SRFB Rivers

# Sampling Fish for the Water Framework Directive - Rivers 2008

The Central and Regional Fisheries Boards

**PROJECT PERSONNEL**

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## 1. INTRODUCTION

Fish stock surveys were undertaken in 83 river sites throughout Ireland during the summer of 2008 as part of the programme for sampling fish for the Water Framework Directive. These surveys were carried out at twelve sites located within the Southern Regional Fisheries Board (SRFB) between July and early October 2008 by staff from the Central Fisheries Board (CFB) and the SRFB (Fig. 2.1). The sites were selected based on criteria set down by the Environmental Protection Agency. These surveys are required by both Irish and European law (Council of the European Communities, 2000). Annex V of the European Water Framework Directive (WFD) stipulates that rivers are included within the monitoring program and that the composition, abundance and age structure of fish fauna are examined (Council of the European Communities, 2000). Although fish survey work has been carried out in Ireland in the past, no project to date has been as extensive as the present study in providing data appropriate for WFD compliance. Continued surveying of these and additional river sites will provide a useful baseline for monitoring water quality in the future.

The SRFB is the second largest regional fisheries board in Ireland and covers a land area of approximately 13,800km$^2$. The most northerly part of this region is located in Co. Offaly, while it also encompasses small parts of Co. Kerry in the south-west and Wexford in the south-east. The coastline within the SRFB stretches for 330 kilometres, encompassing counties Cork, Waterford and Wexford. Major rivers in this region include the Barrow, Blackwater, Lee, Nore and Suir. There are fewer lakes within this region than in any other and this is in part due to the relatively low rainfall in the "Sunny South East". The main urban centres in the region are Kilkenny and Waterford City, but there are also many other large towns, including Carlow, Clonmel, Kildare, Mallow, Portlaoise and Tipperary. The population of this region is gradually increasing due to commuter towns, such as Kildare, servicing the Dublin City area.

This report summarizes the main findings of the fish stock surveys in the 12 river water bodies surveyed in the SRFB during 2008 and reports the current status of the fish stocks in each.

## 2. STUDY AREA

Table 2.1 shows the list of the 12 river sites in five river catchments (Nore, Suir, Womanagh, Colligan and Mahon) that were surveyed within the SRFB in 2008. Sites ranged in area from 361.7m$^2$ for the Nuenna River to 2,464.0m$^2$ for the Colligan River. Figure 2.1 shows the location of these sites within the SRFB.

**Table 2.1. List of river sites surveyed for WFD surveillance monitoring in the SRFB, July to October 2008, details of catchment area (km$^2$), wetted width, surface area (m$^2$), mean depth (m) and max depth (m) are included**

| Site | Catchment | Easting | Northing | Catchment size u/s of the site (km$^2$) | Width (m) | Area (m$^2$) | Mean depth (m) | Max depth (m) |
|---|---|---|---|---|---|---|---|---|
| **Handset sites** | | | | | | | | |
| Ballyroan | Nore | 242178 | 185122 | <100 | 4.88 | 439.50 | 0.31 | 0.51 |
| Duag | Suir | 192040 | 112667 | <100 | 4.14 | 372.60 | 0.19 | 0.33 |
| Glory | Nore | 248480 | 139983 | <100 | 7.40 | 666.00 | 0.37 | 0.58 |
| Nier | Suir | 219922 | 112908 | <100 | 15.60 | 702.00 | 0.31 | 0.70 |
| Nuenna | Nore | 236349 | 163731 | <100 | 5.17 | 361.67 | 0.31 | 0.58 |
| **Boat sites** | | | | | | | | |
| Anner | Suir | 231304 | 135343 | <100 | 8.80 | 1,760.00 | 0.47 | 0.95 |
| Colligan | Colligan | 223215 | 095223 | <100 | 11.20 | 2,464.00 | 0.49 | 1.15 |
| Mahon | Mahon | 242264 | 101091 | <100 | 10.20 | 1,836.00 | 0.48 | 1.30 |
| Multeen | Suir | 200706 | 140185 | <1,000 | 14.00 | 2,100.00 | 0.48 | 0.80 |
| Nore (Quakers' Br) | Nore | 221293 | 186978 | <100 | 7.80 | 1,560.00 | 0.96 | 1.70 |
| Suir (Knocknageragh Br) | Suir | 213094 | 172414 | <100 | 5.80 | 614.80 | 0.49 | 0.69 |
| Womanagh | Womanagh | 198381 | 072632 | <100 | 6.00 | 618.00 | 0.66 | 0.93 |

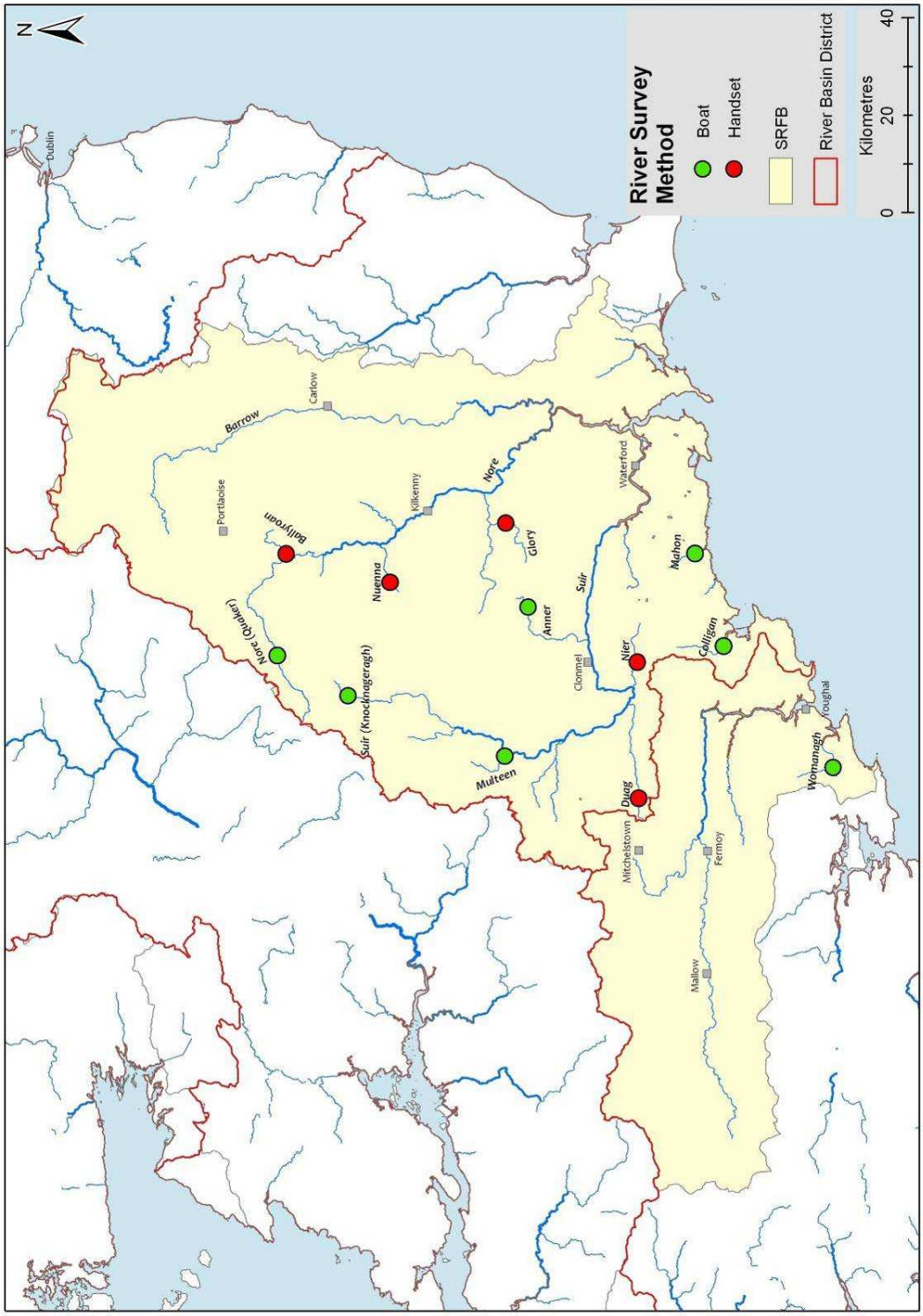


**Fig. 2.1. Location map of river sites surveyed within the SRFB for WFD surveillance monitoring in 2008**

## 3. METHODS

Electric fishing is the method of choice for surveillance monitoring of fish in rivers in order to obtain a representative sample of the fish assemblage at each sampling site. The technique complies with the European Committee for Standardisation (CEN) guidelines for fish stock assessment in wadeable rivers (CEN, 2003). At each site the stretch sampled was isolated, where possible, using stop nets and one to three fishings were carried out using bank-based electric fishing units (hand-sets) or boat-based electric fishing units carried in flat-bottomed boats. Each site ideally included all habitat types: riffle, glide and pool. A number of physical habitat variables were measured, water samples for chemical analyses and a multihabitat kick sample for macroinvertebrates were taken, and a macrophyte survey was conducted at each site.

Fish captured in each fishing occasion were sorted and processed separately. During processing, the species of each fish was identified and its length and weight were measured; sub-samples were weighed when large numbers of fish were present. For species identification, river lamprey (*Lampetra fluviatilis*) and brook lamprey (*Lampetra planeri*) were treated as a single species. Scales samples were taken from salmonids greater than 8.0cm and from most coarse fish species. Opercular bones were used to age perch captured. All fish were held in a large bin of oxygenated water after processing until they were fully recovered and were then returned to the water. Samples of eels were retained for further analysis.

A subsample of the dominant fish species were aged (five fish from each 1cm size class). Fish scales were aged using a microfiche reader. Opercular bones were aged using an epidioscope and an Olympus microscope (SZX10)/digital camera system. Fish growth was determined by back-calculating lengths at the end of each winter, L1 being the mean length at the end of the first winter, etc.

**Plate 3.1. Electric fishing in a small wadeable stream using bank based units**

# 4. RESULTS

## 4.1 Wadeable hand-set sites

### *4.1.1 The Ballyroan River*

**Plate 4.1. The Ballyroan River at Gloreen Bridge.**

The Ballyroan River (Plate 4.1), also known locally as the Gloreen Stream, is a small tributary of the River Nore and rises approximately four kilometres north of Abbeyleix near the village of Ballyroan in Co. Laois. It joins the River Nore approximately three kilometres west of Abbeyleix. An electric fishing survey was conducted along a 90m stretch of the river upstream of Gloreen Bridge on the 14th of July 2008. Two bank based electric fishing units were used to conduct three fishings (Fig. 4.1). The site had a mean width of 4.9m and the mean depth was 0.31m. The total wetted area fished was 439.5m$^2$. The area immediately adjacent to the site consisted of pasture on one bank, and a canopy of small mixed forestry providing a moderate amount shade to the river channel on the other bank. The site had approximately 10% instream vegetation cover over a substrate of mostly gravel with some cobble and sand. The

dominant habitat in the site was glide, with some riffle and pool. Vegetation was mostly emergent macrophytes such as *Rorippa nasturtium-aquaticum*, *Apium nodiflorum* and *Sparganium erectum*. *Phalaris arundinacea* dominated the right-hand back, while the left-hand bank was much steeper with a covering of *Solanum dulcamara*.

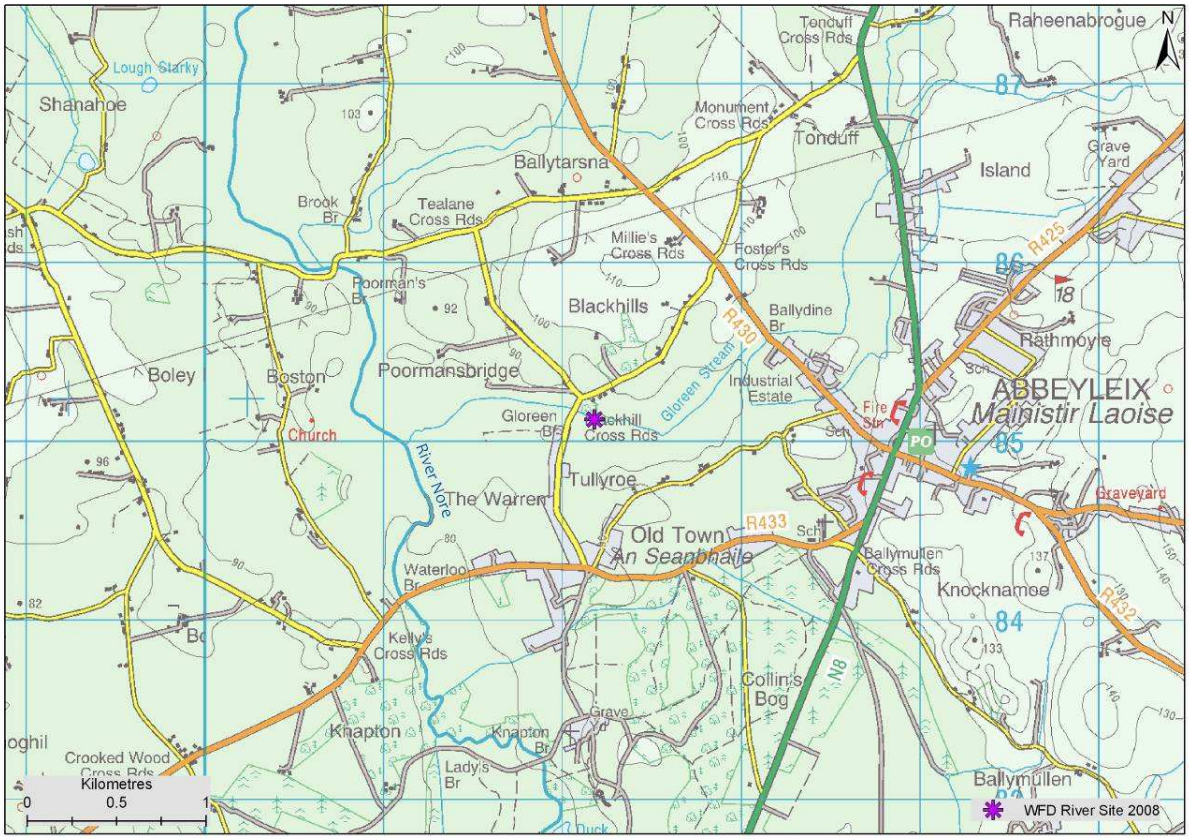


**Fig. 4.1. Location of the Ballyroan River surveillance monitoring site**

Five fish species were recorded in the Ballyroan River (Table 4.1). The most abundant species captured was brown trout, followed by salmon.

**Table 4.1. Density of fish (no./m$^2$) in the Ballyroan site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0114 | 0.2935 | 0.3051 |
| *Salmo salar* | Salmon | 0.0182 | 0.0501 | 0.0683 |
| *Lampetra* spp. | Lamprey | - | - | 0.0410 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0364 |
| *Anguilla anguilla* | Eel | - | - | 0.0023 |
| **All fish** | **All fish** | **-** | **-** | **0.4531** |

Brown trout ranged in length from 5.4cm to 31.7cm (Fig. 4.2). Data analysis indicate that 0+, 1+, 2+ and 3+ fish accounted for approximately 4%, 66%, 28% and 1% of the brown trout population at the site respectively. Mean L1, L2 and L3 of brown trout were 8.3cm, 18.5cm and 24.2cm respectively (Appendix 1). Brown trout at the Ballyroan site were classified as fast growing based on criteria described by Kennedy and Fitzmaurice (1971). The largest brown trout recorded at the site was a 2+ fish measuring 31.7cm in length and 377.0g in weight.

Salmon ranged from 5.2cm to 14.5cm. Scale and length frequency analysis showed that 1+ fish ranged from 8.9cm to 14.5cm and that 0+ and 1+ fish accounted for approximately 27% and 73% of the juvenile salmon population respectively at the site (Fig. 4.3). The largest salmon recorded was a 1+ fish measuring 14.5cm in length and 38.0g in weight. The mean L1 of salmon was 5.3cm (Appendix 2).

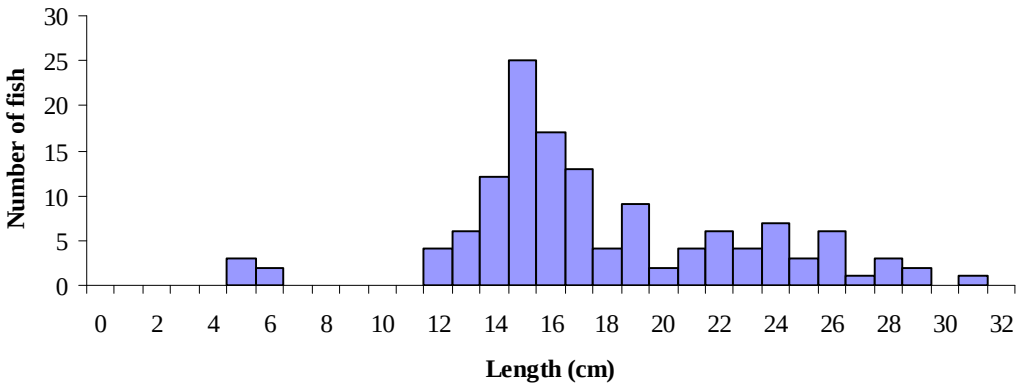


**Fig. 4.2. Length frequency distribution for brown trout in the Ballyroan River, July 2008 (n = 134).**

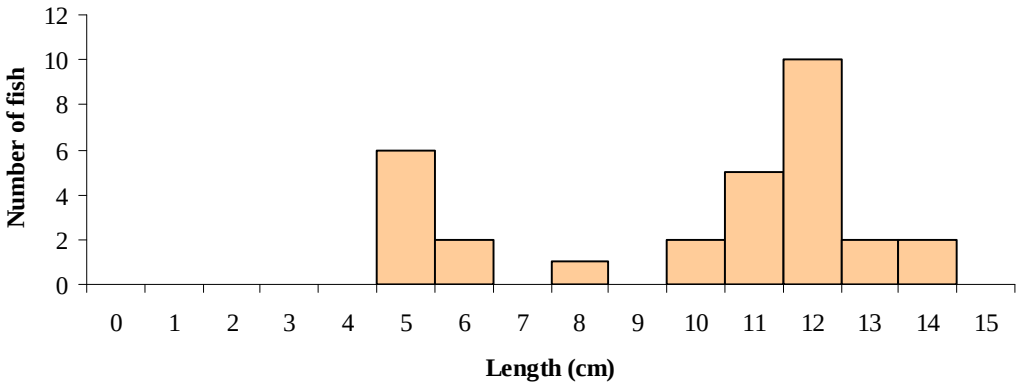


**Fig. 4.3. Length frequency distribution for salmon in the Ballyroan River, July 2008 (n = 30).**

### *4.1.2 The River Duag*

**Plate 4.2. The River Duag upstream of Ballyporeen**

The River Duag (Plate 4.2) is a tributary of the River Suir. It rises in the Kilworth Mountains along the Cork–Tipperary border and flows eastwards through the village of Ballyporeen before joining the River Tar near Clogheen, Co. Tipperary. The survey site was located downstream of an unnamed bridge located approximately 1.5 kilometres west of Ballyporeen in Co. Tipperary (Fig. 4.4). An electric fishing survey was conducted along a 90m stretch of river channel on the 17$^{th}$ of July 2008. Two bank based electric fishing units were used to conduct three fishings. The site had a mean width of 4.1m and a mean depth of 0.19m. The total wetted area fished was 372.6m$^2$. The site was surrounded by pasture, with no canopy cover on either bank (Plate 4.2). The site had approximately 2% instream vegetation cover over a substrate of mostly cobble and gravel, with some sand, mud and boulders. The habitat at the site consisted of a mixture of riffle, glide and pool. A good mix of plants were recorded at the site, including emergent species such as *Sparganium erectum, Oenanthe crocata* and *Phalaris arundinacea,* and mosses including *Chiloscyphus polyanthos* and *Fontinalis antipyretica*.

