Sampling Fish for the Water Framework Directive

Rivers 2012

Eastern River Basin District

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the Eastern River Basin District, 2012

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1. INTRODUCTION

Fish stock surveys were undertaken in 58 river sites throughout Ireland during the summer of 2012 as part of the programme of sampling fish for the Water Framework Directive (WFD). These surveys are required by both national and European law, with Annex V of the WFD stipulating that rivers are included within the monitoring programme and that the composition, abundance and age structure of fish fauna are examined (Council of the European Communities, 2000). Eight of these surveys were carried out at river sites in the Eastern River Basin District (ERBD) from July to September 2012 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 2012 is the fifth year of the rivers sampling programme, many of the sites surveyed this year are repeat surveys of those carried out in 2009. 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 2012 fish stock survey carried out on each site in the ERBD, as part of the Water Framework Directive surveillance monitoring programme.

2. STUDY AREA

Eight river sites were surveyed in five river catchments within the ERBD during 2012: Avoca, Boyne, Dargle, Liffey and Nanny catchments (Table 2.1). The sites ranged in surface area from 212m^2 for the Athboy River (Br. near Clonleasan Ho._A) to 4228m^2 for the River Liffey (Ballyward). All sites except for the River Liffey were wadeable and were surveyed using bank-based electric fishing units. The River Liffey site was 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 ERBD is shown in Figure 2.1.

Table 2.1. Location and codes of river sites surveyed for WFD surveillance monitoring, ERBD 2012

River	Site name	Catchment	Site Code	Waterbody code
ERBD Wadeable sites				
Athboy	Br. nr Clonleasan Ho_A	Boyne	07A010100A	EA_07_971
Athboy	Br. nr Clonleasan Ho_B	Boyne	07A010100B	EA_07_971
Dargle	Bahana_A	Dargle	10D010005A	EA_10_1148
Glencree	Br. u/s Dargle R confl_A	Dargle	10G010200A	EA_10_367
Glenealo	Br. d/s Upper Lake_A	Avoca	10G050200A	EA_10_793
Glenealo	Br. d/s Upper Lake_B	Avoca	10G050200B	EA_10_793
Nanny (Meath)	Br. at Julianstown_A	Nanny	08N010700A	EA_08_814
ERBD Non-Wadeable sites				
Liffey	500 m d/s Ballyward Br._A	Liffey	09L010250A	EA_09_1175

Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, ERBD 2012

River	Upstream catchment (km^2)	Wetted width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
ERBD Wadeable sites					
Athboy (Br. nr Clonleasan Ho._A)	78.02	5.30	212	0.55	0.77
Athboy (Br. nr Clonleasan Ho._B)	78.02	6.23	249	0.49	0.74
Dargle (Bahana_A)	12.92	7.98	311	0.19	0.37
Glencree (Br. u/s Dargle confl_A)	33.86	8.90	401	0.39	0.85
Glenealo (Br. d/s Upper Lake_A)	18.73	7.33	242	0.44	0.78
Glenealo (Br. d/s Upper Lake_B)	18.85	7.25	276	0.40	0.91
Nanny (Meath) (Br. at Julianstown_A)	221.68	11.40	456	0.48	0.75
ERBD Non-Wadeable sites					
Liffey (500 m d/s Ballyward Br._A)	87.70	14.83	4228	0.55	2.77
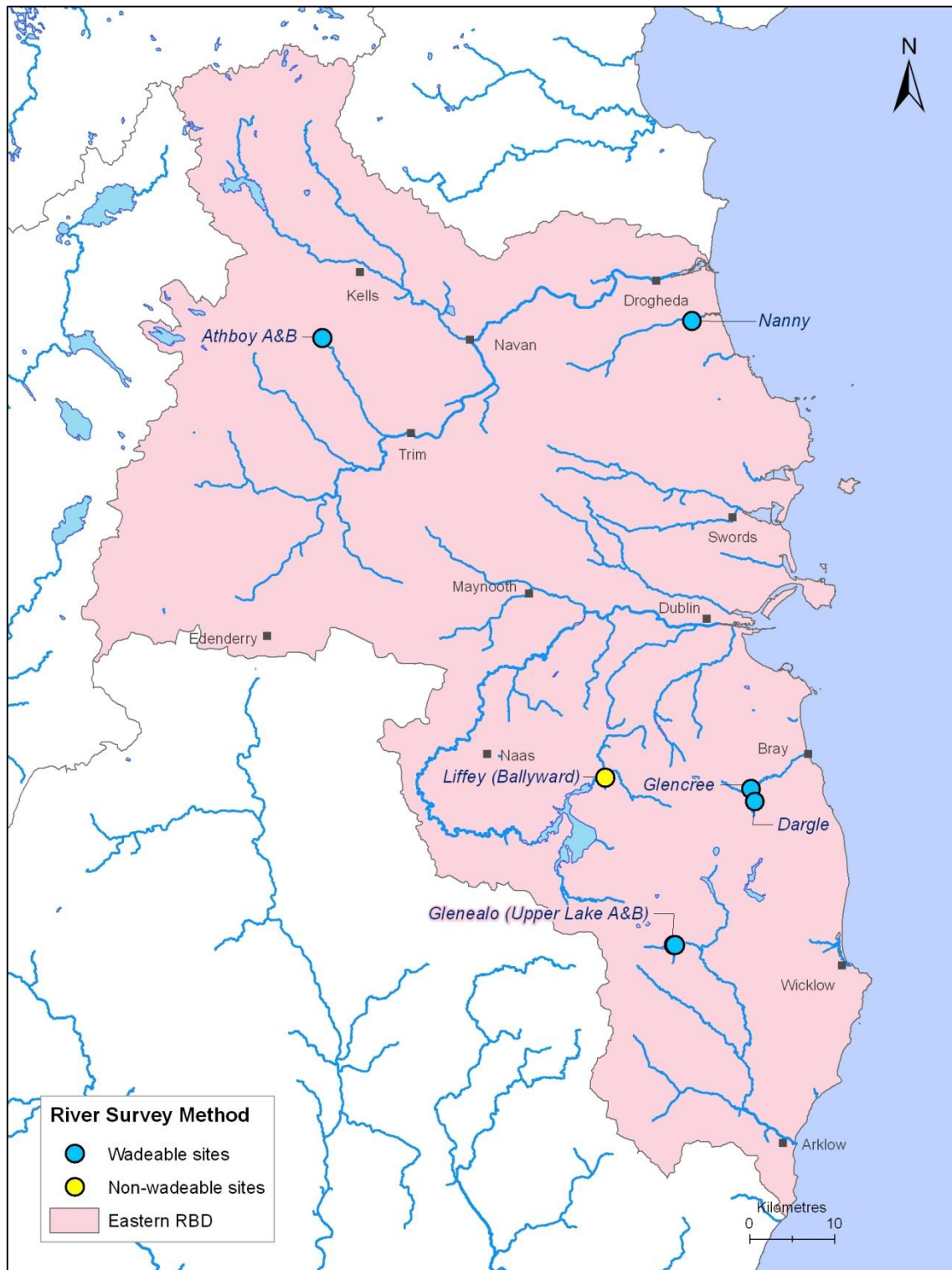
Fig. 2.1. Location map of river sites surveyed throughout the ERBD for WFD fish surveillance monitoring, 2012

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 Athboy River

Two sites were electric fished on the Athboy River as part of the WFD surveillance monitoring programme in rivers 2012; the Athboy River, Clonleasan House 'A' and Athboy River, Clonleasan House 'B'.

The Athboy_Clonleasan House 'A' survey site was located just upstream of a bridge, approximately 6.5km northwest of Athboy, Co. Meath (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 5th of September 2012, along a 40m length of channel. Glide was the most abundant habitat type present, over a substrate of mainly cobble, gravel and sand. Vegetation at this site was diverse, consisting of numerous moss and liverwort species, as well as emergent bank-side and riparian species.

