

Improving statistical methods to protect wildlife populations

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A study by the UB Conservation Biology Team and IRBio warns that the current methodology for calculating population changes in wildlife at risk needs to be improved in order to increase their survival in the future. Credit: University of Barcelona

In human populations, it is relatively easy to calculate demographic

trends and make projections for the future if data on basic processes such as births and immigration is known. The data, given by individuals, can also include death and emigration, which subtract.

In the wild, however, understanding the processes that determine wildlife demographic patterns is a highly complex challenge for the [scientific community](#). Although a wide range of methods are now available to estimate births and deaths in wildlife, quantifying emigration and immigration has historically been difficult or impossible in many populations of interest, particularly in the case of [threatened species](#).

A [paper](#) published in the journal *Biological Conservation* warns that [missing data](#) on emigration and immigration movements in wildlife can lead to significant biases in species' demographic projections. As a result, projections about the short-, medium- and long-term [future](#) of study populations may be inadequate. This puts their survival at risk due to the implementation of erroneous or ineffective conservation strategies.

The authors of the new study are Joan Real, Jaume A. Badia-Boher and Antonio Hernández-Matías, from the Conservation Biology team of the Faculty of Biology of the University of Barcelona and the Institute for Research on Biodiversity (IRBio).

More reliable population predictions

This new study on population biology is based on data collected from 2008 to 2020 on the population of the Bonelli's eagle (*Aquila fasciata*), a threatened species that can be found in Catalonia in the coastal and pre-coastal mountain ranges, from the Empordà to Terres de L'Ebre. In the study, the team emphasizes the precision of the population viability analysis (PVA) methodology to improve the management and conservation of long-lived species in the natural environment.

"Population viability analyses are a set of methods that allow us to project the demography of a species into the future, mainly to quantify the probability of extinction of a given species or population of interest," says Real, professor at the Department of Evolutionary Biology, Ecology and Environmental Sciences and head of the Conservation Biology team.

"To date—he continues—these projections have mostly been carried out only with data on births and deaths, so that migration processes were ignored because of the difficulty of obtaining these data. In other words, we are trying to make demographic projections without considering two key demographic processes."

Threats affecting more and more species

In the study of wildlife, population models that do not incorporate immigration or emigration "have a considerable probability of leading to biased projections of future population trends. However, explicitly considering migratory processes allows us to consider all the key demographic processes that determine the future trend of a population," says expert Jaume A. Badia-Boher, first author of the study.

"This allows us to be much more precise when making demographic predictions, and therefore also when planning future conservation strategies," he adds.

"This new perspective may imply a relevant advance in the reliability of population viability analyses, which will allow us to estimate the future trend of populations more accurately and propose conservation actions more efficiently," notes Professor Antonio Hernández-Matías.

"This is of great importance given that in the current context of global change the extinction rates of species are increasing, and more and more species require urgent and effective conservation actions to reverse their

decline," says the expert.

Applying methodological developments to conserve biodiversity

Introducing changes in the structure and modeling of population viability analyses can lead to multiple benefits in many areas of biodiversity research and conservation. "Methodological advances are effective when they are applied. For this reason, the application of the new methodology in populations and species of conservation interest should be promoted.

"It is a priority to make these methodologies known to the scientific community, managers and administration, in order to prioritize conservation actions with the best available methods," say the authors.

"In the future, new methodologies must continue to be developed, as has been done in this study, as they are key to understanding how wild populations function, what measures need to be implemented to conserve them, and how to make these measures as efficient as possible.

"In the case of endangered species such as the Bonelli's eagle, knowing the rates of emigration and immigration is key to understanding the state of self-sustainability of a population, and thus implementing efficient conservation measures," concludes the team.

More information: Jaume A. Badiá-Boher et al, Assumptions about survival estimates and dispersal processes can have severe impacts on population viability assessments, *Biological Conservation* (2024). [DOI: 10.1016/j.biocon.2024.110550](https://doi.org/10.1016/j.biocon.2024.110550)

Provided by University of Barcelona

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