National Research Survey Programme
Lakes 2018

Lough Owel

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Iascach Intíre Éireann
Inland Fisheries Ireland

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**Fish Stock Survey of Lough Owel,
September 2018**

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

ACKNOWLEDGEMENTS

1.1 Introduction

Lough Owel is located approximately four kilometres north-west of Mullingar, Co. Westmeath in the Upper Shannon catchment (Plate 1.1, Fig. 1.1). The lake has a surface area of 102ha and a maximum depth of 21m. The underlying geology of the lake is limestone. The lake is categorised as typology class 8 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), greater than 50ha and moderate alkalinity (20-100 mg/l CaCO$_3$).

Lough Owel is a public water supply for Mullingar and is also the water supply for the Royal Canal. The lake is fed by four small streams (Ballyboy, Frewin, Kilpatrick and Portnashangan) and is also spring fed. The lake is of major conservation significance as it contains three habitats (alkaline fens, transition mires and hard water lakes) that are listed on Annex I of the EU Habitats Directive (NPWS, 1999). Water quality in the lake has been monitored regularly since the 1970s. Mean concentrations of total phosphorus, mean transparency and mean chlorophyll a placed Lough Owel in the mesotrophic category between 1998 and 2002 (Devins, M., 1998; McGarrigle *et al.,* 2002; OECD, 1982).

Lough Owel is one of the important trout lakes in the midlands and has a resident stock of wild brown trout. The lake also holds stocks of pike, perch and rudd. Spawning and nursery grounds for trout are limited; therefore trout stocks are maintained by stripping the ova from wild adult trout. These are then hatched out at the Inland Fisheries Ireland (IFI) fish farm and large numbers of the resulting fry and adult fish are later stocked back into the lake. The first triploid brown trout ever stocked into any water in Ireland were stocked into Lough Owel in March 2011. Triploid trout are infertile, and unable to breed with each other or cross breed with wild brown trout. IFI is monitoring the performance of these fish and have removed the adipose fin to help anglers identify the fish.

The lake was surveyed during the 1980s, as well as 1979 and 2005, as part of a fish stock assessment by IFI's research section using seven-panel benthic braided survey gill nets (CFB 1981; CFB1982; CFB1983; CFB 1984; CFB 1985; CFB, 1986 and CFB, 1987). These surveys revealed that there were excellent stocks of brown trout in the lake (wild and stocked F1 wild fish). At the time there was also a population of perch and a small pike population in the lake. Rudd were identified as being present in the lake during 1985 (CFB, unpublished data). Historically the lake held a population of Arctic char; however they have been extinct for some time, the last specimen being authenticated from the lake in 1886 (Went, 1945). There is an old unsubstantiated report that Arctic char from Lough Owel were as large as 1.4kg, but this

can never be proven (Went, 1945). An attempt was made to reintroduce Arctic char to Lough Owel in 1995, however there is no evidence that they became established (Tierney *et al*., 2000).

The lake was also previously surveyed by IFI for the WFD fish surveillance monitoring programme in 2008, 2011, 2014 and 2015 (Kelly *et al*., 2009, 2012a, 2015 and 2016). During the 2015 survey, perch were found to be the dominant species present in the lake. Brown trout, roach, pike, tench, hybrids, rudd and eels were also recorded during these surveys.

