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Sampling Fish for the Water Framework Directive

Lakes 2011

Lough Fern

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Fern, August 2011

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1.1 Introduction

Lough Fern is located in the Leannan (Lennon) catchment, two kilometres south of Milford and ten kilometres north of Letterkenny, in Co. Donegal (Fig. 1.1). The lake is situated at an altitude of 18.7m above sea level. It has a surface area of 181ha, a mean depth of 2m and a maximum depth of 3m. The lake is categorised as typology class 6 (as designated by the EPA for the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and moderately alkaline (20-100mg/l $CaCO_3$). The lake has been classed as 2a (i.e. expected to meet good status by 2015 pending further investigation) in the WFD Characterisation report (EPA, 2005). The geology of the area is predominantly schist and gneiss. It is a soft water lake that has been classified as mesotrophic (NPWS, 2005).

Lough Fern is located within the Leannan River Special Area of Conservation. The river has been designated as a SAC as it is home to a number of species listed on Annex II of the EU Habitats Directive. These species include the freshwater pearl mussel and Atlantic salmon.

Lough Fern was one of the great spring salmon lakes until its stocks were hit by ulcerative dermal necrosis (UDN) in the 1970s (O'Reilly, 2007). Since then, however, signs of recovery are slowly emerging and salmon from the River Leannan have been reported to average 4kg, with the largest weighing in at 15kg. The lake now holds a good stock of brown trout (O'Reilly, 2007). The lake was previously surveyed in September 2005 by Inland Fisheries Ireland (previously the Central Fisheries Board and the Northern Regional Fisheries Board) as part of the NS Share "Fish in Lakes" project (Kelly *et al*., 2007). Brown trout, salmon and eels were recorded in this survey. The lake was also surveyed in 2008 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2009). During this survey, brown trout were found to be the dominant species present in the lake. Three-spined stickleback, salmon and eels were also captured during the survey.

This report summarises the results of the 2011 fish stock survey carried out on the lake, as part of the Water Framework Directive surveillance monitoring programme.

