

Lough Owel



Sampling Fish for the Water Framework Directive - Lakes 2008



The Central and Regional
Fisheries Boards

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1.1 Introduction

Lough Owel (Plate 1.1, Fig. 1.1) is located approximately four kilometres north-west of Mullingar, Co. Westmeath in the Upper Shannon catchment. The lake has a surface area of 102ha and a maximum depth of 21m. The underlying geology of the lake is limestone. 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 (20-100 mg/l CaCO₃).

Lough Owel is a public water supply for Mullingar and is also the water supply for the Royal Canal. The lake is fed by four small streams (Ballyboy, Frewin, Kilpatrick and Portnashangan) and is also spring fed. With the exception of Lough Carra in county Mayo, this lake is the best example of a large spring fed calcareous lake in Ireland. The lake is of major conservation significance as it contains three habitats (alkaline fens, transition mires and hard water lakes) that are listed on Annex I of the EU Habitats Directive (NPWS, 1999). Water quality in the lake has been monitored regularly since the 1970s. Mean concentrations of total phosphorus, mean transparency and mean chlorophyll place Lough Owel in the mesotrophic category (Devins, M., 1998; McGarrigle *et al.*, 2002; OECD, 1982).

Lough Owel is one of the important trout lakes in the midlands and has a resident stock of wild brown trout. The lake also holds stocks of pike, perch and rudd. Spawning and nursery grounds for trout are limited; therefore trout stocks are maintained by stripping the ova from wild adult trout. These are then hatched out at the Central Fisheries Board fish farm and large numbers of the resulting fry and adult fish are later stocked back into the lake. Fish stock surveys were undertaken regularly by the CFB and ShRFB during the 1980s (CFB 1981; CFB1982; CFB1983; CFB 1984; CFB 1985; CFB, 1986 and CFB, 1987). These surveys revealed that there were excellent stocks of brown trout in the lake (wild and stocked F1 wild fish). At the time there was also a population of perch and a small pike population in the lake. Rudd were identified in the lake during 1985 (CFB unpublished data).

Historically the lake held a population of arctic char; however they have been extinct for some time, the last specimen being authenticated from the lake in 1886 (Went, 1945). There is an old unsubstantiated report that char from Lough Owel were as large as 1.4kg, but this can never be proven (Went, 1945). An attempt was made to reintroduce char to Lough Owel in 1995, however there is no evidence that they have become established (Tierney *et al.*, 2000).



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

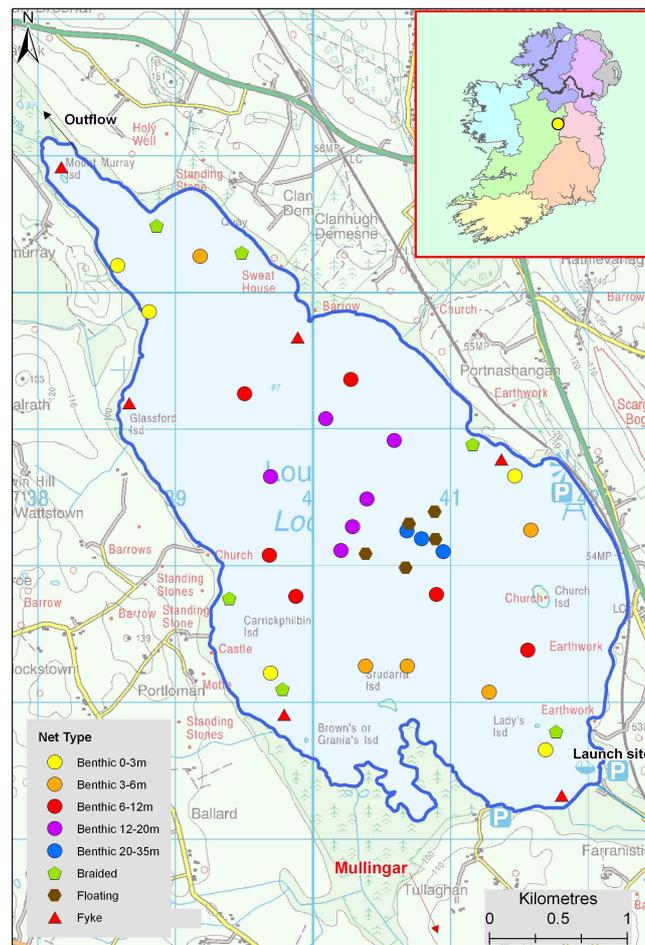


Fig. 1.1. Location map of Lough Owel indicating locations and depths of each net (outflow is indicated on map)

