

RECOVERY PLAN OF THE BEARDED VULTURE IN NORTHEASTERN SPAIN (LIFE98 NAT/E/005296)

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1. CURRENT DISTRIBUTION

The species was widely distributed across all the main Iberian mountain ranges until the end of the 19th century. During the twentieth century numbers decreased dramatically and many populations went extinct (Cantabrian, Iberian and Central mountain ranges, Sierra Morena, and Penibetic and Betic ranges), following the general European trend. Currently, the last population is restricted to the mountainous systems of the Pyrenean range. Only a few territorial and non-breeding birds remain out of the Pyrenees, in the Basque Mountains.

In the Pyrenees, the species may breed from 600m to 2000m above sea level. Over the last several decades the species has been increasing its population size and expanding its range westward and eastward. However, there are still wide unoccupied potential habitat in the eastern and northeastern mountain areas.

The southern central Pyrenees contain up to half of the breeding population (56 breeding pairs in Aragón in 2002) that may produce up to two thirds of the fledglings, making it an important stronghold for the species. This area is also the main wintering area for the preadult population (85-90% of the observations).

The juvenile dispersal and the floater movements and settlements are restricted basically to the area used by breeders, although there are numerous observations out of the Pyrenean range (Antor et al., 2000). The territory use by the juveniles and floaters follows a seasonal pattern, selecting the southern slopes particularly during the winter season and the northern slopes are used basically during the summer. Therefore, settlements and movements of non breeding birds follows a circular pattern with low interyear variability (R.J. Antor, unpublished).

2. POPULATION STATUS

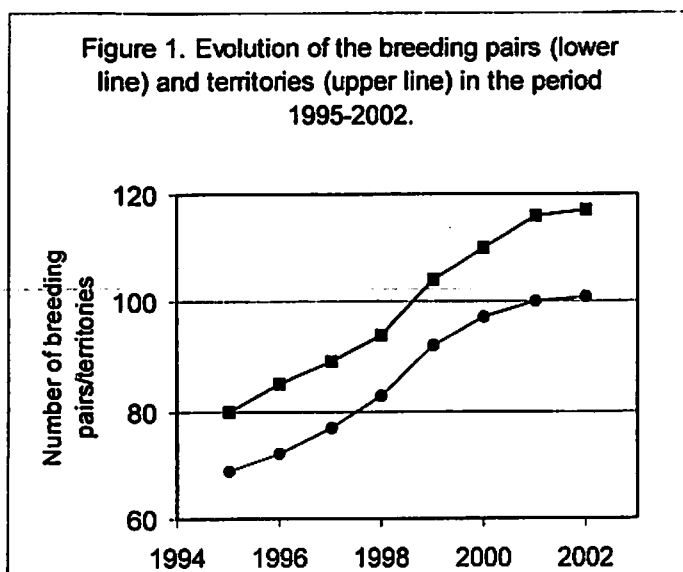
The Pyrenean population is the largest in Europe with 101 breeding pairs (2002), and the only one with an important growing rate. During the period 1995-2002 the breeding population increased at an average annual rate of

5.6%, and it has doubled its size since the early 1990's. This increase is mostly produced by the important recruitment into the adult population and presumably has led to a significant floater population (Antor, 1998).

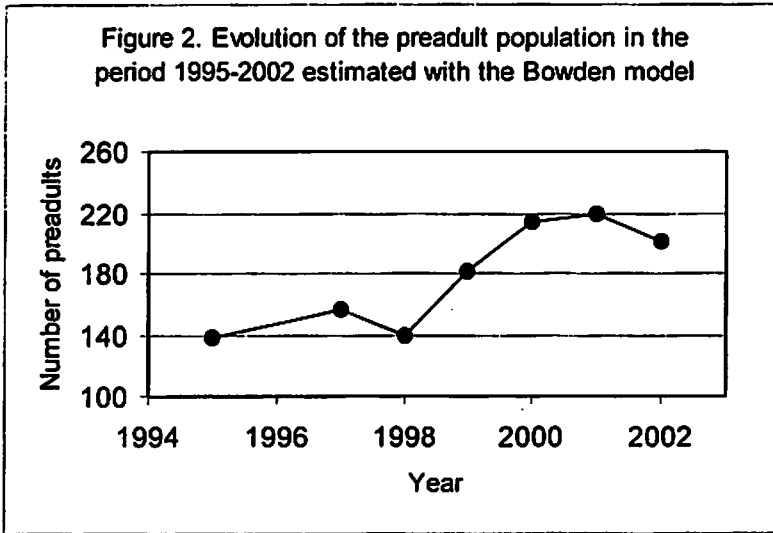
Breeding success is low, around 0.5 fledglings/breeding pair/year, and decreasing with growing number of breeding pairs, but much higher than those known for the other European populations.

