



Sampling Fish for the Water Framework Directive

Rivers 2013

**South Western
River Basin District**



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the South 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). Twelve of these surveys were carried out at river sites in the South Western River Basin District (SWRBD) 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 ecological status of fish in our rivers is improving or deteriorating.

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

2. STUDY AREA

Twelve river sites were surveyed in five river catchments within the SWRBD during 2013: the Adrigole, Blackwater, Cumberagh, Lee and Owvane catchments (Table 2.1). The sites ranged in surface area from 255m² at the Cumberagh River to 26,566m² at the River Lee (Lee Fields). 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 of each site's location and physical characteristics are given in Tables 2.1 and 2.2, and the distribution of sites throughout the SWRBD is shown in Figure 2.1.

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

River	Site name	Catchment	Site Code	Waterbody code
SWRBD Wadeable sites				
Adrigole River	Glashduff confl._A	Adrigole	21A010150A	SW_21_8052
Araglin River	Elizabeth's Br._A	Blackwater	18A030200A	SW_18_1131
Cumberagh River	Owengarriff confl._A	Cumberagh	21C040400A	SW_21_6162
Dalua River	Liscongill_A	Blackwater	18D010200A	SW_18_394
Licky River	Glenlicky_A	Blackwater	18L010100A	SW_18_2819
Owvane River (Cork)	Pierson's Br._A	Owvane	21O070400A	SW_21_8048
SWRBD Non-Wadeable sites				
Blackwater (Munster), River	Killavullen Br._A	Blackwater	18B021900A	SW_18_2292_5
Blackwater (Munster), River	Lismore Br._A	Blackwater	18B022600A	SW_18_2755
Blackwater (Munster), River	Nohaval Br._A	Blackwater	18B020200A	SW_18_450
Funshion, River	Blackwater confl._A	Blackwater	18F051100A	SW_18_1836
Lee (Cork), River	Inchinossig Br._A	Lee	19L030100A	SW_19_928
Lee (Cork), River	Lee Fields_A	Lee	19L030800A	SW_19_1663

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

Site name	Upstream catchment (km ²)	Wetted width (m)	Surface area (m ²)	Mean depth (m)	Max depth (m)
SWRBD Wadeable sites					
Adrigole (Glashduff confl._A)	26.28	10.02	401	0.27	0.66
Araglin (Elizabeth's Br._A)	64.24	14.00	560	0.25	0.44
Cummeragh (Owengarriff confl._A)	19.79	6.37	255	0.32	0.51
Dalua (Liscongill_A)	86.58	11.12	456	0.21	0.46
Licky (Glenlicky_A)	24.90	5.93	267	0.22	0.44
Owvane (Pierson's Br._A)	71.62	15.36	614	0.32	0.81
SWRBD Non-Wadeable sites					
Blackwater (Munster), (Killavullen Br._A)	1256.72	36.80	16413	1.28	2.00
Blackwater (Munster), (Lismore Br._A)	2381.81	35.67	12947	2.00	3.00
Blackwater (Munster), (Nohaval Br._A)	89.00	11.45	2221	0.27	0.66
Funshion, (Blackwater confl._A)	380.46	14.33	2537	1.04	1.80
Lee (Cork), (Inchinossig Br._A)	31.82	9.50	428	0.21	0.44
Lee (Cork), (Lee Fields_A)	1184.03	59.83	26566	0.88	1.80

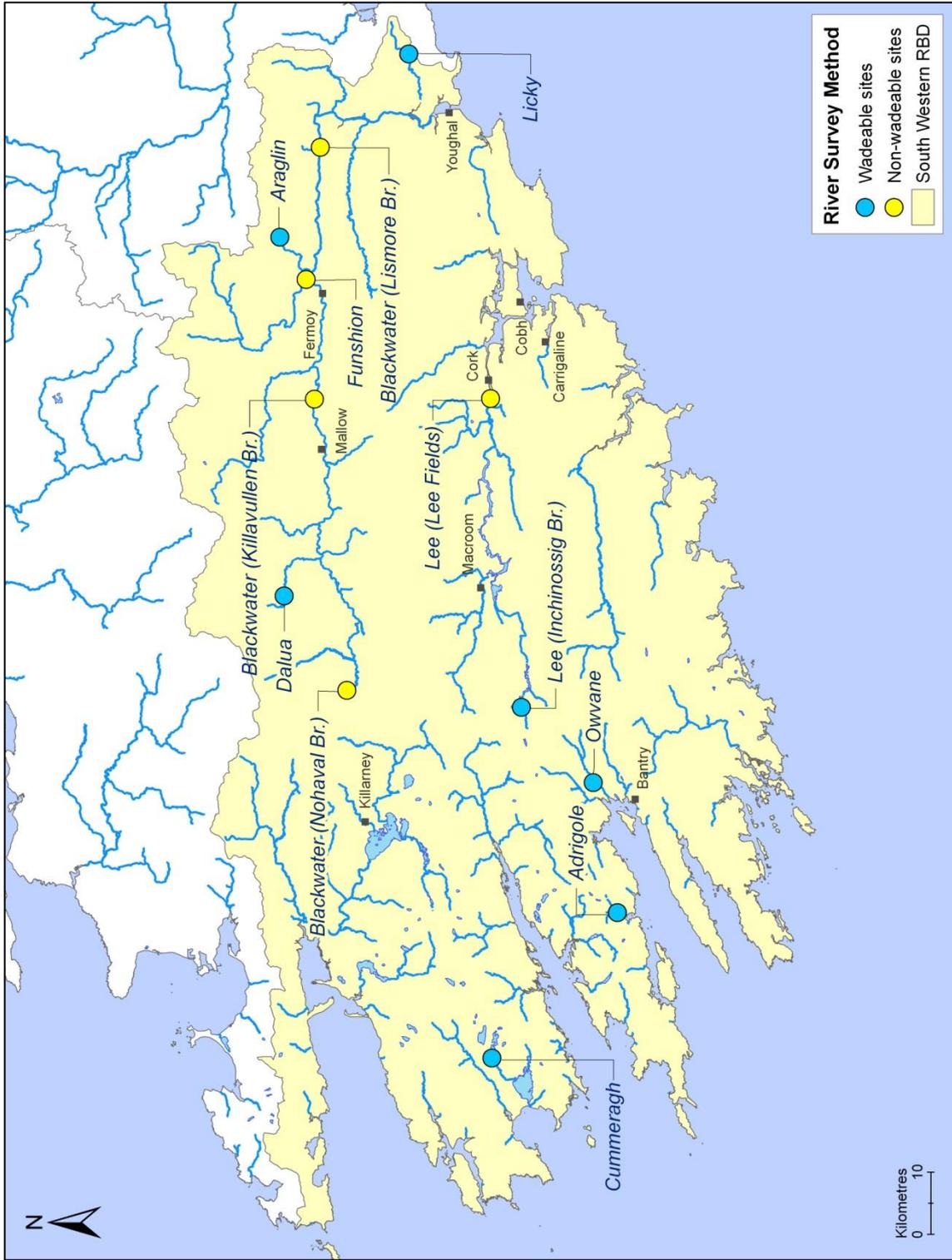


Fig. 2.1. Location map of river sites surveyed throughout the SWRBD for WFD fish surveillance monitoring 2013

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 Adrigole River

One site was electric fished on the Adrigole River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located approximately 2km north of Adrigole, Co. Cork (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 24th of September 2013, along a 40m length of channel. The habitat at this site was an even mix of riffle, glide and pool, while the substrate consisted mainly of boulder and cobble. The vegetation at this site was dominated by bryophytes, with a diverse number of aquatic and semi-aquatic mosses and liverworts present, on the numerous boulders along the stretch.

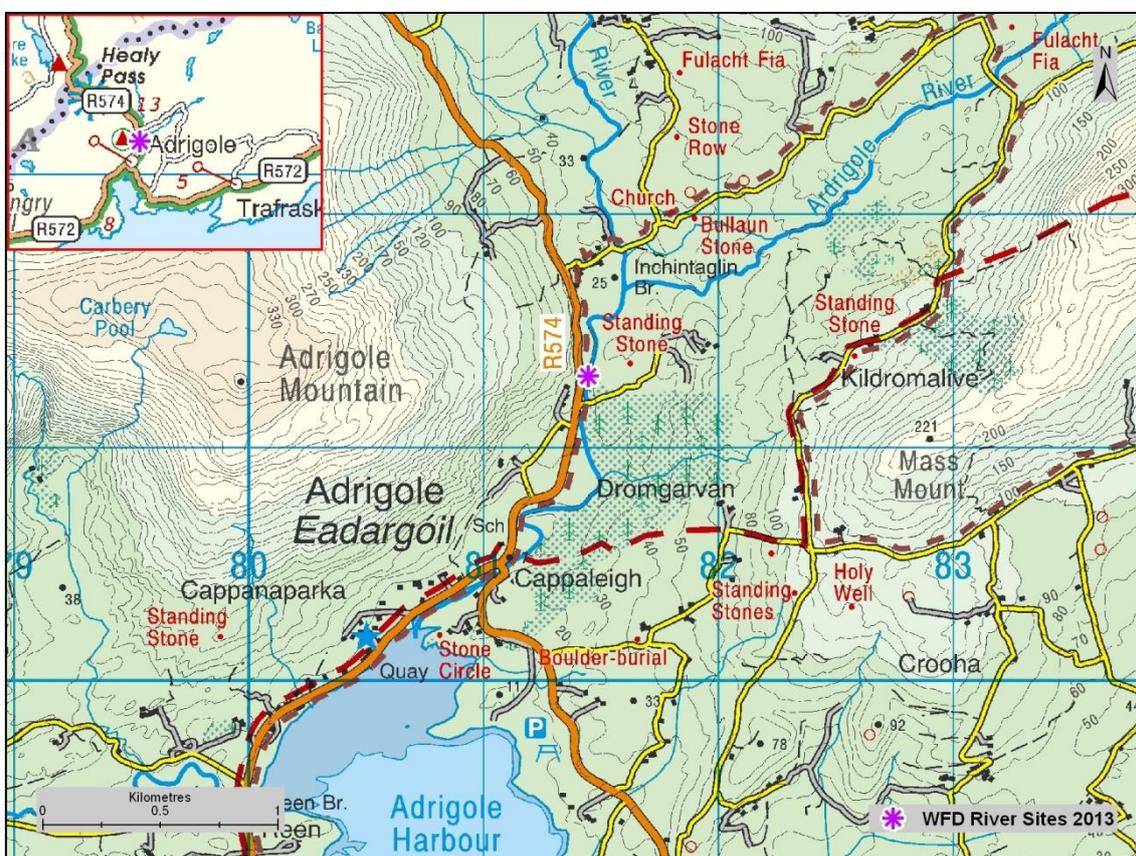


Fig. 4.1. Location of the Adrigole River (Glashduff confl.) surveillance monitoring site



Plate 4.1. The Adrigole River (Glashduff confl.), Adrigole, Co. Cork

Three fish species were recorded in the Adrigole River during the 2013 survey (Table 4.1). Salmon was the most abundant species, followed by brown trout and European eel.

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

Species	Total minimum density	Total minimum density
	2012	2013
Salmon	0.130	0.125
0+ Salmon	0.130	0.047
1++ Salmon	0.000	0.077
Brown trout	0.058	0.065
0+ Brown trout	0.019	0.015
1++ Brown trout	0.040	0.050
European eel	0.023	0.025
All Fish	0.212	0.215

Brown trout captured during the 2013 survey ranged in length from 6.2cm to 19.6cm (mean = 11.8cm) (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 27%, 60%, 10% and 2% of the total brown trout catch respectively. Brown trout captured during the 2012 survey ranged in length from 5.9cm to 18.0cm (mean = 11.9cm). Three age classes were present

(0+, 1+ and 2+), accounting for approximately 36%, 45% and 18% of the brown trout catch respectively.

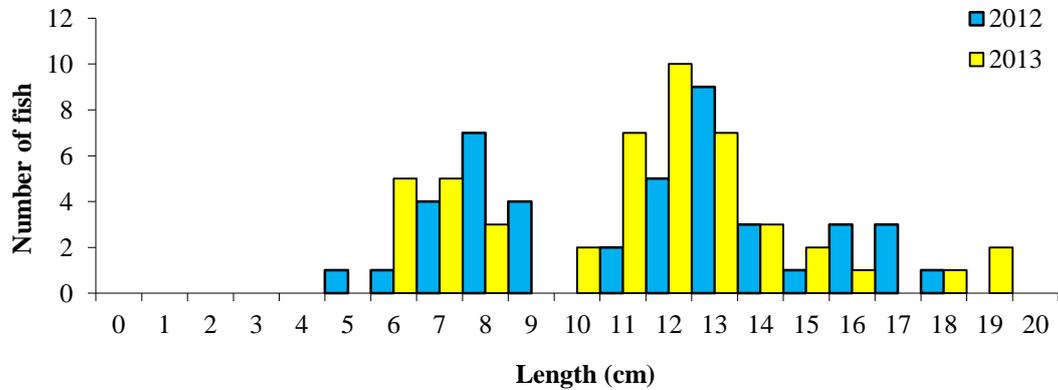


Fig. 4.2. Length frequency distribution of brown trout in the Adrigole River (Glashduff confl.) September 2012 (n = 44) and September 2013 (n = 48)

Salmon captured during the 2013 survey ranged in length from 5.5cm to 13.0cm (mean = 9.2cm) (Fig. 4.3). Two age classes (0+ and 1+) were present, accounting for approximately 41% and 59% of the total salmon catch respectively. Salmon captured during the 2012 survey ranged in length from 5.4cm to 9.6cm (mean = 7.5cm). Only salmon aged 0+ were present.

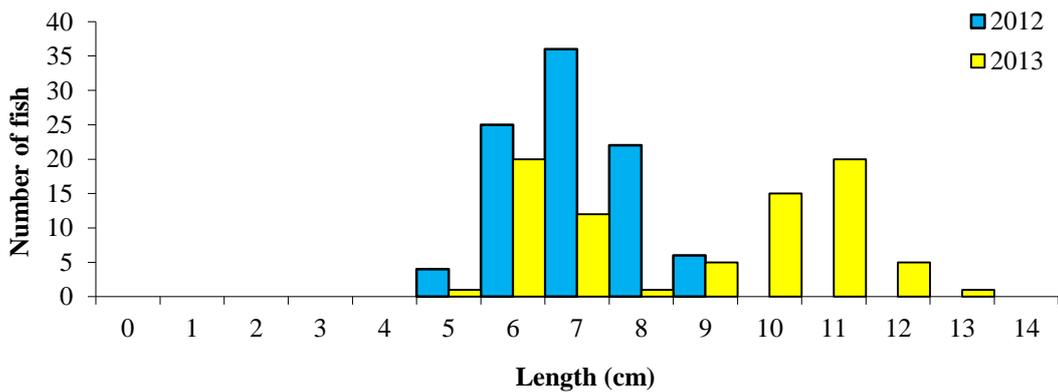


Fig. 4.3. Length frequency distribution of salmon in the Adrigole River (Glashduff confl.), September 2012 (n = 93) and September 2013 (n = 80)

Eels captured during the 2013 survey ranged in length from 14.0cm to 50.5cm (mean = 26.6cm) (Fig. 4.4). Eels captured during the 2012 survey ranged in length from 12.0cm to 30.8cm (mean = 23.0cm).

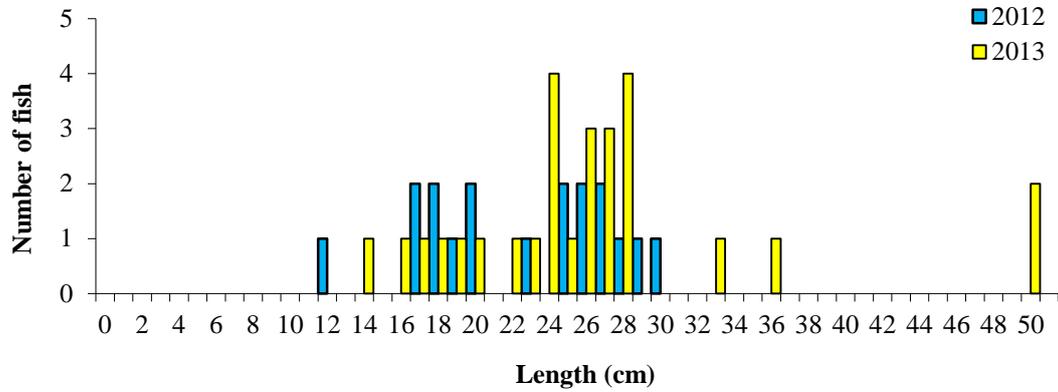


Fig. 4.4. Length frequency distribution of European eel in the Adrigole River (Glashduff confl.), September 2012 (n = 18) and September 2013 (n = 27)

4.1.2 The Araglin River

One site was electric fished on the Araglin River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Elizabeth's Br. approximately 8km northeast of Fermoy, Co. Cork (Fig. 4.5; Plate 4.2). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 25th of July 2013, along a 40m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble and boulder. The vegetation at this site was diverse, with a large number of moss and liverwort species present.

