Sampling Fish for the Water Framework Directive

Lakes 2010

Kylemore Lough

Iascach Intíre Éireann
Inland Fisheries Ireland

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Ms. Amanda Mooney and the staff from IFI, Galway. 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

Kylemore Lough (Plate 1.1, Fig. 1.1) is the largest of the three Kylemore loughs, situated in the Dawros catchment in Co. Galway, approximately 5km north-east of Letterfrack, Co. Galway. It has a surface area of 134ha, a mean depth > 4m, a maximum depth of 30m and falls into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and low alkalinity (<20mg/l $CaCO_3$). The lake has a stock of brown trout, Arctic char and gets a run of salmon and sea trout from June to the end of the angling season (O' Reilly, 2007).

Kylemore Lough is situated within the Twelve Bens/Garraun Complex Special Area of Conservation (SAC). This is an extensive site located in the north-west of Connemara and is dominated by mountainous terrain. Geologically, the site can be divided into two distinct sections; the Twelve Bens which are composed of quartzite and schists in the valleys and the mountains to the north of Kylemore which are composed of gneiss, sandstones and mudstones (NPWS, 2005). The main soil type within the site is peat. Eight of the habitat types listed in the SAC are found in Annex I of the EU Habitats Directive. The SAC also contains the following species listed on Annex II of the Habitats Directive - freshwater pearl mussel, Atlantic salmon, otter and the plant slender naiad (NPWS, 2005).

Arctic char, a species listed in the Irish Red Data Book (King *et al*., 2011) as vulnerable has been recorded in Lough Inagh, Kylemore Lough, Lough Muck and Lough Fee.

Kylemore Lough was previously surveyed in 2007 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007). During this survey brown trout and Arctic char were found to be the dominant species present on the lake. Sea trout, salmon, minnow and eels were also captured during the survey.

