

# National Research Survey Programme

## Lakes 2022

### Lough Mask

IFI/2023/1-4668



Iascach Intíre Éireann  
Inland Fisheries Ireland

## **Fish Stock Survey of Lough Mask, July 2022**



National Research Survey Programme

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## 1. Introduction

Lough Mask is situated north of Lough Corrib, adjacent to the town of Ballinrobe, Co. Mayo (Plate 1.1, Figure 1.1). It is the sixth largest lake in Ireland with a surface area of approximately 8,218ha. The length of the lake from north to south is approximately 16km and the width is approximately 6.4km at its widest point (O' Reilly, 2007). The main rivers flowing into Lough Mask are the Cloon, Robe, Owenbrin, Finny, Glensaul, Glentraig and the Keel River, which is the out flowing river from Lough Carra. Lough Mask is linked to Lough Corrib by the Cong Canal.

Lough Mask is generally a shallow lake with a mean depth of 5m; however, it attains a maximum depth of 57m along a narrow trench on the western shore of the lake (NPWS, 2015). The lake is categorised as typology class 12 (as designated by the EPA for the purposes of the Water Framework Directive (WFD)), *i.e.*, deep (>4m), greater than 50ha and high alkalinity (>100mg/l CaCO<sub>3</sub>). The underlying geology of Lough Mask is Carboniferous limestone, with areas of shale and sandstone, and it is an example of a lowland oligotrophic lake (NPWS, 2015).

Lough Mask, Carra and Cloon make up the Lough Carra/Lough Mask Special Area of Conservation (SAC) complex. Six habitats listed on Annex I of the EU Habitats Directive are found in this site, including two priority habitats - limestone pavement and Cladium fen (NPWS, 2015). This is also an important SAC for otter (*Lutra lutra*), a species that is listed on Annex II of the E.U. Habitats Directive (NPWS, 2015).

The zebra mussel (*Dreissena polymorpha*), an invasive species in Ireland, was confirmed to be present in Lough Mask in 2008. Roach (*Rutilus rutilus*), a non-native species subject to restrictions under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) was first recorded in a fish stock assessment survey on the lake in 1996, since then the population has spread throughout the lake. Bream (*Abramis brama*) was first recorded in fish stock surveys in 2009, which has led to hybridisation with roach. Bream and roach x bream hybrids have been removed from the lake each spring in recent years.

Lough Mask is noted for its populations of brown trout (*Salmo trutta*) and ferox trout (*Salmo trutta*), with the average size of brown trout ranging from 0.6kg to 1.4kg. The largest ferox trout can reach up to 9kg in weight (O' Reilly, 2007).

The lake was surveyed in 1996 as part of Inland Fisheries Ireland's (IFI) brown trout stock assessment programme using seven-panel benthic braided survey gill nets. Five fish species were recorded at that time; brown trout, Arctic char (*Salvelinus alpinus*), pike (*Esox lucius*), perch (*Perca fluviatilis*), and a single roach (O' Grady *et al.*, 1996). More recently the lake was surveyed by IFI for the WFD fish

monitoring programme in 2009, 2012, 2015 and 2019 (Kelly *et al.*, 2010, 2013, 2016 and Corcoran *et al.* 2020). During these surveys, perch, roach, brown trout, bream, Arctic char, eels (*Anguilla anguilla*), pike, stone loach (*Barbatula barbatula*), three-spined stickleback (*Gasterosteus aculeatus*), nine-spined stickleback (*Pungitius pungitius*) and roach x bream hybrids (*Rutilus rutilus* x *Abramis brama*) were recorded.

This report summarises the results of the 2022 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 Mask, July 2022.**



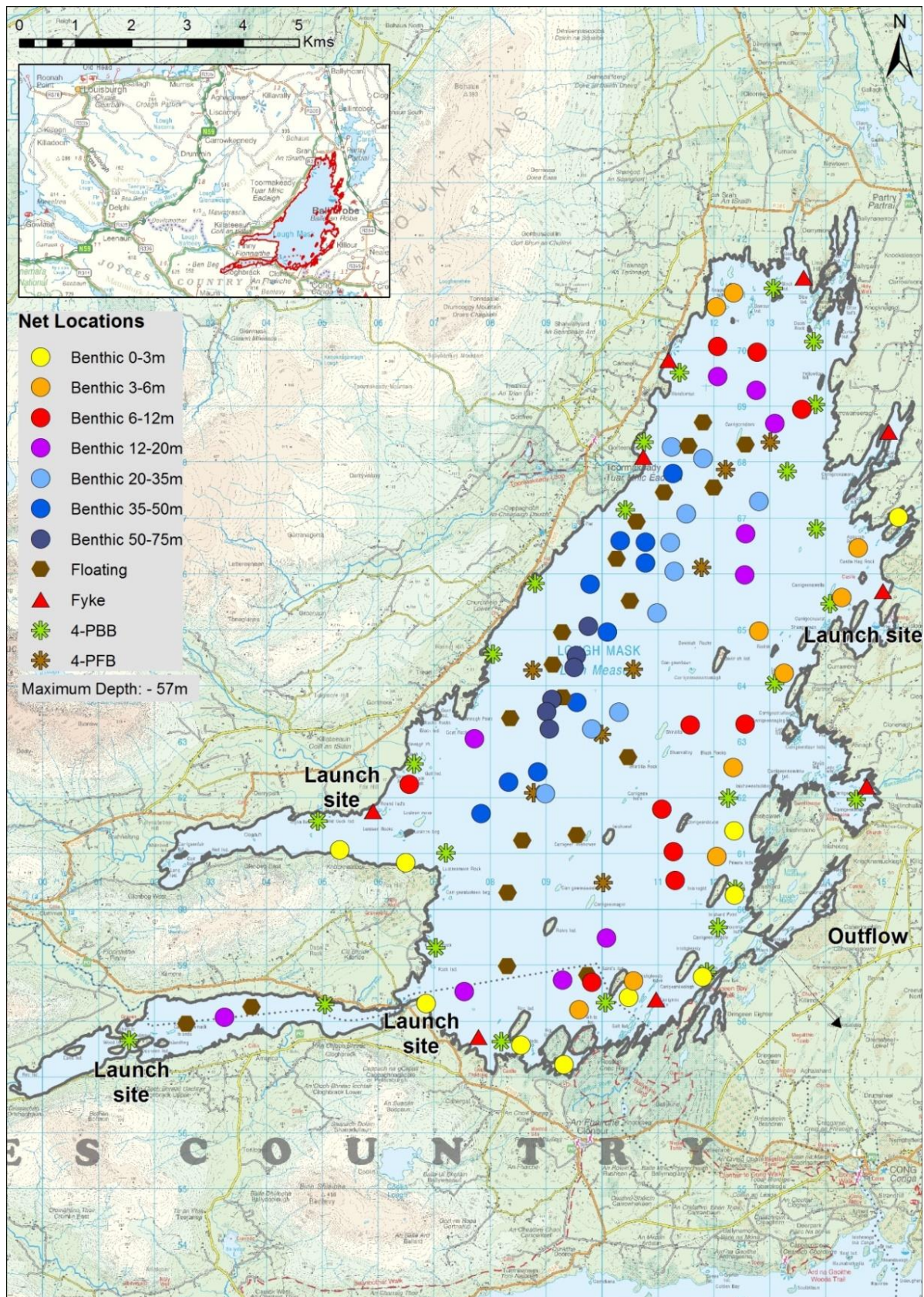


Figure 1.1. Location map of Lough Mask showing net locations and depths of each net (outflow is indicated on map).

