

REINTRODUCTION OF THE OTTER (*Lutra lutra*) IN NORTHEAST SPAIN (GIRONA PROVINCE)

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ABSTRACT

The objective of the project is the reintroduction of the otter in the Aiguamolls de l'Empordà Natural Park and the Muga and Fluvià basins, and the promotion of river conservation through this emblematic species. Since 1995, 32 individuals from Extremadura (SW Spain) and Asturias (NW Spain) have been released. They have occupied most of the study area and there are already reproduction data.

Keywords: NE Spain, otter, radiotracking, reintroduction, translocation.

RESUMEN

Reintroducción de la nutria (Lutra lutra) en el nordeste de España (provincia de Girona)

Este proyecto tiene como objetivo reintroducir la nutria en el Parque Natural de los Aiguamolls de l'Empordà y en las cuencas de los ríos Muga y Fluvià, así como promover la conservación de los ríos a través de esta especie emblemática. Desde 1995 se han soltado 32 individuos procedentes de Extremadura y Asturias, que se han dispersado por la zona de estudio. Además, se dispone de datos de reproducción.

Palabras clave: NE España, nutria, radioseguimiento, reintroducción, translocación.

INTRODUCTION

The otter disappeared from Girona province (Catalonia, NE Spain) 15 years ago due to hunting, pollution and habitat destruction (Delibes 1990; Ruiz-Olmo 1995; Saavedra 1995). In 1993, a project was started in order to restore the disappeared population because the possibilities of recolonization from other populations were extremely low (Ruiz-Olmo and Delibes 1998) and the reintroduction of otters have been successful in other countries as USA, UK or Sweden (Serfass et al. 1996, Wayre 1989, Sjöåsen 1997).

The reintroduction through translocation of wild animals was choose because is desirable (IUCN 1998) and there are healthy populations in certain parts of the Iberian Peninsula (Delibes and Ruiz-Olmo 1998).

In 1994, a study was carried out (Saavedra 1995) in order to determine if the *Otter Project* observed the guidelines for reintroductions proposed by the International Union for the Conservation of Nature (IUCN 1987; 1998). The conclusions were the following:

1. The Eurasian otter is classified as Vulnerable for its total distribution (IUCN 1990) and for Spain (Blanco and González 1992).
2. The reintroduction has been proposed in the Aiguamolls de l'Empordà Natural Park and Muga and Fluvià basins, which are part of the original area of distribution (Delibes 1990; Ruiz-Olmo and Aguilar 1995; Ruiz-Olmo 1995).
3. The causes of extinction were persecution (hunting, trapping), pollution and habitat destruction (Ruiz-Olmo 1995; Saavedra 1995).
4. Extinction in the study area has been complete, with the last citation in 1984 (Delibes 1990). Between Muga and Fluvià basins and the nearest otter populations there are several basins without otters, so spontaneous recolonization is unlikely to occur (Ruiz-Olmo and Delibes 1998).
5. The proposed donor populations (from Extremadura, Galicia, Asturias and Portugal) are healthy and increasing in number (Farinha et al. 1997, Ruiz-Olmo and Delibes 1998).
6. Though there are no specific studies based on genetics, there are no significant morphological differences between the Iberian otters (Ruiz-Olmo 1995). The proposed donor populations are the nearest with enough individuals and live in comparable mediterranean habitats.
7. The extension of the study area is 200,000 ha, with more than 600 km of river and 3,000 ha of wetlands. Considering the densities found in Catalonia (0,1-1,2 otters/km; Ruiz-Olmo 1995), there is enough habitat for a population with a range between 60 and 720 animals. As in other mammal reintroduction projects, the objective is to release 50 otters, because a number smaller disposes a population to inbreeding depression (Gilpin 1987). Nevertheless, this number implies a isolated population that has been decreasing until 50 individuals who are genetically closely related. In our case, the 50 otters will come from different populations and will have a much higher genetic variance.
8. The habitat is in good condition. Riparian and marsh vegetation are well conserved in a major part of the area (Saavedra 1995). Fish biomass varied between 0.6 and 351.9 gr/m² (n=12) in Zamora et al. 1996 study, with only two sites (17%) with a biomass lower than 8 gr/m², the minimum value calculated to support an otter population in Mediterranean rivers (Ruiz-Olmo 1995). The levels of organochlorine compounds in fish of the area are in the order of those calculated in rivers of Catalonia (López-Martín et al. 1995). The levels of PCBs, the main compounds associated with the decline of the otter, ranged between 81 and 136.4 µg/kg wet weight (95% CI, n=37), with 41% of the sites with values higher than 110 µg/kg ww (Mateo et al.

1995). The fishes with levels lower than this 'level of concern' live in catalonian rivers with healthy otter populations (Ruiz-Olmo 1995, Ruiz-Olmo and López-Martín 1994).

