

National Research Survey Programme

Lakes 2021

Lough Alewnaghta

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Iascach Intíre Éireann
Inland Fisheries Ireland

**Fish Stock Survey of Lough Alewnaghta,
September 2021**



**Iascach Intíre Éireann
Inland Fisheries Ireland**

National Research Survey Programme

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

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1. Introduction

Lough Alewnaghta is located north of the town of Whitegate, Co. Clare, close to the western shore of Lough Derg (Plate 1.1, Figure 1.1). It has a surface area of 54ha, a mean depth of <4m and a maximum depth of approximately 4.5m. The Derrainy River is the main stream flowing into the lake. Lough Alewnaghta is connected to Lough Derg by its outflow, which is navigable and discharges directly into Lough Derg close to Rinbarra Point on the western shore of the lake (Figure 1.1).

Lough Alewnaghta is categorised as typology class 6 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and moderate alkalinity (20-100mg/l CaCO₃). The geology in the area consists of sandstone and limestone. The ecological status of the lake is classified as bad and WFD Risk as 'at risk' (EPA, 2021). This is driven by results of previous fish stock assessments on the lake and other parameters. The lake has been surveyed on three occasions since 2009 (2009, 2012 and 2015) (Kelly *et al.*, 2010, Kelly *et al.*, 2013 and Kelly *et al.*, 2016). During the previous surveys, perch and roach were the dominant species present in the lake. Roach x bream hybrids, pike, tench and eels were also captured during these surveys.

