National Research Survey Programme

Lakes 2024

Lough Ramor

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Iascach Intíre Éireann
Inland Fisheries Ireland

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Fish Stock Survey of Lough Ramor, August 2024

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Inland Fisheries Ireland

National Research Survey Programme

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

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1. Introduction

Lough Ramor is located just south of the town of Virginia in County Cavan and adjacent to the N3 (Figure 1.1). Located on the Blackwater (Kells) River, Lough Ramor is the largest lake in the Boyne catchment. Lough Ramor is situated approximately 90 m.a.s.l, has a surface area of 713ha, mean depth of 3.6 and a maximum depth of 14.6m. The lake lies on a bed of sandstone and land use is predominantly rich agricultural pasture. The lake is categorised as typology class 6 for the purposes of Water Framework Directive (WFD) monitoring, i.e. shallow (<4m), greater than 50ha and moderately alkaline (>20mg/l $CaCO_3$).

Lough Ramor is an important coarse and pike fishery, with excellent catches of bream, roach and roach x bream hybrids possible (IFI, 2020). Shore angling is available at several locations, and pike angling by boat is popular. It also holds a fair stock of trout averaging 2lb (1kg) (O' Reilly, 2007).

Lough Ramor was previously surveyed in 2005 by Inland Fisheries Ireland (previously the Central Fisheries Board (CFB, 2006). The lake was again surveyed in 2019 using IFIs lake monitoring protocol (Corcoran *et al.,* 2020). During the 2019 survey, perch were found to be the most abundant species present in the lake. Roach, roach x bream hybrids, bream, brown trout, gudgeon, pike and European eel were also captured during the survey. Rudd and tench were also recorded in 2005.

This report summarises the results of the 2024 fish stock survey carried out on the lake using Inland Fisheries Ireland's fish in lakes monitoring protocol. The protocol is WFD compliant and also provides insight into fish stock status in the lake.

Plate 1.1. Setting a fyke net near the western shore of the Lake, August2024.

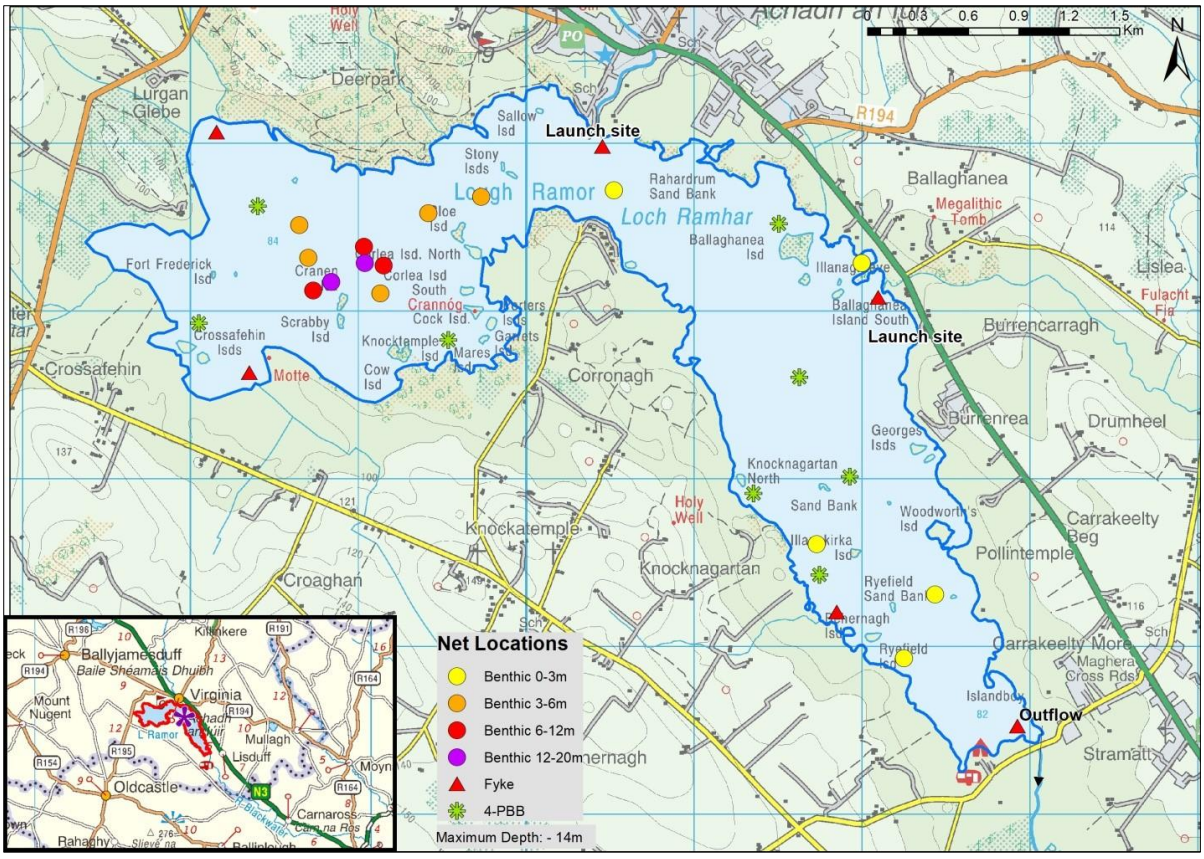

Figure 1.1. Location map of Lough Ramor showing locations and depths of each net

2. Methods

2.1. Netting methods

Lough Ramor was surveyed over three nights from the 26th to the 29th of August 2024. Six sets of Dutch fyke nets, 15 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (5 @ 0-2.9m, 5 @ 3-5.9m, 3 @ 6-11.9m and 2 @ 12-19.9m) were deployed in the lake (21 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at eight 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). 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). 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

A total of seven fish species and one type of cyprinid hybrid were recorded in Lough Ramor in August 2024. A total of 1233 fish were captured. The number of each species captured by each gear type during the survey is shown in Table 3.1. Perch was the most numerous species captured in the 2024 survey, representing *c*. 53% of all fish captured in the survey. Roach (22%) and roach x bream hybrids (17%) were also recorded in relatively large numbers. Bream, pike, gudgeon, brown trout and European eel were also captured.

Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Ramor, August 2024.

