Lough Leane

Sampling Fish for the Water Framework Directive - Lakes 2008

The Central and Regional Fisheries Boards

ACKNOWLEDGEMENTS

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1.1 Introduction

Lough Leane (Plate 1.1, Fig. 1.1) forms part of the Killarney National Park, Macgillycuddy's Reeks and Caragh river catchment candidate Special Area of Conservation. This is a large area that encompasses a wide variety of habitats designated under Annex I of the EU Habitats Directive, including blanket bog, alluvial woodlands, alpine heath and both upland and lowland oligotrophic lakes. The site has also been selected for the following species, Killarney fern, slender naiad, freshwater pearl mussel, Kerry slug, marsh fritillary, Killarney shad, Atlantic salmon, brook lamprey, river lamprey, sea lamprey, lesser horseshoe bat and otter; all species listed on Annex II of the EU Habitats Directive (NPWS, 2005).

Lough Leane itself is the largest of the Killarney lakes, with a surface area of 1,978ha, a mean depth of 13m and a maximum depth of 60m. The lake falls into typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), greater than 50ha and moderate alkalinity (20-100mg/l $CaCO_3$).

Plate 1.1. Lough Leane (Photo courtesy of CFB and No. 3 Operational Wing, Irish Air Corps [Aer Chór na hÉireann])

A decline in water quality in the Lough Leane catchment has been evident throughout the past 40 years and in 1997 Lough Leane was classified as hypertrophic (Coillte 2010; Killarney National Park, 2010). This decline in water quality was principally attributed to increased levels of nutrients, most significantly phosphorus, being transported via the rivers to the lakes, which has led to eutrophication in recent years. (Coillte 2010; Killarney National Park, 2010). A number of algal blooms were noticed in Lough Leane during the summer of 1997 and this event resulted from excessive phosphorus levels within the lake and had the potential to cause significant damage to the ecology of the lake (Anon, 2009). In response to this, Kerry County Council set up the Lough Leane Working Group to co-ordinate efforts to monitor and manage water quality within the catchment between 1998 and 2001 (Coillte, 2010). This monitoring and management programme was a catchment wide initiative, aimed at stopping the eutrophication process and restoring the rivers and lakes to a satisfactory state by reducing phosphorus inputs from all sources. The project also aimed to identify and quantify all significant point and diffuse sources of pollution input, in particular those inputs from local authority activities, agriculture, forestry and septic tanks.

Lough Leane contains a variety of fish species, including brown trout, sea trout, ferox trout, salmon, perch, flounder, eel, tench and Arctic char. A landlocked subspecies of the twaite shad known as the Killarney shad (*Alosa fallax killarnensis*) is also present in Lough Leane and is unique to this lake. Ther Killarney shad are listed as one of the Annex II fish species in the EU Habitats Directive. Lough Leane is famous for its free rising trout and good salmon fishing (O'Reilly 2007), with hundreds of spring salmon and grilse being caught on the troll every year. Brown trout in the lake average 0.23kg; however, a specimen ferox trout was caught in 2005 weighing nearly 8kg (O'Reilly 2007).

The Central Fisheries Board have undertaken a number of fish stock surveys on Lough Leane, the two most recent (prior to 2008) were in 2001 and 2003 to assess the status of the Killarney shad population (Roche and Rosell, 2003). The Killarney shad population size at the time was estimated to be in excess of 20,000 individuals of 1+ and older (Roche and Rosell, 2003). A small number of char were also recorded during the 2003 survey. In 2002, the Irish Char Conservation Group carried out fish surveys on all three Killarney Lakes and brown trout were recorded in all. Muckross (Middle) lake was the only lake in which Artic char were captured, with the population in Lough Leane believed to be extinct due to the eutrophication of the lake (Igoe, *pers. comm.*). Arctic char were not recorded in Upper Lake, however there are reports from anglers that char have been caught and released there.

