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Sampling Fish for the Water Framework Directive

Lakes 2014

Lough Corrib

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Water Framework Directive Fish Stock Survey of Lough Corrib, June 2014

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

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1.1 Introduction

Lough Corrib the second largest lake in Ireland (after Lough Neagh), is situated in Co. Galway in the River Corrib catchment (Plates 1.1 and 1.2). The lake stretches from outside Galway city to within three kilometers of Maam Cross, a distance of over 50 kilometers (Figs. 1.1 and 1.2). The main rivers draining into Lough Corrib include the Black, Clare, Dooghta, Cregg, Owenriff rivers and the Cong canal which joins Lough Corrib to Lough Mask. The lake can be divided into two parts; Lower Lough Corrib - a relatively shallow basin underlain by carboniferous limestone in the south (Fig. 1.1), and Upper Lough Corrib - a larger, deeper basin underlain by more acidic granite, schists, shales and sandstones to the north (Fig. 1.2) (NPWS, 2004). The lake has a surface area of 16,562Ha (5,042ha Lower Lough and 11,520ha Upper Lough), and has a maximum depth of 42m. The lower lake is categorised as typology class 10 (as designated by the EPA for the Water Framework Directive), i.e. shallow (mean depth <4m), greater than 50ha and high alkalinity (>100mg/l $CaCO_3$) and the upper lake fits into typology class 12, i.e. deep (mean depth >4m), greater than 50ha and high alkalinity (>100mg/l $CaCO_3$). The lake supports 14 protected habitats and six species, including salmon that are listed on Annex I and Annex II respectively of the EU Habitats Directive (NPWS, 2004).

Lough Corrib is one of the best game fisheries in the world and is internationally renowned for its brown trout fishing. The lake is known to hold brown trout, salmon, perch, roach, bream, roach x bream hybrids, eels, 3-spined stickleback and pike.

Unfortunately roach a non-native invasive fish species was first identified in Lower Lough Corrib in the early 1980s and subsequently spread to all corners of the lake. High numbers of roach were observed in routine netting operations on the lake from the late 1980s until 1992 when a decline in the stock was observed (O' Grady, 1996). In early 2007, large numbers of the protozoan parasite *Cryptosporidium* sp. were detected in water from the lake, leading to contamination of the public water supply and an outbreak of cryptosporidiosis in Galway city. Another unwelcome visitor to the lake is the highly invasive plant species *Lagarosiphon major* (also known as "Curly Waterweed") which was first identified in the lake in 2005. This rapidly colonizing plant has already excluded native plant species from bays in which it has become established. The Zebra mussel (*Dreissena polymorpha*), another invasive species in Ireland was first recorded in Lough Corrib during 2007 and it is thought they were introduced to the lake in 2000/2001.

Lough Corrib has been included in Inland Fisheries Irelands long term water quality monitoring programme of lake ecosystems since 1975. The lake is currently classified as mesotrophic (Tierney *et al*., 2011).

The lake was previously surveyed to assess its fish stocks by Inland Fisheries Ireland (formerly the Central Fisheries Board and the Western Regional Fisheries Board) in 1986 and 1996 (O' Grady,

1986; O' Grady *et al*, 1996). The lake was also surveyed in 2008 and 2011 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2009 and Kelly *et al*., 2012a). During the 2011 survey, roach followed by perch were found to be the dominant species present in the lake. Brown trout, salmon, sea lamprey, pike, bream, roach x bream hybrids and eels were also captured during the survey.

This report summarises the results of the 2014 fish stock survey carried out on the lake, as part of the Water Framework Directive surveillance monitoring programme.

Plate 1.1. Lower Lough Corrib west shore (near L. Kip river) (Photo courtesy of IFI and No. 3 Operational Wing, Irish Air Corps (Aer Chór na hÉireann))

Plate 1.2. Upper Lough Corrib

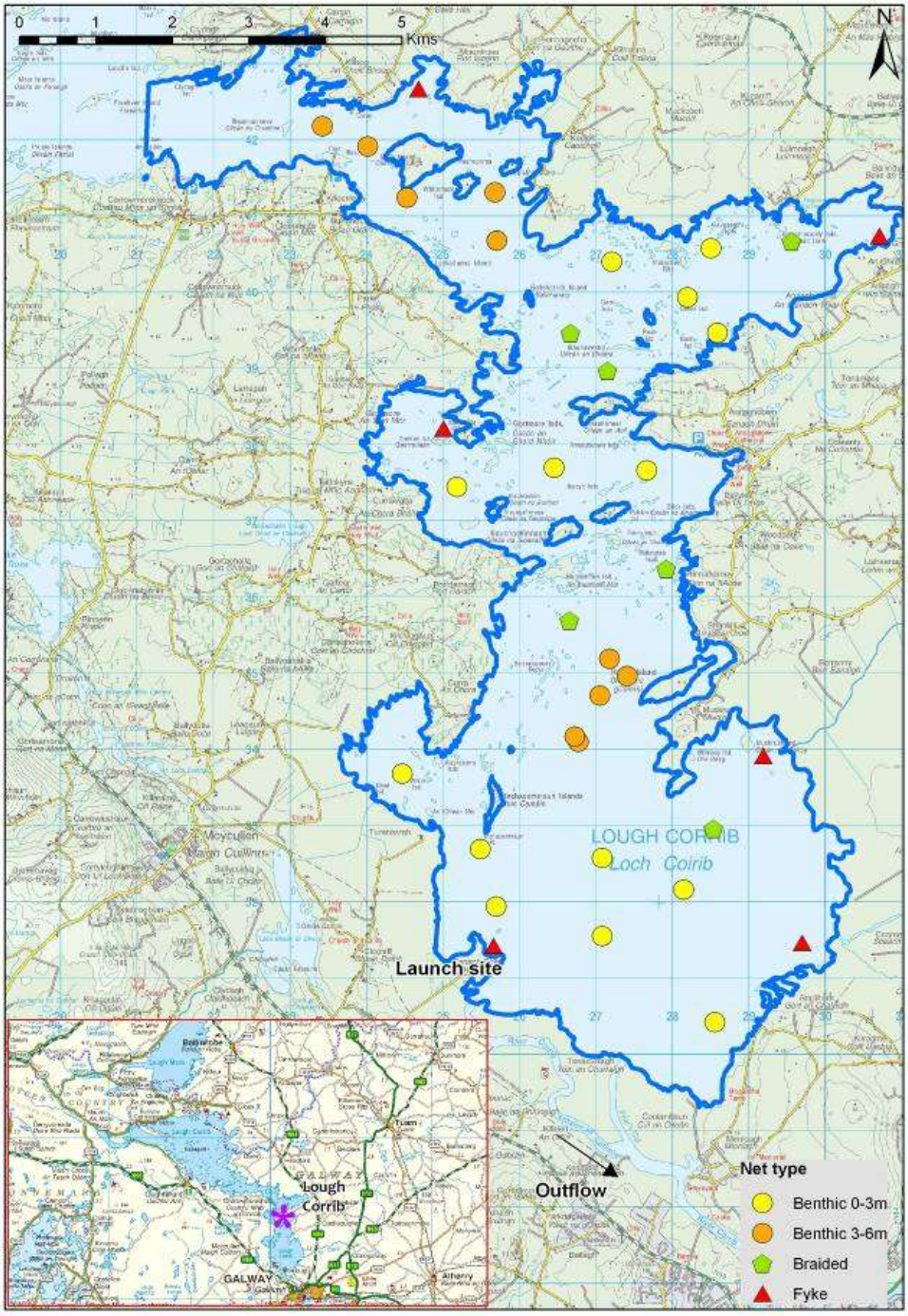

Fig. 1.1. Location map of Lower Lough Corrib showing locations and depths of each net (outflow is indicated on map)

