# National Research Survey Programme

## Lakes 2016

## Beltra Lough

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# Fish Stock Survey of Beltra Lough, August 2016

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

CITATION: Kelly, F.L., Connor, L., Coyne, J., Morrissey, E., Corcoran, W., Cierpial, D., Delanty, K., McLoone, P., Matson, R., Gordon, P., O' Briain, R., Rocks, K., O' Reilly, S., Kelly K., Puttharee, D., McWeeney, D., Robson S. and Buckley, S. (2017) Fish Stock Survey of Beltra Lough, 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

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### 1.1 Introduction

Beltra Lough is a picturesque lake located 8km north-east of Newport and 11km north-west of Castlebar (Plate 1.1, Fig 1.1). The lake is 2.4km in length and 1.6km wide, has a surface area of 403ha, a mean depth of > 4m and a maximum depth of 26.0m. The lake is categorised as typology class 4 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. deep (>4m), greater than 50ha and high alkalinity (<20mg/l CaCO3).

Beltra Lough forms part of the Newport River Special Area of Conservation (SAC). The site consists of the Newport River, its tributaries and Beltra Lough (NPWS, 2005). The site is selected as an SAC for containing Atlantic salmon and freshwater pearl mussel (*Margaritifera margaritifera*), both species listed on Annex II of the E.U. Habitats Directive. The Newport River and Beltra Lough are important for spring salmon and grilse, and contain important spawning areas. Broad-leaved deciduous woodland is also found within the site, which is comprised of ash, hawthorn, downy birch, alder and willow. The kingfisher, a species listed on Annex I of the E.U. Birds Directive, has also been recorded along the Newport River.

Water quality in the lake is considered to be good; however, there are potential threats to water quality through nutrient enrichment, particularly from agricultural run-off. Afforestation within the catchment could also pose a threat to water quality (NPWS, 2005).

Beltra Lough gets an excellent run of spring salmon and, from June onwards, a run of grilse and sea trout. The sea trout average approximately 0.34kg, but fish of between 1.8kg and 2.3kg are taken annually (O' Reilly, 2007).

Beltra Lough was previously surveyed in 2010 and 2013 as part of the Water Framework Directive surveillance monitoring programme (Kelly *et al*., 2011 and 2014). During these surveys perch were found to be the dominant species present in the lake. Brown trout, sea trout eels and salmon were also captured during the two surveys.