The Athboy_Clonleasan House 'B' survey site was located just upstream of, and adjacent to the 'A' site. Three electric-fishing passes were conducted using two bank-based electric fishing units on the 5th of September 2012, along a 40m length of channel. Glide was the most abundant habitat type present, over a substrate of mainly cobble, gravel and sand. Vegetation at this site was diverse, consisting of numerous moss and liverwort species, as well as emergent bank-side and riparian species.
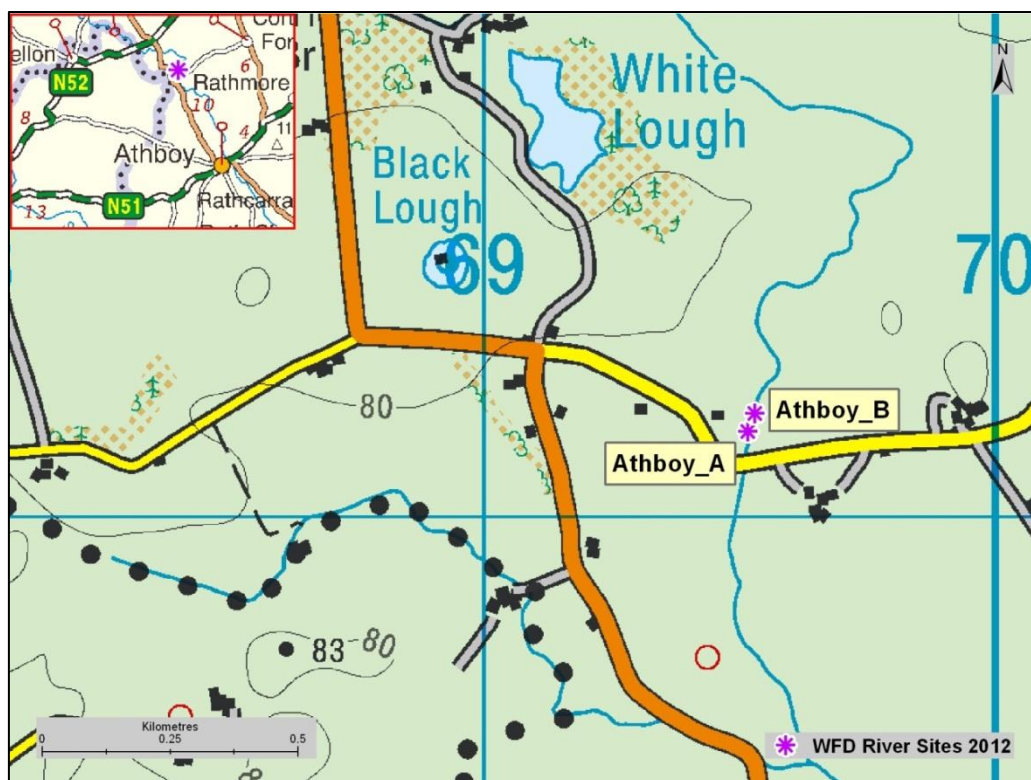
Fig. 4.1. Location of the Athboy River surveillance monitoring sites

Plate 4.1. The Athboy River at Clonleasan, Co. Meath

Athboy River (Site A)

A total of four fish species were recorded in the Athboy River, Clonleasan Site A (Table 4.1) during 2012. Brown trout was the most abundant species, followed by salmon and equal numbers of three-spined stickleback and stone loach.

Table 4.1. Density of fish (no./m^2), Athboy River site A (fish density has been calculated as minimum estimates based on one fishing)

Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.101	0.131	0.233	0.024	0.099	0.123
Salmon	0.023	0.071	0.094	0.009	0.028	0.038
Three-spined stickleback	-	-	0.008	-	-	0.005
Stone loach	-	-	0.004	-	-	0.005
European eel	-	-	0.008	-	-	-
Lamprey juvenile	-	-	0.004	-	-	-
All Fish	-	-	0.349	-	-	0.170

Brown trout captured during the 2012 survey ranged in length from 6.1cm to 28.3cm (mean = 15.0cm) (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 24%, 47%, 24% and 5% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 4.9cm to 24.7cm (mean = 12.3cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 41%, 42% and 18% of the brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 7.0cm to 14.2cm (mean = 11.7cm) (Fig. 4.3). Two age classes (0+ and 1+) were present, accounting for approximately 25% and 75% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 4.6cm to 14.2cm (mean = 10.6cm). Two age classes (0+ and 1+) were present, accounting for approximately 24% and 76% of the salmon catch respectively.

Fig. 4.2. Length frequency distribution of brown trout in the Athboy River site, July 2009 (n = 101) and July 2012 (n = 38)
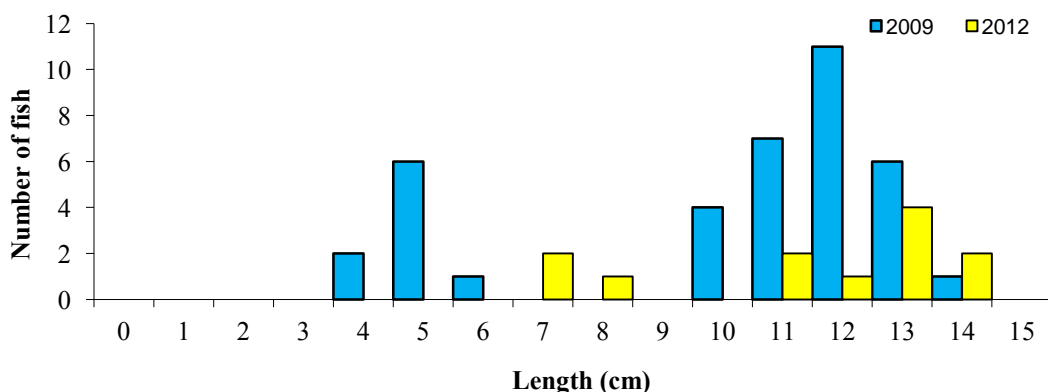
Fig. 4.3. Length frequency distribution of salmon in the Athboy River site, July 2009 (n = 38) and July 2012 (n = 12)

Athboy River (Site B)
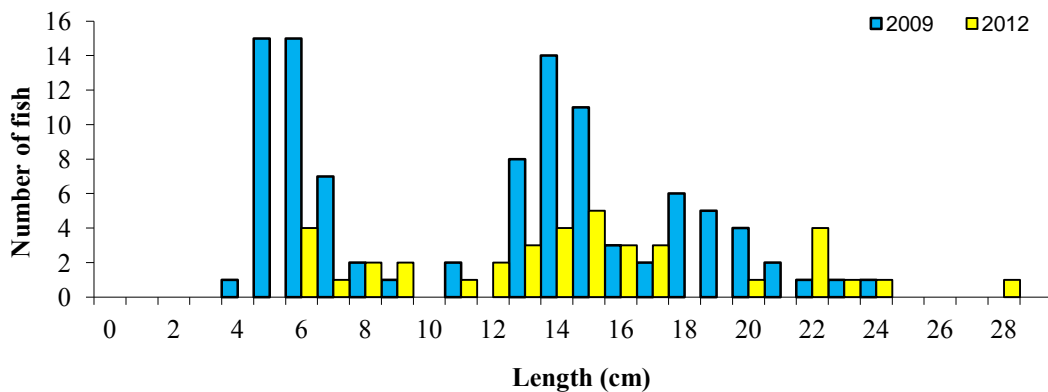
A total of six fish species were recorded in the Athboy River Clonleasan Site B (Table 4.2). Brown trout was the most abundant species, followed by salmon, and equal numbers of eels, minnow, perch and stone loach.

Table 4.2. Density of fish (no./m^2), Athboy River Site B (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Brown trout	0.052	0.108	0.160
Salmon	0.008	0.008	0.008
European eel	-	-	0.004
Minnow	-	-	0.004
Perch	-	-	0.004
Stone loach	-	-	0.004
All Fish	-	-	0.184

Brown trout captured during the 2012 survey ranged in length from 6.9cm to 29.4cm (mean = 15.4cm) (Fig. 4.4). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for 30%, 39%, 23%, 5% and 3% of the total brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 7.2cm to 13.6cm (mean = 10.1cm). Two age classes (0+ and 1+) were present, accounting for approximately 60% and 40% of the total salmon catch respectively.
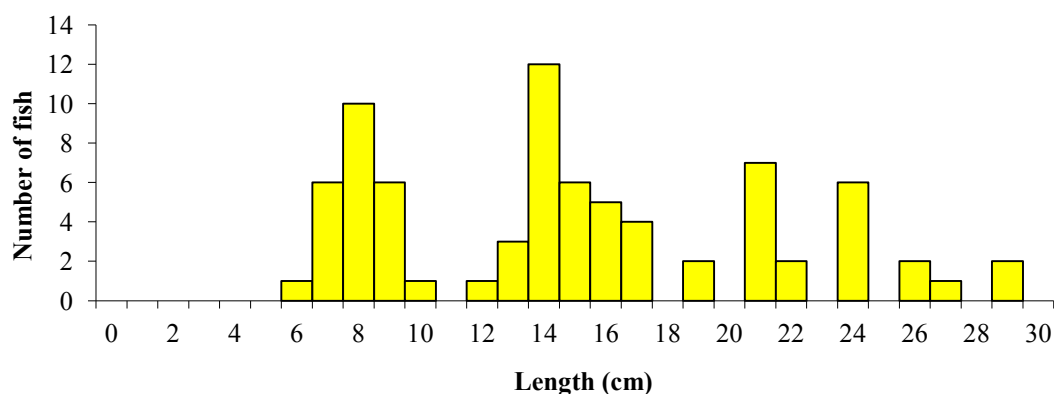
Fig. 4.4. Length frequency distribution of brown trout in the Athboy River site, July 2009 (n = 101) and July 2012 (n = 77)

