National Research Survey Programme

Lakes 2022

Lough Bridget

IFI/2023/1-4655

Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Bridget, August 2022

Iascach Intíre Éireann
Inland Fisheries Ireland

National Research Survey Programme

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

CITATION: McLoone, P., Corcoran, W., Bateman, A., Cierpial, D., Gavin, A., Gordon, P., McCarthy, E., Heagney, B., Hyland, J., Robson, S., Kelly, K., and Kelly, F.L. (2023). Fish Stock Survey of Lough Bridget, August 2022. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cover photo: Lough Lene, Co. Westmeath © Inland Fisheries Ireland

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of all their colleagues in Inland Fisheries Ireland.

The authors would also like to acknowledge the funding provided for the project from the Department of Communications, Climate Action and Environment for 2022.

1. Introduction

Lough Bridget, known locally as Silvergrove Lake, is located 5kms from Tulla on the Scariff road, Co. Clare (Figure 1.1). It has a surface area of 55ha, a mean depth of <4m and a maximum depth of 18.5m. The lake is categorised as typology class 12 (as designated by the EPA for the Water Framework Directive), i.e., deep (<4m), greater than 50ha and highly alkaline (>100 mg/1 CaCO3).

Located in the Bunratty sub-catchment in the Shannon River Basin District it is connected to Kilgory Lough via the Derryruane River at the southern end of the lake. Lough Bridget is regarded as an excellent fishery for roach (*Rutilus rutilus*), bream (*Abramis brama*), and tench (*Tinca tinca*). There is a good stock of pike (*Esox lucius*) present, and the lake is frequently fished by visiting and local anglers (IFI, 2017).

The lake was previously surveyed in 1995, 2006 and 2017 by Inland Fisheries Ireland (IFI unpublished data; McLoone *et al*., 2018). Species recorded in the surveys included roach, bream, rudd (*Scardinius erythrophthalmus*) (and hybrids of these species), perch (*Perca fluviatilis*), pike, and tench.

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 Bridget, August 2022.

