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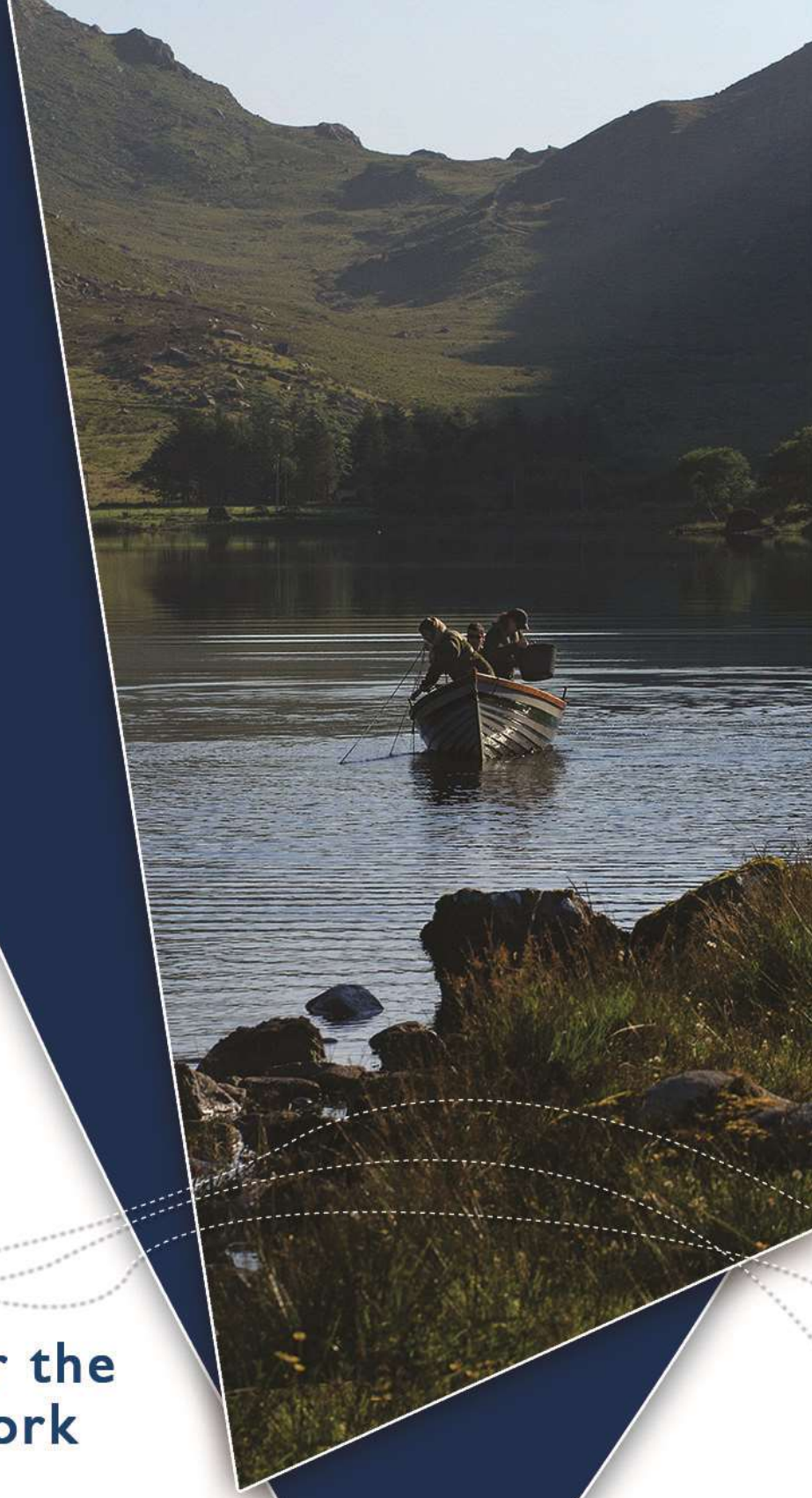

Sampling Fish for the Water Framework Directive

Lakes 2014

Lough Gill

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INLAND FISHERIES IRELAND

Water Framework Directive Fish Stock Survey of Lough Gill, July 2014

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CITATION: Kelly, F.L., Connor, L., Morrissey, E., Coyne, J., Feeney, R., Matson, R. and Rocks, K. (2015n) Water Framework Directive Fish Stock Survey of Lough Gill, July 2014. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Dr. John Conneely and the staff from IFI Ballina. The authors would also like to gratefully acknowledge the help and cooperation of all their colleagues in IFI, Swords.

