

National Research Survey Programme

Lakes 2023

Cavetown Lough

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Iascach Intíre Éireann
Inland Fisheries Ireland

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Fish Stock Survey of Cavetown Lough, October 2023



**Iascach Intíre Éireann
Inland Fisheries Ireland**

National Research Survey Programme

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1. Introduction

Cavetown Lough is situated in Co. Leitrim in the Upper Shannon catchment (Plate 1.1, Figure 1.1). The lake is located approximately eight kilometres south of Boyle, Co. Roscommon and just over nine kilometres west of Carrick-on-Shannon, Co. Leitrim. It has a surface area of 64ha and a maximum depth of 20m. The lake is categorised as typology class 10 (as designated by the EPA for the Water Framework Directive), i.e. shallow (mean depth <4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃). The inflowing streams drain poor marshland and are spring fed. The lake overlies a limestone area and discharges into Clogher Lake. It is also utilised as a public water supply.

Cavetown Lough was previously a managed brown trout fishery and was stocked by a local angling club. However, this practise has since ceased. The lake was surveyed by Inland Fisheries Ireland (formerly the Central Fisheries Board and the Shannon Regional Fisheries Board in 1988 (IFI unpublished data)). During this survey, good stocks of trout aged 3+ or younger were recorded, with some 4+ and 5+ fish present. A large stock of rudd was also recorded.

The lake has since been surveyed on three occasions since 2008 (2008, 2011 and 2014) as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2009, Kelly *et al.*, 2012a and Kelly *et al.*, 2015). Roach and perch were the dominant species recorded in the latter surveys, with perch recorded for the first time 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. Cavetown Lough

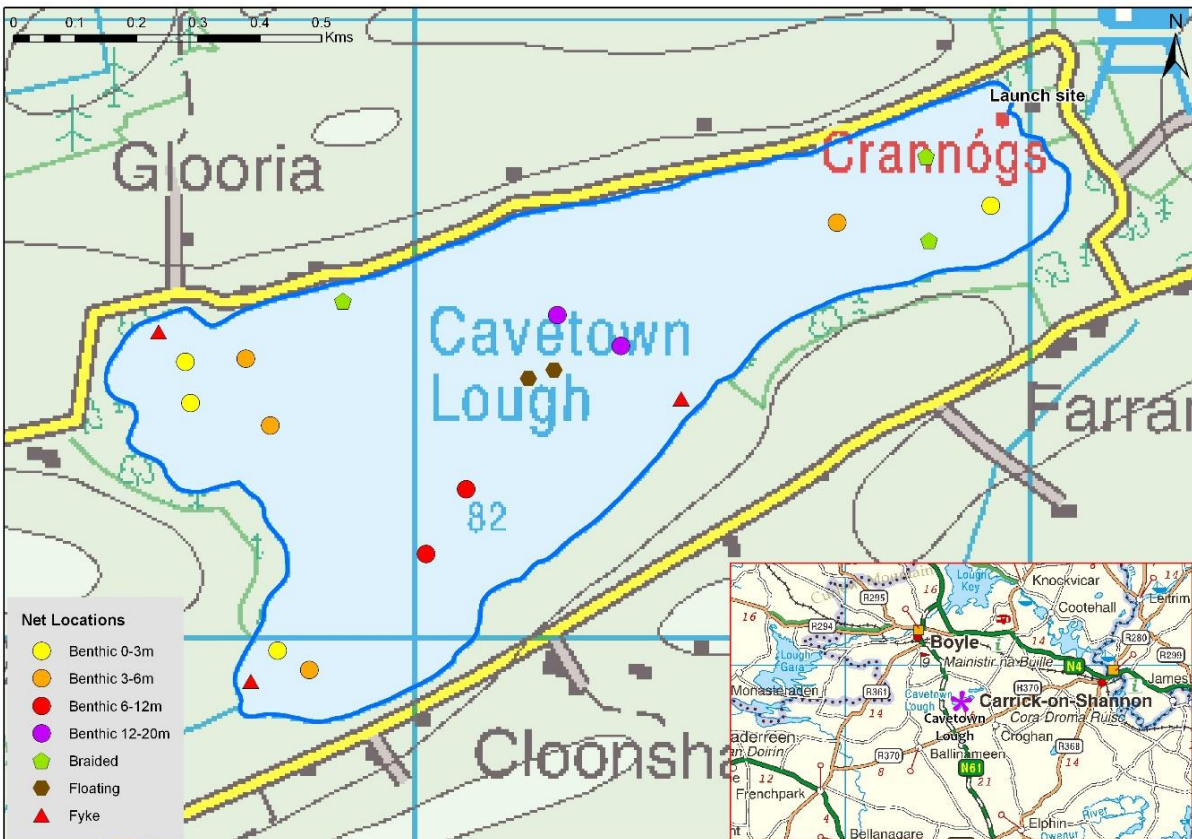


Figure 1.1. Location map of Cavetown Lough showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Cavetown Lough was surveyed over two nights from the 3rd to the 5th of October 2023. 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 in the lake (17 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at three additional sites (Figure 1.1). 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). 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 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).

