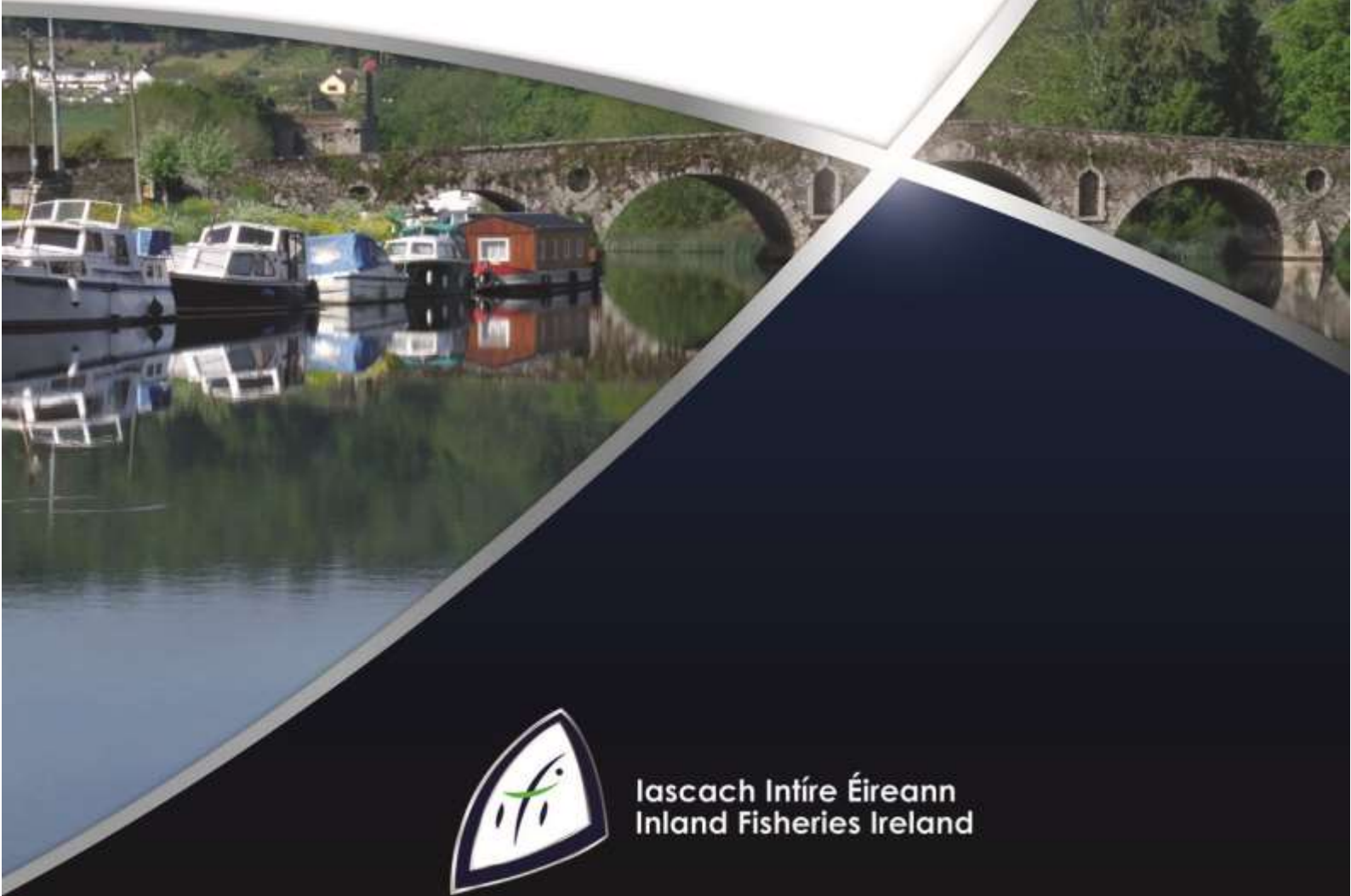


# National Research Survey Programme

## Rivers 2015

### River Barrow Catchment Survey

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Iascach Intíre Éireann  
Inland Fisheries Ireland

# *Fish Stock Assessment of the River Barrow Catchment*

## *2015*

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## Executive Summary

Inland Fisheries Ireland undertook a catchment wide electrofishing survey in the River Barrow catchment during summer 2015. The study surveyed 35 sites on the River Barrow main channel and canal cuts and 118 sites in 21 sub-catchments. The main aim of the survey was to determine the current status of fish stocks within the catchment. This is the first large scale catchment wide survey undertaken in the River Barrow catchment to assess the status of all fish species present.

The River Barrow is Ireland's second longest river after the River Shannon. It is approximately 192km in length from source to sea and drains a large catchment area (3010km<sup>2</sup>). The river is navigable from Athy, Co. Kildare to the tide at St. Mullin's, Co. Carlow (approximately 65km of navigable waterways). The main channel, including the estuary as far downstream as Creadun Head in Waterford and many of its sub-catchments are located within the River Barrow and River Nore Special Area of Conservation (SAC) (site code 002162). The SAC is of considerable conservation significance for habitats and plant and animal species that are listed on Annexes I and II of the EU Habitats Directive (92/43/EEC).

Electrofishing was the method used to obtain a representative sample of the fish assemblage in each site. The methods used were in compliance with European standards for fish stock assessment. All fish captured were identified to species level and counted. Fish lengths and weights were taken and scales were removed from a subsample of species from each site. After processing all fish were returned to the river. Subsequently fish were aged and growth was determined in the IFI laboratory.

Information collected during the course of this survey provided information (e.g. distribution and abundance) on the different life stages of brown trout, Atlantic salmon, coarse fish species and pike. A total of 12 fish species and one hybrid were recorded in the River Barrow main channel sites, with a total of 4070 fish being captured. Dace and roach were widely distributed throughout the main channel being recorded at 91% and 80% of the sites surveyed respectively. Dace ranged in length from 2 cm to 26 cm and were aged from 0+ to 7+ years, while roach ranged in length from 1.5 cm to 29.8 cm and ranged in age from 0+ to 9+. Atlantic salmon were present at 57% of the sites surveyed on the main channel. The abundance of juvenile Atlantic salmon numbers was generally low in the main channel. A small number of adult salmon were also recorded between Athy and St. Mullin's. These fish ranged in length from 49 to 73 cm and were age 2.1 or 2.2 (i.e. fish that had spent either one winter at sea (grilse salmon) or two winters (spring salmon) at sea). Brown trout were only recorded at 46% of the main channel sites surveyed. While not present in large numbers at any site surveyed the overall population appeared balanced. The largest brown trout recorded was aged

3+, 36.8cm in length and weighed 575g. Perch were well distributed (74%) throughout the River Barrow main channel though their numbers were generally low. Pike were present at 54% of sites surveyed on the main channel and in general their abundance was low. They ranged in length from 8 cm to 92 cm and were aged from 0+ to 6+. Other fish species recorded during the survey were minnow, gudgeon, European eel, stone loach, 3 spined stickleback and flounder. Roach x bream hybrids were also recorded. Minnow and gudgeon were widely distributed throughout the sites surveyed, while European eel were only recorded at 15 sites. Simple linear modelling revealed that there was a degree of spatial segregation amongst the four main fish species (dace, roach, juvenile salmon and brown trout) captured in the river during the survey. This has resulted in brown trout and juvenile salmon being largely confined to the faster flowing, non-navigable river sections downstream of the weirs. While the situation is less clear cut for roach and dace, the former species was more prevalent in the canal cuts.

Bream were not recorded in the current survey. The reason for this is unclear; however a small number of roach x bream hybrids were recorded, therefore the presence of juvenile hybrids throughout the main channel suggests that spawning populations of bream are still present. More extensive sampling within localised areas might provide further information into the status of this important coarse angling species in the River Barrow.

A total of 6631 fish and fifteen fish species were recorded across the 83 sites surveyed in the sub-catchments. Brown trout and Atlantic salmon were the most common fish species recorded; brown trout were well distributed while salmon were less so. Key sub-catchments for brown trout spawning would appear to be the Pollmounty, Ierr, Owenass and Douglas (Laois), but notable spawning was also observed at sites in the Greese and Madlin rivers. Important brown trout nursery waters, as highlighted by a relatively high density of 1+ and older fish, include the Dinin, Mountain and Stradbally rivers but there was also a notable site on the Owenass River. The most productive systems for Atlantic salmon spawning, as highlighted by the presence of salmon fry (0+), were the Monefelim, Burren, Douglas (Laois), Greese and lower reaches of the Pollmounty rivers. Salmon nursery waters included the Duiske, Aughavaud and Monefelim rivers. The most unproductive rivers for brown trout and salmon were the Figile and Philipstown rivers. Poor water quality, poor habitat and possibly competition from coarse fish species, particularly dace are the main reasons for this.

Dace were mainly present in the lower river reaches of rivers in the upper catchment such as the Triogue, Cushina, Slate, Figile, Owenass and Tully. Coarse fish species, pike and perch were also poorly represented in the sub-catchments. Lamprey sp. were recorded in 18 sub-catchments, while



eel was recorded within 17 of the 21 sub-catchments. Minnow and 3 spined stickleback were also present at some sites.

The current study is the first large scale catchment wide survey undertaken in the River Barrow catchment to assess the status of all fish species. However, there are still some knowledge gaps in relation to certain species in the River Barrow catchment. For example, what contribution does each tributary catchment make to the over-all brown trout population of the River Barrow main channel. It is also not known how many tributaries contribute sea trout to the river. In addition the interactions between brown trout and the invasive dace are not fully understood and it is unclear about the status of bream in the catchment.

In general Good fish status was recorded in the upper reaches of the River Barrow main channel above Mountmellick and thereafter downstream of weirs where flow and habitat conditions were more favourable for a larger range of fish species (29% of sites), while many ponded sites were assigned a status of moderate or worse (71% of sites). The trend in the sub-catchments was that many of the sites in the lower half of the River Barrow catchment were assigned Good or better status while sites in the upper catchment were Moderate or worse. High fish status was only assigned to five (6%) of the 83 subcatchment sites surveyed, while 36% were assigned Good status. Unfortunately 52% were assigned Moderate status or less across the subcatchments. The main reasons for less than good fish status were poor water quality, poor habitat, the presence of artificial barriers impeding migratory fish passage and possibly competition from the invasive dace. This trend mirrors the overall trend for ecological status in the catchment based on all biological elements and physico-chemical parameters.