The authors would also like to acknowledge the funding provided for the project from the Department of Communications, Energy and Natural Resources for 2014.

We would also like to thank Ms. Ruth Hanniffy for the photographs.

1.1 Introduction

Lough Gill is mainly situated in Co. Sligo, with part of the north-eastern end of the lake extending into Co. Leitrim (Plate 1.1 and Fig. 1.1). 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 is categorised as 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 $CaCO_3$). 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 Inland Fisheries Ireland (IFI) (previously the North Western Regional Fisheries Board and the Central Fisheries Board) (Collins, P., *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 IFI (Collins, P., *pers. comm.*). The lake was also previously surveyed in 2008 and 2011 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2009 and Kelly *et al*., 2012a). During the 2011 survey, perch were found to be the dominant species present in the lake. Brown trout, salmon, roach, bream, pike, roach x bream hybrids, flounder and eels were also captured during the survey.

This report summarises the results of the 2014 fish stock survey carried out on the lake, as part of the Water Framework Directive surveillance monitoring programme.

Plate 1.1. Lough Gill

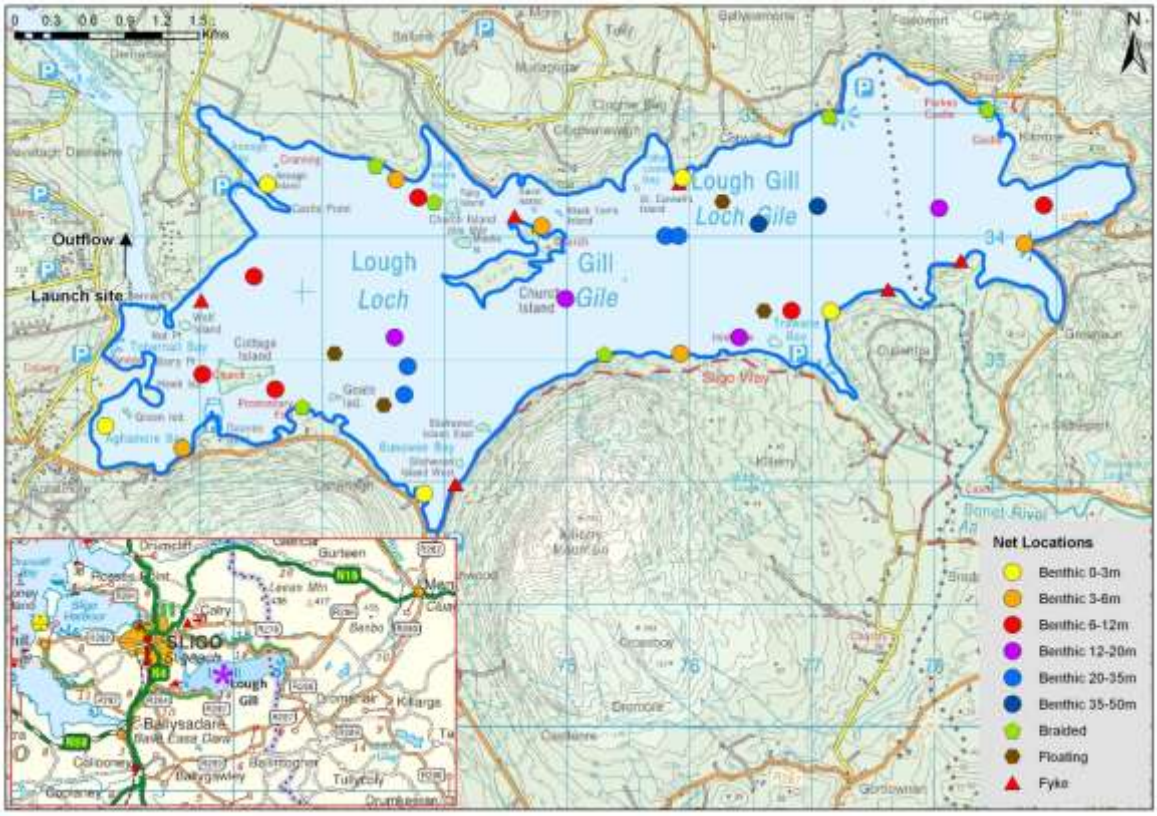

Fig. 1.1 Location map of Lough Gill showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Gill was surveyed over three nights between the 21st and the 24h of July 2014. A total of six sets of Dutch fyke nets, 26 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard 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 floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (36 sites). The netting effort was supplemented using six benthic braided survey gill nets (62.5mm mesh knot to knot) at six additional sites. Nets were deployed in the same locations as were randomly selected in the previous surveys in 2008 and 2011. 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 all brown trout, roach, bream, 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 retained for further analysis.