## 2. Methods

### 2.1. Netting methods

Lough Mask was surveyed over nine nights from the 28<sup>th</sup> June to the 12<sup>th</sup> of July 2022. A total of nine sets of Dutch fyke nets, 66 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (10 @ 0-2.9m, 10 @ 3-5.9m, 10 @ 6-11.9m, 10 @ 12-19.9m, 10 @ 20-34.9m, 10 @ 35-49.9m and 6 @ 50-74.9m) and 20 floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (FM CEN) were deployed in the lake (95 sites).

The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) and four-panel floating braided survey gill nets (4-PFB) at 33 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.

### 2.2. 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.



### **2.3. 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.



**Plate 2.1. Lough Mask (west)**



### 3. Results

#### 3.1. Species Richness

Eight fish species and one cyprinid hybrid variety were recorded in Lough Mask in June/July 2022. A total of 907 fish were captured (Table 3.1). Perch was the most common fish species recorded, representing c. 57% of all fish captured. Roach x bream hybrids and roach were also captured in relatively large numbers. Brown trout, bream, European eel, Arctic char, nine-spined stickleback, and pike were also captured. Similar species mixes were recorded in previous surveys conducted since 2009. Three species have each been recorded in only one survey. These were nine-spined stickleback (2022), three-spined stickleback (2019) and stone loach (2015) (Kelly *et al.*, 2010, 2013, 2016 and Corcoran *et al.* 2020).

**Table 3.1. Number of each fish species captured by each gear type during the survey on Lough Mask, June/July 2022.**

Scientific name	Common name	Number of fish captured					
		BM CEN	FM CEN	4-PBB	4-PFB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	495	0	7	0	12	514
<i>R. rutilus x Abramis brama</i>	Roach x bream hybrid	32	0	154	1	0	187
<i>Rutilus rutilus</i>	Roach	106	1	3	0	0	110
<i>Salmo trutta</i>	Brown trout	16	15	6	3	0	40
<i>Abramis brama</i>	Bream	3	0	31	2	0	36
<i>Salvelinus alpinus</i>	Arctic char	8	0	0	0	0	8
<i>Pungitius pungitius</i>	Nine-spined stickleback	1	0	0	0	0	1
<i>Esox lucius</i>	Pike	0	0	1	0	0	1
<i>Anguilla anguilla</i>	European eel	1	0	1	0	8	10

#### 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. Perch was the dominant species with respect to abundance (mean CPUE). Roach x bream hybrids recorded the highest biomass (mean BPUE) of all other species in 2022 (Table 3.2).

**Table 3.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Mask, June/July 2022.**

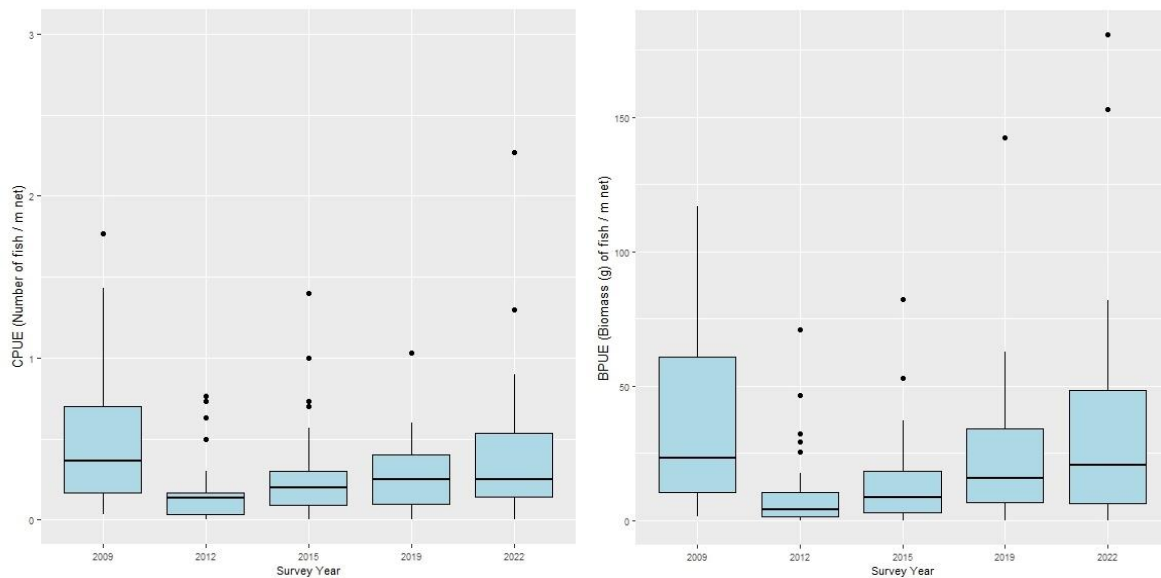
Scientific name	Common name	Mean CPUE ( $\pm$ S.E)	Mean BPUE ( $\pm$ S.E)
<i>Perca fluviatilis</i>	Perch	0.131 (0.026)	11.338 (2.340)
<i>Rutilus Rutilus x Abramis brama</i>	Roach x bream hybrid	0.020 (0.004)	15.188 (3.350)
<i>Rutilus Rutilus</i>	Roach	0.028 (0.007)	7.674 (2.050)
<i>Salmo trutta</i>	Brown trout	0.009 (0.002)	3.513 (0.885)
<i>Abramis brama</i>	Bream	0.003 (0.001)	3.603 (1.351)
<i>Salvelinus alpinus</i>	Arctic char	0.002 (0.001)	0.001 (0.001)
<i>Pungitius pungitius</i>	Nine-spined stickleback	0.000 (0.000)	0.047 (0.022)
<i>Esox lucius</i>	Pike	0.000 (0.000)	0.139 (0.139)
<i>Anguilla anguilla</i>	European eel	0.015 (0.008)*	52.888 (27.975)*

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

Survey catch data is inherently subject to considerable variation and changes in netting methodologies have occurred since 2009 where the number and mesh size of supplementary braided survey gillnets has varied. This can present a considerable challenge in interpreting or identifying population trend for species or groups of species. This is particularly true in deep lakes such as Lough Mask (depth > 50m in this case) where many nets set in deeper depth zones will fail to capture any fish. The population trends of some of the important (in terms of abundance and/or fisheries value) fish species are presented below.

