National Research Survey Programme
Lakes 2016

Lough Rea

IFI/2017/1-4365

Iascach Intíre Éireann
Inland Fisheries Ireland

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**Fish Stock Survey of Lough Rea,
July 2016**

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

ACKNOWLEDGEMENTS

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). It 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. Brown trout with an average weight of 0.6kg are also found in the lake (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 there has been a history of coarse fish and pike management and brown trout stocking in the lake. In the early 1920's brown trout from nearby Lough Atorick in Co. Clare were stocked into the lake which had previously been stocked with only coarse fish (Healy, 1953). Further stocks of brown trout were introduced from Lough Atorick in 1936 and 1939 and this practice continued until at least the 1950's. These stocks were supplemented by fry hatched out locally from ova supplied from Lough Owel in Co. Westmeath and elsewhere (Healy, 1953). In addition female brown trout from the lake have been stripped almost annually since 1939 by the Lough Rea Anglers Association and unfed fry are stocked into the lake.

Lough Rea was previously surveyed in 2010 and 2013 as part of the WFD surveillance monitoring programme (Kelly *et al.*, 2011 and 2014). During the 2013 survey three-spined stickleback were found

to be the dominant species present in the lake followed by eels. Brown trout, pike, rudd, perch and nine-spined stickleback 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

1.2.2 Netting methods

Lough Rea was surveyed over two nights from the 25th to the 27th of July 2016. 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 (BM CEN) (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 (FM CEN) were deployed randomly in the lake (24 sites). The netting effort was supplemented using three two-panel benthic braided (63.5mm and 88.9mm mesh knot to knot) survey gill nets (2-PBB).

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.

1.2.2 Fish diet

Fish were frozen before being dissected for stomach content analysis in the IFI laboratory. Total stomach contents were inspected and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%O) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\%O_i = (N_i/ N)\times100$$

Where:

$\%O_i$ is the percentage frequency of prey item i,
N_i is the number of a particular species with prey i in their stomach,
N is total number of a particular species with stomach contents.

1.2.2 Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment in order to prevent dispersal of alien species and other organisms to uninfected waters. A standard operating procedure was compiled by Inland Fisheries Ireland for this purpose (Caffrey, 2010) and is followed by staff on the IFI NRSP team when moving between water bodies.

1.3 Results

1.3.1 Species Richness

A total of five fish species were recorded on Lough Rea in July 2016, with 191 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most common fish species recorded, followed by rudd, three-spined stickleback, eels and brown trout. During the previous surveys in 2010 and 2013 the same species composition was recorded with the exception of nine-spined stickleback and pike, which were not captured during the 2016 survey but were recorded during the 2010 and 2013 surveys (Kelly *et al.*, 2011 and 2014).

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Rea, July 2016

Scientific name	Common name	Number of fish captured				
		2-PBB	BM CEN	FM CEN	Fyke	Total
Perca fluviatilis	Perch	0	84	0	0	84
Scardinius erythrophthalmus	Rudd	0	43	1	3	47
Gasterosteus aculeatus	Three-spined stickleback	0	26	8	0	34
Anguilla anguilla	European eel	0	0	0	20	20
Salmo trutta	Brown trout	0	6	0	0	6

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 2016 survey are summarised in Table 1.2.

The mean CPUE and BPUE (excluding the 88.9mm mesh panel in 2-PBB) for all species captured in the 2010, 2013 and 2016 surveys are illustrated in Figure 1.2 and 1.3.

