

National Research Survey Programme

Lakes 2017

Lough Derravaragh

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Iascach Iníre Éireann
Inland Fisheries Ireland



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National Research Survey Programme

**Fish Stock Survey of Lough Derravaragh,
July 2017**

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

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

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1.1 Introduction

Lough Derravaragh is situated in County Westmeath, north of Mullingar between Castlepollard, Crookedwood and Multyfarnham in the Inny River catchment (Plates 1.1, 1.2a and b and Fig. 1.1). The lake has a surface area of 914ha and a maximum depth of approximately 30m. The estimated terrain elevation above sea level is 64m. 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 (>100mg/l CaCO₃). The Inny River, which is a major tributary of the River Shannon, flows into and out of Lough Derravaragh on the north-western side of the lake (Fig. 1.1). It is a popular lake for angling and other water sports.

The lake is a Special Protection Area (SPA) under the EU Birds Directive (EC/79/409). Three bird species (Greenland white-fronted goose (*Anser albifrons flavirostris*), whooper swan (*Cygnus cygnus*), and golden plover (*Pluvialis apricaria*)) are listed on Annex I of the Directive, requiring special conservation measures are present on the lake (NPWS, 2002). A notable feature of Lough Derravaragh is the range of stoneworts (Charophytes) that occur within the lake. Eight species have been recorded here, several of which have a restricted range in Ireland; the rare Charophyte, *Chara denundata*, has been recorded in the area. Additionally the Red List species, otter (*Lutra lutra*) and Irish hare (*Lepus timidus hibernicus*), have also been observed within the area. Raised bog and cutover bog are found adjacent to the lake (cutover bog is bog where some peat has been harvested, leaving remaining peat behind). There is only a small area of raised bog on the side of the lake, but formerly it comprised a very large bog complex. Most of this area has been reclaimed for agriculture. Conifers have been planted upon the high bog and a section of cutover (NPWS, 2002). A range of habitats have been created on the lake shore as a result of drainage of the River Inny. At the western side are extensive reed beds and swamps of downy birch and willows. The lake shore is a mineral-rich substrate and several plant species of poor fen habitats occur in abundance, such as black bog rush *Schoenus nigricans* and long-stalked yellow-sedge *Carlex lepidocarpa* (NPWS, 2002).

Historically the lake was managed as a brown trout fishery, and pike and perch were removed annually as predators and competitors of brown trout respectively (Fitzmaurice, 1983). Furthermore, the wild stocks of brown trout were augmented by stocking hatchery reared brown trout to try to improve the angling experience in the lake. However fish stocks in the lake are no longer subject to management intervention in the form of pike and perch removal and stocking of hatchery reared brown trout ceased



in the early to mid-2000's. During the last 30 years the Lough Derravaragh Angling Association has worked closely with Inland Fisheries Ireland, and other stakeholders, to attempt to restore the lake. During the period of approximately 2004 to 2016 a substantial investment was made to enhance and rehabilitate the spawning and nursery habitat of the lake's tributary streams.

The lake is now managed as a mixed fishery with good stocks of brown trout, pike and coarse fish. Roach were first recorded in fish stock assessments of the lake in 1977 (O' Grady, 1986). The lake holds brown trout with an average size of approximately 1.1kg, but fish of up to 2.7kg are caught annually. The northern end of the lake is wide and mostly shallow and it is in this area that the majority of the brown trout fishing is practiced. The southern end of the lake is narrow and deep; however this end of the lake tends to produce bigger fish. The lake provides a good angling experience for other species too, especially pike.

Inland Fisheries Ireland (previously the Central Fisheries Board) undertook a number of fish stock surveys of Lough Derravaragh from 1979 to 2005. Brown trout, perch, pike, roach, rudd, tench, bream, hybrids and eels are present in the lake (IFI unpublished data).

This report summarises the results of the 2017 fish stock survey (e.g. species composition, abundance and age structure) on the lake.



