The reintroduction of the Bearded Vulture Gypaetus barbatus in Andalusia, southern Spain

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Introduction

The Bearded Vulture ***Gypaetus barbatus*** (L.) was a common species throughout the Iberian mountain ranges in the beginning of the 20th century (Chapman & Buck 1893, 1910; Medinaceli 1921). It was also common in Andalusia (see Figure 1), being broadly distributed in the Penibetic Mountains of southern Spain until the middle of the 19th century (Hiraldo ***et al.*** 1979). The presence of this species is well-documented, especially in the Penibetic mountains, from Cadiz to Murcia, Cazorla and Segura (Hiraldo ***et al.*** 1979) (see Figure 2).

Up to the beginning of the 20th century, European naturalists visited Andalusia to observe and collect wildlife specimens (Rosenhauer 1856, López-Seoane 1861, Saunders 1871, Brehm 1881, Sánchez-García 1885, Arévalo 1887, Chapman & Buck 1893, Crú & Crú 1903, Verner 1909, Chapman & Buck 1910, Lynes 1912, Medinaceli 1921, Escherich 1928, Swann 1945). The Bearded Vulture was highly appreciated and many skins and eggs were collected for natural history collections (Sánchez-García 1885, Chapman & Buck 1893, Irby 1895, Crú & Crú 1903, Verner 1909, Chapman & Buck 1910, Medinaceli 1921, Swann 1945, Calderón 1982). For example, 35 of 54 eggs deposited in European museums and examined by Hiraldo ***et al.*** (1979) were collected in Andalusia.

Starting from the end of the 1950s and during the 1960s, several poisoning campaigns led to the disappearance of the last population of Bearded Vultures in the southern Iberian Peninsula (Hiraldo ***et al.*** 1979). The extinction of this species was caused by the direct action of man, at first by persecution – hunting, poisoning and collecting. During the 1960s and 1970s and beginning of the 1980s, intense and periodic poisoning campaigns then brought about the extinction of the already decimated population (Hiraldo ***et al.*** 1979, Donázar 1993). These campaigns were promoted and rewarded by the government in order to fight vermin (Hernández 1999).

Only in the Cazorla Mountains did this species survive until recent times. During the first 40 years of the 20th century, the species became rather rare, and already in the 1950s, its presence was limited to a few mountain ranges in Murcia, Granada, Málaga, Cazorla and Segura (Jaén) (Hiraldo ***et al.*** 1979). In the last two, breeding was confirmed in 1958 and it was estimated that there were four

secure breeding pairs along with some other probable ones (Cano & Valverde 1959). Until the 1960s, six breeding pairs inhabited the Cazorla, Segura and Las Villas Mountains and another survived in the adjacent Castril Range. But the last occurrence of breeding took place in 1983 and the last resident bird was sighted in 1987 (Donázar ***et al.*** 1991).

