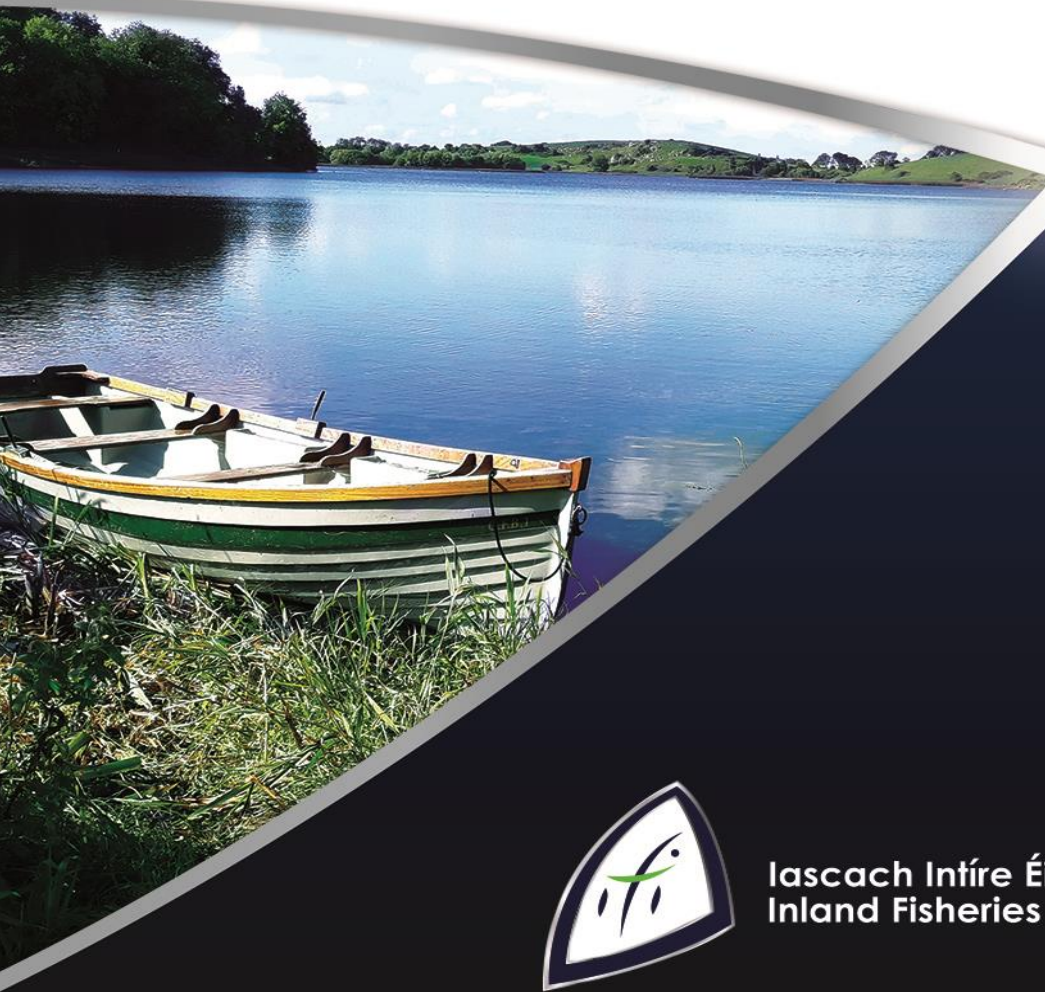


National Research Survey Programme

Lakes 2018

Muckanagh Lough

IFI/2019/1-4457



Iascach Iníre Éireann
Inland Fisheries Ireland



Inland Fisheries Ireland

National Research Survey Programme

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

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

CITATION: Connor, L., Morrissey, E., Coyne, J., Corcoran, W., Cierpial, D., Gavin A., Brett A., McLoone, P., Delanty, K., Rocks, K., Gordon, P., O' Briain, R., Matson, R., McCarthy E. and Kelly, F.L. (2018) Fish Stock Survey of Muckanagh Lough, September 2018. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Caampus, Dublin 24.

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

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1.1 Introduction

Muckanagh Lough is located within the Fergus catchment, approximately 10km east of the village of Corrofin, Co. Clare (Plate 1.1, Fig. 1.1). It is a shallow lake, with a mean depth of 3m, a maximum depth of 19m and a surface area of 95ha. The lake is categorised as typology class 10 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃). The lake is located in the “East Burren Complex” Special Area of Conservation. 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 included within the site, including areas of limestone pavement, calcareous grasslands, heath scrub, woodlands and calcareous lakes and turloughs (NPWS, 2001). The SAC exhibits some of the best and most extensive areas of oligotrophic limestone wetlands to be found in the Burren and in Europe. Some of the most extensive calcareous swamp fen communities in the country also occur within this complex (NPWS, 2001).

