National Research Survey Programme

Lakes 2023

Glenbeg Lough

IFI/2024/1-4729

Iascach Intíre Éireann
Inland Fisheries Ireland

fisheriesireland.ie

Fish Stock Survey of Glenbeg Lough, September 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 Glenbeg Lough, September 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

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.

1. Introduction

Glenbeg Lough is located near Ardgroom on the Beara Pennisula, Cork–Kerry county border (Plate 1.1 and Figure 1.1). The lake has a surface area of 66ha, a maximum depth of 13m and is categorised into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), greater than 50ha and low alkalinity (<20mg/l $CaCO_3$). The Ownagappul River exiting Glenbeg Lough contains freshwater pearl mussels (*Margartifera margaritifera*) and the lake itself is known for its oligotrophic waters and associated vegetation.

Glenbeg Lough forms part of the Glanmore Bog Special Area of Conservation. The site is of particular interest as it contains active blanket bog, an EU Habitats Directive Annex I priority habitat. Glenbeg Lough is an oligotrophic lake, which is representative of another EU Habitats Directive Annex I habitat. Some of the vegetation found on this lake includes quillwort (*Isoetes lacustris*), shoreweed (*Littorella uniflora*), water lobelia (*Lobelia dortmanna*), floating bur-reed (*Sparganium angustifolium*) and six-stamened waterwort (*Elatine hexandra*) (NPWS, 2016).

Cattle graze on some of the lower slopes around the lake, and an area west of the outflow of Glenbeg Lough has been planted with forestry. If significant additional areas were to be planted in the future, the risks of eutrophication and siltation in the catchment could increase (Ownagappul Sub-Basin Management Plan, 2009). Water from Glenbeg Lough is abstracted and supplies much of the Beara Peninsula. There are concerns that any increase in the quantity of water abstracted may adversely impact upon the SAC (Cork Co. Council, 2022)

Glenbeg Lough is known to contain large stocks of small trout, generally around 0.14kg (0.3lb) in weight (O' Reilly, 2007), with the lake shore being readily accessible for angling.

Glenbeg Lough was previously surveyed in 2008, 2011, 2014, 2017 and 2020 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2009, 2012a, 2015, Connor *et al.*, 2018 and Corcoran *et al.,* 2021). On all previous surveys, brown trout were found to be the dominant species present in the lake, while European eels was also present. Salmon was recorded in the lake on one occasion, in 2014.