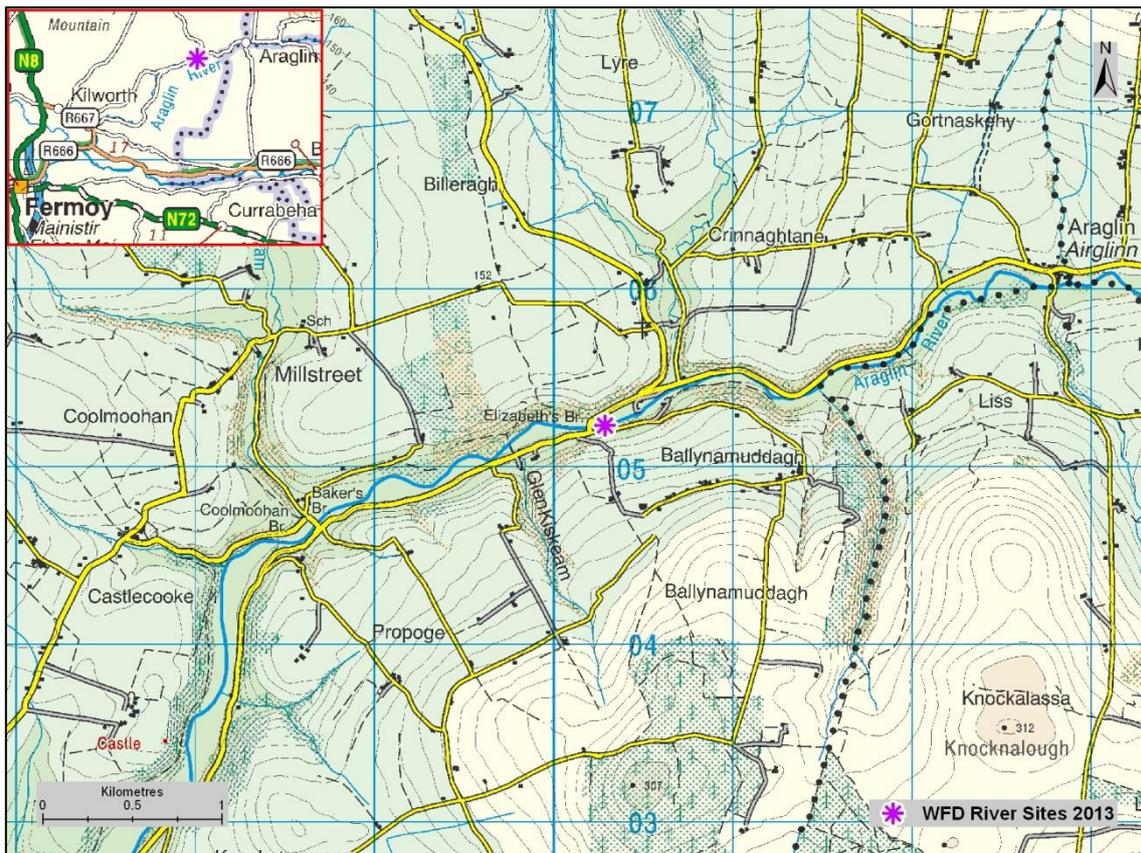


Fig. 4.5. Location of the Araglin River (Elizabeths Br.) surveillance monitoring sites



Plate 4.2. The Araglin River at Elizabeth's Br., Co. Cork

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

Table 4.2. Density of fish (no./m²), Araglin River (Elizabeths Br.) site (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density 2013
Salmon	0.107
0+ Salmon	0.013
1++ Salmon	0.095
Brown trout	0.036
0+ Brown trout	0.013
1++ Brown trout	0.023
European eel	0.016
Lamprey sp.	0.002
All Fish	0.161

Brown trout captured during the 2013 survey ranged in length from 5.6cm to 21.8cm (mean = 11.5cm) (Fig. 4.6). Three age classes (0+, 1+ and 2+) were present, accounting for 27%, 43% and 30% of the total brown trout catch respectively.

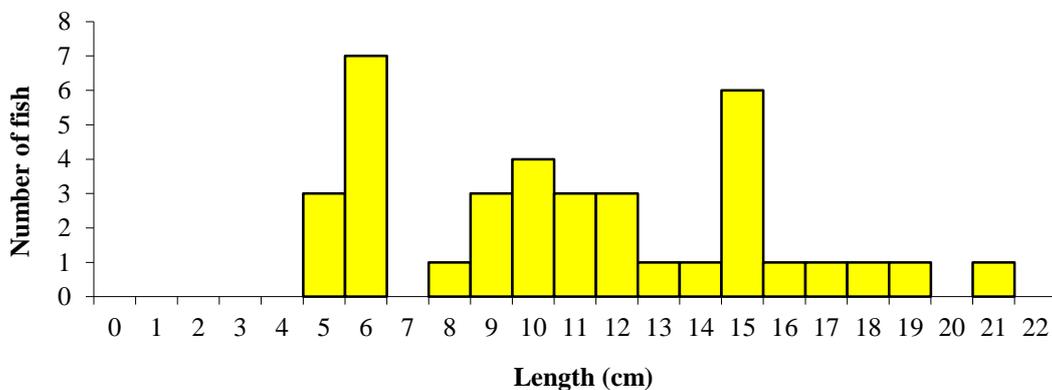


Fig. 4.6. Length frequency distribution brown trout in the Araglin River (Elizabeths Br.), July 2013 (n = 37)

Salmon captured during the 2013 survey ranged in length from 4.9cm to 14.0cm (mean = 9.8cm) (Fig. 4.7). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 9%, 71% and 20% of the total salmon catch respectively.

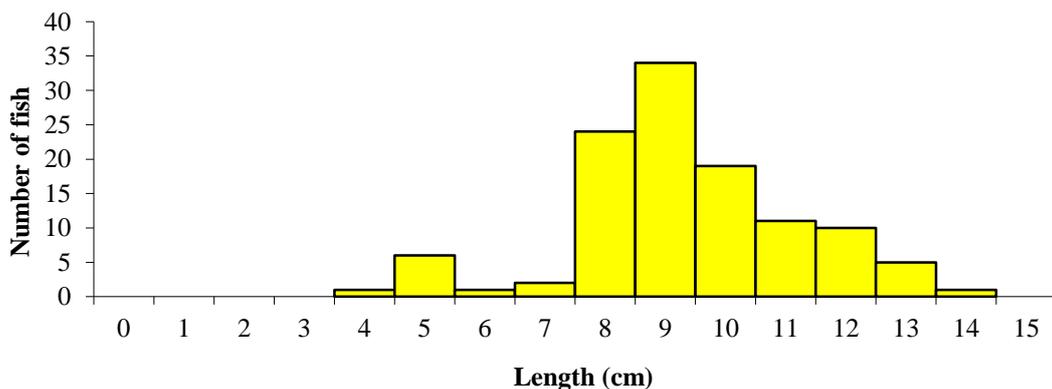


Fig. 4.7. Length frequency distribution salmon in the Araglin River (Elizabeths Br.), July 2013 (n = 114)

Eels captured during the 2013 survey ranged in length from 12.1cm to 33.5cm (mean = 23.5cm) (Fig. 4.8).

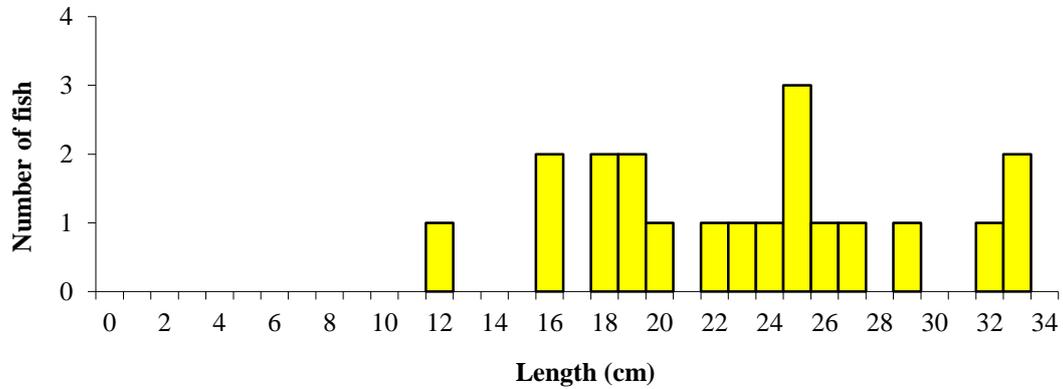


Fig. 4.8. Length frequency distribution of European eel in the Araglin River (Elizabeths Br.), July 2013 (n = 20)

4.1.3 The River Blackwater

Three sites were electric fished on the Munster Blackwater River as part of the WFD surveillance monitoring programme in rivers 2013; the River Blackwater, Killavullen Br., the River Blackwater Lismore and the River Blackwater, Nohaval Br.

The Killavullen survey site was located approximately 500m upstream of Killavullen Br., 9km east of Mallow, Co. Cork (Fig. 4.9; Plate 4.3). One electric-fishing pass was conducted using four boat-based electric fishing units on the 21st of August 2013, along a 446m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble. Vegetation at this site consisted of various groups including floating, submergent and emergent species.

The Lismore survey site was located just upstream of Lismore Br., in Lismore, Co. Waterford (Fig. 4.10; Plate 4.4). One electric-fishing pass was conducted using four boat-based electric fishing units on the 22nd of August 2013, along a 363m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble. Vegetation at this deep site consisted mainly of emergent and riparian bank-side species.

The Nohaval Br. survey site was located approximately 250m upstream of Nohaval Br. approximately 14km northwest of Millstreet, Co. Cork (Fig. 4.11; Plate 4.5). Three electric-fishing passes were conducted using two boat-based electric fishing units on the 2nd of August 2013, along a 194m length of channel. Glide dominated the habitat, while the substrate consisted largely of gravel and cobble. The vegetation at this site was diverse, with a number of bryophytes, floating and riparian species present.

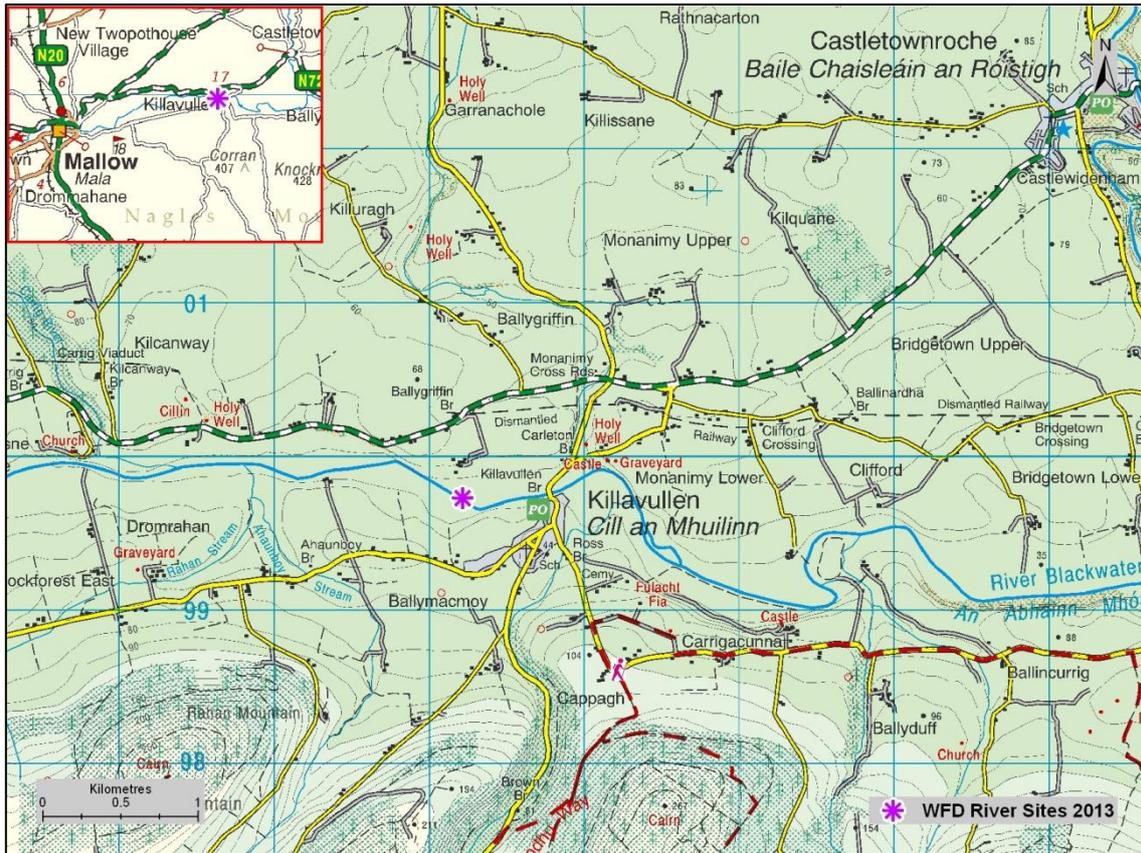


Fig. 4.9. Location of the River Blackwater (Killavullen Br.) surveillance monitoring site



Plate 4.3. The River Blackwater at Killavullen Br., Co. Cork

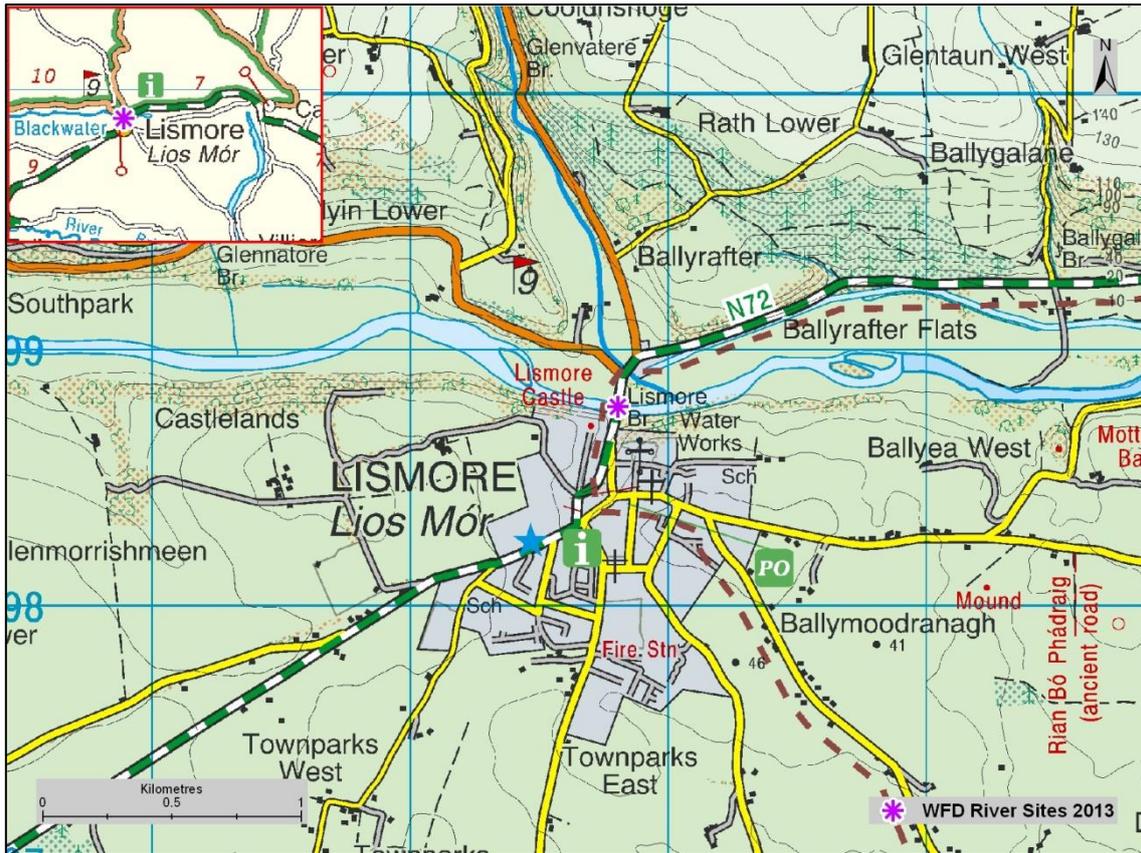


Fig. 4.10. Location of the River Blackwater (Lismore Br.) surveillance monitoring site

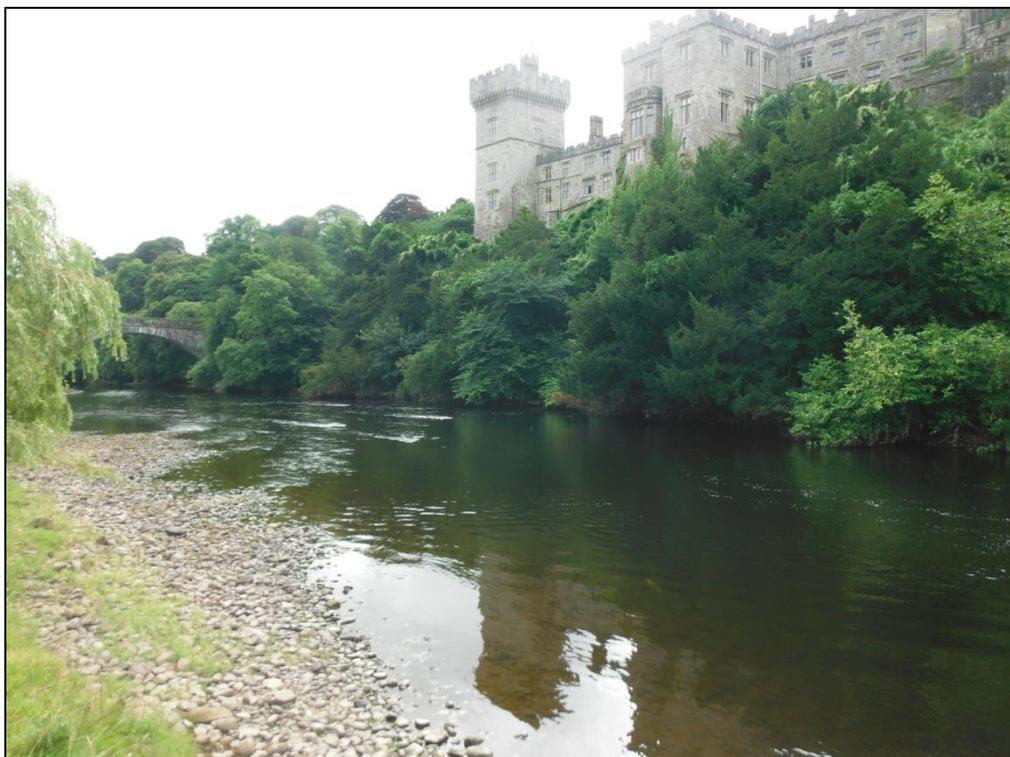


Plate 4.4. The River Blackwater at Lismore Br., Co. Waterford

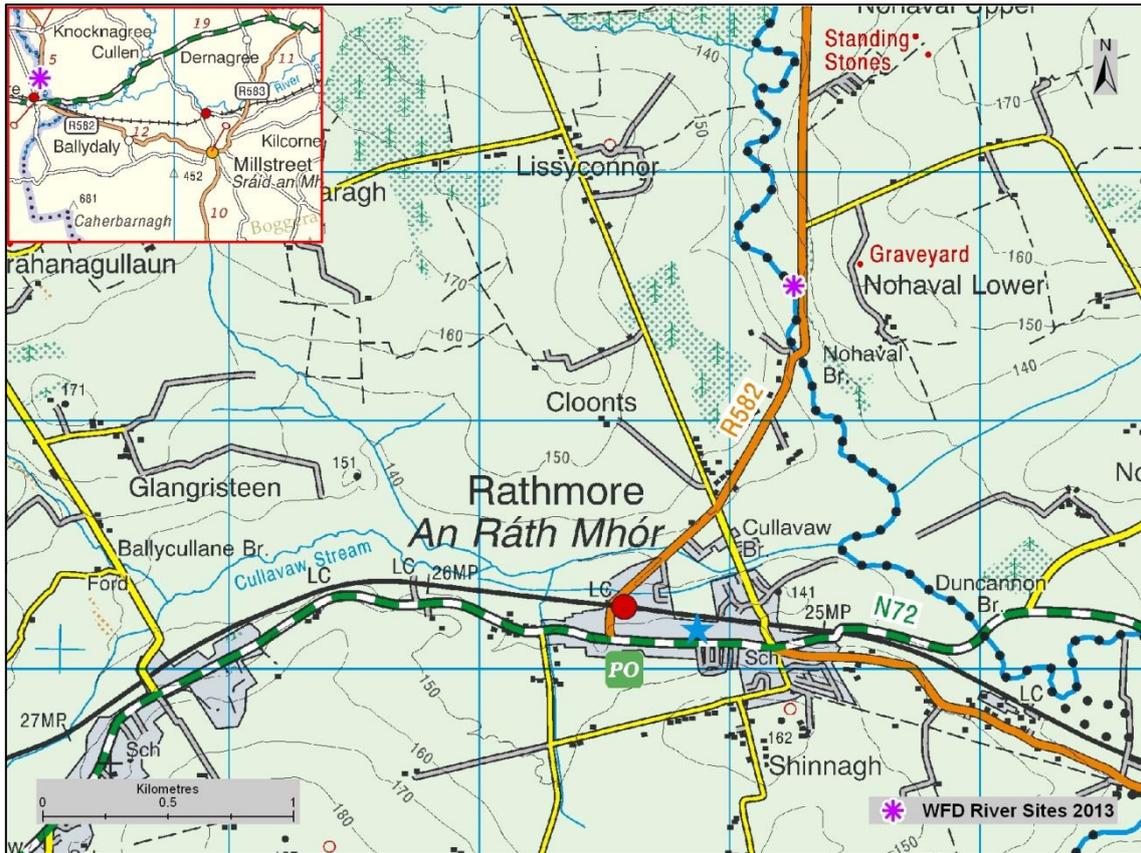


Fig. 4.11. Location of the River Blackwater (Nohaval Br.) surveillance monitoring site



Plate 4.5. The River Blackwater at Nohaval Br., Co. Cork

River Blackwater (Killavullen Br.)