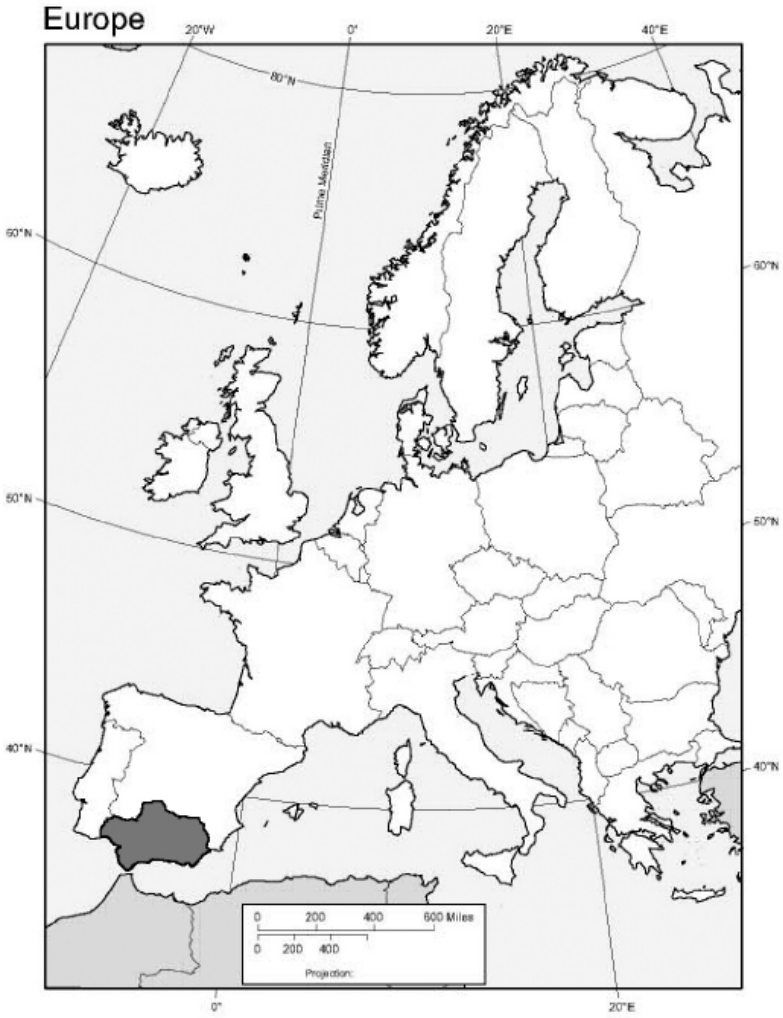

Figure 1. Location of Andalusia in Europe.

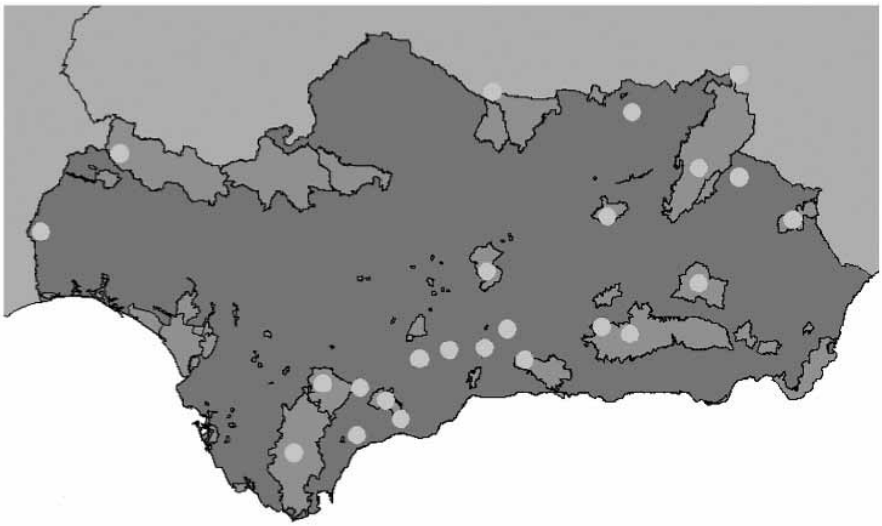

Figure 2. Historical locations (circles) of the Bearded Vulture ***Gypaetus barbatus*** from 1900 to 1940, and the current distribution of the Natura 2000 Network in Andalusia.

After the dramatic results of the census of the Bearded Vulture in Cazorla, Segura and Las Villas in 1986, which resulted in the observation of one single individual, the participants in the "III Coordination Meeting for the Bearded Vulture" recommended a feasibility study for a reintroduction programme (Donázar ***et al.*** 1991).

The first study in this respect focused on the Cazorla, Segura and Las Villas Mountains (Donázar ***et al.*** 1991). Its results indicated that the Cazorla, Segura y Las Villas Natural Park could support a population of at least 13-15 breeding pairs. They also recommended extending the study to all other mountain ranges in southern Spain.

