

Lough Gill



Sampling Fish for the Water Framework Directive - Lakes 2008



The Central and Regional
Fisheries Boards

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1.1 Introduction

Lough Gill (Plate 1.1 and Fig. 1.1) is mainly situated in Co. Sligo, with part of the north-eastern end of the lake extending into Co. Leitrim. It is located within the Garavogue catchment, between Dromahair in Co. Leitrim and Sligo town, and drains into the River Garavogue. Lough Gill is a large lake, with a surface area of 1,401ha and a maximum depth of 31m. It is approximately ten kilometres in length and four kilometres wide, at its widest point. It is surrounded by wooded hills and contains around 20 small islands (Plate 1.1). 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 CaCO₃). The site has been designated as a Special Area of Conservation for a number of reasons, including species listed on Annex II of the Habitats Directive, e.g. sea, river and brook lamprey, white-clawed crayfish, Atlantic salmon and otter (NPWS, 2005). The lake is the main domestic water supply for Sligo town.

Many environmental and ecological studies have been carried out on Lough Gill over the past sixty years (Cotton, 1994). In 1953 samples of planktonic algae were taken from 26 Irish lakes in order to assess their trophic status. A sample analysed from Lough Gill indicated that the lake was eutrophic (Round and Brook, 1959). The first water quality survey of Irish lakes in 1973 and 1974 included Lough Gill and the authors considered that the lake was naturally eutrophic at that time. They determined this from slightly raised orthophosphate levels, from the composition of the phytoplankton community and from reports that algal blooms had occurred in the lake for the two years prior to their study (Flanagan and Toner, 1975). Water quality in the lake has deteriorated due to a number of reasons, one of these was the dumping of chicken slurry in the upstream Bonet catchment (Cotton, 1994). Blooms of blue-green bacteria were a noticeable feature of the lake in the autumn months of the 1980s.

Lough Gill is generally considered to be an important game fishery but is also utilized as a coarse fishery and historically it holds a mixture of fish species including lamprey, eel, salmon, sea trout, brown trout, pike, bream, gudgeon, stone loach, perch, rudd and flounder. The lake receives a large run of spring salmon and it is one of the few lakes in the country to have a reputation for being a predominantly salmon fishery (O'Reilly, 2007). Some stocking of brown trout fingerlings was carried out between 1968 and 1977 in an attempt to enhance the native fish population in the lake. The lake was previously surveyed to assess its fish stocks as part of a fish stock management programme in 1974, 1989 and in the early 1990s by the North Western Regional Fisheries Board and the Central Fisheries Board (Collins, *pers. comm.*; O'Grady, *pers. comm.*; O'Grady, 1990). The 1974 survey revealed that there was a large stock of small perch and a good stock of pike present in the lake. Brown trout and bream were also recorded during the survey (O'Grady, *pers. comm.*). The 1989 survey indicated the presence of five fish species (i.e. salmon, trout, bream, perch and pike) and revealed that there were substantial populations of perch and pike,

localized bream stocks and a relatively small trout population (O' Grady, 1990). Rudd were encountered in the lake in the early 1990s by the NWRFB (Collins, *pers. comm.*).



