



# Sampling Fish for the Water Framework Directive

*Rivers 2013*

**Shannon International  
River Basin District**



Iascach Intíre Éireann  
Inland Fisheries Ireland

# Water Framework Directive Fish Stock Survey of Rivers in the Shannon International River Basin District, 2013

Fiona L. Kelly, Ronan Matson, Lynda Connor, Rory Feeney, Emma Morrissey, John Coyne and  
Kieran Rocks

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

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## PROJECT STAFF

Project Director/Senior Research Officer:	Dr. Fiona Kelly
Project Manager:	Ms. Lynda Connor
Research Officer:	Dr. Ronan Matson
Technician	Mr. Rory Feeney
Technician:	Ms. Emma Morrissey
Technician:	Mr. John Coyne
GIS Officer:	Mr. Kieran Rocks
Fisheries Assistant:	Mr. Johannes Bulfin (Jul 2013 – Dec 2013)
Fisheries Assistant:	Mr. John Finn (Jul 2013 – Dec 2013)
Fisheries Assistant:	Ms. Karen Kelly (Jul 2013 – Dec 2013)
Fisheries Assistant:	Ms. Roisín O’Callaghan (Jul 2013 – Dec 2013)
Fisheries Assistant:	Ms. Laura Walsh (Jul 2013 – Dec 2013)

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## TABLE OF CONTENTS

<b>1. INTRODUCTION.....</b>	<b>3</b>
<b>2. STUDY AREA.....</b>	<b>4</b>
<b>3. METHODS .....</b>	<b>7</b>
<b>4. RESULTS .....</b>	<b>8</b>
<b>4.1 River surveys.....</b>	<b>8</b>
<b>4.1.1 The Ballyfinboy River .....</b>	<b>8</b>
<b>4.1.2 The Boor River .....</b>	<b>13</b>
<b>4.1.3 The Bow River .....</b>	<b>16</b>
<b>4.1.4 The Broadford River .....</b>	<b>19</b>
<b>4.1.5 The River Fergus .....</b>	<b>24</b>
<b>4.1.6 The Glenafelly River .....</b>	<b>31</b>
<b>4.1.7 The Glendine River .....</b>	<b>34</b>
<b>4.1.8 The Gourná River.....</b>	<b>37</b>
<b>4.1.9 The Graney River .....</b>	<b>44</b>
<b>4.1.10 The Mountnugent River.....</b>	<b>47</b>
<b>4.1.11 The Moyree River .....</b>	<b>50</b>
<b>4.1.12 The Newport River.....</b>	<b>53</b>
<b>4.1.13 The Spancelhill River .....</b>	<b>56</b>
<b>4.1.14 The River Suck .....</b>	<b>59</b>
<b>4.2 Species distribution.....</b>	<b>66</b>
<b>4.3 Age and growth.....</b>	<b>67</b>
<b>4.4 Ecological status.....</b>	<b>70</b>
<b>6. REFERENCES.....</b>	<b>73</b>
<b>APPENDIX 1.....</b>	<b>74</b>
<b>APPENDIX 2.....</b>	<b>77</b>
<b>APPENDIX 3.....</b>	<b>79</b>
<b>APPENDIX 4.....</b>	<b>79</b>



## 1. INTRODUCTION

Fish stock surveys were undertaken in 75 river sites (56 waterbodies) throughout Ireland during the summer of 2012 as part of the programme of sampling fish for the Water Framework Directive (WFD). These surveys are required by both national and European law, with Annex V of the WFD stipulating that rivers are included within the monitoring programme and that the composition, abundance and age structure of fish fauna are examined (Council of the European Communities, 2000). Nineteen river sites were surveyed within in 16 waterbodies in the Shannon International River Basin District (ShIRBD) from July to September 2013 by staff from Inland Fisheries Ireland (Table 2.1, 2.2 and Fig. 2.1).

Although fish survey work been carried out in Ireland in the past, no project to date has been as extensive as the current on-going monitoring programme in providing data appropriate for WFD compliance. Continued surveying of these and additional river sites will provide a useful baseline and time-series dataset for future monitoring of ecological and water quality. This in turn will provide information for River Basin District (RBD) managers to compile and implement programmes of measures to improve degraded water bodies. As 2013 is the sixth year of the rivers sampling programme, many of the sites surveyed this year are repeat surveys of those carried out in previous years. As a result, surveys this year can be compared with those from before, to determine whether the status of our rivers is improving or deteriorating.

This report summarises the results of the 2013 fish stock survey carried out on each site in the ShIRBD, as part of the Water Framework Directive surveillance monitoring programme.

## 2. STUDY AREA

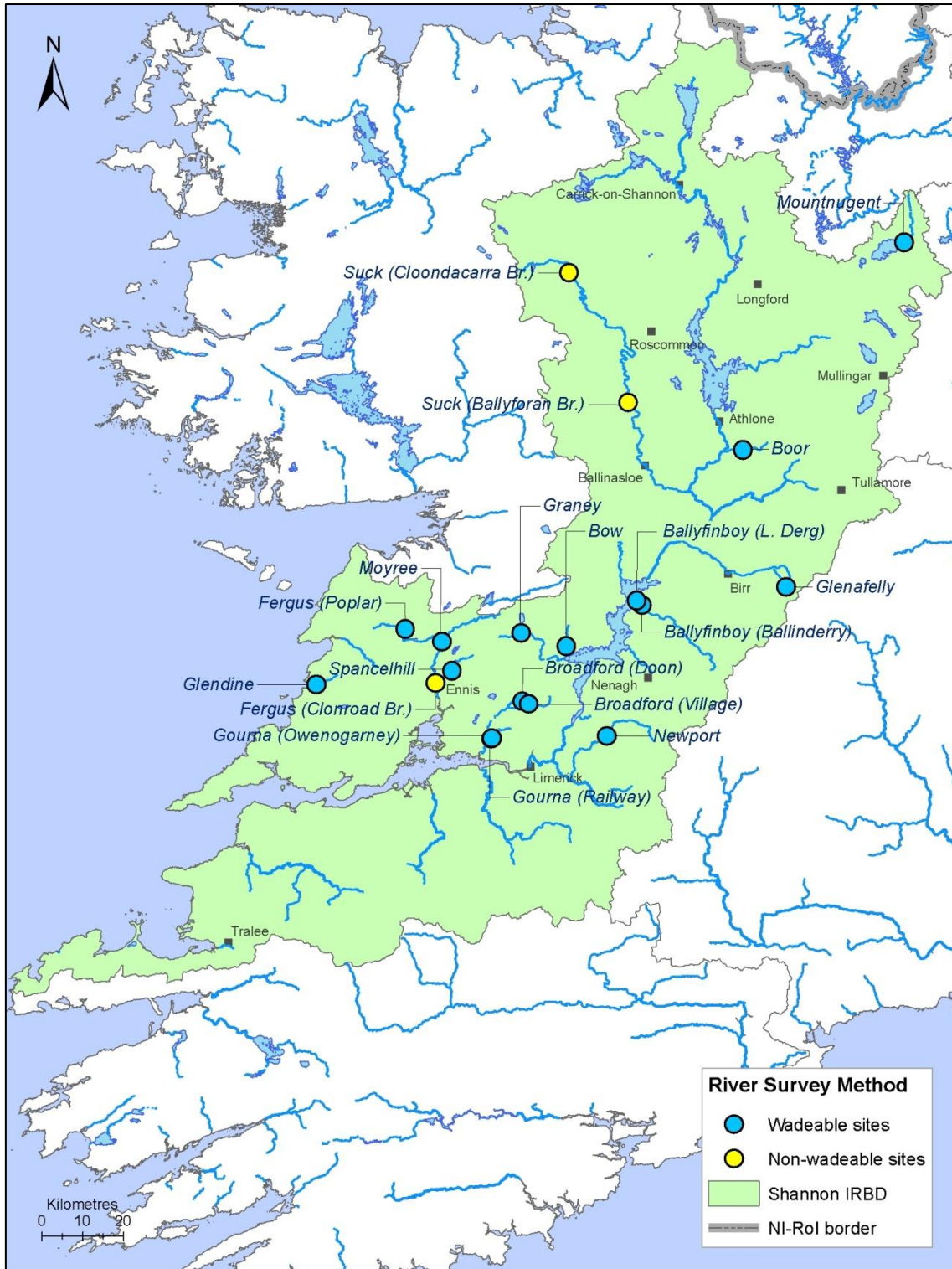
Nineteen river sites were surveyed in seven river catchments within the ShIRBD during 2013: the Annagh, Bunratty, Fergus, Inny, Lower Shannon, Upper Shannon and Suck catchments (Table 2.1). The sites ranged in surface area from 115m<sup>2</sup> at the Spancelhill River to 9,651m<sup>2</sup> at the River Suck (Ballyforan Br.). The sites were divided into two categories for reporting purposes: wadeable sites, which were surveyed with bank-based electric fishing units, and non-wadeable sites, which were surveyed with boat-based electric fishing units. Summary details for each site's location and physical characteristics are given in Tables 2.1 and 2.2, and the distribution of sites throughout the ShIRBD is shown in Figure 2.1.

**Table 2.1. Location and codes of river sites surveyed for WFD surveillance monitoring, ShIRBD 2013**

River	Site name	Catchment	Site Code	Waterbody code
<b>ShIRBD Wadeable sites</b>				
Ballyfinboy River	Ballinderry Br._A	Shannon Lwr	25B020750A	SH_25_1853
Ballyfinboy River	Lough Derg_A	Shannon Lwr	25B020800A	SH_25_1853
Boor River	Kilbillaghan_B	Shannon Upr	26B071100B	SH_26_3921
Bow River	Bow Br._A	Shannon Lwr	25B100100A	SH_25_2145
Broadford River	Doon Lough_A	Bunratty	27B020800A	SH_27_287
Broadford River	Broadford Village_A	Bunratty	27B020700A	SH_27_287
Glenafelly River	Glenafelly Br._A	Shannon Lwr	25G210010A	SH_25_2084
Glendine River (Clare)	Knockloskeraun Br. _A	Annagh	28G020200A	SH_28_231
Gourna River	Railway Br._A	Bunratty	27G020600A	SH_27_885
Gourna River	Owenogarney confl._C	Bunratty	27G020550C	SH_27_885
Graney River	Caher Br._A	Shannon Lwr	25G040025A	SH_25_2081
Mountnugent River	Mountnugent Br._A	Inny	26M020500A	SH_26_2742
Moyree River	Fergus Br._A	Fergus	27M020700A	SH_27_1178
Newport River	Rossaguile Br._A	Shannon Lwr	25N020150A	SH_25_320
Spancelhill River	Spancelhill_A	Fergus	27S030200A	SH_27_1118
<b>ShIRBD Non-Wadeable sites</b>				
Fergus, River	Clonroad Br._A	Fergus	27F010700A	SH_27_1245
Fergus, River	Poplar Br._B	Fergus	27F010100B	SH_27_181
Suck, River	Ballyforan Br._A	Suck	26S071100A	SH_26_1447_4
Suck, River	Cloondacarra Br._A	Suck	26S070300A	SH_26_1447_1

**Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, ShIRBD 2013**

Site name	Upstream catchment (km <sup>2</sup> )	Wetted width (m)	Surface area (m <sup>2</sup> )	Mean depth (m)	Max depth (m)
<b>ShIRBD Wadeable sites</b>					
Ballyfinboy (Ballinderry Br._A)	184.86	6.28	251	0.25	0.48
Ballyfinboy (Lough Derg_A)	187.24	4.63	209	0.34	0.71
Boor (Kilbillaghan_B)	53.65	4.20	214	0.25	0.69
Bow (Bow Br._A)	10.75	4.48	202	0.13	0.25
Broadford (Doon Lough_A)	34.64	4.93	138	0.32	0.64
Broadford (Broadford Village_A)	30.58	5.40	216	0.18	0.84
Glenafelly (Glenafelly Br._A)	4.76	3.27	147	0.12	0.34
Glendine (Knockloskeraun Br._A)	12.31	3.40	153	0.37	0.60
Gourna (Railway Br._A)	15.25	5.30	233	0.20	0.37
Gourna (Owenogarney confl._C)	15.01	4.05	182	0.17	0.37
Graney (Caher Br._A)	13.73	5.06	228	0.15	0.32
Mountnugent (Mountnugent Br._A)	91.11	6.77	298	0.27	0.55
Moyree (Fergus Br. _A)	62.56	7.72	347	0.19	0.33
Newport (Rossaguile Br._A)	65.82	9.50	380	0.31	0.67
Spancelhill (Spancelhill_A)	6.47	3.48	115	0.08	0.34
<b>ShIRBD Non-Wadeable sites</b>					
Fergus, (Clonroad Br._A)	60.14	19.67	5487	1.06	3.00
Fergus, (Poplar Br._B)	138.70	7.95	318	0.35	0.56
Suck, (Ballyforan Br._A)	1006.50	29.33	9651	0.65	1.40
Suck, (Cloondacarra Br._A)	153.55	9.58	2195	0.68	1.40



**Fig. 2.1. Location map of river sites surveyed throughout the ShIRBD for WFD fish surveillance monitoring 2013**

### 3. METHODS

Electric-fishing is the method of choice for the surveillance monitoring of fish in rivers and to obtain a representative sample of the fish assemblage for each survey site. This technique complies with European Committee for Standardisation (CEN) guidelines for fish stock assessment in wadeable rivers (CEN, 2003). At each site, the sample stretch was isolated where possible using stop nets, with one to three fishings carried out using bank-based or boat-based electric fishing units. Each site ideally contained all habitat types, including riffle, glide and pool. A suite of physical and chemical parameters were also recorded.

Fish from each pass were sorted and processed separately. During processing, the species of each fish was identified, with its length and weight measured. Sub-samples were sometimes taken when large numbers of fish were present. For the purpose of species identification, juvenile river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*) and sea lamprey (*Petromyzon marinus*) were recorded as 'Lamprey sp.'. Sea trout and brown trout were listed separately. For ageing analyses, scales were taken from fish greater than 8.0cm for salmonids and most non-native fish species. After processing, fish were held in large bins of oxygenated water until they were fully recovered, before returning them to the water.

For various reasons, including river width and flow rate, stop nets could not be deployed at every site, thus making three fishing passes impractical. Therefore, in order to draw comparisons between sites, fish densities were calculated using data from the first fishing pass only. The number captured in the first pass was divided by the total area surveyed to give a density for each species.

A subsample of the dominant fish species was aged (five fish from each 1cm size class). Fish scales were aged using a microfiche reader. Growth was determined by back-calculating lengths at the end of each winter (e.g. L1 is the mean length at the end of the first winter and L2 is the mean length at the end of the second winter, etc.).



## 4. RESULTS

### 4.1 River surveys

#### 4.1.1 The Ballyfinboy River

Two sites were electric fished on the Ballyfinboy River as part of the WFD surveillance monitoring programme in rivers 2013; Ballyfinboy River, Lough Derg and the Ballyfinboy River, Ballinderry.

The Lough Derg survey site was located less than 1km upstream of Lough Derg, downstream of a small bridge near a forest park, approximately 8.5km northwest of Borrisokane, Co. Tipperary (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 18<sup>th</sup> of September 2013, along a 45m length of channel. Glide dominated the habitat, while the substrate was mixed with cobble the dominant type present. Vegetation at this site consisted of a small number of shade tolerant mosses and liverworts.

The Ballinderry survey site was located a further 2 km upstream from the first site (Fig. 4.1; Plate 4.2). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 18<sup>th</sup> of September 2013, along a 40m length of channel. Glide dominated the habitat, while the substrate was diverse, with cobble the dominant type present. Vegetation at this site consisted of a number of mosses and liverworts and semi-aquatic riparian species.

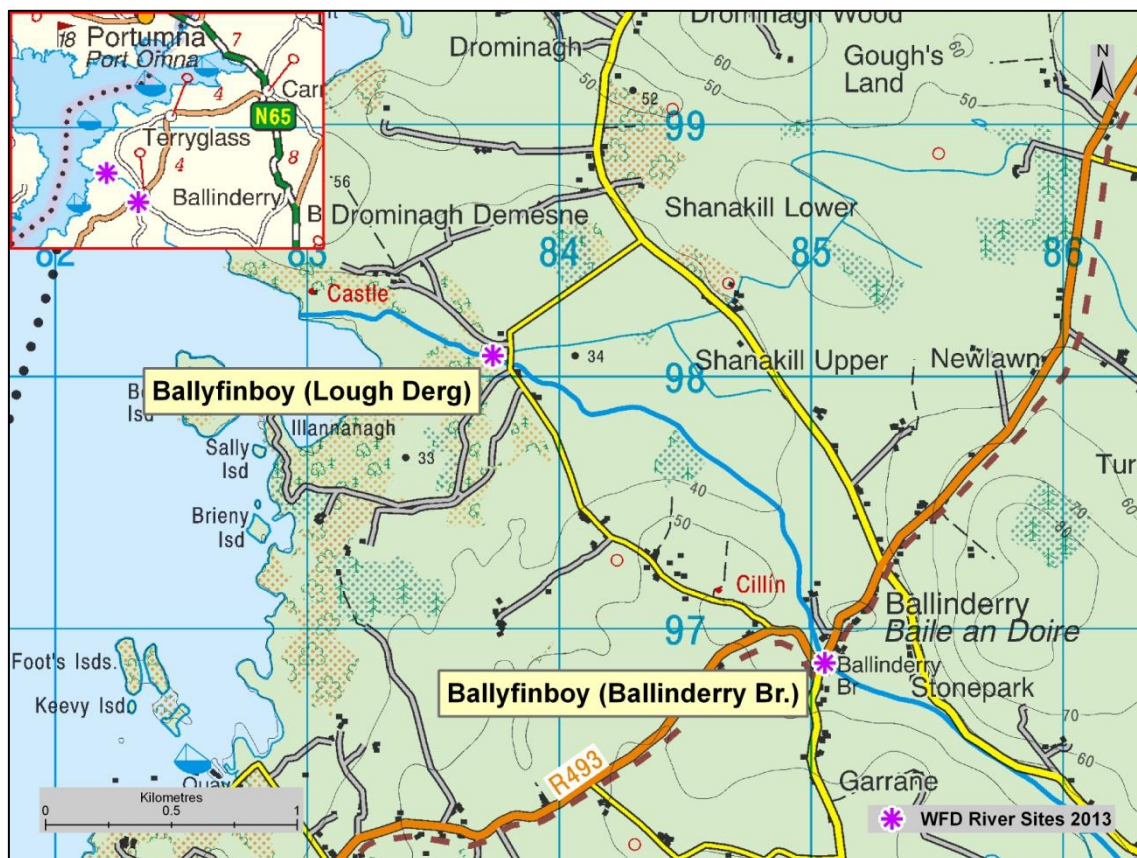
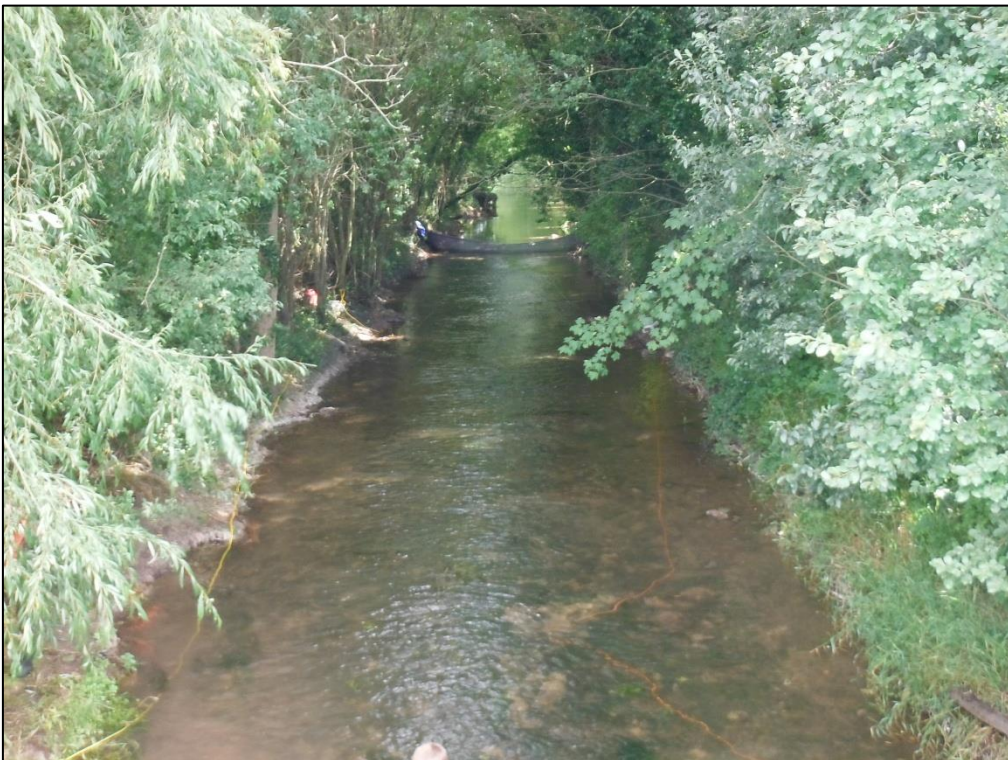


Fig. 4.1. Location of the two Ballyfinboy River surveillance monitoring sites





**Plate 4.1. The Ballyfinboy River near Lough Derg, Co. Tipperary**



**Plate 4.2. The Ballyfinboy River, Ballinderry Br., Co. Tipperary**

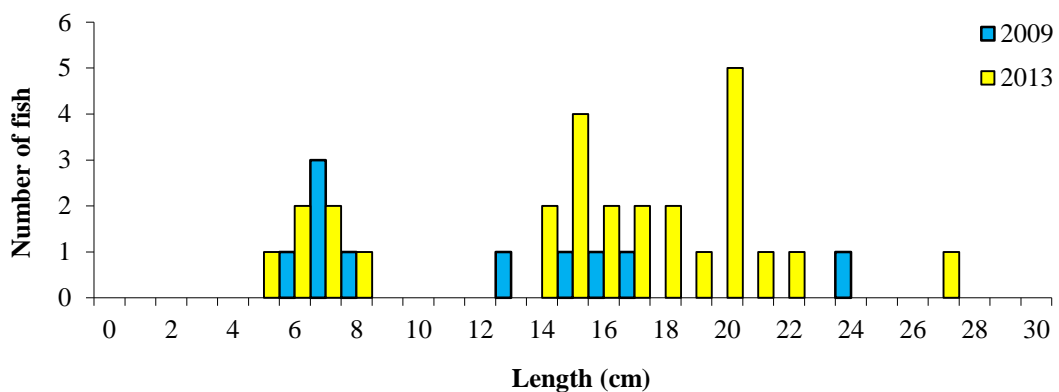
### Ballyfinboy River (Lough Derg)

Four fish species were recorded in the Ballyfinboy River (Lough Derg) site during the 2013 survey (Table 4.2). Brown trout was the most abundant species recorded, followed by salmon, European eel and stone loach.

