



Sampling Fish for the Water Framework Directive

Lakes 2010

Lough Rea



Iascach Intíre Éireann
Inland Fisheries Ireland

ACKNOWLEDGEMENTS

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1.1 Introduction

Lough Rea (Plate 1.1, Fig. 1.1) is situated in the Kilcolgan catchment in Co. Galway. 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 CaCO₃).

Lough Rea is managed by the Loughrea Anglers' Association. There are good numbers of rudd, perch, along with a stock of pike present in the lake. Perch, rudd, pike, 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). 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 is fed by springs and small streams on the south-eastern shore and has poor spawning areas for trout (NPWS, 1999).

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.



Plate 1.1. Lough Rea

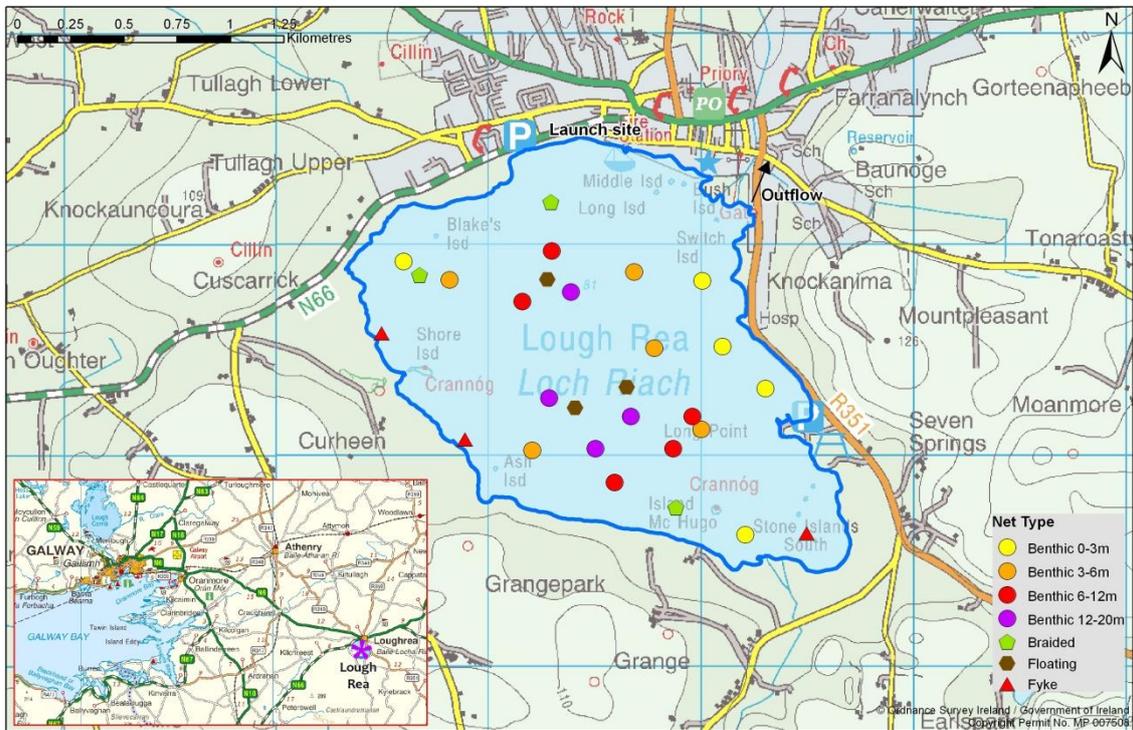


Fig. 1.1. Location map of Lough Rea showing net locations and depths of each net (outflow is indicated on map)

1.2 Methods

Lough Rea was surveyed over three nights from the 26th to the 29th of July 2010. 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. Survey locations were randomly selected within each depth zone using a grid placed over a map of the lake. A handheld GPS was used to mark the precise location of each net. The angle of each gill net in relation to the shoreline was randomised.