4.1.2 The Dargle River

One site was electric fished on the Dargle River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located on the upstream side of a bridge, approximately 1.5km below Powerscourt Waterfall, 4.5km southwest of Enniskerry Co. Wicklow (Fig. 4.5; Plate 4.2). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 20th of August 2012, along a 39m length of channel. Riffle was the most abundant habitat type present, over a substrate of mainly cobble. Vegetation at this site consisted mainly of mosses and liverworts.
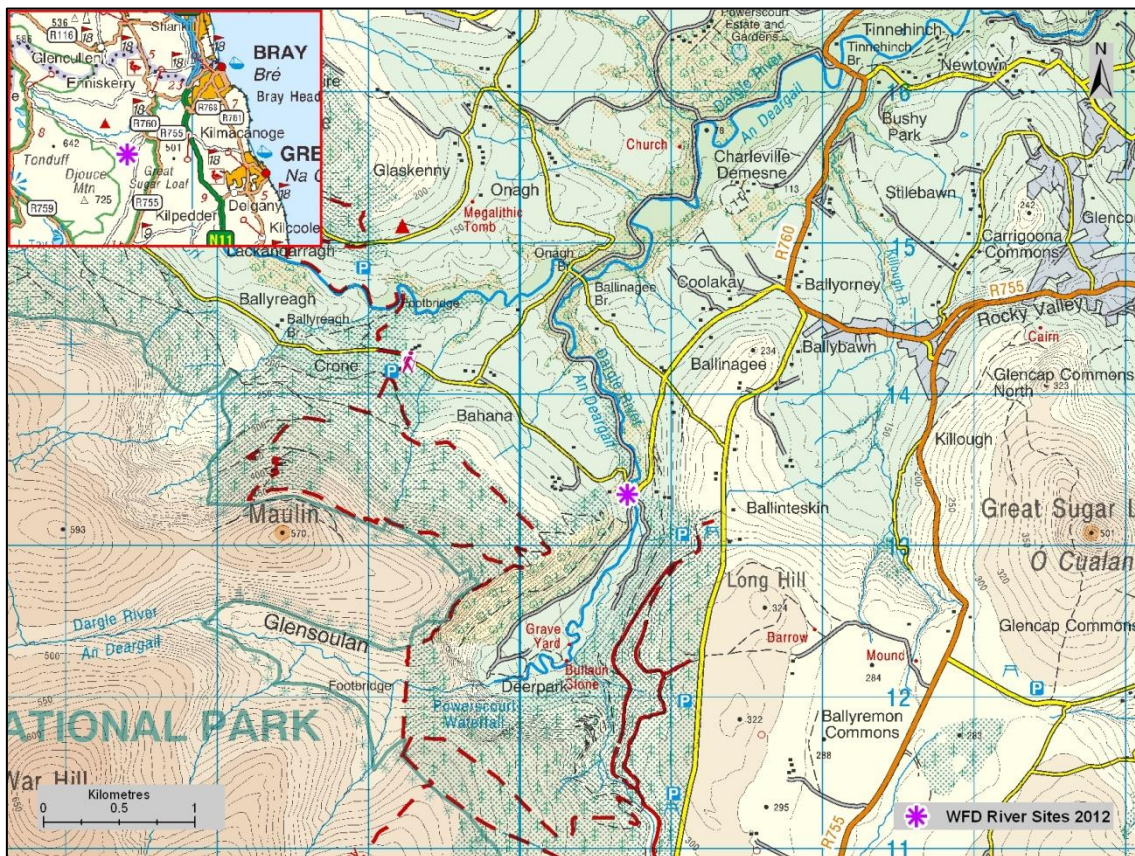
Fig. 4.5. Location of the Dargle River surveillance monitoring site
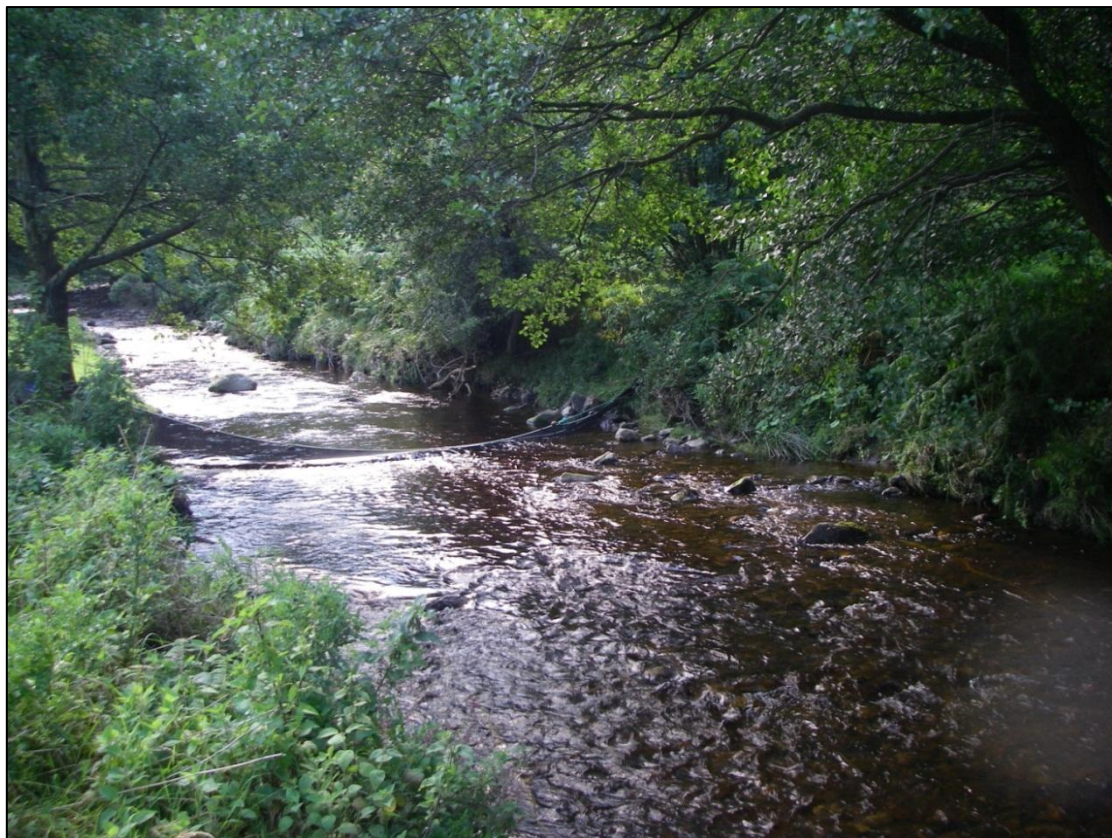
Plate 4.2. The Dargle River at Bahana, Co. Wicklow

Only two fish species were recorded in the Dargle River at Bahana (Table 4.3). Brown trout was the most abundant species followed by salmon.

Table 4.3. Density of fish (no./m^2), Dargle River (Bahana) (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Brown trout	0.087	0.032	0.119
Salmon	0.000	0.003	0.003
All Fish	-	-	0.122

Brown trout captured during the 2012 survey ranged in length from 4.1cm to 17.7cm (mean = 7.2cm) (Fig. 4.6). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 66%, 30% and 3% of the total brown trout catch respectively.

Fig. 4.6. Length frequency distribution of brown trout in the River Dargle site, August 2012 (n = 88)

4.1.3. The Glencree River

One site was electric fished on the Glencree River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located upstream of Ballinagee Bridge, close to the confluence with the Dargle River, approximately 2km southwest of Enniskerry (Fig. 4.7; Plate 4.3). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 4th of July 2012, along a 45m length of channel. Pool was the most abundant habitat type present, over a substrate of mainly cobble. Vegetation at this site consisted mainly of shade tolerant mosses and liverworts.
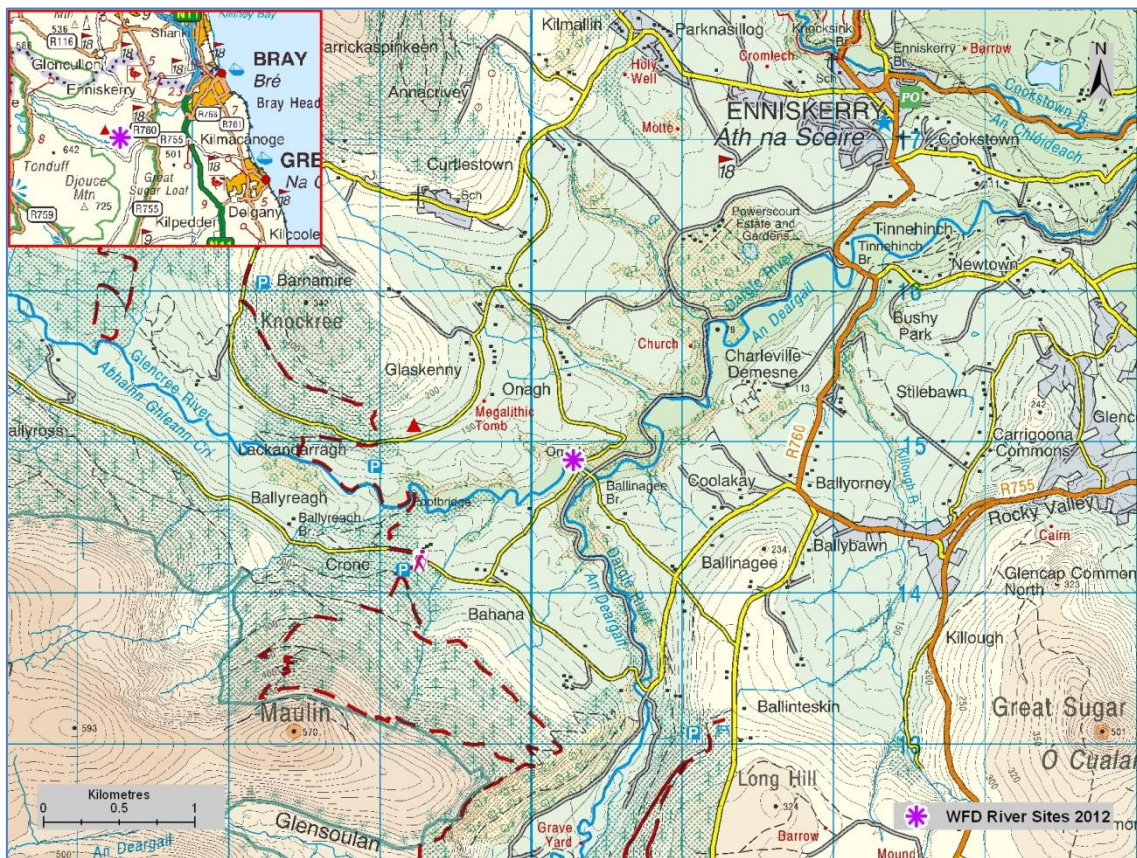
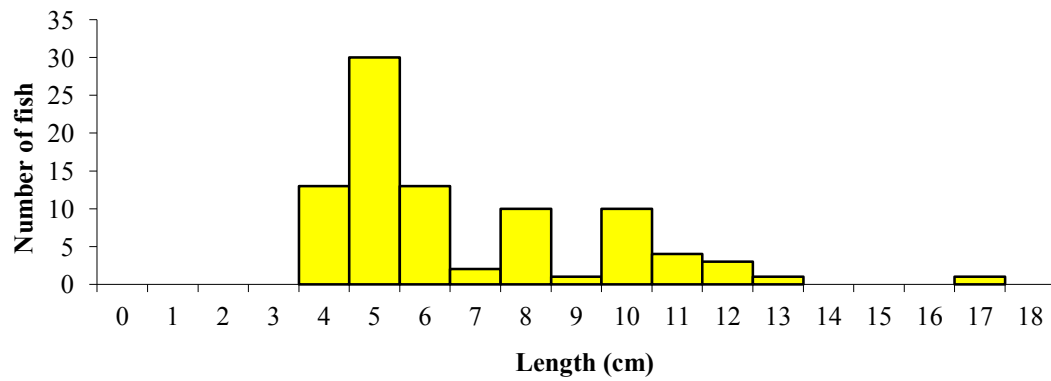**Fig. 4.7. Location of the Glencree River surveillance monitoring site**

