National Research Survey Programme

Lakes 2023

Lough Egish

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Iascach Intíre Éireann
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Fish Stock Survey of Lough Egish, August 2023

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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 Egish (Plate 1.1 and Figure 1.1) is located in the Erne catchment, approximately eight kilometres south of Castleblaney in Co. Monaghan. The lake is situated at an altitude of 160.8m above sea level. It has a surface area of 117ha, a mean depth of 3.3m and a maximum depth of 10m. The lake 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 $CaCO_3$). The geology of the area is predominantly Silurian Quartzite.

The lake has a long history of enrichment and was previously classified as strongly eutrophic by the Environmental Protection Agency (McGarrigle *et al*., 2002) and hypertrophic (Irvine *et al*., 2001). Water quality problems continue and the lake is classified as At Risk (i.e. at risk of failing to meet good status by 2023) and ecological status is currently classified as Bad (EPA, 2021). Lough Egish was previously used as the main water supply for Castleblaney. However, this supply was upgraded, and water is no longer extracted from the lake. Lakeland Dairies Drying Plant also extracted their process and cooling water from the lake prior to 2008.

Historical records of Arctic char exist for Lough Egish (Went 1945; Went, 1971). However, they are now extinct in the lake. The lake is highly regarded as a pike fishery, with good stocks of small to medium sized pike (Angling Ireland, 2018). Lough Egish has been surveyed on three occasions since 2006 (Kelly *et al*., 2007, 2009 and 2012a). During these surveys, perch and roach were found to be the dominant species present in the lake. Pike and European eel were also captured in all surveys, while roach x bream hybrids were recorded in 2011.

This report summarises the results of the 2023 fish stock survey carried out on the lake using Inland Fisheries Ireland's fish in lakes monitoring protocol. The protocol is WFD compliant and provides insight into fish stock status in the lake.