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 Alewnaghta, September 2021

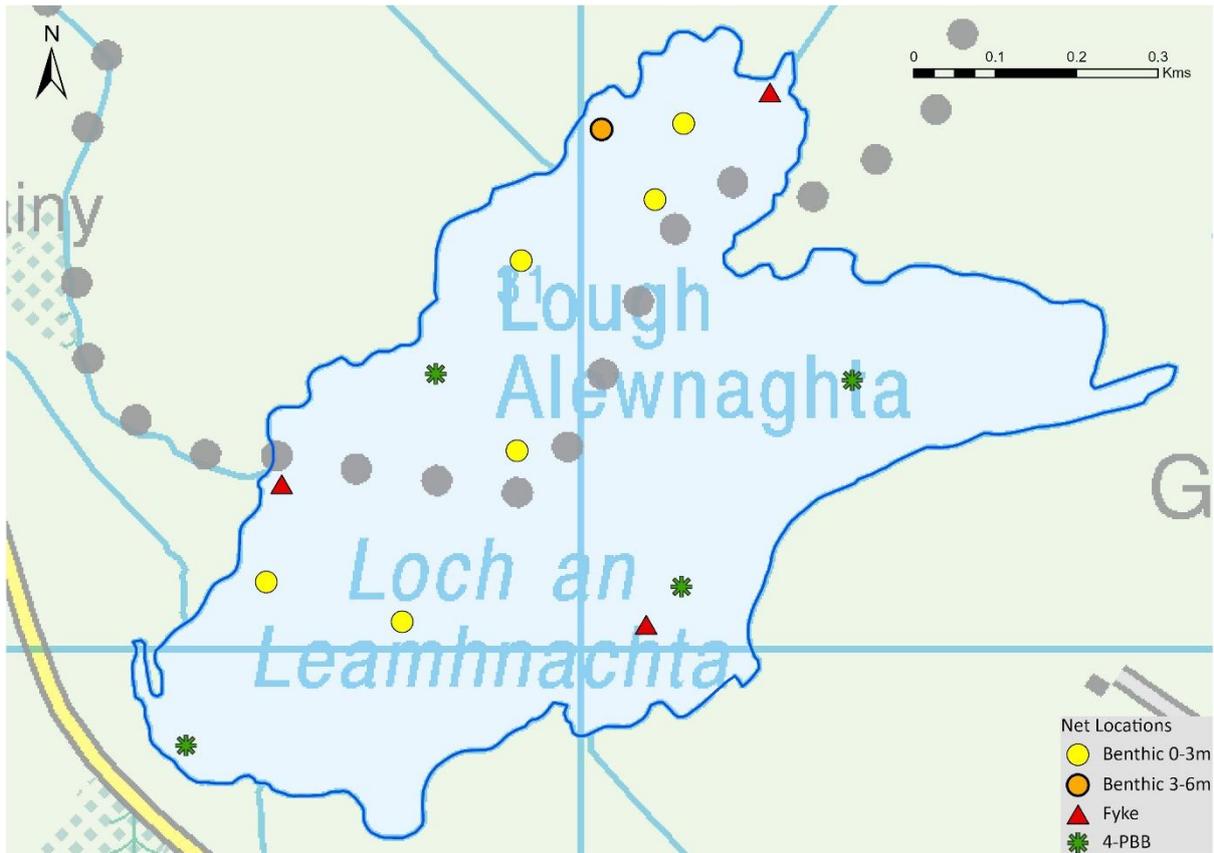


Figure 1.1. Location map of Lough Alewnaghta showing locations and depths of each net

2. Methods

Lough Alewnaghta was surveyed over two nights between the 14th and the 16th of September 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 (6 @ 0-2.9m and 1 @ 3-5.9m) were deployed in the lake (10 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 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).

$$FO_i = \left(\frac{N_i}{N} \right) * 100$$

Where:

FO_i is the percentage frequency of prey item i ,

N_i is the number of fish with prey i in their stomach,

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

Seven fish species and one type of hybrid were recorded on Lough Alewnaghta in September 2021. A total of 584 fish were captured. The number of each species captured by each gear type is shown in Table 3.1. Roach and perch were the most abundant fish species recorded in the 2021 survey. Large numbers of roach x bream hybrids were also captured. Bream, tench, pike, rudd and eels were also recorded. A similar species mix was recorded on previous sampling occasions.

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
<i>Rutilus rutilus</i>	Roach	218	4	0	222
<i>Perca fluviatilis</i>	Perch	178	0	0	178
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	73	77	0	150
<i>Tinca tinca</i>	Tench	0	13	1	14
<i>Esox lucius</i>	Pike	4	3	0	7
<i>Scardinius erythrothalmus</i>	Rudd	4	0	0	4
<i>Abramis brama</i>	Bream	0	6	0	6
<i>Anguilla anguilla</i>	European eel	0	0	3	3

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 roach and perch were the dominant fish species in terms of abundance. Roach x bream hybrids, which were also captured in large numbers were dominant in terms of biomass (Table 3.2).

For comparison purposes box plots of 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. Roach and its hybrid show trends in increasing abundance and biomass, while fewer perch were captured in 2021 compared to earlier surveys (Figures 3.1 and 3.2).

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

Scientific name	Common name	Mean CPUE (\pm S.E) **	Mean BPUE (\pm S.E) **
<i>Rutilus rutilus</i>	Roach	0.522 (0.177)	39.850 (14.373)
<i>Perca fluviatilis</i>	Perch	0.424 (0.143)	7.001 (2.528)
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	0.225 (0.043)	93.627 (17.165)
<i>Tinca tinca</i>	Tench	0.012 (0.004)	7.191 (2.715)
<i>Esox lucius</i>	Pike	0.010 (0.005)	1.110 (0.729)
<i>Scardinius erythrothalmus</i>	Rudd	0.010 (0.004)	13.295 (6.773)
<i>Abramis brama</i>	Bream	0.004 (0.003)	3.261 (1.846)
* <i>Anguilla anguilla</i>	European eel	0.017 (0.010)	5.078 (2.826)

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 Releasing a tench captured on Lough Alewnaghta in August 2021