Nine fish species were recorded in the River Blackwater, Killavullen Br. site during the 2013 survey (Table 4.3). Brown trout was the most abundant species, followed by dace, European eel, gudgeon, Lamprey sp., minnow, salmon, stone loach and three-spined stickleback.

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

Species	Total minimum density	Total minimum density
	2009	2013
Brown trout	0.002	0.004
0+ Brown trout	0.000	0.000
1++ Brown trout	0.002	0.003
Dace	0.003	0.006
European eel	0.00005	0.001
Gudgeon	0.0004	0.001
Lamprey sp.	-	0.000
Minnow	0.0002	0.001
Salmon	0.002	0.009
0+ Salmon	0.000	0.004
1++ Salmon	0.002	0.006
Stone loach	0.0001	0.001
Three-spined stickleback	-	0.001
Roach	0.0001	-
All Fish	0.008	0.025

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 32.5cm (mean = 20.4cm) (Fig. 4.12). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for 5%, 30%, 42%, 20% and 3% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 13.2cm to 38.1cm (mean = 21.1cm). Four age classes (1+, 2+, 3+ and 6+) were present, accounting for approximately 16%, 53%, 29% and 3% of the brown trout catch respectively.

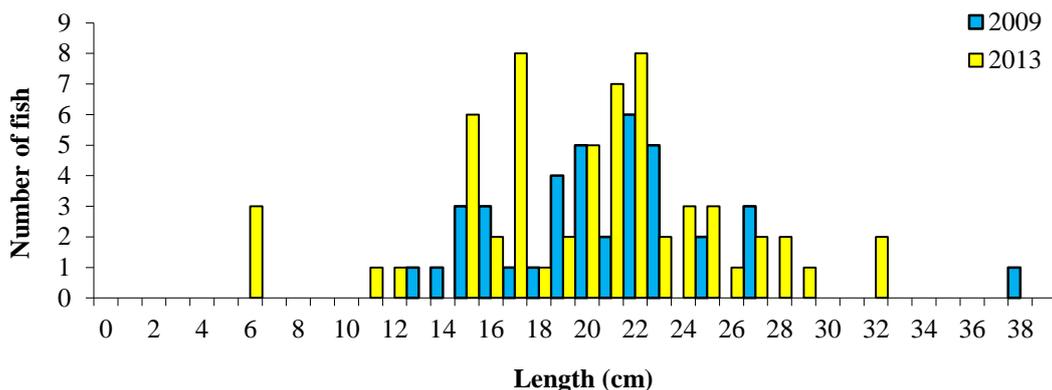


Fig. 4.12. Length frequency distribution of brown trout in the River Blackwater (Killavullen Br.), July 2010 (n = 38) and August 2013 (n = 60)

Salmon captured during the 2013 survey ranged in length from 5.5cm to 15.6cm (mean = 9.8cm) (Fig. 4.13). Two age classes (0+ and 1+) were present, accounting for approximately 37% and 63% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 5.0cm to 17.6cm (mean = 10.8cm). Two age classes (0+ and 1+) were present, accounting for approximately 14% and 86% of the salmon catch respectively.

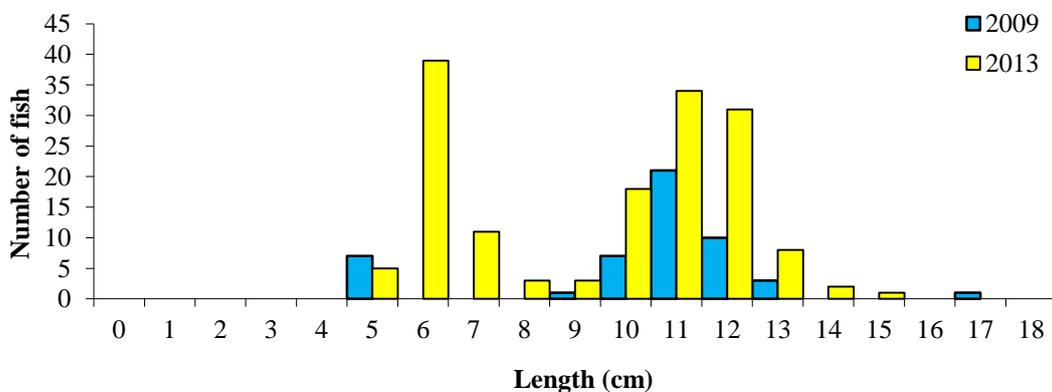


Fig. 4.13. Length frequency distribution of salmon in the River Blackwater (Killavullen Br.), July 2010 (n = 50) and August 2013 (n = 155)

Dace captured during the 2013 survey ranged in length from 4.1cm to 24.1cm (mean = 15.0cm) (Fig. 4.14). Six age classes (0+, 2+, 3+, 4+, 5+ and 6+) were present, accounting for approximately 31%, 5%, 25%, 3%, 14% and 22% of the total dace catch respectively. Dace captured during the 2009 survey ranged in length from 9.0cm to 25.0cm (mean = 17.2cm). Six age classes (2+, 3+, 4+, 5+, 7+ and 8+) were present, accounting for approximately 7%, 64%, 11%, 13%, 3% and 2% of the dace catch respectively.

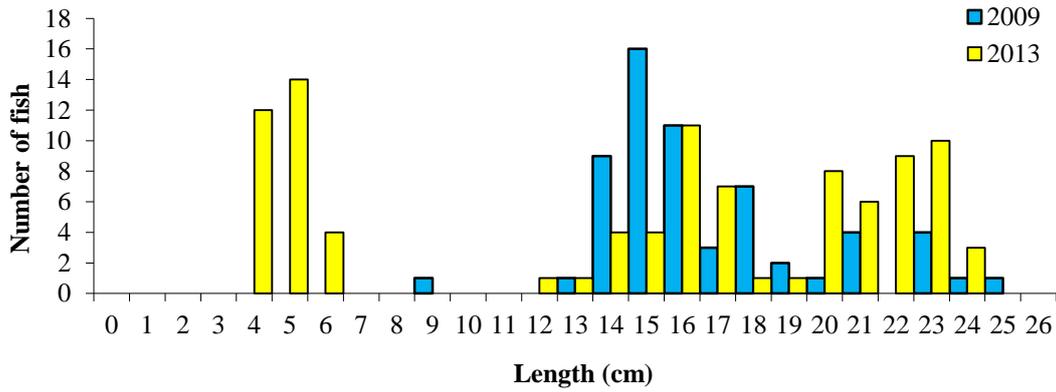


Fig. 4.14. Length frequency distribution of dace in the River Blackwater (Killavullen Br.), July 2010 (n = 61) and August 2013 (n = 96)

Eels captured during the 2013 survey ranged in length from 12.9cm to 35.5cm (mean = 26.5cm) (Fig. 4.15). Only one eel was caught in 2009, measuring 24.5cm in length.

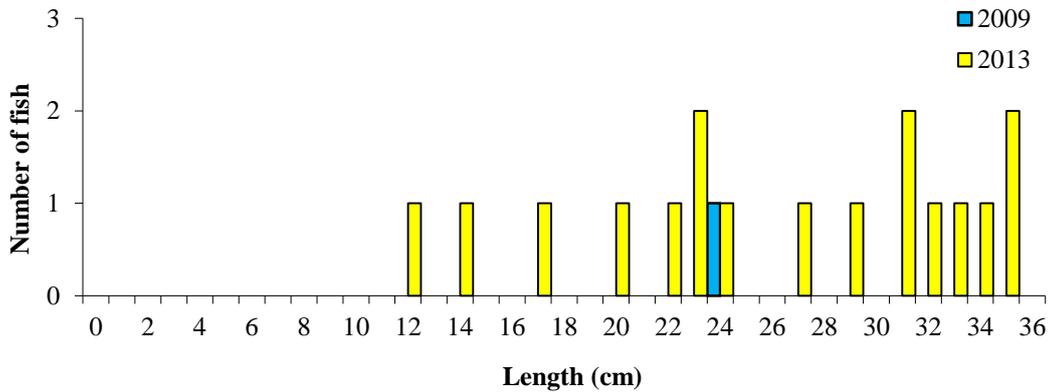


Fig. 4.15. Length frequency distribution of European eel in the River Blackwater (Killavullen Br.), July 2010 (n = 1) and August 2013 (n = 17)

River Blackwater (Lismore Br.)

Nine fish species were recorded in the River Blackwater, Lismore Br. site during the 2013 survey (Table 4.4). Salmon was the most abundant species, followed by flounder, dace, European eel, brown trout, minnow, roach, gudgeon and stone loach.

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

Species	Total minimum density	Total minimum density
	2010	2013
Salmon	0.005	0.007
0+ Salmon	0.000	0.001
1++ Salmon	0.005	0.006
Flounder	0.003	0.004
Dace	0.001	0.002
European eel	0.001	0.001
Brown trout	-	0.001
0+ Brown trout	-	0.0001
1++ Brown trout	-	0.001
Minnow	0.0005	0.001
Roach	0.0001	0.0002
Gudgeon	0.0003	0.0002
Stone loach	0.001	0.0001
Three-spined stickleback	0.0001	-
Lamprey sp.	0.0001	-
All Fish	0.012	0.016

Brown trout numbers were low in the 2013 survey and ranged in length from 8.6cm to 26.6cm (mean = 18.0cm). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 11%, 33%, 33% and 22% of the total brown trout catch respectively. No brown trout were caught during the previous survey in 2010.

Salmon captured during the 2013 survey ranged in length from 5.7cm to 14.8cm (mean = 10.8cm) (Fig. 4.16). Two age classes (0+ and 1+) were present, accounting for approximately 11% and 89% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 4.5cm to 12.3cm (mean = 10.0cm). Four age classes (0+, 1+, 3+ and 4+) were present, accounting for approximately 2%, 95%, 1% and 1% of the salmon catch respectively. Adult salmon (3+ and older) were avoided during the 2013 survey.

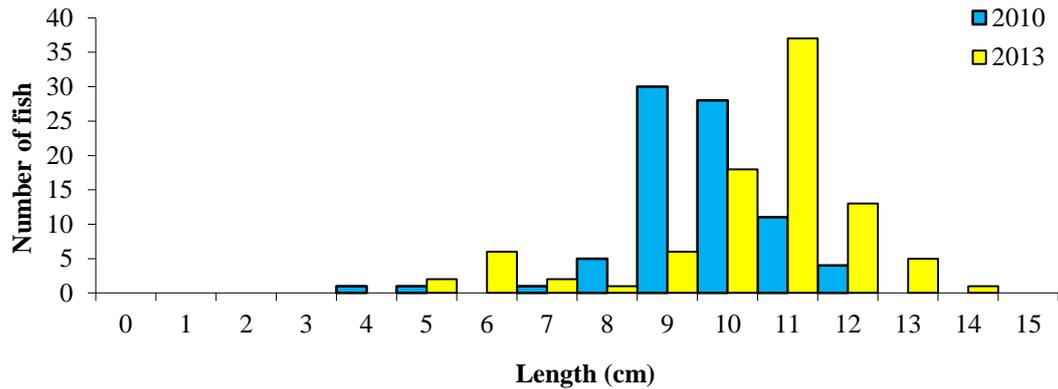


Fig. 4.16. Length frequency distribution of salmon in the River Blackwater (Lismore Br.), June 2010 (sub-sample, n = 81) and August 2013 (sub-sample, n = 91)

Dace captured during the 2013 survey ranged in length from 5.0cm to 22.8cm (mean = 8.1cm) (Fig. 4.17). Four age classes (0+, 2+, 3+ and 4+) were present, accounting for approximately 80%, 3%, 13% and 3% of the total dace catch respectively. Dace captured during the 2010 survey ranged in length from 9.5cm to 25.3cm (mean = 14.2cm). Four age classes (1+, 2+, 3+ and 5+) were present, accounting for approximately 14%, 57%, 21% and 7% of the dace catch respectively.

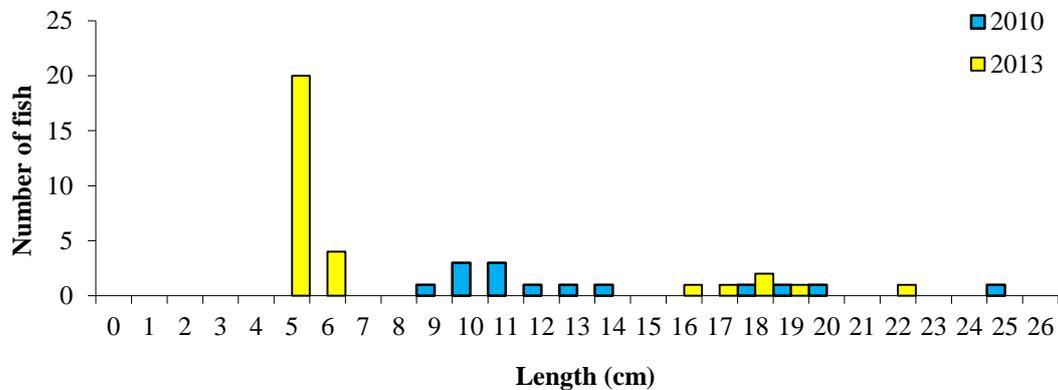


Fig. 4.17. Length frequency distribution of dace in the River Blackwater (Lismore Br.), June 2010 (n = 14) and August 2013 (n = 30)

Flounder captured during the 2013 survey ranged in length from 4.4cm to 19.5cm (mean = 11.2cm) (Fig. 4.18). Flounder captured during the 2010 survey ranged in length from 6.9cm to 13.0cm (mean = 9.9cm).

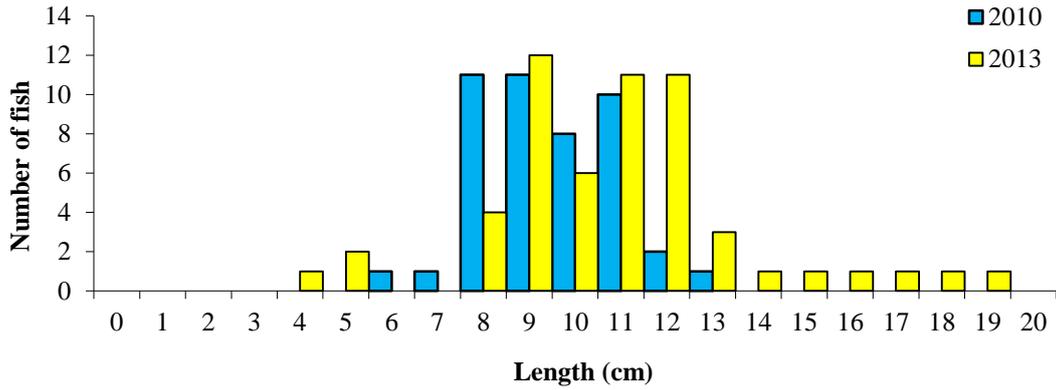


Fig. 4.18. Length frequency distribution of flounder in the River Blackwater (Lismore Br.), June 2010 (n = 45) and August 2013 (n = 56)

Eels captured during the 2013 survey ranged in length from 7.4cm to 38.0cm (mean = 22.2cm) (Fig. 4.19). Eels captured during the 2010 survey ranged in length from 12.8cm to 57.0cm (mean = 27.0cm).

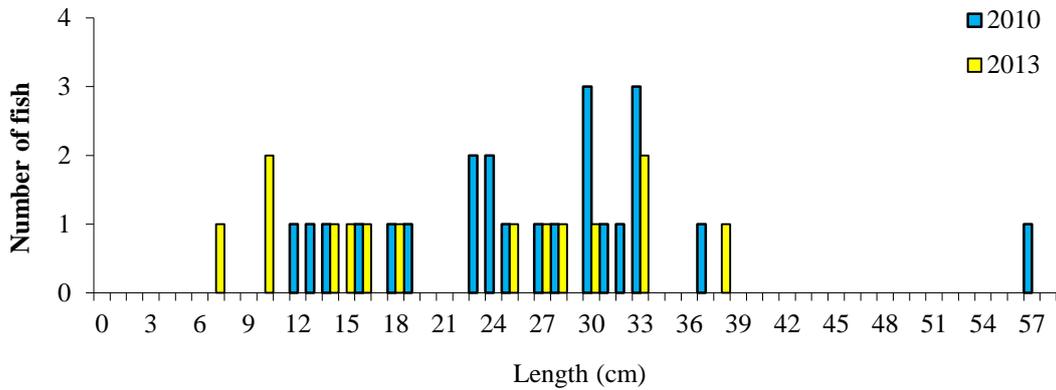


Fig. 4.19. Length frequency distribution of European eel in the River Blackwater (Lismore Br.), June 2010 (n = 23) and August 2013 (n = 14)

River Blackwater (Nohaval Br.)

Seven fish species were recorded in the River Blackwater Nohaval site during the 2013 survey (Table 4.5). Salmon was the most abundant species, followed by brown trout, minnow, lamprey sp., stone loach, three-spined stickleback and gudgeon.