#### Perch population trends

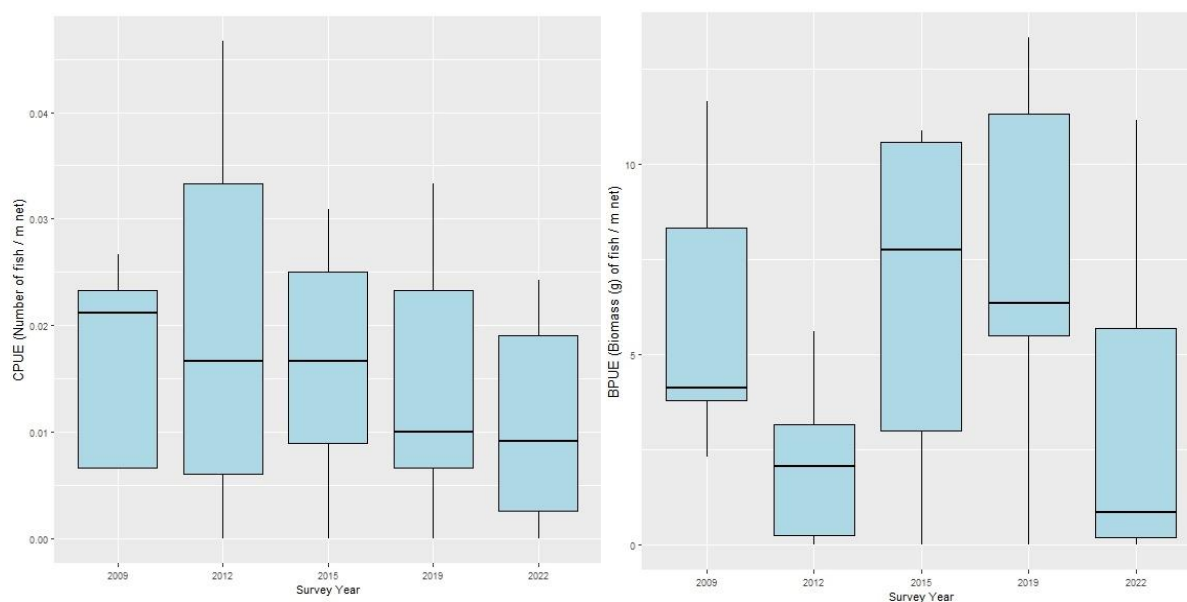
Perch has consistently been the most abundant fish species captured across all surveys of Lough Mask since 2009. A small bodied species, very few perch are generally captured in the braided survey gill nets which are specifically set to target larger bodied species such as brown trout and the larger cyprinid species such as bream and bream hybrids. Furthermore the overwhelming majority of perch are captured in nets deployed in depth zones less than 20m deep. Perch population trends are presented graphically in Figure 3.1 and is restricted to those fish captured in BMCEN nets deployed in depths of 20m or less (i.e. 0-2.9m, 3-5.9m, 6-11.9m, 12-19.9m). The decline in both CPUE and BPUE between 2009 and 2012 is no longer apparent, and median CPUE and BPUE shows an increasing trend since 2012 (Figure 3.1).



**Figure 3.1 CPUE and BPUE (number and biomass of fish captured per linear meter of net deployed) of perch captured in benthic CEN nets (0m-20m) during surveys of Lough Mask between 2009 and 2022. 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.**

### Brown trout population trends

Brown trout, which may be naturally less abundant than smaller species such as perch are often captured in relatively low numbers and in a small proportion of the survey nets deployed. To examine population trends in this species data from floating and benthic CEN nets (0-20m) have been pooled. This has been achieved by aggregating catches within each depth zone for BM CEN nets on each sampling occasion. In this way, all the nets deployed within each depth zone were treated as one sampling unit for that survey occasion. Sampling effort, and netting locations across surveys were essentially identical. Aggregate CPUEs and BPUEs for surveys on Lough Mask are presented in Figure 3.2. While there appears to be a slight downward trend in the median CPUE for brown trout in Lough Mask since 2009 (Figure 3.2a) this is not matched when BPUE is examined. Median BPUE has fluctuated across all sampling occasions but was lowest (though also highly variable) in 2022 (Figure 3.2)

