

National Research Survey Programme

Lakes 2019

Belhavel Lough

IFI/2020/1-4505



Iascach Intíre Éireann
Inland Fisheries Ireland



Inland Fisheries Ireland

National Research Survey Programme

**Fish Stock Survey of Belhavel Lough,
September 2019**

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

CITATION: Corcoran, W., McLoone, P., Connor, L., Bateman, A., Cierpial, D., Coyne, J., Twomey, C., Rocks, K., Gordon, P., Lopez, S., Matson, R., O' Briain, R., and Kelly, F.L. (2020) Fish Stock Survey of Belhavel Lough, September 2019. National Research Survey Programme, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

Cover photo: Aerial view of Lough Shindilla, Co. Galway © Inland Fisheries Ireland

© Inland Fisheries Ireland 2020



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 2019.

The report includes Ordnance Survey Ireland data reproduced under OSi Copyright Permit No. MP 007508.

*Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.
© Ordnance Survey Ireland, 2019.*

1.1 Introduction

Belhavel Lough is located approximately 3 kilometres north of Drumkeeran in Co. Leitrim (Fig. 1.1). The lake is included within the Western River Basin District (WRBD), but drains both east to Lough Allen (Shannon River Basin District) via the Diffagher River and west into the Garavogue catchment (WRBD). The outfall to the Garavogue system occurs as a result of drainage works (McGarrigle, 2014). The lake is situated at an altitude of 60 m.a.s.l., has a surface area of 101ha, mean depth of <4m and maximum depth of 9.6m. The lake is categorised as typology class 6 for the purposes of Water Framework Directive (WFD) monitoring, i.e. shallow (<4m), greater than 50ha and moderately alkaline (>20mg/l CaCO₃). The dominant geology underlying the lake is mudstone and sandstone. Adjacent land use is predominantly agriculture with large areas of natural vegetation, and some coniferous forestry present.

The lake was previously surveyed in 1968 (unpublished IFI data), 1999 (CFB, 2000) and 2016 (McLoone *et al.*, 2017). On each occasion, perch, pike and bream were captured. Brown trout were captured in 1968 but have not been recorded in subsequent surveys.

The lake is seldom fished but is noted for its catches of bream.

