

We don't know how most mammals will respond to climate change, warn scientists

April 7 2021



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A new scientific review has found there are significant gaps in our knowledge of how mammal populations are responding to climate change, particularly in regions most sensitive to climate change. The findings are published in the British Ecological Society's *Journal of Animal Ecology*.

Nearly 25% of [mammal species](#) are threatened with extinction, with this risk exacerbated by [climate change](#). But the ways [climate](#) change is impacting animals now, and projected to in the future, is known to be complex. Different environmental changes have multiple and potentially contrasting, effects on different aspects of animals' lives, such as reproduction and survival (known as demographic rates).

A new review by a global team of researchers from 15 different institutions has found that most studies on [terrestrial mammals](#) only looked at one of these demographic rates at a time, potentially not showing the full picture of climate change impacts.

In a search of 5,728 terrestrial [mammal species](#), the researchers found only 106 studies that looked at both survival and reproduction at the same time. This covered 87 species and constitutes less than 1% of all terrestrial mammals.

"Researchers often publish results on the effects of climate on survival or on reproduction—and not both. But only in rare cases does a climatic variable (say, temperature) consistently negatively or positively affect all studied rates of survival and reproduction." said Dr. Maria Paniw from the University of Zurich and lead author of the review.

For example, higher temperatures could decrease the number of offspring, but if the offspring have a better chance of survival because of less competition, the population size won't necessarily be affected. On the other hand, if higher temperatures decrease both reproduction and survival, a study of only one of these could underestimate the effects on a population.

The review also found a mismatch in the regions where studies on climate change impacts on mammals were taking place and regions recognised as being the most vulnerable to climate change, meaning that

we know very little about the complex climate impacts in the most climate-vulnerable regions of the globe.

"We were surprised by the lack of data on high-altitude (alpine) mammals. Climate change is expected to be very pronounced in higher elevations." said Dr. Paniw. "In our review, we had a few alpine species, such as yellow-bellied marmots and plateau pikas, but I was expecting a study or two on iconic species such as snow leopards.

The review highlights the need for more research on mammal populations that account for multiple demographic responses across entire lifecycles.

"To inform evidence-based conservation, we need to prioritize more holistic approaches in [data collection](#) and integration to understand the mechanisms that drive population persistence." said Dr. Paniw.

"There are many reasons why this data isn't being captured. An important aspect is that collecting such data requires long-term investment without immediate returns, which has not been favoured by many funding agencies and is also logistically challenging. These challenges are compounded in climate-vulnerable regions, which include many countries with underfunded infrastructure for long-term ecological research."

The review raises concerns that there are even bigger data gaps for animal groups that are less well studied than terrestrial mammals, such as insects and amphibians. This data is urgently needed to inform which species are most vulnerable to climate-driven extinction.

In this study, the researchers performed a literature [review](#), using the species names of 5,728 terrestrial mammal to search databases of scientific papers for studies that quantified the relationship between

demographic-rates and climate variables, such as rainfall and temperature.

The researchers only included studies that linked at least two demographic rates, such as survival and reproduction. They also recorded where the studies that did so were distributed globally.

The researchers are now looking to perform similar reviews on less well studied animal groups. Dr. Paniw added: "I would like to foster collaborations that will jumpstart new research and 'repurpose' existing data in climate-vulnerable areas of the globe to fill the knowledge gaps we identified in our work".

More information: Maria Paniw et al, The myriad of complex demographic responses of terrestrial mammals to climate change and gaps of knowledge: A global analysis, *Journal of Animal Ecology* (2021). [DOI: 10.1111/1365-2656.13467](https://doi.org/10.1111/1365-2656.13467)

Provided by British Ecological Society

Citation: We don't know how most mammals will respond to climate change, warn scientists (2021, April 7) retrieved 2 May 2024 from <https://phys.org/news/2021-04-dont-mammals-climate-scientists.html>

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