



Sampling Fish for the Water Framework Directive

Rivers 2013

**Western
River Basin District**



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the Western River Basin District, 2013

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1. INTRODUCTION

Fish stock surveys were undertaken in 75 river sites (56 waterbodies) throughout Ireland during the summer of 2013 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). Four of these surveys were carried out at river sites in the Western River Basin District (WRBD) from July to September 2013 by staff from Inland Fisheries Ireland (Table 2.1, 2.2 and Fig. 2.1).

Although fish survey work has 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 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 WRBD, as part of the Water Framework Directive surveillance monitoring programme.

2. STUDY AREA

Four river sites were surveyed in four river catchments within the WRBD during 2013: the Corrib, Kinvarra, Owenboliska and Screeb catchments (Table 2.1). The sites ranged in surface area from 282m² at the Screeb River to 441m² at the Owenboliska River. Sites are divided into two categories for reporting purposes: wadeable sites, which are surveyed with bank-based electric fishing units, and non-wadeable sites, which are surveyed with boat-based electric fishing units. Only wadeable sites were surveyed in this region in 2013. Summary details of each site's location and physical characteristics are given in Tables 2.1 and 2.2, and the distribution of sites throughout the WRBD is shown in Figure 2.1.

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

River	Site name	Catchment	Site Code	Waterbody code
WRBD Wadeable sites				
Abbert River	Bullaun Br._A	Corrib	30A010500A	WE_30_3424
Owenboliska River	Caravan Park_A	Owenboliska	31O010180A	WE_31_2233
Owendalluleegh River	Killafeen Br._A	Kinvarra	29O011000A	WE_29_150
Screeb River	Lough Aughawoolia_A	Screeb	31S010400A	WE_31_2305

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

Site name	Upstream catchment (km ²)	Wetted width (m)	Surface area (m ²)	Mean depth (m)	Max depth (m)
WRBD Non-Wadeable sites					
Abbert (Bullaun Br._A)	211.86	7.80	351	0.28	0.56
Owenboliska (Caravan Park_A)	88.76	11.60	441	0.25	0.51
Owendalluleegh (Killafeen Br._A)	90.48	9.67	387	0.21	0.48
Screeb (Lough Aughawoolia_A)	30.85	11.26	282	0.41	0.60

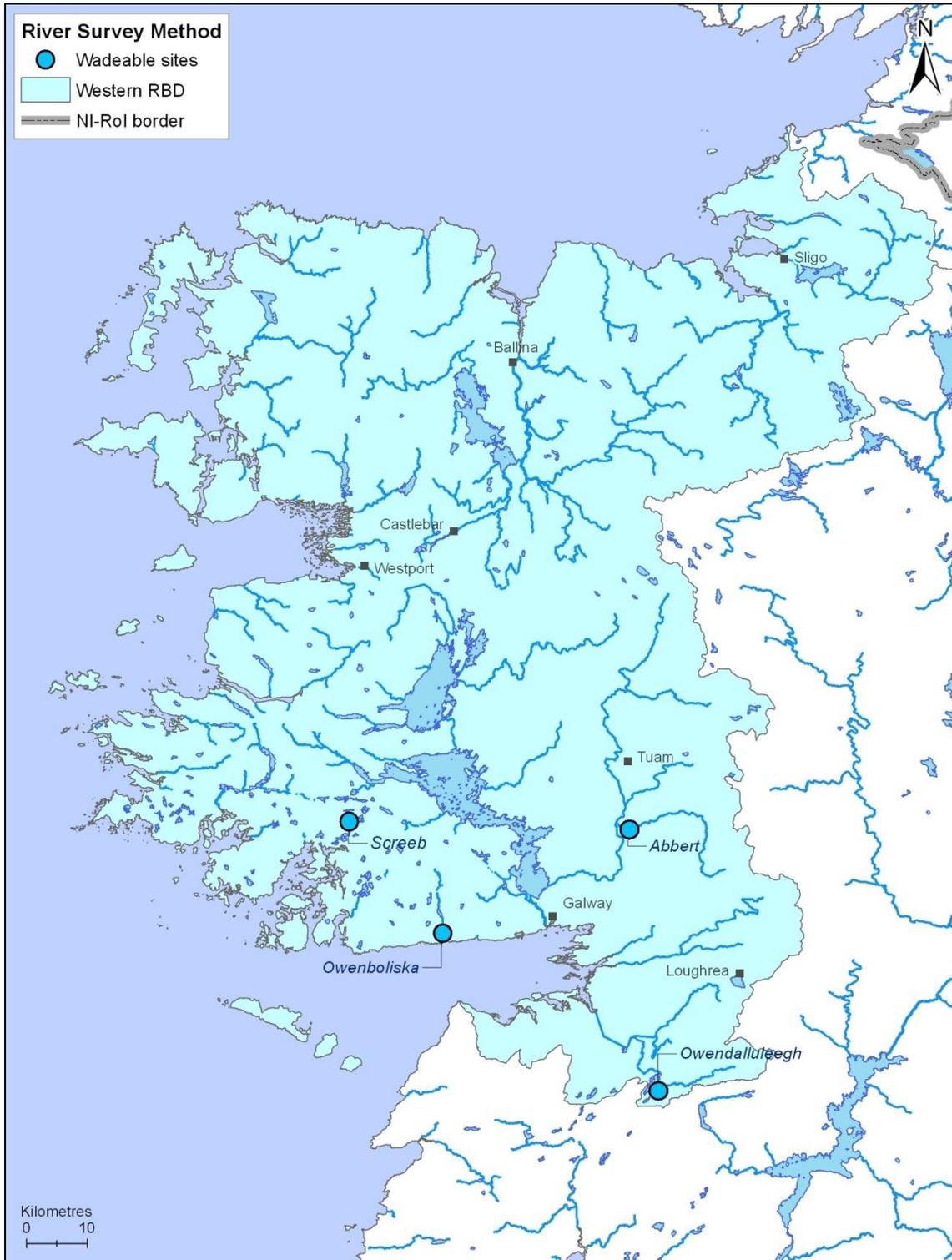


Fig. 2.1. Location map of river sites surveyed throughout the WRBD for WFD fish surveillance monitoring 2013

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 Abbert River

One site was electric fished on the Abbert River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Bullaun Br., approximately 2.5km upstream of the Clare River confluence and 3.5km southeast of Corrofin, Co. Galway (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 27th of August 2013, along a 45m length of channel. Glide dominated the habitat, while the substrate was composed of mainly cobble and gravel. The vegetation at this site was diverse, consisting of a large number of mosses, liverworts and emergent bank-side species.