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

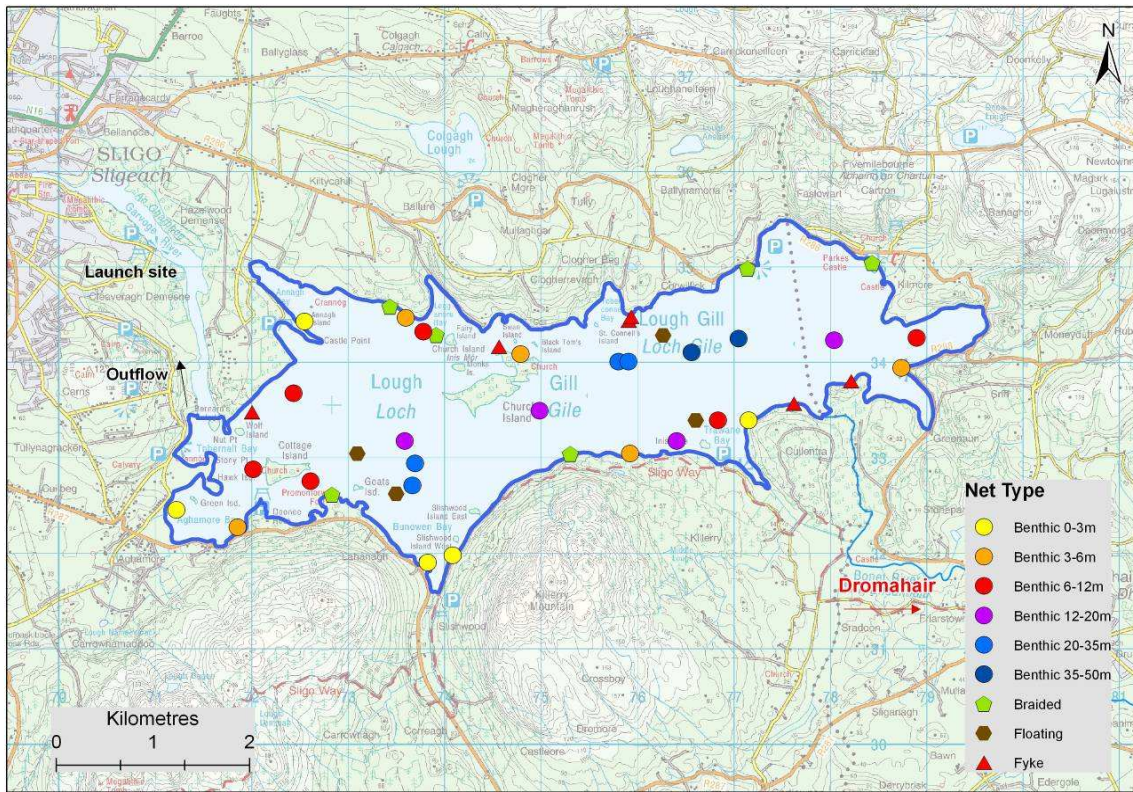


Fig. 1.1. Location map of Lough Gill showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

The lake was surveyed over three nights from the 28th to the 30th of July 2008. A total of six sets of Dutch fyke nets, 26 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 6 @ 6-11.9m, 4 @ 12-19.9m, 4 @ 20-34.9m and 2 @ 35-49.9m) and four 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 (62.5mm mesh knot to knot) survey gill nets (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, bream, roach, pike 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 Gill 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 653 fish were captured during the survey. Perch were the most common fish species encountered in the benthic gill nets. Good numbers of roach and bream were captured during the survey. Small numbers of brown trout were captured in the gill nets. Zebra mussels were also present.

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

Scientific names	Common names	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	1	1	0	0	2
<i>Perca fluviatilis</i>	Perch	310	1	99	12	422
<i>Rutilus rutilus</i>	Roach	95	0	3	0	98
<i>Abramis brama</i>	Bream	46	8	0	0	54
	Roach x bream hybrids	11	2	0	0	13
<i>Esox lucius</i>	Pike	1	0	0	0	1
<i>Barbatula barbatula</i>	Stone loach	1	0	0	0	1
<i>Anguilla anguilla</i>	Eel	0	0	0	62	62

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 Gill, July 2008

Gear type	Brown trout	Perch	Roach	Bream	Pike	Roach x bream	Stone loach	Eel
Mean CPUE (mean number of fish/m of net)								
Gill nets (all)	0.002	0.379	0.085	0.052	0.001	0.017	0.001	-
Fykes	0.000	0.033	0.000	0.000	0.000	0.000	0.000	0.172
Mean BPUE (mean weight (g) of fish/m of net)								
Gill nets (all)	1.972	16.470	10.044	10.058	0.686	3.755	0.008	-
Fykes	0.000	0.387	0.000	0.000	0.000	0.000	0.000	31.025