Table 4.5. Density of fish (no./m²), River Blackwater (Nohaval Br.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density		
	2009	2010	2013
Salmon	0.007	0.038	0.054
0+ Salmon	0.001	0.009	0.023
1++ Salmon	0.006	0.029	0.032
Brown trout	0.025	0.043	0.047
0+ Brown trout	0.000	0.001	0.009
1++ Brown trout	0.025	0.042	0.037
Minnow	0.002	0.017	0.024
Lamprey sp.	-	0.001	0.005
Stone loach	0.0005	0.003	0.002
Three-spined stickleback	-	0.002	0.001
Gudgeon	-	-	0.001
European eel	0.001	0.001	-
All Fish	0.035	0.106	0.135

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 29.6cm (mean = 14.8cm) (Fig. 4.20). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for approximately 19%, 43%, 27%, 9% and 1% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 4.2cm to 27.5.0cm (mean = 16.4cm). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 3%, 67%, 28% and 2% of the brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 12.3cm to 26.4cm (mean = 18.0cm). Four age classes (1+, 2+, 3+ and 4+) were present, accounting for approximately 42%, 42%, 14% and 2% of the brown trout catch respectively.

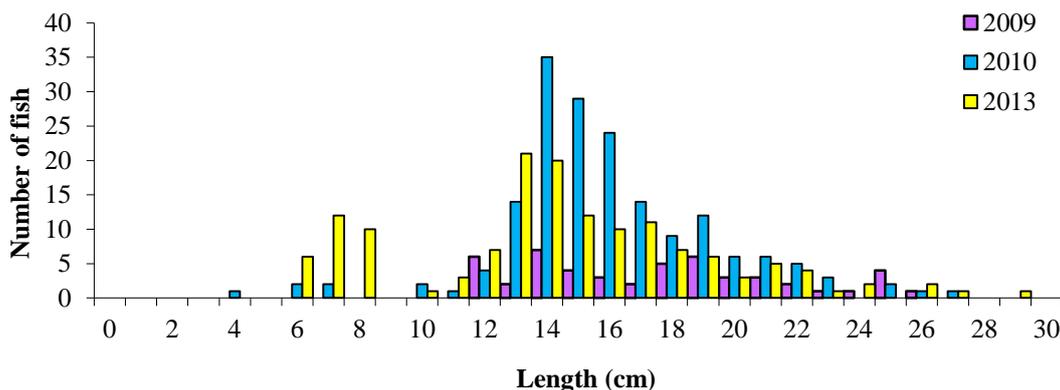


Fig. 4.20. Length frequency distribution of brown trout in the River Blackwater (Nohaval Br.), July 2009 (n = 50), August 2010 (n=173) and August 2013 (sub-sample, n = 145)

Salmon captured during the 2013 survey ranged in length from 5.3cm to 14.1cm (mean = 9.2cm) (Fig. 4.21). Two age classes (0+ and 1+) were present, accounting for approximately 54% and 46% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 5.1cm to 16.7cm (mean = 9.6cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 37%, 61% and 2% of the brown trout catch respectively. Salmon captured during the 2009 survey ranged in length from 5.4cm to 11.9cm (mean = 9.9cm). Two age classes (0+ and 1+) were present, accounting for approximately 14% and 86% of the salmon catch respectively.

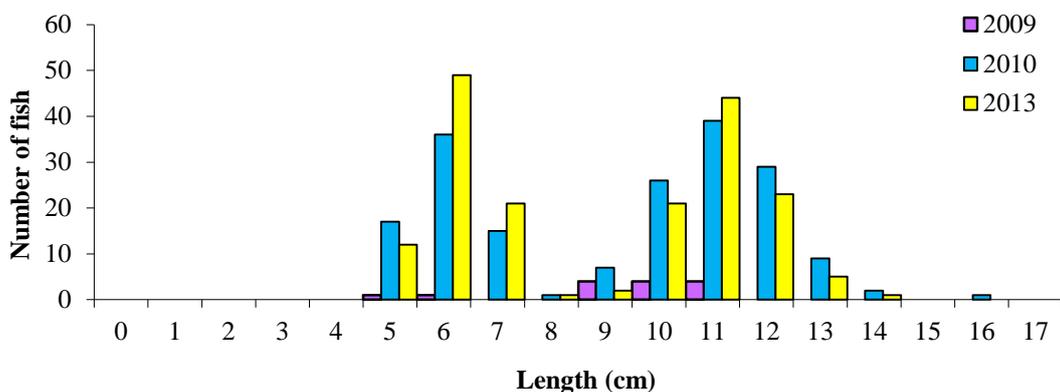


Fig. 4.21. Length frequency distribution of salmon in the River Blackwater (Nohaval Br.), July 2009 (n = 14), August 2010 (n=182) and August 2013 (sub-sample, n = 179)

Lamprey captured during the 2013 survey ranged in length from 5.1cm to 11.7cm (mean = 9.0cm) (Fig. 4.22). Lamprey captured during the 2010 survey ranged in length from 10.0cm to 14.1cm (mean = 12.2cm). No lamprey were recorded during the 2009 survey.

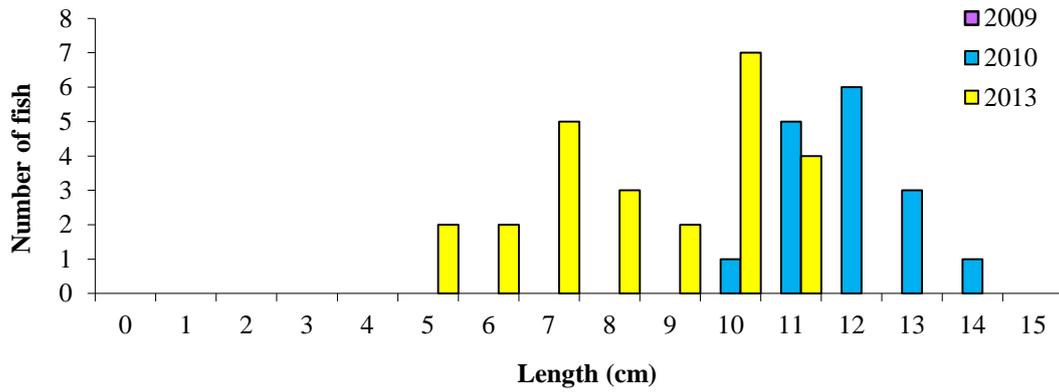


Fig. 4.22. Length frequency distribution of lamprey in the River Blackwater (Nohaval Br.), July 2009 (n = 0), August 2010 (n = 16) and August 2013 (n = 25)

4.1.4 The Cumberagh River

One site was electric fished on the Cumberagh River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located in a valley near Derrineden, between Cahersavane Br. and Cumberagh Br., approximately 9km northeast of Waterville, Co. Kerry (Fig. 4.23; Plate 4.6). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 23rd of September 2013, along a 40m length of channel. Glide dominated the habitat, while the substrate consisted mainly of cobble. The vegetation at this site was diverse, with a number of liverworts present as well as some emergent bank-side and floating species.

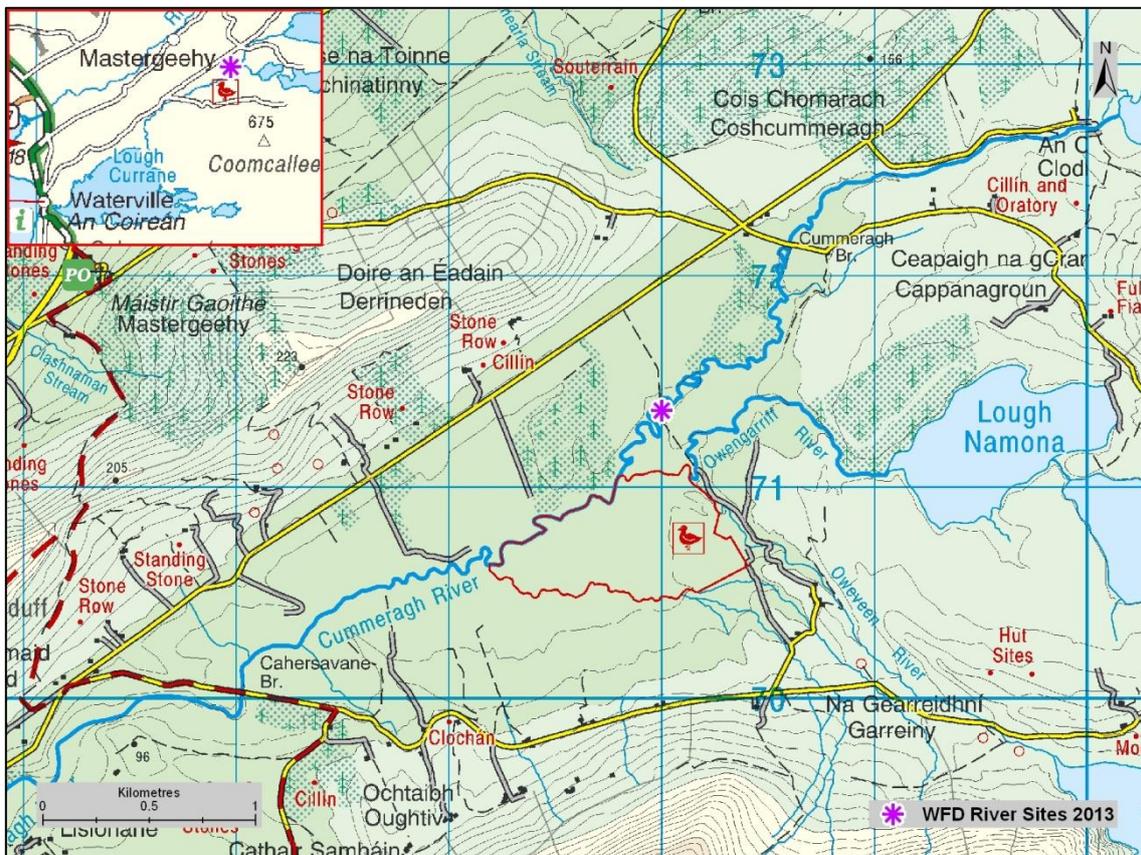


Fig. 4.23. Location of the Cumberagh River (Owengarriff confl.) surveillance monitoring site



Plate 4.6. The Cumberagh River (Owengarrif confl.), Co. Kerry

Four fish species (sea trout are counted as a separate “variety” of brown trout) were recorded in the Cumberagh River site during the 2013 survey (Table 4.6). Salmon was the most common species recorded, followed by three-spined stickleback, brown trout and European eel.

Table 4.6. Density of fish (no./m²), Cumberagh River (Owengarrif confl.) site (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	Total minimum density
	2010	2013
Salmon	0.566	0.487
0+ Salmon	0.475	0.377
1++ Salmon	0.091	0.110
Three-spined stickleback	0.148	0.247
Brown trout	0.158	0.141
0+ Brown trout	0.144	0.114
1++ Brown trout	0.014	0.027
European eel	0.004	0.004
Sea trout	0.007	-
All Fish	0.883	0.880

Brown trout captured during the 2013 survey ranged in length from 4.6cm to 17.7cm (mean = 11.6cm) (Fig. 4.24). Two age classes (0+, and 1+) were present, accounting for 89% and 11% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 3.5cm to 13.9cm (mean = 6.0cm). Two age classes were present (0+ and 1+) accounting for approximately 89% and 11% of the brown trout catch respectively.

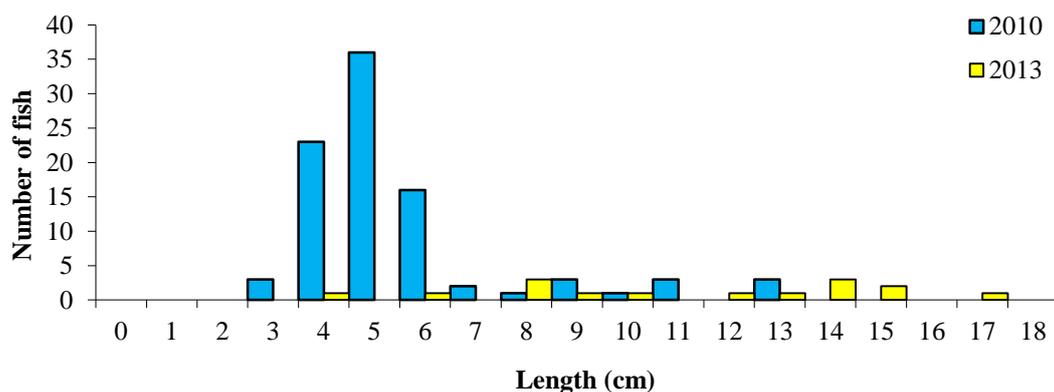


Fig. 4.24. Length frequency distribution of brown trout in the Cumberagh River (Owengarrif confl.) site, August 2010 (n = 91) and September 2013 (sub-sample, n = 15)

Salmon captured during the 2013 survey ranged in length from 3.9cm to 12.5cm (mean = 9.0cm) (Fig. 4.25). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 77%, 22% and 1% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 2.4cm to 11.8cm (mean = 5.2cm). Two age classes (0+ and 1+) were present, accounting for approximately 85% and 15% of the salmon catch respectively.

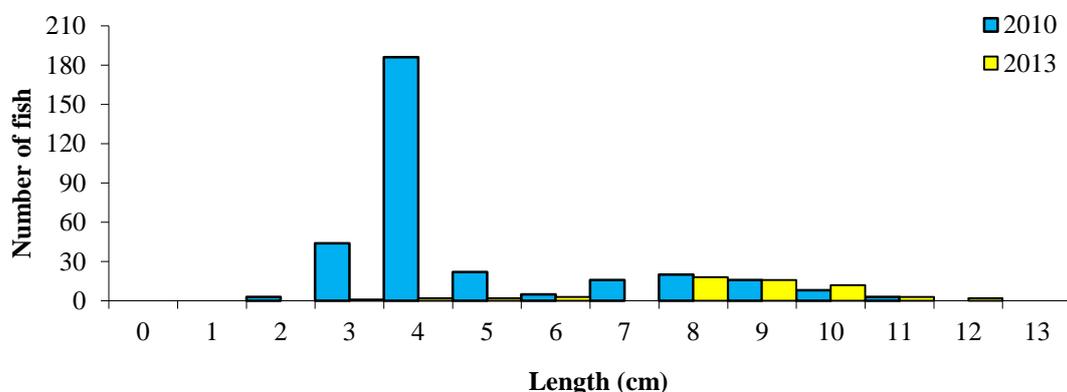


Fig. 4.25. Length frequency distribution of salmon in the Cumberagh River (Owengarrif confl.) site, August 2010 (n = 323) and September 2013 (sub-sample, n = 59)

4.1.5 The Dalua River

One site was electric fished on the Dalua River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located at an old disused ford near Liscongill, approximately 3km south of Newmarket, Co. Cork (Fig. 4.26; Plate 4.7). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 19th of August 2013, along a 41m length of channel. Glide dominated the habitat, while the substrate was dominated by cobble. The vegetation at this site was dominated by bryophytes, with a diverse number of aquatic and semi-aquatic mosses and liverworts present.

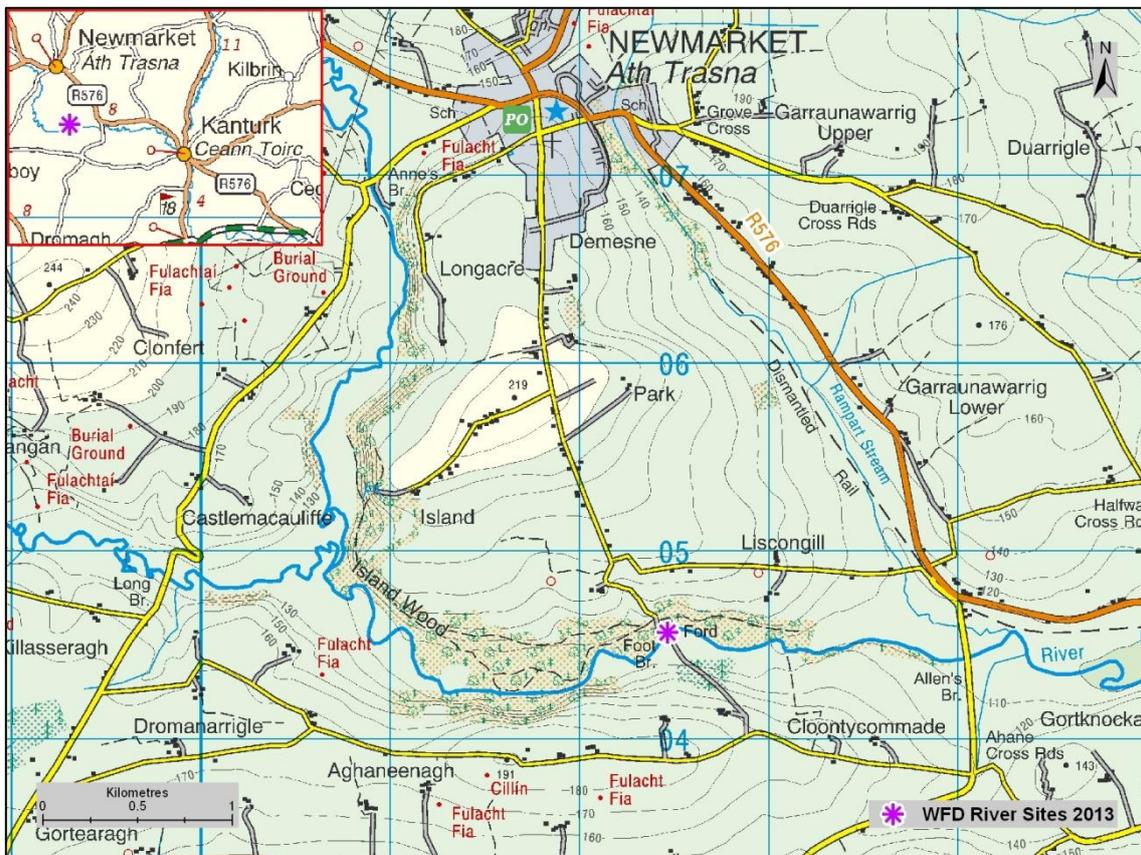


Fig. 4.26. Location of the Dalua River (Liscongill) surveillance monitoring sites



Plate 4.7. The Dalua River at Liscongill, Co. Cork

Five fish species were recorded in the Dalua River during the 2013 survey (Table 4.7). Salmon was the most common species recorded, followed by brown trout, European eel, Lamprey sp. and stone loach.

Table 4.7. Density of fish (no./m²), Dalua River (Liscongill) site (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	Total minimum density
	2010	2013
Salmon	0.629	0.364
0+ Salmon	0.435	0.191
1++ Salmon	0.194	0.173
Brown trout	0.035	0.022
0+ Brown trout	0.000	0.018
1++ Brown trout	0.035	0.004
European eel	0.008	0.007
Lamprey sp.	0.004	0.002
Stone loach	-	0.002
Minnow	0.014	-
All Fish	0.690	0.397

Brown trout captured during the 2013 survey ranged in length from 5.2cm to 13.5cm (mean = 7.8cm) (Fig. 4.27). Two age classes (0+ and 1+) were present, accounting for 77% and 23% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 9.7cm to 22.5cm (mean = 14.1cm). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 70%, 26% and 4% of the salmon catch respectively.

