

National Research Survey Programme

Lakes 2022

Lettercraffroe Lough

IFI/2023/1-4664



Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lettercraffroe Lough, August, 2022



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Inland Fisheries Ireland**

National Research Survey Programme

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1. Introduction

Lettercraffroe Lough is located 6km south-west of Oughterard, Co. Galway on a tributary of the Owenriff River which flows through the town and into Lough Corrib (Plate 1.1, Figure 1.1). It has a surface area of 82ha, a mean depth of 2.86m and a maximum depth of 17.9m (WRFB, 2006). The lake is categorised as typology class 2 (as designated by the EPA for the purposes of the Water Framework Directive), *i.e.*, shallow (<4m), greater than 50ha and low alkalinity (<20mg/l CaCO₃). Lettercraffroe Lough is an excellent example of a lowland oligotrophic lake, an Annex 1 habitat.

Lettercraffroe Lough is situated within the Connemara Bog Complex, a large Special Area of Conservation (SAC) site that encompasses a wide range of habitats, including extensive tracts of blanket bog, heath, woodland, lakes, rivers and streams. The Connemara Bog Complex is underlain by various Galway granites, with small areas along the northern boundary made up of schist and gneiss (NPWS, 2015).

The main perceived threats within the SAC are peat cutting, overgrazing and afforestation. Forestry affects habitat uniformity, lake and river catchments, nesting and feeding habitats for animals, and landscape integrity (NPWS, 2015). The western and southern shores of the lake are heavily forested and there have previously been problems with phosphorus loading in the lake, which reached critical levels in the summer of 2004 (FIE, 2010). Subsequent water samples indicated that phosphorus levels were decreasing in the lake (Coillte, pers. comm.). A tree felling plan was due to take place during 2010, along the streams and in areas surrounding the lake. However, due to issues regarding pearl mussels in the catchment, this plan was revisited and a new forestry management plan was developed (Coillte, 2010). Conifers will be felled and they will not be replaced in areas along the streams or between the access road and the lake. It is hoped that these efforts will lead to the creation of an extensive buffer zone surrounding the lake.

The lake has been surveyed on five occasions since 2007 (2007, 2010, 2013, 2016 and 2019) (Kelly and Connor, 2007 and Kelly *et al.*, 2011, 2014, 2017 and Corcoran *et al.*, 2020). In previous surveys roach (*Rutilus rutilus*) were found to be the dominant species present in the lake. Brown trout (*Salmo salar*), European eel (*Anguilla anguilla*) and three-spined stickleback (*Gasterosteus aculeatus*) were also recorded.

This report summarises the results of the 2022 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. Lettercraffroe Lough, August 2022.