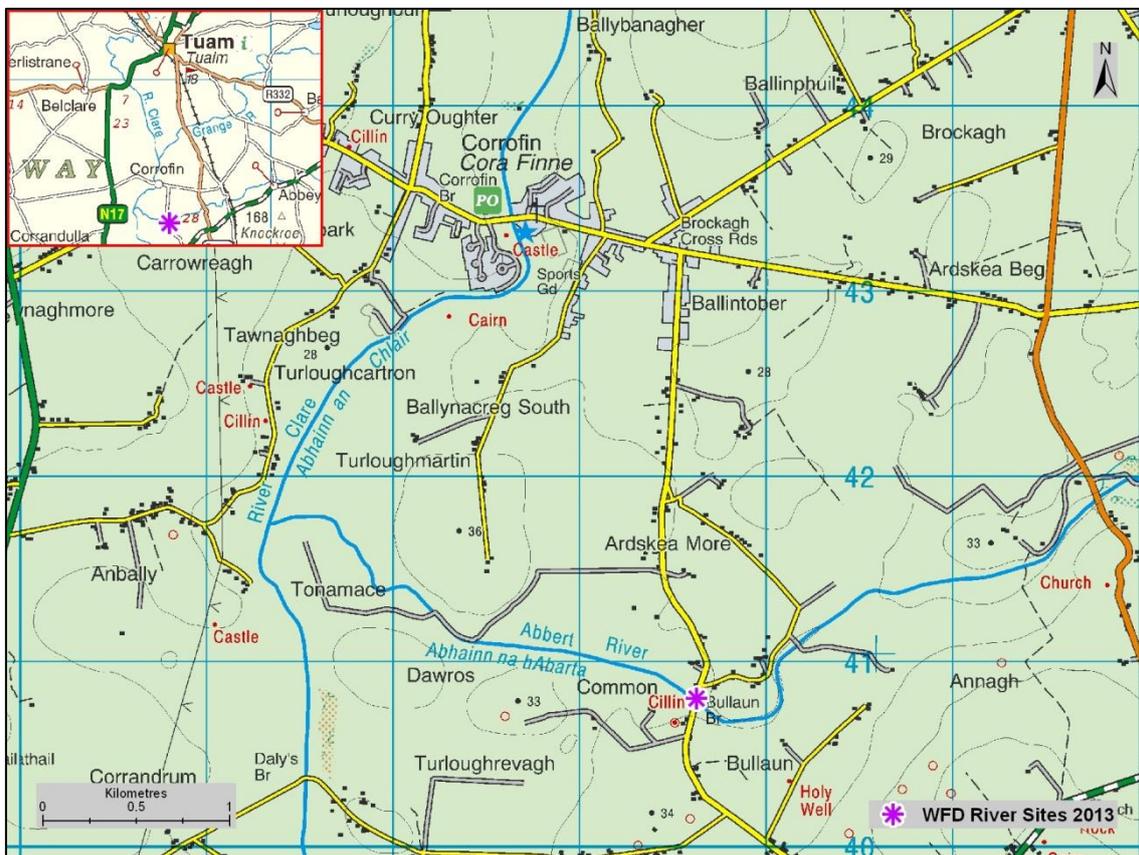


Fig. 4.1. Location of the Abbert River (Bullaun Br.) surveillance monitoring site



Plate 4.1. The Abbart River at Bullaun Br., Co. Galway

Nine fish species were recorded in the Abbart River during the 2013 survey (Table 4.1). Three-spined stickleback was the most common species recorded, followed by salmon, brown trout, roach, stone loach, European eel, lamprey, nine-spined stickleback and perch.

Table 4.1. Density of fish (no./m²), Abbart River (Bullaun Br.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	
	2010	2013
Three-spined stickleback	0.003	0.627
Salmon	0.289	0.330
0+ Salmon	0.090	0.239
1++ Salmon	0.199	0.091
Brown trout	0.174	0.128
0+ Brown trout	0.132	0.088
1++ Brown trout	0.042	0.040
Roach	-	0.014
Stone loach	0.006	0.011
European eel	-	0.003
Lamprey sp.	-	0.003
Nine-spined stickleback	-	0.003
Perch	-	0.003
All Fish	0.472	1.123

Brown trout captured during the 2013 survey ranged in length from 4.2cm to 20.2cm (mean = 8.0cm) (Fig. 4.2). Three age classes (0+, 1+ and 2+) were present, accounting for 80%, 19% and 1% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 3.6cm to 15.9cm (mean = 6.8cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 79%, 20% and 1% of the brown trout catch respectively.

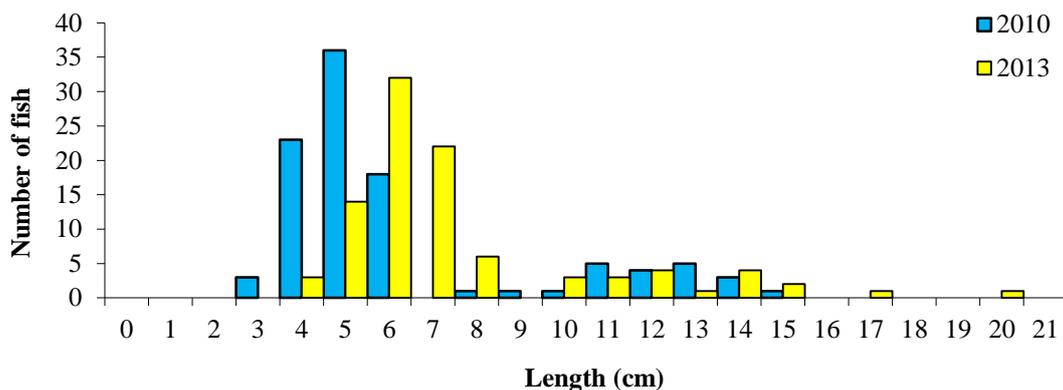


Fig. 4.2. Length frequency distribution of brown trout in the Abbert River (Bullaun Br.), July 2010 (n = 101) and August 2013 (n = 96)

Salmon captured during the 2013 survey ranged in length from 3.8cm to 13.4cm (mean = 6.6cm) (Fig. 4.3). Two age classes (0+ and 1+) were present, accounting for approximately 81% and 19% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 2.6cm to 12.7cm (mean = 7.2cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 39%, 58% and 10% of the salmon catch respectively.

