



THE DECLINE OF OTTER *Lutra lutra* POPULATIONS IN THE REGION OF THE PAYS DE LOIRE, WESTERN FRANCE

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Abstract

In the Pays de Loire region of western France, a field survey carried out between 1984 and 1991 showed that otter populations decreased over 54.2% of sites and are now highly fragmented. In 1991 only 9.5% of 348 sites produced positive records compared to 20.7% in 1984. The decline was most notable in the larger rivers whereas the relative use of marsh habitat increased. Populations become more vulnerable when riparian vegetation declines. Accidental drowning in eel *Anguilla anguilla* fyke nets appears to be the major cause of accidental mortality. The scarcity of otter populations is an indication of serious degradation of aquatic ecosystems.

Key words: Western France, otters, population, habitat destruction.

INTRODUCTION

Populations of European otters *Lutra lutra* L. have suffered serious declines over large areas of Europe, notably in Sweden (Erlinge, 1972a), Germany (Röben, 1974), parts of Britain (Chanin & Jefferies, 1978), Belgium (Libois *et al.*, 1982), Ireland (Chapman & Chapman, 1982), Portugal (Macdonald & Mason, 1982), Poland (Romanowski, 1984), Switzerland (Muller, 1984), Yugoslavia (Liles & Jenkins, 1984) and Spain (Adrian *et al.*, 1985).

In France, during the decade 1960/1970, the otter population remained apparently stable, though no structured surveys were carried out. Since then, despite being protected by law since 1972, the population has steadily declined (Green & Green, 1981; SFPEM, 1984). The range seems to be restricted to the Atlantic seaboard, the Camargue and the Massif Central but even there the distribution is discontinuous. Before 1972, hunting and trapping seemed to be the main causes of otter decline (Bouchardy, 1986). Since then it has been shown that bioaccumulation of toxicants (notably dieldrin, PCBs and mercury) is responsible for the decline of otters in several countries (Chanin & Jefferies, 1978; Barus & Zejda, 1981; Chapman & Chapman, 1982; Madsen & Mason,

1987; Skarén, 1988; Rodriguez *et al.*, 1989; Mason & Madsen, 1990).

However, our knowledge of the status of the otter is not accurate enough to determine why the situation has continued to deteriorate. This is particularly the case in Western France where otter surveys were unstructured until 1980.

From 1984 to 1991, a detailed survey of otter presence was therefore carried out, and an assessment made of the species' status in the Pays de Loire region (Saint-Girons *et al.*, 1988; Lodé *et al.*, 1990a). An attempt was also made to relate the distribution of otters to environmental characteristics which are likely to affect population survival.

STUDY AREA

The Pays de Loire region in western France is an administrative district comprising five departments (Loire-Atlantique, Maine-et-Loire, Mayenne, Sarthe and the Vendée) and covering 30 198 km² (see Fig. 1). The climate is mild, being influenced by the nearby ocean. The average temperatures have a narrow range (July average 16°C, January average 7.2°C, calculated between 1968 and 1988 from the Meteorological Office of Nantes) and the rainfall may reach 800 mm/year. The region stretches along the banks of the River Loire between Brittany and the Parisian Basin. The mostly eroded hercynian relief of the Armorican massif lies between the Mancelles Hills (300 m) and Signal des Avalloirs (417 m) in the northeast to Mont Mercure (285 m) in the south. The terrain consists of schist rock, bounded by chalky plateaux in the east (Saumurois). The whole area is drained by numerous watercourses which belong to the River Loire hydrographic system. The landscape is predominantly wooded farmland ('bocage') which is characterized by a patchwork of small fields surrounded by hedges often with pollarded oaks and ashes. Several wetlands lie along the Atlantic seaboard and have an international value for wildfowl (Brosselin, 1973). The main areas of marsh are (1) the Brière Regional Nature Park peat-bogs lying to the northwest; (2) the Guérande salt-pans to the northwest; (3) the Lake of Grand-Lieu, south of Nantes; and (4) the Marais Vendéen. The most southern part of the Vendée, which forms a small part of