**Table 4.1. Density of fish (no./m<sup>2</sup>), Ballyfinboy River (Lough Derg) site (fish density has been calculated as minimum estimates based on one fishing)**

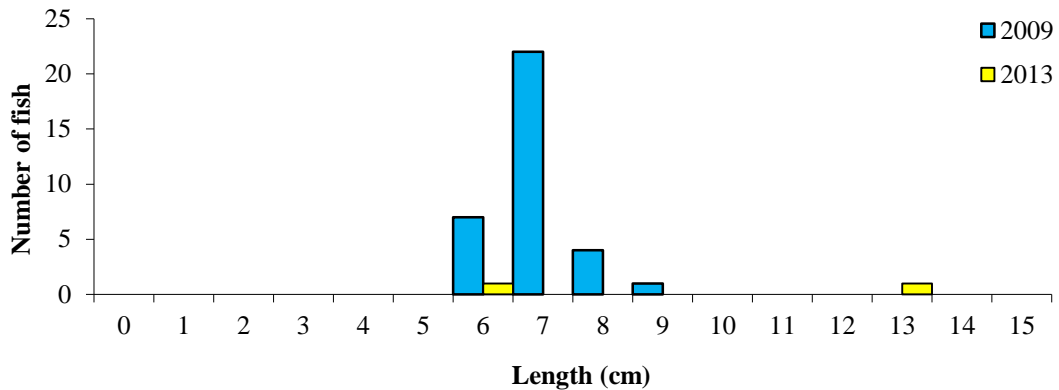
Species	Total minimum density	
	2009	2013
Brown trout	0.027	0.101
0+ Brown trout	0.013	0.019
1++ Brown trout	0.013	0.082
Salmon	0.093	0.010
European eel	0.004	0.010
0+ Salmon	0.093	0.005
1++ Salmon	0.000	0.005
Stone loach	0.027	0.005
All Fish	0.151	0.125

Brown trout captured during the 2013 survey ranged in length from 5.0cm to 27.5cm (mean = 16.0cm) (Fig. 4.2). Five age classes (0+, 1+, 2+ 3+ and 4+) were present, accounting for 22%, 48%, 19%, 7% and 4% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 6.4cm to 24.0cm (mean = 12.4cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 50%, 30% and 20% of the brown trout catch respectively.



**Fig. 4.2. Length frequency distribution of brown trout in the Ballyfinboy River (Lough Derg), August 2009 (n = 10) and September 2013 (n = 27)**

Only two individual salmon were captured during the 2013 survey and these measured 6.9cm and 13.5cm (Fig. 4.3). Two age classes (0+ and 1+) were present, each accounting for 50% of the total salmon catch. Salmon captured during the 2009 survey ranged in length from 6.1cm to 9.0cm (mean = 7.3cm). Only one age class (0+) was present.



**Fig. 4.3. Length frequency distribution of salmon in the Ballyfinboy River (Lough Derg), August 2009 (n = 34) and September 2013 (n = 2)**

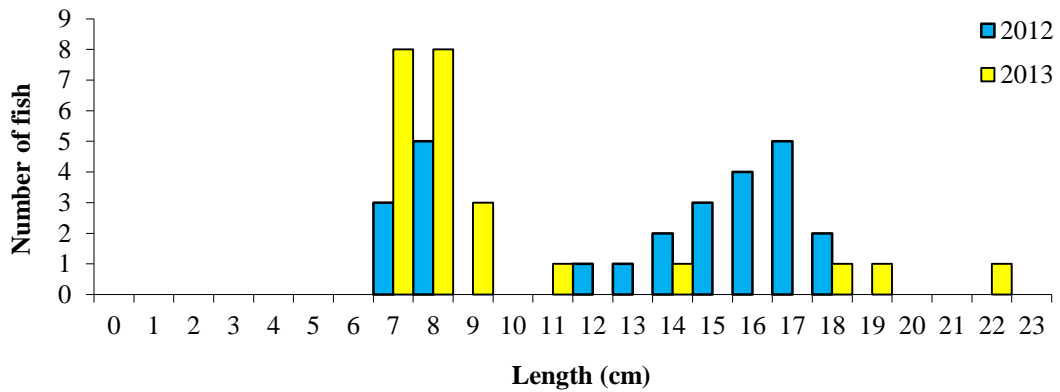
#### **Ballyfinboy River (Ballinderry Br.)**

Four fish species were recorded in the Ballyfinboy River (Ballinderry Br.) site during the 2013 survey (Table 4.2). Brown trout was the most abundant species recorded, followed by lamprey, stone loach and three-spined stickleback.

**Table 4.2. Density of fish (no./m<sup>2</sup>), Ballyfinboy River (Ballinderry Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2012	2013
Brown trout	0.083	0.056
0+ Brown trout	0.024	0.044
1++ Brown trout	0.059	0.012
Lamprey sp.	-	0.004
Stone loach	-	0.004
Three-spined stickleback	-	0.004
Salmon	0.008	-
0+ Salmon	0.000	-
1++ Salmon	0.008	-
All Fish	0.091	0.068

Brown trout captured during the 2013 survey ranged in length from 7.0cm to 22.6cm (mean = 10.0cm) (Fig. 4.4). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 83%, 8%, 4% and 4% of the total brown trout catch respectively. Brown trout captured during the 2012 survey ranged in length from 7.3cm to 18.4cm (mean = 13.7cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 31%, 54% and 55% of the brown trout catch respectively.

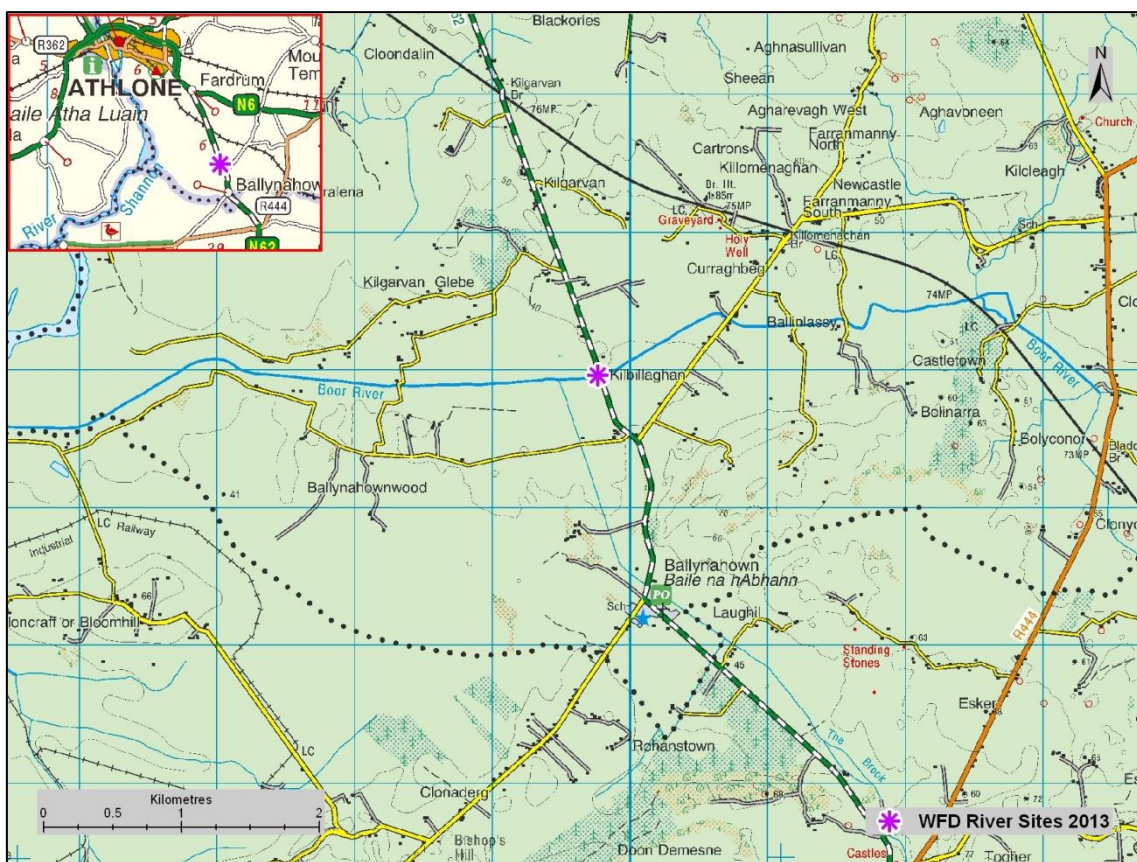


**Fig. 4.4. Length frequency distribution of brown trout in the Ballyfinboy River (Ballinderry Br.), September 2009 (n = 26) and September 2013 (n = 24)**



#### 4.1.2 The Boor River

One site was electric fished on the Boor River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located just upstream of Kilbillaghan Br., 6km south of Athlone, Co. Westmeath and approximately 5km upstream of the River Shannon confluence (Fig. 4.5; Plate 4.3). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 27<sup>th</sup> of August 2013, along a 51m length of channel. Glide was the most abundant habitat type present, with cobble the most abundant substrate. Vegetation at this site was scarce. Heavy shading at one end of the stretch and deep water with steep banks on the other, restricted the plants to a small number of bryophytes and riparian species.



**Fig. 4.5. Location of the Boor (Kilbillaghan Br.) River surveillance monitoring site**



**Plate 4.3. The Boor River at Kilbillighan Br., Co. Westmeath**

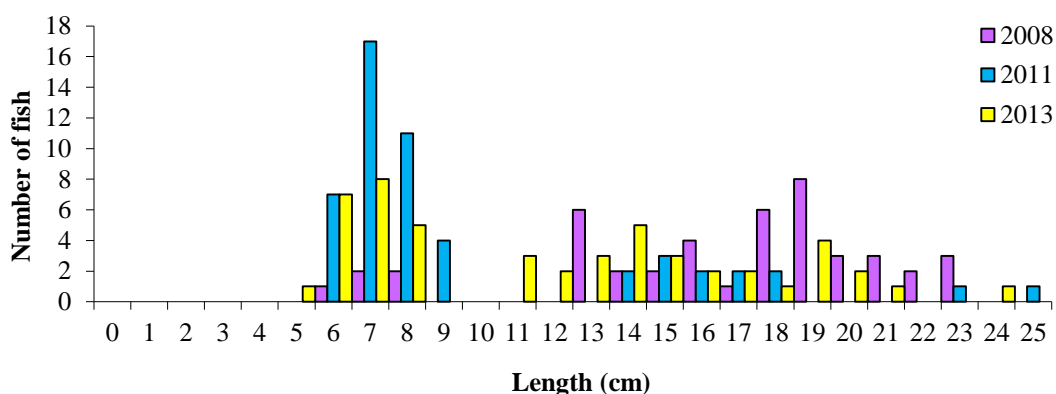
Seven fish species were recorded in the Boor River during the 2013 survey (Table 4.2). Brown trout was the most abundant species recorded, followed by stone loach, minnow, lamprey, European eel, three-spined stickleback and perch.

**Table 4.3. Density of fish (no./m<sup>2</sup>), Boor River (Kilbillighan Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density		
	2008	2011	2013
Brown trout	0.137	0.155	0.191
0+ Brown trout	0.011	0.122	0.065
1++ Brown trout	0.126	0.033	0.126
Stone loach	-	0.028	0.042
Minnow	0.022	-	0.023
Lamprey sp.	0.005	-	0.023
European eel	0.005	0.005	0.014
Three-spined stickleback	0.005	0.023	0.005
Perch	-	-	0.005
Salmon	-	0.005	-
0+ Salmon	-	0.000	-
1++ Salmon	-	0.005	-
Gudgeon	0.055	-	-
Roach	0.005	-	-
All Fish	0.236	0.216	0.303



Brown trout captured during the 2013 survey ranged in length from 5.5cm to 24.7cm (mean = 12.4cm) (Fig. 4.6). Four age classes (0+, 1+, 2+ and 4+) were present, accounting for 42%, 36%, 20% and 2% of the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 6.2cm to 25.4cm (mean = 10.2cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 75%, 21% and 4% of the brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 6.9cm to 23.4cm (mean = 17.1cm). Four age classes were present (0+, 1+, 2+ and 3+), accounting for approximately 11%, 31%, 56% and 2% of the brown trout catch respectively.



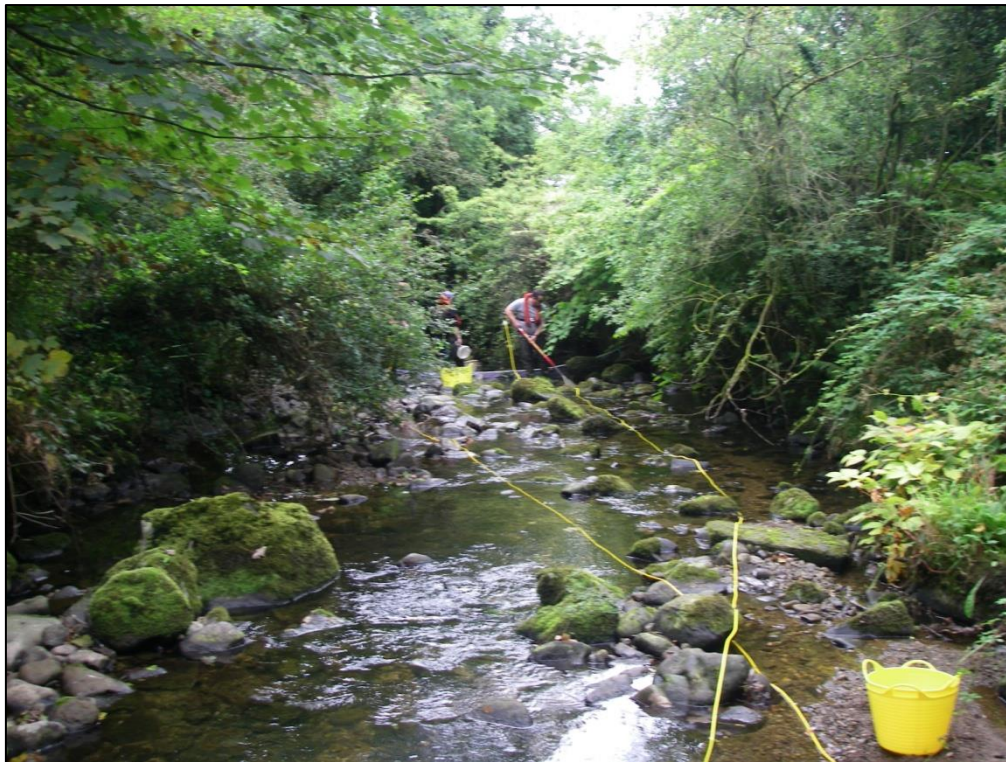
**Fig. 4.6. Length frequency distribution of brown trout in the Boor (Kilbillighan Br.), September 2008 (n = 45), August 2011 (n = 52) and September 2013 (n = 50)**

### 4.1.3 The Bow River

One site was electric fished on the Bow River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located approximately 2.5km upstream of Lough Derg, only 3.5km northeast of Scarriff, Co. Clare (Fig. 4.7; Plate 4.4). Three electric-fishing passes were conducted using one bank-based electric fishing unit on the 3<sup>rd</sup> of September 2013, along a 45m length of channel. Riffle dominated the habitat, while the substrate was a good mix, mainly composed of cobble and gravel. The vegetation at this site was dominated by bryophytes, with a diverse number of aquatic and semi-aquatic mosses and liverworts present.



**Fig. 4.7. Location of the Bow River (Bow Br.) surveillance monitoring site**



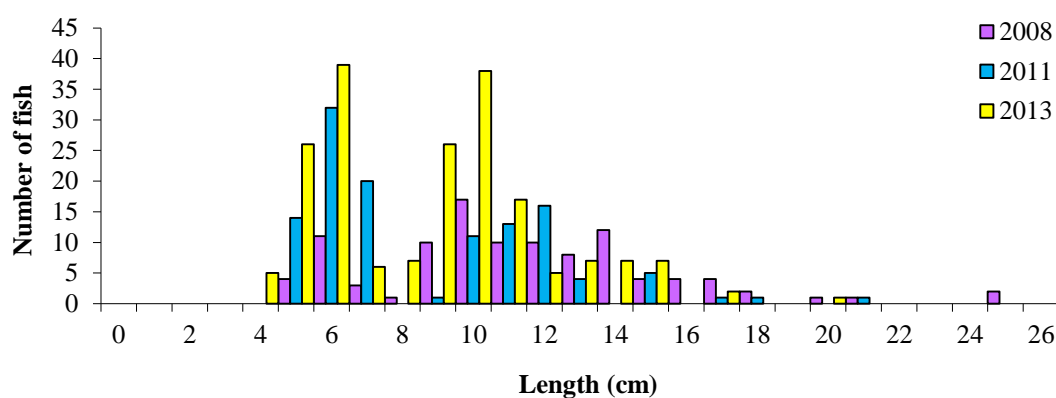
**Plate 4.4. The Bow River (Bow Br.) near Scarrif, Co. Clare**

Two fish species were recorded in the Bow River during the 2013 survey (Table 4.2). Brown trout was the most abundant species recorded, followed by stone loach. No salmon have been recorded at this site during WFD surveillance monitoring since 2008.

**Table 4.4. Density of fish (no./m<sup>2</sup>), Bow River (Bow Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density		
	2008	2011	2013
Brown trout	0.265	0.325	0.530
0+ Brown trout	0.038	0.175	0.193
1++ Brown trout	0.227	0.150	0.337
Stone loach	0.021	0.038	0.015
Salmon	0.035	-	-
0+ Salmon	0.000	-	-
1++ Salmon	0.035	-	-
European eel	0.010	0.013	-
All Fish	0.332	0.375	0.545

Brown trout captured during the 2013 survey ranged in length from 4.5cm to 20.0cm (mean = 9.2cm) (Fig. 4.8). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 39%, 47%, 13% and 1% of the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 5.3cm to 21.9cm (mean = 9.2cm). Four age classes were present (0+, 1+, 2+ and 4+), accounting for approximately 55%, 38%, 6% and 1% of the brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 5.2cm to 25.0cm (mean = 11.9cm). Five age classes were present (0+, 1+, 2+, 3+ and 4+), accounting for approximately 17%, 48%, 29%, 4% and 2% of the brown trout catch respectively.



**Fig. 4.8. Length frequency distribution of brown trout in the Bow (Bow Br.), August 2008 (n = 104), August 2011 (n = 119) and September 2013 (n = 193)**



#### 4.1.4 The Broadford River

Two sites were electric fished on the Broadford River as part of the WFD surveillance monitoring programme in rivers 2013; the Broadford River, Doon Lough and the Broadford River, Broadford Village.

The Doon Lough survey site was located just upstream of Killaderry Br., 600m upstream of Doon Lough, Broadford, Co. Clare (Fig. 4.9; Plate 4.5). One electric-fishing pass was conducted using two bank-based electric fishing units on the 10<sup>th</sup> of July 2013, along a 28m length of channel. Glide dominated the habitat, while the substrate consisted largely of mud, silt and sand. The vegetation at this site consisted of a diverse number of emergent bank-side species.

The Broadford Village survey site was located just upstream of the bridge in Broadford Village, Co. Clare, approximately 1.5km upstream of the Doon Lough site (Fig. 4.9; Plate 4.6). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 10<sup>th</sup> of July 2013, along a 40m length of channel. Glide also dominated the habitat at this site, while the substrate consisted largely of cobble. The vegetation at this site consisted mainly of a small number of mosses, liverworts, and floating species.



**Fig. 4.9. Location of the Broadford River surveillance monitoring sites**





**Plate 4.5. The Broadford River near Doon Lough, Co. Clare**



**Plate 4.6. The Broadford River, Broadford Village, Co. Clare**



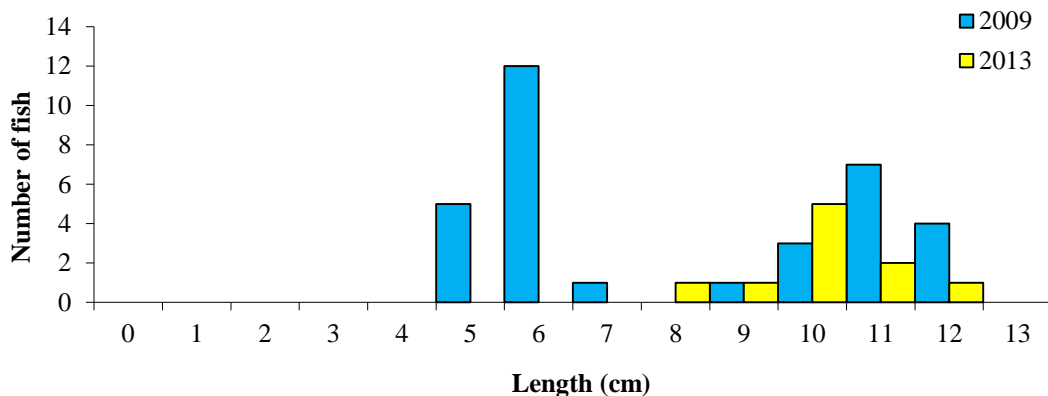
### Broadford River (Lough Doon)

Six fish species were recorded in the Broadford River (Doon Lough) site during the 2013 survey (Table 4.5). Gudgeon was the most abundant species recorded, followed by salmon, perch, brown trout, three-spined stickleback and minnow.

