



Sampling Fish for the Water Framework Directive

Lakes 2011

Lough Corrib



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Corrib, June 2011

Fiona L. Kelly, Lynda Connor, Emma Morrissey, Ciara Wogerbauer, Ronan Matson, Rory Feeney and
Kieran Rocks

Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin

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Cover photo: Lynda and Fiona gill netting © 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 falls into 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 CaCO₃) and the upper lake fits into typology class 12, i.e. deep (mean depth >4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃). 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* 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 and 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 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2009). During this survey, perch and roach were found to be the dominant species present in the lake. Brown trout, three-spined stickleback, bream, pike, roach x bream hybrids and eels were also captured during the survey.



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 looking south east near Cornamona (Photo courtesy of IFI and No. 3 Operational Wing, Irish Air Corps (Aer Chór na hÉireann))

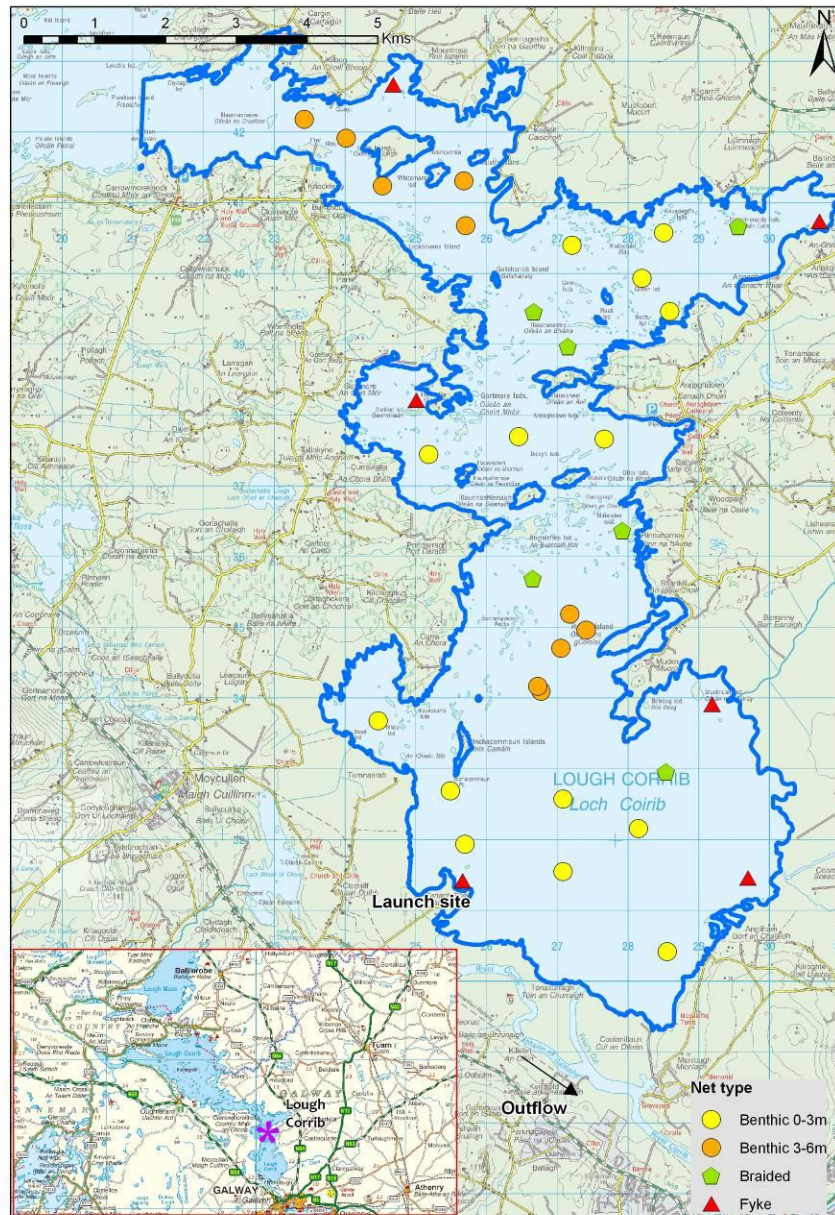


Fig. 1.1. Location map of Lower Lough Corrib showing locations and depths of each net (outflow is indicated on map)

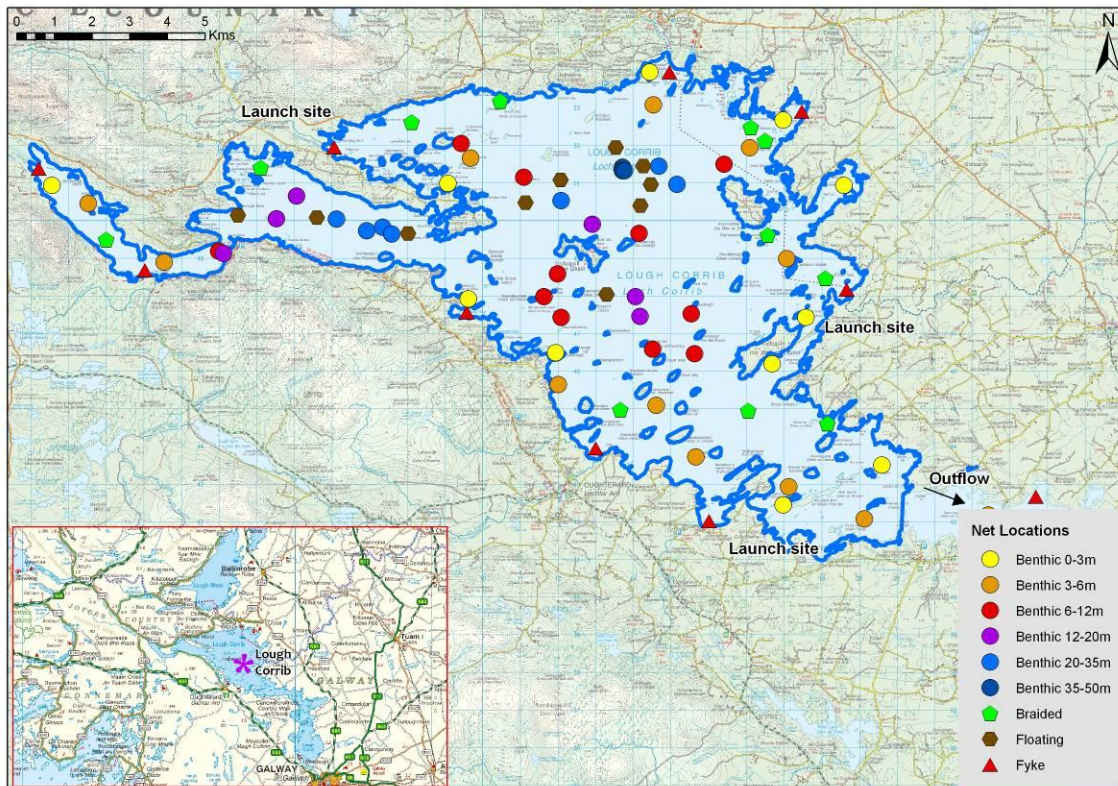


Fig. 1.2. Location map of Upper Lough Corrib showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lower Lough Corrib was surveyed over three nights between the 8th and the 13th of June 2011. 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 six nights between the 14th and the 23rd of June 2011. 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 survey in 2008. 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 ten fish species and two types of hybrids were recorded on Lower and Upper Lough Corrib in June 2011, with 669 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 and Upper Lough Corrib, followed by perch and eels (Tables 1.1 and 1.2). During the previous survey in 2008 the same species composition was recorded with the exception of salmon, tench, sea lamprey and roach x rudd hybrids, which were present during the 2011 survey but were not captured in 2008.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lower Lough Corrib, June 2011

