

National Research Survey Programme

Lakes 2016

Lough Bane

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**Fish Stock Survey of Lough Bane,
July 2016**

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

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

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1.1 Introduction

Lough Bane is situated on the Meath-Westmeath border within the Boyne catchment, approximately 10km south of Oldcastle, Co. Meath (Plate 1.1 and Fig. 1.1). It has a surface area of 75ha, a mean depth of >4m and a maximum depth of 16m. The lake is categorised as typology class 12 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), greater than 50ha and high alkalinity (>100mg/l CaCO₃). Lough Bane is a public water supply for the north Meath area.

Lough Bane is one of three lakes, along with Lough Glass and Lough Glass North, to make up the Lough Bane and Lough Glass Special Area of Conservation (NPWS, 2000). The lakes are situated in a shallow valley that occurs at the headwaters of the River Deel, with the main outflow at the south-east end of Lough Bane. Lough Bane is a good example of a hard water marl lake, an important habitat listed on Annex I of the E.U. Habitats Directive (NPWS, 2000). The lake contains well developed stonewort communities, and at least four species of Charophyte. Mixed woodland composed of beech (*Fagus sylvatica*), oak (*Quercus* sp.), holly (*Ilex aquifolium*), Scots pine (*Pinus sylvestris*) and European larch (*Larix decidua*) occur along parts of the southern and northern shores of the lake. Lough Bane was once home to a population of white-clawed crayfish (*Austropotamobius pallipes*), a species listed on Annex II of the E.U. Habitats Directive (NPWS, 2007). However, in 1986 this species was declared extinct from the lake due to an infestation of the fungal plague, *Aphanomyces astaci* (NPWS, 2000). Bird species found at the lake include the little grebe, cormorant, lapwing, curlew and snipe (NPWS, 2000).

Lough Bane historically held a stock of wild brown trout; however it is also stocked regularly by the Lough Bane Angling Association, who control fishing on the lake (O' Reilly, 2007). The angling association has been in existence for 24 years and has been stocking approximately 1,000 brown trout and 1,000 rainbow trout into the lake each year.

Lough Bane was previously surveyed in 2007, 2010 and 2013 as part of the Water Framework Directive surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al.*, 2011 and 2014). During the 2013 survey perch were found to be the dominant species present in the lake. Brown trout (wild and stocked), rainbow trout (stocked) and eels were also captured during the survey.