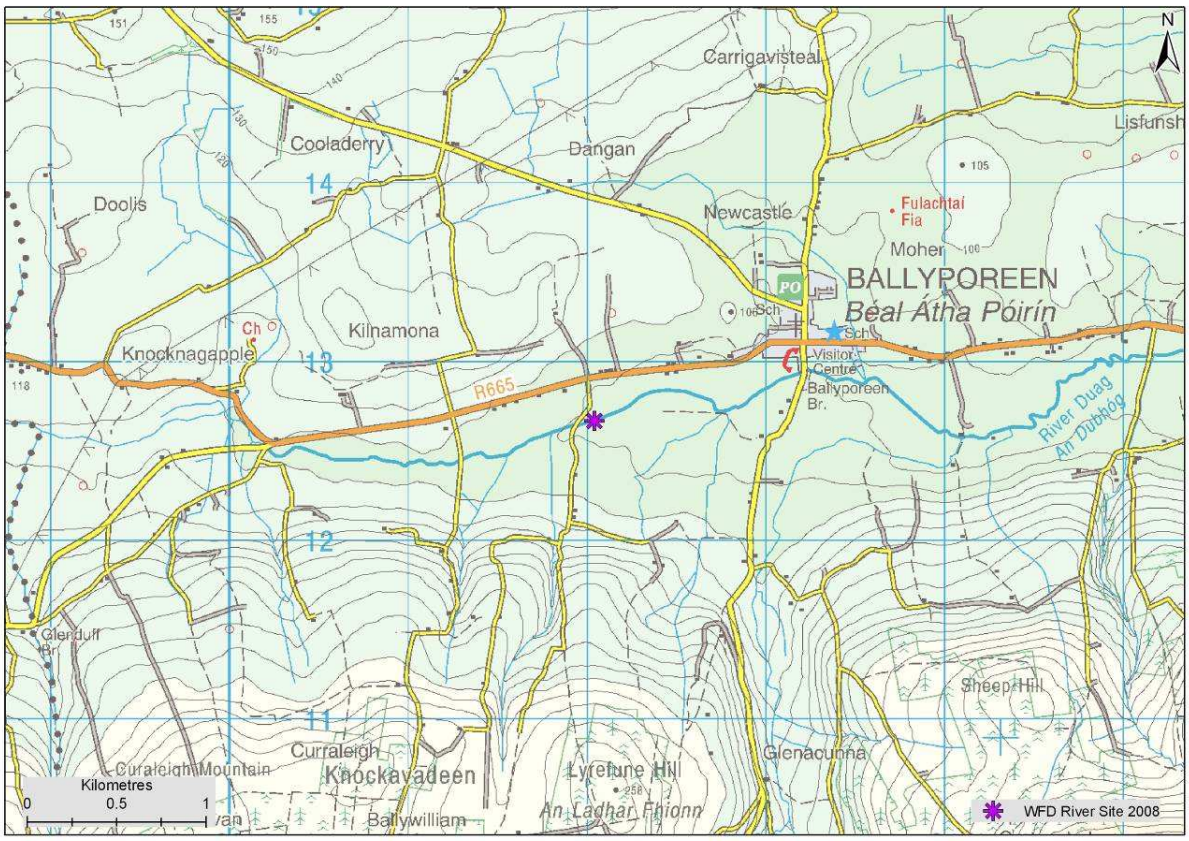


**Fig. 4.4. Location of the River Duag surveillance monitoring site**

Five fish species were recorded in the River Duag (Table 4.2). The most abundant species was brown trout, followed lamprey (Table 4.2).

**Table 4.2. Density of fish (no./m$^2$) in the River Duag site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.1476 | 0.0429 | 0.1906 |
| *Lampetra* spp. | Lamprey | - | - | 0.1342 |
| *Salmo salar* | Salmon | 0.0081 | 0.0456 | 0.0537 |
| *Anguilla anguilla* | Eel | - | - | 0.0161 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0134 |
| **All fish** | **All fish** | **-** | **-** | **0.4079** |

Brown trout ranged in length from 4.9cm to 23.7cm (Fig. 4.5). Scale analysis showed that 0+, 1+ and 2+ fish were present at the site and accounted for approximately 77%, 17% and 6% of the brown trout

population respectively. The largest brown trout recorded at the site was a 2+ fish measuring 23.7cm in length and 172.0g in weight. Mean trout L1 and L2 were 6.1cm and 14.2cm respectively (Appendix 1). Brown trout in the Duag were classified as slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

Lamprey was the second most common species captured in the Duag River and their length frequency distribution graph is shown below in Figure 4.6.

Salmon ranged in length from 5 to 13.3cm (Fig. 4.7). Scale analysis showed that 1+ salmon in the Duag ranged from 9.2cm to 13.3cm, and the mean L1 of salmon in the Duag was 4.8cm (Appendix 2). Data analysis indicates that 0+ and 1+ fish accounted for approximately 15% and 85% of the juvenile salmon population respectively at the site.

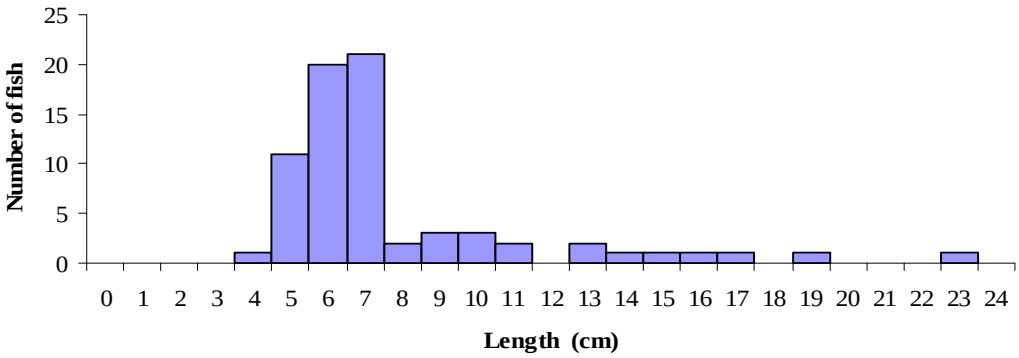


**Fig. 4.5. Length frequency distribution for brown trout in the River Duag, July 2008 (n = 71).**

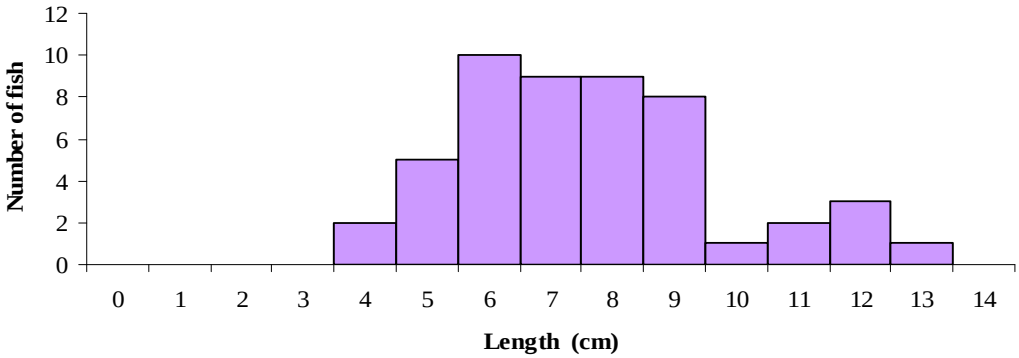


**Fig. 4.6. Length frequency distribution for lamprey in the River Duag, July 2008 (n = 30).**

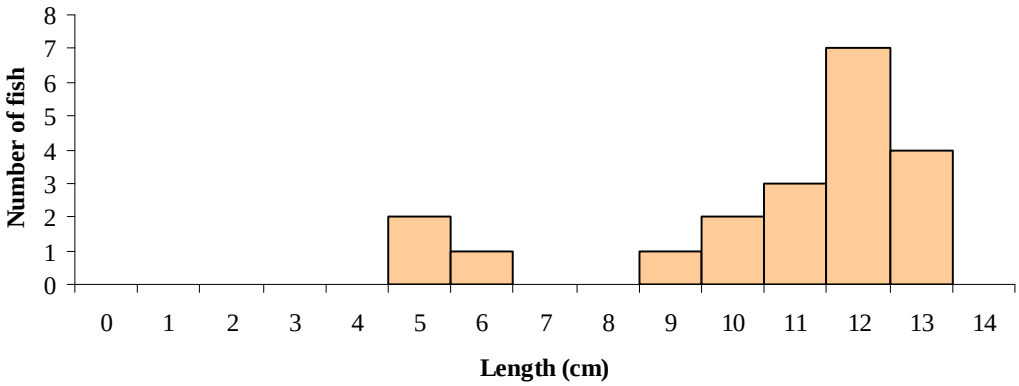


**Fig. 4.7. Length frequency distribution for salmon in the River Duag, July 2008 (n = 20).**

### *4.1.3 The River Glory*

**Plate 4.3. The River Glory at South Chapelizod Bridge.**

The River Glory (Plate 4.3) rises north-east of Windgap Village, Co. Kilkenny, approximately 24 kilometres south of Kilkenny City. It is a small tributary of the King's River, with which it joins one kilometre west of Kells, Co. Kilkenny. The survey site was located downstream of South Chapelizod Bridge, approximately eight kilometres south-east of Callan, Co. Kilkenny (Fig. 4.8). An electric fishing survey was conducted along a 90m stretch of river channel on the 16$^{th}$ of July 2008 using two bank based electric fishing units (three fishings). The mean width and depth of the site were 7.4m and 0.37m respectively, with a total wetted area sampled of 666.0m$^2$. There was minimal instream vegetation cover over a substrate that consisted mostly of cobble and gravel, with some sand and mud. Deciduous canopy cover along one bank provided heavy shading over the site, with the opposite bank consisting of pasture. The habitat in the site consisted of an even mixture of riffle, glide and pool. Long swathes of *Ranunculus penicillatus* occupied the middle of the channel along with *Potamogeton crispus*, while emergent species

such as *Oenanthe crocata* and *Apium nodiflorum* were dotted along the banks. *Fontinalis antipyretica* and *Rhynchostegium riparioides* were the only instream bryophytes encountered.


**Fig. 4.8. Location of the River Glory surveillance monitoring site**

Six fish species were recorded in the River Glory (Table 4.3). The most abundant species present was brown trout, followed by salmon.

**Table 4.3. Density of fish (no./m$^2$) in the River Glory site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0300 | 0.2207 | 0.2508 |
| *Salmo salar* | Salmon | 0.0225 | 0.0420 | 0.0646 |
| *Barbatula barbatula* | Stone loach | - | - | 0.0225 |
| *Lampetra* spp. | Lamprey | - | - | 0.0225 |
| *Anguilla anguilla* | Eel | - | - | 0.0075 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0075 |
| **All fish** | **All fish** | **-** | **-** | **0.3784** |

Brown trout ranged in length from 5.1cm to 31.0cm (Fig. 4.9). Scale and length frequency analyses revealed that 1+ was the dominant age class in the brown trout population at the site, accounting for approximately 67% of the fish, this was followed by 2+ (18%), 0+ (12%) and 3+ (3%). The largest brown trout recorded at the site measured 31.0cm in length and 319.5g in weight. Mean brown trout L1, L2 and L3 were 7.4cm, 15.3cm and 17.0cm respectively (Appendix 1). Brown trout in the Glory River site were classified as slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

Salmon ranged in length from 4.1cm to 13.0cm (Fig. 4.10). Mean salmon length at L1 was 6.3cm (Appendix 2). Scale and length frequency analysis indicate that the 0+ and 1+ fish account for approximately 35% and 65% of the juvenile salmon population respectively. The largest salmon recorded at the site was a 1+ fish measuring 13.0cm in length and 31.0g in weight.

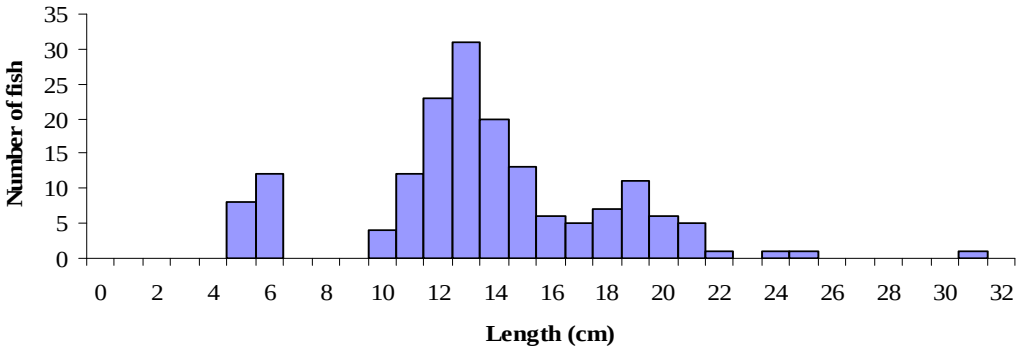


**Fig. 4.9. Length frequency distribution for brown trout in the River Glory, July 2008 (n = 167).**

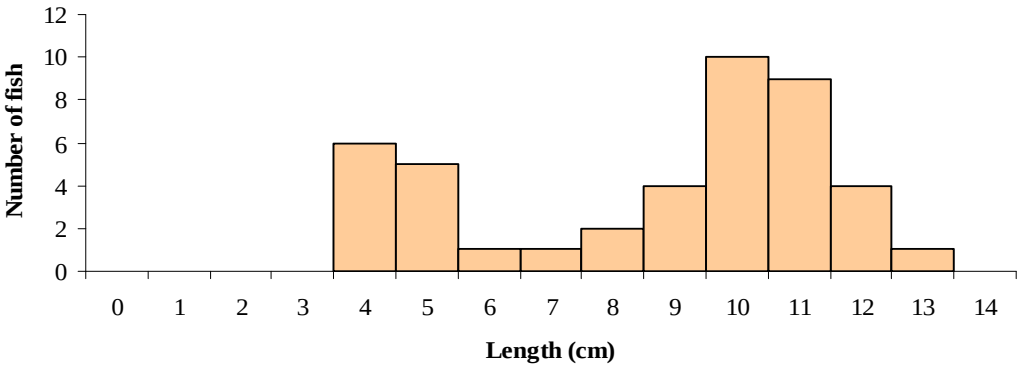


**Fig. 4.10. Length frequency distribution for salmon in the River Glory, July 2008 (n = 43).**

### *4.1.4 The River Nier*

**Plate 4.4. The River Nier at Ballymacarbry Bridge**

The River Nier (Plate 4.4) rises in the Comeragh Mountains in Co. Waterford and flows westwards into the River Suir near Newcastle, Co. Tipperary. The Nier holds good stocks of brown trout for angling (O'Reilly, 2002). An electric fishing survey was conducted along a 45m stretch of river channel upstream of Ballymacarbry Bridge (Fig. 4.11) on the 3rd of October 2008. Four bank based electric fishing units were used to conduct three fishings. The site had a mean width of 15.6m and a mean depth of 0.31m. The total wetted area sampled was 702.0m$^2$. The land adjacent to the site consisted of pasture on both banks with very little shade provided by sparsely distributed riparian trees. There was little instream vegetation cover over a substrate of mostly cobble and gravel, with some sand and boulders. The habitat in the site consisted of a mixture of riffle, glide and pool.

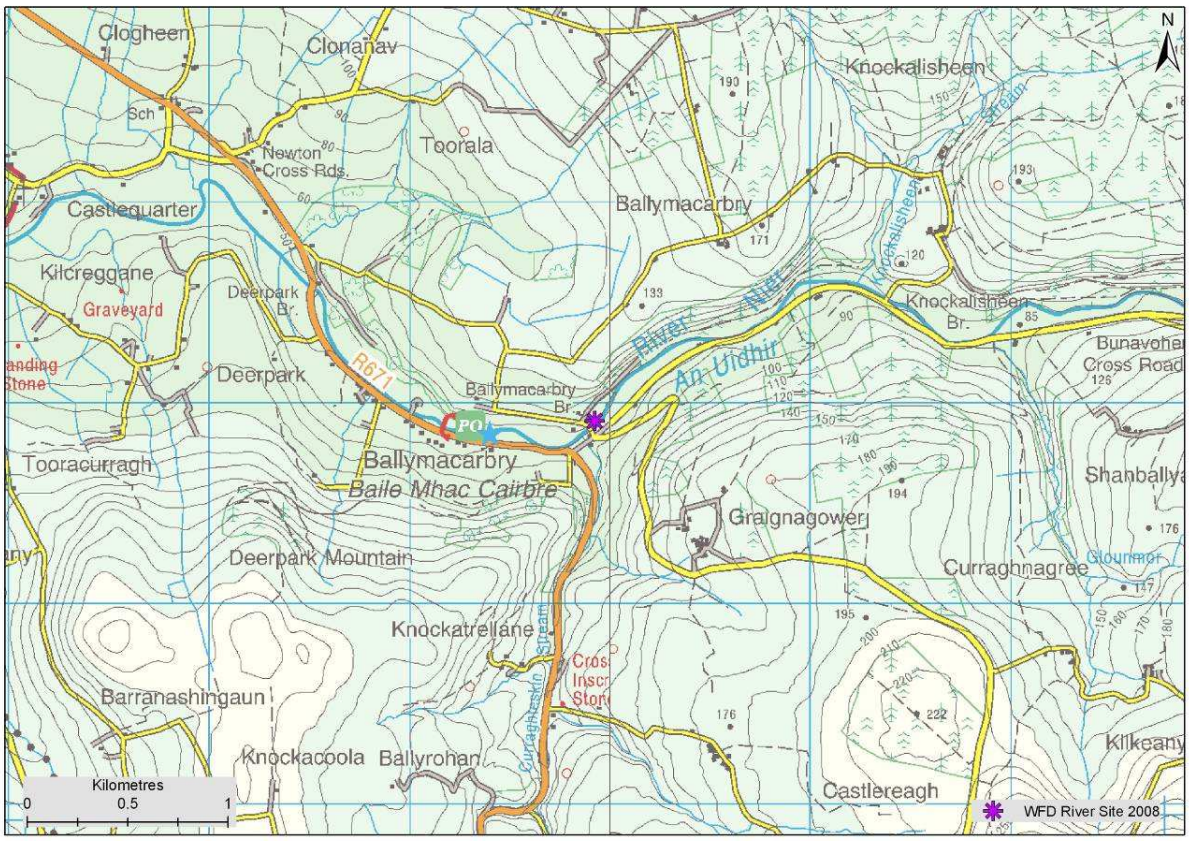


**Fig. 4.11. Location of the River Nier surveillance monitoring site**

Three fish species were recorded on the River Nier site(Table 4.4). The most abundant fish species was salmon, followed by brown trout and eel.

**Table 4.4. Density of fish (no./m$^2$) in the River Nier site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo salar* | Salmon | 0.3362 | 0.3205 | 0.6567 |
| *Salmo trutta* | Brown trout | 0.0185 | 0.0356 | 0.0541 |
| *Anguilla anguilla* | Eel | - | - | 0.0185 |
| **All fish** | **All fish** | **-** | **-** | **0.7293** |

Salmon in the River Nier ranged in length from 3.2cm to 12.9cm (Fig. 4.12). Scale and length frequency analysis showed that 0+, 1+ and 2+ fish accounted for approximately 51%, 48% and 1% of the juvenile salmon population respectively at the site. The mean L1 and L2 of salmon in the Nier were 4.4cm and 8.9cm respectively (Appendix 2).

