

Sampling Fish for the Water Framework Directive

Rivers 2011

**North Western
International River
Basin District**



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the North Western International River Basin District

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CITATION: Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Wogerbauer, C. and Rocks, K.
(2012) Water Framework Directive Fish Stock Survey of Rivers in the North Western International River Basin
District. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.

Cover photo: Ronan and Karen electric-fishing © Inland Fisheries Ireland

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ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Dr. Milton Matthews and staff from IFI Ballyshannon as well as various other offices throughout the region. The authors also gratefully acknowledge the help and cooperation of colleagues in IFI Swords.

We would like to thank the landowners and angling clubs that granted us access to their land and respective fisheries.

Furthermore, the authors would like to acknowledge the funding provided for the project from the Department of Communications, Energy and Natural Resources for 2011.

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TABLE OF CONTENTS

1. INTRODUCTION.....	3
2. STUDY AREA.....	4
3. METHODS	6
4. RESULTS	7
4.1 River surveys.....	7
4.1.1 The Ballyhallan River	7
4.1.2 The Burnfoot River	10
4.1.3 The Cronaniv Burn	13
4.1.4 The Dromore River.....	16
4.1.5 The Glaskeelan River	20
4.1.6 The Owentocker River.....	23
4.1.7 The Swanlinbar River	27
4.1.8 The River Swilly	31
4.1.9 The Waterfoot River	35
4.2 Species distribution.....	38
4.3 Age and growth.....	39
4.4 Ecological status.....	41
5. DISCUSSION	42
6. REFERENCES.....	43
APPENDIX 1.....	44
APPENDIX 1 continued	45
APPENDIX 2.....	45

1. INTRODUCTION

Fish stock surveys were undertaken in 65 river sites throughout Ireland during the summer of 2011 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). Nine of these surveys were carried out at river sites in the North Western International River Basin District (NWIRBD) in August 2011 by staff from Inland Fisheries Ireland (IFI) (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 2011 is the fourth year of the rivers sampling programme, many of the sites surveyed this year are repeat surveys of those carried out in 2008. As a result, surveys this year can be compared with surveys from before to determine whether the status of our rivers is improving or deteriorating.

This report summarises the results of the 2011 fish stock survey carried out on each site, as part of the Water Framework Directive surveillance monitoring programme.

2. STUDY AREA

Nine river sites were surveyed in seven river catchments or three hydrometric areas within the NWIRBD during 2011: the Burnfoot, Clady, Clonmany, Erne, Leannan, Owentocker and Swilly catchments (Table 2.1). The sites ranged in surface area from 183m² for the Ballyhallan River to 393m² for the Swanlinbar River. The sites were divided into two categories for reporting purposes: wadeable sites, which were surveyed with bank-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 NWIRBD is shown in Figure 2.1.

Table 2.1. Location and codes of wadeable river sites surveyed for WFD surveillance monitoring, 2011

River	Site name	Catchment	Site Code	Waterbody code
Dromore	Drummuck	Erne	36D020012	NW_36_30
Swanlinbar	Swanlinbar Br.(Carpark)	Erne	36S010290	NW_36_18
Waterfoot	Letter Br.	Erne	36W030700	XB_36_west_5
Cronaniv	Br. u/s Dunlewy Lough	Clady	38C060100	NW_38_800
Owentocker	D/s of Br. in Ardara	Owentocker	38O060300	NW_38_3037
Burnfoot	Br. in Burnfoot	Burnfoot	39B020600	NW_39_1105
Gliskeelan	Br. W. of Roshin	Leannan	39G050100	NW_39_1136
Swilly	Swilly Br. (near Breenagh)	Swilly	39S020050	NW_39_1508
Ballyhallan	Br. u/s Clonmany River	Clonmany	40B010200	NW_40_1082

Table 2.2. Details of wadeable river sites surveyed for WFD surveillance monitoring, 2011

River	Upstream catchment (km ²)	Wetted width (m)	Surface area (m ²)	Mean depth (m)	Max depth (m)
Dromore (Drummuck)	37.14	5.68	227	0.21	0.39
Swanlinbar (Swanlinbar Br.(Carpark))	21.55	8.55	393	0.24	0.50
Waterfoot (Letter Br.)	29.27	7.62	335	0.08	0.16
Cronaniv Burn (Br. u/s Dunlewy Lough)	6.88	5.60	252	0.21	0.57
Owentocker (D/s Br. in Ardara)	43.09	8.43	354	0.36	0.80
Burnfoot (Br. in Burnfoot)	20.80	4.33	208	0.21	0.40
Gliskeelan (Br. W. of Roshin)	16.45	5.80	255	0.35	0.56
Swilly (Swilly Br. - near Breenagh)	18.93	7.57	341	0.37	0.72
Ballyhallan (Br. u/s Clonmany River)	8.72	4.57	183	0.24	0.45



Fig. 2.1. Location map of river sites surveyed throughout the NWIRBD for WFD fish surveillance monitoring 2011

3. METHODS

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

Fish from each pass were sorted and processed separately. During processing, the species of each fish was identified and its length and weight were measured; sub-samples were measured when large numbers of fish were present. For the purpose of species identification, river lamprey (*Lampetra fluviatilis*) and brook lamprey (*Lampetra planeri*) were treated as one. 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. These fish were held in a large bin of oxygenated water after processing until they were fully recovered and were then returned to the water. Opercular bones were taken from perch for ageing. Samples of European eels were retained for further analysis.

For various reasons, including river width and the practicalities of using stop-nets, three fishing passes were not possible or practical at all sites. 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 were aged (five fish from each 1cm size class). Fish scales were aged using a microfiche, and opercular bones were aged using an Olympus SZX10 microscope/digital camera system. Growth rates were 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, L2 is the mean length at the end of the second winter, etc.).

4. RESULTS

4.1 River surveys

4.1.1 The Ballyhallan River

One site was electric fished on the Ballyhallan River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located on the downstream side of a bridge, just upstream of the confluence with the Clonmany River (Fig. 4.1; Plate 4.2). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 17th of August 2011, along a 40m length of channel. The mean wetted width of the channel was 4.57m and the mean depth was 24.0cm. A total wetted area of 183m² was surveyed. The habitat along this stretch consisted of a good mix of glide, riffle and pool, while the substrate was mostly cobble. The instream vegetation at this heavily shaded site was dominated by a variety of bryophytes.



Fig. 4.1. Location of the Ballyhallan River surveillance monitoring site



Plate 4.1. The Ballyhallan River (bridge u/s Clonmany River), Co. Donegal

A total of three fish species were recorded in the Ballyhallan River site. Salmon was the most abundant species, followed by brown trout and eels (Table 4.1). During the previous survey in 2008, the same species composition was recorded.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.164	0.153	0.316	0.214	0.055	0.268
Brown trout	0.107	0.085	0.192	0.022	0.027	0.049
Eel	-	-	0.034	-	-	0.005
All Fish	-	-	0.542	-	-	0.323

Salmon captured during the 2011 survey ranged in length from 3.9cm to 12.0cm (mean = 5.8cm) with a mean L1 and L2 of 3.9cm and 8.7cm respectively (Appendix 2) (Fig. 4.2). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 80%, 19% and 1% of the total salmon catch respectively. Salmon captured during the 2008 survey had similar lengths to those captured in 2011, ranging in length from 3.6cm to 12.4cm (mean = 7.3cm) with a mean L1 of 4.5cm (Appendix 2) (Fig.

4.2). Two age classes (0+ and 1+) were present, accounting for approximately 50% and 50% of the total salmon catch respectively.

Brown trout captured in 2011 ranged in length from 4.8cm to 14.8cm (mean = 8.9cm) (Fig. 4.3). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 48%, 38% and 14% of the total brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 4.4cm to 15.4cm (mean = 8.5cm) (Fig. 4.3). Three age classes (0+, 1+ and 2+) were also present in 2008, accounting for approximately 62%, 33% and 5% of the total trout catch respectively.

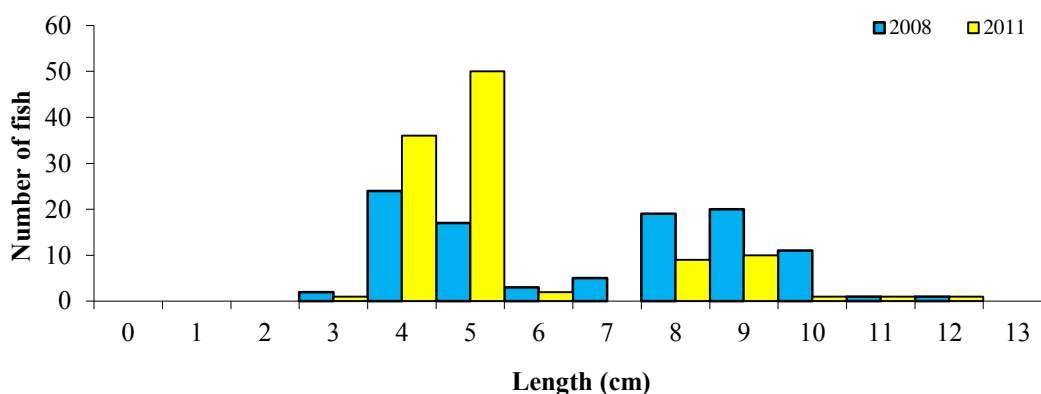


Fig. 4.2. Length frequency distribution of salmon in the Ballyhallan River site, August 2008 (n = 103) and August 2011 (n = 111)

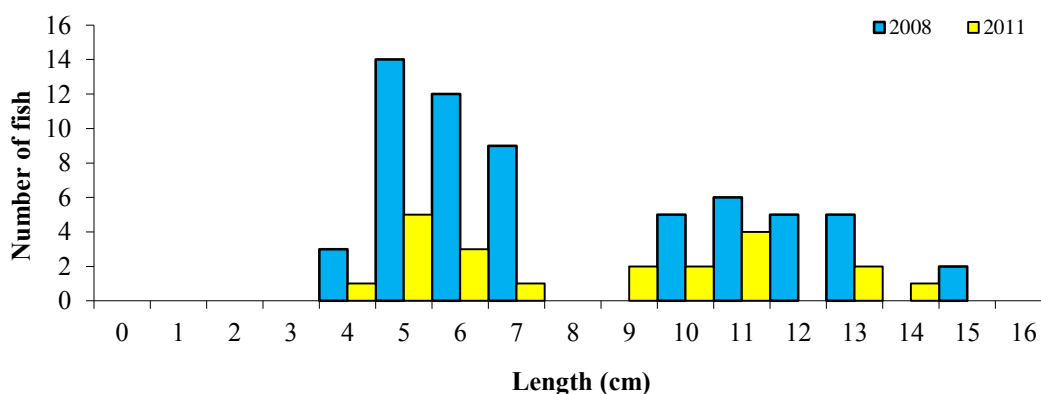


Fig. 4.3. Length frequency distribution of brown trout in the Ballyhallan River site, August 2008 (n = 61) and August 2011 (n = 21)

4.1.2 The Burnfoot River

One site was electric fished on the Ballyhallan River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located downstream of the bridge on the north end of Burnfoot Village (Fig. 4.4; Plate 4.2). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 17th of August 2011, along a 45m length of channel. The mean wetted width of the channel was 4.33m and the mean depth was 21.0cm. A total wetted area of 195m² was surveyed. Glide dominated along this stretch, while gravel was the most abundant substrate. A variety of aquatic instream vegetation was recorded at this site, including filamentous green algae, bryophytes and emergent bankside species.

