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An international team of researchers has discovered that global warming is triggering the migration of plants to higher altitudes. Presented in the journal Science, the findings revealed that vascular plants have moved upwards by 2.7 metres, increasing the chances for high-mountain species to become extinct. The study was funded in part by the GLORIA-EUROPE ('The European dimension of the global observation research initiative in alpine environments - a contribution to the global terrestrial observing system (GTOS)') project, which clinched EUR 1.15 million under the 'Energy, environment and sustainable development' (EESD) Thematic programme of the EU's Fifth Framework Programme (FP5).

Led by the Institute for Mountain Research at the Austrian Academy of Sciences, researchers from Austria, Brazil, Georgia, Greece, Italy, Norway, Romania, Russia, Slovakia, Spain, Sweden, Switzerland and the United Kingdom have observed how species diversity in summits of temperate-boreal regions has increased, but it has decreased in the Mediterranean region. They put the spotlight on species diversity shifts in 66 summits of 17 European regions in the period 2001-2008.

After evaluating two target regions in the Iberian Peninsula - Pyrennes (Ordesa) and Sierra Nevada (Granada) - the team confirmed the upwards migration of the species.

'This finding confirms the hypothesis that a rise in temperatures drives Alpine flora to migrate upwards,' the researchers say. 'As a result, rival species are threatened by competitors, which are migrating to higher altitudes. These changes pose a threat to high-mountain ecosystems in the long and medium term.'

The data show that the number of species growing in summits of mountains in Europe has risen by around 8%. But the jump is not general, say the researchers, it is rather in boreal and temperate areas. Of 14 summits in the Mediterranean area, 8 reported a drop in the number of species represented.

The researchers also identified how the low elevation sites in the Mediterranean region are home to the biggest changes in species diversity, against other regions.

Mountains in the Mediterranean, namely in Sierra Nevada, Corsica, Central Apennines and Crete, are also impacted by the increase in temperatures, which in turn are triggering drops in annual average rainfall. The end result is longer droughts during the summer periods.

The rise in temperature and longer droughts, say the researchers, only put more pressure on endemic species. The mountains reporting the most considerable shifts in species diversity are found in the Mediterranean, and specifically in southern Europe which has a different climate compared to other regions.

The research suggests that climate change affects moist-soil species more than other species. It should be noted, however, that high-mountain endemic species are not left unscathed either.

'For example, in Sierra Nevada, the observation plots revealed a decrease in the number of emblematic species, such as Androsacevitalianasubsp, Nevadensis and Plantagonivalisy Artemisia granatensis,' says Joaquín Molero Mesa, a professor from the University of Granada in Spain.

The GLORIA project has fostered research around the globe. Experts say it is imperative that ecological data sets and ground-based monitoring activity become available. Such information would help researchers better understand the impact of climate change on the planet's environments.

For more information, please visit:

Institute for Mountain Research:
http://www.mountainresearch.at/index.php/en/

University of Granada:
http://www.ugr.es/

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