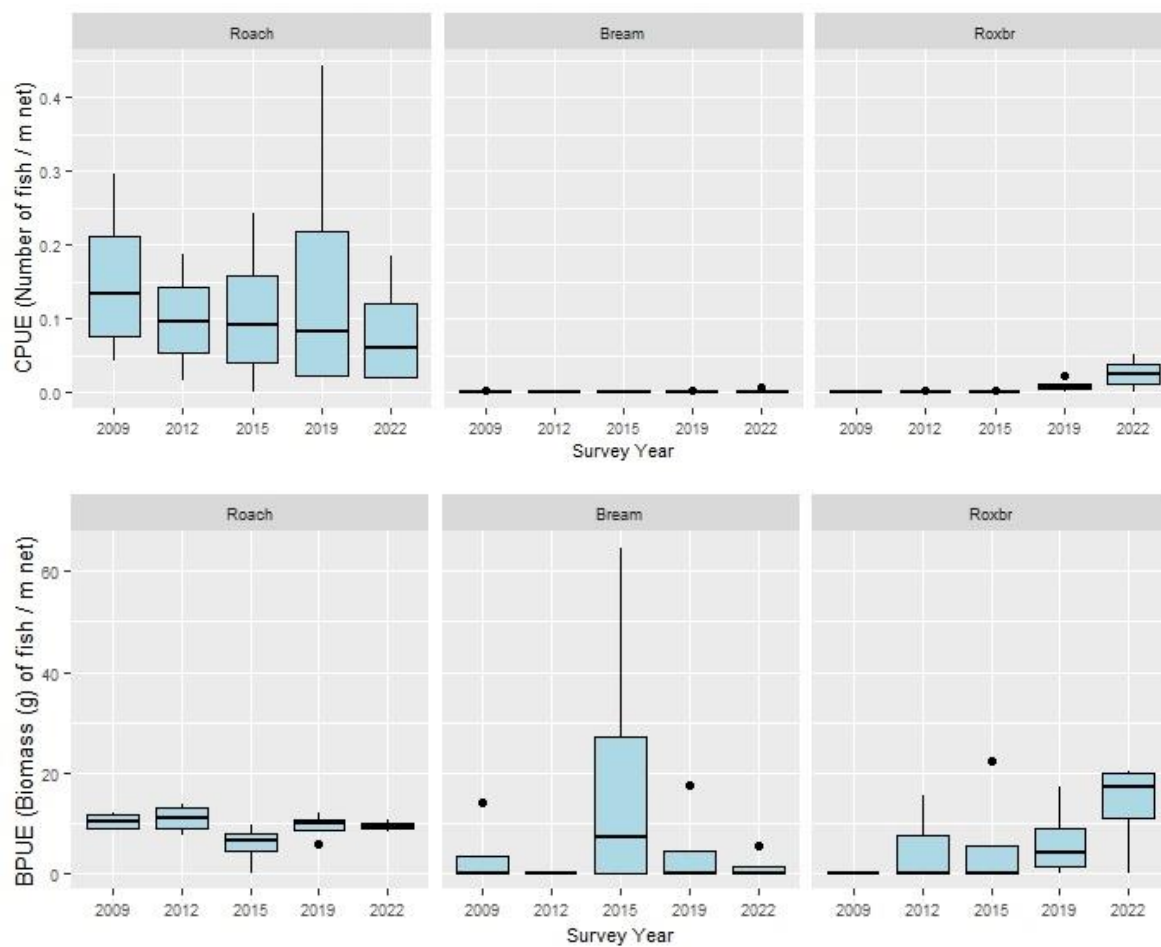


**Figure 3.2. CPUE and BPUE (number and biomass of fish captured per linear meter of net deployed) of brown trout captured in benthic and floating CEN nets during surveys of Lough Mask between 2009 and 2022. Data has been pooled within each depth zone and restricted to depth zones <20m. The horizontal 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.**

### Cyprinid population trends

In Lough Mask (and in common with other waters) cyprinids (specifically, roach, bream and their hybrid in this instance) are rarely captured in water deeper than 20m during fish stock surveys. Only one cyprinid has been captured outside these depth zones on surveys of Lough Mask conducted since 2009. Therefore to ensure comparability across surveys, analysis was restricted to benthic monofilament nets in depths less than 20m. Similar to perch and trout the data from each depth zone has been aggregated. While median CPUE of roach displayed a decreasing trend, median biomass has remained relatively constant (Figure 3.3). While no discernible trend in bream abundance or biomass was evident, both median abundance and biomass of roach x bream hybrids have increased in recent years (Figure 3.3). The latter species recorded the highest biomass of all species in 2022.



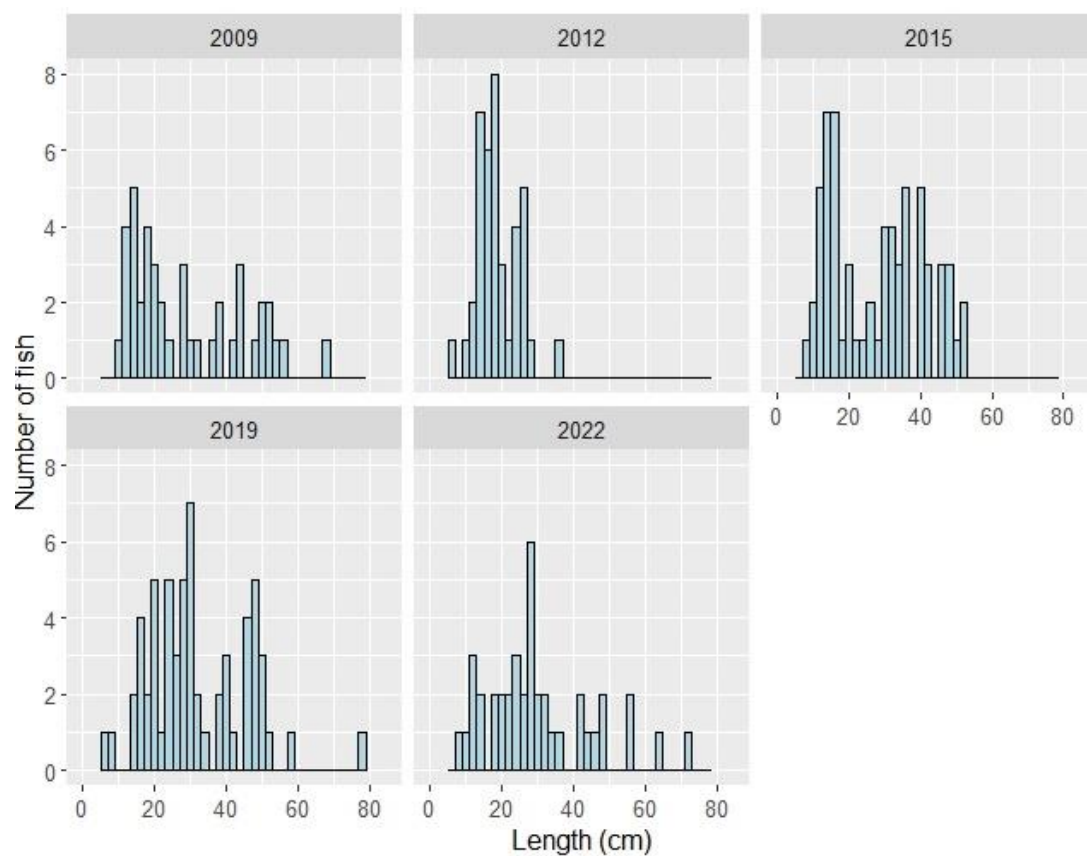


**Figure 3.3. CPUE and BPUE (number and biomass of fish captured per linear meter of net deployed) for roach, bream and their hybrid captured in benthic monofilament survey nets (0-3m to 12-20m) nets during surveys of Lough Mask between 2009 and 2022. Data has been pooled within each depth zone. The 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.**

### 3.3. Length frequency distributions and growth

#### Brown trout

Brown trout captured during the 2022 survey ranged in length from 8.2cm to 71.8cm (mean 30.2cm) (Figure 3.4). Brown trout were aged between 1+ and 9+ with all intervening age classes present in the sample aged. The population was dominated by younger fish. 2+ and 3+ fish (14-30cm) were the most abundant age groups recorded (Figure 3.4). However, larger and older also fish persisted in the population, which is consistent with previous surveys of the lake. Mean L1 (i.e. length at the end of the first year) was 7.3cm (Table 3.3).



