Sampling Fish for the Water Framework Directive

Lakes 2013

Lough MacNean Upper

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Macnean Upper, June 2013

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1.1 Introduction

Lough Macnean Upper is the larger of the two Macnean lakes, situated on the border of Counties Fermanagh, Leitrim and Cavan at an altitude of 47m a.s.l. (Plate 1.1, Fig. 1.1). It is a mesotrophic lake with a surface area of 644ha, mean depth of 5.2m and maximum depth of 22.7m. The lake falls into typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and moderately alkaline (20-100mg/l $CaCO_3$).

Lough Macnean Upper is fed by several rivers (Lurgan River, Esky River and Black River) and flows into Lough Macnean Lower via the Belcoo River. Both Lough Macnean Upper and Lough Macnean Lower were formed by a process of glaciation. Glaciers excavated deep basins in the carboniferous rocks, creating steep valley sides and rocky cliffs (NIEA, 2009a). The shores of the lake have good examples of wet woodland and extensive fen and reedbed communities (NIEA, 2009b). The islands on the lough are important breeding sites for lapwing, snipe and curlew (NIEA, 2009b). The white-clawed crayfish, a species listed on Annex II of the EU Habitats Directive, has been recorded in the lake (NIEA, 2009b).

Lough Macnean Upper is a mixed coarse fishery and is particularly noted for its pike angling. The shoreline is broken up by areas of woodland and sheltered bays fringed with reed swamps and fen (NIEA, 2009a). Agricultural usage along the shorelines of the lake is not very developed when compared to the lower lake. Surrounding fields tend to be rush infested with overgrown hedges (NIEA, 2009a).

A survey carried out in 1969 revealed perch, pike, roach, roach x bream hybrids and brown trout to be present in Lough Macnean Upper (IFT, unpublished data). The lake was again surveyed in 2006 and 2010 as part of the NSSHARE Fish in Lakes Project and the WFD lakes monitoring programme respectively (Kelly *et al.*, 2007 and Kelly *et al.*, 2011). During the 2010 survey perch were found to be the dominant species present in the lake. Roach, pike, bream, roach x bream hybrids, eels, rudd and brown trout were also recorded.

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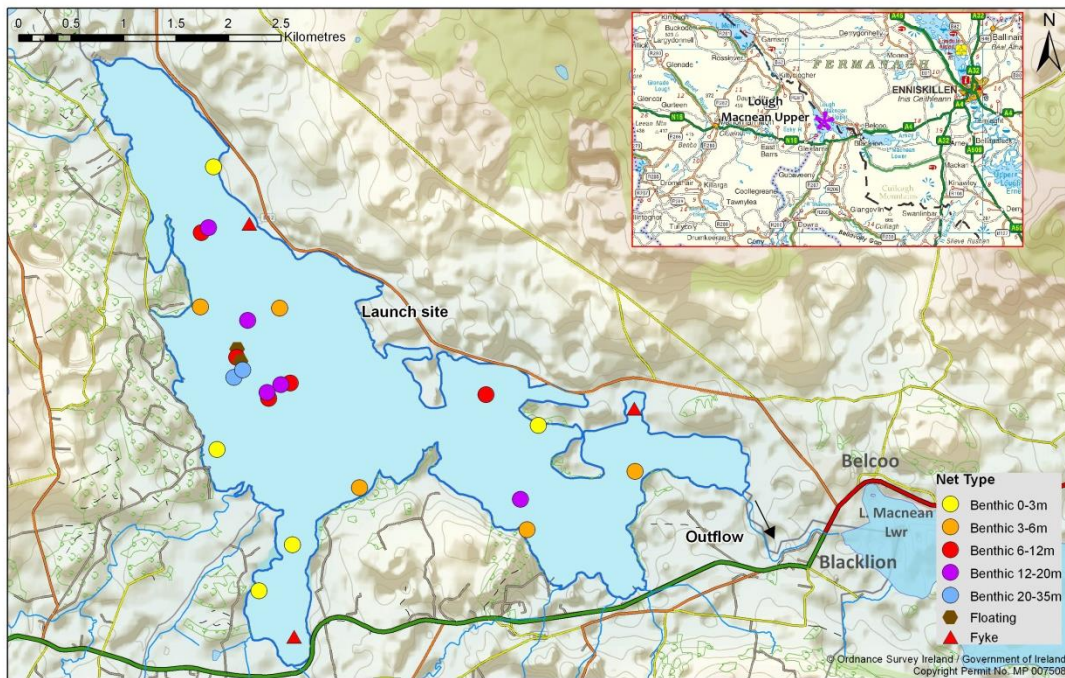
Fig. 1.1. Location map of Lough Macnean Upper showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough MacNean Upper was surveyed over two nights from the 24th to the 26th of June 2013. A total of three sets of Dutch fyke nets, 22 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m, 5 @ 12-19.9m and 2 @ 20-34.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake. Nets were deployed in the same locations as were randomly selected in the previous survey. 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 roach, rudd, bream, trout, pike and roach x bream 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 seven fish species and one type of hybrid were recorded in Lough Macnean Upper in June 2013, with 525 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 and roach x bream hybrids. Pike, bream, eels, rudd and brown trout were also recorded. During the previous survey in 2010 the same species composition was recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Macnean Upper, June 2013