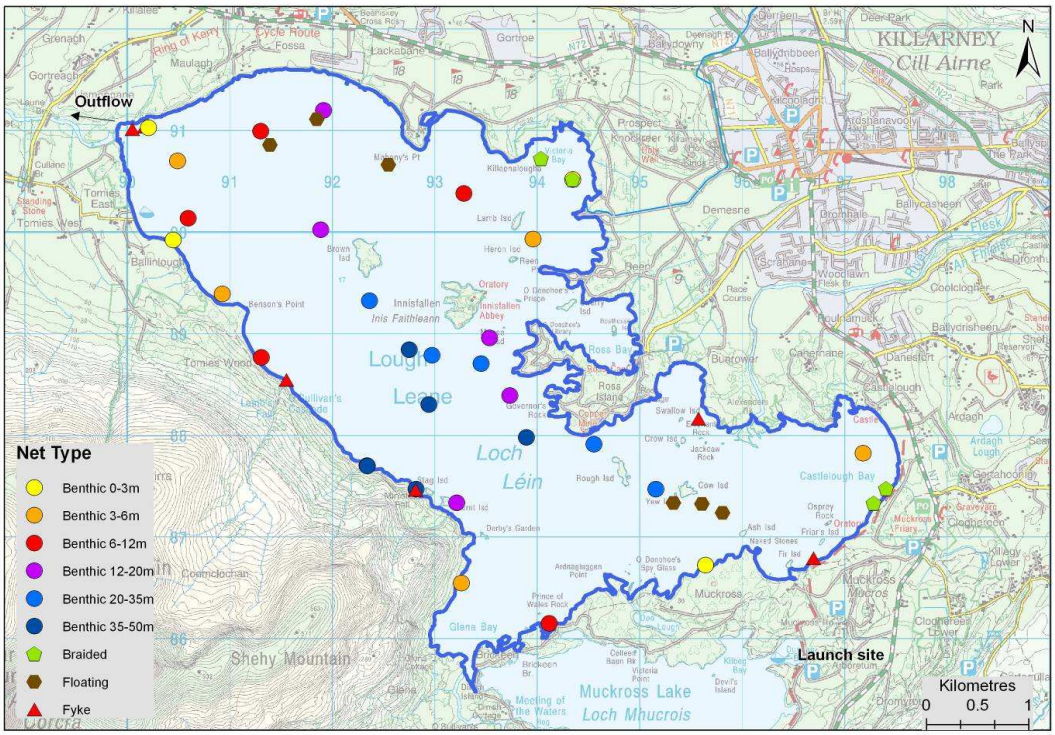

Fig. 1.1. Location map of Lough Leane showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Leane was surveyed over two nights between the 8th and the 11th of September 2008 with the assistance of staff from the National Parks and Wildlife Service and the South Western Regional Fisheries Board. A total of six sets of Dutch fyke nets, 30 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m, 5 @) 12-19.9, 5 @ 20-34.9m and 5 @ 35-49.9m) and six surface floating monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gillnets were deployed randomly in the lake (42 sites). The netting effort was supplemented using four benthic braided (62.5mm mesh knot to knot) survey gill nets (four additional sites). Survey locations were randomly selected using a grid placed over the map of the lake. A handheld GPS was used to mark the precise location of each net. The angle of each gill net in relation to the shoreline was randomised.

All fish apart from perch were measured and weighed on site and scales were removed from trout, salmon, shad and rudd. Live fish were returned to the water whenever possible (i.e. when the likelihood of their survival was considered to be good). Samples of fish were returned to the laboratory for further analysis.

1.3 Results

1.3.1 *Species Richness*

A total of eight fish species were recorded on Lough Leane in September 2008, and a ferox trout was also recorded during the survey. A list of the species encountered and numbers captured by each gear type is compiled in Table 1.1. A total of 371 fish were captured during the survey. Perch was the most common fish species encountered in the benthic gill nets. Good numbers of brown trout were also captured. Salmon and shad were also present.

Table 1.1. List of fish species recorded (including numbers captured) during the survey on Lough Leane, September 2008

Scientific name	Common name	Number of fish captured				
		Benthic mono multimesh gill nets	Benthic braided gill nets	Surface mono multimesh gill nets	Dutch fykes	Total
Perca fluviatilis	Perch	164	1	0	5	170
Salmo trutta	Brown trout (incl ferox)	109	8	14	9	140
Alosa fallax killarnensis	Shad	2	0	9	0	11
Platichthys flesus	Flounder	6	1	0	1	8
Salmo salar	Salmon	4	3	0	0	7
Scardinius erythrophthalmus	Rudd	3	0	0	0	3
Tinca tinca	Tench	0	1	0	1	2
Anguilla anguilla	Eel	0	0	0	30	30

1.3.2 *Fish abundance*

Fish abundance was calculated as the mean number of fish caught per metre of net, i.e. mean CPUE. Fish biomass was calculated as the mean weight of fish caught per metre of net, i.e. mean BPUE. A summary of CPUE and BPUE data for each species and gear type is shown in Table 1.2.

