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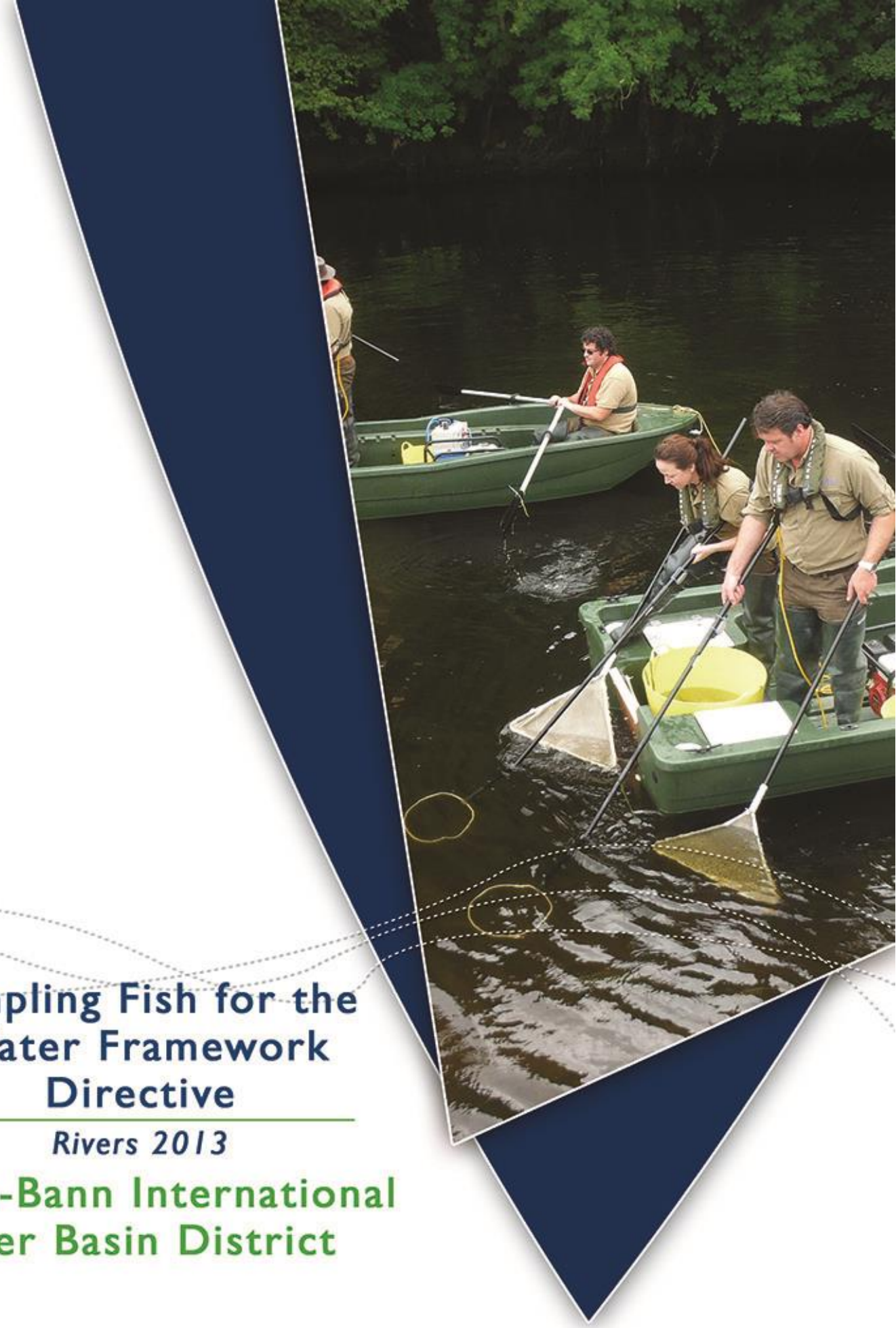

Sampling Fish for the Water Framework Directive

Rivers 2013

Neagh-Bann International River Basin District

Iascach Intíre Éireann
Inland Fisheries Ireland

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Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the Neagh-Bann International River Basin District, 2013

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1. INTRODUCTION

Fish stock surveys were undertaken in 75 river sites (56 waterbodies) throughout Ireland during the summer of 2013 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). Two of these surveys were carried out at river sites in the Neagh-Bann International River Basin District (NBIRBD) from August to September 2013 by staff from Inland Fisheries Ireland (Table 2.1, 2.2 and Fig. 2.1).

Although fish survey work has been carried out in Ireland in the past, no project to date has been as extensive as the current on-going monitoring programme in providing data appropriate for WFD compliance. Continued surveying of these and additional river sites will provide a useful baseline and time-series dataset for future monitoring of water quality. This in turn will provide information for River Basin District (RBD) managers to compile and implement programmes of measures to improve degraded water bodies. As 2013 is the sixth year of the rivers sampling programme, many of the sites surveyed this year are repeat surveys of those carried out in previous years. As a result, surveys this year can be compared with those from before, to determine whether the status of our rivers is improving or deteriorating.