**Plate 1.1. Beltra Lough**

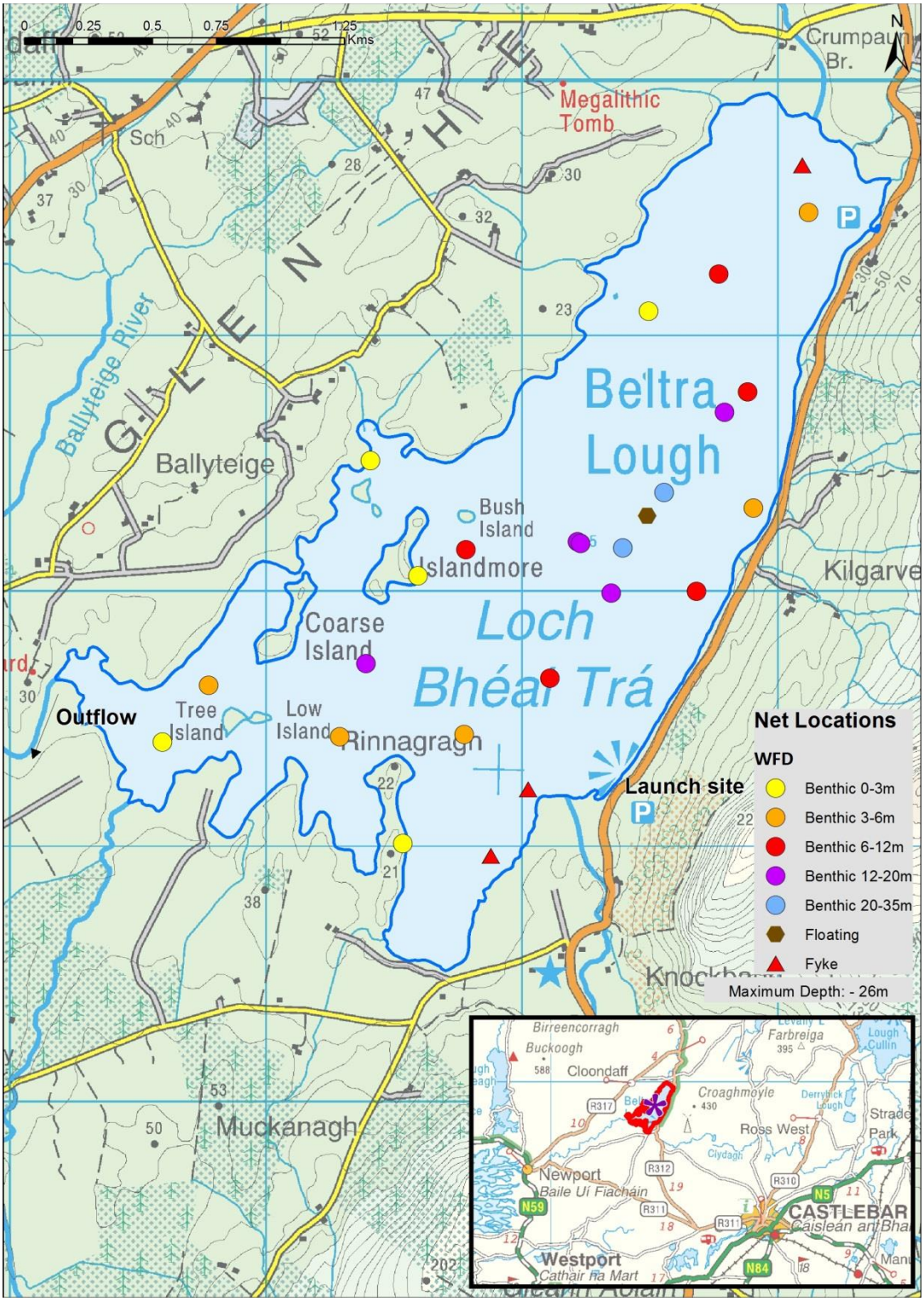


**Fig. 1.1. Location map of Beltra Lough showing net locations and depths of each net (outflow is indicated on map)**

## 1.2 Methods

### *1.2.1 Netting methods*

Beltra Lough was surveyed over two nights from the 17th to the 19th of August 2016. A total of three sets of Dutch fyke nets, 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 one floating monofilament multi-mesh (FM CEN) (12 panel, 5-55mm mesh size) CEN standard survey gill net were deployed randomly in the lake (26 sites).

Nets were deployed in the same locations as were randomly selected in the previous survey. 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 all brown trout and sea trout. 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 in IFI when moving between water bodies.

## 1.3 Results

### *1.3.1 Species Richness*

A total of three fish species (sea trout are included as a separate 'variety' of trout) were recorded in Beltra Lough in August 2016, with 367 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, followed by brown trout, sea trout. Eels were also captured. During the previous surveys in 2010 and 2013 the same species composition was recorded with the exception of salmon which were not recorded in 2016 (Kelly *et al*., 2011 and 2014).

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

| Scientific name | Common name | Number of fish captured | | | |
|---|---|---|---|---|---|
| | | BM CEN | FM CEN | Fyke | Total |
| *Perca fluviatilis* | Perch | 316 | 0 | 7 | 323 |
| *Salmo trutta* | Brown trout | 14 | 2 | 0 | 16 |
| *Salmo trutta* | Sea trout | 8 | 0 | 0 | 8 |
| *Anguilla anguilla* | European eel | 0 | 0 | 0 | 20 |

### *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 2010 and 2013 surveys are summarised in Table 1.2. Mean CPUE and BPUE for all species is illustrated in Figure 1.2 and 1.3.

**Perch**

Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Although the mean perch CPUE and BPUE increased over the three sampling occasions, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

**Brown trout**

Brown trout abundance fluctuated across the three sampling years. The brown trout CPUE and BPUE was significantly higher in 2013 than in 2010 and 2016 (Kruskal-Wallis H=11.49, P<0.05 and H=11.37, P<0.05) (Table 1.2; Fig 1.2 and 1.3).

