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Otter *Lutra lutra* damage at farmed fisheries in southeastern Poland, I: an interview survey

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Fish farmers were interviewed on the occupancy and impact of otters *Lutra lutra* at common carp *Cyprinus carpio* fisheries in southeastern Poland during a preliminary survey in 1994-1995 and in 2003. Otters occurred at 104 (91%) of 114 surveyed fisheries, and in 71 (62%) fish farms the perceived otter predation pressure increased over the last decade. Of the interviewees, 65 (57%) reported serious losses to otters, and of these 51 (78%) claimed to have no otters or to have had the otter problem under control in the mid-1990s. The most frequently listed type of damage was killing or serious injuring of the commercially most valuable brood fish and surplus killing of cultured carps. Non-destructive attempts to protect stocks from otters were reported only exceptionally. Of the farmers with depredation problems, 17% admitted that illegal otter killing occurred at their farms. Field surveys revealed that fish farmers correctly identified otter presence at their ponds. However, farms differing in the perceived otter impact on cultured stocks did not differ in their annual overall fish losses. Private pond owners perceived losses to otters as higher than managers of state-owned fisheries. Spraint analysis at two intensively monitored adjacent fish farms, one with perceived serious economic losses and one which reported a minor otter problem, showed similar proportion of carp by weight (44 vs 41%, respectively) in otter diet.

Key words: carp, Cyprinus carpio, fish ponds, Lutra lutra, otter, wildlife-fisheries conflict

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Although the Eurasian otter *Lutra lutra* has a threatened status in some parts of western Europe, otter populations seem to expand in most countries of central and eastern Europe. The recent increase in otter numbers is often accompanied with complaints about otter damage to cultured fish stocks, mainly the common carp *Cyprinus carpio*, which dominates the aquaculture production in this part of the continent (Kranz 2000). After the political transformation of the region, the process of privatisation of the aquaculture sector commenced in the early 1990s. This may have coincided with the change of attitude towards piscivorous predators that pose a risk to the aquaculture business. Thus, knowledge on utilisation by otters of aquatic livestock and the alleviation of conflicts with fisheries has become a priority challenge for wildlife biologists.

Fish farmers' perceptions of the impact of natural predators on aquaculture stocks have rarely been quan-

tified and little is known on their validity (Pitt & Conover 1996). However, these perceptions may be decisive for otter persecution at fisheries. In Poland otters were protected by hunting law until 1995 and during 1995-2001 the species enjoyed strict protection. Since 2001 local populations may be reduced under permission, at sites regarded by law as fishery precincts. Hence, the validity of fish farmers' opinions about otter damage to domestic stocks is worth investigating.

In this paper, I report on interview surveys of fisheries staff in 1994-1995 and 2003 which were carried out to monitor changes in otter presence during the last decade and to assess the perceived impact of otter damage at fish farms in southeastern Poland. The region has grown into a leading carp farming area in Poland (Bukacińska et al. 1995). I analyse the methodological problems of the reliability of the interviewees' perceptions. My study had two aims: 1) to examine the recent development in otter occupancy of fish farms and predation pressure on commercial stocks in southeastern Poland, and 2) to evaluate the utility and limitations of the interview survey method in studies on otter distribution in fish farming areas and interference with the interests of the fisheries.

Material and methods

Interviews

The surveys took place in 1994-1995 (N = 32 farms) and in 2003 (N = 114, including all farms surveyed in 1994-1995) in southeastern Poland. As the 1994-1995 survey was limited to state-owned middle-sized fish farms with 42-147 ha of water surface, and since it covered only approximately $^1/_3$ of the area surveyed in 2003, it is used here to verify the 2003 data rather than to give an independent picture of otter occurrence and impact. By 2003, 90% of the surveyed farms had been privatised. In 2003 the surveyed area comprised in total ca 16,000 ha of farmed ponds. It was bordered in the north by the river Bug and in the west by the river Vistula, which at its middle course included farms belonging to the western part of the Vistula watershed, up to 20°30'E. Fish farms were identified through field interviews, telephone directories, the local municipalities and district fish farming committees. No general register of fish farms was available, but it was estimated that > 70% of farms of >15 ha in the surveyed area were included in the analyses. Pond groups administered by the same manager, but scattered at distances of > 20 km and supplied with water by different rivers were treated as separate objects. To avoid pseudoreplication, the same managers' opinions were used twice only when their assessment of otter impact differed between pond complexes (in four cases). Otherwise, opinions of fish farm ichthyologists or fishers responsible for the given facilities (for simplification they are all called 'fish farmers' hereafter) were used. Smaller facilities with < 15 ha of water surface, usually run as a source of secondary income, were not included in the survey.

