National Research Survey Programme

Rivers 2016

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National Research Survey Programme

Sampling Fish in Rivers 2016

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EXECUTIVE SUMMARY

Inland Fisheries Ireland's National Research Survey Programme - Lakes and Rivers team (NRSP-L&R) was set up in 2015 as part of a restructuring exercise within the Research and Development Division. In 2016 the National Coarse Fish and Pike (NRSP-NCFP) remit was added to the team. The main functions of the team are to provide expertise in terms of sampling methodologies and field support to a number of research programmes and carry out research and monitoring in lakes and rivers in the areas of Water Framework Directive (WFD), Arctic char, brown trout, coarse fish and pike. Method intercalibration and hydroacoustic development also comes under the jurisdiction of the team.

Fish stock surveys were undertaken at 185 river sites in 39 catchments throughout Ireland during the summer of 2016 as part of Inland Fisheries Irelands National Research Survey Programme (NRSP).

The objectives of the surveys were as follows:

- Monitoring fish at WFD surveillance monitoring (SM) river sites.
- Sampling method intercalibration
- Catchment wide electrofishing surveys (brown trout and coarse fish and pike research)

A total of 37 WFD SM sites were surveyed during 2016. This is the ninth year of the fish in rivers WFD SM sampling programme, with many of the sites surveyed this year being surveyed previously. As a result, much of the data from 2016 can be compared with that from at least one previous sampling occasion, to determine whether the status of fish in rivers is improving or deteriorating.

In 2016 ten sites were surveyed using a ten-minute boat electrofishing method as part of a study to examine the potential for using this sampling method in deeper rivers; these surveys took place on the Anner, Ara and Cromoge Rivers (Suir Catchment - SERBD).

Catchment wide surveys were initiated to increase the spatial coverage of fish stock monitoring and research and to assess the status of fish stocks in relation to various presssures. The data collected will provide information for IFIs brown trout, coarse fish and WFD research and monitoring programmes and will also provide useful information for fisheries management purposes.

A total of 17 fish species (sea trout are included as a separate 'variety' of trout) and one type of hybrid (roach x bream) were recorded at the 185 river sites surveyed. Brown trout was the most common fish species recorded, being present in 72.4% of sites surveyed, followed by salmon (36.8%), stone loach (33.5%), minnow (29.7%), roach 28.6%, three-spined stickleback (22.2%), European eel (21.6%), perch (20.0%), pike (14.1%), lamprey sp. (12.4%), gudgeon (11.4%), roach x bream hybrids (7.6%), bream (2.2%), rudd (1.6%), flounder (1.1%), dace (0.5%), rainbow trout (0.5%) and sea trout (0.5%).

Brown trout were recorded at 134 sites, ranging in ages from 0+ to 4+. Individuals aged 0+ and 1+ were the most abundant age cohorts. The largest brown trout was caught in the River Maigue (Castleroberts Br.), measured 43.9cm in length and was aged 3+. Brown trout from two rivers (Ara River (SERBD) and Tullamore River (SHIRBD)) were assigned a fast rate of growth. The majority of brown trout from the remaining rivers were assigned a moderate rate (28 rivers) of growth and and two had brown trout that were assigned a slow rate growth.

Salmon were recorded at 68 sites, with three age classes (0+ to 2+). Individuals within the 1+ and 0+ were the most common cohorts respectively. Five sites recorded salmon aged 2+.

Roach were captured at 53 sites. Eleven age classes were recorded, ranging in age from 0+ to 10+, with individuals aged 3+ the most frequently encountered cohort. The largest roach (10+) was recorded in the River Shannon (Curley's Island Backwater) and measured 33cm.

Pike were recorded at 26 sites, with seven age classes recorded (0+ to 6+). Individuals aged 1+ and 3+ were the most frequently encountered age cohorts. The largest pike (6+) was recorded on the River Shannon (d/s of Costello's Island) and measured 93.5cm.

Roach x bream hybrids were observed at 14 sites, with 10 age classes recorded. Individuals within the 4+ cohort were the most frequently encountered, although this number was still relatively low when compared with other species. The largest roach x bream hybrid was caught in the River Shannon (Battle Br.), measured 39.3cm and was aged at 12+.

The ecological status classification tool for fish in Irish rivers 'FSC2 Ireland' (SNIFFER, 2011) along with expert opinion, was used to classify many river sites surveyed during 2016; three sites were classified as High status, 42 as Good, 80 as Moderate, 45 as Poor and 4 as Bad fish status.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

Fish stock surveys were undertaken at 185 river sites in 39 catchments throughout Ireland during the summer of 2016 as part of Inland Fisheries Irelands National Research Survey Programme (NRSP).

The objectives of the surveys were as follows:

1.1 Monitoring fish at Water Framework Directive surveillance monitoring sites.

These surveys are required by both national and European law (S.I. No. 722 of 2003and 2000/60/EC). This water Frameowrk Directive (WFD) stipulates that rivers are included within the monitoring programme and that the composition, abundance and age structure of fish fauna in rivers are examined (Council of the European Communities, 2000). A total of 37 surveillance monitoring river sites (SM) were surveyed. 2016 is the ninth year of the fish in rives WFD SM sampling programme, with many of the sites surveyed this year being repeat surveys of those carried out in previous years. As a result, much of the data from 2016 can be compared with that from at least one previous sampling occasion, to determine whether the status of fish in rivers is improving or deteriorating.

1.2 Sampling method intercalibration

A new ten-minute electrofishing sampling method was introduced in 2015 on surveys in the River Barrow catchment (Delanty *et al*., 2017) and developed further by Matson *et al*. (2017). In 2016 ten sites were surveyed using a ten-minute boat electrofishing method as part of a study to examine the potential for using this method in the future in deeper rivers, these surveys took place on the Anner, Ara and Cromoge Rivers (Suir Catchment - SERBD). Of these, six were repeaed using the standard area delineated depletion method.

1.3 Catchment wide surveys

These surveys were initiated to improve the spatial coverage of fish stock assessment across catchments as part of IFI's brown trout and coarse fish and pike research programmes. Various electrofishing methods appropriate to the habitat type were used, e.g. ten-minute electric fishing, systematic point abundance sampling (Boom boat electrofishing (sPASE)), area delineated depletion electric fishing, etc. The data collected will provide information for IFIs brown trout, coarse fish and WFD research programmes.

The ecological status of fish at many of the above mentioned sites has also been calculated for WFD purposes. Continued surveying of the WFD SM and additional river sites provides a useful baseline and time-series dataset for both WFD and fisheries management purposes.

This report summarises the results of the fish stock surveys carried out within each River Basin District (RBD), as part of IFI's national research programme 2016.

2. STUDY AREA

Of the 185 sites surveyed, 117 were wadeable and surveyed using bank-based electric fishing equipment; the remaining 68 sites were non-wadeable and were surveyed using boat based equipment. Sites ranged in surface area from 25m^2 at the Glensaul River (Tonaglanna_A) site to 127,039m^2 for the River Shannon (Coolumber_A). Summary details for each site's location and physical characteristics are given in Appendix 1 and 2. The distribution map of sites throughout Ireland is shown in Fig. 2.1.

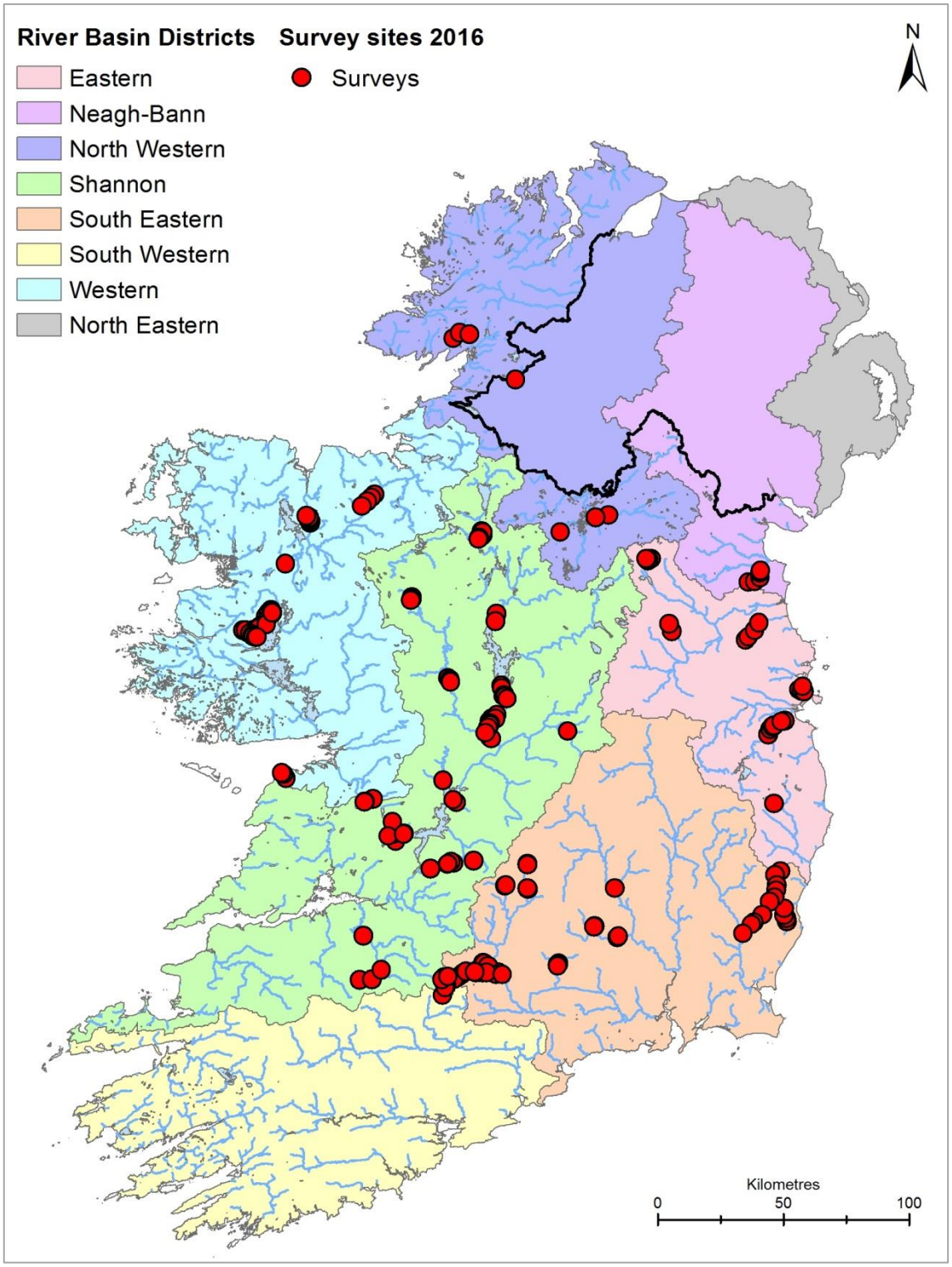

Fig. 2.1. Location map of river sites surveyed throughout the country as part of NRSP, 2016

3. METHODS

Electric-fishing is the method of choice to obtain a representative sample of the fish assemblage in river sites. It is a well-established technique used by fishery biologists all over the world for sampling fish in freshwaters. It is generally the most non-destructive, effective and cost efficient means of sampling freshwater fish, particularly in rivers. Standard methods have been developed by IFI in compliance with the European standards for fish stock assessment in rivers (CEN, 2003 and 2005). Due to the wide range of channel types surveyed a number of electrofishing methods were employed to assess the status of the fish stocks during 2016 and these are described below.

Except for the larger rivers, sites ideally contained all habitat types, including riffle, glide and pool. A suite of physical and chemical parameters were also recorded.

3.1 Fish sampling

There are three main types of electrofishing surveys undertaken by IFI and the method used depends on the aim of the survey. There are also two different habitat types to consider when sampling fish in rivers:

- Shallow rivers (wadeable <0.6m)
- Deep rivers (unwadeable >0.6m)

Fish sampling is carried out using either the quantitative or semi-quantitative area delineated electric fishing method (ADEF) or qualitative time delineated surveys. Quantitative or semi-quantitative ADEF surveys are normally used when the enumeration of a stock or a stock component within a given site over time and space is required, e.g. designated surveillance monitoring sites for the WFD. Qualitative time delineated surveys are used when a large catchment needs to be covered and this method allows more sites to be sampled per day. In the case of the surveys described in this report ten-minutes was used as the standard unit of time (TEF). Sites that could not be effectively electric-fished using the above methods (e.g. too deep or too wide) were sampled using systematic point abundance sampling (sPASE) with electric fishing boom boats.

3.1.1 Area delineated electric-fishing (ADEF)

In wadeable rivers the equipment used consisted of one or more portable generators (220/240V) with appropriate control units (DC converter), a cathode and an anode (. Stop nets were used at the top and bottom of each site to prevent fish escaping. Sites were sampled in an upstream direction, from the downstream end of a riffle where available ADEF (Hand)).

In deeper waters (non-wadeable) electric-fishing was carried using boat mounted electric-fishing equipment. This consisted of a 220v generator with an appropriate control unit along with twin anodes and a trailing cathode. These sites were surveyed in a downstream direction and where possible stop nets were used. On larger rivers, where it was not possible to use stop nets some channels were surveyed using a single pass, (SP (Boat)) or separate passes along each bank (Sep (Boat)).
The number of operators increased with increasing river width.

3.1.2 Ten-minute electric-fishing (TEF)

The timed (10-minute) electrofishing method (TEF) (IFI, 2012; Matson *et al*., 2017) was the most frequently used method in 2016. In wadeable rivers, this method involves only two operators at a site and no stop-nets are used to isolate the survey stretch. Electrofishing equipment consisted of one portable generator (220/240V) with an appropriate control unit (DC converter), a

cathode and an anode. Electric-fishing took place by one person wading in a zig-zag manner in an upstream direction for exactly ten minutes at a steady pace. In non-wadeable channels the boat-based TEF involved only one boat and three crew members.

3.1.3 Systematic point abundance sampling (sPASE) (Boom boat electrofishing)

The sPASE sampling method is intended for clumped distribution based on the statistical theory that many small sample units provide more precise results than a few large samples (Tomanova, 2013). The sPASE approach generally involved moving upstream collecting fish at numerous evenly distributed point samples (20m apart) along the right or left bank over the entire study site or reach. Upon arrival at each sampling point, the power was turned on for 10 seconds. If fish were present the power was kept on until all fish at the anodes were captured. If no fish were present the power was turned off after 10 seconds.

Sites on the larger deeper rivers (Moy and Shannon) were surveyed using this method with electric-fishing boom boats.

3.2 Fish Handling

Fish were held in buckets of fresh cold oxygenated water or in the boat mounted live-well of the electric-fishing boom boats after they were caught until processing. Fish from each pass were processed separately. During processing, each fish was identified to species, with its length and weight measured. 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 coarse fish species and pike. After processing, fish were held in large bins of oxygenated water until fully recovered, before returning them to the water.

3.3 Data analysis

Fish abundance is presented as (minimum) population estimates (number of fish/m^2) or catch per unit effort (CPUE) (sPASE method). CPUE was calculated as the number of fish/activation captured over the length of the site.

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 minimum density for each species.

3.4 Age and growth of fish

A subsample of the dominant fish species was aged (five fish from each 1cm size class). Fish 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.).

Plate 3.1. Electric-fishing using bank-based electric-fishing equipment

Plate 3.2. Electric-fishing using boat-based electric-fishing equipment

Plate 3.3. Processing fish captured using electric-fishing

3.5 Quality Assurance

CEN (2005) recommends that all activities undertaken during the standard fish sampling protocol (e.g. training, handling of equipment, fish handling, fish identification, etc.) should be subjected to a quality assurance programme in order to produce consistent results of high quality. A number of quality control procedures were implemented for the current programme, for example; every tenth fish scale was checked in the laboratory by a second biologist experienced in age analysis techniques.

3.6 Biosecurity and decontamination procedures

Procedures are required for disinfection of equipment in order to prevent dispersal of alien species and other organisms to uninfected waters. A standard operating procedure was compiled by Inland Fisheries Ireland for this purpose (Caffrey, 2010) and was followed by staff undertaking the surveys described in this report.

3.7 Fish status

An essential step in the EU Water Framework Directive 2000/60/EC (European Parliament and Council, 2000) 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. An ecological classification tool for fish in rivers (Fisheries Classification Scheme 2 (FCS2-Ireland)) was developed in 2011 to assign ecological status to fish in rivers for the Republic of Ireland and Northern Ireland along with a separate version for Scotland (SNIFFER, 2011). FCS2-Ireland is a geostatistical model based on Bayesian probabilities and works by comparing various fish community metric values within a site (observed) to those predicted (expected) for that site under reference (un-impacted) condition. The resulting output is an Ecological Quality Rating (EQR) between 1 and 0 for each site, corresponding to the five different ecological status classes of High, Good, Moderate, Poor and Bad (SNIFFER,

2011). Confidence levels are then assigned to each class and represented as probabilities.

The tool has been successfully inter-calibrated in a cross-Europe exercise (EC, 2013).

All outputs of the tool are sense-checked annually by experienced users. Using this tool and expert opinion, each river site surveyed in 2016 was assigned a draft fish classification status.

4. RESULTS

4.1 Eastern River Basin District (ERBD)

Twenty-two river sites were surveyed in seven river catchments within the ERBD. Catchments included the Athboy, Kells Blackwater, Dodder, Glenealo, Mayne and Sluice and the Nanny (Meath). All sites were wadeable and surveyed using either the depletion method (ADEF) or the ten-minute method (TEF) (Fig. 4.1).

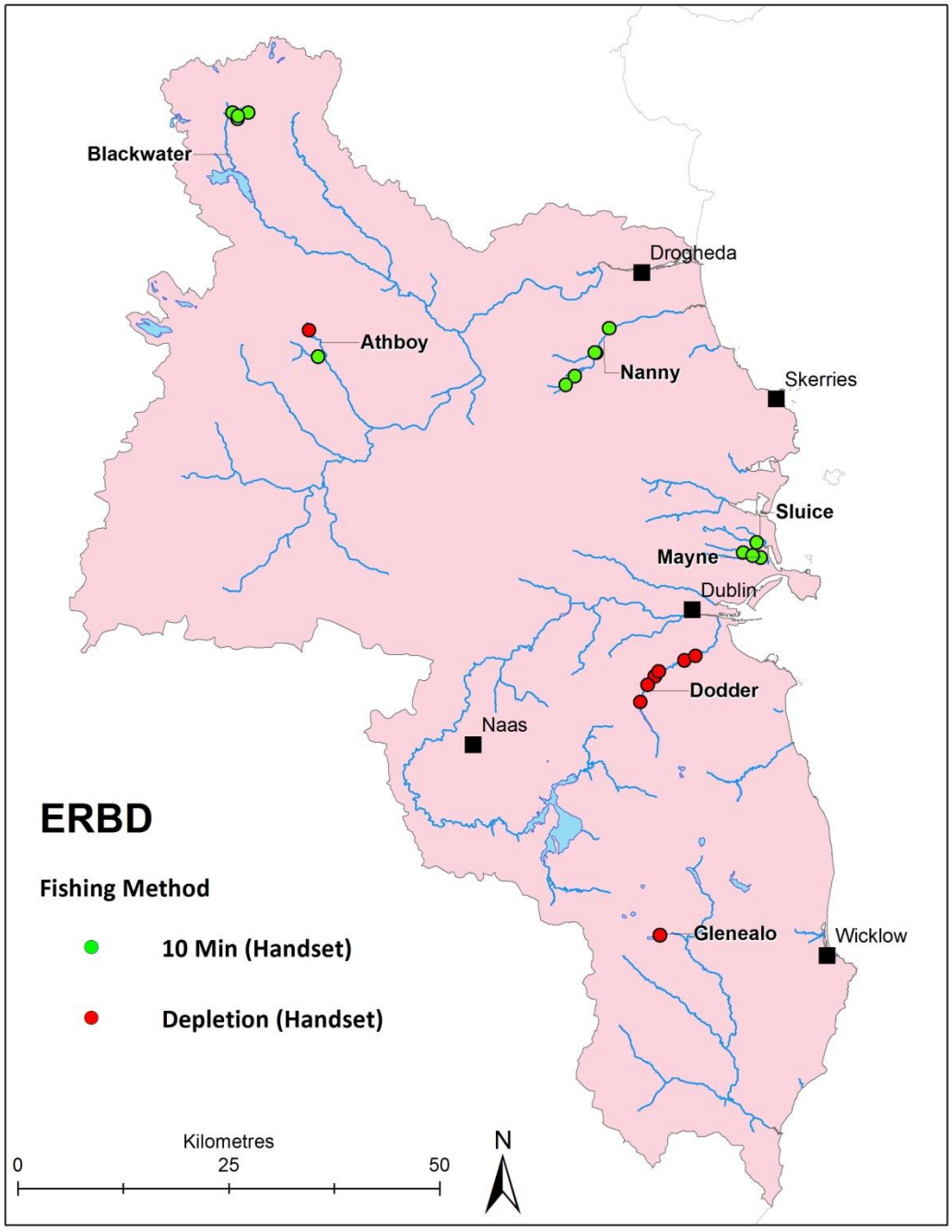

Fig. 4.1. Map of the ERBD showing all sites surveyed in 2016

4.1.1 Avoca Catchment

4.1.1.1 Glenealo River

The Glenealo River is a tributary of the Avoca River. It is located in Co. Wicklow near Glendalough and joins with another tributary, the Avonmore River just outside Laragh. One site was surveyed on the Glenealo River, Co. Wicklow, on the 8th of September 2016 (Fig. 4.2; Table 4.1). This wadeable site was surveyed using the ADEF method and is a WFD SM site that requires surveying triannually.

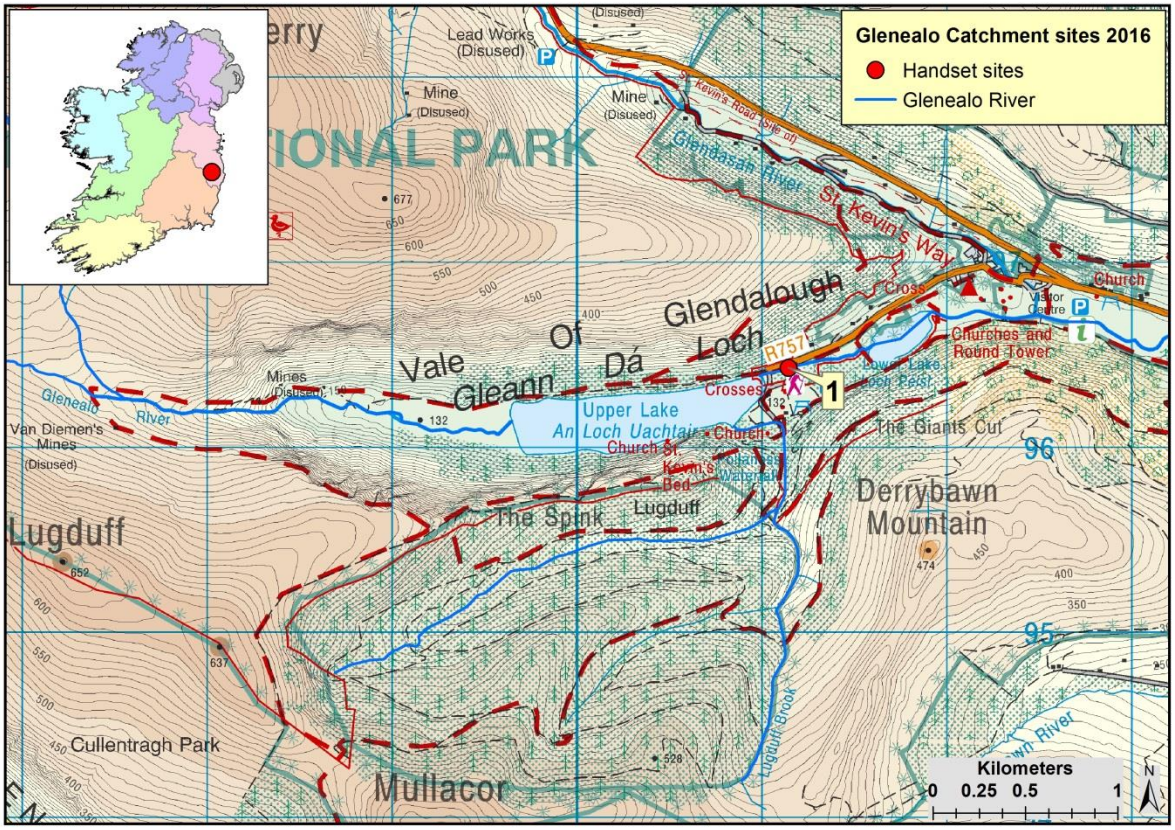

Fig. 4.2. Glenealo River survey sites, 2016

Table 4.1. Sites surveyed on the Glenealo River, 2016

Site No.	River	Site	Method	WFD	Date
1	Glenealo River	Br. d/s Upper Lake_A	ADEF (Hand)	Yes	08/09/2016

Three fish species were recorded in the site in 2016. Brown trout was the most abundant species captured, although present in low numbers (Fig. 4.2). Salmon have not been recorded at this site since 2009. Three age classes of brown trout 0+, 1+ and 2+ were present (Fig. 4.3 and Table 4.3). The former two cohorts were most prevalent (Table 4.3).

Table 4.2. Minimum density of fish (no. /m^2), Glenealo River (Site 1 - Br. d/s Upper lake), 2016

	Minimum density (No./m^2)		
Species	**2009**	**2012**	**2016**
Brown trout	0.039	0.017	0.025
0+ brown trout	0.039	0.004	0.013
1+ & older brown trout	0.003	0.012	0.013
European eel	0.006	-	0.013
Minnow	-	-	0.004
Salmon	0.003	-	-
0+ Salmon	-	-	-
1++ Salmon	0.003	-	-
All Fish	**0.049**	**0.017**	**0.042**

Table 4.3. Percentage catch for brown trout age cohorts in the Glenealo River (Br. d/s Upper lake), 2016

Species	Site No.	% of catch		
		0+	1+	2+
Brown trout	1	44	44	11

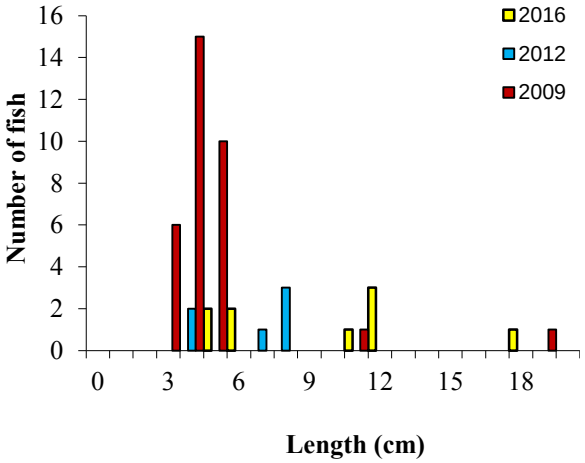

Fig. 4.3. Length frequency distribution of brown trout in the Glenealo River (Site 1-Br. d/s Upper Lake_A), 2009 (n=33), 2012 (n=6) and 2016 (n=9).

4.1.2 River Boyne Catchment

4.1.2.1 Athboy River

The Athboy River (called Tremblestown River in the lower reaches) is a tributary of the River Boyne. It is located in Co. Meath, near Kells and joins the River Boyne near Trim. Two sites were surveyed on the Athboy River near Athboy Co. Meath on the 13th of September 2016 (Fig. 4.4; Table 4.4). Both sites were wadeable; one surveyed using the TEF method and the other using the ADEF method. Site 2 (Br. nr Clonleasan Ho_A) is a WFD SM site and was surveyed previously in 2009 and 2012.

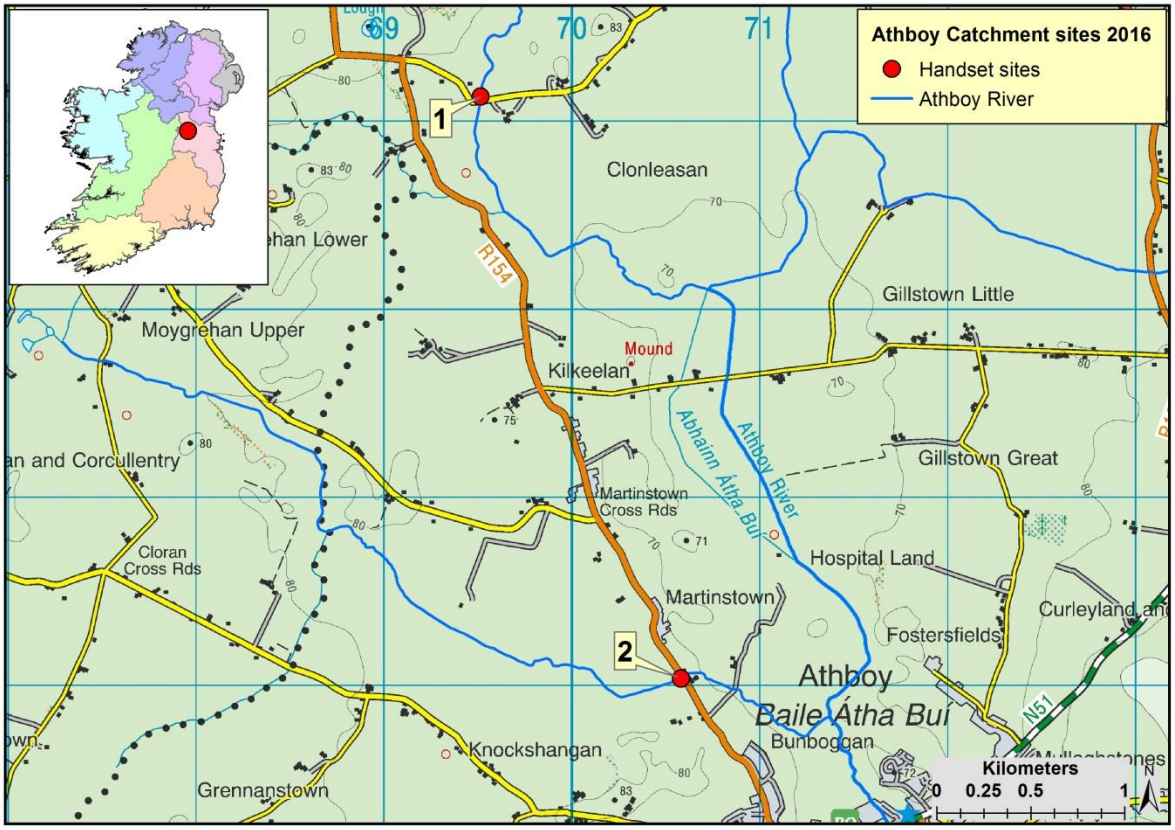

Fig. 4.4. Athboy River survey sites, 2016

Table 4.4. Sites surveyed on the Athboy River, 2016

No.	River	Site	Method	WFD	Date
1	Athboy River	Bunboggan_A	TEF (Hand)	No	13/09/2016
2	Athboy River	Br. nr Clonleasan Ho_A	ADEF (Hand)	Yes	13/09/2016

Four fish species were recorded in two sites on the Athboy River in 2016. The density of fish was greatest in Site 1 (Bunboggan_A) and this was due to high numbers of lamprey and brown trout (Table 4.5).

Brown trout have shown a decrease in density at Site 2, since the site was previously surveyed in 2009 and 2012 (Table 4.5).

Three age classes of brown trout were recorded (0+ to 2+) with 0+ and 1+ the most

prevalent cohorts captured at Site 1, while 1+ and 2+ were most prevalent at Site 2 (Table 4.6). Two age classes of salmon were recorded, 0+ and 1+. The same age classes were largely present for all three years; however their densities declined (Table 4.5; Fig. 4.6 and 4.7).

Table 4.5. Minimum density of fish (no. /m^2), Athboy River Catchment, 2016

	Minimum density (No./m^2)			
	Site 1	Site 2		
Species	**2016**	**2009**	**2012**	**2016**
Brown trout	0.157	0.233	0.123	0.047
0+ brown trout	0.063	0.101	0.024	0.009
1+ & older brown trout	0.094	0.131	0.099	0.038
European eel	-	0.008	-	-
Lamprey sp.	0.189	0.004	-	-
Salmon	-	0.094	0.038	0.017
0+ salmon	-	0.023	0.009	0.004
1+ & older salmon	-	0.071	0.028	0.013
Stone loach	-	0.004	0.005	-
3-spined stickleback	0.047	0.008	0.005	0.009
All Fish	**0.393**	**0.349**	**0.170**	**0.072**

Table 4.6. Percentage catch for aged species in the Athboy River catchment, 2016

Species	Site No.	% of catch		
		0+	1+	2+
Brown trout	1	40	60	-
	2	15	54	31
Salmon	2	25	75	-

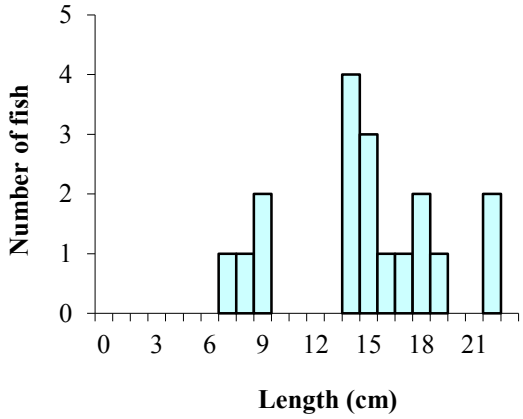

Fig. 4.5. Length frequency distribution of brown trout in the Athboy River (Site 1, Bunboggan) 2016 (n=18).

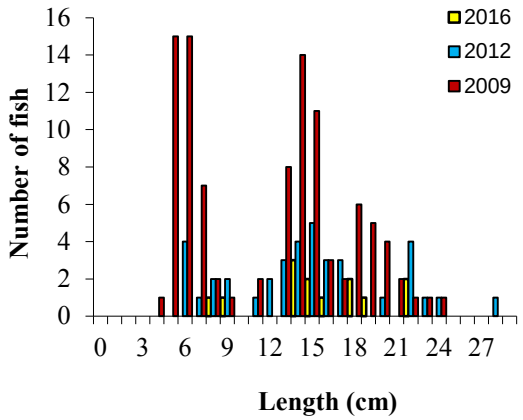

Fig 4.6. Length frequency distribution of brown trout in the Athboy River (Site 2 - Br. nr Clonleasan Ho._A), 2009 (n=101), 2012 (n=38) and 2016 (n=38).

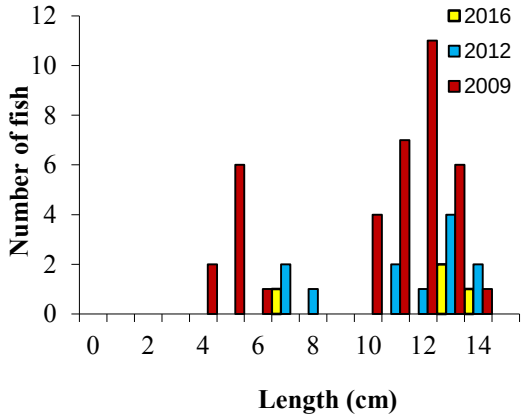

Fig. 4.7. Length frequency distribution of salmon in the Athboy River (Site 2 - Br. nr Clonleasan Ho._A), 2009 (n=38), 2012 (n=12) and 2016 (n=4).

4.1.2.2 River Blackwater (Kells)

The River Blackwater (Kells) is a tributary of the River Boyne. It flows between counties Cavan and Meath and joins with the River Boyne in Navan, Co. Meath. Four sites were surveyed in the catchment near Virginia, Co. Cavan on the 14th of September 2016 (Fig. 4.8; Table 4.7). All sites were wadeable and surveyed using the TEF method.

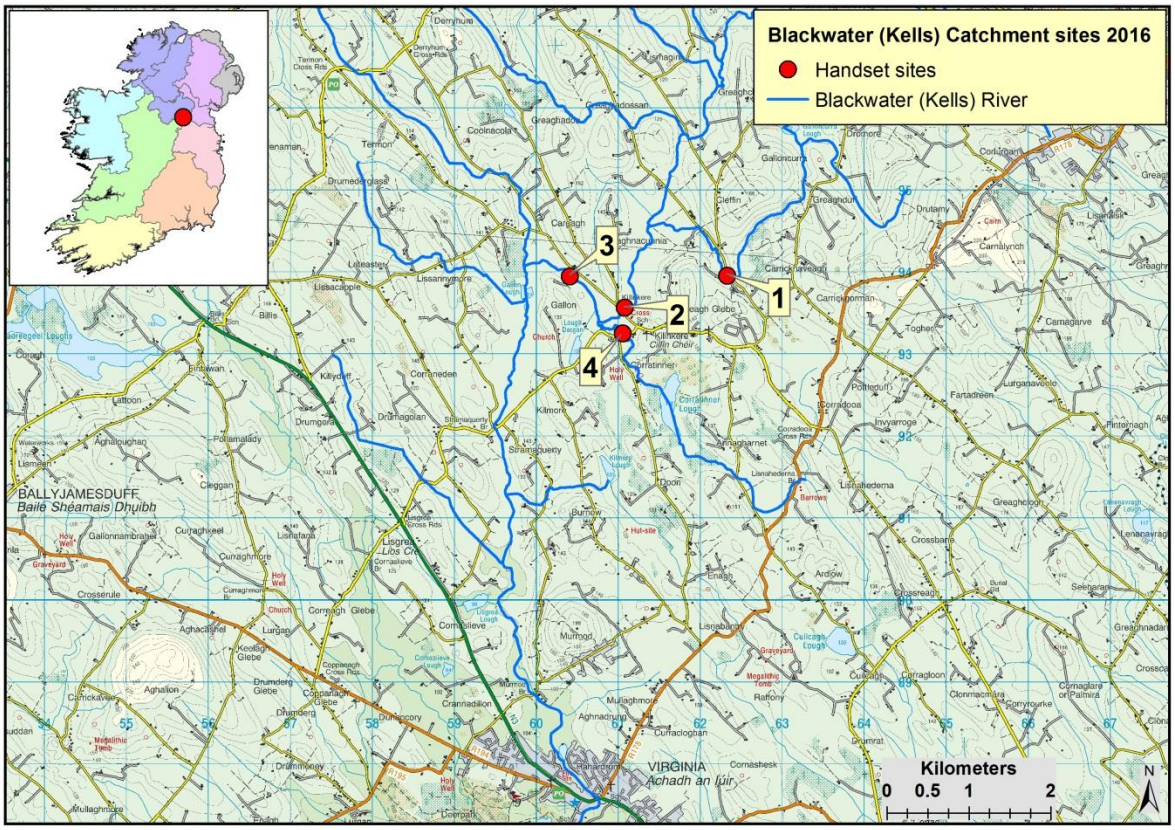

Fig. 4.8. Blackwater (Kells) River survey sites, 2016

Table 4.7. Sites surveyed on the Blackwater (Kells) River, 2016

No.	River	Site	Method	WFD	Date
1	Blackwater (Kells), River	Beagh Glebe_A	TEF (Hand)	No	14/09/2016
2	Blackwater (Kells), River	Killinkere Br._A	TEF (Hand)	No	14/09/2016
3	Blackwater (Kells), River	Gallon_A	TEF (Hand)	No	14/09/2016
4	Corratinner Trib	Corratinner North_A	TEF (Hand)	No	14/09/2016

Six fish species were recorded in the Blackwater River (Kells). Roach was the most abundant species at Site 1 (Beagh Glebe_A); brown trout were the most abundant at Site 3 (Gallon_A), while minnow were the most abundant at Site 2 (Killinkere Br._A) and Site 4 (Corratinner North_A) (Table 4.8).

Four age classes of brown trout were recorded with the 1+ age class most common (Table 4.9). For roach, there were five age classes with 3+ and 4+ individuals among the most commonly encountered cohorts.

Table 4.8. Minimum density of fish (no. /m^2), Blackwater (Kells) River Catchment, 2016

	Minimum density (No./m^2)			
Species	Site 1 2016	Site 2 2016	Site 3 2016	Site 4 2016
Brown trout	0.079	0.009	0.070	0.064
0+ brown trout	-	-	0.035	0.018
1+ & older brown trout	0.079	0.009	0.035	0.045
Gudgeon	0.005	0.004	0.026	0.018
Minnow	0.025	0.135	0.030	0.336
Perch	-	0.009	0.004	-
Roach	0.113	0.009	0.009	0.064
Stone loach	-	0.017	0.013	0.082
All Fish	**0.221**	**0.183**	**0.152**	**0.563**

Table 4.9. Percentage catch for aged species in the Blackwater (Kells) River catchment, 2016

Species	Site No.	% of catch						
		0+	1+	2+	3+	4+	5+	6+
Brown trout	1	-	50	50	-	-	-	-
	2	-	100	-	-	-	-	-
	3	50	30	10	-	10	-	-
	4	25	50	25	-	-	-	-
Roach	1	-	-	-	57	26	13	4
	2	-	-	100	-	-	-	-
	3	-	-	-	50	50	-	-
	4	-	-	-	57	29	14	-

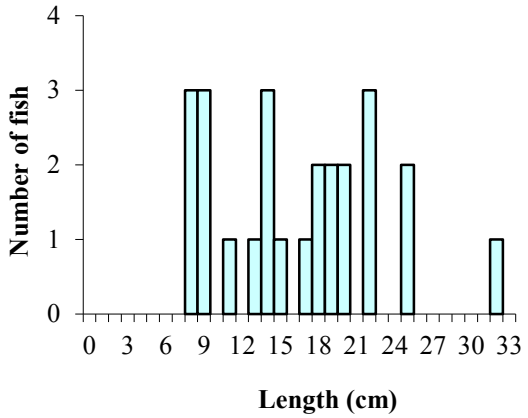

Fig. 4.9. Length frequency distribution of brown trout in the Blackwater River (Kells) (Sites 1-4), 2016 (n=25).

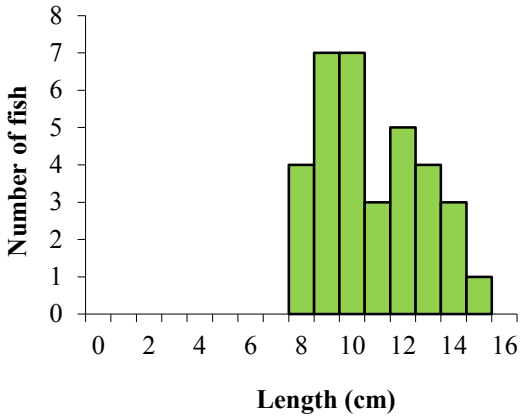

Fig. 4.10. Length frequency distribution of roach in the Blackwater River (Kells) (Sites 1-4), 2016 (n=34).

4.1.3 River Dodder

The River Dodder is located in South Dublin and joins the Liffey Estuary at Grand Canal Dock in Dublin City. Six sites were surveyed on the River Dodder between the 18th and 20th of July 2016 (Fig. 4.11; Table 4.10). All sites were wadeable and surveyed using the ADEF method.

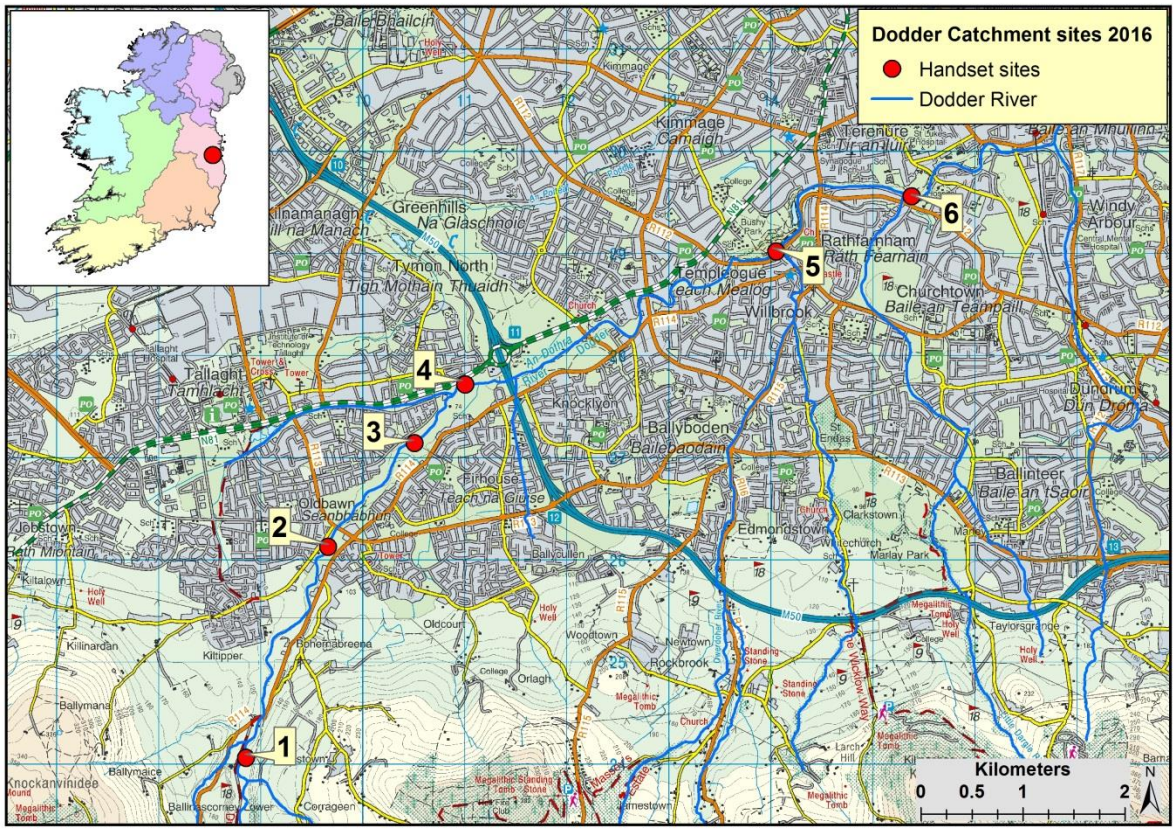

Fig. 4.11. River Dodder survey sites, 2016

Table 4.10. Sites surveyed on the River Dodder, 2016

No.	River	Site	Method	WFD	Date
1	Dodder, River	Bohernabreena_A	ADEF (Hand)	Yes	18/07/2016
2	Dodder, River	Oldbawn_A	ADEF (Hand)	No	18/07/2016
3	Dodder, River	Firhouse_A	ADEF (Hand)	No	19/07/2016
4	Dodder, River	Knocklyon_A	ADEF (Hand)	No	19/07/2016
5	Dodder, River	Bushy Park_A	ADEF (Hand)	No	20/07/2016
6	Dodder, River	Mount Carmel Hospital_A	ADEF (Hand)	Yes	20/07/2016

Six fish species were recorded in the River Dodder in 2016. Brown trout was the most abundant species recorded at all sites (Table 4.11). Site 5 (Bushy Park_A) consistently showed the highest species diversity with six species recorded every year since 2013.

Four age classes of brown trout were captured on the River Dodder in 2016, with 0+

and 1+ the most abundant age cohorts (Table 4.12). Length frequency distributions for brown trout over multiple surveys are shown in Fig. 4.12 to Fig. 4.17.

Table 4.11. Minimum density of fish (no. /m^2), River (Dodder) Catchment, 2016

	Site 1					Site 2			
Species	**2011**	**2013**	**2014**	**2015**	**2016**	**2013**	**2014**	**2015**	**2016**
Brown trout	0.234	0.086	0.067	0.268	0.131	0.064	0.019	0.385	0.188
0+ brown trout	0.095	-	0.022	0.242	0.039	0.016	0.006	0.379	0.103
1+ & older brown trout	0.139	0.086	0.044	0.026	0.092	0.048	0.019	0.006	0.084
European eel	0.004	-	0.003	-	-	0.003	0.003	0.003	-
Lamprey sp.	-	-	-	-	-	0.003	-	-	-
Minnow	-	-	-	-	-	-	-	0.009	-
Stone loach	0.004	0.003	0.003	0.004	0.007	-	0.035	0.034	0.029
3-spined stickleback	-	-	-	-	-	-	-	0.003	0.006
All Fish	**0.241**	**0.089**	**0.073**	**0.272**	**0.138**	**0.071**	**0.058**	**0.432**	**0.217**
	Site 3				**Site 4**				
Species	**2013**	**2014**	**2015**	**2016**	**2011**	**2013**	**2014**	**2015**	**2016**
Brown trout	0.143	0.118	0.249	0.187	-	0.159	0.227	0.449	0.255
0+ brown trout	0.139	0.008	0.224	0.068	-	0.042	0.023	0.382	0.071
1+ & older brown trout	0.004	0.109	0.025	0.119	-	0.117	0.205	0.067	0.184
European eel	0.004	-	-	-	-	0.004	-	-	-
Lamprey sp.	0.025	0.004	0.004	-	-	0.004	0.004	-	-
Minnow	-	-	-	-	-	0.015	0.023	0.004	0.004
Stone loach	0.004	0.055	0.008	0.004	-	0.004	0.015	0.033	0.018
3-spined stickleback	0.004	0.004	-	-	-	0.004	-	-	-
All Fish	**0.181**	**0.181**	**0.262**	**0.191**	**-**	**0.189**	**0.269**	**0.483**	**0.276**
	Site 5				**Site 6**				
Species	**2013**	**2014**	**2015**	**2016**	**2011**	**2013**	**2014**	**2015**	**2016**
Brown trout	0.161	0.187	0.269	0.220	0.111	0.221	0.126	0.350	0.242
0+ brown trout	0.036	0.008	0.174	0.104	0.091	0.150	0.089	0.307	0.206
1+ & older brown trout	0.125	0.179	0.095	0.116	0.020	0.071	0.036	0.043	0.036
European eel	0.003	0.008	0.006	0.003	0.002	0.009	0.003	0.006	-
Lamprey sp.	0.005	0.003	0.003	0.003	-	-	-	-	-
Minnow	0.049	0.073	0.064	0.087	0.002	-	0.120	0.116	-
Stone loach	0.005	0.029	0.070	0.017	0.034	-	0.042	0.021	-
3-spined stickleback	-	0.008	0.086	0.006	0.069	-	0.003	-	-
All Fish	**0.223**	**0.307**	**0.493**	**0.336**	**0.219**	**0.230**	**0.293**	**0.493**	**0.242**

Table 4.12. Percentage catch for aged species in the River Dodder catchment, 2016

		% of catch			
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	29	65	6	-
	2	55	42	2	1
	3	47	46	5	3
	4	35	58	6	1
	5	50	35	3	11
	6	83	16	1	-

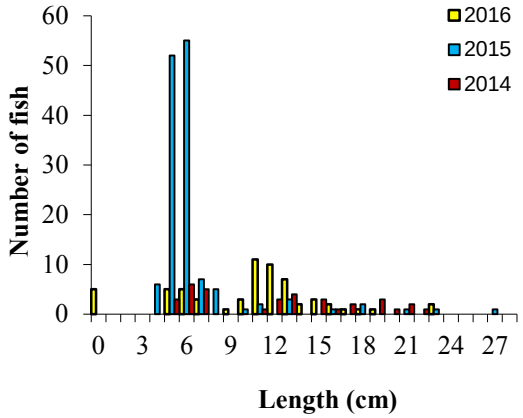

Fig. 4.12. Length frequency distribution of brown trout in the River Dodder (Site 1- Bohernabreena_A), 2014 (n=35), 2015 (n=137) and 2016 (n=62).

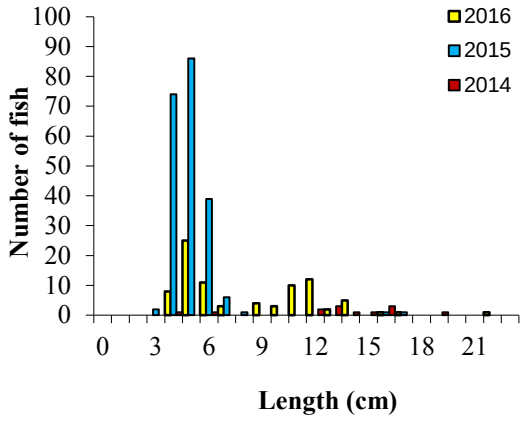

Fig. 4.13. Length frequency distribution of brown trout in the River Dodder (Site 2- Oldbawn_A), 2014 (n=13), 2015 (n=210) and 2016 (n=86).

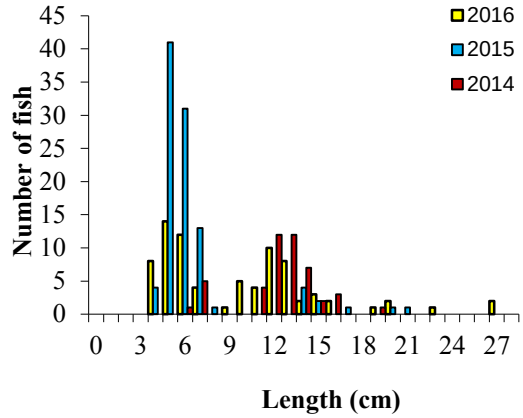

Fig. 4.14. Length frequency distribution of brown trout in the River Dodder (Site 3- Firhouse_A), 2014 (n=47), 2015 (n=99) and 2016 (n=79).

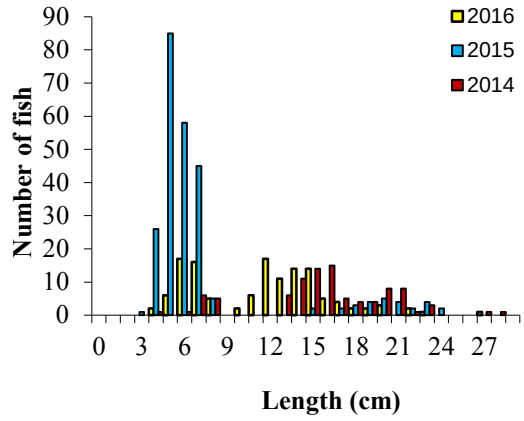

Fig. 4.15. Length frequency distribution of brown trout in the River Dodder (Site 4- Knocklyon_A), 2014 (n=94), 2015 (n=248) and 2016 (n=130).

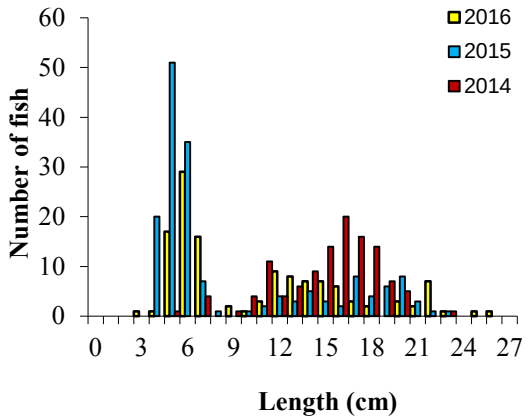

Fig. 4.16. Length frequency distribution of brown trout in the River Dodder (Site 5- Bushy Park_A), 2014 (n=117), 2015 (n=165) and 2016 (n=127).

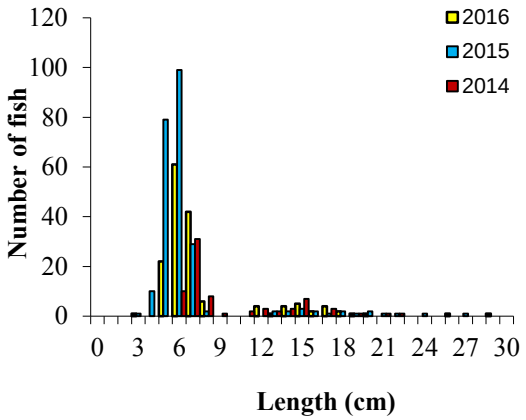

Fig. 4.17 Length frequency distribution of brown trout in the River Dodder (Site 6- Mount Carmel Hospital_A), 2014 (n=73), 2015 (n=239) and 2016 (n=158).

4.1.4 Mayne and Sluice Rivers

The Mayne and Sluice Rivers are small streams located to the north of Dublin City near Donaghmede. Both streams flow into the sea just south of Portmarnock. Three sites were surveyed on the Mayne River catchment and one site was surveyed on the Sluice River on the 21st of July 2016 (Fig. 4.18; Table 4.13). All sites were wadeable, Sites 1, 3 on the Mayne River and the site on the Sluice River were surveyed using the TEF method and one surveyed using the ADEF. Site 2 on the Mayne River was a repeat survey from 2011.

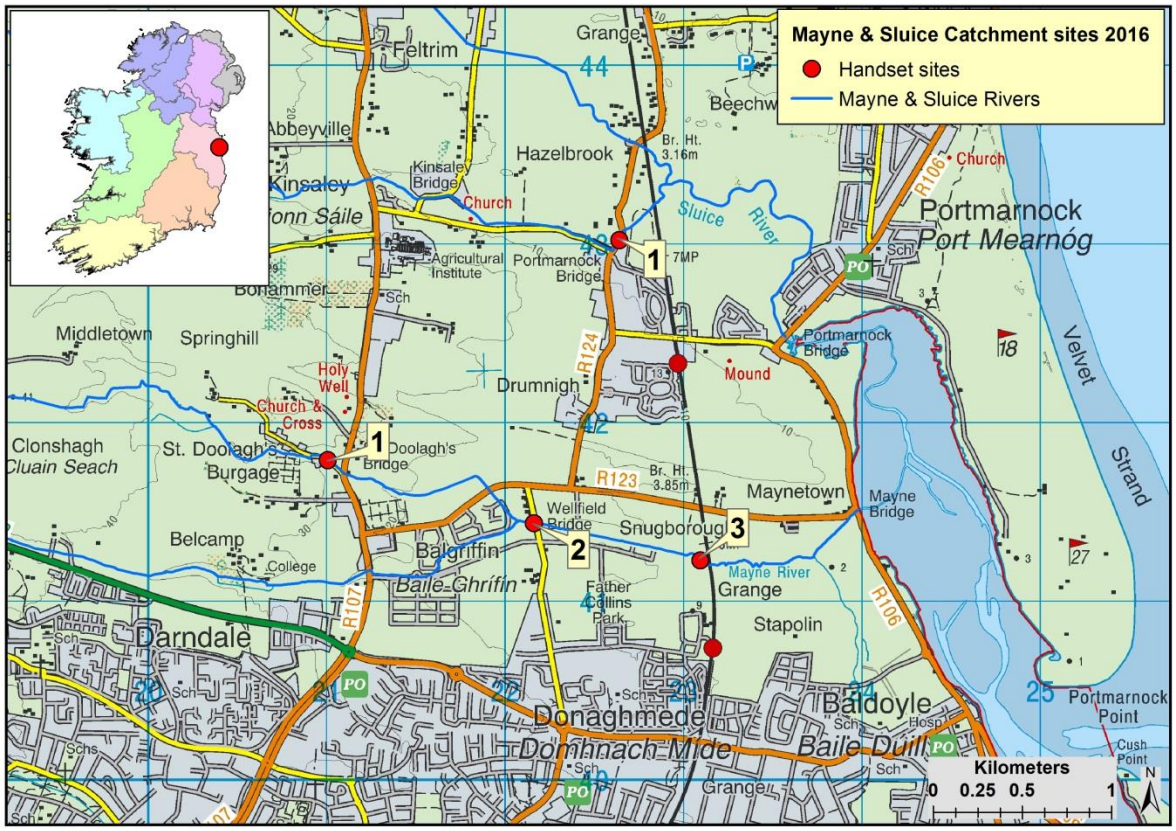

Fig. 4.18. Mayne and Sluice River survey sites, 2016

Table 4.13. Sites surveyed on the Mayne and Sluice Rivers, 2016

No.	River	Site	Method	WFD	Date
1	Mayne (Cuckoo) Trib	Limekiln Lane_A	TEF (Hand)	No	21/07/2016
2	Mayne River	Wellfield Br._A	ADEF (Hand)	No	21/07/2016
3	Mayne River	Snugborough_A	TEF (Hand)	No	21/07/2016
1	Sluice River	Portmarnock Racetrack_A	TEF (Hand)	No	21/07/2016

Three fish species were recorded on the Mayne River, while four species were recorded on the Sluice River. Eel were present at all sites surveyed, while specimens of 3-spined stickleback were present at site 2 and 3 and the site on the Sluice River. Flounder was recorded at Sites 3 on the Mayne River and the site on the Sluice River due to their close proximity to the sea. Three-spined stickleback was the most abundant species at these latter sites. The density of three-spined stickleback showed a reduction in numbers from 2011 at Site 2. Brown trout were also recorded at Site 4 on the Sluice River, but only 0+ individuals were recorded (Table 4.14).

Table 4.14. Minimum density of fish (no. /m^2), Mayne and Sluice River Catchments, 2016

	Minimum density (No./m^2)				
Species	**Mayne - Site 1 2016**	**Mayne - Site 2 2011**	**Mayne - Site 2 2016**	**Mayne - Site 3 2016**	**Sluice - Site 1 2016**
Brown trout					0.057
0+ brown trout					0.057
1+ & older brown trout					-
European eel	0.070	0.038	0.100	0.399	0.043
Flounder	-	-	-	0.156	0.028
3-spined stickleback	-	2.068	0.029	1.181	1.108
All Fish	**0.070**	**2.105**	**0.129**	**1.736**	

4.1.5 Nanny River (Meath)

The Nanny River (Meath) is a small river located in Co. Meath. It flows north-eastwards to reach the sea at Laytown, Co. Meath. Five sites were surveyed on the Nanny catchment near Duleek on the 15th of September 2016 (Fig. 4.19; Table 4.15). All sites were wadeable and surveyed using the TEF method.

