

National Research Survey Programme

Lakes 2023

Derrybrick Lough

IFI/2024/1-4722



Iascach Iníre Éireann
Inland Fisheries Ireland

fisheriesireland.ie

Fish Stock Survey of Derrybrick Lough, August 2023



**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., Cornthwaite, Y., Gordon, P., Heagney, B., Hyland, J., McCarthy, E., O’Keeffe, K., Robson, S., Twomey, C., and Kelly, F.L. (2024). Fish Stock Survey of Derrybrick Lough, August 2023. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cover photo: Lough Allua, Co. Cork © Inland Fisheries Ireland

© Inland Fisheries Ireland 2024

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 Housing, Local Government and Heritage and Department of Communications, Climate Action and Environment for 2023.

CYAL50346939 © National Mapping Division of Tailte Éireann.

1. Introduction

Derrybrick Lough is located in the Erne catchment, north-east of Killashandra and approximately five kilometres south-west of Belturbet (Figure 1.1 and Palte 2.1). The lake is situated at an altitude of 48m above sea level, has a surface area of 36ha, a mean depth of 2.1m and a maximum depth of 4.9m. The lake is categorised as typology class 9 (as designated by the EPA for the Water Framework Directive), i.e. shallow (<4m), less than 50ha and high alkalinity (>100mg/l CaCO₃). Derrybrick Lough is located within the Lough Oughter and associated loughs Special Area of Conservation (NPWS, 2013). The geology of the area is predominantly Lower Carboniferous Limestone.

A previous survey by the Inland Fisheries Trust (IFT) in 1969 established rudd, bream, perch, pike and rudd x bream hybrids to be present in the lake (IFT, unpublished data). A second survey in August 1980 found that roach, rudd, bream, perch, pike and roach x bream hybrids were present (IFT, unpublished data).

The lake has been surveyed on five occasions since 2005 (2005, 2008, 2011, 2014 and 2017 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2007, 2009, 2012a, 2015, Connor *et al.*, 2018)). During these latter surveys, perch and roach were typically the dominant fish species recorded. Other species recorded in these surveys included pike, roach x bream hybrids, European eel and tench. An interesting finding of the most recent survey in 2017 was that no roach were recorded in the survey nets deployed.

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 also provides insight into fish stock status in the lake.



Plate 1.1. Aerial view of Derrybrick Lough (looking south), August 2023.

