

# National Research Survey Programme

## Lakes 2016

### Ardderry Lough

IFI/2017/1-4355



Iascach Intíre Éireann  
Inland Fisheries Ireland



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National Research Survey Programme

**Fish Stock Survey of Ardderry Lough,  
September 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

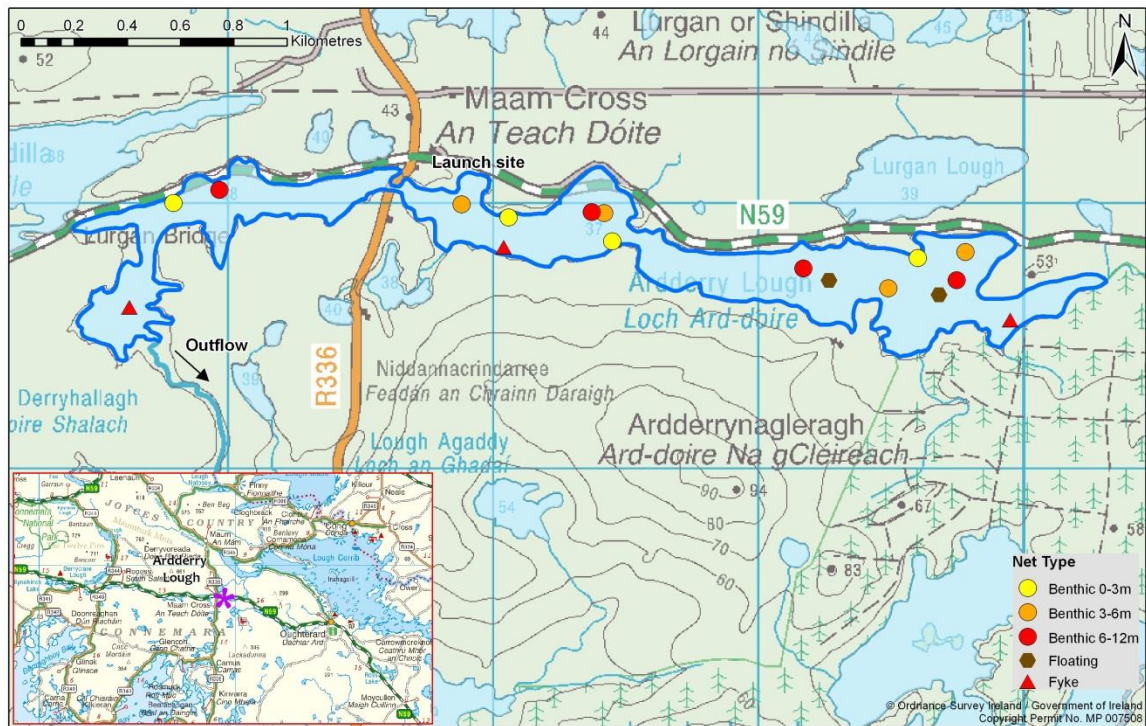
Ardderry Lough is the second lake on the Screebe system in Co. Galway (Plate 1.1, Fig 1.1). The lake is located adjacent to Maam Cross and to the south of the N59 Galway to Clifden road at an altitude of 37m a.s.l. (Fig. 1.1). The underlying geology is categorised as siliceous. The lake has a surface area of 81.1ha, a mean depth of >4m and a maximum depth of 12m. The lake falls into typology class 4 (as designated by the EPA for the Water Framework Directive), i.e. deep (>4m), greater than 50ha and low alkalinity (<20mg/l  $\text{CaCO}_3$ ).

The lake holds a large stock of brown trout, the average size of which is 0.3kg (O' Reilly, 2007). Ardderry Lough was previously surveyed in 2007, 2010 and 2013 as part of the WFD surveillance monitoring programme (Kelly and Connor, 2007 and Kelly *et al.*, 2011 and 2014). During the 2013 survey, perch was found to be the dominant species present in the lake. Brown trout and eels were also captured. Arctic char, salmon and sea trout were captured in previous surveys in 2007 and 2010 but were not recorded in 2013.