Brown trout were much less abundant than salmon, although more age classes were present. Brown trout ranged in length from 6.6cm to 24.3cm (Fig. 4.13). Length frequency and scale analysis indicate that 0+, 1+, 2+ and 3+ fish were present at the site and accounted for approximately 34%, 50%, 13% and 3% of the brown trout population respectively. The mean L1, L2 and L3 of brown trout in the River Nier were 5.9cm, 14.7cm and 20.5cm respectively (Appendix 1). Brown trout in the River Nier were classified as slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

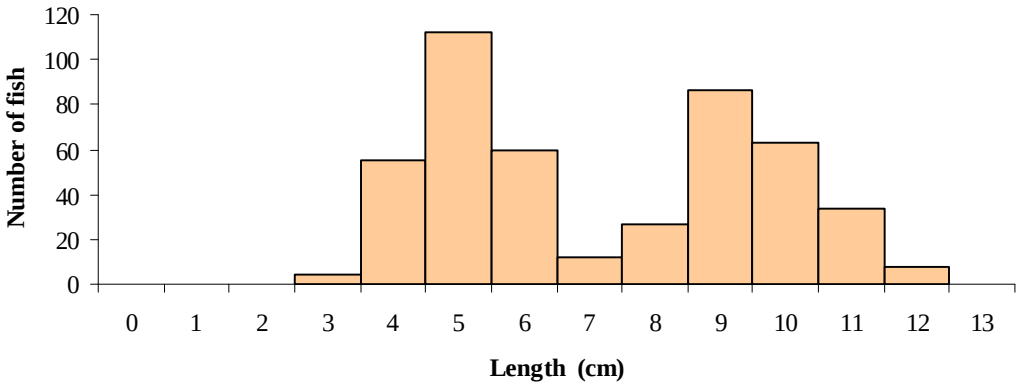


**Fig. 4.12. Length frequency distribution for salmon in the Nier River, October 2008 (n = 461).**

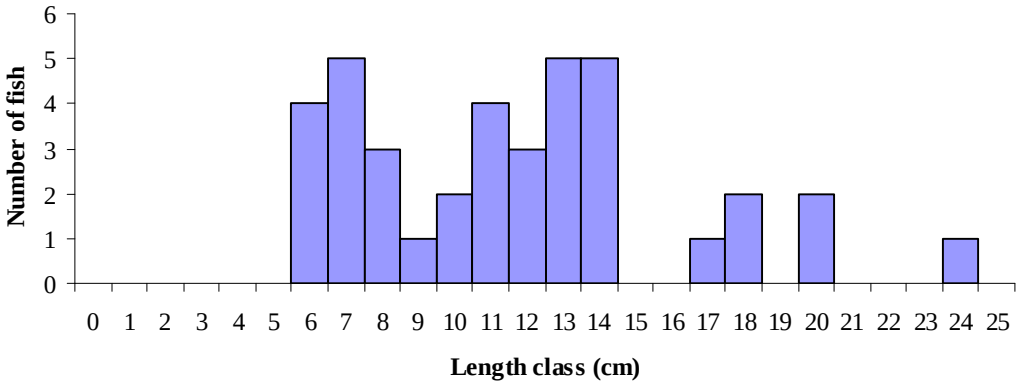


**Fig. 4.13. Length frequency distribution for brown trout in the Nier River, October 2008 (n = 38).**

### *4.1.5 The Nuenna River*

**Plate 4.5. The Nuenna River just outside Clonmantagh**

The Nuenna River (Plate 4.5) rises at the base of the Slieveardagh Hills and flows eastwards to join the River Nore a few kilometres outside of Freshford, Co. Kilkenny. The site was located downstream of the bridge just outside Clomantagh, approximately five kilometres south-west of Freshford (Fig. 4.14). An electric fishing survey was conducted over a 70m stretch of river channel on the 17th of July 2008. Two bank based electric fishing units were used to conduct three fishings. The site had a mean width of 5.2m and a mean depth of 0.31m. Deciduous trees along the banks caused heavy shading at the site. The adjoining fields were used for both tillage and pasture. Instream vegetation covered about 23% of the substrate, which consisted of approximately 50% sand, with some boulders, cobble, gravel and mud. There was a variety of different plant species present, with *Ranunculus* sp. being the most abundant. Bryophyte vegetation consisted of *Amblystegium riparium* and *Fontinalis antipyretica,* and emergent species included *Mentha aquatica* and *Apium nodiflorum*. Two species of floating weeds were also recorded, *Lemna minor and Lemna trisulca*. Prior to the survey, some bankside vegetation had been

removed immediately upstream of the bridge, which may have accounted for the large proportion of sand present in the stretch. The habitat at the site was an even mixture of riffle, glide and pool.

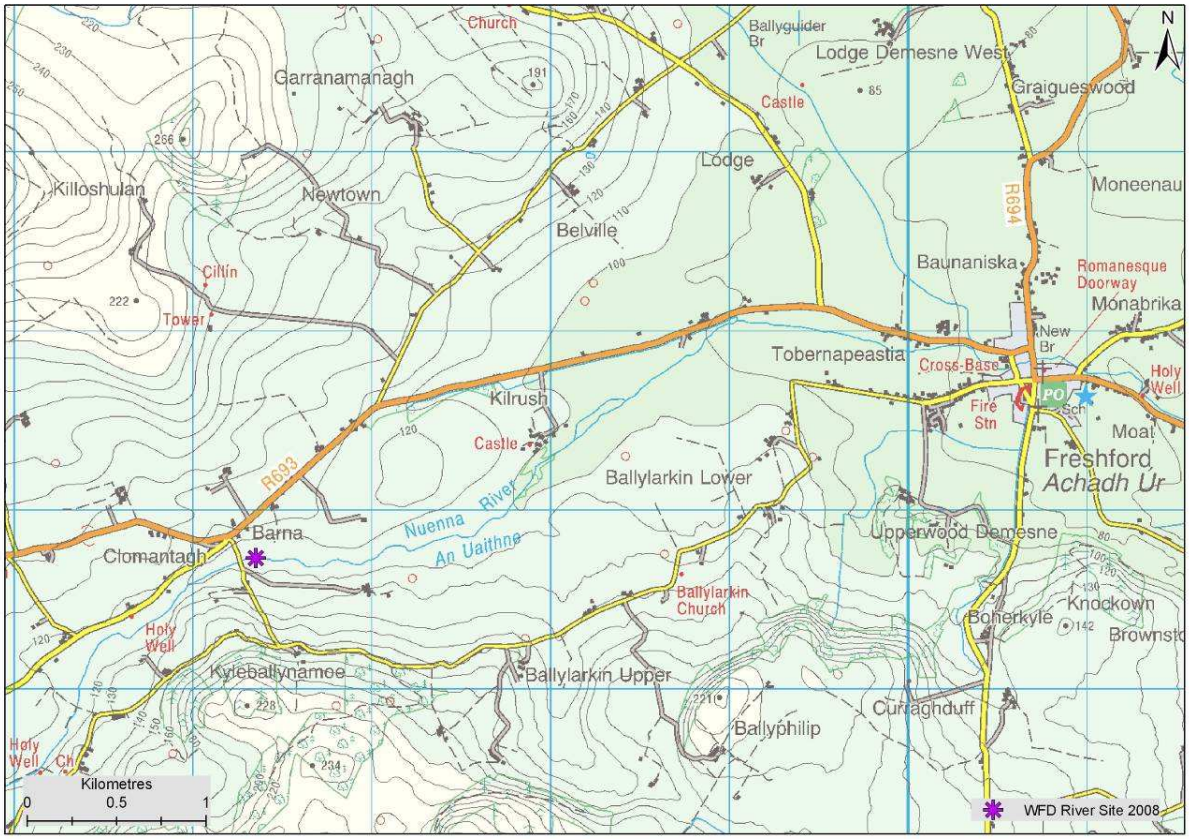


**Fig. 4.14. Location of the Nuenna River surveillance monitoring site**

The fish fauna in the Nuenna River consisted almost entirely of brown trout, with only a single 3-spined stickleback captured. Table 4.1 below shows the densities of each species captured per square metre.

**Table 4.5. Density of fish (no./m$^2$) in the Nuenna site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0359 | 0.1134 | 0.1492 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0028 |
| **All fish** | **All fish** | **-** | **-** | **0.1520** |

Brown trout ranged in length from 4.5cm to 25.2cm (Fig. 4.15). The largest brown trout captured at the site was a 2+ fish measuring 25.2cm in length and 189.5g in weight. Length frequency and scale analysis indicated that 0+, 1+, 2+ and 3+ fish accounted for approximately 24%, 26%, 43% and 7% of the brown trout population respectively. The mean L1, L2 and L3 of brown trout were 6.9cm, 12.9cm and 15.2cm respectively (Appendix 1). Brown trout in the Nuenna River were classified as very slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

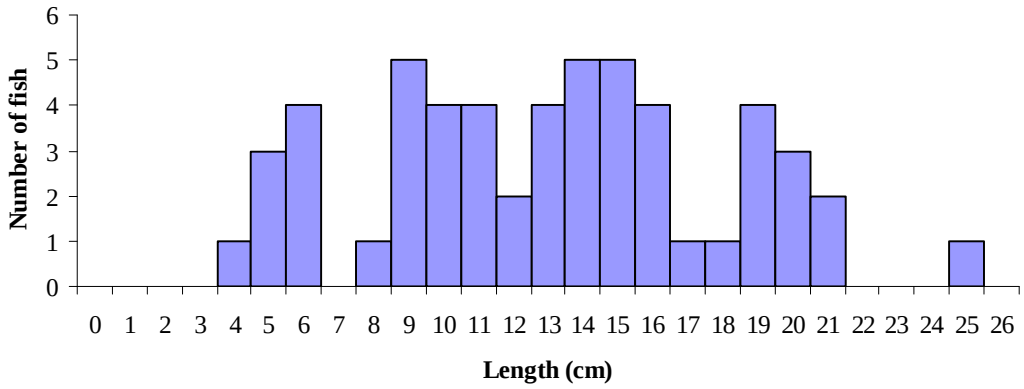


**Fig. 4.15. Length frequency distribution for brown trout in the Nuenna River, July 2008 (n = 54).**

## 4.2 Boat sites

### *4.2.1 The Anner River*

**Plate 4.6. The Anner River at Drummon Bridge**

The Anner River (Plate 4.6) rises in south Tipperary near the village of Drangan and flows south-west along its 34 kilometre course until it meets the River Suir approximately four kilometres south of Clonmel, Co. Tipperary. The site was located downstream of Drummon Bridge, about 11 kilometres east of Fethard, Co. Tipperary (Fig. 4.16). An electric fishing survey was conducted along a 200m stretch of river channel on the 18$^{th}$ of September 2008. The site was surveyed using two boat based electric fishing units and three fishings were conducted. The site had a mean width of 8.8m and a mean depth of 0.47m. The total wetted area sampled was 1,760.0m$^2$. The land-use on either side of the site was pasture, with some light shading being provided to the river channel by riparian trees. Some instream vegetation was present and covered a substrate of mostly cobble and gravel, with some sand and silt. The dominant habitat in the site was glide, with some riffle and a small amount of pool.

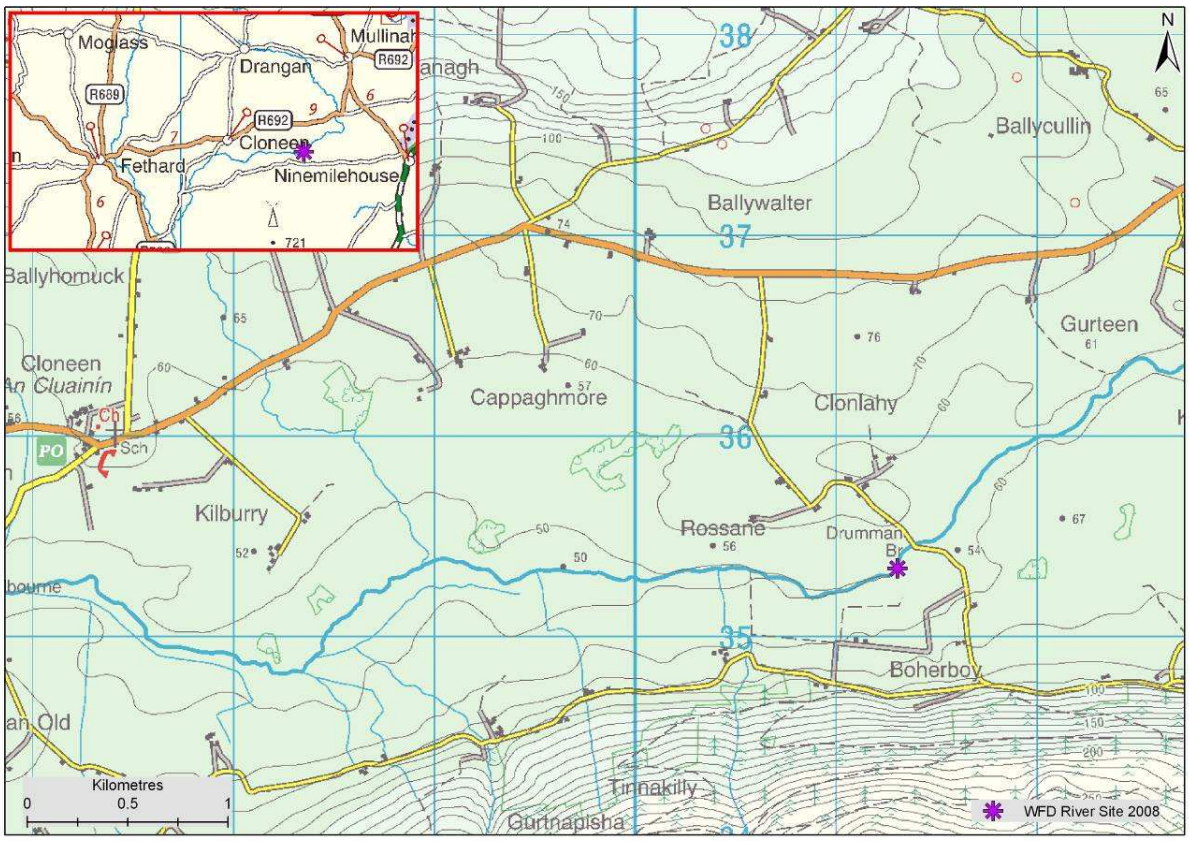


**Fig. 4.16. Location of the Anner River surveillance monitoring site**

Five fish species were recorded in the Anner River (Table 4.6). The most abundant species was brown trout, followed by salmon.

**Table 4.6. Density of fish (no./m$^2$) in the Anner site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0165 | 0.1165 | 0.1335 |
| *Salmo salar* | Salmon | 0.0318 | 0.0835 | 0.0590 |
| *Anguilla anguilla* | Eel | - | - | 0.0030 |
| *Lampetra* spp. | Lamprey | - | - | 0.0023 |
| *Barbatula barbatula* | Stone loach | - | - | 0.0017 |
| **All fish** | **All fish** | **-** | **-** | **0.2000** |

Brown trout ranged in length from 6.5cm to 35.2cm (Fig. 4.17). The largest brown trout caught measured 35.2cm in length and 556.0g in weight. Scale and length frequency analysis indicated that four age classes of brown trout were present at the site, i.e. 0+ to 3+ and 1+ and 2+ were the dominant age classes

accounting for 52% and 31% of the population. Mean L1, L2 and L3 of brown trout were 7.5cm, 17.1cm and 24.9cm respectively (Appendix 1), therefore brown trout in the Anner River were classified as fast growing based on criteria described by Kennedy and Fitzmaurice (1971).

Salmon ranged in length from 5.6cm to 16.4cm (Fig. 4.18). The largest salmon recorded at the site was a 1+ fish measuring 16.4cm in length and 57.0g in weight. Two age classes were present at the site, i.e. 1+ and 2+, with 1+ being the dominant age class (54%).

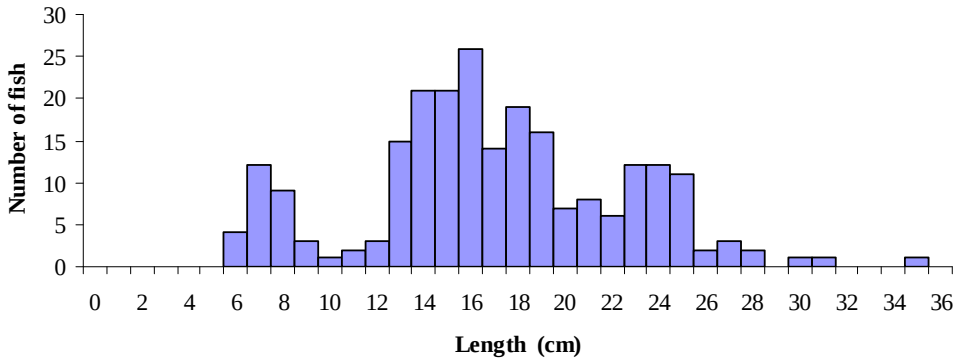


**Fig. 4.17. Length frequency distribution for brown trout in the Anner River, September 2008 (n = 235).**

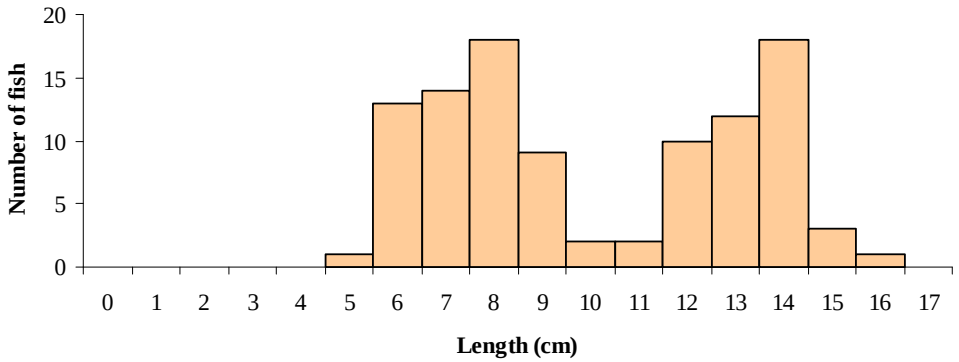


**Fig. 4.18. Length frequency distribution for salmon in the Anner River September 2008 (n = 104).**

### *4.2.2 The Colligan River*

**Plate 4.7. The Colligan River at Kildangan Bridge**

The Colligan River (Plate 4.7) rises in the Monavullagh Mountains in Co. Waterford and flows southwards to join the sea at Dungarvan Harbour (Fig. 4.19). The Colligan is a fast flowing spate river that provides excellent angling for both salmon and sea trout, particularly the latter, during good conditions (O'Reilly, 2002). The survey site was located upstream of Kildangan Bridge approximately four kilometres north-west of Dungarvan (Fig. 4.19). An electric fishing survey was conducted along a 220m stretch of river channel on the 30$^{th}$ of September 2008; two boat based electric fishing units were used to conduct three fishings. The mean channel width and depth of the site were 11.2m and 0.49m respectively, with a total wetted area sampled of 2,464.0m$^2$. The land on either side of the site was used for pasture, with some trees along the banks providing medium shading over the river channel. Some instream vegetation was present, with cobble dominating the substrate. The main habitat types present at the site were riffle and glide.