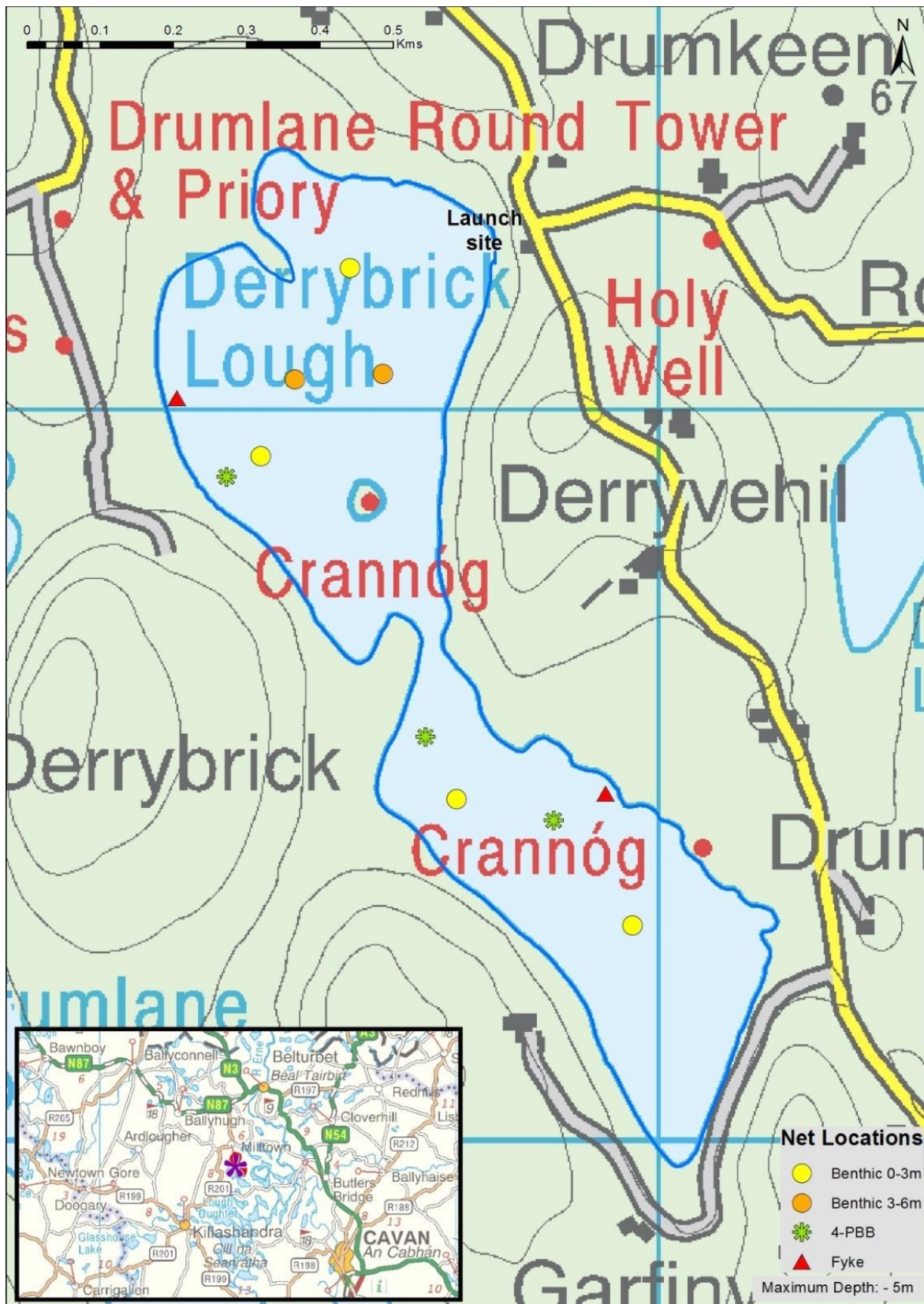


Figure 1.1. Location map of Derrybrick Lough showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Derrybrick Lough was surveyed over one night from the 22nd to the 23rd of August 2023. A total of two sets of Dutch fyke nets and 6 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (4 @ 0-2.9m and 2 @ 3-5.9m) were deployed in the lake. The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at three 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 (11 sites) 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 were recorded in Derrybrick Lough in August 2023. A total of 966 fish were captured (Table 3.1). Perch was the most numerous fish species recorded, representing c. 76% of all fish captured. Roach, pike, tench, rudd and European eels were also recorded. Fish species composition has fluctuated since 2005. Perch, pike and eel were recorded on each survey occasion. Roach were recorded in every survey with the exception of 2017. Bream and roach x bream hybrids have been recorded less frequently. Tench were recorded for the first time in 2017 (Kelly *et al.*, 2009, 2012a, 2015, Connor *et al.*, 2018). Rudd were recorded for the first time in the 2023 survey and no bream or roach x bream hybrids were captured on this occasion

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	725	8	4	737
<i>Rutilus rutilus</i>	Roach	204	0	1	205
<i>Esox lucius</i>	Pike	9	0	3	12
<i>Tinca tinca</i>	Tench	0	7	0	7
<i>Scardinius erythrophthalmus</i>	Rudd	3	0	0	3
<i>Anguilla anguilla</i>	European eel	0	0	2	2

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 were the dominant species with respect to both abundance (CPUE) and biomass (BPUE) (Table 3.2).

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

Scientific name	Common name	Mean CPUE (\pm S.E)	Mean BPUE (\pm S.E)
<i>Perca fluviatilis</i>	Perch	2.209 (0.688)	50.360 (13.721)
<i>Rutilus rutilus</i>	Roach	0.619 (0.195)	21.235 (6.568)
<i>Esox lucius</i>	Pike	0.031 (0.018)	1.358 (0.696)
<i>Tinca tinca</i>	Tench	0.005 (0.003)	10.628 (6.418)
<i>Scardinius erythrophthalmus</i>	Rudd	0.009 (0.006)	0.178 (0.123)
<i>Anguilla anguilla</i> *	European eel	0.016 (0.016)	12.331 (12.331)

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 5.8cm to 42.1cm (mean = 9.0cm) (Figure 3.2). While the population was strongly dominated by smaller fish (i.e. < 10cm), the persistence of smaller numbers of larger fish, in excess of 40cm was evident in 2023.

