National Research Survey Programme

Lakes 2021

Aughrusbeg Lough

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Aughrusbeg,

August 2021

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National Research Survey Programme

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

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1. Introduction

Aughrusbeg Lough is one of the most westerly lakes in the Connemara area of Co. Galway, located approximately 5km west of Cleggan (Plate 1.1, Figure 1.1). It has a surface area of 50ha, a mean depth of less than 4m and a maximum depth of 14m. The lake falls into typology class 7 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), less than 50ha and moderate alkalinity (20-100mg/l $CaCO_3$).

Aughrusbeg Lough forms part of the Aughrusbeg Machair and Lake Special Area of Conservation (SAC). The site has been selected as a candidate SAC for containing a lowland oligotrophic lake, a habitat listed on Annex I of the E.U. Habitats Directive. The underlying geology of the region is made up of Omey granite (NPWS, 2021). Species recorded from the shoreline of the lake include six-stamened waterwort (*Elatine exandra*), quillwort (*Isoetes lacustris*) and shoreweed (*Littorella uniflora*) (NPWS, 2021). The majority of Aughrusbeg Lough has gently sloping granite shores, with a well-developed sand shelf present on the western shore. At the edge of this sand shelf the lake bed falls off steeply to a depth of 6m (NPWS, 2021).

Aughrusbeg Lough was previously surveyed in 1993 when the lake was found to contain brown trout and rudd. Stickleback were recorded in brown trout stomachs. The authors noted that natural spawning was limited to the short outflowing stream; that natural recruitment may have been poor prior to the survey; that the lake was subject to algal blooms that potentially impacted upon trout populations and that the lake's brown trout stocks had been supplemented by stocking with summerling trout in 1992 (Gargan, 1994).

The lake was subsequently surveyed on three occasions (2007, 2010 and 2013) as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007, Kelly *et al*., 2011a and Kelly *et al*., 2014). Similar species composition was recorded on each of these latter survey occasions. Rudd, three-spined stickleback and eel were recorded in each survey. Brown trout were not recorded in 2007 but were captured in 2010 and 2013.

This report summarises the results of the 2021 fish stock survey carried out on the lake using Inland Fisheries Ireland's fish in lakes monitoring protocol. The methodology is WFD compliant and enables determination of ecological status based upon fish communities. It also provides insight into current fish stock status in assessed lakes, facilitating comparison within and between lakes.

