National Research Survey Programme
Lakes 2017

Upper Lough Skeagh

IFI/2018/1-4409

**Iascach Intíre Éireann
Inland Fisheries Ireland**

Inland Fisheries Ireland

National Research Survey Programme – Coarse Fish and Pike

**Fish Stock Survey of Upper Lough Skeagh,
August 2017**

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Cover photo: Netting survey on Lough Derravaragh © Inland Fisheries Ireland

ACKNOWLEDGEMENTS

1.1 Introduction

Upper Lough Skeagh is located seven kilometres north-west of Bailieborough, Co. Cavan, in the Boyne catchment (Plate 1.1 and Fig. 1.1). The lake has a surface area of 61ha and a maximum depth of 4.9m. The lake falls into typology class 6 (as designated by the EPA for the Water Framework Directive), i.e. shallow (mean depth <4m), greater than 50ha and moderate alkalinity (20-100mg/l $CaCO_3$).

Upper Lough Skeagh historically held stocks of bream, pike, roach and perch. The lake is a public water supply and a pump house is present on the shores of the lake. The lake supports an important coarse fishery with shore based angling predominantly occurring on the eastern (roadside) shore of the lake. According to the draft river basin management plan for the Eastern River Basin District, the major pressures affecting the ecological status of Upper Lough Skeagh include excess nutrients from agriculture and septic tanks (ERBD, 2008).

Upper Lough Skeagh was previously surveyed in 2008 and 2011 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al.*, 2009 and Kelly *et al.*, 2012a). During the 2011 survey, roach were found to be the dominant species present in the lake. Perch, pike, bream, roach x bream hybrids and eel were also recorded.

This report summarises the results of the 2017 fish stock survey carried out on the lake as part of the Water Framework Directive surveillance monitoring programme and IFI's national coarse fish and pike research programme.
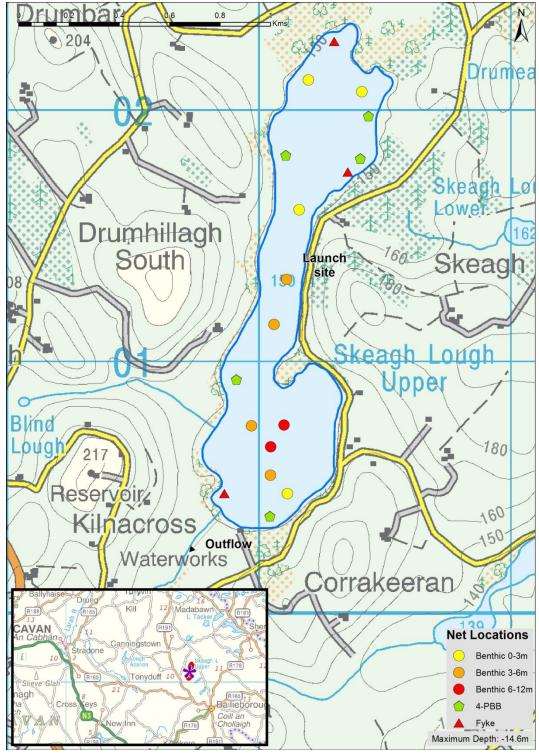

Plate 1.1. Upper Lough Skeagh

Fig. 1.1. Location map of Upper Lough Skeagh showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

Upper Lough Skeagh was surveyed over two nights between the 14th and the 16th of August 2017. A total of three sets of Dutch fyke nets (Fyke) and ten 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 2 @ 6-11.9m) were deployed in the lake (13 sites). The netting effort was supplemented using five four-panel benthic braided survey gill nets (4-PBB) at five additional sites. The 4-PBB nets are composed of four 27.5m long panels each a different mesh size (55mm, 60mm, 70mm and 90mm knot to knot). The site locations for the benthic monofilament multi-mesh gill nets (BM CEN) and the four-panel benthic braided survey gill nets (4-PBB) were chosen randomly within fixed depth zones (0-2.9m, 3-5.9m and 6-11.9m). A handheld GPS was used to mark 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 representative sample of all other fish species (excluding eels) captured. 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.

1.2.2 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 calculated to identify key prey items (Amundsen *et al.*, 1996).

$$\mathbf{FO}_i = \left(\frac{\mathbf{N}_i}{\mathbf{N}}\right) * \mathbf{100}$$

Where:

$\mathbf{FO}_i$ is the percentage frequency of prey item i,

$\mathbf{N}_i$ is the number of pike with prey i in their stomach,

$\mathbf{N}$ is total number of pike with stomach contents.

1.2.3 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.

1.3 Results

1.3.1 Species Richness

A total of five fish species and one hybrid were recorded on Upper Lough Skeagh in September 2017. A total of with 497 fish were captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most numerous fish species recorded, followed by roach, bream and roach x bream hybrids. Pike and eel were also captured. During the previous survey in 2008 and 2011 the same species composition was recorded (Kelly *et al*., 2009 and Kelly *et al*., 2012a).