Perch were aged between 0+ and 5+ and all intervening age groups were present (Table 3.3). Fish aged from 0+ (5cm – 9cm) to 2+ (13cm – 23cm) together represented c. 90% of all fish in the sample aged (Figure 3.2). Mean L1 (i.e. length at the end of the 1st year) was 6.1cm (Table 3.3).

The abundance (CPUE) and biomass (BPUE) of perch recorded in Derrybrick has fluctuated widely since 2005. Both metrics were higher than previous surveys (Figure 3.1).

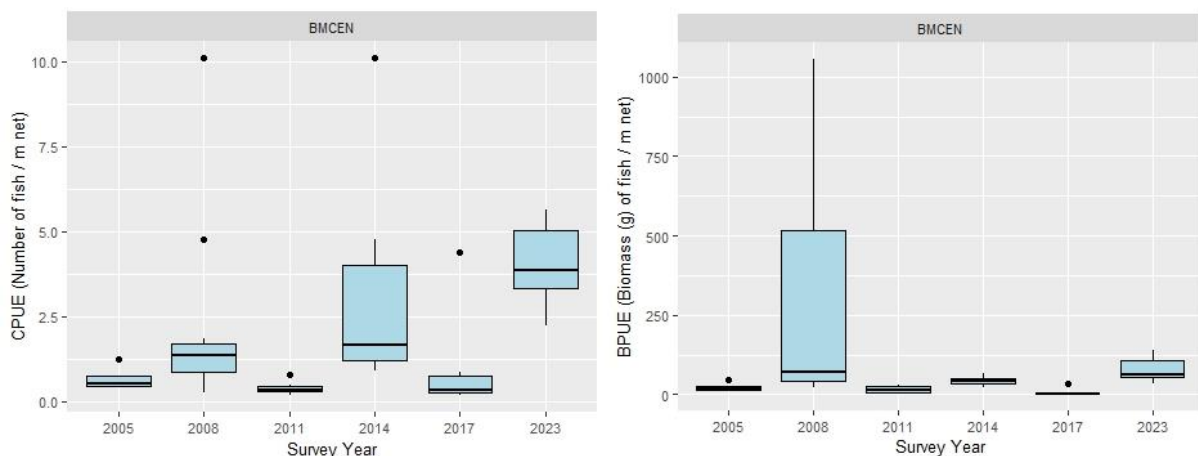


Figure 3.1. CPUE and BPUE of perch captured during surveys of Derrybrick Lough between 2005 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

