Sampling Fish for the Water Framework Directive

Lakes 2010

Lough Macnean Upper

Iascach Intíre Éireann
Inland Fisheries Ireland

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Dr. Milton Matthews and the staff from IFI Ballyshannon, along with the staff from the Department of Culture, Arts and Leisure (DCAL) and the Agri-Food and Biosciences Institute Northern Ireland (AFBINI). 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 2010.

1.1 Introduction

Lough Macnean Upper (Plate 1.1, Fig. 1.1) 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. It is a mesotrophic lake with a surface area of 1001ha, 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 Lough Macnean Upper 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 Lough Macnean Upper (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in 1969 revealed perch, pike, roach, roach x bream hybrids and brown trout to be present in Lough Macnean Upper (IFT, unpublished data).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 as part of the NSSHARE Fish in Lakes Project (Kelly *et al.*, 2007). During this survey perch were found to be the dominant species present in the lake. Pike, bream and roach x bream hybrids were also recorded.

Plate 1.1. Lough Macnean Upper

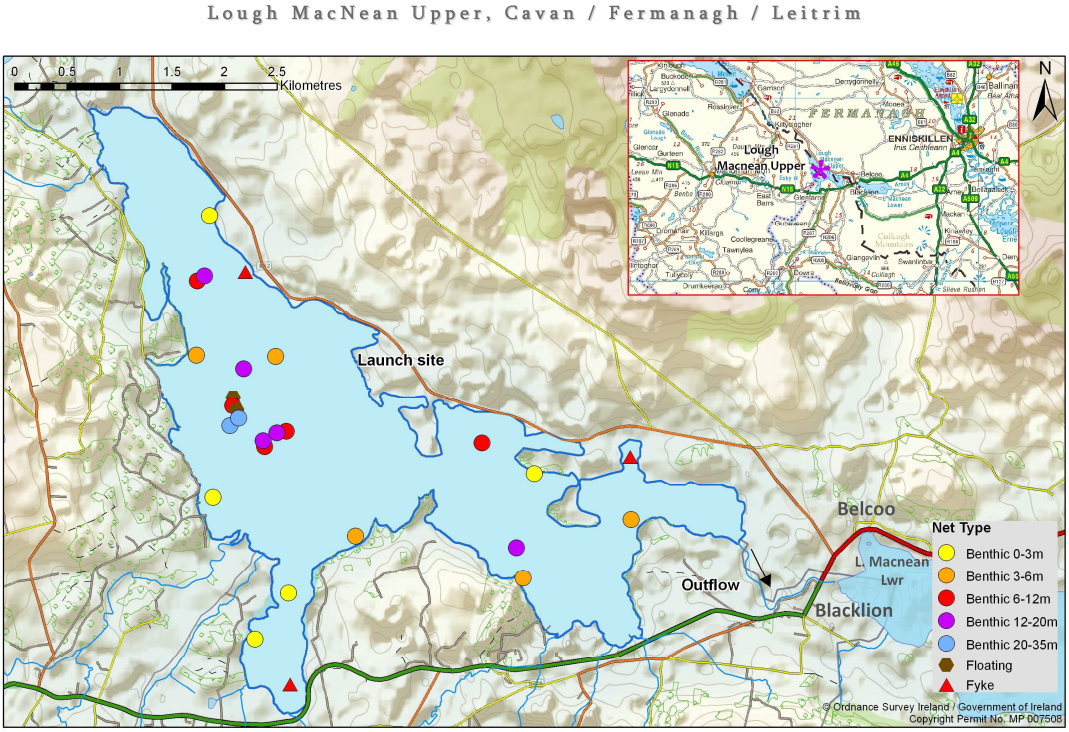

Fig. 1.1. Location map of Lough Macnean Upper showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough MacNean Upper was surveyed over three nights from the 6th to the 9th of July 2010. 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 (28 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, 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 seven fish species and one type of hybrid were recorded in Lough Macnean Upper in July 2010, with 555 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. During the previous survey in 2006 the same species composition was recorded with the exception of rudd, which were not present during the 2006 survey but were captured in the current survey.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Macnean Upper, July 2010

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Perca fluviatilis	Perch	255	6	3	264
Rutilus rutilus	Roach	181	1	3	185
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	72	0	0	72
Anguilla anguilla	European eel	0	0	21	21
Abramis brama	Bream	8	0	0	8
Salmo trutta	Brown trout	1	1	0	2
Scardinius erythrophthalmus	Rudd	2	0	0	2
Esox lucius	Pike	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 are summarised in Table 1.2. Mean CPUE is illustrated in Figure 1.2.