Table 1.1. Number of each fish species captured by each gear type during the survey on Upper Lough Skeagh, September 2017

Scientific name	Common name	Number of fish captured			
		BM CEN	4-Panel	Fyke	Total
Perca fluviatilis	Perch	190	0	0	190
Rutilus rutilus	Roach	173	0	0	173
Abramis brama	Bream	53	21	0	74
Rutilus rutilus x Abramis brama	Roach x bream hybrid	38	1	0	39
Esox lucius	Pike	1	1	0	2
Anguilla anguilla	European eel	0	0	19	19

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. Mean CPUE and BPUE for all fish species captured in the 2017 survey are summarised in Table 1.2.

Perch and roach were the dominant fish species in terms of abundance (CPUE) , while bream followed by perch recorded the highest biomass (BPUE) during the 2017 survey (Table 1.2).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Upper Lough Skaegh, 2017

Scientific name	Common name	Mean CPUE (± S.E) **	Mean BPUE (± S.E) **
Perca fluviatilis	Perch	0.352 (0.002)	20.989 (6.595)
Rutilus rutilus	Roach	0.320 (0.101)	9.167 (2.727)
Abramis brama	Bream	0.109 (0.032)	22.197 (6.565)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.071 (0.022)	6.511 (1.847)
Esox lucius	Pike	0.002 (0.002)	3.004 (2.254)
Anguilla anguilla	European eel	0.106 (0.055)	19.85 (9.948)

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

**CPUE and BPUE data above for all fish species except eels are not comparable to earlier surveys as an extra panels were added to the 2-PBB to provide additional information on large coarse fish.

Mean CPUE and BPUE (excluding data from the 55mm, 70mm and 90mm mesh panels of 4-PBB survey gill net) for all species captured in the 2008, 2011 and 2017 surveys are illustrated in Figures 1.2 and 1.3 and show that fish stocks in the lake have been relatively stable across the surveys conducted.

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Upper Lough Skeagh (Eel CPUE based on fyke nets only), 2008, 2011 and 2017 (For comparison purposes the CPUE figures exclude the 55mm, 70mm and 90mm mesh panel of 4-PBB).
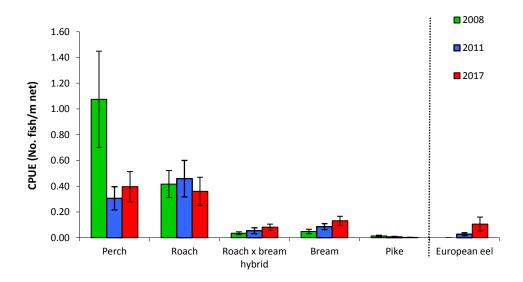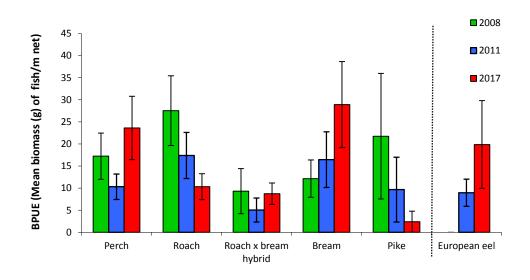

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Upper Lough Skeagh (Eel BPUE based on fyke nets only), 2008, 2011 and 2017 (For comparison purposes the CPUE figures exclude the 55mm, 70mm and 90mm mesh panel of 4-PBB).

1.3.3 Length frequency distributions and growth

Roach

Roach captured during the 2017 survey ranged in length from 6 to 20.2 cm (mean = 20.2 cm) (Fig.1.4). Roach captured during the 2008, 2011 and 2014 surveys had a similar length range (Fig.1.4). All age classes (eight years) from 1+ to 8+ were represented in the sample aged, indicating regular recruitment in recent years. The dominant age class was 2+. Mean length at age 1 was estimated as 3.3cm (Table 1.3).

Fig. 1.4. Length frequency of roach captured on Upper Lough Skeagh, 2008, 2011 and 2017

Table 1.3. Mean (±S.E.) roach length (cm) at age for Upper Lough Skeagh, September 2017

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8
Mean	3.3	6.9	9.8	12.7	14.3	15.9	17.3	18.0
(±S.E.)	0.1	0.3	0.5	0.5	0.4	0.4	0.5	-
N	35	33	22	14	11	8	6	1
Min	2.1	4.8	6.6	8.8	11.0	14.0	16.1	18.0
Max	4.9	10.0	17.2	15.9	15.8	17.5	19.4	18.0

