focus NATURE

LIFE preventing species extinction

Safeguarding endangered flora and fauna through ex-situ conservation

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LIFE ("The Financial Instrument for the Environment") is a programme launched by the European Commission and coordinated by the Environment Directorate-General (LIFE Units - E.3. and E.4.).

The contents of the publication "**LIFE preventing species extinction: Safeguarding endangered flora and fauna through ex-situ conservation**" do not necessarily reflect the opinions of the institutions of the European Union.

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More information on the European Union is available on the Internet *(http://europa.eu)*.
Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2011

ISBN 978-92-79-20026-7
ISSN 1725-5619
doi:10.2779/91189

Printed in Belgium

Printed on recycled paper that has been awarded
the EU Ecolabel *(http://ec.europa.eu/ecolabel/)*

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Most LIFE Nature projects focus on conservation action 'in-situ', i.e. within the natural habitat of a particular threatened species. There are instances, however, where such actions are insufficient by themselves to halt the decline of a species. In those cases, 'ex-situ' conservation measures are required to address the threat of extinction.

Ex-situ conservation often requires a large initial outlay. In this regard, LIFE co-funding has been crucial for projects across the EU that have established seed banks or gene banks, set up species centres for captive breeding and prepared habitats for the reintroduction of a species or the reinforcement of an existing population. With LIFE's help, these projects have built expert teams, established ex-situ conservation protocols and enabled monitoring of reintroduced individuals, all with the goal of improving the 'unfavourable' conservation status of species.

More than 80 LIFE Nature projects have included ex-situ conservation measures, targeting a wide range of vulnerable species, ranging from flagship species such as the brown bear, to lesser-known but equally important and endangered species such as the Spanish toothcarp.

LIFE projects with ex-situ conservation actions have targeted mammals, birds, fish, herpetofauna (reptiles and amphibians), invertebrates and plants. They have also benefited whole areas and habitats, contributing to enhancing biodiversity, thereby supporting the policy goals of the EU's Biodiversity Action Plan and the EU 2020 Biodiversity strategy.

One of the notable features of a number of the LIFE projects highlighted in this brochure is the exemplary work they have done to raise awareness amongst the general public and key target groups such as farmers and hunters so that reintroduced species are not killed through accidental or deliberate means. This has been especially important for species considered a threat (to people or livestock) such as the Hungarian meadow viper (see p.18), and, in Spain, the Iberian lynx (p.10) and bearded vulture (pp.21-25).

The Commission is at present evaluating the contribution that ex-situ conservation has to make to the conservation of European species. This is not only relevant in the context of meeting the objectives of the Birds and Habitats directives, but also for the implementation of the Zoos Directive, which aims to strengthen the role of zoos in the conservation of biodiversity.

The examples contained in this LIFE Focus publication should inspire ongoing and future LIFE Nature projects that feature ex-situ conservation actions by highlighting innovative ideas and good practice that can be put to practical use. Ex-situ conservation can be very challenging, so by pointing out some of the problems that previous LIFE projects have faced, it is our goal that they might be avoided by current and future projects.

CONTENTS

LIFE and ex-situ conservation actions

The LIFE programme has provided crucial support for ex-situ species conservation actions through its nearly 20 years of existence. These actions have played a significant role in preventing species extinctions within the EU.

Photo: Ainhoa Darquistade

Ex-situ conservation means that conservation actions are located "outside" a species's natural habitat. It is defined in the Article 9 of the Convention on Biological Diversity (CBD) as "the conservation of components of biological diversity outside their natural habitats". Ex-situ conservation is one of the tools used to conserve biodiversity, in combination with other tools such as conservation in the natural habitats (in-situ conservation). Several international organisations have developed guidelines that provide best practices and information on ex-situ conservation, such as the International Union for the Conservation of Nature (IUCN)'s Technical Guidelines on the Management of Ex-situ Populations for Conservation[1] which are currently being updated.

Ex-situ conservation actions are designed to conserve the genetic diversity and populations of species. Ex-situ actions provide "insurance" in cases where the success of in-situ measures is uncertain: they can save species from extinction in cases when, even with the elimination of all threats, there is still a chance of extinction.

1 "IUCN/SSC guidelines for reintroductions" (1995) and "IUCN technical guidelines for the management of ex-situ populations for conservation" (2002).

There are two main types of ex-situ conservation actions:

- Seedbanks or germplasm banks - where plants or seeds are kept and preserved in cases where a species is extremely endangered or actually disappears from the wild; and genebanks - which consist of cryogenic facilities used to store living sperm, eggs, or embryos;
- Species centres - where animals or plants are raised and bred to have a stock of individuals for reintroductions or populations reinforcements. Zoos and botanical gardens normally host these facilities, though there is also an array of centres that have been created specifically to develop a captive

Photo: Aixa Sopeña

LIFE has made a major contribution to ex-situ conservation actions, for instance by helping to establish seed germination protocols and nurseries

breeding programme; zoos and botanical gardens also have an educational role, whilst an exclusive breeding centre does not necessarily have this objective.

(A third, lesser used ex-situ action is the temporary removal of eggs from nests during risky periods).

Through the Habitats Directive and Birds Directive, EU Member States have legally committed themselves to achieve 'favourable' conservation status for species and habitats of European conservation concern, listed in the annexes of the directives. The scale of this challenge is reflected in the latest conservation status assessment under Art. 17 of the Habitats Directive[2], as well as in the publication of IUCN species red lists for EU species[3]. Whereas the primary conservation action will continue to be in the natural habitat, ex-situ conservation measures will also have a role to play in ensuring the sustainability of wild populations, and preventing species extinctions. In addition, in the face of climate change, ex-situ conservation can play a role in helping species move to areas where climatic conditions are more favourable. This newly emerging technique is known as assisted translocation or assisted migration.

2 http://bd.eionet.europa.eu/article17
3 http://ec.europa.eu/environment/nature/conservation/species/redlist/

THE ROLE OF THE LIFE PROGRAMME

LIFE Nature has been the main EU mechanism for providing financial support for nature conservation in Europe. More than 1 250 projects have been co-financed since 1992, receiving more than EUR 1.3 billion.

Ex-situ conservation programmes normally require a large initial outlay to set up infrastructure, conduct preparatory actions, and create the skilled teams needed to run the programmes. Public authorities (at local, regional and national levels) and NGOs are eager to use the LIFE programme as a financial support mechanism for ex-situ conservation initiatives. LIFE has been one of the main funding sources for ex-situ conservation actions in the EU for two main reasons: firstly because there is the possibility of

EX-SITU CONSERVATION OF ENDANGERED HABITATS

There are several habitats included in the Annex I of the Habitat Directive as priority for conservation (*) that present an unfavourable conservation status. Some of these habitats have been targeted by LIFE projects that involved ex-situ actions in order to restore the habitat. This normally involves collecting seeds from species typical of the habitat, followed by germination in a nursery to produce plants that are used in the restoration of the targeted habitats. These ex-situ habitat restoration protocols have been used by a number of LIFE projects, enabling the restoration of habitats such as Apennine beech forests with *Taxus* and *Ilex aquifolium* (9210*) or Mediterranean Juniperus dune habitats (2250*). For more examples see pp. 32-36.

In addition, a large part of ex-situ conservation programmes involves parallel actions targeting the management of habitats and conservation of natural populations. Most LIFE projects have implemented a comprehensive package of actions, covering a wide range of measures such as habitat restoration, new creation of habitats, elimination of threats, elimination of artificial infrastructure, surveillance and monitoring of populations, endorsement of recovery plans and designation or enlargement of new Natura 2000 network sites. These actions have mostly been done successfully, benefiting not only the targeted species but improving the conservation status of habitats and therefore contributing to a greater biodiversity in those areas.

Photo: Aixa Sopeña

High mountain nursery with black pine (Pinus nigra) for habitat restoration

75% co-funding for priority species for conservation included in Annex II of the Habitats Directive and Annex I of the Birds Directive as agreed by Ornis Committee; and secondly, because European-level support is often seen as a recognition of the importance of ex-situ actions.

Among the complex actions that LIFE co-funding has helped ex-situ conservation progammes with are the:

- Construction of breeding centres and nurseries;
- Purchase of breeding equipment, such as incubators, etc;
- Drafting of ex-situ conservation protocols;
- Setting up and capacity building of expert teams;
- Exchange of best practices with other ex-situ programs in the EU and worldwide;
- Preparation of habitats for reintroduction and /or reinforcement; and
- Monitoring of reintroductions and reinforcements.

In addition, LIFE support has been used, after the initial actions, to maintain the ex-situ programmes, facilities and personal.

Photo: LIFE04 NAT/HU/000116

LIFE supports the construction of captive breeding centres, such as this one for the Hungarian meadow viper

OVER 300 SPECIES

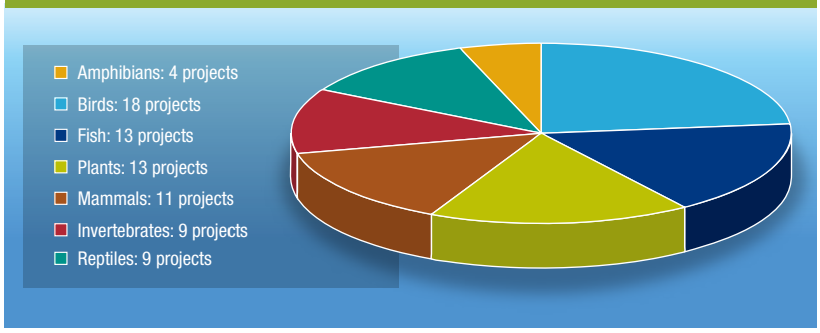
The LIFE programme has benefited more than 300 species included in the annexes of the Birds and Habitats directives. Whilst some of these projects have been centred around ex-situ species conservation, most had a more comprehensive approach in which ex-situ conservation actions were part of a comprehensive conservation strategy for the targeted species and its habitat. In many of these cases, the contribution of LIFE has been essential to prevent species extinction. This has been the case particularly for lesser-known species, such as the Canaries giant lizards or several very rare and endangered plants in Crete and Cyprus. Moreover, LIFE support to local and regional authorities with few resources was crucial for the conservation of these species

More than 80 LIFE Nature projects have included ex-situ conservation measures, (see project list – pp. 54-56) These projects have targeted Europe's most vulnerable species, many of which are now considered flagship species (e.g. brown bear, Canaries giant lizards). Projects with ex-situ conservation actions have

Figure 1: **Species targeted by LIFE projects (1992-2010) more than once with ex-situ conservation actions**

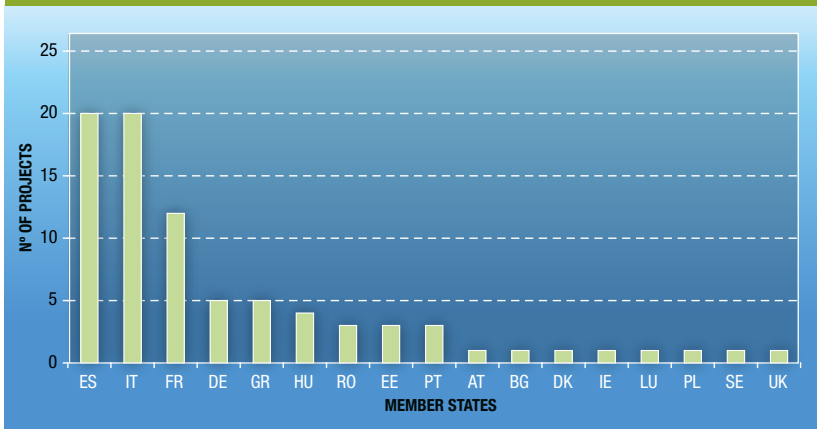
Source: LIFE projects database

Figure 2: **Species groups (taxa) targeted by LIFE projects (1992-2010) with ex-situ conservation actions**



Source: LIFE projects database

Figure 3: **Number of LIFE projects (1992-2010) per Member State with ex-situ actions**



Source: LIFE projects database

also benefited whole areas contributing to enhance biodiversity as umbrella species.

Several species have been subject to ex-situ conservation actions by more than one LIFE project (see figure 1), either because of the need for follow-up projects or for captive breeding and reintroduction measures in additional areas.

The white-clawed crayfish (*Austropotamobius pallipes*) has been assisted by ex-situ actions in five LIFE projects in Italy, whilst four projects involving ex-situ actions have been concerned with the bearded vulture (*Gypaetus barbatus*).

As Figure 2 illustrates, close to 75% of LIFE Nature projects involving ex-situ conservation actions have targeted birds, fish, mammals and plants. By contrast, reptiles have been comparatively under-represented to date.

Many of the target species for ex-situ actions have been flagship species for nature conservation, such as bears, vultures, and lynx.

Some species targeted by ex-situ actions – such as the Atlantic salmon or another fish species, allis shad - also represent some sort of socio-economic benefit for human populations in their territories.

THE CHALLENGES OF EX-SITU CONSERVATION

Despite the need for ex-situ conservation in certain instances, ex-situ actions are not always successful and their contribution to preventing species extinction is not always evident. As a general rule, ex-situ conservation actions should be complemented with in-situ conservation actions (there are exceptions, such as the case of the chytrid fungus). They also need to go hand-in-hand with efforts to preserve or prepare suitable habitats where individuals raised in captivity may be reintroduced or used to reinforce existing populations. Most LIFE projects have followed this comprehensive approach.

LIFE projects incorporating ex-situ conservation actions have faced a range of common challenges. These include:

- Lack of knowledge of the biological and ecological parameters of the species: breeding necessities, feeding, behaviour, habitat needs, germination protocols, etc;
- An inadequate gene pool of founder individuals, which can cause inbreeding problems in the captive population;
- Lack of adaptation to the new ex-situ environment;
- Starting the ex-situ programme too late to enable the recovery and future reintroduction of the species;
- Lack of control of threats to the reintroduced or reinforced species populations;

Reintroducing the Adriatic sturgeon to the wild in Italy

Photo: LIFE03 NAT/IT/000113

- Lack of suitable habitats for species reintroduction and reinforcement;
- Occurrence of diseases and pests;
- Inadequate co-ordination of administrations involved in the programmes.

These factors, combined with the specific environmental needs of many species, some of which are nearly impossible to recreate by man, make ex-situ conservation very difficult (or even impossible) for a great many endangered European flora and fauna.

Nevertheless, it is clear that many of the ex-situ programmes supported by LIFE have effectively meant the recovery of species that would otherwise have become extinct if only habitat management measures had been applied.

The overall success of ex-situ actions carried out by LIFE Nature projects is not easy to assess: ex-situ conservation actions have been very successful for some species and inadequate for others. In both cases, valid scientific and species management experience has been gathered as a result.

Often, the timeframe of LIFE projects is too short to make an adequate assessment of the success or failure of ex-situ conservation actions. Some LIFE projects that did not manage to provide concrete results in the standard four-year project lifetime, achieved their goals after-LIFE. For instance, the project targeting the Canarian blue chaffinch (*Fringilla teydea* - **LIFE98 NAT/E/005354**) established a captive breeding centre, but only achieved a healthy captive bred population and reintroductions some years later.

THE IMPORTANCE OF RAISING AWARENESS

One of the guarantees of success of an ex-situ conservation programme is the awareness-raising component. This is probably the most significant aspect of an ex-situ project when it is followed by reintroductions in areas where the targeted species had been extinct for a long time and, especially, when the main reason for its extinction was the actions of people. Local populations are naturally wary of the reintroduction of species with which they are unfamiliar, whose conservation needs they do not know, and which they fear might interfere with their normal economical activities. The more interaction between people and target species there is, the greater must be the awareness-raising efforts of the LIFE projects to overcome such fears. A number of LIFE projects – such as those targeting the Iberian lynx and bearded vulture in Spain and those conserving the Hungarian meadow viper – have been exemplary in implementing participatory approaches with comprehensive and simple information, and a close involvement of relevant stakeholders. This approach can help to ensure the long-term sustainability of programmes by increasing the general public's understanding of the need to invest efforts in preserving target species, thereby increasing public support for such efforts.

The goal of this LIFE Focus publication is to inspire ongoing and future LIFE Nature projects that feature ex-situ conservation actions, by highlighting new ideas that can be put into practice and sharing best practices and also by pointing out some of the problems that other projects have faced so that they might be avoided by current and future projects.

EU POLICY AND EX-SITU CONSERVATION

The EU is committed to halting biodiversity loss and protecting biodiversity. The EU 2020 Biodiversity strategy, adopted in May 2011[4], includes a long-term (2050) vision for biodiversity, as well as a mid-term target of halting "the loss of biodiversity and the degradation of ecosystem

4 http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

Outcomes of ex-situ conservation actions may only be visible some years after a LIFE project ends, as was the case with the reintroduction of the Canarian blue chaffinch

Photo: Aixa Sopeña

Photo: LIFE06 NAT/E/000199

Ex-situ actions, such as captive breeding, can be a valuable awareness-raising tool

services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss." Another important EU target is to ensure a 'favourable' conservation status of habitats and species protected at EU level, this being the foremost aim of the Birds and Habitats directives, the two main conservation policies of the EU. However, it should be noted that conservation of habitats alone is not always sufficient to ensure species conservation and that species-focused aims and implementation are essential to maintain the ecosystem services that biodiversity provides.

The international community at the 10th Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) reaffirmed the importance of halting biodiversity loss and proposed in 2010 the Aichi biodiversity targets, to monitor progress on biodiversity protection worldwide, in order to halt biodiversity loss by 2020. At the 10th COP, the EU committed to continue implementing actions to halt the loss by 2020, which will be reflected in the new EU Biodiversity strategy.

The current EU 2006 Biodiversity Action Plan[5] recognises the need to identify and fill critical gaps in EU ex-situ (zoo, botanic gardens, etc.) conservation programmes for wild species (Action A1.3.3).

Currently, 62% of habitats and 52% of species covered by the Habitats and Birds directives are considered to be in a 'poor' conservation status[6]. Efforts must be made to improve this status and in certain cases ex-situ conservation has a role to play.

Therefore the EU, its institutions and Member States have a key role to play in ensuring that ex-situ conservation becomes a valuable tool for reducing biodiversity loss, by providing a common framework that ensures co-ordinated efforts across the EU. Based on the previous Biodiversity Action Plan, the Commission is currently preparing an EU-wide strategic approach to ex-situ conservation.

5 http://ec.europa.eu/environment/nature/biodiversity/comm2006/index_en.htm
6 EEA EU 2010 Biodiversity Baseline

EU STRATEGY FOR EX-SITU CONSERVATION

The objective of this strategic approach is to fully integrate ex-situ conservation into species conservation planning processes, and to help ensure that such ex-situ measures are executed to the highest standards, thus maximising the contribution of ex-situ conservation to the favourable conservation status of species of national or EU importance and to the EU biodiversity vision and target. The proposed strategic approach is divided into 10 actions:

- Raise awareness of decision-makers, practitioners, researchers, stakeholders and the broad public to consider ex-situ conservation as a tool in conservation strategies for European species;
- Promote good practices and guidance in ex-situ conservation activities that are effective in achieving the 'favourable conservation status' of European species, especially those whose conservation is prioritised in the Birds and Habitats directives;
- Promote knowledge and data sharing amongst and between researchers and practitioners, e.g. through networks;
- Promote and disseminate advanced research targeted at ex-situ conservation;
- Increase communication between Member States and other relevant parties in relation to ex-situ conservation;
- Ensure that appropriate funding mechanisms are in place to fund ex-situ components required under CBD 2020 targets (research and implementation) and to reach the commitments of the EU for 2020;
- Ensure that appropriate skills are available within the EU to undertake ex-situ conservation;
- Ensure that ex-situ programmes that require long-term follow up and support have continued monitoring and evaluation during the entire period built into the project design and have the means to achieve this;
- Improve the information exchange on the role ex-situ conservation plays in achieving EU biodiversity and conservation objectives; and
- Clarify the regulatory framework and streamline ex-situ conservation in EU policies, including other policy areas such as development and agriculture.