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



Plate 1.1. Belhavel Lough

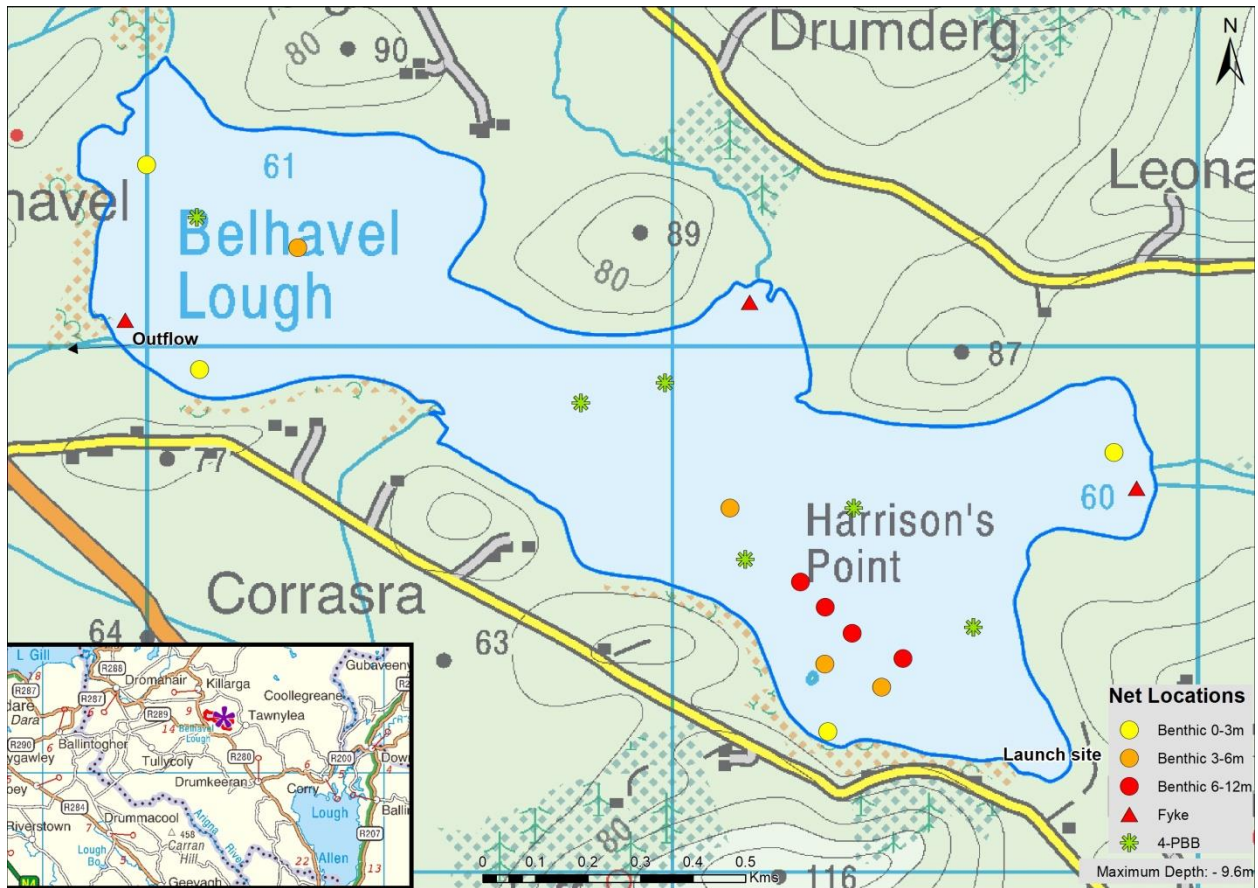


Figure 1.1. Location and depth of survey nets set on Belhavel Lough, September 2019



Plate 1.2 Processing samples at Belhavel Lough, September 2019



1.2 Methods

1.2.1 Netting methods

Belhavel Lough was surveyed over two nights from the 9th to 11th of September 2019. A total of three sets of Dutch fyke nets, 12 benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m and 4 @ 6-11.9m) were deployed in the lake (15 sites).

The netting effort was supplemented using 4-panel benthic braided survey gill nets (4-PBB) at six 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). These nets were deployed in random locations throughout the lake and in the same locations that two panel benthic braided survey gill nets (2-PBB, - 62.5mm and 88.9mm) were set in 2016.

A handheld GPS was used to pinpoint 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 bream, brown trout 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).

$$FO_i = \left(\frac{N_i}{N} \right) * 100$$

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

Five fish species were recorded in Belhavel Lough in September 2019. These were, perch, bream, pike, brown trout and eel. A total of 126 fish were captured. The number of each species captured by each gear type is shown in Table 1.1. Perch were the most abundant fish species recorded, followed by bream. A similar species composition was recorded in the 2016 survey; however one brown trout was captured in 2019.

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

Scientific name	Common name	Number of fish captured			
		BM CEN	4-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	56	2	12	70
<i>Abramis brama</i>	Bream	13	22	3	38
<i>Esox lucius</i>	Pike	2	2	0	4
<i>Salmo trutta</i>	Brown trout	0	0	1	1
<i>Anguilla anguilla</i>	European eel	0	0	13	13

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 2016 and 2019 surveys are summarised in Table 1.2 and Fig.1.1 and Fig. 1.2.



With respect to fish captured in the survey gill nets, perch was the dominant fish species in terms of abundance (CPUE) while bream had the highest biomass (BPUE) recorded during the 2019 survey (Table 1.2, Fig 1.2 and 1.3). In general, abundances (CPUE) of fish captured in the survey gill nets in 2019 were lower than in 2016; however eel CPUE was higher.

