Background to the conservation assessment for the otter *Lutra lutra*

1. Introduction

The Eurasian otter is widespread throughout all Irish fresh-water and most coastal habitats (Chapman & Chapman, 1981; Lunnon & Reynolds, 1991; Bailey & Rochford, 2006). Dramatic declines occurred in many European otter populations during the latter half of the 20th Century (Macdonald & Mason, 1994) and otters remain threatened, declining, rare, or extinct in many European states. However, in a third of European countries, environmental improvements and focussed conservation efforts have helped to re-establish widespread healthy populations (Conroy & Chanin, 2001).

The otter is an opportunistic predator that exploits prey in proportion to its availability in the environment (Ottino & Giller, 2004). In Ireland, as throughout Europe, diet is predominantly of aquatic origin. In freshwater areas, spraints commonly contain stickleback, salmonids, frogs, and eels (Bailey & Rochford, 2006), while crayfish can be a dominant prey species locally (MacFadden & Fairley, 1983). Terrestrial prey is taken infrequently, with birds occurring in just 3% of spraints, and mammals occurring even more rarely (Bailey & Rochford, 2006). Otter diet has not been studied on a national basis for coastal areas, but a survey on Inis Mór found that rockling and wrasse dominated the diet, while eel, sea scorpion, blenny and molluscs were also important (Kingston *et al*., 1999).

In the Irish Red Data book the otter is listed as internationally important (Whilde, 1993). The Eurasian otter is classified as 'near threatened' by the IUCN (2006) and is listed as a strictly protected species under Appendix II of the Bern convention (Council of Europe, 1979). Because it is listed in Appendix 1 of CITES (1979), trade in otter is only permitted in exceptional circumstances.

The otter has been protected in Ireland since 1976 (Wildlife Act 1976), although licenses to hunt otters were issued under this Act until the 1990s. The Wildlife Amendment Act (2000) removed the hunting clause entirely and it is now illegal to hunt, disturb, or intentionally kill otters.

2. Range

Three national surveys of otters have been conducted in Ireland. The first national otter survey found signs of otters throughout the country, at 88% of 2,042 sites (Chapman & Chapman, 1982). A smaller follow-up survey of 246 sites carried out a decade later found that otters were still countrywide although a highly significant 13% decrease in otter presence was recorded (Lunnon & Reynolds, 1991). The most recent otter survey, carried out 14 years later, searched 525 sites and found that otter presence had declined by a further 5% to just over 70%, but that the species was still present throughout the country (Bailey & Rochford, 2006). The current range has been calculated as 66,500 km² from 2004-2007 distribution records held by NPWS. The majority of these records come from the NPWS survey of 2004/05; additional records come from Lughaidh O'Neill (TCD) and NPWS staff. Expert opinion has

been used to fill in some blank squares in the midlands as these areas were not covered in the 2004/05 survey, but otters are known to occur there.

2.1 Trends in range and favourable reference range

Despite the decline in status from 88% in 1980/81 to 70% at present, the otter remains widespread throughout the country with no apparent reduction in range. The current range is therefore take to be the favourable reference range - 66,500 km² .

3. Habitat

Habitat is discussed here before population, as the habitat data was used to calculate population. Habitat was estimated on the basis of four classes of water bodies: rivers, streams, lakes and coast (high water mark).

Rivers are measured as the length of the midline. However, because otters have been observed not to forage beyond 80m from the coast, rivers greater than 80m wide are considered as comprising two separate strips of otter habitat and both banks are measured rather than one. The average width of rivers (as presented in the vector OSI data) was calculated by combining the ground-truth data gathered by Chapman & Chapman (1982) and Bailey & Rochford (2006). In addition to the width of the rivers, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat.

Manipulation of the data set: Manually eliminated one bank where watercourse width was less than 80m.

Streams are measured as the length of the midline. The average width of streams (as presented in the vector OSI data) was calculated by combining the ground-truth data gathered by Chapman & Chapman (1982) and Bailey & Rochford (2006). In addition to the width of the streams, a 10m riparian buffer (both banks) was considered to comprise part of the otter habitat.