The fish farmers were individually interviewed during visits or phone calls. They were asked in a standard way which predator species visited their fish farms, and if otters had been observed, to classify their impact into two categories: 1) otters occurred at the fish farm, but their presence did not cause serious damage to the stocks, either because they were not numerous, or because they were not perceived as a source of significant harm, and 2) otters were a cause of serious economic loss. In the latter case, the respondents of the 2003 survey were asked to describe the type of damage inflicted by otters, whether any antipredator measures were undertaken, and to characterise otter predation patterns: e.g. at what time of the year were the losses the highest, and whether any species or size selectivity was observed. Also, information on the fish farm was collected, e.g. the total area of farmed waters, water supply form, species and age classes farmed, the type of enterprise, i.e. private or state-owned. In 2003 the respondents were asked to classify otter impact both in the last year and during the previous 10 years. They usually believed they were able to describe the development with an accuracy of 2-3 years. For the fish farms surveyed both in 1994-1995 and 2003 (respondents in the two surveys were not always the same persons) the estimates of otter impact in the 'early' or 'mid-1990s' reported in 2003 were with only one exception the same as those given in 1994-1995. Hence, it was assumed justified to use otter impact estimates for this period gathered from farms surveyed only in 2003. When a manager had been employed with a farm for < 10 years, other staff members with sufficient experience were interviewed. A few farms, where staff with the required experience could not be found, were omitted.

To investigate factors influencing otter impact on stocks and farmers' opinions, I used general discriminant analysis, a method applying general linear model procedures to discriminant function analysis (STATISTICA 6). This allowed stepwise analysis of sets of both continuous and categorical explanatory variables potentially distinguishing between farms with reported heavy stock losses and those where otters were perceived as a minor problem. Explanatory variables included: the form of enterprise (private vs state-owned), total pond surface area, the kind of water supply (i.e. from a river vs from

precipitation or springs; rivers could be used by otters as waterways facilitating access to the ponds), farm locations (north, east) based on 10-km UTM grid squares recoded to decimal values.

Verification of fish farmers' perceptions

In 1995 and 2003, I visited 28 pond complexes at least twice to search for otter tracks, and to check the validity of statements on otter presence/absence. Data on fish production in 1994 and 1995 were gathered for all pond complexes surveyed in this period. The percentage losses were calculated on the basis of differences between the numbers of individuals stocked and taken after pond draining. Usually, these numbers were derived from the data on the total fish biomass per pond and mean weight per fish at stocking and draining of the pond. No 'unusual' sources of fish mortality, e.g. disease or increased depredation by piscivorous birds, were reported at the farms during either of the two years. Differences between farms with different levels of perceived otter impact were tested for each carp age class (fry, 1+ and 2+; see Kloskowski 2005) using one-way ANOVA. Analyses were run separately for each year, because due to alternation of age classes, the yearly samples did not include the same farms.

To check whether the perceived losses corresponded to the estimations of carp contribution to otter food based on spraint analysis, dietary data were compared between two intensively monitored adjacent pond complexes. Spraints were collected at fish farms in Jedlanka where the losses were perceived as substantial, and in Tyśmienica where otter impact was perceived as minor (both situated at 22°E, 51°N). At both sites which were state-owned in this period, both the managers and the local ichthyologists were interviewed, and their assessments for the given farm were unanimous. In Tyśmienica otter food composition in relation to carp stock abundance was intensively investigated between April 1994 and March 1995 (see Kloskowski 1999 for a description of the study site and otter predation data), but spraints were also collected on a monthly basis in February-March 1994 and May-July 1995. In Jedlanka, the otter diet was studied in 1994-1995 (see Kloskowski 2005). In the period when both farms were monitored, 879 spraints from Jedlanka and 2,320 from Tyśmienica were collected. Numbers of otters visiting the two fish farms were expected to be comparable because the two pond complexes were located < 10 km apart, were of similar size and because spraint densities were similar at both sampling sites (Kloskowski 2000b). However, in Jedlanka all age classes of carp were stocked, whereas only 0+ and 1+ cohorts were raised in Tyśmienica.