Although the mean perch and bream CPUE was lower in 2010 than in 2006 and the mean roach, roach x bream hybrid and eel CPUE was higher in 2010 than in 2006, these differences were not statistically significant.

The differences in the mean perch CPUE between Lough Macnean Upper and three other similar lakes were assessed with no significant differences being found (Fig. 1.3).

The differences in the mean roach CPUE between Lough Macnean Upper and four other similar lakes were assessed with no significant differences being found (Fig. 1.4).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Macnean Upper, 2006 and 2010

Scientific name	Common name	2006	2010
		Mean CPUE	
Perca fluviatilis	Perch	0.453 (0.162)	0.324 (0.073)
Rutilus rutilus	Roach	0.099 (0.037)	0.226 (0.094)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	0.009 (0.005)	0.089 (0.037)
Abramis brama	Bream	0.035 (0.016)	0.009 (0.005)
Salmo trutta	Brown trout	0.001 (0.001)	0.002 (0.001)
Scardinius erythrophthalmus	Rudd	-	0.002 (0.001)
Esox lucius	Pike	0.002 (0.001)	0.001 (0.001)
Anguilla anguilla	European eel	0.028 (0.020)	0.116 (0.016)
		Mean BPUE	
Perca fluviatilis	Perch	13.719 (3.918)	18.720 (4.481)
Rutilus rutilus	Roach	5.866 (3.214)	11.452 (4.717)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	5.826 (2.614)	7.627 (2.694)
Abramis brama	Bream	7.595 (3.434)	4.122 (2.014)
Scardinius erythrophthalmus	Rudd	-	0.548 (0.405)
Salmo trutta	Brown trout	0.097 (0.097)	0.191 (0.133)
Esox lucius	Pike	1.152 (0.887)	1.244 (1.244)
Anguilla anguilla	European eel	6.362 (5.343)	23.544 (3.535)

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

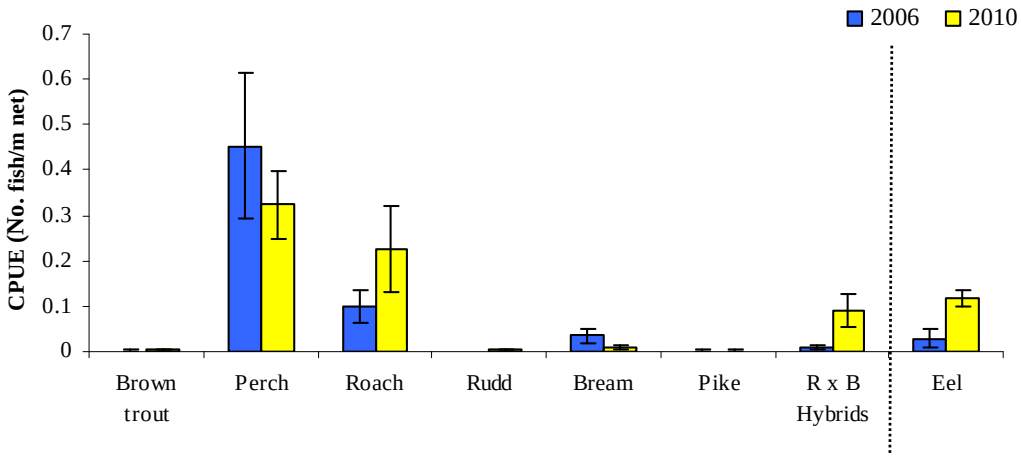

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured on Lough Macnean Upper, 2006 and 2010 (Eel CPUE based on fyke nets only)