Plate 1.1. Kylemore Lough

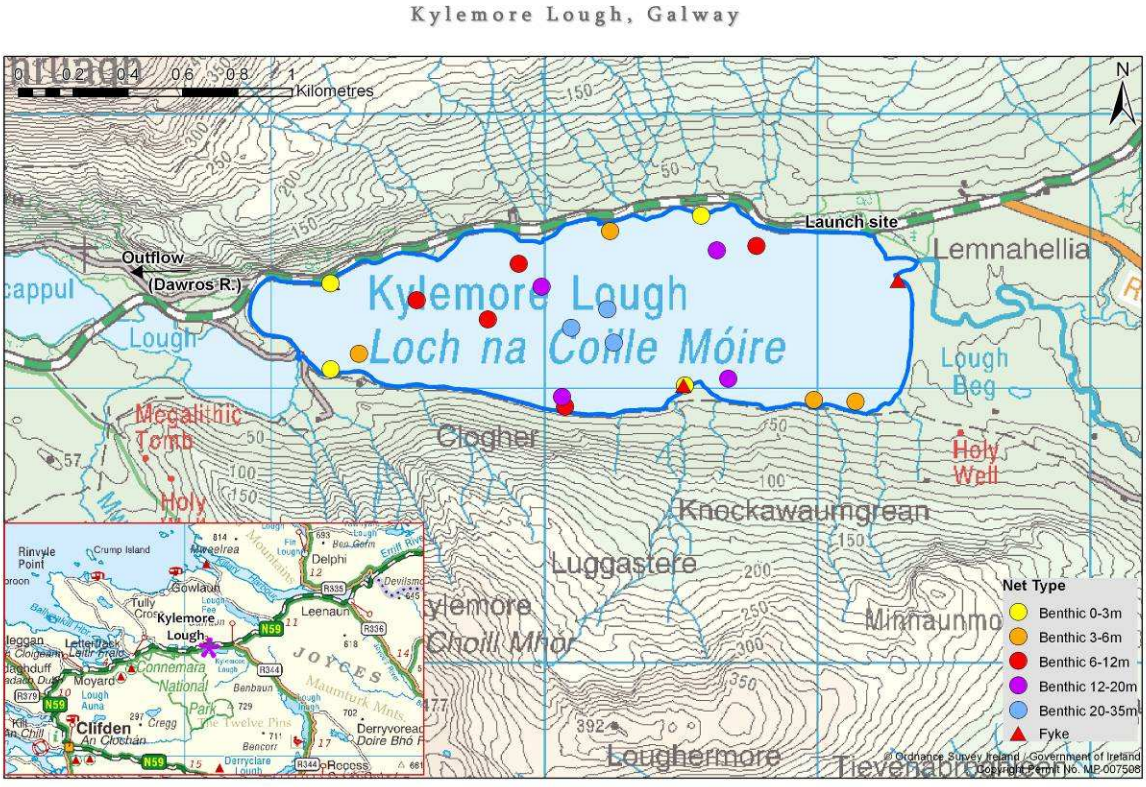

Fig. 1.1. Location map of Kylemore Lough showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Kylemore Lough was surveyed over two nights from the 23rd to the 25th of August 2010. 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 two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (25 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 were measured and weighed on site and scales were removed from all brown trout and sea trout. 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 (sea trout are included as a separate 'variety' of trout) were recorded in Kylemore Lough in August 2010, with 140 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Brown trout and eels were the most abundant fish species recorded, followed by Arctic char. During the previous survey in 2007 the same species composition was recorded, with the exception of salmon, which were present during the 2007 survey but were not captured in the current survey.

Table 1.1. Number of each fish species captured by each gear type during the survey on Kylemore Lough, August 2010

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Salmo trutta	Brown trout	42	0	3	45
Salvelinus alpinus	Arctic char	36	0	0	36
Salmo trutta	Sea trout	6	0	0	6
Phoxinus phoxinus	Minnow	8	0	0	8
Anguilla anguilla	European eel	0	0	45	45

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

recorded during the 2007 and 2010 surveys are summarised in Table 1.2. Mean CPUE for all fish species from both surveys is also illustrated in Figure 1.2.

Although the mean brown trout CPUE was lower in 2010 than in 2007, this was not statistically significant. The differences in the mean brown trout CPUE between Kylemore Lough and two other similar lakes were assessed with no overall significant differences being found (Kruskal-Wallis) (Fig. 1.3). However, Independent-Samples Mann-Whitney U tests between each lake showed that Kylemore Lough had a significantly lower mean brown trout CPUE than Glen Lough, Co. Donegal ($z = -2.191$, $P<0.05$).

The differences in the mean Arctic char CPUE between Kylemore Lough and three other similar lakes were also 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 Kylemore Lough had a significantly higher mean Arctic char CPUE than Ardderry Lough ($z = -2.072$, $P<0.05$).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Kylemore Lough, 2007 and 2009

Scientific name	Common name	2007	2010
		Mean CPUE	
Salmo trutta	Brown trout	0.120 (0.028)	0.058 (0.019)
Salvelinus alpinus	Arctic char	0.047 (0.014)	0.048 (0.020)
Salmo salar	Salmon	0.006 (0.003)	-
Salmo trutta	Sea trout	0.029 (0.009)	0.008 (0.004)
Phoxinus phoxinus	Minnow	0.030 (0.015)	0.010 (0.005)
Anguilla anguilla	European eel	0.122 (0.056)	0.258 (0.258)
		Mean BPUE	
Salmo trutta	Brown trout	7.650 (1.857)	10.321 (5.635)
Salvelinus alpinus	Arctic char	1.598 (0.640)	3.129 (1.406)
Salmo salar	Salmon	0.105 (0.055)	-
Salmo trutta	Sea trout	9.942 (3.691)	3.575 (1.956)
Phoxinus phoxinus	Minnow	0.150 (0.075)	0.173 (0.008)
Anguilla anguilla	European eel	19.361 (10.121)	66.341 (66.341)