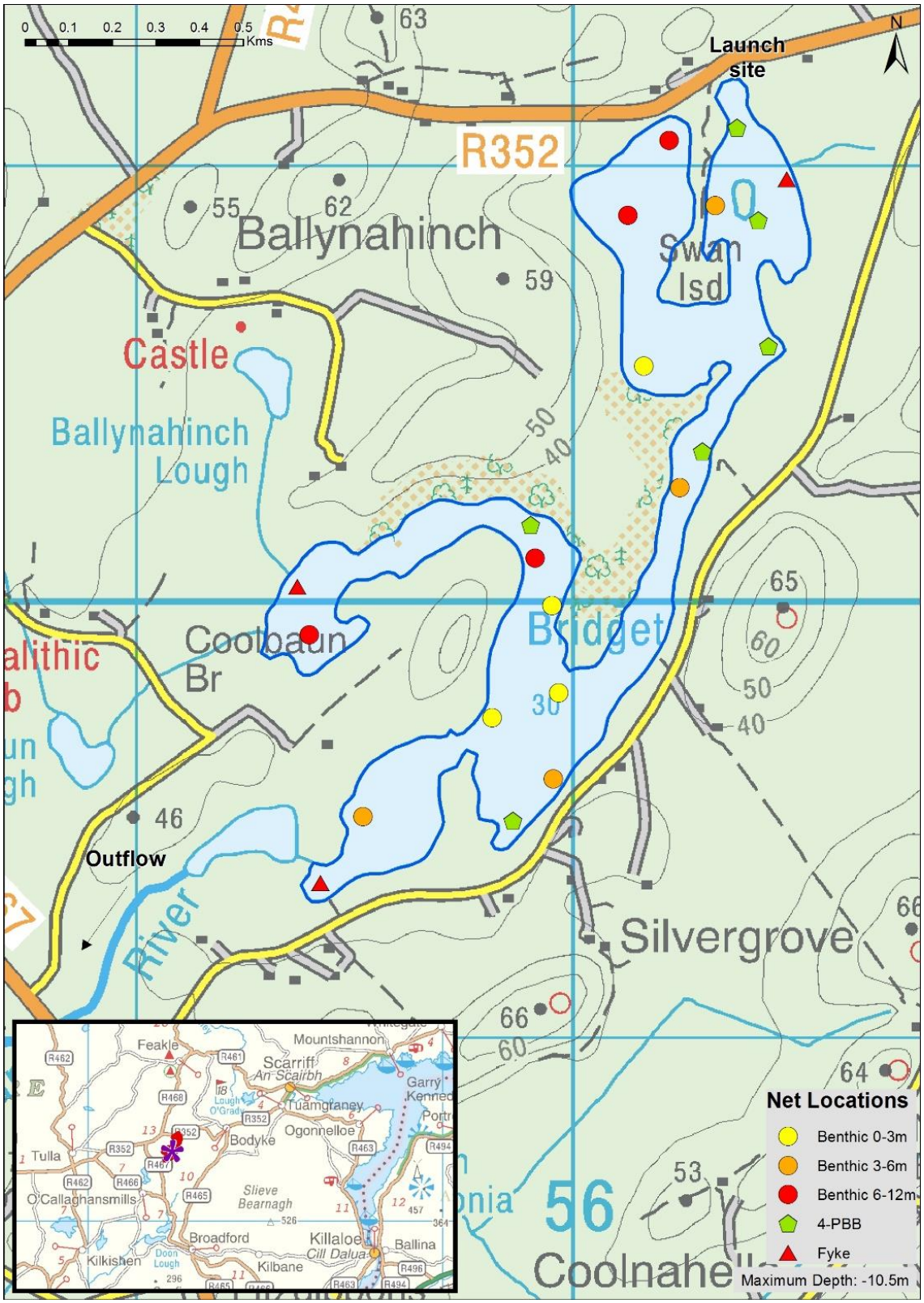

Figure 1.1 Location map of Lough Bridget showing locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Lough Bridget was surveyed over two nights between the 8th to the 10th of August 2022. A total of three sets of Dutch fyke nets and 12 benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m; 4 @ 3-5.9m; 4 @ 6-11.9m) were deployed in the lake (15 sites) at the same locations as previous surveys. The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at six 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 survey nets were deployed in random locations throughout the lake. A handheld GPS was used to locate 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 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).

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

Where:
$\mathbf{FO_i}$ 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

Seven fish species and two cyprinid hybrids were recorded on Lough Bridget in August 2022. A total of 1,106 fish were captured (Table 3.1). Roach and perch were the most common fish species captured in the 2022 survey. Other species captured included rudd, pike, tench, bream, roach x bream hybrids and, rudd x roach hybrids.

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Rutilus rutilus	Roach	692	0	0	692
Perca fluviatilis	Perch	333	0	2	335
Rutilus rutilus x Abramis brama	Roach x bream hybrid	54	0	0	54
Abramis brama	Bream	7	3	0	10
Esox lucius	Pike	6	1	0	7
R. rutilus x S. erythrophthalmus	Roach x rudd hybrid	4	0	0	4
Scardinius erythrophthalmus	Rudd	1	0	0	1
Tinca tinca	Tench	0	1	0	1
Anguilla anguilla	European eel	0	0	7	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. Roach was the most dominant species in terms of abundance and biomass (Table 3.2).

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

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Rutilus rutilus	Roach	1.098 (0.359)	19.125 (5.256)
Perca fluviatilis	Perch	0.522 (0.171)	4.439 (1.554)
R.rutilus x A.brama	Roach x bream hybrid	0.086 (0.031)	4.836 (1.738)
Abramis brama	Bream	0.012 (0.008)	1.391 (0.729)
R. rutilus x S. erythrophthalmus	Roach x rudd hybrid	0.006 (0.006)	1.426 (1.426)
Scardinius erythrophthalmus	Rudd	0.002 (0.002)	0.045 (0.045)
Esox lucius	Pike	0.010 (0.004)	14.126 (5.761)
Tinca tinca	Tench	0.000 (0.000)	0.730 (0.730)
Anguilla anguilla	European eel	0.039 (0.020)*	6.350 (3.275)*

*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*

For comparison purposes box plots of CPUE and BPUE for each species captured in surveys on the lake per net type in 2017 and 2022 are presented in Figures 3.1 (a and B) to 3.2 (a and b) respectively and illustrates fish community change over time. Abundance of roach and to a lesser extent, roach x bream hybrids and eels show increasing trends compared to the previous survey. Catches of other species remained relatively stable across both sampling occasions.

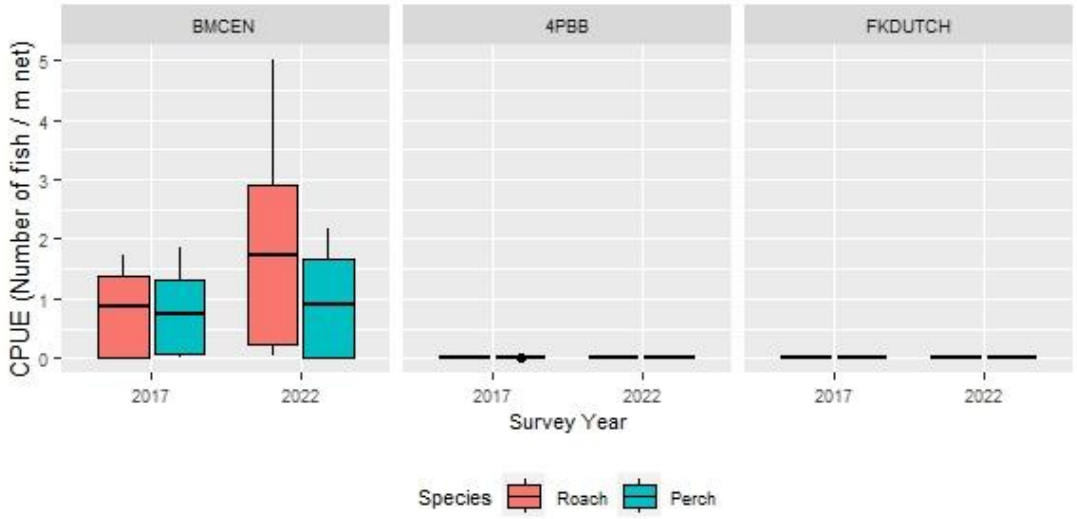

Figure 3.1a CPUE of roach and perch captured in each net type during surveys of Lough Bridget between 2017 and 2022. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are 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.