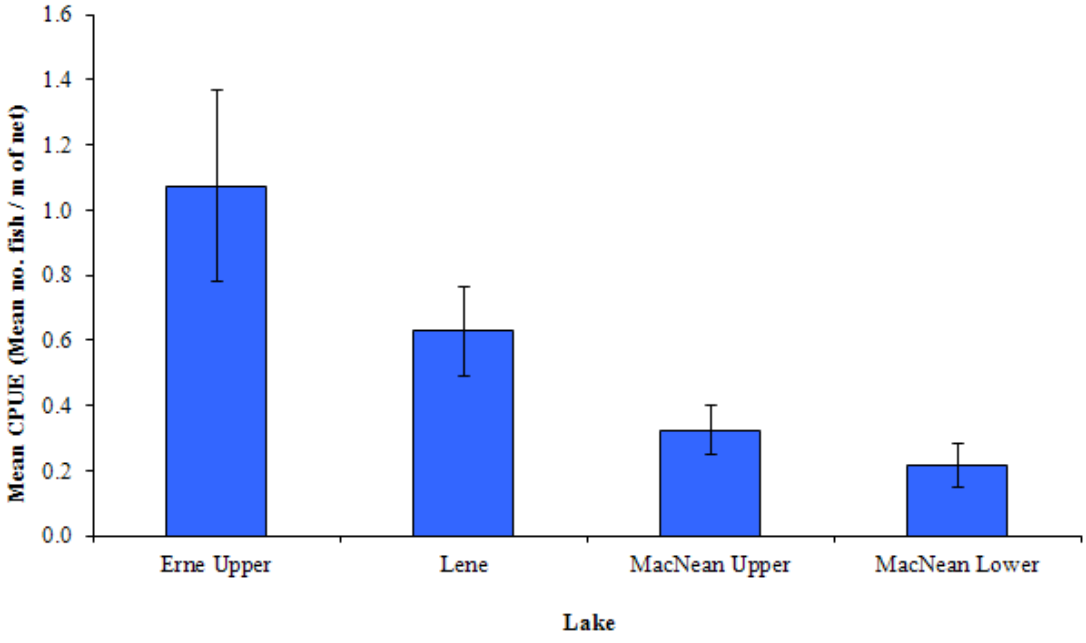

Fig. 1.3. Mean (±S.E.) perch CPUE in four lakes surveyed during 2010

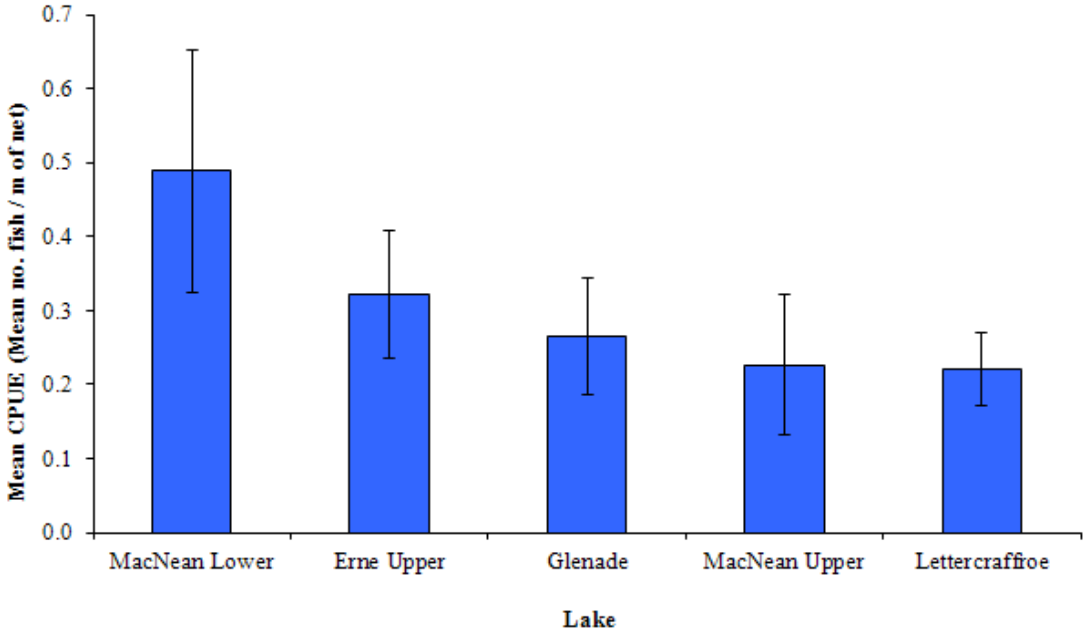

Fig. 1.4. Mean (±S.E.) roach CPUE in five lakes surveyed during 2010

1.3.3 Length frequency distributions

Perch captured during the 2010 survey ranged in length from 6.0cm to 25.6cm (mean = 14.1cm) (Fig. 1.5). Perch captured during the 2006 survey ranged in length from 5.8cm to 27.5cm (Fig. 1.5).

Roach captured during the 2010 survey ranged in length from 5.5cm to 26.0cm (mean = 14.0cm) (Fig.1.6). Roach