Scientific name	Common name	Number of fish captured				Total
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	
<i>Rutilus rutilus</i>	Roach	65	0	0	1	66
<i>Perca fluviatilis</i>	Perch	58	0	0	2	60
<i>Anguilla anguilla</i>	Eel	0	0	0	21	21
<i>Salmo trutta</i>	Brown trout	14	0	4	0	18
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	14	0	4	0	18
<i>Esox lucius</i>	Pike	4	0	4	0	8
<i>Salmo salar</i>	Salmon	0	0	1	1	2
<i>Petromyzon marinus</i>	Sea lamprey	1	0	0	0	1
<i>Abramis brama</i>	Bream	0	0	1	0	1

Table 1.2. Number of each fish species captured by each gear type during the survey on Upper Lough Corrib, June 2011

Scientific name	Common name	Number of fish captured				Total
		Benthic mono multimesh gill nets	Surface mono multimesh gill nets	Benthic braided gill nets	Fyke nets	
<i>Rutilus rutilus</i>	Roach	185	0	0	21	206
<i>Perca fluviatilis</i>	Perch	161	1	0	0	162
<i>Anguilla anguilla</i>	Eel	1	0	0	50	51
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	22	0	2	0	24
<i>Esox lucius</i>	Pike	5	0	1	4	10
<i>Salmo trutta</i>	Brown trout	9	0	0	0	9
<i>Abramis brama</i>	Bream	8	0	0	0	8
<i>Gasterosteus aculeatus</i>	3-spined stickleback	2	0	0	0	2
<i>Tinca tinca</i>	Tench	0	0	0	1	1
<i>Rutilus rutilus x Scardinius erythrophthalmus</i>	Roach x Rudd	1	0	0	0	1

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 2008 and 2011 are summarised in Table 1.3 and Table 1.4. Mean CPUE and BPUE for all fish species is illustrated in Figures 1.2, 1.3, 1.4 and 1.5.

CPUE comparisons

The mean perch and roach CPUE on Lower Lough Corrib was significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.980$ $P < 0.05$, $z = -3.509$ $P < 0.05$) (Fig. 1.2). The mean perch CPUE on Upper Lough Corrib was also significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.638$, $P < 0.05$) (Fig. 1.4). In addition the mean brown trout CPUE on the Upper lake was significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.232$ $P < 0.05$) (Fig. 1.4). Although the mean roach x bream hybrid CPUE on Lower Lough Corrib was higher in 2011 than in 2008, these differences were not statistically significant (Fig. 1.2). The mean eel CPUE on both Lower and Upper Lough Corrib was also higher in 2011 than in 2008; however, these differences were not statistically significant (Fig. 1.2 and 1.4).

The differences in the mean perch CPUE between Lower and Upper Lough Corrib and four similar lakes was assessed and found to be statistically significant (Kruskal-Wallis, $P < 0.05$) (Fig. 1.6). Independent-Samples Mann-Whitney U tests between each lake showed that Lower Lough Corrib had a significantly lower mean perch CPUE than Lough Egish, Lough Sheelin, Lough O'Flynn and Templehouse Lake ($z = -3.408$ $P < 0.05$, $z = -3.081$ $P < 0.05$, $z = -2.573$ $P < 0.05$ and $z = -3.040$ $P < 0.05$). Independent-Samples Mann-Whitney U tests between each lake also showed that Upper Lough Corrib had a significantly lower mean perch CPUE than Lough Egish, Lough Sheelin, Lough O'Flynn and Templehouse Lake ($z = -3.701$ $P < 0.05$, $z = -3.487$ $P < 0.05$, $z = -2.694$ $P < 0.05$ and $z = -2.882$ $P < 0.05$).

The differences in the mean roach CPUE between Lower and Upper Lough Corrib and four similar lakes was assessed and found to be statistically significant (Kruskal-Wallis, $P < 0.05$) (Fig. 1.7). Independent-Samples Mann-Whitney U tests between each lake showed that Lower Lough Corrib had a significantly lower mean roach CPUE than Templehouse Lake and Lough Egish ($z = -4.428$ $P < 0.05$ and $z = -2.177$ $P < 0.05$) and a significantly higher mean roach CPUE than Lough O'Flynn ($z = -2.162$, $P < 0.05$). Independent-Samples Mann-Whitney U tests between each lake also showed that Upper Lough Corrib had a significantly lower mean roach CPUE than Templehouse Lake and Lough Egish ($z = -5.052$ $P < 0.05$ and $z = -2.740$ $P < 0.05$).

BPUE comparisons

The mean perch and roach BPUE on Lower Lough Corrib was significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.405$ $P < 0.05$, $z = -3.763$ $P < 0.05$) (Fig. 1.3). However only the mean perch BPUE on the Upper lake was significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.075$, $P < 0.05$) (Fig. 1.5). In addition the mean brown trout BPUE on Upper Lough Corrib was significantly lower in 2011 than in 2008 (Independent-Samples Mann-Whitney U test: $z = -2.126$ $P < 0.05$) (Fig. 1.5). Although the mean roach x bream hybrid BPUE on the lower lake was higher in 2011 than in 2008, this difference was not statistically significant (Fig. 1.3). The mean eel BPUE on both Lower and Upper Lough Corrib was higher in 2011 than in 2008; however, these differences were not statistically significant (Fig. 1.3 and 1.5).

The differences in the mean perch BPUE between Lower and Upper Lough Corrib and four similar lakes was assessed and found to be statistically significant (Kruskal-Wallis, $P < 0.05$) (Fig. 1.8). Independent-Samples Mann-Whitney U tests between each lake showed that Lower Lough Corrib had a significantly lower mean perch BPUE than Lough Sheelin, Lough Egish, Templehouse Lake and Lough O'Flynn ($z = -3.091$ $P < 0.05$, $z = -3.190$ $P < 0.05$, $z = -2.918$ $P < 0.05$ and $z = -2.050$ $P < 0.05$). Independent-Samples Mann-Whitney U tests between each lake showed that Upper Lough Corrib had a significantly lower

mean perch BPUE than Lough Sheelin, Lough Egish, Templehouse Lake and Lough O’Flynn ($z = -3.492$ $P < 0.05$, $z = -3.465$ $P < 0.05$, $z = -2.910$ $P < 0.05$ and $z = -2.063$ $P < 0.05$).

The differences in the mean roach BPUE between Lower and Upper Lough Corrib and four similar lakes was assessed and found to be statistically significant (Kruskal-Wallis, $P < 0.05$) (Fig. 1.9). Independent-Samples Mann-Whitney U tests between each lake showed that Lower Lough Corrib had a significantly lower mean roach BPUE than Templehouse Lake and Lough Egish ($z = -4.437$ $P < 0.05$ and $z = -2.881$ $P < 0.05$). Independent-Samples Mann-Whitney U tests between each lake also showed that Upper Lough Corrib had a significantly lower mean roach BPUE than Templehouse Lake and Lough Egish ($z = -4.737$ $P < 0.05$ and $z = -2.907$ $P < 0.05$).

