IFI/2013/1-4140

Sampling Fish for the Water Framework Directive

Lakes 2012

Lough Muckno

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Muckno, August 2012

Fiona L. Kelly, Lynda Connor, Emma Morrissey, Ciara Wogerbauer, Ronan Matson, Rory Feeney and Kieran Rocks

Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin

CITATION: Kelly, F.L., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R. and Rocks, K. (2013) Water Framework Directive Fish Stock Survey of Lough Muckno, August 2012. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.

Cover photo: Netting survey on Dromore Lough © Inland Fisheries Ireland

© Inland Fisheries Ireland 2013

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Mr. William Walsh and the staff from IFI, Blackrock. 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 2012.

The report includes Ordnance Survey Ireland data reproduced under OSi Copyright Permit No. MP 007508.
Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.
© Ordnance Survey Ireland, 2012.

1.1 Introduction

Muckno Lough is located within the Muckno Leisure Park on the eastern side of the town of Castleblaney, Co. Monaghan (Plate 1.1, Fig. 1.1). The lake has a surface area of 316ha, a mean depth of >4m and a maximum depth of 20m. The lake is categorised as typology class 8 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), greater than 50ha and moderately alkaline (20-100mg/l CaCo3).

Muckno Lough has been classed as 1a (i.e. at risk of failing to meet good status by 2015) in the WFD Characterization report (EPA, 2005). The lake is designated as a Natural Heritage Area and is described as being highly eutrophic (Monaghan County Council, 2007). There was an algal bloom on the lake in autumn 2009, along with evidence of previous algal blooms observed on the shore line. Algal blooms regularly occur in the lake and have done so for many years. Flanagan and Toner (1975) reported algal blooms on the lake during 1972, 1973 and 1974, stating that it was a highly eutrophic system.

Fishing on Muckno Lough is very popular, with good stocks of various species, including bream, rudd, roach, roach x bream hybrids, tench, perch and pike (IFI, 2010). The lake has also historically contained a stock of brown trout (Flanagan and Toner, 1975; Paddy Green IFI, *pers. comm.*). A fish stock survey carried out in September 1968 revealed that bream, rudd, perch, tench, pike and brown trout were present in the lake, with brown trout up to 1800g being captured (Inland Fisheries Trust, unpublished data).

The lake was also surveyed in 2006 and 2009 as part of the NSSHARE Fish in Lakes Project (Kelly *et al*., 2007) and as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2010). In both years roach or perch was found to be the dominant species, followed by roach x bream hybrids, bream, pike, gudgeon and eel.