1.2 Methods

The lake was surveyed over three nights from the 21st of July to the 23rd of July 2008. A total of six sets of Dutch fyke nets, 25 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets (5 @ 0-2.9 m, 5 @ 3-5.9 m, 6 @ 6-11.9 m, 6 @ 12-19.9 m and 3 @ 20-34.9 m) and five surface floating monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets were deployed randomly in the lake (36 sites). The netting effort was supplemented using six benthic braided survey gill nets (62.5 mm mesh knot to knot) (6 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, rudd, roach, pike, tench and hybrids. 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 seven fish species and one hybrid were recorded on Lough Owel in July 2008. A list of the species encountered and numbers captured by each gear type is compiled in Table 1.1. A total of 949 fish were captured during the survey. Perch were the most common fish species encountered in the benthic gill nets, followed by 3-spined stickleback and rudd. A small number of wild trout (W) and stocked trout (S) were captured in the gill nets. Only one eel was captured during the survey. A large number of crayfish were also encountered in the survey nets.

Table 1.1. List of fish species recorded (including numbers captured) in Lough Owel, July 2008

Scientific name	Common name	Number of fish captured				Total
		Benthic mono multimesh gill nets	Benthic braided gill nets	Surface mono multimesh gill nets	Dutch fykes	
<i>Salmo trutta</i>	Brown trout (W)	1	0	1	0	2
	Brown trout (S)	0	3	4	0	7
<i>Perca fluviatilis</i>	Perch	883	1	0	0	884
<i>Gasterosteus aculeatus</i>	3-spined stickleback	32	0	0	0	32
<i>Scardinius erythrophthalmus</i>	Rudd	10	19	0	0	29
	Roach x Rudd	6	8	0	0	14
<i>Rutilus rutilus</i>	Roach	6	0	0	0	6
<i>Esox lucius</i>	Pike	1	1	0	0	2
<i>Tinca tinca</i>	Tench	1	0	0	1	2
<i>Anguilla anguilla</i>	Eel	0	0	0	1	1

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. Perch were the dominant fish species in terms of abundance and biomass.

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

Gear type	Brown trout (Wild)	Brown trout (stocked)	Perch	Rudd	Roach	Roach x Rudd	3-spined stickleback	Tench	Pike	Eel
Mean CPUE (mean number of fish/m of net)										
Gill nets	0.001	0.008	0.819	0.029	0.006	0.013	0.031	0.001	0.002	-
Fyke nets	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003
Mean BPUE (mean weight (g) of fish/m of net)										
Gill nets	0.069	3.944	52.047	17.277	1.467	7.835	0.119	0.333	8.399	-
Fyke nets	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.284	0.000	3.349

* 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 3.0cm to 33.5cm (mean = 15.1cm) (Fig. 1.2). Rudd ranged in length from 19.2cm to 35.0cm (mean = 28.9cm) (Fig. 1.3). Roach ranged in length from 14.5cm to 32.5cm. Roach x rudd hybrids had lengths from 15.5cm to 37.1cm. Two tench were captured measuring 15.3cm and 31.0cm in length. Brown trout were separated into wild and stocked fish. Stocked brown trout ranged from 16.3cm to 48.7cm in length, and the two wild trout were measured at 18.2cm and 32.5cm. Two pike measuring 28.2cm and 97.0cm and one eel at 75.0cm were also captured.

