South Eastern River Basin District Rivers

Sampling Fish for the Water Framework Directive -



The Central and Regional Fisheries Boards

Rivers 2009

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the CEO, Mr. Brian Sheerin, Assistant CEO, Ms. Suzanne Campion and the staff of the Southern Regional Fisheries Board, as well as the CEO, Mr. Pat Doherty, Assistant CEO, Mr. William Walsh and the staff of the Eastern Regional Fisheries Board. The authors would also like to gratefully acknowledge the help and cooperation from all their colleagues in the Central Fisheries Board.

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 2009.

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1. INTRODUCTION

Fish stock surveys were undertaken in 54 river sites throughout Ireland during the summer of 2009 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). Seven of the 54 surveys were carried out at river sites in the South Eastern River Basin District between July and early September 2009 by staff from the Central Fisheries Board (CFB), Southern Regional Fisheries Board (SRFB) and Eastern Regional Fisheries Board (ERFB) (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 managers to compile and implement programmes of measures to improve degraded water bodies.

The fisheries service in Ireland is currently undergoing a major organisational transition. This follows the recent government plan for the rationalisation of state agencies outlined in the 2009 budget. The eight separate fisheries organisations, comprising the Central Fisheries Board (CFB) and seven Regional Fisheries Boards (RFBs) are set to merge into one single entity and become Inland Fisheries Ireland (IFI). As a result of these changes, the previous administrative zones, the RFBs, will be realigned along the boundaries of River Basin Districts (RBDs) and will in some cases transcend international boundaries. Previous WFD fish surveys were reported based on the seven different RFBs; however, reporting will now reflect these new administrative changes and will group water bodies according to River Basin Districts.

Up until 2010 the Southern Regional Fisheries Board (SRFB) stretched from Co. Kildare in the north, down as far as Co. Kerry in the south-west. The South Eastern River Basin District (SERBD) will cover most of this area but the River Blackwater catchment in north Co. Cork has become part of the South Western River Basin District (SWRBD). The River Slaney catchment, previously within the Eastern Regional Fisheries Board, also forms part of the SERBD.

The SERBD (Fig 2.1) is the second largest RBD in Ireland, covering a land area of approximately 13,000km². It also encompasses a further 1,000km² of marine waters off the coast of Counties Wexford and Waterford. Approximately half a million people live within the SERBD, spread between numerous different counties, including Carlow, Kildare, Kilkenny, Laois, Offaly, Wexford, Wicklow, Cork, Limerick, Tipperary and Waterford. Waterford City is the largest urban centre within the SERBD but the population is also increasing due to the expansion of northern commuter towns serving the Dublin City area. The main river systems within the SERBD include the Barrow, Nore, Suir and Slaney. Other important features include the bays of Dungarvan, Bannow and Rosslare, as

well as two coastal lagoons; Our Lady's Island and Tacumshin Lake. There are fewer lakes within this RBD than in any other throughout the country.

This report summarizes the main findings of the fish stock surveys in the seven river water bodies surveyed in the SERBD during 2009 and reports on the current status of the fish stocks in each.

2. STUDY AREA

Seven river sites were surveyed in three river catchments within the SERBD; the Barrow, Nore and Slaney catchments. Survey sites ranged in surface area from 178m² for the Tully Stream to 10,906m² for the River Barrow and were divided into two categories for reporting purposes, i.e. hand-set and boat sites. 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.

River	Site name Catchment		Site Code	Waterbody code
SERBD Hand-set s	ites			
Burren	Ullard Br.	Barrow	IE14B050100	SE_14_1781
Greese	Bridge NE of Belan House	Barrow	IE14G040350	SE_14_946
Tully Stream	Soomeragh Br.	Barrow	IE14T020390	SE_14_842
SERBD Boat-sites				
Barrow	Pass Br.	Barrow	IE14B011000	SE_14_196_1
Dinin	Dinin Br.	Nore	IE15D020800	SE_15_1955
King's	Kells Br.	Nore	IE15K020800	SE_15_1819
Slaney	Waterloo Br.	Slaney	IE12S020400	SE_12_1524

Table 2.1. Location and codes of river sites surveyed for WFD surveillance monitoring, 2009

Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, 2009

River	Upstream catchment (km ²)	Wetted width (m)	Surface area (m ²)	Mean depth (m)	Max depth (m)
SERBD Hand-set sites					
Burren	38.49	4.27	188	0.43	0.69
Greese	102.39	7.25	326	0.55	0.85
Tully Stream	44.13	4.13	178	0.50	0.93
SERBD Boat sites					
Barrow	1125.58	25.60	10906	0.96	1.80
Dinin	299.23	15.20	3390	0.52	1.40
King's	377.29	16.40	4100	1.75	2.00
Slaney	77.66	9.00	846	0.56	1.20



Fig. 2.1. Location map of river sites surveyed throughout the SERBD for WFD fish monitoring 2009

3. METHODS

Electric-fishing (Plates 3.1 and 3.2) 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. Each site ideally included all habitat types; riffle, glide and pool. At each site, a number of physical habitat variables were measured. Water samples for chemical analyses were taken, along with a multi-habitat kick-sample of macroinvertebrates. Macrophyte surveys were carried out on selected wadeable streams.