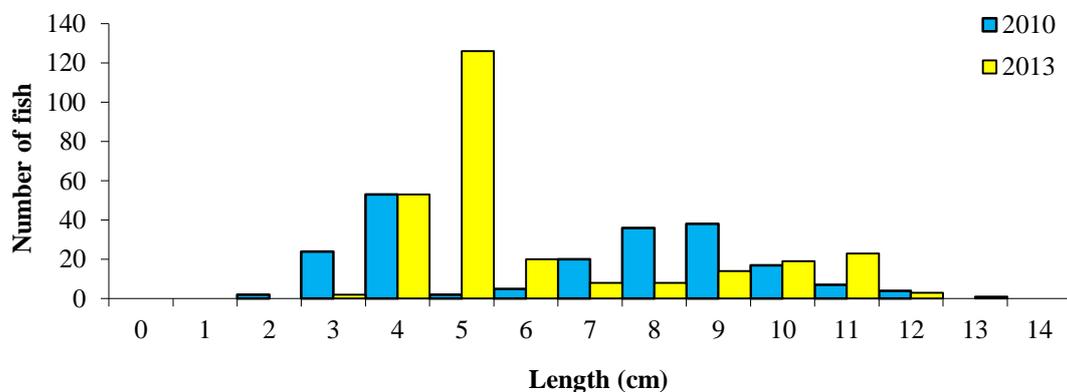


Fig. 4.3. Length frequency distribution of salmon in the Abbert River (Bullaun Br.), July 2010 (n = 208) and August 2013 (n = 277)

4.1.2 The Owenboliska River

One site was electric fished on the Owenboliska River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located approximately 1km north of Spiddal, Co. Galway (Fig. 4.4; Plate 4.2). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 5th of September 2013, along a 38m length of channel. Riffle dominated the habitat, while the substrate consisted mostly of boulder. The vegetation at this site was dominated by bryophytes, with a number of emergent and semi-aquatic riparian species also present.



Fig. 4.4. Location of the Owenboliska River (Caravan Park) surveillance monitoring site



Plate 4.2. The Owenboliska River (Caravan Park), Spiddal, Co. Galway

Three fish species were recorded in the Owenboliska River during the 2013 survey (Table 4.2). Salmon was the most abundant species recorded, followed by brown trout and European eel.

Table 4.2. Density of fish (no./m²), Owenboliska River (Caravan Park) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density 2013
Salmon	0.057
0+ Salmon	0.027
1++ Salmon	0.029
Brown trout	0.052
0+ Brown trout	0.018
1++ Brown trout	0.034
European eel	0.009
All Fish	0.118

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 22.7cm (mean = 12.5cm) (Fig. 4.5). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 28%, 53%, 14% and 6% of the total brown trout catch respectively.

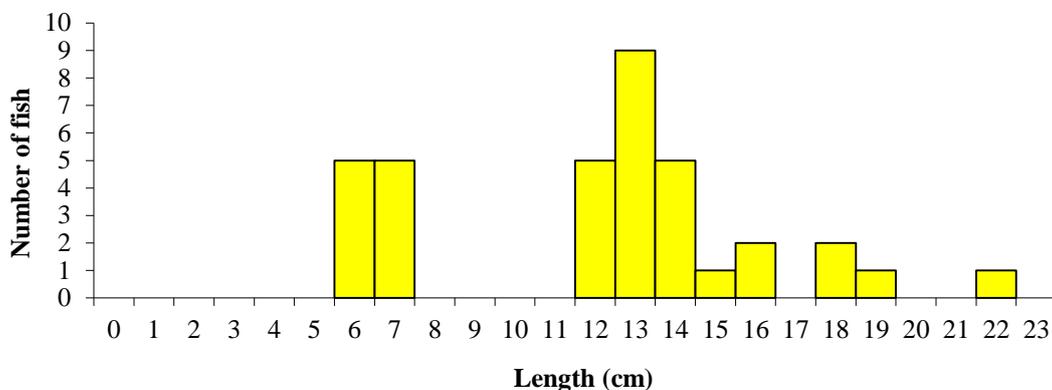


Fig. 4.5. Length frequency distribution of brown trout in the Owenboliska River (Caravan Park), September 2013 (n = 36)

Eels captured during the 2013 survey ranged in length from 7.0cm to 37.0cm (mean = 22.4cm) (Fig. 4.6).

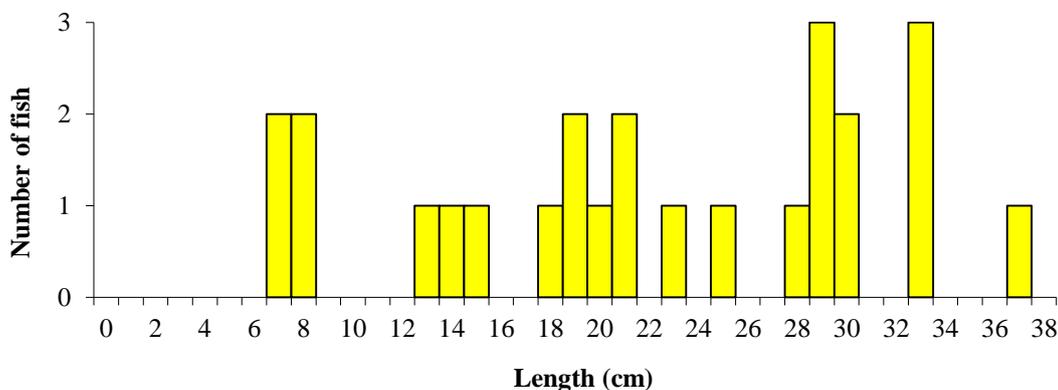


Fig. 4.6. Length frequency distribution of eels in the Owenboliska River (Caravan Park), September 2013 (n = 25)

Salmon captured during the 2013 survey ranged in length from 5.6cm to 12.7cm (mean = 9.3cm) (Fig. 4.7). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 45%, 53% and 2% of the total salmon catch respectively.

