

Press release

Naturhistorisches Museum Wien

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Research projects, Research results

Biology, Environment / ecology, Oceanology / climate, Zoology / agricultural and forest sciences
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Genetic monitoring in times of climate change

Genetic diversity is crucial, if species are to adapt to climate change. An international study co-conducted by the Natural History Museum Vienna shows that current efforts to monitor genetic diversity in Europe are incomplete and insufficient. Researchers particularly focused on those regions that will be especially relevant for adaptation to increasing heat and aridity.

Every living thing on our planet is distinguished from its fellow creatures by small differences in its hereditary material. So, when the environment changes and becomes unfavourable to populations of organisms, this genetic variability can enable them to adapt to the new conditions, rather than becoming extinct or having to migrate to other habitats. In simple terms, then, genetic diversity is one of the keys to species survival. In 2022, the International Convention on Biological Diversity (CBD) placed increased emphasis on the need to protect the genetic diversity found in wild species, a fundamental component of biological diversity and one that has been generally neglected previously.

Global warming is already putting pressure on many species in Europe, particularly those having populations at the climatic limits of their range. These populations, however, are not only threatened with extinction; they are also more likely to harbour genetic variants favoured by natural selection to deal with these harsh conditions. These ecologically peripheral regions may therefore function as reservoirs from which, through gene flow, adaptive variants can spread into populations of the core range that will be affected by climate change later. This increases the overall resilience of species. Analysing genetic diversity and its change through time in climatically peripheral populations is therefore especially important for conservation.

An international study, in which the NHM Vienna was a participant and which was published in *Nature Ecology & Evolution*, has examined the monitoring of genetic diversity in Europe – which countries do it for which and how many species. The study was carried out by 52 scientists, who represent 60 universities and research institutes from 31 countries. The results show that monitoring activities are incomplete and need to be supplemented. Particularly in the southeast of Europe (Turkey and the Balkans) more efforts are necessary as this region is underrepresented, but, at the same time, strongly affected by climate change and therefore harbouring many potential reservoir populations of high adaptive potential.

Monitoring efforts were also heavily biased taxonomically: “As expected, we have found many monitoring projects targeting large carnivores such as brown bears or wolves, iconic species that are also of political relevance. They are, however, ecological generalists and will be less affected by climate change than, for example, amphibians and many tree species. Yet, the latter are only rarely included in genetic monitoring projects”, says Frank Zachos, coauthor of the study and research scientist at the NHM Vienna.

A geographically and taxonomically less biased monitoring strategy as well as the systematic targeting of full environmental gradients and high-biodiversity regions would be an important contribution towards the protection of threatened species, many of which also provide invaluable services to humans, such as crop pollination or pest control. In view of recent agreements to halt the decline in biodiversity, to which Austria is a signatory country, the study also points out that better monitoring of species in general, and their genetic diversity in particular, is urgently needed at an international level. This will enable better land-use planning and better support for ecosystem conservation and

restoration actions, which help to ensure the persistence of species and the services they provide.

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Peter Pearman, Olivier Broennimann, [...], Antoine Guisan and Mike Bruford. Monitoring species' genetic diversity in Europe varies greatly and overlooks potential climate change impacts, *Nature Ecology & Evolution*, 2024. DOI: <https://doi.org/10.1038/s41559-023-02260-0>

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