

# National Research Survey Programme

## Lakes 2021

### Lough Cullaun

IFI/2022/1-4604



Iascach Intíre Éireann  
Inland Fisheries Ireland

# **Fish Stock Survey of Lough Cullaun, August 2021**



**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., Gavin, A., Gordon, P., McCarthy, E., Twomey, C., Burke, E., Matson, R., Robson, S., Duffy, P., Donovan, R. and Kelly, F.L. (2022) Fish Stock Survey of Lough Cullaun, August 2021. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cover photo: Upper Lake, Killarney © Inland Fisheries Ireland

© Inland Fisheries Ireland 2022

## 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 programme from the Department of Housing, Local Government and Heritage and Department of Communications, Climate Action and Environment for 2022.

*The report includes Ordnance Survey Ireland data reproduced under OSi Copyright Permit No. MP 007508.*

*Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.*

*© Ordnance Survey Ireland, 2022.*

## 1. Introduction

Lough Cullaun is located approximately 4km from Corrofin, Co.Clare and forms part of the “East Burren Complex” Special Area of Conservation (SAC) (NPWS, 2018) (Plate 1.1, Figure 1.1). The East Burren Complex SAC is a large area that encompasses all the high ground in the east Burren. A total of 12 different habitats listed on Annex I of the EU Habitats Directive are present in the SAC, including areas of limestone pavement, calcareous grasslands, heath scrub, woodlands and calcareous lakes and turloughs (NPWS, 2018). The site exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe. The shores of Lough Cullaun are also home to a number of important bird species (NPWS, 2018).

Lough Cullaun is a shallow lake that has excellent water clarity as it flows from the Burren (O'Reilly, 2007). The lake has a surface area of 25ha and a mean depth of 6.7m. Lough Cullaun lies in a rich and productive limestone area which produces high quality fish (ShIRBD, 2009). The lake is categorised as typology class 11 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), less than 50ha and of high alkalinity (>100 mg/l CaCO<sub>3</sub>).

It is primarily a coarse fishery (ShIRBD, 2009) but also holds brown trout which have an average weight of less than one kilogram (O'Reilly, 2007). Pike, tench, roach, bream, rudd, perch and eel have all been previously reported from the lake (ShIRBD, 2009).

The lake has been surveyed on three occasions since 2009 (Kelly *et al.*, 2010, 2013 and 2016). In those most recent surveys, perch were the dominant species recorded in the surveys. Other species captured included rudd, pike, brown trout and eel.