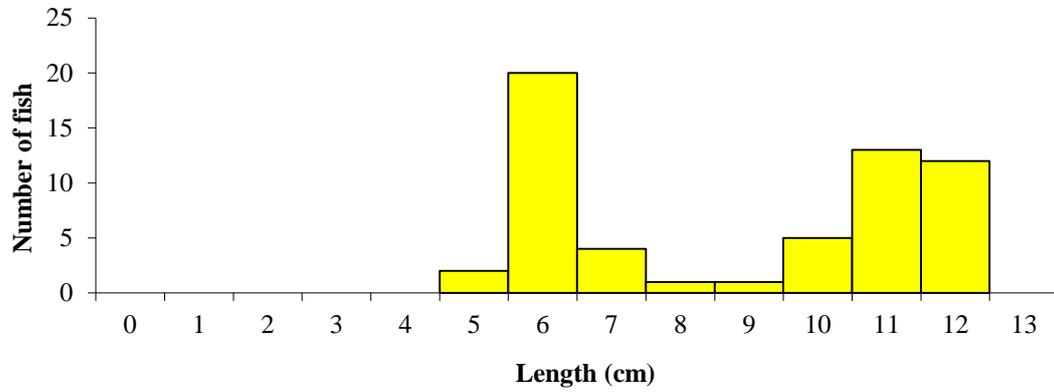


Fig. 4.7. Length frequency distribution of salmon in the Owenboliska River (Caravan Park), September 2013 (n = 58)

4.1.3 The Owendalluleagh River

One site was electric fished on the Owendalluleagh River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Killafeen Br. on the south eastern side of Lough Cutra, Co. Galway (Fig. 4.8; Plate 4.3). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 12th of July 2013, along a 40m length of channel. Glide dominated the habitat, while the substrate was made up of mainly cobble. The vegetation at this site was mainly comprised of a rich variety of bryophytes, with a number of submergent and emergent species also present.

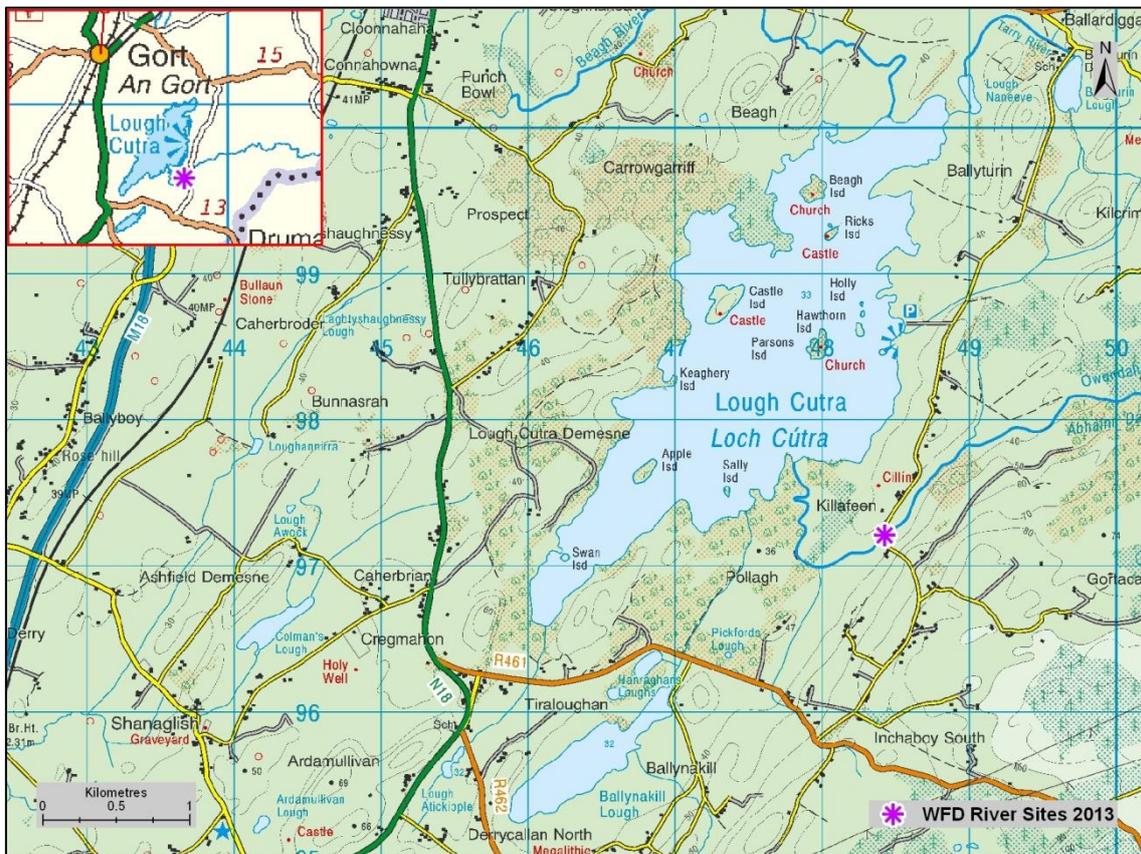


Fig. 4.8. Location of the Owendalluleagh River (Killafeen Br.) surveillance monitoring site



Plate 4.3. The Owendalluleegh River at Killafeen Br., Co. Galway

Six fish species were recorded in the Owendalluleegh River during the 2013 survey (Table 4.3). Brown trout was the most abundant species recorded, followed by European eel, gudgeon, lamprey, perch and stone loach.

Table 4.3. Density of fish (no./m²), Owendalluleegh River (Killafeen Br.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	
	2009	2013
Brown trout	0.067	0.070
0+ Brown trout	0.015	0.010
1++ Brown trout	0.052	0.059
European eel	0.008	0.031
Gudgeon	0.004	0.003
Lamprey sp.	0.002	0.003
Perch	0.002	0.003
Stone loach	0.015	0.003
All Fish	0.099	0.111

Brown trout captured during the 2013 survey ranged in length from 5.2cm to 25.0cm (mean = 13.6cm) (Fig. 4.9). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 20%, 57%, 17% and 6% of the total brown trout catch respectively. Brown trout captured during the 2009 survey

ranged in length from 5.7cm to 29.6cm (mean = 15.1cm). Four age classes were present (0+, 1+, 2+ and 3+), accounting for approximately 24%, 35%, 39% and 2% of the brown trout catch respectively.