Perch were the dominant fish species in terms of both abundance (CPUE) and biomass (BPUE) captured during the 2016 survey, followed by rudd (Table 1.2).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Rea, 2016

Scientific name	Common name	Mean CPUE (± S.E) **
Perca fluviatilis	Perch	0.104 (0.042)
Scardinius erythrophthalmus	Rudd	0.056 (0.024)
Gasterosteus aculeatus	Three-spined stickleback	0.042 (0.011)
Salmo trutta	Brown trout	0.007 (0.003)
Anguilla anguilla *	European eel*	0.111 (0.062) *
		Mean BPUE (± S.E) **
Perca fluviatilis	Perch	13.694 (6.624)
Scardinius erythrophthalmus	Rudd	1.548 (0.686)
Gasterosteus aculeatus	Three-spined stickleback	0.033 (0.011)
Salmo trutta	Brown trout	2.246 (1.584)
Anguilla anguilla *	European eel*	31.039 (14.082) *

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

**CPUE and BPUE data above for all fish species except eels are not comparable to earlier surveys as an extra panel was added to the 2-PBB to provide additional information on large coarse fish.

Perch

Mean perch CPUE and BPUE was significantly higher in 2010 than in 2013 and 2016 (Kruskal-Wallis H=16.17, P<0.05 and H=19.54, P<0.05) (Fig 1.2 and 1.3).

Brown trout

The mean brown trout CPUE and BPUE was higher in 2016 than in 2010 and 2013; however, these differences were not statistically significant (Fig 1.2 and 1.3).
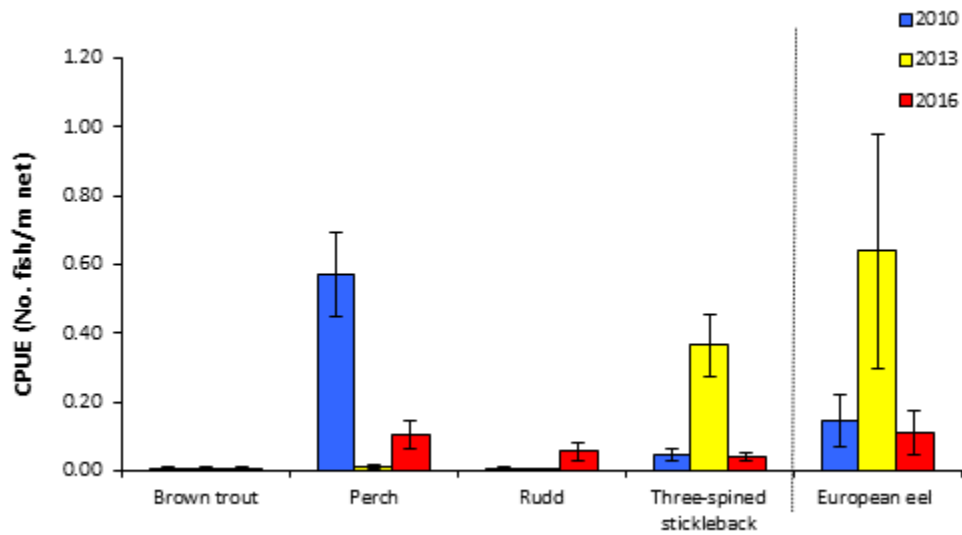
Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Rea (Eel CPUE based on fyke nets only), 2010, 2013 and 2016
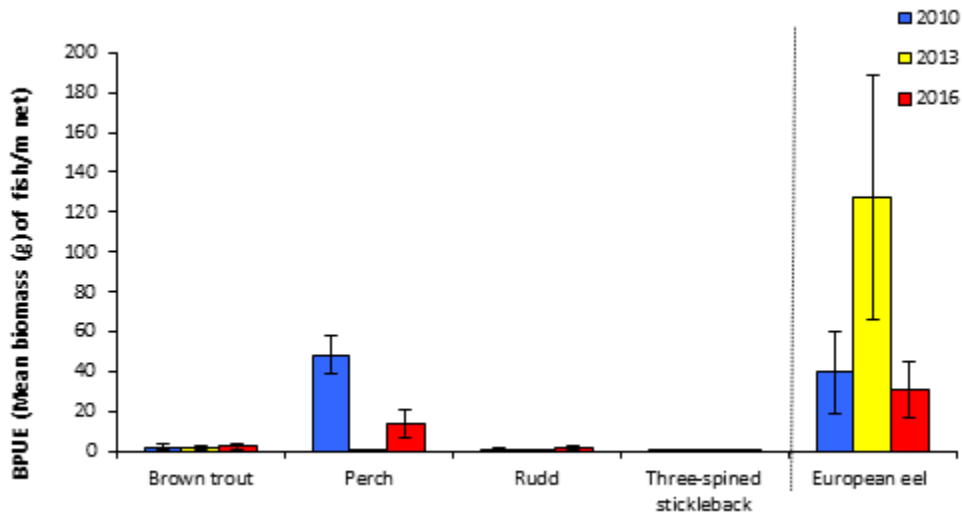