Plate 4.3. The Glencree River, near Ballinagee Bridge, Co. Wicklow

A total of three fish species were recorded in the Glencree River (Ballinagee) site during the 2012 survey (Table 4.4). Brown trout was the most abundant species, followed by salmon and eels.

Table 4.4. Density of fish (no./m^2), Glencree River (Ballinagee) (fish density has been calculated as minimum estimates based on one fishing)

Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.064	0.029	0.094	0.035	0.057	0.092
Salmon	0.035	0.026	0.061	0.005	0.015	0.020
European eel	-	-	0.003	-	-	0.002
Stone loach	-	-	0.003	-	-	-
All Fish	-	-	0.161	-	-	0.115

Brown trout captured during the 2012 survey ranged in length from 3.5cm to 19.5cm (mean = 8.9cm) (Fig. 4.8). Three age classes (0+, 1+ and 2+) were present, accounting for 43%, 32% and 25% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 5.0cm to 25.4cm (mean = 8.9cm). Five age classes were present (0+, 1+, 2+, 3+ and 4+), accounting for approximately 58%, 28%, 6%, 4% and 4% of the brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 3.5cm to 10.7cm (mean = 7.3cm) (Fig. 4.9). Two age classes (0+ and 1+) were present, accounting for approximately 38% and 62% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 4.2cm to 13.6cm (mean = 7.1cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 57%, 41% and 2% of the salmon catch respectively.
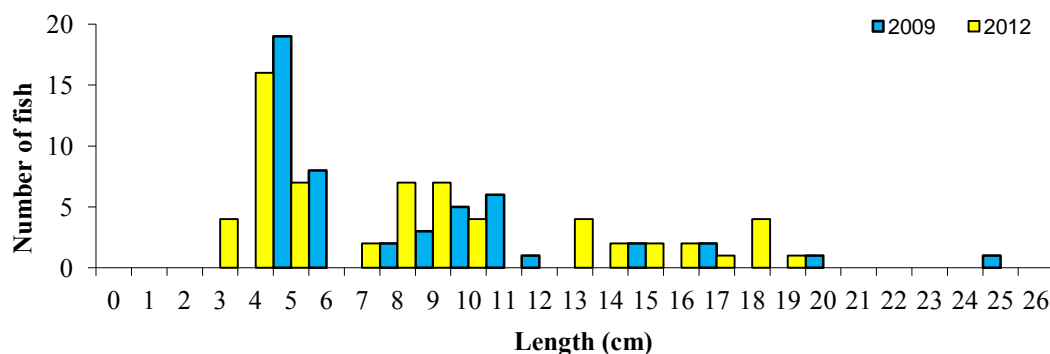
Fig. 4.8. Length frequency distribution of brown trout in the Glencree River site, August 2009 (n = 50) and July 2012 (n = 63)
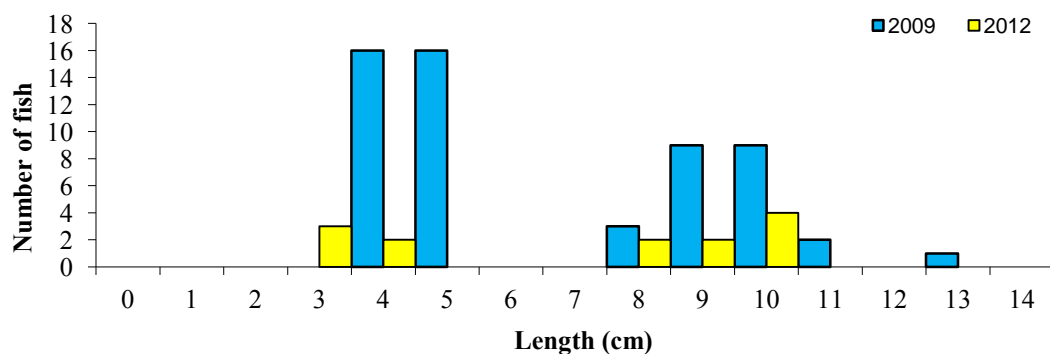
Fig. 4.9. Length frequency distribution of salmon in the Glencree River site, August 2009 (n = 56) and July 2012 (n = 13)
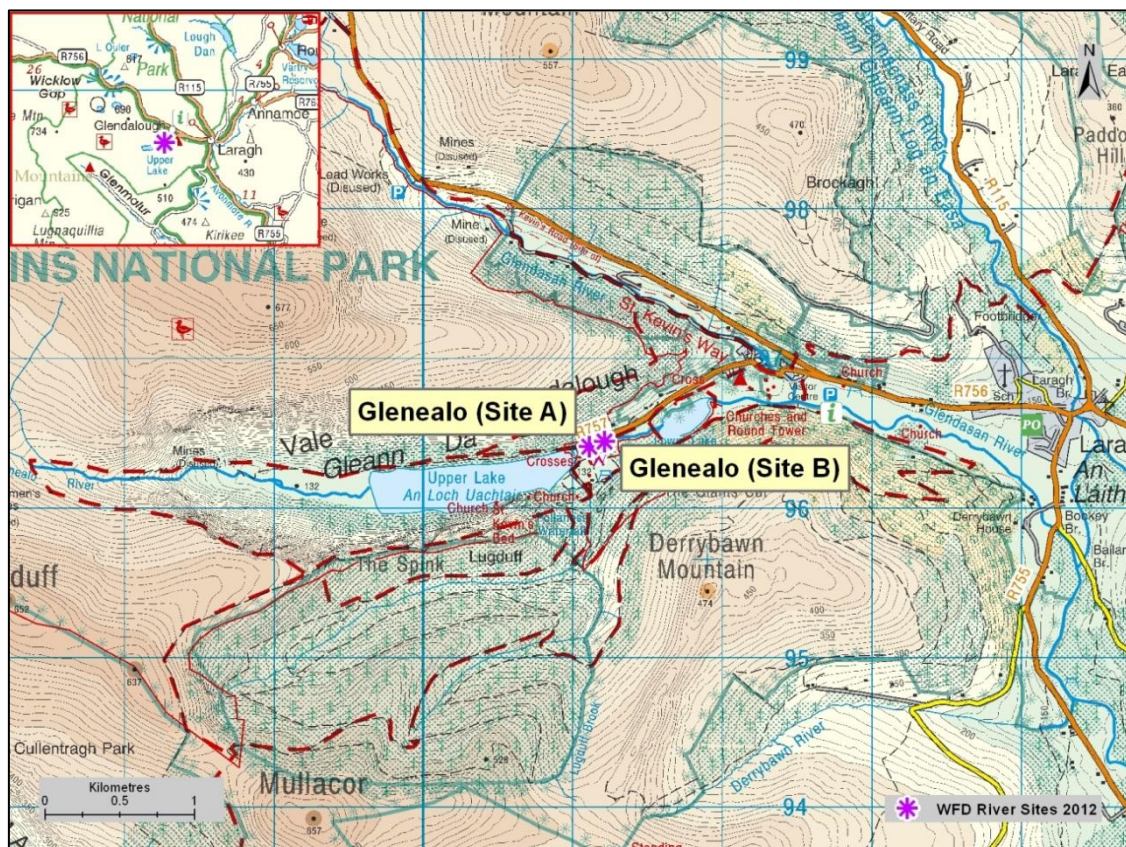
4.1.4. The Glenealo River

Two sites were electric fished on the Glenealo River as part of the WFD surveillance monitoring programme in rivers 2012; the Glenealo (Site A) downstream of the upper lake in Glendalough National Park, Co. Wicklow and the Glenealo (Site B) located about 100m further downstream behind the shop in the car park of Glendalough National Park.

