

**International Otter Survival Fund
Otters and Fisheries Conference Report**



Editors: Sarah Jupp, Lesley Wright and Grace Yoxon, IOSF



7 Black Park, Broadford Isle of Skye IV49 9DE
www.otter.org

IOSF Otters and Fisheries Conference

7th November 2012, Edinburgh

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Opening Session

Andrew Cameron, Facilitator: There is a perceived tension between otter conservationists and anglers. The purpose of this conference is to

1. Determine whether this tension is real, and if so, how widespread it is, both geographically and across the different kinds of anglers and fishery maintainers
2. Discover and eliminate misinformation whether accidental or malicious
3. Find a way forward for both otter conservation and anglers

Short presentations were given in sessions of two or three, followed by questions from the floor.

Session 1

Eurasian Otters and Populations

Paul Yoxon, International Otter Survival Fund

A short description of the Eurasian Otter, *Lutra lutra*, was given covering its basic anatomy and adaptations to a semi-aquatic ecological niche. Particular attention was drawn to the size of the Eurasian Otter: the greatest weight recorded for this species in the UK is 11.8 kg, so reports in the press and anecdotally of 20kg otters are hugely exaggerated.

Otters are protected by European Law from any disturbance, which includes holts as well as the animals themselves. The legislation is the EU Habitats Directive, which is transposed into domestic law through the Conservation (Natural Habitats, &c.) Regulations 1994, often referred to as the 'Habitats Regulations'. Under the Habitats Regulations, otters are classed as "European Protected Species" and therefore given the highest level of species protection.

Freshwater otters are largely nocturnal. The range of a female otter will be smaller than that of a male (20-30km compared with 35-45km).

Coastal otters are active day and night in a cyclical pattern of sleeping, waking, hunting, grooming/playing and then sleeping again several times during each 24 hour period. Female territories for coastal otters include freshwater areas and are from about 2km up to 12km depending on prey availability, freshwater for drinking and washing salt from fur, and suitable holt opportunities.

The IUCN Red List assigns European Otters the status of "Near Threatened" with a decreasing population trend. Worldwide, the species has a very large range, from Ireland to Korea, but this gives no indication of population density. There has been a lot of survey work done in Europe, but outside of Europe true distribution is unknown. This includes the vast areas of Russia and most of Asia.

The only data we have on otter numbers in the UK was published by the Joint Nature Conservancy Council (JNCC) in 2007 based on 2004 data. This survey concluded that there were 10,302 otters in the UK, 8,000 of which were in Scotland. This figure is very unreliable as it was calculated as one otter per 27.32 km of river in areas where the survey showed otter presence on that river but they also stated that one otter can range up to 40km of river. In one area of Catalonia in Spain, Jordi Ruiz-Olmo has found that a female occupies only 200m of river and is rearing cubs there. It is therefore impossible to extrapolate a linear relationship between otter numbers and length of river. Because of the large number of factors that determine otter territory size, none of which are taken into account in this calculation, it is no more than a ballpark figure, and even where food etc is plentiful, otters are by nature solitary and will not crowd together even in the richest habitat.

JNCC stated that the original National Surveys were not designed to detect population trends (JNCC 2007) and they also state that the quality of this estimate of otter numbers is POOR.

Studies have shown that coastal otters mainly feed on eel-like fish (such as butterfish, blennies, sea scorpions, rockling) and saithe which together account for 85% of the diet. Very few of the common prey items of coastal otters have any economic significance for man. In freshwater, historically otters preferred eels where these were available and eels would make up 75% of prey taken. However, European eel numbers have declined by 95% in the last 25 years and only 10% of the expected number of baby ("glass") eels have been arriving from the Atlantic, which shows that otters are not responsible for the decline.

In the UK, otter breeding is mainly non-seasonal. Breeding on Shetland used to be seasonal, but otter populations there are down by 40% since 1991 and breeding is now non-seasonal there too. A female will normally have two cubs and the cubs stay with their mother for a year to 18 months. Sometimes she may have more cubs but she seldom has enough resources to rear them. A female otter will normally breed roughly every 2 years, and will probably only breed twice or three times in her life. Once the cubs are mature and leave their mother, they must travel, often over long distances, to find an empty territory they can claim.

In the UK, wild otters live to a maximum of 8 years. In Germany and the Czech Republic, wild otters are living to 15 years. Why do our otters die young?

However, if we combine this low life span with the otter breeding cycle, it can be seen that in the UK, otter numbers can increase only very slowly.

IOSF mortality data show that most dead otters are the result of Road Traffic Accidents (RTAs), plus deaths by drowning in creels. A few are also killed by dogs, occasionally grey seals and sea eagles may take cubs, and some are illegally shot or snared.

Otters in the UK were once common and widespread, with a presence on every water body. In the late 1950s, numbers crashed due partly to river canalisation and other habitat loss but mainly due to poisoning by organochlorine pesticides introduced in 1948. These chemicals were highly toxic and contaminated the entire food chain, being found even in human milk. They were eventually banned, and as rivers became less contaminated, otters, and other wildlife, returned to them, spreading naturally from areas where organochlorines had not been used.

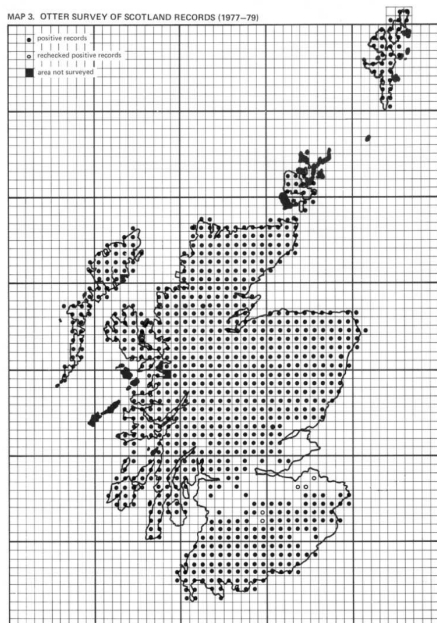
Threats to the returning population still exist however: PCBs, though banned, are present in landfill and leaching into rivers, and new compounds, such as PCDs used as flame retardants, have been introduced whose toxicity in the wider environment is unknown. Fish in some areas still have high levels of heavy metals such as mercury and cadmium, which indicates they are still getting into the food chain despite having been controlled for many years. And nothing is known about the effect of the cocktail of all these chemicals.

There have been some reintroduction attempts in Europe, with limited success. An attempt to reintroduce them into Switzerland failed. In Holland, 42 animals from Latvia and Belarus were reintroduced but many of these been killed on the road.

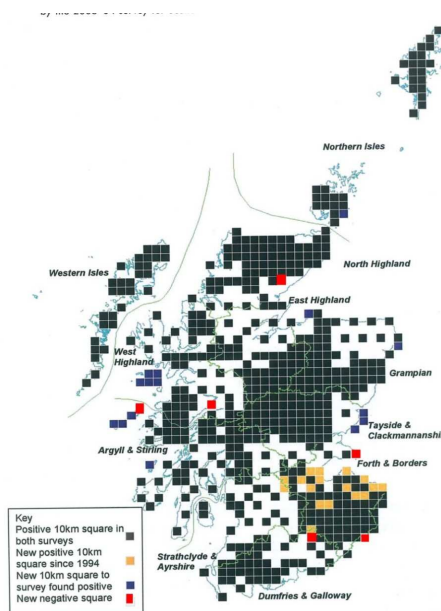
There was a recent spate of reports in the media that otter surveys had shown a 44% increase in otter numbers. National otter surveys are done by dividing the country into 10 km² squares and 6 or more sites for each square were originally selected in the 1977-79 surveys. At each site 600m of river/waterway were surveyed for spraints (droppings) usually 300m up and down stream on one side of a river. As soon as a single “otter sign” is found, the square is marked as positive and the surveyor moves on.

Because of the large size of otter territories, surveys cannot assess otter numbers as many squares could be recording the presence of a single otter whose territory intersects several of the arbitrary survey squares. The survey has been repeated every five years with variable coverage of the UK since 1979 and are reported to show an upward population trend but no indication at all of population density.

However, if we look at the data from Scotland there actually appears to have been a decline:



Vincent Wildlife Trust Survey, 1977-1979



Scottish Natural Heritage Survey, 2002-04

From the first map, we can see that most of the country had positive records apart from the Central belt and a small area on the Borders. For the later survey not all sites were visited and these are marked as white squares on the second map. However the red squares are areas which were positive in the first survey and are now negative.

Sprainting rates are very seasonal and also any given otter will not conveniently always spraint where humans can find it, plus an individual otter could have a territory that extends over many survey squares, so spraint numbers are not directly related to otter numbers except in the simplest sense of "at least one otter was present". A survey on the River Ribble showed a 44% increase in spraints compared to the previous five years but NOT a 44% increase in otters. In fact, that rate of increase is impossible with otters because they simply do not breed that fast! Just because signs are being found doesn't mean otter numbers have gone up – they may just have to travel further for food, especially in times of drought.

The only real estimates on numbers comes from Kruuk's work in Shetland in 1986 and Yoxon on Skye 1999. They correlated active otter holts with actual otter numbers determined by intensively studying areas and working out a relationship. From this the total population for the Isle of Skye was estimated to be between 300-400 and on Shetland it was estimated to be 800-900, although since then there has been a drop in numbers of about 40%.

Can we extrapolate from this? The answer simply is no. The work on Shetland and Skye was done in coastal areas where home ranges are smaller and it is possible to watch the otters and identify individuals to get a relationship between active holts and otters. This is far more difficult in freshwater areas so at the moment the only way of surveying is using spraint. However, in 1986 research was carried out in Shetland on the use of spraints to survey populations of otters. [Kruuk, H, Conroy, J.W.H, Glimmerveen, U and Ouwerkerk, E.J (1986), *Biological Conservation* 35 187-194]. It was concluded that "there was no correlation between sprainting and the frequency of use of an area by otters. This casts doubt on the use of spraint surveys as a method to assess habitat utilisation by otters".

IOSF has just completed work in two areas on Skye where the number of otters present is known. Over a year it was shown that there is no correlation between the number of spraints or number of active sprainting sites and the number of otters present.

Work needs to be done to provide a reliable method to estimate actual otter numbers in freshwater areas. Some work has been undertaken using DNA in Southern Britain, Italy and Thailand but more needs to be done.

Reassuring Implications for a 45 Year Assessment of an Otter Population

James Williams, Chairman, Somerset Otter Group, President, Taunton Flyfishers

There has been an ongoing study of the otter population in Somerset for some 45 years, initially by me, and latterly by the many members of the Somerset Otter Group (SOG). These records started before the decline which removed most of the otters from the whole of England. The first national survey, done to evaluate the extent of this disaster, found that almost half of the otters in England were confined to rivers originating on Dartmoor. My records show that in the early 1970s otters were still present in all parts of Somerset and East Devon, but that by 1979 they had disappeared from over half this area, and that in 1984 they were so scarce as to produce only 12 records for the whole area for the whole year. There were slight signs of recovery the next year, and subsequent records clearly demonstrate a steady spread eastwards from the River Exe in the west back across the county. These gradual annual increments give the lie to current allegations that otters were released; it was a natural recolonisation.