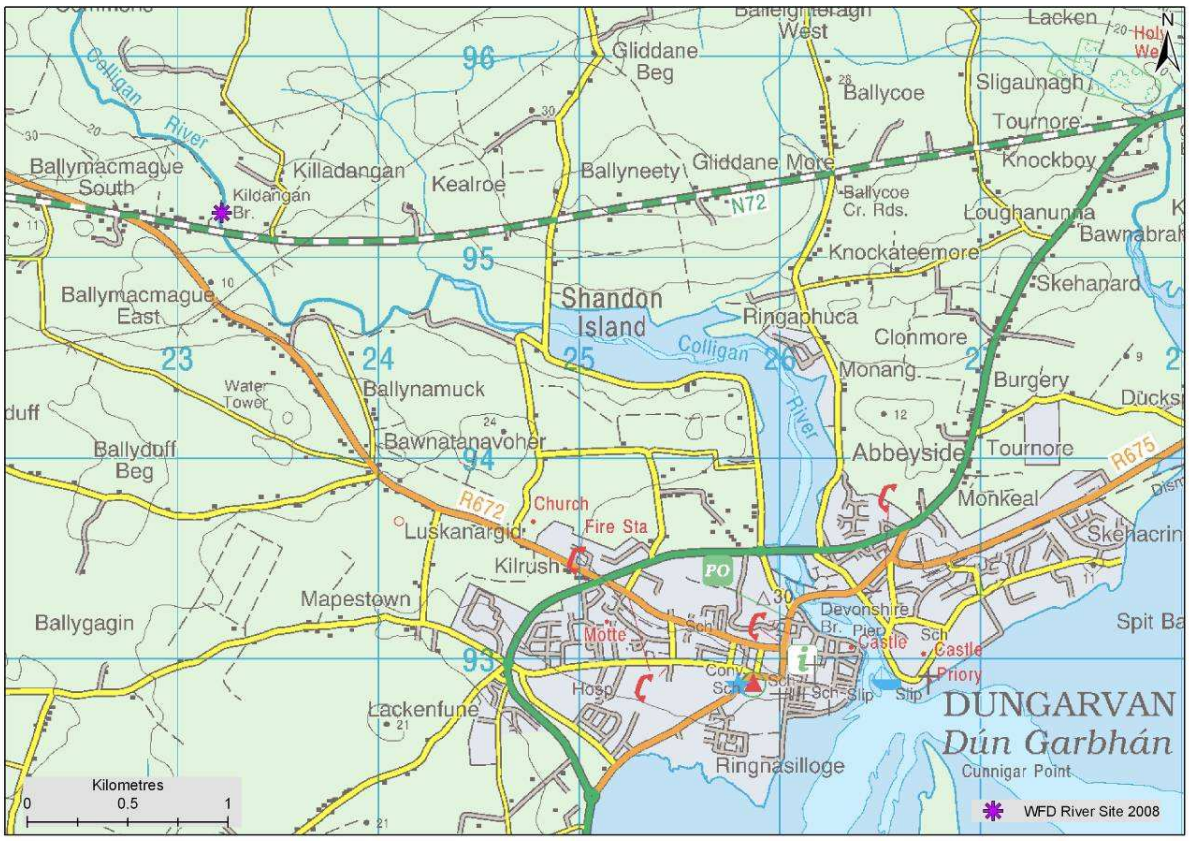


**Fig. 4.19. Location of the Colligan River surveillance monitoring site**

Six fish species were recorded in the Colligan River. The most abundant species was salmon, followed by brown trout. Sea trout were also present and have been listed as a separate variety of trout in this report.

**Table 4.7. Density of fish (no./m$^2$) in the Colligan site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo salar* | Salmon | 0.0235 | 0.0308 | 0.0544 |
| *Salmo trutta* | Brown trout | 0.0037 | 0.0138 | 0.0175 |
| *Anguilla anguilla* | Eel | - | - | 0.0033 |
| *Salmo trutta* | Sea trout | - | - | 0.0028 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0008 |
| *Platichthys flesus* | Flounder | - | - | 0.0004 |
| *Lampetra* spp. | Lamprey | - | - | 0.0004 |
| **All fish** | **All fish** | **-** | **-** | **0.0796** |

Salmon ranged in length from 4.5cm to 49.0cm (Fig. 4.20). The largest salmon captured at the site was a 3-year old individual returning from the sea, measuring 49.0cm in length and weighing 970.0g. Length frequency and scale analysis indicate that 0+, 1+ and 2+ fish account for approximately 44%, 56% and 1% of the juvenile salmon population respectively at the site. Mean L1, L2 and L3 of salmon were 5.1cm, 9.2cm and 36.8cm respectively (Appendix 2).

Brown trout ranged in length from 6.0cm to 20.7cm (Fig. 4.21). The largest brown trout recorded at the site was a 2+ fish measuring 20.7cm in length and 106.0g in weight. Data analysis revealed that three age classes of brown trout were present at the site (0+ - 21%, 1+ - 58% and 2+ (21%). Mean L1 and L2 of brown trout were 7.0 cm and 13.6cm respectively (Appendix 1). Brown trout in the Colligan River were classified as slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

The Colligan River was one of only two rivers in the SRFB in which sea trout were captured. The seven sea trout recorded ranged in length from 27.1cm to 45.1cm and were either two or three years old. The mean L1, L2, and L3 of sea trout were 7.8cm, 15.5cm and 25.7cm respectively (Appendix 3).

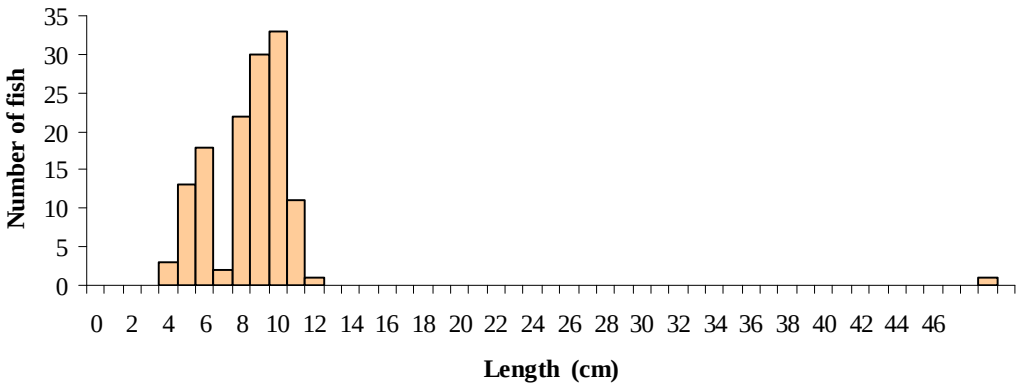


**Fig. 4.20. Length frequency distribution for salmon in the Colligan River, September 2008 (n = 134).**

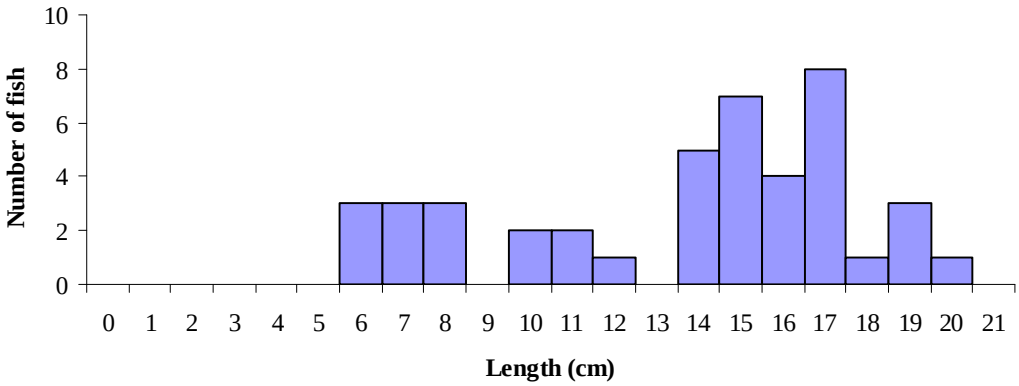


**Fig. 4.21. Length frequency distribution for brown trout in the Colligan River, September 2008 (n = 43).**

### *4.2.3 The River Mahon*

**Plate 4.8. The River Mahon approximately 3km north-east of Bunmahon**

The River Mahon (Plate 4.8) rises a short distance above the Mahon Falls in the Comeragh Mountains in Co. Waterford. It flows south-east through Kilmacthomas before reaching the sea in Bunmahon Bay (Fig. 4.22). The survey site was located downstream of the waterworks, approximately three kilometres north-east of Bunmahon (Fig. 4.22). An electric fishing survey was conducted over a 180m stretch of river channel on the 29$^{th}$ of September 2008. One boat based electric fishing unit was used to conduct three fishings. The site had a mean width of 10.2m and a mean depth of 0.48m, with a total wetted area sampled of 1,836.0m$^2$. The land adjacent to the site was used mainly for pasture and tillage. There was some shading of the river channel by trees along the banks. Heavy instream vegetation covered a substrate dominated by cobble and gravel. Glide and riffle were the dominant habitat types within the site.

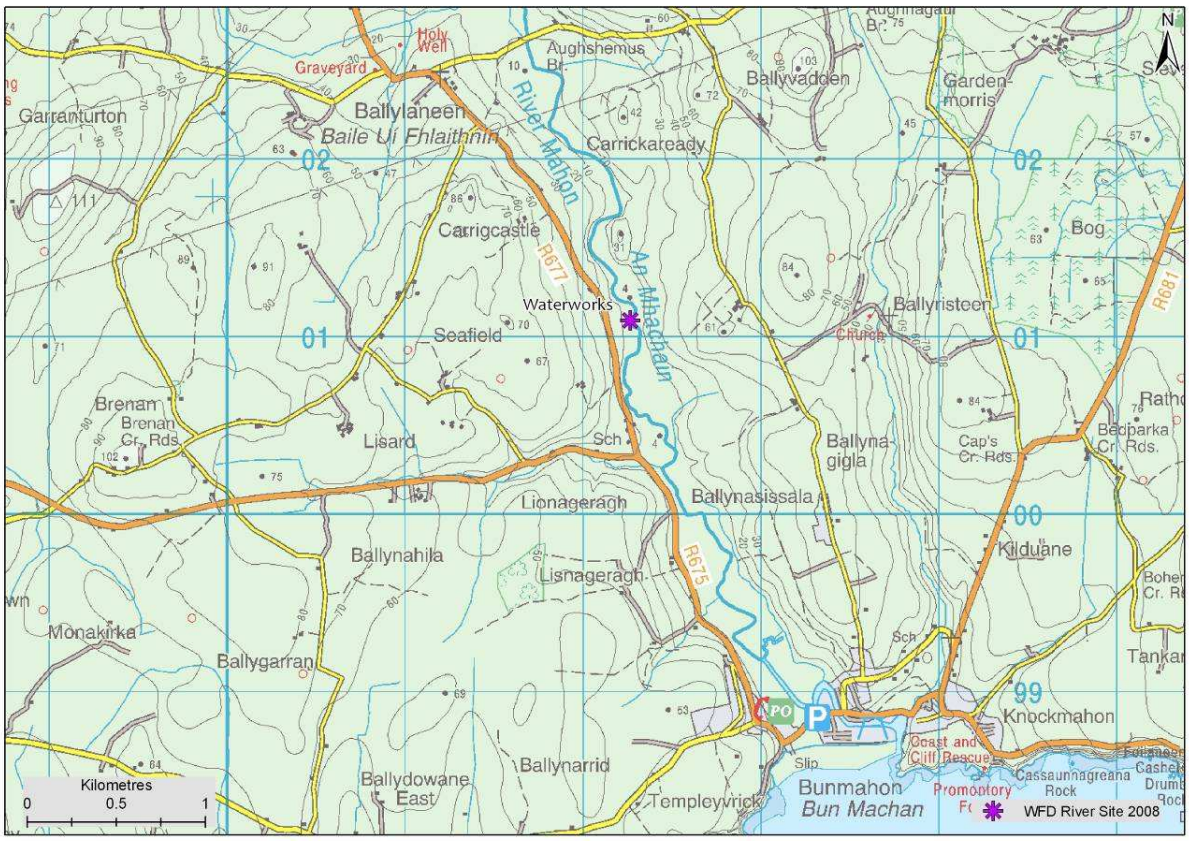


**Fig. 4.22. Location of the River Mahon surveillance monitoring site**

Four fish species were recorded in the River Mahon. The most abundant fish species was salmon, followed by brown trout. Sea trout were also present and have been listed as a separate variety of trout in this report.

**Table 4.8. Density of fish (no./m$^2$) in the River Mahon site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo salar* | Salmon | 0.0011 | 0.0082 | 0.0191 |
| *Salmo trutta* | Brown trout | 0.0014 | 0.0076 | 0.0093 |
| *Platichthys flesus* | Flounder | - | - | 0.0076 |
| *Salmo trutta* | Sea trout | - | - | 0.0055 |
| *Anguilla anguilla* | Eel | - | - | 0.0022 |
| **All fish** | **All fish** | **-** | **-** | **0.0436** |

Salmon ranged in length from 5.5cm to 13.9cm (Fig. 4.23). The largest salmon recorded was a 1+ fish measuring 13.9cm in length and 32.0g in weight. Scale and length frequency analysis indicate that two

age classes of salmon were present at the site, i.e. 0+ and 1+ and these accounted for approximately 60% and 40% of the juvenile salmon population respectively. Mean L1 of salmon was 5.45cm (Appendix 2).

Brown trout ranged in length from 6.2cm to 33.0cm (Fig. 4.24). The largest brown trout recorded at the site measured 33.0cm in length and 272.0g in weight. The data indicates that 0+, 1+ and 2+ fish accounted for approximately 12%, 41% and 47% of the brown trout population respectively. The mean L1 and L2 of brown trout were 7.7cm and 13.2cm respectively (Appendix 1). Brown trout in the River Mahon were classified as slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

The River Mahon was one of only two rivers in the SRFB in which sea trout were captured. The ten sea trout recorded ranged from 12.0cm to 45.8cm in length (Fig. 4.25), and their ages ranged from one to four years old. The largest sea trout was a 4-year old fish measuring 45.8cm in length and 1.08kg in weight. The mean L1, L2, L3 and L4 of sea trout were 9.1cm, 16.6cm, 26.5cm and 42.1cm respectively (Appendix 3).

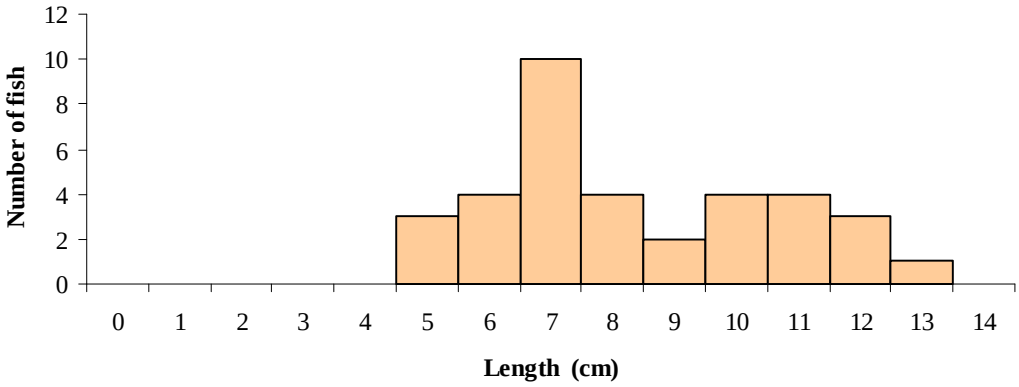


**Fig. 4.23. Length frequency distribution for salmon in the River Mahon, September 2008 (n = 35).**

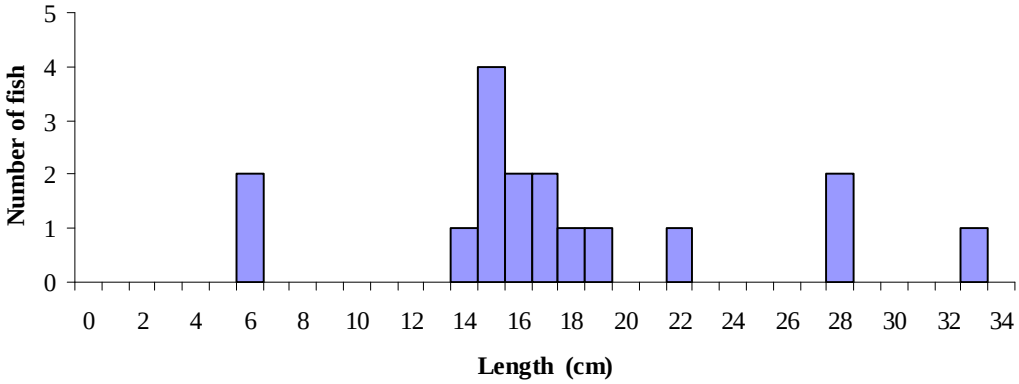

**Fig. 4.24. Length frequency distribution for brown trout in the River Mahon, September 2008 (n = 17).**

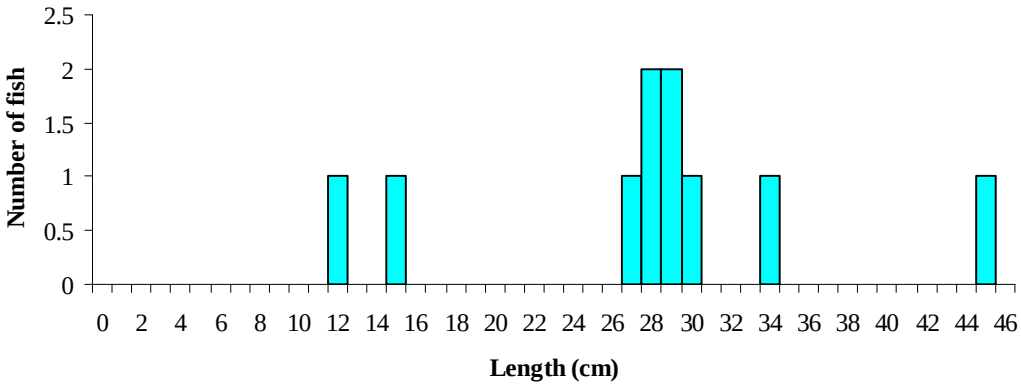


**Fig. 4.25. Length frequency distribution for sea trout in the River Mahon, September 2008 (n = 14).**

### *4.2.4 The Multeen River*

**Plate 4.9. The Multeen River at Ballygriffin Bridge**

The Multeen River (Plate 4.9) rises in the foothills of the Slieve Felim Mountains in Co. Tipperary and passes through the Golden Vale before joining the River Suir. The Multeen holds good stocks of brown trout for angling (O'Reilly, 2002). The survey site was located downstream of Ballygriffin Bridge, approximately two kilometres north of Golden in Co. Tipperary (Fig. 4.26). An electric fishing survey was conducted along a 150m stretch of river channel on the 19$^{th}$ of September 2008. Two boat based electric fishing units were used to conduct three fishings. The site had a mean width of 14.0m and a mean depth of 0.48m. The total wetted area sampled was 2,100.0m$^2$. Landuse adjacent to the site consisted of pasture, with trees along the banks providing moderate shading to the river channel. There was dense instream vegetation covering a substrate dominated by gravel, with some cobble. Glide was the dominant habitat in the site, with some riffle and a small amount of pool also present.

