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Sampling Fish for the Water Framework Directive

Rivers 2012

South Eastern River Basin District

Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the South 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). Fifteen of these surveys were carried out at river sites in the South Eastern River Basin District (SERBD) from May 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 surveys 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, as part of the Water Framework Directive surveillance monitoring programme.

2. STUDY AREA

Fifteen river sites were surveyed in two river catchments within the SERBD during 2012: the Barrow and Nore catchments. The sites ranged in surface area from 102m^2 for the Tully Stream (Soomeragh Br._B) to 25,531m^2 for the River Barrow (Dunleckny). 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 SERBD is shown in Figure 2.1.

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

River	Site name	Catchment	Site Code	Waterbody code
SERBD Wadeable sites				
Burren	Ullard Br._A	Barrow	14B050100A	SE_14_1781
Burren	Ullard Br._B	Barrow	14B050100B	SE_14_1781
Dinin	Dinin Br._A	Nore	15D020800A	SE_15_1955
Greese	Br. NE of Belan House_A	Barrow	14G040350A	SE_14_946
Greese	Br. NE of Belan House_B	Barrow	14G040350B	SE_14_946
Lerr	Prumplestown Br._A	Barrow	14L010200A	SE_14_157
Tully Stream	Soomeragh Br_A	Barrow	14T020390A	SE_14_842
Tully Stream	Soomeragh Br_B	Barrow	14T020390B	SE_14_842
SERBD Non-Wadeable sites				
Barrow	Pass Br._B	Barrow	14B011000A	SE_14_196_1
Barrow	Leighlinbridge_A	Barrow	14B012690A	SE_14_196
Barrow	Dunleckny_A	Barrow	14B012820A	SE_14_196
Barrow	Bagenalstown_A	Barrow	14B012870A	SE_14_196
Barrow	Ballykeenan Lock_A	Barrow	14B013440A	SE_14_1909
Barrow	Graiguenamanagh Br._A	Barrow	14B013500A	SE_14_1909
Barrow	Upper Tinnahinch Lock_A	Barrow	14B013510A	SE_14_1909

Table 2.1. Details of river sites surveyed for WFD surveillance monitoring, SERBD 2012

River	Upstream catchment (km^2)	Wetted width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
SERBD Wadeable sites					
Burren (Ullard Br._A)	38.49	3.97	159	0.70	0.79
Burren (Ullard Br._B)	38.49	5.40	216	0.56	0.82
Dinin (Dinin Br._A)	299.23	15.52	667	0.31	0.79
Greese (Br. NE of Belan House_A)	102.39	7.67	307	0.50	0.67
Greese (Br. NE of Belan House_B)	102.39	7.37	258	0.54	0.68
Lerr (Prumplestown Br._A)	75.87	5.93	225	0.34	0.53
Tully Stream (Soomeragh Br_A)	44.13	4.07	163	0.41	0.71
Tully Stream (Soomeragh Br_B)	44.13	3.50	102	0.52	0.75
SERBD Non-Wadeable sites					
Barrow (Pass Br._B)	1125.58	30.17	10951	0.55	0.85
Barrow (Leighlinbridge Lord_A)	2356.86	36.00	16380	1.04	1.40
Barrow (Dunleckny_A)	2390.38	40.33	25531	1.56	2.25
Barrow (Bagenalstown_A)	2401.33	16.17	16377	1.41	2.00
Barrow (Ballykeenan Lock_A)	2760.76	35.60	11143	1.57	2.45
Barrow (Graiguenamanagh Br._A)	2777.72	42.60	15549	2.20	3.40
Barrow (Upper Tinnahinch Lock_A)	2788.49	40.80	20645	1.73	2.50

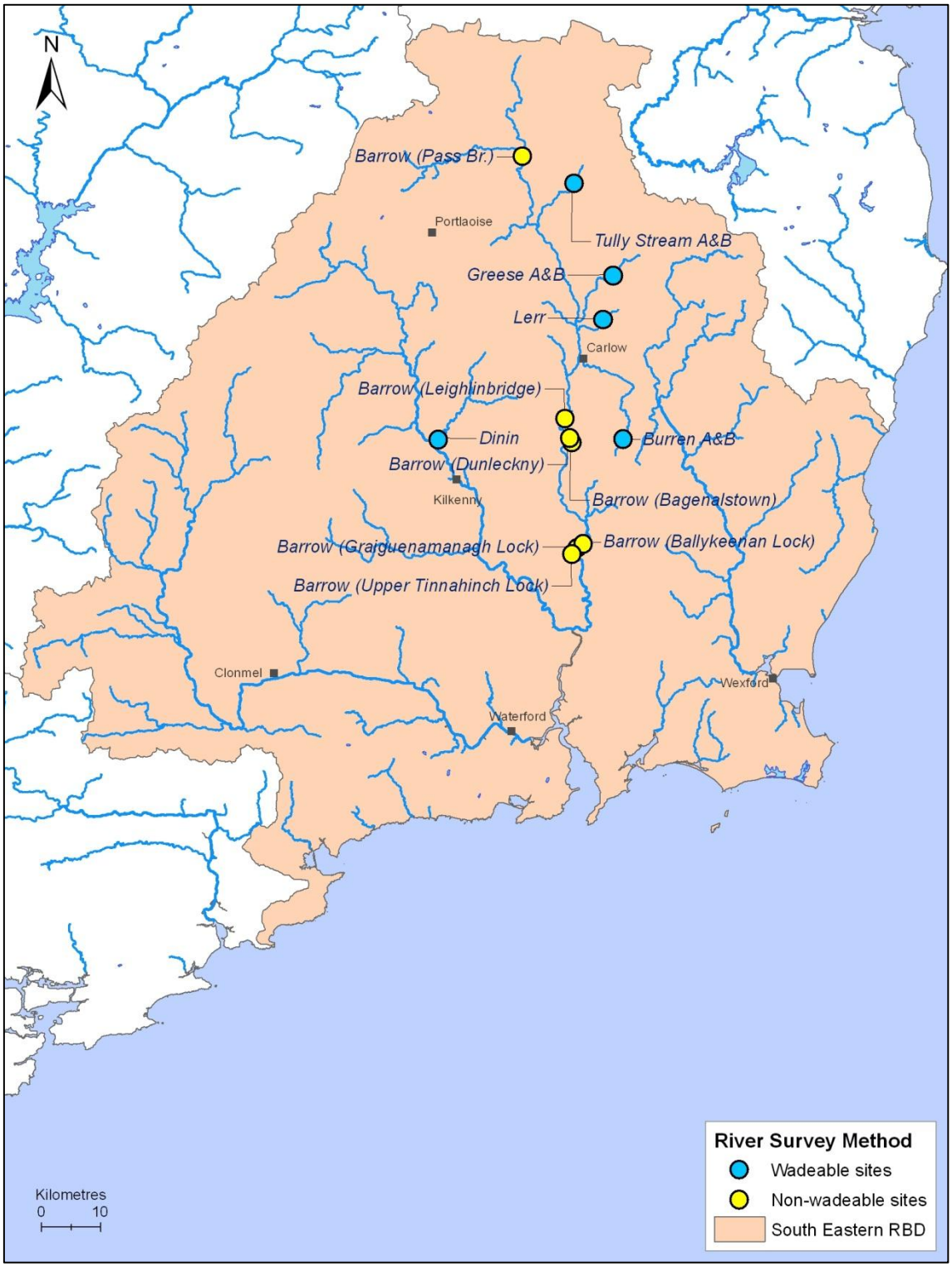

Fig. 2.1. Location map of river sites surveyed throughout the SERBD for WFD fish surveillance monitoring 2012

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 River Barrow

Seven sites were electric fished on the River Barrow as part of the WFD surveillance monitoring programme in rivers 2012; the Barrow (Pass Br.), Barrow (Leighlinbridge), Barrow (Dunleckny), Barrow (Bagenalstown), Barrow (Ballykeenan Lock), Barrow (Graiguenamanagh Br.), and Barrow (Upper Tinnahinch Lock) (Figs. 4.1 to 4.3). These were partial surveys of the entre channel, with fish density estimates reflecting only the area of channel effectively fished.

The River Barrow (Pass Bridge) survey site was located between Pass Bridge and the Grand Canal Bridge, just outside Monasterevin, Co. Kildare (Fig. 4.1; Plate 4.1). One electric-fishing pass was conducted using two boat-based electric fishing units that fished close to the bank on both sides of the channel; each side of the channel was fished separately. The survey was carried out on the 25th of May 2012, along a 363m length of channel. Glide dominated the survey stretch.

The River Barrow (Leighlinbridge) survey site was located downstream of Rathvinden Lock, just north of Leighlinbridge, Co. Carlow (Fig. 4.2; Plate 4.2). One electric-fishing pass was conducted using two boat-based high-voltage electric fishing units that fished close to the bank on both sides of the channel simultaneously. The survey was carried out on the 21st of May 2012, along a 195m length of channel. Glide dominated the survey stretch. Vegetation at this site consisted of tall emergent species as well as other submerged species including mosses.

The River Barrow (Dunleckny) survey site was located near the townland of Dunleckny, just north of Bagenalstown, Co. Carlow (Fig. 4.2; Plate 4.3). One electric-fishing pass was conducted using two boat-based high-voltage electric fishing units that fished close to the bank on both sides of the channel simultaneously and then one single boat fished down the middle of the site after the initial fishing. The survey was carried out on the 22nd of May 2012, along a 633m length of channel. Glide dominated the survey stretch. A variety of vegetation was present at this site, including tall emergent, semi-aquatic bankside and floating species.

The River Barrow (Bagenalstown) survey site was located a few hundred metres downstream of the Dunleckny site, along a canalised portion of the river in Bagenalstown (Fig. 4.2; Plate 4.4). One electric-fishing pass was conducted using one boat-based high-voltage electric fishing unit. The survey was carried out on the 22nd of May 2012, along a 1013m length of channel. Glide dominated the survey stretch. Vegetation at this site consisted of tall emergent species as well as a variety of semi-aquatic bankside and floating species.

The River Barrow (Ballykeenan Lock) survey site was located downstream of Ballykeenan Lock, approximately 2km northeast of Graiguenamanagh on the Carlow, Kilkenny border (Fig. 4.3; Plate

4.5). One electric-fishing pass was conducted using one boat-based high-voltage electric fishing unit that fished close to bank on both sides of the channel; each side of the channel was fished separately. The survey was carried out on the 23rd of May 2012, along a 313m length of channel. Glide dominated the survey stretch. Vegetation at this site consisted mainly of tall emergent species as well as floating plants.

The River Barrow (Graiguenamanagh Bridge) survey site was located upstream of Graiguenamanagh along a wooden boardwalk (Fig. 4.3; Plate 4.6). One electric-fishing pass was conducted using two boat-based high-voltage electric fishing units that fished close to the bank on both sides of the channel; each side of the channel was fished separately. The survey was carried out on the 23rd of May 2012, along a 365m length of channel. Glide dominated the survey stretch. Vegetation at this site consisted of tall emergent species, with some floating plants also present.

The River Barrow (Upper Tinnahinch Lock) survey site was located downstream of Graiguenamanagh, beginning just below Upper Tinnahinch Lock (Fig. 4.3; Plate 4.7). One electric-fishing pass was conducted using one boat-based high-voltage electric fishing unit that fished close to the bank on each side of the channel; each side of the channel was fished separately. The survey was undertaken on the 24th of May 2012, along a 506m length of channel. Glide dominated the survey stretch. Vegetation at this site consisted of tall emergent as well as submerged and floating species.

Fig. 4.1. Location of the River Barrow (Pass bridge) surveillance monitoring site

Fig. 4.2. Location of the River Barrow surveillance monitoring sites (Leighlinbridge, Dunleckny and Bagenalstown)

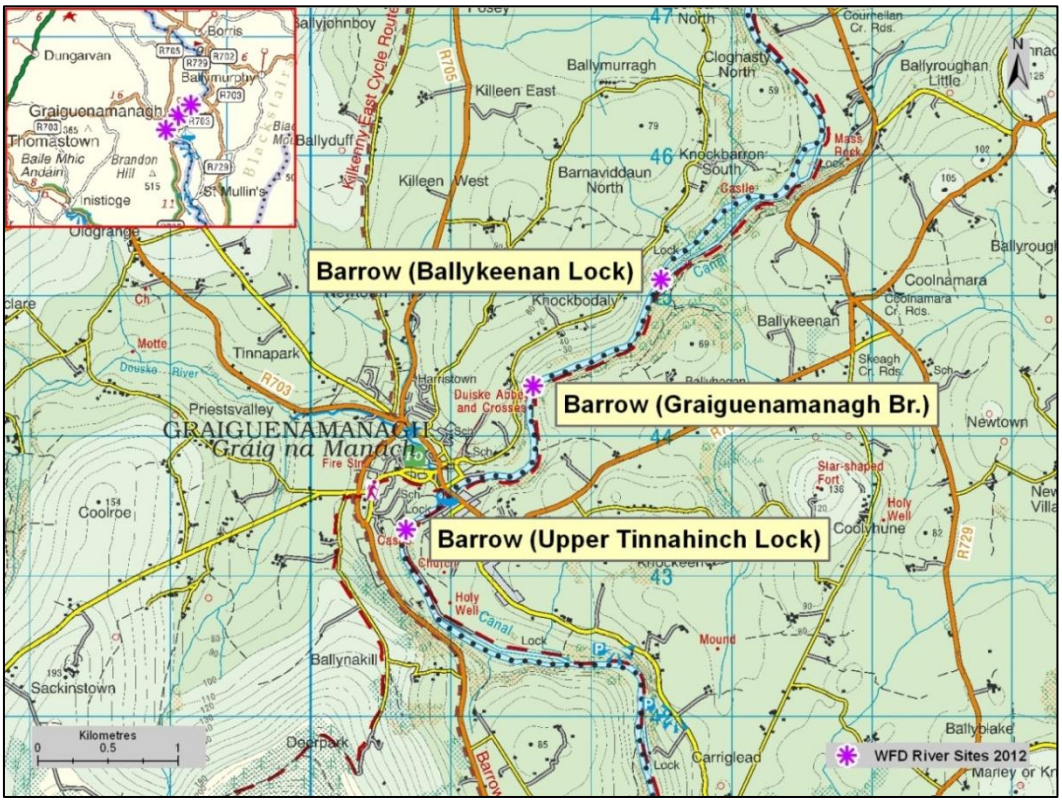

Fig. 4.3. Location of the River Barrow surveillance monitoring sites (Ballykeenan, Graiguenmanagh and Upper Tinnahinch)

Plate 4.1. The River Barrow at Pass Bridge, Co. Kildare

Plate 4.2. The River Barrow upstream of Leighlinbridge, Co. Carlow

Plate 4.3. The River Barrow at Dunleckny, Co. Carlow

Plate 4.4. The River Barrow at Bagenalstown, Co. Carlow

Plate 4.5. The River Barrow downstream of Ballykeenan Lock, Co. Carlow/Kilkenny border

Plate 4.6. The River Barrow upstream of Graiguenamanagh Bridge, Co. Carlow/Kilkenny border

Plate 4.7. The River Barrow downstream of Upper Tinnahinch Lock, Co. Carlow/Kilkenny border

River Barrow (Pass Br.)

A total of thirteen species were recorded in the River Barrow (Pass Br.) site (Table 4.1). Minnow was the most abundant species, followed by roach, gudgeon, dace, salmon, perch, stone loach, brown trout, European eel, three-spined stickleback, lamprey, roach x bream hybrids and pike.