# 1. Introduction

## 1.1 General Introduction

In 2015 Inland Fisheries Ireland undertook a catchment wide electrofishing survey of the River Barrow catchment. The study area covered the River Barrow main channel and 21 sub-catchments. This survey had two objectives:

1. Undertake a catchment wide survey of the fish stocks in the River Barrow catchment to provide the information and data necessary to determine the current status of fish stocks within the River Barrow catchment.
2. Carry out an inter-calibration exercise of two different electrofishing methods (area delineated depletion versus 10-minute timed).

This report summarises the results of the catchment wide fish stock assessment, while the inter-calibration results are presented in a separate paper (Matson *et al.*, submitted for publication). The results of the survey are split into two sections as different survey methods were used due to the diversity of habitat types throughout the catchment.

- (i) River Barrow main channel:
  - i. Upper River Barrow (Rathcoffey, Co. Laois to Monasterevin, Co. Kildare (Fig. 1.1)
  - ii. Mid and Lower Barrow (Belview (upstream Athy, Co. Kildare) to St. Mullin's, Co. Carlow) (Fig. 1.1).
- (ii) Sub-catchments (from the Owenass river to the Pollmounty river (Fig. 1.1)).

Selected sites on the River Barrow main channel and tributaries were surveyed previously as part of Inland Fisheries Irelands (IFI) programmes relating to Salmon Management (CWEF, 2003) and Water Framework Directive (WFD) (Kelly *et al.*, 2009 and 2012). Qualitative electrofishing was carried out by IFI (formerly Central Fisheries Board) on the navigable river and associated canal cuts on behalf of Waterways Ireland in 2001 (CFB, 2002). National Parks commissioned IFI to undertake a survey to investigate the distribution and status of lamprey in the main channel and tributaries in 2004 (King, 2006). However, this is the first large scale catchment wide survey undertaken in the River Barrow catchment to assess the status of all fish species.

The results of the current survey will provide baseline information for future management of the fish stocks in the catchment.

## 1.2 River Barrow Catchment

The River Barrow rises on the northern slopes of the Slieve Bloom Mountains, Co. Laois, and flows north and then east past Mountmellick and Portarlinton to Monasterevin. At Monasterevin it turns south and flows through the towns of Athy, Carlow, Leighlinbridge, Bagenalstown, Goresbridge, Borris, and Graiguenamanagh, before reaching the tide at Saint Mullin's. The river meets the River Nore upstream of New Ross, Co. Wexford and then merges with the River Suir at Cheekpoint, forming Waterford Harbour below this point (Fig. 1.2). On its journey to the sea the River Barrow flows through counties Laois, Kildare, Kilkenny, Carlow, Wexford and Waterford.

The River Barrow is Ireland's second longest river after the River Shannon. It is approximately 192km in length from source to sea and drains a large catchment area (3,010km<sup>2</sup>) consisting of mountain, bog, pasture land and tillage farming. The land use type in the catchment is mostly classified as pasture though large areas in the middle reaches are arable. The main channel is up to 40m wide in places and is generally quite shallow, with a slow to moderate flow. Average depths range from 1m to 3m with the deeper water generally located next to the towpath on the navigable side of the river.

The topography of the river varies from source to sea, the river falls steeply from its upper reaches (4%) onto low-lying terrain with gradients of 0.06% and 0.04% between Two-Mile Bridge and Athy and flows through a relatively open landscape (Plate 1.1). The topography changes again south of Goresbridge where the river channel cuts its way through a narrow gorge cut between the Blackstairs Mountains in the east and Brandon Hill in the west (Plate 1.2).



**Plate 1.1. Examples of the upper, middle and lower reaches of River Barrow main channel**



**Plate 1.2. River Barrow looking upstream from St. Mullins (Brandon Hill on upper left) (photo from @Carlow Weather)**

The river rises on Old Red Sandstone in the Slieve Bloom Mountains at an elevation of 580m before passing through a band of Carboniferous shales and sandstones. The upper reaches of the River Barrow also runs through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end runs over intrusive rocks poor in silica.

The main channel (from upstream of Milford bridge, Co. Carlow (Plate 1.3) to downstream of Tinnahinch bridge (east of Clonaslee, Co. Laois) and some of the tributaries in the upper catchment have been subject to arterial drainage schemes in the past (1926 to 1934) to improve conveyance (Appendix I).



**Plate 1.3. River Barrow looking downstream towards Milford, Co. Carlow (photo from @Carlow Weather)**

The Barrow Line of the Grand Canal links the Grand Canal at Lowtown, Co. Kildare to the River Barrow at Athy. The river is navigable from Athy to the tide at St. Mullins (approximately 65km of navigable waterways). The non-navigable river sections from Athy to the tide are interlinked by 23 lateral canals or canal cuts (approximately 18km of channel in total). Each canal cut has a lock, enabling boat passage around otherwise impassable sections of river. The conversion of the river to a navigable channel (*circa* 1791) involved the construction of locks and weirs (Plates 1.3 and 1.4), which have notably altered the character of the river and have resulted in much ponding and deep water upstream of each weir.



**Plate 1.4. Example of a canal cut on the River Barrow at Clashganny, Co. Carlow.**

### **1.3 Water quality and Ecological quality (WFD) in the River Barrow catchment**

Water quality (biological and chemical) in the River Barrow has been monitored by the Environmental Protection Agency (EPA) and its predecessors since 1971. The EPA has established a network of monitoring sites on the main channel and on selected tributaries that are monitored every three years. Since 2007 this monitoring programme has been expanded to accommodate other biological elements such as fish and plants as per the requirements for the EU Water Framework Directive 2000/60/EC (WFD) (European Parliament and Council, 2000).

Prior to 2009 water quality monitoring in the catchment was undertaken by Inland Fisheries Ireland on behalf of Waterways Ireland. Seasonal sampling (3-4 times per annum) of 27 main channel sites (including canal cuts) and 35 tributaries and drains along the navigable river were, in general, unsatisfactory. While river sections were, on the whole compliant with standards for nutrients, faecal coliform counts (an indicator of animal or human waste) exceeded maximum limits on several occasions between 2006 and 2008. Water quality sampling of the tributary sites revealed non-compliance with both nutrient and faecal coliform standards throughout the same period (2006-2008) with very high counts of faecal coliforms being a regular phenomenon at these sites (Caffrey *et al.*, 2009).

There have been recurring water quality problems on the River Barrow in the past, and fish kills have occurred on the main channel and at least 15 of its tributaries. More than five fish kills have been

reported on both the Owenass and Triogue rivers between 1974 and 2008. Both diffuse and point source pollution have been identified as key pressures in the catchment. The sources vary with location in the catchment. In 2000 29% of the River Barrow and tributaries surveyed were assessed as slightly polluted/eutrophic, while 22% was classed as moderately polluted and 1.9% as seriously polluted (McGarrigle *et al.*, 2001). Since then some improvements have been observed, e.g. Triogue, Tully and Gowran rivers in the 2007-2009 survey period (McGarrigle, 2010). In the most recent WFD ecological assessment of the River Barrow and its tributaries (2010 to 2015), approximately 55% of surveyed sites on the main channel were below Good status (EPA, 2016). In general the trend in the tributary streams was that many sites in the lower half of the catchment were assigned Good or better status (e.g. Black (Borris), Douglas (Laois), Mountain and Aughnabriskey) while sites in the upper catchment were Moderate or worse (e.g. Figile, Tully, Greese, Slate, Triogue)). Overall only 59% of waterbodies in the tributary streams were assigned Moderate or worse (EPA, 2016).

#### **1.4 Management of the River Barrow catchment**

The Local Authorities of Laois, Kildare and Offaly (formerly acting through the joint committee known as the Barrow Drainage Board (established under the Barrow Drainage Acts 1927 and 1933)) are responsible for maintaining the River Barrow and its tributaries from its source in the Slieve Bloom mountains in Co. Laois to the Horse Bridge in Athy, Co. Kildare. The EPA and Local authorities also monitor water quality and regulate discharges to the river.

The River Barrow in conjunction with canal cuts provides a navigable channel between New Ross and the main Grand Canal system at Athy. Waterways Ireland is responsible for the management, maintenance, development and restoration for recreational purposes of the River Barrow navigation channel from Athy to St. Mullins, Co. Carlow.

Inland Fisheries Ireland (IFI) has statutory powers for the protection, management and conservation of the River Barrow fisheries and is empowered to regulate fishing and angling activities on those waters. Maintaining the good health of the river comes within IFI's remit. IFI is also responsible for monitoring fish for the EU Water Framework Directive and Habitats Directive (92/43/EEC) and eel populations EU (Council regulation 11000/2007).

#### **1.5 Special Area of Conservation (SAC)**

Special Areas of Conservation (SACs) are designated under the EU Habitats Directive for the conservation of flora, fauna and habitats of European importance. These sites form part of the "Natura 2000" network of protected areas throughout the European Union. Annex I of the EU

Habitats Directive lists certain habitats that must be given protection through the designation of SACs and Annex II of the Directive lists species whose habitats must be protected throughout the designation of SACs such as Atlantic salmon (*Salmo salar*) and twaite shad (*Alosa fallax*). The River Barrow main channel, including the estuary as far downstream as Creadun Head in Waterford and many of its sub-catchments are located within the River Barrow and River Nore SAC (site code 002162) (Fig. 1.2 & Appendix II). The SAC is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the Directive. The SAC consists of the freshwater stretches of the River Barrow catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The larger of the many tributaries in the River Barrow catchment are also included (Lerr, Fushoge, Mountain, Aughavaud, Owenass, Finnery (Tully) and Stradbally Rivers).

The River Barrow and River Nore SAC is designated for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. It has also been selected for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive.