This report summarises the results of the 2013 fish stock survey carried out on each site in the Neagh-Bann International River Basin District (NBIRBD), as part of the Water Framework Directive surveillance monitoring programme.

2. STUDY AREA

Two river sites were surveyed in two river catchments within the NBIRBD during 2013: the Dee and Fane catchments (Table 2.1). The sites ranged in surface area from 294m^2 for the White River to 336m^2 for the Fane River. Sites are divided into two categories for reporting purposes: wadeable sites, which are surveyed with bank-based electric fishing units, and non-wadeable sites, which are surveyed with boat-based electric fishing units. Only wadeable sites were surveyed in this region in 2013. Summary details for each site's location and physical characteristics are given in Tables 2.1 and 2.2, and the distribution of sites throughout the NBIRBD is shown in Figure 2.1.

Table 2.1. Location and codes of river sites surveyed for WFD surveillance monitoring, NBIRBD 2013

River	Site name	Catchment	Site Code	Waterbody code
NBIRBD Wadeable sites				
Fane River	Inniskeen_A	Fane	06F010650A	XB_06_8
White River (Louth)	Coneyburrow Br._B	Dee	06W010500B	NB_06_550

Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, NBIRBD 2013

Site name	Upstream catchment (km^2)	Wetted width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
NBIRBD Wadeable sites					
Fane (Inniskeen_A)	234.30	7.82	336	0.23	0.47
White (Coneyburrow Br._B)	55.13	6.83	294	0.26	0.46

Fig. 2.1. Location map of river sites surveyed throughout the NBIRBD for WFD fish surveillance monitoring, 2013

3. METHODS

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

Fish from each pass were sorted and processed separately. During processing, the species of each fish was identified, with its length and weight measured. Sub-samples were sometimes taken when large numbers of fish were present. For the purpose of species identification, juvenile river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*) and sea lamprey (*Petromyzon marinus*) were recorded as 'Lamprey sp.'. Sea trout and brown trout were listed separately. For ageing analyses, scales were taken from fish greater than 8.0cm for salmonids and most non-native fish species. After processing, fish were held in large bins of oxygenated water until they were fully recovered, before returning them to the water.

For various reasons, including river width and flow rate, stop nets could not be deployed at every site during 2013, thus making three fishing passes impractical. Therefore, in order to draw comparisons between sites, fish densities were calculated using data from the first fishing pass only. The number captured in the first pass was divided by the total area surveyed to give a density for each species.

A subsample of the dominant fish species was aged (five fish from each 1cm size class). Fish scales were aged using a microfiche reader. Growth was determined by back-calculating lengths at the end of each winter (e.g. L1 is the mean length at the end of the first winter and L2 is the mean length at the end of the second winter, etc.).

4. RESULTS

4.1 River surveys

4.1.1 The Fane River

One site was electric fished on the Fane River as part of the WFD surveillance monitoring programme in rivers 2013. The survey site was located downstream of Inishkeen Village, close to the site of Patrick Kavanagh's Grave, Co. Monaghan (Fig. 4.1; Plate 4.2). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 9th of September 2013, along a 43m length of channel. Glide and riffle dominated the habitat, while the substrate was mostly cobble and boulder. The vegetation at this site was scarce due to tree shading, but contained a small number of algae, moss and riparian species.

