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**Action Plan for the conservation
of Lammergeier/Bearded Vulture
(*Gypaetus barbatus*)**

*Document
prepared by BirdLife International
on behalf of the European Commission
and the Council of Europe*



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Milestones in production of action plan

Workshop: 12-15 December 1996 (Ansó, Spain)
 First draft: January 1997
 Extended draft November 2000

Reviews

This action plan should be reviewed and updated every two years. An emergency review should be undertaken if sudden major environmental changes, liable to affect the population, occur within the species range.

Geographical scope

Within the EU this plan is intended for implementation in: Austria, France, Greece, Italy and Spain. Information has been also compiled for Albania, Andorra, Switzerland, Turkey, Russia and Morocco.

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Summary

The Lammergeier or Bearded Vulture *Gypaetus barbatus* is an Endangered species in Europe because its population numbers fewer than 250 breeding pairs. It is listed on Annex I of the EU Wild Birds Directive and Appendix II of the Bern Convention and Bonn Convention.

The species is sedentary. The global population is not concentrated in Europe, but the species persists in Spain (Pyrenees), Turkey, France (Pyrenees and Corsica), Russia and Greece (Crete and the mainland). The European population is 162 breeding pairs, with 93 in the EU; additionally North Africa has 5 pairs in Morocco. Only the Spanish and Turkish populations number 50 breeding pairs or more.

Following very severe declines during the last two centuries, which exterminated the species from some ten countries of central and south eastern Europe, the population in Europe is now increasing in Spain, stable in France and Russia and decreasing in Greece and probably Turkey. The peripheral population in Morocco is particularly threatened having declined sharply. A re-introduction initiative has been implemented in the Alps since 1986; more recently, a re-introduction project has started in the region of Andalucía in southern Spain.

Threats and limiting factors

- Poisoning – potentially critical
- Decline in extensive livestock farming – high
- Habitat loss and deterioration – high
- Overhead cables – high
- Food shortage – locally high
- Disturbance – potentially high
- Illegal shooting – medium

Conservation priorities

Careful monitoring of poisoning incidents and implementation of anti-poisoning campaigns – essential
 Habitat protection, especially at the breeding territories, through the designation of Special Protection Areas – essential

Targetted supplementary feeding to assist winter survival and boost breeding populations – high

Access restrictions to sites which are regularly disturbed – high

Corrective measures to prevent collision with over-head cables – high

Effective monitoring, especially during the breeding season – high

Special surveillance at sensitive sites – medium

Restoration of wild ungulate populations – medium

Effective co-ordination and information exchange at the international level – medium

Re-introduction to vacant areas of the former range – low

Introduction

The Lammergeier or Bearded Vulture *Gypaetus barbatus* is a specialised scavenger which inhabits mountain areas in southern Europe. It is endangered at European level, numbering fewer than 250 pairs, but its global population is not concentrated in Europe (Tucker and Heath 1994). The species is listed on Annex I of the EU Birds Directive, Appendix II of the Bern Convention, Bonn Convention and CITES.

The European population comprises only 162 breeding pairs, of which 93 are in the EU. Once widespread across the continent, it has undergone dramatic declines leading to extinction in the Alps, the Balkans, the Carpathians, Cyprus and Sicily. The declines were due mainly to persecution by man. The remnant populations are isolated and in urgent need of conservation action assisted by international co-operation and provision of expertise.

This action plan is based on a workshop, held in Ansó (Huesca, Spain) on 13 December 1996, hosted by the regional authorities of Aragón and attended by 14 people from the current EU range states: Spain, France and Greece. It also draws on an extensive consultation process which was carried out thereafter and a thorough review of the available literature.

We expect this action plan to be a catalyst for conservation action and we hope it will serve as a bridge for the exchange of expertise among those involved in the research and management of this emblematic species.

Background information

Distribution and population

The Lammergeier is widely distributed in mountainous regions in Eurasia and Africa with a small proportion of its global range in Europe (Tucker and Heath 1994). There are apparently large populations in East Africa, Central Asia and the Himalayas (del Hoyo *et al.*, 1994). The species is resident throughout its range.

In Europe, the species now breeds only in Spain (regions of Navarra, Aragón and Cataluña, all in the Pyrenees), France (Pyrenees, Corsica and the Alps), Italy (Alps), Greece (in Crete and on the continent in Thrace, Epirus, Thessaly and the Pindus range), Russia (the Caucasus mountains), Turkey (throughout Anatolia) and in North Africa, only in Morocco (Atlas range). The total population for Europe and North Africa is ca. 167 pairs of which 148 breed regularly, including 112 pairs in the EU of which 93 breed regularly.

The species was exterminated from Germany by 1855, Switzerland 1884, Bosnia and Herzegovina 1893, Austria 1906, Italy 1913, Romania 1935, Czechoslovakia 1942, Yugoslavia (Serbia, Montenegro) 1956, Bulgaria 1966, and 'the Former Yugoslav Republic of Macedonia' in 1990 (Tucker and Heath 1994). The decline continued during 1970-1990 in Greece and Albania. However, the species is locally stable, or decreasing only slightly in Russia, stable in Turkey and France and increasing in Spain (Tucker and Heath 1994).