Plate 1.1. Lough Fern, looking south

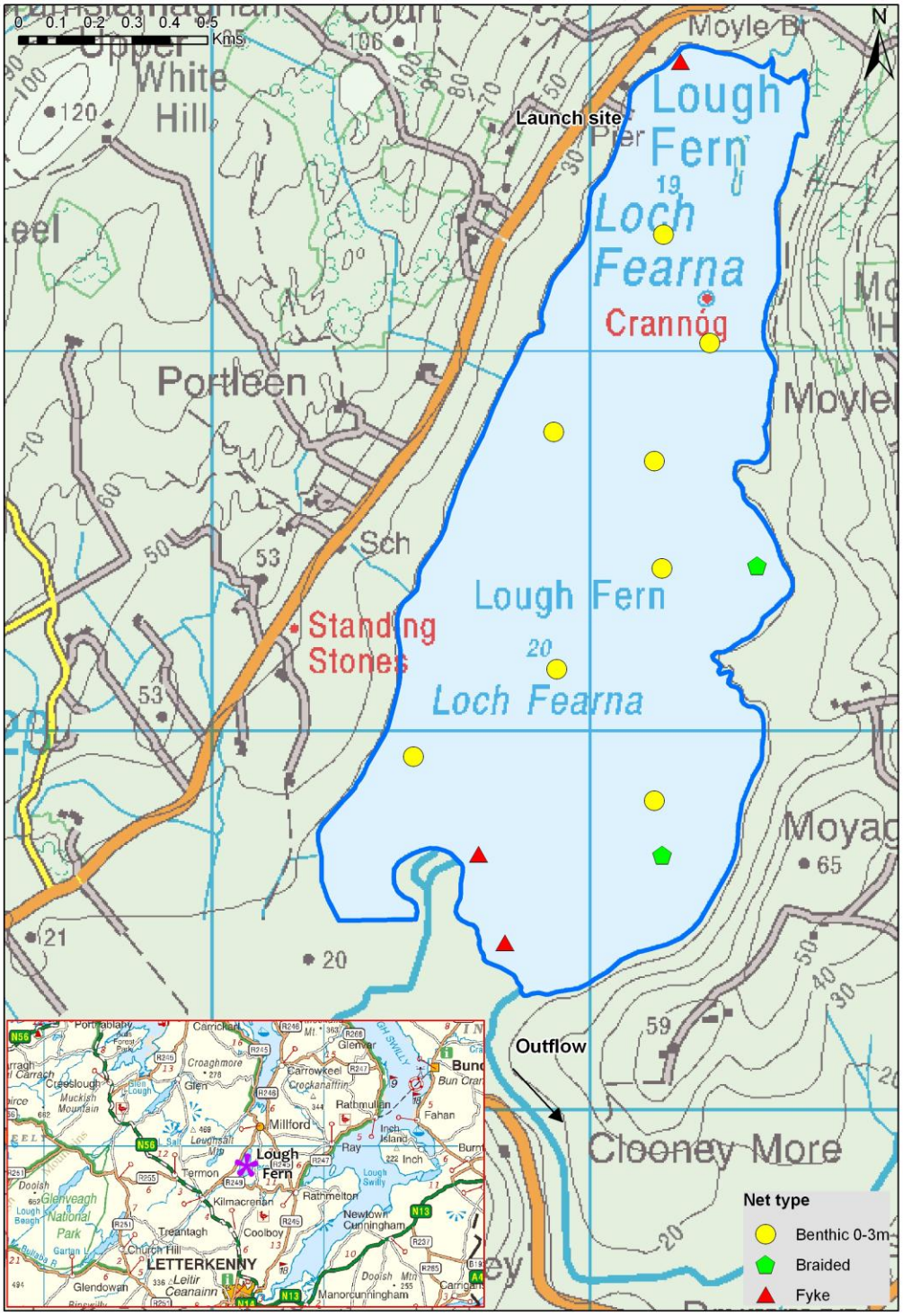

Fig. 1.1. Location map of Lough Fern showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Fern was surveyed over one night on the 16th of August 2011. A total of three sets of Dutch fyke nets and eight benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (8 @ 0-2.9m) were deployed in the lake (11 sites). The netting effort was supplemented using two benthic braided survey gill nets (62.5mm mesh knot to knot) at two additional sites. Nets were deployed in the same locations as were randomly selected in the previous survey in 2008. 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 were measured and weighed on site and scales were removed from all brown trout and salmon. 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 four fish species were recorded on Lough Fern in August 2011, with 228 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Brown trout was the most abundant fish species recorded, followed by three-spined stickleback, eels and salmon. During the previous survey in 2008 the same species composition was recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Fern, August 2011

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
Salmo trutta	Brown trout	157	0	0	157
Gasterosteus aculeatus	3-spined stickleback	59	0	0	59
Salmo salar	Salmon	2	1	0	3
Anguilla anguilla	European eel	0	0	9	9

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 2008 and 2011 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 brown trout CPUE and BPUE were higher in 2011 than in 2008, these differences were not statistically significant (Figs. 1.2 and 1.3).

The differences in the mean brown trout CPUE between Lough Fern and four other similar lakes were assessed and found to be statistically significant (Kruskal-Wallis, $P<0.05$) (Fig. 1.4). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Fern had a significantly higher mean brown trout CPUE than Lough Leane, Lough Gill and Lough Owel ($z = -2.139$ $P<0.05$, $z = -4.791$ $P<0.05$ and $z = -5.036$ $P<0.05$).