MAMMALS

Several species of mammals have been targeted by LIFE projects with ex-situ conservation actions. Since 1992, 12 LIFE projects have supported ex-situ conservation action on species such as the brown bear, European mink, European bison and the Apennine chamois.

This section presents some examples of projects targeting mammal species with ex-situ conservation actions that include captive breeding followed by reintroductions, as well as translocations for population reinforcement. In general, projects have been successful and the conservation status of the target species improved. However, several projects faced some difficulties, such as the Estonian project to conserve the European mink, which was not fully successful in its attempts to stabilise the wild population through a comprehensive reintroduction programme.

For more information on LIFE projects targeting mammals see the LIFE Focus publication: *LIFE and European Mammals: Improving their conservation status.*

Boosting **lynx populations** through reintroductions

Reintroductions after a captive breeding programme offer a significant way forward for conservation of the Iberian lynx, the most threatened large carnivore in Europe.

The decline in numbers of the Iberian lynx (*Lynx pardinus)* has to a large extent been caused by habitat loss and fragmentation, as well as by decimation of rabbit populations in the Iberian peninsula following the outbreaks of myxomatosis in the 1960s and rabbit haemorrhagic disease in the 1980s. For this reason, conservation measures have focused on habitat connectivity and on increasing numbers of the cat's prey.

Along with conserving habitat and boosting the rabbit population by reintroductions, an efficient captive breeding programme is needed to prevent the Iberian lynx from becoming extinct.

LIFE has funded two projects carried out by the regional government (Junta) of Andalusia that have targeted the two surviving Iberian lynx populations in the Spanish region – in Sierra Morena and in Doñana. The first project, 'Population recovery of Iberian lynx in Andalusia' (**LIFE02 NAT/E/008609**), succeeded in stemming the decline of the lynx, stabilising populations in Doñana and increasing the number of individuals and breeding territories in Sierra Morena. The follow-up project, 'Conservation and reintroduction of the Iberian lynx in Andalusia' (**LIFE06 NAT/E/000209**) is attempting to increase the genetic diversity of the populations, both by improving connectivity and carrying out translocations between isolated sub-populations and by reinforcements – continuing to extend their territories by enhancing the existing populations and by undertaking the first reintroductions of animals in territories where the lynx was previously found.

Photo: Junta de Andalucia

Release (2011) of the Iberian lynx "Íbero" in the reintroduction site

Lynx born in captivity in 2006. This individual was the offspring of one lynx from Sª Morena and another from Doñana, helping ensure the genetic diversity of the species

Photo: Aixa Sopeña

FIRST STEPS TO RECOVERY

Showing the value of ex-situ conservation actions, two captive-bred lynxes were recently released into the wild (in the Guarrizas area, near Jaén). The two females were born in the project's captive breeding centre, La Olivilla, in 2009 and have been in a pre-release enclosure since December 2010. The project team have closely monitored their adaptation to this semi-wild environment and have gradually reduced active support for the animals.

The females were released together with a juvenile male captured from the wild in the area of Cardeña (Córdoba) in late 2010. By containing them in the same area, the project developed interaction between the three individuals, important for the learning of hunting and other survival techniques.

Guarrizas was selected for recolonisation by the Iberian lynx because it is made up of a large area of quality habitat and hosts adequate populations of rabbits and other prey. Furthermore, a project survey found 90% of the local population to be in favour of their reintroduction. By releasing lynx of different origin into the area, the project hopes to create the genetic diversity needed for the long-term viability of the population.

Previously, the project had released nine lynx into the area of Guadalmellato during 2010. Among this group were seven adults captured in other areas – three adult pairs and one non-reproductive female – and the two cubs of one of the pairs, born during the pre-release phase. Although one adult male and one cub have died since release, this figure is much lower than the 50% mortality rate anticipated at the start of the project.

Photo: LIFE05NAT/E/000073

Captive breeding is an essential part of European mink (*Mustela lutreola*) conservation. The species, which is under severe threat as a result of competition from the invasive species, American mink (*Mustela vison*), has been the subject of LIFE-supported reintroduction programmes in Estonia and Spain.

Captive breeding offers hope for **European mink**

The European mink was once found along riverbanks, streams and in wetlands across Europe. Today, this small carnivore, which has a typical body length of around 30-40 cm, occupies less than 10% of the area it once covered and has disappeared in more than 20 countries. Within the EU, fewer than 2 000 adult individuals survive in the wild – found mainly in northern Spain and southern France, but also in Romania and Estonia. In only a few decades, their EU distribution area has reduced by 70% to around 40 000 km^2, making the mink one of the most endangered mammals in Europe.

The 2000-2004 Estonian project (**LIFE00 NAT/EE/007081**) aimed to increase European mink numbers on the island of Saarema by releasing animals bred in captivity under a programme established at Tallinn Zoo in 1999. The captive breeding stock numbered some 100 individuals and a trial release programme was started up on Hiiumaa Island in western Estonia in 2000.

The LIFE project built on previously acquired experience to launch a more substantial breeding programme to reinforce the size and the genetic status of the captive population at Tallinn Zoo. Releases also helped the existing captive-bred population on Hiiumaa. By the end of the project, 149 animals had been released into the wild and the surviving population was estimated to be 16-28 animals.

Such a low survival rate highlights the difficulties associated with this type of ex-situ conservation work. Future reintroduction programmes in Europe should set long-term targets of up to 10 years. Efforts are continuing after the end of the LIFE project, however, and the project helped to extend the Natura 2000 network for the species.

SPANISH SUCCESS

The Spanish project (**LIFE02 NAT/E/008604**) also included a captive breeding programme along with other common conservation measures, such as controlling the spread of the American mink, limiting the occurrence of disease and pollution, and restoring natural habitats.

The project established new procedures for captive breeding and built, equipped and successfully demonstrated a designated breeding and stocking centre in Catalonia. The first breeding season exceeded expectations, with a stock of 10 individuals producing 18 cubs. However, until now no individuals have been reintroduced in to the wild.

Suitable habitats for the reintroduction of the European mink were studied and restored. In particular, barriers to natural re-colonisation in the Navarre region were removed and a proposal made for SCI designation. All the important habitats for the species will be in the Natura 2000 network, and protected corridors will ease dispersal.

The European mink has become a bellwether species for riverine habitats. The challenge of successfully introducing mink bred in captivity into the wild is one that LIFE projects have explored. Finding effective and viable introduction methods, as well as controlling American mink populations and ensuring healthy, well-connected riparian habitats, is key to the survival of the species. The collaborative approach encouraged by LIFE projects represents a clear way in which this goal can be achieved.

Pre-release mink enclosure on Hiiumaa island in Estonia

Photo: Tiit Maran

Preventing the disappearance of **brown bear populations**

Brown bear (*Ursus arctos*) reintroductions in the Italian Alps have boosted the region's struggling populations. Two LIFE projects transported captured bears from Slovenia to the Adamello Brenta Park to avoid the bear's complete extinction from the area.

There are an estimated 13 500-16 000 brown bears in the EU, and the species is classified as threatened by the IUCN. The Article 17 Habitats Directive conservation status assessment (excluding Bulgaria and Romania), resulted in an overall assessment for the Continental region of 'unfavourable-bad', though a few small populations remain scattered throughout central and western Europe – the Cantabrian Mountains of northern Spain, the Pyrenees, the Italian Alps and the Apennines, for example.

The bear population in the Adamello Brenta Park was estimated to be five individuals at the start of the first LIFE project in 1996, and no births had been recorded since 1989. While the park authority, the Province of Trento, was carrying out conservation measures – preventing disturbance to bear habitat and prohibiting new road construction and forestry tracks – recovery of the bear population required further action. The specific objective of the initial LIFE project (**LIFE96 NAT/IT/003152**) was to release (genetically compatible) brown bears from Slovenia into the park.

In total, three bears were released during this project and these were monitored using radio-tracking techniques. Though one of the released bears was killed by an avalanche, by the end of the project the first newborn bear was observed. Furthermore, the project drew up a detailed protocol for the capture and release operation that included handling of bears, the necessity of sanitary checks, transportation, and release methods and equipment. Radio tracking allowed the team to learn more about the bears' behaviour and quickly compensate farmers for any damage to their livestock. Such monitoring was useful for gaining the acceptance of the local population for the bear reintroduction and building up a favourable opinion towards the conservation work.

Photo: LIFE00 NAT/IT/007131

The sixth bear from Slovenia being released in Adamello Brenta National Park, Italy (2001)

A second project (**LIFE00 NAT/IT/007131**) in Adamello Brenta aimed to continue the reintroductions and help achieve a minimum viable population of 40-60 individuals for the brown bear. The main focus of the project was the release of an additional four bears in sites selected on the basis of optimal contact with the native population and individuals introduced previously. Two bear cubs were born in 2002, followed by two more in 2003 and another five in 2004, underlining the good adaptation of the released animals to the new environment.

Again public awareness activities were crucial to the success of this project, assuring the local population that the bear introductions were being properly controlled and individuals tracked. Typical conservation measures for the coexistence of human beings and large carnivores were also implemented, such as the construction of electric fences to protect livestock and information campaigns.

EXPORTING THE LESSONS

Illustrating the importance of ex-situ conservation actions, bears from Slovenia have also been introduced to the French Pyrenees (**LIFE93/NAT/F/011805** and **LIFE96/NAT/F/004794**). The experiences and lessons of learned by the two Italian LIFE projects should prove invaluable for other regions considering similar reintroductions.

Photo: Antonio Antonucci

Creating new populations of **Abruzzo chamois**

The captive breeding and reintroduction of a medium-sized mammal, such as the Abruzzo chamois, presents its own particular challenges. However, LIFE projects have refined techniques and protocols for capturing the animals and redistributing across all five national parks in Abruzzo to create new populations of this rare subspecies.

The Abruzzo chamois (*Rupicapra pyrenaica ornata*), a sub-species found in the central Apennines (Italy) came close to extinction when its numbers fell to around 40 individuals within the confines of the Abruzzo National Park in the 1920s. It is listed in Annex II of the Habitats Directive as priority for conservation.

Following the drawing up of a national plan for Italy to encourage population growth of this subspecies, individuals were reintroduced into the Majella and the Gran Sasso e Monti della Laga National Parks in the 1990s with some success. By the start of the LIFE project (**LIFE97 NAT/IT/004143**), the Abruzzo chamois population was estimated at some 500 individuals in the Abruzzo National Park, 95 in Gran Sasso and 90 in Majella. However, the sub-species was still threatened by a range of factors, including poor genetic diversity, the impact of tourism, competition with free-ranging livestock and red deer (in Abruzzo National Park) and poaching.

Reintroduced chamois feeding in the Abruzzo National Park

Photo: Jon Eldridge

MAXIMISING GENETIC DIVERSITY

The genetic variability of the Abruzzo chamois subspecies is very low – its value is 0.438, lower than another subspecies *Rupicapra pyrenaica pyrenaica* (0.79) – because all the chamois come from the same small group (the last one found in Abruzzo National Park). As a result, a captive breeding programme was launched to support the creation of new populations. The Italian action plan for the subspecies proposed five geographically isolated populations for

conservation purposes and the use of captive animals. Through exchanges of breeding animals between different enclosures, the programme ensured that the genetic value of populations was maintained.

A particularly important step for the future sustainability of the Abruzzo chamois population was the development of an emergency healthcare response system under a follow-up LIFE project, 'Rupicapra II - Conservation of *Rupicapra pyrenaica ornata* in the Central Apennines' (**LIFE02 NAT/IT/008538**). This emergency response system provides the structure and organisation for rapid intervention in the event of an epidemic or serious health problem of any kind spotted by the continuing monitoring activities.

Photo: LIFE02 NAT/IT/008532 Franco Tassi

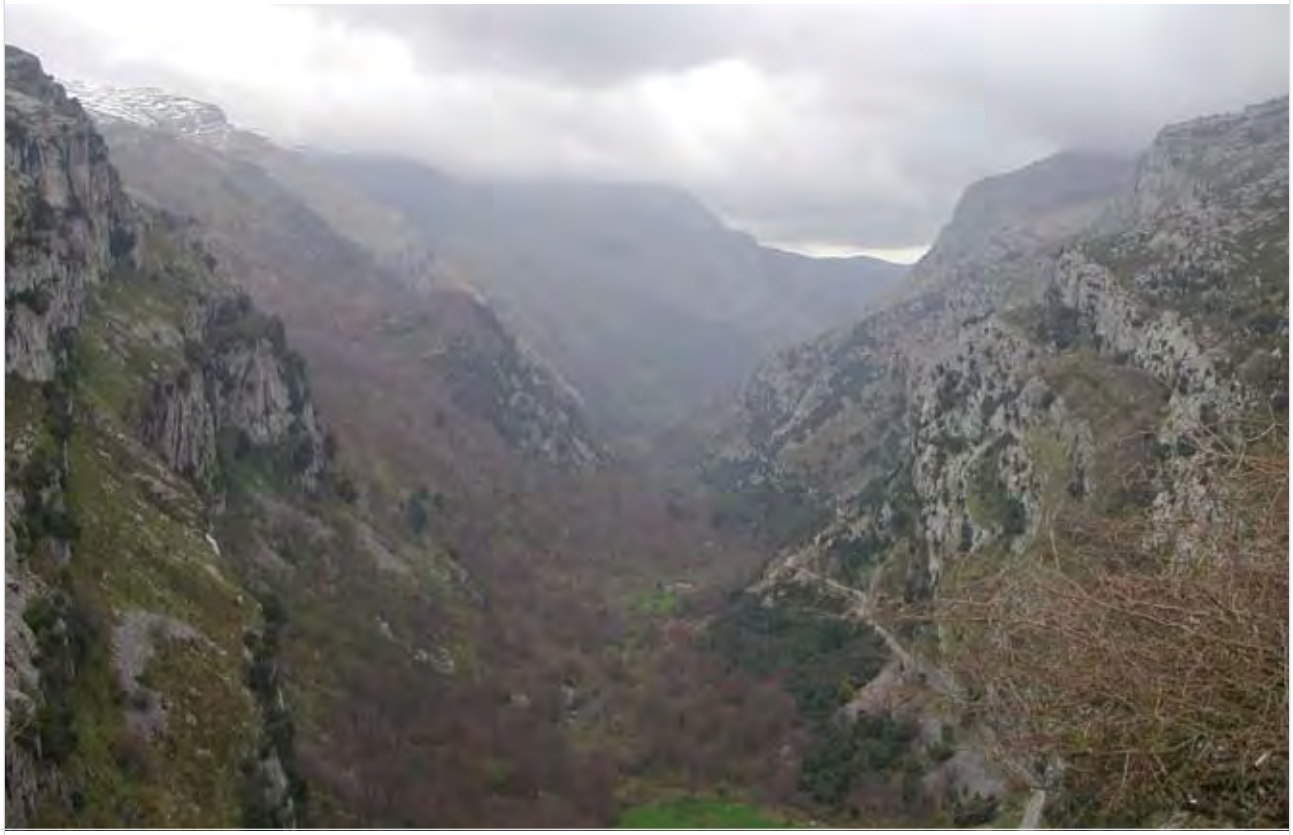
First female released from Majella National Park in the captive breeding area of Bolognola (Monti Sibillini National Park)

At present, numbers in the Abruzzo National Park have stalled (or even fallen) and the park services are analysing the problem as part of an ongoing LIFE project,'Coornata' (**LIFE09 NAT/IT/000833**). "It is probably due to many factors, including spatial and trophic competition with red deer and the possible spread of disease from livestock," says project manager, Franco Mari.

"The project is analysing interaction between the chamois and other animals and trying to prevent a critical situation from arising. There is a risk that the chamois could be defenceless against every kind of disease that could be passed between domestic and wild animals," explains Simone Angelucci, a veterinary surgeon based in Majella National Park.

Reintroduction area of the Cantabrian chamois (Rupicapra pyrenaica parva) in Asón, Cantabria, Spain

Photo: LIFE99 NAT/E/006333



REINTRODUCTION OF THE CANTABRIAN CHAMOIS

Rupricapra pyrenaica parva is an endemic subspecies of chamois that exists in the Cantabrian mountains, in northern Spain. The LIFE project "Biodiversity conservation and recovery in the river basin of Asón" (**LIFE99 NAT/E/6333**) aimed at the conservation of the entire Asón basin, through the optimum management of three Natura 2000 sites. One of the project actions was the reintroduction of the Cantabrian chamois at a site in the Cantabrian mountains where the species was last recorded as present in the 18th century.

Between 2002 and 2003, the project beneficiary released 26 Cantabrian chamois that had been collected from another part of the same mountain range. Each individual released was fitted with a radio-transmitter, so it was possible to follow the adaptation of the chamois to the new habitat. By 2010, the population had grown to more than 95 individuals with at least 19 new offspring born that year.

Photo: LIFE99 NAT/E/006333

Release of a Cantabrian chamois

Overall, however, the total number of Abruzzo chamois is growing at a "very high rate", according to the project organisers, and new populations in the Majella and Gran Sasso are increasing by 23% per year. Moreover, the new colony established in 2008 in Sibillini is prospering: two chamois were born in 2009 and five in 2010.

TRANSFER OF ANIMALS

The transfer of individuals from one population to another is not easy to perform as the animal must be tranquilised before it can be moved.

Several techniques can be used including shooting with tranquiliser guns, trapping in cages and catching with nets. The 'Coornata' project has already established protocols for chamois transfer to ensure that the safety of the animal is maximised. In the breeding enclosures, individuals have become accustomed to the sound and presence of people, which allows staff to get close enough to be able to fire a tranquiliser dart accurately.

This latest LIFE project will help achieve the goal of five geographically isolated colonies of Apennine chamois in five parks –the Abruzzo National Park, the Majella National Park, the Gran Sasso and Monti della Laga National Park, the Monti Sibillini National Park and the Sirente Velino Regional Park – by establishing two new populations. It will finish the programme in Sibillini, where 13 chamois were released in 2008 and 2009, with the reintroduction of a further 15 chamois from Majella and Gran Sasso. The project will also begin a new colony in Sirente Velino with the release of the first group of eight chamois at the end of the project.

According to Mr. Mari, Monti Sibillini consists of 24 000 ha of suitable habitat connected by eco-corridors. It is also possible to control the impact of human beings and livestock, and he is confident that a new colony of chamois can be established in the park. "Two kids were born in 2008 and five in 2009 in the area and we hope that a further five will be born in 2011," he says.

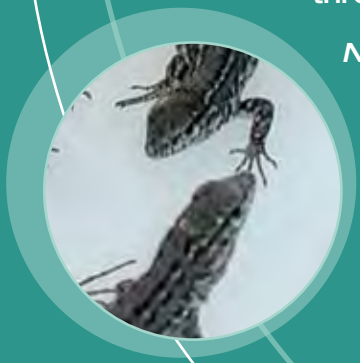
To avoid inbreeding, comparisons of genetic information from all the areas are being made. Information gained from these studies will allow the park authorities to maximise the success of the captive breeding and reintroduction programme.