This report summarises the results of the 2018 fish stock survey carried out on the lake.
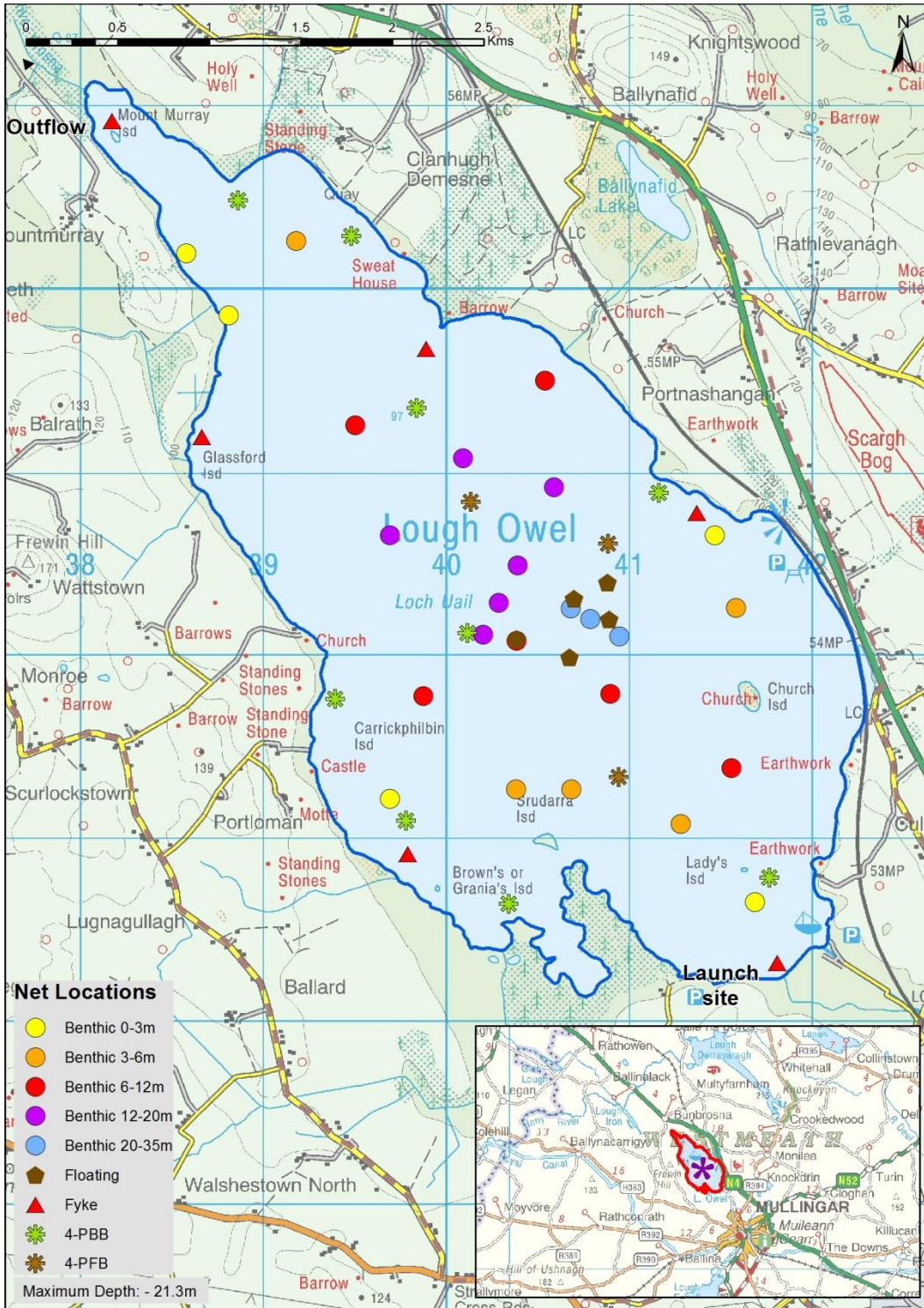

Plate 1.1. Lough Owel

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

1.2 Methods

1.2.1 Netting methods

Lough Owel was surveyed over three nights from the 10th to the 13th of September 2018. A total of six sets of Dutch fyke nets (Fyke), 25 benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets (5 @ 0-2.9m, 5 @ 3-5.9m, 6 @ 6-11.9m, 6 @ 12-19.9m and 3 20-34.9m) and five floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (36 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 12 additional sites. The 4-panel nets are composed of four 27.5m long panels each a different mesh size (55mm, 60mm, 70mm and 90mm knot to knot). Nets were deployed in the same locations as were randomly selected in the previous survey. 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 all brown trout, roach, rudd, hybrids, tench and pike. Live fish were returned to the water whenever practical or when the likelihood of their survival was considered to be good. Samples of fish were returned to the laboratory for further analysis.