Plate 1.1. Lough Egish, August 2023

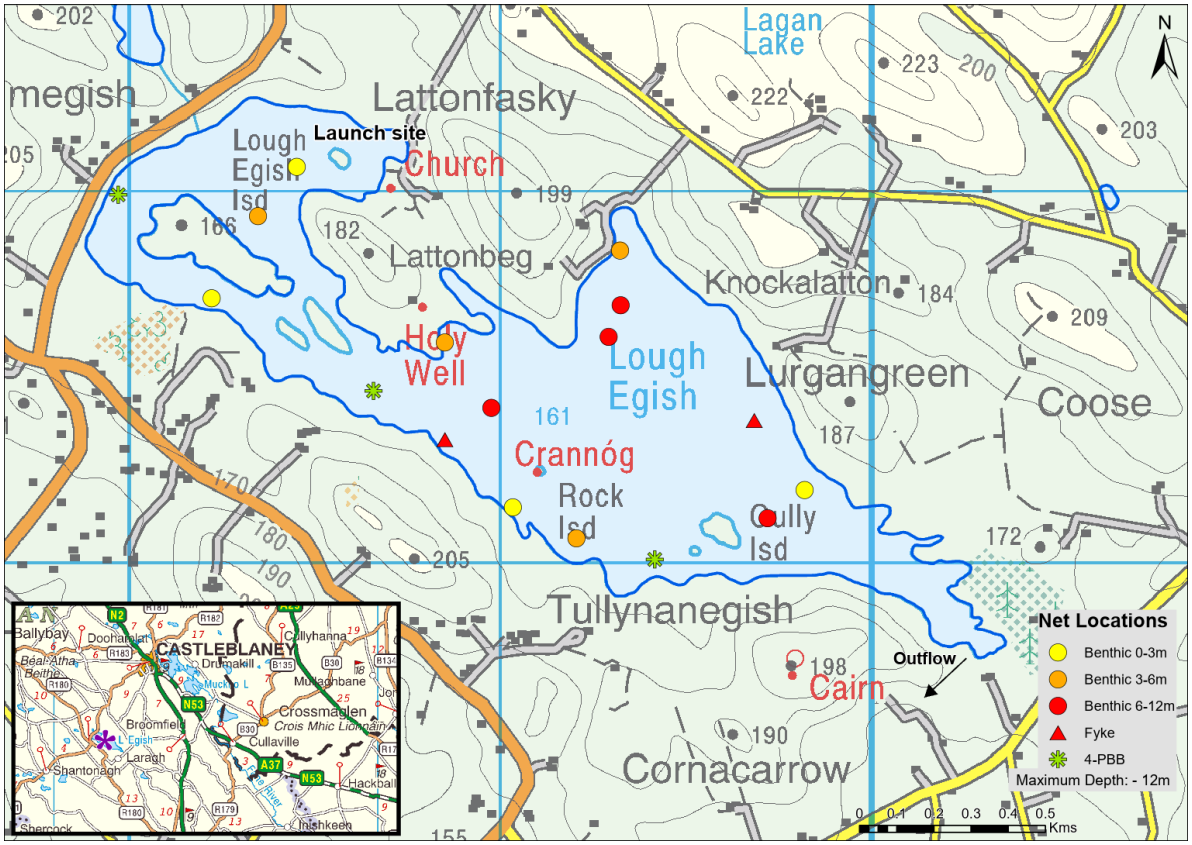

Figure 1.1. Location map of Lough Egish showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Lough Egish was surveyed over three nights between the 21st to the 29th of August 2023 (21st-23rd and 28th-29th). A total of two sets of Dutch fyke nets, 12 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (4 @ 0-2.9m, 4 @ 3-5.9m and 4 @ 6-11.9m) (14 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at three additional sites. The four-panel braided nets are composed of four 27.5m long panels each a different mesh size (55mm, 60mm, 70mm and 90mm) tied together randomly. 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 a sub-sample of other species. 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 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).

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

Where:
$\mathbf{FO}_{\boldsymbol{i}}$ is the percentage frequency of prey item i,
$\boldsymbol{N}_{\boldsymbol{i}}$ 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 six fish species and one type of cyprinid hybrid were recorded on Lough Egish in August 2023. A total of 2032 fish were captured (Table 3.1). Perch was the most numerous fish species recorded, representing *c.* 72% of all fish captured. Roach were also recorded in relatively high numbers, accounting for 27% of the catch. Pike, minnow, roach x bream hybrids, bream and European eel were also captured. The same species composition was recorded on the previous survey of the lake in 2011, with the exception of minnow and bream which have not been recorded previously (Kelly *et al*., 2007, 2009 and 2012a).

Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Egish, August 2023.

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Perca fluviatilis	Perch	1447	1	5	1453
Rutilus rutilus	Roach	552	0	0	552
Esox lucius	Pike	10	7	1	18
Phoxinus phoxinus	Minnow	5	0	0	5
Rutilus rutilus x Abramis brama	Roach x bream hybrid	2	0	0	2
Abramis brama	Bream	1	0	0	1
Anguilla anguilla	European eel	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. Perch were the dominant species with respect to abundance (CPUE), while roach was the dominant species in terms of biomass (BPUE). The biomass of pike and perch were also relatively high (Table 3.2).

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Egish, August 2023.

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Perca fluviatilis	Perch	2.843 (0.895)	32.140 (9.953)
Rutilus rutilus	Roach	1.082 (0.300)	75.654 (18.586)
Esox lucius	Pike	0.024 (0.010)	31.188 (12.107)
Phoxinus phoxinus	Minnow	0.010 (0.010)	0.018 (0.018)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.004 (0.003)	1.103 (1.102)
Abramis brama	Bream	0.002 (0.002)	0.023 (0.023)
*Anguilla anguilla**	European eel	0.008 (0.008)	2.650 (2.650)

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). *Eel CPUE and BPUE based on fyke nets only.

Plate 2.1. Blue-green algal build up on the shore of Lough Egish, August 2023.