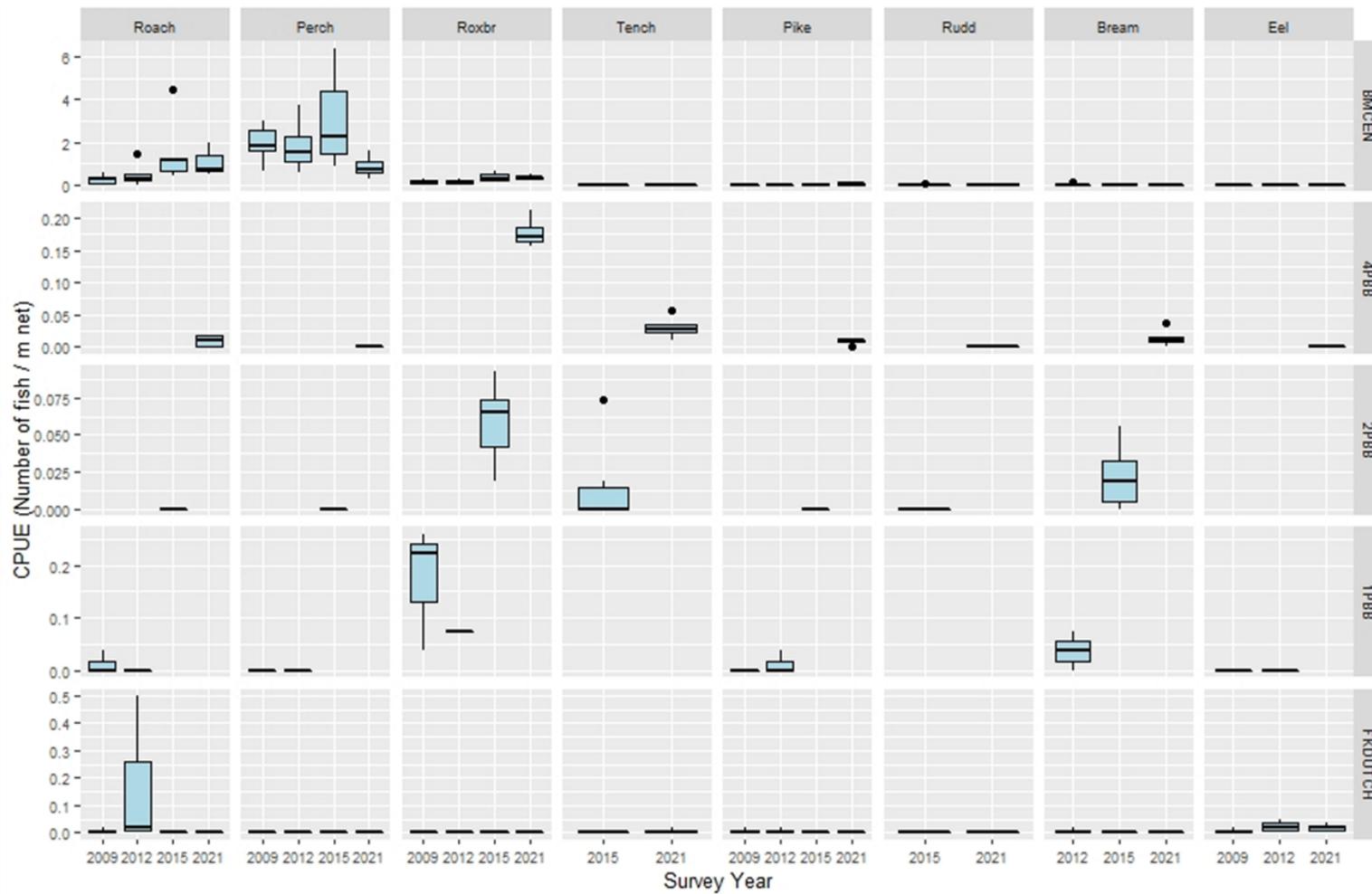


Figure 3.1 CPUE of all fish species captured in each net type during surveys of Lough Alewnaghta between 2009 and 2021. Figures are expressed as number of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles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