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

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

Six fish species and two cyprinid hybrid types were recorded in Cavetown Lough in October 2023. A total of 522 fish were captured (Table 3.1). Perch was the most numerous fish species recorded, representing c. 60% of all fish recorded. Roach, roach x bream hybrids, pike, rudd x roach hybrids, rudd, bream and European eel were also captured. During the previous surveys in 2011 and 2008, the same species composition was recorded with the exception of perch, which were not captured during the 2008 survey but were recorded during the 2011 and 2014 surveys. No rudd were recorded in the 2014 survey (Kelly *et al.*, 2015).

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

Scientific name	Common name	Number of fish captured				
		BM CEN	FMCEN	4-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	308	0	1	4	313
<i>Rutilus rutilus</i>	Roach	132	6	0	0	138
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	13	2	9	0	24
<i>Esox lucius</i>	Pike	9	0	0	2	11
<i>Scardinius erythrophthalmus x R. rutilus</i>	Rudd x roach hybrid	9	2	0	0	11
<i>Scardinius erythrophthalmus</i>	Rudd	8	1	0	0	9
<i>Abramis brama</i>	Bream	4	0	4	0	8
<i>Anguilla anguilla</i>	European eel	0	0	0	8	8

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 was the dominant species with respect to abundance (CPUE) while roach had the highest biomass (BPUE) (Table 3.2).

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

Scientific name	Common name	Mean CPUE (\pm S.E)	Mean BPUE (\pm S.E)
<i>Perca fluviatilis</i>	Perch	0.517 (0.191)	12.197 (4.841)
<i>Rutilus rutilus</i>	Roach	0.230 (0.054)	32.694 (7.612)
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	0.029 (0.010)	9.422 (3.893)
<i>Esox lucius</i>	Pike	0.016 (0.006)	5.670 (2.783)
<i>Scardinius erythrophthalmus x R. rutilus</i>	Rudd x roach hybrid	0.018 (0.006)	6.124 (2.988)
<i>Scardinius erythrophthalmus</i>	Rudd	0.015 (0.008)	2.681 (1.386)
<i>Abramis brama</i>	Bream	0.008 (0.003)	3.465 (1.756)
<i>Anguilla anguilla</i> *	European eel	0.044 (0.024)	27.580 (16.156)

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 3.1 Bream from Cavetown Lough, October 2023.

3.3. Species Profiles

Perch

Perch captured during the 2023 survey ranged in length from 3.0cm to 34.1cm (mean = 8.9cm) (Figure 3.1). While the overall length range was broadly similar across all surveys where perch were captured, the population in 2023 was more heavily dominated by smaller fish (i.e. <10cm) compared to earlier surveys. Perch were aged between 0+ and 10+ and all age classes between 0+ and 7+ were represented in the sampled aged. Perch aged between 0+ (5cm – 7cm) and 2+ (11cm – 20cm) dominated the population, representing c. 74% of all the fish aged (Figure 3.1). Mean L1 (i.e. length at the end of the 1st year) was 6.1cm (Table 3.3).

The expansion in the abundance (CPUE) and biomass (BPUE) of perch that was evident between 2011 and 2014 appears to have stabilised (Figure 3.2).