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Perca fluviatilis	Perch	387	2	1	390
Rutilus rutilus	Roach	74	6	0	80
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	28	0	0	28
Anguilla anguilla	European eel	0	0	16	16
Scardinius erythrophthalmus	Rudd	4	0	0	4
Esox lucius	Pike	2	0	2	4
Abramis brama	Bream	2	0	0	2
Salmo trutta	Brown trout	1	0	0	1

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 2010 and 2013 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) in the survey gill nets. Although the mean perch CPUE and BPUE was higher in 2013 than in 2010, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3). The mean roach CPUE and BPUE was lower in 2013 than in 2010, however, these differences were also 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 Macnean Upper, 2010 and 2013**

Scientific name	Common name	2010	2013
		Mean CPUE	
Perca fluviatilis	Perch	0.324 (0.074)	0.481 (0.110)
Rutilus rutilus	Roach	0.227 (0.094)	0.099 (0.034)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	0.089 (0.037)	0.035 (0.013)
Abramis brama	Bream	0.010 (0.006)	0.002 (0.002)
Salmo trutta	Brown trout	0.002 (0.002)	0.001 (0.001)
Scardinius erythrophthalmus	Rudd	0.002 (0.002)	0.005 (0.005)
Esox lucius	Pike	0.001 (0.001)	0.004(0.004)
Anguilla anguilla	European eel*	0.117 (0.117)	0.117 (0.117)
		Mean BPUE	
Perca fluviatilis	Perch	18.720 (4.481)	30.122 (7.934)
Rutilus rutilus	Roach	11.452 (4.717)	4.515 (1.662)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	7.627 (2.694)	4.553 (1.658)
Abramis brama	Bream	4.122 (2.014)	2.065 (1.514)
Scardinius erythrophthalmus	Rudd	0.548 (0.405)	0.126 (0.126)
Salmo trutta	Brown trout	0.191 (0.133)	0.842 (0.842)
Esox lucius	Pike	1.244 (1.244)	6.295 (4.321)
Anguilla anguilla	European eel*	23.544 (3.535)	32.522 (25.713)

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
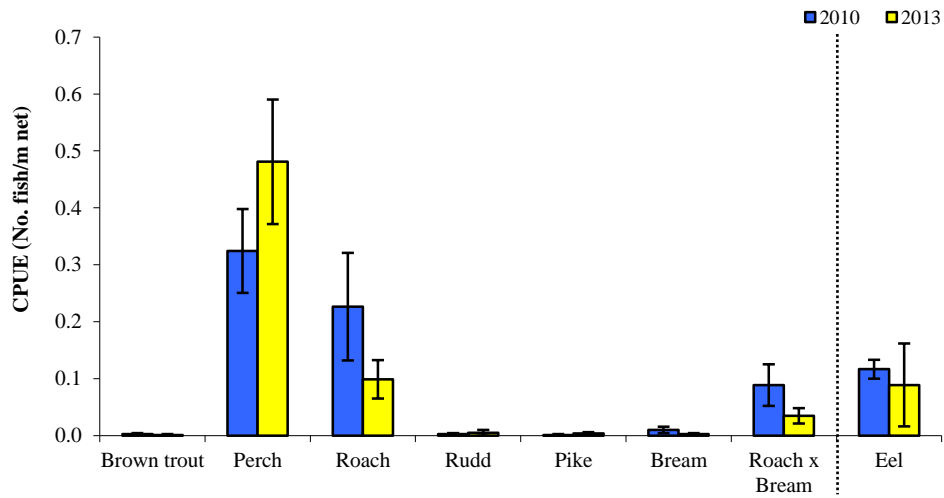
Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured on Lough Macnean Upper, 2010 and 2013 (Eel CPUE based on fyke nets only)
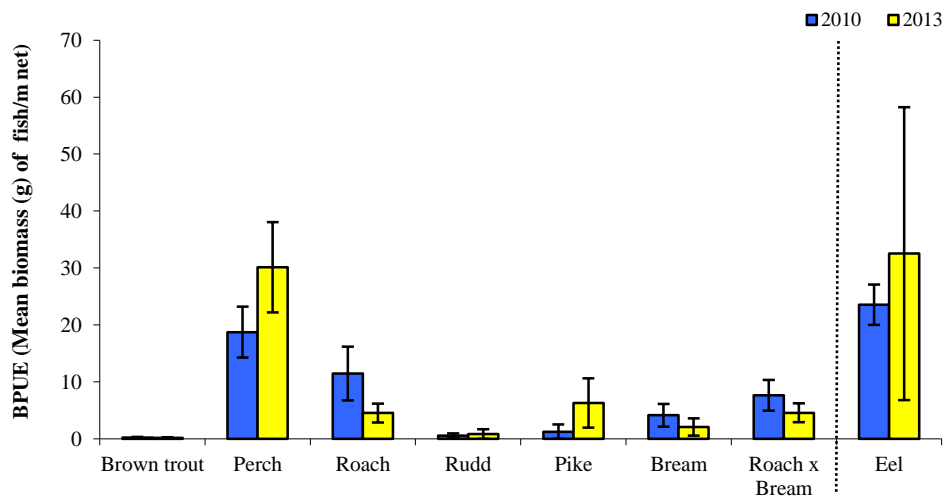
Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Macnean Upper (Eel BPUE based on fyke nets only), 2010 and 2013