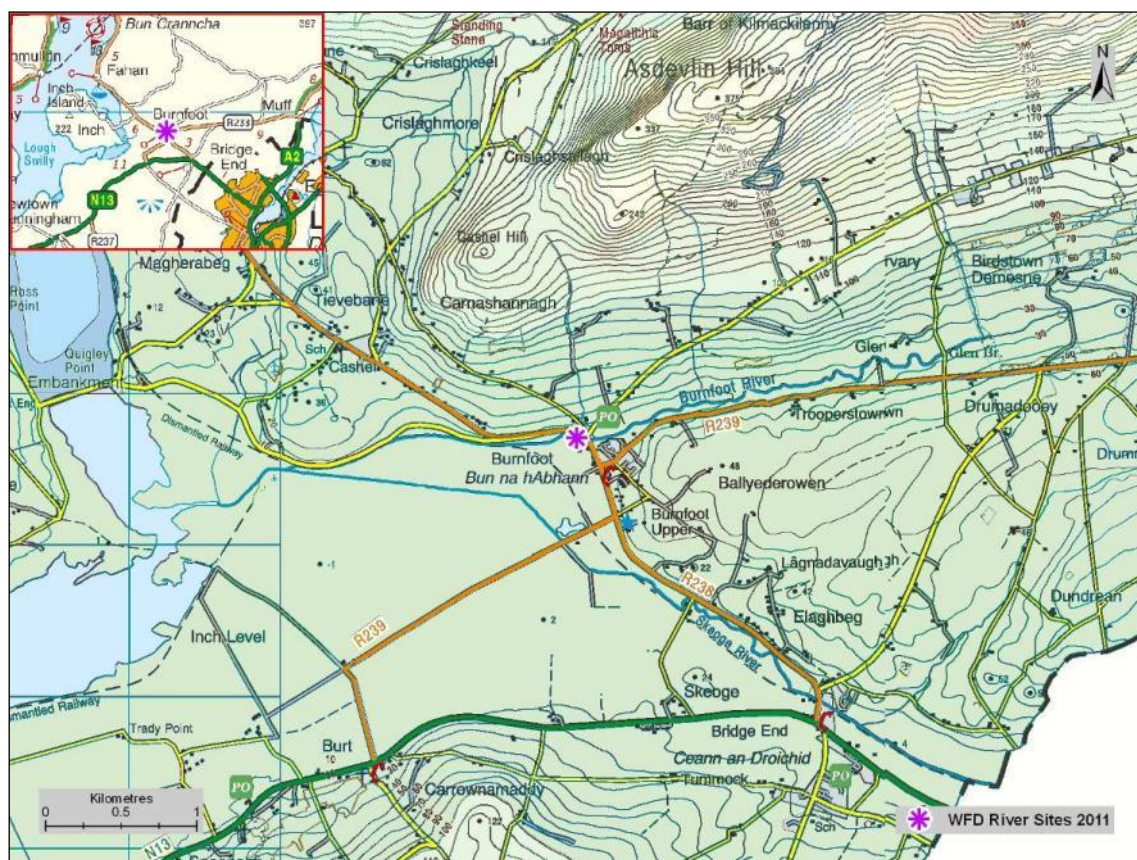


Fig. 4.4. Location of the Burnfoot River surveillance monitoring site



Plate 4.2. The Burnfoot River, Burnfoot Village, Co. Donegal

A total of five fish species were recorded in the Burnfoot River site. Brown trout was the most abundant species, followed by lamprey, eels, three-spined stickleback and salmon (Table 4.2). During the previous survey in 2008, the same species composition was recorded; however, no brown trout fry or salmon fry were captured in 2008.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	-	0.267	0.267	0.297	0.092	0.390
Lamprey sp.	-	-	0.032	-	-	0.036
Eel	-	-	0.008	-	-	0.015
Three-spined stickleback	-	-	0.093	-	-	0.005
Salmon	-	0.069	0.069	0.005	0.005	0.005
All Fish	-	-	0.470	-	-	0.451

Brown trout captured in 2011 ranged in length from 5.1cm to 19.1cm (mean = 8.1cm) (Fig. 4.5). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 82%, 9%, 7% and 2% of the total brown trout catch respectively. Brown trout captured in 2008 ranged in length from 6.0cm to 21.6cm (mean = 8.6cm) (Fig. 4.5). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 94%, 4% and 2% of the brown trout population, respectively.

Only two salmon were caught in the Burnfoot River in 2011, a 0+ individual measuring 5.2cm in length and a 1+ individual measuring 13.4cm. Salmon captured in 2008 ranged in length from 5.6cm to 8.9cm (mean = 7.0cm) and only one age group (1+) was present.

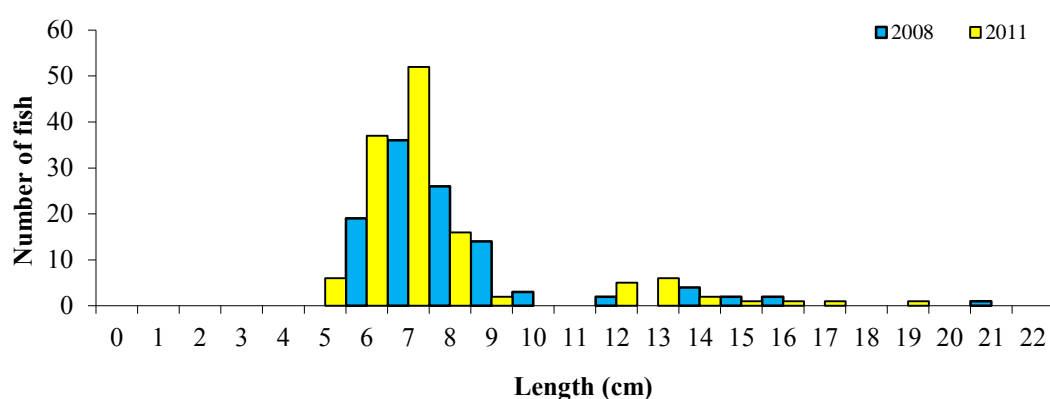


Fig. 4.5. Length frequency distribution of brown trout in the Burnfoot River site, August 2008 (n = 109) and August 2011 (n = 130)

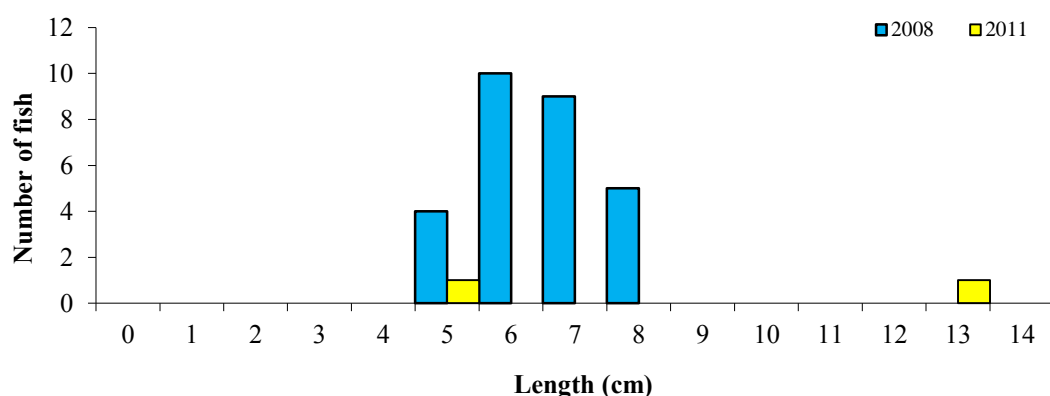


Fig. 4.6. Length frequency distribution of salmon in the Burnfoot River site, August 2008 (n = 28) and August 2011 (n = 2)

4.1.3 The Cronaniv Burn

One site was electric fished on the Cronaniv Burn as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located just upstream of the confluence with a sister stream flowing in from the northeast, approximately 0.5km from Dunlewy Lough (Fig. 4.7; Plate 4.3). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 15th of August 2011, along a 45m length of channel. The mean wetted width of the channel was 5.60m and the mean depth was 21.0cm. A total wetted area of 252m² was surveyed. Riffle and pool were the main habitat types present along this stretch, while cobble and boulder dominated the substrate. The instream vegetation at this site was composed mainly of filamentous green algae and a small number of bryophytes.



Fig. 4.7. Location of the Cronaniv Burn surveillance monitoring site



Plate 4.3. The Cronaniv Burn, upstream of Dunlewy Lough, Co. Donegal

Two fish species were recorded in the Cronaniv Burn site. Salmon was the most abundant species, followed by brown trout (Table 4.3). During the previous survey in 2008, the same species composition was recorded.

Table 4.3. Density of fish (no./m²), Cronaniv Burn site (fish density has been calculated as minimum estimates based on one fishing)

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.023	0.090	0.113	0.067	0.103	0.171
Brown trout	0.015	0.011	0.026	0.024	0.008	0.032
All Fish	-	-	0.140	-	-	0.202

Salmon captured during the 2011 survey ranged in length from 3.5cm to 10.6cm (mean = 6.3cm) (Fig. 4.8). Three age classes (0+, 1+ and 2+) were present, accounting for 38%, 44% and 18% of the total salmon catch respectively. Salmon captured during the 2008 survey ranged in length from 3.8cm to 12.6cm (mean = 6.5cm) (Fig. 4.10). Three age classes (0+, 1+ and 2+) were also present, accounting for approximately 36%, 48% and 16% of the total salmon catch respectively.

Brown trout captured during the 2011 survey ranged in length from 3.9cm to 11.0cm (mean = 7.9cm) (Fig. 4.9). Two age classes (0+ and 1+) were present, accounting for approximately 30% and 70% of the total brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 4.1cm to 14cm (mean = 6.6cm) (Fig. 4.9). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 67%, 22% and 11% of the total brown trout catch respectively.