A re-introduction project in the Alps (Austria, France, Italy and Switzerland) has released 68 captive bred birds during 1986-1996 at 5 release sites. The number of free-flying birds is estimated at 38-43. One pair laid eggs in the French Alps in 1996 and hatched one chick in 1997. One pair has also bred in the Italian Alps since 1998.

Table 1. Population status of the Lammergeier in Europe and North Africa

Country	Number of breeding pairs	Number of occupied territories	Year of estimate	Population trend	Source
Andorra	(1)*				
Spain	56	66	1996	Large increase	R. Heredia pers comm
France	25	28		Stable	
– Pyrenees	16	19	1996	Slight increase	M. Razin, pers comm.
– Corsica	8	8	1996	Stable	JC. Thibault pers comm
– Alps	1	2	1997		JJ. Lafitte <i>in litt.</i>
Italy	1	1	2000	Stable	L. Herr pers comm.
Greece	12	18			Handrinos&Akriotis 1997
– continent	3	7	1996	Large decrease	G. Handrinos <i>in litt.</i>
– Crete	9	11	1996	Stable	S. Xirouchakis pers comm
Total EU	93	112	1996		
Morocco	5	5	1996	Decline	B. Heredia own data
Turkey	100-500	100-500	1996	Unknown	Tucker & Heath (1994) DHKD (unpubl.)
Russia	30-50	30-50			A. Abuladze (1997)
Total	228-648	247-667			

* One of the Spanish breeding pairs occupies a territory which is partly in Andorra.

Breeding pairs are those which reproduce regularly. Occupied territories include breeding pairs, pairs which have recently established territories but not yet bred and traditional territories where one or both birds are still present but not breeding. Figures are those contributed at the Ansó workshop, December 1996

Life history

Breeding

The Lammergeier breeds in caves and on cliffs in mountain ranges at 400-2000 metres a.s.l. It builds a bulky stick nest and lays one or two eggs from late December to early March. Both adults participate in incubation. After 54-58 days the young hatch in February or March and after 112-119 days they fledge in June. Although both chicks may hatch one normally dies due to sibling aggression; one of the few records of both chicks fledging is from Ethiopia in 1996. The young remain in the area until the beginning of the next breeding cycle in November (Heredia, 1990). Sexual maturity is at about seven years or later (del Hoyo, 1994).

Usually monogamous. Polyandrous trios, two males and one female, were first recorded in the Pyrenees in 1979. Numbers of such records have increased ever since including in Corsica; 14% of the breeding territories in the Pyrenees were occupied by trios in 1996. Trios have similar reproductive success to that of the pairs which formerly occupied the same territories and also to that of neighbouring pairs. The formation of trios has been attributed to biased sex ratios, low food availability, high breeding density or genetic relatedness between males, but as yet there is no proof of which is the key factor (Donazar 1990, Fasce *et al* 1993). The phenomenon could have important implications for conservation of the Lammergeier.

Feeding

The diet of the Lammergeier consists of bones (up to 85% of diet), especially large bones and flesh taken from dead animals (del Hoyo, 1994). It breaks large bones into small pieces which it can eat by flying up with the bone and dropping it on special rocky slopes. Small animals (birds and rodents) are fed to chicks, forming an important part of their diet.

In the Pyrenees, 88% of prey items are mammals, mainly domestic ungulates (extremities of sheep and goat), Chamois *Rupicapra rupicapra* and Marmot *Marmotta marmotta*; 7% birds; and 0.7% reptiles (n=152 prey items) (Heredia, 1990). A recent study of a nestling in the Spanish Pyrenees revealed that 59% of prey items were sheep or goat, 25% rabbit, 3% wild boar, 3% cow/horse, 1.6% dog and 1.6% fox (n=78 prey items) (Margalida *et al.*, in prep).

In Corsica the diet is mainly limbs of domestic ungulates (36% sheep and goat, 33% cattle, mostly calves), pigs, both wild and domestic (16%), Mouflon (12%); birds and reptiles are scarce in the diet (Thibault *et al.* 1993). Breeding success on Corsica seems to depend on particular stock rearing activities as their main food source is transhumant caprines and free range cattle.

In the Alps, the main diet of the released birds is Chamois and sheep.

Habitat Requirements

The Lammergeier forages over montane and sub-alpine vegetation, mostly above 1000 m, where both domestic and wild ungulates occur. In winter and early spring it exploits mid-altitude and steep-cliff areas where snow does not accumulate (Thibault *et al.* 1993). In the Pyrenees, during winter and spring, the bird visits the *muladares*, which are places near the villages where domestic animal carcasses are dumped regularly.

Movements

It is largely a resident species, although with enormous home ranges and the young may disperse widely. Although there have been more than 100 sightings of Lammergeiers outside the Pyrenees since the late 1980s (M. Hernández, *in litt.* 1997), none of the 33 young wing-tagged in the Pyrenees during 1987-1996 were seen among them (R. Antor *in litt.* 1997). The average home range of 13 of these young was 4,932 (950-10,294) sq km (Heredia 1990). No adults have so far been wing tagged or radio tagged. In the Alps 70% of the released birds return to the release site although one bird was recorded ca. 1,300 km from the release area, outside the Alps.