Following the recommendations of Donázar ***et al.*** (1991), we finished the required studies for an environmental assessment of the Andalusia mountains at the end of 2001 (Romero ***et al.*** 2001), which was subsequently updated on 2005 (Hernández ***et al.*** 2005, Padial ***et al.*** 2005). In the meantime, other studies on population genetics and molecular phylogenetics helped to resolve some of the technical difficulties for the reintroduction programme (i.e. genetic origin of the birds, theoretical analysis of trends in the reintroduced population) (Bustamante 1998, Negro & Torres 1999, Godoy ***et al.*** 2004).

In order to meet international trends and criteria, as well as to benefit from

other experiences, we followed the IUCN's international guidelines for reintroduction (IUCN 1987), http://www.iucn.org/themes/ssc/pubs/policy/reints.htm). From among the main recommendations, we largely based our actions on the following: (1) reintroductions must be carried out in the historical range of the species, (2) selected areas must assure the conservation of the reintroduced species, (3) environmental evaluations must precede the reintroductions, (4) reintroductions should take place only when the causes of the decline have disappeared or, at least, have been reduced to acceptable levels.

With the approval of the Spanish Bearded Vulture Working Group (BVWG), which includes all the species' national experts, the reintroduction project of the Bearded Vulture in Andalusia set out to meet international and national criteria.

The reintroduction project

In November 2004, the Gypaetus Foundation was granted the LIFE Project "Preliminary Actions for the Reintroduction of the Bearded Vulture in Andalusia" by the European Commission. The beneficiary of the project is the Gypaetus Foundation, and the partners are the Environment Regional Government of Andalusia, the Andalusian Hunting Federation and the Small Farmers and Stockbreeders Association (Fundación Gypaetus 2006). The project will last five years and has a total budget of 1,649,250.

The main tasks of the project are:

To promote relationships between different Bearded Vulture teams

The Bearded Vulture is a quite well-studied species in Europe (Hiraldo et al. 1979, Heredia 1991, Donázar 1993, Margalida 2005) and taking advantage of previous experience (such as the Bearded Vulture reintroduction project in the Alps [Frey 1992]) is crucial for the success of the project and the optimisation of its resources. The Gypaetus Foundation has taken note of the inputs made during international meetings, as well as contributed some of the early project results (Couto ***et al.*** 2005b, García-Baquero ***et al.*** 2005b, 2005c, 2005d, Padial ***et al.*** 2005, Couto ***et al.*** 2006, Salamanca ***et al.*** 2006, Simón ***et al.*** 2006a).

To promote the "Guadalentín Breeding Center (GBC)"

The beginning of the GBC was closely related to the expert advice of the Foundation for the Conservation of the Bearded Vulture and the economic support from the Andalusian Ministry for the Environment. The Dr Alex Llopis was the manager of the GBC from its beginning in 1996 to 2005. Under his leadership, the GBC Bearded Vultures bred successfully from 2001 onwards (see Table 1). Except during hatching and during the subsequent few days, up to a maximum of two weeks (when the incubator and GBC staff replacing the parent care), the eggs were incubated by the natural or foster parents, and the chicks are reared by them, minimizing any human intervention (Llopis ***et al.*** 2001).

Table 1. Breeding summary of the GBC for the 2001-2006 period.

Breeding season	***Layed eggs***	***Hatched eggs***	***Fledged chicks***
2001-2002	3	2	1
2002-2003	3	2	2
2003-2004	5	2	1
2004-2005	6	4	3
2005-2006	4	2	1
2001-2006	***21***	***12***	***8***

The GBC, located in Cazorla (Jaén), is a member of the Endangered Species European Programme (Hannover Zoo 2006) and is responsible for the National Breeding Program, the National Stud Book and the creation of new breeding centres in Spain. The incoming individuals are unable to live in the wild. The current stock is 24 individuals, 12 males and 12 females, of which there are ten settled pairs (three pairs have already successfully reproduced and five will reach sexual maturity during the 2006/2007 breeding season, and two of them are inmatures), the remaining Bearded Vultures are three young individuals and one imprinted individual. All these new individuals have been used for genetic stock or placed in other Bearded Vulture reintroduction projects (ASTERS 2006), following the guidelines of the Endangered Species European Programme.

