National Research Survey Programme

Lakes 2021

Lough Gur

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Gur,

August 2021

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National Research Survey Programme

Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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1. Introduction

Lough Gur is located within the River Maigue catchment approximately 20km south-east of Limerick city, north of Bruff in Co. Limerick (Plate 1.1, Figure 1.1). It has a surface area of 78ha, a mean depth of 2.4m and a maximum depth of 5.0m. The lake is categorised as typology class 10 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l CaCO3). The lake catchment is relatively small and limited to surface run-off from surrounding hills. It is a eutrophic lake with consistently high levels of phosphorus (King and O' Grady, 1994; Lough Gur EMS, 2009). A process of enrichment which has been ongoing for several centuries, has accelerated since the 1950s (Walsh, 2017).

Lough Gur and the surrounding area is internationally and nationally important for migrant wildfowl species and has been designated as a Natural Heritage Area and a Wildfowl Sanctuary (Lough Gur EMS, 2009). The lake and the adjoining Red Bog possess a diverse range of terrestrial and aquatic habitats for both flora and fauna. The flora of the lake was surveyed in 1989 (King and O' Grady, 1994) and was composed mainly of Hornwort sp. (*Ceratophylum* sp.) and Fennel pondweed (*Potamogeton pectinatus)* - indicative of nutrient enriched waters.

The lake was previously surveyed by the Inland Fisheries Trust in March 1978 (IFT, unpublished data) and by IFI (previously the Central Fisheries Board) between December 1988 and October 1989 (King and O' Grady, 1994). These surveys revealed that a relatively large stock of fast growing rudd and pike were present in the lake. Since 2009 the lake has been surveyed on four occasions (2009, 2012, 2015 and 2018) (Kelly *et al*., 2010, 2013, 2016; Connor *et al*., 2019). Perch were first captured in the 2012 survey of the lake and dominated biomass in the 2018 survey.

This report summarises the results of the 2021 fish stock survey carried out on the lake using Inland Fisheries Ireland's fish in lakes monitoring protocol. The protocol is WFD compliant and also provides insight into fish stock status in the lake.