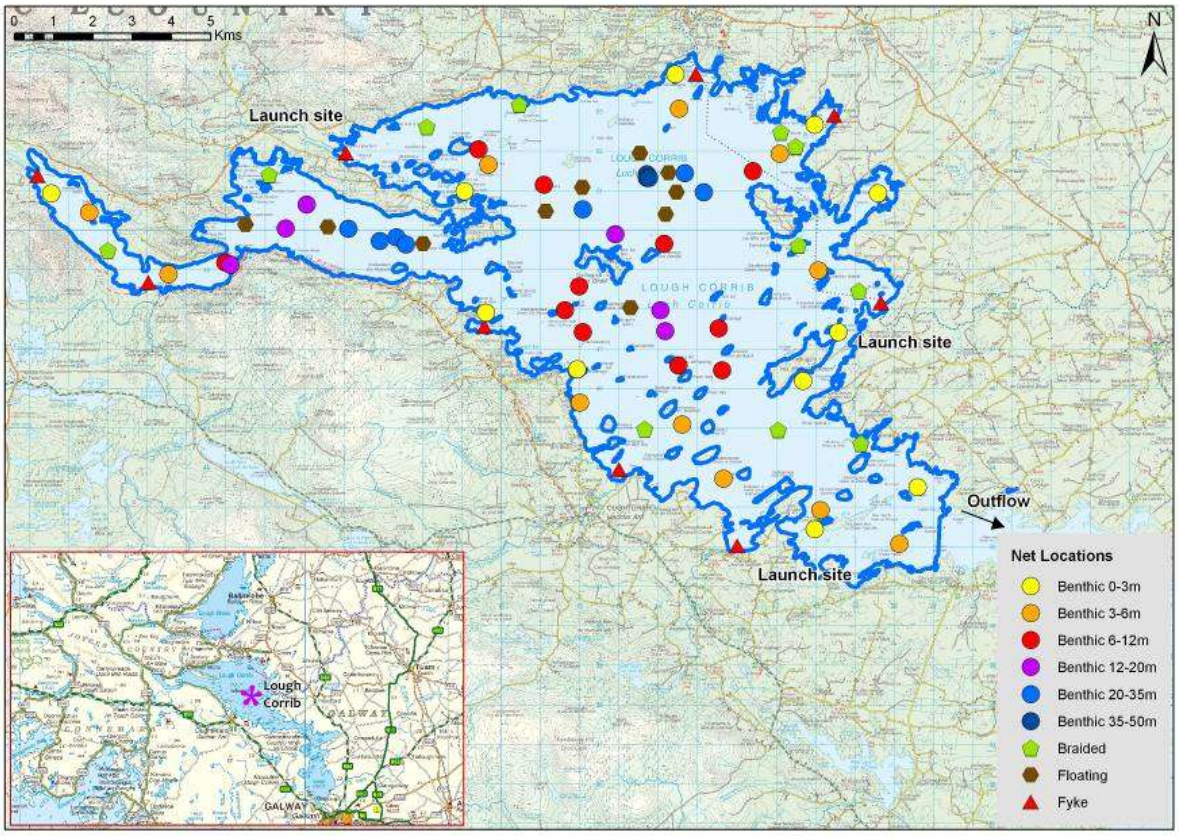

Fig. 1.2. Location map of Upper Lough Corrib showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lower Lough Corrib was surveyed over three nights between the 9th and the 12th of June 2014. A total of six sets of Dutch fyke nets and 24 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (14 @ 0-2.9m and 10 @ 3-5.9m) were deployed in the lake (30 sites). The netting effort was supplemented using six benthic braided survey gill nets (62.5mm mesh knot to knot) at six additional sites.

Upper Lough Corrib was surveyed over five nights between the 11th and the 19th of June 2014. A total of nine sets of Dutch fyke nets, 49 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (11 @ 0-2.9m, 11 @ 3-5.9m, 11 @ 6-11.9m, 6 @ 12-19.9m, 7 @ 20-34.9m and 3 @ 35-49.9m) and ten floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (68 sites). The netting effort was supplemented using 11 benthic braided survey gill nets (62.5mm mesh knot to knot) at 11 additional sites.

Nets were deployed in the same locations as were randomly selected in the previous surveys in 2008 and 2011. 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 brown trout, salmon, roach, pike, bream, tench and roach x bream hybrids. 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 eleven fish species and one type of hybrid were recorded in Lower and Upper Lough Corrib in June 2014, with 1006 fish being captured. The number of each species captured by each gear type is shown in Tables 1.1 and 1.2. Roach was the most abundant fish species recorded on Lower Lough Corrib and perch was the most abundant fish species recorded on Upper Lough Corrib (Tables 1.1 and 1.2). During the previous surveys in 2008 and 2011 the same species composition was recorded with the exception of salmon, which were not recorded during the 2008 survey. Rudd, stone loach and nine-spined stickleback were only recorded in the 2014 survey. Sea lamprey, tench and roach x rudd hybrids were only recorded in 2011.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lower Lough Corrib, June 2014

Scientific name	Common name	Number of fish captured				
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
Rutilus rutilus	Roach	201	0	0	1	202
Perca fluviatilis	Perch	113	0	0	1	114
Salmo trutta	Brown trout	16	0	7	0	23
Gasterosteus aculeatus	3-spined stickleback	12	0	0	2	14
Esox lucius	Pike	9	0	2	1	12
Rutilus rutilus x Abramis brama	Roach x Bream	3	0	3	0	6
Salmo salar	Salmon	0	0	2	0	2
Pungitius pungitius	9-spined stickleback	2	0	0	0	2
Scardinius erythrophthalmus	Rudd	1	0	0	0	1
Barbatula barbatula	Stone loach	1	0	0	0	1
Anguilla anguilla	Eel	0	0	0	8	8

Table 1.2. Number of each fish species captured by each gear type during the survey on Upper Lough Corrib, June 2014

Scientific name	Common name	Number of fish captured				
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	Total
Perca fluviatilis	Perch	392	0	0	5	397
Rutilus rutilus	Roach	85	1	0	3	89
Salmo trutta	Brown trout	20	2	1	0	23
Rutilus rutilus x Abramis brama	Roach x Bream	7	0	4	0	11
Esox lucius	Pike	3	0	1	1	5
Salmo salar	Salmon	1	0	1	0	2
Abramis brama	Bream	1	0	0	0	1
Gasterosteus aculeatus	3-spined stickleback	1	0	0	0	1
Anguilla anguilla	Eel	1	0	0	91	92

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 the 2008, 2011 and 2014 surveys on Lower Lough Corrib and Upper Lough Corrib are summarised in Table 1.2 and 1.3. Mean CPUE and BPUE for all species is illustrated in Figures 1.2, 1.3, 1.4 and 1.5.

