Lough Cullaun

Sampling Fish for the Water Framework Directive - Lakes 2009

The Central and Regional Fisheries Boards

ACKNOWLEDGEMENTS

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1.1 Introduction

Lough Cullaun (Plate 1.1, Fig. 1.1) is located approximately 4km from Corrofin, Co.Clare and forms part of the "East Burren Complex" Special Area of Conservation (NPWS, 2001). The East Burren Complex SAC is a large area that encompasses all the high ground in the east Burren. A total of 12 different habitats listed on Annex I of the EU Habitats Directive are present, including areas of limestone pavement, calcareous grasslands, heath scrub, woodlands and calcareous lakes and turloughs (NPWS, 2001). The site exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe. The shores of Lough Cullaun are also home to a number of important bird species (NPWS, 2001).

Lough Cullaun is a shallow lake that has excellent water clarity as it flows from the Burren (O'Reilly 2007). The lake has a surface area of 25ha and a mean depth of 6.7m. Lough Cullaun lies in a rich and productive limestone area which produces high quality fish (ShRFB, 2009). It is primarily a coarse fishery (ShRFB, 2009) but also holds brown trout which have an average weight of just less than one kilogram (O' Reilly, 2007). Pike, tench, roach, bream, rudd, perch and eel have all been previously reported from the lake (ShRFB, 2009). The lake is categorised as typology class 11 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), less than 50ha and of high alkalinity (>100 mg/l CaCO3).

