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Diet in a free ranging individual of *Lutra lutra* in Valsavarenche

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ABSTRACT

We analysed the diet of a single individual of Eurasian otter *Lutra lutra* that escaped from an enclosure of the Conservation Centre of the Gran Paradiso National Park. In this area otters were present until the late 1960s, when conflicts with humans led the species to extinction. We found that the diet of the otter is based mainly on fish. This is an important step in evaluating if this area could be still suitable for the species.

Keywords: Gran Paradiso National Park (GPNP), Eurasian otter, *Lutra lutra*, prey

INTRODUCTION

Food resource availability is one of the most important elements for the suitability of habitat for a target species (Ruiz-Olmo *et al*., 2001; Kruuk, 2006). Studies on food resource availability are particularly important for species in decline, in danger or with potential for future recolonization and/or reintroduction within a territory, since food supply is a crucial limiting factor for the successful presence of most wildlife species. Analysis of faeces allows the study of both a species' diet and, in relation to the area considered, the availability of different food resources.

The Eurasian otter *Lutra lutra* is an opportunistic predator with a strong preference for aquatic prey (Kruuk, 2006; Sales-Luís and Pedroso, 2007). Otters may vary their diet based on the seasonality of prey (Remonti *et al*., 2008), on the latitudinal and altitudinal gradient (Clavero *et al*., 2003; Remonti *et al*., 2009) and on the availability of preferred prey. The preference for aquatic prey can be partly explained by its innate ability to hunt in the water compared to the land, where still it is able to prey on small mammals, birds, eggs, amphibians, etc.

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In the territory of the Gran Paradiso National Park, the Eurasian otter was present until the late 1970s. In the following years, together with the severe decline of the otter's species in most of Europe which led to several local extinctions, no more signs of the otter's presence were detected and the species was considered as locally extinct. The Scientific Service of the GPNP in the 1990s started the 'Progetto LONTRA' with a strong emphasis on education and research, including an educational centre where a couple of otters were kept in captivity. Following an escape by one of the two otters housed in the centre (a 3-year-old male), we started monitoring all the signs of a presence in the area left by the escaped individual by using video from camera traps, and by monitoring anal secretions, tracks, and spraint. In this article, we examine the diet of the otter by spraint analysis.

MATERIAL AND METHODS

From December 2013 to November 2014, we collected 23 spraints suitable for continuous analysis. We kept the scats in a plastic bag where we noted the day and site of collection, then we stored them in the freezer at –20° until the samples were taken to the laboratory for analysis.

SPECIES

The Eurasian otter is a semi-aquatic mustelid, with an elongated body strongly reflecting its relationship with water. The total length is about 1.2–1.5 metres, with a long tail up to 60 cm. The weight ranges from 4 to 8 kg, showing sexual dimorphism in relation to size (with the male being bigger and heavier than the female).

Individuals of the Eurasian otter are generally territorial, and they use spraints and jelly to mark and to communicate their presence to other individuals. Spraints, characterized by a strong fishy smell, are generally left on prominent rocks and on visible patches, which can be chosen as permanent marking sites by the individual animal (Kruuk, 2006).

ANALYSIS OF FAECAL SAMPLES

Spraints were washed using three sieves with progressively smaller meshes (1.00 – 0.54 – 0.21 mm) to simplify the detection of tiny food items. The three sub-samples were observed under a stereo-microscope (50x), and the volume of different kinds of food remains were estimated in each sample. The identification of food items was carried out by comparison with reference material leading to the recognition of fish bones (Forneris *et. al.*, 1990).

Results were expressed as an absolute percentage frequency of occurrence (%occ: [number of occurrences of each food category/total number of spraints]*100) and a percentage of volume (%vol: [estimated volume of each food category/total estimated volume]*100).

RESULTS

The diet is dominated by fish (%vol = 81.36; %occ = 91.30). Unfortunately, the identification of the largest part of fish remains has been difficult because of the lack of diagnostic elements. Nevertheless, we were able to identify the vomer bone of a small species of brown trout (*Salmo trutta fario*).

Insects represent the second food item in terms of volume (%vol = 4.09; %occ = 69.57), and macro-benthonic larvae (Plecoptera, Trichoptera and Diptera) are the most frequent groups.

Birds represent a limited part of the total volume (%vol = 3.31; %occ = 13.04).