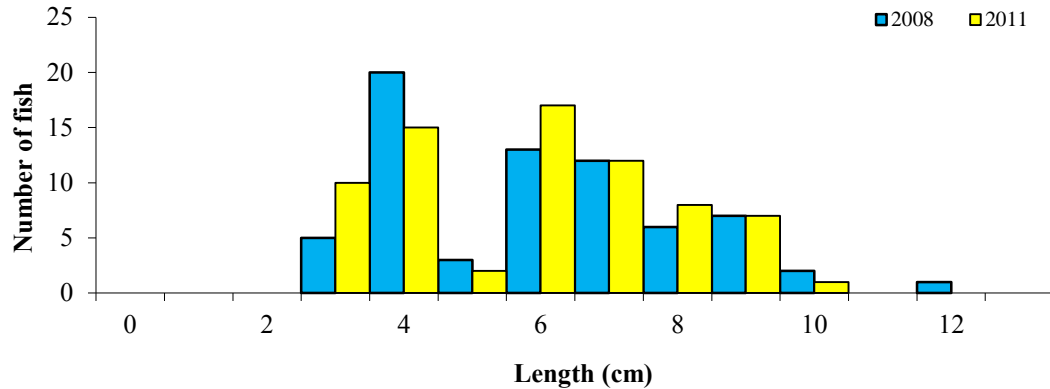


Fig. 4.8. Length frequency distribution of salmon in the Cronaniv Burn site, August 2008 (n = 69) and August 2011 (n = 72)

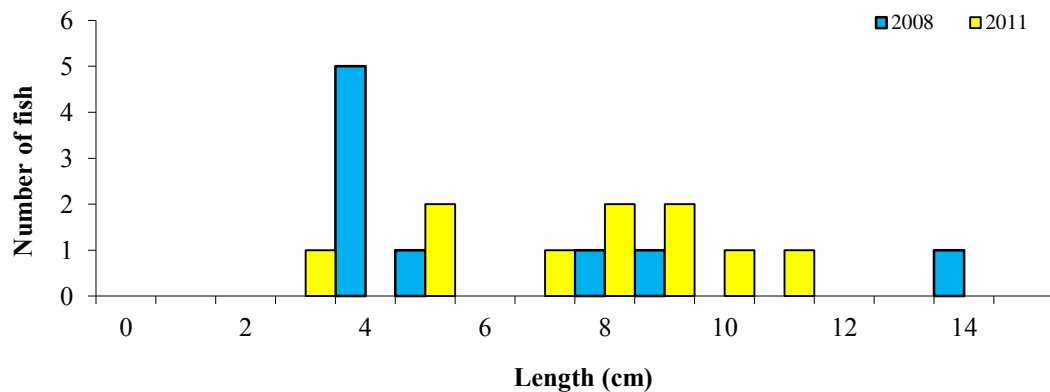


Fig. 4.9. Length frequency distribution of brown trout in the Cronaniv Burn site, August 2008 (n = 9) and August 2011 (n = 10)

4.1.4 The Dromore River

One site was electric fished on the Dromore River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located on the upstream side of a bridge near Drummuck, approximately 2km west of Ballybay (Fig. 4.10; Plate 4.4). Four electric-fishing passes were conducted using two bank-based electric fishing units on the 11th of August 2011, along a 40m length of channel. The mean wetted width of the channel was 5.68m and the mean depth was 21.0cm. A total wetted area of 227m² was surveyed. Glide and pool were the main habitats present along this stretch, while cobble dominated the substrate. The instream vegetation at this site was mainly comprised of filamentous green algae and bryophytes.

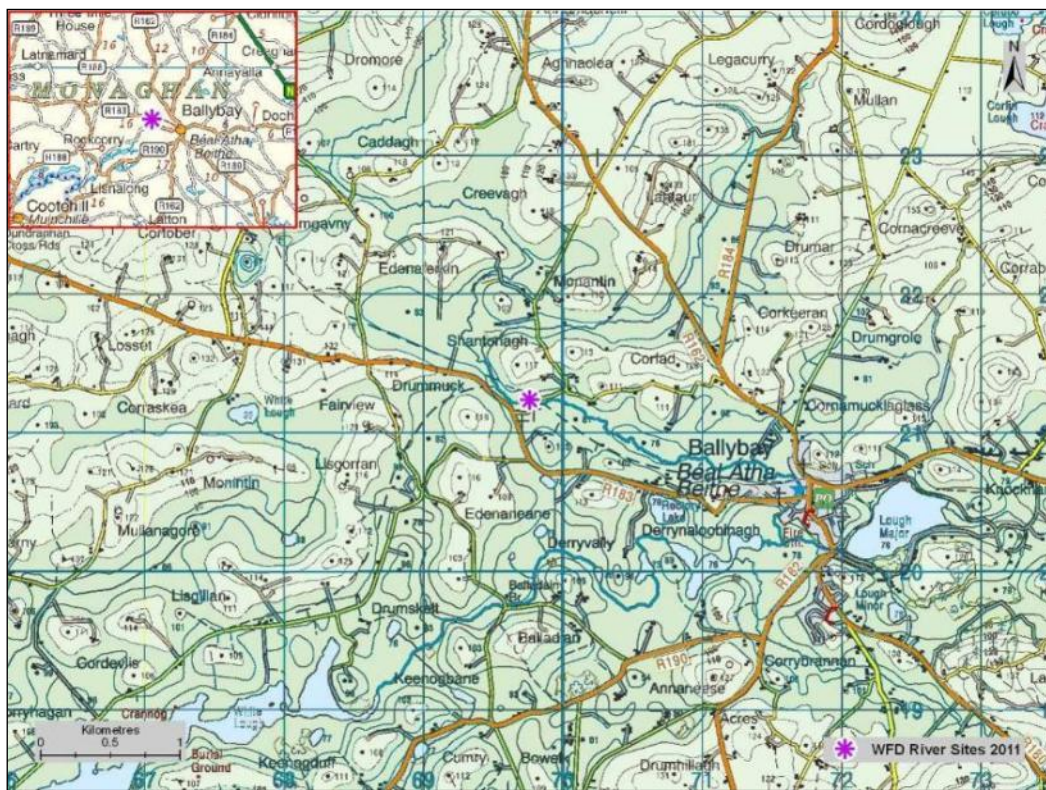


Fig. 4.10. Location of the Dromore River surveillance monitoring site



Plate 4.4. The Dromore River (Drummuck), upstream of Ballybay, Co. Monaghan

Six fish species were recorded in the Dromore River site. Three-spined stickleback was the most abundant species, followed by minnow, brown trout, lamprey, nine-spined stickleback and roach (Table 4.4). A different site located further downstream on this river (in Ballybay) was surveyed using boats in 2008. In 2011, however, access was no longer present at that location due to building works.

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

Common name	2011		
	0+	1+ & older	Total minimum density
Three-spined stickleback	-	-	0.677
Minnow	-	-	0.343
Brown trout	0.022	0.009	0.031
Lamprey sp.	-	-	0.018
Nine-spined stickleback	-	-	0.018
Roach	-	-	0.004
All Fish	-	-	1.091

Three spined stickleback ranged in length from 1.8cm to 6.0cm (mean = 3.2cm) (Fig. 4.11). Minnow ranged in length from 2.5cm to 8.4cm (mean = 5.6cm) (Fig. 4.12).

Brown trout captured during the 2011 survey ranged in length from 6.9cm to 20.5cm (mean = 9.5cm) (Fig. 4.13). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 89%, 5.5% and 5.5% of the total brown trout catch respectively.

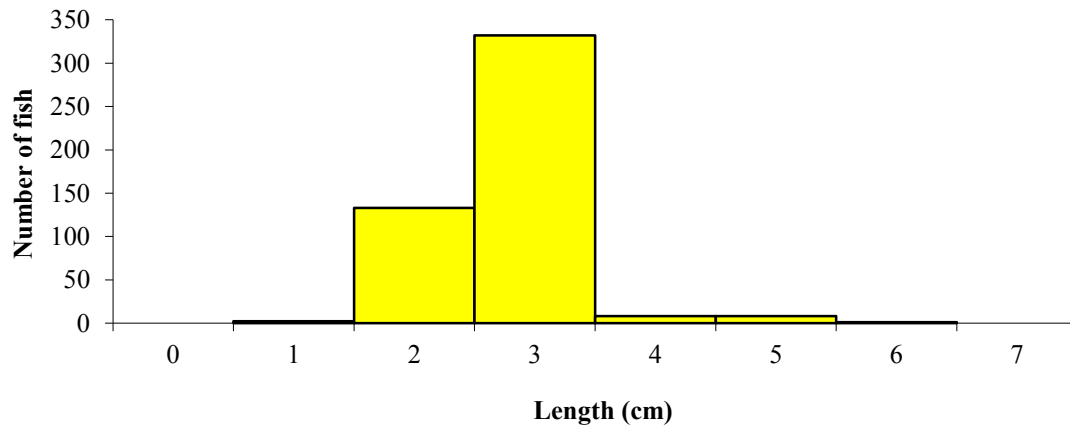


Fig. 4.11. Length frequency distribution of three-spined stickleback in the Dromore River site, August 2011 (n = 484)



Fig. 4.12. Length frequency distribution of minnow in the Dromore River site, August 2011 (n = 212)

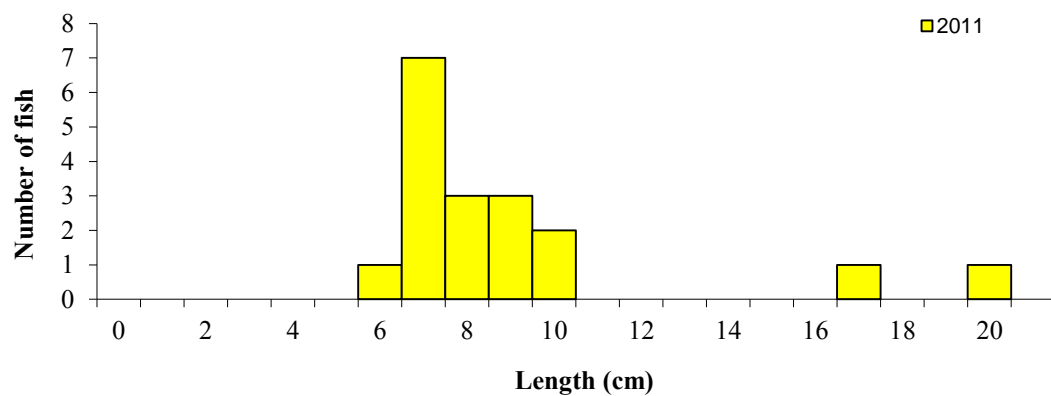


Fig. 4.13. Length frequency distribution of brown trout in the Dromore River site, August 2011
(n = 18)

4.1.5 The Glaskeelan River

One site was electric fished on the Glaskeelan River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located downstream of Glaskeelan Bridge approximately 1km upstream of where it enters Gartan Lough (Fig. 4.14; Plate 4.5). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 16th of August 2011, along a 44m length of channel. The mean wetted width of the channel was 5.80m and the mean depth was 35.0cm. A total wetted area of 255m² was surveyed. Glide and riffle dominated the habitat along this stretch, while cobble and boulder were the most abundant substrate types. A variety of vegetation was recorded at this site, including filamentous green algae and bryophytes, as well as emergent bankside and submerged species.