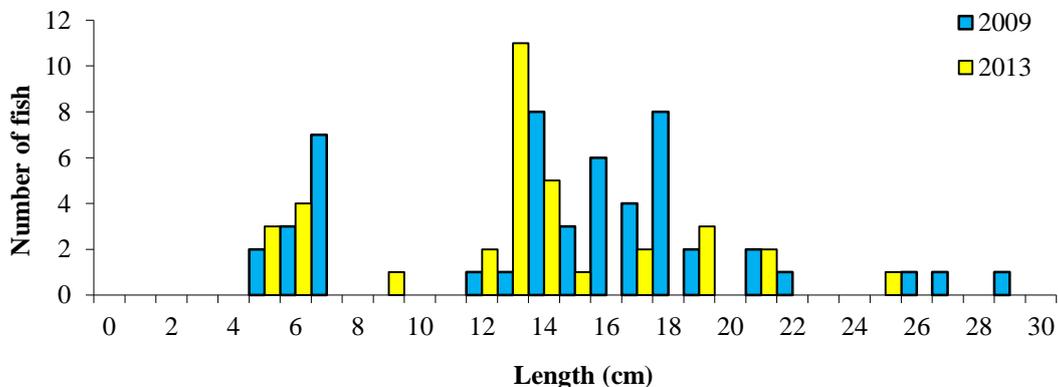


Fig. 4.9. Length frequency distribution of brown trout in the Owendalluleagh River (Killafeen Br.), July 2013 (n = 35)

Eels captured during the 2013 survey ranged in length from 21.6cm to 50.5cm (mean = 30.6cm) (Fig. 4.10). Eels captured during the 2009 survey ranged in length from 21.9cm to 47.6cm (mean = 31.8cm).

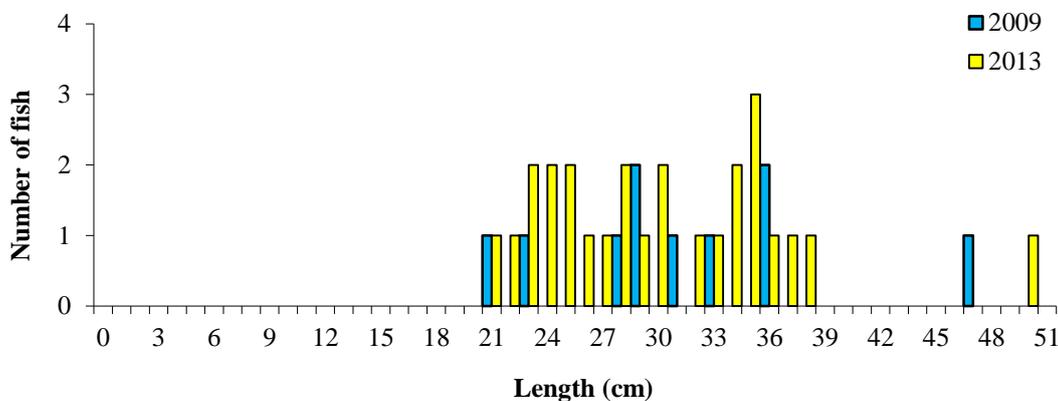


Fig. 4.10. Length frequency distribution of eels in the Owendalluleagh River (Killafeen Br.), July 2013 (n = 26)

4.1.4 The Screeb River

One site was electric fished on the Screeb River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located close to the road, between Loughaunfree and Lough Aughawoolia, approximately 4.5km south of Maam Cross, Co. Galway (Fig. 4.11; Plate 4.4). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 5th of September 2013, along a 25m length of channel. Glide dominated the habitat, while the substrate consisted mostly of cobble. The vegetation at this site was diverse, with bryophytes, submerged, floating and emergent species all present.

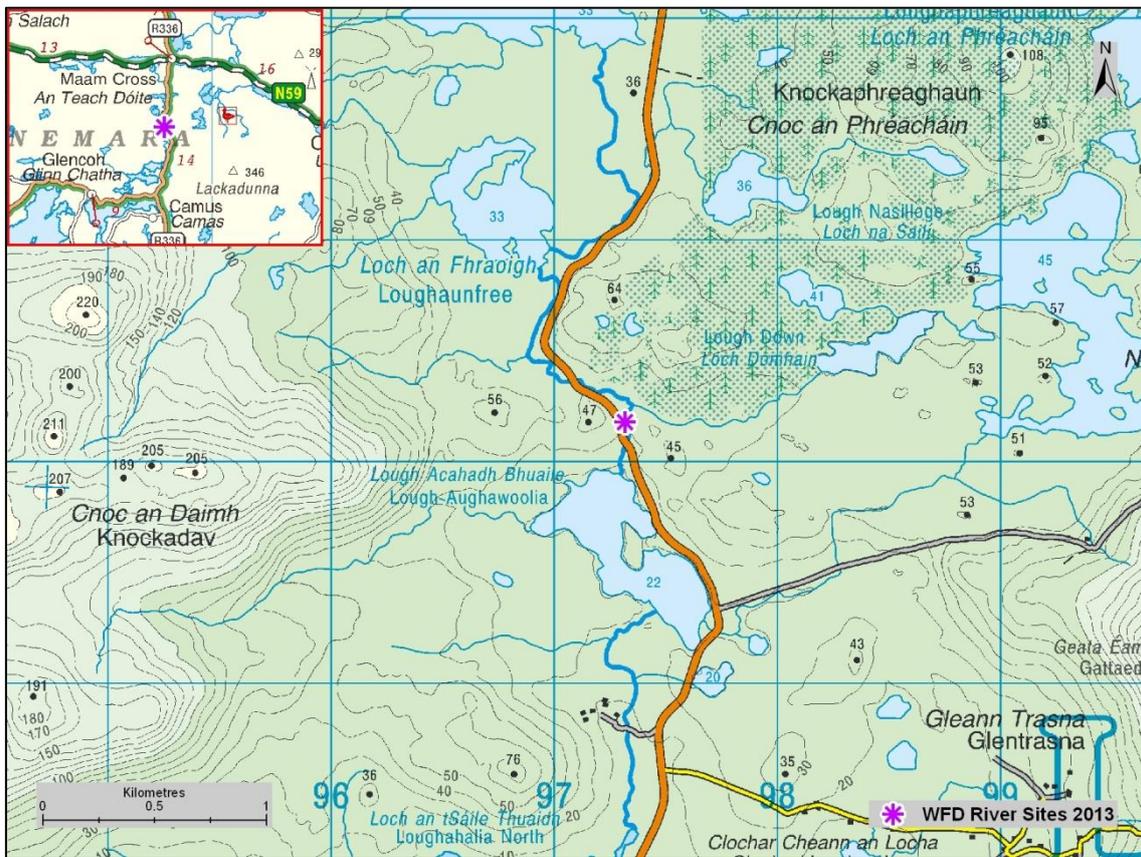


Fig. 4.11. Location of the Screeb River (Lough Aughawoolia) surveillance monitoring site



Plate 4.4. The Screeb River, (Lough Aughawoolia) near Maam Cross, Co. Galway

Four fish species were recorded in the Screeb River during the 2013 survey (Table 4.4). Salmon was the most abundant species recorded, followed by European eel, brown trout and minnow.

