National Research Survey Programme

Lakes 2022

Lough Bane

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Bane, September 2022

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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 Bane is situated on the Meath-Westmeath border within the Boyne catchment, approximately 10km south of Oldcastle, Co. Meath (Plate 1.1 and Figure 1.1). It has a surface area of 75ha, a mean depth of >4m and a maximum depth of 16m. The lake is categorised as typology class 12 (as designated by the EPA for the purposes of the Water Framework Directive), i.e., deep (>4m), greater than 50ha and high alkalinity (>100mg/l CaCO3).

Lough Bane is a public water supply for the north Meath area. Lough Bane is one of three lakes, along with Lough Glass and Lough Glass North, to make up the Lough Bane and Lough Glass Special Area of Conservation (NPWS, 2013). The lakes are situated in a shallow valley that occurs at the headwaters of the River Deel, with the main outflow at the south-east end of Lough Bane. Lough Bane is a good example of a hard water marl lake, an important habitat listed on Annex I of the E.U. Habitats Directive (NPWS, 2013). The lake contains well developed stonewort communities, and at least four species of charophyte. Mixed woodland composed of beech (*Fagus sylvatica*), oak (*Quercus* spp.), holly (*Ilex aquifolium*), Scots pine (*Pinus sylvestris*) and European larch (*Larix decidua*) occur along parts of the southern and northern shores of the lake. Lough Bane was once home to a population of white-clawed crayfish (*Austropotamobius pallipes*), a species listed on Annex II of the E.U. Habitats Directive (NPWS, 2007). However, in 1986 this species was declared extinct from the lake due to an infestation of the fungal plague, *Aphanomyces astaci* (NPWS, 2013). Bird species found at the lake include the little grebe, cormorant, lapwing, curlew and snipe (NPWS, 2013).

Lough Bane historically held a stock of wild brown trout (*Salmo trutta*). The lake is stocked annually by the Lough Bane Angling Association with both brown trout and rainbow trout (O' Reilly, 2007).

The lake has been surveyed on four occasions since 2007 (2007, 2010, 2013 and 2016) (Kelly and Connor, 2007 and Kelly *et al*., 2011, 2014 and 2017). In all surveys conducted to date, perch were found to be the dominant species present in the lake.

This report summarises the results of the 2022 fish stock survey carried out 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 Bane, September 2022.