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. Glenbeg Lough

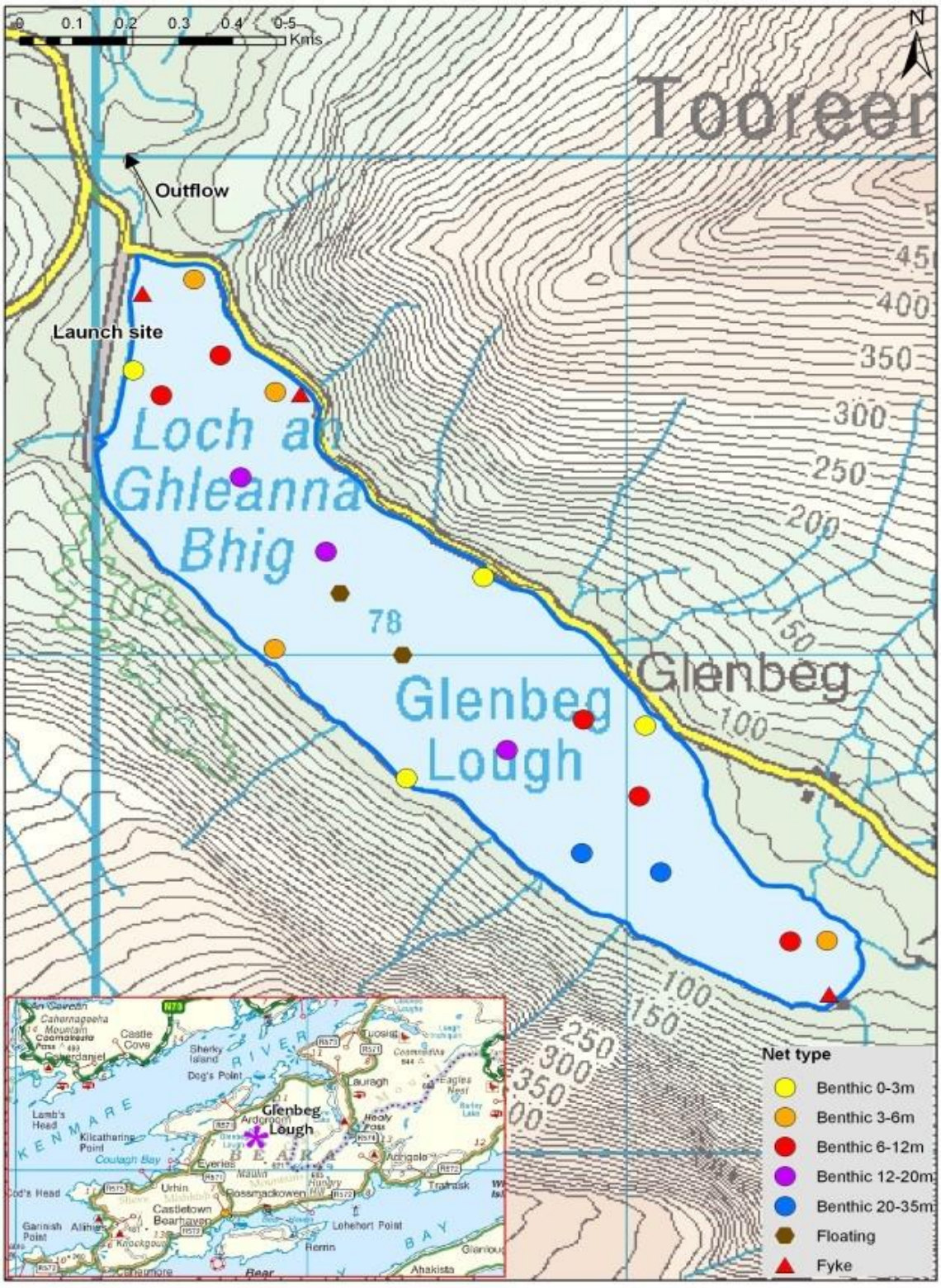

Figure 1.1. Location map of Glenbeg Lough showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Glenbeg Lough was surveyed over two nights from the 12th to the 14th of September 2023. A total of three sets of Dutch fyke nets, 18 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, 5 @ 6-11.9m, 3 @ 12-19.9m and 2 @ 20-34.9m) and two floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (23 sites). 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 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).

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

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

Three fish species, including two types of trout (brown trout and sea trout) were recorded in Glenbeg Lough in September 2023. A total of 417 fish were captured (Table 3.1). Brown trout was the most numerous fish species recorded, representing *c*. 98% of all fish captured in the survey. Sea trout, salmon and eels were also captured. Salmon was captured in 2014 only, while one sea trout was recorded in surveys for the first time in 2023 (Kelly *et al.*, 2009, 2012a, 2015, Connor *et al.*, 2018 and Corcoran *et al.*, *2021*).

Table 3.1. Number of each fish species captured by each gear type during the survey on Glenbeg Lough

Scientific name	Common name	Number of fish captured			
		BM CEN	FMCEN	Fyke	Total
Salmo trutta	Brown trout	334	22	54	410
	Sea trout	1	0	0	1
Salmo salar	Salmon	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. Brown trout was 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 Glenbeg Lough

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Salmo trutta	Brown trout	0.555 (0.098)	51.159 (9.948)
	Sea trout	0.001 (0.001)	0.235 (0.235)
Salmo salar	Salmon	0.001 (0.001)	0.091 (0.091)
*Anguilla anguilla**	European eel	0.028 (0.020)	3.308 (2.453)