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 Cullaun, August 2021

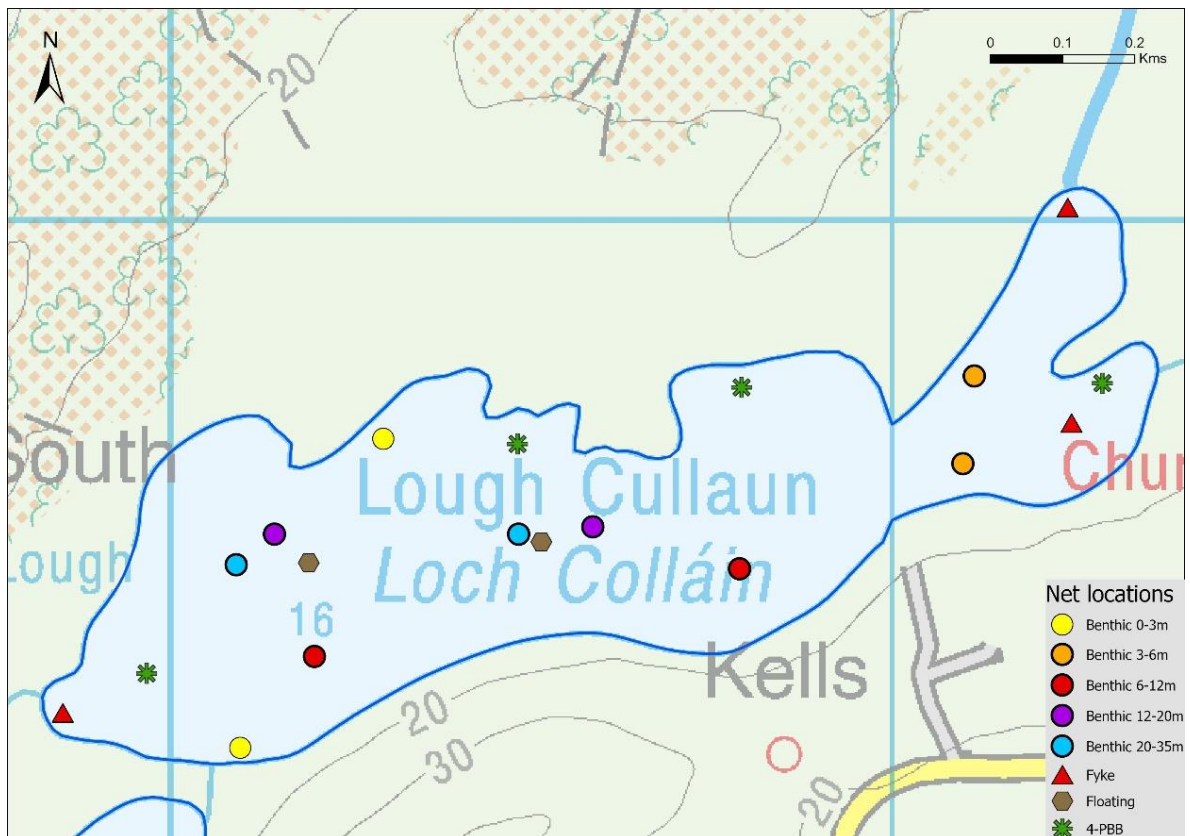


Figure 1.1. Location map of Lough Cullaun showing survey net locations.

## **2. Methods**

### **2.2. Netting methods**

Lough Cullaun was surveyed over one night on the 16<sup>th</sup> of August 2021. A total of three sets of Dutch fyke nets, ten benthic monofilament multi-mesh (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (BM CEN) (2 @ 0-2.9m, 2 @ 3-5.9m, 2 @ 6-11.9m, 2 @ 12-19.9m and 2 @ 20-34.9m) and two surface monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets were deployed randomly in the lake (15 sites) (Fig. 1.1). 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 (Fig. 1.1). 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.

### **2.3. 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

Six fish species were recorded on Lough Cullaun in August 2021. A total of 255 fish were captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most abundant fish species recorded. Rudd, pike, eels, brown trout and tench were also recorded. While tench were known to be present in Lough Cullaun, this was the first occasion that they were recorded during fish stock surveys of the lake.

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

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	4-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	206	0	1	6	213
<i>Scardinius erythrophthalmus</i>	Rudd	15	7	0	4	26
<i>Esox lucius</i>	Pike	2	0	1	2	5
<i>Salmo trutta</i>	Brown trout	0	1	0	0	1
<i>Tinca tinca</i>	Tench	0	0	0	1	1
<i>Anguilla anguilla</i> *	European eel	0	0	0	9	9

#### 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 (WFD and WFD+). For all fish species except eel, CPUE/BPUE is based on all nets, whereas eel CPUE/BPUE is based on fyke nets only. Perch was the dominant fish species in terms of abundance and biomass in 2021 (Table 3.2).

For comparison purposes CPUE and BPUE for each species captured in all surveys per net type between 2009 and 2021 are presented in Figures 3.1 and 3.2. respectively and illustrates fish community change over time. Perch have dominated fish stocks across all surveys of the lake. While numbers captured have varied, no clear trends are apparent. Catches of eel in fyke nets have been

lower in the latter surveys (i.e. 2012, 2015 and 2021) compared to the initial survey in 2009 (Fig. 3.1 and 3.2).