Plate 1.1. Lough Gur, August 2021

Plate 1.2. Setting a survey net on Lough Gur, August 2021

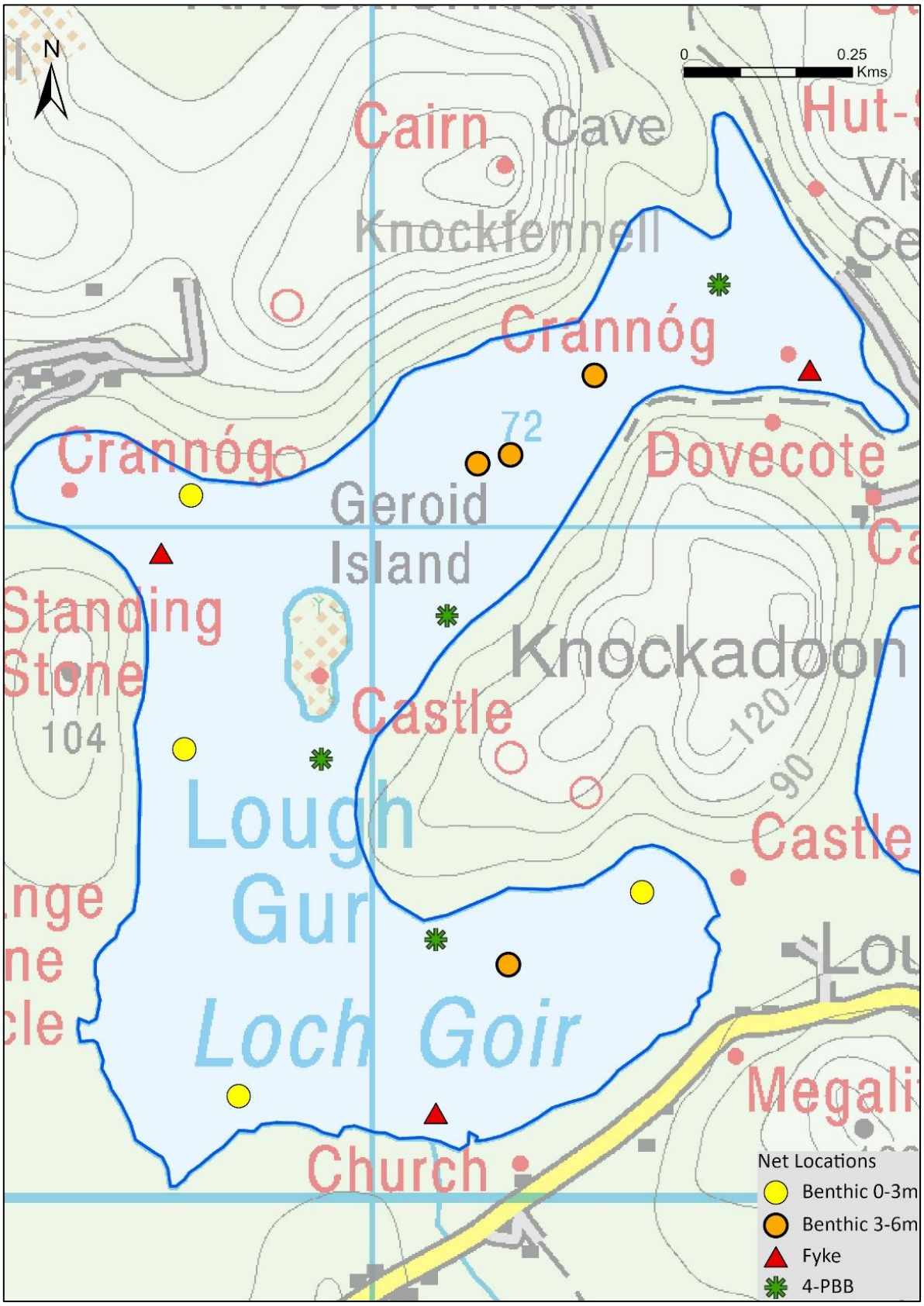

Figure 1.1. Location map of Lough Gur showing locations and depths of each survey net

2. Methods

2.1. Netting methods

Lough Gur was surveyed over two nights from the 17th to the 19th of August 2021. A total of three sets of Dutch fyke nets (Fyke), eight benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m and 4 @ 3-5.9m) were deployed in the lake (11 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at four additional sites. The four-panel survey gill nets are composed of four 27.5m long panels each a different mesh size (55mm, 60mm, 70mm and 90mm knot to knot). These nets were deployed in random locations throughout the lake. A handheld GPS was used to locate 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 a sub-sample of other species except eels. 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. Fish were frozen immediately after the survey and transported back to the IFI laboratory for later dissection.

2.2. Fish diet

Total stomach contents were inspected and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%FO) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\mathbf{FO}_{\boldsymbol{i}} = \left(\frac{\boldsymbol{N_i}}{\boldsymbol{N}}\right) * \mathbf{100}$$

Where:

$\mathbf{FO}_{\boldsymbol{i}}$ is the percentage frequency of prey item i,
$\boldsymbol{N_i}$ is the number of fish with prey i in their stomach,
$\boldsymbol{N}$ is total number of fish with stomach contents.

2.3. Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment 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 in IFI when moving between water bodies.

3. Results

3.1. Species Richness

A total of three fish species were recorded on Lough Gur in August 2021. A total of 369 fish were captured. The number of each species captured by each gear type is shown in Table 3.1. Perch was the most abundant fish species recorded. Rudd and pike were also captured during the survey. No eels were recorded in the 2021 survey.

Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Gur, August 2021

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Perca fluviatilis	Perch	249	1	2	252
Scardinius erythrothalmus	Rudd	108	4	0	112
Esox lucius	Pike	3	0	2	5

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 (WFD and WFD+). For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. In 2021 perch was the dominant fish species in terms of abundance (CPUE) and rudd was the dominant fish species in terms of biomass (BPUE) captured during the survey (Table 3.2).