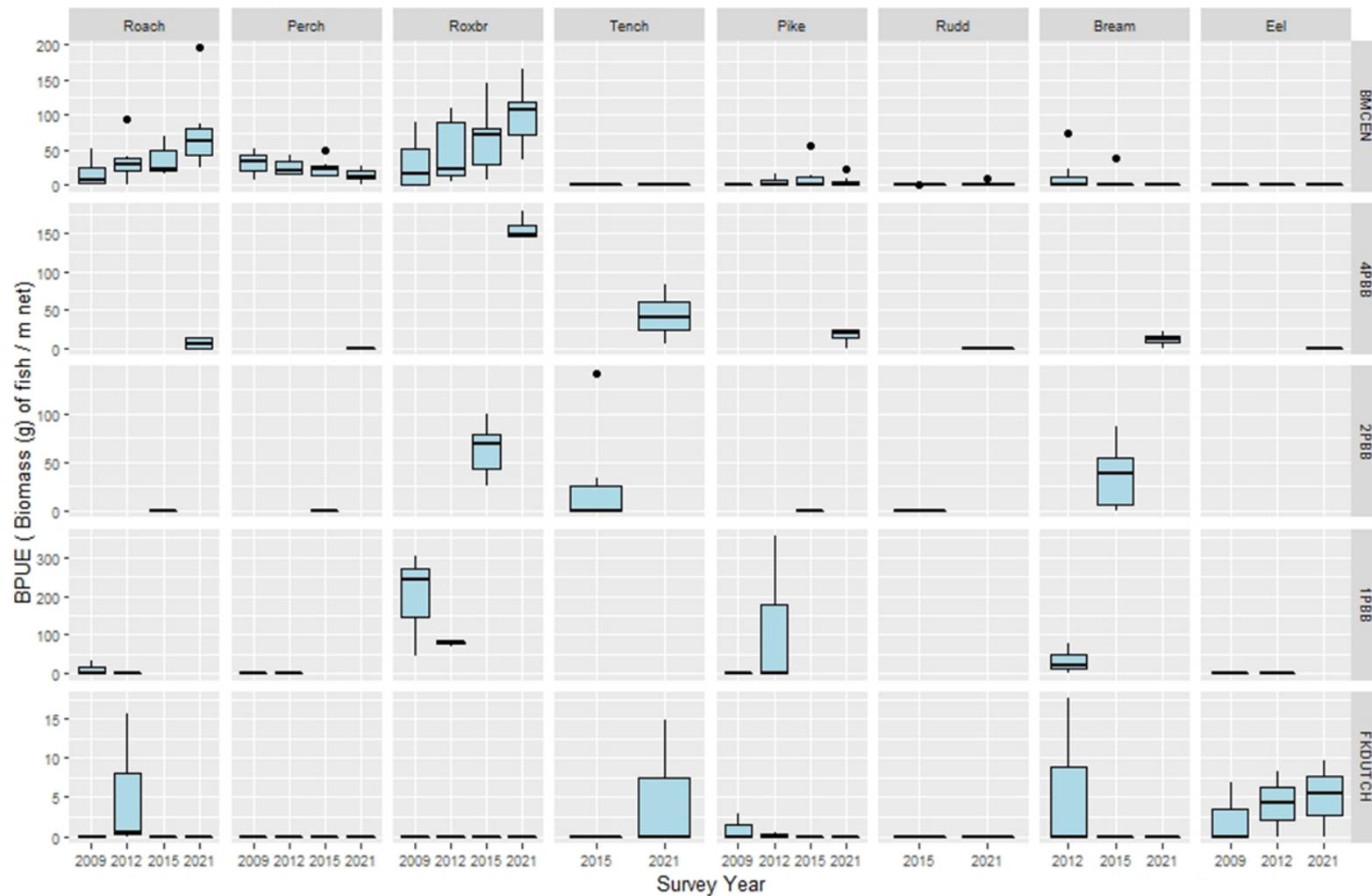


Figure 3.2. BPUE of all fish species captured in each net type during surveys of Lough Alewnaghta between 2009 and 2021. Figures are expressed as biomass (g) of fish captured per linear meter of net deployed. The horizontal bars represent the median value of the sample, while the 75th and 25th percentiles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

