National Research Survey Programme

Lakes 2016

Lough Conn

IFI/2017/1-4352

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Fish Stock Survey of Lough Conn, August 2016

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

CITATION: 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.., O' Reilly, S., Puttharee, D., McWeeney, D., Robson S. and Buckley, S. (2017) Fish Stock Survey of Lough Conn, August 2016. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cover photo: Netting survey on Lough Tay © 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 2016.

1.1 Introduction

Lough Conn is located in the Moy catchment in north County Mayo (Plate 1.1, Fig. 1.1). The lake is connected to its immediate neighbour to the south, Lough Cullin, by a narrow channel that passes under a regional road at Pontoon village (Fig. 1). The River Deel flows into Lough Conn and exits Lough Cullin at its southern end near Foxford, just before joining the River Moy which discharges into the Atlantic at Killala Bay. The lake has a surface area of 4,704ha and a maximum depth of 37.9m. The lake is categorised as typology class 12 (as designated by the EPA for the Water Framework Directive), i.e. deep (mean depth >4m), greater than 50ha and high alkalinity (>100 mg/l $CaCO_3$).

Lough Conn is part of a Special Protection Area (SPA) (Site code: 004228) under the E.U. Birds Directive. The SPA is of special conservation interest for the following species: Greenland White-fronted Goose, Tufted Duck, Common Scoter and Common Gull. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated water birds are of special conservation interest (NPWS, 2014).

Lough Conn's reputation as a fine brown trout and salmon fishery goes back to the very beginning of angling in the west of Ireland (O' Reilly, 1998). The main run of spring salmon enters Lough Conn from the end of March and continues right through April. The grilse run begins in May and continues into July (IFI, 2016).

The lake was surveyed by Inland Fisheries Ireland (IFI) on eight occasions between 1978 and 2001 (1978, 1984, 1990, 1994, 1998, 2001, 2005 and 2013) as part of a brown trout fish stock assessment programme (O'Grady and Delanty, 2001). Brown trout, rudd, roach, perch and pike were captured in the surveys. Historically the lake held a population of Arctic char; however they have been extinct for some time. Following the apparent collapse of the Arctic char population IFI surveyed the spawning areas where Arctic char, if present, would be congregating to spawn. The surveys were carried out during the Arctic char spawning seasons of 1991 to 1994. Three Arctic char were captured in the 1991 sampling, one fish in 1992 and none thereafter in 1993 or 1994. An examination of pike stomachs from fish captured in various parts of Lough Conn, throughout the 1990s, found no char (Igoe, *et al*., 2000). It is therefore reasonable to assume that Arctic char had become extinct in Lough Conn by the mid-1990s.

The current survey had two objectives:

1. Determine the current status of the fish stocks in the lake

2. Undertake an intercalibration exercise between the WFD multi method approach (BM CEN, FM CEN, Fyke and 2-PBB) and the "modified" method established by IFI in the late 1970s to assess the status of brown trout in lakes (8-PBB).

This report summarises the results of the 2016 fish stock survey (e.g. species composition, abundance and age structure) on Lough Conn using both sampling methods mentioned above. The results from the intercalibration exercise are detailed in a separate report.

Plate 1.1. Lough Conn (photo taken from the shore at Brackwanshagh)