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

Scientific name	Common name	2008	2011
Mean CPUE			
<i>Salmo trutta</i>	Brown trout	0.018 (0.006)	0.017 (0.006)
<i>Salmo salar</i>	Salmon	-	0.001 (0.001)
<i>Perca fluviatilis</i>	Perch	0.263 (0.077)	0.054 (0.017)
<i>Rutilus rutilus</i>	Roach	0.253 (0.045)	0.061 (0.016)
<i>Esox lucius</i>	Pike	0.015 (0.004)	0.007 (0.003)
<i>Abramis brama</i>	Bream	0.001 (0.001)	0.001 (0.001)
<i>Petromyzon marinus</i>	Sea lamprey	-	0.001 (0.001)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	0.007 (0.002)	0.017 (0.006)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.002 (0.001)	-
<i>Anguilla anguilla</i>	European eel	0.016 (0.011)	0.058 (0.023)
Mean BPUE			
<i>Salmo trutta</i>	Brown trout	12.837 (7.604)	11.963 (8.096)
<i>Salmo salar</i>	Salmon	-	1.914 (1.899)
<i>Perca fluviatilis</i>	Perch	18.528 (5.751)	4.575 (1.861)
<i>Rutilus rutilus</i>	Roach	21.849 (3.488)	3.698 (1.543)
<i>Esox lucius</i>	Pike	31.142 (14.817)	15.412 (10.732)
<i>Abramis brama</i>	Bream	2.171 (2.171)	0.343 (0.343)
<i>Petromyzon marinus</i>	Sea lamprey	-	0.361 (0.361)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	2.58 (1.558)	13.754 (6.2)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.009 (0.006)	-
<i>Anguilla anguilla</i>	European eel	0.816 (0.584)	13.879 (4.667)

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

Table 1.4. Mean (S.E.) CPUE and BPUE for all fish species captured on Upper Lough Corrib, 2008 and 2011

Scientific name	Common name	2008	2011
Mean CPUE			
<i>Salmo trutta</i>	Brown trout	0.009 (0.002)	0.003 (0.001)
<i>Perca fluviatilis</i>	Perch	0.292 (0.049)	0.068 (0.012)
<i>Rutilus rutilus</i>	Roach	0.12 (0.02)	0.082 (0.016)
<i>Esox lucius</i>	Pike	0.003 (0.001)	0.003 (0.001)
<i>Abramis brama</i>	Bream	0.008 (0.003)	0.003 (0.002)
<i>Tinca tinca</i>	Tench	-	0.0002 (0.0002)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	0.014 (0.004)	0.01 (0.003)
<i>Scardinius erythrophthalmus</i>	Roach x Rudd	-	0.0004 (0.0004)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.001 (0.001)	0.0008 (0.0005)
<i>Anguilla anguilla</i>	European eel	0.005 (0.003)	0.092 (0.036)
Mean BPUE			
<i>Salmo trutta</i>	Brown trout	8.877 (3.236)	0.795 (0.525)
<i>Perca fluviatilis</i>	Perch	22.6 (4.563)	5.062 (1.072)
<i>Rutilus rutilus</i>	Roach	18.739 (3.457)	15.197 (3.324)
<i>Esox lucius</i>	Pike	7.964 (4.273)	5.552 (3.997)
<i>Abramis brama</i>	Bream	5.131 (1.926)	3.661 (2.272)
<i>Tinca tinca</i>	Tench	-	0.052 (0.052)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream	8.545 (3.027)	9.258 (3.497)
<i>Scardinius erythrophthalmus</i>	Roach x Rudd	-	0.147 (0.147)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.003 (0.002)	0.001 (0.0004)
<i>Anguilla anguilla</i>	European eel	1.361 (0.736)	21.823 (9.158)

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

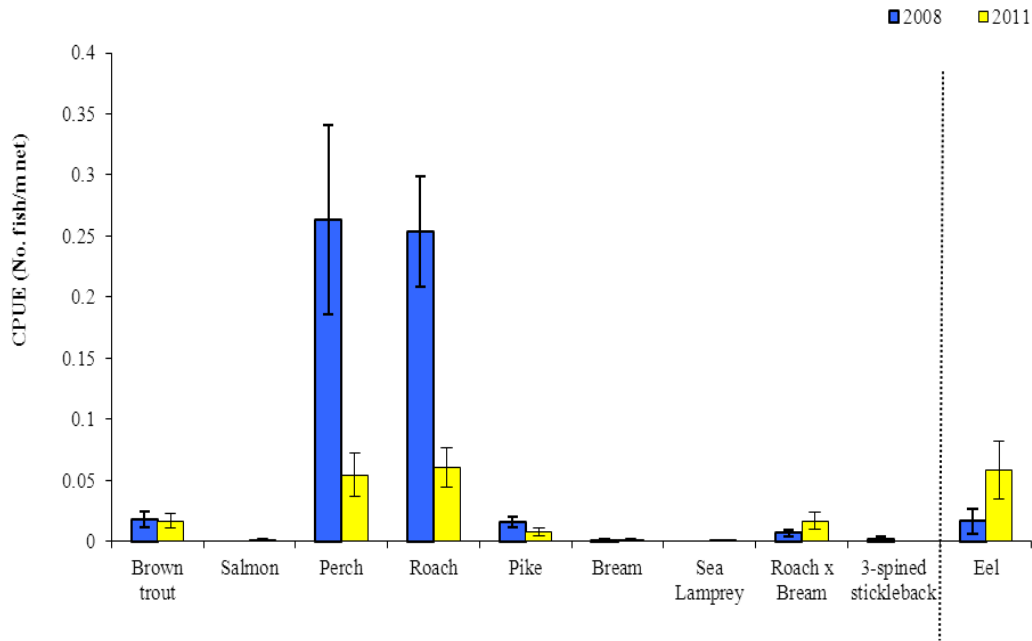


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Lower Lough Corrib (Eel CPUE based on fyke nets only), 2008 and 2011

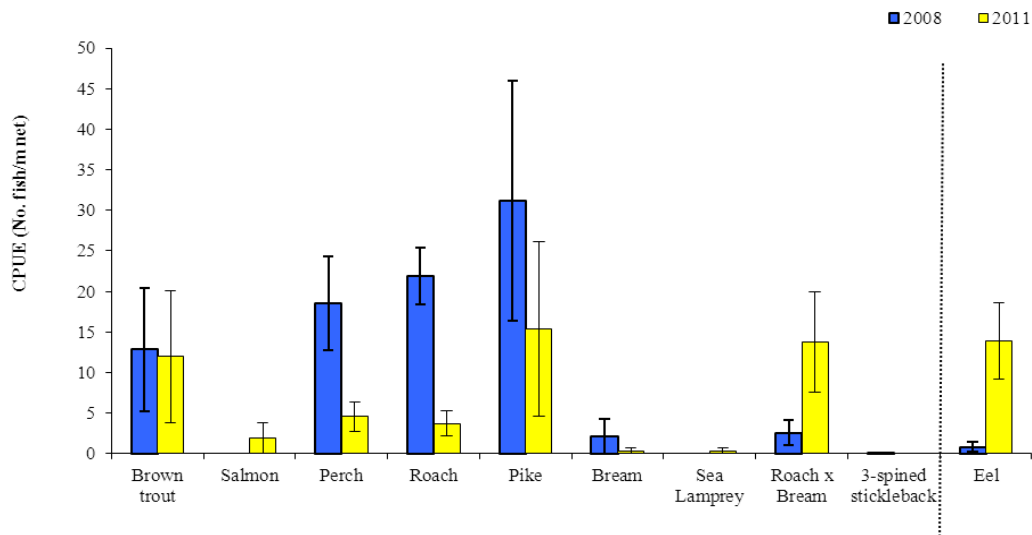


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lower Lough Corrib (Eel CPUE based on fyke nets only), 2008 and 2011