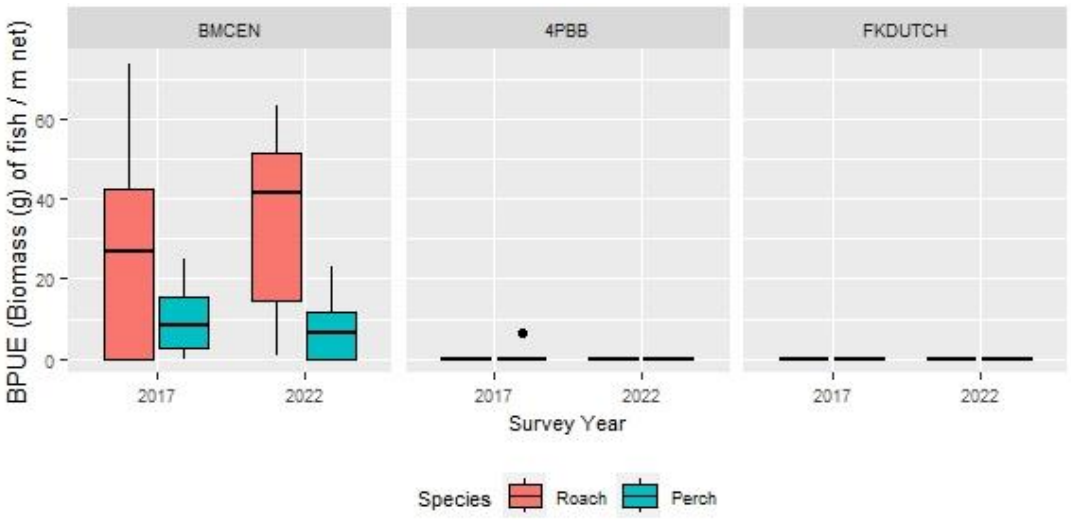

Figure 3.1b BPUE of roach and perch captured in each net type during surveys of Lough Bridget between 2017 and 2022. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles 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.