Plate 1.1. Lough Bane

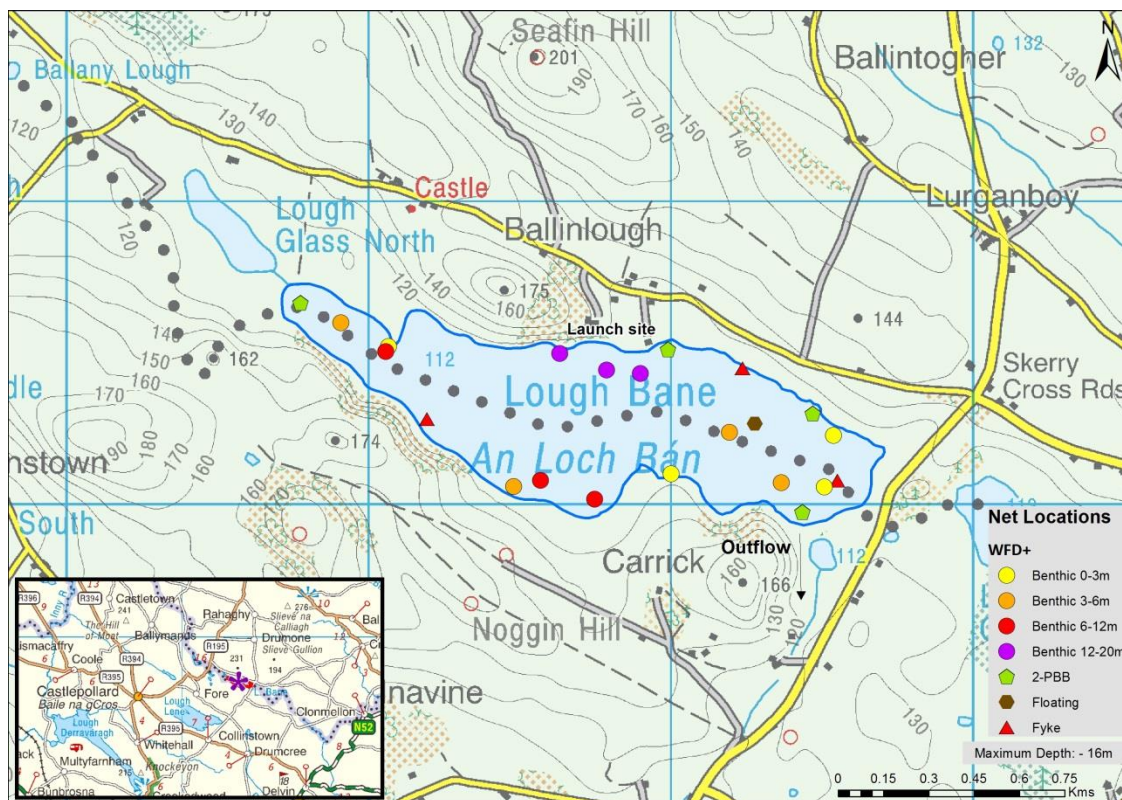


Fig. 1.1. Location map of Lough Bane and depths of each net (outflow is indicated on map)



1.2 Methods

1.2.1 Netting methods

Lough Bane was surveyed over two nights from the 12th to 14th of July 2016. A total of three sets of Dutch fyke nets, 14 benthic monofilament multi-mesh CEN standard survey gill nets (4 @ 0-2.9m, 4 @ 3-5.9m, 3 @ 6-11.9m and 3 @ 12-19.9m) and one floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill net were deployed in the lake (18 sites). The netting effort was supplemented using four two-panel benthic braided (63.5mm and 88.9mm mesh knot to knot) survey gill nets (2-PBB).

The nets were deployed in the same locations as were randomly selected in the previous survey. The site locations for additional two-panel benthic braided survey gill net sites (2-PBB) locations were chosen randomly within fixed depth zones. 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 brown trout, rainbow 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.

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 six fish species were recorded on Lough Bane in July 2016, with 366 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Perch was the most common fish species recorded. Rainbow trout, brown trout, eels, nine-spine stickleback and pike were also recorded. During the previous surveys in 2013, 2010 and 2007 a similar species composition was recorded, with the exception of pike and nine-spined stickleback which were not recorded in the 2013 survey. Stocked brown trout only were recorded in 2010 and 2016 whilst both wild and stocked brown trout were recorded in the 2013 survey. No brown trout were recorded in 2007 (Kelly *et al.*, 2011b and 2014).

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

Scientific name	Common name	Number of fish captured				
		BM CEN	FM CEN	2-PBB	Fyke	Total
<i>Perca fluviatilis</i>	Perch	348	0	0	3	351
<i>Salmo trutta</i>	Brown trout (stocked)	3	0	1	0	4
<i>Oncorhynchus mykiss</i>	Rainbow trout (stocked)	1	0	3	0	4
<i>Esox lucius</i>	Pike	1	0	0	0	1
<i>Pungitius pungitius</i>	Nine-spined stickleback	1	0	0	0	1
<i>Anguilla anguilla</i>	Eel	0	0	0	5	5

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. The mean CPUE and BPUE (excluding the larger 88.9mm mesh panel) for all species captured in the 2007, 2010, 2013 and 2016 surveys are illustrated in Figures 1.2 and 1.3.



Perch

Perch was the dominant fish species in terms of both abundance (CPUE) and biomass (BPUE), captured during the 2016 survey (Table 1.2). Perch CPUE and BPUE fluctuated over the four sampling occasions. Perch CPUE was significantly lower in 2007 than 2010 and 2016 (Kruskal-Wallis $H=8.14$, $P<0.05$). Perch BPUE was significantly higher in 2016 than in 2010 and 2007 (Kruskal-Wallis $H=9.57$, $P<0.05$) (Fig 1.2 and 1.3).

