Sampling Fish for the Water Framework Directive

Rivers 2010

North Western International River Basin District

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

1. INTRODUCTION

Fish stock surveys were undertaken in 43 river sites throughout Ireland during the summer of 2010 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). One of the 43 surveys was conducted on a river site in the North Western International River Basin District (NWIRBD) in June 2010 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.

The NWIRBD is the largest of three cross-border RBDs. It encompasses all of Co. Donegal and parts of counties Derry, Tyrone, Fermanagh, Sligo, Leitrim, Longford, Monaghan and Cavan (Fig. 2.1). It has a land surface area of approximately 12,300km^2 and a marine area (most of which belongs to Co. Donegal) of approximately 2,500km^2. The Erne and Foyle are the two largest river systems within the NWIRBD. The region has a relatively low population, less than 0.5 million, with most people living in the larger towns such as Derry/Londonderry, Enniskillen, Omagh, Letterkenny and Cavan. The NWIRBD encompasses a number of different landscape types, ranging from scenic mountains and coastline in the west, to rich fertile farmland in the east. Some of the most important anthropogenic activities affecting water quality include agriculture, forestry and tourism.

This report summarises the main findings of the single fish stock survey conducted in the NWIRBD during 2010 and reports on the current ecological status of the fish stocks present.

2. STUDY AREA

One river site in the NWIRBD, on the Cullies River, was surveyed during 2010. This survey was conducted using bank-based electric fishing units. Summary details of the site's location and physical characteristics are given in Tables 2.1 and 2.2, and the location of this site within the NWIRBD is shown in Figure 2.1.

Table 2.1. Location and codes of river sites surveyed for WFD surveillance monitoring, 2010

River	Site name	Catchment	Site Code	Waterbody code
NWIRBD Wadeable sites				
Cullies	Br near Kilbracken House	Erne	36C030600F	NW_36_2032

Table 2.2. Details of river sites surveyed for WFD surveillance monitoring, 2010

River	Upstream catchment (km^2)	Wetted width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
NWIRBD Wadeable sites					
Cullies	110.4	5.03	227	0.17	0.40

The Cullies River rises along the borders of Co. Leitrim and Co. Longford (Plate 2.1). It flows through a series of small lakes as it makes its way towards Co. Cavan, joining Lough Oughter and the River Erne system near Killashandra. Fishing in the Cullies River and its lakes is popular among coarse anglers, with good stocks of pike present (IFI, 2010).

The survey site was located downstream of Kilbracken Bridge, between Glasshouse Lough and Rockfield Lough, on the border between Counties Cavan and Leitrim (Fig. 2.2). Three electric-fishing passes were conducted using two bank-based electric-fishing units on the 6th of June 2010 along a 45m length of channel. The mean wetted width of the surveyed stretch was 5.0m and the mean depth was 17.0cm. A total wetted area of 227m^2 was surveyed. Riffle and glide were the predominant habitats present, with a substrate of mainly gravel.

Fig. 2.1. Location map of river sites surveyed throughout the NWIRBD for WFD fish surveillance monitoring 2010