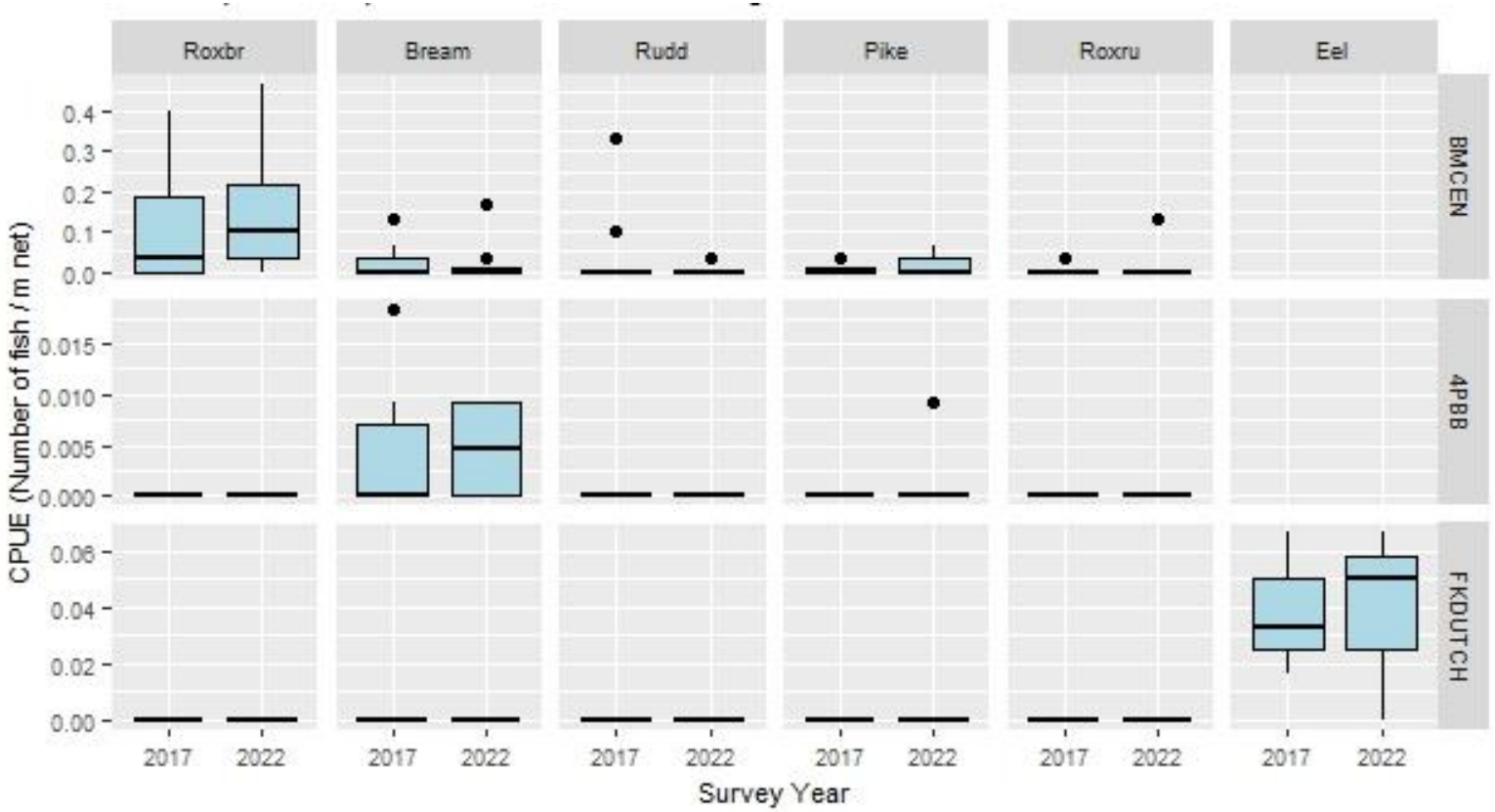

Figure 3.2a. CPUE (number of fish captured per linear meter of net) of other fish species captured in each net type during surveys of Lough Bridget in 2017 and 2022. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. The y axis is unique for each net type.

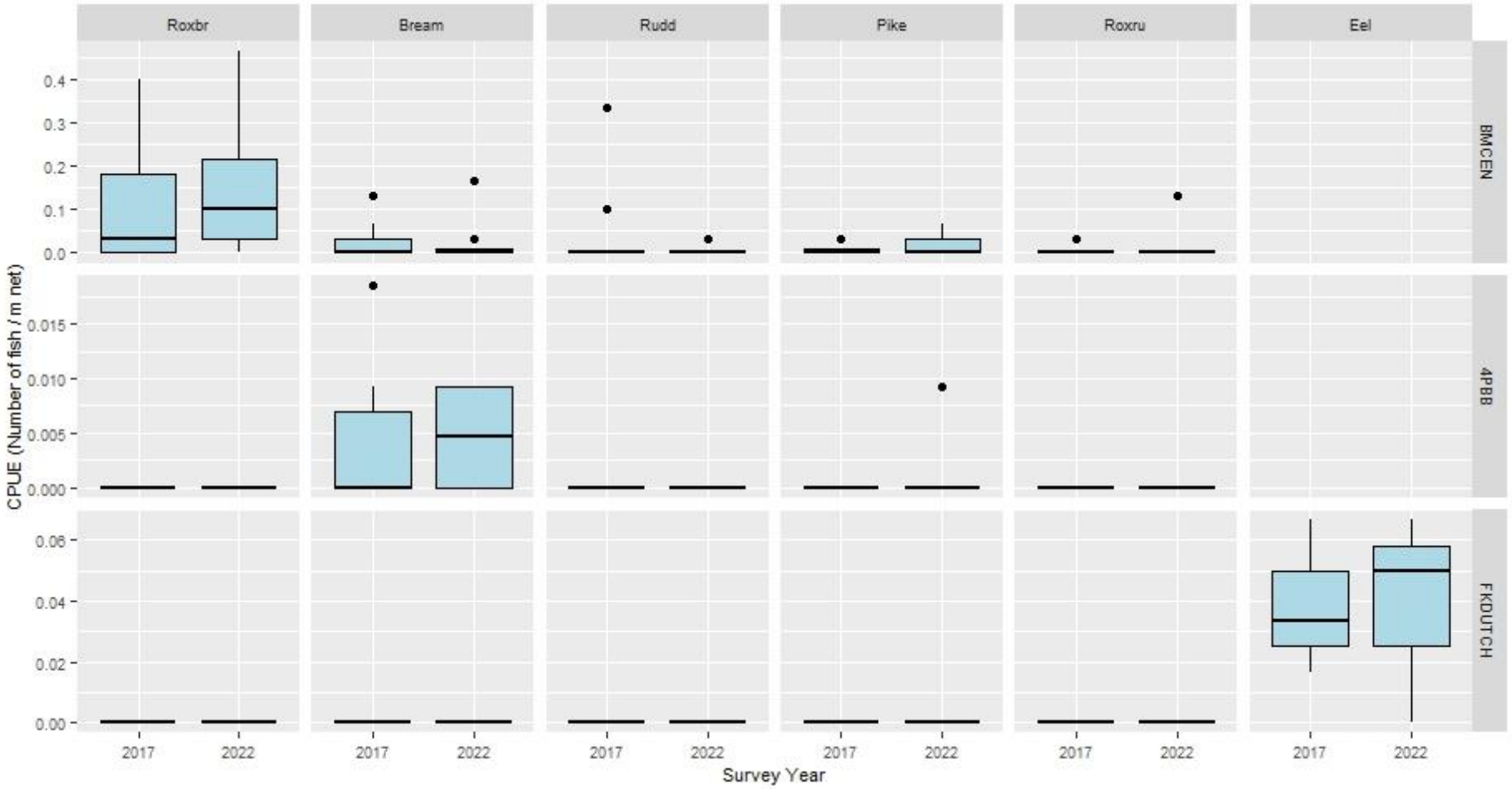

Figure 3.2b. BPUE (biomass of fish captured per linear meter of net) of other fish species captured in each net type during surveys of Lough Bridget in 2017 and 2022. The horizontal bars represent the median value of the sample, while while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. The y axis is unique for each net type.