**Table 4.5. Density of fish (no./m<sup>2</sup>), Broadford River (Doon Lough) site (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2009	2013
Gudgeon	0.148	0.109
Salmon	0.109	0.043
0+ Salmon	0.049	0.000
1++ Salmon	0.059	0.043
Perch	-	0.036
Brown trout	0.010	0.022
0+ Brown trout	0.010	0.000
1++ Brown trout	0.000	0.022
Three-spined stickleback	0.010	0.007
Minnow	-	0.007
European eel	0.025	-
All Fish	0.301	0.224

Salmon captured during the 2013 survey ranged in length from 8.6cm to 12.1cm (mean = 10.6cm) (Fig. 4.10). Only one age class (1+) was present. Salmon captured during the 2009 survey ranged in length from 5.1cm to 12.6cm (mean = 8.6cm). Two age classes were present (0+ and 1+), accounting for 55% and 45% of the salmon catch respectively.



**Fig. 4.10. Length frequency distribution of salmon in the Broadford (Doon Lough) site, August 2009 (n = 33) and July 2013 (n = 10)**

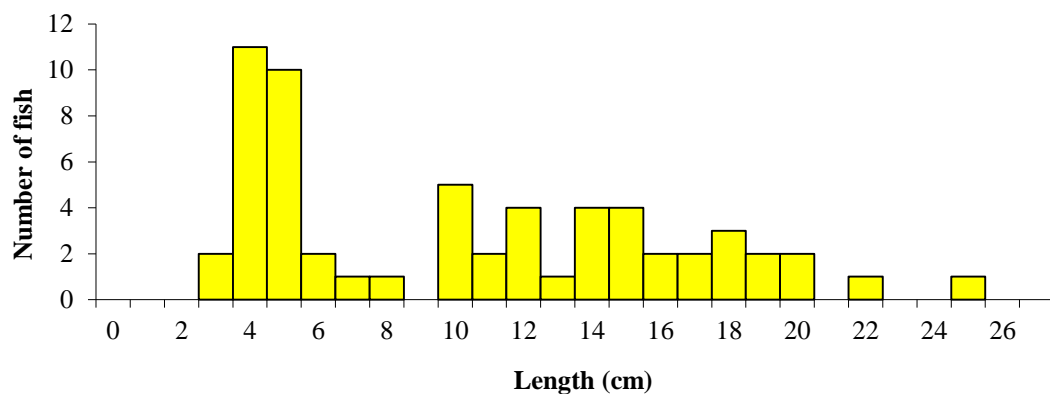
### Broadford River (Broadford Village)

Three fish species were recorded in Broadford River (Broadford Village) site during the 2013 survey (Table 4.6). Brown trout was the most abundant species recorded, followed by salmon and European eel.

**Table 4.6. Density of fish (no./m<sup>2</sup>), Broadford River (Broadford Village) site (fish density has been calculated as minimum estimates based on one fishing)**

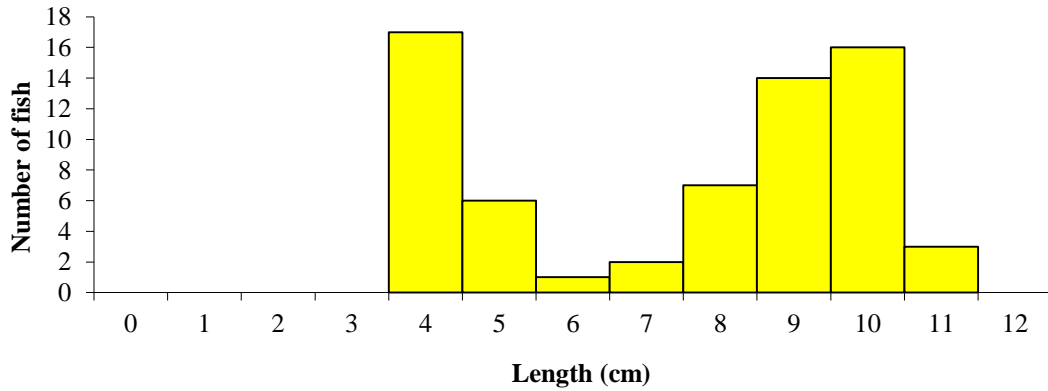
Species	Total minimum density 2013
Brown trout	0.167
0+ Brown trout	0.069
1++ Brown trout	0.097
Salmon	0.167
0+ Salmon	0.079
1++ Salmon	0.088
European eel	0.009
All Fish	0.343

Brown trout captured during the 2013 survey ranged in length from 3.9cm to 25.3cm (mean = 10.8cm) (Fig. 4.11). Three age classes (0+, 1+ and 2+) were present, accounting for 43%, 23% and 33% of the total brown trout catch respectively.



**Fig. 4.11. Length frequency distribution of brown trout in the Broadford (Broadford Village) site, July 2013 (n = 60)**

Salmon captured during the 2013 survey ranged in length from 4.1cm to 11.2cm (mean = 8.0cm) (Fig. 4.12). Two age classes (0+ and 1+) were present, accounting for 39% and 61% of the total salmon catch respectively.



**Fig. 4.12. Length frequency distribution of salmon in the Broadford (Broadford Village) site, July 2013 (n = 66)**

#### 4.1.5 The River Fergus

Two sites were electric fished on the River Fergus as part of the WFD surveillance monitoring programme in rivers 2013; the River Fergus, Clonroad Br. and the River Fergus, Poplar Br.

The Clonroad survey site was located just upstream of Clonroad Br., Ennis, Co. Clare (Fig. 4.13; Plate 4.7). One electric-fishing pass was conducted using four boat-based electric fishing units on the 4<sup>th</sup> of September 2013, along a 279m length of channel. Glide dominated the habitat at this site, while the substrate consisted largely of cobble. The vegetation at this site was diverse, consisting of mosses and liverworts as well as a number of submerged, floating and emergent species.

The Poplar Br. survey site was located just downstream of Poplar Br., 1km upstream of Inchiquin Lough, Co. Clare (Fig. 4.14; Plate 4.8). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 11<sup>th</sup> of July 2013, along a 40m length of channel. Glide was the most abundant substrate type, while the substrate consisted largely of boulder and cobble. Vegetation at this site was diverse, consisting of a large number of submerged mosses, liverworts and emergent species.



**Fig. 4.13.** Location of the River Fergus (Clonroad Br.) surveillance monitoring site





**Fig. 4.14.** Location of the River Fergus (Poplar Br.) surveillance monitoring site



**Plate 4.7.** The Fergus River at Clonroad Br., Ennis, Co. Clare





**Plate 4.8. The Fergus River at Poplar Br., Co Clare**

#### **Fergus River (Clonroad)**

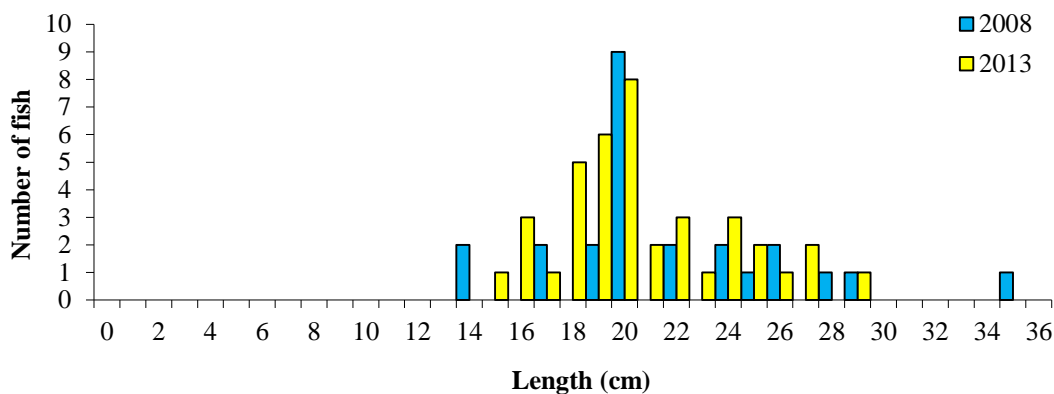
Eight fish species were recorded in the Fergus River (Clonroad) site during the 2013 survey (Table 4.7). Brown trout was the most abundant species recorded, followed by salmon, perch, flounder, European eel, three-spined stickleback, pike and Lamprey.

**Table 4.7. Density of fish (no./m<sup>2</sup>), Fergus River (Clonroad Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2008	2013
Brown trout	0.002	0.007
0+ Brown trout	0.000	0.000
1++ Brown trout	0.002	0.007
Salmon	0.001	0.002
0+ Salmon	0.000	0.000
1++ Salmon	0.001	0.002
Perch	0.001	0.007
Flounder	0.000	0.004
European eel	0.003	0.003
Three-spined stickleback	0.000	0.002
Pike	0.000	0.001
Lamprey sp.	0.000	0.001
All Fish	0.008	0.027

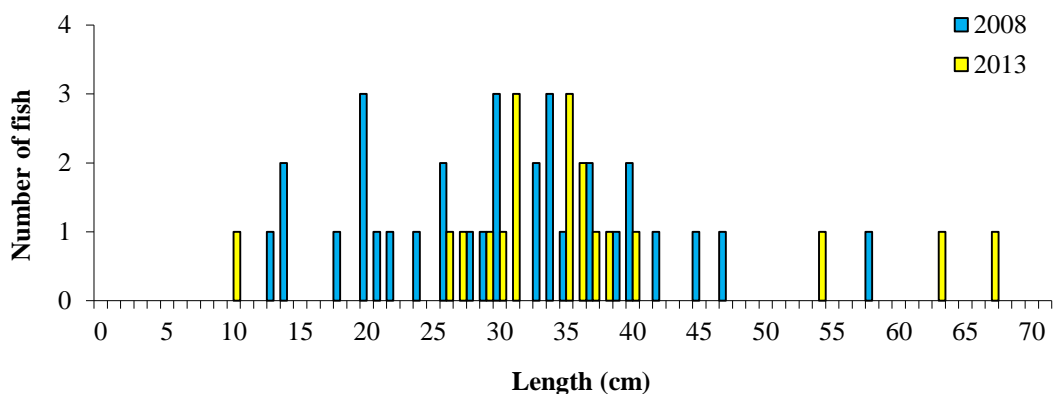


Brown trout captured during the 2013 survey ranged in length from 15.6cm to 29.6cm (mean = 21.1cm) (Fig. 4.15). Three age classes (1+, 2+ and 3+) were present, accounting for 15%, 64% and 21% of the total brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 14.5cm to 35.2cm (mean = 22.1cm). Four age classes were present (0+, 1+, 2+ and 3+) accounting for approximately 20%, 56%, 20% and 4% of the brown trout catch respectively.



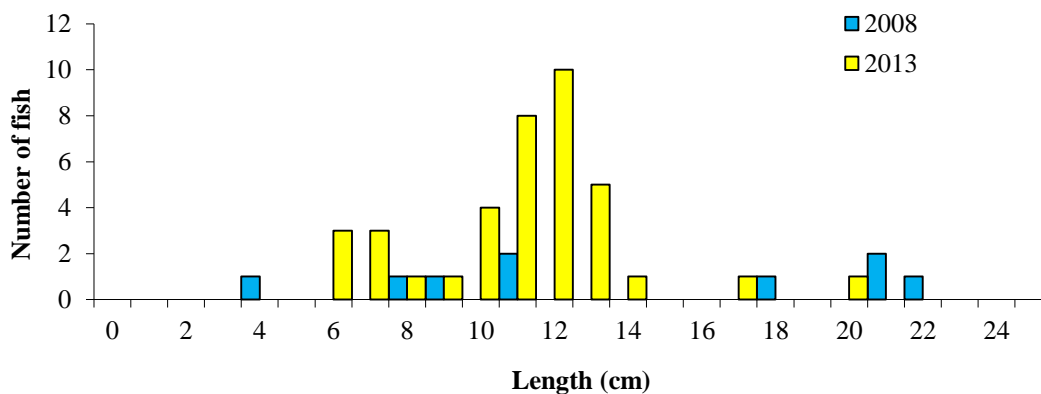
**Fig. 4.15. Length frequency distribution of brown trout in the River Fergus (Clonroad Br.) site, July 2008 (n = 25) and September 2013 (n = 39)**

European eel captured during the 2013 survey ranged in length from 10.2cm to 67.0cm (mean = 36.7cm) (Fig. 4.16). European eel captured during the 2008 survey ranged in length from 13.6cm to 58.0cm (mean = 30.8cm).



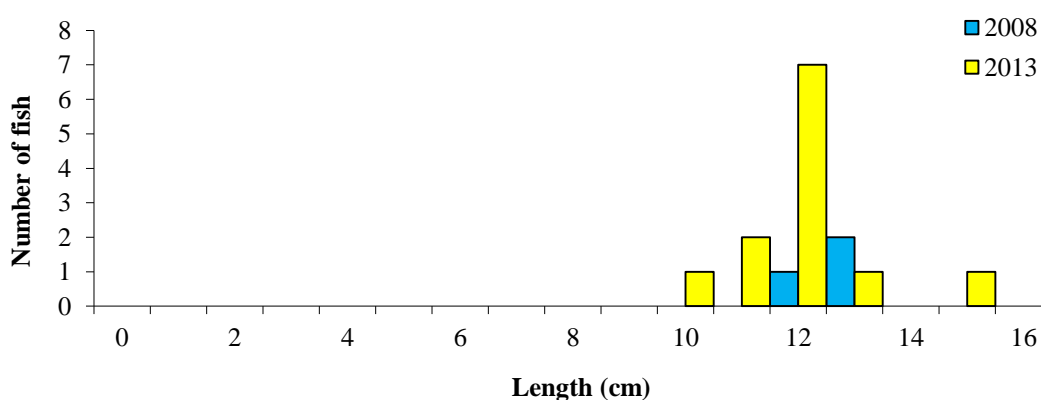
**Fig. 4.16. Length frequency distribution of European eel in the River Fergus (Clonroad Br.) site, July 2008 (n = 32) and September 2013 (n = 19)**

Perch captured during the 2013 survey ranged in length from 6.3cm to 20.3cm (mean = 11.5cm) (Fig. 4.17). Perch captured during the 2008 survey ranged in length from 4.6cm to 22.2cm (mean = 14.3cm).



**Fig. 4.17. Length frequency distribution of perch in the River Fergus (Clonroad Br.) site, July 2008 (n = 9) and September 2013 (n = 38)**

Salmon captured during the 2013 survey ranged in length from 10.5cm to 15.9cm (mean = 12.5cm) (Fig. 4.18). Only one age class (1+) was present. Salmon captured during the 2008 survey ranged in length from 12.0cm to 13.5cm (mean = 12.9cm). Two age classes were present (1+ and 3+), accounting for 43% and 57% of the salmon catch respectively.



**Fig. 4.18. Length frequency distribution of salmon in the River Fergus (Clonroad Br.) site, July 2008 (n = 7) and September 2013 (n = 12)**

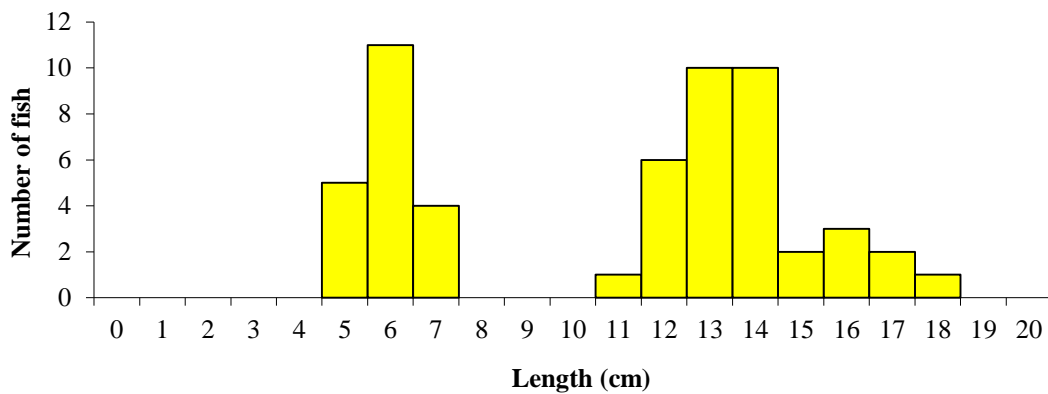
### Fergus River (Poplar Br.)

Five fish species were recorded in the Fergus River (Poplar Br.) site during the 2013 survey (Table 4.8). Brown trout was the most abundant species recorded, followed by pike, three-spined stickleback, European eel and perch.

**Table 4.8. Density of fish (no./m<sup>2</sup>), Fergus River (Poplar Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

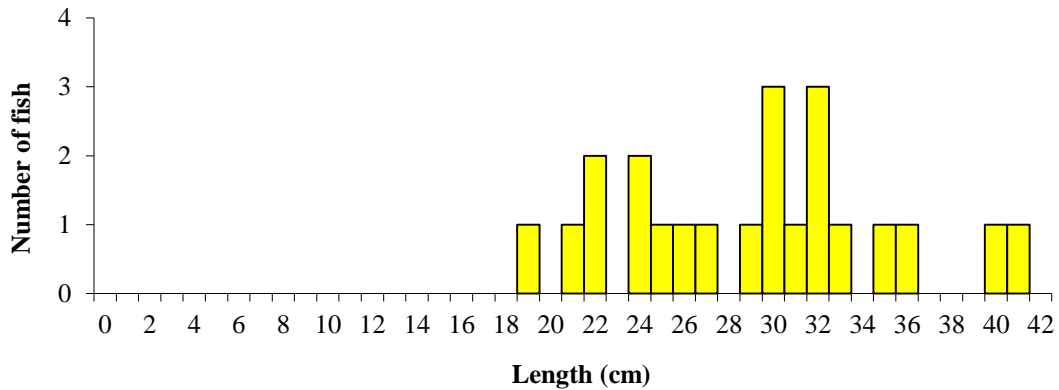
Species	Total minimum density 2009
Brown trout	0.012
0+ Brown trout	0.004
1++ Brown trout	0.009
Pike	0.000
Three-spined stickleback	0.000
European eel	0.000
Perch	0.000
All Fish	0.014

Brown trout captured during the 2013 survey ranged in length from 5.1cm to 18.3cm (mean = 11.4cm) (Fig. 4.19). Two age classes (0+ and 1+) were present, accounting for 36% and 64% of the total brown trout catch respectively.



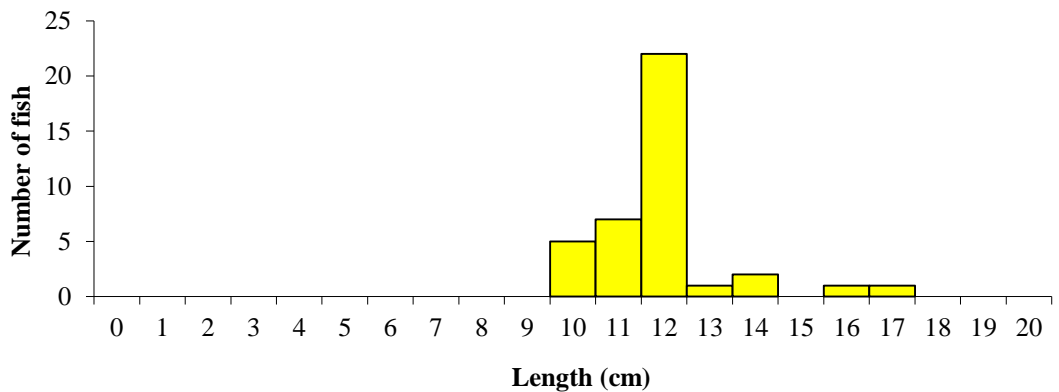
**Fig. 4.19. Length frequency distribution of brown trout in the River Fergus (Poplar Br.) site, July 2013 (n = 55)**

European eel captured during the 2013 survey ranged in length from 19.0cm to 41.1cm (mean = 29.6cm) (Fig. 4.20).



**Fig. 4.20. Length frequency distribution of European eel in the River Fergus (Poplar Br.) site, July 2013(n = 22)**

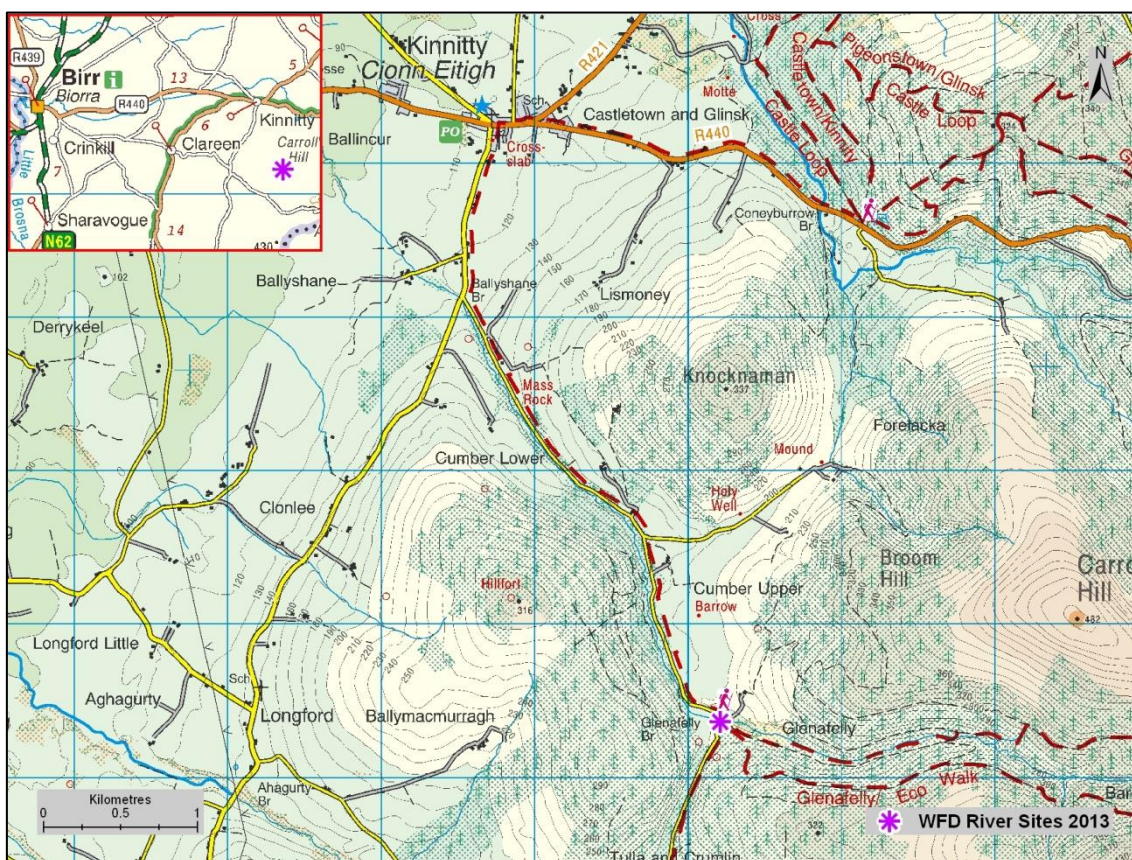
Salmon captured during the 2013 survey ranged in length from 10.1cm to 17.1cm (mean = 12.3cm) (Fig. 4.21). Two age classes (1+ and 2+) were present, each accounting for 95% and 5% of the total salmon catch respectively.