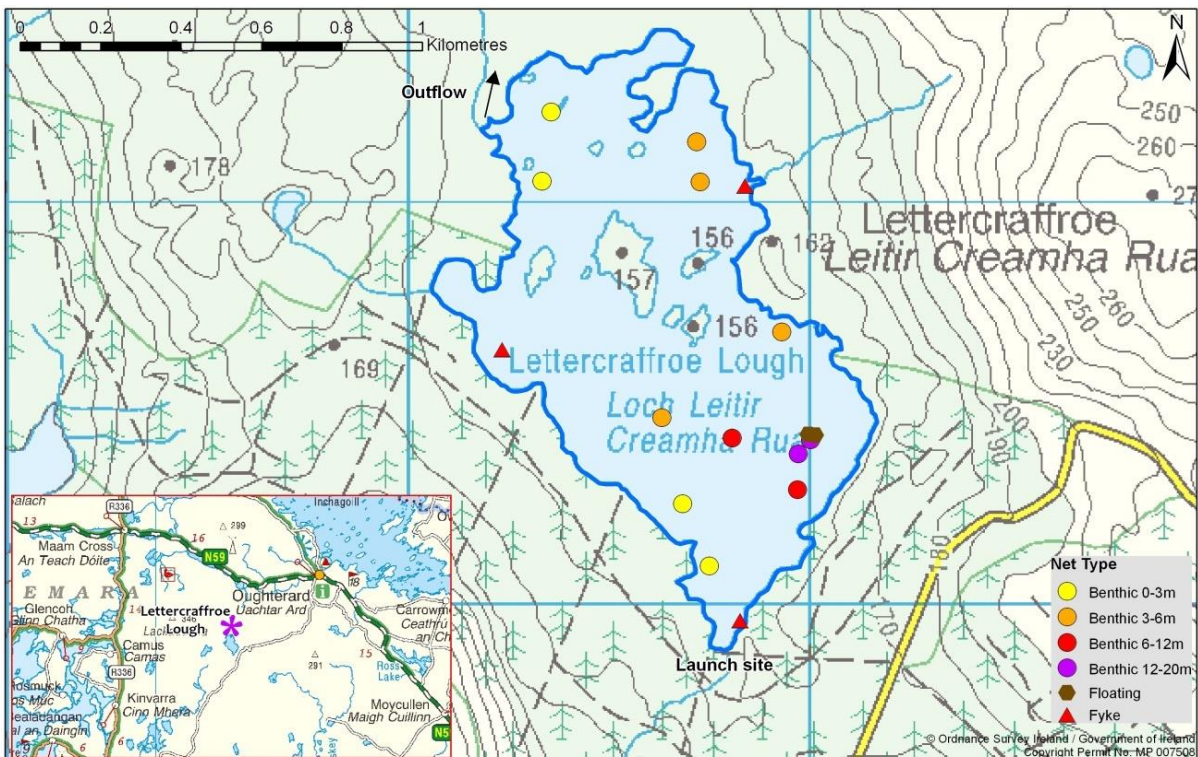


Figure 1.1. Location map of Lettercraffroe Lough showing net locations and depths of each net (outflow is indicated on map)

2. Methods

2.1. Netting methods

Lettercraffroe Lough was surveyed over one night on the 10th of August 2022. A total of three 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, 2 @ 6-11.9m and 2 @ 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 (17 sites). Nets were deployed in the same locations as were randomly selected in previous surveys. 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 were measured and weighed on site and scales were removed from a sub-sample of roach and brown trout. 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.

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).

$$FO_i = \left(\frac{N_i}{N} \right) * 100$$

Where:

FO_i is the percentage frequency of prey item i ,

N_i is the number of fish with prey i in their stomach,

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

Three fish species were recorded in Lettercraffroe Lough in August 2022. A total of 253 fish were captured (Table 3.1). Roach was the most abundant fish species captured. Brown trout were also captured in relatively large numbers and three-spined stickleback were also recorded. During the previous surveys the same species composition was recorded, with the exception of eels which were not recorded in 2013 or 2022 (Kelly and Connor, 2007 and Kelly *et al.*, 2011, 2014, 2017 and Corcoran *et al.*, 2020).

Table 3.1. Number of each fish species captured by each gear type during the survey on Lettercraffroe Lough.

Scientific name	Common name	Number of fish captured			Total
		BM CEN	FM CEN	Fyke	
<i>Rutilus rutilus</i>	Roach	116	26	0	142
<i>Salmo trutta</i>	Brown trout	82	2	3	87
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	13	0	11	24

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. In 2022 roach dominated fish stocks with respect to both abundance (CPUE) and biomass (BPUE) (Table 3.2).

For comparison purposes box plots of 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. No clear trends in fish abundance (CPUE) or biomass (BPUE) are apparent. Populations of the two most abundant species (*i.e.* roach and brown trout) have remained relatively stable over all sampling occasions.

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lettercraffroe Lough.

Scientific name	Common name	Mean CPUE (\pm S.E)	Mean BPUE (\pm S.E)
<i>Rutilus rutilus</i>	Roach	0.278 (0.052)	43.737 (8.261)
<i>Salmo trutta</i>	Brown trout	0.168 (0.043)	17.490 (4.378)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.036 (0.027)	0.073 (0.54)

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.

