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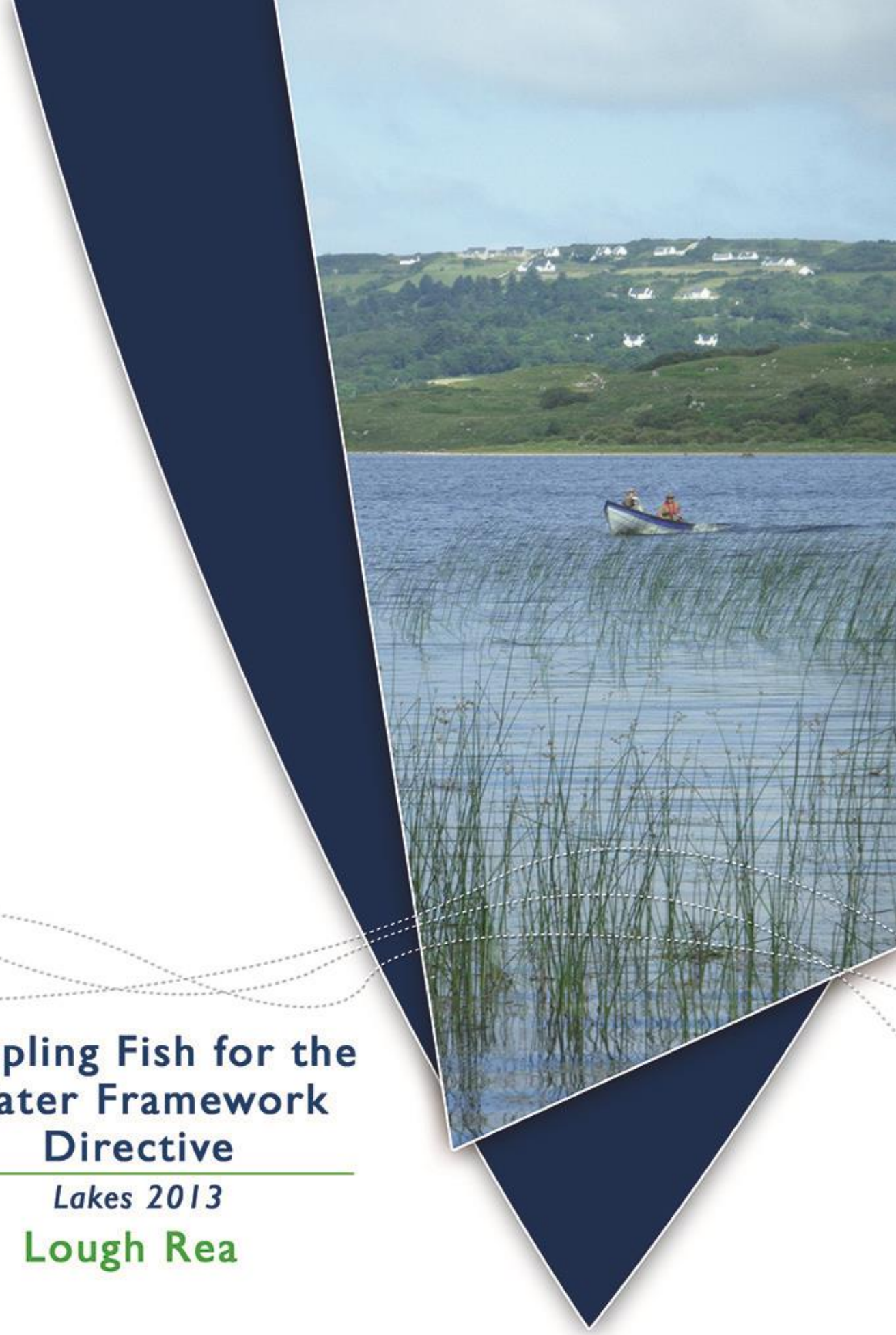

Sampling Fish for the Water Framework Directive

Lakes 2013

Lough Rea

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Lough Rea, July 2013

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1.1 Introduction

Lough Rea is situated in the Kilcolgan catchment in Co. Galway (Plate 1.1, Fig. 1.1). It is an abstraction lake, providing water to the nearby town of Loughrea (County Galway Guide, 2010). The lake is situated at an altitude of 85m a.s.l., has a surface area of 301ha, a mean depth of 3.9m, a maximum depth of 23m and is categorised as typology class 10 (as designated by the EPA for the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l $CaCO_3$).