The site is also designated a SAC for the following fish species listed on Annex II of the Directive - Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*), Brook Lamprey (*Lampetra planeri*), Twaite Shad and Atlantic Salmon (NPWS, 2011). The SAC is one of only a handful of spawning grounds in Ireland for Twaite Shad (NPWS, 2011). The SAC is also designated for the freshwater Pearl Mussel (*Margaritifera margaritifera*), Nore Freshwater Pearl Mussel *Margaritifera margaritifera durrovensis*, crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) (NPWS, 2011). In addition the SAC is of high conservation value for the populations of bird species that use it (e.g. Kingfisher) (NPWS, 2011).

## **1.6 Recreational angling**

The River Barrow is a mixed stock fishery containing Atlantic salmon, trout (*Salmo trutta*), pike (*Esox Lucius*) and many coarse fish species such as roach (*Rutilus rutilus*), rudd (*Scardinius erythrophthalmus*), perch (*Perca fluviatilis*), bream (*Abramis brama*) and tench (*Tinca tinca*). It is regarded by many Irish and overseas coarse anglers as one of Ireland's finest coarse angling river fisheries. Roach-bream hybrids (*Rutilus rutilus- Abramis brama*), rudd-bream hybrids (*Scardinius*



*erythrophthalmus-Abramis brama*) and the invasive fish species dace (*Leuciscus leuciscus*) are also present.

Coarse fishing on the River Barrow is easily accessible all along the 68km of towpath or by crossing agricultural lands with the permission of the landowners. The River Barrow is an all year round fishery and even when water levels are extremely high during the winter and early spring, good fishing can still be found at many of the 23 canal locks located along the length of the river. These canal sections are an important feature of this river producing exceptional angling in their own right. When water levels are high and strong floods are present in the main river, these canal cuts and sections provide refuge and shelter from the strong currents for many coarse fish species. Trophy anglers regularly capture specimen pike from the River Barrow (ISFC, 2016).

Game angling waters (salmon, brown trout and sea trout) are generally located immediately below the weirs and many of these fisheries are controlled privately and by angling associations. The River Barrow is mainly a salmon grilse fishery and is currently open for catch and release only.

The River Barrow at St. Mullin's is also famous for its Twaite Shad angling. It is the only known sizeable spawning population of Twaite shad in Ireland (King, 2006). During the month of May Twaite shad navigate their way upstream to the gravel beds at St. Mullins each year to spawn, before returning to the sea. The ascending fish provide sport for leisure anglers and specimen fish are commonly taken (ISFC, 2016). This angling also provides information on the status of the Twaite shad in the River Barrow.

## **1.7 Other recreational activities**

The River Barrow main channel has been identified as an important amenity for waterside and waterborne activities. A national walking trail (Barrow Way – 114km) enables walking and cycling along the banks of the river. Management of the locks and navigation permits pleasure cruisers to travel from the main line of the Grand Canal via the Barrow Line to the River Barrow main channel and then to navigate downstream to Waterford Harbour and beyond.

There are numerous companies offering canoe hire, guided canoeing and kayak trips, stand up paddle boarding along the main channel. There are also some rowing clubs based at many locations along the river. Open water swimming is also a regular pastime on the river with lifeguards present at some locations during the months of July and August.

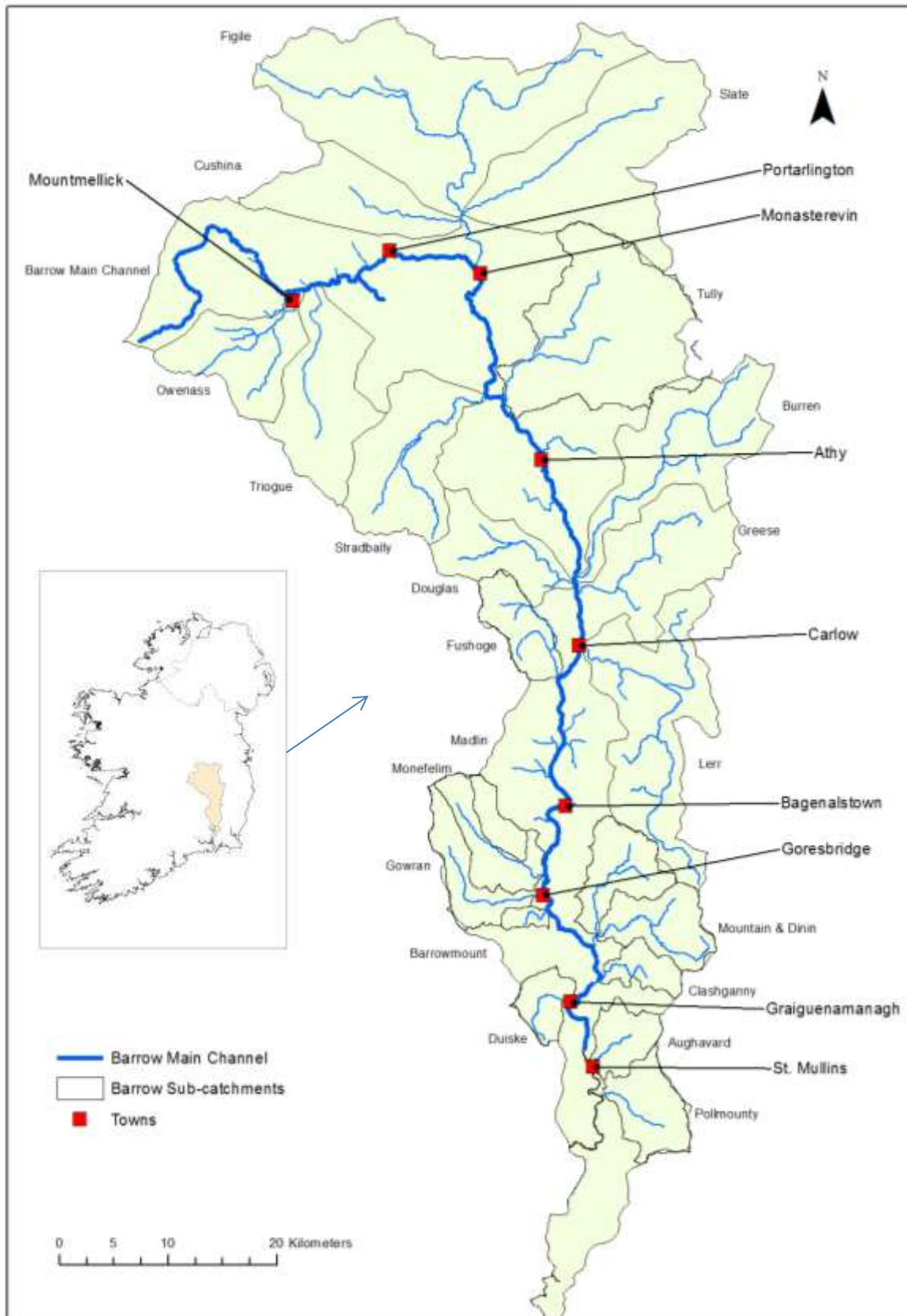


Figure 1.1. Map of River Barrow main channel and sub-catchments surveyed in 2015. The main urban centres are included.

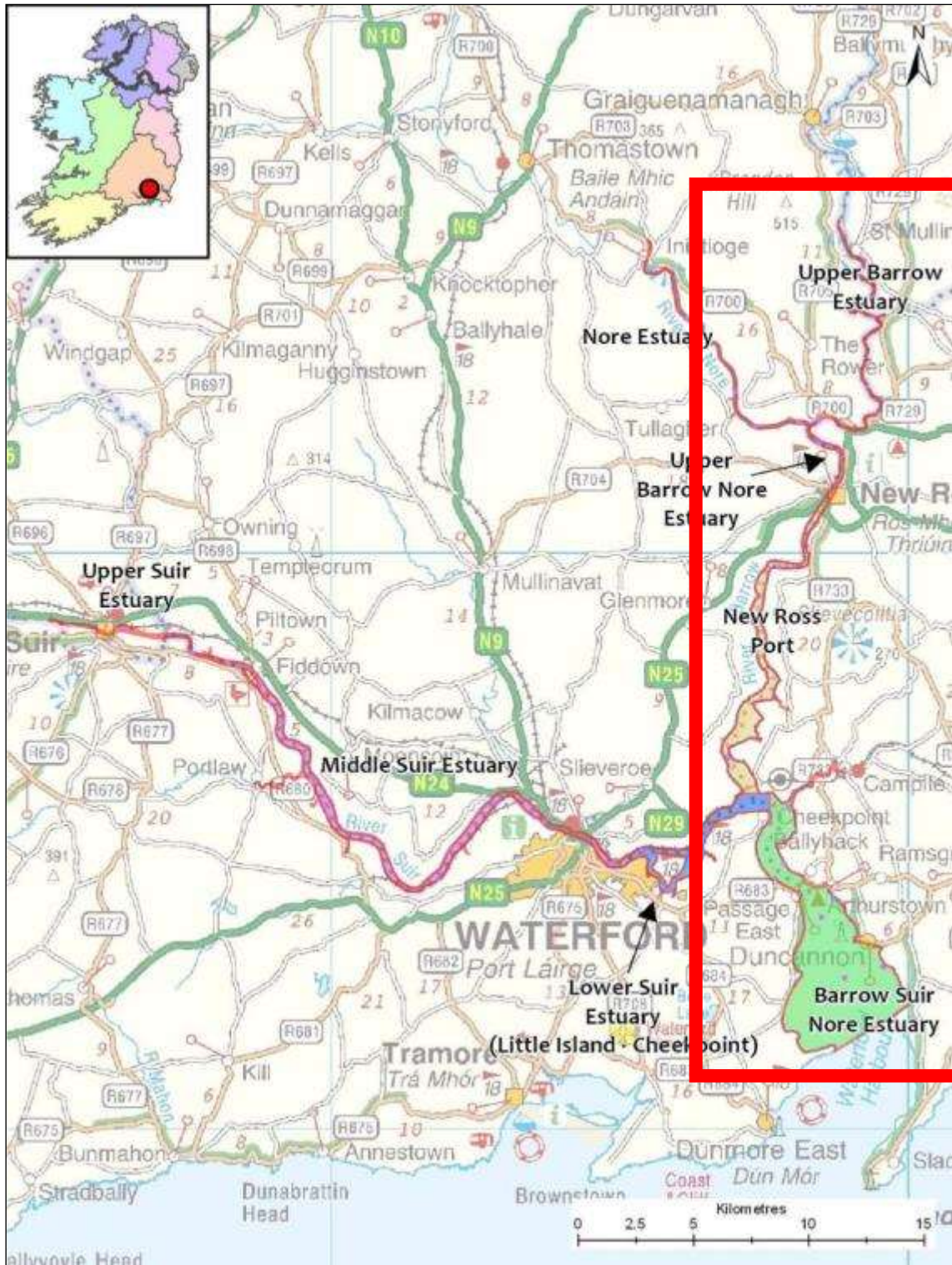


Figure 1.2. River Barrow and estuary to Waterford harbour.