For comparison purposes CPUE and BPUE for each species captured in all surveys per net type between 2009 and 2021 are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time. Perch were not recorded when the lake was first surveyed in 2009. Numbers of perch increased rapidly following their first record in 2012 and this species now dominates fish stocks. While rudd numbers appear to be relatively stable, the apparent decrease in BPUE recorded in all surveys since 2009 is driven by the stock in 2009 being dominated by larger individuals. Eel catches have declined over the survey period and none were captured in the 2021 survey (Figure 3.1 and 3.2).

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Gur, August 2021

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Perca fluviatilis	Perch	0.556 (0.156)	12.734 (3.665)
Scardinius erythrothalmus	Rudd	0.242 (0.081)	19.472 (6.402)
Esox lucius	Pike	0.009 (0.004)	1.902 (1.005)

Note: Where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species (Connor et al., 2017).

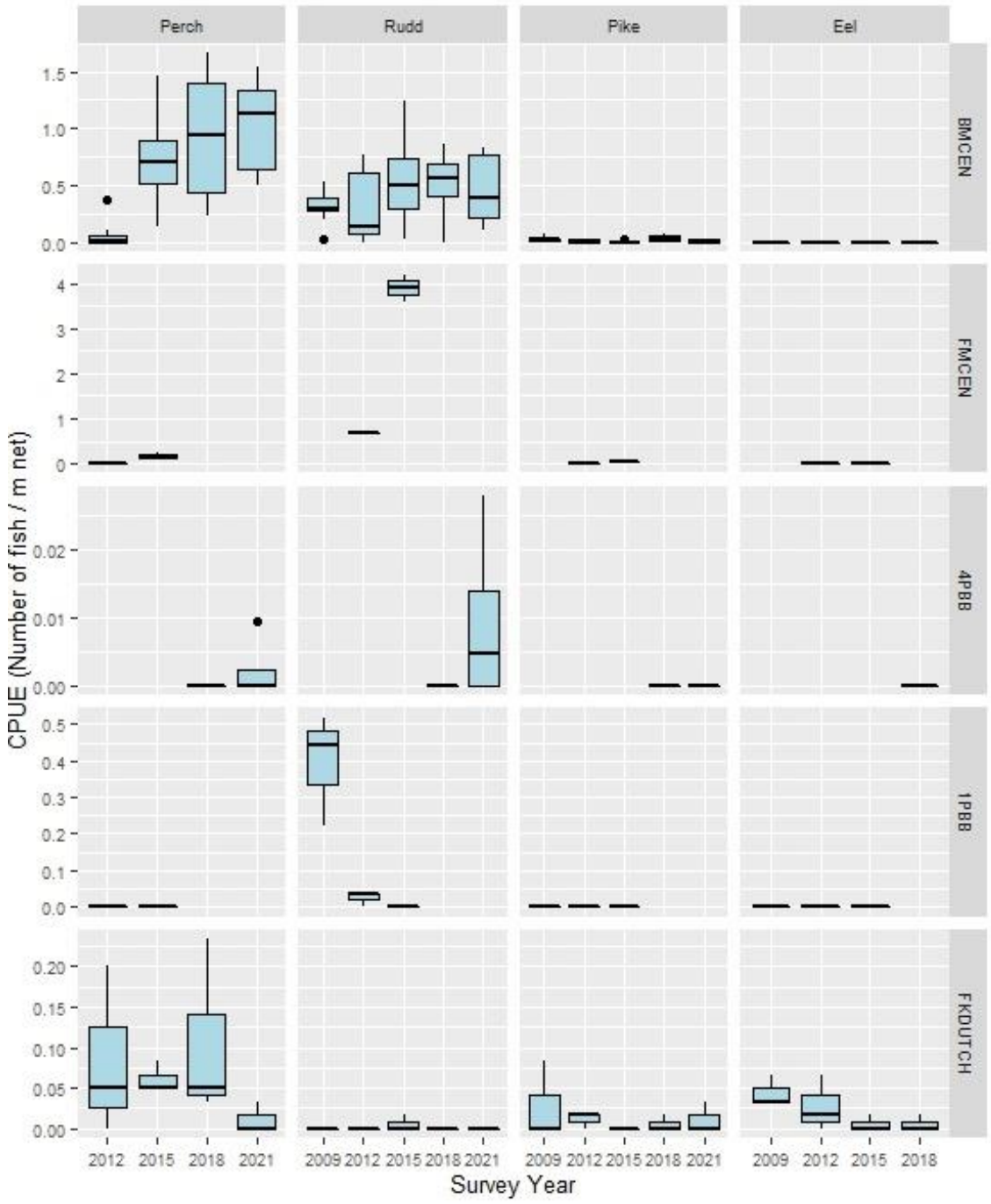

Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lough Gur between 2009 and 2021. Figures are expressed as number of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis (CPUE) is unique for each net type.