Plate 1.2. Lough Derravaragh at Donore shore



Plate 1.2a. Lough Derravaragh Upper Basin



Plate 1.2b. Lough Derravaragh Lower Basin

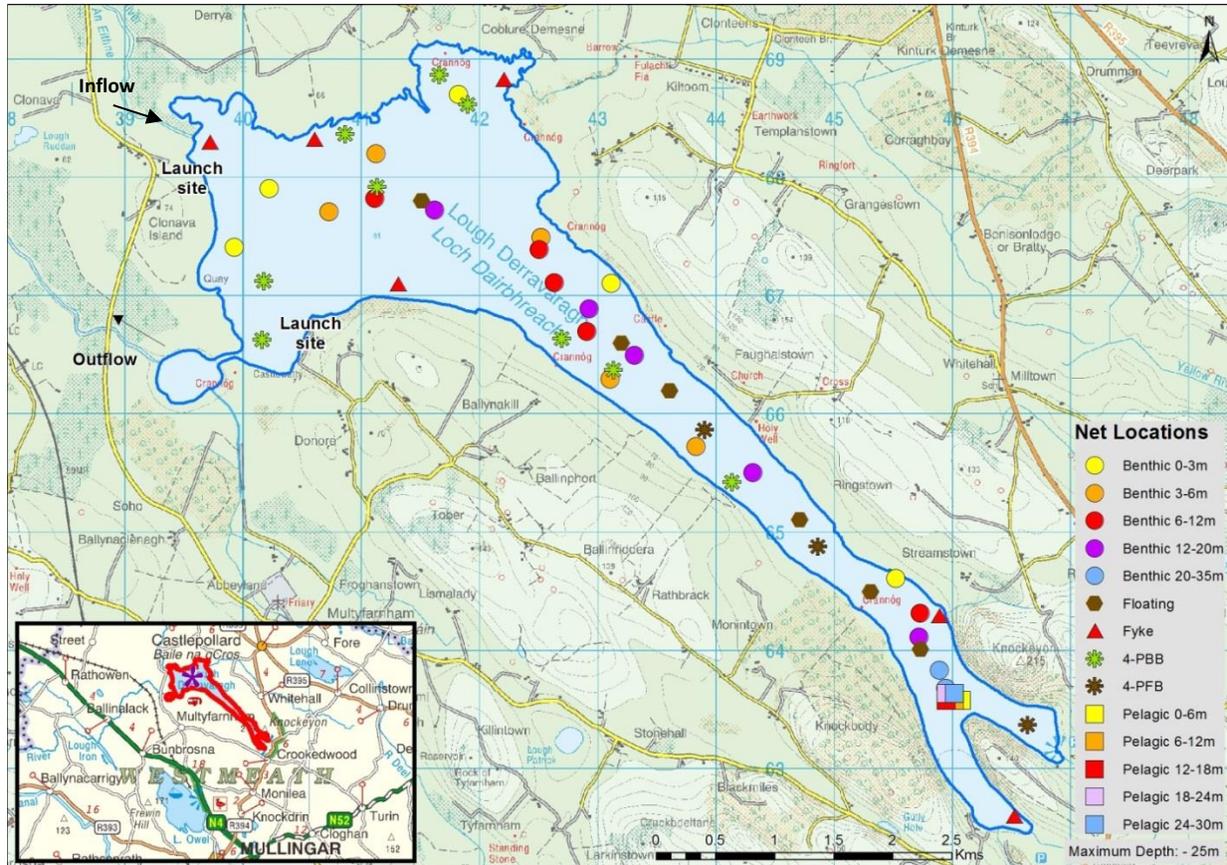


Fig. 1.1 Location map of Lough Derravaragh showing locations and depths of each net (outflow is indicated on map)

1.2 Methods

1.2.1 Netting methods

Lough Derravaragh was surveyed over three nights from the 3rd to the 6th of July 2017. A total of six sets of Dutch fyke nets (Fyke), 22 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (BM CEN) (5 @ 0-2.9m, 5 @ 3-5.9m, 5 @ 6-11.9m, 5 @ 12-19.9m and 2 @ 20-34.9m) and six floating monofilament multi-mesh (FM CEN) 12 panel, 5-55mm mesh size) CEN standard survey gill nets were deployed in the lake (34 sites) (Fig. 1.1). A further four pelagic multi-mesh (12 panel, 6.25-55mm mesh size) 30m x 6m CEN standard survey gill nets were set (PM CEN). In addition nine four-panel benthic braided survey gill nets (4-PBB) and three four-panel floating braided survey gill nets (4-PFB) were deployed in the lake to supplement the catches. The four-panel nets are composed of four 27.5m long panels each a standard mesh size (55mm, 60mm, 70mm and 90mm knot to knot) tied together randomly.