9. The human local population is mainly in favour of the reintroduction, because the otter does not negatively affect the interests of any economic group in the area (Saavedra 1995). In Spain it's a fully protected species from 1973.
10. The project has the permission and support of the government agencies.

The main objectives of the *Otter Project* are:

- The restoration of an eradicated population.
- The promotion of river and wetland conservation through an emblematic species.

STUDY AREA AND METHODS

The reintroduction project is being carried out in the Muga and Fluvià river basins, a territory which includes approximately 2,000 km². Both are low headwaters Mediterranean rivers with irregular water regime, fed by surface waters (rainfall) and lower flow typified by a low absolute volume. The Muga basin presents a surface of 853.78 km² and a average flow of 2.44 m³/seg. The total length of its main branch is 64.7 km. The Fluvià river is 97.2 km long, with a mean flow of 1.27 m³/seg and a basin surface of 1123.58 km² (Brusi 1992). Both rivers flow into Aiguamolls de l'Empordà wetlands, with 4,800 ha protected as Natural Park and 800 ha as Strict Reserve (figure 1).

The riparian forests include *Populus alba*, *Fraxinus angustifolia* and *Alnus glutinosa*, but in many places has been replaced with plantations of trees, with *Populus nigra* and *Platanus x hybrida*. Helophitic and halophil vegetation (*Phragmites sp.*, *Typha sp.*, *Arthrocnemum sp.*) occurs on the wetlands and coastal zones (Folch and Franquesa 1984).

The fish community is mainly represented by Ciprinidae, with a great proportion of introduced species (Carp, Roach, Rudd) and Anguillidae (Eel). In the upper course Trout is found and near the mouth of both rivers and in the wetlands some marine species (Mullet, Sea bass) are common (Zamora et al. 1996).

The density of population is c.60 habitants/km², but increases in the coast during the summer period. The main activities in the study area are the agriculture and the tourism, with more than 400,000 tourist places. The main roads pass through the area from north to south, connecting Spain with the rest of Europe. (Cals 1987, El País 1993).

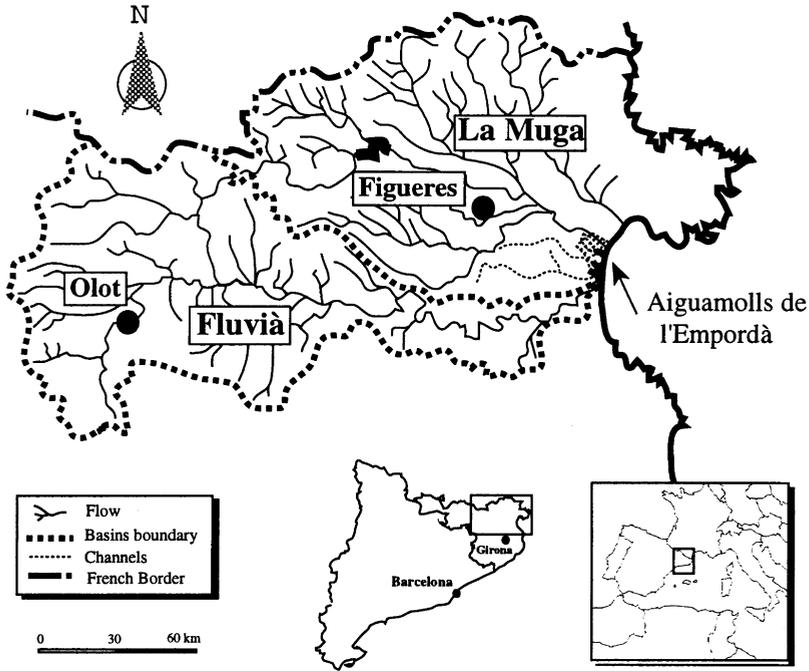


Figure 1. Geographical area of the reintroduction program

Àrea geogràfica del programa de reintroducció

The only semi-aquatic mustelid present in the area is the polecat (*Mustela putorius*) though there are some observations of American mink (*Mustela vison*), coming from a nearby population (Ruiz-Olmo and Aguilar 1995, Ruiz-Olmo et al. 1997).