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, 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 aging 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.

In order to draw comparisons between sites, fish densities were calculated using data from the first fishing pass, as three fishing passes were not possible or practical at all sites. The number captured in the first pass was divided by the total area surveyed to give a minimum population 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 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, L2 is the mean length at the end of the second winter, etc.).



Plate 3.1. Electric fishing using hand-set units on the Glashaboy River (SWRBD)



Plate 3.2. Electric fishing using boat-based units on the Nenagh River (ShIRBD)

4. RESULTS

4.1 Wadeable hand-set sites

4.1.1 The Burren River



Plate 4.1. The Burren River downstream of Ullard Bridge near Fennagh, Co. Carlow

The Burren River (Plate 4.1) is a tributary of the River Barrow. It rises in the Blackstairs Mountains in Co. Carlow and runs in a north-westerly direction until it reaches the River Barrow in Carlow Town. The Burren River is considered to be a very good brown trout fishery of interest to the fly angler (O'Reilly, 2009).

The survey site was located downstream of Ullard Bridge just outside the village of Fennagh (Fig. 4.1). Three electric-fishing passes were conducted using two hand-set electric-fishing units on the 27th of August 2009 along a 44m length of channel. The dominant habitat present was glide, while the majority of substrate was sand. The mean wetted width of the surveyed stretch was 4.3m and the mean depth was 43.0cm. Macrophyte vegetation present included common mosses and emergent species, while the banks were covered with nettles and grasses. A total wetted area of 188m² was surveyed.



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

A total of six fish species were recorded in the Burren River site. Brown trout was the most abundant species, followed by juvenile lamprey, three-spined stickleback, nine-spined stickleback, salmon and stone loach (Table 4.1).

Scientific name	Common name	0+	1+ & older	Total minimum density
Salmo trutta	Brown trout	0.0852	0.1172	0.2024
	Lamprey sp.	-	-	0.0906
Gasterosteus aculeatus	Three-spined stickleback	-	-	0.0852
Pungitius pungitius	Nine-spined stickleback	-	-	0.0213
Salmo salar	Salmon	0.0107	0.0053	0.0160
Barbatula barbatula	Stone loach	-	-	0.0053
All fish	All fish	-	-	0.4208

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

Brown trout ranged in length from 6.1cm to 29.4cm (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 32%, 30%, 30% and 8% of the total brown trout catch respectively. Mean brown trout L1, L2 and L3 were 7.6cm, 12.4cm and 17.0cm respectively (Appendix 1), indicating a 'very slow' rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

Three-spined stickleback ranged in length from 2.2cm to 5.1cm (Fig. 4.3). Lamprey ranged in length from 6.0cm to 15.4cm (Fig. 4.4).

Salmon were relatively scarce in the Burren River site and ranged in size from 6.6cm to 13.7cm. Two age classes (0+ and 1+) were present accounting for 22% and 78% of the total salmon catch respectively. Mean salmon L1 was 5.1cm (Appendix 2).



Fig. 4.2. Length frequency distribution of brown trout in the Burren River site, August 2009 (n = 63)



Fig. 4.3. Length frequency distribution of three-spined stickleback in the Burren River site, August 2009 (n = 35)



Fig. 4.4. Length frequency distribution of lamprey in the Burren River site, August 2009 (n = 22)

4.1.2 The River Greese



Plate 4.2. The River Greese at Belan Bridge near Timolin, Co. Kildare

The River Greese (Plate 4.2) is also a tributary of the River Barrow, rising near Dunlavin in Co. Wicklow and flowing south-westwards to join the River Barrow approximately 6.0km north of Carlow Town. Stocks of brown trout are known to be quite healthy within this river and it has recently produced individuals of up to 3.0kgs (O'Reilly, 2009).

The survey site was located upstream of Belan Bridge, approximately 3.5km south-west of Timolin, Co. Kildare (Fig. 4.5). Some bank slippage and erosion was evident at this site due to grazing and access by livestock. One electric-fishing pass was conducted using three hand-set electric-fishing units on the 25th of August 2009 along a 45m length of channel. The mean wetted width of the surveyed stretch was 7.3m and the mean depth was 55.0cm. Glides dominated the habitat, while the substrate was composed of mainly gravel and sand. Submerged and emergent macrophyte vegetation was abundant in this site, both in-stream and along the margins. A total wetted area of 326m² was surveyed.



Fig. 4.5. Location of the River Greese surveillance monitoring site

A total of six fish species were recorded in the River Greese site. Salmon was the most abundant species, followed by brown trout, stone loach, European eel, three-spined stickleback and juvenile lamprey (Table 4.2).