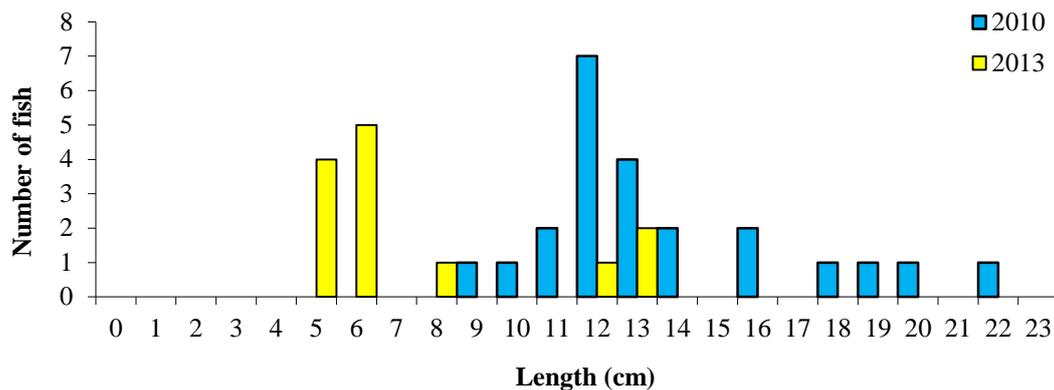


Fig. 4.27. Length frequency distribution of brown trout in the Dalua River (Liscongill), July 2010 (n = 23) and August 2013 (n = 13)

Salmon captured during the 2013 survey ranged in length from 4.1cm to 13.6cm (mean = 7.1cm) (Fig. 4.28). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 61%, 34% and 5% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 2.4cm to 16.9cm (mean = 6.3cm). Three age classes were present (0+, 1+ and 2+) accounting for approximately 71%, 27% and 2% of the brown trout catch respectively.

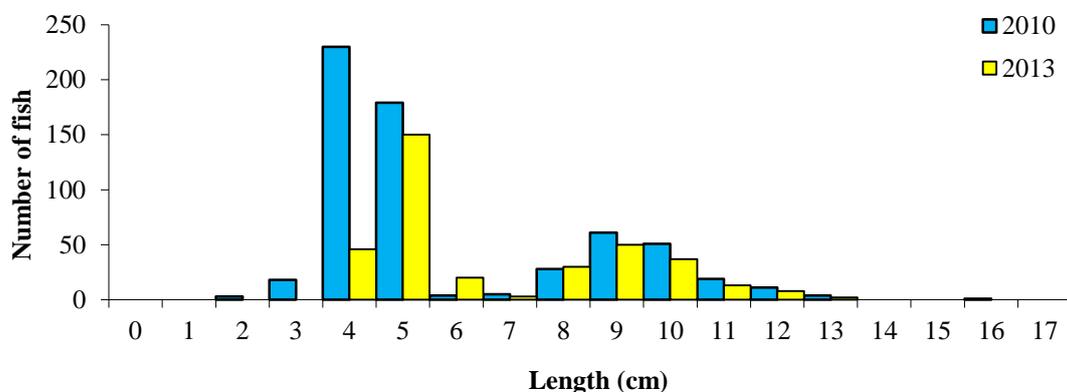


Fig. 4.28. Length frequency distribution of salmon in the Dalua River (Liscongill), July 2010 (n = 614) and August 2013 (n = 359)

4.1.6 The River Funshion

One site was electric fished on the River Funshion as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of Ballyfean Br., approximately 1km upstream of the River Blackwater (Munster) confluence and only 4km northeast of Fermoy, Co. Cork (Fig. 4.29; Plate 4.8). One electric-fishing pass was conducted using two boat-based electric fishing units on the 22nd of August 2013, along a 177m length of channel. Glide and pool dominated the habitat, while the substrate was mixed, consisting mainly of cobble. The vegetation at this relatively deep site consisted of emergent, floating and submerged species.

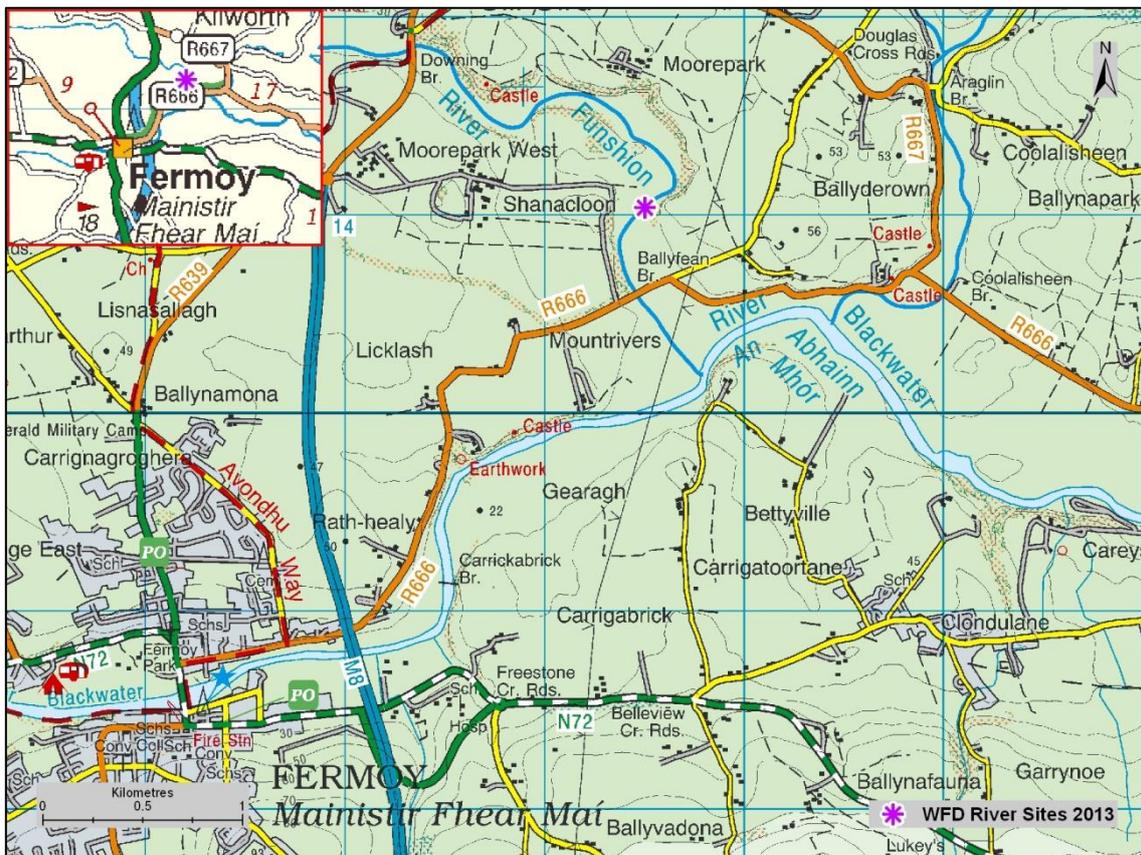


Fig. 4.29. Location of the River Funshion (Blackwater confl.) surveillance monitoring site



Plate 4.8. The River Funshion at (Blackwater confl.), Co. Cork

Eight fish species were recorded in the River Funshion during the 2013 survey (Table 4.8). Salmon was the most common species recorded, followed by brown trout, three-spined stickleback, European eel, minnow, stone loach, dace and Lamprey sp.

Table 4.8. Density of fish (no./m²), River Funshion (Blackwater confl.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	Total minimum density
	2010	2013
Salmon	0.031	0.011
0+ Salmon	0.003	0.002
1++ Salmon	0.028	0.010
Brown trout	0.010	0.008
0+ Brown trout	0.000	0.000
1++ Brown trout	0.010	0.008
Three-spined stickleback	0.004	0.007
European eel	0.003	0.004
Minnow	0.001	0.004
Stone loach	0.005	0.004
Dace	0.001	0.002
Lamprey sp.	0.001	0.0004
All Fish	0.057	0.039

Brown trout captured during the 2013 survey ranged in length from 14.6cm to 28.4cm (mean = 21.9cm) (Fig. 4.30). Two age classes (2+ and 3+) were present, accounting for 65% and 35% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 14.1cm to 30.6cm (mean = 20.4cm). Three age classes were present (1+, 2+ and 3+), accounting for approximately 30%, 39% and 30% of the brown trout catch respectively.

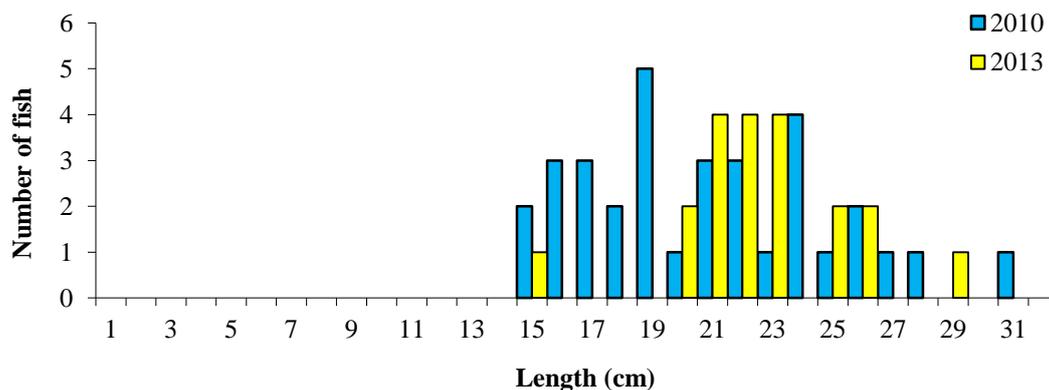


Fig. 4.30. Length frequency distribution of brown trout in the Funshion River (Blackwater confl.), August 2010 (n = 33) and August 2013 (n = 20)

Salmon captured during the 2013 survey ranged in length from 5.6cm to 13.2cm (mean = 10.7cm) (Fig. 4.31). Two age classes (0+ and 1+) were present, accounting for approximately 14% and 86% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 5.6cm to 14.6cm (mean = 11.0cm). Two age classes (0+ and 1+) were present, accounting for approximately 10% and 90% of the salmon catch respectively.

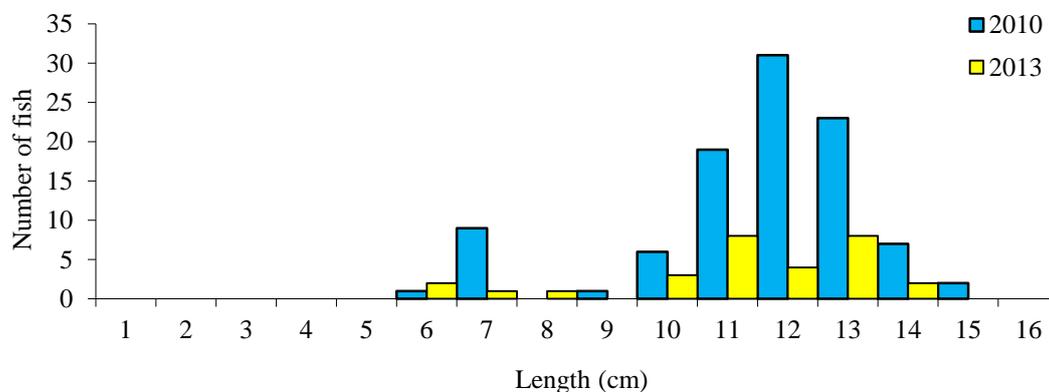


Fig. 4.31. Length frequency distribution of salmon in the Funshion River (Blackwater confl.), July 2010 (n = 99) and August 2013 (n = 29)

Eels captured during the 2013 survey ranged in length from 17.9cm to 49.8cm (mean = 29.7cm) (Fig. 4.32). Eels captured during the 2010 survey ranged in length from 9.1cm to 36.1cm (mean = 28.5cm).

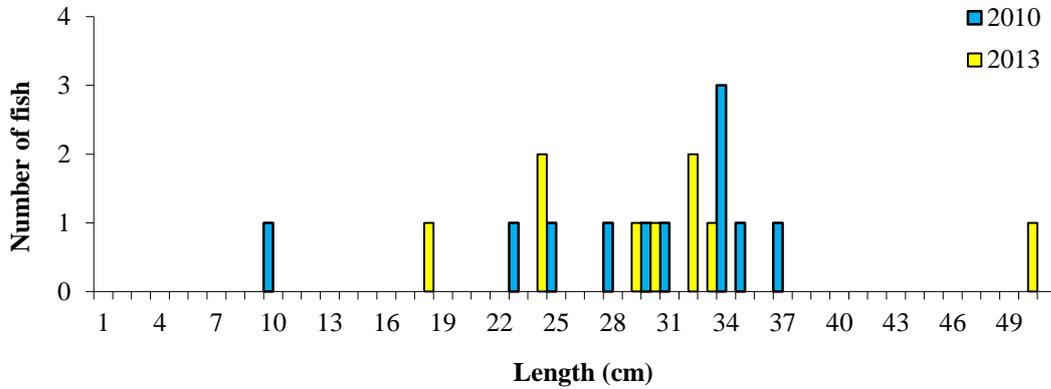


Fig. 4.32. Length frequency distribution of European eel in the Funshion River (Blackwater confl.), August 2010 (n = 11) and August 2013 (n = 9)

4.1.7 The River Lee

Two sites were electric fished on the River Lee as part of the WFD surveillance monitoring programme in rivers 2013; the River Lee, Inchinossig Br. and the River Lee, Lee Fields.

The Inchinossig Br. survey site was located upstream of Inchinossig Br., just outside Ballingearry, Co. Cork (Fig. 4.33; Plate 4.9). Three electric-fishing passes were conducted using threebank-based electric fishing units on the 30th of July 2013, along a 45m length of channel. Glide dominated the habitat, with a mixt substrate of mostly cobble. The vegetation at this site was diverse, consisting of a number of bryophytes, submergent and emergent species.

The Lee Fields survey site was located along the Carrigohane Straight, approximately 3km west of Cork City Centre (Fig. 4.34; Plate 4.10). One electric-fishing pass was conducted using four boat-based electric fishing units on the 20th of August 2013, along a 444m length of channel. Glide dominated the habitat, while the substrate was a mix of cobble, gravel, sand, mud and silt. The vegetation at this site consisted mainly of various emergent bank-side and submergent species.

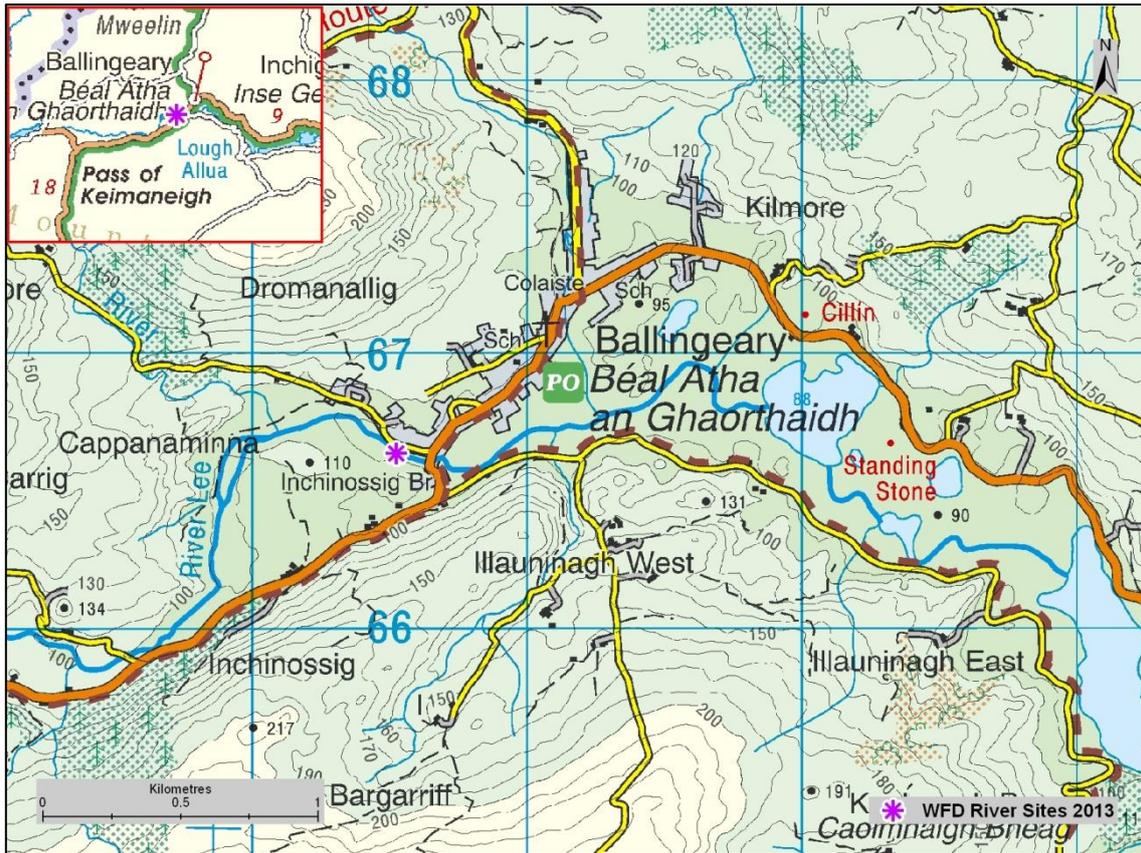


Fig. 4.33. Location of the River Lee (Inchinossig Br.) surveillance monitoring site



Plate 4.9. The River Lee at Inchinossig Br., Co. Cork

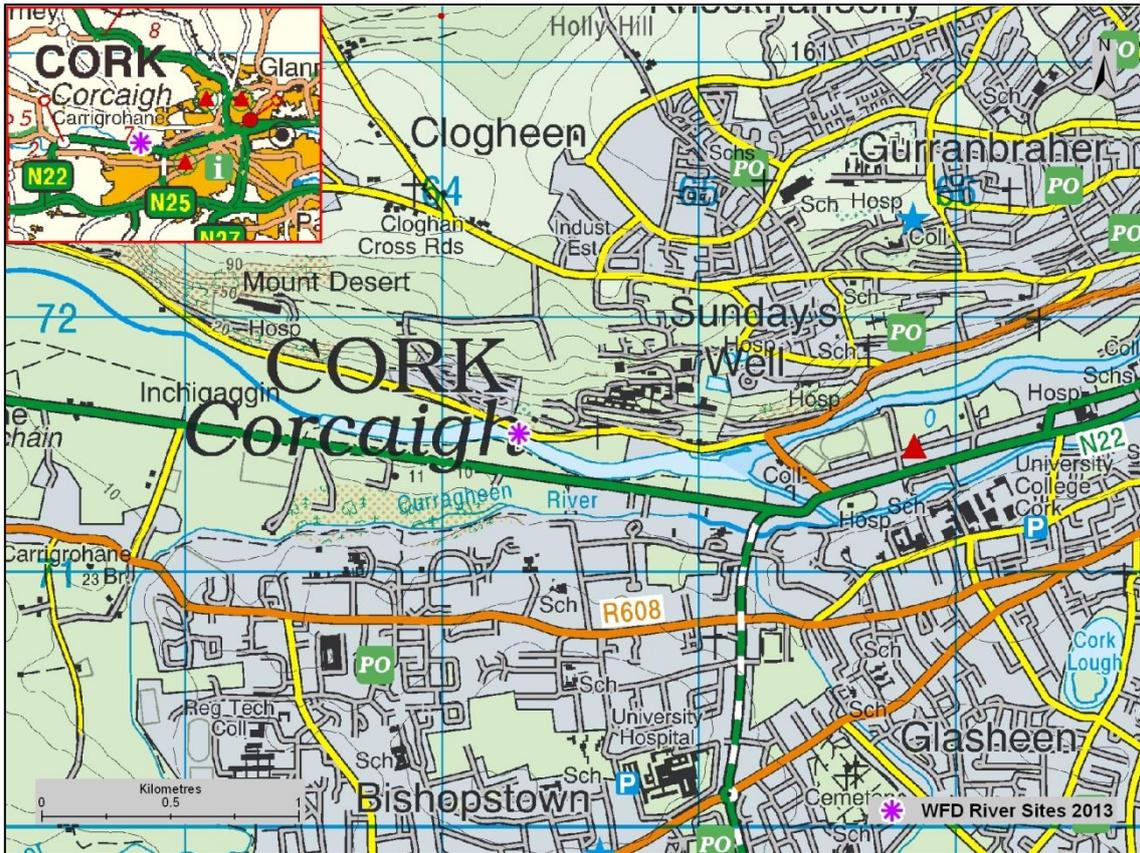


Fig. 4.34. Location of the River Lee (Lee Fields) surveillance monitoring site



Plate 4.10. The River Lee at Lee Fields, Co. Cork

River Lee (Inchinossig Br.)