Lough Rea has been designated as both a Special Area of Conservation (SAC) and a Special Protected Area (SPA) (NPWS, 1999 and 2007). The lough is a hard water lake, a habitat listed on Annex I of the EU Habitats Directive. The underlying geology of the area is of carboniferous limestone. Plant species characteristic of calcareous waters and common to the lake include stonewort species, *Chara curta* and *C. contraria*. Internationally important numbers of over wintering shoveler birds have been recorded at the site, along with nationally important numbers of tufted duck and coot. The presence of these birds has led to the site being designated as an SPA (NPWS, 2007).

Lough Rea is surrounded by intensively farmed pasture land and consequently the main threat to the lake comes from agricultural run-off and possible nutrient input from the town of Loughrea.

Fishing on Lough Rea is managed by the Loughrea Anglers' Association. There are good numbers of rudd and perch, along with a stock of pike present in the lake. Eels, brook lamprey, stickleback and brown trout with an average weight of 0.6kg are also found in the lake (NPWS, 1999; O' Reilly, 2007). Lough Rea is fed by springs and small streams on the south-eastern shore and has poor spawning areas for trout (NPWS, 1999). Brown trout spawning is limited to a single narrow inflowing stream and to the outflowing stream therefore, the club stocks unfed brown trout fry into the lake every year.

Lough Rea was previously surveyed in 2010 as part of the WFD surveillance monitoring programme (Kelly *et al*., 2011). During this survey perch were found to be the dominant species present in the lake. Brown trout, pike, rudd, three-spined stickleback, nine-spined stickleback and eels were also recorded.