Plate 1.1. Muckno Lough

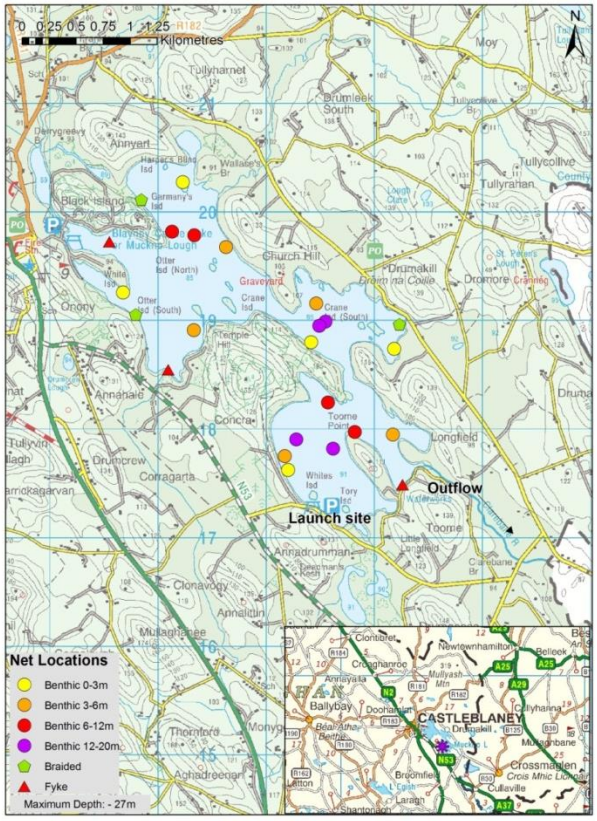

Fig. 1.1. Location map of Lough Muckno showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Muckno was surveyed over three nights between the 28th and the 31st of August 2012. A total of three sets of Dutch fyke nets and 18 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 4 @ 6-11.9m and 4 @ 12-19.9m) were deployed in the lake (21 sites). The netting effort was supplemented using three benthic braided survey gill nets (62.5mm mesh knot to knot) at three additional sites. Nets were deployed in the same locations as were randomly selected in the previous survey in 2009 and 2006. 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, pike, bream, brown trout, 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 returned to the laboratory for further analysis.

1.3 Results

1.3.1 Species Richness

A total of seven fish species and one type of hybrid were recorded on Lough Muckno in August 2012, with 1826 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, bream, roach x bream hybrids, gudgeon, pike, brown trout and eels. During the previous survey in 2009 the same species composition was recorded with the exception of brown trout, which were present during the 2012 survey but were not captured in 2009 (Kelly *et al.*, 2010).

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Muckno, August 2012

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
Salmo trutta	Brown trout	1	0	0	1
Perca fluviatilis	Perch	1162	0	4	1166
Rutilus rutilus	Roach	509	0	2	511
Abramis brama	Bream	57	7	2	66
Rutilus rutilus x Abramis brama	Roach x bream hybrid	40	7	0	47
Gobio gobio	Gudgeon	23	0	0	23
Esox Lucius	Pike	4	2	0	6
Anguilla Anguilla	European eel	0	0	6	6

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 2009 and 2012 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

Although the mean perch CPUE and BPUE were slightly different in 2012 than in 2009, these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

The differences in the mean perch CPUE and BPUE between Lough Muckno and two similar lakes was assessed, with no overall significant differences being found (Kruskal-Wallis, $P>0.05$) (Fig. 1.4 and Fig. 1.5).

Although the mean roach CPUE and BPUE appeared higher in 2012 than in 2009, these differences were not statistically significant (Fig. 1.2 and Fig. 1.3).

The differences in the mean roach CPUE and BPUE between Lough Muckno and two similar lakes were assessed, with no overall significant differences being found (Fig. 1.6 and Fig. 1.7).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Muckno, 2009 and 2012

Scientific name	Common name	2009	2012
		Mean CPUE	
Salmo trutta	Brown trout	-	0.001 (0.001)
Perca fluviatilis	Perch	0.529 (0.151)	1.617 (0.539)
Rutilus rutilus	Roach	0.252 (0.077)	0.708 (0.205)
Abramis brama	Bream	0.028 (0.007)	0.091 (0.025)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.093 (0.026)	0.066 (0.019)
Gobio gobio	Gudgeon	0.014 (0.005)	0.031 (0.011)
Esox Lucius	Pike	0.022 (0.007)	0.009 (0.003)
Anguilla Anguilla	European eel	0.017 (0.000)	0.033 (0.019)
		Mean BPUE	
Salmo trutta	Brown trout	-	0.259 (0.259)
Perca fluviatilis	Perch	28.416 (7.781)	26.385 (5.616)
Rutilus rutilus	Roach	19.653 (6.356)	48.643 (14.234)
Abramis brama	Bream	9.035 (4.528)	25.397 (7.413)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	18.777 (6.023)	30.792 (9.518)
Gobio gobio	Gudgeon	0.097 (0.038)	0.158 (0.060)
Esox Lucius	Pike	31.906 (12.701)	18.396 (10.485)
Anguilla Anguilla	European eel	2.178 (0.471)	10.400 (7.243)