But the recovery seemed to fail around Bridgwater. Our maps clearly show an empty area which we called the Bridgwater gap, which we could not explain at the time. We realised the cause when it suddenly filled several years later. A munitions factory had been discharging acid from TNT manufacture into a 7km open ditch, under Crown immunity. When the works were privatised, the pollution had to stop, and the otters could survive in that area. Not only does this detail reinforce the evidence that our population regenerated naturally, but the late date, 1992/3, was at a time when the recovery of the otter across England was being generally celebrated. I feel this disturbing instance demonstrates that the wide-ranging otter is susceptible to considerable harm from localised pollutions or other hazards, and that its recovery should not be too loudly celebrated just yet.

Another detailed local study scheme also points this out. The otters reached my local river, the Tone, in 1987. In 1988 I moved to a house with a tributary in the garden, and built an 'Otter Loo' to record spraint daily, as I still do. This simple but effective monitoring system showed an increase every year for 11 years, from 10 visits in the first year to 66. The graph then plateaus out in the late 1990s at between 50 and 60 visits each year, a simple indication that the population on the River Tone had stabilised. In 2002 the score crashed to 30; there was a bad pollution, deliberate dumping of slurry, which killed all the fish, and we had no otters for 5 months. This again shows the sensitivity of this species to damaging incidents, and also the value of monitoring at a scale which picks this sort of thing up. In 2003 we started to hatch trout to restock the stream, and the otters came back, and even bred, but in 2006 the records fell away to a similar level as after the pollution. There had been no pollution, and they recovered well the next year, but that something had affected them was confirmed by another of our studies, which showed similarly worrying downturns across the whole county. Had we not known about the slurry, the lack of otter visits would still have told us that there was a problem with the river.

SOG undertakes an annual co-ordinated survey of the whole area. Some 130 trained volunteers look at most of the water-courses in the county on a nominated Saturday, and scratch out any spraints or padmarks. They then look again the following morning, and record any fresh

evidence. This is not the same as counting spraints, but it does give the undoubted location of many otters on the same night. It was originally started to see whether the otters were recolonising, but over time it shows trends and variations. For instance, it showed that 2006 was a problem year across most of the county, and this was later reflected in the very increased annual total of dead otter records. We did not get onto this problem sufficiently quickly to investigate it at the time, but our guess is that it was in some way connected with the very dry, hot summer, possibly Blue-green Algae. But this blip apart, the surveys show that Somerset consistently has a widespread population of otters.

The coarse fishermen already knew that, they claim; they also claim there is a very large number in total, mostly released by us. It would be very helpful in this debate to be able to assess just how many otters there are in our successful area. A clue to this comes through a study on the River Tone. In the year 2000 a study of that river, through the medium of DNA from fresh spraints, revealed a resident population of 7 otters. Comparison of our annual survey results since then with this unassailable distribution confirms that level of occupation, and, over the full extent of the catchment, rather more than the DNA study area, shows consistently about 10 or 12 adult otters. That this method of two-day survey accords so well with the DNA result emboldened us to extend the method to the whole county. The last five years, since recovering from the collapse of 2006, we recorded 65, 62, 69, 69, 67 otters. The maps indicate that there is not much room for more at the same spacing. We consider this an informed estimation of the extent to which predation can be expected, a useful counter to extravagant claims.

However, it is not a high total for so large and well-watered an area. We also record deaths, and collect as many as possible for post mortem examination at Cardiff University. In a normal year we average about 30 deaths, rising to 43 in a disaster year. Most are collected from roads, but on examination two other problems come to light. There is a lot of fighting, with wounds severe enough to compromise the viability of that animal; the otters control their own population density, so the claims of major infestations of predators are unlikely, or even impossible. In addition, many of our otters, in fact almost all from the slower rivers, carry a burden of the newly imported parasite, the bile fluke, first discovered in one of our otters in 2003. The full extent of the impact of this is being investigated by Cardiff University, but it has already been shown to be sufficiently damaging to be a worry for the future of otters in some areas.

We think that these accumulated results from interested amateurs show that otters can recolonise our aquatic habitats again now, but that they will limit their own presence to a level at which it should be possible to accommodate both otters and anglers. We find that looking in closer detail at local populations also reveals that they are still very vulnerable, and that we should not assume that they are firmly established without survival problems yet.

Panel Discussion

Survey Methods

Question: When you find spraint, do you remove it?

Answer: No, we scuff it about with a stick so when we revisit we can tell old spraint from new.

Pollution and Population Fragility

Comment: The point about population fragility is very important. On the River Teifi there are no otters in the upper reaches, because there are no fish, because there are no invertebrates because of the high use of synthetic pyrethroids in agriculture.

Comment: There are a lot of emerging contaminants whose effects are unknown. There is currently work being done on new pharmaceuticals that are entering the ecosystem and whose effects are not known.

Otters and Mink

Question: How do otters and mink interact?

Answer 1: In Somerset, where there are more otters there are fewer mink.

Answer 2: In Scotland, mink and otters seem to coexist on the coasts.

Question: Otters did not come back until mink were removed – were otters not able to return until mink numbers were controlled?

Answer 1: Laura Bonesi's records show that when otters arrive, mink move out.

Answer 2: David MacDonald at Oxford (WILDCRU) found that if food resources are scarce, otters will kill mink.

Answer 3: In east of England, otters and mink coexist.

Answer 4: People believe that if there are otters there are no mink, but on Tayside they coexist.

Answer 5: Is it related to food supply? Low food supply could lead to more aggression. What we need is better fish welfare. If there aren't many fish, both mink and otters have to work harder.

Answer 6: When otters were reintroduced on the River Lee, there were also otters recolonising from Cambridgeshire. Mink were present but otters recolonised successfully, indicating that mink presence was unimportant. It is cormorants that have massively affected the fish supply on stillwaters in summer and flowing waters in winter.

Answer 7: Otters and mink are sympatric. When otters are present, mink behaviour changes somewhat. The biggest declines in mink are due to trapping and shooting, not to whether otters are present.

Otters on the River Ribble: 44% increase

Comment: Although the EA website did say there was a 44% increase in otters on the River Ribble, it was an over-enthusiastic web editor that wrote it, not any of the EA biologists. But the media got carried away.

Otter Territories

Comment: Otters will go a long way from the coast – they travel via ponds, drains, marshes, all kinds of things. Snow tracking is excellent for finding where and how they are travelling.

Session 2

Impact of Birds and Mammals on Fish Farms and Fisheries

Ian Semple, Howietoun Fishery, Stirling University

I work across Europe but this presentation is on the Howietoun Fishery at Stirling University, where I have worked since 1980.

The fishery was established in 1881 although the earliest records of trout culture on the estate date back to 1873. After several trials with makeshift hatcheries freezing up and, in another instance, being washed away they settled on the current sites of the hatchery and on-growing facility due to the supply of spring water and control over water-flow. There is no mention of predators in the "History of Howietoun" by Sir James Maitland, and at that time there was no fencing or cover nets. All losses were the result of human theft.

The earth ponds at Howietoun had never been netted over in the history of the farm. There did not appear to be any necessity due to diligent removal of predators within a wider area and hence very low predation pressure. Cormorants were never seen until the late 1980's and otters made a return around this time as well. Since 1980 predation has increased and changing attitudes and legislation change have altered the dynamics of predator numbers and impact.

Hérons have been a big problem. 50% of fry in small ponds vanished and 12% of yearlings vanished from their ponds. This is because herons only take the tiny fish. Cover netting was put over one fingerling pond. Extra fish were put in, and the amount recovered at the end of the season was the same. However, once cover netting was extended to all ponds, predation resumed. This is because when one pond was covered, the herons used the other ponds but if all the ponds were netted, the herons worked harder to get fish so predation resumed. They would jump on the net to get it down to a level where they could fish through it. Netting had to be raised away from the water and sealed at the edges.

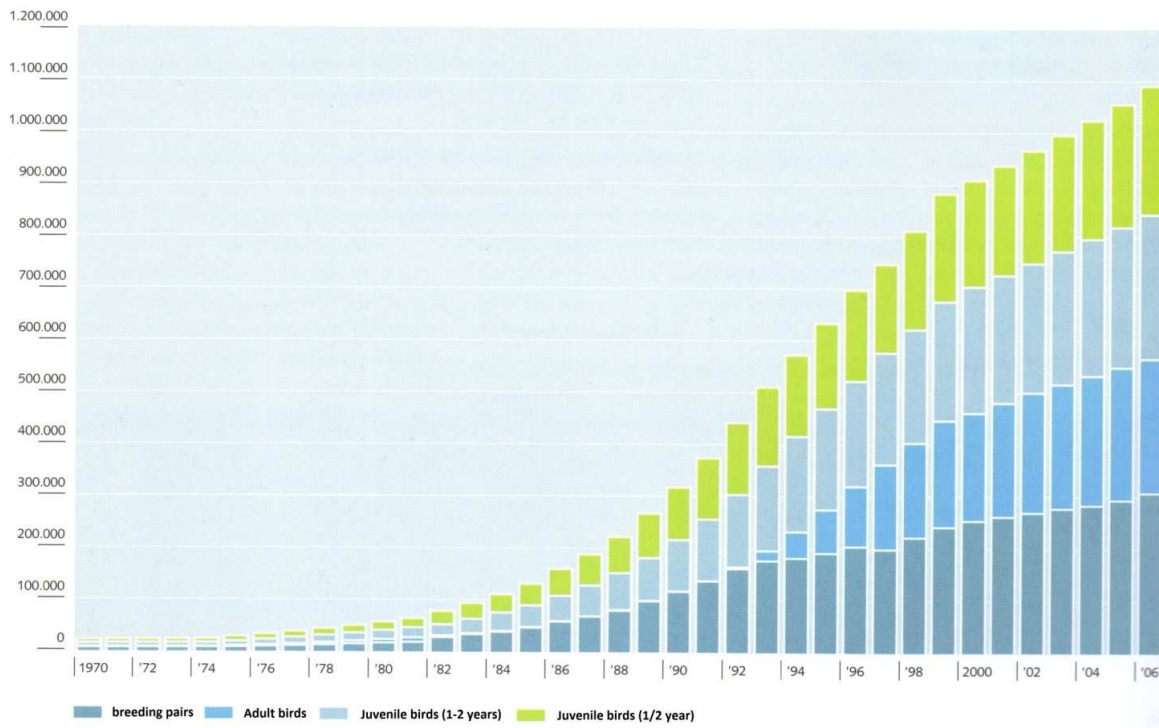
Installation of overhead netting in Scotland is continually at risk during winter due to "wet snow" as the accumulation of snow often collapses the whole system into the water. Such weather events are often followed by freezing conditions which compromise re-installation or damages netting beyond repair.