**Fig. 4.21. Length frequency distribution of salmon in the River Fergus (Poplar Br.) site, July 2013(n = 39)**

#### 4.1.6 The Glenafelly River

One site was electric fished on the Glenafelly River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of a small bridge near Glenafelly, townland, approximately 4.5km north of Kinnitty, Co. Offaly (Fig. 4.22; Plate 4.9). Three electric-fishing passes were conducted using one bank-based electric fishing unit on the 9<sup>th</sup> of September 2013, along a 45m length of channel. Glide dominated the habitat, while the substrate was a good mix, consisting mostly of cobble. Aquatic vegetation at this site was scarce, due to heavy tree shading on one bank and thick long grass on the other. A small number of bryophytes were present.



**Fig. 4.22.** Location of the Glenafelly River (Glenafelly Br.) surveillance monitoring site





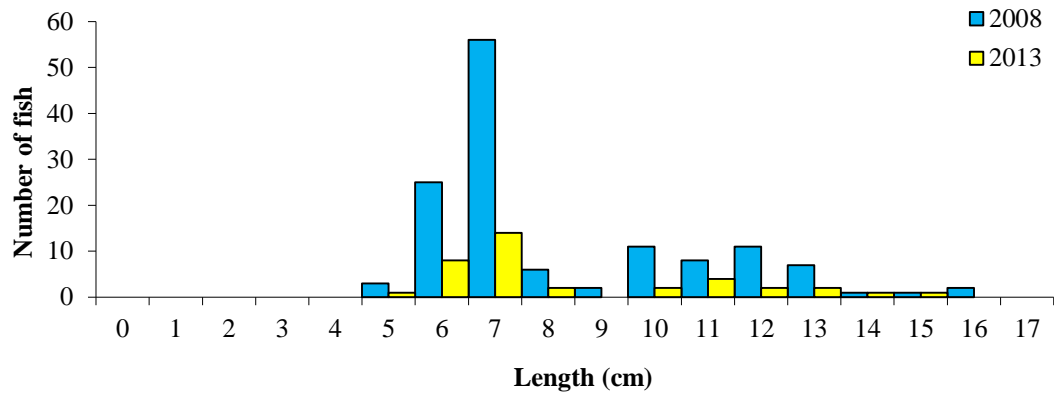
**Plate 4.9. The Glenafelly River (Glenafelly Br.) near Kinnitty, Co. Offaly**

Brown trout was the only fish species recorded in the Glenafelly River during the 2013 survey (Table 4.9).

**Table 4.9. Density of fish (no./m<sup>2</sup>), Glenafelly River (Glenafelly Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2008	2013
Brown trout	0.304	0.143
0+ Brown trout	0.156	0.082
1++ Brown trout	0.148	0.061
All Fish	0.304	0.143

Brown trout captured during the 2013 survey ranged in length from 5.9cm to 15.9cm (mean = 8.9cm) (Fig. 4.23). Three age classes (0+, 1+ and 2+) were present, accounting for 68%, 30% and 3% of the salmon catch respectively. Salmon captured during the 2008 survey ranged in length from 5.2cm to 16.5cm (mean = 8.7cm). Three age classes (0+, 1+ and 2+) were present, accounting for 59%, 38% and 3% of the salmon catch respectively.



**Fig. 4.23. Length frequency distribution of brown trout in the Glenafelly (Glenafelly Br.), September 2008 (n = 133) and September 2013 (n = 37)**

#### 4.1.7 The Glendine River

One site was electric fished on the Glendine River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Knockloskeraun Br., 1.5km south of Milltown Malbay, Co. Clare (Fig. 4.24; Plate 4.10). Due to rainfall upstream of the site and subsequent flash flooding, only one electric-fishing pass could be conducted. This was done using one bank-based electric fishing unit on the 17<sup>th</sup> of September 2013, along a 45m length of channel. Riffle dominated the habitat, while gravel was the most abundant substrate. The vegetation at this site consisted mainly of riparian species with a small number of bryophytes in the splash zone.



**Fig. 4.24.** Location of the Glendine River (Knockloskeraun Br.) surveillance monitoring site





**Plate 4.10. The Glendine River (Knockloskeraun Br.) near Miltown Malbay, Co. Clare**

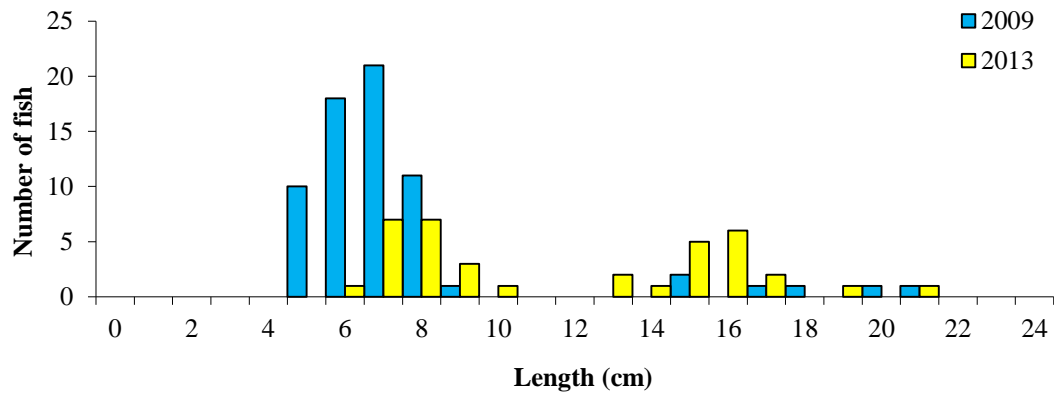
Two fish species were recorded in the Glendine River during the 2013 survey (Table 4.10). Brown trout was the most abundant species recorded, followed by European eel.

**Table 4.10. Density of fish (no./m<sup>2</sup>), Glendine River (Knockloskeraun Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2009	2013
Brown trout	0.431	0.242
0+ Brown trout	0.397	0.124
1++ Brown trout	0.034	0.118
Salmon	0.008	-
0+ Salmon	0.000	-
1++ Salmon	0.008	-
European eel	0.068	0.020
All Fish	0.507	0.261

Brown trout captured during the 2013 survey ranged in length from 6.7cm to 21.2cm (mean = 12.1cm) (Fig. 4.25). Three age classes (0+, 1+ and 2+) were present, accounting for 51%, 46% and 3% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 5.0cm to 21.6cm (mean = 7.9cm). Three age classes (0+, 1+ and 2+) were present, accounting for 91%, 3% and 6% of the total brown trout catch respectively.





**Fig. 4.25. Length frequency distribution of brown trout in the Glendine (Knockloskeraun Br.), July 2009 (n = 67) and September 2013 (n = 37)**

#### 4.1.8 The Gourná River

Two sites were electric fished on the Gourná River as part of the WFD surveillance monitoring programme in rivers 2013; the Gourná River, Railway Br. and the Gourná River, Owenagarney Confluence.

The Railway Br. survey site was located just upstream of a disused railway bridge, approximately 1.8km south of Sixmilebridge, Co. Clare and only 350m from the confluence with the Owenagarney River (Fig. 4.26; Plate 4.11). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 9<sup>th</sup> of July 2013, along a 44m length of channel. Glide dominated the habitat, with a very evenly mixed substrate. The vegetation at this heavily shaded site consisted mainly of bryophytes, with a small number of mosses and liverworts present.

The Owenagarney Confluence survey site was located a further 300m upstream of the first site (Fig. 4.26; Plate 4.12). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 9<sup>th</sup> of July 2013, along a 45m length of channel. Pool was the most abundant habitat, with gravel the dominant substrate present. The vegetation at this site consisted of a number of bryophytes as well as riparian species.

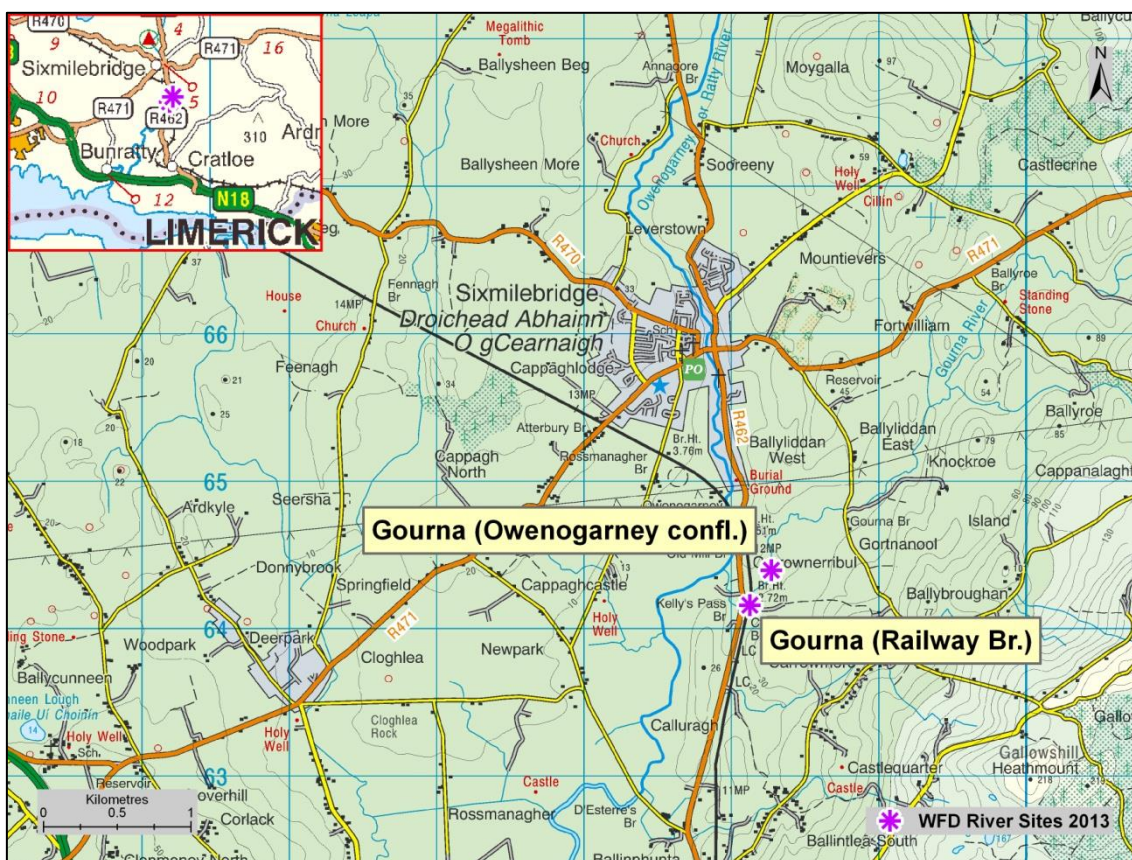


Fig. 4.26. Location of the Gourná River surveillance monitoring sites





**Plate 4.11. The Gourná River (Railway Br.), Co. Clare**



**Plate 4.12. The Gourná (Owenogarney confl.), Co. Clare**

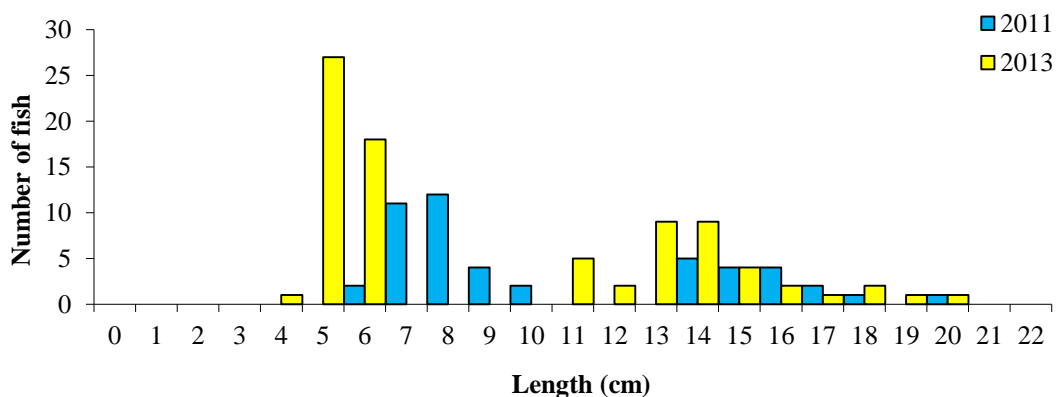
### Gourna River (Owenogarney)

Six fish species were recorded in the Gourna River (Owenogarney confl.) site during the 2013 survey (Table 4.11). Brown trout was the most abundant species recorded, followed by salmon, European eel, Lamprey, three-spined stickleback and stone loach.

**Table 4.11. Density of fish (no./m<sup>2</sup>), Gourna River (Owenogarney confl.) site (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2011	2013
Brown trout	0.175	0.329
0+ Brown trout	0.112	0.181
1++ Brown trout	0.064	0.148
Salmon	0.319	0.219
0+ Salmon	0.271	0.121
1++ Salmon	0.048	0.099
European eel	0.085	0.011
Lamprey sp.	0.085	0.082
Three-spined stickleback	0.064	0.033
Stone loach	0.032	0.016
All Fish	0.760	0.691

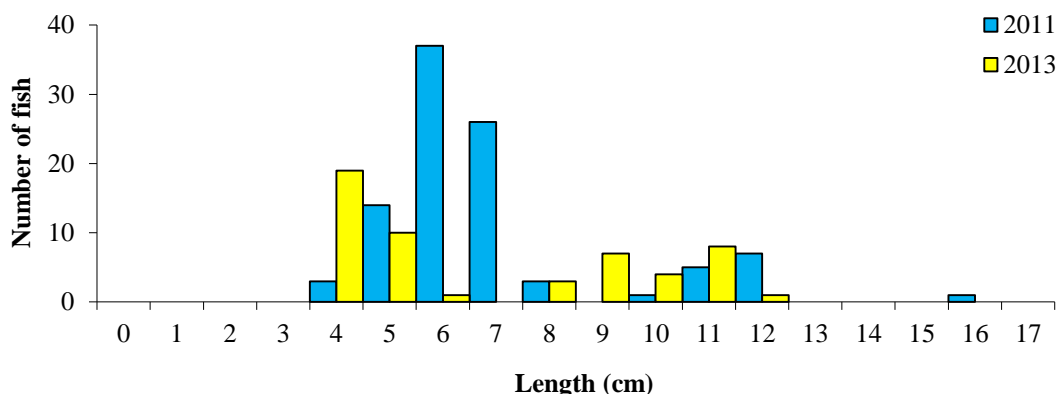
Brown trout captured during the 2013 survey ranged in length from 4.9cm to 20.1cm (mean = 9.7cm) (Fig. 4.27). Three age classes (0+, 1+ and 2+) were present, accounting for 56%, 41% and 2% of the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 6.5cm to 20.4cm (mean = 11.0cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 65%, 33% and 2% of the brown trout catch respectively.



**Fig. 4.27. Length frequency distribution of brown trout in the Gourna (Owenogarney confl.), July 2011 (n = 48) and August 2013 (n = 82)**

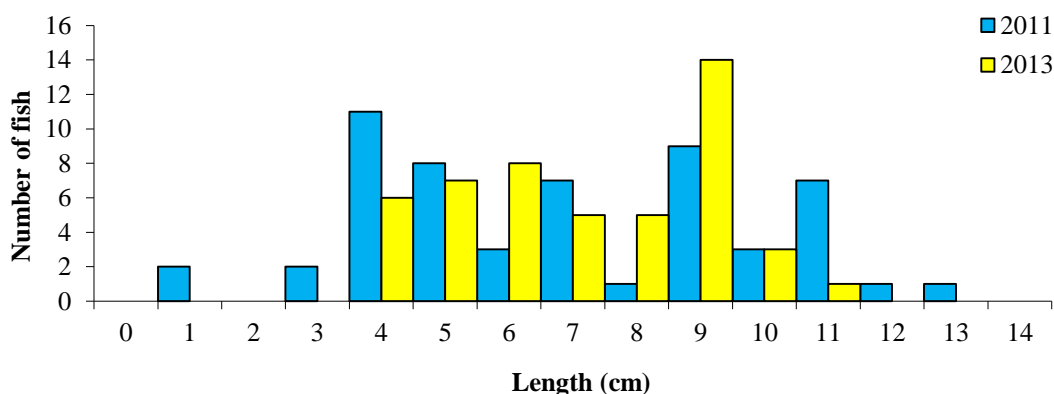


Salmon captured during the 2013 survey ranged in length from 4.3cm to 12.3cm (mean = 7.3cm) (Fig. 4.28). Two age classes (0+ and 1+) were present, each accounting for 58% and 42% of the salmon catch respectively. Salmon captured during the 2011 survey ranged in length from 4.8cm to 16.6cm (mean = 7.4cm). Two age classes were present (0+ and 1+), accounting for 88% and 14% of the salmon catch respectively.



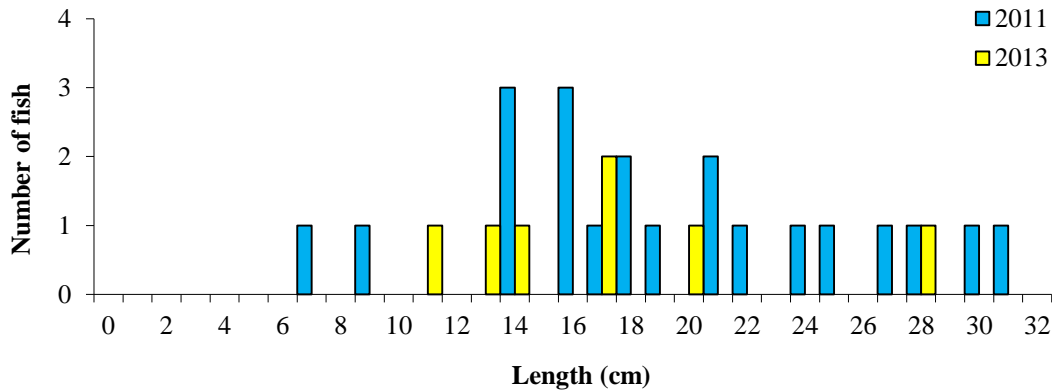
**Fig. 4.28. Length frequency distribution of salmon in the Gourná (Owenogarney confl.), July 2011 (n = 97) and August 2013 (n = 53)**

Lamprey captured during the 2013 survey ranged in length from 4.3cm to 11.3cm (mean = 7.5cm) (Fig. 4.29). Lamprey captured during the 2011 survey ranged in length from 1.8cm to 13.5cm (mean = 7.4cm).



**Fig. 4.29. Length frequency distribution of lamprey in the Gourná (Owenogarney confl.), July 2011 (n = 55) and August 2013 (n = 49)**

European eel captured during the 2013 survey ranged in length from 11.8cm to 28.9cm (mean = 17.7cm) (Fig. 4.30). Salmon captured during the 2011 survey ranged in length from 7.5cm to 31.4cm (mean = 19.8cm). Two age classes were present (0+ and 1+), accounting for 88% and 12% of the salmon catch respectively.



**Fig. 4.30. Length frequency distribution of European eel in the Gourná (Owenogarney confl.), July 2011 (n = 21) and August 2013 (n = 7)**

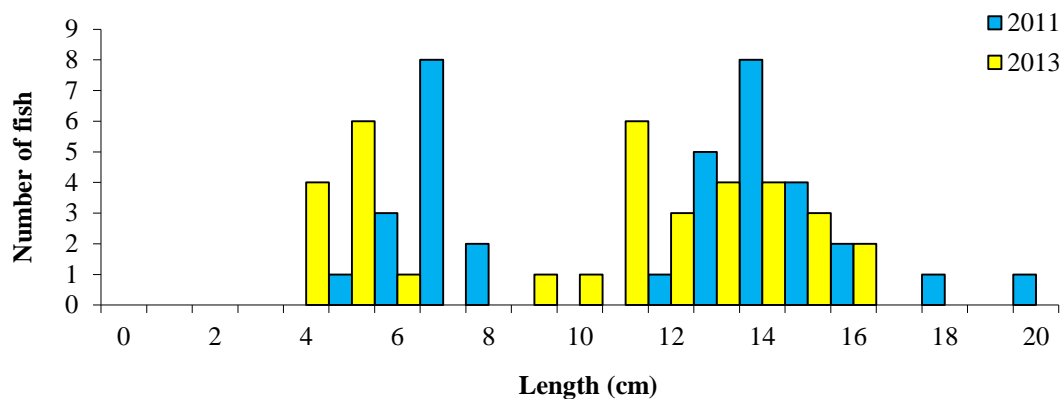
#### Gourná River (Railway)

Five fish species were recorded in the Gourná River (Railway) site during the 2013 survey (Table 4.2). Salmon was the most abundant species recorded, followed by brown trout, lamprey, European eel and stone loach.