1.2.2 Fish diet

Fish were frozen immediately after the survey and transported back to the IFI laboratory for later dissection. 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).

$$\%FO_i = (N_i/ N) \times 100$$

Where:

$\%FO_i$ is the percentage frequency of prey item i,
N_i is the number of a particular species with prey i in their stomach,
N is total number of a particular species 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 six fish species and two types of hybrid were recorded on Lough Owel in September 2018, with 1252 fish being 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, followed by roach. Tench, pike, rudd, stocked brown trout, roach x rudd hybrids and rudd x bream hybrids were also recorded. During the previous surveys in 2008, 2011, 2014 and 2015 the same species composition was recorded, with the exception of rainbow trout, which were only captured during the 2014 survey. Also pike and rudd were not captured during the 2014 survey but were recorded during the 2008, 2011, 2015 and 2018 surveys. Eels were not captured during the 2014 and 2018 surveys but were recorded during the 2008, 2011 and 2015 surveys. Rudd x bream hybrids were recorded during the 2018 survey (Kelly *et al*., 2009, 2012a, 2015 and 2016). The IFI surveys conducted from 1979 to 2005 captured the same species composition as above.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Owel, September 2018

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	4-Panel	Fyke	Total
Perca fluviatilis	Perch	1022	0	4	5	1031
Rutilus rutilus	Roach	188	0	13	2	203
Rutilus rutilus x Scardinius erythrophthalmus	Roach x rudd hybrid	1	0	5	0	6
Salmo trutta	Brown trout (stocked)	1	2	2	0	5
Scardinius erythrophthalmus	Rudd	4	0	0	0	4
Scardinius erythrophthalmus x Abramis brama	Rudd x bream hybrid	1	0	0	0	1
Esox lucius	Pike	1	0	0	0	1
Tinca tinca	Tench	0	0	1	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. Mean CPUE and BPUE for all fish species captured in the 2018 survey are summarised in Table 1.2.

Perch was the dominant fish species in terms of abundance (CPUE) and biomass (BPUE) captured during the 2018 survey (Table 1.2). The mean CPUE and BPUE (excluding the 55mm, 70mm and 90mm mesh panel of 4-PBB) for all species captured in the 2009, 2012, 2015 and 2018 surveys are illustrated in Figures 1.2 and 1.3. The mean perch, roach and brown trout CPUE and BPUE fluctuated over the four sampling occasions, however the highest mean CPUE of perch and roach was recorded in the 2018 survey (Table 1.2; Fig 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Owel, 2018

Scientific name	Common name	Mean CPUE (± S.E) **
Perca fluviatilis	Perch	0.712 (0.168)
Rutilus rutilus	Roach	0.134 (0.036)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x Rudd hybrid	0.002 (0.001)
Salmo trutta	Brown trout (stocked)	0.002 (0.001)
Scardinius erythrophthalmus	Rudd	0.003 (0.002)
Scardinius erythrophthalmus x Abramis brama	Rudd x Bream hybrid	0.001 (0.01)
Esox lucius	Pike	0.001 (0.001)
Tinca tinca	Tench	0.0001 (0.0001)
		Mean BPUE (± S.E) **
Perca fluviatilis	Perch	30.073 (6.396)
Rutilus rutilus	Roach	10.132 (3.093)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x Rudd hybrid	0.898 (0.437)
Salmo trutta	Brown trout (stocked)	3.335 (2.208)
Scardinius erythrophthalmus	Rudd	0.481 (0.430)
Scardinius erythrophthalmus x Abramis brama	Rudd x Bream hybrid	0.212 (0.212)
Esox lucius	Pike	0.380 (0.380)
Tinca tinca	Tench	0.325 (0.325)

Note: On the rare occasion where biomass data was unavailable for an individual fish, this was determined from a length/weight regression for that species (Connor *et al.*, 2017).