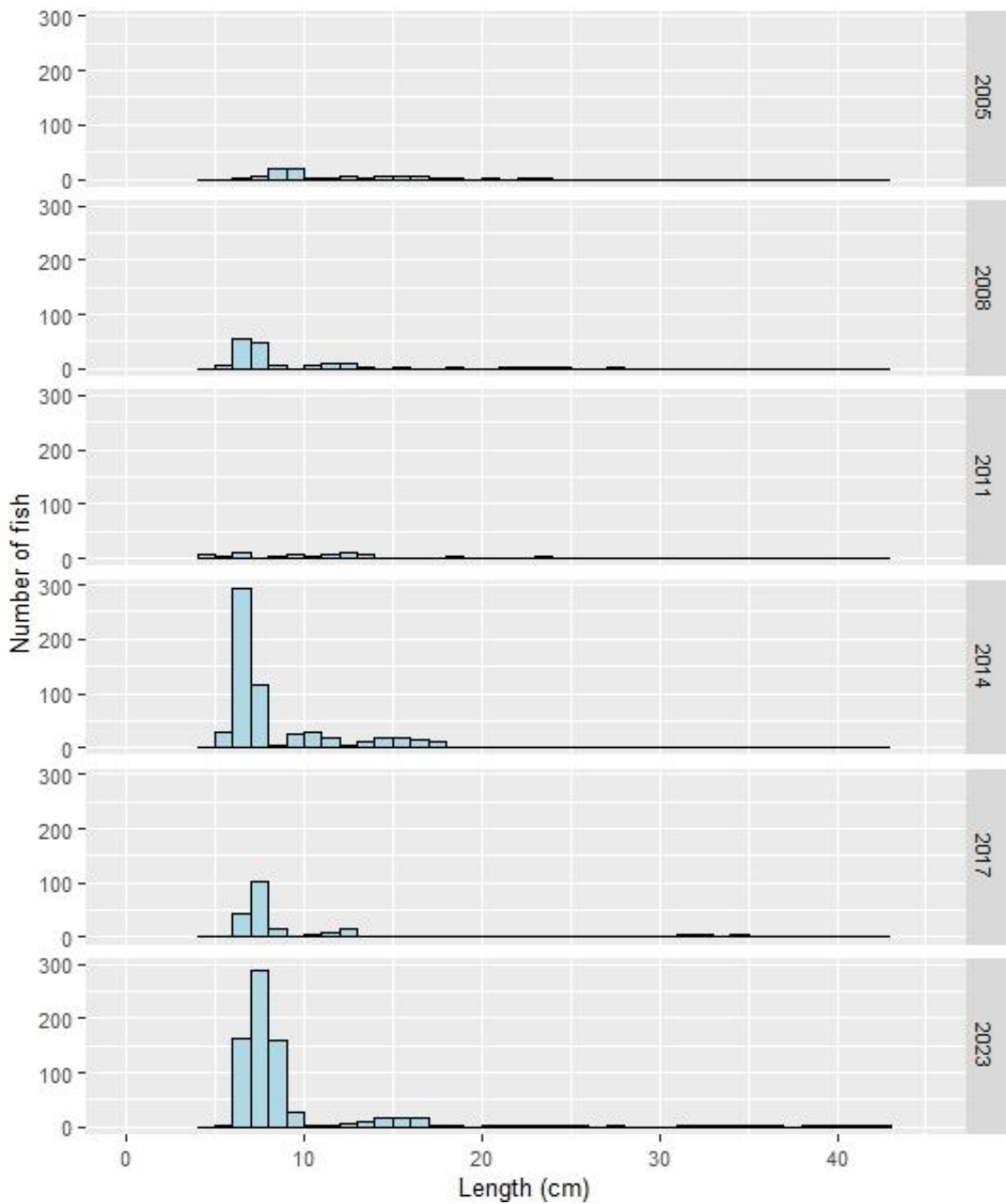


Figure 3.2. Length frequency of perch captured on Derrybrick Lough between 2005 and 2023.

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

Length (cm)	L ₁	L ₂	L ₃	L ₄	L ₅
Mean (\pm S.E.)	7.0 (0.17)	12.2 (0.61)	18.1 (0.67)	24.0 (0.99)	27.8 (1.97)
N	42	16	6	6	4
Range	4.5-9.5	8.7-16.8	16.6-20.2	20.0-26.7	21.9-30.1

Roach

Roach captured during the 2023 survey ranged in length from 8.0cm to 22.4cm (mean = 12.3cm) (Figure 3.3). The length range of roach was relatively narrow compared to earlier surveys (no roach were captured in 2017) and the population was dominated by fish measuring between 10cm and 15cm (Figure 3.3). Roach were aged between 2+ and 4+ (Table 3.4). The most abundant age group in the sample aged was 2+ (8-13cm) (Figure 3.3 and Table 3.4). This cohort represented c. 64% of all fish in the sample aged.

