National Research Survey Programme

Lakes 2023

Lough Tay

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Fish Stock Survey of Lough Tay, June 2023

National Research Survey Programme

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

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1. Introduction

Lough Tay is located in Luggala Estate in County Wicklow, lying between the mountains of Djouce and Luggala at an altitude of 250m a.s.l. (Plate 1.1, Figure 1.1). It is a small lake with a surface area of approximately 50ha, a maximum depth of 35m and a mean depth of 10.1m. It is fed by the Cloghoge River and drains into Lough Dan to the south. Lough Tay is categorised as typology class 3 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), less than 50ha and low alkalinity (<20mg/l $CaCO_3$). The Estate has commenced a programme of work aimed at restoring peatlands in the area (O' Sullivan, 2021)

Arctic char were historically known to be present in three lakes in Co. Wicklow, including Lough Tay. The first recorded Arctic char in Lough Tay was reported in 1832; however, they are believed to be extinct since the 1930's (Tierney *et al*., 2000). Gill net surveys carried out between 1984 and 2005 revealed that brown trout was the only species present in this lake (Walsh, 1987; Tierney *et al*., 2000 and Igoe *et al*., 2005).

The lake has been surveyed on three occasions since 2009 (2009, 2012 and 2016) as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2010, 2013 and 2017). During the last two surveys, brown trout was the only fish species recorded in the lake, while European eel was also captured in 2009.

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. Lough Tay, Looking south along the lake