Brown trout

The mean brown trout CPUE and BPUE decreased over the three sampling occasions; however, these differences were not statistically significant (Fig 1.2 and 1.3).

Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lough Bane, 2016

Scientific name	Common name	Mean CPUE (\pm S.E) **
<i>Perca fluviatilis</i>	Perch	0.530 (0.167)
<i>Salmo trutta</i>	Brown trout (stocked)	0.005 (0.003)
<i>Oncorhynchus mykiss</i>	Rainbow trout (stocked)	0.004 (0.003)
<i>Esox lucius</i>	Pike	0.002 (0.002)
<i>Pungitius pungitius</i>	Nine-spined stickleback	0.002 (0.002)
<i>Anguilla anguilla</i>	European eel	0.028 (0.011) *
		Mean BPUE (\pm S.E) **
<i>Perca fluviatilis</i>	Perch	21.876 (6.311)
<i>Salmo trutta</i>	Brown trout (stocked)	4.758 (32.256)
<i>Oncorhynchus mykiss</i>	Rainbow trout (stocked)	4.900 (3.566)
<i>Esox lucius</i>	Pike	2.879 (2.879)
<i>Pungitius pungitius</i>	Nine-spined stickleback	0.002 (0.002)
<i>Anguilla anguilla</i>	European eel	6.585 (1.736) *

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

**CPUE and BPUE data above for all fish species except eels are not comparable to earlier surveys as an extra panel was added to the 2-PBB to provide additional information on large coarse fish.

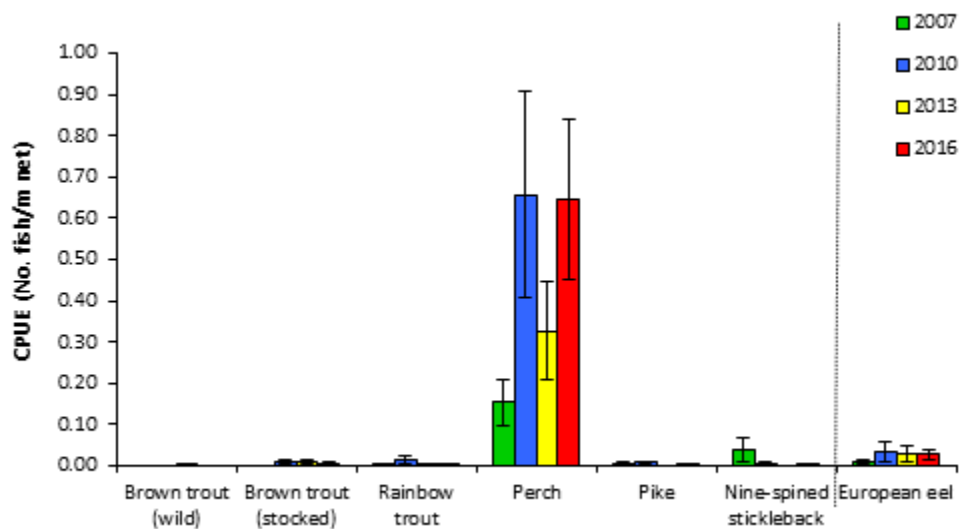


Fig. 1.2. Mean (\pm S.E.) CPUE for all fish species captured in Lough Bane (Eel CPUE based on fyke nets only), 2007, 2010, 2013 and 2016