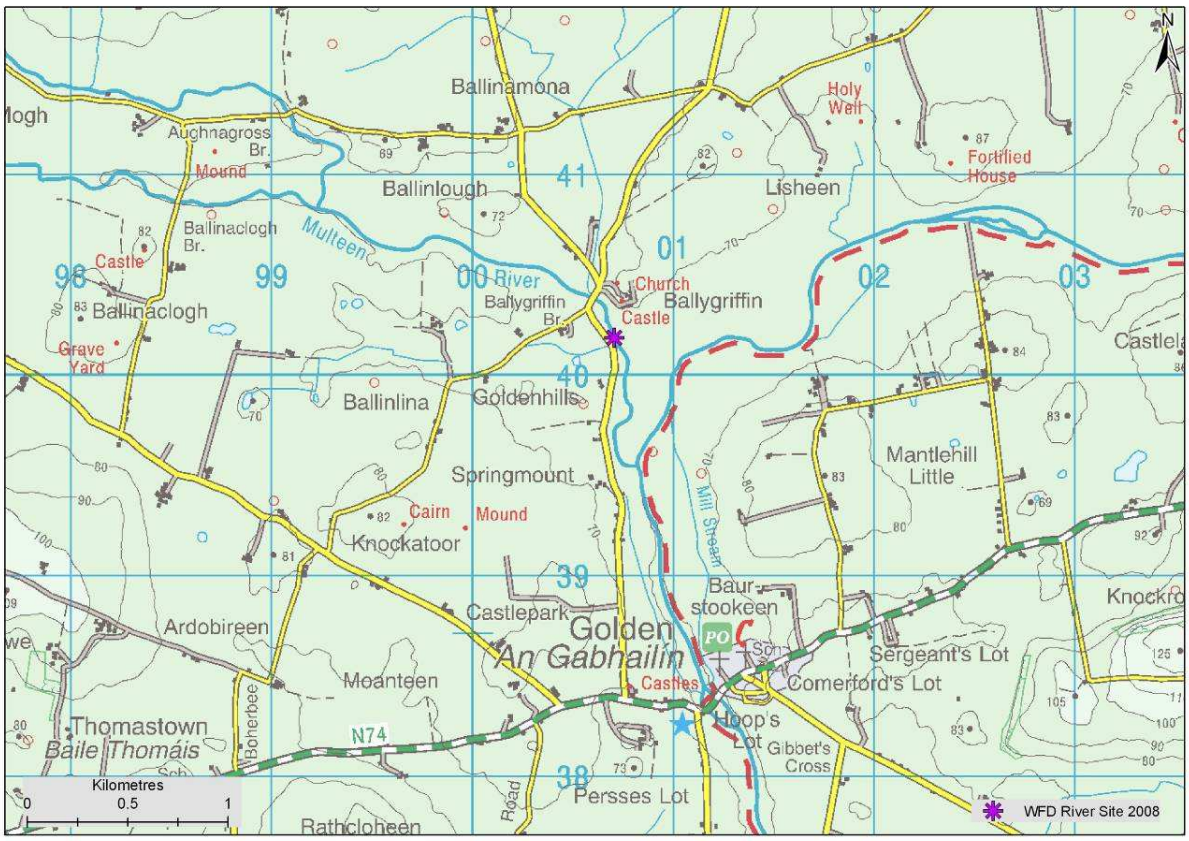


**Fig. 4.26. Location of the Multeen River surveillance monitoring site**

Four fish species were recorded in the Multeen River (Table 4.9). The most abundant fish species was salmon, followed by brown trout. Stone loach and juvenile lamprey were also present.

**Table 4.9. Density of fish (no./m$^2$) in the Multeen site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo salar* | Salmon | 0.0119 | 0.0419 | 0.0538 |
| *Salmo trutta* | Brown trout | 0.0005 | 0.0362 | 0.0367 |
| *Barbatula barbatula* | Stone loach | - | - | 0.0014 |
| *Lampetra* spp. | Lamprey | - | - | 0.0005 |
| **All fish** | **All fish** | **-** | **-** | **0.0924** |

Salmon ranged in length from 5.0cm to 14.6cm (Fig. 4.27). Length frequency and age analysis indicate that two age classes of salmon (0+ and 1+) were present at the site. These data also indicate that 0+ and

1+ fish accounted for approximately 21% and 79% of the juvenile salmon population respectively. The largest salmon recorded was a 1+ fish measuring 14.6cm in length and 40.0g in weight. The mean L1 of salmon was 5.2cm (Appendix 2).

Brown trout ranged in length from 6.5cm to 32.1cm (Fig. 4.28). The largest brown trout recorded was a 3+ fish measuring 32.1cm in length and 152.0g in weight. Four age classes (0+ to 3+) were present in the brown trout population at the site. 1+ was the dominant age class at the site accounting for approximately 70% of the population. The mean L1, L2 and L3 of brown trout were 7.0cm, 15.5cm and 28.8cm respectively, therefore brown trout in the Multeen River were classified as fast growing based on criteria described by Kennedy and Fitzmaurice (1971).

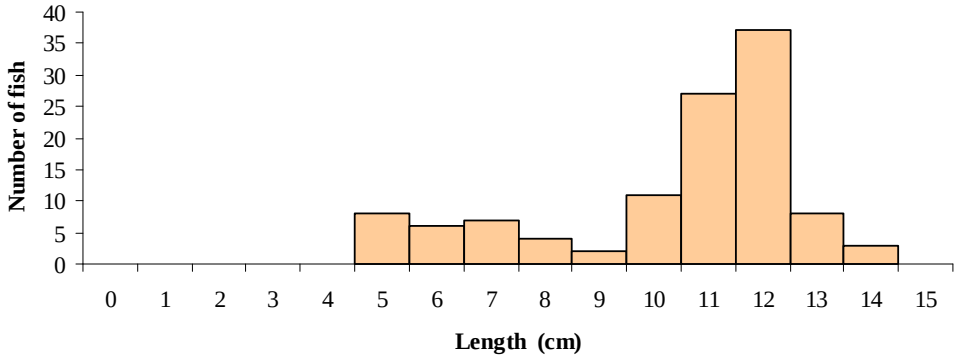


**Fig. 4.27. Length frequency distribution for salmon in the Multeen River, Sept 2008 (n=113).**

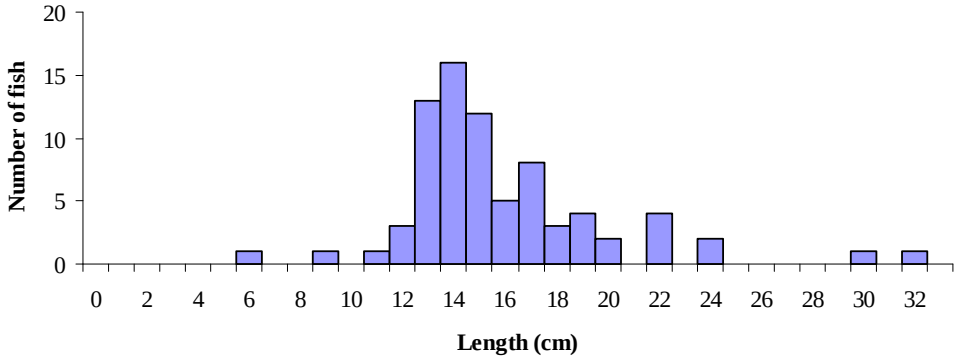


**Fig. 4.28. Length frequency distribution for brown trout in the Multeen River, Sept 2008 (n=77).**

### *4.2.5 The River Nore (Quaker's Bridge)*

**Plate 4.10. The River Nore at Quaker's Bridge**

The River Nore (Plate 4.10) rises in north Tipperary and flows in a south-easterly direction into Co. Laois and Co. Kilkenny. It eventually joins with the River Barrow just north of New Ross, Co. Wexford, before entering the sea at Waterford Harbour. The underlying geology is mostly calcareous limestone, with areas of sandstone, granite and other siliceous rock in places. The River Nore holds good stocks of brown trout for angling in some areas, and is characterised by long, deep, slow stretches downstream from weirs along with prolific fly hatches (SRFB, 2006a). Although the Nore is a good trout fishery, it has declined as a salmon fishery in recent years, with uncertain grilse and autumn runs (O'Reilly, 2002). The best of the salmon fishing extends as far upstream as the confluence with the River Dinin, Co. Kilkenny (O'Reilly, 2002). The River Nore forms part of the River Barrow and River Nore SAC, designated to protect several Annex I habitats and Annex II species, including lamprey, twaite shad, salmon, freshwater pearl mussel and crayfish (National Parks and Wildlife Service, 2003).

The survey site was located downstream of Quakers' Bridge, located on the Laois–Tipperary border approximately three kilometres south-east of Borris in Ossory, Co. Laois (Fig. 4.29). An electric fishng survey was conducted along a 200m stretch of river channel on the 5th of August 2008. Two boat based electric fishing units were used to conduct three fishings. The mean width and depth of the survey site were 7.8m and 0.96m respectively, with a total wetted area of 1,560 $m^2$ being surveyed. The area immediately around the site consisted of pasture, and there was heavy shading of one side of the river channel by bankside trees. Dense instream vegetation covered the substrate. The dominant habitat was glide.

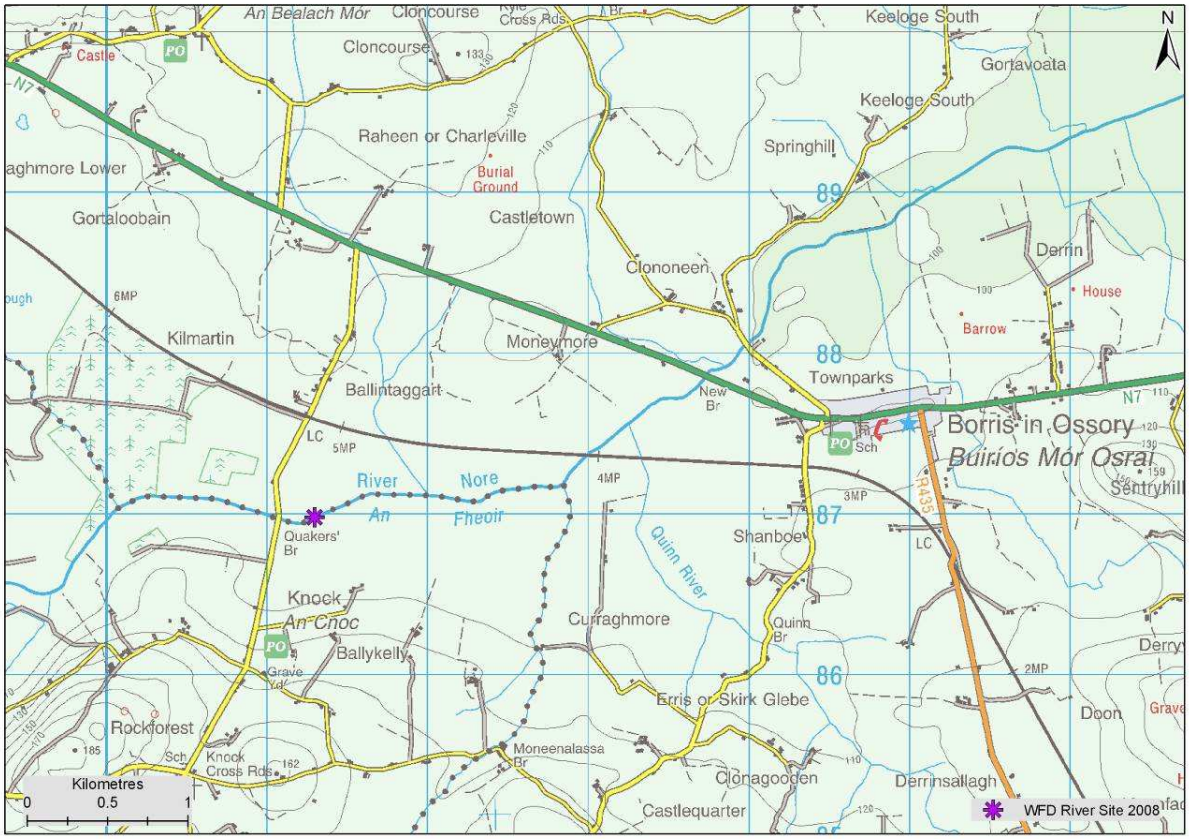


**Fig. 4.29. Location of the River Nore surveillance monitoring site**

Nine fish species were recorded in the River Nore at Quaker's Bridge (Table 4.10). Despite the high number of species recorded, the number of individual fish captured was relatively low: The most abundant species was brown trout, with the least abundant being eel.

**Table 4.10. Density of fish (no./m$^2$) in the Nore (Quakers' Br.) site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0000 | 0.0135 | 0.0135 |
| *Phoxinus phoxinus* | Minnow | - | - | 0.0109 |
| *Esox lucius* | Pike | - | - | 0.0103 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0045 |
| *Gobio gobio* | Gudgeon | - | - | 0.0026 |
| *Barbatula barbatula* | Stone loach | - | - | 0.0019 |
| *Salmo salar* | Salmon | 0.0013 | 0.0000 | 0.0013 |
| *Anguilla anguilla* | Eel | - | - | 0.0006 |
| *Lampetra* spp. | Lamprey | - | - | 0.0006 |
| **All fish** | **All fish** | **-** | **-** | **0.0462** |

Brown trout ranged in length from 11.0cm to 33.7cm (Fig. 4.30). Four age classes of brown trout were present at the site and data analysis indicate that 1+, 2+, 3+ and 4+ fish accounted for approximately 52%, 19%, 24% and 5% of the brown trout population respectively. The largest brown trout recorded was a 4+ fish measuring 33.7cm in length and 605.0g in weight was also recorded. The mean L1, L2, L3 and L4 of brown trout were 7.5cm, 16.1cm, 22.9cm and 29.5cm respectively (Appendix 1). Brown trout at this site were classified as fast growing based on criteria described by Kennedy and Fitzmaurice (1971).

The River Nore was the only river in the SRFB in which pike and minnow were captured. Pike ranged from 12.0cm to 75.1cm (Fig. 4.31), with scale analysis showing that the age classes 0+, 1+, 2+ and 4+ were present. The largest pike captured was a 4+ fish measuring 75.1cm in length and 3.64kg in weight.

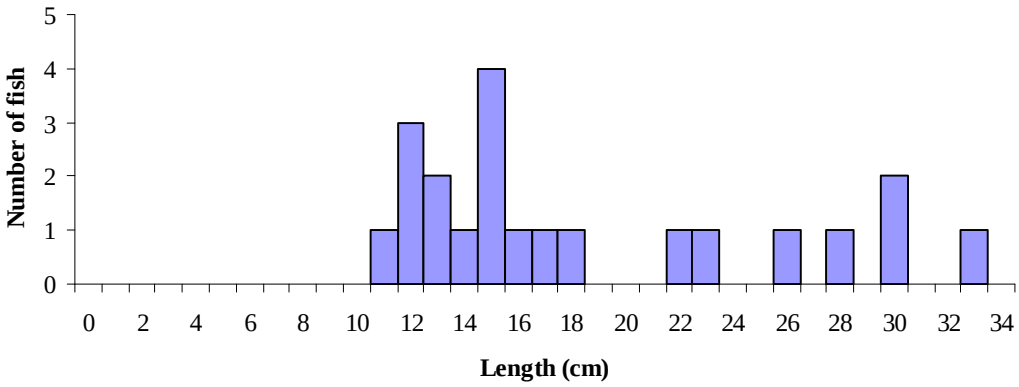


**Fig. 4.30. Length frequency distribution for brown trout in the Nore at Quakers' Br., August 2008 (n = 21).**

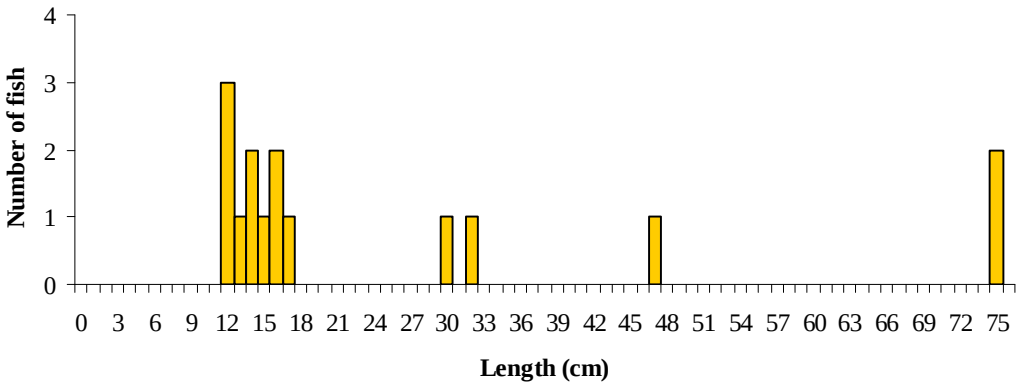


**Fig. 4.31. Length frequency distribution for pike in the Nore at Quakers' Br., August 2008 (n = 16).**

### *4.2.6 The River Suir (Knocknageragh Bridge)*

**Plate 4.11. The Suir at Knocknageragh Bridge**

The River Suir (Plate 4.11) rises in the Devilsbit Mountain in Co. Tipperary and flows in a southerly direction through Templemore, Thurles, Cahir, Clonmel and Carrick-on-Suir before joining the River Barrow and the River Nore near Cheekpoint, Co. Waterford to become one of the Three Sisters emptying into Waterford Harbour. The Suir is one of Ireland's premier brown trout fisheries, characterised by interspersed shallow or deep glides and shallow riffles, prolific fly hatches and large stocks of brown trout (SRFB, 2006b). Massive recruitment from many tributaries and a near-perfect environment in the main channel make the River Suir ideal for trout production (O'Reilly, 2002).

The survey site was located downstream of Knocknageragh Bridge just outside Templemore in Co. Tipperary (Fig. 4.32). An electric fishing survey was conducted along a 106m stretch of river channel on the 6$^{th}$ of August 2008, using one boat based electric fishing unit to conduct three fishings. The site had a mean width of 5.8m and a mean depth of 0.49m, with a total wetted area fished of 614.8m$^2$. The land

adjacent to the site comprised of tillage and urban areas. Trees along the banks provided a moderate amount of shading to the river channel. The habitat in the site consisted entirely of glide.

