

Lough Cullin



Sampling Fish for the Water Framework Directive - Lakes 2009



The Central and Regional
Fisheries Boards

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the CEO Mr. Vincent Roche, Assistant CEO Dr. John Conneely and their staff from the North Western Regional Fisheries Board. The authors would also like to gratefully acknowledge the help and cooperation of all their colleagues in the Central Fisheries Board (CFB).

The authors would also like to acknowledge the funding provided for the project from the Department of Communications, Energy and Natural Resources for 2009.

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1.1 Introduction

Lough Cullin (Plate 1.1, Fig. 1.1) is a large, shallow lake situated to the west of Foxford, which is connected to Lough Conn by a narrow inlet at Pontoon, Co. Mayo. The outflow from the lake discharges directly into the River Moy south-west of Foxford (NPWS, 2004). Lough Cullin has a surface area of 1019.3ha with a maximum depth of approximately 3m (O'Reilly 2007). It is accessible only from its northern shore. The underlying geology of the lake is mainly granite with some areas of limestone present in the southern region of the catchment (NPWS, 2004). The lake is categorised as typology class 10 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃).

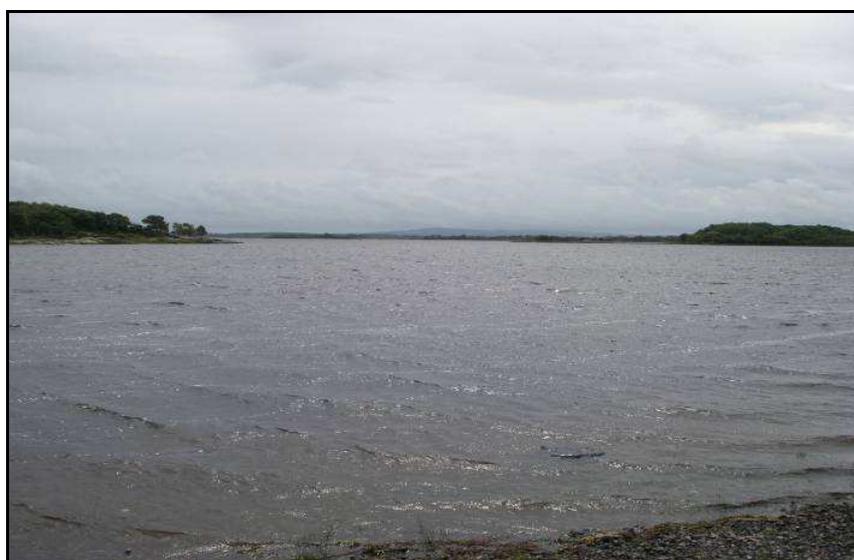


Plate 1.1. Lough Cullin

Lough Cullin is located within the River Moy Special Area of Conservation (NPWS, 2005). The underlying geology of the majority of the site is Carboniferous limestone, with areas of Carboniferous sandstone, Dalradian quartzites and schists also present. Some of the tributaries at the east and south of Lough Conn, and all in Lough Cullin are underlain by granite. The site has been selected as a candidate SAC for containing alluvial wet woodlands, raised bog, old oak woodlands (present on the shores of Lough Cullin), degraded raised bog and Rhynchosporion depressions (*Rhynchospora alba*), all priority habitats on Annex I of the E.U. Habitats Directive. This SAC has also been selected due to the presence of the following species, listed on Annex II of the same Directive – Atlantic salmon, otter, sea and brook lamprey and white-clawed crayfish (NPWS, 2005). Lough Cullin is a moderately hard water lake with relatively low colour and good water clarity. The phytoplankton in the lake is dominated by diatoms and blue-green algae (NPWS, 2005). Lough Cullin also supports important

concentrations of wintering waterfowl and is designated as a Special Protection Area, as one of the few breeding sites for Common Scoter in Ireland (NPWS, 2005).

Lough Cullin was once regarded as one of Ireland’s premier brown trout fisheries, but was often considered to be the ‘poor relation’ of Lough Conn. Historically, in angling terms, Lough Cullin was noted for supporting a large population of relatively small (<0.5kg) brown trout (O’ Grady and Delanty, 2001). Today brown trout averaging 0.3kg to 0.45kg are often caught, with some weighing up to 1.8kg (O’Reilly 2007). The lake was also regarded as a very important salmon fishery and receives a run of salmon during the spring and summer months (NPWS, 2004; O’Reilly 2007). In fact, all the salmon, of which there can be many, destined for Lough Conn and its inflowing rivers must pass through Lough Cullin.