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

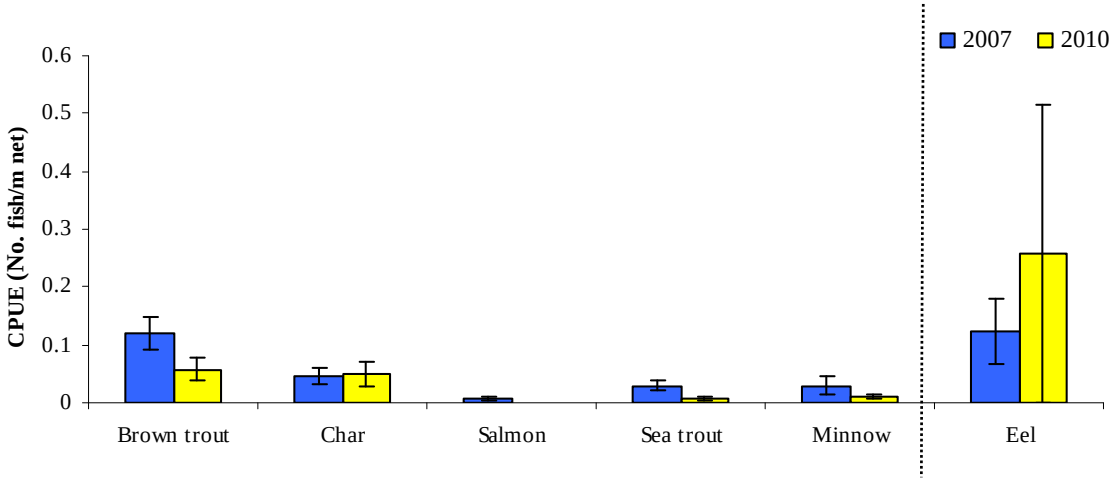

Fig. 1.2. Mean (±S.E.) CPUE on Kylemore Lough (Eel CPUE based on fyke nets only)