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

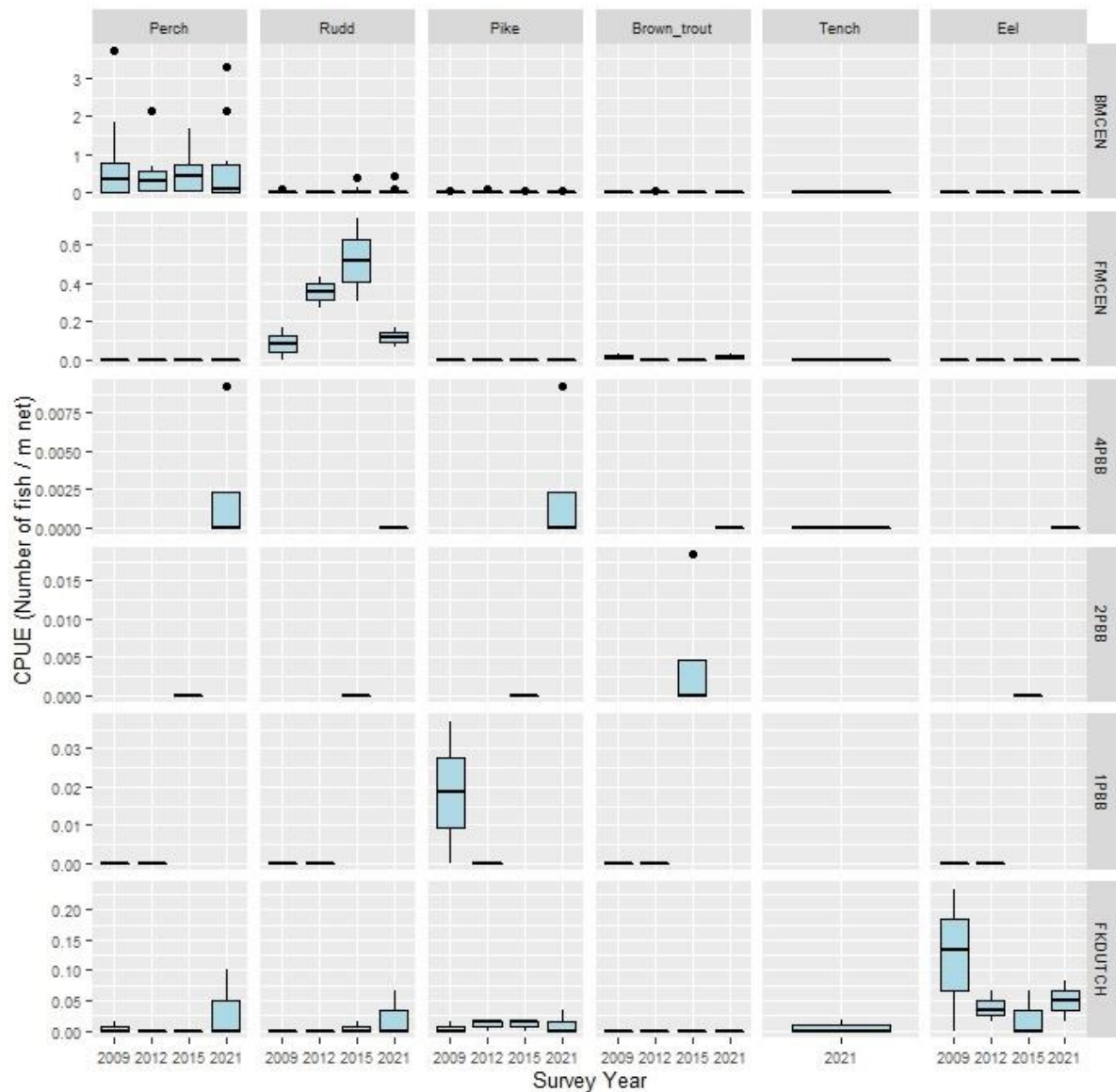
Scientific name	Common name	Mean CPUE ( $\pm$ S.E)	Mean BPUE ( $\pm$ S.E)
<i>Perca fluviatilis</i>	Perch	0.367 (0.201)	8.862 (4.721)
<i>Scardinius erythrophthalmus</i>	Rudd	0.042 (0.024)	1.437 (0.947)
<i>Esox lucius</i>	Pike	0.006 (0.003)	2.871 (1.905)
<i>Salmo trutta</i>	Brown trout	0.002 (0.002)	0.207 (0.207)
<i>Tinca tinca</i>	Tench	0.001 (0.001)	0.918 (0.918)
<i>Anguilla anguilla</i> *	European eel	0.050 (0.019)	14.503 (5.189)