Table 4.4. Density of fish (no./m²), Screeb River (Lough Aughawoolia) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density 2013
Salmon	0.036
0+ Salmon	0.000
1++ Salmon	0.036
European eel	0.025
Brown trout	0.018
0+ Brown trout	0.011
1++ Brown trout	0.007
Minnow	0.007
All Fish	0.085

Brown trout captured during the 2013 survey ranged in length from 6.3cm to 13.5cm (mean = 8.7cm) (Fig. 4.12). Two age classes (0+ and 1+) were present, accounting for 75% and 25% of the total brown trout catch respectively.

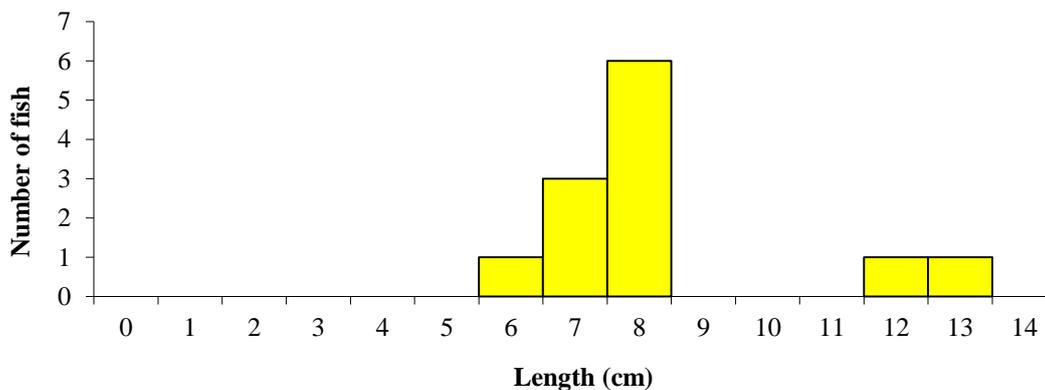


Fig. 4.12. Length frequency distribution of brown trout in the Screeb River (Lough Aughawoolia), September 2013 (n = 12)

Eels captured during the 2013 survey ranged in length from 16.7cm to 50.5cm (mean = 30.3cm) (Fig. 4.13).

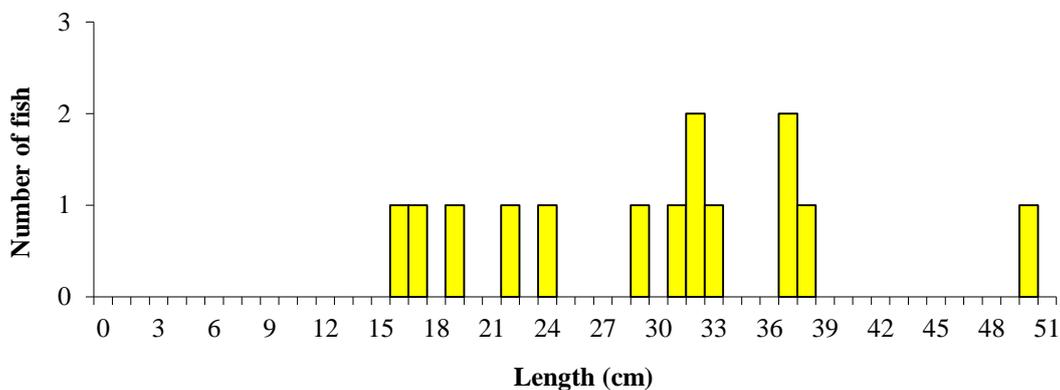


Fig. 4.13. Length frequency distribution of European eel in the Screeb River (Lough Aughawoolia), September 2013 (n = 14)

Salmon captured during the 2013 survey ranged in length from 7.4cm to 15.7cm (mean = 10.6cm) (Fig. 4.14). Although the bimodal graph below suggests that more than one age class was present, only one age class (1+) was observed with the apparent separation size class possibly due to the presence of larger stocked fish at this site.

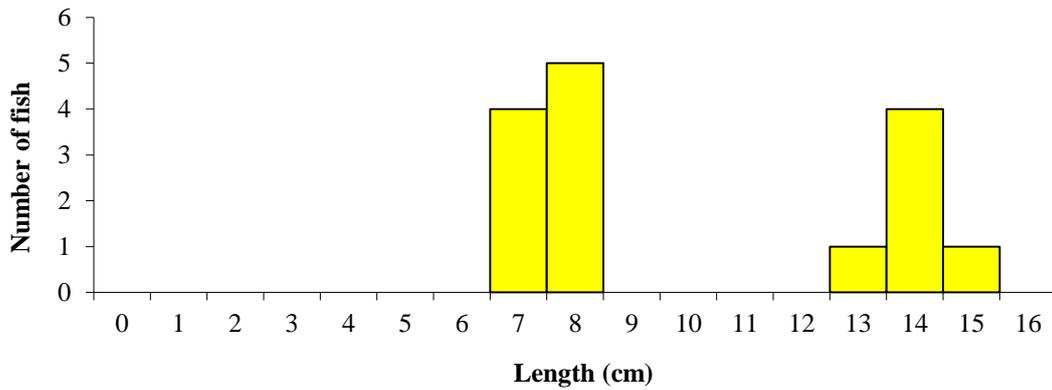


Fig. 4.14. Length frequency distribution of salmon in the Screeb River (Lough Aughawoolia), September 2013 (n = 15)

4.2 Community Structure

A total of 11 fish species were recorded within the four WRBD sites surveyed during 2013 (Fig. 4.15). Brown trout and European eel was the most common fish species recorded, occurring in all four sites, followed by salmon, stone loach, lamprey and perch. Three-spined stickleback, nine-spined stickleback, minnow, gudgeon and roach were only recorded in one site each.