The differences in the mean brown trout BPUE between Lough Fern and four other similar lakes were also assessed and found to be statistically significant (Kruskal-Wallis, $P<0.05$) (Fig. 1.5). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Fern also had a significantly higher mean brown trout BPUE than Lough Leane, Lough Gill and Lough Owel ($z = -2.137$ $P<0.05$, $z = -4.790$ $P<0.05$ and $z = -5.036$ $P<0.05$).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Fern, 2008 and 2011

Scientific name	Common name	2008	2011
		Mean CPUE	
Salmo trutta	Brown trout	0.346 (0.728)	0.436 (0.095)
Gasterosteus aculeatus	3-spined stickleback	0.032 (0.014)	0.163 (0.068)
Salmo salar	Salmon	0.002 (0.002)	0.008 (0.004)
Anguilla anguilla	European eel	0.166 (0.034)	0.075 (0.025)
		Mean BPUE	
Salmo trutta	Brown trout	58.887 (12.032)	64.033 (15.118)
Gasterosteus aculeatus	3-spined stickleback	0.128 (0.586)	0.218 (0.091)
Salmo salar	Salmon	5.564 (5.564)	23.051 (15.631)
Anguilla anguilla	European eel	17.811 (3.766)	5.691 (1.641)

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

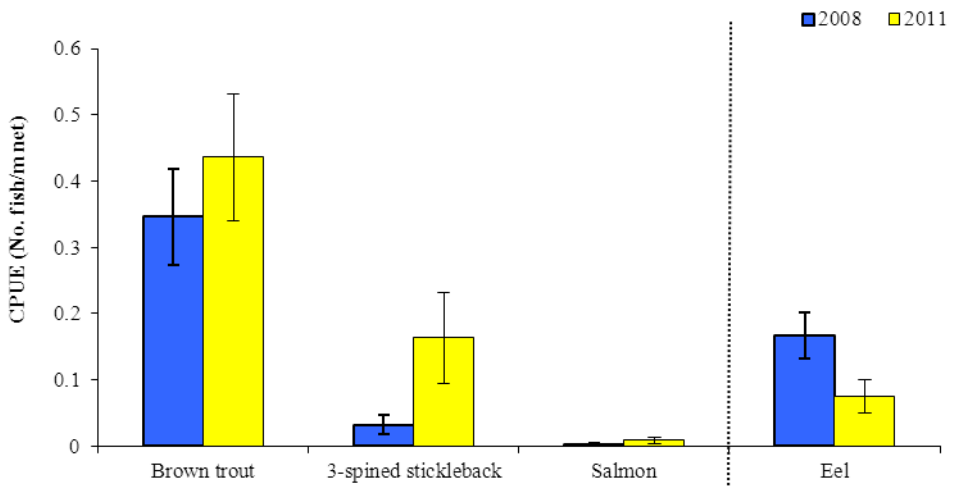

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Fern (Eel CPUE based on fyke nets only), 2008 and 2011

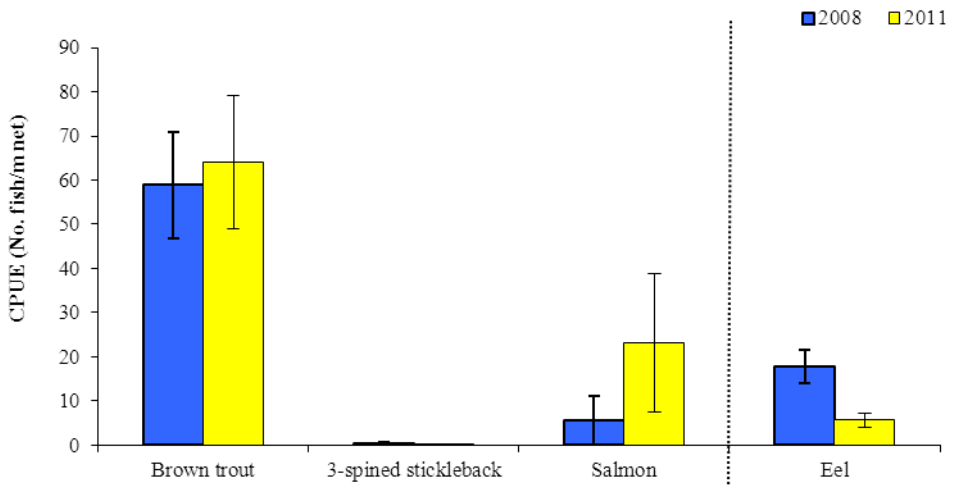

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Fern (Eel CPUE based on fyke nets only), 2008 and 2011