The site locations for the benthic monofilament multi-mesh gill nets (BM CEN) and the four-panel braided survey gill nets (4-PBB and 4-PFB) were chosen randomly within fixed depth zones (0-2.9m, 3-5.9m, 6-11.9m, 12-19.9m and 20-34.9m). The pelagic gill nets were set over the deepest part of the lake, at 6m intervals from the surface to the lake bed. 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 were measured and weighed on site and scales were removed from all brown trout, tench, hybrids, roach, bream and pike. 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 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 one type of hybrid were recorded on Lough Derravaragh in July 2017, with 686 fish being captured. The number of each species and hybrid captured by each gear type is shown in Table 1.1. Perch was the most common fish species recorded, followed by roach. Roach x bream hybrids, tench, brown trout, pike, bream and eels were also recorded. During the previous surveys in 1979 to 2005 the same species composition was recorded; however rudd were captured in the earlier surveys but were not present in 2017.

Table 1.1. Number of each fish species captured by each method during the survey on Lough Derravaragh, July 2017

Scientific name	Common name	Number of fish captured					Total
		BM CEN	FM CEN	Fyke	4- panel	PM CEN	
<i>Perca fluviatilis</i>	Perch	319	1	2	9	8	339
<i>Rutilus rutilus</i>	Roach	113	7	0	80	8	208
<i>Rutilus rutilus x Abramis brama</i>	Roach x bream hybrid	7	0	0	79	1	87
<i>Tinca tinca</i>	Tench	0	0	0	32	0	32
<i>Salmo trutta</i>	Brown trout	1	2	0	1	5	9
<i>Esox lucius</i>	Pike	3	0	1	0	0	4
<i>Abramis brama</i>	Bream	0	0	0	1	-	1
<i>Anguilla anguilla</i>	European eel	0	0	6	0	-	6

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 (Fig. 1.2 and 1.3).

Overall perch was the dominant species in terms of CPUE and roach were the dominant species in terms of biomass (BPUE) (Fig. 1.2 and 1.3). Perch were the dominant species in the pelagic zone in terms of CPUE and brown trout was dominant in terms of BPUE (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 Derravaragh, 2017

Scientific name	Common name	Mean CPUE (\pm S.E.)
<i>Perca fluviatilis</i>	Perch	0.217 (0.045)
<i>Rutilus rutilus</i>	Roach	0.096 (0.020)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream hybrid	0.019 (0.009)
<i>Tinca tinca</i>	Tench	0.006 (0.003)
<i>Salmo trutta</i>	Brown trout	0.003 (0.002)
<i>Esox lucius</i>	Pike	0.002 (0.002)
<i>Abramis brama</i>	Bream	0.0002 (0.0002)
<i>Anguilla anguilla</i> *	European eel*	0.017 (0.007) *

		Mean BPUE (\pm S.E.)
<i>Perca fluviatilis</i>	Perch	19.903 (5.138)
<i>Rutilus rutilus</i>	Roach	46.097 (9.503)
<i>Rutilus rutilus x Abramis brama</i>	Roach x Bream hybrid	36.476 (17.776)
<i>Tinca tinca</i>	Tench	13.358 (7.051)
<i>Salmo trutta</i>	Brown trout	1.980 (1.162)
<i>Esox lucius</i>	Pike	2.821 (1.986)
<i>Abramis brama</i>	Bream	0.685 (0.685)
<i>Anguilla anguilla</i> *	European eel*	9.389 (4.353) *

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

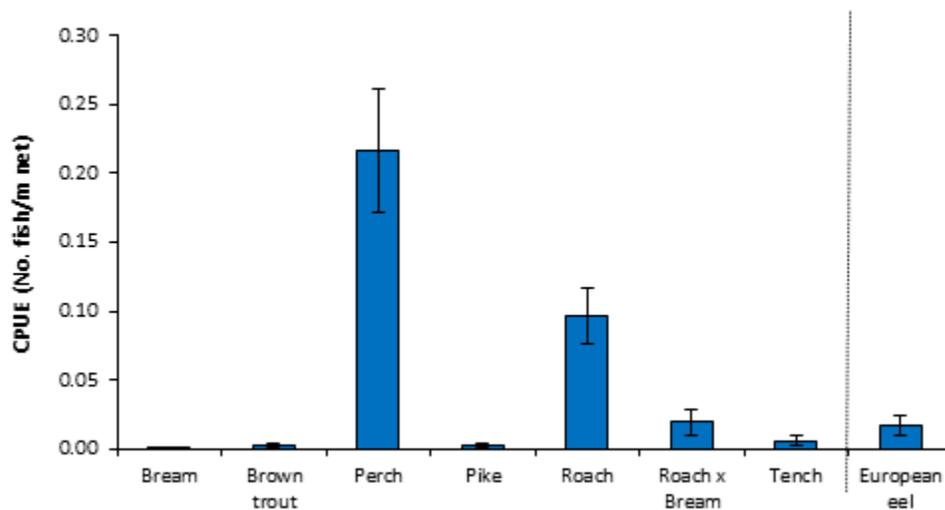


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Lough Derravaragh (all nets) (Eel CPUE based on fyke nets only), 2017