Bream

Bream captured ranged in length from 6.2 to 36.6 cm (mean 23.2 cm) (Fig. 1.5). Bream captured during the 2008, 2011 and 2014 surveys had a similar length range (Fig.1.5). Ten age classes were present. All ages between 1+ and 12+ (with the exception of 2+ and 6+) were represented in the sample aged. While this indicates regular recruitment of bream in the lake, 8 year old fish dominated the population. Mean length at age 1 was estimated as 3.2cm (Table 1.4).
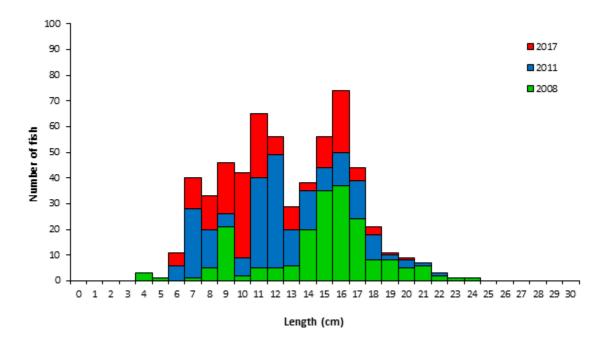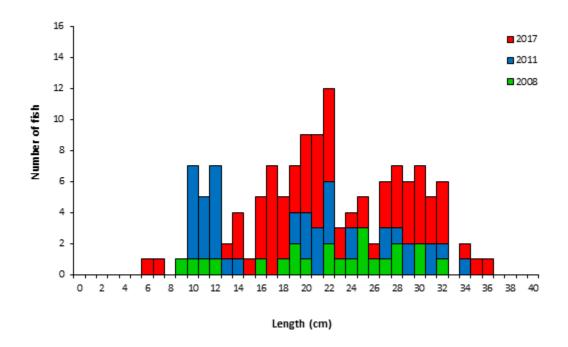

Fig. 1.5. Length frequency of bream captured on Upper Lough Skeagh, 2008, 2011, and 2017

Table 1.4. Mean (±S.E.) bream length (cm) at age for Lough Skeagh, September 2017

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	L_{11}	L_{12}
Mean	3.2	7.0	10.5	13.2	16.3	19.1	22.2	25.2	28.2	30.4	32.3	34.8
(±S.E.)	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.5	0.6	0.7	0.0
N	58	57	57	52	47	40	40	30	16	11	7	1
Min	2.3	5.3	8.6	10.6	11.8	13.8	16.6	18.0	25.4	28.4	30.0	34.8
Max	4.6	10.8	13.4	16.5	20.7	23.7	29.2	28.9	30.9	33.3	34.9	34.8

Roach x bream hybrids

Roach x bream hybrids captured ranged in length from 8.5 to 36.9 cm (mean 16.5 cm) (Fig. 1.6). Eight age classes were present. All ages between 0+ and 9+ (except 1+) were represented in the sample aged. This indicates that there has been regular recruitment (i.e. hybridisation between the parent species) in the lake, with two dominant age classes (3+ and 7+) recorded. Mean length at age 1 was estimated as 3.4cm (Table 1.5).
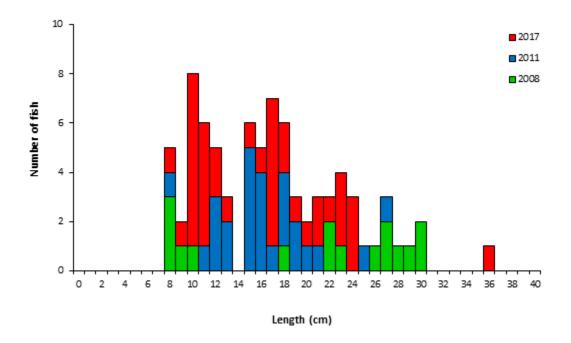

Fig. 1.6. Length frequency of roach x bream hybrids captured on Upper Lough Skeagh, 2008, 2011 and 2017

Table 1.5. Mean (±S.E.) bream length (cm) at age for Upper Lough Skeagh, September 2017

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9
Mean	3.4	7.4	10.7	14.8	16.7	19.1	20.8	20.7	20.4
(±S.E.)	0.1	0.3	0.4	0.4	0.6	0.6	0.7	3.0	-
N	27	27	25	17	12	10	9	2	1
Min	2.7	5.4	7.6	10.7	12.1	14.6	15.9	17.8	20.4
Max	4.4	10.3	13.6	16.5	19.0	21.4	23.5	23.7	20.4