The reintroduction protocol was agreed between the government and a group of biologists and veterinaries. The project is coordinated by a biologist. The protocol is similar to the Pennsylvania River Otter Reintroduction Project (Serfass 1996) and has the following steps:

1. Identification of suitable places to set the traps.
2. Trapping using leghold traps (1.5 Softcatch Traps, Woodstream Corporation, USA).
Every time an otter is captured:
3. Anesthesia injection through a blowpipe. Anesthetics used are ketamine (0.05 mg/kg) and metedomidine (0.05 mg/kg).
4. Trap removal, sex determination, wound inspection and treatment, antibiotic injection and body condition calculation. The body condition is used to

choose the animals prepared to resist the stress of handling and implanting, collecting generally the otters with $K = 0.90$. The old individuals and pregnant or lactating females are immediately released.

$$K_{\text{male}} = \text{Weight}(\text{kg}) / 5.91 \text{ Total Length}(\text{m})^{2.76}$$

$$K_{\text{female}} = \text{Weight}(\text{kg}) / 5.36 \text{ Total Length}(\text{m})^{2.61} \text{ (Ruiz-Olmo 1995)}$$

5. Neuroleptic injections (Haloperidol and Trilafon)
6. Reversal by Antisedans (0.05 ml/kg) and introduction into the transport cage.
7. Transport to Barcelona Zoo by car during the night or by airplane.
8. Two-four weeks stay in Barcelona Zoo veterinary services where veterinary evaluations and the intraperitoneal implantation of a transmitter are done, following the protocols described in Fernandez et al. 1997 and Hoover 1984.
9. Release in the study area.
10. Radiotracking. The transmitters used are from Advanced Telemetry Systems (100 and 300 days), Telonics (one year) and Wagener (one year), with frequencies between 150.000 and 151.999 MHz. The receivers used are from Advanced Telemetry Systems (R4000 and R2100). The individuals are radiolocalised at least once every two weeks until the animal is lost or found dead.

RESULTS

Until 31/12/98 32 otters have been released, 13 males and 19 females. The implantation of transmitters in most of the otters (94%, n=32) has been essential for supplying knowledge about the new population's adaptation, movements and mortality (table 1). The mean radiotracking period was 131 days (2-597 days, n=30). At least two females have bred (Saavedra and Sargatal 1996, 1997), in one case the animal's transmitter still worked and in the other a direct observation of an otter with a cub was made. Post-release mortality has been caused (19%, n=6) mainly by car crashing (n=3), but also drowned in fyke nets (n=1) or irrigation channels syphons (n=1) (Ruiz-Olmo et al. 1997).

The otters reintroduced have occupied in three years most of Aiguamolls Natural Park, most of Fluvià and Muga rivers and many tributaries (table 2, figures 2, 3 and 4). Some animals have travelled from one basin to the other using Aiguamolls wetlands as a corridor and one animal reached a basin out of the reintroduction area. Dispersal and establishment pattern has been similar to Swedish reintroduction project, with different movements depending on whether other otters were present or absent (Sjöåsen 1997). Female home ranges after establishment are usually smaller than male's and are included in male's home range. Core areas tend to be segregated and any disappearance is quickly occupied (Saavedra et al. 1997).

TABLE 1
Otters released in the study area

Nutrias liberadas en la zona de estudio

Sex Sexo	Captured Capturado	Released Soltado	Died Muerto	Lost Perdido	Tracking period Periodo seguim.	Remarks Observaciones
F	16/10/95	14/11/95	18/12/95		35 days	drowned in fyke net
M	21/10/95	01/12/95		09/07/97	587 days	
M	05/11/95	01/12/95	27/06/96		210 days	unknown causes
F	06/02/96	01/03/96		19/10/96	233 days	breed in august '96
F	06/03/96	21/03/96		16/10/97	597 days	breed in autumn '97
F	21/09/96	21/10/96		13/12/96	53 days	
M	02/10/96	21/10/96		25/07/97	279 days	
F	09/10/96	28/10/96		13/06/97	229 days	
M	18/10/96	04/11/96		19/05/97	194 days	
M	23/10/96	11/11/96		30/04/97	170 days	
F	26/10/96	11/11/96		17/12/96	37 days	
F	01/11/96	02/12/96	25/01/97		55 days	runned over
F	01/11/96	02/12/96		13/12/96	12 days	Cub (2.6kg)
F	01/11/96	02/12/96		10/12/96	9 days	Cub (2.3kg)
M	03/11/96	26/11/96		17/12/96	22 days	
M	20/11/96	10/12/96	11/12/96		2 days	runned over
M	22/11/96	14/07/97				without transmitter
M	25/11/96	27/12/96		30/05/97	155 days	
F	25/11/96	27/12/96	13/01/97		18 days	drowned in a irrigation channel siphon
M	08/05/97	21/06/97				without transmitter
F	25/02/97	08/05/97		13/06/97	53 days	
M	04/11/97	10/12/97		08/01/98	31 days	
M	16/11/97	16/12/97		17/02/98	63 days	
M	13/05/98	08/06/98			207 days	(until 31/12/98)
F	26/08/98	18/09/98			105 days	(until 31/12/98)
F	25/08/98	18/09/98			105 days	(until 31/12/98)
F	02/09/98	18/09/98			105 days	(until 31/12/98)
F	01/09/98	02/10/98			91 days	(until 31/12/98)
F	27/08/98	05/10/98			88 days	(until 31/12/98)
F	24/09/98	15/10/98	08/11/98		25 days	runned over
F	24/09/98	15/10/98			78 days	(until 31/12/98)
F	27/09/98	15/10/98			78 days	(until 31/12/98)

The first studies of feeding habits (using spraint contents) have shown that otters main prey are fish (Angullidae, Cyprinidae and Mugilidae) and crayfish (*Procambarus clarkii*).