Plate 1.1. Lough Cullaun

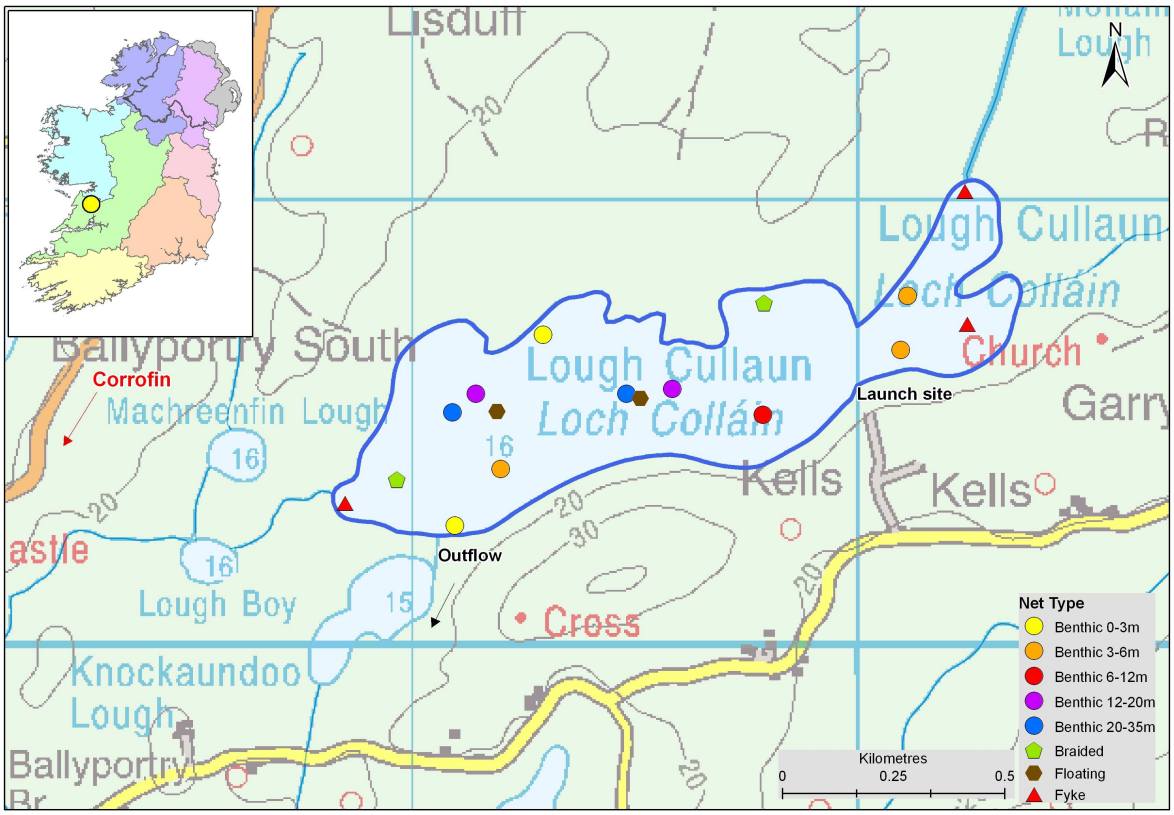

Fig. 1.1. Location map of Lough Cullaun showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Cullaun was surveyed over two nights between the 26th and the 28th of August 2009. A total of three sets of Dutch fyke nets, ten benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (2 @ 0-2.9m, 2 @ 3-5.9m, 2 @ 6-11.9m, 2 @ 12-19.9 and 2 @ 20-34.9m) and two surface monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed randomly in the lake (15 sites). The netting effort was supplemented using two benthic braided (62.5mm mesh knot to knot) survey gill nets at two additional sites. Survey locations were randomly selected within each depth zone using a grid placed over a map of the lake. 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 rudd, pike and 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 returned to the laboratory for further analysis.

1.3 Results

1.3.1 Species Richness

A total of five fish species were recorded on Lough Cullaun in August 2009, with 269 fish being captured (Table 1.1). Perch was the most abundant fish species recorded. One brown trout was recorded (Plate 1.2), along with small numbers of pike and rudd. Eels were captured in fyke nets only.

Plate 1.2. Brown trout captured on Lough Cullaun (length - 33.3cm, weight - 620g)

Table 1.1. List of fish species recorded (including numbers captured) during the survey on Lough Cullaun, August 2009

Scientific name	Common name	Number of fish captured				
		Benthic mono multimesh gill nets	Benthic braided gill nets	Surface mono multimesh gill nets	Fyke nets	Total
Perca fluviatilis	Perch	234	0	0	1	235
Scardinius erythropthalmus	Rudd	2	0	5	0	7
Esox lucius	Pike	2	1	0	1	4
Salmo trutta	Brown trout	0	0	1	0	1
Anguilla anguilla	European eel	0	0	0	22	22

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.

The differences in the mean perch CPUE between Lough Cullaun and four other similar lakes were assessed and found to be statistically significant (Kruskal-Wallis, $P<0.05$) (Fig. 1.2). Independent-Samples Mann-Whitney U tests between each lake showed that the mean CPUE from Lough Cullaun was not significantly different to the mean CPUE from the other lakes surveyed, however, Dromore Lough had a significantly higher mean perch CPUE than Lough Bunny ($z = -2.086$, $P<0.05$) and Muckanagh Lough ($z = -2.943$, $P<0.001$). Inchicronan Lough also had a significantly higher mean perch CPUE than Muckanagh Lough ($z = -1.996$, $P<0.05$).

The differences in the mean rudd CPUE between Lough Cullaun and four other similar lakes were also assessed and found to be statistically significant (Kruskal-Wallis, $P<0.001$) (Fig. 1.3). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Cullaun had a significantly lower mean rudd CPUE than Lough Gur ($z = -4.153$, $P<0.001$).

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

Scientific name	Common name	
		Mean CPUE
Perca fluviatilis	Perch	0.460 (0.237)
Scardinius erythropthalmus	Rudd	0.014 (0.010)
Esox lucius	Pike	0.007 (0.003)
Salmo trutta	Brown trout	0.002 (0.002)
Anguilla anguilla	European eel	0.122 (0.068)
		Mean BPUE
Perca fluviatilis	Perch	6.539 (2.758)
Esox lucius	Pike	4.347 (3.746)
Salmo trutta	Brown trout	1.216 (1.216)
Scardinius erythropthalmus	Rudd	0.694 (0.694)
Anguilla anguilla	European eel	25.433 (13.613)