**Figure 3.4. Length frequency of brown trout captured on Lough Mask, 2009, 2012, 2015, 2019 and 2022.**

**Table 3.3. Mean ( $\pm$ S.E.) brown trout length (cm) at age for Lough Mask, June/July 2022.**

Length (cm)	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>	L <sub>7</sub>	L <sub>8</sub>	L <sub>9</sub>
Mean	7.3	13.7	21.7	28.7	35.7	42.9	49.1	52.2	-
$\pm$ S.E.	0.1	0.1	0.2	0.5	0.6	1.0	1.4	1.0	-
N	30	26	17	9	8	5	3	2	1
Range	5.9- 8.2	12.2- 15.4	20.0- 23.9	27.3- 31.9	33.8- 37.9	40.1- 45.6	46.8- 51.6	51.2- 53.2	58.5

## Perch

Perch captured during the 2022 survey ranged in length from 7.0cm to 41.0cm (mean 16.1cm) (Figure 3.5). Perch captured during the 2022 survey had a similar length and age range to previous surveys, although there was a greater proportion of large (i.e. 30cm) perch captured in 2022. Nine age classes were present in the sample. Perch were aged between 1+ and 9+ and all intervening age groups were represented (Table 3.4). The population was largely dominated by younger age groups and the most abundant cohort was 3+. Mean L1 (i.e. age at the end of the 1<sup>st</sup> year) was 8.4cm (Table 3.4).

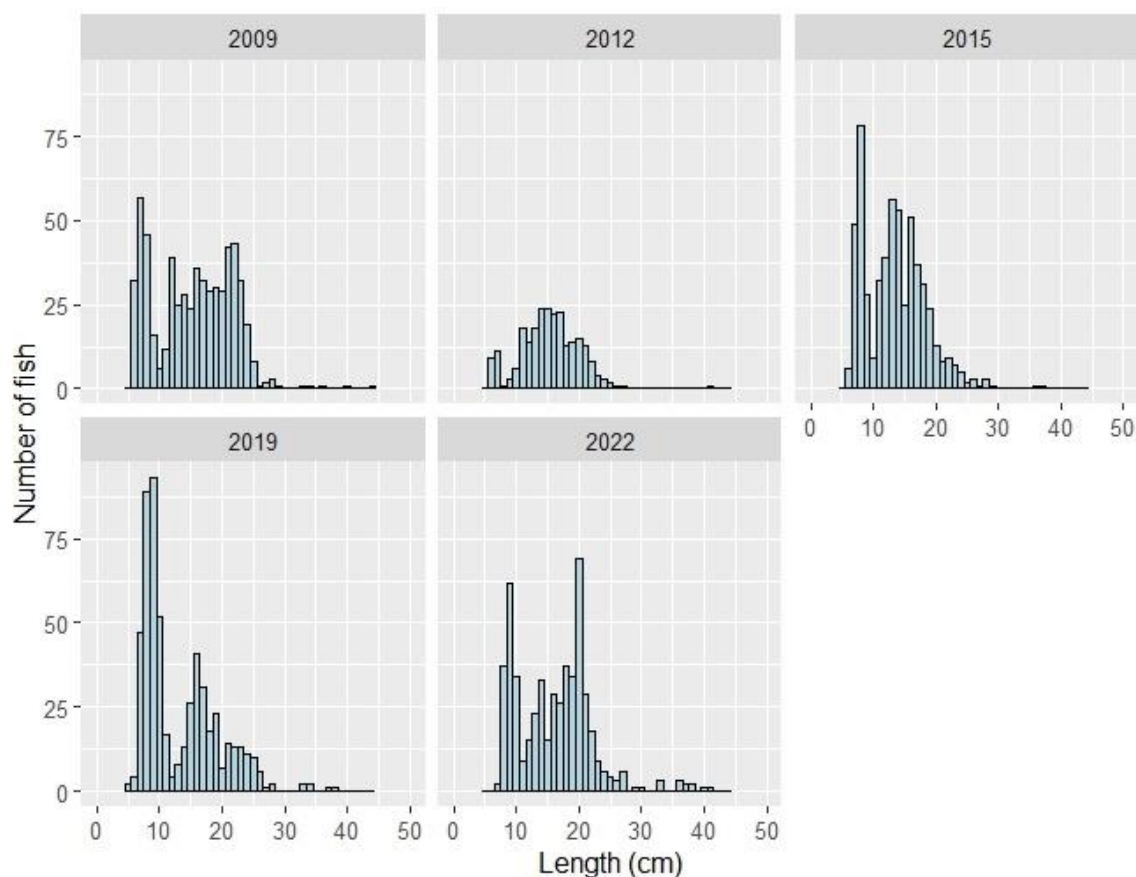


Figure 3.5. Length frequency of perch captured on Lough Mask, 2009, 2012, 2015, 2019 and 2022

Table 3.4. Mean ( $\pm$ S.E.) perch length (cm) at age for Lough Mask, June/July 2022

Length (cm)	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>	L <sub>7</sub>	L <sub>8</sub>	L <sub>9</sub>
Mean	8.4	13.3	17.2	21.8	24.5	27.7	30.8	33.2	33.9
$\pm$ S.E.	0.2	0.3	0.4	0.6	1	1.6	2.3	2.2	1.9
N	97	80	57	26	11	8	5	3	2
Min	5.3	8.3	11	14.1	19.5	21.9	25.2	29	32
Max	14.5	19.9	25.9	27.6	30.2	32.7	35.3	36.3	35.7

## Roach

Roach captured during the 2022 survey ranged in length from 13.7cm to 35.0cm (mean 24.4cm) (Figure 3.6). In 2022 there was a marked decrease in the number of roach 5+ (< 20.0cm) when compared to earlier surveys. Roach were aged between 3+ and 11+ (Figure 3.6 and Table 3.5). The population was dominated by older and larger cohorts with six year old fish being the largest cohort in the sample aged (Figure 3.6).