1.3 Results

1.3.1 Species Richness

A total of six fish species and one type of hybrid were recorded on Lough Gill in July 2014, with 576 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded, followed by roach, roach x bream hybrids, bream, brown trout, eels and pike. During the previous surveys in 2008 and 2011 the same species composition was recorded with the exception of salmon and flounder, which were only captured during the 2011 survey but were not recorded during the 2008 and 2014 survey. Stoneloach were only recorded during the 2008 survey.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Gill, July 2014

Scientific name	Common name	Number of fish captured				
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
Perca fluviatilis	Perch	315	2	0	13	330
Rutilus rutilus	Roach	96	60	0	0	156
Rutilus rutilus x Abramis brama	Roach x bream hybrid	27	3	7	0	37
Abramis brama	Bream	18	0	4	0	22
Salmo trutta	Brown trout	2	3	0	0	5
Esox lucius	Pike	3	0	0	0	3
Anguilla anguilla	Eel	1	0	0	22	23

1.3.2 Fish abundance

Fish abundance (mean CPUE) and biomass (mean BPUE) were calculated as the mean number/weight of fish caught per metre of net. For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. Mean CPUE and BPUE for all fish species captured in the 2008, 2011 and 2014 surveys are summarised in Table 1.2. Mean CPUE and BPUE for all species is illustrated in Figure 1.2 and 1.3.

Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Although the mean brown trout, perch and roach CPUE and BPUE fluctuated slightly over the three sampling years, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Gill, 2008, 2011 and 2014

Scientific name	Common name	2008	2011	2014
			Mean CPUE	
Salmo trutta	Brown trout	0.002 (0.001)	0.002 (0.001)	0.004 (0.002)
Salmo salar	Salmon	-	0.001 (0.001)	-
Perca fluviatilis	Perch	0.330 (0.103)	0.184 (0.048)	0.276 (0.061)
Esox lucius	Pike	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)
Rutilus rutilus	Roach	0.073 (0.025)	0.072 (0.023)	0.133 (0.037)
Abramis brama	Bream	0.044 (0.010)	0.010 (0.003)	0.019 (0.004)
Platichthys flesus	Flounder	-	0.0004 (0.004)	-
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.014 (0.005)	0.013 (0.004)	0.032 (0.008)
Barbatula barbatula	Stoneloach	0.001 (0.001)	-	-
Anguilla anguilla	Eel	0.172 (0.038)	0.083 (0.24)	0.091 (0.033)
			Mean BPUE	
Salmo trutta	Brown trout	1.690 (1.274)	0.436 (0.273)	1.348 (0.778)
Salmo salar	Salmon	-	1.904 (1.904)	-
Perca fluviatilis	Perch	14.172 (4.261)	16.022 (4.436)	14.267 (3.062)
Esox lucius	Pike	0.588 (0.588)	2.238 (2.238)	2.370 (2.280)
Rutilus rutilus	Roach	8.609 (2.873)	9.788 (3.671)	13.425 (3.384)
Abramis brama	Bream	8.620 (2.095)	2.776 (1.130)	10.679 (2.601)
Platichthys flesus	Flounder	-	0.0341 (0.341)	-
Rutilus rutilus x Abramis brama	Roach x bream hybrid	3.218 (1.140)	3.967 (1.353)	11.971 (3.622)
Barbatula barbatula	Stoneloach	-	-	-
Anguilla anguilla	Eel	31.025 (8.112)	15.577 (4.471)	19.636 (7.502)