Muckanagh Lough has historically held a good stock of brown trout (O’ Reilly, 1998). A survey carried out by the Inland Fisheries Trust during 1970 recorded stocks of brown trout and pike in the lake. Although perch, rudd and tench were present in the inlet canal in 1970, none of these species were recorded in the lake during this previous survey (Inland Fisheries Trust, unpublished data). The lake was previously stocked with brown trout during 1977; however test netting of the lake revealed that none of these fish survived (Inland Fisheries Trust, unpublished data).

This lake was surveyed as part of the Water Framework Directive surveillance monitoring programme in 2009, 2012 and 2015 (Kelly *et al.*, 2010, 2013 and 2016). During the 2015 survey, perch were found to be the dominant species present in the lake. Rudd, brown trout, and pike were also captured during the survey.

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



Plate 1.1. Muckanagh Lough

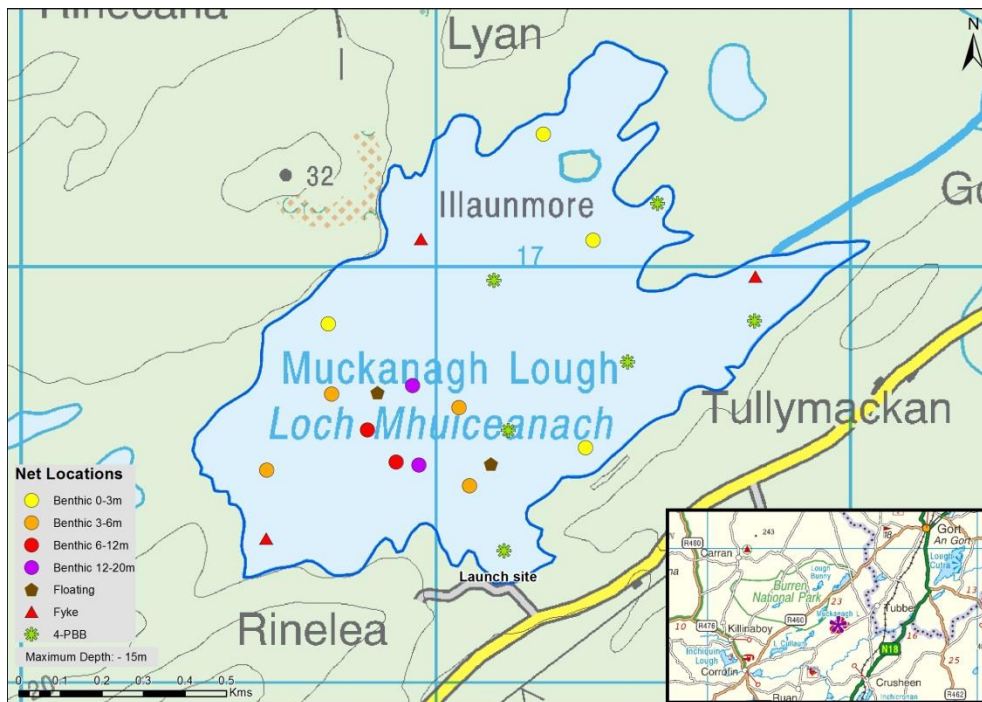


Fig. 1.1. Location map of Muckanagh Lough showing locations and depths of each net (outflow is indicated on map)



1.2 Methods

1.2.1 Netting methods

Muckanagh Lough was surveyed over two nights from the 24th to the 26th of September 2018. A total of three sets of Dutch fyke nets (Fyke), twelve 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, 2 @ 6-11.9m and 2 @ 12.0-19.9m) and two floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (17 sites). The netting effort was supplemented using six four-panel benthic braided survey gill nets (4-PBB) at six 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). 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, tench, rudd 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 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 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 were recorded on Muckanagh Lough in September 2018, with 511 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. Pike, rudd, tench, brown trout and eels were also recorded. During the previous surveys in 2009, 2012 and 2015 a similar species composition was recorded with the exception of three-spined stickleback, which were captured during both the 2009 and 2012 surveys but were not recorded during the 2015 or 2018 surveys (Kelly *et al.*, 2010, 2013 and 2016). Tench and eels were captured during the 2009, 2012 and 2018 surveys but were not recorded during the 2015 survey (Kelly *et al.*, 2010, 2013 and 2016).

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

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	4-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	482	0	0	0	482
<i>Esox lucius</i>	Pike	12	0	0	1	13
<i>Scardinius erythrophthalmus</i>	Rudd	9	2	0	0	11
<i>Tinca tinca</i>	Tench	0	0	3	0	3
<i>Salmo trutta</i>	Brown trout	0	0	1	0	1
<i>Anguilla anguilla</i>	European eel	0	0	0	1	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 CPUE increased and the mean eel CPUE decreased over the four sampling occasions, all other species had similar CPUEs over the sampling period. Mean BPUE for all species except eel were also similar over the four sampling occasions (Table 1.2; Fig 1.2 and 1.3).