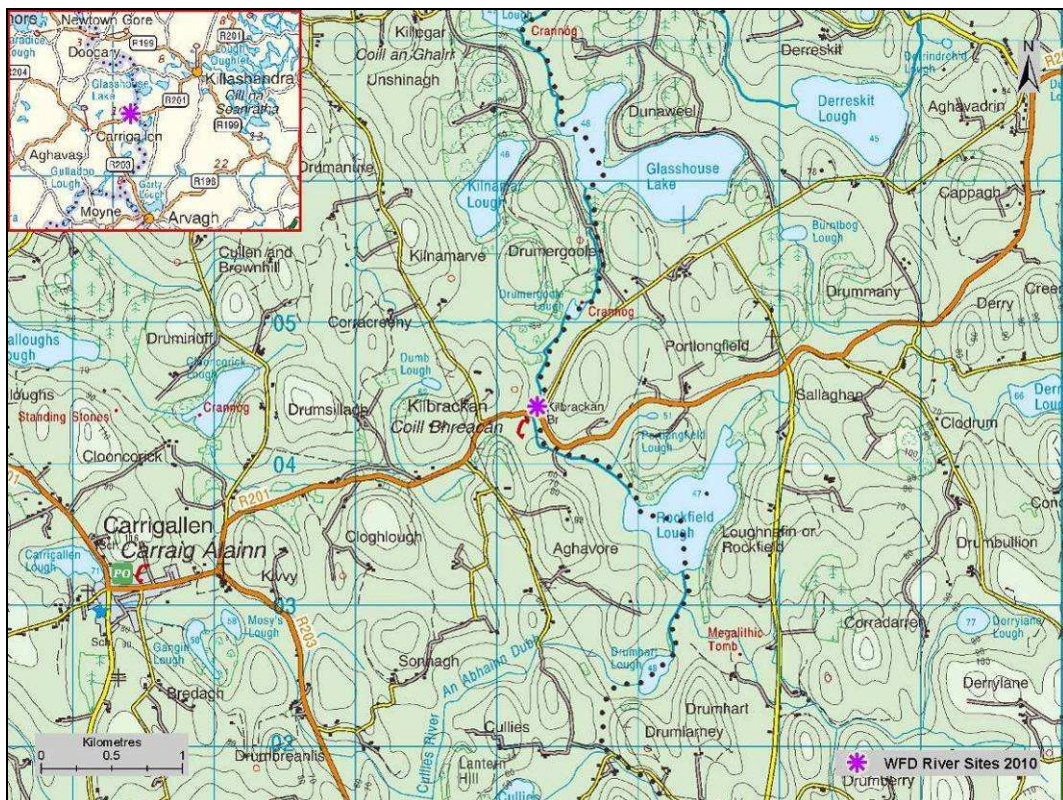**Plate 2.1. The Cullies River downstream of Kilbracken Bridge, Co. Leitrim/Cavan**

Fig. 2.2. Location of the Cullies River surveillance monitoring site

3. METHODS

Electric-fishing is the method of choice for surveillance monitoring of fish in rivers to obtain a representative sample of the fish assemblage at each sampling site (Plates 3.1 and 3.2). This technique complies with European Committee for Standardisation (CEN) guidelines for fish stock assessment in wadeable rivers (CEN, 2003). At each site, where possible, the stretch sampled was isolated using stop nets and one to three fishing passes were conducted using bank-based electric fishing units or boat-based electric fishing units. Each survey encompassed all habitat types: riffle, glide and pool. A number of physical habitat variables were measured at each site. Water samples for chemical analyses were also taken, along with a multi-habitat kick-sample of macroinvertebrates. Macrophyte surveys were conducted on a selected number of wadeable streams.

Fish from each pass were sorted and processed separately. Fish were identified and lengths and weights were recorded; sub-samples were measured when large numbers of fish were present. For the purpose of species identification, where recorded, 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 recorded separately. For aging analyses, scales were taken from salmonids and most non-native fish species greater than 8.0cm in length. These fish were held in a large bin of oxygenated water after processing until they were fully recovered before being returned to the water. When present in a survey, a sub-sample of perch were retained for aging using opercular bones.

Three fishing passes were not possible or practical at all sites. Therefore in order to standardise abundance estimates across all sites, fish densities were calculated using data from the first fishing pass only. The number captured in the first fishing pass was divided by the total area surveyed to give a minimum population density for each species.

A sub-sample of the dominant fish species were aged (five fish from each 1cm size class). Fish scales were aged using a microfiche, and opercular bones were aged using an Olympus SZX10 microscope/digital camera system. Growth was determined by back-calculating lengths at the end of each winter (e.g. L1 is the mean length at the end of the first winter, L2 is the mean length at the end of the second winter, etc.).

Plate 3.1. Electric-fishing using bank-based units on the Owenriff River (WRBD)

Plate 3.2. Electric-fishing using boat-based units on the River Shannon (Clonmacnoise)

4. RESULTS

4.1 Species composition, abundance and age structure

A total of eight fish species and one hybrid were recorded in the Cullies River site. Roach was the most abundant species, followed by perch, roach × bream hybrids, brown trout, pike, bream, lamprey, gudgeon and eels (Table 4.1).