## **2. Sampling Methods**

### **2.1 Site Selection**

The River Barrow main channel was sampled at 35 locations between June 29<sup>th</sup> and August 13<sup>th</sup>, 2015 (Fig. 2.1 and Appendix III & IV). A variety of habitat types were chosen (shallow riffle areas, deep ponded slow sections upstream of weirs, faster sections downstream of weirs and canal sections). Seven sites were surveyed in the upper reaches of the main channel (Fig. 2.1 and Table 2.1), while 28 sites were electrofished from upstream of Athy (Belview) downstream to St. Mullin's (Fig. 2.1 and Table 2.1).

Site selection for the catchment wide survey was undertaken at the sub-catchment (tributary) level. Sixteen main sub-catchments and five smaller systems that drain directly into the River Barrow main channel were chosen to provide an overall assessment of the status of the fish stocks in the catchment (Table 2.2). The sites chosen represented a range of habitat types present throughout the entire Barrow catchment. Where river characteristics varied a lot (in terms of habitat type, landuse, flows, depth, width, etc.) additional sites were required. In total 83 sites in the tributary streams were sampled between June 29<sup>th</sup> and August 13<sup>th</sup>, 2015 (Fig. 2.2 and Appendix III).

**Table 2.1– List of sites surveyed on the River Barrow Main Channel, July 2015**

Site Code	Site Name	Equipment type	Habitat Description	Habitat Type
<b>ADM</b>				
31	Rathcoffey Br.	Handset	River, non-navigable	Riffle/glide/pool
17	Clonterry	Boat	River, non-navigable	Glide
36	u/s Portarlinton	Boat	River, non-navigable	Glide
30	Portarlinton School Br.	Boat	River, non-navigable	Glide
35	u/s Black R. confluence	Boat	River, non-navigable	Glide
28	Pass Br. A	Boat	River, non-navigable	Glide
29	Pass Br. B	Boat	River, non-navigable	Glide
<b>PASE</b>				
12	Belview	Boom boat	River, non-navigable	Glide/pool/ponded
10	Barrowford	Boom boat	River, non-navigable	Glide/pool/ponded River
3	Ardreigh	Boom boat	River, non-navigable	Below Weir
23	Levitstown Canal	Boom boat	Canal Cut	Canal Cut
24	Levitstown	Boom boat	River, Navigable	Glide/pool/ponded
8	Ballyfoyle	Boom boat	River, Navigable	Glide/pool/ponded
13	Bestfield	Boom boat	River, non-navigable	Below Weir
33	Strawhall_A	Boom boat	River, Navigable	Glide/pool/ponded
34	Strawhall_B	Boom boat	River, Navigable	Glide/pool/ponded
16	Clogrennan Br.	Boom boat	River, Navigable	Glide/pool/ponded
25	Mortarstown Lower	Boom boat	River, Navigable	Glide/pool/ponded
14	Burgage	Boom boat	River, non-navigable	Below Weir
18	Dunleckny	Boom boat	River, Navigable	Glide/pool/ponded
4	Bagenalstown	Boom boat	Canal Cut	Canal Cut
20	Goresbridge Graveyard	Boom boat	River, Navigable	Glide/pool/ponded
7	Ballyellin Upper	Boom boat	River, non-navigable	Below Weir
5	Ballyellin Canal	Boom boat	Canal Cut	Canal Cut
6	Ballyellin Tomb	Boom boat	River, non-navigable	Below Weir
11	Barrowmount	Boom boat	River, Navigable	Glide/pool/ponded
26	Mountloftus Lock	Boom boat	River, non-navigable	Below Weir
27	Mountloftus	Boom boat	River, Navigable	Glide/pool/ponded
19	Fishersgraique	Boom boat	River, non-navigable	Below Weir
9	Ballykeenan Lock	Boom boat	River, Navigable	Glide/pool/ponded
21	Graiguenamanagh Br.	Boom boat	River, Navigable	Glide/pool/ponded
22	Graiguenamanagh Weir	Boom boat	River, non-navigable	Below Weir
37	Upper Tinnahinch Lock	Boom boat	River, Navigable	Glide/pool/ponded
15	Carriglead Weir	Boom boat	River, non-navigable	Below Weir
32	St. Mullins Canal	Boom boat	Canal Cut	Canal Cut

*NOTE: Please see Section 3.1.4 for explanation of habitat description.*

**Table 2.2. List of River Barrow catchments and number of sites included in the 2015 fish stock survey.**

<b>Catchments surveyed</b>	<b>No. sites surveyed</b>
Owenass	4
Triogue	4
Cushina	4
Figile (Black)	6
Slate	4
Stradbally	4
Tully	6
Greese	5
Douglas	4
Lerr	4
Burren	5
Fushoge	4
Madlin	1
Monefelim	3
Gowran	4
Barrowmount	1
Mountain and Dinin	8
Clashganny	2
Duiske	5
Aughavaud	2
Pollmounty	3
<b>TOTAL</b>	<b>83</b>

## **2.2 Survey Requirements**

All fish species present were recorded at all sites surveyed. General physical characteristics of the site were also recorded (e.g. landuse, riparian vegetation and instream features – flow, width, depth and substrate type).

## **2.3 Electrofishing methods**

Electrofishing is the method of choice to obtain a representative sample of the fish assemblage in river sites. Standard methods have been developed by Inland Fisheries Ireland in compliance with the European standards for fish stock assessment in wadeable rivers (CEN, 2003 and 2005). Due to the wide range of channel types within the River Barrow catchment a number of electrofishing techniques were employed to adequately assess the status of the fish stocks. Methods used included; area delineated depletion electrofishing (wadeable and non-wadeable) (ADEF), timed (10-minute) electrofishing (wadeable and non-wadeable) (TMEF), systematic point abundance sampling

(sPASE) using boom boat electrofishing (Barrow main channel and canal cuts from upstream Athy (Belview) to St. Mullin's) (Fig. 2.1).

### 2.3.1 *Area delineated depletion electrofishing (ADEF)*

In wadeable waters (generally spawning and nursery areas) fish sampling was carried out using bank based electrofishing equipment. This consisted of one or more portable generators (220/240 v) with appropriate control units (DC converter), a cathode and an anode (Plate 2.1a). Stop nets were used at the top and bottom of the site to prevent fish escaping from the site during the electrofishing operation. Wadeable survey sites were sampled in an upstream direction, from the downstream end of a riffle where available. Sites were chosen to contain a range of habitat types including riffle, glide and pool.

In deeper waters (non-wadeable) electrofishing was carried out by boat. This involved the use of a 220v generator with an appropriate control unit along with twin anodes and a trailing cathode, which were mounted in a flat bottomed boat crewed by three staff (Plate 2.1b). Non-wadeable survey sites were surveyed in a downstream direction.

Fish were held in buckets of fresh cold oxygenated water after they were caught until processing. . After processing they were returned to the river as soon as possible to avoid further stress. All fish were identified to species level and counted. Fish lengths and weights were taken and scales were removed from a subsample of species from each site.



**Plate 2.1. (a) Wadeable ADM electrofishing and (b) Non-wadeable boat-based ADM electrofishing**

### 2.3.2 *Ten-minute single pass electrofishing (TMEF)*

In wadeable sites the timed 10-minute electrofishing method (TME) involves only two operators at a site. No stop-nets are used to isolate the survey stretch. Electrofishing equipment consists of one portable generator (220/240 v) with an appropriate control unit (DC converter), a cathode and an anode. Electrofishing takes place by one person wading in a zig zag manner in an upstream direction for exactly 10 minutes and electrofishing at a steady pace (width < 5m). On a wider channel (>5m) it may be necessary to sample on one side of the channel only with a good habitat variety.

In non-wadeable channels the boat based TMEF method involves only one boat and three crew members. Again, as with the 10-minute bank based electrofishing, a stretch of river is electrofished for 10 minutes only and no stop nets are used. Regardless of the width of the river being surveyed only one boat and crew are required to sample the river.

### 2.3.3 *Systematic point abundance sampling (Boom boat electrofishing) (sPASE)*

Sites that could not be effectively electrofished using the above methods (e.g. too deep or too wide) were sampled using systematic point abundance sampling (sPASE) with boom boats (Plate 2.2). 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).

This 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 in fishable zones. 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.

Captured fish were held in the boat mounted live-well after they were caught until processing, which was carried out after a complete site was surveyed (i.e. each site is comprised of several point sampling efforts). After processing they were returned to the river as soon as possible to avoid further stress. Larger fish such as adult salmon and pike were processed immediately after capture and returned to the river. All fish were identified to species level and counted. Fish lengths and weights were taken and scales were removed from a subsample of species from each site.





**Plate 2.2. Electrofishing boom boat**

## **2.4 Other methods**

### *2.4.1 Habitat assessment*

An evaluation of habitat quality is critical to any assessment of ecological integrity and a rapid habitat assessment was performed at each survey site. At each site the percentage of overhead shade, substrate type and instream cover were visually assessed. Wetted width and depth were also measured throughout each stretch at three transects, with five depth intervals along each. The percentage of riffle, glide and pool was also estimated in each reach surveyed.