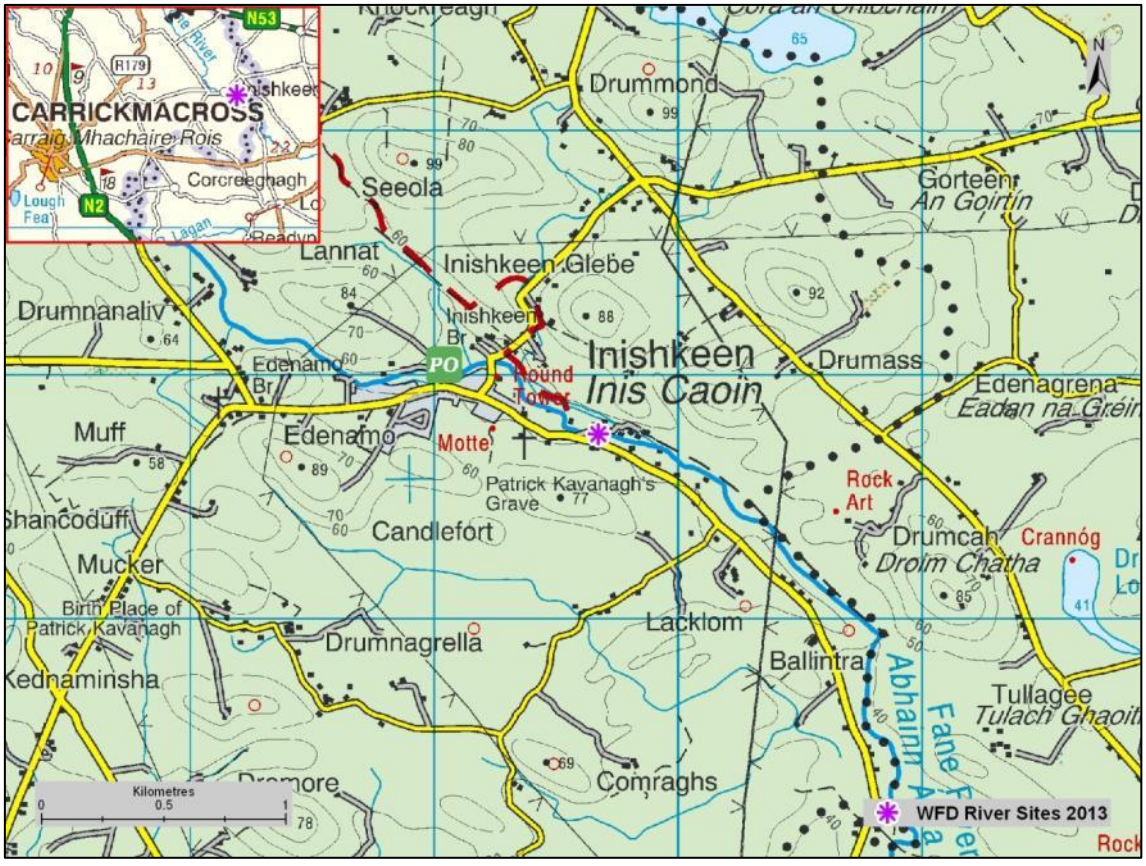

Fig. 4.1. Location of the Fane River (Inishkeen) surveillance monitoring site

Plate 4.1. The Fane River at Inishkeen, Co. Monaghan

Five fish species were recorded in the Fane River during the 2013 survey (Table 4.1). Brown trout was the most abundant species recorded, followed by salmon, European eel, stone loach and three-spined stickleback.

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

	Total minimum density	
Species	**2010**	**2013**
Brown trout	0.109	0.286
0+ Brown trout	0.013	0.092
1++ Brown trout	0.096	0.193
Salmon	0.637	0.241
0+ Salmon	0.362	0.080
1++ Salmon	0.275	0.161
European eel	0.037	0.024
Stone loach	0.024	0.015
Three-spined stickleback	-	0.003
Lamprey sp.	0.003	-
All Fish	0.810	0.568

Brown trout captured during the 2013 survey ranged in length from 4.6cm to 33.6cm (mean = 15.0cm) (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 38%, 21%, 31% and 10% of the total brown trout catch respectively. Brown trout captured during the 2010 survey ranged in length from 5.4cm to 29.9cm (mean = 18.3cm). Five age classes were present (0+, 1+, 2+, 3+ and 4+), accounting for approximately 11%, 38%, 33%, 15% and 3% of the brown trout catch respectively.

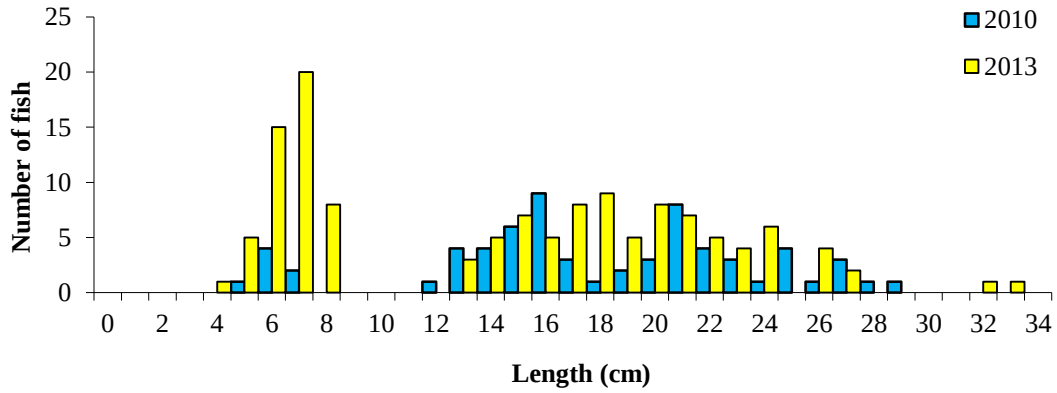

Fig. 4.2. Length frequency distribution of brown trout in the Fane River (Inishkeen), June 2010 (n = 66) and September 2013 (n = 129)

Salmon captured during the 2013 survey ranged in length from 5.0cm to 15.7cm (mean = 9.6cm) (Fig. 4.3). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 40%, 56% and 3% of the total salmon catch respectively. Salmon captured during the 2010 survey ranged in length from 3.6cm to 14.3cm (mean = 7.5cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 62%, 32% and 6% of the salmon catch respectively.

