



Sampling Fish for the Water Framework Directive

Rivers 2012

**Neagh-Bann International
River Basin District**



Iascach Intíre Éireann
Inland Fisheries Ireland

Water Framework Directive Fish Stock Survey of Rivers in the Neagh-Bann International River Basin District, 2012

Fiona L. Kelly, Ronan Matson, Lynda Connor, Rory Feeney, Emma Morrissey, Ciara Wogerbauer
and Kieran Rocks

Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin

CITATION: Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Wogerbauer, C. and Rocks, K. (2013) Water Framework Directive Fish Stock Survey of Rivers in the Neagh-Bann International River Basin District. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.

Cover photo: Ronan electric-fishing © Inland Fisheries Ireland

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the help and co-operation of the regional director Mr. William Walsh and staff from IFI Blackrock as well as various other offices throughout the region. The authors also gratefully acknowledge the help and cooperation of colleagues in IFI Swords.

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

Furthermore, the authors would like to acknowledge the funding provided for the project from the Department of Communications, Energy and Natural Resources for 2012.

PROJECT STAFF

Project Director/Senior Research Officer:	Dr. Fiona Kelly
Project Manager:	Ms. Lynda Connor
Research Officer:	Dr. Ronan Matson
Technician	Mr. Rory Feeney
Technician:	Ms. Emma Morrissey
Technician:	Dr. Ciara Wögerbauer
GIS Officer:	Mr. Kieran Rocks
Fisheries Assistant:	Dr. Letizia Cocchiglia (Jul 2012 – Nov 2012)
Fisheries Assistant:	Ms. Karen Kelly (Jul 2012 – Nov 2012)
Fisheries Assistant:	Mr. Kilian Kelly (Jul 2012 – Nov 2012)
Fisheries Assistant:	Dr. Bernadette O’Neill (Jul 2012 – Nov 2012)
Fisheries Assistant:	Ms. Sinead O’Reilly (Jul 2012 – Nov 2012)
Fisheries Assistant:	Mr. Samuel Thomas (Jul 2012 – Nov 2012)

The report includes Ordnance Survey Ireland data reproduced under OSi Copyright Permit No. MP 007508.

*Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.
© Ordnance Survey Ireland, 2013.*

TABLE OF CONTENTS

1. INTRODUCTION.....	3
2. STUDY AREA.....	4
3. METHODS	6
4. RESULTS	7
4.1 River surveys.....	7
4.1.1 The Big River.....	7
4.1.2 The White River.....	10
4.2 Species distribution.....	13
4.3 Age and growth.....	14
4.4 Ecological status.....	15
5. DISCUSSION	16
6. REFERENCES.....	17
APPENDIX 1.....	18
APPENDIX 2.....	18

1. INTRODUCTION

Fish stock surveys were undertaken in 58 river sites throughout Ireland during the summer of 2012 as part of the programme of sampling fish for the Water Framework Directive (WFD). These surveys are required by both national and European law, with Annex V of the WFD stipulating that rivers are included within the monitoring programme and that the composition, abundance and age structure of fish fauna are examined (Council of the European Communities, 2000). Two of these surveys were carried out at river sites in the Neagh-Bann International River Basin District (NBIRBD) in July 2012 by staff from Inland Fisheries Ireland (Table 2.1, 2.2 and Fig. 2.1).

Although fish survey work has been carried out in Ireland in the past, no project to date has been as extensive as the current on-going monitoring programme in providing data appropriate for WFD compliance. Continued surveying of these and additional river sites will provide a useful baseline and time-series dataset for future monitoring of water quality. This in turn will provide information for River Basin District (RBD) managers to compile and implement programmes of measures to improve degraded water bodies. As 2012 is the fifth year of the rivers sampling programme, many of the sites surveyed this year are repeat surveys of those carried out in 2009. As a result, surveys this year can be compared with surveys from before to determine whether the status of our rivers is improving or deteriorating.