3.3. Length frequency distributions and growth

Roach

Roach captured during the 2022 survey ranged in length from 3.0cm to 27.1cm (mean 9.2cm) (Figure 3.3). Roach length frequency distribution was broadly similar between 2017 and 2022, although there were significantly more small fish (6.0cm to 8.9cm) captured in 2022. Roach in the sample aged ranged from 1+ to 8+ (Table 3.3). Several small fish (i.e. 3cm) were captured but no scales were available for analysis. It is probable that these fish were 0+ fry. Two age classes (1+ and 3+) dominated the population, corresponding to the modal peaks at approximately 6.0 and 12.0cm (Figure 3.3). There has been regular recruitment in recent years (Table 3.3).

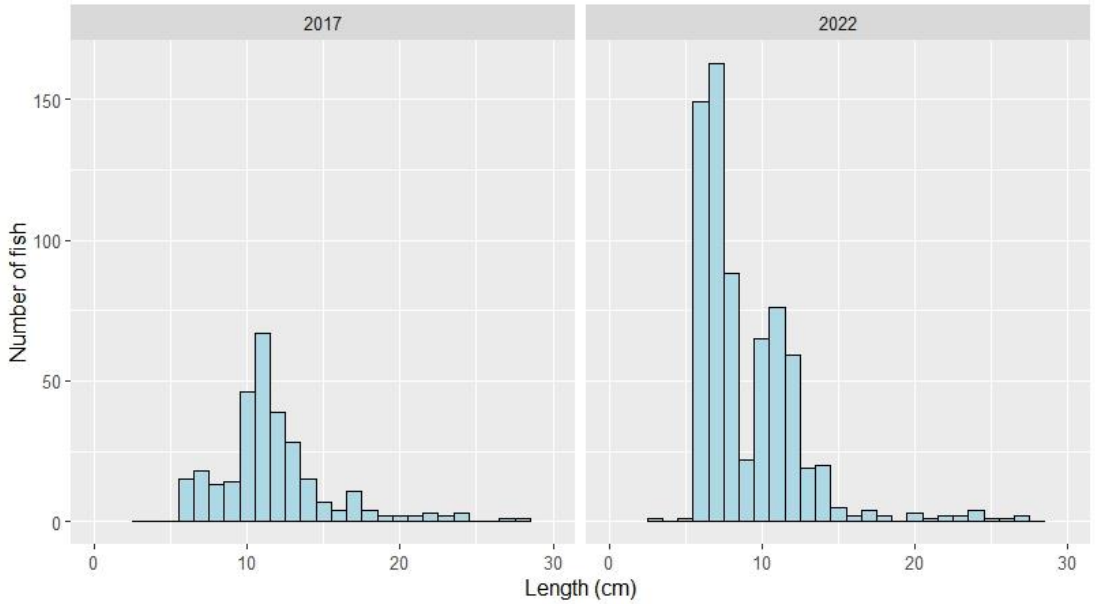

Figure 3.3. Length frequency of roach captured on Lough Bridget in 2017 and 2022.

Table 3.3. Summary age data of roach captured on Lough Bridget, August 2022. Number of fish (N) and length ranges of all fish aged in the sample is presented.

	Age class								
Length (cm)	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**
N	0	15	9	15	8	5	6	7	2
Mean	-	7.5	9.6	12.4	14.4	17.8	22.5	22.9	25.3
Min	-	6.4	8.2	10.6	11.7	14.5	17.6	18.5	23.7
Max	-	9.9	10.6	15.0	17.1	23.0	27.1	26.4	26.9

Perch

Perch captured during the 2022 survey ranged in length from 5.0cm to 23.4cm (mean 8.2cm) (Figure 3.4). The length range of perch was similar between the two surveys but with a greater proportion of smaller fish captured in 2022. Seven age classes were recorded with perch ranging in age from 0+ to 6+, and all intervening age classes were present in the sample. The population was dominated by younger fish with very strong 0+ and 1+ year classes captured. Mean length at L1 was 6.5cm (Table 3.4).

