National Research Survey Programme

Lakes 2022

Lough Barra

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Barra, July 2022

National Research Survey Programme

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

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1. Introduction

Lough Barra is situated in the upper part of the Gweebarra River catchment close to the south-western perimeter of Glenveagh National Park in Co. Donegal. The lake is situated at an altitude of 88.6m above sea level. It has a surface area of 63ha, a mean depth of 4.4m and a maximum depth of 11.6m (Plate 1.1, Figure 1.1). The lake is categorised as typology class 4 (as designated by the EPA for the Water Framework Directive), i.e., deep (>4m), greater than 50ha and low alkalinity (<20mg/l CaCO3).

The geology of the area is predominantly granite, felsite, and other intrusive rocks rich in silica. Lough Barra Bog SPA is situated immediately to the south-west of the lake (Figure 1.1) and part of the bog is a nature reserve. Lough Barra itself forms part of the Cloghernagore Bog and Glenveagh National Park Special Area of Conservation (NPWS, 2013). This is a particularly large SAC located in north-west Donegal. It contains many different habitats ranging from exposed rock and scree mountains to blanket bogs, lakes, and rivers.

The lake has been surveyed on five occasions since 2005 (2005, 2008, 2011, 2014 and 2019) (Kelly *et al*., 2007, 2009, 2012a and 2015, Corcoran *et al*., 2020). Brown trout, salmon, and eels (*Anguilla anguilla*) were recorded in all surveys.