This report summarises the results of the 2012 fish stock survey carried out on each site in the 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 2012: the Castletown and Dee catchments (Table 2.1). The sites ranged in surface area from 209m² for the Big River to 358m² for the White River. Both sites were wadeable and were surveyed using bank-based electric fishing units. 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 2012

River	Site name	Catchment	Site Code	Waterbody code
NBIRBD Wadeable sites				
Big (Louth)	Ballygoly Br._A	Castletown	06B010100A	NB_06_642
White (Louth)	Coneyburrow Br. B	Dee	06W010500B	NB_06_550

Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, NBIRBD 2012

River	Upstream catchment (km ²)	Wetted width (m)	Surface area (m ²)	Mean depth (m)	Max depth (m)
NBIRBD Wadeable sites					
Big (Louth) (Ballygoly Br._A)	10.58	4.35	209	0.31	0.72
White (Louth) (Coneyburrow Br. B)	55.13	7.95	358	0.34	0.58

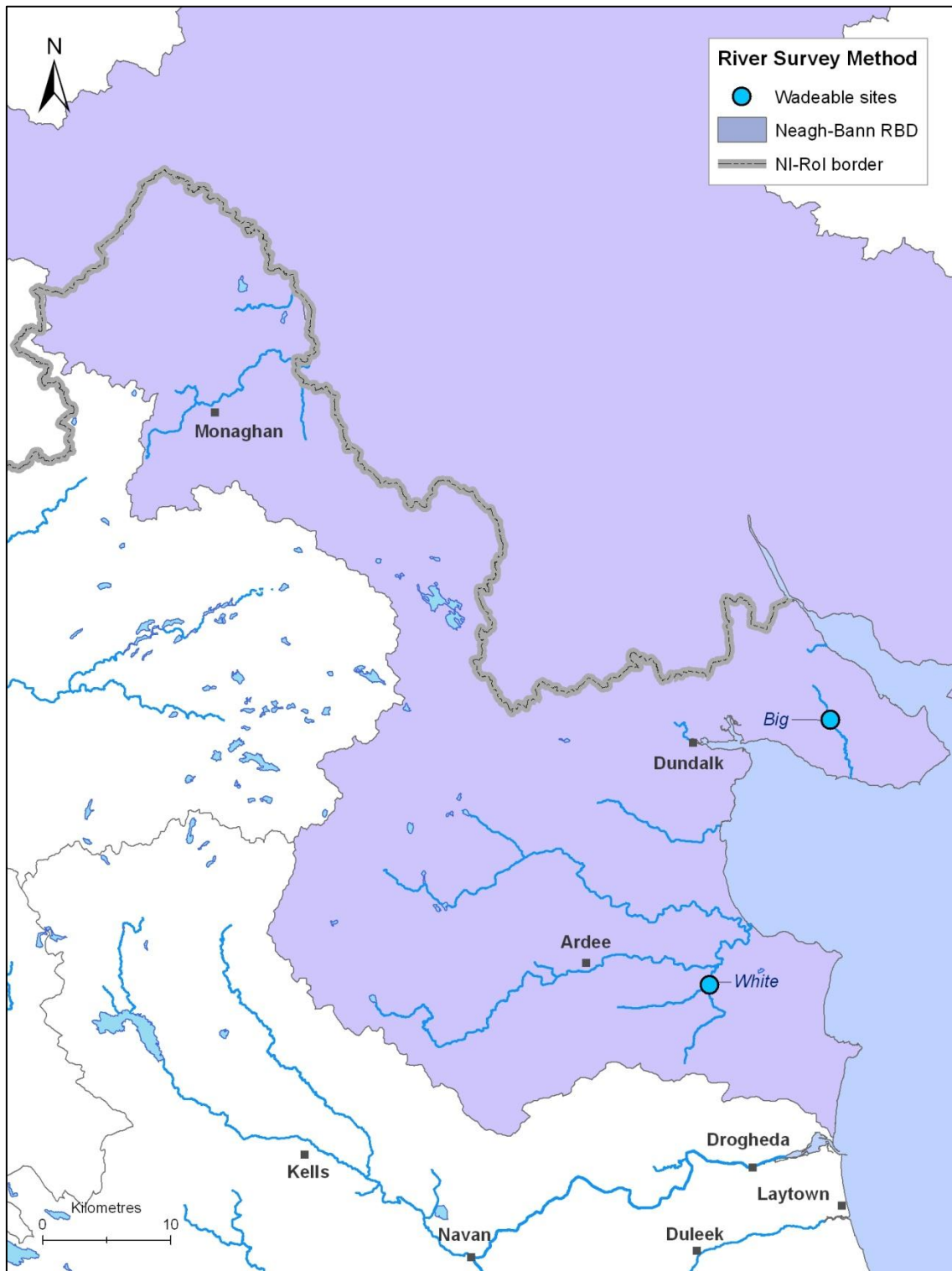


Fig. 2.1. Location map of river sites surveyed throughout the NBIRD for WFD fish surveillance monitoring, 2012