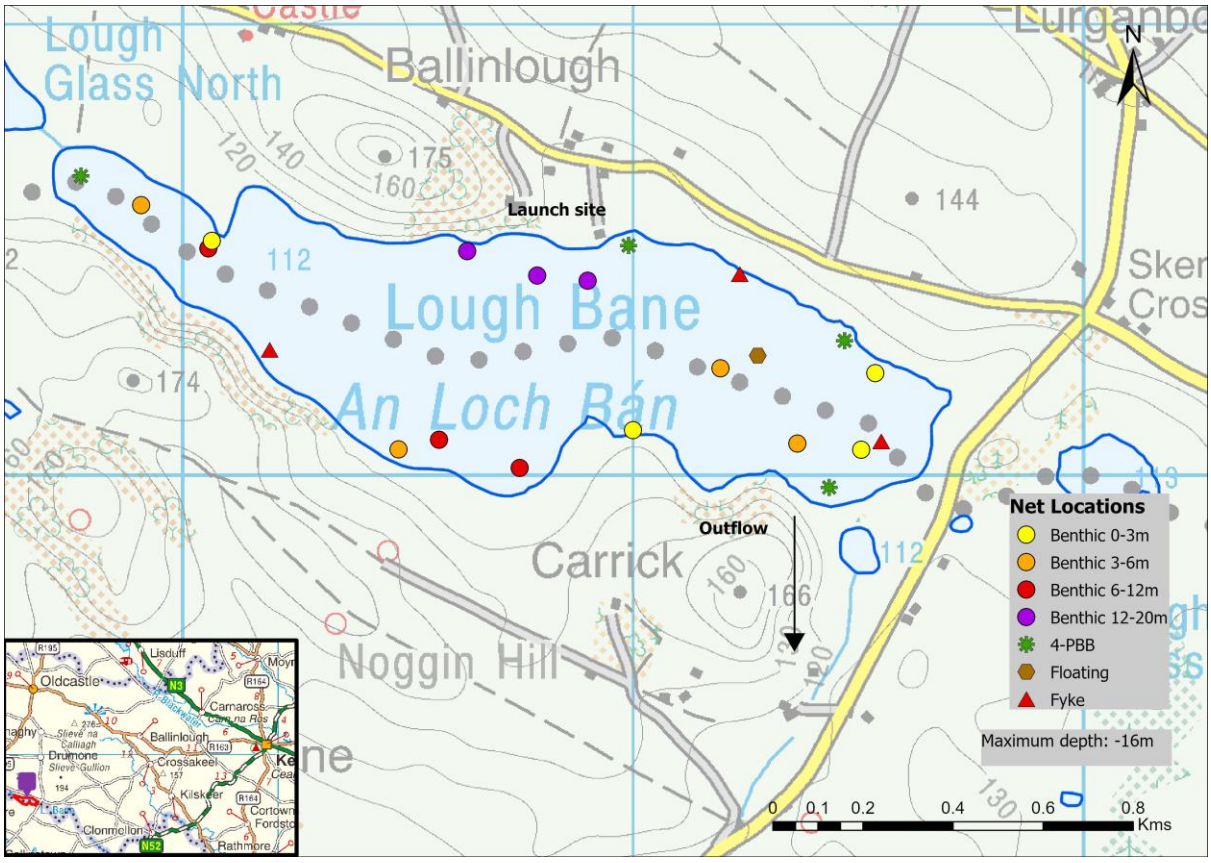

Figure 1.1. Location map of Lough Bane and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Lough Bane was surveyed over two nights from the 19th to 21st of September 2022. A total of three sets of Dutch fyke nets, 14 benthic monofilament multi-mesh CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 3 @ 6-11.9m and 3 @ 12-19.9m) and one floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill net were deployed in the lake (18 sites) at the same locations as previous surveys.

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 survey net. The angle of each survey 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

Four fish species were recorded on Lough Bane in September 2022 (Table 3.1). A total of 1,155 fish were captured. Perch was the most abundant fish species recorded, comprising almost 98% of all fish captured in the survey. Perch have also dominated fish stocks on previous survey occasions, with other species captured in smaller numbers. Rudd were recorded for the first time in the current survey. Rainbow trout (stocked) have been recorded in all previous surveys. Pike have also been captured in previous surveys with the exception of 2013. Wild brown trout (2013) and nine-spined stickleback were also recorded in previous surveys (2007,2010 and 2013). No eels were recorded in 2022.

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

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	4-PBB	Fyke	Total
Perca fluviatilis	Perch	1116	0	0	24	1140
Oncorhynchus mykiss	Rainbow trout (stocked)	5	0	0	0	5
Esox lucius	Pike	1	0	0	2	3
Scardinius erythrophthalmus	Rudd	3	4	0	0	7

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, perch were the most abundant species captured, (Table 3.2).

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

Scientific name	Common name	Mean CPUE (± S.E.)	Mean BPUE (± S.E.)
Perca fluviatilis	Perch	1.709 (0.439)	44.900 (15.117)
Oncorhynchus mykiss	Rainbow trout (stocked)	0.008 (0.004)	10.948 (5.637)
Esox lucius	Pike	0.003 (0.002)	0.615 (0.436)
Scardinius erythrophthalmus	Rudd	0.011 (0.007)	0.534 (0.398)

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).

For comparison purposes, box plots of CPUE and BPUE for each species captured in all surveys per net type between 2007 and 2022 are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time. An increasing trend in both CPUE and BPUE of perch, which was most pronounced in 2022, was evident (Figure 3.1 and 3.2).