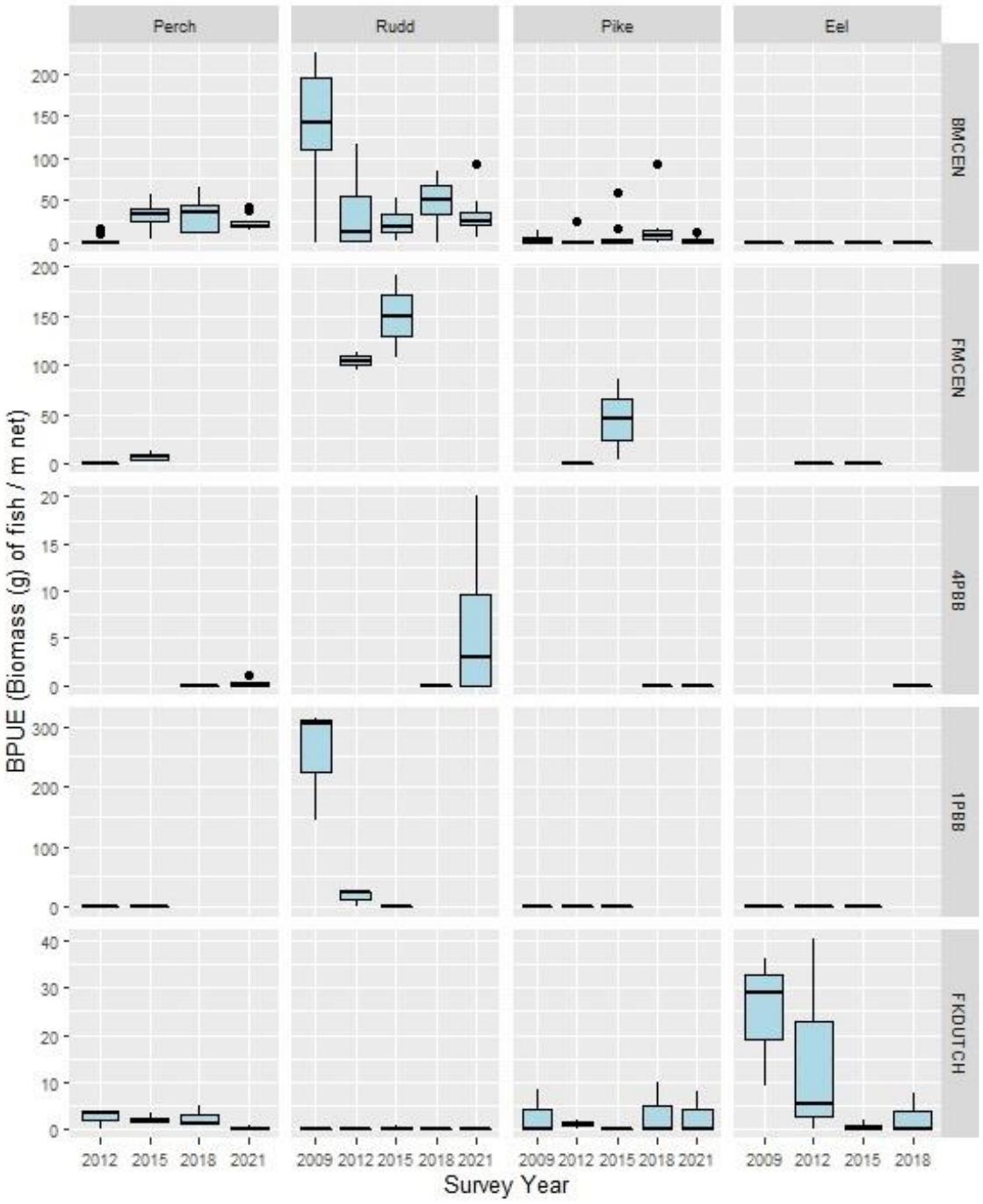

Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Gur between 2009 and 2021. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis (BPUE) is unique for each net type.

3.3. Length frequency distributions and growth

Perch

Perch captured during the 2021 survey ranged in length from 4.0cm to 20.8cm (mean = 10.5cm) (Figure 3.3). Perch in the sample ranged in age from 0+ to 4+. Mean length at the end of the 1st year (L1) was 6.0cm (Table 3.3). All year classes between 1+ and 4+ were well represented in the sample, but no older (i.e. 5+) fish were captured. Fewer larger perch were captured in 2021 compared to surveys conducted in 2015 and 2018 (Figure 3.3).