Threats and limiting factors

Poisoning

The only two radio-tagged juvenile Lammergeiers recovered dead to date in the Spanish Pyrenees were found to be poisoned, one with Strychnine and the other with Warfarin (a rodenticide) (M. Hernández *in litt.*, 1997). It is likely that the use of poisoned baits for predator control is increasing in the Pyrenees, especially in hunting areas to eliminate fox and corvids, and at rubbish dumps to eliminate rats.

The extinction in the Balkan peninsula was largely due to extensive poisoning campaigns against wolves and jackals. In France five birds were poisoned between 1955 and 1991 (Terrasse 1991). In Crete there is a risk of poisoning from agriculture pesticides and insecticides used to protect cattle. In the Alps (Austria, Germany and Switzerland) raptors have been poisoned with Carbofuran, an agricultural pesticide normally used as a seed dressing.

Importance: potentially critical

Pollution

There is no evidence that pesticide levels in the Lammergeier have been high enough to cause breeding failure although:

- pesticide residue analyses of three eggs from two clutches and six carcasses from the Spanish Pyrenees found medium levels of Lindane, HCH isomers, Dieldrin, DDT and derivatives and hexachlorobenzene in both eggs and carcasses; and

- scanning Electron Microscopy of the comparative ultrastructure and composition of 14 Lammergeier eggshells from Spain and France and eight eggshells from museums collected before the use of pesticides found serious signs of pollution of the modern eggs.

With the rapid intensification of farming and industrial development of the Spanish and French Pyrenees, pollution levels are expected to increase in future, and may become a threat if agrochemical use and industrial waste are not carefully regulated.

Importance: medium/potentially high

Lead poisoning

Lead poisoning is a possible cause of death in areas of intensive hunting (Heredia and Heredia 1992) and migration pathways. Lead may reach Lammergeiers through consumption of prey shot by hunters (woodpigeons, thrushes, etc.). However, a study in Aragón (Spain) on chronic lead exposure, found lead levels far below those indicative of chronic poisoning in blood from 16 individuals including chicks, juveniles and adults and liver and bone samples from 13 individuals.

Importance: medium/potentially high

Illegal shooting

This is an important cause of mortality. In the Pyrenees, in Spain six (all adults) out of 11 birds found dead during the last 13 years were shot and on the French side three adults have been shot since 1986 (M. Razin pers. comm. 1996). Lammergeiers often fly over cols and passes where hunters wait for game, thus providing an easy target. In Corsica two birds were shot in 1991 (J.C. Thibault pers. comm. 1997). Since the beginning of the re-introduction project three birds have been shot in the Alps, in France in 1993, in Italy in 1994 and in Switzerland in 1997.

Importance: high

Habitat loss and deterioration

The risk of progressive, piecemeal development of mountain areas is one of the major threats to the future of the species. Developments such as roads, dams, ski-resorts etc. can cause irreversible habitat loss and also disturbance by tourists. For example, the creation of tracks in sensitive areas can bring the risk of disturbance and associated development to previously inaccessible places. Such tracks are often associated with modern forestry developments (FIR 1996). In the French Pyrenees, one breeding area was abandoned due to the construction of a small hydroelectric power station.

In addition, habitat deterioration that leads to a decline in wild ungulates and marmots could be a problem, especially where there is a shortage of domestic stock.

Importance: high

Decline in extensive livestock farming

The Lammergeier relies largely on domestic animals for survival, especially sheep and goats. The decrease or the total abandonment of traditional farming practices could be a great problem in the near future. The lack of food resources can be especially acute during the winter, when herds come down to lower altitudes to be kept indoors or move to other areas out of the birds' range. Wild ungulates, an important food source, are usually scarce and localised.

Food scarcity during winter is an important limiting factor for young birds (0-3 years), which are inexperienced and often lack knowledge of the territory and food storage behaviour. Food may be a limiting factor in Corsica but does not seem to be in Crete. In the French Pyrenees the birds rely largely on wild ungulates and feeding stations.

Importance: high (potentially critical in Corsica)

Changes in methods of carcass disposal

New regulations mean that traditional methods of disposing of carcasses, which involved leaving them in the open where they could be accessible to scavengers, are no longer acceptable, at least within the EU. This could remove an important food source of the Lammergeier, e.g. in Spain (Heredia, 1990).

Importance: high

Disturbance

The Lammergeier is especially sensitive to disturbance. Any human intrusion at or near the nest during the breeding period can lead to reproductive failure. The main causes of disturbance are hunting parties, where people, dogs and 4-wheel drive vehicles pass through the valleys making a great deal of noise and flushing wildlife towards the cols and passes where hunters are waiting. Wild boar hunting in this way is a very popular sport in the Pyrenees, and it takes place during the winter months when the Lammergeier is laying or incubating. Every year there are reproductive failures which are directly caused by these hunting parties. In France one clutch was lost for this reason in 1983 and a pair could not lay in 1996.

