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FOOD OF *Lutra lutra* IN CENTRAL FINLAND

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Abstract: In the years 1988-1992 3095 faeces of otters were analysed in YIä-Savo, Central Finland. Because the report (Skarén 1992) was written in Finnish, I present the main results here. Fish are the preferred prey, some carrying significant pollutant burdens, but in winter, frogs are significant. Muskrats are also frequently eaten in winter. Crayfish are rare in the area due to disease, but where present are eaten, and presence in spraint could be used to track the recovery of crayfish populations.

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STUDY AREA AND METHOD

Description of the study area is given in Skarén & Kumpulainen (1986), The western part (Iisaimi river system) is more eutrophic mainly owing to agriculture. The eastern Nilsiä river system is sparsely inhabited and oligotrophic. The size of the present study area is about 12000km^2.

In order to declare the seasonal variation in diet the spraints were collected every month through the years. The following limiting dates of the four seasons were used: 1 March, 1 June, 1 September and 1 November. Similar-looking spraints were pooled. Therefore there are altogether 2355 samples concerning 3095 faeces. Thus one sample contains on an average 1,3 spraints. The samples were soaked in hot water with dentists' Corega-tabs and sieved through 1,5 mm-gauge mesh. Material which passed the mesh was analysed using a stereo microscope.

The results are given both as percentages of frequencies (Table 1) and as bulk percentages after scoring the volume of each item in each scat (Fig, 1).

Table 1: Per cent frequency of the components of otter diet in Ylä-Savo

	Spring	Summer	Autumn	Winter
Amphibia	50.2	10.8	35.6	63.1
Lacerta	-	0.3	-	-
Aves	2.1	19.1	8.3	2.9
Ondatra	17.8	14.5	18.7	18.3
Mammalia	28.9	27.5	37.2	25.4
Cyprinidae	27.5	56.5	57.7	16.1
Perca	54.7	54.9	57.3	47.5
Gymnocephalus	34.6	20.1	27.4	20.7
Esox	26.1	44.8	41.9	16.6
Lota	13.3	4.9	12.3	14.1
Salmonidae	2.8	5.2	10.5	5.0
Cottus	22.7	3.1	8.2	36.4
Pungitius	3.3	-	6.9	-
Pisces	94.5	93.5	93.6	88.1
Astacus	5.2	8.6	4.6	6.0
Dytiscus	1.4	0.3	1.2	0.6
Mollusca	-	-	0.2	0.5
Berries of *Vaccinium vitis-idaea*	0.2	-	-	-
Number of samples	422	324	503	1106

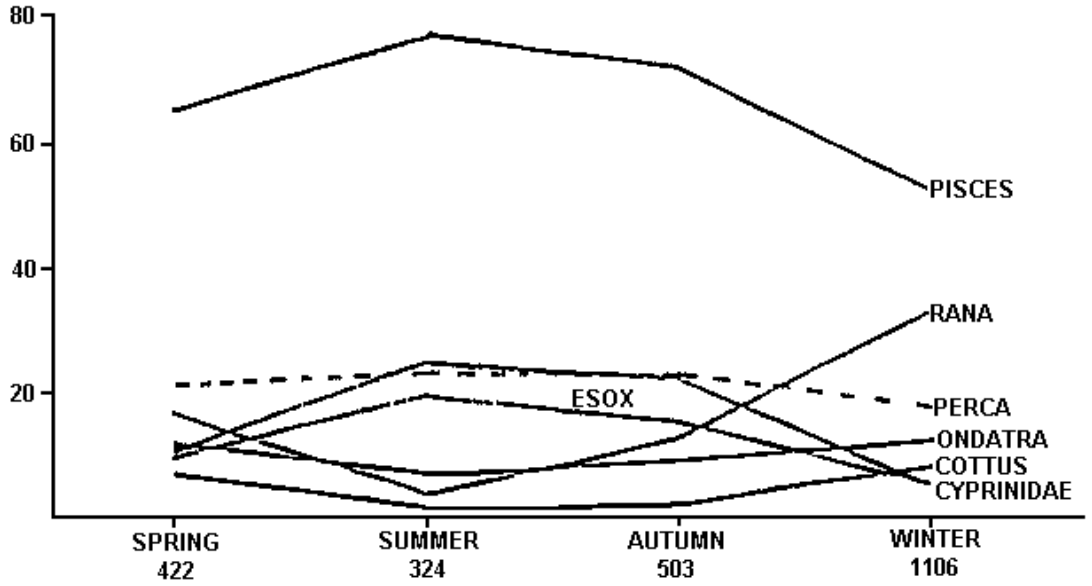

Figure 1.Seasonal shift in the diet of otters, expressed as bulk percentages in the volume. Sample sizes below.

