

# National Research Survey Programme

## Lakes 2016

### Lettercraffroe Lough

IFI/2017/1-4360



Iascach Intíre Éireann  
Inland Fisheries Ireland



Inland Fisheries Ireland

National Research Survey Programme

**Fish Stock Survey of Lettercraffroe Lough,  
September 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 Lettercraffroe Lough, September 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

© Inland Fisheries Ireland 2017



## 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 2016.

*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, 2016.*



## 1.1 Introduction

Lettercraffroe Lough is located 6km south-west of Oughterard, Co. Galway on a tributary of the Owenriff River which flows through the town and into Lough Corrib (Plate 1.1, Fig. 1.1). It has a surface area of 82ha, a mean depth of 2.86m and a maximum depth of 17.9m (WRFB, 2006). The lake is categorised as typology class 2 (as designated by the EPA for the purposes of the Water Framework Directive), i.e. shallow (<4m), greater than 50ha and low alkalinity (<20mg/l CaCO<sub>3</sub>). Lettercraffroe Lough is an excellent example of a lowland oligotrophic lake, an Annex 1 habitat. It holds a very large stock of brown trout, ranging in size from 0.23kg to 0.34kg (O' Reilly, 2007).

Lettercraffroe Lough is situated within the Connemara Bog Complex, a large Special Area of Conservation (SAC) site that encompasses a wide range of habitats, including extensive tracts of blanket bog, heath, woodland, lakes, rivers and streams. The Connemara Bog Complex is underlain by various Galway granites, with small areas along the northern boundary made up of schist and gneiss (NPWS, 2005).

The main perceived threats within the SAC are peat cutting, overgrazing and afforestation. Forestry affects habitat uniformity, lake and river catchments, nesting and feeding habitats for animals, and landscape integrity (NPWS, 2005). A tree felling plan was due to take place during 2010, along the streams and in areas surrounding the lake. However, due to issues regarding pearl mussels in the catchment, this plan has had to be revisited and a new forestry management plan was developed (Coillte, 2010). It is hoped that this plan will include the development of riparian zones. Conifers will be felled and they will not be replaced in areas along the streams or between the access road and the lake. It is hoped that these efforts will lead to the creation of an extensive buffer zone surrounding Lettercraffroe Lough.

The western and southern shores of the lake are heavily forested and there have previously been problems with phosphorus loading in the lake, which reached critical levels in the summer of 2004 (FIE, 2010). Water samples have since indicated that phosphorus levels are decreasing in the lake (Coillte, *pers. comm.*).