**CPUE and BPUE data above for all fish species except eels are not comparable to earlier surveys as extra panels were added to the 1-PBB to provide additional information on large fish.
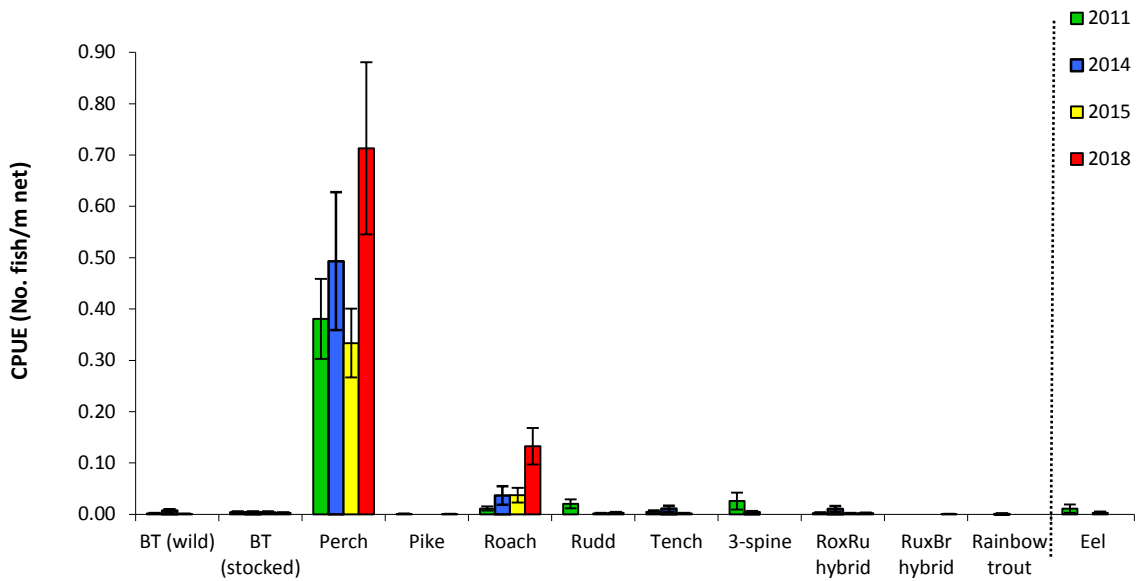
Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Owel (Eel CPUE based on fyke nets only), 2011, 2014, 2015 and 2018
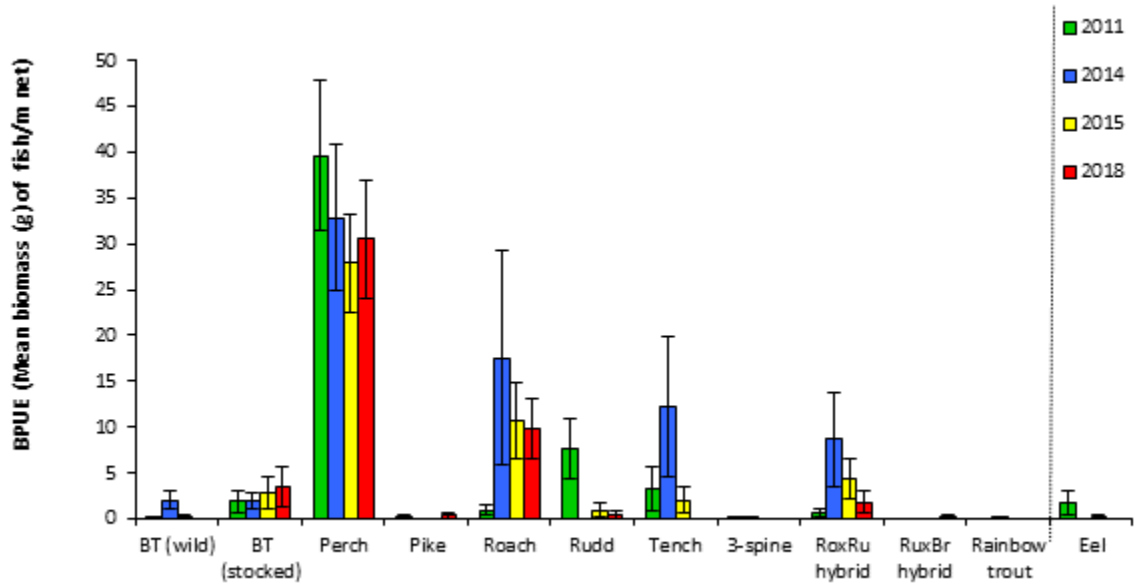

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Owel (Eel BPUE based on fyke nets only), 2011, 2014, 2015 and 2018