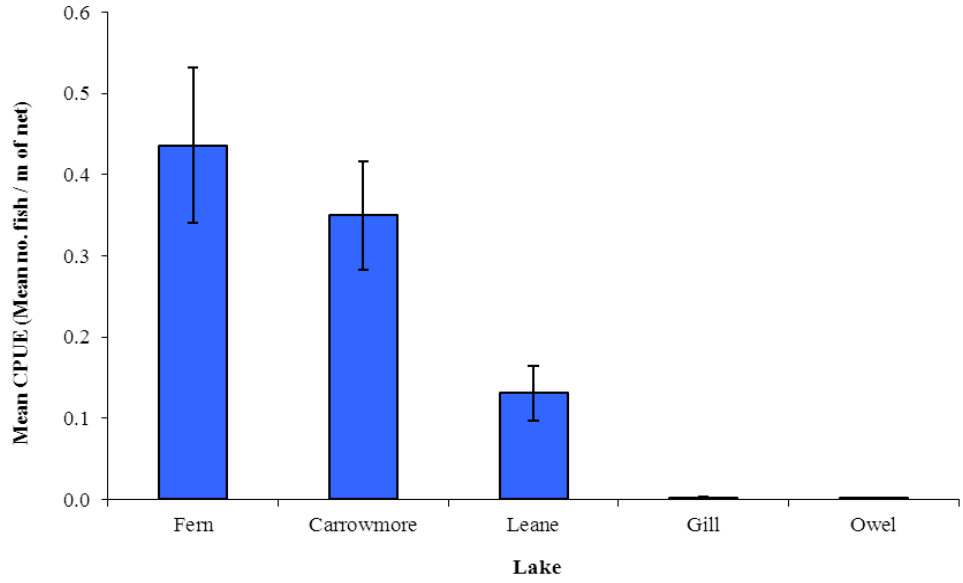

Fig. 1.4. Mean (±S.E.) brown trout CPUE in five lakes surveyed during 2011

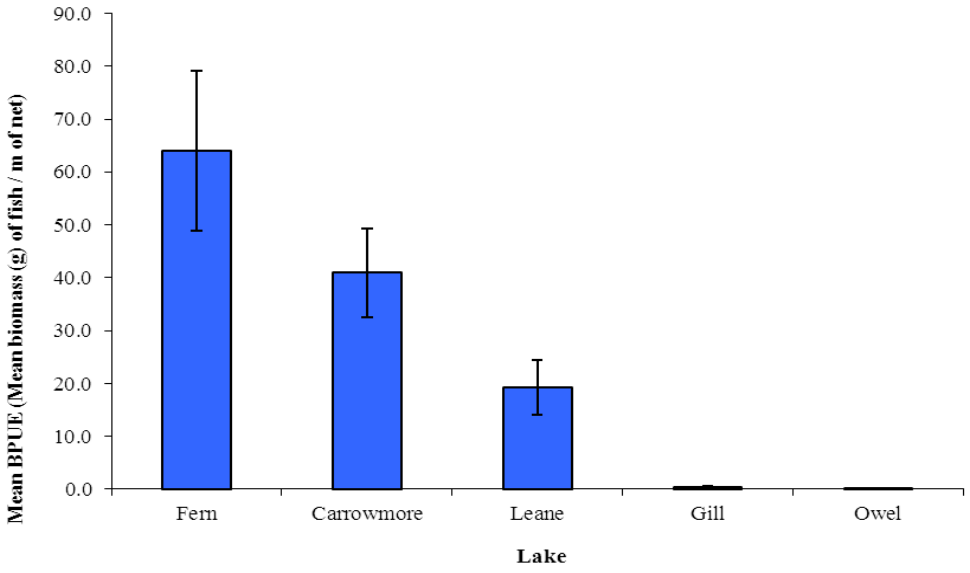

Fig. 1.5. Mean (±S.E.) Brown trout BPUE in five lakes surveyed during 2011

1.3.3 Length frequency distributions

Brown trout captured during the 2011 survey ranged in length from 11.2cm to 40.4cm (mean = 20.9cm) (Fig. 1.6). Brown trout captured during the 2008 survey ranged in length from 7.5cm to 36.5cm (Fig. 1.6).