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. Lough Barra, July 2022

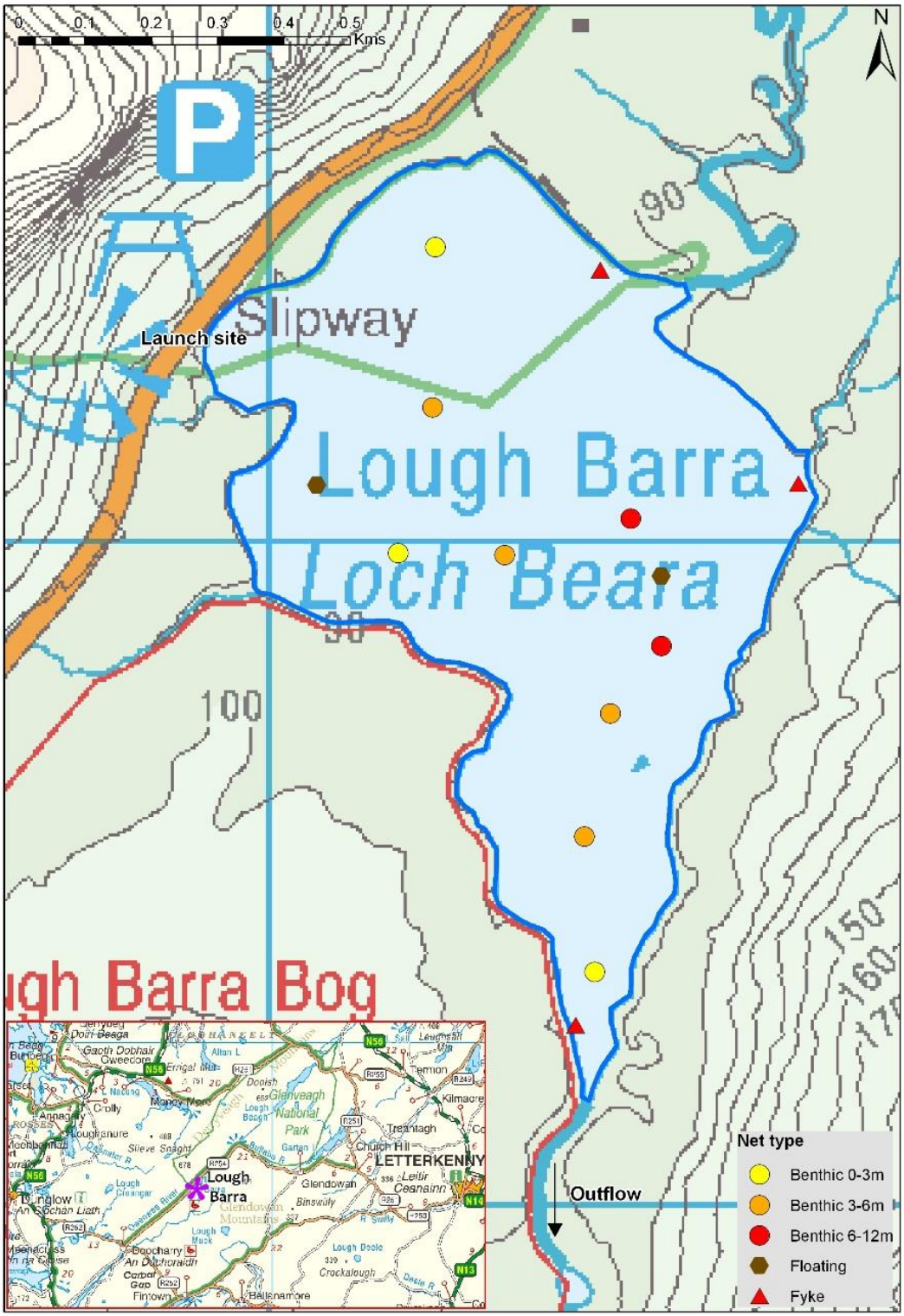

Figure 1.1 Location map of Lough Barra showing locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Lough Barra was surveyed over one night on the 25th of July 2022. A total of three sets of Dutch fyke nets, nine benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (3 @ 0-2.9m, 4 @ 3-5.9m and 2 @ 6-11.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (14 sites). Survey nets were deployed in the same locations as were randomly selected in the previous surveys. 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 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 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

Three fish species were recorded on Lough Barra in July 2022. A total of 213 fish were captured. Brown trout was the most abundant fish species recorded. Eels and salmon were also captured (Table 3.1). The same species composition was recorded during the previous surveys in 2008, 2011, 2014 and 2019 (Kelly *et al*., 2009, 2012a and 2015). One sea trout was recorded during the 2019 survey (Corcoran *et al*. 2020).

Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Barra, July 2022.

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
Salmo trutta	Brown trout	140	32	24	196
Salmo salar	Salmon	7	0	1	8
Anguilla anguilla	European eel	0	0	9	9

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. Brown trout dominated with respect to abundance and biomass. Eels which were captured in fyke nets also recorded a high biomass in 2022; however the median BPUE was lower than previous years (Table 3.2 and Figure 3.2).

For comparison purposes box plots of CPUE and BPUE for each species captured in all surveys per net type between 2005 and 2022 are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time. While the abundance and biomass of all the regularly captured species have fluctuated over time, no clear or consistent population trends are apparent overall.

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Barra, 2022.

Scientific name	Common name	Mean CPUE (± S.E.)	Mean BPUE (± S.E.)
Salmo trutta	Brown trout	0.438 (0.127)	26.230 (7.534)
Salmo salar	Salmon	0.018 (0.010)	12.178 (11.870)
Anguilla anguilla	European eel	0.050 (0.035)*	57.158 (55.380)*