Plate 1.1. Aughrusbeg Lough, July 2021

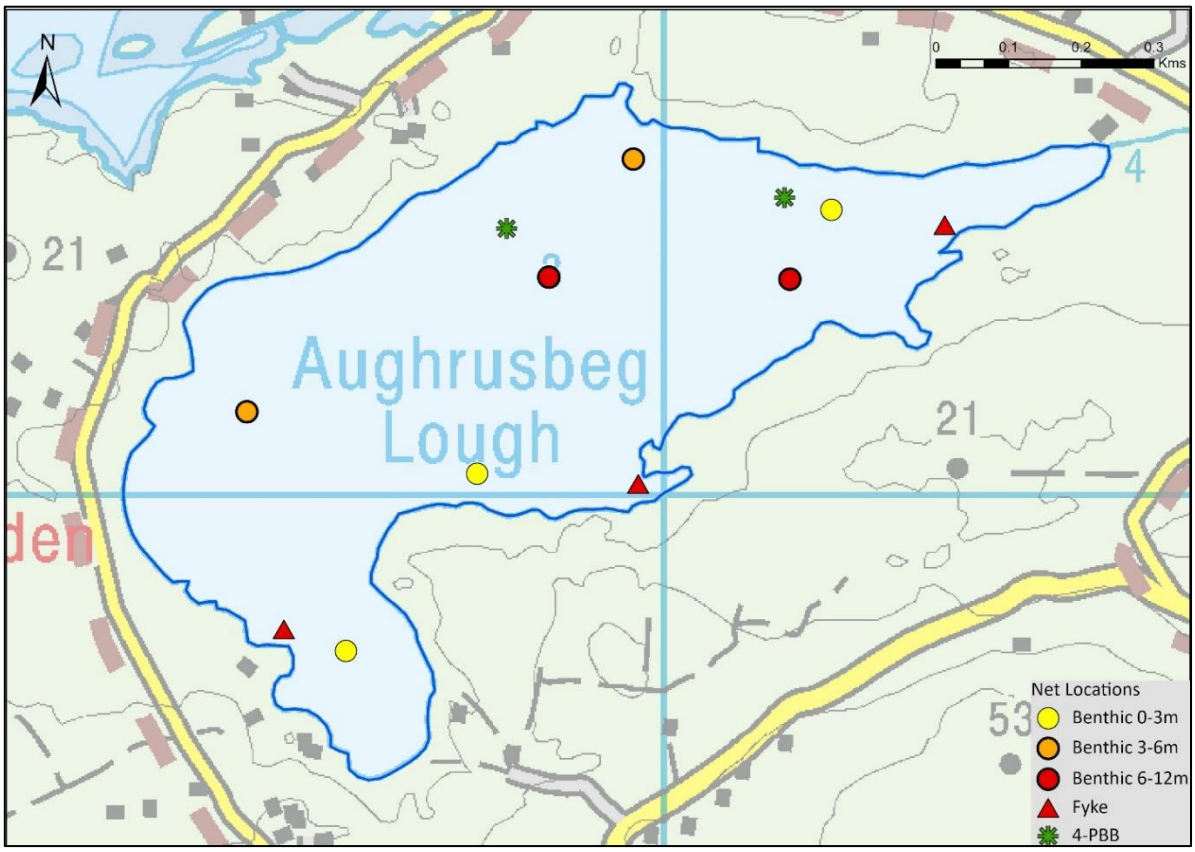

Figure. 1.1. Location map of Aughrusbeg Lough showing net locations and depths of each net (outflow is indicated on map)

2. Methods

Aughrusbeg Lough was surveyed over one night on the 9th and 10th of July 2021. A total of three sets of Dutch fyke nets and seven benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (3 @ 0-2.9m, 2 @ 3-5.9m and 2 @ 6-11.9m) were deployed in the lake. The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at two 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 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.

2.1. Fish diet

Total stomach contents were inspected and individual items were counted and 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.

2.2. Biosecurity - disinfection and decontamination procedures

Procedures are required for disinfection of equipment in order 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 were recorded on Aughrusbeg Lough in August 2021. A total of 124 fish were captured. The number of each species captured by each gear type during the survey is shown in Table 3.1. Rudd, brown trout (stocked), eel, flounder and pike were recorded in the survey gill nets. Visible deformities to dorsal fins of the brown trout captured indicated that these fish may have been stocked. Pike were recorded for the first time during the 2021 survey and had not previously been recorded in the fishery district. No three-spined stickleback were recorded on this occasion.

Table 3.1. Number of each fish species captured by each gear type during the survey on Aughrusbeg Lough, August 2021

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Scardinius erythrophthalmus	Rudd	81	0	8	89
Anguilla anguilla	European eel	1	0	21	22
Salmo trutta	Brown trout (stocked)	7	0	0	7
Esox lucius	Pike	5	0	0	5
Platichthys flesus	Flounder	0	1	0	1

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 (Table 3.2). For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. For comparison purposes, box plots of CPUE and BPUE for each species captured per net type in all surveys between 2007 and 2021 are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time.

In 2021, rudd was the dominant species with respect to both mean CPUE and BPUE (Table 3.1) for fish caught in all net types. Eel also recorded a relatively high mean CPUE and BPUE with relatively large numbers recorded in the fyke nets deployed.

While the number of rudd captured has varied across sampling occasion, no clear trend is apparent (Figs. 3.1 and 3.2). The number of fish captured in benthic monofilament survey nets (BM CEN) has remained relatively steady and the population remains stable. There is an apparent downward trend in the number of eel captured in fyke nets across all sampling occasions.

Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Aughrusbeg Lough, 2021

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Scardinius erythrophthalmus	Rudd	0.236 (0.087)	14.210 (5.230)
Salmo trutta	Brown trout	0.019 (0.008)	10.421 (3.945)
Esox lucius	Pike	0.014 (0.006)	5.754 (2.543)
Platichthys flesus	Flounder	0.001 (0.001)	0.475 (0.475)
Anguilla anguilla	European eel	0.117 (0.058)*	15.175 (8.206)*

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.