Finally, the occurrence of vegetal matter is relatively high (%vol = 3.31; %occ = 52.17), while the contribution of this food category to the total volume is not substantial.

DISCUSSION

Despite the limited samples from one individual in a relatively short period (11 months), the analysis of its diet suggests that the Eurasian otter could live in the area using fish as a main food resource. In one case, we have been able to estimate the biomass of the prey caught by the otter. Following Prenda *et al.*

Table 1 List of the food items exploited by the Eurasian otter in Valsavarenche (GPNP). Frequency of occurrence (%occ) and percentage of volume (%vol) are reported for each food category. In one case only, we have been able to determine the species of fish eaten by the otter. We suppose that most of the small invertebrates found in the spraints were already present in the digestive system of the fish predated by the otter.

Food categories	%occ	%vol
INVERTEBRATES		
Insects	**69.57**	**4.09**
Coleoptera	21.74	0.56
Larvae	52.17	3.31
Plecoptera	13.04	0.30
Trichoptera	34.78	2.02
Diptera	30.43	0.99
Unidentified insects	17.39	0.22
Other invertebrates	**4.35**	**0.04**
Lumbricidae	4.35	0.04
VERTEBRATES		
Fish	**91.30**	**81.36**
Salmo trutta fario	4.35	0.86
Unidentified fish	91.30	80.50
Birds	**13.04**	**3.31**
Galliformes	13.04	3.31
VEGETAL MATTER	52.17	3.31
UNIDENTIFIED MATERIAL	21.74	7.88

(2002), and comparing the vomer bone found with reference samples from the same alpine area, we were able to estimate the length of the fish. The unique vomer bone found in the faecal samples was 4.41 mm long, so the total length of this fish is about 10–12 cm (Figure 1). We were unable to determine the species of predated fish, but we assume they were all salmonids, since Alpine rivers and torrents are generally inhabited by this family.

The Eurasian otter has also been reported to feed upon invertebrates by other authors (see Clavero *et al.*, 2003). Nevertheless, since insects found in otter spraints are generally small (0.5–1 cm), it is likely that these invertebrates were included in the digestive system of the fish eaten by the otter (Figure 2).

Birds can also be included in *Lutra lutra*'s alternative pool of prey. The finding of bird remains (feathers, beaks, etc.) indicates that the escaped otter probably also ate a few chicks left near the centre. This confirms the Eurasian otter's opportunistic behaviour.

CONCLUSION

This work explored the diet of one individual Euroasian otter in order to evaluate whether the area could be suitable for a potential re-colonization of the species in the distant future. The study of food resources is undoubtedly an important factor,

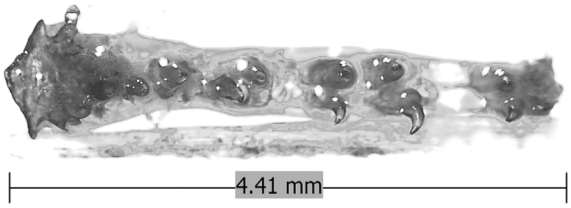

Figure 1 The only vomer bone (*Salmo trutta fario)* found in the otter's faecal samples. Following Prenda *et al.* (2002), we can argue that the total fish length is about 10–12 cm.

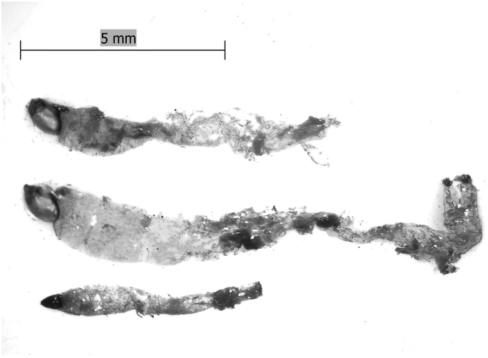

Figure 2 Chironomidae larvae (Diptera) found in some faecal samples.

and in these circumstances we took advantage of an unusual 're-introduction' to collect important information about the quality and quantity of food in the area. Results indicate that the otter could count on a good quantity of fish. This is encouraging, even if we recognise that the small data sample (1 individual, 23 faeces) cannot be considered as statically relevant. Other studies should be taken into consideration in order to evaluate the suitability of the area, such as road impact or human attitude towards the species.

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