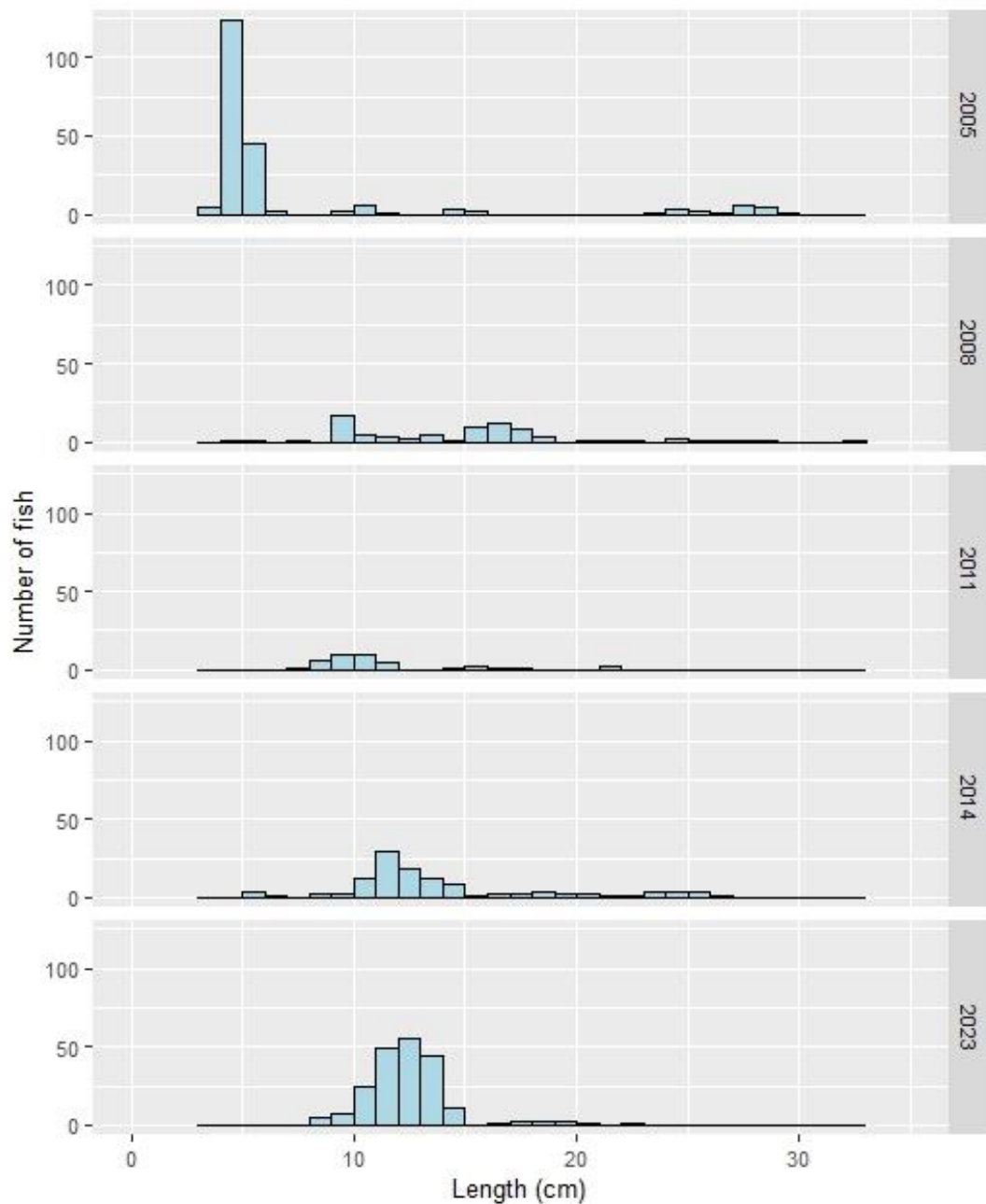


Figure 3.3. Length frequency of roach captured on Derrybrick Lough between 2005 and 2023. No roach were recorded in 2017.

Table 3.4. Summary age data from roach captured on Derrybrick 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	-	-	21	10	4
Mean	-	-	10.7	13.2	18.6
Min	-	-	8.2	11.5	17
Max	-	-	13	14.3	19.9

The generally decreasing trend in both abundance (CPUE) and biomass (BPUE) of roach evident between 2005 and 2017 (which culminated in no fish being recorded in 2017) has now reversed (Figure 3.4).

