



**Sampling Fish for the  
Water Framework  
Directive**

*Rivers 2012*

**North Western  
International River  
Basin District**



lascach Intíre Éireann  
Inland Fisheries Ireland

# Water Framework Directive Fish Stock Survey of Rivers in the North Western International River Basin District 2012

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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 North Western 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 Dr. Milton Matthews and staff from IFI Ballyshannon 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.

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## TABLE OF CONTENTS

<b>1. INTRODUCTION.....</b>	<b>3</b>
<b>2. STUDY AREA.....</b>	<b>4</b>
<b>3. METHODS .....</b>	<b>6</b>
<b>4. RESULTS .....</b>	<b>7</b>
<b>4.1 River surveys.....</b>	<b>7</b>
<i>4.1.1 The Clady River .....</i>	<i>7</i>
<i>4.1.2 The Eany Water.....</i>	<i>10</i>
<b>4.2 Species distribution.....</b>	<b>13</b>
<b>4.3 Age and growth.....</b>	<b>14</b>
<b>4.4 Ecological status.....</b>	<b>16</b>
<b>5. DISCUSSION .....</b>	<b>17</b>
<b>6. REFERENCES.....</b>	<b>18</b>
<b>APPENDIX 1.....</b>	<b>19</b>
<b>APPENDIX 2.....</b>	<b>19</b>
<b>APPENDIX 3.....</b>	<b>20</b>

## 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 North Western International River Basin District (NWIRBD) 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 those 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 NWIRBD, as part of the Water Framework Directive surveillance monitoring programme.

## 2. STUDY AREA

Two river sites were surveyed in two river catchments within the NWIRBD during 2012: the Clady, and Eany Water catchments (Table 2.1). The sites ranged in surface area from 380m<sup>2</sup> for the Clady River to 7849m<sup>2</sup> for the Eany Water. The sites were divided into two categories for reporting purposes: wadeable sites, which were surveyed with bank-based electric fishing units, and non-wadeable sites, which were surveyed with boat-based electric fishing units. Summary details of each site's location and physical characteristics are given in Tables 2.1 and 2.2, and the distribution of sites throughout the NWIRBD is shown in Figure 2.1.

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

River	Site name	Catchment	Site Code	Waterbody code
<b>NWIRBD Wadeable sites</b>				
Clady (Donegal)	Bryan's Br._A	Clady	38C040150A	NW_38_4124
<b>NWIRBD Non-Wadeable sites</b>				
Eany Water	Just d/s Eany Beg/More confl_A	Eany water	37E030300A	NW_37_3646

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

River	Upstream catchment (km <sup>2</sup> )	Wetted width (m)	Surface area (m <sup>2</sup> )	Mean depth (m)	Max depth (m)
<b>NWIRBD Wadeable sites</b>					
Clady (Donegal) (Bryan's Br._A)	78.63	10.27	380	0.28	0.61
<b>NWIRBD Non-Wadeable sites</b>					
Eany Water (Just d/s Eany Beg/More confl_A)	93.87	23.50	7849	0.56	1.90



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

### 3. METHODS

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

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

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

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

## 4. RESULTS

### 4.1 River surveys

#### 4.1.1 The Clady River

One site was electric fished on the Clady River as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located downstream of a bridge, just outside of Gweedore, Co. Donegal (Fig. 4.1; Plate 4.1). Three electric-fishing passes were conducted using three bank-based electric fishing units on the 10<sup>th</sup> of July 2012, along a 37m length of channel. Glide dominated the habitat, while the substrate consisted largely of cobble. The vegetation at this site was dominated by a diverse number of aquatic and semi-aquatic mosses and liverworts.

