

New study reveals link between 'climate footprints' and mass mammal

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An international team of scientists have discovered that climate change played a major role in causing mass extinction of mammals in the late quaternary era, 50,000 years ago. Their study, published in *Evolution*, takes a new approach to this hotly debated topic by using global data modelling to build continental 'climate footprints.'

"Between 50,000 and 3,000 years before present (BP) 65% of mammal species weighing over 44kg went extinct, together with a lower proportion of small mammals," said lead author Dr David Nogues-Bravo from the Center for Macroecology, Evolution and Climate in University of Copenhagen. "Why these species became extinct in such large numbers has been hotly debated for over a century."

During the last 50,000 years the [global climate](#) became colder and drier, reaching full glacial conditions 21,000 years before present time. Since then the climate has become warmer, and this changing climate created new opportunities for colonization of new regions by humans. While both of these global change actors played significant roles in [species extinction](#) this study reveals that changing climate was a significant force driving this [mass extinction](#).

"Until now global evidence to support the [climate change](#) argument has been lacking, a large part of existing evidence was based on local or regional estimates between numbers of extinctions, dates of human arrivals and dates of climate change," said Dr Nogues-Bravo. "Our approach is completely different. By dealing with the issue at a

global scale we add a new dimension to the debate by showing that the impact of climate change was not equal across all regions, and we quantify this to reveal each continent's "footprint of climate change."

The study shows that climate change had a global influence over extinctions throughout the late quaternary, but the level of extinction seems to be related to each continent's footprint of climate change. When comparing continents it can then be seen that in Africa, where the climate changed to a relatively lesser extent there were fewer extinctions. However, in North America, more species suffered extinction, as reflected by a greater degree of climate change.

A key piece of evidence in the humans versus climate debate is the size of the extinct mammals. It has always been assumed that humans mainly impacted on populations of large mammals, while if climate change played the key role there should be evidence of large impacts on small mammals as well as the larger animals.

The team's results show that continents which suffered larger climate change impacts suffered larger extinctions of small mammals and viceversa, further strengthening the idea that climate change was a key factor in controlling past extinctions on a global scale.

This research has important implications for the current study of climate change, not only in revealing the role of the climate in causing extinction in [mammals](#), but also by demonstrating how the effect will be different across regions and continents.

"Our results show that continents with the highest 'climate footprints' witnessed more extinctions than continents with lower 'climate footprints'. These results are consistent across species with different body masses, reinforcing the view that past climate changes contributed to global extinctions."

"While climate change is not the only factor behind extinction, past, present or future, we cannot neglect in any way that climate change, directly or indirectly, is a crucial actor to understand past and future species extinctions.", said Miguel Araújo, a co-author of the paper from the National Museum of Natural Sciences in Spain.

Provided by Wiley

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