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

*Eel CPUE and BPUE based on fyke nets only

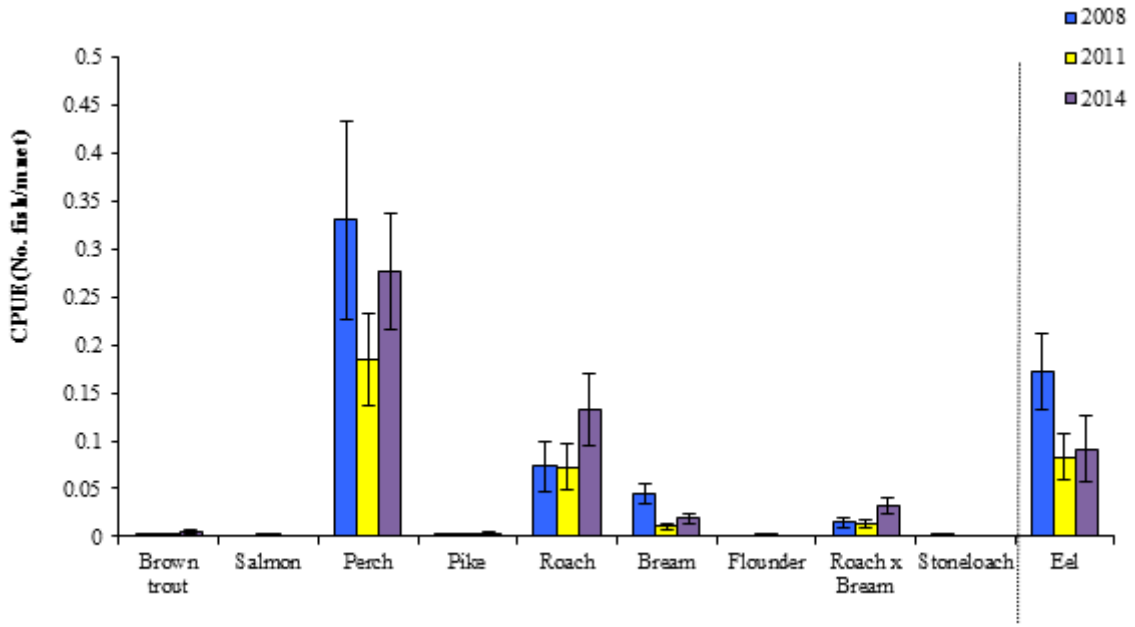

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Gill (Eel CPUE based on fyke nets only), 2008, 2011 and 2014

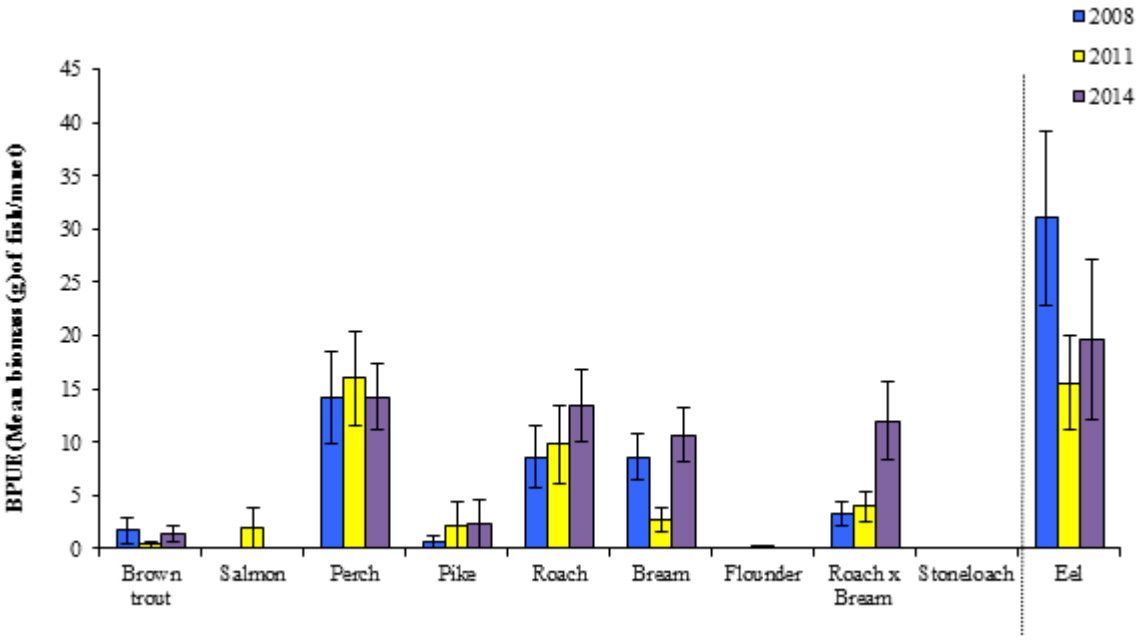

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Gill (Eel BPUE based on fyke nets only), 2008, 2011 and 2014

1.3.3 Length frequency distributions and growth

Perch captured during the 2014 survey ranged in length from 4.3cm to 28.6cm (mean = 13.3cm) (Fig. 1.4) with ten age classes present, ranging from 0+ to 9+, with a mean L1 of 6.6cm (Table 1.3). The dominant age class was 1+ (Fig. 1.4). Perch captured during the 2008 and 2011 surveys had similar length ranges with the narrowest length range exhibited in 2014 (Fig. 1.4). The three sampling years had a similar age range and growth rate (Fig. 1.4).