Although the annual production of fledglings has been fairly constant during the second half of the eighties and the nineties (around 30 fledgling/year), the preadult population size has increased until more than 200 birds in 2001 (estimated from resighting data of 55 tagged vultures by means of mark-recapture models; Antor et al., 2003). The improvement of the juvenile survival seems to be the main cause of the population increase, and has been over 90% in the first year of life (Antor, 2001).

However, recent population estimates indicate that the upward population trend is reversing. In this way, between the 2001 and 2002 breeding seasons it has been recorded an important reduction in population growth down to about 0.86% in the number of territories and 1% in breeding pairs in the 2002, which are about a factor of 6 shorter than the average rates for the period 1995-2002 (figure 1).



The preadult fraction has been even more affected for this trend. In the 1998 and 2002 breeding seasons it has suffered 11,5 and 8,22% reductions in population size, respectively (figure 2).



The existence of these two recessive episodes is also supported by the data obtained through radiotracking 55 individuals in the Pyrenees from 1994 to 2002. The major mortality episodes occurred during the 1997-98 and 2001-02 seasons, when 5 and 4 marked birds were found dead from poisoning. Therefore, the population size of the pre-breeding and breeding fractions are apparently affected by these mortality episodes. The excessive mortalities have been mostly produced by the illegal use of poisoned baits against predatory mammals, and the several types of toxic substances were involved: strychnine, aldicarb and carbofuran (Hernandez, unpublished).

On the other hand, the important repercussion this mortality has had on the evolution of the preadult fraction is not due to a high juvenile mortality. Surprisingly, the annual juvenile survival rate was estimated to be over 90% during the three first years after fledging, similar to the rate estimated for adults, and even higher than the one estimated for subadult birds (Antor, 1998). Although the supplementation of clean food has been not fully effective in preventing poisoning, it seems that the high juvenile survival is due to the strong attachment of inexperienced birds on food subsidy during the critical season.

The floater population is apparently the fraction more severely affected by the mortality episodes. Actually the scarcity of floaters may have led to the decrease of the breeding population growth since there are not enough adults to quickly replace all the losses.

3. THREATS AND LIMITING FACTORS

The main mortality causes recorded in the Pyrenees during the eighties were shooting and collision with power lines (Canut et al., 1987). Although the earlier concerns have not yet been fully resolved, the current radiotracking program and the analysis of the casualties has shown a prevalent incidence of poisoning.

Poisoned Baits: The illegal use of poisoned baits is the main mortality factor, causing the 36.7% of the recorded casualties in the last decade (n=30). The substances involved were strychnine, warfarine, aldicarb, carbamates and carbofuran (M. Hernández, unpublished).

Accidents on power lines: They caused the 23.3% of the recorded casualties in the last decade. Although the collision mortality was more important historically, currently it has been recorded an increase of the electrocution mortality up to about 43% in the last few years.

Shooting: It was the main mortality cause recorded in the eighties, causing the 60% of the losses. In the last decade it has been the cause of about one-fourth of the accidental deaths (23.3%; n=30).

Chemical contamination: It is a potential problem to the species conservation, since its high position in the food chain. Therefore the contaminant levels were studied in dead birds, blood samples from marked birds, eggs and eggshells obtained after the breeding failure.

The levels of organochlorines and polychlorinated biphenyls (PCBs) found were lower than the thresholds known to harm raptors, therefore this chemicals seem not to be causing mortality or affecting the breeding performance (Hernández, 2003).