Table 1.2. Mean CPUE (mean number of fish per metre of net) and mean BPUE (mean weight of fish per m of net) for all fish species recorded on Lough Leane, September 2008

Gear type	Brown trout	Salmon	Shad	Flounder	Perch	Rudd	Tench	Eel
Mean CPUE (mean number of fish/m of net)								
Gill nets (all)	0.109	0.006	0.009	0.006	0.138	0.003	0.001	-
Fyke nets	0.025	0.000	9.000	0.003	0.014	0.000	0.003	0.083
Mean BPUE (mean weight (g) of fish/m of net)								
Gill nets (all)	15.959	14.562	0.424	1.075	6.712	0.436	0.692	-
Fyke nets	1.092	0.000	0.000	0.136	0.093	0.000	0.417	13.936

* On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species

1.3.3 *Length frequency distributions*

Perch ranged in length from 4.6cm to 34.0cm (mean = 13.8cm) (Fig. 1.2). Brown trout ranged in length from 13.7cm to 31.2cm (Fig. 1.3). Rudd ranged in length from 17.1cm to 25.5cm. Eel had recorded lengths from 13.5cm to 60.0cm. Salmon lengths ranged from 56.7cm to 65.4cm. Flounder ranged in length from 15.1cm to 29.5cm, and shad ranged in length from 16.2cm to 18.2cm. Two tench measuring 20.0cm and 34.5cm, and one ferox trout measuring 62.5cm in length and 3.8kg in weight were also captured.

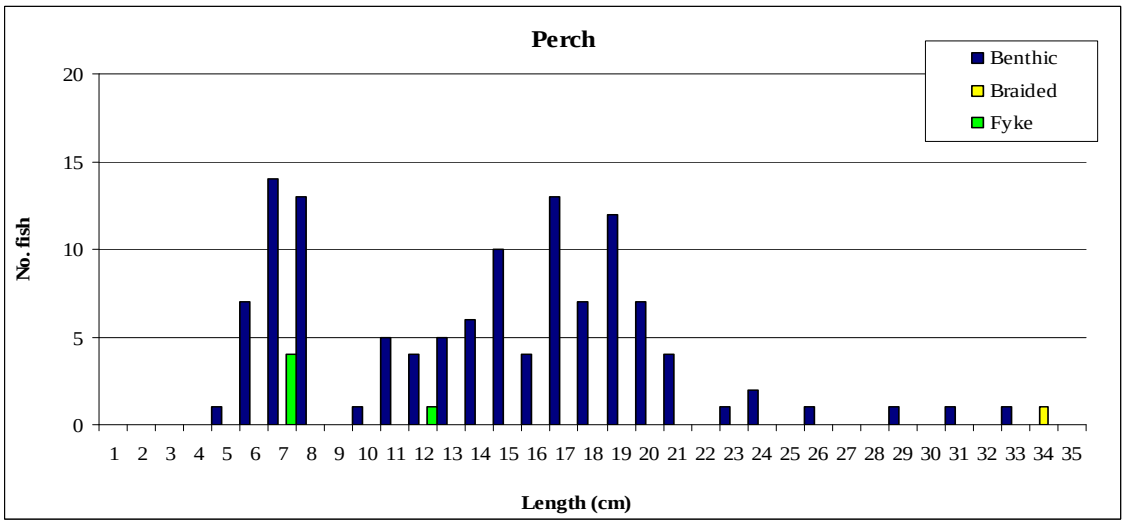

Fig. 1.2. Length frequency of perch captured on Lough Leane, September 2008

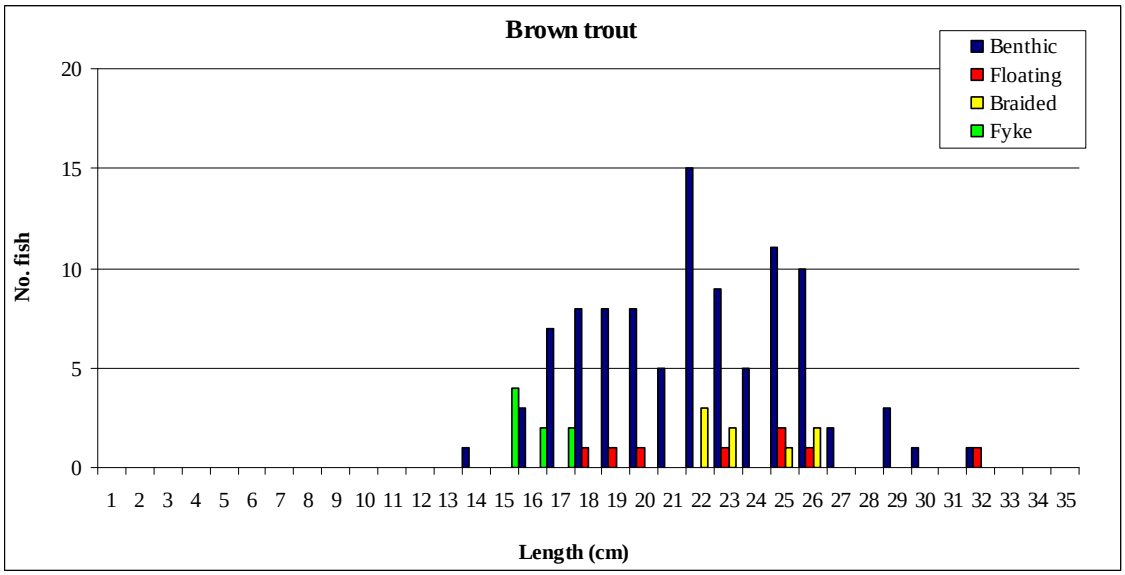

Fig. 1.3. Length frequency of brown trout captured on Lough Leane, September 2008