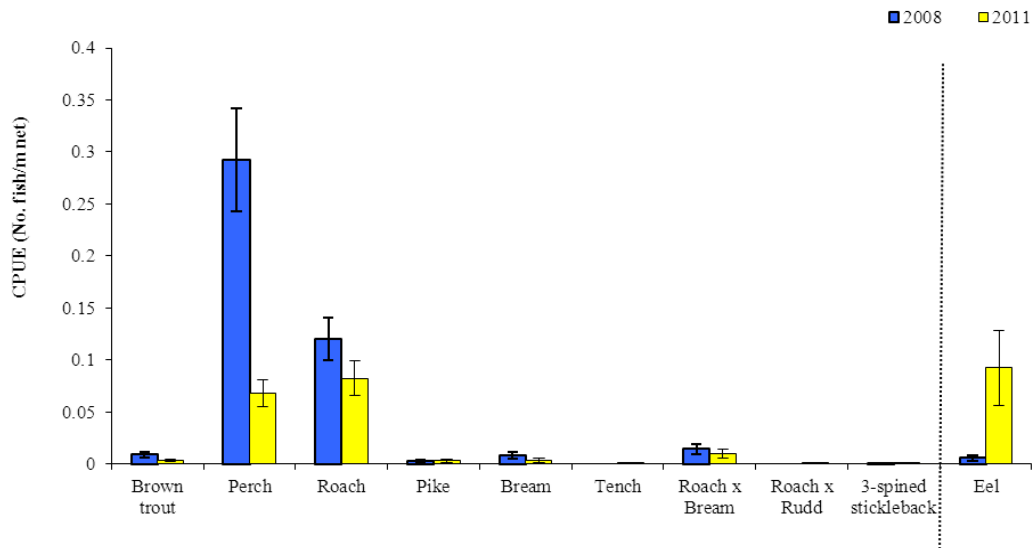


Fig. 1.4. Mean (\pm S.E.) CPUE for all fish species captured in Upper Lough Corrib (Eel CPUE based on fyke nets only), 2008 and 2011

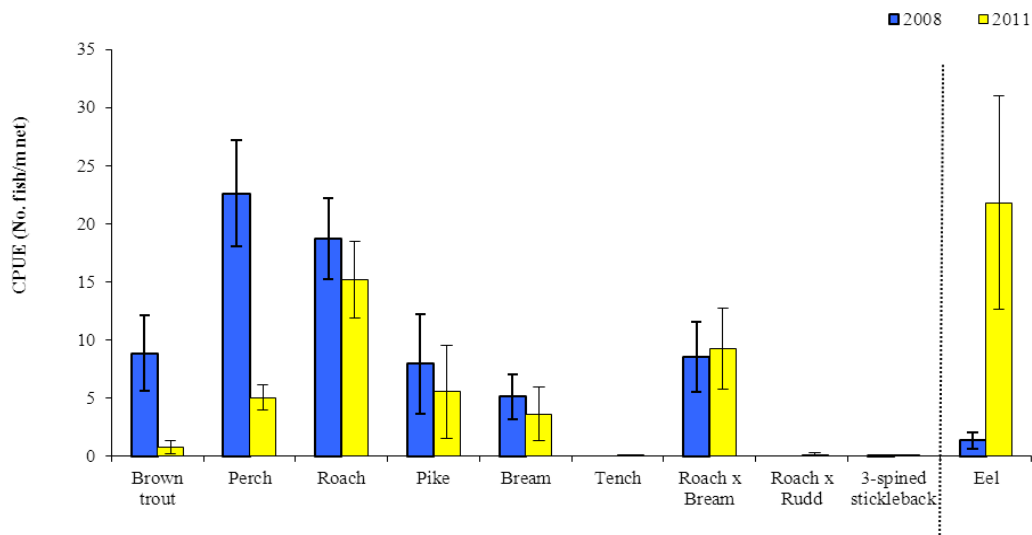


Fig. 1.5. Mean (\pm S.E.) BPUE for all fish species captured in Upper Lough Corrib (Eel CPUE based on fyke nets only), 2008 and 2011