On Lower Lough Corrib roach was the dominant species in terms of abundance (CPUE) and brown trout was the dominant species in terms of biomass (BPUE). There was no difference in the mean brown trout CPUE across the sampling occasions; however, the mean brown trout BPUE was significantly higher in 2014 than in 2008 (Kruskal-Wallis $H=3.8$, $P<0.05$) (Table 1.2; Fig 1.2 and 1.3). The mean roach CPUE and BPUE was significantly lower in 2014 than in 2008 (Kruskal-Wallis $H=12.8$, $P<0.001$ and $H=16.7$, $P<0.001$ respectively) (Table 1.2 and 1.3; Fig 1.2 to 1.5). The mean perch CPUE was significantly higher in 2014 than in 2011 (Kruskal-Wallis $H=8.8$, $P<0.01$) (Table 1.2; Fig 1.2 and 1.3), but there was no difference in the mean perch BPUE in 2014 in comparison to the other sampling occasions.

On Upper Lough Corrib perch were the dominant species in terms of abundance (CPUE) and biomass (BPUE). Although the mean brown trout CPUE and BPUE fluctuated slightly between the three sampling occasions, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3). The mean roach BPUE was significantly lower in 2014 than in 2008 and 2011 (Kruskal-Wallis $H=8.7$, $P<0.01$) (Table 1.2 and 1.3; Fig 1.2 to 1.5), but there was no difference in the mean roach CPUE across the sampling occasions. The mean perch CPUE was significantly lower in 2014 than in 2008 and significantly higher in 2014 than in 2011 (Kruskal-Wallis $H=13.0$, $P<0.001$) (Table 1.2 and

1.3; Fig 1.2 to 1.5); however, there was no difference in the mean perch BPUE across the sampling occasions.

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lower Lough Corrib, 2008, 2011 and 2014

Scientific name	Common name	2008	2011	2014
			Mean CPUE	
Salmo trutta	Brown trout	0.018 (0.006)	0.017 (0.006)	0.020 (0.006)
Salmo salar	Salmon	-	0.001 (0.001)	0.002 (0.002)
Perca fluviatilis	Perch	0.263 (0.077)	0.054 (0.017)	0.105 (0.021)
Rutilus rutilus	Roach	0.253 (0.045)	0.061 (0.016)	0.186 (0.079)
Esox lucius	Pike	0.015 (0.004)	0.007 (0.003)	0.011 (0.003)
Abramis brama	Bream	0.001 (0.001)	0.001 (0.001)	-
Scardinius erythrophthalmus	Rudd	-	-	0.003 (0.001)
Rutilus rutilus x Abramis brama	Roach x Bream	0.007 (0.002)	0.017 (0.006)	0.0009 (0.0009)
Petromyzon marinus	Sea lamprey	-	0.001 (0.001)	
Gasterosteus aculeatus	3-spined stickleback	0.002 (0.001)	-	0.012 (0.009)
Pungitius pungitius	9-spined stickleback	-	-	0.002 (0.001)
Barbatula barbatula	Stone loach	-	-	0.0009 (0.0009)
Anguilla anguilla	Eel	0.016 (0.011)	0.058 (0.023)	0.022 (0.008)
			Mean BPUE	
Salmo trutta	Brown trout	12.837 (7.604)	11.963 (8.096)	17.977 (8.566)
Salmo salar	Salmon	-	1.914 (1.899)	5.709 (5.709)
Perca fluviatilis	Perch	18.528 (5.751)	4.575 (1.861)	3.504 (0.845)
Rutilus rutilus	Roach	21.849 (3.488)	3.698 (1.543)	4.190 (1.672)
Esox lucius	Pike	31.142 (14.817)	15.412 (10.732)	10.603 (5.488)
Abramis brama	Bream	2.171 (2.171)	0.343 (0.343)	
Scardinius erythrophthalmus	Rudd	-	-	0.872 (5.524)
Rutilus rutilus x Abramis brama	Roach x Bream	2.58 (1.558)	13.754 (6.2)	0.287 (0.287)
Petromyzon marinus	Sea lamprey	-	0.361 (0.361)	
Gasterosteus aculeatus	3-spined stickleback	0.009 (0.006)	-	0.009 (0.007)
Pungitius pungitius	9-spined stickleback	-	-	0.005 (0.004)
Barbatula barbatula	Stone loach	-	-	0.0004 (0.0004)
Anguilla anguilla	Eel	0.816 (0.584)	13.879 (4.667)	5.233 (2.641)

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

*Eel CPUE and BPUE based on fyke nets only

Table 1.3. Mean (S.E.) CPUE and BPUE for all fish species captured on Upper Lough Corrib, 2008, 2011 and 2014

Scientific name	Common name	2008	2011	2014
			Mean CPUE	
Salmo trutta	Brown trout	0.009 (0.002)	0.003 (0.001)	0.008 (0.002)
Salmo salar	Salmon	-	-	0.001 (0.001)
Perca fluviatilis	Perch	0.292 (0.049)	0.068 (0.012)	0.166 (0.035)
Rutilus rutilus	Roach	0.120 (0.020)	0.082 (0.016)	0.036 (0.010)
Esox lucius	Pike	0.003 (0.001)	0.003 (0.001)	0.002 (0.001)
Abramis brama	Bream	0.008 (0.003)	0.003 (0.002)	0.019 (0.013)
Tinca tinca	Tench	-	0.0002 (0.0002)	-
Rutilus rutilus x Abramis brama	Roach x Bream	0.014 (0.004)	0.01 (0.003)	0.0004 (0.0004)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x Rudd	-	0.0004 (0.0004)	-
Gasterosteus aculeatus	3-spined stickleback	0.001 (0.001)	0.0008 (0.0005)	0.0004 (0.0004)
Anguilla anguilla	Eel	0.005 (0.003)	0.092 (0.036)	0.168 (0.106)
			Mean BPUE	
Salmo trutta	Brown trout	8.877 (3.236)	0.795 (0.525)	6.477 (2.641)
Salmo salar	Salmon	-	-	1.442 (1.436)
Perca fluviatilis	Perch	22.6 (4.563)	5.062 (1.072)	9.008 (2.271)
Rutilus rutilus	Roach	18.739 (3.457)	15.197 (3.324)	7.141 (2.244)
Esox lucius	Pike	7.964 (4.273)	5.552 (3.997)	1.352 (1.282)
Abramis brama	Bream	5.131 (1.926)	3.661 (2.272)	5.074 (3.413)
Tinca tinca	Tench	-	0.052 (0.052)	-
Rutilus rutilus x Abramis brama	Roach x Bream	8.545 (3.027)	9.258 (3.497)	0.995 (0.995)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x Rudd	-	0.147 (0.147)	-
Gasterosteus aculeatus	3-spined stickleback	0.003 (0.002)	0.001 (0.0004)	0.0002 (0.0002)
Anguilla anguilla	Eel	1.361 (0.736)	21.823 (9.158)	43.584 (28.056)