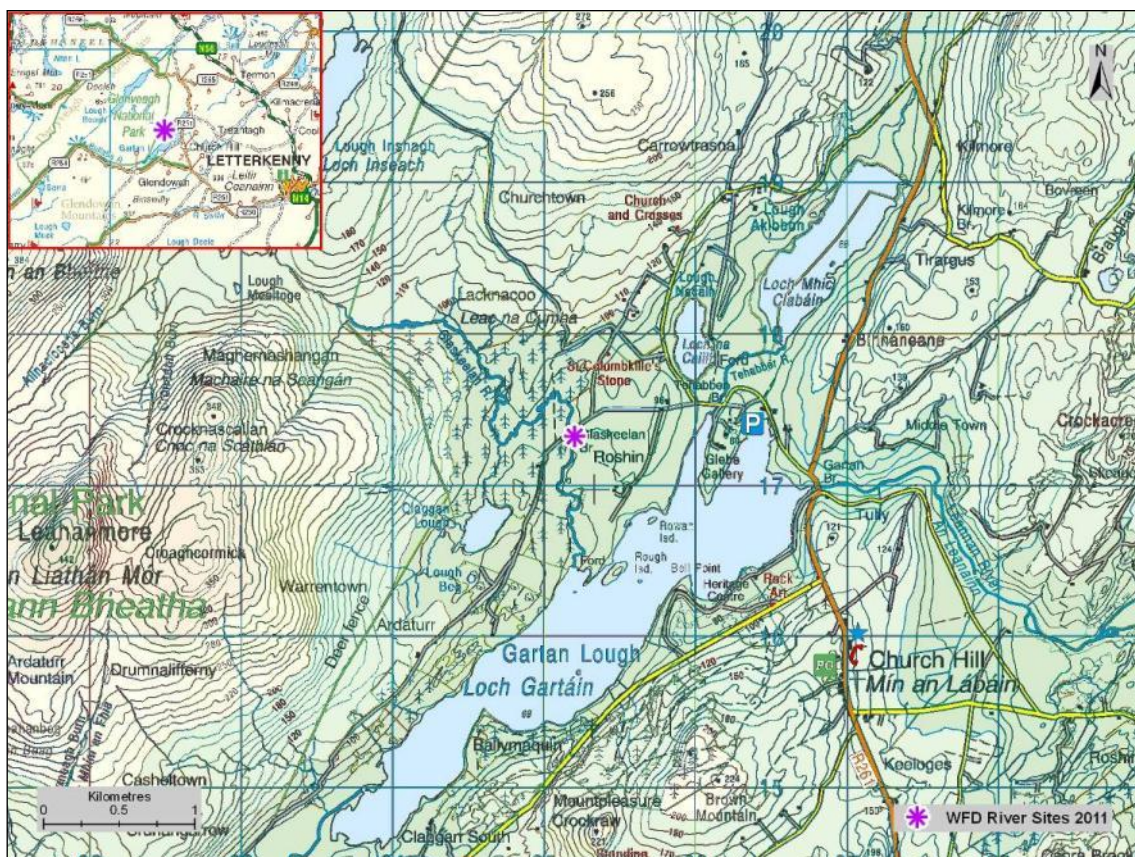


Fig. 4.14. Location of the Glaskeelan River surveillance monitoring site



Plate 4.5. The Glaskeelan River (bridge west of Roshin), Co. Donegal

Three fish species were recorded in the Glaskeelan River site. Salmon was the most abundant species, followed by brown trout and three-spined stickleback (Table 4.5). During the previous survey in 2008, the same species composition was recorded with the exception of three-spined stickleback, which was only recorded in 2011.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.070	0.180	0.250	0.071	0.071	0.141
Brown trout	0.035	0.053	0.088	0.051	0.031	0.082
Three-spined stickleback	-	-	-	-	-	0.004
All Fish	-	-	0.337	-	-	0.227

Salmon captured during the 2011 survey ranged in length from 4.8cm to 13.0cm (mean = 7.9cm) (Fig. 4.15). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 48%, 16% and 35% of the total salmon catch respectively. Salmon captured during the 2008 survey ranged in length

from 3.0cm to 11.7cm (mean = 6.9cm) (Fig. 4.12). Three age classes (0+, 1+ and 2+) were also present, accounting for approximately 39%, 51% and 10% of the total salmon catch respectively.

Brown trout captured during the 2011 survey ranged in length from 4.4cm to 20.0cm (mean = 7.7cm) (Fig. 4.16). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 61%, 23%, 10% and 6% of the total brown trout catch respectively. Brown trout captured during 2008 ranged in length from 3.9cm to 18.4cm (mean = 9.0cm (Fig. 4.13). Four age classes (0+, 1+, 2+ and 3+) were also present, accounting for approximately 39%, 39%, 18% and 4% of the total brown trout catch respectively.

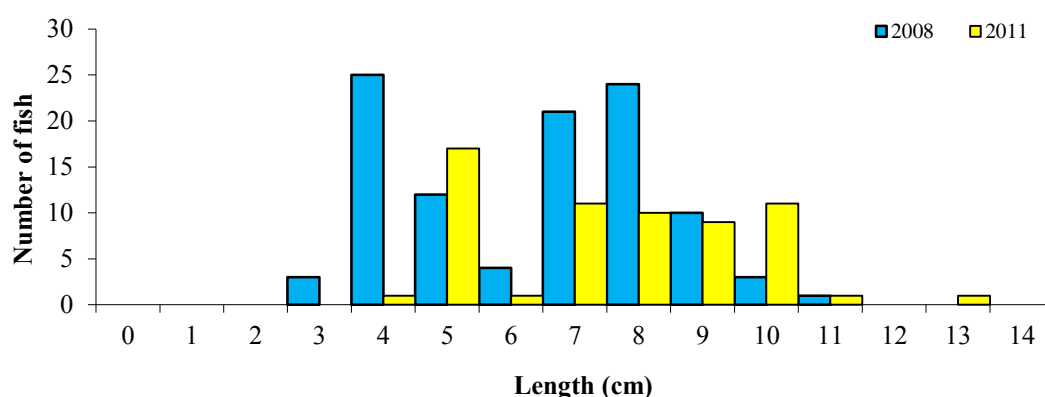


Fig. 4.15. Length frequency distribution of salmon in the Glaskeelan River site, August 2008 (n = 103) and August 2011 (n = 62)

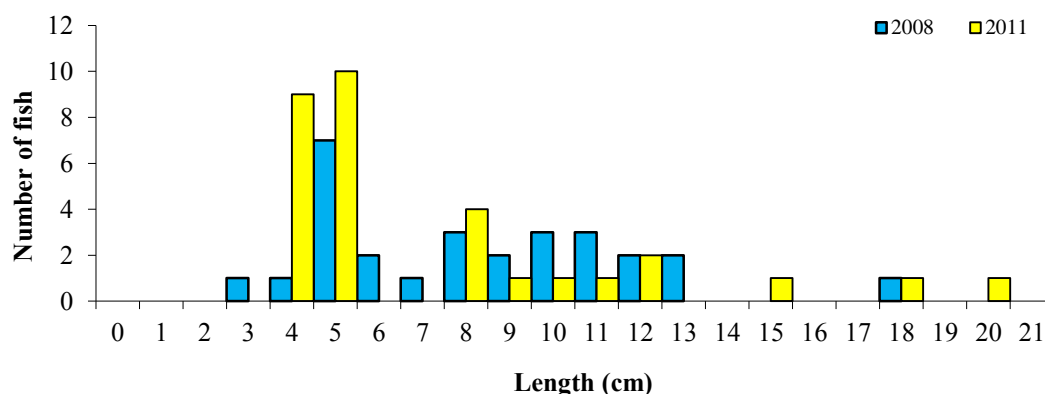


Fig. 4.16. Length frequency distribution of brown trout in the Glaskeelan River site, August 2008 (n = 28) and August 2011 (n = 31)

4.1.6 The Owentocker River

One site was electric fished on the Owentocker River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located midway between the N56 bridge on the western side of Ardara and where it enters the Owenea Estuary (Fig. 4.17; Plate 4.6). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 9th of August 2011, along a 42m length of channel. The mean wetted width of the channel was 8.43m and the mean depth was 36.0cm. A total wetted area of 354m² was surveyed. Riffle and glide were the main habitats present along this stretch, while the substrate consisted of mainly cobble, boulder and gravel. The vegetation at this site was dominated by a wide variety of aquatic mosses and liverworts.



Fig. 4.17. Location of the Owentocker River surveillance monitoring site



Plate 4.6. The Owentocker River (downstream of bridge in Ardara), Co. Donegal

Three fish species were recorded in the Owentocker River site. Salmon was the most abundant species, followed by brown trout and eels (Table 4.6). During the previous survey in 2008, the same species composition was recorded.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.260	0.229	0.490	0.361	0.344	0.706
Brown trout	0.007	0.009	0.017	0.020	0.014	0.034
Eel	-	-	0.007	-	-	0.028
All Fish	-	-	0.513	-	-	0.768

Juvenile salmon captured during the 2011 survey ranged in length from 4.0cm to 12.6cm (mean = 7.2cm) (Fig. 4.18). Three age classes were present (0+, 1+ and 2+), accounting for approximately 47%, 35% and 17% of the total salmon catch respectively. Juvenile salmon captured during 2008 ranged in length from 3.2cm to 12.4cm (mean = 6.9cm) (Fig. 4.15). Four age classes (0+, 1+ and 2+)

were also present, accounting for approximately 56%, 36%, 7% and <1% of the salmon population, respectively.

Eels captured during the 2011 survey ranged in length from 9.1cm to 37.9cm (mean = 21.2cm) (Fig. 4.19). In 2008 they ranged in length from 21.2cm to 37.0cm (mean = 29.9cm).

Brown trout captured during the 2011 survey ranged in length from 5.7cm to 28.6cm (mean = 13.6cm) (Fig. 4.20). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for approximately 50%, 6%, 22%, 6% and 17% of the total brown trout catch respectively. Brown trout captured in 2008 ranged in length from 4.6cm to 24.4cm (mean = 13.5cm). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 30%, 20%, 30% and 20% of the total brown trout catch respectively.