There are other problems with netting:

- High capital cost
- Maintenance costs
- Replacement every few years
- Negative impact on foxes, herons, badgers, otters, kingfishers and swans which can get tangled in the netting. Swans never used to be present at Howietoun but are now.
- But it DOES stop heron predation.

At any one time there can be 35 herons on the fishery (maximum 42). They can take fish up to 300g but prefer fry and fingerlings and they take up to 300g of fish per heron per feeding session. Stock is also lost when the fish are damaged by herons spearing them but not being able to take them but they still cannot be sold on. It is noticeable that there is more predation on moonlit nights and small ponds are more affected than large ones.

Cormorants were never a problem until the late 1980s but numbers have soared all year round and they will take wild and stock fish equally.



Cormorants have increased across Europe since 1970. The above graph based on data from Germany shows an increase in populations from 1970 to 2006 and they have not reached a plateau. (Landesfischereiverband Bayern E. V. LFV Bayern, Kormoran- und Fischbestand Kritische Analyse und Forderungen des Landesfischereiverbandes Bayern ISBN 978-3-00-022465-2, Munich 2007)

Figures in the UK are similar but the rise is not as steep. At the Loch Leven trout fishery, trout made up 85% of the gut contents (by weight) of cormorants shot under licence and there was no significant difference in the ratio of stocked to wild brown trout. In seven months, the cormorants took 80,803 trout whereas the average annual catch by anglers on Loch Leven is 5,928 fish. So the increased take by cormorants far outweighs any stock increases and fish taken by anglers. (*Diet and prey selection of Cormorants (Phalacrocorax carbo) at Loch Leven, a major stocked trout fishery.* D. C. Stewart et al *Journal of Zoology* Vol. 267: pages 191-201, 2005). Cormorants previously did not impact on freshwater fish and it is not only stock fish that are impacted. Wild fish are severely depleted also with consequent reduction in fish available to anglers.

Mink have been widely shown to have impacts on waterfowl, water voles and amphibians but they are not seen as a problem at Howietoun. In 1981 a total of 35 mink were trapped/shot. This reduced the following year to around 12 and in subsequent years the annual cull hovered around 6 until 1990 when otters made a comeback. Mink were then a very rare sight. Otters displace mink by direct aggression and competition and they can produce a permanent suppression of mink density.

As otter numbers increased so did damage and disturbance to fish. Mink do not impact fish stocks because they can be legally shot and can be eradicated and there is even grant aid to do so. However complete eradication may be very difficult over island/coastal areas with limited easy access.

Although mink have been blamed for declining waterfowl and wader numbers, otters can inflict damage on birds nesting close to rivers and wetlands. Otters are not exclusive fish eaters; an internal report by the Institute of Fisheries Management referred to research on the diet of otters in Somerset which indicated a shift in diet preference - 41% bird remains in spraint in 2008 compared to 4.6% bird remains in 1981. Otters sometimes kill ducks and water birds but do not eat them, particularly if the bitch otter is teaching young to hunt.

Otters catch fish and may only take one bite from the shoulder if they eat any of it at all. If otters ate the fish, farmers could allow for it, but they do not and it is carnage.

Carp in winter are particularly vulnerable as they are easily captured by otters, damaged, stressed and only a single bite may be taken. Increasing numbers of otters are causing serious problems for fish pond managers throughout Europe. Losses attributable to otters in Czech Republic equated to \$US 1.268 million in 1999. (*Impacts of otter (Lutra lutra L.) predation on fishponds: A study of fish remains at ponds in the Czech Republic. Aquaculture International 11: 389-396, 2003*). Sometimes only 27% of the fish bodymass was eaten by otters but there may be heavy carp losses due to stress under ice. Each fish is worth £300 or possibly £600.

Angling is a big participation sport in the UK and contributes billions of pounds to our economy, particularly coarse angling.

Electric fencing is prohibitively expensive for the huge ponds at Howieton, which is 1.2 km in circumference for the main production facility. The site is fenced around the perimeter but to make it otter proof would almost require replacement of materials.

Losses to otters can be considerable. For example, in Autumn 2011, 14,399 brown trout fry and 42,000 salmon fry were installed in ponds netted from birds but accessible to otters. In March 2012 these fish were recounted and there were then 10,600 trout (26% loss) and 21,000 salmon (50% loss). Both species of fish were similar in size at the time of introduction to ponds - about 30g each and each day records were taken of mortality, weather, food fed, stock movements etc. Mortality to any other cause than predation for this group of fish was negligible (< 2%). Therefore otters are eating unsustainable numbers of fish and they clearly preferred salmon to trout. Ponds set up at lower density exhibited lower percentage loss.

A significant number of the surviving fish exhibited signs of bite marks and many of the fish were left uneaten on the banks. This appeared to be mainly bitch otters teaching their cubs to hunt.

The 12,600 surviving salmon were installed in a large open pond (100m long x 20m) at the beginning of March 2012. They fed well initially but were impacted by herons, cormorants, goosanders and also ospreys. Up to 15 herons could be counted around the banks at any time and otters actively fished this pond both at night and during the day. By July it was obvious that the numbers of fish had declined alarmingly and the pond was seine netted and drained. Only 235 fish remained. Of these more than 21% exhibited either score marks typical of heron damage or bites to the back or caudal area.

Conclusions:

- Predation losses have become more severe over the last 30 years.
- The cost of preventing predation is unlikely to be borne by conservationists who are promoting even more predation.
- It is very likely that wild fish are also being impacted.
- Water quality in the UK is very poor
- Are the public prepared to pay to watch fish being eaten? Those at the conference confirmed that the public are happy to pay to watch fish eaters, as for example seal feeding sessions in zoos.

Editors' Note:

Readers may like to refer to Appendix 1 for the experience of another fishery manager.

Diet of Recovering Otter Populations: Use of UK Stillwaters

Emily Alderton, University College London

Based on this paper: <http://onlinelibrary.wiley.com/doi/10.1002/aqc.1241/pdf>

To help alleviate human-otter conflicts, greater understanding of the diet of this recovering predator is needed.

This covers two case studies: Malham Tarn in Yorkshire, a natural fishery not stocked since 1994, and the Riven Glaven in Norfolk, a river with many associated lakes and ponds in its catchment.

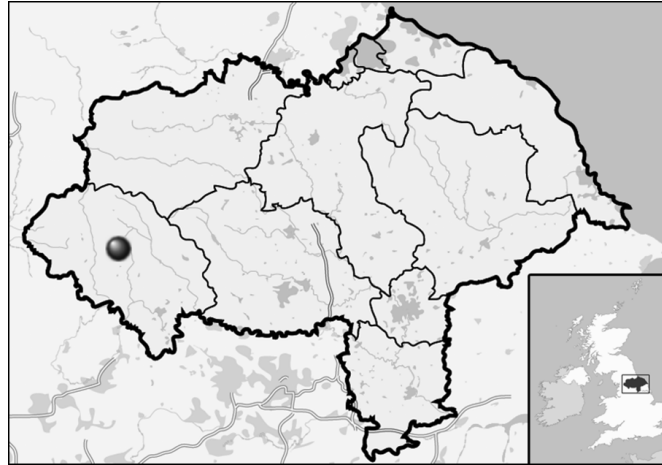


Figure 1 – Location map for Malham Tarn

Malham Tarn is a large upland marl lake with peat bog to the west, and limestone cliffs on the north side. The short inflow stream is a spawning ground for brown trout, but it is degrading. There is a large elevation change between the Tarn and the nearby river systems, so the otters there are fairly isolated. There are six species of fish present in the Tarn (bullhead, brown trout, perch, stone loach, minnow and three spined stickleback), plus a very small population of white-clawed crayfish, as well as amphibians and wading birds. Malham Tarn is frequently visited by bird watchers, anglers and walkers all year round.

Otters arrived at the tarn in 2009; observations by the many bird watchers that monitor the tarn indicate that there seem to be two individuals, and there is no indication of them breeding.

Spraint analysis was carried out monthly from December 2011 to June 2012, and indicated that bullhead was the most frequent prey item throughout the period, with brown trout making up a further 20% of the diet by frequency. Anurans were up to 15% in winter and spring (as they hibernate and then spawn), and the rest was mainly birds (rooks, pheasants, gulls, tufted duck and one heron, with some evidence of scavenging). Very few white-clawed crayfish were taken. Significant seasonal variation was seen in the numbers of anurans and 'other fish' (grouping stickleback, stone loach and perch together), being consumed. These seasonal changes are thought to reflect changes in prey availability.

Only 3 perch scales were found in spraint, despite the abundance of this fish in the Tarn, suggesting otters are avoiding this prey.

In terms of the biomass diet composition, birds probably make the biggest energetic contribution to the diet, followed by anurans, whereas trout and bullheads make a smaller contribution to the diet.

Most brown trout taken were less than 25cm long (juvenile fish from the inflow stream and spawning grounds, rather than fish from the main Tarn). There was no evidence of large trout in the spraint, again suggesting otters are avoiding the fast swimming, open water fish. Walkers and anglers found no evidence of dead fish around the tarn.

On the whole, the otters are taking shallow water species (especially bullhead), with opportunist bird predation, probably including scavenging.

Otters are probably not having an impact on the white clawed crayfish population, with the small number of crayfish appearing in the diet reflecting the very low abundance of this prey type in the Tarn. Bird predation is low but they may be disturbing nesting birds. Otters are taking young trout, thus decreasing recruitment, but not taking specimen fish. However, the degradation of the trout spawning ground is more likely to be having a much larger effect on trout recruitment than otter predation.

Observations of otter foraging behaviour made over May to June 2012 supported the suggestions from spraint analysis, that otters are hunting mainly in the shallow waters of the Tarn, and in the inflow stream. Otters were observed regularly and on consecutive nights feeding in the inflow stream, and in a shallow bay next to this. Foraging seemed to target bullhead, with otters rolling vigorously over stones in the shallow water, and then catching these fish as they swam out from under the stones.

On the River Glaven, spraint analysis was carried out bi-weekly between February 2009 and June 2010. Previous data on the diet of otters had been collected from the River Glaven between 1970-1975, and was compared to that from 2009-2010.

Alongside the river there are some shallow ornamental lakes and several small marl pit ponds, much used by otters. These contain a wide variety of fish: Roach, rudd, perch, pike, eel, tench, common carp, ruffe, and a few crucian carp, a recent Norfolk BAP species. Both kinds of crayfish are found (native white-clawed and non-native signal crayfish) in the river system.