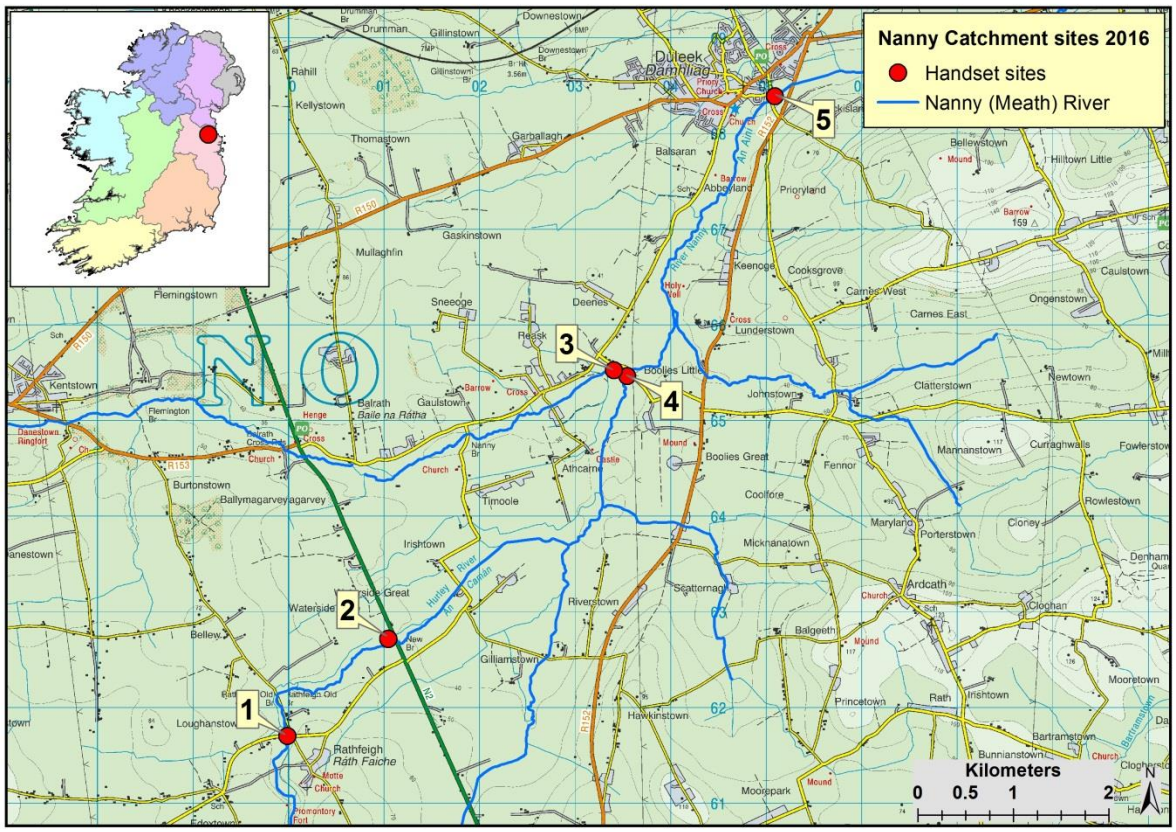

Fig. 4.19. Nanny (Meath) River survey sites, 2016

Table 4.15. Sites surveyed on the Nanny (Meath) River, 2016

Site No.	River	Site	Method	WFD	Date
1	Hurley Trib	Rathfeigh_A	TEF (Hand)	No	15/09/2016
2	Hurley Trib	New Br. (North)_A	TEF (Hand)	No	15/09/2016
3	Nanny (Meath), River	Reask West_A	TEF (Hand)	No	15/09/2016
4	Hurley Trib	Boolies Little_A	TEF (Hand)	No	15/09/2016
5	Nanny (Meath), River	Knockisland_A	TEF (Hand)	No	15/09/2016

Site 5 recorded the highest species diversity with a total of six fish species present. Brown trout was the most abundant species at the two most upstream sites (Sites 1 and 2); while minnow was the most commonly encountered species at the remaining three sites (Table 4.16). The length frequency distribution of brown trout is shown in (Fig. 4.20). Three age classes of brown trout were recorded 0+, 1+ and 2+, with 1+ by far the most abundant cohort across all five sites (Table 4.17).

Table 4.16. Minimum density of fish (no./m^2), Nanny River (Meath) Catchment, 2016

	Minimum density (No./m^2)				
Species	**Site 1 2016**	**Site 2 2016**	**Site 3 2016**	**Site 4 2016**	**Site 5 2016**
Brown trout	0.214	0.582	0.107	0.294	0.150
0+ brown trout	0.032	0.051	-	0.294	0.069
1+ & older brown trout	0.182	0.531	0.107	-	0.080
European eel	-	-	-	0.020	0.053
Minnow	0.011	0.017	0.164	0.475	0.374
Salmon	0.011	-	-	-	0.021
0+ salmon	-	-	-	-	0.021
1+ & older salmon	0.011	-	-	-	-
Stone loach	0.011	-	0.038	0.013	0.139
3-spined stickleback	-	-	0.076	-	0.166
All Fish	**0.246**	**0.599**	**0.384**	**0.802**	**0.903**

Table 4.17. Percentage of catch for aged species in the Nanny (Meath) River catchment, 2016

		% of catch		
Species	**Site No.**	**0+**	**1+**	**2+**
Brown trout	1	16	84	-
	2	9	88	3
	3	-	100	-
	4	5	67	29
	5	31	69	-
Salmon	1	-	100	-
	5	100	-	-

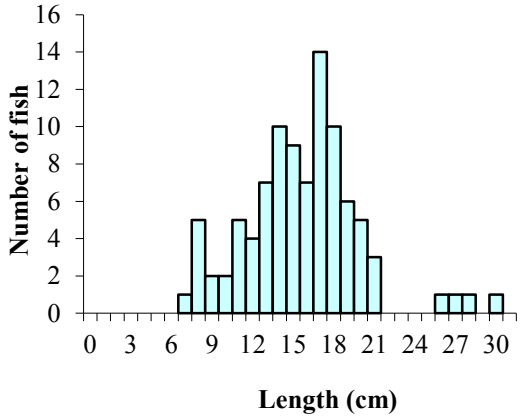

Fig. 4.20. Length frequency distribution of brown trout in the Nanny River (Meath), 2016 (n=90).

4.2 Neagh Bann International River Basin District (NBIRBD)

Six river sites were surveyed on the White River catchment within the NBIBD. All sites were wadeable and surveyed using either the ADEF method or the TEF method (Fig. 4.21).

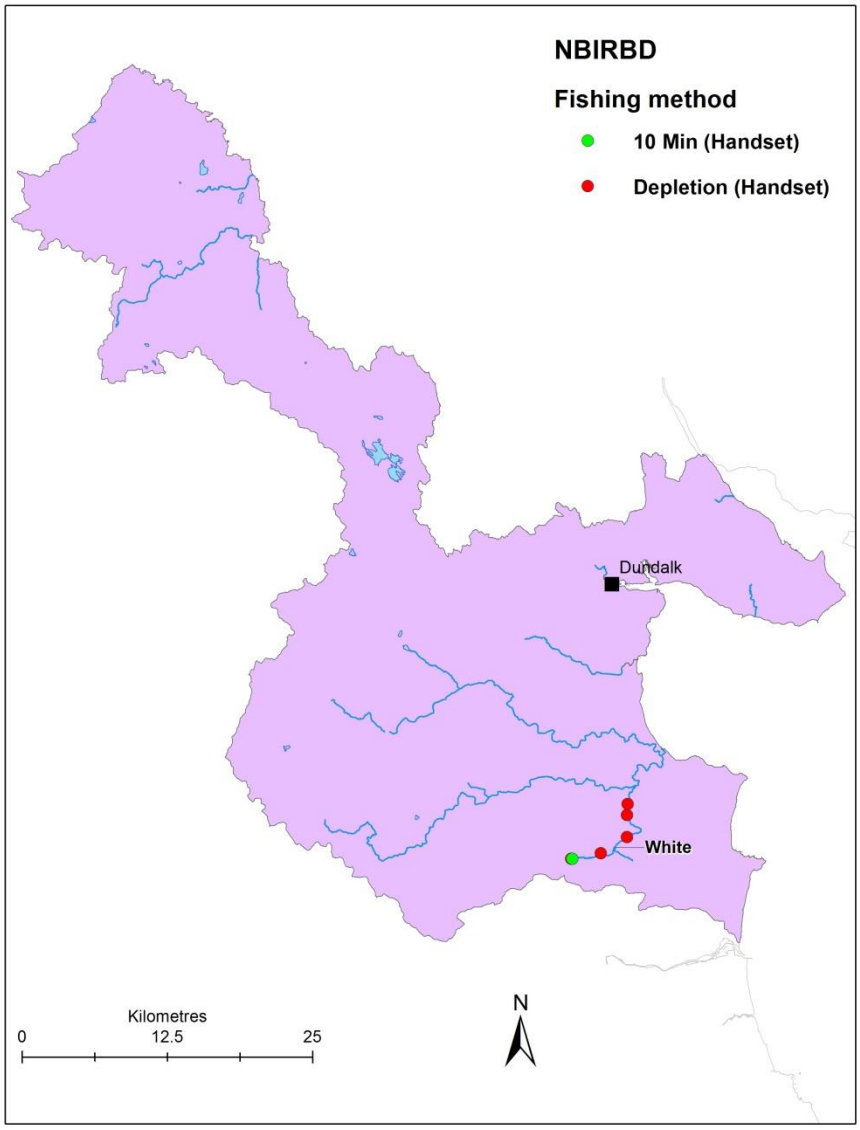

Fig. 4.21. Map of the NBIRBD showing the site surveyed in 2016

4.2.1 White River (Louth)

The White River is a tributary of the River Dee. It is located in Co. Louth, near Dunleer and joins the sea only a few kilometres downstream of its confluence with the River Dee. Six sites were surveyed on the White River, near Dunleer, Co. Louth between the 12th and 14th of September 2016 (Fig. 4.22; Table 4.18). All sites were wadeable; one site was surveyed using the TEF method, with the remaining five sites surveyed using the ADEF method.

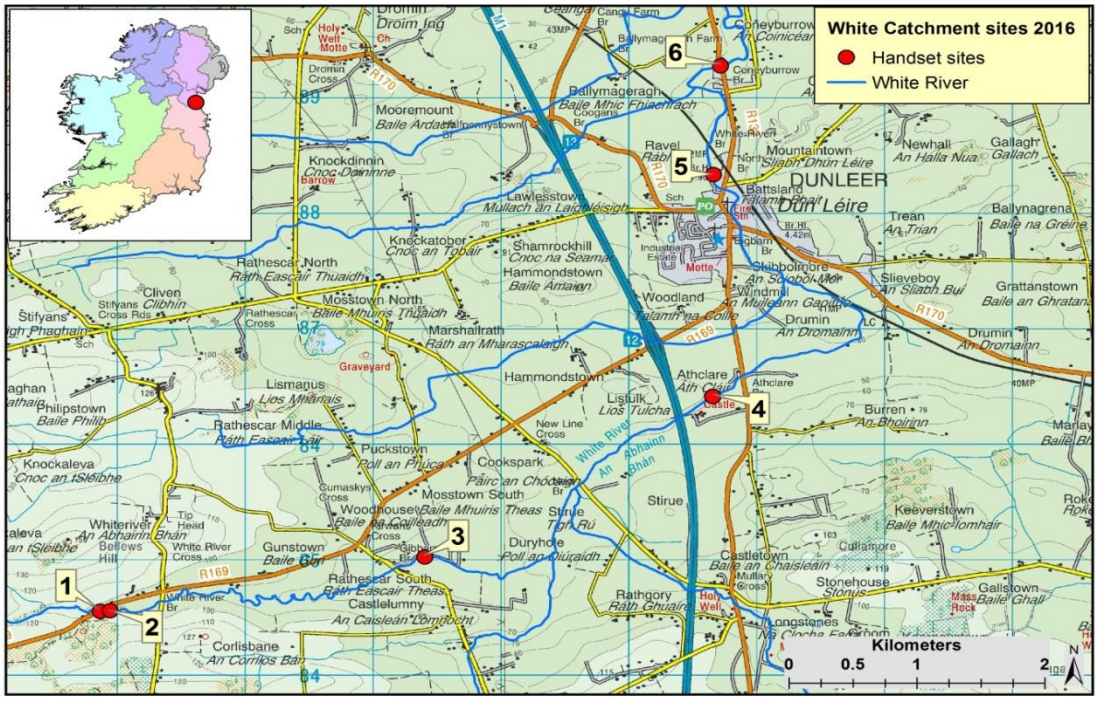

Fig. 4.22. White River survey sites, 2016

Table 4.18. Sites surveyed on the White River, 2016

Site No.	River	Site	Method	WFD	Date
1	White (Louth) River	Martinstown Wood_A	TEF (Hand)	No	14/09/2016
2	White (Louth) River	Martinstown Br._A	ADEF (Hand)	No	14/09/2016
3	White (Louth) River	Gibber's Br._A	ADEF (Hand)	No	12/09/2016
4	White (Louth) River	Athclare_A	ADEF (Hand)	No	13/09/2016
5	White (Louth) River	Dunleer_A	ADEF (Hand)	No	12/09/2016
6	White (Louth) River	Coneyburrow Br._B	ADEF (Hand)	Yes	13/09/2016

Minnow was the most commonly encountered species on the White River, recorded at all six sites. Site 6, the most downstream site, has consistently had the highest species diversity for all surveys on this river since 2012. The most upstream sites (Site 1 and 2) had low species diversity (Table 4.19). Brown trout densities decreased at all sites in 2016; however an increase in 1+ and older cohorts was observed at three sites (Sites 3, 5 and 6). Salmon were only recorded in the two most downstream sites (Sites 5 and 6).

Four age classes of brown trout and one age class of salmon were recorded (Table 4.20).

For brown trout the 0+ age was most abundant at Site 3, while for Site 6 it was 1+. Both the 0+ and 1+ age classes were evenly split at Sites 4 and 5. Only one age cohort (0+) of salmon was recorded and these were encountered in Sites 5 and 6.

Length frequency distributions are shown for brown trout and salmon at selected sites (Fig. 4.23 to Fig. 4.28).

Table 4.19. Minimum density of fish (no./m^2), White River Catchment, 2016

	Site 1	Site 2				Site 3			
Species	**2016**	**2013**	**2014**	**2015**	**2016**	**2013**	**2014**	**2015**	**2016**
Brown trout	-	-	-	-	-	0.376	0.196	0.377	0.231
0+ brown trout	-	-	-	-	-	0.253	0.139	0.371	0.204
1+ & older brown trout	-	-	-	-	-	0.122	0.057	0.006	0.027
European eel	-	-	-	-	-	0.008	-	-	-
Lamprey sp.	-	-	-	-	-	-	-	-	-
Minnow	0.032	0.049	0.107	-	0.056	-	0.155	0.122	0.068
Salmon	-	-	-	-	-	-	-	-	-
0+ salmon	-	-	-	-	-	-	-	-	-
1+ & older salmon	-	-	-	-	-	-	-	-	-
Stone loach	0.021	0.068	0.078	0.007	0.023	0.016	0.073	0.012	0.020
3-spined stickleback	0.032	0.010	-	0.007	0.006	0.024	0.008	0.195	0.054
All Fish	**0.084**	**0.127**	**0.185**	**0.015**	**0.085**	**0.424**	**0.433**	**0.705**	**0.374**
		Site 4				**Site 5**			
Species	**-**	**2013**	**2014**	**2015**	**2016**	**2013**	**2014**	**2015**	**2016**
Brown trout	-	0.099	0.104	0.334	0.099	0.557	0.137	0.330	0.168
0+ brown trout	-	0.085	0.042	0.269	0.056	0.453	0.066	0.269	0.078
1+ & older brown trout	-	0.014	0.061	0.065	0.043	0.104	0.071	0.061	0.090
European eel	-	0.005	-	-	-	0.019	0.005	0.008	-
Lamprey sp.	-	-	-	-	-	0.009	0.005	-	-
Minnow	-	0.033	0.279	0.079	0.360	0.274	0.024	0.106	0.033
Salmon	-	-	-	-	-	0.071	0.118	0.053	0.008
0+ salmon	-	-	-	-	-	0.071	0.108	0.016	0.008
1+ & older salmon	-	-	-	-	-	-	0.009	0.037	-
Stone loach	-	0.401	0.208	0.019	0.017	0.236	0.090	0.053	0.016
3-spined stickleback	-	0.581	0.057	0.232	0.043	0.038	-	0.041	0.008
All Fish	**-**	**1.119**	**0.647**	**0.664**	**0.519**	**1.203**	**0.377**	**0.591**	**0.234**
		Site 6							
Species	**2012**	**2013**	**2014**	**2015**	**2016**				
Brown trout	0.123	0.007	0.011	0.155	0.057				
0+ brown trout	0.087	0.003	0.006	0.142	0.006				
1+ & older brown trout	0.036	0.007	0.006	0.013	0.051				
European eel	0.003	0.007	-	-	-				
Lamprey sp.	0.008	-	0.011	0.006	0.003				
Minnow	0.081	0.214	0.386	0.487	0.113				
Salmon	0.025	0.014	0.003	0.019	0.006				
0+ salmon	0.022	0.010	0.003	0.016	0.006				
1+ & older salmon	0.003	0.003	-	0.003	-				
Stone loach	0.006	0.160	0.059	0.065	0.026				
3-spined stickleback	0.008	1.760	0.112	0.245	0.045				
All Fish	**0.254**	**2.161**	**0.581**	**0.978**	**0.249**				

Table 4.20. Percentage catch for aged species in the White (Louth) River catchment, 2016

Species	Site No.	% of catch			
		0+	1+	2+	3+
Brown trout	1	91	7	2	-
	4	49	47	5	-
	5	47	49	4	-
	6	16	65	10	10
Salmon	5	100	-	-	-
	6	100	-	-	-

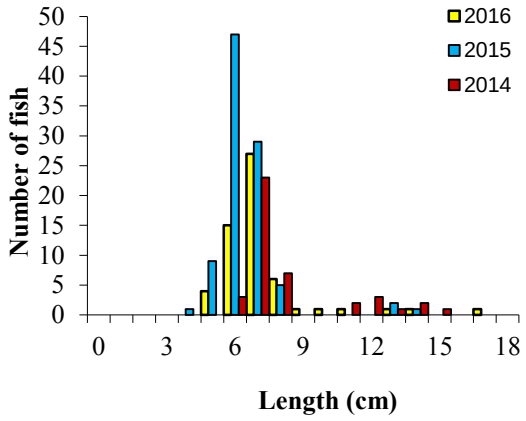

Fig. 4.23. Length frequency distribution of brown trout in the White River (Louth) (Site 3-Gibber's Br._A), 2014 (n=42), 2015 (n=94) and 2016 (n=58).

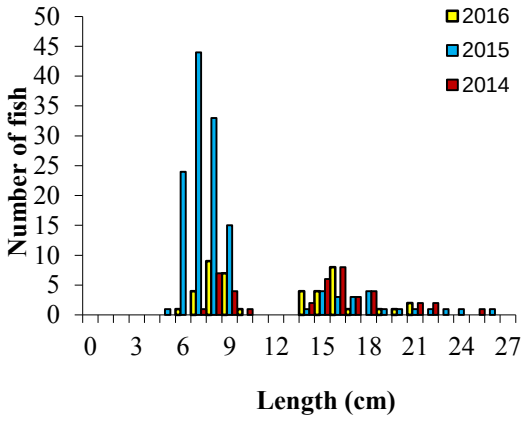

Fig. 4.24. Length frequency distribution of brown trout in the White River (Louth) (Site 4-Athclare_A), 2014 (n=41), 2015 (n=139) and 2016 (n=43).

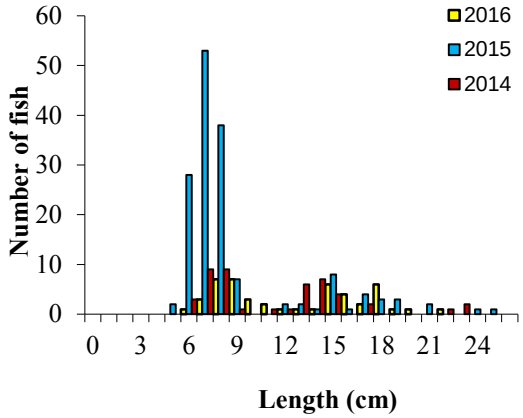

Fig. 4.25. Length frequency distribution of brown trout in the White River (Louth) (Site 5-Dunleer_A), 2014 (n=46), 2015 (n=156) and 2016 (n=47).

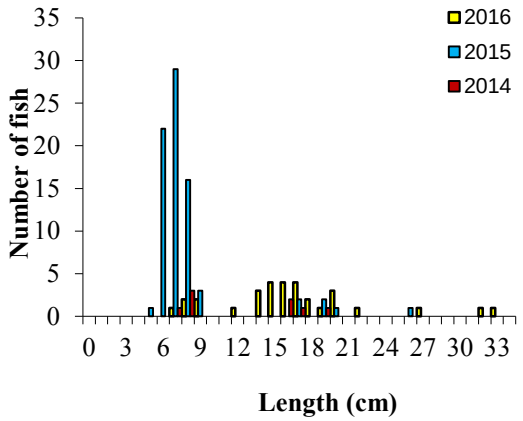

Fig. 4.26. Length frequency distribution of brown trout in the White River (Louth) (Site 6-Coneyburrow Br._B), 2014 (n=37), 2015 (n=77) and 2016 (n=31).

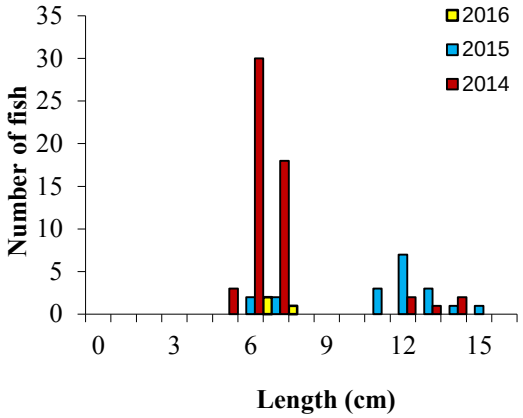

Fig. 4.27. Length frequency distribution of salmon in the White River (Louth) (Site 5-Dunleer_A), 2014 (n=56), 2015 (n=19) and 2016 (n=3).

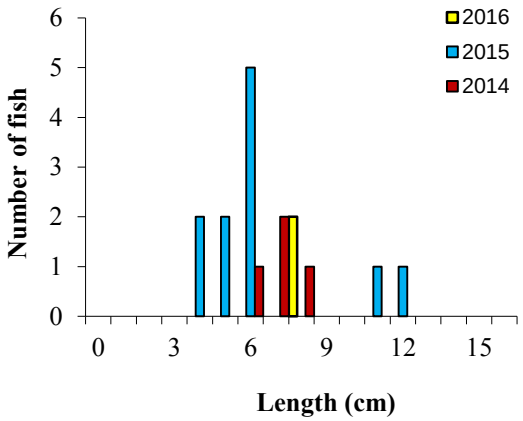

Fig. 4.28. Length frequency distribution of salmon in the White River (Louth) (Site 6-Coneyburrow Br._B), 2014 (n=4), 2015 (n=11) and 2016 (n=2).

4.3 South Eastern River Basin District (SERBD)

Fifty-six river sites were surveyed in the SERBD during 2016. Catchments included the Aherlow, Anner, Ara, Bann, Cromoge, Dinin, King's, Owenavorragh and Suir. Thirty-three sites were wadeable and surveyed using either the ADEF or TEF method, with the remaining 23 sites non-wadeable and surveyed with boat-mounted electric fishing equipment (Fig. 4.29).

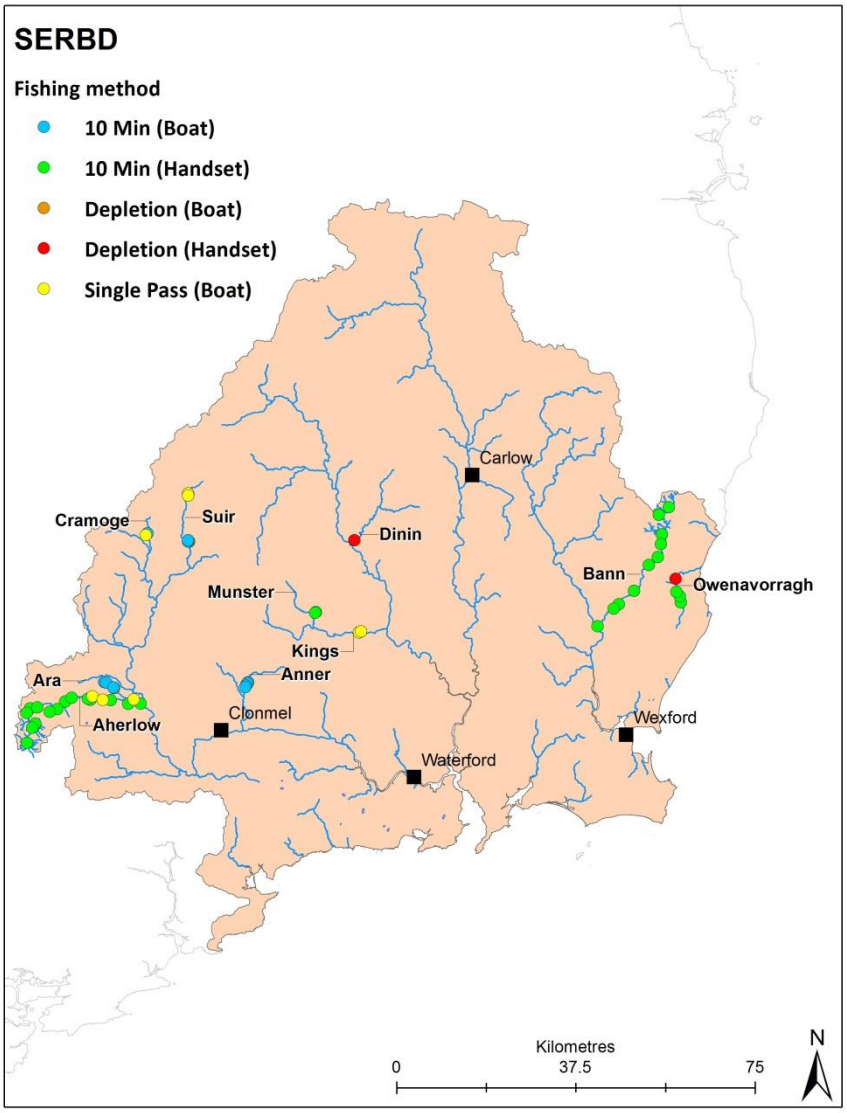

Fig. 4.29. Map of the SERBD showing the sites surveyed in 2016

4.3.1 River Nore

4.3.1.1 Dinin River

The Dinin River is a large tributary of the River Nore. It is located in north Co. Kilkenny flowing in a southerly to join the River Nore a few kilometres outside Kilkenny City. One site was surveyed on the Dinin River, north of Kilkenny on the 25th of July 2016 (Fig. 4.30; Table 4.21). This site was wadeable and surveyed using the ADEF method and is a WFD SM site.

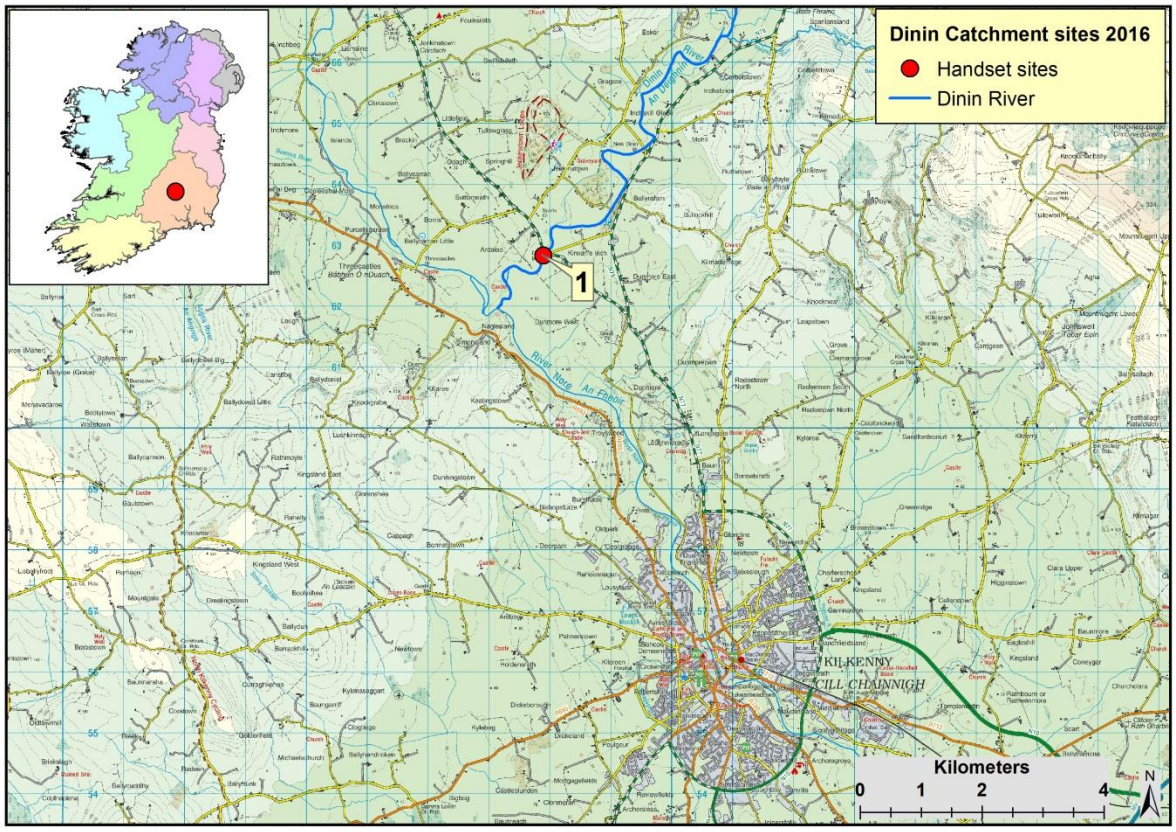

Fig. 4.30. Dinin River survey sites, 2016

Table 4.21. Sites surveyed on the Dinin River, 2016

Site No.	River	Site	Method	WFD	Date
1	Dinin River	Dinin Br._A	ADEF (Hand)	Yes	25/07/2016

Seven fish species were recorded at Dinin Bridge. Minnow was by far the most abundant species recorded in 2016, followed by salmon (Table 4.22).

Four age classes of brown trout were encountered, with 1+ individuals the most abundant cohort. Of the two salmon age classes present, 0+ was the most abundant (Table 4.23). This site has been surveyed on two previous occasions, in 2009 and 2012. The length frequency distributions for brown trout (Fig. 4.31) and salmon (Fig. 4.32) are shown below.

Table 4.22. Minimum density of fish (no./m^2), Dinin River (Site 1 – Dinin Br.) 2016

	Minimum density (No./m^2)		
Species	**2009**	**2012**	**2016**
Brown trout	0.012	0.046	0.055
0+ brown trout	-	0.015	0.007
1+ & older brown trout	0.012	0.031	0.055
European eel	0.001	0.001	0.010
Lamprey sp.	-	-	0.007
Minnow	0.0003	0.042	0.524
Salmon	0.034	0.240	0.186
0+ salmon	0.003	0.202	0.093
1+ & older salmon	0.031	0.037	0.093
Stone loach	-	0.003	0.076
3-spined stickleback	-	-	0.007
All Fish	**0.047**	**0.333**	**0.865**

Table 4.23. Percentage catch for aged species in the Dinin River catchment, 2016

Species	Site No.	% of catch			
		0+	1+	2+	3+
Brown trout	1	12	64	20	4
Salmon	1	57	43	-	-

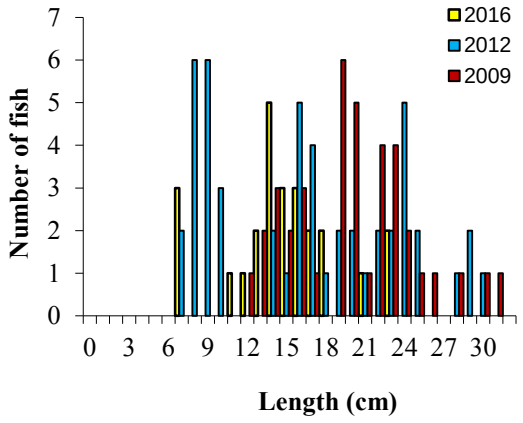

Fig. 4.31. Length frequency distribution of brown trout in the Dinin River (Dinin Br._A), 2009 (n=39), 2012 (n=50) and 2016 (n=25).

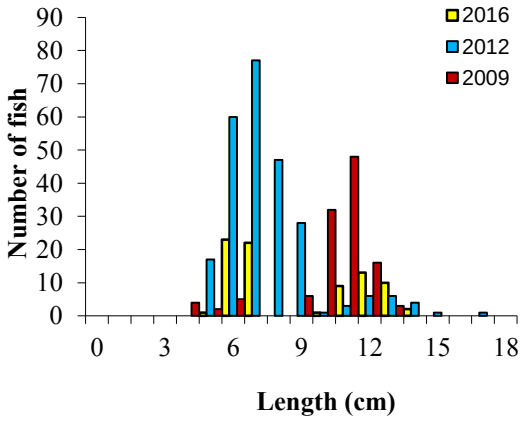

Fig. 4.32. Length frequency distribution of salmon in the Dinin River (Dinin Br._A), 2009 (n=116), 2012 (n=251) and 2016 (n=81

4.3.1.2 King's River

The King's River is a large tributary of the River Nore. It is located between Co. Tipperary and Co. Kilkenny and flows in an easterly direction before reaching the Nore near Thomastown, Co. Kilkenny. Four sites were surveyed on the King's River, north of Callan, Co. Kilkenny on the 26th of July 2016 (Fig. 4.33, Table 4.24). Two sites were wadeable and surveyed using the TEF method, with the remaining two non-wadeable and surveyed using the single pass boat method (SP (Boat)). The Kells Bridge site is a WFD SM site.

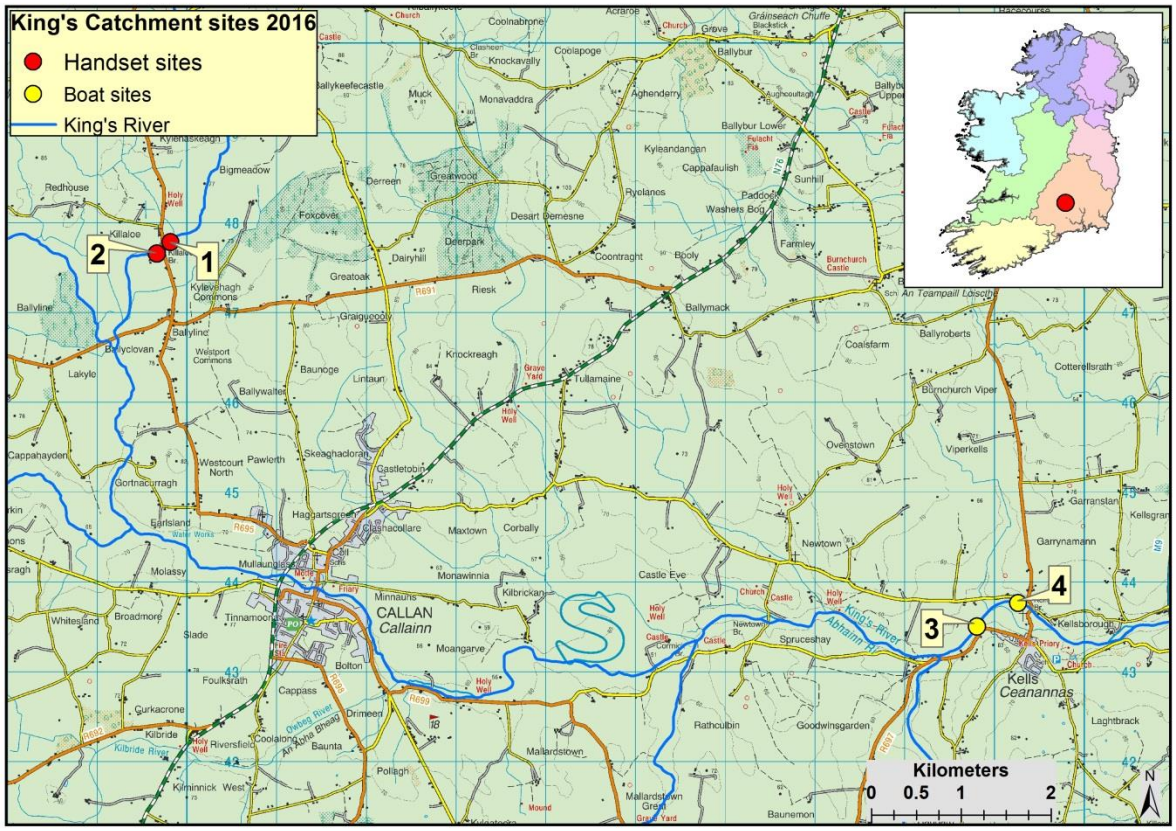

Fig. 4.33. King's River survey sites, 2016

Table 4.24. Sites surveyed on the King's River, 2016

No.	River	Site	Method	WFD	Date
1	King's (Kilkenny) River	Bigmeadow_A	TEF (Hand)	No	26/07/2016
2	King's (Kilkenny) River	Killaloe Br._A	TEF (Hand)	No	26/07/2016
3	King's (Kilkenny) River	Killinny_A	SP (Boat)	No	26/07/2016
4	King's (Kilkenny) River	Kells Br._A	SP (Boat)	Yes	26/07/2016

Five fish species were recorded in the King's River in 2016. Brown trout was recorded at all four sites (Table 4.25). Lamprey sp. which had been present at Site 4 in 2009 was not recorded in 2016. The highest density of brown trout was recorded at Site 2 (Killaloe Br._A) (Table 4.25).

Four age classes of brown trout were encountered (Table 4.26), with younger cohorts (0+ and 1+) generally more abundant in the shallower upper sites and older cohorts (2+ and 3+) in the deeper lower reaches.

Length frequency distributions are shown below for brown trout (Fig. 4.34; Fig. 4.36) and salmon (Fig. 4.35). Site 4 (Kells Br._A) was surveyed previously in 2009.

Table 4.25. Minimum density of fish (no./m^2), King's River Catchment, 2016

	Minimum density (No./m2)				
	Site 1	Site 2	Site 3	Site 4	
Species	2016	2016	2016	2009	2016
Brown trout	0.103	0.331	0.030	0.010	0.001
0+ brown trout	0.089	0.084	-	-	-
1+ & older brown trout	0.014	0.246	0.030	0.010	0.001
European eel	-	-	0.0003	0.0005	-
Minnow	-	0.019	-	-	-
Lamprey sp.	-	-	-	0.0002	-
Salmon	0.301	0.182	0.0003	0.001	-
0+ salmon	0.287	0.143	-	-	-
1+ & older salmon	0.014	0.039	0.0003	0.001	-
Stone loach	0.014	-	0.0003	-	-
3-spined stickleback	0.021	0.182	0.001	-	-
All Fish	**0.438**	**0.713**	**0.031**	**0.012**	**0.001**

Table 4.26. Percentage catch for aged species in the King's River (Kilkenny) catchment, 2016

Species	Site No.	% of catch			
		0+	1+	2+	3+
Brown trout	1	86	14	-	-
	2	25	42	33	-
	4	-	-	75	25
	3	-	47	38	14
Salmon	1	95	5	-	-
	2	79	21	-	-
	3	-	100	-	-

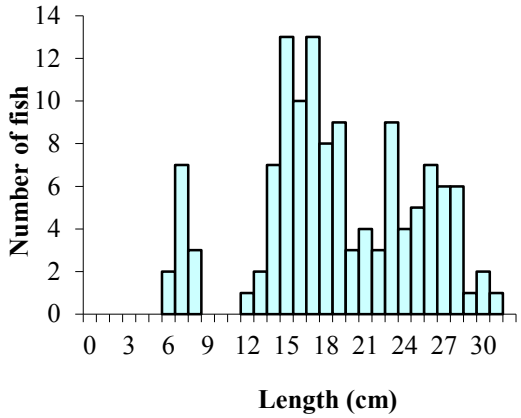

Fig. 4.34. Length frequency distribution of brown trout in the King's River (Kilkenny), 2016 (n=126).

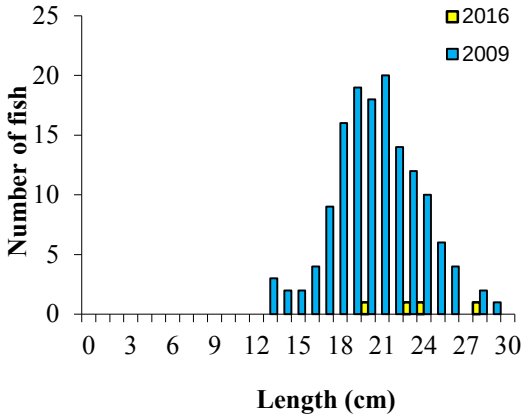

Fig. 4.36. Length frequency distribution of brown trout in the King's River (Kells Br.), 2009 (n=142) and 2016 (n=4).

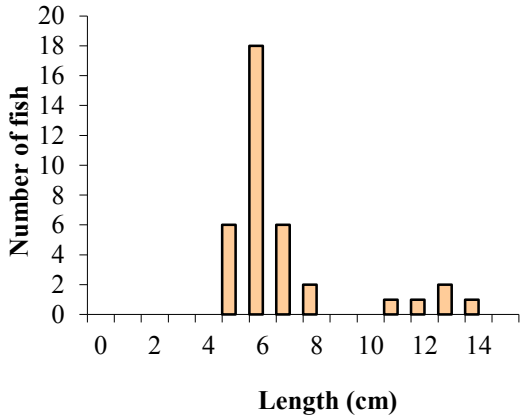

Fig. 4.35. Length frequency distribution of salmon in the King's River (Kilkenny) 2016 (n=37).

4.3.2 Owenavorragh River

The Owenavorragh River is located in north Co. Wexford and flows in a northerly direction before reaching the sea just outside Courtown. Four sites were surveyed on the river on the 27th of July 2016; Fig. 4.37 and Table 4.27). All sites were wadeable with three surveyed using the TEF method and one surveyed using the ADEF method.

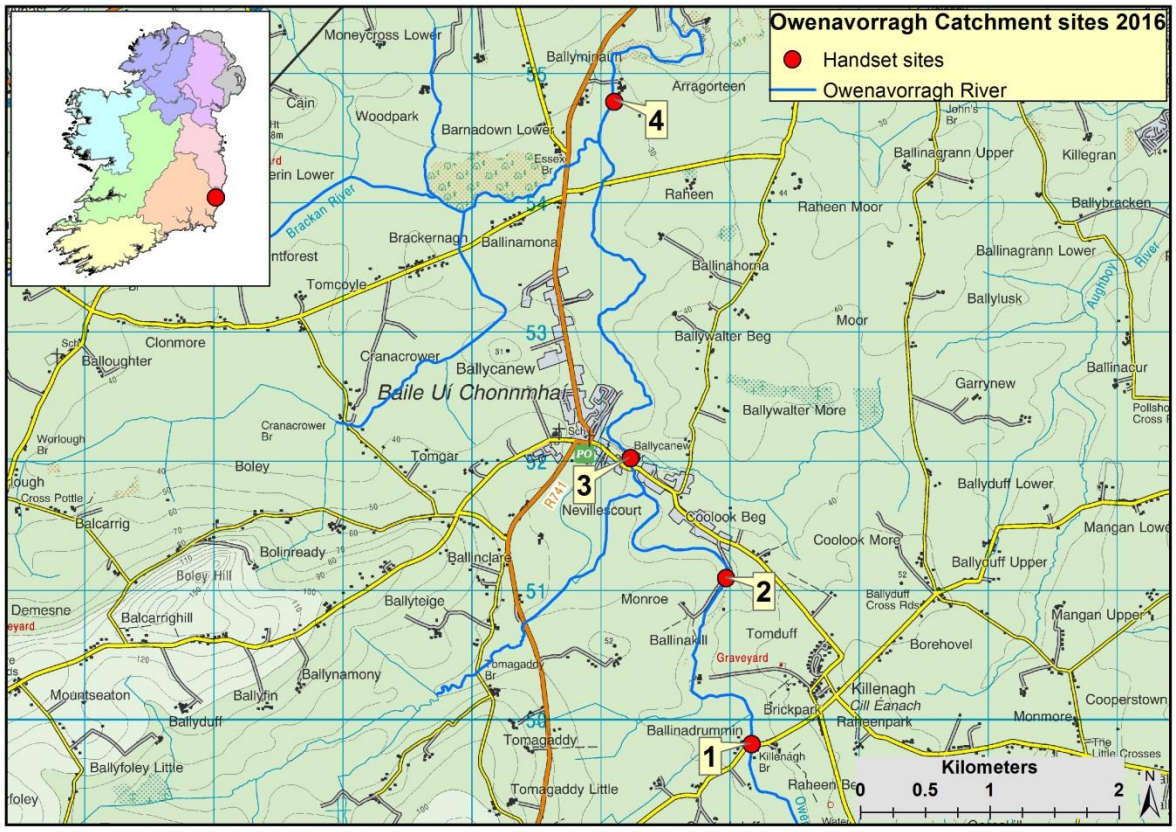

Fig. 4.37. Owenavorragh River survey sites, 2016

Table 4.27. Sites surveyed on the Owenavorragh River, 2016

Site No.	River	Site	Method	WFD	Date
1	Owenavorragh River	Killanagh_A	TEF (Hand)	No	27/07/2016
2	Owenavorragh River	Coolock Beg_A	TEF (Hand)	No	27/07/2016
3	Owenavorragh River	Ballycanew Br._A	TEF (Hand)	No	27/07/2016
4	Owenavorragh River	Ballyminaun_A	ADEF (Hand)	No	27/07/2016

Seven fish species were recorded in the Owenavorragh River in 2016. Brown trout and minnow were the two most frequently encountered species being captured at all four sites (Table 4.28).

The highest density of brown trout was recorded at Site 3 (Ballycanew Br._A). Minnow was the most abundant species recorded at Site 2 (Coolock Beg_A) and Site 4 (Ballyminaun_A) (Table 4.28). Salmon were

only encountered at one site, Site 3 (Ballycanew Br._A).

Three age classes of brown trout were recorded, with individuals aged 1+ representing the highest proportion at each site (Table 4.29).

The length frequency distribution of brown trout across all four sites is shown in Fig. 4.38.

Table 4.28. Minimum density of fish (no. /m^2), Owenavorragh River Catchment, 2016

	Minimum density (No./m^2)			
Species	**Site 1 2016**	**Site 2 2016**	**Site 3 2016**	**Site 4 2016**
Brown trout	0.010	0.093	0.163	0.048
0+ brown trout	-	0.012	0.010	0.010
1+ & older brown trout	0.010	0.081	0.152	0.038
European eel	0.014	0.019	-	0.003
Lamprey sp.	-	0.012	-	0.046
Minnow	0.024	0.343	0.061	0.223
Salmon	-	-	0.010	-
0+ salmon	-	-	-	-
1+ & older salmon	-	-	0.010	-
Stone loach	0.029	0.069	-	0.013
3-spined stickleback	0.043	0.019	-	-
All Fish	**0.120**	**0.554**	**0.234**	**0.332**

Table 4.29. Percentage catch for aged species in the Owenavorragh River catchment, 2016

Species	**Site No.**	**% of catch**		
		0+	**1+**	**2+**
Brown trout	1	-	100	-
	2	14	86	-
	3	7	80	13
	4	21	79	-
Salmon	3	-	100	-

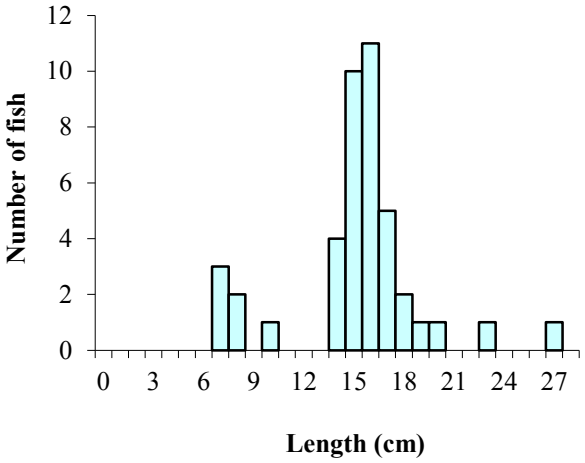

Fig. 4.38. Length frequency distribution of brown trout in the Owenavorragh River (all sites), 2016 (n=42).

4.3.3 Slaney River Catchment

4.3.3.1 River Bann

The River Bann is a tributary of the River Slaney. It is located in north Co. Wexford and flows southwards to join the Slaney, just north of Enniscorthy. Ten sites were surveyed on the River Bann in Co. Wexford on the 28th of July 2016 using the TEF method (Fig. 4.39; Table 4.30).

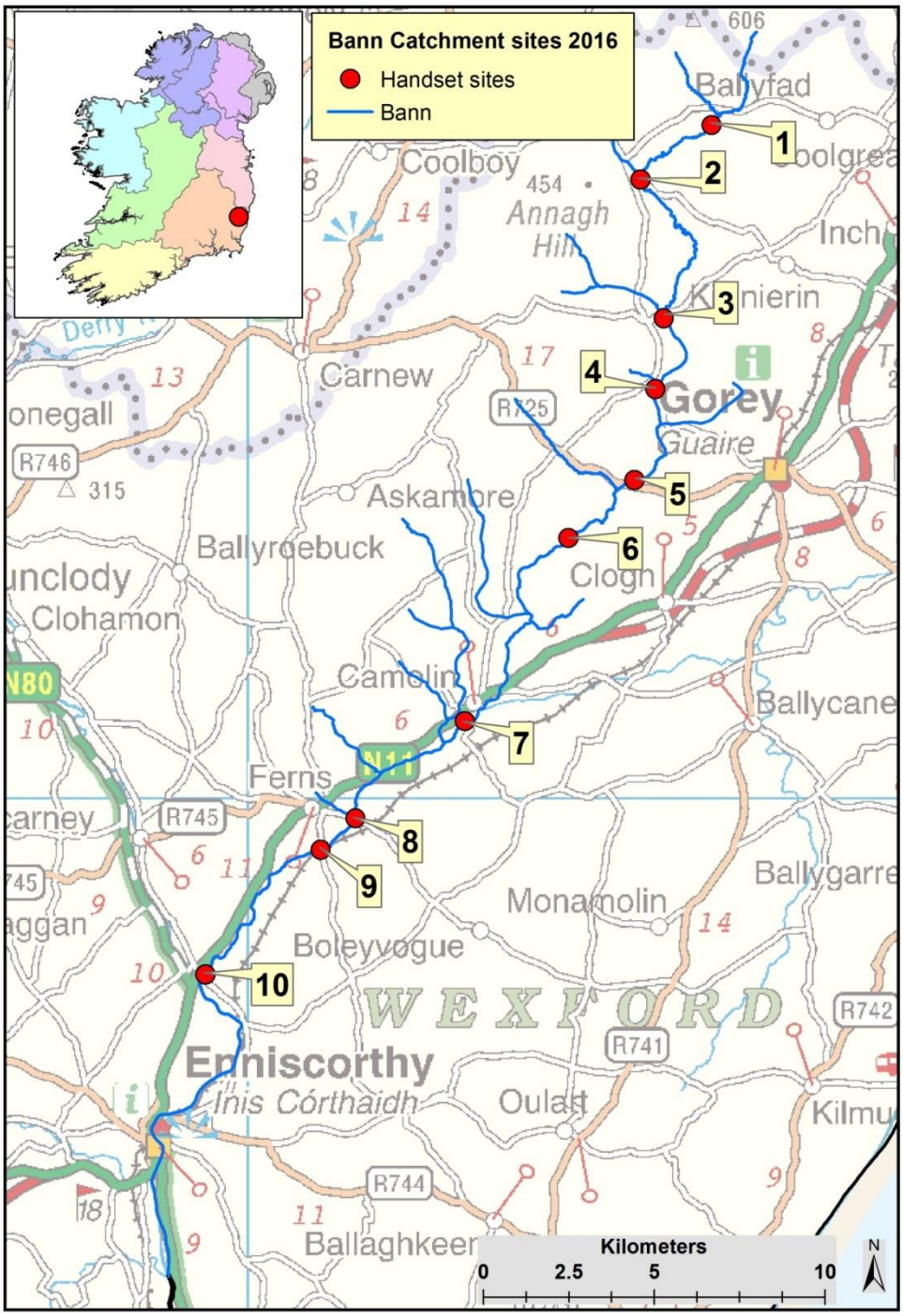

Fig. 4.39. River Bann survey sites, 2016

Table 4.30. Sites surveyed on the River Bann, 2016

Site No.	River	Site	Method	WFD	Date
1	Bann, River	Tinnabaum_A	TEF (Hand)	No	28/07/2016
2	Bann, River	Pallis Br._A	TEF (Hand)	No	28/07/2016
3	Bann, River	Grovemill_A	TEF (Hand)	No	28/07/2016
4	Bann, River	d/s Ballingarry Wood_A	TEF (Hand)	No	28/07/2016
5	Bann, River	Margerry's Br._A	TEF (Hand)	No	28/07/2016
6	Bann, River	Island Br._A	TEF (Hand)	No	28/07/2016
7	Bann, River	Milseoge Br._A	TEF (Hand)	No	28/07/2016
8	Bann, River	Milltown Br._A	TEF (Hand)	No	28/07/2016
9	Bann, River	Doran's Br._A	TEF (Hand)	No	28/07/2016
10	Bann, River	Bann Br._A	TEF (Hand)	No	28/07/2016

A total of seven fish species were captured in the River Bann during the 2016 survey. Brown trout was the most commonly encountered species and were recorded at nine sites (Table 4.31). The highest densities of brown trout were recorded at the most upstream sites, Sites 1 and 2.

Four age classes of brown trout were present), 0+ to 3+ inclusive, with 1+ generally the most abundantly encountered cohort (Table 4.32). There was relatively low numbers of salmon caught, with only one age class (1+) encountered.

The length frequency distributions for brown trout and salmon across all sites surveyed are shown below (Fig. 4.40 and Fig 4.41).

Table 4.31. Minimum density of fish (no./m^2), River Bann Catchment, 2016

	Minimum density (No./m^2)									
Species	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Site 7**	**Site 8**	**Site 9**	**Site 10**
Brown trout	0.541	0.416	0.052	0.064	0.014	0.020	0.066	0.030	0.003	-
0+ brown trout	0.168	0.091	0.026	0.012	0.014	0.007	-	-	0.003	-
1+ & older brown trout	0.373	0.325	0.026	0.052	0.000	0.013	0.066	0.030	-	-
European eel	0.028	-	0.019	-	0.019	0.005	0.020		0.014	0.010
Lamprey sp.	-	-	-	-	0.008			0.006	0.001	-
Minnow	-	-	-	-	-	0.028	0.006	0.024	0.082	0.010
Salmon	-	0.041	-	0.016	-	0.013	0.034	0.004	0.003	0.041
0+ salmon	-	-	-	-	-	-	-	-	-	-
1+ & older salmon	-	0.041	-	0.016	-	0.013	0.034	0.004	0.003	0.041
Stone loach	-	-	0.013	0.044	-	0.032	0.006	0.004	0.010	0.014
3-spined stickleback	-	-	-	-	-	0.037	0.014	0.006	0.053	-
All Fish	0.568	0.457	0.084	0.123	0.041	0.136	0.147	0.074	0.165	0.075

Table 4.32 Percentage catch for aged species in the River Bann catchment, 2016

Species	Site No.	% of catch			
		0+	1+	2+	3+
Brown trout	1	32	64	4	-
	2	29	57	10	5
	3	50	50	-	-
	4	25	63	13	-
	5	100	-	-	-
	6	33	67	-	-
	7	-	64	36	-
	8	-	86	14	-
	9	100	-	-	-
Salmon	2	-	100	-	-
	4	-	100	-	-
	6	-	100	-	-
	7	-	100	-	-
	8	-	100	-	-
	9	-	100	-	-
	10	-	100	-	-

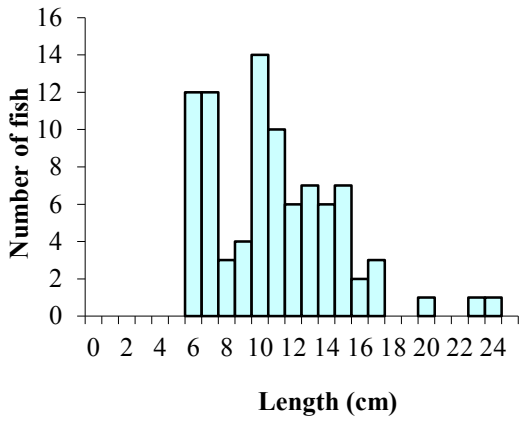

Fig. 4.40. Length frequency distribution of brown trout in the River Bann 2016 (n=89)

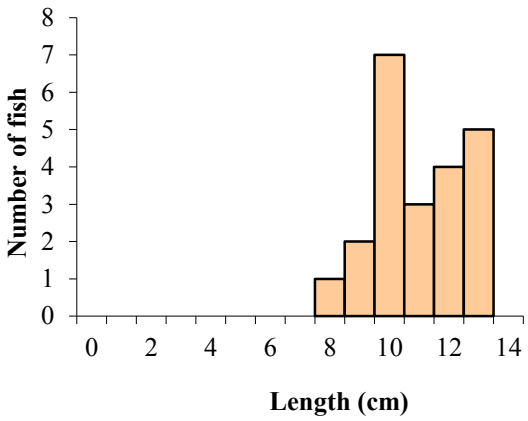

Fig. 4.41. Length frequency distribution of salmon in the River Bann 2016 (n=22)

4.3.4 River Suir Catchment

4.3.4.1 Aherlow River

The Aherlow River is a large tributary of the River Suir and is located between Co. Limerick and Co. Tipperary. It flows eastwards, joining the River Suir just north of Caher. Nineteen sites were surveyed on the Aherlow River, Co. Tipperary, between the 18th and 21st of July 2016 (Fig. 4.42 and Table 4.33). All sites were wadeable and surveyed using the TEF method except for three sites in the lower reaches which were non-wadeable and surveyed using the single pass boat method (SP (boat)).

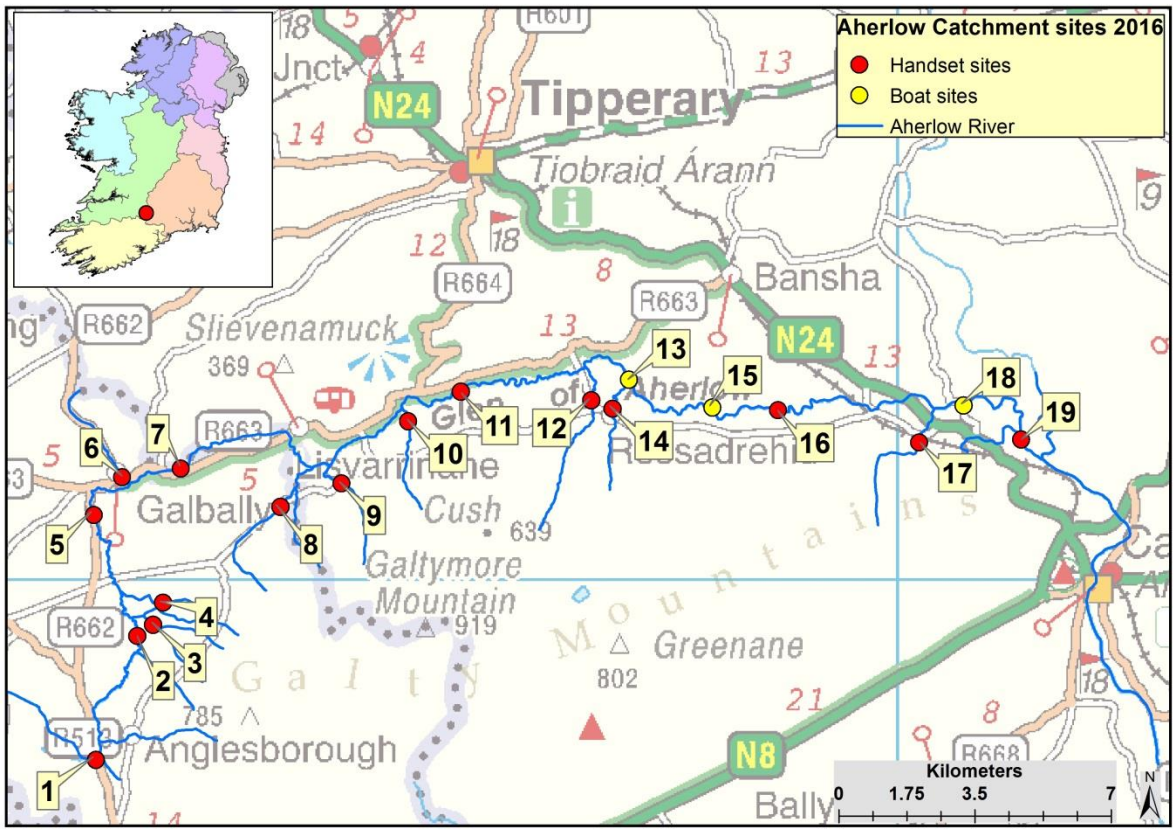

Fig. 4.42. Aherlow River survey sites, 2016

Table 4.33. Sites surveyed on the Aherlow River, 2016

Site No.	River	Site	Method	WFD	Date
1	Aherlow River	Ballybrien North_A	TEF (Hand)	No	19/07/2016
2	Aherlow River	u/s Assaroola Confl._A	TEF (Hand)	No	19/07/2016
3	Assaroola Trib	u/s Aherlow Confl._A	TEF (Hand)	No	19/07/2016
4	Aherlow River	Lyre_A	TEF (Hand)	No	19/07/2016
5	Aherlow River	Ardrahin_A	TEF (Hand)	No	18/07/2016
6	Galbally Trib	Galbally_A	TEF (Hand)	No	19/07/2016
7	Aherlow River	Moor Abbey_A	TEF (Hand)	No	20/07/2016
8	Knockanebrack Trib	Knockanebrack_A	TEF (Hand)	No	20/07/2016
9	Moneynaboola Trib	Moneynaboola_A	TEF (Hand)	No	20/07/2016
10	Clydagh Trib	Gortaclivore_A	TEF (Hand)	No	20/07/2016
11	Aherlow River	Gortnafurra_A	TEF (Hand)	No	20/07/2016
12	Rossadrehid Trib	Dromamarka Br._A	TEF (Hand)	No	20/07/2016
13	Aherlow River	Pollagh East_A	SP (Boat)	No	21/07/2016
14	Knockastakeen Trib	Rossadrehid Br._A	TEF (Hand)	No	19/07/2016
15	Aherlow River	Ashgrove Br._A	SP (Boat)	No	21/07/2016
16	Aherlow River	North of Ballydavid_A	TEF (Hand)	No	19/07/2016
17	Toureen Trib	Toureen Peacaun_A	TEF (Hand)	No	19/07/2016
18	Aherlow River	Killardy Br._A	SP (Boat)	Yes	21/07/2016
19	Aherlow River	South of Drangan Beg_A	TEF (Hand)	No	20/07/2016

Ten fish species were recorded in the Aherlow River in 2016. Brown trout was the most common species caught in the catchment, present at all 19 sites (Table 4.34 and 4.35). Dace, rainbow trout and roach were recorded at one site each. In general species richness was higher at sites located on the main river channel and at sites located in the lower reaches. The highest density of brown trout was recorded at Site 17 (Toureen Peacaun_A), one of the most downstream sites surveyed, while the highest density of salmon was also recorded at this site.