Lough Cullin was previously surveyed by the Central Fisheries Board and the North Western Regional Fisheries Board in 1994, 1998 and 2001 (O’Grady and Delanty, 2001). These surveys revealed that the brown trout population has declined dramatically between 1995 and 2001. Eutrophication problems have been evident in the lake in recent years. There has been a population of rudd in the lake since the 1960s; however roach, a highly prolific non-native species, became established in the lake in the 1990s (O’ Grady and Delanty, 2001).

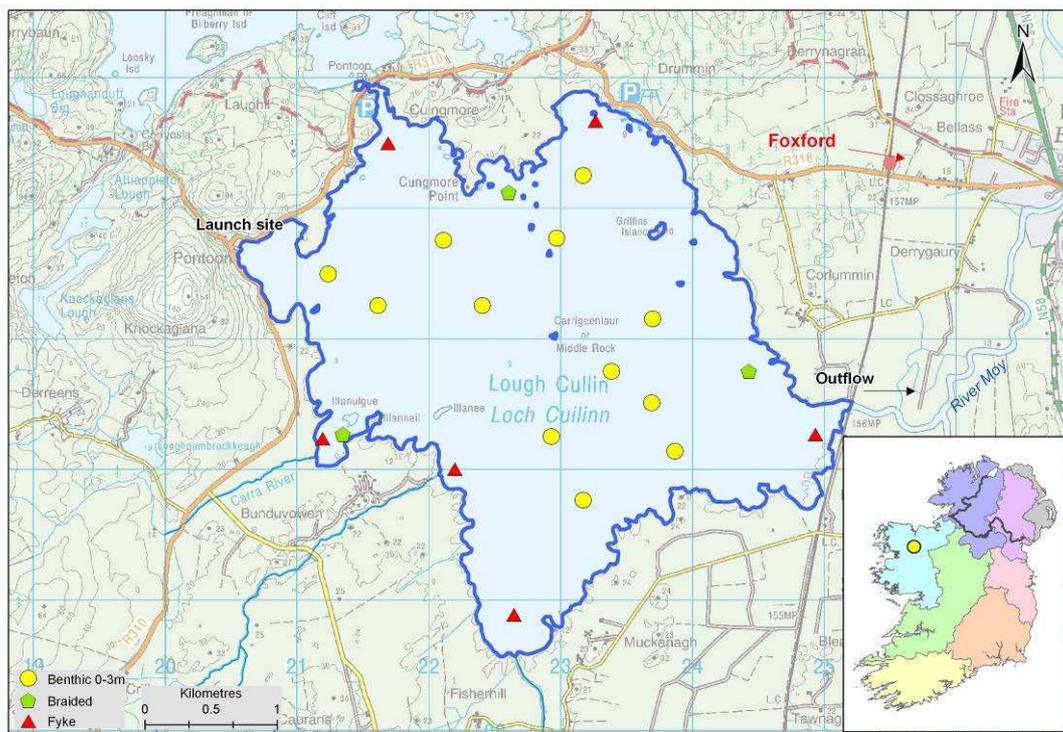


Fig. 1.1. Location map of Lough Cullin showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Cullin was surveyed over one night on the 27th of July 2009. A total of six sets of Dutch fyke nets and 12 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (12 @ 0-2.9m) were deployed randomly in the lake (18 sites). The netting effort was supplemented using three benthic braided (62.5mm mesh knot to knot) survey gill nets at three 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 trout, pike and roach. 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.



Plate 1.2. Lough Cullin brown trout (length - 28cm, weight - 288g)

1.3 Results

1.3.1 Species Richness

A total of six fish species were recorded on Lough Cullin in July 2009, with 516 fish being captured (Table 1.1). Roach was the most abundant fish species recorded, followed by perch and brown trout. Two tench and one pike were also captured. Eels were captured in fyke nets only.