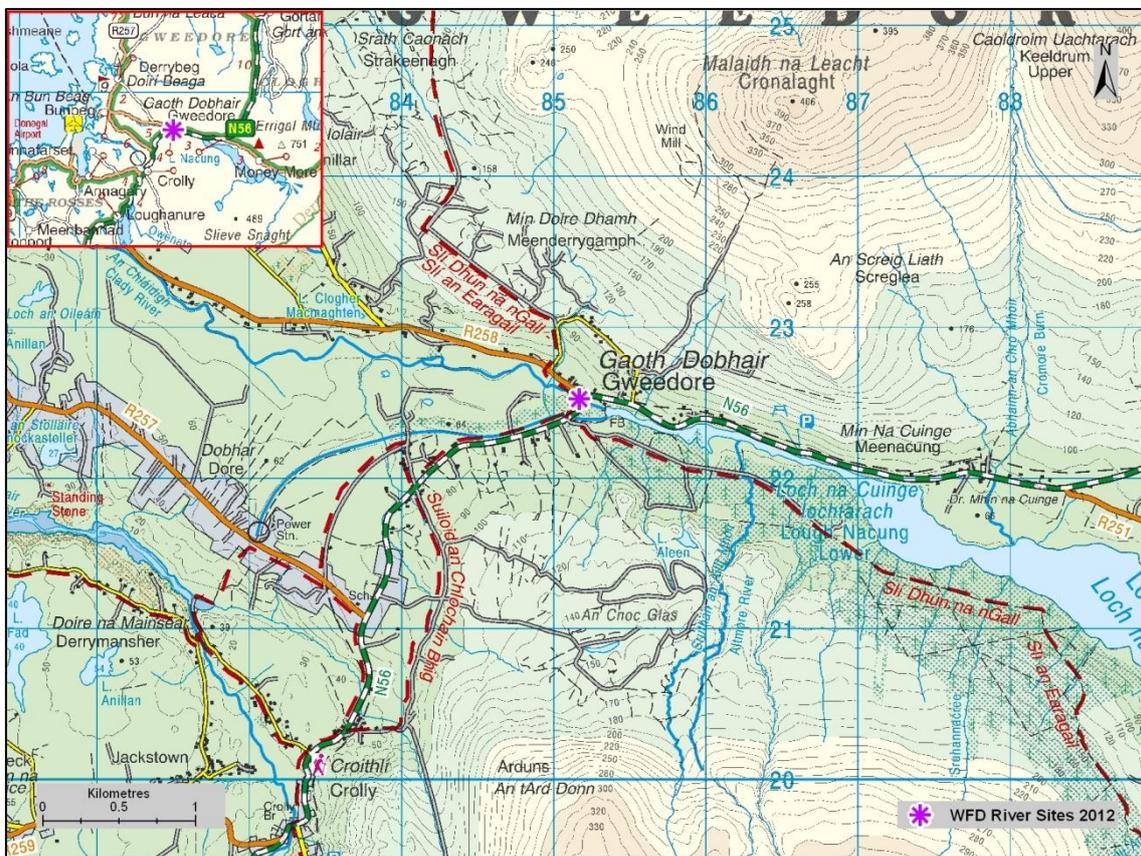


Fig. 4.1. Location of the Clady River surveillance monitoring site



**Plate 4.1. The Clady River, Gweedore, Co. Donegal**

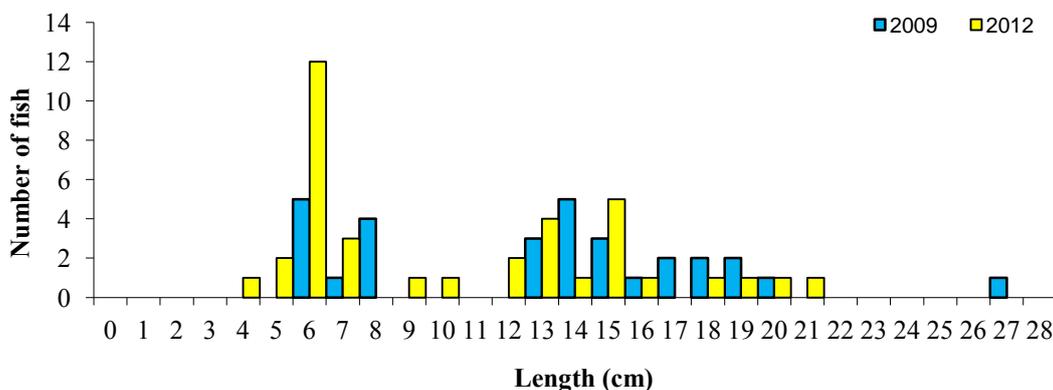
A total of four species were present in the Clady River site (Table 4.1). Salmon was the most abundant species, followed by brown trout, sea trout and European eels.