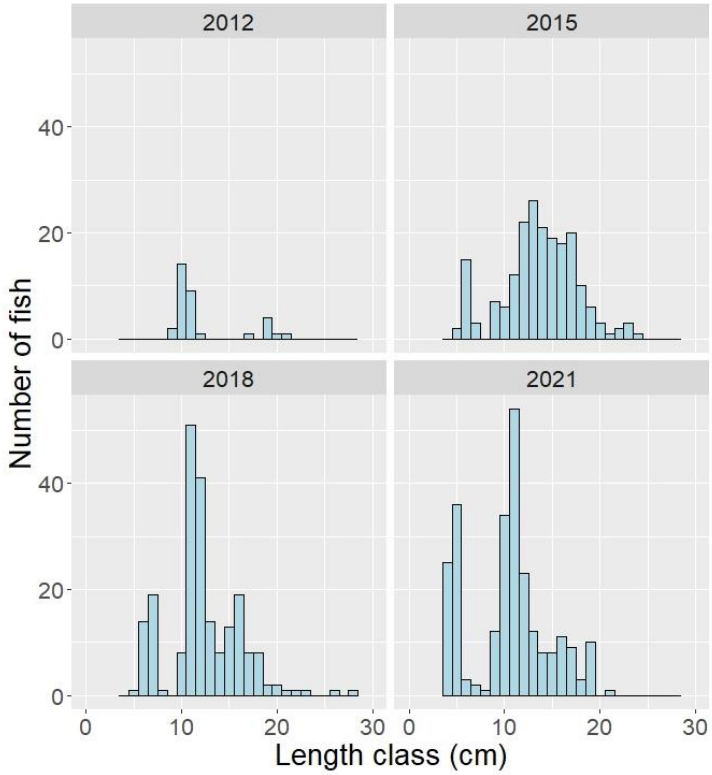

Figure 3.3. Length frequency of perch captured on Lough Gur, 2012, 2015, 2018 and 2021

Table 3.3. Mean (±S.E.) perch length (cm) at age for Lough Gur, August 2021

	L_1	L_2	L_3	L_4
Mean (±S.E.)	6.0 (0.1)	10.6 (0.2)	13.9 (0.2)	16.2 (0.2)
N	58	46	29	12
Range	4.4-8.7	8.0-13.8	10.6-15.6	15.2-18.2

Rudd

Rudd captured during the 2021 survey ranged in length from 6.2cm to 34.3cm (mean = 14.2cm) (Figure 3.4). Rudd were aged between 1+ and 10+, with the majority of the rudd sampled aged between 1+ and 5+ (Table 3.4). While relatively few older (i.e. >6+) or larger (i.e. >25cm) fish were captured in 2021, their persistence in the population is similar to the earlier surveys conducted in 2009 and 2012.