Scientific name	Common name	0+	1+ & older	Total minimum density
Salmo salar	Salmon	0.1441	0.0368	0.1808
Salmo trutta	Brown trout	0.0613	0.0521	0.1134
Barbatula barbatula	Stone loach	-	-	0.0153
Anguilla anguilla	European eel	-	-	0.0061
Gasterosteus aculeatus	Three-spined stickleback	-	-	0.0061
	Lamprey sp.	-	-	0.0031
All fish	All fish	-	-	0.3249

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

Salmon ranged in length from 5.3cm to 14.9cm (Fig. 4.6). Two age classes (0+ and 1+) were present, accounting for approximately 80% and 20% of the total salmon catch respectively. Mean salmon L1 was 5.2cm (Appendix 2).

Brown trout ranged in length from 5.3cm to 27.4cm (Fig. 4.7). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 54%, 27% and 19% of the total brown trout catch respectively. Mean brown trout L1 and L2 were 9.2cm and 17.0cm respectively (Appendix 1), indicating a fast rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

Two European eels were captured, with lengths of 32.0cm and 49.0cm. A single juvenile lamprey measuring 11.7cm in length was also recorded.



Fig. 4.6. Length frequency distribution of salmon in the River Greese site, August 2009 (n = 59)



Fig. 4.7. Length frequency distribution of brown trout in the River Greese site, August 2009 (n = 37)

4.1.3 The Tully Stream



Plate 4.3. The Tully Stream downstream of Soomeragh Bridge near Nurney, Co. Kildare

The Tully Stream (Plate 4.3) is a small tributary of the River Barrow, rising just south of Kildare Town and flowing south-westwards to join the River Barrow near Vicarstown on the Laois/Kildare border.

The survey site was located downstream of Soomeragh Bridge near Nurney in Co. Kildare (Fig. 4.8). Three electric-fishing passes were conducted using one bank-based electric-fishing unit on the 24th of August 2009 along a 43m length of channel. The mean wetted width of the surveyed stretch was 4.1m and the mean depth was 50.0cm. The dominant habitat and substrate present were glide and mud/silt respectively. There was a mixture of macrophytes present, which included bryophytes (mosses and liverworts) as well as emergent and floating species. A total wetted area of 178m² was surveyed.



Fig. 4.8. Location of the Tully Stream surveillance monitoring site

A total of four fish species were recorded in the Tully Stream site. Three-spined stickleback was the most abundant species, followed by brown trout, date and nine-spined stickleback (Table 4.3).

Scientific name	Common name	0+	1+ & older	Total minimum density
Gasterosteus aculeatus	Three-spined stickleback	-	-	0.1013
Salmo trutta	Brown trout	-	0.0844	0.0844
Leuciscus leuciscus	Dace	-	-	0.0056
Pungitius pungitius	Nine-spined stickleback	-	-	0.0056
All fish	All fish	-	-	0.1969

 Table 4.3. Density of fish (no./m²), Tully Stream site (fish density has been calculated as minimum estimates based on the first fishing)

Three-spined stickleback ranged in length from 1.8cm to 5.3cm (Fig. 4.9).

Brown trout ranged in length from 19.0cm to 38.0cm (Fig. 4.10). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 10%, 60% and 30% of the total brown trout catch respectively. Mean brown trout L1, L2 and L3 were 7.3cm, 16.6cm and 23.5cm respectively

(Appendix 1), indicating a fast rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

One dace was recorded, measuring 14.7cm in length, and a single nine-spined stickleback was also recorded measuring 5.4cm in length.



Fig. 4.9. Length frequency distribution of three-spined stickleback in the Tully Stream site, August 2009 (n = 24)



Fig. 4.10. Length frequency distribution of brown trout in the Tully Stream site, August 2009 (n = 20)

4.2 Boat sites

4.2.1 The River Barrow (Pass Bridge)



Plate 4.4. The River Barrow at Pass Bridge in Monasterevin, Co. Kildare

The River Barrow (Plate 4.4) is a large river located in south Leinster. It rises in the Slieve Bloom Mountains in County Laois and flows eastwards towards Monasterevin, before heading south through a number of large towns including Athy, Carlow, Leighlinbridge, Bagenalstown, Graiguenamanagh and New Ross. It joins with the River Suir a few kilometres east of Waterford City before joining the sea at Waterford Harbour. The Local Authorities of Laois, Kildare and Offaly, acting through the joint committee known as the Barrow Drainage Board (established under the Barrow Drainage Acts 1927 and 1933) are responsible with the duty of maintaining the Barrow and its tributaries from its source in the Slieve Bloom mountains in Offaly to the Horse Bridge in Athy, Co. Kildare. The River Barrow in conjunction with stretches of the canal, provides a navigable channel between New Ross and the main Grand Canal system at Athy. Waterways Ireland is responsible for the management, maintenance, development and restoration for recreational purposes of the Barrow navigation channel from Athy to St. Mullins, Co. Carlow.

