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Sampling Fish for the Water Framework Directive

Lakes 2012

Lough Cullaun

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Cullaun, August 2012

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

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1.1 Introduction

Lough Cullaun is located approximately 4km from Corrofin, Co.Clare and forms part of the "East Burren Complex" Special Area of Conservation (NPWS, 2001) (Plate 1.1, Fig. 1.1). 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 (ShIRBD, 2009). It is primarily a coarse fishery (ShIRBD, 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 (ShIRBD, 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).

The lake was previously surveyed in August 2009 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2010). During this survey, perch were found to be the dominant species present in the lake. Brown trout, rudd, pike and eels were also captured during the survey.

Plate 1.1. Lough Cullaun

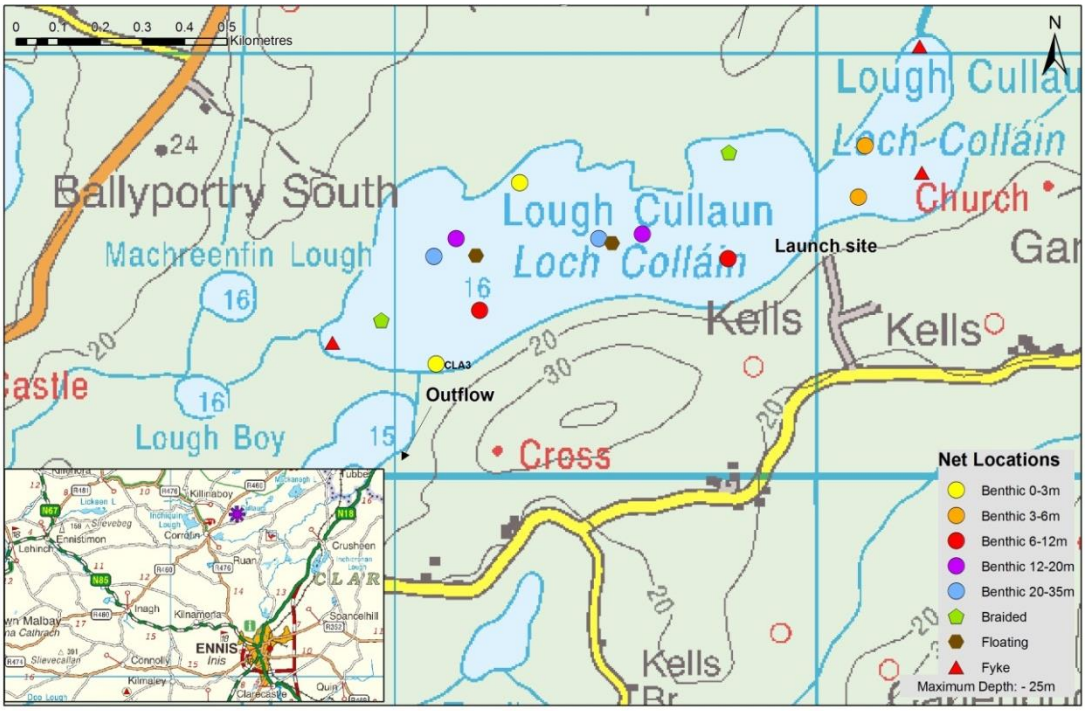

Fig. 1.1. Location map of Lough Cullaun showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Cullaun was surveyed over two nights between the 21st and the 23rd of August 2012. 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 @ 12-19.9m 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. Nets were deployed in the same locations as were randomly selected in the previous survey in 2009. 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 2012, with 175 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded, followed by rudd, pike brown trout and eels. A similar species composition was recorded during the previous survey in 2009. For information regarding the previous 2009 survey refer to Kelly *et al.*, 2010.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Cullaun, August 2012

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
Salmo trutta	Brown trout	1	0	0	0	1
Perca fluviatilis	Perch	139	0	0	0	139
Scardinius erythropthalmus	Rudd	0	0	21	0	21
Esox lucius	Pike	5	0	0	2	7
Anguilla anguilla	European eel	0	0	0	7	7

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 2009 and 2012 are summarised in Table 1.2. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2 and 1.3.

The mean brown trout CPUE and BPUE recorded in 2012 and 2009 were similar with only one fish being recorded therefore no statistics could be carried out between years (Fig. 1.2 and Fig. 1.3).