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

*Eel CPUE and BPUE based on fyke nets only

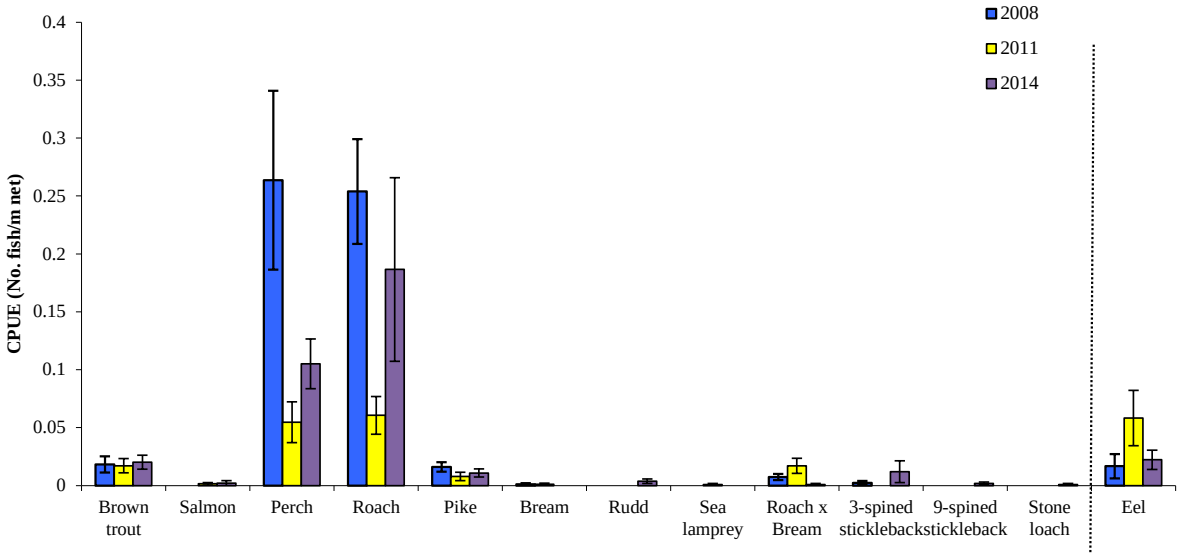

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lower Lough Corrib (Eel CPUE based on fyke nets only), 2008, 2011 and 2014

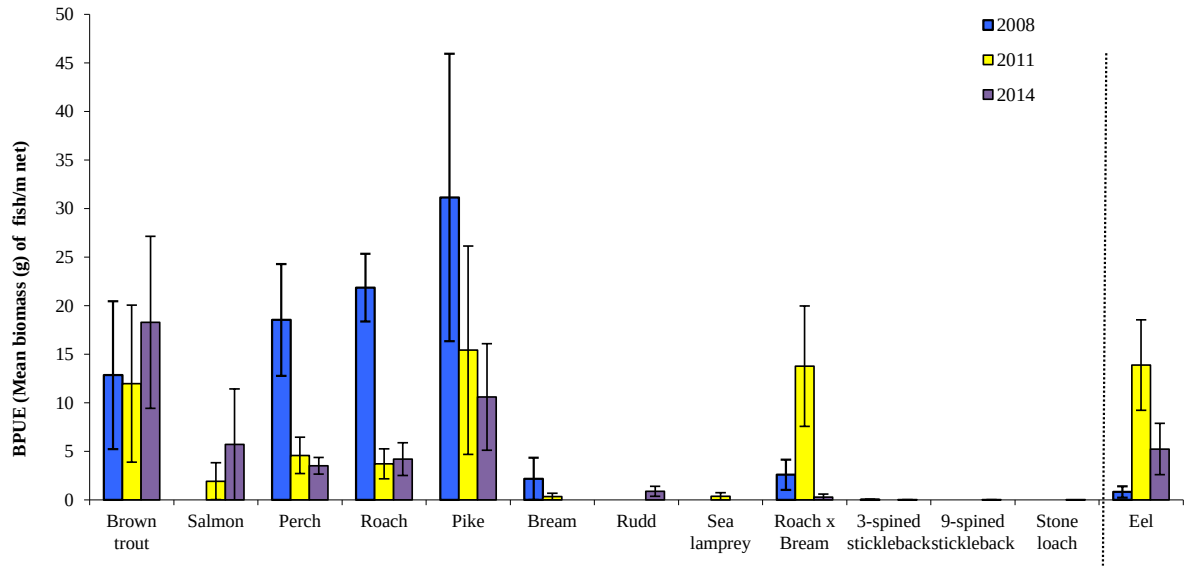

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lower Lough Corrib (Eel BPUE based on fyke nets only), 2008, 2011 and 2014

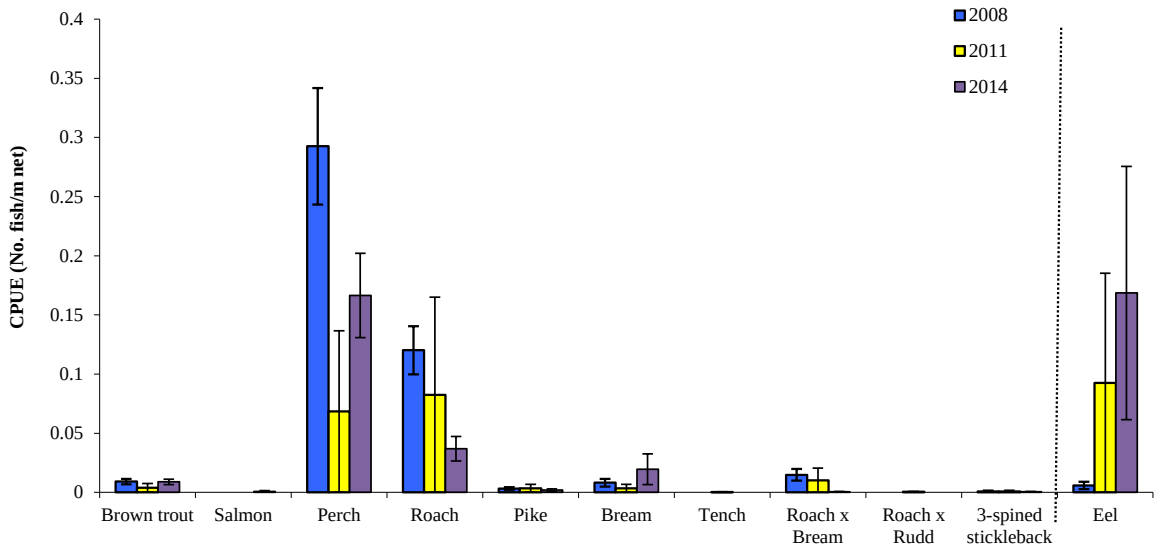

Fig. 1.4. Mean (±S.E.) CPUE for all fish species captured in Upper Lough Corrib (Eel CPUE based on fyke nets only), 2008, 2011 and 2014