Another source of disturbance in the Pyrenees is military training, which often takes place during the incubation period, including heavy vehicle traffic along forest tracks, shooting exercises and overflying of planes and helicopters. In the French Pyrenees two pairs suffer disturbance from low-flying aircraft. Fires lit by farmers are also a problem (FIR 1996).

Mountain sports, such as rock-climbing, ice-climbing, parachuting and canyoning, are an increasing problem disturbing breeding pairs. In Crete there is a great problem with rock climbing on Mt. Dicti, Asteroussia and Lefka Ori. Tourism in mountain areas is not a big problem at present, but it could become so in the future if the numbers of visitors continue to increase.

Other notable causes of disturbance are filming and photography. There is an increasing demand from photographers and film makers to get Lammergeier shots. In Spain any filming at the nest needs a specific permit. In France a permit is also needed to film in protected areas (Nature Reserves and National Parks). Illegal filming causes disturbance problems in both countries.

In certain parts of the range, such as the Chechen Republic, military action is also a source of major disturbance.

Importance: medium (high in the Pyrenees and in Crete)

Overhead cables

Overhead cables are, together with illegal shooting, the most important cause of mortality in the Pyrenees. At least four birds (three adults and one subadult) have died so far on both sides of the range. Also, collision with high tension power lines has caused the death of two birds in the French Alps. Medium sized lines with three cables are especially dangerous, since they are difficult to see, especially when they cross high cols and passes. The construction of dams, ski-resorts, antennas, etc. usually brings the associated construction of new electric lines.

Importance: high

Lack of awareness

In the French and Spanish Pyrenees and in Crete a number of public awareness campaigns have been carried out in recent years, with EU LIFE funding. This is not the case in continental Greece, Turkey and Morocco, where public awareness of the Lammergeier and the problems it is facing remains low. This constitutes a threat in itself as it is not easy to undertake conservation measures where there is a lack of concern about the species status and trends. This relates particularly to the threats of direct persecution and poisoned baits.

Importance: low

Conservation status and recent conservation measures

Albania

Little recent information. In 1962 the species was considered as a rare resident (Zeko 1962), but there have been few observations since then - this may well be because few ornithologists are active in the mountainous regions. In the 1970s one Lammergeier was killed in the southern part of Albania. Observations from 'the former Yugoslav Republic of Macedonia' (Micevski pers. comm.) mention one individual seen along the border between Albania and 'the former Yugoslav Republic of Macedonia' and an indication that this bird formerly bred in Albania (the area has legal protection in both countries). The main threats appear to be poisoning and illegal shooting.

Andorra

There is one breeding pair which is shared with Cataluña, Spain and foraging birds from other areas are very often seen. The main threats are Chamois hunting, tourist developments and helicopters. There is no specific legislation for nature conservation and neither EU Directives nor international conventions apply. The species has been monitored since 1980.

Since July 1999, conservation measures have been increased beyond previous trans-Pyrenean monitoring activity. The Andorran Government has become an active participant in Lammergeier conservation, with the formation of Pla d'Actuacions per a la Conservaciã del Trencals (run as a separately-budgeted sub-group of AND), and there are plans for public-awareness campaigns from 2000.

Austria

As part of the Alpine re-introduction project, 25 birds were released between 1986-1996.

France

Pyrenees

The Lammergeier has been protected since 1976. In recent years there has been a slight population increase, but long term stability is not guaranteed. There are 19 occupied territories and 16 breeding pairs. One of these is within the Pyrenees National Park (an SPA) and two more are in protected areas (sites classés). New reserves and other legal measures are foreseen to cover breeding areas.

In some areas there are agreements to prevent disturbance by helicopters, fires lit by farmers and forest exploitation. Vulnerable nests are guarded every day during the breeding period. Since 1994, supplementary food has been provided at 14 sites. This operation is very helpful to breeding pairs, especially those at lower altitudes. It also assists the establishment of new pairs in the eastern part of the range. A Restoration Plan has been prepared by FIR and endorsed by the Ministry of the Environment (FIR 1996 and Ministère de l'Environnement 1997).

Corsica

The breeding population was stable at eight pairs during 1983 - 1996. They all bred within the Natural-Regional Park of Corsica. This provides a soft level of protection. The designation of protected areas in Corsica is a priority for the future.

Monitoring is carried out annually by Paolo Fasce in collaboration with the Natural-Regional Park. Breeding data have been collected from 1976 and since 1983 almost the whole population has been checked (Fasce *et al.* 1989). During 1983-1996 the mean productivity was 0.22 fledged young/checked pair/year; this low ratio may correspond to insular conditions and high density, but data from Crete are insufficient to confirm these hypotheses. There could be a problem of infertility in one pair at least, which is attributed to ageing in addition to food shortage (P. Fasce, pers comm. 1996). In 1979 one trio was formed (Fasce *et al.* 1989).