Lead (Pb) poisoning resulting from ingestion of bullet fragments in prey is one of the most commonly reported mortality causes in raptors. Bearded Vulture are at risk of lead toxicosis because of the gunshot imbedded in some of its potential prey, since lead bullets are the standard ammunition used in the mammalian and avian hunting game species in the Pyrenees. Although the laboratory analysis of tissues of 63 individuals (44 blood samples y 19 corpses) found a high prevalence of lead exposure, the lead levels were generally below the toxicity threshold for raptors (M. Hernández, 2003). The only case of acute lead poisoning documented was detected early, and the affected bird was captured and treated successfully by chelation therapy.

4. CONSERVATION ACTIONS

The existing three regional recovery plans in Aragón, Cataluña and Navarra since the 1990's, have lead to the preservation of a significant proportion of the breeding habitat through the designation of Special Protection Areas (based on Directive 79/409/EEC). The recovery plans have also allowed the assessment of the activities that would have affected the habitat or directly the species, and the proposal of mitigating measures.

One of the main objectives of the actions undertaken has been to prevent the disturbance at the breeding sites during incubation and the early stages of breeding, with specific warding campaigns at those sites where the species regularly fail to breed successfully. Artificial incubation and foster parent rearing have been used successfully with two clutches removed from the wild.

Food subsidy is acknowledged as a fundamental tool for the species conservation management. For this reason, since 1988 a supplementary feeding program has been carried out during the critical season (from January to April). Currently around 30 sites are food supplied through the whole range. Nine of these areas are located in Aragón and are supplied with a yearly average of about one tone of food in each location. Although the specific supplementary feeding has been not fully effective in enhancing breeding productivity or reducing the major mortality causes, the frequency of poisoning mortality presumably would have been much higher in the absence of food subsidy.

Avoidance of wild boar hunting disturbance is routinely undertaken since these hunting parties have been identified as a potential cause of failure during the incubation. The sensitive breeding areas located inside private hunting grounds have been mapped on a yearly basis, and the hunting parties inside these areas have been suspended during the critical periods.

5. PROPOSALS FOR THE MANAGEMENT OF THE SPECIES

5.1. Population monitoring

The present population's distribution and its recent history are well documented, and the monitoring of the changes should be continued.

It is also essential to continue the long-term monitoring of the breeding success and population size that have been routinely monitored since 1984 to provide basic information for management (Heredia y Razin, 1999). The absence of territorial behaviour in the preadults has prevented the obtention of estimates of the size of this segment until the recent use of

specific mark-resighting methodology (Antor, Margalida y Heredia, 2003). In addition, these techniques allowed to estimate the preadult survival rates and, therefore, the current program should continue. It would be convenient to increase the sampling effort in the annual global censuses with the goal of increase the precision of preadult population estimates.

Radio-tracking has provided information on the seasonal movement and settlement of non-territorial individuals within the species range. But, more importantly, it has provided vital information on the limiting factors and mortality causes. Although expensive and labor-intensive, continued monitoring of mortality causes with radio-tracking is essential since the changes in the species population are very sensitive to excessive mortality.

5.2. Habitat conservation and improvement

It is of primary interest to promote the inclusion of the remaining unprotected habitat (new breeding territories, juvenile settlement areas) within of the protected areas networks.

The promotion of the traditional livestock management activities, the reestablishment of the specific dumping areas for animal carcasses, and the restoration of wild ungulate populations within the species distribution area needed to have any assurance of the species' long-term persistence.

5.3. Management of the species

Despite all the actions undertaken to increase the breeding productivity, the population remains threatened by the excessive adult mortality, since the growth rate is more sensitive to adult survival than reproduction (Antor 1995). Therefore, it is urgent to take further action against the main mortality causes.

It is essential the continuation of the monitoring of poisoning incidents and toxicological examination of dead specimens to determine the cause of death. The implementation of anti-poisoning campaigns, specific public awareness campaign and enforcing the prohibitions against poisoning are necessary and urgent measures.

The high prevalence of blood lead (Pb) levels indicate incidental exposure. The existence of important local mortality of birds in areas or seasons not sampled could not be ruled out. For this reason, we recommend periodic monitoring for early detection of lead and progressive replacement of lead ammunition with non-toxic alternatives.