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

Brown trout

Brown trout captured during the 2023 survey ranged in length from 6.5cm to 38.1cm (mean 19.0cm) (Figure 3.2). Brown trout captured in previous surveys had similar length ranges. The population is heavily dominated by smaller fish with relatively few fish greater than 25cm recorded. Small trout (i.e.< 10cm) are also a feature of the lake (Figure 3.2). Brown trout were aged between 1+ and 6+ and the population was heavily dominated by fish aged 1+ to 3+. These cohorts represented c. 99% of all fish in the sample aged. Two year old fish (14cm – 23cm) were the most abundant age class present in the sample (Figure 3.1). Mean L1 (i.e. length at the end of the 1st year) was 6.5cm (Table 3.3).

Brown trout abundance (CPUE) and biomass (BPUE) have remained relatively stable across all surveys of the lake (Figure 3.1).

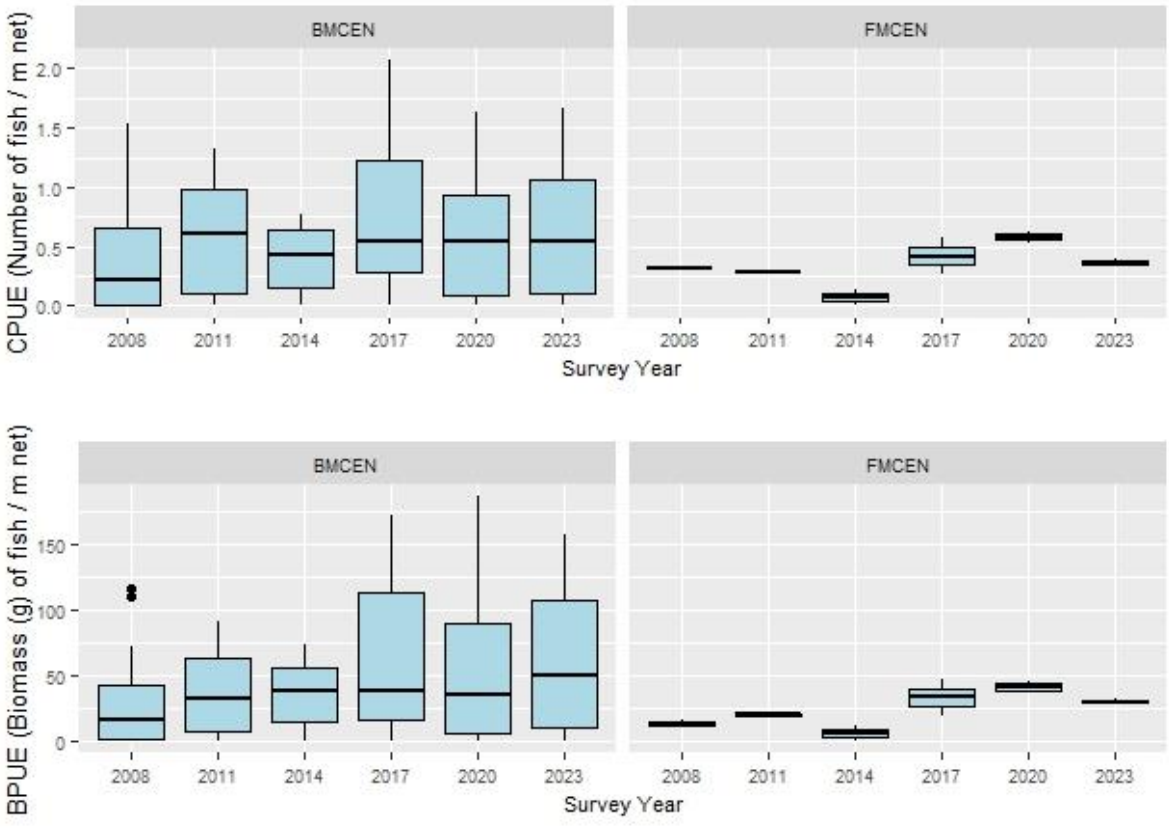

Figure 3.1. CPUE and BPUE of brown trout captured during surveys of Glenbeg Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