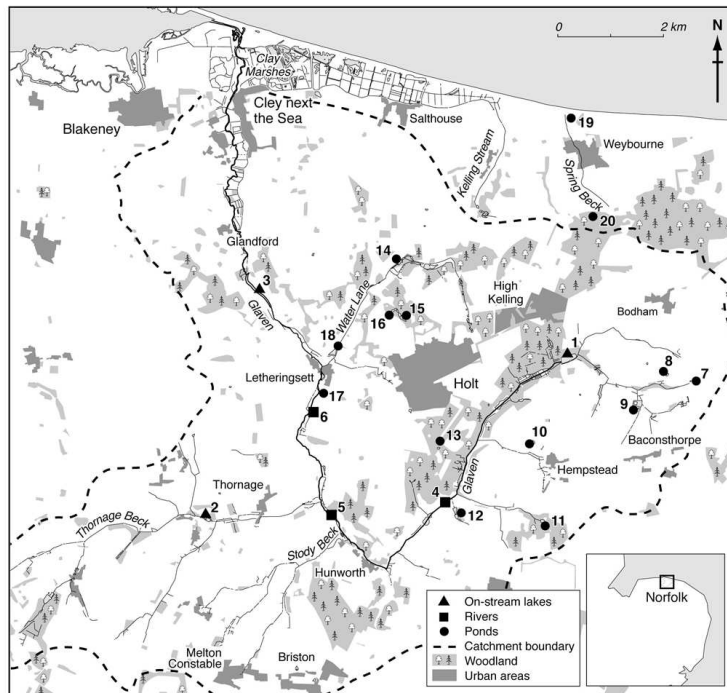


Figure 2 – Map of the study area for the River Glaven research, with sampling sites by number. Sites 1-3 are in-stream reservoirs, 4-6 are stream stretches, and 7-20 are ponds. Figure from Almeida et al. (2012)

Spraint analysis carried out in 2009-2010 revealed that fish made up over 50% of the otters’ diet by biomass, with birds being of secondary importance. Other prey types found in low abundances included aquatic and terrestrial invertebrates, signal crayfish and berries.

Comparison of the diet in the 1970s to that found in 2009-2010 revealed changes in certain prey groups; the percentage of eels being consumed by otters decreased overall (reflecting the nationwide decline of this species), as did consumption of three-spine stickleback. In contrast, consumption of cyprinids and birds was higher in the 2009-2010 study (fig. 3).

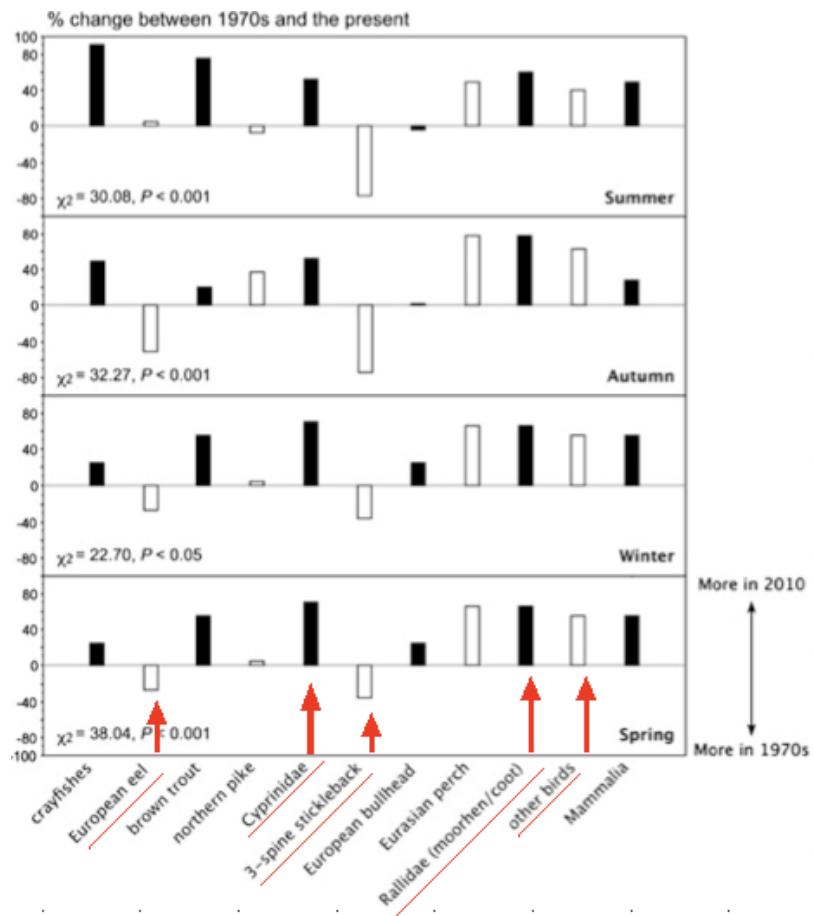


Figure 3 – Percentage change for different food categories in the diet of Eurasian otters between the 1970s study period, and the 2009-2010 study period. Figure from Almeida et al. (2012)

There is also some evidence that otters are feeding increasingly in stillwaters (fig. 4); dividing the fish species found in the otters’ diet into those associated with rivers, with stillwaters, or those found in both, there seems to be a general shift towards more stillwater associated species in the 2009-2010 study.

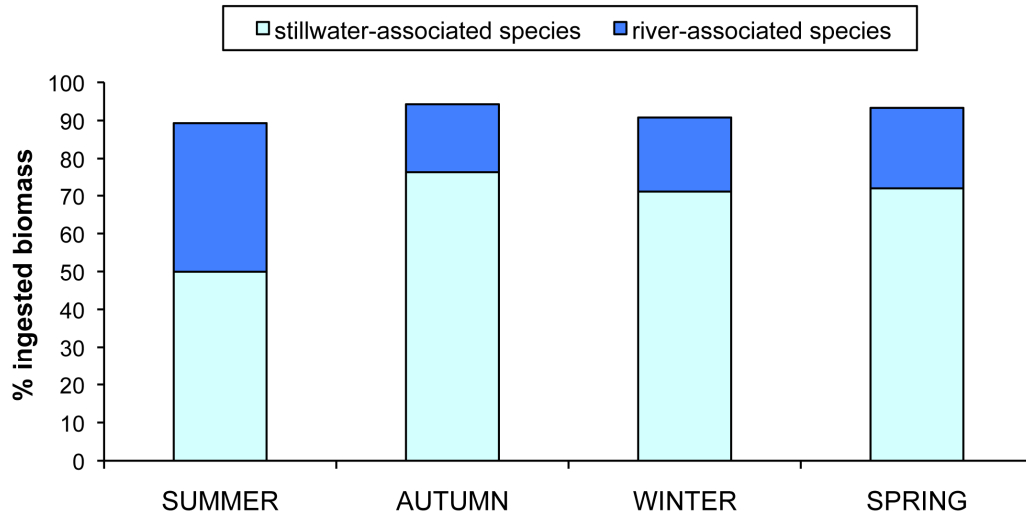


Figure 4 – Percentage biomass contribution of stillwater and river-associated fish species to the diet of otters. Graph by Carl Sayer (unpublished)

From a conservation point of view, otter diet analysis can indicate what is happening in the river system, including the decline of the protected European eel. Apparent shifts towards greater consumption of stillwater fish, anurans, and birds may indicate a general decline in the fish stock of the river.

The crucian carp population has been rising in some ponds even despite heavy otter predation, but more work is needed to work out the impact of otters on fish populations in ponds and lakes in the catchment– how are they co-existing?

Carl Sayer, one of the authors of the paper, suggests that in lakes and ponds with good water quality, substantial submerged plant stands and healthy fish populations with good fish recruitment, otters may have limited impact. However, where the fish population is under stress due to factors such as poor water quality, little vegetation cover, fish diseases etc – otter predation has a larger effect. Otter diet is very plastic – they will adapt to what they find.

One solution to the “otter problem” that conservationists and anglers can all help with is to improve and maintain water and habitat quality in our rivers, lakes and ponds so that otter predation will be more sustainable.

Panel Discussion

Otter Fencing/Deterrents

Question: Are there any deterrents for otters?

Answer 1: Electric fencing works, with one wire at ground level then two higher up. However the otters will learn to jump. Also the grass has to be kept mowed which increases costs. A better

method is to use a normal fence with a hot wire further up. Inside the electric fence, mallard and moorhens breed successfully. Without the fence they are all killed by otters.

Comment: Otters are much more active in daytime and can detect the presence of fish really quickly even if they can't see them.

Signal Crayfish

Comment: Signal crayfish are a big predator of fish fry and have a big impact on fish availability

Crucian Carp

Question: So the crucian carp population is expanding?

Answer: Yes in two lakes which have good habitat, the crucian carp population is expanding despite the presence of otters.

Comment: There are a few lakes where crucian carp are abundant, but mainly crucian carp in Norfolk are in decline, having reduced by 75%. Goldfish introduction has caused big problems.

Cormorants

Comment: Worldwide, the impact of cormorants on fisheries exactly mirrors the amount of organochlorines in the environment. If you exclude predators from one food source, they will switch to another.

Questions: Could inflatables be used to deter cormorants?

Answer: They don't work, and cormorants ignore warning shots fired over them.

Question: Why are cormorants increasing?

Answer: Because they are not being shot because Europe bans it.

Session 3

Otters, Fisheries and Conservation – The Experience of Somogy Provincial Association for Nature Conservation, Hungary

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Hungary is very rich in wetland habitats. As a result, it has a significant and stable Eurasian Otter (*Lutra lutra*) population. This is especially true for Somogy county, in SW Hungary where a chain of natural lakes and fishpond systems stretching from Lake Balaton to the River Drava provide perfect conditions for otters with plentiful food and ample shelter.



Many of these wetlands have been bought for conservation by Somogy Provincial Association for Nature Conservation (Somogy PANC) – with the help of foreign funders - at the beginning of the privatisation, in 1989-1993. The aim was to conserve their nature values and to show them to the public.

Today, we own 650 hectares, of which 400 hectares are fishing “Ponds”: these are lakes created at the end of the nineteenth century that provide feeding and breeding grounds for a large number of waterfowl and wild otters.

Apart from buying fishponds, we also revive and establish new wetlands in our reserves, in Inner Somogy, we are rehabilitating destroyed wetlands and creating new wetlands as well as providing new feeding and breeding habitats for White Storks, Black Storks, White-tailed Eagles, waterfowl (ducks, herons, egrets) and the Eurasian Otter. This work, the “Establishment of the network of feeding ponds for birds and otters in Inner Somogy and the rehabilitation of the nearby woody pasture lands” (project number: KEOP-3.1.2./09-11-2012-0004) is carried out within the New Szechenyi Plan, supported by an EU programme and co-financed by the European Regional Development Fund.

Our approach is to protect and manage whole habitats. Some of our lakes are farmed for fish while others are left as natural ponds. We use extensive fish farming as a conservation management tool.