### *2.4.2 Age and growth of fish*

Subsamples of the dominant fish species were aged. Fish scales were read using a microfiche reader. Growth was determined by back-calculating lengths at the end of each winter using the following formula:

$$L_n = (S_n/S)l$$

Where:

$L_n$  = length of fish when annulus “n” was formed

$l$  = length of fish when scale sample was taken

$S_n$  = radius of annulus “n” (at fish length  $L_n$ )

$S$  = total scale radius

### 2.4.3 *Data analysis*

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

## 2.5 **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.

## 2.6 **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 survey on the River Barrow catchment.

## 2.7 **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. Using this tool and expert opinion, each site surveyed in the Barrow catchment in 2015 (excluding canal cuts) was assigned a draft fish classification status.

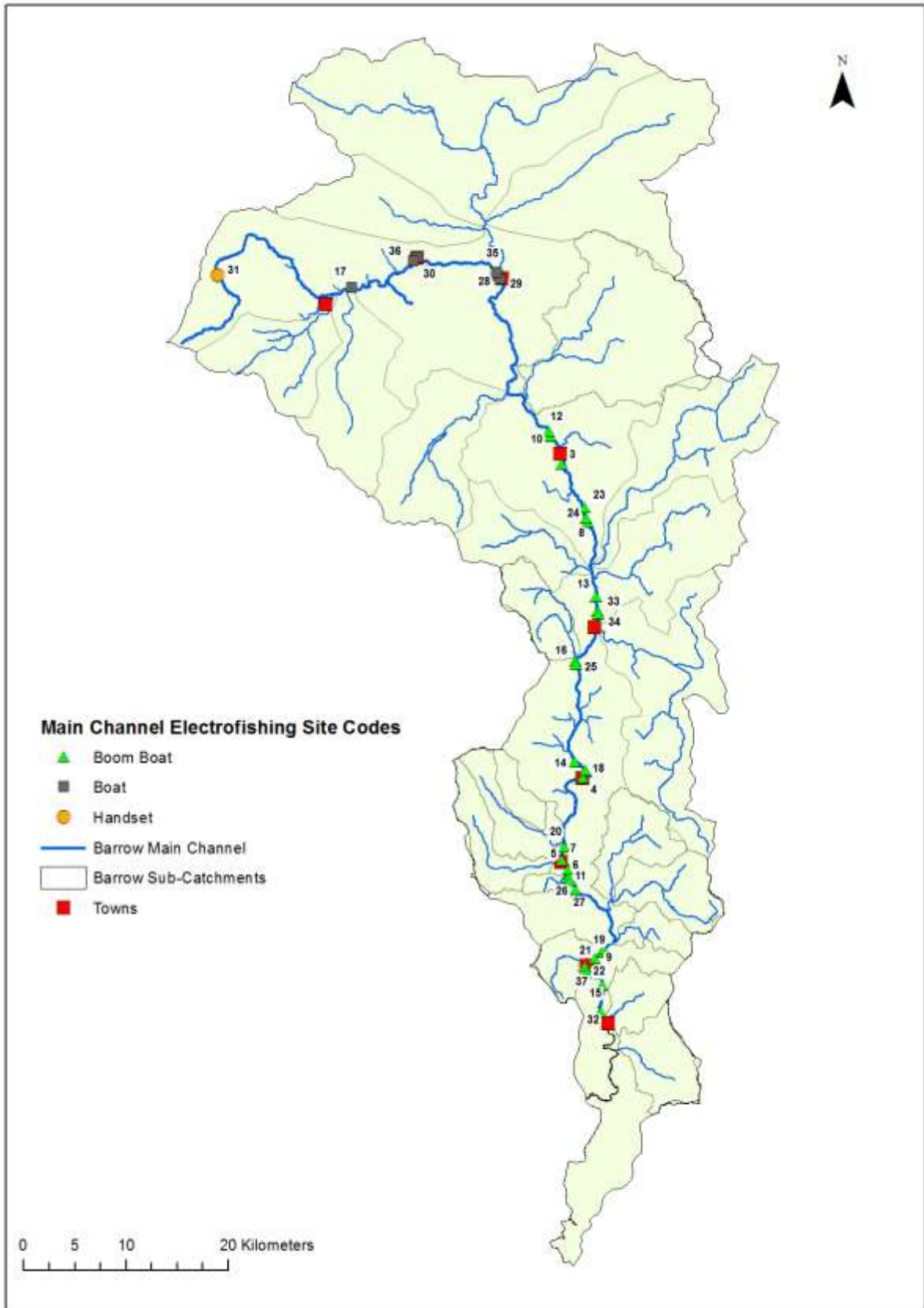


Figure 2.1. Location of all main channel sites surveyed, July 2015 (with numbered identification).

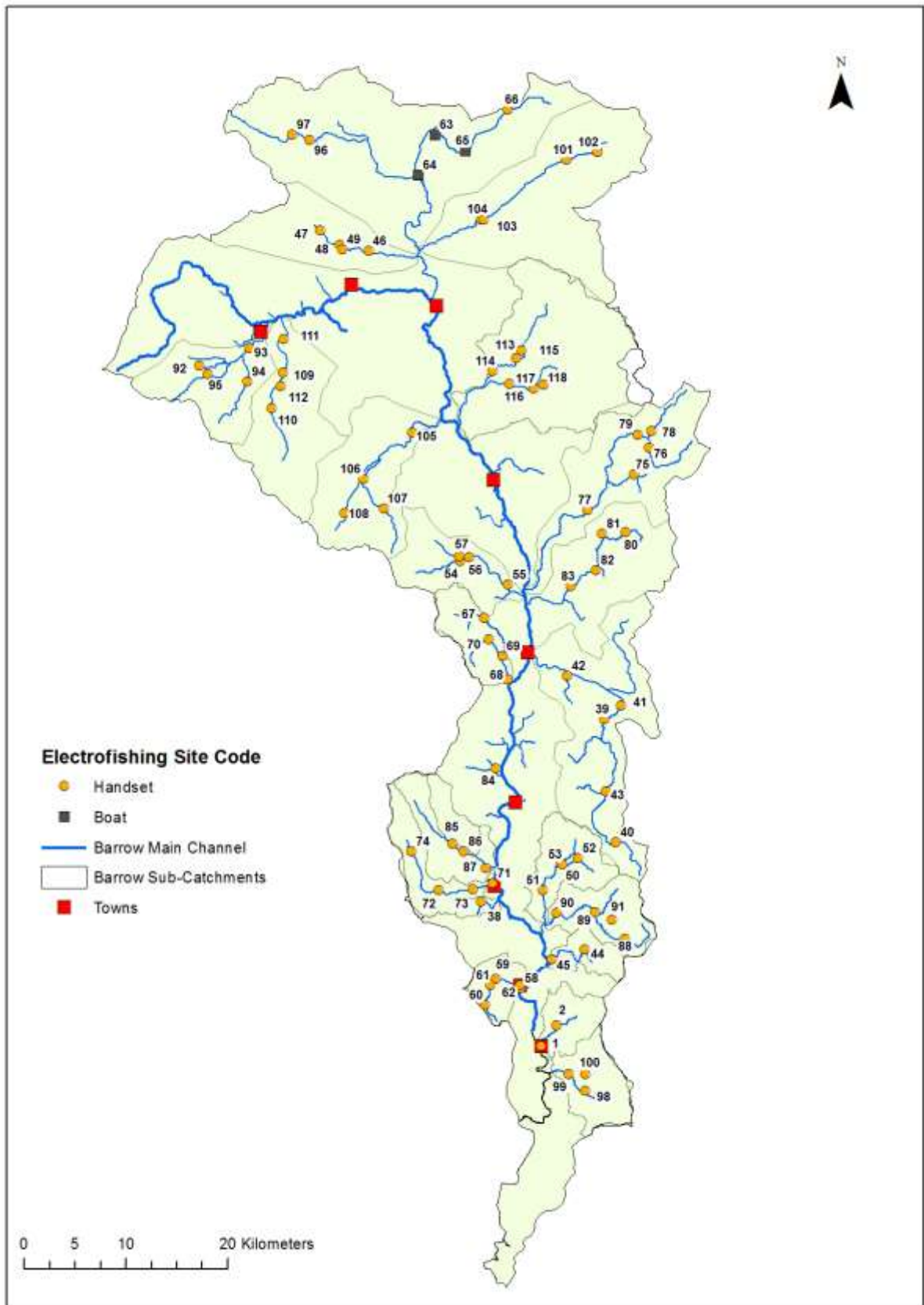


Figure 2.2. Location of all sub-catchment sites surveyed, June - August 2015 (with numbered identification).

### 3. Results

The electrofishing survey results are presented below for the main channel and canal sections combined (here after referred to as River Barrow main channel) along with each sub-catchment. A general over-view is also provided.

#### 3.1 River Barrow main channel

##### 3.1.1 Species Richness

A total of 12 fish species and one type of hybrid were recorded in the River Barrow main channel sites, with a total of 4070 fish being captured. The majority of sites were dominated by dace and roach. Excellent juvenile salmon numbers were recorded in the upper reaches of the main channel (Table 3.1). The range of fish species encountered (in order of abundance) during the course of the sampling programme on main channel sites included: dace (*Leuciscus leuciscus*), Atlantic salmon, roach, minnow (*Phoxinus phoxinus*), gudgeon (*Gobio gobio*), brown trout, pike, European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*), roach x bream hybrids, 3 spined stickleback (*Gasterosteus aculeatus*) and flounder (*Platichthys flesus*) (Table 3.1).

