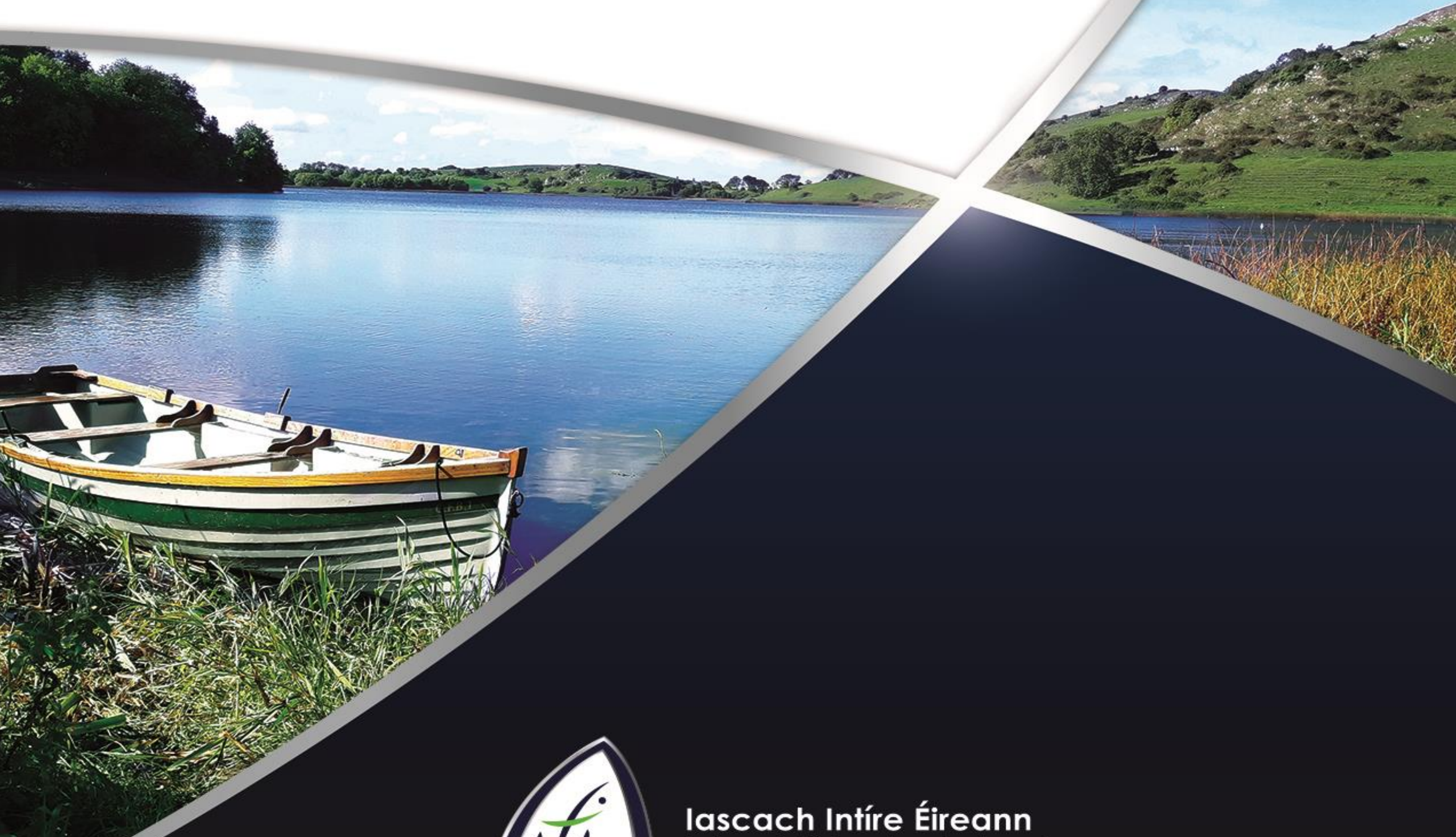
National Research Survey Programme

Lakes 2018

White Lough

IFI/2019/1-4448



Iascach Intíre Éireann
Inland Fisheries Ireland

Inland Fisheries Ireland

National Research Survey Programme

Fish Stock Survey of White Lough, July 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 White Lough, July 2018. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Caumpus, Dublin 24.

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

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of all their colleagues in Inland Fisheries Ireland.

