National Research Survey Programme

Lakes 2019

Lough Boderg

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Inland Fisheries Ireland

National Research Survey Programme

Fish Stock Survey of Lough Boderg & Bofin, September 2019

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1.1 Introduction

Loughs Boderg and Bofin together with Lough Scannal form a complex of connected lakes on the Upper Shannon system, lying on the border between counties Roscommon and Leitrim and are located immediately upstream of the villages of Dromod and Rooskey. Lough Boderg flows downstream to Lough Bofin *via* the Derrycarne narrows. The deepest part of the lake complex is found in Lough Scannal, which forms part of Lough Bofin (Plate 1.1, Fig. 1.1). For the purpose of this fish stock survey, the lakes are considered one combined lake unit, referred to as Lough Boderg & Bofin throughout.

The system is situated at an altitude of 37 m.a.s.l, has a combined surface area of 970ha and a maximum depth of 9.0m. The predominant geology is limestone, and surrounding land use is primarily pasture, with some forestry. The main terrestrial and semi-aquatic habitats are woodland on the lakeshore which grades down to a stony shore with a well-developed typical Shannon flora and reed swamps. The lake forms part of the Shannon Navigation.

The lake is categorised as typology class 6 (as designated by the EPA for the Water Framework Directive), i.e. shallow (mean depth <4m), greater than 50ha and moderate alkalinity (20-100mg/I CaCO₃).

The lake is known to hold large stocks of coarse fish including bream, roach x bream hybrids, roach, perch and pike. The Lough Boderg part of the system is regarded as the better fishery, and access for competition and leisure anglers is available at the Derrycarne Forest Park (IFI, 2020).



This report summarises the results of the 2019 fish stock survey carried out on the lake.

Plate 1.1. Lough Boderg and Bofin at Derrycarne





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



1.2 Methods

1.2.1 Netting methods

Lough Boderg & Bofin was surveyed over three nights from the 3rd to the 5th of September and from the 11th to the 12th of September 2019. A total of six sets of Dutch fyke nets and 14 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 and 4 @ 6-11.9m) were deployed in the lake (20 sites). The netting effort was supplemented using 4-panel benthic braided survey gill nets (4-PBB) at seven 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).

A handheld GPS was used to locate 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 a sub sample of all other species except eels. 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).

$$\mathbf{FO}_i = \left(\frac{N_i}{N}\right) * \mathbf{100}$$

Where:

FO_{*i*} is the percentage frequency of prey item *i*,

 N_i is the number of pike with prey i in their stomach,

N is total number of pike 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 Boderg & Bofin in September 2019, with 794 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, roach X bream hybrids and bream. Pike, tench, rudd and eels were also recorded.

Colombilio norma	Common	Number of fish captured						
Scientific name	Common name	BM CEN	4-PBB	Fyke	Total			
Perca fluviatilis	Perch	326	0	2	328			
Rutilus rutilus	Roach	263	1	0	264			
Rutilus rutilus x Abramis brama	Roach x bream hybrid	59	107	0	166			
Abramis brama	Bream	3	10	0	13			
Esox lucius	Pike	4	1	4	9			
Tinca tinca	Tench	0	6	0	6			
Scardinius erythrophthalmus	Rudd	5	0	0	5			
Anguilla anguilla	European eel	0	0	3	3			

Table 1.1. Number of each fish species captured by each gear type during the survey on Lough Boderg
& Bofin, September 2019



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 2019 surveys are summarised in Table 1.2 and illustrated in Figures 1.2 and 1.3.

Perch and roach were the dominant species in terms of abundance (CPUE). Roach x bream hybrids were more abundant than bream, and were the most dominant 'species' in terms of biomass (BPUE) (Table 1.2; Fig. 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Boderg & Bofin,September 2019

Scientific name	Common name	Mean CPUE (± S.E)	Mean BPUE (± S.E)
Perca fluviatilis	Perch	0.404 (0.109)	10.390 (2.838)
Rutilus rutilus	Roach	0.325 (0.074)	41.530 (9.641)
Rutilus rutilus x Abramis brama	Roach x bream hybrid	0.110 (0.025)	55.272 (11.539)
Abramis brama	Bream	0.007 (0.004)	5.637 (2.829)
Esox lucius	Pike	0.008 (0.003)	8.338 (4.549)
Scardinius erythrophthalmus	Rudd	0.006 (0.004)	1.620 (1.061)
Tinca tinca	Tench	0.002 (0.001)	2.958 (1.404)
Anguilla anguilla*	European eel*	0.008 (0.006)*	5.574 (3.541)*

Note: 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 (±S.E.) CPUE for all fish species captured in Lough Boderg & Bofin (Eel CPUE based on fyke nets only), September 2019



Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured Lough Boderg & Bofin (Eel BPUE based on fyke nets only), September 2019



1.3.3 Length frequency distributions and growth

<u>Perch</u>

Perch captured during the 2019 survey ranged in length from 4.8cm to 35.2cm (mean = 9.2cm) (Fig.1.4). Nine age classes were present, ranging from 0+ to 8+. Mean L1 (age at 1 year) was 5.8cm (Table 1.3). This corresponds to the large modal peak at 5-7cm, indicating that the majority of the perch captured during the survey were young of year (YOY) fish at the end of their first growing season (Fig. 1.4).