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

Scientific name	Common name	Number of fish captured			
		Benthic mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
<i>Rutilus rutilus</i>	Roach	376	0	0	376
<i>Perca fluviatilis</i>	Perch	70	0	1	75
<i>Salmo trutta</i>	Brown trout	13	1	0	14
<i>Tinca tinca</i>	Tench	0	0	2	2
<i>Esox lucius</i>	Pike	1	0	0	1
<i>Anguilla anguilla</i>	European eel	0	0	48	48

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 brown trout and perch CPUE between Lough Cullin and four other similar lakes were assessed, with no significant differences being found (Fig. 1.2 and 1.3).

The differences in the mean roach CPUE between Lough Cullin and two other similar lakes were assessed and were found to be statistically significant (Kruskal-Wallis, $P < 0.001$) (Fig. 1.4). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Cullin had a significantly higher mean roach CPUE than both Lough Derg and (z = -3.020, $P < 0.001$) and Lough Mask (z = -3.273, $P < 0.001$).

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

Scientific name	Common name	Mean CPUE
<i>Rutilus rutilus</i>	Roach	0.597 (0.130)
<i>Perca fluviatilis</i>	Perch	0.118 (0.031)
<i>Salmo trutta</i>	Brown trout	0.022 (0.011)
<i>Tinca tinca</i>	Tench	0.002 (0.002)
<i>Esox lucius</i>	Pike	0.002 (0.002)
<i>Anguilla anguilla</i>	European Eel	0.133 (0.076)
		Mean BPUE
<i>Rutilus rutilus</i>	Roach	77.660 (17.373)
<i>Salmo trutta</i>	Brown trout	7.766 (3.940)
<i>Esox lucius</i>	Pike	2.238 (2.238)
<i>Perca fluviatilis</i>	Perch	1.937 (0.751)
<i>Tinca tinca</i>	Tench	**
<i>Anguilla anguilla</i>	European Eel	31.883 (19.451)

* 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.