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

Common name	2012		
	0+	1+ & older	Total minimum density
Minnow	-	-	0.029
Roach	-	-	0.012
Gudgeon	-	-	0.010
Dace	-	-	0.008
Salmon	0.000	0.002	0.002
Perch	-	-	0.002
Stone loach	-	-	0.002
Brown trout	0.000	0.002	0.002
European eel	-	-	0.001
Three-spined stickleback	-	-	0.0004
Lamprey juvenile	-	-	0.0003
Roach x bream hybrid	-	-	0.0003
Pike	-	-	0.0002
All Fish	-	-	0.070

Brown trout captured during the 2012 survey ranged in length from 9.2cm to 24.2cm (mean = 15.6cm) (Fig. 4.4). Two age classes (1+ and 2+) were present, accounting for 58% and 42% of the total brown trout catch respectively.

Dace captured during the 2012 survey ranged in length from 5.0cm to 15.3cm (mean = 9.4cm) (Fig. 4.5). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 27%, 71% and 2% of the total salmon catch respectively.

Perch captured during the 2012 survey ranged in length from 10.5cm to 23.2cm (mean = 14.7cm) (Fig. 4.6).

Roach captured during the 2012 survey ranged in length from 3.7cm to 26.5cm (mean = 8.6cm) (Fig. 4.7). Six age classes (0+, 1+, 2+, 5+,6+ and 7+) were present, accounting for approximately 2%, 8)%, 13%, 2%, 1% and 1% of the total roach catch respectively.

Salmon captured during the 2012 survey ranged in length from 7.8cm to 11.0cm (mean = 9.6cm) (Fig. 4.8). Only one age class (0+) was present.

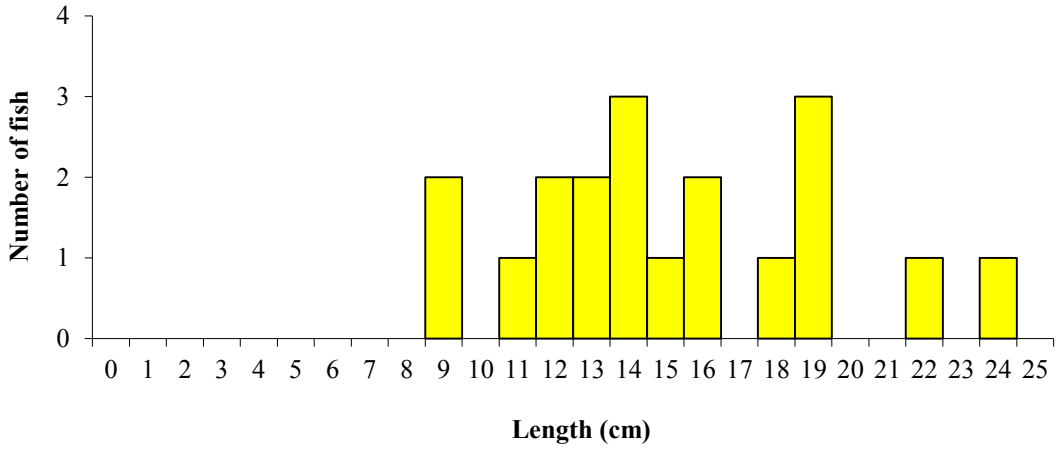

Fig. 4.4. Length frequency distribution of brown trout in the River Barrow (Pass Bridge) site, May 2012 (n = 19)

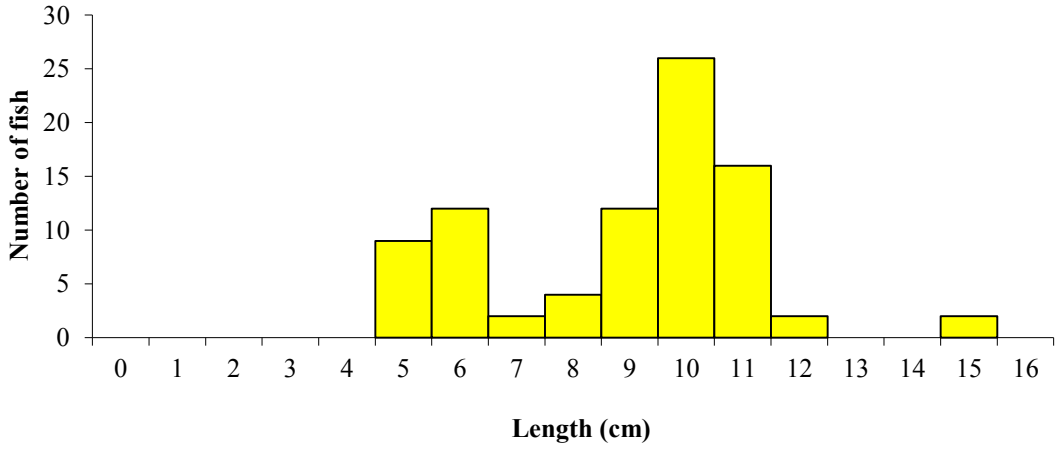

Fig. 4.5. Length frequency distribution of dace in the River Barrow (Pass Bridge) site, May 2012 (n = 85)

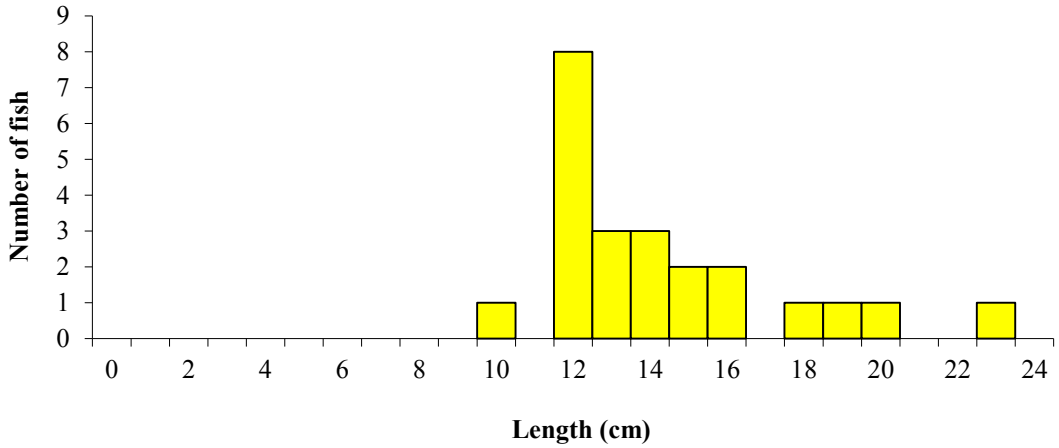

Fig. 4.6. Length frequency distribution of perch in the River Barrow (Pass Bridge) site, May 2012 (n = 23)

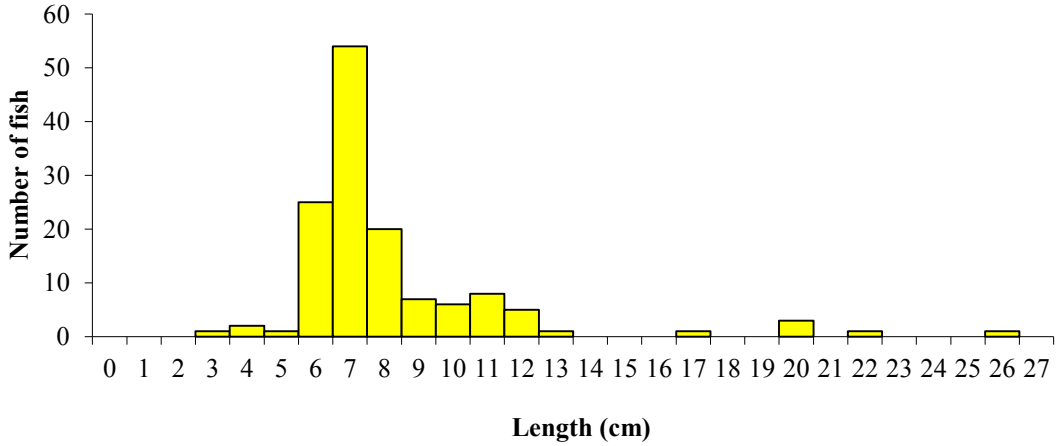

Fig. 4.7. Length frequency distribution of roach in the River Barrow (Pass Bridge) site, May 2012 (n = 136)

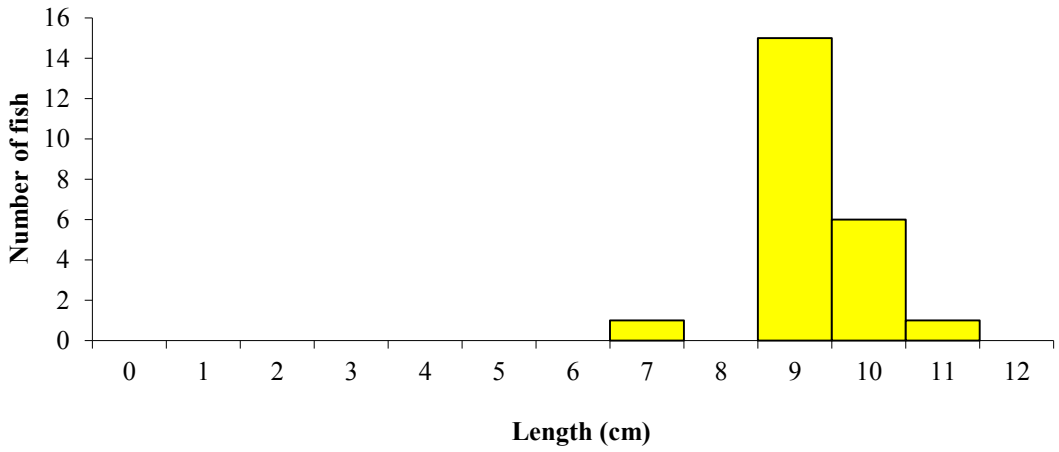

Fig. 4.8. Length frequency distribution of salmon in the River Barrow (Pass Bridge) site, May 2012 (n = 23)

River Barrow (Leighlinbridge)

A total of seven species were recorded in the River Barrow (Leighlinbridge) site (Table 4.2). Dace was the most abundant species, followed by minnow, roach, brown trout, salmon, European eels and three-spined stickleback.

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

Common name	2012		
	0+	1+ & older	Total minimum density
Dace	-	-	0.010
Minnow	-	-	0.008
Roach	-	-	0.002
Brown trout	0.000	0.002	0.002
Salmon	0.000	0.0004	0.0004
European eel	-	-	0.0004
Three-spined stickleback	-	-	0.0001
All Fish	-	-	0.023

Dace captured during the 2012 survey ranged in length from 4.1cm to 22.1cm (mean = 11.3cm) (Fig. 4.9). Six age classes (0+, 1+, 2+, 3+, 4+,5+) were present, accounting for approximately 4%, 8%, 57%, 12%, 8% and 12% of the total dace catch respectively.

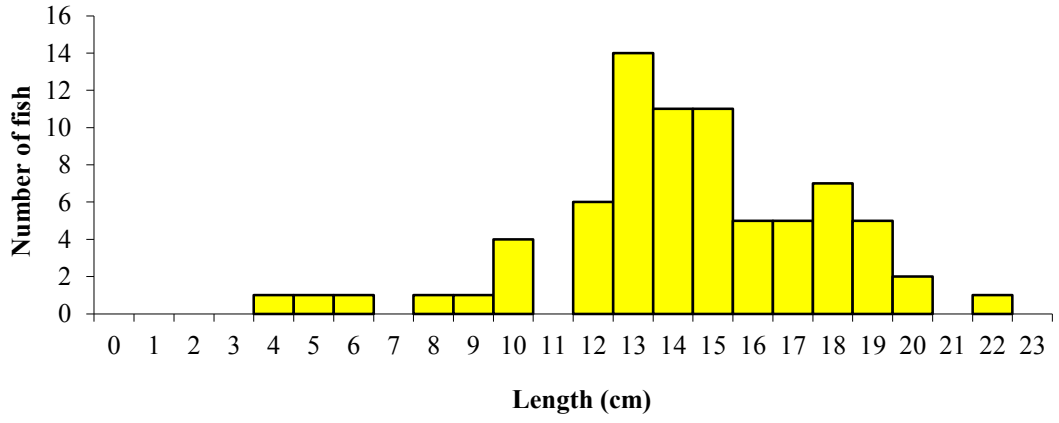

Fig. 4.9. Length frequency distribution of dace in the River Barrow (Leighlinbridge) site, May 2012 (n = 76)

River Barrow (Dunleckny)

A total of eleven species were recorded in the River Barrow (Dunleckny) site (Table 4.3). Minnow was the most abundant species, followed by roach, dace, perch, European eels, pike, gudgeon, three-spined stickleback, brown trout, salmon and stone loach.

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

Common name	2012		Total minimum density
	0+	1+ & older	
Minnow	-	-	0.01290
Roach	-	-	0.00386
Dace	-	-	0.00246
Perch	-	-	0.00140
European eel	-	-	0.00079
Pike	-	-	0.00061
Gudgeon	-	-	0.00053
Three-spined stickleback	-	-	0.00026
Brown trout	0.00000	0.00018	0.00018
Salmon	0.00000	0.00009	0.00009
Stone loach	-	-	0.00009
All Fish	-	-	0.02317

Dace captured during the 2012 survey ranged in length from 3.4cm to 23.2cm (mean = 10.9cm) (Fig. 4.10). Six age classes (0+, 1+, 2+, 3+, 4+ and 5+) were present, accounting for approximately 39%, 29%, 11%, 4%, 11% and 7% of the total dace catch respectively.

Roach captured during the 2012 survey ranged in length from 2.2cm to 26.9cm (mean = 9.3cm) (Fig. 4.11). Six age classes (0+, 1+, 2+, 3+, 6+ and 7+) were present, accounting for approximately 7%, 75%, 11%, 2%, 2% and 2% of the total roach catch respectively.