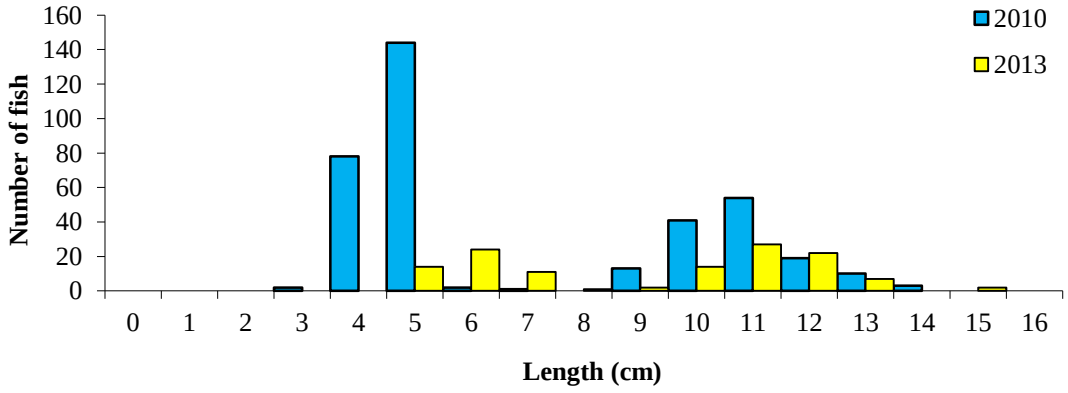

Fig. 4.3. Length frequency distribution of salmon in the Fane River (Inishkeen), June 2010 (n = 367) and September 2013 (n = 124)

4.1.2 The White River

One site was electric fished on the White River as part of the WFD surveillance monitoring programme in rivers 2013. The Coneyburrow Br. survey site was located just upstream of Coneyburrow Br., Dunleer, Co. Louth (Fig. 4.4; Plate 4.2). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 2nd of August 2013, along a 43m length of channel. The habitat was almost entirely made up of glide, while the dominant substrate was gravel. The vegetation at this site was mainly composed of riparian species along the two banks.