Plate 3.2. Flounder captured in Aughrusbeg Lough, July 2021

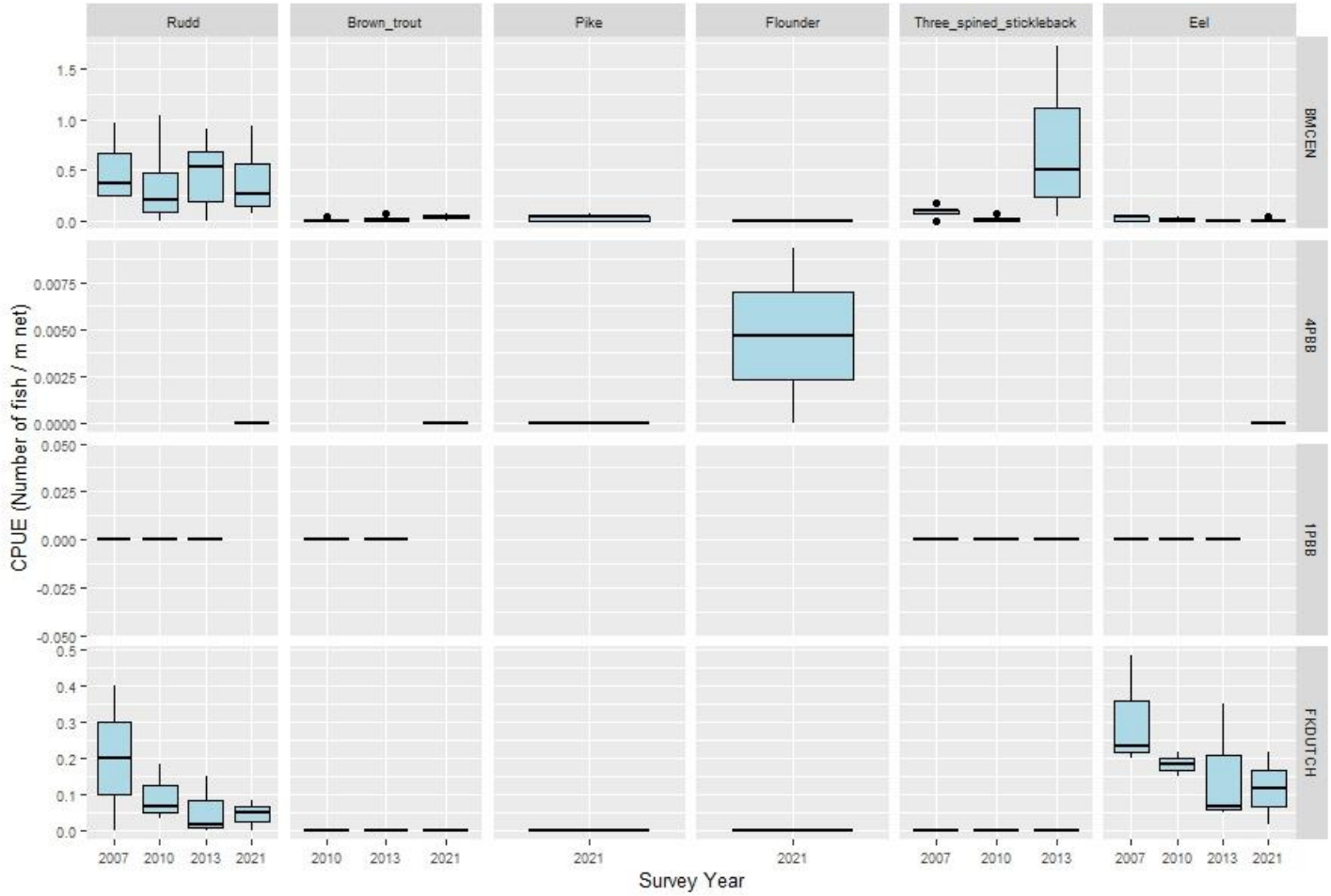

Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lough Aughrusbeg between 2007 and 2021. Figures are expressed as numbers of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles 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