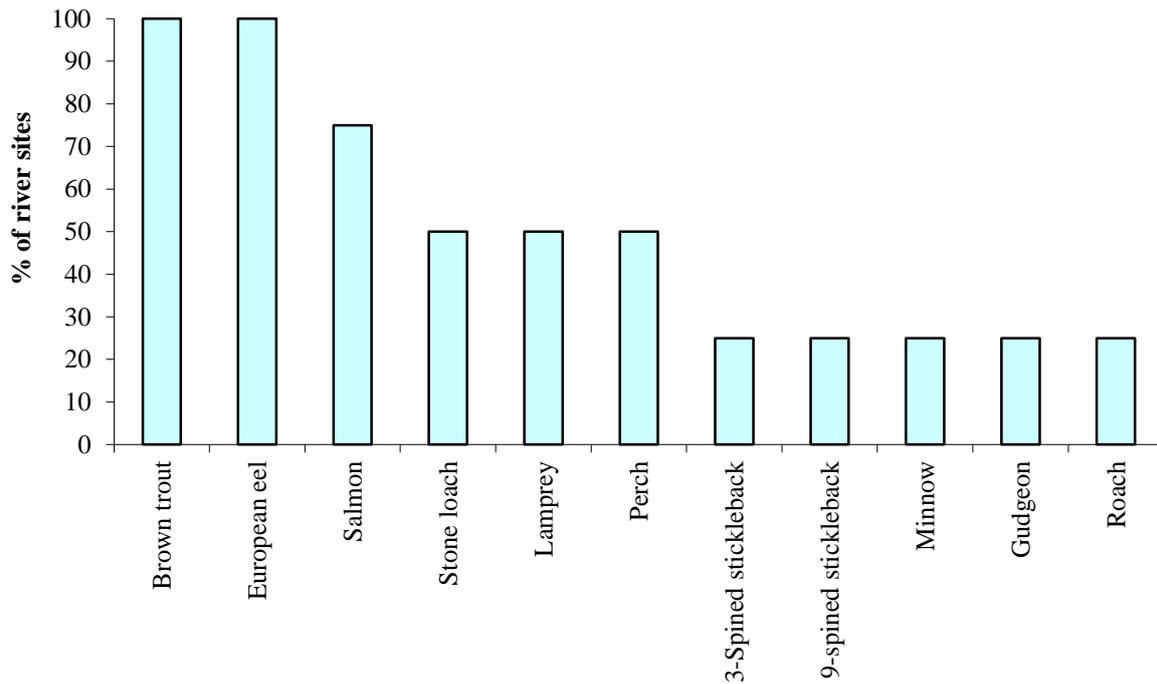


Fig. 4.15. Percentage of sites where each fish species was recorded in the WRBD for WFD SM monitoring 2013

4.3 Age and growth

Growth rates based on back-calculated length-at-age data were analysed for brown trout and salmon in each river site surveyed in the WRBD during 2013.

The mean back-calculated length-at-age data for brown trout in the four river sites WRBD are shown in Figure 4.16 and Appendix 1. Brown trout were recorded in all sites, with each site containing brown trout aged 1+ or older. Ages ranged from 0+ to 3+, with fish aged 0+ and 1+, comprising the most abundant age classes within the region. The largest brown trout recorded in the WRBD in 2013 was caught in the Owendalluleegh River site, measured 25.0cm in length, weighed 152g and was aged 3+. Whenever possible, the brown trout at each river site are 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 could only be reliably estimated from fish at sites where individual fish were 2+ or older and where sufficient numbers were caught. Growth was considered slow in both the Owenboliska and Owendalluleegh Rivers (Appendix 1).

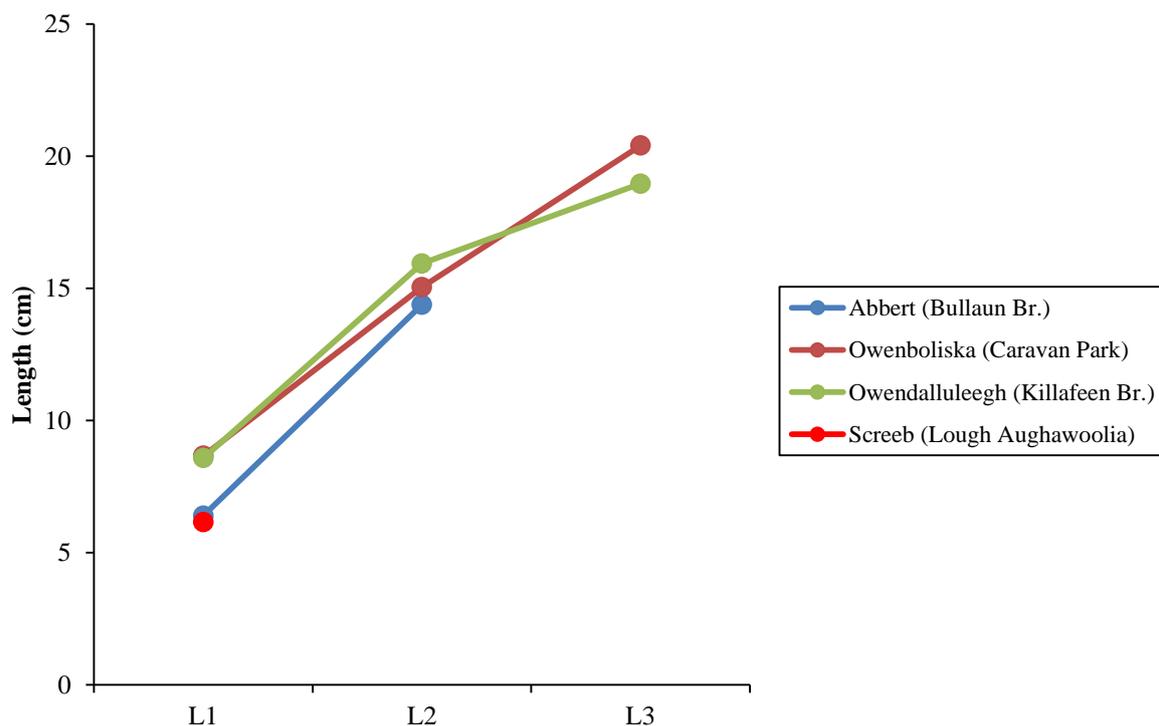


Fig. 4.16. Back calculated length-at-age for brown trout in each river, WFD surveillance monitoring 2013

The mean back-calculated length-at-age data for salmon in the WRBD are shown in Figure 4.17 and Appendix 2. Salmon were recorded in three river sites and ranged in age from 0+ to 2+. The most abundant age class in the Abbert River was 0+, while it was 1+ in both the Owenboliska and Screeb Rivers. The largest juvenile salmon recorded in the WRBD during 2013 was caught in the Screeb River, measured 15.7cm, weighed 47.0g and was aged 1+.