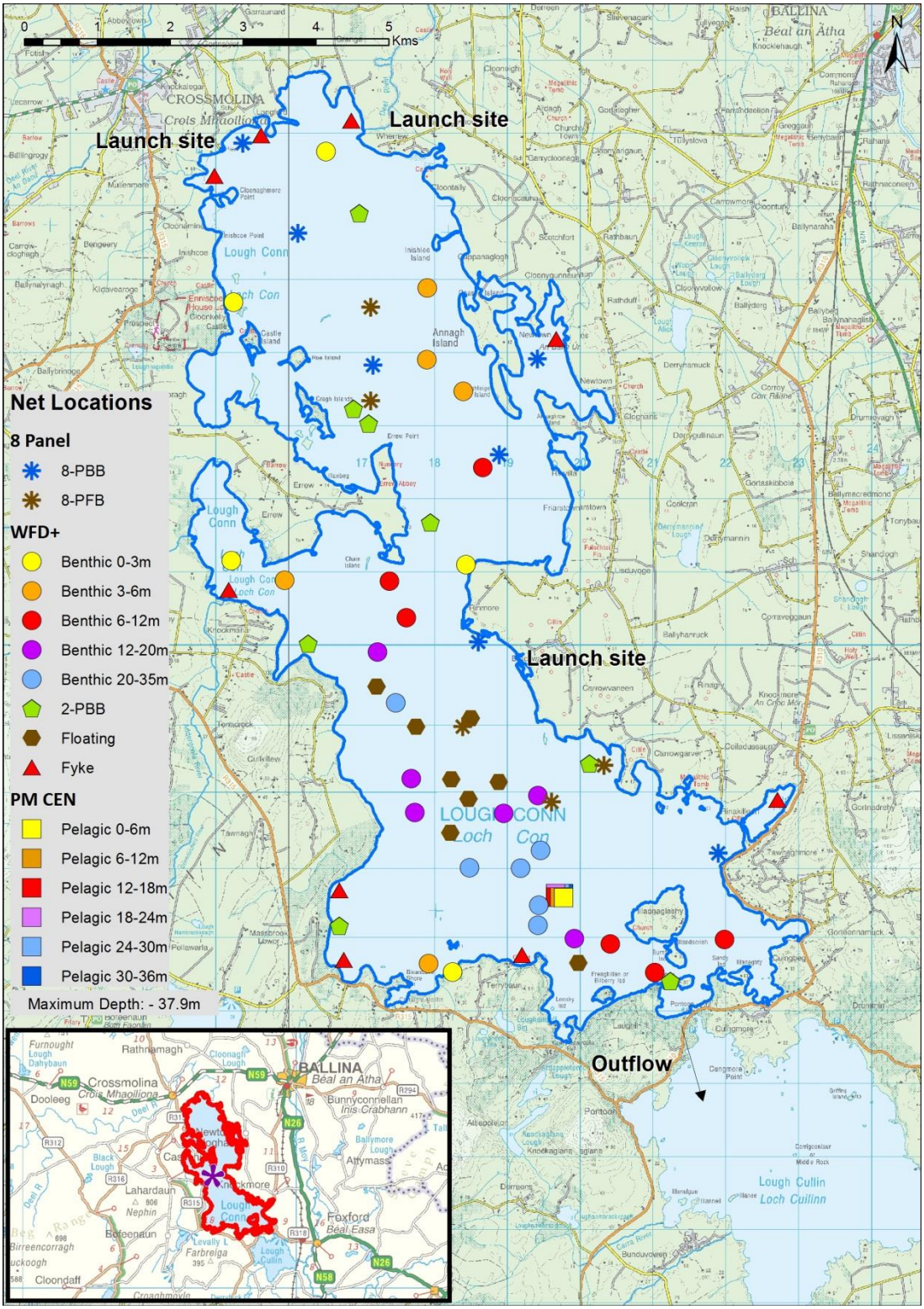

Fig. 1.1. Location map of Lough Conn showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

WFD+

Lough Conn was surveyed over four nights between the 22nd to the 26th of August 2016. The WFD + survey comprised a total of nine Dutch fyke nets (Fyke), 28 benthic monofilament multi-mesh (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets (BM CEN) and eight surface floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh knot to knot) CEN standard survey gill nets were deployed in the lake. The netting effort was supplemented using eight two-panel benthic braided (63.5mm and 88.9mm mesh knot to knot) survey gill nets (2-PBB).

8-panel

In addition seven eight-panel benthic braided survey gill nets (8-PBB) and five eight-panel floating braided survey gill nets (8-PFB) were deployed on the lake. These are composed of eight 27.5m long panels each a different mesh size, tied together randomly. The panels ranged from 2" (25.4mm mesh knot to knot) to 5" (63.5mm mesh knot to knot) in half inch (12.7mm) increments (O'Grady, 1981) with the addition of a 7" (88.9mm mesh knot to knot) panel.