To develop feasibility studies

The feasibility studies selected the Cazorla Ranges as the most suitable area for reintroduction, followed by Sierra Nevada, after some habitat improvement measures (Romero ***et al.*** 2001, Hernández ***et al.*** 2005, Padial ***et al.*** 2005) (see "Identification and control of threats"). New feasibility studies are currently being carried out in Murcia and Albacete, since these provinces are close to the Cazorla Ranges and may therefore serve as a possible ranging area for the released Bearded Vultures.

To carry out hacking and monitoring techniques

Suitable caves have been selected in Cazorla Range for the hacking of the vultures. The reintroduction project staff have been trained in hacking techniques by the Alps reintroduction project, where the technique has met with great success (Frey 1992). Monitoring is implemented by means of feather bleach, coloured rings, and satellite-tracking (Simón ***et al.*** 2006a). The transmitter is attached to a pelvic harness, based on a modification of the model designed by Hegglin ***et al.*** (2004). The pelvic harness has been already successfully tested for the species in the Alps reintroduction project, and, in the Andalusian case, its use is justified by the strong vulture migration between Iberia and Africa (Donázar 1993), the low human population density and

inaccessibility of the reintroduction areas (Couto ***et al.*** 2005a). This tracking device has previously been tested on Griffon Vultures ***Gyps fulvus*** in the Cazorla Range. The information gathered has been very useful for the reintroduction programme, not only for checking the device, but also because young Bearded Vultures show a food searching strategy that is more like that of vultures of the genus ***Gyps*** than of the adults of their own species (Brown 1988, Sunyer 1990), facilitated by a more frequent and efficient use of thermals, and greater ability to fly longer distances due, probably, to its smaller aspect ratio relative to adult Bearded Vultures (Donázar 1993). As a consecuence young Bearded Vultures in the dispersion phase are likely to follow Griffon Vultures when searching for food and concentrate on landfills and large carrion which are used by the latter species.

The first releases took place on 13 May 2006 in the Segura Range. Three males were released, namely: Libertad, from the GBC (Cazorla, Spain); Tono, from the Viena Breeding Unit (Austria); and Faust from Liberec Zoo (Czech Republic). The Bearded Vultures were released following the hacking techniques and have been monitoring intensely (Simón ***et al.*** 2006a). When released, the age of the birds was 91 (Libertad), 99 (Tono) and 103 days (Faust). They flew for the first time at 111 (Libertad), 118 (Tono) and 123 days (Faust). Currently the three birds have been sighted in several adjacent ranges (Simón ***et al.*** 2006a), developing natural feeding behaviour of the species and are likely to join Griffon Vultures at carcasses or make use of ossuaries.

To raise awareness of the project

Awareness-raising has been directed toward all social groups, but most efforts are being targeted at hunters, livestock farmers, school children, university students and inhabitants of the potential habitat areas. To date, more than 66,000 members of the public have been contacted directly (Salamanca ***et al.*** 2006). A thematic visitors' centre opened in Cazorla in September 2004 and was visited by more than 50,000 people during its first year alone.