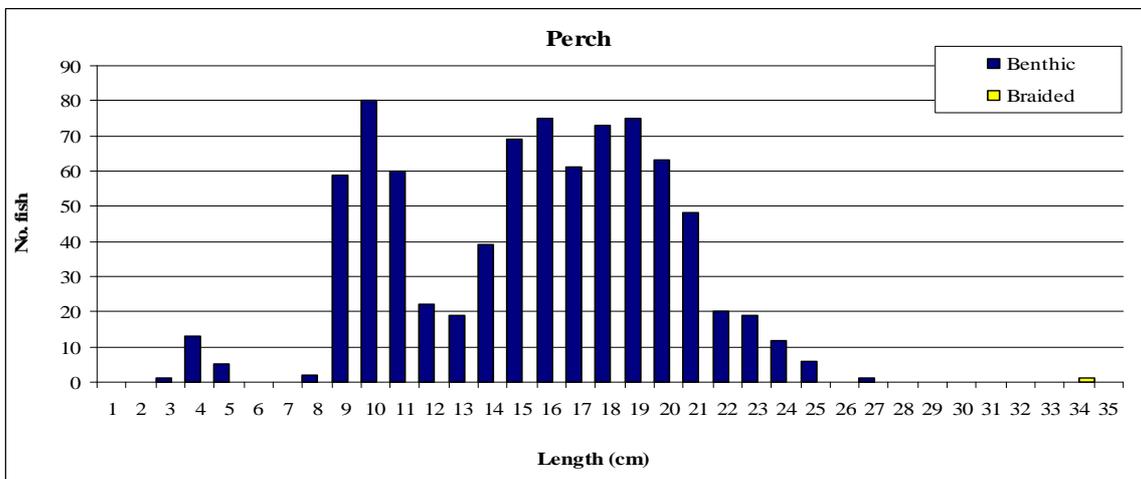


Fig. 1.2. Length frequency of perch captured on Lough Owel, July 2008

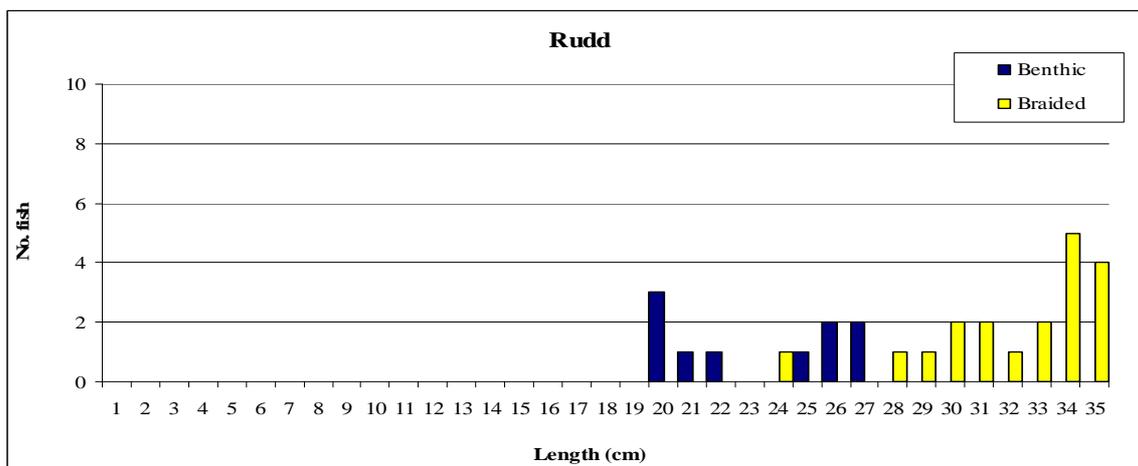


Fig. 1.3. Length frequency of rudd captured on Lough Owel, July 2008

1.3.4 Fish age and growth

Perch were aged from 0+ to 6+ years. Length frequency and age analysis revealed that 1+, 2+ and 3+ fish were the dominant age classes in the population accounting for approximately 92% of the population. The mean perch L1 was 6.3cm (Table 1.3).

Rudd ranged in age from 5+ to 10+. The mean rudd L1 was 4.0cm (Table 1.4). Four of the six roach captured were aged at 3+, 5+, 6+ and 8+. Roach x rudd hybrids were aged 3+, 4+ and 7+ to 12+. Two pike aged 1+ and 7+ were also captured. The two wild brown trout recorded were aged 2+ (18.2cm and 75g) and 4+ (32.5cm and 464g). In addition two of the larger stocked brown trout were aged as 4+ (44.5cm and 1100g) and 5+ (48.7cm and 1590g).

Table 1.3. Mean (SD) perch length at age for Lough Owel, July 2008

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean	6.3 (1.08)	12.3 (1.75)	18.1 (1.72)	21.7 (2.14)	23.6 (3.66)	22.8
N	89	65	41	19	7	1
Range	4.2-10	8.4-16.8	15-22.5	18.6-27.2	20.7-31.3	22.8-22.8

Table 1.4. Mean (SD) rudd length at age for Lough Owel, July 2008

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀
Mean	4.0 (0.57)	7.4 (0.80)	11.4 (1.18)	15.0 (1.18)	18.6 (1.36)	22.1 (1.86)	25.5 (2.02)	28.8 (2.19)	31.6 (1.59)	33.23 (1.65)
N	20	20	20	20	20	18	16	13	9	5
Range	3.0- 5.0	5.9- 8.9	9.7- 14.0	13.2- 17.5	16.9- 22.1	19.3- 27	23.3- 30.6	25.1- 33.2	28.3- 33.4	30.8- 35.1

1.4 Summary

Perch was the dominant fish species in terms of abundance and biomass in Lough Owel. Roach were the second most abundant species followed by 3-spined stickleback and rudd. The mean abundance (CPUE) for perch was the second highest recorded in moderate alkalinity lakes surveyed during 2008 (Kelly *et al.*, 2009). Only Lough Skeagh Upper had a higher mean CPUE. Lough Owel also had the highest mean biomass (BPUE) of perch in the moderate alkalinity lakes and was ranked second behind Lough Egish when compared to all the lakes surveyed. Mean biomass of rudd was higher than other lakes in the moderate alkalinity category (Kelly *et al.*, 2009).