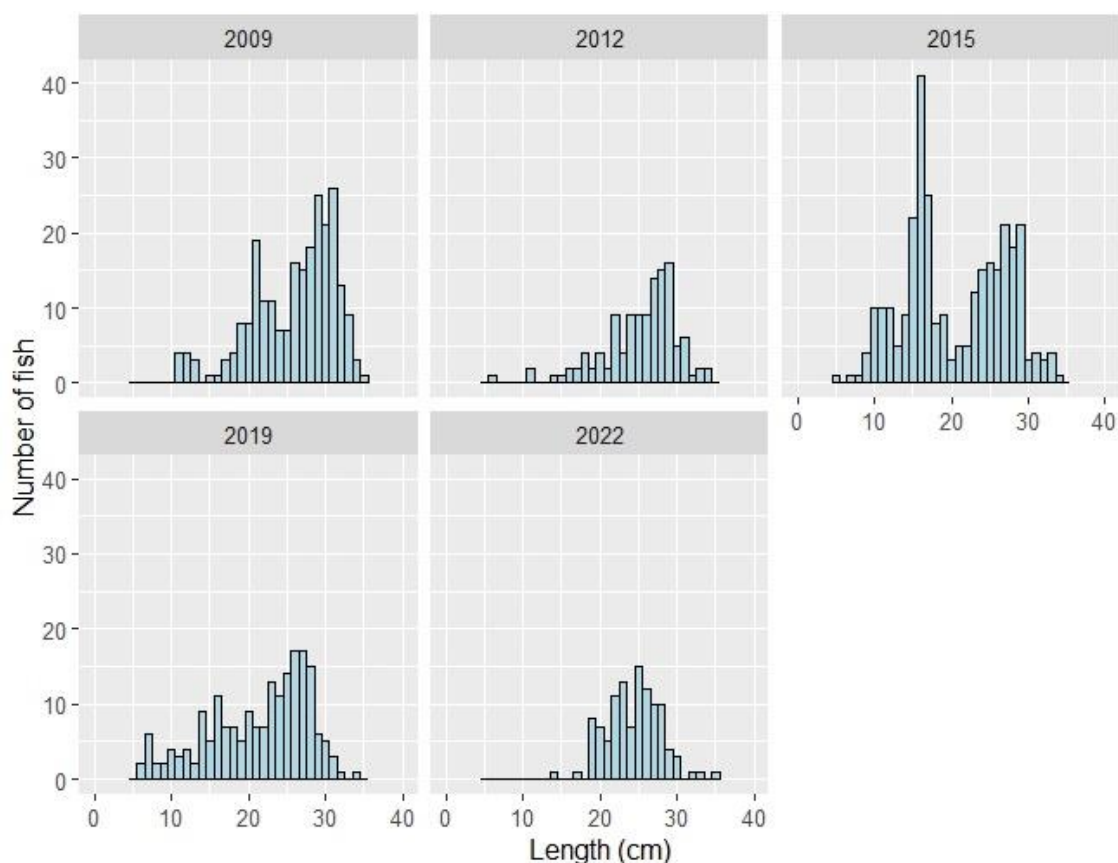


Figure 3.6. Length frequency of roach captured on Lough Mask, 2009, 2012, 2015, 2019 and 2022.

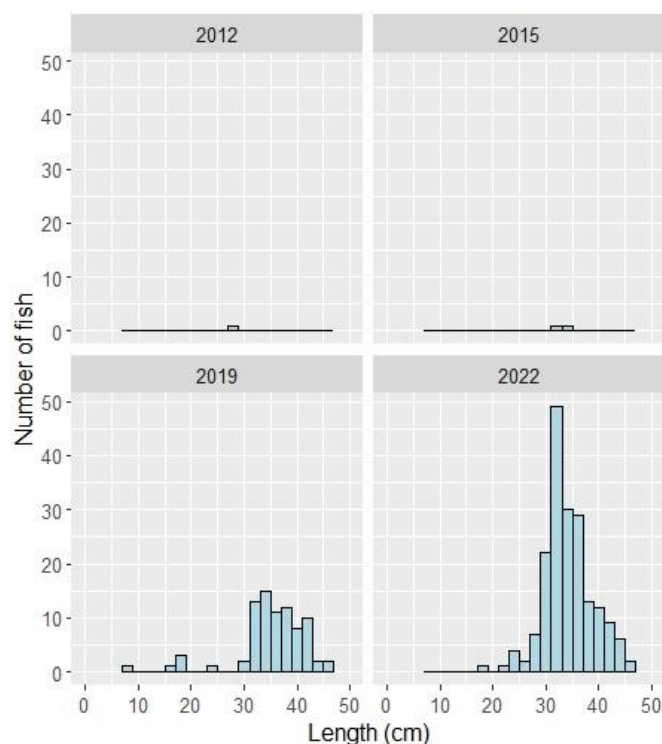
Table 3.5. Summary age data from roach captured on Lough Mask, June/July 2022. Number of fish (N) and length ranges of all fish aged in the sample is presented.

Length (cm)	Age class											
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+
N	0	0	0	1	2	2	13	7	7	5	2	1
Mean L (cm)	-	-	-	13.7	17.8	18.9	21.6	24.3	27.7	29.6	32.9	-
Min L (cm)	-	-	-	-	16.8	18.8	19.3	19.9	26.8	29.1	32.5	35
Max L (cm)	-	-	-	-	18.7	18.9	24.1	26	28.5	30.1	33.3	35



### Roach x bream hybrids

Roach x bream hybrids captured during the 2022 survey ranged in length from 17.3cm to 45.5cm (mean 34.2cm) (Figure 3.7). Roach x bream hybrids in the sample were aged between 5+ and 18+ and all intervening age groups were present. Seven to 10 year old fish were the most abundant cohorts. Much older cohorts were present in the sample, with many fish greater than 13 years old captured (Table 3.6).



**Figure 3.7. Length frequency of roach x bream captured on Lough Mask, 2012, 2015, 2019 and 2022. No roach x bream hybrids were recorded in 2009.**

**Table 3.6. Summary age data from roach x bream hybrids captured on Lough Mask, June/July 2022. Number of fish (N) and length ranges of all fish aged in the sample is presented.**

Length (cm)	Age class													
	5+	6+	7+	8+	9+	10+	11+	12+	13+	14+	15+	16+	17+	18+
<b>N</b>	1	1	8	7	8	9	2	1	5	4	3	4	2	1
<b>Mean</b>	-	22.6	26	29.4	31.7	34.6	36	-	38.5	39.8	40.7	42.9	44.8	-
<b>Min</b>	17.3	-	23.5	28.1	30.6	33.4	35.6	37	37.5	39	40	41.5	44	45.5
<b>Max</b>	17.3	-	27.5	30.9	32.5	36.1	36.3	37	40	41.2	41.5	44	45.5	45.5

## Bream

Bream captured during the 2022 survey ranged in length from 18.6cm to 51.3cm (mean 38.7cm) (Figure 3.8). Fish less than 20cm in length were captured for the first time in 2022. Bream in the sample were aged between 4+ and 15+. All intervening age classes were represented with the exception of 10+ fish which were absent. Nine year old bream were also poorly represented (Table 3.7).