**Table 4.12. Density of fish (no./m<sup>2</sup>), Gourná River (Railway Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

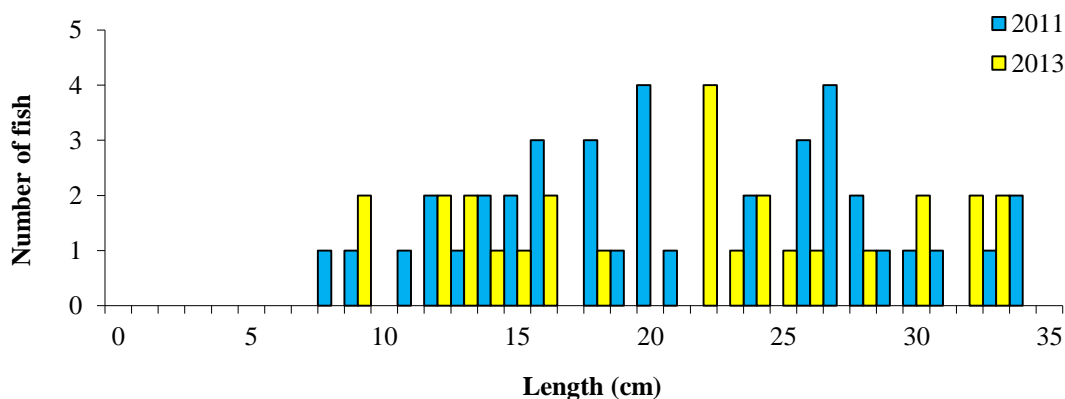
Species	Total minimum density	
	2011	2013
Salmon	0.196	0.244
0+ Salmon	0.123	0.077
1++ Salmon	0.073	0.167
Brown trout	0.137	0.090
Lamprey sp.	0.187	0.064
0+ Brown trout	0.055	0.030
1++ Brown trout	0.082	0.060
European eel	0.082	0.043
Stone loach	0.023	0.009
Three-spined stickleback	0.009	-
All Fish	0.634	0.450

Brown trout captured during the 2013 survey ranged in length from 4.4cm to 16.5cm (mean = 10.7cm) (Fig. 4.31). Two age classes (0+ and 1+) were present, accounting for 31% and 69% the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 5.9cm to 20.0cm (mean = 11.9cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 39%, 56% and 6% of the brown trout catch respectively.



**Fig. 4.31. Length frequency distribution of brown trout in the Gourna (Railway Br.), August 2011 (n = 36) and July 2013 (n = 35)**

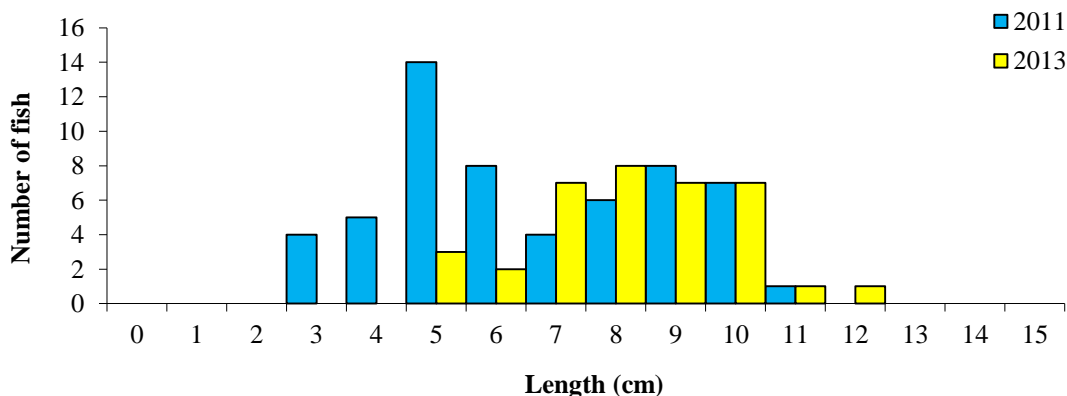
European eel captured during the 2013 survey ranged in length from 9.1cm to 33.4cm (mean = 21.7cm) (Fig. 4.32). European eel captured during the 2011 survey ranged in length from 8.9cm to 34.5cm (mean = 21.6cm).



**Fig. 4.32. Length frequency distribution of European eel in the Gourna (Railway Br.), August 2011 (sub-sample, n = 39) and July 2013 (n = 27)**

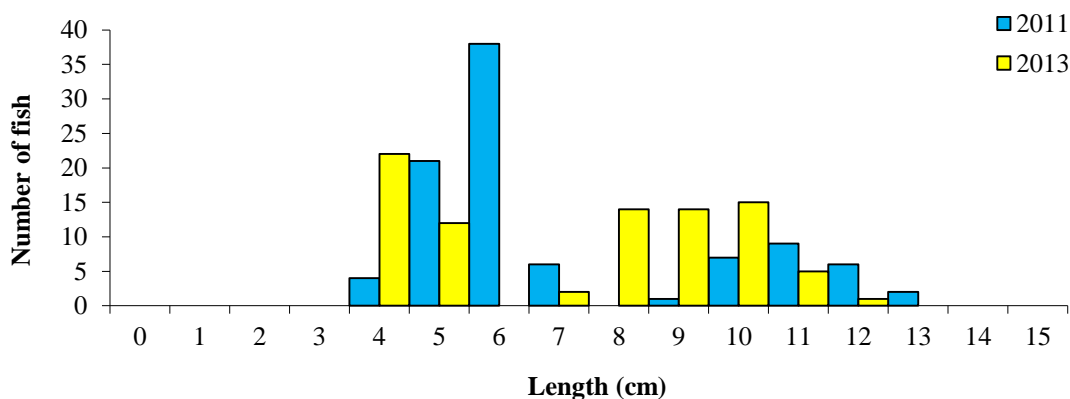


Lamprey captured during the 2013 survey ranged in length from 5.1cm to 12.4cm (mean = 8.7cm) (Fig. 4.33). Salmon captured during the 2011 survey ranged in length from 3.7cm to 11.9cm (mean = 7.1cm).



**Fig. 4.33. Length frequency distribution of lamprey in the Gourná (Railway Br.), August 2011 (n = 57) and July 2013 (n = 36)**

Salmon captured during the 2013 survey ranged in length from 4.2cm to 12.0cm (mean = 7.7cm) (Fig. 4.34). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 40%, 59% and 1% of the salmon catch respectively. Salmon captured during the 2011 survey ranged in length from 4.6cm to 13.0cm (mean = 7.5cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 73%, 26% and 1% of the salmon catch respectively.



**Fig. 4.34. Length frequency distribution of salmon in the Gourná (Railway Br.), August 2011 (n = 94) and July 2013 (n = 85)**

#### 4.1.9 The Graney River

One site was electric fished on the Graney River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located downstream of Caher Br., less than 2km upstream of Lough Graney, Co. Clare (Fig. 4.35; Plate 4.13). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 16<sup>th</sup> of September 2013, along a 45m length of channel. Riffle and glide dominated the habitat, while the substrate was composed mainly of gravel. The vegetation at this site was dominated by bryophytes, with a diverse number of aquatic and semi-aquatic mosses and liverworts present.

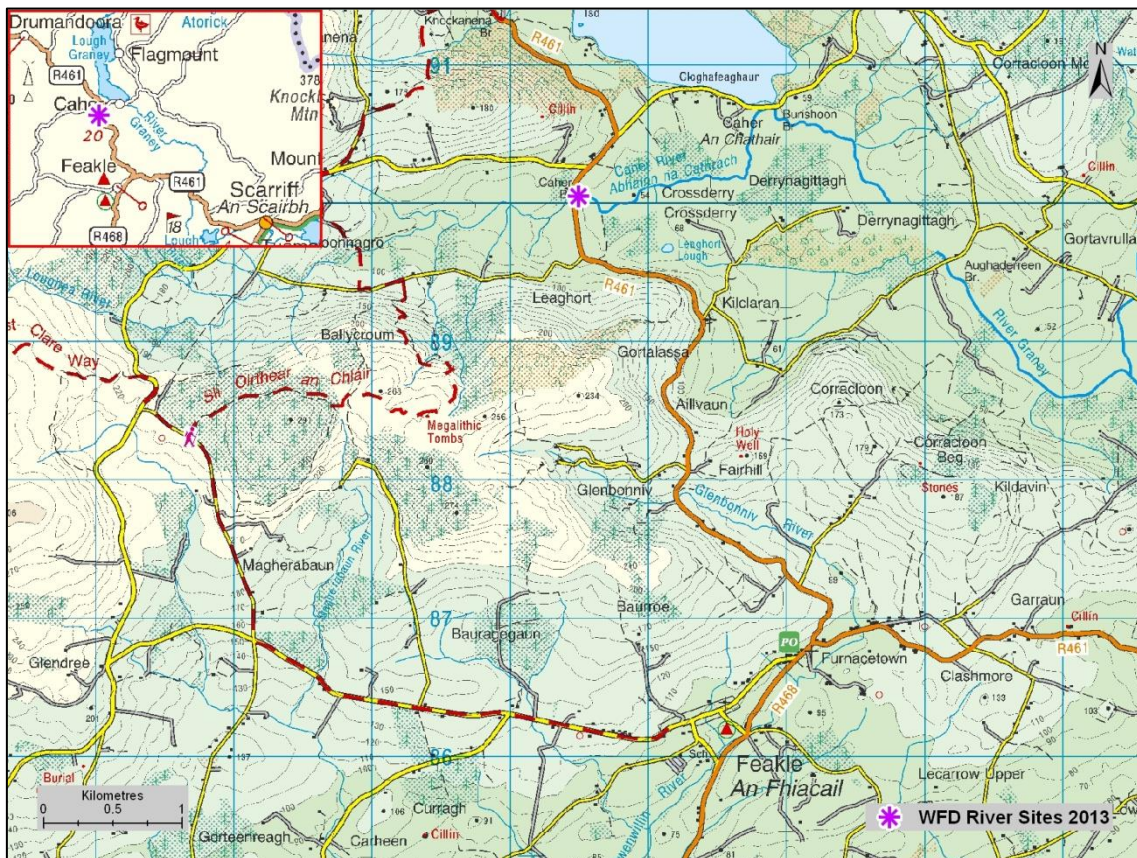


Fig. 4.35. Location of the Graney River surveillance monitoring site





**Plate 4.13. The Graney River at Caher Br., Co. Clare**

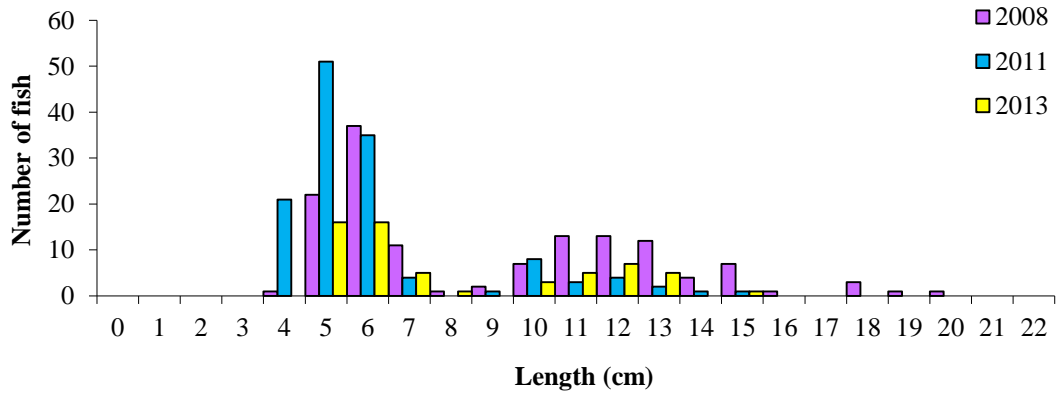
Brown trout was the only fish species recorded in the Graney River during the 2013 survey (Table 4.13). Salmon were not recorded at this site during WFD surveillance monitoring surveys since 2008.

**Table 4.13. Density of fish (no./m<sup>2</sup>), Graney River (Caher Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density		
	2008	2011	2013
Brown trout	0.162	0.389	0.189
0+ Brown trout	0.100	0.300	0.110
1++ Brown trout	0.062	0.089	0.079
Stone loach	-	0.009	-
Lamprey sp.	0.004	0.005	-
Salmon	0.008	-	-
All Fish	0.174	0.403	0.189

Brown trout captured during the 2013 survey ranged in length from 5.1cm to 15.4cm (mean = 8.4cm) (Fig. 4.36). Three age classes (0+, 1+ and 2+) were present, accounting for 64%, 34% and 2% of the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 4.6cm to 15.9cm (mean = 6.6cm). Two age classes were present (0+ and 1+), accounting for approximately 85% and 15% of the brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 4.6cm to 20.5cm (mean = 9.5cm). Three age classes were present

(0+, 1+ and 2+), accounting for approximately 66%, 31% and 3% of the brown trout catch respectively.



**Fig. 4.36. Length frequency distribution of brown trout in the Graney River (Caher Br.), August 2008 (n = 136), August 2011 (n = 131) and September 2013 (n = 59)**



#### 4.1.10 The Mountnugent River

One site was electric fished on the Mountnugent River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located just upstream of a bridge in Mountnugent, Co. Cavan, approximately 2.3km upstream of Lough Sheelin (Fig. 4.37; Plate 4.14). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 26<sup>th</sup> of August 2013, along a 44m length of channel. Glide dominated the habitat, while the dominant substrate was cobble. The vegetation at this site was composed of a number of bryophytes and emergent species.



**Fig. 4.37. Location of the Mountnugent River (Mountnugent) surveillance monitoring site**



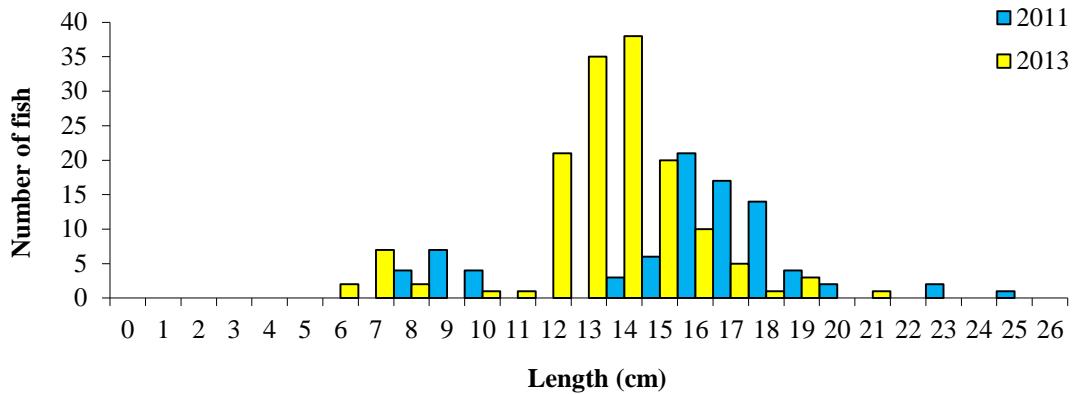
**Plate 4.14. The Mountnugent River, Mountnugent, Co. Cavan**

Seven fish species were recorded in the Mountnugent River during the 2013 survey (Table 4.14). Brown trout was the most abundant species recorded, followed by perch, three-spined stickleback, lamprey, stone loach, roach and minnow.

**Table 4.14. Density of fish (no./m<sup>2</sup>), Mountnugent River (Mountnugent) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density	
	2011	2013
Brown trout	0.123	0.336
0+ Brown trout	0.013	0.027
1++ Brown trout	0.110	0.309
Perch	0.019	0.020
Three-spined stickleback	0.010	0.020
Lamprey sp.	0.010	0.010
Stone loach	0.032	0.007
Roach	-	0.007
Minnow	0.003	0.003
Gudgeon	-	-
All Fish	0.197	0.403

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 21.0cm (mean = 13.9cm) (Fig. 4.38). Three age classes (0+, 1+ and 2+) were present, accounting for 7%, 89% and 3% of the total brown trout catch respectively. Brown trout captured during the 2011 survey ranged in length from 7.3cm to 24.8cm (mean = 15.2cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 16%, 80% and 4% of the brown trout catch respectively.

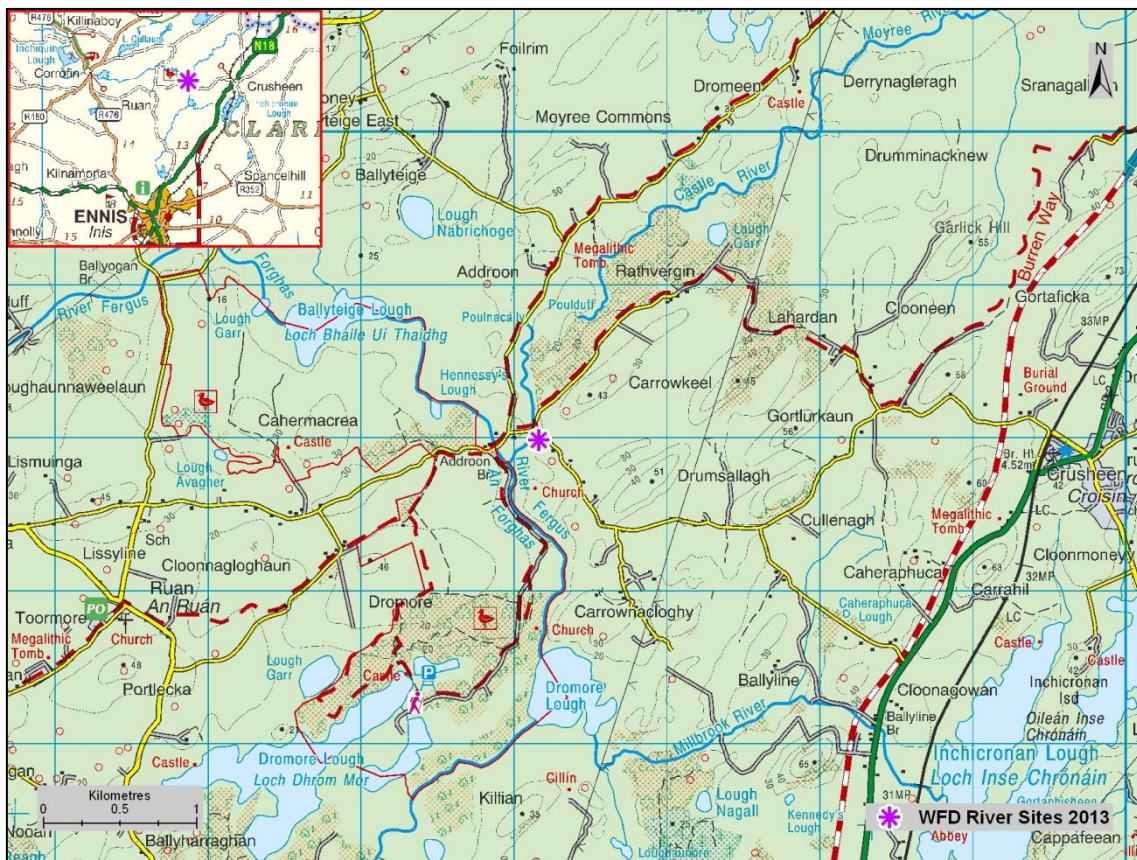


**Fig. 4.38. Length frequency distribution of brown trout in the Mountnugent River (Mountnugent), August 2011 (n = 85) and August 2013 (n = 147)**



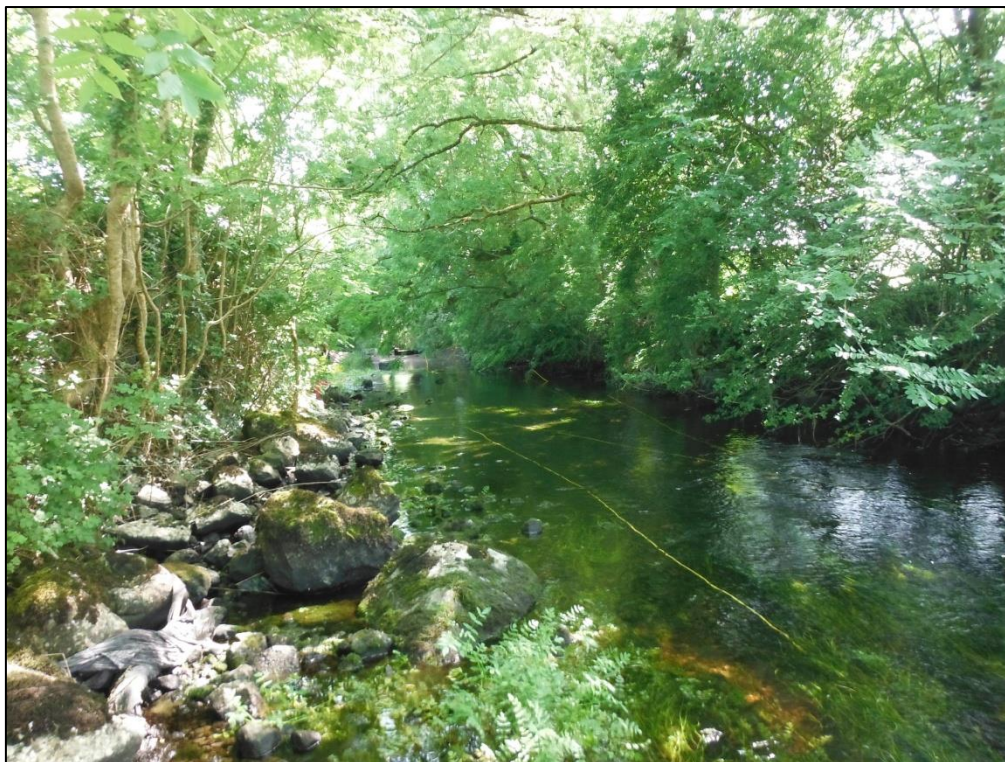
#### 4.1.11 The Moyree River

One site was electric fished on the Moyree River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located just upstream of a bridge approximately 9km east of Corrofin, Co. Clare (Fig. 4.39; Plate 4.15). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 11<sup>th</sup> of July 2013, along a 45m length of channel. Glide dominated the habitat, while the substrate was mostly cobble and boulder. The vegetation at this site was dominated by bryophytes, with a number of emergent and riparian species also present.