Tourist disturbance in the area of the Gran Sasso Monti dellla Laga National Park where the Apennine chamois has been reintroduced

Photo: LIFE99 NAT/E/006333

REPTILES

LIFE has provided crucial support for ex-situ conservation action targeting reptiles around the EU - from the European pond turtle to giant lizards in the Canary Islands. To date, there have been nine LIFE projects including elements of ex-situ reptile conservation. The majority of these have consisted of a captive breeding programme followed by reintroductions and habitat management. Two ongoing LIFE+ Nature projects are currently implementing elements of ex-situ conservation: a project in Cyprus (**LIFE09 NAT/CY/000247**) is looking to introduce a captive breeding programme for three species endemic to the island - *Mauremys rivulata*, *Natrix natrix cypriaca* and *Coluber cypriensis*; In Latvia, the project *LIFE09 NAT/LV/00239* aims to establish ex-situ breeding programmes followed by reintroductions of the fire-bellied toad (*Bombina bombina*) and the European pond turtle (*Emys orbicularis*).



For more information on LIFE projects targeting reptiles see the LIFE Focus publication: *LIFE and Europe's reptiles and amphibians: Conservation in practice.*

A successful breeding programme for the giant lizards of La Gomera in the Canary Islands could be an important step towards achieving a sustainable population of this endangered species.

Sustaining populations of **giant lizards** through reintroductions

The plant-eating giant lizards from the genus *Gallotia* are lacertids (wall lizards) unique to the Canary Islands, with different species that have evolved on each island. Surviving populations, however, are under threat from predation by introduced species (particularly feral cats and rats) and by human activities (tourism and agriculture).

THE LIZARDS OF LA GOMERA

Among several actions targeted to directly reduce the impact of these threats, a captive breeding programme (CBP) formed part of a plan for the recovery of the giant lizard, *Gallotia bravoana,* on La Gomera, which was started up by a 2002 LIFE project (**LIFE02 NAT/E/008614**). The species was thought to be extinct on the island, but a very localised population of no more than 20 individuals was rediscovered in 1999. At the time of the project, this population had grown to 40, of which eight were captured to become the founders of the CBP. By the end of the project, there was a wild population of 118 individuals and a captive population of 62 (53 born during the project duration).

La Gomera giant lizard in the captive reproduction centre's terrarium

Photo: LIFE06 NAT/E/000199

A follow-up project (**LIFE06 NAT/E/000199**) was launched to prepare the sites for the release of these captive-bred lizards. In order to maximise their chance of survival, measures were taken to reduce threats such as predation. The programme of cat removal, which was introduced by the former project, was continued and several areas relevant for future reintroductions were fenced. The natural habitats of the lizard are close to agricultural land and built-up areas, so it was also important to inform the local population and visitors of the conservation requirements of the species.

As part of this ongoing project, six males were released in an experimental reintroduction. Unfortunately this was not successful as all six animals died within a short time. Other challenges faced by the CBP are that breeding numbers remain low and the captive breeding rate, for the moment, is lower than anticipated. Lessons learned, the beneficiary hopes, will be successfully transferred to similar reintroduction efforts in the Canary Islands and farther away in the Balearic Islands.

HOPES FOR EL HIERRO

In neighbouring el Hierro, which also contains a struggling population of giant lizards of the same genus, a captive breeding programme formed part of a pioneering LIFE project launched in 1997 (**LIFE97 NAT/E/004190**). Two experimental reintroductions took place, one on the islet of Roque Chico de Sálmor, and the other at El Julan (both Natura 2000 network sites). The lizards thrived in these habitats and the reintroductions continued after the project in El Julan, where 200 lizards were released in late 2000. A long-term subsequent management and monitoring-reinforcement plan was introduced, and El Julan was considered the most likely place to host a new viable wild population of lizards.

The breeding programme was bolstered by improvements to the methods used at the centre that gave rise to an increase in the production rate – in the final year of the project 100 lizards were born, with almost 95% of eggs hatching successfully.

La Gomera giant lizard hatching

Photo: LIFE02 NAT/E/008614

One of the most endangered snakes in Europe, the Hungarian meadow viper, has benefited from long-term conservation measures, particularly a captive breeding programme, introduced by LIFE projects.

Photo: Bálint Halpern

LIFE-supported centre leads **rare snake's fight for survival**

Studies have shown that inbreeding poses a large threat to the Hungarian meadow viper (*Vipera ursinii rakosiensis*) affecting the species' ability to reproduce. To counteract this threat, the NGO MME BirdLife Hungary established a captive breeding centre in 2004 on the site of an old farm owned by Kiskunsag National Park. With financial assistance from LIFE (**LIFE04 NAT/HU/000116**), the beneficiary started a programme of collecting individuals from threatened populations and reintroducing them into the wild in suitable and secured habitats. The viper breeding programme supported by LIFE started with 10 adult vipers, collected from four different populations in the national park. The breeding pairs were kept inside 3x3 m wired enclosures where they were able to breed in conditions replicating semi-natural viper grassland habitat. The project even developed an artificial burrow that can serve as a hiding and wintering place for vipers.

These ex-situ conservation methods have a number of benefits for the species. A higher percentage of newborn vipers and juveniles reach maturity at the breeding centre than in the wild thanks to a steady supply of crickets to feed on and a lack of predators. Most of the juveniles are kept and fed in temperature controlled rooms over winter. This accelerates the growing process by up to one year compared with juveniles that winter in burrows in the enclosures.

Juvenile vipers in terrariums with heat lamps

Photo: LIFE04 NAT/HU/000116

Genetic screening of all the individuals was carried out in order to reduce the chance of inbreeding depression. DNA matching made possible the identification of the ancestors of newborn individuals, thus allowing the creation of larger breeding groups while still keeping control over breeding lineages. Moreover, the project established a viper identification methodology using photographs of each viper's head – the scales and markings are unique to each individual.

FROM EX-SITU TO IN-SITU

Successful captive breeding took place every year for the duration of the LIFE project. By the end of 2008, the centre was already home to 388 Hungarian meadow vipers and planned reintroduction into the wild was scheduled for the following year. So far more than 70 vipers have been released.

The centre also provided an opportunity to increase knowledge about the reproduction, behaviour and ecology of this shy species. Veterinary support – and crickets as food for the vipers – came from Budapest Zoo.

Photo: LIFE04 NAT/HU/000116

Viper enclosures for captive breeding

FOLLOW-UP TARGETS VIPER HABITAT

An ongoing LIFE project (**LIFE07 NAT/HU/000322**) is building on the achievements of the earlier project, helping maximise the chance of successful reintroductions by increasing the amount of grassland habitat available for the snake. It aims to create 1 600 ha of continuous viper habitat in Hanság and 28.9 ha of new habitat in Kiskunság.

Again Budapest Zoo is having an important role to play in boosting public acceptance of the conservation aims. The current project is also identifying options for future introduction of the species into Austria, where it became extinct during the 20th century.

The European pond turtle (*Emys orbicularis*) is a small reptile found in Southern and Central Europe. Populations are highly localised and often in severe decline. Reintroductions supported by LIFE are providing hope for the recovery of small populations in Spain and Lithuania.

Ex-situ conservation offers hope for **the European pond turtle**

Threats to the pond turtle – listed in Annex II of the Habitats Directive and classified as 'near threatened', according to the 2009 IUCN European red list of threatened species – include habitat loss due to urbanisation, road construction, wetland drainage, and over exploitation of water resources. Other pressures include water pollution and competition from the non-native red-eared slider terrapin (*Trachemys scripta*), a popular pet that has become widely established across Europe.

The Spanish 'EmysTer' project (**LIFE04 NAT/ES/000059**) was carried out in the Baix Ter wetlands, an area of coastal lagoons and marshes in Catalonia – one of only three areas locally where the turtles have been sighted. With only 10 known individuals in the wild, the Baix Ter population was 'rescued' in the 1990s by the breeding centre, Centre de Reproducció de Tortugues de l'Albera (CRT). The aim was that these surviving turtles would be kept in captivity for breeding and subsequent reintroduction into their natural environment once the causes of their decline had been addressed.

The project carried out various restoration actions to improve the turtles' preferred habitat – the wetlands of the Ter Vell floodplain – and to eliminate more than 50 alien terrapins. A management plan was then drawn up for the reintroduction of the turtles into two main areas: the restored (temporary and permanent) ponds of Mas Pinell; and a newly-created breeding pond. At the same time, the beneficiary worked with various partners and stakeholder groups, including tourism organisations, to halt or restrict public access to the restored sites.

BACK FROM THE BRINK

These project actions have proved beneficial to the recovery of the Baix Ter pond turtle population. The LIFE team successfully reintroduced 36 young turtles from the breeding centre into the Mas Pinell ponds (some of them radio-tagged for monitoring), and also released 40 juvenile specimens into the breeding pond. Meanwhile, the captive population grew from 10 at project launch to over 60 by the end of 2008.

The project implemented an effective captive breeding programme, rearing a satisfactory number of turtles for release. The species' habitat was also prepared and the reintroductions were successful in terms of adaptation. However, subsequent breeding was not confirmed during the project because of the youth of the released turtles. Overall, the ex-situ conservation worked well and serves as a valuable experience for similar initiatives elsewhere.

Building on this success, another Spanish LIFE project, also located in Catalonia (**LIFE09 NAT/ES/000520)** is hoping to establish a new pond turtle population in a restored area of coastal ponds and salt marshes in the Ebro Delta Natural Park through the reintroduction of at least 100 individuals bred in captivity.

This strategy is also being implemented by a project in Lithuania (**LIFE05 NAT/LT/000094**). Using supportive breeding – from turtles bred in captivity at Kaunas Zoo – the project hopes to improve the reproductive success of surviving small populations in the wild. There are also plans to release individuals for recolonisation of sites where the turtles were previously found.

Reintroduced European pond turtle in Catalonia, Spain

Photo: LIFE04 NAT/ES/000059

BIRDS

A significant proportion of LIFE projects featuring ex-situ conservation actions have targeted bird species around the EU - 18 projects since 1992, aimed at more than 10 species. LIFE co-funding has supported the captive breeding of endangered waterfowl species, such as the crested coot in Spain, as well as reintroductions of birds of prey in Ireland, Spain and Bulgaria. Ongoing projects include one that aims to reintroduce the great bustard to England (**LIFE09 NAT/UK/000020**), and one that will develop a captive breeding programme and reinforce the wild population of Cantabrian capercaille in northern Spain (**LIFE09 NAT/ES/000513**). Ex-situ actions for bird species often require the reintroduction of individuals from source populations located a significant distance away from the project area, such as black vultures from Spain reintroduced to Bulgaria, or great bustards brought from Russia to the UK.

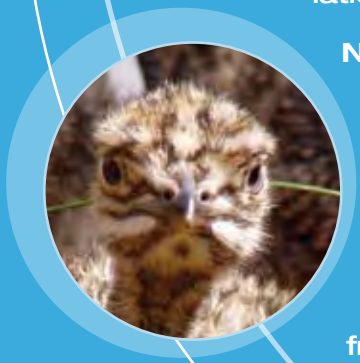


Photo: LIFE04 NAT/ES/000056

Rural collaboration breeds success for **bearded vultures**

Drawing on the success of earlier captive breeding programmes in the Alps, LIFE has helped not only to reintroduce the bearded vulture (*Gypaetus barbatus*) to Andalusia in Spain, but also to begin to win the trust and support of local stakeholders and the wider community.

The bearded vulture (*Gypaetus barbatus*) was very common in almost all of Andalusia until the end of the 19th century. However, with the increasing use of poisoned bait as part of programmes to eradicate vermin, the species, which lives almost entirely off bones (see box: *Gypaetus barbatus*), saw a dramatic decline in numbers in the 20th century, culminating in the extinction of the last of the Andalusian population, in the Sierra de Cazorla mountain range, in 1986.

Responding to this development, in 1988, the government of Andalusia initiated studies to assess the viability of a future reintroduction project. Following the identification of suitable sites for breeding in the Natural Park of Sierras de Cazorla, Segura and Las Villas (Jaén) and following in the footsteps of a successful captive breeding programme in the Alps (see box: Alpine antecedents), Andalusia's bearded vulture reintroduction programme began in December 1996 with the construction of the Cazorla Vulture Breeding Centre.

CAPTIVE BREEDING AND REINTRODUCTION

The Cazorla Vulture Breeding Centre (CCQ in Spanish) has successfully bred 20 birds via seven breeding pairs. The first chicks born in captivity at the centre hatched in 2002. The key to the breeding techniques is that captive breeding parents clutch and

feed the chick (whether they are its natural or foster parents), guaranteeing that it will behave naturally in the wild. As Francisco Rodriguez from the centre explains, "Adoption is the most difficult part of the process - You can't do anything once the chick is alone with the parents - sometimes they can attack the chick if they get stressed."

After being fed on a diet of rabbit, fallow deer, goat, sheep and rat, the fledgling vulture is taking to a 'hacking' site in the mountains, aged 90-105 days, before making its first flight at around 120 days. It will then assimilate this place (usually a cave) as its birthplace and return there as an adult to breed.

"The size of the cave is an important part of hacking," explains the NGO, Fundación Gypaetus. "If there are two or more birds they could fight if the cave is too small. Hence you need a large cave with more than one feeding point."

The first three birds from CCQ were reintroduced to the wild in 2006. To date 19 birds have been released at two hacking sites, of which 10 are still alive and being closely monitored using GPS tracking units and a sighting programme involving the local community and visitors to the national park.

LIFE HELPS VULTURES TAKE FLIGHT

With its captive breeding centre up-and-running, Fundación Gypaetus, secured LIFE funding for a project (**LIFE04 NAT/ES/000056**) to establish the bases to ensure the viability of the future reintroduced population (i.e. to ensure the released vultures would be capable of surviving and breeding independently). As well as enabling the beneficiary to add extra staff at the vulture breeding centre, LIFE funding was also used to provide technical support for preparatory actions, releases and monitoring, including interaction with other bearded vulture reintroduction programmes. The project developed a methodology for assessing suitable areas for reintroductions, which has been used for several SCIs from Andalusia and Murcia. Equally importantly, LIFE support also enabled the identification and control of present and emerging threats in the reintroduction areas, and awareness-raising activities among the local population, visitors and wider Andalusian society.

"The bearded vulture's mountains should be full of life and bring together rural development and conservation... It was essential to build up a collaborative work scheme at the local level," the project beneficiary explains.

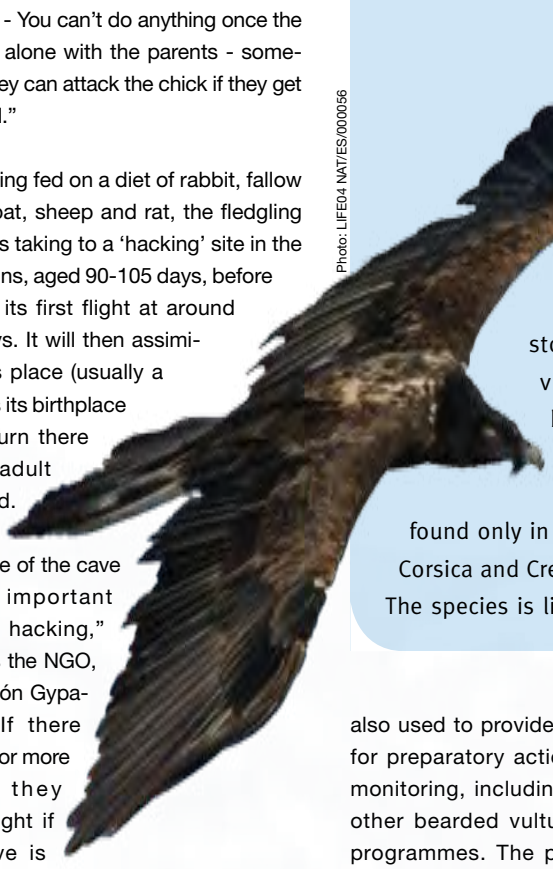


Photo: LIFE04 NAT/ES/000056

GYPAETUS BARBATUS

The bearded vulture (or Lammergeier) is a philopatric bird that breeds on crags in high mountains. Typically starting breeding at eight, each pair bears, at best, only a single chick per season. With a wingspan of up to 2.8 m, the bearded vulture is unique among birds in feeding almost exclusively on bones. As LIFE project beneficiary Fundación Gypaetus, explains, "the species is able to digest bone marrow because it has a wider oesphagus than other birds and special mucus lining the throat that dissolves sharp edges. It also has an extremely acidic stomach (pH<1)." Fundación Gypaetus adds that bearded vultures will "usually eat once or twice a day in captivity, but because of their slow metabolism, can go a week without food."

Once widespread in Europe, the bearded vulture is today found only in the Alps and Pyrenees, alongside isolated populations in Corsica and Crete and the recently reintroduced individuals of Andalusia. The species is listed in Annex I of the EU Birds Directive.

Adult bearded vulture in the Cazorla Vulture Breeding Centre (CCQ), Spain

Photo: Justin Toland

Photo: Justin Toland

Newly-hatched vultures – such as this three-day old chick – must be fed round-the-clock

INNOVATIVE ACTIONS TO MANAGE THREATS

"Acting on the threats against the bearded vulture "requires complex social changes," says Fundación Gypaetus. To reduce the danger from power lines, the NGO engaged in advocacy work that saw the regional government agree to mark all the lines in the the Natural Park of Sierras de Cazorla, Segura and Las Villas and saw electricity company Sevillana-Endesa agree to modify one line identified as particularly hazardous to bearded vultures. To remove the biggest threat to the species - accidental poisoning – the beneficiary sought to collaborate with "very specific rural groups", in particular hunters and stockbreeders. Working in harness with the regional government's Strategy for the Eradication of Illegal Poisoning in Andalusia, the project team used a network model and local intermediaries to develop a "threat management network".

ALPINE ANTECEDENTS

One of 18 LIFE projects that have targeted the species, the Andalusian bearded vulture project drew heavily on the lessons of earlier actions, including two LIFE projects. Continuing the work of an international reintroduction programme started in 1986, Gypaete/Alpes (**LIFE98 NAT/F/005194**) implemented a number of measures to increase the bearded vulture population in the French Alps. These included the construction of a new breeding centre, measures to reduce disturbance to nests, measures to reduce threats (from poisoning and power lines – including raising awareness among mountain inhabitants), and the development of an action plan for the species in the French Alps. A follow-up LIFE project, GYPAETE (**LIFE03 NAT/F/000100**) continued work to increase numbers bred in captivity in France, Italy and Austria (with some captive breeding also in Switzerland), remove threats and disturbances to breeding sites, and improve monitoring activities. Results were very positive: the beneficiary bred 33 bearded vultures in captivity and reintegrated 26 young birds into the wild between 2003 and 2007 (in total between 1986 and 2010 more than 170 individuals were reintroduced); it also developed agreements with, among others, rock climbers and helicopter pilots, to avoid disturbances to bearded vultures in protected areas during the mating season; finally, the project increased the number of trained monitors in the region to more than 4 000, with nearly 10 000 monitoring forms completed. The net result was an increase in the numbers of bearded vultures in the Alps - with about 150 birds in the wild as of 2011, the population is now considered to be sustainable. For more information see: www.gypaete-barbu.com.

Photo: LIFE03 NAT/F/000100 - Julien Heuret

Photo: LIFE04 NAT/ES/000056

Photo: LIFE04 NAT/ES/000056

The CCQ has successfully bred 20 birds for reintroduction to Andalusia

As proof of the success of this approach, the 'Towns Against Poison' (RMCV) network (covering 31 towns - 519 899 ha) and managers of 32 225 ha of land used for hunting have signed stewardship agreements banning the use of poisoned bait and lead ammunition.