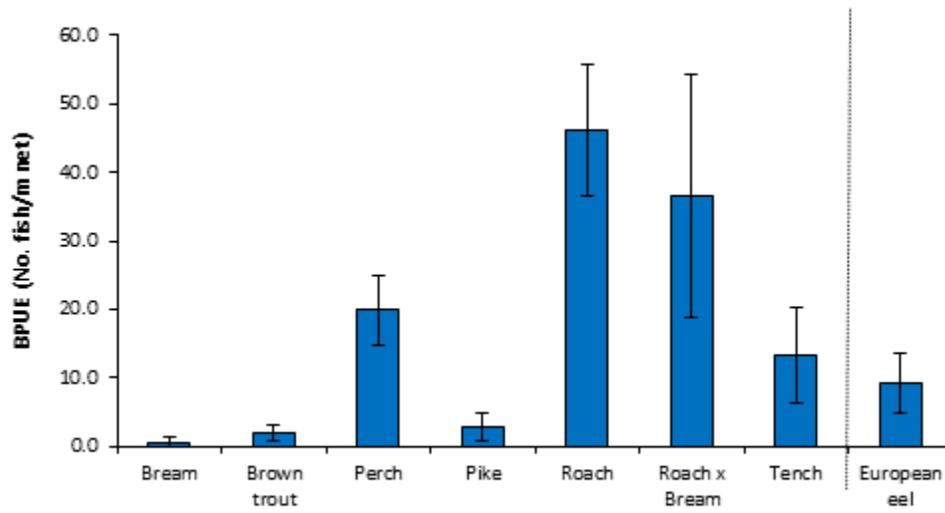


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lough Derravaragh (all nets) (Eel CPUE based on fyke nets only), 2017

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2017 survey ranged in length from 3.0cm to 35.1cm (mean = 14.0cm) (Fig.1.4) with ten age classes present, ranging from 0+ to 9+ with a mean L1 of 6.2cm (Table 1.3). The dominant age class was 0+ (Fig. 1.4).

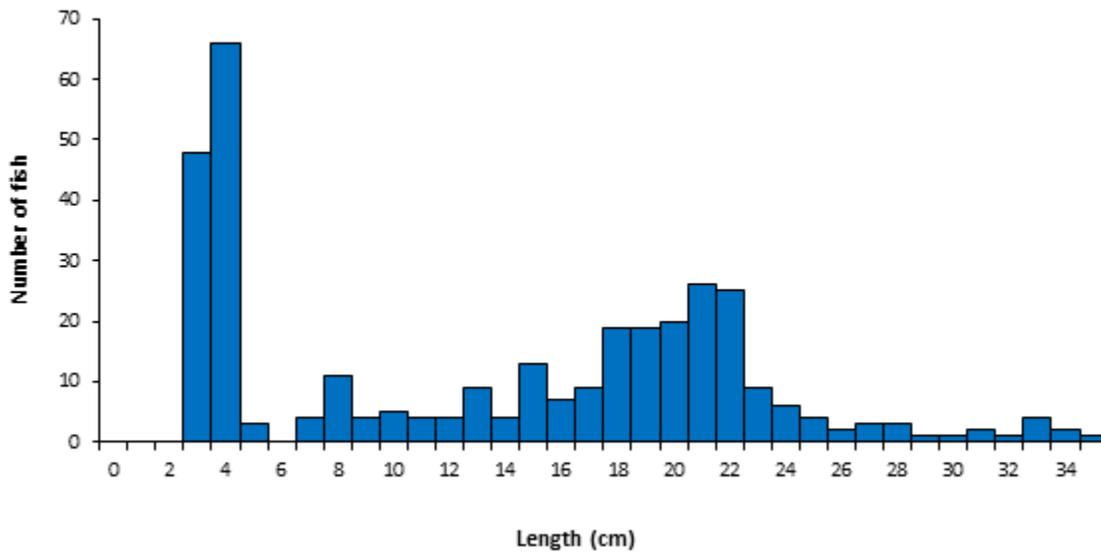


Fig. 1.4. Length frequency of perch captured on Lough Derravaragh, 2017

Table 1.3. Mean (\pm S.E.) perch length (cm) at age for Lough Derravaragh, July 2017