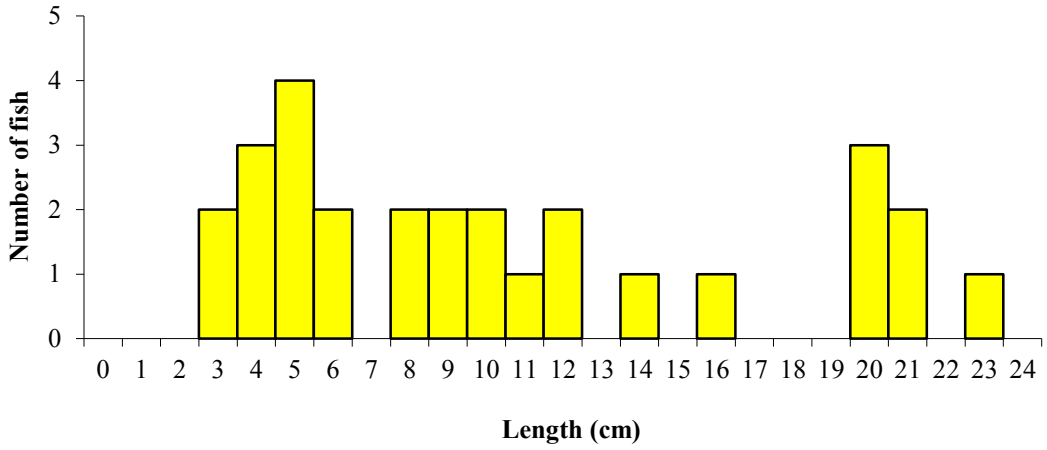

Fig. 4.10. Length frequency distribution of dace in the River Barrow (Dunleckny) site, May 2012 (n = 28)

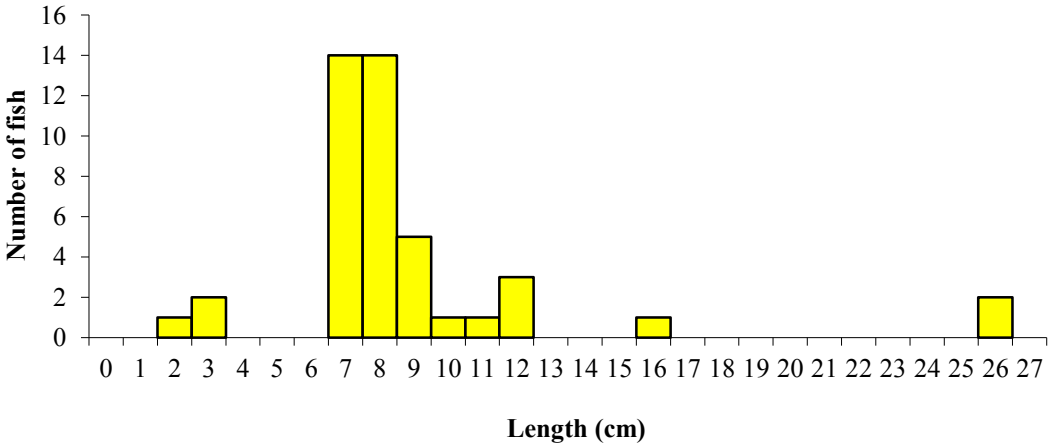

Fig. 4.11. Length frequency distribution of roach in the River Barrow (Dunleckny) site, May 2012 (n = 44)

River Barrow (Bagenalstown)

A total of eleven species were recorded in the River Barrow (Bagenalstown) site (Table 4.4). Dace was the most abundant species, followed by roach, European eels, perch, pike, gudgeon, brown trout, salmon, minnow, bream and stone loach (the latter six of which had only one individual present).

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

Common name	2012		
	0+	1+ & older	Total minimum density
Dace	-	-	0.00444
Roach	-	-	0.00222
European eel	-	-	0.00148
Perch	-	-	0.00123
Pike	-	-	0.00111
Gudgeon	-	-	0.00074
Brown trout	0.00000	0.00049	0.00049
Salmon	0.00000	0.00012	0.00012
Minnow	-	-	0.00012
Bream	-	-	0.00012
Stone loach	-	-	0.00012
All Fish	-	-	0.01222

Dace captured during the 2012 survey ranged in length from 4.0cm to 24.0cm (mean = 16.6cm) (Fig. 4.12). Seven age classes (0+, 1+, 2+, 3+, 4+, 5+ and 6+) were present, accounting for approximately 6%, 6%, 47%, 8%, 17%, 14% and 3% of the total dace catch respectively.

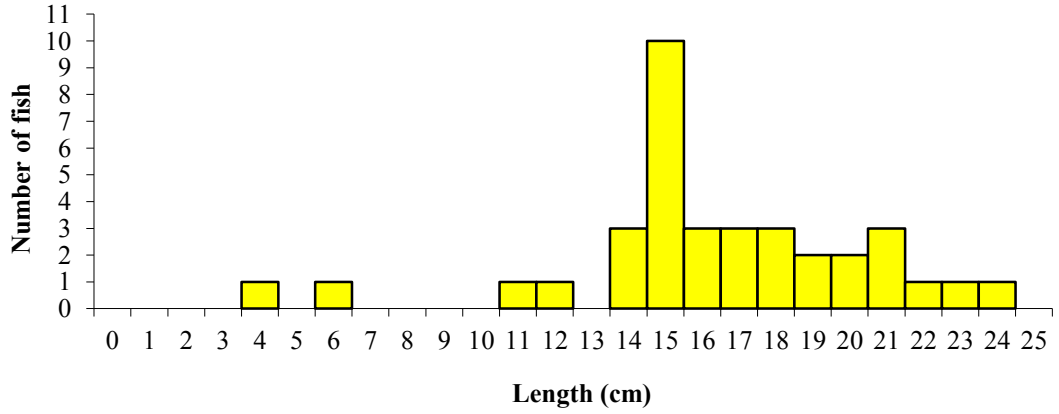

Fig. 4.12. Length frequency distribution of dace in the River Barrow (Bagenalstown) site, May 2012 (n = 36)

River Barrow (Ballykeenan Lock)

A total of ten species were recorded in the River Barrow (Ballykeenan Lock) site (Table 4.5). Minnow was the most abundant species, followed by dace, European eel, perch, roach, brown trout, stone loach, three-spined stickleback, salmon and pike.

Table 4.5. Density of fish (no./m^2), River Barrow (Ballykeenan Lock) (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Minnow	-	-	0.03195
Dace	-	-	0.00958
European eel	-	-	0.00280
Perch	-	-	0.00140
Roach	-	-	0.00120
Brown trout	0.00000	0.00100	0.00100
Stone loach	-	-	0.00080
Three-spined stickleback	-	-	0.00040
Salmon	0.00000	0.00040	0.00040
Pike	-	-	0.00020
All Fish	-	-	0.04972

Dace captured during the 2012 survey ranged in length from 4.9cm to 23.2cm (mean = 13.0cm) (Fig. 4.13). Six age classes (0+, 1+, 2+, 3+, 4+ and 5+) were present, accounting for approximately 23%, 25%, 27%, 2%, 17% and 6% of the total dace catch respectively.

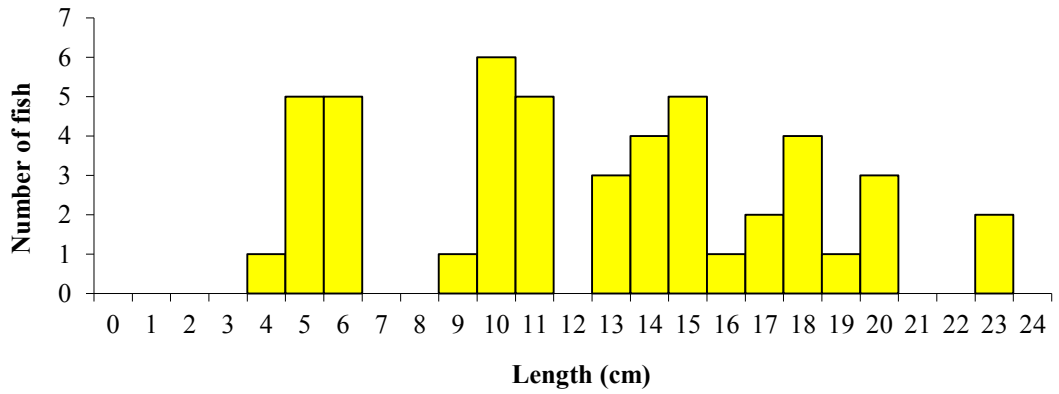

Fig. 4.13. Length frequency distribution of dace in the River Barrow (Ballykeenan Lock) site, May 2012 (n = 48)

River Barrow (Graiguenamanagh)

A total of eleven species were recorded in the River Barrow (Graiguenamanagh) river site (Table 4.6). Dace was the most abundant species, followed by minnow, roach, perch, European eels, gudgeon, pike, brown trout, salmon, roach × bream hybrids and lamprey.

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

Common name	2012		
	0+	1+ & older	Total minimum density
Dace	-	-	0.027
Minnow	-	-	0.021
Roach	-	-	0.004
Perch	-	-	0.002
European eel	-	-	0.002
Gudgeon	-	-	0.001
Pike	-	-	0.001
Brown trout	0.000	0.001	0.001
Salmon	0.000	0.001	0.001
Roach x bream hybrid	-	-	0.0003
Lamprey juvenile	-	-	0.0001
All Fish	-	-	0.058

Dace captured during the 2012 survey ranged in length from 3.6cm to 23.7cm (mean = 10.2cm) (Fig. 4.14). Seven age classes (0+, 1+, 2+, 3+, 4+, 5+ and 6+) were present, accounting for 45%, 21%, 21%, 6%, 5%, 1% and 1% of the total dace catch respectively. Dace captured during the 2010 survey ranged in length from 4.0cm to 4.5cm (mean = 4.3cm). Only one age class (0+) was present.

Roach captured during the 2012 survey ranged in length from 6.5cm to 23.5cm (mean = 9.8cm) (Fig. 4.15). Four age classes (1+, 2+, 3+ and 6+) were present, accounting for 71%, 13%, 10% and 6% of the total roach catch respectively. No roach were recorded at this site in 2010.

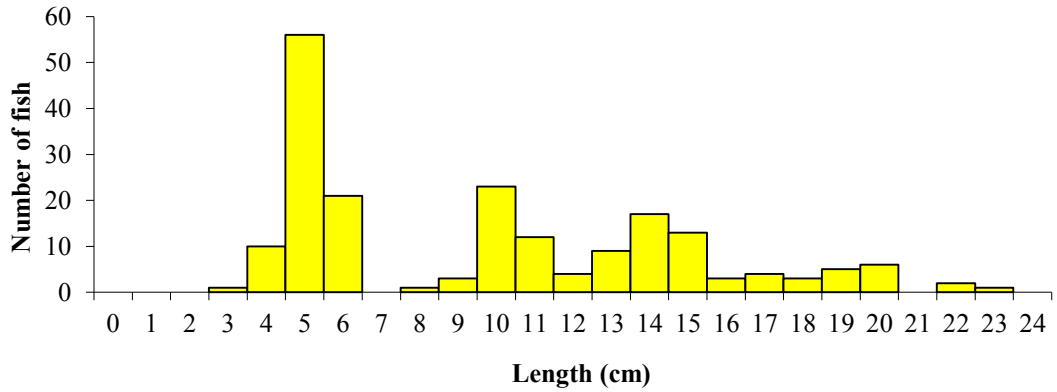

Fig. 4.14. Length frequency distribution of dace in the River Barrow (Graiguenamanagh) site, May 2012 (n = 194)

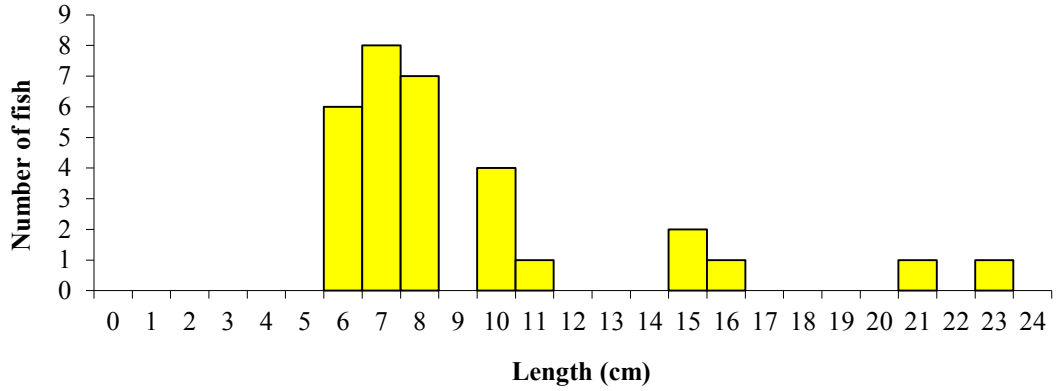

Fig. 4.15. Length frequency distribution of roach in the River Barrow (Graiguenamanagh) site, May 2012 (n = 31) (no roach recorded in 2010)

River Barrow (Upper Tinnahinch Lock)

A total of ten species were recorded in the River Barrow (Upper Tinnahinch Lock) site (Table 4.7). Minnow was the most abundant species, followed by dace, gudgeon, European eels, roach, brown trout, perch and three-spined stickleback, salmon and pike.

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

Common name	2012		
	0+	1+ & older	Total minimum density
Minnow	-	-	0.04012
Dace	-	-	0.01858
Gudgeon	-	-	0.01245
European eel	-	-	0.00296
Roach	-	-	0.00178
Brown trout	0.00000	0.00138	0.00138
Perch	-	-	0.00079
Three-spined stickleback	-	-	0.00079
Salmon	0.00000	0.00020	0.00020
Pike	-	-	0.00020
All Fish	-	-	0.07925

Dace captured during the 2012 survey ranged in length from 3.0cm to 25.0cm (mean = 9.5cm) (Fig. 4.16). Seven age classes (0+, 1+, 2+, 3+, 4+, 5+ and 6+) were present, accounting for approximately 47%, 22%, 15%, 9%, 5%, 1% and 1% of the total dace catch respectively.

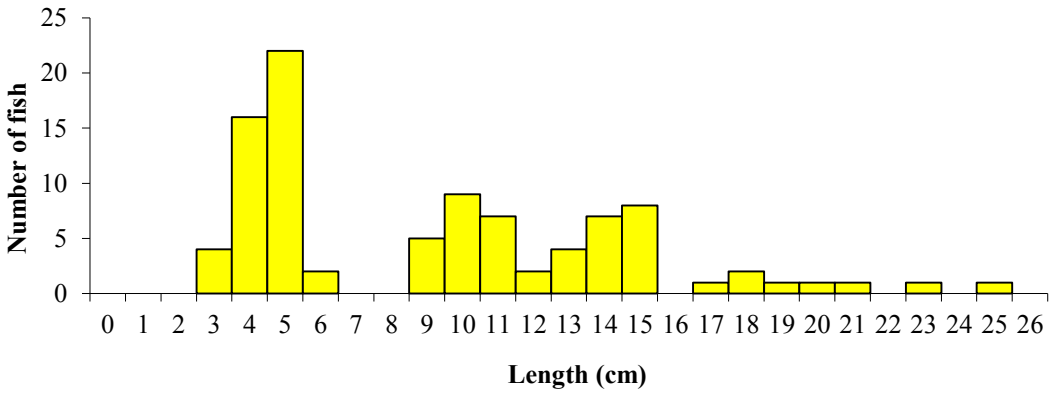

Fig. 4.16. Length frequency distribution of dace in the River Barrow (Upper Tinnahinch Lock) site, May 2012 (n = 94)

4.1.2 The Burren River

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

The Ullard Br. 'A' survey site was downstream of Ullard Bridge, approximately 9km east of Bagenalstown, Co. Carlow (Fig. 4.17; Plate 4.8). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 25th of July 2012, along a 40m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. The vegetation at this site consisted of a large strands of *Ranunculus* sp. along with a small number of floating and emergent, bank-side species.

The Ullard Br. 'B' survey site was just upstream of, and adjacent to the 'A' site. Three electric-fishing passes were conducted using two bank-based electric fishing units on the 25th of July 2012, along a 40m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. The vegetation at this site consisted of a large strands of *Ranunculus* sp. along with a small number of floating and emergent, bank-side species.