The differences in the mean brown trout CPUE and BPUE between Lough Cullaun and six similar lakes was assessed, with an overall significant difference being found (Kruskal-Wallis, $P<0.05$) (Fig. 1.4 and Fig. 1.5). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Cullaun had a significantly lower mean brown trout CPUE and BPUE than Lough Carra ($z = 2.029$, $P<0.05$ and $z = 2.06$, $P<0.05$).

The mean perch CPUE was also lower in 2012 than in 2009, however this difference was not statistically significant (Fig. 1.2).

The differences in the mean perch CPUE and BPUE between Lough Cullaun and three similar lakes was assessed, with no overall significant differences being found (Fig. 1.6 and Fig. 1.7).

Although the mean perch BPUE also appeared higher in 2012 than in 2009, this difference was not statistically significant (Fig. 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Cullaun, 2009 and 2012

Scientific name	Common name	2009	2012
		Mean CPUE	
Salmo trutta	Brown trout	0.002 (0.002)	0.002 (0.002)
Perca fluviatilis	Perch	0.460 (0.237)	0.273 (0.131)
Scardinius erythropthalmus	Rudd	0.014 (0.010)	0.041 (0.029)
Esox lucius	Pike	0.007 (0.003)	0.012 (0.007)
Anguilla anguilla	European eel	0.122 (0.068)	0.039 (0.015)
		Mean BPUE	
Salmo trutta	Brown trout	1.216 (1.216)	0.373 (0.373)
Perca fluviatilis	Perch	6.539 (2.758)	9.000 (4.959)
Scardinius erythropthalmus	Rudd	0.694 (0.694)	1.260 (0.877)
Esox lucius	Pike	4.347 (3.746)	0.422 (0.211)
Anguilla anguilla	European eel	25.433 (13.613)	8.550 (3.438)

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

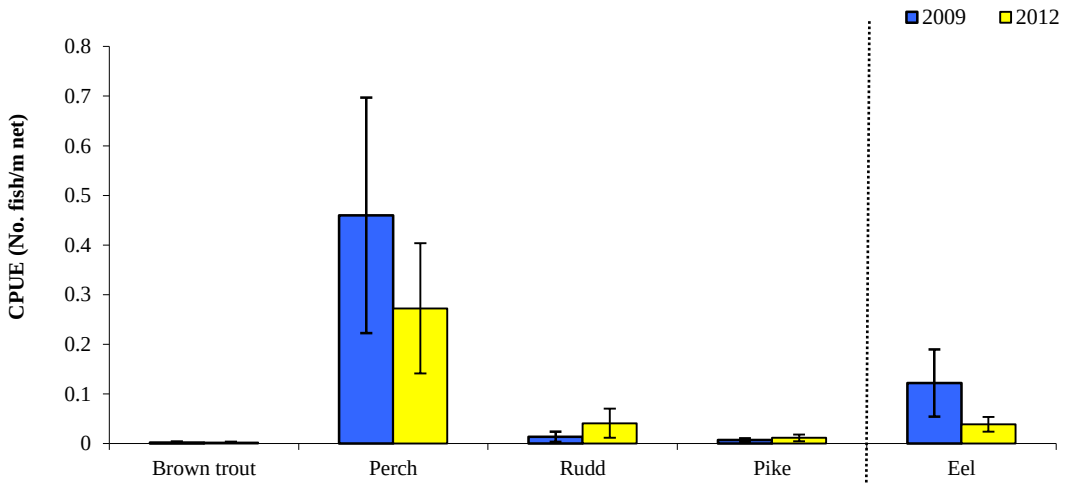

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Cullaun (Eel CPUE based on fyke nets only), 2009 and 2012