Manipulation of the data set: none

Lakes and coast are measured as the length of a single shore where less than 80m wide, and both shores where greater than 80m wide. Any shore within 80m of another shore gives access to the same foraging habitat and should not therefore be counted twice. The width of lake and coast habitat was estimated to be an 80m strip of water from the length of shore calculated above. In addition to this 80m strip of water for lakes and coast, a 10m terrestrial buffer was considered to comprise part of the otter habitat.

Manipulation of the data set: Lakes layer buffered on inside by 40m, (by buffering both sides by 40m then intersecting with original lakes layer). Lakes length is = perimeter / 2

HWM layer buffered by 40m. HWM length = number of sections *((total perimeter/2)-buffer width)

Results

The ground-truth data gathered by Chapman & Chapman (1982) and Bailey & Rochford (2006) divided river width into the following classes; <2m, 2-5m, 5-10m,

10-20m, >20m. Using the following mid range values; 1m, 4m, 8m, 15.5m, 30m[1], the average width of river features comes out as 12.9m (n = 893), and the average width of stream features comes out as 4.2m (n = 955). The total habitat may thereby be calculated by simple multiplication of the lengths of various habitats available (table 1).

Table 1 – the total length and area of otter habitat present in the Republic of Ireland.

	Total rivers	Total Streams	Total Coast	Total Lake
Width of water body (m)	12.9	4.2	80.0	80.0
Width of habitat (m)	32.9	24.2	90.0	90.0
Length of habitat (km)	13326.1	64458.1	8107.6	4298.9
Habitat areas (Sq. km)	439.0	1560	729.7	386.9
Total habitat size (Sq. km)	**3115.4**			

Table 2 – the total length and area of otter habitat protected within candidate SACs selected for otter in the Republic of Ireland.

	Total rivers	Total Streams	Total Coast	Total Lake
Length of habitat (km)	3344.0	5025.0	4493.0	837.0
Width of water body (m)	12.9	4.2	80.0	80.0
Width of habitat (m)	32.9	24.2	90.0	90.0
Habitat areas (Sq. km)	110.151	121.605	404	75.33
Total habitat size (Sq. km)	**711.086**			

3.1 Habitat trends and favourable reference value

While there has been some localised reduction in otter habitat quality, due mainly to water pollution and clearance of riparian vegetation, this has been balanced to some extent by the reduced occurence of severe water pollution episodes (e.g. those causing fish kills) and the abandonment of pastoral systems which has led to increased scrubby vegetation and reduced disturbance of river corridors. The area of suitable habitat available at present (3115 km^2) is considered favourable for the long term viability of the otter in Ireland.

4. Population

The otter population in Ireland is estimated to be in the region of 6,416 female animals (not including juveniles), with an upper confidence level of 9,724 and a lower confidence level of 4,537. Females are used here because of their tendency to maintain stable home ranges.

[1] a conservative estimate based on the midpoint of the next logical division 20-40m.

These population estimates were calcluated (by Lughaidh O'Neill, TCD) from average females home ranges derived from the following:

- Observations of seven adult females in mesotrophic Irish rivers (>4mg orthophosphate per l), showed females occupying exclusive home-ranges averaging 7.5 ± 1.5 km that were inversely related to river width ($R^2_{adj} = 0.68$, $F_6 = 13.5$, $P = 0.014$). The relationship was approximated by the equation [*(home range length) = 40.42/(river-width) + 5.284*] (L. Ó Néill unpublished data).
- Observations of ten female otters on oligotrophic rivers (<2mg orthophosphate per l) in Scotland showed no relationship between home-ranges and river width, with home-ranges averaging 18.7±3.5km (Kruuk, 2006).
- Observations of 10 coastal otters on Shetland found that adult females occupied group ranges at densities of 2.6±0.9 km/individual (Kruuk and Moorhouse, 1991).

To account for the lack of data for watercourses with orthophosphate levels between 2 and 4mg per l, L. O'Neill calculated the fitted line as the average intercept and slopes for more and less productive rivers. Note that the oligotrophic group showed no relationship with river width so they had a slope of 0 and an intercept of 18.6. The confidence intervals for spatial requirements of otters in this intermediate class of river were taken to be the most extreme limits for the other two groups.