**Plate 1.1. Ardderry Lough**





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



## 1.2 Methods

### 1.2.1 Netting methods

Ardderry Lough was surveyed over two nights from the 7<sup>th</sup> to the 9<sup>th</sup> of September 2016. 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 (BM CEN) (4 @ 0-2.9m, 4 @ 3-5.9m and 4 @ 6-11.9m) and two floating benthic monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (FM CEN) were deployed in the lake (17 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 were measured and weighed on site and scales were removed from all brown 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 four fish species were recorded on Ardderry Lough in September 2016, with 169 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, eels and minnow. During the previous surveys between 2007 and 2013 the same species composition was recorded with some exceptions. Sea trout were only recorded in the 2010 survey, while salmon were only logged in 2007. In addition Arctic char were not captured in the 2013 survey but were present in 2007 and 2010. Minnow were only recorded in 2016 survey (Kelly and Connor, 2007 and Kelly *et al.*, 2011 and 2014).

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

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
<i>Perca fluviatilis</i>	Perch	142	9	6	157
<i>Salmo trutta</i>	Brown trout	5	1	0	6
<i>Anguilla anguilla</i>	European eel	0	0	5	5
<i>Phoxinus phoxinus</i>	Minnow	1	0	0	1

### 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 2007, 2010, 2013 and 2016 surveys are summarised in Table 1.2 and illustrated in Figures 1.2 and 1.3.

#### Perch

Perch was the dominant species in terms of both abundance (CPUE) and biomass (BPUE). Although the mean perch CPUE increased over the four sampling occasions, these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3). There were also no significant differences in mean perch BPUE across the four sampling years, although the BPUE fluctuated slightly.





## **Brown trout**

The mean brown trout CPUE and BPUE was slightly lower in 2016 than in 2007, 2010 and 2013; however, there were no significant statistical differences across years (Table 1.2; Fig 1.2 and 1.3).

**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Ardderry Lough, 2007 to 2016**

Scientific name	Common name	2007	2010	2013	2016
<b>Mean CPUE</b>					
<i>Salmo trutta</i>	Brown trout	0.019 (0.007)	0.017(0.009)	0.018 (0.007)	0.012 (0.005)
<i>Perca fluviatilis</i>	Perch	0.127 (0.042)	0.187 (0.042)	0.278 (0.094)	0.302 (0.076)
<i>Salvelinus alpinus</i>	Arctic char	0.015 (0.007)	0.002 (0.002)	-	-
<i>Phoxinus phoxinus</i>	Minnow	-	-	-	0.002 (0.002)
<i>Salmo trutta</i>	Sea trout	-	0.002 (0.002)	-	-
<i>Salmo salar</i>	Salmon	0.002 (0.002)	-	-	-
<i>Anguilla anguilla</i>	European eel	0.002 (0.001)	0.133 (0.034)	0.006 (0.006)	0.028 (0.015)
<b>Mean BPUE</b>					
<i>Salmo trutta</i>	Brown trout	3.347 (1.340)	2.400 (1.526)	2.445 (0.897)	1.689 (0.761)
<i>Perca fluviatilis</i>	Perch	18.200 (5.641)	19.339 (4.534)	22.449 (7.911)	19.404 (4.989)
<i>Salvelinus alpinus</i>	Arctic char	1.950 (0.901)	0.378 (0.378)	-	-
<i>Phoxinus phoxinus</i>	Minnow	-	-	-	0.001 (0.001)
<i>Salmo trutta</i>	Sea trout	-	0.458 (0.458)	-	-
<i>Salmo salar</i>	Salmon	4.901 (4.901)	-	-	-
<i>Anguilla anguilla</i>	European eel	3.616 (1.838)	18.088 (6.748)	0.656 (0.656)	1.807 (0.904)