1.3.4 *Fish age and growth*

Perch ranged in age from 0+ to 7+. Mean perch L1 was 6.8cm (Table 1.3). Brown trout ranged in age from 1+ to 4+. Length frequency and age analysis revealed that 2+ and 3+ were the dominant age groups in the population accounting for approximately 32% and 37% respectively of the fish recorded during the survey. . Mean L4 for brown trout in Lough Leane was 26.9cm (Table 1.4), indicating that the growth of trout in the lake is slow based on a classification developed by Kennedy and Fitzmaurice (1971). Rudd ranged in age from 2+ to 5+. The single ferox trout was 6+ in age.

Table 1.3. Mean (SD) perch length (cm) at age for Lough Leane, September 2008

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean	6.8 (1.06)	12.3 (1.81)	16.1 (2.49)	19.0 (1.76)	23.1 (3.25)	27.0 (4.43)	27.1 (0.74)
N	60	46	22	12	6	3	2
Range	4.8-9.7	8.5-16.6	12.1-20.2	17.1-21.7	20.1-27.4	24.3-32.2	26.5-27.6

Table 1.4. Mean (SD) brown trout length (cm) at age for Lough Leane, September 2008

	L_1	L_2	L_3	L_4
Mean	6.8 (0.95)	14.4 (2.7)	21.4 (2.22)	26.9 (3.16)
N	60	44	21	6
Range	4.9-8.9	9.8-20.7	18.3-26.4	21.8-30.8

1.4 Summary

The survey revealed that perch were the most abundant species in Lough Leane, followed by brown trout and eels. The mean CPUE for brown trout and eels in the lake was below average when compared with other moderate alkalinity lakes surveyed during 2008 (Kelly *et al*., 2009). The mean CPUE for perch in the lake was also low when compared with other moderate alkalinity lakes surveyed, e.g. Lough Owel and Lough Meelagh (Kelly *et al*., 2009).

Perch growth was average in comparison to other moderate alkalinity lakes surveyed, e.g. Lough Talt and Lough Gill.

Brown trout growth was slightly below average in comparison to other moderate alkalinity lakes surveyed, e.g. Lough Fern, Co. Donegal. Kennedy and Fitzmaurice (1971) related growth rates to alkalinity and classified the growth of lake trout generally into four different categories. This description was applied to trout from Lough Leane and therefore the growth of trout in the lake was classified as slow.

Adult salmon and ferox trout were also recorded during the survey; however, no arctic char were captured, raising cause for concern as they were recorded in the 2003 survey. A number of Irish populations of char have become extinct as a direct result of anthropogenic pressures, such as

eutrophication. It is recommended therefore that the fish stocks in Lough Leane be closely monitored in the future.

A unique population of a landlocked subspecies of the twaite shad known as the Killarney shad (*Alosa fallax killarnensis*) (Annex II fish species in the EU Habitats Directive) continues to be present in the lake. The population size at the time of the 2003 survey was estimated (from hydroacoustic data) to be in excess of 20,000 individuals of 1+ and older (Roche and Rosell, 2003). It was not possible to calculate a similar estimate from the 2008 fish survey data, however the shad were captured from similar locations to the 2003 survey. The length of the specimens captured also falls within the range recorded during the previous survey (Roche and Rosell, 2003). It is recommended that the next WFD fish stock survey (2011) on the lake should include a hydroacoustic survey in order to estimate the size of the population. A targeted netting survey similar to the 2003 survey would also provide useful information on their current status.

Classification and assigning lakes with an ecological status is a critical part of the WFD monitoring programme. It allows River Basin District managers to identify and prioritise lakes that currently fall short of the minimum "Good Ecological Status" that is required by 2015 if Ireland is not to incur penalties. A new WFD multimetric fish classification tool has been developed for the island of Ireland (Ecoregion 1) using Agri-Food and Biosciences Institute Northern Ireland (AFBINI) and CFB data (Kellt *et al*., 2008). Using this tool and expert opinion, Lough Leane has been assigned a draft classification of good status for fish. The EPA has assigned an overall classification of moderate status to Lough Leane in an interim draft classification. This is based on physico-chemical parameters and biotic elements, such as macroinvertebrates and macrophytes.

1.5 References

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