The authors would also like to acknowledge the funding provided for the project from the Department of Communications, Climate Action and Environment for 2018.

1.1 Introduction

White Lough is located in the Erne catchment, approximately 5km south-west of Ballybay, Co. Monaghan (Plate 1.1, Fig. 1.1). The lake is situated at an altitude of 80m a.s.l. It has a surface area of 54ha, a mean depth of <4m and a maximum depth of 6m. The lake 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 moderately alkaline (20-100mg/l $CaCO_3$). The lake has been classed as 1a (i.e. risk of failing to meet good status by 2015) in the WFD Characterization report (EPA, 2005).

White Lough was previously surveyed in 1969 by the Inland Fisheries Trust (IFT unpublished data). Bream and rudd were abundant during the 1969 survey, with pike (up to 6300g), perch (up to 675g), roach (up to 675g), and roach x bream hybrids also being recorded (Inland Fisheries Trust, unpublished data).

The lake was also surveyed in 2006, as part of the NSSHARE Fish in Lakes Project (Kelly *et al*., 2007) and as part of the Water Framework Directive surveillance monitoring programme in 2009, 2012 and 2015 (Kelly *et al*., 2010, 2013 and 2016). Perch were the dominant species, followed by roach, bream, roach x bream hybrids, pike, eel and tench in the 2015 survey.

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

Plate 1.1. White Lough (Ballybay)

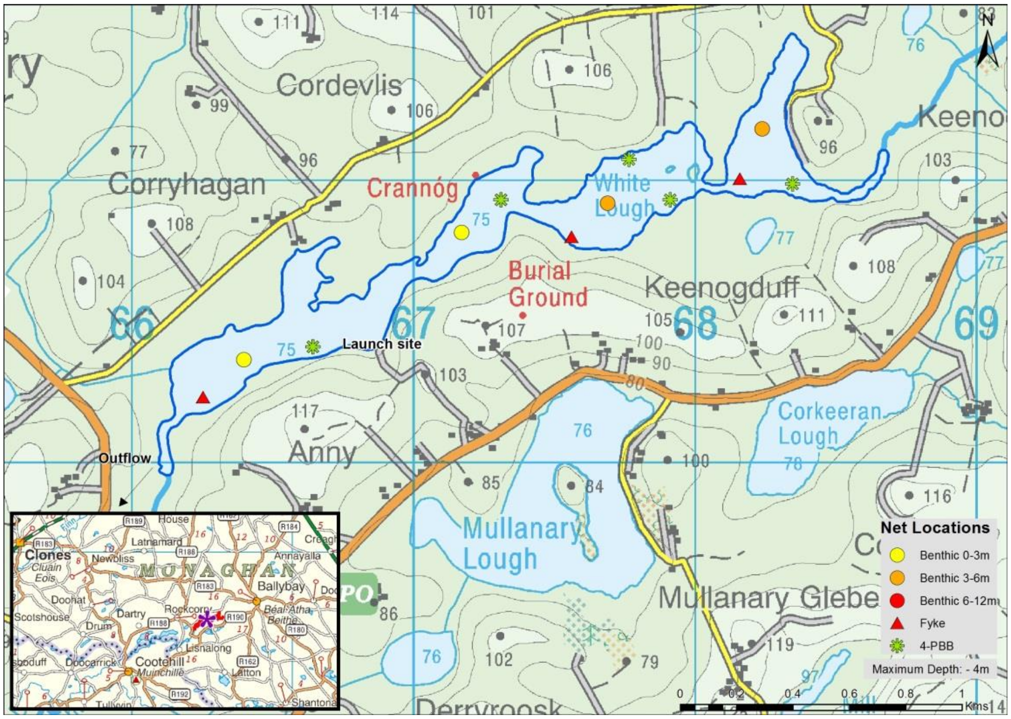


Fig. 1.1. Location map of White Lough showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

White Lough was surveyed over one night from the 16th to the 17th of July 2018. A total of three sets of Dutch fyke nets (Fyke), four benthic monofilament multi-mesh (BM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill nets (2 @ 0-2.9m and 2 @ 3-5.9m) were deployed in the lake (7 sites). The netting effort was supplemented using four-panel benthic braided survey gill nets (4-PBB) at two 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 roach, bream, hybrids, pike and tench. 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 seven fish species and two types of hybrid were recorded on White Lough in July 2018, with 590 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, bream, rudd, roach x bream hybrids, roach x rudd hybrids and eels were also recorded. During the previous surveys in 2006, 2009, 2012 and 2015 a similar species composition was recorded with the following exceptions. Tench were not captured during the 2006 and 2009 surveys, pike were not recorded in 2006 or 2015, rudd and roach x rudd hybrids were only recorded in 2018 and bream were present during the 2009, 2015 and 2018 survey but were not captured in 2012 (Kelly *et al*., 2007, 2010, 2013 and 2016).