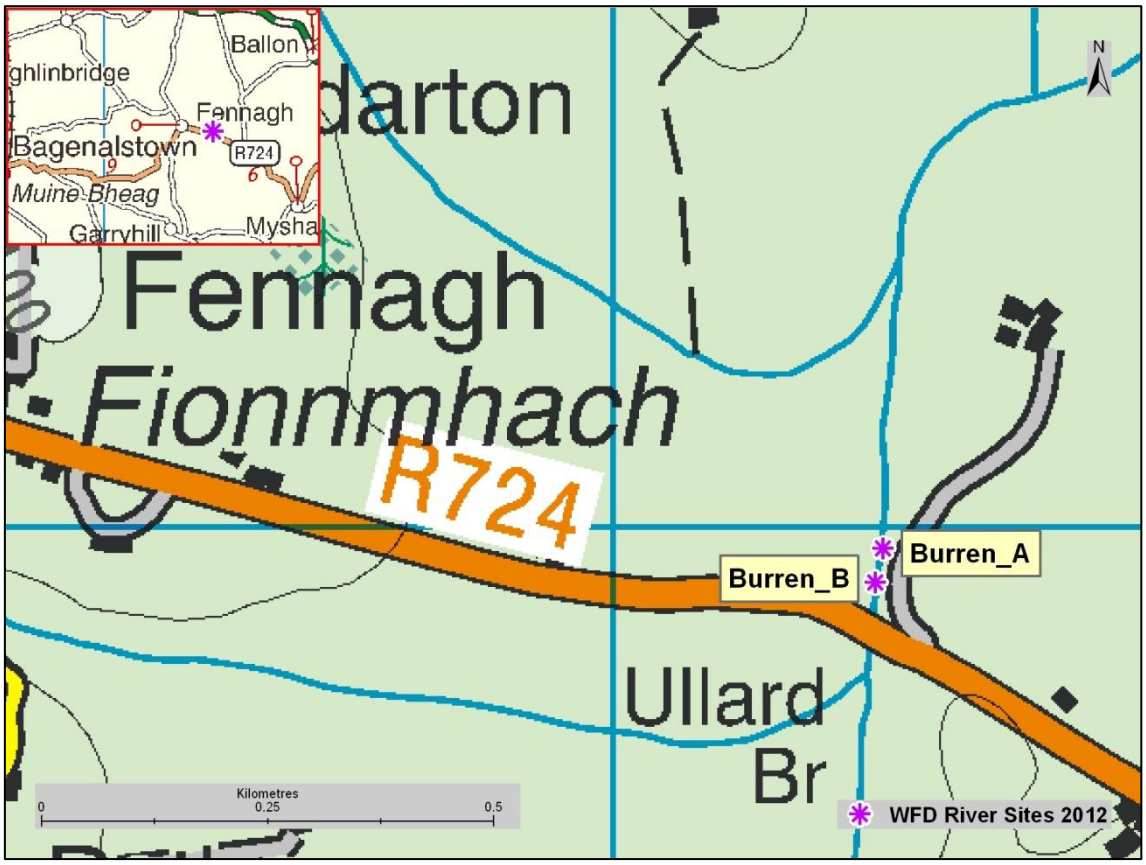

Fig. 4.17. Location of the Burren River surveillance monitoring sites

Plate 4.8. The Burren River at Ullard Bridge, Co. Carlow

Burren River (Site A)

A total of six fish species were recorded in the Burren River site (Table 4.8). Brown trout was the most abundant species, followed by salmon, lamprey, three-spined stickleback, European eels and stone loach.

Table 4.8. Density of fish (no./m^2), Burren 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	0.085	0.117	0.202	0.044	0.113	0.158
Salmon	0.011	0.005	0.016	0.013	0.069	0.082
Lamprey juvenile	-	-	0.090	-	-	0.019
Three-spined stickleback	-	-	0.085	-	-	0.013
European eel	-	-	-	-	-	0.006
Stone loach	-	-	0.005	-	-	0.006
Nine-spined stickleback	-	-	0.021	-	-	-
All Fish	-	-	0.420	-	-	0.284

Brown trout captured during the 2012 survey ranged in length from 5.4cm to 21.4cm (mean = 13.9cm) (Fig. 4.18). Three age classes (0+, 1+ and 2+) were present, accounting for 32%, 55% and 13% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 6.1cm to 29.4cm (mean = 15.3cm). Four age classes were present (0+, 1+, 2+ and 3+), accounting for approximately 32%, 30%, 30% and 8% of the brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 6.0cm to 15.1cm (mean = 12.4cm) (Fig. 4.19). Two age classes (0+ and 1+) were present, accounting for approximately 14% and 86% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 6.6cm to 13.7cm (mean = 11.1cm). Two age classes (0+ and 1+) were also present, accounting for approximately 22% and 78% of the salmon catch respectively.

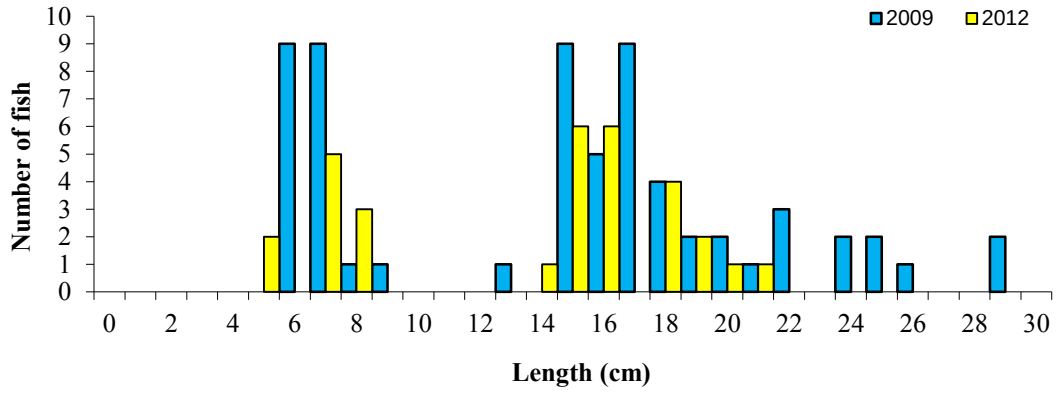

Fig. 4.18. Length frequency distribution of brown trout in the Burren River site, August 2009 (n = 63) and July 2012 (n = 31)

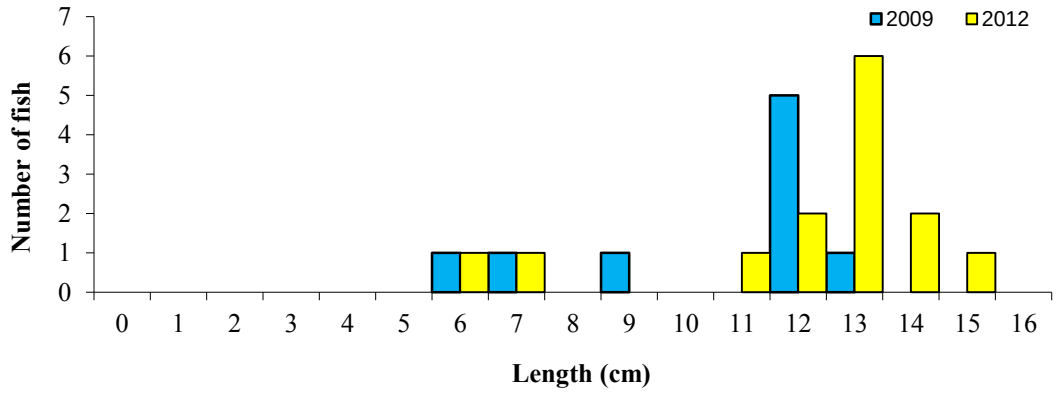

Fig. 4.19. Length frequency distribution of salmon in the Burren River site, August 2009 (n = 9) and July 2012 (n = 14)

Burren River (Site B)

A total of five fish species were recorded in the Burren River site (Table 4.9). Brown trout was the most abundant species, followed by three-spined stickleback, salmon, stone loach and lamprey.

Table 4.9. Density of fish (no./m^2), Burren 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	0.005	0.079	0.083
Three-spined stickleback	-	-	0.023
Salmon	0.009	0.009	0.019
Stone loach	-	-	0.009
Lamprey juvenile	-	-	0.005
All Fish	-	-	0.139

Brown trout captured during the 2012 survey ranged in length from 6.8cm to 25.4cm (mean = 17.1cm) (Fig. 4.20). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 7%, 61%, 25% and 7% of the total brown trout catch respectively.

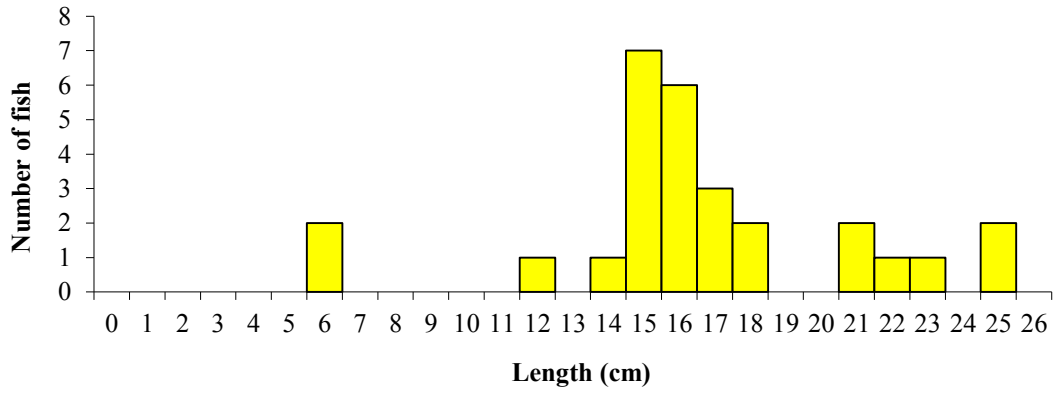

Fig. 4.20. Length frequency distribution of brown trout in the Burren River site, July 2012 (n = 28)

4.1.3 The Dinin River

One site was electric fished on the Dinin River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located downstream of Dinin Bridge, approximately 7.5km northwest of Kilkenny City, Co. Kilkenny (Fig. 4.21; Plate 4.9). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 17th of September 2012, along a 43m length of channel. Glide dominated the habitat, while the substrate consisted mostly of cobble. Vegetation was sparse at this site consisting mainly of filamentous green algae and a small number of mosses and liverworts.

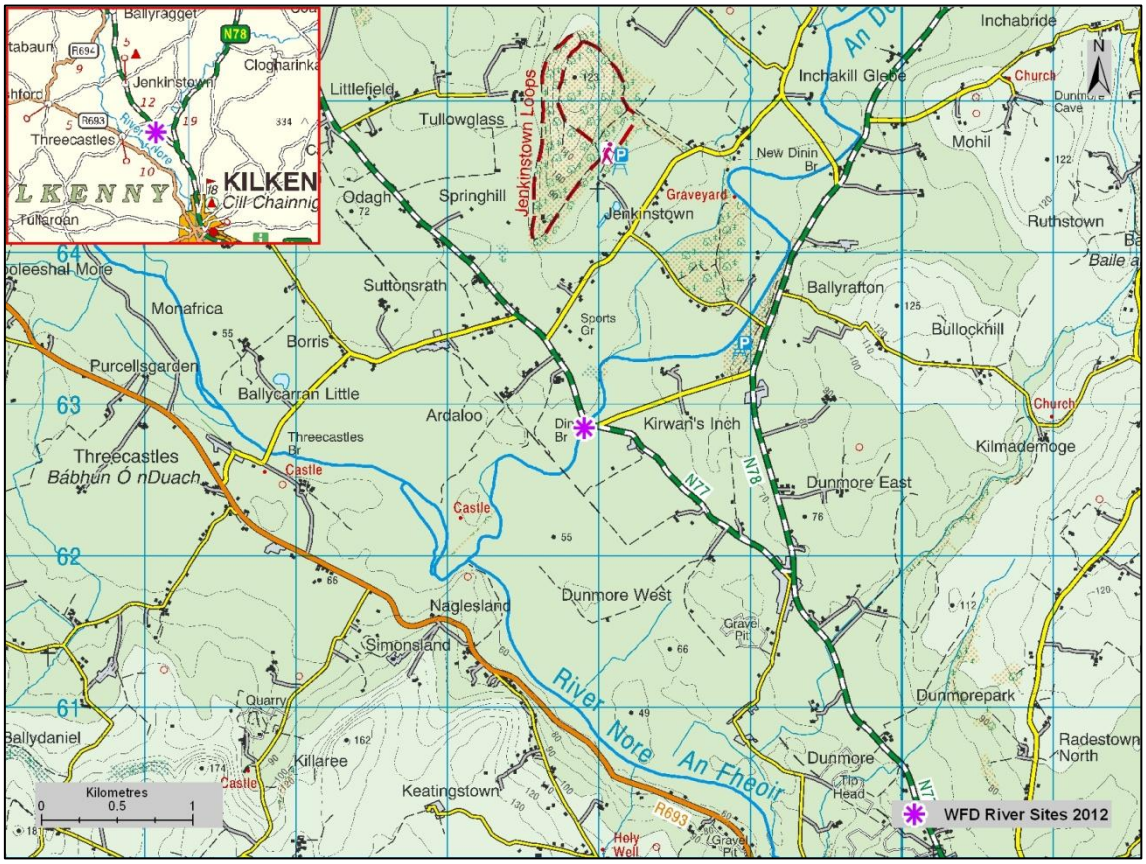

Fig. 4.21. Location of the Dinin River surveillance monitoring site

Plate 4.9. The Dinin River at Dinin Bridge, Co. Kilkenny

A total of five fish species were recorded in the Dinin River site (Table 4.10). Salmon was the most abundant species, followed by brown trout, minnow, stone loach and European eels.

Table 4.10. Density of fish (no./m^2), Dinin River (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Salmon	0.202	0.037	0.240
Brown trout	0.015	0.031	0.046
Minnow	-	-	0.042
Stone loach	-	-	0.003
European eel	-	-	0.001
All Fish	-	-	0.333

Brown trout captured during the 2012 survey ranged in length from 7.3cm to 30.0cm (mean = 16.9cm) (Fig. 4.22). Six age classes (0+, 1+, 2+, 3+, 4+ and 5+) were present, accounting for 34%, 28%, 16%, 8%, 12% and 2% of the total brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 5.3cm to 17.1cm (mean = 8.0cm) (Fig. 4.23). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 82%, 16% and 2% of the total salmon catch respectively.