**Fig. 4.39. Location of the Moyree River (Fergus Br.) surveillance monitoring site**





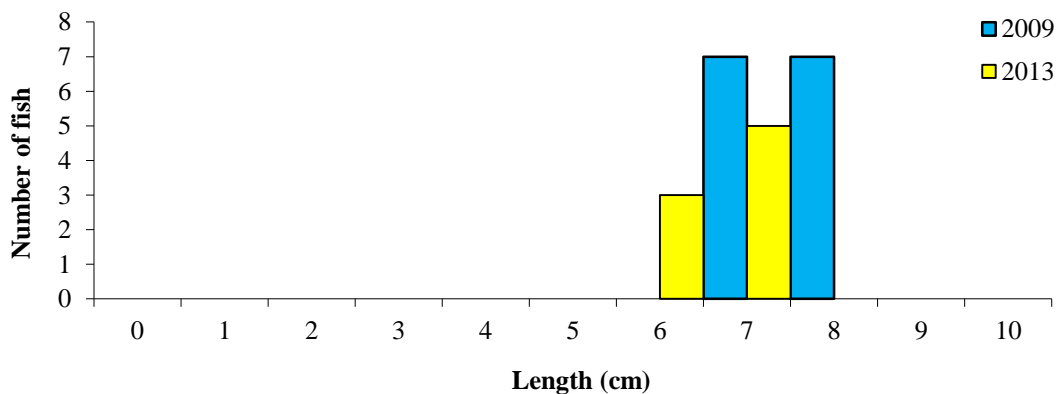
**Plate 4.15. The Moyree River (River Fergus Br.), Co. Clare**

Six fish species were recorded in the Moyree River during the 2013 survey (Table 4.15). Salmon was the most abundant species recorded, followed by perch, brown trout, European eel, stone loach and lamprey.

**Table 4.15. Density of fish (no./m<sup>2</sup>), Moyree River (Fergus Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

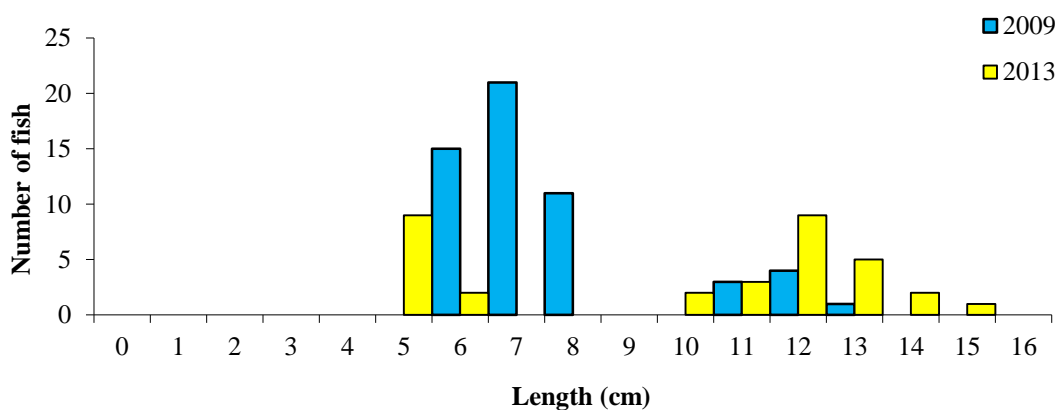
Species	Total minimum density	
	2009	2013
Salmon	0.074	0.063
1++ Salmon	0.014	0.046
0+ Salmon	0.060	0.017
Perch	0.005	0.029
Brown trout	0.018	0.014
0+ Brown trout	0.018	0.014
1++ Brown trout	0.000	0.000
European eel	0.014	0.003
Stone loach	-	0.003
Lamprey sp.	0.002	0.003
Pike	0.005	-
All Fish	0.118	0.115

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 7.3cm (mean = 6.9cm) (Fig. 4.40). Only one age class (0+) was present. Brown trout captured during the 2009 survey ranged in length from 7.0cm to 8.9cm (mean = 7.9cm). Only one age class (0+) was present.



**Fig. 4.40. Length frequency distribution of brown trout in the Moyree River (Fergus Br.), August 2009 (n = 14) and July 2013 (n = 8)**

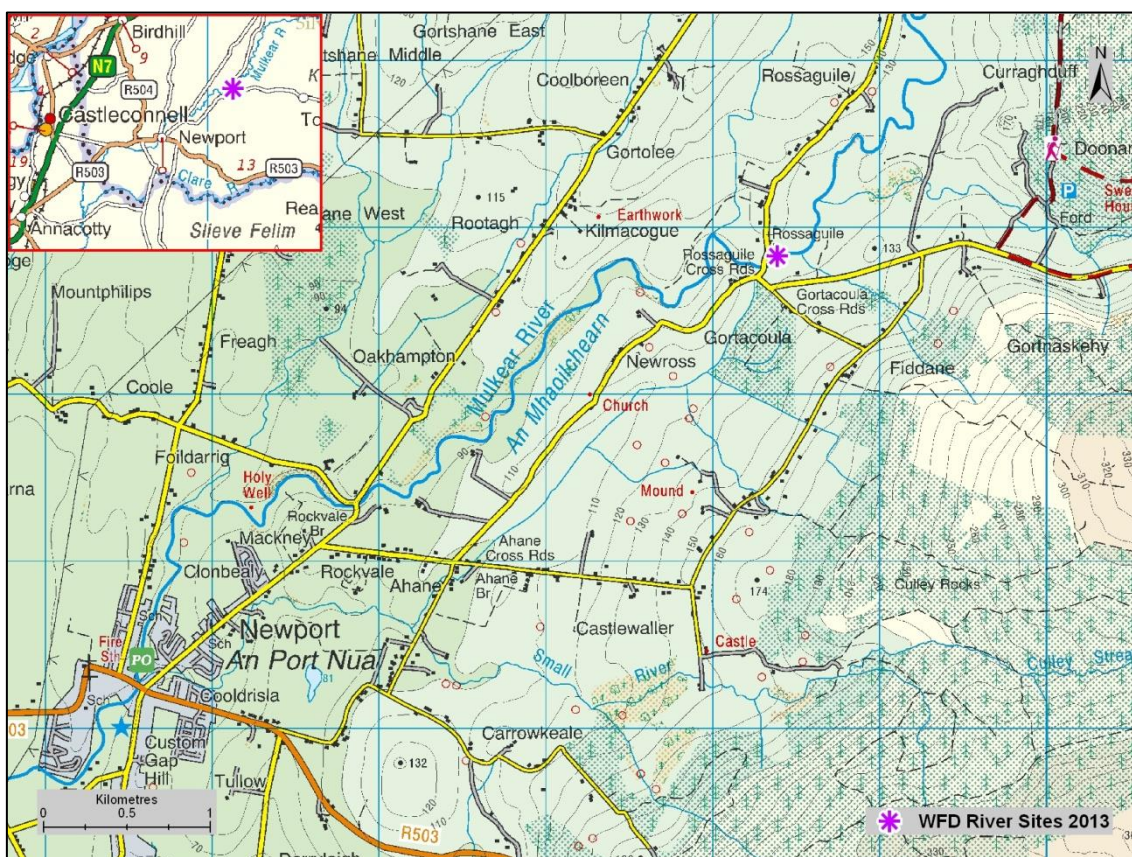
Salmon captured during the 2013 survey ranged in length from 5.1cm to 15.1cm (mean = 10.4cm) (Fig. 4.41). Two age classes (0+ and 1+) were present, accounting for 33% and 67% of the salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 6.5cm to 13.2cm (mean = 8.1cm). Two age classes (0+ and 1+) were present, accounting for 85% and 15% of the salmon catch respectively.



**Fig. 4.41. Length frequency distribution of salmon in the Moyree River (Fergus Br.), August 2009 (n = 55) and July 2013 (n = 33)**

#### 4.1.12 The Newport River

One site was electric fished on the Newport River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Rossaguile Br., just outside the village of Newport, Co. Tipperary (Fig. 4.42; Plate 4.16). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 8<sup>th</sup> of July 2013, along a 40m length of channel. Riffle and pool dominated the habitat, while gravel and sand were most abundant among a good mix of substrate types. The vegetation at this site was dominated by bryophytes with different types of algae and emergent species also present.



**Fig. 4.42. Location of the Newport River (Rossaguile Br.) surveillance monitoring site**





**Plate 4.16. The Newport River near Rossaguile Br., Co. Limerick**

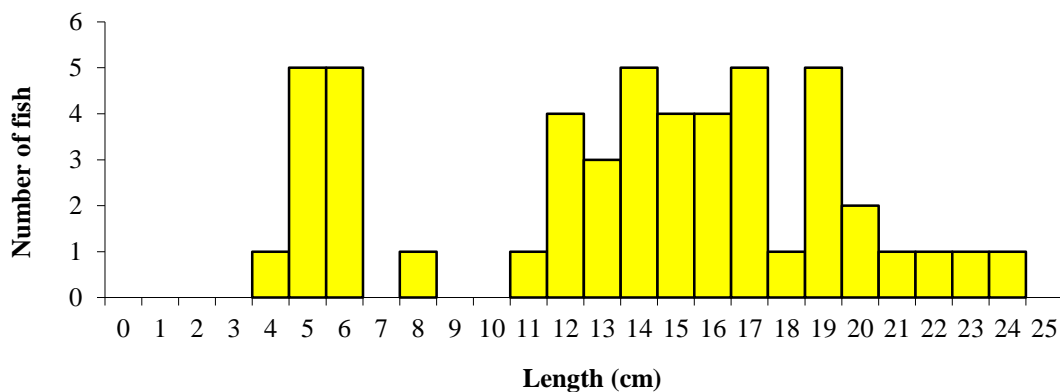
Four fish species were recorded in the Newport River during the 2013 survey (Table 4.16). Salmon was the most abundant species recorded, followed by brown trout, stone loach and lamprey.

**Table 4.16. Density of fish (no./m<sup>2</sup>), Newport River (Rossaguile Br.) (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density
	2013
Salmon	0.289
0+ Salmon	0.229
1++ Salmon	0.061
Brown trout	0.074
0+ Brown trout	0.016
1++ Brown trout	0.058
Stone loach	0.005
Lamprey sp.	0.003
All Fish	0.371

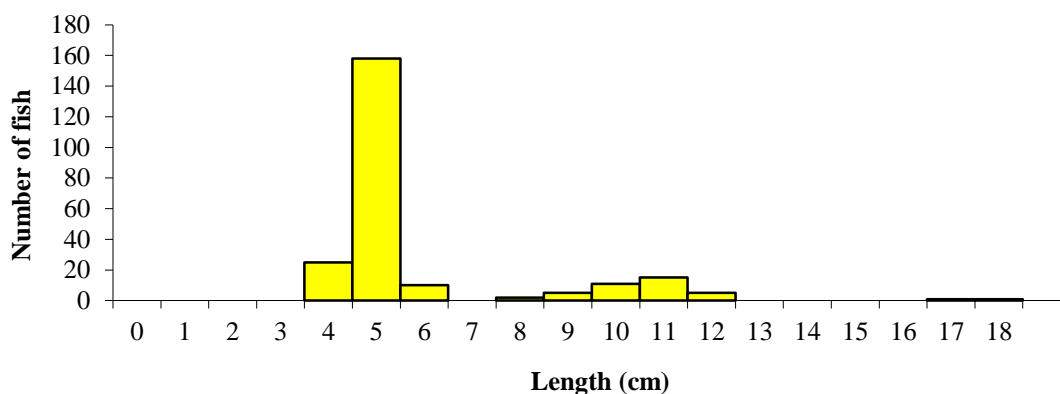


Brown trout captured during the 2013 survey ranged in length from 4.0cm to 23.1cm (mean = 13.3cm) (Fig. 4.43). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 24%, 14%, 52% and 10% of the total brown trout catch respectively.



**Fig. 4.43. Length frequency distribution of brown trout in the Newport River (Rossaguile Br.), July 2013 (n = 50)**

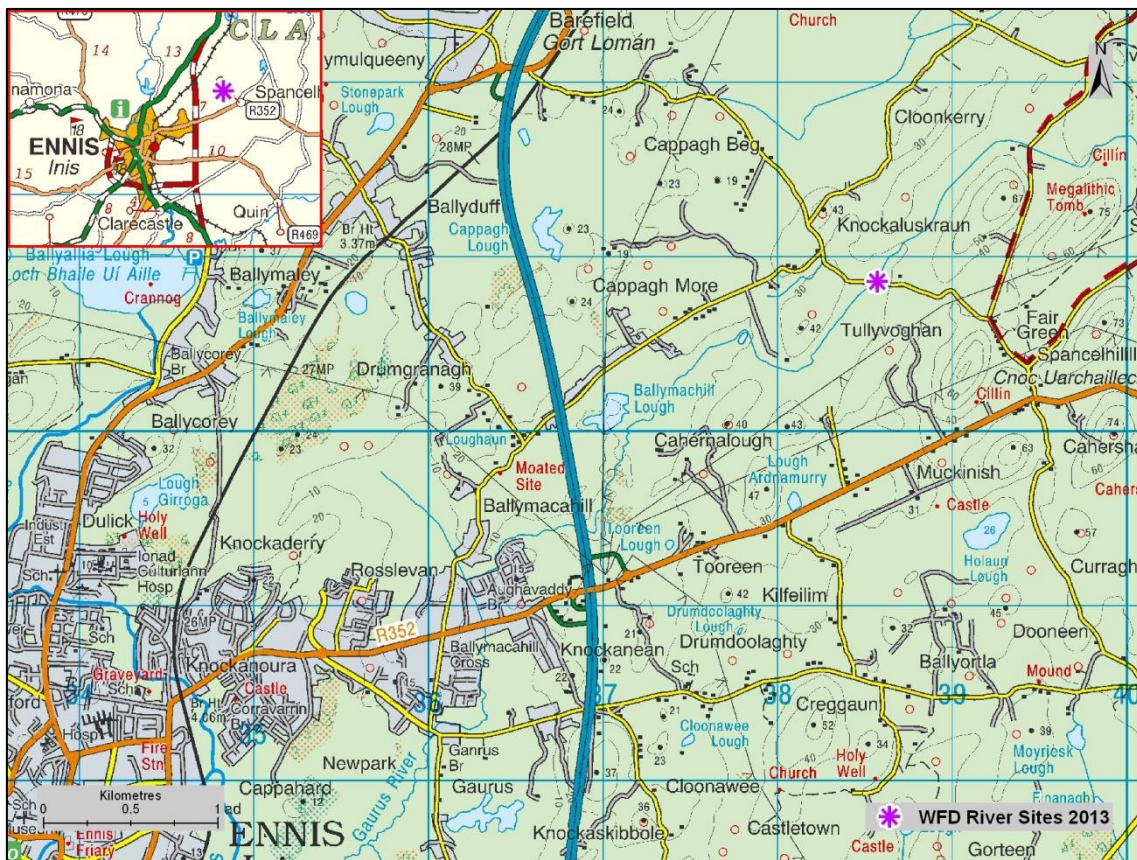
Salmon captured during the 2013 survey ranged in length from 3.4cm to 17.8cm (mean = 5.4cm) (Fig. 4.44). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 83%, 16% and 1% of the total salmon catch respectively.



**Fig. 4.44. Length frequency distribution of salmon in the Newport River (Rossaguile Br.), July 2013 (n = 233)**

#### 4.1.13 The Spancelhill River

One site was electric fished on the Spancelhill River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located just upstream of a bridge near Spancelhill, approximately 7km northeast of Ennis, Co. Clare (Fig. 4.45; Plate 4.17). Three electric-fishing passes were conducted using one bank-based electric fishing unit on the 17<sup>th</sup> of September 2013, along a 33m length of channel. Riffle dominated the habitat, while the substrate was mainly composed of cobble. The vegetation at this site was dominated by emergent riparian species.



**Fig. 4.45. Location of the Spancelhill River (Spancelhill) surveillance monitoring site**



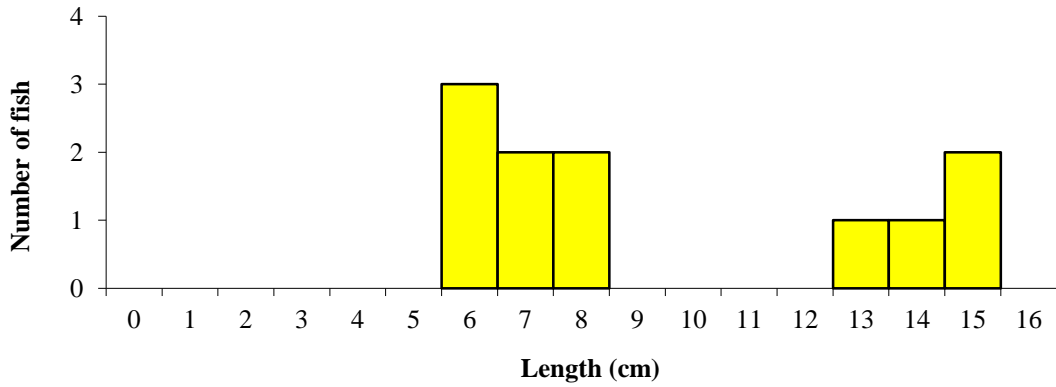
**Plate 4.17. The Spancelhill River, near Spancelhill, Co. Clare**

Four fish species were recorded in the Spancelhill River site during the 2013 survey (Table 4.17). Brown trout was the most abundant species recorded, followed by perch, three-spined stickleback and European eel.

**Table 4.17. Density of fish (no./m<sup>2</sup>), Spancelhill River (Spancelhill) site (fish density has been calculated as minimum estimates based on one fishing)**

Species	Total minimum density
	2013
Brown trout	0.078
0+ Brown trout	0.043
1++ Brown trout	0.035
Perch	0.043
Three-spined stickleback	0.026
European eel	0.009
All Fish	0.157

Brown trout captured during the 2013 survey ranged in length from 6.5cm to 15.5cm (mean = 10.0cm) (Fig. 4.46). Two age classes (0+ and 1+) were present, accounting for 64% and 36% of the total brown trout catch respectively.



**Fig. 4.46. Length frequency distribution of brown trout in the Spancelhill River (Spancelhill), September 2013 (n = 11)**



#### 4.1.14 The River Suck

Two sites were electric fished on the River Suck as part of the WFD surveillance monitoring programme in rivers 2013; the River Suck, Ballyforan Br. and the River Suck, Cloondacarra Br.

The Ballyforan Br. survey site was located upstream of Ballyforan Br., Ballyforan Village, on the Galway, Roscommon border, approximately 18km west of Athlone (Fig. 4.47; Plate 4.18). One electric-fishing pass was conducted using four boat-based electric fishing units on the 28<sup>th</sup> of July 2013, along a 329m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble. Vegetation at this site consisted mainly of emergent and bank-side riparian species.

The Cloondacarra Br. survey site was located just upstream of Cloondacarra Br., approximately 1.5km south of Castlerea, Co. Roscommon (Fig. 4.48; Plate 4.19). Three electric-fishing passes were conducted using two boat-based electric fishing units on the 29<sup>th</sup> of July 2013, along a 229m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble and gravel. Vegetation at this site consisted of a number of submergent, floating and emergent species.



**Fig. 4.47. Location of the River Suck (Ballyforan Br.) surveillance monitoring site**



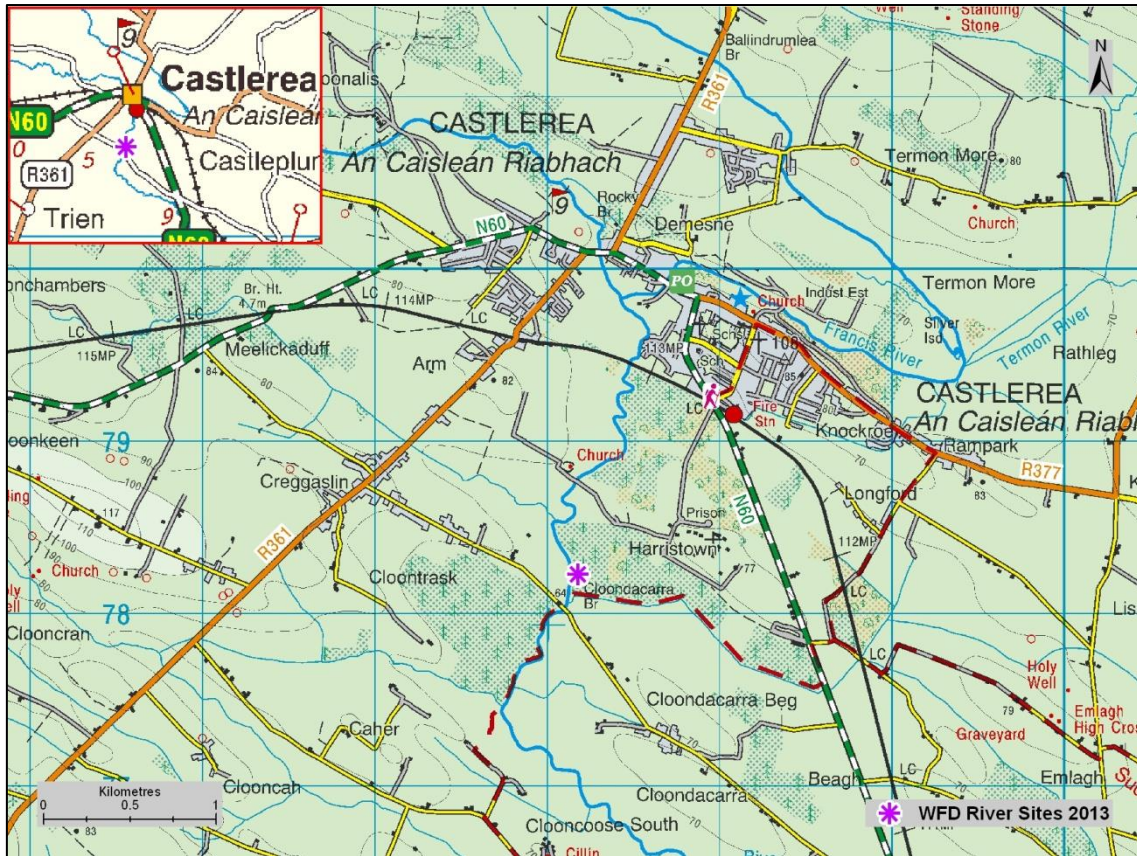


Fig. 4.48. Location of the River Suck (Cloondacarra Br.) surveillance monitoring site



Plate 4.18. The River Suck at Ballyforan Br.



