Sampling Fish for the Water Framework Directive

Lakes 2014

Lough Allua

IASCACH INTIRE ÉIREANN
INLAND FISHERIES IRELAND

Water Framework Directive Fish Stock Survey of Lough Allua, September 2014

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

ACKNOWLEDGEMENTS

1.1 Introduction

Lough Allua is a ten kilometre chain of lakes situated near Ballingeary, Co. Cork in the Lee catchment (Plate 1.1, Fig. 1.1). The lake has a surface area of 138ha, a mean depth of 4m and a maximum depth of 28m. The lake is categorized as typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), larger than 50ha and low alkalinity (<20mg/l $CaCO_3$).

Under the 2009 Cork Development plan, Lough Allua has been proposed as a Natural Heritage Area, indicating the presence of important semi-natural and natural habitats, landforms or geomorphological features, wild plant and animal species or a diversity of these natural attributes (Cork County Council, 2009).

Historically Lough Allua was known for producing good trout, salmon and Arctic char. In the 1830s there was an accidental release of pike from a local privately owned pond and this event and human predation were attributed to the destruction of the char population in the lake (Went, 1945). The lake is now well known for its pike angling, with pike of between 10kg and 14kg regularly being caught.

Water quality monitoring is carried out on the lake on a monthly basis by IFI Macroom.

Lough Allua was 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, roach were the dominant species present in the lake, followed by roach x bream hybrids. Perch, brown trout, bream, pike, gudgeon, rudd and eels were also captured during the survey.
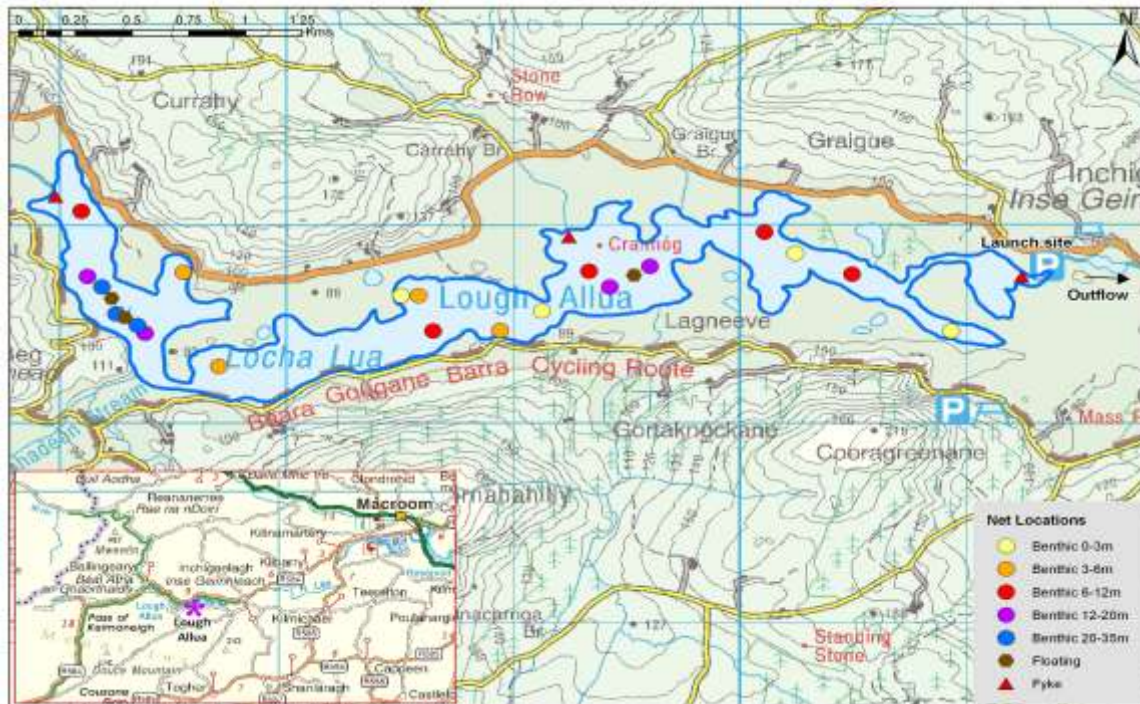
Plate 1.1. Lough Allua