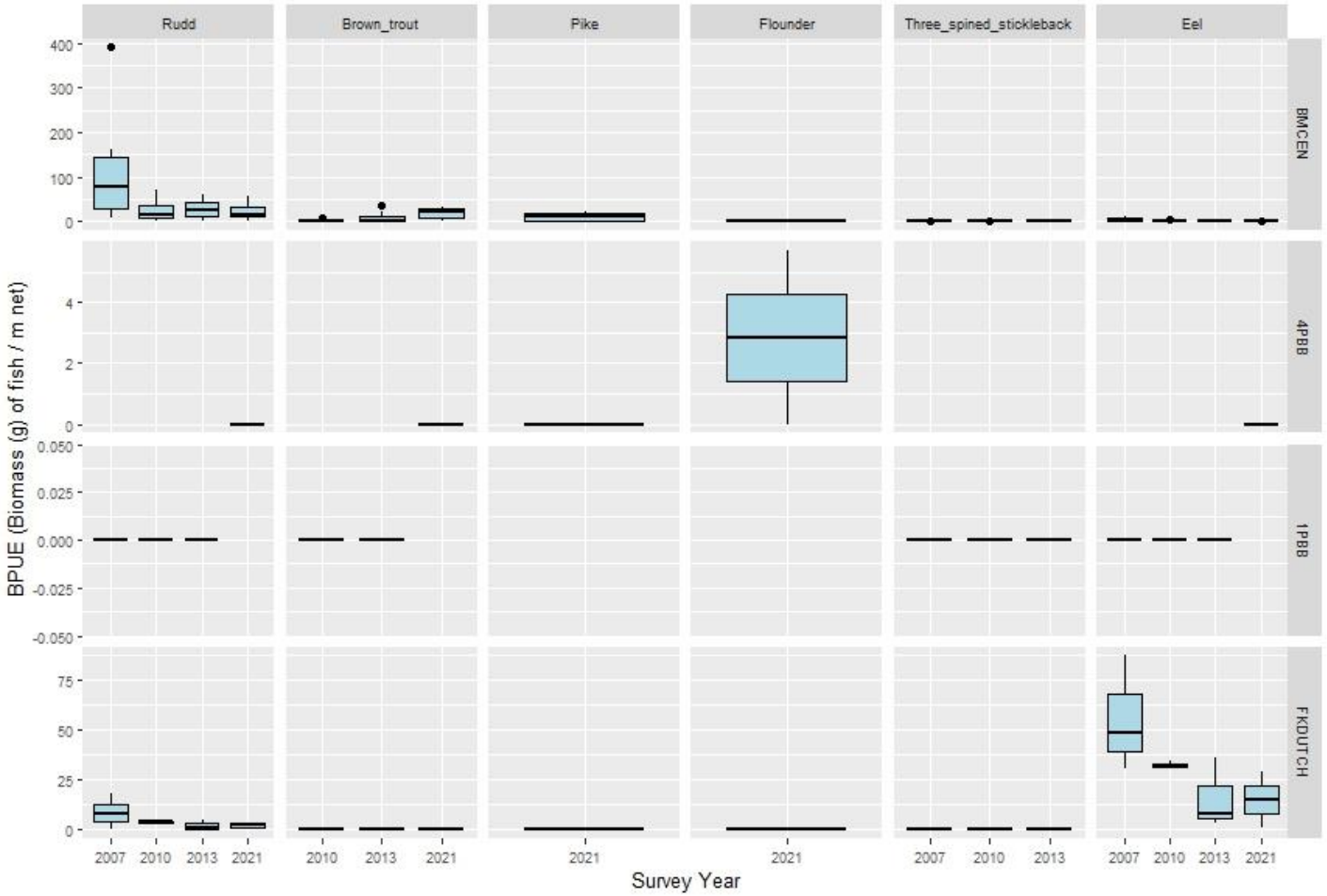

Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Aughrusbeg between 2007 and 2021. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles 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.

3.3. Length frequency distributions and growth

Rudd

Rudd captured during the 2021 survey ranged in length from 10.0cm to 21.2cm (mean = 14.8cm) and length range was similar across surveys conducted since 2007 (Figure 3.3). Seven year classes (2+ to 8+) were recorded in the sample of rudd aged and all intervening year classes were present. The rudd population was dominated by relatively old fish and 4+ and 5+ fish were the most abundant cohort aged (Table 3.3). This corresponds to the modal peak recorded between 14.0-15.0cm (Figure 3.3). However, no 0+ or 1+ rudd were captured in the survey, while 2+ fish were also poorly represented (Table 3.3).