3. METHODS

Electric-fishing is the method of choice for the surveillance monitoring of fish in rivers and to obtain a representative sample of the fish assemblage for each survey site. This technique complies with European Committee for Standardisation (CEN) guidelines for fish stock assessment in wadeable rivers (CEN, 2003). At each site, the sample stretch was isolated where possible using stop nets, with one to three fishings carried out using bank-based 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, 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 Big River

One site was electric fished on the Big River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located upstream of Ballygoly Br., approximately 5km from Carlingford on the Carlingford/Cooley Peninsula, Co. Louth (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using two bank-based electric fishing units on the 3rd of July 2012, along a 48m length of channel. Glide was the most abundant habitat type present, over a substrate of mainly cobble. Vegetation at this site consisted mainly of small shade plants including mosses and liverworts.



Fig. 4.1. Location of the Big River (Ballygoly Br.) surveillance monitoring site



Plate 4.1. The Big River at Ballygoly Bridge, Co. Louth

Only two fish species were recorded in the Big River (Ballygoly) site (Table 4.1). Brown trout was the most abundant species, followed by European eels.

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

Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Brown trout	0.092	0.304	0.396	0.177	0.283	0.460
European eel	-	-	0.005	-	-	0.005
All Fish	-	-	0.402	-	-	0.465

Brown trout captured during the 2012 survey ranged in length from 4.2cm to 21.8cm (mean = 10.1cm) (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 39%, 48%, 5% and 8% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 4.5cm to 19.6cm (mean = 10.3cm). Four age classes were also present (0+, 1+, 2+ and 3+), accounting for approximately 31%, 46%, 22% and 1% of the brown trout catch respectively.

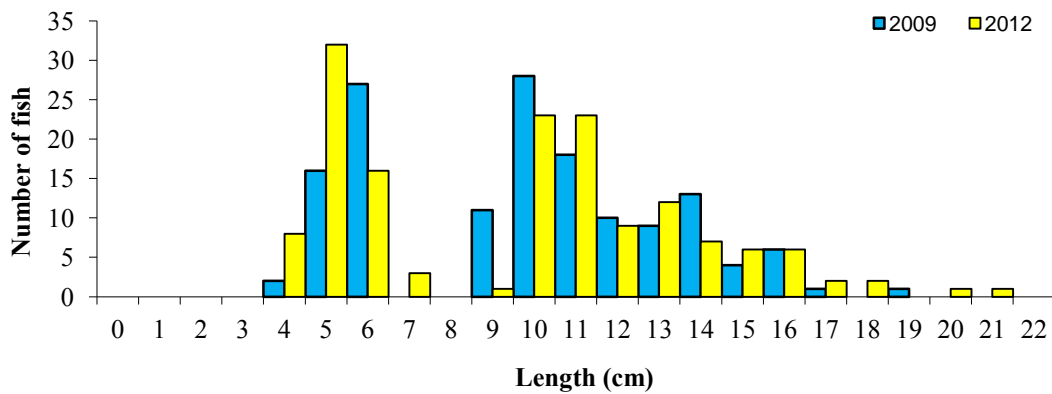


Fig. 4.2. Length frequency distribution of brown trout in the Big River site, July 2009 (n = 146) and July 2012 (n = 152)

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 2012. The survey site was located upstream of Coneyburrow Br., 1km north of Dunleer, Co. Louth (Fig. 4.3; Plate 4.2). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 2nd of July 2012, along a 45m length of channel. Glide was the most abundant habitat type present, over a substrate of mainly gravel. The vegetation at this site consisted mainly of tall emergent and semi-aquatic riparian species.