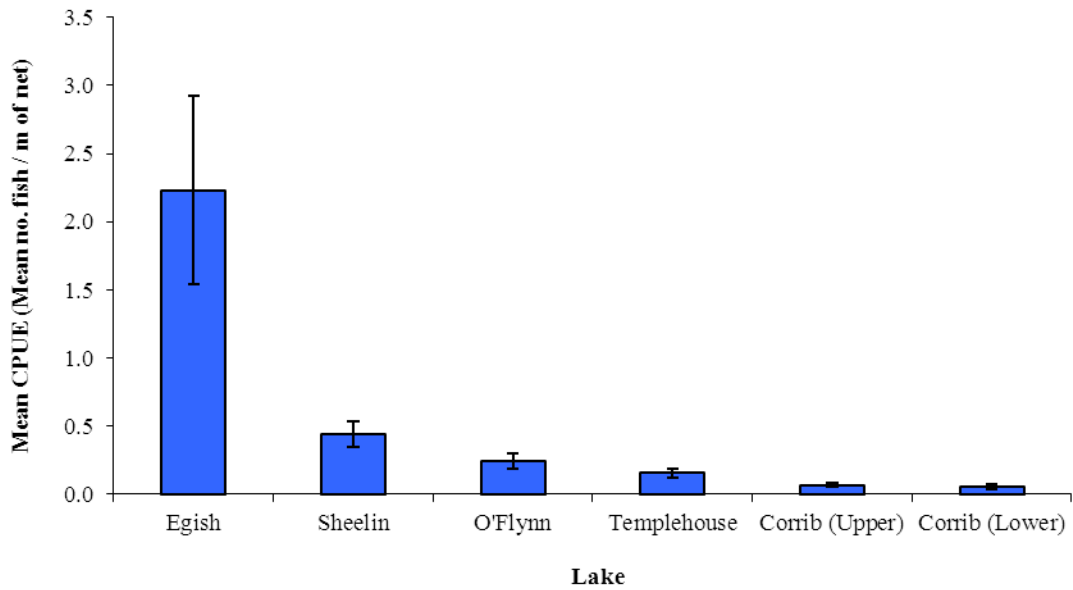


Fig. 1.6. Mean (\pm S.E.) perch CPUE in six lakes surveyed during 2011

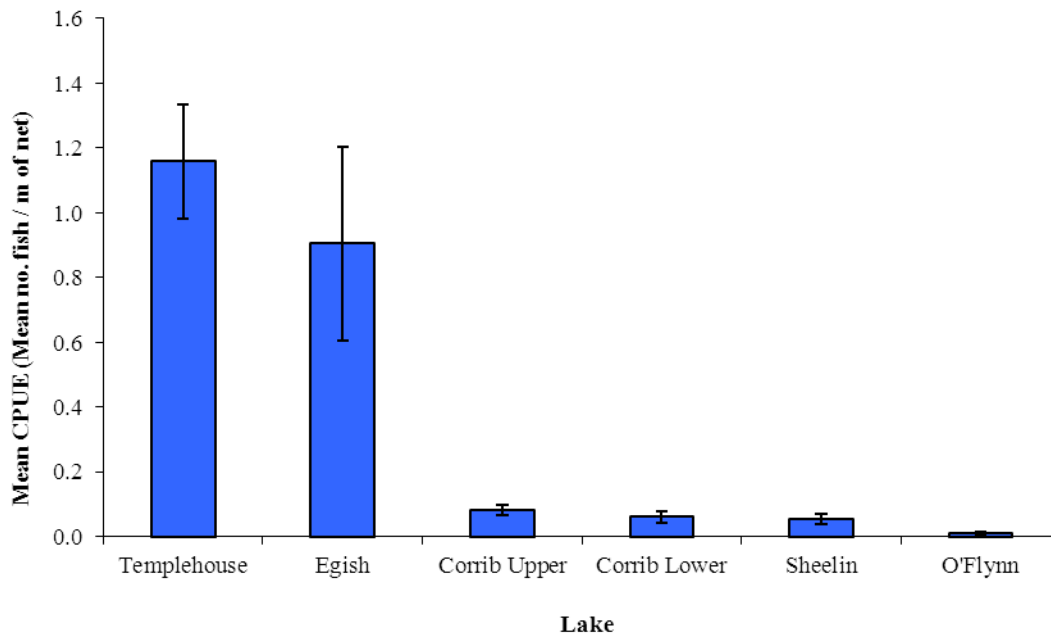


Fig. 1.7. Mean (\pm S.E.) roach CPUE in six lakes surveyed during 2011

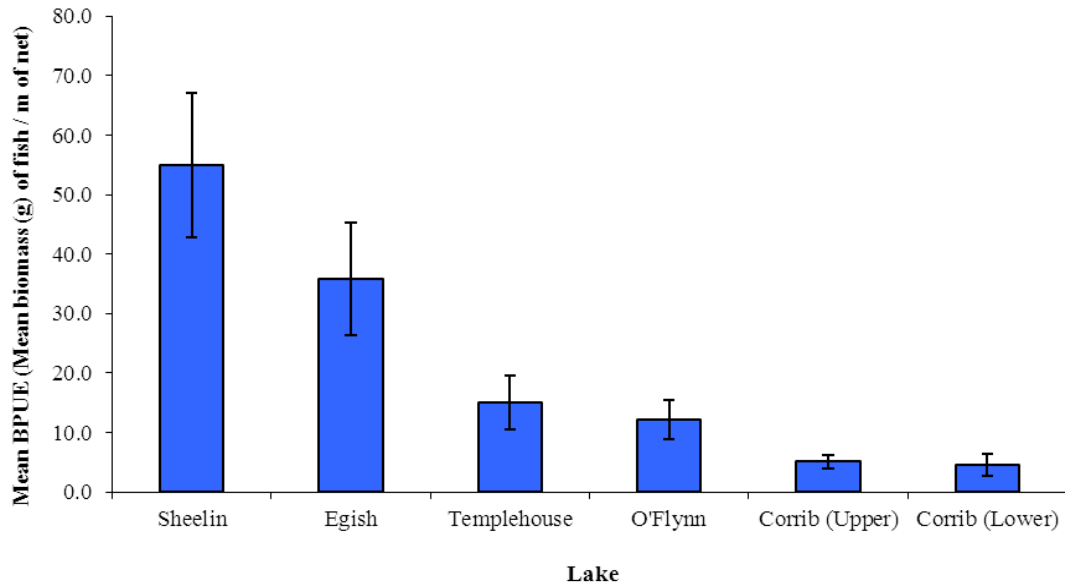


Fig. 1.8. Mean (\pm S.E.) perch BPUE in six lakes surveyed during 2011

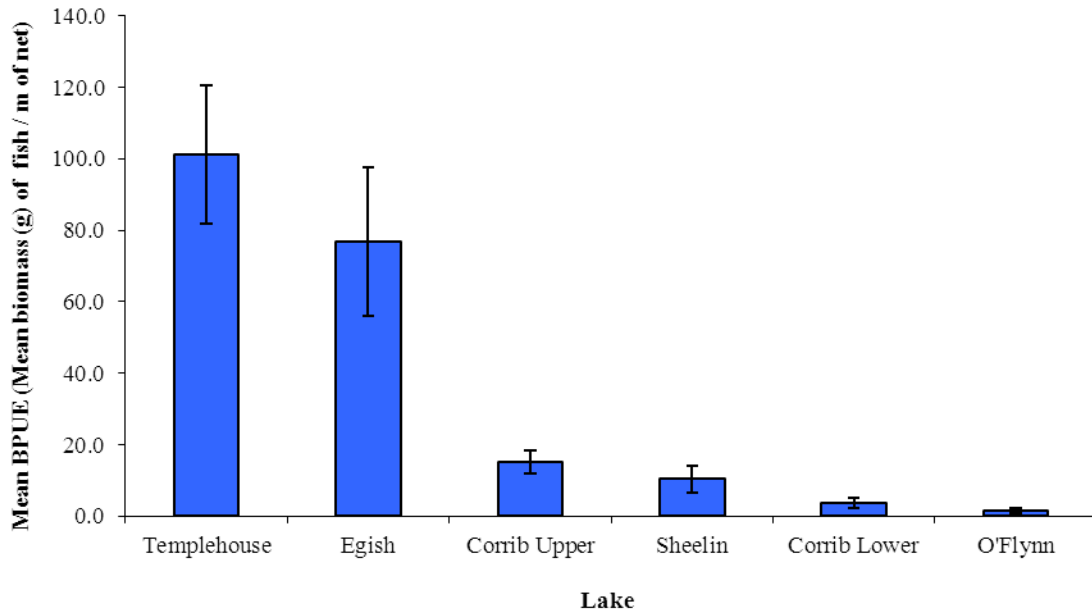


Fig. 1.9. Mean (\pm S.E.) roach BPUE in six lakes surveyed during 2011

Comparison of CPUEs - 1996 v^s 2008 v^s 2011

For comparative purposes, CPUEs for the dominant fish species from the 1996 survey (braided multi-mesh nets, 62.5-125mm mesh size, 96250m² total area), the 2008 and 2011 WFD survey (monofilament multi-mesh nets, 5-55mm mesh size, 3735m² total area) were recalculated as the total number of each species captured/total area of net deployed for the whole lake (Fig 1.10).

Brown trout CPUE was approximately twice as high in 2008 compared to 1996 and decreased slightly in 2011. Roach CPUE in 2008 was over 10 times higher of that in 1996 and roach CPUE in 2011 was 50% less than the roach CPUE in 2008. Perch CPUE in 2008 was over 1200 times that recorded in 1996 and perch CPUE in 2011 was 80% less than CPUE in 2008.

Pike CPUE was similar in 2011 and 1996 with a very small increase in 2008 and roach x bream hybrid CPUE was almost 20 times greater in 2008 and 2011 than in 1996 (Fig. 1.10).

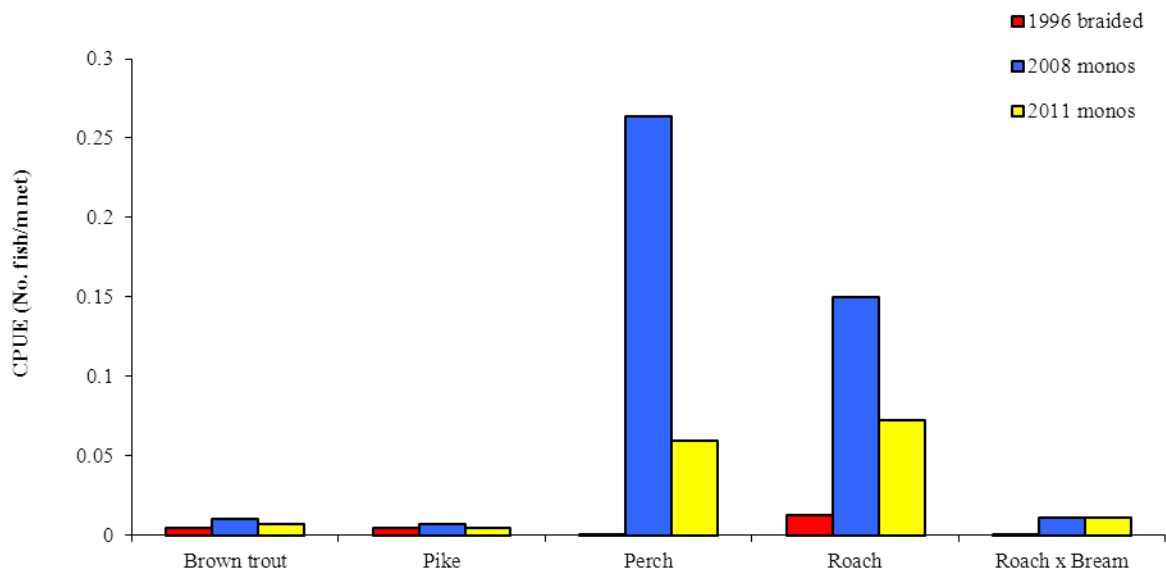


Fig. 1.10. CPUE of selected fish species (total number of fish/total area of net) captured in 1996, 2008 and 2011 on Lower and Upper Lough Corrib

1.3.3 Length frequency distributions

On Lower Lough Corrib perch captured during the 2011 survey ranged in length from 7.0cm to 30.0cm (mean = 15.7cm) (Fig. 1.11). Perch captured during the 2008 survey on Lower Lough Corrib had a wider length range than 2011, ranging from 3.0cm to 37.5cm (Fig. 1.11). Roach captured during the 2011 survey ranged in length from 5.7cm to 26.2cm (mean = 12.9cm) (Fig.1.12). Roach captured during the 2008 survey were larger than 2011, ranging from 5.8cm to 31.3cm (Fig.1.12). Brown trout captured during the 2011 survey ranged in length from 14.6cm to 54.7cm and brown trout recorded in the 2008 survey had similar length, ranging from 13.3cm to 53.3cm (Fig.1.13). Pike captured during the 2011 survey ranged in length from 16.6cm to 82.0cm, roach x bream hybrids ranged in length from 19.5cm to 43.7cm and eels ranged in length from 36.5cm to 59.5cm. Two salmon were captured at 14.0cm and 57.0cm and one bream was captured at 26.0cm.