3.3 Species Profiles

Perch

Perch captured during the 2023 survey ranged in length from 5.0cm to 35.0cm (mean 7.8cm) (Figure 3.1). Overall length range was similar across all surveys since 2008, and the population in 2023 was heavily dominated by small perch (i.e. < 10cm, see the large modal peak at 6-7cm (Figure 3.1). Perch were aged between 0+ and 9+ and all year classes to 6+ were represented in the sample aged. Fish aged between 0+ (5cm-7cm) and 2 + (13cm to 18cm) together represented 71% of all the fish in the aged sample (Figure 3.1). Mean L1 (i.e. length at the end of the 1st year) was 5.8cm (Table 3.3).

While perch abundance (CPUE) was higher in 2011 and 2023 compared to the earlier surveys, the biomass (CPUE) has remained relatively stable (Figure 3.2).

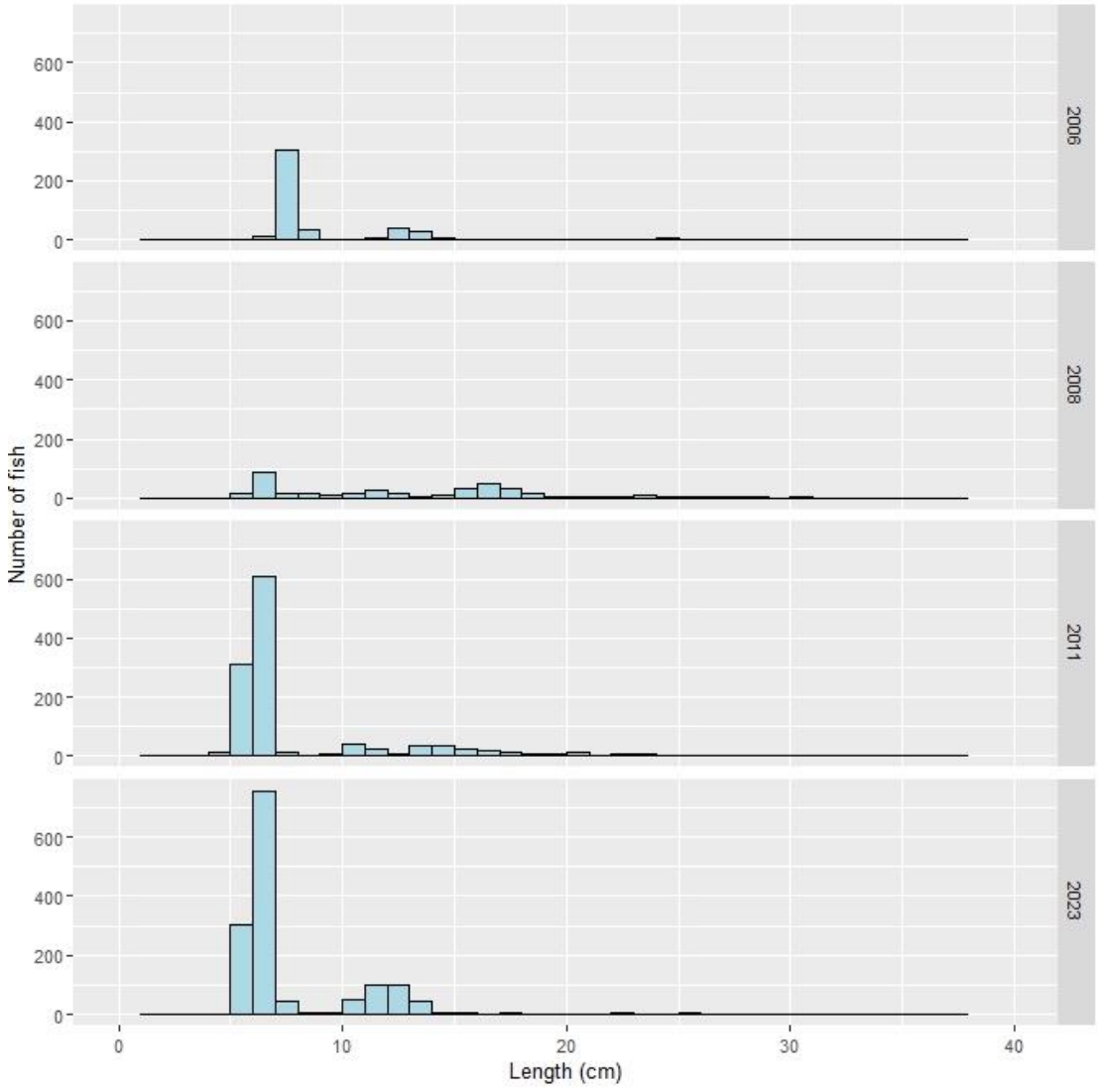

Figure 3.1. Length frequency of perch captured on Lough Egish between 2006 and 2023.

Table 3.3. Mean (±S.E.) perch length (cm) at age for Lough Egish, August 2023

Length (cm)	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