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
Perca fluviatilis	Perch	286	0	0	286
Rutilus rutilus	Roach	157	0	5	162
Tinca tinca	Tench	4	42	4	50
Rutilus rutilus x Abramis brama	Roach x bream hybrid	21	22	0	43
Abramis brama	Bream	0	16	0	16
Esox lucius	Pike	2	0	2	4
Scardinius erythrophthalmus	Rudd	3	0	0	3
Rutilus rutilus x Scardinius erythrophthalmus	Roach x rudd hybrid	1	1	0	2
Anguilla anguilla	European eel	0	0	24	24

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 tench was the dominant fish species in terms of 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. Mean perch, roach and hybrids CPUE and BPUE fluctuated slightly 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 White Lough, 2018

Scientific name	Common name	Mean CPUE (± S.E) **
Perca fluviatilis	Perch	1.059 (0.546)
Rutilus rutilus	Roach	0.591 (0.292)
Tinca tinca	Tench	0.062 (0.028)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.102 (0.057)
Abramis brama	Bream	0.016 (0.012)
Esox lucius	Pike	0.015 (0.010)
Scardinius erythrophthalmus	Rudd	0.011 (0.008)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x rudd hybrid	0.005 (0.004)
Anguilla Anguilla*	European eel*	0.133 (0.019)*
		Mean BPUE (± S.E) **
Perca fluviatilis	Perch	1.059 (0.546)
Rutilus rutilus	Roach	0.591 (0.292)
Tinca tinca	Tench	63.799 (29.316)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.102 (0.057)
Abramis brama	Bream	23.387 (15.567)
Esox lucius	Pike	0.015 (0.010)
Scardinius erythrophthalmus	Rudd	0.011 (0.008)
Rutilus rutilus x Scardinius erythrophthalmus	Roach x rudd hybrid	0.005 (0.004)
Anguilla Anguilla*	European eel*	39.303 (5.162)*

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.

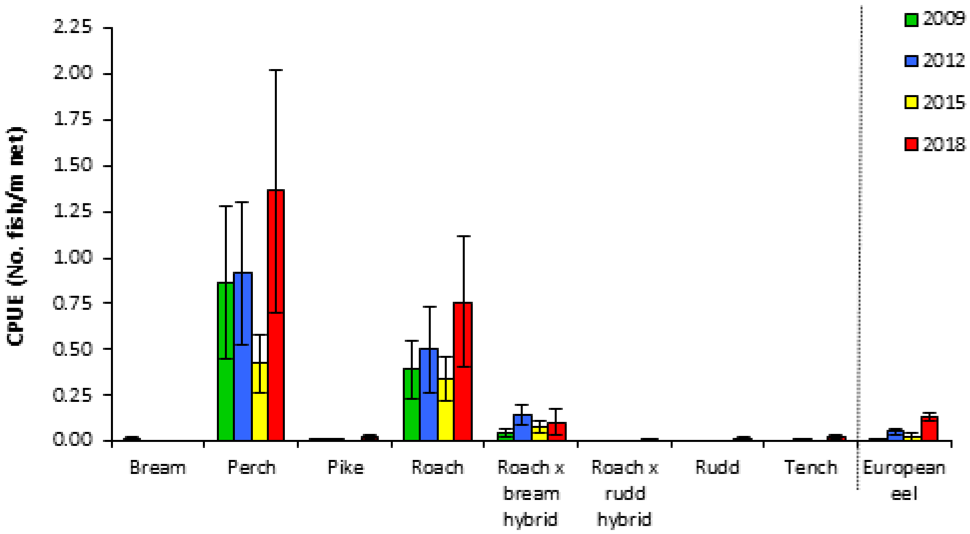


Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in White Lough (Eel CPUE based on fyke nets only), 2009, 2012, 2015 and 2018