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Grand Total
Perca fluviatilis	Perch	629	0	24	653
Rutilus rutilus	Roach	274	0	1	275
Rutilus rutilus x Abramis brama	Roach x bream	146	60	5	211
Abramis brama	Bream	17	50	0	67
Esox lucius	Pike	1	6	0	7
Gobio gobio	Gudgeon	6	0	1	7
Salmo trutta	Brown trout	0	5	0	5
Anguilla anguilla	European eel	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). Roach x bream hybrids were the dominant species in terms of biomass (BPUE) (Table 3.2)

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Ramor, August 2024.

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Perca fluviatilis	Perch	0.737 (0.185)	25.289 (6.263)
Rutilus rutilus	Roach	0.316 (0.094)	23.520 (6.633)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.190 (0.037)	67.361 (11.947)
Abramis brama	Bream	0.036 (0.012)	23.218 (7.399)
Gobio gobio	Gudgeon	0.007 (0.005)	0.077 (0.048)
Esox lucius	Pike	0.003 (0.002)	9.067 (5.518)
Salmo trutta	Brown trout	0.002 (0.001)	3.429 (2.165)
*Anguilla anguilla**	European eel	0.022 (0.016)	3.851 (3.352)

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.

3.3. Species Profiles

Perch

Perch captured during the 2024 survey ranged in length from 5.3cm to 33.5cm (mean = 12.3cm) (Figure 3.1). The overall length range of perch captured was similar on both occasions and the proportions of fish of different sizes were also similar. Perch were aged between 0+ and 7+ (Table 3.3). All intervening age classes were represented in the sample aged. No one age class dominated and fish aged from 0+ to 3+ (6cm – 22cm) were well represented in the sample aged (Figure 3.1). In contrast fish aged 4+ and older were infrequently recorded.

Both abundance (CPUE) and biomass (BPUE) have remained relatively similar between the two sampling periods; however the median values for both metrics were slightly lower in 2024 (Figure 3.2).

Table 3.3. Mean (±S.E.) perch length (cm) at age for Lough Ramor, August 2024.

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean (±S.E.)	6.2 (±0.13)	10.8 (±0.27)	14.6 (±0.46)	17.1 (±0.87)	19.4 (±1.58)	21.4 (±1.01)	23.5
N	69	52	37	18	11	4	1
Range	3–8.2	6.6–15.8	9–22.3	10.1–26.6	10.9–31.2	19.1–23.4	23.5–23.5

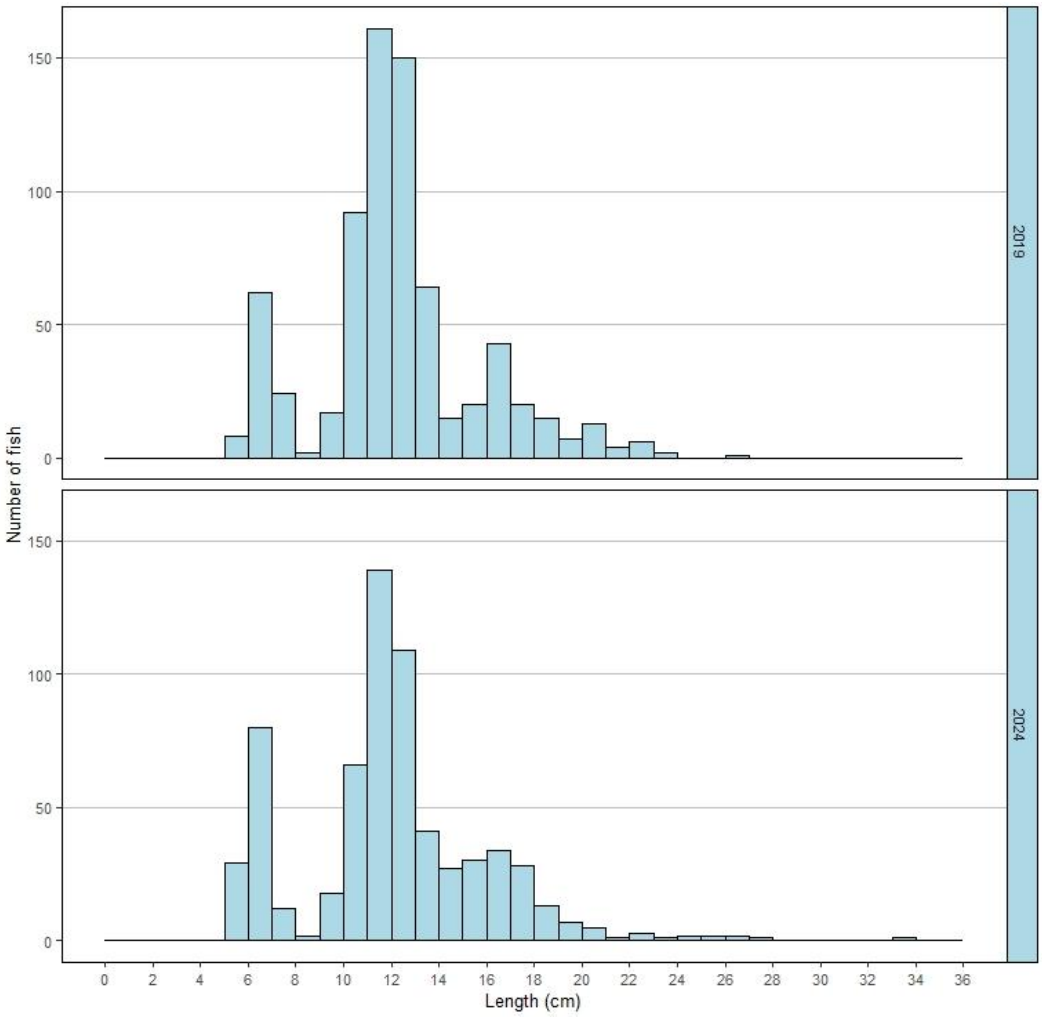

Figure 3.1. Length frequency of perch captured on Lough Ramor in 2019 and 2024.