Furthermore, the members of the RMCV network have committed to prosecuting people for illegal poisoning, a policy that has led to three prison sentences to date, including one sentence of 18 months, the heaviest ever handed down in Andalusia for this crime.

The importance of changing attitudes to the use of illegal poisons and lead ammunition is illustrated by the fact that two of Andalusia's 19 reintroduced bearded vultures have died as a result of poisoned bait left to protect livestock from predation, and two have died from lead poisoning.

Captive bred vulture chicks are fed on a diet of fallow deer, goat, sheep, rat and rabbit

Photo: LIFE04 NAT/ES/000056

"Four deaths remind us of the need to keep working, but the balance is certainly positive," says Fundación Gypaetus. "We have shown that with the active participation of rural groups, that is, the real managers of the land, threats linked to bad practice in the exploitation of natural resources can be controlled."

To this end, the LIFE project also promoted three other threat management networks: Veterinarians Against Poison, Hunters Against Poison and Stockbreeders Against Poison. "Stockbreeders are the most difficult to get close to because they don't have the same interest in the countryside," says Fundación Gypaetus. With the help of LIFE funding, the beneficiary attempted to bridge that divide by linking the return of the bearded vulture with the "free service" to stockbreeders of livestock carcass removal (something required by law since the mad-cow disease outbreak).

For Fundación Gypaetus, it is essential that conservation teams link with the local community in order for their objectives to be accepted. "If people see us as neighbours, as friends, they see us as part of their life, and by extension they see the project and the birds as part of their life too. This is a very important part of this kind of project." The 96 000 total visitors to Fundación Gypaetus's visitor centre on endangered species in Cazorla is one example of how the LIFE project is moving towards this goal.

The LIFE team's success in combining technical achievements with a human perspective, including listening to the needs and wishes of local people, has sown the seeds for the long-term success of the bearded vulture reintroduction programme in Andalusia.

"Diminishing the effects of poisoning and lead is possible with the participation and active commitment of the people who live, think and work 'in' and, above all, 'from' the bearded vulture's mountains," says Fundación Gypaetus. "We are convinced that the demonstrative nature of the achievements reached in Andalusia thanks to the LIFE programme will contribute to the implementation of initiatives based on similar approaches in other European regions." One such initiative is the newly started LIFE project, "Innovation against poison" **(LIFE09 NAT/ES/000933**), led by the same beneficiary.

Project number: LIFE04 NAT/ES/000056

Title: Preliminary actions and reintroduction of the bearded vulture

Beneficiary: Fundación Gypaetus

Contact: Don Jesus Charco

Email: fundacion@gypaetus.org

Website: www.gypaetus.org

Period: 01-NOV-2004 to 31-OCT-2009

Total budget: €1 649 000

LIFE contribution: €1 237 000

LIFE is helping to implement the Natura 2000 network in Bulgaria through targeted actions such as this project to restore the populations of Europe's three large vulture species to the country.

LIFE works to **return vultures to Bulgaria**

As in other parts of the EU, the Bulgarian populations of Europe's three large vulture species - the griffon vulture (*Gyps fulvus*), black vulture (*Aegypius monachos*), and bearded vulture (*Gypaetus barbatus*) – have been significantly affected by a range of direct and indirect threats, including poisoning, hunting, electrocution by power lines and habitat change.

Of the three vulture species, only the griffon vulture continues to have a viable population in Bulgaria, and this is restricted to the Eastern Rhodope Mountains in the south of the country. The black vulture no longer breeds in Bulgaria (although it can be found at various feeding sites), whilst the bearded vulture is not found in the country at all.

A VIABLE FUTURE FOR VULTURES

Green Balkans, one of the two environmental NGOs that is working to develop the Natura 2000 network in Bulgaria, has established the country's first and only Wildlife Rescue Centre, at Stara Zagora. At the centre, the NGO has initiated a captive breeding programme for the griffon and black vultures with the aim of restoring the species to their former ranges in Bulgaria, and especially in the Balkan Mountains. Following on from this, Green Balkans is the beneficiary of LIFE support for the Vultures' Return project (**LIFE08 NAT/BG/000278**), which aims to restore the populations of the three large vulture species in Bulgaria through specific conservation actions and through measures targeting the institutional capacity for vulture conservation.

The LIFE project, which runs until 2014, will reintroduce the griffon vulture to the Balkan Mountains and create favourable breeding conditions for the griffon, black and bearded vultures.

There are an estimated 55 breeding pairs of griffon vultures in Bulgaria, concentrated around the River Arda, southeastern Rhodope. The LIFE beneficiary plans to release 150-200 griffon vultures acquired from Spain at four target sites. As of May 2011, 31 of these vultures had been transported from the transfer centre in Mallorca to the wildlife rehabilitation centre in Bulgaria and 26 of these had been released into the wild.

To ensure the success of its actions (and drawing on the example of earlier LIFE projects, such as **LIFE04 NAT/ES/000056** – see pages 21-24 – and **LIFE00 NAT/ES/007340**), the project team will focus on reducing the impact of direct and indirect threats to the vultures, for instance by making power lines more visible to raptors and by launching educational campaigns against the use of poison bait and lead ammunition. Creating positive attitudes towards vultures through the promotion of ecotourism and nature-friendly agriculture is a key goal of the project.

Another important social aspect will be the creation of a functioning network of stakeholders – including, among others, NGOs, park authorities, forest wardens, hunters, vets and local communities. It is hoped that this network will enable ongoing monitoring of target habitats and reintroduced vultures, leading to the long-term goal of the res-establishment of viable populations of the three target species.

Transport of black vultures from Spain to Bulgaria for reintroduction

Photo: LIFE00 NAT/E/007340

Photo: LIFE00 NAT/IRL/007145 Laurie Campbell

After more than 100 years Ireland can see golden eagles in the skies again. With the support of LIFE, 58 golden eagles from Scotland were reintroduced to the country between 2001 and 2010 and the species is now breeding regularly in its new Irish home.

Golden eagles return to Ireland after 100 years

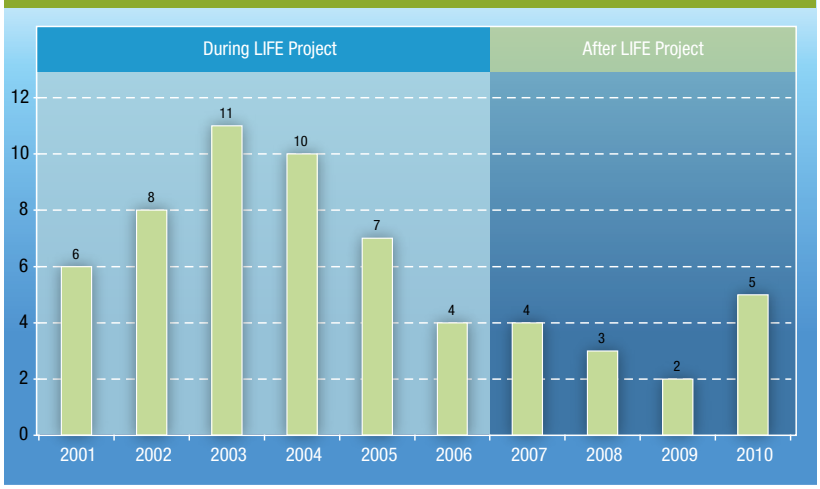
The European population of the golden eagle (*Aquila chrysaetos*) has a widespread but discontinuous distribution across much of Europe, and accounts for less than a quarter of its global breeding range. The European breeding population is small, and it is estimated to be around as few as 8 400 pairs. Its range has been drastically reduced over the past century as a result of persecution, destruction of breeding sites and pollution. Breeding areas are now restricted to remote mountain areas in Sweden, Finland, Scotland and parts of southern Europe. Nesting densities in central Europe are often lower than one pair per 100 km², which makes golden eagle conservation that much more complex. The last record of a golden eagle in Ireland goes back to 1912. One of its last remaining strongholds was on the extreme north-west coast of Ireland in County Donegal at Glenveagh, where the landscape essentially consists of uplands and mountains dominated by blanket bogs. In its heyday, this area used to hold up to 12 golden eagle home ranges.

EAGLES BROUGHT FROM SCOTLAND

The golden eagle reintroduction programme in Glenveagh National Park began with funding from the National Millennium Committee in 2000 and has been co-funded since 2001 to 2006 by LIFE in the context of the project "The re-introduction of Golden eagle into the Republic of Ireland" (**LIFE00 NAT/IRL/007145**).

The success of the project relied on the availability and transfer of young birds from Scotland to Ireland. Scottish Natural Heritage (SNH) issued a collection licence for the duration

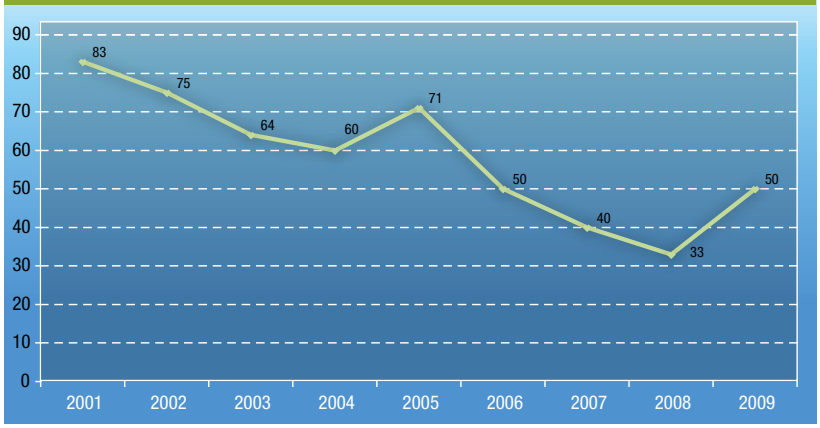
Figure 1: **Golden eagles released in Ireland (2001-2010)**



of the LIFE project: a single golden eagle chick could be taken from broods of two at about six weeks old (chicks reaching that age have a good chance of survival). Raptor workers visited up to 110 golden eagle nests in the Scottish Highlands in 2001 in search of broods of two chicks and some six chicks were selected for the reintroduction programme. This was fewer than anticipated as experts had over-estimated the number of two-chick broods prior to the start of the project.

The received chicks were placed in an acclimation enclosure in an isolated part of Glenveagh National Park to avoid human contact. The birds were released when the chicks had their flight feathers fully developed. The project subsequently received a constant flow of chicks from Scotland. In total the LIFE project received and released 46 birds by 2006. However, SNH licence restrictions were imposed from 2006 onwards, because of increasing concerns over the decline of the Scottish golden eagle population. Nevertheless, the relationships forged between eagle conservation programmes in Scotland and Ireland enabled the continuation of the Irish reintroductions on a reduced scale after-LIFE. As a result, by the end of 2010, 58 birds had been released in Glenveagh National Park.

Figure 2: **First years survival rates (%) of released golden eagles in Ireland**



FOOD DUMPS BOOST SURVIVAL RATES

In order to maximise the survival rate of the released immature golden eagles food dumps were installed in the national park. These food dumps were used by the birds immediately after release; but after some months birds were seen feeding independently. The food dumps were also an important tool to boost first-year survival rates and manage dispersal patterns. Stopping the food dumps after full adaptation encourages birds to disperse. In 2004, one bird used the food dump three-to-four times before leaving the national park. However, with time it becomes more difficult to be precise about survival rates after releases.

There have been an increased number of sightings outside of Donegal. This is an indication that the birds are dispersing further away making tracking difficult and thus confirming that wider dispersal may lower 'known' survival rates (see figure 2).

These rates were initially higher than expected - and of course the actual survival rate may be much higher - just because an eagle has not been detected does not mean it has died. As the small nucleus golden eagle population has established itself in Donegal, the rate of eagle dispersal has increased. As a result it has become more difficult to accurately assess the annual survival rates of each cohort and the minimum known survival rates may be misleading. The current estimate is that there are between 20 and 30 golden eagles in Ireland.

FIRST CHICKS BORN

Golden eagles first nested and laid eggs in Donegal in 2005 and then again in 2006, but it was in 2007 that the first young were hatched in Ireland in more than 100 years. The nest, or 'eyrie', was in a remote area within the boundary of Glenveagh National Park. According to project manager, Lorcán O'Toole, from the Golden Eagle Trust (LIFE project beneficiary), "having a Golden Eagle eyrie with a chick in Ireland was not unusual prior to the late 19th century, as they were a feature of our natural and cultural heritage for millennia."

First golden eagle chick born in Ireland (2007)

Photo: LIFE00 NAT/IRL/007145

ESTABLISHING A VIABLE POPULATION OF EAGLES

The project's primary aim was to establish a viable breeding population of golden eagles in Ireland. The key indicators for measuring how successfully the species has become established are the number of territories they occupy, the number of breeding pairs and the number of fledged young per breeding pair. In other similar reintroduction projects, such as the one to reintroduce the white-tailed eagle in Scotland, it took 13 years from the first reintroduction (in 1982) till there were five successful breeding pairs. The Irish golden eagle population increased with an input of approximate six birds per year (58 birds/9 years = 6.5). The reintroduced birds have tended to visit and begin to settle in other Natura 2000 sites in the counties of Donegal, Mayo and Galway in Northwest Ireland. By 2010, there were seven established eagles' territories in Co. Donegal.

The golden eagle's main prey in the Irish uplands is hare, however, this LIFE project, unlike species reintroduction programmes elsewhere – e.g. **LIFE03/NAT/SK/000098** and **LIFE06 NAT/H/000096**, which reintroduced the suslik as prey for the Eastern imperial eagle (*Aquila heliaca*) and Saker falcon (*Falco cherrug*) in Slovakia and Hungary – had not foreseen any habitat or prey management actions. However, as Mr O'Toole points out, "there is a need, after the project's successful eagle reintroduction, to establish upland conservations actions that promote upland habitats (such as heather) for red grouse, hare and sustainable sheep grazing."

COUNTERING THE THREAT OF POISONING

The use of poisoned baits by some farmers to protect lambs from predation by foxes and crows has a direct impact on scavenging birds of prey such as golden eagles, often resulting in death.

According to the project beneficiary, more than 20 raptors have been tested and confirmed to have died from poisons in Ireland over the last three years. The Irish Raptor Study Group first raised the issue during the LIFE project with the Department of Agriculture, which registers and approves poisons in Ireland. This lobbying continued after LIFE, and in October 2010 the Irish Minister for the Environment, Heritage and Local Government introduced new regulations restricting the use of poisons targeting wildlife. These regulations make it illegal to use any poison to kill birds or animals apart from rodents and rabbits underground. However, the enforcement of the law is still incomplete as there is no formal post mortem and toxicology poisoning protocol in place to detect poisons in wildlife and no wildlife crime database to monitor the impact.

Photo: Lorcan O'Toole

Reintroduced eagle killed by poisonining in Co. Donegal, Ireland

WINNING OVER THE PUBLIC

The LIFE project conducted an impressive publicity and awareness-raising campaign, focused on local media. As a result, the majority of the Donegalese public is now aware of the golden eagle reintroduction project. The campaign emphasised the cultural heritage of the golden eagle in Ireland, highlighting Old Gaelic place names, songs, poems, family crests and folklore with eagle connotations. This helped non-wildlife enthusiasts buy into and support the project.

The potential for golden eagle tourism in Co. Donegal was also highlighted by the beneficiary. Tourism is already the county's main source of employment and now the Glenveagh National Park features the eagle in its publicity material and in a display at its visitor centre. National TV and other media coverage of the eagles have made people in other parts of Ireland aware of Glenveagh National Park, leading to increased visitor numbers. Indeed, the golden eagle has even displaced the red deer as the symbol of the national park.

HABITAT MANAGEMENT A FUTURE REQUIREMENT

Successful species reintroductions normally rely on concrete conservation actions on the land such as habitat restoration and prey management. Unusually, the Irish golden eagle project drew on existing habitat and food resources, mainly hare, rabbits and seabirds, in the Irish highlands and coastal areas. Whilst the eagles are slowly becoming established in Ireland, the population still needs support in the form of habitat management to maintain the availability of prey. Nevertheless, Mr O'Toole says that LIFE project support from 2001 to 2006 "was vital during the earlier years, when some people were doubtful that the project would work."

Project number: LIFE00 NAT/IRL/007145

Title: The re-introduction of Golden eagle into the Republic of Ireland

Beneficiary: Irish Raptor Study Group

Contact: Lorcan O'Toole

Email: lorcanotoole@goldeneagle.ie

Website: http://www.goldeneagle.ie

Period: 01-APR-2001 to 31-MAR -2006

Total budget: €309 000

LIFE contribution: €103 000

Photo: LIFE04 NAT/F/000091

With LIFE support a captive breeding and release programme was successfully established for the main migratory population of the little bustard in France. Released birds have integrated with the wild population, an important stage in the struggle to prevent the extinction of a species threatened by a lack of favourable habitats.

Reinforcing the migratory **little bustard population** in France

Listed in Annex I of the Birds Directive, populations of little bustard *(Tetrax tetrax)* have shown pronounced declines in European farmland landscapes over the last 25 years as a result of the intensification of agricultural practices. In France, there are only two significant remaining populations of this endangered bird, one sedentary in the Mediterranean region and the other migratory, on the verge of extinction, in the cereal plains of west central France – the target area of the project **(LIFE04 NAT/FR/000091)**.

The team knew from a previous LIFE project (**LIFE96 NAT/F/003207**) that lack of food sources and nest destruction during harvesting were the main causes of the dramatic decline in the numbers of French migratory population (from 6 800 to 400 singing males between 1978 and 2000). Therefore, five Natura 2000 network sites were identified for conservation activities in order to prevent the extinction of the little bustard in the French cereal plains. Moreover, a captive breeding, rearing and release programme was implemented, which included using eggs collected from nesting areas in Spain and France, and also from a breeding stock established by the project.

Existing agri-environment measures were reinforced to improve breeding habitats for the birds and project findings were carefully monitored to help improve knowledge about the success factors associated with the species recovery. Stakeholder awareness campaigns also formed an integral part of the conservation plans.

Two breeding centres were established – one, located in Deux-Sèvres for rearing young chicks and releasing young bustards, as well as helping to establish a captive breeding stock; another located in Indre for breeding adults. The eggs laid at this centre were then moved to the centre in Deux-Sèvres.

Initial problems prevented the project from breeding as many chicks as expected. For example, the chicks hatched from the Spanish eggs did not migrate during winters and fewer Spanish eggs were collected than originally anticipated, because of the need to conserve egg stocks in Spain where the birds are also at risk. From 363 eggs collected in France, 202 were used in the captive breeding programme.

TRIAL AND ERROR

Through a process of 'trial and error', the programme improved its effectiveness. Final results saw 282 eggs laid in captivity, 190 chicks released in three Natura 2000 network sites (Charente, Charente-Maritime and Deux-Sèvres) and 82 adult breeding males retained as breeding stock. The project successfully reinforced the little bustard population numbers in the target areas: released little bustards represent 8% of the local population. Monitoring confirmed that released birds integrated with the wild populations and migrated over the winter. Encouragingly, the breeding and release is continuing after the end of the project, financed by the local partners (aiming for the release of 100 chicks per year).

Nevertheless, with such a high extinction risk at metapopulation level, the species is still considered to be seriously threatened in France by a lack of favourable habitats, following continued intensification of farming practices and land use changes.