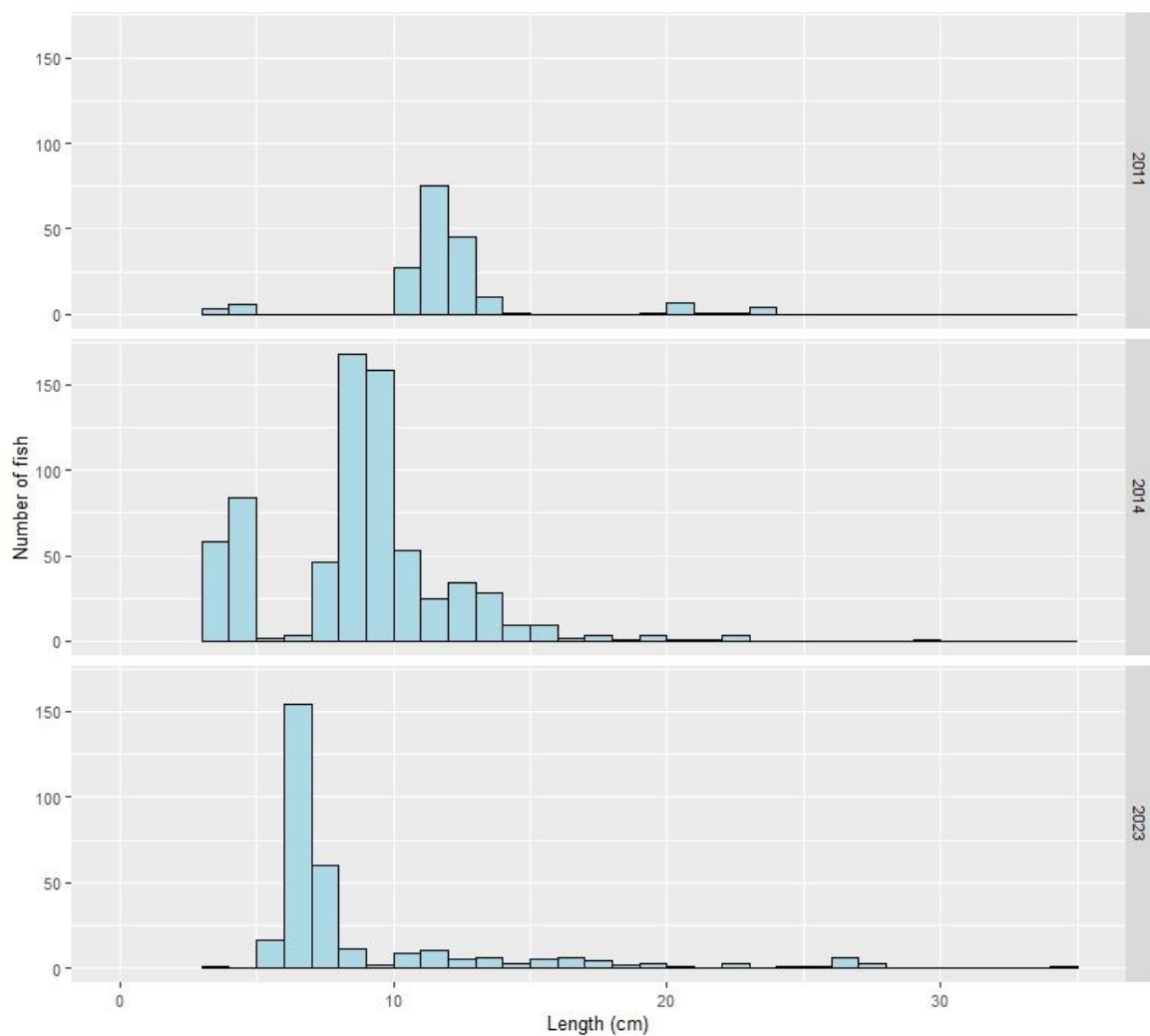


Figure 3.1. Length frequency of perch captured on Cavetown Lough between 2011 and 2023 (no perch were captured in 2008).

Table 3.3. Mean (\pm S.E.) perch length (cm) at age for Cavetown Lough, October 2023

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀
Mean (\pmS.E.)	6.1 (0.09)	11.1 (0.23)	15.8 (0.26)	20.0 (0.42)	22.3 (0.54)	24.6 (0.47)	25.1 (0.81)	-	-	-
N	60	40	20	12	10	7	3	1	1	1
Range	4.8-8.4	8.8-15.0	14.3- 18.0	17.4- 21.7	19.7- 24.6	22.2- 25.8	23.7- 26.5	24. 7	25. 8	27. 1

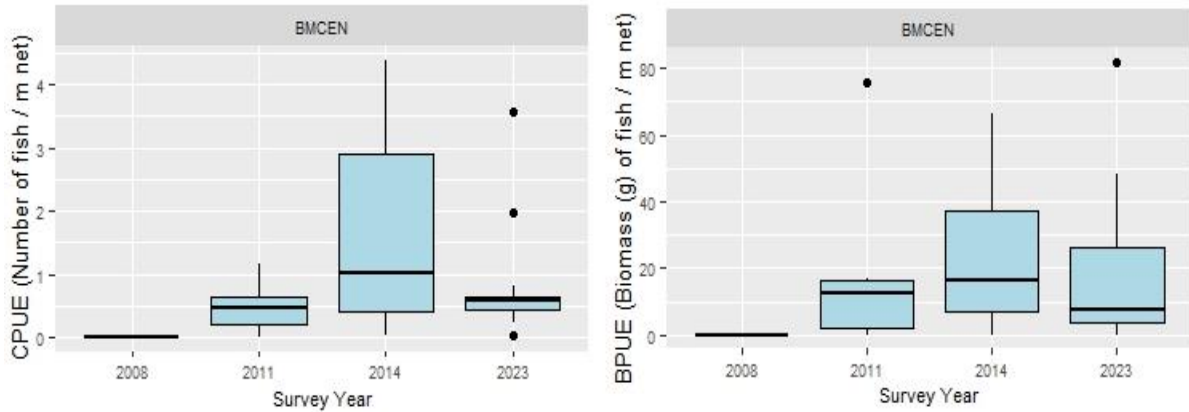


Figure 3.2. CPUE and BPUE of perch captured during surveys of Cavetown Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper 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 27.7cm (mean = 17.3cm) (Figure 3.3). While the overall length range was broadly similar across all surveys, in 2023 (and also 2011) the proportion of small (i.e. < 10cm) roach in the population was lower than in other surveys. Roach in the sample were aged between 2+ (8cm – 11cm) and 10+ (26cm – 27cm). All year groups were represented, and no one year group dominated the population (Figure 3.3 and Table 3.4).