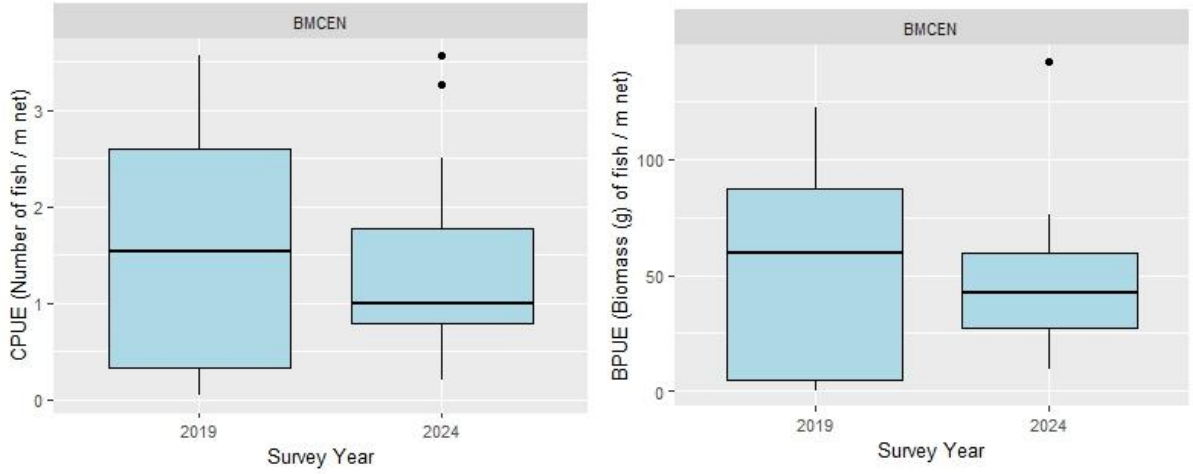

Figure 3.2. CPUE and BPUE of perch captured during surveys of Lough Ramor in 2019 and 2024. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Roach

Roach captured during the 2024 survey ranged in length from 4.3cm to 25.8cm (mean = 14.3cm) (Figure 3.3). Length range was broadly similar in both surveys. In 2024, smaller roach (i.e.< 10cm) were more prominent than in the earlier survey. Roach in the population were aged between 2+ and 8+ (Table 3.5). All intervening age classes were present (Table 3.4). 3+ (8cm – 15cm) and 5+ roach (16cm - 21cm) were the most abundant year classes in the sample aged. Together they represented *c.* 48% of all fish in the sample aged.

Median roach abundance (CPUE) was higher in 2024 than in 2019, but the median biomass (BPUE) was lower (Figure3.4).

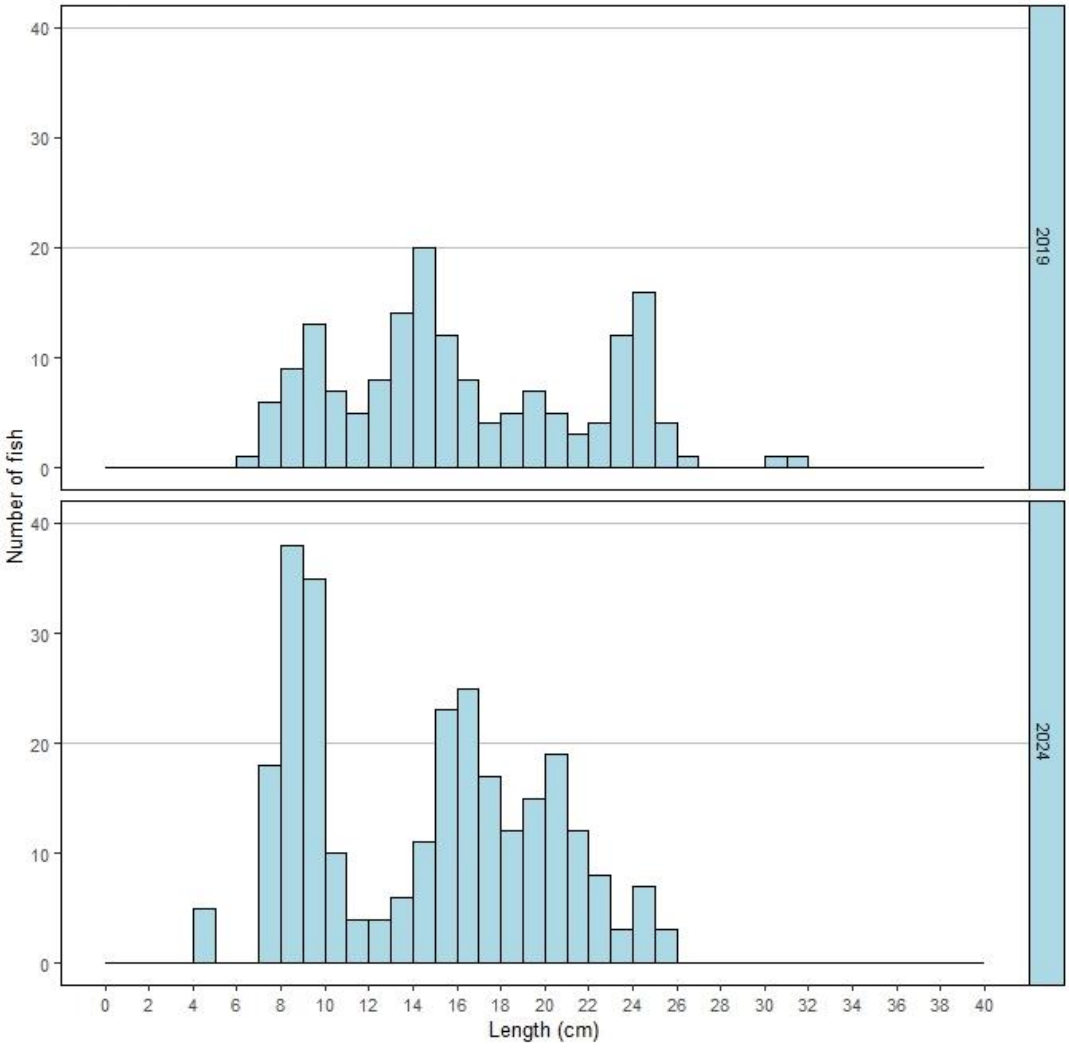

Figure 3.3. Length frequency of roach captured on Lough Ramor in 2019 and 2024.

