

**IUCN OTTER SPECIALIST GROUP BULLETIN
VOLUME 8 PAGES 34 - 36**

Citation: Ruiz-Olmo, J. (1993) Artificial Food Support for *Lutra lutra* in a River in Spain. *IUCN Otter Spec. Group Bull.* 8: 34 - 36

ARTIFICIAL FOOD SUPPORT FOR *Lutra lutra* IN A RIVER IN SPAIN

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Abstract: In the Spanish Pyrenees, otters are only present in six rivers, and populations are fragmented by hydrological schemes, and high, dry mountains. Because of the great water level fluctuations caused by hydroelectricity generation, fish levels often drop very low, endangering the otters. It was decided to restock one of the rivers, the Noguera Ribagorçana, with two species found below the dams and thus native to the river, which are better able to cope with high fluctuations in water level. An ongoing monitoring program shows otters are using this new resource.

Although European otter populations in Spain are in an acceptable state, according to the results of the "Otter Survey" (Delibes 1990), its status in the Mediterranean slope is considerably worrying (Ruiz-Olmo *et al* 1989a). The Iberian rivers flowing to the Mediterranean Sea are the ones most disturbed by several classical factors, which influence the distribution of this mustelid (Mason & Macdonald 1986). To these factors can be added others, originating in the overuse of the hydrological resorts (Jimenez & Lacomba 1989) and the isolation of the populations (Ruiz-Olmo *et al.* 1989b).

In the Spanish Pyrenees the otter only survives in six rivers, containing eight different populations. They are completely isolated by dams and high mountains, often considerably dry. In NE Iberia, two translocated otters and a wild one, followed by means of radio-tracking (Ruiz-Olmo & Jimenez, *in press*; Ruiz-Olmo, Lopez-Martin & van Iersel, *unpublished*) show a loyalty to the watercourses without moving away from them. It is because of this that these populations are susceptible to minor environmental modifications.

The river Noguera Ribagorçana is one of these rivers, with two well defined and clearly isolated subpopulations. The one situated in the middle course of the river occupies a length of about 55 km. The estimate carried out (Ruiz-Olmo, *in prep.*) shows minimal population densities fluctuating between 0,35 and 0,91 individuals/km, although it is estimated that this is somewhat high. This would represent at least 35 otters, probably some 40-60. It seems that this population is small, possibly close to the concept of minimal viable population (Soule 1987; Ruiz Olmo *et al.* 1989b; Wansink & Rigenaldus, 1989).

In the winter of 1991-1992 an obvious decrease in the presence of fish was noted. During the year 1992 we started electrofishing in the river Noguera Ribagorçana to establish the state of the fish population. In several stretches we found abnormally low densities of fish, with approximately 114 fish of more than 4 cm per km, representing approximately 5-8 kg/km and 100-150 kg/ha. In the years 1989 and 1990 the electrofishing showed a medium density of 6707 fish of more than 4 cm per km (range 1495-13942 fishes). The most affected species was the French nase (*Chondrostoma toxostoma*), a cyprinid that in this population represents, about 65,7 % of the prey consumed by the otter (Ruiz-Olmo *et al.* 1989c). Previously, the disappearance of the otter has been detected in the rivers Algars and Montsant, after important mortalities of fish in respectively 1987-88 and 1989. All of this signifies a warning to be alert and to conserve this otter population (one of the four most important in NE Iberia).

The causes of this major decrease in the otter population are not clear. There haven't been big mortalities because of contamination, as it doesn't exist in this stretch (Ruiz-Olmo, Delibes, Lopez-Martin & Hernandez *in prep.*), nor because of diseases caused by fungi or other pathogens. Numbers of dead fish have been observed frequently; caused by the abrupt changes of the water level in the river (up to 1-2 m), owing to hydro-electric exploitation upstream. Increases of the water level are usually associated with high increases of the width of the river, at some points more than 100 m. When the level goes down abruptly, many fish get trapped in small pools. In these cases they are not only eaten

by the otters, but also by foxes *Vulpes vulpes*, Egyptian vultures *Neophron percnopterus*, and kites *Milvus* sp. These resources that temporarily facilitate fishing for the otter, can be fatal in the long term. The abrupt changes of the water level could also affect egg-laying of fish and survival of the fish-nurseries. Moreover, during the period referred to some moments of drought and drastic decrease of waterflow were observed in 1991, which without doubt also affected the fish population.

For the above reasons it was decided to artificially boost the fish population. In January of 1991 -1000 fish were liberated (about 600 kg) at two points of known otter occurrence, where one showed diurnal behaviour. In October of 1992 about 17 300 fish of an average size between 22 and 25 cm (2600 kg) were liberated at seven places on the river Noguera Ribagorçana, along a stretch of some 26 km. This operation represents the liberation of an average of 692 fish/km or 104 kg/km.

The fish belonged to the two species living in this zone, namely the French nase and *Barbus graellsii*, from the same river, downstream from the dams functioning as barriers to the distribution of otters. In this way the availability of food for the otter was not affected, and nor were kinds or ecotypes of fish introduced potentially different from those in this zone.

With this operation two goals are thought to be achieved:

- Supply enough food for the otter for a sufficiently long period.
- Strengthen the autochthonous fish population to obtain their reestablishment reproducing themselves (Iberian cyprinids are perfectly well adapted to strong environmental fluctuations because of a higher biological efficiency) and therefore the availability of food for the otter.

The efficiency of the measurement will be tested by means of radio-tracking of a wild female otter, present in this zone, and electrofishing to estimate the fish populations. Initial data show an important use of this new resource by otters.

ACKNOWLEDGEMENTS - "Chema" Lopez-Martin, Erwin van Iersol, Josa Antonio Muñoz, Josep Jordana, Antonio Berenjeno, "Cinto" Medina, Llorenç Ricou, Josep Bolado, Miquel Palacin, Leocadio Cruz and Angel Cierco have assisted in the program of ichthyological reinforcement.

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