Pelagic

A further six pelagic multi-mesh (12 panel, 6.25-55mm mesh size) 30m x 6m CEN standard survey gill nets (PM CEN) were also set during the survey. These survey nets were set over the deepest part of the lake from the surface to the lake bed.

The site locations for the benthic and surface monofilament multi-mesh gill net (BM CEN and FM CEN) were chosen randomly within fixed depth zones (0-2.9m, 3-5.9m, 6-11.9m, 12-19.9m and 20-34.9m). 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 also randomised.

All fish apart from perch were measured and weighed on site and scales were removed from all brown trout, roach, pike, tench and salmon. 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 returned to the laboratory for further analysis.

1.2.2 Fish diet

Fish were frozen before being dissected for stomach content analysis in the IFI laboratory. Total stomach contents were inspected and individual items were counted and identified to the lowest taxonomic level possible. The percentage frequency occurrence (%O) of prey items were then calculated to identify key prey items (Amundsen *et al.*, 1996).

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

Where:

$\%O_i$ 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 on the IFI NRSP team when moving between water bodies.

1.3 Results

1.3.1 Species Richness

A total of seven fish species were recorded on Lough Conn in August 2016, with 1485 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Roach was the most common fish species recorded, followed by perch. Brown trout, eels, pike, salmon and tench were also recorded.

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Conn, August 2016

Scientific name	Common name	Number of fish captured			
		WFD+	Pelagic	8-panel	Total
Rutilus rutilus	Roach	310	3	573	886
Perca fluviatilis	Perch	278	24	162	464
Salmo trutta	Brown trout	26	14	44	84
Anguilla anguilla	European eel	33	0	3	36
Esox lucius	Pike	0	0	12	12
Salmo salar	Salmon	1	0	1	2
Tinca tinca	Tench	1	0	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 2016 survey are summarised in Table 1.2 (Fig. 1.2 and 1.3).

Roach was the dominant fish species in terms of abundance (CPUE) and biomass (BPUE) (Table 1.2, Fig. 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE (per metre of net) for all fish species captured on Lough Conn, WFD+, PM CEN and 8-Panel

Scientific name	Common name	WFD+	PM CEN	8-Panel
			Mean CPUE (±S.E.)	
Rutilus rutilus	Roach	0.1920 (0.043)	0.0060 (0.006)	0.2170 (0.058)
Perca fluviatilis	Perch	0.1730 (0.038)	0.0500 (0.031)	0.0610 (0.028)
Salmo trutta	Brown trout	0.0107 (0.005)	0.0290 (0.024)	0.0160 (0.005)
Esox lucius	Pike	-	-	0.0005 (0.003)
Salmo salar	Salmon	0.0003 (0.0003)	-	0.0004 (0.0004)
Tinca tinca	Tench	0.0003 (0.0003)	-	-
*Anguilla anguilla**	European eel*	0.0610 (0.025)*	-	0.001 (0.001)*
			Mean BPUE (±S.E.)	
Rutilus rutilus	Roach	26.348 (6.082)	0.148 (0.148)	-
Perca fluviatilis	Perch	12.499 (2.885)	0.254 (0.074)	-
Salmo trutta	Brown trout	3.321 (0.995)	2.419 (2.123)	-
Esox lucius	Pike	-	-	-
Salmo salar	Salmon	2.230 (2.230)	-	-
Tinca tinca	Tench	0.048 (0.048)	-	-
*Anguilla Anguilla**	European eel*	14.997 (6.450)*	-	-

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.