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

1.2 Methods

Lough Allua was surveyed over two nights between the 15th to the 17th of September 2014. A total of three sets of Dutch fyke nets, 20 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 5 @ 6-11.9m, 4 @ 12-19.9m and 3 @ 20-34.9m) and three floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (26 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, rudd, roach, hybrids, bream and pike. 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 eight fish species and one type of hybrid were recorded on Lough Allua in September 2014, with 697 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Roach was the most abundant fish species recorded, followed by roach x bream hybrids. During the previous surveys in 2008 and 2011 the same species composition was recorded with the exception of rudd x bream hybrids, which were only captured during the 2008 survey and brown trout which were not recorded in 2008.

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

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Rutilus rutilus	Roach	337	106	3	446
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	152	5	2	159
Perca fluviatilis	Perch	50	0	3	53
Abramis brama	Bream	26	0	0	26
Esox lucius	Pike	6	0	0	6
Gobio gobio	Gudgeon	3	0	0	3
Salmo trutta	Brown trout	1	0	0	1
Scardinius erythrophthalmus	Rudd	1	0	0	1
Anguilla anguilla	Eel	0	0	2	2

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 Figures 1.2 and 1.3.

Roach was the dominant species in terms of abundance (CPUE) and pike was the dominant species in terms of biomass (BPUE). The mean roach and roach x bream hybrid CPUE was significantly higher in 2014 than in 2008 (Kruskal-Wallis H=17.7, P<0.05 and H=19.6, P<0.001 respectively) (Table 1.2; Fig 1.2 and 1.3). The mean roach and roach x bream hybrid BPUE was significantly higher in 2014 than in 2008 (Kruskal-Wallis H=16.2, P<0.001 and H=19.4, P<0.001 respectively) (Table 1.2; Fig 1.2 and 1.3). Although the mean perch CPUE and BPUE fluctuated slightly between the three sampling years, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).
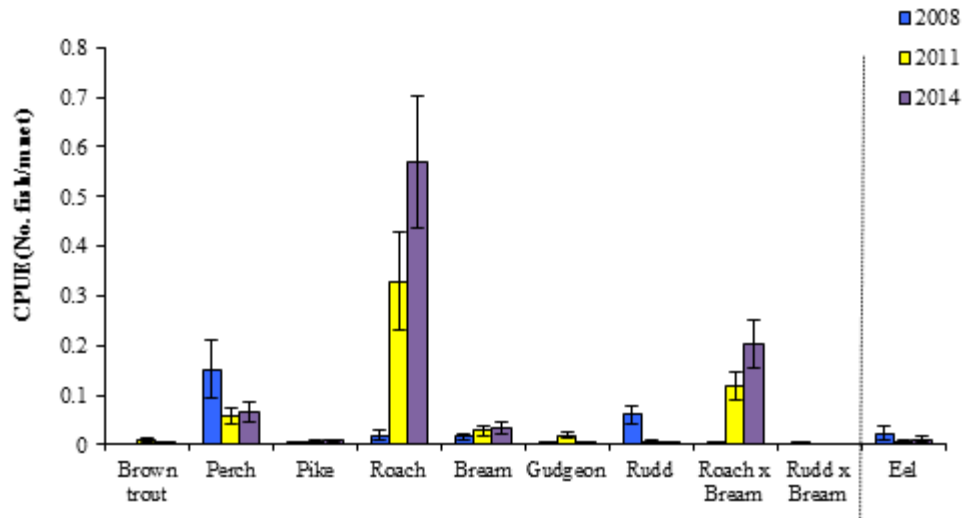
Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Allua, 2008, 2011 and 2014