*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.*

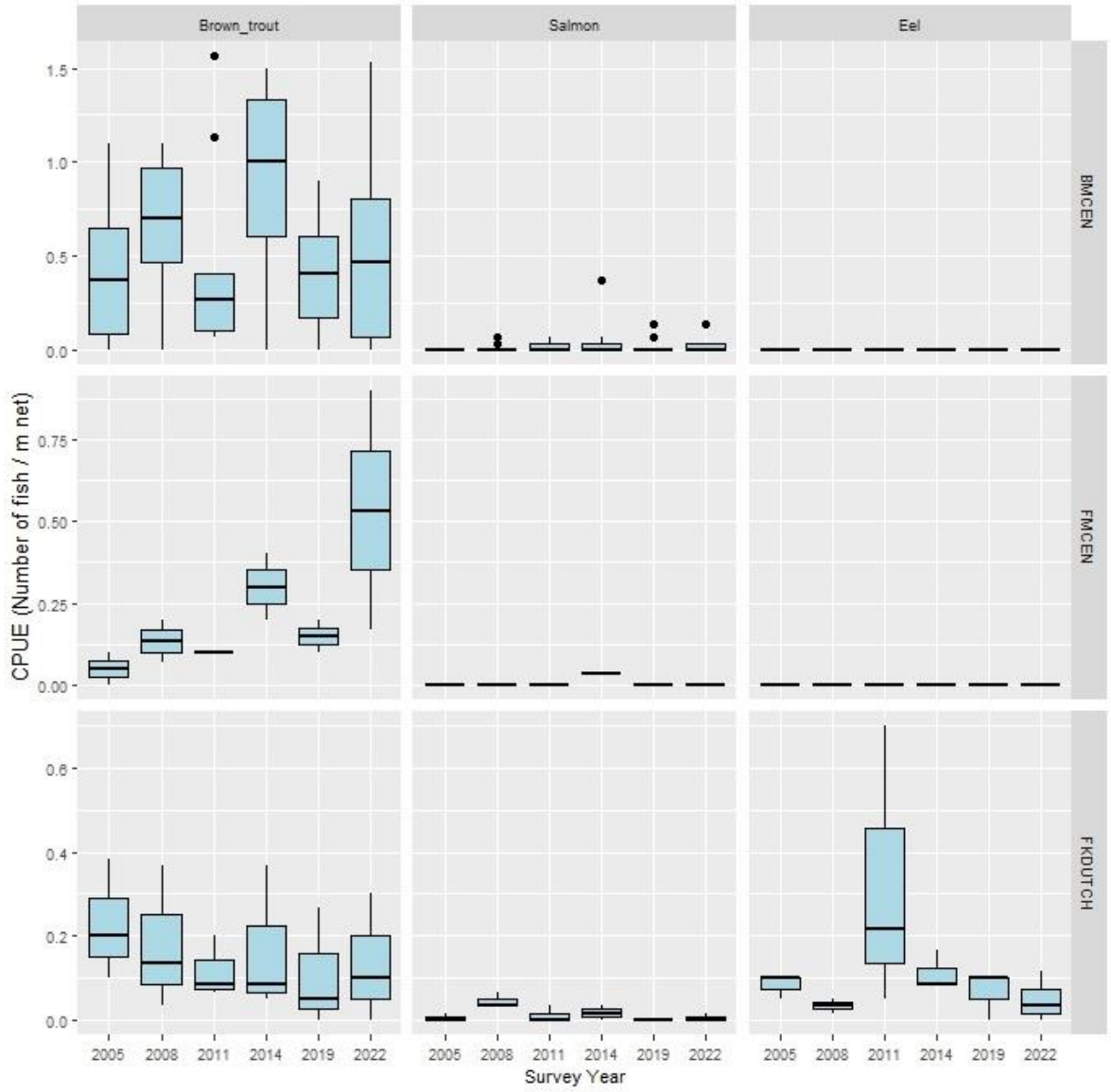

Figure 3.1. CPUE of all fish species (except sea trout) captured in each net type during surveys of Lough Barra between 2005 and 2022. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th 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.