Roach

Roach captured during the 2021 survey ranged in length from 4.0cm to 34.1cm (mean = 19.6cm). There were a greater proportion of larger sized roach (i.e.> 20cm) captured in 2021 compared to earlier surveys (Figure 3.3). Roach were aged between 1+ and 10+ and all intervening age classes were present in the sample aged. The largest age class was 2+ (c 7-11cm) and all age classes between 2+ and 6+ were well represented in the sample aged (Table 3.3).

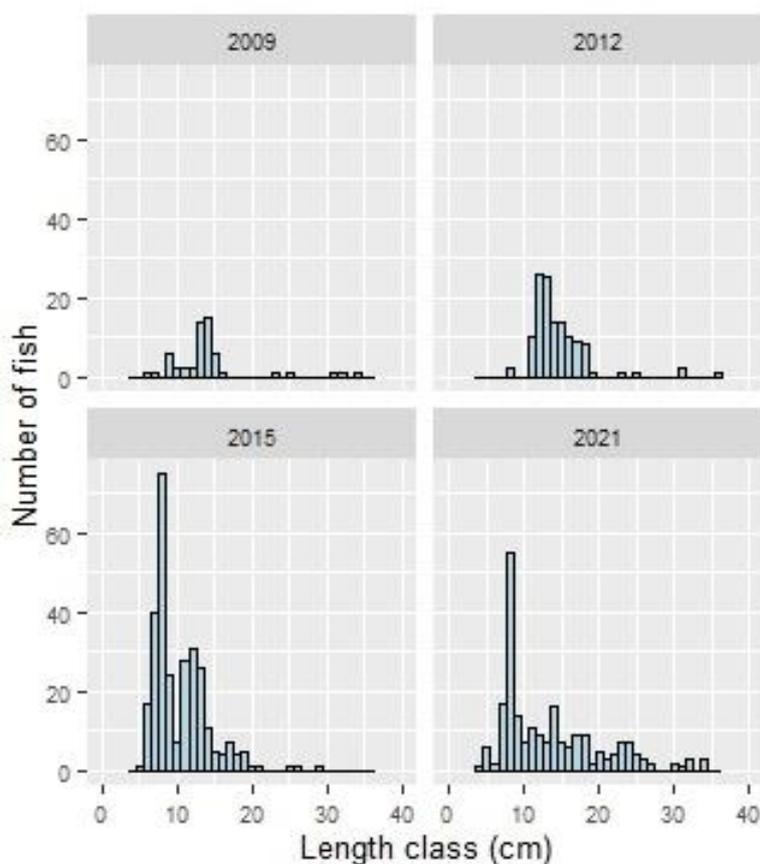


Figure 3.3. Length frequency of roach captured on Lough Alewnaghta, 2009, 2012, 2015 and 2021

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

	Age Class										
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+
N	-	3	18	13	17	14	12	6	2	3	3
Mean L (cm)	-	5.9	9.1	12.2	16.0	20.0	23.4	25.6	28.5	32.2	33.4
Min L (cm)	-	5.3	7.5	10.4	13.7	18.3	21.9	24.3	27	31.4	32.2
Max L (cm)	-	6.8	11.4	14.3	17.8	23	24.8	27.1	30	33.6	34.1

Perch

Perch captured during the 2021 survey ranged in length from 5.0cm to 32.0cm (mean = 8.5cm) with fewer perch captured in 2021 compared to previous surveys (Figure 3.4). Five age classes were present, ranging from 0+ to 4+, and all intervening age classes were present in the sample. Larger fish were released alive and were not therefore available for age analysis. Mean L1 (i.e. age at the end of the 1st year) was 5.5cm (Table 3.4). This corresponds to the modal peak at 6.0-7.0cm, indicating that while the majority of the perch captured in 2021 were 0+ juveniles, this cohort was much less prevalent in 2021 compared to earlier surveys (Figure 3.4).