*Eel CPUE and BPUE based on fyke nets only

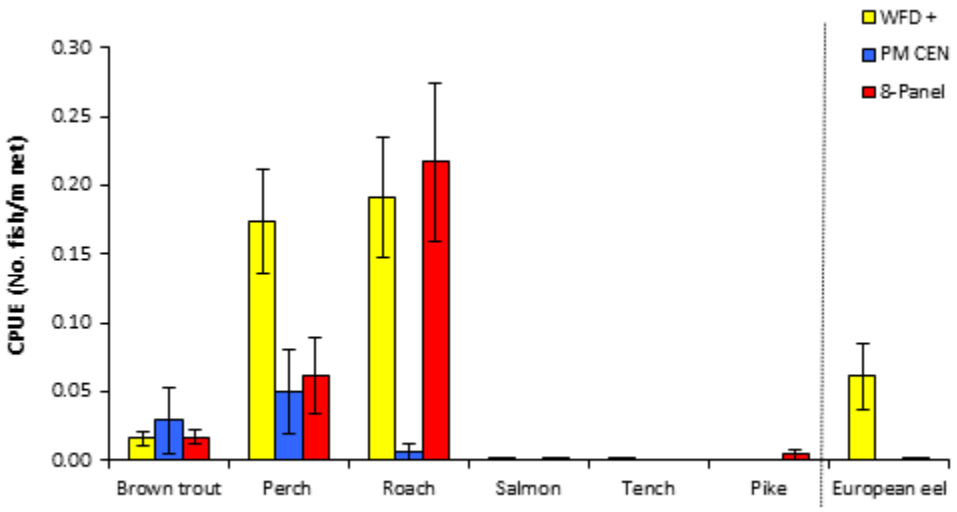

Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Lough Conn (Eel CPUE based on fyke nets only), 2016

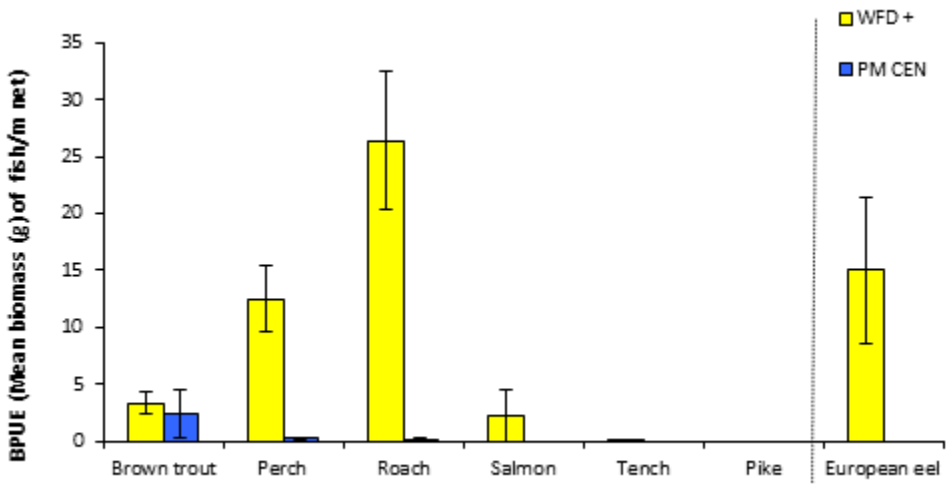

Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Lough Conn (Eel BPUE based on fyke nets only), 2016

1.3.3 Length frequency distributions and growth

Roach

Roach captured during the 2016 survey ranged in length from 6.0cm to 31.1cm (mean = 20.7cm) (Fig.1.4) with eleven age classes present, ranging from 2+ to 13+ with a mean L1 of 3.3cm (Table 1.3).