**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Beltra Lough, 2010, 2013 and 2016**

| Scientific name | Common name | 2010 | 2013 | 2016 |
|---|---|---|---|---|
| | | | **Mean CPUE** | |
| *Salmo trutta* | Brown trout | 0.021 (0.012) | 0.064 (0.014) | 0.021 (0.012) |
| | Sea trout | 0.004 (0.003) | 0.008 (0.003) | 0.010 (0.004) |
| *Perca fluviatilis* | Perch | 0.104 (0.031) | 0.205 (0.056) | 0.410 (0.121) |
| *Anguilla anguilla* | European eel | 0.406 (0.078) | 0.156 (0.106) | 0.111 (0.058) |
| | | | **Mean BPUE** | |
| *Salmo trutta* | Brown trout | 2.249 (1.383) | 4.363 (1.140) | 1.207 (0.675) |
| | Sea trout | 1.095 (0.889) | 3.494 (1.602) | 3.236 (1.535) |
| *Perca fluviatilis* | Perch | 4.400 (1.259) | 8.401 (2.310) | 12.684 (3.472) |
| *Anguilla anguilla* | European eel | 54.839 (21.326) | 24.500 (11.570) | 11.856 (5.536) |

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

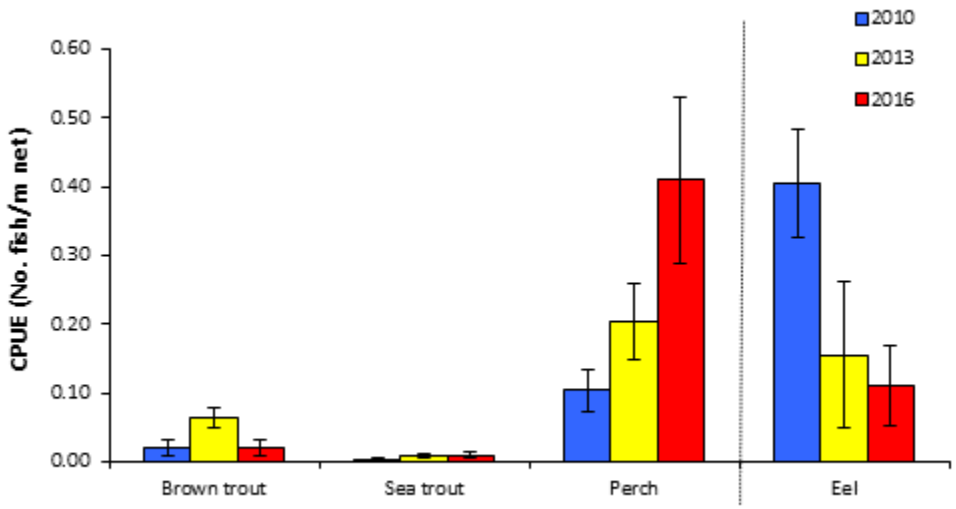


**Fig. 1.2. Mean (±S.E.) CPUE for all fish species captured in Beltra Lough (Eel CPUE based on fyke nets only), 2010, 2013 and 2016**

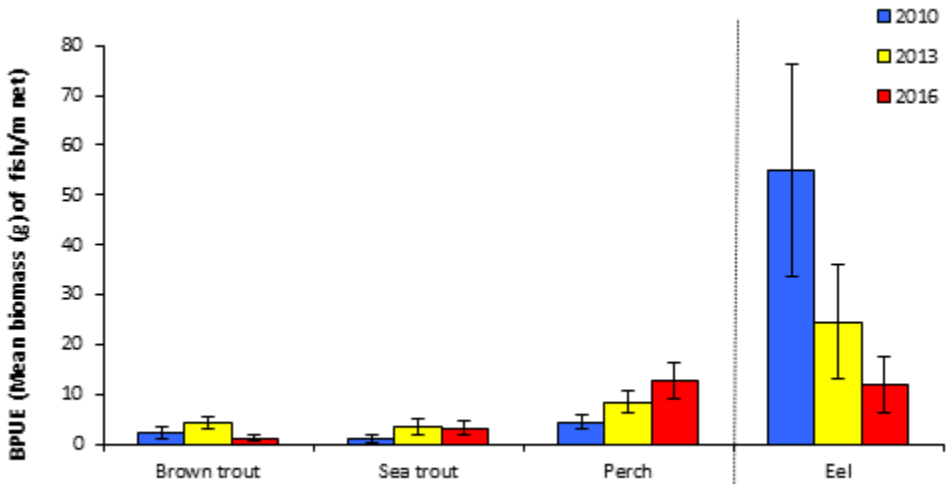


**Fig. 1.3. Mean (±S.E.) BPUE for all fish species captured in Beltra Lough (Eel BPUE based on fyke nets only), 2010, 2013 and 2016**