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

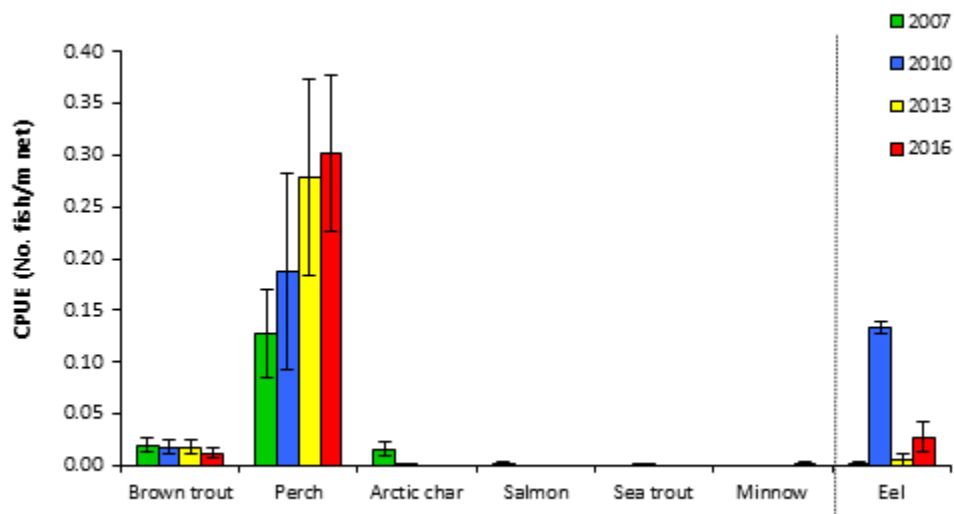


Fig. 1.2. Mean ( $\pm$ S.E.) CPUE for all fish species captured in Ardderry Lough (Eel CPUE based on fyke nets only), 2007, 2010, 2013 and 2016

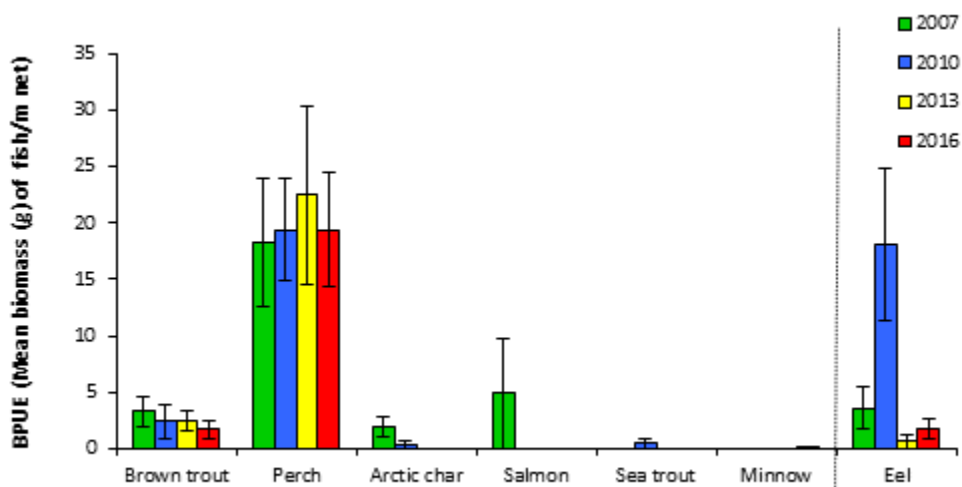
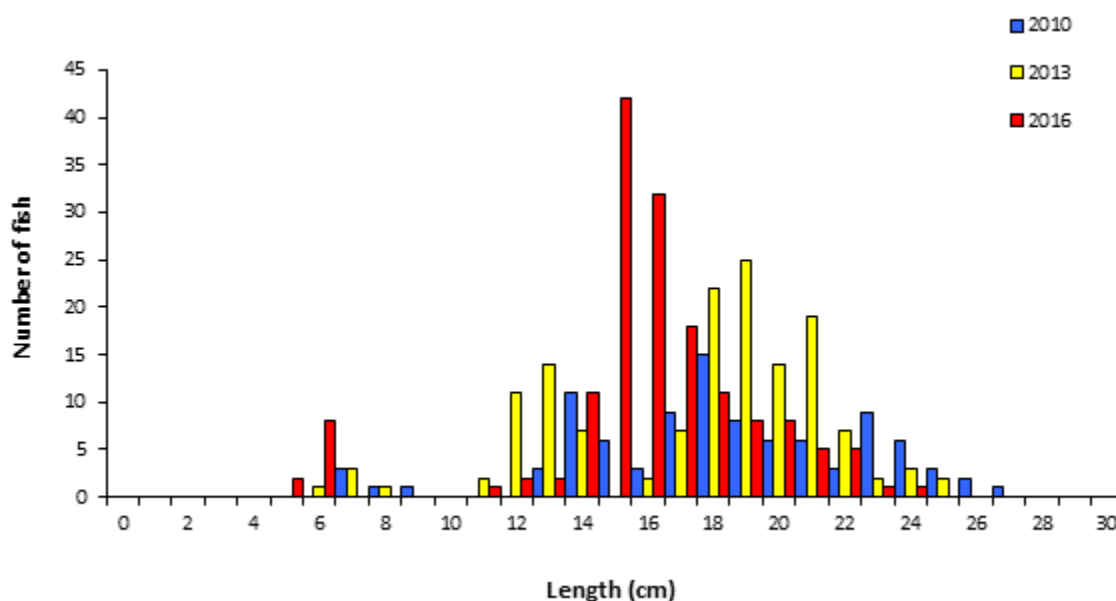