Perch

Perch captured during the 2017 survey ranged in length from 5 to 33.9 cm (mean = 14.7 cm) (Fig.1.7). Perch captured during the 2008, 2011 and 2017 surveys had a similar length and age range. However, with the exception of the first survey in 2008, very few juvenile perch have been recorded during the surveys (Figure 1.7). Furthermore, two larger fish (>30cm) were recorded in 2017 (Fig.1.7) and both were captured in benthic monofilament nets. A total of eight age classes (1+ to 8+ with all intervening years) were present in the sample. No one age class dominated the population of perch in the lake. Mean length at L1 was 5.2 cm (Table 1.6).
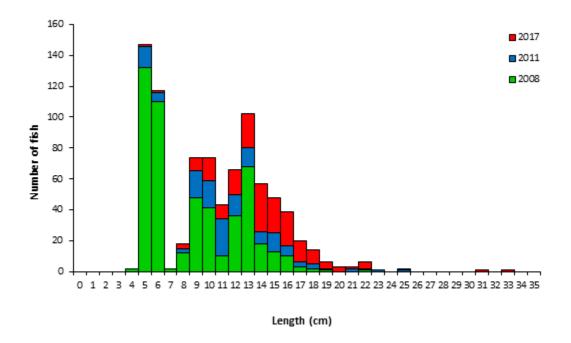

Fig. 1.7. Length frequency of perch captured on Upper Lough Skeagh, 2008, 2011 and 2017

Table 1.6. Mean (±S.E.) perch length (cm) at age for Upper Lough Skeagh, September 2017

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8
Mean	5.2	8.4	11.8	14.1	16.3	18.0	18.7	20.2
(±S.E.)	0.1	0.2	0.3	0.4	0.4	0.9	1.2	1.9
N	46	36	34	24	18	9	6	3
Min	3.9	5.8	7.6	10.5	13.4	14.6	16.0	17.8
Max	9.0	13.0	18.4	17.8	19.9	21.6	23.0	24.0

1.3.4 Stomach and diet analysis

Perch

Perch initially start to feed on pelagic zooplankton. Once they reach an intermediate size they start feeding on benthic resources eventually moving on to feed on fish once they are large enough (Hjelm *et al.*, 2000). A total of 69 perch stomachs were examined. Of these 35 (51 %) contained food (Fig 1.8). Of those, 13 (41%) contained unidentified digested material, while fish were recorded in 11 stomachs (31%). Zooplankton and invertebrates were found in ten (29%) and one (3%) stomachs respectively. Ontogenetic differences in perch diet, showing differences in the size of zooplankton and fish eaters respectively, are illustrated in Fig 1.9.
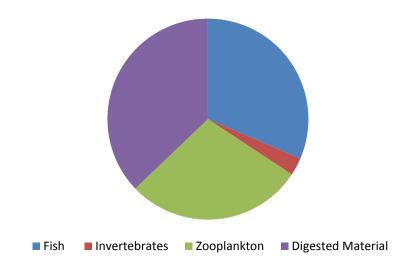

■ Fish   ■ Invertebrates   ■ Zooplankton   ■ Digested Material

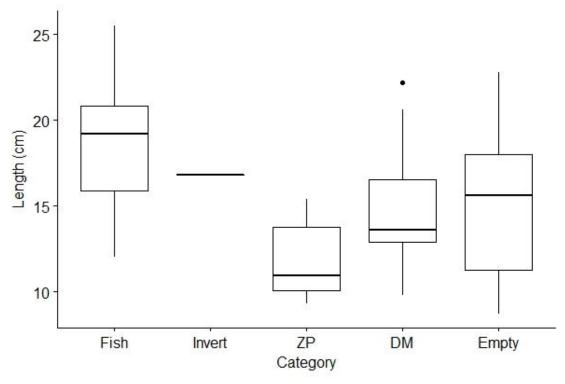**Fig 1.8. Diet of perch (n=35) captured on Upper Lough Skeagh in 2017 (% FO)**

Figure 1.9. Boxplot illustrating ontogenetic differences in diet of perch captured in Upper Lough Skeagh in 2017. The horizontal bars represent the median value of the sample, while the 75% and 25% percentiles are marked by the upper and lower boundary of each box. The vertical 'whiskers' show the data range. Outliers are marked by dots. (Fish = Fish; Invert = Invertebrates; ZP = Zooplankton; DM = unidentified digested material; Empty = no food)

1.4 Summary and ecological status

A total of five fish species and one hybrid were recorded in Upper Lough Skeagh in August 2017. Perch and roach were the dominant species with respect to CPUE, while bream had the highest BPUE of the species captured during the survey. Abundance (CPUE) and biomass (BPUE) of all species have remained relatively stable over the three surveys conducted since 2008.

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.*, 2012b). Using the FIL2 classification tool, Upper Lough Skeagh has been assigned an ecological status of Poor for 2017 based on the fish populations present. The lake was assigned a fish status of Poor/Bad in 2008 and 2011.

In the 2010 to 2015 surveillance monitoring reporting period, the EPA assigned Upper Lough Skeagh an overall ecological status of Bad.

1.5 References

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