The survey site on the River Barrow was located at Pass Bridge, just downstream of the confluence with the Black River in Monasterevin, Co. Kildare (Fig. 4.11). Game fishing is popular along the River Barrow and brown trout fishing is considered to be best upstream of Monasterevin and in the tributaries (O'Reilly, 2009). The survey site, together with most of the River Barrow and its main tributaries, are within the River Barrow and River Nore SAC. A number of Annex II listed species are present in the SAC, including sea, river and brook lamprey, Atlantic salmon, twaite shad, otters, crayfish, freshwater pearl mussels and freshwater pearl mussels (NPWS, 2003).

One electric-fishing pass was conducted using four boat-based electric-fishing units on the 6th of July 2009 along a 426m length of channel. The mean wetted width of the surveyed stretch was 25.6m and the mean depth was 96.0cm. Riffle and glide dominated the habitat, while the substrate was a mixture of cobble, gravel and sand. Macrophyte vegetation consisted mostly of riparian grasses but some submerged species were also present. A total wetted area of 10906m² was surveyed.



Fig. 4.11. Location of the River Barrow surveillance monitoring site

A total of eleven fish species were recorded in the River Barrow (Pass Bridge) site (as well as roach x bream hybrids). Gudgeon was the most abundant species, followed by roach, salmon, perch, pike, minnow, brown trout, stone loach, European eel, dace, roach x bream hybrids and bream (Table 4.4).

Scientific name	Common name	0+	1+ & older	Total minimum density
Gobio gobio	Gudgeon	-	-	0.0037
Rutilus rutilus	Roach	-	-	0.0031
Salmo salar	Salmon	-	0.0031	0.0031
Perca fluviatilis	Perch	-	-	0.0026
Esox lucius	Pike	-	-	0.0024
Phoxinus phoxinus	Minnow	-	-	0.0013
Salmo trutta	Brown trout	-	0.0009	0.0009
Barbatula barbatula	Stone loach	-	-	0.0007
Anguilla anguilla	European eel	-	-	0.0006
Leuciscus leuciscus	Dace	-	-	0.0006
Rutilus rutilus x Abramis brama	Roach x bream hybrid	-	-	0.0004
Abramis brama	Bream	-	-	0.0001
All fish	All fish	-	-	0.0193

 Table 4.4. Density of fish (no./m²), River Barrow (Pass Bridge) site (fish density has been calculated as minimum estimates based on the first fishing)

Gudgeon ranged in length from 8.2cm to 12.0cm (Fig. 4.12). Roach ranged in length from 5.5cm to 25.0cm. Four age classes (2+, 3+, 4+ and 5+) were present, accounting for approximately 14.7%, 35.3%, 29.4% and 17.6% of the total roach catch respectively.

Salmon ranged in length from 9.0cm to 14.0cm (Fig. 4.13). All individuals were aged 1+.

Perch ranged in length from 10.6cm to 36.0cm (Fig 4.14). Six age classes (1+, 2+, 3+, 4+, 5+ and 8+) were present. Pike ranged in length from 17.5cm to 59.0cm (Fig. 4.15). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 77%, 8% and 15% of the total pike catch respectively.

Brown trout ranged in length from 12.0cm to 38.5cm (Fig. 4.16). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 20%, 70% and 10% of the total brown trout catch respectively. Mean brown trout L1, L2 and L3 were 10.6cm, 18.3cm and 19.4cm respectively (Appendix 1), indicating a fast rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

Eels ranged in length from 46.0cm to 58.0cm.



Fig. 4.12. Length frequency distribution of gudgeon in the River Barrow (Pass Br. site) (n = 40)



Fig. 4.13. Length frequency distribution of salmon in the River Barrow (Pass Br. site) (n = 34)



Fig. 4.14. Length frequency distribution of perch in the River Barrow (Pass Br. site) (n = 28)



Fig. 4.15. Length frequency distribution of pike in the River Barrow (Pass Br. site) (n = 26)



Fig. 4.16. Length frequency distribution of brown trout in the River Barrow (Pass Br. site) (n = 10)

4.2.2 The Dinin River



Plate 4.5. The Dinin River, downstream of Dinin Bridge near Kilkenny City

The Dinin River (Plate 4.5) is a tributary of the River Nore. It rises in the Castlecomer Hills, north of Castlecomer Town and flows south to join the River Nore just a few kilometres north-west of Kilkenny City. There are good stocks of brown trout present within the Dinin itself, while salmon angling is popular on the Nore as far upstream as the Dinin confluence (O'Reilly, 2009). The Dinin River is included within the River Barrow and River Nore SAC (see Section 4.2.1).

The survey site was located approximately 1.5km upstream of the confluence with the River Nore, on the downstream side of Dinin Bridge (Fig. 4.17). A single electric-fishing pass was conducted using two boat-based electric-fishing units on the 9th of July 2009 along a 223m length of channel. The site surveyed contained a good mix of habitats (riffle, glide, pool) over a substrate dominated by boulder and cobble. The mean wetted width of the surveyed stretch was 15.2m and the mean depth was 52.0cm. A total wetted area of 3390m² was surveyed.



