National Research Survey Programme

Lakes 2023

Drumkeery Lough

IFI/2024/1-4723

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Fish Stock Survey of Drumkeery Lough, August 2023

National Research Survey Programme

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

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1. Introduction

Drumkeery Lough is situated in the Blackwater River (Kells) sub-catchment of the River Boyne, near Bailieborough, Co. Cavan (Plate 1.1, Figure 1.1). The lake is situated at an altitude of 132 m.a.s.l., has a total surface area of 13ha, mean depth of 3.4m and maximum depth of 9.3m. The lake is categorised as typology class 5 for the purposes of WFD (as designated by the EPA), i.e. shallow (<4m), less than 50ha and moderate alkalinity (20 - 100mg/l $CaCO_3$). Significant pressures affecting the ecological status of Upper Lough Skeagh include agricultural enrichment and domestic wastewater discharges (EPA, 2021). The geology of the area is predominantly Lower Carboniferous limestone. The lake is located downstream of Upper Lough Skeagh, to which it is connected *via* a stream which enters at the south-western portion of the lake (Figure 1.1). The lake is formed by two discrete basins, which are separated by thick reed beds. The survey was conducted on the upper basin of the lake. Significant pressures affecting the ecological status of Drumkeery Lough include agricultural enrichment and domestic wastewater discharges (EPA, 2021).

The lake supports a coarse fishery and bank fishing is available along the northern shore which is accessed from the road running along its length. This lake provides angling for bream, roach x bream hybrids, perch and pike (IFI, 2019).

The lake was surveyed by the Inland Fisheries Trust in 1968 and 1965 (IFI unpublished archival data). Bream, rudd, rudd x bream hybrids, tench, pike and perch were recorded at that time. The lake was surveyed in 2018 using IFIs lake monitoring protocol (McLoone *et al*., 2018). On that occasion, perch was found to be the most abundant species. Roach, bream, pike, tench, roach x bream hybrids, rudd x bream hybrids and European eel were also captured.

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 Drumkeery Lough, August 2023.

Plate 1.2. Drumkeery Lough, looking east across the lake.