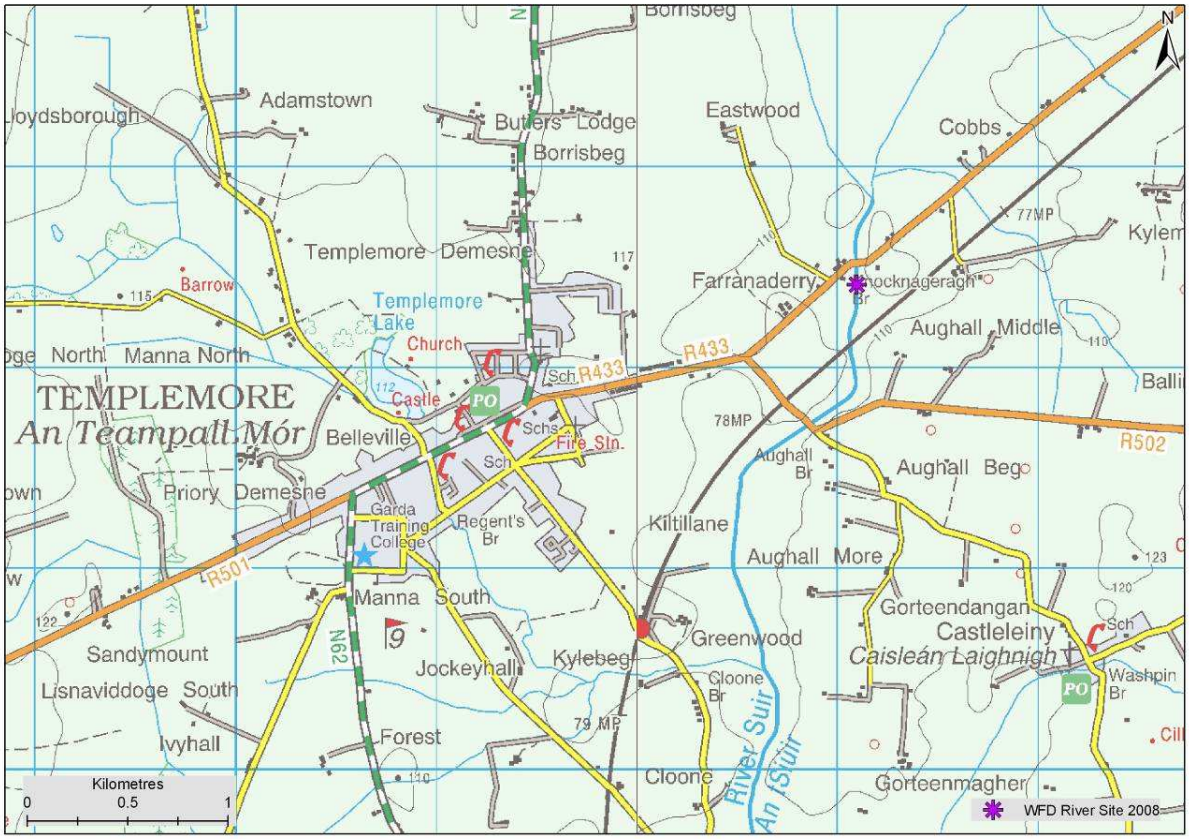


**Fig. 4.32. Location of the River Suir (Knocknageragh Br.) surveillance monitoring site**

Five fish species were captured in the River Suir at Knocknageragh Bridge (Table 4.11). The most abundant species was brown trout, followed by gudgeon.

**Table 4.11. Density of fish (no./m$^2$) in the Suir (Knocknageragh Br.) site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.0000 | 0.2554 | 0.2554 |
| *Gobio gobio* | Gudgeon | - | - | 0.0374 |
| *Barbatula barbatula* | Stone loach | - | - | 0.0098 |
| *Rutilus rutilus* | Roach | - | - | 0.0033 |
| *Salmo salar* | Salmon | 0.0000 | 0.0016 | 0.0016 |
| **All fish** | **All fish** | **-** | **-** | **0.3074** |

Brown trout ranged in length from 12.8cm to 33.8cm (Fig. 4.33). The largest brown trout recorded was a 4+ fish measuring 33.8cm in length and 414.0g in weight. Data analysis indicated that four age classes of brown trout were present at the site, of which 1+, 2+, 3+ and 4+ fish accounted for approximately 55%, 38%, 4% and 3% of the population respectively. The mean L1, L2, L3 and L4 of brown trout were 7.3cm, 16.9cm, 22.2cm and 28.9cm respectively (Appendix 1). Brown trout in the River Suir site were classified as fast growing based on criteria described by Kennedy and Fitzmaurice (1971).

Gudgeon was the second most abundant fish species recorded. They ranged in length from 8.4cm to 14.1cm (Fig. 4.34). The River Suir was the only river site in the SRFB in which roach were captured. Roach measured 15.5cm to 15.7cm in length and were aged at 3+.

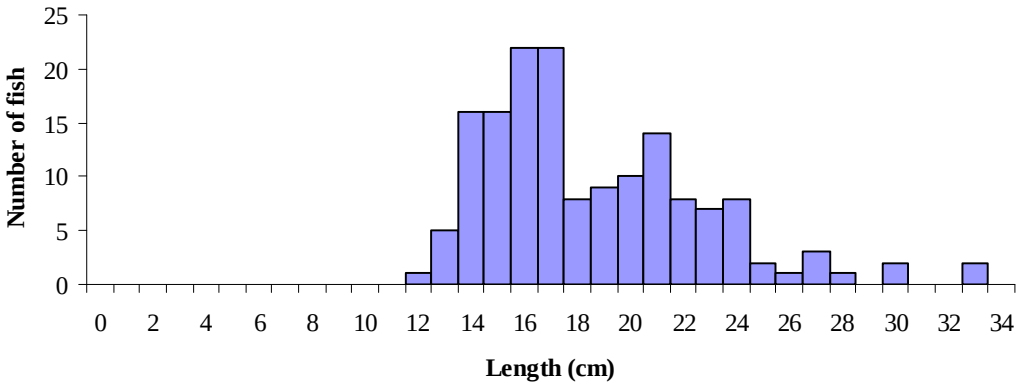


**Fig. 4.33. Length frequency distribution for brown trout in the Suir (Knocknageragh Br.) , August 2008 (n = 157).**

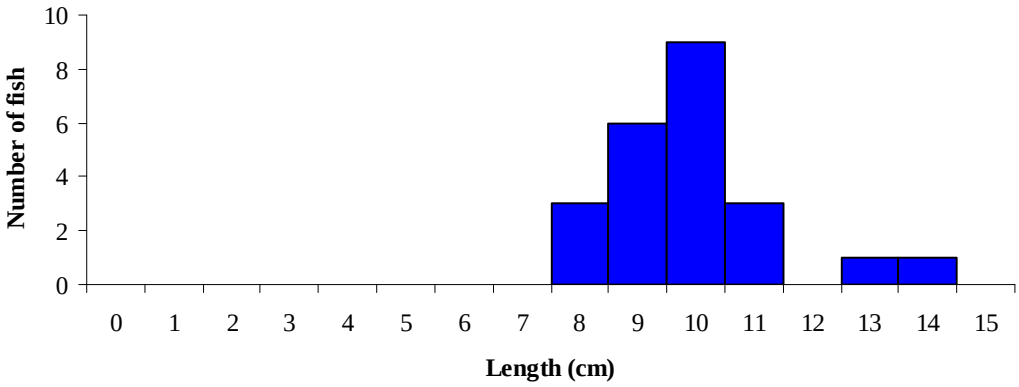


**Fig. 4.34. Length frequency distribution for gudgeon in the Suir (Knocknageragh Br.), August 2008 (n = 23).**

### *4.2.7 The Womanagh River*

**Plate 4.12. The Womanagh River**

The Womanagh River (Plate 4.12) is a small river that rises near Castlemartyr, Co. Cork. It flows westwards for approximately 14 kilometres, before reaching the sea at Youghal Bay. The survey site was located upstream of a small bridge about two kilometres north-east of Ladysbridge in Co. Cork (Fig. 4.35). An electric fishing survey was conducted along a 103m stretch of river channel on the 7$^{th}$ of August 2008, using one boat based electric fishing unit to conduct three fishings. The site had an average width and depth of 6.0m and 0.66m respectively. The total wetted area sampled was 618.0m$^2$. The site was surrounded by pasture, and trees along the bank provided a moderate amount of shading to the river channel. The stretch sampled had a deep layer, approximately 20cm to 30cm thick, of mud that was difficult to walk through and clouded up the river when disturbed. The habitat in the site consisted entirely of glide.

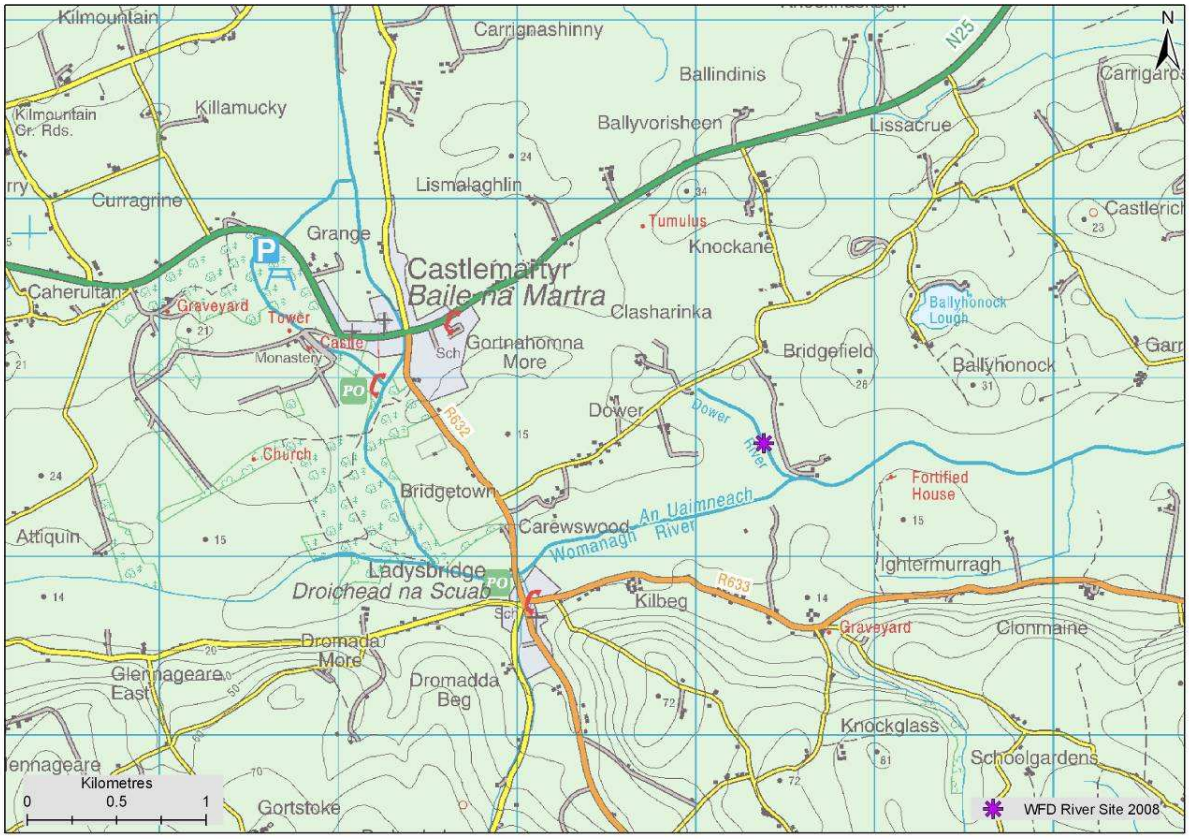


**Fig. 4.35. Location of the Womanagh River surveillance monitoring site**

Four fish species were recorded in the Womanagh River (Table 4.12). The most abundant fish species was brown trout, followed by 3-spined stickleback.

**Table 4.12. Density of fish (no./m$^2$) in the Womanagh site (fish density calculated as minimum estimates based on 3 fishings).**

| Species name | Common name | 0+ | 1+ & older | Total density |
|---|---|---|---|---|
| *Salmo trutta* | Brown trout | 0.000 | 0.0550 | 0.0550 |
| *Gasterosteus aculeatus* | 3-Spined stickleback | - | - | 0.0210 |
| *Salmo salar* | Salmon | 0.000 | 0.0065 | 0.0065 |
| *Anguilla anguilla* | Eel | - | - | 0.0049 |
| **All fish** | **All fish** | **-** | **-** | **0.0874** |

Brown trout ranged in length from 11.7cm to 21.8cm (Fig. 4.36). The largest brown trout captured at the site was a 2+ fish measuring 21.8cm in length and 141.0g in weight. Two age classes of brown trout were present at the site, i.e. 1+ and 2+. Scale and length frequency analysis indicate that 1+ and 2+ fish

accounted for approximately 88% and 12% of the brown trout population at the site respectively. The mean L1 and L2 of brown trout were 7.4cm and 12.1cm respectively (Appendix 1). Brown trout in the Womanagh River were classified as very slow growing based on criteria described by Kennedy and Fitzmaurice (1971).

Salmon ranged in length from 10.1 to 11.7cm and were all aged as 1+ (parr). Three-spined stickleback ranged in length from 21.cm to 5.5cm and eel ranged from 16.3 to 24.5cm in length.

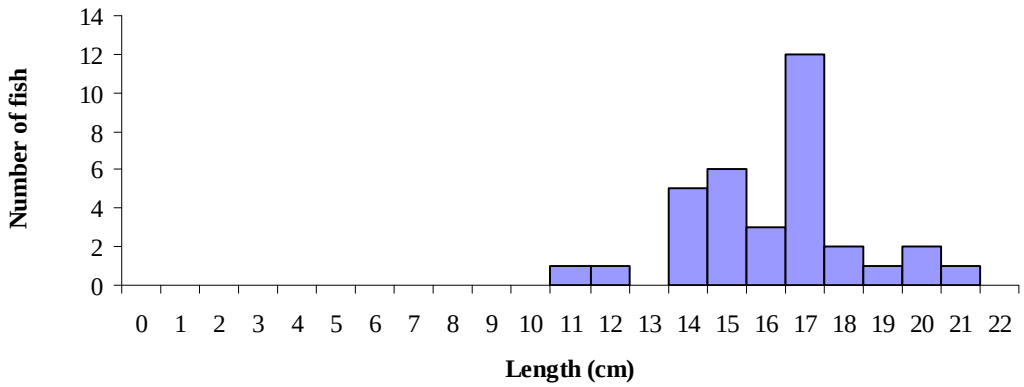


**Fig. 4.36. Length frequency distribution for brown trout in the Womanagh River, August 2008 (n = 34).**

## 4.3 Community structure

### *4.3.1 Species richness and composition*

A total of 11 fish species were recorded among the 12 river sites sampled during 2008 in the SRFB (Fig. 4.37). Brown trout was the most widespread species, being recorded at 100% of the sites. Salmon, the next most widespread, was recorded in 92% of the 12 sites. Minnow, roach and pike were the least widespread species, each being recorded in only 8% of sites.

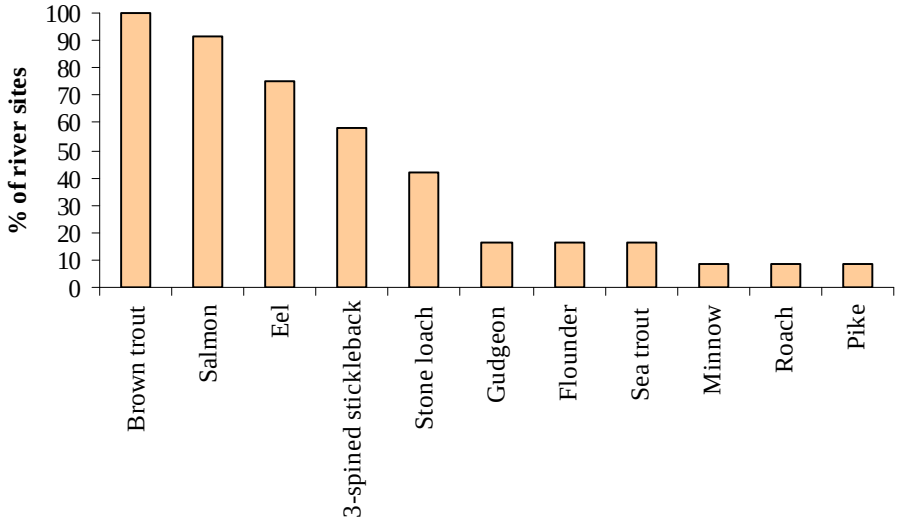


**Fig. 4.37. Percentage of sites where each fish species was present (total of 12 SRFB river sites surveyed) for WFD SM monitoring 2008**

Fish species richness ranged from two species at one river site (Nuenna) to a maximum of nine species at one site, i.e. the River Nore (Quaker's Bridge) (Table 4.13). Native species (e.g.brown trout, salmon, 3-spined stickleback and eel) were present at all sites surveyed (Table 4.13). Non-native species (group 2 – e.g. pike, minnow, stone loach) were recorded at four of the sites surveyed in the SRFB. Non-native group 3 fish species (e.g. gudgeon) were present at only two sites, the Suir at Knocknageragh Bridge and the Nore at Quakers Bridge (Table 4.12). Table 4.5 of the summary report gives an explanation of the different fish groups.

**Table 4.13. Species richness at each river sites surveyed in the SRFB, July to October 2008**

| Site | Species richness | No. native species (Group 1) | No. non-native species (Group 2) | No. non-native species (Group 3) |
|---|---|---|---|---|
| | | **BOAT SITES** | | |
| Nore (Quakers Bridge) | 9 | 5 | 3 | 1 |
| Colligan | 7 | 7 | 0 | 0 |
| Mahon | 5 | 5 | 0 | 0 |
| Anner | 5 | 4 | 1 | 0 |
| Suir (Knocknageragh) | 5 | 2 | 2 | 1 |
| Multeen | 4 | 3 | 1 | 0 |
| | | **HAND-SET SITES** | | |
| Glory | 6 | 5 | 0 | 0 |
| Duag | 5 | 5 | 0 | 0 |
| Ballyroan | 5 | 5 | 0 | 0 |
| Nier | 3 | 3 | 0 | 0 |
| Nuenna | 2 | 2 | 0 | 0 |

### *4.3.2 Species abundance and distribution*

Abundance and distribution maps for all species recorded within the SRFB sites surveyed during 2008 are shown below in Figures 4.38 to 4.48. Brown trout and salmon are both split into two maps to show fry (0+) and older fish (≥1+).

Salmonids (0+ and ≥1+) displayed a good distribution throughout the 12 sites surveyed (Figs. 4.38 to 4.41). Brown trout were present at all sites surveyed, however brown trout fry were not present at three sites, i.e. Suir (Knocknageragh Br.), Nore (Quakers Br.) and Womanagh. The highest densities of brown trout fry recorded were on the Duag River (0.15 fish/$m^2$), whereas, the Ballyroan site (0.29fish/$m^2$) recorded the highest density of 1+ and older brown trout and this was followed by the Suir at Knocknageragh Br. (0.26fish/$m^2$) and the Glory (0.22fish/$m^2$) (Fig. 4.39 and 4.40). Sea trout (Fig. 4.42) and flounder (Fig 4.43) were both present in two sites close to the sea, the Colligan and the Mahon, densities of both were higher at the Mahon site than the Colligan site. Salmon fry (0+) and parr (1+ and older) were captured at eight and ten sites respectively. Highest densities of salmon fry and parr were recorded on the Nier (fry - 0.34fish/$m^2$ and parr - - 0.32fish/$m^2$) (Fig. 4.40 and 4.41).

Juvenile lamprey and eel were distributed in low densities at the majority of sites in the Nore and Suir catchments and were captured in greatest densities in the Duag (Fig. 4.44 and Fig. 4.45). Stone loach (Fig. 4.47) were mostly recorded in river sites within the Suir catchment.

The Nore at Quakers' Bridge and the Suir at Knocknageragh Bridge were the only sites at which cyprinids (gudgeon and roach) were captured. Gudgeon (Fig. 4.48) were recorded at both sites, however they were present in a greater density in the Suir. Roach were only recorded at the River Suir site.