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Rea (Eel BPUE based on fyke nets only), 2010, 2013 and 2016

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2016 survey ranged in length from 6.2cm to 34.6cm (mean = 16.5 cm) (Fig. 1.4). Six age classes were present, ranging from 0+ to 6+, with a mean L1 of 6.4cm (Table 1.3). The dominant age class was 1+ (Fig. 1.4). Perch captured during the 2010 survey had a similar length and age range (Fig.1.4); however the perch recorded in 2013 had a much smaller length and age range (Fig 1.4).
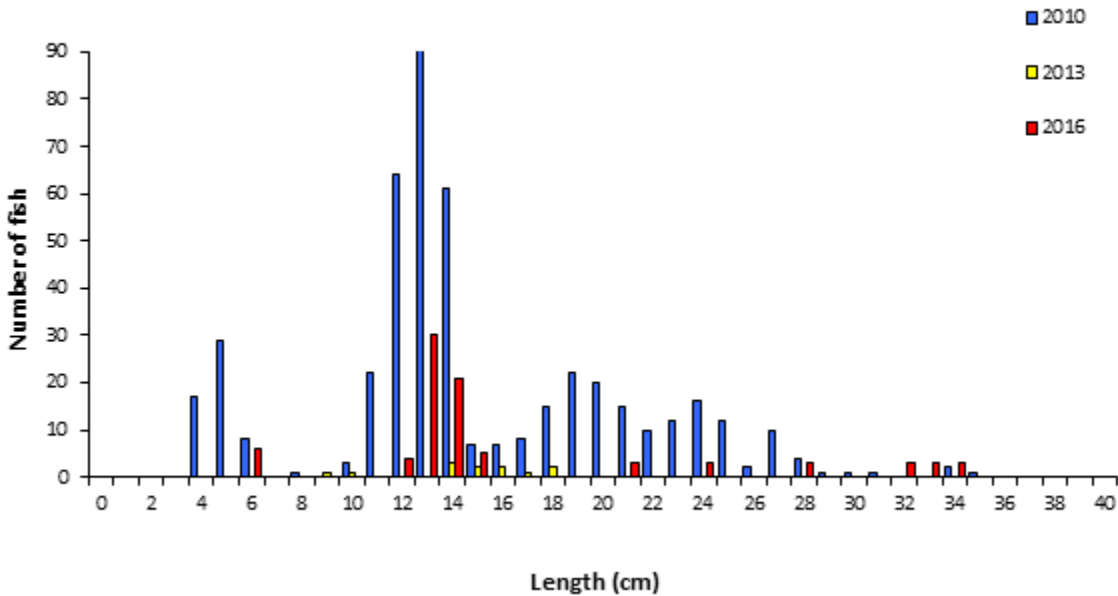

Fig. 1.4. Length frequency of perch captured on Lough Rea, 2010, 2013 and 2016

Table 1.3. Mean (±S.E.) perch length (cm) at age for Lough Rea, July 2016

	L_1	L_2	L_3	L_4	L_5	L_6
Mean (±S.E.)	6.4 (0.4)	14.0 (0.7)	20.2 (1.9)	24.6 (3.2)	27.5 (1.7)	31.4 (1.3)
N	12	7	4	3	2	2
Range	4.5-9.3	10.8-17.5	15.5-25.1	19.2-30.4	25.8-29.2	30.0-32.8