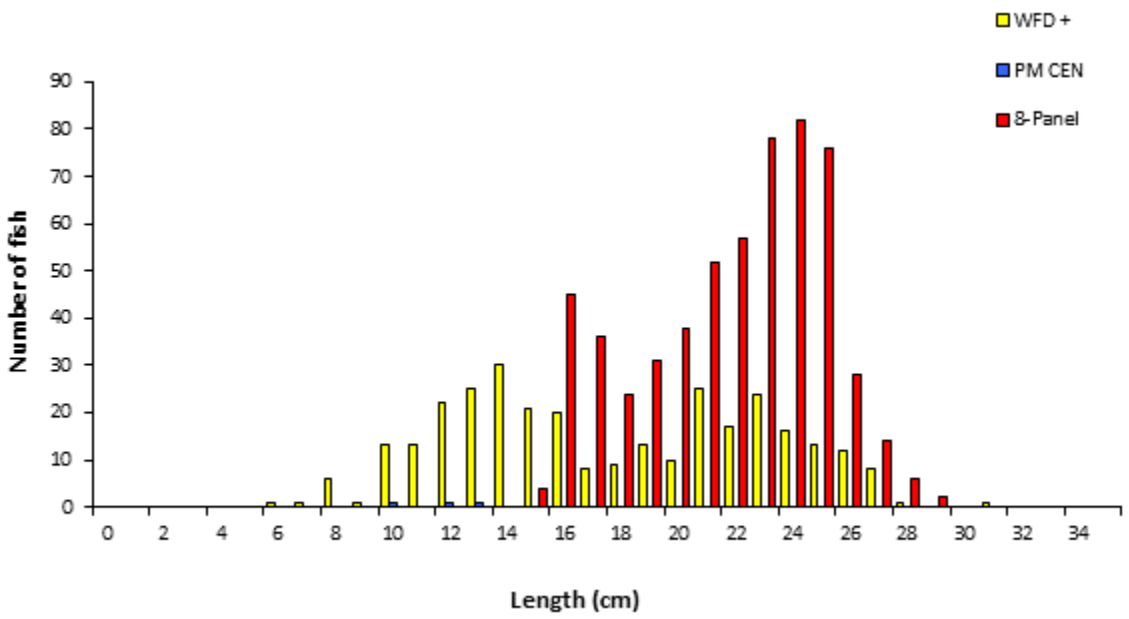

Fig. 1.4. Length frequency of roach captured on Lough Conn, 2016

Table 1.3. Mean (±S.E.) roach length (cm) at age for Lough Conn, August 2016

	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	L_{11}	L_{12}	L_{13}
Mean (± S.E.)	3.3 (0.1)	7.1 (0.1)	11.1 (0.2)	14.5 (0.3)	17.0 (0.3)	19.0 (0.3)	20.5 (0.3)	22.2 (0.3)	23.7 (0.4)	25.2 (0.4)	26.0 (0.5)	26.3 (0.9)	28.0 (1.6)
N	60.0	60.0	52.0	37.0	34.0	26.0	24.0	23.0	17.0	12.0	8.0	3.0	2.0
Range	2.5-4.8	5.1-9.8	8.8-14.2	10.2-17.8	14.1-20.0	16.9-22.0	18.6-23.7	20.2-24.6	21.5-26.2	22.9-27.9	24.1-28.3	25.1-28.2	26.4-29.6

Perch

Perch captured during the 2016 survey ranged in length from 5.0cm to 38.0cm (mean = 16.3cm) (Fig.1.5) with eight age classes present, ranging from 0+ to 7+ with a mean L1 of 6.5cm (Table 1.4). The dominant age class was 3+ (Fig. 1.5).