**Table 4.1. Density of fish (no./m<sup>2</sup>), Clady River (Gweedore) site (fish density has been calculated as minimum estimates based on one fishing)**

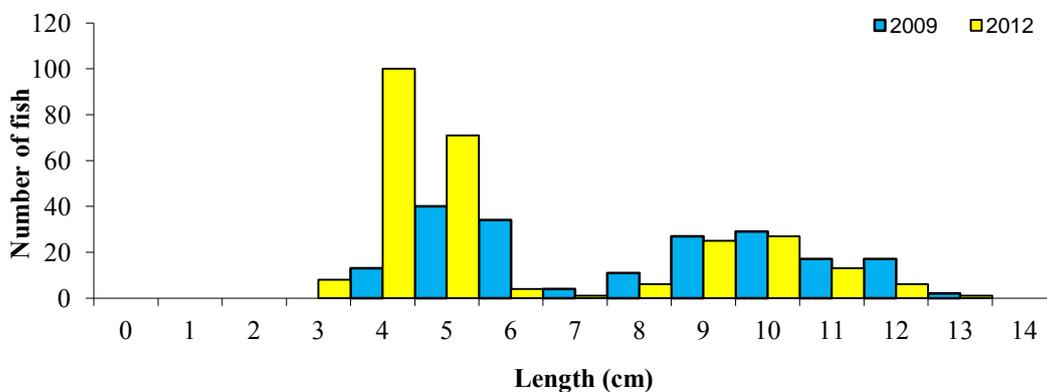
Common name	2009			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.089	0.132	0.221	0.200	0.092	0.292
Brown trout	0.012	0.022	0.034	0.021	0.018	0.039
Sea trout	-	-	-	-	-	0.003
European eel	-	-	0.005	-	-	0.003
All Fish	-	-	0.259	-	-	0.337

Brown trout captured during the 2012 survey ranged in length from 4.9cm to 21.3cm (mean = 10.8cm) (Fig. 4.2). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for 49%, 8%, 35% and 8% of the total brown trout catch respectively. Brown trout captured during the 2009 survey ranged in length from 6.0cm to 27.9cm (mean = 13.5cm). Four age classes were also present (0+, 1+, 2+ and 3+), accounting for approximately 33%, 27%, 23% and 17% of the brown trout catch respectively.

Salmon captured during the 2012 survey ranged in length from 3.3cm to 13.1cm (mean = 7.1cm) (Fig. 4.3). Four age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 70%, 24%, 6% and <1% of the total salmon catch respectively. Salmon captured during the 2009 survey ranged in length from 4.2cm to 13.3cm (mean = 8.3cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 48%, 46% and 7% of the salmon catch respectively.



**Fig. 4.2. Length frequency distribution of brown trout in the Clady River site, September 2009 (n = 30) and July 2012 (n = 37)**



**Fig. 4.3. Length frequency distribution of salmon in the Clady River site, September 2009 (n = 194) and July 2012 (n = 262)**

#### 4.1.2 The Eany Water

One site was electric fished on the Eany Water as part of the WFD surveillance monitoring programme in rivers 2012. The survey site was located downstream of a bridge approximately 5km northwest of Mountcharles, Co. Donegal (Fig. 4.4; Plate 4.2). One electric-fishing pass was conducted using one boat-based electric fishing unit on the 10<sup>th</sup> of July 2012, along a 334m length of channel. Pool and glide dominated the habitat, while the substrate consisted largely of cobble.



**Fig. 4.4. Location of the Eany Water surveillance monitoring site**



**Plate 4.2. The Eany Water, (EanyBeg confluence), Co. Donegal**

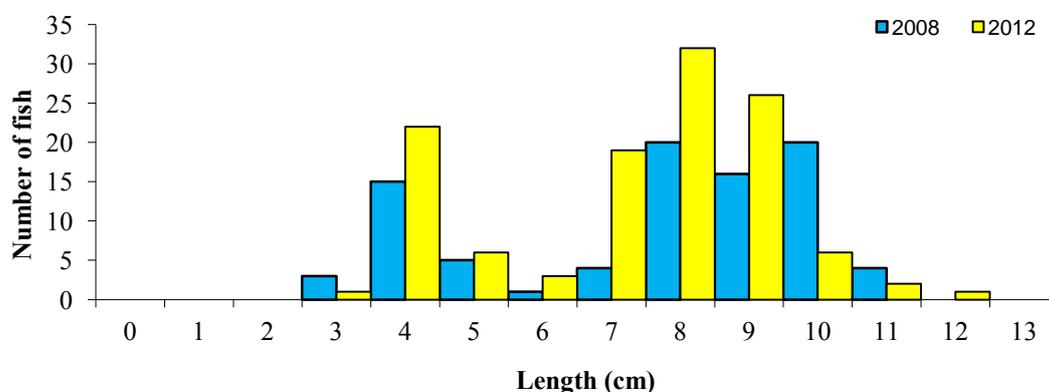
Three species were recorded in the Eany Water site (Table.4.2). Salmon was the most abundant species, followed equally by brown trout and European eels.