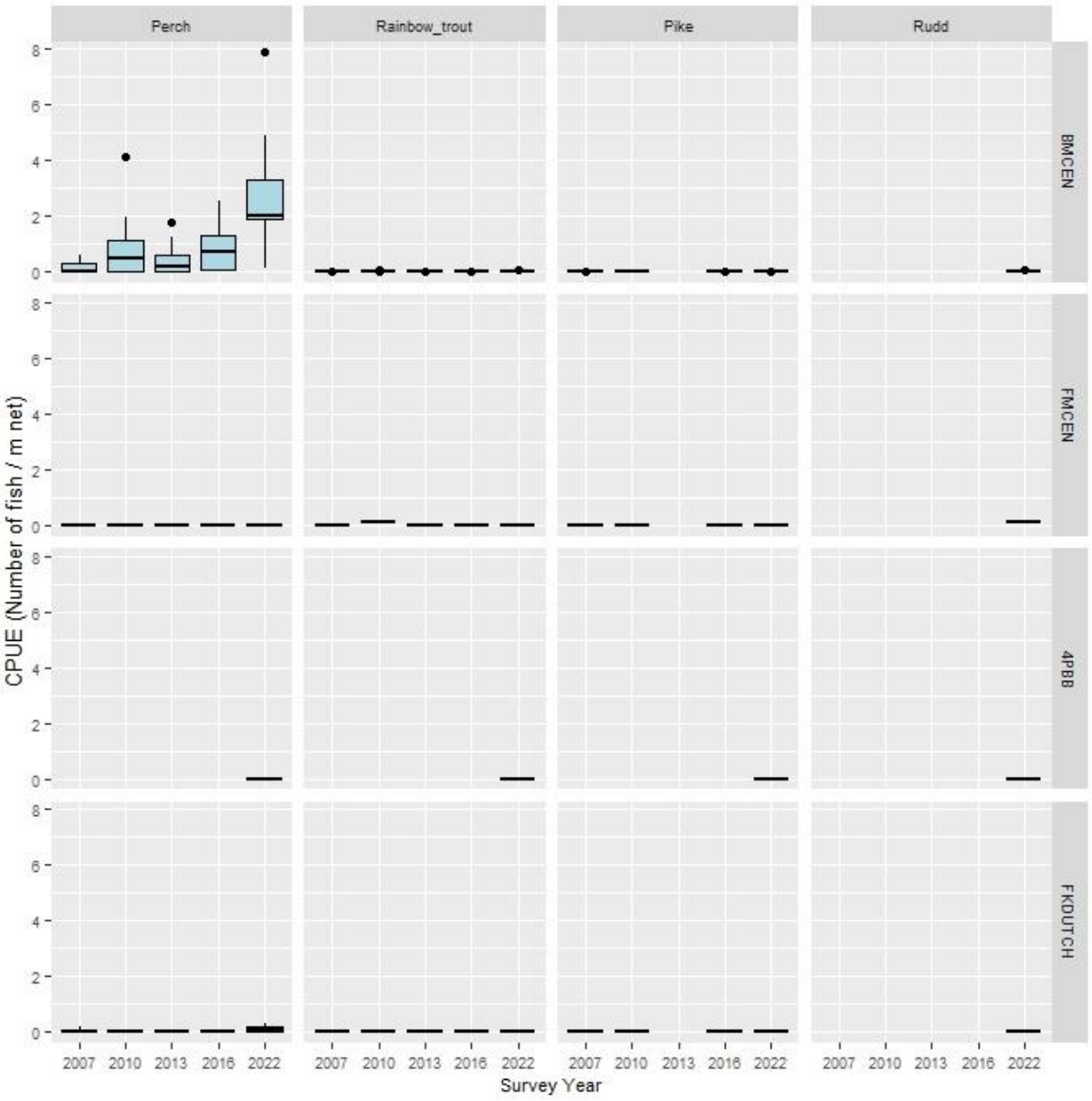

Figure 3.1. CPUE of fish species captured in each net type during surveys of Lough Bane between 2007 and 2022. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked 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.