** Two tench captured in a fyke net were released before they could be measured.

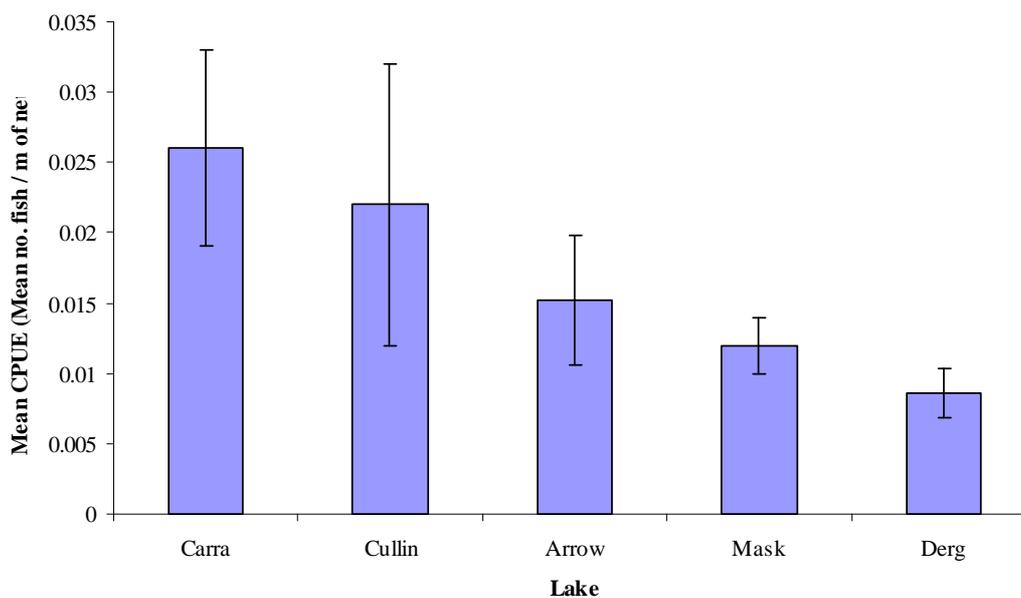


Fig. 1.2. Mean (\pm S.E.) brown trout CPUE in five lakes surveyed during 2009

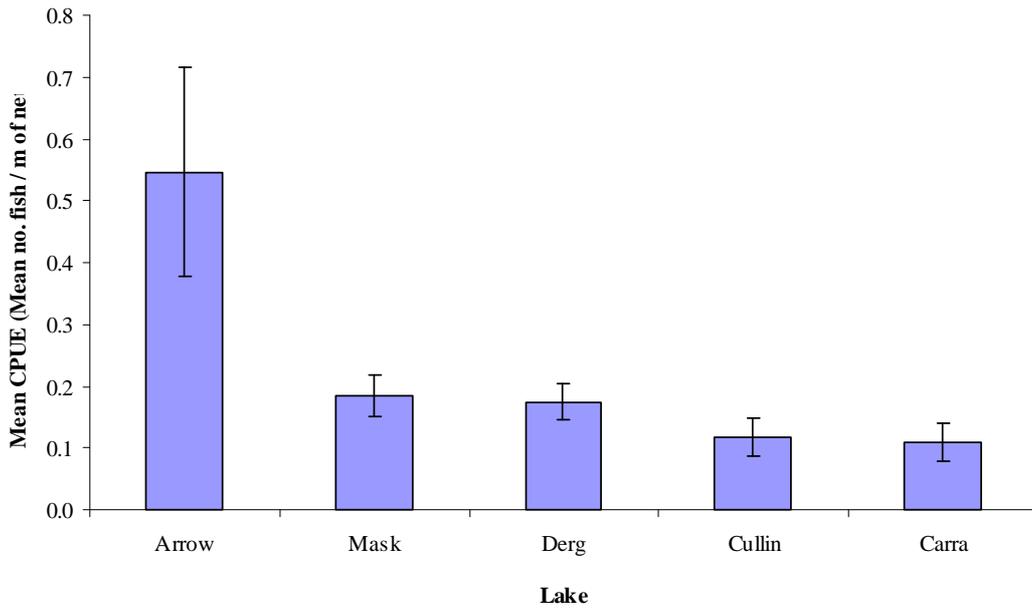


Fig. 1.3. Mean (\pm S.E.) perch CPUE in five lakes surveyed during 2009

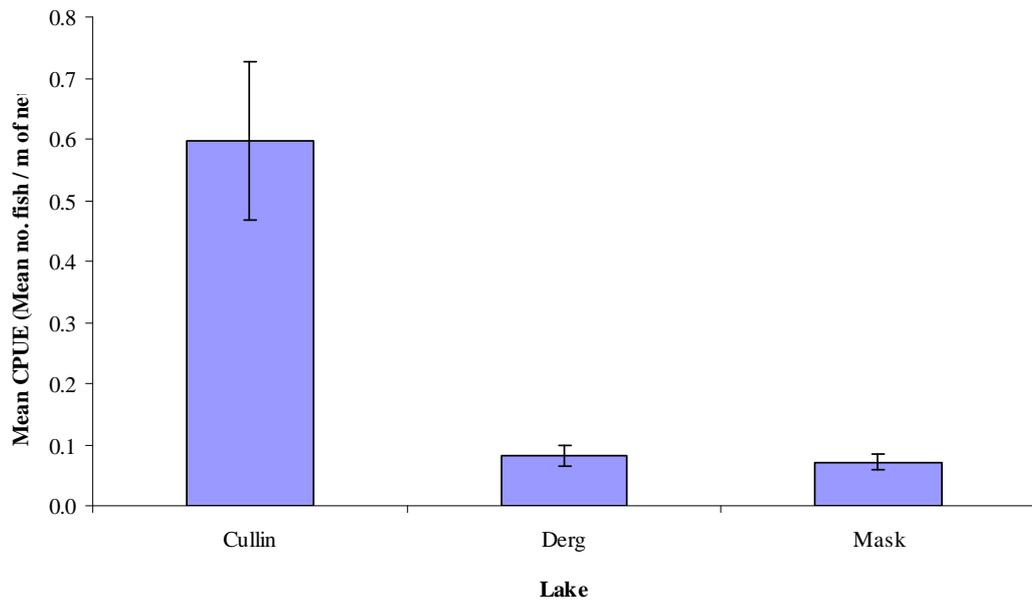


Fig. 1.4. Mean (\pm S.E.) roach CPUE in three lakes surveyed during 2009

1.3.3 Length frequency distributions

Brown trout ranged in length from 17.5cm to 51.8cm (mean = 27.8cm) (Fig. 1.5). Perch ranged in length from 4.9cm to 28.6cm (mean = 7.9cm) (Fig.1.6). Roach ranged in length from 7.0cm to 30.2cm (mean = 18.9cm) (Fig.1.7). Eels ranged in length from 34.0cm to 73.4cm and one pike was recorded measuring 54.5cm in length.