Fig. 1.3. Mean ( $\pm$ S.E.) BPUE for all fish species captured in Ardderry Lough (Eel BPUE based on fyke nets only), 2007, 2010, 2013 and 2016

### 1.3.3 Length frequency distributions and growth

#### Perch

Perch captured during the 2016 survey ranged in length from 5.9cm to 24.8cm (mean = 16.3cm) (Fig. 1.4). Seven age classes were present, ranging from 0+ to 6+, with a mean L1 of 6.8cm (Table 1.3). The dominant age class was 3+ (Fig. 1.4). Perch captured during the 2010 and 2013 surveys had a similar length range (Fig.1.4) and ranged in age from 0+ to 7+. The dominant age class was 2+ and 3+ in 2010 and 2013 respectively (Fig 1.4).



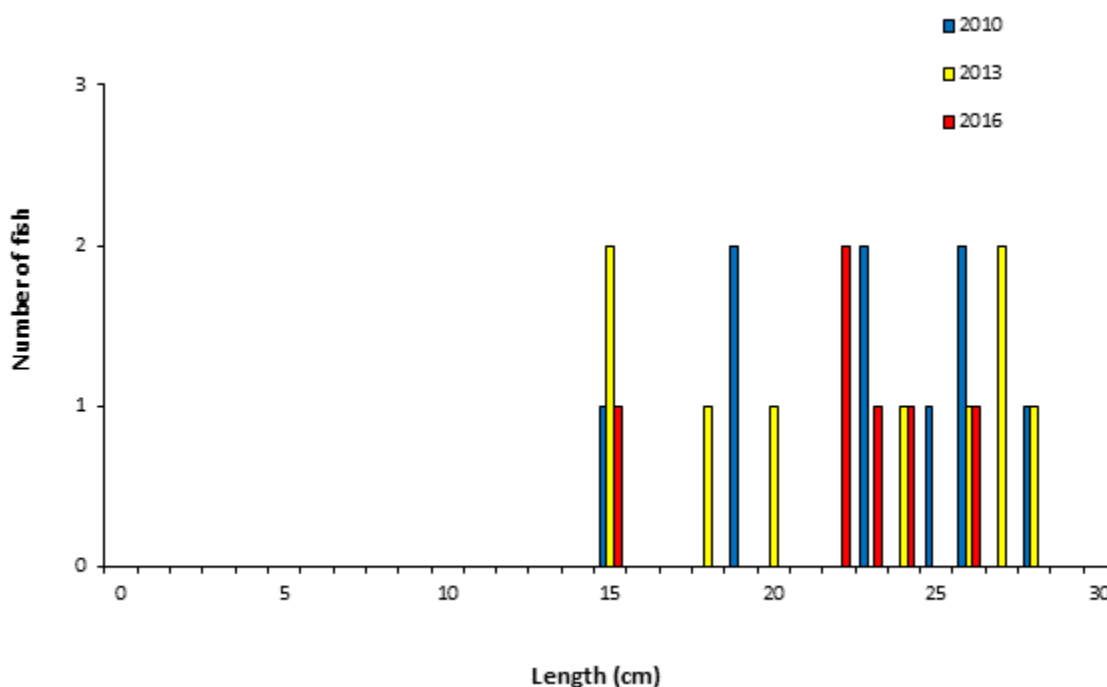
**Fig. 1.4. Length frequency of perch captured on Ardderry Lough, 2010, 2013 and 2016**

