



**Sampling Fish for the
Water Framework
Directive**

Lakes 2013

Lough MacNea Lower



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough MacNea Lower, June 2013

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1.1 Introduction

Lough MacNea Lower is a large freshwater lake located in County Fermanagh, at an altitude of 51m a.s.l. (Plate 1.1, Fig. 1.1). It is a mesotrophic lake, with a surface area of 456ha, mean depth of 1.5m and maximum depth of 12.7m. The lake is categorised as typology class 6 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and moderately alkaline (20-100mg/l CaCO₃).

Lough MacNea Lower is fed by the Belcoo River which flows from Lough MacNea Upper into the lake near the village of Belcoo (Fig. 1.1). Lough MacNea Lower contains two islands, Cushrush Island which is the larger of the two and Inishee or Jinny's Island, which is smaller and is completely forested. A causeway was built onto Cushrush Island in the 1960's to allow animals to be moved on to the island. The shores of both the lower and upper loughs have good examples of wet woodland and of extensive fen and reed bed communities (NIEA, 2009b). The islands in both loughs are important breeding sites for lapwing, snipe and curlew (NIEA, 2009b).

Both Lough MacNea Upper and Lough MacNea 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 lower lough is enclosed by a steep limestone escarpment. Agricultural usage along the shorelines of Lough MacNea Lower is more developed when compared to the upper lough. The underlying limestone soils produce good quality grassland and the southern shores and lower slopes are farmed intensively (NIEA, 2009a).

The shape of Lough MacNea Lower was changed dramatically during the 1960's when a major dredging operation took place. The level of the lake was dropped by approximately 1m resulting in wide areas of shallows as well as exposure of a lot of soft and barren shoreline (IFT, unpublished data).

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perch, pike, rudd, roach, bream, rudd x bream and roach x bream hybrids were all recorded in Lough MacNea Lower (IFT, unpublished data).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