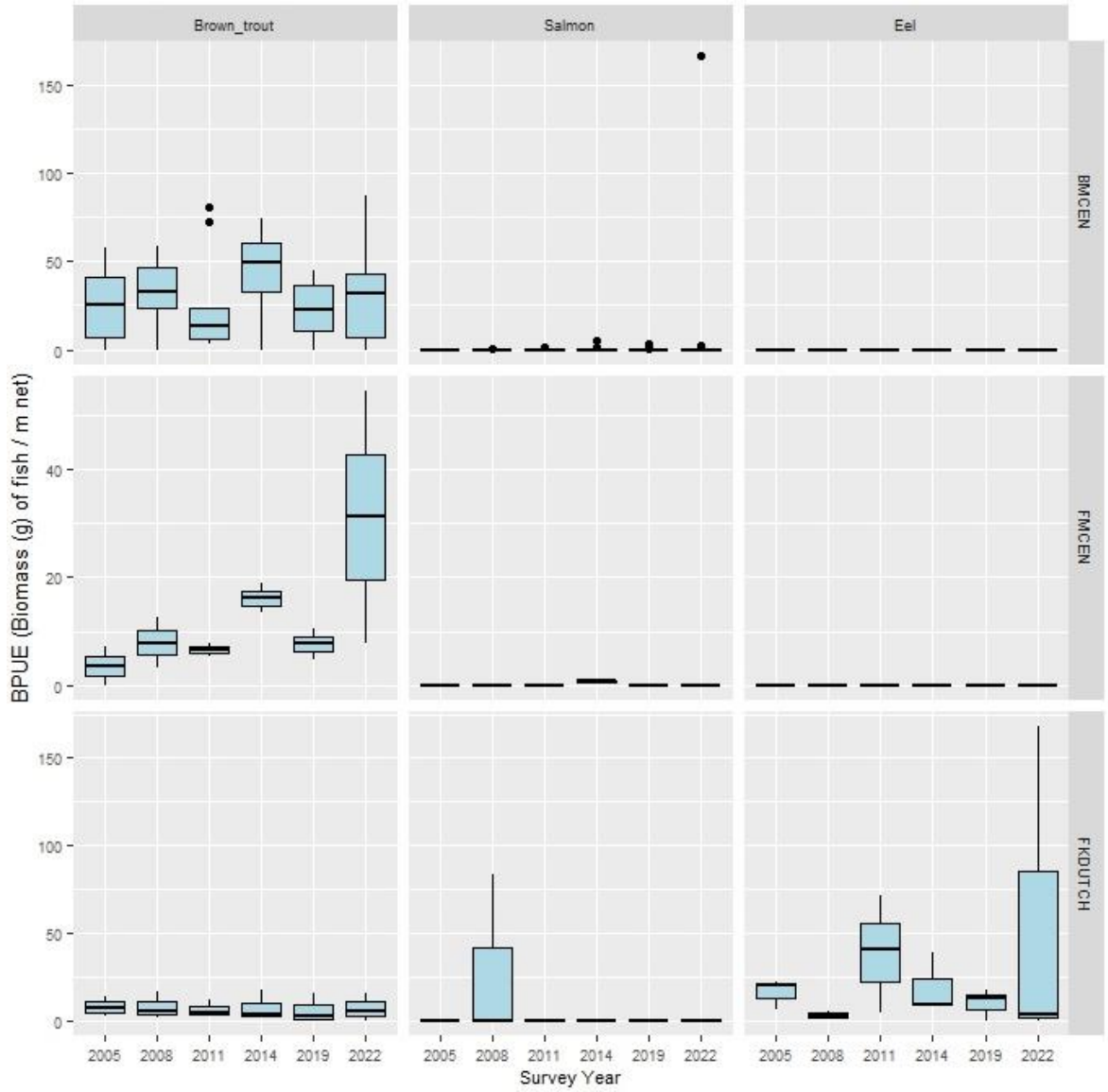

Figure 3.2. BPUE of all fish species (except sea trout) captured in each net type during surveys of Lough Barra between 2005 and 2022. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 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

Brown trout captured during the 2022 survey ranged in length from 10.5cm to 28.5cm (mean 16.8cm). Similar length ranges were recorded in earlier surveys, where few fish <30cm have been captured (Figure 3.3). Three age classes were present, with brown trout aged from 1+ to 3+. Mean L1 (i.e., length at the end of the first year) was 5.6cm (Table 3.3). The most abundant age classes were 1+ and 2+ (i.e.,12.0 – 17.0cm), with comparatively fewer older or larger fish recorded (Figure 3.3).