**Table 1.3. Mean ( $\pm$ S.E.) perch length (cm) at age for Ardderry Lough, September 2016**

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>
Mean ( $\pm$ S.E.)	6.8 (0.1)	13.4 (0.2)	16.3 (0.3)	19.0 (0.4)	20.7 (0.5)	20.7 (0.8)
N	36	34	31	17	12	12
Range	5.1-8.8	11.0-18.1	13.7-21.0	16.2-23.0	18.0-23.9	21.7-24.5

### **Brown trout**

Brown trout captured during the 2016 survey ranged in length from 15.8cm to 26.5cm (mean = 22.5cm) (Fig. 1.5). Two age classes were present (1+ and 2+), with a mean L1 of 6.5cm (Table 1.4). The dominant age class was 2+ (Fig. 1.5). Brown trout captured during the 2010 and 2013 surveys had similar length and age ranges, with some larger and older fish recorded in the 2010 and 2013 surveys (Fig.1.5).



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

**Table 1.4. Mean ( $\pm$ S.E.) brown trout length (cm) at age for Ardderry Lough, September 2016**

	L <sub>1</sub>	L <sub>2</sub>
Mean ( $\pm$ S.E.)	6.5 (0.8)	17.2 (0.6)
N	6	4
Range	4.8-10.1	16.1-18.8

### **Other fish species**

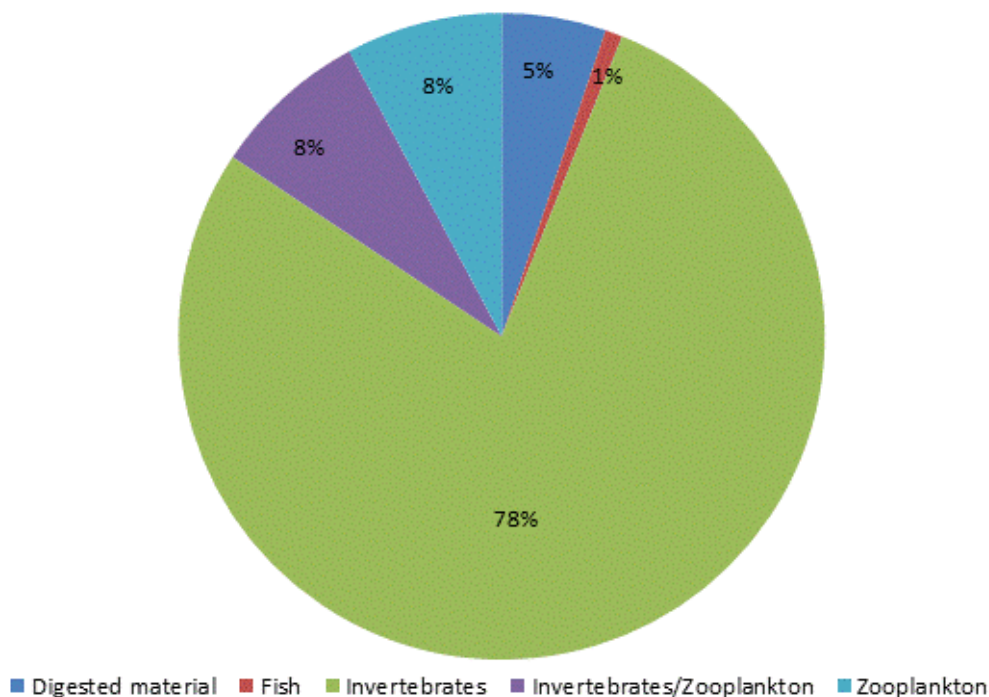
Eels captured during the 2016 survey ranged in length from 38.4cm to 50.8cm and one minnow was captured measuring 4.1cm.