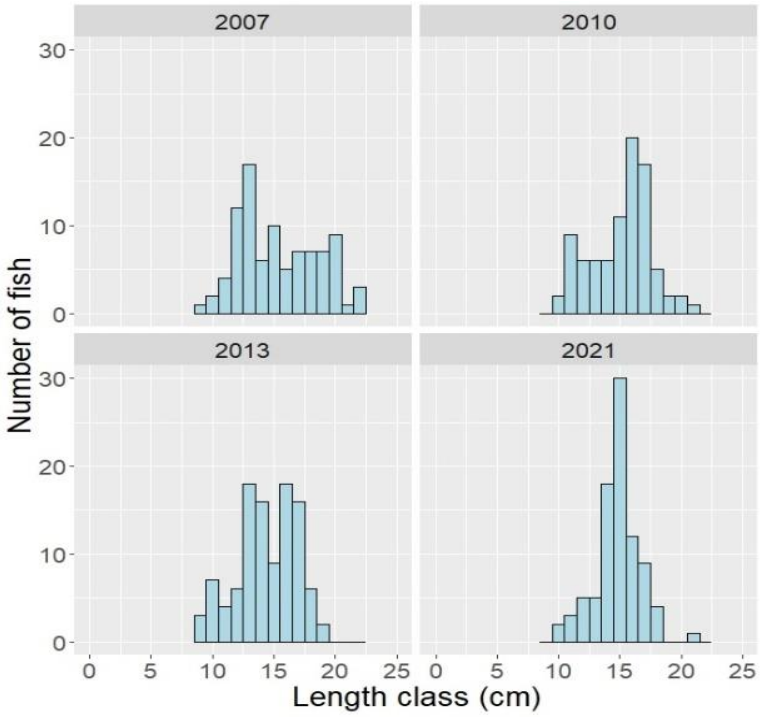

Figure. 3.3. Length frequency of rudd captured on Aughrusbeg Lough, 2007, 2010, 2013 and 2021

Table. 3.3. Summary age data from rudd captured on Aughrusbeg Lough, August 2021. Number (N) of fish and length ranges of all fish aged in the sample is presented

	Age Class								
	0+	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**
N	0	0	2	6	8	9	4	6	1
Mean L (cm)	-	-	10.2	11.4	13.3	15.3	16.9	17.8	21.2
Min L (cm)	-	-	10.0	10.8	12.3	14.1	16.6	17.0	-
Max L (cm)	-	-	10.4	12.1	15.5	16.4	17.5	18.4	-

Eels

Twenty-two eels were captured during the survey. They ranged in length from 31.5cm to 55.7cm (mean = 42.1cm)(Figure 3.4).

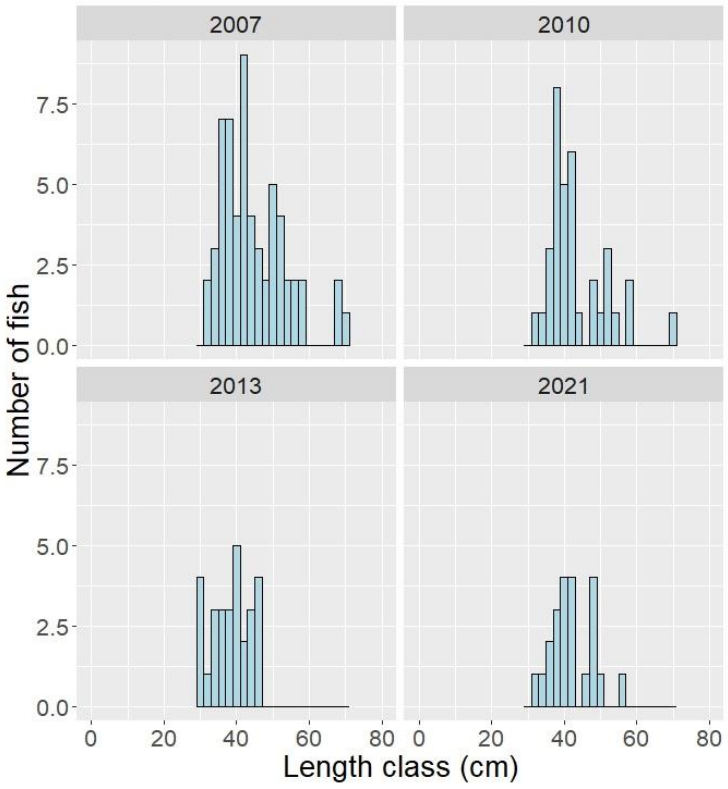

Figure. 3.4. Length frequency of European eel captured on Aughrusbeg Lough, 2007, 2010, 2013 and 2021

Brown trout

Seven brown trout captured during the 2021 survey ranged in length from 29.8cm to 45.0cm (mean = 35.9cm). All fish had mild deformations of the dorsal fin consistent with having been stocked. Six trout were available for aging. Five of these were aged at 2+ and ranged in length from 29.8 to 35.0cm. One larger fish measured 44.2cm and was aged at 4+.