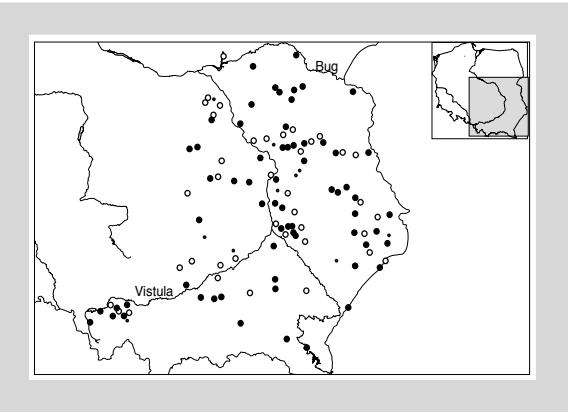

Figure 1. Location of 114 Polish carp fisheries surveyed in 2003 related to otter occupancy and impact (• otters absent; ○ minor stock losses to otters; ● serious stock losses to otters).

Results

According to the fish farmers interviewed, otters were present at 104 (91%) of 114 farms surveyed in 2003 (Fig. 1). Other piscivorous species most frequently associated with predation damage were grey herons *Ardea cinerea* and cormorants *Phalacrocorax carbo*. Field surveys confirmed that fish farmers identified otter presence/absence correctly with exception of one farm, where otters were not noted even though spraints were found. In 71 (62%) fish farms, otter predation pressure was believed to have increased over the last decade. At 65 (57%) farms, otters were accused of significant damage to the stocks; 51 (78%) of the respondents who reported serious losses claimed either that they had no otters or that they had had the otter problem under control in the mid-1990s. A few respondents that (unrequested) provided more precise damage estimates set the additional losses at > 20% of annual production of 1+ stocks in the 'worst' years. The most common type of damage described was killing or serious injuring of brood fish reported at 26 farms (40%; < 1/3 of all surveyed farms maintained brood fish); 25 (38%) blamed otters for surplus killing, 13 (20%) reported injuring of stock fish and 7 (11%) reported disturbance of the overwintering stocks resulting in loss of weight and eventually increased mortality. Of the farmers who perceived serious losses, 14 (21%) believed winter to be the period of peak otter predation activity (half of them noted that solid ice cover protects the stocks) whereas 3 (5%) respondents pointed at late autumn and early spring; 12 (18%) claimed that otters foraged on fish selectively, i.e. taking preferentially other (mainly non-cyprinid) species than carp when stocked separately for wintering, or to alternate

Table 1. Mean total annual losses (in %) at fish farms based on the farmers' perception of otter impact on stocks. Sample sizes are given in brackets. All ANOVA values were insignificant (all Ps > 0.16).

Year	Age class	Farms without otters	Minor losses perceived	Serious losses perceived
1994	0+	77.2 (12)	70.4 (11)	74.8 (8)
	1+	51.5 (11)	49.4 (9)	47.7 (11)
	2+	15.2 (8)	19.6 (10)	18.5 (10)
1995	0+	65.1 (12)	74.6 (11)	71.5 (8)
	1+	48.7 (12)	53.9 (10)	35.6 (10)
	2+	19.9 (8)	24.4 (10)	16.1 (10)

between prey species. Of the respondents who commented on size selectivity by otters, 7 (11%) reported no size preferences (similar losses from all ponds), 3 (5%) claimed preference for smaller fish and 20 (31%) for larger fish.

The size of enterprise, water supply form and farm location did not differ between farms which reported heavy stock losses and farms at which otters were perceived as a minor problem. The only significant difference was found between private and state-owned enterprises: private owners assessed damage inflicted by otters as more severe (Wilks Lambda = 0.961, $F_{1,102}$ = 4.16, P < 0,044; all the other terms were eliminated from the model at P > 0.15).

Although otter populations may be reduced under special permits at fisheries, many of the complaining fish farmers appeared not to know about this or claimed that hunters showed no interest in shooting otters. However, 11 (17%) owners of ponds that allegedly experienced heavy losses, (in)directly admitted that illegal otter killing, i.e. by shooting, clubbing of young or trapping, took place at their fish farms and some others described futile attempts. The number of farms with unlicensed control was presumably higher as some respondents mentioned some forms of predator control at their farms, but refused to talk about the subject, apparently fearing reprisals.

Most of the interviewees stressed the ineffectiveness of non-lethal antipredator techniques due to the vastness of carp holding structures. Only six farms undertook any preventive measures, such as mowing of dams and removal of emergent aquatic vegetation (two farms), fencing of the overwintering ponds with magnetic tape or plastic foil, wire nets, or use of chemical repellents advertised in the anglers' press (rated to be ineffective). Some of the fisheries' managers were familiar with more specific methods of otter damage prevention like electric fences and diversion ponds, but they claimed that they were economically unviable.