**Fig. 4.38. Distribution map for 0+ brown trout in the SRFB, WFD surveillance monitoring 2008**

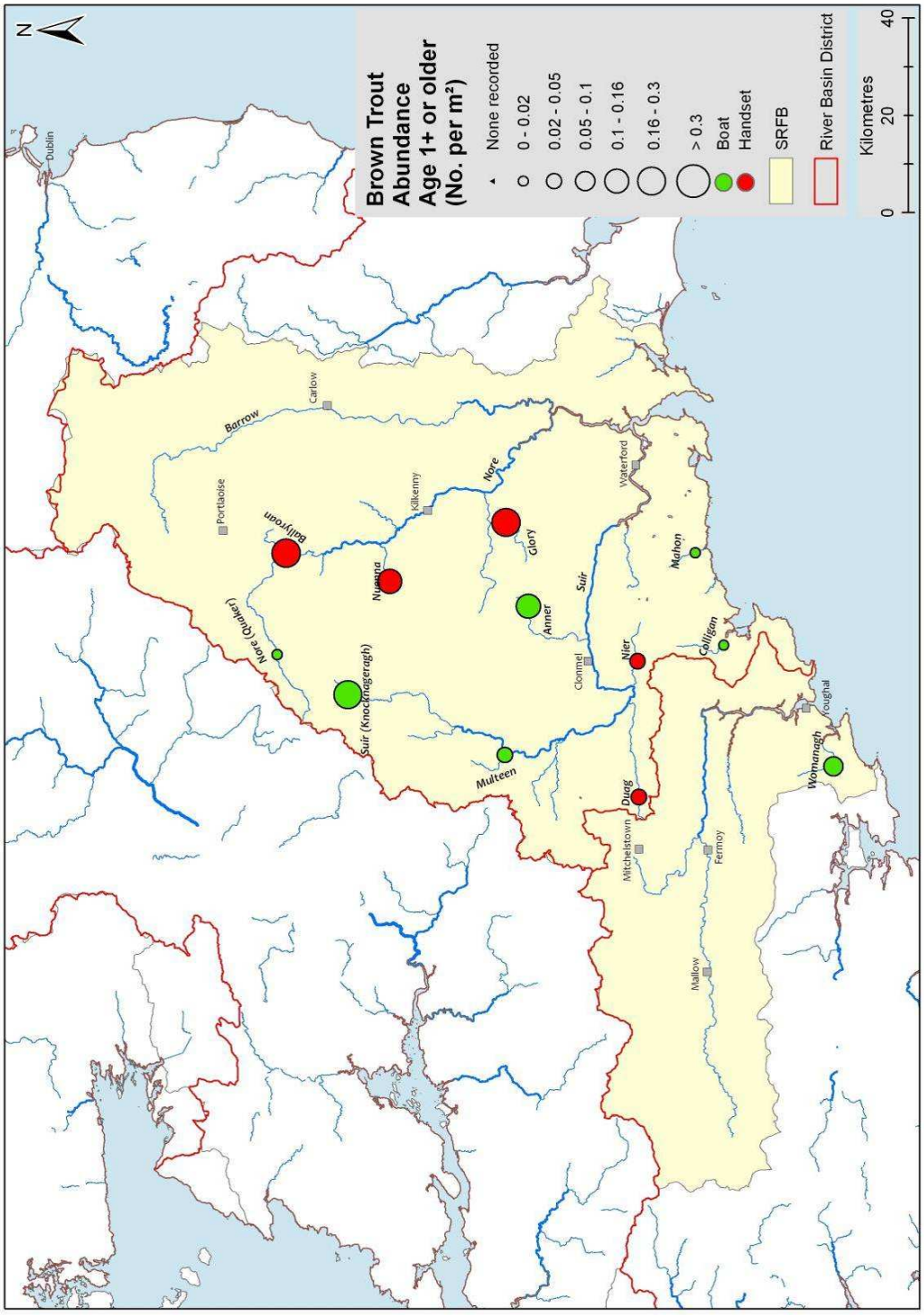


**Fig. 4.39. Distribution map for 1+ brown trout in the SRFB, WFD surveillance monitoring 2008**


**Fig. 4.40. Distribution map for 0+ salmon in the SRFB, WFD surveillance monitoring 2008**

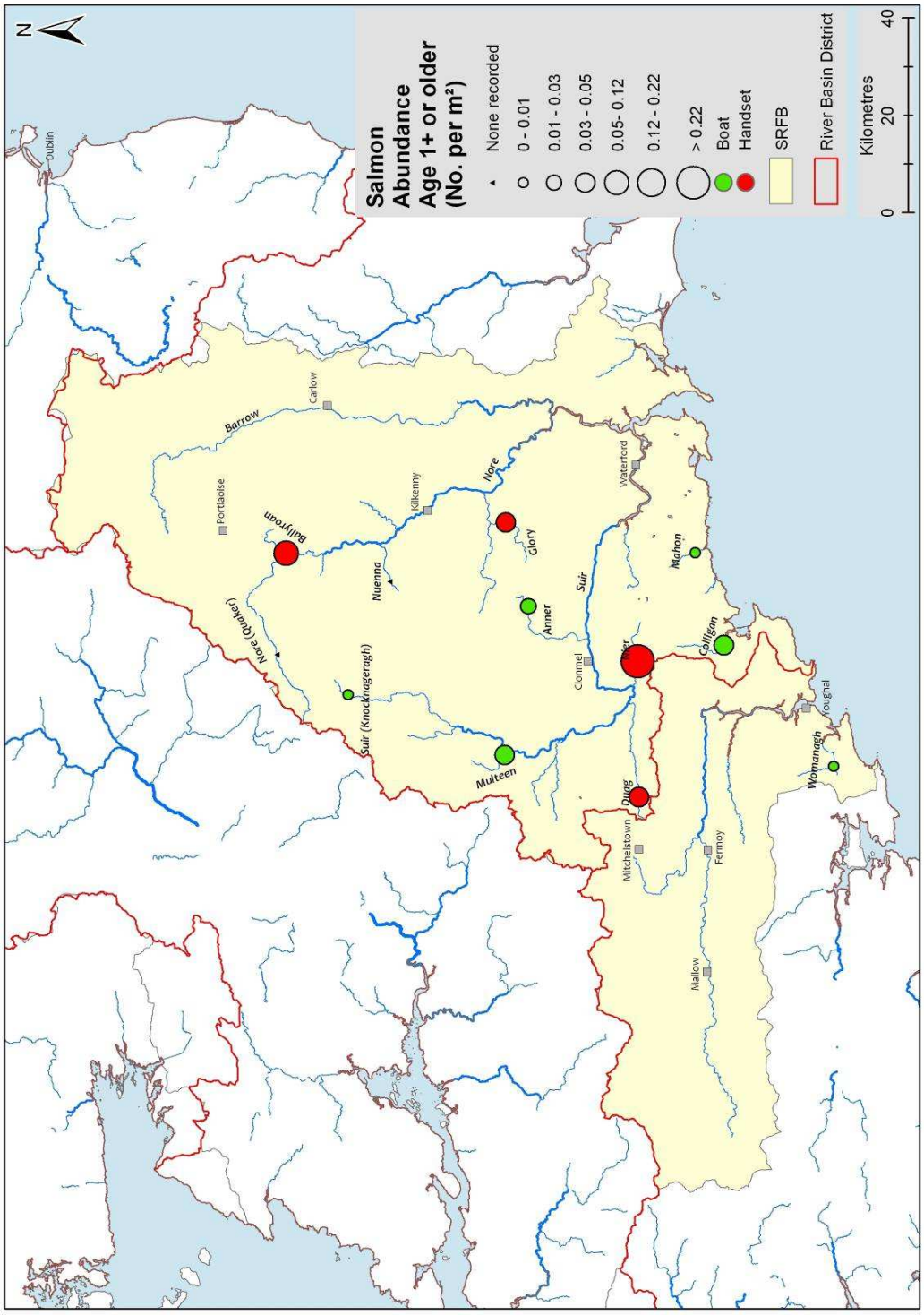


**Fig. 4.41. Distribution map for 1+ salmon in the SRFB, WFD surveillance monitoring 2008**


**Fig. 4.42. Distribution map for sea trout in the SRFB, WFD surveillance monitoring 2008**

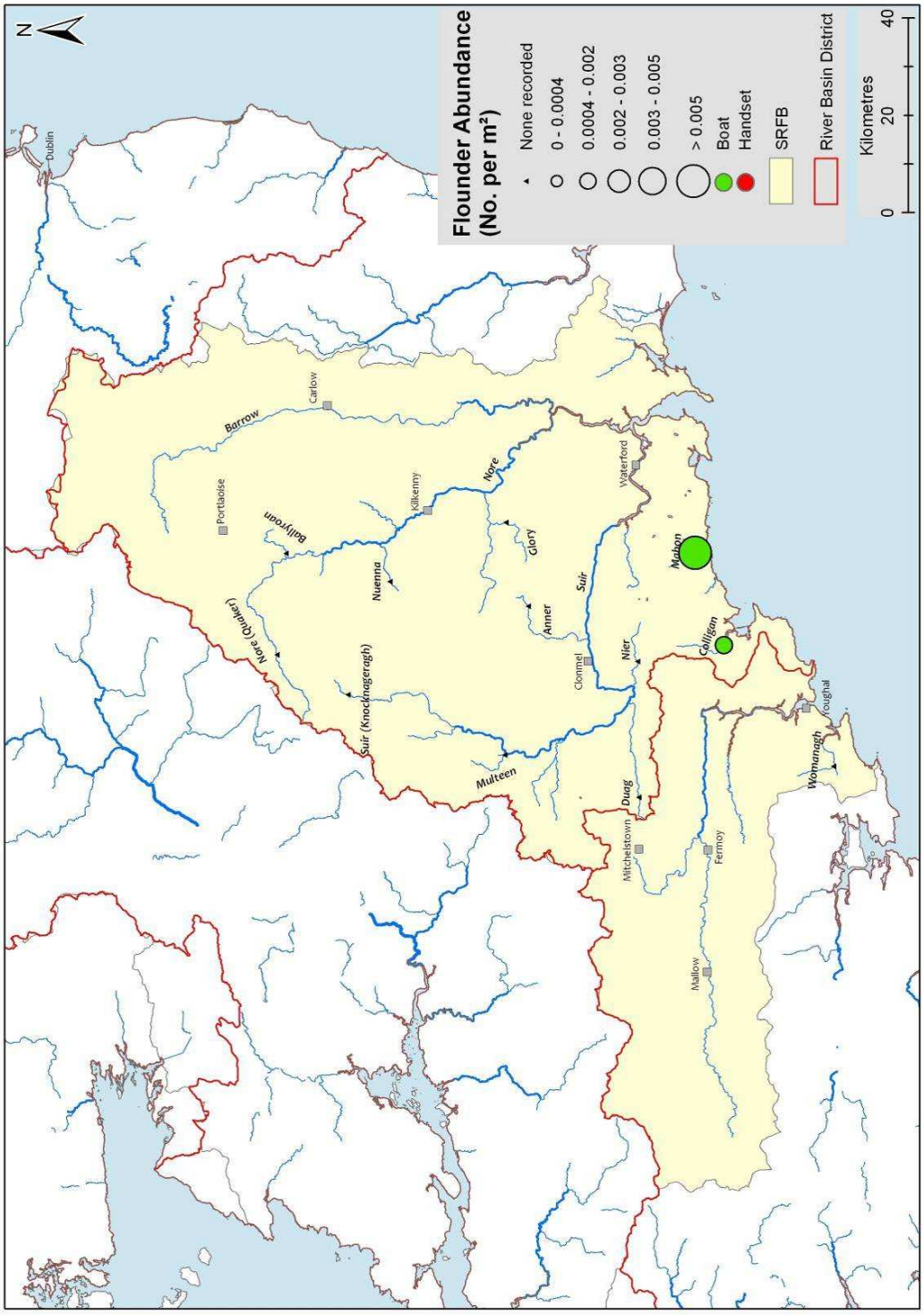


**Fig. 4.43. Distribution map for flounder in the SRFB, WFD surveillance monitoring 2008**

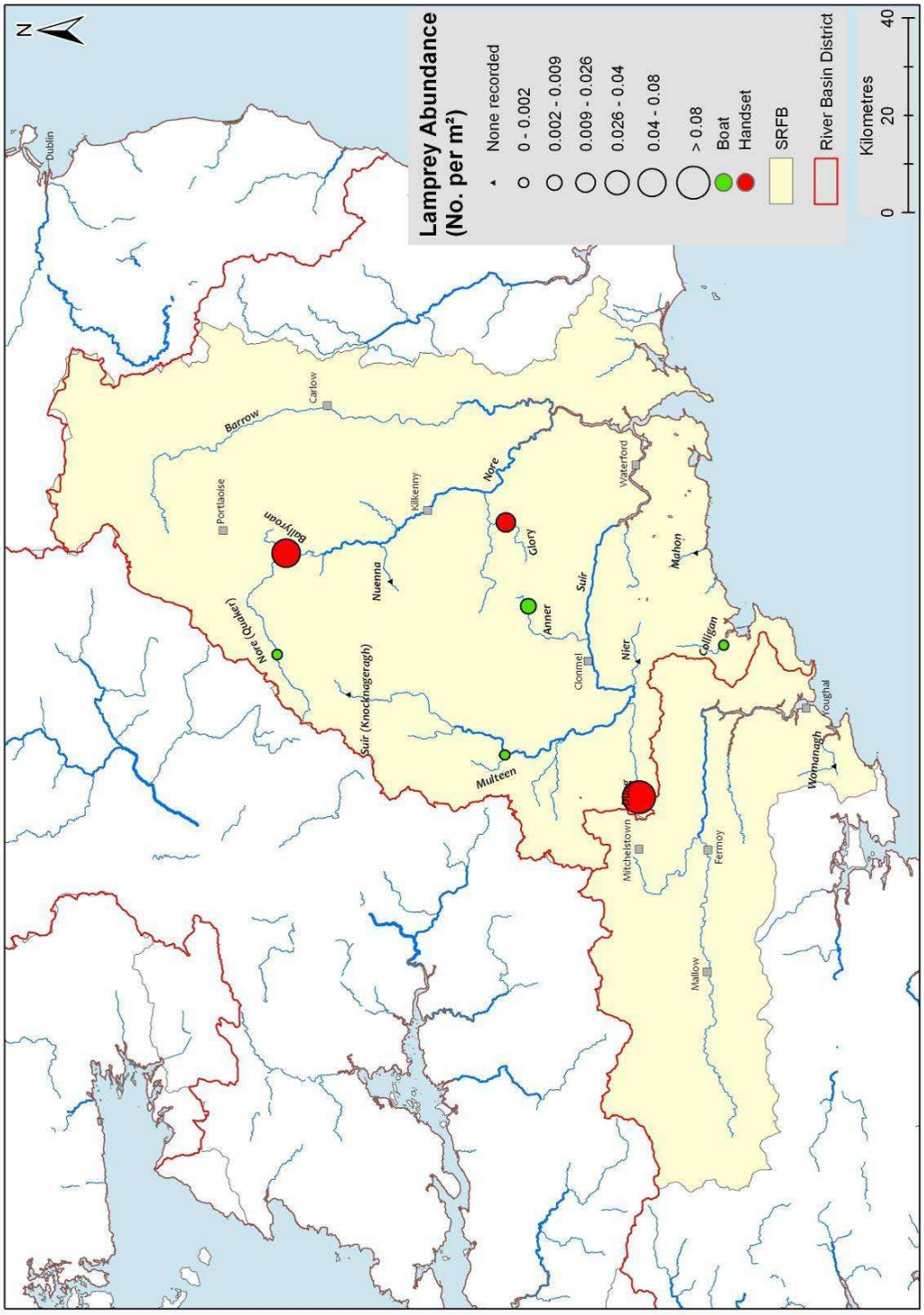


**Fig. 4.44. Distribution map for lamprey in the SRFB, WFD surveillance monitoring 2008**


**Fig. 4.45. Distribution map for eels in the SRFB, WFD surveillance monitoring 2008**

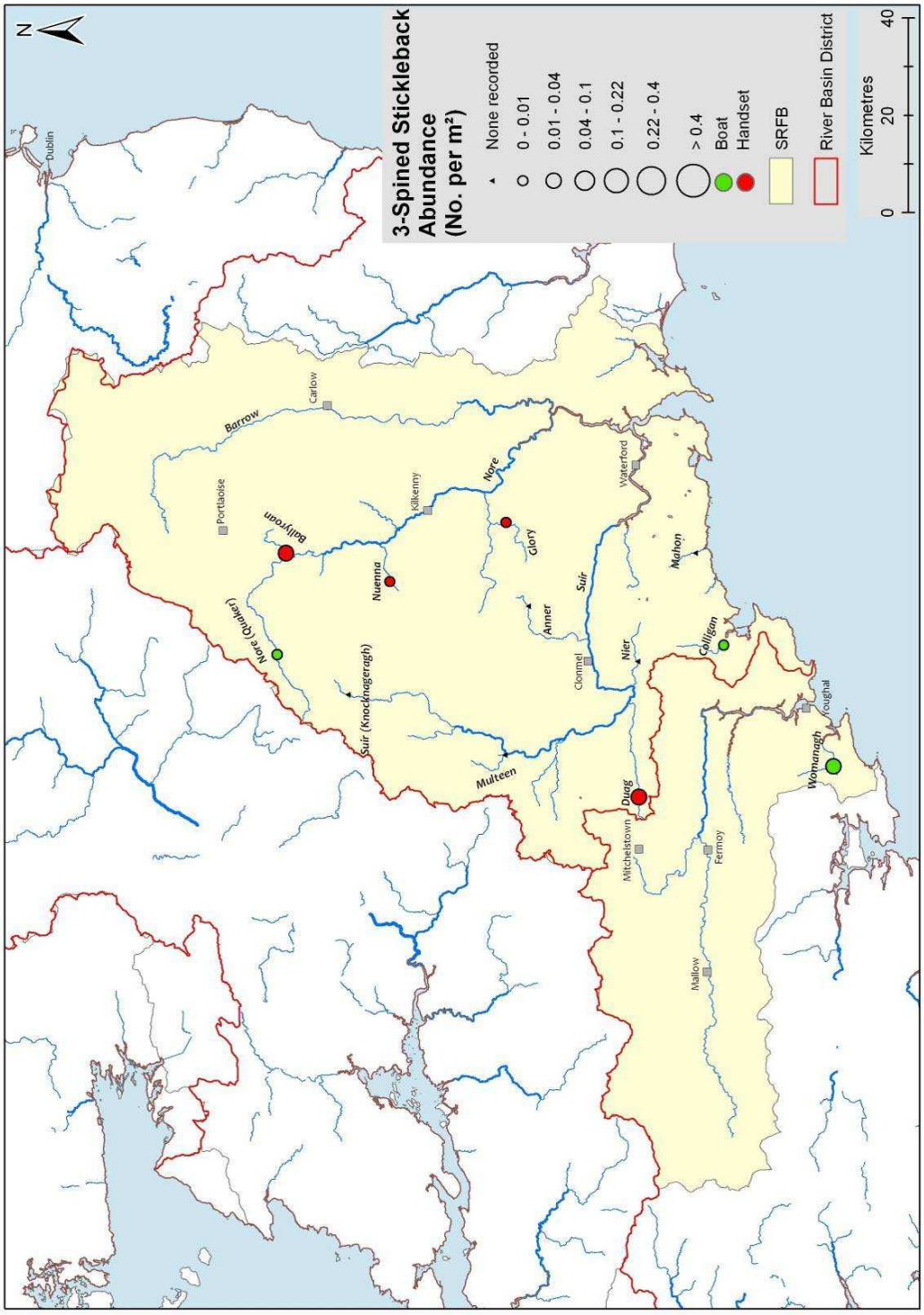


**Fig. 4.46. Distribution map for 3-spined stickleback in the SRFB, WFD surveillance monitoring 2008**


**Fig. 4.47. Distribution map for stone loach in the SRFB, WFD surveillance monitoring 2008**


**Fig. 4.48. Distribution map for gudgeon in the SRFB, WFD surveillance monitoring 2008**

### *4.3.3 Growth of brown trout, salmon and sea trout*

Age and growth of fish were determined for the dominant fish species on each river site, comprising a range of age groups (from 0+ to 4+ depending on species). Brown trout ages ranged from 0+ to 4+ with 1+ and 2+ being the dominant age classes at most sites. The largest brown trout (length 33.7cm and weight 0.6kg) recorded during the survey was captured on the River Nore site at Quakers Bridge.