**Plate 4.19. The River Suck at Cloondacarra Br.**

#### **River Suck (Ballyforan Br.)**

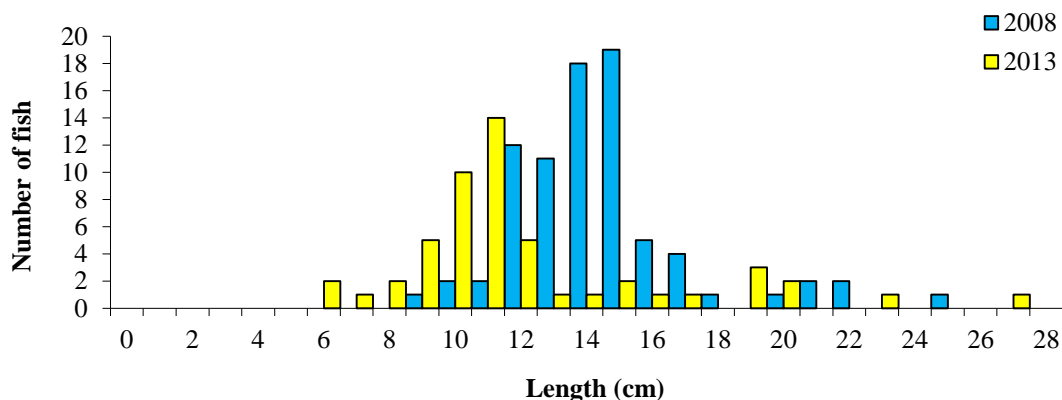
Seven fish species were recorded in the River Suck (Ballyforan Br.) site during the 2013 survey (Table 4.18). Roach was the most abundant species recorded, followed by minnow, perch, gudgeon, pike, stone loach and European eel.

**Table 4.18. Density of fish (no./m<sup>2</sup>), River Suck (Ballyforan Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

<b>Species</b>	<b>Total minimum density</b>	
	<b>2008</b>	<b>2013</b>
Roach	0.033	0.039
Minnow	0.002	0.007
Perch	0.007	0.005
Gudgeon	0.005	0.005
Pike	0.001	0.003
Stone loach	0.001	0.001
European eel	0.0005	0.000
Brown trout	0.0002	-
0+ Brown trout	0.000	-
1++ Brown trout	0.000	-
Bream	0.0001	-
<b>All Fish</b>	<b>0.049</b>	<b>0.061</b>

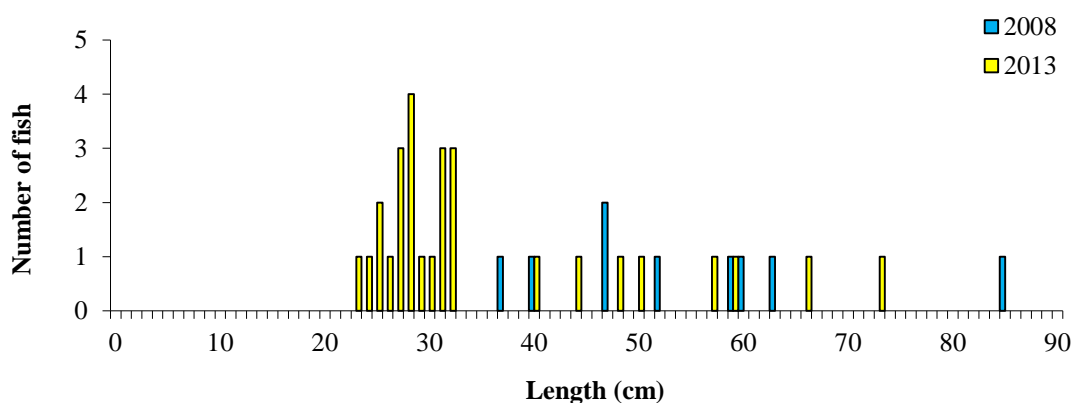


Perch captured during the 2013 survey ranged in length from 6.5cm to 27.2cm (mean = 12.5cm) (Fig. 4.49). Perch captured during the 2008 survey ranged in length from 9.0cm to 25.0cm (mean = 14.0cm).



**Fig. 4.49. Length frequency distribution of perch in the River Suck (Ballyforan Br.) site, July 2008 (n = 81) and July 2013 (n = 52)**

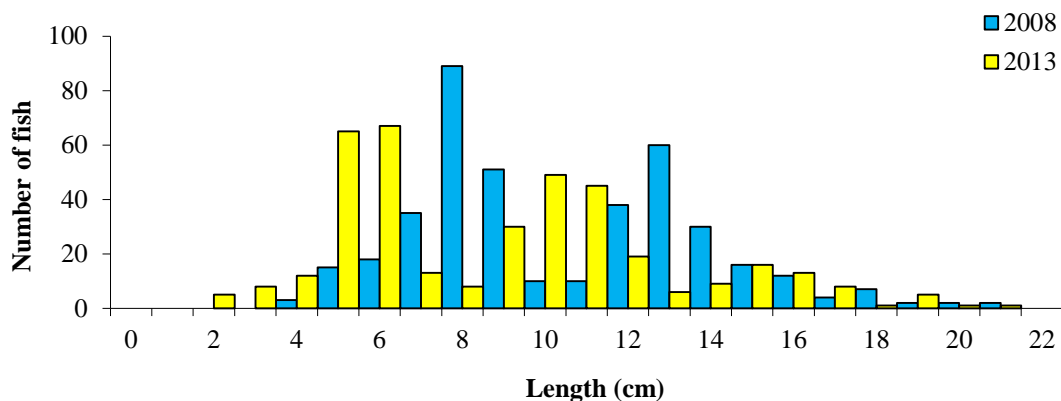
Pike captured during the 2013 survey ranged in length from 23.2cm to 73.5cm (mean = 36.2cm) (Fig. 4.50). Five age classes (1+, 2+, 3+, 4+ and 5+) were present, accounting for 18%, 61%, 11%, 7% and 4% of the pike catch respectively. Pike captured during the 2008 survey ranged in length (class) from 37.0cm to 85.0cm (mean = 54.0cm). Four age classes (2+, 3+, 4+ and 6+) were present accounting for 44%, 11%, 33% and 11% of the pike catch respectively.



**Fig. 4.50. Length frequency distribution of pike in the River Suck (Ballyforan Br.) site, July 2008 (n = 9) and July 2013 (n = 28)**



Roach captured during the 2013 survey ranged in length from 2.5cm to 21.1cm (mean = 9.3cm) (Fig. 4.51). Ten age classes (0+ to 9+) were present, with 1+ and 3+ the dominant age classes present, accounting for 39% and 36% of the roach catch respectively. Roach captured during the 2008 survey ranged in length from 4.0cm to 21.0cm (mean = 10.0cm). Six age classes (1+ to 6+) were present, with 2+ and 3+ the dominant age classes present, accounting for 43% and 29% of the roach catch respectively.



**Fig. 4.51. Length frequency distribution of roach in the River Suck (Ballyforan Br.) site , July 2008 (n = 404) and July 2013 (n = 381)**

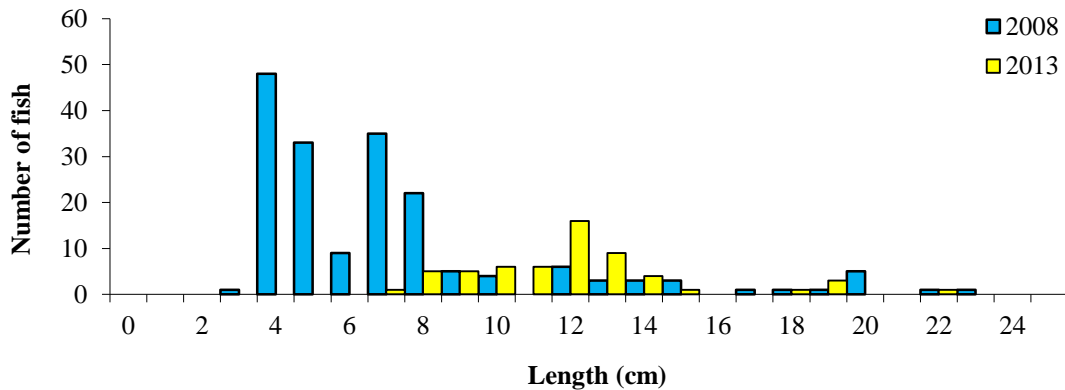
#### River Suck (Cloondacarra Br.)

Eight fish species were recorded in the River Suck (Cloondacarra) during the 2013 survey (Table 4.19). Roach was the most abundant species recorded, followed by perch, minnow, pike, stone loach, gudgeon, European eel and three-spined stickleback.

**Table 4.19. Density of fish (no./m<sup>2</sup>), River Suck (Cloondacarra Br.) site (fish density has been calculated as minimum estimates based on one fishing)**

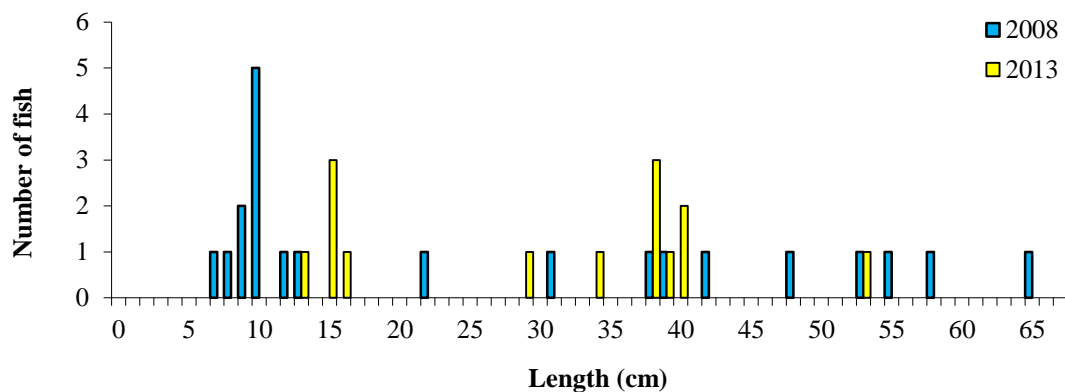
Species	Total minimum density	
	2008	2013
Roach	0.068	0.049
Perch	0.021	0.038
Minnow	0.012	0.005
Pike	0.006	0.004
Stone loach	0.002	0.000
Gudgeon	-	0.002
European eel	0.001	0.000
Three-spined stickleback	0.001	0.001
Brown trout	0.001	-
0+ Brown trout	0.000	-
1++ Brown trout	0.001	-
All Fish	0.111	0.099

Perch captured during the 2013 survey ranged in length from 7.4cm to 22.5cm (mean = 12.4cm) (Fig. 4.52). Perch captured during the 2008 survey ranged in length from 3.5cm to 23.4cm (mean = 7.7cm).



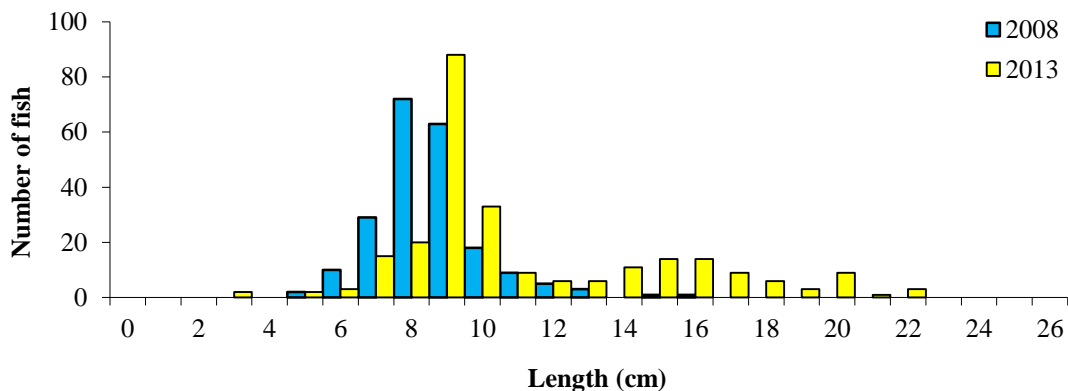
**Fig. 4.52. Length frequency distribution of perch in the River Suck (Cloondacarra Br.) site , July 2008 (n = 58) and July 2013 (n = 182)**

Pike captured during the 2013 survey ranged in length from 13.7cm to 53.5cm (mean = 30.6cm) (Fig. 4.53). Six age classes (0+, 1+, 2+, 3+, 4+ and 5+) were present, accounting for 52%, 10%, 14%, 10%, 10% and 5% of the pike catch respectively. Pike captured during the 2008 survey ranged in length from 7.7cm to 65.2cm (mean = 27.0cm). Four age classes were present (0+, 1+, 2+ and 3+), accounting for 36%, 7%, 50% and 7% of the pike catch respectively.



**Fig. 4.53. Length frequency distribution of pike in the River Suck (Cloondacarra Br.) site , July 2008 (n = 21) and July 2013 (n = 14)**

Roach captured during the 2013 survey ranged in length from 3.6cm to 22.7cm (mean = 11.6cm) (Fig. 4.54). Ten age classes (0+ to 9+) were present, with 2+ and 3+ the dominant age classes present, accounting for 35% and 29% of the roach catch respectively. Roach captured during the 2008 survey ranged in length from 5.5cm to 16.3cm (mean = 9.0cm). Four age classes were present (1+, 2+, 3+ and 4+), accounting for approximately 31%, 61%, 7% and 2% of the roach catch respectively.



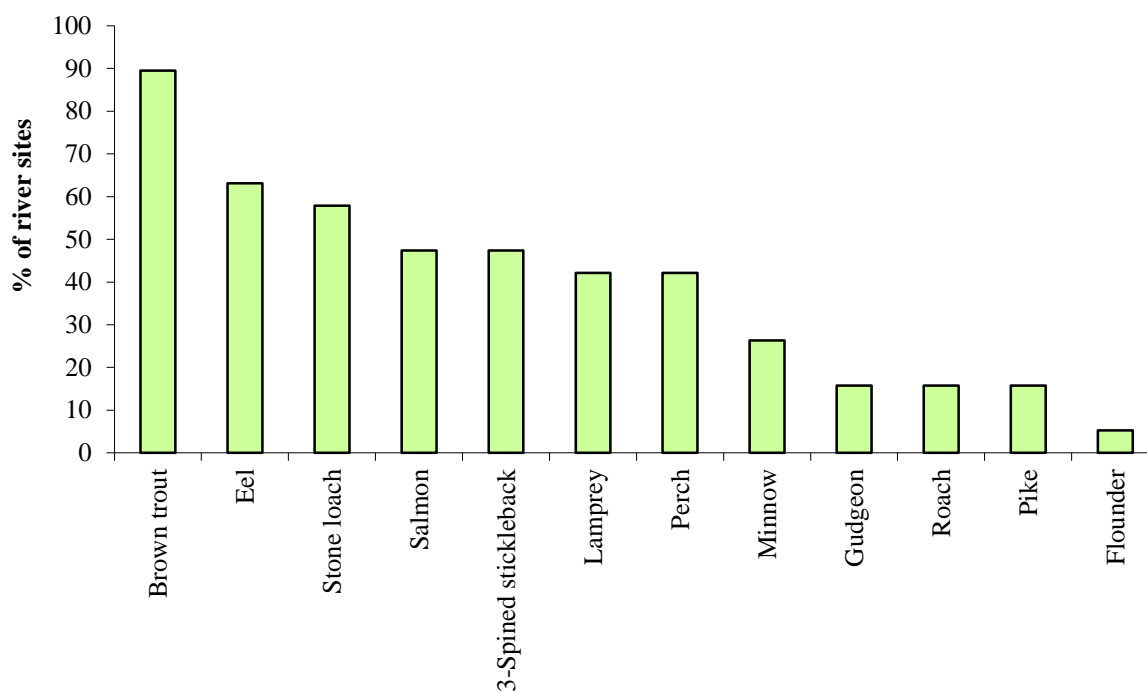
**Fig. 4.54. Length frequency distribution of roach in the River Suck (Cloondacarra Br.) site , July 2008 (n = 213) and July 2013 (n = 254)**



## 4.2 Community Structure

### 4.2 Species distribution

A total of twelve fish species were recorded within the 19 ShIRBD sites surveyed during 2013 (Fig. 4.55). Brown trout was the most common fish species recorded, occurring at 17 of the 19 sites, followed by eels, stone loach, salmon, three-spined stickleback, lamprey, perch, minnow, gudgeon, pike and roach. Flounder were only recorded at one site.

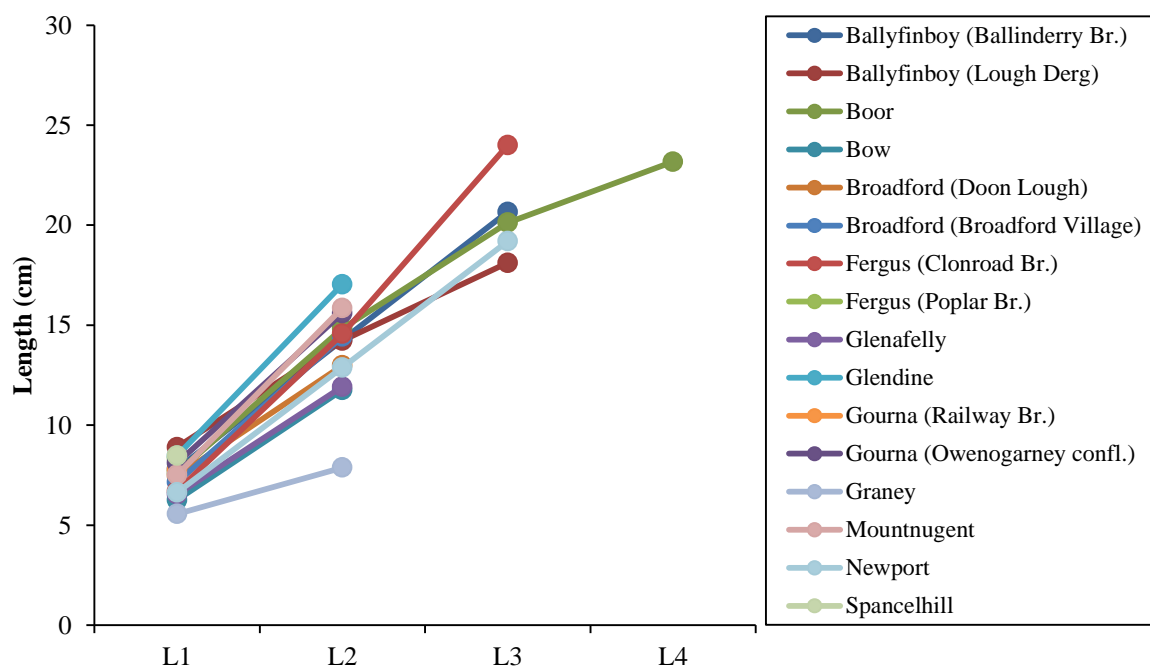


**Fig. 4.55. Percentage of sites where each fish species was recorded in the ShIRBD for WFD SM monitoring 2013**

### 4.3 Age and growth

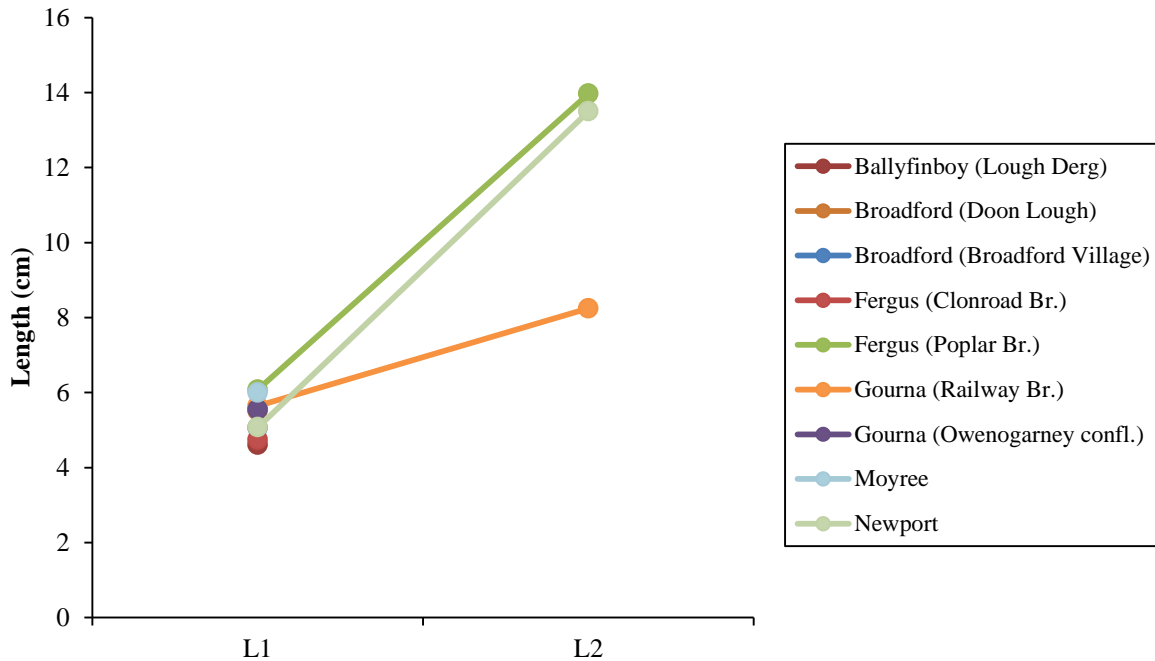
Growth rates based on back-calculated length-at-age data were analysed for selected species in each river sites surveyed in the ShIRBD during 2013.