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉
Mean	6.2	10.6	15.5	19.4	23.2	25.2	26.1	27.2	29.5
(\pm S.E.)	(0.1)	(0.2)	(0.4)	(0.5)	(0.5)	(0.6)	(0.7)	(0.9)	(2.1)
N	66	54	42	36	17	9	5	4	2
Range	4.4-10.4	6.3-17.7	10.1-22.9	13.4-24.8	20.3-27.6	23.3-29.9	24.6-28.4	25.9-30.0	27.4-31.6

Roach

Roach captured during the 2017 survey ranged in length from 5.1cm to 36.6cm (mean = 29cm) (Fig.1.5) with twelve age classes present, ranging from 1+ to 13+ with a mean L1 of 3.3cm (Table 1.4). The dominant age class was 8+ (Fig. 1.5).

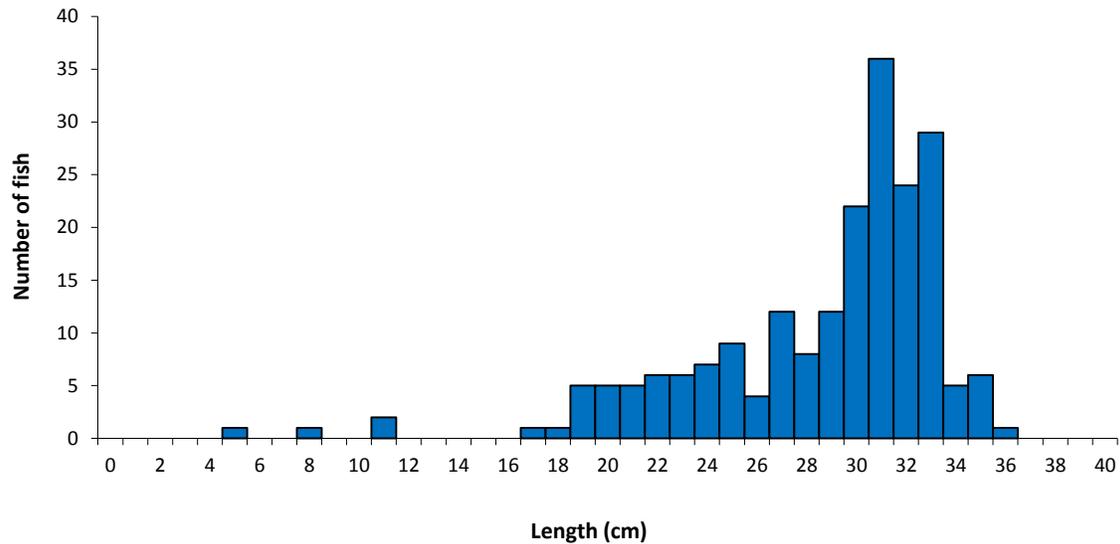


Fig. 1.5. Length frequency of roach captured on Lough Derravaragh, 2017

Table 1.4. Mean (\pm S.E.) roach length (cm) at age for Lough Derravaragh, July 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	L ₁₃
Mean	3.3	7.4	11.6	16.1	19.2	22.3	25.3	27.3	29.5	31.3	32.4	34.4	36.2
(\pm S.E.)	(0.1)	(0.2)	(0.3)	(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(0.3)	(0.1)	(0.5)	(0.4)	
N	56	55	52	52	38	33	31	21	17	15	11	4	1
Range	2.0- 4.6	5.2- 10.9	8.1- 17.7	11.2- 22.3	14.9- 24.4	17.9- 26.2	19.9- 29.5	21.3- 30.9	25.4- 31.7	30.5- 32.9	28.4- 34.0	33.8- 35.4	36.2- 36.2

Brown trout

Brown trout captured during the 2017 survey ranged in length from 25.7cm to 71.5cm (mean 35.3cm) (Fig. 1.6). Five age classes were present, ranging from 2+ to 10+, with a mean L1 of 7.6cm (Table 1.5). The dominant age class was 3+ (Fig. 1.6).