| Scientific name	Common name	2008	2011	2014
		Mean CPUE		
Rutilus rutilus	Roach	0.019 (0.010)	0.329 (0.099)	0.569 (0.132)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	0.001 (0.001)	0.117 (0.029)	0.202 (0.049)
Perca fluviatilis	Perch	0.151 (0.057)	0.057 (0.017)	0.066 (0.020)
Abramis brama	Bream	0.016 (0.007)	0.028 (0.008)	0.033 (0.010)
Esox lucius	Pike	0.002 (0.001)	0.005 (0.002)	0.007 (0.002)
Gobio gobio	Gudgeon	0.002 (0.001)	0.019 (0.007)	0.003 (0.002)
Salmo trutta	Brown trout	-	0.008 (0.003)	0.001 (0.001)
Scardinius erythrophthalmus	Rudd	0.060 (0.018)	0.005 (0.003)	0.001 (0.001)
Scardinius erythrophthalmus x Abramis brama	Rudd x Bream hybrid	0.003 (0.002)	-	-
Anguilla anguilla	European eel	0.022 (0.014)	0.005 (0.005)	0.011 (0.005)
		Mean BPUE		
Rutilus rutilus	Roach	0.861 (0.487)	14.243 (3.906)	9.169 (2.234)
Rutilus rutilus x Abramis brama	Roach x Bream hybrid	0.098 (0.098)	11.781 (3.226)	11.853 (3.145)
Perca fluviatilis	Perch	3.612 (1.471)	1.572 (0.516)	2.453 (1.232)
Abramis brama	Bream	2.761 (1.429)	6.033 (2.294)	4.029 (1.434)
Esox lucius	Pike	2.500 (2.447)	4.248 (2.081)	14.648 (6.541)
Gobio gobio	Gudgeon	0.018 (0.012)	0.242 (0.093)	0.039 (0.024)
Salmo trutta	Brown trout	-	0.438 (0.191)	0.076 (0.076)
Scardinius erythrophthalmus	Rudd	6.698 (1.997)	0.903 (0.582)	0.037 (0.037)
Scardinius erythrophthalmus x Abramis brama	Rudd x Bream hybrid	2.042 (1.379)	-	-
Anguilla anguilla	European eel	14.061 (10.781)	1.744 (1.744)	3.677 (2.057)

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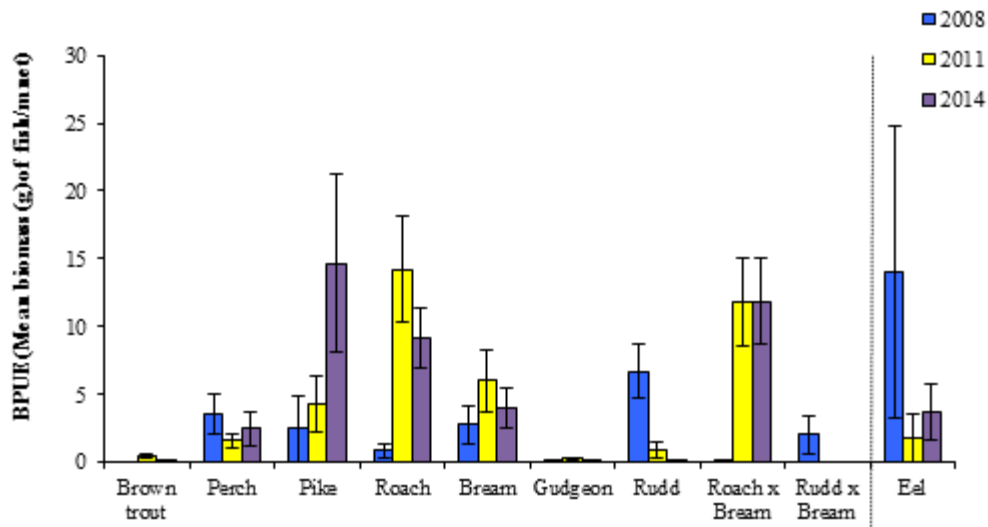
Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Allua (Eel BPUE based on fyke nets only), 2008, 2011 and 2014

1.3.3 Length frequency distributions and growth

Roach captured during the 2014 survey ranged in length from 4.5cm to 27.1cm (mean = 10.0cm) (Fig.1.4). Seven age classes were present, ranging from 0+ to 7+, with a mean L1 of 3.4cm (Table 1.3). Roach captured during the 2011 and the 2014 surveys had similar lengths, age ranges and growth rates with a dominant age class of 2+; however, the 2008 length range was much narrower with all fish aged at 3+ (Fig.1.4).