**Table 4.2. Density of fish (no./m<sup>2</sup>), Eany Water (Eanybeg confluence) site (fish density has been calculated as minimum estimates based on one fishing)**

Common name	2008			2012		
	0+	1+ & older	Total minimum density	0+	1+ & older	Total minimum density
Salmon	0.002	0.0030	0.0050	0.0040	0.0110	0.0150
Brown trout	0.000	0.0003	0.0003	0.0001	0.0003	0.0004
European eel	-	-	0.0010	-	-	-
All Fish	-	-	0.0060	-	-	0.0160

Only three brown trout were captured during the 2012 survey, ranging in length from 6.3cm to 11.1cm (mean = 9.4cm). They were recorded in two age classes, 0+ and 1+. Brown trout captured during the 2008 survey ranged in length from 16.0cm to 19.3cm (mean = 17.3cm) and all were within the 2+ age class.

Salmon captured during the 2012 survey ranged in length from 3.8cm to 12.1cm (mean = 7.7cm) (Fig. 4.5). Three age classes (0+, 1+, 2+ and 3+) were present, accounting for approximately 25%, 71% and 4% of the total salmon catch respectively. Salmon captured during the 2008 survey ranged in length from 3.3cm to 11.4cm (mean = 8.1cm). Three age classes (0+, 1+ and 2+) were present, accounting for approximately 42%, 57% and 1% of the salmon catch respectively.

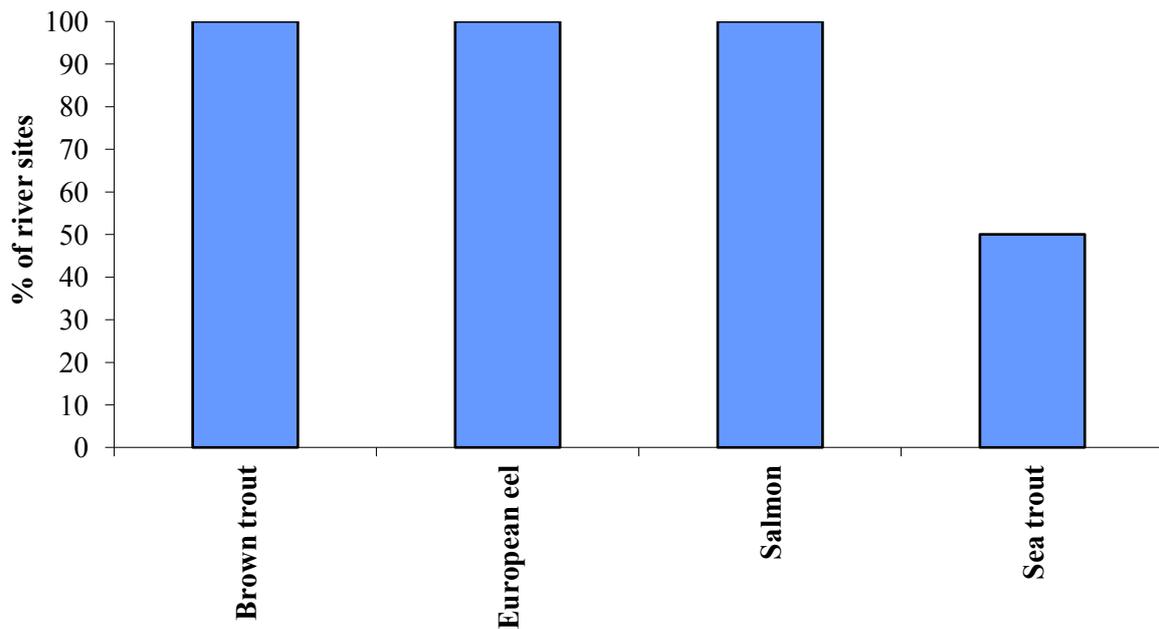


**Fig. 4.5. Length frequency distribution of salmon in the Eany Water site, July 2008 (n = 88) and July 2012 (n = 118)**

## 4.2 Community Structure

### 4.2 Species distribution

Four fish species (including sea trout) were recorded within the two NWIRBD sites surveyed during 2012 (Fig. 4.6). Brown trout, eels and salmon were present at both sites, while sea trout were only recorded at one.