Little bustard chick born in captivity

Photo: LIFE04 NAT/F/000091 C. Attié

Crested coots fly high once more in Valencia

The captive breeding and release programme implemented by an early Spanish LIFE Nature project for the crested coot (*Fulica cristata*) proved more successful than initially expected, helping to lay the foundations for the recovery of the species in the Valencia region.

Until the mid-19th century, the crested coot was relatively abundant in the wetlands along the Mediterranean coast. Since then, however, its European population has declined drastically. The crested coot is 'endangered' in the EU, where only about 20 breeding pairs occur. Although the exact causes of this decline are not known, the Annex I Birds Directive-listed species has clearly been deprived of habitats as wetlands have been drained for cultivation. At the same time, hunting of another very similar species - the common coot (*Fulica atra)* - has probably added to the pressure and speeded up its disappearance.

The short-term objective of the 1999-2002 project (**LIFE99 NAT/E/006393**) was to reintroduce the crested coot populations in two Valencian SPAs: Albufera and Marjal del Moro. Once this had been achieved, the medium-term goal was for the species to recolonise its former range on the Iberian Peninsula.

Photo: Biopauker

Crested coot (Fulica cristata)

EGGS FROM MOROCCO

A programme for breeding in captivity was agreed, whereby Morocco - where the species is well conserved - would supply eggs for hatching in a wildlife recovery centre in Valencia (CPEMN). An experimental release of 10 birds took place in the Marjal del Moro, where habitat conditions are most suitable and hunting is banned. Six cages were then built in the Albufere National Park, where the other main reintroductions took place. The cages could be easily set up and dismantled in the field, and they proved to be successful.

Alongside the captive breeding programme, some habitat management actions were also undertaken. For example, vegetation was removed, new channels were constructed to allow water flow in critical periods and the water levels were controlled in the Marjal del Moro in order to increase the site's hosting capacity for the species. An information and awareness-raising campaign was also carried out, involving in particular hunters.

Almost all of the project's €280 000 budget was devoted to ex-situ measures. This has proved to be money well spent, as the captive breeding programme was more successful than foreseen: with a total of 23 pairs of breeding coots reared at the centre. This figure includes birds reared from 30 eggs from the north of Morocco, as well as some already at the centre. From these, 290 chicks were born, and 259 birds were released into four Natura 2000 sites – the original two SPAs, together with two other wetland sites, at El Hondo and Clot de Galvany. All the released birds were ringed with a collar, with 22 also fitted with transmitters for more accurate monitoring. Most of the birds adjusted well to their new environment, with at least 13 pairs breeding successfully by the end of the project.

The project also started reintroductions into additional areas in neighbouring Catalonia (e.g. in the Ebro delta). It is hoped that this wider area of releases will favour the species natural recolonisation of the whole region.

Reintroductions help improve the conservation status of Portugal's **purple gallinule**

Captive breeding and reintroductions of the purple gallinule (*Porphyrio porphyrio*) in Portugal have helped improve the conservation status of this very rare wetland bird species in the country.

The purple gallinule (*Porphyrio porphyrio*), also known as the purple swamp-hen, is a sedentary bird that lives in wetlands (marshes, lagoons, and reservoirs). It has an 'unfavourable' conservation status in Europe – where its distribution range is restricted to just a handful of Mediterranean countries, notably Spain, which holds over 85% of the EU population. In Portugal, the species declined greatly in the 19th and 20th centuries so that by the 1990s, only a small population remained, confined to the south of the country. but in the 1920s purple gallinules were still breeding as far north as the lower Mondego valley where they were observed sporadically until 1975. Illegal hunting was the main cause for its disappearance.

Employing captive breeding techniques and reintroducing birds originating from Spain, the LIFE Porphyrio project (**LIFE98 NAT/P/005267**) aimed to restore a viable population of purple gallinules in a Natura 2000 network site (Paul de Arzila) in the lower Mondego in central Portugal. The Paul de Arzila nature reserve was established in 1988 to protect what was left of the natural heritage in the region.

Some habitat restoration works were also carried out in order to prepare the ground for the reintroductions. These focused on the eradication of non-native plants to favour the expansion of the indigenous vegetation (sedges reeds and bulrushes), which provides shelter and foraging opportunities for the purple gallinule.

BIRDS FROM SPAIN

Installations to breed and acclimatise the (30) gallinules brought from Andalusia and Valencia in Spain were built and over the three-year project period some 107 birds were released. All these individuals were carefully monitored through radio tracking and surveys. At the same time, the project team worked hard to ensure local people, especially hunters, became aware of the significance of these habitats and the uniqueness of their avifauna in particular.

Employing total funds of some €199 000, the project was the first to implement a monitored bird reintroduction plan in Portugal. The captive breeding programme proved successful; resulting in more birds being released into the wild than anticipated. Although the final numbers of surviving birds in the wild were not provided at the end of the project, the population has continued to expand. Importantly, the reintroductions and other actions are credited with a positive change in the conservation status of the bird in Portugal from 'threatened' to 'vulnerable' (source: Portuguese Red Data Book). The project also contributed to the preparation of the EU Purple Gallinule Action Plan (1999), which was prepared by BirdLife International on behalf of the European Commission.

FURTHER ACTIONS

Industrial water pollution from outside the Natura 2000 site also affects it directly. Although a ditch ringing Arzila wetland drains polluted water and keeps the water found in the reed beds reasonably pure, it has been known to overflow during winter floods and pollute the core wetland. Both problems were tackled, at least partially; through a follow-up LIFE project (**LIFE00 NAT/P/007085**).

Purple gallinule (Porphyrio porphyrio) in the wild

Photo: Martien Brand

PLANTS

LIFE projects that have targeted plants with ex-situ conservation actions have often involved botanical gardens and universities as partners, drawing on the facilities and know-how of these organisations. Project actions typically begin with the collection and creation of seeds/germoplasm banks, followed by the setting up of germination protocols and nurseries and finally, population reinforcement and/or reintroductions. LIFE support in this area has been mostly focused on endemic species with restricted distribution ranges that only occur at one or very few Natura 2000 network sites. Ongoing projects include one in Hungary that aims to establish a Pannonian seed bank for the long-term preservation of seeds of the wild vascular flora of the Pannonian biogeographical region (**LIFE08 NAT/H/000288**). In Cyprus, a current LIFE+ Nature project is in the process of establishing a seed bank and plant collections for 85% of the country's endemic flora (**LIFE08 NAT/CY/000453**).

For more information on LIFE projects targeting plant species see the LIFE Focus publication:

LIFE reintroduces and reinforces **endangered flowering plants**

Two consecutive LIFE projects have used ex-situ conservation as a key tool in returning endangered endemic flowering plants - *Viola hispida* and *Biscutella neustriaca* - to the dry grassland and scree habitats of river valleys in northern France.

The Rouen pansy (*Viola hispida*) and *Biscutella neustriaca* are two species of flowering plant endemic to northern France included as priority for conservation in Annex II of the Habitats Directive. The calcareous grasslands and scree of the Seine and Eure valleys are essential habitats for these two species, which are limited to just two Natura 2000 network sites.

The plants have become endangered by the shrinking of their habitats as well as the distance between the small remaining populations. The modernisation of agricultural practices has been a key factor in this process. It has led to the abandonment of these areas and the encroachment of woody species to the detriment of flowering plants. A 1999 survey only found 2 000 *Biscutella* at 40 sites and even fewer Rouen pansies - 1 500 individuals at 10 sites.

Two LIFE projects have been working to restore the grassland and scree habitats of the Seine and Eure valleys. Project actions included the removal of dense and woody vegetation through the reintroduction of viable agro-grazing practices in collaboration with local farmers. However, the critical situation of the two flowering plant species also required special actions to conserve and increase their populations: ex-situ conservation has been an important tool in this process.

The first project, 'Espèces/Seine - Priority species, chalk grasslands and scree in the lower Seine valley catchment area' (**LIFE99/NAT/F/006332**) worked with the French National Botanical Conservatories to store the plants' seeds ex-situ and also carried out germination tests. This helped to create a stock from which to reinforce the natural populations and also ensure that the two species cannot become extinct.

Photo: LIFE99 NAT/F/006332

Viola hispida (right) and Biscutella neustriaca (left) - plant species targeted with ex-situ conservation actions

Following these preparatory actions and careful monitoring of the target species, plants were introduced to target areas either to reinforce existing populations or to recolonise areas from which the plants had disappeared completely.

VARYING CONSERVATION STRATEGIES NEEDED

Through detailed study of the biology of the two target species, the project learnt that *Viola hispida* seeds have good germination power even after a long time and that stripping scree created favourable conditions for the plant to return naturally in many areas. In contrast, the Biscutella seeds do not last and therefore the seed bank remaining in the soil cannot be relied upon to lead to the natural return of *Biscutella neustriaca*. This implied different conservation strategies for each species.

Building on the learning and experiences of the first project, a follow-up project was launched in 2006: 'Violette et Biscutelle - Rescue of *Viola hispida* and *Biscutella neustriaca* in the Seine Valley' (**LIFE06/NAT/F/000137**). This project is expanding the work of clearing and restoring areas of potential habitat for the small flowering plants. It is using plants from the ex-situ conservation actions in the botanical gardens to reinforce dwindling populations or establish new ones across the project sites.

Conserving the **rare** ***Dianthus diutinus***

Ex-situ propagation is an integral part of efforts to conserve the rare lasting pink *Dianthus diutinus*. Promising results from an ongoing LIFE project in Hungary show that seedlings can be grown under nursery conditions and successfully out-planted to their natural habitat.

Dianthus diutinus is an extremely rare plant which is only found in the Danube-Tisza Interfluve area of Hungary. It is strictly protected by Hungarian law and also recognised as a priority species for conservation in Annex II of the Habitats Directive. In the Article 17 assessment of the Habitats Directive, the plant's conservation status is categorised as 'unfavourable-bad', because of its small and declining population and a lack of suitable habitats.

The natural habitat of *D. diutinus* is open patchworks of grassland with scattered stands of forest (with native juniper and poplar species). However, natural habitats in their original state are rare, largely as a result of fragmentation and isolation effects caused by forestry.

To safeguard its conservation status, the LIFE Hundidi project (**LIFE06 NAT/H/000104**) is attempting to stabilise 85% of the presently known population stands of the Pannonic biogeographical region endemic *D. diutinus*. The project aims to create and establish a semi-natural habitat network by enlarging and connecting existing habitats at the three most important Natura 2000 network sites for the species in Hungary: Bodoglér, Bócsa and Csévharaszt.

Photo: LIFE06 NAT/H/000104

Flowering Dianthus diutinus

OUT-PLANTING IN RESTORED HABITATS

A key action of the project concerns the ex-situ propagation of new plants, which will then be used to populate these restored habitats, as well as to strengthen existing populations where the number of individuals is critically low. Moreover, the project actions included habitat restoration by eradication of non-indigenous tree species such as common milkweed (*Asclepias syriacae*) and by planting indigenous species. Attempts to remove milkweed specimens have however been less successful than hoped.

Scientists at the University of Szeged developed a methodology for the project's ex-situ activities involving:

- DNA analysis to help plan seed collection and out-planting;
- The establishment of a nursery in the botanical garden of the University of Szeged;
- Out-planting of 15 000 seedlings in the project sites; and
- DNA analysis to assess the effects of the out-planting.

Seeds were collected at each of the sites at two different time intervals: in the first and second part of the vegetation period. Only slight differences in the germination and survival rates of the seedlings from the different collections were noted. The raising and analysis of the plants in the nursery is ongoing and, so far, 16 255 ex-situ raised plants have been reintroduced to all project sites. This is already more than foreseen in the project objectives. Monitoring of the survival rate of the reintroduced *D. diutinus* specimens showed that a survival rate of 87% for the first 200 specimens reintroduced in autumn 2007.

Out-plantings took place in the autumn and spring of 2008, 2009 and 2010. Observations to date show that most of the autumn plantings have survived in the wild. Individuals planted in the spring fared less well, however. This was mainly attributed to an extreme spring drought, which is uncharacteristic in Hungary.

Photo: LIFE04 NAT/CY/000013

Recovery of habitats and plant species

For rare or threatened plant species and habitats, ex-situ conservation measures can provide a basis for recovery in the event of accidental loss or degradation. LIFE project actions involving the establishment of plant seed banks and plant micro-reserves are helping to advance knowledge in this area.

In Hungary, a LIFE project (**LIFE08 NAT/H/000288**) led by the Central Agricultural Office is focusing on the establishment of a "Pannonian seed bank" to support the long-term preservation of seeds of the wild vascular flora of the Pannonian biogeographical region.

Around 2 200 wild vascular plant species occur within the Pannonian biogeographical region in Hungary, a region rich in biodiversity and endemic species. The proposed Pannonian seed bank aims to collect and store approximately 50% of the native Hungarian flora (at least 800 species).

The project will develop a strategy for seed collection and ex-situ storage, building on existing methodologies, with duplicate seed banks being established at two different geographical locations: in a mine in the Aggtelek national park, and at the Institute of Ecology and Botany in Vácrátót. A computer-based information system for data management of the seed bank will also be developed.

Once established, a selection of seed bank samples will be used for pilot reintroductions in a typical sand steppe community with priority habitats in the Kiskunság National Park, a Natura 2000 site.

COASTAL DUNES WITH JUNIPER SPECIES

The establishment of a seed bank is also an important component of a LIFE project (**LIFE07 NAT/GR/000296**) in Greece,

Habitat restoration by planting nursery breed plants (yews) on Aitana mountain, Spain

Photo: LIFE03 NAT/E/0064 Luis Serra

which is focusing on the conservation of coastal dunes with *Juniperus spp.* in Crete and the South Aegean (Greece).

Coastal dunes with *Juniperus spp.* are a priority habitat (code 2250*) listed in the Habitats Directive, but in Greece, no conservation measures have been taken for the protection and restoration of this threatened habitat.

The project, therefore, aims to establish a basis for long-term conservation. Target sites have been selected to represent the full range of characteristics and threats found in all the habitat's locations in Greece, thereby strengthening the demonstration potential.

In addition to undertaking actions to protect and restore the habitat, a key objective of the project is to collect, store, and propagate the keystone species of the coastal dunes with *Juniperus spp.* outside of their natural habitat, thereby enhancing their conservation ex-situ.

Genetic material, both seeds and cuttings, is being collected from all Cretan sites for storage in a seed bank and for cultivation in the botanical garden of the Mediterranean Agronomical Institute of Chania (MAICh). According to results of the first stages of the project, there are 31 keystone species in the habitat in Crete. Seed lots of *Juniperus macrocarpa* and five other keystone species have already been collected. The drafting of germination protocols is under way for most of the collected species.

Seedlings coming from the germination experiments are cultivated in greenhouses and in the botanical garden. To date, most attention has focused on the germination and propagation of *Juniperus macrocarpa*. However, the processing of the seeds of this species as well as the germination experiments, have proved to be a difficult and time consuming task.

Cuttings of *Juniperus macrocarpa* have also been collected from populations in Kedrodasos and on the islet of Chrysi. Here again, the vegetative propagation of juniper has proven difficult. However, so far, about 200 cuttings of juniper have been successfully rooted and transplanted in pots.

HABITAT CONSERVATION IN CYPRUS

In Cyprus, ex-situ conservation is also a key aspect of a LIFE project (**LIFE08 NAT/CY/000453**) that focuses on the conservation of priority habitats (Cedrus brevifolia forests (*Cedrosetum brevifoliae*) and Scrub and low forest vegetation of *Quercus alnifolia*) and species (*Arabis kennedyae*, *Astragalus macrocarpus ssp. lefkarensis*, *Centaurea akamantis* and *Ophrys kotschyi*).

The project will seek to improve the conservation status of the priority plant species and habitats by establishing and managing a network of five plant micro-reserves (PMRs) - small plots of land that are of great value in terms of plant richness, endemism and rarity.

In addition to undertaking actions to reduce threats arising from recreational activities, fire, the use of pesticides, and the uncontrolled expansion of cultivated areas, the project also includes actions to promote the ex-situ conservation of plant genetic resources, aimed at securing the long term survival of the target species.

Seed lots will be collected over three successive years for storage in a seed bank and in living plant collections. This will help to facilitate the project's longer term goal of enriching the natural populations of the targeted species and habitats, as most are believed to have low genetic variability and to suffer from genetic erosion. Greater genetic diversity will help to improve their resilience, in particular against the threat of climate change.

RESTORING HABITATS IN RÉUNION

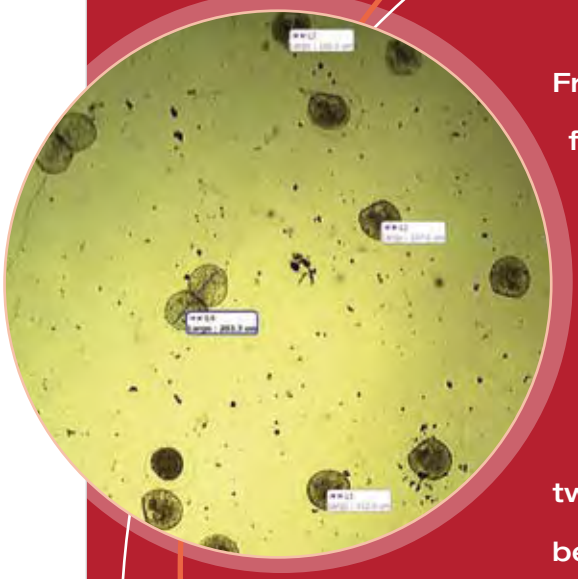
Réunion is classified as one of the world's top 25 hotspots for land biodiversity. The semi-xerophilous (semi-dry, drought loving) habitats represent some of the most remarkable habitats of the island. Now completely disappeared from other areas of the Mascareignes, today these habitats are estimated to cover only 1% of their original area (56 800 ha) on Réunion.

These last relics are subject to significant natural and man-made threats and are present today only in degraded form and in inaccessible areas (gullies and cliffs). The project (**LIFE07 NAT/F/000188**) aims to restore 9 ha of the unique semi-xerophilous habitats on Réunion to their original condition with the help of ex-situ actions. The project expects to reinforce the populations of at least 22 rare and endangered species typical of the habitat by collecting their seeds and producing the plants in nurseries.

School children on Réunion learn about the restoration of endangered habitats

Photo: LIFE07 NAT/F/000188

INVERTEBRATES



Freshwater pearl mussels and freshwater crayfish have been the only invertebrate species targeted with ex-situ conservation actions by completed LIFE projects (a recently started German project – **LIFE09 NAT/DE/000010** – is aiming to reintroduce the marsh fritillary butterfly in four sites). Project actions for the two endangered aquatic invertebrates have been quite distinct, because each species has very specific ecological requirements. All the projects targeting freshwater pearl mussels have involved the ex-situ action of controlled infection of fish held in captivity (normally brown trout and salmon) with the parasitic pearl mussels' larvae (Glochidia) followed by the release of the "infected" fish to rivers. Two current projects – **LIFE09 NAT/ES/000514** in Galicia (Spain) and LIFE09 NAT/FR/000583 in Brittany (France) -- are also adopting this approach.

Ex-situ breeding programmes are playing a huge role in the conservation of the white-clawed crayfish, an indicator species of river cleanliness. In Italy, LIFE projects have supported actions to introduce individuals into new areas and bolster endangered populations.

Breeding healthy **crayfish populations**

The white-clawed crayfish (*Austropotamobius pallipes*) is extremely susceptible to water pollution and its range in Europe has decreased markedly in recent decades. It is also threatened by habitat degradation, poaching, the introduction of exotic species, disease and the isolation of populations. For reintroductions to be successful, habitat preparation and protection is essential and research is first required to determine possible sites for actions.