### *1.3.3 Length frequency distributions and growth*

**Perch**

Perch captured during the 2016 survey ranged in length from 5.2cm to 35.7cm (mean = 12.9cm) (Fig. 1.4). Six age classes were present, ranging from 2+ to 9+, with a mean L1 of 5.6cm (Table 1.3). The dominant age class was 2+ (Fig. 1.4). Perch captured during the 2010 and 2013 surveys had similar length and age ranges, with some larger and older fish recorded in the 2016 survey (Fig.1.4).

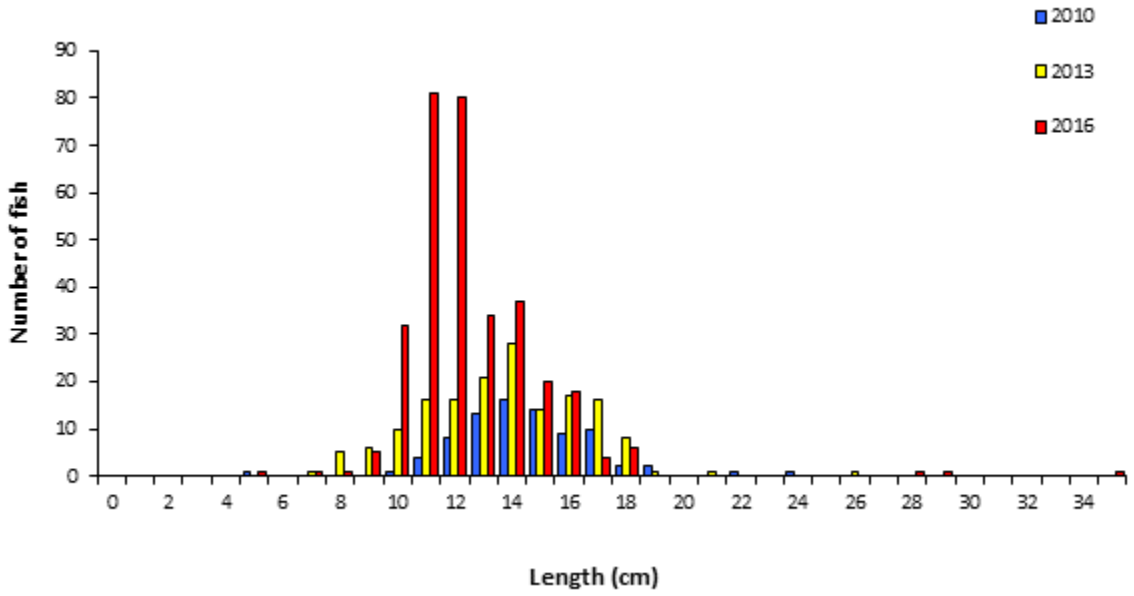


**Fig. 1.4. Length frequency of perch captured on Beltra Lough, 2010, 2013 and 2016**

**Table 1.3. Mean (±S.E.) perch length (cm) at age for Beltra Lough, August 2016**

| | $L_1$ | $L_2$ | $L_3$ | $L_4$ | $L_5$ | $L_6$ | $L_7$ | $L_8$ | $L_9$ |
|---|---|---|---|---|---|---|---|---|---|
| Mean (±S.E.) | 5.6 | 10.7 | 14.3 | 16.1 | 19.0 | 21.5 | 25.0 | 27.7 | 30.1 |
| N | 32 | 32 | 18 | 11 | 5 | 4 | 3 | 3 | 3 |
| Range | 4.0-7.3 | 7.6-14.0 | 10.9-16.9 | 12.7-18.8 | 16.5-22.6 | 17.9-26.0 | 22.9-28.5 | 24.5-31.7 | 28.4-33.4 |

**Brown trout**

Brown trout captured during the 2016 survey ranged in length from 10.0cm to 23.6cm (mean = 16.3cm) (Fig.1.5) with three age classes present, ranging from 1+ to 3+, with a mean L1 of 7.0cm (Table 1.4). The dominant age class was 1+ (Fig. 1.5). Brown trout captured during the 2010 and 2013 surveys had a similar age range and a larger length range than the 2016 survey (Fig.1.5).