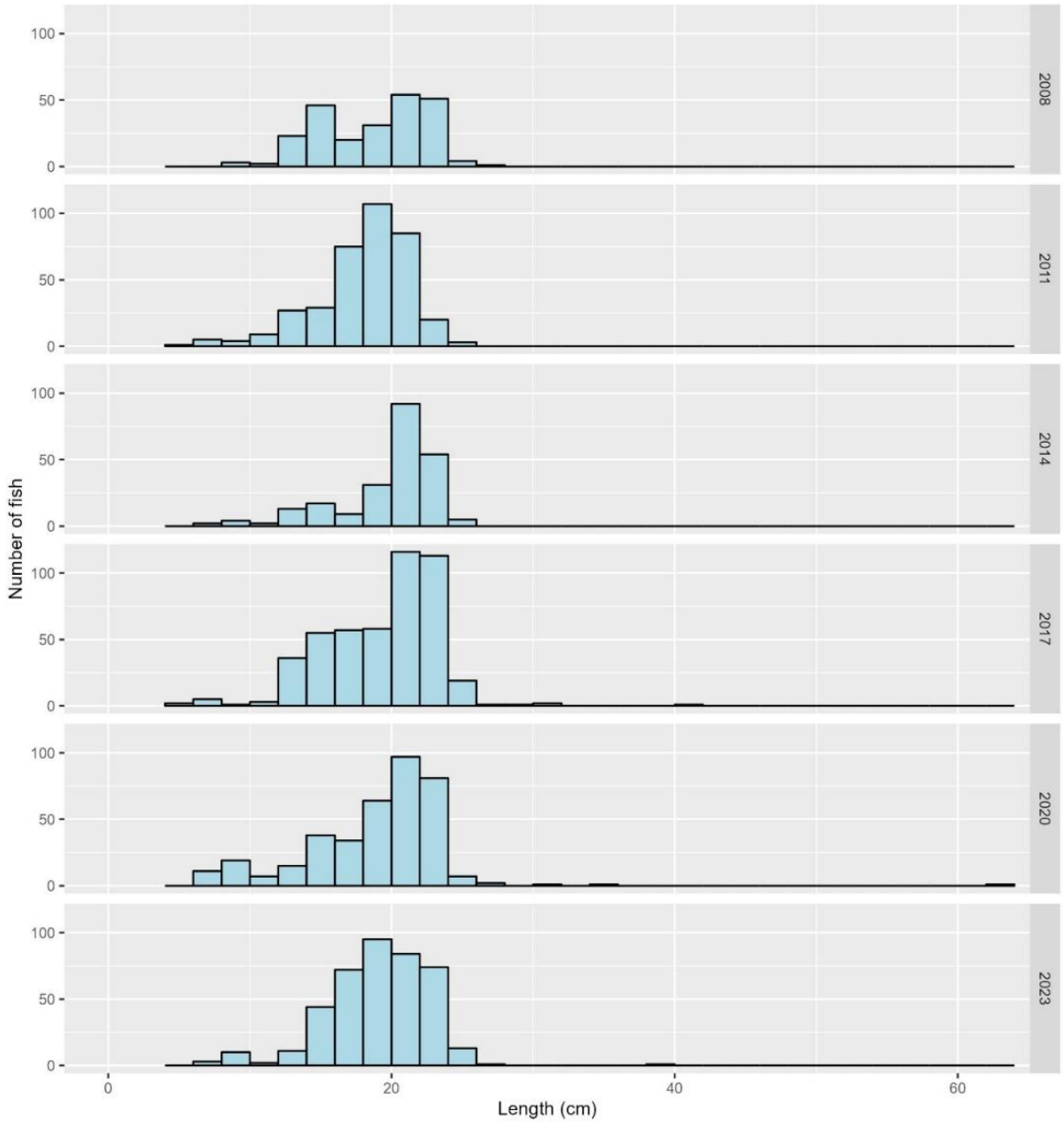

Figure 3.2. Length frequency of brown trout captured on Glenbeg Lough between 2008 and 2023