Mean back-calculated lengths for brown trout in the SRFB are shown in Figures 4.49 and in Appendix 1 (L1 = back-calculated length at the end of the first winter, etc.). According to the growth categories of brown trout in relation to alkalinity described by Kennedy and Fitzmaurice (1971), fish growth was very slow in the Nuenna and Womanagh Rivers, slow in the Colligan, Duag, Glory, Mahon, and Nier, and fast in the Ballyroan, Multeen, Nore and Suir.

Growth up to L1 was greatest in the Ballyroan River and lowest in the River Nier. At L2, growth was again greatest in the Ballyroan and the Womanagh was the river with the slowest growth. Of the eight rivers with brown trout aged at least 3+, growth was markedly lower in the Glory and Nuenna, whereas in the Multeen River, brown trout growth increased quickly after L2 and was higher at L3 than in other rivers. Only two rivers, the Suir and Nore, had any brown trout aged 4+ and the growth of brown trout in these two rivers was similar over the four age classes.

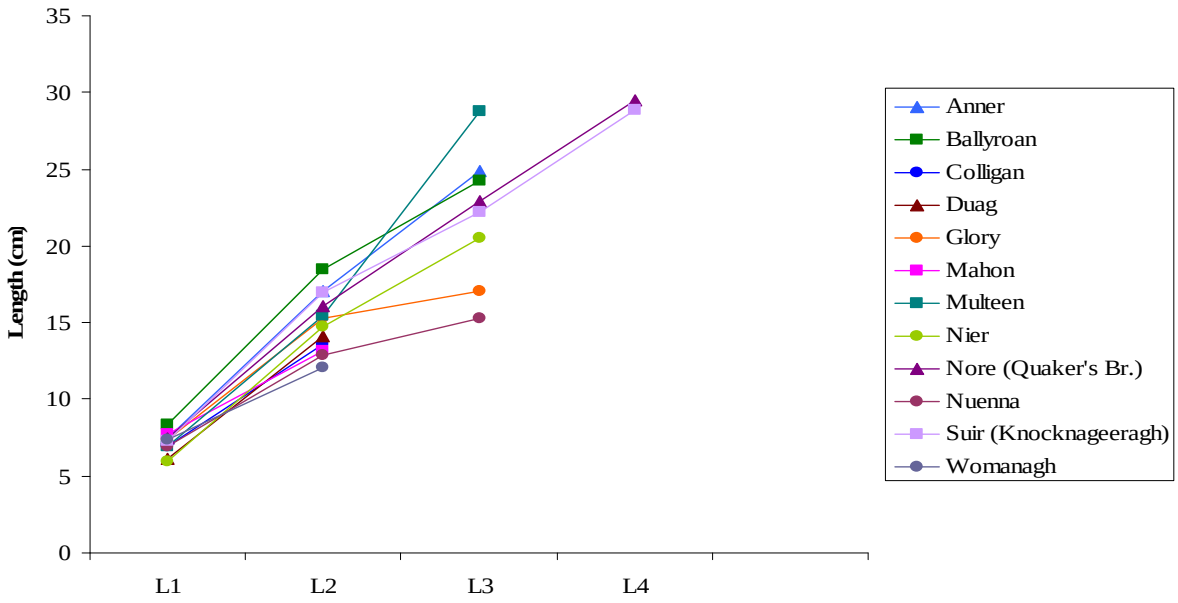


**Fig. 4.49. Back calculated lengths for brown trout in each river, WFD surveillance monitoring 2008.**

Back calculated lengths for salmon in the SRFB river sites are shown in Figure 4.50 and Appendix 2 respectively. All rivers had salmon aged at least 1+, with the growth rate of salmon in all rivers to be similar up to this age. Only two rivers, the Nier and the Colligan, had fish older that 1+ present, and growth up to L2 in both of these rivers was also similar.

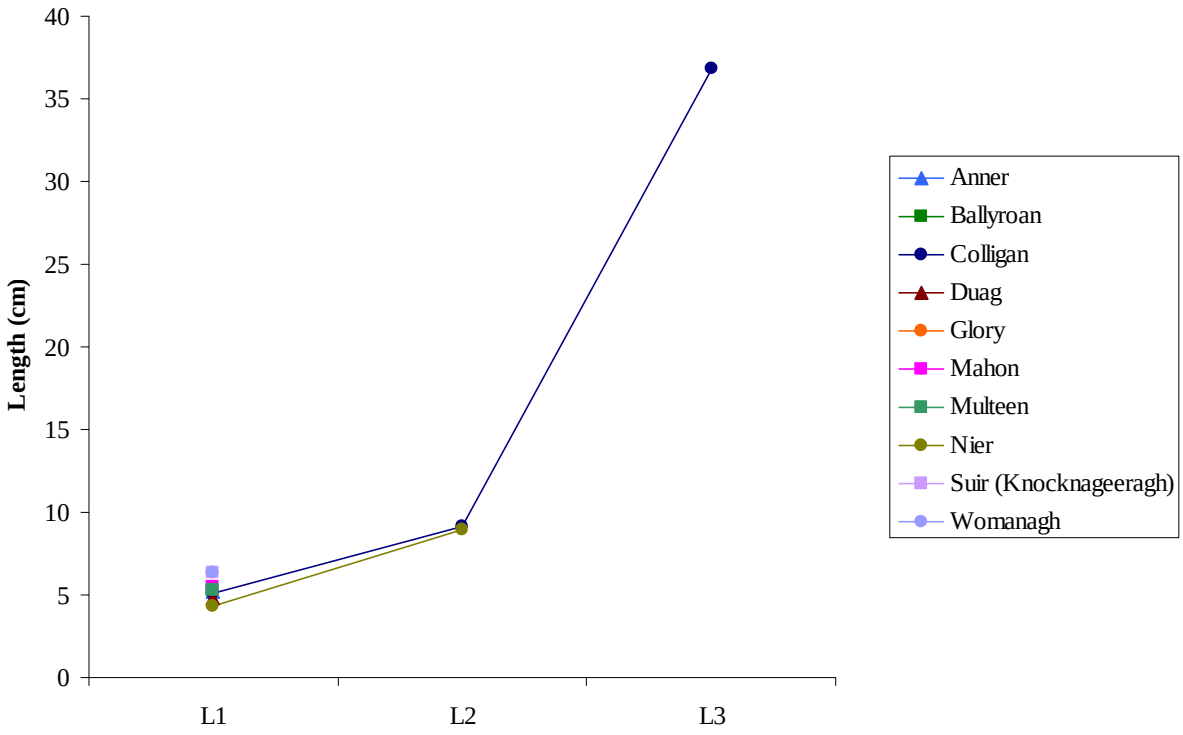


**Fig. 4.50. Back calculated lengths for salmon in each river, WFD surveillance monitoring 2008**

Back calculated lengths for sea trout in the SRFB rivers are shown in Figure 4.51 and Appendix 3 respectively. Only two rivers within the SRFB, the Colligan River and River Mahon, had sea trout present, with similar growth rates displayed in both.

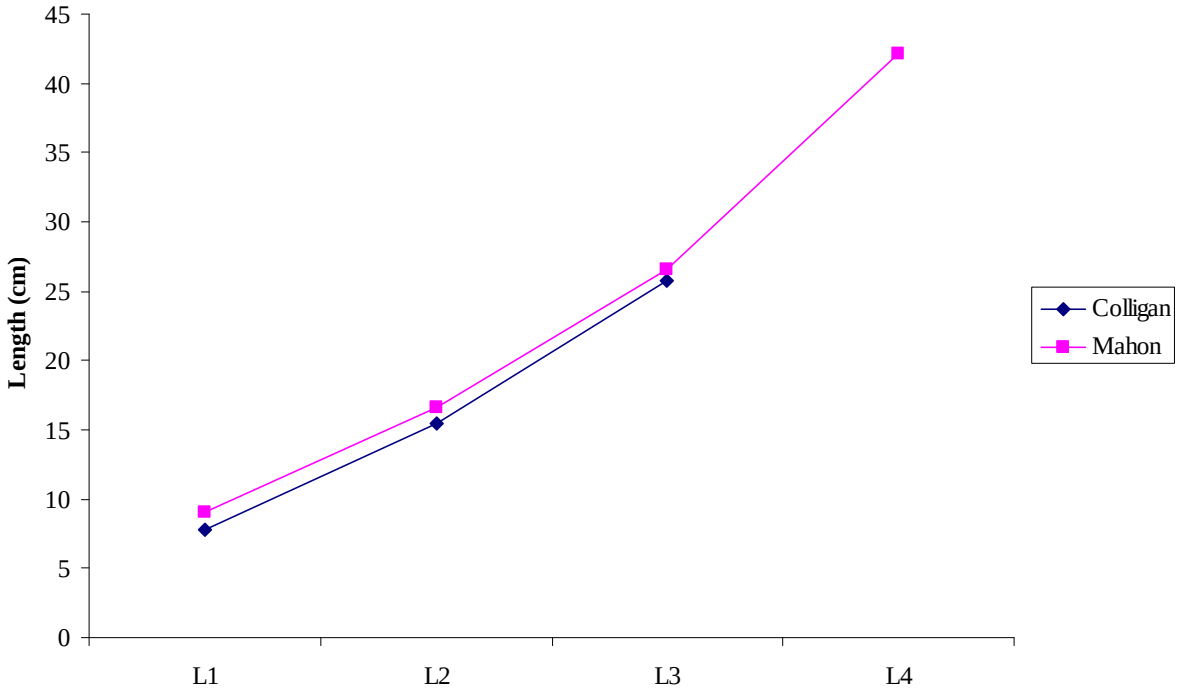


**Fig. 4.51. Back calculated lengths for sea trout in each river, WFD surveillance monitoring 2008**

## 5. DISCUSSION

A total of 11 fish species were recorded at 12 sites during the 2008 WFD river fish sampling program in the SRFB. Brown trout were the most widespread fish species, being present in 100% of sites surveyed, with salmon being the second most common species, occurring in all but one site. The three least common species were minnow, roach and pike, all of which were present in only one site each. The River Nore had the highest species diversity with nine species, while the Nuenna River had the lowest with only two. High species diversity such as that observed in the River Nore was typically observed in the larger river sites where cyprinids were present, while small wadeable streams such the Nuenna River usually tended to have only two or three (native) species (Kelly *et al*., 2009).

Growth for brown trout varied throughout the region. Seven rivers had growth rates categorised as slow or very slow, while five had growth rates categorised as fast (Appendix 1). All rivers had fish aged 1+ and 2+. Only the River Nore (Quakers' Br.) and the River Suir (Knocknageragh Br.) sites contained fish up to age 4+. The SRFB sites had good nursery streams for both brown trout and salmon, with 0+ (fry) of both species recorded in nine out of the 12 sites surveyed. It was generally the larger rivers, such as the Anner, Multeen, Nore and Suir that had the fastest growth rates for brown trout.

When compared to other regions, the SRFB had low numbers of non-native fish species present. Non-native species were recorded in five of the twelve rivers surveyed. However, three of these had only stone loach present - a species, along with minnow, that is widely distributed throughout the whole country (Kelly, *et al.*, 2009). 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. Rivers containing only native fish species were the Ballyroan, the Duag, the Nier, the Nuenna, the Colligan, the Mahon and the Womanagh. The Colligan had the greatest diversity of native fish species, with six species recorded at the site. 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). Four group 2 (pike, minnow, roach and stone loach) and one group 3 species (gudgeon) were recorded in the SRFB.

Cyprinid species appeared to be relatively uncommon in the sites surveyed. Pike and minnow were only recorded in the Nore (Quakers' Bridge), while roach were only present in the Suir (Knocknageragh Bridge). These two rivers were also the only ones to have gudgeon present.

These results show that the rivers within the SRFB surveyed for the WFD to date are still relatively free of non-native species; however, these species may become more of a concern in the future. The low diversity of non-native coarse fish and notable absence of species such as roach and perch may be attributed, to some extent, to the paucity of lakes within the region and lack of connectivity to systems within other regions where these fish are present, such as the ShRFB and NRFB.

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. There is currently no WFD compliant classification tool for fish in Irish rivers. However; a new project (WFD68) has been initiated (summer 2009) through the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) to develop a rivers fish classification tool for ROI, NI and Scotland and is due for completion in May 2010. Ecological status classes for fish at surveillance monitoring sites will therefore be calculated once this tool has been developed.

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## Appendix 1

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

| River | | L1 | L2 | L3 | L4 | Growth category |
|---|---|---|---|---|---|---|
| **Anner** | Mean | 7.45 | 17.05 | 24.9 | | Fast |
| | SD | 1.57 | 2.6 | 2.49 | | |
| | n | 79 | 38 | 5 | | |
| | Range min. | 4.1 | 11.35 | 21.58 | | |
| | Range max. | 10.61 | 20.59 | 27.92 | | |
| **Ballyroan** | Mean | 8.33 | 18.48 | 24.21 | | Fast |
| | SD | 2.12 | 3.12 | 1.72 | | |
| | n | 127 | 39 | 2 | | |
| | Range min. | 3.6 | 10.32 | 22.99 | | |
| | Range max. | 15.91 | 23.87 | 25.42 | | |
| **Colligan** | Mean | 6.96 | 13.57 | | | Slow |
| | SD | 1.23 | 2.3 | | | |
| | n | 33 | 9 | | | |
| | Range min. | 4.35 | 10.54 | | | |
| | Range max. | 9.94 | 17.56 | | | |
| **Duag** | Mean | 6.14 | 14.15 | | | Slow |
| | SD | 1.61 | 4.01 | | | |
| | n | 14 | 4 | | | |
| | Range min. | 4.03 | 11.2 | | | |
| | Range max. | 9.55 | 20.08 | | | |
| **Glory** | Mean | 7.37 | 15.32 | 17.04 | | Slow |
| | SD | 1.76 | 3.74 | 2.7 | | |
| | n | 76 | 28 | 5 | | |
| | Range min. | 4.14 | 8.07 | 12.95 | | |
| | Range max. | 12.38 | 21.38 | 20.18 | | |
| **Mahon** | Mean | 7.74 | 13.19 | | | Slow |
| | SD | 2.49 | 5.63 | | | |
| | n | 13 | 6 | | | |
| | Range min. | 3.11 | 8.24 | | | |
| | Range max. | 13.11 | 23.51 | | | |
| **Multeen** | Mean | 6.95 | 15.47 | 28.79 | | Fast |
| | SD | 1.73 | 3.05 | 0.14 | | |
| | n | 40 | 17 | 2 | | |
| | Range min. | 3.6 | 10.45 | 28.69 | | |
| | Range max. | 11.06 | 22.47 | 28.89 | | |
| **Nier** | Mean | 5.93 | 14.7 | 20.53 | | Slow |
| | SD | 1.13 | 1.58 | n/a | | |
| | n | 21 | 5 | 1 | | |
| | Range min. | 4.61 | 12.29 | 20.53 | | |
| | Range max. | 8.16 | 16.72 | 20.53 | | |

## Appendix 1 continued

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

| River | | L1 | L2 | L3 | L4 | Growth category |
|---|---|---|---|---|---|---|
| **Nore (Quakers' Br)** | Mean | 7.47 | 16.12 | 22.89 | 29.49 | Fast |
| | SD | 1.88 | 2.53 | 2.79 | n/a | |
| | n | 19 | 9 | 5 | 1 | |
| | Range min. | 3.68 | 12.08 | 19.04 | 29.49 | |
| | Range max. | 9.92 | 19.44 | 26.19 | 29.49 | |
| **Nuenna** | Mean | 6.93 | 12.88 | 15.24 | | Very slow |
| | SD | 2.54 | 2.82 | 2.23 | | |
| | n | 38 | 24 | 3 | | |
| | Range min. | 3.94 | 7.53 | 13.92 | | |
| | Range max. | 15.91 | 19.6 | 17.81 | | |
| **Suir (Knocknageragh Br)** | Mean | 7.28 | 16.93 | 22.19 | 28.88 | Fast |
| | SD | 1.77 | 2.63 | 1.88 | 0.91 | |
| | n | 71 | 43 | 8 | 3 | |
| | Range min. | 4.08 | 9.85 | 19.19 | 27.83 | |
| | Range max. | 10.89 | 20.99 | 25.26 | 29.51 | |
| **Womanagh** | Mean | 7.36 | 12.11 | | | Very slow |
| | SD | 1.72 | 2.16 | | | |
| | n | 34 | 4 | | | |
| | Range min. | 3.79 | 10.41 | | | |
| | Range max. | 10.86 | 15.2 | | | |

## Appendix 2

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

| River | | L1 | L2 | L3 |
|---|---|---|---|---|
| **Anner** | Mean | 5.14 | | |
| | SD | 0.94 | | |
| | n | 24 | | |
| | Range min. | 3.48 | | |
| | Range max. | 6.94 | | |
| **Ballyroan** | Mean | 5.3 | | |
| | SD | 1.33 | | |
| | n | 21 | | |
| | Range min. | 3.08 | | |
| | Range max. | 7.93 | | |
| **Colligan** | Mean | 5.05 | 9.16 | 36.84 |
| | SD | 0.97 | 0.06 | n/a |
| | n | 31 | 2 | 1 |
| | Range min. | 3.04 | 9.12 | 36.84 |
| | Range max. | 7.24 | 9.2 | 36.84 |
| **Duag** | Mean | 4.8 | | |
| | SD | 0.79 | | |
| | n | 17 | | |
| | Range min. | 3.83 | | |
| | Range max. | 6.38 | | |
| **Glory** | Mean | 6.33 | | |
| | SD | 0.85 | | |
| | n | 23 | | |
| | Range min. | 4.99 | | |
| | Range max. | 8.42 | | |
| **Mahon** | Mean | 5.47 | | |
| | SD | 0.95 | | |
| | n | 14 | | |
| | Range min. | 4.05 | | |
| | Range max. | 6.91 | | |
| **Multeen** | Mean | 5.24 | | |
| | SD | 1.22 | | |
| | n | 25 | | |
| | Range min. | 3.27 | | |
| | Range max. | 7.97 | | |
| **Nier** | Mean | 4.37 | 8.94 | |
| | SD | 0.92 | 1.24 | |
| | n | 28 | 2 | |
| | Range min. | 2.9 | 8.06 | |
| | Range max. | 6.73 | 9.82 | |

**Appendix 2 continued**

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

| River | | L1 | L2 | L3 |
|---|---|---|---|---|
| **Suir (Knocknageragh Br)** | Mean | 6.37 | | |
| | SD | n/a | | |
| | n | 1 | | |
| | Range min. | 6.37 | | |
| | Range max. | 6.37 | | |
| **Womanagh** | Mean | 6.36 | | |
| | SD | 0.96 | | |
| | n | 4 | | |
| | Range min. | 5.04 | | |
| | Range max. | 7.09 | | |

## Appendix 3

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

| River | | L1 | L2 | L3 | L4 |
|---|---|---|---|---|---|
| **Colligan** | Mean | 7.77 | 15.46 | 25.72 | |
| | SD | 1.45 | 3.43 | 7.86 | |
| | n | 7 | 7 | 2 | |
| | Range min. | 6.55 | 11.79 | 20.16 | |
| | Range max. | 10.8 | 22.4 | 31.28 | |
| **Mahon** | Mean | 9.08 | 16.57 | 26.54 | 42.14 |
| | SD | 4.28 | 6.18 | 14.29 | n/a |
| | n | 10 | 9 | 2 | 1 |
| | Range min. | 3.57 | 10.27 | 16.43 | 42.14 |
| | Range max. | 16.49 | 29.31 | 36.64 | 42.14 |

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