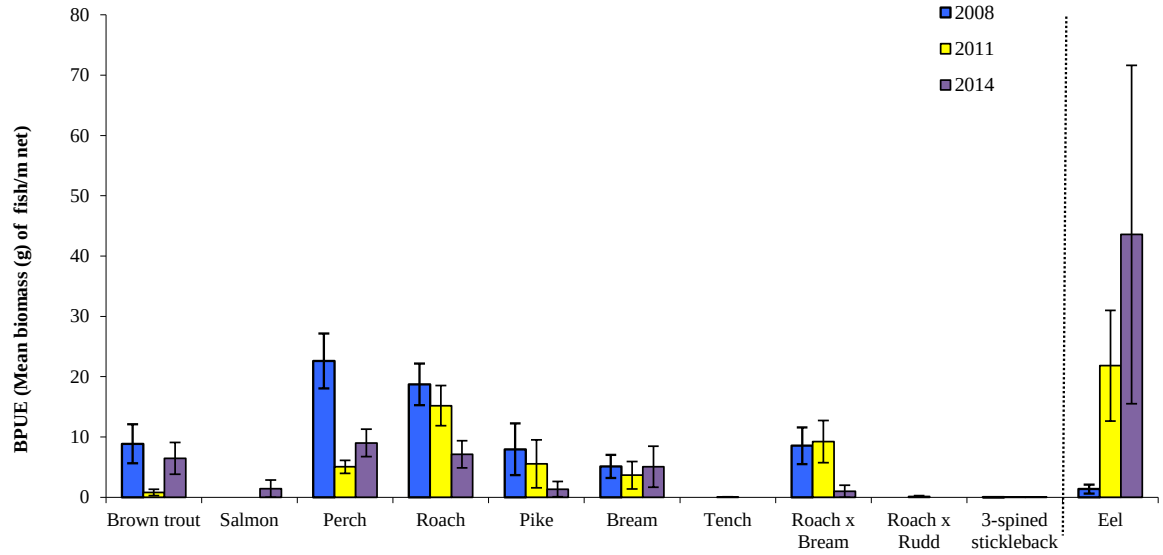

Fig. 1.5. Mean (±S.E.) BPUE for all fish species captured in Upper Lough Corrib (Eel BPUE based on fyke nets only), 2008, 2011 and 2014

1.3.3 Length frequency distributions and growth

Lower Lough Corrib:

Brown trout captured during the 2014 survey ranged in length from 16.2cm to 53.5cm (mean = 32.8cm) (Fig. 1.4) with six age classes present, ranging from 1+ to 6+, with a mean L1 of 6.0cm (Table 1.3). The dominant age class was 1+ (Fig. 1.4). Mean brown trout L4 in 2014 was 33.6cm indicating a fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971). Brown trout captured during the 2008 and 2011 surveys had a similar length range, age range and growth rate to the 2014 survey (Fig. 1.4).

Perch captured during the 2014 survey ranged in length from 7.2cm to 25.0cm (mean = 11.6cm) (Fig.1.5) with seven age classes present, ranging from 1+ to 7+, with a mean L1 of 6.7cm (Table 1.4). The dominant age class was 1+ (Fig. 1.5). Perch captured during the 2011 and 2014 surveys had similar lengths; however, perch captured during the 2008 survey had a much wider length range. Age ranges and growth rates were similar over the three sampling years; however, the dominant age class was different across sampling years (Fig.1.5).

Roach captured during the 2014 survey ranged in length from 5.1cm to 23.2cm (mean = 9.8cm) (Fig.1.6) with five age classes present, ranging from 1+ to 5+, with a mean L1 of 3.3cm (Table 1.5). The dominant age class was 2+ (Fig. 1.6). Roach captured during the 2008 and 2011 surveys had a similar length range, age range and growth rate to the 2014 survey (Fig.1.6).

Pike captured during the 2014 survey ranged in length from 16.8cm to 78.2cm, roach x bream hybrids ranged from 31.5cm to 43.5cm and eels ranged from 44.5cm to 59.8cm. Two adult salmon captured were aged 2.1+ and 2.2+ and measured 56.6cm to 69.6cm. One rudd measuring 24.0cm was captured, two nine-spined stickleback at 3.5cm and 3.6cm and one stone loach at 3.5cm. Three-spined stickleback ranged in length from 2.0cm to 4.6cm.

Upper Lough Corrib:

Brown trout captured during the 2014 survey ranged in length from 9.0cm to 71.5cm (mean = 32.7cm) (Fig. 1.7) with seven age classes present, ranging from 1+ to 8+, with a mean L1 of 6.8cm (Table 1.6). Mean brown trout L4 in 2014 was 30.9cm indicating a fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971). Brown trout captured during the 2008 and 2011 surveys had similar length ranges with some larger fish captured during the 2008 and 2014 surveys (Fig. 1.7). Age ranges and growth rates were similar over the three sampling years, with the largest age range recorded in 2014 (Fig. 1.7).

Perch captured during the 2014 survey ranged in length from 6.0cm to 30.1cm (mean = 13.5cm) (Fig.1.8) with eight age classes present, ranging from 1+ to 8+, with a mean L1 of 6.2cm (Table 1.7). The dominant age class was 1+ (Fig. 1.8). Perch captured during the 2008 and 2011 surveys had similar lengths and ages to the 2014 survey, with less age classes recorded in 2014 in comparison to 2011 (Fig.1.8).

Roach captured during the 2014 survey ranged in length from 4.8cm to 32.4cm (mean = 19.5cm) (Fig.1.9) with ten age classes present, ranging from 2+ to 11+, with a mean L1 of 2.5cm (Table 1.8). The dominant age class was 2+ (Fig. 1.9). Roach captured during the 2008 and 2011 surveys had similar lengths to the 2014 survey (Fig.1.9). Age ranges and growth rates were similar in 2008 and 2011, with the smallest age range shown in the 2011 survey, however, the dominant age class was different across sampling years (Fig.1.9).

Pike captured during the 2014 survey ranged in length from 16.2cm to 70.4cm and eels ranged from 8.8cm to 71.5cm. Two salmon captured were aged 1+ and 2.1+ and had lengths of 10.6cm and 67.0cm respectively. Roach x bream hybrids ranged in length from 30.4cm to 44.5cm. One three-spined stickleback measuring 4.4cm was recorded and one bream at 48.5cm.