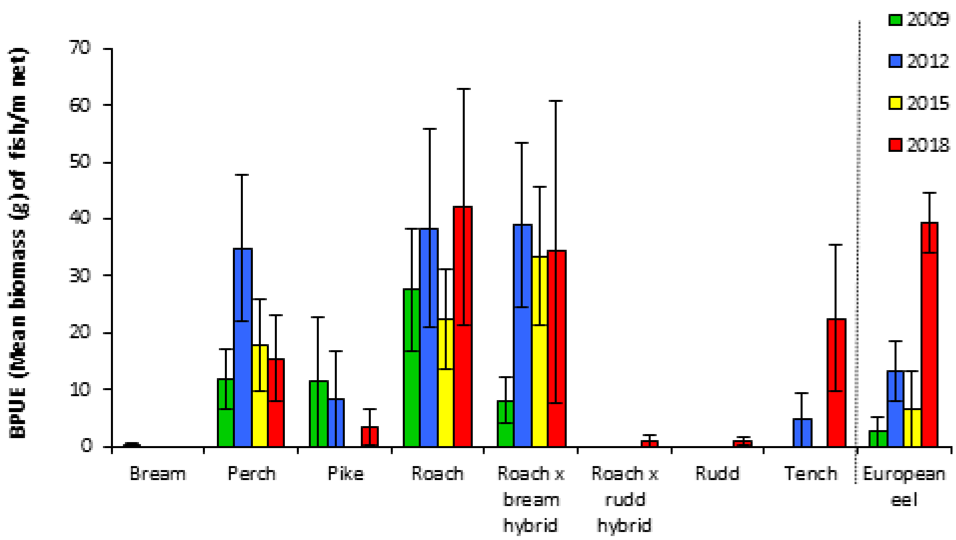


Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in White Lough (Eel BPUE based on fyke nets only), 2009, 2012, 2015 and 2018

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2018 survey ranged in length from 4.6cm to 21.3cm (mean = 8.2cm) (Fig.1.4) with eight age classes present, ranging from 0+ to 7+ with a mean L1 of 5.5cm (Table 1.3). Perch captured during the 2006, 2009, 2012 and 2015 surveys had a similar length and age range (Fig.1.4).

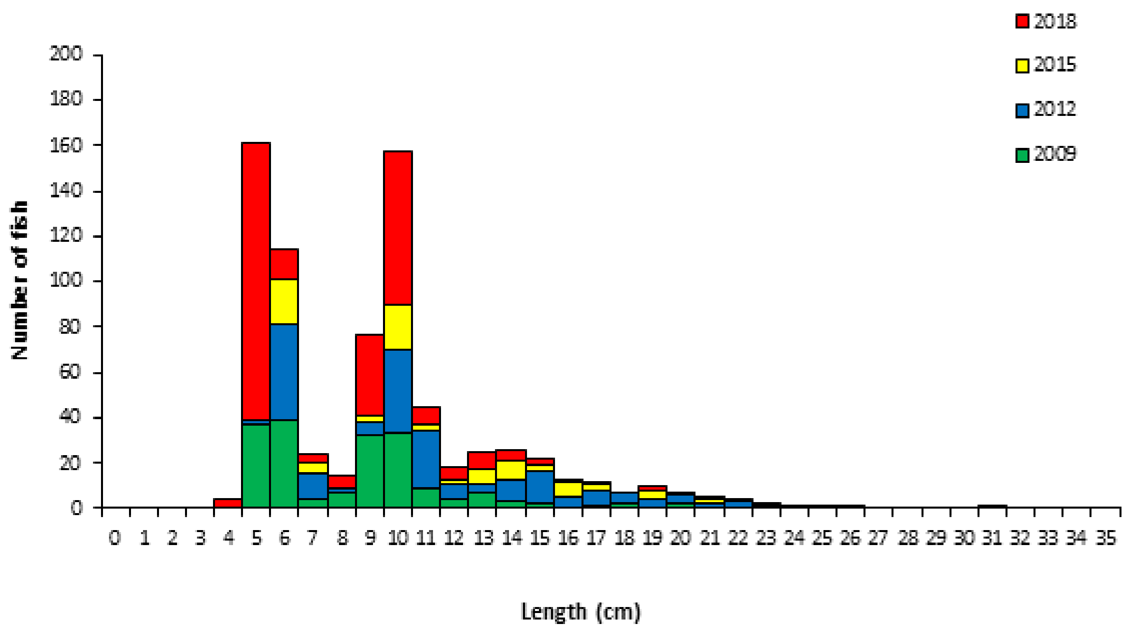


Fig. 1.4. Length frequency of perch captured on White Lough, 2009, 2012, 2015 and 2018