During the 20th century, stock rearing activities in Corsica have undergone important changes. Numbers of sheep and goats decreased during the 1950s and 1960s, becoming more stable during the 1970s although with a 40% decrease in the number of transhumant animals. During 1979-1988 the number of cattle increased by 42% because of new subsidies, so cattle are now a very important food source for the Lammergeier (Thibault *et al.* 1993). The Mouflon population is estimated at less than 1000 (J.C. Thibault, pers comm. 1996).

Supplementary food - mainly goat and sheep carcasses - is put out in autumn at four inaccessible sites, by helicopter and at two other places by car during autumn and spring. Persecution is rare (although 2 immatures were shot in 1991) and overhead wires do not seem to be a problem.

French Alps

As part of the alpine re-introduction project, there has been a project to restore the species to the Haute Savoie and Alpes Maritimes by releasing captive bred birds: 28 at two release sites during 1987-1996. Two territorial pairs have been established (J.J. Lafitte *in litt.* 1997) and the first chick hatched in 1997.

Greece

The total population for Greece is estimated at 12-18 pairs (Handrinos and Akriotis, 1997), although other sources claim that the species no longer breeds on the mainland, despite a juvenile being seen in 1995 (C. Papaconstantinou *in litt.* 1997). The Lammergeier has been protected since 1977 and particularly since 1985 (Joint Ministerial Decision n° 414985/85). It is included in the Greek Red Data Book as Endangered (Handrinos 1992). All the breeding areas have been designated as SPAs under the EU Birds Directive (79/409/EEC) and as prospective NATURA 2000 sites under the Habitats Directive (43/92/EEC).

Mainland Greece

The precise number of breeding pairs in mainland Greece is unknown at the moment though there is a pessimistic estimate of 1-2 pairs with single adults in Dadia, Olympus and the border with FYR Macedonia (S. Xirouchakis pers comm. 1996). In 1980 it was present in Thrace (2-3 pairs), FYR Macedonia (1-2 pairs), Epirus (1-2 pairs), Thessaly (more than 2 pairs on Mt Olympus and probably in the central Pindus), Sterea (5-6 pairs in the Parnassos, Giona and Vardoussia mountains). The total estimate at that time was 23 pairs (Handrinos 1985).

There has been a dramatic population decline which is attributed to poison baits laid for wolves and shortage of food (S. Xirouchakis pers comm. 1996). Shooting and the construction of mountain roads are also a threat. Overall, a factor responsible for the species decline is the Government's lack of capability to control land-use changes and enforce protective measures (C. Papaconstantinou *in litt.* 1997).

Crete

It is present in all the mountain chains of the island above 400 m. Areas of major importance include the mountains of Selinou province, Lefka Ori, Mt. Krioneritis, Mt. Kedros, Mt. Idi, Mt. Dikti, Asterusia Ori and Mts. Thrypti and Orno. There are nine pairs and two more territories occupied by single adults. The total population is 31 birds, 38% of which are juveniles. The population is considered to have been stable for the last ten years, though one or two pairs may have been lost due to direct persecution by man (Xirouchakis and Giannatos 1996, Xirouchakis pers comm. 1996).

The main problem is illegal shooting by young stock breeders and hunters. Target shooting is very popular and perhaps the cause of the species' decline in certain areas. Road building is another serious problem, especially the network of truck roads which now render accessible previously remote areas. As a result, human pressure and disturbance has increased considerably in some territories. Habitat loss due to a forest fire was recorded at Mt. Dikti, where a nest was abandoned in 1995. Poisoned baits do not currently seem to be a problem, although beekeepers use lindane and farmers use poison for ravens (Xirouchakis and Giannatos 1996, Xirouchakis pers comm. 1996). Neither does food shortage as there are ca. 800.000 free range domestic ungulates on the island, mainly goats and sheep.

During 1995-1996 EU LIFE-Nature funding was given to the NGO, Immediate Intervention for the Protection of Nature, for a project to conserve the species in Crete. This included study of the ecology, distribution, feeding habits and demographics with a view to proposing conservation action eg identification of potential SPAs, establishment of artificial feeding stations and wardening schemes at vulnerable nests and a public information campaign targetted at local communities and authorities.

Italy

As part of the alpine re-introduction project, four birds were released during 1994-1996, the release site being a protected area.

Morocco

In recent years the range has contracted and the Lammergeier is now probably extinct in the Rif, the central plateau and most of the middle Atlas. It is now very localised, occurring only in small numbers in the high Atlas (Toubkal and Oukaimeden), the anti-Atlas (between Tiznit and Tafraout) and probably in Figuig province ((Z. Arhzaf *in litt.* 1995, Thevenot *et al* 1985). Information on the Moroccan population is very scarce and fragmented.

Russia

The Lammergeier is included in the draft Red Data Book for the Russian Federation (Red Data of Russia - Legislative Acts: Moscow 2000). It occupies a range of around 600 km by 50km on the northern slopes of the Caucasus Mountains, along the border with Georgia and Azerbaijan. The total population in Russia (believed to be relatively stable) is estimated at 30-50 pairs (A. Abuladze 1997), though no systematic survey or monitoring has been undertaken.