Plate 1.1. Lough Rea

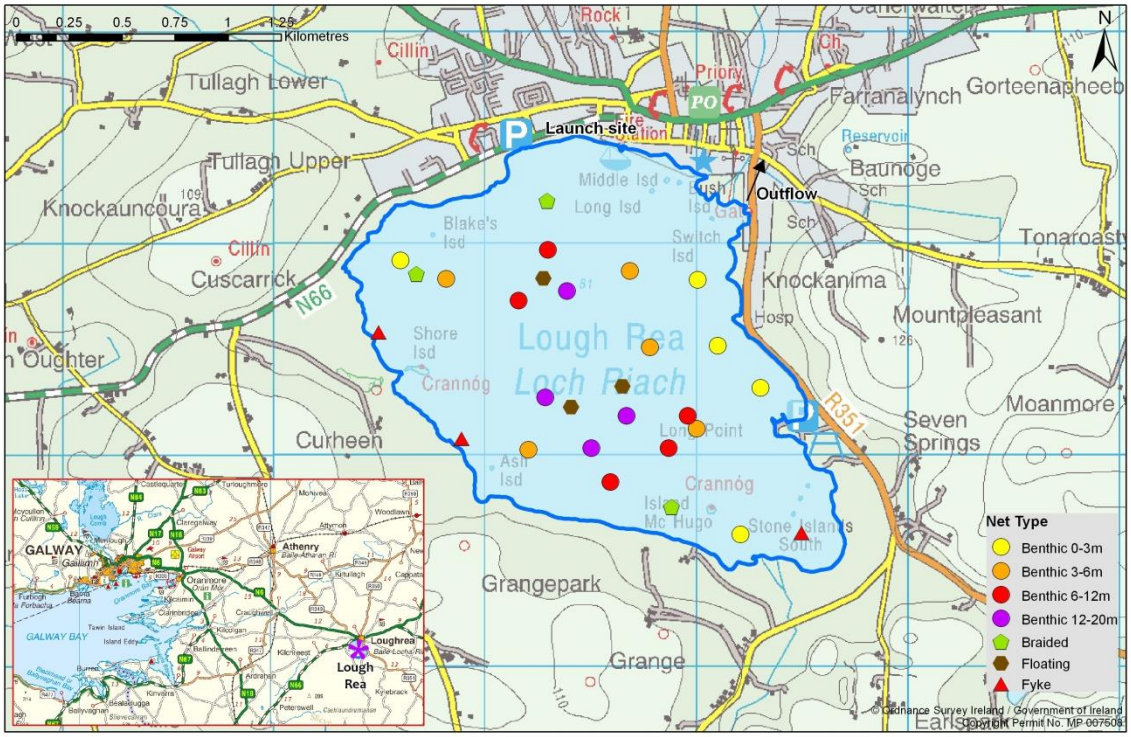

Fig. 1.1. Location map of Lough Rea showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Rea was surveyed over two nights from the 8th to the 10th of July 2013. A total of three sets of Dutch fyke nets, 19 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m and 4 @ 12-19.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed randomly in the lake (24 sites). The netting effort was supplemented using three benthic braided survey gill nets (62.5mm mesh knot to knot) at three additional sites. Nets were deployed in the same locations as were randomly selected in the previous survey. 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, rudd and pike. 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 seven fish species were recorded in Lough Rea in July 2013, with 459 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Three-spined stickleback was the most abundant fish species recorded, followed by eels. Nine-spined stickleback, brown trout, perch, pike and rudd were also recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Rea, July 2013

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
Gasterosteus aculeatus	Three-spined stickleback	295	0	0	1	296
Pungitius pungitius	Nine-spined stickleback	21	0	0	0	21
Perca fluviatilis	Perch	8	0	0	4	12
Salmo trutta	Brown trout	7	0	0	0	7
Scardinius erythrophthalmus	Rudd	0	3	0	1	4
Esox lucius	Pike	2	0	2	0	4
Anguilla anguilla	European eel	0	0	0	115	115

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 2010 and 2013 surveys are summarised in Table 1.2. Mean CPUE and BPUE for all species is illustrated in Figure 1.2 and 1.3.

Three-spined stickleback 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. The mean perch CPUE and BPUE was significantly lower in 2013 than in 2010 (Mann-Whitney, $P<0.001$) (Table 1.2; Figs 1.2 and 1.3). Although the mean brown trout CPUE was slightly higher in 2013 than in 2010 and BPUE was slightly lower in 2013 than in 2010, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE on Lough Rea, 2010 and 2013

Scientific name	Common name	2010	2013
		Mean CPUE	
Gasterosteus aculeatus	Three-spined stickleback	0.048 (0.018)	0.365 (0.091)
Pungitius pungitius	Nine-spined stickleback	0.001 (0.001)	0.026 (0.013)
Anguilla anguilla	European eel*	0.144 (0.074)	0.639 (0.340)
Perca fluviatilis	Perch	0.571 (0.122)	0.012 (0.005)
Salmo trutta	Brown trout	0.007 (0.004)	0.009 (0.003)
Scardinius erythrophthalmus	Rudd	0.007 (0.004)	0.004 (0.003)
Esox lucius	Pike	0.001 (0.001)	0.005 (0.003)
		Mean BPUE	
Gasterosteus aculeatus	Three-spined stickleback	0.042 (0.017)	0.238 (0.062)
Pungitius pungitius	Nine-spined stickleback	0.001 (0.001)	0.017 (0.009)
Perca fluviatilis	Perch	48.237 (9.725)	0.659 (0.254)
Anguilla anguilla	European eel*	39.439 (20.748)	127.428 (61.011)
Salmo trutta	Brown trout	1.881 (1.400)	1.719 (0.981)
Scardinius erythrophthalmus	Rudd	0.809 (0.725)	0.289 (0.185)
Esox lucius	Pike	1.629 (1.629)	24.616 (23.507)