RESULTS

Fish was preferred prey. Most waters here freeze in winter and therefore fewer fish are available. In summer 93,5 % of samples contained fish with about 75 % bulk percentage. *Perca fluviatilis* is always the most important fish prey. The perches eaten were small, but probably the main source of heavy metals found in otters. *Gymnocephalus cernua* is less common than perch. Respectively it is less frequently found in spraints. *Esox lucius* is the third potential major source of pollutants. It is more difficult to catch in winter and so the accumulation of pollutants may temporally decrease. Every second spraint in summer contained pike, in winter only 16,6 % ($P < 0,001$). *Lota lota* is another dangerous fish to otters as a source of e.g. mercury. However, especially in summer it is rarely taken. Salmonidae are not common in the study area. The maximum bulk percentage value was 7,8 % salmonids in autumn in the oligotrophic parts of the Nilsiä river system. Only two fish farming ponds are here, both keeping *Oncorhynchus mykiss*, which otters visit once or twice monthly, but have thus far done only minor damage.

Cottus spp (*C. cottus, C. poecilopus*) are small fishes, apparently taken as relief food, especially in winter. They live in rapids which don't freeze. Locally their role seems to be important. Every second spraint on Matkusjoki river contained *Cottus* in winter. However, the bulk percentage was only 13.0. Even so, only Matkusjoki perch reached higher bulk percentages in winter. Cyprinidae are favoured most in summer. They spend winter deep under ice in seas and rivers and are therefore more difficult to catch.

Amphibia. No traces of toad (*Bufo bufo*) were found in the faeces. Toads live here but are not common. Two frogs (*Rana temporaria* and *R. arvalis*) are present but their identification in scats is not possible. Therefore both species have been united as *Rana* spp.

Frogs seem to be very important prey in winter. The hibernating animals are found in ditches of moors, in wells and on banks of rivers. One could imagine that the proportion of frogs increases in spring at their breeding time. However, this is not the case. The ice is melting and more fish can be caught. If other food is available otters leave frogs.

In the whole material frogs ore less often caught in spring than in winter (Table 1, X^2 19,7; $P<0,001$). However, there is a clear difference (X^2 5,41; $P = 0,02$) in the spring proportion of frogs between the eutrophic Iisaimi and the oligotrophic Nilsiä river systems. In the oligotrophic eastern rivers the proportion of frogs remains as high in spring (n = 81 in 162 samples) as in winter (165/281). Thus amphibians are a particularly important compensating food in rivers where apparently less prey (e.g. muskrats) is available.

Birds are rarely taken. Some young, downy waterfowl are caught in early summer. In autumn the bulk percentage is highest (2.5 %). This is probably owing to waterfowl hunting: otters catch the wounded birds escaped from hunters. At least the following species were taken: *Anas* sp. *Mergus merganser*, *Podiceps cristatus* and *Cinclus cinclus*. Some tens of dippers spend winter on the same rapids with otters. However, only once the bird remnants wore confirmed to belong to *Cinclus*. The rarest bird taken by otters was a kingfisher (*Alcedo attis*).

Mammalia. By far the most important mammalian prey was muskrat *Ondatra zibethica*. In the eutrophic parts of the study area it was common every year. One reason may be that very few hunters currently trap it owing to low prices of the pelt. Otters eat about 50 % of the muskrat leaving the skin, tail, skull, stomach and intestines. These parts weighed 250 grams in a 500 gram female muskrat. Thus catching such a muskrat corresponds to about 50 *Cottus* fishes. Taking muskrats otters save much trouble and energy in the hard times of winter. It is impossible to estimate how many muskrats are taken, therefore the total biomass eaten cannot be evaluated. The proportion of muskrats starts to increase after summer remaining on a relatively high level until the next summer. In the total sample (Table 1) this tendency is not significant (X^2 2,7; P = 0,10) because samples originating from oligotrophic areas obscure the results. However, In the eutrophic Iisaimi river system with more muskrats the difference is clear (X^2 5.66: P<0,02). Watervoles *Arvicola terrestris* were rarely taken. But for some reason they were not often seen in either of these years. Otters caught even watershrews (*Neomys fodiens*) more frequently than watervoles.

Crayfish. The study area was formerly a very important source of crayfish (*Astacus fluviatilis*). After *Aphanomyces astaci* infections the crayfish populations have remained low. Therefore they are rarely caught by otters. Spraints of otters may be used as a tool in mapping the distribution and possible recovery of crayfish populations. According to Harris (1968) the scales of crayfish pass through otters within one hour. Thus otters probably don't go very far before leaving the scats containing crayfish. Acidification seems to cause the absence of crayfish in the oligotrophic parts of the study area.

CONCLUSIONS

The otter population of the present study area seems to be viable. It may thrive best on the eutrophic part of the area in spite of more people living there. Nutrients originating from sewage, agriculture and cattle-farming are the main causes of eutrophication of the Iisaimi river system. Otters benefit because of more shelter and food (including muskrats and crayfish). But if the eutrophication is too strong, resulting in fish kills due to oxygen shortage, the otter population will be in danger. The prey choice strategy described here enables a stable otter population. Every winter some family groups are seen, the last on 9 January 1992.

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