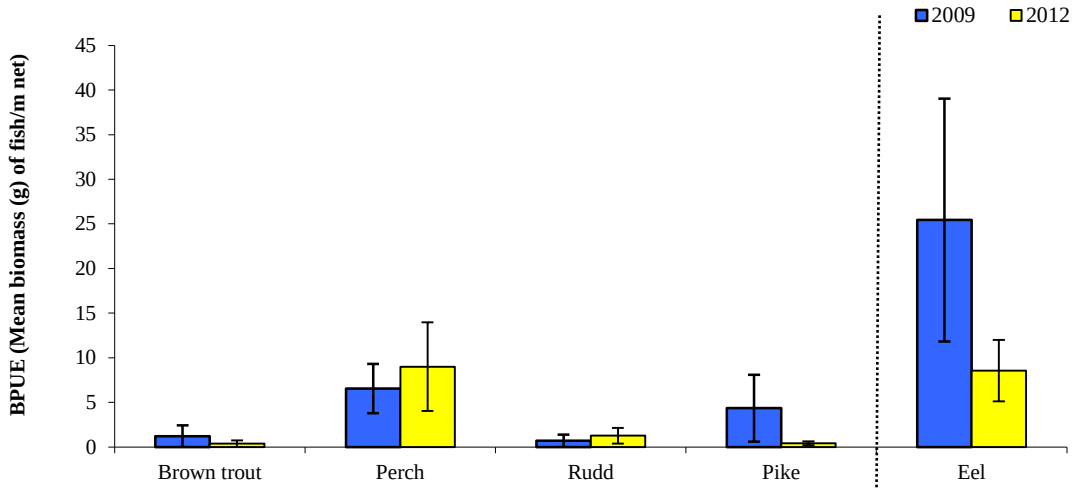

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Cullaun (Eel BPUE based on fyke nets only), 2009 and 2012