Based on interpolation of the EPA point data for orthophosphate levels, each section of river within the contours of a particular orthophosphate level was assigned that orthophosphate value. The length of each water course type (oligotrophic river, meso-oligotrophic river, mesotrophic river, oligotrophic stream etc.) within each river basin district was converted into a number of otters by dividing it by the spatial requirements of female otters in that habitat. For otters in rivers the appropriate spatial requirements was for watercourses 12.9m wide, for streams 4.2m wide, for lakes 80m wide (see Habitat above).

4.1 Population trends

Between the first national survey in 1980/81 and the most recent survey in 2004/05, a net population loss of 23.7% (- 0.98% p.a.) has been estimated, with the majority of this decline occuring in the first ten years.

It is assumed that the decline in status between the first survey (Chapman & Chapman, 1982) and more recent surveys is a result of population decline. To calculate the decline in the otters population since the original otter survey, the proportional change in status[2] within each river basin district was recorded for the 1991 survey (Lunnon & Reynolds, 1991) and the 2006 survey (Bailey & Rochford, 2006). Then the otter population calculated above was multiplied by the change in status. Upper CI for status was multiplied by upper CI for population estimators etc.

[2] It is unlikely that any survey will ever find 100% regardless of the status of otters. Hence, it makes more sense to look at trends using 1982 as the reference. A drop from 88% in the reference survey (1982) to 70% in the latest survey therefore equates to a 20.5% decline (rather than 18%).

The change in status within each river basin district and nationally is presented in Fig 1.

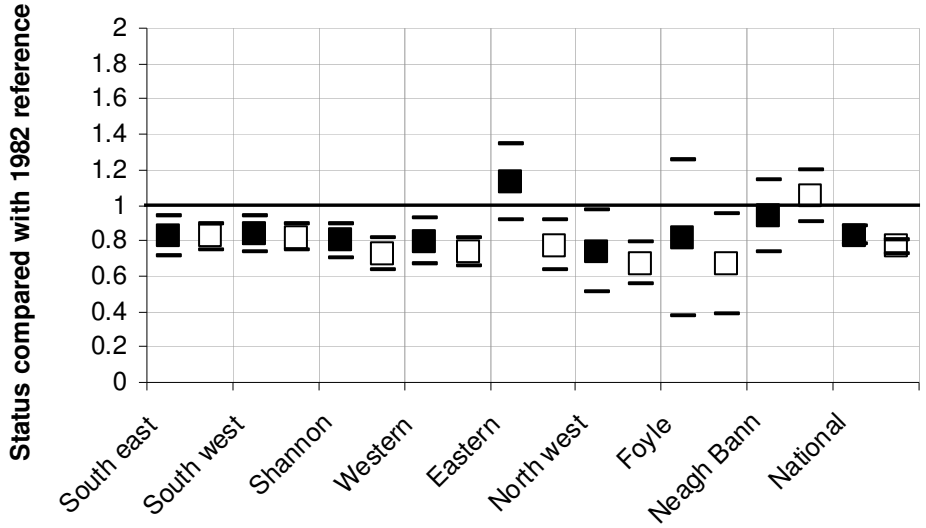

Fig. 1 – Status of the otter within each river basin district and nationally as recorded in 1992 (Lunnon – filled symbols) and 2006 (Bailey – open symbols) by comparison with the 1982 result (Chapman – '1' line).

Note that the Bailey & Rochford (2006) survey shows a 20% decline even for the upper confidence limit for the national situation. For the observed population result this decline is as high as 23.6%. The Shannon, Western, and North Western river basin districts show the greatest declines (according to the upper confidence intervals). How these declines in status are likely to effect population sizes is shown in Fig. 2 and Table 3.