Plate 1.1. Lough MacNeán Lower

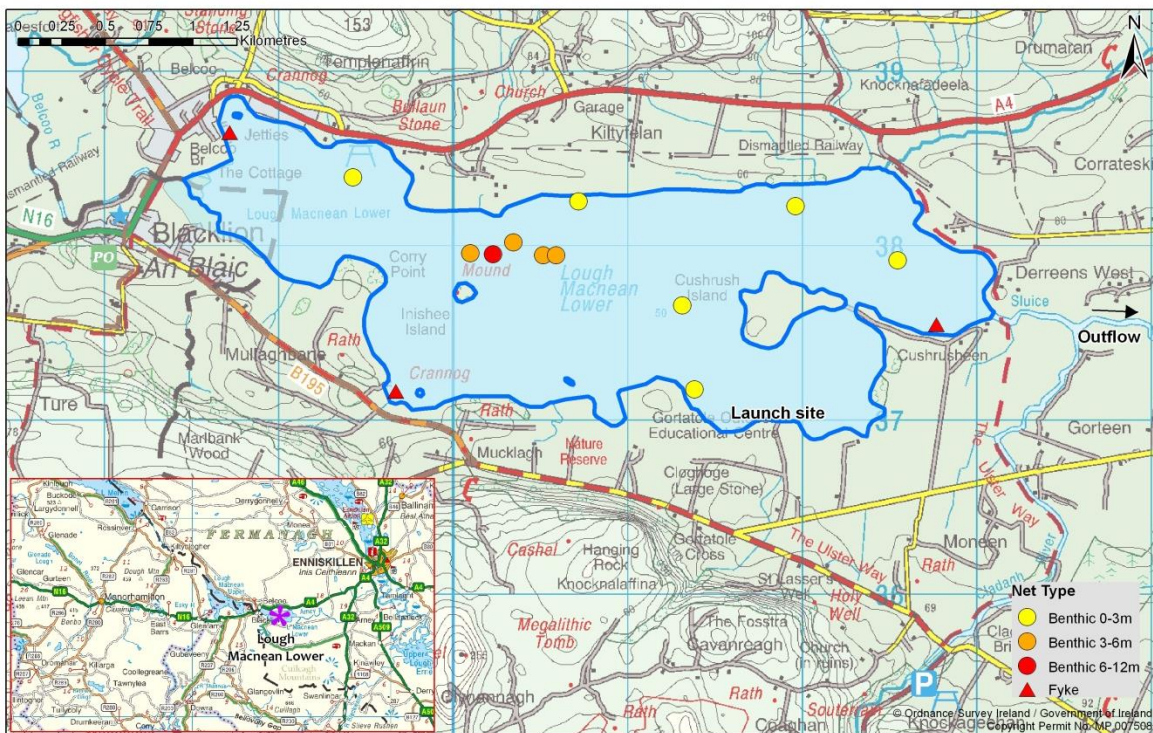


Fig. 1.1. Location map of Lough MacNeán Lower showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough MacNea Lower was surveyed over two nights from the 26th to the 28th of June 2013. A total of three sets of Dutch fyke nets and eleven benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (6 @ 0-2.9m, 4 @ 3-5.9m and 1 @ 6-11.9m) were deployed in the lake (14 sites). 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, pike, bream 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 six fish species and one type of hybrid were recorded in Lough MacNea Lower in June 2013, with 543 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, rudd, bream and eels were also recorded. The same species composition was recorded in 2010 with the exception of pike which were only present in 2013.

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

Scientific name	Common name	Number of fish captured		
		Benthic mono multimesh gill nets	Fyke nets	Total
<i>Perca fluviatilis</i>	Perch	305	1	306
<i>Rutilus rutilus</i>	Roach	133	0	133
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream hybrid	94	0	94
<i>Esox lucius</i>	Pike	4	0	4
<i>Scardinius erythrophthalmus</i>	Rudd	3	0	3
<i>Abramis brama</i>	Bream	2	0	2
<i>Anguilla anguilla</i>	European eel	0	1	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 roach x bream hybrids were the dominant species in terms of biomass (BPUE). The mean perch CPUE was significantly higher in 2013 than in 2010 (Mann-Whitney, $P < 0.05$) (Table 1.2; Figs 1.2 and 1.3). Although the mean perch BPUE was higher in 2013 than in 2010, this difference was not statistically significant (Table 1.2; Fig 1.2 and 1.3). Although the mean roach CPUE was lower in 2013 than in 2010 and the mean roach BPUE was higher in 2013 than in 2010, 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 on Lough MacNea Lower

Scientific name	Common name	2010	2013
Mean CPUE			
<i>Perca fluviatilis</i>	Perch	0.214 (0.068)	0.727 (0.189)
<i>Rutilus rutilus</i>	Roach	0.488 (0.164)	0.317 (0.084)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream hybrid	0.195 (0.063)	0.224 (0.052)
<i>Abramis brama</i>	Bream	0.009 (0.004)	0.005 (0.003)
<i>Scardinius erythrophthalmus</i>	Rudd	0.004 (0.005)	0.007 (0.007)
<i>Esox lucius</i>	Pike	-	0.010 (0.004)
<i>Anguilla anguilla</i>	European eel*	0.094 (0.029)	0.006 (0.006)
Mean BPUE			
<i>Perca fluviatilis</i>	Perch	21.248 (7.175)	23.821 (6.003)
<i>Rutilus rutilus</i>	Roach	7.145 (3.163)	16.300 (4.718)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream hybrid	17.238 (4.913)	28.832 (6.003)
<i>Abramis brama</i>	Bream	7.145 (3.163)	3.036 (2.261)
<i>Scardinius erythrophthalmus</i>	Rudd	0.602 (0.602)	0.281 (0.281)
<i>Esox lucius</i>	Pike	-	10.241 (6.137)
<i>Anguilla anguilla</i>	European eel*	35.278 (14.590)	2.217 (2.217)