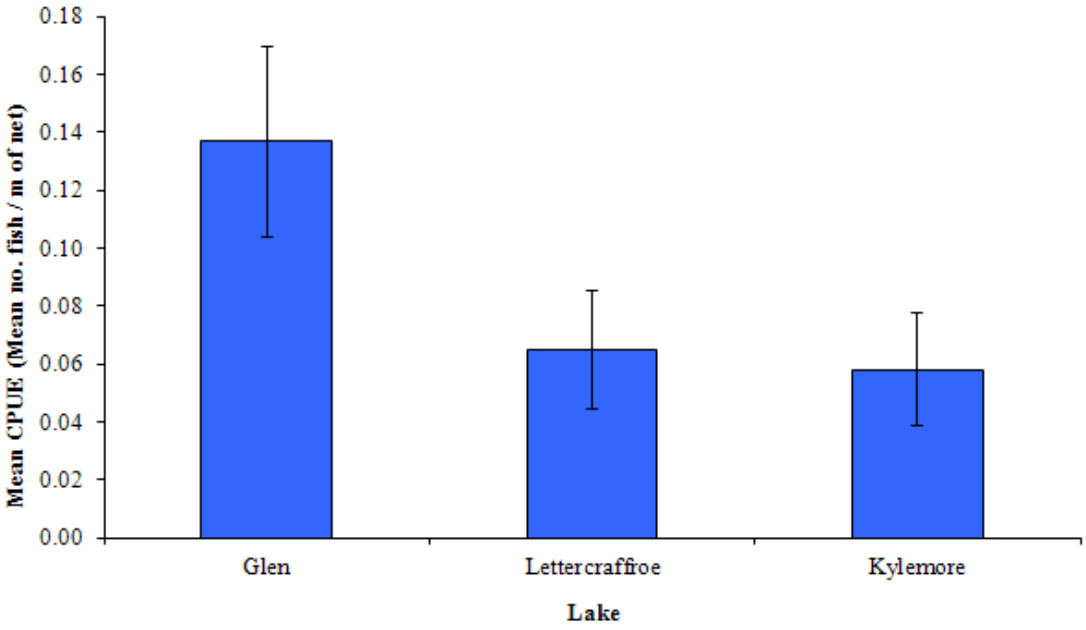

Fig. 1.3. Mean (±S.E.) brown trout CPUE in three lakes surveyed during 2010

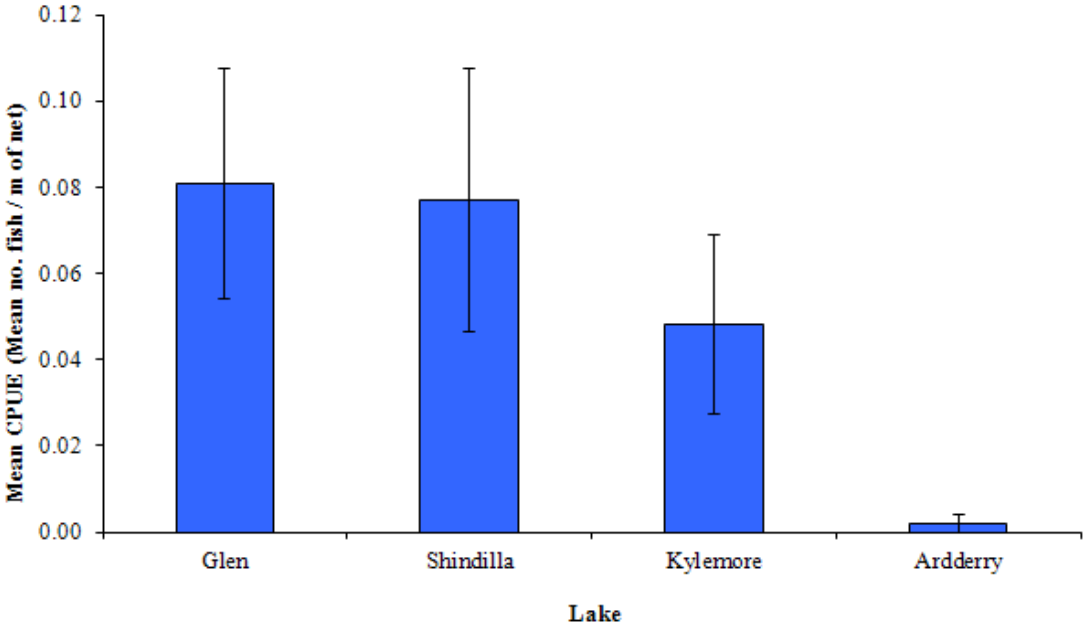

Fig. 1.4. Mean (±S.E.) Arctic char CPUE in four lakes surveyed during 2010

1.3.3 Length frequency distributions

Brown trout captured during the 2010 survey ranged in length from 10.0cm to 81.4cm (mean = 20.2cm) (Fig. 1.5). With the exception of the 81.4cm ferox trout (Plate 1.2) captured in 2010, brown trout captured during the 2007 survey had similar lengths to 2010, ranging from 11.8cm to 35.2cm (Fig. 1.5). Arctic char captured during the 2010 survey ranged in length from 10.0cm to 21.9cm (mean = 17.5cm) (Fig.1.6). Arctic char captured during the 2007 survey had lengths ranging from 7.4cm to 20.8cm (Fig.1.6). Eels captured during the 2010 survey ranged in length from 34.2cm to 85.1cm and sea trout ranged in length from 31.0cm to 45.0cm.