It is not only water quality, but the environment as a whole that determines the feasibility of a site. For example, tree cover is important because, without such shade, the sun can heat up the water to temperatures that are too high to support crayfish (the limit is 25-27 °C).

The Italian province of Chieti in the Abruzzo region has managed two LIFE projects: 'Austropotamobius pallipes: protection and management in SAC sites of Central Italy' (**LIFE03 NAT/IT/000137**) and the ongoing project, 'Conservation and Recovery of Austropotamobius pallipes in Italian Natura 2000 Sites' (**LIFE08 NAT/IT/000352**). Project sites, however, ranged over six other provinces in three other regions (Molise and Marche as well as Abruzzo for the first project with the addition of Lombardy for the second). An Action Plan for the crayfish was produced by the first project and is being updated by the follow-up project. The reintroduction programme is the mainstay of this plan, consisting of the establishment of a range of breeding sites and extensive analyses of sites to determine their suitability for the species.

Dr Tommaso Pagliani, head of the Environmental Science Centre – Mario Negri Sud Consortium, Chieti, says that there are four ways of carrying out reintroductions: simple transfer of ex-situ bred individuals into protected sites; reintroductions into sites where there are no longer populations; the transfer of females with eggs from one area to another to improve fitness; and introductions into newly created sites, the "source areas". Dr Pagliani describes the latter as a "totally new methodology", inspired by the channels used in agriculture. "These channels are a very good habitat because they contain vegetation beneficial for crayfish," he says.

Photo: LIFE03 NAT/IT/000147

Captive breeding of freshwater crayfish (female showing eggs)

THE BREEDING PROCESS

The reproductive cycle of crayfish begins in November, the mating season. Eggs are hatched in December and stay on the abdomen of the mother until the following July, when the eggs open. The newborn crayfish stays under the mother for a couple of weeks and then falls down. In the reproduction centres they are removed from the mother to prevent her from cannibalising her own young. Individuals for breeding are captured either by hand or in traps with bait. A ratio of two females to one male is maintained at the centres.

It is not very difficult to control the captive breeding process, but the great sensitivity of crayfish to chemicals in water can pose a problem. For example, in the centre of L'Aquila, also used for trout aquaculture, the water could contain traces of chemicals used to control diseases, which damages the health of the species, and at the centre in the Grand Sasso National Park, low oxygen content has created difficulties. One solution is to use spring water, an option that is also being considered even at successful centres such as the one at Borrello.

The research centre in the Mario Negri Sud Consortium, Chieti, is home to a special breeding centre. According to Dr Pagliani, "it will demonstrate that ex-situ reproduction of the species is possible

Photo: LIFE03/NAT/IT/000137

Measuring water quality parameters prior to reintroduction

very far from the site even in unnatural conditions.... Autochtonous crayfish can be saved anywhere," he says. At present the team at the centre are working to create optimum conditions in the tanks for the arrival of individuals, and the breeding programme will shortly be up and running. Around 50-100 adults will be brought in and some 1 000 young are expected to be produced in the first breeding cycle. The sub-population from central Italy will be reintroduced to those sites of greatest genetic similarity. "We will respect the great biodiversity of the species," says Dr Pagliani.

Without LIFE support, it would have been difficult to buy the facilities needed to carry out the breeding programme. Through the course of the projects, the beneficiary has acquired valuable knowledge of the species. It is important that individuals taken from populations involved in the breeding programme are not mixed until it can be determined that they are from the same species (Analysis is conducted at the University of Piemonte Orientale). In fact, the ambition of the organisers is to establish a separate breeding centre in each river basin. The current LIFE project may lead to an unforeseen action - the creation of a reproduction centre in Santa Maria del Molise.

A DEMONSTRABLE LEGACY

The organisers of the projects are eager to demonstrate that their actions have tangible results. The initiative, which includes a five-year 'After Plan', must show that is possible to return to population sizes comparable to those before invasive species were introduced into rivers and streams or it must reveal new populations. In fact, three new populations were recently found in Aterno and analysis is currently being carried out to determine whether these are a positive result of LIFE. No direct reintroductions were performed in these sites, but the populations could be moving.

More specifically, at the end of the first project more than 4 400 young individuals and 277 adult individuals were released in 18 SCIs. The ongoing project expects to result in the production of 23 200 juvenile native crayfish specimens and the creation of at least three source areas for the spread of the species. It will also assess the current distribution of the species in 47 SCIs.

Dr Pagliani believes that it is also important to demonstrate the economic value of his centre's work. He hopes that "the experience of the project will encourage others – maybe in Portugal or Greece where the species has been lost – to bring back this beautiful part of biodiversity."

OTHER INITIATIVES

A restocking programme of the white-clawed crayfish was also carried out as part of the project, 'Valvestino Marogna 2' (**LIFE03 NAT/IT/0000147**) in northern Italy. At the SCIs, Val Vestino and Corno della Marogna, breeding techniques were improved and 610 young crayfish were introduced into natural habitats.

Crayfish reintroductions were also carried out as part of the project, 'Conservation of Austropotamobius pallipes in two SIC sites of Lombardy' (**LIFE00 NAT/IT/007159**). More than 3 000 individuals collected from parts of Oltrepo and Lecco were released in two pSCIs (the rivers Ticino and Pegorino). Genetic and sanitary studies were undertaken to choose the source populations, and reintroduced animals were permanently marked in order to facilitate monitoring. The extent of the naturalisation of the reintroduced population, the presence of newborns and the overall dispersal patterns of the released specimens were observed. The population of crayfish, which was introduced to semi-natural conditions in a pool of the Ticino Park, is being used as a source for future reintroductions.

Captive breeding nests for crayfish

Photo: Jon Eldridge

Mussel reintroductions overcome great difficulties

Despite significant challenges, reintroductions of freshwater pearl mussels have been successfully carried out by LIFE projects across Europe, thereby demonstrating an effective way of conserving this endangered species.

Freshwater pearl mussels (*Margaritifera margaritifera*) live in fresh, running water streams or rivers with clean bottoms bordered by alluvial forest. The presence of the species is therefore a good indicator of clean water. Much conservation work has focused on restoring riparian habitats, as well as ensuring the health of populations of host fish. The mussels have a parasitic lifecycle stage dependent on a host fish (normally brown trout or salmon) before they reach maturity.

However, it is possible to rear mussels in a breeding station, such as the one established by a LIFE project in Luxembourg (**LIFE05 NAT/L/000116**).The regular reintroduction of young pearl mussels, the beneficiary hopes, will reinforce the size of the surviving population. The reintroduction programme forms part of a conservation plan that includes such measures as monitoring and reinforcing the trout population.

In Sweden, with the help of LIFE (**LIFE04 NAT/SE/000231**), 1 000 mussels were reintroduced into nine locations at one project site at Silverån. The mussels were taken from a healthy and relatively abundant population in the River Sällevadsån. Monitoring found that the mussels were surviving, but could not yet find glochides on the gills of host fish, which would demonstrate reproduction. However, young trout that could become hosts for the pearl mussel were found in restored areas.

PAN-EUROPEAN EFFORTS

The German project "Large freshwater mussels Unionoidea in the border area of Bavaria, Saxonia and the Czech Republic" (**LIFE02 NAT/D/008458**) released young freshwater pearl mussels five times in the Südliche Regnitz and Zinnbach creeks and on two occasions in the Höllbach and Mähringsbach creeks. The project used the following technique: brown trout were infected with mussel larvae in a fish farm; after nine months the young mussels come off the fish gills and are collected from the fish tanks using fine sieves and are infiltrated into the cleaned bottom of the brook via a tube: some 342 000 individuals were released in total. This technique was also used for another mussel species, the thick shelled river mussel (*Unio crassus*), with the release of 115 000 young mussels in the project sites.

Photo: Aixa Sopeña

Freshwater pearl mussel (Magaritifera auricularia) recovered from the wild to increase captive breeding stocks

An ongoing UK project (**LIFE08 NAT/UK/000201**) is also developing an assisted breeding programme with the aim of reintroducing the species to the Irfon catchment area in mid-Wales. However, freshwater pearl mussel reintroductions can be very difficult to achieve. A Spanish LIFE project (**LIFE04 NAT/ES/000033**) was unsuccessful in its attempts to breed another freshwater pearl mussel species (*Magaritifera auricularia*) in captivity. The project team infected 100 fish and recovered 115 000 juveniles. Yet, despite using several different methodologies, none of the juveniles managed to grow and survive beyond 10 weeks. As a result, no infected fish or juvenile mussels were released into the wild. With no natural breeding in wild populations (the youngest specimen being over 70 years), the future for the species looks bleak in Spain.

Development of the captive breeding programme for freshwater pearl mussels

Photo: Aixa Sopeña

AMPHIBIANS

To date just four LIFE projects have established ex-situ conservation actions targeting amphibians. The two main species targeted have been a subspecies of the common spadefoot (*Pelobates fuscus insubricus*) and the fire-bellied toad (*Bombina bombina*). Project actions have included captive breeding followed by reintroduction on restored habitats such as ponds and lakes at defined Natura 2000 network sites. Often the aim is to increase the genetic variability of the target species by reinforcing existing populations or establishing new ones.

For more information on LIFE projects targeting amphibians see the LIFE Focus publication: *LIFE and Europe's reptiles and amphibians: Conservation in practice*

Ex-situ conservation and reintroduction of **the fire-bellied toad**

A number of LIFE projects have used ex-situ conservation measures to promote the conservation of the fire-bellied toad (*Bombina bombina*).

The fire-bellied toad has a preference for low marshy or grassy wetland areas with small lakes and ponds, often near rivers. Occasionally it is found in (forest) steppe areas and forests. The species has declined in numbers as a result of water pollution caused by agricultural intensification and industry, as well as habitat fragmentation. The European fire-bellied toad is listed in Annex II of the EU Habitats Directive and its conservation status is assessed as 'bad' in most geographical regions (Alpine, Atlantic and Boreal) under article 17 of that directive.

In Latvia, one of the species's strongholds, the fire-bellied toad was found at only four sites in 2004, with only an estimated 90 calling males by 2006. In an effort to establish a new breeding population of the species, a LIFE project (**LIFE04 NAT/LV/000199**) on the protection of habitats and species in the Razna nature park included measures to reintroduce the fire-bellied toad to the park.

In order to facilitate the reintroduction of the species, Latgale Zoo established a captive breeding programme for *Bombina bombina*, starting off with five mature toads. As a result of the programme, some 870 individuals were reintroduced to selected wetlands in the park between 2006 and 2008. The project team also restored four ponds in Makoņkalns rural municipality to make the habitat favourable to fire-bellied toads and ensure their survival. The captive breeding programme is continuing after-LIFE, with up to 300 individuals being released and monitored each year by researchers working in co-operation with Latgale Zoo.

Photo: LIFE04 NAT/DE/000028

These juvenile fire-bellied toads (Bombina bombina) are ready for release to the wild

BUILDING RESILIENCE

Building on the experience of this Latvian project, a LIFE project (**LIFE04 NAT/DE/000028**) involving a collaboration between conservationists in Latvia, Sweden, Denmark and Germany used genetic analysis to learn more about the resilience of different populations of fire-bellied toads and to facilitate the introduction of genetically appropriate animals from captive breeding to reinforce selected wild populations.

Rearing centre for fire-bellied toads

Photo: Hauke Drews

Project actions involved the spawning of mated toads in cages and the collection of eggs in spawning areas; the raising of tadpoles in artificial water basins; and the release of juvenile toads. During an extensive breeding programme, more than 25 000 fire-bellied toads were raised and released back into the wild. In-situ, a range of habitat improvement actions, such as the development of new ponds and hibernation sites, also helped to prepare the ground for the reintroductions.

A more recent project (**LIFE09 NAT/LV/000239**) aims to build on earlier LIFE support to further increase the fire-bellied toad population in Latvia and ensure its long term survival. In addition to creating a new Natura 2000 site in the Daugavpils district, which is home to one of the largest *Bombina bombina* populations in the country, a "Rare Reptile and Amphibian Breeding Centre" will be set up with the purpose of breeding fire-bellied toads and the endangered European pond turtle (*Emys orbicularis*) ex-situ. An estimated 3 000 juvenile fire-bellied toads will be raised in the centre and released by the end of the project.

Digging deep for **the spadefoot toad**

LIFE support for the establishment of a captive breeding centre represents a key element of efforts to improve the conservation status of the spadefoot toad.

Pelobates fuscus insubricus, commonly known as the spadefoot toad, is an endemic subspecies of amphibian found in only a few localities of the Po Basin, in northern Italy. The rarest and most restricted amphibian in Italy, it has been classified as an endangered species since 1975 and is a priority species for conservation included in Annex II of the Habitats Directive. This toad is also one of the most threatened species of amphibians in Europe.

The subspecies is represented by an estimated 13 populations, which are breeding actively but are geographically isolated and contain very small numbers of individuals. In recent years a sharp decline has been observed both in the number of individuals and the number of sites where they occur.

The surviving populations are simultaneously threatened by human activities, such as agriculture (drainage of pools) and recreation (introduction of exotic fish for angling), as well as by natural factors (reclamation of wetlands). The introduction of the invasive American bullfrog (*Rana catasbeiana*) which competes against the spadefoot toad represents another threat to the subspecies.

Photo: LIFE00 NAT/IT/007233

Pelobates fuscus insubricus

CAPTIVE BREEDING CENTRE

An Italian LIFE project dating from 1998 (**LIFE98 NAT/IT/005095**) carried out urgent conservation measures at spadefoor toad breeding sites, in particular those sites included in the Natura 2000 network.

One of the main actions of the project was the establishment of a captive breeding centre to raise cohorts of toads of different ages for release at secured sites. Although the project did not release any captive bred spadefoot toads into the wild, it can be considered the first Italian experience in amphibian conservation and it furnished new data on the reproductive characteristics of the species. This know-how was put to good use by a follow-up project led by Ticino Regional Park in Piedmont (**LIFE00 NAT/IT/007233**).

This second Italian project focused specifically on the main population of spadefoot toads, which was located in two Natura 2000 sites in the regional park. The number of specimens there was estimated to be more than 50% of the entire known population of the species. The project developed the existing captive breeding centre by adding more pools and deepening the irrigation canal. During the project, 100 *Pelobates* tadpoles were successfully bred in the centre, although this did not have a significant effect on population reintroduction and reinforcement.

However, the project did successfully carry out actions to improve the habitat of the species and reduce threats. These included the creation of two underpasses with side road barriers for toad migration, the restoration of wetlands in known reproduction sites, purchasing of land and land rights (5.2 ha in total) and monitoring and awareness actions. In addition, five new water bodies were identified as potential reproductive sites.

As a result of the project actions, the species resettled some of its historical sites. Another valuable outcome of the project was the fact that genetic analysis showed that the subspecies *Pelobates fuscus insubricus* is a distinct taxon.

FISH

A total of 13 LIFE Nature projects have targeted fish species with ex-situ conservation actions since 1992. Over 10 species have been targeted, with four species – the Loire salmon, Spanish toothcarp, allis shad and European sturgeon - being subject to the actions of more than one project. Actions have included setting up reproduction protocols for breeding in aquariums or fish farms, followed by the release into rivers of juvenile fish and fry. Typically, to ensure a successful reintroduction, large numbers of captive-bred fry must be released. For instance, one Estonian project (**LIFE07 NAT/EE/000120**) aims to reintroduce 50 000 one-summer-old fry of the asp (*Aspius aspius*) into the Emajõgi river. Success also often entails persuading anglers and fish farms to become involved with and support a project's ex-situ actions and river habitat restoration.

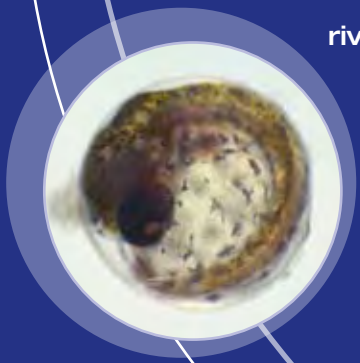


Photo: LIFE06 NAT/D/000005

A LIFE project developed a successful European breeding programme for the allis shad and started reintroducing the fish to the Rhine. Managing a programme for capturing and breeding fish in France and transferring them to Germany has been a major challenge and an exciting success story

Returning **allis shad** to the Rhine

Allis shad (*Alosa alosa*) is a herring-like fish species that lives in saltwater but returns to freshwater to breed. The fish migrates up European rivers when the water temperature rises above about 11°C, spawning in water of at least 16°C. Historically, the spawning process created so much splashing that the fish was nicknamed 'bull' in French. The German name for the species - Maifisch - reflects its spawning period around the month of May and also shows how well-known the 'bull' would have been in riverside communities.

The eastern Atlantic and North Sea were densely populated with the fish, which was culturally and economically important far upstream in rivers such as the Rhine. At the end of the 19th century more than 250 000 allis shad were caught each season in the Dutch stretch of the Rhine alone. The fish was sold in local markets and hostelries - its cultural importance is reflected in historical documents and even paintings.

However, over-fishing, increasing river pollution, destruction of spawning grounds and the construction of river obstacles such as dams and weirs all but eradicated the species from the Atlantic tributaries by the middle of the 20th century. Major hauls of the fish in the Lower Rhine stopped in the 1940s. Since then, the fish has been considered extinct in the Rhine and in most Atlantic tributaries. The species is listed in Annexes II and V of the EU Habitats Directive.

MOTIVES FOR REINTRODUCTION

The idea of reintroducing allis shad to the Rhine was motivated by several factors, as Dr Andreas Scharbert, one of the LIFE project managers from the Rhineland Fishing Association (RhFB – a project partner), explains: "It is clearly important biologically to improve the conservation status of the fish. But there is also a strong cultural, human element." Indeed, despite its long disappearance from the Rhine, the fish lives on in the cultural heritage of the region. There is a Maifisch Street in Cologne and the folk festival Maispill still commemorates the allis shad every year in the former fishing village of Poll.

RhFB had the idea for an allis shad reintroduction programme based on the experiences of the existing North-Rhine Westphalia (NRW) migratory fish programme. Many of the pollution problems facing the river had already been alleviated by environmental legislation and greater awareness of river pollution. The programme therefore focused on overcoming river barriers. By constructing fish ladders across weirs, it demonstrated improved access to spawning grounds for migratory fish such as salmon and North Sea houting.

The challenge with the allis shad was that, although the conditions for it to prosper in the Rhine seemed to exist, there were not enough individuals in the river to re-establish a sustainable population. Individual sexually mature allis shad were sometimes found upstream in the Rhine, but there had been no evidence of any successful reproduction of the species there for decades. Dr Klinger from the project beneficiary, the NRW State Agency for Nature and the Environment, highlights that "some people believed that the fish would return naturally, but it was clear to the agency that the fish needed a helping hand."

One thing in the species's favour was that relatively large spawning populations had survived, albeit only in a few rivers in south-west France, notably the Garonne and the Dordogne. The German partners therefore started to consider a restocking programme, based on catching and spawning of allis shad from the sustainable stocks in France.

The allis shad larvae develop in a rearing basin

Photo: LIFE06 NAT/D/000005

Photo: LIFE06 NAT/D/000005

The fish were injected with a hormone to stimulate spawning

The result was the LIFE project 'Maifisch - The re-introduction of allis shad (*Alosa alosa*) in the Rhine System' (**LIFE06/NAT/D/000005**).