Mean (±S.E.)	5.8 (0.11)	10.1 (0.25)	14.3 (0.62)	17.5 (0.89)	20.7 (0.89)	24.6 (1.60)	27.9 (2.75)	30.1 (2.55)	31.8 (2.25)
N	68	39	23	15	8	4	2	2	2
Range	3.5-8.7	7.0-13.3	10.0-20.2	12.7-24.2	17.9-24.8	22.4-29.3	25.2-30.7	27.6-32.7	29.6-34.1

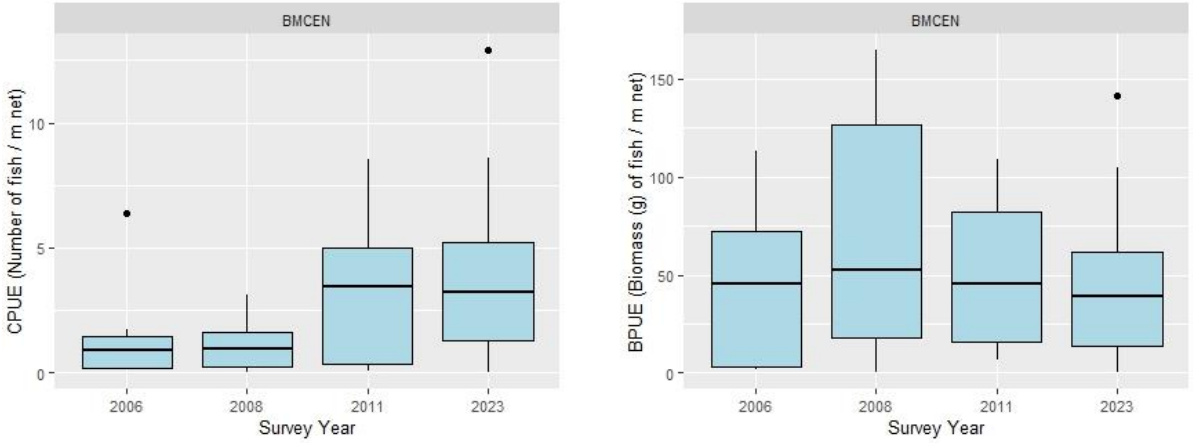

Figure 3.2. CPUE and BPUE of perch captured during surveys of Lough Egish between 2006 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Roach

Roach captured during the 2023 survey ranged in length from 3.5cm to 26.9cm (mean 14.4cm) (Figure 3.3). Overall length range was broadly similar across all surveys. The population was dominated by smaller fish and no roach greater than 30cm have been captured in any survey of the lake. Roach in the sample were aged between 3+ and 11+ (Table 3.4). Four year old fish (10cm – 14cm) were the most abundant year class in the sample aged (Figure 3.3). Scales were not available from several small roach (3-6cm) that were captured. It is likely that these contained a mix of 0+ and 1+ individuals.

