

National Research Survey Programme

Lakes 2021

Lough Bunny

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Iascach Intíre Éireann
Inland Fisheries Ireland

Fish Stock Survey of Lough Bunny, September 2021



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National Research Survey Programme

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1. Introduction

Lough Bunney is located just within the boundary of the Burren National Park, approximately 8km from Corofin, County Clare (Plate 1.1, Figure 1.1). Lough Bunney has a surface area of 102ha, a mean depth of 2.7m and maximum depth of 14m. The lake is categorised as typology class 10 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃). The lake is situated in the “East Burren Complex” Special Area of Conservation; a large area that encompasses all of the high ground in the east Burren. A total of 12 different habitats listed on Annex I of the EU Habitats Directive exist within the SAC, including areas of limestone pavement, calcareous grasslands, heath scrub, woodlands and calcareous lakes and turloughs (NPWS, 2022). The site exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe. Some of the most extensive calcareous swamp fen communities in the country occur within this complex and especially around the shores of Lough Bunney. The shores of the lake are home to a number of important bird species (NPWS, 2022). The area also contains some ecologically sensitive habitats, including large areas of alkaline fen (Pybus *et al.*, 2003). Such vegetation is in serious decline in Europe and has been included in Annex I of the Habitats Directive (CEC, 1992).

Lough Bunney is a permanent lake and is believed to have been formed by the localised collapse of the underlying bedrock (Ragneborn-Tough *et al.*, 1999). The surrounding geology of the lake is composed of Upper Carboniferous limestone. While most of the lakes to the south of Lough Bunney are connected to the River Fergus by small streams Lough Bunney has no permanent over ground inflow or outflow. It is fed from springs and drains through sinkholes at the northern end of the lake (Ragneborn-Tough *et al.*, 1999).

Surveys conducted by the Inland Fisheries Trust in 1970 and 1980 reported stocks of pike, rudd and perch in the lake. Eels were also reported in the 1970 survey (IFT, 1980; IFI unpublished data).

The lake has been surveyed on three occasions since 2009 (2009, 2012 and 2015) (Kelly *et al.*, 2010, 2013 and 2016). A similar species composition has been recorded in the lake on each of the latter survey occasions, with perch and rudd being the dominant species recorded.

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 protocol is WFD compliant and also provides insight into fish stock status in the lake.