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

A total of four fish species were recorded in the Dinin River site. Salmon was the most abundant species, followed by brown trout, European eel and minnow (Table 4.5).

Scientific name	Common name	0+	1+ & older	Total minimum density
Salmo salar	Salmon	0.0032	0.0310	0.0342
Salmo trutta	Brown trout	-	0.0115	0.0115
Anguilla anguilla	European eel	-	-	0.0012
Phoxinus phoxinus	Minnow	-	-	0.0003
All fish	All fish	-	-	0.0472

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

Salmon ranged in length from 4.0cm to 13.0cm (Fig. 4.18). Two age classes (0+ and 1+) were present, accounting for approximately 9% and 91% of the total salmon catch respectively. Mean salmon L1 was 5.1cm (Appendix 2).

Brown trout ranged in length from 12.5cm to 31.5cm (Fig.4.19). Three age classes (1+, 2+ and 3+) were present, accounting for approximately 23%, 64% and 13% of the total brown trout catch

respectively. Mean brown trout L1, L2 and L3 were 6.8cm, 16.6cm and 18.9cm respectively (Appendix 1), indicating a slow rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

Eels ranged in length from 14.0cm to 46.0cm. One 6.0cm minnow was also recorded.



Fig. 4.18. Length frequency distribution of salmon in the Dinin River site, September 2009 (n = 116)



Fig. 4.19. Length frequency distribution of brown trout in the Dinin River site, September 2009 (n = 39)

4.2.3 The King's River (Kilkenny)



Plate 4.6. The King's River upstream of Kells Bridge in Kells, Co. Kilkenny

The King's River (Plate 4.6) is a large tributary of the River Nore. It rises in the Slieveardagh Hills in Co. Tipperary and flows eastwards into Co. Kilkenny, eventually joining the River Nore near Stonyford. This River is popular among anglers for brown trout. This site, along with most of the King's River, is located within the River Barrow and River Nore SAC (see Section 4.2.1).

The survey site was located upstream of Kells Bridge, just outside the village of Kells, Co. Kilkenny (Fig. 4.20). Three electric-fishing passes were conducted using three boat-based electric-fishing units on the 9th of July 2009 along a 250m length of channel. The mean wetted width of the surveyed stretch was 16.4m and the mean depth was 175.0cm. The entire stretch consisted of glide over a substrate of mud, cobble and gravel. A total wetted area of 4100m² was surveyed.



Fig. 4.20. Location of the King's River surveillance monitoring site

A total of four fish species were recorded in the King's River site. Brown trout was the most abundant species, followed by salmon, European eel and juvenile lamprey (Table 4.6).

Scientific name	Common name	0+	1+ & older	Total minimum density
Salmo trutta	Brown trout	-	0.0105	0.0105
Salmo salar	Salmon	-	0.0007	0.0007
Anguilla anguilla	European eel	-	-	0.0005
	Lamprey sp.	-	-	0.0002
All fish	All fish	-	-	0.0120

Table 4.6. Density of fish (no./m²), King's River site (fish density has been calculated as minimum estimates based on the first fishing)

Brown trout ranged in length from 13.0cm to 29.5cm (Fig. 4.21). Four age classes (1+, 2+, 3+ and 4+) were present, accounting for approximately 14%, 36%, 35% and 15% of the total brown trout catch respectively. Mean brown trout L1, L2, L3 and L4 were 7.1cm, 14.4cm, 18.6cm and 21.4cm respectively (Appendix 1), indicating a slow rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

European eel ranged in length from 25.6cm to 46.0cm. A single juvenile lamprey was also recorded, measuring 13.6cm.



Fig. 4.21. Length frequency distribution of brown trout in the King's River, July 2009 (n = 142)

4.2.4 The River Slaney (Waterloo Bridge)



Plate 4.7. The River Slaney at Waterloo Bridge near Stratford, Co. Wicklow

The River Slaney (Plate 4.7) is a large river located in south-east Leinster. It rises in the Wicklow Mountains on Lugnaquilla Mountain, within the Glen of Imall Artillery Range. It flows in a southward direction through a number of towns including Baltinglass, Tullow, Bunclody and Enniscorthy, until it reaches the sea at Wexford Town. Salmon angling is historically popular on the River Slaney; however, in recent years a reduced stock of salmon and relatively small sized brown trout have made it less appealing (O'Reilly, 2009; ERFB, 2010).

The source of the River Slaney is located within the Wicklow Mountains SAC, approximately 20km upstream from the survey site. The survey site is located within the Slaney River Valley SAC. This is a candidate SAC, selected for a number of habitats listed in Annex I of the EU Habitats Directive, including alluvial wet woodland, floating vegetation, tidal mudflats and estuaries (NPWS, 2005). Several species listed in Annex II of the same directive are also present throughout this SAC, adding further to its conservation value. These include sea, river and brook lamprey, freshwater pearl mussel, twaite shad, Atlantic salmon and otter (NPWS, 2005).