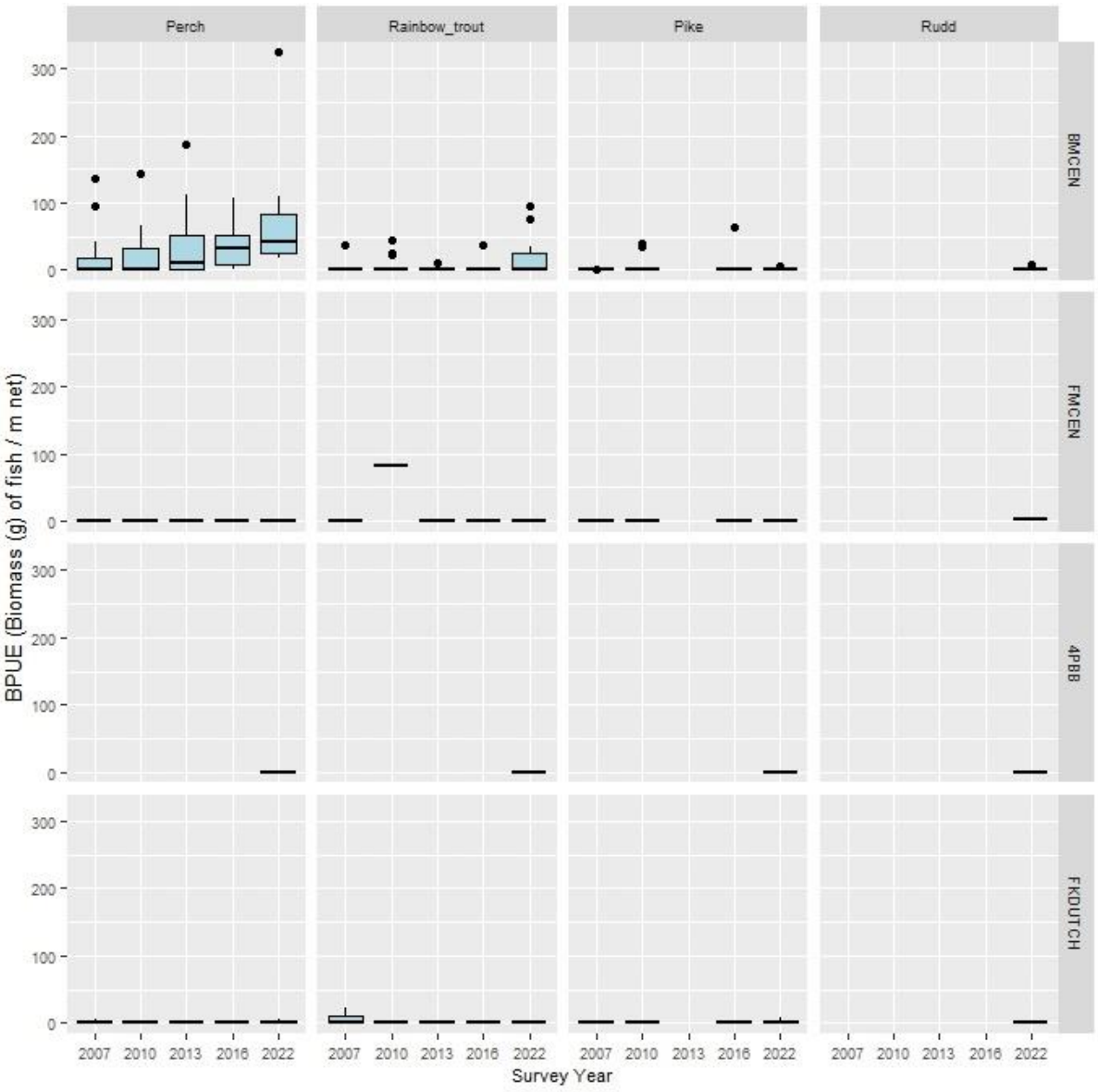

Figure 3.2. BPUE of fish species captured in each net type during surveys of Lough Bane between 2007 and 2022. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are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

Perch

Perch captured during the 2022 survey ranged in length from 5.0cm to 31.1cm (mean 9.4cm) (Figure 3.3). While the range was largely similar across all surveys some differences in the relative proportion of length groups is shown between surveys. Ten age classes were present, ranging from 0+ to 10+, and all intervening age classes were present in the sample aged. Mean L1 (i.e., age at the end of the 1st year) was 6.4cm (Table 3.3). This corresponds to the modal peak at 5.0-7.0cm, indicating that a large proportion of the perch captured in 2022 were 0+ juveniles. Several other strong year classes are apparent (Figure 3.3).