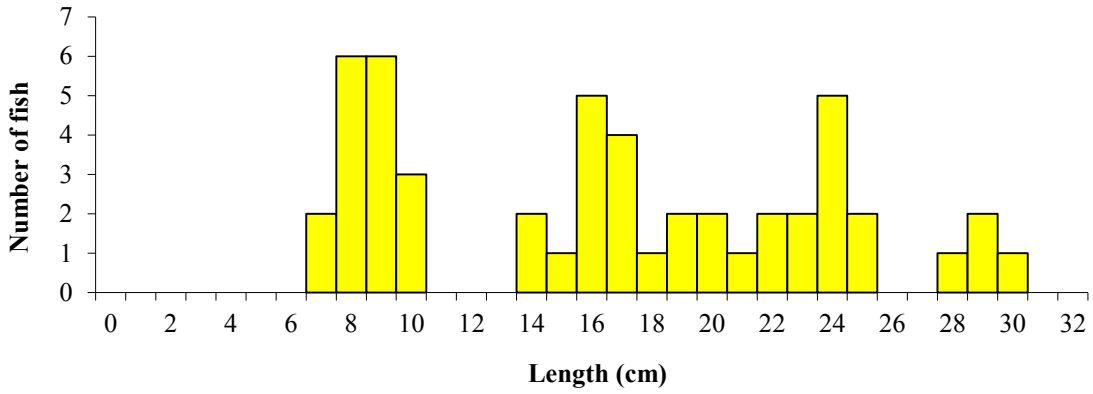

Fig. 4.22. Length frequency distribution of brown trout in the Dinin River site, July 2009 (n = 39) and September 2012 (n = 50)

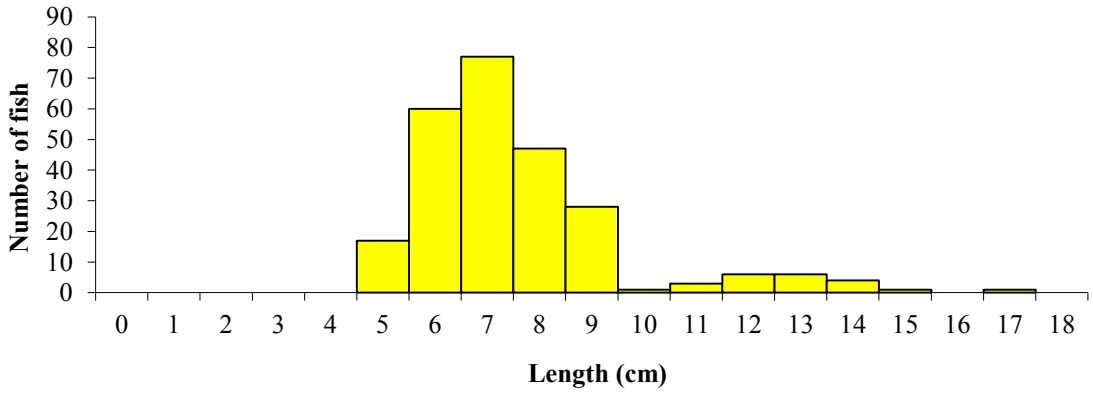

Fig. 4.23. Length frequency distribution of salmon in the Dinin River site, July 2009 (n = 116) and September 2012 (n = 251)

4.1.4 The River Greese

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

The Belan House 'A' survey site was located just upstream of Belan Bridge, approximately 10km southeast of Athy, Co. Kildare (Fig. 4.24; Plate 4.10). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 23rd of August 2012, along a 40m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. Vegetation at this site consisted mainly of filamentous green algae and a number of emergent bank-side and riparian species.

The Belan House 'B' survey site was located just upstream and adjacent to the 'A' site. Three electric-fishing passes were conducted using three bank-based electric fishing units on the 23rd of August 2012, along a 35m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. Vegetation at this site consisted mainly of filamentous green algae and a number of emergent bank-side and riparian species.

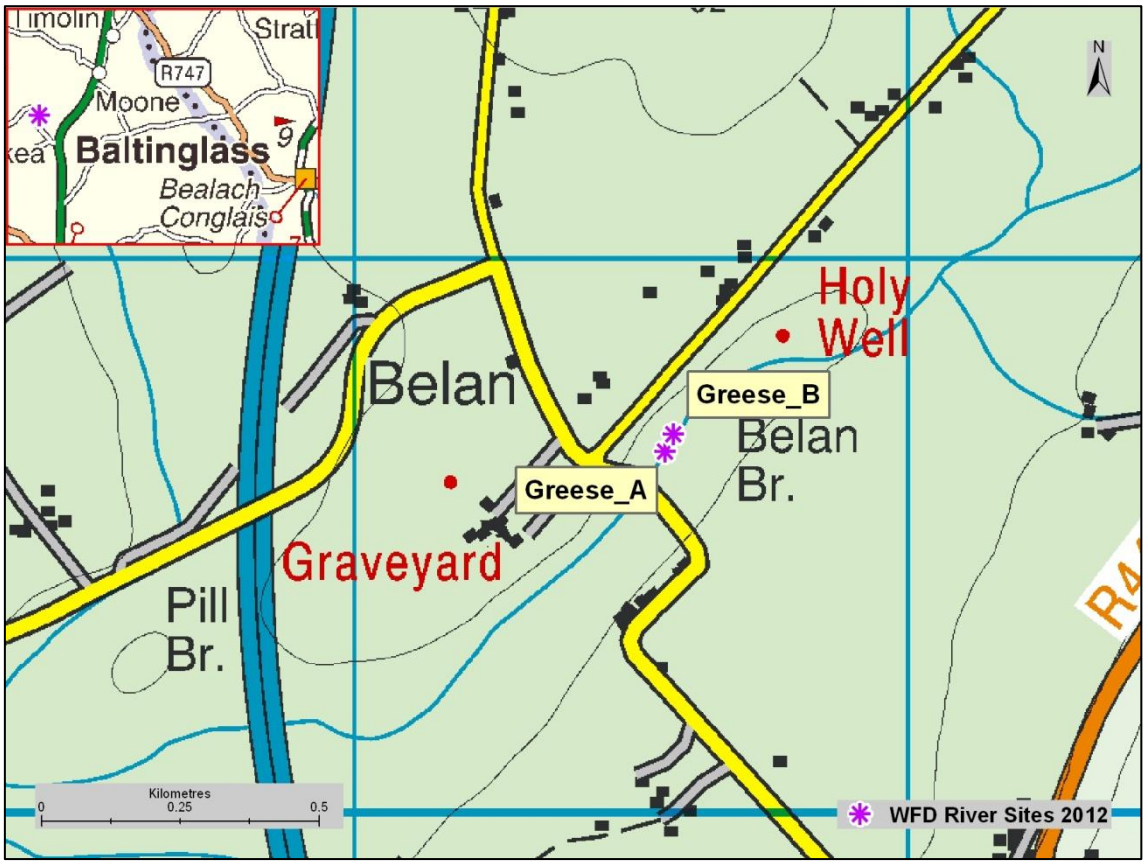

Fig. 4.24. Location of the River Greese surveillance monitoring sites

Plate 4.10. The River Greese at Belan House, Co. Kildare

River Greese (Site A)

A total of eight fish species were recorded in the River Greese, Site A (Table 4.11). Three-spined stickleback was the most abundant species, followed by brown trout, salmon, minnow, lamprey, dace, European eels and stone loach.

Table 4.11. Density of fish (no./m^2), Greese 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
Three-spined stickleback	-	-	0.006	-	-	0.130
Brown trout	0.061	0.052	0.113	0.039	0.052	0.091
Salmon	0.144	0.037	0.181	0.078	0.007	0.085
Minnow	-	-	-	-	-	0.033
Lamprey juvenile	-	-	0.003	-	-	0.013
Dace	-	-	-	-	-	0.003
European eel	-	-	0.006	-	-	0.003
Stone loach	-	-	0.015	-	-	0.003
All Fish	-	-	0.325	-	-	0.362

Brown trout captured during the 2012 survey ranged in length from 7.0cm to 25.4cm (mean = 14.7cm) (Fig. 4.25). Three age classes (0+, 1+ and 2+) were present, accounting for 41%, 31% and 28% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 5.3cm to 27.4cm (mean = 13.2cm). Three age classes were also present (0+, 1+ and 2+), accounting for approximately 54%, 27% and 19% of the brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 5.6cm to 13.4cm (mean = 7.9cm) (Fig. 4.26). Two age classes (0+ and 1+) were present, accounting for approximately 93% and 7% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 5.3cm to 14.9cm (mean = 8.1cm). Two age classes (0+ and 1+) were present, accounting for approximately 80% and 20% of the salmon catch respectively.

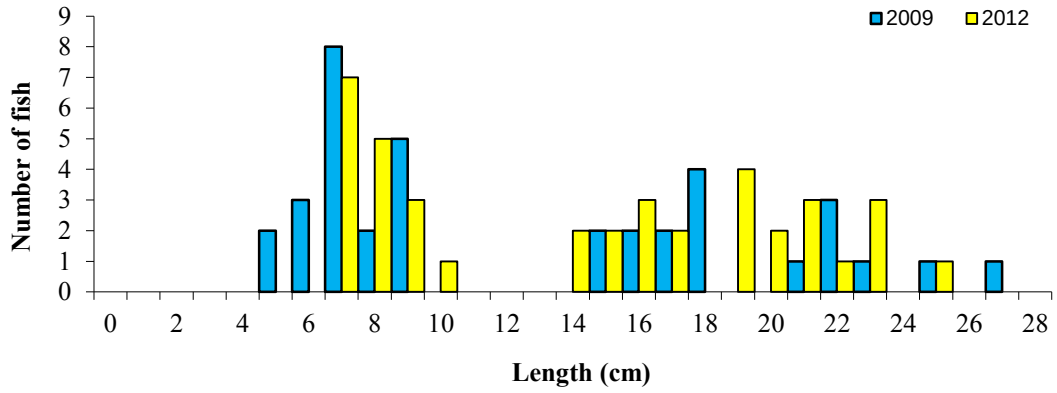

Fig. 4.25. Length frequency distribution of brown trout in the River Greese site, August 2009 (n = 37) and August 2012 (n = 39)

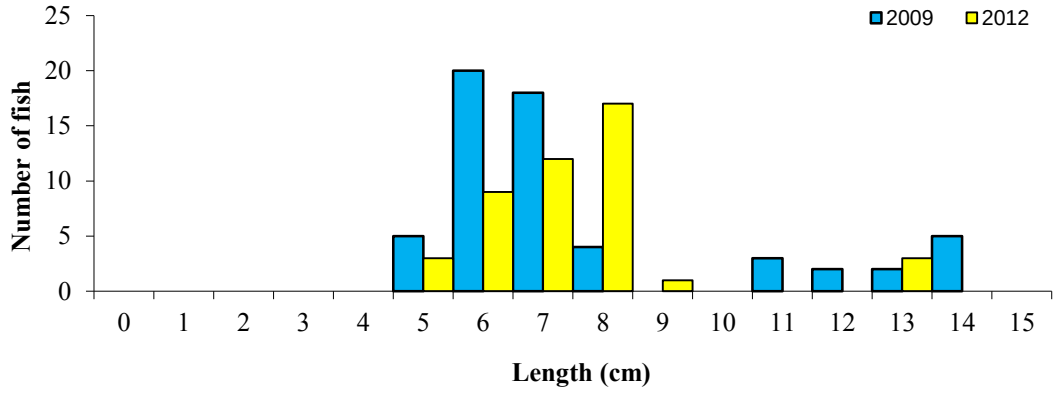

Fig. 4.26. Length frequency distribution of salmon in the River Greese site, August 2009 (n = 59) and August 2012 (n = 45)

River Greese (Site B)

A total of eight fish species were recorded in the River Greese, Site B (Table 4.12). Brown trout was the most abundant species, followed by three-spined stickleback, salmon, minnow, dace, European eels, lamprey and stoneloach.

Table 4.12. Density of fish (no./m^2), Greese 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	0.047	0.116	0.163
Three-spined stickleback	-	-	0.066
Salmon	0.043	0.012	0.043
Minnow	-	-	0.016
Dace	-	-	0.004
European eel	-	-	0.004
Lamprey juvenile	-	-	0.004
Stone loach	-	-	0.004
All Fish	-	-	0.303

Brown trout captured during the 2012 survey ranged in length from 7.5cm to 24.8cm (mean = 15.4cm) (Fig. 4.27). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 29%, 36%, 27% and 8% of the total brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 5.5cm to 15.2cm (mean = 8.0cm) (Fig. 4.28). Two age classes (0+ and 1+) were present, accounting for approximately 88% and 12% of the total salmon catch respectively.

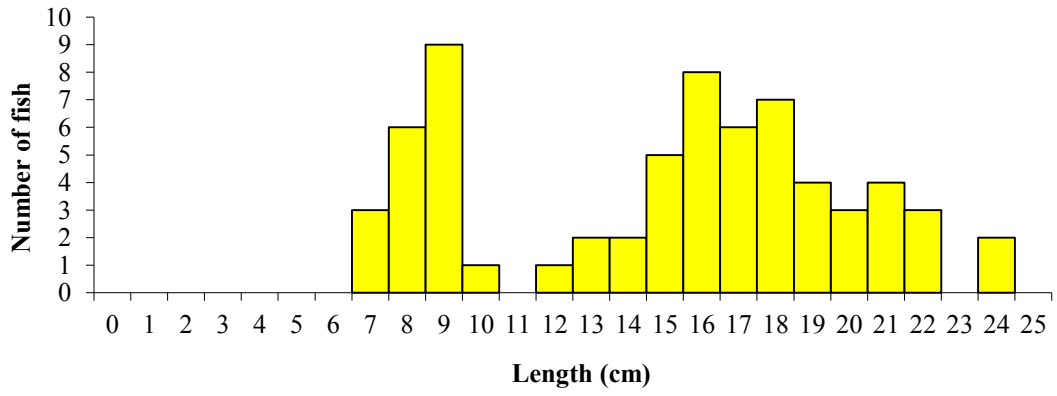

Fig. 4.27. Length frequency distribution of brown trout in the River Greese site, August 2012 (n = 66)

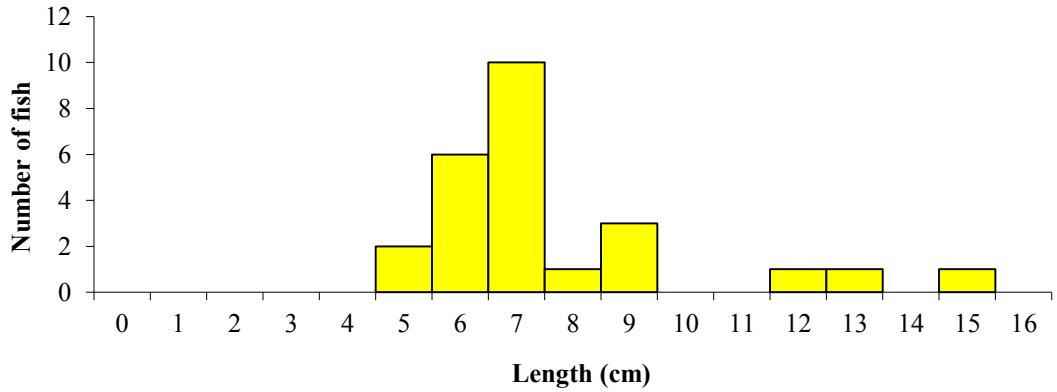

Fig. 4.28. Length frequency distribution of salmon in the River Greese site, August 2012 (n = 25)

4.1.5 The Lerr River

One site was electric fished on the Lerr River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located downstream of Prumplestown Bridge, approximately 3km southwest of Castledermot, Co. Kildare (Fig. 4.29; Plate 4.11). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 24th of August 2012, along a 38m length of channel. Riffle dominated the habitat, while the substrate consisted mostly of gravel. The vegetation at this site consisted of a small number of mosses and liverworts as well as clumps of *Ranunculus* sp.