Five fish species were recorded in the River Lee at Inchinossig Br. during the 2013 survey (Table 4.9). Brown trout was the most common species recorded, followed by minnow, lamprey sp., roach and three-spined stickleback.

Table 4.9. Density of fish (no./m²), River Lee (Inchinossig Br.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	
	2010	2013
Brown trout	0.083	0.098
0+ Brown trout	0.075	0.080
1++ Brown trout	0.007	0.019
Minnow	0.110	0.033
Lamprey sp.	0.017	0.007
Roach	0.002	0.007
Three-spined stickleback	0.044	0.002
European eel	0.002	-
Stone loach	0.002	-
Pike	0.002	-
Gudgeon	0.002	-
All Fish	0.265	0.147

Brown trout captured during the 2013 survey ranged in length from 4.5cm to 24.8cm (mean = 8.2cm) (Fig. 4.35). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for 75%, 10%, 13%, 2% and 2% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 4.8cm to 25.7cm (mean = 7.9cm). Four age classes were present (0+, 1+, 2+ and 3+), accounting for approximately 78%, 16%, 5% and 1% of the brown trout catch respectively.

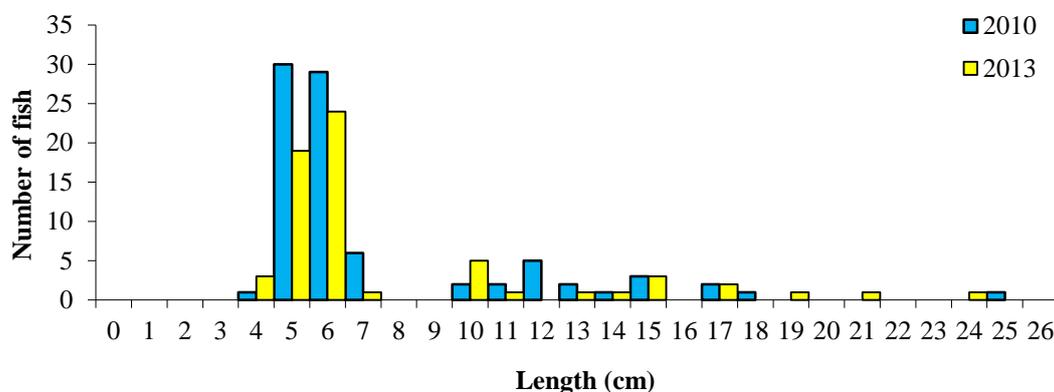


Fig. 4.35. Length frequency distribution of brown trout in the River Lee (Inchinossig Br.) site, July 2010 (n = 85) and July 2013 (n = 63)

River Lee (Lee Fields)

Twelve fish species were recorded in the River Lee at the Lee Fields site during the 2013 survey (Table 4.10). Minnow was the most common species recorded, followed by salmon, three-spined stickleback, European eel, gudgeon, stone loach, brown trout, perch, lamprey sp., pike, bream and roach.

Table 4.10. Density of fish (no./m²), River Lee (Lee Fields) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	Total minimum density
	2010	2013
Minnow	0.00004	0.005
Salmon	0.001	0.002
0+ Salmon	0.000	0.002
1++ Salmon	0.000	0.000
Three-spined stickleback	0.001	0.002
European eel	0.002	0.002
Gudgeon	0.0003	0.002
Stone loach	0.0004	0.001
Brown trout	0.0003	0.0003
0+ Brown trout	0.000	0.0000
1++ Brown trout	0.000	0.0003
Perch	-	0.0002
Lamprey sp.	0.004	0.0002
Pike	-	0.0001
Bream	-	0.00004
Roach	-	0.00004
All Fish	0.009	0.014

Brown trout captured during the 2013 survey ranged in length from 16.7cm to 26.4cm (mean = 19.7cm) (Fig. 4.36). Three age classes (1+, 2+ and 3+) were present, accounting for 75%, 13% and 13% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 10.5cm to 25.4cm (mean = 16.7cm). Three age classes were present (1+, 2+ and 3+), accounting for approximately 67%, 17% and 17% of the brown trout catch respectively.

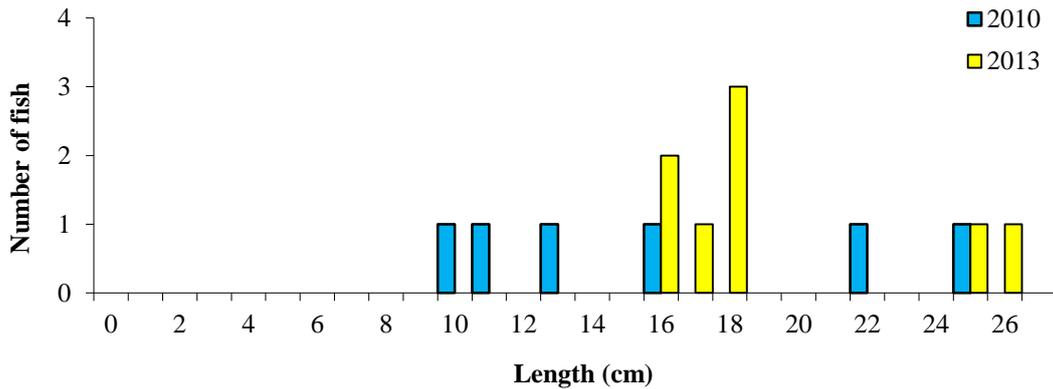


Fig. 4.36. Length frequency distribution of brown trout in the River Lee (Lee Fields) site, June 2010 (n = 6) and August 2013 (n = 8)

Salmon captured during the 2013 survey ranged in length from 5.5cm to 13.9cm (mean = 8.0cm) (Fig. 4.37). Two age classes (0+ and 1+) were present, accounting for 90% and 10% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 3.4cm to 9.8cm (mean = 5.9cm). Two age classes were present (0+ and 1+), accounting for approximately 57% and 43% of the salmon catch respectively.

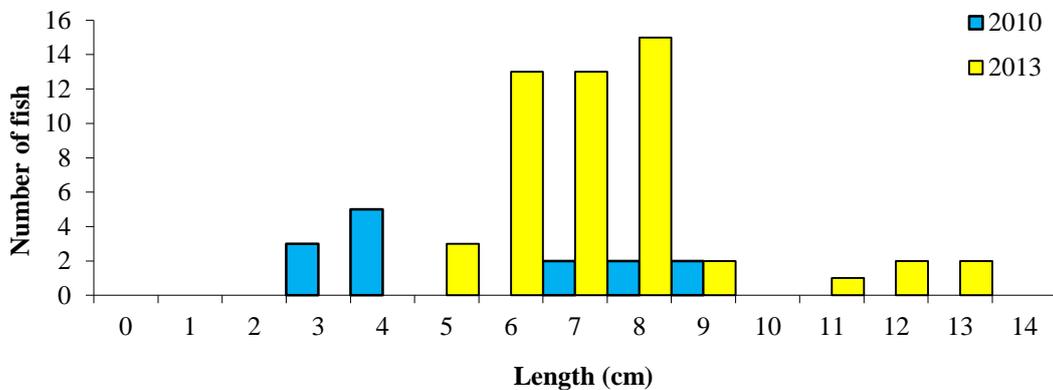


Fig. 4.37. Length frequency distribution of salmon in the River Lee (Lee Fields) site, June 2010 (n = 14) and August 2013 (n = 51)

Eels captured during the 2013 survey ranged in length from 7.4cm to 60.6cm (mean = 30.3cm) (Fig. 4.38). European eel captured during the 2010 survey ranged in length from 9.1cm to 56.8cm (mean = 25.9cm).

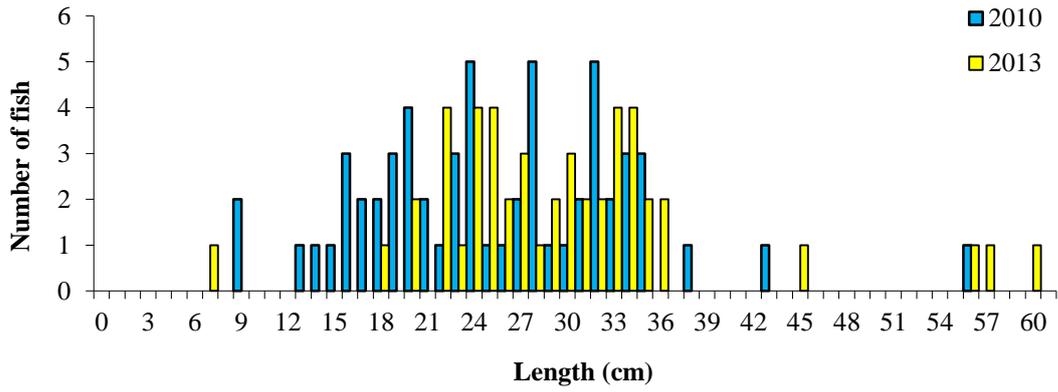


Fig. 4.38. Length frequency distribution of European eel in the River Lee (Lee Fields) site, June 2010 (n = 59) and August 2013 (n = 48)

4.1.8 The Licky River

One site was electric fished on the Licky River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located upstream of an abandoned bridge near Glenlicky, approximately 12km southwest of Dungarvan, Co. Waterford (Fig. 4.39; Plate 4.11). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 23rd of July 2013, along a 45m length of channel. Glide dominated the habitat, with a substrate mostly composed of cobble. The vegetation at this site was dominated by bryophytes, with a diverse number of aquatic and semi-aquatic liverworts present.

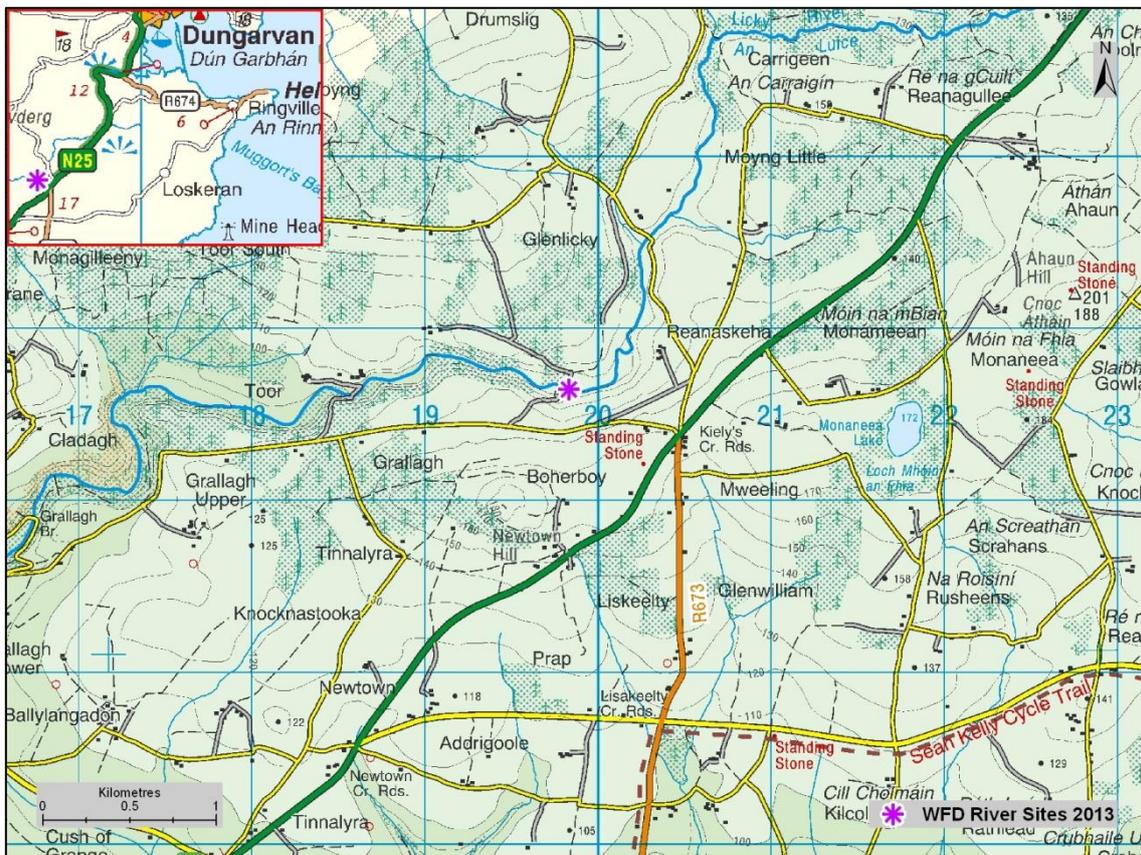


Fig. 4.39. Location of the Licky River (Glenlicky) surveillance monitoring site



Plate 4.11. The Licky River at Glenlicky, Co. Waterford

Three fish species were recorded in the Licky River during the 2013 survey (Table 4.11). Salmon was the most common species recorded, followed by brown trout and European eel.

Table 4.11. Density of fish (no./m²), Licky River (Glenlicky) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density	Total minimum density
	2010	2013
Salmon	0.035	0.090
0+ Salmon	0.009	0.004
1++ Salmon	0.025	0.086
Brown trout	0.088	0.079
0+ Brown trout	0.006	0.015
1++ Brown trout	0.082	0.064
European eel	0.016	0.011
All Fish	0.138	0.180

Brown trout captured during the 2013 survey ranged in length from 5.4cm to 16.8cm (mean = 11.6cm) (Fig. 4.40). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 21%, 59%, 18% and 3% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 5.5cm to 18.8cm (mean = 12.3cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 14%, 67% and 19% of the brown trout catch respectively.

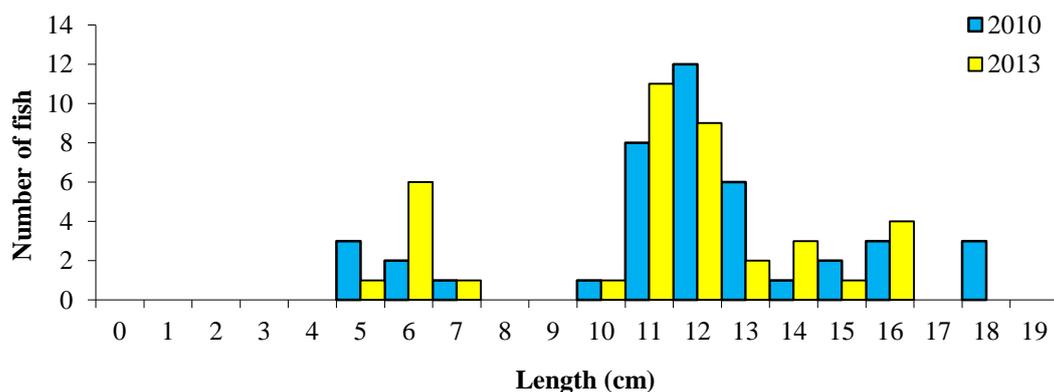


Fig. 4.40. Length frequency distribution of brown trout in the Licky River (Glenlicky), July 2010 (n = 42) and July 2013 (n = 39)

Salmon captured during the 2013 survey ranged in length from 5.9cm to 13.1cm (mean = 10.5cm) (Fig. 4.41). Three age classes (0+, 1+ and 2+) were present, accounting for 3%, 90% and 7% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 4.6cm to 11.9cm (mean = 8.5cm). Two age classes were present (0+ and 1+) accounting for approximately 32% and 68% of the salmon catch respectively.

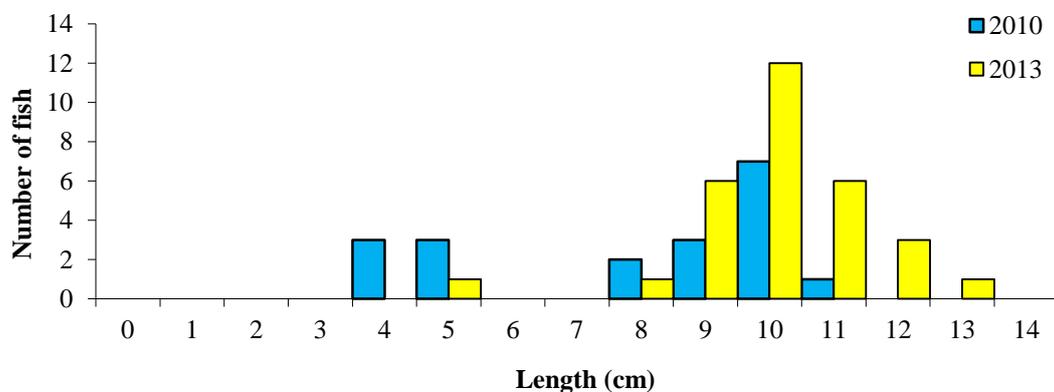


Fig. 4.41. Length frequency distribution of salmon in the Licky River (Glenlicky), July 2010 (n = 19) and July 2013 (n = 30)

Eels captured during the 2013 survey ranged in length from 9.7cm to 32.7cm (mean = 18.0cm) (Fig. 4.42). Eels captured during the 2010 survey ranged in length from 9.2cm to 32.5cm (mean = 21.2cm).