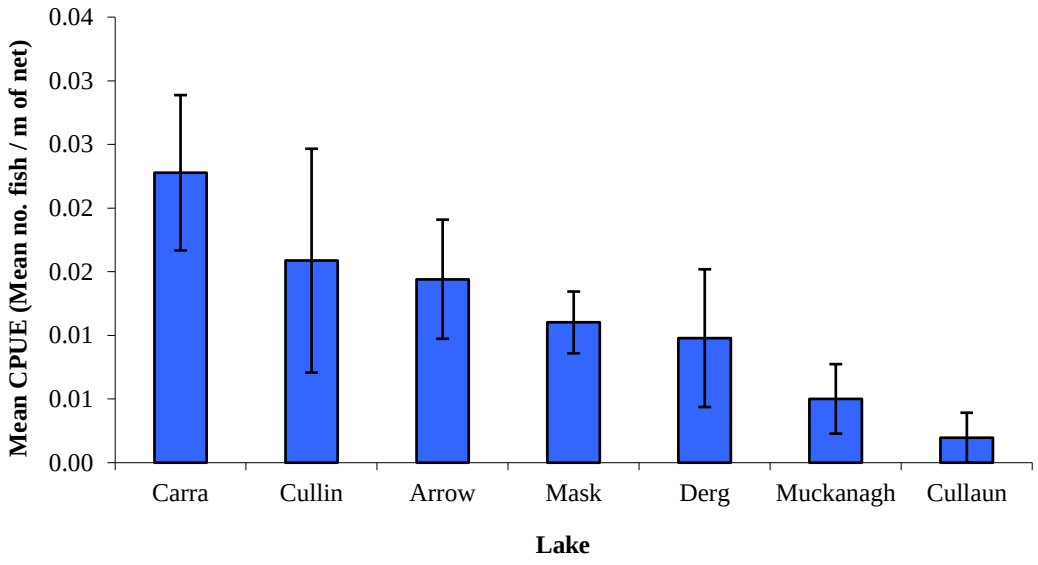

Fig. 1.4. Mean (±S.E.) brown trout CPUE in seven lakes surveyed during 2012

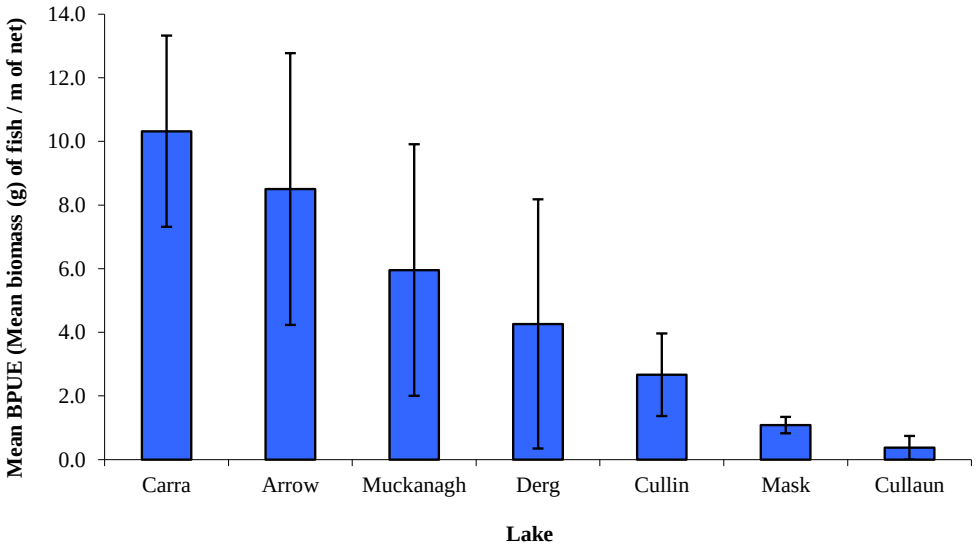

Fig. 1.5. Mean (±S.E.) brown trout BPUE in seven lakes surveyed during 2012

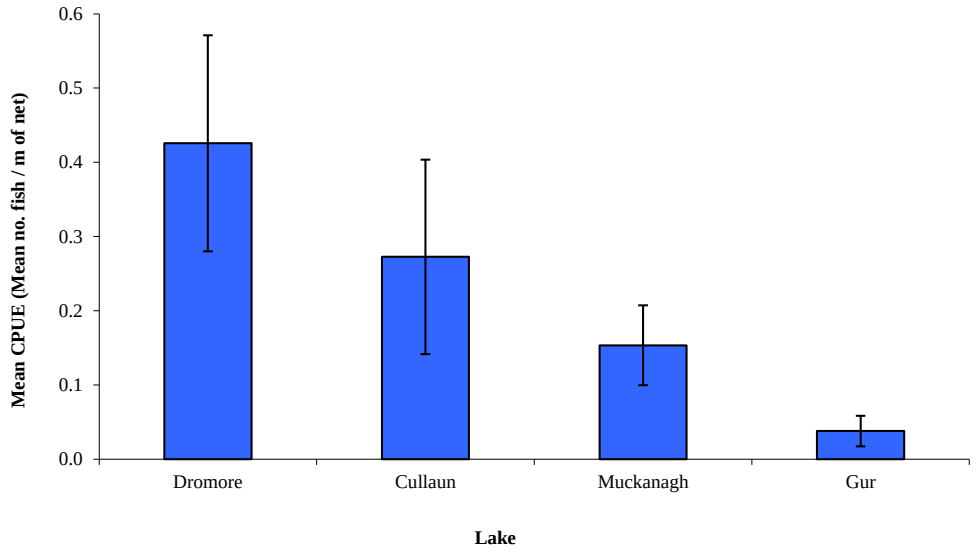

Fig. 1.6. Mean (±S.E.) perch CPUE in four lakes surveyed during 2012

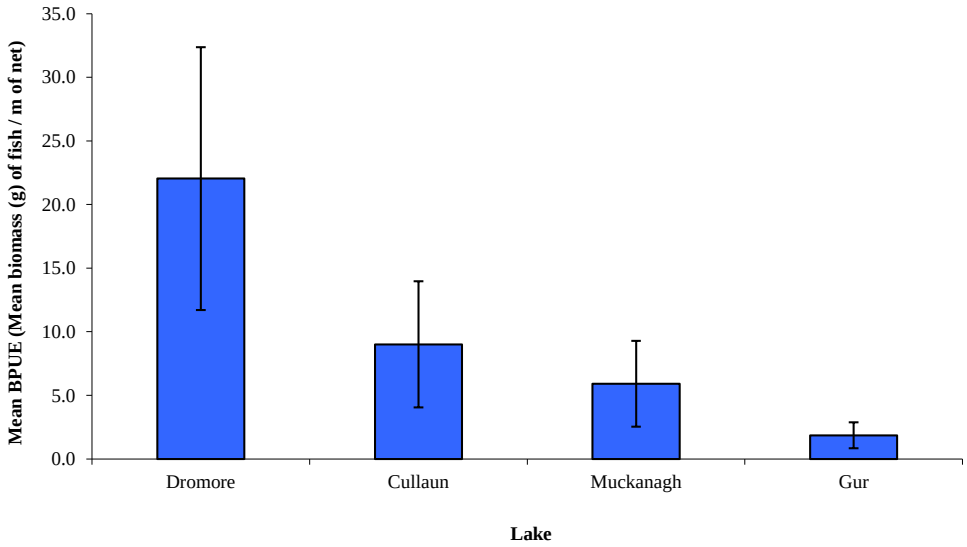

Fig. 1.7. Mean (±S.E.) perch BPUE in four lakes surveyed during 2012

1.3.3 Length frequency distributions

One brown trout was captured during the 2012 survey at a length of 24.3cm. One brown trout was also captured during the 2009 survey at a length of 33.3cm.

Perch captured during the 2012 survey ranged in length from 4.1cm to 26.3cm (mean = 9.6cm) (Fig. 1.8). Perch captured during the 2009 survey ranged in length from 4.5cm to 23.5cm (Fig. 1.8).