### 1.3.3 Length frequency distributions and growth

Perch captured during the 2013 survey ranged in length from 4.8cm to 29.4cm (mean = 14.3 cm) (Fig. 1.4) with nine age classes present, ranging from 1+ to 9+, with a mean L1 of 5.4cm (Table 1.3). The dominant age class was 1+ (Fig 1.4). Perch captured during the 2010 survey had a similar length range, age range and dominant age class (Fig. 1.4).

Roach captured during the 2013 survey ranged in length from 7.5cm to 21.8cm (mean = 13.7cm) (Fig.1.5) with six age classes present, ranging from 2+ to 7+, with a mean L1 of 2.4cm (Table 1.4). The dominant age class was 3+ (Fig 1.5). Roach captured during the 2010 survey ranged in length from 5.5cm to 26.0cm (Fig.1.5) with seven age classes present, ranging from 3+ to 10+. The dominant age class was 4+ (Fig 1.5).

Roach x bream hybrids captured during the 2013 survey ranged in length from 8.2cm to 25.9cm. Eels ranged in length from 38.0cm to 71.9cm, pike ranged in length from 21.1cm to 73.0cm and bream ranged in length from 31.8cm to 39.7cm. Rudd ranged in length from 16.6 cm to 23.1cm and one brown trout of 20.6cm was captured during the 2013 survey.
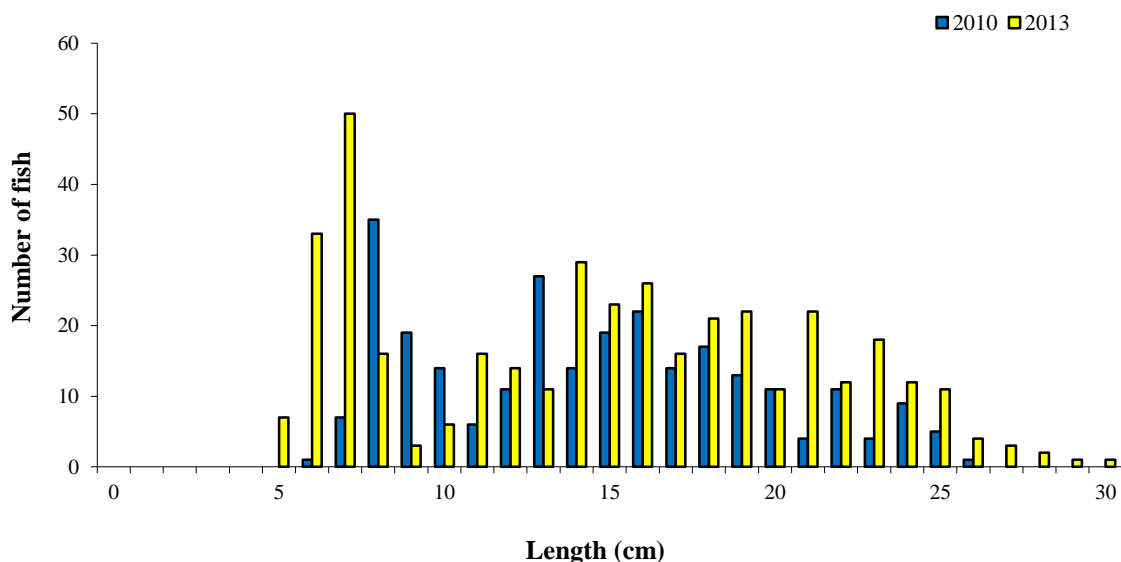
Fig. 1.4. Length frequency of perch captured on Lough Macnean Upper, 2010 and 2013
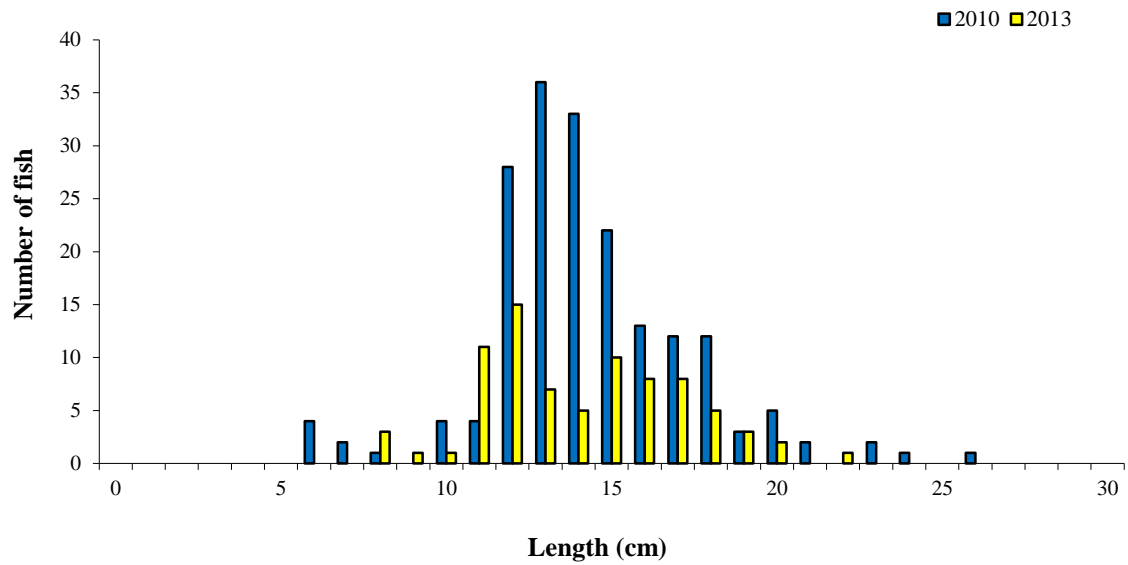
Fig. 1.5. Length frequency of roach captured on Lough Macnean Upper, 2010 and 2013

Table 1.3. Mean (±SE) perch length (cm) at age for Lough Macnean Upper, June 2013

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
Mean	5.4 (0.1)	9.4 (0.1)	13.3 (0.2)	16.8 (0.2)	19.4 (0.3)	21.3 (0.5)	22.7 (0.7)	24.0 (0.9)	26.3 (0.6)
N	108	89	68	50	43	28	15	11	7