Roach abundance (CPUE) and biomass (BPUE) have fluctuated across all surveys of the lake since 2008 and no clear trends are apparent (Figure 3.4)

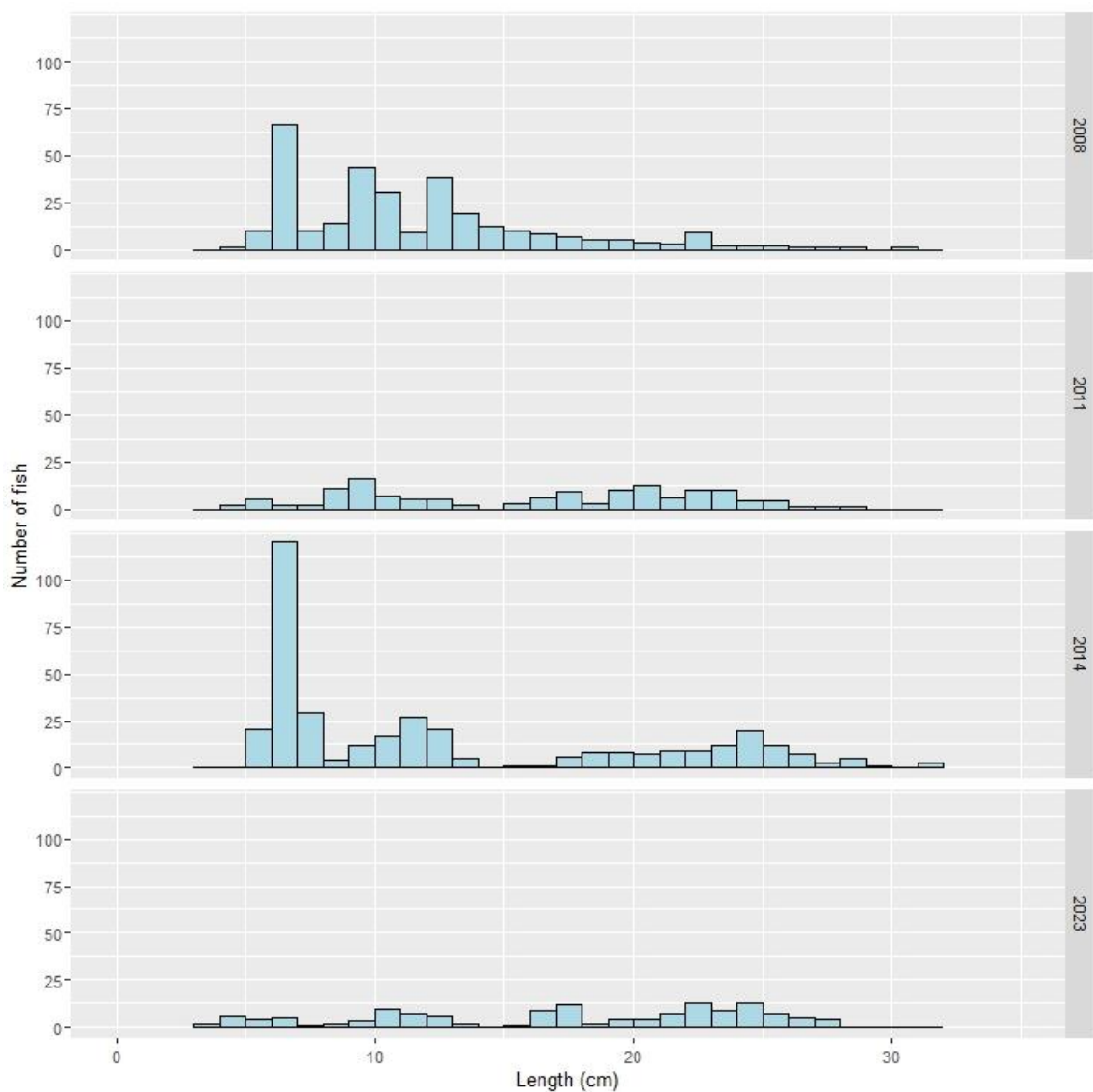


Figure 3.3. Length frequency of roach captured on Cavetown Lough between 2008 and 2023.