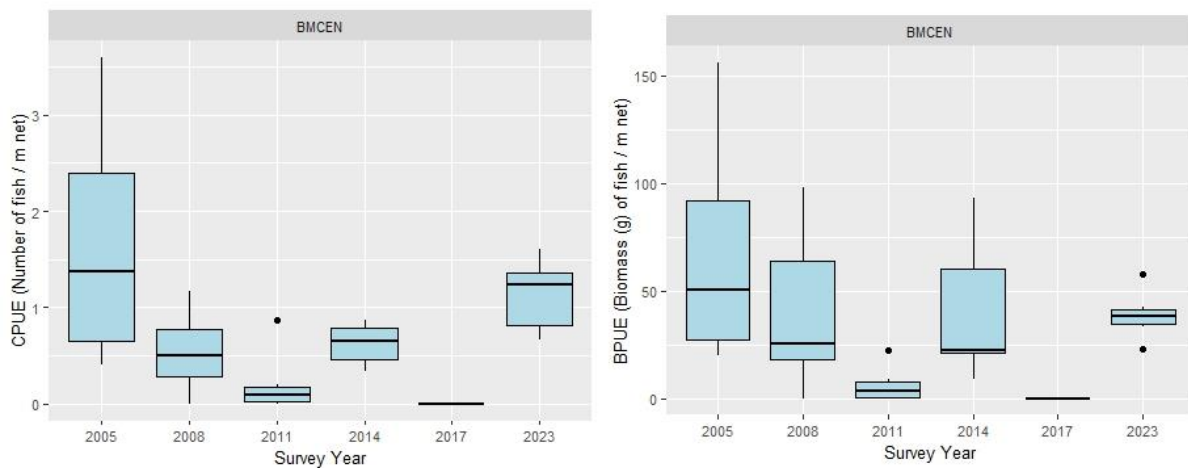


Figure 3.4. CPUE and BPUE of roach captured during surveys of Derrybrick Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the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

European eel

Two European eels were captured during the survey. They measured 74.5cm and 80.0cm. Abundance (CPUE) and biomass (BPUE) of eel captured increased between 2005 and 2011, but both metrics have since declined (Figure 3.5).

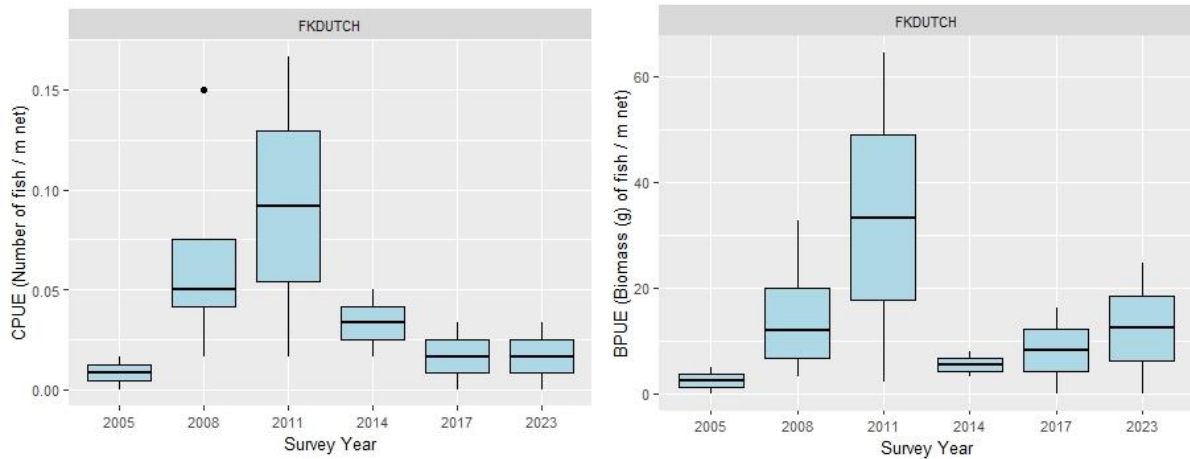


Figure 3.5. CPUE and BPUE of European eel captured during surveys of Derrybrick Lough between 2005 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Other species

Pike ranged in length from 14.2 to 21.5cm (mean = 17.9cm). All fish were aged 1+. Tench ranged in length from 41.6cm to 52cm (mean = 46.2cm). Tench were aged between 7+ and 9+. Rudd ranged in length from 10.2cm to 11.1cm. All rudd were aged 2+.

