

Species distribution models are of only limited value for predicting future mammal distributions

December 15 2009



The Eurasian Lynx (*Lynx lynx*) is one of 140 European mammalian species, whose climate niches researchers have been studying. Credit: Foto: André Künzelmann/UFZ

Species distribution models are of only limited use in predicting the future distribution of mammals. This is the finding of a study of the climate niches of 140 indigenous European mammals.

The researchers analysed data on species distribution, [climate](#), land cover and topography, as well as the phylogenetic information of the species. Judging by the large differences in climate niches even for closely related species, [mammals](#) seem to adapt fast to changing climatic conditions. This in turn makes predictions based on current distributions

unreliable. Writing in *Biology Letters*, a journal of the British Royal Society, scientists from the Helmholtz Centre for Environmental Research (UFZ) say that since many mammals around the world are endangered by the loss of their habitats and by chemicals and traffic, climate change is just one of many threats.

In their study, the researchers produced distribution models for European mammals and calculated the climate niche overlap. These show under which climate conditions a species currently occurs. Then they compared the climate niche distance and the phylogenetic distance to the species' closest relative. The niche overlap was much less than one would have expected from the phylogenetic information. For example, species such as Greater Mouse-Eared Bat (*Myotis myotis*) and Lesser Mouse-Eared Bat (*Myotis blythii*), Beech Marten (*Martes foina*) and European Pine Marten (*Martes martes*) or Iberian hare (*Lepus granatensis*) and European Hare (*Lepus europaeus*) are closely related, but seem to occupy different Climate niches.

"Our analysis points to a high degree of climate flexibility - regardless of phylogenetic distance," explains Dr Carsten Dormann of the UFZ. "Competition between closely related species has ensured that they currently occupy different climate niches. This does not appear to require slow evolutionary adaptations, but can be achieved within the physiological constraints of the species. The realized climate niche currently occupied is therefore probably only a small part of the 'fundamental' niche." Mammals can occupy broader fundamental climate niches than insects or plants because, as endothermic organisms, they are better able to buffer variations in climate: "We suspect that phylogenetic distance will play a greater role in reptiles and insects." Moreover, the niche overlap is lower among lagomorphs, rodents and insectivores than among bats and carnivores. This indicates that mobile species are better able to avoid competition from related species.

More information: Publication: Dormann, C.F., Gruber, B., Winter, M., Hermann, D. (2009). Evolution of climate niches in European mammals. *Biology Letters*, [rsbl.royalsocietypublishing.org ... 9.0688.full.pdf+html](https://rsbl.royalsocietypublishing.org/doi/10.1098/rsbl.2009.0688)

Provided by Helmholtz Association of German Research Centres

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