Table 4.1. Minimum density of each fish species (no./m^2) captured on the Cullies River site, July 2010

Scientific name	Common name	0+	1+ & older	Total minimum density
Rutilus rutilus	Roach	-	-	0.468
Perca fluviatilis	Perch	-	-	0.437
Rutilus rutilus × Abramis brama	Roach × bream hybrid	-	-	0.026
Salmo trutta fario	Brown trout	-	0.018	0.018
Esox lucius	Pike	-	-	0.018
Abramis brama	Bream	-	-	0.013
Lampetra sp.	Lamprey sp.	-	-	0.009
Cyprinidae	Cyprinid fry	-	-	0.009
Gobio gobio	Gudgeon	-	-	0.004
Anguilla anguilla	Eel	-	-	0.004
All Fish	All Fish	-	-	1.007

Only four brown trout, ranging in length from 15.4cm to 21.4cm, were captured. Two age classes (1+ and 2+) were present, accounting for approximately 75% and 25% of the total brown trout catch respectively. The mean brown trout L1 and L2 were 8.9cm and 15.7cm respectively (Appendix 1). This indicates that the growth of brown trout in this river site is 'slow' according to the classification scheme of Kennedy and Fitzmaurice (1971).

Roach ranged in length from 8.4cm to 24.4cm (Fig. 4.1). Six age classes (2+, 3+, 4+, 5+, 6+ and 7+) were present, accounting for approximately 41%, 15%, 29%, 7%, 5% and 3% of the total roach catch respectively. One hundred and five unidentified cyprinid fry also captured at the site are likely to have been 0+ roach.

Perch ranged in length from 3.0cm to 22.5cm. The length frequency distribution indicates that most of the population was composed of 0+ fry and 1+ juveniles, with smaller numbers of older age classes present (Fig. 4.2).

Other species of fish recorded included, pike ranging in length from 9.2cm to 67.1cm, bream ranging in length from 11.1cm to 24.1cm and lamprey ranging in length from 12.2cm to 16.6cm. Roach x

bream hybrids ranged in length from 13.4cm to 25.2cm. Single specimens of gudgeon measuring 5.4cm in length and eel were also recorded.
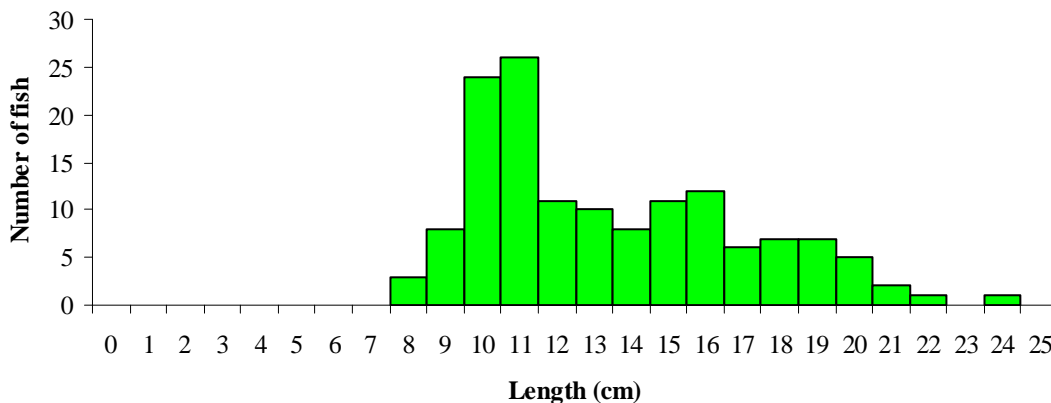

Fig. 4.1. Length frequency distribution of roach in the Cullies River site, June 2010 (n = 142)
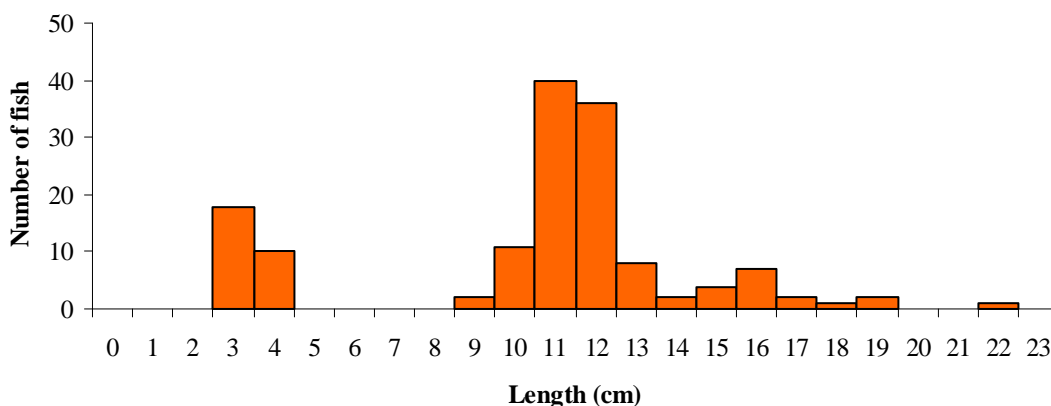

Fig. 4.2. Length frequency distribution of perch in the Cullies River site, June 2010 (n = 144)

4.2 Age and growth of brown trout and roach

Growth rates based on back-calculated length-at-age data were analysed for brown trout and roach in the Cullies River site.