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

Scientific name	Common name	Mean CPUE (\pm S.E) **
<i>Perca fluviatilis</i>	Perch	0.699 (0.320)
<i>Esox lucius</i>	Pike	0.018 (0.006)
<i>Scardinius erythrophthalmus</i>	Rudd	0.016 (0.007)
<i>Tinca tinca</i>	Tench	0.001 (0.001)
<i>Salmo trutta</i>	Brown trout	0.0004 (0.0004)
<i>Anguilla anguilla</i> *	European eel*	0.006 (0.006)*
Mean BPUE (\pm S.E) **		
<i>Perca fluviatilis</i>	Perch	6.810 (2.668)
<i>Esox lucius</i>	Pike	2.201 (0.889)
<i>Scardinius erythrophthalmus</i>	Rudd	1.023 (0.608)
<i>Tinca tinca</i>	Tench	2.544 (1.813)
<i>Salmo trutta</i>	Brown trout	0.422 (0.422)
<i>Anguilla Anguilla</i> *	European eel*	1.081 (1.081)*

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).

* 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 extra panels were added to the 1-PBB to provide additional information on large fish.

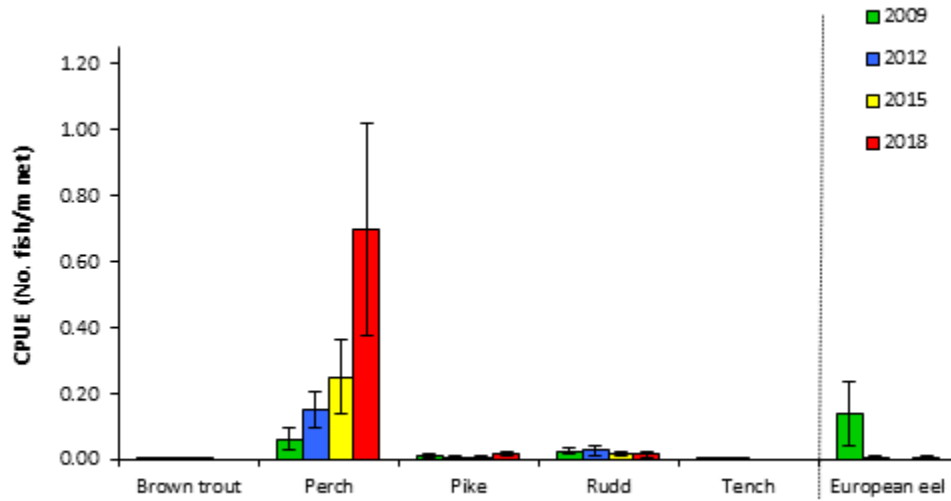


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Muckanagh Lough (Eel CPUE based on fyke nets only), 2009, 2012, 2015 and 2018

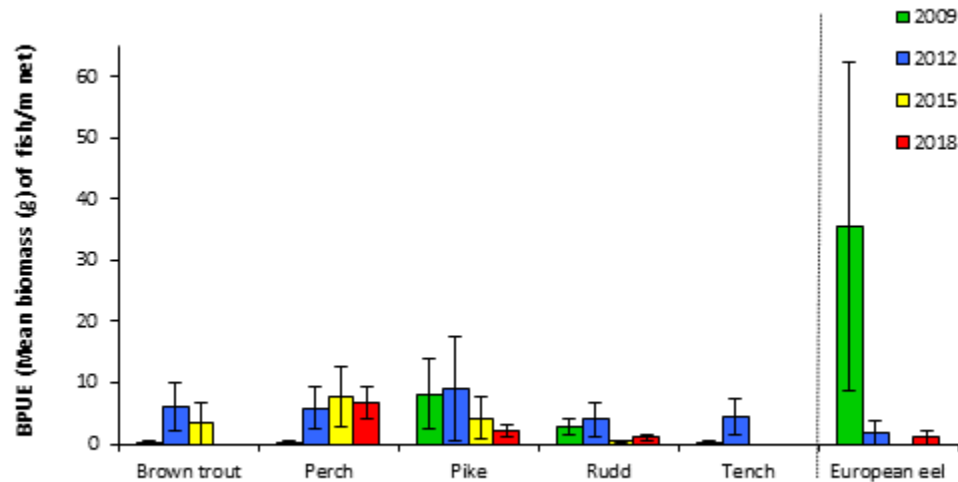


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Muckanagh Lough (Eel BPUE based on fyke nets only), 2009, 2012, 2015 and 2018

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2018 survey ranged in length from 5.0cm to 30.2cm (mean = 7.2cm) (Fig.1.4) with seven age classes present, ranging from 0+ to 6+ with a mean L1 of 6.1cm (Table 1.3). The dominant age class was 0+ (Fig. 1.4). Perch captured during the 2009, 2012 and 2015 surveys had a similar length and age range with larger fish recorded in 2018 (Fig.1.4).