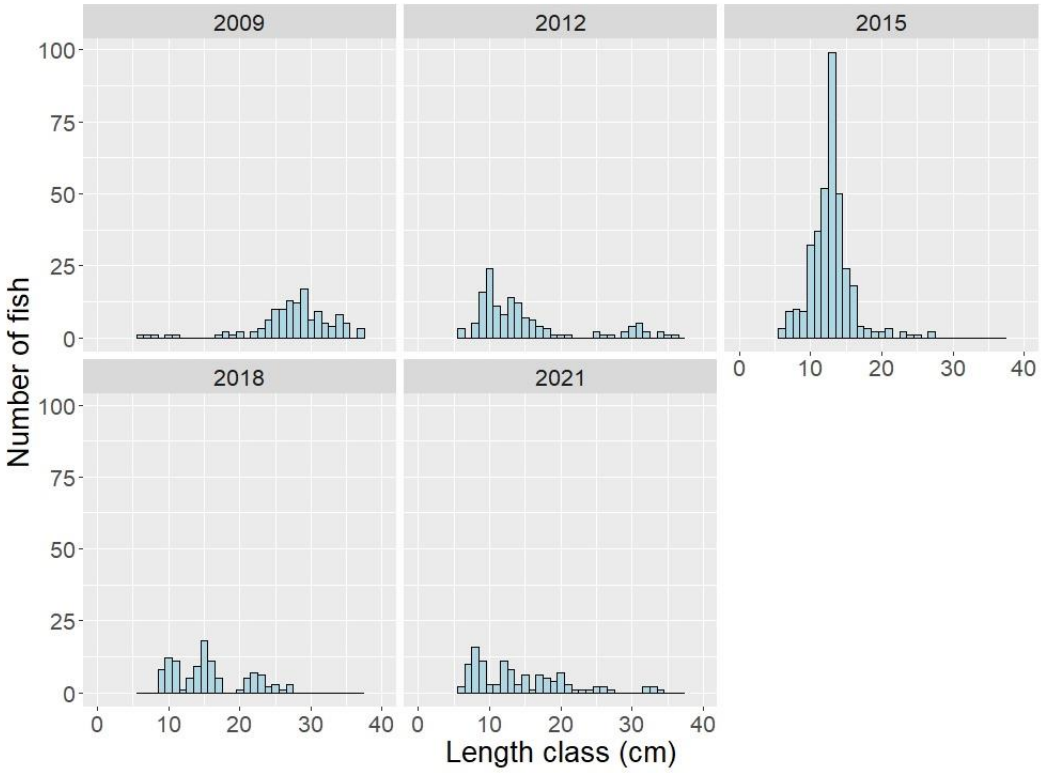

Figure 3.4. Length frequency of rudd captured on Lough Gur, 2009, 2012, 2015, 2018 and 2021

Table 3.4. Summary age data from rudd captured on Lough Gur, August 2021. Number (N) of fish and length ranges of all fish aged in the sample is presented.

	Age class									
	1+	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**	**9+**	**10+**
N	13	10	10	7	9	0	2	0	1	1
Mean L (cm)	8.1	12.1	15.8	17.9	20.6	-	26.4	-	-	-
Min L (cm)	6.2	10.1	14.0	16.8	18.7	-	26.0	-	32.2	31.7
Max L (cm)	9.7	13.7	18.1	19.8	23.3	-	26.7	-	32.2	31.7

Other fish species

Five pike were captured during the 2021 survey. They ranged in in length from 21.2cm to 38.0cm (mean = 29.6cm). Three age classes (2+ - 4+) were recorded.

3.4. Stomach and diet analysis

The dietary analysis conducted provides insight to the prey of examined fish immediately prior to capture. Longer term and seasonal studies provide a more robust assessment of fish diet. The stomach contents of a subsample of perch and pike captured during the survey were examined and are presented below.

Perch

A total of 56 stomachs were examined. Of these 29 (52%) were found to contain no prey items. Of the remaining 27 stomachs, 16 (59%) contained invertebrates. Zooplankton and plant material were each recorded in one stomach (4%). Unidentified digested material was recorded in nine perch (33%) (Figure 3.5).