Breeding pairs live undisturbed at five Federal Protected Areas within the breeding range. However outside them lammergeiers are disturbed by mountain tourists and in some regions such as the Chechen Republic probably by military actions. Food scarcity is a threat due to a decline in sheep numbers within lammergeier hunting areas.

Spain

Pyrenees

The Lammergeier is listed as endangered in the Spanish Red Data Book (Blanco and González 1992) and in the National Catalogue of Threatened Species (Royal Decree 439/90). The species breeds only in the Pyrenees, but there are observations of dispersing birds in numerous places outside the Pyrenees, especially in the Iberian range (*cordillera Ibérica*), Cantabrian range (*Cordillera Cantábrica*) and central mountains (*Sistema Central*).

In 1996 there were 56 breeding pairs and 66 territories (6 in Navarra, 44 in Aragón and 16 in Cataluña). Thirteen (20%) of these territories are occupied by polyandrous trios made of two males (sometimes three) and one female. There was an annual population growth of 10% during 1986-1996 (Heredia *in litt*, 1996).

The first survey was done in the 1970s in Aragón and since 1984 the population has been regularly monitored. According to Figure 1 there is an average growth of 5.22% for territorial pairs (n=10) and 3.5% for breeding pairs (n=10) (R. Antor *in litt*, 1997). About 60% of the fledged young reach maturity (R. Antor pers. comm. 1996), an exceptionally high survival rate.

In 1988 an action plan was launched by ICONA and the regions of Navarra, Aragón and Cataluña. Legally binding recovery plans were approved in Navarra in 1991, and in Aragón and Cataluña in 1994.

A supplementary feeding program began in 1986. A network of feeding stations provides predictable food (90% sheep extremities, 10% domestic ungulate skeletons) usually on a weekly basis from December to April. The stations are located in steep, quiet locations with very little disturbance and low hunting pressure: protected areas, Game Reserves, Special Protection Areas and also in private hunting grounds in agreement with their tenants or landowners. Sites are selected if they have a high winter concentration of juveniles, to increase pre-adult survival; and no breeding pairs, to attract potential breeding birds. They provide the birds with a safe, poison-free food source and help to fix young erratic birds.

The two main reasons for the population growth are: an increase in pre-adult survival (60% of fledged young reaching maturity); and relatively high breeding success (78% pairs laying eggs, 59% raising young) (Heredia *in litt* 1996). The programme of supplementary feeding plays a large part in enabling the high survival rate and is also helpful to breeding pairs, especially when they have small chicks in February-March.

To help achieve one of the recovery plan objectives, to increase breeding success, a number of pairs which regularly fail are wardened every year. This has proved to be effective with 88% of wardened nests succeeding in raising young. Also, the continuous observation of one particular nest provides interesting data on the species' breeding biology.

Only 28% of the breeding territories are within protected areas. The designation of protected areas in the Pyrenees is a priority for the future.

Andalucía

A project to re-introduce the Lammergeier is ongoing in Andalucía. Breeding facilities have been built at the Natural Park of the Sierras de Cazorla, Segura y Las Villas and three birds from the Alps project are being kept for captive breeding. A habitat study to assess the feasibility of re-introduction has been carried out by the Doñana Biological Station.

In 1995 the regional government of Andalucía also promoted a genetic study to determine the most suitable source of birds for the re-introduction project. The study was carried out by the Doñana Biological Station on the basis of samples from 20 wild birds from the Pyrenees and captive birds from the Alps project.

Switzerland

As part of the alpine re-introduction project, 19 birds have been released in Switzerland during the period 1991-2000. Breeding has commenced in the Alps (in France and Italy, but not yet in Switzerland).

Turkey

Widespread across the country except in the European part, the central Anatolian plain and the Black Sea coast. The population has been estimated at 100-500 breeding pairs (Tucker & Heath 1994). Recent surveys of the east of Anatolia and of the Central Taurus mountains suggest that the real population size might be close to the upper limit of this estimate. One single site in the Central Taurus range (Bolkar Mountains) holds a population of at least 5 pairs (DHKD, *unpubl.*; Eken & Magnin 1999). Main threats are poison baits laid for wolves and other predators, illegal shooting and lack of awareness.

Aims and objectives

Aims

In the short term, to maintain and enhance the existing Lammergeier populations in Europe. In the long term, to encourage the re-colonisation of the former range.

Objectives

1. Policy and legislation

1.1. Develop the Common Agriculture Policy to maintain traditional farming practices in mountain areas throughout the Council of Europe.

Priority: high

Time-scale: ongoing

1.2. Make provision for maintenance of the traditional system of disposal of animal carcasses near villages, ensuring adequate sanitary control.

Priority: medium

Time-scale: long

1.3. Ensure full legal protection for the Lammergeier at international and national level

1.3.1. Ensure that the Lammergeier is given the highest degree of protection under national and international legislation.

Priority: essential (Greece, Turkey, Morocco)

Time-scale: short

1.3.2. Promote the production of national catalogues and inventories of threatened species and incorporate recovery plans into domestic legislation.