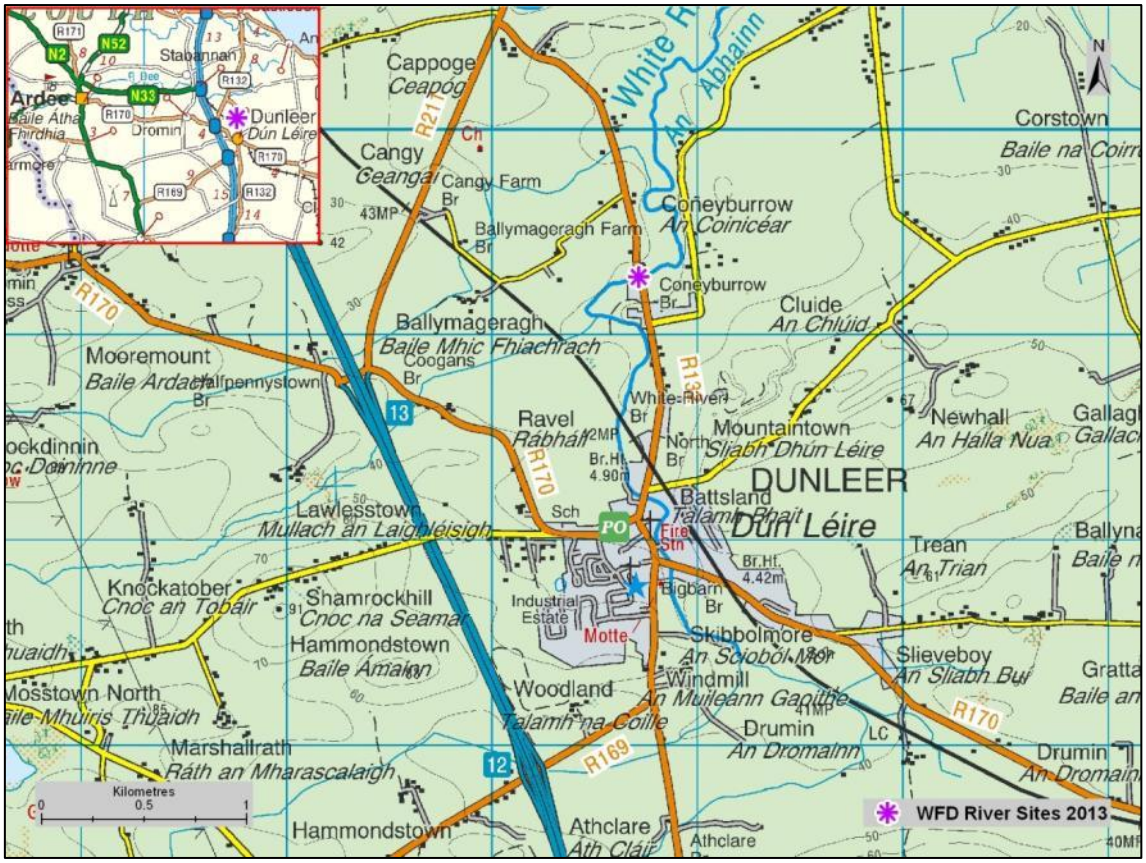

Fig. 4.4. Location of the White River (Coneyburrow Br.) surveillance monitoring site

Plate 4.2. The White River at Coneyburrow Br., Co. Louth

Six fish species were recorded in the White River at Coneyburrow Br. during the 2013 survey (Table 4.2). Three-spined stickleback was the most abundant species recorded, followed by minnow, stone loach, salmon, brown trout and European eel.

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

	Total minimum density	
Species	**2012**	**2013**
Three-spined stickleback	0.008	1.760
Minnow	0.081	0.214
Stone loach	0.006	0.160
Salmon	0.025	0.014
0+ Salmon	0.022	0.010
1++ Salmon	0.003	0.003
Brown trout	0.123	0.007
0+ Brown trout	0.087	0.003
1++ Brown trout	0.036	0.007
European eel	0.003	0.007
Lamprey sp.	0.008	-
All Fish	0.254	2.161

Brown trout captured during the 2013 survey ranged in length from 6.0cm to 15.3cm (mean = 12.8cm) (Fig. 4.5). Two age classes (0+ and 1+) were present, accounting for 25% and 75% of the total brown trout catch respectively. Brown trout captured during the 2012 survey ranged in length from 3.7cm to 26.1cm (mean = 9.4cm). Three age classes were present (0+, 1+ and 2+), accounting for approximately 77%, 16% and 8% of the brown trout catch respectively.

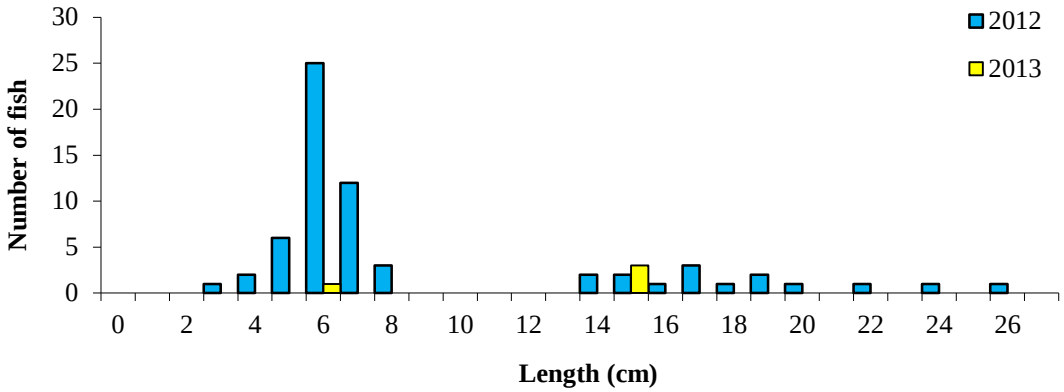

Fig. 4.5. Length frequency distribution of brown trout in the White River (Coneyburrow Br.) site, August 2012 (n = 64) and September 2013 (n = 4)

Salmon captured during the 2013 survey ranged in length from 5.4cm to 12.1cm (mean = 7.4cm) (Fig. 4.6). Two age classes (0+ and 1+) were present, accounting for approximately 75% and 25% of the total salmon catch respectively. Salmon captured during the 2012 survey ranged in length from 5.2cm to 15.0cm (mean = 6.5cm). Two age classes (0+ and 1+) were present, accounting for approximately 91% and 9% of the salmon catch respectively.