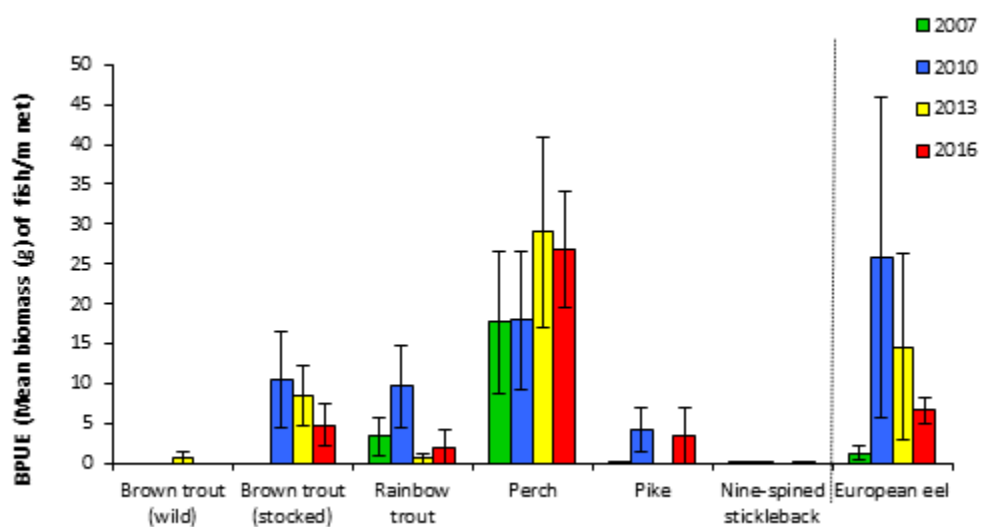


Fig. 1.3. Mean (\pm S.E.) BPUE for all fish species captured in Lough Bane (Eel BPUE based on fyke nets only), 2007, 2010, 2013 and 2016

1.3.3 Length frequency distributions and growth

Perch

Perch captured during the 2016 survey ranged in length from 3.0cm to 30.4cm (mean = 10.6cm) (Fig. 1.4). Six age classes were present, ranging from 0+ to 6+, with a mean L1 of 5.8cm (Table 1.3). The dominant age class was 1+ (Fig. 1.4). Perch captured during the 2010 and 2013 surveys had a similar length and age range (Fig.1.4), apart from a large number of fish in the 3-4cm range in 2010 (Fig 1.4). The dominant age class in 2010 was 0+, whereas the dominant age class in 2013 and 2016 was 1+.