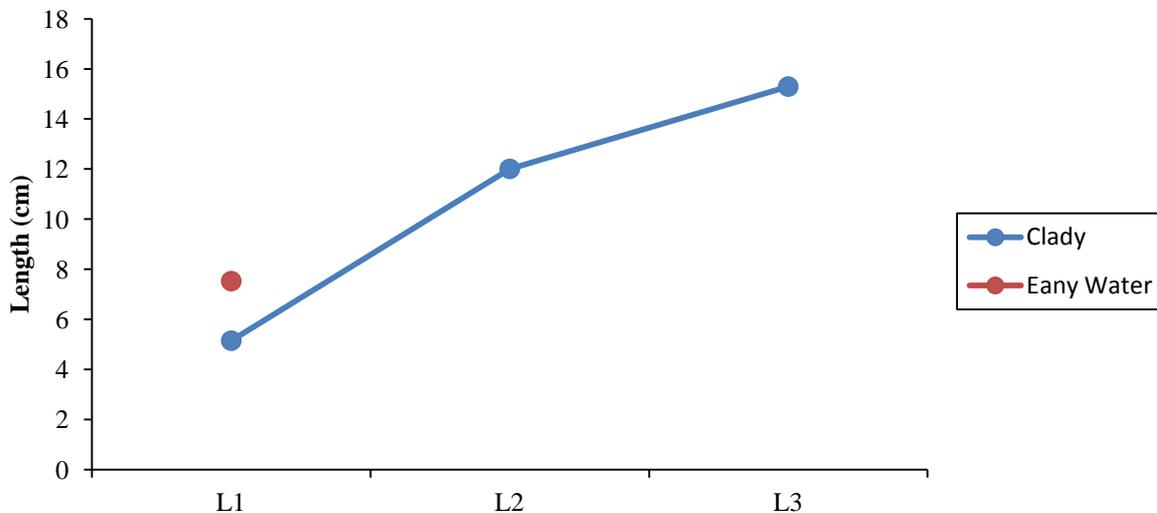
**Fig. 4.6. Percentage of sites where each fish species was recorded in the NWIRBD for WFD SM monitoring 2012**

### 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 NWIRBD during 2012.

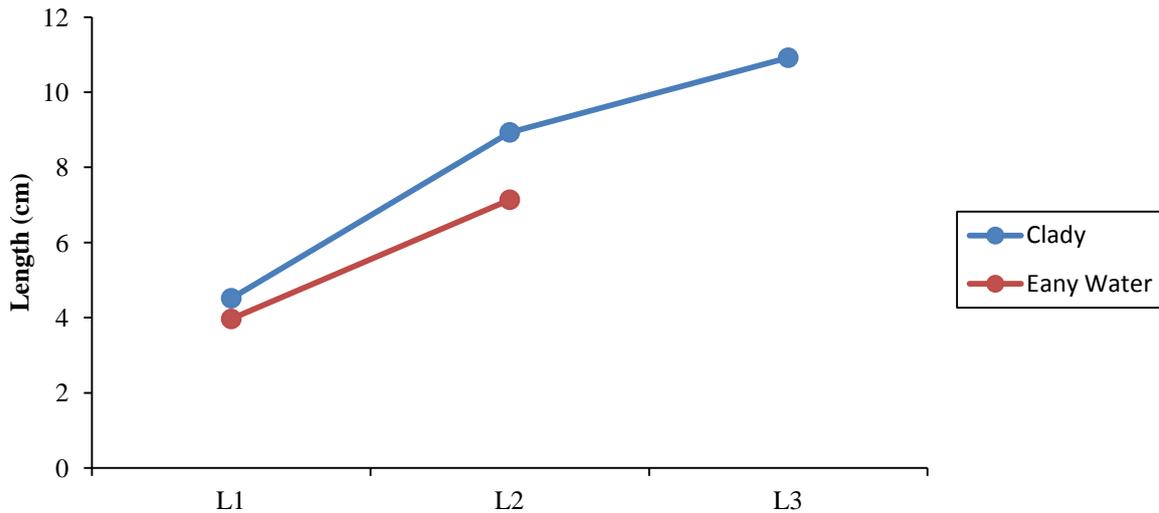
The mean back-calculated length-at-age data for brown trout in the NWIRBD are shown in Figure 4.7 and Appendix 1. Brown trout were recorded in both sites surveyed, with both containing fry (0+) and older fish. Ages ranged from 0+ to 3+ in the Clady River and 0+ to 1+ in the Eany Water. Brown trout aged 0+ were the most common age group in the Clady River.