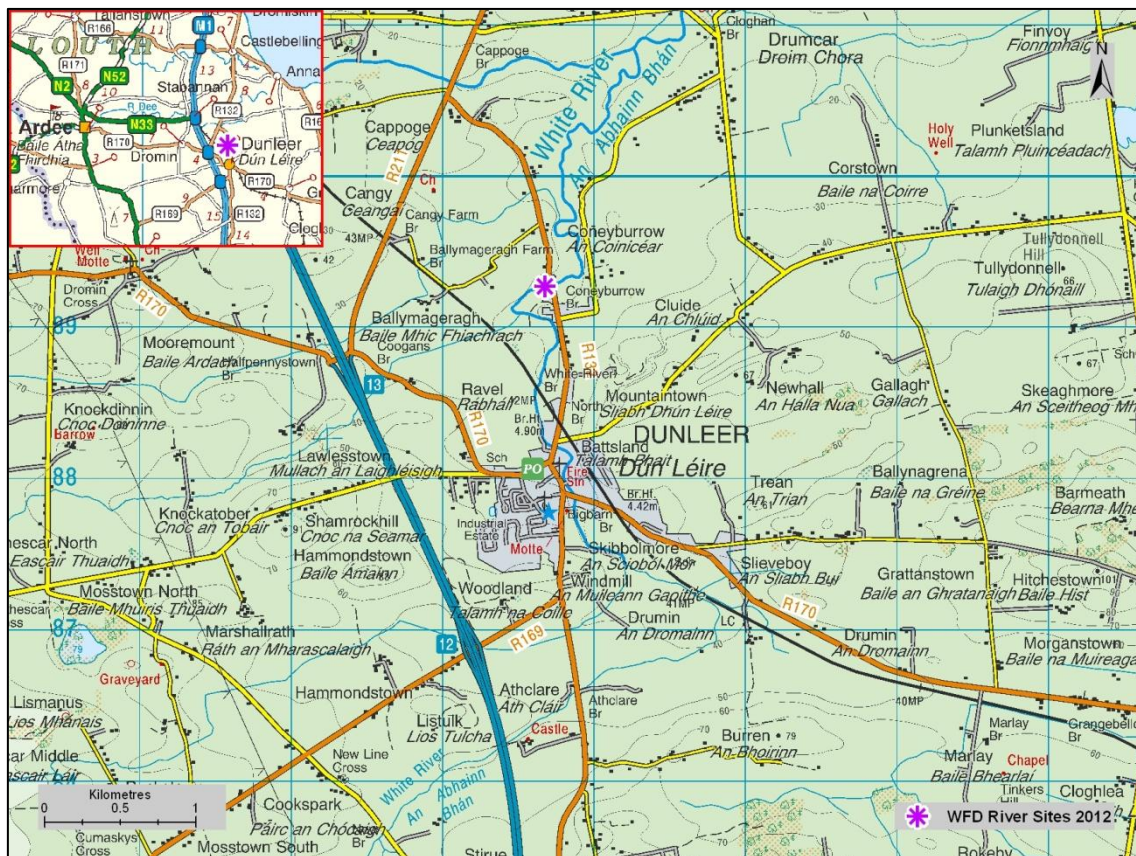


Fig. 4.3. Location of the White River surveillance monitoring site



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

A total of seven species were recorded in the White River (Coneyburrow) site (Table 4.2). Brown trout was the most abundant species followed by salmon, minnow, lamprey, three-spined stickleback, stone loach and European eels.

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

Common name	2012		Total minimum density
	0+	1+ & older	
Brown trout	0.087	0.036	0.123
Salmon	0.022	0.003	0.025
Minnow	-	-	0.081
Lamprey juvenile	-	-	0.008
Three-spined stickleback	-	-	0.008
Stone loach	-	-	0.006
European eel	-	-	0.003
All Fish	-	-	0.254

Brown trout captured during the 2012 survey ranged in length from 3.7cm to 26.1cm (mean = 9.4cm) (Fig. 4.4). Three age classes (0+, 1+ and 2+) were present, accounting for 77%, 16% and 8% of the total brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 5.2cm to 15.0cm (mean = 6.5cm) (Fig. 4.5). Two age classes (0+ and 1+) were present, accounting for 91%, 9% of the total brown trout catch respectively.