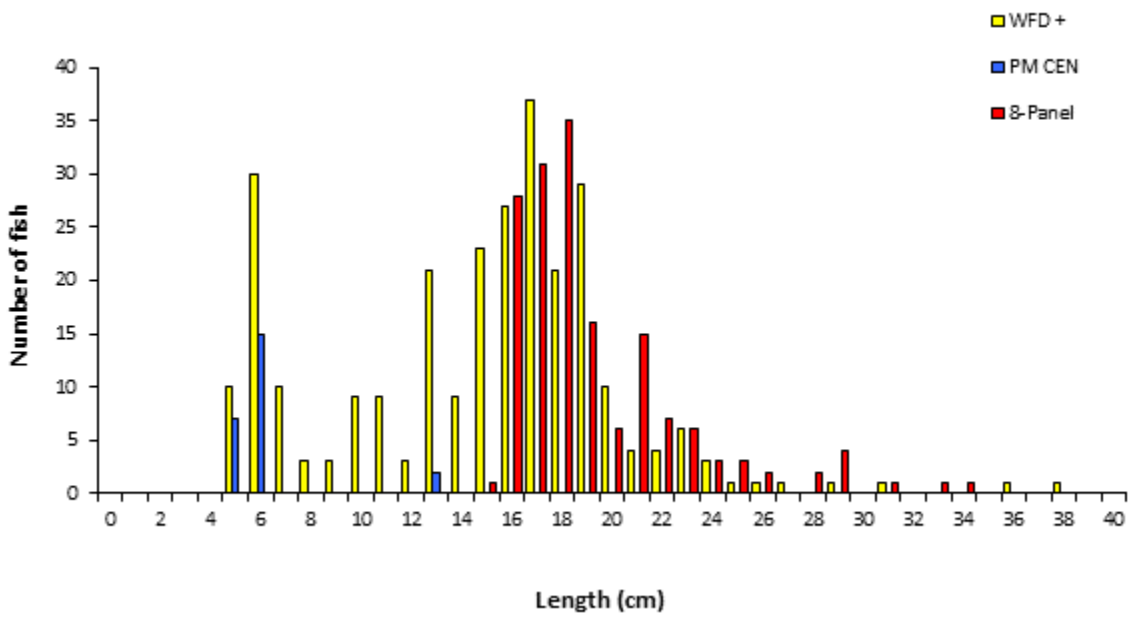

Fig. 1.5. Length frequency of perch captured on Lough Conn, 2016

Table 1.4. Mean (±S.E.) perch length (cm) at age for Lough Conn, August 2016

	L_1	L_2	L_3	L_4	L_5	L_6	L_7
Mean (±S.E.)	6.5 (0.1)	12.0 (0.2)	16.8 (0.4)	19.7 (0.7)	21.7 (0.9)	23.1 (1.0)	27.0 (0.8)
N	51	44	35	16	11	6	3
Range	4.4-8.9	9.1-17.9	13.2-22.7	15.3-25.2	18.0-27.0	19.9-26.1	25.3-28.0

Brown trout

Brown trout captured during the 2016 survey ranged in length from 15.4cm to 43.1cm (mean 25.2cm) (Fig. 1.6). Five age classes were present, ranging from 1+ to 5+, with a mean L1 of 6.8cm (Table 1.5). The dominant age class was 2+ (Fig. 1.6).