Brown trout were all aged either aged 1+ or 2+. The largest brown trout recorded measured 21.4cm in length, weighed 103g and was aged 2+. Brown trout in the Cullies River site were assigned a growth category described by Kennedy and Fitzmaurice (1971), who examined the relationship between alkalinity and growth of brown trout in Irish streams and rivers. Brown trout growth was classified as 'slow' (Fig. 4.3, Appendix 1); however, this is based on limited data from a total of only four fish captured.
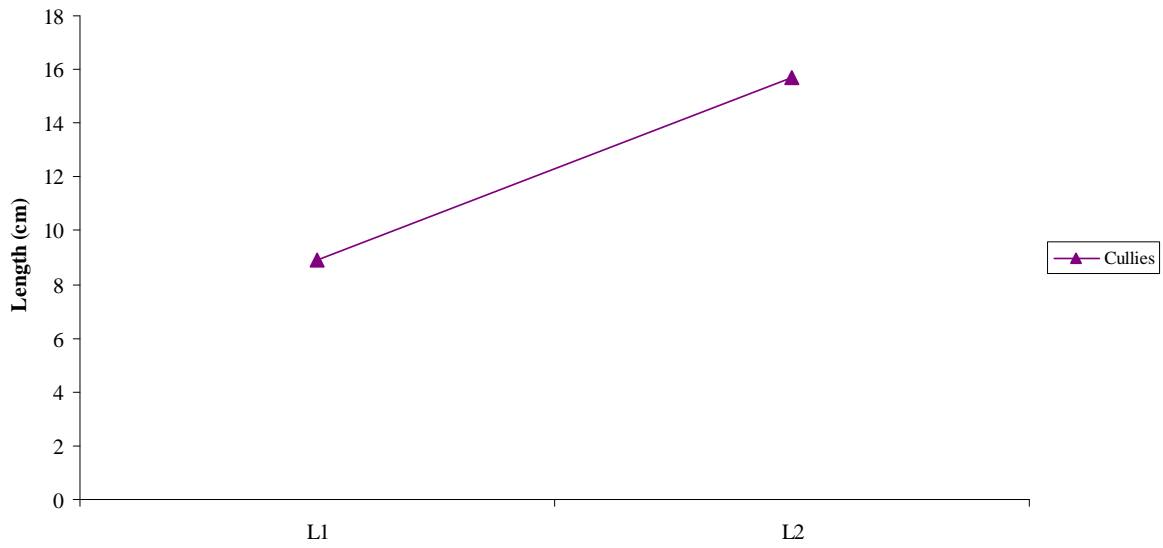
Fig. 4.3. Back calculated length-at-age for brown trout in the Cullies River, 2010