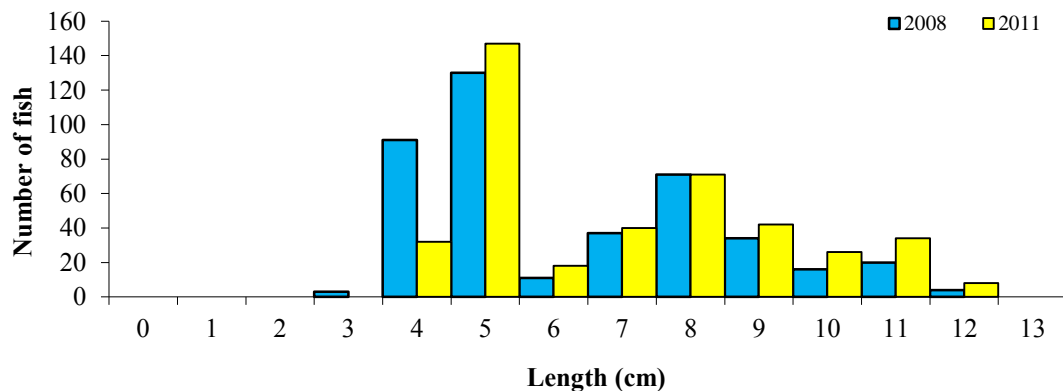


Fig. 4.18. Length frequency distribution of a sub-sample of salmon in the Owentocker River site, August 2008 (n = 418) and August 2011 (n = 418)

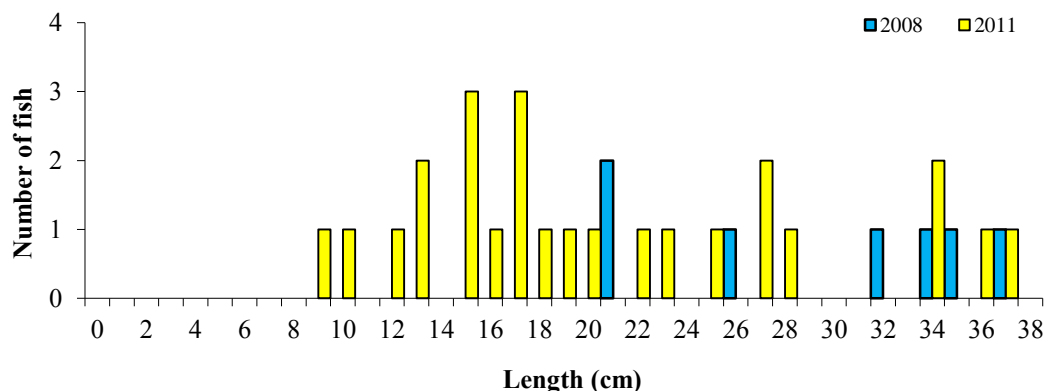


Fig. 4.19. Length frequency distribution of eels in the Owentocker River site, August 2011 (n = 25)

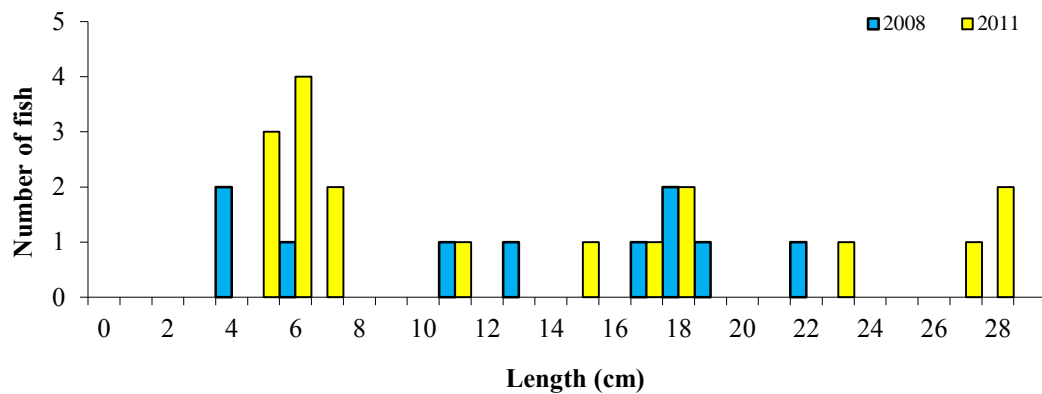


Fig. 4.20. Length frequency distribution of brown trout in the Owentocker River site, August 2008 (n = 10) and August 2011 (n = 18)

4.1.7 The Swanlinbar River

One site was electric fished on the Swanlinbar River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located downstream of the N87 bridge on the Drumcona side of Swanlinbar town, just upstream of the River Blackwater confluence (Fig. 4.21; Plate 4.7). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 10th of August 2011, along a 46m length of channel. The mean wetted width of the channel was 8.55m and the mean depth was 24.0cm. A total wetted area of 393m² was surveyed. A mix of habitat was present long this stretch, riffle and pool dominant, while the substrate was consistent of mainly cobble and boulder. The instream vegetation at this site was dominated by a variety of aquatic mosses and liverworts.

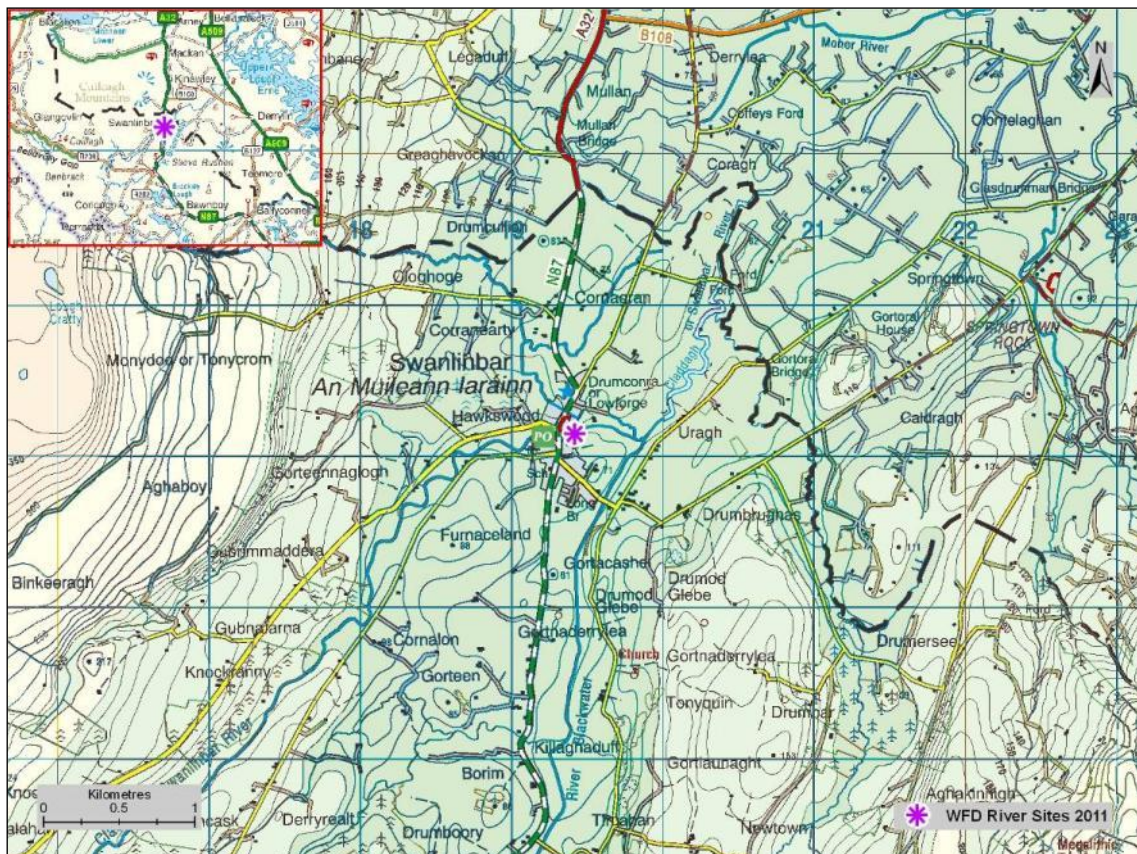


Fig. 4.21. Location of the Swanlinbar River surveillance monitoring site



Plate 4.7. The Swanlinbar River (Swanlinbar Br.) site, Co. Cavan

Four fish species were recorded in the Swanlinbar River site. Brown trout was the most abundant species, followed by salmon, eels and gudgeon (Table 4.7). During the previous survey in 2008, three-spined stickleback and lamprey were recorded; however, gudgeon were only recorded in the 2011 survey.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.118	0.032	0.149	0.041	0.104	0.145
Salmon	0.003	0.083	0.086	0.010	0.003	0.013
Eel	-	-	0.006	-	-	0.005
Gudgeon	-	-	-	-	-	0.003
Three-spined stickleback	-	-	0.009	-	-	-
Lamprey sp.	-	-	0.003	-	-	-
All Fish	-	-	0.252	-	-	0.165

Brown trout captured during the 2011 survey ranged in length from 6.1cm to 24.9cm (mean = 11.3cm) (Fig. 4.22). Five age classes (0+, 1+, 2+, 3+ and 4+) were present, accounting for approximately 36%, 49%, 12%, 1% and 3% of the total brown trout catch respectively. Brown trout captured in 2008 ranged in length from 5.9cm to 20.8cm (mean = 9.1cm) (Fig. 4.17). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 76%, 21%, and 2% of the total brown trout catch respectively.

Salmon captured during the 2011 survey ranged in length from 5.8cm to 11.0cm (mean = 6.9cm) (Fig. 4.23). Two age classes (0+, 1+ and 2+) were present, with a mean L1 of 7.17cm (Appendix 2), accounting for 92% and 8% of the total salmon catch respectively. Salmon captured in 2008 ranged in length from 7.1cm to 13.4cm (mean = 11.2cm) (Fig. 4.18). Two age classes were (0+ and 1+) present, with a mean L1 of 4.96cm, accounting for approximately 2% and 98% of the total salmon catch respectively.