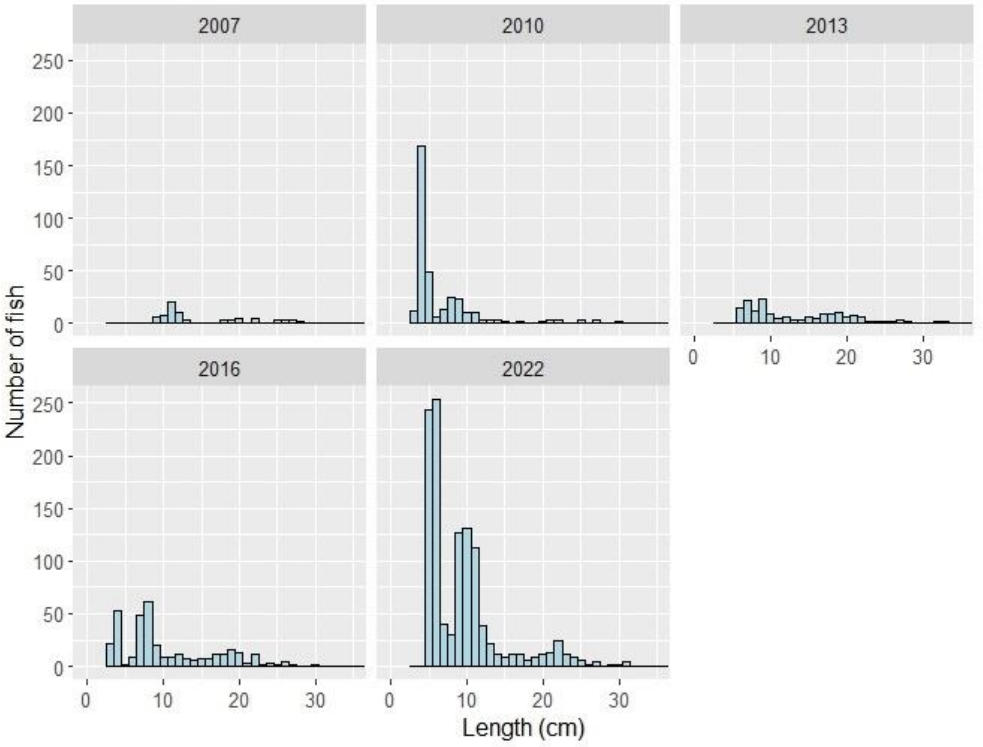

Figure. 3.3. Length frequency of perch captured on Lough Bane in 2007 and 2022.

Table 3.3. Mean (±S.E.) perch length (cm) at age for Bane Lough, September 2022.

Length (cm)	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}
Mean	6.4	11.1	16.1	19.9	22.9	24.8	25.5	28.3	28.7	-
(±S.E.)	0.1	0.2	0.2	0.3	0.4	0.6	0.4	0.9	0.1	-
N	110	78	53	39	18	12	5	3	2	1
Min	4.5	6.8	11.5	11.5	20.0	22.0	24.2	26.9	28.6	29.9
Max	9.5	16.5	20.6	24.5	27.2	29.2	26.4	30.0	28.7	29.9

Other Species

Three pike were captured during the 2022 survey. They ranged in length from 21.3cm to 38.8cm (mean 29.4cm) and were aged from 3+ to 4+. Five rainbow trout were captured ranging in length from 46.1cm to 67.0cm (mean 51.5cm). Seven rudd, ranging in length from 10.0cm to 21.3cm (mean 13.2cm) were captured and they were aged 2+ to 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 perch and rainbow trout captured during the survey were examined and are presented below.

Perch

A total of 95 perch stomachs were examined. 53 (6%) were found to contain no prey items. 42 stomachs contained food. 34 (81%) stomachs contained invertebrates only. Fish were recorded with invertebrates in five (12%) stomachs. Fish were the sole prey item recorded in three (7%) stomachs (Figure 3.4).

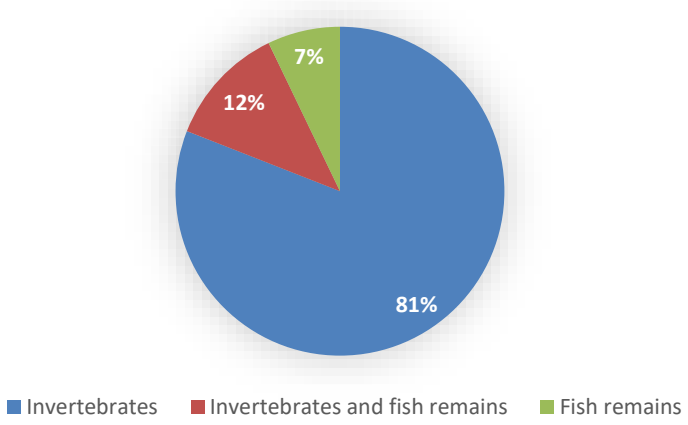

Figure 3.4. Diet of perch (N = 42) captured on Lough Bane, 2022 (% FO)

Rainbow trout

The stomach contents of three rainbow trout were examined. Two were empty and one contained the remains of three perch.