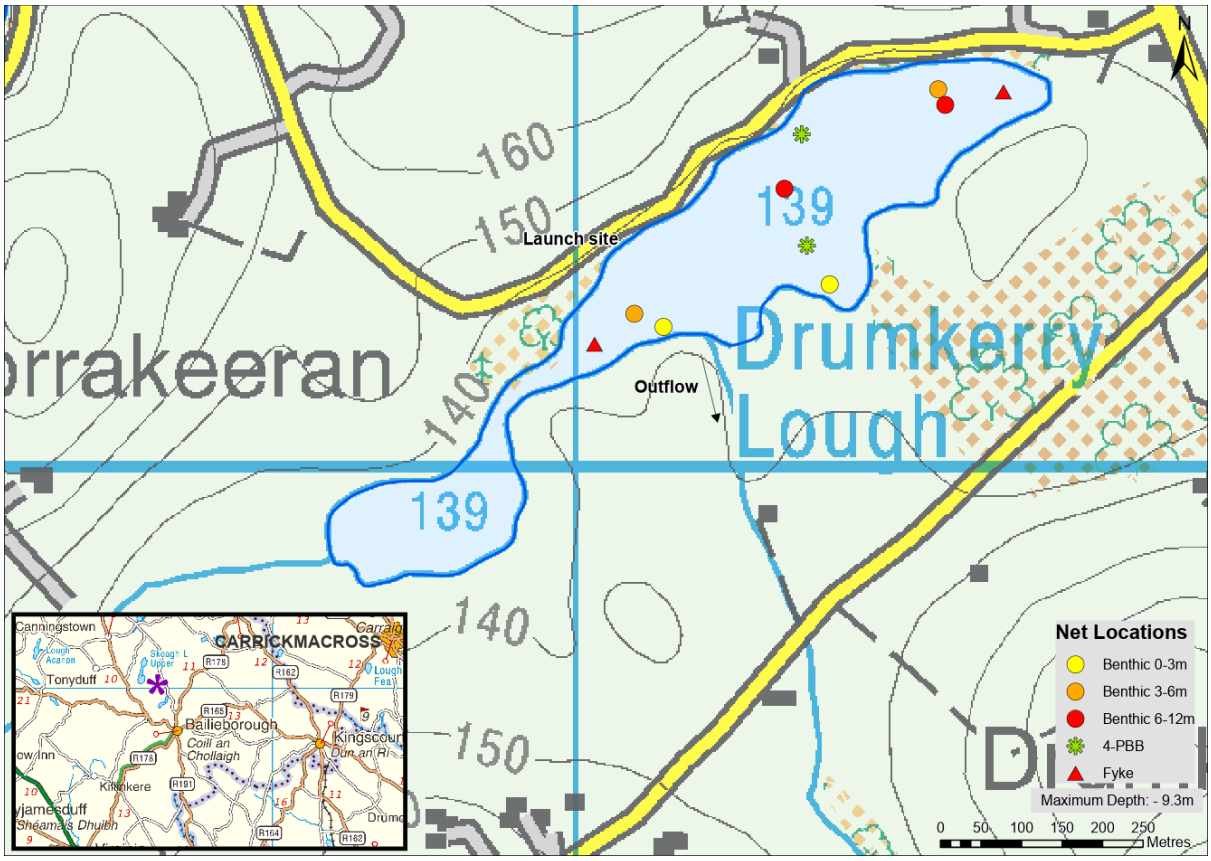

Figure 1.1. Location map of Drumkeery Lough showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Drumkeery Lough was surveyed over one night from the 29th to the 30th of August 2023. A total of two sets of Dutch fyke nets and six benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (2 @ 0-2.9m, 2 @ 3-5.9m and 2 @ 6-11.9m (8 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at an additional two sites. The 4-PBB nets are composed of four 27.5m long panels each a different mesh size (55mm, 60mm, 70mm and 90mm), tied together randomly. Nets were deployed in the same locations as were randomly selected in the previous survey. 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).

$$\mathbf{FO}_{\boldsymbol{i}} = \left(\frac{\boldsymbol{N_i}}{\boldsymbol{N}}\right) * \mathbf{100}$$

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

Five fish species, as well as one type of cyprinid hybrid, were recorded in Drumkeery Lough in August 2023. A total of 160 fish were captured (Table 3.1). Perch and roach were the most numerous fish species recorded. Together they represented *c*. 71% of all fish captured in the survey. Roach x bream hybrids, bream, pike and European eels were also captured. The same species composition was recorded on the previous survey of the lake, with the exception of tench and rudd x bream hybrids which were recorded in 2018 but not on this survey (McLoone *et al.*, 2018).

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Perca fluviatilis	Perch	49	0	11	60
Rutilus rutilus	Roach	54	0	0	54
Rutilus rutilus x Abramis brama	Roach x bream hybrid	25	0	0	25
Abramis brama	Bream	8	7	0	15
Esox lucius	Pike	1	0	0	1
Anguilla anguilla	European eel	0	0	5	5

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 and roach were the dominant species with respect to abundance (CPUE). Bream recorded the highest relative of biomass (BPUE) across all survey nets.

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

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Perca fluviatilis	Perch	0.182 (0.100)	4.603 (2.396)
Rutilus rutilus	Roach	0.180 (0.092)	3.766 (1.931)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.083 (0.040)	6.336 (3.180)
Abramis brama	Bream	0.033 (0.016)	10.359 (5.514)
Esox lucius	Pike	0.003 (0.003)	7.313 (7.313)
*Anguilla anguilla**	European eel	0.042 (0.042)	9.332 (9.332)

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 2023 survey ranged in length from 5.7cm to 27.5cm (mean = 10.6cm) (Figure 3.1). While the overall length range of perch captured was similar on both occasions, in 2023, the population was characterised by a smaller proportion of small, juvenile (i.e. <10cm) fish. Larger fish were also less prevalent.

Perch were aged between 0+ and 6+ and all intervening age classes were represented in the sampled aged. Perch aged between 0+ (5cm – 6cm) and 2+ (10cm – 13cm) dominated the population, representing *c*. 84% of all the fish aged (Figure 3.1). Mean L1 (i.e. length at the end of the 1st year) was 5.9cm (Table 3.3).

Both abundance (CPUE) and biomass (BPUE) of perch were lower in 2023 compared to 2018 (Figure 3.2).