Lettercraffroe 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

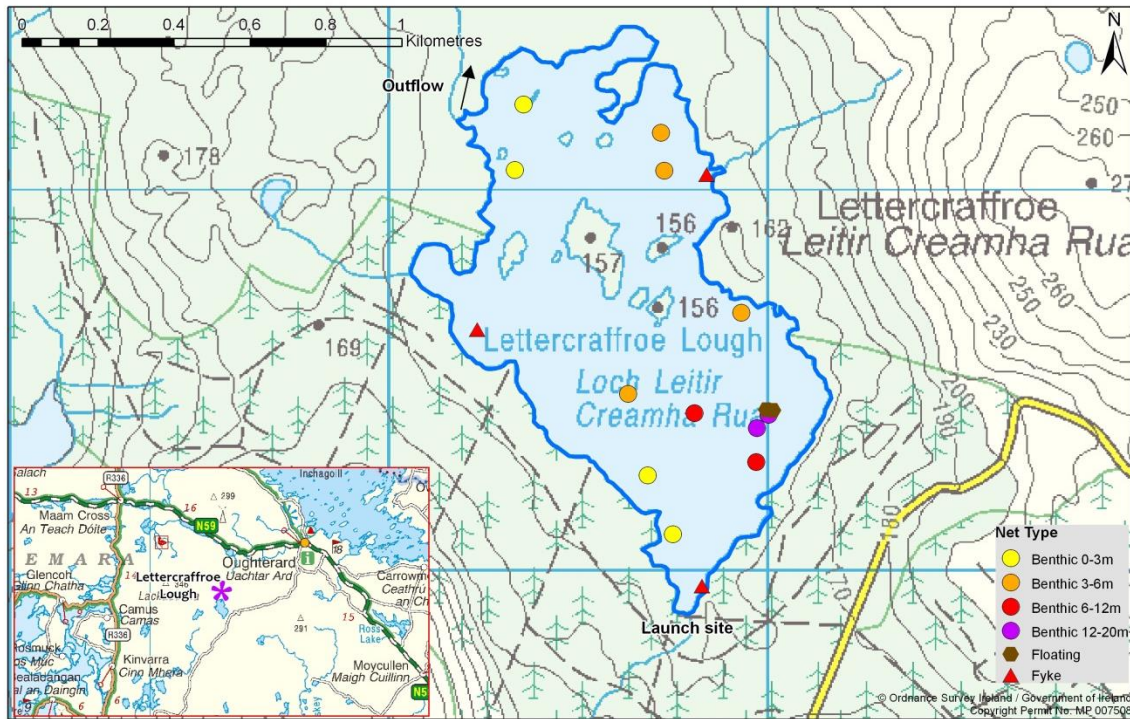


survey roach were found to be the dominant species present in the lake. Brown trout and three-spined stickleback were also recorded.



**Plate 1.1. Lettercraffroe Lough**





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



## 1.2 Methods

### 1.2.1 Netting methods

Lettercraffroe Lough was surveyed over one night from the 12<sup>th</sup> to the 13<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, 2 @ 6-11.9m and 2 @ 12-19.9m) and two floating monofilament multi-mesh (12 panel, 5-55mm mesh size) CEN standard survey gill nets (FM CEN) were deployed randomly 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 locate 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 roach and 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<sub>i</sub> is the percentage frequency of prey item i,  
N<sub>i</sub> 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 in Lettercraffroe Lough in September 2016, with 175 fish being captured. The number of each species captured by each gear type is shown in Table 1.1. Roach was the most common fish species recorded, followed closely by brown trout. Three-spined stickleback and eels were also recorded. During the previous surveys in 2007, 2010 and 2013 the same species composition was recorded with the exception of eels that were not recorded in 2013 (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 Lettercraffroe Lough, September 2016**

Scientific name	Common name	Number of fish captured			
		BM CEN	FM CEN	Fyke	Total
<i>Rutilus rutilus</i>	Roach	86	4	0	90
<i>Salmo trutta</i>	Brown trout	67	3	4	74
<i>Anguilla anguilla</i>	European eel	0	0	8	8
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0	0	3	3

### 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. Mean CPUE and BPUE for all species is illustrated in Figure 1.2 and 1.3.

#### Roach

Roach was the dominant species in terms of abundance (CPUE) and biomass (BPUE). Although the mean roach CPUE and BPUE decreased slightly since the last two sampling occasions, this difference was not statistically significant (Table 1.2; Fig 1.2 and 1.3).





## Brown trout

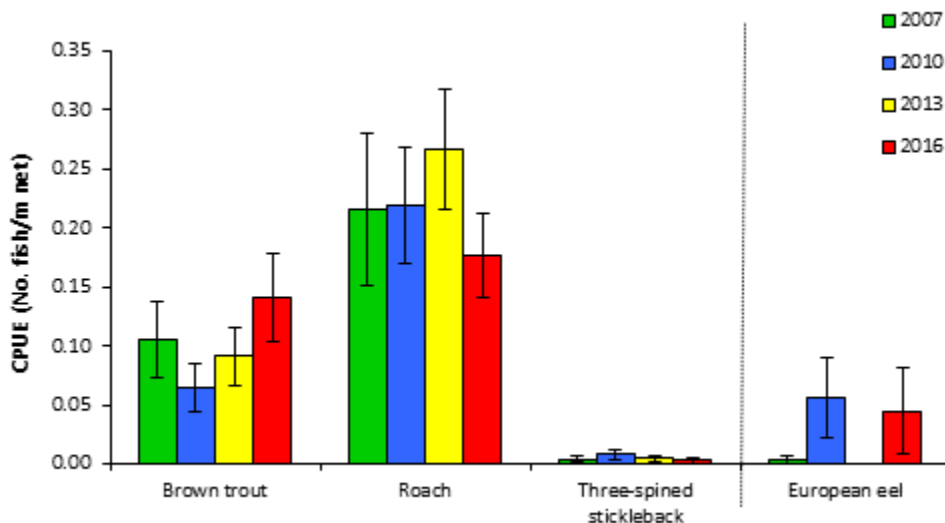
Mean brown trout CPUE and BPUE has been increasing since 2010; however these differences were not statistically significant (Table 1.2; Fig 1.2 and 1.3).