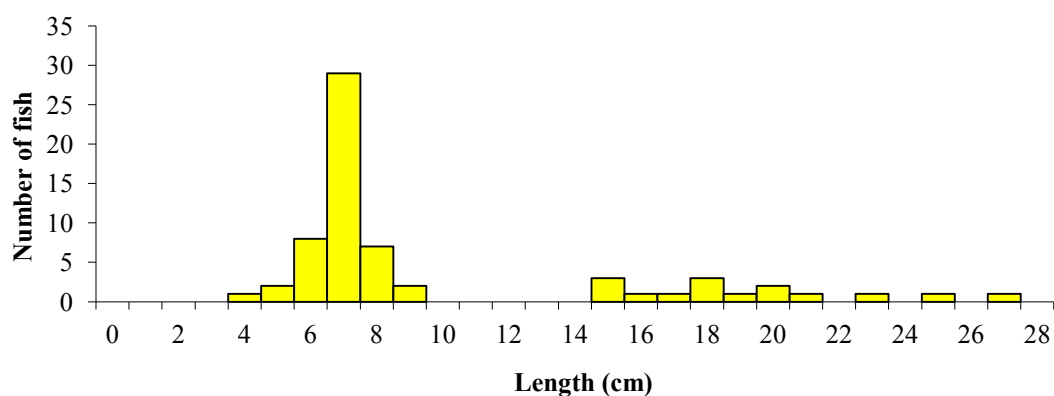


Fig. 4.4. Length frequency distribution of brown trout in the White River site, July 2009 (n = 64) and July 2012 (n = 64)

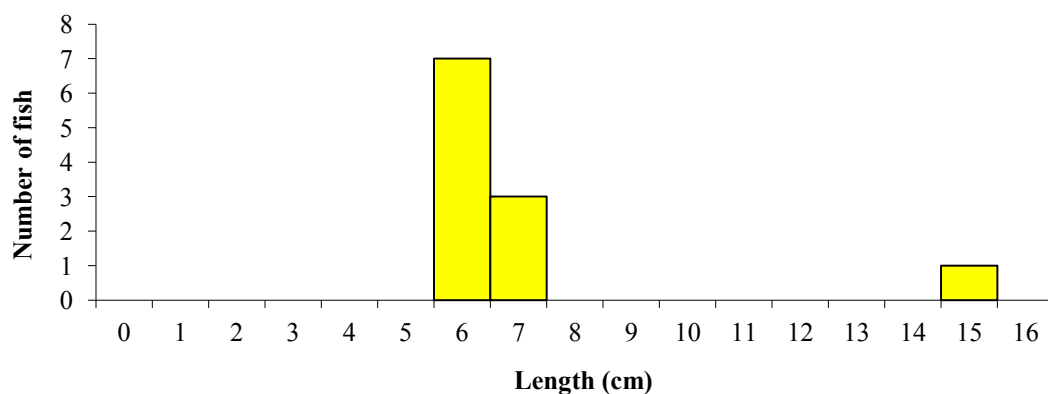


Fig. 4.5. Length frequency distribution of salmon in the White River site, July 2009 (n = 35) and July 2012 (n = 11)

4.2 Community Structure

4.2 Species distribution

A total of seven fish species were recorded within the two NBIRBD sites surveyed during 2012 (Fig. 4.6). Brown trout and European eel were the two most common fish species recorded, occurring at both sites followed by lamprey, minnow, salmon, stone loach and three-spined stickleback, all of which were recorded in one site each.