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2018 survey ranged in length from 5.0cm to 34.8cm (mean = 11.6cm) (Fig.1.4) with eight age classes present, ranging from 0+ to 7+ with a mean L1 of 5.8cm (Table 1.3). Perch captured during the 2011, 2014 and 2015 surveys had similar length and age ranges (Fig.1.4).
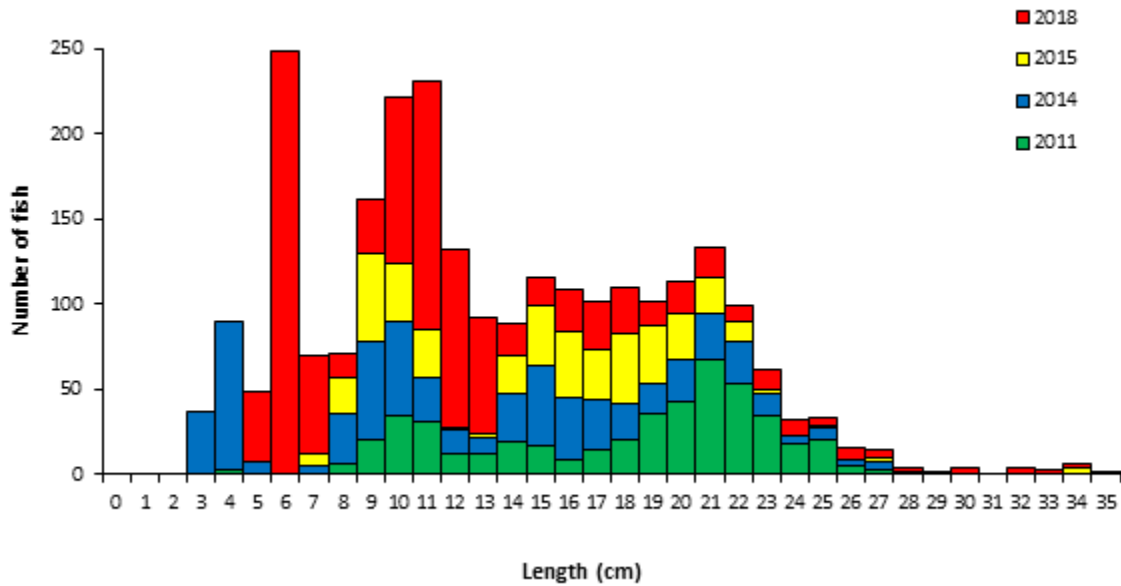

Fig. 1.4. Length frequency of perch captured on Lough Owel, 2011, 2014, 2015 and 2018

Table 1.3. Mean (±S.E.) perch length (cm) at age for Lough Owel, September 2018

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean (±S.E.)	5.8 (0.1)	10.9 (0.3)	15.6 (0.3)	19.0 (0.4)	22.2 (0.6)	23.4 (0.9)	26.7 (1.4)
N	98	70	49	36	27	15	6
Range	3.7-9.7	6.8-16.1	11.1-19.9	14.3-24.6	17.4-28.6	18.7-30.4	24.1-32.4

Roach

Roach captured during the 2018 survey ranged in length from 5.0cm to 36.0cm (mean = 13.6cm) (Fig.1.5) with nine age classes present, ranging from 1+ to 12+ (Table 1.4). Roach captured during the 2008, 2011, 2014 and 2015 surveys had a similar length and age range with the smallest range exhibited in 2014 (Fig.1.5).
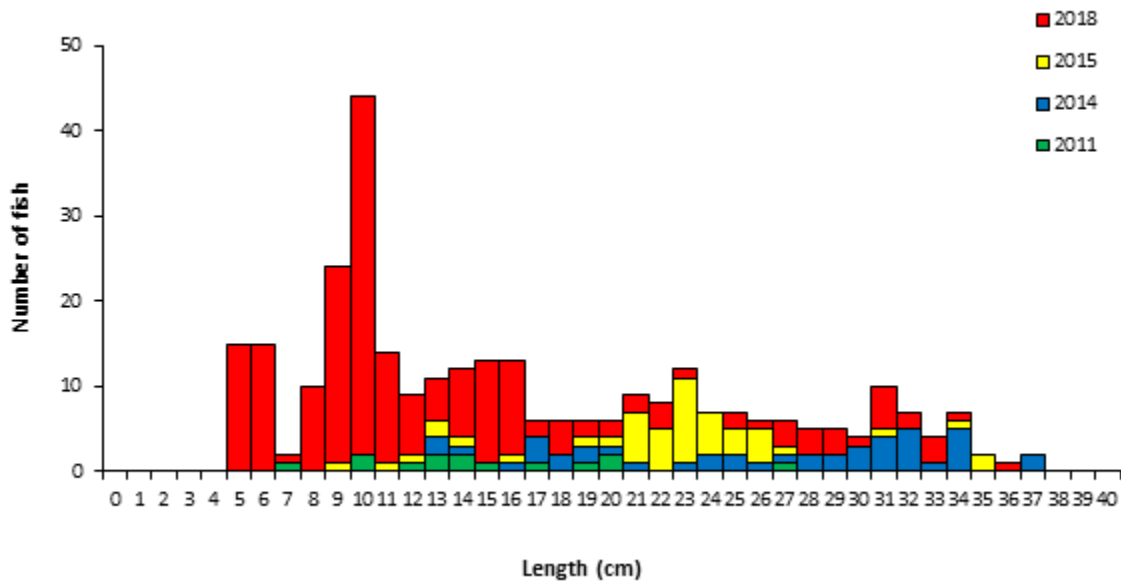

