerous temperatures.

The research team from UCL, University of Cape Town, University of Connecticut and University at Buffalo analyzed data from more than 35,000 species of animals (including mammals, amphibians, reptiles, birds, corals, fish, cephalopods and plankton) and seagrasses from every continent and ocean basin, alongside [climate](#) projections running up to 2100.

The researchers investigated when areas within each species' geographical range will cross a threshold of thermal exposure, defined as the first five consecutive years where temperatures consistently exceed the most extreme monthly temperature experienced by a species across its geographic range over recent history (1850–2014).

Once the thermal exposure threshold is crossed, the animal is not necessarily going to die out, but there is no evidence that it is able to survive the higher temperatures—that is, the research projects that for many species there could be an abrupt loss of habitat due to future climate change.

The researchers found a consistent trend that for many animals, the thermal exposure threshold will be crossed for much of their geographic range within the same decade.

Lead author Dr. Alex Pigot (UCL Center for Biodiversity & Environment Research, UCL Biosciences) said, "It is unlikely that climate change will gradually make environments more difficult for animals to survive in. Instead, for many animals, large swaths of their geographic range are likely to become unfamiliarly hot in a short span of time.

"While some animals may be able to survive these higher temperatures, many other animals will need to move to cooler regions or evolve to adapt, which they likely cannot do in such short timeframes.

"Our findings suggest that once we start to notice that a species is suffering under unfamiliar conditions, there may be very little time before most of its range becomes inhospitable, so it's important that we identify in advance which species may be at risk in coming decades."

The researchers found that the extent of global warming makes a big difference: if the planet warms by 1.5°C, 15% of species they studied will be at risk of experiencing unfamiliarly hot temperatures across at least 30% of their existing geographic range in a single decade, but this doubles to 30% of species at 2.5°C of warming.

Dr. Pigot added, "Our study is yet another example of why we need to urgently reduce [carbon emissions](#) to mitigate the harmful effects climate change is having on animals and plants, and avoid a massive extinction crisis."

The researchers hope that their study could help with targeting [conservation efforts](#), as their data provides an early warning system showing when and where particular animals are likely to be at risk.

Co-author Dr. Christopher Trisos (African Climate and Development Initiative, University of Cape Town) said, "In the past we've had snapshots to show the impact of climate change, but here we are presenting the data more like a film, where you can see the changes unfold over time. This shows that for many species the risk is a bit like everything, everywhere, all at once. By animating this process, we hope to help direct conservation efforts before it's too late, while also showing the potentially catastrophic consequences of letting climate change continue unchecked."

The researchers say that this pattern of abrupt exposure may be an inevitable feature of living on a round planet—because of the shape of the Earth, there is more area available to species in environments near the hot end of what they are used to, such as in low-lying areas or near the equator.

A previous study by the same lead authors found that even if we stop climate change so that global temperatures peak and start to decline, the [risks to biodiversity](#) could persist for decades after. In another analysis similar to the current study, they found that many species facing unfamiliar temperatures will be living alongside other animals experiencing similar [temperature](#) shocks, which could pose grave [risks to local ecosystem](#) function.

More information: Alex Pigot, Abrupt expansion of climate change risks for species globally, *Nature Ecology & Evolution* (2023). [DOI: 10.1038/s41559-023-02070-4](#).
www.nature.com/articles/s41559-023-02070-4

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