Pike

Pike were recorded in Lough Aughrusbeg for the first time in the 2021 survey. Five individuals were captured. They ranged in length from 37.8 to 41.3cm. All pike were aged between 2+ and 3+.

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 pike and brown trout captured during the survey were examined and are presented below.

Pike

Five pike stomachs were examined, three of which were empty. Both remaining pike had consumed rudd.

Plate 3.3. Pike captured from Aughrusbeg Lough in August 2021, with digested rudd prey item. An intact rudd of similar size (15.0cm) is included for visual comparison.

Brown trout

Five brown trout stomach were examined. Four stomachs contained food. All of these were found to contain invertebrate prey items.

4. Summary

Rudd and eels were the dominant species with respect to CPUE and BPUE, with the latter species captured exclusively in fyke nets. Both species were prominent in other surveys of the lake conducted since 2007 (Kelly *et al*., 2014).

Previous surveys of the lake using similar methods, conducted since 2007 typically recorded few if any wild brown trout, while earlier surveys noted the paucity of natural recruitment (Gargan, 1994). The brown trout captured during the 2021 survey exhibited mild deformities of the dorsal fin consistent with recent stocking, and fish captured had a narrow length and size range, also consistent with recently stocked fish.

Pike were recorded on Lough Aughrusbeg for the first time during the 2021 survey. An opportunistic piscivore, pike will alter fish community structure in newly invaded lakes, and coexistence of pike and brown trout in small Irish lakes is unlikely (McLoone *et al*., 2018). The introduction of a novel piscivore will, therefore further limit natural brown trout recruitment in the lake.

Three-spined sticklebacks were recorded in the three previous lake surveys, but were not captured on this occasion. No three-spined stickleback were recorded in pike stomachs examined. Extirpation of native three-spined stickleback populations has been noted elsewhere (Patankar *et al*., 2006). However, it is not possible to say whether the apparent reduction in three-spined stickleback in the lake is as a direct consequence of the introduction of pike.

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) in order to make it fully WFD compliant, including producing EQR values for each lake and associated confidence in classification (Kelly *et al*., 2011b).

Using the FIL2 classification tool, Aughrusbeg Lough has been assigned an ecological status of Bad based on the fish populations present in 2021. In previous years the lake was also assigned Bad fish ecological status (2007 and 2010) and poor in 2013 (Fig. 4.1).

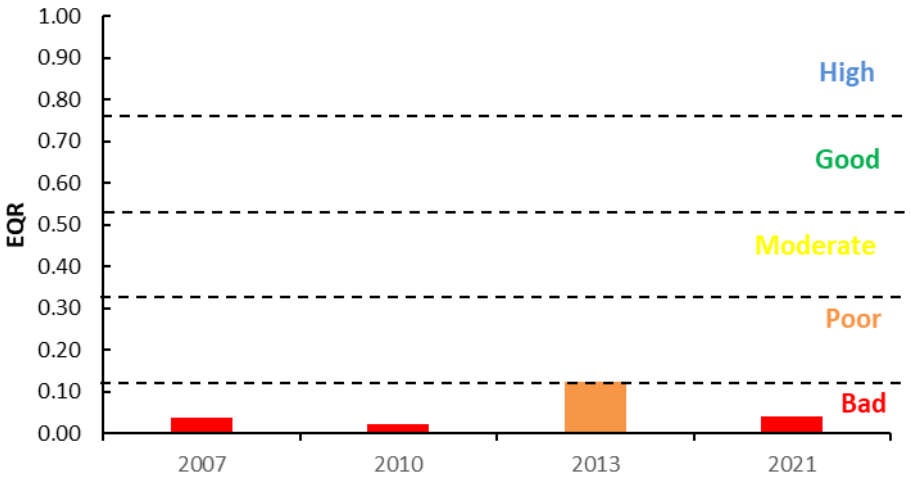

Fig. 4.1 Fish ecological status of Aughrusbeg Lough, 2007, 2010, 2013 and 2021

In the 2013 to 2018 surveillance monitoring reporting period, the EPA assigned Aughrusbeg Lough an overall draft ecological status of Poor, based on all monitored physico-chemical and biological elements, including fish.

5. References

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