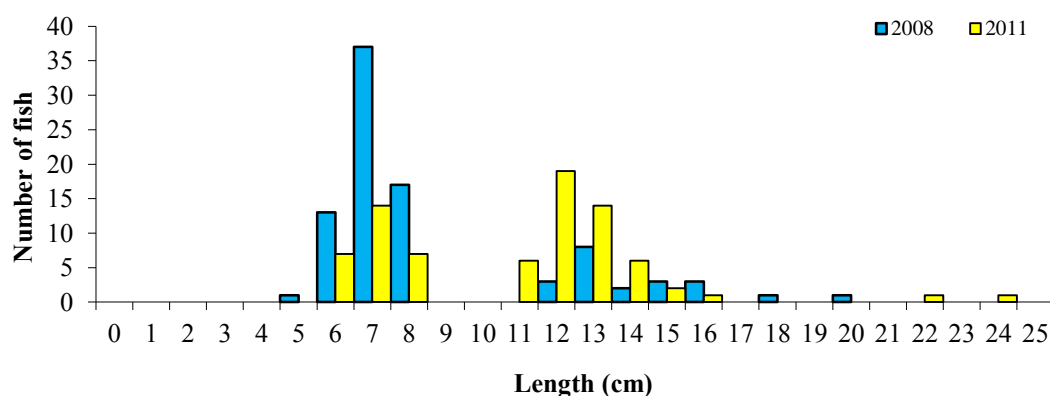


Fig. 4.22. Length frequency distribution of brown trout in the Swanlinbar River site, August 2008 (n = 89) and August 2011 (n = 78)

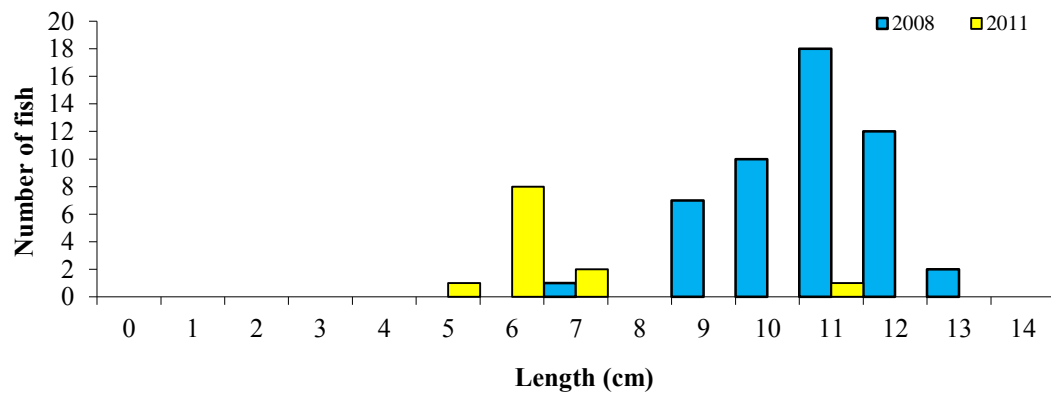


Fig. 4.23. Length frequency distribution of salmon in the Swanlinbar River site, August 2008 (n = 50) and August 2011 (n = 12)

4.1.8 The River Swilly

One site was electric fished on the River Swilly as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located relatively close to the source, near the townland of Breenagh and downstream of the bridge at Drumnahough (Fig. 4.24; Plate 4.8). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 16th of August 2011, along a 45m length of channel. The mean wetted width of the channel was 7.57m and the mean depth was 37.0cm. A total wetted area of 341m² was surveyed. Riffle was the dominant habitat present along this stretch, while cobble was the most abundant substrate present. The aquatic vegetation at this site was comprised mainly of a number of bankside mosses and liverworts.

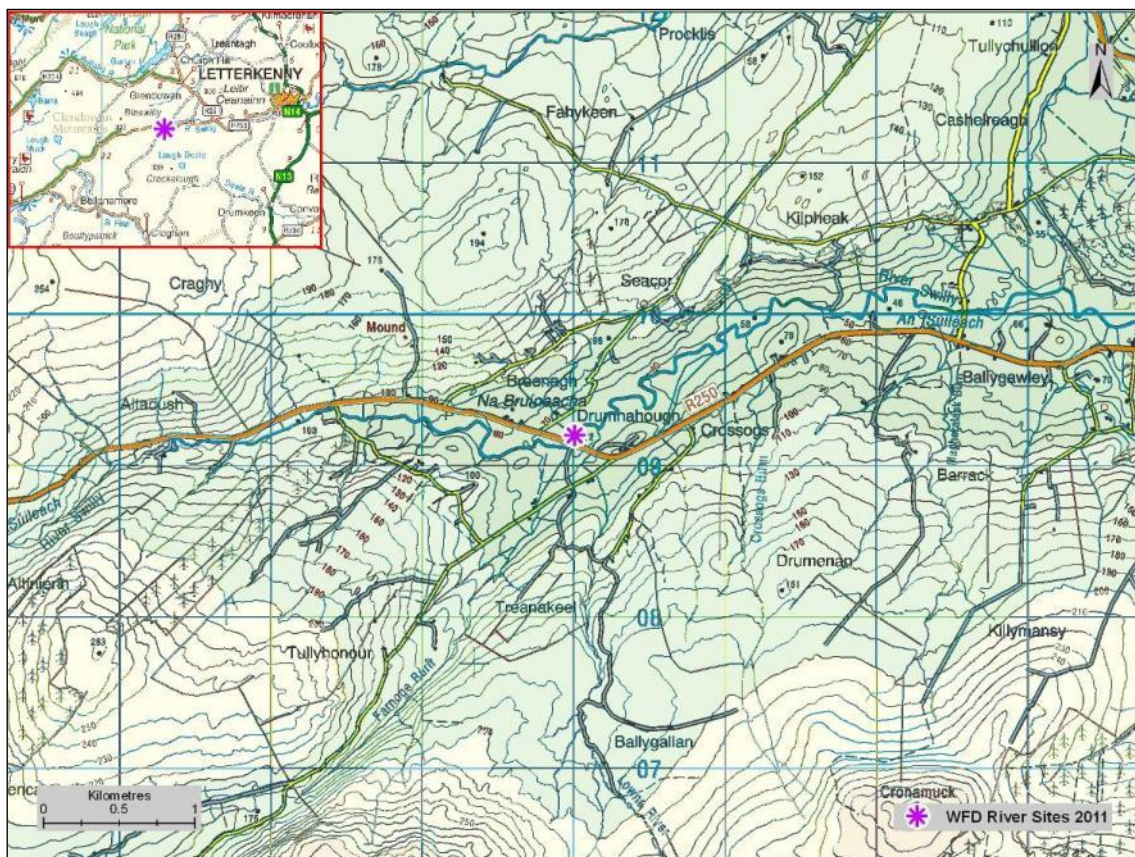


Fig. 4.24. Location of the River Swilly surveillance monitoring site



Plate 4.8. The River Swilly (near Breenagh), Co. Donegal

Four fish species were recorded in the River Swilly site. Brown trout was the most abundant species, followed by salmon, lamprey and eels (Table 4.8). During the previous survey in 2008, the same species composition was recorded.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.028	0.031	0.059	0.073	0.056	0.129
Salmon	0.053	0.034	0.087	0.026	0.023	0.050
Lamprey sp.	-	-	0.016	-	-	0.009
Eel	-	-	0.006	-	-	0.006
All Fish	-	-	0.168	-	-	0.194

Brown trout captured during the 2011 survey ranged in length from 5.1cm to 17.8cm (mean = 8.6cm) (Fig. 4.25). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 56%, 36%, 5% and 2% of the total brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 5.1cm to 22.5cm (mean = 10.7cm) (Fig. 4.21). Four age classes (0+, 1+, 2+ and 3+) were also present, accounting for approximately 45%, 32%, 21% and 3% of the total brown trout catch respectively.

Salmon captured during the 2011 survey ranged in length from 5.0cm to 11.7cm (mean = 7.6cm) (Fig. 4.26). Two age classes (0+ and 1+) were present, accounting for 60%, 40% of the total salmon catch respectively. Salmon captured during the 2008 survey ranged in length from 4.5cm to 10.5cm (mean = 7.2cm) (Fig. 4.20). Two age classes (0+ and 1+) were also present, accounting for approximately 52%, and 48% of the total salmon catch respectively.

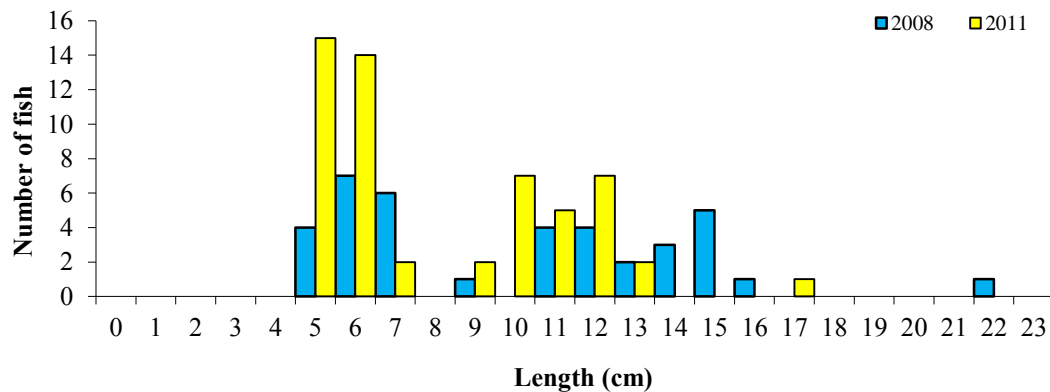


Fig. 4.25. Length frequency distribution of brown trout in the River Swilly site, August 2008 (n = 38) and August 2011 (n = 55)

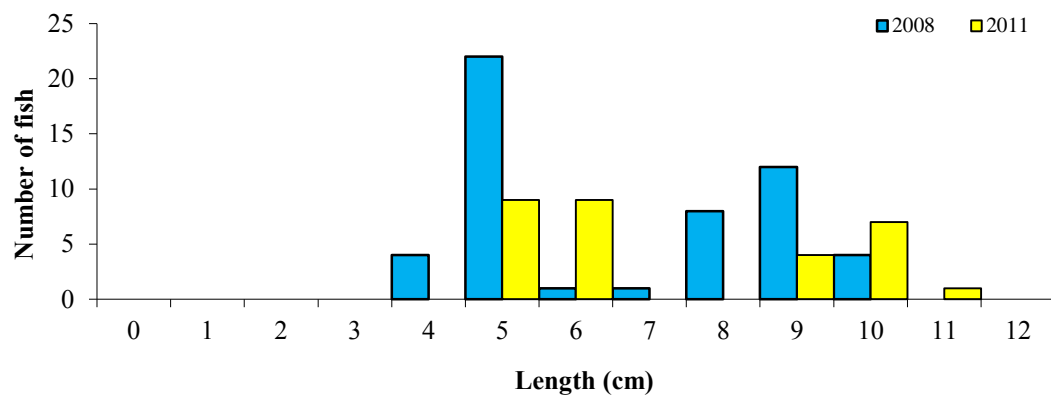


Fig. 4.26. Length frequency distribution of salmon in the River Swilly site, August 2008 (n = 52) and August 2011 (n = 30)

4.1.9 The Waterfoot River

One site was electric fished on the Waterfoot River as part of the WFD surveillance monitoring programme in rivers 2011. The survey site was located on the border between the Republic of Ireland and Northern Ireland on the upstream side of Letter Bridge (Fig. 4.27; Plate 4.9). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 9th of August 2011, along a 44m length of channel. The mean wetted width of the channel was 7.62m and the mean depth was 8.0cm. A total wetted area of 335m² was surveyed. The habitat at this site consisted mainly of glide, while cobble and gravel dominated the substrate. A wide variety of aquatic vegetation was recorded at this site, including bryophytes and emergent bankside species.