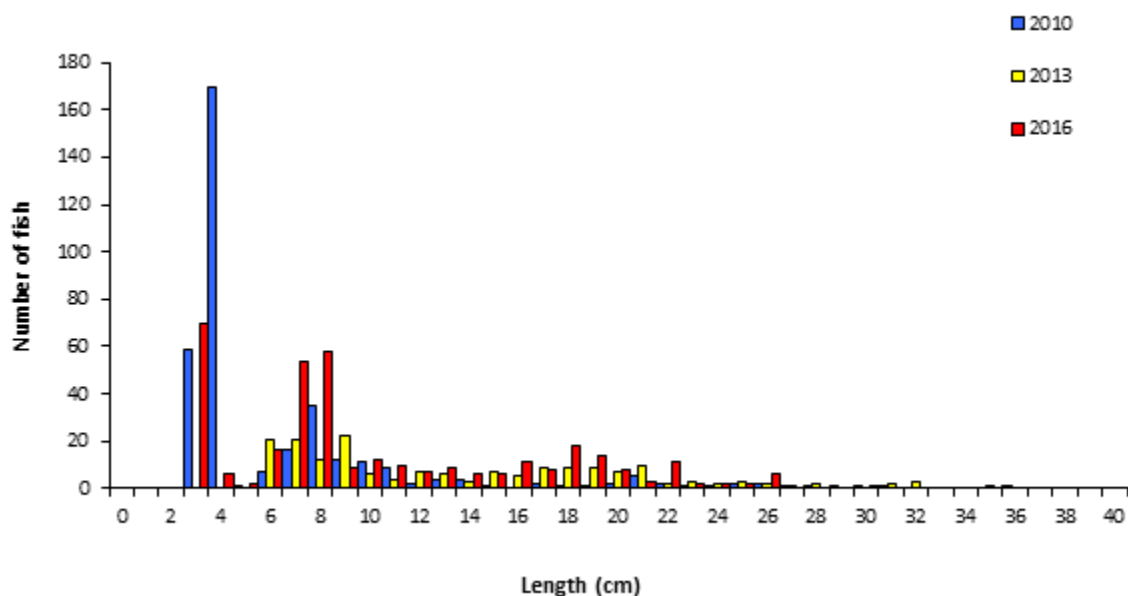


Fig. 1.4. Length frequency of perch captured on Lough Bane, 2010, 2013 and 2016

Table 1.3. Mean (\pm S.E.) perch length (cm) at age for Lough Bane, July 2016

	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆
Mean (\pm S.E.)	5.8 (0.1)	11.4 (0.3)	17.1 (0.5)	23.1 (0.8)	24.1 (2.4)	27.3 (2.5)
N	58	47	36	9	3	2
Range	4.2-8.3	7.7-15.7	11.4-22.4	17.8-25.5	20.4-28.7	24.7-29.8

Brown trout

Only four brown trout (stocked) were captured during the 2016 survey ranging in length from 44.0cm to 46.1cm (mean = 44.9cm) (Fig. 1.5) and were aged at 2+. Brown trout (stocked) captured during the 2010 and 2013 surveys had similar length and age ranges (Fig.1.5).

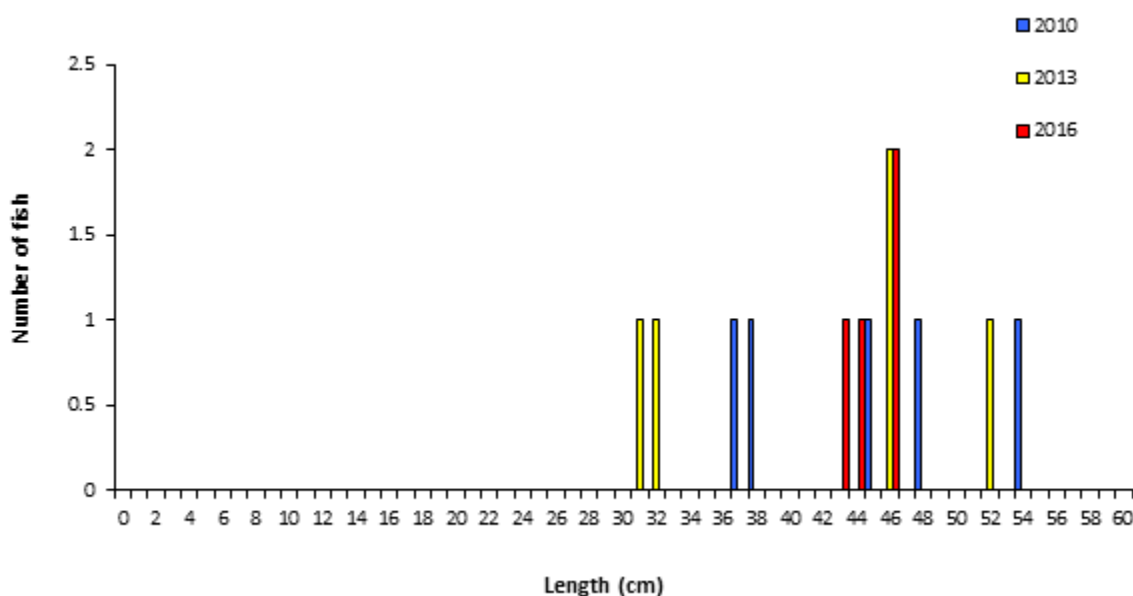


Fig. 1.5. Length frequency of brown trout (stocked) captured on Lough Bane, 2010, 2013 and 2016

Other fish

Eels captured during the 2016 survey ranged in length from 23.5cm to 63.0cm and rainbow trout ranged in length from 48.2cm to 51.2cm. One nine-spined stickleback at 4.0cm and one pike at 62.0cm 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 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 begin 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 33 were found to contain no prey items. Of the 60 stomachs containing food, 35% zooplankton, 23% contained invertebrates, 18% fish, 12% unidentified digested material, 8% zooplankton/invertebrates and 4% fish/invertebrates (Fig. 1.6).