Roach abundance (CPUE) fluctuated since 2008 and the median CPUE was higher in 2023 than earlier surveys. However, biomass (BPUE) has remained relatively stable across all surveys of the lake (Figure 3.4).

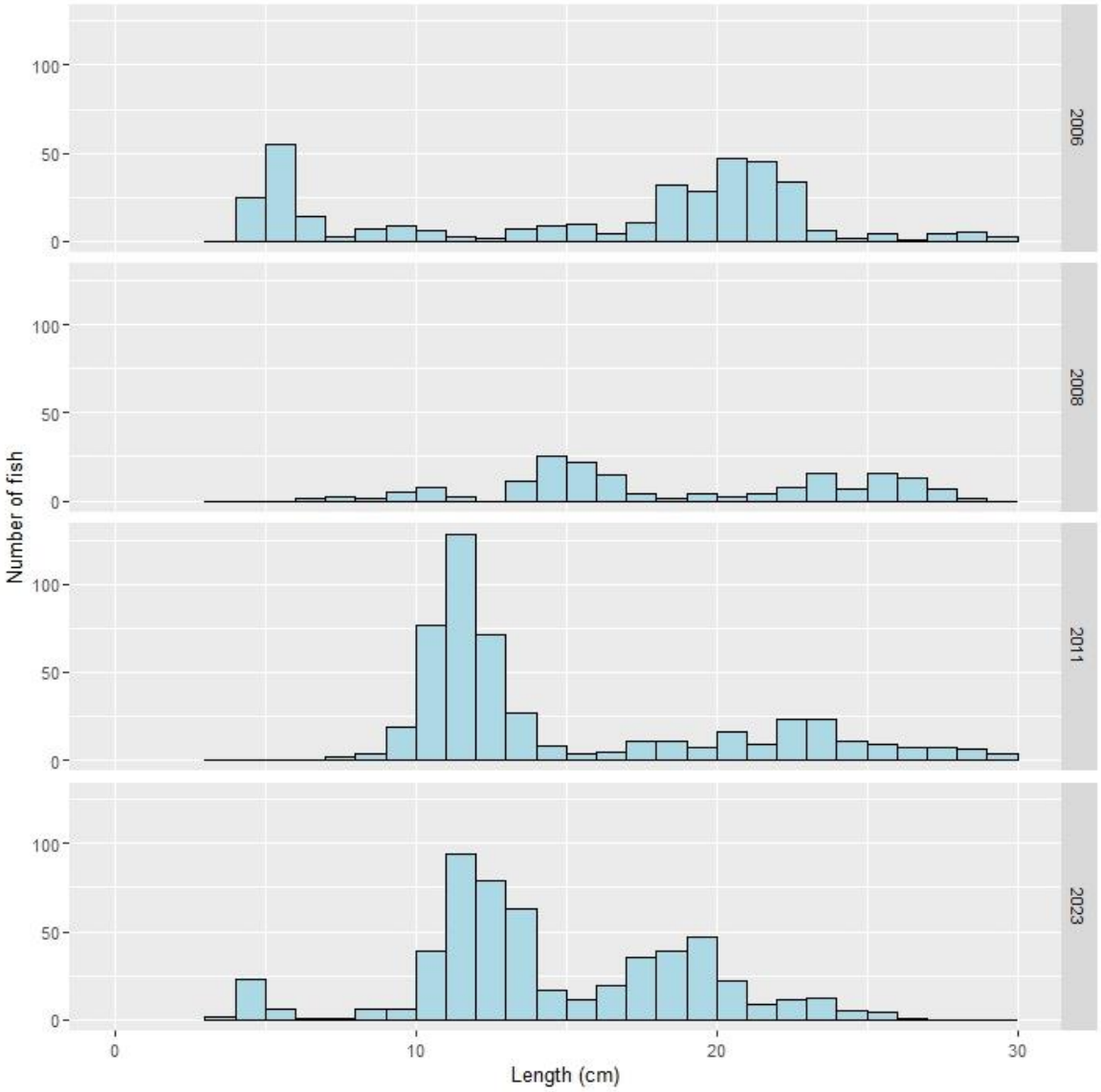

Figure 3.3. Length frequency of roach captured on Lough Egish between 2006 and 2023.