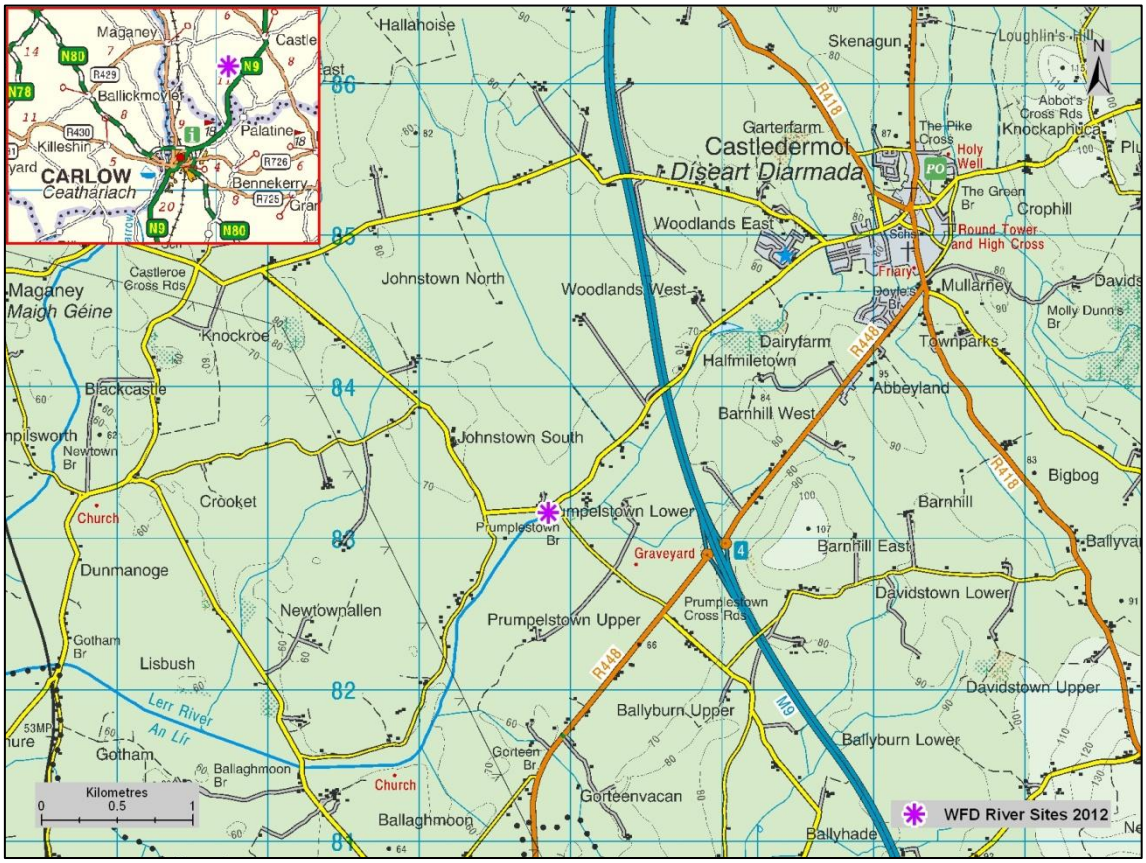

Fig. 4.29. Location of the Lerr River surveillance monitoring site

Plate 4.11. The Lerr River, at Prumplestown Bridge, Co. Kildare

A total of four fish species were recorded in the Lerr River site (Table 4.13). Brown trout was the most abundant species, followed by salmon, dace and three-spined stickleback.

Table 4.13. Density of fish (no./m^2), Lerr River (fish density has been calculated as minimum estimates based on one fishing)

Common name	2012		
	0+	1+ & older	Total minimum density
Brown trout	0.027	0.151	0.177
Salmon	0.142	0.013	0.155
Dace	-	-	0.093
Three-spined stickleback	-	-	0.004
All Fish	-	-	0.430

Brown trout captured during the 2012 survey ranged in length from 4.7cm to 26.4cm (mean = 15.2cm) (Fig. 4.30). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 22%, 44%, 28% and 6% of the total brown trout catch respectively.

Dace captured during the 2012 survey ranged in length from 9.9cm to 14.7cm (mean = 11.4cm) (Fig. 4.31). Two age classes (0+ and 1+) were present, accounting for approximately 90% and 10% of the total dace catch respectively.

Salmon captured during the 2012 survey ranged in length from 5.0cm to 14.3cm (mean = 7.1cm) (Fig. 4.32). Two age classes (0+ and 1+) were present, accounting for approximately 94% and 6% of the total salmon catch respectively.

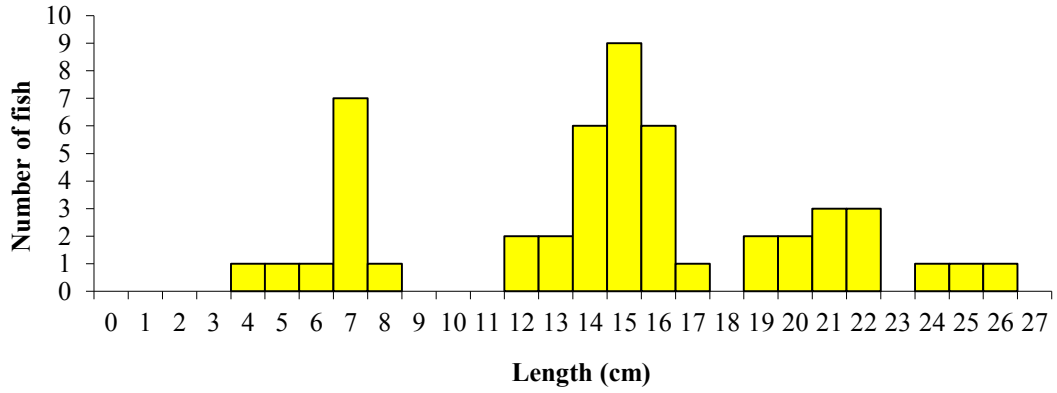

Fig. 4.30. Length frequency distribution of brown trout in the Lerr River site, August 2012 (n = 50)

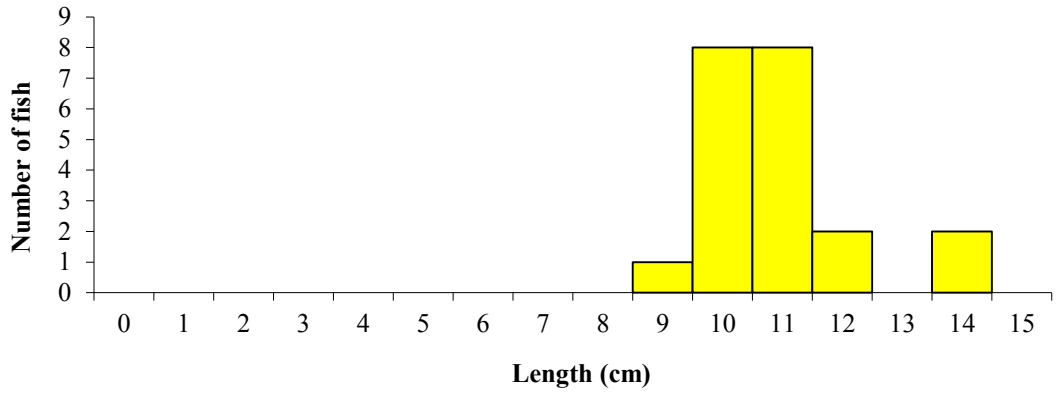

Fig. 4.31. Length frequency distribution of dace in the Lerr River site, August 2012 (n = 21)

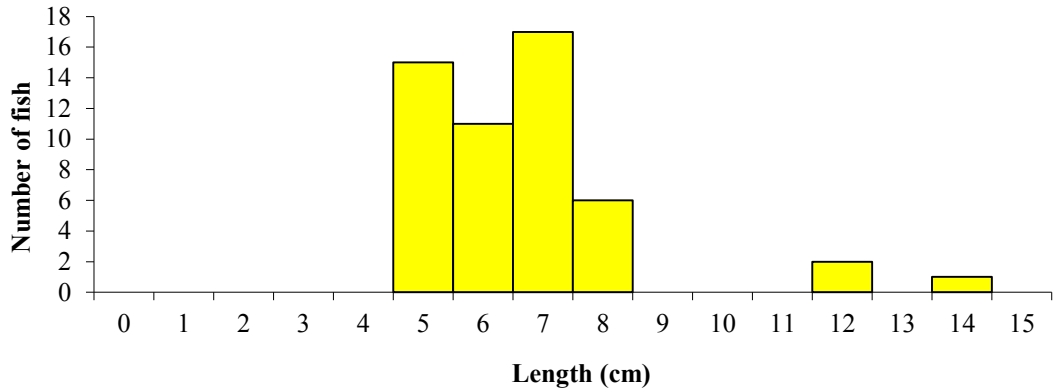

Fig. 4.32. Length frequency distribution of salmon in the Lerr River site, August 2012 (n = 52)

4.1.6 The Tully Stream

Two sites were electric fished on the Tully Stream as part of the WFD surveillance monitoring programme in rivers 2012; the Tully Stream, Soomeragh Br. 'A' and Tully Stream, Soomeragh Br. "B".

The Tully 'A' survey site was located just downstream of Soomeragh Bridge, approximately 1km northeast of Nurney, Co. Kildare (Fig. 4.33; Plate 4.12). Three electric-fishing passes were conducted using one bank-based electric fishing unit on the 24th of July 2012, along a 69m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. Vegetation along this stretch was scarce due to high levels of shading.

The Tully 'B' survey site was located just downstream of and adjacent to the 'A' site (4.33; Plate 4.12). Three electric-fishing passes were conducted using one bank-based electric fishing unit on the 24th of July 2012, along a 69m length of channel. Glide dominated the habitat, while the substrate consisted mostly of gravel. Vegetation at this site mainly consisted of tall emergent bank-side and riparian species.

Fig. 4.33. Location of the Tully Stream surveillance monitoring sites

Plate 4.12. The Tully Stream at Soomeragh Bridge, Co. Kildare

Tully Stream (Site A)

Only one fish species (brown trout) was recorded during the survey on the Tully Stream, Site A (Table 4.14).

Table 4.14. Density of fish (no./m^2), Tully Stream 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	0.000	0.068	0.068	0.000	0.043	0.043
Three-spined stickleback	-	-	0.018	-	-	-
Dace	-	-	0.006	-	-	-
All Fish	-	-	0.092	-	-	0.043

Brown trout captured during the 2012 survey ranged in length from 16.3cm to 27.3cm (mean = 21.0cm) (Fig. 4.34). Two age classes (2+ and 3+) were present, accounting for 60% and 40% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 19.1cm to 38.7cm (mean = 25.7cm). Three age classes were present (1+, 2+ and 3+), accounting for approximately 13%, 53% and 33% of the brown trout catch respectively.

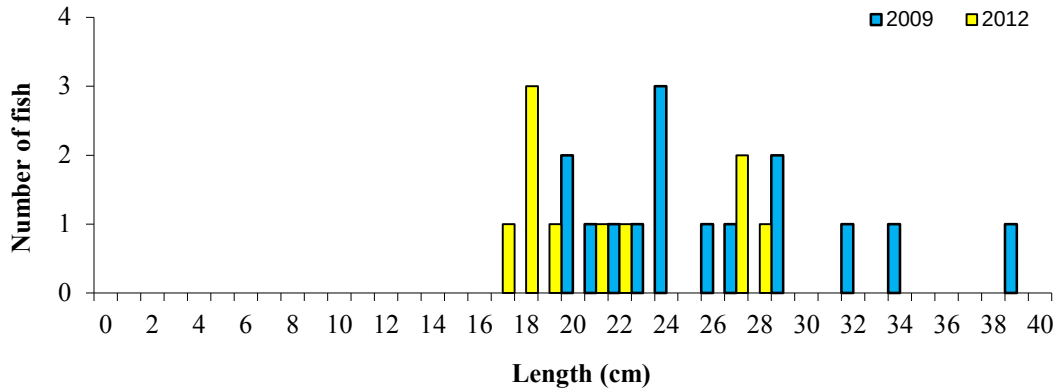

Fig. 4.34. Length frequency distribution of brown trout in the Tully Stream site, August 2009 (n = 15) and July 2012 (n = 10)

Tully Stream (Site B)

A total of three species were found in the Tully Stream site (Table 4.15). Brown trout was the most abundant species followed by three-spined stickleback and European eels.

Table 4.15. Density of fish (no./m^2), Tully Stream Site B (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	0.000	0.032	0.032	0.000	0.108	0.108
Three-spined stickleback	-	-	0.119	-	-	0.020
European eel	-	-	-	-	-	0.010
Nine-spined stickleback	-	-	0.008	-	-	-
All Fish	-	-	0.159	-	-	0.138

Brown trout captured during the 2012 survey ranged in length from 17.8cm to 32.2cm (mean = 23.9cm) (Fig. 4.35). Three age classes (2+, 3+ and 4+) were present, accounting for 21%, 64% and 14% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 24.7cm to 38.0cm (mean = 28.2cm). Two age classes were present (2+ and 3+), accounting for approximately 80% and 20% of the brown trout catch respectively.

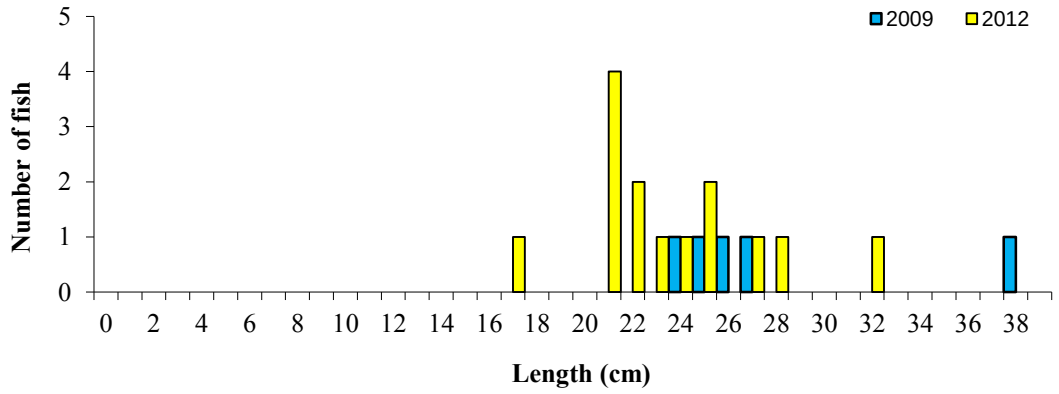

Fig. 4.35. Length frequency distribution of brown trout in the Tully Stream site, August 2009 (n = 5) and July 2012 (n = 14)

4.2 Community structure

4.2 Species distribution

A total of 13 fish species and one type of hybrid were recorded within the 15 SERBD sites surveyed during 2012 (Fig.4.36). Brown trout was the most common fish recorded, occurring in all of the sites surveyed, followed by salmon, European eels, three-spined stickleback, dace, minnow, stone loach, roach, lamprey, perch, pike, gudgeon, and roach x bream hybrids. Bream were only present at one site.