All fish apart from perch were measured and weighed on site and scales were removed from all 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 2010, with 543 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 three-spined stickleback and eels. Small numbers of brown trout and rudd, one nine-spined stickleback and one eel were also recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Rea, July 2010

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>Perca fluviatilis</i>	Perch	461	0	2	0	463
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	39	0	0	0	39
<i>Anguilla anguilla</i>	European eel	1	0	0	26	27
<i>Salmo trutta</i>	Brown trout	6	0	0	0	6
<i>Scardinius erythrophthalmus</i>	Rudd	6	0	0	0	6
<i>Pungitius pungitius</i>	Nine-spined stickleback	1	0	0	0	1
<i>Esox lucius</i>	Pike	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 are summarised in Table 1.2.

The differences in the mean perch CPUE between Lough Rea and three other similar lakes were assessed with no statistically significant differences being found (Fig. 1.2).

The differences in the mean brown trout CPUE between Lough Rea and two other similar lakes were assessed and found to be statistically significant (Kruskal-Wallis, $P < 0.001$) (Fig. 1.3). Independent-Samples Mann-Whitney U tests between each lake showed that Lough Rea had a significantly lower mean brown trout CPUE than Glencar Lough ($z = -3.687$, $P < 0.001$) (Fig 1.3).

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

Scientific name	Common name	Mean (S.E.) CPUE
<i>Perca fluviatilis</i>	Perch	0.571 (0.122)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.048 (0.018)
<i>Pungitius pungitius</i>	Nine-spined stickleback	0.001 (0.001)
<i>Anguilla anguilla</i>	European eel	0.144 (0.074)
<i>Salmo trutta</i>	Brown trout	0.007 (0.004)
<i>Scardinius erythrophthalmus</i>	Rudd	0.007 (0.004)
<i>Esox lucius</i>	Pike	0.001 (0.001)
		Mean (S.E.) BPUE
<i>Perca fluviatilis</i>	Perch	48.237 (9.725)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.042 (0.017)
<i>Pungitius pungitius</i>	Nine-spined stickleback	0.001 (0.001)
<i>Anguilla anguilla</i>	European eel	39.439 (20.748)
<i>Salmo trutta</i>	Brown trout	1.881 (1.400)
<i>Scardinius erythrophthalmus</i>	Rudd	0.809 (0.725)
<i>Esox lucius</i>	Pike	1.629 (1.629)