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

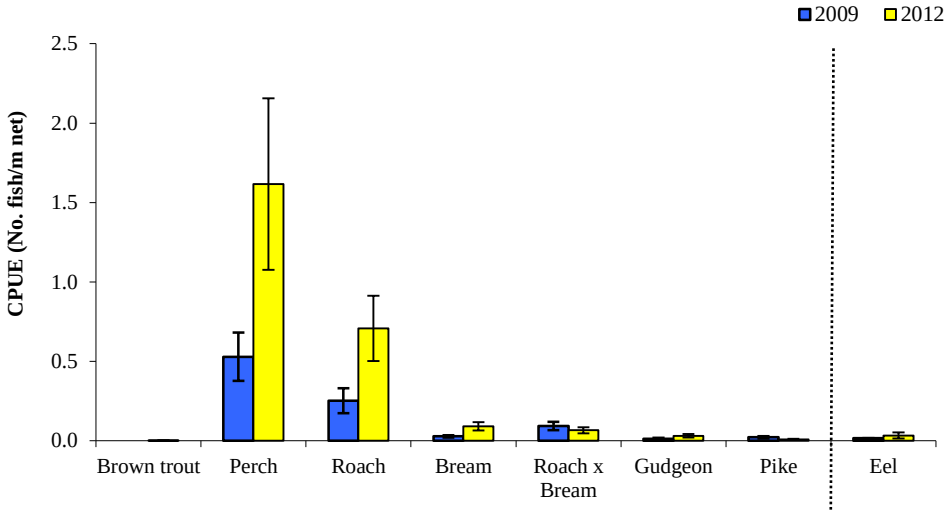

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Muckno (Eel CPUE based on fyke nets only), 2009 and 2012

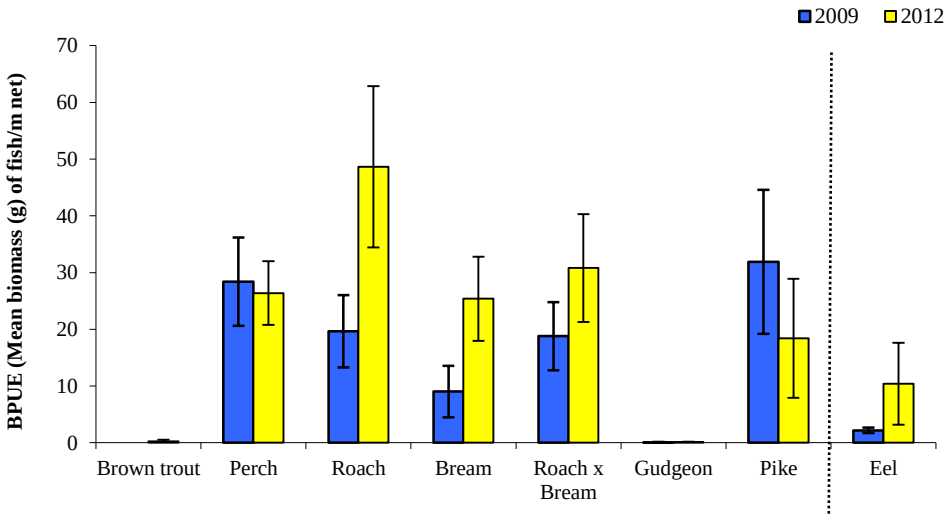

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Muckno (Eel BPUE based on fyke nets only), 2009 and 2012