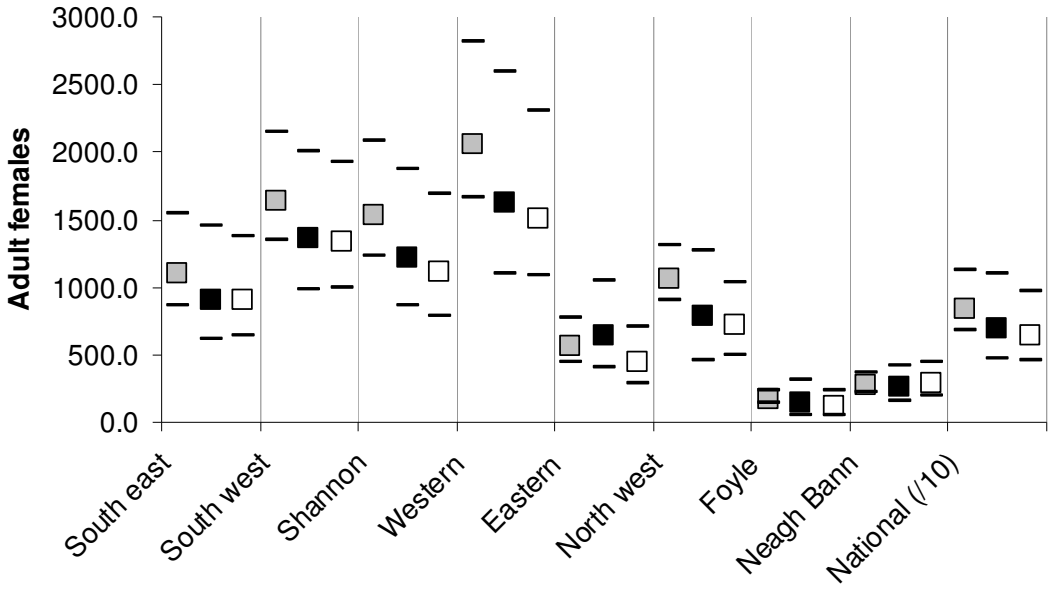

Fig. 2 – Changes in the estimated otter population taking into account changes in status as recorded by the national otter surveys. Chapman & Chapman (1982) – Grey; Lunnon & Reynolds (1992) – Black; Bailey & Rochford (2006) – White.

Table 3 – Population estimates of adult females based on the status recorded in 1982, 1992 and 2006.

	CHAPMAN			**LUNNON**			**BAILEY**		
	estimate	LCL	UCL	estimate	LCL	UCL	Estimate	LCL	UCL
South east	1096.5	860.4	1547.4	909.4	616.8	1457.3	899.3	643.3	1381.2
South west	1637.4	1347.7	2143.1	1365.6	987.7	2004.1	1340.9	998.8	1921.9
Shannon	1534.1	1230.3	2087.8	1224.1	859.7	1872.9	1108.1	779.5	1693.2
Western	2051.2	1657.5	2818.1	1628.9	1105.9	2595.5	1507.1	1081.7	2302.0
Eastern	568.7	445.7	776.3	641.6	406.9	1042.9	439.9	283.0	708.2
North west	1063.9	908.0	1309.0	785.8	461.7	1268.2	714.1	498.7	1038.3
Foyle	181.4	144.2	254.5	147.8	54.1	319.3	120.9	56.0	240.6
Neagh Bann	272.6	216.7	367.7	257.0	160.3	421.6	285.5	195.4	438.9
National	**8405.8**	6810.5	11304.0	**6960.2**	4653.1	10981.8	**6416.1**	4536.5	9724.3

5.1 Favourable reference population

The current population estimate (6416) is 7.8% below the 1991 population estimate and 23.6 % below the 1982 figure. However, despite these decreases it would appear that the otter population in Ireland remains healthy; population modelling for the south-eastern river basin district has shown that even the present otter population in that area is sufficent to maintain the otter within that district for up to 100 years, assuming that there is no futher decline in status (O'Neill, unpublished data). Similar modelling has yet to be done, however, for the other river basin districts.

The Habitats Directive requires that the favourable reference population be no lower than the population in 1994. However, given the significant decrease in status before 1994 and the extensieve network of SACs now designated for the otter, it has been decided that a more optimistic target is justified and can be achieved. Consequently, the target for the otter population is to return all SACs to the status that was recorded within the Chapman & Chapman (1982) survey, while simultaneously ensuring that no further loss of status occurs outside SACs.

Table 4 – Population estimates of adult females within otter SACs based on the status recorded in 1982, 1992, and 2006.