Table 3.4. Summary age data from roach captured on Cavetown Lough, October 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+
N	-	-	8	5	8	5	10	8	9	7	3
Mean	-	-	9.8	11.8	16.8	19.6	20.8	22.0	23.9	25.9	26.9
Min	-	-	8	10	16	17	19	21	23	25	27
Max	-	-	11	13	18	26	25	23	25	27	27

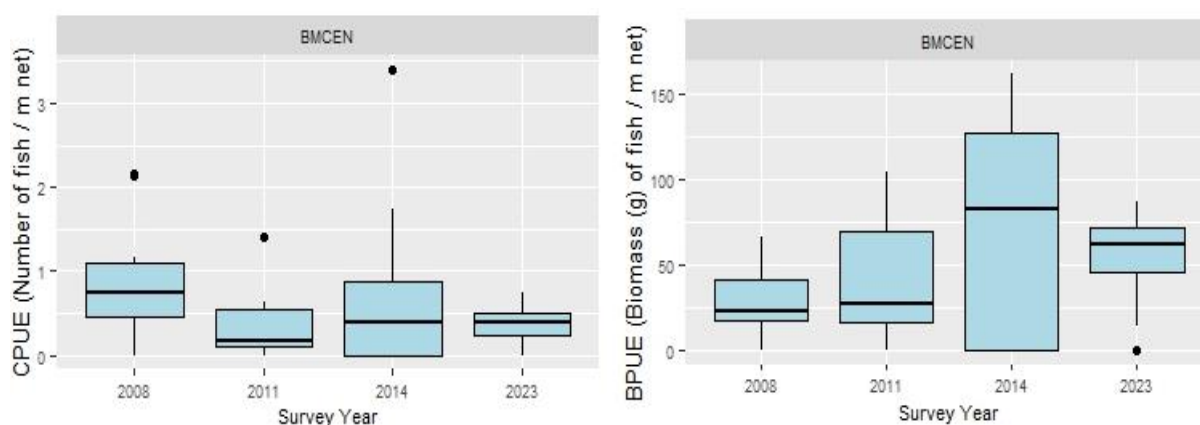


Figure 3.4. CPUE and BPUE of roach captured during surveys of Cavetown Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Roach x bream hybrids

Roach x bream hybrids captured during the 2023 survey ranged in length from 8.9cm to 34.5cm (mean = 26.0cm) (Figure 3.5). The length of fish captured was broadly similar across the four surveys of the lake conducted since 2008. Roach x bream hybrids were aged between 1+ and 12+. While no one age class dominated, the population was characterised by a large proportion of larger and older individuals (i.e. $\geq 6+$). Younger year groups were relatively poorly represented (Table 3.5).

While generally captured in small numbers there is some evidence that abundance (CPUE) and biomass (BPUE) of roach x bream hybrids were higher in 2023 compared to earlier surveys of the lake (Figure 3.6)

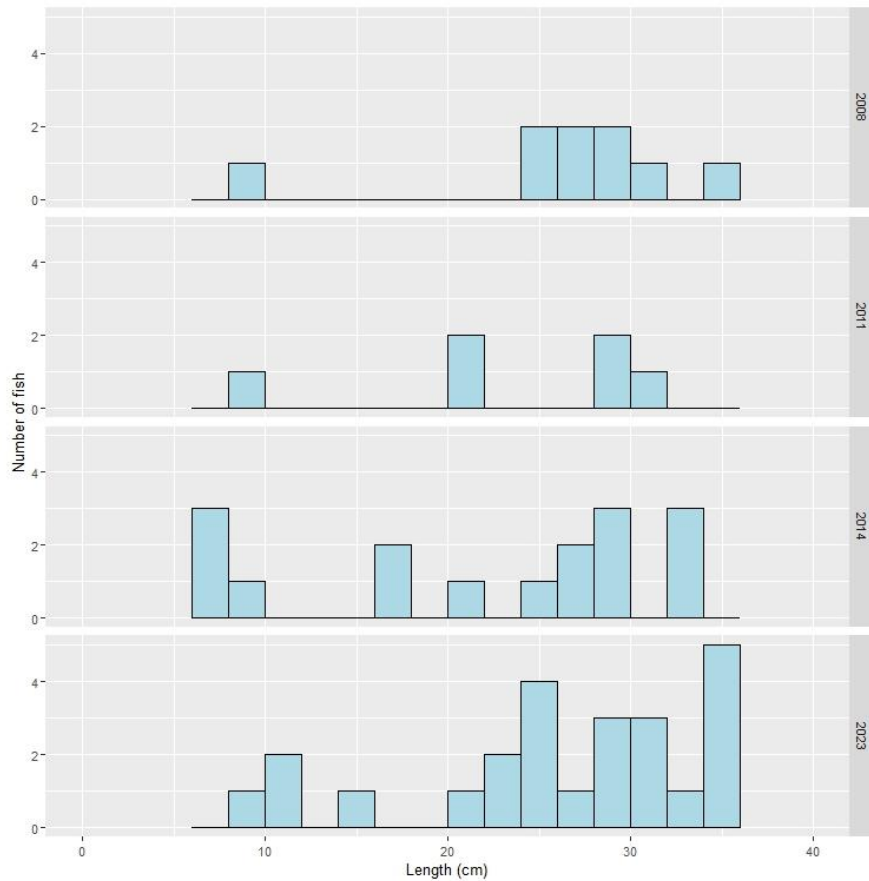


Figure 3.5. Length frequency of roach x bream hybrids captured on Cavetown Lough between 2008 and 2023