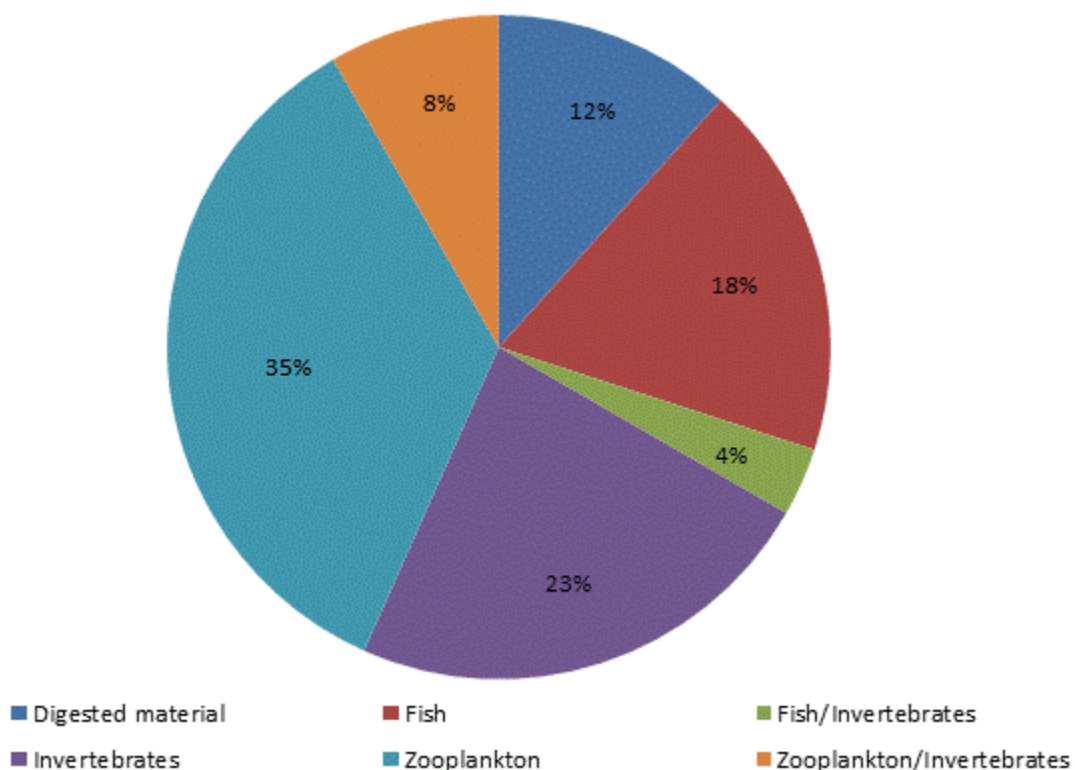


Fig 1.6. Diet of perch (n=60) captured on Lough Bane, 2016 (% occurrence)



1.4 Summary and ecological status

A total of six fish species were recorded on Lough Bane in July 2016. Perch was the dominant fish species in terms of both abundance (CPUE) and biomass (BPUE), captured during the 2016 survey.

The perch BPUE was significantly higher in 2016 than in 2010 and 2007. Perch ranged in length from 3.0cm to 30.4cm and ranged in age from 0+ to 6+, indicating reproductive success in each of the previous seven years. The dominant age class was 1+. Zooplankton (35%), invertebrates (23%) and fish (18%) were the main food items present in the stomachs of perch captured during the survey.

Lough Bane is stocked annually with brown trout and rainbow trout (a non-native species). These hatchery reared fish have been released into the lake to create an angling amenity in the area, as the native brown trout stock have declined in recent years and cannot support large fishing pressures. The mean brown trout (stocked) CPUE and BPUE decreased over the three sampling occasions; however, these differences were not statistically significant. Only four brown trout (stocked) were captured during the 2016 survey ranged in length from 44.0cm to 46.1cm and were aged at 2+.

A summary of the effects of stocking on the lake and recommendations for the future can be found in a previous report (Kelly *et al.*, 2011b).

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 by 2015 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). Using the FIL2 classification tool, Lough Bane has been assigned an ecological status of Good for 2016 based on the fish populations present. In previous surveys the lake was assigned a fish status of Good for 2010 and High for 2007 and 2013.

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



1.5 References

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