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

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean (±S.E.)	5.5 (0.1)	9.1 (0.2)	13.5 (0.5)	16.4 (0.6)	18.0 (0.2)	19.5 (0.4)	21.0
N	45	24	9	5	3	2	1
Range	4.1-6.6	7.3-11.9	10.9-15.7	15.1-18.1	17.7-18.3	19.1-19.9	21.0-21.0

Roach

Roach captured during the 2018 survey ranged in length from 6.2cm to 26.2cm (mean = 13.2cm) (Fig.1.5) with eight age classes present, ranging from 1+ to 8+ (Table 1.4). Roach captured during the 2006, 2009, 2012 and 2015 surveys had a similar length and age range (Fig.1.5).

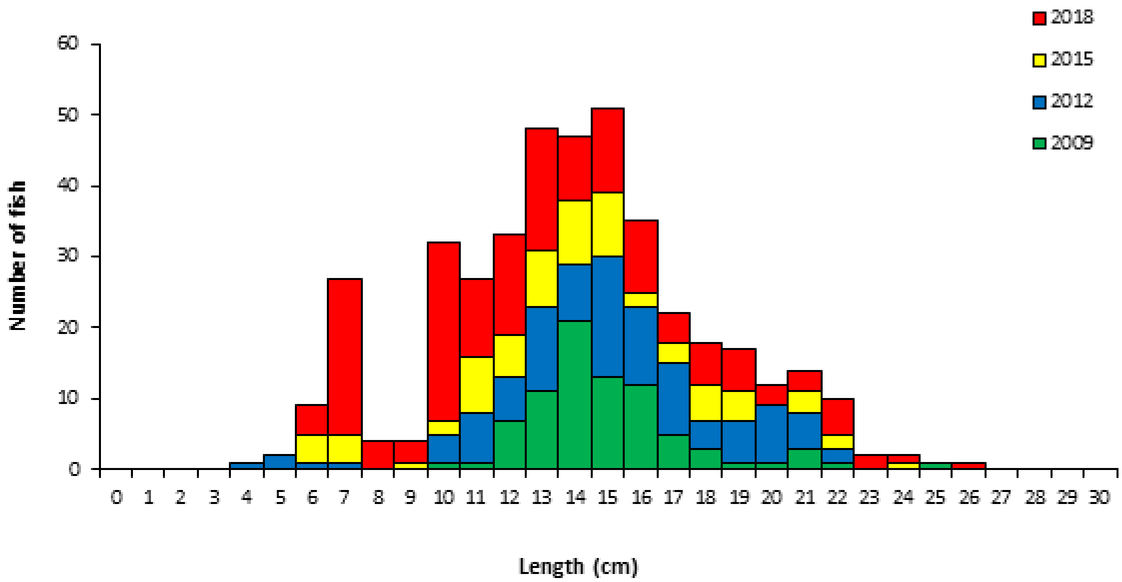


Fig. 1.5. Length frequency of roach captured on White Lough, 2009, 2012, 2015 and 2018

Table 1.4. Summary age data for a sub-sample of roach captured on White Lough Arrow, July 2018. Number of fish and length ranges of all fish aged in the sample is presented

	Age								
	0+	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**
Mean L (cm)	NA	6.9	9.5	12.8	15.3	19.1	20.4	23.7	23.2
N	NA	3	15	11	15	11	12	3	2
Range (cm)	NA	6.2-8.0	6.8-12.2	10.9-14.2	12.6-17.5	17.0-22.6	16.5-24.1	22.5-26.2	22.8-23.6

Other fish species

Eels were captured during the 2018 survey and ranged in length from 45.5cm and 67.0cm. Bream ranged in length from 26.1cm to 51.6cm with six age classes ranging from 5+ to 13+ and tench captured ranged in length from 30.5cm to 46.8cm. Roach x bream hybrids ranged in length from 7.1cm to 41.8cm (twelve age classes were present ranging from 1+ to 13+), roach x rudd hybrids 21.4cm (5+) to 32.8cm

(13+), rudd ranged from 11.1cm to 17.4cm and pike ranged in length from 10.5cm to 44.5cm, with three age classes present ranging from 2+ to 5+.