The Glenealo River, Site A, was located downstream of the Upper Lake within Glendalough National Park on the upstream side of a wooden footbridge near the main car park (Fig. 4.10; Plate 4.4). Two electric-fishing passes were conducted using three bank-based electric fishing units on the 4th of July 2012, along a 33m length of channel. Glide was the dominant habitat at this stretch, with a substrate of mainly cobble. Vegetation at this site consisted mainly of small shade plants including mosses and liverworts.

The Glenealo River, Site B, was located further downstream of the car park within 100m of Site A (Fig. 4.10; Plate 4.5). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 20th of August 2012, along a 38m length of channel. Glide dominated this stretch, with a substrate mix of mainly cobble and gravel. Vegetation at this site also consisted mainly of small shade plants including mosses and liverworts.

Fig. 4.10. Location of the Glenealo River surveillance monitoring sites

Plate 4.4. The Glenealo River (Site A), Upper Lake Glendalough, Co. Wicklow

Plate 4.5. The Glenealo River (Site B), Upper Lake, Glendalough, Co. Wicklow

Glenealo River (Upper Lake, Site A)

Brown trout was the only species captured at the Glenealo River, Site A during the 2012 survey (Table 4.5).

Table 4.5. Density of fish (no./m^2), Glenealo River (Upper Lake, Site A) (fish density has been calculated as minimum estimates based on one fishing)

Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.039	0.003	0.039	0.004	0.012	0.017
Salmon	0.000	0.003	0.003	-	-	-
European eel	-	-	0.006	-	-	-
All Fish	-	-	0.049	-	-	0.017

Brown trout captured during the 2012 survey ranged in length from 4.3cm to 8.3cm (mean = 6.7cm) (Fig. 4.11). Two age classes (0+ and 1+) were present, accounting for 33%, 67% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 3.2cm to 19.4cm (mean = 5.2cm). Two age classes were present (0+ and 1+), accounting for approximately 94% and 3% of the brown trout catch respectively.
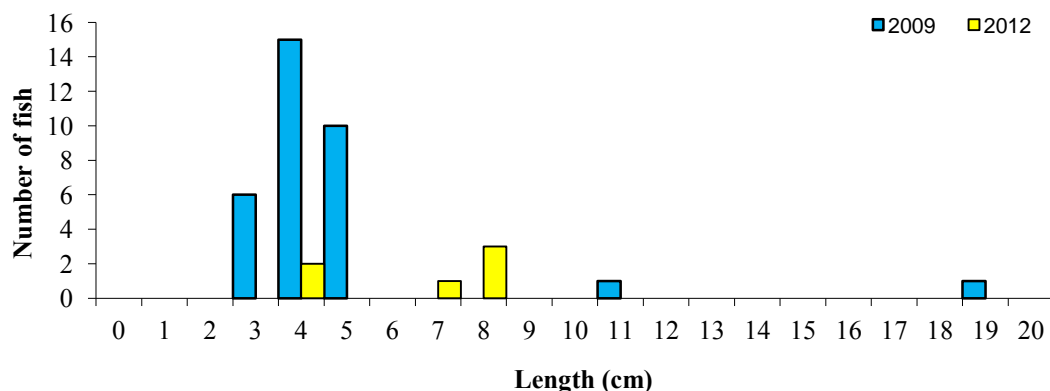
Fig. 4.11. Length frequency distribution of brown trout in the Glenealo River (Upper Lake) site, August 2009 (n = 33) and July 2012 (n = 6)

Glenealo River (Upper Lake B)

Brown trout and eels were both captured in equal numbers at the Glenealo River (Upper Lake) B site during the 2012 survey (Table 4.6).

Table 4.6. Density of fish (no./m^2), Glenealo River (Upper Lake B) (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Brown trout	0.000	0.025	0.025
European eel	-	-	0.025
All Fish	-	-	0.051

Brown trout captured during the 2012 survey ranged in length from 6.6cm to 12.8cm (mean = 10.0cm) (Fig. 4.12). Two age classes (0+ and 1+) were present, accounting for 89% and 11% of the total brown trout catch respectively.

European eels captured during the 2012 survey ranged in length from 19.7cm to 32.1cm (mean = 24.4cm) (Fig. 4.13).
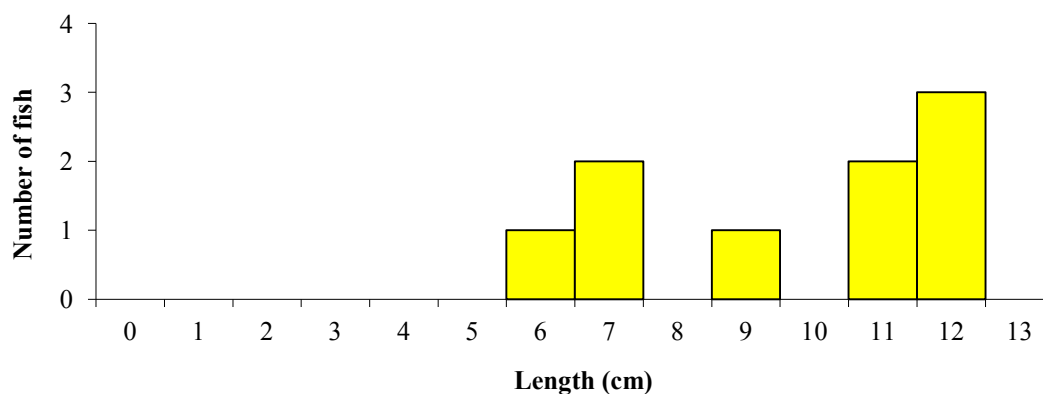
Fig. 4.12. Length frequency distribution of brown trout in the Glenealo River (Shop) site, August 2012 (n = 9)
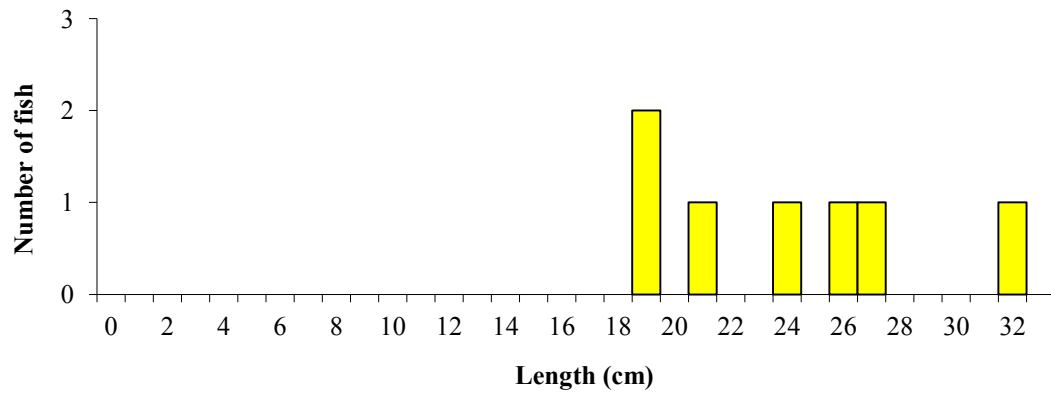
Fig. 4.13. Length frequency distribution of European eels in the Glenealo River (Shop) site, August 2012 (n = 7)