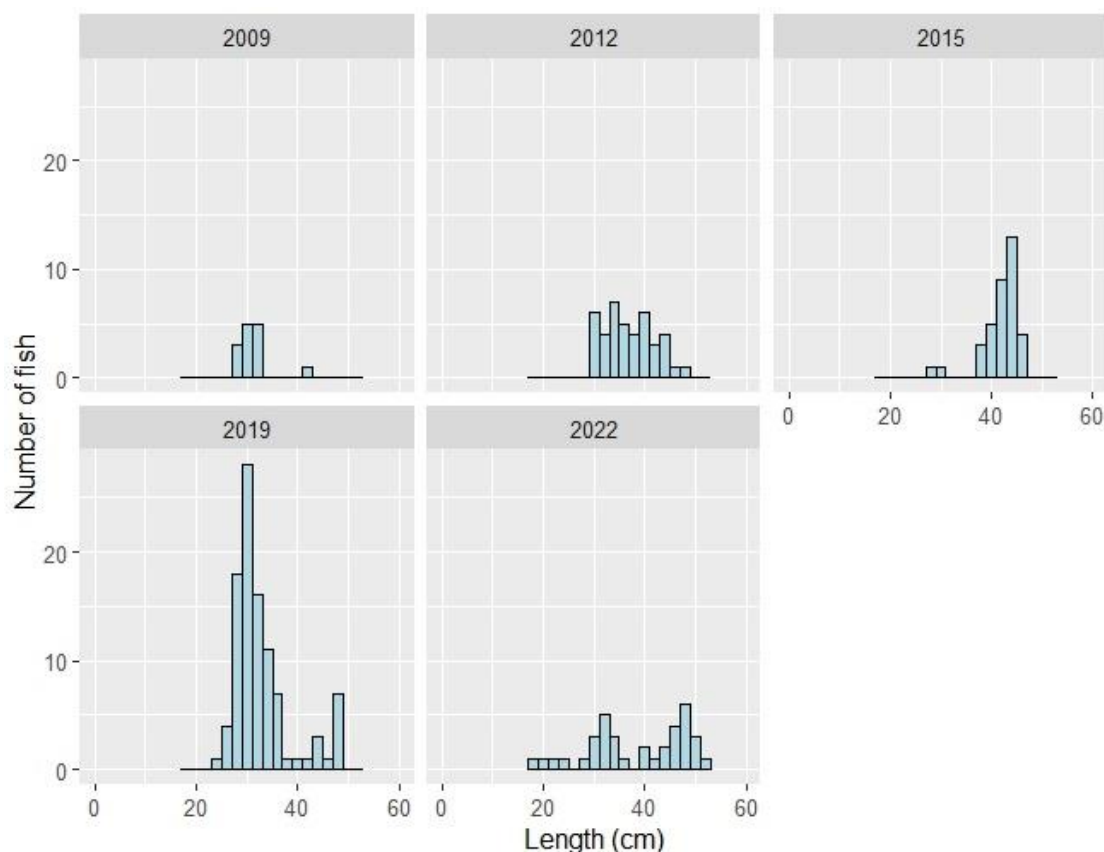


Figure 3.8. Length frequency of bream captured on Lough Mask, 2012, 2015, 2019 and 2022.

Table 3.7. Summary age data from bream hybrids captured on Lough Mask, June/July 2022. Number of fish (N) and length ranges of all fish aged in the sample is presented.

Length (cm)	Age class											
	4+	5+	6+	7+	8+	9+	10+	11+	12+	12+	14+	15+
<b>N</b>	1	3	3	4	6	1	0	3	4	4	3	2
<b>Mean</b>	-	22.8	29.6	31.5	33.9	-	-	43.8	46.9	48.2	49.3	51.2
<b>Min</b>	18.6	21.0	28.6	31.0	32.4	39.3	-	43.0	46.4	47.4	49.0	51.0
<b>Max</b>	18.6	24.4	30.5	32.2	36.5	39.3	-	44.5	47.8	49.0	49.5	51.3

### Other fish species

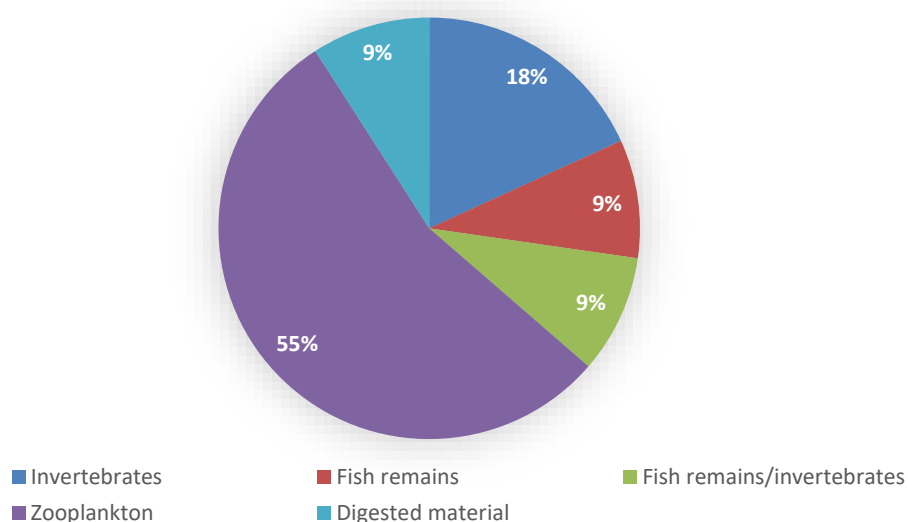
Arctic char captured in the 2022 survey ranged in length from 10.0cm to 18.0cm, with a mean length of 11.8cm. European eel ranged from 48.0cm to 82.3cm (mean 58.3cm). One pike was captured measuring 63.4cm. One nine-spined stickleback measuring 4.0cm was recorded.