Plate 1.1. Lough Bunny

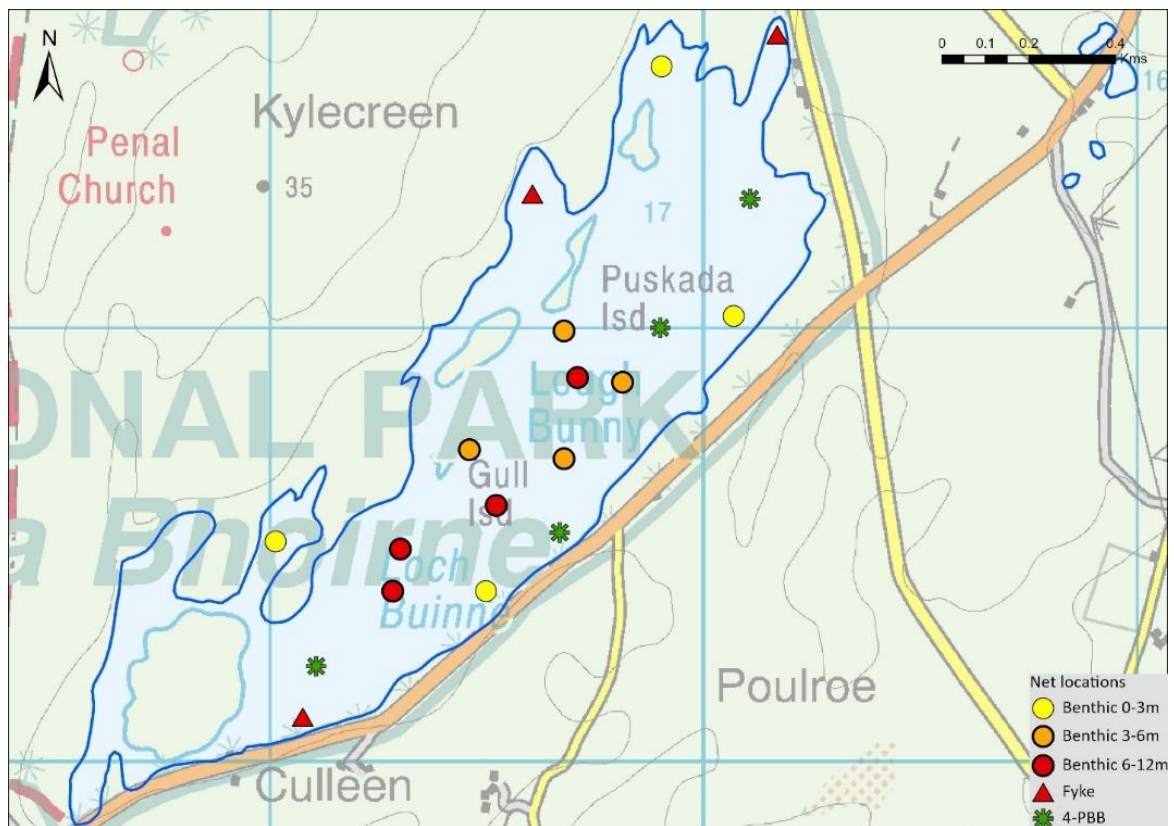


Figure 1.1. Location map of Lough Bunny showing locations and depths of each net.

2. Methods

2.1. Netting Methods

Lough Bunny was surveyed over two nights between the 14th and the 16th of September 2021. 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 and 4 @ 6-11.9m) were deployed randomly in the lake (15 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at four 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 subsample 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. 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

Five fish species were recorded on Lough Bunny in September 2021. A total of 228 fish were captured. The number of each species captured by each gear type is shown in Table 3.1. Rudd and perch were the most abundant species recorded. Pike, three-spined stickleback and eels were also captured (Table 3.1). Similar fish species compositions were recorded in previous surveys since 2009 (Kelly *et al.*, 2016).

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

Scientific name	Common name	Number of fish captured		
		BM CEN	Fyke	Total
<i>Perca fluviatilis</i>	Perch	110	0	110
<i>Scardinius erythrophthalmus</i>	Rudd	94	1	95
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0	21	21
<i>Esox lucius</i>	Pike	1	0	1
<i>Anguilla anguilla</i>	European eel	0	1	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. For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. In 2021, rudd and perch were the dominant fish species in terms of both abundance and biomass (Table 3.2 and Figures 3.1 and 3.2).

For comparison purposes box plots of CPUE and BPUE for each species captured in all surveys between 2006 and 2021 per net type are presented in Figures 3.1 and 3.2 respectively and illustrates fish community change over time. Perch and rudd have dominated catch across all survey years. Populations of both species have fluctuated but remain relatively stable across all survey occasions. An apparent upward trend in the rudd population (CPUE and BPUE) is influenced by the capture of higher numbers in the latter two surveys (i.e. 2015 and 2021) (Figures 3.1 and 3.2)

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

Scientific name	Common name	Mean CPUE (\pm S.E)	Mean BPUE (\pm S.E)
<i>Perca fluviatilis</i>	Perch	0.193 (0.071)	13.460 (7.345)
<i>Scardinius erythrophthalmus</i>	Rudd	0.166 (0.068)	9.633 (3.962)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.018 (0.018)	0.026 (0.026)
<i>Esox lucius</i>	Pike	0.002 (0.002)	0.024 (0.024)
<i>Anguilla anguilla</i> *	European eel*	0.006 (0.006)	1.171 (1.171)

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 2.1. Low water levels on Lough Bunny, September 2021