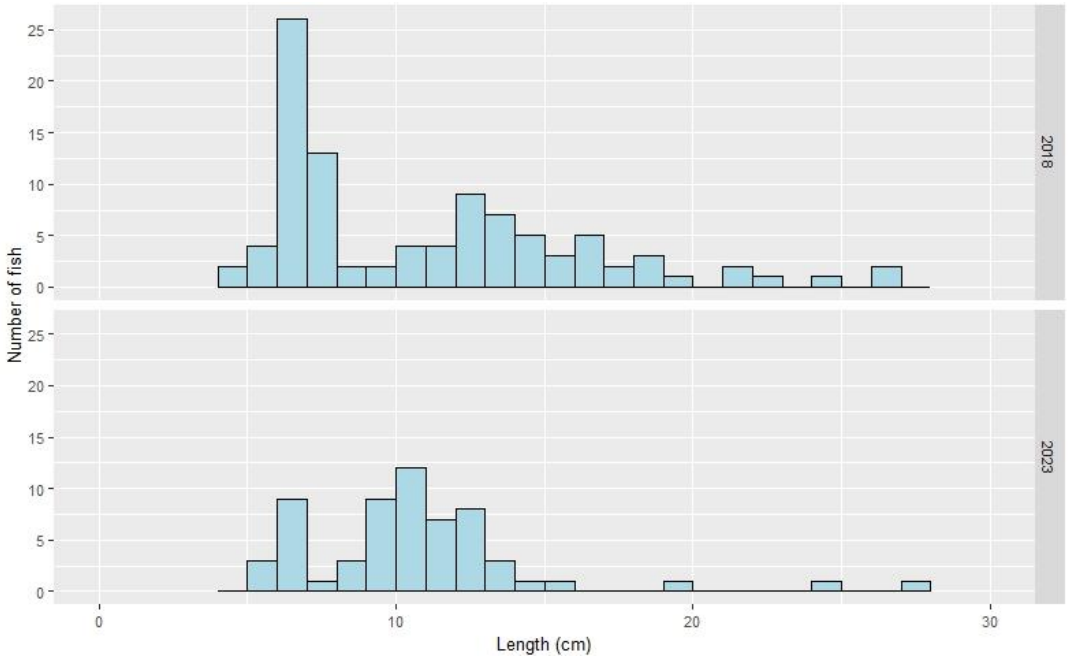

Figure 3.1. Length frequency of perch captured on Drumkeery Lough in 2018 and 2023

Table 3.3. Mean (±S.E.) perch length (cm) at age for Drumkeery Lough, August 2023

Length (cm)	L_1	L_2	L_3	L_4	L_5	L_6
Mean (±S.E.)	5.9 (0.23)	9.2 (0.20)	12.1 (0.65)	16.1 (1.48)	23.0 (1.45)	-
N	23	11	5	4	2	1
Range	4.6-9.1	8.3-10.2	10.8-13.7	12.4-19.5	21.6-24.5	26.5

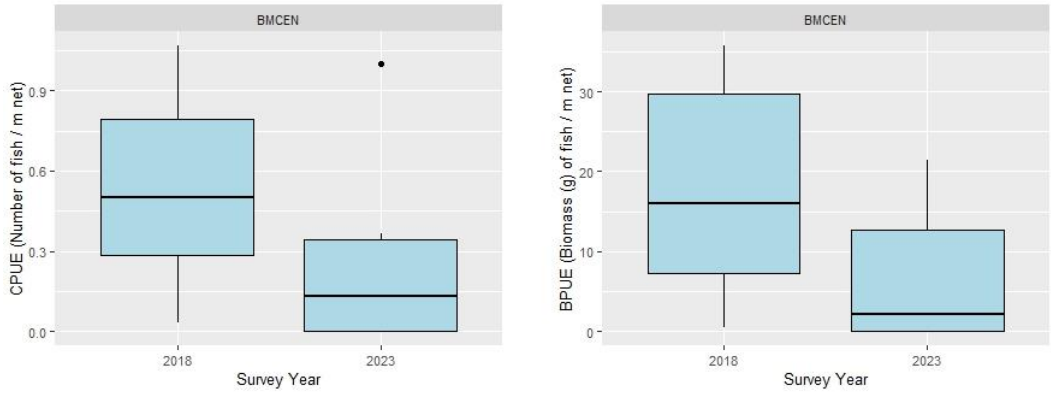

Figure 3.2. CPUE and BPUE of perch captured during surveys of Drumkeery Lough in 2018 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper 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 6.7cm to 19.5cm (mean = 10.4cm) (Figure 3.3). The length range of roach was broadly similar in both surveys. The population was characterised by the apparent absence of roach greater than 20cm on both occasions. In 2023 the roach sampled were aged between 2+ and 4+ (7cm and 12cm) (Figure 3.3 and Table 3.4). This possibly is an underrepresentation of the maximum age of fish in the lake as it was not possible to obtain scale samples from many of the roach which were damaged in the survey nets.

The relative abundance (CPUE) of roach captured remained relatively stable between 2018 and 2023, while there was a small, apparent decrease in biomass (BPUE) (Figure 3.4).