Table 3.4. Summary age data from roach captured Lough Ramor, August 2024. 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+
N	-	-	10	18	9	20	13	6	1
Mean	-	-	8.4	12.0	16.2	19.1	22.4	24.6	25.8
Min	-	-	7.6	8.6	14.8	16.1	20.5	24.0	25.8
Max	-	-	10.6	15.7	17.2	21.5	24.0	25.3	25.8

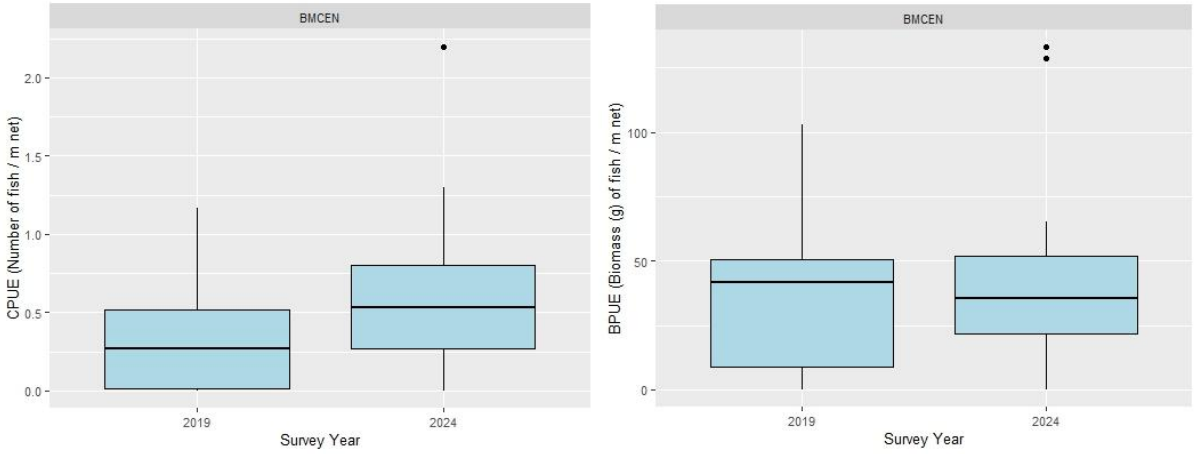

Figure 3.4. CPUE and BPUE of roach captured during surveys of Lough Ramor in 2019 and 2024. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and 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 2024 survey ranged in length from 9.3cm to 40.8cm (mean =26.5cm) (Figure 3.5). The overall length range was similar on both sampling occasions. However, in 2024, fish measuring <30cm in length were more prominent. Roach x bream hybrids were aged between 2+ and 13+ (Table 3.5). All age classes were represented in the sample aged. Roach x bream aged 7+ and 8+ (23cm – 34cm) dominated the population (Table 3.5 and Figure 3.5). Together, these cohorts represented c. 45% of all roach x bream in the sample aged. 4+ fish (15 – 20cm) were also prominent (Figure 3.5 and Table 3.5).

The median roach x bream abundance (CPUE) and biomass (BPUE) captured in benthic survey gill nets was higher in 2024 than in 2019, while these metrics appeared to have remained relatively stable for the 4-PBB survey gill nets (Figure3.6).

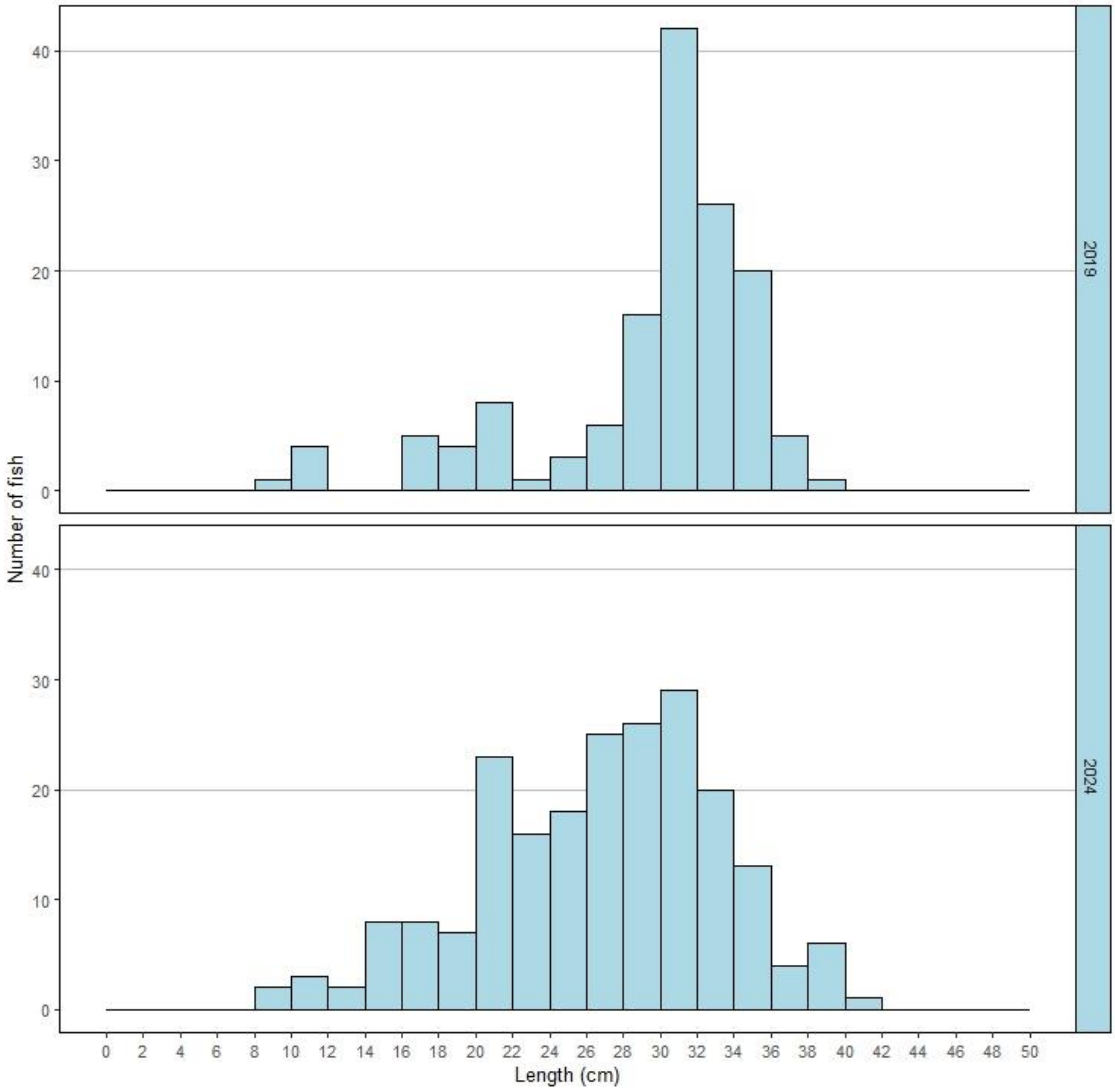

Figure 3.5. Length frequency of roach x bream hybrids captured on Lough Ramor in 2019 and 2024.