1.3.3 Length frequency distributions

Perch ranged in length from 3.0cm to 34.0cm (mean = 11.7cm) (Fig. 1.2). Roach ranged in length from 7.4cm to 24.3cm (mean = 17.3cm) (Fig. 1.3). Bream ranged in length from 9.1cm to 31.0cm (mean = 21.2cm) (Fig. 1.4). Eel length ranged from 32.5cm to 75.2cm. Roach x bream hybrids ranged from 14.0cm to 31.0cm. Two brown trout measuring 36.2cm and 45.1cm, one pike measuring 46.1cm, and one stone loach measuring 8.5cm were also recorded.

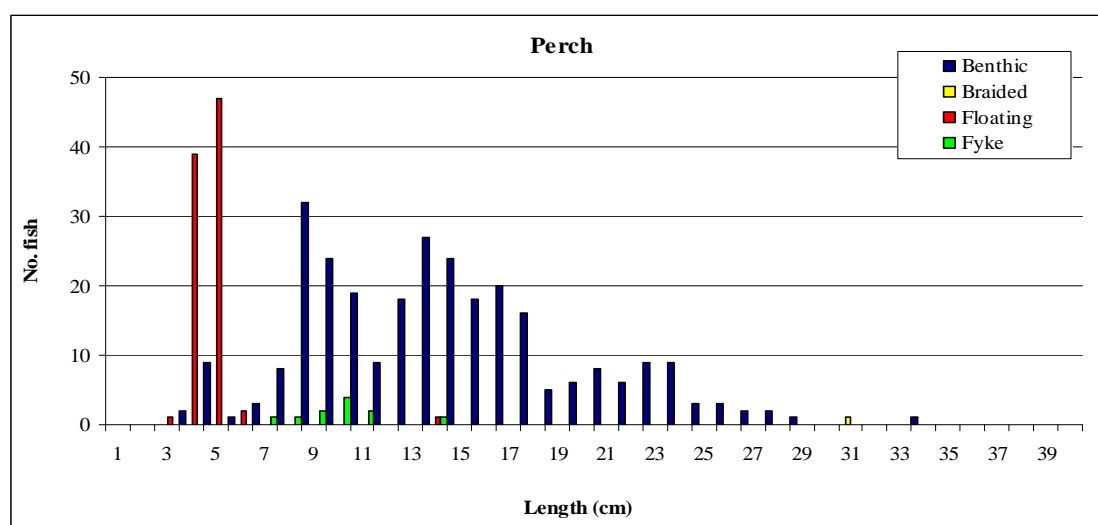


Fig. 1.2. Length frequency of perch captured on Lough Gill, July 2008

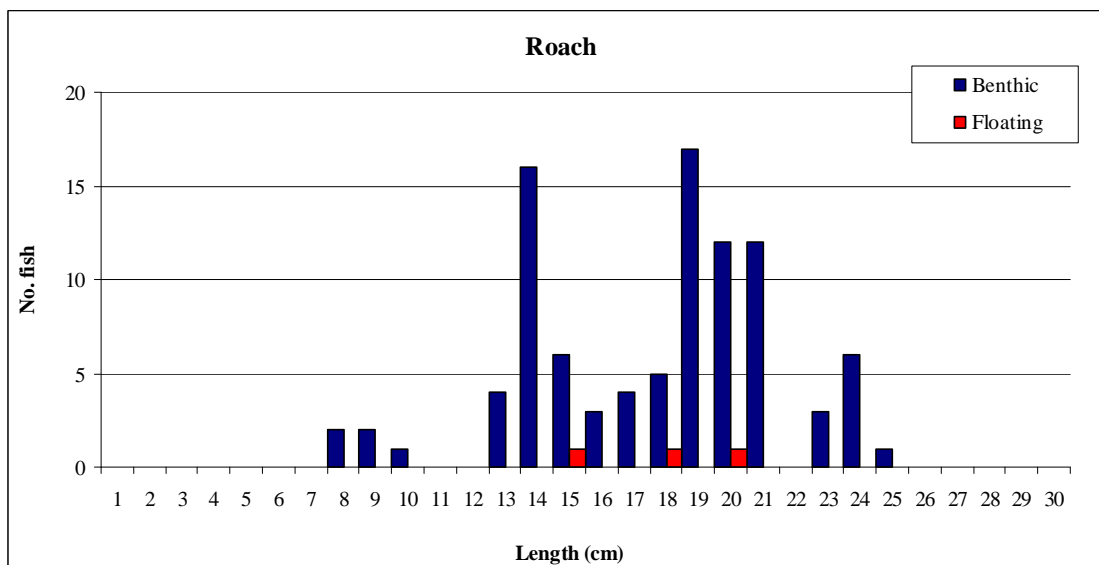


Fig. 1.3. Length frequency of roach captured on Lough Gill, July 2008

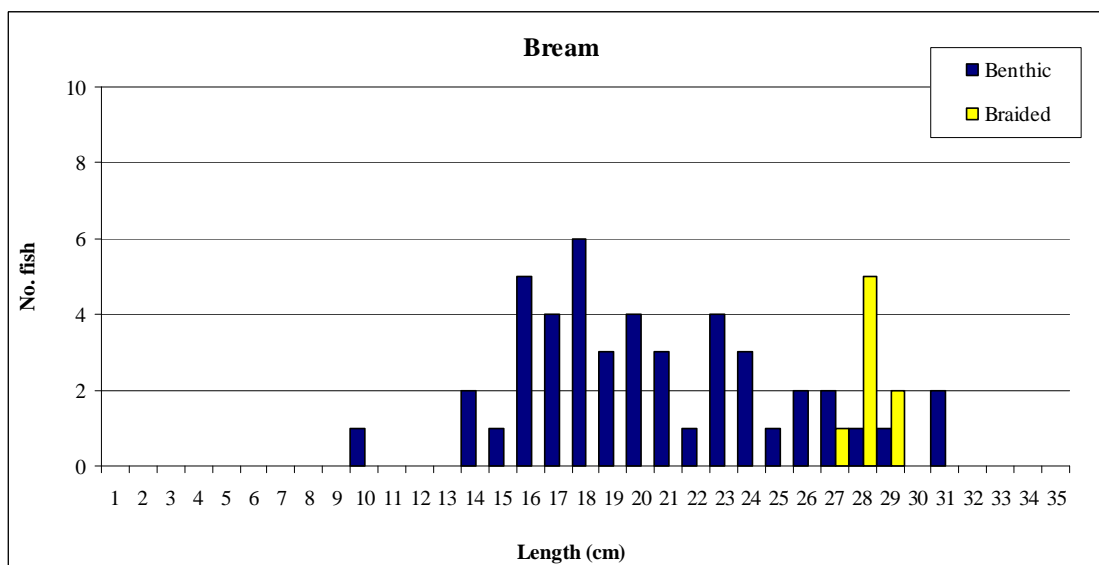


Fig. 1.4. Length frequency of bream captured on Lough Gill, July 2008

1.3.4 Fish age and growth

Perch ranged in age from 0+ to 10+. Perch aged 0+ and 1+ accounted for the largest proportion of the population captured in the gill nets (approximately 31% and 22% respectively). Mean perch L1 was 6.0cm (Table 1.3). Roach ranged in age from 1+ to 4+. 3+ roach (representing approximately 57% of the population) were the dominant age class in the roach population recorded during the survey. Bream

ranged from 3+ to 10+. Mean roach L1 was 4.8cm (Table 1.4). Roach x bream hybrids ranged in age from 5+ to 7+. Both brown trout were aged 4+ (36.2cm and 0.64kg and 45.1cm and 1.34kg). One pike aged 4+ was also recorded and measured 46.1cm in length and weighed 0.74kg.