Perch captured during the 2014 survey ranged in length from 4.5cm to 33.0cm (mean = 11.1cm) (Fig. 1.5) with six age classes present, ranging from 0+ to 6+, with a mean L1 of 6.0cm (Table 1.4). The dominant age class was 1+ (Fig. 1.5). The length range of perch increased over the three sampling years from the 2008 to the 2014 survey (Fig. 1.5) with 2008 and 2011 showing a similar age range and growth rate, whilst a small number of larger fish were captured in the 2014 survey (Fig. 1.5).

Roach x bream hybrids ranged in length from 9.5cm to 31.8cm with seven age classes present, ranging from 2+ to 9+. Bream captured during the 2014 survey ranged in length from 14.1cm to 30.7cm and eels ranged from 55.0cm to 62.0cm. Gudgeon ranged in length from 7.2cm to 11.6cm, pike ranged in length from 35.0cm to 77.0cm and one rudd was recorded at 12.7cm. One brown trout measuring 17.7cm was aged at 2+.
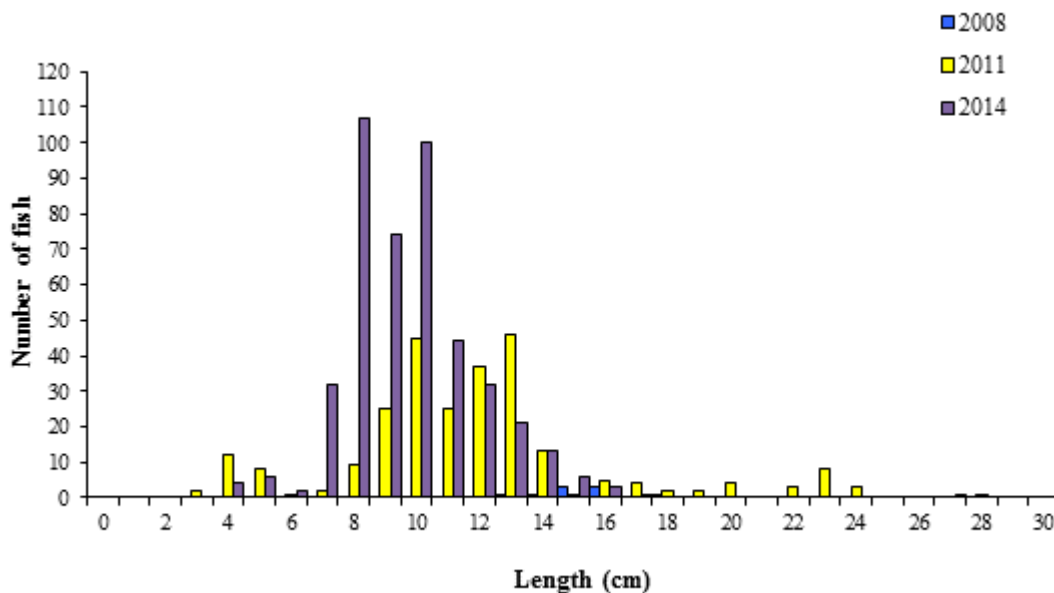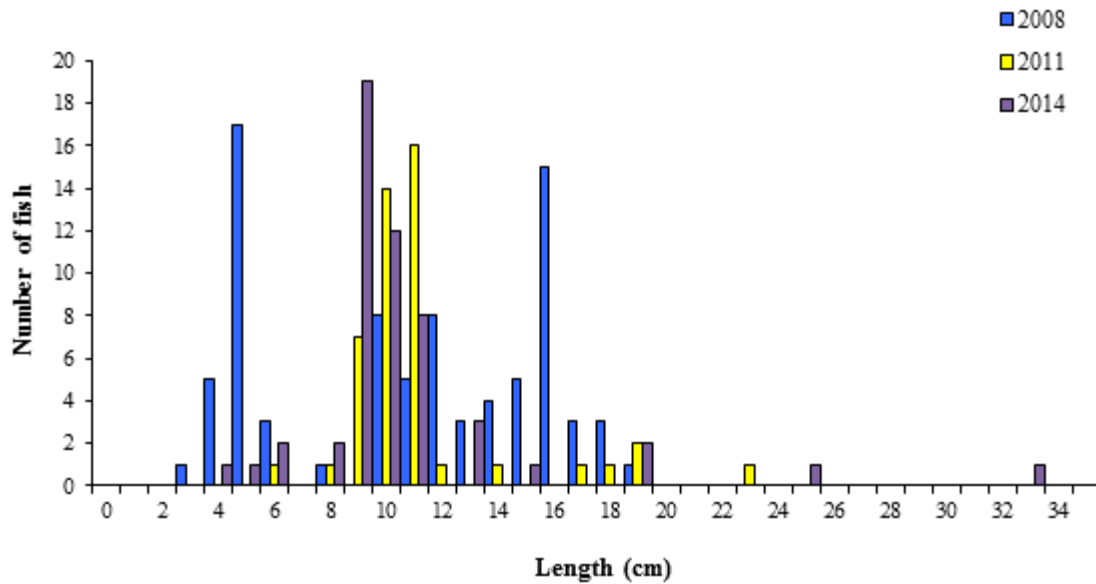

