

Bonelli's Eagle: Improving the Conservation of an Endangered Species Across Europe

ScienceDaily (Apr. 16, 2010) - What is the homerange of the Bonelli's eagle? Do males and females share territories? Do patterns of spatial use vary during the year? A study led by the UB's Conservation Biology Group provides new information on spatial patterns of the Bonelli's eagle (Aquila fasciata), an emblematic species of the Mediterranean area and considered endangered across Europe. The study, published in the international journal The Ibis, provides new data on the spatial use of the species which reveal valuable new ecological information and will form the basis of new territorial conservation and species management strategies.

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- only the breeding areas is no longer sufficient," explains Joan Real, head of the Conservation Biology Group, who argues that, "We also need to protect areas further from nesting , sites but ideal for hunting, as these are key to the survival of territorial individuals." The article, which explains that Bonelli's eagles often use areas that have great biological value but are generally unprotected, is the fruit of a project supported by the Barcelona City Council and the

"The classical approach of protecting

Spanish Ministry of Education and Science The group radiotracked 18 Bonelli's Marine conservation

Eagles in three geographically different areas (Vallès, Garraf and Priorat) in the period 2006-2008 to answers important questions about

the biology and ecology of the species: the size of home ranges, spatial use patterns, and differences in territorial behaviour between males and females and between pairs with and without chicks. The findings suggest that the Bonelli's eagle has a typical pattern of spatial use. Males and females occupy similar areas throughout the year, and outside the breeding season the eagles use larger territories. Nonreproductive pairs have very large home-ranges (like reproductive pairs outside the breeding season).

The study underlines the degree of territorial dependence of Bonelli's eagles, particularly on breeding areas. Joan Real explains that, "eagles are highly dependent on its breeding area throughout the year. Outside the breeding season, nesting sites retain their importance as the eagles will use them to rest shelter and sleep. Therefore, regulations on the conservation of breeding areas should not just be observed during the breeding season but throughout the year, which would include controlling leisure activities that disturb the birds.

What are the key factors of recruitment in Bonelli's eagles?

When and where does recruitment take place? Do birds return to their birth territories? Which are the most attractive areas to recruiting birds? Recruitment is the process by which individuals are incorporated into the reproductive segment of the population, and the factors that determine its dynamics are little known in bird species. The Auk, one of the highest impact factor journals in the field of ornithology, published anothe study conducted by the UB group and other experts, focused on inter-populational movements of Bonelli's eagles in Catalonia and south-west France. "Recruitment is a basic aspect of the life cycle and a key determinant of population dynamics," explains Antoni Hernández-Matías, a researcher in the Conservation Biology Group and lead author of the study. "A crucial aspect in the dynamics of a metapopulation is to understand exchanges of individuals between local populations, which are determined by the success and survival of recruited birds. These are issues dealt with in the study.

The largest populations of Bonelli's eagles in Europe are found in the Iberian Peninsula and south-west France. For its study



Bonelli's eagle (Aguila fasciata), an emblematic species of the Mediterranean area and considered , endangered across Europe. (Credit: Image courtesy of Universidad de Barcelona)

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and use extensive spatial territories," explains Hernández-Matías. "In the study we found that eagles are recruited into the population relatively late and that the global return rate of 9.97% is comparatively low, probably due to the high mortality rate during dispersion."

So what are the factors that determine recruitment in raptor populations? The process depends on complex connections between individual factors, parental characteristics and environmental scenarios. "In the study we state that recruitment depends on year of birth, parental quality and territory or origin, among other variables," says Hernández-Matías, who explains that "Most movements between populations occur between the time that the eagles leave the nest and their recruitment into a territory. These movements connect local populations, and in the case of Bonelli's eagles they are essential maintaining local populations of an endangered species." The study also shows that females disperse much further than males and that females in Catalan populations disperse more extensively than females belonging to populations in France.

The study, which received financial support from the *Fundació Miquel Torres*, provides new information with which to evaluate population viability and reveals that populations are connected across geographical boundaries. As Joan Real explains, "There is no sense in managing populations individually. Endangered species have no boundaries, and conservation action is usually carried out at the local level. If we want to increase the survival of this and other species, we must unify conservation strategies between different agents and different geographical areas."

Does the diet of Bonelli's eagles reveal changes in their ecosystems?

Another area on which little information is available is the consumption dynamics of different prey species. The first analysis of the trophic profile of the Bonelli's eagle is presented in an article in the *Journal of Biogeography*, written by the UB group and other researchers in Spain, France and Portugal, that focuses on the diet of Bonelli's eagles in various regions of Europe over the period 1968-2006 and the changes observed in the wake of rabbit haemorrhagic disease (RHD), which was first recorded in 1988.

According to the study, led by Marcos Monleón of the University of Granada, the most common prey of Bonelli's eagles before the outbreak of RHD was the rabbit, followed by pigeons and partridges. However, although in southern areas rabbits and partridges were the most frequently captured prey, in northern areas a wider range of prey species including pigeons and other birds was consumed, probably due to the lower abundance of rabbits and partridges. When RHD reached Europe in 1988, it extended across the Iberian Peninsula and the total rabbit population decreased by approximately 30%. This obliged eagles to diversify their prey items and hunt for other mammals, pigeons, corvids and other birds. If we consider that despite this impact, Bonelli's eagles now consume a higher proportion of rabbits relative to the total population, it is clear that this is a key prey species in the survival of eagle populations. The appearance of new species in the diet of Bonelli's eagles after the outbreak of RHD, such as gulls and starlings -- subject to anthropogenic influence and possible carriers of pathogens and contaminants, as well as providing little in the way of energy -- is a clear indicator of how emergent diseases can alter trophic relations and the general stability of ecosystems. The challenge now faced by researchers is to discover how these alterations may affect the life-cycle of Bonelli's eagles and the survival of populations

Since 1980, the UB's Conservation Biology Group has conducted applied research into the conservation of Bonelli's eagles (*Aquila fasciata*) to support the work of conservation managers in implementing efficient measures for the protection of this species. The group is supported by the *Fundació Miquel Torres*, in Vilafranca del Penedès. The most recent findings of the research group were presented at the annual conference of the Raptor Research Foundation, in Pitlochry (Scotland), an international event drawing the participation of the most prestigious figures in the field of raptors and their conservation.

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