4.1.5 The River Liffey

One site was electric fished on the River Liffey as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located upstream of Ballyward Br., just outside the village of Kilbride, Co. Wicklow (Fig. 4.14; Plate 4.6). Three electric-fishing passes were conducted using two boat-based electric fishing units on the 4th of September 2012, along a 285m length of channel. Glide was the most abundant habitat type present, over a mixed substrate of cobble, gravel and sand. Aquatic vegetation was scarce throughout the stretch.
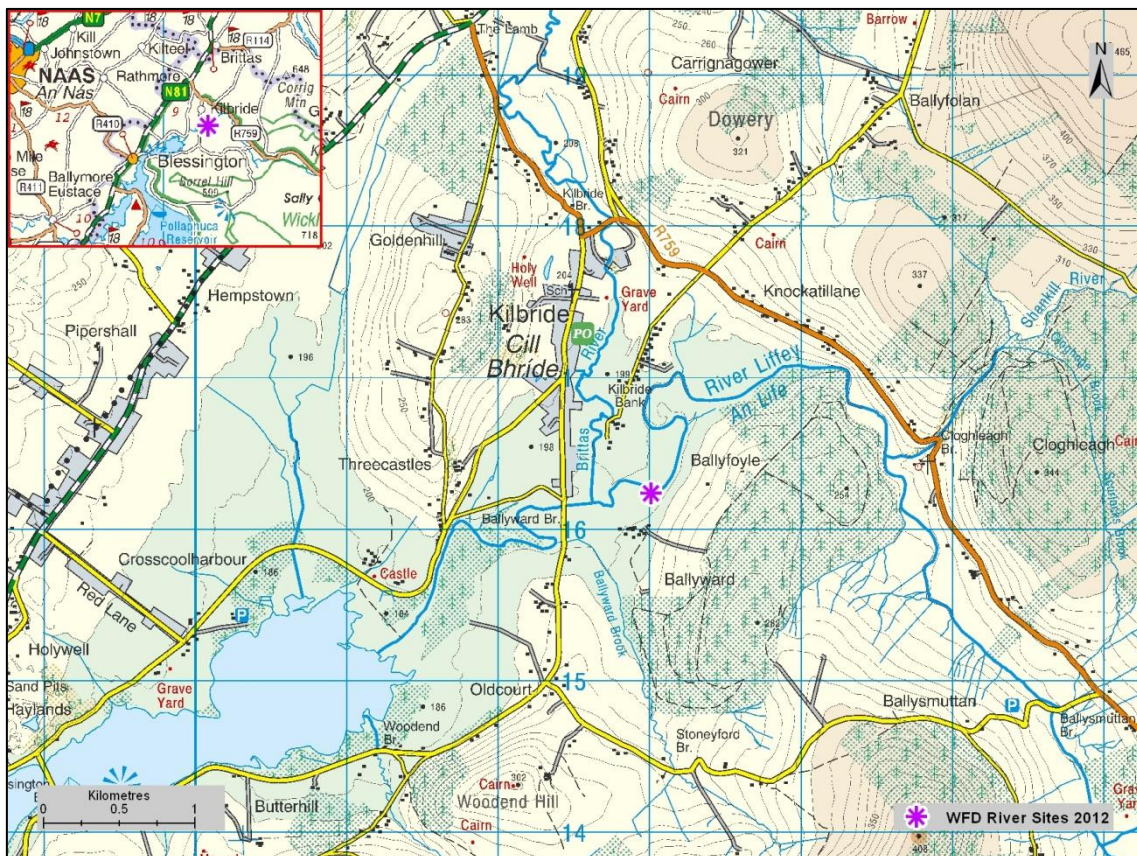
Fig. 4.14. Location of the River Liffey (Ballyward) surveillance monitoring site

Plate 4.6. The River Liffey at Ballyward, Co. Wicklow

A total of four fish species were recorded in the River Liffey site at Ballyward during the 2012 survey (Table 4.7). Brown trout was the most abundant species recorded, followed by minnow, perch and stone loach.

Table 4.7. Density of fish (no./m^2), River Liffey (fish density has been calculated as minimum estimates based on one fishing)

Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.001	0.001	0.0030	0.003	0.010	0.0130
Minnow	-	-	0.0010	-	-	0.0060
Perch	-	-	-	-	-	0.0005
Stone loach	-	-	-	-	-	0.0002
Roach	-	-	0.0002	-	-	-
All Fish	-	-	0.0040	-	-	0.0200

Brown trout captured during the 2012 survey ranged in length from 5.3cm to 36.8cm (mean = 17.8cm) (Fig. 4.15). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for 23%, 33%, 32%, 11% and 1% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 6.8cm to 29.7cm (mean = 15.0cm). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for approximately 45%, 18%, 18%, 9% and 9% of the brown trout catch respectively.
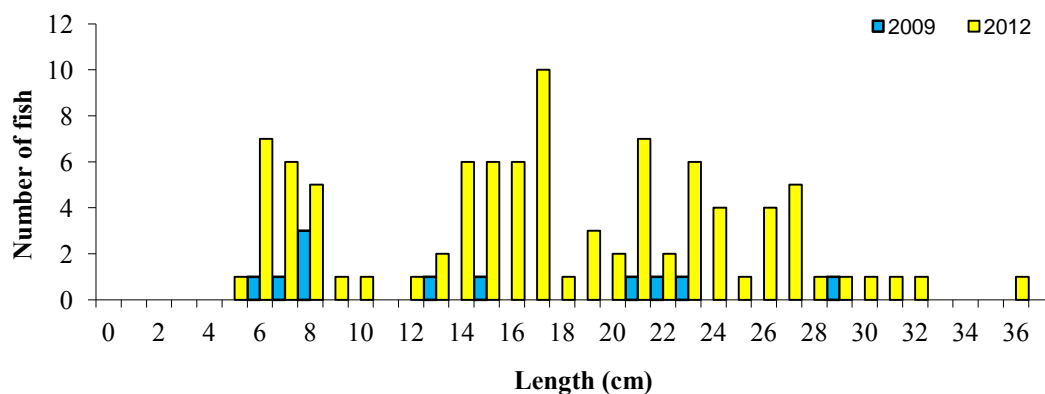
Fig. 4.15. Length frequency distribution of brown trout in the River Liffey (Ballyward Br.) site, August 2009 (n = 11) and September 2012 (n = 93)

4.1.6 The River Nanny (Meath)

One site was electric fished on the River Nanny as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located upstream of a bridge in Julianstown, approximately 4km north of Athboy, Co. Meath (Fig. 4.16; Plate 4.7). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 5th of September 2012, along an 80m length of channel. Glide was the most abundant habitat type present, with a substrate consisting of mainly gravel. The vegetation at this site consisted of tall emergent and semi-aquatic riparian species.

Fig. 4.16. Location of the River Nanny surveillance monitoring site

Plate 4.7. The River Nanny at Julianstown, Co. Meath

A total of eight fish species were recorded in the River Nanny (Julianstown) site (Table 4.8). Minnow was the most abundant species followed by stone loach, eels, brown trout, flounder, salmon, sea trout and three-spined stickleback.

Table 4.8. Density of fish (no./m^2), River Nanny (Julianstown) (fish density has been calculated as minimum estimates based on one fishing)

| Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Minnow	-	-	0.143	-	-	0.125
Stone loach	-	-	0.067	-	-	0.033
European eel	-	-	0.030	-	-	0.031
Brown trout	0.014	0.006	0.020	0.004	0.009	0.013
Flounder	-	-	0.032	-	-	0.011
Salmon	0.004	0.000	0.004	0.004	0.002	0.004
Sea trout	-	-	-	-	-	0.004
Three-spined stickleback	-	-	0.018	-	-	0.002
All Fish	-	-	0.313	-	-	0.224

Brown trout captured during the 2012 survey ranged in length from 7.5cm to 25.3cm (mean = 12.6cm) (Fig. 4.17). Three age classes (0+, 1+ and 2+) were present, accounting for 50%, 42% and 8% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 7.1cm to 21.0cm (mean = 10.7cm). Two age classes were present (0+ and 1+) accounting for approximately 79% and 21% of the brown trout catch respectively.

European eels captured during the 2012 survey ranged in length from 9.2cm to 48.0cm (mean = 23.4cm) (Fig. 4.18). In 2009 they ranged in length from 10.6cm to 36.7cm (mean = 21.4cm).

Flounder captured during the 2012 survey ranged in length from 4.1cm to 12.1cm (mean = 6.2cm) (Fig. 4.19). In 2009 they ranged in length from 4.2cm to 17.3cm (mean = 8.3cm).