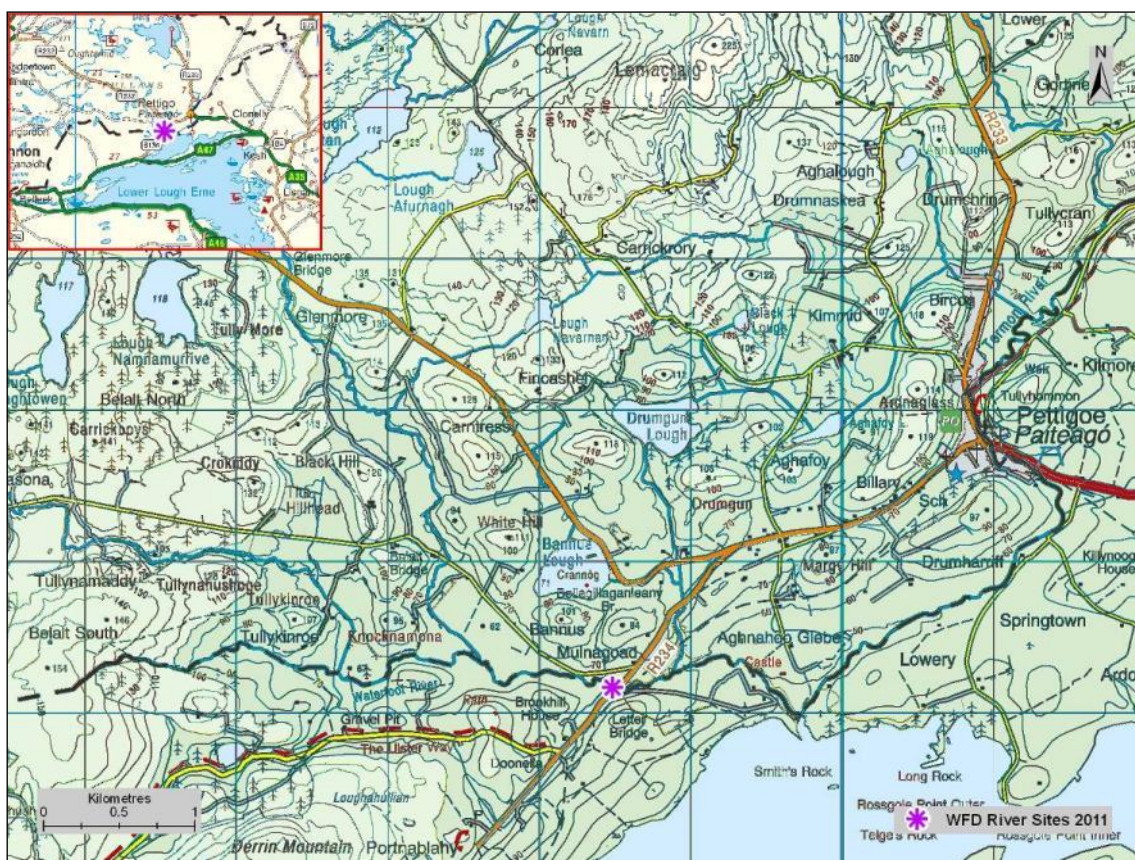


Fig. 4.27. Location of the Waterfoot River surveillance monitoring site



Plate 4.9. The Waterfoot River at Letter Bridge, Co. Donegal

Six fish species were recorded in the Waterfoot River site. Salmon was the most abundant species, followed by brown trout, minnow, lamprey, three-spined stickleback and eels (Table 4.9). During the previous survey in 2008, the same species composition was recorded, with the exception of eels which were only recorded in 2011.

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

Common name	2008			2011		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.149	0.035	0.184	0.346	0.045	0.391
Brown trout	0.045	0.008	0.053	0.101	0.107	0.209
Minnow	-	-	0.038	-	-	0.036
Lamprey sp.	-	-	0.010	-	-	0.027
Three-spined stickleback	-	-	0.030	-	-	0.018
Eel	-	-	-	-	-	0.003
All Fish	-	-	0.315	-	-	0.683

Salmon captured during the 2011 survey ranged in length from 4.4cm to 17.5cm (mean = 5.6cm) (Fig. 4.28). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 86%, 13% and 1% of the total salmon catch respectively. Salmon captured during the 2008 survey ranged in length from 4.9cm to 12.1cm (mean = 7.1cm) (Fig. 4.23). Three ages (0+, 1+ and 2+) were also present, accounting for approximately 79%, 19% and 2% of the total salmon catch respectively.

Brown trout captured during the 2011 survey ranged in length from 3.8cm to 17.9cm (mean = 8.9cm) (Fig. 4.29). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 51%, 43% and 5% of the total brown trout catch respectively. Brown trout captured during the 2008 survey ranged in length from 5.2cm to 15.4cm (mean = 7.7cm) (Fig. 4.24). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 81%, 16%, and 3% of the total brown trout catch respectively.

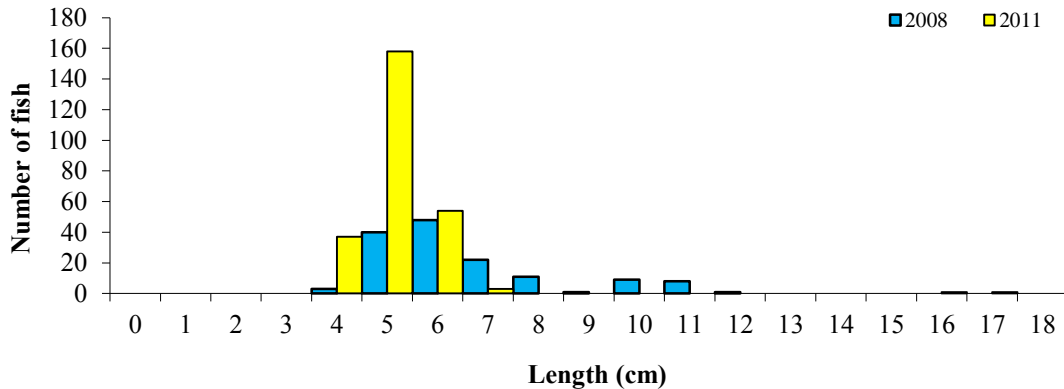


Fig. 4.28. Length frequency distribution of salmon in the Waterfoot River site, August 2008 (n = 143) August 2011 (n = 254)

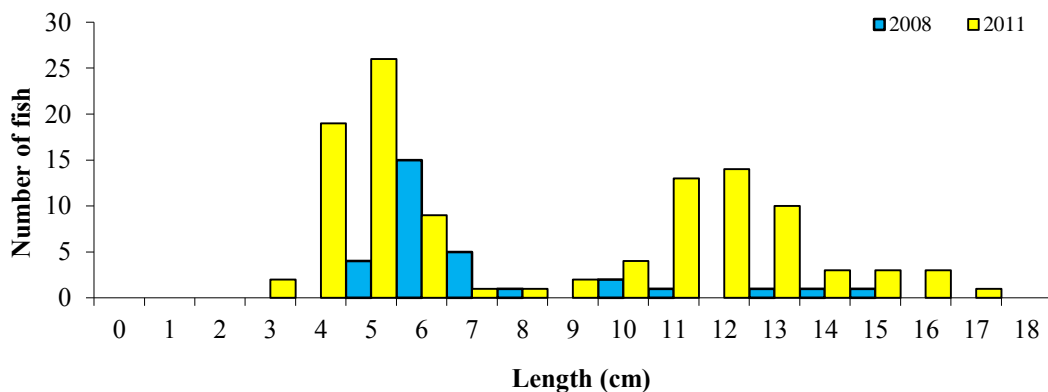


Fig. 4.29. Length frequency distribution of brown trout in the Waterfoot River site, August 2008 (n = 31) and August 2011 (n = 111)

4.2 Community Structure

4.2 Species distribution

A total of nine fish species were recorded within the nine NWIRBD sites surveyed during 2011 (Fig. 4.30). Brown trout was the most common species, present at all sites surveyed. Salmon was the next most common species, occurring at eight sites, followed by eels, lamprey and three-spined stickleback and minnow. Gudgeon, nine-spined stickleback and roach were only recorded at one site each.

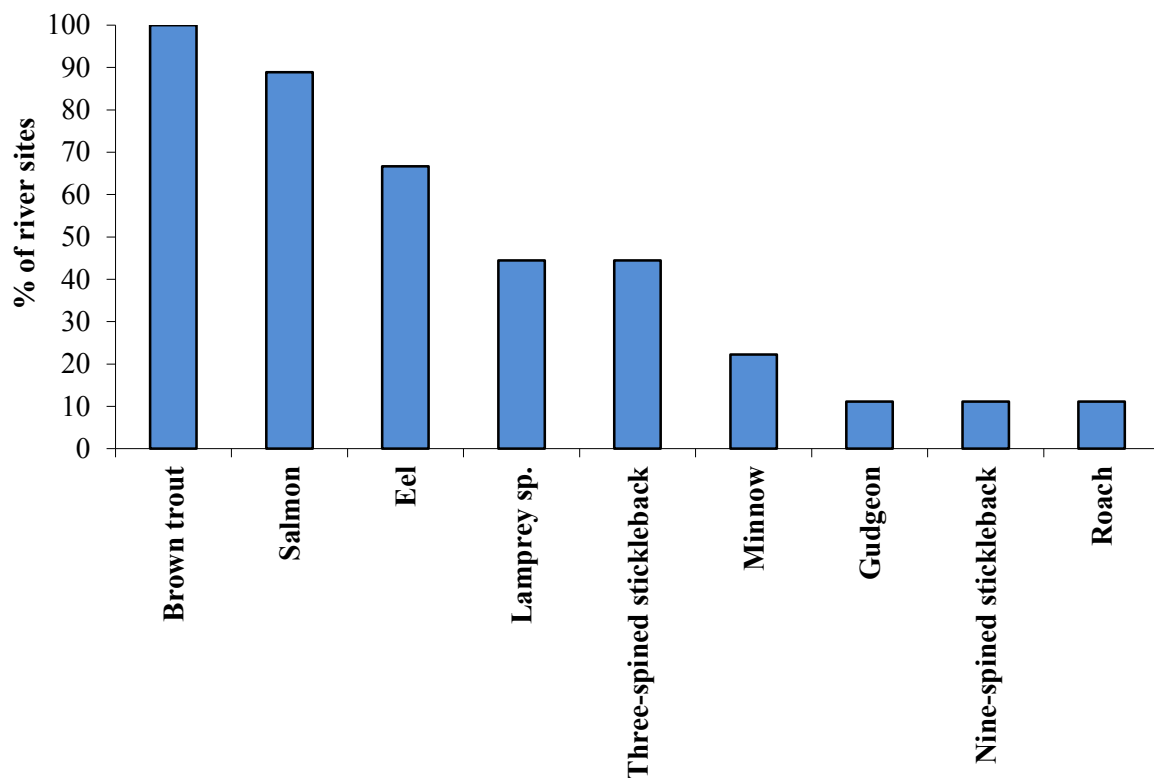


Fig. 4.30. Percentage of sites where each fish species was recorded in the NWIRBD for WFD SM monitoring 2011

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 NWIRBD during 2011.