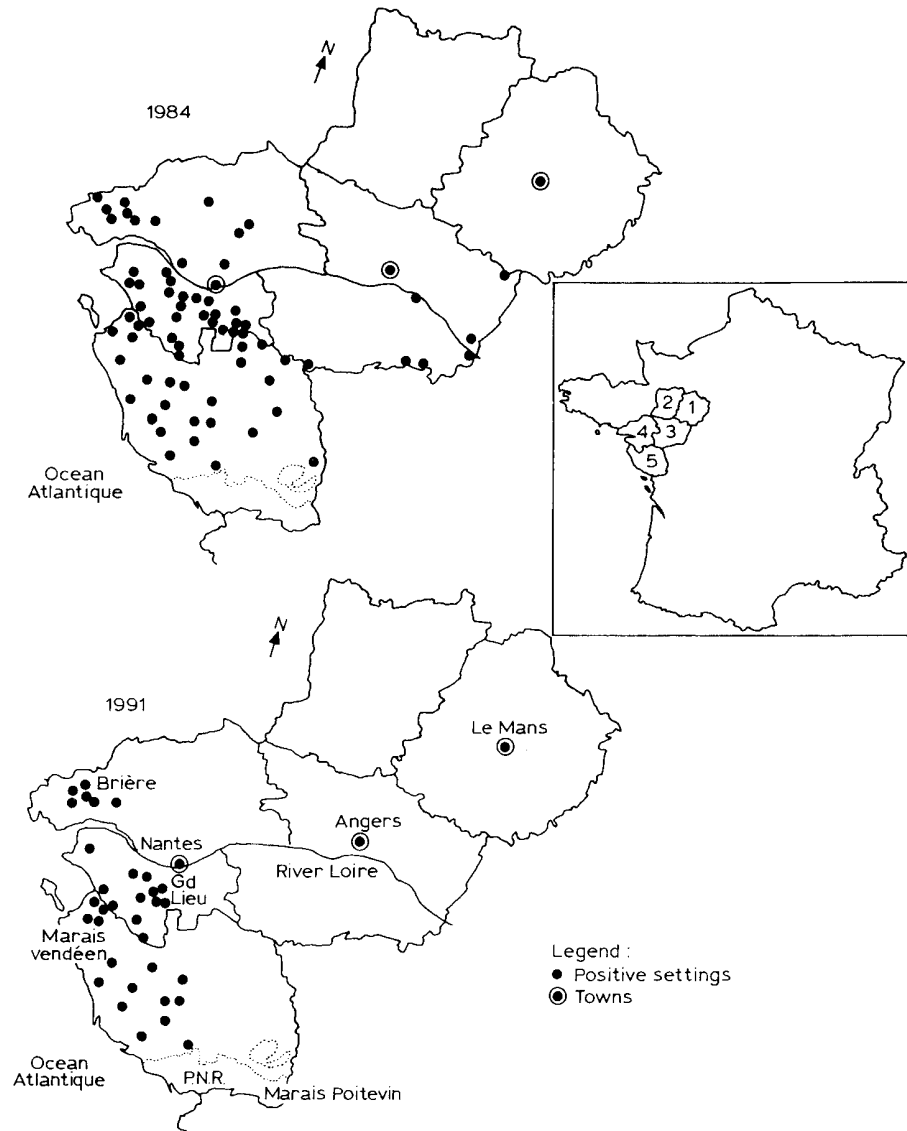


Fig. 1. Change in otter distribution between 1984 and 1991 in Pays de Loire. Inset shows the study area.

Marais Poitevin Regional Nature Park, is not considered here. The plateau of Saumurois and the valley of the River Sèvre Nantaise have vineyards. Cereal production, fodder crops, cattle rearing and orchards are the main agricultural activities.

METHODS

This study was carried out between 1984 and 1991 and was concentrated on the sites where otters were present in 1984 (SFPEM, 1984; Saint-Girons *et al.*, 1988).

Sites were chosen for their accessibility, and would start, for instance, under a bridge or a substantial promontory. Each site was carefully searched for a maximum of 400 m upstream and 400 m downstream from the chosen access point but recording stopped as soon as a spraint was found on either bank. In 1984 and 1985, one or two searches a year per site were carried out, but from 1986 three searches a year were made in spring, autumn and winter, and a site was

recorded as positive when at least one spraint, or a very clear footprint, was found. Other signs were not considered as sufficiently specific. Otters were presumed absent if a site produced no signs during the three visits. Although local extinction can never be confirmed from negative records, the continuous absence of spraints at sites where they were previously recorded may be taken as good evidence of at least a marked decline in populations. Note that by carrying out three searches a year from 1986, whilst only two searches a year were made in 1984 and 1985, this will have increased the likelihood of finding spraints. If an increase in positive records had been obtained, this increased sampling effort could have invalidated any conclusion regarding an increase in otters. However, with the decreasing number of positive records obtained, the extra search effort helps to confirm the conclusion that fewer sites were occupied.