Range	3.7-7.7	5.9-12.9	9.1-17.5	11.9-20.4	13.9-22.6	15.8-25.2	17.3-25.8	17.7-27.9	24.5-28.8

Table 1.4. Mean (±SE) roach length (cm) at age for Lough Macnean Upper, June 2013

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean	2.4 (0.1)	5.3 (0.2)	9.4 (0.3)	12.8 (0.4)	14.8 (0.4)	16.1 (0.8)	16.9 (1.5)
N	57	57	51	32	23	10	5
Range	1.4-3.7	2.9-9.5	5.2-13.4	6.8-16.1	8.7-17.8	12.6-19.4	14.0-21.5

1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE) in the survey gill nets during the 2013 survey.

Although the mean perch CPUE and BPUE was higher in 2013 than in 2010, these differences were not statistically significant. Perch ranged in age from 1+ to 9+ indicating reproductive success in nine of the previous ten years. The dominant age class was 1+.

Although the mean roach CPUE and BPUE was lower in 2013 than in 2010, these differences were not statistically significant. Roach ranged in age from 2+ to 7+, indicating reproductive success in six of the previous eight years; however, no 0+ or 1+ fish were recorded. The dominant age class was 3+.

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*., 2012). Using the FIL2 classification tool, Lough Macnean Upper has been assigned an ecological status of Good for both 2010 and 2013 based on the fish populations present.

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

1.5 References

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NIEA (2009a) http://www.ni-environment.gov.uk/print/landscape/country_landscape/5/5-land.htm

NIEA (2009b) Wetlands and Lakes http://www.ni-environment.gov.uk/print/land-home/landscape_home/country_landscape/5/5-bio.htm

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