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

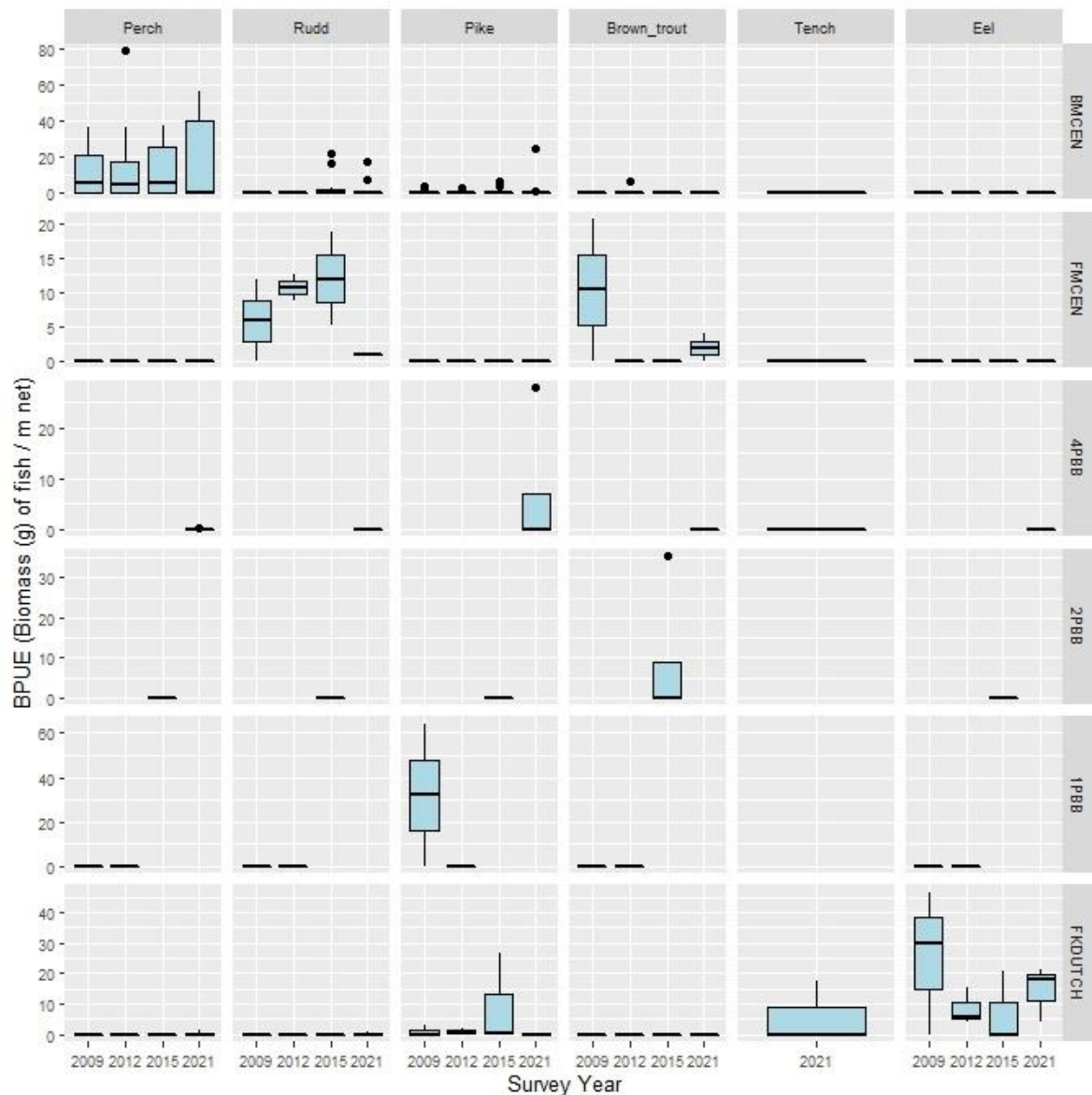


**Plate 3.1. Setting fyke nets (Dutch Fyke) on Lough Cullaun in August 2021**





**Figure 3.1. CPUE of all fish species captured in each net type during surveys of Lough Cullaun 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 75<sup>th</sup> and 25<sup>th</sup> 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.**

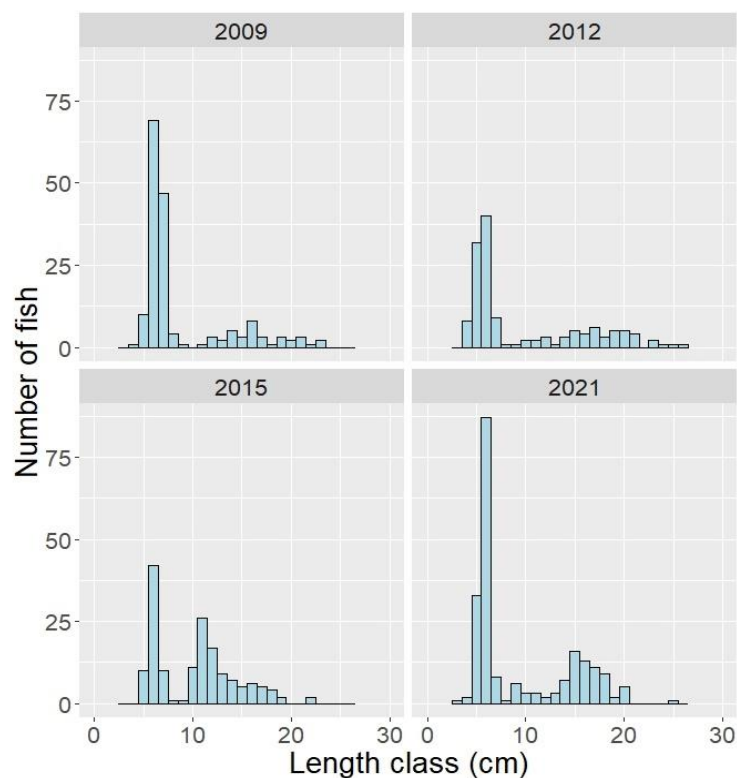


**Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Alewnaghta between 2009 and 2021. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75<sup>th</sup> and 25<sup>th</sup> 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

#### Perch

Perch captured during the 2021 survey ranged in length from 3.1cm to 25.5cm (mean = 9.4cm) (Fig. 3.3). Mean length at the end of the 1st year (L1) was 6.5cm (Table 3.3). Perch in the sample ranged in age from 0+ to 5+ and all intervening ages classes were present. The population was dominated by small young of year individuals (c. 5cm - 6cm, Fig. 3.3) in common with previous surveys of the lake. However, the proportion of older and larger fish was greater in 2021 compared to previous surveys.