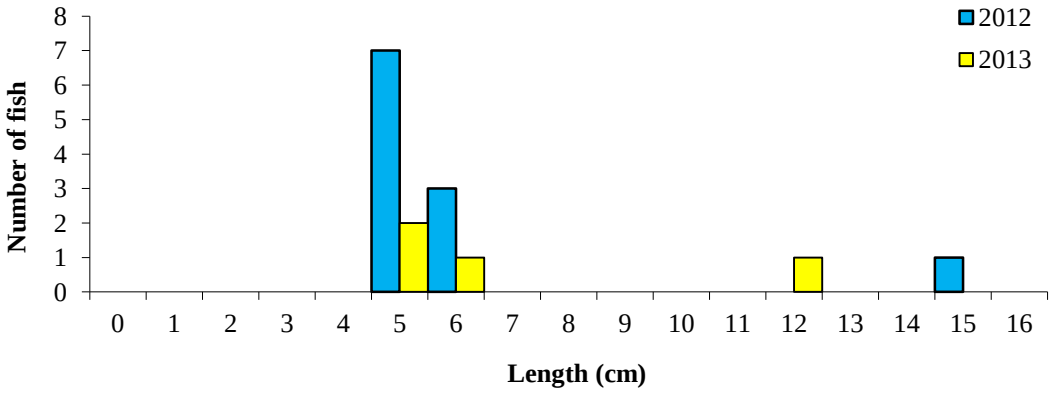

Fig. 4.6. Length frequency distribution of brown trout in the White River (Coneyburrow Br.) site, August 2012 (n = 11) and September 2013 (n = 4)

4.2 Community Structure

A total of six fish species were recorded within the two NBIRBD sites surveyed during 2013 (Fig. 4.7). Except for minnow, all species were recorded at both sites.

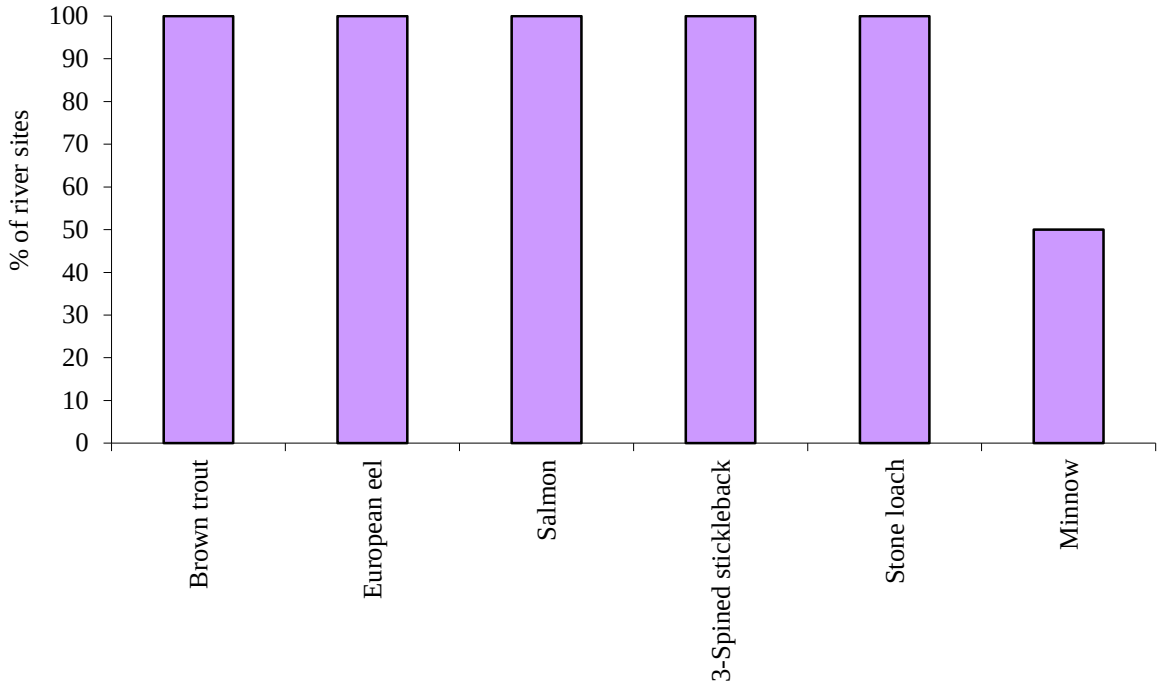

Fig. 4.7. Percentage of sites where each fish species was recorded in the NBIRBD for WFD SM monitoring 2013

4.3 Age and growth

Growth rates based on back-calculated length-at-age data were analysed for brown trout and salmon in each river site surveyed in the NBIRBD during 2013.

The mean back-calculated length-at-age data for brown trout in the NBIRBD are shown in Figure 4.8 and Appendix 1. Brown trout were recorded in both sites, with both sites containing brown trout aged 1+ or older. Ages ranged from 0+ to 3+, with fish aged 0+, the most abundant age class within the region. The largest brown trout recorded in the NBIRBD in 2013 was caught in the Fane River site, measured 33.6cm in length, weighed 415g and was aged 3+. Whenever possible, the brown trout at each river site are assigned growth categories described by Kennedy and Fitzmaurice (1971), who examined the relationship between alkalinity and growth of brown trout in Irish streams and rivers. Using this method, the growth rate could only be reliably estimated from fish at sites where individual fish were 2+ or older and where sufficient numbers were caught. Growth was considered slow in the Fane River (Appendix 1).