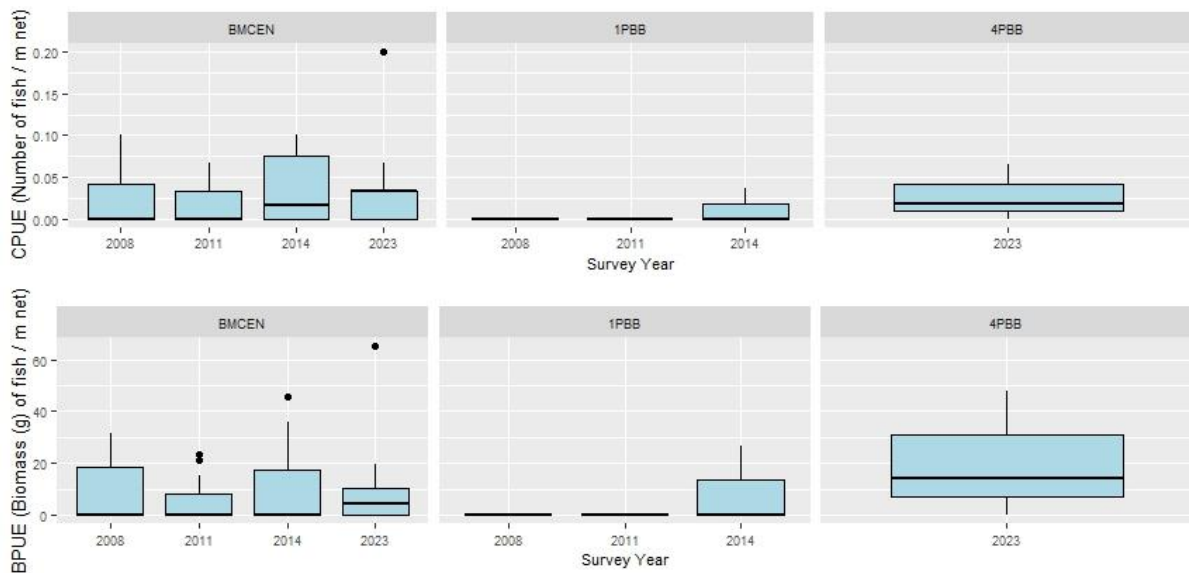


Figure 3.6. CPUE and BPUE of roach x bream hybrids captured during surveys of Cavetown Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Table 3.5. Summary age data from roach x bream x hybrids captured on Cavetown Lough, October 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+	12+
N	-	2	1	1	-	-	3	2	3	-	3	3	3
Mean	-	9.9	10.2	16.4	-	-	23.0	24.6	25.2	-	30.8	33.2	34.3
Min	-	8.9	10.2	16	-	-	21.6	24	24	-	30	31.1	34
Max	-	10.9	10.2	16	-	-	25.5	26	26.3	-	32	34.5	35

European eel

European eel captured during the 2023 survey ranged in length from 63.0cm to 80.0cm (mean = 70.3cm) (Figure 3.7). Both abundance (CPUE) and biomass (BPUE) of eel captured have fluctuated, and no clear trends are apparent (Figure 3.8)