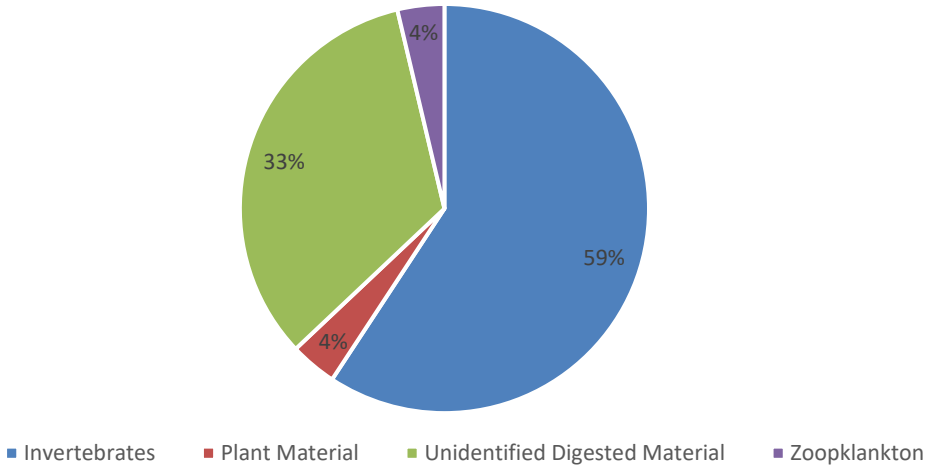

Figure 3.5. Diet of perch (n = 27) captured on Lough Gur, 2021 (% frequency occurrence)

Pike

Three pike were available for dietary analysis. The stomach of one fish (L = 27.9cm) was empty. Both fish (perch) and invertebrates were recorded in the stomach of one pike (L = 21.2cm). Perch was the sole prey item recorded in the third pike (L = 37.9cm).

4. Summary and ecological status

A total of three fish species (perch, rudd and pike) were recorded on Lough Gur in August 2021. Perch and rudd were the dominant species with respect to abundance and biomass respectively. While rudd have been present in the lake for some time, perch were first recorded in the 2012 survey. The initial increase in perch CPUE and BPUE evident since their initial record in 2012 would appear to have stabilised at this time. Both species exhibit regular recruitment patterns in the lake and populations of both species are dominated by younger and smaller individuals. There is evidence of some larger and longer lived fish persisting in the rudd population. No eel were recorded in the 2021 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 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 Gur has been assigned an ecological status of Moderate for 2021 based on the fish populations present. In previous years the lake was assigned a fish status of Bad for 2009, Poor for 2012 and 2015 and Moderate for 2018 (Figure 4.1).

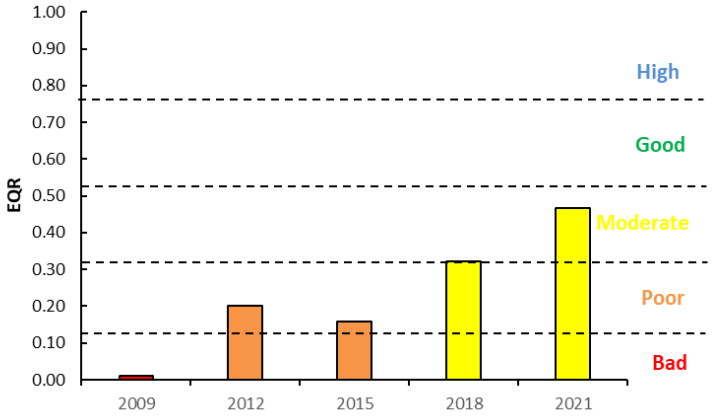

Figure 4.1. Fish ecological status of Lough Gur, 2009 to 2021

In the 2013 to 2018 WFD monitoring reporting period, the EPA assigned Lough Gur an overall draft ecological status of Moderate, based on all monitored physico-chemical and biological elements, including fish.

5. References

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