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

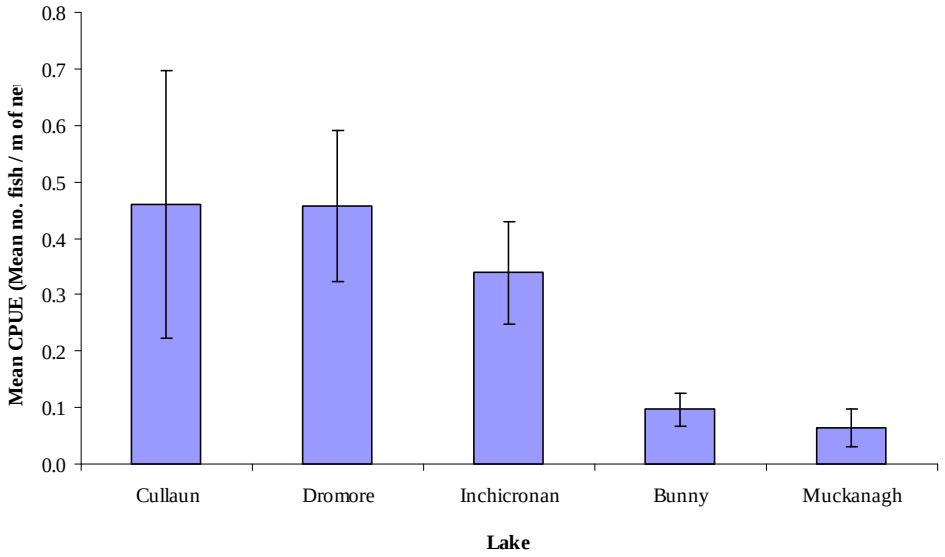

Fig. 1.2. Mean (±S.E.) perch CPUE in five lakes surveyed during 2009

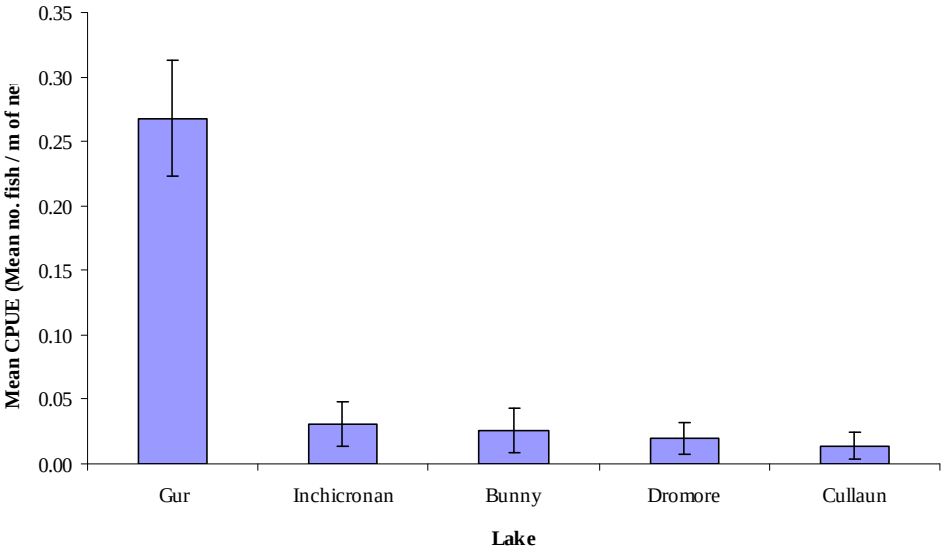

Fig. 1.3. Mean (±S.E.) rudd CPUE in five lakes surveyed during 2009

1.3.3 Length frequency distributions

Perch ranged in length from 4.5cm to 23.5cm (mean = 8.5cm) (Fig. 1.4). Rudd ranged in length from 10.4cm to 16.5cm (Fig. 1.5). Pike ranged in length from 22.0cm to 62.5cm and eels ranged from 37.0cm to 55.0cm. Only one brown trout was recorded, measuring 33.3cm.

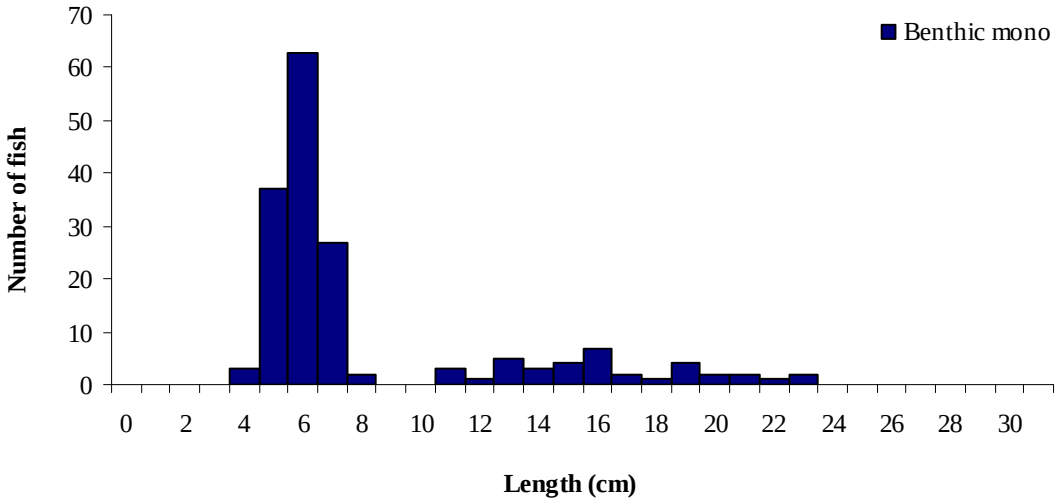

Fig. 1.4. Length frequency of perch (n=169) captured on Lough Cullaun, August 2009