captured during the 2006 survey ranged in length from 7.3cm to 22.2cm (Fig.1.6).

Bream captured during the 2010 survey ranged in length from 17.6cm to 39.3cm, brown trout ranged in length from 18.8cm to 19.0cm, eels ranged in length from 36.0cm to 58.0cm, roach x bream hybrids ranged in length from 9.8cm to 25.3cm and rudd ranged in length from 19.2cm to 24.1cm. The one pike captured measured 55.0cm in length.

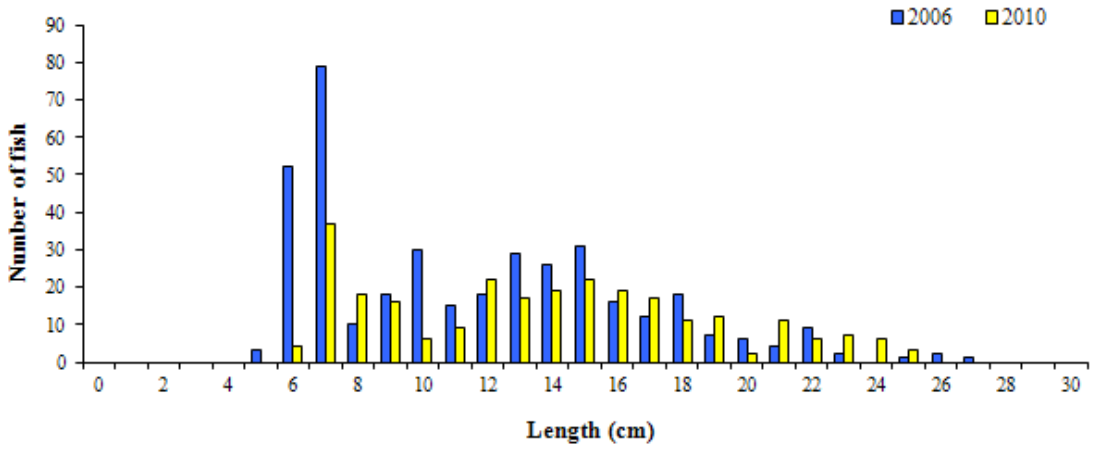

Fig. 1.5. Length frequency of perch captured on Lough Macnean Upper, 2006 and 2010