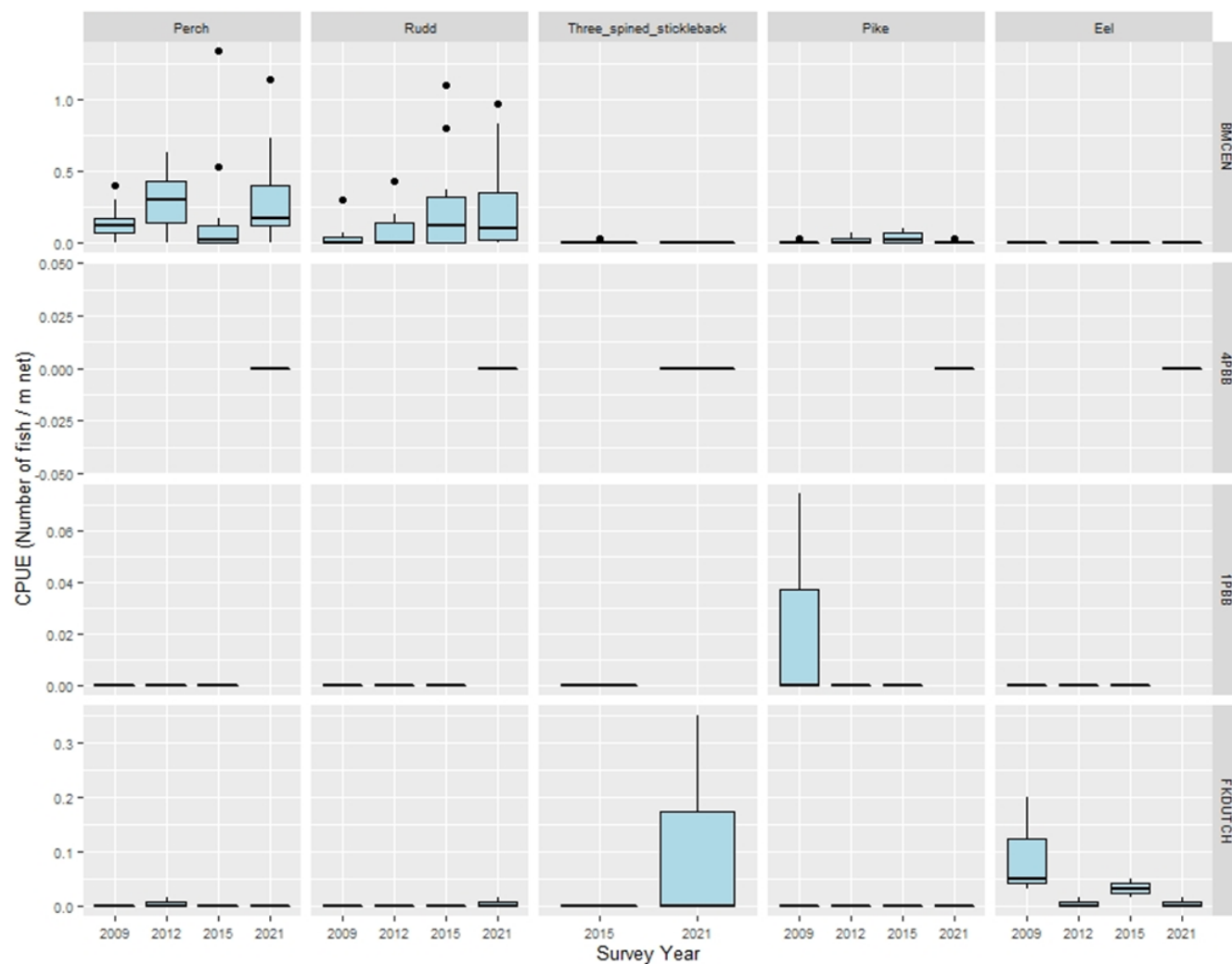


Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lough Bunny between 2009 and 2021. Figures are expressed as number of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles are 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.