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

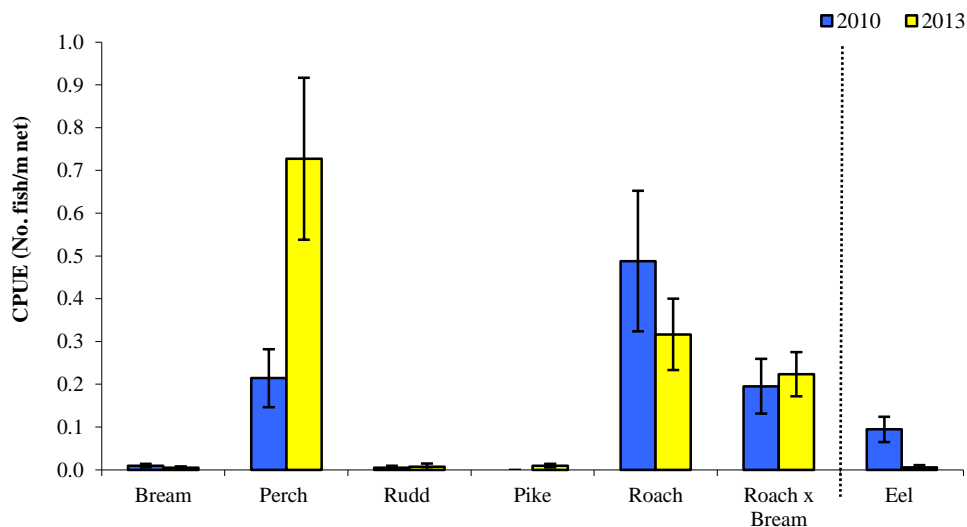


Fig. 1.2. Mean (\pm S.E.) CPUE on Lough MacNean Lower (Eel CPUE based on fyke nets only)

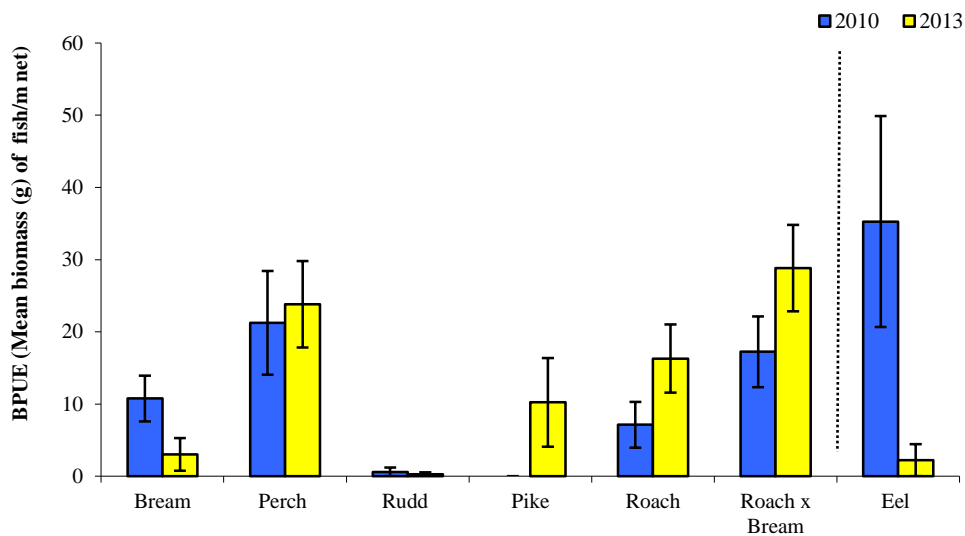


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lough MacNean Lower (Eel BPUE based on fyke nets only), 2010 and 2013

1.3.3 Length frequency distributions and growth

Perch captured during the 2013 survey ranged in length from 6.0cm to 25.1cm (mean = 10.8cm) (Fig.1.4) with eight age classes present, ranging from 1+ to 8+, with a mean L1 of 5.3cm (Table 1.3). The dominant age class was 1+ (Fig 1.4). Perch captured during the 2010 survey ranged in length from 3.0cm to 26.0cm (Fig.1.4), age ranged from 0+ to 6+ with dominant age classes of 1+ and 2+.