The largest brown trout recorded in the NWIRBD in 2012 was caught in the Clady River, which measured 21.3cm in length, weighed 105g and was aged 3+. The brown trout at each river site were assigned growth categories described by Kennedy and Fitzmaurice (1971), who examined the relationship between alkalinity and growth of brown trout in Irish streams and rivers. Using this method, the growth rate 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 very slow at the Clady River (Appendix 1).



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

The mean back-calculated length-at-age data for salmon in the NWIRBD is shown in Figure 4.8 and Appendix 2. Salmon were recorded in both of the NWIRBD sites surveyed, with both sites containing both fry (0+) and parr (1+ and 2+). Ages ranged from 0+ to 3+, with fish aged 0+ comprising the most abundant age class within the Clady River and those within the 1+ age class most common in the Eany Water. The largest juvenile salmon recorded in the NWIRBD in 2012 was caught in the Clady River, which measured 13.1cm in length, weighed 29g and was aged 3+.



**Fig. 4.8. Back calculated length-at-age for salmon in each river, WFD surveillance monitoring 2012**

Sea trout were only recorded in one site and only one individual was caught. Their mean back-calculated length-at-age data is shown in appendix 3. Sea trout ageing was carried out as described in Poole (2010). This fish was aged as 3.0+ (total age 3+), a 3-year old smolt that returned to freshwater after only a few months at sea (finnock).

#### 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 has been assigned a draft fish classification status (Table 4.5). The Clady River site was classed as High, while the Eany Water was classed as Good. When compared with previous years (2008 and 2009), the Clady River showed an improvement in status, while the Eany Water remained the same (Table 4.5).

**Table 4.5. Ecological status of sites surveyed in the NWIRBD for surveillance monitoring 2012**  
**(figures in brackets indicate confidence in class)**

River	Site Code	Site name	Previous ecological status	Ecological status 2012
<b>NWIRBD Wadeable sites</b>				
Clady (Donegal)	38C040150A	Bryan's Br._A	Good (2009) (72%)	High (100%)
<b>NWIRBD Non-Wadeable sites</b>				
Eany Water	37E030300A	Just d/s Eany Beg/More confl_A	Good (2008)	Good

## 5. DISCUSSION

A total of four fish species (sea trout are included as a separate ‘variety’ of trout) were recorded during the 2012 WFD surveillance monitoring programme for fish in rivers within the NWIRBD. Brown trout, European eels and salmon were all recorded in both sites, while sea trout were recorded at one. Of the two sites surveyed, the Clady River was the more diverse, with four species recorded (sea trout included).

Following the methods of Kennedy and Fitzmaurice (1971), growth could only be estimated at the Clady River where it was categorised as very slow.

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. The Clady river site was classed as High status which is an improvement on the previous status (2009) of good while the status of the Eany Water site remained the same at Good status.

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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
<b>Clady River (Donegal)</b>	Mean	5.1	12.0	15.3	Very Slow
	S.D.	0.8	2.5	1.8	
	S.E.	0.2	0.7	1.0	
	n	15	13	3	
	Min	3.9	8.0	13.4	
	Max	6.7	16.0	17.0	
<b>Eany Water</b>	Mean	7.5			n/a
	S.D.	1.2			
	S.E.	0.9			
	n	2			
	Min	6.7			
	Max	8.4			

### 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	L3
<b>Clady River (Donegal)</b>	Mean	4.5	8.9	10.9
	S.D.	0.8	1.2	n/a
	S.E.	0.2	0.4	n/a
	n	24	10	1
	Min	3.1	6.2	10.9
	Max	5.6	10.1	10.9
<b>Eany Water</b>	Mean	4.0	7.1	
	S.D.	0.8	0.6	
	S.E.	0.2	0.4	
	n	21	3	
	Min	2.7	6.6	
	Max	6.1	7.9	

### APPENDIX 3

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

River		L1	L2	L3
<b>Clady (Donegal)</b>	Mean	6.80	12.40	19.20
	S.D.	n/a	n/a	n/a
	S.E.	n/a	n/a	n/a
	n	1	1	1
	Min	6.80	12.40	19.20
	Max	6.80	12.40	19.20



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