Table 3.4. Summary age data from roach captured on Lough Egish, August 2023. Number of fish and length ranges of all fish aged in the sample is presented.

Length (cm)	Age class											
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+
N	-	-	-	9	14	8	5	2	4	1	2	4
Mean	-	-	-	9.9	12.6	15.4	17.3	18.6	22.3	22.7	24.8	25.5
Min	-	-	-	8.5	10.9	13.5	15.9	18	21	22.7	24.4	24.1
Max	-	-	-	10.8	14.5	16.8	17.9	19.1	23.3	22.7	25.2	26.9

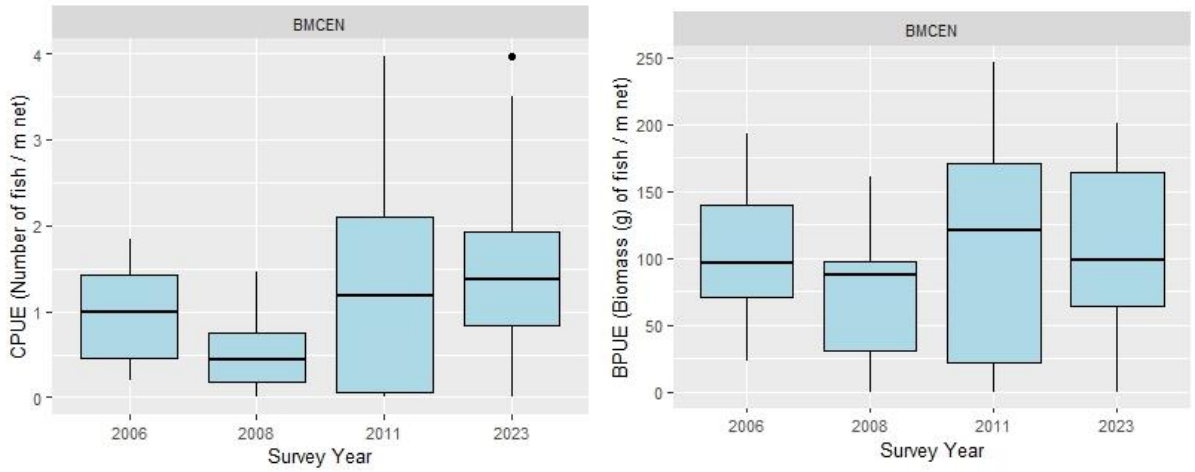

Figure 3.4. CPUE and BPUE of roach captured during surveys of Lough Egish between 2006 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Other species

Pike captured during the 2023 survey ranged in length from 13.1cm to 79.4cm (mean = 52.0cm). Minnow ranged in length from 4.5 to 5cm (mean = 4.8). Two roach x bream hybrids measured 4cm and 29.6cm. One bream was captured and measured 9cm.

One European eel was captured. It measured 58cm. CPUE and BPUE of European eel declined between 2006 and 2011 and have remained at a similar level in the 2023 survey (Figure 3.5)