The mean back-calculated length-at-age data for brown trout in the ShIRBD are shown in Figure 4.56 and Appendix 1. Brown trout were recorded at 17 of the 19 sites, with 16 of these containing brown trout aged 1+ or older. Ages ranged from 0+ to 4+, with fish aged 1+ comprising the most abundant age class within the region. The largest brown trout recorded in the ShIRBD in 2013 was caught in the Fergus River (Clonroad Br.), which measured 29.6cm in length, weighed 277g and was aged 3+. The brown trout at each river site were assigned growth categories described by Kennedy and Fitzmaurice (1971), who examined the relationship between alkalinity and growth of brown trout in Irish streams and rivers. Using this method, the growth rate can only be reliably estimated from fish at sites where individual fish are 2+ or older, and where sufficient numbers are caught. Growth was considered very slow at the Bow River and slow at the Ballyfinboy (Ballinderry Br. and Lough Derg), Boor, Broadford (Broadford Village), Fergus (Clonroad Br.), Mountnugent and Newport Rivers (Appendix 1).



**Fig. 4.56. Back calculated lengths for brown trout in each river site, WFD surveillance monitoring 2013**

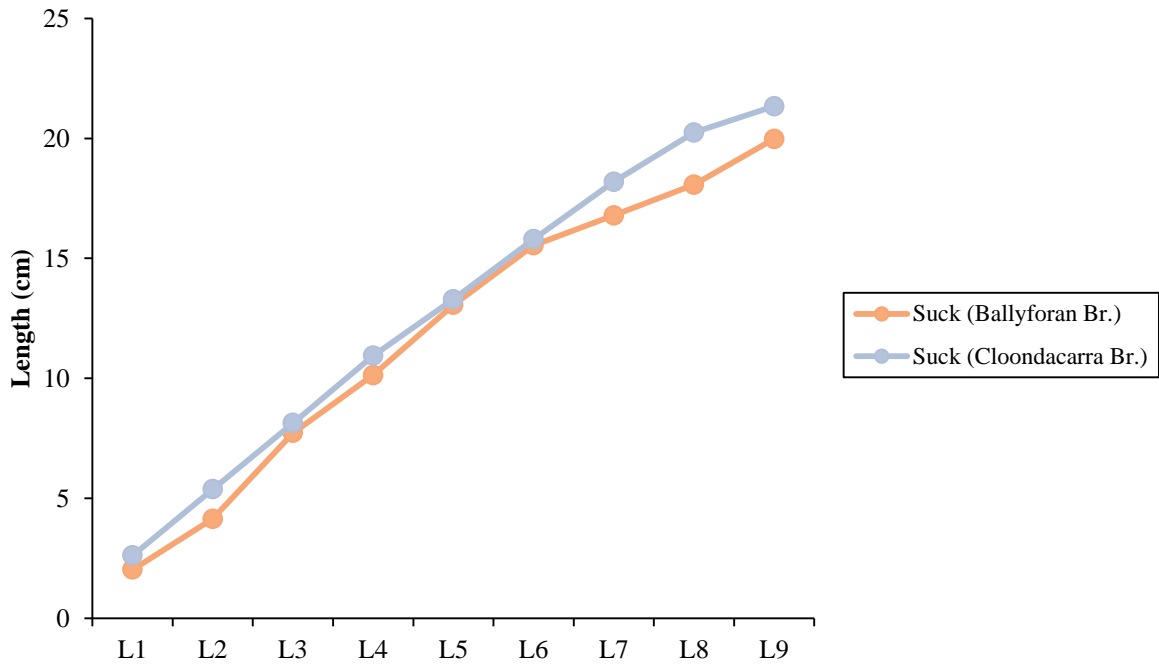
The mean back-calculated length-at-age data for salmon in the ShIRBD are shown in Figure 4.57 and Appendix 2. Salmon were recorded in nine river sites and ranged in age from 0+ to 2+. The most abundant age class was 0+, with those aged 1+ also highly represented. The largest juvenile salmon recorded in the ShIRBD during 2013 was caught at the Newport River site, measured 17.8cm.



**Fig. 4.57. Back calculated lengths for salmon in each river, WFD surveillance monitoring 2013**

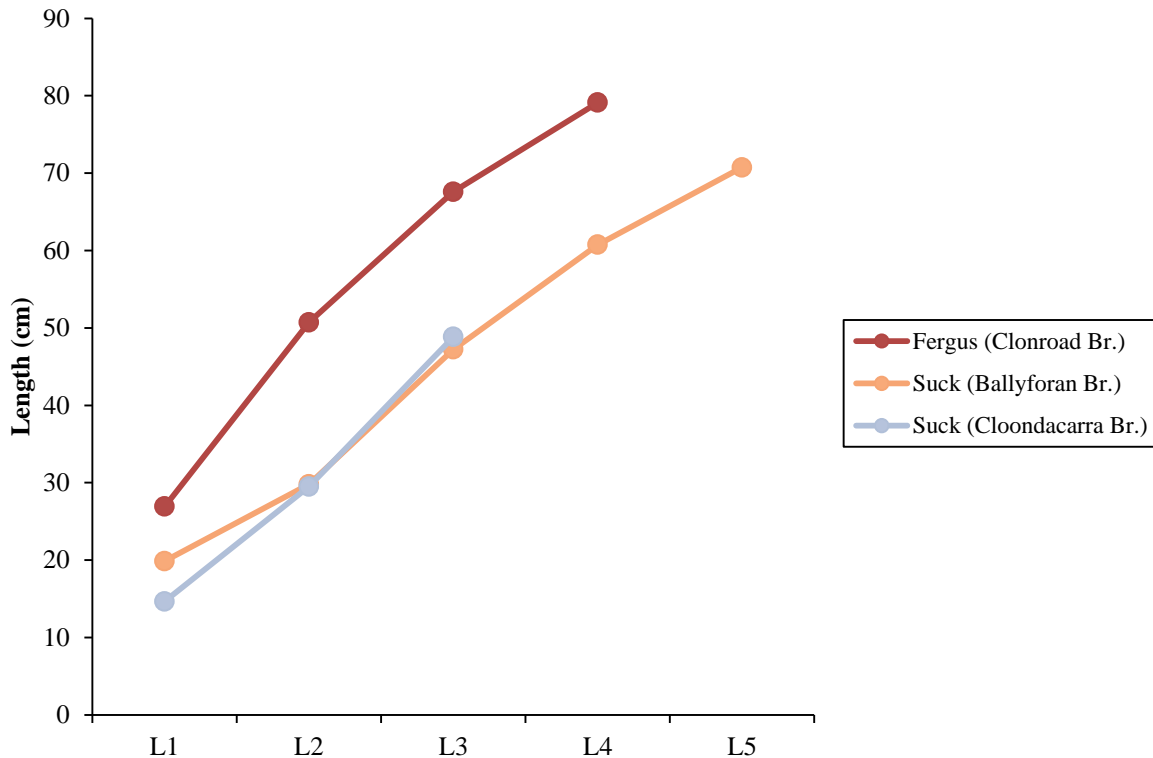
The mean back-calculated length-at-age data for roach in the ShIRBD are shown in Figure 4.58 and Appendix 3. Roach were recorded in only two sites and ranged in age from 0+ to 9+. The most abundant age class was 3+, with those aged 1+ also highly represented. The largest roach recorded in the ShIRBD during 2013 was caught on the River Suck at Cloondacarra Br., measured 22.7cm, weighed 201g and was aged 8+.





**Fig. 4.58. Back calculated lengths for roach in each river site, WFD surveillance monitoring 2013**

The mean back-calculated length-at-age data for pike in the ShIRBD are shown in Figure 4.59 and Appendix 4. Pike were recorded in only three sites and ranged in age from 0+ to 5+. The most abundant age class was 2+. The largest pike recorded in the ShIRBD during 2013 was caught at the River Fergus at Clonroad Br., measured 93.5cm and was aged 4+.



**Fig. 4.59. Back calculated lengths for pike in each river site, WFD surveillance monitoring 2013**

#### 4.4 Ecological status

An essential step in the WFD process is the classification of the ecological status of lakes, rivers and transitional waters, which in turn will assist in identifying objectives that must be set in the individual River Basin District Management Plans. Following an approach similar to that developed by the Environment Agency in England and Wales, the Fisheries Classification Scheme 2 (FCS2) has been developed for the Republic of Ireland and Northern Ireland, along with a separate version for Scotland, to comply with the requirements of the WFD. Agencies throughout each of the three regions contributed data to be used in the model, which was developed under the management of the Scotland & Northern Ireland Forum for Environmental Research (SNIFFER). This method is a geostatistical model based on Bayesian probabilities, that makes probabilistic comparisons of observed fish counts with expected (predicted) fish counts under reference (un-impacted conditions). This classification system (SNIFFER, 2011) generates Ecological Quality Ratings (EQRs) between 1 and 0 for each site, corresponding to the five different ecological status classes of High, Good, Moderate, Poor and Bad. Confidence levels are then assigned to each class and represented as probabilities. The confidence level for a site is expressed as the probability of that site being assigned to each different status class, with the highest class probability being the overall classification.

Using this tool and expert opinion, each site surveyed in 2013 was assigned a draft fish classification status (Table 4.20). Two sites were classed as High, ten as Good and seven as Moderate. When

comparing the status this year with that from previous years, there was an improvement in the River Fergus at Clonroad Br. and all other sites remained unchanged.

**Table 4.20. Ecological status of sites surveyed in the ShIRBD for surveillance monitoring 2013 (figures in brackets indicate confidence of site status being correct)**

River	Site name	Site Code	Previous ecological status	Ecological status 2013
<b>ShIRBD Wadeable sites</b>				
Ballyfinboy	Ballinderry Br._A	25B020750A	Mod (2012)	Moderate
Ballyfinboy	Lough Derg_A	25B020800A	Mod (2009)	Moderate
Boor	Kilbillaghan Br._B	26B071100B	Good (75%)(2008), Good (82%)(2011)	Good
Bow	Bow Br._A	25B100100A	Good (82%)(2008), Mod (75%)(2011)	Moderate (99%)
Broadford	Doon Lough_A	27B020800A	Good (2009)	Good
Broadford	Broadford (Broadford Village)_A	27B020700A		Good
Fergus	Poplar Br._B	27F010100B		Good (89%)
Glenafelly	Glenafelly Br._A	25G210010A	Good (2008)	Good
Glendine	Knockloskeraun Br._A	28G020200A	Good (81%)(2009)	Good (84%)
Gourna	Railway Br._A	27G020600A	High (100%)(2011)	High (95%)
Gourna	Owenogarney confl._C	27G020550C	High (100%)(2011)	High (100%)
Graney	Caher Br._A	25G040025A	Good (2008), Good (2011)	Good
Mountnugent	Mountnugent Br._A	26M020500A	Good (2008), Good (72%)(2011)	Good
Moyree	Fergus Br._A	27M020700A	Mod (99%)(2009)	Moderate
Newport	Rossaguile Br._A	25N020150A		Good (90%)
Spancelhill	Spancelhill_A	27S030200A	Mod (2002)	Moderate (94%)
<b>ShIRBD Non-Wadeable sites</b>				
Fergus	Clonroad Br._A	27F010700A	Mod (99%)(2008)	Good (75%)
Suck	Ballyforan Br._A	26S071100A	Mod (2008)	Moderate (87%)
Suck	Cloondacarra Br._A	26S070300A	Mod (2008)	Moderate

## 5. DISCUSSION

A total of 12 fish species were recorded during the 2013 WFD rivers surveillance monitoring programme for fish in rivers within the ShIRBD. Brown trout was the most common fish species encountered in the ShIRBD, recorded in 17 of the 19 sites, followed by European eel and stone loach. The River Suck (Cloondacarra Br.) was the most diverse site surveyed within the ShIRBD for the Water Framework Directive in 2013 with a total of eight species present. The sites that recorded the lowest diversity in this region were the Glenfelly and Graney Rivers, both with one species present, brown trout. The greatest abundances of brown trout and salmon were both recorded in the Bow and Newport Rivers respectively.

Following the methods of Kennedy and Fitzmaurice (1971), growth could be estimated at some sites. Growth was considered very slow at the Bow River and slow at the Ballyfinboy (Ballinderry Br. and Lough Derg), Boor, Broadford (Broadford Village), Fergus (Clonroad Br.), Mountnugent and Newport Rivers (Appendix 1).

The Fish Classification Scheme 2 (FCS2) tool for assessing the ecological status of rivers has been recently developed for the Republic of Ireland which is compliant with the requirements of the WFD. Using this tool and expert opinion, each site surveyed in 2013 was assigned a draft fish classification status. Two sites were classed as High, ten as Good and seven as Moderate.



## 6. REFERENCES

CEN (2003) *Water Quality — Sampling of Fish with Electricity*. European Standard. Ref. No. EN 14011:2000.

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## APPENDIX 1

Summary of the growth of brown trout in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2	L3	L4	Growth category
<b>Ballyfinboy (Ballinderry)</b>	Mean	7.80	14.27	20.66		Slow
	S.D.	1.95	0.82	n/a		
	S.E.	0.98	0.58	n/a		
	n	4	2	1		
	Min	6.46	13.69	20.66		
	Max	10.67	14.85	20.66		
<b>Ballyfinboy (Lough Derg)</b>	Mean	8.90	14.23	18.11		Slow
	S.D.	1.61	2.76	n/a		
	S.E.	0.38	1.13	n/a		
	n	18	6	1		
	Min	5.91	10.51	18.11		
	Max	12.22	17.55	18.11		
<b>Boor (Kilbillaghan Br.)</b>	Mean	7.63	14.84	20.13	23.18	Slow
	S.D.	1.58	1.59	n/a	n/a	
	S.E.	0.30	0.48	n/a	n/a	
	n	27	11	1	1	
	Min	4.64	12.05	20.13	23.18	
	Max	10.13	17.76	20.13	23.18	
<b>Bow (Bow Br.)</b>	Mean	6.25	11.76			Very Slow
	S.D.	1.36	1.41			
	S.E.	0.22	0.35			
	n	39	16			
	Min	4.00	8.69			
	Max	9.24	14.03			
<b>Broadford (Doon Lough)</b>	Mean	7.46	12.98			n/a
	S.D.	2.36	0.16			
	S.E.	0.96	0.11			
	n	6	2			
	Min	5.23	12.87			
	Max	11.13	13.10			
<b>Broadford (Broadford Village)</b>	Mean	7.15	14.43			Slow
	S.D.	1.23	2.67			
	S.E.	0.25	0.77			
	n	25	12			
	Min	4.61	10.81			
	Max	10.38	18.55			

**APPENDIX 1 continued**

Summary of the growth of brown trout in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2	L3	L4	Growth category
<b>Fergus (Clonroad Br.)</b>	Mean	6.71	14.57	24.00		Slow
	S.D.	1.63	2.85	2.12		
	S.E.	0.32	0.62	0.95		
	n	26	21	5		
	Min	4.08	10.77	20.91		
	Max	9.44	19.86	26.36		
<b>Fergus (Poplar Br.)</b>	Mean	8.33				n/a
	S.D.	1.08				
	S.E.	0.23				
	n	23				
	Min	6.78				
	Max	10.83				
<b>Glenafelly (Glenafelly Br.)</b>	Mean	6.53	11.93			n/a
	S.D.	1.06	n/a			
	S.E.	0.30	n/a			
	n	12	1			
	Min	5.00	11.93			
	Max	8.26	11.93			
<b>Glendine (Knockloskeraun Br.)</b>	Mean	8.46	17.04			n/a
	S.D.	1.14	n/a			
	S.E.	0.28	n/a			
	n	17	1			
	Min	6.65	17.04			
	Max	10.86	17.04			
<b>Gourna (Railway Br.)</b>	Mean	7.76				n/a
	S.D.	1.30				
	S.E.	0.34				
	n	15				
	Min	5.81				
	Max	10.15				
<b>Gourna (Owenogarney confl.)</b>	Mean	8.10	15.61			n/a
	S.D.	1.85	1.34			
	S.E.	0.35	0.95			
	n	28	2			
	Min	4.03	14.66			
	Max	11.81	16.55			

**APPENDIX 1 continued**

Summary of the growth of brown trout in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2	L3	L4	Growth category
<b>Graney (Caher Br.)</b>	Mean	5.56	7.88			n/a
	S.D.	0.91	n/a			
	S.E.	0.21	n/a			
	n	18	1			
	Min	3.91	7.88			
	Max	7.82	7.88			
<b>Mountnugent (Mountnugent)</b>	Mean	7.51	15.86			Slow
	S.D.	1.76	0.80			
	S.E.	0.30	0.36			
	n	35	5			
	Min	4.82	15.07			
	Max	11.83	17.12			
<b>Newport (Rossaguile Br.)</b>	Mean	6.63	12.88	19.19		Slow
	S.D.	1.28	2.02	2.31		
	S.E.	0.23	0.40	1.63		
	n	32	25	2		
	Min	3.69	9.38	17.56		
	Max	9.76	16.53	20.83		
<b>Spancelhill (Spancelhill)</b>	Mean	8.47				n/a
	S.D.	1.46				
	S.E.	0.84				
	n	3				
	Min	7.03				
	Max	9.95				



## APPENDIX 2

Summary of the growth of salmon in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2
<b>Ballyfinboy (Lough Derg)</b>	Mean	4.60	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	4.60	
	Max	4.60	
<b>Broadford (Doon Lough)</b>	Mean	5.51	
	S.D.	0.83	
	S.E.	0.26	
	n	10	
	Min	3.78	
	Max	6.80	
<b>Broadford (Broadford Village)</b>	Mean	5.06	
	S.D.	0.69	
	S.E.	0.17	
	n	17	
	Min	4.00	
	Max	6.54	
<b>Fergus (Clonroad Br.)</b>	Mean	4.74	
	S.D.	1.07	
	S.E.	0.34	
	n	10	
	Min	3.59	
	Max	6.57	
<b>Fergus (Poplar Br.)</b>	Mean	6.08	13.97
	S.D.	1.07	0.14
	S.E.	0.25	0.10
	n	19	2
	Min	4.71	13.87
	Max	8.92	14.07
<b>Gourna (Railway Br.)</b>	Mean	5.64	8.25
	S.D.	0.78	n/a
	S.E.	0.18	n/a
	n	18	1
	Min	4.12	8.25
	Max	6.83	8.25

**APPENDIX 2 continued**

**Summary of the growth of salmon in rivers (L1=back calculated length at the end of the first winter etc.)**

<b>River</b>		<b>L1</b>	<b>L2</b>
<b>Gourna (Owenogarney confl.)</b>	Mean	5.55	
	S.D.	0.73	
	S.E.	0.18	
	n	17	
	Min	4.08	
	Max	7.08	
<b>Moyree (Fergus Br.)</b>	Mean	6.00	
	S.D.	1.06	
	S.E.	0.25	
	n	18	
	Min	4.09	
	Max	7.85	
<b>Newport (Rossaguile Br.)</b>	Mean	5.07	13.50
	S.D.	1.11	n/a
	S.E.	0.24	n/a
	n	22	1
	Min	3.74	13.50
	Max	8.64	13.50

### APPENDIX 3

#### Summary of the growth of roach in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2	L3	L4	L5	L6	L7	L8	L9
<b>Suck (Ballyforan Br.)</b>	Mean	2.03	4.15	7.73	10.14	13.06	15.55	16.79	18.07	19.98
	S.D.	0.62	0.82	1.56	1.42	1.20	1.32	1.69	0.68	n/a
	S.E.	0.07	0.11	0.21	0.26	0.23	0.37	0.84	0.40	n/a
	n	79	60	55	31	26	13	4	3	1
	Min	1.02	2.55	4.24	6.31	11.07	13.40	15.29	17.47	19.98
	Max	4.00	5.90	11.36	13.53	15.52	17.74	18.89	18.82	19.98
<b>Suck (Cloondacarra Br.)</b>	Mean	2.62	5.38	8.14	10.94	13.29	15.79	18.19	20.25	21.34
	S.D.	0.79	1.23	1.29	1.55	1.57	1.75	1.06	0.75	0.02
	S.E.	0.08	0.14	0.16	0.24	0.26	0.32	0.37	0.33	0.01
	n	89	81	64	43	37	30	8	5	2
	Min	1.12	2.99	5.96	8.21	10.57	12.38	16.31	19.57	21.32
	Max	4.84	8.17	10.85	14.34	16.64	19.55	19.32	21.24	21.35

### APPENDIX 4

#### Summary of the growth of pike in rivers (L1=back calculated length at the end of the first winter etc.)

River		L1	L2	L3	L4	L5
<b>Fergus (Clonroad Br.)</b>	Mean	26.92	50.73	67.60	79.12	
	S.D.	6.70	8.50	8.01	9.48	
	S.E.	3.00	4.91	4.62	6.71	
	n	5.00	3.00	3.00	2.00	
	Min	20.07	43.32	60.13	72.41	
	Max	34.89	60.01	76.06	85.82	
<b>Suck (Ballyforan Br.)</b>	Mean	19.88	29.80	47.23	60.75	70.74
	S.D.	3.54	5.44	5.32	6.23	n/a
	S.E.	0.67	1.13	2.17	3.60	n/a
	n	28.00	23.00	6.00	3.00	1.00
	Min	14.18	22.08	38.36	53.93	70.74
	Max	26.86	40.43	53.29	66.15	70.74
<b>Suck (Cloondacarra Br.)</b>	Mean	14.67	29.52	48.85		
	S.D.	3.52	2.86	n/a		
	S.E.	1.17	1.01	n/a		
	n	9.00	8.00	1.00		
	Min	10.88	26.06	48.85		
	Max	21.98	33.58	48.85		

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**IFI Dublin,  
3044 Lake Drive,  
Citywest Business Campus,  
Dublin 24,  
Ireland**

**[www.fisheriesireland.ie](http://www.fisheriesireland.ie)  
[dublin@fisheriesireland.ie](mailto:dublin@fisheriesireland.ie)  
+353 1 8842 600**