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

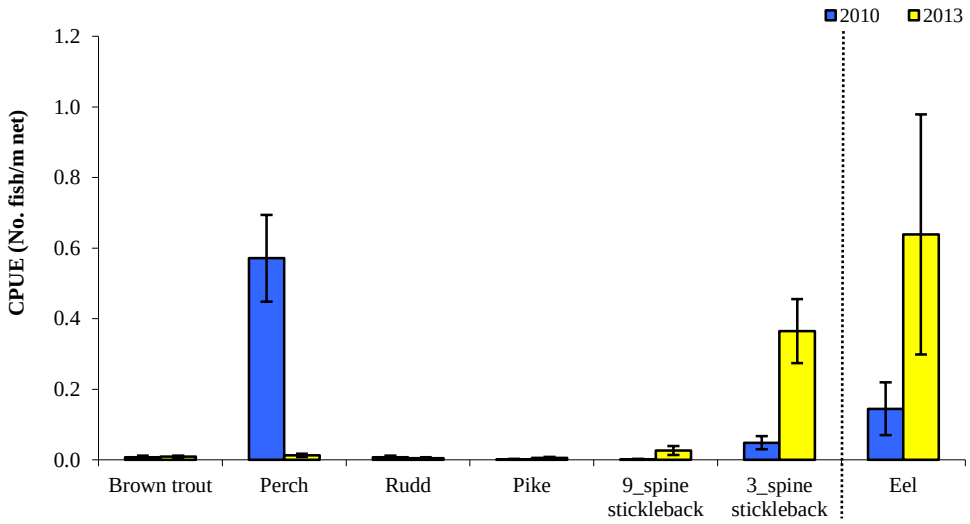

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Rea (Eel CPUE based on fyke nets only), 2010 and 2013

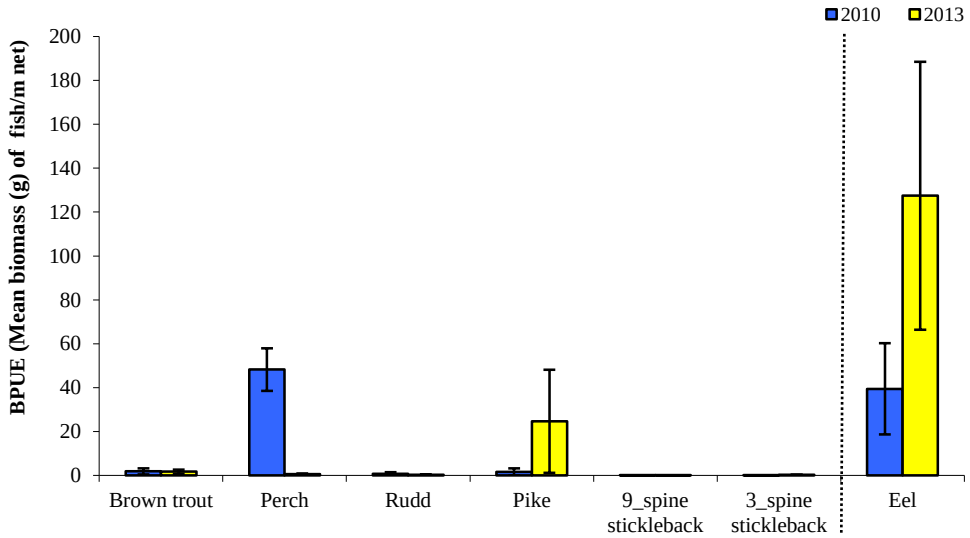

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Rea (Eel BPUE based on fyke nets only), 2010 and 2013

1.3.3 Length frequency distributions and growth

Three-spined stickleback captured during the 2013 survey ranged in length from 3.1cm to 5.1cm (mean = 4.0cm) (Fig. 1.4). Three-spined stickleback captured during the 2010 survey ranged in length from 2.5cm to 4.4cm (Fig. 1.4).

Eels captured during the 2013 survey ranged in length from 35.4 cm to 73.5cm (mean = 47.7cm) (Fig. 1.5). Eels recorded in the 2010 survey ranged in length from 44.0cm to 69.2cm (Fig. 1.5).

