Study finds 17 mountains at high risk of losing biodiversity under climate change

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Ishizuchi Mountain is one of high climate velocity area which species are likely threatened by warming. Credit: Shipher Wu

Species living in 17 mountains around the world are facing the risk of extinction due to the rapid rate of warming attributed to climate change. However, the establishment of additional meteorological monitoring stations in mountainous areas globally is essential for a deeper understanding of the extent of these threats, according to a study published in *Nature*.

An international team led by Research Fellow Sheng-Feng Shen from the Biodiversity Research Center of Academia Sinica in Taiwan developed a new methodology to estimate climate velocities, highlighting 17 mountain regions at significant risk due to global warming, including Brazilian highlands, Iran-Pakistan region, Western America and Mexico, Mediterranean basin and Northeast Asia.

Climate velocities track the rate of climate condition changes, illustrating the speed at which species must move to stay within their survivable habitats. This research emphasized the pressing need for strategies specifically designed for biodiversity conservation and climate change adaptation within these habitats.

Setting up meteorological observation stations in mountainous areas is challenging, leading to a global shortfall in long-term climate data for mountain regions. This gap, compounded by the complex topography, has limited the understanding of warming trends.

Sheng-Feng Shen pointed out that this study incorporates the theories of atmospheric science, considering two important factors that influence the climatic speeds in mountainous areas: the degree of surface warming and humidity. The approach compensates for the lack of station data and assesses shifts in temperature isotherms in mountain regions under climate change.

The study identified regions with notably high climate velocities encompassing 17 mountain areas, ranging from the Alaska-Yukon territory to Sumatra and from the Mediterranean to Japan, overlapping with several biodiversity hotspots.

I-Ching Chen, the corresponding author of the study and an associate professor at National Cheng Kung University, highlighted the noticeable lag in migration speeds among mountain species. "Even in regions not listed in the 17 identified mountain areas, species may still face the risk of not keeping up with climate velocities, and this makes the early establishment of monitoring networks necessary," I-Ching Chen said.

Dr. Wei-Ping Chan, lead author of the study and a postdoctoral researcher at Harvard University's Rowland Institute, pointed out that in many humid climates, warming is less pronounced, but climate velocity can be high.

"The mountainous regions of Taiwan, like Japan, are more affected by humidity-induced high velocities than continental regions. Our study suggests that accounting for humidity is critical to fully understanding the variability of temperature isothermal shifts in mountainous areas worldwide," Chan said.

Shen said, "The lack of meteorological observation data from mountains is both the most valuable and the biggest challenge of our study." He noted that without direct data, they have to rely on models to make estimates, which can vary significantly depending on the model and method used.

Moreover, global data isn't suitable for making local predictions due to differences in scale. The unique characteristics of various mountain regions and the absence of local data mean that just because an area isn't highlighted, doesn't mean it's unaffected.

Therefore, the study emphasizes the need to set up more weather stations in mountains to better understand the real situation and tackle the effects of climate change on species.

More information: Wei-Ping Chan et al, Climate velocities and species tracking in global mountain regions, *Nature* (2024). DOI: 10.1038/s41586-024-07264-9

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