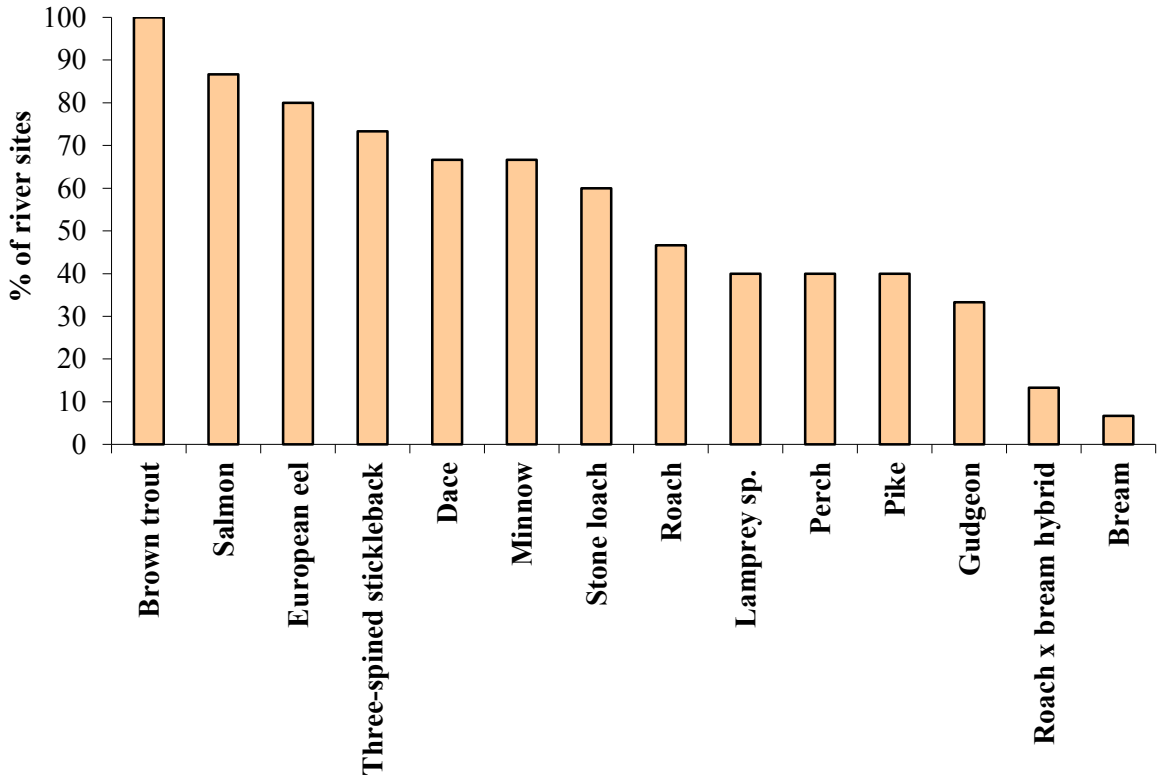

Fig. 4.36. Percentage of sites where each fish species was recorded in the SERBD for WFD SM monitoring 2012

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 SERBD during 2012.

The mean back-calculated length-at-age data for brown trout in the SERBD are shown in Figure 4.37 and Appendix 1. Brown trout were recorded at all 15 sites, with each containing brown trout aged 1+ or older. Ages ranged from 0+ to 5+, and fish aged 2+ comprised the most abundant age class within the region. The largest brown trout recorded in the SERBD in 2012 was caught in the River Barrow at Bagenalstown, which measured 40.6cm in length, weighed 802g and was aged 3+. The brown trout at each river site were assigned growth categories described by Kennedy and Fitzmaurice (1971), who examined the relationship between alkalinity and growth of brown trout in Irish streams and rivers. Using this method, the growth rate can only be reliably estimated from fish at sites where individual fish are 2+ or older, and where sufficient numbers are caught. Growth was considered slow at the River Barrow (Leighlinbridge and Pass Br. sites), Burren (Site B), Dinin, Greese (Site B) and Tully River (Site A and Site B) and fast at the Greese River (Site A) (Appendix 1).

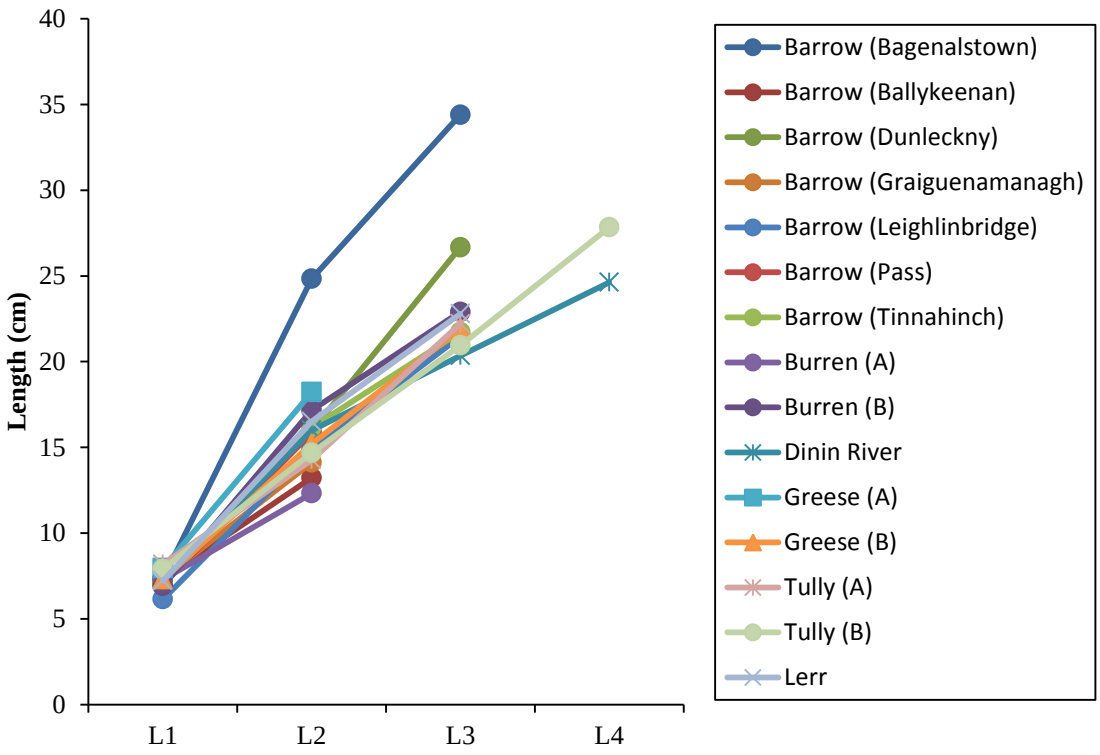

Fig. 4.37. Back calculated lengths for brown trout in each river, WFD surveillance monitoring 2012

Salmon were recorded at 13 sites but only a few sites contained multiple age classes, making growth rates impractical to determine. Length at age data for salmon is shown in Appendix 2.

Growth rates based on back-calculated length-at-age data were also analysed for roach pike and dace. Roach were recorded at seven sites, all of which were surveyed on the River Barrow (Fig. 4.38 and Appendix 4). The largest roach was caught on the River Barrow (Dunleckny site), which measured 26.9cm, weighed 429g and was aged 7+. Pike (Fig. 4.39 and Appendix 3) were recorded at six sites, all of which were captured on the River Barrow. The largest pike recorded was caught in the River Barrow (Upper Tinnahinch), measured 70cm, weighed 2.6kg and was aged 4+. Dace were recorded in 10 sites, including all of the River Barrow sites surveyed (Fig. 4.40 and Appendix 5). The largest dace was recorded in the River Barrow (Upper Tinnahinch), which measured 25cm, weighed 198g and was aged 6+. Appendices are also shown for bream (Appendix 6) and roach x bream hybrids (Appendix 7), although these were recorded in very low numbers.

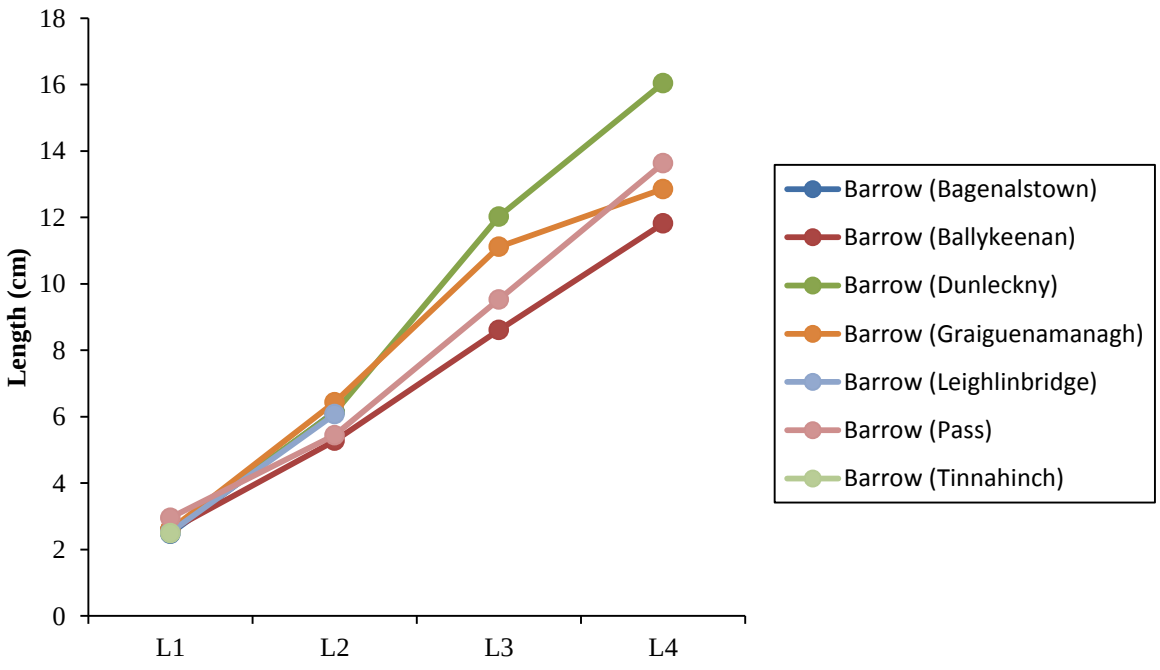

Fig. 4.38. Back calculated lengths for roach in each river, WFD surveillance monitoring 2012

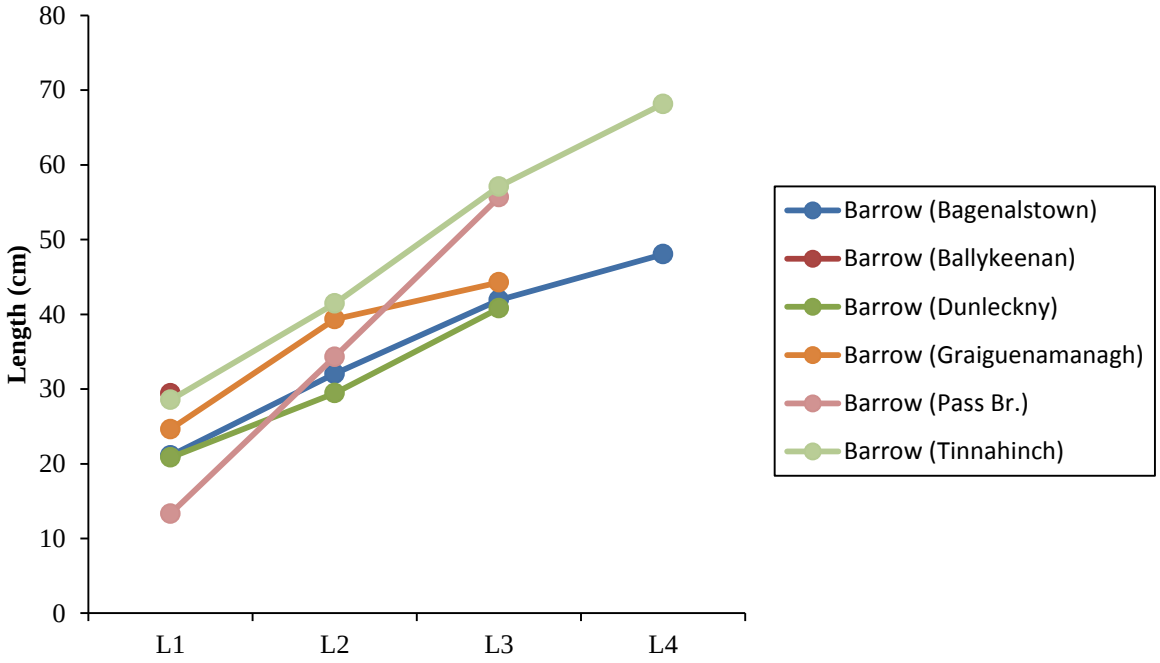

Fig. 4.39. Back calculated lengths for pike in each river, WFD surveillance monitoring 2012

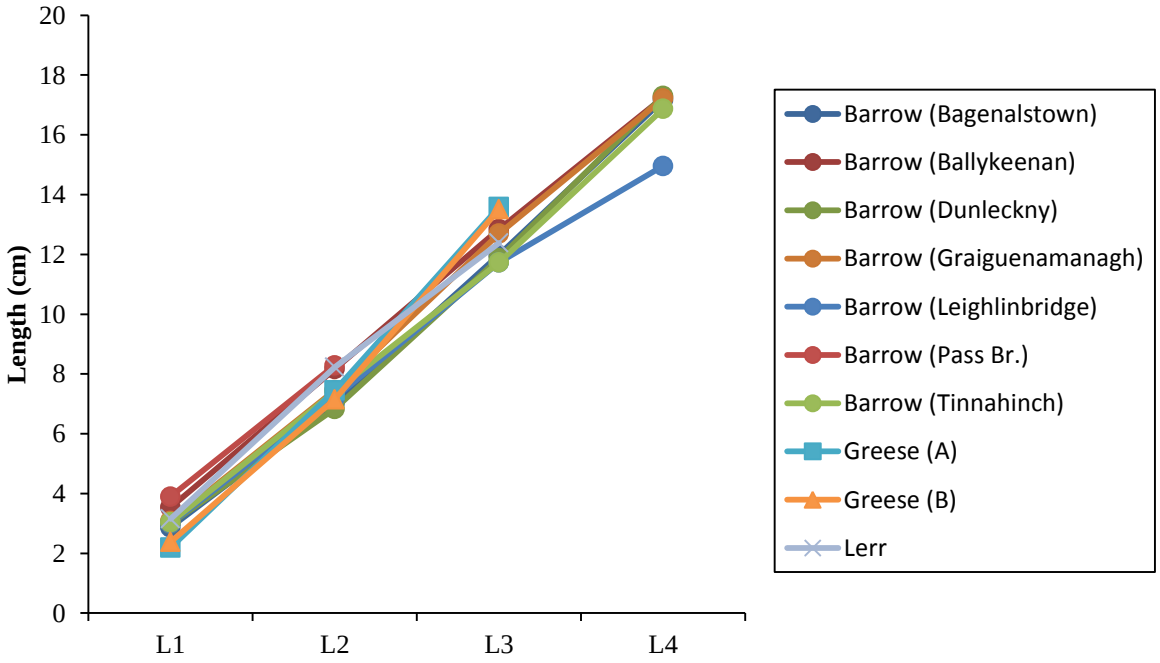

Fig. 4.40. Back calculated lengths for dace in each river, WFD surveillance monitoring 2012

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 4.11). Of the 15 sites surveyed in 2012, eight achieved Good status, five Moderate status and one Poor status. When comparing the status this year with that from previous years (five sites from 2009), three sites showed no change in status. One site, the Greese River Site A, improved in status from Moderate to Good, while another site, the Tully River, Site A deteriorated from Moderate to Poor.