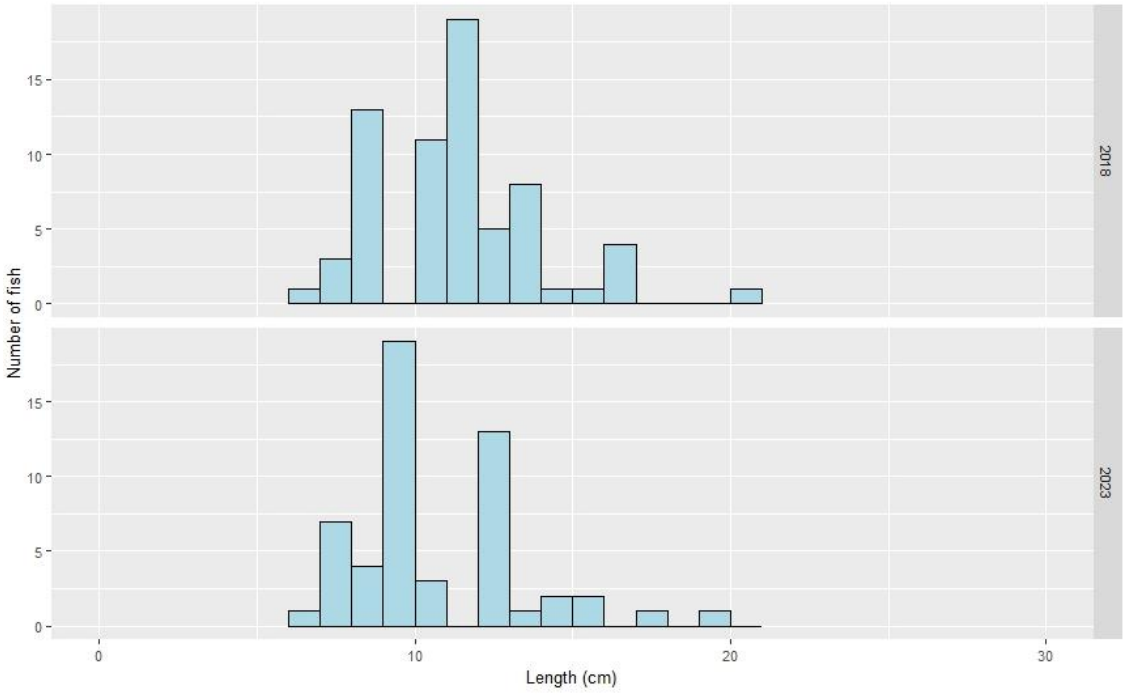

Figure 3.3. Length frequency of roach captured on Drumkeery Lough in 2018 and 2023.

Table 3.4. Summary age data from roach captured on Drumkeery Lough, August 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+
N	-	-	7	5	1
Mean	-	-	7.7	9.3	12.3
Min	-	-	7.5	8.3	12.3
Max	-	-	8	10	12.3

Note: it was not possible to estimate age from the full length range of roach captured.

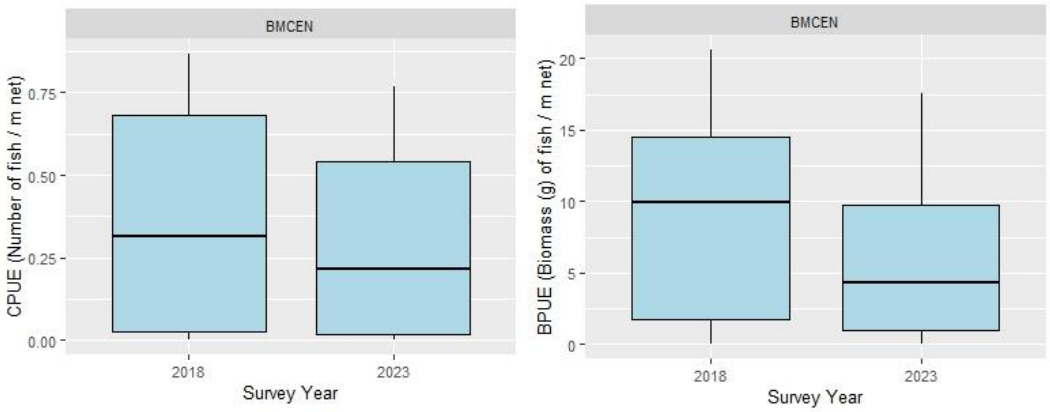

Figure 3.4. CPUE and BPUE of roach captured during surveys of Drumkeery Lough in 2018 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper 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 7.0cm to 23.0cm (mean = 15.9cm). While the sample size overall is small, no larger roach x bream hybrids (i.e. > 30cm) were captured in 2023. Smaller (i.e. < 15cm) fish were also less abundant than the 2018 survey.

Roach x bream hybrids were aged between 3+ and 10+ (11cm – 21cm) (Figure 3.5 and Table 3.5).

Observed differences in the relative abundance (CPUE) and biomass (BPUE) of roach x bream hybrids between surveys was influenced by the reduced number of larger fish captured in the larger 4PBB and a concomitant reduction in CPUE of smaller fish recorded in BMCEN survey nets in 2023 (Figure 3.6).