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 23 of these were empty. Of the remaining 13 stomachs containing food, 62% contained unidentified digested material, 23% fish and 15% invertebrates (Fig. 1.6).

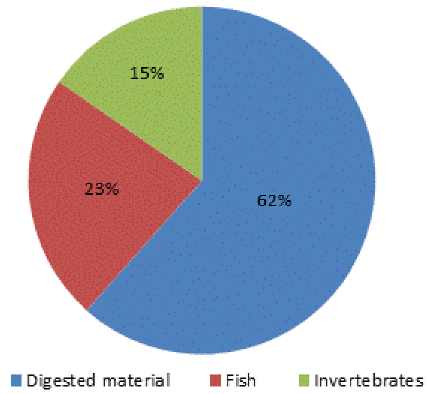


Fig 1.6. Diet of perch (n=13) captured on White Lough, 2018 (% FO)

1.4 Summary and ecological status

A total of seven fish species and two types of hybrid were recorded on White Lough in July 2018. Perch was the dominant fish species in terms of abundance and tench was the dominant fish species in terms of biomass captured during the 2018 survey.

Perch captured during the 2018 survey ranged in length from 4.6cm to 21.3cm, 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 6.2cm to 26.2cm, with eight age classes present, ranging from 1+ to 8+, indicating reproductive success in eight of the previous nine 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.*, 2012). Using the FIL2 classification tool, White Lough has been assigned an ecological status of Poor for 2018 based on the fish populations present. In previous years the lake was assigned a fish status of Bad for 2006 and 2012 and Moderate for 2009 and 2015 based on the fish populations present.

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

1.5 References

Amundsen, P.A., Gabler H.M., Staldvik F.J. (1996) A new approach to graphical analysis of feeding strategy from stomach contents data—modification of the Costello (1990) method. *Journal of Fish Biology,* **48,** 607–614.

Caffrey, J. (2010) *IFI Biosecurity Protocol for Field Survey Work*. Inland Fisheries Ireland.

Connor, L., Matson R. and Kelly F.L. (2017) Length-weight relationships for common freshwater fish species in Irish lakes and rivers. *Biology and Environment: Proceedings of the Royal Irish Academy,* **117 (2)**, 65-75.

EPA (2005) *The Characterisation and Analysis of Ireland's River Basin Districts in accordance with section 7 (2&3) of the European Communities (Water Policy) Regulations 2003* (S.I. No. 722 of 2003). National Summary Report (Ireland). 166pp.

Hjelm, J., Persson, L., and Christensen, B. (2000) Growth, morphological variation and ontogenetic niche shifts in perch (*Perca fluviatilis*) in relation to resource availability. *Oecologia*, **122 (2),** 190-199.

Kelly, F.L., Connor, L., and Champ, W.S.T. (2007) *A Survey of the Fish Populations in 46 lakes in the Northern Regional Fisheries Board, June to September 2005 and 2006*. Central Fisheries Board, unpublished report.

Kelly, F.L., Harrison, A., Connor, L., Allen, M., Rosell, R. and Champ, T. (2008) *FISH IN LAKES Task 6.9: Classification tool for Fish in Lakes. FINAL REPORT*. Central Fisheries Board, NS Share project.

Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., O'Callaghan, R., Wogerbauer, C., Feeney, R., Hanna, G. and Rocks, K. (2010) *Sampling Fish for the Water Framework Directive – Summary Report 2009*. The Central and Regional Fisheries Boards.

Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.

Kelly, F.L., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R. and Rocks, K. (2013) *Water Framework Directive Fish Stock Survey of White Lough, August 2012*. Inland Fisheries Ireland.

Kelly, F.L., Connor, L., Delanty K., McLoone, P., Coyne, J., Morrissey, E., Corcoran, W., Cierpial, D., Matson, R., Gordon, P., O' Briain, R., Rocks, K., Walsh, L., O' Reilly, S., O'Callaghan, R., Cooney, R.

and Timbs, D. (2016) *Fish Stock Survey of White Lough, September 2015*. National Research Survey Programme, Inland Fisheries Ireland.

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

www.fisheriesireland.ie
info@fisheriesireland.ie

+353 1 8842 600