Brown trout captured during the 2013 survey ranged in length from 15.2cm to 32.7cm (mean = 24.4cm) (Fig. 1.6) with four age classes present, ranging from 1+ to 4+, with a mean L1 of 5.9cm (Table 1.3). Mean brown trout L4 was 27.3cm indicating a slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971). Brown trout captured during the 2010 survey had a similar length range (Fig. 1.6) and age range to the 2013 survey. However, the growth rate was fast/very fast in the 2010 survey.

Perch captured during the 2013 survey ranged in length from 9.5cm to 18.9cm (Fig. 1.7) with two age classes present, ranging from 1+ to 2+, with a mean L1 of 6.5cm (Table 1.4). In contrast, the 2010 survey showed perch ranged in length from 4.5cm to 35.0cm (Fig. 1.7) with eight age classes present, ranging from 0+ to 7+, with a mean L1 of 5.8cm. The dominant age class was 2+ (Fig. 1.7).

Pike captured during the 2013 survey ranged in length from measured 33.6cm to 108.0cm and rudd ranged in length from 14.2cm to 17.1cm.

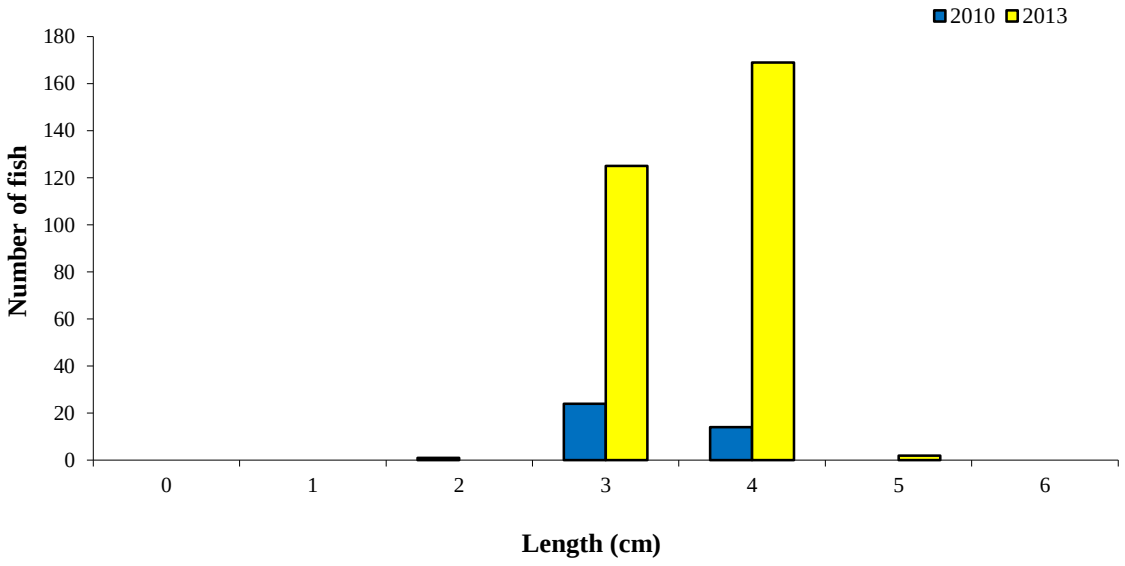

Fig. 1.4. Length frequency of three-spined stickleback captured on Lough Rea, 2010 and 2013