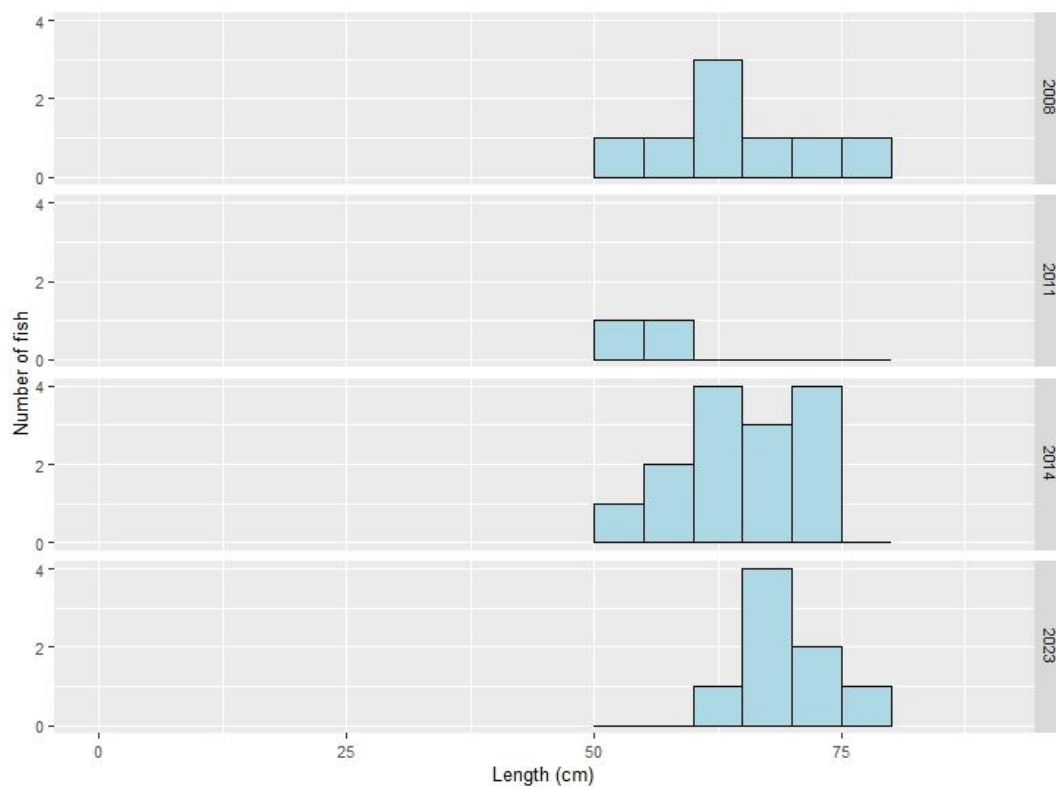


Figure 3.7. Length frequency of European eel captured on Lough Cavetown between 2008 and 2023.

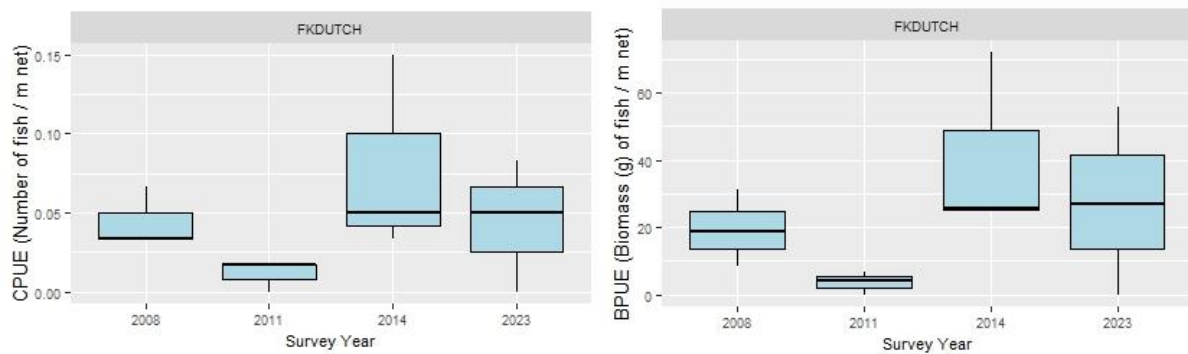


Figure 3.8. CPUE and BPUE of European eel captured during surveys of Cavetown Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Other fish species

Pike captured during the 2023 survey ranged in length from 18.0cm to 58.5cm (mean = 29.8cm). They were aged between 1+ and 4+.

Rudd x roach hybrids ranged in length from 8.4 to 34cm (mean = 22.8cm). Rudd x roach hybrids were aged between 2+ and 11+. Rudd captured during the survey ranged in length from 6.6cm to 27.4cm (mean = 18.2cm). Rudd were aged between 2+ and 10+

Bream captured during the survey ranged in length from 9.9cm to 39.2cm (mean = 29.0cm). Bream were aged between 2+ and 10+.

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 66 perch stomachs were examined. Thirty-seven (56%) were empty. Twenty-nine stomachs contained food. Invertebrates were the sole prey type recorded in 19 (66%) stomachs and were found together with plant matter in one (3%) stomach. Invertebrate prey included crayfish which were recorded in one stomach. Zooplankton was the sole prey type recorded in five (17%) stomachs. Unidentified digested material was recorded in four (14%) fish (Figure 3.9).

Pike

A total of nine pike stomachs were available for analysis. Of these, two (22%) were empty. Of the seven stomachs that contained food, five (71%) stomachs contained only fish. Fish and invertebrates were found together in one stomach. Invertebrates were the only prey item in one stomach. Perch were the most commonly found fish prey, recorded in five pike stomachs.