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

Common name	Mean CPUE (\pm S.E) **		Mean BPUE (\pm S.E) **	
	2016	2019	2016	2019
Perch	0.118 (0.043)	0.098 (0.023)	3.755 (1.304)	1.304 (0.751)
Bream	0.089 (0.028)	0.032 (0.007)	6.297 (1.900)	8.758 (3.053)
Pike	0.006 (0.003)	0.003 (0.002)	9.952 (5.099)	2.161 (1.667)
Brown trout	-	0.001 (0.001)	-	0.030 (0.030)
European eel*	0.011 (0.006)*	0.072 (0.032)*	6.275 (3.307)*	37.225 (19.803)*

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

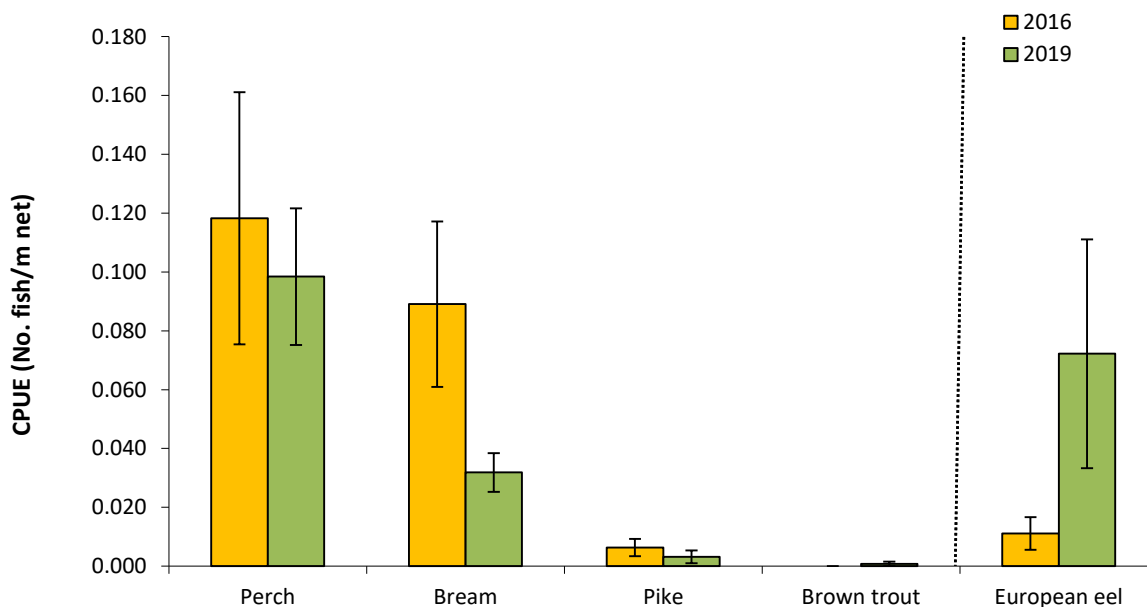


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Belhavel Lough (Eel CPUE based on fyke nets only), 2016 and 2019