To identify and control threats

The feasibility study showed that habitat loss and food availability are not limiting factors in any of the eight Andalusian ranges analysed in the study (Romero ***et al.*** 2001, Hernández ***et al.*** 2005, Padial ***et al.*** 2005). In Spain, for the period 1979 to 2004, the main causes of registered Bearded Vulture death were poisoning (32% of registered deaths), power lines (23.3%), and shooting (18%) (Heredia 2004), n=39. During the 1980s, shooting was the main registered cause of death (60%), while it caused 23.3% of deaths in the 1990s. This decreasing trend went on, resulting in 18% for the 1979-2004 period overall (Antor ***et al.*** 2003). Power lines are affecting the species both by electrocution and collision (Fernández & Azkona 2002, Báguena ***et al.*** 2005) and were evaluated for the eight ranges (Romero ***et al.*** 2001, Hernández ***et al.*** 2005, Padial ***et al.*** 2005). Modification and marking have been proposed (García-Baquero ***et al.*** 2005a, Couto ***et al.*** 2006a) and the implementation of proposed measures is a priority for the

first reintroduction area selected by the feasibility study (Cazorla, Segura y Las Villas Natural Park) followed by Sierra Nevada Natural and National Park. All submissions for the authorisation of any activity inside the Cazorla, Segura y Las Villas Natural Park (Jaén) and Sierra Nevada Natural and National Park (Granada) are reviewed and evaluated in terms of threats to the habitat or the species (Couto ***et al.*** 2006a).

Illegal poisoning

Illegal poisoning has been the main cause of death for the Bearded Vulture in Spain during recent times (Antor ***et al.*** 2003, Heredia 2004). There was a clear upturn in poisoning in Spain after the second half of the 1990s but, at least in Andalusia, it is difficult to precisely assess the trend in recent years, since the search effort has become increasingly intensive, producing a lack of minimum effort constancy (Couto ***et al.*** 2005a).

An important part of the project targets this threat by means of the "Gypaetus Foundation Action Plan against Poisoning" (Fundación Gypaetus 2005), which has specific actions grouped into three main categories: (1) Data gathering and reporting (Couto ***et al.*** 2005a); (2) Prevention and dissuasion targeted at mass media, hunters, livestock breeders, phytosanitary distributors and educational centres by means of awareness-raising (Salamanca ***et al.*** 2006) (e.g. the free book, written for and geared to hunters, "Hunters against poisoning" [Gutiérrez & Yanes 2005]), providing information about the legal framework, promoting sustainable farm management, and using a specific pilot programme to promote sustainable hunting management, the "Hunting Management Improvement Program" (Gutiérrez 2005). A network of municipalities (Municipalities Against Poisoning) has been developed in order to guarantee coordination to fight this crime. To join this network the municipalities should sign an agreement in which they agree to prosecute individuals responsible for illegal poisonings in their municipality. As incentives, the Gypaetus Foundation offer free management, advisory and educational services to the municipality (Couto ***et al.*** 2006); and (3) fighting the crime by awareness-raising and training authority officers about the removal and custody of poisoned bait and carcasses. During trials, the Gypaetus Foundation promotes private prosecution in criminal and administrative legal proceedings (Couto ***et al.*** 2006). This Action Plan is tightly coordinated with the Andalusia plan against poisoning, the "Strategy for the eradication of illegal use of poisoned baits in Andalusia" (CMA - Junta de Andalucía 2004), which includes very successful and innovative control methods like the Canine Team: a group of dogs trained to detect poisoned baits and carcasses in the field (Simón ***et al.*** 2006b).

Conclusion

At this time, the project for the reintroduction of the Bearded Vulture is experiencing a favourable moment for implementation; there is a deep and solid understanding of the species at the European level, which makes it possible to adopt appropriate management

measures which are contrasting and based on scientific criteria; finance is guaranteed for the medium-term and there is a high probability of financing for the long-term; the technical, human, economic and material means are available; social appreciation of the project is very high, due to the fact that the Bearded Vulture is not a conflictive species in any way, its aspect and behaviour awaken interest and attraction and massive environmental education campaigns have taken place; there is currently the political will to undertake the required legal and administrative measures to alleviate the important threats to the species; and there is an unparalleled effort to fight poisoning in Andalusia and an understanding of the dimension of the problem at Spanish level which, while limited, is one of the most documented in Europe.

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Bearded Vulture ***Gypaetus barbatus***.

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