Brown trout

Brown trout captured during the 2016 survey ranged in length from 16.6cm to 42.7cm (mean = 27.5cm) (Fig. 1.5). Four age classes were present, ranging from 1+ to 5+, with a mean L1 of 7.3cm (Table 1.4). The dominant age class was 2+ (Fig. 1.5). Mean brown trout L4 in 2016 was 37.1cm indicating a very fast rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 1.4). Brown trout captured during the 2010 and 2013 surveys had similar length and age ranges, with some larger and older fish recorded in the 2010 and 2016 surveys (Fig.1.5).
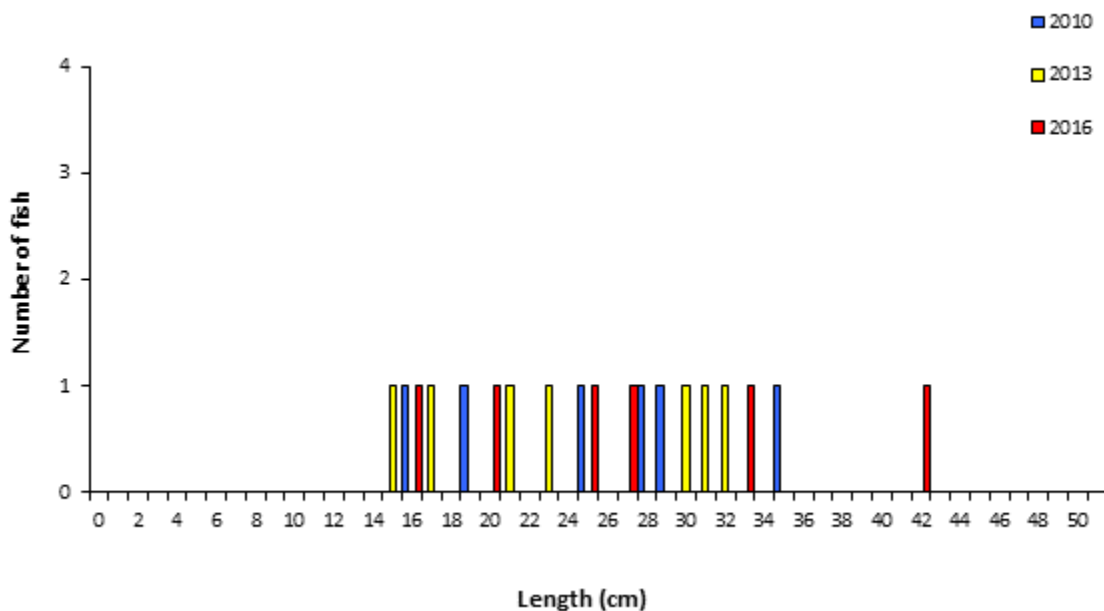

Fig. 1.5. Length frequency of brown trout captured on Lough Rea, 2010, 2013 and 2016

Table 1.4. Mean (±S.E.) brown trout length (cm) at age for Lough Rea, July 2016

	L_1	L_2	L_3	L_4	L_5	Growth Category
Mean (±S.E.)	7.3 (0.5)	22.4 (0.5)	30.6 (0.4)	37.1	41.1	Very fast
N	6	4	2	1	1	
Range	5.6-9.2	21.1-23.4	30.1-31.0	37.1-37.1	41.1-41.1	

Other fish

Eels captured during the 2016 survey ranged in length from 42.6cm to 68.4cm and three-spined stickleback ranged in length from 3.2cm to 6.0cm. Rudd ranged in length from 7.0cm to 17.1cm with four age classes present ranging from 1+ to 4+.

1.3.4 Stomach and diet analysis

Dietary analysis studies provide a good indication of the availability of food items and the angling methods that are likely to be successful. However, the value of stomach content analysis is limited unless undertaken over a long period as diet may change on a daily basis depending on the availability of food items. The stomach contents of a subsample of perch and brown trout captured during the survey were examined and are presented below.