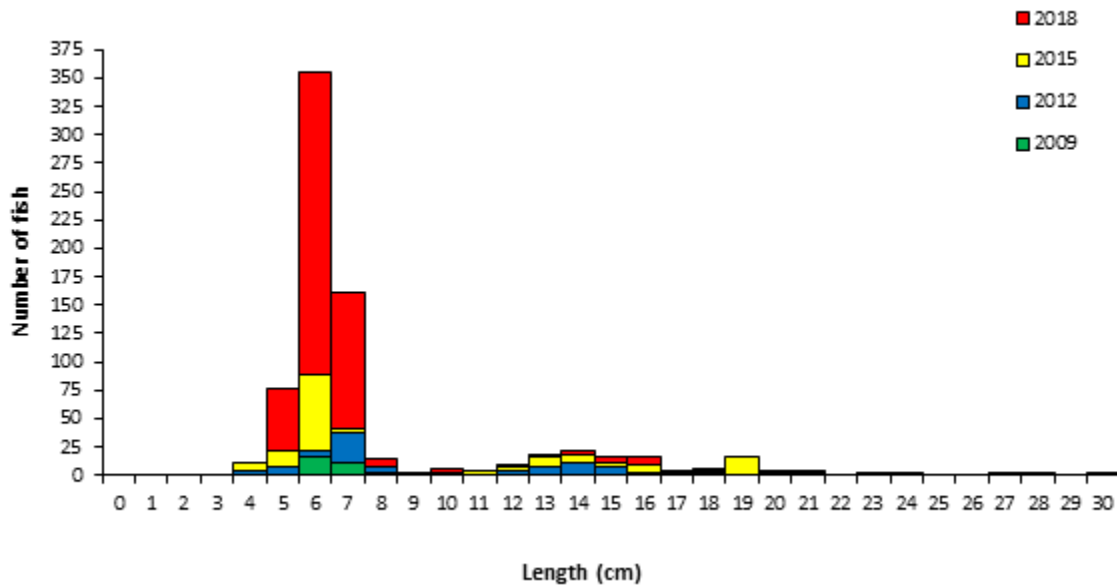


Fig. 1.4. Length frequency of perch captured on Muckanagh Lough, 2009, 2012, 2015 and 2018

Table 1.3. Mean (\pm S.E.) perch length (cm) at age for Muckanagh Lough, September 2018

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean (\pm S.E.)	6.1 (0.2)	10.6 (0.3)	16.0 (0.5)	20.2 (0.8)	23.0 (0.8)	28.0
N	36	22	6	4	3	1
Range	4.5-9.0	8.8-14.2	14.2-18.2	18.1-21.9	21.9-24.5	28.0-28.0



Other fish species

One brown trout was recorded during the 2018 survey and was measured at 43.9cm and aged 3+. One eel was captured and was 49.4cm in length. Three tench ranging from 44.6cm to 51.2cm were recorded. Rudd ranged in length from 4.8cm to 21.5cm (five age classes ranging from 0+ to 5+) and pike ranged in length from 12.3cm to 38.9cm.

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 36 stomachs were examined and 20 of these were empty. Of the remaining 16 stomachs containing food, 50% contained unidentified digested material, 44% invertebrates and 6% fish (Fig. 1.5).

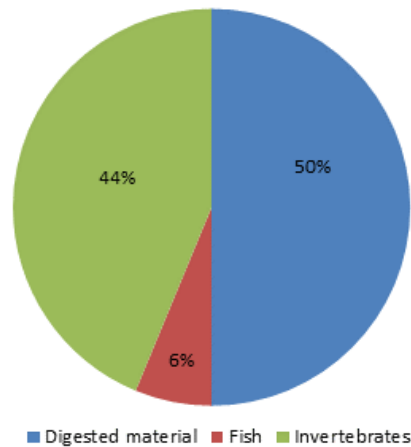


Fig 1.5. Diet of perch (n=16) captured on Muckanagh Lough, 2018 (% FO)



1.4 Summary and ecological status

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

Perch captured during the 2018 survey ranged in length from 5.0cm to 30.2cm, with seven age classes present, ranging from 0+ to 6+, indicating reproductive success in each of the previous seven years. The dominant age class was 0+.

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, Muckanagh Lough has been assigned an ecological status of High for 2018 based on the fish populations present. In previous years the lake was assigned a fish status of Good for 2009, Moderate for 2012 and High for 2015 based on the fish populations present.

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



1.5 References

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