Fig. 1.5. Length frequency of roach captured on Lough Owel, 2011, 2014, 2015 and 2018

Table 1.4. Summary age data from a sub-sample of roach captured on Lough Owel, September 2018. Number of fish and length ranges of all fish aged in the sample is presented (no 9+, 10+ or 11+ fish were present in the sample).

	Age class								
	1+	2+	3+	4+	5+	6+	7+	8+	12+
Mean (cm)	8.9	11.9	15.8	21.5	24.6	30.6	30.5	31.3	36.0
N	7.0	44.0	18.0	7.0	7.0	4.0	7.0	8.0	1.0
Range (cm)	6.0-11.8	8.0-17.0	9.2-21.7	18.8-25.3	19.5-27.4	29.7-31.2	28.0-33.3	27.8-34.0	36.0

Other fish species

Brown trout (stocked) were captured during the 2018 survey and ranged in length from 36.4cm to 61.0cm. One pike at 41.4cm was recorded and rudd captured ranged in length from 11.8cm (1+) to 24.2cm (2+). Roach x rudd hybrids ranged in length from 21.4cm to 38.1cm, one rudd x bream hybrid was measured at 25.4cm (4+) and one tench was recorded at 42.2cm.

1.3.4 Stomach and diet analysis

Dietary analysis studies provide a good indication of the availability of food items and the angling methods that are likely to be successful. However, the value of stomach content analysis is limited unless undertaken over a long period as diet may change on a daily basis depending on the availability of food items. The stomach contents of a subsample of perch captured during the survey were examined and are presented below.

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 107 stomachs were examined. Of these 58 were found to contain no prey items. The remaining 49 stomachs contained 78% unidentified digested material, 12% fish, 8% zooplankton and 2% invertebrates (Fig. 1.6).
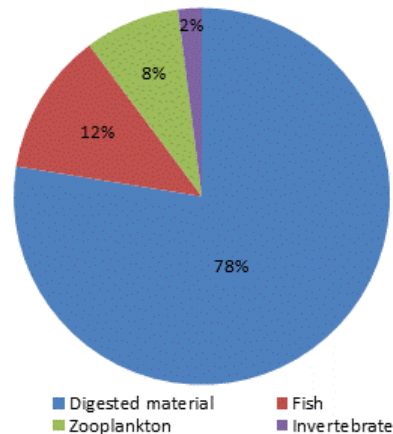

Fig 1.6. Diet of perch (n=49) captured on Lough Owel, 2018 (% FO)

1.4 Summary and ecological status

A total of six fish species and two types of hybrid were recorded on Lough Owel in September 2018. Perch was the dominant fish species in terms of abundance and biomass captured during the 2018 survey.

Perch captured during the 2018 survey ranged in length from 5.0cm to 34.8cm, with eight age classes present, ranging from 0+ to 7+, indicating reproductive success in each of the previous eight years.

Roach captured during the 2018 survey ranged in length from 5.0cm to 36.0cm, with nine age classes present, ranging from 1+ to 12+, indicating reproductive success in nine of the previous thirteen years.

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, Lough Owel has been assigned an ecological status of Good for 2018 based on the fish populations present. In previous years the lake was assigned a fish status of Moderate for 2008 and 2014 and Good for 2011 and 2015 based on the fish populations present.

In the 2010 to 2015 surveillance monitoring reporting period, the EPA assigned Lough Owel an overall ecological status of Good.

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