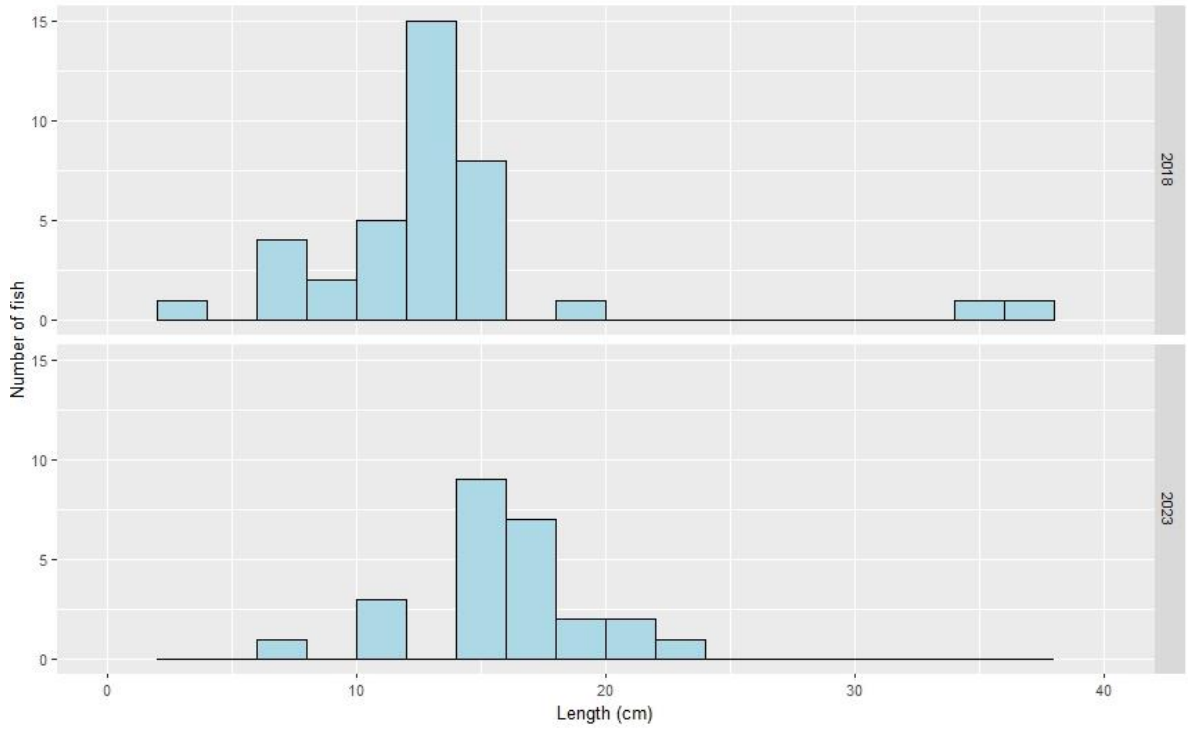

Figure 3.5. Length frequency of roach x bream hybrids captured on Drumkeery Lough in 2018 and 2023.

Table 3.5. Summary age data from roach x bream hybrids captured on Drumkeery Lough, August 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	-	-	-	1	-	4	1	2	-	-	2
Mean	-	-	-	11.3	-	15.4	16.1	17.5	-	-	21.5
Min	-	-	-	11.3	-	15.2	16.1	17.3	-	-	21.2
Max	-	-	-	11.3	-	15.5	16.1	17.6	-	-	21.8