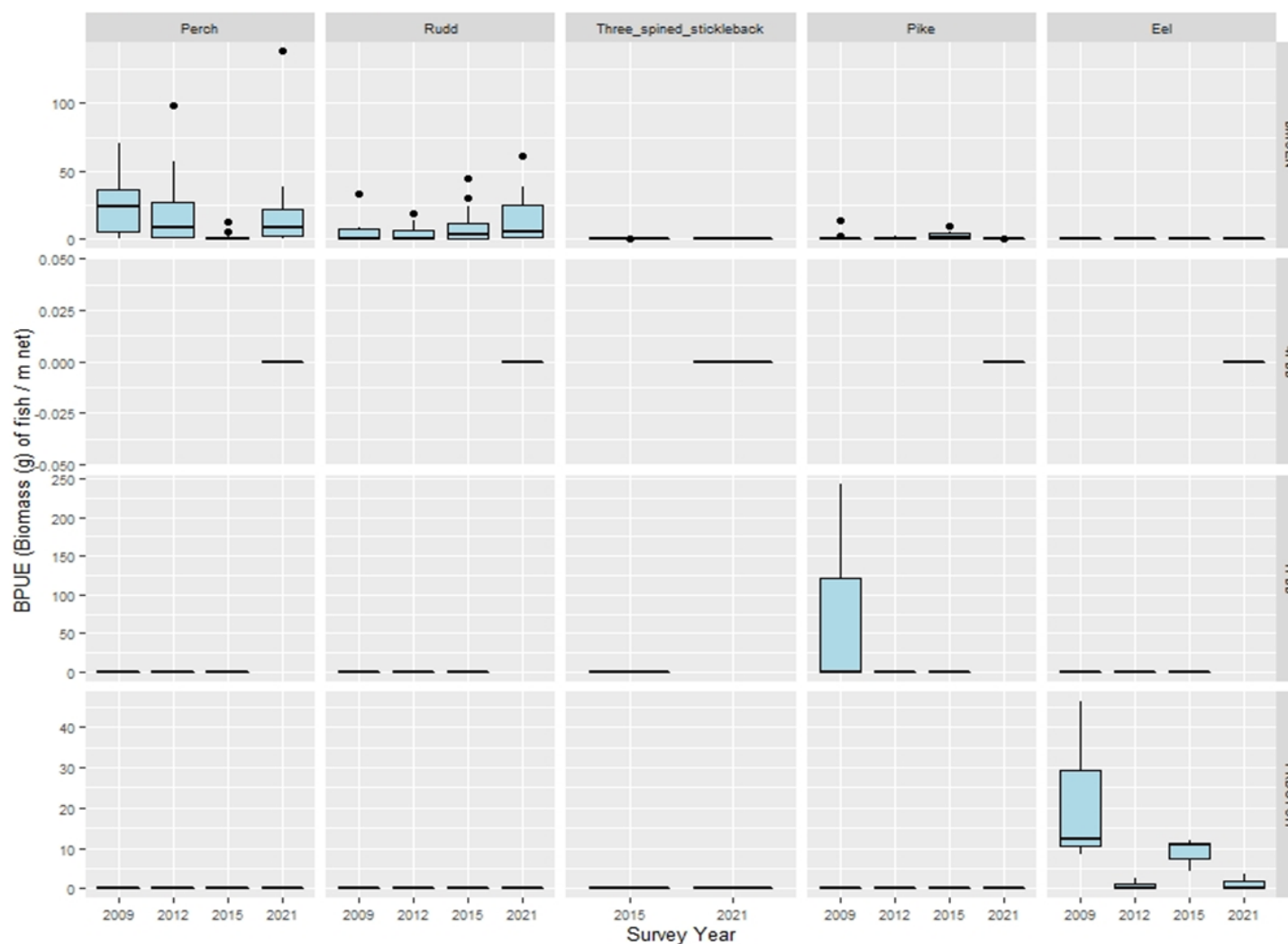


Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Buny between 2009 and 2021. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles 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 (CPUE) is unique for each net type.

3.3. Length frequency distributions and growth

Rudd

Rudd captured during the 2021 survey ranged in length from 4.7cm to 24.2cm (mean = 13.6cm). Length range was similar to that recorded in 2015, when a greater number of smaller rudd were captured in comparison to earlier surveys in 2009 and 2012 (Figure 3.3). Eight year classes (0+ to 7+) were recorded in the sample of rudd aged, and all intervening year classes were represented (Table 3.3). The most abundant cohort recorded in the sample was 2+ fish, corresponding to the modal peak around 10.0cm. Other age groups up to 5+ were also well represented, though few large or older (>20cm / 6+) fish were recorded (Figure 3.3).