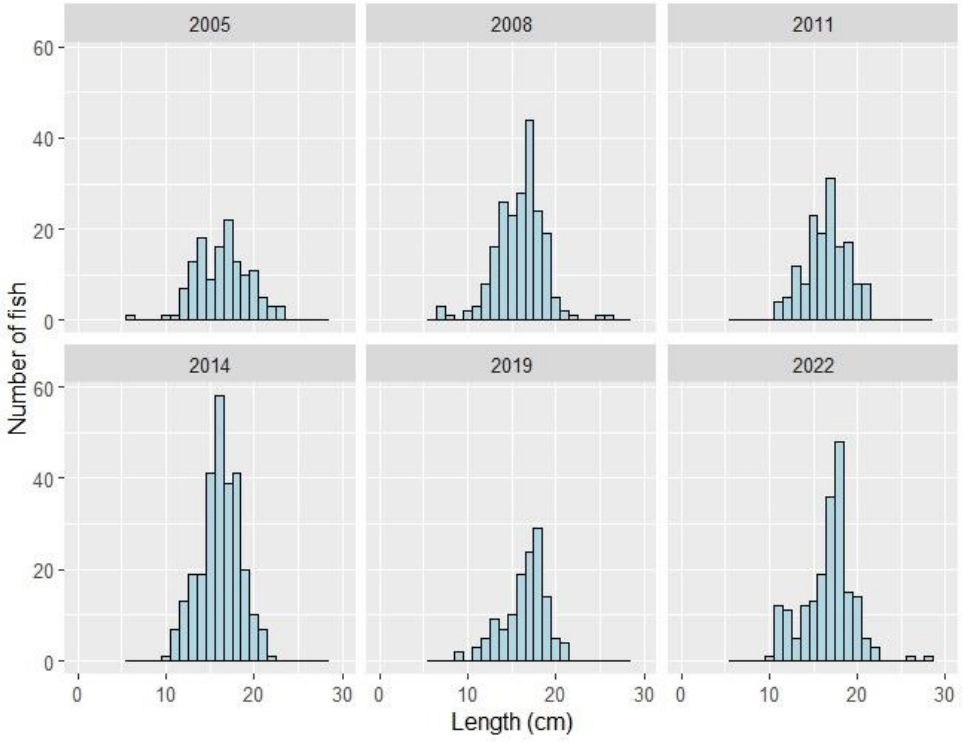

Figure. 3.3. Length frequency of brown trout captured on Lough Barra, 2005, 2008, 2011, 2014, 2019 and 2022.

Table. 3.3. Summary of length at age data from brown trout captured on Lough Barra, July 2022. Number (N) of fish and length ranges of all fish aged in the sample is presented.

	L_1	L_2	L_3
Mean	5.6	11.2	17.3
N	33	28	9
Range	5.9 - 6.9	10.1 - 15.5	15.2 - 24.4

Other species

Eels (N = 9) captured during the 2022 survey ranged in length from 27.0cm to 53.0cm (mean 41.1cm). Salmon (N = 7) ranged from 5.2cm to 79.0cm (mean 19.9cm). Three juvenile salmon captured were aged at 1+ and ranged in length from 5.2cm to 12.2cm (mean 10.2cm). One salmon measuring 18.7cm was aged at 3+.

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 and juvenile salmon captured during the survey were examined and are presented below.

Brown trout

A total of 56 brown trout stomachs were examined. Of these, 13 (23%) were found to contain no prey items. Of the remaining 43 stomachs containing food, 41 (95%) contained invertebrates only. One stomach (2%) contained zooplankton. It was not possible to identify the contents of one other fish (Figure 3.4).

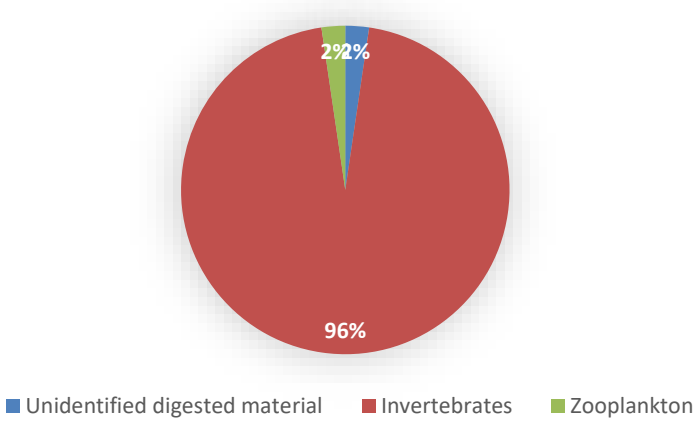

Figure 3.4. Diet of brown trout (N = 43) captured on Lough Barra 2022 (% FO)

Atlantic salmon

Three juvenile salmon stomachs were examined, one of which was empty. The remaining salmon had each consumed zooplankton and invertebrates.