Creating multi-national co-operation was essential to the project's success. NRW contacted CEMAGREF (a French public research institute specialising in environmental technologies) to carry out preparatory work. Dutch partners were brought on board for their control over the river delta and their expertise in tracking other migratory fish, such as salmon. Expertise in capturing, breeding and transporting American shad (*Alosa sapidissima*) was also harnessed through a US expert.

Preparatory work included a feasibility study of the ex-situ conservation programme, financed by the HIT foundation, and more detailed investigations of the suitably of conditions in the Rhine for the allis shad. The species likes to spawn in fast-flowing, shallow waters with gravel beds. However, unlike the French rivers, the Rhine has been subject to extensive hydraulic modification, notably the demolishing of gravel banks and filling of deep washouts to create waterways with homogenous depth for shipping. The shipping itself and the wash it creates was another potential threat.

Investigations by US and French experts concluded that existing fish ladders provided access to sufficient well structured sections of the Rhine to offer adequate spawning grounds and habitats for the fry. Experiments also concluded that allis shad fry are quick to adapt to the effect of shipping on water movement and are able to move to areas close to the ground and away from banks to reduce their risk of being grounded. Thus, the conditions for a successful restocking of allis shad in the Rhine were judged to be in place.

DEVELOPING A EUROPEAN BREEDING PROGRAMME

Tests on individual allis shad caught in the Rhine proved that they were very similar to the Garonne population. This made France a highly suitable potential source for fish to restock the Rhine. Furthermore, CEMAGREF had some, albeit limited, experience of breeding allis shad successfully. With the support of the US expert, experience gained with restocking shad populations from captive breeding programmes was taken as the basis for developing an adapted European strategy.

"Every aspect of the conservation programme was a major challenge for us," recalls Dr. Scharbert. "Capturing, breeding, transporting and releasing the allis shad.... we had no experience of any of these stages. But we saw from the US that it could work." The experience of CEMAGREF was also to be crucial as it had recently developed techniques for

capturing shad in the fish lifts used to raise them over river barriers.

CEMAGREF's capturing techniques had two major advantages. Firstly, they overcame the extreme fragility of the allis shad, enabling them to be caught and moved into suitable transport containers without removing them from water or subjecting them to nets or electric currents. Secondly, they ensured that only sexually mature fish that were already migrating to spawning grounds were captured, thus increasing the likelihood of obtaining suitable gametes.

CEMAGREF shared its knowledge with MIGADO - the Association for restoration and management of migratory fish in the Garonne and Dordogne basins - which was responsible for catching and transporting adult allis shad in the project. MIGADO ensured that it had enough of each gender before moving the fish into special round channel containers with oxygen inflow for transportation. They were driven to a contracted fish farm in Bruch, also in south-west France, where the project had funded the construction of an extension to the existing facilities.

MIGADO oversaw the breeding programme. A hormone was injected into each fish to stimulate the release of gametes. This was done through a water-filled plastic bag so that no physical contact was necessary with the fish, which were then released into pools. Flowing water was maintained at around 20°C and in darkness to imitate the natural spawning conditions of the fish. Optimum fertilisation was achieved with a ratio of between 2:1 and 3:2 males to females.

The process developed involves the fertilised eggs dropping through a bottom outlet in the pools and transferring to an oxygenated water circuit where they can develop. Once hatched - approximately four days after fertilisation - the larvae eat their yolk and pass over the rim of their incubation jars into a rearing basin where they need to receive food that is as close as possible to their natural food - freshwater plankton.

Photo: E.Braun

The first captive bred allis shad being reintroduced to the Rhine

The newly hatched larvae of *Artemia salina* (a type of brine shrimp) are a suitable food for allis shad and the project therefore ran a simultaneous captive breeding programme for this salt-water crustacean. The shrimp are fed into the basin through an automated dosing system during the early days of the shad's life. This programme was successful, but also relatively expensive, so as the shad grow older, they were instead fed on much cheaper dry food.

The experiences of the project enabled optimisation of all stages of the processes. Particular adjustments were made to the temperature, salinity and lighting of the water at different times. From the first attempts in 2008 to the end of the project in 2010, survival rate of eggs

The shad were introduced to the river carefully

Photo: LIFE06 NAT/D/000005

during incubation increased from 28% to 65%, the survival rate of larvae from 49.8% to 95.6% and the number of larvae per female increased from 9 412 to 24 696.

RESTOCKING OF THE RHINE

A final key innovation of the project was to develop a successful marking system for the fish so that they could be tracked after release. As Dr Scharbert explains, "It is not viable to raise young allis shad in captivity to a size where they can be visibly marked on the outside before release." The challenge was therefore to mark the fish whilst still just a few millimetres long.

The adopted approach was to immerse them in a fluorescent dye solution, which marks bony structures such that they can be seen under a fluorescence microscope. The time since the dye was applied can also be deduced. The project experimented with exposing the fish to different concentrations of the dye oxytetracycline (OTC) for different lengths of time before settling on the level that provided the clearest markings without excessive increases in mortality - 300ppm OTC solution for four hours.

The marked larvae were transported to Germany in large plastic sacks filled with one-third water and two-thirds pure oxygen, and containing up to 12 000 larvae. Release sites were chosen for their accessibility to the transportation vans, the quality of the habitat they offer the young fish and low risks from predators, strong currents and wash. Sites chosen – all linked to the Rhine – included a relatively natural tributary, a moderate-flowing channel and former gravel pits. A pre-release stage was sometimes implemented in which the fish were introduced to the water within containers and provided with food. Full release was usually at night to minimise the risk from predators.

Photo: LIFE06 NAT/D/000005

Juvenile shad were found to have developed in the Rhine

The restocking activities were accompanied by further investigations and monitoring activities to increase understanding of the species's behaviour and needs. Tracking of the fry after release was extremely difficult, because of the small size and translucent colour of the fish. However, the success of restocking was proven when the first young adult fish was caught downstream by a fisherman in Holland in September 2010. "We were delighted when we heard that someone had caught an allis shad in the Rhine. Then they caught 30 in two months!" enthuses Dr Klinger.

The caught fish were an impressive 12-14 cm in length and their markings revealed that they had been released earlier that year. They were clear evidence that a substantial number had survived the most dangerous period of their lives and were developing into adults. It is hoped that mature allis shad will return to the Rhine to spawn over the coming years, but by its conclusion, the project had already demonstrated tremendous success in breeding, marking and releasing the species.

Continued restocking is needed to build on the project's success and achieve a sustainable allis shad population in the Rhine in the long-term. A follow-up LIFE+ project (**LIFE09 NAT/DE/000008**) intends to release a further 10 million larvae from the breeding programme into the Rhine tributaries as well as establishing a pilot ex-situ facility in Germany. This aims to improve the sustainability of ex-situ conservation of allis shad and reduce pressure on the French population, which has suffered an unexplained decline since 2006. Possible migration barriers in the French rivers will also be identified and tackled.

Making children aware of the allis shad reintroduction

Photo: LIFE06 NAT/D/000005

Project number: LIFE06/NAT/D/000005

Title: The re-introduction of allis shad (*Alosa alosa*) in the Rhine System

Beneficiary: Landesanstalt für Natur, Umwelt und Verbraucherschutz NRW (LANUV)

Contact: Heiner Klinger

Email: heiner.klinger@lanuv.nrw.de

Website: http://www.alosa-alosa.eu

Period: 01-JAN-2007 to 31-DEC-2010

Total budget: €956 000

LIFE contribution: €478 000

High breeding rate boosts struggling **Spanish toothcarp**

A LIFE project targeting the rare Spanish toothcarp has carried out a range of conservation measures, including the restoration of sites for reintroduction, the drawing up of protocols and the development of facilities for implementing a captive breeding programme.

The Spanish toothcarp, or 'fartet' (*Aphanius iberus*) is a small fish species (< 5cm) endemic to the Spanish coastline. In last decades 40% of the total population of the species has disappeared, dividing its range into smaller and smaller subpopulations. The reasons for the toothcarp's decline are the destruction of habitat, unsuitable land uses and practices, the proliferation of exotic species that compete with it or predate it, and the absence of specific knowledge about the species, which impedes proper management and awareness-raising activities.

To counteract these threats, LIFE co-funded a project - 'Fartet Murcia - Conservation of Aphanius iberus genetic stocks (Murcia)' (**LIFE04 NAT/ES/000035**) – that has introduced a recovery programme to safeguard the future of the species.

CAPTIVE BREEDING PROTOCOLS

A key part of the recovery programme was the development of protocols for captive breeding and maintenance of the species. Several studies, such as the analysis of various physicochemical parameters, photoperiod, substrate types and proportion of breeding in aquariums, were carried out in order to optimise these protocols. An analysis of the composition of the toothcarp's diet, especially the diet of young specimens, was also carried out in order to increase its survival rate.

Male spanish toothcarp in the captive breeding centre

Photo: Carlos Gonzalez Revelles

The project aimed to avoid genetic contamination among the species's two breeding lines – one from the Chícamo River and other from the Marchamalo salt pans. To achieve this captive breeding took place in two separate locations. In addition to laboratory breeding, pools were installed outside to keep individuals under semi-captive conditions prior to reintroduction.

Other important project actions in support of the reintroduction programme included the restoration of two potential places where the Spanish toothcarp could be reintroduced – the ponds of the Rambla Salada complex and the entrance to the Rasall salt pans – and the eradication of invasive alien species (mainly Gambusia and the American red crab) in the Chicamo river and at Rambla Salada.

The project also developed a programme for the monitoring and biological assessment of all of its target actions. This revealed that results of ex-situ actions were satisfactory: the survival rates of hatched eggs, larvae and young fish was high (around 70% on average). Specimens were released following the guidelines established by the "Protocol for the Establishment of Fartet Populations in Murcia", which were developed within the framework of this LIFE Project. The monitoring programme developed by the beneficiary is ongoing, and genetic studies on the captive Spanish toothcarp population have also been undertaken. With the project, the species management plan for the region of Murcia was drawn up, but still needs to be endorsed.

Photo: LIFE04 NAT/ES/000035

Restoring water flow and levels in coastal lagoon habitats for the Spanish toothcarp

Project number: LIFE04 NAT/ES/000035

Title: Fartet Murcia - Conservation of Aphanius iberus genetic stocks (Murcia)

Beneficiary: Consejería de Agricultura y Agua

Contact: Pablo Fernández Abellán

Email: juanf.martinez@carm.es

Website: http://www.carm.es/siga/europa/life0035/

Period: 01-JAN-2005 to 31-DEC-2008

Total budget: €1 237 000

LIFE contribution: €574 000

Early success signalled for in-vitro reproduction and trial reintroductions of **Rhone streber**

A recently-closed French project has shown early successes in the reproduction in captivity and trial reintroductions of a critically endangered fish species, the Rhone streber.

The Rhone streber (*Zingel asper*) is a member of the perch family, only found in the Rhône river catchment area. The fish is considered 'in critical danger of extinction' on French territory. Its population declined seriously during the 20th century: where once it was found along an estimated 2 200-km stretch of river, today the figure is just 240 km. The main reasons for this decline are hydraulic engineering works such as dams that have created barriers and thus isolated sub-populations of the species from each other. River pollution and flow changes caused by water abstraction for agricultural purposes have also led to a severe degradation of the Rhone Streber's habitat.

Photo: LIFE04 NAT/FR/00083

Rhone streber (Zingel asper)

A first LIFE Nature project (**LIFE98 NAT/F/005208**) carried out an extensive survey of the presence of the species in French rivers. Currently, the remaining sub-populations are localised on the following rivers: the Loue; the Ardèche and its tributary the Beaume; the Durance and some of its tributaries (Buëch, Jabron, Asse, Verdon); and the Drôme. The three-year project considerably improved knowledge about the ecological requirements of the Rhone Streber. Importantly, it also conducted a feasibility study for rearing the species for reintroduction purposes and published guidelines for a long-term conservation strategy.

HATCHING FRY

A second project was put in place (**LIFE04 NAT/FR/000083**) for this species. The first stage of the project's captive breeding and trial release programme, however, has already shown positive results. In collaboration with Besançon Natural History Museum (a project partner) tests started in 2005 on the reproduction of the fish in captivity. This led to the hatching of thousands of fry and confirmed, for the first time, the feasibility of this methodology for conserving the species.

Trial releases into the Drôme river were then carried out in 2006, 2008 and 2009 with individuals bred in captivity. In total, some 1 700 Rhone strebers were released and monitoring has confirmed the survival of individuals after two years. Whilst it is still too early to make substantive conclusions from these early results – the monitoring time during LIFE was too short to prove that individuals hatched in captivity could reproduce in the wild - the pilot reintroductions are nevertheless very encouraging.

The project was not an unqualified success, however: tests on reproducing the species in captivity were also run at another site (the Lake Bourget aquarium) and these failed. The beneficiary concluded that the success of this type of operation is dependent on a high degree of technical input, requiring highly skilled personnel.

Habitat conservation actions played an important role in the success of the reintroductions: the construction of five fish passes allowed intra-population mixing and population increases at favourable habitats.

Whilst it is too early to assess the project's effectiveness in halting the overall decline of the species, the actions implemented with the support of LIFE point to a major contribution towards reaching this objective.

Reinforcing the rare **Adriatic sturgeon** in Italy

Thanks to captive breeding, restocking and the reduction of numbers of an invasive freshwater species, an isolated population of very rare Adriatic sturgeon has been preserved in the river Ticino in northern Italy.

The Adriatic sturgeon (*Acipenser naccarii*), a priority species for conservation according to the Habitats Directive, is only found in the Adriatic basin. It has a complex lifecycle, characterised by seasonal migrations from the sea to spawning areas, located in the middle reaches of rivers. In the Po river basin in Italy, numbers have declined drastically in recent years, mainly as a result of a hydroelectric dam built in the 1960s that prevents the sturgeon from reaching its main spawning areas. However, a population of sturgeon that passes its entire lifecycle in freshwaters has adapted itself for survival in the lower river Ticino, a Po tributary. This surviving population, isolated from the sea by the Isola Se dam, was the target of the 'Acipenser Ticino-Lomb' project (**LIFE03 NAT/IT/000113**).

Managed by the Ticino regional park in Lombardy, the project targeted the protection of this sturgeon population through improvements to its spawning habitat, and restocking with bred sturgeons originating from the same Po river catchment area. Knowledge of the species has been strengthened by studies on reproductive and spatial behaviour and a number of key threats were tackled: For example, the project purchased fishing rights on a strategic tract of the river where the sturgeon breed, so as to directly control fishing. And to reduce competition, some 2 000 sheat-fish (*Silurus glanis*), an invasive freshwater species, were removed from targeted areas in three Natura 2000 sites.

'LANDLOCKED'

These measures proved effective in preserving the 'landlocked' population of the Adriatic sturgeon in the river Ticino.

One of the species's main threats is the reduced genetic variability of its populations that resulted from its isolation. To overcome this threat, the project repopulated the river with bred sturgeons, coming from the same river basin. The fish selected to start the breeding programme were chosen because they showed similar levels of genetic variability to other natural populations.

The LIFE project spent two years developing artificial reproduction techniques with a group of mature sturgeons. The project beneficiary was able to gain the experience and technical know-how to commence breeding of the Adriatic sturgeon using the regional park's structures.

Photo: LIFE03 NAT/IT/000113

Detail of the head of an Adriatic sturgeon in captivity

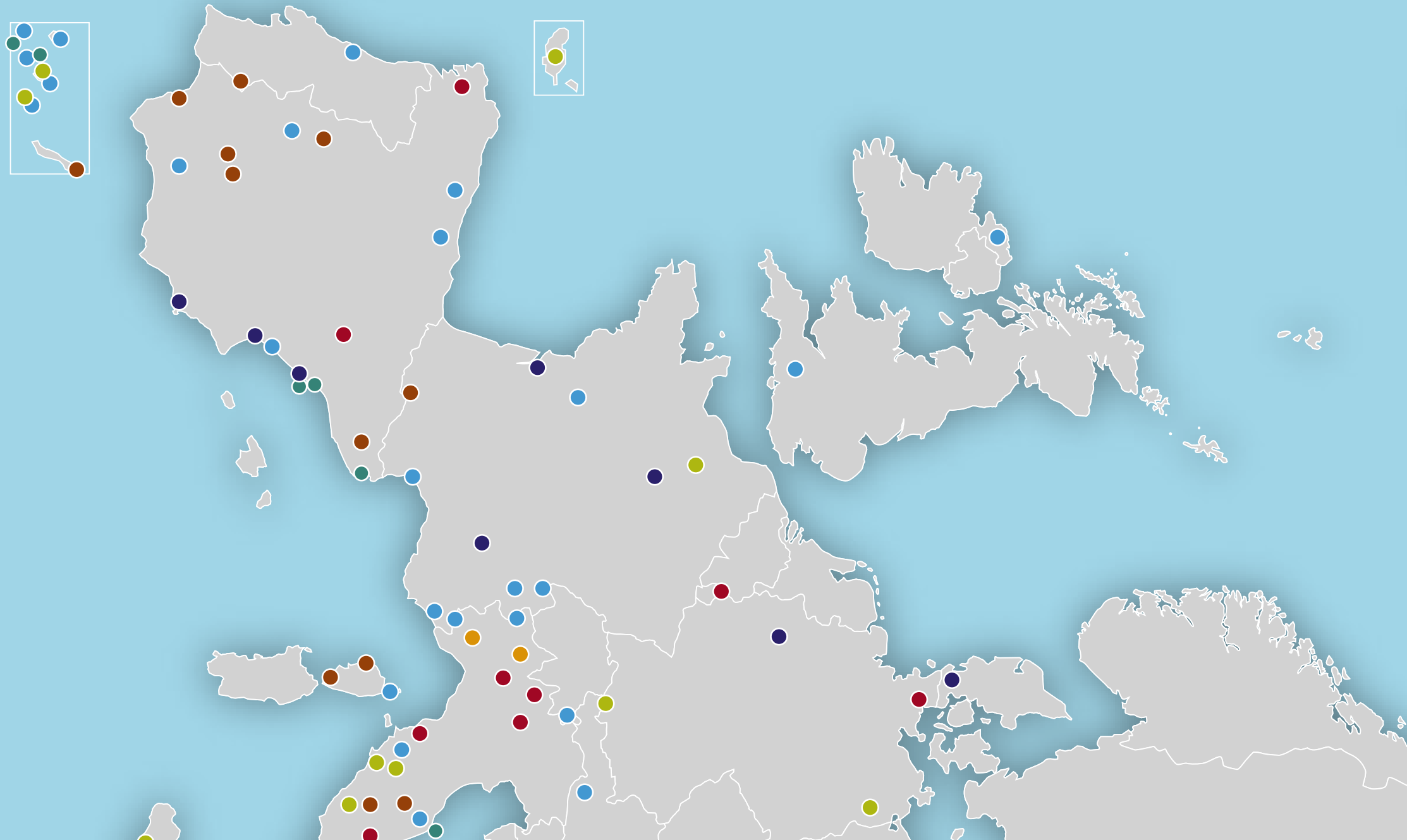
A total of 1 828 sturgeon were successfully bred in captivity and then marked and released in groups at selected sites. All the released fish were marked with a microchip, in order to track their movements. Ahead of their release, the groups of sturgeon underwent a period of adaptation in semi-natural breeding tanks in preparation for their life in the natural environment. Here they gradually became accustomed to feeding themselves with the riverbed fauna.