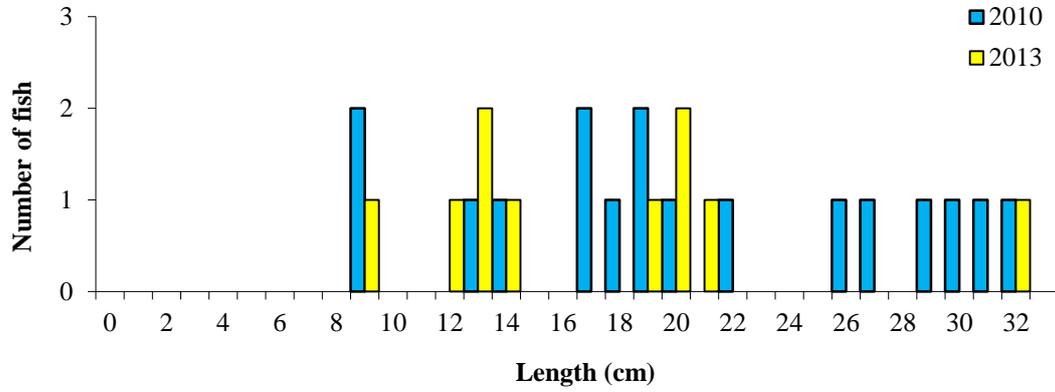


Fig. 4.42. Length frequency distribution of eels in the Licky River (Glenlicky), July 2010 (n = 17) and July 2013 (n = 10)

4.1.9 The Owvane (Cork) River

One site was electric fished on the Owvane River (Cork) as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located behind St Colum's GAA Club, halfway between Ballylickey and Kealkill, Co. Cork (Fig. 4.43; Plate 4.12). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 25th of September 2013, along a 40m length of channel. Glide dominated the habitat, with a substrate of mainly gravel and cobble. Despite the paucity of vegetation at this site, most of the major groups were represented, including bryophytes, submergent, floating and emergent species. Himalayan balsam was also present along the banks.

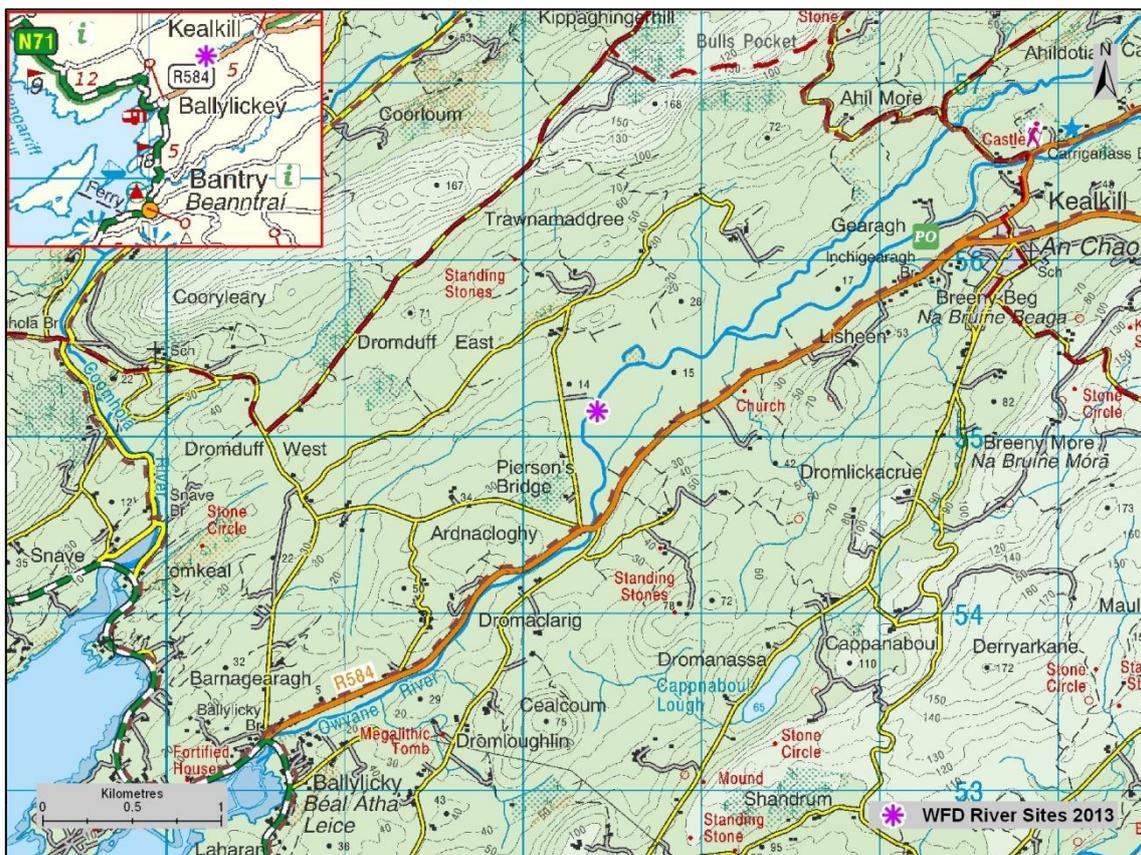


Fig. 4.43. Location of the Owvane River (Pierson's Br.) surveillance monitoring site



Plate 4.12. The Owvane River (Pierson's Br.), Co. Cork

Four fish species (sea trout are included as a separate “variety” of brown trout) were recorded in the Owvane River during the 2013 survey (Table 4.12). Minnow was the most common species recorded, followed by salmon, brown trout and European eel.

Table 4.12. Density of fish (no./m²), Owvane River (Pierson's Br.) (fish density has been calculated as minimum estimates based on one fishing)

Species	Total minimum density
	2013
Minnow	1.006
Salmon	0.098
0+ Salmon	0.081
1++ Salmon	0.016
Brown trout	0.047
0+ Brown trout	0.029
1++ Brown trout	0.018
European eel	0.042
Sea trout	-
All Fish	1.193

Brown trout captured during the 2013 survey ranged in length from 5.4cm to 20.0cm (mean = 8.4cm) (Fig. 4.44). Three age classes (0+, 1+ and 2+) were present, accounting for 69%, 26% and 6% of the total brown trout catch respectively.

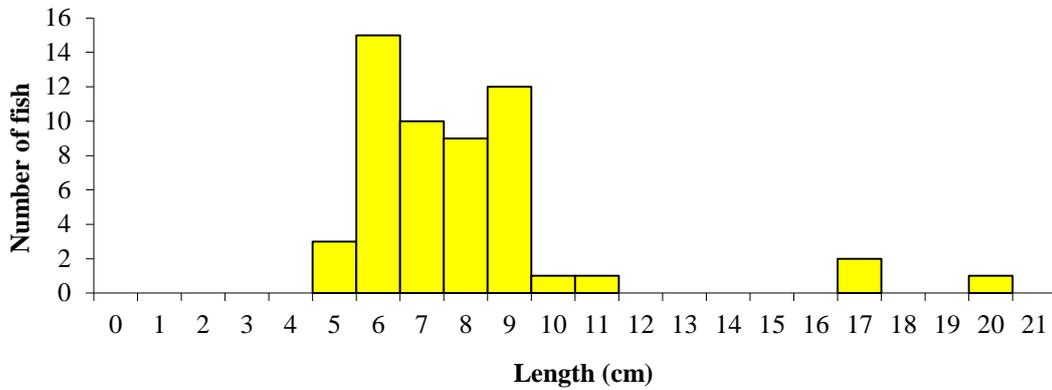


Fig. 4.44. Length frequency distribution of brown trout in the Owvane River (Pierson's Br.), September 2010 (n = 4) and August 2013 (n = 54)

Salmon captured during the 2013 survey ranged in length from 5.2cm to 13.6cm (mean = 12.2cm) (Fig. 4.45). Three age classes (0+, 1+ and 2+) were present, accounting for 86% and 14% of the total brown trout catch respectively.

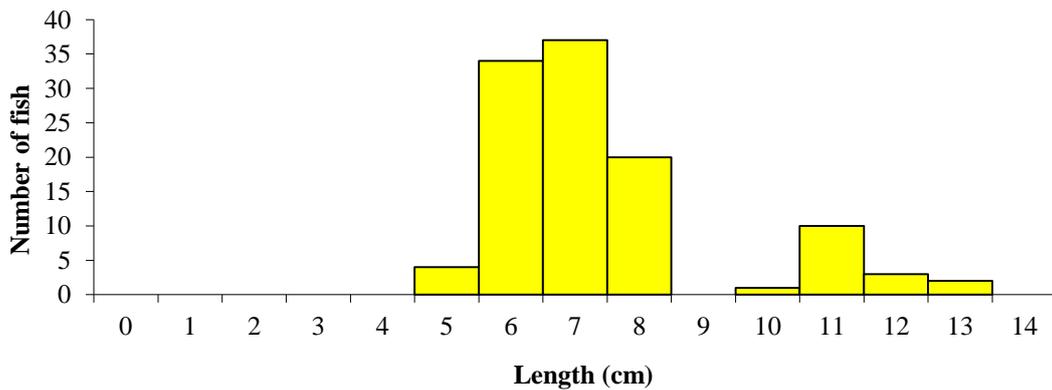


Fig. 4.45. Length frequency distribution of salmon in the Owvane River (Pierson's Br.), September 2010 (n = 21) and August 2013 (n = 111)

Eels captured during the 2013 survey ranged in length from 7.4cm to 32.6cm (mean = 12.2cm) (Fig. 4.46).

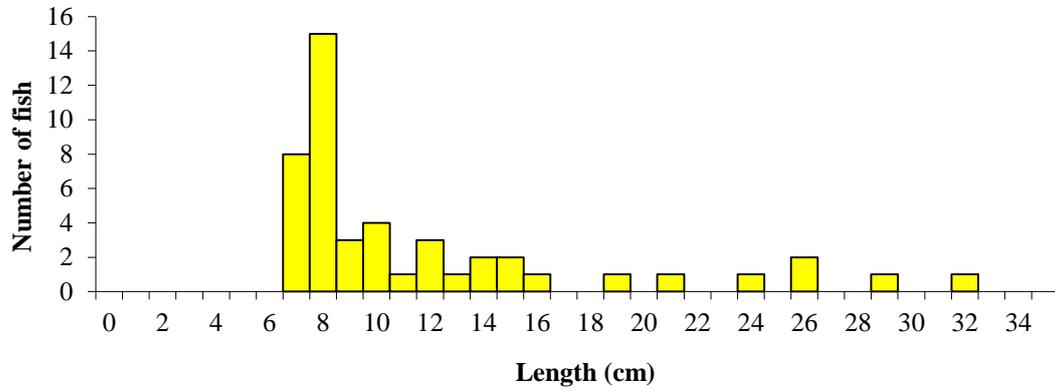


Fig. 4.46. Length frequency distribution of eels in the Owvane River (Pierson's Br.), September 2010 (n = 4) and August 2013 (n = 47)

4.2 Community Structure

A total of 14 fish species were recorded within the 12 SWRBD sites surveyed during 2013 (Fig. 4.47). Brown trout was the most common fish species recorded, occurring in all 12 sites, followed by salmon, European eel, minnow, lamprey sp., three-spined stickleback, stone loach, gudgeon, roach, and dace. Flounder, perch, pike and bream were only recorded in one site each.

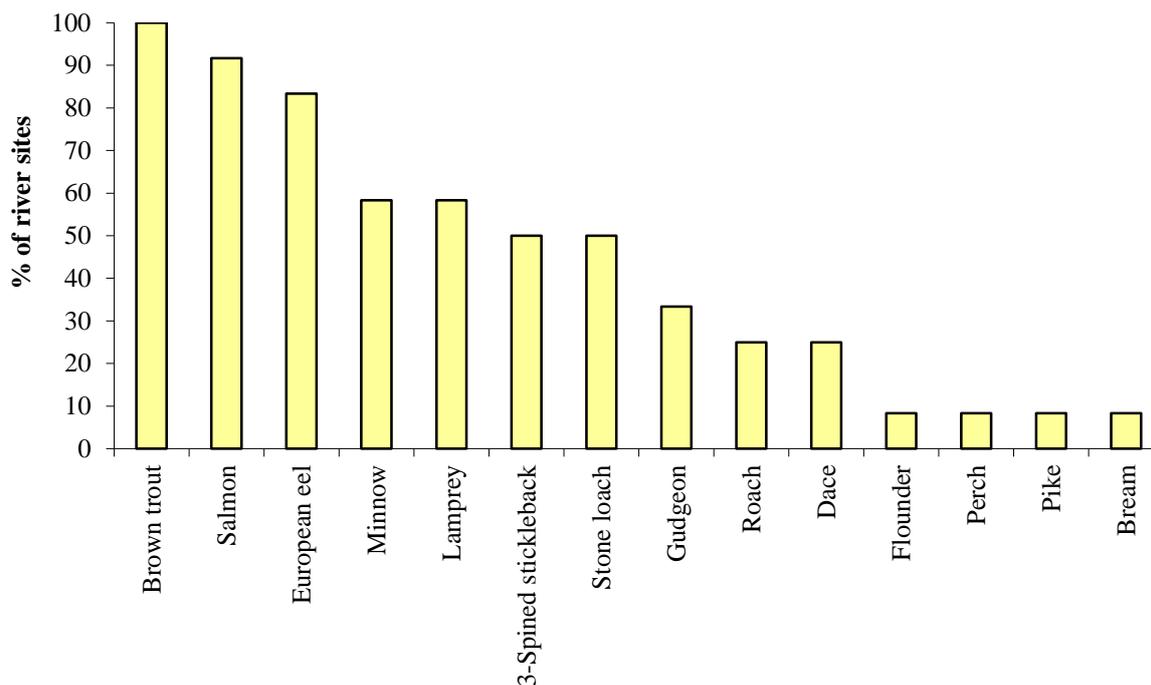


Fig. 4.47. Percentage of sites where each fish species was recorded in the SWRBD for WFD SM monitoring 2013

4.3 Age and growth

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

The mean back-calculated length-at-age data for brown trout in the SWRBD are shown in Figure 4.48 and Appendix 1. Brown trout were recorded at all 12 sites, with each containing brown trout aged 1+ or older. Ages ranged from 0+ to 4+, with fish aged 0+ and 1+ comprising the most abundant age classes within the region. The largest brown trout recorded in the SWRBD in 2013 was caught in the River Blackwater at Killavullen Br., which measured 32.5cm in length and was aged 4+. 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 Araglin, Blackwater (Nohaval Br.), Lee (Inchinossig Br.), Licky and Ovwane Rivers, slow at Blackwater (Killavullen Br. and Lismore Br.) and Funshion Rivers and fast at the River Lee (Lee Fields) (Appendix 1).

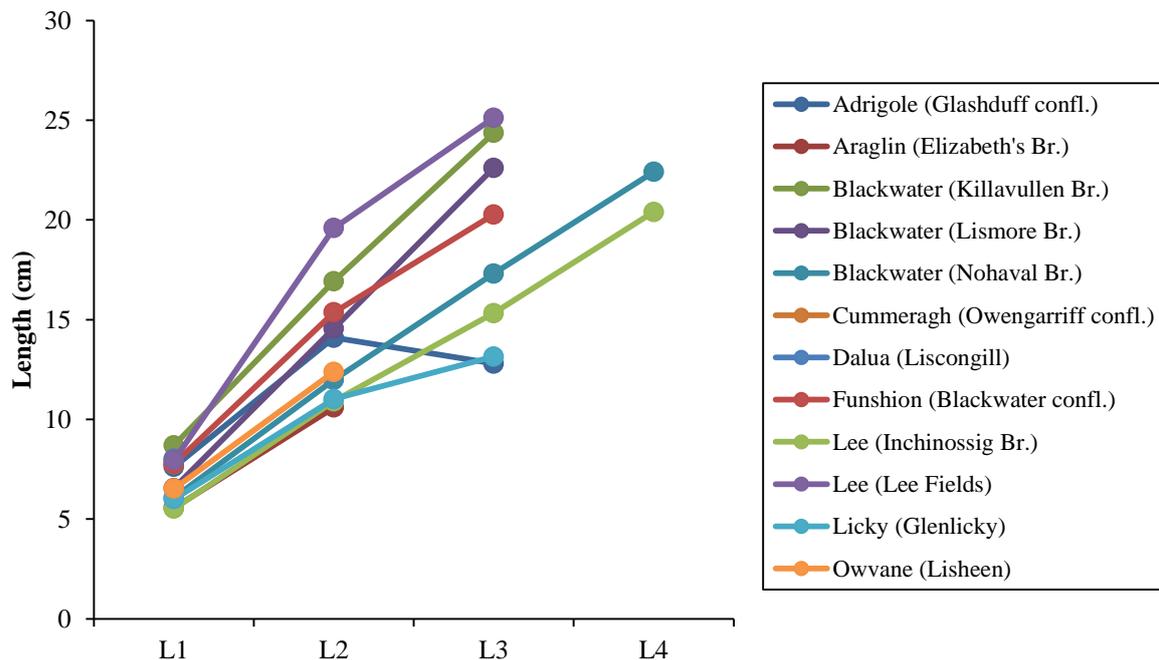


Fig. 4.48. Back calculated lengths for brown trout in each river, WFD surveillance monitoring 2013

The mean back-calculated length-at-age data for salmon in the SWRBD are shown in Figure 4.49 and Appendix 2. Salmon were recorded in eleven river sites and ranged in age from 0+ to 2+. The most abundant age class was 0+. The largest juvenile salmon recorded in the SWRBD during 2013 was caught in the River Blackwater (Killavullen Br.), measured 15.6cm and was aged 1+.