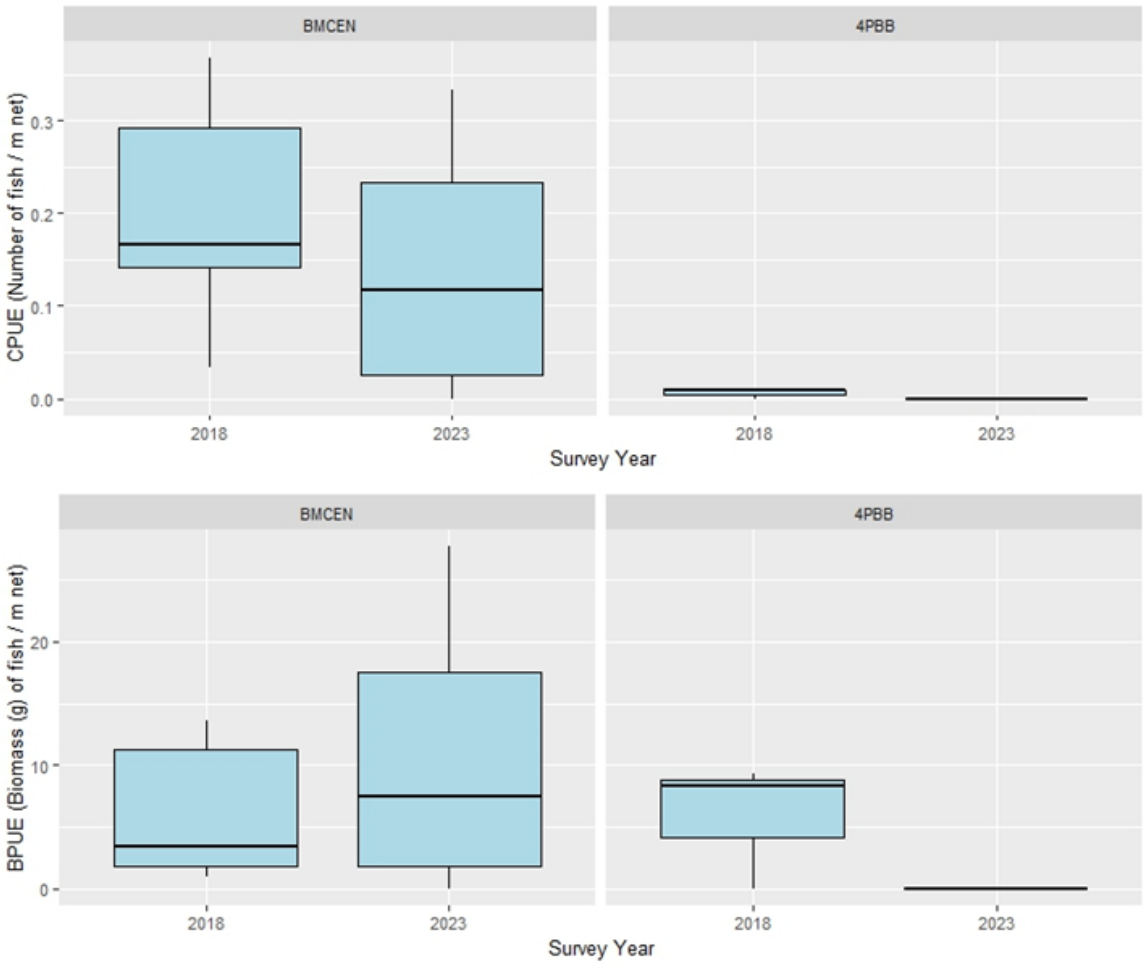

Figure 3.6. CPUE and BPUE of roach x bream hybrids captured during surveys of Drumkeery Lough in 2018 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Bream

Bream captured during the 2023 survey ranged in length from 15.0cm to 39.0cm (mean = 27.2cm) (Figure 3.7). Fewer small bream (<15cm) were recorded in 2023 compared to 2018. Bream were aged between 6+ and 17+, with six year classes present in the population sampled (Table 3.6). This indicates that bream in the lake are long-lived and that recruitment is variable and potentially limited.

The reduced number of small bream captured in 2023 compared to 2018 is evidenced by a decrease in both abundance (CPUE) and biomass (BPUE) of fish recorded in BMCEN nets (Figure 3.8).