	CHAPMAN			**LUNNON**			**BAILEY**		
	estimate	LCL	UCL	estimate	LCL	UCL	estimate	LCL	UCL
South east	244.1	192.9	299.2	202.4	138.3	281.7	200.2	144.3	267.0
South west	398.9	328.2	511.4	332.7	240.5	478.2	326.6	243.2	458.6
Shannon	370.8	300.5	484.2	295.8	210.0	434.3	267.8	190.4	392.6
Western	583.1	479.1	764.2	463.1	319.7	703.9	428.5	312.7	624.3
Eastern	45.4	36.4	56.6	51.2	33.3	76.1	35.1	23.1	51.7
North west	734.5	608.0	936.5	542.5	309.2	907.3	493.0	334.0	742.8
Foyle	12.2	7.8	31.6	9.9	2.9	39.7	8.1	3.0	29.9
Neagh Bann	0.0	0.0	7.4	0.0	0.0	8.5	0.0	0.0	8.8
National	**2389**	1952.9	3091.1	**1897.6**	1253.9	2929.7	**1759.3**	1250.7	2575.7

Table 5 – Target future population of female otters based on all SACs returning to the status observed in the reference survey (1982) while the rest of the habitat remains at the current status.

	estimate	LCL	UCL
Current population	6416.1	4536.5	9724.3
Predicted increase if SACs return to 1982 status	629.7	702.2	515.4
Target population	7046	5239	10240

The favourable reference population is therefore set at 7046 female otters, a 10.2% increase on the present level.

6. Threat and pressures

Otters are subject to pressures in both the terrestrial and the aquatic (freshwater and marine) environments. Impacts that reduce the availability or quality of, or cause disturbance to, these habitats are likely to affect otters. These factors may act directly (e.g. through road kills or the removal of holt sites) or indirectly (e.g. by reducing prey availability).

The following impacts are considered relevant:

110 Use of pesticides
120 Fertilisation
151 removal of hedges and copses
152 removal of scrub
168 felling of native or mixed woodland
210 Professional fishing (including loster pots and fyke nets)
230 Hunting
243 trapping, poisoning, poaching
300 Sand and gravel extraction
312 mechanical removal of peat
400 Urbanised areas, human habitation
401 continuous urbanisation
410 Industrial or commercial areas
420 Discharges
421 disposal of household waste
422 disposal of industrial waste
423 disposal of inert materials
424 other discharges
502 routes, autoroutes
507 bridge, viaduct
701 water pollution
709 other forms or mixed forms of pollution
803 infilling of ditches, dykes, ponds, pools, marshes or pits

810 Drainage
811 management of aquatic and bank vegetation for drainage purposes
820 Removal of sediments (mud ...)
830 Canalisation
852 modifying structures of inland water course

Overall, these can all be classed as both past pressures and future threats. While some of these impacts are declining, with future prospects in some cases looking bright (pollution etc.) they are still likely to continue to pose localised or occasional threats. New autoroutes and bridges are probably not a significant threat (because of modern mitigation requirements), however existing roads will continue to threaten otter populations (or at least cause deaths) (L.Ó Neill pers. comm.).

It can be difficult to identify the cause of death of an otter, although the number of otters reported dead from "unknown" causes is surprisingly low (Reuther, 2002). Explaining the absence of otters from certain sites can also pose difficulties. A number of reviews of otter mortality have been carried out in Ireland: O'Sullivan & Fitzgerald (1995) reported, for a period between 1982 and 1992, a total of 628 otters found dead in Ireland. The vast majority of recorded otter deaths were caused by road traffic accidents with a further 14% killed by fishing gear. Poole *et al.* (2007) examined otter mortality in fyke nets specifically, but also concluded that roadkill was probably the most signficant cause of direct mortality in this country. There is likely to be some bias in both of these datasets, however, as road kills are relatively visible whereas it is likely that fishermen fail to report all otters found dead in fishing gear (Reuther, 2002). Nonetheless, a roadkill website was established in January 2007 to track the geographical and seasonal mortality of otters on Irish roads (see: www.biology.ie). O'Sullivan (1996) quoted eight major and 16 specific threats to otters from data collated for 29 European countries (Table 6).

