

Study reveals a greater diversity of Iberian spiders that were previously unknown

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The new paper is the broadest study on the biodiversity of spiders of the Iberian Peninsula carried out using the DNA barcoding methodology. Credit: *Cyclosa conica*, Marc Domènech

Populations of peninsular spiders that make aerial spider webs and move around the air by ballooning (using the silk threads as parachutes)

present a more homogeneous genetics structure and are better connected between them. However, species of nocturnal spiders, which hunt on the ground and have a low dispersal capacity, show less genetically connected populations and are more vulnerable to local extinction processes due to environmental factors.

This is concluded in an article published in the journal *Insect Conservation and Diversity*, led by Professor Miquel Arnedo, from the Faculty of Biology and the Biodiversity Research Institute (IRBio) of the UB. Among the participants are the UB-IRBio experts Marc Domènec—first author of the article—Alba Enguídanos and Cesc Múrria, and Jagoba Malumbres-Olarte, from the University of the Azores (Portugal).

Genetic diversity of Iberian spider populations

In the context of the current biodiversity loss due to human activity, the use of genetic techniques to accelerate cataloging and identification of species for their preservation has become especially relevant. These techniques require databases that relate species to their genetic sequencing.

The new paper is the broadest study on the biodiversity of spiders of the Iberian Peninsula carried out using the DNA barcoding methodology, a comparative genetics technique for the identification of species. With this genetic information, the team revealed the existence of a taxonomic diversity that had been unnoticed to date.



The team provided more than 3,200 new sequences of spiders corresponding to 371 species that live in different oak woodlands of six national parks. Credit: Miquel Arnedo

The team provided more than 3,200 new sequences of spiders corresponding to 371 species—that is, a quarter of the total of registered species in the Iberian Peninsula that live in different oak woodlands of six national parks: Aigüestortes i Estany de Sant Maurici, Ordesa y Monte Perdido, Picos de Europa, Monfragüe, Cabañeros and Sierra Nevada.

Populations of Iberian spiders are characterized by an exceptionally [high diversity](#) and a high endemic level. This high level of endemism—and a relatively reduced distribution—makes peninsular populations to be

more vulnerable to potential local extinctions, compromising the viability of the species. "In other populations of the European continent, the endemism level is lower and this involves a broader distribution which guarantees the permanence of the species despite the potential extinction of some of their populations," notes Professor Miquel Arnedo, from the Department of Evolutionary Biology, Ecology and Environmental Sciences.

As stated in the paper, some peninsular species show a high genetic homogeneity in the area but others present a high variability between populations. "In different cases, the delimitation of species based on [genetic information](#) has revealed the existence of well differentiated lineages within the same species," notes Arnedo.

"These lineages —he continues— could simply reflect populations that are less connected to each other. However, in some cases, this could indicate the potential existence of a hidden diversity that we had not found before, if we consider the morphological characters exclusively," adds Arnedo. "Therefore, we have found that species such as *Eratigena montigena* or *Nuctenea umbratica* have different lineages that had been unnoticed due to the strong morphological similarities between them. Future studies with these species will determine whether these lineages correspond to different species."



The study shows that better connected and genetically homogeneous populations are associated to diurnal spiders that live among plants. Credit: Marc Domènech

How to protect Iberian spider populations

The genetic structure of peninsular spider populations is associated to their functional features, as noted in the paper. The correlation of the patterns of genetic diversity at a peninsular scale with different functional and environmental variables enabled the researchers to determine that better connected and genetically homogeneous populations are associated to diurnal spiders that live among plants, hunt preys with aerial spider webs and move by ballooning. However, those

associated with the ground, which are active and nocturnal hunters, are more vulnerable to local extinctions due to a lower genetic connection between populations.

Keeping the genetic variability in a population "is a fundamental factor to ensure the adaptation skills and deal with environmental changes since it is the substrate on which natural selection acts," says Marc Domènech (UB-IRBio), first signatory of the article.

"Regarding the species with a low dispersal capacity, if a population disappears due to some external perturbation, it is even harder to repopulate the area it occupied at the beginning," notes Domènech. "The fragmentation of the habitats is one of the most negative effects derived from the alteration of natural environments. Therefore, it is important to ensure the existence of biological corridors that ease the connectivity among populations that are separated by altered environments and that are inhospitable by these species."



The genetic structure of peninsular spider populations is associated to their functional features, as noted in the paper. Credit: *Eratigena fuesslini*, Marc Domènech

DNA Barcoding: A revolution in taxonomic studies

The DNA Barcoding methodology has changed the analysis of biodiversity in several faunistic groups through new great-resolution bioinformatic tools to accelerate the classification and identification of species. Using this technology, it is possible to classify juvenile individuals—morphologically unidentifiable—at a species and subspecies level. It is also an efficient technique to identify different life stages of the same species which are impossible to identify by other methodologies.

In the study field of Iberian spiders, the team led by Miquel Arnedo is working on a DNA barcode library of all Iberian [spiders](#). This task will enable the future implementation of automated and large-scale identification systems to facilitate the monitoring of communities and habitats of interest, and therefore establish an early warning system to detect potential perturbations on the populations. "Extrapolating these results to other natural habitats will allow us to see up to what extent our results are generalizable," conclude the experts.

More information: Marc Domènech et al, What DNA barcodes reveal: microhabitat preference, hunting strategy and dispersal ability drive genetic variation across Iberian spider species, *Insect Conservation and Diversity* (2021). [DOI: 10.1111/icad.12552](https://doi.org/10.1111/icad.12552)

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