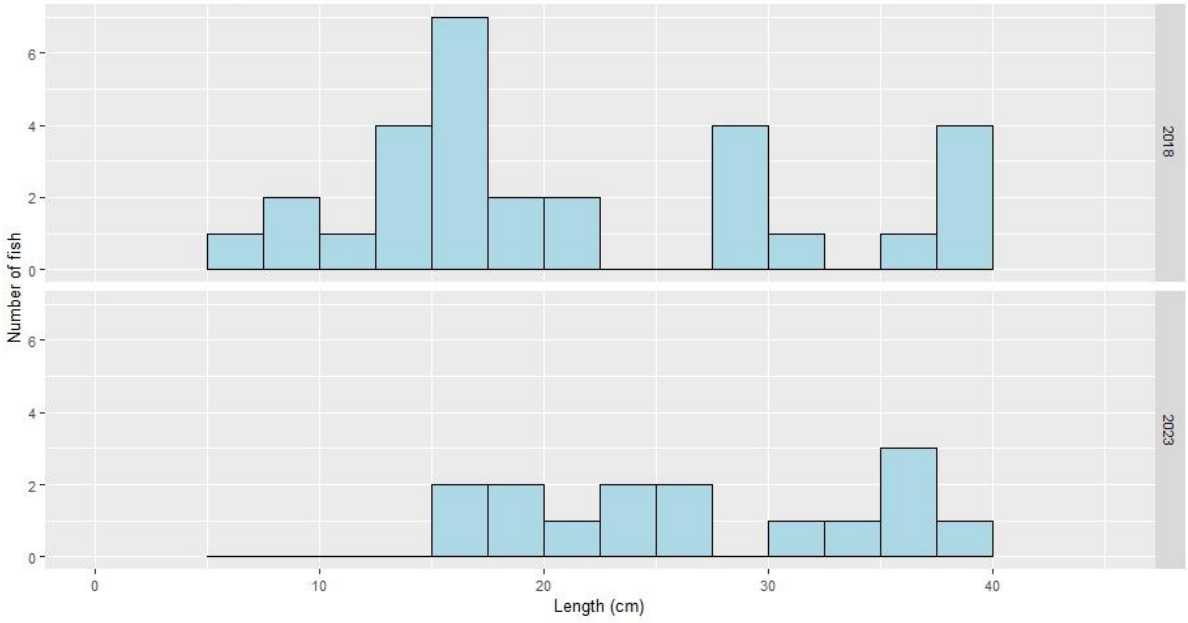

Figure 3.7. Length frequency of bream captured on Drumkeery Lough in 2018 and 2023

Table 3.6. Summary age data from bream captured on Drumkeery Lough, August 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	-	-	-	-	-	-	2	-	-	1	1
Mean	-	-	-	-	-	-	18.5	-	-	27.2	27.2
Min	-	-	-	-	-	-	18.3	-	-	27.2	27.2
Max	-	-	-	-	-	-	18.6	-	-	27.2	27.2

Length (cm)	Age class						
	11+	12+	13+	14+	15+	16+	17+
N	-	-	-	2	1	-	1
Mean	-	-	-	36.0	37.0	-	39.0
Min	-	-	-	35.5	37	-	39
Max	-	-	-	36.5	37	-	39

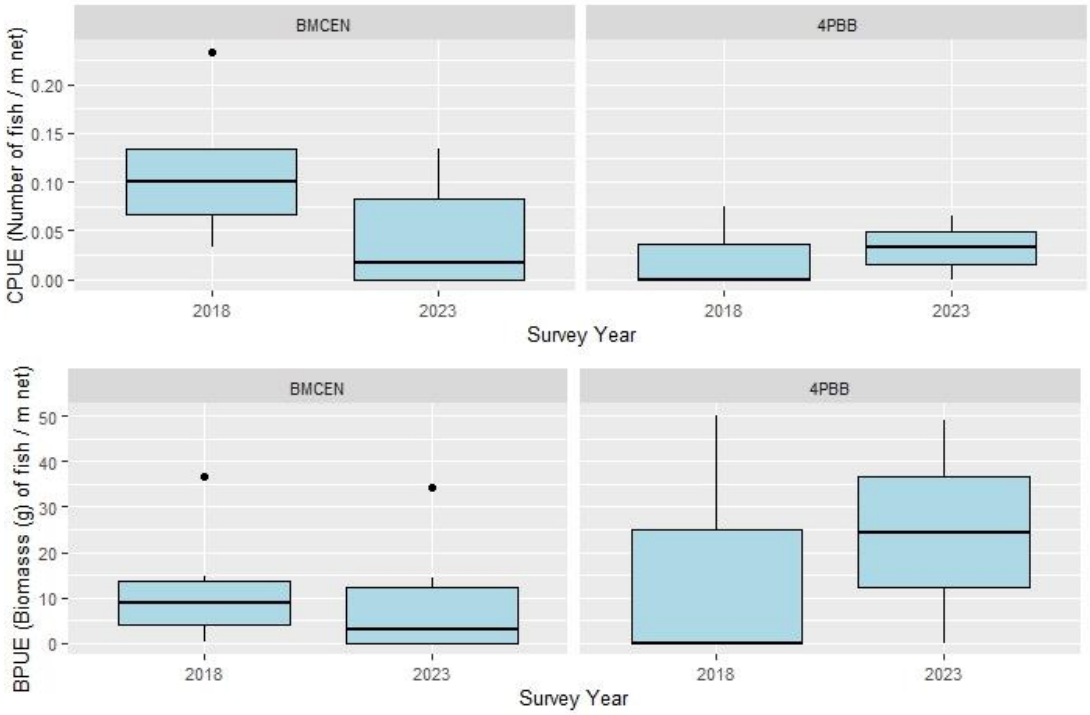

Figure 3.8. CPUE and BPUE of bream captured during surveys of Drumkeery Lough in 2018 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Other species

Eel captured during the 2023 survey ranged in length from 42.5cm to 61.0cm (mean = 48.9cm). Abundance (CPUE) and, to a lesser extent, biomass (BPUE) recorded in 2023 was greater than in 2017 (Figure 3.9)