Some habitat data and an assessment of the degree of pollution were recorded at all sites. We graded

watercourses into three categories as ponds, ditches and streams (width < 5 m), small rivers (width < 10 m), and large rivers, i.e. the Loire and direct tributaries (width > 10 m). The river banks at each site were classified on the extent of bankside vegetation as follows: 0, low herbaceous ground cover; 1, tall herbaceous cover with scattered bushes; 2, irregular hedges; 3, continuous hedges with intermittent trees; 4, tree-covered bankside; 5, forest watercourses. Aquatic macrophytes were also recorded as an indicator of pollution (Haury, 1990) and compared with the water quality map (Agence de Bassin Loire-Bretagne, 1985). The χ^2 test was used to compare changes in frequency of records between years but some categories had few records and were therefore combined. Known cases of otter accidental mortality between 1984 and 1991 were listed.

RESULTS

Of the 348 sites surveyed in 1984, throughout the whole Pays de Loire region, 72 sites (20.7%) showed evidence of otters —50% in Loire-Atlantique, 31.6% in the Vendée and 13.9% in the other eastern departments (Fig. 1). In 1991, only 33 (9.60/0) of the sites surveyed showed evidence of otters. Thus, we concluded that otters had disappeared from 54.2% of the sites occupied in 1984 and populations had become more fragmented (Table 1). The decline averaged 7.7% sites per year, with the lowest decreases in 1988 and 1991. The distribution of the species decreased from east to west, the most frequented parts in 1991 being the marshes of Brière, Lake of Grand-Lieu and adjoining Rivers Marais-Vendeens, and a diffuse area in the Vendée.

Note that if only two searches had been carried out, as in 1984 and 1985 then the indicated percentage reduction in occupied sites may well have been even greater than that shown here as a result of increasing the search effort (see Methods above).

Between 1984 and 1991, evidence of otters strongly decreased on the Loire and its direct tributaries, while marshes, including the Lake of Grand-Lieu and ponds, produced 60.6% of all positive records (Table 2, $\chi^2 = 7.936$, $p < 0.05$).

The study of bankside cover showed that otters have survived better in the more wooded areas (Table 3). There was an increase in otter signs on banksides with continuous hedges and trees. On the other hand, banksides with tall herbaceous cover and scattered bushes showed a decrease in otter signs ($\chi^2 = 6.435$, $p < 0.05$).

Otters clearly avoided polluted waters with no significant change between surveys ($\chi^2 = 1.567$, $p > 0.05$) (Table 4). In 1984 and 1991, otter signs were found respectively in 90.3% and 96.9% of sites with average or good-quality water.

Table 5 presents the data of known cases of otter mortality between 1984 and 1991. The sample is very small ($n = 15$) but shows that drowning accidents due to eel *Anguilla anguilla* fyke nets could be the main cause of accidental mortality.

Table 1. Changes in otter records on 348 sites surveyed in the Pays de Loire

	1984	1985/86	1987	1988	1989/90	1991
Positive sites	72	60	48	44	35	33
Positive site frequency (%)	20.7	17.2	13.8	12.6	10.1	9.5
Annual decline (%)	—	16.7	20.0	8.0	20.5	5.7

Table 2. Records of otters (spraints or footprints) in different habitats

	Ponds	Marshes (+Grand-Lieu)	Streams	Small rivers	Loire and tributaries
1984 ($n = 72$)	5	22	9	20	16
		27		29	
1991 ($n = 13$)	3	17	3	9	1
		20		12	
Relative change (%)		+23.1		-3.9	-19.2

Table 3. Occurrence of otters in relation to different types of bankside vegetation^a

	Herbaceous cover		Irregular hedges (2)	Wooded banksides		
	(0)	(1)		(3)	(4)	(5)
1984 ($n = 72$)	4	15	43	6	3	1
		19				10
1991 ($n = 33$)	0	3	20	7	2	1
		3				10
Relative change (%)		-17.3	+0.9			+16.4

^a 0, low herbaceous ground cover; 1, tall herbaceous cover with scattered bushes; 2, irregular hedges; 3, continuous hedges with intermittent trees; 4, tree-covered bankside; 5, forest watercourses.