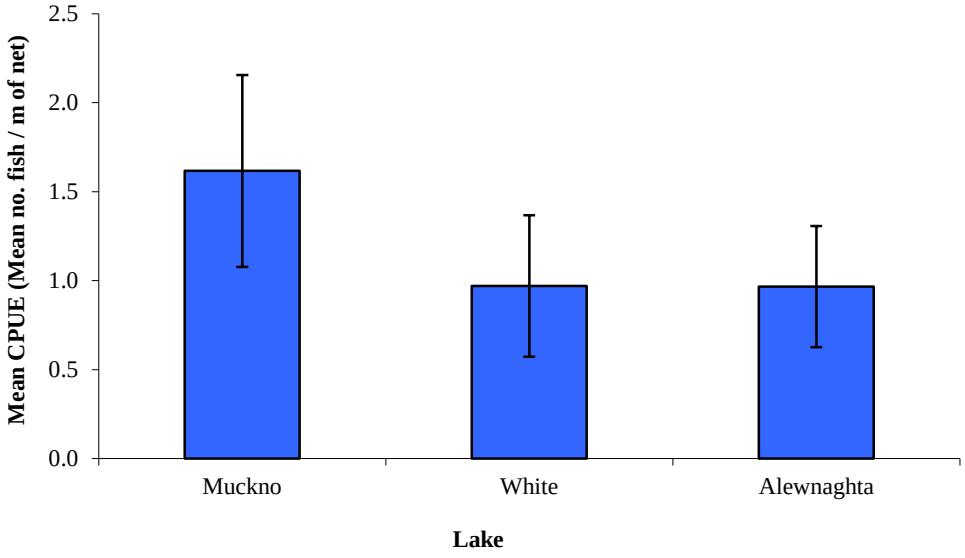

Fig. 1.4. Mean (±S.E.) perch CPUE in three lakes surveyed during 2012

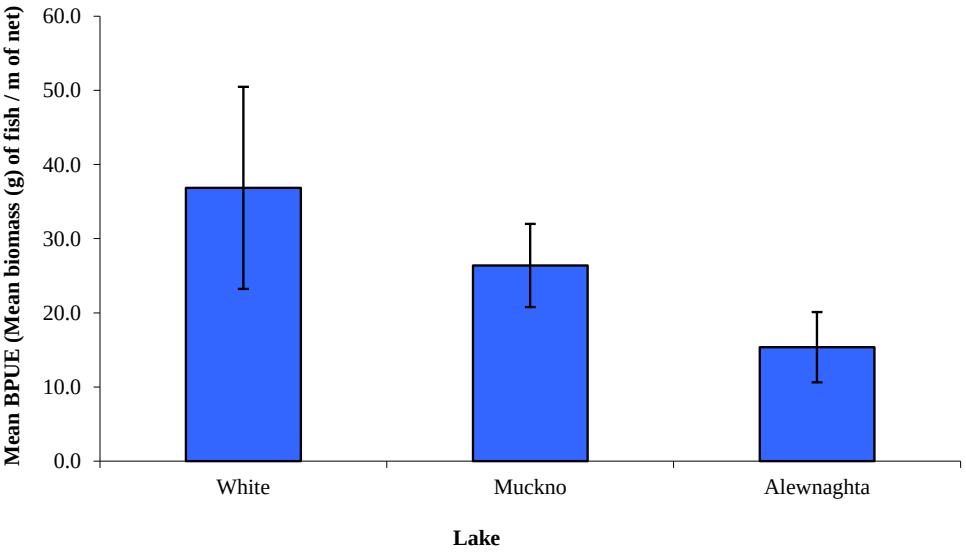

Fig. 1.5. Mean (±S.E.) perch BPUE in three lakes surveyed during 2012

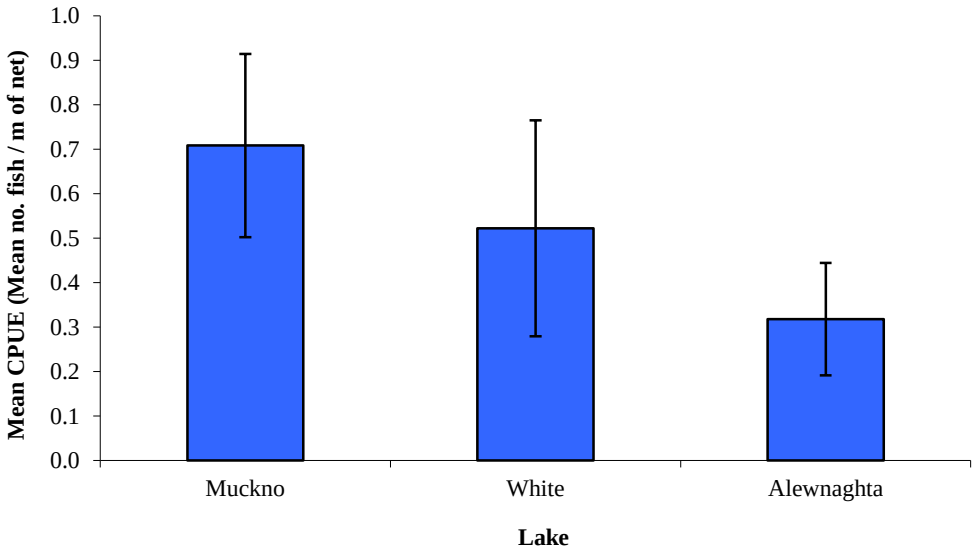

Fig. 1.6. Mean (±S.E.) roach CPUE in three lakes surveyed during 2012

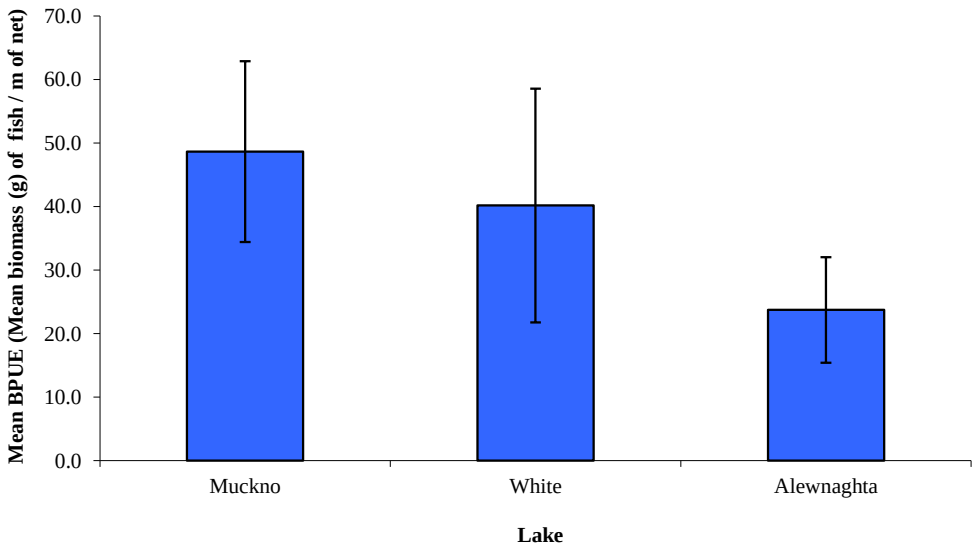

Fig. 1.7. Mean (±S.E.) roach BPUE in three lakes surveyed during 2012

1.3.3 Length frequency distributions

Perch captured during the 2012 survey ranged in length from 3.5cm to 31.5cm (mean = 7.9cm) (Fig. 1.6). Perch captured during the 2009 survey ranged in length from 5.0cm to 28.6cm (Fig. 1.6).

Roach captured during the 2012 survey ranged in length from 4.0cm to 27.1cm (mean = 14.5cm) (Fig. 1.7). Roach captured during the 2009 survey ranged in length from 4.7cm to 26.4cm (Fig. 1.7).

Bream captured during the 2012 survey ranged in length from 8.0cm to 43.2cm, eels ranged in length from 40.5cm to 69.8cm, gudgeon ranged in length from 6.5cm to 8.5cm and pike ranged in length from 16.6cm to 75.6cm. Roach x bream hybrids ranged in length from 8.8cm to 39.8cm and one brown trout was recorded at 25.0cm.