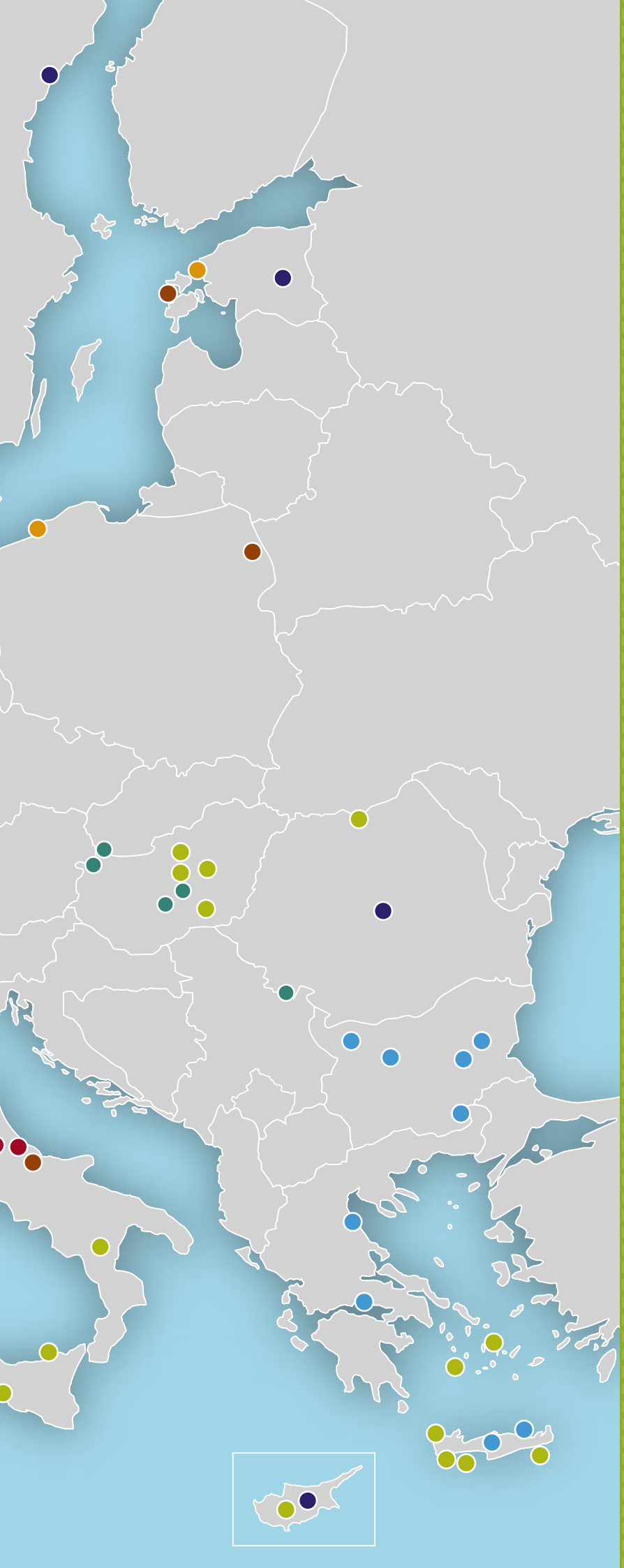
Finally, a major project deliverable was the publication, in 2006, of a species action plan for the Adriatic sturgeon, with a special emphasis on the conservation and improvement of its spawning habitat and on restocking. This has been adopted by the Ticino regional park authority, helping to guarantee the continuation of sturgeon conservation measures after-LIFE.

Reintroduction (left), marking with transponder for release (middle) and egg spawning (right) of the Adriatic sturgeon

Photo: LIFE03 NAT/IT/000113

Ex-situ conservation actions in Europe



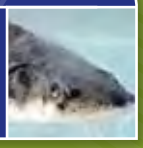


Species groups (taxa) targeted by LIFE projects (1992-2010) with ex-situ conservation actions

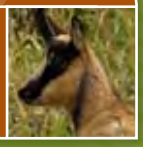
BIRDS
18 projects

PLANTS
17 projects

FISH
14 projects



MAMMALS
12 projects



REPTILES
9 projects

INVERTEBRATES
9 projects

AMPHIBIANS
4 projects

N.B. Some projects had more than one location

Project list

The table below provides the complete list of LIFE projects mentioned in this publication. For more information on individual projects, visit the online database at: http://ec.europa.eu/environment/life/project/projects/index.cfm

Project	Project Title	Targeted Species	Country
	AMPHIBIANS		
LIFE04 NAT/DE/000028	Bombina in the Baltic Region - Management of fire-bellied toads in the Baltic region	*Bombina bombina*	DE
LIFE03 NAT/EE/000181	Silma - Restoration of habitats of endangered species in Silma Nature Reserve	*Bufo calamita*	EE
LIFE00 NAT/IT/007233	Pelobates Ticino - Pelobates project in the Ticino Valley Natural Park of Piedmont	*Pelobates fuscus insubricus*	IT
LIFE98 NAT/IT/005095	Pelobates fuscus insubricus - Urgent actions for the conservation of Common Spade-foot Pelobates fuscus insubricus	*Pelobates fuscus insubricus*	IT
	BIRDS		
LIFE00 NAT/IRL/007145	Reintroduction of the Golden Eagle into Ireland	*Aquila chrysaetos*	IE
LIFE96 NAT/E/003095	Columba bollii/junoniae - Increase in the size population of Columba bollii y Columba junoniae	*Columba bollii and Columba junoniae*	ES
LIFE05 NAT/F/000134	LIFE TRANSFERT - Reinforcement and conservation of Lesser Kestrel populations in Aude (FR) and Extrémadure (ES)	*Falco naumanni*	FR
LIFE98 NAT/E/005354	Pinzón azul - Conservation of the blue chaffinch of Gran Canaria	*Fringilla teydea*	ES
LIFE99 NAT/E/006393	Focha cornuda Valencia - Reintroduction of Crested coot in two SPAs of the Valencian region	*Fulica cristata*	ES
LIFE02 NAT/GR/008492	Gypaetus II - Conservation actions for Gypaetus barbatus and biodiversity in Crete	*Gypaetus barbatus*	GR
LIFE03 NAT/F/000100	GYPAETE - International programme for the Bearded vulture in the Alps	*Gypaetus barbatus*	FR
LIFE04 NAT/ES/000056	Quebranta Andalucía - PRELIMINARY ACTIONS AND REINTRODUCTION OF THE BEARDED VULTURE	*Gypaetus barbatus*	ES
LIFE98 NAT/F/005194	Gypaete/Alpes - Bearded Vulture conservation into the French Alps	*Gypaetus barbatus*	FR
LIFE98 NAT/GR/005276	Gypaetus/Greece - Conservation of Gypaetus barbatus in Greece	*Gypaetus barbatus*	GR
LIFE08 NAT/BG/000278	VULTURES' RETURN - Recovery of the Populations of Large European Vultures In Bulgaria	*Gyps fulvus*	BG
LIFE04 NAT/IT/000173	BIARMICUS - Protection of habitats and raptors in M. Labbro and Upper Albegna Valley	*Milvus milvus*	IT
LIFE08 NAT/IT/000332	save the Flyers	*Milvus milvus*	IT
LIFE09 NAT/UK/000020	Reintroducing Otis tarda - Reintroducing the great bustard Otis tarda to southern England	*Otis tarda*	UK
LIFE97 NAT/F/004226	Etang de Biguglia - Oxyura leucocephala's reintroduction on Biguglia's pond	*Oxyura leucocephala*	FR
LIFE98 NAT/P/005267	Porphyrio - Porphyrio project - Reintroduction of the Purple Gallinule in the Lower Mondego River Valley	*Porphyrio porphyrio*	PT
LIFE09 NAT ES 513	Conservation of the Cantabrian Capercaillie(Tetrao urogallus cantabricus) and its habitat in the Cantabrian Mountain range.	*Tetrao urogallus cantabricus*	ES
LIFE04 NAT/FR/000091	RENF TETRAX - Reinforcement of the migratory breeding populations of the Little Bustard, Tetrax tetrax in France	*Tetrax tetrax*	FR
	FISH		
LIFE94 NAT/F/000862	Restoration of the sturgeon Acipenser sturio	*Acipenser sturio*	FR
LIFE98 NAT/F/005212	Esturgeon - Conservation and restoration of the European sturgeon	*Acipenser sturio*	FR

Project	Project Title	Targeted Species	Country
LIFE06 NAT/D/00005	LIFE-Projekt Maifisch - The re-introduction of allis shad (Alosa alosa) in the Rhine System	*Alosa alosa*	DE
LIFE09 NAT/DE/000008	Alosa alosa - Conservation and restoration of the Allis shad in the Gironde and Rhine watersheds	*Alosa alosa*	DE
LIFE04 NAT/ES/000035	Fartet Murcia - Conservation of Aphanius iberus genetic stocks (Murcia)	*Aphanius iberus*	ES
LIFE96 NAT/E/003180	Isla de Buda - Restoration and integrated management of the island of Buda	*Aphanius iberus*	ES
LIFE07 NAT/EE/000120	HAPPYFISH - Saving life in meanders and oxbow lakes of Emajõgi River on Alam-Pedja NATURA2000 area	*Aspius aspius*	EE
LIFE05 NAT/DK/000153	Houting - Urgent actions for the endangered Houting "Coregonus oxyrhunchus"	*Coregonus oxyrhynchus*	DK
LIFE98 NAT/GR/005279	Ladigesocypris Ghigii 31/10/03 - Conservation measures for the endangered fish Ladigesocypris ghigii	*Ladigesocypris ghigii*	GR
LIFE99 NAT/RO/006429	Romanichthys 30/9/2003 - Survival of Romanichthys valsanicola	*Romanichthys valsanicola*	RO
LIFE00 NAT/F/007252	Saumon Loire - Big Loire salmon preservation	*Salmo salar*	FR
LIFE05 NAT/S/000109	Moälvsprojektet ReMo - From source to sea, retoring river Moälven	*Salmo salar*	SE
LIFE00 NAT/E/007339	Dunas Albufera - Model of restoration of dunes habitats in 'L'Albufera de Valencia'	*Valencia hispanica, Aphanius iberus*	ES
LIFE98 NAT/F/005208	Apron - Strategy of conservation of Apron	*Zingel asper*	FR
INVERTEBRATES			
LIFE07 NAT/IT/000433	WaterSCIs	*Austropotamobius pallipes*	IT
LIFE00 NAT/IT/007159	Austropot. lombardo - Conservation of Austropotamobius pallipes in two SIC sites of Lombardy	*Austropotamobius pallipes*	IT
LIFE03 NAT/IT/0000147	Valvestino Marogna 2	*Austropotamobius pallipes*	IT
LIFE03 NAT/IT/000137	AUSTROP CENTRO - Austropotamobius pallipes: protection and management in SAC sites of Central Italy	*Austropotamobius pallipes*	IT
LIFE08 NAT/IT/000352	CRAINat - Conservation and Recovery of Austropotamobius pallipes in Italian Natura2000 Sites	*Austropotamobius pallipes*	IT
LIFE09 NAT/DE/000010	LIFE-Aurinia - Reestablishment of the Marsh Fritillary (Euphydryas aurinia)	*Euphydryas aurinia*	DE
LIFE04 NAT/ES/000033	Margarita Aragón - Conservación de Margaritifera auricularia en Aragón	*Margaritifera auricularia*	ES
LIFE05 NAT/L/000116	Ardmouperl - Restoration of pearl mussel populations in the Ardennes	*Margaritifera margaritifera*	LU
LIFE09 NAT/ES/000514	MARGAL ULLA - Recovery of populations of Margaritifera margaritifera and Galemys pyrenaicus in the Ulla rive ...	*Margaritifera margaritifera*	ES
MAMMALS			
LIFE06 NAT/PL/000105	BISON-LAND - European Bison conservation in the Bialowieza Forest, Poland	*Bison bonasus*	PL
LIFE06 NAT/E/000209	Introducción Lince Andalucia - Conservation and reintroduction of the Iberian lynx in Andalucia	*Lynx pardinus*	ES
LIFE06 NAT/P/000191	Lince Moura/Barrancos - Recovery of Iberian Lynx habitat in Moura/Barrancos Site	*Lynx pardinus*	PT
LIFE96 NAT/E/003144	Actions for the recovery of the Atlantic Monk Seal (Monachus monachus) population	*Monachus monachus*	ES
LIFE00 NAT/EE/007081	LUTREOLA - Recovery of Mustela lutreola in Estonia : captive and island populations	*Mustela lutreola*	EE
LIFE02 NAT/E/008604	Visón Cataluña - Conservation of european mink (Mustela lutreola) in Catalonia (Spain)	*Mustela lutreola*	ES
LIFE2003NAT/CP/E/000002	Visón Co-op - Collaboration actions for the conservation of Mustela lutreola	*Mustela lutreola*	ES
LIFE03 NAT/F/000099	MOUFFLON - Preservation and spread of the corsican moufflon populations within Corsica	*Ovis gemelini musinom*	FR
LIFE02 NAT/IT/008538	Rupicapra II - Conservation of Rupicapra pyrenaica ornata in the Central Apennines	*Rupicapra ornata*	IT

Project	Project Title	Targeted Species	Country
LIFE97 NAT/IT/004143	Rupicapra - Conservation and increase of the Abruzzo chamois - Rupicapra ornata - in "NATURA 2000 Sites" of ...	*Rupicapra ornata*	IT
LIFE09 NAT/IT/000833	COORNATA	*Rupicapra pyrenaica ornata*	IT
LIFE96 NAT/F/004794	ours en Pyrénées centrales - Conservation of large carnivores in Europe: Brown bear in central Pyrenees	*Ursus arctos*	FR
PLANTS			
LIFE00 NAT/IT/007228	Nebrodensis - Conservation of Abies nebrodensis (Lojac) Mattei in situ and ex situ	*Abies nebrodensis*	IT
LIFE04 NAT/IT/000182	MACALIFE - Preservation and extension of priority habitats damaged from agriculture activity	*Aster sorrentinii*	IT
LIFE06 NAT/H/000141	Hundidi	*Dianthus diutinus*	HU
LIFE07 NAT/GR/000296	JUNICOAST - Actions for the conservation of coastal dunes with Juniperus spp. in Crete and the South Aegean (Greece)	*Juniperus spp.*	GR
LIFE98 NAT/IT/005117	Parco della Maremma - Maremma Park : management of wetlands and sand dunes	*Limonium etruscum*	IT
LIFE00 NAT/A/007069	Protecting the habitat of myosotis rehsteineri in Bregenz' (Myosotis Bregenz)	*Myosotis rehsteineri*	AT
LIFE03 NAT/RO/000027	Piedrosul Rodnei 1/6/2007 - Restoration forest habitats from Pietrosul Rodnei biosphere reserve	*Pinus cembra*	RO
LIFE08 NAT/D/000003	Kalkmoore Brandenburgs - Preservation and restoration of base-rich to alkaline fens ("brown moss fens", NATURA 2000 habitat	*Plants/Habitat*	DE
LIFE03 NAT/IT/000134	GRAVINE - Safeguard Thero - Brachypodietea habitat SIC 'Area delle Gravine'	*Several plant species*	IT
LIFE99 NAT/GR/006497	Rouva's Forest - Amelioration and conservation of Rouva's Forest on Idi Mountain	*Several plant species*	GR
LIFE99 NAT/IT/006217	Isole Eolie - EOLIFE99 - Conservation of priority plant species in Aeolian Islands	*Several plant species*	IT
LIFE99 NAT/P/006431	espécies vegetais/Madeira - Conservation of priority and rare plant species of Madeira	*Several plant species*	PT
LIFE09 NAT/IT/000118	RICOPRI - Restoration and conservation of dry grasslands in southern and central Italy	*Several plant species*	IT
LIFE08 NAT/H/000288	HUSEEDBANK - Establishment of the Pannon Seed Bank for the long-term ex situ conservation of Hungarian vascular plants	*Several plant species*	HU
LIFE97 NAT/E/004165	Monteverde - Conservation of 5 species of the Monteverde in Canaries	*Several plant species*	ES
LIFE04 NAT/IT/000191	UCAP - Conservation of Apennine beech forests with Abies alba SIC Pigelleto - M. Amiata	*Taxus baccata*	IT
LIFE99 NAT/F/006332	Espèces/Seine - Priority species, chalk grasslands and screen in the lower Seine valley catchment area	*Viola hispida* and *Biscutella neustriaca*	FR
REPTILES			
LIFE04 NAT/ES/000059	EmysTer - Recovery of the habitat of amphibians and Emys orbicularis in the Baix Ter	*Emys orbicularis*	ES
LIFE09 NAT/ES/000520	Δ-LAGOON - Restauración y gestión del hábitat en dos lagunas costeras del Delta del Ebro: Alfacada y Tanca ...	*Emys orbicularis*	ES
LIFE09 NAT/IT/000608	Re.S.C.We. - Restoration of Sentina coastal wetlands	*Emys orbicularis*	IT
LIFE02 NAT/E/008614	Lagarto Gomera - Recovery plan for the giant lizard of La Gomera	*Gallotia bravoana*	ES
LIFE06 NAT/E/000199	Gallotia bravoana - Program for the recovery of Gallotia bravoana and its distribution area	*Gallotia bravoana*	ES
LIFE97 NAT/E/004190	Lagarto Gigante - Reintroduction of el Hierro Giant Lizard in its former natural habitat	*Gallotia simonyi*	ES
LIFE00 NAT/RO/007171	Iron Gates 31/10/2004 - Iron Gates Natural Park - habitat conservation and management	*Testudo hermanni*	RO
LIFE04 NAT/HU/000116	HUNVIPURS - Establishing the background of saving the Hungarian meadow viper (Vipera ursinii rakosiensis) f ...	*Vipera ursinii rakosiensis*	HU
LIFE07 NAT/HU/000322	Hungarian viper	*Vipera ursinii rakosiensis*	HU

Available LIFE Nature publications

LIFE Focus Nature brochures

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Other publications

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The programme

LIFE+ "**L**'**I**nstrument **F**inancier pour l'**E**nvironnement" / The financial instrument for the environment

Period covered (LIFE+) 2007-2013.

EU funding available approximately EUR 2 143 million

Type of intervention at least 78% of the budget is for co-financing actions in favour of the environment (LIFE+ projects) in the Member States of the European Union and in certain non-EU countries.

LIFE+ projects

> **LIFE Nature projects** improve the conservation status of endangered species and natural habitats. They support the implementation of the Birds and Habitats Directives and the Natura 2000 network.

> **LIFE+ Biodiversity projects** improve biodiversity in the EU. They contribute to the implementation of the objectives of the Commission Communication, "*Halting the loss of Biodiversity by 2010 – and beyond*" (COM (2006) 216 final).

> **LIFE+ Environment Policy and Governance projects** contribute to the development and demonstration of innovative policy approaches, technologies, methods and instruments in support of European environmental policy and legislation.

> **LIFE+ Information and Communication projects** are communication and awareness raising campaigns related to the implementation, updating and development of European environmental policy and legislation, including the prevention of forest fires and training for forest fire agents.

Further information further information on LIFE and LIFE+ is available at http://ec.europa.eu/life.

How to apply for LIFE+ funding The European Commission organises annual calls for proposals. Full details are available at http://ec.europa.eu/environment/life/funding/lifeplus.htm

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LIFE Focus / LIFE preventing species extinction: Safeguarding endangered flora and fauna through ex-situ conservation

Luxembourg: Office for Official Publications of the European Union

2011 - 60p - 21 x 29.7 cm
ISBN 978-92-79-20026-7
ISSN 1725-5619
doi:10.2779/91189

KH-AJ-11-003-EN-C

Publications Office

ISSN 1725-5619

ISBN 978-92-79-20026-7
9 789279 200267