Table 6. The major and specific threats (percentage of times listed) to otters in 29 European countries/regions, ranging from Ireland to Siberia (from O'Sullivan (1996)).

Major threats	%	Specific threats/areas of conflict	%
Habitat destruction	28	River/wetland drainage	17
Water pollution	25	Sand/gravel abstraction	3
Mortalities/illegal killings	19	Water abstraction	1
Recreation/disturbances	13	Urbanisation	5
Hydroelectric schemes	5	Organic pollution	14
Aquaculture/fisheries	5	Industrial pollution	14
Oil spillages	1	Acidification/forestry	3
American mink	1	Poisonous marine algae	1
		Aquaculture/fisheries	8
		Fyke nets/fish traps	7
		Mammal traps	5
		Hunting/killing	8
		Road traffic	9
		Angling	2
		Boating	1
		Tourism	2

(Data source: modified from Foster-Turley *et al.* (1990). The criteria used to classify threats are not necessarily mutually exclusive.)

Licenses to hunt otters were issued under the 1976 Wildlife Act until the early 1990s. No further license were issued after then and the Wildlife Amendment Act (2000) removed the otter hunting clause entirely. However, there are some concerns that where mink hunting (which is not regulated) takes place along water courses this may be indirectly or directly threatening otter populations (L. Ó Neill, pers. comm.). Also while trapping (for fur) is certainly a past threat, 'vermin control' continues and some accidental or even deliberate bi-catch of otter is possible.

7. Future Prospects

Although otter range has remained stable in Ireland, the results of the national surveys suggest that otter densities have declined since 1980. Most of this decline seems to have taken place in the 1980s, when levels of severe water pollution were at their worst, with a significantly lower rate of decline in the 15 year period between 1990 and 2005. Despite these declines, population modelling for the south-eastern river basin district has shown that even the present otter population in that area is sufficent to maintain the otter within that district for up to 100 years, assuming that there is no futher decline in status (O'Neill, unpublished data).

A number of significant steps have been take in recent years to secure the long term future of the otter in Ireland: 44 SACs have been designated for the otter. Most of these are large sites incorporating extensive river/lake or coastal systems. The National Roads Authority have prepared strict guidance for the protection of otters during the planning and construction of national roads. NPWS has drafted a Species Action Plan for the otter which will be published later this year following a period of public consultation. Furthermore, under the Water Framework Directive, water quality is expected to improve.

In England, Scotland and Wales, the otter is showing strong recovery from previous low levels. Although the Irish population (North and South) has bucked this trend, population densities here remain among the highest in Europe. It is also clear from the experience in Britain that when water quality and terrestrial habitat needs are met, this species is capable of strong and sustained population expansion.

8. Complementary information

8.1 Favourable reference range

Despite the decline in status from 1980/81 to the present, the otter remains widespread throughout the country with no apparent reduction in range. The current range is therefore taken to be the favourable reference range - 66,500 km².

8.2 Favourable reference population

The target for the otter population is to return all SACs to the status that was recorded within the Chapman & Chapman (1982) survey, without any further loss of status outside SACs. The favourable reference population is therefore calculated 7046 female otters, a 10.2% increase on the present level.

8.3 Suitable habitat

The area of suitable habitat available at present (3115 km^2) is considered favourable for the long term viability of the otter in Ireland.

9. Conclusions

8.1 Range

As range is stable and not smaller than the favourable reference range, this parameter is considered to be Favourable.

8.2 Population

The population has declined 23.6% in the last 24 years and is 10.2% below the favourable reference population. This parameter is considered to be Unfavourable - Inadequate.

8.3 Habitat

The area of suitable habitat available at present (3115 km^2) is considered sufficient in extent and quality for the long term viability of the otter in Ireland. This parameter is considered Favourable.

8.4 Future prospects

Otters are expected to persist and thrive in Ireland for the long term. Otter status is expected to improve again in the coming decades, returning to previously high levels within the extensive SAC network designated for the species. This parameter is considered Favourable.

8.5 Overall assessment

Amber : Unfavourable - Inadequate

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