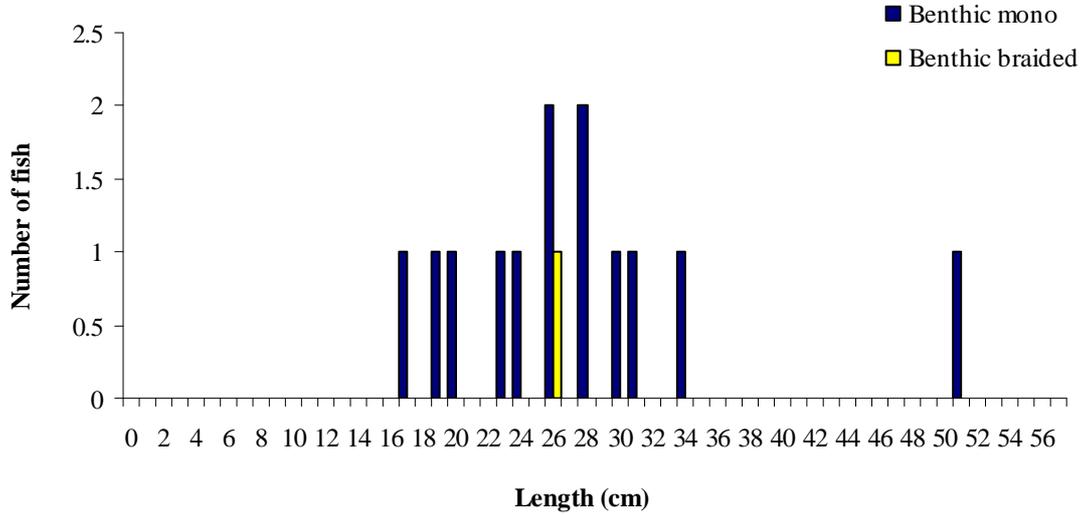


Fig. 1.5. Length frequency of brown trout (n=14) captured on Lough Cullin, July 2009