Six age classes of brown trout were recorded (0+, 1+, 2+, 3+, 4+ and 5+) and three age classes of salmon (0+, 1+ and 2+). The most abundant age class for both species was 0+ followed by 1+ (Table 4.36).

The length frequency distribution for brown trout and salmon in the Aherlow River are shown below (Figs. 4.43 to Fig. 4.46).

Table 4.34. Minimum density (No./m^2) of fish, Aherlow River Catchment, 2016

	Minimum density (No./m2)								
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site	Site 8	Site 9
Species	2016	2016	2016	2016	2016	2016	2016	2016	2016
Brown trout	0.091	0.335	0.546	0.205	0.026	0.075	0.128	0.265	0.372
0+ Brown trout	0.091	0.134	0.333	0.205	-	-	0.012	0.197	0.197
1++ Brown trout	-	0.201	0.213	-	0.026	-	0.116	0.068	0.175
Dace	-	-	-	-	-	-	-	-	-
European eel	-	-	-	-	-	-	-	-	0.023
Lamprey sp.	-	-	-	0.008	-	-	-	-	0.008
Perch	-	-	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-	-	-
Roach	-	-	-	-	-	-	-	-	-
Salmon	-	0.015	0.037	0.098	0.113	-	0.070	0.017	0.030
0+ Salmon	-	-	-	0.098	0.087	-	0.070	0.017	0.015
1++ Salmon	-	0.015	0.037	-	0.026	-	-	-	0.015
Stone loach	-	-	-	-	-	-	-	-	-
3-spined stickleback	-	-	-	-	-	0.530	-	0.180	-
All Fish	**0.091**	**0.350**	**0.298**	**0.311**	**0.140**	**0.605**	**0.198**	**0.462**	**0.433**

	Minimum density (No./m^2)								
	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Site 16	Site 17	Site 19
Species	2016	2016	2016	2016	2016	2016	2016	2016	2016
Brown trout	0.238	0.211	0.251	0.008	0.193	0.019	0.055	0.262	0.008
0+ Brown trout	0.200	0.117	0.211	-	0.111	-	0.015	-	0.004
1++ Brown trout	0.038	0.095	0.040	0.008	0.082	0.019	0.040	0.262	0.004
Dace	-	-	-	-	-	0.002	-	-	-
European eel	-	-	0.020	-	-	-	-	-	-
Lamprey sp.	-	-	-	-	-	-	-	-	0.002
Perch	-	-	-	-	-	-	-	-	-
Rainbow trout	-	-	-	-	-	-	-	-	-
Roach	-	-	-	-	-	0.001	-	-	-
Salmon	0.307	0.109	0.040	0.002	0.222	0.001	0.150	0.524	0.024
0+ Salmon	0.157	0.066	0.040	0.0003	0.119	-	0.143	0.524	0.008
1++ Salmon	0.150	0.044	-	0.002	0.104	0.001	0.006	-	0.016
Stone loach	-	-	0.013	0.001	-	-	0.006	-	0.008
3-spined stickleback	-	-	-	-	-	-	-	-	-
All Fish	**0.545**	**0.321**	**0.324**	**0.012**	**0.415**	**0.022**	**0.211**	**0.786**	**0.041**

Table 4.35. Minimum density (No./m^2) of fish, Aherlow River Catchment (Site 18), 2010, 2014 and 2016

	Minimum density (No./m^2) (Site 18)		
Species	**2010**	**2014**	**2016**
Brown trout	0.025	0.006	0.011
0+ Brown trout	0.001	0.000	-
1++ Brown trout	0.024	0.006	0.011
Dace	-	-	-
European eel	-	-	-
Lamprey sp.	-	-	-
Perch	-	0.001	-
Rainbow trout	-	-	0.0002
Roach	0.001	0.003	-
Salmon	0.025	0.005	0.001
0+ Salmon	0.009	0.0003	-
1++ Salmon	0.017	0.005	0.001
Stone loach	0.001	0.001	-
3-spined stickleback	0.0003	-	-
All Fish	**0.052**	**0.016**	**0.013**

Table 4.36. Percentage catch for aged species in the Aherlow River catchment, 2016

River	Site No.	% of catch					
		0+	1+	2+	3+	4+	5+
Brown trout	1	100	-	-	-	-	-
	2	46	42	13	-	-	-
	3	86	14	-	-	-	-
	4	100	-	-	-	-	-
	5	-	67	33	-	-	-
	7	10	76	14	-	-	-
	8	78	22	-	-	-	-
	9	59	41	-	-	-	-
	10	87	13	-	-	-	-
	11	63	31	6	-	-	-
	12	87	13	-	-	-	-
	13	-	35	42	23	-	-
	14	64	36	-	-	-	-
	15	-	26	35	35	3	-
	16	33	56	11	-	-	-
	17	-	100	-	-	-	-
	18	-	20	58	20	2	-
	19	50	50	-	-	-	-
Salmon	2	-	100	-	-	-	-
	3	-	100	-	-	-	-
	4	100	-	-	-	-	-
	5	77	23	-	-	-	-
	7	100	-	-	-	-	-
	8	100	-	-	-	-	-
	9	50	50	-	-	-	-
	10	54	42	4	-	-	-
	11	63	38	-	-	-	-
	12	100	-	-	-	-	-
	13	11	89	-	-	-	-
	14	53	47	-	-	-	-
	15	-	100	-	-	-	-
	16	96	4	-	-	-	-
	17	100	-	-	-	-	-
	18	-	100	-	-	-	-
	19	33	67	-	-	-	-
Dace	15	-	-	-	-	100	-
Roach	15	-	-	-	-	-	100

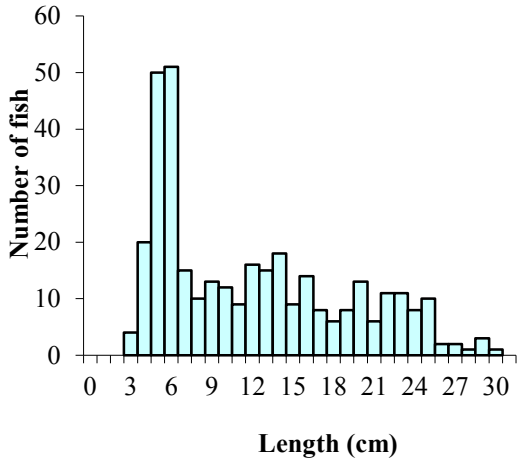

Fig. 4.43. Length frequency distribution of brown trout in the Aherlow River 2016 (n=346)

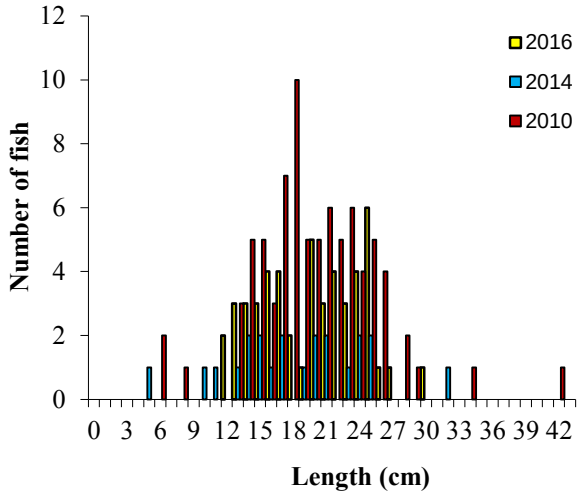

Fig. 4.45. Length frequency distribution of brown trout in the Aherlow River (Site 18), 2010 (n=81), 2014 (n=22) and 2016 (n=50)

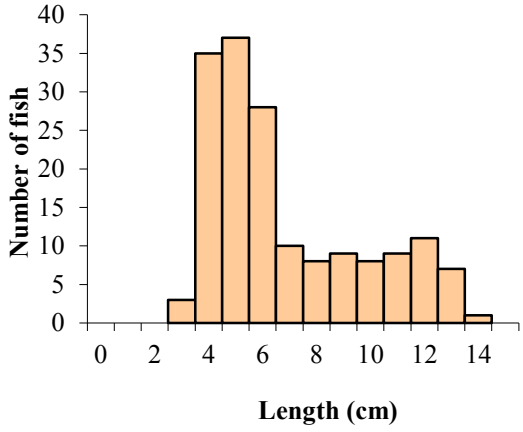

Fig. 4.44. Length frequency distribution of salmon in the Aherlow River 2016 (n=166)

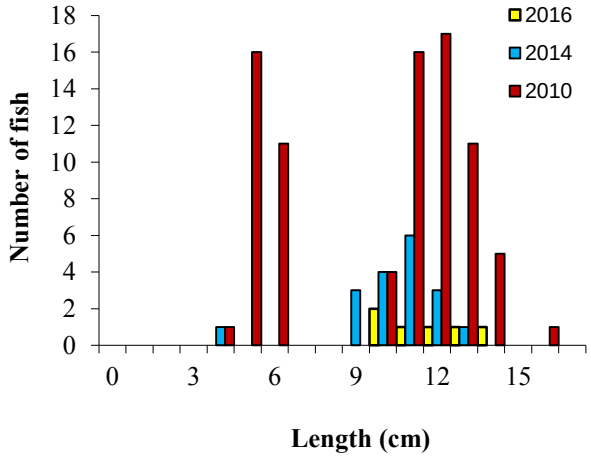

Fig. 4.46. Length frequency distribution of salmon in the Aherlow River (Site 18), 2010 (n=82), 2014 (n=18) and 2016 (n=6)

4.3.4.2 Anner River

The Anner River is a large tributary of the River Suir and is located on the south-eastern corner of Co. Tipperary. It joins the River Suir just east of Clonmel. Five sites were surveyed on the Anner River, near Fethard, Co. Tipperary between the 8th and 31st of August 2016 (Fig. 4.47; Table 4.37). All sites were non-wadeable. Four sites were surveyed using a new ten-minute boat method that is being trialled by IFI, with the remaining site surveyed using the standard depletion method (ADEF). One site (Killusty_A) is a WFD SM survey site.

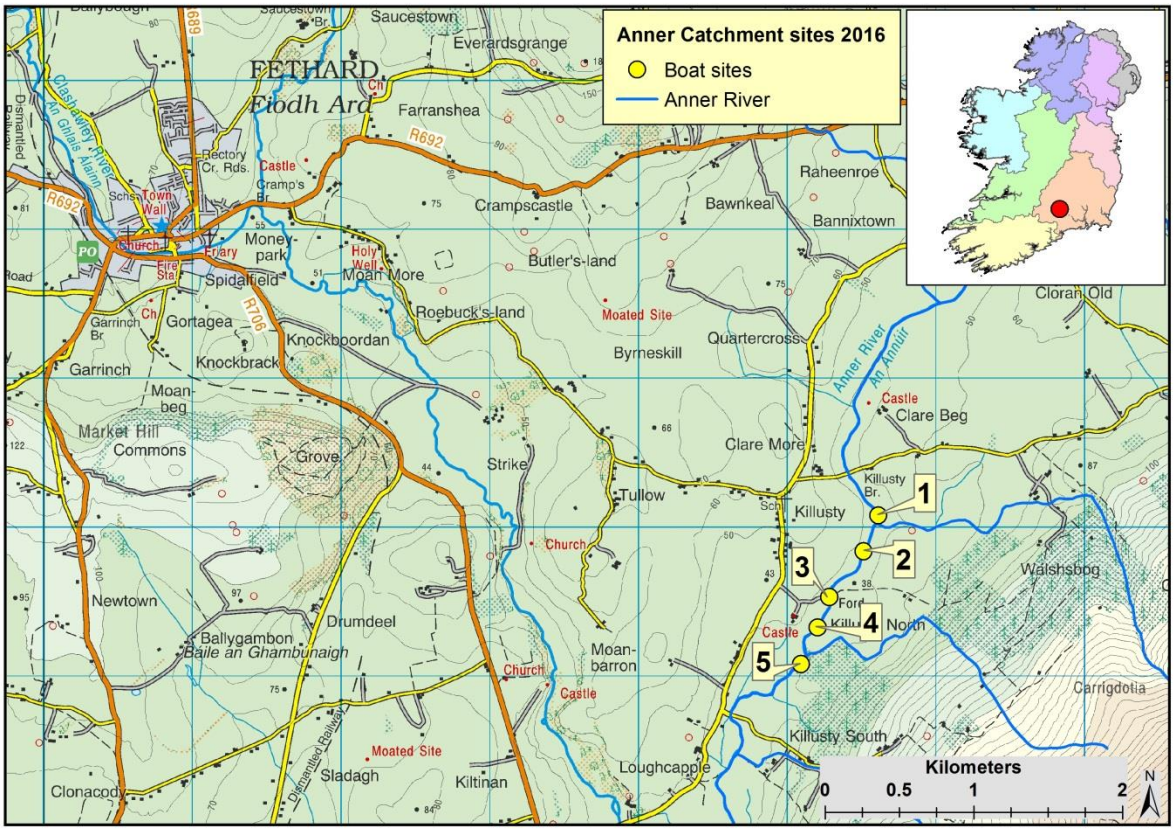

Fig. 4.1. Anner River survey sites, 2016

Table 4.37. Site surveyed on the Anner River, 2016

Site No.	River	Site	Method	WFD	Date
1	Anner River	South of Killusty Br._A	TEF (Boat)	No	31/08/2016
2	Anner River	West of Killusty Ringfort_A	TEF (Boat)	No	31/08/2016
3	Anner River	Killusty_A	ADEF (Boat)	Yes	08/08/2016
4	Anner River	Killusty North_A	TEF (Boat)	No	31/08/2016
5	Anner River	Killusty Wood_A	TEF (Boat)	No	31/08/2016

Brown trout and salmon were the two most commonly encountered fish species recorded at the five sites surveyed (Table 4.38).

The highest density of brown trout was recorded at the most upstream site (Site 1), while the highest density of salmon was recorded at the most downstream site (Site

5). The depth of the sites surveyed on this river facilitated much greater numbers of older cohorts and as a result, there was relatively high proportion of 1+ and 2+ brown trout individuals recorded (Table 4.39). Three age cohorts of salmon were recorded on this river, with Site 1 having the greatest range of ages encountered (0+, 1+ and 2+).

Length frequency distributions for both brown trout (Fig. 4.48) and salmon (Fig. 4.49) are shown below.

Site 3 was previously surveyed in 2014 and a comparison length frequency distribution is shown between both years (Fig. 4.50 and Fig. 4.51). No salmon fry (0+) were recorded at this site in 2016.

Table 4.38. Minimum density of fish (no. /m^2), Anner River, 2016

	Minimum density (No./m^2)					
	Site 1	Site 2	Site 3		Site 4	Site 5
Species	2016	2016	2014	2016	2016	2016
Brown trout	0.127	0.112	0.038	0.079	0.064	0.061
0+ Brown trout	0.006	-	0.001	0.002	-	0.001
1++ Brown trout	0.121	0.112	0.037	0.077	0.064	0.061
European eel	-	-	0.001	-	-	0.001
Lamprey sp.	-	-	-	-	-	0.001
Salmon	0.028	0.028	0.005	0.028	0.017	0.033
0+ Salmon	0.009	0.003	0.001	-	0.001	0.011
1++ Salmon	0.019	0.025	0.004	0.028	0.016	0.022
Stone loach	-	-	0.004	-	0.001	-
All Fish	**0.155**	**0.140**	**0.047**	**0.106**	**0.082**	**0.097**

Table 4.39. Percentage catch for aged species in the Anner River, 2016

		% of catch				
Species	Site No.	0+	1+	2+	3+	4+
Brown trout	1	5	61	20	15	-
	2	-	57	32	11	-
	3	2	74	20	2	2
	4	-	72	16	7	4
	5	1	63	26	10	-
Salmon	1	33	56	11	-	-
	2	10	90	-	-	-
	3	-	100	-	-	-
	4	6	94	-	-	-
	5	34	66	-	-	-

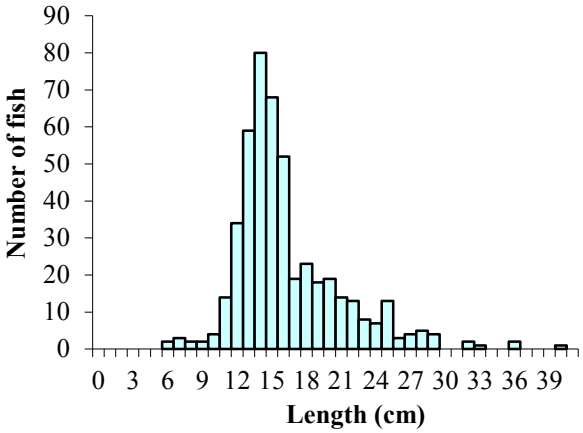

Fig. 4.48. Length frequency distribution of brown trout in the Anner River, 2016 (n=476)

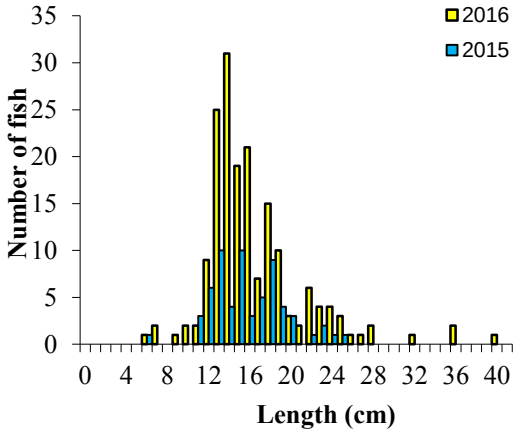

Fig. 4.50. Length frequency distribution of brown trout in the Anner River (Site 3), 2014 (n=63) and 2016 (n=175)

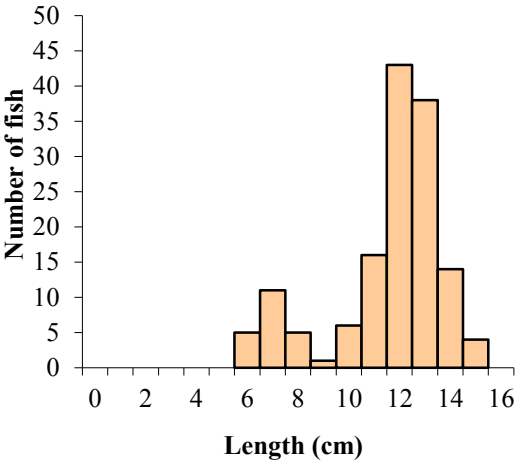

Fig. 4.49. Length frequency distribution of salmon in the Anner River, 2016 (n=143)

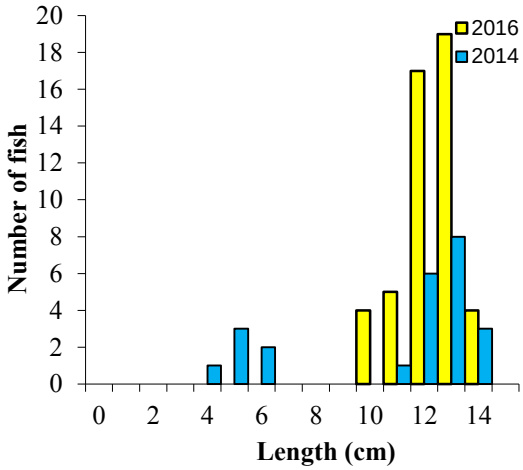

Fig. 4.51. Length frequency distribution of salmon in the Anner River (Site 3), 2014 (n=24) and 2016 (n=49)

4.3.4.3 *Ara River*

The Ara River is a large tributary of the River Suir. It is located in south Co. Tipperary and flows eastwards, first joining the Aherlow River and then River Suir near Caher. Five sites were surveyed on the Ara River, near Bansha, Co. Tipperary between the 9th and 30th of August 2016 (Fig. 4.52, Table 4.40). All sites were non-wadeable. Three sites were surveyed using a new ten-minute boat method that is being trialled by IFI, with the remaining two sites surveyed using the standard ADEF method. Two sites (Site 2 and 5) are WFD SM sites (Table 4.42).

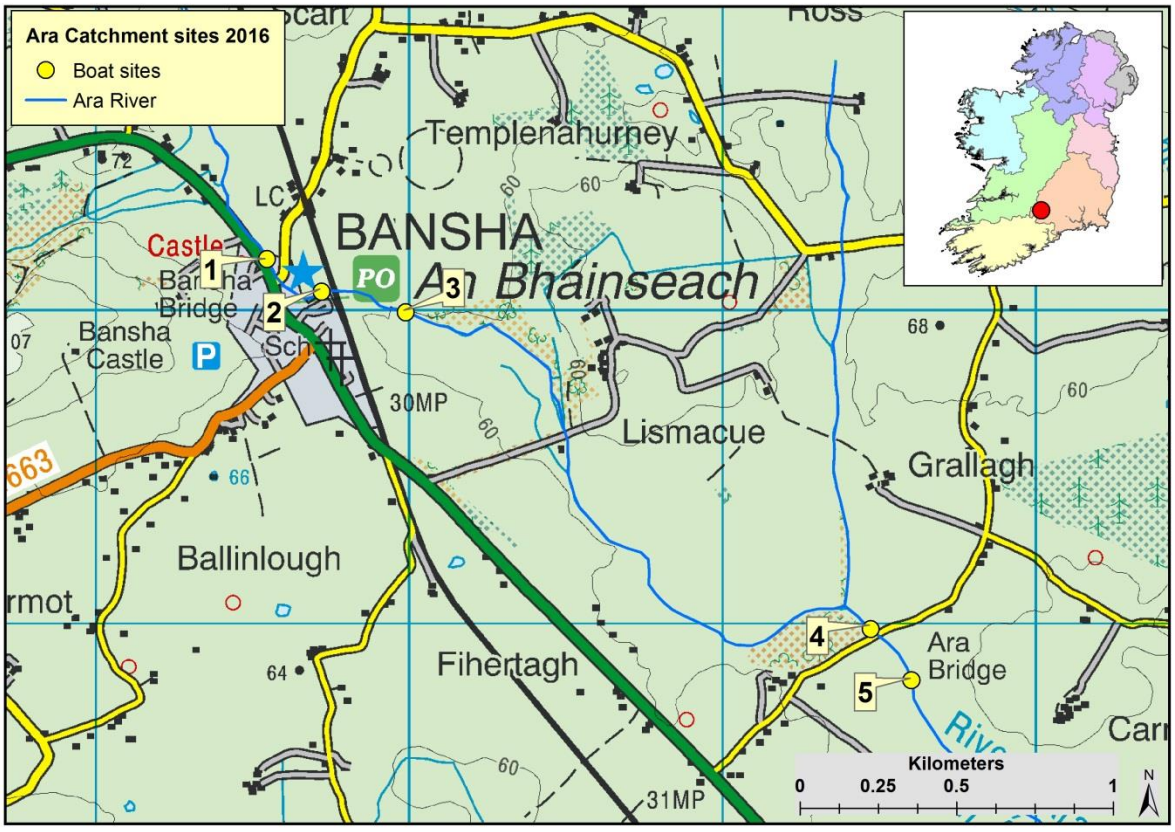

Fig. 4.52. Ara River survey sites, 2016

Table 4.40. Sites surveyed on the Ara River, 2016

No.	River	Site	Method	WFD	Date
1	Ara River	Bansha Castle_A	TEF (Boat)	No	30/08/2016
2	Ara River	Bansha_A	ADEF (Boat)	Yes	09/08/2016
3	Ara River	Lismacue_A	TEF (Boat)	No	30/08/2016
4	Ara River	Grallagh_A	TEF (Boat)	No	30/08/2016
5	Ara River	Ara Br._A	ADEF (Boat)	Yes	09/08/2016

Brown trout and salmon were the two most commonly encountered fish species recorded in the Ara catchment and were present at all five sites. The highest density of brown trout in 2016 was recorded at Site 2 followed closely by Site 5 (Table 4.41).

Five cohorts of brown trout were recorded on the Ara River (Table 4.42). There were relatively high proportions of 1+ and 2+ individuals recorded. Two age classes of salmon were encountered (0+ and 1+).

Length frequency distributions for both brown trout (Fig. 4.53) and salmon (Fig. 4.54) in the Ara River for 2016 are shown below.

The length frequency distributions for both Site 2 and Site 5 are also shown below for 2010 and 2014 (Fig. to Fig. 4.58).

Table 4.41. Minimum density of fish (no. /m^2), Ara River, 2016

	Minimum density (No./m^2)						
	Site 1	Site 2		Site 3	Site 4	Site 5	
Species	2016	2014	2016	2016	2016	2010	2016
Brown trout	0.112	0.025	0.128	0.094	0.090	0.129	0.124
0+ Brown trout	0.008	0.001	0.002	0.013	0.002	0.012	0.004
1++ Brown trout	0.104	0.025	0.126	0.081	0.088	0.117	0.120
European eel	0.003	0.001	-	-	0.003	0.002	0.006
Lamprey sp.	-	-	-	-	-	-	0.005
Salmon	0.033	0.001	0.014	0.004	0.009	0.034	0.019
0+ Salmon	0.008	-	-	0.001	-	0.005	0.005
1++ Salmon	0.025	0.001	0.014	0.004	0.009	0.029	0.019
Stone loach	-	0.001	-	0.005	-	0.003	0.005
3-spined stickleback	-	-	-	-	-	0.003	-
All Fish	**0.147**	**0.027**	**0.141**	**0.104**	**0.102**	**0.171**	**0.159**

Table 4.42. Percentage catch for aged species in the Ara River, 2016

		% catch				
Species	Site No.	0+	1+	2+	3+	4+
Brown trout	1	7	66	19	8	-
	2	1	83	15	1	-
	3	14	68	7	8	2
	4	2	80	15	3	-
	5	3	82	15	-	-
Salmon	1	24	76	-	-	-
	2	-	100	-	-	-
	3	20	80	-	-	-
	4	-	100	-	-	-
	5	17	83	-	-	-

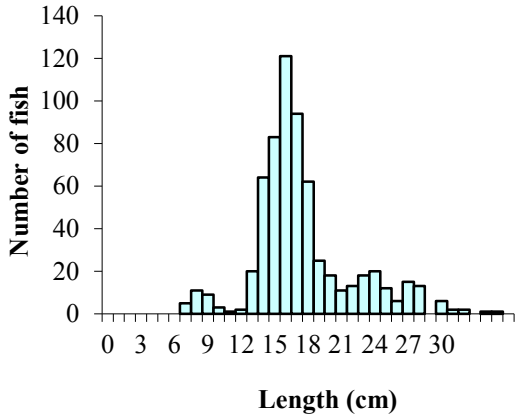

Fig. 4.53. Length frequency distribution of brown trout in the Ara River 2016 (n=638).

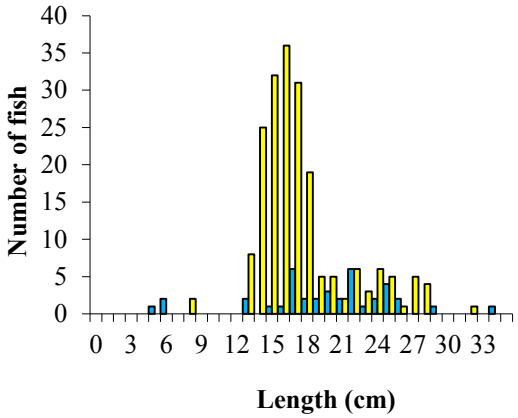

Fig. 4.55. Length frequency distribution of brown trout in the Ara River (Bansha_A), 2014 and (n=39), 2016 (n=196)

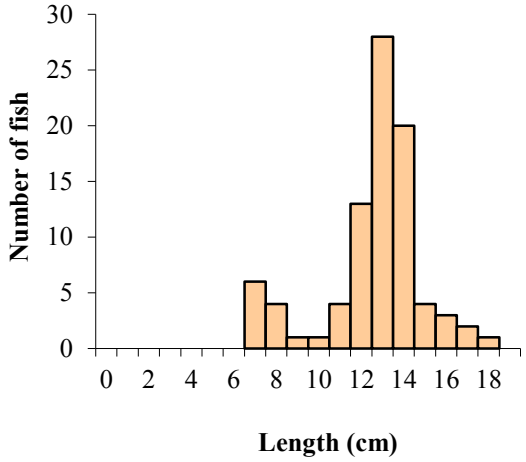

Fig. 4.54. Length frequency distribution of salmon in the Ara River 2016 (n=87)

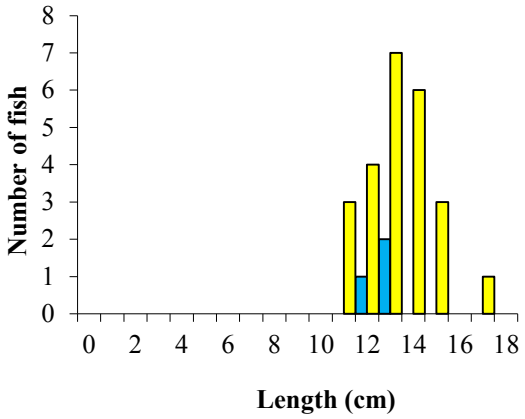

Fig. 4.56. Length frequency distribution of salmon in the Ara River (Bansha_A), 2014 and (n=3), 2016 (n=24)

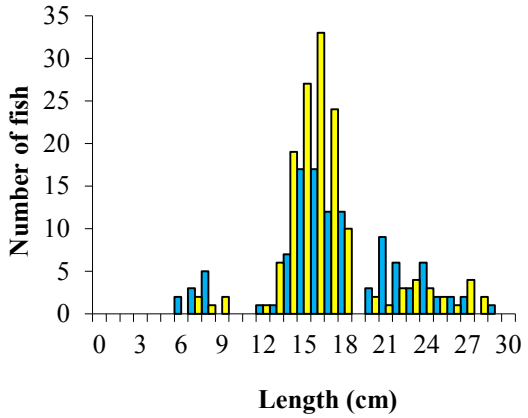

Fig. 4.57. Length frequency distribution of brown trout in the Ara River (Ara Br._A), 2010 and (n=111), 2016 (n=147)

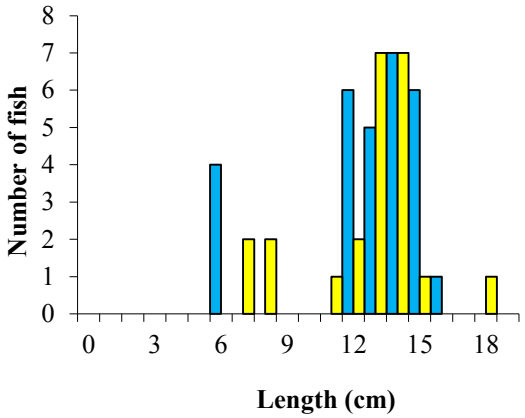

Fig. 4.58. Length frequency distribution of salmon in the Ara River (Ara Br._A), 2010 and (n=29), 2016 (n=23)

4.3.4.4 Cromoge River

The Cromoge River is a tributary of the River Suir. It is located in North Co. Tipperary, near Borrisoleigh and flows southwards, to first joining with the Clodiagh River and then the River Suir, north of Cashel. Two sites (Fig. 4.59) were surveyed on the Cromoge River and its tributary, near Borrisoleigh, Co. Tipperary between the 11th of August and 1st of September 2016. Both sites were non-wadeable. One site was surveyed using a new ten-minute boat method (TEF) that is being trialled by IFI, with the remaining site surveyed using a boat (SP (Boat)).

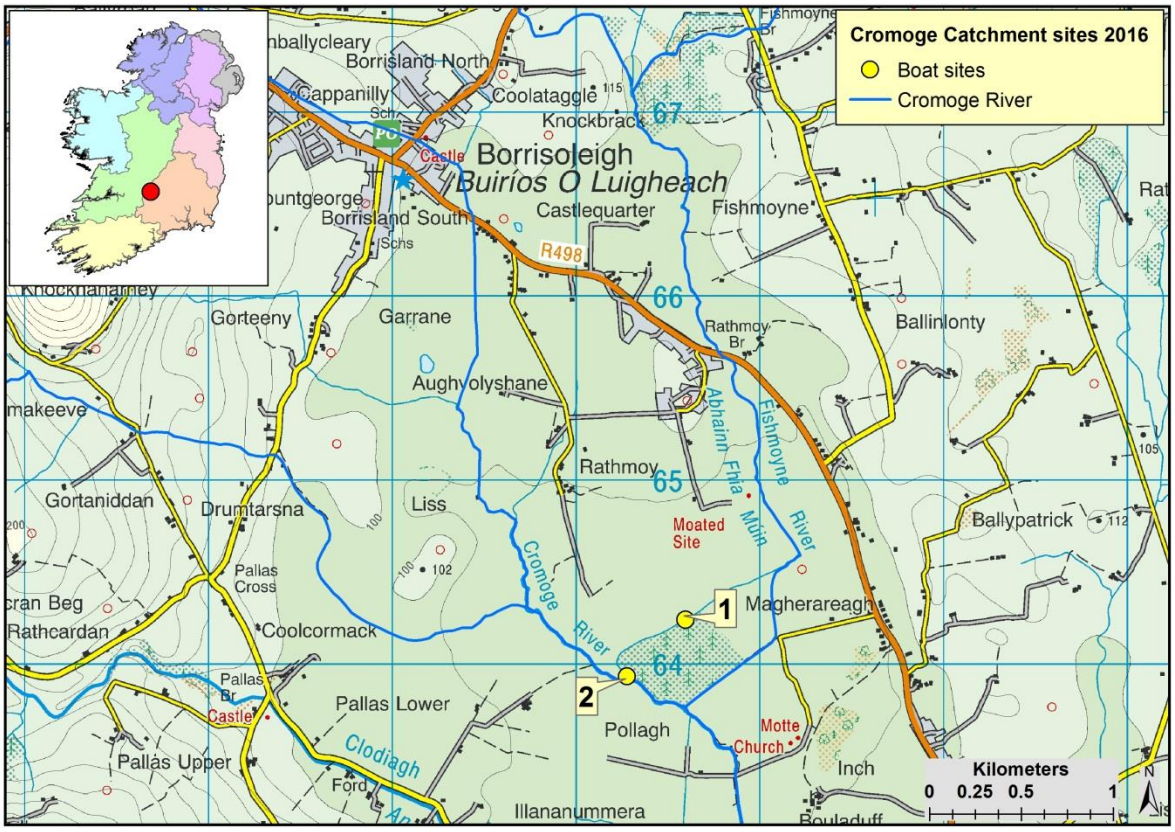

Fig. 4.59. Cromoge River survey sites, 2016

Table 4.43. Sites surveyed on the Cromore River, 2016

No.	River	Site	Method	WFD	Date
1	Cromoge (Fishmoyne) River	Magherareagh_A	TEF (Boat)	No	01/09/2016
2	Cromoge (Fishmoyne) Trib	Pollagh_A	SP (Boat)	No	11/08/2016

Table 4.44. Percentage catch for aged species in the Cromoge River, 2016

Species	Site	% catch 0+	1+	2+	3+
Brown trout	1	1	61	32	5
	2	1	44	53	2

There were only three fish species recorded on the Cromoge River; brown trout, minnow and stone loach. Of these, brown trout was the most abundant (Table 4.45). Four age classes of brown trout were encountered, with the 1+ and 2+ cohorts the most commonly caught (Table 4.44).

The length frequency for brown trout captured at two sites in the Cromoge River is shown below (Fig. 4.60).

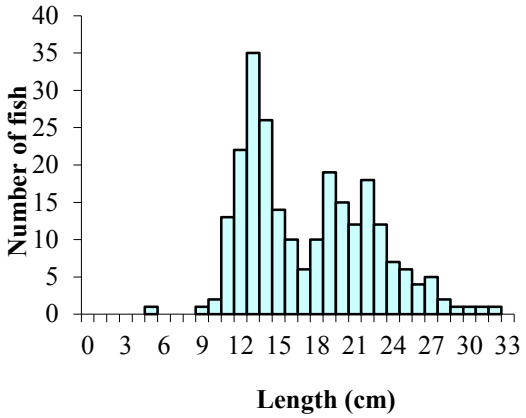

Fig. 4.60 Length frequency distribution of brown trout in the Cromoge River 2016 (Sites 1 and 2) (n=244)

Table 4.45. Minimum density of fish (no. /m^2), Cromoge River, 2016

	Site 1	Site 2
Species	**2016**	**2016**
Brown trout	0.192	0.106
0+ Brown trout	0.002	0.001
1++ Brown trout	0.190	0.106
Minnow	0.014	-
Stone loach	-	0.001
All Fish	**0.206**	**0.107**

4.3.4.5 River Suir (main channel)

The River Suir is one of Ireland's longest rivers and flows in a southerly direction through Co. Tipperary, eventually dividing Co. Kilkenny and Co. Waterford before reaching the sea at Waterford Harbour. The river's tidal zone reaches upstream as far as Carrick-on-Suir. Six sites were surveyed on the River Suir main channel between the 10th of August and 1st of September 2016 (Fig. 4.61; Table 4.46). All sites were non-wadeable. Two sites were surveyed using the ADEF method and four using the TEF boat method that is being trialled by IFI. One site (Site 2) is a WFD SM site and has been surveyed previously.

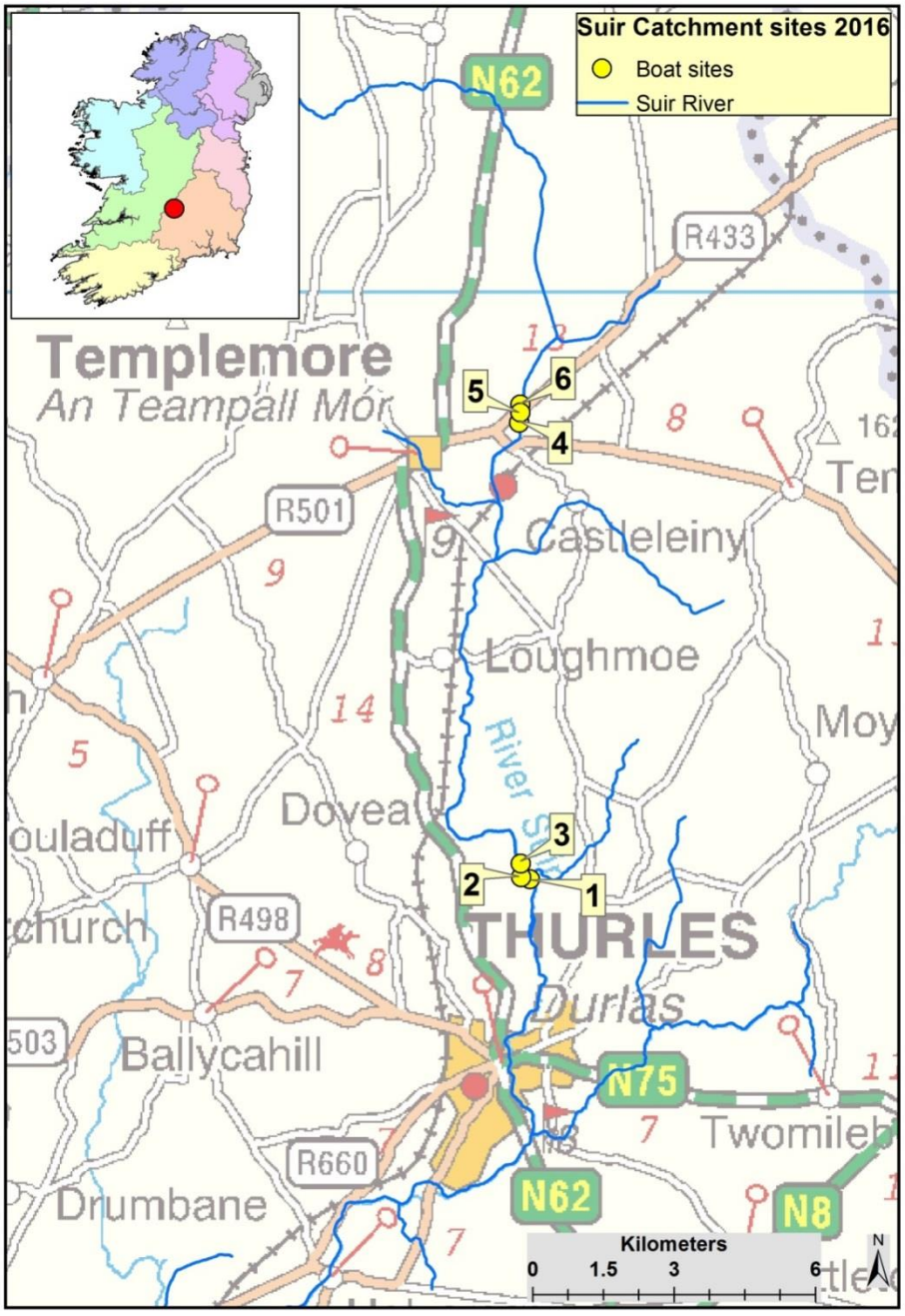

Fig. 4.61. River Suir survey sites, 2016

Table 4.46. Sites surveyed on the River Suir, 2016

Site No.	River	Site	Method	WFD	Date
1	River Suir	Eastwood_A	TEF (Boat)	No	29/08/2016
2	River Suir	Knocknageragh Br._A	ADEF (Boat)	Yes	10/08/2016
3	River Suir	Aughall Middle_A	TEF (Boat)	No	29/08/2016
4	River Suir	Rossestown_C	TEF (Boat)	No	01/09/2016
5	River Suir	Rossestown_B	TEF (Boat)	No	01/09/2016
6	River Suir	Rossestown_A	ADEF (Boat)	No	10/08/2016

Brown trout was the most commonly encountered fish species recorded in the River Suir catchment and was present at all six sites (Table 4.47). The highest density of brown trout was recorded at Site 3.

Four age classes of brown trout were present (Table 4.48). Brown trout fry (0+) were absent but relatively high proportions of 1+, 2+ and 3+ individuals were present. Six age classes of roach were present, 0+ to 5+ inclusive, with the greatest proportion of individuals present within the 2+ and 3+ age categories. The proportion of the catch within each age class for salmon and pike are also shown.

The length frequency distributions for brown trout (Fig. 4.62) and roach (Fig. 4.63) are shown below for 2016. This was the fourth occasion that Site 2 had been surveyed for WFD purposes. A comparison length frequency distribution for this site is shown for the three most recent surveys (Fig. 4.64).

Table 4.47. Minimum density of fish (no./m^2), River Suir, 2016

	Minimum density (No./m^2)								
	Site 1	Site 2				Site 3	Site 4	Site 5	Site 6
Species	**2016**	**2008**	**2010**	**2014**	**2016**	**2016**	**2016**	**2016**	**2016**
Brown trout	0.156	0.153	0.127	0.104	0.167	0.259	0.001	0.004	0.007
0+ Brown trout	-	-	-	-	-	-	-	-	-
1++ Brown trout	0.156	0.153	0.127	0.104	0.167	0.259	0.001	0.004	0.007
European eel	-	-	0.002	-	-	-	-	0.002	0.003
Gudgeon	-	0.024	-	-	-	-	0.004	0.009	0.009
Lamprey sp.	-	-	0.002	0.002	-	-	-	-	-
Minnow	0.019	-	-	-	0.002	-	0.005	-	0.008
Pike	-	-	0.002	-	-	-	-	0.001	0.001
Roach	-	0.002	-	-	-	-	0.009	0.024	0.061
Salmon	0.002	0.002	0.003	-	-	-	-	0.001	0.005
0+ Salmon	-	-	-	-	-	-	-	-	0.001
1++ Salmon	0.002	0.002	0.003	-	-	-	-	0.001	0.004
Stone loach	-	0.007	0.005	0.002	-	-	0.003	0.005	0.002
3-spined stickleback	-	-	0.002	-	-	-	0.001	0.002	0.002
All Fish	**0.177**	**0.187**	**0.141**	**0.104**	**0.167**	**0.259**	**0.023**	**0.046**	**0.098**

Table 4.48. Percentage of catch for aged fish species in the River Suir, 2016

Species	Site	% catch 0+	1+	2+	3+	4+	5+
Brown trout	1	-	58	31	11	-	-
	2	-	31	56	12	-	-
	3	-	42	39	19	-	-
	4	-	100	-	-	-	-
	5	-	100	-	-	-	-
	6	-	23	69	-	8	-
Salmon	1	-	100	-	-	-	-
	5	-	100	-	-	-	-
	6	17	83	-	-	-	-
Roach	4	-	-	36	64	-	-
	5	-	3	50	43	3	3
	6	1	13	6	61	15	5
Pike	5	-	100	-	-	-	-
	6	-	100	-	-	-	-

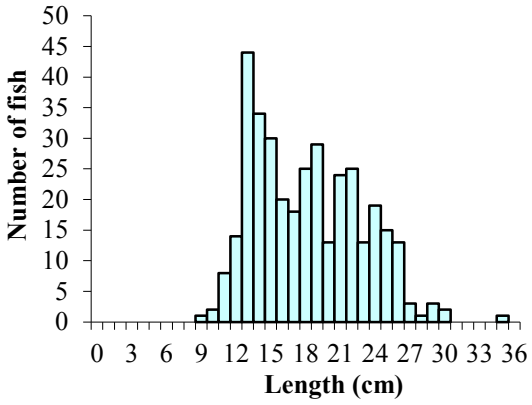

Fig. 4.62. Length frequency distribution of brown trout in the River Suir, 2016 (n=357).

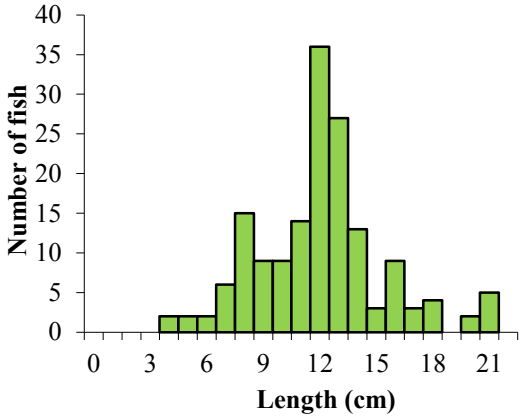

Fig. 4.63. Length frequency distribution of roach in the River Suir, 2016 (n=161).

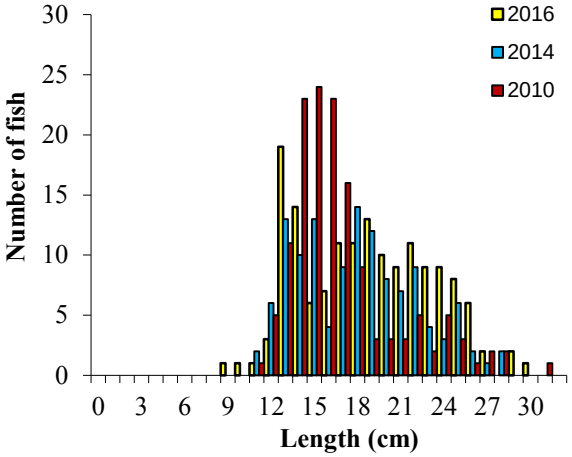

Fig. 4.64. Length frequency distribution of brown trout in the River Suir (Site 2 - Br._A), 2010 (n=142), 2014 (n=125) and 2016 (n=154).

4.4 Shannon International River Basin District (ShIRBD)

Fifty-five river sites were surveyed in the ShIRBD during 2016. Subcatchments included the Ballydangan, Ballyfinboy, Caher, Cross, Kilcrow, Kilmastulla, Maigue, Nenagh, Scarrif, Shannon, Suck and Tullamore. Nineteen sites were wadeable and surveyed using either the ADEF or TEF methods, with the remaining 36 sites non-wadeable and surveyed with boats, using the SP (boat), ADEF or sPASE methods (Fig. 4.2).

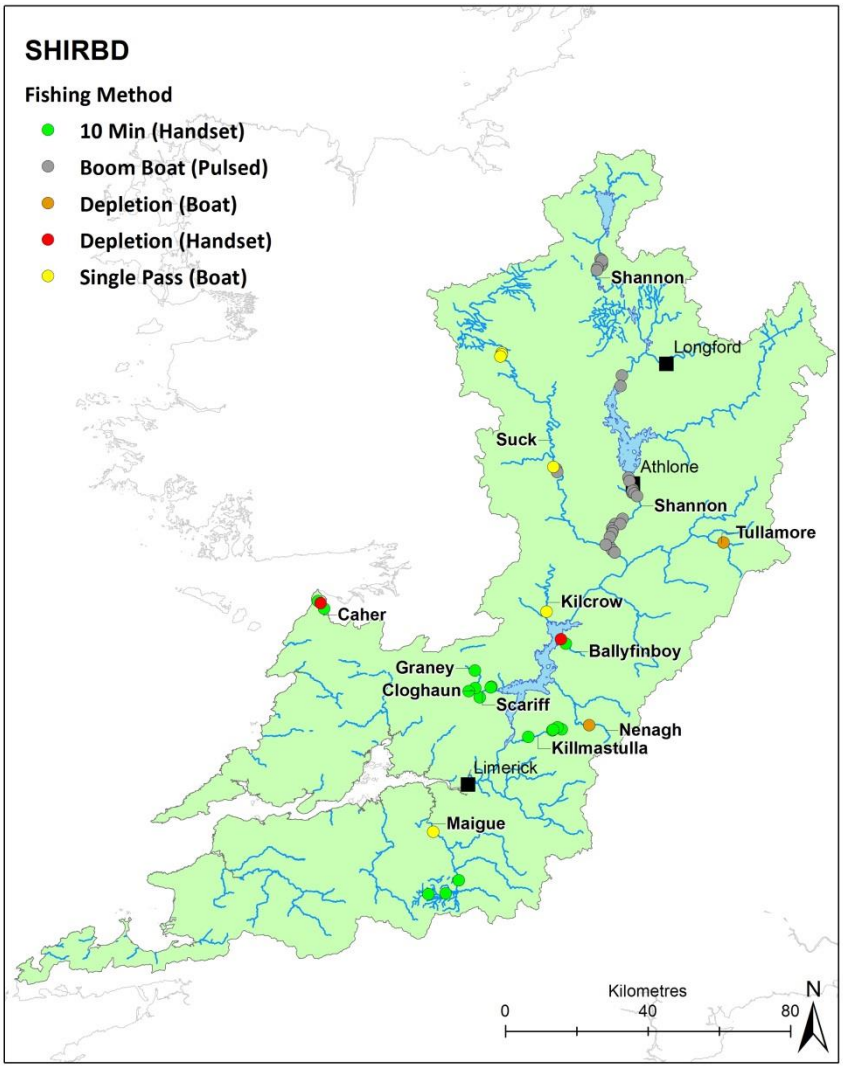

Fig. 4.2. Map of the ShIRBD showing sites surveyed in 2016

4.4.1 Caher River

The Caher River is a small stream located in the Burren, Co. Clare. It flows into the sea at Fanore Beach as the Murrogh River. Three sites were surveyed on the river on the 21st of September 2016 (Fig. 4.66; Table 4.49). All sites were wadeable; two were surveyed using the TEF method and the other two surveyed using the ADEF method. Site 2 is a WFD SM site and has been surveyed previously.

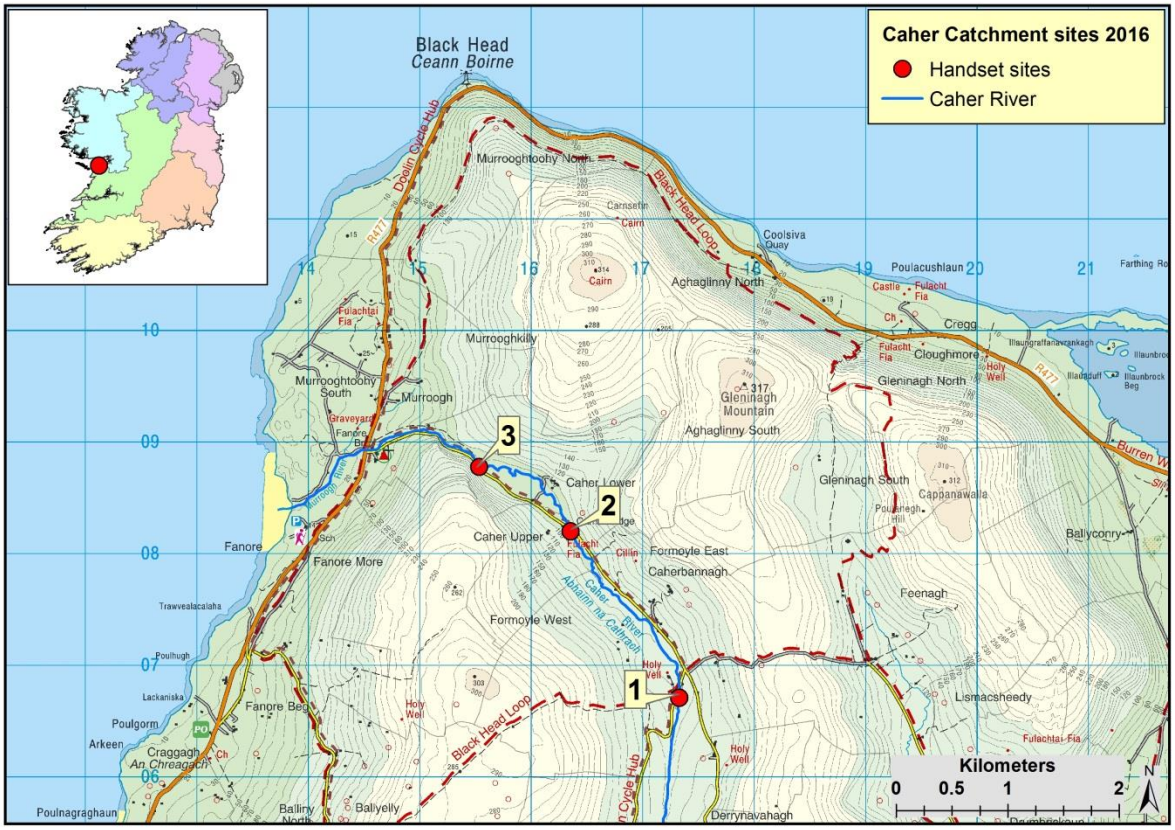

Fig. 4.66. Caher River survey sites, 2016

Table 4.49. Sites surveyed on the Caher River, 2016

Site No.	River	Site	Method	WFD	Date
1	Caher River	Derrynavanagh_A	TEF (Hand)	No	21/09/2016
2	Caher River	Br. 2 km d/s Formoyle_A	ADEF (Hand)	Yes	21/09/2016
3	Caher River	Murroogh_A	TEF (Hand)	No	21/09/2016

Only two fish species were recorded in the Caher River; brown trout and European eel. Brown trout was the only species recorded at all three sites and was also the most abundant species at each (Table 4.50).

Two age classes of brown trout were recorded, 0+ and 1+ (Table 4.51).

Site 2 was surveyed on two previous occasions (2009 and 2012). The length frequency distributions for brown trout in the Caher River (Fig. 4.67) and Site 2 for each sampling occasion are shown below (Fig. 4.68).

Table 4.50. Minimum density of fish (no. /m^2), Caher River, 2016

	Minimum density (No./m^2)				
	Site 1	Site 2			Site 3
Species	2016	2009	2012	2016	2016
Brown trout	0.089	0.254	0.480	0.433	0.037
0+ Brown trout	0.030	0.181	0.422	0.204	0.010
1++ Brown trout	0.059	0.073	0.058	0.229	0.027
European eel	-	0.004	0.004	0.005	0.017
All Fish	**0.089**	**0.259**	**0.485**	**0.438**	**0.054**

Table 5.51. Percentage catch for aged species in the Caher River, 2016

		% catch	
Species	Site	0+	1+
Brown trout	1	33	67
	2	57	43
	3	29	71

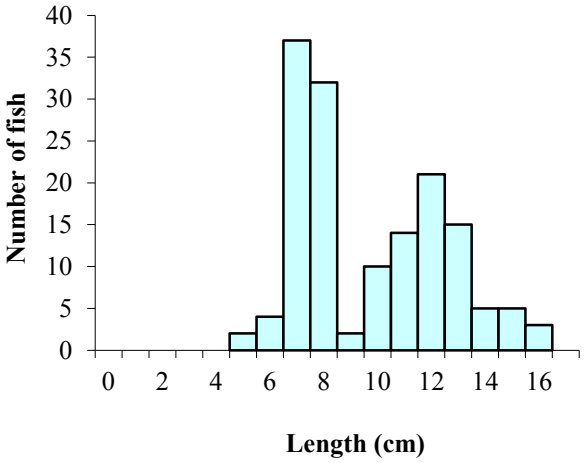

Fig. 4.67. Length frequency distribution of brown trout in the Caher River, 2016 (n=150).

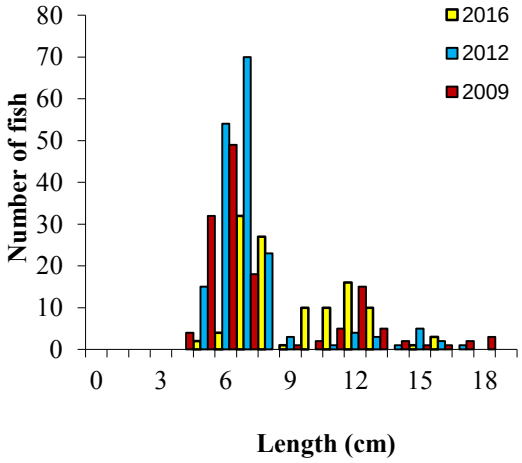

Fig. 4.68. Length frequency distribution of brown trout in the Caher River (Br. 2 km d/s Formoyle_A), 2009 (n=140), 2012 (n=182) and 2016 (n=116).

4.4.2 River Shannon

4.4.2.1 Ballydangan River

The Ballydangan River is a small tributary of the River Shannon. It is located at the most southerly tip of Co. Roscommon and joins the Shannon just downstream of Clonmacnoise.

One site was surveyed on the Ballydangan River (Co. Roscommon side), near Clonmacnoise on the 12th of July 2016 (Fig. 4.69; Table 4.52). This site was non-wadeable and surveyed using the sPASE method. It is a WFD SM site and has been surveyed previously.

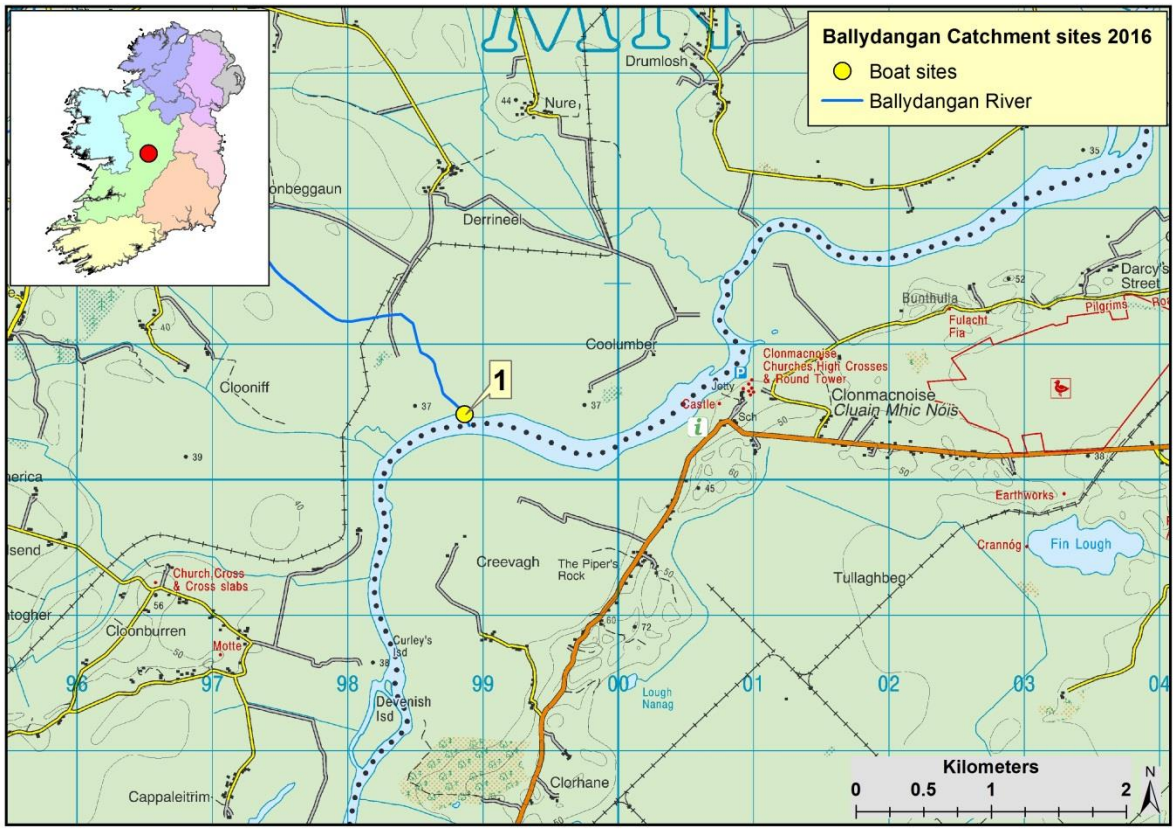

Fig. 4.69. Ballydangan River survey site, 2016

Table 4.52. Sites surveyed on the Ballydangan River, 2016

Site No.	River	Site	Method	WFD	Date
1	Ballydangan	Br. u/s Shannon R. Confl_A	sPASE	Yes	12/07/2016

Table 4.53. Percentage catch for aged species in the Ballydangan River, 2016

Species	Site	% catch					
		0+	1+	2+	3+	4+	5+
Roach	1	-	10	-	40	20	30

Only two fish species were recorded in the Ballydangan River; perch and roach. The overall abundance of fish recorded was relatively low (Table 4.54). The catch per unit effort (CPUE) of roach was slightly higher than that of perch.

Four age classes of roach were encountered (1+, 3+, 4+ and 5+), with the 3+ cohort the most frequently recorded (Table 4.53).

Length frequency distributions are shown below for both perch (Fig. 4.70) and roach (Fig. 4.71).