Table 3.5. Summary age data from roach x bream hybrids captured Lough Ramor, August 2024. 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+	13+
N	-	-	2	8	17	8	6	20	22	8	3	1	1	1
Mean	-	-	10.4	14.2	18.6	21.3	22.0	26.2	30.1	33.4	35.8	37.2	39.0	40.8
Min	-	-	9.8	11.6	15.8	20.4	21.6	23.1	27.7	31.7	34.6	37.2	39.0	40.8
Max	-	-	11.0	15.6	20.5	22.4	22.7	34.3	32.5	35.2	37.2	37.2	39.0	40.8

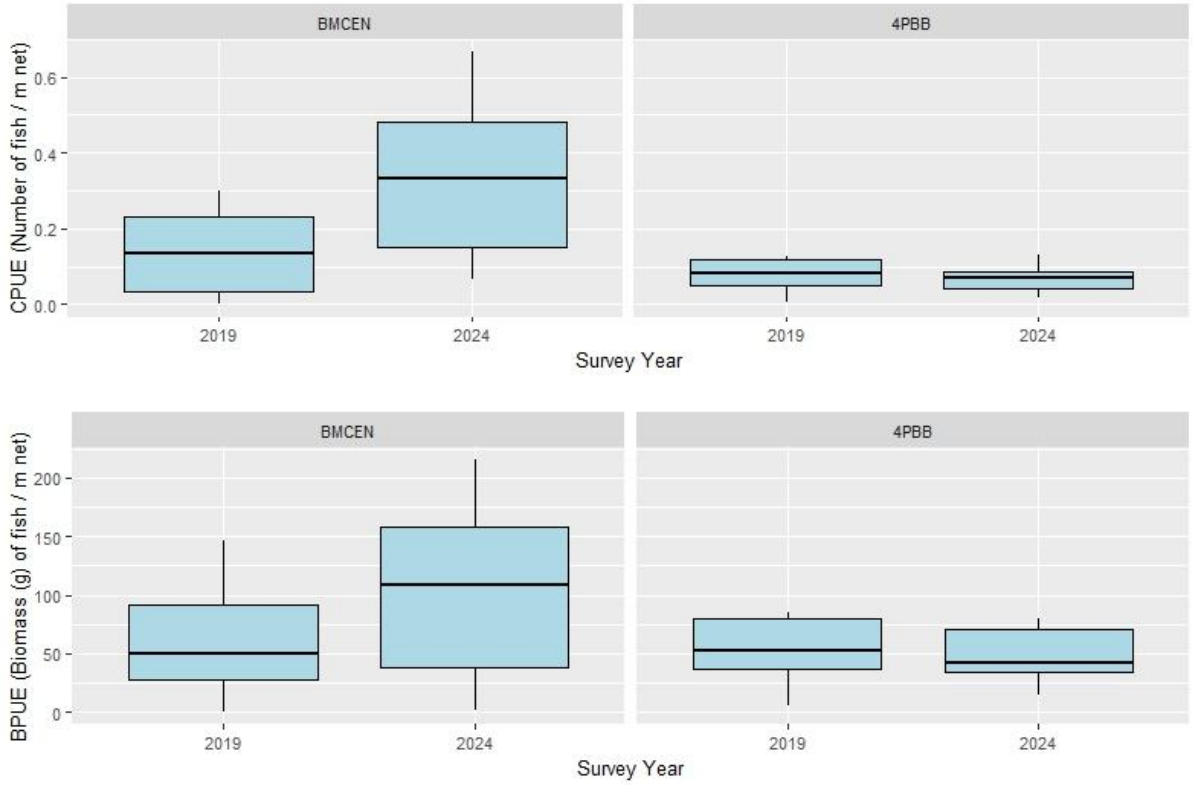

Figure 3.6. CPUE and BPUE of roach x bream hybrids captured during surveys of Lough Ramor in 2019 and 2024. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Bream

Bream captured during the 2024 survey ranged in length from 15.3cm to 49.0cm (mean = 33.6cm) (Figure 3.7). Length range was broadly similar in both surveys. In 2024, bream ranging between 30cm to 35cm were less prominent than in the earlier survey. Bream were aged between 3+ and 13+ (Table 3.6). All intervening age classes were present (Table 3.6). While no one age class dominated the population, 9+ bream (39cm – 40 cm) were the most abundant cohort (Figure 3.7 and Table 3.6).

Bream abundance (CPUE) and biomass (BPUE) appear to have remained relatively stable; however the medians for these metrics was lower in 2024 (Figure3.8).