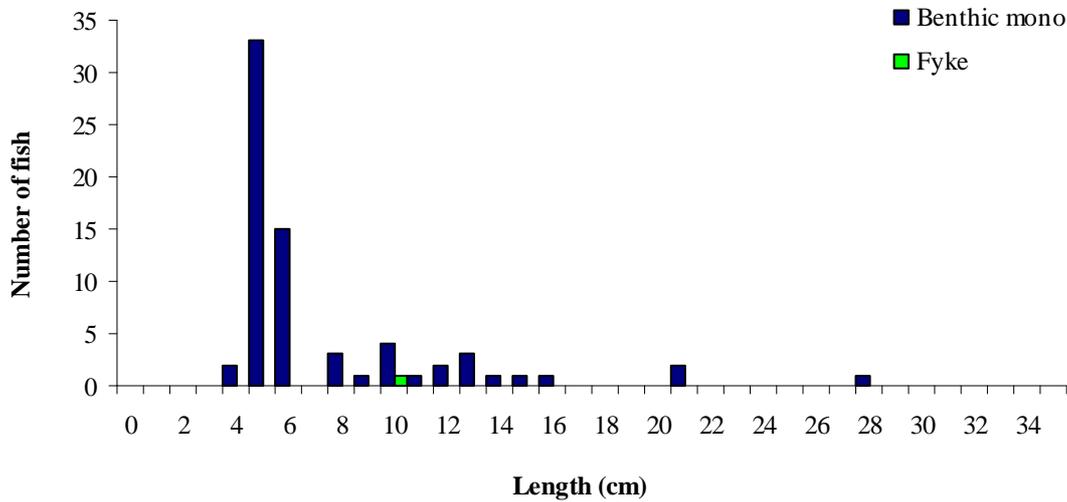


Fig. 1.6. Length frequency of perch (n=71) captured on Lough Cullin, July 2009

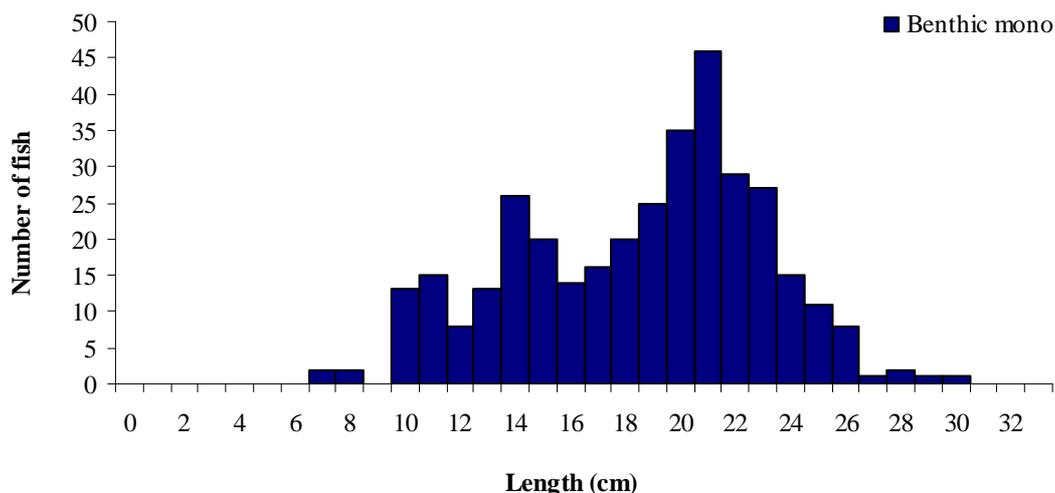


Fig. 1.7. Length frequency of roach (n=350) captured on Lough Cullin, July 2009

1.3.4 Fish age and growth

Four age classes of brown trout were present, ranging from 1+ to 6+ (Table 1.3), with a mean L1 of 8.2cm. Nine age classes of roach were present, ranging from 1+ to 9+, with a mean L1 of 3.4cm (Table 1.4).

Six age classes of perch were present, ranging from 0+ to 9+, with a mean L1 of 6.4cm (Table 1.5). The dominant age class was 0+ and ranged in length from 4cm to 6cm (Fig. 1.6). The single pike recorded was aged 7+.

Table 1.3. Mean (\pm SE) brown trout length at age for Lough Cullin, July 2009

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean	8.2 (0.5)	16.9 (0.8)	26.4 (1.4)	31.4	44.1	49.8
N	13	11	4	1	1	1
Range	4.2-10.5	13.2-21.9	24.0-30.1	31.4-31.4	44.1-44.1	49.8-49.8

Table 1.4. Mean (\pm SE) roach length at age for Lough Cullin, July 2009

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉
Mean	3.4	7.7	12.7	17.3	19.8	21.9	23.7	26.4	27.4
	(0.0)	(0.1)	(0.2)	(0.3)	(0.3)	(0.3)	(0.5)	(0.7)	(2.2)
N	118	117	100	76	68	50	25	8	2
Range	2.1-5.3	4.6-10.7	6.9-17.6	12.2-22.8	14.7-24.6	17.6-26.8	19.9-28.3	23.0-29.1	25.1-29.5

Table 1.5. Mean (\pm SE) perch length at age for Lough Cullin, July 2009

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉
Mean	6.4 (0.3)	10.8 (0.6)	16.4 (0.8)	18.3 (0.5)	21.0	22.8	24.0	27.1	28.2
N	21	9	4	2	1	1	1	1	1
Range	4.4-8.7	8.4-13.6	14.7- 18.6	17.8- 18.7	21.0- 21.0	22.8- 22.8	24.0- 24.0	27.1- 27.1	28.2- 28.2

1.4 Summary

Roach was the dominant species in terms of both abundance (CPUE) and biomass (BPUE).

Although Lough Cullin exhibited a lower mean brown trout CPUE than Lough Carra and a higher mean CPUE than Loughs Arrow, Mask and Derg, these differences were not statistically significant. Brown trout ranged in age from 1+ to 6+ indicating reproductive success in the last number of years.

Although Lough Cullin exhibited a lower mean perch CPUE than Lough Arrow, this was not statistically significant. The dominant age class of perch was 0+, with ages ranging from 0+ to 9+, indicating reproductive success in each of the previous number of years.

The mean roach CPUE in Lough Cullin was significantly higher than Lough Derg and Lough Mask. Roach ranged in age from 1+ to 9+, indicating reproductive success in each of the previous number of 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 Cullin 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 Cullin 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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