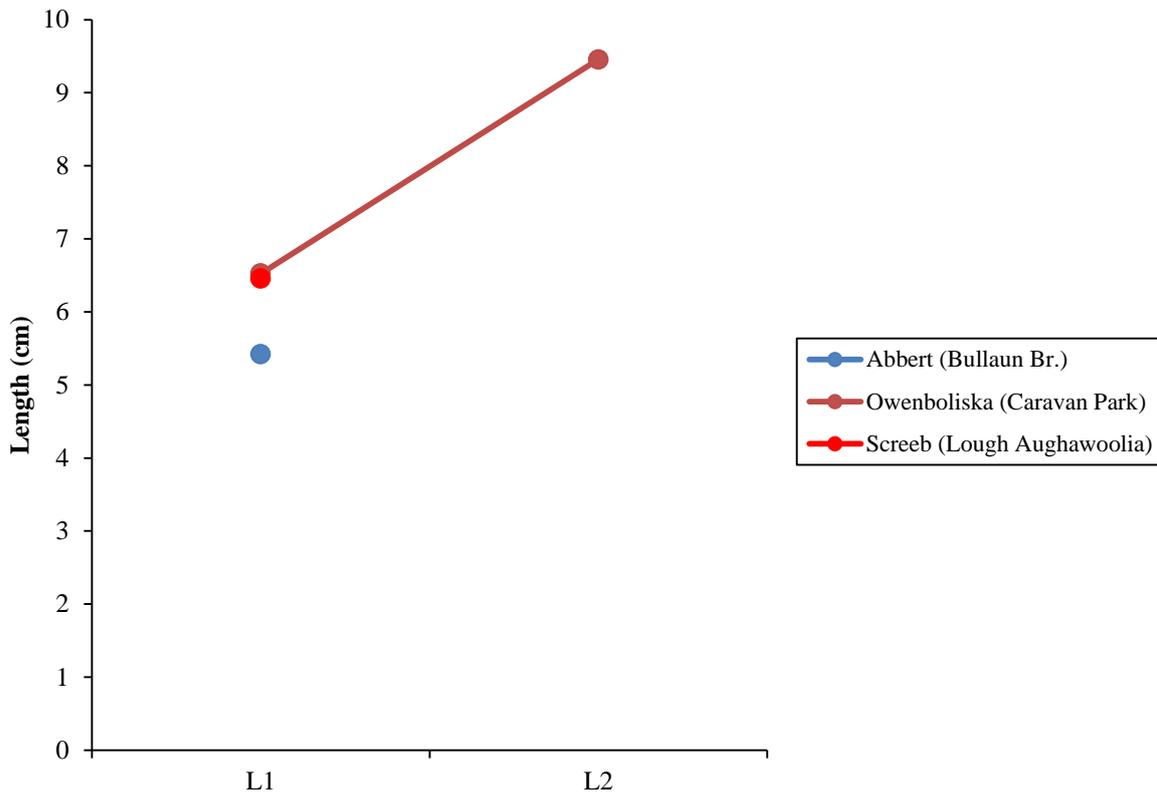


Fig. 4.17. Back calculated length-at-age for salmon in each river, WFD surveillance monitoring 2013

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 4.5). Three sites were classed as Good and one as Moderate. When comparing the status this year with that from previous years, there were no changes at the Abbert and Owendaluleegh sites.

Table 4.5. Ecological status of sites surveyed in the WRBD 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
WRBD Wadeable sites				
Abbert	Bullaun Br._A	30A010500A	Good (92%)(2010)	Good
Owenboliska	Caravan Park_A	31O010180A		Good (78%)
Owendaluleegh	Killafeen Br._A	29O011000A	Moderate (97%)(2009)	Moderate (92%)
Screeb	Lough Aughawoolia_A	31S010400A		Good

5. DISCUSSION

A total of eleven fish species were recorded during the 2013 WFD surveillance monitoring programme for fish in rivers within the WRBD. Brown trout and eels were the most commonly encountered species in the WRBD, recorded in all four sites. The Abbert River was the most diverse site surveyed within the WRBD in 2013 with a total of nine species recorded. The site that recorded the lowest diversity in this region was the Owenboliska site, with only three species (brown trout, salmon and eels) present. The greatest abundances of brown trout and salmon were both recorded in the Abbert River.

Following the methods of Kennedy and Fitzmaurice (1971), growth was deemed slow in both the Owenboliska and Owendalluleagh Rivers.

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. Three sites were classed as Good and one as Moderate.

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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	Growth category
Abbott (Bullaun Br.)	Mean	6.39	14.38		n/a
	S.D.	1.01	n/a		
	S.E.	0.23	n/a		
	n	19	1		
	Min	5.11	14.38		
	Max	8.96	14.38		
Owenboliska (Caravan Park)	Mean	8.66	15.04	20.40	Slow
	S.D.	1.19	2.16	2.52	
	S.E.	0.25	0.82	1.79	
	n	22	7	2	
	Min	6.09	12.08	18.61	
	Max	10.35	18.06	22.18	
Owendalluleagh (Killafeen Br.)	Mean	8.58	15.94	18.96	Slow
	S.D.	0.98	2.95	4.82	
	S.E.	0.20	1.04	3.41	
	n	23	8	2	
	Min	6.60	10.36	15.55	
	Max	10.53	19.82	22.37	
Screeb (Lough Aughawoolia)	Mean	6.15			n/a
	S.D.	0.31			
	S.E.	0.18			
	n	3			
	Min	5.82			
	Max	6.43			

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
Abbert (Bullaun Br.)	Mean	5.42	
	S.D.	0.91	
	S.E.	0.21	
	n	18	
	Min	4.13	
	Max	7.06	
Owenboliska (Caravan Park)	Mean	6.53	9.45
	S.D.	1.14	n/a
	S.E.	0.26	n/a
	n	19	1
	Min	3.47	9.45
	Max	8.40	9.45
Screeb (Lough Aughawoolia)	Mean	6.46	
	S.D.	1.04	
	S.E.	0.30	
	n	12	
	Min	5.10	
	Max	8.13	

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
Abbert (Bullaun Br.)	Mean	4.10	
	S.D.	0.61	
	S.E.	0.20	
	n	9	
	Min	3.21	
	Max	4.84	

A dark blue, trapezoidal shape is positioned on the left side of the page, extending from the top to the bottom. It is partially overlaid by several white, dashed, wavy lines that originate from the left edge and curve across the page towards the right. The lines vary in frequency and amplitude, creating a decorative, wave-like pattern.

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