**Table 3.1. Total number of each fish species recorded, number of sites present and percentage occurrence of each species recorded throughout the River Barrow main channel electrofishing survey.**

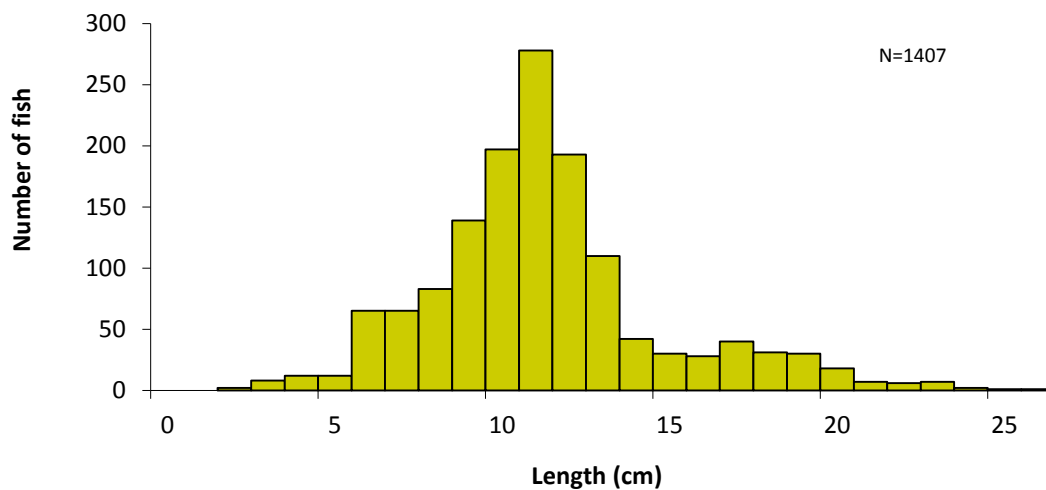
<b>Fish Species</b>	<b>Total Count</b>	<b>No sites present</b>	<b>% occurrence</b>
Dace	1381	32	91
Roach	754	28	80
Perch	224	26	74
Minnow	442	24	69
Atlantic Salmon (juvenile)	774	20	57
Atlantic Salmon (adult)	19	7	20
Pike	58	19	54
Gudgeon	215	17	49
Brown Trout (juvenile and adult)	139	16	46
European Eel	33	15	43
Stone loach	22	11	31
Roach x Bream hybrids	14	6	17
3 spined stickleback	8	1	3
Flounder	2	1	3

### 3.1.2 Fish species abundance and distribution

#### Dace

Dace ranged in length from 2 cm to 26 cm with 8 age classes present ranging from 0+ to 7+yrs. The majority were within the 6 cm to 13 cm length range (1+ and 2+ age class) (Fig. 3.1).

Dace were widely distributed throughout the main channel being recorded at 91% of the sites surveyed (Fig. 3.2). Their range extended from Mountmellick downstream to St. Mullin's (Fig. 3.2). The abundance of dace was generally mixed with greater numbers being recorded at Ardreigh, Tinnahinch (downstream of Graiguenamanagh), Graiguenamanagh (upstream), Ballyellin (downstream Goresbridge) and Fishersgrague (Fig. 3.2).



**Figure 3.1 Length frequency distribution of Dace at surveyed sites on the River Barrow main channel, June to August 2015.**

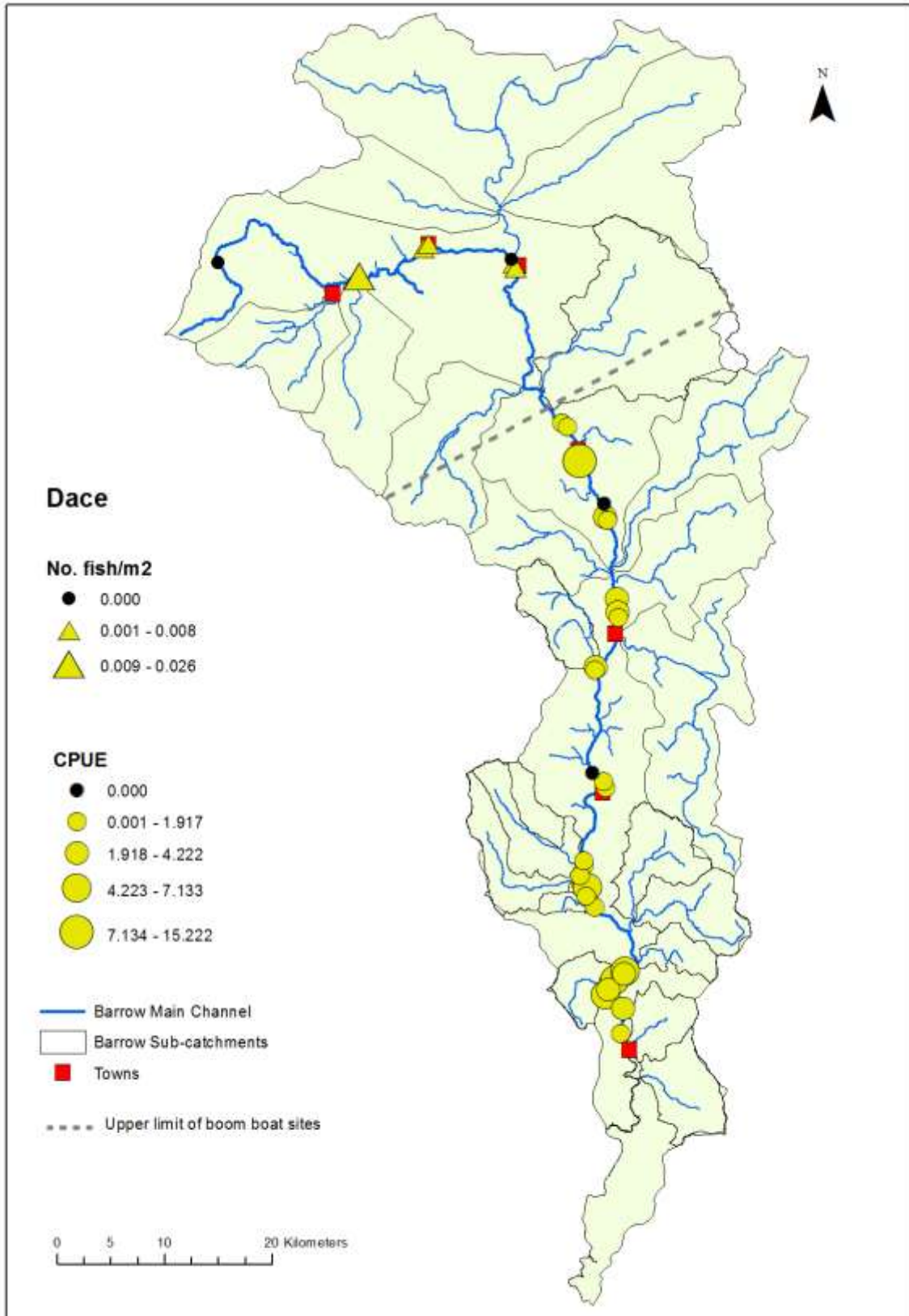


Figure 3.2. Dace distribution at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

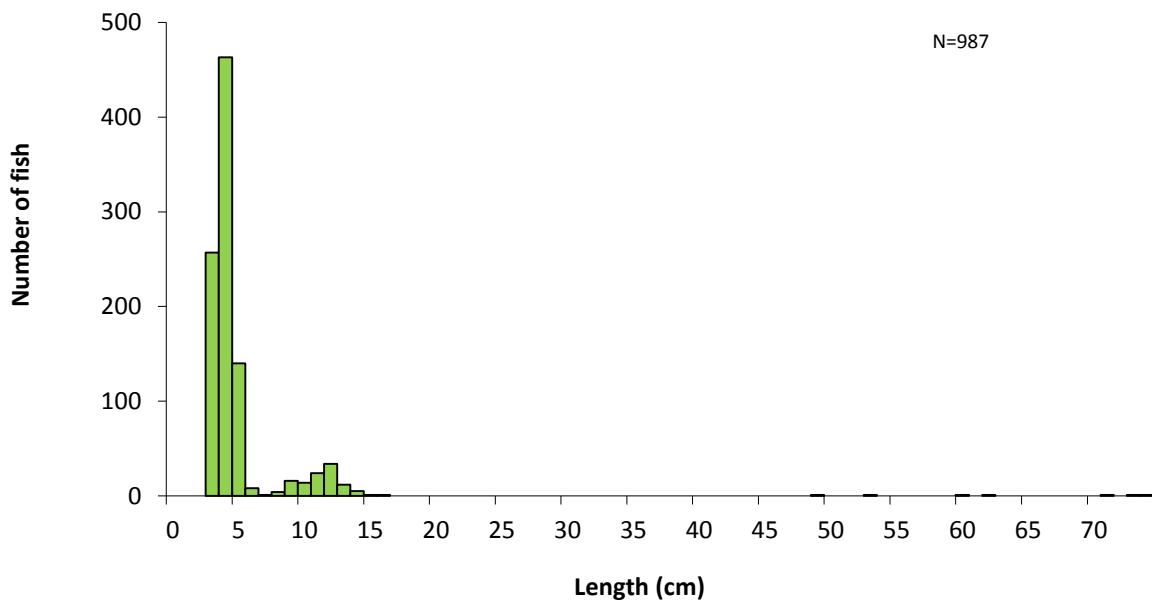


### Atlantic salmon

Juvenile Atlantic salmon ranged in length from 3 cm to 13 cm with two age classes present (0+ and 1+) (Fig. 3.3).

Atlantic salmon were present at 57% of the sites surveyed on the main channel. The only site of importance in relation to juvenile salmon was the upper most site on the main channel at Rathcoffey Bridge. This site recorded the highest density estimate of juvenile salmon fry (0+) throughout the entire Barrow Catchment survey in July 2015. The numbers of juvenile salmon elsewhere on the Barrow main channel were generally low and were mainly restricted to the non-navigable sections of the main channel in particular below weirs such as at Graiguenamanagh, Fishersgraique and Carriglead (between Graiguenamanagh and St. Mullin's) (Fig. 3.4 and 3.5).

A small number of adult salmon were also recorded during the course of the electrofishing survey at sites which included Graiguenamanagh, Athy and Mountloftus (Fig. 3.6)). These fish ranged in length from 49 to 73 cm and when aged were found to be 2.1 or 2.2 (i.e. fish that had spent either 1 winter at sea (grilse salmon) or 2 winters (spring salmon) at sea).