Plate 1.2. Surveying on Lough Tay, June 2023

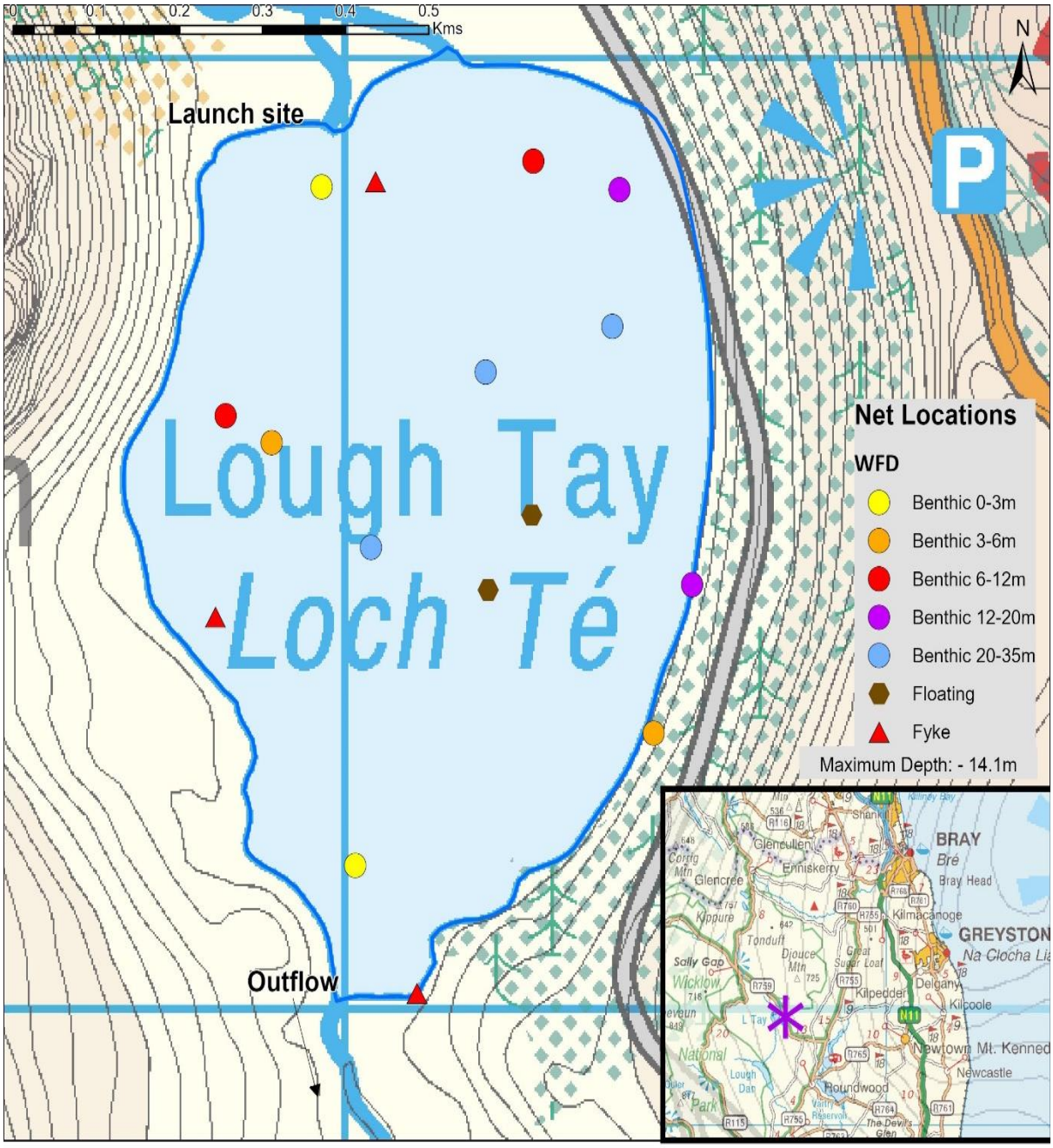

Figure 1.1. Location map of Lough Tay showing net locations and depths of each net (outflow is indicated on map).

2. Methods

2.1. Netting methods

Lough Tay was surveyed over two nights from the 6th to the 8th of June 2023. A total of three sets of Dutch fyke nets, 11 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, 2 @ 6-11.9m, 2 @ 12-19.9m and 3 @ 20-34.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (FM CEN) were deployed in the lake (16 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

Two fish species were recorded in Lough Tay in June 2023. A total of 204 fish were captured (Table 3.1). Brown trout was the most numerous fish species recorded. Minnow was also captured. Brown trout was the sole species captured during the last two surveys of the lake in 2012 and 2016 (Kelly *et al.,* 2013 and 2017*)*, while European eel was recorded as well as brown trout in 2009 (Kelly *et al.,* 2010). Minnow was recorded for the first time in 2023.

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

Scientific name	Common name	Number of fish captured			
		BM CEN	FMCEN	Fyke	Total
Salmo trutta	Brown trout	159	36	3	198
Phoxinus phoxinus	Minnow	6	0	0	6

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. Brown trout 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 Lough Tay

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Salmo trutta	Brown trout	0.409 (0.091)	34.667 (7.327)
Phoxinus phoxinus	Minnow	0.013 (0.009)	0.051 (0.038)

3.3 Species Profiles

Brown trout

Brown trout captured during the 2023 survey ranged in length from 8.9cm to 26.9cm (mean 18.7cm). Brown trout captured in previous surveys had similar length ranges. The population was dominated by small individuals, with relatively few fish achieving a length greater than 25cm in any survey of the lake (Figure 3.1). Brown trout were aged between 1+ and 4+ and all intervening age classes were present in the sample aged. Two and three year old fish were the most abundant year classes, and *c*. 94% of the sample were aged between 1+ and 3+ (10cm – 25cm) (Figure 3.1). Mean L1 (i.e. length at the end of the 1st year) was 5.9cm. The most abundant age class was 2+, with several older fish captured (Table 3.3).

The brown trout population appears to be stable, with some evidence that the overall population trend in abundance (CPUE) and biomass (BPUE) is upwards (Figure 3.2)