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

#### Brown trout

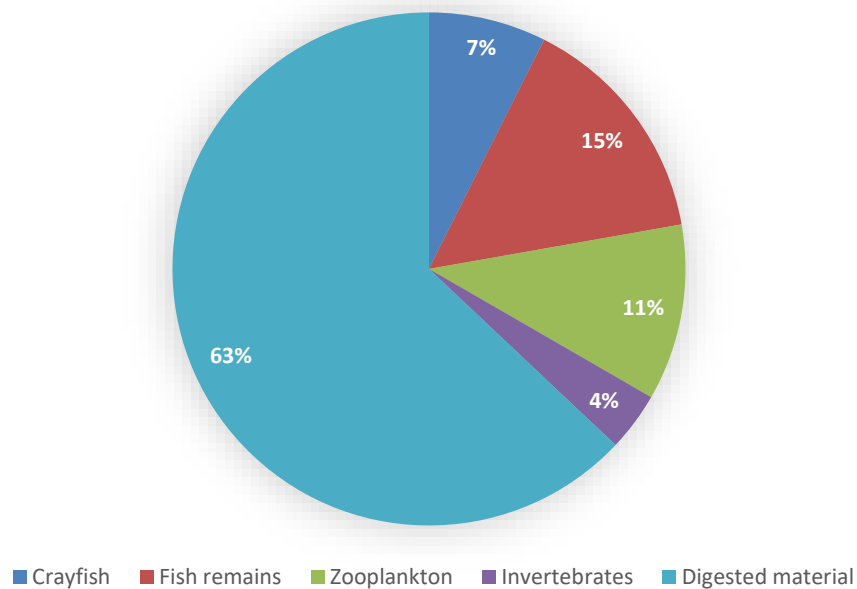
A total of 20 brown trout stomachs were examined. Nine (45%) were found to contain no prey items. Of the remaining 11 stomachs containing food, six (55%) contained zooplankton. Invertebrates were the sole prey type recorded in two (18%) stomachs, while they were found together with fish in one (9%) stomach. Fish were the sole prey type one (9%) stomach. One stomach also contained unidentified digested material (Figure 3.9).



**Figure 3.9. Diet of brown trout (N = 11) captured on Lough Mask, June/July 2022 (% FO)**

## Perch

A total of 92 perch stomachs were examined. Sixty five (71%) were empty. Of the 27 remaining stomachs 17 (63%) contained unidentified digested material. Fish were recorded in four (15%) stomachs. Zooplankton was recorded in three (11%) stomachs. Invertebrates were recorded in three (11%) stomachs and crayfish were recorded in two (7%) stomachs (Figure 3.10).



**Figure 3.10. Diet of perch (N = 27) captured on Lough Mask, 2022 (% FO).**



## 4. Summary

Eight fish species and one cyprinid hybrid variety were recorded in Lough Mask in June/July 2022. Perch was the most abundant species recorded in the survey. This population was dominated by younger year classes, and recruitment is regular and stable.

Lough Mask is an important brown trout (and ferox trout) angling fishery. While the population sampled was dominated by younger cohorts indicative of regular recent recruitment, there was some evidence to suggest that there may have been a slight decline in recent years.

Roach x bream hybrids represented the dominant species (wrt biomass) captured in the survey gill nets. Roach x bream hybrids, which requires both parent species to spawn (Hayden *et al.*, 2010) was recorded in surveys for the first time in 2012. Both abundance and biomass have increased since that time. Comparatively few young (i.e. 4+) fish were captured in 2022. However, relatively few smaller or younger hybrids have been captured in any surveys of the lake and it is therefore unclear whether this represents a failure to recruit in recent years. However, populations of both parent species (i.e. roach and bream) were also dominated by larger and older fish, although small (i.e. < 20cm) bream were recorded for the first time. There is also some evidence that the roach population has declined slightly since the 2009 survey.

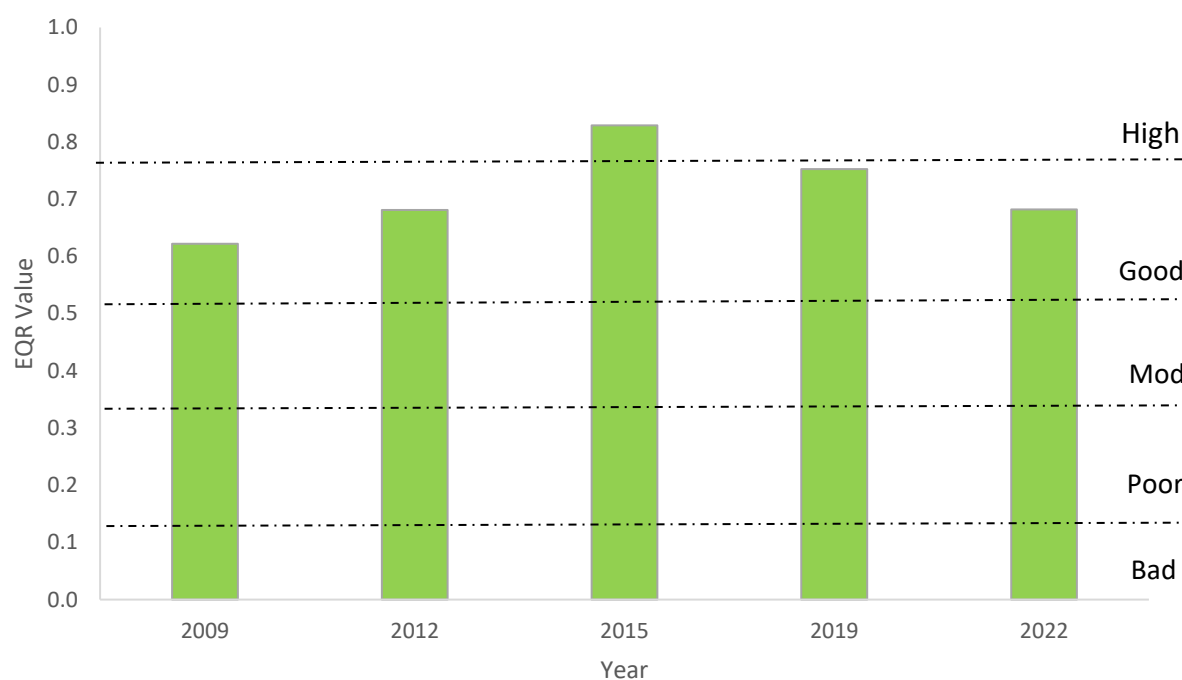
With the exception of the initial survey in 2009 (when 30 fish were captured) relatively similar numbers of arctic char have been recorded in all surveys of the lake. The continued presence of smaller (and younger) fish is indicative of continued recruitment to the population.

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) 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 Mask has been assigned an ecological status of Good for 2022 based on the fish populations present. The lake has also been assigned Good status in all previous surveys. In 2015 the FIL2 tool, assigned High status to Lough Mask, however following an expert opinion review, the lake was downgraded to Good, due to the presence of roach in the lake. Roach is

a non-native species subject to restrictions under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) (Figure 4.1).

In the 2016 to 2021 surveillance monitoring reporting period, the EPA assigned Lough Mask an overall ecological status of Good, based on all monitored physico-chemical and biological elements, excluding fish (EPA2021).



**Figure 4.1. Fish ecological status, Lough Mask, 2009, 2012, 2015, 2019 and 2022 (dashed line indicates EQR status boundaries).**

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