Fig. 1.4. Length frequency of roach captured on Lough Allua, 2008, 2011 and 2014

Fig. 1.5. Length frequency of perch captured on Lough Allua, 2008, 2011 and 2014

Table 1.3. Mean (±SE) roach length (cm) at age for Lough Allua, September 2014

	L$_1$	L$_2$	L$_3$	L$_4$	L$_5$	L$_6$	L$_7$
Mean	3.4 (0.2)	6.9 (0.3)	11.2 (0.4)	13.8 (0.7)	17.1 (4.1)	21.1	24.0
N	33	25	18	8	2	1	1
Range	1.4-5.7	4.4-10.2	7.0-13.8	11.0-16.9	13.0-21.3	21.1-21.1	24.0-24.0

Table 1.4. Mean (±SE) perch length (cm) at age for Lough Allua, September 2014

	L$_1$	L$_2$	L$_3$	L$_4$	L$_5$	L$_6$
Mean	6.0 (0.2)	10.6 (0.4)	14.3 (1.3)	17.8 (2.3)	21.0 (6.7)	32.4
N	22	7	3	3	2	1
Range	4.6-7.8	9.2-11.8	11.8-16.4	13.5-21.5	14.3-27.7	32.4-32.4

1.4 Summary

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

The mean roach and roach x bream hybrid CPUE and BPUE were significantly higher in 2014 than in 2008. Roach ranged in age from 0+ to 7+, indicating reproductive success in the previous eight years.

Although the mean perch CPUE and BPUE fluctuated slightly between the three sampling years, these differences were not statistically significant. Perch ranged in age from 0+ to 6+, indicating reproductive success in the previous seven years. The dominant age class was 1+. One brown trout was captured and aged 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*., 2012b). Using the FIL2 classification tool, Lough Allua has been assigned an ecological status of Bad in 2008, Moderate in 2011 and Poor in 2014 based on the fish populations present.

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

1.5 References

Cork County Council (2009) http://www.corkcoco.ie/co/pdf/324758.pdf

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.L., Connor, L., Wightman, G., Matson, R. Morrissey, E., O'Callaghan, R., Feeney, R., Hanna, G. and Rocks, K. (2009) *Sampling fish for the Water Framework Directive – Summary report 2008*. Central and Regional Fisheries Boards report.

Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., Wogerbauer, C., Feeney, R., O'Callaghan, R. and Rocks, K. (2012a) *Sampling Fish for the Water Framework Directive – Summary Report 2011*. Inland Fisheries Ireland.

Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012b) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.

Went A.E.J. (1945). The distribution of Irish char (*Salvelinus* spp.). *Biology and Environment. Proceedings of the Royal Irish Academy,* **50B,** 167-89

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