Total annual fish loss did not differ between fish farms where otters were not observed, fish farms where otter impact on cultured stocks was perceived as insignificant and fish farms where the damage was perceived as serious (Table 1).

When comparing otter predation in Jedlanka (high losses perceived) and in Tyśmienica (no complaints), the average monthly proportion of carp in otter diet (by weight; mean values from months when spraints were collected at both study sites) was only slightly higher in Jedlanka (44.0%) than in Tyśmienica (41.0%). Carp consumption in terms of numbers was even slightly lower in Jedlanka (11.6 vs 12.9%). Documented by the fisheries, annual losses were lower in Jedlanka than in Tyśmienica both in fry (66 vs 82% in 1994 and 72 vs 73% in 1995) and in fingerling production (29 vs 53% in 1994 and 38 vs 41% in 1995, respectively). The presence of 2+ (marketable) cohorts in Jedlanka could influence the assessment of otter impact as 2+ fish represented 55.8% of carp consumption by weight. However, Jedlanka 2+ carp losses (10% in 1994 and 22% in 1995) were low or comparable to farms without serious depredation problem (see Table 1).

Discussion

The survey revealed that otters were common visitors at carp farming sites in the entire region. Over half of the respondents believed that the losses to otters were considerable and a large part of them reported that the menace had increased during the last 10 years. Respondents correctly identified otter presence at their fish ponds, and it seems that the interviewing of fisheries staff can be used to reliably assess otter distribution. However, gathering information on otter impact in this way appears to be insufficient for even such a rough classification of the magnitude of fish depredation, as the one used in my study. Lack of an evident relationship between the level of the perceived damage and total stock losses does not exclude the possibility that farmers assessed otter impact correctly, as the numbers of missing fish document total losses resulting from various factors and are not necessarily related to the impact

of a specific predator (Parkhurst et al. 1987). Also, secondary damage like lost body weight of fish, and in consequence loss of market value due to disturbance (Bodner 1998), to some extent goes unrecorded. Even so, complaints about heavy stock losses to otters appeared not always to be plausible, as the level of loss did not differ between farms without otters and those with perceived serious damage to the crops. Although some fish farmers reported even doubling of the losses due to otter activities at the ponds, the total annual losses of 1+ and 2+ carp cohorts were insignificantly higher at farms where otters were perceived as a minor problem than at those from which serious losses were reported. Also, the proportions of carp in otter droppings were similar at the two studied pond complexes, though the damage attributed to otters was differently perceived. It must be noted that the perceptions of higher losses in Jedlanka where 'marketable' carps were produced alongside younger age classes, may be somehow justified as depredation of older fish brings larger economic losses. On the other hand, older carps such as 2+, are apparently more difficult to prey upon than younger cohorts (see also Lanszki et al. 2001), as larger fish may be able to sustain a faster swimming speed (Bond 1979). It is predicted that higher losses occur when fish are within the size range at which susceptibility to the predator is the greatest (Parkhurst et al. 1987).

Of the factors associated with type and location of the aquaculture enterprise, only the form of ownership appeared to influence the impressions of fish farmers. Private pond owners reported higher losses than managers of state-owned facilities (see also Pitt & Conover 1996). This cannot be attributed to differences in density or age of stocked fish between private and state-owned fisheries, because usually the cultural techniques at the private farms have not changed much. Scale of enterprise was not associated with the perception of losses. However, small aquaculture enterprises were often mentioned by the respondents as those exposed to heavy predation by otters (see also Kranz 2000). Compensation expectations were presumably insignificant as no system of compensation payment had been developed.

Fish farmers' reports on prey size selection were not unanimous, but selective taking of larger fish was most frequently mentioned, whereas the analyses of spraints from the two intensively monitored farms indicated otter preference of 1+ to 2+ carps (Kloskowski 2005), or even 0+ to 1+ carps (Kloskowski 2000a). Both spraint analysis and farmers' opinions should be treated with caution. Faecal analyses are likely to underestimate the fraction of larger fish (Carss et al. 1990, Carss & Nelson 1998). Fish culturists' perceptions of losses to predators may be based on casual observations (Pitt & Conover 1996), which are not evident from documentation of production. Conspicuous incidents like taking of brood fish, individuals of the largest size and highest quality, surely affect the attitudes of pond owners. More signs of depredation will be found at ponds with older cohorts, because otters discard some parts of large fish (Erlinge 1967, Jacobsen & Hansen 1996). Also, otters bring large fish ashore, but eat small fish in the water (e.g. Kruuk et al. 1987).