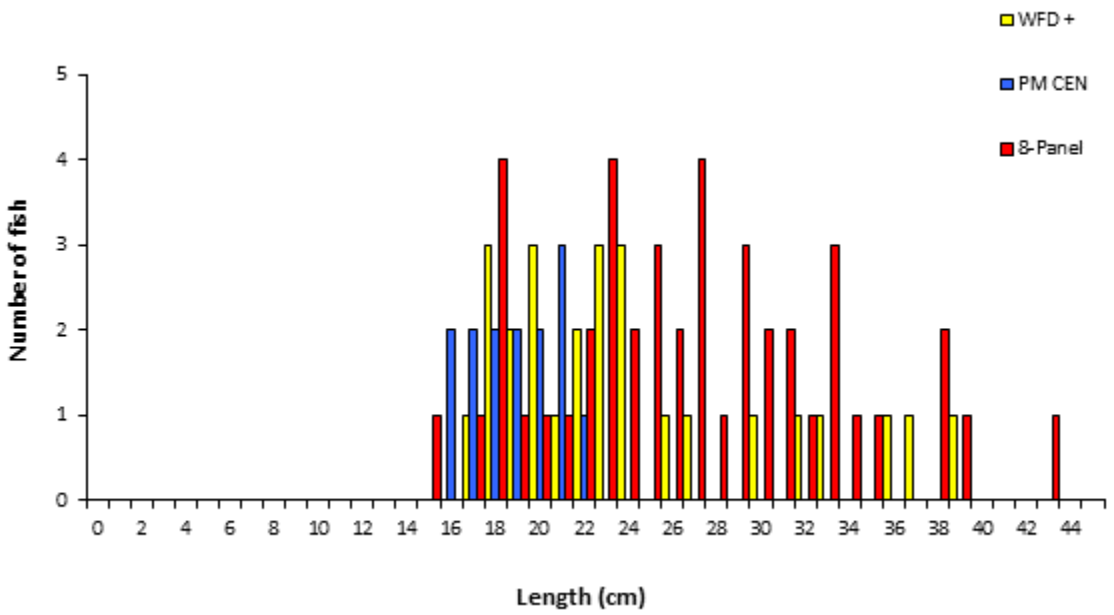

Fig. 1.6. Length frequency of brown trout captured on Lough Conn, 2016

Table 1.5. Mean (±S.E.) brown trout length (cm) at age for Lough Conn, August 2016

	L_1	L_2	L_3	L_4	L_5
Mean (± S.E.)	6.8 (0.1)	16.9 (0.4)	24.4 (0.5)	29.4 (0.3)	35.1
N	37	26	12	5	1
Range	5.4-8.2	12.4-20.3	22.2-27.5	28.7-30.6	35.1-35.1

Other fish

Eels recorded during the 2016 survey ranged in length from 35.8cm to 77.6cm. Two salmon were recorded at 78.0 cm and 86.0cm. One tench was captured and measured 20.3cm. Pike ranged in length from 33.1cm to 100.0cm.

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 and brown trout 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 93 stomachs were examined. Of these 38 were found to contain no prey items. Of the remaining 55 stomachs containing food, 33% contained fish, 24% unidentified digested material, 23% invertebrates, 18% zooplankton and 2% invertebrates/zooplankton (Fig. 1.7).

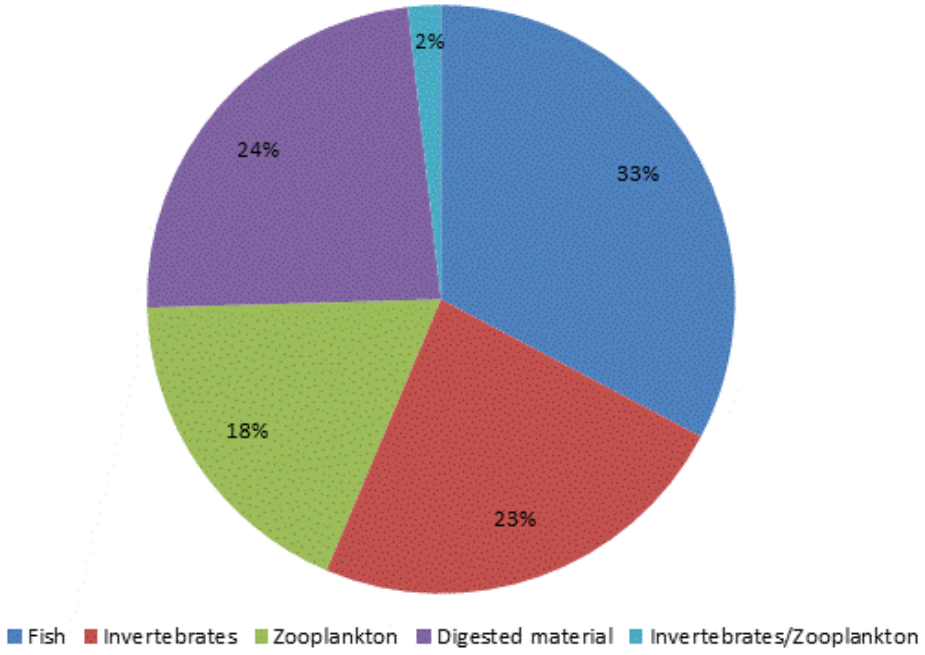

Fig. 1.7. Diet of perch (n=55) captured on Lough Conn, August 2016 (% occurrence)

Brown trout

Adult trout usually feed principally on crustaceans (*Asellus* sp. and *Gammarus* sp.), insects (principally chironomid larvae and pupae) and molluscs (snails) (Kennedy and Fitzmaurice, 1971, O' Grady, 1981). A total of 51 stomachs were examined. Of these seven were found to contain no prey items. Of the remaining 44 stomachs containing food, 46% contained invertebrates, 32% zooplankton, 9% invertebrates/zooplankton, 9% unidentified digested material, 2% fish/invertebrates and 2% digested material/invertebrates (Fig. 1.8).