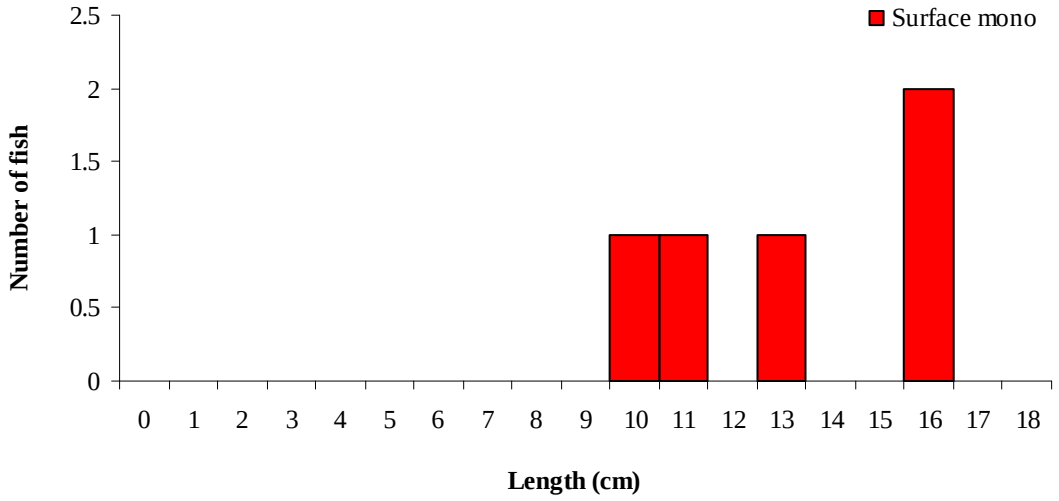

Fig. 1.5. Length frequency of rudd (n=5) captured on Lough Cullaun, August 2009

1.3.4 Fish age and growth

Six age classes of perch were present, ranging from 0+ to 5+ (Table 1.3), with a mean L1 of 7.0cm. The dominant age class of perch was 0+ corresponding to the 4cm to 8cm length class (Fig. 1.4). Three age classes of pike were present, ranging from 2+ to 5+ and three age classes of rudd were present, ranging from 1+ to 3+. The single brown trout recorded was aged 3+.

Table 1.3. Mean (±SE) perch length at age for Lough Cullaun, August 2009

	L_1	L_2	L_3	L_4	L_5
Mean	7.0 (0.2)	13.5 (0.3)	17.9 (0.4)	20.9 (0.3)	22.4
N	36	33	10	4	1
Range	5.0-9.0	10.1-16.3	15.1-19.4	20.3-21.5	22.4-22.4

1.4 Summary

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

The mean perch CPUE in Lough Cullaun was relatively high when compared to other similar type lakes; however, these differences were not statistically significant. The dominant age class of perch was 0+, with ages ranging from 0+ to 5+, indicating reproductive success in each of the previous five years.

The mean rudd CPUE in Lough Cullaun was significantly lower than Lough Gur but was similar to the mean CPUE from Inchicronan Lough, Dromore Lough and Lough Bunny. Rudd ranged in age from 1+ to 3+, indicating reproductive success in each of the previous three years.

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 WFD multimetric fish classification tool has been developed for the island of Ireland (Ecoregion 17) using CFB and Agri-Food and Biosciences Northern Ireland (AFBINI) data generated during the NSSHARE Fish in Lakes project (Kelly *et al.*, 2008). Using this tool, Lough Cullaun has been assigned an ecological status classification of Moderate based on the fish populations present.

The EPA has assigned an overall status of Moderate to Lough Cullaun in an interim draft classification. This is based on physico-chemical parameters and biotic elements such as macroinvertebrates, macrophytes and fish.

1.5 References

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The Central Fisheries Board
Swords Business Campus,
Swords,
Co. Dublin,
Ireland.

Web: www.wfdfish.ie
www.cfb.ie
Email: info@cfb.ie
Tel: +353 1 8842600
Fax: +353 1 8360060

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