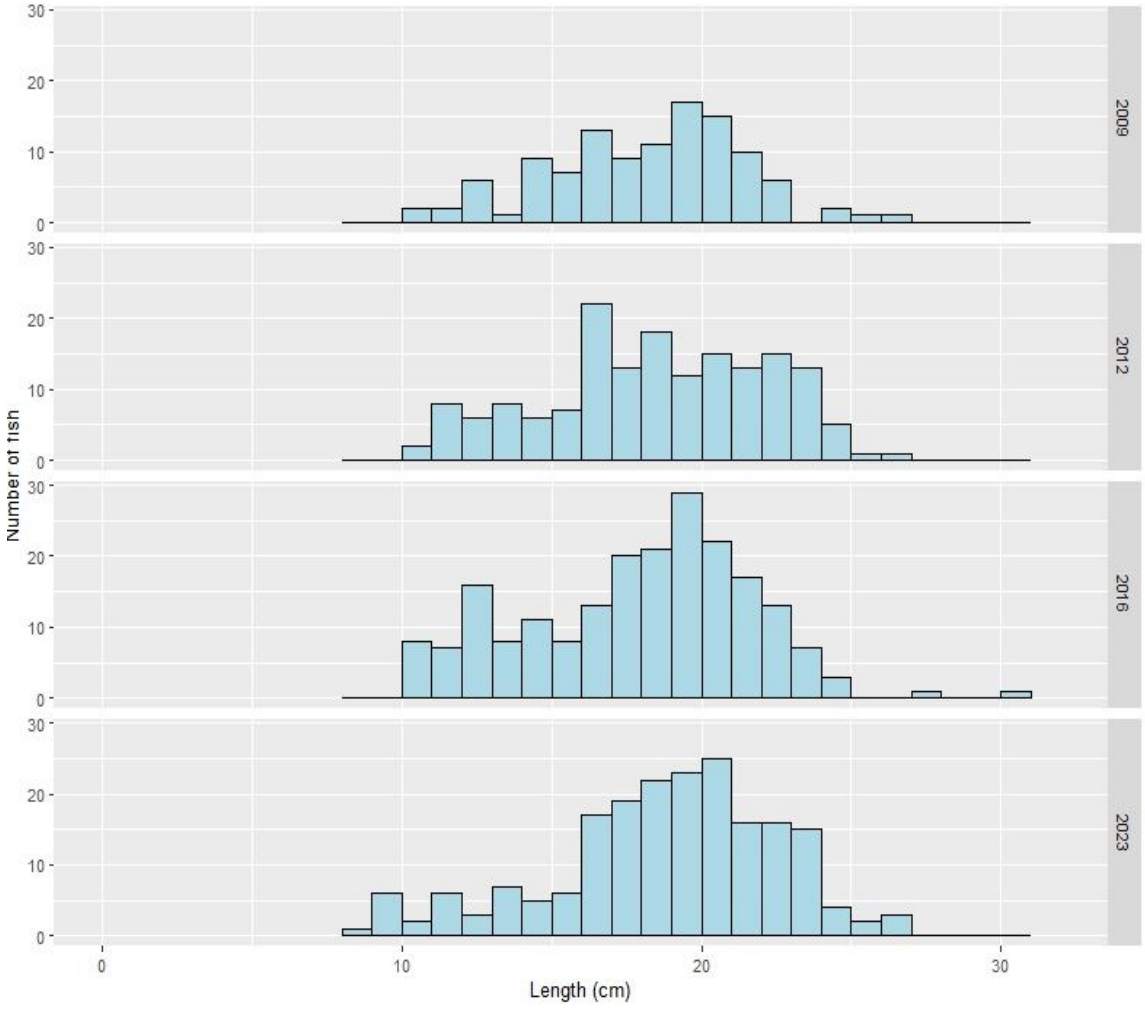

Figure 3.1. Length frequency of brown trout captured on Lough Tay between 2009 and 2023.

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

	L_1	L_2	L_3	L_4
Mean (±S.E.)	5.9 (0.04)	11.9 (0.08)	18.0 (0.12)	22.9 (0.40)
N	85	72	37	5
Range	5.1-7.2	10.3-13.8	16.5-19.3	21.6-24.1