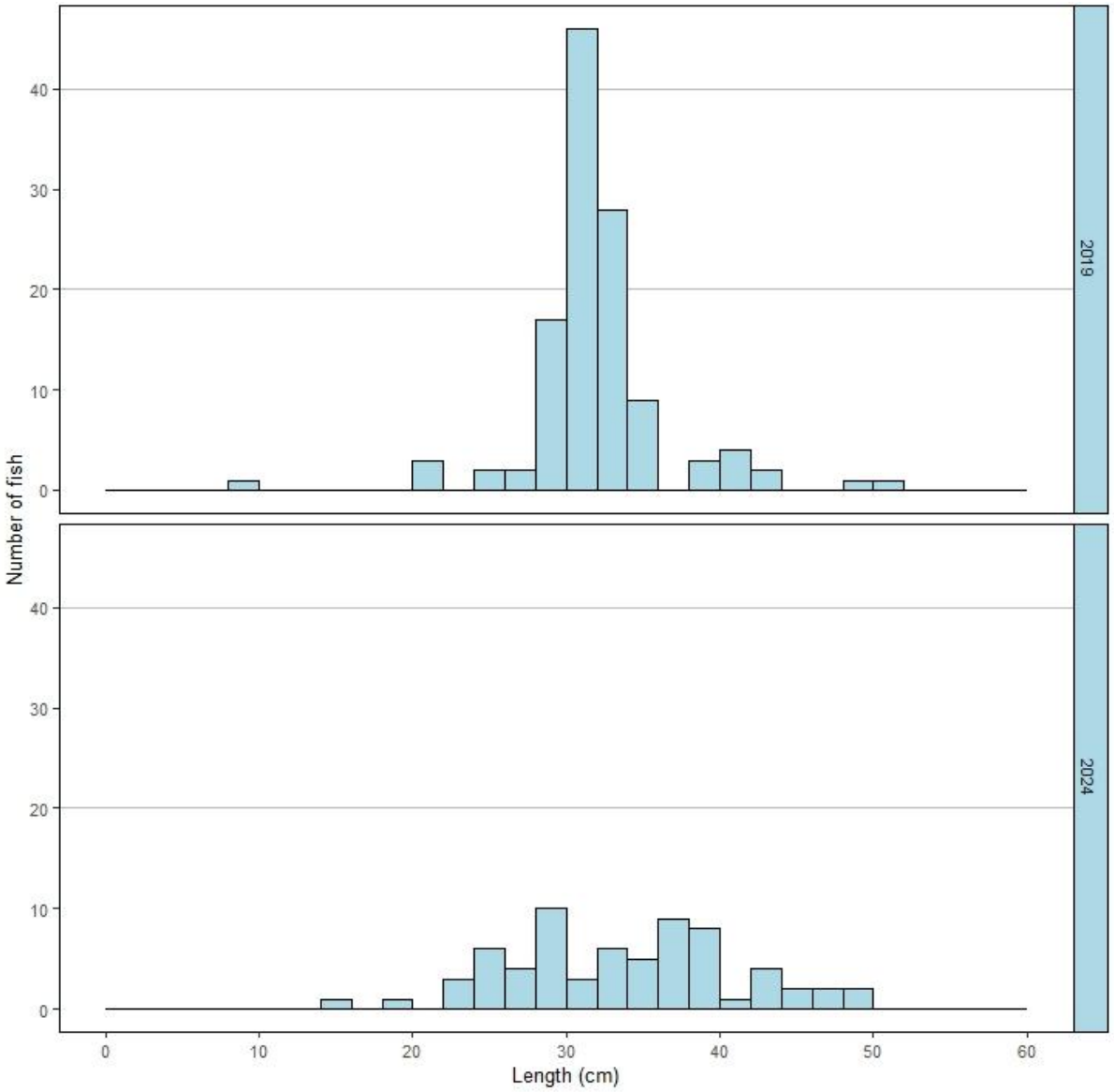

Figure 3.7. Length frequency of bream captured on Lough Ramor in 2019 and 2024.

Table 3.6. Summary age data from bream captured Lough Ramor, August 2024. 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+	13+
N	-	-	-	2	4	1	4	2	4	6	2	2	4	1
Mean	-	-	-	19.6	26.4	26.2	30.7	35.0	37.1	39.5	40.6	45.3	46.0	46.0
Min	-	-	-	15.3	23.6	26.2	29.1	33.6	34.7	39.0	37.4	43.9	43.3	46.0
Max	-	-	-	24.0	29.3	26.2	32.8	36.5	38.8	40.0	43.8	46.8	49.0	46.0

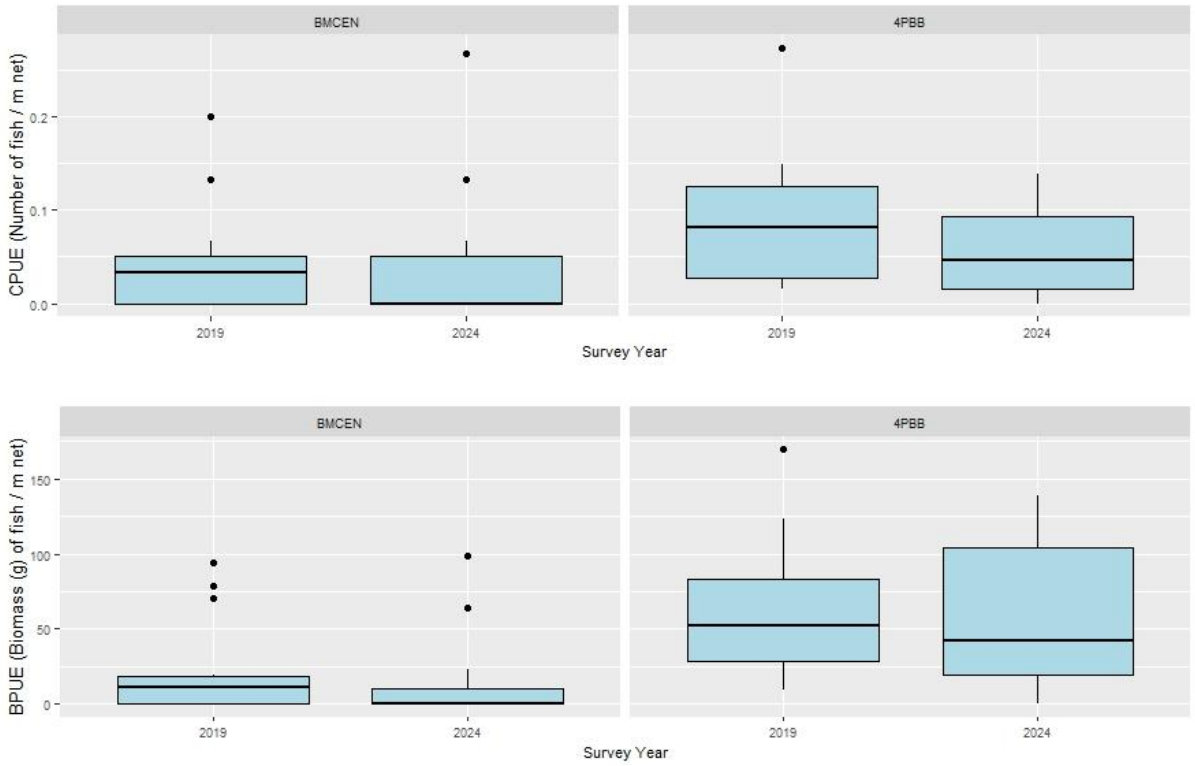

Figure 3.8. CPUE and BPUE of bream captured during surveys of Lough Ramor in 2019 and 2024. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

<u>Other fish species</u>

Eight European eel were captured. They ranged in length from 29.2cm to 59.9cm (mean = 45.6cm) (Figure 3.9). Abundance (CPUE) and biomass (BPUE) were both lower in 2024 compared to 2019 (Figure 3.10).

Seven pike captured ranged in length from 64.4cm to 87.3 cm (mean = 87.3cm). These fish were all aged between 5+ and 8+ (Table 3.7).

Seven gudgeon captured ranged in length from 9.0cm to 10.5 cm (mean = 9.4cm).

Five brown trout were captured. They ranged in length from 45.6cm to 67.1cm (mean = 54.4cm). It was possible to estimate age from the four smaller individuals (45.6cm-54.9cm). These fish were aged 5+ and 6+. Mean L1 (i.e. length at the end of the 1st year) was 6.8cm (Table 3.8).