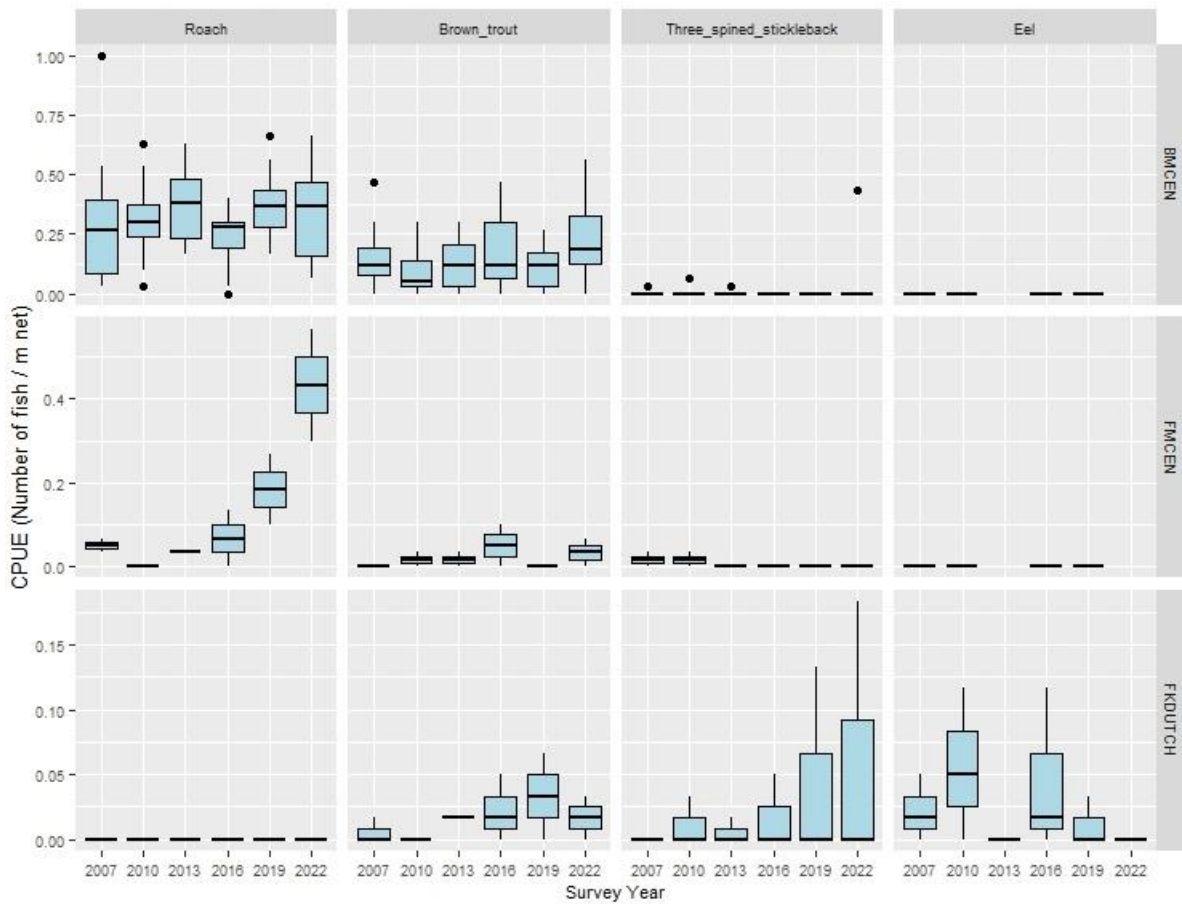


Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lettercraffroe Lough between 2007 and 2022. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis (CPUE) is unique for each net type.