4. Summary and ecological status

Three fish species were recorded in Lough Barra in July 2022. These species, (i.e., brown trout, Atlantic salmon and eel) have been recorded in all surveys of Lough Barra conducted since 2005.

Brown trout 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 fish stocks on all previous sampling occasions and while CPUE and BPUE have fluctuated over this time no clear population trends are apparent. The species recruits regularly to the lake and is dominated by younger and smaller individuals.

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*., 2012b).

Using the FIL2 classification tool, Lough Barra has been assigned an ecological status of High for 2022 based on the fish populations present. This is an increase in status compared to 2019, when the lake was assigned a status of Good. The reason for the increase in status between years, is likely due to an increasing population of type specific indicator species, in this case brown trout (Corcoran *et al.,* 2023). In previous years the lake was also assigned a fish status of High in 2011, while the lake was assigned a status of Good in 2008 and 2014 (Figure 4.1).

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

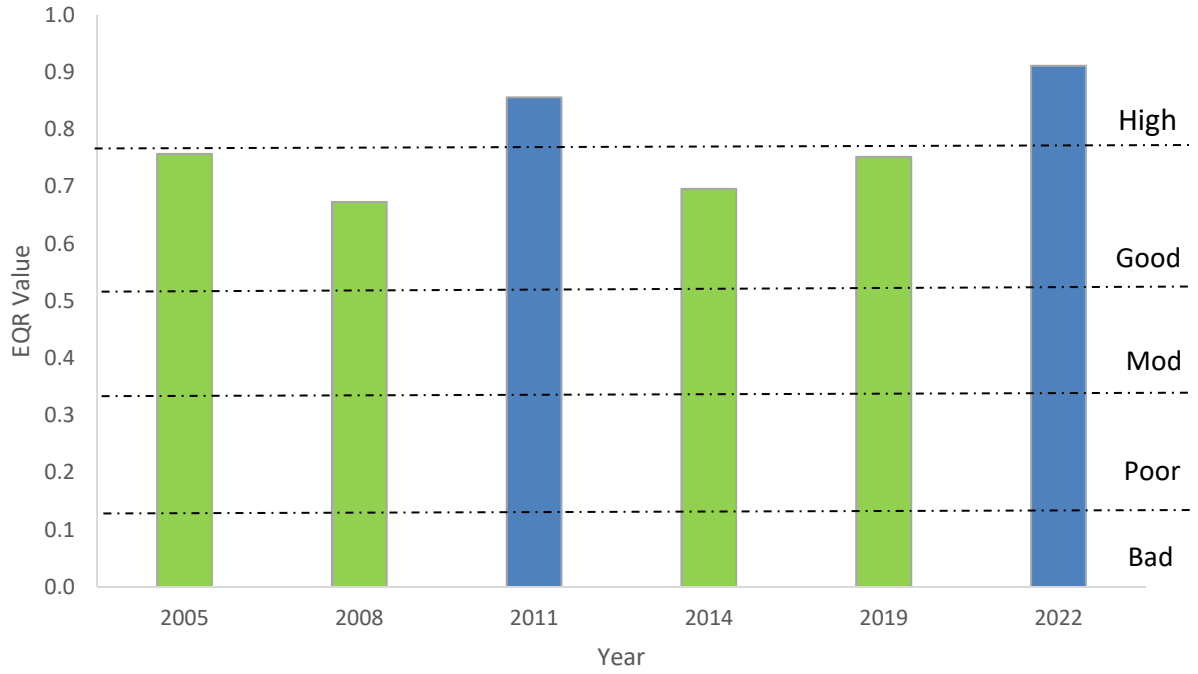

Figure. 4.1. Fish ecological status, Lough Barra, 2005, 2008, 2011, 2014, 2019 and 2022 (dashed line indicates EQR status boundaries).

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Inland Fisheries Ireland
3044 Lake Drive,
Citywest Business Campus,
Dublin 24,
Ireland.
D24 CK66

www.fisheriesireland.ie
info@fisheriesireland.ie

+353 1 8842 600