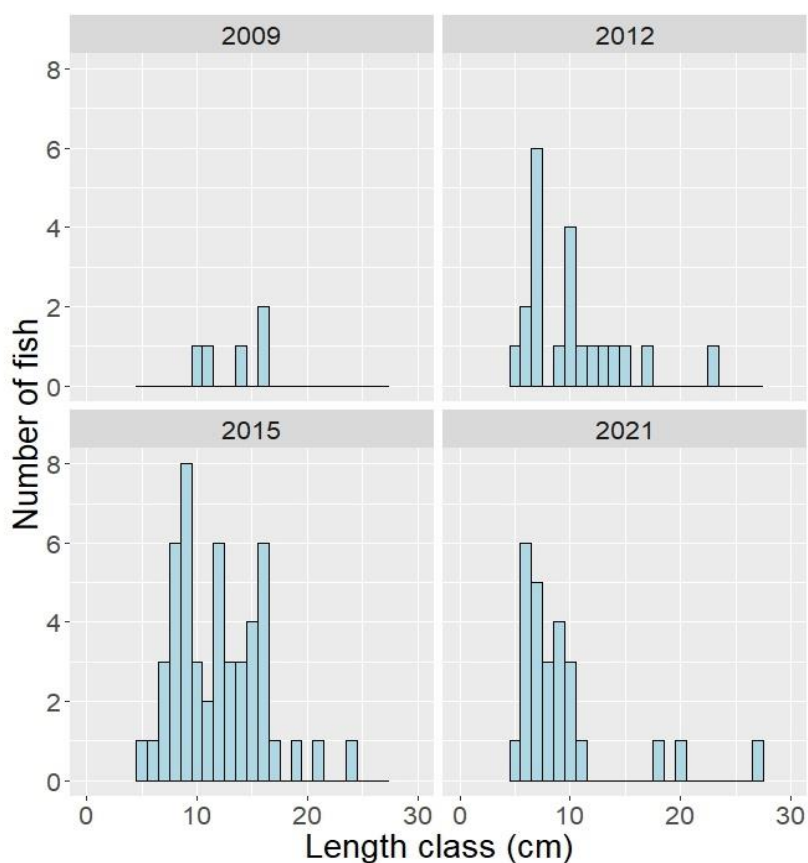
**Figure 3.3. Length frequency of perch captured on Lough Cullaun, 2021**

**Table 3.3. Mean ( $\pm$ S.E.) perch length (cm) at age for Lough Cullaun, August 2021**

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>
Mean ( $\pm$ S.E.)	6.5 (0.2)	11.9 (0.2)	16.1 (0.3)	18.4 (0.7)	20.8 (2.9)
N	53	41	23	6	2
Range	4.5-8.7	10.1-14.5	13.8-18.8	15.9-20.4	17.9-23.7

## **Rudd**

Rudd captured during the 2021 survey ranged in length from 5.0cm to 27.5cm (mean = 9.5cm) (Fig. 3.4). Six year classes were present (0+ to 7+) in the sample of rudd aged (Table 3.4). The population was dominated by smaller and younger fish and the dominant age class was 1+. Few rudd greater than 10.0cm were recorded in 2021 (Figure 3.4).



**Figure 3.4. Length frequency of rudd captured on Lough Cullaun, 2021**

**Table 3.4. Summary age data from rudd captured on Lough Cullaun, August 2021. Number of fish and length ranges of all fish aged in the sample is presented**

	Age Class							
	0+	1+	2+	3+	4+	5+	6+	7+
<b>N</b>	1	12	5	0	1	1	0	1
<b>Mean L (cm)</b>	5.0	6.9	9.7	-	18.4	20.2	-	-
<b>Min L (cm)</b>	-	5.7	8.7	-	-	-	-	27.5
<b>Max L (cm)</b>	-	7.8	11.2	-	-	-	-	27.5

### **Other Species**

Nine eels were captured during the survey. They ranged in length from 46.5cm to 66.0cm. Mean length was 55.7cm. Five pike captured ranged in length from 12.2cm to 73.5cm (mean = 33.0cm). One tench and one brown trout were captured during the survey. They measured 37.4cm and 21.2cm respectively.

## **4. Summary and ecological status**

Perch was the dominant species in terms of abundance (CPUE) and biomass during the 2021 survey.