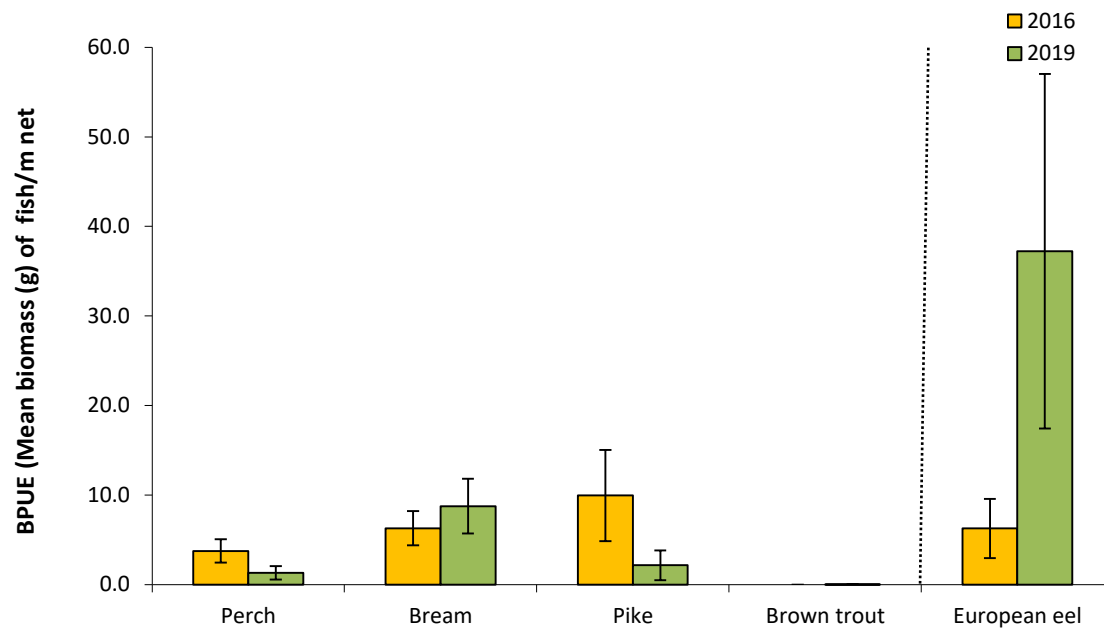


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Belhavel Lough (Eel BPUE based on fyke nets only), 2016 and 2019

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2019 survey ranged in length from 6.3cm to 33.9cm (mean = 9.1cm) (Fig.1.4). Perch in the sample were aged from 1+ to 6+. The sample was dominated by 1+ fish (6-7cm; Fig 1.4) and no 3+ to 5+ perch were captured. Mean L1 (length at 1 year) was 5.9cm (Table 1.3). Larger perch were captured in the 2019 survey compared to 2016, although no perch between 12 and 32cm (corresponding to the missing 3+ to 5+ cohorts) were captured in 2019 (Fig.1.4).

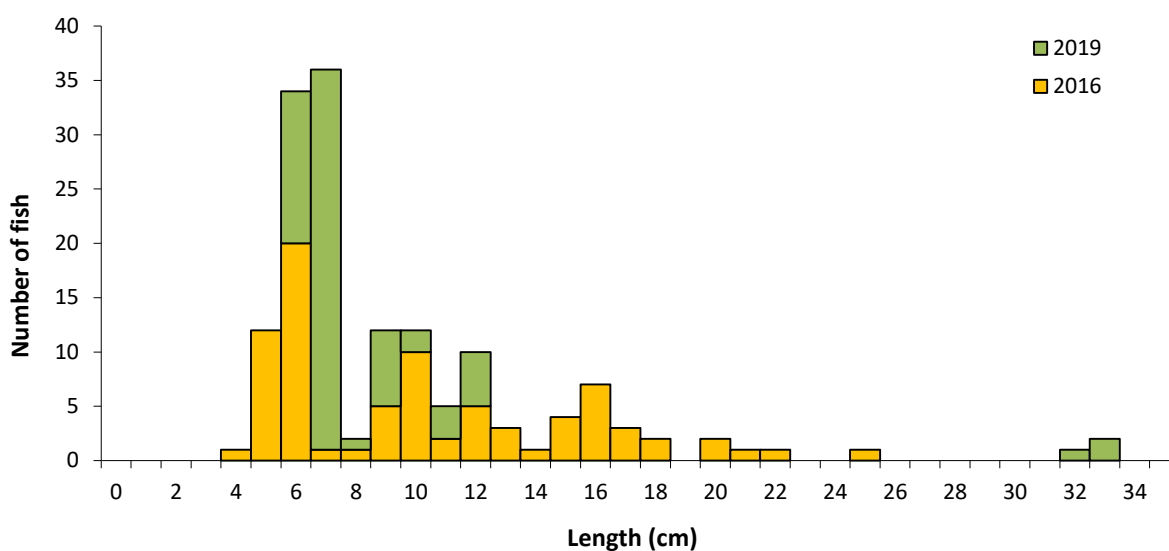


Fig. 1.4. Length frequency of perch captured on Belhavel Lough, 2016 and 2019

Table 1.3. Mean (\pm S.E.) perch length (cm) at age for Belhavel Lough, September 2019