Table 4.54. Fish CPUE (no. of fish /activation), Ballydangan River, 2016

	CPUE (No./activation) Site 1
Species	**2016**
Perch	1.000
Roach	1.111
All Fish	**2.111**

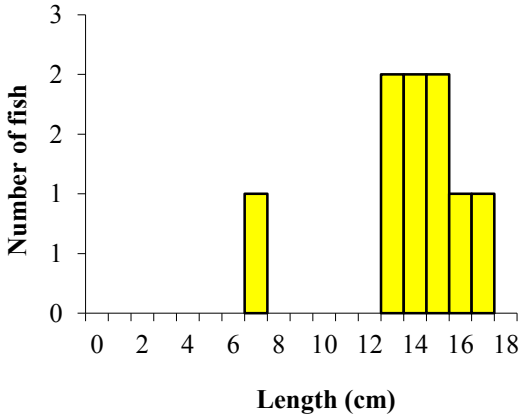

Fig. 4.3. Length frequency distribution of perch in the Ballydangan (Site 1) 2010 (n=22) and 2016 (n=9).

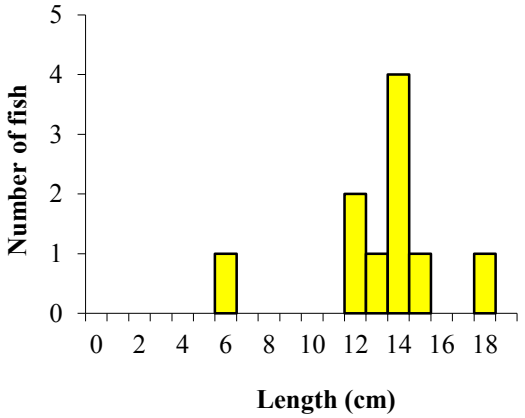

Fig. 4.4. Length frequency distribution of roach in the Ballydangan (Site 1) 2010 (n=4) and 2016 (n=10).

4.4.2.2 Ballyfinboy River

The Ballyfinboy River is a tributary of the river Shannon. Its catchment is located near Borrisokane, Co. Tipperary, on the northeastern side of Lough Derg. Two sites were surveyed on the river near Ballinderry Co. Tipperary on the 21st of September 2016 (Fig. 4.72; Table 4.55). Both sites were wadeable; one was surveyed using the TEF method and the other using the ADEF method. Site 2 is a WFD SM site and has been surveyed previously.

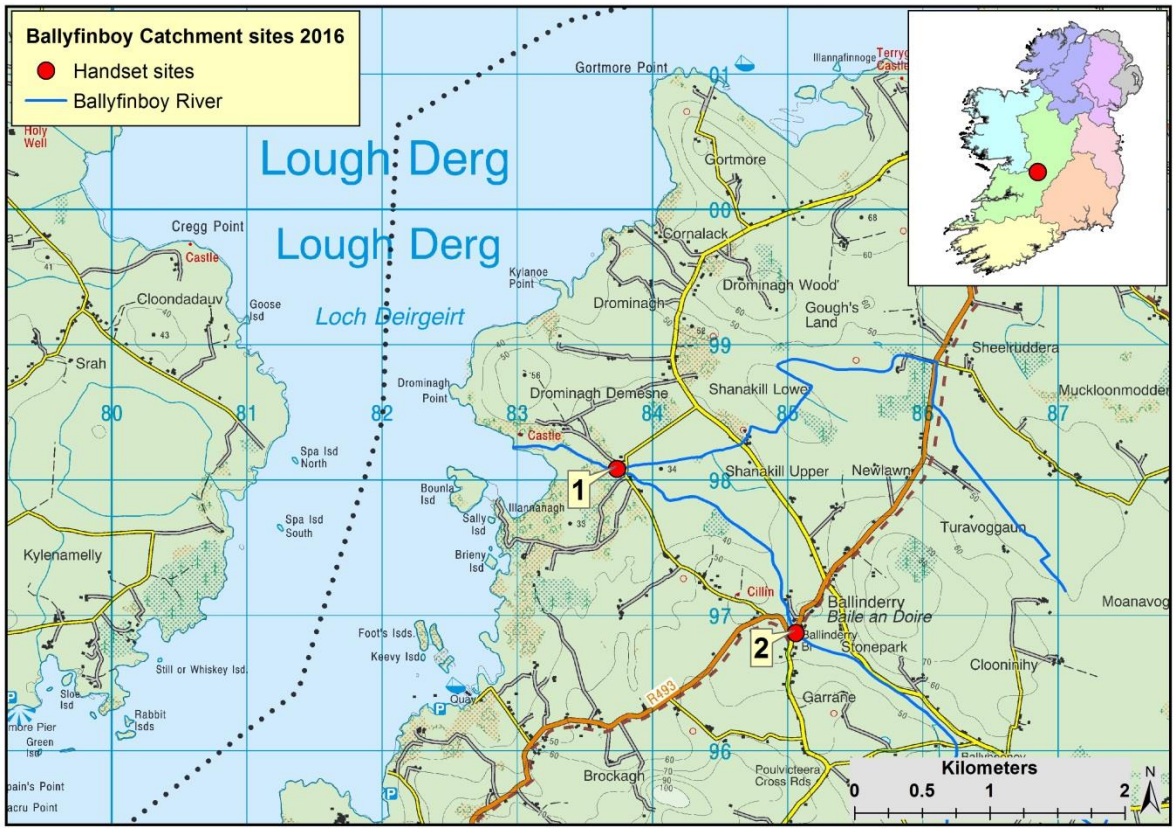

Fig. 4.5. Ballyfinboy River survey sites, 2016

Table 4.55. Sites surveyed on the Ballyfinboy River, 2016

Site No.	River	Site	Method	WFD	Date
1	Ballyfinboy River	Ballinderry Br._A	TEF (Hand)	No	21/09/2016
2	Ballyfinboy River	Br. just u/s L. Derg_A	ADEF (Hand)	Yes	21/09/2016

Four fish species were recorded in the Ballyfinboy River during the 2016 surveys. Brown trout was the only species recorded during both previous survey occasions at each site (Table 4.56). Brown trout was the most abundant species recorded at both sites.

Only two age classes of brown trout were present at the site in 2016; 0+ and 1+ (Table 4.57).

The length frequency of brown trout (Fig. 4.73; Fig. 4.74) and salmon (Fig. 4.75) for sites on the Ballyfinboy River, 2016, are shown below.

Table 4.56. Minimum density of fish (no./m^2), Ballyfinboy River, 2016

	Minimum density (No./m^2)					
	Site 1			Site 2		
Species	2012	2013	2016	2009	2013	2016
Brown trout	0.083	0.056	0.186	0.027	0.101	0.033
0+ Brown trout	0.024	0.044	0.110	0.013	0.019	-
1++ Brown trout	0.059	0.012	0.075	0.013	0.082	0.033
European eel	-	-	-	0.004	0.010	-
Lamprey sp.	-	0.004	-	-	-	-
Salmon	0.008	-	0.023	0.093	0.010	0.005
0+ Salmon	-	-	0.012	0.093	0.005	-
1++ Salmon	0.008	-	0.012	-	0.005	0.005
Stone loach	-	0.004	0.012	0.027	0.005	-
3-spined stickleback	-	0.004	0.017	-	-	-
All Fish	**0.091**	**0.068**	**0.238**	**0.151**	**0.125**	**0.037**

Table 4.57. Percentage catch for aged species in the Ballyfinboy River, 2016

		% catch	
River	Site	0+	1+
Brown trout	1	60	40
	2	-	100
Salmon	1	50	50
	2	-	100

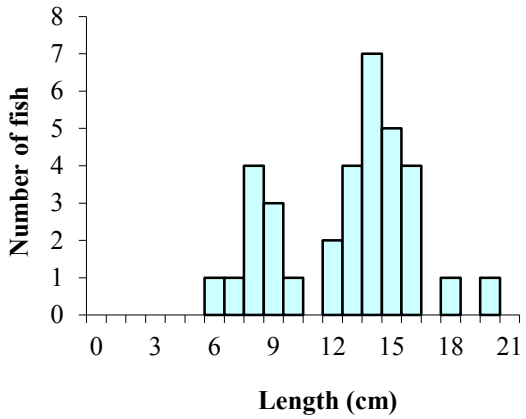

Fig. 4.73. Length frequency distribution of brown trout in the Ballyfinboy River, 2016 (n=34).

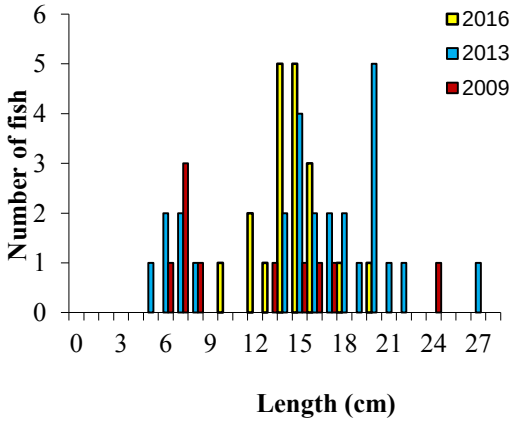

Fig. 4.74. Length frequency distribution of brown trout in the Ballyfinboy River (Site 2), 2009 (n=10), 2013 (n=27) and 2016 (n=19).

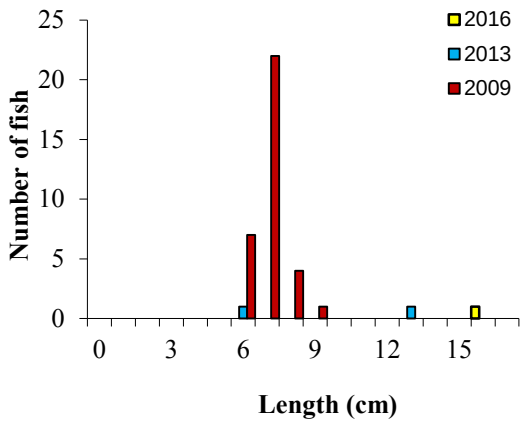

Fig. 4.75. Length frequency distribution of salmon in the Ballyfinboy River (Site 2), 2009 (n=34), 2013 (n=2) and 2016 (n=1).

4.4.2.3 Cross River

The Cross River is a small tributary of the River Shannon, located in southern Co. Roscommon. It joins with the River Shannon just south of Athlone. One site was surveyed on the river, just south of Athlone on the 7th of July 2016 (Fig. 4.76; Table 4.58). This site was non-wadeable and surveyed using the sPASE method.

Fig. 4.76. Cross River survey site, 2016

Table 4.58. Sites surveyed on the Cross River, 2016

Site No.	River	Site	Method	WFD	Date
1	Cross River	Br. u/s Shannon River_A	sPASE	Yes	07/07/2016

Four fish species and one hybrid were recorded in the Cross River in 2016. Roach was the most abundant species followed by perch (Table 4.60).

The majority of fish captured at this site were roach and among these, seven age classes were encountered, 1+ to 7+ inclusive (Table 4.59.

The length frequency distributions for both roach (Fig. 4.77) and perch (Fig. 4.78) are shown below.

Table 4.59. Percentage catch for aged species in the Cross River, 2016

River	Site No.	% catch							
		0+	1+	2+	3+	4+	5+	6+	7+
Brown trout	1	-	-	86	-	14	-	-	-
Roach	1	-	12	42	18	21	4	3	>0
Roach x Bream Hybrid	1	-	100	-	-	-	-	-	-
Pike	1	-	-	50	50	-	-	-	-

Table 4.60. Fish CPUE (no. of fish activation), Cross River, 2016

	CPUE (No./activation) Site 1
Species	**2016**
Brown trout	0.233
0+ Brown trout	-
1++ Brown trout	0.233
Perch	0.467
Pike	0..067
Roach	9.667
Roach x Bream Hybrid	0.033
All Fish	**10.467**

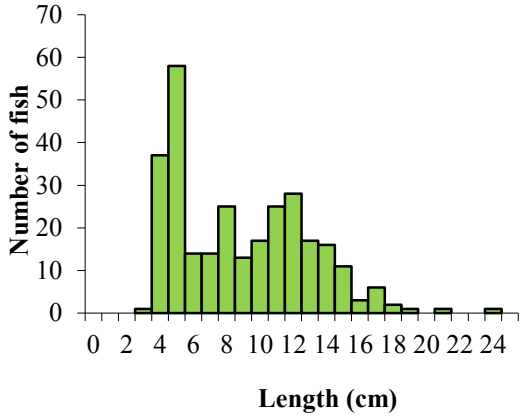

Fig. 4.77. Length frequency distribution of roach in the Cross River (Site 1), 2008 (n=43) and 2016 (n=290).

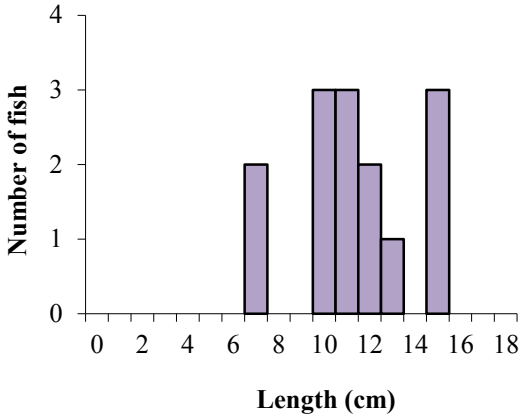

Fig. 4.78. Length frequency distribution of perch in the Cross River (Site 1), 2008 (n=75) and 2016 (n=14).

4.4.2.4 Kilcrow River

The Kilcrow River is a tributary of the River Shannon. It is located in south Co. Galway and flows into the north end of Lough Derg near Portumna. One site was surveyed on the Kilcrow near Portumna, Co. Galway on the 28th of September 2016 (Fig. 4.79; Table 4.61). This site was non-wadeable and surveyed using the Sp (boat) method. This is a WFD SM site and has been surveyed previously.

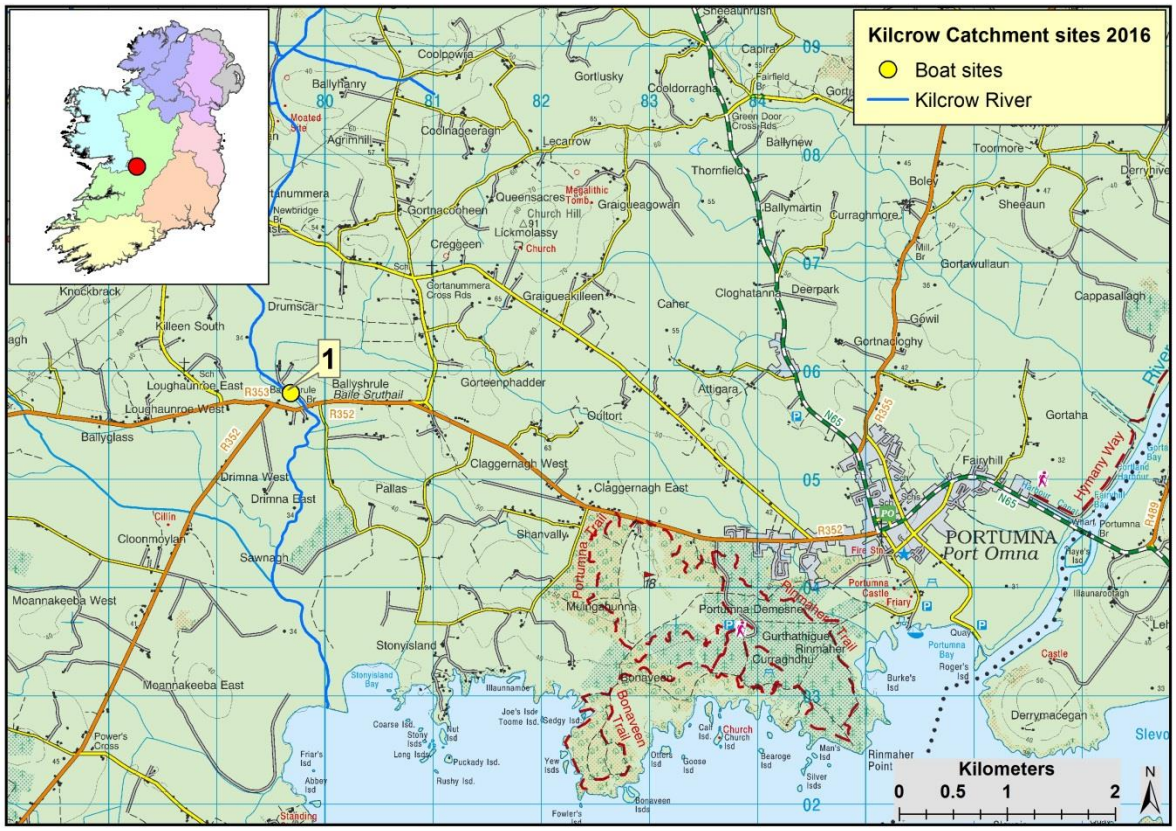

Fig. 4.79. Kilcrow River survey site, 2016

Table 4.61. Sites surveyed on the Kilcrow River, 2016

Site No.	River	Site	Method	WFD	Date
1	Kilcrow River	Ballyshrule Br._A	SP (Boat)	Yes	28/09/2016

Five fish species were recorded and of these, roach was the most abundant (Table 4.62).

Two age cohorts of roach (2+ and 3+) and pike (0+ and 4+) were captured (Table 4.63).

Length frequency distributions for brown trout (Fig. 4.80), roach (Fig. 4.81) and perch (Fig. 4.82) are shown below.

Table 4.62. Minimum density of fish (no. /m^2), Kilcrow River, 2016

	Minimum density (No./m^2) Site 1		
Species	**2008**	**2012**	**2016**
Brown trout	0.002	0.008	0.001
0+ Brown trout	0.001	0.001	-
1++ Brown trout	0.001	0.008	0.001
European eel	0.0004	0.001	-
Gudgeon	0.011	0.003	0.001
Minnow	0.001	0.004	-
Perch	0.027	0.007	0.003
Pike	0.004	0.002	0.001
Roach	0.022	0.005	0.006
Salmon	0.0004	0.002	-
0+ Salmon	-	-	-
1++ Salmon	0.0004	0.002	-
Stone loach	0.001	0.001	-
All Fish	**0.068**	**0.033**	**0.013**

Table 4.63. Percentage catch for aged species in the Kilcrow River, 2016

		% catch				
River	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**
Brown trout	1	-	100	-	-	-
Roach	1	-	-	80	20	-
Pike	1	50	-	-	-	50

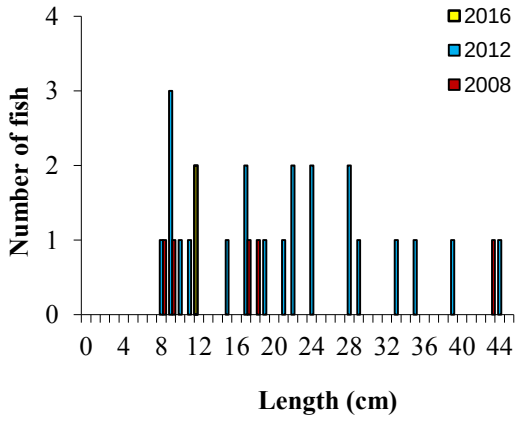

Fig. 4.80. Length frequency distribution of brown trout in the Kilcrow River (Site 1) 2008 (n=5), 2012 (n=22) and 2016 (n=2).

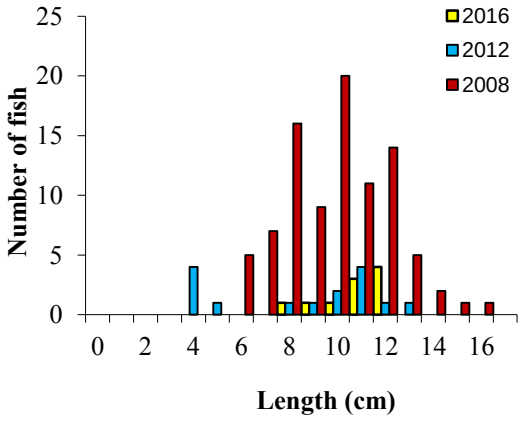

Fig. 4.81. Length frequency distribution of roach in the Kilcrow River (Site 1) 2008 (n=91), 2012 (n=15) and 2016 (n=10).

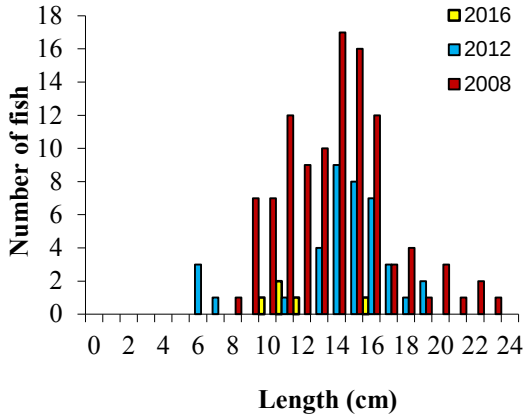

Fig. 4.82. Length frequency distribution of perch in the Kilcrow River (Site 1) 2008 (n=106), 2012 (n=39) and 2016 (n=5).

4.4.2.5 Kilmastulla River

The Kilmastulla River is a tributary of the River Shannon. It is located in north Co. Tipperary and flows westwards, joing the River Shannon just south of Killaloe. Five sites were surveyed on the Kilmastulla near Ballina, Co. Mayo on the 18th and 20th of July 2016 (Fig. 4.83; Table 4.64). All sites were wadeable and surveyed using the TEF method.

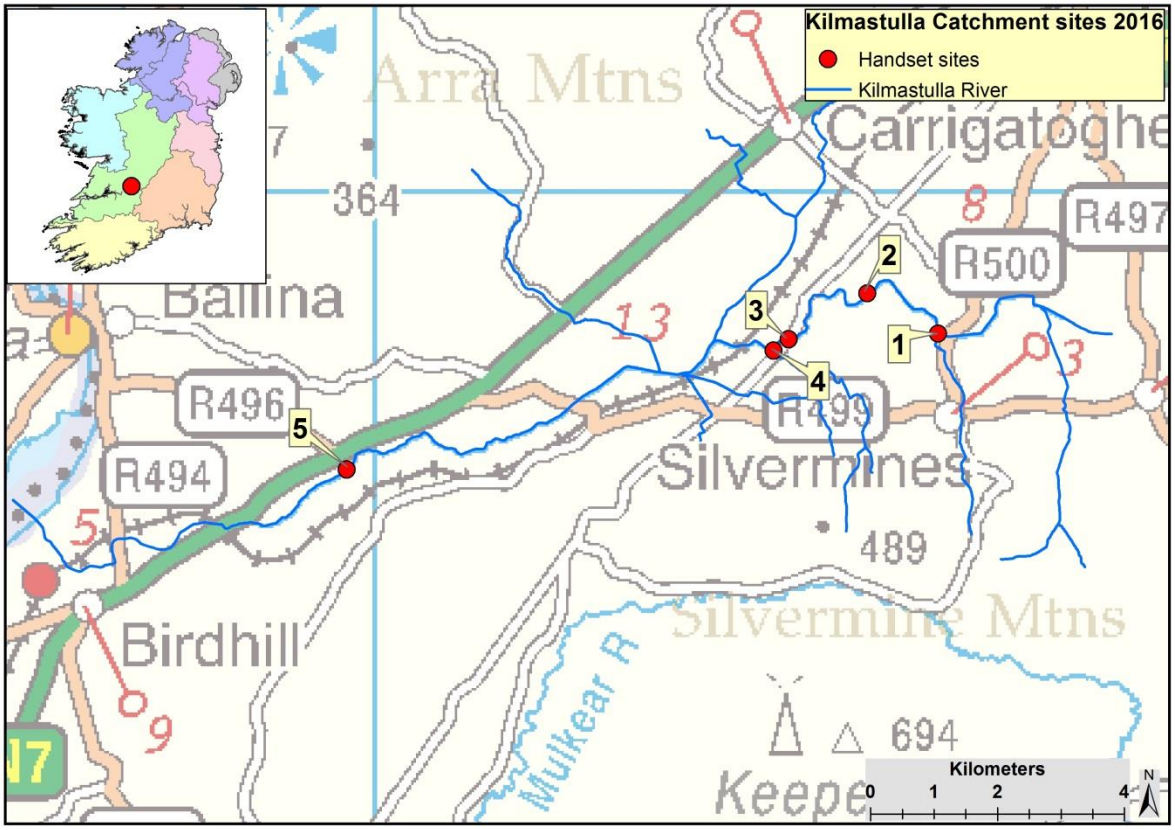

Fig. 4.83. Kilmastulla River survey sites, 2016

Table 4.64. Sites surveyed on the Kilmastulla River, 2016

No.	River	Site	Method	WFD	Date
1	Killmastulla (Erinagh) Trib	Garryclogher_A	TEF (Hand)	No	22/09/2016
2	Killmastulla (Garryclogher) Trib	Carrow Br._A	TEF (Hand)	No	22/09/2016
3	Killmastulla River	Erinagh Br._A	TEF (Hand)	No	22/09/2016
4	Killmastulla River	Gortnacleha_A	TEF (Hand)	No	22/09/2016
5	Killmastulla River	Cappadine_A	TEF (Hand)	No	22/09/2016

Seven fish species were recorded in the Kilmastulla River in 2016 (Table 4.65). Brown trout were most abundant in the most upstream site (Site 1) and least abundant furthest downstream (Site 5). Salmon were most abundant in Site 4 followed closely by Site 2.

Four age classes of brown trout were recorded, with 0+ and 1+ the most frequently encountered age cohorts (Table 4.66).

Only 0+ and 1+ salmon were recorded. The length frequency distributions for both brown trout and salmon are shown below (Fig.4.84 and 4.86).

Table 4.65. Minimum density of fish (no. /m^2), Kilmastulla River, 2016

	Minimum density (No./m^2)				
Species	**Site 1 2016**	**Site 2 2016**	**Site 3 2016**	**Site 4 2016**	**Site 5 2016**
Brown trout	0.714	0.479	0.132	0.350	0.064
0+ Brown trout	0.595	-	-	0.350	0.008
1++ Brown trout	0.119	0.479	0.132	-	0.057
European eel	0.045	0.038	-	0.062	-
Lamprey sp.	0.030	-	-	0.021	-
Minnow	-	-	-	0.329	0.011
Salmon	0.059	0.227	0.016	0.247	0.151
0+ Salmon	0.059	0.176	0.016	0.247	0.098
1++ Salmon	-	0.050	-	-	0.053
Stone loach	-	-	0.047	0.082	0.053
3-spined stickleback	0.178	-	0.047	0.062	-
All Fish	**1.026**	**0.744**	**0.241**	**1.152**	**0.280**

Table 4.66. Percentage catch for aged species in the Kilmastulla River catchment, 2016

		% catch			
River	**Site**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	83	17	-	-
	2	-	89	6	6
	3	-	88	13	-
	4	100	-	-	-
	5	13	88	-	-
Salmon	1	100	-	-	-
	2	78	22	-	-
	3	100	-	-	-
	4	100	-	-	-
	5	65	35	-	-

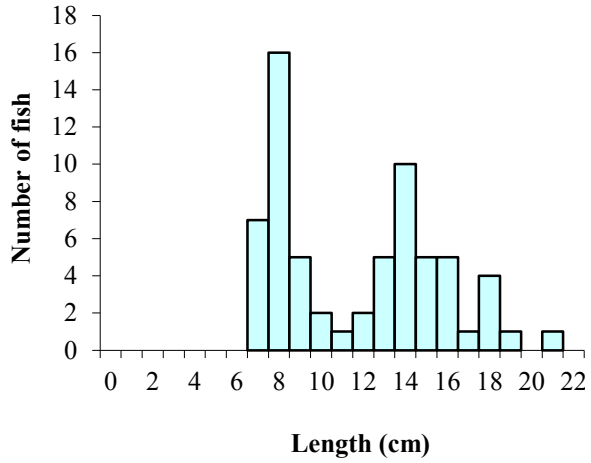

Fig. 4.84. Length frequency distribution of brown trout in the Kilmastulla River, 2016 (n=65).

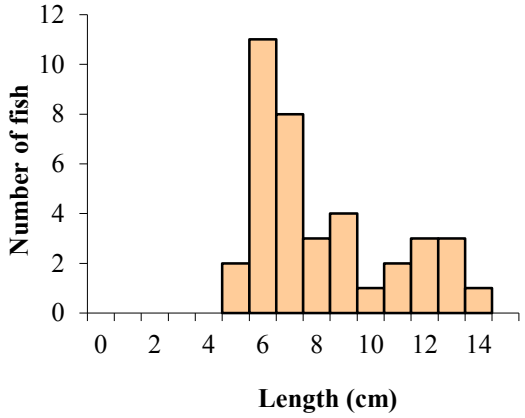

Fig. 4.85. Length frequency distribution of salmon in the Kilmastulla River, 2016 (n=38).

4.4.2.6 Nenagh River

The Nenagh River is a tributary of the River Shannon. It is located in north Co. Tipperary, near Nenagh and flows into Lough Derg at Dromineer Bay. One site was surveyed on the river, south of Nenagh, Co. Tipperary on the 28th of September 2016 (Fig. 4.86; Table 4.67). This site was non-wadeable and surveyed using the ADEF depletion boat method; it is a WFD SM site and was surveyed previously.

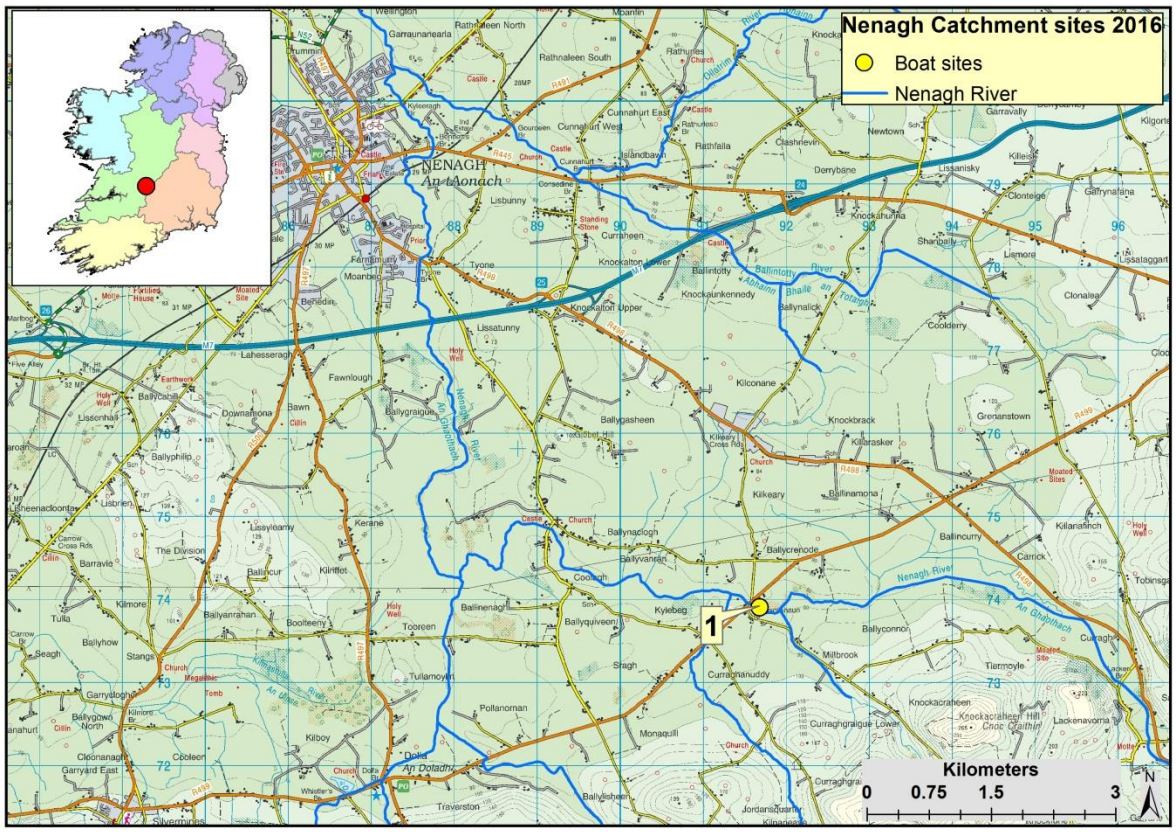

Fig. 4.6. Nenagh River survey site, 2016

Table 4.67. Sites surveyed on the Nenagh River, 2016

No.	River	Site	Method	WFD	Date
1	Nenagh River	Ballysoilshaun Br._A	ADEF (Boat)	Yes	28/09/2016

Five fish species were recorded in the Nenagh River in 2016. Brown trout was the most abundant species, followed by salmon (Table 4.68).

Four age classes of brown trout were recorded, with 1+ the most abundant cohort (Table 4.69). Two age classes were recorded for salmon.

This site was surveyed twice before, in 2009 and 2012. The length frequency distributions for brown trout and salmon are shown below (Figs. 4.87 and 4.88).

Table 4.68. Minimum density of fish (no. fish/m^2), Nenagh River Catchment, 2016

	Minimum density (No./m^2) Site 1		
Species	**2009**	**2012**	**2016**
Brown trout	0.082	0.021	0.045
0+ Brown trout	0.014	0.002	0.003
1++ Brown trout	0.067	0.019	0.045
European eel	0.001	-	-
Minnow	0.023	0.002	0.003
Salmon	0.002	0.002	0.013
0+ Salmon	0.002	-	0.003
1++ Salmon	0.002	0.002	0.011
Stone loach	0.003	0.001	0.001
3-spined stickleback	-	0.002	-
All Fish	**0.111**	**0.029**	**0.062**

Table 4.69. Percentage catch for aged species in the Nenagh River, 2016

		% catch			
River	**Site No.**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	3	56	38	3
Salmon	1	17	83	-	-

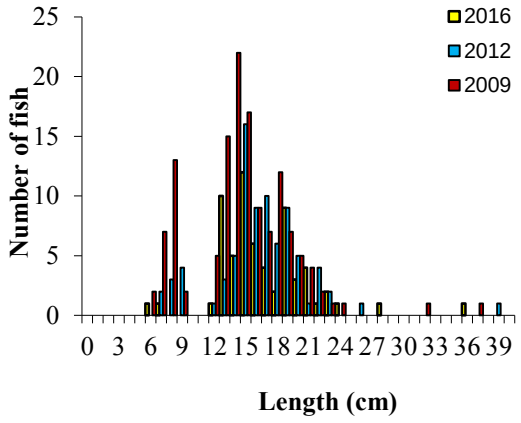

Fig. 4.87. Length frequency distribution of brown trout in the Nenagh River (Site 1), 2009 (n=133), 2012 (n=82) and 2016 (n=64).

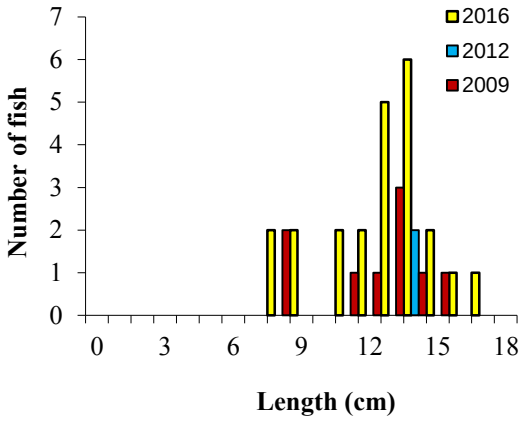

Fig. 4.88. Length frequency distribution of salmon in the Nenagh River (Site 1), 2009 (n=9), 2012 (n=2) and 2016 (n=23).

4.4.2.7 Scariff River

The Scarrif River is a tributary of the River Shannon. It is located in Co. Clare and flows eastwards joining Lough Derg near Scarrif. Six sites were surveyed in the Scarrif Catchment on the 22nd of September 2016 (Fig. 4.89; Table 4.70). All sites were wadeable and surveyed using the TEF method.

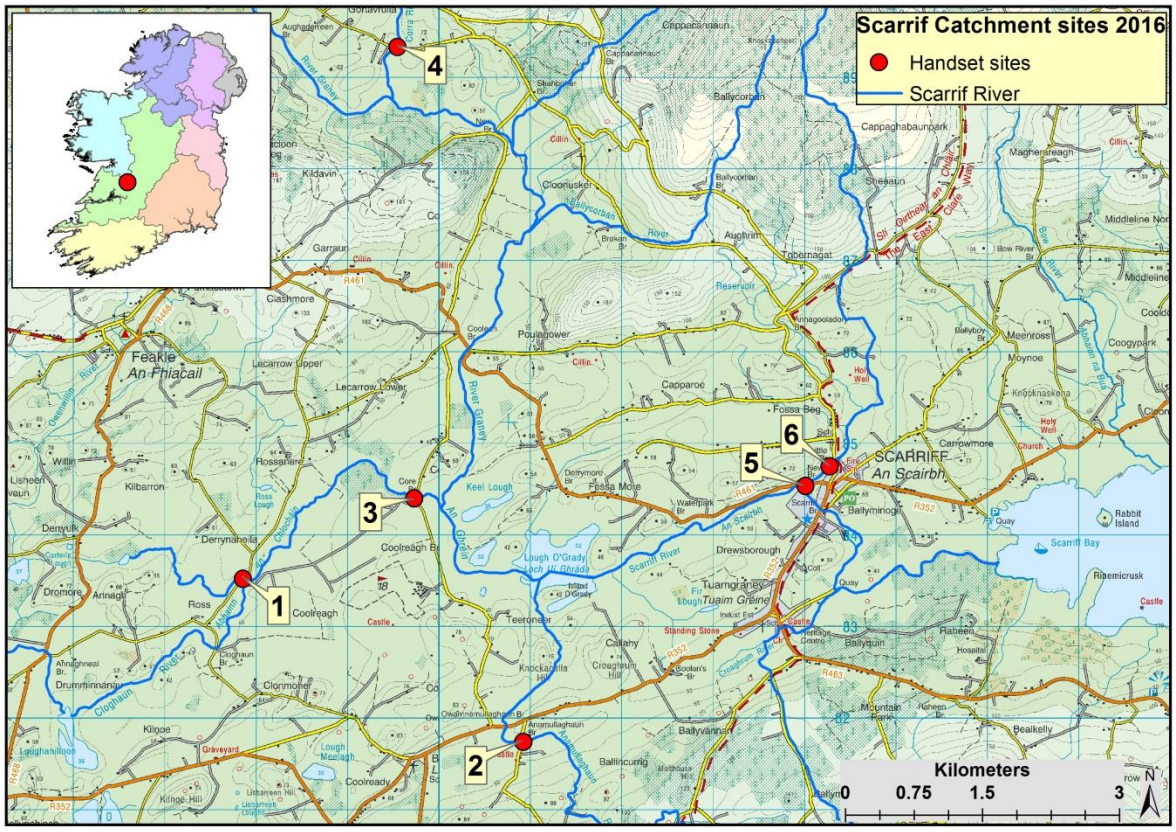

Fig. 4.89. Scarrif River survey sites, 2016

Table 4.70. Sites surveyed on the Scarrif River, 2016

No.	River	Site	Method	WFD	Date
1	Scarrif (Glenbonniv) River	Derrynahelia_A	TEF (Hand)	No	22/09/2016
2	Scariff (Anamullaghaun) River	Anamullaghaun Br._A	TEF (Hand)	No	22/09/2016
3	Scarrif (Cloghan) River	Core Br._A	TEF (Hand)	No	22/09/2016
4	Scariff (Corra) River	Gortavrulla_A	TEF (Hand)	No	22/09/2016
5	Scariff (Sheeaun) River	Scarrif West_A	TEF (Hand)	No	22/09/2016
6	Scariff (Sheeaun) River	Little Br._A	TEF (Hand)	No	22/09/2016

Seven fish species were recorded in the Scariff River catchment (Table 4.71). Brown trout was the most frequently encountered species, recorded in all but one of the six survey sites. The highest density of brown trout was recorded in the most downstream site, Site 6 followed closely by Site 2.

Four age classes of brown trout were recorded, with the majority of individuals in the 0+ or 1+ category. Four age classes of roach were also captured, most within the 1+ and 2+ categories (Table 4.72).

Length frequency distributions for both brown trout and salmon are also shown (Figs. 4.90 and 4.91).

Table 4.71. Minimum density of fish (no. fish/m^2), Scarriff River Catchment, 2016

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
	2016	2016	2016	2016	2016	2016
Brown trout	-	0.478	0.207	0.079	0.186	0.481
0+ Brown trout	-	0.018	0.131	0.045	0.121	0.033
1++ Brown trout	-	0.460	0.076	0.033	0.065	0.449
European eel	-	0.027	-	-	-	-
Gudgeon	0.008	-	0.028	-	0.016	0.041
Perch	0.023	-	-	-	0.008	-
Roach	0.085	-	0.034	-	0.056	0.098
Stone loach	0.031	0.018	0.014	0.008	-	-
3-spined stickleback	-	0.027	-	-	-	-
All Fish	**0.147**	**0.550**	**0.282**	**0.087**	**0.266**	**0.620**

Table 4.72. Percentage catch for aged species in the Scariff River catchment, 2016

		% catch			
River	Site	0+	1+	2+	3+
Brown trout	1	4	96	-	-
	3	64	29	7	-
	4	56	22	11	11
	5	64	36	-	-
	6	7	79	11	4
Roach	1	9	18	64	9
	3	-	-	100	-
	5	14	86	-	-
	6	-	100	-	-

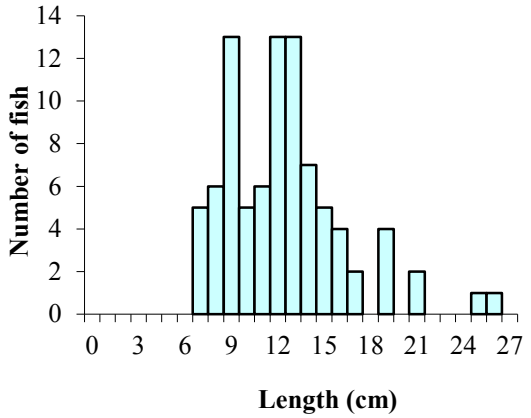

Fig. 4.90. Length frequency distribution of brown trout in the Scarrif River, 2016 (n=87).

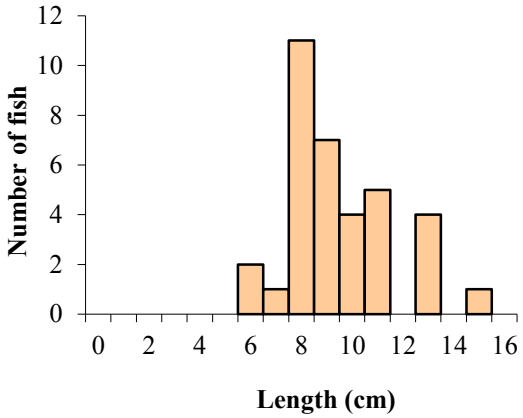

Fig. 4.91. Length frequency distribution of roach in the Scarrif River, 2016 (n=35).

4.4.2.8 River Shannon

The River Shannon is Ireland's longest river and flows in a southerly direction from Co. Cavan, eventually reaching the sea at Limerick. Twenty-three sites were surveyed on the main channel of the River Shannon between the 5th and 12th of July 2016 (Fig. 4.92a and 4.92b; Table 4.73). Eight sites were surveyed between Lough Allen and Lough Ree, with the remainder surveyed between Lough Ree and Lough Derg. All sites were non-wadeable and surveyed using the sPASE method.

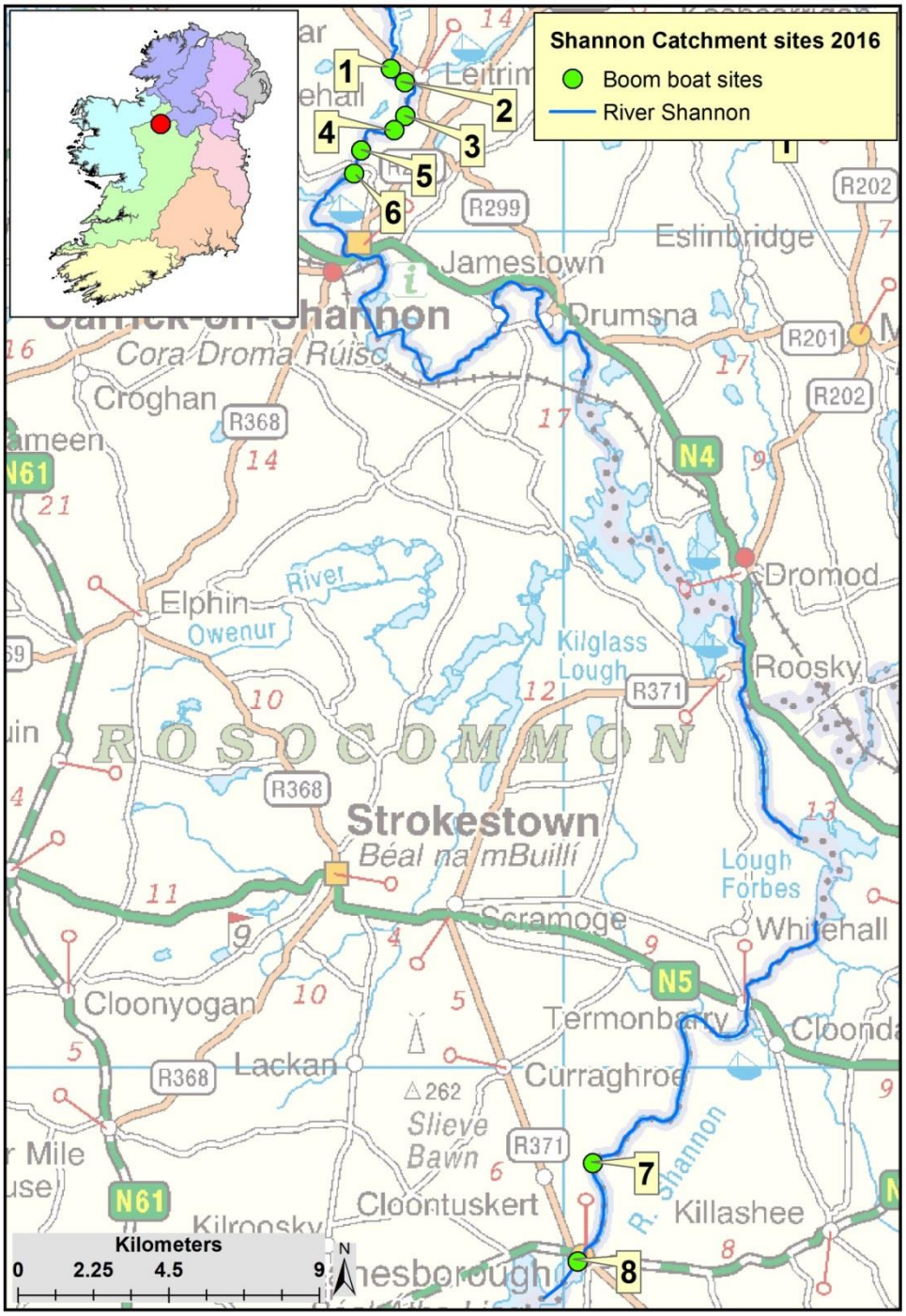

Fig. 4.92a. River Shannon survey sites, 2016

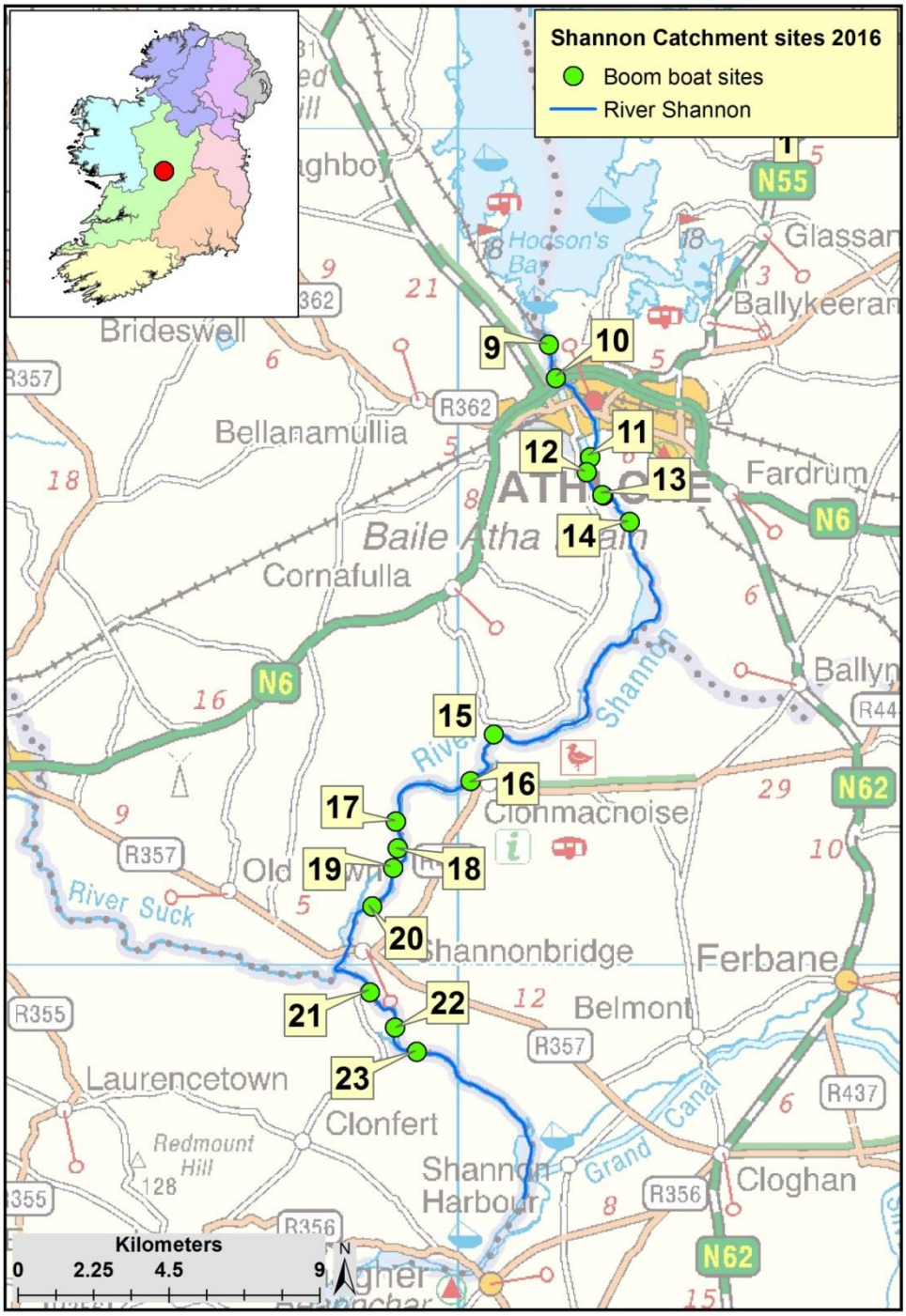

Fig. 4.92b. River Shannon survey sites, 2016

Table 4.73. Sites surveyed on the River Shannon, 2016

No.	River	Site	Method	WFD	Date
1	Shannon, River	Battle Br. Lock_A	sPASE	No	05/07/2016
2	Shannon, River	Cloonfad_A	sPASE	No	05/07/2016
3	Shannon, River	Battle Br._B	sPASE	Yes	05/07/2016
4	Shannon, River	Battle Br._C	sPASE	Yes	05/07/2016
5	Shannon, River	Hartley_A	sPASE	No	05/07/2016
6	Shannon, River	Cleaheen_A	sPASE	No	05/07/2016
7	Shannon, River	Kilnacarrow_A	sPASE	Yes	06/07/2016
8	Shannon, River	Ballyleague Br. Lanesboro_A	sPASE	Yes	06/07/2016
9	Shannon, River	Hillquarter_A	sPASE	No	08/07/2016
10	Shannon, River	Bogganfin_A	sPASE	No	08/07/2016
11	Shannon, River	Athlone Canal_A	sPASE	No	07/07/2016
12	Shannon, River	Bunaribba_A	sPASE	Yes	07/07/2016
13	Shannon, River	Carrickynaghtan_A	sPASE	Yes	07/07/2016
14	Shannon, River	Carrickobreen_A	sPASE	No	07/07/2016
15	Shannon, River	Clonmacnoise, at Jetty_A	sPASE	Yes	12/07/2016
16	Shannon, River	Coolumber_A	sPASE	No	12/07/2016
17	Shannon, River	Creevagh_A	sPASE	No	12/07/2016
18	Shannon, River	Curley's Island Backwater_A	sPASE	No	12/07/2016
19	Shannon, River	Devenish Island_A	sPASE	No	12/07/2016
20	Shannon, River	Cloniff_A	sPASE	No	12/07/2016
21	Shannon, River	Shannonbridge Railway Br._A	sPASE	No	11/07/2016
22	Shannon, River	Bishops Islands_A	sPASE	No	11/07/2016
23	Shannon, River	d/s of Costello's Island_A	sPASE	No	11/07/2016

Nine fish species were recorded in the 23 sites surveyed on the River Shannon in 2016. Roach was the most frequently encountered species recorded at 22 sites, followed by perch (18 sites) and pike (12 sites) (Table 4.74). No salmon or brown trout were recorded at any of the sites surveyed. Roach x bream hybrids were captured at ten sites. Bream and rudd were rare only recorded at three sites each (Table 4.70).

Roach were also the most abundant fish captured at all sites. The highest CPUEs of roach were recorded at sites 11, 12 and 18 (Table 4.70). The highest CPUEs of perch were recorded at site 11 followed by site 8 (Table 4.70).

Roach was the most diverse species in terms of age, with a total of 11 age classes recorded (0+ to 10+ inclusive) (Table 4.75). A total of 35 pike were captured during these surveys and these ranged in age from 1+ to 6+.

Length frequency distributions are shown below for perch (Fig. 4.93), pike (Fig. 4.94) and roach (Fig. 4.95).

Table 4.74. Fish CPUE (no. of fish/activation), River Shannon, 2016

	1	2	3	4	5	6	7	8
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Bream	-	0.033	-	0.033	-	0.033	-	-
European eel	-	-	-	-	-	-	-	-
Gudgeon	-	-	0.037	0.033	-	-	-	0.017
Lamprey sp.	-	-	-	-	-	-	-	-
Perch	0.250	-	0.111	0.167	0.200	0.167	0.216	0.683
Pike	-	-	-	-	-	-	0.081	0.100
Roach	2.800	2.600	2.481	2.133	1.667	2.500	1.257	2.667
Roach x Bream	-	0.033	0.111	0.033	0.067	0.133	-	-
Rudd	-	-	-	-	-	-	-	0.100
All Fish	**3.050**	**2.667**	**2.741**	**2.400**	**1.933**	**2.833**	**1.554**	**3.567**
	9	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Bream	-	-	-	-	-	-	-	-
European eel	-	-	-	-	-	-	-	-
Gudgeon	-	-	-	-	0.033	-	-	-
Lamprey sp.	-	-	-	-	-	-	-	-
Perch	-	0.267	0.800	0.167	0.050	0.067	0.167	-
Pike	-	-	0.500	0.056	0.050	0.033	0.100	-
Roach	-	0.733	14.800	13.444	3.650	0.833	3.333	1.800
Roach x Bream	-	0.033	0.100	-	-	-	-	0.067
Rudd	-	-	-	-	-	-	-	-
All Fish	-	**1.033**	**16.200**	**13.667**	**3.783**	**0.933**	**3.600**	**1.867**
	17	**18**	**19**	**20**	**21**	**22**	**23**	
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	
Bream	-	-	-	-	-	-	-	
European eel	-	-	-	-	-	-	-	
Gudgeon	-	-	-	-	-	-	-	
Lamprey sp.	-	-	-	-	-	-	-	
Perch	0.167	0.111	0.167	-	0.033	0.267	-	
Pike	0.067	0.111	-	-	0.067	0.100	0.033	
Roach	2.400	6.722	1.833	1.333	2.000	3.100	2.967	
Roach x Bream	-	0.167	0.056	-	-	-	-	
Rudd	-	0.167	-	-	-	-	0.100	
All Fish	**2.633**	**7.278**	**2.056**	**1.333**	**2.100**	**3.467**	**3.100**	

Table 4.75. Percentage catch for aged species in the River Shannon catchment, 2016

		% catch												
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**	**9+**	**10+**	**11+**	**12+**
Bream	4	-	-	-	100	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	100	-	-	-	-	-	-	-
	2	-	100	-	-	-	-	-	-	-	-	-	-	-
Rudd	8	-	-	67	33	-	-	-	-	-	-	-	-	-
	18	-	33	33	-	33	-	-	-	-	-	-	-	-
	23	-	-	33	67	-	-	-	-	-	-	-	-	-
Roach	11	-	-	5	41	43	3	3	3	1	1	-	-	-
	8	6	35	18	38	1	1	1	1	-	-	-	-	-
	1	-	7	36	32	14	4	4	-	4	-	-	-	-
	3	-	13	52	22	4	6	1	-	-	-	-	-	-
	4	-	3	41	41	3	3	2	3	-	3	2	-	-
	22	-	30	4	29	23	8	3	1	1	1	-	-	-
	10	50	50	-	-	-	-	-	-	-	-	-	-	-
	12	-	35	9	29	21	6	>0	-	-	-	-	-	-
	14	-	24	28	12	32	4	-	-	-	-	-	-	-
	13	-	9	3	30	55	3	-	>0	-	-	-	-	-
	6	-	25	45	16	5	1	1	1	3	1	-	-	-
	20	-	5	15	63	10	8	-	-	-	-	-	-	-
	15	-	17	6	3	50	3	12	3	2	2	2	-	-
	2	-	24	50	14	6	3	-	3	-	-	-	-	-
	16	-	6	9	22	44	4	13	2	-	-	-	-	-
	17	-	7	3	15	36	15	24	-	-	-	-	-	-
	18	-	6	17	13	23	18	18	1	2	-	1	-	-
	23	-	4	6	15	34	21	15	3	2	-	-	-	-
	19	-	12	21	42	21	3	-	-	-	-	-	-	-
	5	-	12	74	6	4	2	-	2	-	-	-	-	-
	7	1	12	27	17	35	5	1	1	-	-	-	-	-
	21	-	-	5	35	12	32	15	2	-	-	-	-	-
Roach x Bream hybrid	11	-	-	-	-	100	-	-	-	-	-	-	-	-
	3	-	-	33	-	-	-	-	-	-	33	-	-	33
	4	-	-	-	-	-	-	-	-	-	100	-	-	-
	10	-	100	-	-	-	-	-	-	-	-	-	-	-
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	19	-	-	-	-	100	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	50	-	-	50	-	-	-
Pike	11	-	-	20	20	60	-	-						
	8	-	33	-	33	33	-	-						
	22	-	33	-	33	-	-	33						
	12	-	-	100	-	-	-	-						
	14	-	100	-	-	-	-	-						
	13	-	67	-	33	-	-	-						
	15	-	33	-	67	-	-	-						
	17	-	-	-	-	100	-	-						
	18	-	50	-	50	-	-	-						
	23	-	-	-	-	-	-	100						
	7	-	67	33	-	-	-	-						
	21	-	-	-	100	-	-	-						

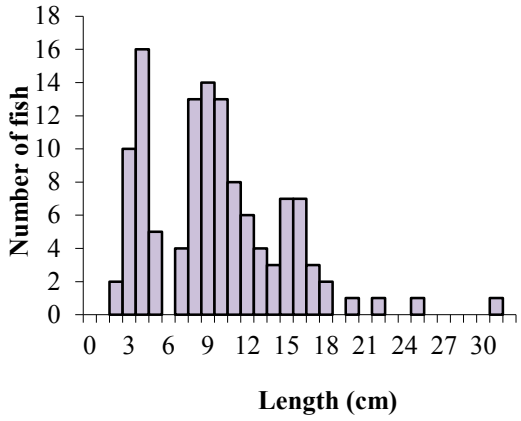

Fig. 4.93. Length frequency distribution of perch in the River Shannon, 2016 (n=121).

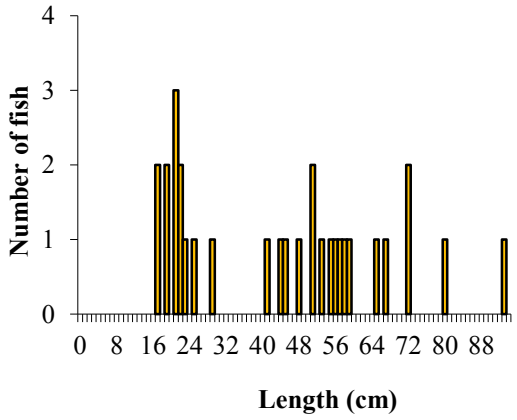

Fig. 4.94. Length frequency distribution of pike in the River Shannon, 2016 (n=30).

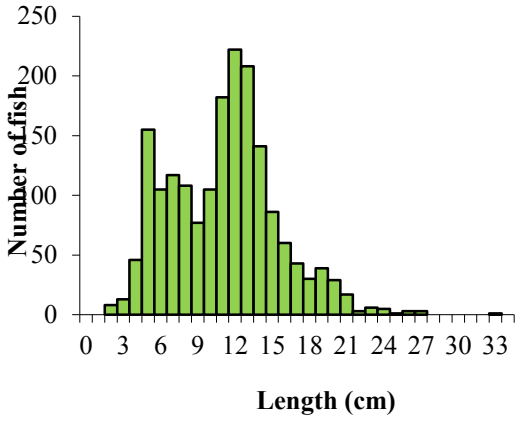

Fig. 4.95. Length frequency distribution of roach in the River Shannon, 2016 (n=1813).

4.4.3 River Suck

The River Suck is a large tributary of the River Shannon and flows in a southerly direction between Co. Galway and Co. Mayo before reaching the Shannon just south of Shannonbridge. Seven sites were surveyed on the River Suck along the Galway and Roscommon border between the 11th and 14th of July 2016 (Fig. 4.96; Table 4.76). Three sites were surveyed using the sPASE method and four sites surveyed using the Sp (Boat) method. The surveys on Sites 1 and 4 were surveyed previously and are WFD SM sites.