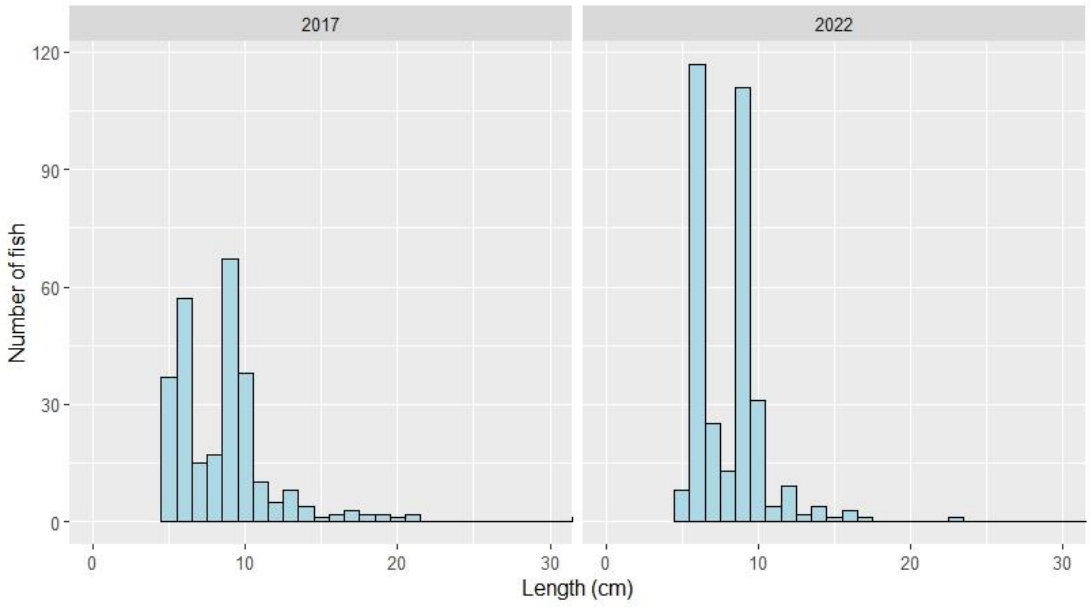

Figure 3.4. Length frequency of perch captured on Lough Bridget in 2017 and 2022.

Table 3.4. Mean (±S.E.) perch length (cm) at age for Lough Bridget, August 2022.

Length (cm)	L_1	L_2	L_3	L_4	L_5	L_6
Mean (±S.E.)	6.5 (0.1)	9.0 (0.2)	11.5 (0.2)	14.4 (0.5)	17.0 (1.4)	-
N	43	25	18	10	2	1
Range	4.5 - 7.6	6.1 - 10.4	10.5 - 14.0	12.9 - 17.2	15.6 - 18.4	21.90

Roach x bream hybrids

Roach x bream hybrids captured ranged in length from 11.0cm to 23.7cm (mean 15.3cm) (Figure 3.5). Roach x bream hybrids were aged between 2+ and 8+ and no 0+ or 1+ fish were captured in 2022(Table 3.5). The most abundant age class was 3+, corresponding to the model peak around 12-14cm (Figure 3.5).

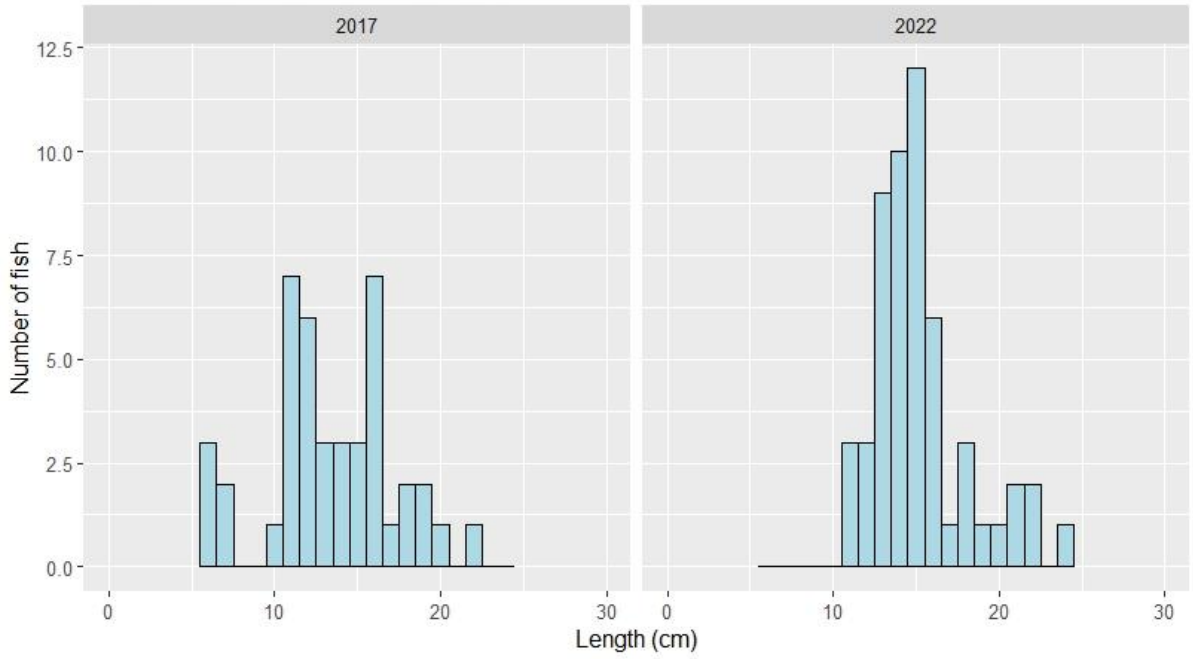

Figure 3.5. Length frequency of roach x bream hybrids captured on Lough Bridget in 2017 and 2022.

Table 3.5. Summary age data from roach x bream hybrids captured on Lough Bridget, August 2021. Number of fish (N) and length ranges of all fish aged in the sample is presented.

	Age class								
Length (cm)	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**
N	0	0	4	11	7	6	2	3	1
Mean	-	-	12.43	13.45	15.71	17.53	19.10	21.17	-
Min	-	-	11.00	12.40	14.90	15.50	17.60	20.00	23.7
Max	-	-	14.60	14.90	17.80	22.50	20.60	22.30	23.7

Bream

Bream captured during the survey ranged in length from 13.9cm to 31.0cm (mean 20.0cm) (Figure 3.6). Five ages classes (3+ to7+) were observed in the sample aged (N = 10). The length and age profile of the population indicates that recruitment has been relatively sporadic in recent years with no 0+-2+ fish captured.