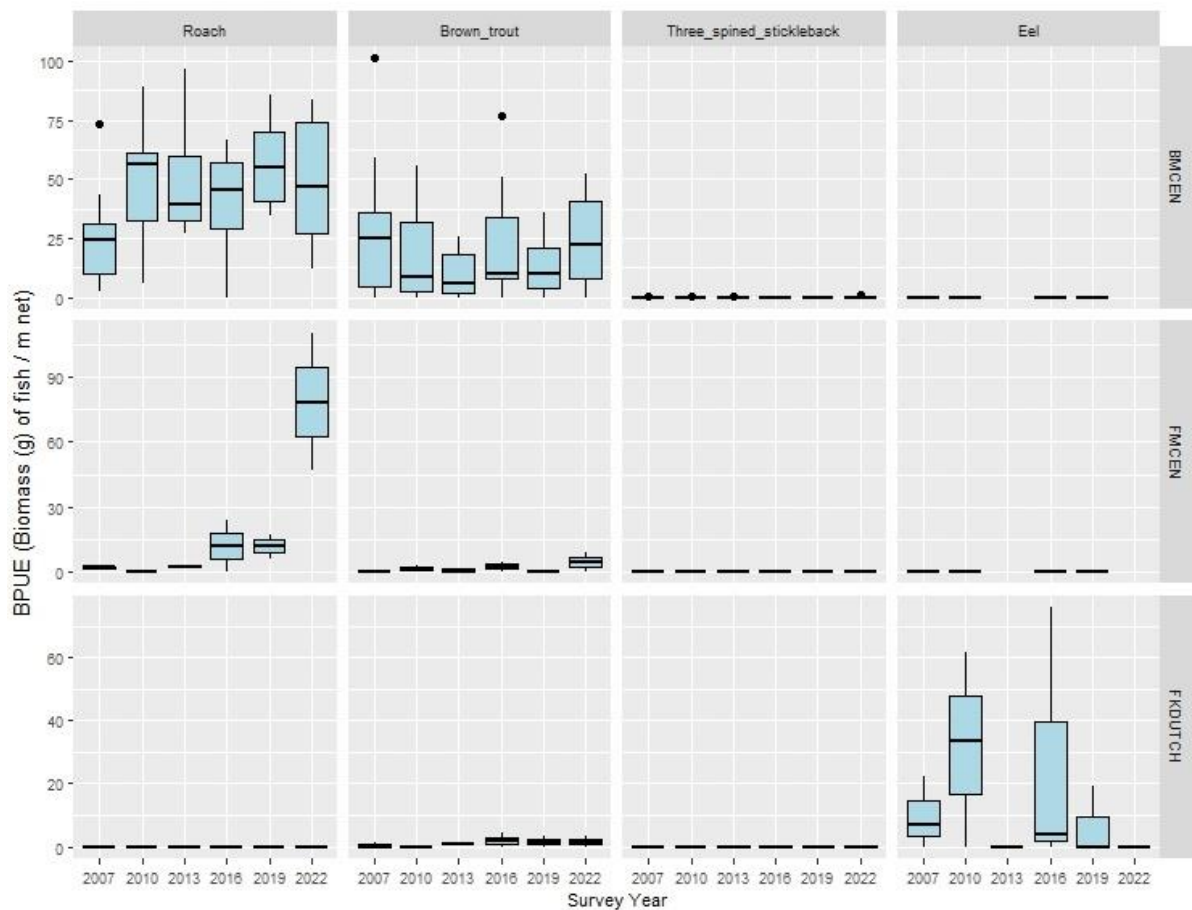


Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lettercraffroe Lough between 2007 and 2022. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles 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

Roach

Roach captured during the 2022 survey ranged in length from 8.2cm to 27.9cm (mean 19.8cm) (Figure 3.3). Larger (> 20cm) and older fish dominated the population. While roach were aged between 2+ and 10+, 7 to 9 year old fish were the most abundant cohorts. No 1+, or 3+ to 4+ roach (10cm 18cm, Figure 3.3) were recorded in the sample aged suggesting that recruitment has been intermittent in recent years (Table 3.3 and Figure 3.3).