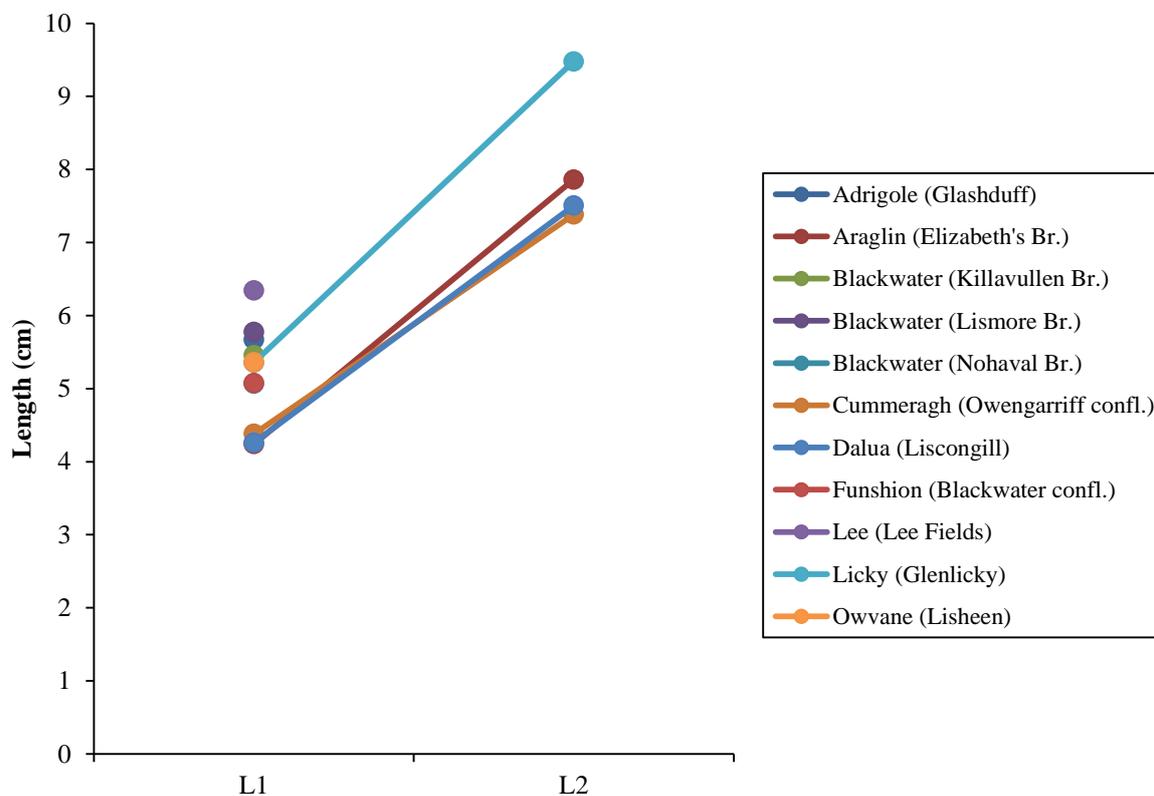


Fig. 4.49. Back calculated lengths for salmon in each river, WFD surveillance monitoring 2013

The mean back-calculated length-at-age data for roach in the SWRBD are shown in Figure 4.50 and Appendix 3. Roach were recorded in three river sites and ranged in age from 1+ to 3+. The most abundant age class was 2+. The largest roach recorded in the SWRBD during 2013 was caught in the River Lee (Inchinossig Br.), measured 12.5cm, weighed 26g and was aged 3+.

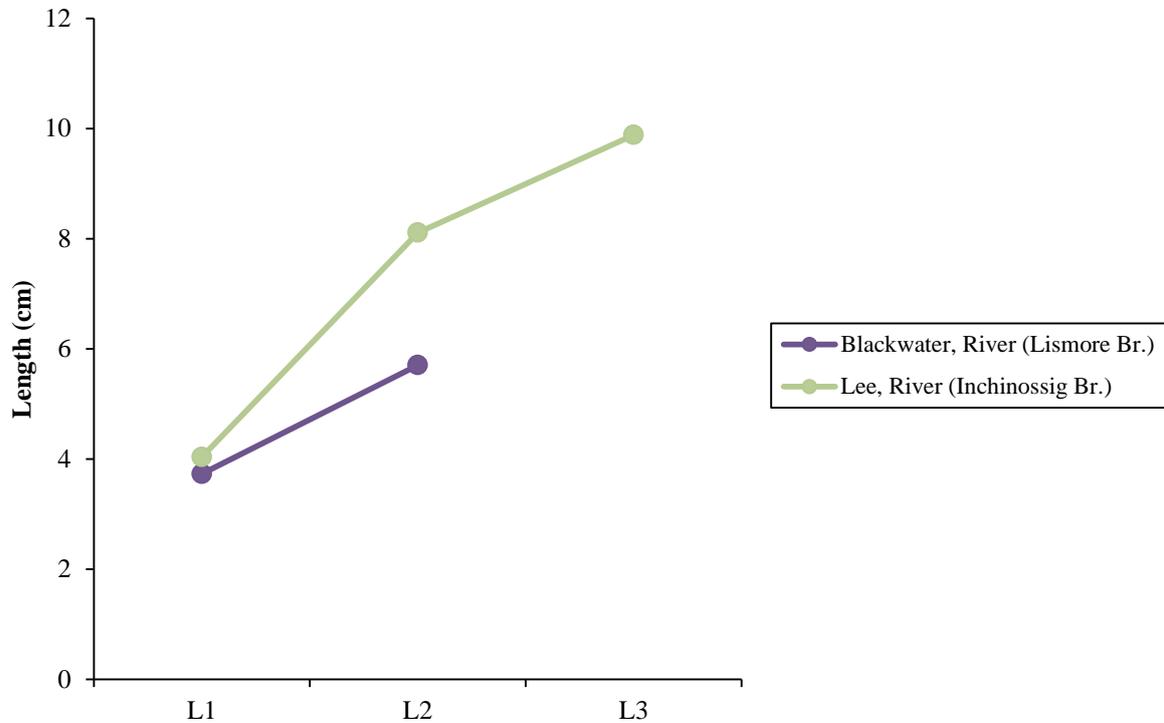


Fig. 4.50. Back calculated lengths for roach in each river, WFD surveillance monitoring 2013

The mean back-calculated length-at-age data for dace in the SWRBD are shown in Figure 4.51 and Appendix 4. Dace were recorded in three river sites and ranged in age from 0+ to 6+. The most abundant age class was 0+. The largest dace recorded in the SWRBD during 2013 was caught in the River Blackwater (Killavullen Br.), measured 24.1cm and was aged 5+.

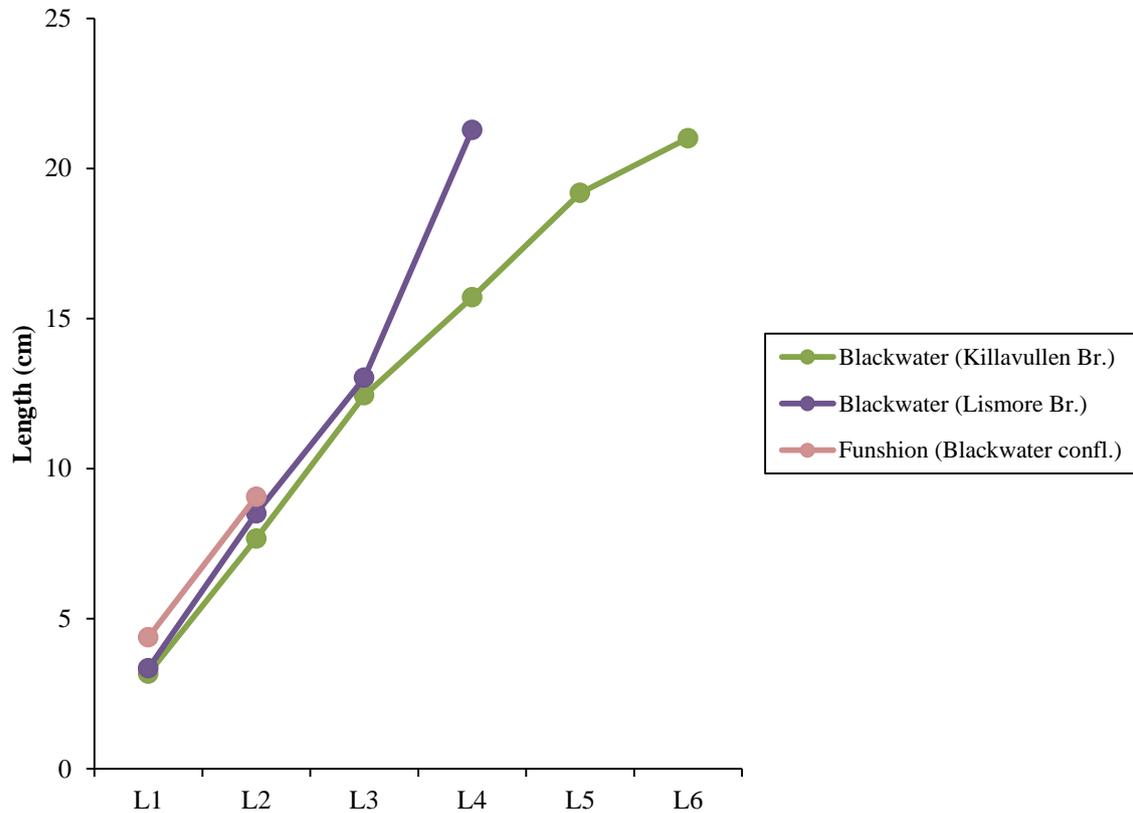


Fig. 4.51. Back calculated lengths for dace in each river, WFD surveillance monitoring 2013

Pike were only recorded in one SWRBD site, the River Lee (Lee Fields). Only two individuals were caught, the largest of which measured 64.6cm and was aged 3+. Length at age data for pike is shown in Appendix 5.

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 4.13). One site was classed as High, six as Good and five as Moderate. When comparing the status this year with that from previous years, there was a deterioration in status on the River Lee at Inchinossig Br., while all other sites remained the same.

Table 4.13. Ecological status of sites surveyed in the SWRBD 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
SWRBD Wadeable sites				
Adrigole	Glashduff confl._A	21A010150A	Good (73%)(2012)	Good (97%)
Araglin	Elizabeth's Br._A	18A030200A		Good (100%)
Cummeragh	Owengarriff confl_A	21C040400A	High (100%)(2010)	High (100%)
Dalua	Liscongill_A	18D010200A	Good (100%)(2010)	Good (97%)
Lee (Cork)	Inchinossig Br._A	19L030100A	Good (2008)	Moderate
Licky	Glenlicky_A	18L010100A	Moderate (88%)(2010)	Moderate (100%)
Owvane (Cork)	Pierson's Br._A	21O070400A		Good (72%)
SWRBD Non-Wadeable sites				
Blackwater	Killavullen Br._A	18B021900A	Moderate (92%)(2009)	Moderate
Blackwater	Lismore Br._A	18B022600A	Moderate (94%)(2010)	Moderate (57%)
Blackwater	Nohaval Br._A	18B020200A	Good (2009), Good (2010)	Good
Funshion	Blackwater confl_A	18F051100A	Good (2010)	Good (98%)
Lee (Cork)	Lee Fields_A	19L030800A	Moderate (73%)(2010)	Moderate

5. DISCUSSION

A total of 14 fish species were recorded during the 2013 WFD rivers surveillance monitoring programme for fish in rivers within the SWRBD. Brown trout was the most common fish species encountered in the SWRBD, recorded in all 12 sites, followed by salmon and European eel. The River Lee (Lee Fields) was the most diverse site surveyed within the SWRBD for the Water Framework Directive in 2013 with a total of 12 species present. The sites that recorded the lowest diversity in this region were the Adrigole River and Licky River, both with only three species present, brown trout, European eel and salmon. The greatest abundances of brown trout and salmon were both recorded in the Cumberagh River.

Following the methods of Kennedy and Fitzmaurice (1971), growth could be estimated at some sites. Growth was considered very slow at the Araglin, Blackwater (Nohaval Br.), Lee (Inchinossig Br.), Licky and Owvane Rivers, slow at the Blackwater (Killavullen Br.), Blackwater (Lismore Br.) and Funshion Rivers and fast at the River Lee (Lee Fields) (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. One site was classed as High, six as Good and five as Moderate.

6. REFERENCES

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Kennedy, M. and Fitzmaurice, P. (1971) Growth and food of brown trout *Salmo Trutta* (L.) in Irish waters. *Proceedings of the Royal Irish Academy*, **71 (B) (18)**, 269-352.

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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
Adrigole (Glashduff confl.)	Mean	7.62	14.10	12.80		n/a
	S.D.	1.69	2.69	n/a		
	S.E.	0.34	1.20	n/a		
	n	25	5	1		
	Min	4.53	9.60	12.80		
	Max	10.22	16.37	12.80		
Araglin (Elizabeth's Br.)	Mean	5.57	10.60			Very Slow
	S.D.	0.86	1.01			
	S.E.	0.18	0.38			
	n	23	7			
	Min	4.02	9.39			
	Max	7.39	11.92			
Blackwater (Killavullen Br.)	Mean	8.70	16.93	24.37		Slow
	S.D.	1.85	1.72	1.90		
	S.E.	0.45	0.54	0.95		
	n	17	10	4		
	Min	6.27	14.11	23.01		
	Max	14.14	19.14	27.11		
Blackwater (Lismore Br.)	Mean	6.56	14.56	22.61		Slow
	S.D.	1.11	3.40	n/a		
	S.E.	0.42	1.70	n/a		
	n	7	4	1		
	Min	5.36	11.79	22.61		
	Max	8.87	19.51	22.61		
Blackwater (Nohaval Br.)	Mean	6.07	11.98	17.31	22.41	Very Slow
	S.D.	1.38	2.47	2.38	0.67	
	S.E.	0.19	0.41	0.62	0.47	
	n	54	37	15	2	
	Min	3.30	7.20	13.78	21.94	
	Max	9.73	18.62	22.81	22.88	
Cummeragh (Owengarrif confl.)	Mean	7.75				n/a
	S.D.	2.56				
	S.E.	0.85				
	n	9				
	Min	4.38				
	Max	12.39				

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
Dalua (Liscongill)	Mean	8.03				n/a
	S.D.	0.98				
	S.E.	0.56				
	n	3				
	Min	6.92				
	Max	8.78				
Funshion (Blackwater confl.)	Mean	7.77	15.37	20.27		Slow
	S.D.	2.02	2.57	1.12		
	S.E.	0.46	0.59	0.46		
	n	19	19	6		
	Min	5.41	9.73	18.64		
	Max	11.50	20.91	21.30		
Lee (Inchinossig Br.)	Mean	5.52	10.91	15.33	20.40	Very Slow
	S.D.	1.12	2.29	0.38	n/a	
	S.E.	0.29	0.72	0.27	n/a	
	n	15	10	2	1	
	Min	3.40	8.08	15.06	20.40	
	Max	7.21	14.78	15.60	20.40	
Lee (Lee Fields)	Mean	7.96	19.60	25.13		Fast
	S.D.	1.56	2.97	n/a		
	S.E.	0.55	2.10	n/a		
	n	8	2	1		
	Min	5.09	17.49	25.13		
	Max	10.21	21.70	25.13		
Licky (Glenlicky)	Mean	6.00	11.02	13.15		Very Slow
	S.D.	1.23	1.48	n/a		
	S.E.	0.27	0.52	n/a		
	n	21	8	1		
	Min	4.75	9.13	13.15		
	Max	9.48	12.99	13.15		
Owvane (Pierson's Br.)	Mean	6.53	12.38			Very Slow
	S.D.	1.97	2.92			
	S.E.	0.62	1.68			
	n	10	3			
	Min	5.20	10.68			
	Max	11.91	15.74			

APPENDIX 2

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

River		L1	L2
Adrigole (Glashduff confl.)	Mean	5.67	
	S.D.	1.10	
	S.E.	0.24	
	n	21	
	Min	3.93	
	Max	7.80	
Araglin (Elizabeth's Br.)	Mean	4.24	7.86
	S.D.	0.88	0.92
	S.E.	0.16	0.27
	n	29	12
	Min	3.00	6.14
	Max	7.01	9.75
Blackwater (Killavullen Br.)	Mean	5.46	
	S.D.	0.71	
	S.E.	0.41	
	n	3	
	Min	4.64	
	Max	5.90	
Blackwater (Lismore Br.)	Mean	5.78	
	S.D.	0.96	
	S.E.	0.19	
	n	27	
	Min	4.32	
	Max	7.89	
Blackwater (Nohaval Br.)	Mean	5.07	
	S.D.	1.05	
	S.E.	0.24	
	n	19	
	Min	3.64	
	Max	7.40	
Cummeragh (Owengarrif confl.)	Mean	4.38	7.38
	S.D.	0.87	0.73
	S.E.	0.20	0.42
	n	19	3
	Min	3.05	6.54
	Max	5.70	7.81

APPENDIX 2 continued

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

River		L1	L2
Dalua (Liscongill)	Mean	4.26	7.50
	S.D.	0.64	0.81
	S.E.	0.12	0.27
	n	27	9
	Min	3.13	6.45
	Max	6.00	8.95
Funshion (Blackwater confl.)	Mean	5.08	
	S.D.	1.05	
	S.E.	0.23	
	n	21	
	Min	3.03	
	Max	7.02	
Lee (Lee Fields)	Mean	6.34	
	S.D.	1.55	
	S.E.	0.69	
	n	5	
	Min	4.76	
	Max	8.94	
Licky (Glenlicky)	Mean	5.36	9.48
	S.D.	0.68	1.53
	S.E.	0.16	1.08
	n	19	2
	Min	4.18	8.40
	Max	6.90	10.56
Owvane (Pierson's Br.)	Mean	5.36	
	S.D.	0.74	
	S.E.	0.22	
	n	11	
	Min	4.33	
	Max	6.70	

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
Blackwater (Lismore Br.)	Mean	3.73	5.70	
	S.D.	0.08	0.22	
	S.E.	0.05	0.13	
	n	3	3	
	Min	3.65	5.45	
	Max	3.82	5.87	
Lee (Inchinossig Br.)	Mean	4.04	8.11	9.88
	S.D.	0.86	0.58	n/a
	S.E.	0.35	0.24	n/a
	n	6	6	1
	Min	2.91	7.49	9.88
	Max	5.06	9.07	9.88

APPENDIX 4

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

River		L1	L2	L3	L4	L5	L6
Blackwater (Killavullen Br.)	Mean	3.17	7.67	12.44	15.70	19.18	21.01
	S.D.	0.67	1.19	1.78	2.52	2.16	0.94
	S.E.	0.17	0.31	0.46	0.80	0.72	0.42
	n	15	15	15	10	9	5
	Min	2.40	5.65	8.81	11.30	16.05	20.23
	Max	4.78	9.33	16.17	20.68	22.86	22.34
Blackwater (Lismore Br.)	Mean	3.35	8.51	13.03	21.28		
	S.D.	0.34	1.24	1.61	n/a		
	S.E.	0.15	0.55	0.80	n/a		
	n	5	5	4	1		
	Min	3.07	6.96	11.46	21.28		
	Max	3.94	10.07	15.20	21.28		
Funshion (Blackwater confl.)	Mean	4.38	9.06				
	S.D.	1.59	0.34				
	S.E.	0.80	0.24				
	n	4	2				
	Min	3.01	8.83				
	Max	6.06	9.30				

APPENDIX 5

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

River		L1	L2	L3
Lee (Lee Fields)	Mean	21.54	45.97	57.15
	S.D.	1.16	n/a	n/a
	S.E.	0.82	n/a	n/a
	n	2	1	1
	Min	20.72	45.97	57.15
	Max	22.36	45.97	57.15



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