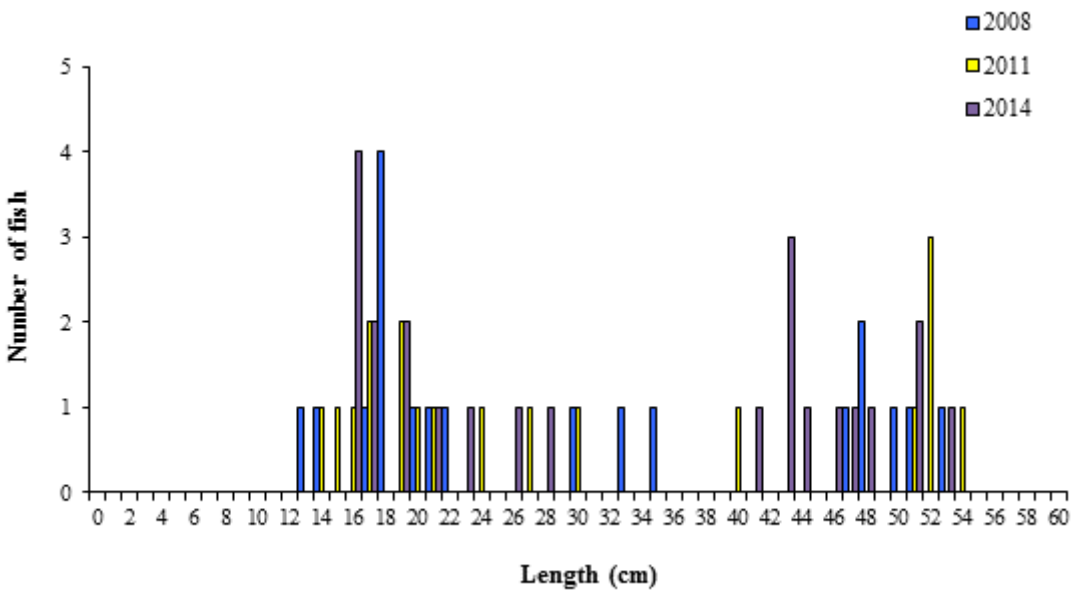

Fig. 1.4. Length frequency of brown trout captured on Lower Lough Corrib, 2008, 2011 and 2014

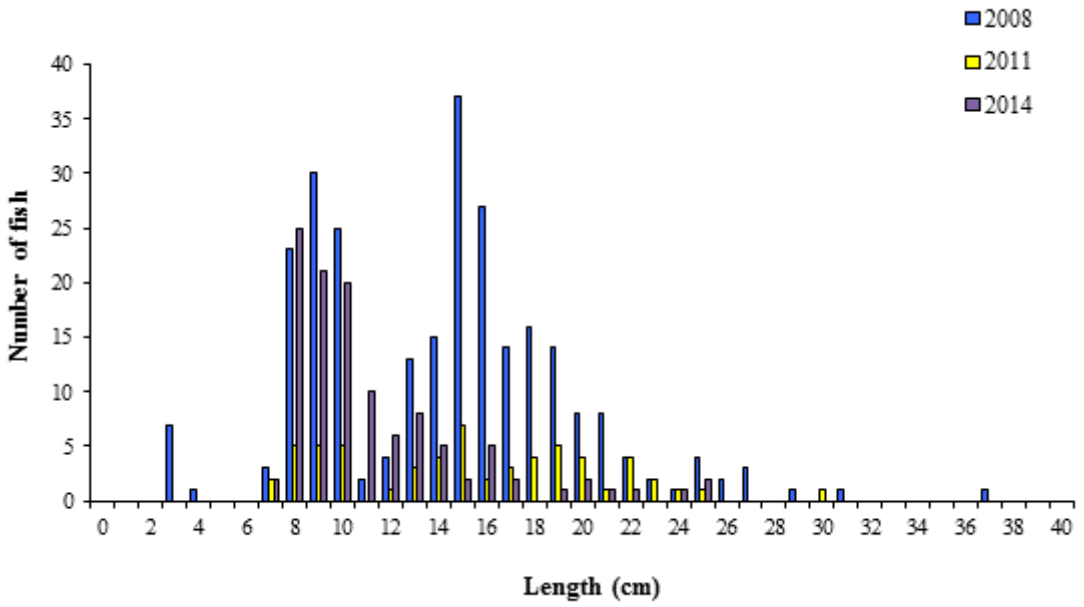

Fig. 1.5. Length frequency of perch captured on Lower Lough Corrib, 2008, 2011 and 2014

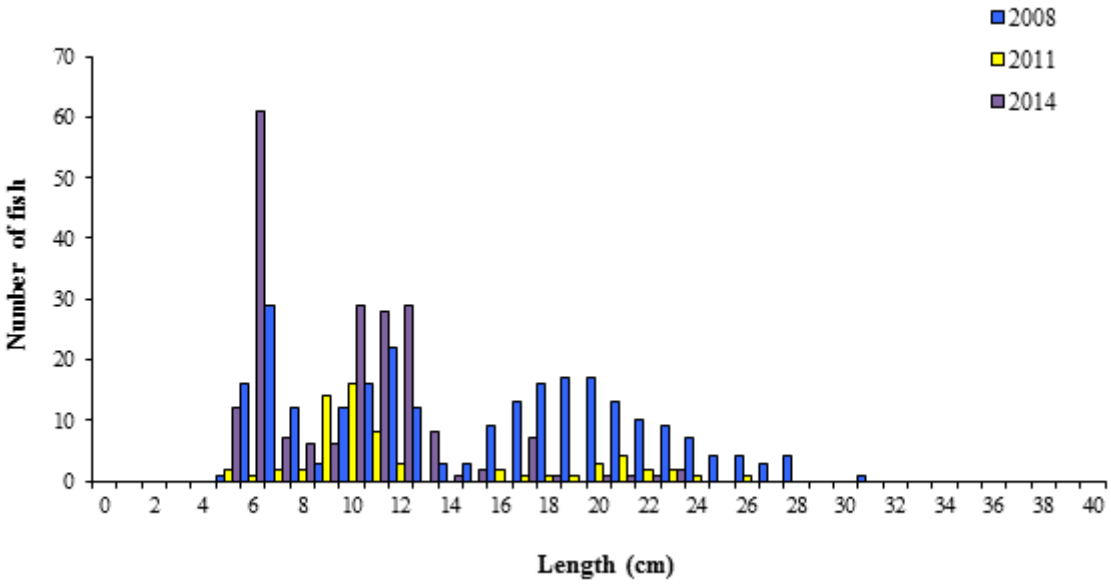

Fig. 1.6. Length frequency of roach captured on Lower Lough Corrib, 2008, 2011 and 2014