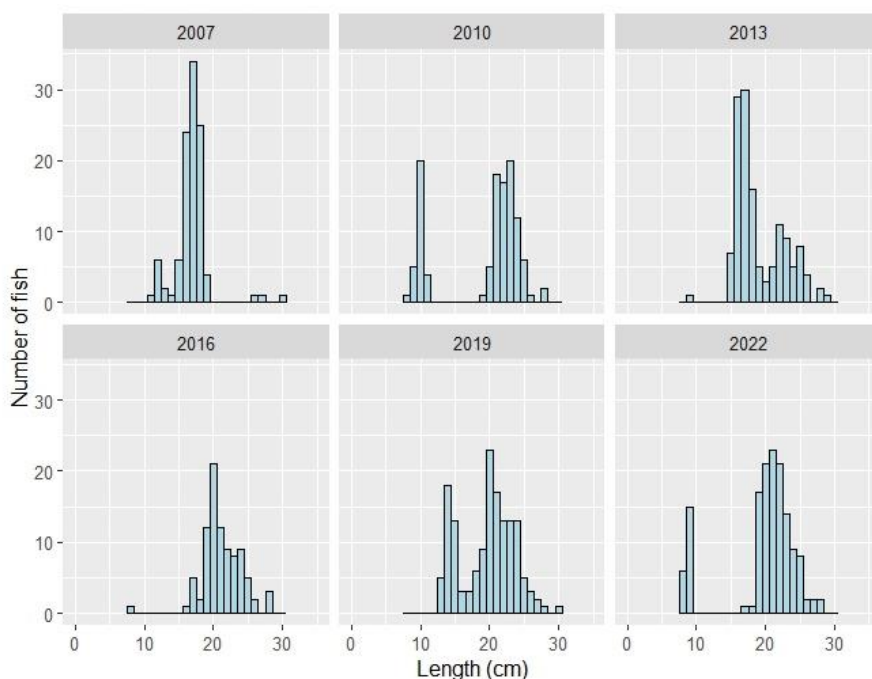


Figure 3.3. Length frequency of roach captured on Lettercraffroe Lough, 2010, 2013, 2016, 2019 and 2022.

Table 3.3. Summary age data from roach captured on Lettercraffroe Lough, August 2022. Number of fish (N) 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+
N	0	0	6	0	0	4	9	8	10	4	1
Mean L (cm)	-	-	8.9	-	-	19.5	20.2	21.5	24.1	26.7	-
Min L (cm)	-	-	8.5	-	-	18.7	19.3	19.7	22.4	25.6	27.2
Max L (cm)	-	-	9.4	-	-	21.6	21	23.2	25.5	27.9	27.2

Brown trout

Brown trout captured during the 2022 survey ranged in length from 8.4cm to 30.0cm (mean 19.6cm) with relatively stable length ranges across all surveys (Figure 3.4). Brown trout were aged between 0+ and 5+ and all intervening age classes were present. The most abundant year age class was 2+ (c. 18cm - 22cm) (Figure 3.4). Mean L1 (i.e. age at the end of the 1st year) was 7.0cm (Table 3.4).