Priority: high (France, Greece, Turkey, Morocco)

Time-scale: medium

1.3.3. Encourage States to join the relevant international treaties and conventions, in particular the Bern Convention.

Priority: medium
Time-scale: medium

1.4. *Ensure Environmental Impact Assessment for all activities likely to affect habitats or species on SPAs.*

Priority: high
Time-scale: medium

1.5. *Promote the inclusion of as many Lammergeier territories as possible within the European networks of protected areas.*

Whilst the Lammergeier is a species that ranges widely over a given area and is dependent on certain human activities within its habitat, it is also sensitive to specific intrusions within its immediate nesting area. Protected area mechanisms that allow a combination of specific protection measures in traditional nesting areas, along with wider agricultural and livestock management measures in the surrounding countryside, are needed.

Priority: high
Time-scale: medium

2. Species and habitat conservation

2.1. *Pursue the designation as Special Protection Areas of IBAs which include the Lammergeier.*

Priority: high
Time-scale: short

2.2. *Draw up international conservation projects to be submitted to the EU LIFE regulation or other funding agencies.*

Priority: high
Time-scale: short

2.3. *Undertake specific supplementary feeding in all the European populations and especially in the island populations.*

Priority: essential (high in Crete)
Time-scale: short

2.4. *Prevent disturbance at the breeding sites during incubation and the early stages of breeding (December to May). All human activities within 1 km around the nest should be restricted.*

Priority: medium
Time-scale: short

2.5. *Undertake specific wardening campaigns at those sites where Lammergeiers regularly fail to breed successfully.*

Priority: medium
Time-scale: short

2.6. *Promote the restoration of wild ungulate populations and control poaching of them.*

Priority: medium
Time-scale: long

2.7. *Ensure that livestock which dies in the field is left out for the vultures and re-establish the old tradition of dumping animal carcasses at a specific place near the villages with full agreement and co-operation of local authorities, local farmers and hunters.*

Priority: high
Time-scale: long

2.8. *Oppose or seek modification of damaging developments, such as road construction, within Lammergeier areas*

Priority: high
Time-scale: ongoing

2.9. *Enforce prohibitions on shooting Lammergeiers more effectively*

Priority: medium
Time-scale: short

3. Monitoring and research

3.1. *Promote international co-operation and exchange of experience among experts working on the species.*

Priority: essential (Greece, Turkey, Morocco)
Time-scale: short

3.2. *Survey and monitoring*

3.2.1. *Carry out baseline surveys of population status in countries where the species is less well-known.*

Priority: high
Time-scale: short

3.2.2. *Carry out regular monitoring of the breeding population, including breeding success.*

Priority: high
Time-scale: short

3.2.3. *Carry out annual searches for new pairs.*

Priority: high
Time-scale: short

3.2.4. *Monitor attendance at feeding stations.*

Priority: medium
Time-scale: short

3.3. *Undertake research on requirements and factors influencing population trends sufficient to prepare national recovery plans.*

3.3.1. *Carry out studies on population dynamics and age structure and complete population viability analysis on islands and in countries where the species is decreasing.*

Priority: medium
Time-scale: long

3.3.2. *Undertake detailed research to find out causes of repeated breeding failure in island populations.*

Priority: high
Time-scale: short

3.3.3. Undertake satellite tracking to find out causes of mortality, survival rates and dispersal patterns.

Priority: high

Time-scale: short

3.3.4. Promote research on genetic variation at European and global level, and undertake genetic studies to determine the degree of inbreeding in isolated populations.

Priority: medium

Time-scale: short

3.3.5. Promote research on food availability, especially in winter, where scarcity is believed to be a factor

Priority: medium

Time-scale: short

3.4. Examine specimens to determine cause of death/failure and levels of environmental contaminants

3.4.1. Undertake pathological examination of dead specimens to determine cause of death and ensure proper collection, handling and conservation of pathological, genetic or scientific material.

Priority: medium

Time-scale: short

3.4.2. Undertake toxicological and pathological examinations of failed eggs and examine by Scanning Electron Microscopy eggshells from eggs with suspected or confirmed high pesticide levels or from pairs with repeated breeding failure, to determine fertility and embryo development.

Priority: low

Time-scale: long

3.4.3. Investigate the exposure to, and incidence of, lead poisoning in untested populations or in susceptible populations.

Priority: low

Time-scale: long

4. Public awareness and training

4.1. Prepare information and education materials about the Lammergeier, underlining the problems of poisoning, illegal shooting and habitat degradation. These materials should be targetted at landowners, hunters and livestock farmers.

Priority: medium/high

Time scale: short/medium

4.2. Where poisoning is a problem, prepare specific information materials and undertake a campaign targetted at farmers, gamekeepers and landowners.

Priority: essential

Time-scale: short

4.3. Incorporate a special section on the Lammergeier at information centres within protected areas where the species occurs.