**Table 1.2. Mean (S.E.) CPUE and BPUE for all fish species captured on Lettercraffroe Lough, 2007, 2010, 2013 and 2016**

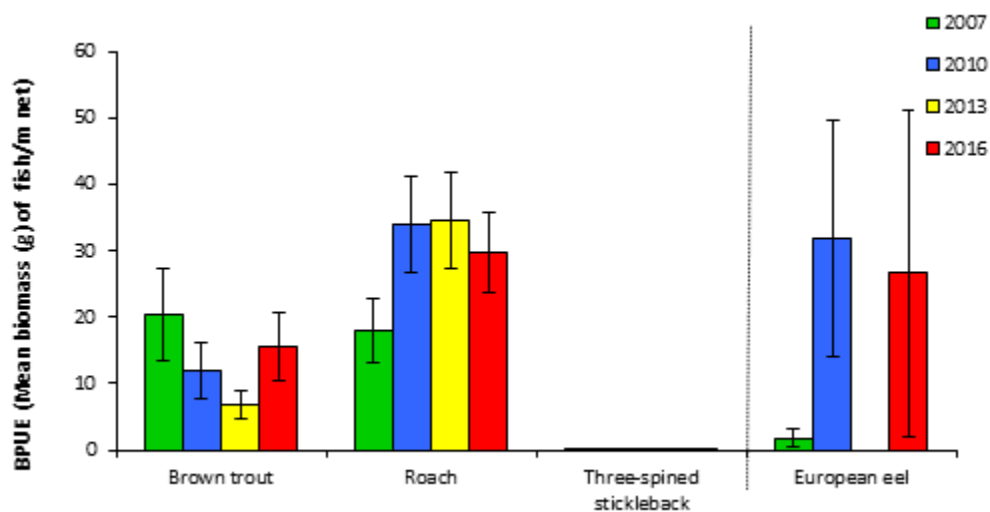
Scientific name	Common name	2007	2010	2013	2016
<b>Mean CPUE</b>					
<i>Rutilus rutilus</i>	Roach	0.215 (0.064)	0.220 (0.049)	0.267 (0.051)	0.176 (0.035)
<i>Salmo trutta</i>	Brown trout	0.104 (0.032)	0.065 (0.020)	0.091 (0.024)	0.141 (0.038)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.004 (0.002)	0.008 (0.005)	0.005 (0.003)	0.003 (0.003)
<i>Anguilla anguilla</i>	European eel	0.004 (0.003)	0.056 (0.034)	-	0.044 (0.036)
<b>Mean BPUE</b>					
<i>Rutilus rutilus</i>	Roach	18.100 (4.846)	33.925 (7.243)	34.687 (7.193)	29.766 (6.110)
<i>Salmo trutta</i>	Brown trout	20.383 (6.838)	11.833 (4.192)	6.888 (2.192)	15.633 (5.180)
<i>Gasterosteus aculeatus</i>	Three-spined stickleback	0.016 (0.010)	0.010 (0.006)	0.013 (0.007)	0.004 (0.004)
<i>Anguilla anguilla</i>	European eel	1.730 (1.356)	31.861 (17.870)	-	26.600 (24.659)

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 Lettercraffroe 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 Lettercraffroe Lough (Eel BPUE based on fyke nets only), 2007, 2010, 2013 and 2016**

### ***1.3.3 Length frequency distributions and growth***

#### **Roach**

Roach captured during the 2016 survey ranged in length from 8.1cm to 28.0cm (mean = 21.2cm) (Fig. 1.4). Ten age classes were present, ranging from 1+ to 10+, with a mean L1 of 3.3cm (Table 1.3). The dominant age class was 5+ (Fig. 1.4). Roach captured during the 2010 and 2013 surveys had similar length ranges, with the largest age range recorded in the 2016 survey (Fig.1.4).