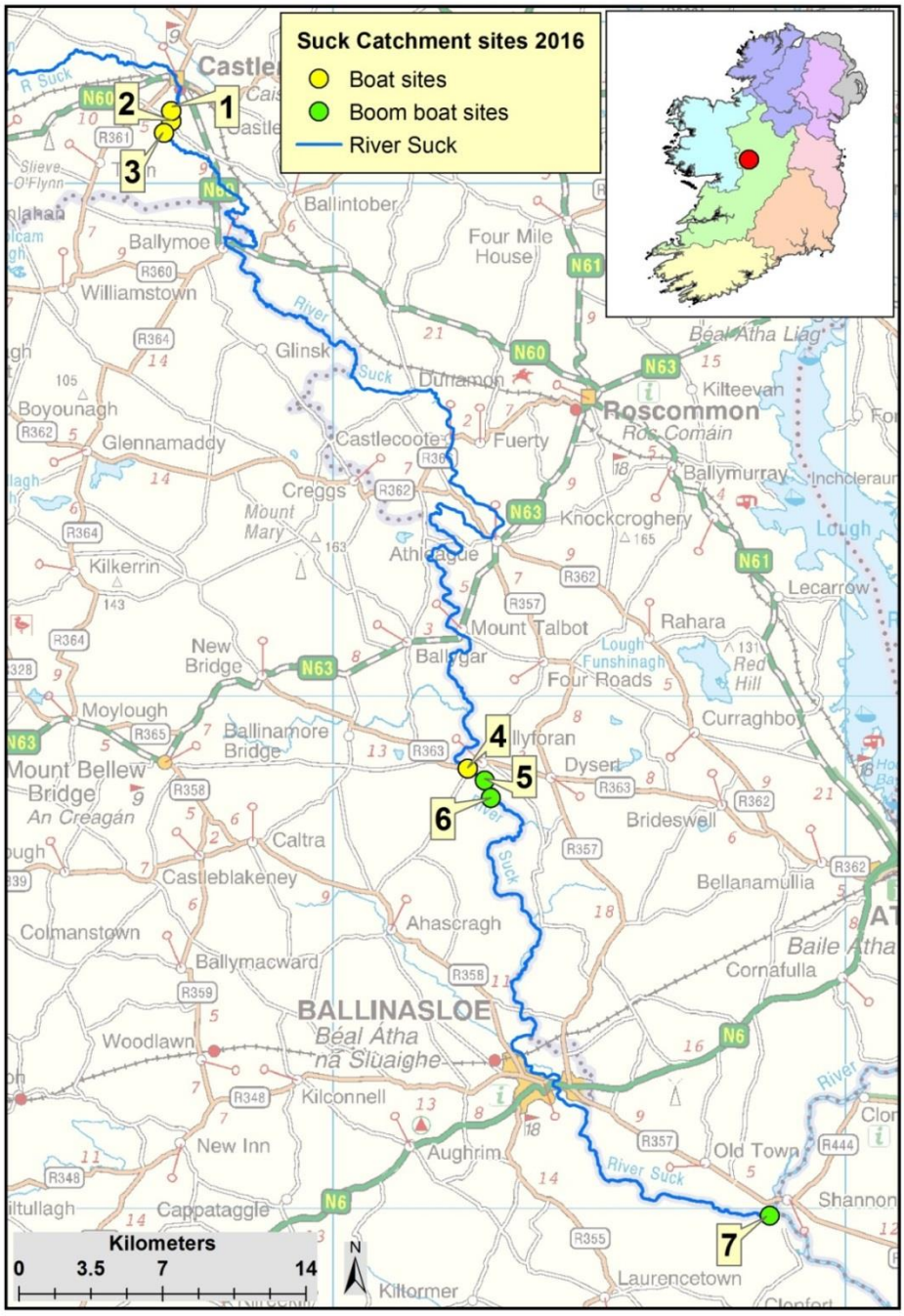

Fig. 4.96. River Suck survey sites, 2016

Table 4.76. Sites surveyed on the River Suck, 2016

No.	River	Site	Method	WFD	Date
1	River Suck	Harristown_A	SP (Boat)	No	14/07/2016
2	River Suck	Cloondacarra Br._A	SP (Boat)	Yes	14/07/2016
3	River Suck	Cloontrask Forest_A	SP (Boat)	No	14/07/2016
4	River Suck	Ballyforan Br._A	SP (Boat)	Yes	13/07/2016
5	River Suck	Ballyforan Forest_A	sPASE	No	13/07/2016
6	River Suck	Cloonagh_A	sPASE	No	13/07/2016
7	River Suck	u/s Shannon Confl._A	sPASE	No	11/07/2016

Five fish species and one hybrid were recorded in the River Suck in 2016. Pike and roach were the most frequently encountered species, recorded at all seven sites, followed by which was caught at six. Brown trout were caught at Site 2 and Site 4) in 2008 but have gone not been recorded on two sampling occasions since then (Table 4.77 and 4.78).

The age class structure is shown below for species that were assigned ages (Table 4.79). Eleven age classes of roach were captured (0+ to 10+), with the majority of individuals aged between 1+ and 5+.

Length frequency distributions are shown below for perch, pike and roach (Figs. 4.97 to 4.99). Site 2 (Cloondacarra Br._A) and Site 4 (Ballyforan Br._A) were both surveyed previously in 2008 and 2013. The length frequency distribution of roach is shown for both of these sites (Fig. 4.100; Fig. 4.101).

Table 4.77. Minimum density of fish (no. /m^2), River Suck Catchment, 2016

	Site 1	Site 2			Site 3	Site 4		
Species	**2016**	**2008**	**2013**	**2016**	**2016**	**2008**	**2013**	**2016**
Bream	-	-	-	-	-	0.0001	-	-
Brown trout	-	0.001	-	-	-	0.0002	-	-
0+ Brown trout	-	-	-	-	-	0.0001	-	-
1++ Brown trout	-	0.001	-	-	-	0.0001	-	-
European eel	-	0.001	0.0005	-	-	0.0005	0.0001	-
Gudgeon	-	-	0.002	-	-	0.005	0.006	-
Minnow	0.006	0.012	0.005	0.002	-	0.002	0.009	0.001
Perch	0.001	0.021	0.038	0.001	0.0004	0.007	0.007	0.0001
Pike	0.0003	0.006	0.004	0.003	0.001	0.001	0.004	0.0002
Roach	0.006	0.068	0.049	0.007	0.006	0.033	0.048	0.004
Roach x Bream Hybrid	-	-	-	-	-	-	-	-
Stone loach	-	0.002	0.0005	-	-	0.001	0.001	-
3-spined stickleback	-	0.001	0.001	-	-	-	-	0.000
All Fish	**0.013**	**0.111**	**0.099**	**0.013**	**0.007**	**0.049**	**0.075**	**0.005**

Table 4.78. Fish CPUE (no. of fish /activation), Suck River Catchment, 2016

	Site 5	Site 6	Site 7
Species	**2016**	**2016**	**2016**
Bream	0.0002	-	-
Brown trout	-	-	-
0+ Brown trout	-	-	-
1++ Brown trout	-	-	-
European eel	-	-	-
Gudgeon	-	-	-
Minnow	-	-	-
Perch	-	0.001	0.001
Pike	0.0002	0.001	0.002
Roach	0.008	0.015	0.015
Roach x Bream Hybrid	-	0.0003	-
Stone loach	-	-	-
3-spined stickleback	-	-	-
All Fish	**0.008**	**0.017**	**0.018**

Table 4.79. Percentage catch for aged species in the River Suck catchment, 2016

		% catch										
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**	**8+**	**9+**	**10+**
Bream	4	-	-	100	-	-	-	-	-	-	-	-
Roach	1	-	28	-	22	17	11	22	-	-	-	-
	2	-	6	13	6	19	25	6	13	13	-	-
	3	-	-	3	5	30	28	18	13	-	3	3
	4	-	27	5	18	37	3	2	5	2	2	-
	5	-	12	38	40	10	-	-	-	-	-	-
	6	-	18	18	27	31	4	-	-	2	-	-
	7	2	46	19	21	10	2	-	-	-	-	-
Roach x Bream Hybrid	6	-	-	-	-	-	-	-	-	-	-	100
Pike	1	-	-	-	100	-	-	-	-	-	-	-
	2	-	-	-	67	33	-	-	-	-	-	-
	3	-	20	-	80	-	-	-	-	-	-	-
	4	-	33	33	33	-	-	-	-	-	-	-
	5	-	100	-	-	-	-	-	-	-	-	-
	6	-	100	-	-	-	-	-	-	-	-	-
	7	20	20	20	40	-	-	-	-	-	-	-

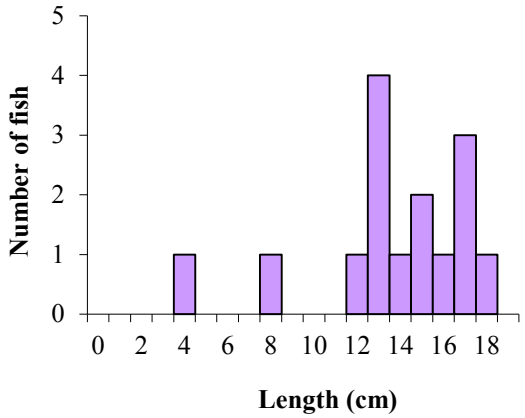

Fig. 4.97. Length frequency distribution of perch in the River Suck, 2016 (n=15).

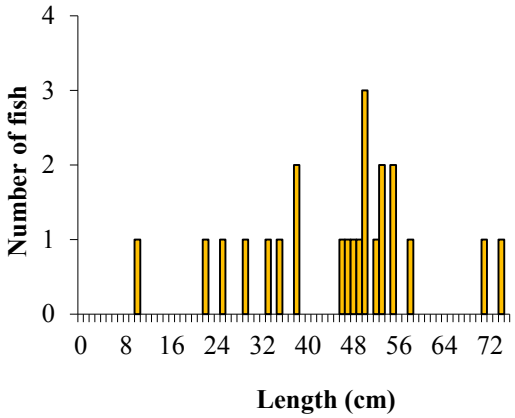

Fig. 4.99. Length frequency distribution of pike in the River Suck, 2016 (n=23).

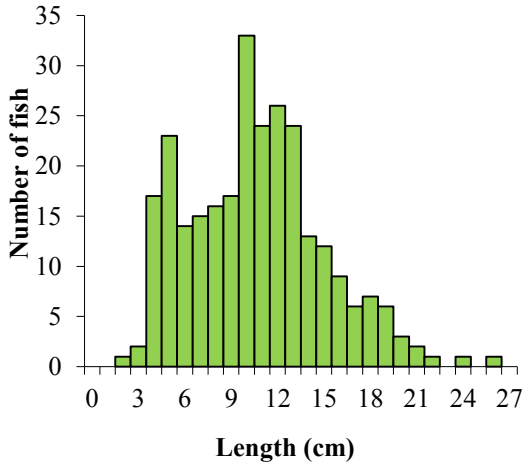

Fig. 4.98. Length frequency distribution of roach in the River Suck, 2016 (n=273).

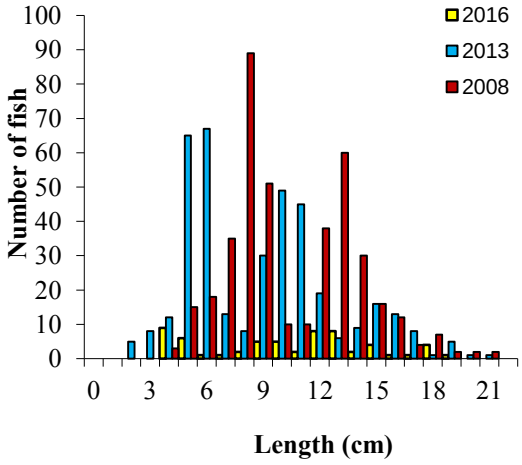

Fig. 4.100. Length frequency distribution of roach in the River Suck (Site 4 - Ballyforan Br._A), 2008 (n=404), 2013 (n=381) and 2016 (n=60).

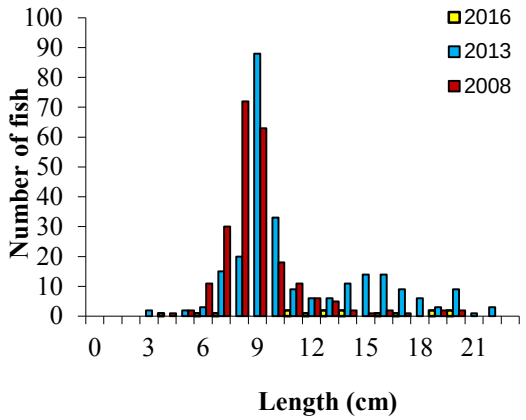

Fig. 4.101. Length frequency distribution of roach in the River Suck (Site 2 - Cloondacarra Br._A), 2008 (n=229), 2013 (n=254) and 2016 (n=16).

4.4.4 Tullamore River

The Tullamore River is a tributary of the River Shannon. It is located in Co. Offaly and flows in a westerly direction joining with the Clodiagh and Brosna Rivers before meeting the Shannon just north of Banagher. One site was surveyed on the Tullamore River near Tullamore, Co. Offaly on the 27th of September 2016 (Fig. 4.102, Table 4.80). This site was non-wadeable and surveyed using the SP (boat) method; it is a WFD SM site and was surveyed previously.

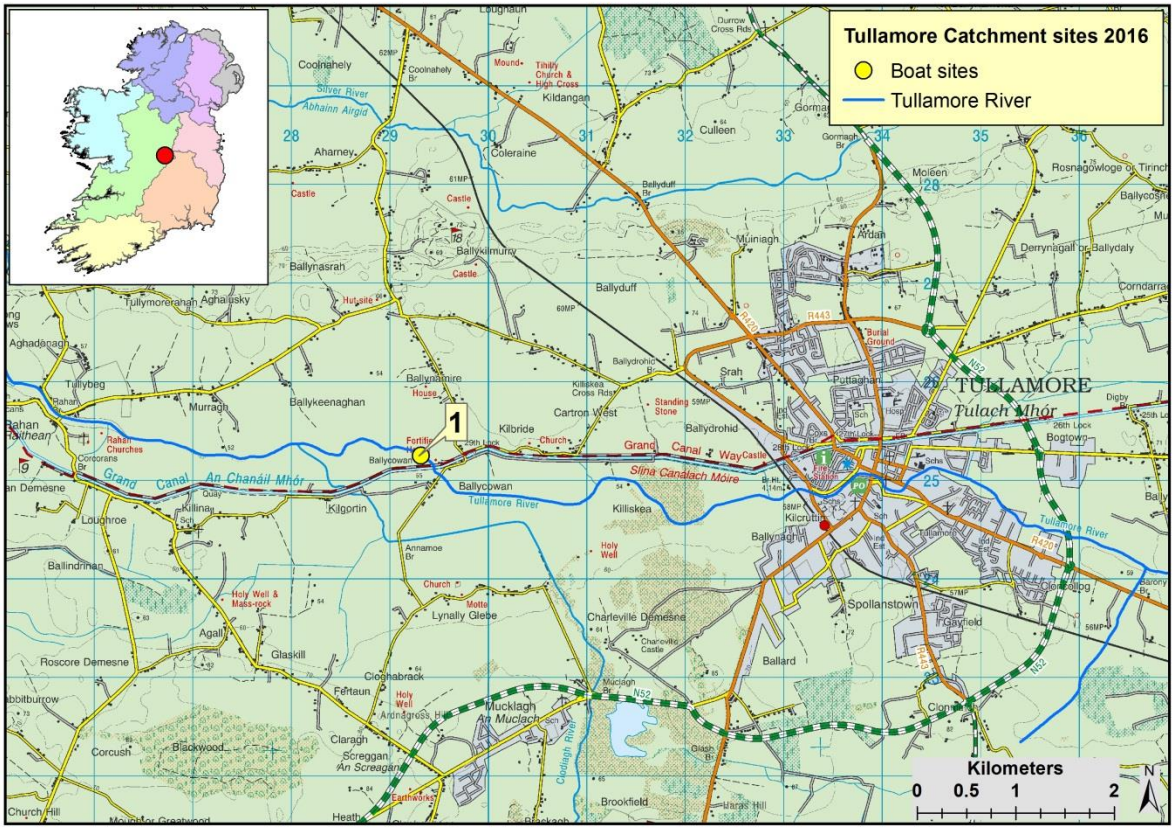

Fig. 4.102. Tullamore River survey sites, 2016

Table 4.80. Sites surveyed on the Tullamore River, 2016

No.	River	Site	Method	WFD	Date
1	Tullamore River	Br. SW of Ballycowen Br._A	ADEF (Boat)	Yes	27/09/2016

Five species were recorded in the Tullamore River in 2016. Brown trout was the most abundant species but, no fry were present. Pike and roach have not been recorded at this site since 2008 (Table 4.81).

Three age classes of brown trout were recorded at this site, 0+, 1+ and 2+ (Table 4.82).

This site was also surveyed on two previous occasions, 2008 and 2012. The length frequency distribution for brown trout across all three surveys is shown below (Fig. 4.103).

Table 4.81. Minimum density of fish (no. /m^2), Tullamore River Catchment, 2016

	1		
Species	**2008**	**2012**	**2016**
Brown trout	0.020	0.006	0.040
0+ Brown trout	0.002	-	-
1++ Brown trout	0.018	0.006	0.040
Gudgeon	0.001	0.006	0.001
Minnow	0.084	0.014	0.001
Pike	0.002	-	-
Roach	0.002	-	-
Stone loach	-	0.001	0.001
3-spined stickleback	0.004	0.001	0.001
All Fish	**0.112**	**0.029**	**0.045**

Table 4.82. Percentage catch for aged species in the Tullamore River catchment, 2016

		% catch			
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	-	79	19	2

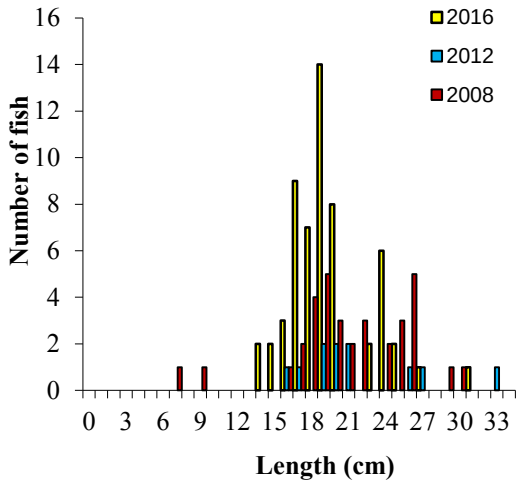

Fig. 4.103. Length frequency distribution of brown trout in the Tullamore River (Br. SW of Ballycowen Br._A), 2008 (n=34), 2012 (n=11) and 2016 (n=57).

4.4.5 Maigue River

The Maigue River is located in Co. Limerick and flows in a northerly direction to reach the Shannon Estuary just west of Limerick City. Four sites were surveyed on the River Maigue Dodder, in South Co. Limerick on the 20th of September 2016 (Fig. 4.104 Table 4.83). Three sites were wadeable and surveyed using the TEF method, with the remaining site (site 4) surveyed using the SP (boat) method. The latter site is a WFD SM site and was surveyed previously.

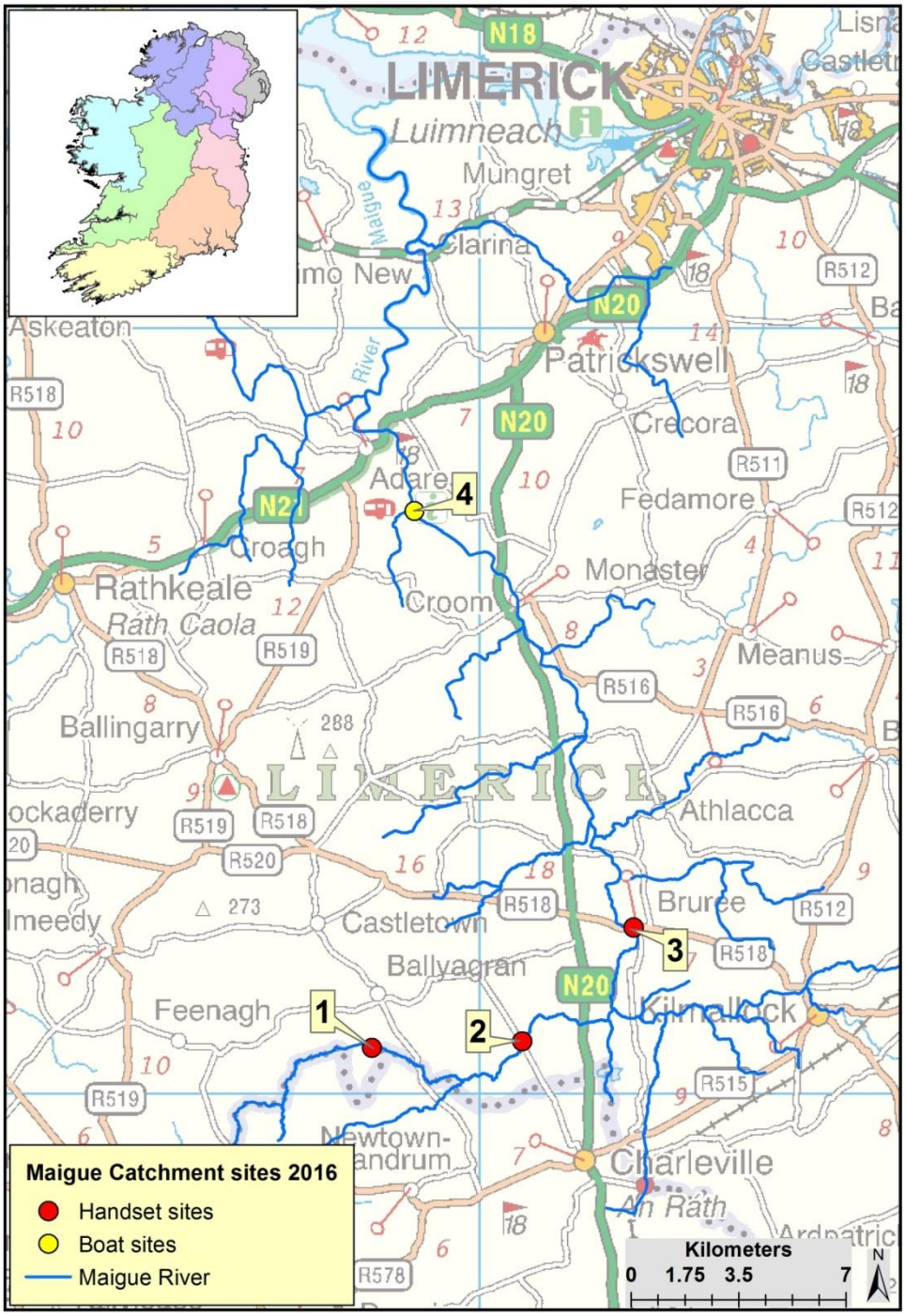

Fig. 4.104. Maigue River survey sites, 2016

Table 4.83. Sites surveyed on the River Maigue, 2016

No.	River	Site	Method	WFD	Date
1	Maigue, River	Ballybane_A	TEF (Hand)	No	20/09/2016
2	Maigue, River	Fort Bridge East_A	TEF (Hand)	No	20/09/2016
3	Maigue, River	Bruree_A	TEF (Hand)	No	20/09/2016
4	Maigue, River	Castleroberts Br._A	ADEF SP (Boat)	Yes	20/09/2016

Nine fish species were recorded in the River Maigue in 2016. Brown trout, salmon and stone loach were the most frequently encountered species, recorded in all four sites (Table 4.84).

Four age classes of brown trout (0+ to 3+) and two age classes (0+ and 1+) of salmon were recorded (Table 4.85).

Length frequency distributions for brown trout (Fig. 4.105) and salmon (Fig. 4.106) are shown below. Site 4 was surveyed on two previous occasions. The length frequency distribution for this site is also shown (Fig. 4.107).

Table 4.84. Minimum density of fish (no. /m^2), River Maigue Catchment, 2016

	Site 1	Site 2	Site 3	Site 4		
Species	**2016**	**2016**	**2016**	**2008**	**2012**	**2016**
Brown trout	0.056	0.013	0.024	0.006	0.002	0.001
0+ Brown trout	0.014	-	0.010	-	-	-
1++ Brown trout	0.042	0.013	0.015	0.006	0.002	0.001
European eel	-	0.019	-	0.002	0.002	0.0001
Lamprey sp.	-	0.013	-	0.0001	0.004	0.0001
Minnow	-	0.136	0.048	0.0002	0.007	0.003
Salmon	0.098	0.026	0.015	0.001	0.0002	0.001
0+ Salmon	0.098	0.026	0.015	0.0001	-	-
1++ Salmon	-	-	-	0.001	0.0002	0.001
Stone loach	0.014	0.058	0.034	0.002	0.004	0.0004
3-spined stickleback	0.063	0.078	-	-	0.001	-
All Fish	**0.232**	**0.343**	**0.121**	**0.010**	**0.020**	**0.005**

Table 4.85. Percentage catch for aged species in the River Maigue catchment, 2016

		% catch			
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	25	75	-	-
	2	-	100	-	-
	3	40	60	-	-
	4	-	22	56	22
Salmon	1	100	-	-	-
	2	100	-	-	-
	3	100	-	-	-
	4	-	100	-	-

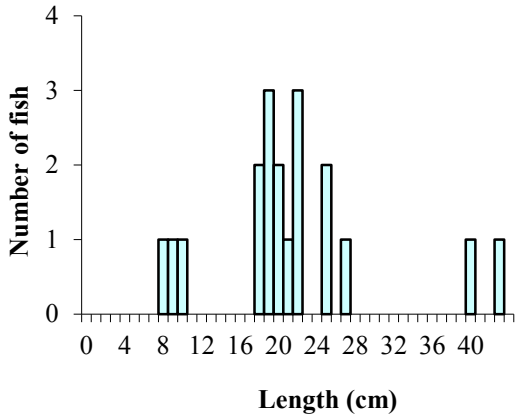

Fig. 4.105. Length frequency distribution of brown trout in the River Maigue, 2016 (n=19).

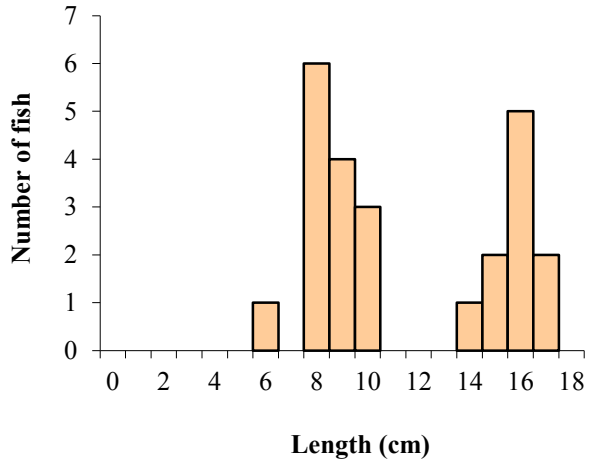

Fig. 4.106. Length frequency distribution of salmon in the River Maigue, 2016 (n=24).

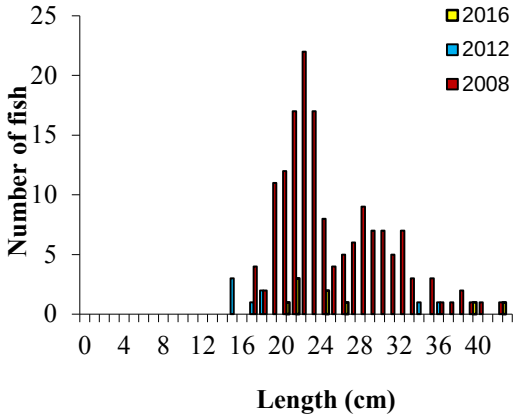

Fig. 4.107. Length frequency distribution of brown trout in the River Maigue (Site 4), 2008 (n=156), 2012 (n=8) and 2016 (n=9).

4.5 North West International River Basin District (NWIRBD)

Four river sites were surveyed in the NWIRBD. Catchments included the Annalee, Cullies, Eany Water and Waterfoot. Four sites were wadeable and surveyed using either the ADEF or TEF method, with the remaining three sites non-wadeable and surveyed with boats, using the Sp (Boat) or ADEF (boat) (Fig. 4.108).

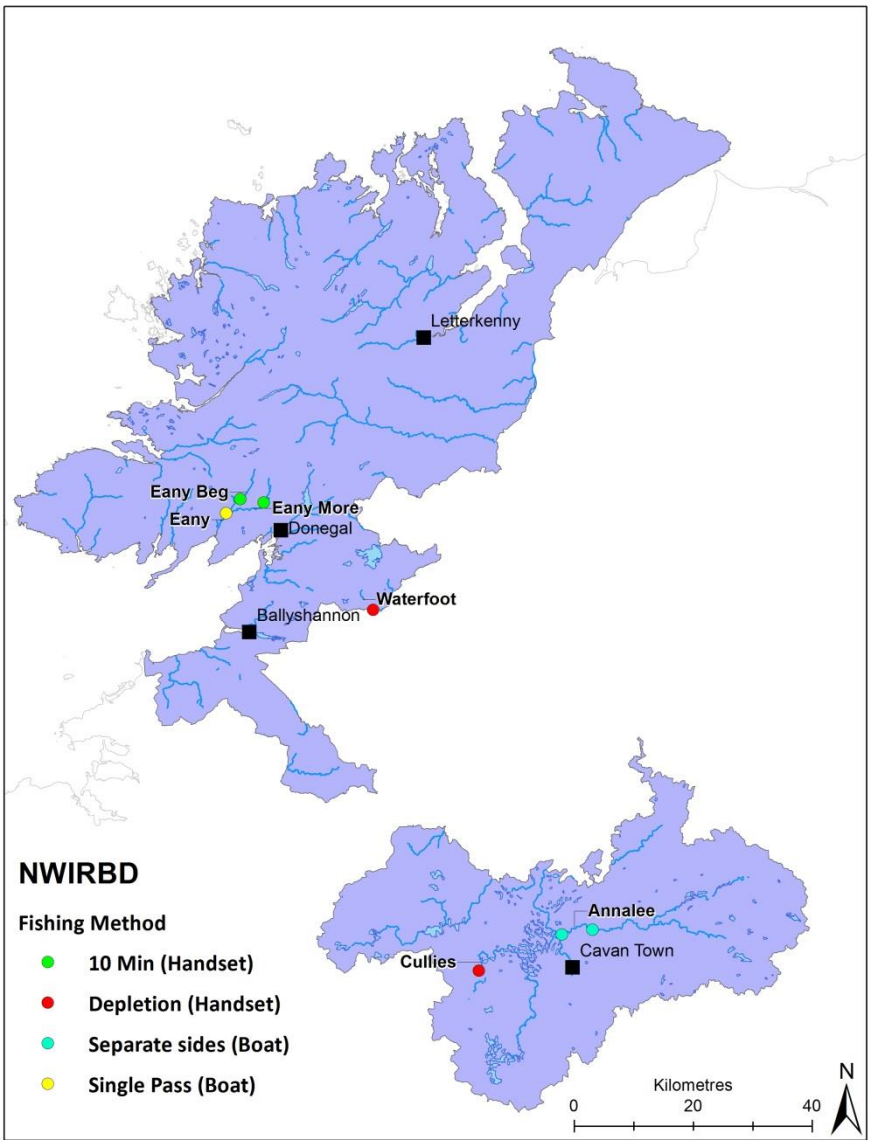

Fig. 4.108. Map of the NWIRBD showing the site surveyed in 2016

4.5.1 River Erne catchment

4.5.1.1 Annalee River

The Annalee River is a tributary of the River Erne. It is located in Co. Cavan and flows in a south westerly direction to reach Lough Oughter near Butlersbridge and soon afterward, the River Erne. Two sites were surveyed on the Annalee River, near Ballyhaise, Co. Cavan on the 11th of August 2016 (Fig. 4.109, Table 4.86). Both sites were non-wadeable and surveyed using boats. One site was surveyed using the ADEF (boat) method and one was surveyed using the Sp (Boat). Site 2 is a WFD SM site and was surveyed previously.

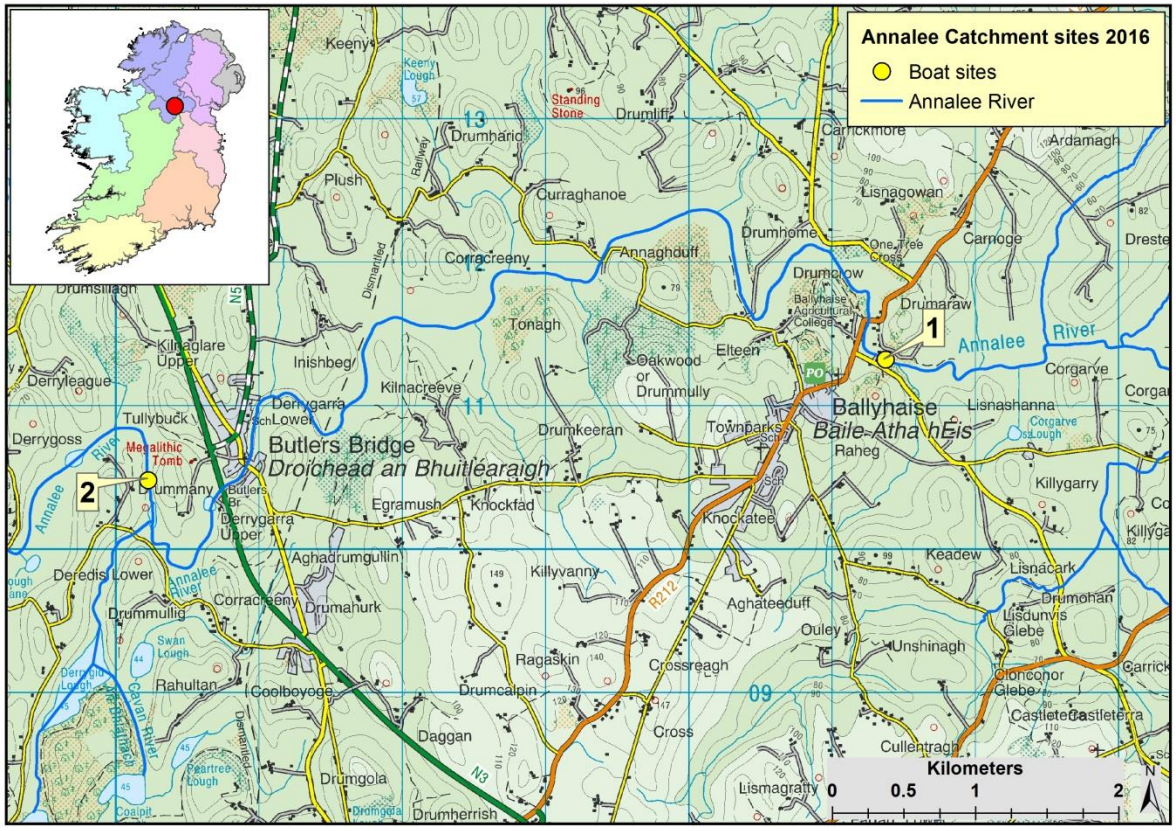

Fig. 4.109. Annalee River survey sites, 2016

Table 4.86. Sites surveyed on the Annalee River, 2016

No.	River	Site	Method	WFD	Date
1	Annalee River	Drumaraw_A	Sp (Boat)	No	11/08/2016
2	Annalee River	0.2km d/s Cavan R confl_A	ADEF (Boat)	Yes	11/08/2016

Eight fish species were recorded in the Annalee catchment in 2016 (Table 4.87). Gudgeon was the most abundant species caught at Site 1, while roach was the most abundant at Site 2.

Four age classes of brown trout were encountered, 0+ to 3+, with the highest proportions within the 1+ and 2+ age classes (Table 4.88). Seven age classes of roach were recorded, with the highest proportion of the catch within the 3+ cohort.

Length frequency distributions are shown below for brown trout (Fig. 4.110), perch (Fig. 4.111) and roach (Fig. 4.112). Site 2 was surveyed previously in 2008 and 2013. The length frequency for brown trout, perch and roach at this site across the three years are shown below (Fig. 4.113 to Fig. 4.115).

Table 4.87. Minimum density of fish (no. /m^2), Annalee River Catchment, 2016

	1	2		
Species	**2016**	**2008**	**2013**	**2016**
Bream	-	0.0030	0.0010	-
Brown trout	0.0090	0.0050	0.0010	0.0004
0+ Brown trout	0.0004	-	-	0.0010
1++ Brown trout	0.0080	0.0050	0.0010	0.0004
European eel	-	0.0010	0.0010	-
Gudgeon	0.0100	0.0330	0.0370	0.010
Lamprey sp.	0.0002	0.0004	-	-
Minnow	0.0002	-	0.0010	-
Perch	0.0004	0.0550	0.0210	0.0020
Pike	-	0.0030	0.0030	0.0004
Roach	0.0070	0.1310	0.0370	0.0160
Roach x bream hybrid	-	0.0004	0.0003	0.0004
All Fish	**0.026**	**0.232**	**0.102**	**0.029**

Table 4.88. Percentage catch for aged species in the Annalee River catchment, 2016

		% catch							
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**	**6+**	**7+**
Brown trout	1	4	74	17	4	-	-	-	-
	2	22	33	44	-	-	-	-	-
Roach	1	-	6	26	51	17	-	-	-
	2	-	8	23	55	7	6	1	1

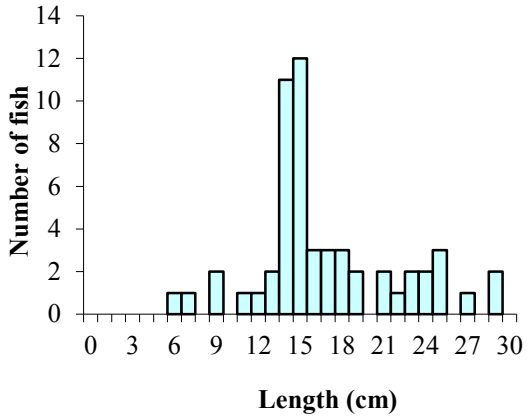

Fig. 4.110. Length frequency distribution of brown trout in the Annalee River, 2016 (n=55).

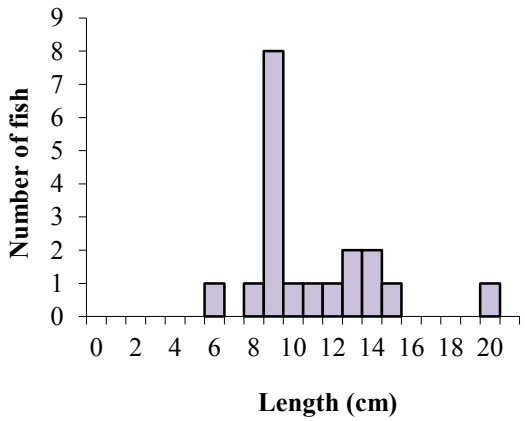

Fig. 4.111. Length frequency distribution of perch in the Annalee River, 2016 (n=19).

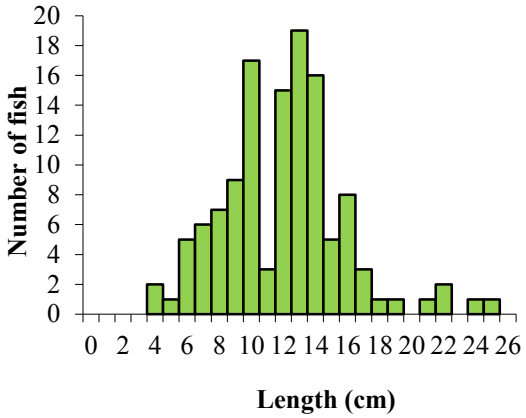

Fig. 4.112. Length frequency distribution of roach in the Annalee River, 2016 (n=123).

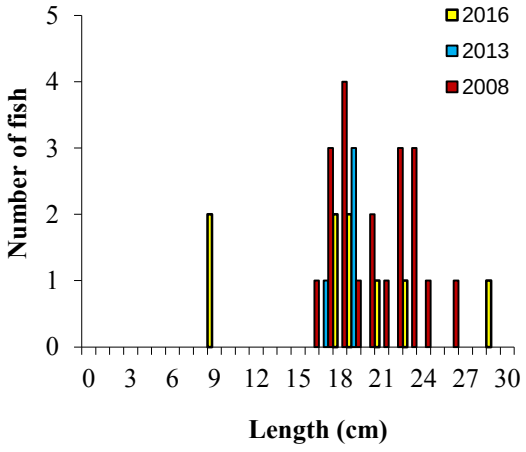

Fig. 4.113. Length frequency distribution of brown trout in the Annalee River (Site 2), 2008 (n=20), 2013 (n=4) and 2016 (n=9).

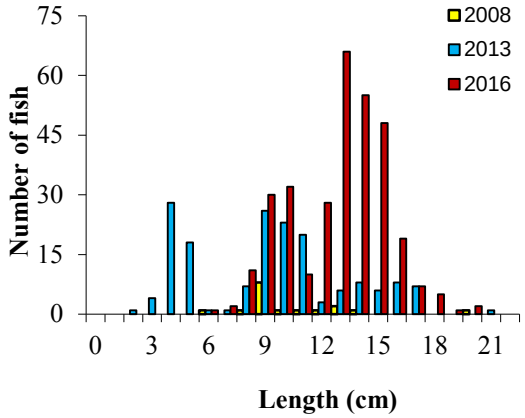

Fig. 4.114. Length frequency distribution of perch in the Annalee River (Site 2), 2008 (n=317), 2013 (n=168) and 2016 (n=17).

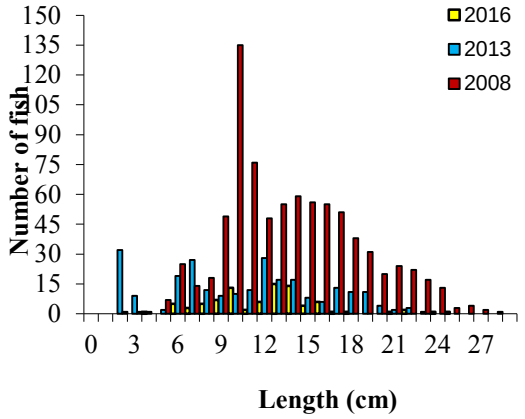

Fig. 4.115. Length frequency distribution of roach in the Annalee River (Site 2), 2008 (n=825), 2013 (n=254) and 2016 (n=88).

4.5.1.2 Cullies River

The Cullies River is a tributary of the River Erne. It is located between Co. Leitrim and Co. Cavan and flows in a north-easterly direction to reach Lough Oughter near Killashandra, Co. Cavan. One site was surveyed on the Cullies River, near Killashandra, Co. Cavan on the 8th of August 2016 (Fig. 4.116, Table 4.89). This site was wadeable and surveyed using the ADEF method; it is a WFD SM site and was surveyed previously.

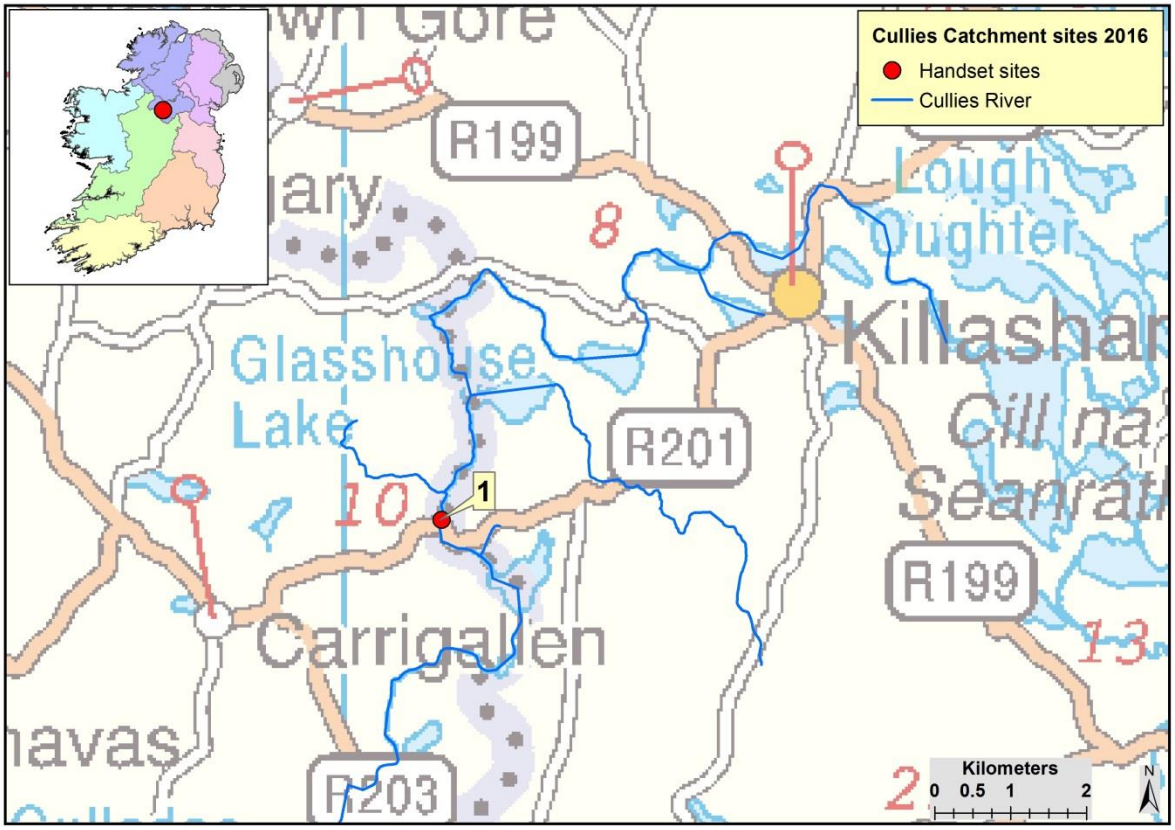

Fig. 4.116. Cullies River survey sites, 2016

Table 4.89. Sites surveyed on the Cullies River, 2016

No.	River	Site	Method	WFD	Date
1	Cullies River	Br. nr Kilbrackan House_A	ADEF (Hand)	Yes	08/08/2016

Five fish species were recorded in the Cullies River in 2016 and of these, roach was the most abundant (Table 4.90). No brown trout have been recorded at this site since the 2010 survey.

Five age classes of roach were recorded (0+ to 4+), with the highest proportion being within the 0+ category (Table 4.91). The only roach x bream hybrid caught was aged 5+. All but one of the pike recorded were within the 1+ age class.

This site was survey previously in 2010 and 2013. The length frequency distribution for perch (Fig. 4.117) and roach (Fig. 4.118) for all three years is shown below.

Table 4.90. Minimum density of fish (no. fish/m^2), Cullies River Catchment, 2016

	Site 1		
Species	**2010**	**2013**	**2016**
Bream	0.013	-	-
Brown trout	0.018	-	-
0+ Brown trout	-	-	-
1++ Brown trout	0.018	-	-
European eel	0.004	-	-
Gudgeon	0.004	0.118	0.054
Lamprey sp.	0.009	0.004	-
Perch	0.437	0.130	0.017
Pike	0.018	0.012	0.014
Roach	0.477	0.185	0.269
Roach x bream hybrid	0.026	-	0.003
All Fish	**1.007**	**0.450**	**0.357**

Table 4.91. Percentage catch for aged species in the Cullies River catchment, 2016

		% catch					
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**	**5+**
Roach	1	72	11	11	5	1	-
Roach x Bream Hybrid	1	-	-	-	-	-	100
Pike	1	20	80	-	-	-	-

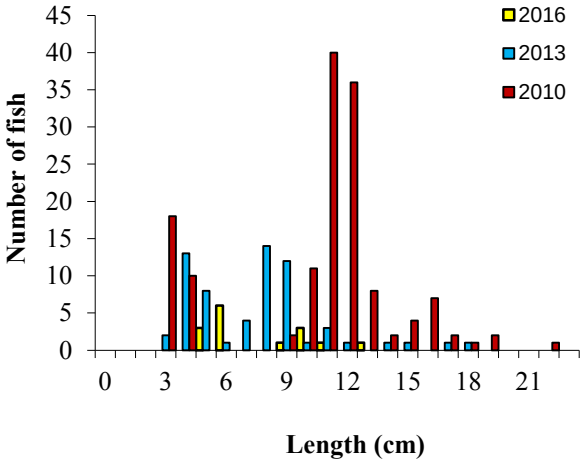

Fig. 4.117. Length frequency distribution of perch in the Cullies River (Site 1), 2010 (n=144), 2013 (n=63) and 2016 (n=15).

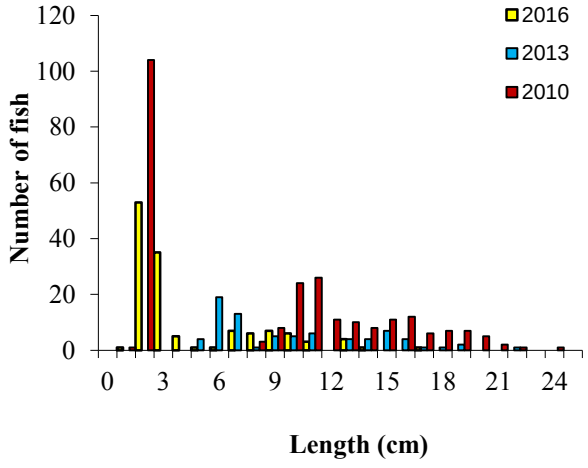

Fig. 4.118. Length frequency distribution of roach in the Cullies River (Site 1), 2010 (n=247), 2013 (n=77) and 2016 (n=131).

4.5.1.3 Waterfoot River

The Waterfoot River is a tributary of the River Erne. It is located in south Co. Donegal and flows in a southerly direction, reaching Lough Erne near Pettigoe. One site was surveyed on the Waterfoot River, on the Donegal Fermanagh border on the 10th of August 2016 (Fig. 4.119; Table 4.92). This site was wadeable and surveyed using the ADEF method; it is a WFD SM site and was surveyed previously.

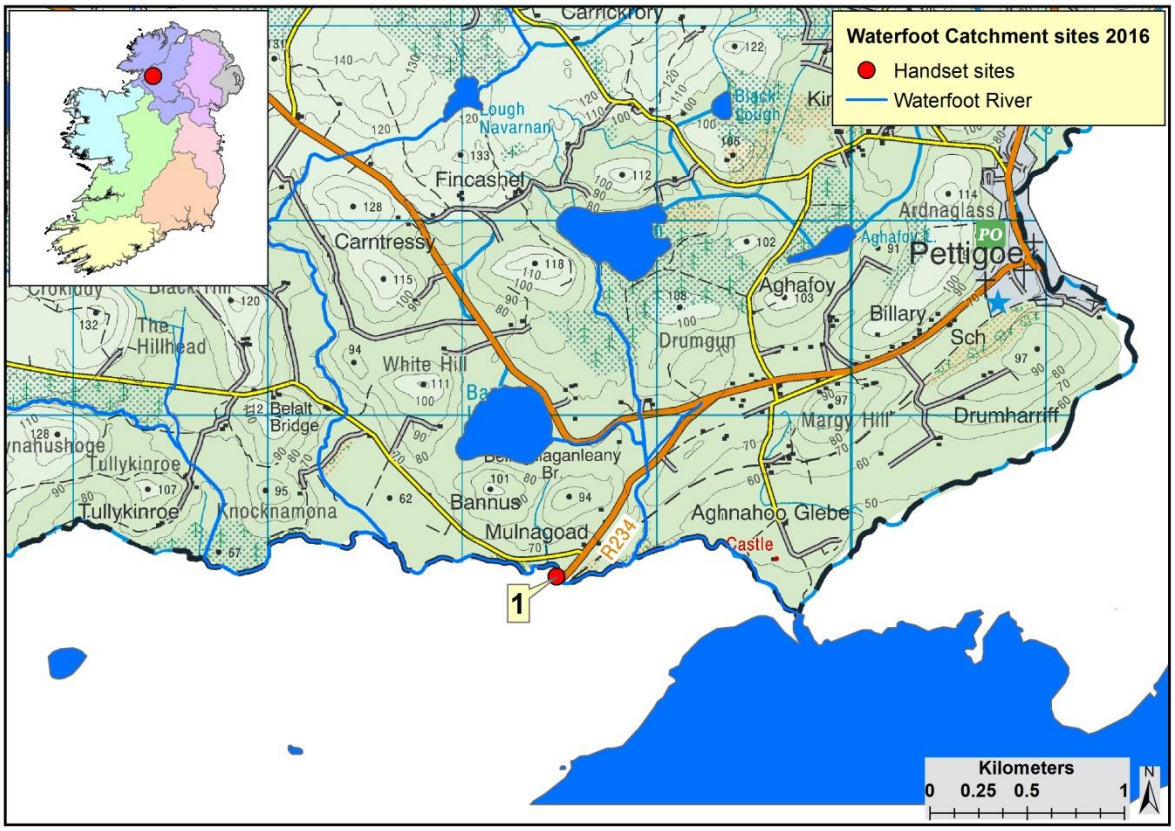

Fig. 4.119. Waterfoot River survey sites, 2016

Table 4.92. Sites surveyed on the Waterfoot River, 2016

No.	River	Site	Method	WFD	Date
1	Waterfoot River	Letter Br._A	ADEF (Hand)	Yes	10/08/2016

Six fish species were recorded in the Waterfoot River in 2016. Eels which had been present in 2011 were not recorded in 2016, while roach was recorded for the first time during these surveys (Table 4.93).

Table 4.94 shows the age class breakdown for species that were aged, including brown trout, salmon and roach. Five age classes of brown trout were recorded, from 0+ to 4+ inclusive.

This site was surveyed on two previous occasions, in 2008 and 2011. The length frequency distributions for both brown trout (Fig. 4.120) and salmon (Fig. 4.121) are shown below.

Table 4.93. Minimum density of fish (no. fish/m^2), Waterfoot River Catchment, 2016

	Site 1		
Species	**2008**	**2011**	**2016**
Brown trout	0.053	0.209	0.072
0+ Brown trout	0.045	0.101	0.032
1++ Brown trout	0.008	0.107	0.040
European eel	-	0.003	-
Lamprey sp.	0.010	0.027	0.007
Minnow	0.038	0.036	0.007
Roach	-	-	0.004
Salmon	0.184	0.391	0.032
0+ Salmon	0.149	0.346	0.004
1++ Salmon	0.035	0.045	0.029
3-spined stickleback	0.030	0.018	0.004
All Fish	**0.315**	**0.683**	**0.126**

Table 4.94. Percentage catch for aged species in the Waterfoot catchment, 2016

		% catch				
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**	**4+**
Brown trout	1	42	39	12	3	3
Salmon	1	36	64	-	-	-
Roach	1	-	100	-	-	-

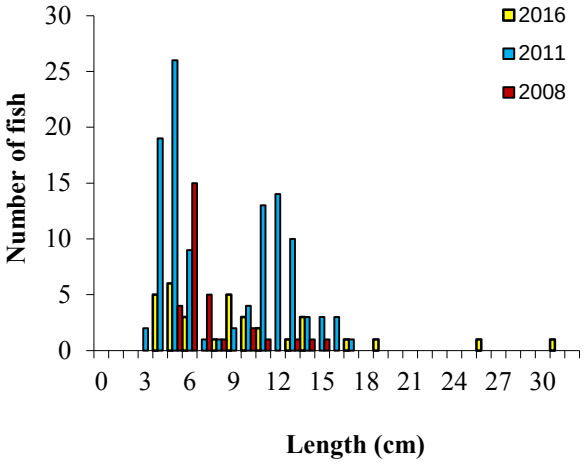

Fig. 4.120 Length frequency distribution of brown trout in the Waterfoot River (Site 1), 2008 (n=31), 2011 (n=111) and 2016 (n=33).

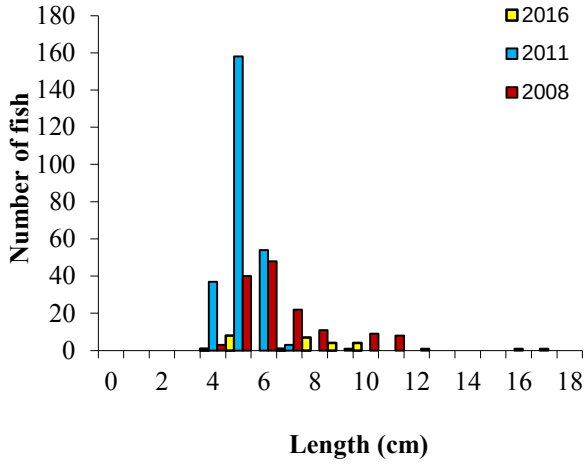

Fig. 4.121. Length frequency distribution of salmon in the Waterfoot River (Site 1), 2008 (n=143), 2011 (n=254) and 2016 (n=25).

4.5.2 Eany Water

The Eany Water is located in Co. Donegal and flows in a south-westerly direction joining the sea at Inver Bay. Three sites were surveyed on the Eany Water on the 9th of August 2016 (Fig. 4.122, Table 4.95). One site was non-wadeable and surveyed using the ADEF (SP) boat method. The other two sites were wadeable and surveyed using the TEF method. Site 3 is a WFD SM site and was surveyed previously.

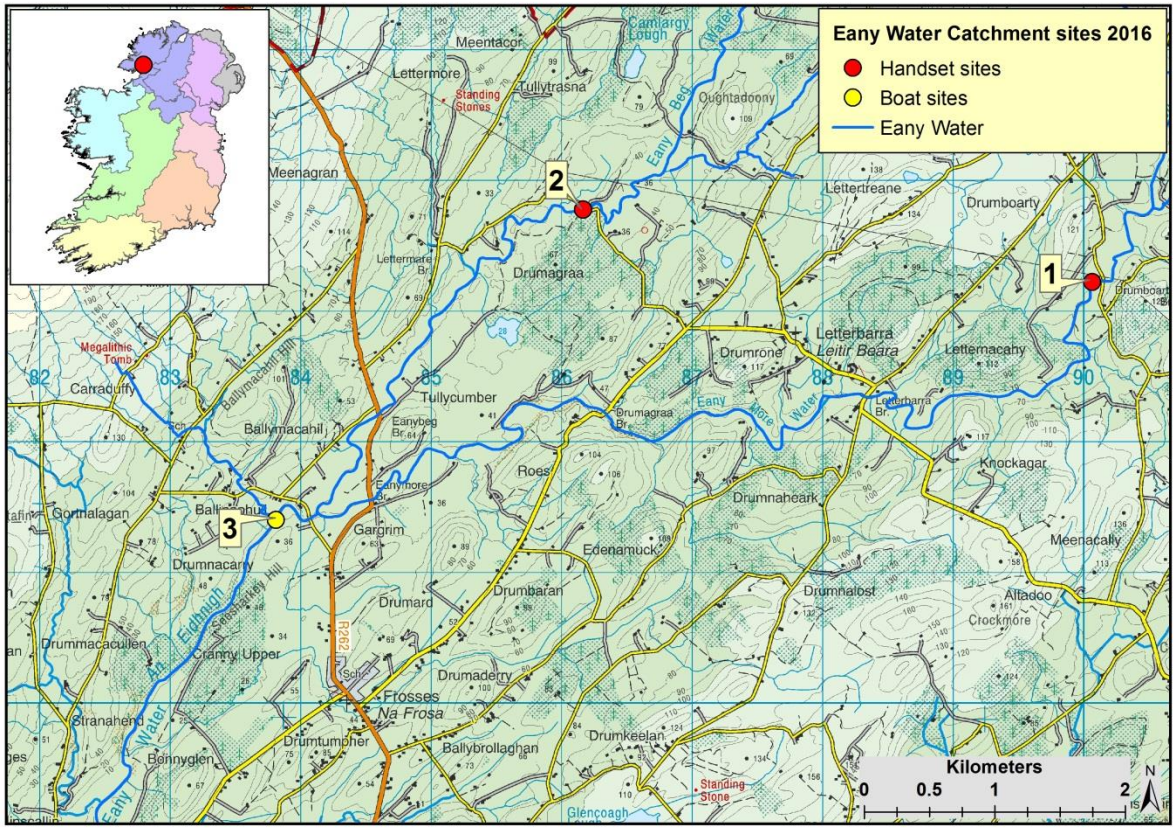

Fig. 4.122. Eany Water survey sites, 2016

Table 4.95. Sites surveyed on the Eany Water, 2016

No.	River	Site	Method	WFD	Date
1	Eany More	Drumboarty_A	TEF (Hand)	No	09/08/2016
2	Eany Beg	Drumagraa_A	TEF (Hand)	No	09/08/2016
3	Eany Water	Just d/s Eany Beg/More confl_A	ADEF (Sp) Boat)	Yes	09/08/2016

Four fish species were recorded within the Eany Water Catchment (Table 4.96) in 2016, with sea trout caught for the first time during these surveys. Three age classes (0+ to 2+) were encountered for both salmon and brown trout (Table 4.97).

The length frequency distribution for salmon is shown for all three sites combined (Fig. 4.123). Site 3 was surveyed on two previous occasions; the length frequency distribution for salmon is shown for all three surveys (Fig. 4.124).

Table 4.96. Minimum density of fish (no. fish/m^2), Eany Water Catchment, 2016

	Site 1	Site 2	Site 3		
Species	**2016**	**2016**	**2008**	**2012**	**2016**
Brown trout	0.006	0.013	0.0003	0.0004	0.003
0+ Brown trout	0.006	-	-	0.0001	-
1++ Brown trout	-	0.013	0.0003	0.0003	0.003
European eel			0.001	0.0004	0.002
Salmon	0.046	0.073	0.005	0.015	0.082
0+ Salmon	0.034	0.020	0.002	0.004	0.008
1++ Salmon	0.011	0.053	0.003	0.011	0.074
Sea trout			-	-	0.002
All Fish	**0.052**	**0.087**	**0.006**	**0.016**	**0.088**

Table 4.97. Percentage catch for aged species in the Eany Water catchment, 2016

		% catch		
Species	**Site No.**	**0+**	**1+**	**2+**
Brown trout	1	100	-	-
	2	-	100	-
	3	-	50	50
Salmon	1	75	13	13
	2	33	33	33
	3	10	77	13

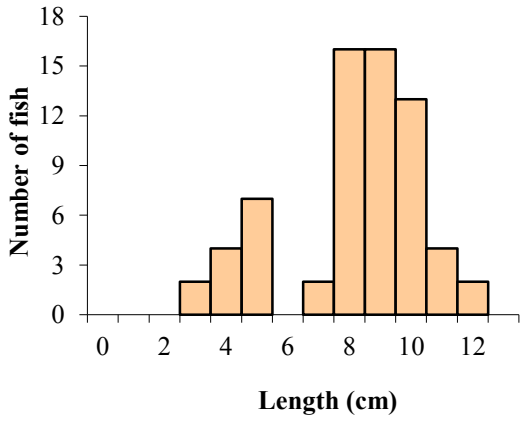

Fig. 4.123. Length frequency distribution of salmon in the Eany Water, 2016 (n=66).