Table 1.3. Mean (SD) perch length at age (cm) in Lough Gill, July 2008

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀
Mean	6.04 (0.93)	11.1 (1.41)	15.8 (1.62)	19.4 (1.76)	22.1 (1.61)	23.8 (1.78)	26.1 (1.86)	28.4 (2.1)	30.4 (2.48)	33.3
N	94	75	51	36	24	8	6	3	2	1
Range	3.8- 9.1	7.1- 15.1	13.2- 20.9	16.3- 24.2	18.9- 25.2	20.8- 25.7	23.1- 28.8	26.9- 30.8	28.6- 32.1	33.3

Table 1.4. Mean (SD) roach length at age (cm) in Lough Gill, July 2008

	L ₁	L ₂	L ₃	L ₄
Mean	4.8 (0.47)	10.3 (1.04)	16.2 (1.71)	20.9 (1.8)
N	35	32	24	3
Range	4-5.9	8.3-12.5	11.5-18.8	18.9-22.3

1.4 Summary

Perch were found to be the dominant fish species in Lough Gill, followed by roach and eel in this most recent survey. The mean CPUE for perch in the lake was average in comparison with other moderate alkalinity lakes surveyed during 2008 (Kelly *et al.*, 2009). The mean CPUE for roach in the lake was below average when compared with other moderate alkalinity lakes surveyed, e.g. Lough Meelagh and Lough Skeagh Upper (Kelly *et al.*, 2009). Lough Gill had the highest CPUE for eels within the moderate alkalinity lakes studied. The survey also revealed that Lough Gill had the lowest pike CPUE when compared with other moderate alkalinity lakes studied (Kelly *et al.*, 2009). The mean CPUE for brown trout was very low, with only two specimens being captured during the survey. This would suggest that they are present in low numbers compared to other species and that the population may be under unsustainable pressure.

Perch growth was below average in comparison with other moderate alkalinity lakes surveyed in 2008, e.g. Lough Talt, Co. Sligo and Inniscarra Reservoir, Co. Cork. Roach had a similar growth pattern to Lough Meelagh and the second fastest growth rate in comparison with other moderate alkalinity lakes surveyed in 2008, e.g. Inniscarra reservoir and Lough Owel, Co. Westmeath.

Unfortunately roach (a non-native fish species) are now present in the lake, along with a small population of roach x bream hybrids. During the early 1990s, a small population of rudd was captured in the lake;

however rudd (and ruddxroach hybrids) were completely absent during the current survey. The presence of a roach population would suggest that roach were introduced to the lake in the mid 1990s and have subsequently displaced the rudd population through competition and hybridization. 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 (Ferguson, 2006). 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 Gill, 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).

It is extremely important that the fish population in Lough Gill should be monitored closely due to the current practice of water abstraction. Duration of drawdown and extent of exposure will determine the impact on macroinvertebrates, lake productivity and the availability and type of food for fish (Igoe and Hammar, 2004). Water level fluctuations are particularly detrimental to species such as *Gammarus* sp. that are an important food base for trout (Igoe, *pers. comm.*). The lowering of water levels as a consequence of water abstraction can also be detrimental to the spawning success of resident fish populations that may utilise shallow, gravelly lake margins as spawning substrate in the absence of suitable inflowing streams. In the case of Lough Gill, however, this is unlikely to be a major issue, as there are several inflowing streams that can potentially be utilised by spawning fish. Assessing/monitoring spawning activity in these streams would be useful to establish the primary trout spawning streams and the importance (if any) of the littoral lake area as spawning habitat. An appropriate water abstraction management regime needs to take into account the spawning times and ova incubating period of the resident brown trout population in order to prevent egg desiccation.

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 17) using Agri-Food and Biosciences Institute Northern Ireland (AFBINI) and CFB data (Kelly *et al.*, 2008). Using this tool and expert opinion, Lough Gill has been assigned a draft classification of moderate status for fish. The EPA has assigned an overall classification of good status to Lough Gill in an interim draft classification. This was based on physico-chemical parameters and biotic elements, such as macroinvertebrates and macrophytes.

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