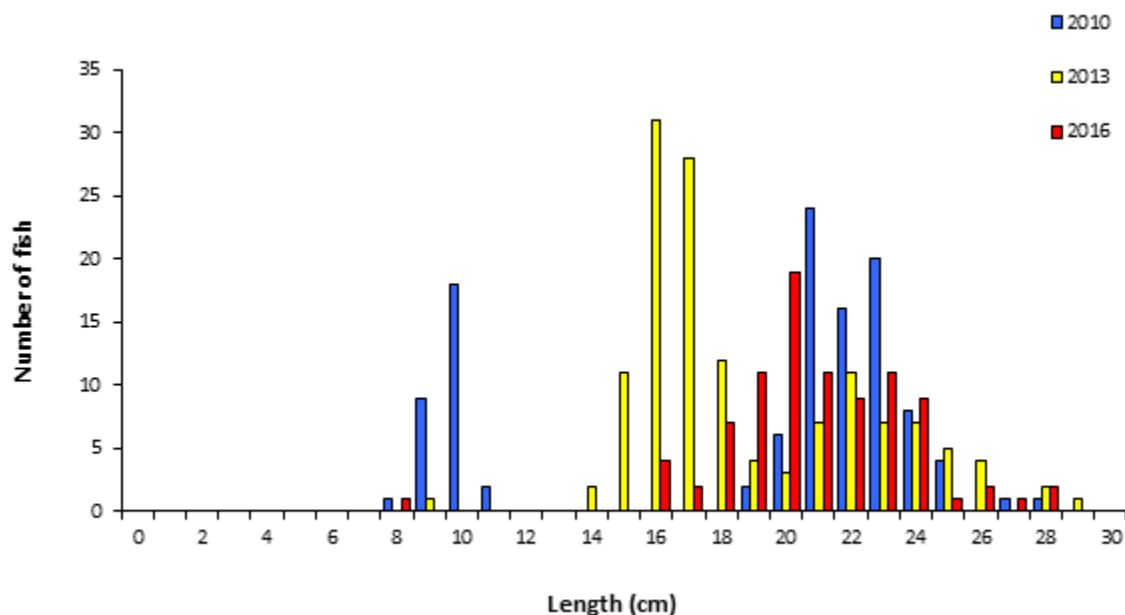


Fig. 1.4. Length frequency of roach captured on Lettercraffroe Lough, 2010, 2013 and 2016

Table 1.3. Mean ( $\pm$ S.E.) roach length (cm) at age for Lettercraffroe 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>	L <sub>7</sub>	L <sub>8</sub>	L <sub>9</sub>	L <sub>10</sub>
Mean	3.3	8.5	13.6	16.8	19.0	20.9	22.6	24.3	26.3	27.4
( $\pm$ S.E.)	(0.1)	(0.3)	(0.3)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)	(0.2)	(0.1)
N	33	32	32	27	26	21	16	10	4	3
Range	2.3-4.0	5.4-10.6	10.4-16.2	14.6-18.9	16.8-21.2	17.8-22.9	20.1-23.9	22.6-25.4	25.9-26.9	27.2-27.6

### **Brown trout**

Brown trout captured during the 2016 survey ranged in length from 7.2cm to 30.5cm (mean = 19.2cm) (Fig. 1.5). Five age classes were present, ranging from 0+ to 4+, with a mean L1 of 7.0cm (Table 1.4). The dominant age class was 3+ (Fig. 1.5). Mean brown trout L4 in 2016 was 27.2cm indicating a slow rate of growth for brown trout in this lake according to the classification scheme of Kennedy and Fitzmaurice (1971) (Table 1.4). Brown trout captured during the 2010 and 2013 surveys had similar length and age ranges (Fig.1.5).