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

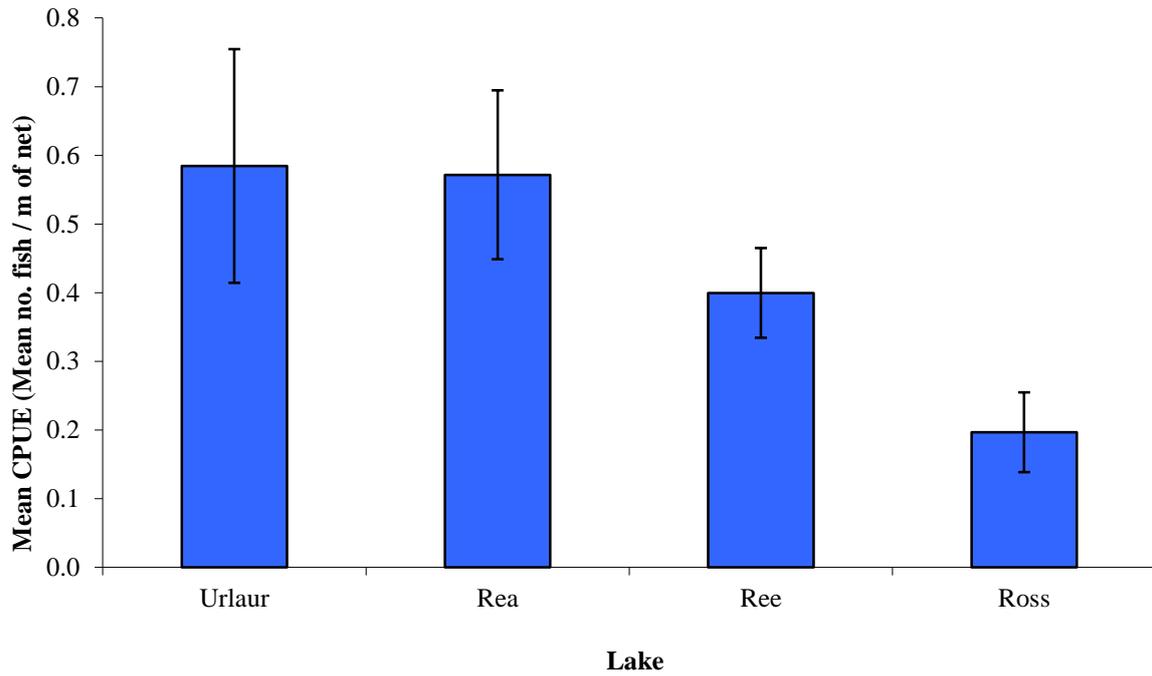


Fig. 1.2. Mean (\pm S.E.) perch CPUE in four lakes surveyed during 2010

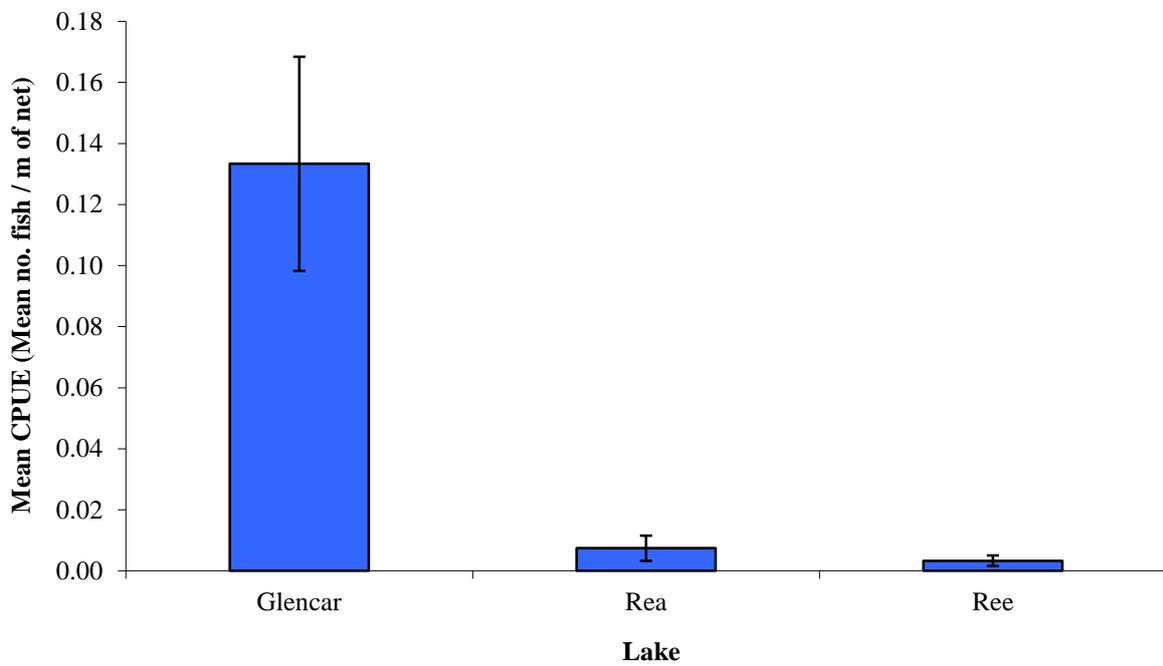


Fig. 1.3. Mean (\pm S.E.) brown trout CPUE in three lakes surveyed during 2010

1.3.3 Length frequency distributions

Perch ranged in length from 4.5cm to 35.0cm (mean = 15.3cm) (Fig. 1.4). Three-spined stickleback ranged in length from 2.5cm to 4.4cm (mean = 3.4cm) (Fig. 1.5). Brown trout ranged in length from 16.3cm to 35.8cm (Fig. 1.6). Eels ranged in length from 44.0cm to 69.2cm and rudd ranged in length from 6.2cm to 22.8cm. The single pike captured measured 55.5cm.