On Upper Lough Corrib perch captured during the 2011 survey ranged in length from 6.5cm to 36.5cm (mean = 16.1cm) (Fig. 1.14). Perch captured during the 2008 on Upper Lough Corrib were smaller, ranging in length from 6.4cm to 30.6cm (Fig. 1.14). Roach captured during the 2011 survey ranged in length from 6.5cm to 31.5cm (mean = 20.2cm) (Fig.1.15). Roach captured during the 2008 survey had lengths ranging from 5.5cm to 35.0cm (Fig.1.15). Brown trout captured during the 2011 survey ranged in length from 5.5cm to 45.0cm; larger brown trout were recorded in the 2008 survey, they ranged in length from 6.6cm to 65.5cm (Fig.1.16). Bream captured during the 2011 survey ranged in length from 28.3cm to 44.8cm, roach x bream hybrids ranged in length from 23.3cm to 44.1cm, pike ranged in length from 15.5cm to 95.8cm and eels ranged in length from 36.0cm to 63.2cm. Two three-spined stickleback were captured measuring 3.3cm and 4.0cm, one tench was captured at 21.6cm and one roach x rudd hybrid was captured at 26.8cm.

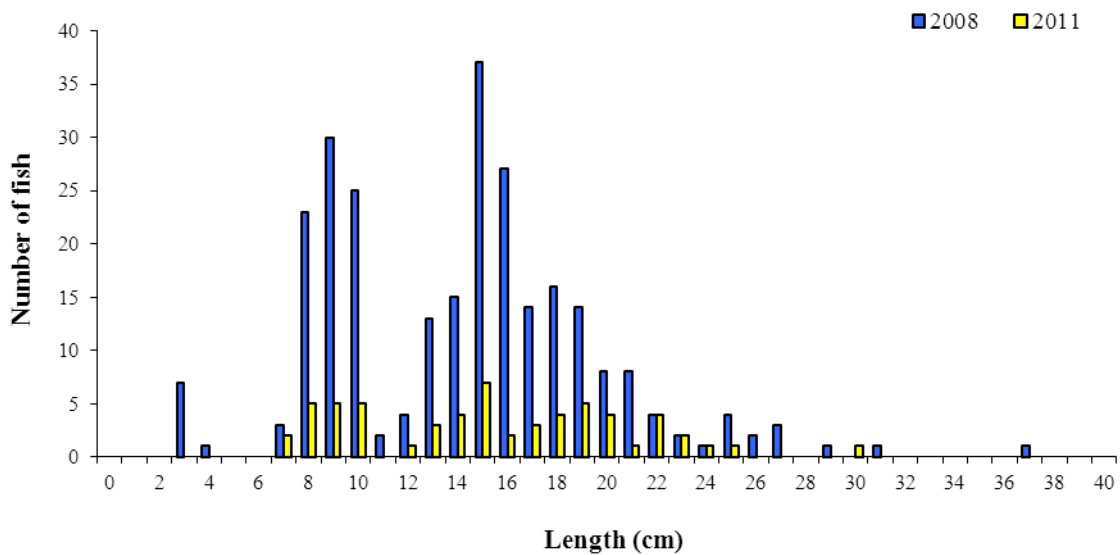


Fig. 1.11. Length frequency of perch captured on Lower Lough Corrib

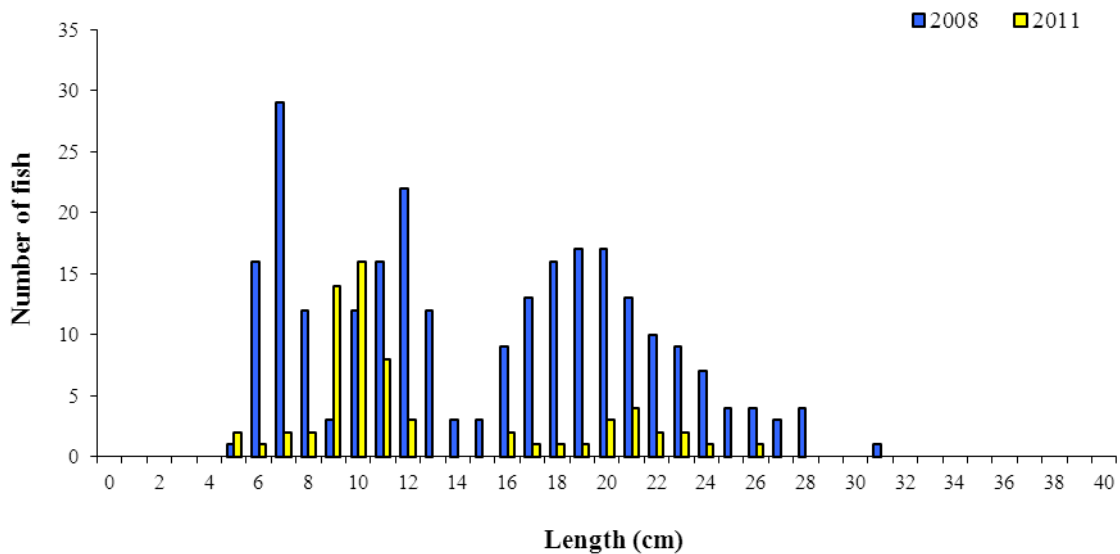


Fig. 1.12. Length frequency of roach captured on Lower Lough Corrib

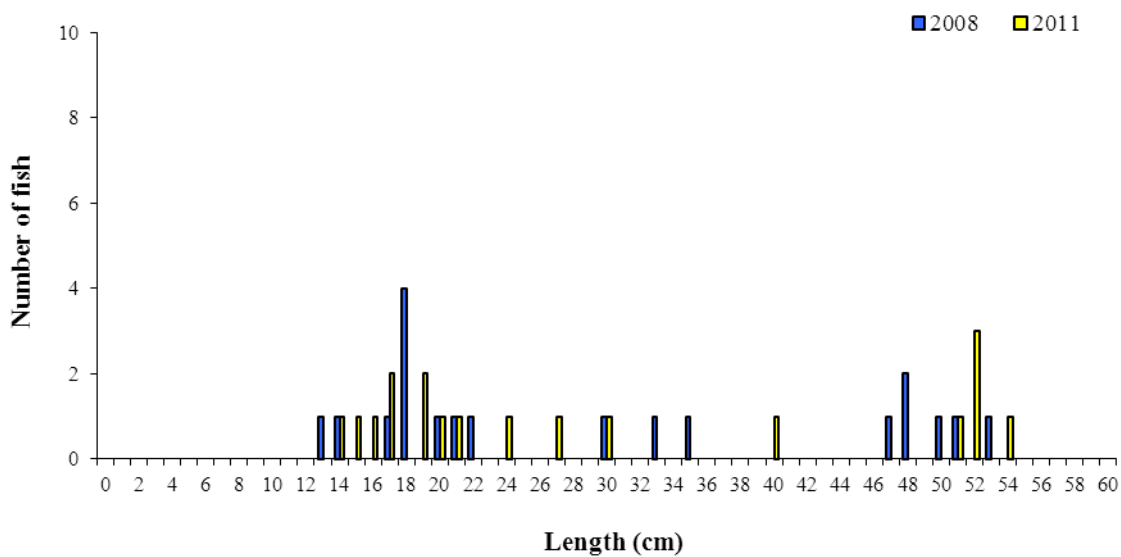


Fig. 1.13. Length frequency of brown trout captured on Lower Lough Corrib