Stone loach captured during the 2012 survey ranged in length from 5.7cm to 9.8cm (mean = 7.6cm) (Fig. 4.20). In 2009 they ranged in length from 6.2cm to 9.4cm (mean = 7.4cm).
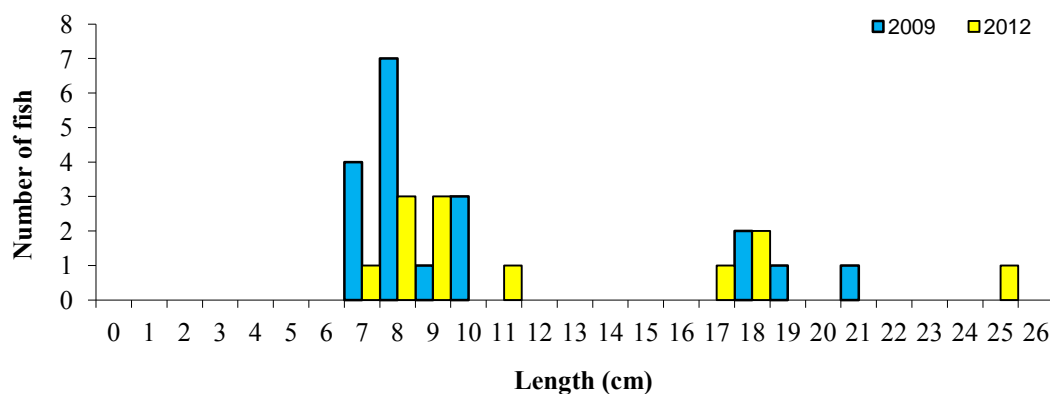
Fig. 4.17. Length frequency distribution of brown trout in the River Nanny site, August 2009 (n = 19) and September 2012 (n = 12)
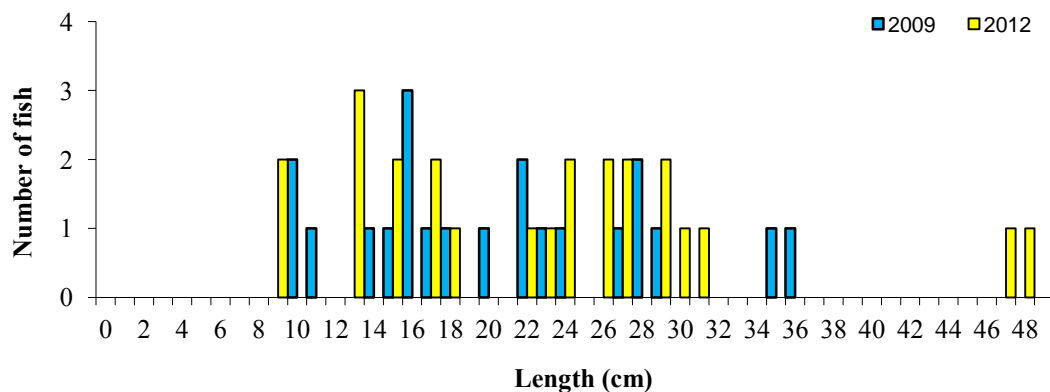
Fig. 4.18. Length frequency distribution of European eels in the River Nanny site, August 2009 (n = 21) and September 2012 (n = 24)
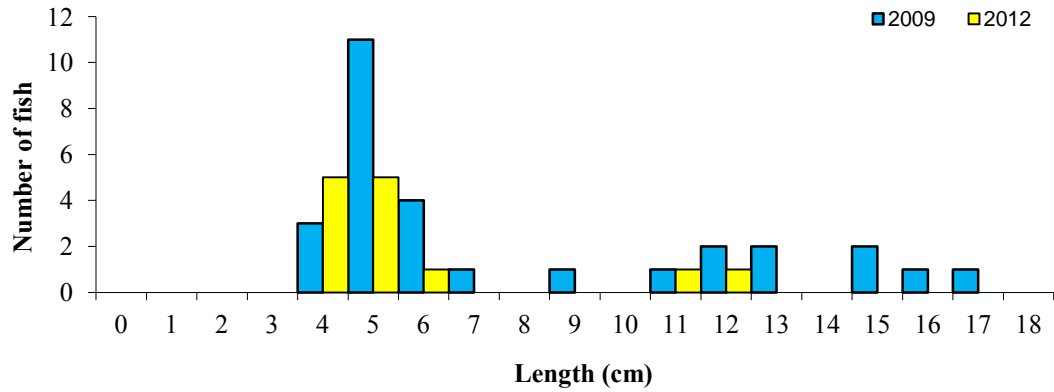
Fig. 4.19. Length frequency distribution of flounder in the River Nanny site, August 2009 (n = 29) and September 2012 (n = 13)
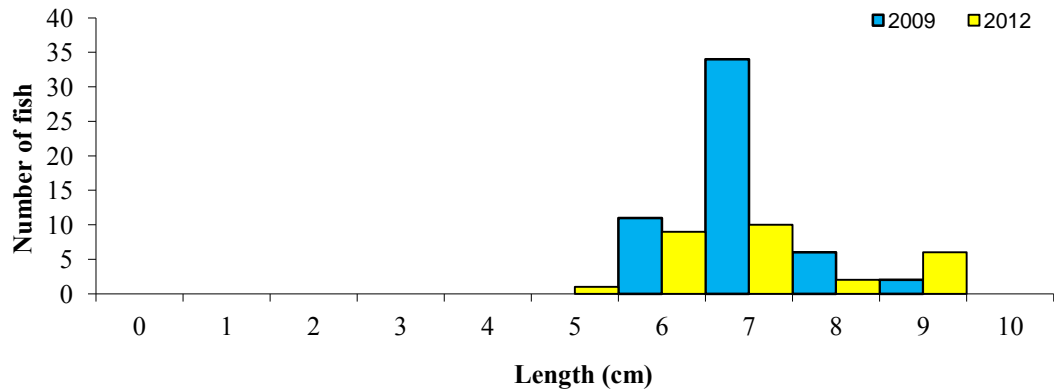
Fig. 4.20. Length frequency distribution of stone loach in the River Nanny site, August 2009 (n = 53) and September 2012 (n = 28)

4.2 Community Structure

4.2 Species distribution

A total of nine fish species (sea trout are included as a separate 'variety' of trout) were recorded within the eight ERBD sites surveyed during 2012 (Fig. 4.21). Brown trout was the most common fish species recorded, occurring in all eight sites, followed by salmon, eel, stone loach, minnow, perch and three-spined stickleback. Flounder and sea trout were only recorded in one site each.
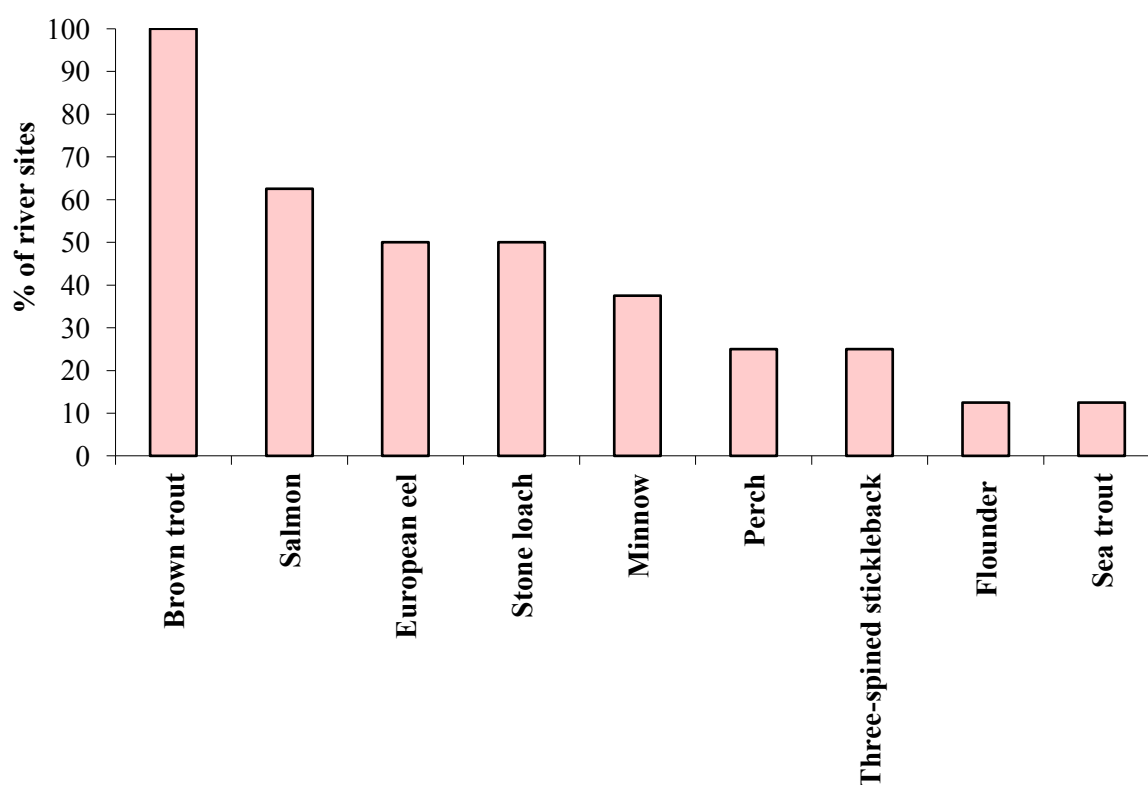
Fig. 4.21. Percentage of sites where each fish species was recorded in the ERBD for WFD SM monitoring 2012

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 ERBD during 2012.

The mean back-calculated length-at-age data for brown trout in the ERBD are shown in Figure 4.22 and Appendix 1. Brown trout were recorded in all eight sites, with each site 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 ERBD in 2012 was caught in the River Liffey (Ballyward) site, which measured 36.8cm in length, weighed 608g 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 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 the Glencree River, fast in both Athboy River sites and fast in the River Liffey (Appendix 1).
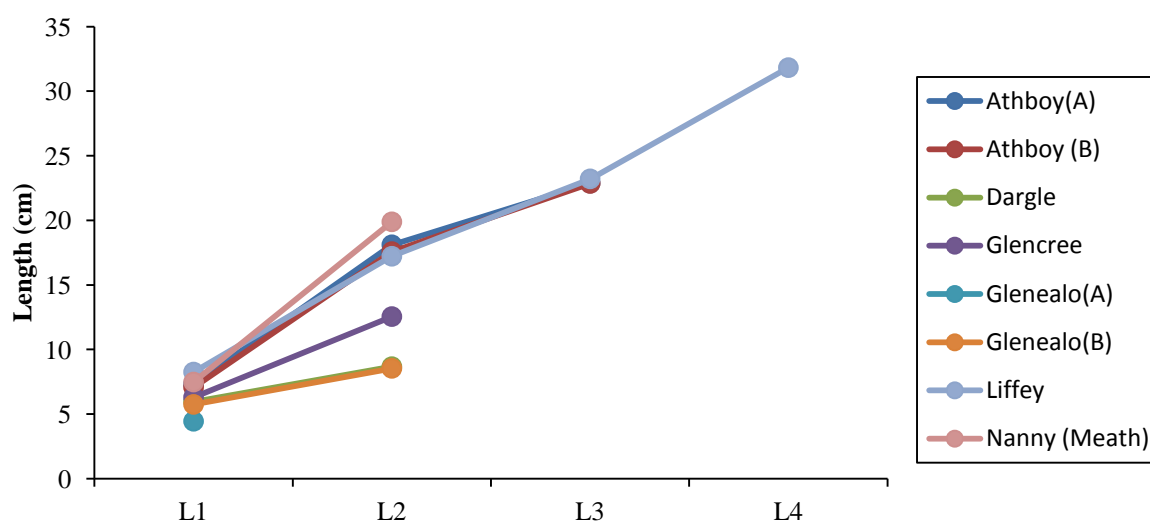
Fig. 4.22. Back calculated length-at-age for brown trout in each river, WFD surveillance monitoring 2012