Table 3.3. Mean (±S.E.) brown trout length (cm) at age for Glenbeg Lough, September 2023

	L_1	L_2	L_3	L_4	L_5	L_6
Mean (±S.E.)	6.5 (0.07)	13.9 (0.20)	20.7 (0.49)	-	-	-
N	69	52	8	1	1	1
Range	5.0-7.8	10.1-16.9	18.1-22.8	27.2	31.7	35.3

European eel

European eel captured during the 2023 survey ranged in length from 32.2m to 46.3cm (mean 41.4cm) (Figure 3.3). Abundance and biomass of eel were highest in the initial survey in 2008 and have remained at a lower level since that time (Figure 3.4).

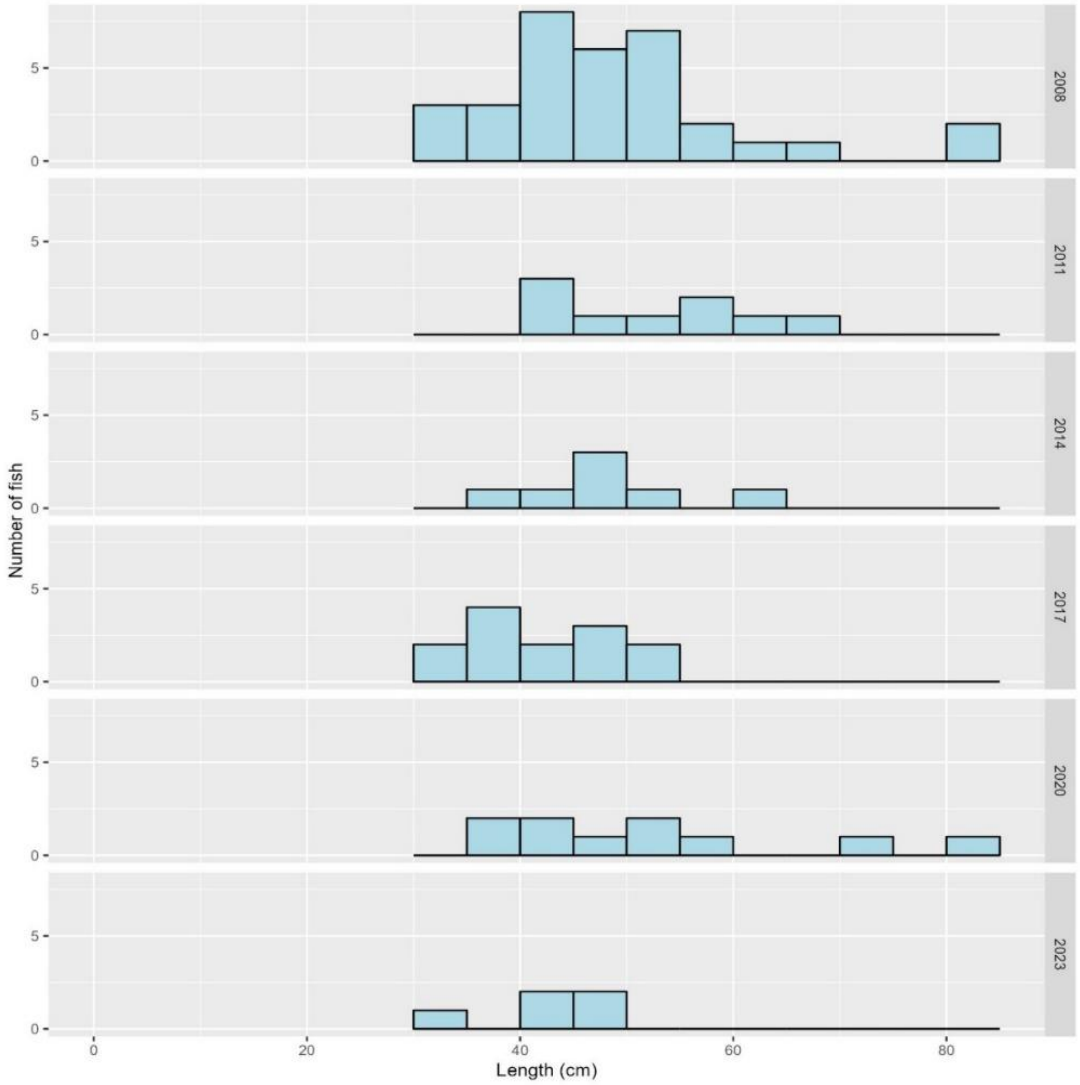

Figure 3.3. Length frequency of European eel captured on Glenbeg Lough between 2008 and 2023

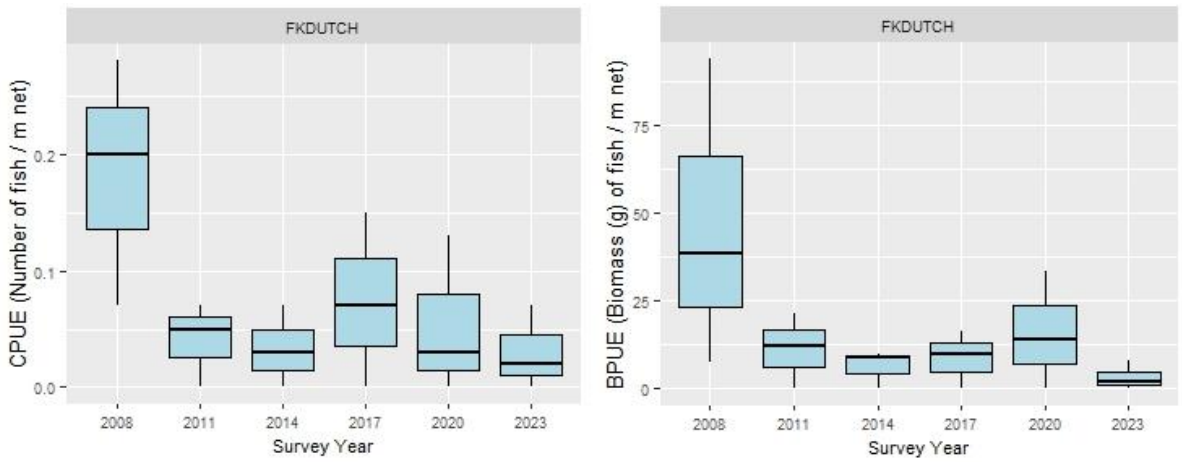

Figure 3.4. CPUE and BPUE of European eel captured during surveys of Glenbeg Lough between 2008 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by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

Other fish species

One sea trout was captured and measured 24.2cm. One salmon measured 17.5cm.

Plate 3.1 Processing the catch on Glenbeg Lough, September 2023

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

Brown trout

A total of 139 brown trout stomachs were examined. Sixty-nine (49.6%) were empty. Seventy stomachs contained food. Zooplankton was the sole prey type recorded in 41 (59%) stomachs and were found together with invertebrates in a further six (9%) stomachs. Invertebrates were the sole prey type recorded in 16 (23%) stomachs. Fish was found in one (1%) stomach and unidentified digested material was recorded in six (9%) fish (Figure 3.5).