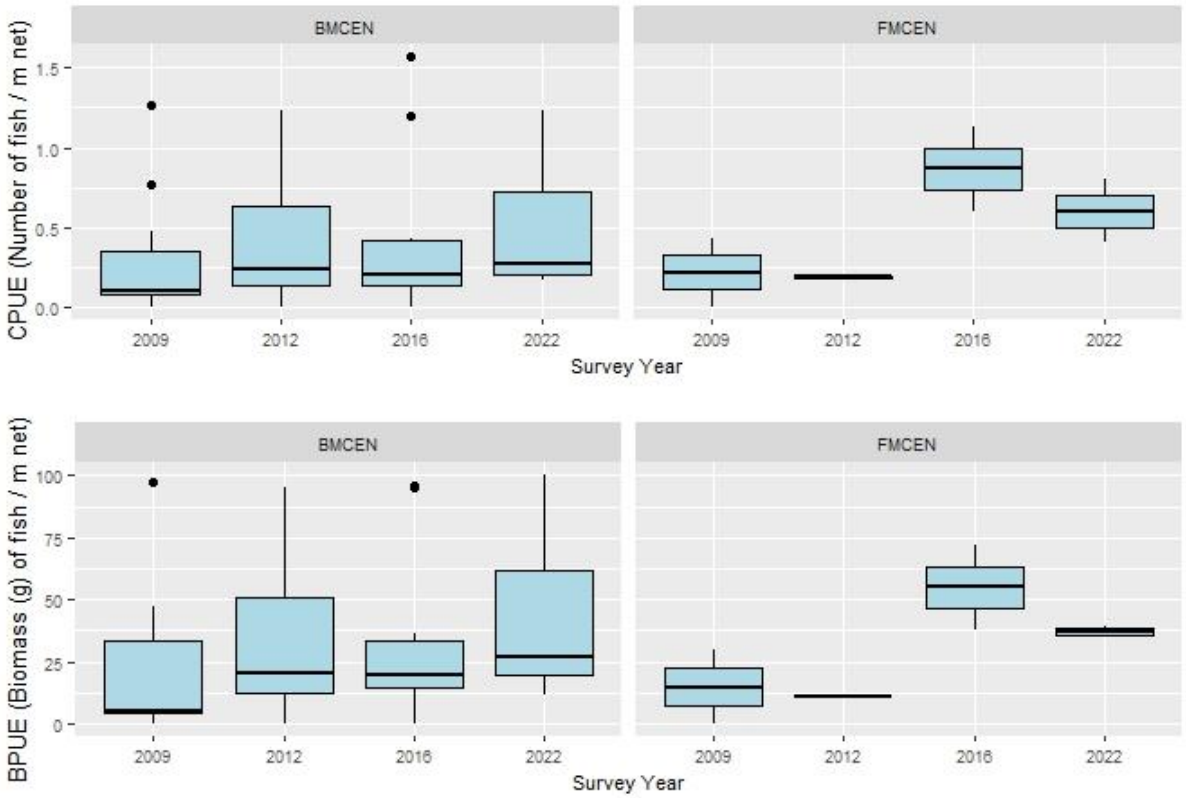

Figure 3.2. CPUE and BPUE of brown trout captured during surveys of Lough Tay between 2009 and 2023. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots.

Other fish species

Six minnow were caught during the 2023 survey. They ranged in length from 5.5cm to 8.0cm (mean = 6.7cm).

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 captured during the survey were examined and are presented below.

Brown trout

A total of 75 brown trout stomachs were examined. Sixteen (21%) were empty. Fifty-nine stomachs contained food. Invertebrates were the sole prey type recorded in 55 (93.2%) stomachs and were found together with zooplankton in two stomachs (3.4%). The stomach contents of two (3.4%) trout consisted solely of zooplankton (Figure 3.3).

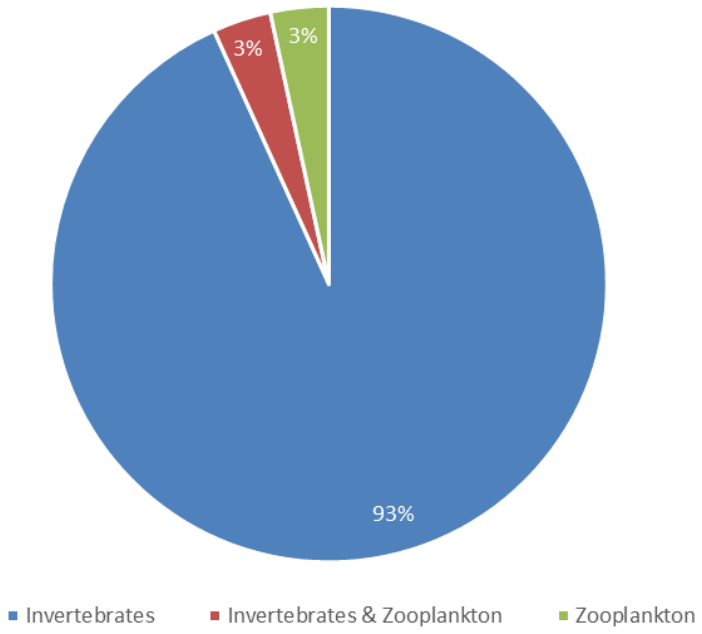

Figure 3.3. Diet of brown trout (N = 59) captured on Lough Tay, 2023 (% FO).