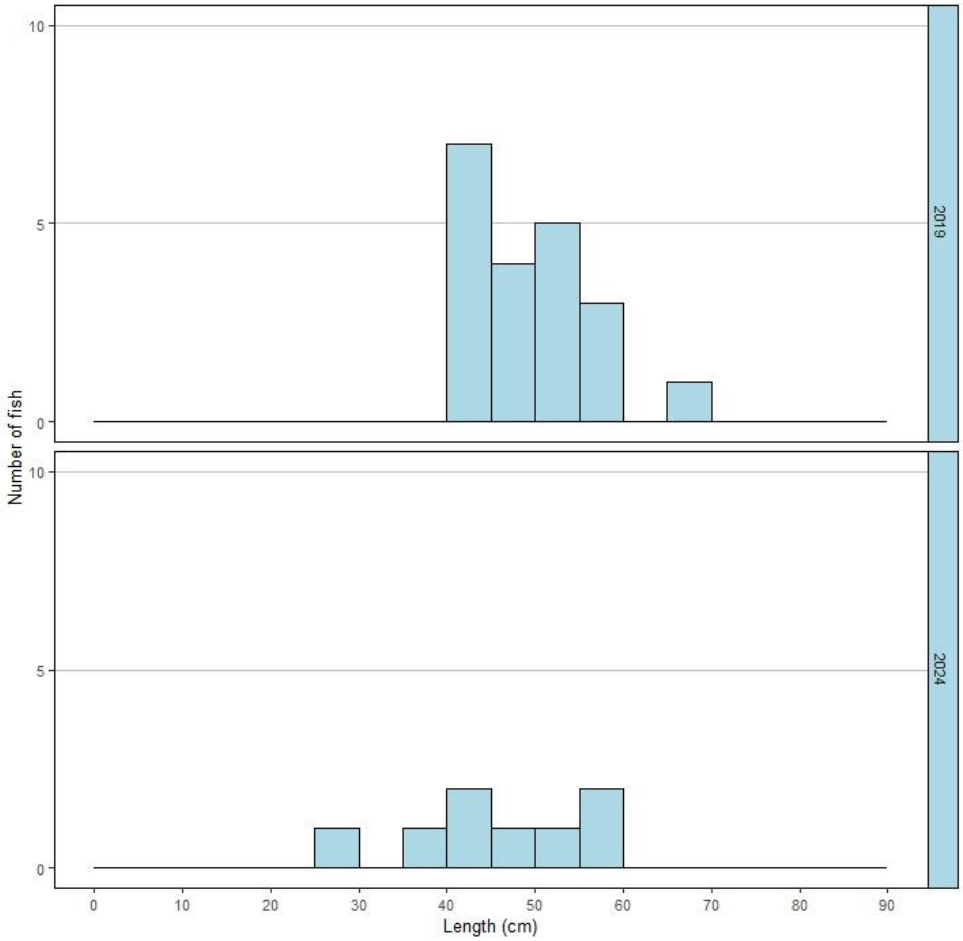

Figure 3.9. Length frequency of eel captured on Lough Ramor in 2019 and 2024.

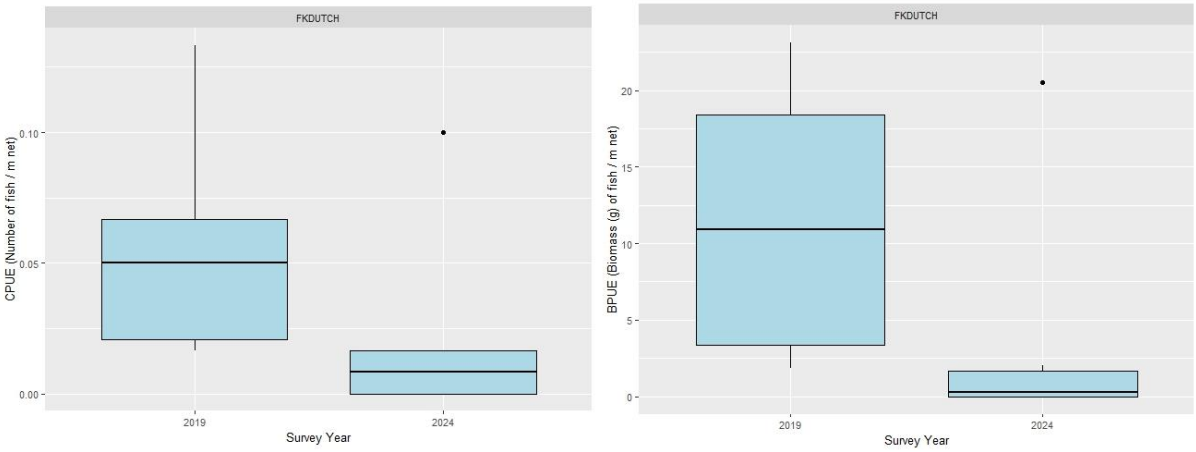

Figure 3.10. CPUE and BPUE of eel captured during surveys of Lough Ramor in 2019 and 2024. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Table 3.7. Summary age data from pike captured Lough Ramor, August 2024. 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+
N	-	-	-	-	-	2	2	1	1
Mean	-	-	-	-	-	64.4	75.5	86.4	87.3
Min	-	-	-	-	-	64.4	72.5	86.4	87.3
Max	-	-	-	-	-	64.4	78.6	86.4	87.3

Table 3.8. Mean (±S.E.) brown trout length (cm) at age for Lough Ramor, August 2024.

Length (cm)	L_1	L_2	L_3	L_4	L_5	L_6
Mean (±S.E.)	6.8 (0.25)	14.9 (1.01)	24.8 (1.44)	34.9 (1.70)	42.0 (2.15)	46.9 (3.30)
N	4	4	4	4	4	2
Range	6.5-7.6	12.3-17.1	21.0-28.1	30.1-38.0	36.1-46.4	43.6-50.2

Plate 3.1. Harbour on Lough Ramor, Virginia, September 2024.

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

Perch

A total of 58 perch stomachs were examined. Thirty-seven stomachs contained food (64%). Zooplankton was the sole prey type recorded in 22 (64%) stomachs and was found together with invertebrates in one (3%) stomach. Invertebrates were the sole prey type recorded in five (14%) perch stomachs. Fish was the sole prey type recorded in five (14%) perch stomachs. Fish and invertebrates were recorded together in two (5%) perch stomachs, and fish were recorded with zooplankton in one perch (Figure 3.11).