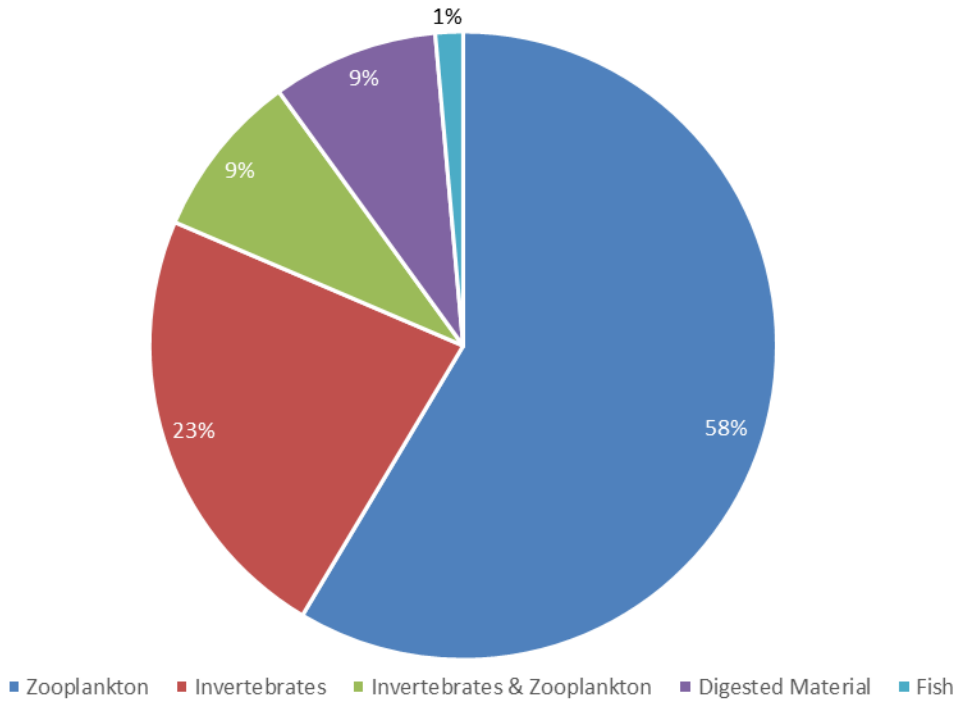

Figure 3.5. Diet of brown trout (N = 70) captured on Lough Glenbeg, 2023 (% FO).

Salmon

One juvenile salmon stomach was examined. It contained unidentified digested matter.

Sea trout

One sea trout stomach was examined. The stomach was empty.

4. Summary and fish ecological status

A total of three fish species, including two varieties of trout (brown and sea trout) were recorded in Glenbeg Lough in September 2023. Brown trout was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2023 survey. Recruitment appears to be regular and the population, in common with previous surveys was dominated by younger and smaller individuals but with some older and larger cohorts persisting in the population.

The abundance (CPUE) and biomass (BPUE) of eels captured declined between 2008 and 2011 and has remained at lower levels since that time.

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, Glenbeg Lough has been assigned an ecological status of Good for 2023 based on the fish populations present. Glenbeg Lough has been assigned a status of either High or Good following all surveys conducted since 2008 (Figure 4.1).