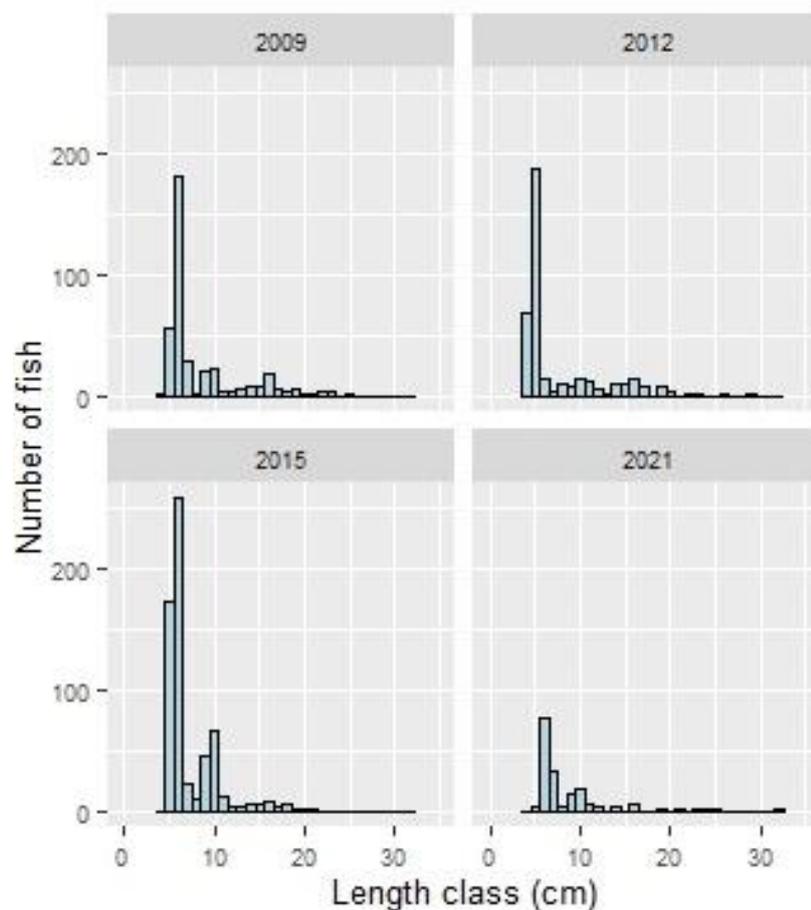


Figure 3.4. Length frequency of perch captured on Lough Alewnaghta, 2009, 2012, 2015 and 2021

Table 3.4. Mean (\pm S.E.) perch length (cm) at age for Lough Alewnaghta, August 2021

	L ₁	L ₂	L ₃	L ₄
Mean (\pmS.E.)	5.5 (0.1)	9.9 (0.4)	13.5 (0.4)	-
N	18	10	3	1
Range	4.4-6.7	8.7-11.1	12.7-13.8	16.1

Roach x bream hybrids

Roach x bream hybrids captured during the 2021 survey ranged in length from 7.3cm to 41.8cm (mean = 28.6cm) (Figure 3.5 and Table 3.5). Roach x bream hybrids in the sample were aged between 1+ and 14+. All intervening age classes were represented, indicating regular recruitment in the lake. The most abundant age class in the sample was 6+ although other strong cohorts were also present (Table 3.5 and Figure 3.5).