**Figure 3.3. Atlantic salmon length frequency distribution at surveyed sites on the River Barrow main channel, June to August 2015.**

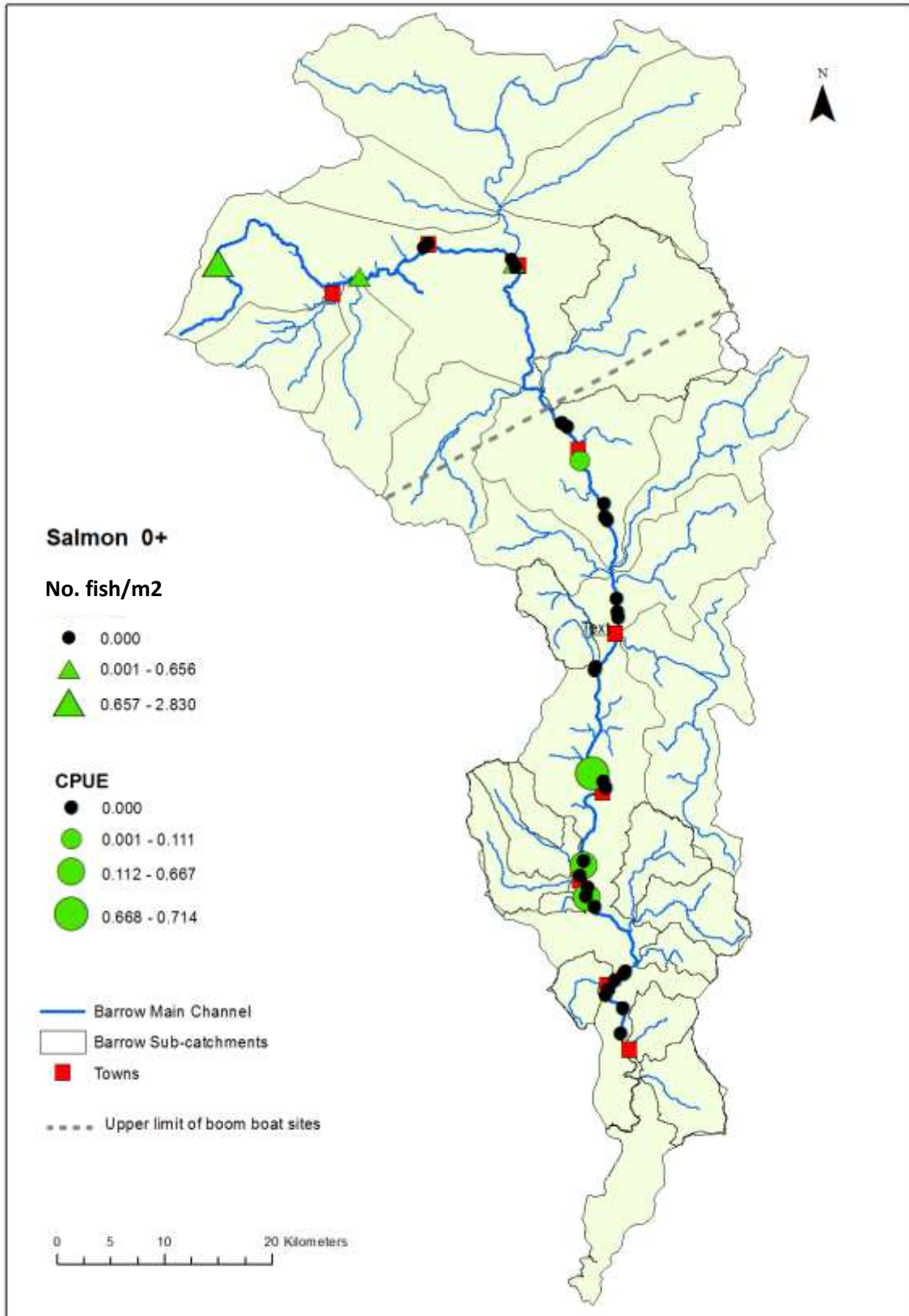


Figure 3.4. Salmon fry (0+) distribution at surveyed sites on the River Barrow main channel, June to August 2015 (*dashed line denotes a change in sampling method and data analysis*).

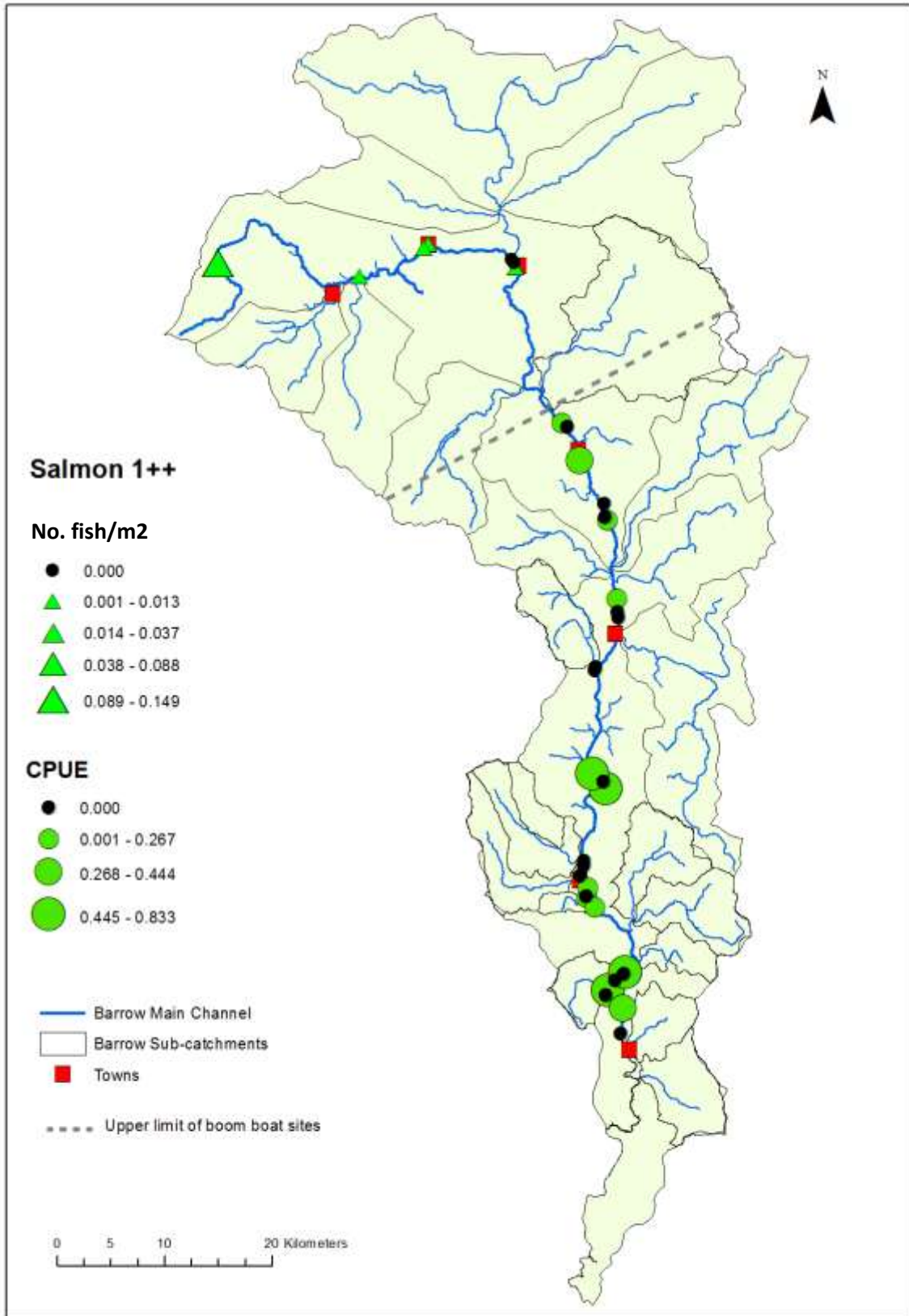


Figure 3.5. Salmon parr (1++) distribution at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