The Davodi lakes, in our Boronka reserve, consist of six dammed fish ponds (0.8 to 1m deep), with carp-dominated polyculture. They are 83 hectares in extent and active with extensive fish pond management (such as feeding fish with wheat and corn). Thanks to the fish farming, White-tailed Eagles and Black Storks nesting in the vicinity of the ponds find plenty of food for bringing up their chicks.

At Labod-Petesmalom, there are 14 ponds, covering 140 hectares in total, surrounded by woodland (gallery forests). We bought the area in 1993.

In 1998, we opened an Otter Sanctuary here, with observation huts for otters and birds, and enclosures for injured otters and those that cannot be released back to the wild. Injured and abandoned otter cubs are reared here.



Photo: Tibor Tömösváry

Visitors can get to know these nocturnal and otherwise rarely seen animals at feeding time. There are hides with one-way glass for photographers, and ecotourist and heritage activities both for the public and for schools.

The Eurasian Otter is protected under Hungarian legislation since 1974 and strictly protected since 1982. It is

enlisted as a NATURA 2000 marking species. Its population is declared "stable" in Hungary, where its main habitat is natural expanses of freshwater, artificial lakes and reservoirs.

The estimation of otter numbers is very difficult in Hungary too at the moment and our aim at the moment is to detect presence or absence at each habitat.

Before protection, there were only occasional observations and hunting statistics to rely on. Since 1987, there have been investigations by several methods, but due to the different survey techniques applied, their results cannot be compared. From 1990-2006 there have been mail questionnaire surveys sent out to Game Management Units and based on the answers and the field surveys, the otter numbers were estimated in the order of thousands of individuals in Hungary. However it is very difficult to assess/estimate actual number of individuals and there is a variation in otter densities among habitat types which is largely influenced by food availability and habitat quality.

Fishermen in the past and some of them up to now, have considered otters as enemies. Prior to 1974 when otters became protected, the fishing masters used to shoot otters because it was their duty to keep otters away from the fishponds. Of course, it was a short-term and ineffective solution, because otters are more or less territorial animals and removal of an individual created a vacuum which was occupied by another otter in due course. Nowadays, other methods should be used to conserve both fish and otters.

Without reliable scientific data, no realistic judgement can be formed on the otter's role in fishponds.

A well-known mammal specialist (and member of Somogy PANC), Dr József Lanszki and his colleagues have carried out comprehensive research since 1991 on the distribution and factors influencing the occurrence of otters in Hungary. They also used genetic based approaches to estimate population size and structure. They have gained biological data from post mortem analysis of otters examining metal levels in tissues.

From fisheries' point of view, their most important research has concentrated on the diet and fish choice of otters living by eutrophic fish ponds and wintering ponds in Hungary.

As is common in many places, it is not easy to observe otters feeding and most assessment of diet is from spraint analysis. Otters' daily food requirements are approximately 1 kg. They have been found to eat mostly fish but also amphibians, water insects and terrestrial animals are taken. Regarding fish, they are generalists ie. eat a large number of different species .

Work in our Petesmalom fish ponds showed that otters prefer fish with no economic importance, and their main food consists of so-called “non-desired” or “weed-fish” and very few carp are consumed. Most fish eaten are less than 100g and only occasionally are large fish taken. Remains are usually left on the banks only because the otter has been disturbed while eating. Also, the remains of large fish found on the banks are not necessarily due to otters – other animals will take sick fish in the shallows, and it is usually because of poor fish management that fish get into that state.



Overall, based on scientific research and our own experience, we can conclude:

- Otters' primary food source are fish, composition depends on the habitat.
- Economically important fish is not significant in otters' diet in Hungary.
- Otters mainly eat the unwanted fish and so to some extent otters do the “dirty work” by eating “weed fish”.
- There are lots of misconceptions about otters and damage is overvalued.
- Otter damage can be minimised by knowing its fish preference, by good pond management and fencing - there are good examples of effective methods being used.
- More education of fish farmers on good management is needed.
- Whole habitats must be managed, not just parts – small watercourses are one of the most endangered habitats.

- Nature conservation organisations can play a great role in education.
- Creation of otter feeding ponds (sacrificial ponds) are effective.
- Ponds used for overwintering fish, which are densely stocked with torpid fish, must be especially protected as winter is also a time of food shortage for otters.

Otters and Fish-Farming in France and other European Countries

Rachel Kuhn, SFPEM, Co-ordinator of the French National Otter Action Plan

Otters in France declined during the twentieth century due to hunting, trapping and habitat loss. They were protected in 1972 and have been recovering since the 1990s. There is a National Otter Action Plan and one of the main issues is to improve the co-existence of otters and fish-farming.

Today otters are found mainly in Brittany, along the Atlantic coast, in the Massif Central and in the Pyrenees. These populations are now connected to each other and are spreading. Otters have recovered naturally apart from in Alsace, where they were reintroduced.

At the end of the 1990s, a young farmer bought a fish farm in Limousin. He was getting serious damage due to otters and asked for help so a project to investigate how to prevent otter predation was devised. To find a solution is very difficult because the “local” otters were very motivated and not really shy. They were used to feeding there regularly; the facility was part of their “home” and they knew it by heart. Also winters in Limousin are very hard, which encourages otters to go for easy prey even more.

Various ways of deterring otters were tried: fences, dogs and so on. Some worked for a couple of months before the otters found a way round them. What did work was having a fence with the bottom buried in the ground, and an overhang outwards at the top.

The farmer opened his fish farm to the public and became very involved in otter-fishery reconciliation. He wrote a book and a movie was made of it, called “Le Banquet des Loutres”, which is available on DVD.

Reconciliation is now high profile.

A first step was to gather information on otters and fish farming from other countries to benefit from experience elsewhere and compile a report which is available at www.sfepm.org/pdf/Loutres_et_activites_aquacoles.pdf

To give an overview of the problem and solutions in some European countries:

Scandinavia: the main economic species is the rainbow trout. In Denmark the fishery owners are advised to use fencing and given information about fencing types. In Sweden, some compensation is offered after careful investigation. In Finland, according to a survey carried out in the 1980s, some fencing is used by fishery owners but they do not consider otters a major problem.

Germany: studies, surveys, fencing tests, workshops, conferences and publications have been done. In some regions, for example Saxony, there are subsidies for fences, and to support sustainable aquaculture. In Bavaria they no longer pay compensation because the money ran out.

Portugal: most fish farms are coastal. Fences are effective where farmers use them. The farmers complain about the cost but still prefer to make this investment rather than lose part of their production.

Georgia: fish farming is developing and, as a consequence, damage due to otters is getting more important. Fencing and sacrificial ponds, together with conservation of habitat for amphibians and snakes, could reduce the complaints. Fish farmers are also invited to participate in research projects (radio-tracking...).

Central Europe: commercial carp pond farming is economically very important and has a long-standing tradition.

Lots of research has been done on otter diet and damage due to otters. Meetings were organised, guides have been edited, awareness campaigns were conducted.

Measures taken are:

- fencing
- repellents
- sacrificial ponds
- compensation

Further recommendations to diminish the damage are:

- drain ponds during winter and keep fish in protected tanks.
- support extensive rather than intensive production, particularly in ponds that cannot be fenced.
- improve the habitat for non-commercial fish species and anurans.

Compensation schemes are used in Austria, Czech Republic, Slovenia and Slovakia. In Austria such schemes have run since 1984 then paid by the government, a hunters association and two nature conservation organisations. They require evidence of otter predation confirmed by an expert. The fish farmer also has to keep records on the quantity of stocked fish, on any possible disease, on water quality and an estimate of amounts taken by other predators. Nowadays in Austria, compensation is only available for large ponds which cannot be fenced.

Compensation schemes are complicated, slow and bureaucratic, and require a lot of money to fund them. What do you do when the money runs out?

Otters and Fisheries in the UK: Issues, Conflicts and the Way Forward

Graham Scholey, Environment Agency

The Environment Agency (EA) is the main environmental regulator in England and Wales. Its range of duties include both wildlife conservation (particularly in relation to the water environment) and the management and promotion of fisheries. The equivalent in Scotland is the Scottish Environment Protection Agency (SEPA), and in Northern Ireland it is the Northern Ireland Environment Agency (NIEA), although both these bodies do have different roles to some extent.

The first review of otter status in England and Wales was carried out by Marie Stephens, and published as the "Otter Report" in 1957. This was based on questionnaires to river keepers and water authorities/ conservancies and she found that otters were common and widespread despite being legally persecuted. Subsequently, the first national otter surveys based on field signs showed that by the late 1970s otters had significantly declined, and the only healthy populations remained in northern and western Scotland.

Otter hunting and other persecution was still legal in England and Wales until 1978, and during 1959-1964 over 1,100 otters were killed by otter hunts alone. A voluntary ban on killing otters was brought in by most hunts when the decline became evident, although some hunts continued to kill, e.g. Border Counties Otter Hunt killed 61 otters during 1964-1977. Hunting probably eliminated remnant populations in several parts of England.

Otter hunting may have exacerbated the decline of otters but the main cause was organochlorine pesticide contamination of their food supply – the decline of otters can be correlated both with the extent of arable agriculture where crops were sprayed against pests such as wheat bulb fly, and also with the use of sheep dip, both uses of pesticides such as dieldrin. These pesticides accumulate in the body fat of top predators and are toxic above certain threshold levels.

These pesticides were successively banned from use for various purposes, and as the contamination of their aquatic food supply has reduced over time, otter populations have slowly recovered. Otters were first protected in England and Wales in 1978, and this was consolidated under the Wildlife & Countryside Act 1981. They now also receive protection under the European Habitats Directive 1994, as transposed under UK law. They are also a UK Biodiversity Action Plan priority species.

In 1977-79, when the first national otter survey of England was undertaken, 94% of sites surveyed had no evidence of otters. In the 2009-10 national otter survey of England, 57% of survey squares were positive, demonstrating the scale of otter recovery. Although these surveys are based on field signs and cannot distinguish between individual otters, there is no doubt that this represents a significant population recovery.

There is significant misunderstanding about the role of re-introductions and captive-bred releases in the recovery of otter populations, and whether these are indeed still occurring. In fact, there have been relatively few otter reintroductions in the UK when the timespan of the recovery period is considered. The Otter Trust released 117 captive-bred otters over a period of 15 years, but agreed to terminate this programme in 2000 following concern about local impacts of some releases and pressure from the UK Otter BAP Steering Group, who felt that captive-bred releases were not necessary to secure the recovery of the population. These are the only known captive bred otters

released in the UK. The last release was of 17 otters in 1999, and a number of these were killed on the roads in the following months, illustrating the potential mortality rates experienced by re-introduced animals. Between 1990-1996 the Vincent Wildlife Trust released 49 rehabilitated animals, mainly in a carefully planned release programme in Yorkshire. Currently, there are a small number of releases of rehabilitated wild otters each year, predominantly orphaned cubs released back to the wild once they are old enough to fend for themselves.