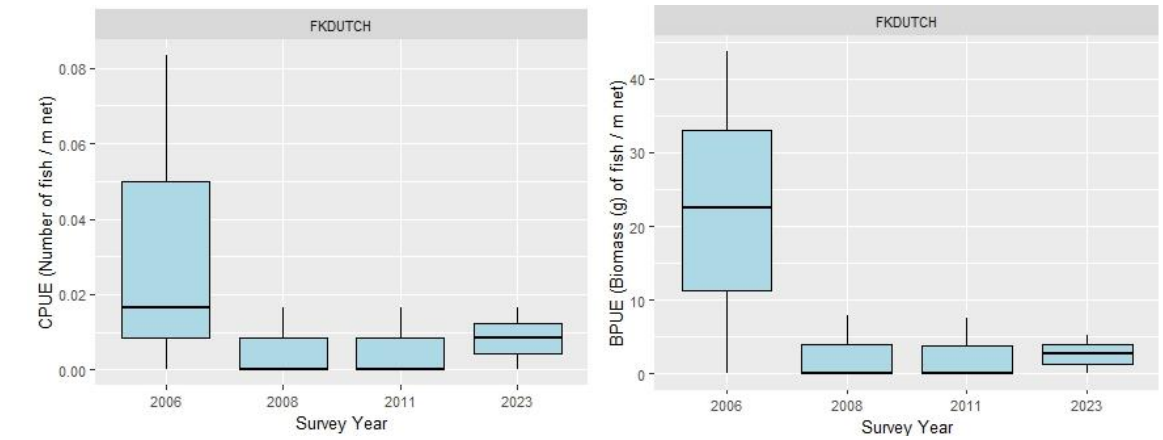

Figure 3.5. CPUE and BPUE of European eel captured during surveys of Lough Egish between 2006 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

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 72 perch stomachs were examined. Forty-two (59%) were empty. Thirty stomachs contained food. Invertebrates were the sole prey type recorded in 13 (43%) stomachs and were found together with fish in one other stomach (3%). Fish was the sole prey type recorded in eight (27%) perch. Unidentified digested material was recorded in eight (27%) perch (Figure 3.6).

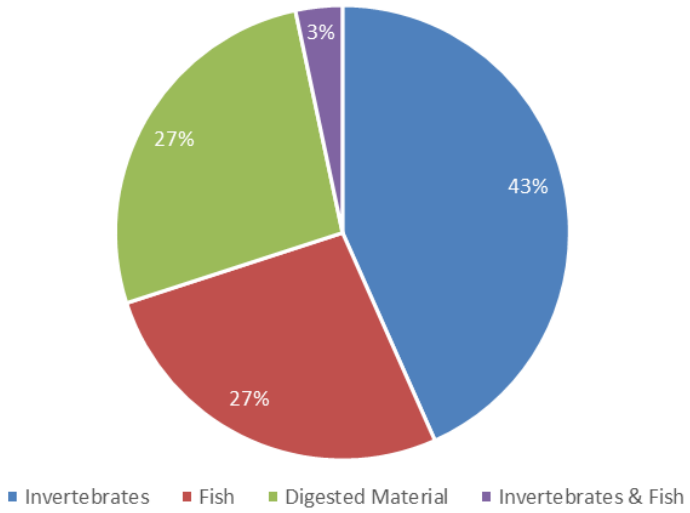

Figure 3.6. Diet of perch (N = 30) captured on Lough Egish, 2023 (% FO).

Pike

A total of nine pike stomachs were available for analysis. Of these, two (22%) were empty. Of the remaining seven stomachs containing food, five (71%) contained fish, one (14%) contained invertebrates. Detritus was recorded in one (14%) pike stomach. Fish prey included roach (3 stomachs), pike (1 stomach) and unidentified fish (1 stomach).

4. Summary and fish ecological status

A total of six fish species and one cyprinid hybrid type were recorded in Lough Egish in August 2023. Perch was the dominant species in terms of abundance (CPUE) while roach had the highest biomass (BPUE) captured in the survey gill nets during the 2023 survey. Abundance (CPUE) of both species have fluctuated across surveys; however biomass (BPUE) has remained relatively stable (and high).

One juvenile bream was recorded in 2023, the first capture of this species in recent surveys of the lake. This, coupled with the concomitant record of small roach x bream hybrid (which requires both parent species to spawn (Hayden *et al.*, 2010) indicates that there is likely to be a small bream population in the lake.