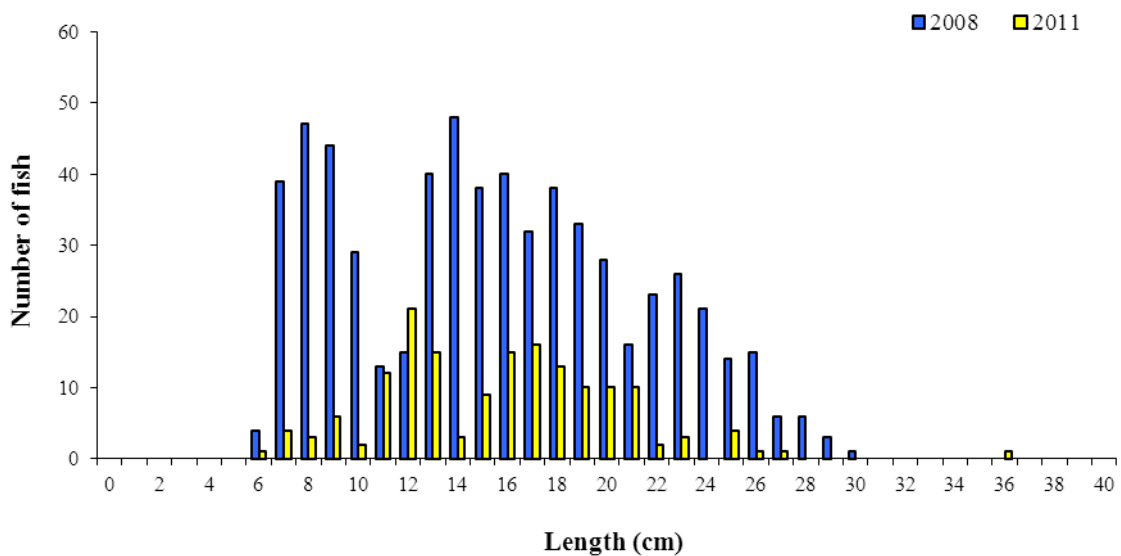


Fig. 1.14. Length frequency of perch captured on Upper Lough Corrib

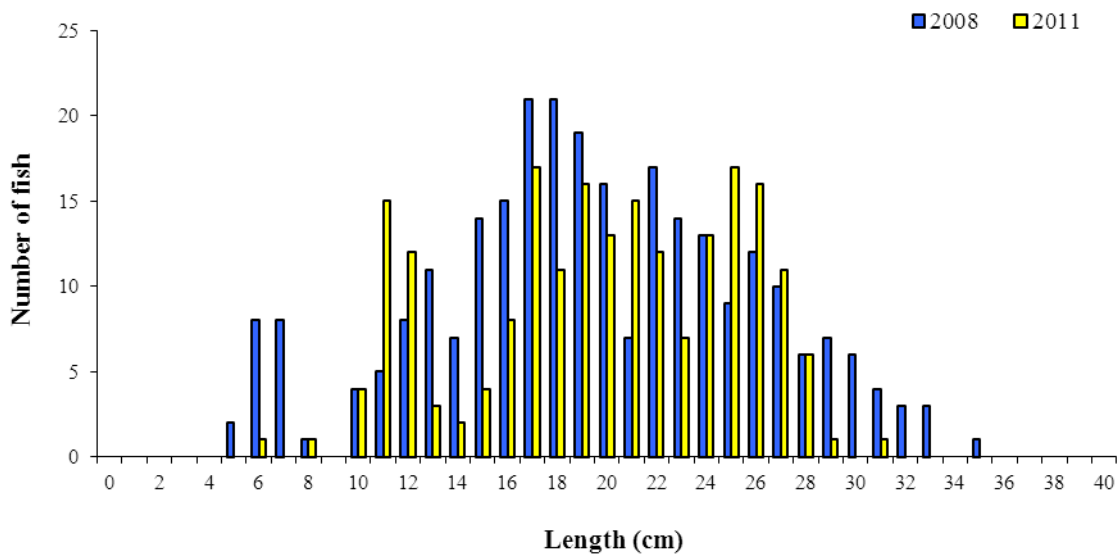


Fig. 1.15. Length frequency of roach captured on Upper Lough Corrib

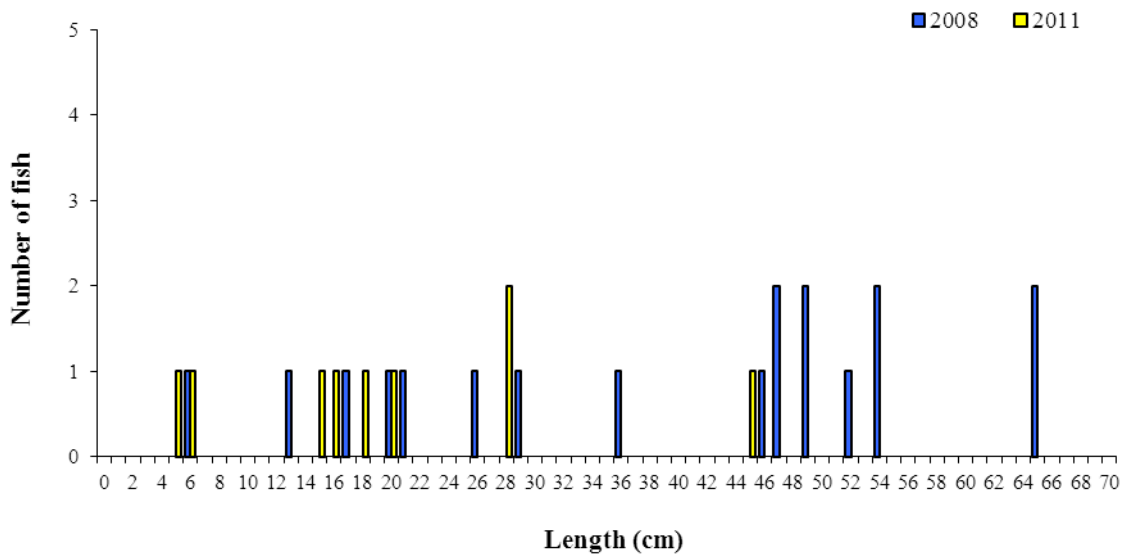


Fig. 1.16. Length frequency of brown trout captured on Upper Lough Corrib

1.3.4 Fish age and growth

Seven age classes of perch were present on Lower Lough Corrib in 2011. The dominant age class of perch was 3+, with ages ranging from 1+ to 7+ indicating reproductive success in each of the previous seven years. The mean L1 for perch was 5.9cm (Table 1.5). In the 2008 survey, perch ranged from 0+ to 5+ with a mean L1 of 6.1cm.

Seven age classes of roach were present, ranging from 0+ to 6+ indicating reproductive success in each of the previous seven years. The dominant age class of roach was 2+ and the mean L1 was 3.1cm (Table 1.6). In the 2008 survey, roach ranged from 1+ to 7+ with a mean L1 of 3.4cm.

Four age classes of brown trout were present, ranging from 1+ to 4+, with a mean L1 of 7.1cm. Mean brown trout L4 in 2011 was 45.3cm indicating a very fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Five age classes of pike and roach x bream hybrids were present, ranging from 0+ to 8+ and 5+ to 12+ respectively. A single bream captured was aged at 6+.