4. Summary

A total of four fish species were recorded on Lough Bane in September 2022. Perch was the dominant fish species in terms of both abundance (CPUE) and biomass (BPUE) captured in 2022. This species comprised approximately 98% of all fish captured. Perch were aged between 0+ and 10+ with all intervening year classes represented. The population was dominated by younger individuals with some persistence of older age groups apparent. There is evidence that the population of this species has been increasing in the lake.

A total of seven rudd were recorded in 2022 and all fish captured were aged between 2+ and 3+. Historically rudd were widespread though patchily distributed in Ireland and their colonisation history was uncertain (Kennedy & Fitzmaurice, 1974). It is not known whether this represents a new colonisation or is an increase of a previously undetected population.

No brown trout (wild or stocked) were recorded and there was no evidence of continued natural recruitment of this species in the lake. Salmonid stocks are augmented regularly with introductions of non-native rainbow trout and stocked brown trout.

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, Lough Bane has been assigned an ecological status of Good for 2022 based on the fish populations present. Previously Lough Bane was assigned High status in 2013 and 2007 and Good status in 2016 and 2010 (Figure 4.1)

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

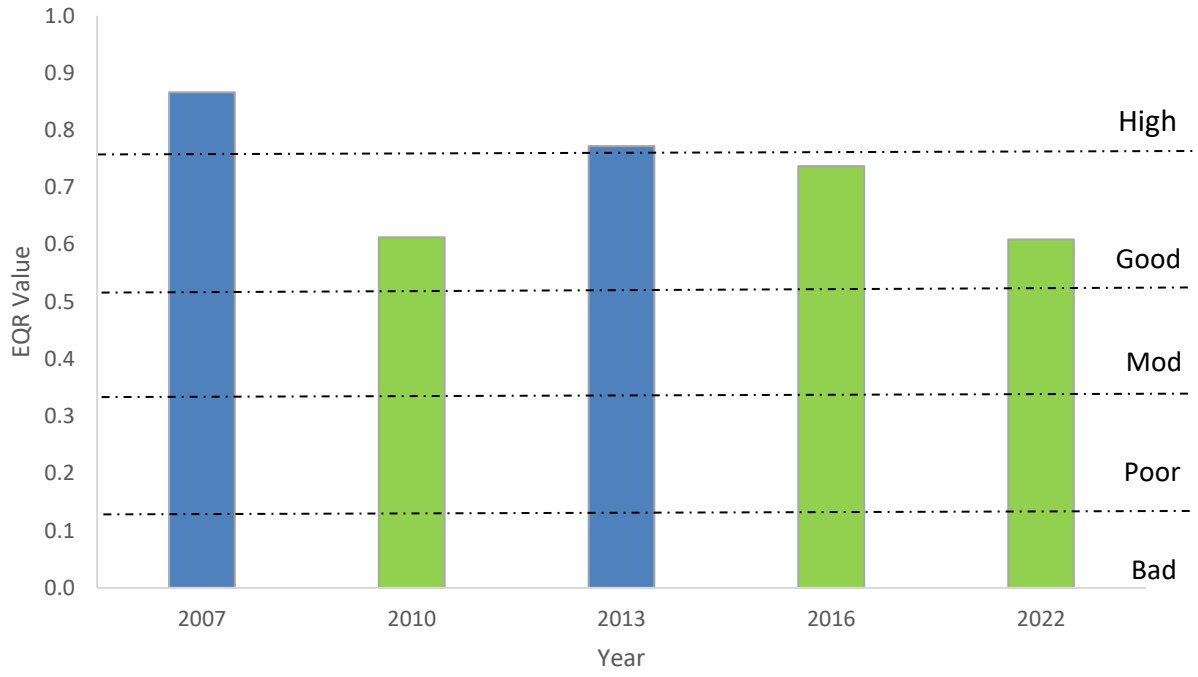

Figure. 4.1. Fish ecological status, Lough Bane, 2007, 2010, 2013, 2016 and 2022 (dashed line indicates EQR status boundaries).

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