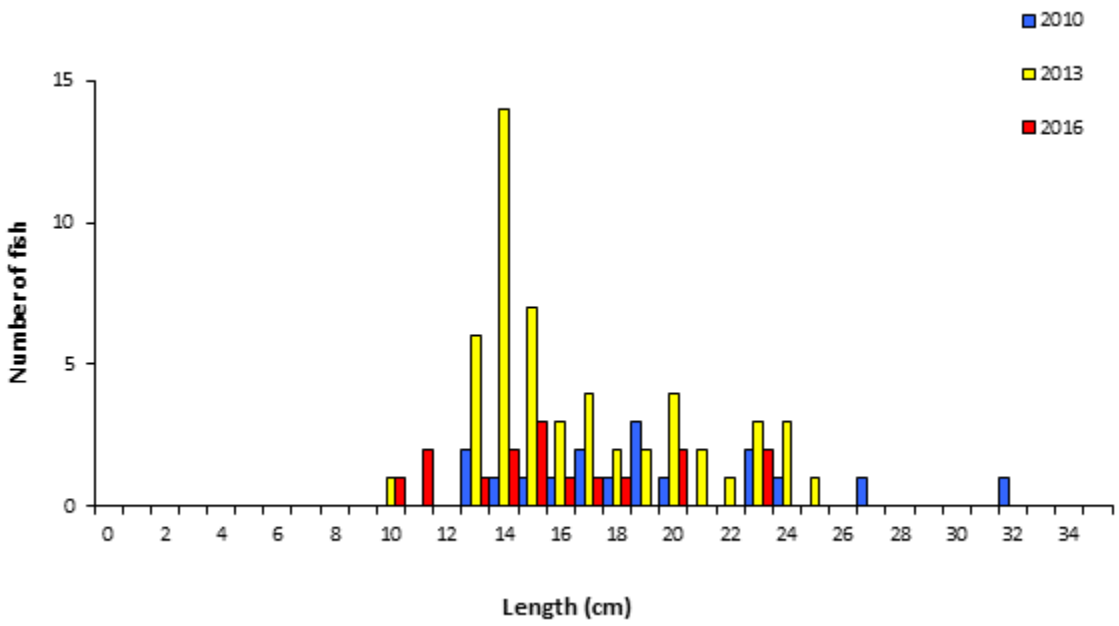


**Fig. 1.5. Length frequency of brown trout captured on Beltra Lough, 2010, 2013 and 2016**

**Table 1.4. Mean (±S.E.) brown trout length (cm) at age for Beltra Lough, August 2016**

| | $L_1$ | $L_2$ | $L_3$ |
|---|---|---|---|
| Mean (±S.E.) | 7.0 (0.4) | 14.7 (1.1) | 19.9 |
| N | 13 | 8 | 1 |
| Range | 5.1-9.5 | 10.6-18.9 | 19.9-19.9 |

**Other fish species**

Eels captured during the 2016 survey ranged in length from 29.5cm to 60.0cm. Sea trout ranged in length from 26.5cm to 39.3cm and ages ranged from 2.0+ to 3.0+.

***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 49 stomachs were examined. Of these 12 were found to contain no prey items. Of the remaining 37 stomachs containing food, 41% contained invertebrates, 32% unidentified digested material, 22% zooplankton and 5% invertebrates/digested material (Fig. 1.6).