4. Summary and fish ecological status

Two fish species were recorded in Tay Lough in June 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. The population was dominated by small and young fish and recruitment is regular. The brown trout population appears to be stable, with some evidence that the overall trend in abundance (CPUE) and biomass (BPUE) is upwards.

Minnow was recorded for the first time in 2023.

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, Lough Tay has been assigned an ecological status of High for 2022 based on the fish populations present. Lough Tay has also been assigned a status of High following all previous surveys of the lake since 2009 (Figure 4.1).

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

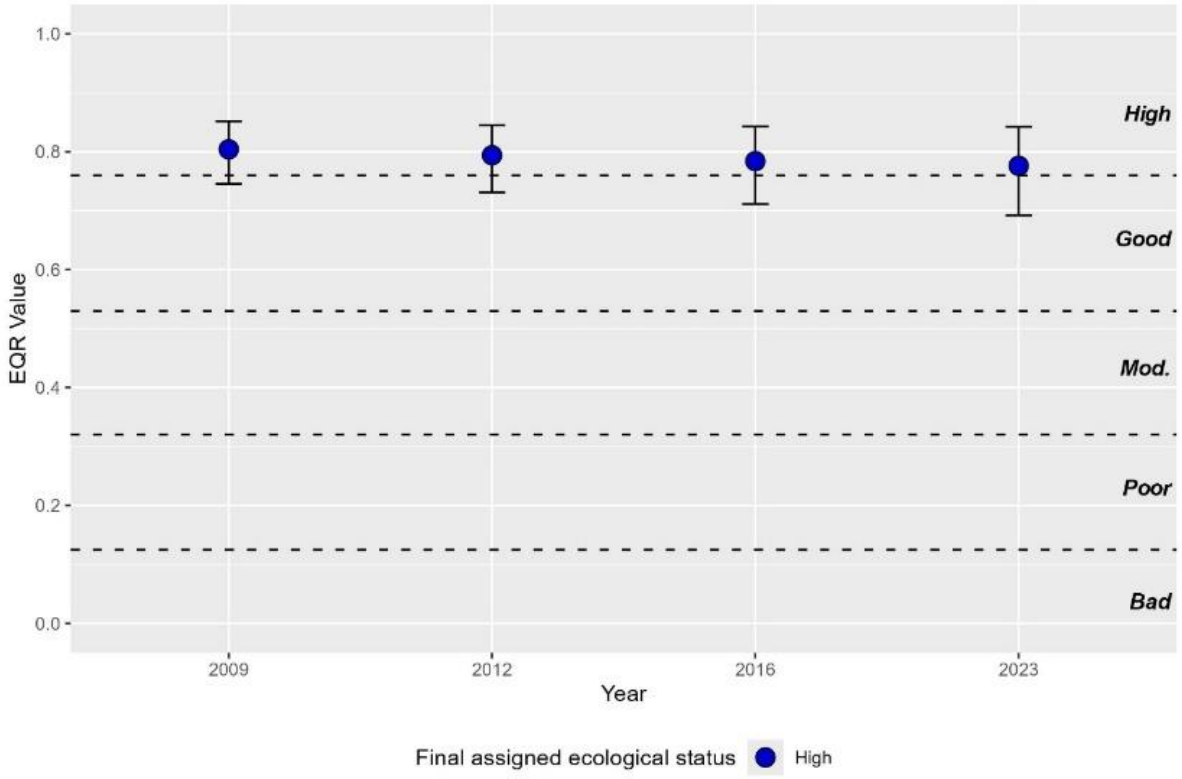

Figure 4.1. Fish ecological status, Lough Tay, between 2009 and 2023 (dashed line indicates EQR status boundaries).

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