The recovery of otters to their levels of 60 years ago has largely been achieved by the natural return of otters from areas where they never died out, with re-introductions making a small contribution to speeding up the recovery in certain areas. As the environment has improved and levels of toxic pollutants have declined, the environment has been able to sustain otter populations once again.

However, with the return of otters to much of the landscape, their predation activities on some rivers and stillwaters, particularly in areas where they have been absent for perhaps several decades, has raised concerns and alarm amongst some sectors of the angling and fish-farming community. As a result, certain elements of the angling press swiftly started demonising otters with headlines such as "Tarka the Terror", and "The brown plague"! The majority of concerns emanate within England and to a lesser extent Wales.

It has been necessary to address these concerns as they arose, and the UK Otter BAP Steering Group, and particularly the Environment Agency in England and Wales, has been engaged with this issue for some time. Quite evidently otters are predominantly piscivorous, and will take fish from accessible fish-rearing facilities as well as predate large specimen fish, and it has been necessary to consider the implications of this for angling interests.

Early measures to address concerns from the angling community included:

- IN 2000, the UK Biodiversity Action Plan Steering Group decided that reintroductions of captive bred otters should stop, and persuaded the Otter Trust to end their release programme. Natural recovery was good, but there was already conflict with angling groups.
- DEFRA published an advisory document signposting fishery managers to the EA and the Wildlife Trusts for otter predation mitigation advice.
- The EA sponsored research on otter-proof fencing designs.

When considering the issue and nature of otter predation impacts on fisheries there are a number of factors which should be taken into account:

Specimen fishing: the growth in specimen fishing over the last few decades has mirrored the growth in artificial stillwaters such as gravel pits, many of which have been stocked with large carp, and we have also seen a growth in the number of large specimen fish on some rivers. These large fish are the target of a subset of anglers, some of which have come into the sport for this reason. However, river fish populations with a large cohort of specimen fish reflect a depauperate fish community structure, especially where there is poor recruitment of young fish. These target specimen fish will inevitably perish in due course, and without younger fish in a more balanced fish community there is nothing to replace them.

Biogeography and Co-evolution: both otters and fish have been around for a long time and we need to understand and put into context the relationship between otters and prey species; they have occupied the same range throughout Europe for all this time and one hasn't made the other extinct. However, anthropogenic activities have added pressures to the water environment, including physical habitat damage, pollution and enrichment, and these can affect the health and structure of fish communities which may make them more vulnerable.

Ecology of Predation: some sectors of the angling press claim that there will be an endless increase in predators such as otters unless they are controlled, but in reality, predator numbers are largely determined by prey availability and, in some circumstances, access to breeding sites. Simplistically, territoriality has evolved as a means of dispersing predators in the landscape at a density that food and other resources allow and can support. A healthy population of aquatic predators indicates that the whole of the rest of the ecological pyramid is in good condition – fish, fish prey, habitat, water quality etc.

In lowland Britain in particular, still waters are mainly artificial, often based on gravel pits and reservoirs, and many were developed as fisheries during the time that otters had been lost from much of the country. Otters came back to an environment with damaged or recovering rivers and with many more stillwaters managed as intensive or specialist fisheries. A proportion of these fisheries contain predominantly large specimen fish. In the winter particularly, when there is little else available and these large fish are more torpid, otters can easily catch and kill them.

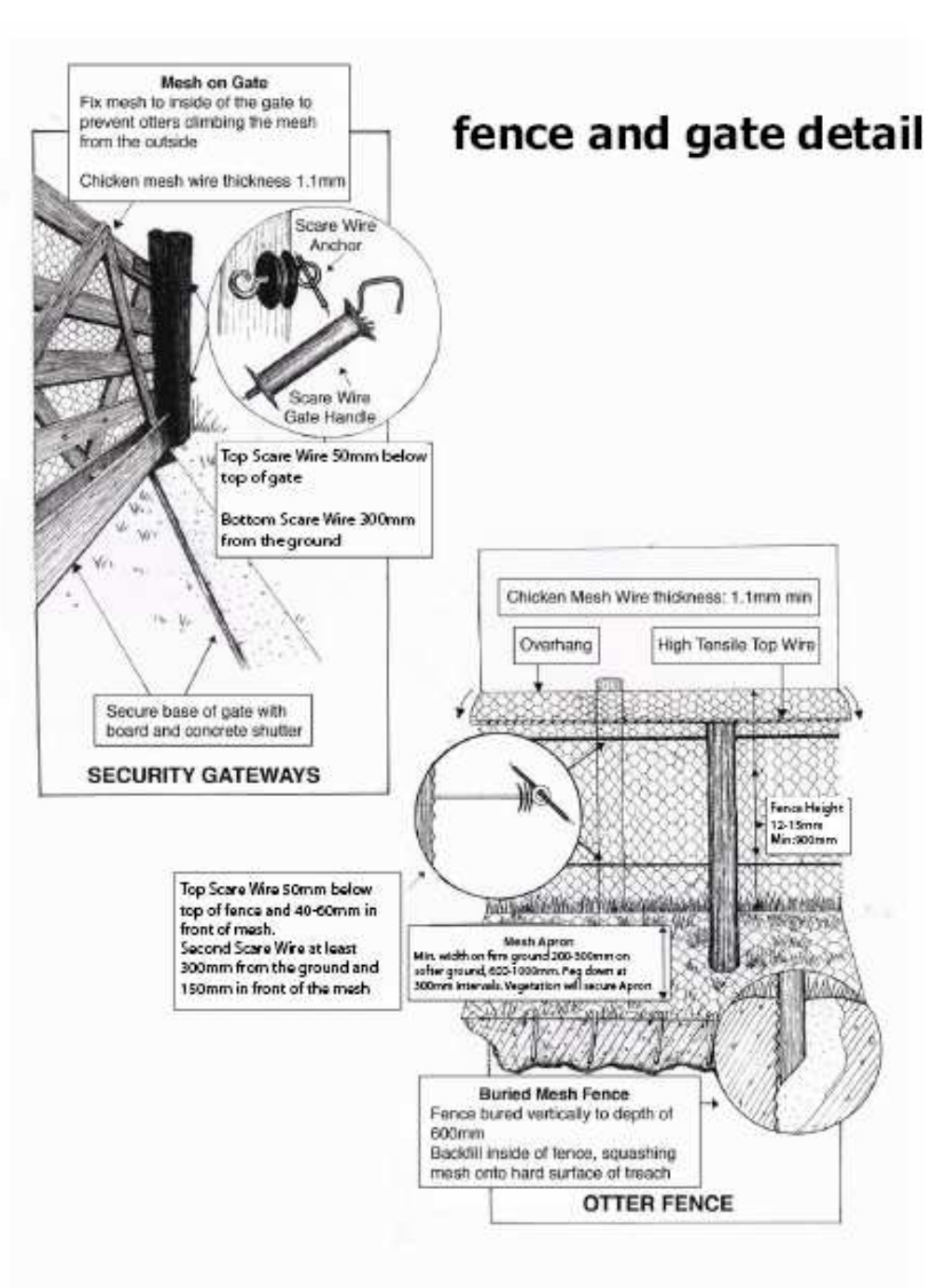
Over the last few years, in recognition of these concerns, the EA has put aside a moderate amount of funding to help fence fisheries to keep otters out, with an emphasis on day ticket fisheries, as this benefits far more people than private syndicates and private club waters. This is based on the principle that the funding is for the promotion of angling, and emanates from a fisheries funding pot. Not all of the potential funding is taken up each year.

The EA has also worked with the Wildlife Trusts to develop advice for fishery managers on methods of preventing access by otters to fisheries. This guidance document - 'Otters and Stillwater Fisheries' – is on the EA website. There are a number of companies that can provide and/or erect otter-proof fencing.

The amount of damage from otter predation to a fishery is greatest where there are large, uniform ponds with poor marginal structure and little cover, and those which are populated primarily by large fish. Better fishery habitat management, introducing more marginal vegetation and woody debris for cover, and a healthier fish population age profile can help reduce predation impacts.

Otters are resourceful and quite good climbers, so to be absolutely certain they can't access a fishery a robust fencing specification is needed, with the greatest success achieved with fences which are buried in the ground at the base, have electric scare wires and an outward overhang. When the EA and Wildlife Trusts were producing their recommendations in the 'Otters and Stillwater Fisheries' guide, there was strong pressure from the fishing industry to recommend this robust solution as the preferred option, although it is expensive. Even with the high security solution, fishery managers and anglers have to remember to attend to weak spots and to secure the gates and then close them. Otters will use gates just like fishermen do!

Today, the EA recommends fisheries to improve the diversity of lake habitat where they can, and to consider the use of cheaper fencing solutions where these may be appropriate. Mesh fencing should be buried in the ground to stop otters squeezing underneath and digging under and the top could have an outward facing overhang with barbed wire to prevent livestock damage. If the boundary fence is secure enough it may not be necessary to add electric wire. Gates should be carefully fenced, with the base secured with board and concrete shuttering. Some fisheries have effectively kept otters out of their waters just by the use of three strands of electric wire – and although daily maintenance checks are essential, for waters with an attendant site manager this can be an inexpensive option.



Detail from 'Otters and Stillwater Fisheries'

Sacrificial ponds with silver fish may help reduce pressure on specimen fish as long as fish stocks in the ponds are replenished, and it may be advantageous if the pond is sited on a route which otters are known to use to approach the fishery. Ideally fish habitat in ponds to be safeguarded should be improved by adding refugia, especially marginal woody vegetation, although even fish cages, as

shown below, can help by providing protection for small fish from otters and piscivorous birds. Use the maximum mesh size of 12cm to prevent otters being trapped under water and drowning.



Examples of measures which DO NOT seem to work:

- Deterrents such as lights and dogs can be used, but otters habituate quickly to them.
- Removing adjacent otter habitat does not work – otters can cover considerable distances in their search for food.
- Trapping and removing otters – this is illegal without a licence, and as otters are territorial this would only be a temporary solution as another otter will soon occupy the vacated territory. For this reason conservation agencies are not minded to grant licences when alternatives such as exclusion can be adopted.

It is clear that the main options with respect to stillwater fisheries is to either live with otters and accept the losses, or prevent access by otters to the fishery.

The situation with rivers is different. There appear to be few complaints about otters on rivers where otters have always been present. The majority of the complaints are from rivers in lowland Britain, particularly south and southeast England where otters have been largely absent for 40 years.

These rivers can contain large specimen fish which in some circumstances dominate the fish community. This is a relatively recent development and as explained above does not represent a healthy fish community. Possible causes of this fish community imbalance include the poor recruitment of spring gravel spawners on some rivers, due to loss of spawning habitat and possible intra-gravel water quality problems, and perhaps also the long-term absence of the otter as top aquatic predator, allowing large fish to become larger and more dominant as they get beyond a size which other aquatic predators are able to handle and overcome.