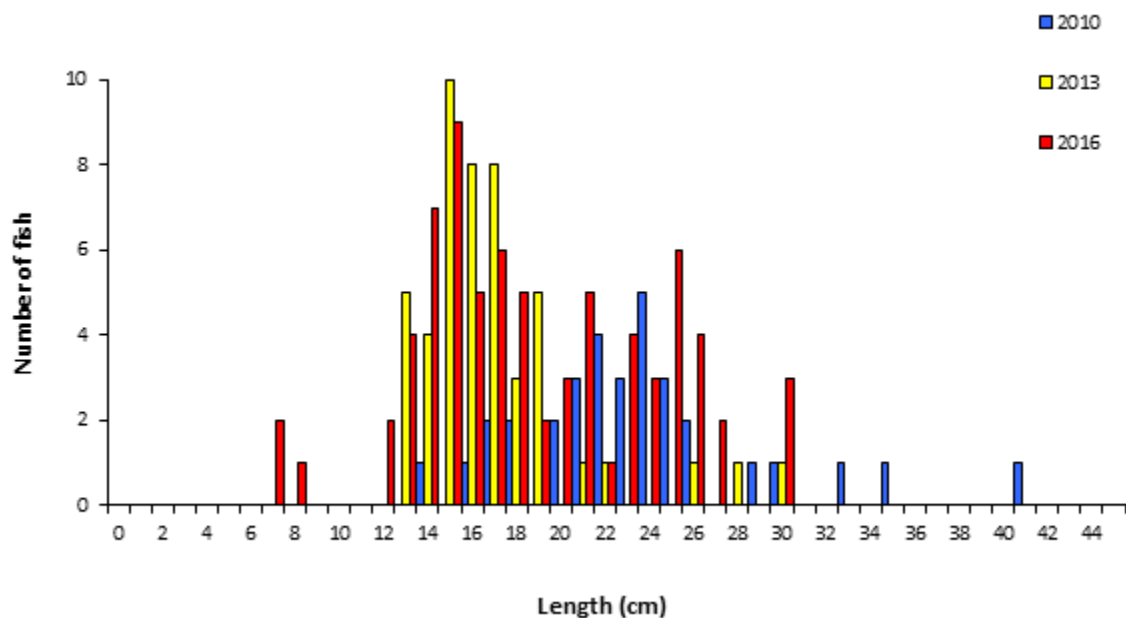


Fig. 1.5. Length frequency of brown trout captured on Lettercraffroe Lough, 2010, 2013 and 2016

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

	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	Growth Category
Mean ( $\pm$ S.E.)	7.0 (0.1)	15.1 (0.3)	21.5 (0.2)	27.2 (0.2)	Slow
N	44	25	13	3	
Range	5.4-8.2	10.1-16.7	20.8-22.7	26.9-27.5	

### Other fish species

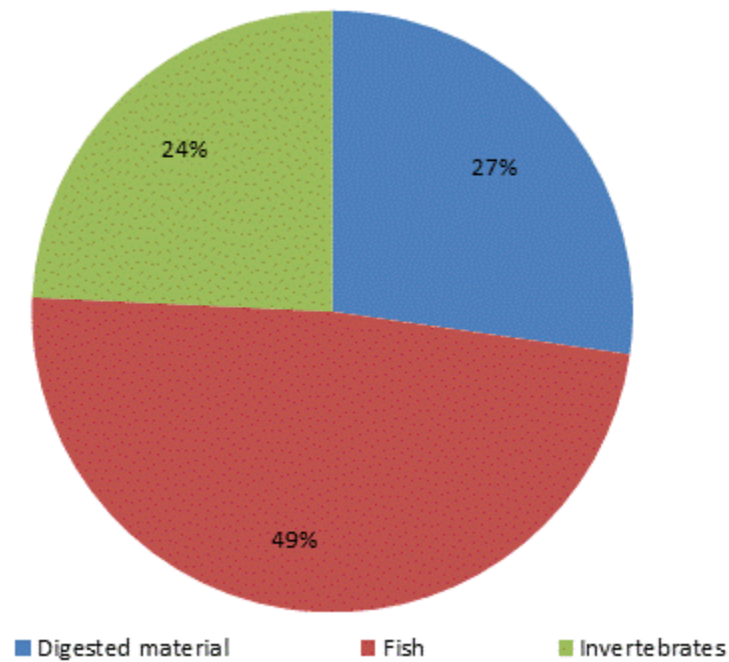
Eels captured during the 2016 survey ranged in length from 40.5cm to 77.1cm. Three-spined stickleback ranged in length from 2.3cm to 4.9cm.

### **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 brown trout captured during the survey were examined and are presented below.

### **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 43 stomachs were examined. Of these ten were found to contain no prey items. Of the remaining 33 stomachs containing food, 49% contained fish, 27% unidentified digested material and 24% invertebrates (Fig 1.6).



