

PRESS RELEASE

Climate change and species interactions are reshaping brown bear distribution across Europe

- Understanding trophic relationships is key to predicting species range shifts and protecting ecosystems
- Researchers analyzed over three million localizations from approximately 3,000 bears, representing 14 European and Turkish populations



Brown bear (Ursus arctos) in the boreal forests of Scandinavia. Credit: Vincenzo Penteriani

Seville, June 4 2025. An international scientific team, involving has studied how species interactions influence the distribution of brown bears in Europe and Turkey. The researchers found that the bears' range at the continental scale is largely shaped by their interactions with other species, especially, bears occupy areas where the species they feed on are distributed. The study, published in *Global Change Biology*, highlights the importance of species interactions in ecosystem conservation, using the brown bear as a case study.

Understanding how global changes — such as climate change or land-use shifts — affect species is critical to preserving biodiversity and maintaining the benefits nature provides, such as clean water, fertile soils, and pollination. Climate change, for instance, is causing many species to shift their distributions toward higher altitudes or toward the poles, where climate conditions remain within their tolerance limits. While most studies have focused on direct impacts — such as temperature, rainfall, or land-use change — this research sheds light on the indirect effects by examining species interactions.

“Brown bears have a highly diverse diet — we identified 276 species in their diet. Bears living in warmer areas, such as the Cantabrian Mountains, Greece, or Turkey, tend to consume more plant-based foods, whereas those in colder regions like Scandinavia and Finland are more carnivorous. This means their ecological role varies from herbivore to apex predator,” explains Pablo M. Lucas, a researcher at the University of Seville.

Thanks to a large international collaboration, the team gathered over three million GPS locations from around 3,000 bears belonging to 14 subpopulations across Europe and Turkey, covering a wide range of environmental conditions. “This allowed us to study the effects of local interactions across an entire continent. We found that bears are more likely to inhabit areas where there is more energy available from the species in their diet. For example, in the Cantabrian Mountains, the presence of oak and beech trees — key food sources in that region — increases the likelihood of bear presence. In more carnivorous populations, such as in Northern Europe, bear distribution correlates more strongly with wild ungulates like wild boar or deer,” says MNCN researcher Vincenzo Penteriani.

This information is especially valuable for predicting where species will live in the future and what ecological roles they will play, in the face of climate and land-use changes. It also underlines the importance of conserving the ecosystems that support these species. “If the species that bears depend on for food shift their distributions, this could affect the bear's position in the food web and its viability at the local scale,” adds Lucas.

Other species, unlike the generalist brown bear, may have more specialized diets, lower mobility, or stricter environmental requirements, and could therefore respond very differently to climate and land-use changes, or to changes in the species they interact with. Advancing human understanding in this area is essential for designing more effective biodiversity conservation strategies and safeguarding the ecosystem services nature provides.

This study was led by the University of Seville, La Sapienza University of Rome, and the Institute of Nature Conservation in Poland, and involved a team of 87 researchers from 75 institutions across 26 countries,

including the National Museum of Natural Sciences (MNCN) and the Doñana Biological Station (EBD), both part of the Spanish National Research Council (CSIC).

Reference:

P.M. Lucas et al. (2025). Trophic interactions are key to understanding the effects of global change on the distribution and functional role of the brown bear. *Global Change Biology*. <https://doi.org/10.1111/gcb.70252>