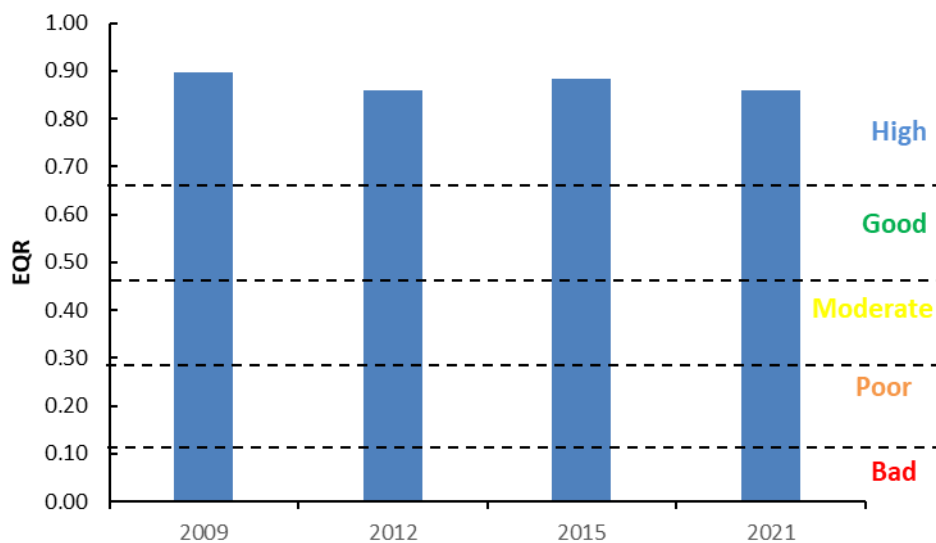
Perch ranged in length from 3.1cm to 25.5cm and ranged in age from 0+ to 5+. All intervening age classes were present indicating that this species has been recruiting regularly in the lake.

Rudd ranged in length from 5.0cm to 27.5cm and ranged in age from 0+ to 7+. The population was dominated by younger fish, and 1+ fish were the most abundant age group. In contrast, fewer older fish (>3+) were recorded during the survey

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 Cullaun has been assigned an ecological status of High based on the fish populations present in 2021 (Fig. 3.5). In previous years the lake was also assigned High fish ecological status (Fig. 4.1).

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



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

## 5. References

- Amundsen, P.A., Gabler H.M., 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.
- 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., Harrison A., Connor, L., Matson, R., Morrissey, E., O’Callaghan, R., Wogerbauer, C., Feeney, R., Hanna, G. and Rocks, K. (2010) *Sampling Fish for the Water Framework Directive – Summary Report 2009*. The Central and Regional Fisheries Boards.
- Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- Kelly, F., Connor, L., Matson, R., Feeney, R., Morrissey, E., Wogerbauer, C. and Rocks, K. (2013) *Sampling Fish for the Water Framework Directive – Summary Report 2012*. Inland Fisheries Ireland.



Kelly, F.L., Connor, L., Delanty, K., McLoone P., Coyne, J., Morrissey, E., Corcoran, W., Cierpial, D., Matson, R., Gordon, P., O' Briain, R., Rocks, K., Walsh L., O'Reilly, S., O'Callaghan, R., Cooney, R. and Timbs, D. (2016) Fish Stock Survey of Lough Cullaun, August 2015. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Kennedy, M. and Fitzmaurice, P. (1971) Growth and Food of Brown Trout *Salmo Trutta* (L.) in Irish Waters. *Proceedings of the Royal Irish Academy*, **71 (B) (18)**, 269-352.

NPWS (2018) *Site Synopsis: East Burren Complex. Site Code: 001926*. Site Synopsis report, National Parks and Wildlife Service.

<https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF001926.pdf>.

O' Reilly, P. (2007) *Loughs of Ireland. A Flyfisher's Guide. 4<sup>th</sup> Edition*. Merlin Unwin Books.

ShIRBD (2009) <http://www.shannon-fishery-board.ie/guides/coarse/corofin-loughcullaun.htm>

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

**[www.fisheriesireland.ie](http://www.fisheriesireland.ie)  
[info@fisheriesireland.ie](mailto:info@fisheriesireland.ie)**

**+353 1 8842 600**