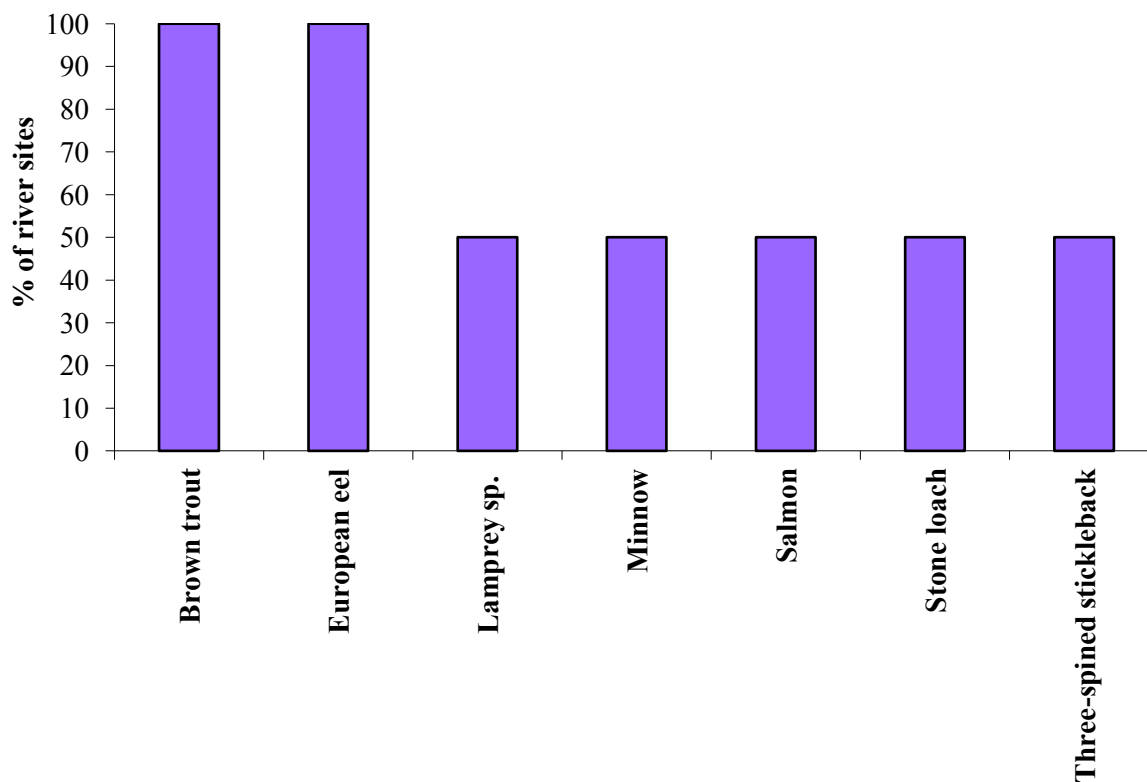


Fig. 4.6. Percentage of sites where each fish species was recorded in the NBIRBD for WFD SM monitoring 2012

4.3 Age and growth

Growth rates based on back-calculated length-at-age data were analysed for brown trout and salmon in each river site surveyed in the NBIRBD during 2012.

The mean back-calculated length-at-age data for brown trout in the NBIRBD are shown in Figure 4.7 and Appendix 1. Brown trout were recorded in both sites surveyed, with both containing fry (0+) and older fish. Ages ranged from 0+ to 3+ in the Big River and 0+ to 2+ in the White River. The most abundant age class for the Big River was 1+, while in the White River, 0+ was the dominant age group. The largest brown trout recorded in the NBIRBD in 2012 was caught in the White River, which measured 26.1cm in length, weighed 210g and was aged 2+.