Table 4.11. Ecological status of sites surveyed in the SERBD for surveillance monitoring 2012 (figures in brackets indicate confidence in class)

River	Site Code	Site name	Previous ecological status	Ecological status 2012
SERBD Wadeable sites				
Burren	14B050100A	Ullard Br._A	Moderate (2009)	Moderate
Burren	14B050100B	Ullard Br._B	N/A	Moderate (82%)
Dinin	15D020800A	Dinin Br._A	Good (2009) (57%)	Good
Greese	14G040350A	Br. NE of Belan House_A	Moderate (2009)	Good
Greese	14G040350B	Br. NE of Belan House_B	N/A	Good
Lerr	14L010200A	Prumplestown Br._A	N/A	Moderate (61%)
Tully Stream	14T020390A	Soomeragh Br._A	Moderate (2009) (98%)	Poor (98%)
Tully Stream	14T020390B	Soomeragh Br._B	Moderate (2009) (83%)	Moderate (99%)
SERBD Non-Wadeable sites				
Barrow	14B011000B	Pass Br._B	N/A	Good
Barrow	14B012690A	Leighlinbridge Lord Bagenal Hotel_A	N/A	Moderate (87%)
Barrow	14B012820A	Dunleckny (Swimming pool)_A	N/A	Good (63%)
Barrow	14B012870A	Bagenalstown (Slipway to lock)_A	N/A	N/A
Barrow	14B013440A	Ballykeenan Lock_A	N/A	Good (54%)
Barrow	14B013500A	Graiguenamanagh Br._A	N/A	Good (54%)
Barrow	14B013510A	Upper Tinnahinch Lock_A	N/A	Good (62%)

5. DISCUSSION

A total of 13 fish species and one hybrid were recorded during the 2012 WFD rivers surveillance monitoring programme for fish in rivers within the SERBD. Brown trout was the most common fish species encountered in the SERBD, recorded in all 15 sites, followed by European eels and salmon. The River Barrow (Pass Br.) site was the most diverse site surveyed within the SERBD for the Water Framework Directive in 2012 with a total of 12 species and one type of hybrid present. The site that recorded the lowest diversity in this region was the Tully Stream (Barrow catchment), with three species present, brown trout, European eels and three-spined stickleback. The greatest abundances of brown trout and salmon were recorded in the Lerr River and Dinin River respectively.

Following the methods of Kennedy and Fitzmaurice (1971), growth could be estimated at some sites. Growth was considered slow at the River Barrow (Leighlinbridge and Pass Br. sites), Burren River (Site B), Dinin River, Greese River (Site B) and Tully River (Site A and Site B). Fast growth was determined for the Greese River (Site A) (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. Eight sites were classed as Good, five as Moderate and one as Poor. The status of most repeat sites remained the same, while there was an improvement in the Greese River and a deterioration in the Tully stream.

6. REFERENCES

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

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
Barrow, River (Bagenalstown)	Mean	7.34	24.84	34.39		n/a
	S.D.	0.81	n/a	n/a		
	S.E.	0.40	n/a	n/a		
	n	4	1	1		
	Min	6.30	24.84	34.39		
	Max	8.12	24.84	34.39		
Barrow, River (Ballykeenan)	Mean	7.35	13.23			n/a
	S.D.	3.28	3.14			
	S.E.	1.64	1.81			
	n	4	3			
	Min	3.79	11.37			
	Max	10.28	16.86			
Barrow, River (Dunleckny)	Mean	7.09	15.98	26.66		n/a
	S.D.	0.19	2.94	4.29		
	S.E.	0.14	2.08	3.03		
	n	2	2	2		
	Min	6.95	13.90	23.63		
	Max	7.22	18.06	29.70		
Barrow, River (Graiguenamanagh)	Mean	7.35	14.12			n/a
	S.D.	1.83	3.02			
	S.E.	0.82	1.74			
	n	5	3			
	Min	5.34	10.71			
	Max	8.84	16.46			
Barrow, River (Leighlinbridge)	Mean	6.15	14.92	21.47		Slow
	S.D.	1.99	4.88	3.68		
	S.E.	0.63	1.54	1.39		
	n	10	10	7		
	Min	4.19	8.03	16.92		
	Max	10.40	21.62	27.60		
Barrow, River (Upper Tinnahinch)	Mean	7.06	16.17	21.72		n/a
	S.D.	2.13	3.87	n/a		
	S.E.	0.80	1.93	n/a		
	n	7	4	1		
	Min	4.71	11.19	21.72		
	Max	10.48	19.87	21.72		

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
Barrow, River (Pass Br.)	Mean	7.01	15.87			Slow
	S.D.	1.26	2.40			
	S.E.	0.32	0.85			
	n	16	8			
	Min	4.80	12.95			
	Max	9.51	20.13			
Burren River (Site A)	Mean	7.30	12.33			n/a
	S.D.	1.15	0.52			
	S.E.	0.27	0.26			
	n	18	4			
	Min	6.28	11.82			
	Max	9.95	12.87			
Burren River (Site B)	Mean	6.93	17.17	22.90		Slow
	S.D.	1.48	2.07	0.88		
	S.E.	0.43	0.78	0.62		
	n	12	7	2		
	Min	4.03	13.82	22.28		
	Max	8.97	19.24	23.52		
Dinin River	Mean	7.21	16.00	20.35	24.62	Slow
	S.D.	1.59	2.85	2.27	2.02	
	S.E.	0.29	0.69	0.72	0.76	
	n	31	17	10	7	
	Min	3.42	10.42	15.95	21.79	
	Max	10.39	20.54	22.73	27.13	
Greese, River (Site A)	Mean	7.96	18.22			Fast
	S.D.	1.52	1.76			
	S.E.	0.35	0.62			
	n	19	8			
	Min	5.34	15.68			
	Max	10.68	20.08			
Greese, River (Site B)	Mean	7.31	15.21	21.92		Slow
	S.D.	1.94	2.87	1.91		
	S.E.	0.38	0.83	1.10		
	n	26	12	3		
	Min	4.19	9.75	19.73		
	Max	10.91	19.29	23.21		

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
Tully Stream (Site A)	Mean	8.19	14.28	22.21		Slow
	S.D.	1.89	2.92	4.92		
	S.E.	0.63	0.97	2.84		
	n	9	9	3		
	Min	5.98	10.27	16.56		
	Max	11.32	17.74	25.53		
Tully Stream (Site B)	Mean	7.67	15.06	20.47	27.83	Slow
	S.D.	1.65	3.69	3.68	1.51	
	S.E.	0.52	1.17	1.30	1.06	
	n	10	10	8	2	
	Min	4.66	9.51	14.45	26.77	
	Max	9.91	20.35	25.83	28.90	
Lerr River	Mean	7.24	16.52	22.80		n/a
	S.D.	1.48	3.09	n/a		
	S.E.	0.36	1.38	n/a		
	n	17	5	1		
	Min	4.72	13.07	22.80		
	Max	9.87	19.74	22.80		

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
Barrow, River (Bagenalstown)	Mean	8.73	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	8.73	
	Max	8.73	
Barrow, River (Ballykeenan)	Mean	5.58	
	S.D.	1.20	
	S.E.	0.85	
	n	2	
	Min	4.73	
	Max	6.43	
Barrow, River (Graiguenamanagh)	Mean	5.81	
	S.D.	1.33	
	S.E.	0.67	
	n	4	
	Min	4.95	
	Max	7.79	
Barrow, River (Leighlinbridge)	Mean	6.31	
	S.D.	0.89	
	S.E.	0.52	
	n	3	
	Min	5.36	
	Max	7.14	
Barrow, River (Pass Br.)	Mean	5.59	
	S.D.	0.96	
	S.E.	0.28	
	n	12	
	Min	4.23	
	Max	7.32	
Barrow, River (Tinnahinch)	Mean	5.12	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	5.12	
	Max	5.12	

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
Burren River (Site A)	Mean	4.68	
	S.D.	0.78	
	S.E.	0.24	
	n	11	
	Min	3.26	
	Max	5.83	
Burren River (Site B)	Mean	6.65	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	6.65	
	Max	6.65	
Dinin River	Mean	5.42	10.89
	S.D.	1.01	1.17
	S.E.	0.21	0.52
	n	23	5
	Min	4.04	9.31
	Max	7.56	12.35
Greese, River (Site A)	Mean	5.35	
	S.D.	0.89	
	S.E.	0.52	
	n	3	
	Min	4.37	
	Max	6.12	
Greese, River (Site B)	Mean	6.26	
	S.D.	0.74	
	S.E.	0.43	
	n	3	
	Min	5.57	
	Max	7.04	
Lerr River	Mean	5.58	
	S.D.	1.63	
	S.E.	0.94	
	n	3	
	Min	4.51	
	Max	7.46	

APPENDIX 3

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

River		L1	L2	L3	L4
Barrow, River (Bagenalstown)	Mean	21.11	32.04	41.92	48.04
	S.D.	5.41	5.51	4.91	7.73
	S.E.	1.80	1.95	1.86	4.46
	n	9	8	7	3
	Min	12.94	21.57	35.43	42.18
	Max	27.19	38.13	48.73	56.80
Barrow, River (Ballykeenan)	Mean	29.43			
	S.D.	n/a			
	S.E.	n/a			
	n	1			
	Min	29.43			
	Max	29.43			
Barrow, River (Dunleckny)	Mean	20.85	29.45	40.80	
	S.D.	3.94	4.05	n/a	
	S.E.	1.49	2.34	n/a	
	n	7	3	1	
	Min	14.88	25.50	40.80	
	Max	26.40	33.60	40.80	
Barrow, River (Graiguenamanagh)	Mean	24.63	39.35	44.27	
	S.D.	3.02	n/a	n/a	
	S.E.	1.23	n/a	n/a	
	n	6	1	1	
	Min	20.37	39.35	44.27	
	Max	27.94	39.35	44.27	
Barrow, River (Pass Br.)	Mean	13.33	34.33	55.67	
	S.D.	0.37	9.72	n/a	
	S.E.	0.26	6.88	n/a	
	n	2	2	1	
	Min	13.07	27.45	55.67	
	Max	13.59	41.20	55.67	
Barrow, River (Tinnahinch)	Mean	28.55	41.45	57.11	68.16
	S.D.	n/a	n/a	n/a	n/a
	S.E.	n/a	n/a	n/a	n/a
	n	1	1	1	1
	Min	28.55	41.45	57.11	68.16
	Max	28.55	41.45	57.11	68.16

APPENDIX 4

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

River		L1	L2	L3	L4
Barrow, River (Bagenalstown)	Mean	2.48	6.15		
	S.D.	0.61	0.93		
	S.E.	0.16	0.42		
	n	15	5		
	Min	1.47	4.55		
	Max	3.64	7.02		
Barrow, River (Ballykeenan)	Mean	2.59	5.28	8.61	11.82
	S.D.	0.83	0.30	n/a	n/a
	S.E.	0.48	0.21	n/a	n/a
	n	3	2	1	1
	Min	2.03	5.07	8.61	11.82
	Max	3.55	5.49	8.61	11.82
Barrow, River (Dunleckny)	Mean	2.58	6.14	12.03	16.05
	S.D.	0.52	1.09	0.86	1.20
	S.E.	0.11	0.38	0.50	0.85
	n	23	8	3	2
	Min	1.63	4.22	11.50	15.20
	Max	3.87	7.11	13.03	16.90
Barrow, River (Graiguenamanagh)	Mean	2.60	6.44	11.12	12.86
	S.D.	0.60	2.24	2.48	1.58
	S.E.	0.14	0.75	1.11	1.12
	n	19	9	5	2
	Min	1.67	3.69	8.73	11.74
	Max	3.55	11.07	15.09	13.97
Barrow, River (Leighlinbridge)	Mean	2.53	6.08		
	S.D.	0.76	0.88		
	S.E.	0.20	0.28		
	n	14	10		
	Min	1.76	4.56		
	Max	4.29	6.97		
Barrow, River (Pass Br.)	Mean	2.96	5.45	9.53	13.63
	S.D.	0.89	1.29	1.59	1.03
	S.E.	0.15	0.34	0.71	0.46
	n	35	14	5	5
	Min	1.85	3.33	7.26	12.36
	Max	5.81	7.23	11.00	14.83

APPENDIX 4 continued

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

River		L1	L2	L3	L4
Barrow, River (Tinnahinch)	Mean	2.50			
	S.D.	0.29			
	S.E.	0.15			
	n	4			
	Min	2.12			
	Max	2.74			

APPENDIX 5

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
Barrow, River (Bagenalstown)	Mean	2.87	7.02	11.98	17.17
	S.D.	0.96	1.74	2.22	1.71
	S.E.	0.18	0.34	0.57	0.49
	n	28	26	15	12
	Min	1.85	4.62	7.93	14.42
	Max	5.71	10.93	16.15	20.31
Barrow, River (Ballykeenan)	Mean	3.54	8.16	12.85	17.26
	S.D.	1.11	1.51	1.72	1.32
	S.E.	0.18	0.31	0.52	0.42
	n	36	24	11	10
	Min	2.11	5.28	10.37	13.95
	Max	6.57	11.24	15.39	18.94
Barrow, River (Dunleckny)	Mean	3.00	6.83	11.87	17.31
	S.D.	0.97	1.67	2.09	0.85
	S.E.	0.24	0.56	0.85	0.38
	n	16	9	6	5
	Min	1.85	3.71	8.58	16.69
	Max	4.55	8.74	14.15	18.73
Barrow, River (Graiguenamanagh)	Mean	3.08	7.46	12.70	17.21
	S.D.	0.94	1.75	1.96	2.08
	S.E.	0.13	0.28	0.42	0.60
	n	54	40	22	12
	Min	1.60	4.60	9.49	12.54
	Max	5.85	11.03	17.09	21.65
Barrow, River (Leighlinbridge)	Mean	3.01	7.21	11.73	14.96
	S.D.	0.82	1.75	1.18	1.46
	S.E.	0.12	0.27	0.25	0.41
	n	49	43	22	13
	Min	2.04	3.72	9.37	12.48
	Max	6.72	12.92	13.54	17.27
Barrow, River (Pass Br.)	Mean	3.90	8.29		
	S.D.	0.69	n/a		
	S.E.	0.17	n/a		
	n	17	1		
	Min	2.76	8.29		
	Max	5.66	8.29		

APPENDIX 5 continued

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
Barrow, River (Tinnahinch)	Mean	3.04	7.42	11.73	16.87
	S.D.	0.99	1.38	2.24	1.58
	S.E.	0.16	0.29	0.75	0.60
	n	38	23	9	7
	Min	1.68	5.14	9.12	14.95
	Max	4.84	10.71	14.88	20.00
Greese, River (Site A)	Mean	2.19	7.45	13.59	
	S.D.	n/a	n/a	n/a	
	S.E.	n/a	n/a	n/a	
	n	1	1	1	
	Min	2.19	7.45	13.59	
	Max	2.19	7.45	13.59	
Greese, River (Site B)	Mean	2.38	7.15	13.51	
	S.D.	n/a	n/a	n/a	
	S.E.	n/a	n/a	n/a	
	n	1	1	1	
	Min	2.38	7.15	13.51	
	Max	2.38	7.15	13.51	
Lerr River	Mean	3.16	8.23	12.39	
	S.D.	0.64	1.01	0.29	
	S.E.	0.17	0.26	0.21	
	n	15	15	2	
	Min	2.37	6.49	12.18	
	Max	4.48	9.46	12.59	

APPENDIX 6

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

River		L1	L2	L3	L4
Barrow, River (Bagenalstown)	Mean	4.61	7.97	12.58	20.55
	S.D.	n/a	n/a	n/a	n/a
	S.E.	n/a	n/a	n/a	n/a
	n	1	1	1	1
	Min	4.61	7.97	12.58	20.55
	Max	4.61	7.97	12.58	20.55

APPENDIX 7

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

River		L1	L2	L3	L4
Barrow, River (Graiguenamanagh)	Mean	2.10	6.69	9.94	14.33
	S.D.	n/a	n/a	n/a	n/a
	S.E.	n/a	n/a	n/a	n/a
	n	1	1	1	1
	Min	2.10	6.69	9.94	14.33
	Max	2.10	6.69	9.94	14.33
Barrow, River (Pass Br.)	Mean	2.05	5.25	8.76	15.73
	S.D.	0.12	0.99	1.90	3.10
	S.E.	0.07	0.57	1.10	1.79
	n	3	3	3	3
	Min	1.94	4.11	7.26	12.17
	Max	2.18	5.95	10.90	17.84

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