Perch growth was average in comparison with other moderate alkalinity lakes, e.g. Lough Leane, Co. Kerry and Lough Talt, Co. Sligo. Rudd had an average growth rate in comparison with other moderate alkalinity lakes sampled, such as Lough Leane and Inniscarra Reservoir, Co. Cork (Kelly *et al.*, 2009).

Brown trout are regularly stocked into Lough Owel as the lake has limited spawning and nursery streams to sustain large numbers of wild fish. Despite the lake being stocked, the mean CPUE and BPUE for brown trout were low in comparison with other lakes of moderate alkalinity, e.g. Lough Melvin. Lough Owel also had the lowest CPUE for eels in comparison with other moderate alkalinity lakes surveyed (Kelly *et al.*, 2009).

Hatchery reared fish have been released into the lake to increase numbers for angling purposes, as the small native stock cannot support great fishing pressures. Many factors must be considered before fish stocking is carried out, as inappropriate stocking could have detrimental effects on the local environment. Some fears exist that stocked fish may pass on parasites or diseases to the wild fish population when introduced to a lake. These fish may also change the genetic composition and fitness of wild stocks through interbreeding. There is also concern that stocked fish may out-compete native fish for food and habitat. However, netting surveys and angling catches indicate that stocked and wild trout do not mix and that wild stocks occupy the best feeding areas at any particular time (O'Grady, 2008). A review of the survival of stocked fish in this lake is recommended, and the stocking policy for the lake should also be reviewed and revised. Stocking programmes developed should be consistent with EU legislation (WFD, Habitats Directive and the Fish Health Directive) and national programmes such as the National Biodiversity Plan. The revised stocking policy for the lake should include a review of habitat and spawning potential of the wild brown trout population, catch and release policy, bag limits, etc.

Unfortunately roach (a non-native fish species) are now present in the lake, along with a small population of roach x rudd hybrids. The first record of rudd in the lake was identified in 1985. The presence of a small roach population in the current survey would suggest that roach were introduced to the lake relatively recently. Roach is one of the most invasive and prolific freshwater species that has

been introduced to Irish waters in the last 100 years and has been associated with declines in native fish and other species. The presence of roach x rudd hybrids in the lake indicates that the roach may eventually displace the rudd population through competition and hybridization as has been evident in other lakes, such as Lough Gill, Co. Sligo, Lough Meelagh and Cavetown lake, Co. Leitrim. Eno *et al.* (1997) differentiate between both non-native and alien species, with the former being those that have established themselves and the latter being those that have not established themselves and cannot do so without some sort of human intervention. Ireland's native fauna has come under increasing threat from non-native introductions. Invasions by non-native species represent one of the greatest threats to natural biodiversity, second only to habitat destruction (Scalera and Zaghi, 2004). There is no evidence to suggest how roach were introduced to Lough Owel, however, non-native and invasive species can be spread directly by ill-informed anglers; they are brought into Ireland to stock their favourite water or are illegally translocated within Ireland to new catchments. Anglers have also used them illegally as live bait. The angling community in particular must be made aware of the potential negative impacts of these non-native species on Ireland's native fish fauna, as invasions by non-native species represent one of the greatest threats to natural biodiversity, second only to habitat destruction (Scalera and Zaghi, 2004). Non-native species can also transform ecosystems, threatening native and high conservation status species (Stokes *et al.*, 2006). Impacts of these non-native species (e.g. roach) include the displacement of native species through competition for space and food. Direct impacts through predation (e.g. pike) are also evident (Barton and Heard, 2005).

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 fish classification tool has been developed for the island of Ireland (Ecoregion 1) using Republic of Ireland (CFB) and Northern Ireland (Agri-Food and Biosciences Institute) data generated during the North South Share Fish in Lakes project (Kelly *et al.*, 2008). Using this tool and expert opinion on non-native/alien species, Lough Owel has been assigned a draft classification of moderate status for fish. The EPA has assigned Lough Owel an overall status of Good 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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