Roach captured during the 2014 survey ranged in length from 4.9cm to 28.2cm (mean = 15.6cm) (Fig.1.5) with eight age classes present, ranging from 1+ to 8+, with a mean L1 of 2.5cm (Table 1.4). The dominant age class was 1+ (Fig. 1.5). Roach captured during the 2011 and 2014 surveys had a similar length range and growth rate; however, the 2008 survey exhibited a narrower length and age range (Fig.1.5). There was also a difference in the dominant age class in 2014 compared to other years.

Five brown trout were captured during the 2014 survey ranged in length from 15.2.cm to 38.0cm and were aged at 2+ and 4+, with a mean L1 of 6.1cm (Table 1.5). Mean brown trout L4 in 2014 was 30.7cm indicating a fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Bream captured during the 2014 survey ranged in length from 10.5cm to 41.4cm and eels ranged from 37.9cm to 61.8cm. Pike captured ranged in length from 24.0cm to 58.0cm and roach x bream hybrids ranged in length from 16.7cm to 38.9cm.

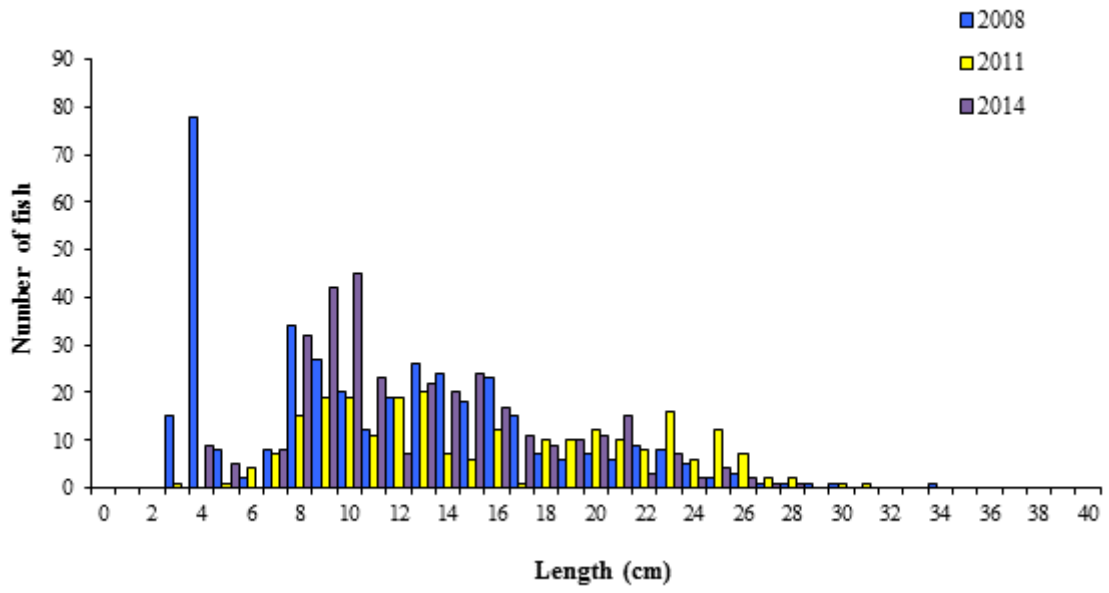

Fig. 1.4. Length frequency of perch captured on Lough Gill, 2008, 2011 and 2014

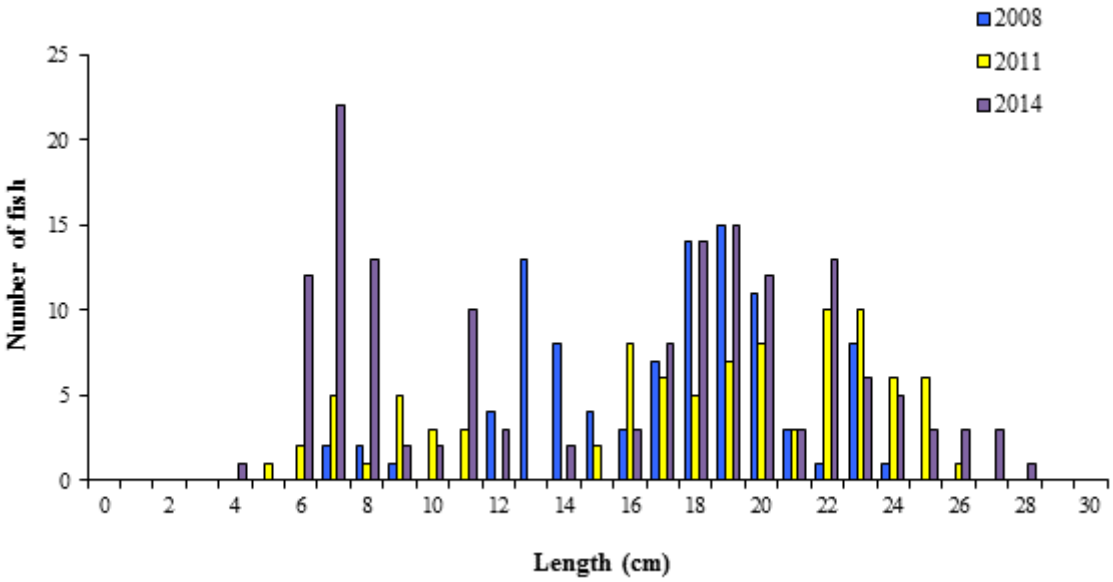

Fig. 1.5. Length frequency of roach captured on Lough Gill, 2008, 2011 and 2014

Table 1.3. Mean (±SE) perch length (cm) at age for Lough Gill, July 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
Mean	6.6 (0.1)	10.6 (0.2)	14.8 (0.3)	17.9 (0.4)	20.4 (0.5)	22.8 (0.6)	23.6 (0.9)	24.0 (3.2)	22.2
N	61	45	34	30	24	12	6	2	1
Range	4.5-9.0	7.9-14.8	11.0-18.1	13.8-22.6	15.5-24.6	19.1-26.0	19.9-25.7	20.8-27.1	22.1-22.1

Table 1.4. Mean (±SE) roach length (cm) at age for Lough Gill, July 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8
Mean	2.5 (0.1)	6.4 (0.2)	11.1 (0.3)	15.4 (0.3)	19.1 (0.3)	22.1 (0.4)	25.0 (0.4)	26.3
N	54	45	38	36	32	22	8	1
Range	1.3-4.2	4.0-8.4	7.7-14.7	11.6-19.9	16.2-22.4	18.7-25.2	23.8-27.1	26.3-26.3

Table 1.5. Mean (±SE) brown trout length (cm) at age for Lough Gill, July 2014

	L_1	L_2	L_3	L_4	Growth Category
Mean	6.1 (0.5)	14.5 (1.2)	22.2 (1.4)	30.7 (1.7)	Fast