The mean back-calculated length-at-age data for brown trout in the NWIRBD are shown in Figure 4.31 and Appendix 1. Brown trout were recorded in all nine sites surveyed, with all sites containing both fry (0+) and older fish. Ages ranged from 0+ to 4+, with fish aged 0+ comprising the most abundant age class within the sites surveyed. The largest brown trout recorded in the NWIRBD in 2011 was caught in the Owentocker River, which measured 28.6cm in length, weighed 247g 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 “very slow” at the Burnfoot and Swanlinbar sites (Appendix 1).

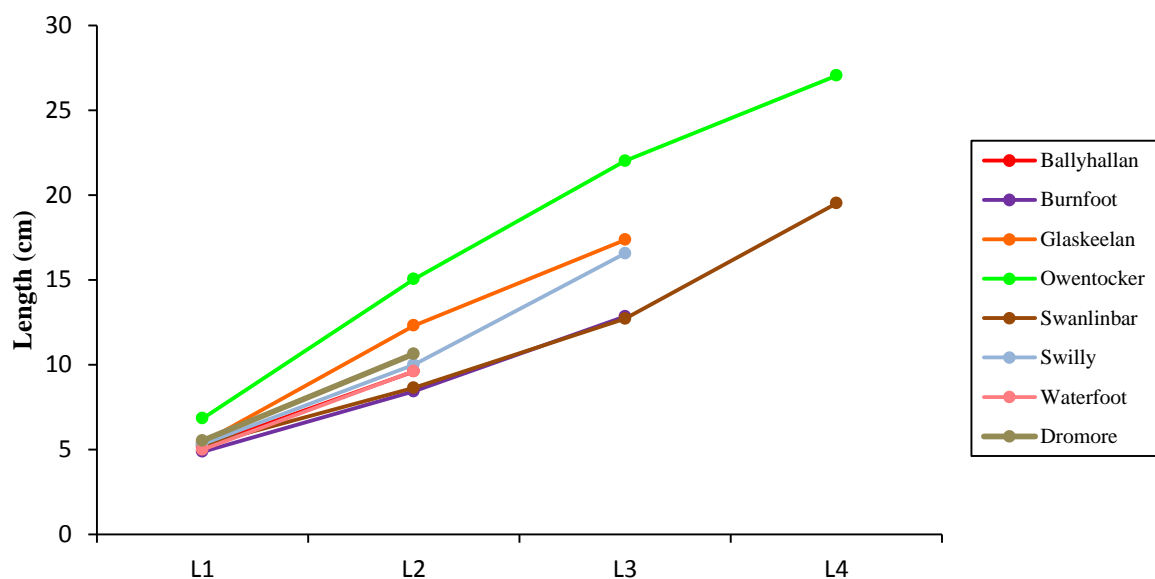


Fig. 4.31. Back calculated length-at-age for brown trout in each river, WFD surveillance monitoring 2011

The mean back-calculated length-at-age data for salmon in the NWIRBD is shown in Figure 4.32 and Appendix 2. Salmon were recorded in eight of the NWIRBD sites surveyed, with five sites containing both fry (0+) and parr (1+ and 2+). Ages ranged from 0+ to 2+, with fish aged 0+ comprising the most abundant age class within the region. The largest salmon recorded in the NWIRBD in 2011 was caught in the Waterfoot River, which measured 17.5cm in length, weighed 66g and was aged 2+.

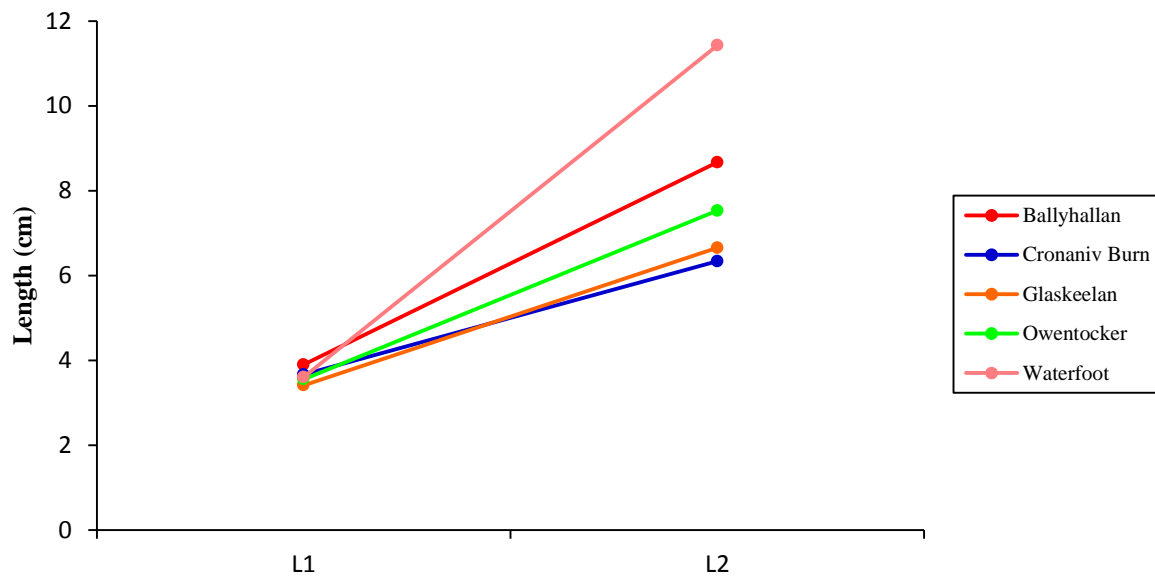


Fig. 4.32. Back calculated length-at-age for salmon in each river, WFD surveillance monitoring 2011

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 2011 has been assigned a draft fish classification status (Table 4.10). One site was classified as “High”, six sites as “Good”, one site as “Moderate” and one site as “Poor”. All of these sites were surveyed in both 2008 and 2011 and when comparing the status for both years, one site showed an improvement, six sites had no change and two sites deteriorated.

Table 4.10. Ecological status of sites surveyed in the NWIRBD for surveillance monitoring 2011
(figures in brackets indicate confidence in class)

River	Site Code	Site name	Previous ecological status	Ecological status 2011
Ballyhallan	40B010200	Br. u/s Clonmany River	Good (2008)	Good (79%)
Burnfoot	39B020600	Br. in Burnfoot	Moderate (2008)	Good (62%)
Cronaniv	38C060100	Br. u/s Dunlewy Lough	High (2008)	High
Dromore	36D020012	Drummuck	Moderate (2008)	Poor (97%)
Gliskeelan	39G050100	Br. W. of Roshin	Good (2008)	Good (75%)
Owentocker	38O060300	D/s of Br. in Ardara	High (2008)	High (62%)
Swanlinbar	36S010290	D/s Swanlinbar Br.	Good (2008)	Moderate (86%)
Swilly	39S020050	Swilly Br. (near Breenagh)	Good (2008)	Good (87%)
Waterfoot	36W030700	Letter Br.	Good (2008)	Good

5. DISCUSSION

A total of nine fish species were recorded during the 2011 WFD surveillance monitoring programme for fish in rivers within the NWIRBD. Brown trout was the most commonly encountered species, recorded in all nine sites, followed by salmon and eels. The Dromore and Waterfoot River sites were the most diverse sites surveyed within the NWIRBD in 2011 with a total of six fish species recorded in both. The site that recorded the lowest diversity in this region was the Cronaniv Burn, with only two species recorded, brown trout and salmon. The greatest abundances of brown trout and salmon were recorded in the Burnfoot and Owentocker Rivers respectively.

Following the methods of Kennedy and Fitzmaurice (1971), growth could only be estimated at two sites, on the Burnfoot and Swanlinbar Rivers, where it was determined to be “very slow” in both. This dominance of the slow categories is unsurprising given that Kennedy and Fitzmaurice (1971) found that in general, the growth of brown trout is positively related to the alkalinity of a river: all rivers surveyed in the NWIRBD except for the Dromore River are categorised as having a low or moderate alkalinity.

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 2011 has been assigned a draft fish classification status. One site was classified as “High”, six sites as “Good”, one site as “Moderate” and one site as “Poor”. All of these sites were surveyed in both 2008 and 2011 and when comparing the status for both years, one site showed an improvement, six sites had no change and two sites deteriorated.

6. REFERENCES

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Council of the European Communities (2000) Establishing a framework for Community action in the field of water policy. Directive of the European Parliament and of the Council establishing a framework for community action in the field of water policy (2000/60/EC). *Official Journal of the European Communities*, **43**, 1-73.

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.

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
Ballyhallan	Mean	5.2	9.6			n/a
	S.D.	0.9	0.5			
	S.E.	0.3	0.4			
	n	10	2			
	Min	4.1	9.2			
	Max	6.4	10.0			
Burnfoot	Mean	4.9	8.4	12.8		Very slow
	S.D.	1.2	1.2	0.6		
	S.E.	0.3	0.4	0.4		
	n	17	10	2		
	Min	2.9	7.0	12.4		
	Max	7.3	11.2	13.3		
Cronaniv Burn	Mean	4.1				n/a
	S.D.	0.5				
	S.E.	0.2				
	n	5				
	Min	3.5				
	Max	4.9				
Dromore	Mean	5.5	n/a			n/a
	S.D.	2.4	n/a			
	S.E.	1.7	n/a			
	n	2	1			
	Min	3.8	10.6			
	Max	7.3	10.6			
Glaskeelan	Mean	5.4	12.3	17.4		n/a
	S.D.	1.6	2.3	1.3		
	S.E.	0.5	1.0	0.9		
	n	12	5	2		
	Min	3.5	9.1	16.4		
	Max	8.6	14.9	18.3		
Owentocker	Mean	6.8	15.0	22.0	27.0	n/a
	S.D.	1.1	2.5	1.0	0.4	
	S.E.	0.4	1.0	0.6	0.3	
	n	8	7	3	2	
	Min	5.0	11.5	21.0	26.8	
	Max	7.9	18.6	22.9	27.3	

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
Swanlinbar	Mean	5.3	8.6	12.7	19.5	Very slow
	S.D.	1.4	1.5	1.3	2.7	
	S.E.	0.3	0.4	0.8	1.9	
	n	26	12	3	2	
	Min	2.9	5.8	11.5	17.6	
	Max	8.6	10.5	14.2	21.4	
Swilly	Mean	5.3	10.0	n/a		n/a
	S.D.	0.9	2.0	n/a		
	S.E.	0.2	1.2	n/a		
	n	19	3	1		
	Min	3.2	7.9	16.6		
	Max	6.9	12.0	16.6		
Waterfoot	Mean	5.0	9.6			n/a
	S.D.	1.0	1.5			
	S.E.	0.2	0.6			
	n	32	6			
	Min	3.1	7.7			
	Max	6.7	11.6			

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
Swilly	Mean	4.26	
	S.D.	0.77	
	S.E.	0.26	
	n	9	
	Min	3.16	
	Max	5.83	
Waterfoot	Mean	3.61	11.42
	S.D.	0.42	0.98
	S.E.	0.24	0.69
	n	3	2
	Min	3.20	10.73
	Max	4.04	12.12



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