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean (\pm S.E.)	5.9 (0.2)	9.7 (0.2)	14.4	20.7	25	28.1
N	19	5	1	1	1	1
Range	4.6-7.5	9.1-10.5	-	-	-	-



Bream

Bream captured during the 2019 survey ranged in length from 3.5cm to 38.1cm (mean = 25.4cm) (Fig.1.5). Ten age classes, ranging from 0+ to 12+ were present in the sample aged. The population was dominated by larger, older fish and the two strongest year classes were 8+ and 9+ fish. No 3+ or 6+ fish were recorded in the sample aged (Table 1.4). This is in contrast with the previous survey carried out in 2016, when smaller and younger bream were more prominent.

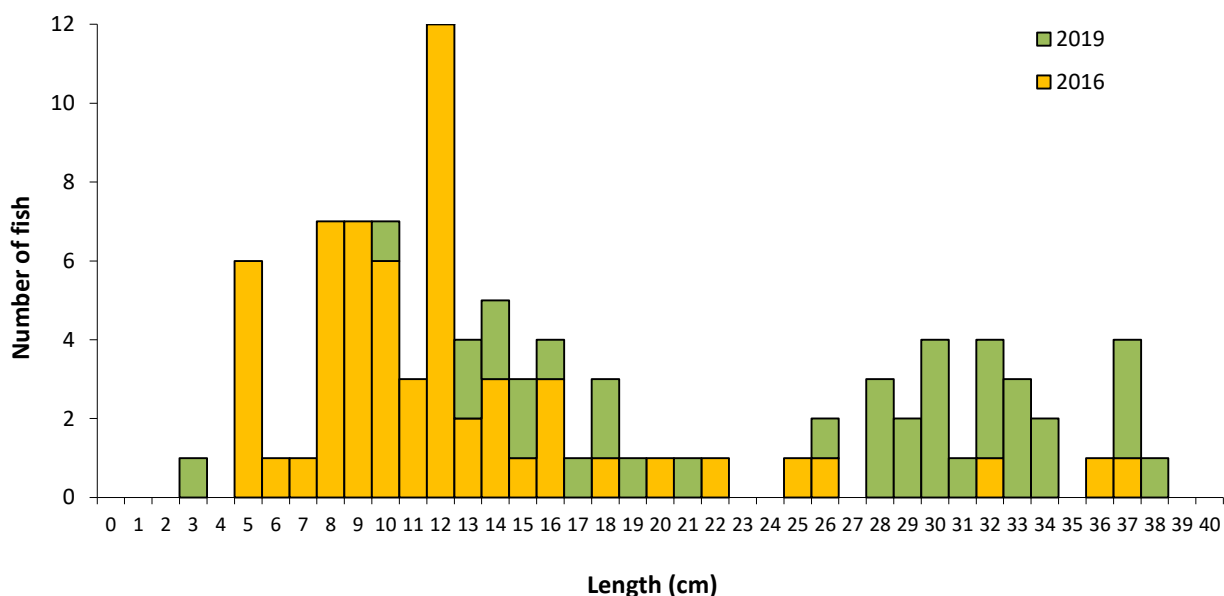


Fig. 1.5. Length frequency of bream captured on Belhavel Lough 2016 and 2019

Table 1.4. Summary age data from bream captured on Belhavel Lough, 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+
n	1	-	3	-	5	3	-	4	6	7	3	2	1
Mean L (cm)	3.5	-	13.4	-	16.4	19.6	-	30.5	31.2	30.8	34.8	37.7	38.1
Min L (cm)	3.5	-	12.6	-	15.3	18.3	-	26.9	28.6	28.5	32.6	37.5	38.1
Max L (cm)	3.5	-	14.5	-	18.1	21.0	-	34.9	33.3	33.7	37.5	37.8	38.1



Other fish species

Four pike ranging from 51.8cm to 66.4cm (mean = 59.9cm) were recorded. One brown trout 14.0cm in length and aged 1+ was captured. Thirteen European eels, ranging from 42.5cm-84.0cm (mean = 64.4cm) were also recorded.