N	5	5	3	3	
Range	4.6-7.3	9.9-16.3	19.6-24.4	27.4-33.5	

1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and eels were the dominant species in terms of biomass (BPUE) captured in the survey gill nets during the 2014 survey.

Although the mean perch CPUE and BPUE fluctuated slightly over the three sampling years, these differences were not statistically significant. Perch ranged in age from 0+ to 9+, indicating reproductive success in each of the previous ten years. The dominant age class was 1+.

The mean roach CPUE and BPUE fluctuated slightly from 2008 to 2014; however, these differences were not statistically significant. Roach ranged in age from 1+ to 8+, indicating reproductive success in eight of the previous nine years. The dominant age class was 1+.

The mean brown trout CPUE and BPUE also fluctuated slightly over the three sampling years, but these differences were not statistically significant. Brown trout ranged in age from 2+ to 4+, indicating reproductive success in two of the previous five years. Length at age analyses revealed that brown trout in the lake exhibit a fast rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

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 multimetric fish ecological classification tool (Fish in Lakes – 'FIL') was developed for the island of Ireland (Ecoregion 17) using IFI and Agri-Food and Biosciences Institute Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). This tool was further developed during 2010 (FIL2) in order to make it fully WFD compliant, including producing EQR values for each lake and associated confidence in classification (Kelly *et al*., 2012b). Using the FIL2 classification tool, Lough Gill has been assigned an ecological status of Good for 2008, 2011 and 2014 based on the fish populations present.

In the 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Lough Gill an overall draft ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish.

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