The Environmental Education Program is essential for the achievement of the *Otter Project's* second objective: the promotion of the conservation of rivers and wetlands using an emblematic species.

The program began with the creation of a tale for children (The Return of the Otter, Saavedra et al. 1995) along with other pedagogical tools.

Since the end of 1998, 5000 schoolboys and girls have been visited by the Otter Project educators, bringing the message of river and wetlands conservation using the otter and the following reasoning: "If the otter can live in this river, it is surely in good enough condition for the other animals, for the plants and for the people. But people need work in order to have their rivers clean and healthy again".

For this reason we are promoting the creation of local groups (on every village in the area) called "Otter Groups", which act voluntarily to conserve and restore their nearest stretch of river, removing rubbish, planting trees, preparing exhibitions

and events about nature protection and so on. All these activities have the economic support of private sponsorship.

TABLE 2
Dispersal of the new otter population in Aiguamolls Natural park and Muga and Fluvià basins

Dispersión de la población de nutria en el Parque Natural de los Aiguamolls y en las cuencas de los ríos Muga y Fluvià

Period Periodo	number of days número de días	number of released otters número de nutrias soltadas	kilometers of river kilómetros de río	hectares of wetland hectáreas de marisma
14/11/95-31/12/95	47	3	0	500
14/11/95-31/12/96	413	18	135	940
14/11/95-31/12/97	778	23	290	2200
14/11/95-31/12/98	1143	32	320	2500

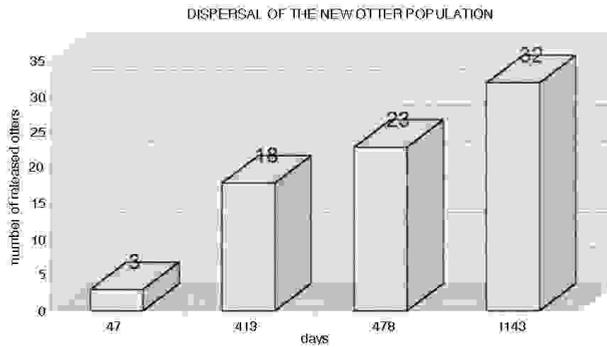


Figure 2. Dispersal of the new otter population (number of released otters)

Dispersión de la nueva población de nutrias (número de nutrias liberadas)

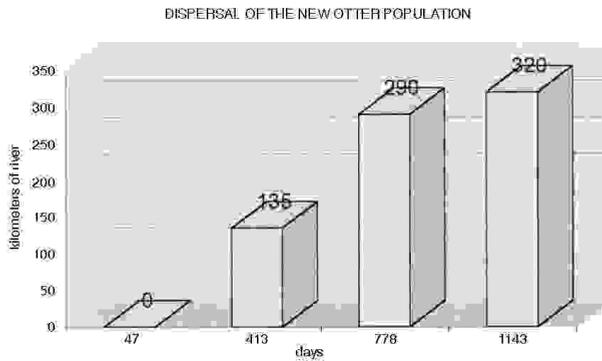


Figure 3. Dispersal of the new otter population (kilometers of river)

Dispersión de la nueva población de nutrias (kilómetros de río)

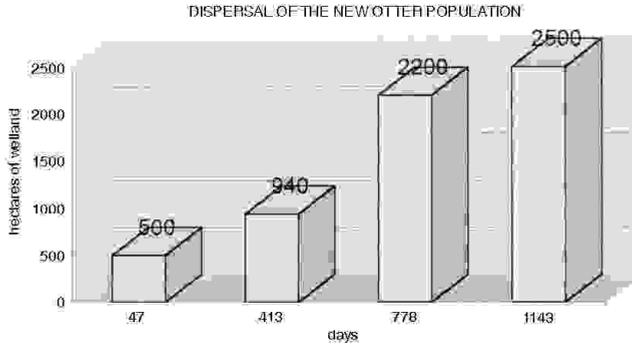


Figure 4. Dispersal of the new otter population (hectares of wetland)

Dispersión de la nueva población de nutrias (hectareas de humedales)

DISCUSSION

Until now, the reintroduction project has been successful because practically all the otters translocated have acclimated to the new habitat and the post-release mortality has been due to accidents and not by human persecution.

In the next months the release of otters will continue, until a total of 50 individuals, all implanted with transmitters. The creation of Otter Groups will continue and so the restoration activities in rivers, lakes and marshes. The end of the project is planned for the year 2000, but the evolution of the new population (through otter surveys and visual censuses) will continue some more years.

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