Table 1.5. Mean (\pm SE) perch length (cm) at age for Lower Lough Corrib, June 2011

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇
Mean	5.9 (0.1)	11.1 (0.3)	16.1 (0.3)	19.4 (0.4)	22.7 (0.8)	25.2 (3.8)	21.9
N	55	44	29	14	8	2	1
Range	3.4-7.9	6.7-15.7	11.8-20.9	15.5-22.6	19.4-27.3	21.4-29.1	21.9-21.9

Table 1.6. Mean (\pm SE) roach length (cm) at age for Lower Lough Corrib, June 2011

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean	3.1 (0.1)	7.8 (0.2)	12.5 (0.5)	18.9 (0.4)	21.5 (0.7)	23.7 (0.7)
N	47	42	18	16	5	2
Range	1.5-5.5	4.8-10.1	8.1-16.7	15.1-21.3	19.6-23.3	22.9-24.5

On Upper Lough Corrib nine age classes of perch were present, ranging from 1+ to 10+ indicating reproductive success in each of the previous ten years. The dominant age class of perch was 4+ and the mean L1 was 5.7cm (Table 1.7). In the 2008 survey, perch ranged from 0+ to 9+ with a mean L1 of 5.9cm.

Seven age classes of roach were present in 2011, ranging from 2+ to 8+ indicating reproductive success in previous years. The dominant age class of roach was 5+ and the mean L1 was 2.8cm (Table 1.8). In the 2008 survey, roach ranged from 1+ to 11+ with a mean L1 of 3.6cm.

Six age classes of brown trout were present, ranging from 0+ to 5+, with a mean L1 of 6.1cm.

Five age classes of bream were present, ranging from 5+ to 13+. Four age classes of pike were present, 1+, 2+, 9+ and 11+. Seven age classes of roach x bream hybrids were present, ranging from 6+ to 12+. A single roach x rudd hybrid captured was aged at 6+.

Table 1.7. Mean (\pm SE) perch length (cm) at age for Upper Lough Corrib, June 2011

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀
Mean	5.7 (0.1)	10.9 (0.2)	15.6 (0.2)	18.6 (0.3)	20.6 (0.5)	22.9 (0.7)	23.7 (1.2)	24.9 (2.1)	30.9	34.6
N	83	72	53	40	18	8	4	3	1	1
Range	3.6-7.5	5.6- 15.0	9.9- 20.3	13.4- 23.6	15.2- 24.8	19.2- 25.1	20.2- 25.6	21.2- 28.7	30.9- 30.9	34.6- 34.6

Table 1.8. Mean (\pm SE) roach length (cm) at age for Upper Lough Corrib, June 2011

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈
Mean	2.8 (0.1)	7.1 (0.2)	12.0 (0.3)	17.1 (0.3)	20.9 (0.3)	24.4 (0.4)	26.6 (0.6)	29.0 (1.2)
N	90	90	83	62	42	21	8	2
Range	1.7-5.1	3.8-12.3	7.1-17.3	11.9-22.3	16.1-24.1	20.0-27.0	24.0-29.4	27.7-30.3

1.4 Summary

Roach was the dominant species in terms of abundance (CPUE) and pike was the dominant species in terms of biomass (BPUE) captured in the survey gill nets on Lower Lough Corrib in 2011. Roach was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets on Upper Lough Corrib in 2011.

The mean perch and roach CPUE on Lower Lough Corrib was significantly lower in 2011 than in 2008 and the mean perch CPUE on Upper Lough Corrib was also significantly lower in 2011 than in 2008. The mean brown trout CPUE on Upper Lough Corrib was significantly lower in 2011 than in 2008. In a comparison of perch CPUE with other high alkalinity lakes surveyed during 2011 the mean perch CPUE in Lower and Upper Lough Corrib was significantly lower than the perch CPUE from Lough Egish, Lough Sheelin, Lough O'Flynn and Templehouse Lake. The mean roach CPUE in Lower Lough Corrib was also significantly lower than Templehouse Lake and Lough Egish and was significantly higher than the mean roach CPUE from Lough O'Flynn. Upper Lough Corrib had a significantly lower mean roach CPUE than Templehouse Lake and Lough Egish, other similar lakes surveyed.

The mean perch and roach BPUE on Lower Lough Corrib was significantly lower in 2011 than in 2008 and the mean perch BPUE on Upper Lough Corrib was also significantly lower in 2011 than in 2008. The mean brown trout BPUE on Upper Lough Corrib was significantly lower in 2011 than in 2008. In a comparison of BPUE with other high alkalinity lakes the mean perch BPUE in Lower and Upper Lough Corrib was significantly lower than Lough Sheelin, Lough Egish, Templehouse Lake and Lough O'Flynn, other similar lakes surveyed in 2011. The mean roach BPUE in Lower and Upper Lough Corrib was also significantly lower than Templehouse Lake and Lough Egish.

Comparisons between the 1996, 2008 and 2011 surveys are difficult as the CPUE values are not directly comparable. The net types used were different and there was also a seasonal difference between surveys. The monofilament, multi-mesh survey gill nets (5-55mm mesh) supplemented by single panel braided survey gill nets (62.5mm mesh) and fyke nets used in the recent 2008 survey are designed to capture a range of fish species and sizes and are much more effective at catching small and juvenile fish than the multi-panel braided nets used in 1996. The multi-panel (62.5 to 125mm mesh knot to knot) braided survey gill nets used in 1996 were designed to specifically assess the status of brown trout greater than 19.8cm in length, with fewer smaller fish being captured. The 1996 survey was conducted in spring, when few juvenile perch would have been captured, compared with the 2008 and 2011 surveys which were conducted during the summer.

However, for comparative purposes, CPUEs for the dominant fish species from the 1996 survey (braided multi-mesh nets, 62.5-125mm mesh size, 96250m² total area) and the 2008 and 2011 surveys (monofilament multi-mesh nets, 5-55mm mesh size, 3735m² total area) were recalculated as the total number of each species captured/total area of net deployed on the whole lake. These results show large increases in the CPUEs of roach and particularly perch between 1996 and 2008/2011. Although it is likely that the abundance of these two species, particularly roach has indeed increased between 1996 and the 2008/2011 surveys, it must be recognised that a large proportion of the increases seen are likely due to the capture of a much greater proportion of small juveniles of both perch and roach in the 2008/2011 survey compared with the 1996 survey. Although the brown trout CPUE approximately doubled between 1996 and 2008, much of this increase may be due to the difference in nets used.

In 2011 perch ranged in age from 1+ to 10+ on Lower Lough Corrib, indicating reproductive success in each of the previous ten years, however, the absence of 0+ (young-of-the-year) fish may indicate a reduction in recruitment in the last year. Roach ranged in age from 0+ to 8+, indicating reproductive success in each of the previous eight years, however, the very low numbers of 0+ (young-of-the-year) fish captured in 2011 may also indicate a reduction in roach recruitment in the last year.

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. A decrease in brown trout abundance and biomass in the Upper lake was also observed between 2008 and 2011. In addition there was also an increase in roach x bream hybrids in both the Upper and Lower lake. Reasons for this significant decrease and increase 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 or 2011 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.*, 2012). Using the FIL2 classification tool, Lower Lough Corrib has been assigned an ecological status of Moderate based on the fish populations present, this is an improvement on the 2008 status which was Poor/Bad. The Upper lake has been assigned an ecological status of Poor/Bad based on the fish populations present in 2011, however the ecological status assigned to the lake based on the 2008 survey data was Good. This deterioration in status is attributed to the significant changes in the fish population structure observed in the Upper lake in 2011.

In the 2007 to 2009 surveillance monitoring reporting period, the EPA assigned both Lower Lough Corrib and Upper Lough Corrib 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 2011.

1.5 References

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**Inland Fisheries Ireland
Swords Business Campus,
Swords,
Co. Dublin,
Ireland.**

**Web: www.fisheriesireland.ie
Email: info@fisheriesireland.ie
Tel: +353 1 8842 600
Fax: +353 1 8360 060**