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 sub-sample 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 17 perch stomachs were examined. Of these, seven were found to contain no prey items. Of the ten stomachs which contained food six (60%) contained unidentified digested material, two (20%) had consumed invertebrates, one stomach (10%) zooplankton, and one perch (10%) both invertebrates and zooplankton (Fig. 1.6).

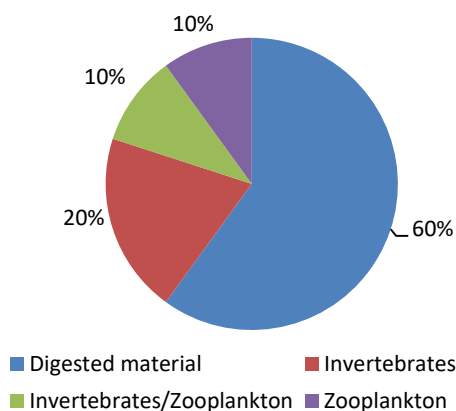


Fig. 1.6. Diet of perch (n=10) captured on Belhavel Lough, 2019 (% FO)



1.4 Summary and ecological status

A total of five fish species were recorded on Belhavel Lough in September 2019. A similar species composition was recorded in both the 2016 and 2019 surveys, with the exception of brown trout, which were captured in 2019. Several brown trout had also been recorded in a previous survey in 1968 (unpublished IFI data).

Perch was the dominant fish species in terms of abundance (CPUE), while bream was the dominant species in terms of biomass (BPUE) captured in the survey gillnets.

Perch captured during the 2019 survey ranged in length from 6.3cm to 33.9cm. Perch were aged between 1+ and 6+. However, no three to five year old fish were recorded. One year old fish were the most abundant cohort in the sample aged. While the capture of the large individuals (6+) may be influenced to some degree by the deployment of additional larger mesh braided survey gill nets during the 2019 survey, the absence of 3 to 5 year old fish may reflect changes in the population structure since 2016.

Bream captured during the 2019 survey ranged in length from 3.5cm to 38.1cm. Ten age classes were recorded, ranging from 0+ to 12+. The presence of younger age classes suggests that some on-going recruitment is occurring. However, the population was dominated by older cohorts in contrast with the previous survey carried out in 2016, when smaller and younger bream were more prominent. While the additional large mesh benthic braided survey gill nets deployed in 2019 survey may also account for some of this difference in the bream population between years, this could also reflect a change in the population structure of bream in the lake.

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 (AFBNI) 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 gill nets to ensure comparability of effort between surveys. Using the FIL2 classification tool and expert opinion, Belhavel Lough has been assigned an ecological status of Good for 2019 based on the fish populations present.

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.
- CFB (2000) *Central Fisheries Board TOP Lake Survey Report, Belhavel Lough*.
- 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 (2014) *Integrated Water Quality Assessment for the Western River Basin District 2013*.
- 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., 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.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012b) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- McGarrigle, M. (2014) Assessment of small water bodies in Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy*, **114 (3)**, 119-128).
- McLoone, P., Connor, L., Coyne, J., Morrissey, E., Corcoran, W., Cierpial, D., Delanty, K., Matson, R., Gordon, P., O' Briain, R., Rocks, K., O' Reilly, S., Puttharee, D., McWeeney, D., Robson S., Buckley, S. and Kelly, F.L. (2017) *Fish Stock Survey of Belhavel Lough, September 2016*. National Research Survey Programme - Coarse Fish and Pike, Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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

**www.fisheriesireland.ie
info@fisheriesireland.ie**

+353 1 8842 600