Eels captured during the 2011 survey ranged in length from 31.0cm to 39.5cm (mean = 34.6cm). Eels captured during the 2008 survey had lengths ranging from 30.0cm to 49.0cm.

Three-spined stickleback captured during the 2011 survey ranged in length from 3.8cm to 5.7cm and salmon ranged in length from 13.1cm to 75.5cm.

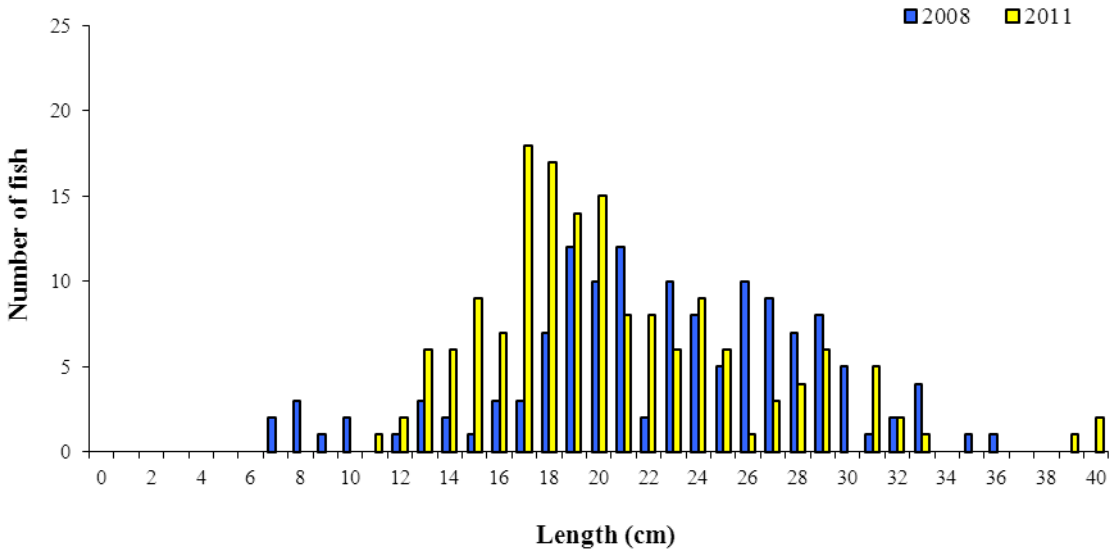

Fig. 1.6. Length frequency of brown trout captured on Lough Fern

1.3.4 Fish age and growth

Four age classes of brown trout were present, ranging from 1+ to 4+, with a mean L1 of 7.6cm (Table 1.3). In the 2008 survey, brown trout ranged from 0+ to 4+ with a mean L1 of 7.9cm. Mean brown trout L4 in 2011 was 30.2cm indicating a fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Three salmon were aged at 1+, 1.1+ and 2.1+.

Table 1.3. Mean (±SE) brown trout length (cm) at age for Lough Fern, August 2011

	L_1	L_2	L_3	L_4
Mean	7.6 (0.2)	16.8 (0.4)	26.1 (1.1)	30.28 (3.9)
N	84	60	16	3
Range	3.1-12.4	10.9-25.2	19.5-36.2	25.1-38.1

1.4 Summary

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

Although the mean brown trout CPUE and BPUE was slightly higher in 2011 than in 2008, these differences were not statistically significant. The mean brown trout CPUE and BPUE in Lough Fern was significantly higher than three other similar lakes surveyed during 2011; Lough Leane, Lough Gill and Lough Owel. Brown trout ranged in age from 1+ to 4+, indicating reproductive success in four of the previous five years. Length at age analyses revealed that brown trout in the lake exhibit a fast rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

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 Fern has been assigned an ecological status of Good based on the fish populations present. The ecological status assigned to the lake based on the 2008 survey data was Moderate.

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