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

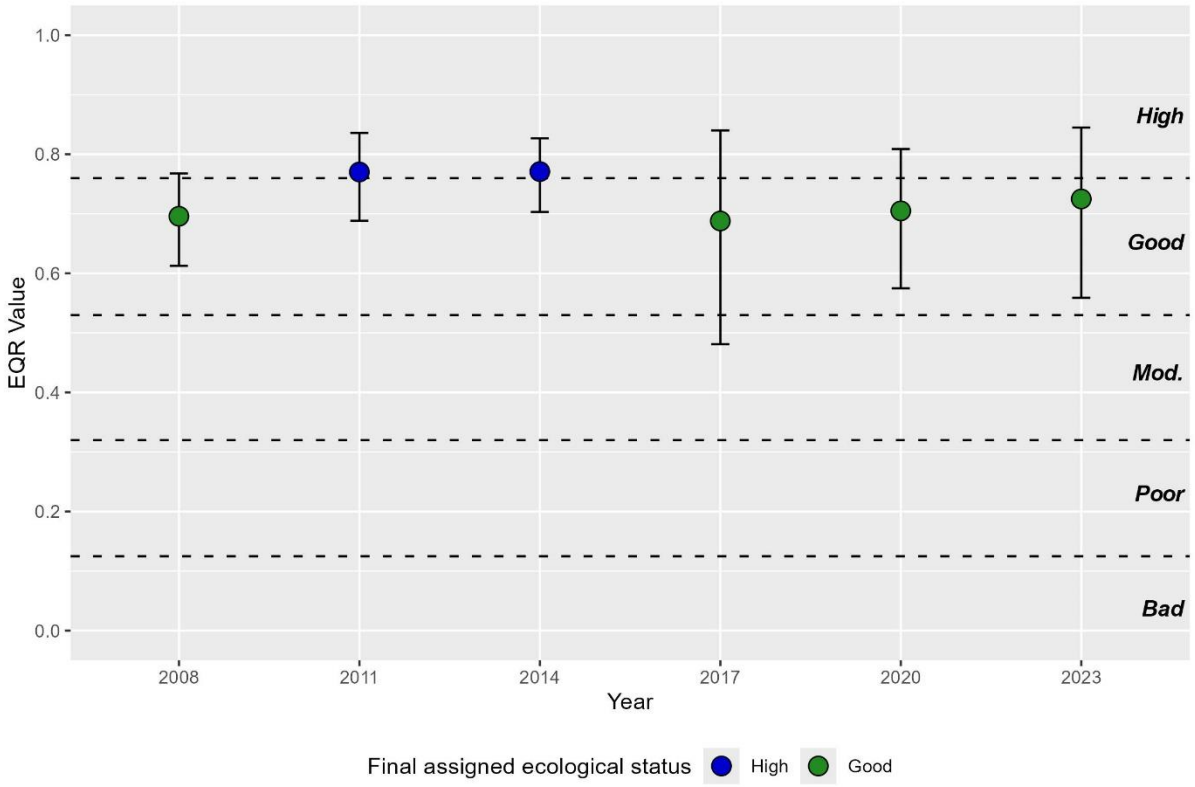

Figure 4.1. Fish ecological status, Glenbeg Lough, between 2008 and 2023 (dashed lines indicates EQR status boundaries).

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. and Kelly, F.L. (2018) *Fish Stock Survey of Glenbeg Lough, September 2017*. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Corcoran, W., Connor, L., McLoone, P., Bateman, A., Cierpial, D., Gavin, A., Gordon, P., McCarthy, E., Putthaaree, D., Twomey, C., Matson, R., Robson, S., Duffy, P., Rocks, K., Donovan, R., Crowley, D., and Kelly, F.L. (2021) *Fish Stock Survey of Lough Glenbeg, August 2020.* National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cork County Council (2022) Addendum to SEA Environmental Report. Cork County Council. 17th January 2022. https://www.corkcoco.ie/sites/default/files/2022-04/environmental-reports-the-proposed-amendments-to-the-draft-plan-have-been-assessed-addendum-to-sea-environmental-report-18th-january-2022-pdf. pdf

EPA (2021) https://gis.epa.ie/EPAMaps/ Data - Catchments.ie - Catchments.ie. Accessed in May2024.

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 Glenbeg Lough, September 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 Glenbeg Lough, September 2014*. Inland Fisheries Ireland.

NPWS (2016) Site synopsis*: Glanmore Bog cSAC. Site code: 1879*. National Parks and Wildlife Service Conservation Statement 2009.

O' Reilly, P (2007) *Loughs of Ireland*. A Flyfisher's Guide. 4th edition. Merlin Unwin Books.

Ownagappul Sub-Basin Management Plan (2009) www.wfdireland.ie

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

www.fisheriesireland.ie
info@fisheriesireland.ie

+353 1 8842 600