Regardless of the population impact of hunting mortality (currently about one-fourth of the recorded deaths), the deliberate killing of raptors is seen by society as a serious impropriety that should be avoided. Therefore, it is necessary to enforce the laws against shooting and implement public awareness campaigns.

About one-fourth of all fatalities were caused by collisions and electrocutions in power lines. In order to reduce these unnecessary losses, mitigative measures should be undertaken: correcting inappropriate pole design and location, and increasing line visibility by attaching highly visible markers. Some mitigation measures have been initiated by the power companies and the regional governments. It is proposed to continue the radio-tagging and tracking of bearded vultures as a way of determining the efficacy of these changes.

The food subsidy program is a relatively inexpensive managing method, and its continuation is of the highest interest to the species conservation since the poisoning threat is currently the main conservation concern. In addition, the food subsidy is proving an effective technique to attract the birds for marking purposes and to estimate the preadult population size. The subsidy of clean carcasses should not be reduced or eliminated from the population core area, as it has been suggested to promote juvenile dispersal, until better ways of countering the poisoning threat could be implemented.

5.4. Research

Factors limiting the reproduction are poorly understood. Documenting the causes of breeding failure has proven to be a particularly difficult task and, therefore, supplementary data is required.

Although the breeding monitoring should continue, the emphasis of long-term monitoring should be estimation of total population size (preadult, floater and breeding fractions) and survival since the changes in the species population are more sensitive to survival than reproduction (Antor 1995).

5.5. Public awareness and education

It is urgent to increase public awareness of the critical need for mitigation of the main man-induced threats, and to develop specific awareness campaigns against the illegal use of poisoned baits. The public involvement is essential to strengthen compliance with the existing species protection legislation.

5.6. Policy and legislation

Competent public authorities are involved in the implementation and effective enforcement of the existing legislation against any deliberate or accidental killing of this protected species. These authorities may accomplish this mission by monitoring, inspecting and conducting investigations of suspected violations and implementing appropriate enforcement responses, including prosecutions when warranted. Finally, they are also responsible for enforcing the species conservation through the designation of the unprotected habitat as SPAs.

6. LESSONS LEARNT BY NETWORKING

The five network workshops funded by the Life Programme have facilitated the mutual exchange of expertise among the different projects and the pooling of knowledge about the species conservation status, benefiting the quality of the implemented conservation actions and of the awareness common products.

The education common products promoted basically by the island projects (common poster and field identification guide) have been distributed in all the benefiting regions, enriching the Pyrenean awareness campaign.

In addition to these common products, the networking has played an essential role in the improvement of communication and the searching of a consensus on the conservation priorities, that may lead, in the long term, to more effective conservation strategies. In this way, the two island populations may particularly benefit from the existing intensive management expertise.

The extremely low bird numbers existing in both islands imply that a population crash may be imminent. The current failure of recruitment to compensate even overly optimistic survival rates (98%) with the current reproductive rates, imply that there is an need for immediate management measures as well as the adequate monitoring of the population to ensure the long-term persistence. These active management may be based on measures successfully proven in the mainland projects (Alps and Pyrenees).

The first group of these measures are related with the identification and monitoring of the main mortality causes through the marking and radio-tracking of birds, the collection and analysis of blood samples, eggshells and casualty remains (toxicological and genetic assessment, molecular sexing). Actually, the wide knowledge on marking and tracking techniques acquired in the Pyrenees have already been of some use to the Cretan radio-tracking project of juveniles. The Pyrenean project has also assisted the Corsican project in the toxicological assessment of eggshells and casualty remains.

A second group of measures are related with the correction of the factors that are limiting the recruitment. The small island populations may boost its low productivities by using the intensive management and manipulation techniques of breeding wild pairs developed for the Pyrenean population, as well as the captive breeding experience of the Alpine project. This intensive management techniques have not been used in the island populations in spite of having the greatest potential in helping to correct their current minimal recruitment.

Finally, the lengthy Pyrenean experience in the supplementary feeding may have been decisive in facilitating the rapid implementation of this essential technique for most of the current projects.

7. REFERENCES

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