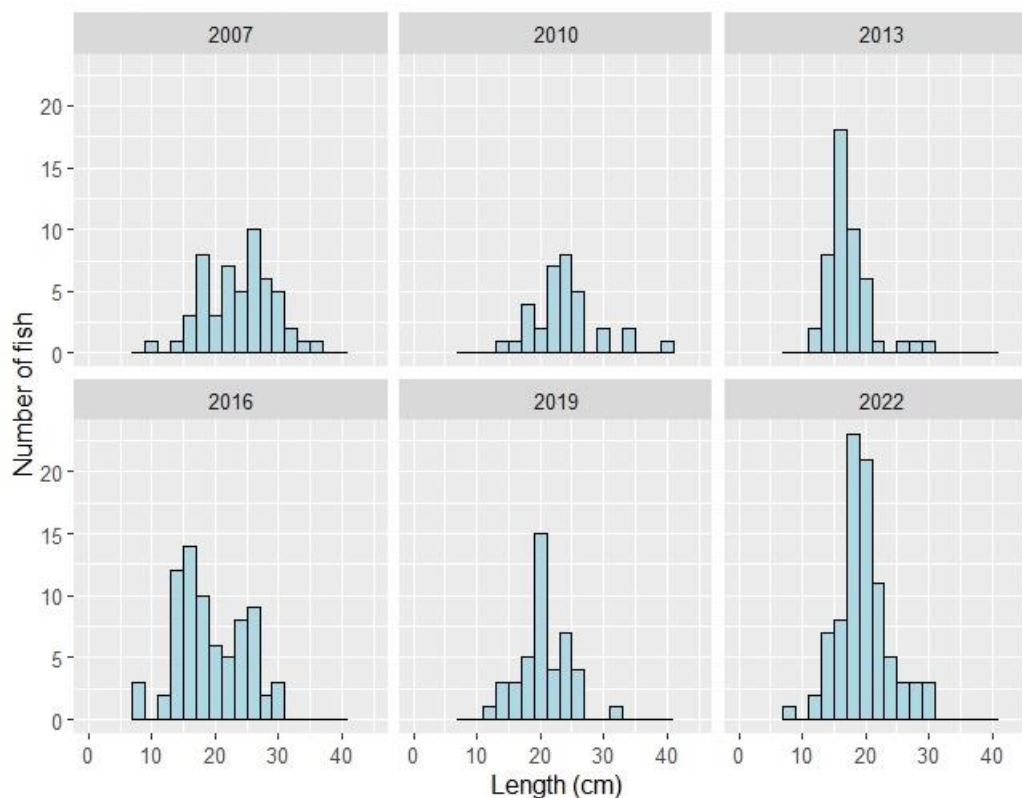


Figure 3.4. Length frequency of brown trout captured on Lettercraffroe Lough, 2010, 2013, 2016, 2019 and 2022.

Table 3.4. Mean (\pm S.E.) brown trout length (cm) at age for Lettercraffroe Lough, August 2022.

Length (cm)	L ₁	L ₂	L ₃	L ₄
Mean (\pm S.E.)	7.0 (0.1)	15.0 (0.2)	21.9 (0.4)	26.2 (0.1)
N	40	30	12	2
Range	5.7 - 8.4	12.8 - 16.7	19.2 - 24.0	26.1 - 26.3

Other fish species

Twenty-four three-spined sticklebacks were recorded during the 2022 survey. They ranged in length from 4.0cm to 5.0cm.

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 brown trout captured during the survey were examined and are presented below.

Brown trout

A total of 50 brown trout stomachs were examined. Thirty-four stomachs contained food. Invertebrates were the sole prey type recorded in 23 (68%) stomachs. Invertebrates were recorded together with fish in three stomachs (9%) and fish were the sole prey type found in six stomachs. Two (6%) stomachs contained unidentified digested material (Figure 3.5).

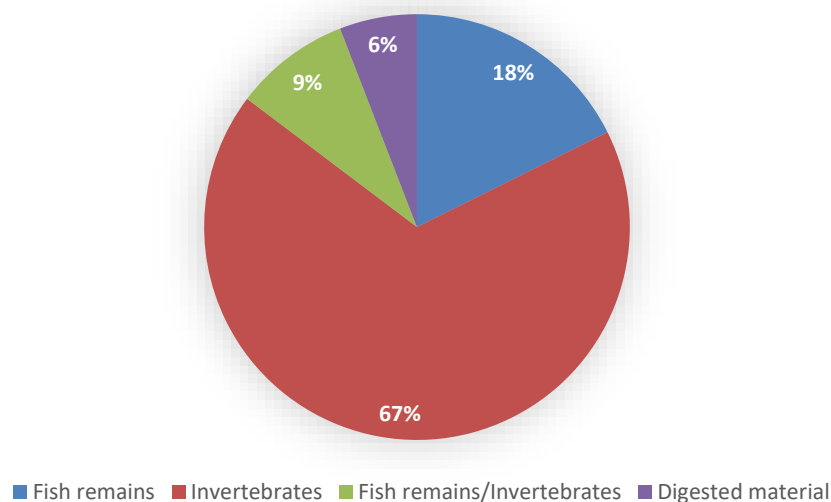


Figure 3.5. Diet of brown trout (N = 34) captured on Lettercraffroe Lough, 2022 (% FO)

4. Summary and fish ecological status

A total of three fish species were recorded in Lough Lettercraffroe in August 2022.