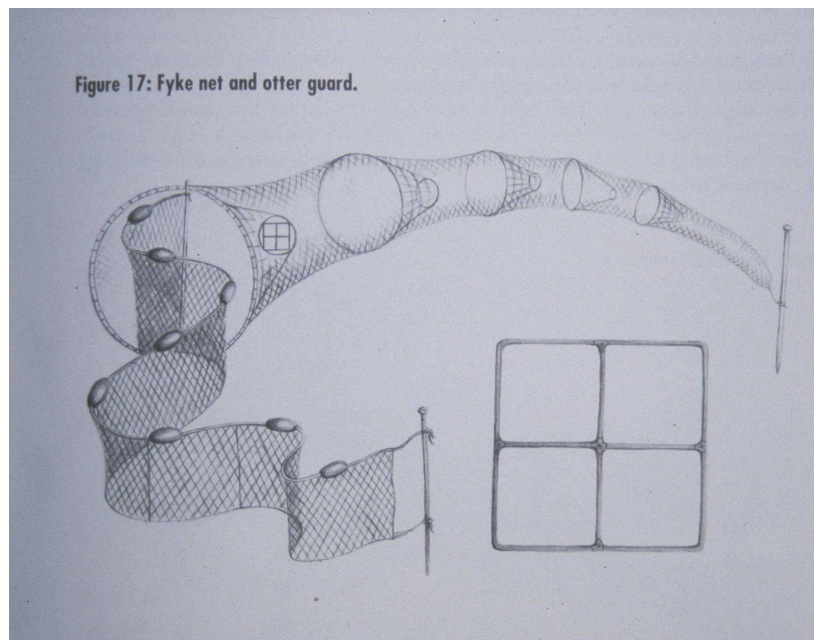
It is conceivable that otters may help to re-balance the ecology by selectively removing some of the larger fish, as this may increase the survival rates of younger fish through reduced competition. Ecologically healthy rivers are a requirement in the UK under the European Water Framework Directive, and one of the measures is a balanced and healthy fish community - otters could in fact play a role in helping the UK comply with its statutory duty for rivers where fish communities are currently decidedly unbalanced.

A number of years ago an Otter Predation Group was convened to address some of the concerns from the angling community regarding otter predation, comprising representatives from the Angling Trust, EA and Natural England (since the majority of the complaints are from England). It runs by “Chatham House Rules” i.e. members are free to speak openly and without fear of prejudice or attribution, as minutes are not circulated outside the group, but outputs of the discussions are.

Quite early after its formation, The Otter Predation Group produced a short document - “Otters: the Facts” – for the angling community, to explain some basic background facts about otters and to explode some of the myths about them and related conservation activities. The group has also undertaken to examine long term fishery data sets held by the EA to see if they may be able to show the different trends in fish populations in rivers which did not lose their otters and those to which they have recently returned.

The Otter Predation Group is also minded to recommend consideration of cheaper fencing solutions than the more robust specifications previously endorsed in ‘Otters and Stillwater Fisheries’. In practice, three strands of electric wire can work provided they are erected before there is a problem i.e. before the otters learn there is a fish resource to exploit. It can be enough to persuade them not to bother but to move on to an easier source of food.

There is another side to the conflict between otters and fisheries, and that is the (usually) unintended consequence of otters drowning in crayfish traps and fyke nets. Legally, otter guards must be fitted to such traps in England and Wales (as shown below), but a growing number of traps are not fitted with guards and some designs of crayfish trap in use are themselves illegal. As a result, increasing numbers of otters are drowning in traps.



The EA has supported otter post-mortem work and associated tissue analysis for many years. From 1988-2003, Cardiff University and veterinary surgeon Vic Simpson examined 1,027 otters mainly from south-west England under contract to the EA. Cardiff University is now continuing as

collaborators in this work with the EA through their Otter Project and is carrying out post mortems on all dead otters found in England and Wales. Liver analysis is also being done for organochlorine pesticides, PCBs and heavy metals by the EA. About 200 otters per year are collected and analysed...

It is not so long ago that we lost a significant proportion of our otter population due to the impact of toxic pollutants, so it is important to continue monitoring them as a barometer for the whole aquatic environment and to detect potential problems arising from new toxic pollutants. Current priorities for the Otter BAP Steering Group and the EA with respect to otter conservation are:

1. Monitoring and surveillance of the otter population as a critical environmental health indicator.
2. Reducing human-induced mortality.
3. Addressing predation conflict.
 - a. Provide anglers and fishery managers a secure understanding of the role of predators in the freshwater environment.
 - b. Consider the future of specimen fisheries on rivers vs. the need for healthy and sustainable fish populations to meet Water Framework Directive requirements.
 - c. Address the health of the environment for fish – habitat, pollution, water resources. Healthy fish populations can sustain predation.
 - d. Work with stillwater fishery managers to develop an understanding that there must be some responsibility for safeguarding their product and production environment. – Just as other businesses secure their premises against thieves, fisheries and fish-farmers must be prepared to invest resources in securing their premises from predators, or accept this as the risk of rearing fish within the context of an environment with a healthy population of fish predators.

Panel Discussion

Fencing

Question: How much money is available for fencing subsidies?

Answer: All the fencing help is from the EA's Fishing and Aquaculture section: It is not conservation money, but is there to support economic development.

Comment: It is like pheasant fencing, and the existence of the money is well-known.

Comment: I have the costs of different types of fencing and can provide them

Comment: IOSF approached several fisheries about fencing. One fishery used fencing angled outward – the otters started to climb but then fell off.

Comment: There are YouTube clips of otters overcoming all kinds of fencing including overhangs.

Economic Impact

Comment: Are there figures for the economic impact of otter predation?

Answer 1: I have the figures for 2006 for the Czech Republic:

Losses from cormorants	940 metric tonnes
Losses from otters	891 metric tonnes

Answer 2: Otter loss in all water bodies in Czech Republic in 2000 was \$1.268 million.

Question: Can this loss be insured for?

Answer 1: Insurance is prohibitive so fishery managers don't take it out but use the money elsewhere. As soon as you make a claim your premiums go up. Also they expect you to put in protection.

Answer 2: The main insurer of fish farms and so on is Agricultural Risk Management – they will cover loss of fish through theft and disease but you can add on other protections if relevant – at a price. If you have a major incident more than once every seven years, it is worth it, even though the premium will go up by 15% of the loss.

Post Mortems

Question: Are these still being done? What do they find?

Answer: Yes they are. PCBs, heavy metals and organochlorines are now at very low levels with occasional spikes which the EA investigate as it indicates spot pollution. We now need to test for the new pollutants for which we don't know the environmental effects.

Comment: Post mortems and toxicological analysis are not being done in Scotland.

Otter Deterrents

Question: Has there been any work on the hearing threshold of otters?

Answer 1: Yes there has, but the results are not in yet. There are claims that otters can be seen off by seal deterrents so the EA is looking at this, but I feel they will habituate quickly

Answer 2: There was a theory that otters could be deterred by sounds of human activity, but someone put a TV up a tree, and the otters did not care in the least about the sound of American cop shows, flashing lights, sound, music etc.

Answer 3: There is work on deterrents being done in Austria

Question: Could you find a sound that elicits the startle response?

Answer: Generally people thought otters were too smart not to habituate.

Should Legal Protection be Removed?

Question: Should otters still be protected?

Answer: Yes! A few people want to remove protection, but there is no appetite for it nationally. If protection was removed, otters would be killed out, as has happened with other animals. A more intelligent response is to get round it. Otters are a predator that lives at low density, with a fragile population, and which is a superb barometer of environmental health.

Comment: In France, fish farmers do NOT want to kill otters, because they are very, very dependent on the good will of the public

Comment: Many people disapprove of angling, so anglers could easily get a bad name by demonising otters. If people have to choose between otters and anglers, anglers will not win. The fact is that most fish losses are because of poor fishery management.

Fishery Management

Comment: The amount of ground bait used by anglers causes eutrophication, plus there are no controls on what goes into ground bait.

Comment: There is research happening about this, because it could be that otters, and other animals, are poisoned by ground bait.

Session 4: Discussion and Recommendations for Future Work

Everyone was assigned to one of eight tables to consider the questions posed and report back. Below is a summary of the responses:

Question 1: What is the Environmental, Social and Economic Impact of doing Nothing?

It was agreed by all that doing nothing was simply not an option.

- a) Otters and anglers would suffer in public perception. In business, brand reputation is everything – it is a key driver. Businesses will go to any lengths to protect their reputation with the public. So public perception is very important.
- b) There will be an increased backlash from anglers and still water managers even though there is an onus on still water owners to protect their fishery.
- c) There will be an increased polarization of views, like the badger question, and nobody will listen to anyone else. Fish continue to get sick, rivers continue to get sick, and anglers get a terrible press.
- d) Those people who are putting out false or misleading information on the problem will continue to create the image that otters are eating all the fish and are a menace.
- e) There could be an increase in illegal otter persecution and negative public image if an angling association is proven or suspected of being involved.
- f) There will be more pressure to remove legal protection from otters.
- g) Fish populations will continue to struggle.
- h) Water quality is not good enough and no-one will look to improve it.
- i) Fishery owners will continue to struggle and there will be more economic problems. In Yorkshire it was reported that £2.8 million was lost to predators in carp mortality and angling is worth £3.5 billion. However, there is an economic benefit of otters from wildlife tourism.
- j) The unnatural environment will continue being unmanaged and this will exert more pressure on fish stocks, otters and the environment.
- k) The predation problem is bigger than just otters and needs to be looked at as a bigger picture

- l) In Scotland, otters are much less of a problem and most anglers regard seeing an otter as a plus. Fish stocks are entirely different to those in England and Wales, and there are fewer specimen fish. Also there is a healthier biodiversity in the aquatic environments and otters have always been present. In Scotland, the health of stock fish is the issue as there are big problems. Some people considered the north-south divide to be more from the Severn to the Wash as south of this line carp fishing is big, whereas in the north “ordinary” coarse fishing on day tickets is more common.
- m) We will miss the last chance for real factual research by neutral academics.
- n) The conflict is not otter-fish but human-human, so the solution is with humans, not with otters! Sociological aspects need to be investigated.
- o)

Question 2: What is KNOWN about the Otter/Fisheries Interaction?