Eels captured during the 2012 survey ranged in length from 35.5cm to 58.1cm, pike ranged in length from 12.1cm to 25.4cm and rudd ranged in length from 5.5cm to 22.9cm.

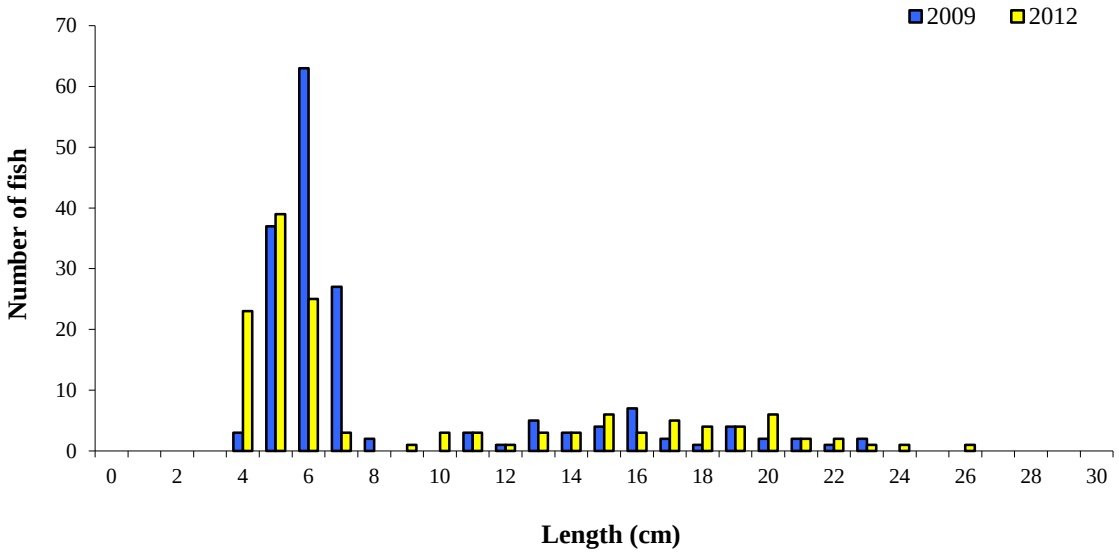

Fig. 1.8. Length frequency of perch captured on Lough Cullaun, 2009 and 2012

1.3.4 Fish age and growth

Six age classes of perch were present, ranging from 1+ to 6+, with a mean L1 of 6.2cm (Table 1.3). The dominant age class was 1+ (Fig. 1.8). In the 2009 survey, perch ranged from 0+ to 5+ with a mean L1 of 7.0cm.

Six age classes of rudd were present, ranging from 0+ to 5+, with a mean L1 of 2.1cm (Table 1.4). In the 2009 survey, rudd ranged from 1+ to 3+ with a mean L1 of 3.6cm.

One brown trout was aged at 2+.

Table 1.3. Mean (±SE) perch length (cm) at age for Lough Cullaun, August 2012

	L_1	L_2	L_3	L_4	L_5	L_6
Mean	6.2 (0.1)	12.3 (0.3)	16.5 (0.3)	19.0 (0.5)	21.5 (0.7)	23.4 (2.4)
N	64	38	32	11	7	2
Range	3.7-8.6	8.9-16.8	12.1-20.2	16.8-21.9	19.9-24.0	21.1-25.8

Table 1.4. Mean (±SE) rudd length (cm) at age for Lough Cullaun, August 2012

	L_1	L_2	L_3	L_4	L_5
Mean	2.1 (0.1)	5.6 (0.4)	9.6 (0.8)	15.7 (0.5)	20.6 (0)
N	19	12	5	2	1
Range	1.4-3.6	4.1-8.5	8.1-12.7	15.2-16.1	20.6

1.4 Summary

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

The mean brown trout CPUE and BPUE in Lough Cullaun was significantly lower than Lough Carra, another similar lake surveyed. The brown trout captured was aged at 2+, indicating reproductive success in one of the previous three years.

The mean perch CPUE and BPUE in Lough Cullaun were slightly different in 2012 than in the 2009 survey, however these differences were not statistically significant. The mean perch CPUE in Lough Cullaun was similar to three other similar lakes assessed during 2012, with no statistically significant differences being found between lakes. Perch ranged in age from 1+ to 6+, indicating reproductive success in six of the previous seven 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 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 Cullaun has been assigned an ecological status of High based on the fish populations present in 2012. The ecological status assigned to the lake based on the 2009 survey data was also High.

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