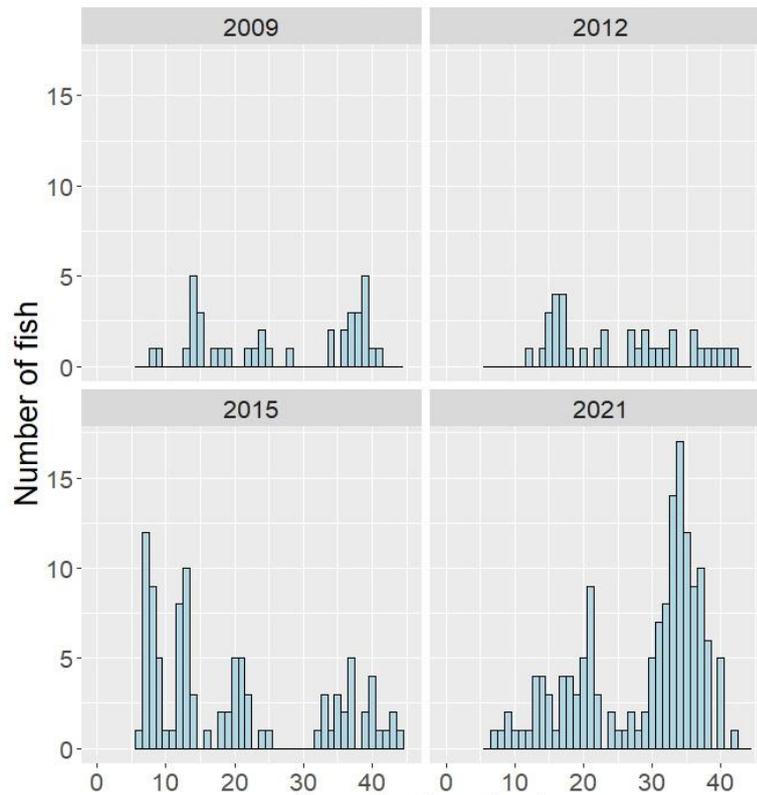


Figure 3.5. Length frequency of roach x bream hybrids captured on Lough Alewnaghta, 2009, 2012, 2015 and 2021

Table 3.5. Summary age data from roach x bream hybrids captured on Lough Alewnaghta, September 2021. Number of fish (N) and length ranges of all fish aged in the sample is presented.

	Age Class													
	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+	12+	13+	14+
N	2	4	7	4	7	12	2	1	3	6	9	7	4	1
Mean L (cm)	7.6	9.5	13.4	16.4	18.5	21.8	25.2	28.5	32.9	32.3	34.2	36.0	37.8	-
Min L (cm)	7.3	8.7	11.8	14.6	17.3	20.3	24.3	28.5	30.2	31.1	33.1	35.4	37	41.8
Max L (cm)	7.8	10.6	14.5	17.5	19.7	25	26	28.5	37.1	34.9	35.2	36.7	39.7	41.8

Other fish species

Fourteen tench were captured during the 2021 survey. They ranged in length from 32.2cm to 52.5cm (mean = 41.5cm). Seven pike captured ranged in length from 16.6cm to 70.5cm (mean 45.7cm). Pike were aged between 2+ and 6+. Six bream were captured, they ranged in length from 29.9cm to 41.4cm (mean = 34.5cm) and were aged from 5+ to 9+. Rudd (n = 4) ranged in length from 14.4cm to 19.4cm (mean = 17.7cm). Rudd were aged at 2+ and 4+. Three eels captured measured from 48.2cm-61.7cm (mean = 55.5cm)

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

Perch

A total of 41 stomachs were examined. Of these 28 (68%) were found to contain no prey items. Of the remaining 13 stomachs, 12 (92%) contained unidentified digested material. Fish were recorded in one (8%) stomach (Figure 3.6).