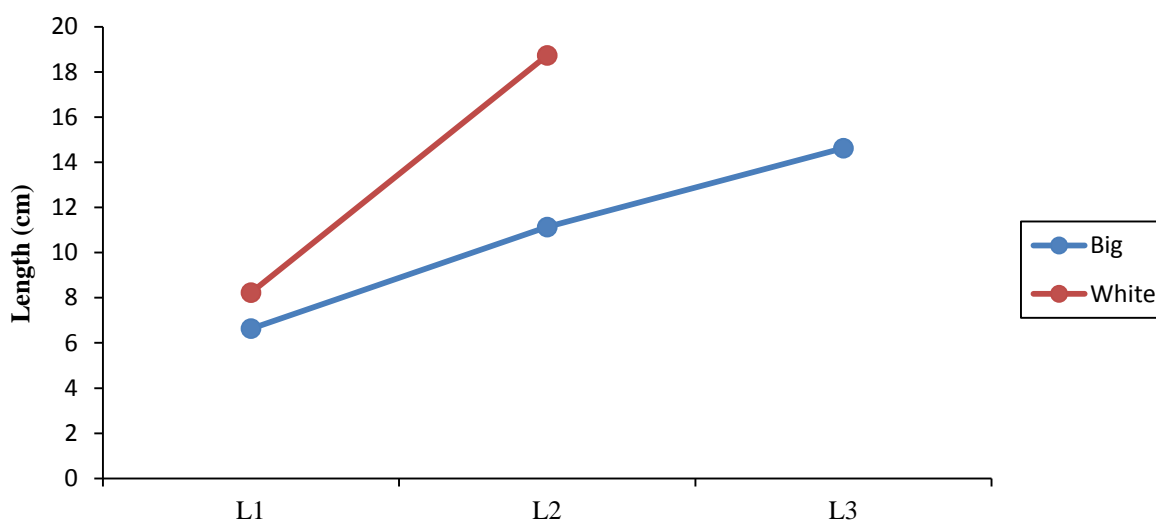


Fig. 4.7. Back calculated length-at-age for brown trout in each river, WFD surveillance monitoring 2012

Salmon were only recorded in the White River and ranged in age from 0+ to 1+. The largest salmon recorded, measured 15.0cm, weighed 42.5g and was aged 1+. Information on growth for salmon is shown in Appendix 2.

4.4 Ecological status

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

Using this tool and expert opinion, each site surveyed in 2012 was assigned a draft fish classification status (Table 4.3). The Big River was classed as Good, showing no change from 2009, while the White River was classed as Poor, a deterioration from 2009. A fish kill occurred on the White river in August 2012 almost one month after the WFD fish stock survey. Further investigations of the fish stocks in the river have led to the waterbody being assigned a status of Poor (Table 4.3).

Table 4.3. Ecological status of sites surveyed in the NBIRBD for surveillance monitoring 2012 (figures in brackets indicate confidence in class)

River	Site Code	Site name	Previous ecological status	Ecological status 2012
NBIRBD Wadeable sites				
Big (Louth)	06B010100A	Ballygoly Br._A	Good (2009) (73%)	Good (86%)
White (Louth)	06W010500B	Coneyburrow Br._B	Moderate (2009)	Poor

5. DISCUSSION

A total of seven fish species were recorded during the 2012 WFD surveillance monitoring programme for fish in rivers within the NBIRBD. Of the two sites surveyed, the White River was the more diverse, with seven species recorded, compared to just two in the Big River. Brown trout and eels were recorded in both sites, while all other species were present only in the White River.

Due to insufficient numbers within each age class, the methods of Kennedy and Fitzmaurice (1971), growth could not be used to estimate the growth rate of brown trout at either site.

The Fish Classification Scheme 2 (FCS2) tool for assessing the ecological status of rivers has been recently developed for the Republic of Ireland which is compliant with the requirements of the WFD. Using this tool and expert opinion, each site surveyed in 2012 was assigned a draft fish classification status. One site was classed as Good, while the other was classed as Poor. The Big River showed no change in status, while the White River deteriorated in status from 2009 due to a fish kill in August 2012.

6. REFERENCES

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

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

Kennedy, M. and Fitzmaurice, P. (1971) Growth and food of Brown Trout *Salmo Trutta* (L.) in Irish Waters. *Proceedings of the Royal Irish Academy*, **71 (B) (18)**, 269-352.

APPENDIX 1

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

River		L1	L2	L3	Growth category
Big River (Louth)	Mean	6.6	11.1	14.6	n/a
	S.D.	1.0	1.4	0.5	
	S.E.	0.3	0.7	0.3	
	n	15	4	3	
	Min	5.2	9.5	14.3	
	Max	9.2	12.3	15.2	
White River (Louth)	Mean	8.2	18.7		n/a
	S.D.	1.3	1.5		
	S.E.	0.4	0.7		
	n	13	4		
	Min	5.4	17.6		
	Max	10.2	20.8		

APPENDIX 2

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

River		L1
White River (Louth)	Mean	7.5
	S.D.	n/a
	S.E.	n/a
	n	1
	Min	7.5
	Max	7.5

A dark blue abstract shape, resembling a stylized wave or a corner of a page, occupies the lower-left portion of the page. It features several white dashed lines that curve across its surface and extend towards the right edge of the page. The background is white.

**Inland Fisheries Ireland
Swords Business Campus,
Swords,
Co. Dublin,
Ireland.**

**Web: www.fisheriesireland.ie
Email: info@fisheriesireland.ie
Tel: +353 1 8842 600
Fax: +353 1 8360 060**