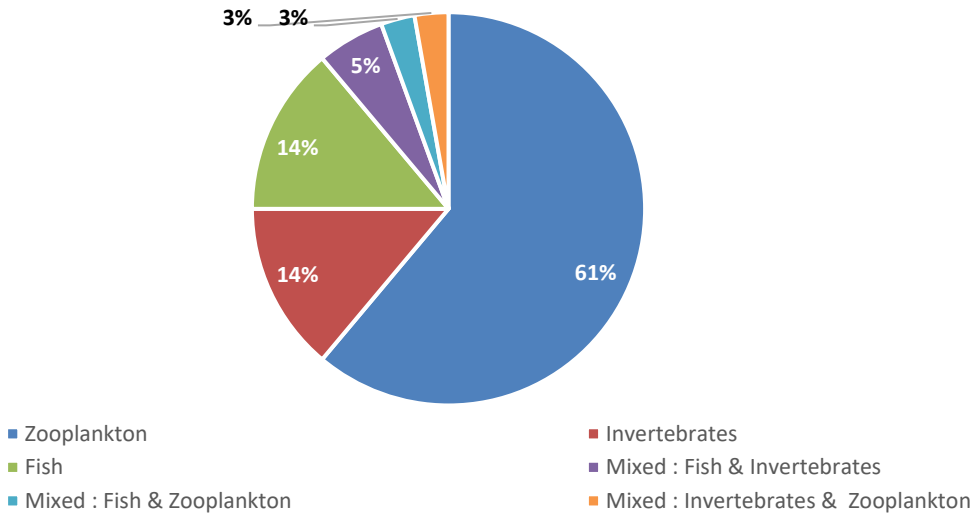

Figure 3.11. Diet of perch (N =37) captured on Lough Ramor, 2024 (% FO).

Brown trout

Three brown trout stomachs were analysed. Two stomachs were empty and one stomach contained invertebrates.

Pike

Five pike stomachs were available for analysis. Four stomachs were empty. One pike stomach (86.4cm) contained fish (unidentified cyprinid).

4. Summary and fish ecological status

A total of seven fish species and one type of cyprinid hybrid were recorded in Lough Ramor in August 2024.

Perch was the dominant species with respect to abundance (CPUE) and roach x bream hybrids were the dominant species in terms of biomass (BPUE).

Perch numbers have remained relatively stable between the two surveys. Perch are recruiting regularly to the lake fishery and the population is dominated by younger and smaller fish.

The roach population also exhibited stable and regular recruitment patterns, and the population was also dominated by relatively younger cohorts.

Roach x bream hybrids were captured in relatively high numbers and this species recorded the highest biomass of all species captured in 2024. This hybrid variety (which requires spawning populations of both parent species (Hayden *et al*., 2010) is longer lived than roach in Lough Ramor. The population in 2024 was characterised by a greater proportion of smaller and younger fish than in the previous survey indicating that spawning between the two parent species has been frequent in recent years.

The bream population appeared to be relatively stable.

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 Ramor has been assigned an ecological status of Bad for 2024 based on fish populations present. Lough Ramor was also assigned a bad status following the 2019 fish stock survey.

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

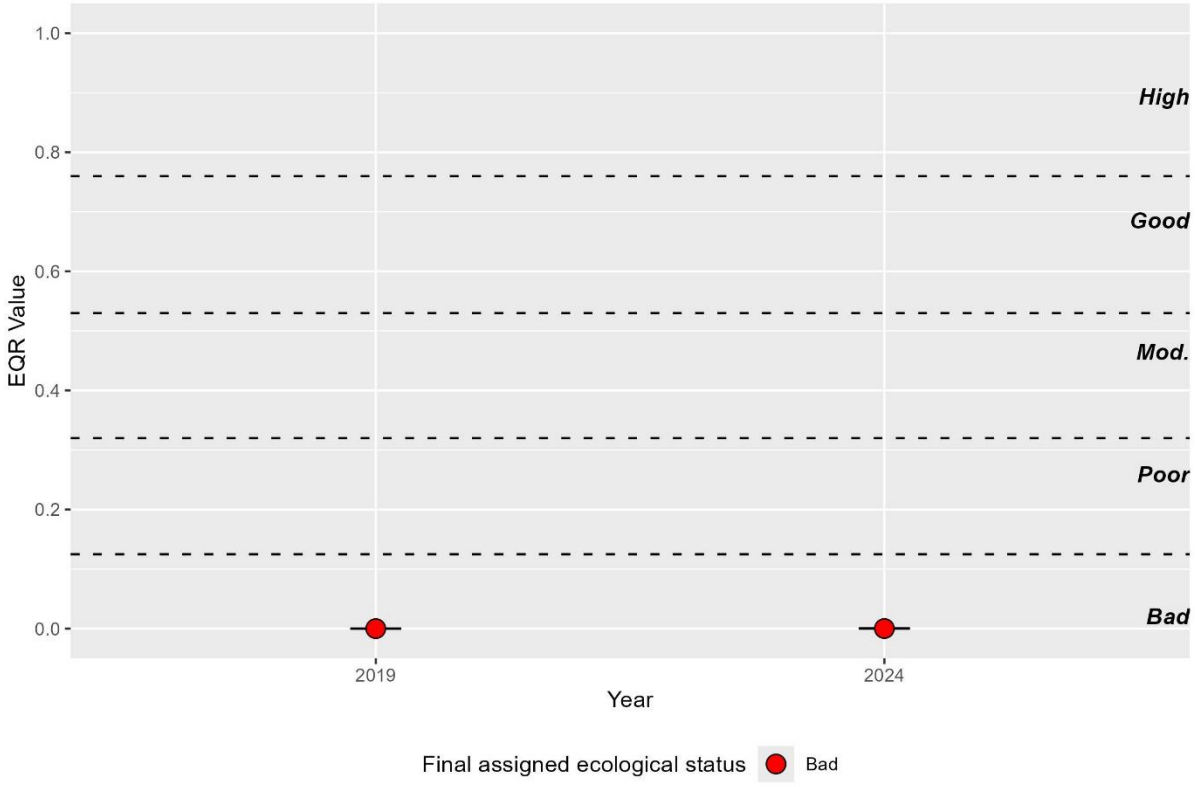

Figure 4.1. Fish ecological status, Lough Ramor in 2019 and 2024 (dashed line indicates EQR status boundaries).

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