- a) Heavy predation does occur on some still waters but there are other predators which are important.
- b) Predators are generally controlled naturally by prey availability.
- c) There are more fisheries so there is bound to be more conflict.
- d) Otter numbers are increasing but not at the rate implied in the media. The River Derwent system is at full capacity for otters.
- e) There is a better knowledge of otter ecology and diet. Otters are territorial.
- f) It is less of an issue in a healthy diverse environment. Some rivers are cleaner than they have been for the past 50 years but in other areas river fisheries are in an unhealthy unbalanced state.
- g) The situation for otters is not the same today as 60 years ago as the ecosystem is different. For example, Essex rivers used to have plenty of eels but do not now. Salmon and sea trout are declining on the River Wye.
- h) Otters are eating signal crayfish in East Anglia and these are a “pest” to fisheries.
- i) Good fencing works.
- j) There is no sound science behind fishery protection other than high spec and costly fences. So the economic costs of protecting fisheries is a big issue and there needs to be a cheaper alternative.
- k) The best approach for sensitive fish stocks is to increase safe refugia rather than exclusion fencing. The use of such refugia/fish cages/improved habitat for fish in farms has been experimentally tested.
- l) The otter is an iconic species peg for ecotourism.
- m)

Question 3: What are the Unknowns?

- a) How many otters are there?
- b) What data is there on fish populations and health of fish stocks? Why is there so much deformity in fish populations in Scotland?
- c) How has the change in fish behaviour affected the perception of a change in fish population? What are the benefits of habitat protection and improvement to fish populations?
- d) What proportion of eel biomass is in rivers now compared to 30 years ago? Is the decline in eel populations a significant issue regarding otter diet? What measures might restore eel populations?
- e) What percentage of the otter diet is specimen fish and does it vary according to season and/or location? What will happen naturally with otters present in specimen river fisheries? What will happen to river specimen fish without otters? Will otters be the “tipping point”

- for rivers with poor fish recruitment, e.g. by removing specimen fish? Can anglers expectations of specimen fish numbers in rivers be changed?
- f) If all inland fisheries were protected how would this affect the problem?
 - g) Will the return of the otter help to restore more balanced river fisheries?
 - h) What is the proportion of predation for all species? What is the cumulative impact of otters and cormorants?
 - i) How do we remove alien crayfish from a river system?
 - j) Is there a more effective way of protecting still water fisheries than fencing?
 - k) How clean are our rivers in reality? What are the effects of new chemical pollutants in our rivers/seas and the “cocktail” effect of these chemicals? Will a healthy diverse river system allow fisheries to support otters with no adverse effect? Can degraded river habitats be restored to benefit fisheries and otters and what funding is available?
 - l) What would be the outcome of a referendum of otters or anglers?
 - m) What is the full financial impact on fisheries of otter predation - losses (actual and perceived), mitigation, costs v profits, cost benefit analysis?
 - n) What funding is available for research to find commercial scale deterrents?
 - o) If grants are available to fisheries what is the ceiling limit?

Question 4: What are the Priorities and How do we go Further?

- a) Maintain dialogue between anglers and otter workers - stakeholder engagement is vital.
 - i) Create a working group of stakeholders to build on the work of the Otter Predation Group
- b) Look at the whole predation picture:
 - i) Determine how much is lost to each predator and what is sustainable?
 - ii) Address the cormorant problem
 - iii) More work needs to be done on implementing the Water Framework Directive and Eels Directive.
- c) Academic research should be funded by EU, Government, conservation bodies, fisheries and big company sponsorship:
 - i) Ascertain otter population numbers – DNA; scent analysis is currently being investigated by Cardiff University Otter Project
 - ii) Full analysis of otters and fisheries including socio-economics and effective alternatives for fishery protection (fencing and deterrents) which is more tailored to fishery type.
 - iii) Wild fish stocks and impact of eel decline.
 - iv) Role of still water fisheries on otter carrying capacity
 - v) Environmental/socio-economic impacts of predation on fisheries (e.g. still water, specimen fish, different locations) and role of other factors e.g. pollutants
- d) Other:
 - i) National referendum on “carp v otter”
 - ii) Public awareness through Institute of Fisheries publications, Wild Trout Trust, Angling Trust, CEFAS, Fishery Trusts, etc. Improve cultural understanding/expectations as to more natural or wild fisheries and role of predators. Also there must be an angler education initiative about specimen fish.
 - iii) Effective protection of fish habitat – fish refugia, etc.

- iv) Degraded rivers must be restored; this is already happening a bit, but more is needed
- v) Huge issue Europe-wide. Needs international collaboration and funding

All agreed that a Working Group is needed. If people are interested in being part of this, they should email IOSF, who will take it further.

The whole conference agreed to this

After final general remarks, the conference closed

APPENDIX

The following is a paper written by a trout farmer in Aberdeenshire who was unable to attend the conference:

Otters – A Scottish Trout Fishery Perspective

To appreciate the context, it is best I start with a description of the fishery.

Raemoir Trout Fishery is located one mile from the town of Banchory on Royal Deeside in the County of Aberdeenshire. It is also one mile from the River Dee, a noted salmon river.

The River Dee has long been a stronghold for otters, and has otter territories throughout its course. There is general tolerance of otters on the river as they are native to the river, and as the Dee holds mainly migratory salmon and sea trout, always on the move, no beat proprietor suffers undue losses to otters.

A trout fishery differs in that the population of trout are captive in ponds, and at a much higher density than fish in the wild.

Given this, and our proximity to the River Dee, it is inevitable that we have otters.

The fishery is man-made; we made it in 1992, consisting of three fly-fishing ponds of four acres within a site of eleven acres. Adjacent is forest and extensive marshland with a burn (stream) which drains into the Dee. Otters would always have nosed up this burn, so from the start we had otters present.

As a hobby naturalist and an angler, I have been accustomed to seeing otters on a regular basis, and I am pleased to live in an area with a diversity of animals nearby such as, otter, badger, fox, pine marten, and even wildcat.

Personally therefore I take pleasure in otter sightings, and as the fishery is a hobby business, I am not overly concerned by the financial loss of fish to otters.

This is an important point.

To any other fishery owner wholly or partly dependent on his fishery for a livelihood, the toleration level is somewhat lower, if not intolerant.

The fishery owner also faces another quandary – customers.

Angling customers are divided roughly as follows –

- Those who are excited by the sighting of an otter, or even knowing they share the fishery with them.
- Those who are simply not bothered one way or the other.
- Those who get quite upset on seeing an otter, or even knowing they are present.

The first two obviously pose no problem for the otters or the fishery owner.

The latter however are of concern as they see otters as either scaring fish they may have caught, or having robbed fish they may otherwise have caught. They invariably complain, ask why we are not trapping them, and make it clear that if it were their fishery, the otters would “disappear!”

The obvious inference, of course, is that as a consequence there are less fish present to be caught, even though we make it common knowledge that we stock higher than normal to compensate for otter losses, and they are a protected species.

Is it also that otters are only briefly sighted that there is mixed toleration?

Except for this summer, we have had osprey come to fish. With the co-operation of Scottish & Southern Electric and Forest Enterprise, we erected a substantial artificial osprey nest platform adjacent to the fishery. Strangely, no one complains about the osprey, or even our attempt to attract them.

Is it that the osprey provides a spectacle? A bird relatively unafraid of man, circling conspicuously, and with the dive and rising with a trout suspended, wondrous to all.

Protecting from otters –

The only viable protection is fencing off the fishery completely.

If I had no empathy toward otters and felt the financial effect, or were a fish farm instead of a fishery, this would be vital, in the same way a fish farm has suspended netting strung over the stew ponds to protect from ospreys.

In our case fencing is out of the question, even if the cost was subsidised. Erection around the whole site would be prohibitive, and in any case a good man-made trout fishery is one which looks natural within its setting. In addition all wildlife now indigenous to the fishery has to have free movement in and out of the fishery.

Talking for fisheries as a whole, the only sensible way to guarantee continued acceptance of the presence of otters, especially for the intolerant, is some sort of compensation scheme.

I am not suggesting a free for all or endless paperwork, simply a survey of a claimants fishery to ascertain their presence, a calculation of the effect, according to transience or permanent territory. I am not even suggesting full compensation, merely a sensible percentage of the calculated loss.

I am not qualified to put bones on this including how such would be funded.

Otter observations –

If you look up our website www.raemoirtroutfishery.co.uk you will see we have a wildlife page.

On there are video clips taken with a stealth camera of the otter's activity at the fishery, including with cubs, along with clips of adjacent badger sett activity and assorted other wildlife.

Two of the clips show a young female taking koi carp and orfe out of my ornamental pond on the patio at home. This has happened in subsequent years. As no watercourse is nearby, the assumption is they are displaced cubs seeking new territory, over-landing, and simply smelling the water or hearing the waterfall into the pond (circulating pump) and homing in on that.

At the fishery, their presence is obvious without sighting –

Very defined pathways from the burn or marsh into each pond. Conspicuous scat marking spots, remains of trout variably consumed. In winter mostly consumed, only skin and bones left, in summer often just the head or entrails eaten. A boon for the resident foxes that follow the otters at night. This is so obvious in winter snowfall, the fox tracks closely following the otter tracks, and not a scrap is left for the buzzards in the morning.

Also following winter snowfall the otters make slides down the embankment into a cleared hole in the ice. Judging from the compaction of the slides and accompanying tracks, this must take a big slice of the night foray time, an indication of how easy the pickings are at a trout fishery.

In a severe winter as in 2010/ 2011 the ice is very thick and continuous cover for months. Despite this and with the only access to the ponds being through the tiny hole kept open by the inflow pipe, the tracks and blood show the otters successfully catching fish in what must be pitch black at night underwater and under light blanking ice and snow, yet navigating back to this one and only tiny escape hole.

You just have to marvel at that!

Contrary to some belief, otters cohabit with American mink. I have seen both hunting in proximity albeit with the mink giving way to the otter. We have recently eliminated our mink as part of a funded programme of eradication in all the northern river catchments. Not before time, whilst a pest to fisheries in that they can take occasional fish, they decimated all water birds. We have lost all water hens and coots in the area, and only the more elusive water rails managed to survive.

The otters of course are not averse to taking birds, but not a major problem, as they appear not to ambush, as a mink will.

Otters have also been observed taking frogs, but with toads they do the same as the heron, by turning the toad inside out and leaving the skin and poison glands intact.

Observation over the years has shown that the fishery is a continuous territory for breeding females (not suggesting it is the same one). Some years she has only one cub, other years two and even three cubs.

The breeding males are transient and only occasionally seen.

This year she has two cubs. At the time of writing they are three quarters grown and fun to watch. Their mother fishes mainly at night and if she is out in daylight, enters the water quietly and within minutes can be seen departing with a trout. The cubs either singly or together, fish in daylight in full view of the anglers. I watched one for nearly two hours streaming bubbles and breaching, tearing hither and thither after trout without managing to catch a single one. You have to wonder, if a weaned cub struggles to catch amongst hundreds of captive trout, how many survive to maturity in a wild river sparsely populated with wild fish.

Man-made trout fisheries are a fairly recent innovation and must have contributed greatly to the healthy and growing population of otters.

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