Mountain ranges may act as 'safe haven' for species facing climate change

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Swiss researchers studying the projected effects of climate change on alpine plant species have discovered that mountain ranges may represent a 'safer' place to live during changing climate conditions. The research, published in the *Journal of Biogeography*, finds that the habitat diversity of mountain ranges offer species 'refuge habitats' which may be important for conservation.

The research, led by Daniel Scherrer and Christian Körner from the University of Basel, Switzerland, was carried out over two seasons in the Swiss Central Alps at 2500m. The authors used a high resolution infrared camera and hundreds of soil sensors to monitor the actual temperature experienced by plants in alpine landscapes.

The authors used known 'indicator values' for thermal preferences of plant species permitted to link microhabitat life conditions with biodiversity, the number and abundance of species.

"In this study we examined if different vegetation types and plant species occur under different micro-habitat temperatures," said Körner. "We also estimated the potential loss and shift in abundance of micro-habitat temperatures under a warming climate scenario."

"Comparing various slopes, the study made it obvious that slope exposure and ruggedness of terrain produce a broad spectrum of life conditions not seen over similar areas in forests or in the forelands and plains," said Scherrer. "While it was known from measurements with

thermometers that plant and air temperatures can differ substantially in alpine terrain, the high degree of sustained thermal contrasts among habitats still came as a surprise."

Depending on exposure, low stature alpine vegetation warms up dramatically when the sun is out, but under cloudy weather part of that warmth remains stored in the soil, which also makes nights cosier for roots in many places.

"We found that the occurrences of plant species across these mosaics of warmth match with their known temperature preferences," explained Körner. "This means that rugged alpine terrain offers refuge habitats - or at least stepping stones to these - at short distance, for both small plants and animals that prefer cool life conditions."

The authors simulated the frequency of certain temperatures for a 2 degrees warmer climate with a computer, and found that only 3% of all types of temperature conditions will disappear. So, while the extent of some of the cooler habitats will shrink, importantly, they will not be lost altogether.

The authors found that warm habitats become more frequent, and new, warmer habitats will become established, so habitat diversity will in fact increase. The study also illustrates that weather station data is not a suitable basis for projecting future life conditions of organisms in such high elevation terrain.

"We suggest that alpine terrain is, for the majority of species a much 'safer' place to live under conditions of climate warming, compared to flat terrain, which offers no short-distance escapes from the changing temperatures," said Scherrer.

"It is known from earlier geological periods that mountains were always

important for survival of species during periods of climatic change such as in glacial cycles, because of their 'habitat diversity,'" concluded Körner. "Mountains are therefore particularly important areas for the conservation of biodiversity in a given region under climatic change and thus deserve particular protection."

Provided by Wiley

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