Roach captured during the 2013 survey ranged in length from 6.0cm to 25.3cm (mean = 13.9cm) (Fig. 1.5) with eight age classes present, ranging from 1+ to 8+, with a mean L1 of 2.7cm (Table 1.4). Roach captured during the 2010 had a similar length range (Fig. 1.5) with five age classes present, ranging from 2+ to 6+. The dominant age class for both years was 3+ (Fig 1.5).

Roach x bream hybrids captured during the 2013 survey ranged in length from 7.1cm to 27.4cm (age classes ranged from 1+ to 9+), bream ranged in length from 27.5cm to 36.9cm and rudd ranged in length from 8.5cm to 16.9cm. One eel was recorded at 60.6cm.

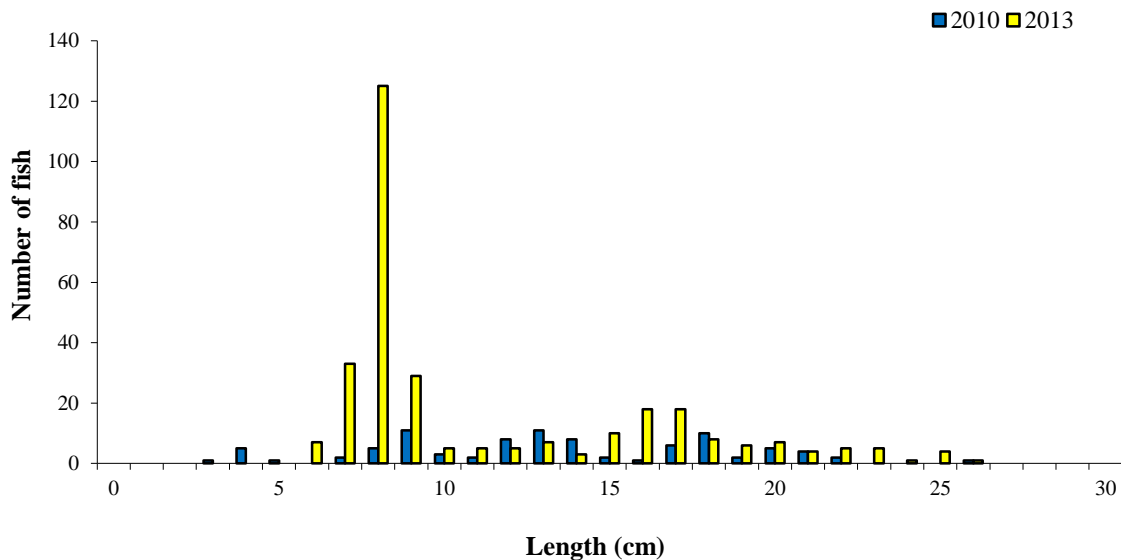


Fig. 1.4. Length frequency of perch captured on Lough MacNea Lower

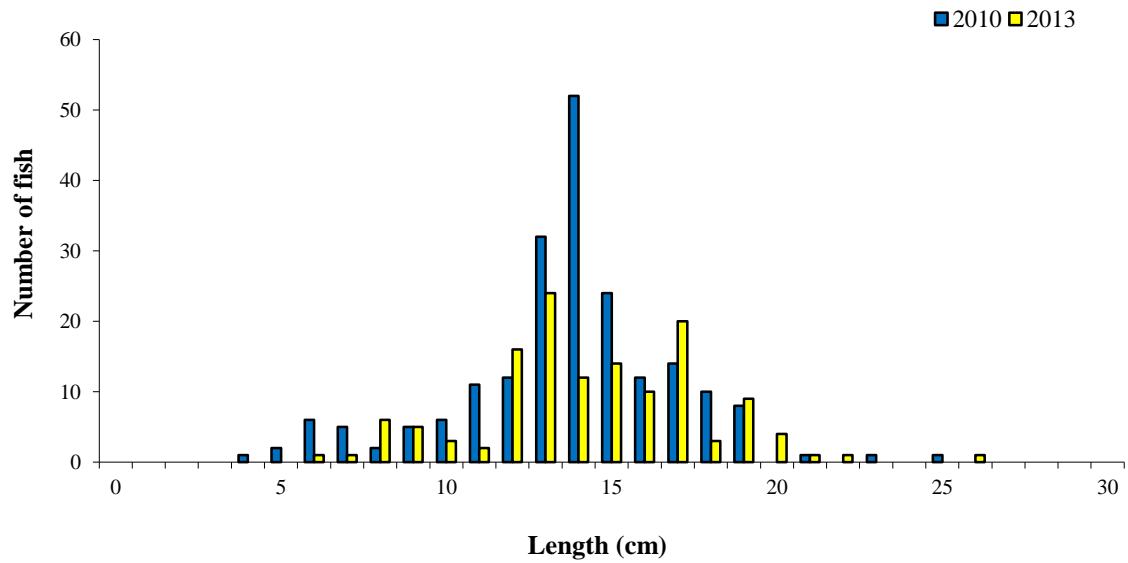


Fig. 1.5. Length frequency of roach captured on Lough MacNea Lower

Table 1.3. Mean (\pm SE) perch length (cm) at age for Lough MacNea Lower, June 2013

	L₁	L₂	L₃	L₄	L₅	L₆	L₇	L₈
Mean	5.3 (0.1)	9.5 (0.2)	14.4 (0.2)	17.9 (0.3)	20.4 (0.4)	21.6 (0.5)	23.7 (0.6)	23.6
N	82	62	48	28	17	10	4	1
Range	3.4-8.2	7.7-13.9	11.2-17.1	14.7-21.3	16.6-22.9	18.9-23.7	22.6-24.7	23.6-23.6

Table 1.4. Mean (\pm SE) roach length (cm) at age for Lough MacNea Lower, June 2013

	L₁	L₂	L₃	L₄	L₅	L₆	L₇	L₈
Mean	2.7 (0.1)	6.0 (0.1)	9.9 (0.2)	12.9 (0.3)	14.9 (0.3)	16.8 (0.3)	18.2 (0.5)	21.4 (1.8)
N	78	77	69	43	29	22	11	3
Range	1.7-4.2	4.0-9.8	6.6-13.6	7.6-16.0	10.3-17.3	13.5-19.6	16.1-21.3	18.9-24.9

1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and roach x bream hybrids were the dominant species in terms of biomass (BPUE).

The mean perch CPUE was significantly higher in 2013 than in 2010 and although the mean perch BPUE was higher in 2013 than in 2010, this difference was not statistically significant. Perch ranged in age from 1+ to 8+ indicating reproductive success in eight of the previous nine years. The dominant age class was 1+.

Although the mean roach CPUE was lower in 2013 than in 2010 and the mean roach BPUE was higher in 2013 than in 2010, 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 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 MacNea Lower has been assigned an ecological status of Poor in both 2010 and 2013 based on the fish populations present.

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

1.5 References

- Kelly, F.L., Connor, L. and Champ, W.S.T. (2007). *A Survey of the Fish Populations in 46 Lakes in the Northern Regional Fisheries Board, June to September 2005 and 2006*. North South Shared aquatic Resource (NS Share) Lakes Project.
- Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. and Champ, T. (2008) *FISH IN LAKES Task 6.9: Classification tool for Fish in Lakes. FINAL REPORT*. Central Fisheries Board, NSSHARE project.
- Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., Wogerbauer, C., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Sampling Fish for the Water Framework Directive – Summary Report 2010*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison A., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Water Framework Directive Fish Stock Survey of Lough MacNea Lower, July 2010*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- 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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