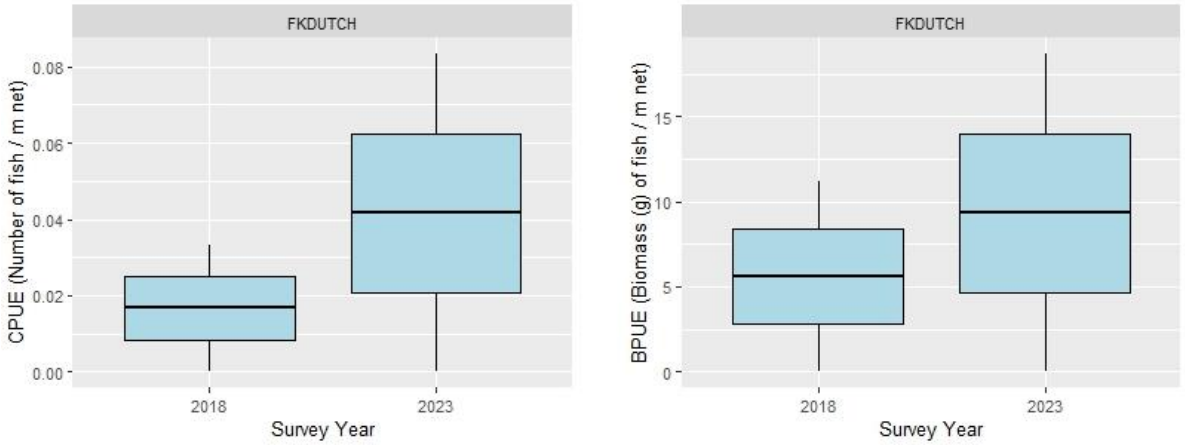

Figure 3.9. CPUE and BPUE of European eel captured during surveys of Drumkeery Lough between 2018 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

One pike captured measured 66.2cm. It was aged at 4+.

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 31 perch stomachs were examined. Three (10%) were empty. Twenty-eight stomachs contained food. Zooplankton was the sole prey type recorded in 14 (50%) stomachs and was found together with invertebrates in two (7%) stomachs. Invertebrates were the sole prey type recorded in nine (32%) perch stomachs. Unidentified digested material was recorded in three (11%) fish (Figure 3.10).

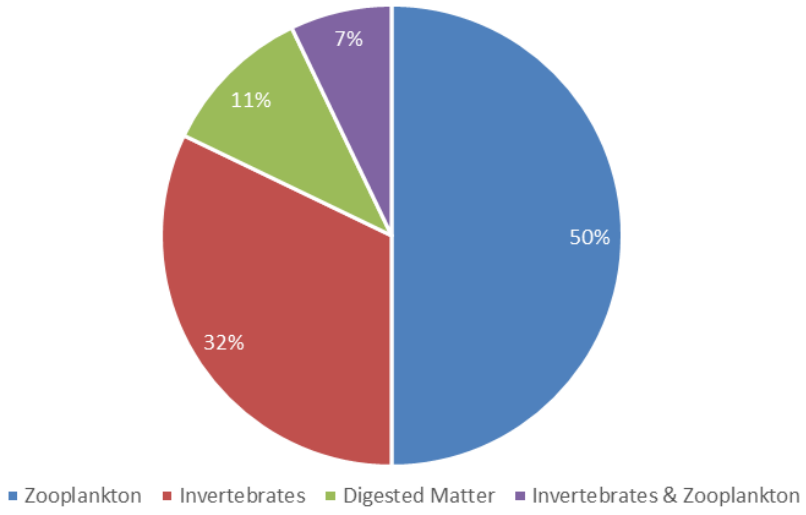

Figure 3.10. Diet of perch (N = 28) captured on Drumkeery Lough, 2023 (% FO).

Pike

One pike stomach was available for analysis. The stomach contained roach.

4. Summary and fish ecological status

A total of five fish species and one type of cyprinid hybrid were recorded in Drumkeery Lough in August 2023. Perch and roach were the dominant species in terms of abundance (CPUE) while bream had the highest biomass (BPUE) captured in the survey gill nets during the 2023 survey. While perch recruitment appears to be relatively stable, in roach it looks to be more variable. The youngest fish captured (and the largest year class) were two-year-old fish and there was limited persistence of larger or older fish in the population. A similar situation existed in 2018 when the roach population was characterised by relatively small and short lived individuals (Mc Loone *et al*., 2018).

In contrast to the roach, bream are longer lived, with several very old fish recorded in 2023. Recruitment in this important angling species also appears to be limited in the lake with no very small or juvenile bream captured in 2023. Similarly, very small and juvenile roach x bream hybrids which requires both parent species to spawn (Hayden *et al.*, 2010) were also not recorded in the 2023 survey.

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*., 2012).

Using the FIL2 classification tool, Drumkeery Lough has been assigned an ecological status of Moderate for 2023 based on the fish populations present. In 2018 the lake was also assigned a status of Moderate based on fish stocks and expert judgement (McLoone *et al*., 2018).

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

5. References

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