Classification and assigning lakes with an ecological status is a critical part of the WFD monitoring programme. It allows for the identification and prioritisation of 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 (Ecological Quality Ratio) values for each lake and associated confidence in classification (Kelly *et al*., 2012b).

Using the FIL2 classification tool, Lough Egish has been assigned an ecological status of Bad for 2023 based on the fish populations present. Lough Egish has also been assigned a status of Bad following all other fish stock surveys of the lake (Figure 4.1).

In the 2016 to 2021 surveillance monitoring reporting period, the EPA assigned Lough Egish an overall ecological status of Bad, based on all monitored physico-chemical and biological elements, including fish (EPA 2021).

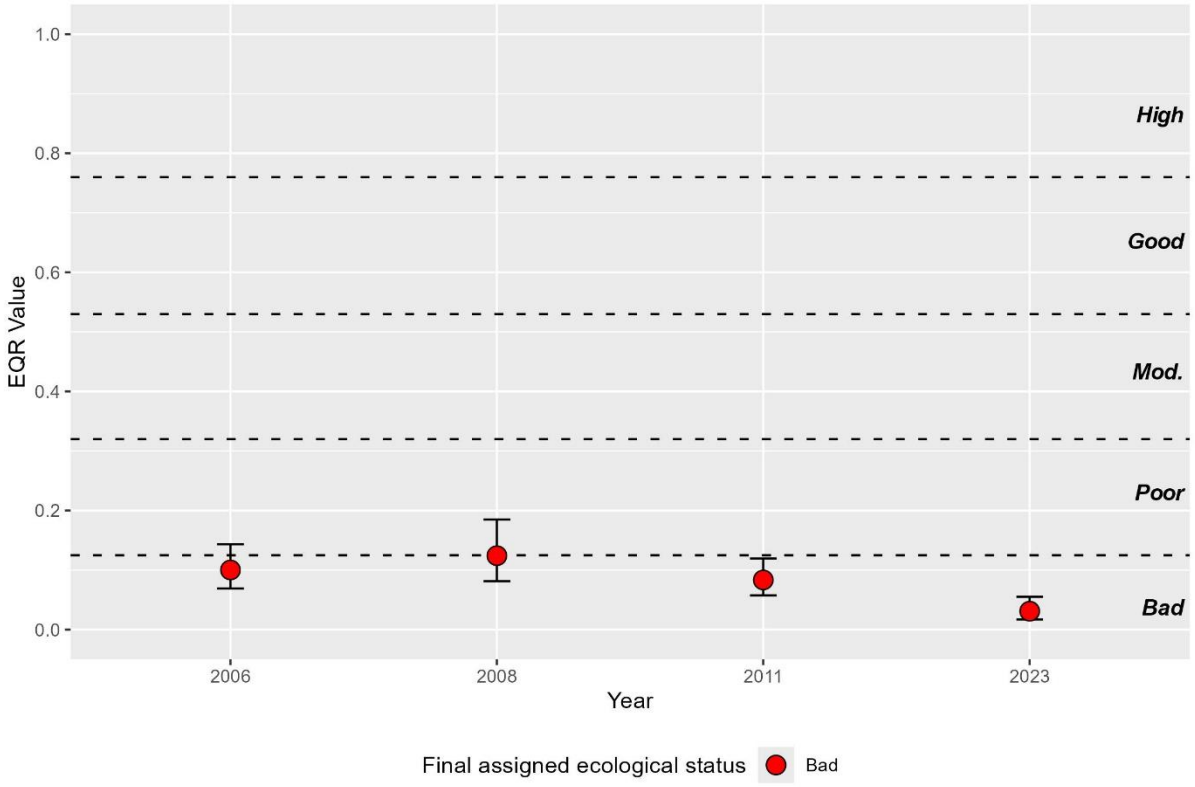

Figure 4.1. Fish ecological status, Lough Egish, between 2006 and 2023 (dashed line indicates EQR status boundaries).

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