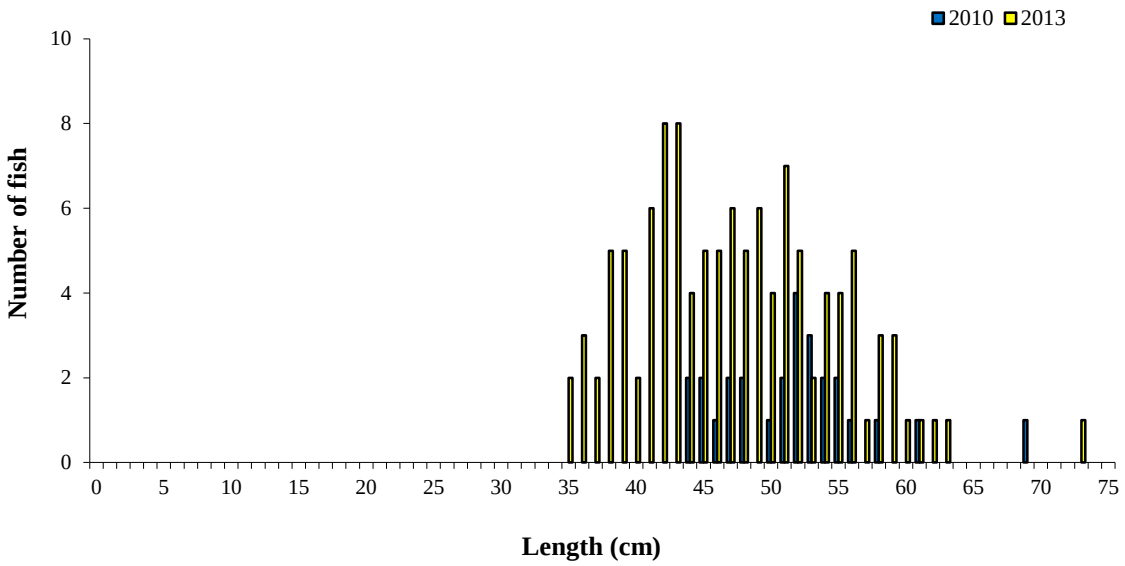

Fig. 1.5. Length frequency of eels captured on Lough Rea, 2010 and 2013

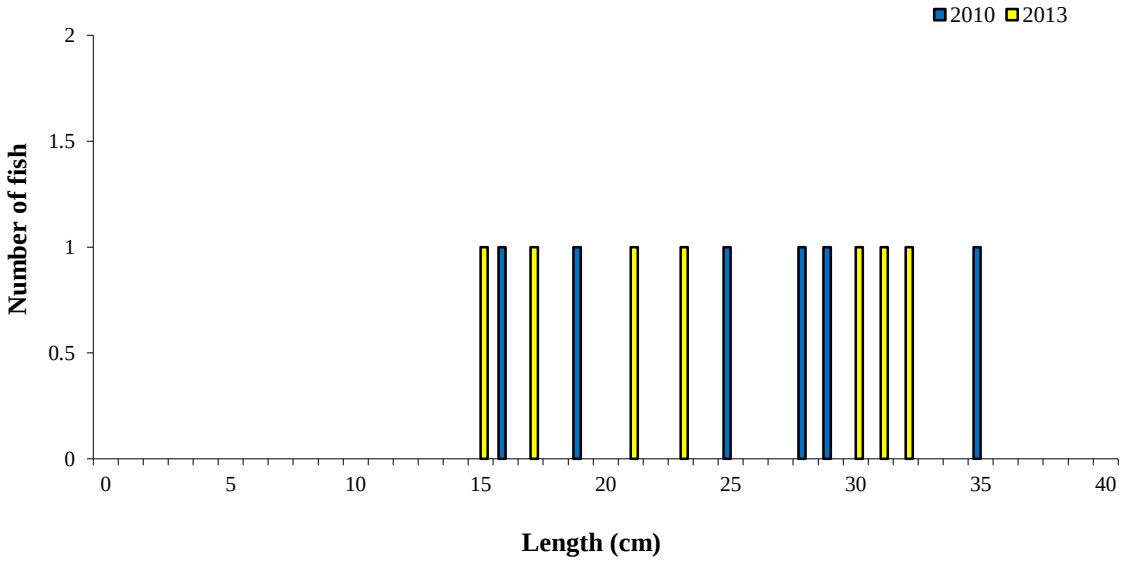

Fig. 1.6. Length frequency of brown trout captured on Lough Rea, 2010 and 2013

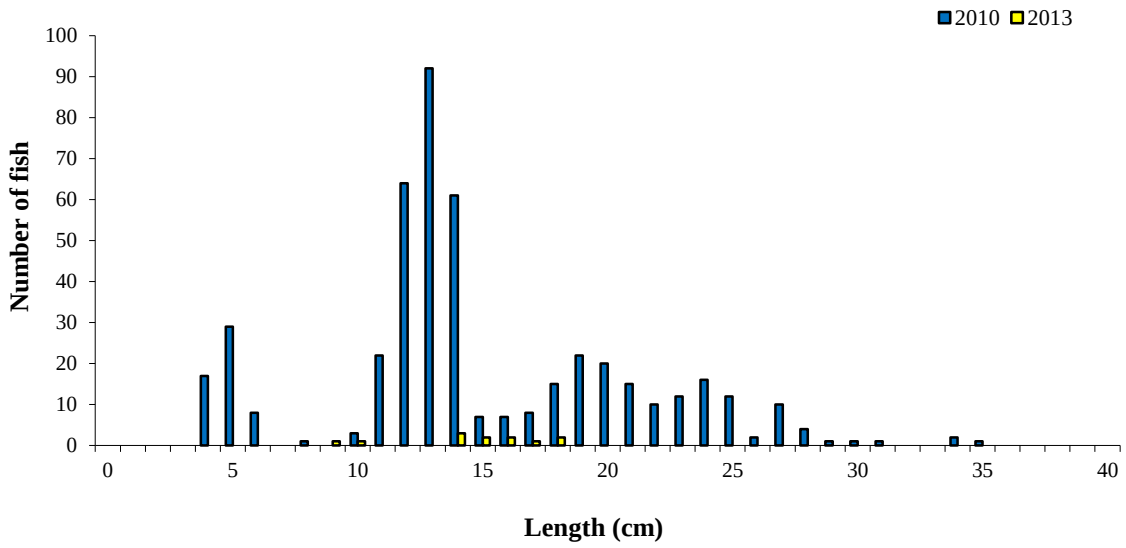

Fig. 1.7. Length frequency of perch captured on Lough Rea, 2010 and 2013

Table 1.3. Mean (±SE) brown trout length (cm) at age in Lough Rea, July 2013

	L_1	L_2	L_3	L_4
Mean	5.9 (0.4)	12.6 (0.9)	22.6 (1.6)	27.3
N	7	6	3	1
Range	4.8-7.8	10.1-15.3	19.4-24.3	27.3-27.3

Table 1.4. Mean (±SE) perch length (cm) at age in Lough Rea, July 2013

	L_1	L_2
Mean	6.5 (0.2)	13.1 (0.6)
N	8	6
Range	5.8-7.4	11.6-14.9

1.4 Summary

Three-spined stickleback 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. The mean perch CPUE and BPUE was significantly lower in 2013 than in 2010. A significant number of dead perch (various age classes) were found on the shoreline of Lough Rea in May 2013. The cause of this fish kill is unknown but it is suspected that it was a spawning failure or a post spawning mortality as perch were the only species present and only perch of 1+ to 2+ were recorded during the survey. Whereas perch aged 0+ to 7+ were recorded in the 2010 survey.

Although the mean brown trout CPUE was slightly higher in 2013 than in 2010 and BPUE was slightly lower in 2013 than in 2010, these differences were not statistically significant. Brown trout captured during the survey ranged in age from 1+ to 4+, indicating reproductive success in four of the previous five years. Results show that the lake holds a population of slow growing brown trout (mean L4= 27.3cm) according to the classification scheme of Kennedy and Fitzmaurice (1971).

IFI have provided advice to the Loughrea Anglers Association in relation to a fisheries enhancement scheme for the main inflowing stream and also the main outflow to improve spawning and nursery areas for the wild brown trout population in the lake. The angling club have been implementing this plan since the 2010 survey.

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 Rea has been assigned an ecological status of Moderate based on the fish populations present in 2013. The ecological status assigned to the lake based on the 2010 survey data was Good.

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

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