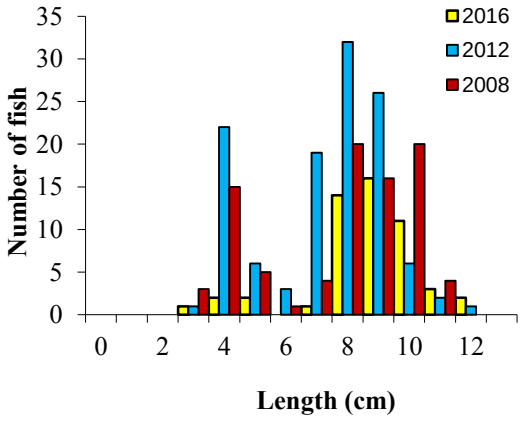

Fig. 4.124. Length frequency distribution of salmon in the Eany Water (Site 3), 2008 (n=88), 2012 (n=118) and 2016 (n=52).

4.6 Western River Basin District (WRBD)

Thirty-nine sites were surveyed in the WRBD during 2016. Catchments included the Castlebar, Glensaul, Moy, Owenbrin, Owendalluleegh and Srah. Thirty-three sites were wadeable and surveyed using either the ADEF or TEF method, with the remaining 6 sites non-wadeable and surveyed with the SPASE method (Fig. 4.125).

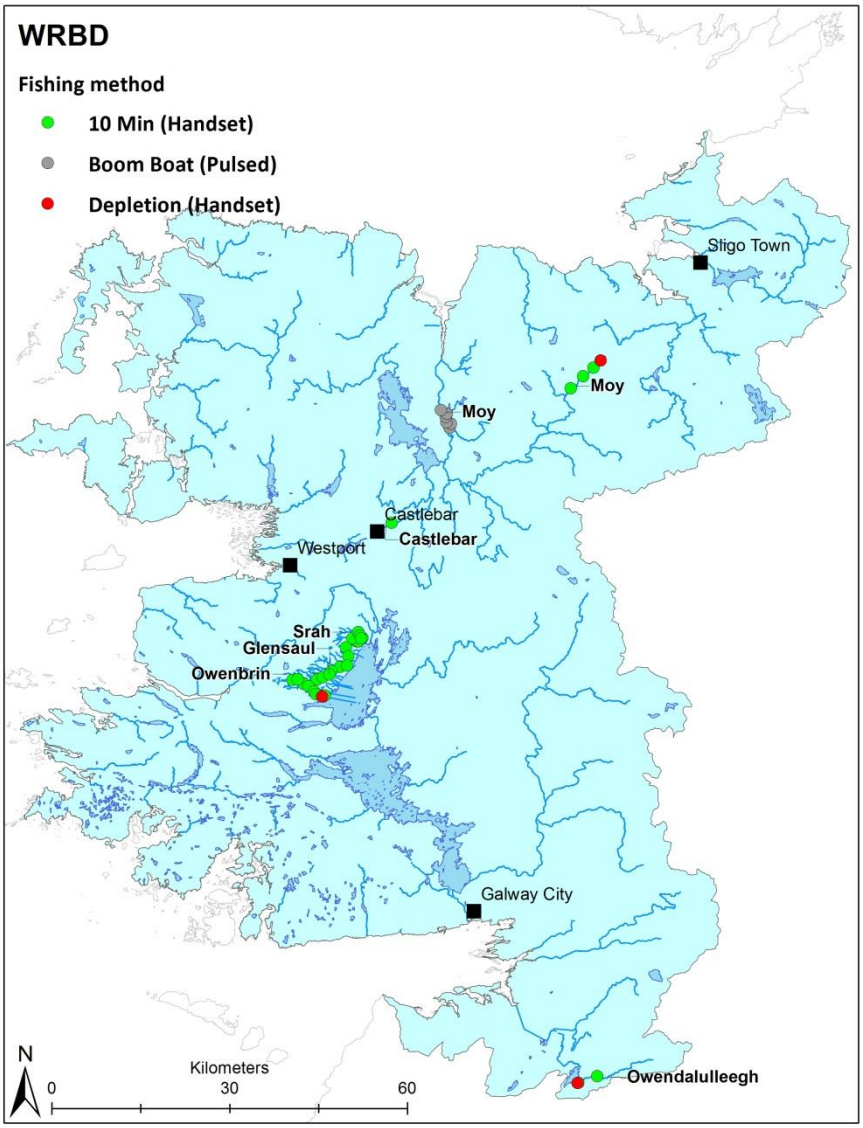

Fig. 4.125. Map of the WRBD showing the site surveyed in 2016

4.1.1 Corrib catchment

Sites in three sub-catchments of the Lough Corrib catchment were surveyed during 2016; Glensaul River, Srah River and the Owenbrin River (Fig. 4.126, 4.128 and 4.130). All three sub catchments are located on the western side of Lough Mask (Fig. 4.126).

4.1.1.1 Glensaul River

The Glensaul River is a small stream in Co. Mayo that flows into the western side of Lough Mask, near Toormakeady. Eight sites were surveyed on the river and its tributaries between the 6th and 7th of September 2016 (Fig. 4.126; Table 4.98). All sites were wadeable and surveyed using the TEF method.

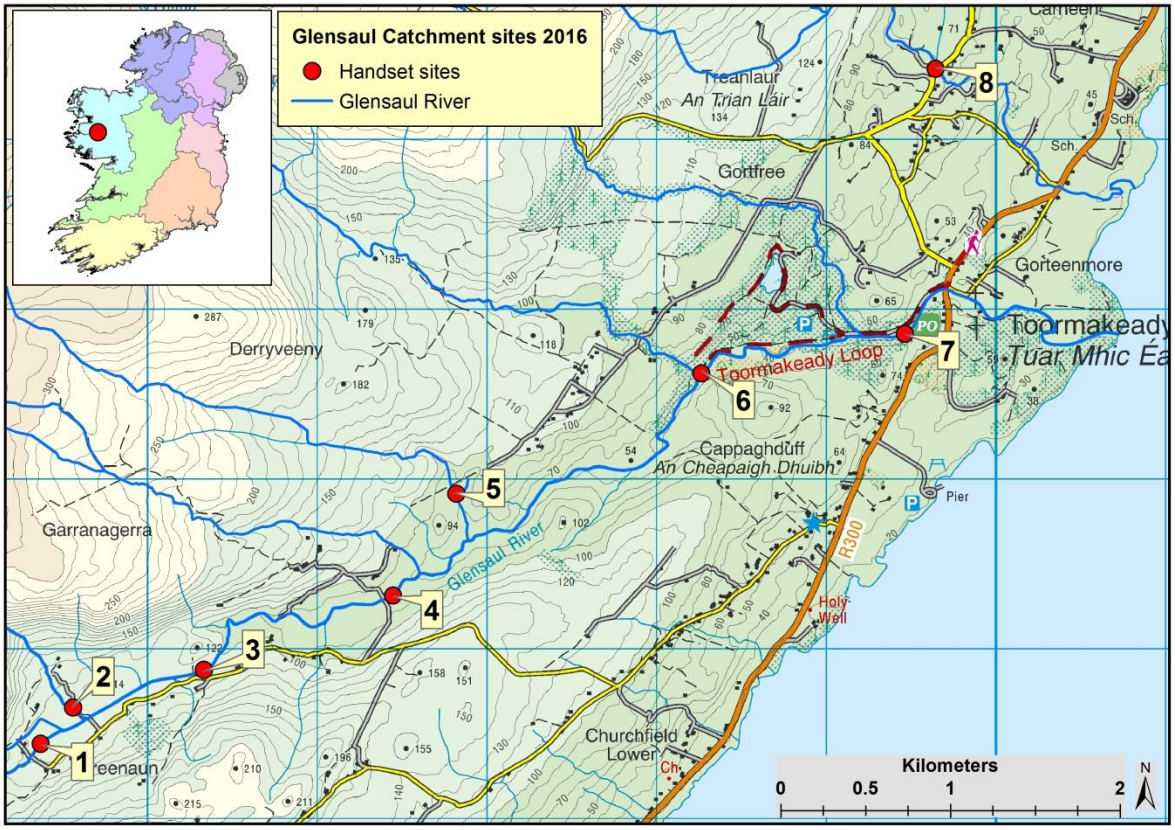

Fig. 4.126. Glensaul River survey sites, 2016

Table 4.98. Sites surveyed on the Glensaul River, 2016

No.	River	Site	Method	WFD	Date
1	Glensaul River	Tonaglanna_A	TEF (Hand)	No	07/09/2016
2	Sruffaunnagreeve Trib	Sruffaunnagreeve_A	TEF (Hand)	No	07/09/2016
3	Glensaul River	Greenaun_A	TEF (Hand)	No	07/09/2016
4	Glensaul River	Garrangarra_A	TEF (Hand)	No	06/09/2016
5	Derryveeny Trib	Derryveeny_A	TEF (Hand)	No	07/09/2016
6	Tourmakeady Trib	Tourmakeady_A	TEF (Hand)	No	06/09/2016
7	Glensaul River	Tourmakeady Forest_A	TEF (Hand)	No	06/09/2016
8	Ballybanaun Stream	Carheen_A	TEF (Hand)	No	07/09/2016

Two fish species were recorded on the Glensaul River and its tributaries. Brown trout was the most common species captured (Table 4.99). Only one site recorded minnow and there were two sites where no fish were captured. Three age classes of brown trout were encountered during these surveys, with the vast majority of individuals within the 0+ cohort (Table 4.100). The length frequency distribution for brown trout is also shown below (Fig. 4.127).

Table 4.99. Minimum density of fish (no. fish/m^2), Glensaul River Catchment, 2016

Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
	2016	2016	2016	2016	2016	2016	2016	2016
Brown trout	2.200	0.150	-	0.275	0.096	0.057	0.035	-
0+ Brown trout	1.880	0.150	-	0.275	0.078	0.020	0.035	-
1++ Brown trout	0.320	-	-	-	0.017	0.037	-	-
Minnow	-	-	-	-	-	-	0.008	-
No Fish	**2.200**	**0.150**	-	**0.275**	**0.096**	**0.057**	**0.043**	-

Table 4.100. Percentage catch for aged species in the Glensaul River catchment, 2016

		% catch				
Species	Site No.	0+	1+	2+	3+	4+
Brown trout	1	87	13	-	-	-
	2	100	-	-	-	-
	4	100	-	-	-	-
	5	86	14	-	-	-
	6	38	50	-	-	13
	7	100	-	-	-	-

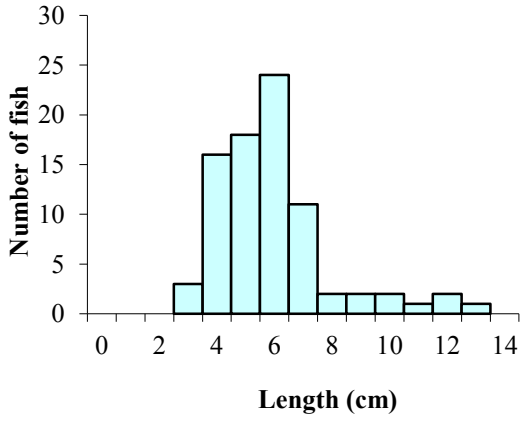

Fig. 4.127. Length frequency distribution of brown trout in the Glensaul River, 2016 (n=82).

4.6.1.2 Srah River

The Srah River is a small stream in Co. Mayo that flows into the north western end of Lough Mask. Eight sites were surveyed on the river and its tributaries between the 6th and 7th of September 2016 (Fig. 4.128; Table 4.101). All sites were wadeable and surveyed using the TEF method.

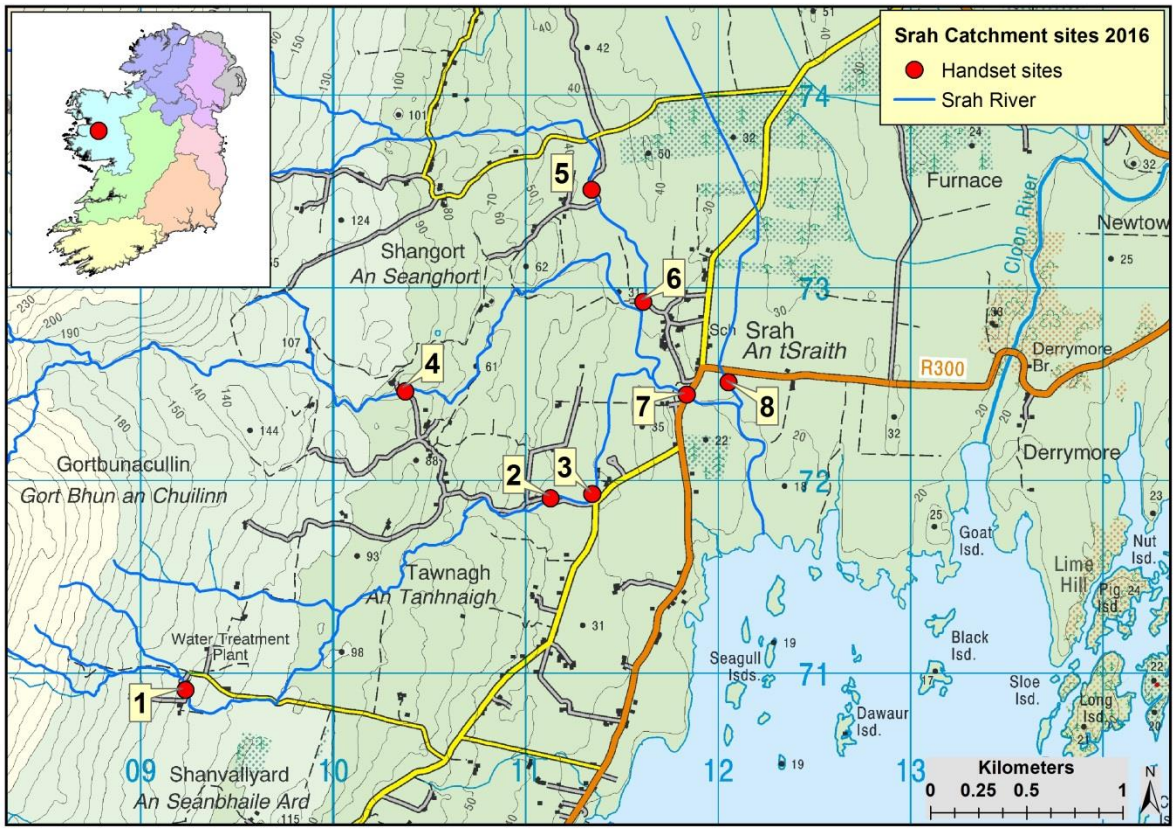

Fig. 4.128. Srah River survey sites, 2016

Table 4.101. Sites surveyed on the Srah River, 2016

No.	River	Site	Method	WFD	Date
1	Srah River	u/s Treatment Plant_A	TEF (Hand)	No	06/09/2016
2	Srah River	Tawnagh Hill_A	TEF (Hand)	No	06/09/2016
3	Srah River	Tawnagh Junction_a	TEF (Hand)	No	06/09/2016
4	Srah River	Gortbunacullin_A	TEF (Hand)	No	06/09/2016
5	Srah River	Shangort_A	TEF (Hand)	No	07/09/2016
6	Srah River	Srah East_A	TEF (Hand)	No	07/09/2016
7	Srah River	Srah Br._A	TEF (Hand)	No	07/09/2016
8	Srah River	Drain_A	TEF (Hand)	No	07/09/2016

Three fish species were recorded on the Srah River and tributaries in 2016 (Table 4.102). Brown trout was the most common species captured. Site 8 was the only site where minnow and pike were caught. No fish were caught at Site 4. The highest density of fish was recorded at Site 3 (Table 4.102).

Three age classes of brown trout were encountered, 0+, 1+ and 2+, with the majority of individuals within the 0+ category (

Table 4.103). The length frequency distribution for brown trout across all sites surveyed on the Srah River is shown below (Fig. 4.129).

Table 4.102. Minimum density of fish (no. /m^2), Srah River Catchment, 2016

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Brown trout	0.124	0.805	1.448	-	0.133	0.700	0.122	0.065
0+ Brown trout	0.124	0.641	0.921	-	0.120	0.638	0.083	0.065
1++ Brown trout	-	0.165	0.527	-	0.013	0.062	0.039	-
Minnow	-	-	-	-	-	-	-	0.065
Pike	-	-	-	-	-	-	-	0.011
All Fish	**0.124**	**0.805**	**1.448**	**-**	**0.133**	**0.700**	**0.122**	**0.141**

Table 4.103. Percentage catch for aged species in the Srah River catchment, 2016

Species	Site	% catch 0+	1+	2+
Brown trout	1	100	-	-
	2	83	17	-
	3	67	30	3
	5	92	8	-
	6	92	8	-
	7	71	29	-
	8	100	-	-
Pike	8	100	-	-

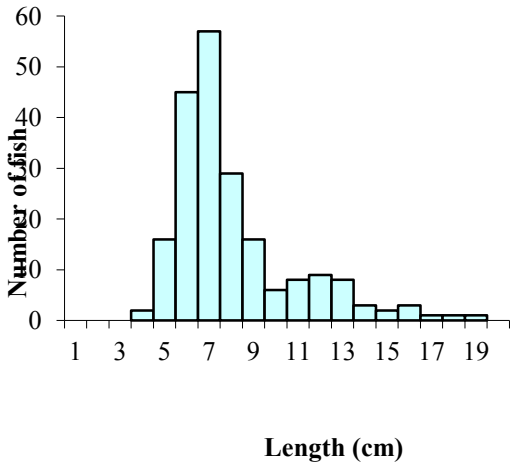

Fig. 4.129. Length frequency distribution of brown trout in the Srah River, 2016 (n=207).

4.6.1.3 Owenbrin River

The Owenbrin is a small river in Co. Mayo that flows into the western side of Lough Mask. Nine sites were surveyed on the Owenbrin and its tributaries, between the 5th and 6th of September 2016 (Fig. 4.130; 4.104). All sites were wadeable, with one surveyed using the ADEF method and nine surveyed using the TEF. Site 7 is a WFD SM site and was surveyed previously.

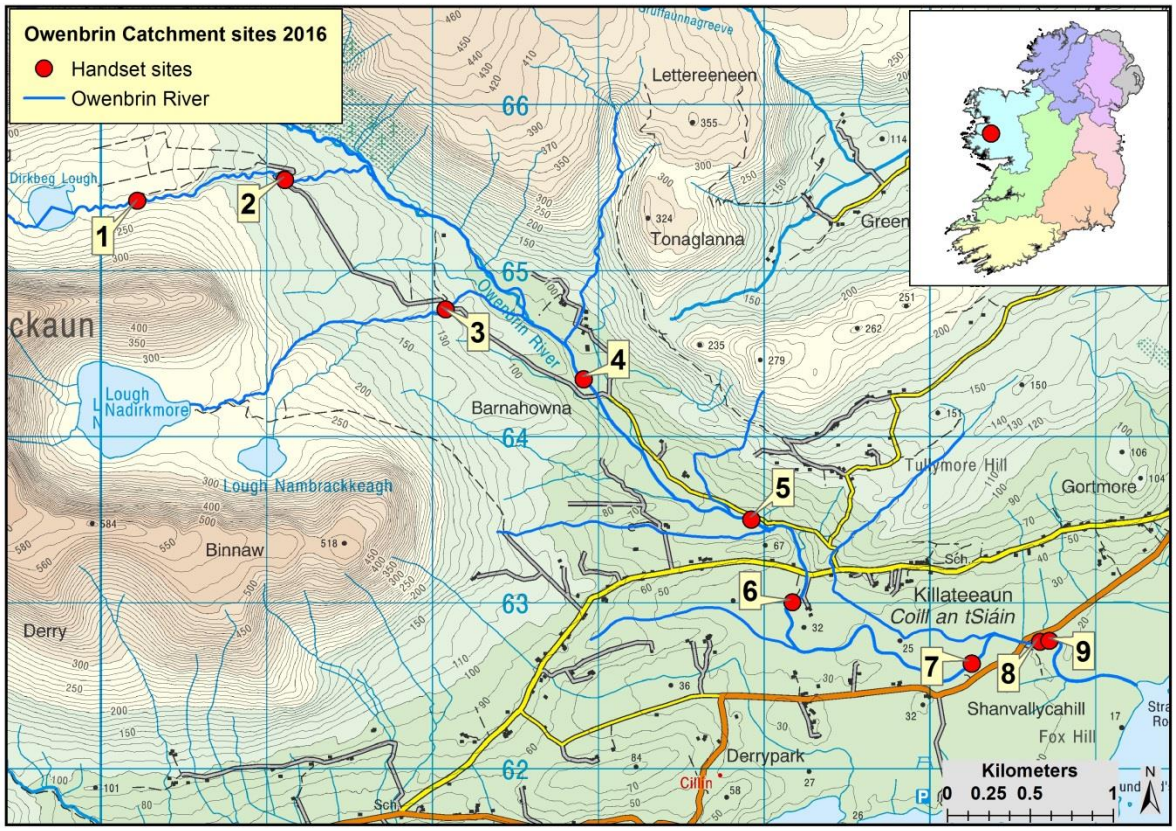

Fig. 4.130. Owenbrin River survey sites, 2016

Table 4.104. Sites surveyed on the Owenbrin River, 2016

No.	River	Site	Method	WFD	Date
1	Owenbrin River	d/s Dirkbeg Lough_A	TEF (Hand)	No	05/09/2016
2	Owenbrin River	Dirkbeg Hill_A	TEF (Hand)	No	06/09/2016
3	Nadirkmore Trib	Ford_A	TEF (Hand)	No	06/09/2016
4	Owenbrin River	Barnahowna_A	TEF (Hand)	No	06/09/2016
5	Owenbrin River	Tullymore_A	TEF (Hand)	No	06/09/2016
6	Owenbrin River	Killateeaun_A	TEF (Hand)	No	05/09/2016
7	Owenbrin River	Br. u/s L. Mask_A	ADEF (Hand)	Yes	05/09/2016
8	Owenbrin River	Shanvallycahill_A	TEF (Hand)	No	06/09/2016
9	Owenbrin River	Shanvallycahill_B	TEF (Hand)	No	06/09/2016

Five fish species were recorded in the Owenbrin River in 2016 (Table 4.105). Brown trout was the most frequently encountered species, caught in seven of the nine sites. The highest density of fish was recorded at Site 7, with the majority of these being minnow. The density of fish at this site was lower than it had been on two previous occasions.

Three age classes of brown trout were captured, 0+, 1+ and 2+, with the majority of individuals caught within the 0+ and 1+ age group (Table 4.106).

The length frequency distribution for brown trout in the Owenbrin River is shown below (Fig. 4.131). The length frequency distribution is also shown for brown trout at Site 7 where surveys had been undertaken previously (Fig. 4.132).

Table 4.105. Minimum density of fish (no. fish/m^2), River Owenbrin Catchment, 2016

	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7			Site 8	Site 9
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**	**2009**	**2012**	**2016**	**2016**	**2016**
Brown trout	0.014	0.027	0.009	0.018	0.030	0.007	0.067	0.006	0.006	-	-
0+ Brown trout	0.014	-	-	0.016	0.026	0.007	0.062	0.006	0.004	-	-
1++ Brown trout	-	0.027	0.009	0.002	0.004	-	0.005	-	0.002	-	-
European eel	-	-	-	-	0.003	-	-	0.003	-	-	-
Lamprey sp.	-	-	-	-	-	-	-	0.003	-	-	-
Minnow	-	-	-	0.014	0.005	0.013	0.368	0.298	0.036	0.219	0.152
Perch	-	-	-	-	-	0.002	0.002	-	-	-	-
Salmon	-	-	-	-	-	-	0.002	-	-	-	-
0+ Salmon	-	-	-	-	-	-	-	-	-	-	-
1++ Salmon	-	-	-	-	-	-	0.002	-	-	-	-
Stone loach	-	-	-	-	-	-	0.012	-	0.002	0.010	-
All Fish	**0.014**	**0.027**	**0.009**	**0.032**	**0.038**	**0.021**	**0.451**	**0.309**	**0.043**	**0.229**	**0.152**

Table 4.106. Percentage catch for aged species in the Owenbrin River catchment, 2016

		% catch		
Species	**Site No.**	**0+**	**1+**	**2+**
Brown trout	1	100	-	-
	2	-	100	-
	3	-	67	33
	4	89	11	-
	5	89	11	-
	6	100	-	-
	7	67	33	-

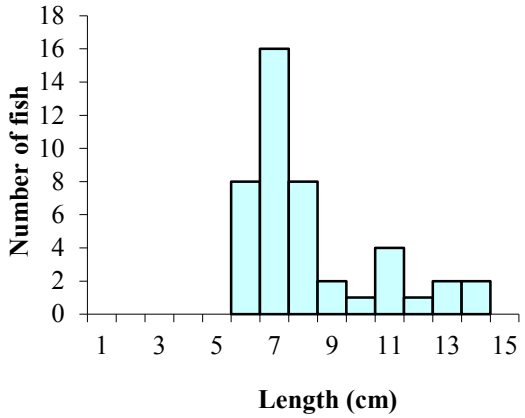

Fig. 4.131. Length frequency distribution of brown trout in the Owenbrin River, 2016 (n=44).

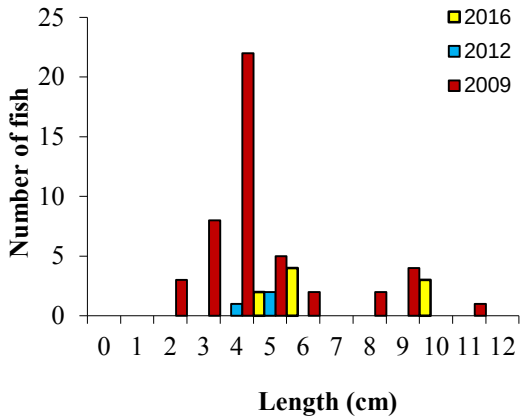

Fig. 4.132. Length frequency distribution of brown trout in the Owenbrin River (Br. u/s L. Mask_A), 2009 (n=47), 2012 (n=3) and 2016 (n=9).

4.6.2 River Moy Catchment

The River Moy is a large river in northwest Co. Mayo that flows from the Ox Mountains in Co. Sligo, in a south-westerly direction before looping back northwards through Ballina before reaching the sea at Killala Bay. One site on the Castlebar River and ten sites on the River Moy main channel were surveyed within the catchment during 2016.

4.6.2.1 Castlebar River

The Castlebar River is a tributary of the River Moy. It is located near Castlebar, Co. Mayo and joins with the Clydagh River before entering Lough Cullin and then the River Moy. One site was surveyed on the river, near Castlebar, Co. Mayo on the 7th of September 2016 (Fig. 4.133, Table 4.107). This site was wadeable, surveyed using the TEF method and is a WFD SM site.

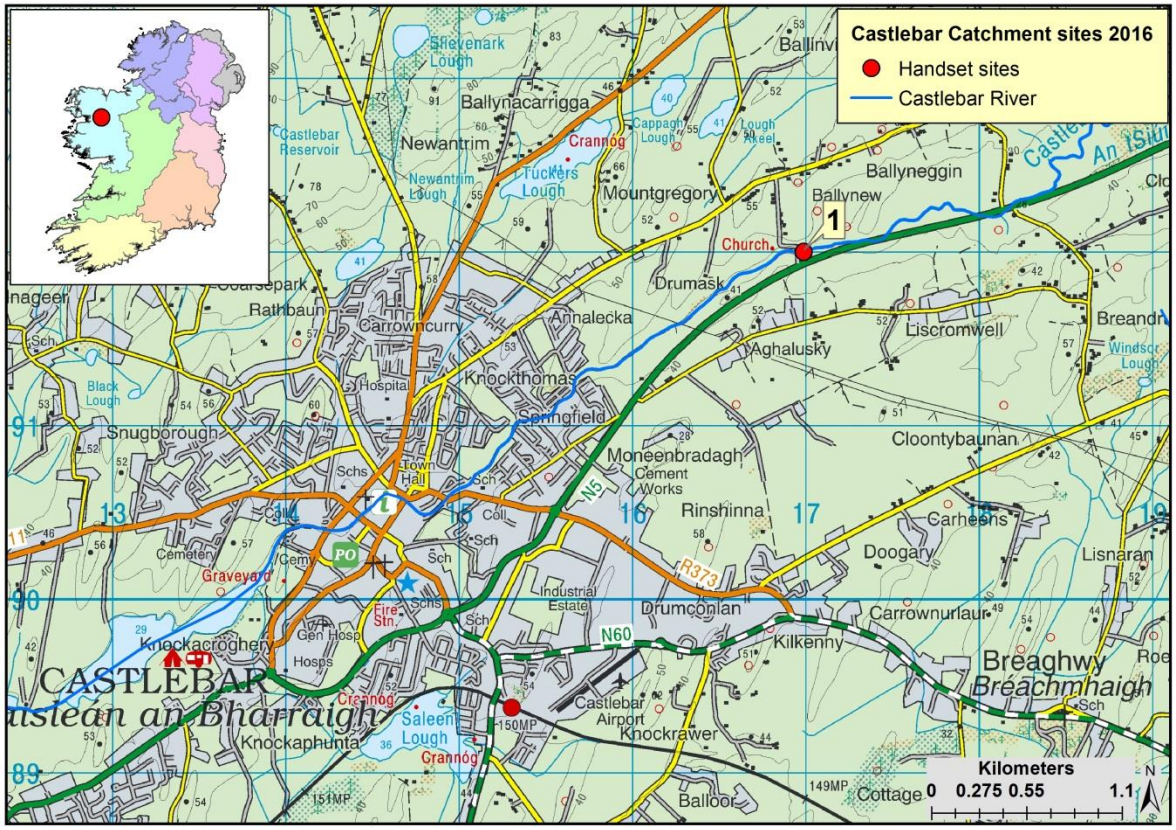

Fig. 4.133. Castlebar River survey sites, 2016

Table 4.107. Sites surveyed on the Castlebar River, 2016

No.	River	Site	Method	WFD	Date
1	Castlebar River	Br. 2.5 km d/s Castlebar_A	TEF (Hand)	Yes	07/09/2016

Only two fish species were recorded in the Castlebar River in 2016 (Table 4.108) and of these, salmon was the most abundant. Only one brown trout was caught, aged 3+. The majority of salmon were within the 0+ age category (Table 4.109).

The length frequency distribution for salmon in the Castlebar River is shown below (Fig. 4.134).

Table 4.108. Minimum density of fish (no. /m^2), Castlebar River Catchment, 2016

	Site1		
Species	**2008**	**2011**	**2016**
Brown trout	0.003	0.003	0.012
0+ Brown trout	-	-	-
1++ Brown trout	0.003	0.003	0.012
European eel	0.014	0.212	-
Lamprey sp.	-	0.003	-
Perch	0.002	-	-
Roach	-	0.137	-
Salmon	0.002	0.009	0.277
0+ Salmon	-	0.009	0.156
1++ Salmon	0.002	-	0.120
All Fish	**0.021**	**0.364**	**0.289**

Table 4.109. Percentage catch for aged species in the Castlebar catchment, 2016

		% catch			
Species	**Site No.**	**0+**	**1+**	**2+**	**3+**
Brown trout	1	-	-	-	100
Salmon	1	57	43	-	-

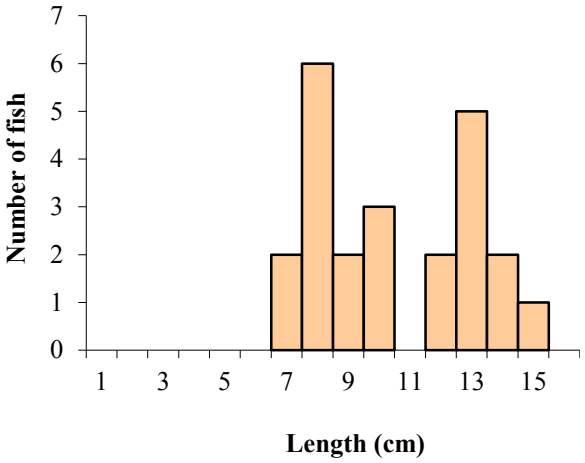

Fig. 4.134. Length frequency distribution of salmon in the Castlebar River (Site 1), 2016 (n=23).

4.6.2.2 Moy, River

Ten sites were surveyed on the River Moy, main channel between the 15th and 16th of August 2016 (Fig. 4.135). Four sites were wadeable, with one surveyed using the ADEF method and three surveyed using the TEF method. The remaining six sites were surveyed using the sPASE method. Site 1 is a WFD SM site and was surveyed previously (Table 4.110).

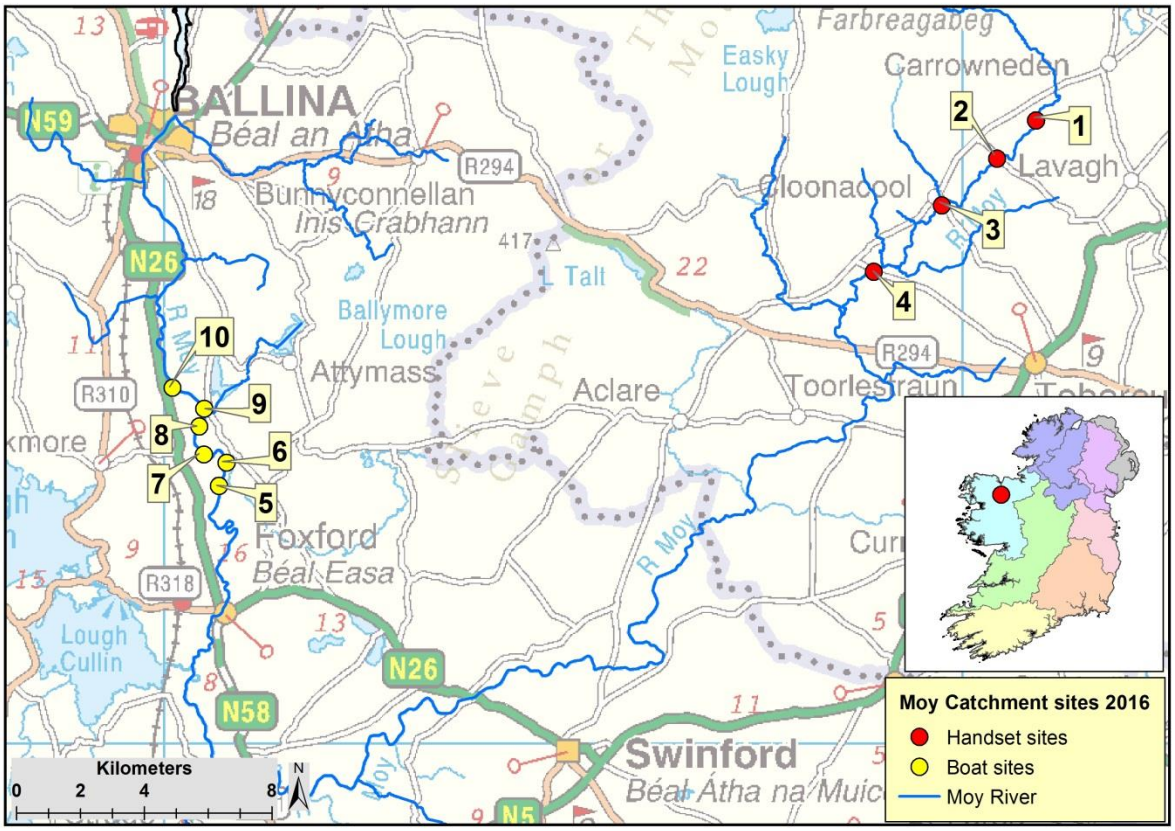

Fig. 4.135. River Moy survey sites, 2016

Table 4.110. Sites surveyed on the River Moy, 2016

No.	River	Site	Method	WFD	Date
1	Moy, River	Cloonbaniff Br._C	ADEF (Hand)	Yes	15/08/2016
2	Moy, River	Leitrim North_A	TEF (Hand)	No	16/08/2016
3	Moy, River	Cloonacool Br._A	TEF (Hand)	No	16/08/2016
4	Moy, River	Sessuecommon_A	TEF (Hand)	No	16/08/2016
5	Moy, River	Moorbrook_A	sPASE	No	16/08/2016
6	Moy, River	Curragh_A	sPASE	No	16/08/2016
7	Moy, River	Bunnafinglas South_A	sPASE	No	16/08/2016
8	Moy, River	Bunnafinglas West_A	sPASE	No	16/08/2016
9	Moy, River	Bunnafinglas Confl._A	sPASE	No	16/08/2016
10	Moy, River	Rathbaun_A	sPASE	No	16/08/2016

Eight fish species were recorded in the River Moy in 2016 (Table 4.111). Salmon and roach were the two most frequently encountered species, recorded in five of the ten sites. Site

2 had the highest density of fish, comprising mainly salmon and brown trout.

Three age classes of brown trout were captured during these surveys, 0+ to 2+ (Table 4.112). The two most upstream sites, Site 1 and 2 recorded the highest density of brown trout with the majority of these within the 0+ and 1+ age classes.

Two age classes of salmon were recorded, 0+ and 1+; however there were adult salmon encountered during the surveys on the deeper downstream sections of channel. Adult salmon were intentionally avoided in an effort to circumvent injury. Five age classes of roach were recorded, 1+ to 5+, with the majority within the 2+ and 3+ age categories.

The length frequency distributions of brown trout (Fig. 4.136), salmon (Fig. 4.137) and roach (Fig. 4.138) are shown below. Site 1 was surveyed previously in 2010. The length frequency distribution for both brown trout (Fig. 4.139) and salmon (Fig. 4.140) for both occasions are shown.

Table 4.111. Minimum density of fish (no. /m^2), River Moy, 2016

	Site 1		Site 2	Site 3	Site 4
Species	**2010**	**2016**	**2016**	**2016**	**2016**
Brown trout	0.031	0.091	0.033	0.018	0.010
0+ Brown trout	0.003	0.047	0.014	-	-
1++ Brown trout	0.028	0.044	0.019	0.018	0.010
Lamprey sp.	-	0.005	-	-	-
Minnow	0.165	-	0.033	0.023	-
Perch	-	-	-	-	-
Roach	-	-	-	-	-
Salmon	0.039	0.062	0.376	0.344	0.052
0+ Salmon	0.014	0.039	0.291	0.239	0.042
1++ Salmon	0.025	0.023	0.085	0.105	0.010
Stone loach	0.003	0.008	-	-	-
3-spined stickleback	0.003	0.003	-	-	-
All Fish	**0.240**	**0.169**	**0.441**	**0.385**	**0.063**

Table 4.112. Fish CPUE (no. of fish /activation), River Moy, 2016

	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
Species	**2016**	**2016**	**2016**	**2016**	**2016**	**2016**
Brown trout	-	-	-	-	-	-
0+ Brown trout	-	-	-	-	-	-
1++ Brown trout	-	-	-	-	-	-
Lamprey sp.	-	-	-	-	-	-
Minnow	-	-	-	-	-	-
Perch	-	-	0.067	-	-	-
Roach	0.200	0.258	-	0.033	0.100	0.467
Salmon	-	-	-	-	0.067	-
0+ Salmon	-	-	-	-	0.033	-
1++ Salmon	-	-	-	-	0.033	-
Stone loach	-	-	-	-	-	-
3-spined stickleback	-	-	-	-	-	-
All Fish	**0.200**	**0.258**	**0.067**	**0.033**	**0.167**	**0.467**

Table 4.113. Percentage catch for aged species in the River Moy, 2016

Species	Site No.	% catch					
		0+	1+	2+	3+	4+	5+
Brown trout	1	43	46	11	-	-	-
	2	50	50	-	-	-	-
	3	-	-	100	-	-	-
	4	-	50	50	-	-	-
Salmon	1	62	38	-	-	-	-
	2	80	20	-	-	-	-
	3	74	26	-	-	-	-
	4	82	18	-	-	-	-
	9	50	50	-	-	-	-
Roach	5	-	-	67	33	-	-
	6	-	-	13	88	-	-
	8	-	-	100	-	-	-
	9	-	-	67	33	-	-
	10	-	7	29	43	14	7

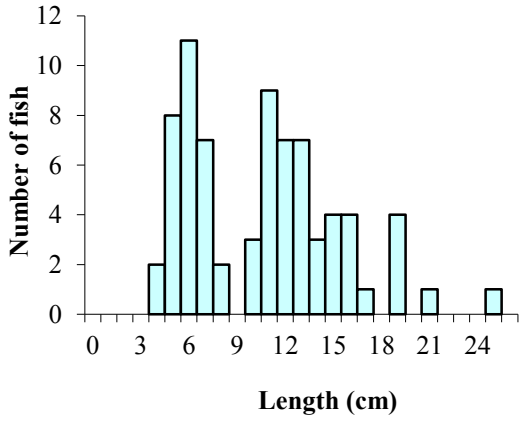

Fig. 4.136. Length frequency distribution of brown trout in the River Moy, 2016 (n=74).

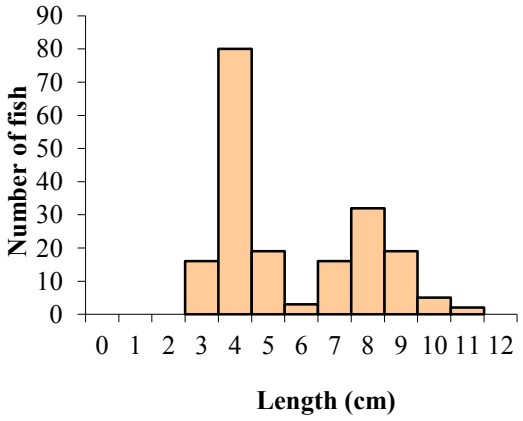

Fig. 4.137. Length frequency distribution of salmon in the River Moy, 2016 (n=192).

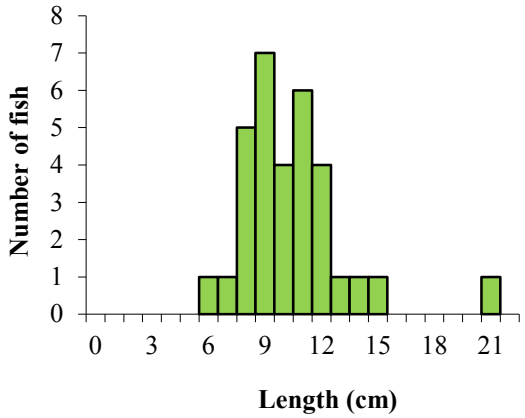

Fig. 4.138. Length frequency distribution of roach in the River Moy, 2016 (n=32).

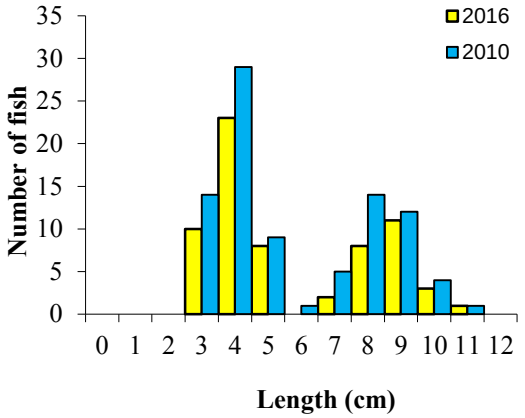

Fig. 4.140. Length frequency distribution of salmon in the River Moy (Site 1), 2010 (n=89) and 2016 (n=66).

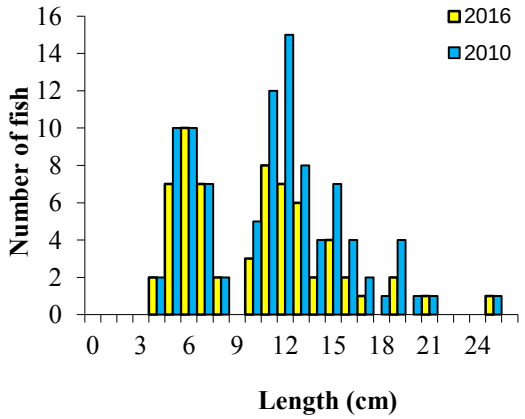

Fig. 4.139. Length frequency distribution of brown trout in the River Moy (Site 1), 2010 (n=96) and 2016 (n=65).

4.6.3 Owendalluleegh River

The Owendalluleegh River is located near Gort, Co. Galway. It flows in a south-westerly direction into Lough Cutra after which it disappears into karst drains and fissures which eventually drain into the sea at Kinvarra Bay (Gill *et al*., 2013). A large landslide occurred in the upper part of the catchment in 2003, near Derrybrien, resulting in a major fish kill on the river. Three sites were surveyed on the Owendalluleegh River, near Gort, Co. Galway on the 19th of September 2016 (Fig. 4.141; Table 4.114). All sites were wadeable, two were surveyed using the ADEF method and one surveyed using the TEF method. Site 1 is a WFD SM site and was surveyed previously.

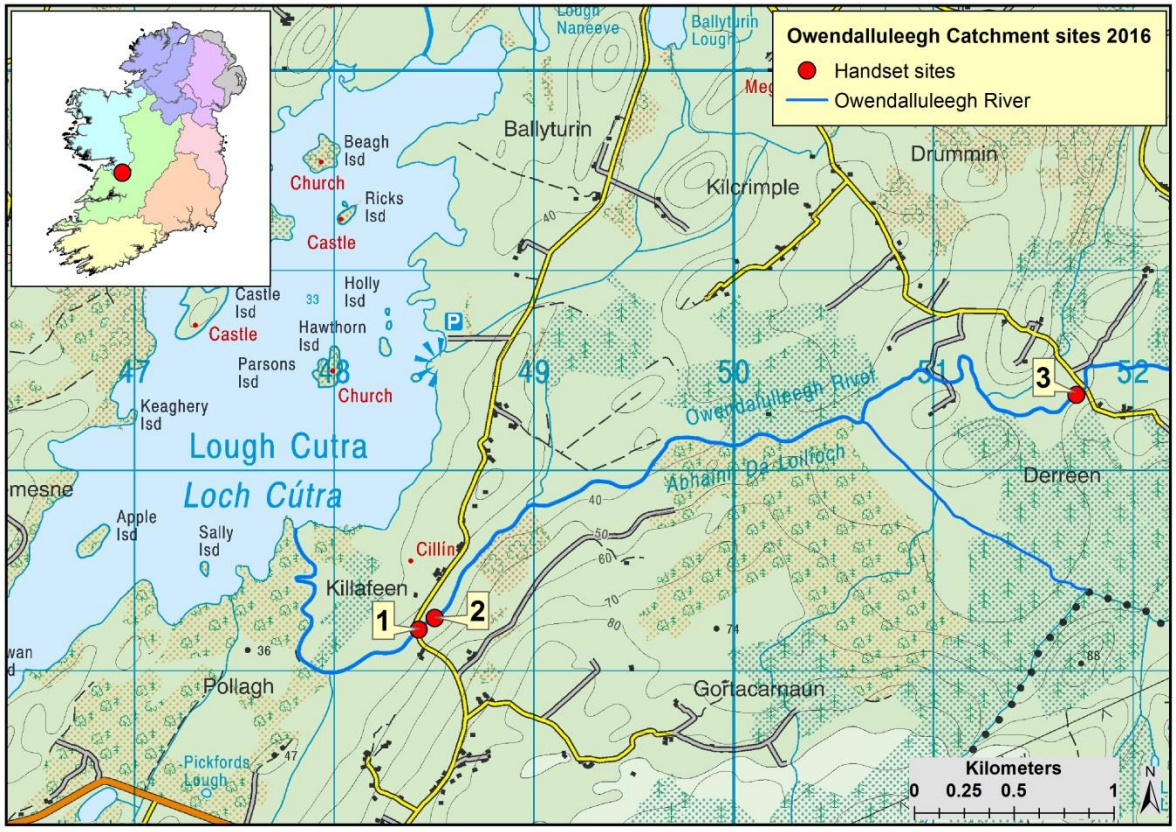

Fig. 4.141. Owendalluleegh River survey sites, 2016

Table 4.114. Sites surveyed on the Owendalluleegh River, 2016

No.	River	Site	Method	WFD	Date
1	Owendalluleegh	Br. SE Killafeen_A	ADEF (Hand)	Yes	19/09/2016
2	Owendalluleegh	Killafeen Field_A	TEF (Hand)	No	19/09/2016
3	Owendalluleegh	Dereen_A	TEF (Hand)	No	19/09/2016

Six fish species were recorded in the Owendalluleegh River in 2016 (Table 4.115). Brown trout and stone loach were the only species caught at all three sites. The highest density of fish was recorded at Site 1, the most downstream site and these were predominantly brown trout.

Three age classes of brown trout were recorded across the three sites, 0+, 1+ and 2+ (Table 4.116). The combined length

frequency for brown trout for all three sites is shown below (Fig. 4.142**Fig.**) as well as the length frequency distribution of brown trout at Site 1, which had been surveyed on two previous occasions (Fig. 4.143).

Table 4.115. Minimum density of fish (no. /m^2), Owendalluleegh River, 2016

	Site 1			Site 2	Site 3
Species	**2009**	**2013**	**2016**	**2016**	**2016**
Brown trout	0.067	0.070	0.029	0.004	0.026
0+ brown trout	0.015	0.010	0.004	0.004	0.018
1++ Brown trout	0.052	0.059	0.025	0.000	0.008
European eel	0.008	0.031	0.004	-	0.004
Gudgeon	0.004	0.003	0.002	-	-
Lamprey sp.	0.002	0.003	-	-	0.003
Perch	0.002	0.003	0.004	-	-
Stone loach	0.015	0.003	0.006	0.023	0.003
All Fish	0.099	0.111	0.045	0.027	0.035

Table 4.116. Percentage catch for aged species in the Owendalluleegh River, 2016

		% catch		
Species	**Site**	**0+**	**1+**	**2+**
Brown trout	3	67	22	11
	2	100	-	-
	1	13	70	17

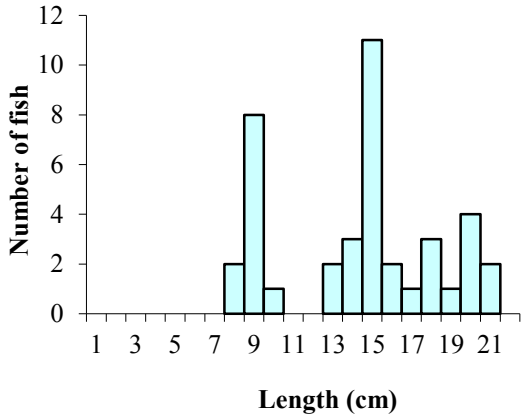

Fig. 4.142. Length frequency distribution of brown trout in the Owendalluleegh River, 2016 (n=40).

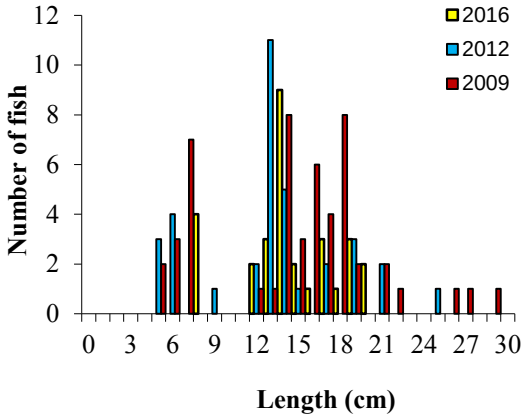

Fig. 4.143. Length frequency distribution of brown trout in the Owendalluleegh River (Site 1), 2009 (n=51), 2013 (n=35) and 2016 (n=30).

4.6.4 Community structure and distribution

A total of 17 fish species (sea trout are included as a separate 'variety' of brown trout) and one hybrid were recorded within the 185 sites surveyed during 2016 (Table 4.117). Brown trout was the most common fish species recorded, occurring in 72% of sites, followed by salmon, stone loach, minnow, roach, three-spined stickleback, European eel, perch, pike, lamprey sp., gudgeon, roach x bream hybrids, bream, rudd, flounder, dace, rainbow trout and sea trout. No fish were recorded at four sites, the Glensaul River (Ballybanaun Mountain Tributary) at Carheen, Glensaul River at Greenaun, Srah River at Gortbunacullin and River Shannon at Hillquarter.

In contrast the highest total density of fish at any wadeable site in 2016 was recorded on the Glensaul River at Tonaglanna (1.240 fish/m^2), all of which were brown trout. For non-wadeable sites, the highest total density was recorded on the River Suir at Aughall Middle (0.259 fish/m^2); this was another site composed exclusively of brown trout fry.

Brown trout fry (0+) were present in 98 sites (Fig. 4.144) while older brown trout (1+ and older) were encountered in 118 sites (Fig. 4.145). As expected brown trout fry (0+) densities were generally higher in the small shallower wadeable streams than in the non-wadeable deeper river sites. In wadeable streams, the highest densities of brown trout fry (1.080 fish/m^2) and 1+ and older (0.253 fish/m^2) were recorded in the Glensaul River (Tonaglanna)(WRBD) and Nanny River (New Br. (North) (ERBD) sites respectively. In non-wadeable rivers sites, the highest densities of both brown trout fry (0+) (0.013 fish/m^2) and 1+ and older (0.259 fish/m^2) were captured in the Ara River (Lismacue) and River Suir (Aughall Middle) sites respectively, both within the SERBD.

Salmon were also widely distributed throughout many of the sites surveyed, being present in 68 sites (Fig. 4.146 and Fig. 4.147). Salmon fry (0+) were recorded in 48 sites (Fig. 4.146), while older salmon (1+ & older) were recorded in 55 sites (Fig. 4.147). Abundance of salmon followed a similar trend to that of brown trout, where fry (0+) densities were generally more abundant in shallow wadeable streams, than in non-wadeable deeper channels, sampled with boat based electric-fishing equipment. In wadeable streams, the highest densities of fry (0+) (0.325 fish/m^2) and 1+ and older fish (0.093 fish/m^2) were recorded in the Aherlow (Toureen) River (Toureen Peacaun) (SERBD) and Dinin River (Dinin Br.) (SERBD) sites respectively. For non-wadeable streams, the highest densities of salmon fry (0+) (0.011 fish/m^2) and 1+ and older fish (0.074 fish/m^2) were captured in the Anner River (Killusty Wood) (SERBD) and Eany Water (Just d/s Eany Beg/More confl) (NWIRBD) respectively.

Stone loach was the third most frequently encountered species, captured at 62 sites (Fig. 4.148) The greatest density of stone loach was recorded in the Dinin River (Dinin Br.) (0.076 fish/m^2).

Minnow were recorded in 55 river sites (Fig. 4.149) with their greatest density (0.524 fish/m^2) also recorded in the Dinin River (Dinin Br.) (SERBD).

Roach were recorded at 53 river sites (Fig. 4.150) The greatest density of roach (0.269 fish/m^2) was recorded in the Cullies River (Br. nr Kilbracken House) (NWIRBD).

Three-spined stickleback was present in 41 of the river sites surveyed (Fig. 4.151). Their highest density (0.503 fish/m^2) was recorded in the Mayne River (Snugborough) (SERBD).

Perch were recorded at 37 sites (Fig. 4.152). Their highest density (0.023 fish/m^2) was

recorded in the Scariff River at Derrynahelia in the SHIRBD.

European eel was captured at 40 sites (Fig. 4.153Its highest density (0.112 fish/m^2) was also recorded in the Mayne River (Snugborough) (ERBD).

Juvenile lampreys were recorded in 23 river sites (Fig. 4.154), with their highest density (0.110 fish/m^2) recorded in the Athboy (Bunboggan) River at Bunboggan in the ERBD.

Pike were captured at 26 river sites (Fig. 4.155) with their highest density (0.014 fish/m^2) recorded in the Cullies River (Br. nr Kilbracken House) in the NWIRBD.

Gudgeon were recorded at 21 river sites (Fig. 4.156), with the Cullies River (Br. nr Kilbrackan House) (NBIRBD) again recording the highest density (0.054 fish/m^2).

Roach x bream hybrids were caught at 14 sites (Fig. 4.157), with their highest density (0.003 fish/m^2) also recorded in the Cullies River (Br. nr Kilbracken House) (NWIRBD).

Bream, rudd and flounder were relatively rare during the 2016 surveys and only captured in small numbers. Bream (Fig. 4.159) were caught at only four sites, rudd at three (Fig. 4.158) and flounder (Fig. 4.161) at only two. Bream and rudd were only recorded in the River Shannon during the pulsed-boom boot surveys and flounder only in locations relatively close to the sea, in the Mayne and Sluice Rivers (ERBD).

Dace (Fig. 4.160), sea trout (Fig. 4.162) and rainbow trout (Fig. 4.163) were recorded at only one site each and at these, only one individual was recorded.