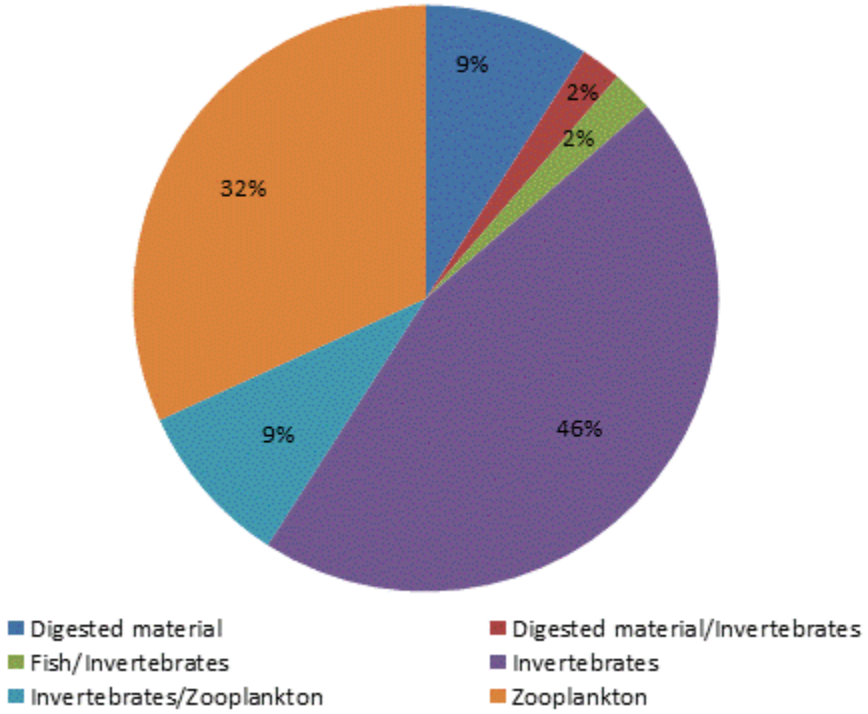

Fig. 1.8. Diet of brown trout (n=44) captured on Lough Conn, August 2016 (% occurrence)

1.4 Summary and ecological status

A total of seven fish species were recorded on Lough Conn in August 2016. Roach was the dominant fish species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2016 survey. Perch and trout were the dominant species in terms of abundance (CPUE) in the pelagic survey gill nets set in the deepest part of the lake, while brown trout were dominant in terms of biomass (BPUE).

Roach ranged in length from 6.0cm to 31.1cm and ranged in age from 2+ to 13+, indicating reproductive success in twelve of the previous fourteen years. The dominant age class was 3+.

Perch ranged in length from 5.0cm to 38.0cm and ranged in age from 0+ to 7+, indicating reproductive success in each of the previous eight years. The dominant age class was 3+. The main food items recorded in stomachs of perch captured during the survey were fish (33%), invertebrates (23%) and zooplankton (18%).

Brown trout ranged in length from 15.4cm to 43.1cm with five age classes present, ranging from 1+ to 5+, indicating reproductive success in five of the previous six years. The dominant age class was 2+. The main food items present in stomachs of brown trout captured during the survey were invertebrates (46%), zooplankton (32%) and invertebrates/zooplankton (9%). A small proportion also had fish present in their stomachs (2%).

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 Conn has been assigned an ecological status of Good for 2016 based on the fish populations present.

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

1.5 References

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