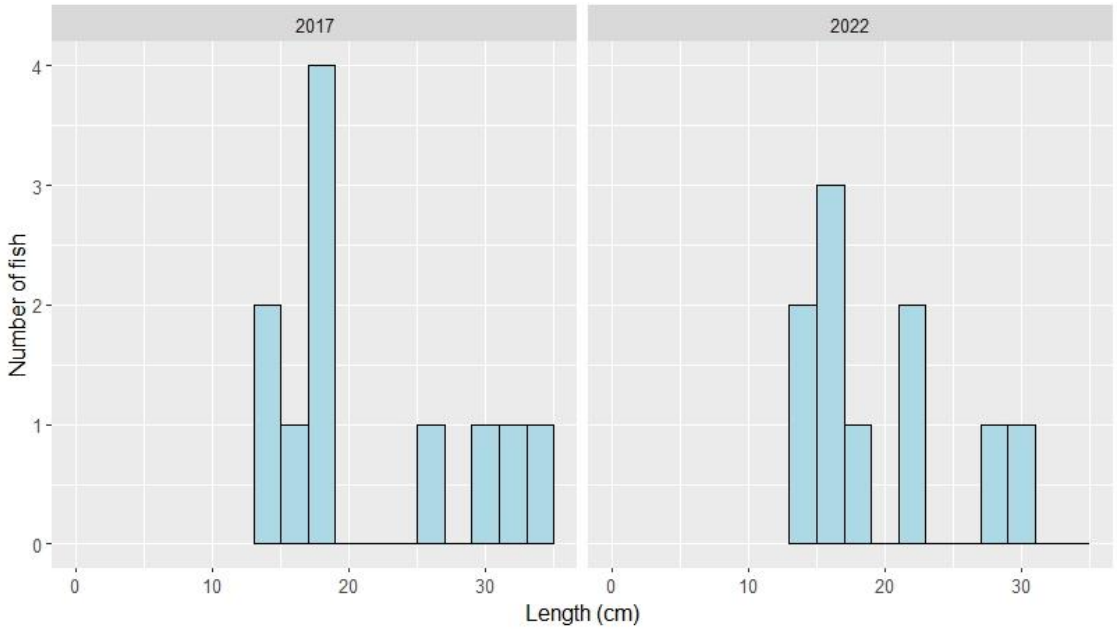

Figure 3.6. Length frequency of bream captured on Lough Bridget in 2017 and 2022.

Table 3.6. Summary age data from bream captured on Lough Bridget, August 2022. Number of fish (N) and length ranges of all fish aged in the sample is presented.

	Age class							
Length (cm)	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**
N	0	0	0	2	2	3	2	1
Mean	-	-	-	14.3	16.4	19.2	26.2	28.2
Min	-	-	-	13.9	16.2	17.0	21.4	-
Max	-	-	-	14.7	16.5	22.2	31.0	-

Other fish species

One rudd was captured during the survey measuring 12.3cm and aged 4+. Eel ranged in length from 35.5cm to 56.5cm (mean 43.8cm). Pike ranged in length from 37.4cm to 76.2cm (mean 57.1cm) and ranged in age from 4+ to 6+. Roach x rudd hybrids ranged in size from 21.9cm to 25.5cm (mean 23.5cm) and were aged at 8+ and 9+. One tench measuring 45.2cm was also captured.

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 47 perch stomachs were examined; of these six (14.0%) contained food (Figure 3.7). Five stomachs (83.3% FO) contained fish remains and one (16.7% FO) contained unidentified digested material.

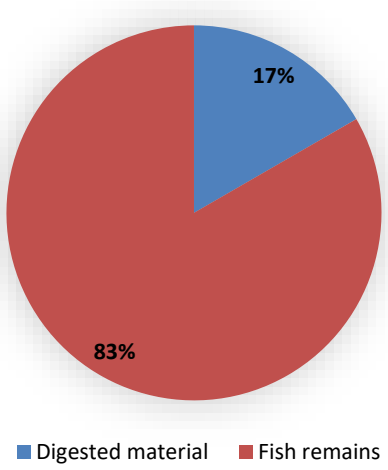

Figure 3.7. Diet of perch (N = 6) captured on Lough Bridget in 2022 (% FO)

Pike

Two pike were available for analysis. One stomach was empty, while the second pike stomach contained one perch and unidentified fish remains.

4. Summary

A total of seven fish species and two cyprinid hybrid varieties were recorded on Lough Bridget in the August 2022 fish stock survey.

Roach was the most abundant species recorded in Lough Bridget. Median CPUE and BPUE of roach was higher compared to the 2017 survey. This was largely driven by an increase in the numbers of 6.0cm to 9.0cm (i.e. 1+ and 2+ fish) roach captured in 2022 indicating increased survival in recent years.

Perch were also captured in relatively high numbers. While there was no significant difference in median CPUE and BPUEs between 2017 and 2022, an increase in 6.0cm fish and 9.0cm fish was observed. Seven age classes were recorded in Lough Bridget with perch ranging from 0+ to 6+ recorded.

Both roach and perch exhibited strong and regular recruitment to their populations. Conversely, recruitment of bream and roach x bream hybrids (which requires both parent species to spawn (Hayden *et al.*, 2010) showed more limited recruitment in recent years, with no fish of either species aged 2+ or younger recorded in the survey.