Roach was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2022 survey. This species has dominated the fish community in the lake across all survey occasions since 2007. Since 2007 there has been no obvious trend in roach abundance, although in that time the population structure has shifted to one dominated by larger fish (<20.0cm). Several roach age classes (i.e. 1+, 3 + or 4+) were absent from the sample captured during the survey. This may indicate that there has been very limited recruitment to the adult population on several occasions in recent years.

Brown trout abundance and biomass have remained relatively steady across all survey periods. All age groups from 0+ to 4+ were recorded indicating regular recruitment of brown trout in the lake.

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) 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, Lettercraffroe Lough was initially assigned an ecological status of High for 2022 based on the fish populations present. Following an expert opinion review of these results, this status was then downgraded to Good, due to the presence of roach in the lake. Roach are one of four fish species listed as a non-native species subject to restrictions under regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011). The lake was also assigned Good fish ecological status on all previous occasions (Fig. 4.1)

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

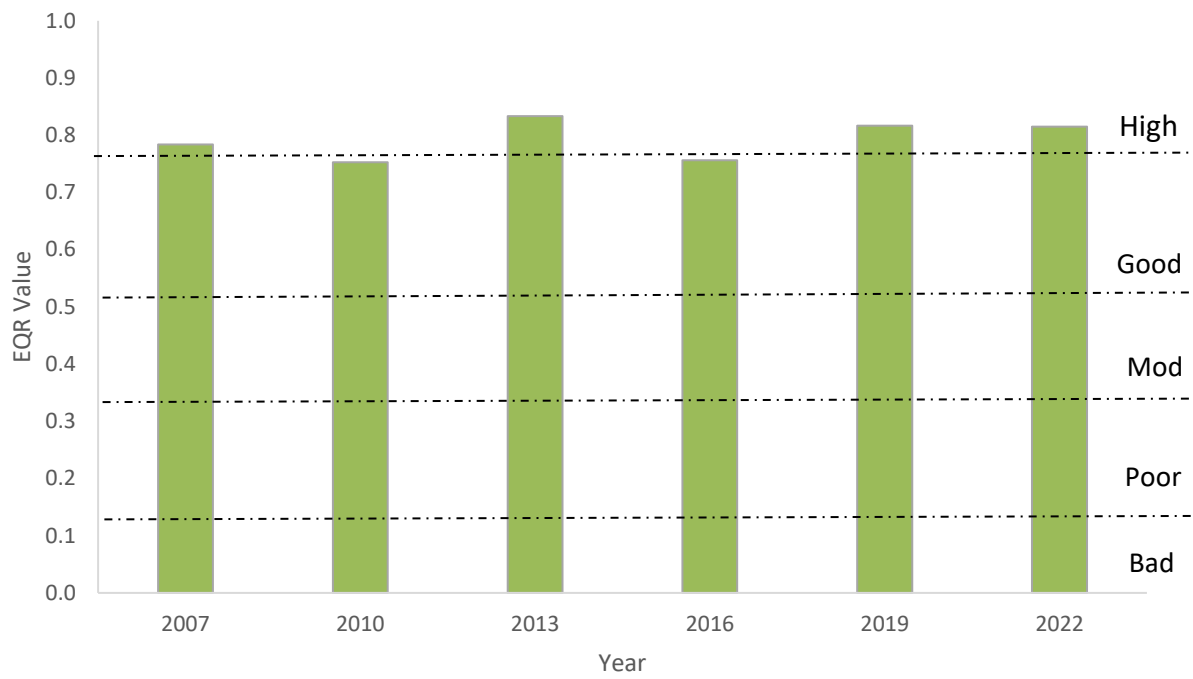


Figure 4.1. Fish ecological status, Lough Lettercraffroe, 2007, 2010, 2013, 2016, 2019 and 2022 (dashed line indicates EQR status boundaries).

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