The survey site was located upstream of Waterloo Bridge, approximately 5km west of the Glen of Imall, Co. Wicklow (Fig. 4.22). Three electric-fishing passes were conducted using one boat-based electric-fishing unit on the 18th of August 2009 along a 94m length of channel. _The mean wetted width of the surveyed stretch was 9.0m and the mean depth was 56.0cm. The habitat was dominated by riffle and pool, while the substrate consisted mainly of mud and silt. A total wetted area of 846m² was surveyed.



Fig. 4.22. Location of the River Slaney (Waterloo Bridge) surveillance monitoring site

A total of four fish species were recorded in the River Slaney site. Salmon was the most abundant species, followed by brown trout, European eel and stone loach (Table 4.7).

Scientific name	Common name	0+	1+ & older	r Total minimum density
Salmo salar	Salmon	0.00	0.0366	0.0437
Salmo trutta	Brown trout	0.002	0.0177	0.0177
Anguilla anguilla	European eel	-	-	0.0035
Barbatula barbatula	Stone loach	-	-	0.0024
All fish	All fish	-	-	0.0674

Table 4.7. Density of fish (no./m²), River Slaney (Waterloo bridge site) (fish density has been calculated as minimum estimates based on the first fishing)

Salmon ranged in length from 5.5cm to 13.4cm (Fig. 4.23). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 19%, 64% and 17% of the total salmon catch respectively. Mean salmon L1 and L2 were 5.1cm and 9.6cm respectively (Appendix 2).

Brown trout ranged in length from 6.4cm to 26.2cm (Fig. 4.24). Five age classes (0+, 1+, 2+, 3+ and 5+) were present, accounting for approximately 4%, 46%, 35%, 10% and 4% of the total brown trout catch respectively. Mean brown trout L1, L2, L3, L4 and L5 were 5.9cm, 13.0, 16.2cm, 17.5cm and 20.6cm respectively (Appendix 1), indicating a very slow rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971).

Three stone loach were recorded, ranging in length from 8.1cm to 9.8cm. Eels ranged in length from 21.2cm and 36.0cm.



Fig. 4.23. Length frequency distribution of salmon in the River Slaney, August 2009 (n = 69)



Fig. 4.24. Length frequency distribution of brown trout in the River Slaney, August 2009 (n = 48)

4.3 Community structure

4.3.1 Species richness and composition

A total of 14 fish species and one hybrid were recorded within the seven SERBD sites surveyed. Brown trout was the most common fish species recorded, occurring in all sites surveyed within the region. This was followed by salmon (86%), European eel (71%), stone loach (57%) three-spined stickleback (43%), lamprey (43%), nine-spined stickleback (29%), dace (29%) and minnow (29%). Bream, gudgeon, perch, pike, roach and roach x bream hybrids were only recorded in one site each (Fig.4.25).



Fig. 4.25. Percentage of sites where each fish species was recorded in the SERBD for WFD SM monitoring 2009

Species richness ranged from four fish species at four sites (Tully Stream, Dinin River, King's River and River Slaney) to a maximum of twelve species recorded in the River Barrow (Pass Bridge) site (Table 4.8). Kelly *et al.*, (2008) classified fish species in Ireland into three groups. Group 1 - native species (e.g. salmonids, three-spined stickleback, lamprey and eel) were present at all sites surveyed. Group 2 - non-native species that influence ecology (e.g. pike, perch, roach, minnow, stoneloach) were recorded in all sites surveyed except for the King's River, and Group 3 - non-native species that generally don't influence ecology (e.g. gudgeon) were recorded in only one site, the River Barrow (Pass Bridge).

Site	Species richness	No. native species (Group 1)	No. non-native species (Group 2)	No. non-native species (Group 3)
		HAND-SET SIT	ES	
Burren	6	5	1	0
Greese	6	5	1	0
Tully Stream	4	3	1	0
		BOAT SITES		
Barrow (Pass Bridge)	11	3	6	1
Dinin	4	3	1	0
King's	4	4	0	0
Slaney (Waterloo Bridge)	4	3	1	0

Fable 4.8. Si	pecies richness	at each river	site surveyed in	the SERBD, Ju	y to October 2009

4.3.2 Species abundance and distribution

Abundance (minimum population density) and distribution maps for the most common fish species recorded within the SERBD are shown in Figures 4.26 to 4.45. Recorded fish densities are generally much higher in surveys using hand-set electric-fishing gear than in those conducted with boat-based electric-fishing gear. This is primarily due to the tendency for younger trout and salmon to utilise shallow, riffle areas as nursery habitat and may also be due to the difference in sampling efficiency of the two methods. As such, population densities recorded for each species using the two methods are displayed on separate maps. For comparative purposes, densities from surveys conducted during 2008 are also displayed.