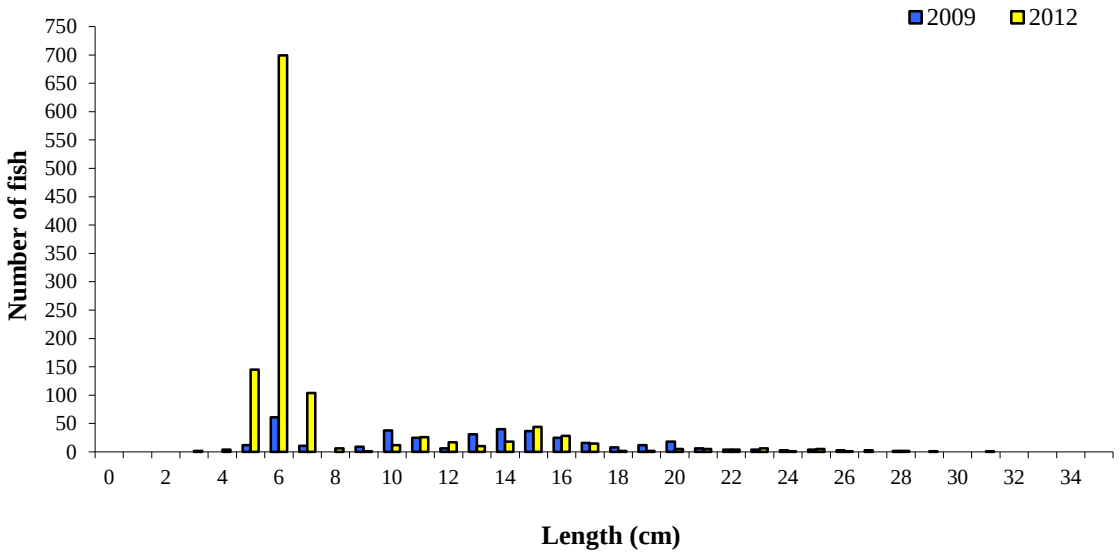

Fig. 1.6. Length frequency of perch captured on Lough Muckno, 2009 and 2012

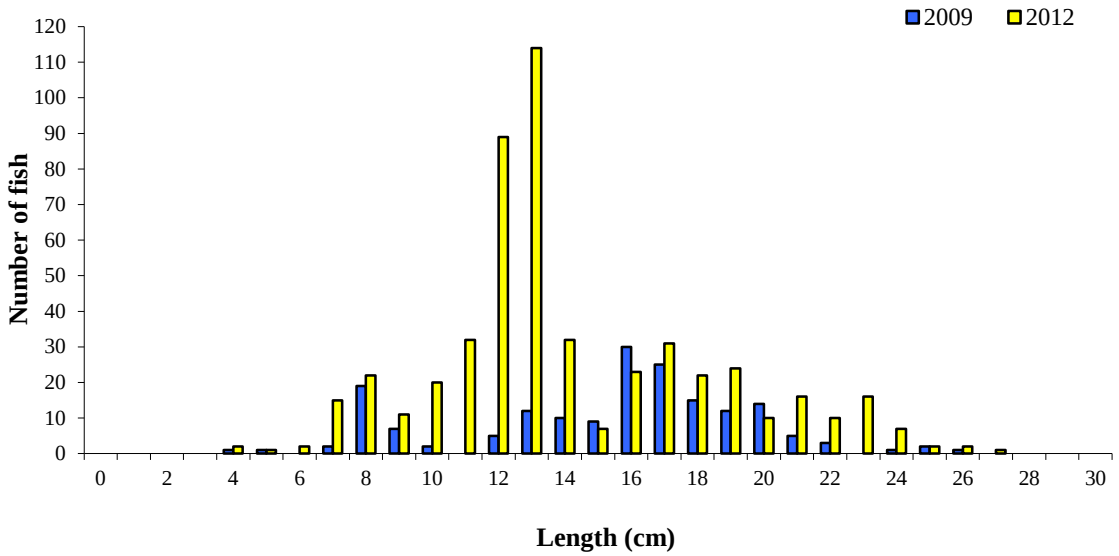

Fig. 1.7. Length frequency of roach captured on Lough Muckno, 2009 and 2012

1.3.4 Fish age and growth

Eight age classes of perch were present, ranging from 0+ to 8+, with a mean L1 of 5.5cm (Table 1.3). The dominant age class was 0+ (Fig 1.6). In the 2009 survey, perch ranged from 0+ to 7+ with a mean L1 of 5.4cm.

Eleven age classes of roach were present, ranging from 0+ to 11+, with a mean L1 of 2.7cm (Table 1.4). The dominant age class was 2+ (Fig 1.7). In the 2009 survey, roach ranged from 1+ to 11+ with a mean L1 of 3.2cm.