Table 4. Occurrence of otters in relation to water quality

	Very bad	Polluted	Average	Good
1984 ($n = 72$)	—	7	39	26
1991 ($n = 33$)	—	1	18	14
Relative change (%)	—	-6.7	+0.3	+6.3

Table 5. Accidental causes of otter mortality between 1984 and 1991 in Pays de Loire

	Accidental traps	Drowning in eel fyke nets	Road kills
Male	1 (young)	2 (young)	2 (adult)
Female		2 (young), 2 (adult)	1 (young)
Unknown	2	2	1
%	20	53.3	26.7

DISCUSSION

In some areas of Britain otters show seasonal variation in spraint frequency with a winter maximum (Kruuk *et al.*, 1986; Kruuk & Conroy, 1987; Mason & Macdonald, 1987). On the other hand, in Portugal Macdonald and Mason (1982) noted a higher spraint frequency in summer, and Palomares *et al.* (1988) in Spain noticed large fluctuations but no seasonal trend. When otters are at low densities, the frequency of spraints may also be very low (Macdonald, 1983). Otter spraints cannot provide information on otter abundance, only about distribution (Jenkins & Burrow, 1980; Conroy & French, 1987; Mason & Macdonald, 1987).

Throughout most of the region, the reduced distribution of otter signs, and the apparent fragmentation of populations, suggests that otters are endangered. The status of the species is undoubtedly affected by a combination of factors. Changes in otter distribution varied from habitat to habitat. The decline was most notable in the larger rivers whereas the importance of marshes was clearly apparent. Riparian engineering works were frequently conducted in these larger rivers especially on the Sèvres, and the Erdre. The vulnerability of otter populations becomes more pronounced as riparian vegetation decreases and the less vegetated sites are more frequently deserted. Several authors have stressed the importance of vegetation cover for maintaining otters (Macdonald *et al.*, 1978; Jenkins & Burrow, 1980; Blanchon, 1983; Bas *et al.* 1984; Adrià *et al.* 1985). Otters utilise between 15 and 20 km of linear bank side (Erlinge, 1968; Green *et al.* 1984) and may need several diurnal resting holts (Green *et al.*, 1984; R. Rosoux, pers. comm.) often located under larger trees (Macdonald *et al.*, 1978; Harper, 1981).

In the Pays de Loire, otters mainly frequent natural eutrophic environments where cyprinids and eels constitute the major food component of its diet (Lodé, 1989), and eels are important in the diet elsewhere (Fairley, 1972; Jenkins *et al.*, 1979; Adrià & Delibes, 1987; Libois & Rosoux, 1989). Mason and Lodé (1992) have recorded generally low concentrations of pesticide residues in otter spraints in the Pays de Loire. Pollution can reduce fish stocks (Leynaud, 1976) and thus reduce the food supply of otters. Maizeret *et al.* (1981) estimated that otters need a minimum of 30 kg fish biomass per km of river. Otters also feed on muskrats *Onnatra zibethicus*, in winter, and these made up 6% of the diet in the Lake of Grand-Lieu (Lodé, 1989). Poisoning campaigns conducted against muskrats and coypus *Myocastor coypus* in numerous wetlands in the region coincided with a reduction in otter distribution (Lodé *et al.* 1990a).

Otters may be victims of trap setting for muskrats (Braun, 1985), but accidental drowning in eel nets appeared to be more important, especially in the Lake of Grand-Lieu. Casualties were chiefly females and juveniles. Fish nets are known to cause serious otter mortality (Fairley, 1972; Erlinge, 1972a; Chapman & Chapman, 1982) and Jefferies *et al.* (1984) considered that fish traps can reduce otter populations when they are set for long periods in single localities.

Various authors have tried to evaluate the potential competition between otter and feral American mink *Mustela vison* but concluded that any dietary overlap is small (Erlinge, 1972b; Jenkins & Harper, 1980; Chanin, 1981; Wise *et al.*, 1981). Feral American mink have only just reached the north-west of the region (Lodé *et al.*, 1990b).

Although the authorities in the region have been informed since 1985 on the decline in otter populations, no serious conservation measures have been taken. A real political will for environmental conservation is now needed before further losses occur.

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