Table 4.117. List of fish species recorded in the 185 river sites surveyed during 2016

	Species name	Common name	Number of river sites	% of river sites
1	Brown trout	*Salmo trutta fario*	134	72.4
	0+ Brown trout	0+ *Salmo trutta fario*	98	53.0
	1++ Brown trout	1++ *Salmo trutta fario*	118	63.8
2	Salmon	*Salmo salar*	68	36.8
	0+ Salmon	0+ *Salmo salar*	48	25.9
	1++ Salmon	1++ *Salmo salar*	55	29.7
3	Stone loach	*Barbatula barbatula*	62	33.5
4	Minnow	*Phoxinus phoxinus*	55	29.7
5	Roach	*Rutilus rutilus*	53	28.6
6	Three-spined stickleback	*Gasterosteus aculeatus*	41	22.2
7	European eel	*Anguilla anguilla*	40	21.6
8	Perch	*Perca fluviatilis*	37	20.0
9	Pike	*Esox lucius*	26	14.1
10	Lamprey sp.	*Lampetra sp.*	23	12.4
11	Gudgeon	*Gobio gobio*	21	11.4
12	Roach x Bream Hybrid	*Rutilus rutilus x Abramis brama*	14	7.6
13	Bream	*Abramis brama*	4	2.2
14	Rudd	*Scardinius erythrophthalmus*	3	1.6
15	Flounder	*Platichthys flesus*	2	1.1
16	Dace	*Leuciscus leuciscus*	1	0.5
17	Rainbow trout	*Oncorhynchus mykiss*	1	0.5
18	Sea trout	*Salmo trutta trutta*	1	0.5
	No fish present		4	2.2

*Sea trout are included as a separate “variety” of brown trout

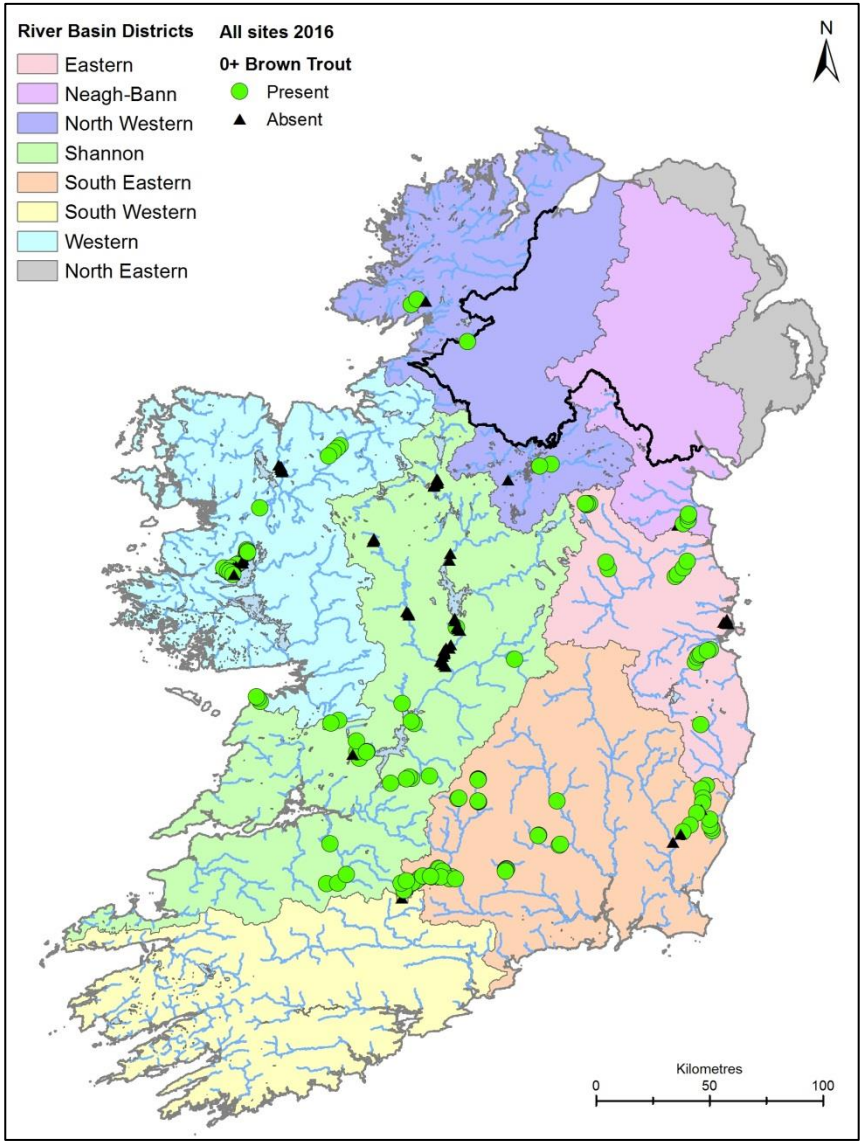

Fig. 4.144. Presence and absence distributionof 0+ brown trout at river sites surveyed in 2016

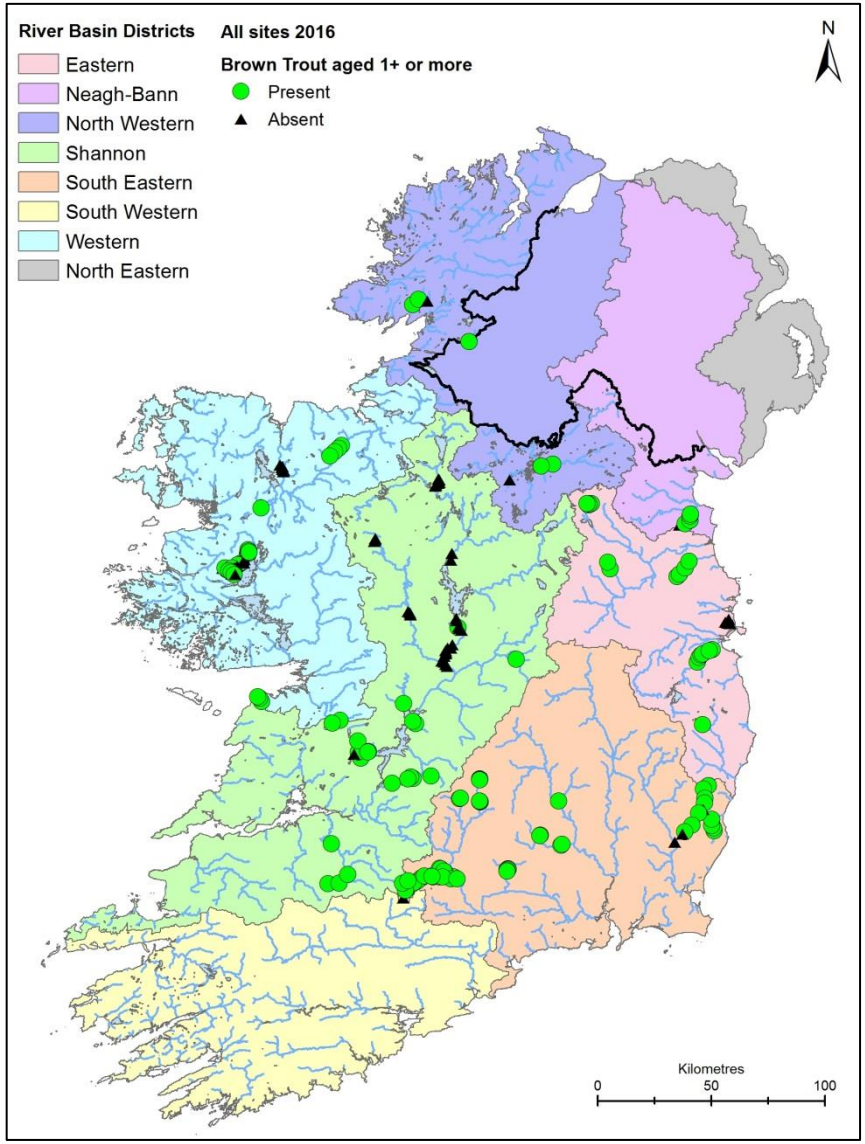

Fig. 4.145. Presence and absence distribution of 1+ and older brown trout at river sites surveyed in 2016

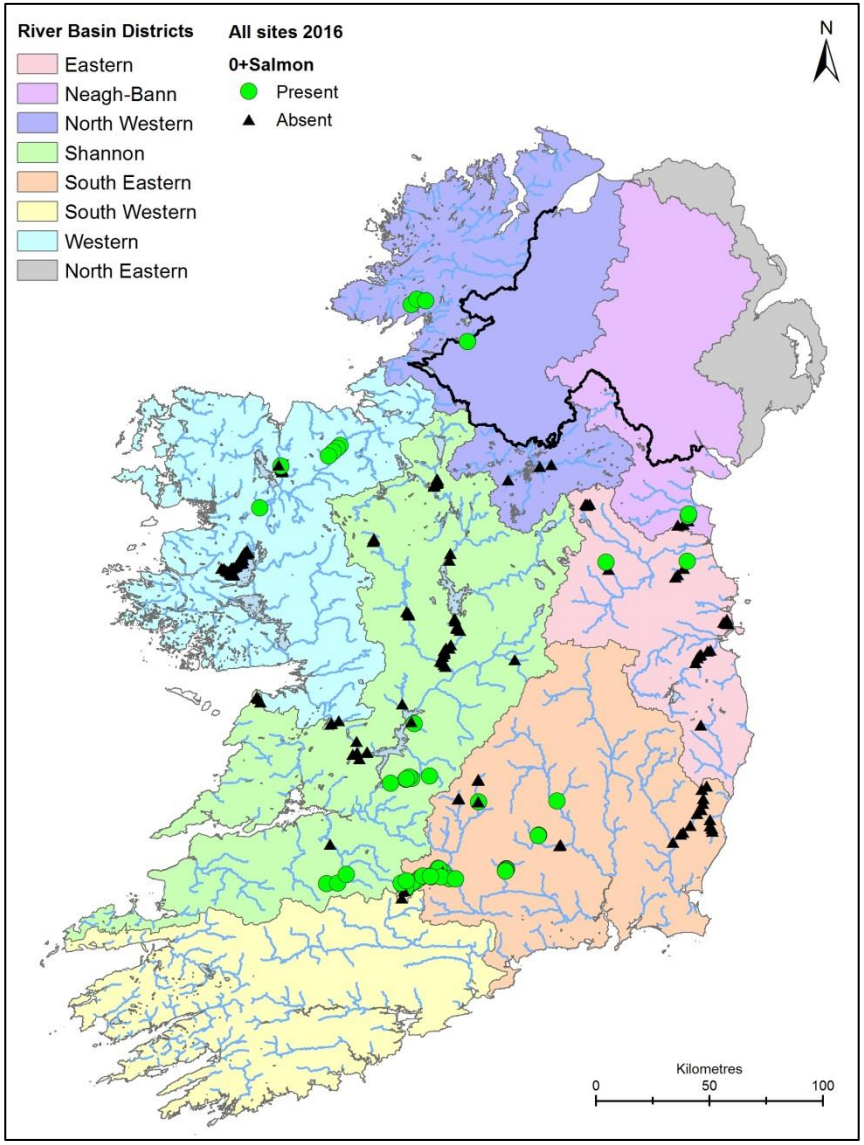

Fig. 4.146. Presence and absence distribution of 0+ salmon at river sites surveyed in 2016

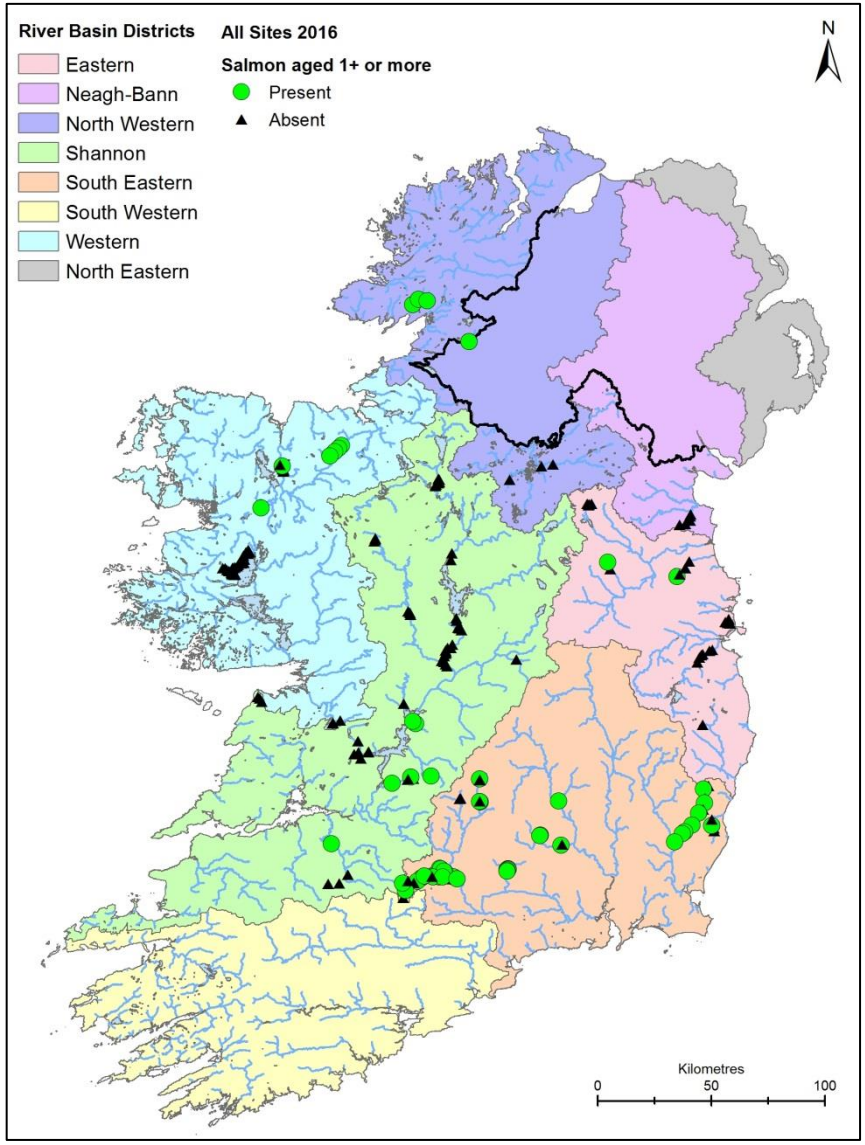

Fig. 4.147. Presence and absence distribution of 1+ and older salmon at river sites surveyed in 2016

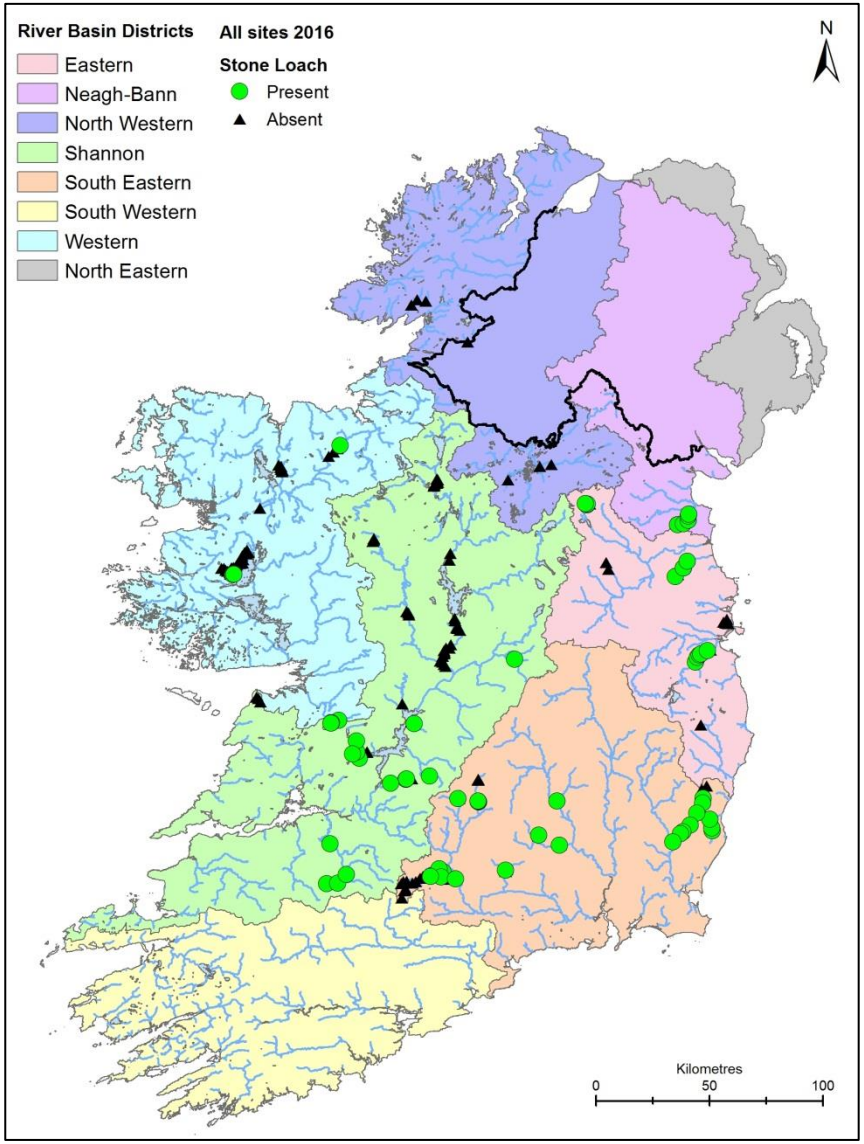

Fig. 4.148. Presence and absence distribution of stone loach at river sites surveyed in 2016

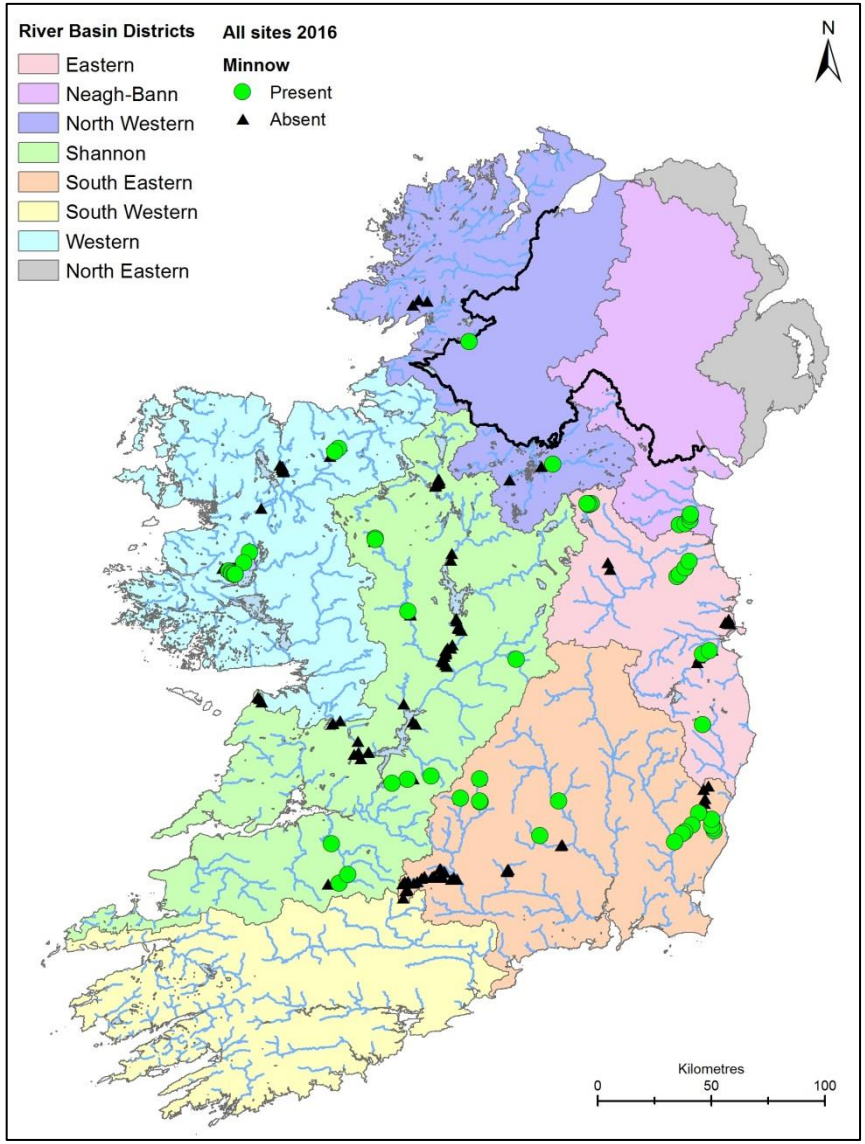

Fig. 4.149. Presence and absence distribution of minnow at river sites surveyed in 2016

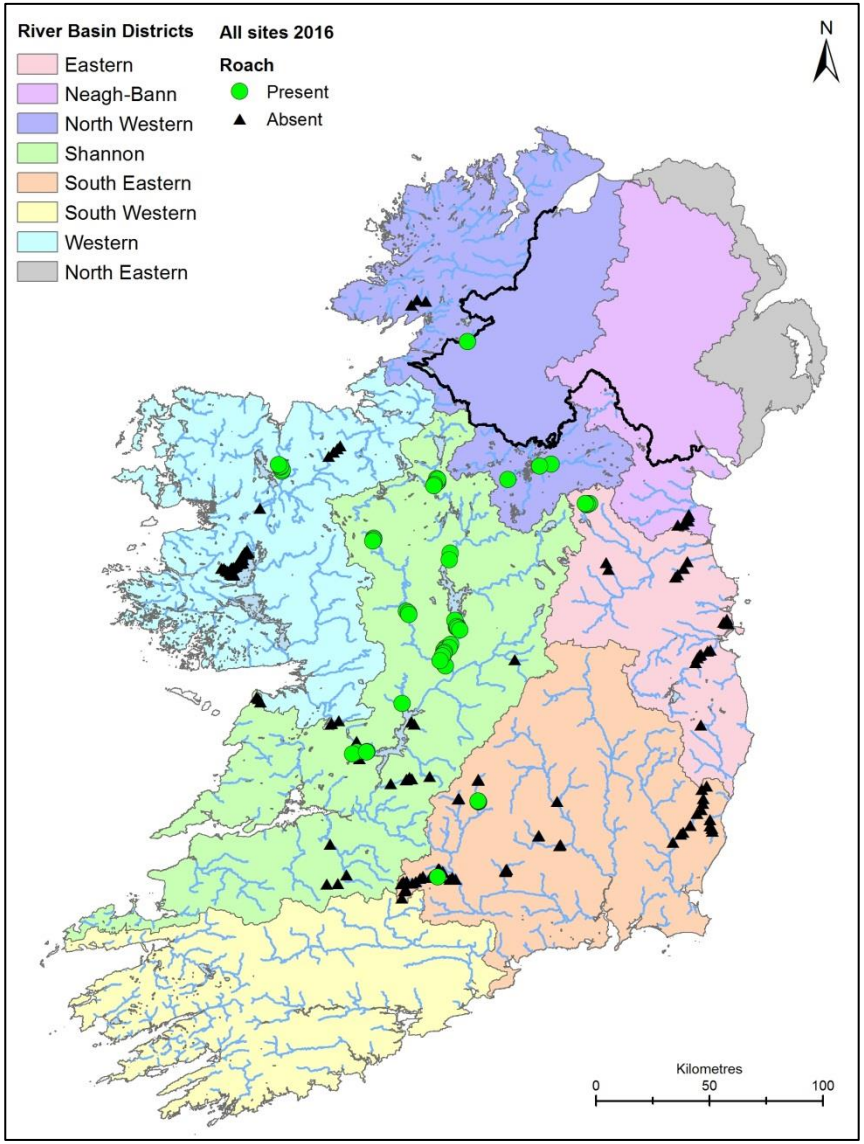

Fig. 4.150. Presence and absence distribution of roach at river sites surveyed in 2016

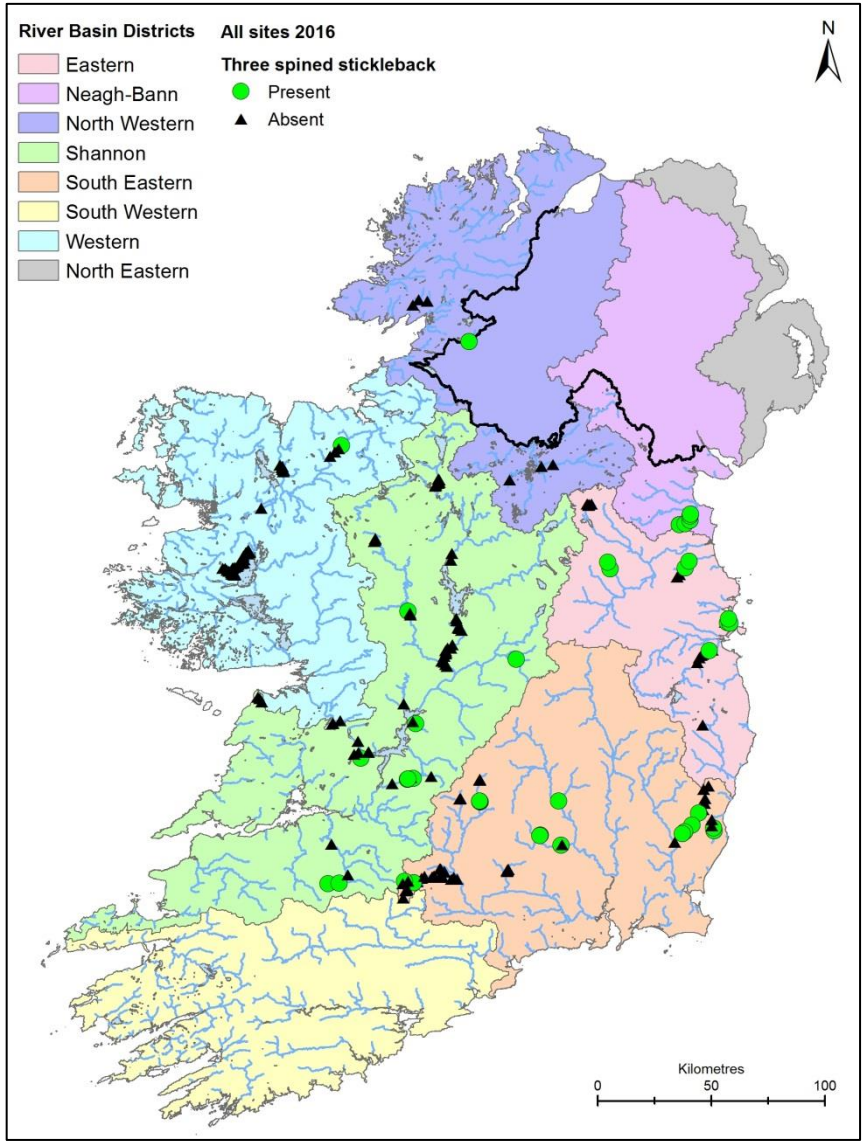

Fig. 4.151. Presence and absence distribution of three-spined sticklebackat river sites surveyed in 2016

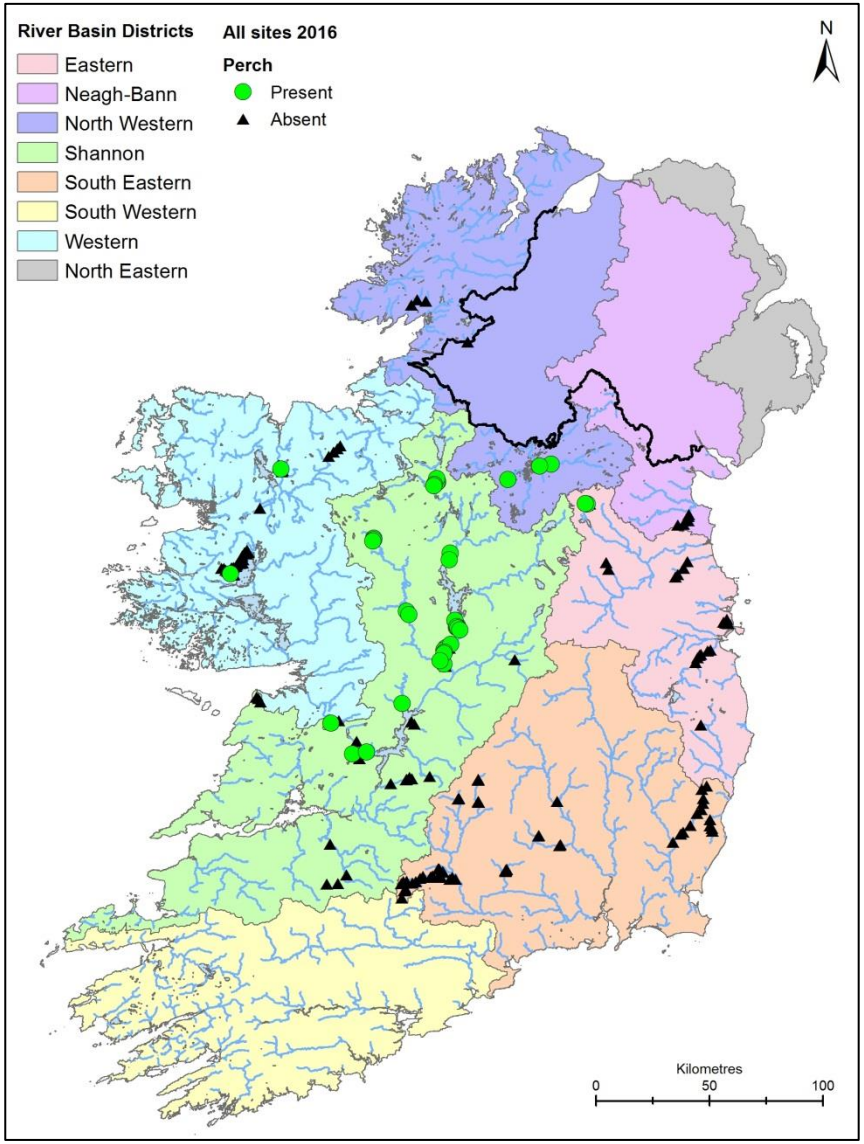

Fig. 4.152. Presence and absence distribution of perch at river sites surveyed in 2016

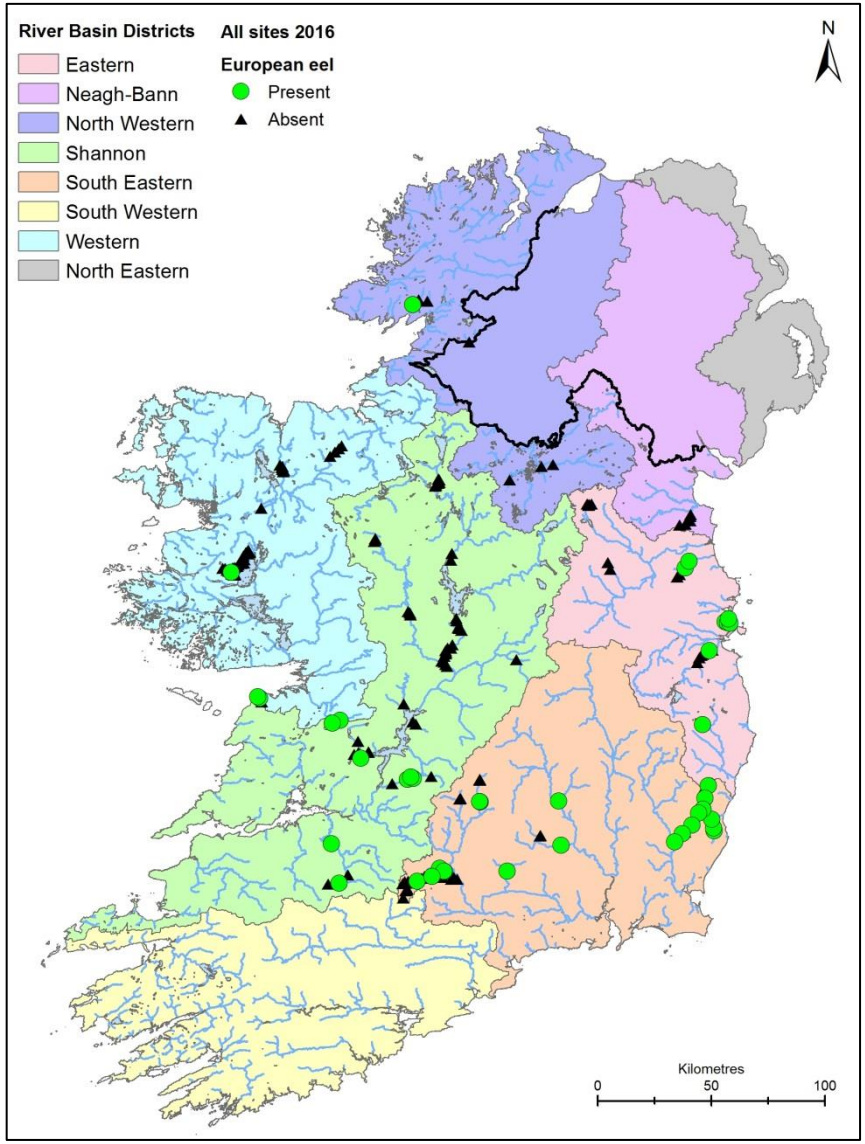

Fig. 4.153. Presence and absence distribution of European eel at river sites surveyed in 2016

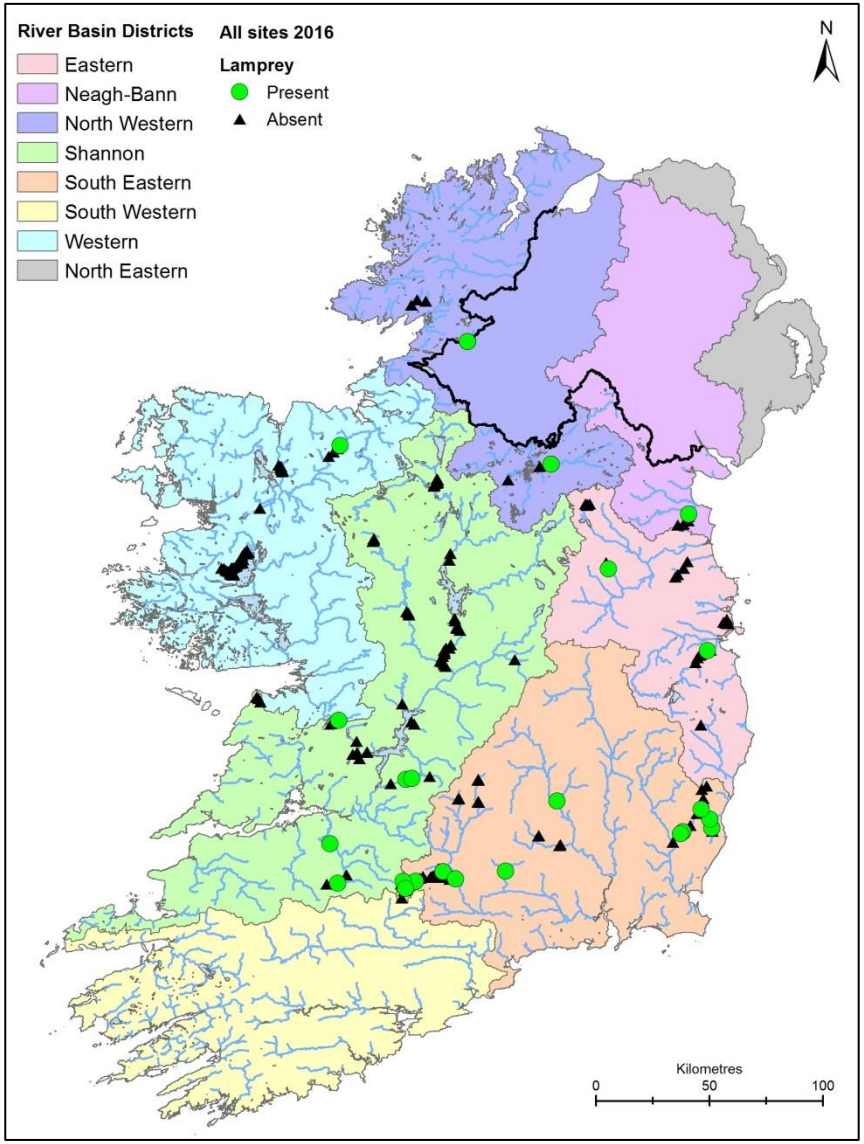

Fig. 4.154. Presence and absence distributionof lamprey sp. at river sites surveyed in 2016

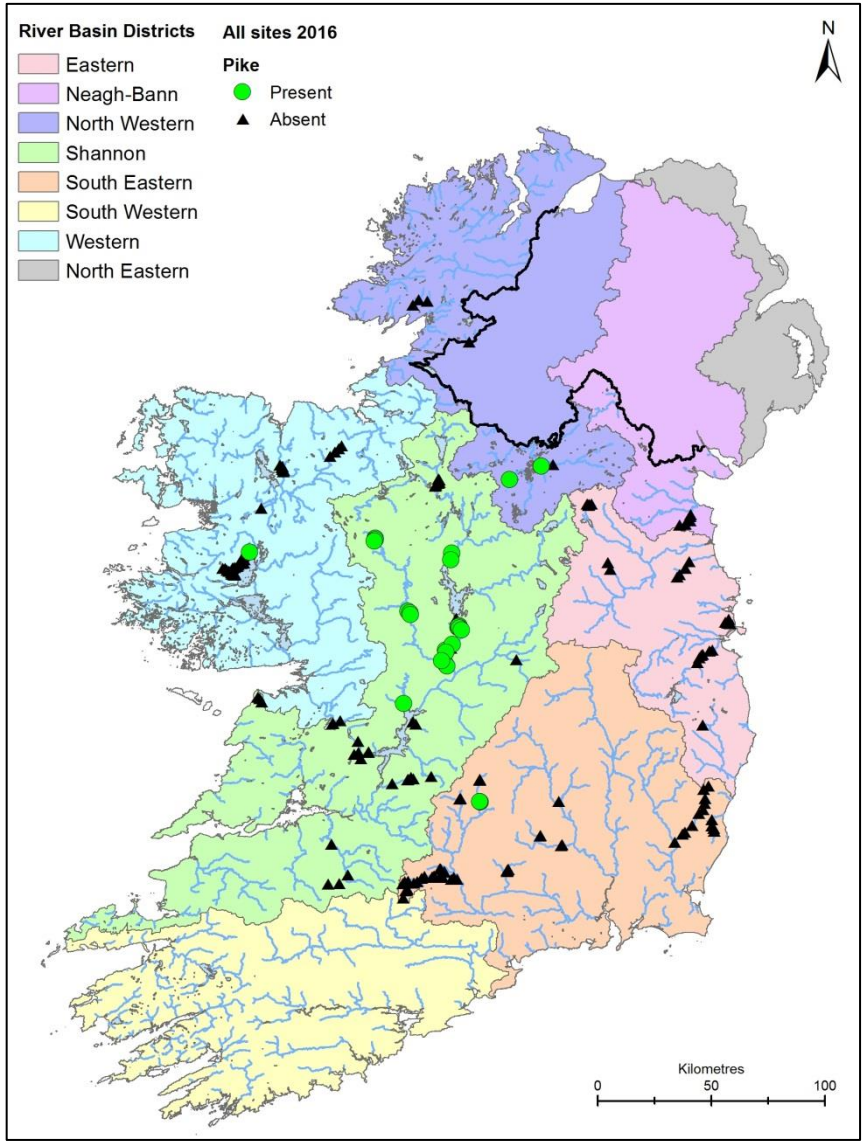

Fig. 4.155. Presence and absence distribution of pike at river sites surveyed in 2016

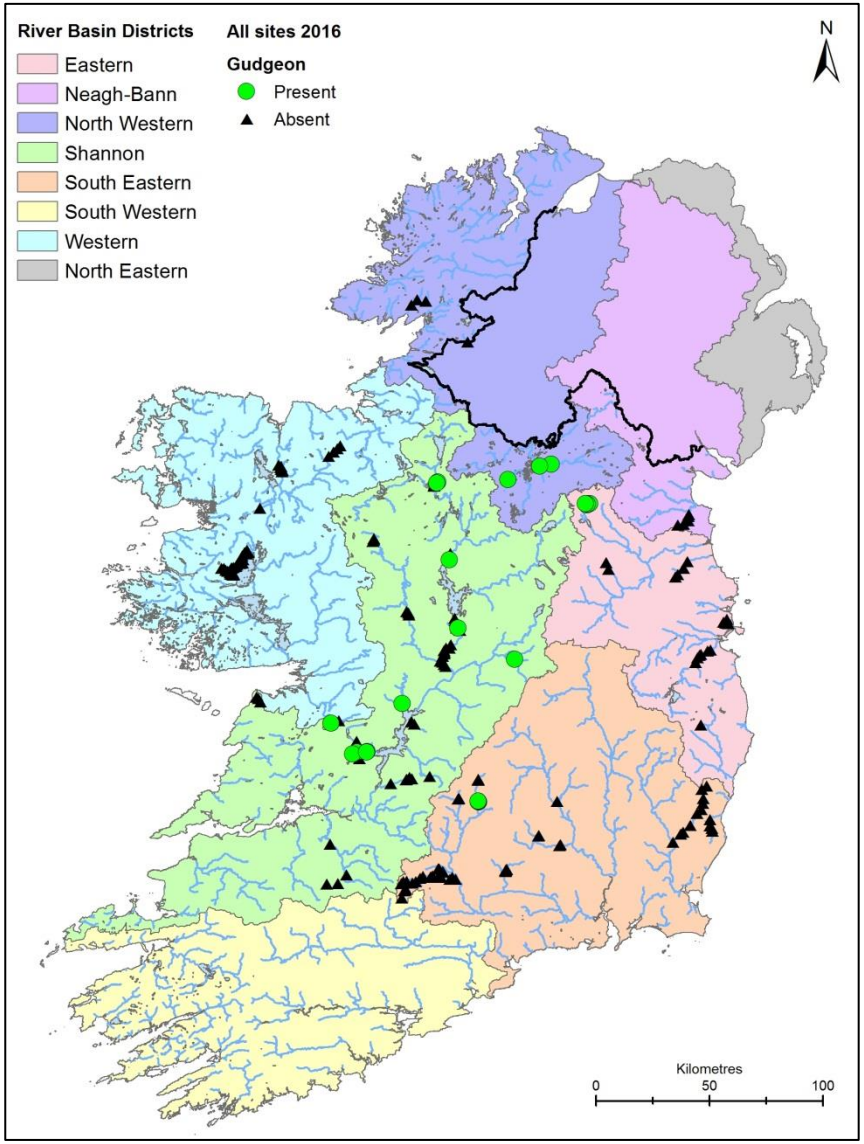

Fig. 4.156. Presence and absence distributionof gudgeon at river sites surveyed in 2016

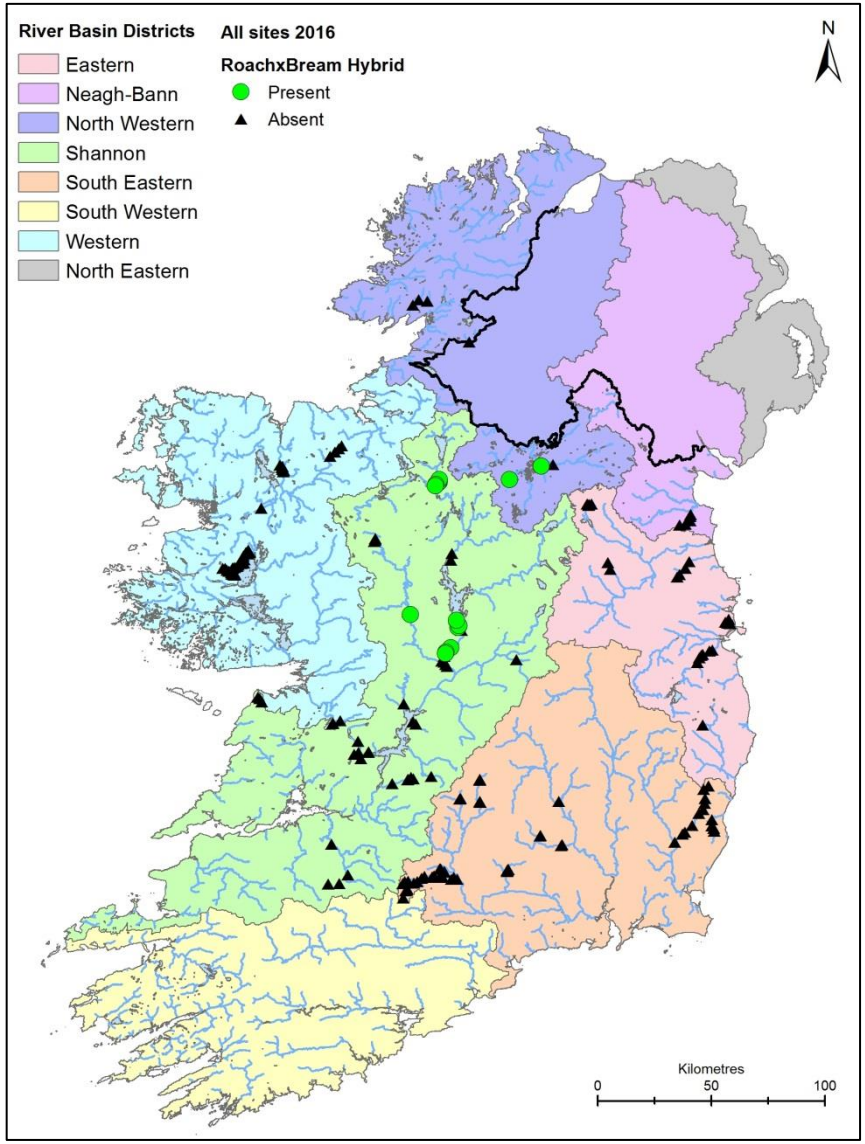

Fig. 4.157. Presence and absence distributionof roach x bream hybrids at river sites surveyed in 2016

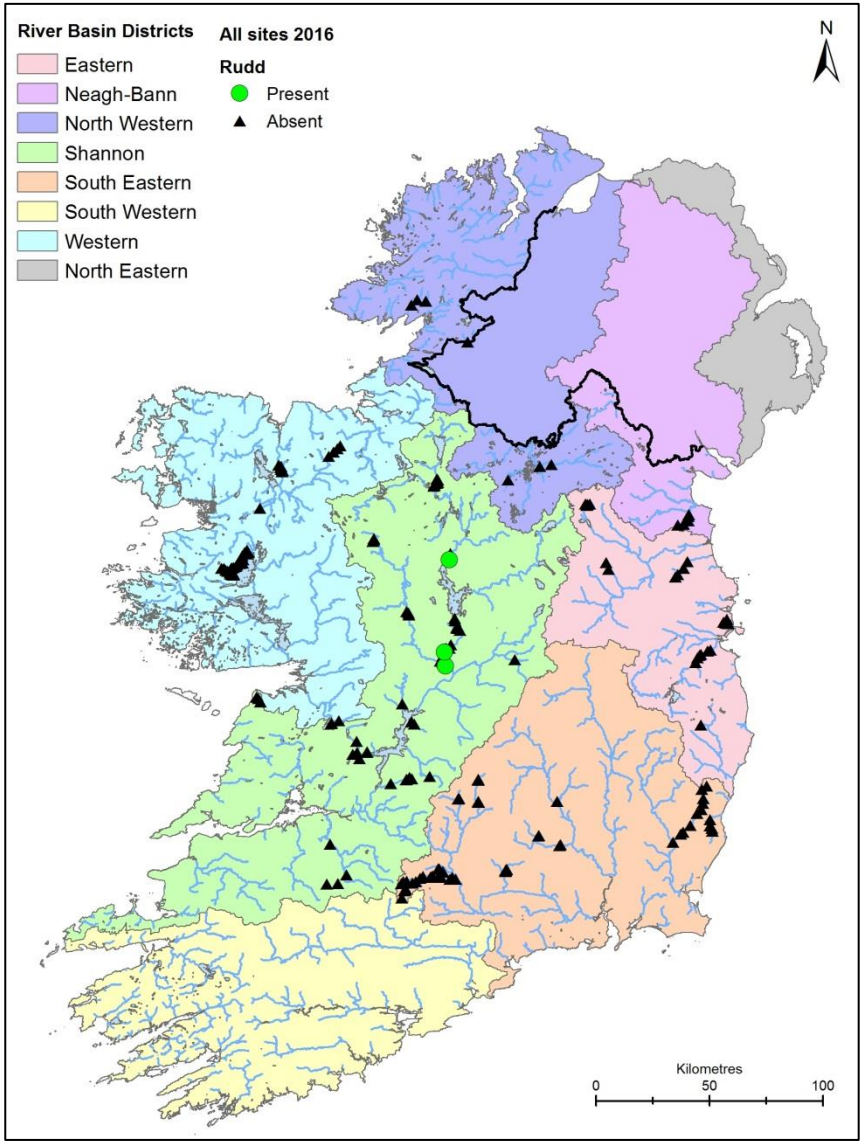

Fig. 4.158. Presence and absence distribution of rudd at river sites surveyed in 2016

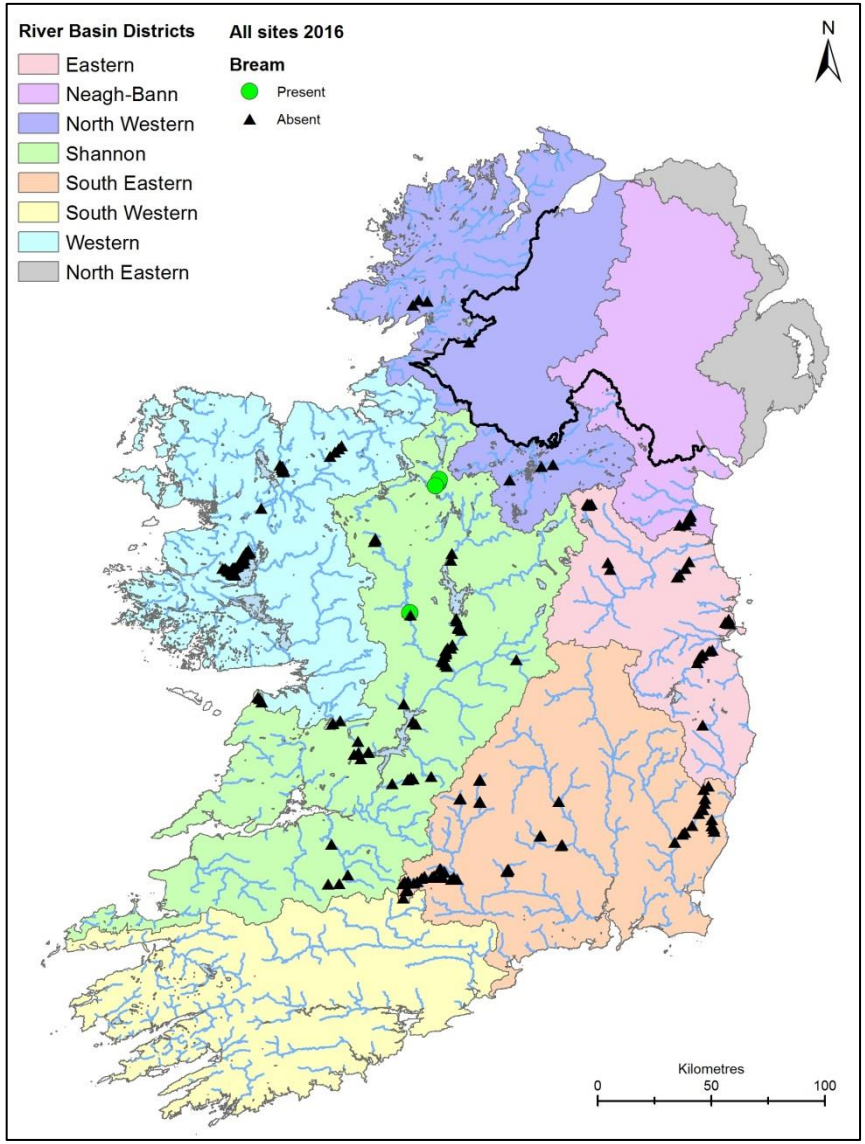

Fig. 4.159. Presence and absence distribution of bream at river sites surveyed in 2016

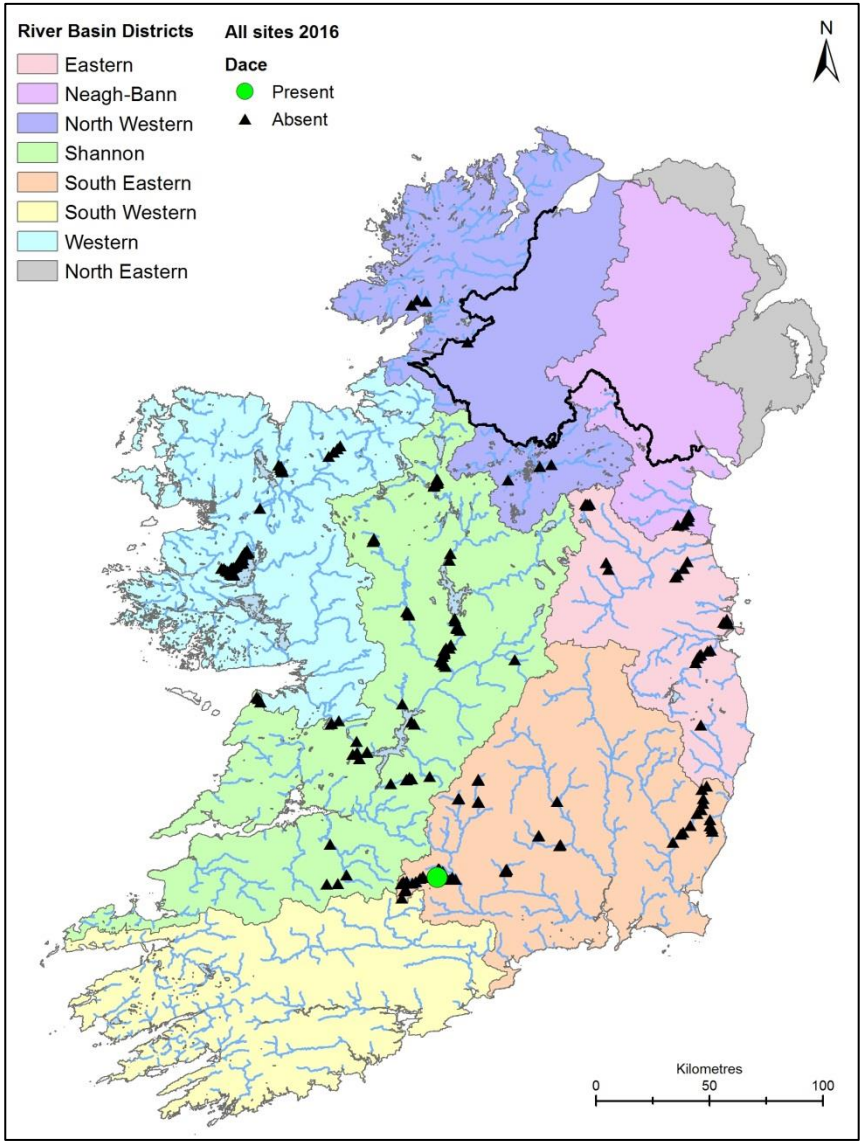

Fig. 4.160. Presence and absence distributionof dace at river sites surveyed in 2016

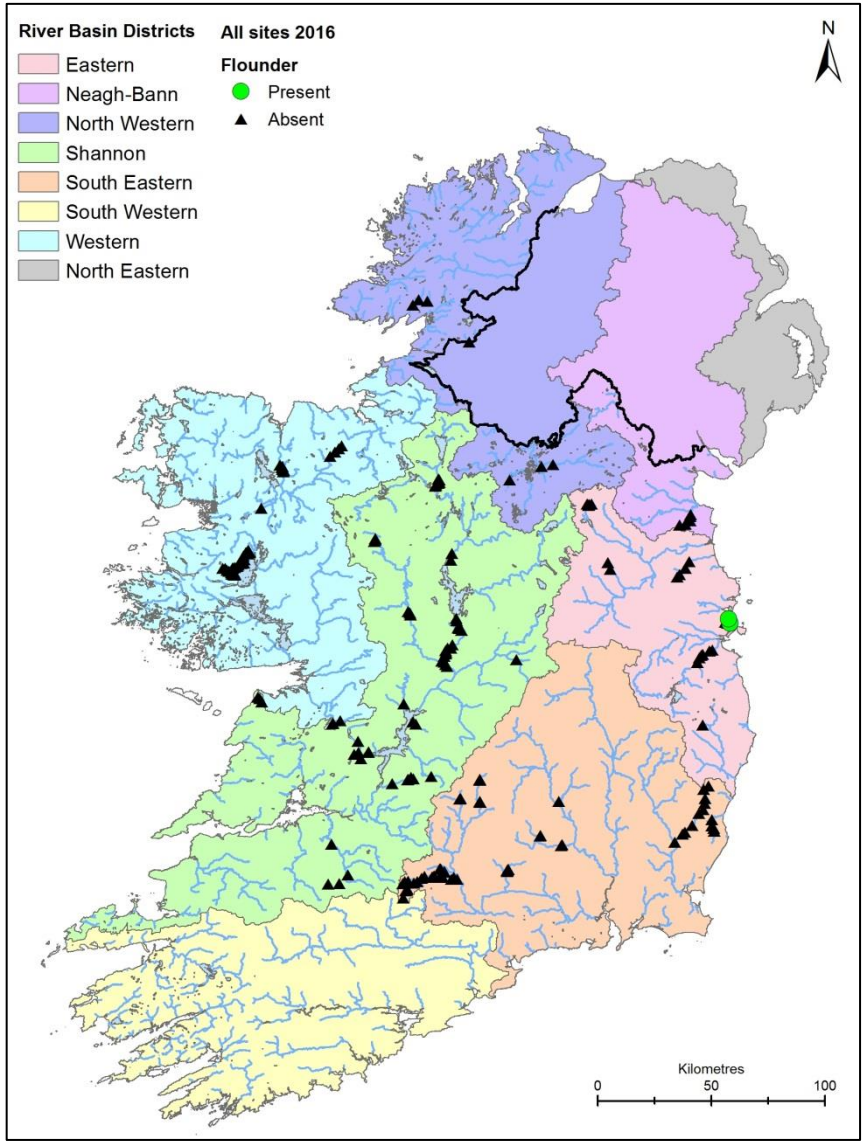

Fig. 4.161. Presence and absence distributionof flounder at river sites surveyed in 2016

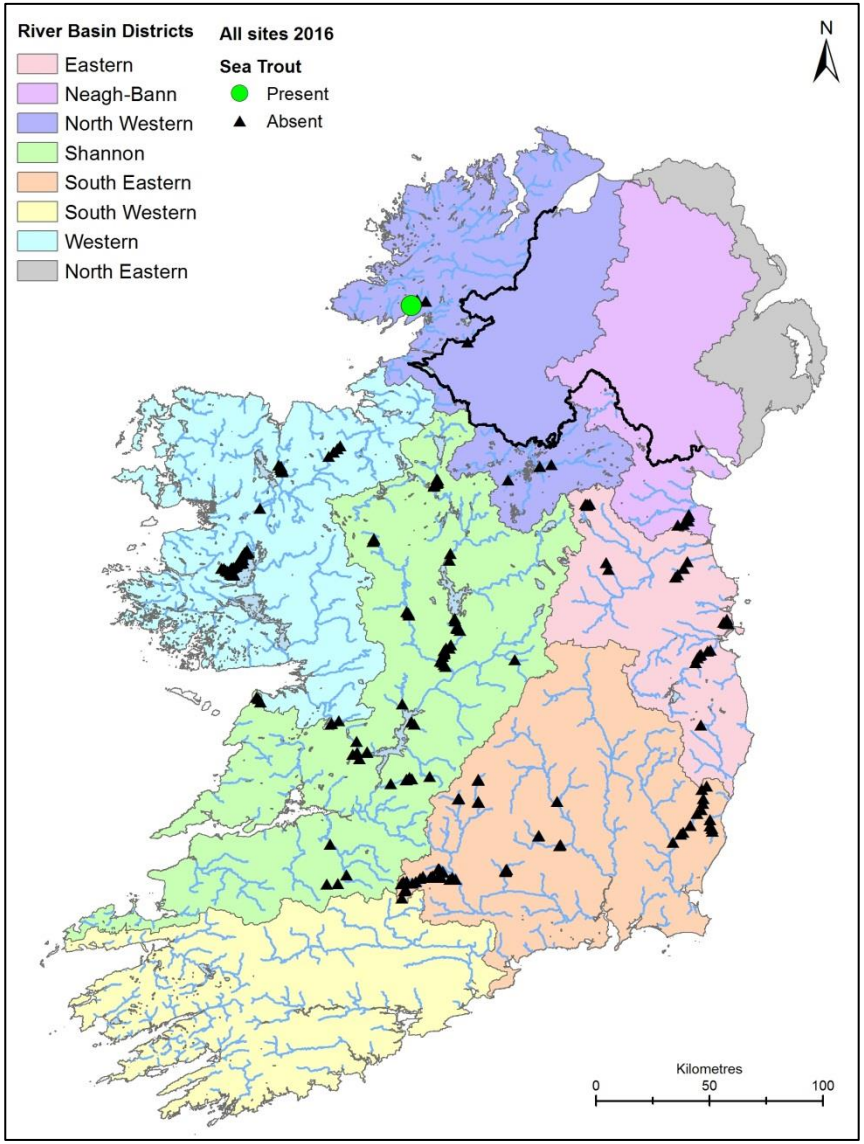

Fig. 4.162. Presence and absence distributionof sea trout at river sites surveyed in 2016

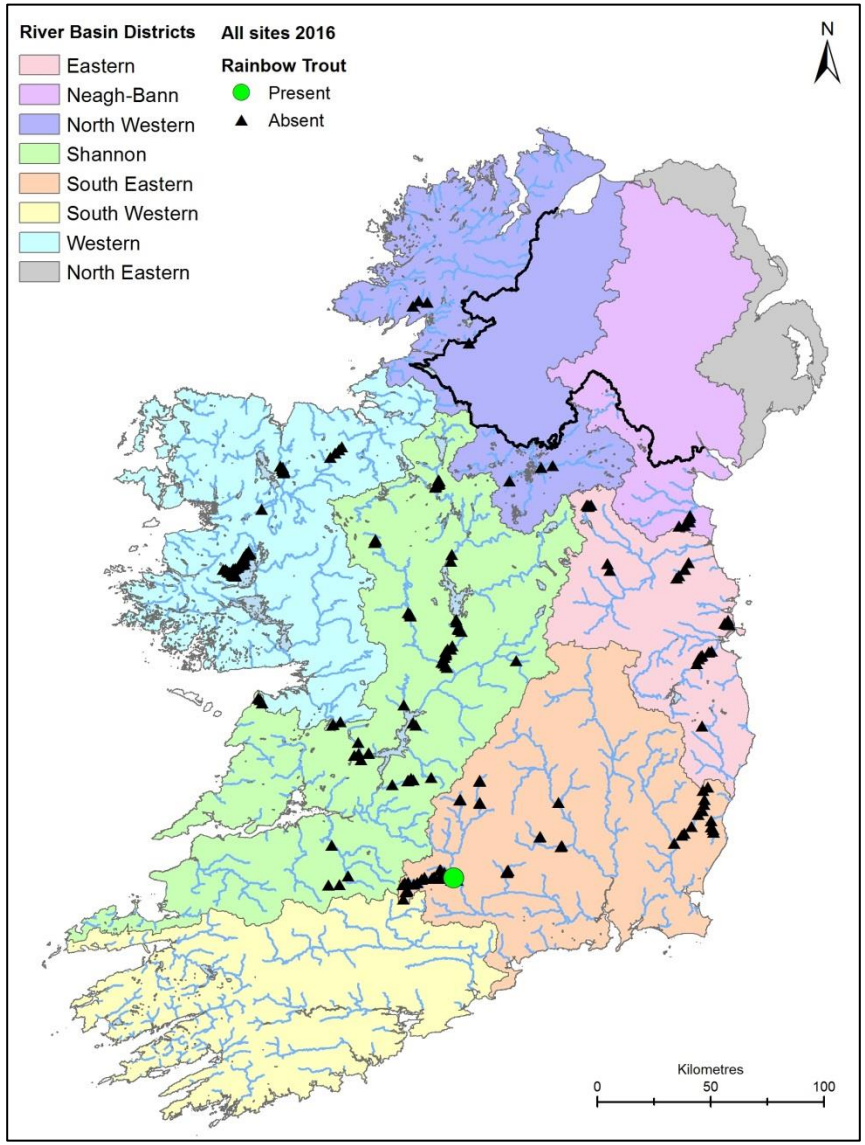

Fig. 4.163. Presence and absence distributionof rainbow trout at river sites surveyed in 2016

4.6.5 Age and growth

Brown trout aged 0+ and 1+ were the most abundant age cohorts (Fig. 4.165). Older brown trout cohorts were encountered much less frequently, with 3+ and 4+ individuals recorded in only 35 and 10 sites respectively (Fig. 4.165). The largest brown trout was caught in the River Maigue (Castleroberts Br._A), measured 43.9cm in length and was aged 3+. The mean back-calculated length-at-age data for brown trout, where individuals aged 1+ and older were recorded are shown in Appendix 4.

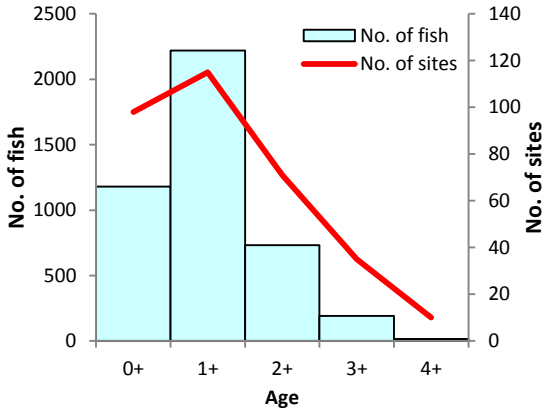

Fig. 4.165. Brown trout age composition and number of sites where they were recorded during 2016.

Brown trout at each river were assigned growth categories (Table 4.118) using length at age data (L1, L2, L3 and L4) (Matson and Kelly, in prep.). Two rivers recorded fast brown trout growth, the Ara River (SERBD) and Tullamore River (SHIRBD), 28 rivers were assigned moderate and two had brown trout that were assigned slow growth (Table 4.119).

Dace were only recorded at one site, the Aherlow River (Ashgrove Br._A). Only three individuals were caught and all were aged 4+.

Pike were recorded at 26 sites, with seven age classes recorded (0+ to 6+) (Fig. 4.166). Individuals aged 1+ and 3+ were the most frequently encountered age cohorts (Fig. 4.166). The largest pike (6+) was recorded on the River Shannon (d/s of Costello's Island_A) and measured 93.5cm. The mean back-calculated length-at-age data for pike, where individuals aged 1+ and older were recorded are shown Appendix 5.

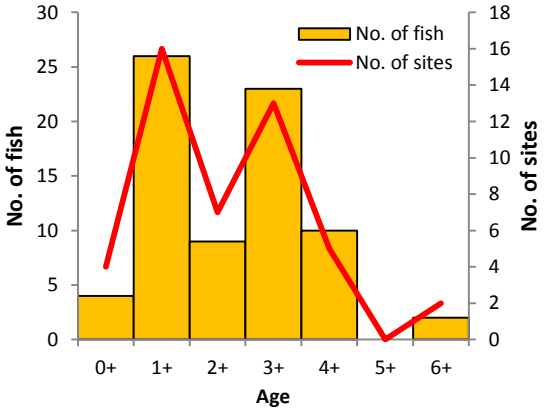

Fig. 4.166. Pike age composition and number of sites where they were recorded during 2016.

Roach were captured at 53 sites (Fig. 4.167). Eleven age classes were recorded, ranging in age from 0+ to 10+, with individuals aged 3+ the most frequently encountered cohort (Fig. 4.167). The largest roach (10+) was recorded in the River Shannon (Curley's Island Backwater_A) and measured 33cm. The mean back-calculated length-at-age data for roach, where individuals aged 1+ and older were recorded, are shown in Appendix 6.

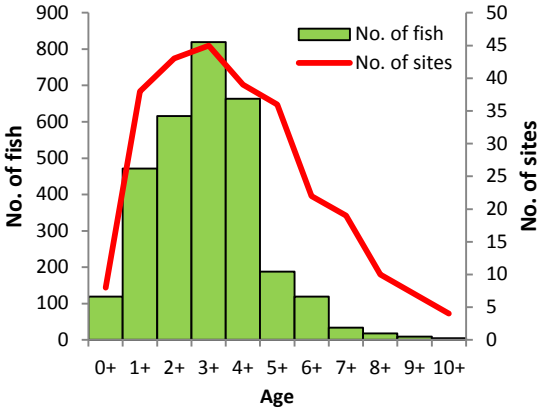

Fig. 4.167. Roach age composition and number of sites where they were recorded during 2016.