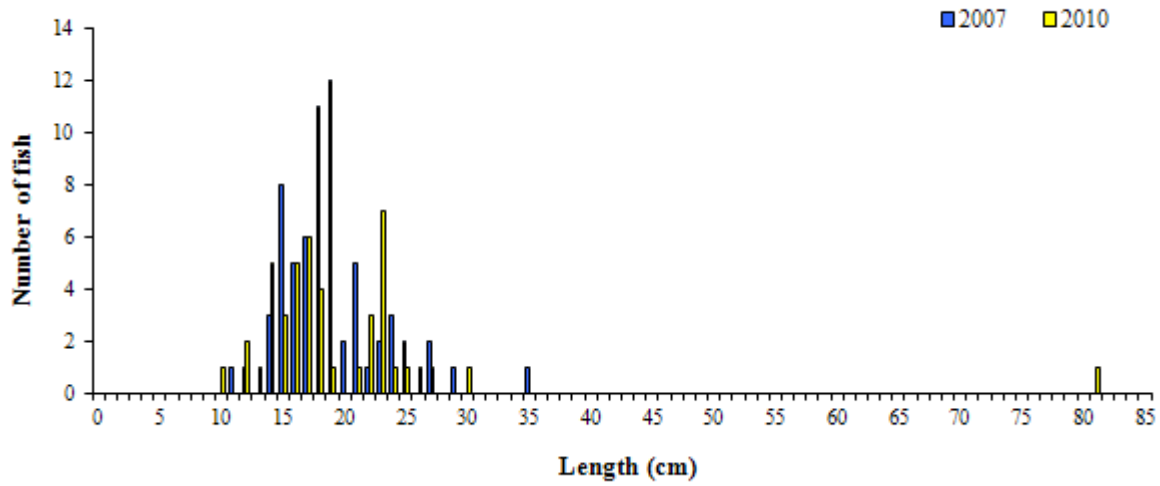

Fig. 1.5. Length frequency of brown trout captured on Kylemore Lough

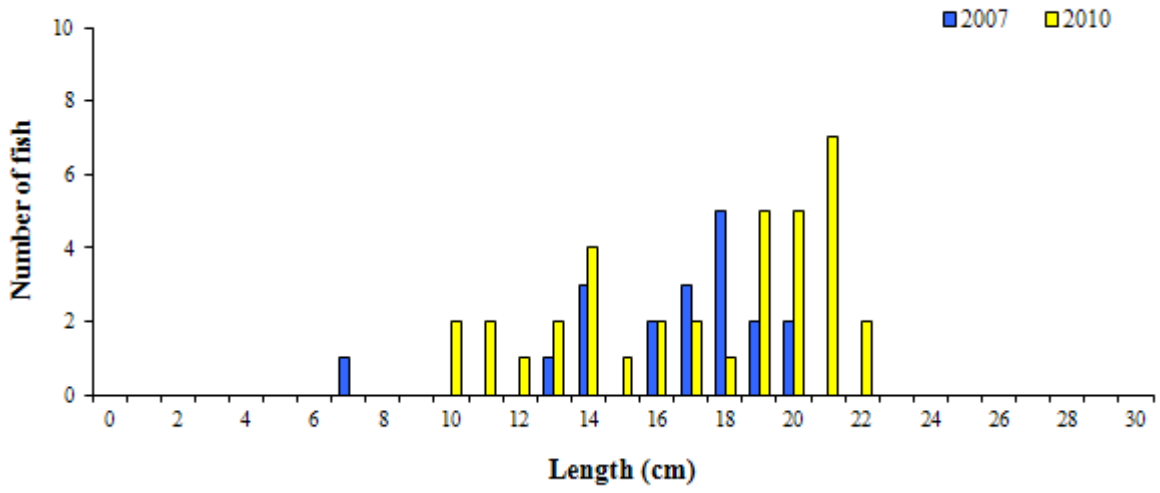

Fig. 1.6. Length frequency of Arctic char captured on Kylemore Lough

Plate 1.2. Ferox trout captured and released on Kylemore Lough, 2010 (length 81.4cm, weight 4.0kg and age 7+)

1.3.4 Fish age and growth

Eight age classes of brown trout were present, ranging from 0+ to 7+, with a mean L1 of 6.0cm (Table 1.3). In the 2007 survey, brown trout ranged from 1+ to 6+, with a mean L1 of 6.5cm. Mean brown trout L4 was 22.9cm (Table 1.3) indicating a very slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Five age classes of Arctic char were present, ranging from 1+ to 6+. In the 2007 survey, Arctic char ranged from 1+ to 5+.

Sea trout captured were aged 1.1+1SM, 1.2+1SM, 2.0+1SM+ and 2.0+3SM+, with a mean L1 of 7.2cm. In the 2007 survey, sea trout had a mean L1 of 7.7cm.

Table 1.3. Mean (±SE) brown trout length (cm) at age for Kylemore Lough, August 2010

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean	6.0 (0.2)	12.6 (0.4)	19.0 (0.6)	22.9 (1.9)	27.2 (4.1)	37.6 (10.6)	76.0
N	41	31	16	6	4	3	1
Range	3.6-8.5	9.3-16.9	14.8-23.5	19.9-31.9	21.5-39.2	26.4-58.8	76.0-76.0

1.4 Summary

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

The mean brown trout CPUE in Kylemore Lough was significantly lower than Glen Lough, Co. Donegal but similar to Lettercraffroe Lake, Co. Galway. Although the mean brown trout CPUE was lower in 2010 than in 2007, this was not statistically significant. Brown trout ranged in age from 0+ to 7+, indicating reproductive success in each of the previous eight years. Length at age analyses revealed that brown trout in the lake exhibit a very slow rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971). The survey also revealed that ferox trout are present in the lake.

The mean Arctic char CPUE in Kylemore Lough was significantly higher than Ardderry Lough and similar to Glen Lough and Lough Shindilla. Arctic char ranged in age from 1+ to 6+, indicating reproductive success in six of the previous seven years. However, no 0+ fish were captured.

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, Kylemore Lough has been assigned an ecological status of Good based on the fish populations present. The ecological status assigned to the lake based on the 2007 survey data was High.

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