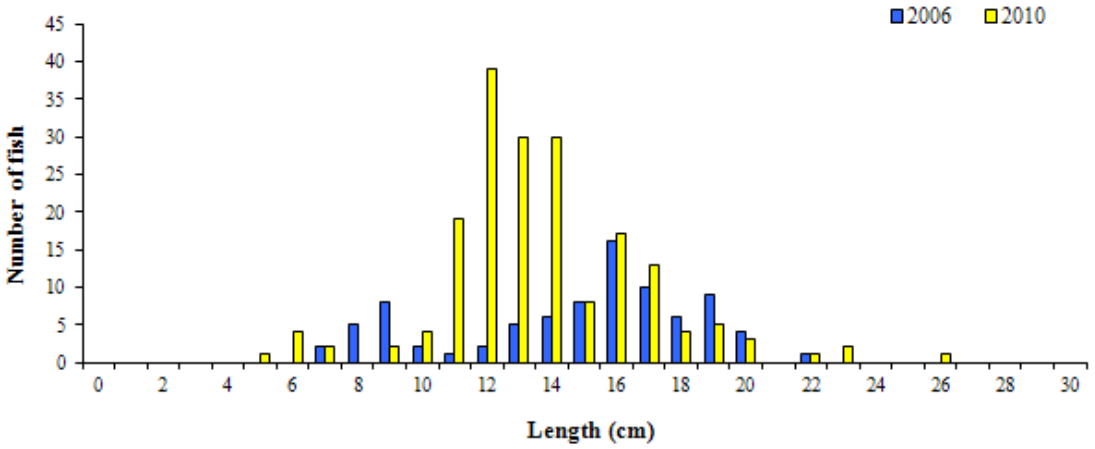

Fig. 1.6. Length frequency of roach captured on Lough Macnean Upper, 2006 and 2010

1.3.4 Fish age and growth

Nine age classes of perch were present, ranging from 1+ to 9+, with a mean L1 of 5.2cm (Table 1.3). In the 2006 survey, perch ranged from 1+ to 9+ with a mean L1 of 5.4cm.

Seven age classes of roach were present, ranging from 3+ to 10+, with a mean L1 of 3.1cm (Table 1.4). In the 2006 survey, roach ranged from 1+ to 6+ with a mean L1 of 3.0cm.

Seven age classes of roach x bream hybrids were present, ranging from 2+ to 8+, six age classes of bream were present, ranging from 4+ to 10+ and two age classes of rudd were present, ranging from 4+ to 6+. The two brown trout captured were aged 2+ and the one pike captured was aged 5+.

Table 1.3. Mean (±SE) perch length (cm) at age for Lough Macnean Upper, July 2010

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
Mean	5.2 (0.1)	9.0 (0.1)	13.0 (0.2)	16.0 (0.3)	18.5 (0.4)	20.0 (0.4)	22.2 (0.5)	21.7 (1.1)	20.7
N	106	85	74	54	35	28	17	3	1
Range	3.3-7.0	6.8-11.6	9.8-17.3	11.7-20.0	13.9-22.4	15.6-23.1	18.4-25.0	19.9-23.6	20.7-20.7

Table 1.4. Mean (±SE) roach length (cm) at age for Lough Macnean Upper, July 2010

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}
Mean	3.1 (0.1)	6.5 (0.2)	10.4 (0.2)	13.6 (0.2)	16.4 (0.2)	18.5 (0.5)	19.8 (0.6)	22.2 (0.3)	23.2	25.1
N	43	43	43	34	22	10	4	3	1	1
Range	2.1-4.1	4.0-9.1	8.4-12.8	10.6-16.2	14.6-18.4	16.8-21.7	18.5-21.3	21.5-22.6	23.2-23.2	25.1-25.1

1.4 Summary

Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE).

The mean perch CPUE in Lough Macnean Upper was relatively low when compared to both Upper Lough Erne and Lough Lene; however, these differences were not statistically significant. Perch ranged in age from 1+ to 9+ indicating reproductive success in each of the previous nine years.

The mean roach CPUE in Lough Macnean Upper was not significantly different from the other four similar lakes included in the comparison. Roach ranged in age from 1+ to 10+, indicating reproductive success in 10 of the previous eleven years; however, no 0+ fish were recorded.

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. Using the FIL2 classification tool, Lough Macnean Upper has been assigned an ecological status of Good for both 2006 and 2010 based on the fish populations present.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Macnean Upper an overall ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish. This status classification will be revised at the end of 2012.

1.5 References

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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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