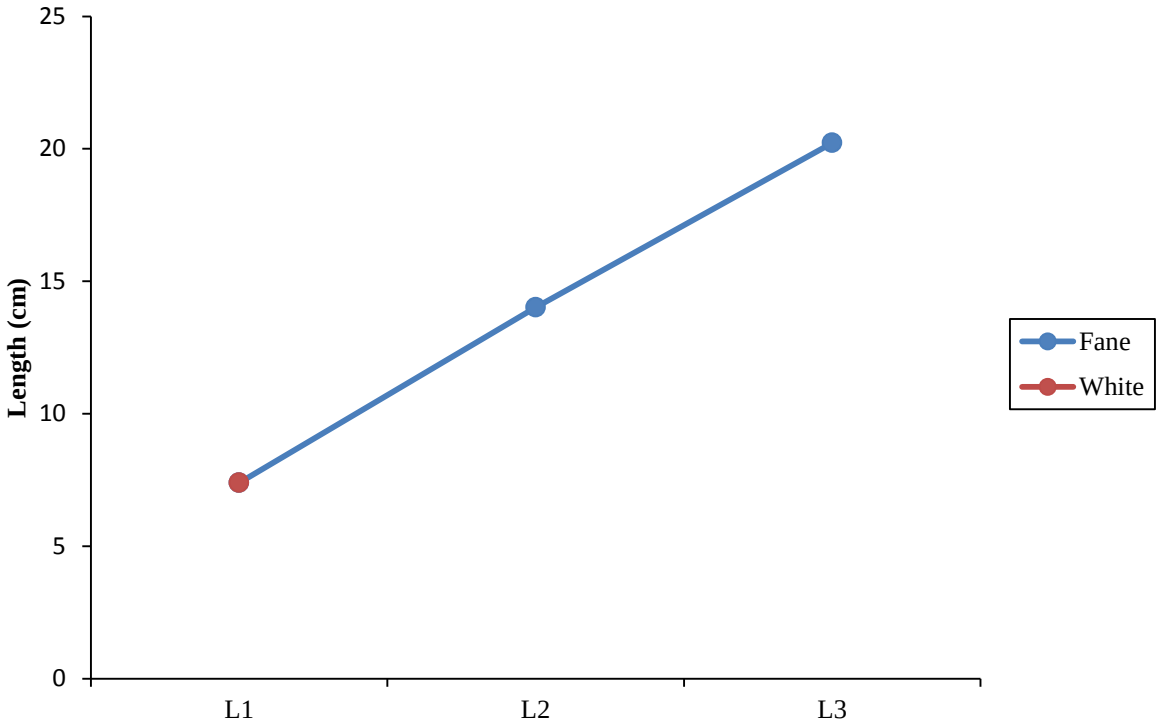

Fig. 4.8. Back calculated length-at-age for brown trout in each river, WFD surveillance monitoring 2013

The mean back-calculated length-at-age data for salmon in the NBIRBD are shown in Figure 4.9 and Appendix 2. Salmon were only recorded in the Fane River and ranged in age from 0+ to 2+. The most abundant salmon age class in the Fane River was 1+. The largest juvenile salmon recorded in the Fane River measured 15.7cm, weighed 52.0g and was aged 2+.