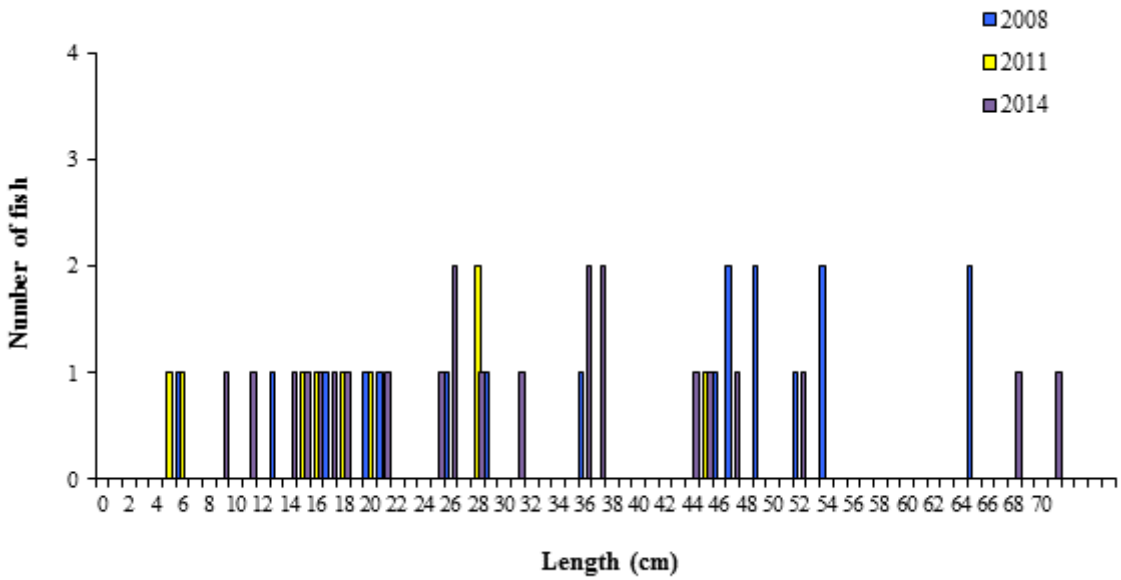

Fig. 1.7. Length frequency of brown trout captured on Upper Lough Corrib, 2008, 2011 and 2014

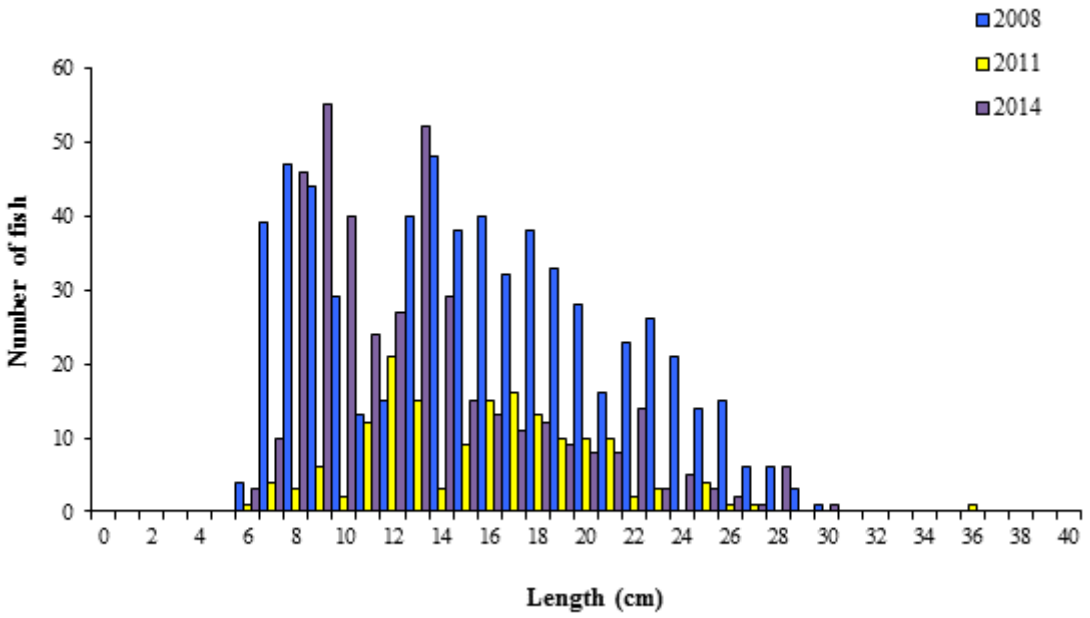

Fig. 1.8. Length frequency of perch captured on Upper Lough Corrib, 2008, 2011 and 2014

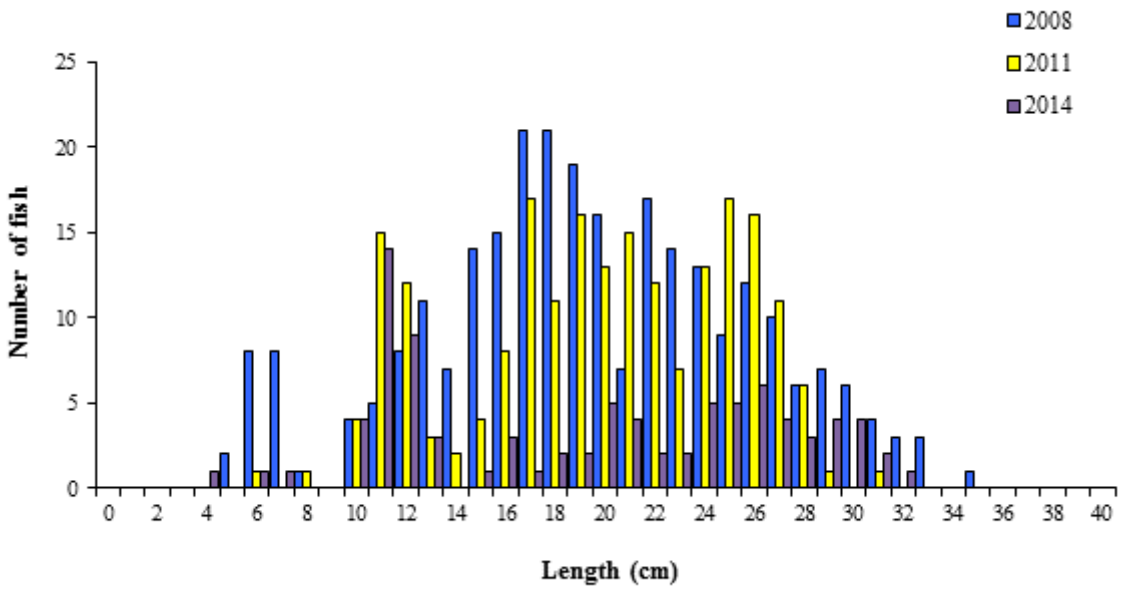

Fig. 1.9. Length frequency of roach captured on Upper Lough Corrib, 2008, 2011 and 2014

Table 1.3. Mean (±SE) brown trout length (cm) at age for Lower Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5	L_6	Growth Category
Mean	6.0 (0.4)	12.9 (1.1)	23.8 (2.1)	33.6 (2.9)	42.0 (2.3)	40.3	Fast
N	21	16	12	10	7	1	
Range	2.9-10.3	6.6-24.7	12.1-33.8	14.9-45.2	35.149.9	40.3-40.3	