The single brown trout captured was aged at 2+.

Table 1.3. Mean (±SE) perch length (cm) at age for Lough Muckno, August 2012

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8
Mean	5.5 (0.1)	10.1 (0.1)	14.2 (0.3)	17.9 (0.4)	21.1 (0.6)	23.3 (0.9)	21.6	22.8
N	101	73	37	30	20	12	1	1
Range	3.7-9.2	6.6-12.6	8.9-17.2	12.3-22.2	16.2-25.3	17.7-29.3	21.6-21.6	22.8-22.8

Table 1.4. Mean (±SE) roach length (cm) at age for Lough Muckno, August 2012

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	L_{11}
Mean	2.7 (0.1)	6.0 (0.1)	10.7 (0.2)	14.8 (0.3)	18.3 (0.4)	20.3 (0.5)	22.3 (0.7)	22.2 (1.8)	22.2 (0.8)	22.5	24.1
N	97	86	55	42	31	15	9	3	2	1	1
Range	1.4-5.4	3.1-9.9	7.5-13.5	11.5-17.7	13.9-21.9	16.8-23.1	18.5-24.4	19.8-25.8	21.4-23.0	22.5-22.5	24.1-24.1

1.4 Summary

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

Only one brown trout was captured in Lough Muckno therefore statistical comparisons with other lakes could not be carried out. The brown trout was aged at 2+ indicating reproductive success in one of the previous three years.

Although the mean perch CPUE and BPUE in Lough Muckno was slightly higher in 2012 than in the 2009 survey, these differences were not statistically significant. The mean perch CPUE and BPUE in Lough Muckno was similar to the other lakes assessed during 2012, with no statistically significant differences being found between lakes. Perch ranged in age from 0+ to 8+, indicating reproductive success in eight of the previous nine years. The dominant age class was 0+.

Although the mean roach CPUE and BPUE in Lough Muckno was slightly higher in 2012 than in the 2009 survey, these differences were not statistically significant. The mean roach CPUE and BPUE in Lough Muckno was similar to the other lakes assessed during 2012, with no statistically significant differences being found between lakes. Roach ranged in age from 0+ to 11+, indicating reproductive success in eleven of the previous twelve years. The dominant age class was 2+.

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 Muckno has been assigned an ecological status of Poor based on the fish populations present in 2012. The ecological status assigned to the lake based on the 2009 survey data was Bad.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned Lough Muckno an overall ecological status of Bad, 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

EPA (2005) *The Characterisation and Analysis of Ireland's River Basin Districts in accordance with section 7 (2&3) of the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003)*. National Summary Report (Ireland). 166pp.

Flanagan, P.J. and Toner, P.F. (1975) *A Preliminary Survey of Irish lakes*. An Foras Forbatha, 164pp.

IFI (2010) www.fishinginireland.info/coarse/east/monaghan/castleblaney.htm

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*. Central Fisheries Board, unpublished report.

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, NS Share project.

Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., O'Callaghan, R., Wogerbauer, C., Feeney, R., Hanna, G. and Rocks, K. (2010) *Sampling Fish for the Water Framework Directive – Summary Report 2009*. The Central and Regional Fisheries Boards.

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.

Monaghan County Council (2007) *Monaghan County Development Plan 2007 – 2013 (Incorporating the Development Plan for Castleblayney Town) - Screening Report for Proposed Variation No. 16 – Rezoning of lands adjacent to the existing public sewage treatment works from Recreation/Amenity and Town Centre Use to Civic/Community/Educational Use at Drumillard Little, Castleblayney. Determination of the Need for Strategic Environmental Assessment (SEA).*

Prepared by: Planning Department Monaghan County Council on behalf of Castleblayney Town Council.

Inland Fisheries Ireland
Swords Business Campus,
Swords,
Co. Dublin,
Ireland.

Web: www.fisheriesireland.ie
Email: info@fisheriesireland.ie
Tel: +353 1 8842 600
Fax: +353 1 8360 060