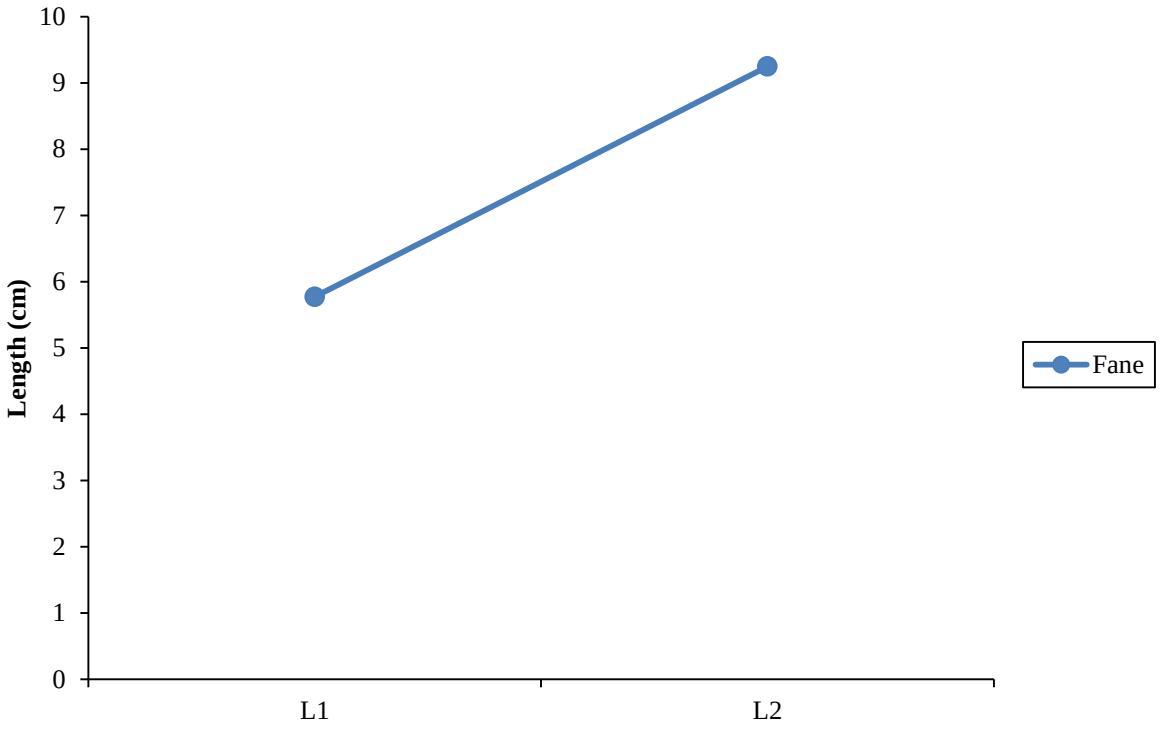

Fig. 4.9. Back calculated length-at-age for salmon in each river, WFD surveillance monitoring 2013

4.4 Ecological status

An essential step in the WFD process is the classification of the ecological status of lakes, rivers and transitional waters, which in turn will assist in identifying objectives that must be set in the individual River Basin District Management Plans. Following an approach similar to that developed by the Environment Agency in England and Wales, the Fisheries Classification Scheme 2 (FCS2) has been developed for the Republic of Ireland and Northern Ireland, along with a separate version for Scotland, to comply with the requirements of the WFD. Agencies throughout each of the three regions contributed data to be used in the model, which was developed under the management of the Scotland & Northern Ireland Forum for Environmental Research (SNIFFER). This method is a geostatistical model based on Bayesian probabilities, that makes probabilistic comparisons of observed fish counts with expected (predicted) fish counts under reference (un-impacted conditions). This classification system (SNIFFER, 2011) generates Ecological Quality Ratings (EQRs) between 1 and 0 for each site, corresponding to the five different ecological status classes of High, Good, Moderate, Poor and Bad. Confidence levels are then assigned to each class and represented as probabilities. The confidence level for a site is expressed as the probability of that site being assigned to each different status class, with the highest class probability being the overall classification.

Using this tool and expert opinion, each site surveyed in 2013 was assigned a draft fish classification status (Table 4.3). One site was classed as Good and the other as Poor (Table 4.3). When comparing the status this year with that from previous years, there was a deterioration on the White River at Coneyburrow.

Table 4.3. Ecological status of sites surveyed in the NBIRBD for surveillance monitoring 2013 (figures in brackets indicate confidence of site status being correct)

River	Site name	Site Code	Previous ecological status	Ecological status 2013
NBIRBD Wadeable sites				
Fane	Inniskeen_A	06F010650A	Good (2010)	Good
White (Louth)	Coneyburrow Br._B	06W010500B	Moderate (77%)(2012)	Poor (100%)

5. DISCUSSION

A total of six fish species were recorded during the 2013 WFD surveillance monitoring programme for fish in rivers within the NBIRBD. The same species were recorded at both sites, except for minnow, which were only recorded at the White River. The greatest abundances of brown trout and salmon were both recorded at the Fane River.

Following the methods of Kennedy and Fitzmaurice (1971), growth was deemed slow in the Fane River.

The Fish Classification Scheme 2 (FCS2) tool for assessing the ecological status of rivers has been recently developed for the Republic of Ireland which is compliant with the requirements of the WFD. Using this tool and expert opinion, each site surveyed in 2013 was assigned a draft fish classification status. One site was classed as Good and the other as Poor.

A fish kill occurred on the White River in August 2012 downstream of Dunleer, results from this survey indicate that there has been no significant improvement in the fish population in this stretch of river since 2012.

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APPENDIX 1

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

River		L1	L2	L3	Growth category
Fane (Inishkeen)	Mean	7.40	14.02	20.23	Slow
	S.D.	1.44	2.45	2.04	
	S.E.	0.20	0.41	0.72	
	n	53	35	8	
	Min	5.13	10.18	16.00	
	Max	11.10	19.60	22.91	
White River (Coneyburrow Br.)	Mean	7.40			n/a
	S.D.	0.14			
	S.E.	0.10			
	n	2			
	Min	7.31			
	Max	7.50			

APPENDIX 2

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

River		L1	L2
Fane (Inishkeen)	Mean	5.77	9.25
	S.D.	1.09	0.52
	S.E.	0.22	0.30
	n	24	3
	Min	3.38	8.89
	Max	7.79	9.85
White (Coneyburrow Br.)	Mean	6.39	
	S.D.	n/a	
	S.E.	n/a	
	n	1	
	Min	6.39	
	Max	6.39	

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