Priority: medium

Time-scale: medium

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Annex: Recommended conservation actions by country

Andorra

- 1.3.1 Promote the development of legislation to protect nature in general and threatened species in particular
- 1.3.2 Full incorporation of the Lammergeier into the conservation plan which is ongoing in the French and Spanish Pyrenees
- 4 Undertake awareness campaigns for the Lammergeier, highlighting its conservation problems

Austria

- 2.4, 2.5 Undertake surveillance of newly formed pairs
- 3.2.2 Improve population monitoring
- 4 Promote public awareness of the re-introduction scheme and of the species in general

France

General

- 2.1 Designate new SPAs that cover all territories of the species in the Pyrenees and Alps.
- 2.4
- 3.2.2 Undertake close surveillance and monitoring of the existing pairs during breeding

Pyrenees

- 1.3.2 Stimulate the implementation of the Restoration Plan (FIR 1996 and Ministère de l'Environnement 1997) recently approved by the Ministry of the Environment
- 2.3 Continue the effort to supply food during winter and spring
- 2.4 Reduce disturbance of breeding pairs, especially that related to hunting, sports, photography and tourism
- 2.5 Undertake specific wardening campaigns at those sites which fail regularly
- 2.8 Enforce regulations to restrict road building and human activity near the breeding areas
- 3.1 Improve co-ordination with Spain and promote joint activities
- 3.2.2 Promote surveillance and monitoring of the existing pairs during breeding
- 3.3 Promote research projects for the restoration of the population in the eastern part of the range
- 4.2 Undertake public awareness and information initiatives among hunters in order to prevent the risk of accidental killing

Corsica

- 2.3 Increase the effort to supply food during winter and spring
- 2.6 Promote the restoration of wild ungulates
- 3.1 Promote co-operation and information exchange with experts working in the Pyrenees
- 3.3.2 Identify causes of breeding failure
- 3.3.3 Identify and monitor causes of juvenile mortality
- 3.3.4 Undertake a genetic study under the framework of a broader European project

Alps

- 2.4 Undertake surveillance of newly formed pairs
- 3.2.2 Ensure the monitoring and follow up of the re-introduction project in the French Alps and improve population monitoring generally.
- 4 Promote public awareness

Greece

General

1.3.2

2.4

3.2.2 Undertake a national conservation and monitoring project, including close surveillance and wardening

2.1 Designate new SPAs if and when new sites for the species are identified, and managing existing SPAs in accordance with the needs of the species

2.8 Object to, or seek modification of, damaging land use changes, especially road construction

2.9, 4.1 Reduce illegal hunting

Mainland Greece

1.3.2 Draw up a recovery plan and seek endorsement from national authorities

2.3 Provide supplementary feeding at Sterea Hellas and in selected areas where the species still exists

2.8, 4.1 Undertake a specific campaign against road building on sensitive areas

3.2.1 Undertake an urgent survey and assess conservation status

2.9, 4.1 Prevent poaching of large raptors

4.2 Carry out a public awareness campaign against poisoning and enforce existing regulations

Crete

1.3.2 Prepare a conservation plan for adoption by regional authorities

3.1 Promote information exchange with the Pyrenees

3.2.2 Continue to monitor the population and its breeding success on a regular basis

3.3.3 Identify and monitor causes of juvenile mortality

3.3.5 Assess food availability during winter

Italy

2.4 Undertake surveillance of newly formed pairs

3.2.2 Improve population monitoring

4 Promote public awareness

Morocco

1.3.2 Undertake a conservation programme

2.1 Identify potential protected areas; designate breeding areas as protected areas and manage them appropriately

3.2.1 Carry out a national survey and evaluate conservation status

Russia

3.2.2 Monitor population size

3.3 Promote research programmes focussed on conservation and management

3.3 Identify and monitor causes of mortality

4 Promote public awareness, particularly among mountain tourists

Spain

Pyrenees

1.3.2. Continue with the implementation of the regional recovery plans and extend their geographical scope to areas newly occupied

2.3 Extend the network of feeding stations to areas in the periphery of the Pyrenees, such as the Iberian range or the Cantabric range

2.6 Undertake the restoration of wild ungulates

2.1 Designate new SPAs at breeding and feeding areas according to the following priority Important Bird Area list:

- Turbón-Espés-Sis
- Dos Ríos, Orba and Leire Mountain Range
- Santo Domingo, Riglos, Gratal
- Oturia-Canciás
- Saint Gervais Mountains
- Boumort Mountains
- Monteixo-Lorri-Tornafort
- San Juan de la Peña-Oroel crag
- Montsech and Montgai Mountains
- Panticosa-Viñamala-Tendeñera

3.1 Improve co-ordination with France and promote joint activities

3.2.2 Monitor population size

3.3 Promote research programmes focussed on conservation and management

3.3 Identify and monitor causes of mortality

3.4.1 Evaluate the incidence of poisoning on the population and undertake toxicology studies

Andalucía

1.3.2 Prepare and approve an official Recovery Plan for the Lammergeier in the region

Switzerland

2.4 Undertake surveillance of newly formed pairs

3.2.2 Improve population monitoring

4 Continue to promote public awareness

Turkey

2.1. Pursue the designation as protected areas of IBAs which include the Lammergeier.

3.2.1 Carry out a national survey to determine extent and size of the actual population,

4.2 Undertake anti-poisoning campaigns