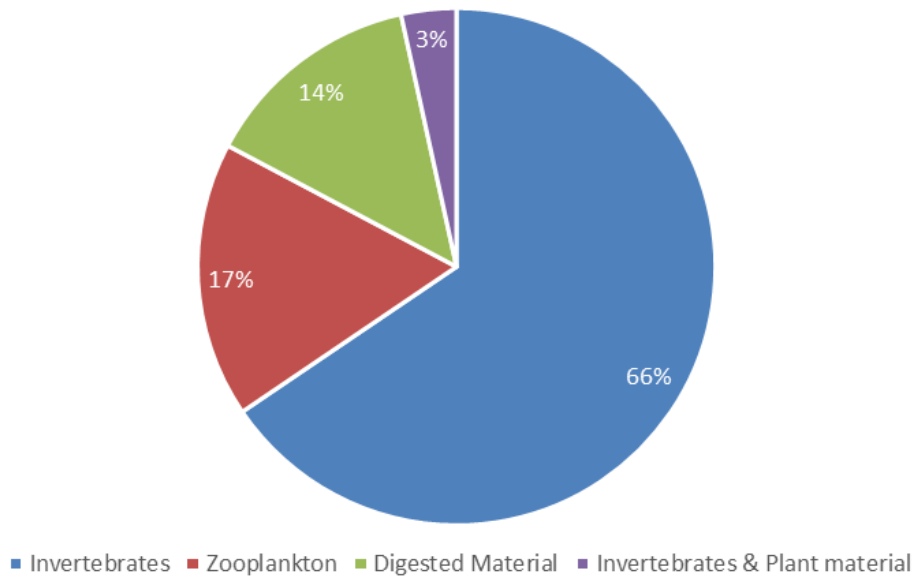


Figure 3.9. Diet of perch (N = 29) captured on Cavetown Lough, 2023 (% FO).

4. Summary and fish ecological status

A total of six fish species, including two varieties of cyprinid hybrid were recorded in Cavetown Lough in September 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.

Perch, recruitment appears to be regular and the population was dominated by younger and smaller individuals. Younger roach were much less prevalent than in previous surveys, and no one age group dominated the population. Bream were recorded in relatively small numbers. The presence of two year old fish is evidence that there continues to be an extant breeding population of bream in the lake. There is some evidence to suggest that the population of roach x bream hybrids (which requires successful spawning between both parent species (Hayden *et al.*, 2010) may have increased.

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, Cavetown Lough has been assigned an ecological status of Good for 2023 based on the fish populations present. The status of Cavetown Lough following fish stock surveys of the lake between 2008 and 2023 is presented in Figure 4.1.

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

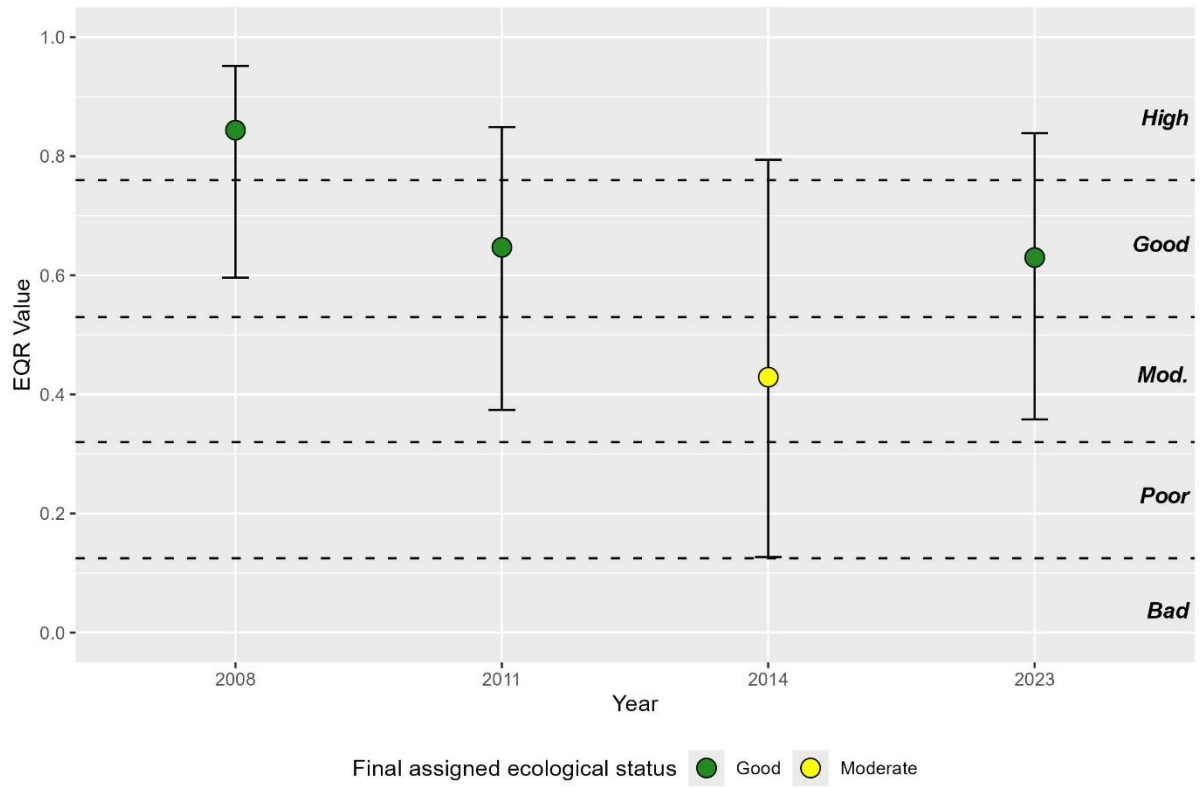


Figure 4.1. Fish ecological status, Cavetown Lough, between 2008 and 2022 (dashed line indicates EQR status boundaries).

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