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 Bridget has been assigned an ecological status of Moderate for 2022 based on the fish populations present. Lough Bridget had previously been assigned a status of Good in 2017 (Figure 4.1). This deterioration in status is likely due to an increase in total fish biomass (Corcoran *et al*., 2023).

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

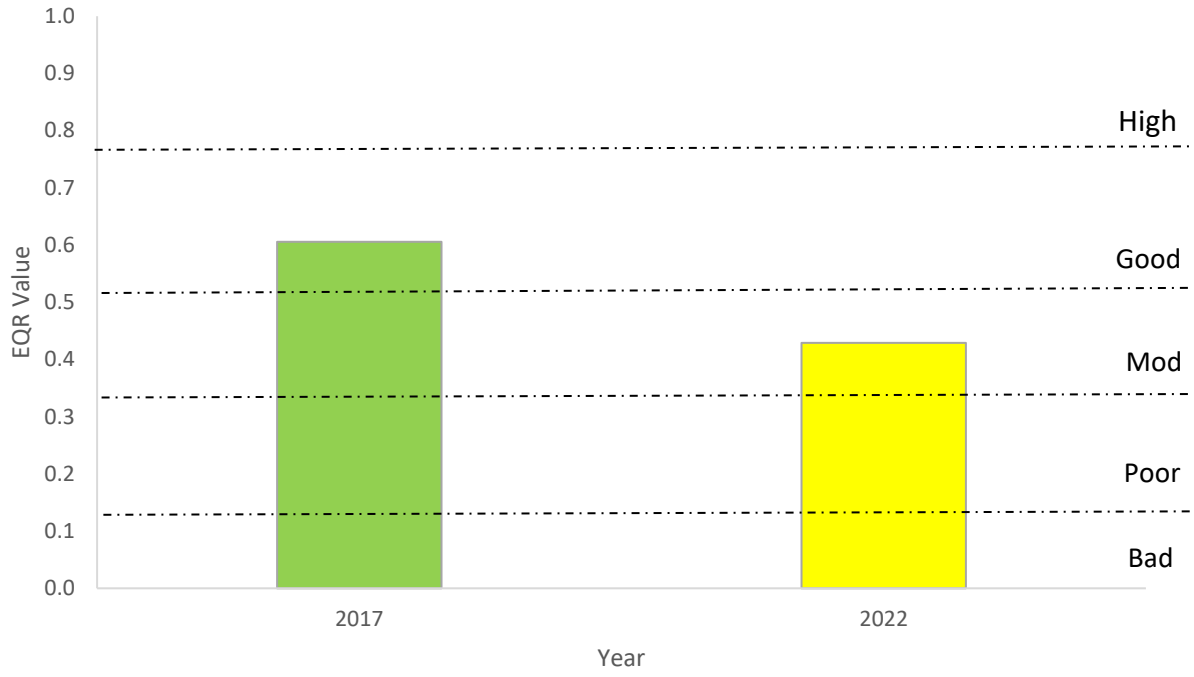

Figure 4.1. Fish ecological status, Lough Bridget in 2017 and 2022 (dashed line indicates EQR status boundaries).

5. References

Amundsen, P-A, Gabler, H-M and Staldvik FJ. (1996) A new approach to graphical analysis of feeding strategy from stomach contents data—modification of the Costello (1990) method. *Journal of Fish Biology*, **48**, 607–614.

Caffrey, J. (2010) *IFI Biosecurity Protocol for Field Survey Work*. Inland Fisheries Ireland.

Connor L., Matson R. and Kelly F.L. (2017) Length-weight relationships for common freshwater fish species in Irish lakes and rivers. *Biology and Environment: Proceedings of the Royal Irish Academy*, **117 (2)**, 65-75.

Corcoran, W., Matson, R., McLoone, P., Bateman, A., Cierpial, D., Gavin, A., Gordon, P., McCarthy, E., Kelly, K., Robson, S., Wightman, G., Roche, W. and Kelly, F.L (2023) *Sampling Fish for the Water Framework Directive - Summary Report 2021*. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

EPA (2021) https://gis.epa.ie/EPAMaps/ Data - Catchments.ie - Catchments.ie. Accessed in May/June 2023.

Hayden, B., Pulcini, D., Kelly-Quinn, M., O'Grady, M., Caffrey, J., McGrath, A., and Mariani, S. (2010) Hybridisation between two cyprinid fishes in a novel habitat: genetics, morphology and life-history traits. *BMC Evolutionary Biology*, **10(1)**, 169.

IFI (2017) www.fishinginireland.info

Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. and Champ, T. (2008) *FISH IN LAKES Task 6.9: Classification tool for Fish in Lakes. FINAL REPORT*. Central Fisheries Board, NS Share project.

Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012). Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.

Kelly, F.L., Connor, L., Coyne, J., Corcoran, W., Cierpial, D., Morrissey, E., Delanty, K., McLoone, P., Matson, R., Gordon, P., O'Briain, R., Rocks, K., O'Reilly, S., Ni Dhonnaibhain, L., Brett, A. and Garland, D. (2017). *Fish Stock Survey of Lough Bridget, June 2017*. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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

www.fisheriesireland.ie
info@fisheriesireland.ie

+353 1 8842 600