Fig. 1.4. Length frequency of perch captured on Lough Boderg & Bofin, September 2019

Table 1 3 Mean	(+S F)	nerch leng	th (cm)) at age I d	ugh Roder	& Rofin	Sentember	2019
Table 1.5. Weall	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	percirieng	sun (cini	j aι age ει	ugii bouei	g & DUIIII, 3	september	2013

	L ₁	L ₂	L ₃	L ₄	L₅	L ₆	L ₇	L ₈
Mean (±S.E.)	5.8 (0.1)	10.6 (0.3)	16.2 (0.4)	19.7 (0.6)	21.7 (0.6)	23.9 (0.7)	24.2 (1.3)	27.1
Ν	64	35	23	15	10	7	3	1
Range	4.3-9.4	8.2-15.4	11.6-20.7	14.7-23.9	17.6-23.7	20.6-26.0	21.9-26.4	-



<u>Roach</u>

Roach captured during the 2019 survey ranged in length from 4.9cm to 31.0cm (mean = 17.4cm) (Fig.1.5). Roach were aged between 0+ and 11+. All age classes were represented in the sample aged, with the exception of nine year old fish. The population was dominated by fish aged between 2+ and 5+ (Table 1.5).



Fig. 1.5. Length frequency of roach captured on Lough Boderg & Bofin, September 2019

Table 1.4. Summary age data from roach captured on Lough Boderg & Bofin, September 2019.Number of fish and length ranges of all fish aged in the sample is presented

	Age Class												
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+	
n	1	8	16	18	19	20	10	5	3	-	1	2	
Mean L (cm)	5	8.4	12.5	15.4	19	22.2	24.7	25.1	27.4	-	29.8	30.1	
Min L (cm)	5	7.4	10.4	12.3	13.5	14	18.5	23.3	26	-	29.8	29.8	
Max L (cm)	5	9.3	17.3	19.6	24.2	27.8	28	29	30.1	-	29.8	30.5	



Roach x bream

Roach x bream hybrids captured during the 2019 survey ranged in length from 8.8cm to 39.5cm (mean = 30.1cm) (Fig.1.6). Roach x bream hybrids were aged between 1+ and 14+, and all intervening ages classes were represented in the sample aged. The dominant age class was 10+. Other strong year classes were present, including two and three year old fish (Table.1.5). These age groupings are also apparent in the lengths of roach x bream hybrids captured during the survey (Fig. 1.6).



Fig. 1.6. Length frequency of roach x bream hybrids captured on Lough Boderg & Bofin 2019

Table 1.5. Summary age data from roach x bream hybrids captured on Lough Boderg & Bofin, September 2019. Number of fish and length ranges of all fish aged in the sample is presented.

	Age Class														
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+	12+	13+	14+
n	-	2	7	11	3	5	5	3	14	7	19	14	9	2	2
Mean L (cm)	-	9.9	14.1	14.5	20.3	22.6	29.4	30.5	31.8	33.7	33.9	35.7	34.8	37.9	37.9
Min L (cm)	-	8.8	12.7	12.5	19.6	20.7	26.9	29.4	25.9	32.4	29	31.9	30.7	36.4	37.6
Max L (cm)	-	11.1	15.2	18.4	21.7	26.8	30.6	31.5	34	35.2	37	38.6	38.5	39.5	38.2



Other fish species

Thirteen bream ranging in length from 28.0cm to 45.0cm were recorded in Lough Boderg & Bofin. Bream were aged between 5+ and 11+ indicating that bream recruitment has been poor in the lake in recent years.

Pike (n = 9) captured ranged in length from 24.4cm to 87.3cm. Tench (n = 6) ranged from 36.1cm to 48.9cm. Rudd (n = 5) ranged in length from 18.9cm to 28.3cm. Three eels measuring from 62.2cm to 85.5cm were also captured.



Plate 1.2 Lough Boderg & Bofin, September 2019



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 pike captured during the survey were examined and are presented below.

<u>Perch</u>

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, of these 41 were found to contain no prey items. Of the 39 remaining stomachs, 13 (34%) contained invertebrates, 13 (34%) contained unidentified digested material respectively. Nine perch (24%) had consumed fish and four stomachs (8%) contained zooplankton (Fig. 1.7).



Fig. 1.7. Diet of perch (n=39) captured on Lough Boderg & Bofin, September 2019 (% FO)

<u>Pike</u>

Three pike samples were available for stomach analysis. All three contained fish prey. Two stomachs contained perch, while the other stomach contained cyprinid remains.



1.4 Summary and ecological status

A total of seven fish species and one type of hybrid were recorded on Lough Boderg & Bofin in September 2019. Perch and roach were the dominant fish species in terms of abundance (CPUE) and roach x bream hybrids was dominant in terms of biomass (BPUE) captured during the 2019 survey.

The two most abundant species captured (i.e. perch and roach) have each been recruiting regularly in the lake. While all age groups between 0+ and 8+ were represented in the sample aged the perch population was dominated by younger individuals. YOY perch were the most abundant cohort recorded.

Roach captured were aged between 0+ and 11 +. Recruitment was regular and all age classes with the exception of nine year old fish were recorded in the sample aged. Two to five year old fish dominated the roach population.

The roach x bream hybrid population, which requires both parent species to spawn (Hayden *et al.*, 2010), also exhibited consistent, but variable recruitment patterns. Roach x bream hybrids were long-lived, with fish in the sample aged between 1+and 14+, with all intervening cohorts represented.

Both roach and roach x bream hybrids were more abundant than bream. The latter species exhibited irregular recruitment in the lake. Indeed, the youngest cohort recorded in the sample was aged at 5+.

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). The tool utilises catch data from all nets deployed in each lake, with the exception of those fish captured in the 55mm, 70mm and 90mm meshes of the benthic braided survey gill nets to ensure comparability of effort between surveys. Using the FIL2 classification tool, Lough Boderg & Bofin has been assigned an ecological status of Bad for 2019 based on the fish populations present.



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