The present survey showed an increase both in the numbers of fisheries frequented by otters in southeastern Poland during the past decade and in the harm perceived. It also revealed that fishery staff rated the non-destructive antipredator devices ineffective or unacceptable because of the additional costs connected with these. In fact, illegal persecution can be widespread. As private owners tended to perceive otter menace as more severe than managers of state-owned facilities, the otter-fisheries conflict in the former Eastern Block countries may be worsened by the ongoing privatisation of aquaculture and increased pressure on profit making at fisheries.

Fish farmers' perceptions appear valid for identification of otter occurrence at their farms, but not for assessment of the damage value. A complete verification of farmers' perceptions would require quantification of predator-related losses and estimates both of populations of predators and of predator consumption (Pitt et al. 1998); in this study estimates were compared only with annual total stock losses and dietary data based on spraint analysis. Even if the farmers' impressions differ from 'reality', conservation policy at fisheries should take them into account, to address all dimensions of the problem (Kranz 2000). However, when quantitative interview information on lost production is concerned, the psychological and socioeconomic realities must be carefully delineated within the damage perceptions.

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References

Bodner, M. 1998: Damage to stock in fish ponds as a result of otters (Lutra lutra) predation. - BOKU-Reports on Wildlife Research & Game Management 14: 106-117.

Bond, C.E. 1979: Biology of Fishes. - W.B. Saunders Co., Philadelphia, 514 pp.

Bukacińska, M., Bukaciński, D., Cygan, J.P., Dobrowolski,

K.A. & Kaczmarek, W. 1995: Przyrodniczo-ekonomiczna waloryzacja stawów rybnych w Polsce. (In Polish with an English summary: Environmental-Economic Evaluation of Fish Ponds in Poland.) - IUCN Poland, Warszawa, 114 pp.

Carss, D.N., Kruuk, H. & Conroy, J.W.H. 1990: Predation on adult Atlantic salmon, Salmo salar L., by otters, Lutra lutra (L.), within the River Dee system, Aberdeenshire, Scotland. - Journal of Fish Biology 37: 935-944.

Carss, D.N. & Nelson, K. 1998: Cyprinid prey remains in otter Lutra lutra faeces: some words of caution. - Journal of Zoology (London) 245: 238-244.

Erlinge, S. 1967: Food studies of the fish-otter Lutra lutra L. in south Swedish habitats. - Viltrevy 4: 371-443.

Jacobsen, L. & Hansen, H.M. 1996: Analysis of otter (Lutra lutra) spraints: Part 1: Comparison of methods to estimate prey proportions; Part 2: Estimation of the size of prey fish. - Journal of Zoology (London) 238: 167-180.

Kloskowski, J. 1999: Otter Lutra lutra predation in cyprinid-dominated habitats. - Zeitschrift für Säugetierkunde 64: 201-209.

Kloskowski, J. 2000a: Selective predation by otters Lutra lutra on common carp Cyprinus carpio at farmed fisheries. - Mammalia 64: 287-294.

Kloskowski, J. 2000b: The distribution of otter Lutra lutra spraints in relation to habitat exploitation in a fish-pond area, South-East Poland. - Lutra 43: 19-28.

Kloskowski, J. 2005: Otter Lutra lutra damage at farmed fisheries in southeastern Poland, II: exploitation of common carp Cyprinus carpio. - Wildlife Biology 11: 257-261.

Kranz, A. 2000: Otters (Lutra lutra) increasing in Central Europe: from the threat of extinction to locally perceived overpopulation? - Mammalia 64: 357-368.

Kruuk, H., Conroy, J.W.H. & Moorhouse, A. 1987: Seasonal reproduction, mortality and food of otters (Lutra lutra L.) in Shetland. - Symposia of the Zoological Society, London, 58: 263-278.

Lanszki, J., Körmendi, S., Hancz, C. & Martin, T.G. 2001: Examination of some factors affecting selection of fish prey by otters (Lutra lutra) living by eutrophic fish ponds. - Journal of Zoology (London) 255: 97-103.

Parkhurst, J.A., Brooks, R.P. & Arnold, D.E. 1987: A survey of wildlife depredation and control techniques at fish-rearing facilities. - Wildlife Society Bulletin 15: 386-394.

Pitt, W.C., Beauchamp, D.A. & Conover, M.R. 1998: Evaluation of bioenergetics models for predicting Great Blue Heron consumption of Rainbow Trout at hatcheries. - North American Journal of Fisheries Management 18: 52-65.

Pitt, W.C. & Conover, M.R. 1996: Predation at Intermountain West fish hatcheries. - Journal of Wildlife Management 60: 616-624.