The highest density of brown trout fry (0+) among boat sites (Fig. 4.26) was in the River Slaney (0.002 fish/m^2) , whilst the highest density of brown trout fry amongst hand-set sites (Fig. 4.27) was in the Burren River (0.09 fish/m²). The River Slaney (0.02 fish/m²) also exhibited the highest density of 1+ and older brown trout amongst boat sites (Fig. 4.28), whilst the highest density of 1+ and older brown trout in hand-set sites (Fig. 4.29) was in the Burren River (0.12 fish/m²). No sea trout were encountered during the seven surveys in the SERBD.

Salmon were captured in six of the sites surveyed. The highest density of salmon fry aged 0+ amongst boat sites (Fig. 4.30) was recorded in the River Slaney (0.01 fish/m²), whilst the highest density amongst hand-set sites (Fig. 4.31) was recorded in the River Greese (0.14 fish/m²). Salmon parr aged 1+ and older were captured at highest densities in the River Slaney amongst boat sites (0.04 fish/m²) (Fig. 4.32) and in the River Greese (0.04 fish/m²) (Fig. 4.33) amongst hand-set sites.

European eels were also well distributed, occurring in five sites (Fig. 4.34 & Fig. 4.35). The greatest density was observed in the River Greese (0.01 fish/m²). Lamprey were captured in three sites; the only boat site in which lamprey were recorded (Fig. 4.36) was in the Kings River (0.0002 fish/m²), whereas the greatest density within the SERBD was recorded in the hand-set-surveyed Burren River (0.09 fish/m²) (Fig. 4.37).

Three-spined stickleback were recorded in three sites (Fig. 4.38 and Fig. 4.39), stone loach were recorded in four sites (Fig. 4.40 and Fig. 4.41), while minnow (Fig. 4.42 and Fig. 4.43) and dace (Fig. 4.44 and Fig. 4.45) were recorded in only two sites.























4.3.3 Age and growth of brown trout and salmon

Age and growth were determined for brown trout and salmon (where present) in each river site. Brown trout ages ranged from 0+ to 5+, with 1+ being the dominant age class at most sites. The largest brown trout (age 3+, length 38.7cm and weight 0.41kg) recorded was captured in the Tully Stream. Three age classes of salmon were recorded; 0+, 1+ and 2+, with those in the 1+ age class the most abundant. The largest juvenile salmon (1+) recorded in the SERBD was captured in the River Greese, measuring 14.9cm and weighing 44.5g.

Length-at-age analyses and growth curves are presented for brown trout (Fig. 4.46, Appendix 1) and salmon (Fig. 4.47, Appendix 2) recorded in the seven river sites surveyed within the SERBD during 2009. 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. Growth was classified as very slow in the Burren River and River Slaney, slow in the Dinin and King's Rivers and fast in the River Barrow, River Greese and Tully Stream.

Salmon aged 2+ and older were only recorded in the River Slaney, therefore comparisons of growth is not possible for this older age class. Back calculated lengths at age 1+, however, are very similar among all sites (Fig. 4.47).



Fig. 4.46. Back calculated lengths for brown trout in each river, WFD surveillance monitoring 2009



Fig. 4.47. Back calculated lengths for salmon in each river, WFD surveillance monitoring 2009

5. DISCUSSION

A total of 15 fish species (including hybrids) were recorded during the 2009 sampling program within the SERBD. This was higher than in any of the other RBDs and can be attributed to the presence of many non-native fish species. The River Barrow (Pass Bridge) contained the highest number of species amongst all sites surveyed throughout the country during 2009, with a total of twelve species recorded (including hybrids). The main summary report for 2009 (Kelly *et al.*, 2010) provides information on species composition, richness and distribution for the whole country.

Brown trout were the most widely distributed species within the SERBD, occurring in all of the sites surveyed, with the highest densities recorded on the Burren River and River Greese. No sea trout were encountered within the SERBD in 2009. Salmon were captured at six sites, with the greatest density recorded on the River Greese. European eels were also well distributed, occurring in five sites. Lamprey were captured in three sites, including the Burren River which exhibited the highest density of lamprey for any site surveyed throughout the country during 2009 (Kelly *et al.*, 2010). Dace, a non-native species, the spread of which is becoming more of a concern within the region, were captured at two sites; the River Barrow (Pass Bridge) and the Tully Stream. Many of the other non-native fish species found in this region, such as bream, gudgeon, perch, pike and roach were only present in the River Barrow main channel.

Ireland's indigenous fauna has come under increasing threat from non-native introductions. Invasions by non-native species represent one of the greatest threats to natural biodiversity, second only to habitat destruction (Scalera and Zaghi, 2004). Non-native and invasive species can transform ecosystems, threatening both indigenous and high conservation status species (Stokes *et al.*, 2006), with impacts including displacement through competition for space and food. Direct impacts through predation are also evident (Barton and Heard, 2005).