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 48 perch stomachs were examined. Twenty-six (54%) were empty. Twenty-two stomachs contained food. Invertebrates were the sole prey type recorded in 20 (91%) stomachs and were found together with fish in one stomach (4.5%). Zooplankton was the sole prey type recorded in one (4.5%) stomach (Figure 3.6).

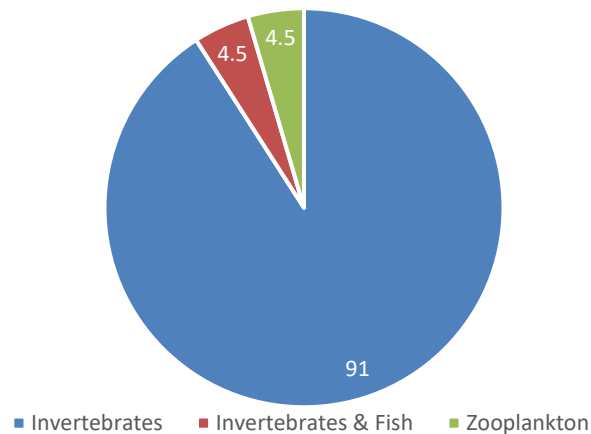


Figure 3.6. Diet of perch (N = 22) captured on Lough Derrybrick, 2023 (% FO).

Pike

A total of nine pike stomachs were examined. Of these, four (44%) were empty. Of the five stomachs which contained food, invertebrates were the sole prey item found in each.

4. Summary and fish ecological status

A total of six fish species were recorded in Derrybrick Lough in August 2023. Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2023 survey. The population of perch (i.e. abundance and biomass) has fluctuated across all surveys of the lake since 2005. In recent years, recruitment of this species has been regular and stable. In 2023 the population was heavily dominated by small and young fish, but with smaller numbers of larger and older fish.

Roach which are invasive in Ireland (Stokes *et al.*, 2004), and are one of four fish species listed as a non-native species subject to restrictions under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 [SI. 477] were first recorded in the lake in 1980 and dominated fish stocks in terms of abundance and or biomass in several surveys (e.g. Kelly *et al.*, 2007, 2012a). The failure to record roach in the survey gill nets in 2017 is unusual and was the first instance of an apparent (albeit short term) collapse in the population of this species observed during fish stock surveys in recent years. In 2023, while roach were again recorded in the survey gill nets, no fish older than 4+ were recorded, which is consistent with a small or greatly depleted population at that time (2017). No roach younger than 2+ were recorded in 2023, perhaps indicating that there are ongoing challenges to recruitment of this species in the lake.

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, Derrybrick Lough has been assigned an ecological status of Moderate for 2023 based on the fish populations present. The status of Derrybrick Lough following fish stock surveys of the lake between 2005 and 2023 is presented in Figure 4.1.

