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Climate change will alter the structure of Europe's tree of life

Climate change will cause widespread biodiversity loss in Europe, but is unlikely to wipe out entire groups of closely related species, according to a new study. The researchers made their predictions using cutting edge modelling techniques to assess the impact of climate change on the "tree of life".

The Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report states that approximately 20-30 per cent of plant and animal species will be at risk of extinction if the global average temperature rise exceeds 1.5-2.5ºC[1]. There has been some debate about how those species might be distributed and previous research has suggested that they could be unevenly spread throughout the tree of life, with scientists speculating that whole groups of similar species could be lost – akin to snapping off whole branches of the tree – while others would be much less affected.

Partly conducted under the EU ECOCHANGE[2] project, the new study comes to a different conclusion. Through mapping of species by phylogenetic methods (which are based on genetic similarity), the authors reveal that the distribution of extinctions resulting from climate change is likely to be more evenly spread. As such, the effect on the tree of life is more akin to pulling off many leaves from different parts of the tree than to snapping off whole branches. In one sense, this result may seem reassuring, since it suggests that climate change will not have such the devastating effect on future evolutionary potential that losing whole genetic groups would have. However, in another sense, it puts a larger number of diverse groups at risk.

The researchers based their assessment on results from three established climate forecasting models and six species distribution models. They modelled effects of changes in climate for a wide range of species: 1,280 European plants, 140 mammals and 340 birds.

Although species loss is expected to occur relatively evenly across the evolutionary tree, geographical regions will be affected in very different and, in some cases, opposite ways. The researchers' modelling results predict that biodiversity, here modelled as phylogenetic diversity, will fall in southern Europe as a result of climate change, whilst some parts of northern Europe will actually see an increase in biodiversity. Scandinavia, for instance, is expected to experience an increase in plant biodiversity. However, the authors point out that southern Europe may also see migration of species from more southern regions closer to the Equator.

Overall, the study predicts that biodiversity will fall across Europe, and remaining phylogenetic diversity will be more uniform, meaning, inevitably, that some of the benefits (goods and services) that ecosystems provide for humans will be lost. Thus, the study highlights the need for action to mitigate biodiversity losses caused by climate change, but raises new questions about how the spread of species loss should be interpreted.

1. IPCC. (2007). Climate Change 2007: Working Group II: Impacts, Adaption and Vulnerability. Intergovernmental Panel on Climate Change. [Online]. Available: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/spmsspm-c-2-ecosystems.html
2. ECOCHANGE was supported by the European Commission under the Sixth Framework Programme. See: www.ecochange-project.eu

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