Non-native fish species were recorded in six of the seven rivers surveyed within the SERBD. Eno *et al.* (1997) differentiate between non-native and alien species, with the former being those that have established themselves and the latter being those that have not established themselves and cannot do so without some sort of human intervention. The only river containing exclusively native species was the King's River. Kelly *et al.* (2008) categorised non-native species in Ireland into two categories (Group 2, which are those that influence the ecology, and Group 3, which are those that generally have no influence on the ecology). Seven Group 2 species (Stone loach, dace, minnow, bream, perch, pike and roach) and one Group 3 species (gudgeon) were recorded within the SERBD region. Roach x bream hybrids were also recorded in one river site, the River Barrow (Pass Bridge).

Following the methods of Kennedy and Fitzmaurice (1971), brown trout growth was classified as very slow in the Burren River and River Slaney, slow in the Dinin and King's Rivers and fast in the River Barrow, River Greese and the Tully Stream. In contrast to the brown trout within the SERBD, salmon

showed very similar back calculated L1 values. Individuals in the 2+ age class were only present in the River Slaney, therefore salmon growth beyond 1+ cannot be compared.

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. No fish classification method currently exists in Ireland for classifying river water quality based on fish populations. Currently, ecological status classifications are based on expert opinion using information collected during a project to investigate the relationship between fish stocks, ecological quality ratings (Q-values), environmental factors and degree of eutrophication (Kelly et al., 2007c). An ecological classification tool, however, is being 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 have contributed data to be used in the model, which is being developed under the management of the Scotland & Northern Ireland Forum for Environmental Research (SNIFFER). It was recommended during the earlier stages of this project that an approach similar to that developed by the Environment Agency in England and Wales (FCS2) be used. This scheme works by comparing various fish community metric values within a site (observed) to those predicted (expected) for that site under reference (unimpacted) conditions using a geo-statistical model based on bayesian probabilities. The proposed method will provide an Ecological Quality Ratio (EQR) between 1 and 0 for all sites. Five class boundaries will be defined along this range, to correspond with the five ecological status classes of High, Good, Moderate, Poor and Bad. Confidence levels will then be assigned to each class and represented as probabilities. Work on the rivers classification tool is still ongoing and is due for completion in mid-2010.

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APPENDIX 1

River		L1	L2	L3	L4	L5	Growth category
Barrow	Mean	10.6	18.3	19.4			Fast
	S.D.	5.2	8.4	n/a			
	S.E.	1.7	3.2	n/a			
	n	9	7	1			
	Range min.	4.6	9.6	19.4			
	Range max.	19.3	34.4	19.4			
Burren	Mean	7.6	12.4	17.0			Very slow
	S.D.	1.9	2.6	2.1			
	S.E.	0.3	0.6	1.5			
	n	31	18	2			
	Range min.	3.4	9.1	15.6			
	Range max.	11.9	20.2	18.5			
Dinin	Mean	6.8	16.6	18.9			Slow
	S.D.	1.4	2.7	n/a			
	S.E.	0.2	0.5	n/a			
	n	33	24	1			
	Range min.	4.1	10.4	18.9			
	Range max.	9.7	20.4	18.9			
Greese	Mean	9.2	17.0				Fast
	S.D.	1.9	1.1				
	S.E.	0.5	0.5				
	n	15	5				
	Range min.	6.0	15.4				
	Range max.	11.6	18.5				
King's	Mean	7.1	14.4	18.6	21.4		Slow
	S.D.	1.2	2.3	1.9	2.1		
	S.E.	0.2	0.4	0.4	1.0		
	n	32	31	18	4		
	Range min.	4.6	9.4	15.3	18.3		
	Range max.	10.5	18.5	21.7	22.8		
Slaney	Mean	5.9	13.0	16.2	17.5	20.6	Very Slow
	S.D.	1.1	2.3	2.8	n/a	n/a	
	S.E.	0.2	0.5	1.3	n/a	n/a	
	n	34	20	5	1	1	
	Range min.	3.9	8.2	12.9	17.5	20.6	
	Range max.	8.4	16.3	20.4	17.5	20.6	
Tully Stream	Mean	7.3	16.6	23.5			Fast
	S.D.	2.5	4.8	4.9			
	S.E.	0.6	1.2	2.4			
	n	17	15	4			
	Range min.	4.0	9.7	16.2			
	Range max.	11.6	26.0	26.3			

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

APPENDIX 2

River		L1	L2
Barrow	Mean	5.1	
	S.D.	0.6	
	S.E.	0.2	
	n	9	
	Range min.	3.9	
	Range max.	6.3	
Burren	Mean	5.1	
	S.D.	0.9	
	S.E.	0.3	
	n	7	
	Range min.	4.0	
	Range max.	6.2	
Dinin	Mean	5.1	
	S.D.	1.2	
	S.E.	0.3	
	n	17	
	Range min.	3.4	
	Range max.	7.4	
Greese	Mean	5.2	
	S.D.	0.8	
	S.E.	0.2	
	n	12	
	Range min.	3.3	
	Range max.	6.9	
Slaney	Mean	5.1	9.6
-	S.D.	0.9	1.1
	S.E.	0.2	0.4
	n	22	8
	Range min.	3.4	8.1
	Range max.	6.6	10.9

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

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