**Fig 1.6. Diet of brown trout (n=33) captured on Lettercraffroe Lough, 2016 (% occurrence)**





#### 1.4 Summary and ecological status

A total of four fish species were recorded in Lettercraffroe Lough in September 2016. Roach 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 roach CPUE and BPUE decreased slightly since the last two sampling occasions, these differences were not statistically significant. Ten age classes were present, ranging from 1+ to 10+, indicating reproductive success in ten of the previous eleven years. The dominant age class was 5+.

The mean brown trout CPUE and BPUE also increased slightly since the last two sampling occasions; however these differences were not statistically significant. Brown trout ranged in age from 0+ to 4+, indicating reproductive success in the previous five years. The dominant age class was 3+. Length at age analyses revealed that brown trout in the lake exhibit a slow rate of growth according to the classification scheme of Kennedy and Fitzmaurice (1971).

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, Lettercraffroe Lough has been assigned an ecological status of Good for 2016 based on the fish populations present. The lake was also assigned a fish status of Good in 2007, 2010 and 2013.

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



## 1.5 References

- Amundsen P-A, Gabler H-M, Staldvik FJ. (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.
- Coillte (2010) [http://www.coillte.ie/fileadmin/user\\_upload/FMPs/fmp\\_pdf/gy22\\_derrada.pdf](http://www.coillte.ie/fileadmin/user_upload/FMPs/fmp_pdf/gy22_derrada.pdf) [accessed on April 20th 2010].
- FIE (2010) Friends of the Irish Environment  
<http://www.friendsoftheirishenvironment.net/fnn/index.php?action=view&id=200> [accessed on April 20<sup>th</sup> 2010].
- Kelly, F. and Connor, L. (2007) *WFD Surveillance Monitoring - Fish in Lakes 2007*. Central Fisheries Board Report.
- 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, NSSHARE project.
- Kelly, F., Harrison A., Connor, L., Matson, R., Morrissey, E., Wogerbauer, C., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Sampling Fish for the Water Framework Directive – Summary Report 2010*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison A., Connor, L., Morrissey, E., Wogerbauer, C., Matson, R., Feeney, R., O'Callaghan, R. and Rocks, K. (2011) *Water Framework Directive Fish Stock Survey of Lettercraffroe Lough, September 2010*. Inland Fisheries Ireland.
- Kelly, F.L., Harrison, A.J., Allen, M., Connor, L. and Rosell, R. (2012) Development and application of an ecological classification tool for fish in lakes in Ireland. *Ecological Indicators*, **18**, 608-619.
- Kelly, F.L., Connor, L., Morrissey, E., Coyne, J., Matson, R., Feeney, R. and Rocks, K. (2014) *Water Framework Directive Fish Stock Survey of Lettercraffroe Lough, September 2013*. Inland Fisheries Ireland.
- Kennedy, M. and Fitzmaurice, P. (1971) Growth and food of brown trout *Salmo Trutta* (L.) in Irish waters. *Proceedings of the Royal Irish Academy*, **71(B) (18)**, 269-352.



King, J.J., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., Fitzpatrick, Ú., Gargan, P.G., Kelly, F.L., O' Grady, M.F., Poole, R., Roche, W.K. and Cassidy, D. (2011) *Ireland Red List No. 5: Amphibians, Reptiles and Freshwater Fish*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

NPWS (2005) *Site synopsis: Connemara Bog Complex. Site code: 2034* Site Synopsis report, National Parks and Wildlife Service.

O' Reilly P. (2007) *Loughs of Ireland. A Flyfisher's Guide*. 4<sup>th</sup> Edition. Merlin Unwin Books.

O' Grady, M.F. (1981) *A Study of Brown Trout (Salmo trutta L.) Populations in Selected Irish Lakes*. Ph.D. Thesis, National University of Ireland.

WRFB (2006) *Bathymetric survey of lakes in the Western Regional Fisheries Board Area. A Water Framework Directive Project, 2006*.

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

**[www.fisheriesireland.ie](http://www.fisheriesireland.ie)  
[info@fisheriesireland.ie](mailto:info@fisheriesireland.ie)**

**+353 1 8842 600**