Roach x bream hybrids were observed at 14 sites, with 10 age classes recorded (Fig. 4.168). Individuals within the 4+ cohort were the most frequently encountered, although this number was still relatively low when compared with other species (Fig. 4.168). The largest roach x bream hybrid was caught in the River Shannon (Battle Br. B_A), measured 39.3cm and was aged at 12+. The mean back-calculated length-at-age data for roach x bream hybrids are shown in Appendix 7.

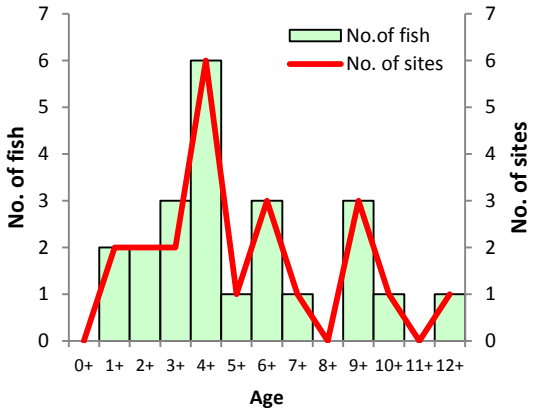

Fig. 4.168. Roach x bream age composition for 2016 sites.

Bream were only caught at one site (Appendix 3).

Four age classes (1+ nto 4+) of rudd were recorded at only three sites on the River Shannon captured, 1+ to 4+. 2+ was the most abundant cohort, albeit with very low numbers caught (Fig. 4.169) (Appendix 8).

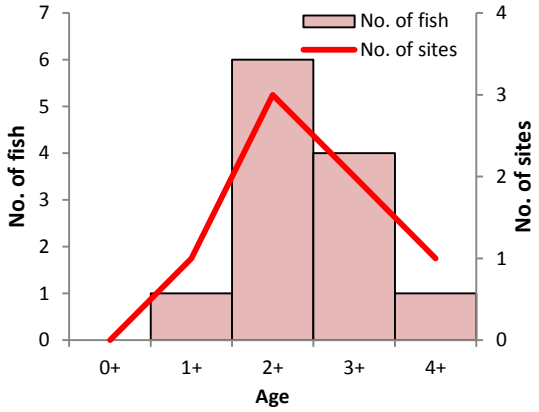

Fig. 4.169. Rudd age composition and number of sites where they were recorded during 2016.

Salmon were recorded at 68 sites, with three age classes (0+ to 2+) (Fig. 4.170). Individuals within the 1+ and 0+ were the most common cohorts respectively. Five sites recorded salmon aged 2+ (Fig. 4.170). Adult salmon were observed at a number of sites including the Eany Water and River Moy. The mean back-calculated length-at-age data for salmon, where individuals aged 1+ and older were recorded are shown Appendix 9.

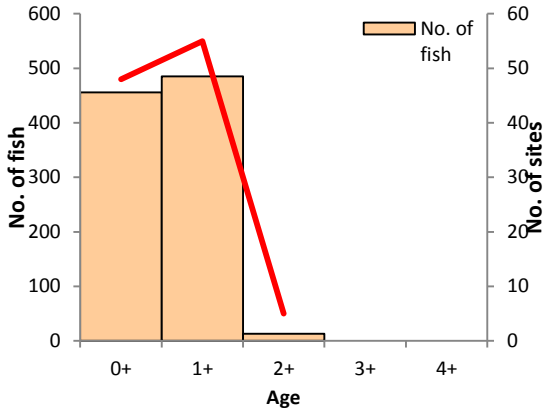

Fig. 4.170. Salmon age composition for 2016 sites.

Sea trout were only recorded in the Eany Water (Just d/s Eany Beg/More confl_A). This fish was a 2+ Finnock, measuring 28cm and weighing 258g.

Table 4.118. Length at age limits for each growth category (Matson and Kelly, in prep)

Growth Category	L1	L2	L3	L4
Very Slow	<5	<10	<14.5	<20
Slow	5 to 5.5	10 to 12	14.5 to 18	20 to 24
Moderate	5.5 to 9	12 to 18.5	18 to 24.5	24 to 32
Fast	9 to 10	18.5 to 21.5	24.5 to 29.5	32 to 36.5
Very Fast	>10	>21.5	>29.5	>36.5

Table 4.119. Categories of brown trout growth in the river sites surveyed in 2016

RBD	River	Growth category
ERBD	Glenealo River	Slow/moderate
	Athboy River	Moderate
	Blackwater (Kells), River	Moderate
	Dodder, River	Moderate
	Nanny (Meath), River	Moderate
NBIRBD	White River (Louth)	Moderate
SERBD	Ara River	Fast
	Aherlow River	Moderate
	Anner River	Moderate
	Bann, River	Moderate
	Cromoge River	Moderate
	Dinin River	Moderate
	King's (Kilkenny) River	Moderate
	Owenavorragh River	Moderate
	Suir, River	Moderate
SHIRBD	Tullamore River	Fast
	Ballyfinboy River	Moderate
	Kilcrow River	Moderate
	Killmastulla River	Moderate
	Maigue, River	Moderate
	Nenagh River	Moderate
	Scarrif River	Moderate
	Cross River	Slow/moderate
NWIRBD	Annalee River	Moderate
	Eany Water	Moderate
	Waterfoot River	Moderate
WRBD	Caher River	Moderate
	Glensaul River	Moderate
	Moy, River	Moderate
	Owenbrin River	Moderate
	Owendalluleegh River	Moderate
	Srah River	Moderate

5. 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. The Fisheries Classification Scheme 2 for Ireland (FCS2-Ireland) has been developed to assign ecological status to fish in rivers for the Republic of Ireland and Northern Ireland to comply with the requirements of the WFD (Sniffer, 2011). FCS2-Ireland is a geostatistical model based on Bayesian probabilities that make 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 (Sniffer, 2011). 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 status class, with the highest class probability being the overall classification (SNIFFER, 2011). The tool has been intercalibrated in a cross-Europe exercise (EC, 2013).

Using this tool and expert opinion, many of the sites surveyed in 2016 were assigned a draft fish classification status (Table 4.120). Where applicable, the status is also given for previous surveys.

Three sites were assigned high fish status during 2016; these were located on the Srah and Glensaul rivers, WRBD and on a tributary of the Kilmastulla, ShIRBD (Table 4.120).

Good fish status was assigned to 42 sites; one in the ERBD, two in the NWIRBD, 17 in the SERBD, 9 in the SHIRBD and 12 in the WRBD (Table 4.120).

A total of eighty sites were assigned moderate fish status; 17 in the ERBD and NBIRBD, 2 in NWIRBD, 26 in SERBD, 20 in SHIRBD and 15 in WRBD (Table 4.120).

Forty five sites were assigned Poor status; 7 in ERBD and NBIRBD, 2 in NWIRBD, 11 in SERBD, 15 in SHIRBD and 7 in WRBD (Table 4.120).

Five sites were assigned Bad fish status. Three of these sites were located in the WRBD, one on the Srah River, one on the Glensaul fish and one on a small tributary flowing into Lough Mask. Further investigation is required at these sites to determine the cause of these failures.

When comparing the ecological status in 2016 with that from the previous survey, two sites showed an improvement in status, i.e. Ballyfinboy (Ballinderry Br.), ShIRBD, improved from Moderate to Good fish status and the Castlebar River (Br. 2.5 km d/s Castlebar), WRBD improved from Poor to Moderate fish status. However eight sites deteriorated; four of these were located in the ERBD (Athboy, Dodder and Mayne rivers), two in the SERBD (Aherlow and Ara rivers), one on the Ballydangan River (ShIRBD) and one on the Owenbrin River (WRBD).

Table 4.120. Draft fish ecological status for river sites surveyed in 2016. Previous status is included where applicable (*further investigation recommended)

River	Site name	2008	2009	2010	2011	2012	2013	2014	2015	2016
ERBD Sites										
Athboy, Bunboggan Trib	Bunboggan_A									M
Athboy	Br. nr Clonleasan Ho_A		G			G				P
Blackwater (Kells), Corratinner Trib	Corratinner North_A									M
Blackwater (Kells)	Beagh Glebe_A									P
Blackwater (Kells)	Gallon_A									M
Blackwater (Kells)	Killinkere Br._A									B*
Dodder	Bohernabreena_A				G		M	M	M	M
Dodder	Bushy Park_A						G	G	G	M
Dodder	Firhouse_A						M	M	M	M
Dodder	Knocklyon_A						G	G	G	M
Dodder	Mount Carmel Hospital_A				M		M	M	M	?
Dodder	Oldbawn_A						M	M	M	M
Glenealo	Br. d/s Upper Lake_A		G			M				M
Mayne, Cuckoo Trib	Limekiln Lane_A									B
Mayne	Snugborough_A									P
Mayne	Wellfield Br._A				M					P
Nanny (Meath), Hurley Trib	Boolies Little_A									M
Nanny (Meath), Hurley Trib	New Br. (North)_A									G
Nanny (Meath), Hurley Trib	Rathfeigh_A									M
Nanny (Meath)	Knockisland_A									M
Nanny (Meath)	Reask West_A									M
Sluice	Portmarnock Racetrack_A									P
NBIRBD Sites										
White (Louth)	Athclare_A						M	M	M	M
White (Louth)	Coneyburrow Br._B					M	P	P	M	M
White (Louth)	Dunleer_A						M	M	M	M
White (Louth)	Gibber's Br._A						M	M	M	M
White (Louth)	Martinstown Br._A						P	P	P	P
White (Louth)	Martinstown Wood_A									P
NWIRBD Sites										
Annalee	0.2km d/s Cavan R confl_A	M					M			M
Annalee	Drumaraw_A									M
Cullies	Br. nr Kilbrackan House_A			P			P			P
Eany Beg	Drumagraa_A									P
Eany More	Drumboarty_A									P
Eany Water	Just d/s Eany Beg/More confl_A	G				G				G
Waterfoot	Letter Br._A	G			G					G
SERBD Sites										
Aherlow	Ardrahin_A									P
Aherlow	Ballybrien North_A									M
Aherlow	Gortnafurra_A									G
Aherlow	Lyre_A									M
Aherlow	Moor Abbey_A									M

Table 4.120. (continued). Draft fish Ecological status for rivers sites surveyed in 2016, including previous status where applicable (*further investigation recommended)

River	Site name	2008	2009	2010	2011	2012	2013	2014	2015	2016
SERBD Sites (continued)										
Aherlow	North of Ballydavid_A									M
Aherlow	South of Drangan Beg_A									P
Aherlow	u/s Assaroola Confl._A									M
Aherlow	Ashgrove Br._A									M
Aherlow, Knockanebrack Trib	Knockanebrack_A									M
Aherlow, Knockastakeen Trib	Rossadrehid Br._A									G
Aherlow, Moneynaboola Trib	Moneynaboola_A									M
Aherlow, Rossadrehid Trib	Dromamarka Br._A									M
Aherlow, Toureen Trib	Toureen Peacaun_A									M
Aherlow	Killardy Br._A			G						M
Aherlow	Pollagh East_A									M
Aherlow, Assaroola Trib	u/s Aherlow Confl._A									G
Aherlow, (Clydagh) Trib	Gortaclivore_A									G
Aherlow, (Galbally) Trib	Galbally_A									B
Anner	Killusty North_A									M
Anner	Killusty Wood_A									M
Anner	Killusty_A							G		G
Anner	South of Killusty Br._A									G
Anner	West of Killusty Ringfort_A									G
Ara	Ara Br._A			H						G
Ara	Bansha Castle_A									G
Ara	Bansha_A							G		G
Ara	Grallagh_A									G
Ara	Lismacue_A									G
Bann	Bann Br._A									P
Bann	d/s Ballingarry Wood_A									M
Bann	Doran's Br._A									P
Bann	Grovemill_A									M
Bann	Island Br._A									M
Bann	Margerry's Br._A									P
Bann	Milltown Br._A									P
Bann	Milseoge Br._A									M
Bann	Pallis Br._A									G
Bann	Tinnabaum_A									G
Cromoge, Fishmoyne Trib	Magherareagh_A									P
Cromoge, Fishmoyne Trib	Pollagh_A									P
Dinin	Dinin Br._A		G							G
King's (Kilkenny)	Kells Br._A									M
King's (Kilkenny)	Killinny_A									M
King's (Kilkenny), Tullaroan Trib	Bigmeadow_A									G
King's (Kilkenny), Tullaroan Trib	Killaloe Br._A									G
Owenavorragh	Ballycanew Br._A									M
Owenavorragh	Ballyminaun_A									M

Table 4.120 (continued). Draft fish ecological status for river sites surveyed in 2016, including previous status where applicable (*further investigation recommended)

River	Site name	2008	2009	2010	2011	2012	2013	2014	2015	2016
SERBD Sites (continued)										
Owenavorragh	Coolock Beg_A									M
Owenavorragh	Killanagh_A									P
Suir	Aughall Middle_A									M
Suir	Eastwood_A									M
Suir	Knocknageragh Br._A	M		G				M		M
Suir	Rossestown_A									P
Suir	Rossestown_B									P
Suir	Rossestown_C									P
SHIRBD Sites										
Ballydangan	Br. u/s Shannon R. Confl_A			M						P
Ballyfinboy	Ballinderry Br._A						M			G
Ballyfinboy	Br. just u/s L. Derg_A		M				M			M
Caher	Br. 2 km d/s Formoyle_A		G							G
Caher	Derrynavanagh_A									M
Caher	Murroogh_A									M
Cross	Br. u/s Shannon River_A	M								M
Kilcrow	Ballyshrule Br._A	M				M				N/A
Killmastulla	Cappadine_A									G
Killmastulla	Carrow Br._A									G
Killmastulla	Erinagh Br._A									M
Killmastulla, Erinagh Trib	Gortnacleha_A									G
Killmastulla, Garryclogher Trib	Garryclogher_A									H
Maigue	Ballybane_A									M
Maigue	Bruree_A									M
Maigue	Fort Bridge East_A									M
Maigue	Castleroberts Br._A	M				M				M
Nenagh	Ballysoilshaun Br._A		G			G				G
Scariff (Anamullaghaun	Anamullaghaun Br._A									G
Scariff, Corra Trib	Gortavrulla_A									M
Scariff, Sheeaun Trib	Scarrif West_A									N/A
Scariff, Sheeaun Trib	Little Br._A									G
Scarrif, Cloghan Trib	Core Br._A									G
Scarrif, Glenbonniv Trib	Derrynahelia_A									P
Shannon	Ballyleague Br. Lanesboro_A		M	M						M
Shannon	Battle Br. Lock_A									N/A
Shannon	Battle Br._B			M						N/A
Shannon	Battle Br._C			M						M
Shannon	Bishops Islands_A									P
Shannon	Bogganfin_A									M
Shannon	Bunaribba_A			M						N/A
Shannon	Carrickobreen_A									P
Shannon	Carrickynaghtan_A									M
Shannon	Cleaheen_A									N/A

Table 4.120 (continued). Draft fish ecological status for river sites surveyed in 2016, including previous status where applicable (*further investigation recommended)

River	Site name	2008	2009	2010	2011	2012	2013	2014	2015	2016
SHIRBD Sites (continued)										
Shannon	Cloniff_A									P
Shannon	Clonmacnoise: at Jetty_A			M						M
Shannon	Cloonfad_A									N/A
Shannon	Coolumber_A									P
Shannon	Creevagh_A									P
Shannon	Curley's Island Backwater_A									N/A
Shannon	d/s of Costello's Island_A									M
Shannon	Devenish Island_A									N/A
Shannon	Hartley_A									N/A
Shannon	Hillquarter_A									P
Shannon	Kilnacarrow_A			M						M
Shannon	Shannonbridge Railway Br._A									P
Shannon (Canal Cut)	Athlone Canal_A									N/A
Suck	Ballyforan Br._A	M					M			M
Suck	Ballyforan Forest_A									P
Suck	Cloonagh_A									P
Suck	Cloondacarra Br._A	M					M			P
Suck	Cloontrask Forest_A									P
Suck	Harristown_A									P
Suck	u/s Shannon Confl._A									P
Tullamore	Br. SW of Ballycowen Br._A	M				M				M
WRBD Sites										
Castlebar River	Br. 2.5 km d/s Castlebar_A	P			P					M
Glensaul	Garrangarra_A									M
Glensaul	Greenaun_A									Bad*
Glensaul	Tonaglanna_A									H
Glensaul	Tourmakeady Forest_A									P
Ballybanaun stream (Treanlaur)	Carheen_A									Bad*
Glensaul, Derryveeny Trib	Derryveeny_A									M
Glensaul, Sruffaunnagreeve Trib	Sruffaunnagreeve_A									M
Glensaul, Tourmakeady Trib	Tourmakeady_A									M
Moy	Cloonacool Br._A									G
Moy	Cloonbaniff Br._C			G						G
Moy	Leitrim North_A									G
Moy	Sessuecommon_A									M
Moy	Bunnafinglas Confl._A									G
Moy	Bunnafinglas South_A									G
Moy	Bunnafinglas West_A									G
Moy	Curragh_A									G
Moy	Moorbrook_A									G
Moy	Rathbaun_A									B
Owenbrin	Barnahowna_A									M
Owenbrin	Br. u/s L. Mask_A		G			G				M

Table 4.120 (continued). Draft fish ecological status for river sites surveyed in 2016, including previous status where applicable (*further investigation recommended)

River	Site name	2008	2009	2010	2011	2012	2013	2014	2015	2016
WRBD Sites (Continued)										
Owenbrin	d/s Dirkbeg Lough_A									P
Owenbrin	Dirkbeg Hill_A									M
Owenbrin	Killateeaun_A									M
Owenbrin	Shanvallycahill_A									P
Owenbrin	Shanvallycahill_B									P
Owenbrin	Tullymore_A									G
Owenbrin, Nadirkmore Trib	Ford_A									M
Owendalluleegh	Dereen_A									M
Owendalluleegh	Br. SE Killafeen_A		N/A				N/A			M
Owendalluleegh	Killafeen Field_A									P
Srah	Drain_A									P
Srah	Gortbunacullin_A									Bad*
Srah	Shangort_A									M
Srah	Srah Br._A									M
Srah	Srah East_A									G
Srah	Tawnagh Hill_A									H
Srah	Tawnagh Junction_A									H
Srah	u/s Treatment Plant_A									G

6. SUMMARY

A total of 17 fish species (including sea trout) and one hybrid were recorded during the 2016 NRSP river monitoring programme across Ireland. Brown trout was the most commonly encountered species, recorded at 134 sites. The most diverse site was River Suir at Rossestown_A, with a total of nine species recorded. The second most diverse site (eight species) was also on the River Suir at Rossestown_B. Four sites recorded seven species, while 29 sites recorded only a single species (roach x bream hybrids are counted here, as are sea trout, included as a separate "variety" of brown trout). The greatest densities of brown trout and salmon were recorded in the Glensaul River (Tonaglanna_A) and Aherlow River (Toureen Peacaun_A) sites respectively.

The growth of brown trout was assigned by ranking sites according to length at age data for each length class (L1, L2, L3 etc.). Sites were then split into growth categories. Only sites with sufficient fish caught (N = 32) could be assigned a growth rate category (Matson and Kelly, *In Prep*). The majority of sites were classed as having moderate growth (28), with fast growth and slow/moderate growth at only two sites each.

Many of the sites surveyed in 2016 were assigned a draft fish classification status using FCS2-Ireland and expert opinion. Three sites were assigned High fish status, 42 sites as Good, 80 as Moderate, 45 sites as Poor and 4 sites as bad fish status.

7. REFERENCES

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APPENDIX 1

Site location information for WFD surveillance monitoring, 2016

River	Site name	Easting	Northing
ERBD (Wadeable sites)			
Athboy, Bunboggan Trib	Bunboggan_A	270579	265036
Athboy	Br. nr Clonleasan Ho_A	269514	268132
Blackwater (Kells), Corratinner Trib	Corratinner North_A	261055	293250
Blackwater (Kells)	Beagh Glebe_A	262326	293955
Blackwater (Kells)	Gallon_A	260409	293946
Blackwater (Kells)	Killinkere Br._A	261080	293564
Dodder	Bohernabreena_A	308855	224063
Dodder	Bushy Park_A	314051	229018
Dodder	Firhouse_A	310509	227140
Dodder	Knocklyon_A	311004	227716
Dodder	Mount Carmel Hospital_A	315378	229556
Dodder	Oldbawn_A	309661	226129
Glenealo	Br. d/s Upper Lake_A	311144	196429
Mayne, Cuckoo Trib	Limekiln Lane_A	321005	241789
Mayne	Snugborough_A	323094	241227
Mayne	Wellfield Br._A	322160	241436
Nanny (Meath), Hurley Trib	Boolies Little_A	303544	265462
Nanny (Meath), Hurley Trib	New Br. (North)_A	301043	262718
Nanny (Meath), Hurley Trib	Rathfeigh_A	299984	261701
Nanny (Meath)	Knockisland_A	305090	268387
Nanny (Meath)	Reask West_A	303403	265523
Sluice	Portmarnock Racetrack_A	322638	243020
NBIRBD (Wadeable sites)			
White (Louth)	Athclare_A	305654	286414
White (Louth)	Coneyburrow Br._B	305716	289279
White (Louth)	Dunleer_A	305657	288338
White (Louth)	Gibber's Br._A	303401	285023
White (Louth)	Martinstown Br._A	300863	284555
White (Louth)	Martinstown Wood_A	300941	284557
NWIRBD (Wadeable sites)			
Cullies	Br. nr Kilbrackan House_A	226286	304416
Eany Beg	Drumagraa_A	186162	383777
Eany More	Drumboarty_A	190065	383222
Waterfoot	Letter Br._A	208484	365171
NWIRBD (Non-wadeable sites)			
Annalee	0.2km d/s Cavan R confl_A	240225	310479
Annalee	Drumaraw_A	245371	311320
Eany Water	Just d/s Eany Beg/More confl_A	183807	381401

APPENDIX 1 (continued)

Site location information for WFD surveillance monitoring, 2016

River	Site name	Easting	Northing
SERBD (Wadeable sites)			
Aherlow, Assaroola Trib	u/s Aherlow Confl._A	180863	123832
Aherlow, Clydagh) Trib	Gortaclivore_A	187426	129060
Aherlow, Galbally) Trib	Galbally_A	180062	127618
Aherlow, Knockanebrack Trib	Knockanebrack_A	184134	126861
Aherlow, Knockastakeen Trib	Rossadrehid Br._A	192677	129377
Aherlow, Moneynaboola Trib	Moneynaboola_A	185705	127464
Aherlow, Rossadrehid Trib	Dromamarka Br._A	192132	129596
Aherlow, Toureen Trib	Toureen Peacaun_A	200560	128515
Aherlow	Ardrahin_A	179345	126648
Aherlow	Ballybrien North_A	179395	120365
Aherlow	Gortnafurra_A	188777	129821
Aherlow	Lyre_A	181114	124399
Aherlow	Moor Abbey_A	181572	127837
Aherlow	North of Ballydavid_A	196931	129345
Aherlow	South of Drangan Beg_A	203189	128590
Aherlow	u/s Assaroola Confl._A	180456	123535
Bann	Bann Br._A	298770	144824
Bann	d/s Ballingarry Wood_A	311998	161996
Bann	Doran's Br._A	302160	148475
Bann	Grovemill_A	312246	164081
Bann	Island Br._A	309441	157627
Bann	Margerry's Br._A	311382	159327
Bann	Milltown Br._A	303190	149404
Bann	Milseoge Br._A	306392	152247
Bann	Pallis Br._A	311553	168146
Bann	Tinnabaum_A	313646	169745
Dinin	Dinin Br._A	247892	162832
King's (Kilkenny), Tullaroan Trib	Bigmeadow_A	239813	147782
King's (Kilkenny), Tullaroan Trib	Killaloe Br._A	239662	147659
Owenavorragh	Ballycanew Br._A	315228	152025
Owenavorragh	Ballyminaun_A	315102	154783
Owenavorragh	Coolock Beg_A	315969	151097
Owenavorragh	Killanagh_A	316164	149810

APPENDIX 1 (continued)

Site location information for WFD surveillance monitoring, 2016

River	Site name	Easting	Northing
SERBD (Non-wadeable sites)			
Aherlow	Ashgrove Br._A	195248	129416
Aherlow	Killardy Br._A	201698	129467
Aherlow	Pollagh East_A	193100	130127
Anner	Killusty North_A	225202	132325
Anner	Killusty Wood_A	225092	132081
Anner	Killusty_A	225280	132531
Anner	South of Killusty Br._A	225611	133078
Anner	West of Killusty Ringfort_A	225511	132838
Ara	Ara Br._A	197603	131819
Ara	Bansha Castle_A	195546	133163
Ara	Bansha_A	195720	133059
Ara	Grallagh_A	197473	131982
Ara	Lismacue_A	195989	132994
Cromoge, Fishmoyne Trib	Magherareagh_A	204593	164241
Cromoge, Fishmoyne Trib	Pollagh_A	204275	163932
King's (Kilkenny)	Kells Br._A	249261	143765
King's (Kilkenny)	Killinny_A	248804	143506
Suir	Aughall Middle_A	213069	172209
Suir	Eastwood_A	213091	172589
Suir	Knocknageragh Br._A	213095	172420
Suir	Rossestown_A	213299	162506
Suir	Rossestown_B	213113	162562
Suir	Rossestown_C	213101	162841
SHIRBD (Wadeable sites)			
Ballyfinboy	Ballinderry Br._A	185059	196869
Ballyfinboy	Br. just u/s L. Derg_A	183735	198083
Caher	Br. 2 km d/s Formoyle_A	116353	208202
Caher	Derrynavanagh_A	117325	206708
Caher	Murroogh_A	115533	208777
Killmastulla, Erinagh Trib	Gortnacleha_A	181292	172480
Killmastulla, Garryclogher Trib	Garryclogher_A	183886	172746
Killmastulla	Cappadine_A	174571	170610
Killmastulla	Carrow Br._A	182769	173378
Killmastulla	Erinagh Br._A	181529	172659
Maigue	Ballybane_A	146517	126479
Maigue	Bruree_A	155047	130414
Maigue	Fort Bridge East_A	151404	126690
Scariff (Anamullaghaun	Anamullaghaun Br._A	160921	181738
Scariff, Corra Trib	Gortavrulla_A	159547	189333
Scariff, Sheeaun Trib	Scarrif West_A	164006	184538
Scariff, Sheeaun Trib	Little Br._A	164272	184749
Scarrif, Cloghan Trib	Core Br._A	159731	184400
Scarrif, Glenbonniv Trib	Derrynahelia_A	157853	183523

APPENDIX 1 (continued)

Site location information for WFD surveillance monitoring, 2016

River	Site name	Easting	Northing
SHIRBD (Non-wadeable sites)			
Ballydangan	Br. u/s Shannon R. Confl_A	198862	230482
Cross	Br. u/s Shannon River_A	203691	239195
Kilcrow	Ballyshrule Br._A	179683	205796
Maigue	Castleroberts Br._A	147902	144002
Nenagh	Ballysoilshaun Br._A	191674	173905
Shannon (Canal Cut)	Athlone Canal_A	203941	240163
Shannon	Ballyleague Br. Lanesboro_A	200425	269204
Shannon	Battle Br. Lock_A	194842	304844
Shannon	Battle Br._B	195273	303438
Shannon	Battle Br._C	194941	303024
Shannon	Bishops Islands_A	198120	223106
Shannon	Bogganfin_A	202928	242517
Shannon	Bunaribba_A	203847	239711
Shannon	Carrickobreen_A	205129	238233
Shannon	Carrickynaghtan_A	204341	239009
Shannon	Cleaheen_A	193748	301712
Shannon	Cloniff_A	197448	226737
Shannon	Clonmacnoise: at Jetty_A	201075	231873
Shannon	Cloonfad_A	195261	304445
Shannon	Coolumber_A	200380	230470
Shannon	Creevagh_A	198144	229272
Shannon	Curley's Island Backwater_A	198210	228468
Shannon	d/s of Costello's Island_A	198772	222387
Shannon	Devenish Island_A	198070	227884
Shannon	Hartley_A	193959	302409
Shannon	Hillquarter_A	202717	243525
Shannon	Kilnacarrow_A	200877	272139
Shannon	Shannonbridge Railway Br._A	197383	224162
Suck	Ballyforan Br._A	181571	246434
Suck	Ballyforan Forest_A	182413	245866
Suck	Cloonagh_A	182698	245020
Suck	Cloondacarra Br._A	167102	278035
Suck	Cloontrask Forest_A	166751	277467
Suck	Harristown_A	167108	278532
Suck	u/s Shannon Confl._A	196310	224632
Tullamore	Br. SW of Ballycowen Br._A	229314	225249

APPENDIX 1 (continued)

Site location information for river fish monitoring, 2016

River	Site name	Easting	Northing
WRBD (Wadeable sites)			
Castlebar River	Br. 2.5 km d/s Castlebar_A	116986	292002
Glensaul, Ballybanaun Mountain Trib	Carheen_A	109644	269414
Glensaul, Derryveeny Trib	Derryveeny_A	106818	266912
Glensaul, Sruffaunnagreeve Trib	Sruffaunnagreeve_A	104557	265652
Glensaul, Tourmakeady Trib	Tourmakeady_A	108263	267621
Glensaul	Garrangarra_A	106444	266312
Glensaul	Greenaun_A	105328	265875
Glensaul	Tonaglanna_A	104369	265441
Glensaul	Tourmakeady Forest_A	109462	267853
Moy	Cloonacool Br._A	149367	316817
Moy	Cloonbaniff Br._C	152315	319476
Moy	Leitrim North_A	151098	318279
Moy	Sessuecommon_A	147234	314746
Owenbrin, Nadirkmore Trib	Ford_A	102078	264766
Owenbrin	Barnahowna_A	102910	264346
Owenbrin	Br. u/s L. Mask_A	105250	262633
Owenbrin	d/s Dirkbeg Lough_A	100217	265420
Owenbrin	Dirkbeg Hill_A	101107	265546
Owenbrin	Killateeaun_A	104169	263002
Owenbrin	Shanvallycahill_A	105661	262763
Owenbrin	Shanvallycahill_B	105718	262769
Owenbrin	Tullymore_A	103920	263501
Owendalluleegh	Dereen_A	151715	198379
Owendalluleegh	Br. SE Killafeen_A	148422	197206
Owendalluleegh	Killafeen Field_A	148502	197263
Srah	Drain_A	112053	272510
Srah	Gortbunacullin_A	110374	272463
Srah	Shangort_A	111340	273508
Srah	Srah Br._A	111834	272445
Srah	Srah East_A	111610	272928
Srah	Tawnagh Hill_A	111128	271908
Srah	Tawnagh Junction_A	111345	271929
Srah	u/s Treatment Plant_A	109232	270913
WRBD (Non-wadeable sites)			
Moy	Bunnafinglas Confl._A	126277	310453
Moy	Bunnafinglas South_A	126266	309024
Moy	Bunnafinglas West_A	126131	309911
Moy	Curragh_A	126972	308762
Moy	Moorbrook_A	126742	308045
Moy	Rathbaun_A	125288	311107

APPENDIX 2

Details of river sites surveyed for river fish monitoring, 2016

River	Site name	Width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
ERBD (Wadeable sites)					
Athboy, Bunboggan Trib	Bunboggan_A	2.53	64	0.15	0.32
Athboy	Br. nr Clonleasan Ho_A	5.88	235	0.52	0.88
Blackwater (Kells), Corratinner Trib	Corratinner North_A	3.93	110	0.36	0.64
Blackwater (Kells)	Beagh Glebe_A	7.53	203	0.42	0.60
Blackwater (Kells)	Gallon_A	8.20	230	0.39	0.61
Blackwater (Kells)	Killinkere Br._A	9.00	230	0.44	0.76
Dodder	Bohernabreena_A	6.58	283	0.22	0.53
Dodder	Bushy Park_A	9.58	354	0.22	0.53
Dodder	Firhouse_A	6.74	236	0.17	0.42
Dodder	Knocklyon_A	7.06	282	0.25	0.53
Dodder	Mount Carmel Hospital_A	10.28	360	0.22	0.47
Dodder	Oldbawn_A	8.36	309	0.23	0.62
Glenealo	Br. d/s Upper Lake_A	6.85	240	0.32	0.78
Mayne, Cuckoo Trib	Limekiln Lane_A	1.48	43	0.08	0.20
Mayne	Snugborough_A	1.92	58	0.24	0.80
Mayne	Wellfield Br._A	2.00	70	0.29	0.72
Nanny (Meath), Hurley Trib	Boolies Little_A	5.27	150	0.50	1.00
Nanny (Meath), Hurley Trib	New Br. (North)_A	5.47	119	0.33	0.83
Nanny (Meath), Hurley Trib	Rathfeigh_A	5.98	187	0.27	0.67
Nanny (Meath)	Knockisland_A	8.91	187	0.23	0.43
Nanny (Meath)	Reask West_A	4.30	159	0.38	0.57
Sluice	Portmarnock Racetrack_A	2.13	70	0.06	0.12
NBIRBD (Wadeable sites)					
White (Louth)	Athclare_A	5.68	233	0.26	0.66
White (Louth)	Coneyburrow Br._B	7.84	353	0.31	0.58
White (Louth)	Dunleer_A	6.10	244	0.28	0.72
White (Louth)	Gibber's Br._A	3.50	147	0.15	0.29
White (Louth)	Martinstown Br._A	4.43	177	0.06	0.14
White (Louth)	Martinstown Wood_A	2.80	95	0.16	0.45
NWIRBD (Wadeable sites)					
Cullies	Br. nr Kilbrackan House_A	7.54	294	0.50	0.87
Eany Beg	Drumagraa_A	5.00	150	0.24	0.42
Eany More	Drumboarty_A	9.97	349	0.53	0.93
Waterfoot	Letter Br._A	6.30	277	0.28	0.54
NWIRBD (Non-wadeable sites)					
Annalee	0.2km d/s Cavan R confl_A	18.33	2750	0.52	1.00
Annalee	Drumaraw_A	21.50	5182	0.67	2.00
Eany Water	Just d/s Eany Beg/More confl_A	24.00	636	0.89	1.00

APPENDIX 2 (continued)

Details of river sites surveyed for river fish monitoring, 2016

River	Site name	Width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
SERBD (Wadeable sites)					
Aherlow, Assaroola Trib	u/s Aherlow Confl._A	3.90	134	0.23	0.58
Aherlow, Clydagh) Trib	Gortaclivore_A	5.90	160	0.12	0.29
Aherlow, Galbally) Trib	Galbally_A	4.17	147	0.06	0.18
Aherlow, Knockanebrack Trib	Knockanebrack_A	4.57	117	0.05	0.10
Aherlow, Knockastakeen Trib	Rossadrehid Br._A	4.10	135	0.15	0.27
Aherlow, Moneynaboola Trib	Moneynaboola_A	3.47	132	0.07	0.28
Aherlow, Rossadrehid Trib	Dromamarka Br._A	3.90	151	0.14	0.33
Aherlow, Toureen Trib	Toureen Peacaun_A	2.37	95	0.13	0.21
Aherlow	Ardrahin_A	5.33	229	0.14	0.26
Aherlow	Ballybrien North_A	2.02	77	0.09	0.17
Aherlow	Gortnafurra_A	8.27	137	0.31	0.60
Aherlow	Lyre_A	3.30	122	0.06	0.15
Aherlow	Moor Abbey_A	7.82	344	0.22	0.54
Aherlow	North of Ballydavid_A	14.07	328	0.21	0.47
Aherlow	South of Drangan Beg_A	16.40	507	0.26	0.68
Aherlow	u/s Assaroola Confl._A	3.90	134	0.23	0.58
Bann	Bann Br._A	15.50	295	0.35	0.79
Bann	d/s Ballingarry Wood_A	7.47	252	0.29	0.66
Bann	Doran's Br._A	18.30	732	0.31	0.91
Bann	Grovemill_A	6.57	154	0.24	0.47
Bann	Island Br._A	14.93	597	0.44	1.00
Bann	Margerry's Br._A	5.90	366	0.14	0.41
Bann	Milltown Br._A	13.97	503	0.32	0.48
Bann	Milseoge Br._A	11.60	348	0.32	0.66
Bann	Pallis Br._A	4.27	99	0.14	0.39
Bann	Tinnabaum_A	3.70	107	0.16	0.36
Dinin	Dinin Br._A	13.42	290	0.21	0.64
King's (Kilkenny), Tullaroan Trib	Bigmeadow_A	4.18	146	0.13	0.24
King's (Kilkenny), Tullaroan Trib	Killaloe Br._A	4.98	154	0.17	0.47
Owenavorragh	Ballycanew Br._A	8.20	197	0.17	0.53
Owenavorragh	Ballyminaun_A	9.86	394	0.22	0.42
Owenavorragh	Coolock Beg_A	7.83	161	0.21	0.42
Owenavorragh	Killanagh_A	7.20	209	0.23	0.48

APPENDIX 2 (continued)

Details of river sites surveyed for river fish monitoring, 2016

River	Site name	Width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
SERBD (Non-wadeable sites)					
Aherlow	Ashgrove Br._A	12.00	1656	0.33	0.55
Aherlow	Killardy Br._A	16.00	4368	0.41	0.67
Aherlow	Pollagh East_A	13.27	3782	0.24	0.44
Anner	Killusty North_A	8.40	1067	0.23	0.66
Anner	Killusty Wood_A	7.40	1140	0.30	0.57
Anner	Killusty_A	8.00	1016	0.38	0.59
Anner	South of Killusty Br._A	6.60	647	0.36	0.66
Anner	West of Killusty Ringfort_A	7.00	721	0.29	0.64
Ara	Ara Br._A	7.53	806	0.45	0.59
Ara	Bansha Castle_A	5.60	767	0.50	0.73
Ara	Bansha_A	7.41	1011	0.36	0.64
Ara	Grallagh_A	7.50	1133	0.42	1.00
Ara	Lismacue_A	8.25	1139	0.42	1.00
Cromoge, Fishmoyne Trib	Magherareagh_A	4.30	499	0.47	0.73
Cromoge, Fishmoyne Trib	Pollagh_A	6.65	1390	0.42	0.64
King's (Kilkenny)	Kells Br._A	16.00	3936	1.36	1.90
King's (Kilkenny)	Killinny_A	11.50	3082	0.80	1.20
Suir	Aughall Middle_A	6.63	398	0.37	0.75
Suir	Eastwood_A	5.30	514	0.34	0.49
Suir	Knocknageragh Br._A	5.93	564	0.36	0.95
Suir	Rossestown_A	10.75	1301	0.35	0.60
Suir	Rossestown_B	11.50	1691	0.31	0.40
Suir	Rossestown_C	10.20	1561	0.57	1.00
SHIRBD (Wadeable sites)					
Ballyfinboy	Ballinderry Br._A	7.07	172	0.29	0.38
Ballyfinboy	Br. just u/s L. Derg_A	4.77	215	0.39	0.68
Caher	Br. 2 km d/s Formoyle_A	5.14	206	0.14	0.29
Caher	Derrynavanagh_A	19.77	642	0.30	0.51
Caher	Murroogh_A	11.37	405	0.21	0.40
Killmastulla, Erinagh Trib	Gortnacleha_A	1.80	49	0.13	0.24
Killmastulla, Garryclogher Trib	Garryclogher_A	1.72	67	0.12	0.30
Killmastulla	Cappadine_A	7.54	265	0.32	0.51
Killmastulla	Carrow Br._A	4.18	79	0.26	0.72
Killmastulla	Erinagh Br._A	3.78	129	0.28	0.40
Maigue	Ballybane_A	3.65	142	0.20	0.39
Maigue	Bruree_A	14.73	413	0.42	0.60
Maigue	Fort Bridge East_A	5.33	155	0.34	0.65
Scariff (Anamullaghaun	Anamullaghaun Br._A	4.23	111	0.42	0.72
Scariff, Corra Trib	Gortavrulla_A	8.03	242	0.21	0.43
Scariff, Sheeaun Trib	Scarrif West_A	3.77	124	0.33	0.59
Scariff, Sheeaun Trib	Little Br._A	3.97	123	0.41	0.64
Scarrif, Cloghan Trib	Core Br._A	5.40	145	0.37	0.59
Scarrif, Glenbonniv Trib	Derrynahelia_A	5.13	129	0.38	0.77

APPENDIX 2 (continued)

Details of river sites surveyed for river fish monitoring, 2016

River	Site name	Width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
SHIRBD (Non-wadeable sites)					
Ballydangan	Br. u/s Shannon R. Confl_A	2.37	189	1.03	1.30
Cross	Br. u/s Shannon River_A	5.00	1805	1.13	1.60
Kilcrow	Ballyshrule Br._A	11.17	1541	1.07	1.50
Maigue	Castleroberts Br._A	24.20	15415	1.00	2.30
Nenagh	Ballysoilshaun Br._A	7.22	758	0.54	0.95
Shannon (Canal Cut)	Athlone Canal_A	21.50	4085	1.09	1.40
Shannon	Ballyleague Br. Lanesboro_A	45.20	17651	2.22	3.00
Shannon	Battle Br. Lock_A	30.50	6253	1.71	2.30
Shannon	Battle Br._B	31.00	17174	2.62	4.40
Shannon	Battle Br._C	36.43	15628	3.10	4.40
Shannon	Bishops Islands_A	81.57	36626	2.77	3.70
Shannon	Bogganfin_A	124.75	68363	4.02	6.50
Shannon	Bunaribba_A	3.15	1047	4.04	6.20
Shannon	Carrickobreen_A	116.33	60261	1.93	3.70
Shannon	Carrickynaghtan_A	114.00	68286	4.03	6.20
Shannon	Cleaheen_A	35.67	23683	2.54	3.50
Shannon	Cloniff_A	96.17	62316	2.04	2.90
Shannon	Clonmacnoise: at Jetty_A	89.33	52260	3.53	6.70
Shannon	Cloonfad_A	28.00	14420	3.09	4.40
Shannon	Coolumber_A	165.20	127039	2.86	7.90
Shannon	Creevagh_A	85.67	69390	4.02	7.90
Shannon	Curley's Island Backwater_A	13.00	2561	1.72	4.20
Shannon	d/s of Costello's Island_A	137.60	88752	3.21	3.70
Shannon	Devenish Island_A	33.29	12948	1.93	3.30
Shannon	Hartley_A	34.20	19015	3.50	4.70
Shannon	Hillquarter_A	160.50	91004	2.96	3.90
Shannon	Kilnacarrow_A	79.40	53397	2.73	4.50
Shannon	Shannonbridge Railway Br._A	113.80	77612	3.79	4.80
Suck	Ballyforan Br._A	47.17	14150	0.75	1.00
Suck	Ballyforan Forest_A	63.00	42084	3.99	5.20
Suck	Cloonagh_A	42.14	17068	1.20	2.00
Suck	Cloondacarra Br._A	10.00	2230	1.00	1.00
Suck	Cloontrask Forest_A	13.00	6903	1.39	1.70
Suck	Harristown_A	12.00	3072	1.17	1.50
Suck	u/s Shannon Confl._A	45.00	17595	5.38	7.60
Tullamore	Br. SW of Ballycowen Br._A	7.30	803	0.47	0.92

APPENDIX 2 (continued)

Details of river sites surveyed for river fish monitoring, 2016

River	Site name	Width (m)	Surface area (m^2)	Mean depth (m)	Max depth (m)
WRBD (Wadeable sites)					
Castlebar River	Br. 2.5 km d/s Castlebar_A	6.93	166	0.32	0.60
Glensaul, Ballybanaun Mountain Trib	Carheen_A	4.67	112	0.20	0.32
Glensaul, Derryveeny Trib	Derryveeny_A	5.00	115	0.27	0.46
Glensaul, Sruffaunnagreeve Trib	Sruffaunnagreeve_A	3.33	53	0.14	0.24
Glensaul, Tourmakeady Trib	Tourmakeady_A	10.33	300	0.28	0.48
Glensaul	Garrangarra_A	5.33	160	0.76	8.00
Glensaul	Greenaun_A	4.67	177	0.30	0.92
Glensaul	Tonaglanna_A	1.00	25	0.13	0.24
Glensaul	Tourmakeady Forest_A	8.33	258	0.46	1.00
Moy	Cloonacool Br._A	9.68	343	0.33	0.75
Moy	Cloonbaniff Br._C	8.55	385	0.16	0.39
Moy	Leitrim North_A	8.52	213	0.25	0.38
Moy	Sessuecommon_A	9.59	383	0.35	0.69
Owenbrin, Nadirkmore Trib	Ford_A	17.54	702	0.09	0.34
Owenbrin	Barnahowna_A	26.33	1001	0.22	0.56
Owenbrin	Br. u/s L. Mask_A	14.00	532	0.26	0.81
Owenbrin	d/s Dirkbeg Lough_A	4.32	143	0.28	0.64
Owenbrin	Dirkbeg Hill_A	5.84	151	0.22	0.54
Owenbrin	Killateeaun_A	16.00	560	0.17	0.37
Owenbrin	Shanvallycahill_A	13.33	493	0.25	0.55
Owenbrin	Shanvallycahill_B	18.00	738	0.34	0.55
Owenbrin	Tullymore_A	31.23	977	0.11	0.57
Owendalluleegh	Dereen_A	17.48	734	0.17	0.42
Owendalluleegh	Br. SE Killafeen_A	12.84	514	0.27	0.60
Owendalluleegh	Killafeen Field_A	12.50	475	0.28	0.63
Srah	Drain_A	1.54	93	0.20	0.48
Srah	Gortbunacullin_A	4.93	184	0.09	0.22
Srah	Shangort_A	5.08	158	0.20	0.80
Srah	Srah Br._A	6.85	206	0.29	0.74
Srah	Srah East_A	4.38	129	0.21	0.39
Srah	Tawnagh Hill_A	5.00	116	0.20	0.55
Srah	Tawnagh Junction_A	3.43	84	0.25	0.61
Srah	u/s Treatment Plant_A	3.46	121	0.07	0.19
WRBD (Non-wadeable sites)					
Moy	Bunnafinglas Confl._A	37.33	20795	3.27	3.70
Moy	Bunnafinglas South_A	32.00	25088	2.73	3.20
Moy	Bunnafinglas West_A	31.67	15042	3.37	3.80
Moy	Curragh_A	32.67	14602	3.70	4.20
Moy	Moorbrook_A	40.33	18271	1.70	2.00
Moy	Rathbaun_A	40.00	29000	2.57	2.70

APPENDIX 3

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

River		L1	L2	L3	L4	L5
Shannon, River	Mean	4.65	8.90	13.41	19.88	23.46
	S.D.	0.44	0.68	2.50	-	-
	n	3	2	2	1	1
	Min	4.15	8.42	11.65	19.88	23.46
	Max	4.97	9.39	15.18	19.88	23.46
River Suck	Mean	2.91	5.82			
	S.D.	-	-			
	n	1	1			
	Min	2.91	5.82			
	Max	2.91	5.82			

APPENDIX 4

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

River		L1	L2	L3	L4	L5	L6	L7	Growth category
Aherlow River	Mean	7.05	15.35	21.18	23.73				Moderate
	S.D.	2.60	3.38	2.83	-				
	n	114	54	19	1				
	Min	3.13	10.94	16.73	23.73				
	Max	14.71	22.45	26.80	23.73				
Annalee River	Mean	7.43	16.23	23.11					Moderate
	S.D.	1.70	3.04	0.74					
	n	20	12	2					
	Min	4.62	11.15	22.58					
	Max	10.85	22.43	23.63					
Anner River	Mean	7.77	16.23	24.01	31.71				Moderate
	S.D.	1.97	3.47	4.12	4.51				
	n	65	33	14	3				
	Min	4.24	9.23	16.06	26.60				
	Max	12.55	24.15	32.85	35.13				
Ara River	Mean	10.35	20.10	25.41	24.05				Fast
	S.D.	1.88	3.29	2.55	-				
	n	28	23	10	1				
	Min	6.46	13.77	21.08	24.05				
	Max	14.99	25.15	28.55	24.05				
Athboy River	Mean	8.44	18.42						Moderate
	S.D.	1.51	0.80						
	n	6	2						
	Min	6.83	17.85						
	Max	10.49	18.98						
Ballyfinboy River	Mean	8.69							Moderate
	S.D.	1.66							
	n	12							
	Min	6.00							
	Max	11.33							
Bann, River	Mean	7.55	14.53						Moderate
	S.D.	1.70	3.89						
	n	20	6						
	Min	5.22	11.06						
	Max	10.85	20.93						
Blackwater (Kells), River	Mean	8.32	17.62	24.49	28.73				Moderate
	S.D.	1.48	1.37	-	-				
	n	5	4	1	1				
	Min	6.78	16.40	24.49	28.73				
	Max	10.36	19.55	24.49	28.73				
Caher River	Mean	7.79							Moderate
	S.D.	1.08							
	n	9							
	Min	6.46							
	Max	10.20							

APPENDIX 4 continued

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

River		L1	L2	L3	L4	L5	L6	L7	Growth category
Cromoge River	Mean	7.77	16.62	25.37					Moderate
	S.D.	1.93	3.26	0.52					
	n	32	22	4					
	Min	3.06	8.99	24.67					
	Max	10.56	23.34	25.86					
Cross River	Mean	7.02	11.65						Slow/moderate
	S.D.	2.12	2.75						
	n	6	6						
	Min	4.02	8.44						
	Max	10.20	15.98						
Dinin River	Mean	7.68	16.46	22.19					Moderate
	S.D.	1.56	3.40						
	n	14	6	1					
	Min	4.71	12.44	22.19					
	Max	10.59	21.96	22.19					
Dodder, River	Mean	8.25	15.90	20.90					Moderate
	S.D.	2.62	2.77	2.28					
	n	60	24	8					
	Min	4.16	11.64	18.62					
	Max	14.69	20.93	24.77					
Eany Water	Mean	6.47	12.16						Moderate
	S.D.	1.48	-						
	n	3	1						
	Min	5.36	12.16						
	Max	8.15	12.16						
Glenealo River	Mean	5.27	12.18						Slow/moderate
	S.D.	-	-						
	n	1	1						
	Min	5.27	12.18						
	Max	5.27	12.18						
Glensaul River	Mean	6.64							Moderate
	S.D.	0.76							
	n	6							
	Min	5.40							
	Max	7.60							
Kilcrow River	Mean	7.51							Moderate
	S.D.	1.16							
	n	2							
	Min	6.70							
	Max	8.33							
Killmastulla River	Mean	7.60	13.93	18.61					Moderate
	S.D.	1.47	0.55	-					
	n	20	2	1					
	Min	5.41	13.53	18.61					
	Max	10.48	14.32	18.61					

APPENDIX 4 continued

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

River		L1	L2	L3	L4	L5	L6	L7	Growth category
King's (Kilkenny) River	Mean	8.32	18.33	23.52					Moderate
	S.D.	1.63	3.80	2.07					
	n	55	31	5					
	Min	3.80	10.28	21.10					
	Max	10.84	24.62	25.87					
Maigue, River	Mean	8.47	18.25	33.81					Moderate
	S.D.	1.35	3.73						
	n	15	6	1					
	Min	6.09	15.27	33.81					
	Max	10.16	25.27	33.81					
Moy, River	Mean	8.34	14.82						Moderate
	S.D.	0.73	2.81						
	n	7	4						
	Min	7.56	12.62						
	Max	9.50	18.50						
Nanny (Meath), River	Mean	7.65							Moderate
	S.D.	1.50							
	n	15							
	Min	4.80							
	Max	10.09							
Nenagh River	Mean	8.41	16.16	29.02					Moderate
	S.D.	1.07	3.44	4.30					
	n	13	10	2					
	Min	6.92	8.19	25.97					
	Max	10.41	19.77	32.06					
Owenavorragh River	Mean	7.54							Moderate
	S.D.	1.59							
	n	10							
	Min	5.00							
	Max	11.04							
Owenbrin River	Mean	5.90	12.28						Moderate
	S.D.	0.99	-						
	n	11	1						
	Min	3.90	12.28						
	Max	7.26	12.28						
Owendalluleegh River	Mean	8.45	15.98						Moderate
	S.D.	1.21	0.84						
	n	14	5						
	Min	6.32	15.28						
	Max	10.77	17.42						
Scarrif River	Mean	8.19	14.80	20.66					Moderate
	S.D.	1.84	3.06	1.60					
	n	29	7	2					
	Min	4.90	10.29	19.53					
	Max	11.43	18.52	21.79					

APPENDIX 4 continued

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

River		L1	L2	L3	L4	L5	L6	L7	Growth category
Srah River	Mean	6.83	14.13						Moderate
	S.D.	1.63	-						
	n	18	1						
	Min	3.25	14.13						
	Max	9.41	14.13						
Suir, River	Mean	7.61	16.23	24.12	29.52				Moderate
	S.D.	1.72	2.19	1.89	-				
	n	38	24	7	1				
	Min	3.75	12.45	21.15	29.52				
	Max	11.73	21.77	26.17	29.52				
Tullamore River	Mean	8.96	20.61	28.38					Fast
	S.D.	1.36	1.69	-					
	n	18	7	1					
	Min	6.69	17.78	28.38					
	Max	10.96	22.88	28.38					
Waterfoot River	Mean	6.82	14.28	24.73					Moderate
	S.D.	1.47	2.98	2.61					
	n	16	5	2					
	Min	4.94	10.93	22.88					
	Max	9.90	18.60	26.57					
White River (Louth)	Mean	9.37	17.54	23.25					Moderate
	S.D.	2.11	2.42	-					
	n	35	8	1					
	Min	4.39	12.69	23.25					
	Max	14.81	20.34	23.25					

APPENDIX 5

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

River		L1	L2	L3	L4	L5	L6
Annalee River	Mean	19.46	35.41				
	S.D.	1.74	0.63				
	n	4	2				
	Min	17.75	34.97				
	Max	21.35	35.85				
Cross River	Mean	25.01	39.23	58.07			
	S.D.	12.45	5.84	-			
	n	2	2	1			
	Min	16.20	35.10	58.07			
	Max	33.81	43.37	58.07			
Cullies River	Mean	14.48					
	S.D.	2.52					
	n	3					
	Min	11.58					
	Max	16.06					
Kilcrow River	Mean	18.02	26.28	37.54	43.55		
	S.D.	-	-	-	-		
	n	1	1	1	1		
	Min	18.02	26.28	37.54	43.55		
	Max	18.02	26.28	37.54	43.55		
Shannon, River	Mean	19.79	36.09	47.62	56.50	71.14	79.39
	S.D.	6.77	6.54	7.89	8.65	11.93	13.95
	n	34	22	18	9	3	2
	Min	9.39	23.77	33.49	46.89	59.46	69.52
	Max	31.96	48.45	61.20	75.65	83.30	89.25
Srah River	Mean						
	S.D.						
	n						
	Min						
	Max						
Suck, River	Mean	19.35	36.82	46.94			
	S.D.	3.75	3.89	3.88			
	n	11	6	4			
	Min	13.62	31.86	44.01			
	Max	24.29	43.73	52.63			
Suir, River	Mean	23.92					
	S.D.	-					
	n	1					
	Min	23.92					
	Max	23.92					

APPENDIX 6

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

River		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Annalee River	Mean	3.71	7.28	11.39	15.30	19.01	19.91	24.42			
	S.D.	0.85	1.55	2.04	2.83	3.00	4.70	-			
	n	40	36	26	12	7	2	1			
	Min	2.00	4.54	8.32	11.12	14.49	16.59	24.42			
	Max	5.36	10.65	15.16	19.41	21.66	23.23	24.42			
Ballydangan River	Mean	3.74	7.29	11.01	13.55	15.29					
	S.D.	0.71	1.49	1.84	1.58	2.16					
	n	8	8	8	5	3					
	Min	2.54	5.07	8.46	11.42	13.53					
	Max	4.64	9.66	13.87	15.68	17.69					
Blackwater (Kells), River	Mean	2.58	5.15	7.95	10.09	12.25	12.95				
	S.D.	0.53	0.48	1.05	1.17	0.87	-				
	n	13	13	13	8	4	1				
	Min	1.86	4.52	6.34	8.57	11.21	12.95				
	Max	3.55	5.98	10.07	12.49	13.16	12.95				
Cross River	Mean	3.13	6.11	9.52	12.42	15.35	17.41	20.96			
	S.D.	0.70	1.09	1.29	1.77	2.11	2.64	-			
	n	39	37	30	23	13	7	1			
	Min	2.01	4.19	6.87	8.71	13.05	14.27	20.96			
	Max	4.86	8.67	12.36	17.75	21.18	22.39	20.96			
Cullies River	Mean	3.50	7.38	9.86	13.75						
	S.D.	0.44	0.94	0.72	-						
	n	16	11	5	1						
	Min	2.45	6.14	8.75	13.75						
	Max	4.06	8.95	10.53	13.75						
Kilcrow River	Mean	3.09	6.65	7.74							
	S.D.	0.54	1.16	0.01							
	n	10	10	2							
	Min	2.37	4.97	7.73							
	Max	4.10	8.40	7.74							
Moy, River	Mean	3.31	6.50	9.44	13.24	18.64					
	S.D.	0.93	1.15	1.48	2.43	-					
	n	28	27	16	3	1					
	Min	2.02	4.55	6.98	11.05	18.64					
	Max	5.36	8.57	12.43	15.86	18.64					
Scarrif River	Mean	4.15	7.19	9.17							
	S.D.	1.01	1.37	0.28							
	n	18	16	5							
	Min	3.10	3.86	8.82							
	Max	7.33	10.32	9.60							
Shannon, River	Mean	3.50	6.63	10.14	12.98	15.63	17.83	20.05	21.44	23.00	23.84
	S.D.	0.79	1.40	1.70	1.72	1.80	1.97	1.93	1.85	2.35	0.27
	n	350	310	255	191	117	83	43	21	8	2
	Min	1.76	3.51	5.88	8.30	11.79	13.74	15.33	17.52	18.73	23.66
	Max	6.53	12.10	15.66	19.82	24.12	25.55	24.50	24.64	26.41	24.03

APPENDIX 6 continued

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

River		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Suck, River	Mean	2.98	5.64	8.61	11.21	13.52	15.41	17.64	18.73	20.88	25.46
	S.D.	0.50	0.96	1.06	1.36	1.55	1.57	1.69	2.06	2.33	-
	n	89	82	73	58	34	24	14	6	3	1
	Min	1.81	4.19	6.57	8.97	10.99	12.97	15.16	16.48	18.95	25.46
	Max	4.10	8.62	10.95	14.14	16.89	19.45	21.21	22.57	23.47	25.46
Suir, River	Mean	3.49	6.88	11.25	15.65	18.50					
	S.D.	0.82	1.42	2.08	2.25	1.95					
	n	44	37	29	16	6					
	Min	2.05	4.65	7.93	11.43	15.40					
	Max	5.32	10.39	15.15	18.40	20.03					

APPENDIX 7

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

River		L1	L2	L3	L4	L5	L6	L7	L8	L9
Annalee River	Mean	3.09	6.65	11.63	14.95					
	S.D.	-	-	-	-					
	n	1	1	1	1					
	Min	3.09	6.65	11.63	14.95					
	Max	3.09	6.65	11.63	14.95					
Cross River	Mean	3.79								
	S.D.	-								
	n	1								
	Min	3.79								
	Max	3.79								
Cullies River	Mean	4.09	7.00	12.64	14.78	22.37				
	S.D.	-	-	-	-	-				
	n	1	1	1	1	1				
	Min	4.09	7.00	12.64	14.78	22.37				
	Max	4.09	7.00	12.64	14.78	22.37				
Shannon, River	Mean	3.78	6.87	10.95	14.14	18.96	21.78	24.49	26.45	28.39
	S.D.	1.43	1.71	1.98	1.78	1.69	1.29	1.36	0.16	0.64
	n	14	13	13	11	6	6	3	2	2
	Min	2.38	4.10	8.64	11.11	16.80	20.57	23.59	26.34	27.94
	Max	7.62	10.29	15.87	16.59	21.21	23.62	26.05	26.57	28.84
Suck, River	Mean	1.30								
	S.D.	-								
	n	1								
	Min	1.30								
	Max	1.30								

APPENDIX 8

Summary rudd growth in rivers (L1=back calculated length (cm) at the end of the first winter

River		L1	L2	L3	L4
Shannon (Upper), River	Mean	3.46	7.10	9.99	12.23
	S.D.	0.51	1.05	0.52	-
	n	12	11	5	1
	Min	2.68	5.71	9.08	12.23
	Max	4.32	8.47	10.36	12.23

APPENDIX 9

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

River		L1	L2
Aherlow River	Mean	5.69	7.57
	S.D.	1.35	1.14
	n	25	2
	Min	3.33	6.76
	Max	8.55	8.37
Anner River	Mean	5.37	9.12
	S.D.	1.05	0.80
	n	24	2
	Min	3.27	8.55
	Max	7.27	9.68
Ara River	Mean	7.13	
	S.D.	1.30	
	n	19	
	Min	4.33	
	Max	8.78	
Athboy River	Mean	8.25	
	S.D.	0.49	
	n	3	
	Min	7.71	
	Max	8.68	
Ballyfinboy River	Mean	8.12	
	S.D.	-	
	n	1	
	Min	8.12	
	Max	8.12	
Bann, River	Mean	6.27	
	S.D.	0.79	
	n	15	
	Min	5.08	
	Max	7.81	
Dinin River	Mean	6.53	
	S.D.	0.83	
	n	6	
	Min	5.55	
	Max	7.50	
Eany Water	Mean	4.14	8.09
	S.D.	0.85	1.67
	n	19	7
	Min	2.58	4.97
	Max	5.73	10.28
Killmastulla River	Mean	6.36	
	S.D.	1.11	
	n	6	
	Min	4.55	
	Max	7.65	

APPENDIX 9 continued

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

River		L1	L2
King's (Kilkenny) River	Mean	5.47	
	S.D.	0.81	
	n	5	
	Min	4.63	
	Max	6.33	
Maigue, River	Mean	7.33	
	S.D.	1.60	
	n	4	
	Min	5.44	
	Max	8.70	
Moy, River	Mean	4.81	
	S.D.	1.04	
	n	11	
	Min	3.40	
	Max	6.21	
Nanny (Meath), River	Mean	3.73	
	S.D.		
	n	1	
	Min	3.73	
	Max	3.73	
Nenagh River	Mean	6.36	
	S.D.	1.66	
	n	4	
	Min	4.96	
	Max	8.31	
Suir, River	Mean	6.70	
	S.D.	1.29	
	n	4	
	Min	4.87	
	Max	7.84	
Waterfoot River	Mean	5.39	
	S.D.	0.59	
	n	4	
	Min	4.50	
	Max	5.70	

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