Table 1.4. Mean (±SE) perch length (cm) at age for Lower Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean	6.7 (0.3)	12.3 (0.5)	17.1 (1.5)	17.1 (0.8)	19.3 (0.3)	22.0 (0.1)	24.7
N	34	18	7	4	3	2	1
Range	4.3-10.9	9.8-17.1	13.5-23.3	16.0-19.7	18.7-19.8	21.9-22.1	24.7-24.7

Table 1.5. Mean (±SE) roach length (cm) at age for Lower Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5
Mean	3.3 (0.2)	7.8 (0.4)	11.2 (0.6)	15.6 (0.6)	19.7 (1.1)
N	36	27	14	10	7
Range	1.8-5.3	4.1-11.3	8.0-17.1	12.3-17.5	15.0-22.8

Table 1.6. Mean (±SE) brown trout length (cm) at age for Upper Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	Growth Category
Mean	6.8 (0.2)	12.6 (0.5)	22.3 (0.4)	30.9 (0.8)	38.6 (1.0)	45.2 (2.6)	54.9 (3.1)	60.1 (4.5)	Fast
N	22	20	15	11	7	4	3	3	
Range	5.2-8.6	9.5-15.9	19.1-25.1	25.2-35.9	33.4-41.6	38.9-50.2	48.7-58.3	51.1-64.7	

Table 1.7. Mean (±SE) perch length (cm) at age for Upper Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8
Mean	6.2 (0.1)	11.3 (0.2)	15.7 (0.3)	19.0 (0.4)	21.9 (0.4)	24.3 (0.6)	26.8 (1.0)	24.3
N	64	50	35	26	22	13	5	1
Range	4.2-8.7	8.1-15.7	12.3-18.7	15.6-22.9	18.7-25.8	21.0-28.9	23.028.3	24.3-24.3

Table 1.8. Mean (±SE) roach length (cm) at age for Upper Lough Corrib, June 2014

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	L_{11}
Mean	2.5 (0.1)	6.1 (0.2)	9.9 (0.1)	14.0 (0.3)	17.6 (0.3)	21.6 (0.5)	23.9 (0.5)	26.4 (0.5)	28.2 (0.4)	29.4 (0.5)	30.6
N	56	56	49	41	34	27	18	11	8	3	1
Range	1.8-3.4	4.4-10.5	7.8-12.6	10.8-18.2	14.1-20.4	17.1-29.8	19.1-26.5	23.6-28.6	26.3-29.7	28.6-30.2	30.6-30.6

1.4 Summary

Lower Lough Corrib:

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

The mean brown trout BPUE was significantly higher in 2014 than in 2008, and there was no difference in the mean brown trout CPUE across the sampling occasions. Brown trout ranged in age from 1+ to 6+, indicating reproductive success in six of the previous seven years. The dominant age class was 1+. 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).

The mean perch CPUE was significantly higher in 2014 than in 2011 and there was no difference in the mean perch BPUE in 2014 in comparison to the other sampling occasions. Perch ranged in age from 1+ to 7+, indicating reproductive success in seven of the previous eight years. The dominant age class was 1+.

The mean roach CPUE and BPUE was significantly lower in 2014 than in 2008. Roach ranged in age from 1+ to 5+, indicating reproductive success in five of the previous six years. The dominant age class was 2+.

Upper Lough Corrib:

Eels followed very closely by perch were the dominant species in terms of abundance (CPUE) and eels were the dominant species in terms of biomass (BPUE).

Although the mean brown trout CPUE and BPUE fluctuated slightly between the three sampling occasions, these differences were not statistically significant. Brown trout ranged in age from 1+ to 8+, indicating reproductive success in eighth of the previous nine 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).

The mean perch CPUE was significantly lower in 2014 than in 2008 and significantly higher in 2014 than in 2011. There was no difference in the mean perch BPUE across the sampling occasions. Perch ranged in age from 1+ to 8+, indicating reproductive success in eighth of the previous nine years. The dominant age class was 1+.

The mean roach BPUE was significantly lower in 2014 than in 2008 and 2011 and there was no difference in the mean roach CPUE across the sampling occasions. Roach ranged in age from 2+ to 11+, indicating reproductive success in ten of the previous twelve years. No 0+ or 1+ fish were recorded. The dominant age class was 2+.

In 2011 perch ranged in age from 1+ to 10+ on Lower Lough Corrib and 1+ to 7+ in 2014. On Upper Lough Corrib in 2014 perch ranged in age from 1+ to 8+, indicating reproductive success in eight of the previous nine years, but the absence of 0+ (young-of-the-year) may indicate a reduction in recruitment in the last number of years. However, perch abundance did increase from 2011 to 2014. Roach ranged in age from 1+ to 5+ and 2+ to 11+ in Lower and Upper Lough Corrib respectively, however, no 0+ (young-of-the-year) fish were captured in 2014 which may also indicate a reduction in roach recruitment in the last year. Roach abundance increased in Lower Lough Corrib but decreased in Upper Lough Corrib in 2014.

The main notable change observed in species composition and abundance/biomass was the dramatic reduction in the roach and perch population between 2008 and 2011, however, perch abundance increased again in 2014. Roach abundance in 2014 only increased in the Lower Lake and decreased further in the Upper Lake. A decrease in brown trout abundance and biomass in the Upper Lake was also observed between 2008 and 2011 and increased again in 2014. In addition there was also a decrease in roach x bream hybrids in both the Upper and Lower lake in 2014. Reasons for these significant fluctuations in abundance for certain fish species are unknown but may be attributable to a number of factors, such as the harsh winters of the previous two years affecting recruitment and to the spread of zebra mussels throughout the lake since 2007. The zebra mussel can disturb the food web in a lake by filtering microscopic algae (phytoplankton) from the water column, divert nutrients from

open water to lake bottom systems, thus favouring bottom-feeding fish such as bream and roach x bream hybrids (and their predators) over those fish species (and their predators) which feed in the open water.

Arctic char have historically existed in Lough Corrib; however none were recorded in the 2008, 2011 or 2014 surveys or in the previous 1996 survey. The last reports of char in the lake came from anglers in the 1980's (O' Grady, 1996). It is most likely that char became extinct between the late 1980's and early 1990's due to a moderate increase in trophic status observed in the lake (O' Grady, 1996) as it is known that char are sensitive to changes in water quality (Baroudy, 1995).

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*., 2012b). Using the FIL2 classification tool, Lower Lough Corrib has been assigned an ecological status of Poor in 2008 and Moderate in both 2011 and 2014 based on the fish populations present and Upper Lough Corrib has been assigned an ecological status of Poor in 2011 and Good for both 2008 and 2014 based on the fish populations present.

In the 2010 to 2012 surveillance monitoring reporting period, the EPA assigned Lower Lough Corrib an overall draft ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish and Upper Lough Corrib an overall draft ecological status of Poor.

1.5 References

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