The mean back calculated length-at-age data for roach in the Cullies River site are shown in Figure 4.4 and Appendix 2.
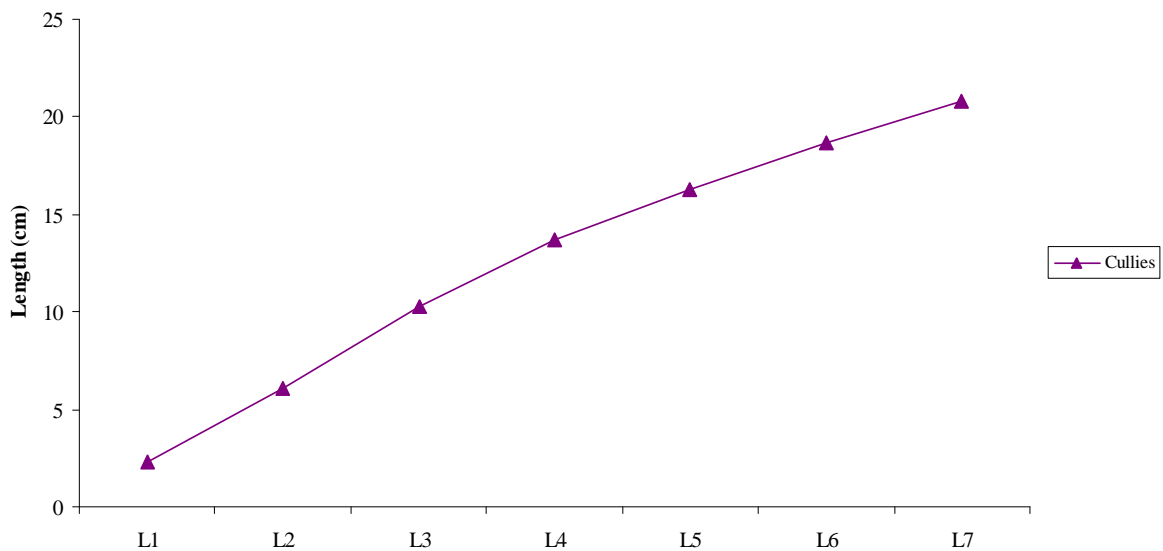

Fig. 4.4. Back calculated length-at-age for roach in the Cullies River, 2010

4.3 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 Management Plans.

An ecological classification tool for fish in rivers has recently been developed for Ecoregion 17 (Republic of Ireland and Northern Ireland), along with a separate version for Scotland to comply with the requirements of the WFD. Agencies throughout each of the three regions have contributed data which was used in the model development. It was recommended during the earlier stages of this project that an approach similar to that developed by the Environment Agency in England and Wales (Fisheries Classification Scheme 2, or 'FCS2') be used. This approach has broadly been followed and improved to develop the new classification tool – 'FCS2 Ireland'. The tool works by comparing various fish community metric values within a site (observed) to those predicted (expected) for that site under reference (un-impacted) conditions using a geo-statistical model based on Bayesian probabilities. The resultant output is an Ecological Quality Ratio (EQR) between 1 and 0, with five class boundaries defined along this range corresponding with the five ecological status classes of High, Good, Moderate, Poor and Bad. Confidence levels are assigned to each class and represented as probabilities.

Using FCS2 Ireland, along with expert opinion, the Cullies river site surveyed during 2010 has been assigned a draft fish ecological status class of moderate (Table 4.2).

Table 4.2. Ecological status of sites surveyed in the NWIRBD for surveillance monitoring 2010

River	Site code	Site name	Ecological status
NWIRBD Wadeable sites			
Cullies	36C030600F	Br nr Kilbrackan Ho	Moderate

5. DISCUSSION

A total of eight fish species and one hybrid were recorded in the Cullies River site within the NWIRBD during the 2010 monitoring programme. The highest species diversity recorded in any site throughout the country during 2010 was ten species in the River Blackwater (Lismore) where there was a high number of non-native fish species present. Information on fish species richness, composition, distribution and abundance throughout the whole country can be found in the WFD summary report for 2010 (Kelly *et al*., 2011).

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

Following the methods of Kennedy and Fitzmaurice (1971), the growth of brown trout was classified as 'slow' in the Cullies River site (Appendix 1). Roach growth rates were comparable to other river sites surveyed during 2010 such as the River Moy at Gweestin Br. and River Shannon at Battle Br. (B) (Kelly *et al*., 2011).

Using the recently completed ecological classification tool for fish in rivers (FCS2 Ireland), along with expert opinion, the Cullies River has been assigned a draft ecological status classification of Moderate based on the fish populations present.

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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	L4	Growth category
Cullies	Mean	8.9	15.7			Slow
	S.D.	1.5	n/a			
	S.E.	0.7	n/a			
	n	4	1			
	Min	8.1	15.7			
	Max	11.2	15.7			

APPENDIX 2

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

River		L1	L2	L3	L4	L5	L6	L7
Cullies	Mean	2.3	6.1	10.2	13.7	16.2	18.6	20.8
	S.D.	0.4	1.3	1.7	1.8	1.5	0.8	0.7
	S.E.	0.1	0.2	0.2	0.3	0.4	0.3	0.4
	n	61	61	47	37	15	7	3
	Min	1.6	3.4	6.4	10.2	13.2	16.9	20.0
	Max	3.4	9.0	13.9	17.7	18.5	19.4	21.4