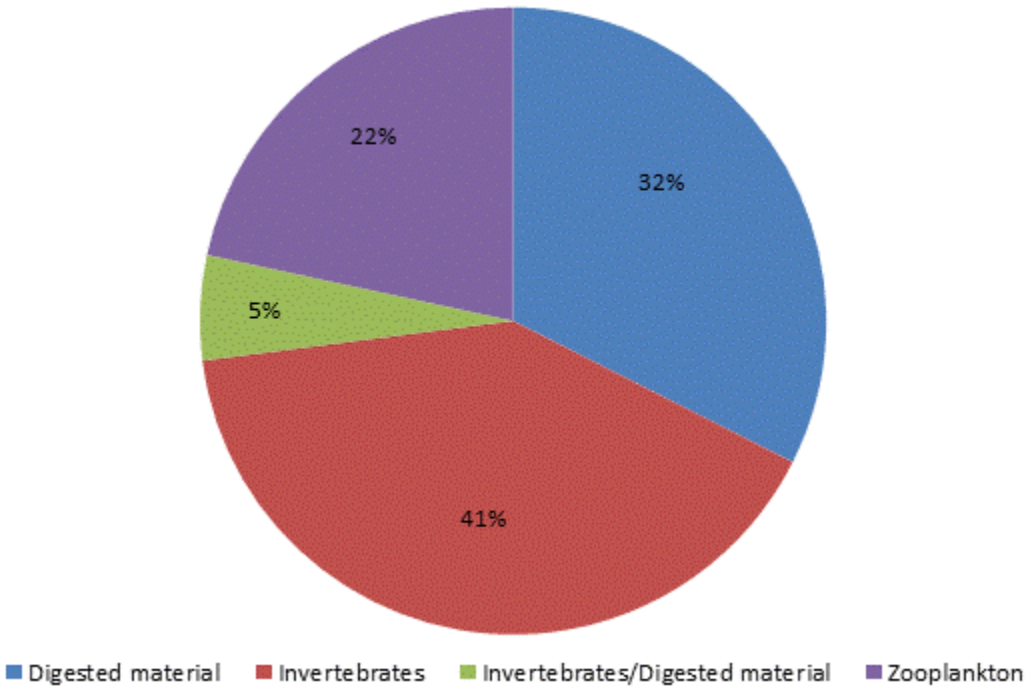


**Fig 1.6. Diet of perch (n=37) captured on Beltra ough, 2016 (% occurrence)**

**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 10 stomachs were examined. Of these two were found to contain no prey items. Of the eight stomachs containing food, 88% contained invertebrates and 12% unidentified digested material (Fig. 1.7).

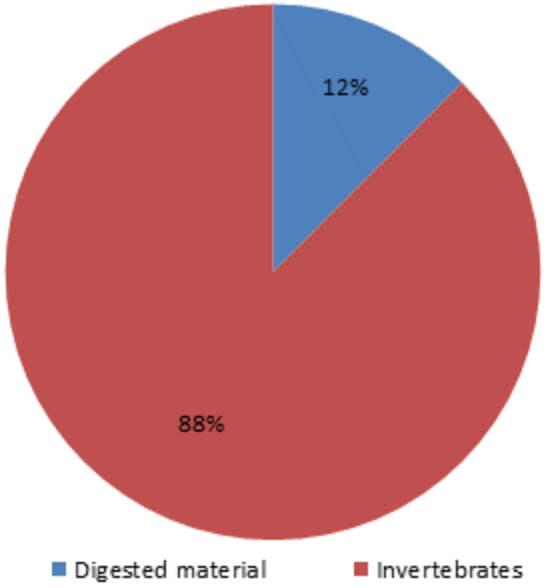


**Fig 1.7. Diet of brown trout (n=8) captured on Beltra Lough, 2016 (% occurrence)**

### 1.4 Summary and ecological status

A total of three fish species (sea trout are included as a separate 'variety' of trout) were recorded in Beltra Lough in August 2016. Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2016 survey.

Although the mean perch CPUE and BPUE increased over the three sampling occasions, these differences were not statistically significant. Six age classes of perch were present, ranging from 2+ to 9+, indicating reproductive success in six of the previous ten years. The dominant age class was 2+. Invertebrates (41%) and zooplankton (22%) were the main food items found in the stomachs of perch captured during the survey.

The brown trout CPUE and BPUE was significantly higher in 2013 than in 2010 and 2016. Brown trout ranged in age from 1+ to 3+, indicating reproductive success in three of the previous four years. The dominant age class was 1+. Invertebrates were the main food item in stomachs of brown trout captured during the survey.

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, Beltra Lough has been assigned an ecological status of High for 2016 based on the fish populations present. In previous years the lake was assigned a fish status of High in 2013 and Good in 2010.

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

### 1.5 References


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

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

**+353 1 8842 600**