The mean back-calculated length-at-age data for salmon in the ERBD are shown in Figure 4.23 and Appendix 1. Salmon were recorded in five river sites, in low numbers. Their highest abundance (0.02 fish/m^2) was recorded in the Glencree River. Four of these sites contained individuals aged 1+ or older. Salmon ages ranged from 0+ to 2+, with the most abundant age class 1+. The largest juvenile salmon recorded in the ERBD during 2012 was caught in the River Nanny, which measured 18.6cm, weighed 85.5g and was aged 2+.
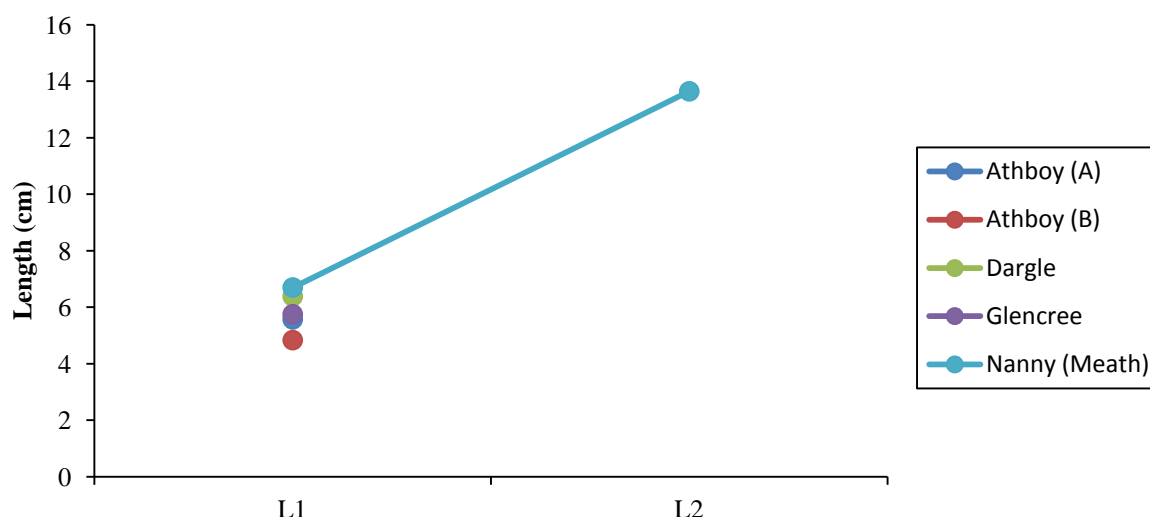
Fig. 4.23. Back calculated length-at-age for salmon in each river, WFD surveillance monitoring 2012

Sea trout were only recorded in one site, with only two individuals caught. Their mean back-calculated length-at-age data is shown in appendix 3. Sea trout ageing was carried out as described in Poole (2010). The first fish was aged as 2.0+, a 2-year smolt, that returned to freshwater after only a few months at sea, also known as a "finnock" (total age 2+) and the second fish was aged as 2.0+1SM+, a 2-year smolt that went to sea for a few months, returned to the river to spawn (finnock spawner), went out to sea again and was captured on its freshwater return later that year (total age 3+).

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 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 2012 was assigned a draft fish classification status (Table 4.9). Four sites were classed as Good and four as Moderate. When comparing the status this year with that from previous years (five sites from 2009), there was no change in status.

Table 4.9. Ecological status of sites surveyed in the ERBD for surveillance monitoring 2012 (figures in brackets indicate confidence in class)

River	Site Code	Site name	Previous ecological status	Ecological status 2012
ERBD Wadeable sites				
Athboy	07A010100A	Br. nr Clonleasan Ho_A	Good (2009)	Good (54%)
Athboy	07A010100B	Br. nr Clonleasan Ho_B	N/A	Moderate (80%)
Dargle	10D010005A	Bahana_A	N/A	Good
Glencree	10G010200A	Br. u/s Dargle R confl_A	Good (2009) (98%)	Good (51%)
Glenealo	10G050200A	Br. d/s Upper Lake_A	Moderate (2009)	Moderate
Glenealo	10G050200B	Br. d/s Upper Lake_B	N/A	Moderate (53%)
Nanny (Meath)	08N010700A	Br. at Julianstown_A	Moderate (2009)	Moderate (63%)
ERBD Non-Wadeable sites				
Liffey	09L010250A	500 m d/s Ballyward Br._A	Good (2009)	Good

5. DISCUSSION

A total of nine fish species (sea trout are included as a separate 'variety' of trout) were recorded during the 2012 WFD surveillance monitoring programme for fish in rivers within the ERBD. Brown trout was the most commonly encountered species in the ERBD, recorded in all nine sites, followed by eels and salmon. The River Nanny was the most diverse site surveyed within the ERBD in 2012 with a total of eight species recorded (including sea trout). The site that recorded the lowest diversity in this region was the Glenealo (Upper Lake) site, with only one species (brown trout) present. The greatest abundance of brown trout was in the Dargle River, while salmon were most abundant in the Glencree River.

Following the methods of Kennedy and Fitzmaurice (1971), growth was deemed slow in the Glencree River and fast in both the Athboy River sites and River Liffey (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 2012 was assigned a draft fish classification status. Four sites were classed as Good and four as Moderate. No change in status was observed for the five repeat surveys.

6. REFERENCES

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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
Athboy River (Site A)	Mean	7.30	18.10	22.88		Fast
	S.D.	1.32	1.84	3.15		
	S.E.	0.28	0.75	2.23		
	n	22	6	2		
	Min	4.99	15.31	20.65		
	Max	9.53	20.20	25.10		
Athboy River (Site B)	Mean	7.07	17.57	22.85		Fast
	S.D.	1.57	2.34	2.18		
	S.E.	0.35	0.67	1.26		
	n	20	12	3		
	Min	3.43	13.84	20.44		
	Max	9.98	21.73	24.70		
Dargle River	Mean	5.96	8.66			n/a
	S.D.	1.28	0.28			
	S.E.	0.32	0.20			
	n	16	2			
	Min	3.38	8.47			
	Max	7.60	8.86			
Glencree River	Mean	6.29	12.54			Slow
	S.D.	1.35	1.69			
	S.E.	0.31	0.60			
	n	19	8			
	Min	4.39	9.79			
	Max	9.60	15.00			
Glenealo River (Site A)	Mean	4.44				n/a
	S.D.	0.95				
	S.E.	0.55				
	n	3				
	Min	3.60				
	Max	5.47				
Glenealo River (Site B)	Mean	5.74	8.53			n/a
	S.D.	1.01	n/a			
	S.E.	0.38	n/a			
	n	7	1			
	Min	4.27	8.53			
	Max	6.72	8.53			

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
Liffey, River	Mean	8.25	17.21	23.21	31.82	Fast
	S.D.	1.88	3.57	2.86	n/a	
	S.E.	0.27	0.65	1.01	n/a	
	n	49	30	8	1	
	Min	5.19	10.69	20.45	31.82	
	Max	14.19	24.91	29.08	31.82	
Nanny (Meath), River	Mean	7.48	19.88			n/a
	S.D.	2.44	n/a			
	S.E.	1.09	n/a			
	n	5	1			
	Min	4.71	19.88			
	Max	10.30	19.88			

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
Athboy River (Site A)	Mean	5.57	
	S.D.	1.13	
	S.E.	0.40	
	n	8	
	Min	3.98	
	Max	6.80	
Athboy River (Site B)	Mean	4.83	
	S.D.	0.83	
	S.E.	0.58	
	n	2	
	Min	4.25	
	Max	5.42	
Dargle River	Mean	6.38	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	6.38	
	Max	6.38	
Glencree River	Mean	5.75	
	S.D.	0.79	
	S.E.	0.30	
	n	7	
	Min	4.63	
	Max	6.78	
Nanny (Meath), River	Mean	6.70	13.64
	S.D.	n/a	n/a
	S.E.	n/a	n/a
	n	1	1
	Min	6.70	13.64
	Max	6.70	13.64

APPENDIX 3

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

River		L1	L2	L3
Nanny (Meath)	Mean	6.63	15.33	18.03
	S.D.	0.69	1.98	n/a
	S.E.	0.49	1.40	n/a
	n	2	2	1
	Min	6.15	13.93	18.03
	Max	7.12	16.73	18.03

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