Perch

Perch initially start to feed on pelagic zooplankton. Once they reach an intermediate size they begin feeding on benthic resources eventually moving on to feed on fish once they are large enough (Hjelm *et al.*, 2000). A total of 11 stomachs were examined. Of these two contained no prey items. Of the remaining nine stomachs containing food, 89% contained fish and 11% unidentified digested material (Fig 1.6).
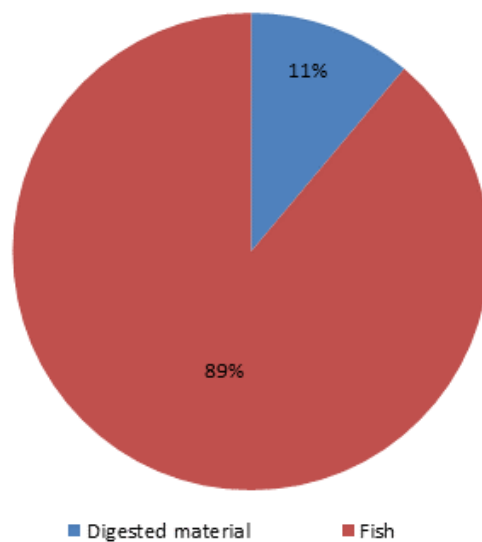

Fig. 1.6. Diet of perch (n=9) captured on Lough Rea, 2016 (% occurrence)

Brown trout

Adult trout usually feed principally on crustaceans (*Asellus* sp*.* and *Gammarus* sp.), insects (principally chironomid larvae and pupae) and molluscs (snails) (Kennedy and Fitzmaurice, 1971, O'Grady, 1981). A total of 3 stomachs were examined. Of these one was empty. Of the remaining two stomachs containing food, both contained invertebrates (Fig. 1.7).
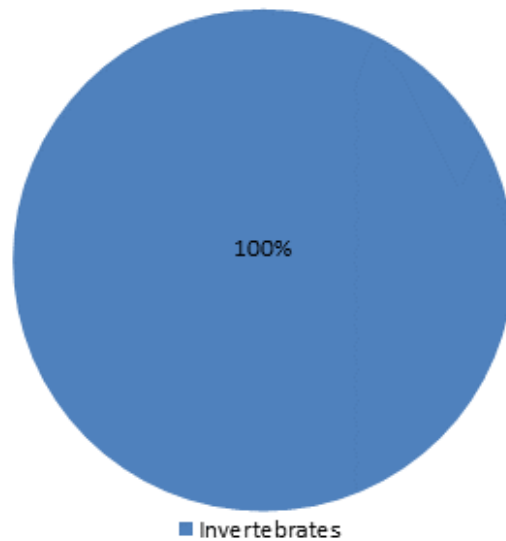

Fig. 1.7. Diet of brown trout (n=2) captured on Lough Rea, 2016 (% occurrence)

1.4 Summary and ecological status

A total of five fish species were recorded on Lough Rea in July 2016. Perch were the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2016 survey, followed by rudd.

The perch CPUE and BPUE was significantly higher in 2010 than in 2013 and 2016. Perch ranged in length from 6.2cm to 34.6cm and ranged in age from 0+ to 6+, indicating reproductive success in each of the previous seven years. The dominant age class was 1+.

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 2013 survey. Whereas perch aged 0+ to 7+ were recorded in the 2010 survey. The 2016 survey showed an increase in perch numbers from the 2013 survey which indicates a possible recovery in the perch population.

The mean brown trout CPUE and BPUE was higher in 2016 than in 2010 and 2013; however, these differences were not statistically significant. Brown trout ranged in length from 16.6cm to 42.7cm with four age classes ranging from 1+ to 5+, indicating reproductive success in five of the previous six years. The dominant age class was 2+. Length at age analyses revealed that brown trout in the lake exhibit a very fast rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

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 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, Lough Rea has been assigned an ecological status of High for 2016 based on the fish populations present. In previous years the lake was assigned a fish status of Moderate for 2013 and Good for 2010.

In the 2010 to 2015 surveillance monitoring reporting period, the EPA assigned Lough Rea an overall ecological status of Moderate.

1.5 References

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