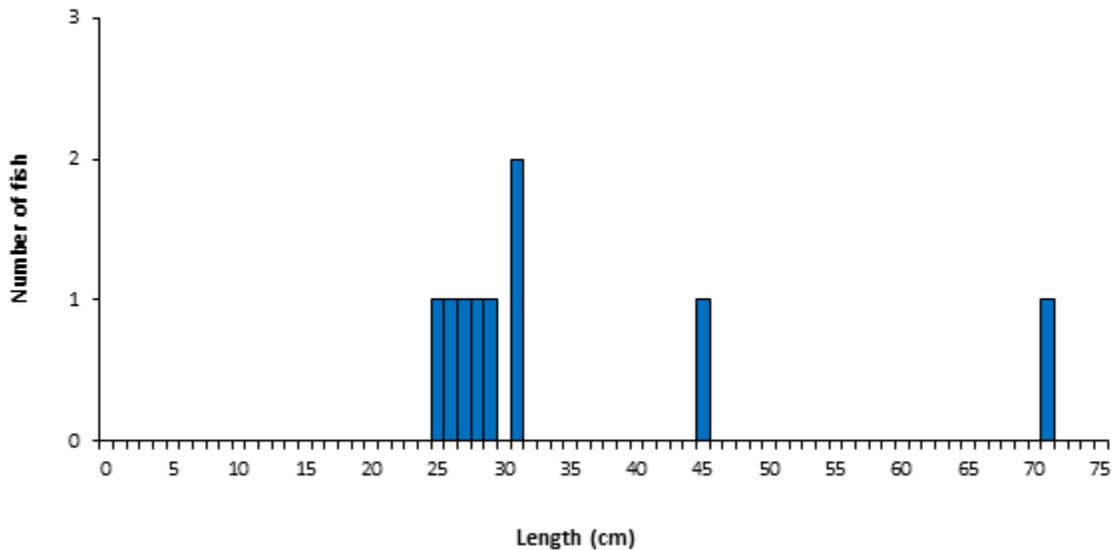


Fig. 1.6. Length frequency of brown trout captured on Lough Derravaragh, 2017

Table 1.5. Mean (\pm S.E.) brown trout length (cm) at age for Lough Derravaragh, July 2017

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	Growth Category
Mean (\pm S.E.)	7.6 (0.5)	14.5 (0.8)	21.4 (1.2)	29.1 (0.9)	37.6	44.0	Slow
N	8	8	7	3	1	1	
Range	5.7-10.3	11.5-18.5	16.4-27.1	27.6-30.7	37.6-37.6	44.0-44.0	

Other fish

Eels recorded during the 2017 survey ranged in length from 56.0cm to 72.8cm. One bream was measured at 55.5cm and was aged 10+. Pike ranged in length from 25.3cm to 67.0cm, roach x bream hybrids ranged from 29.6cm to 48.6cm (ages ranged from 9+ to 21+) and tench ranged from 36.0cm to 55.8cm.

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 roach 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 80 stomachs were examined and 28 were empty. Of the remaining 52 stomachs containing food, 100% contained zooplankton only.

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 six stomachs were examined. Of these two were found to contain no prey items. Of the four stomachs containing food, 75% contained zooplankton and 25% fish (Fig. 1.7).

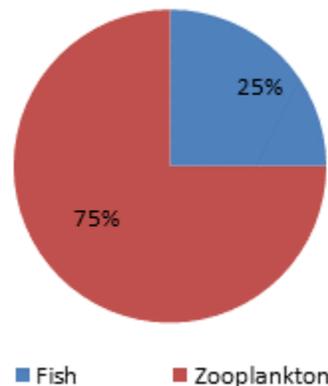


Fig 1.7. Diet of brown trout (n=4) captured on Lough Derravaragh, 2017 (% FO)



1.4 Summary and ecological status

A total of seven fish species and one type of hybrid were recorded on Lough Derravaragh in the July 2017 survey. Perch was the dominant fish species in terms of abundance (CPUE) and roach were the dominant fish species in terms of biomass (BPUE) captured in the survey gill nets during the 2017 survey.

Perch captured during the 2017 survey ranged in length from 3.0cm to 35.1cm and ranged in age from 0+ to 9+, indicating reproductive success in each of the previous ten years. The dominant age class was 0+.

Roach ranged in length from 5.1cm to 36.6cm and ranged in age from 1+ to 13+, indicating reproductive success in twelve of the previous fourteen years. The dominant age class was 8+.

Brown trout ranged in length from 25.7cm to 71.5cm with five age classes present, ranging from 2+ to 10+, indicating reproductive success in five of the previous eleven years. The dominant age class was 3+.

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, Lough Derravaragh has been assigned an ecological status of Poor for 2017 based on the fish populations present.

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



1.5 References

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