



## Early «Homo sapiens» facilitated the establishment of the Bonelli's eagle in the Mediterranean 50,000 years ago

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**A study led by the University of Granada (UGR) shows that our ancestors influenced the relationship between Bonelli's eagles and their main competitors, golden eagles.**

**Paradoxically, the future of the Bonelli's eagle is now being threatened by human activity.**



A team of Spanish and Portuguese scientists led by the UGR have unravelled the ancestral history of one of the most iconic birds of prey in the current Iberian fauna: the Bonelli's eagle (*Aquila fasciata*).

The study, published in the prestigious scientific journal *People and Nature*, combines evidence from several disciplines, including palaeontology, genetics and ecology, to answer questions about when and why the Bonelli's eagle, a species primarily found in tropical and subtropical areas, colonised the Mediterranean Basin.

As Marcos Moleón Paiz, a Senior Lecturer at the UGR's Department of Zoology and lead author of the paper, explains: "The Bonelli's eagle is a 'newcomer' to Europe. This species probably began to establish itself in the Mediterranean Basin no more than 50,000 years ago, while others, such as the golden eagle (*Aquila chrysaetos*), have been here much longer, as evidenced by the fossil record".

The spatial analysis carried out in the study showed that cold climatic periods are largely unfavourable for the Bonelli's eagle, but not for the golden eagle. "During the last glacial period, the Bonelli's eagle could only find refuge in warm coastal areas, which is precisely where the oldest fossils of this species have been found," says Moleón. Genetic analysis confirmed that around the Last Glacial Maximum, the Mediterranean population of Bonelli's eagles consisted of only a few individuals. This ancestral population of Bonelli's eagles thrived as the temperature in the Mediterranean Basin rose and the human population grew and became sedentary.

However, as Moleón points out: «Once the question of 'when' was resolved, the inevitable question arose: Why did the Bonelli's eagle begin to colonise the Mediterranean in such a complex climatic period? And why did it establish itself during the last glacial cycle and not before?»

### **The role of our ancestors**

According to Moleón, "after testing several alternative hypotheses, all of the pieces of the puzzle indicated that the first settlers of our species (*Homo sapiens*) in Europe played a fundamental role".

The study collected and analysed the most comprehensive information currently available on the competitive interactions between Bonelli's eagles and golden eagles. This enabled the scientists to confirm that the golden eagle is the dominant species and the Bonelli's eagle is the subordinate species in this relationship. Thus, the results showed that Bonelli's eagles can only survive in places where golden eagles are rare, which is mainly in areas that are densely populated by humans.

Moleón continues: «In addition, our mathematical models showed that if we were able to eliminate all the existing golden eagle pairs in climatically favourable areas, we would expect to see a significant increase in the number of Bonelli's eagle pairs, but not the other way round. We also know that golden eagles can kill Bonelli's eagles and take over their territories, but not vice versa».

It is worth noting that golden eagles are less tolerant of human presence than Bonelli's eagles. The authors hypothesise that with the arrival of the first anatomically modern humans in Europe, some of the golden eagle territories closest to human settlements were abandoned and these "vacant" territories were then occupied by Bonelli's eagles from the Middle East. "In short, Bonelli's eagles could not have established themselves in the Mediterranean before the arrival of the first *Homo sapiens* because the competitive pressure from golden eagles and other species would have been too overwhelming", the UGR researcher adds.

## **Living near or far from humans**

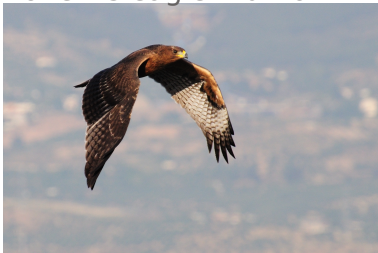
Knowledge of the ability of humans to influence species distribution is nothing new. The novelty of this study lies in revealing a mechanism called «human-mediated competitive release», by which our species, including our ancestors, could indirectly affect the distribution of other species, including long-lived species. “In order to understand what we observe in nature today, we often have to look to the past,» says Moleón.

However, the advantage that living close to humans once gave Bonelli’s eagles has now turned against them. “Paradoxically, the future of the Bonelli’s eagle in the Mediterranean region is currently being threatened by the relentless intensification of human activities in the environment, which is reflected, among other factors, in the deaths caused by power lines, the lack of prey, and the disturbance of nesting sites,» the authors conclude.

### **Bibliographic reference:**

Moleón, M. et al. (2024) Wildlife following people: A multidisciplinary assessment of the ancient colonization of the Mediterranean Basin by a long-lived raptor. *People and Nature*. DOI: 10.1002/pan3.10642

Bonelli’s eagle. Author: F. David Carmona



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