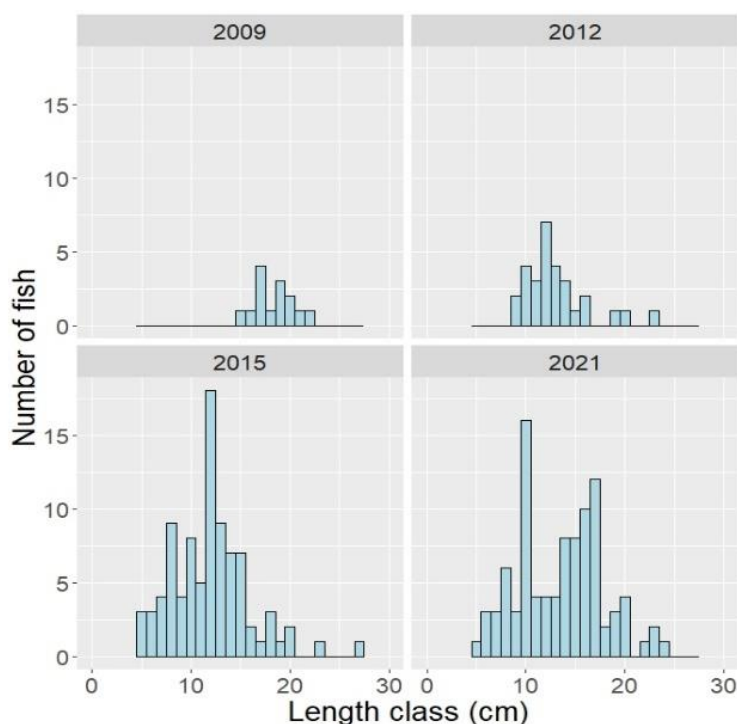


Fig. 3.3 Length frequency of rudd captured on Lough Bunny, 2009,2012, 2015 and 2021

Table 3.3 Summary age data from rudd captured on Lough Bunny, September 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+
N	1	9	13	10	9	9	2	1
Mean L (cm)	4.7	7.3	9.9	13.2	16.1	18.4	22.2	-
Min L (cm)	-	5.8	8.6	11.5	14.5	17.2	21.6	22.6
Max L (cm)	-	8.4	11.3	16.1	17.2	20.4	22.8	22.6

Perch

Perch captured during the 2021 survey ranged in length from 6.3cm to 28.8cm (mean = 13.4cm) (Figure 3.4). Mean length at the end of the 1st year (L1) was 6.4cm (Table 3.4). Perch ranged in age from 1+ to 7+ and all intervening age classes were represented in the sample aged. No 0+ or young of year perch were recorded in the survey. 1+ perch were the most abundant cohort in the sample aged (~7-9cm, Figure 3.4). Other strong year classes (i.e., 3+ and 5+) were also recorded in 2021, in contrast to the previous survey (2015), when few perch greater than 10.0cm were recorded (Figure 3.4).