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

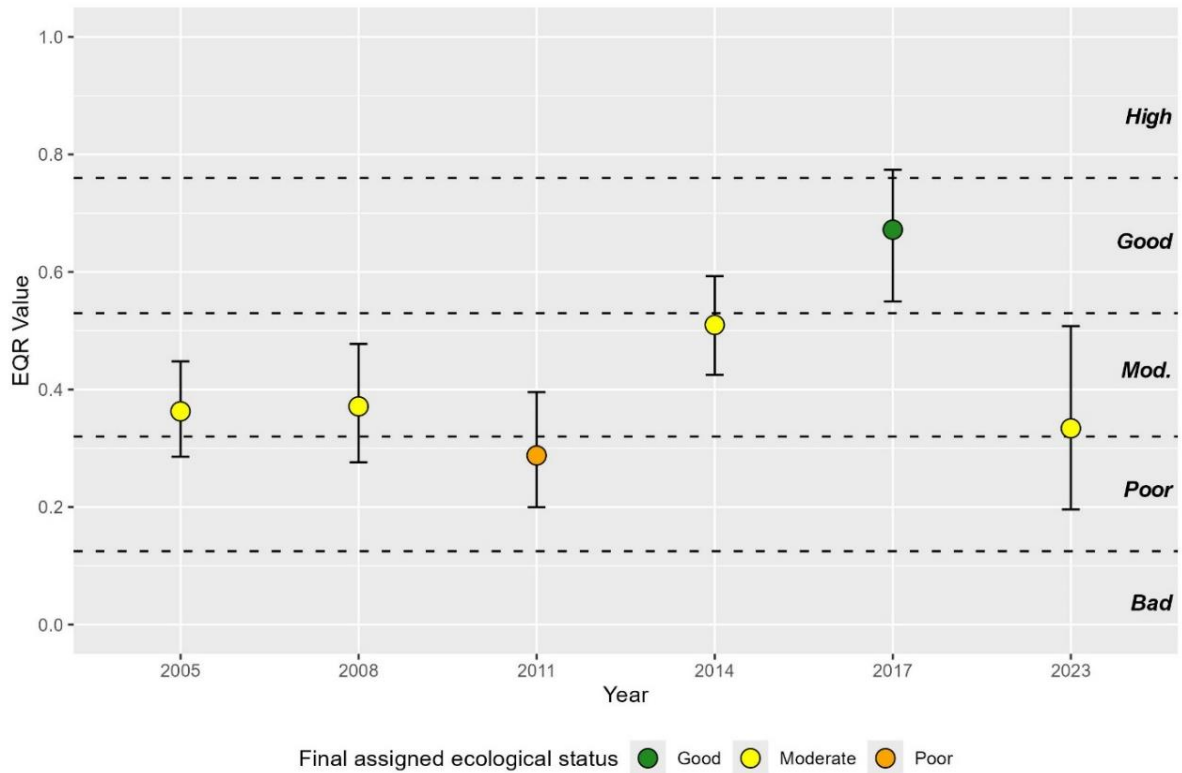


Figure 4.1. Fish ecological status, Derrybrick Lough, between 2005 and 2023 (dashed line indicates EQR status boundaries).

5. References

- Amundsen, P.A., Gabler, H.M. and Staldvik, F.J. (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.
- Connor, L., Coyne, J., Corcoran, W., Cierpial, D., Ni Dhonnaibhain L., Delanty, K., McLoone, P., Morrissey, E., Gordon, P., O' Briain, R., Matson, R., Rocks, K., O' Reilly, S., Brett A., Garland D., Kelly and F.L. (2018) *Fish Stock Survey of Derrybrick Lough, August 2017*. 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](https://gis.epa.ie/EPAMaps/Data-Catchments.ie) . Accessed in May 2024.
- Kelly, F., Connor L., and Champ, T. (2007) *A Survey of the Fish Populations in 46 lakes in the Northern Regional Fisheries Board, June to September 2005 and 2006*. Central Fisheries Board, unpublished report.
- 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., Connor, L., Wightman, G., Matson, R. Morrissey, E., O'Callaghan, R., Feeney, R., Hanna, G. and Rocks, K. (2009) *Sampling fish for the Water Framework Directive – Summary report 2008*. Central and Regional Fisheries Boards report.
- Kelly, F.L., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R. and Rocks, K. (2012a) Water Framework Directive *Fish Stock Survey of Derrybrick Lough, October 2011*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012b) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- Kelly, F.L., Connor, L., Morrissey, E., Coyne, J., Feeney, R., Matson, R. and Rocks, K. (2015) Water Framework Directive *Fish Stock Survey of Derrybrick Lough, August 2014*. Inland Fisheries Ireland.
- NPWS (2013) Site synopsis: *Lough Oughter and Associated Loughs Site code: 000007*. Site Synopsis report, National Parks and Wildlife Service.

Stokes, K., O'Neill, K. & McDonald, R. A. 2004. *Invasive species in Ireland*. Unpublished report to Environment & Heritage Service and National Parks & Wildlife Service. Quercus, Queens University Belfast, Belfast.

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

**www.fisheriesireland.ie
info@fisheriesireland.ie**

+353 1 8842 600