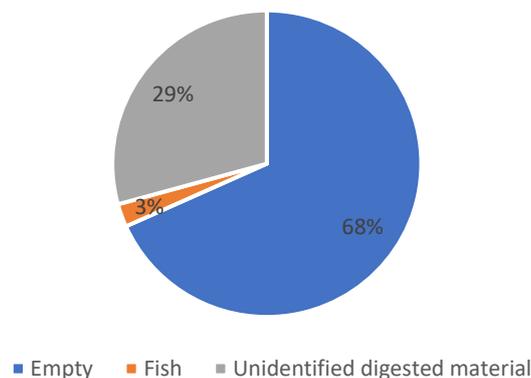


Figure 3.6. Diet of perch captured on Lough Alewnaghta 2021 (n = 41)

Pike

Six pike stomachs were available for analysis. Three stomachs (L = 17.2cm-70.5cm) were empty. The three remaining pike stomachs (L = 16.6cm – 85.5cm) all contained fish prey. Prey species included roach, perch, pike and unidentified fish.

4. Summary and ecological status

A total of seven fish species and one type of hybrid (roach x bream) were recorded on Lough Alewnaghta in September 2021. A similar species mix was recorded when the lake was last surveyed in 2015 and on previous survey occasions.

Roach and perch were the dominant fish species in terms of abundance (CPUE). The two most abundant species captured (i.e. perch and roach) have each been recruiting regularly in the lake. However, while perch were strongly dominant (wrt CPUE) in previous surveys, this was not the case in 2021 when this species was relatively less abundant. Concomitantly there is an apparent trend towards increasing roach population size.

Roach x bream hybrids were also recorded in relatively large numbers. This species, characterised by a large proportion of large (i.e. >30cm) and older fish, had the highest biomass (BPUE) captured during the 2021 survey. The roach x bream hybrid population, which requires both parent species to spawn (Hayden *et al.*, 2010), exhibited relatively consistent recruitment patterns.

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 Alewnaghta has been assigned an ecological status of Bad for 2021 based on the fish populations present. In previous years the lake was also assigned Bad fish ecological status in 2015 and 2012, and Poor in 2009 (Figure 4.1) (Kelly *et al.*, 2016).

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

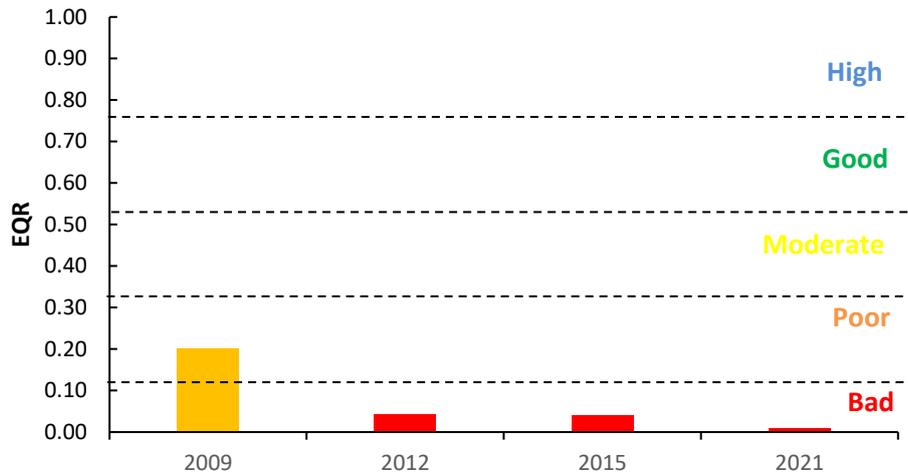


Figure 4.1: Fish ecological status of Lough Alewnaghta, 2009, 2012, 2015 and 2021

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**Inland Fisheries Ireland
3044 Lake Drive,
Citywest Business Campus,
Dublin 24,
Ireland.
D24 Y265**

**www.fisheriesireland.ie
info@fisheriesireland.ie**

+353 1 8842 600