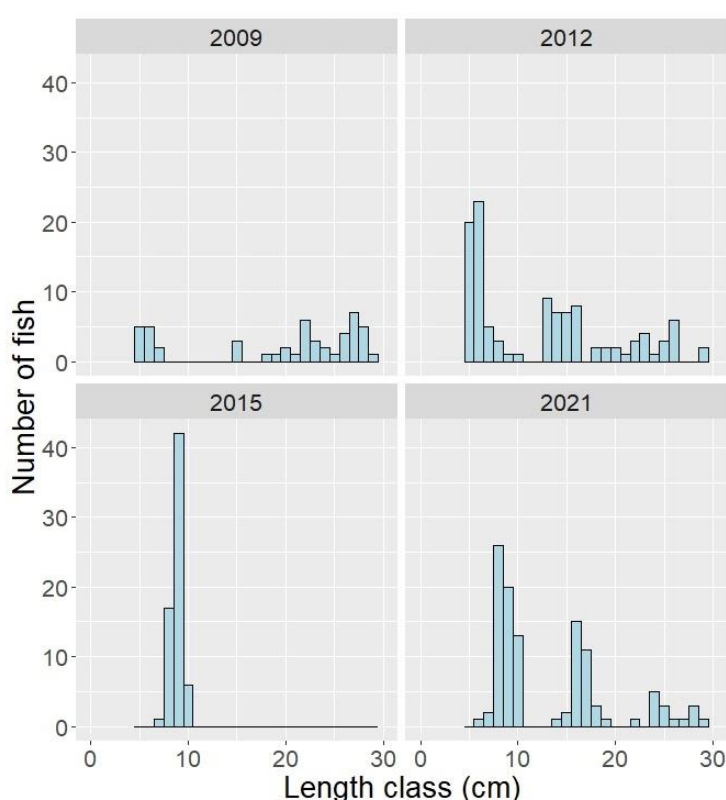


Fig. 3.4 Length frequency of perch captured on Lough Bunny, 2021

Table 3.4 Mean (\pm S.E.) length (cm) at age of perch captured on Lough Bunny, September 2021

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇
Mean (\pm S.E.)	6.4 (0.2)	11.2 (0.3)	16.3 (0.3)	20.4 (0.7)	24.4 (0.6)	25.8 (0.6)	27.4 (0.1)
N	58	45	38	21	15	3	2
Range	3.7-8.9	7.7-15.8	12-21.5	14-25.1	18.5-28.5	24.3-24.6	27.3-27.5

Other fish species

Twenty-one three-spined stickleback were captured. They ranged in length from 1.5cm to 3.0cm (mean = 2.9cm). One eel, measuring 49.0cm and a single pike of 12.6cm was captured. The pike was a young of year juvenile (0+).

4. Summary and ecological status

Rudd and perch were the dominant species in terms of both abundance (CPUE) and biomass (BPUE) captured in the 2021 survey. Both species have each been recruiting regularly in the lake, with several strong year classes present in populations of both species. While no 0+ or young of the year perch were recorded in 2021, the presence of several strong year classes contrasts with results of the previous survey conducted in 2015, when the perch populations was strongly dominated by small individuals, and larger fish were largely absent.

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.*, 2012).

Using the FIL2 classification tool, Lough Bunny has been assigned an ecological status of Good based on the fish populations present in 2021. In previous years the lake was assigned Good fish ecological status in 2009, High in 2012 and Moderate in 2015 (Figure 4..1).

In the 2013 to 2018 surveillance monitoring reporting period, the EPA assigned Lough Bunny an overall ecological status of Good, based on all monitored physico-chemical and biological elements, including fish. This overall status classification will be revised during 2022.

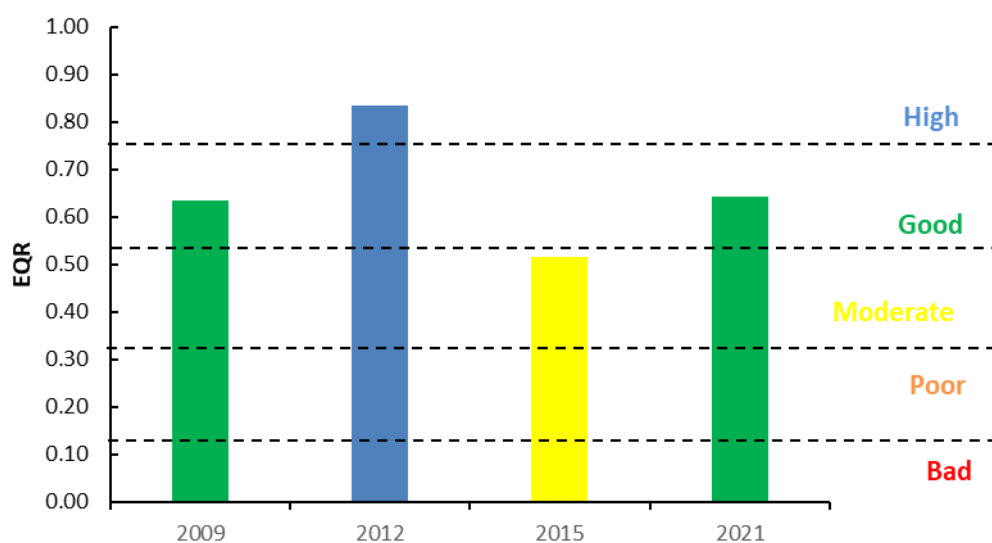


Figure. 4.1. Fish ecological status of Lough Bunny, 2009 to 2021.

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