#### 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

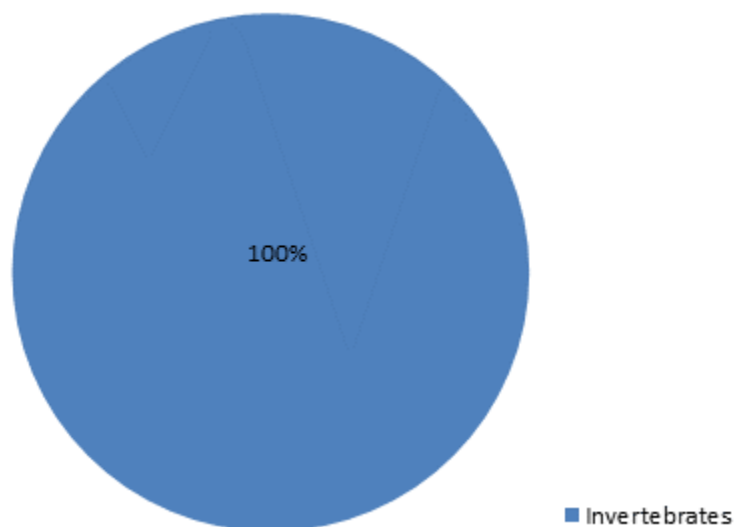
Perch initially start to feed on pelagic zooplankton. Once they reach an intermediate size they start feeding on benthic resources eventually moving on to feed on fish once they are large enough (Hjelm *et al.*, 2000). A total of 137 stomachs were examined. Of these 22 were found to contain no prey items. Of the remaining 115 stomachs containing food, 78% contained invertebrates, 8% zooplankton, 8% invertebrates/zooplankton, 5% unidentified digested material and 1% fish (Fig. 1.6).



**Fig 1.6. Diet of perch (n=115) captured on Ardderry Lough, September 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 6 stomachs were examined. Of these one was found to contain no prey items. Of the five remaining stomachs containing food, 100% contained invertebrates (Fig. 1.7).



**Fig 1.7. Diet of brown trout (n=5) captured on Ardderry Lough, 2016 (% occurrence)**

### **1.4 Summary and ecological status**

A total of four fish species were recorded on Ardderry Lough in the September 2016 survey. Perch was the dominant species in terms of abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2016 survey.

The mean perch CPUE increased slightly over the four sampling occasions; however, these differences were not statistically significant. There were also no significant differences in mean BPUE across the three sampling years. Seven age classes were present, ranging from 0+ to 6+, indicating reproductive success in each of the previous seven years. The dominant age class was 3+. During the survey the main dietary components were invertebrates (78%), zooplankton (8%), invertebrates/zooplankton (8%), unidentified digested material (5%) and fish (1%).





The mean brown trout CPUE and BPUE was lower in 2016 than in 2010 and 2013; however, these differences were also not statistically significant. Brown trout ranged in age from 1+ to 2+, with two age classes present. Invertebrates were the only food items present in the stomachs of trout captured during the survey.

No Arctic char were recorded during the 2016 or 2013 surveys; however, they were recorded in the 2007 and 2010 surveys which indicates that the population is either so small that it is difficult to capture using standard sampling methods or they have become extinct.

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). Using the FIL2 classification tool, Ardderry Lough has been assigned an ecological status of Good for 2016 based on the fish populations present and has been stable since 2007.

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



## 1.5 References

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