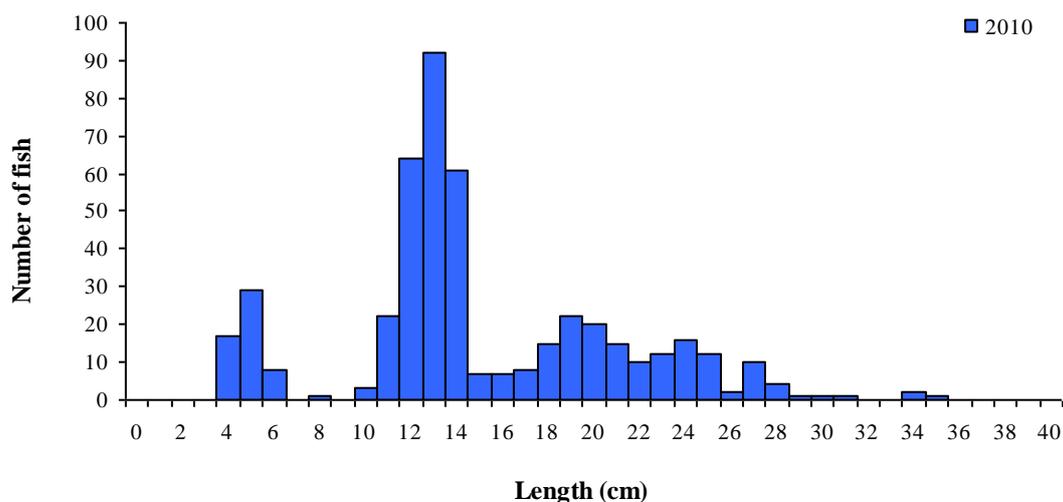


Fig. 1.4. Length frequency of perch captured on Lough Rea

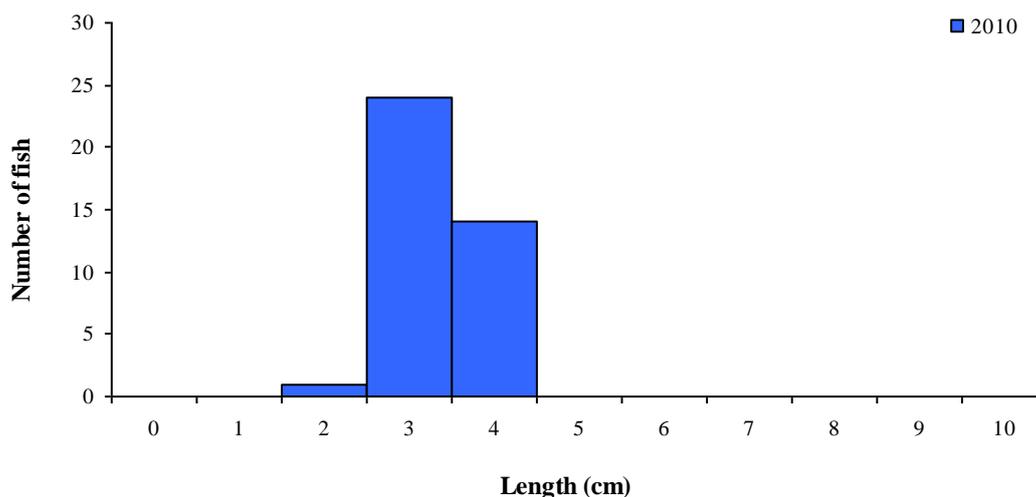


Fig. 1.5. Length frequency of three-spined stickleback captured on Lough Rea

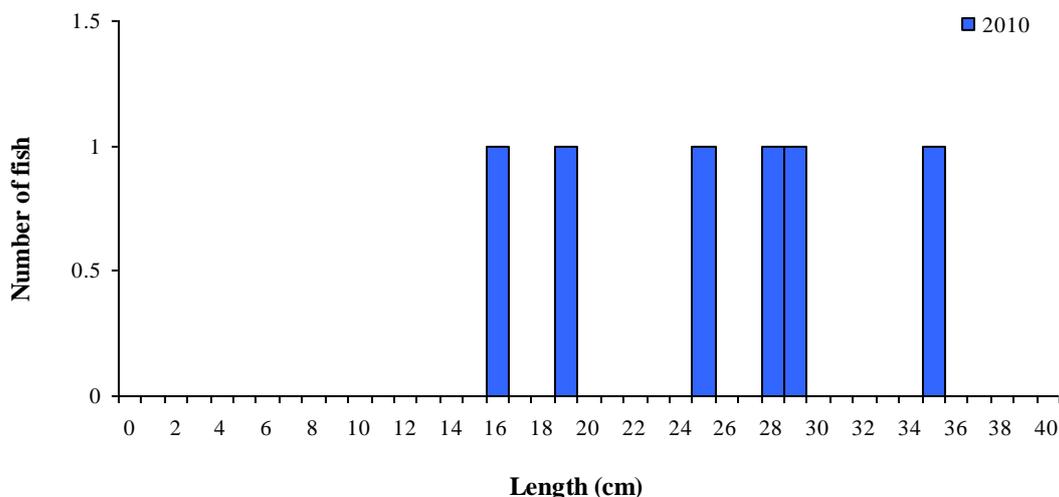


Fig. 1.6. Length frequency of brown trout captured on Lough Rea

1.3.4 Fish age and growth

Three age classes of brown trout were present, ranging from 1+ to 3+, with a mean L1 of 8.7cm (Table 1.3). Mean brown trout L3 in 2010 was 31.2cm indicating a fast/very fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971).

Eight age classes of perch were present, ranging from 0+ to 7+, with a mean L1 of 5.8cm (Table 1.4). The dominant age class for perch was 1+ which corresponded to the 10cm to 15cm length class (Fig. 1.4).

Three age classes of rudd were present, ranging from 3+ to 5+ and the single pike captured was aged 2+.

Table 1.3. Mean (\pm SE) brown trout length (cm) at age in Lough Rea, July 2010

	L₁	L₂	L₃
Mean	8.7 (0.8)	22.2 (1.1)	31.2
N	6	4	1
Range	6.4-11.6	20.7-25.3	31.2-31.2

Table 1.4. Mean (\pm SE) perch length (cm) at age in Lough Rea, July 2010

	L₁	L₂	L₃	L₄	L₅	L₆	L₇
Mean	5.8 (0.1)	12.4 (0.2)	18.5 (0.2)	23.2 (0.4)	24.6 (1.0)	26.2 (1.1)	30.1 (1.5)
N	114	87	48	27	7	6	5
Range	3.7-8.6	8.4-16.7	12.6-21.6	19.1-27.0	21.1-29.2	22.9-29.3	26.2-33.5

1.4 Summary

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

The mean perch CPUE in Lough Rea was not significantly different to three other similar lakes included in the comparison. The dominant age of perch was 1+, with ages ranging from 0+ to 7+, indicating reproductive success in each of the previous eight years.

The survey has shown that brown trout numbers in the lake are not excessive and mean CPUE for brown trout in the lake is similar to Lough Ree (Shannon) and significantly lower than the population in Glencar Lough, Co. Sligo. Brown trout captured during the survey ranged in age from 1+ to 3+, indicating reproductive success in three of the previous four years. Results show that the lake holds a population of fast growing brown trout (mean L3= 31.2cm) according to the classification scheme of Kennedy and Fitzmaurice (1971).

An inspection was carried out on the inflowing and outflowing stream by IFI staff in early July 2010. Water quality problems, dumping and siltation were evident in the outflowing stream during the inspection (Plate 1.2). IFI have given 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.



Plate 1.2: Lough Rea streams, showing dumping, filamentous algae and siltation, July 2010

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 Good based on the fish populations present.

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