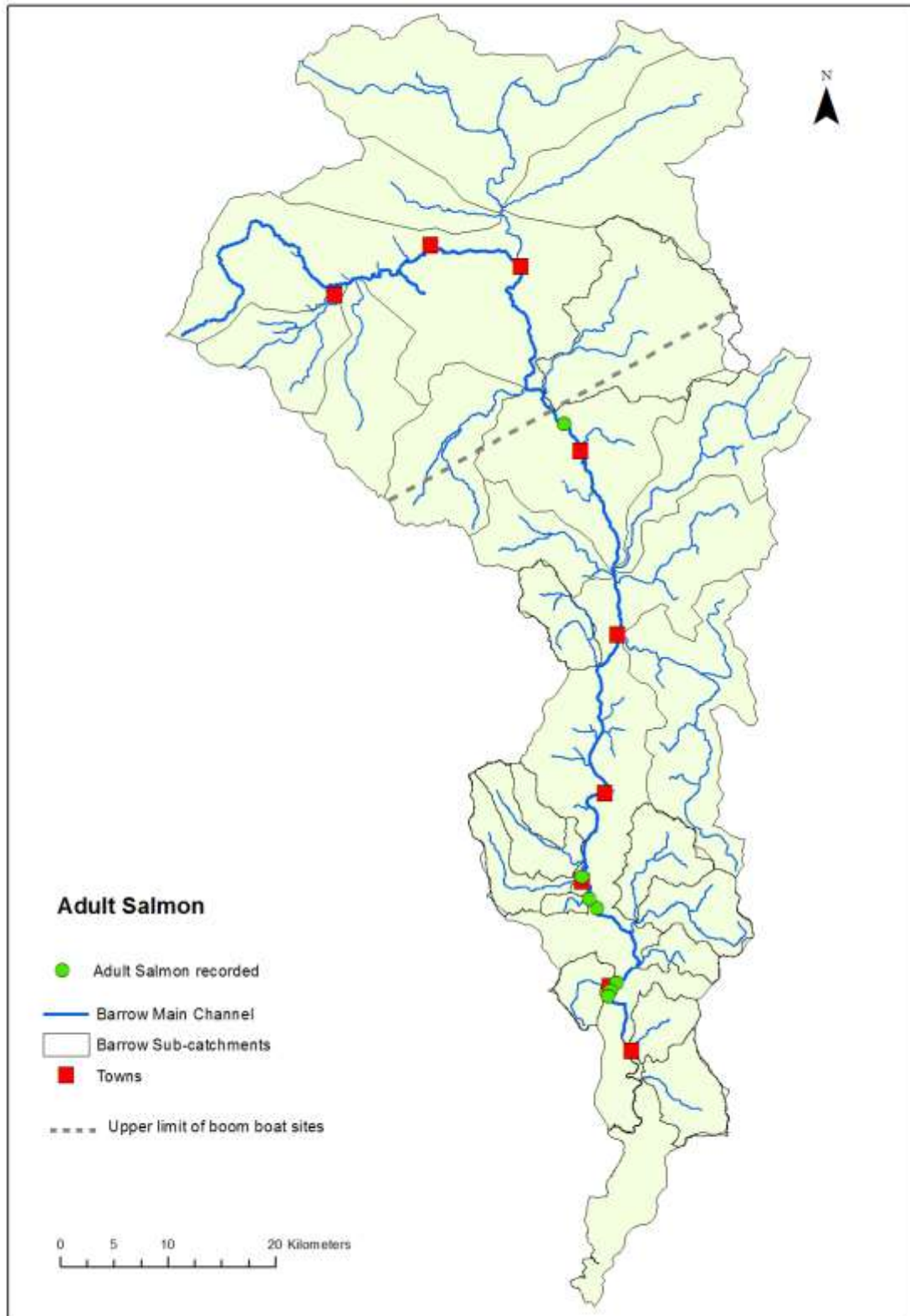
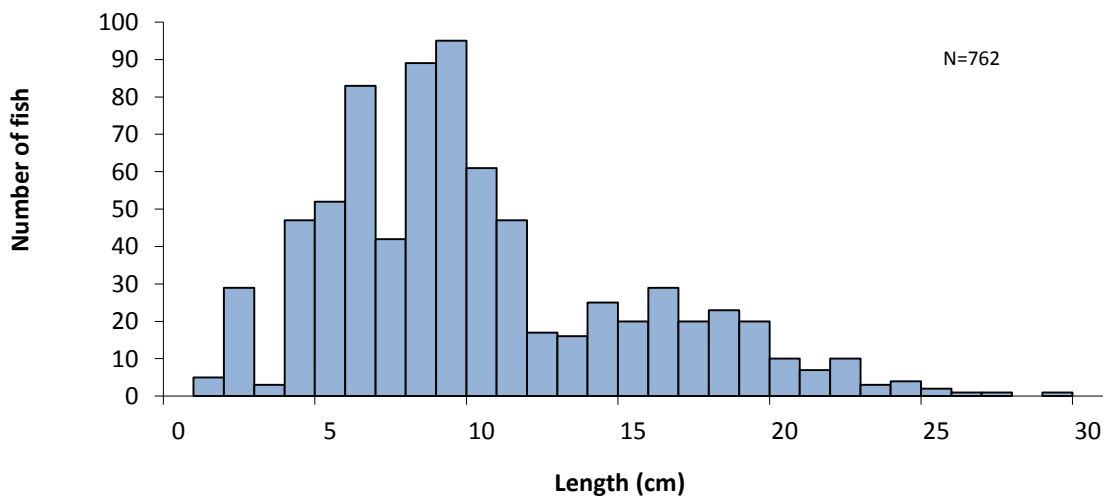


Figure 3.6. Location of adult salmon recorded at surveyed sites on the River Barrow main channel, June to August 2015 (*dashed line denotes a change in sampling method and data analysis*).

## Roach

Roach in the main channel ranged in length from 1.5 cm to 29.8 cm, with 10 age classes present ranging from 0+ to 9+. A large proportion of the roach recorded were less than 11 cm in length (66%) representing the 0+ to 2+ age class (Fig. 3.7).

They were widely distributed throughout the main channel being recorded at 80% of the sites sampled. Their range extended from Portarlinton downstream to St. Mullins (Fig. 8). Roach were most abundant at Dunleckny (Bagenalstown), Belview (Athy), Strawhall (upstream of Carlow) and St. Mullin's Canal cut (Fig. 3.8). Roach were present in all canal cuts and were the dominant fish species.



**Figure 3.7. Length frequency distribution of Roach at surveyed sites on the River Barrow main channel, June to August 2015.**

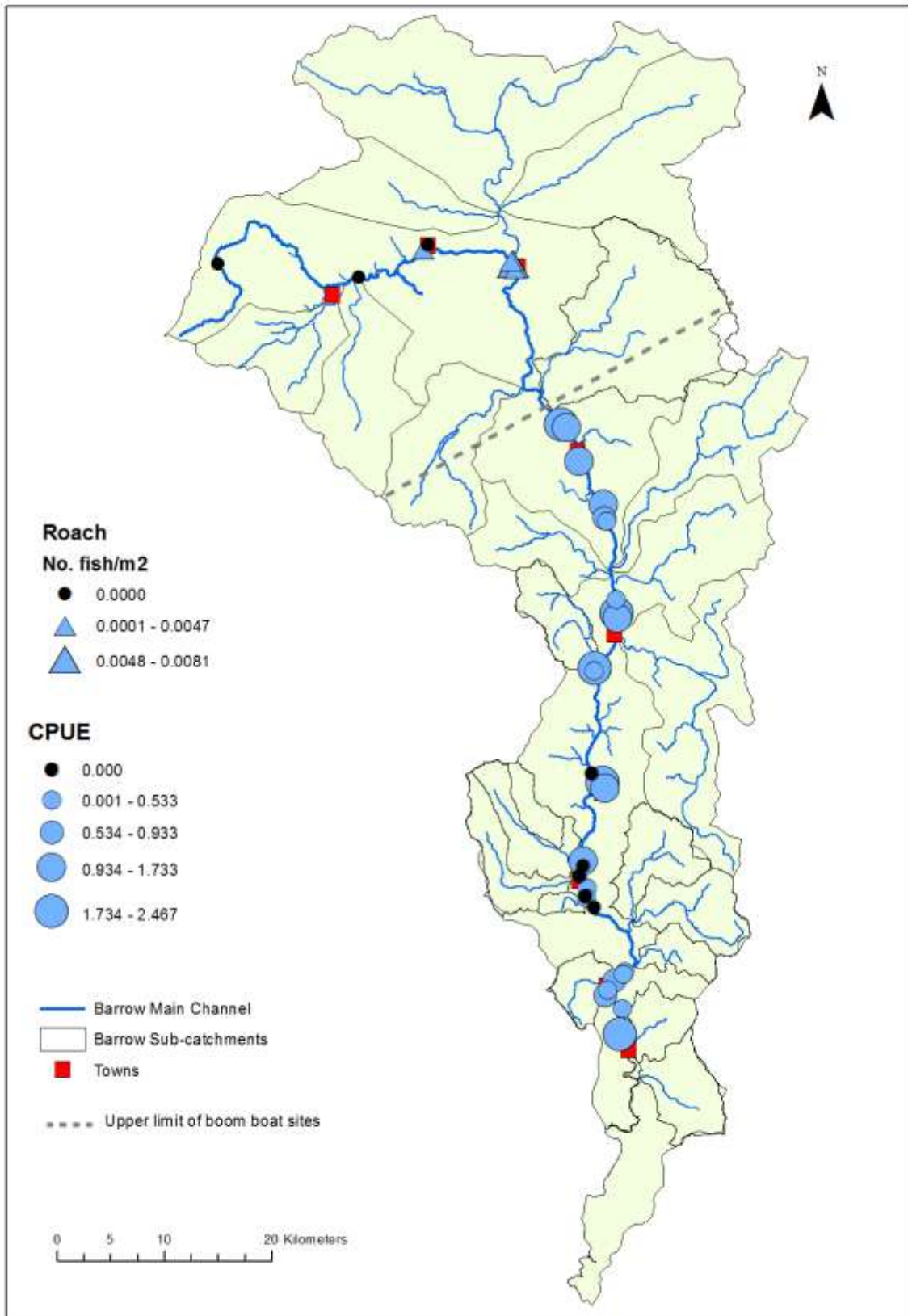
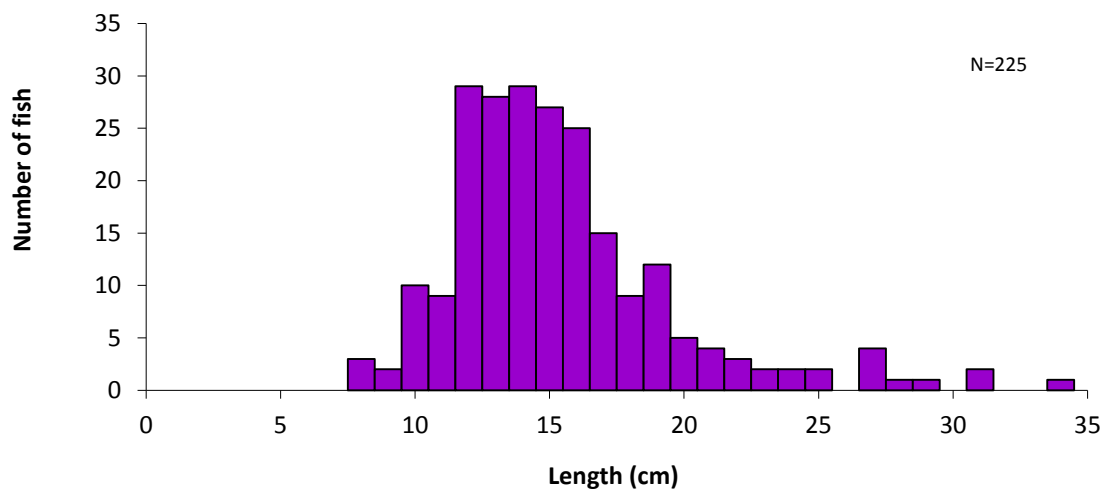


Figure 3.8. Roach distribution at surveyed sites throughout the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

## Perch

Perch ranged in length from 8 cm to 34 cm, with 88% of the population under 19 cm (Fig. 3.9).

Perch were well distributed throughout the River Barrow main channel though their numbers were generally low. They were present at 74% of all sites surveyed. The species was most common at Strawhall (Carlow), Ballykennan lock (downstream of Clashganny) and Upper Tinnahinch lock (downstream of Graiguenamanagh) (Fig. 3.10).



**Figure 3.9. Length frequency distribution of perch at surveyed sites on the River Barrow main channel, June to August 2015.**

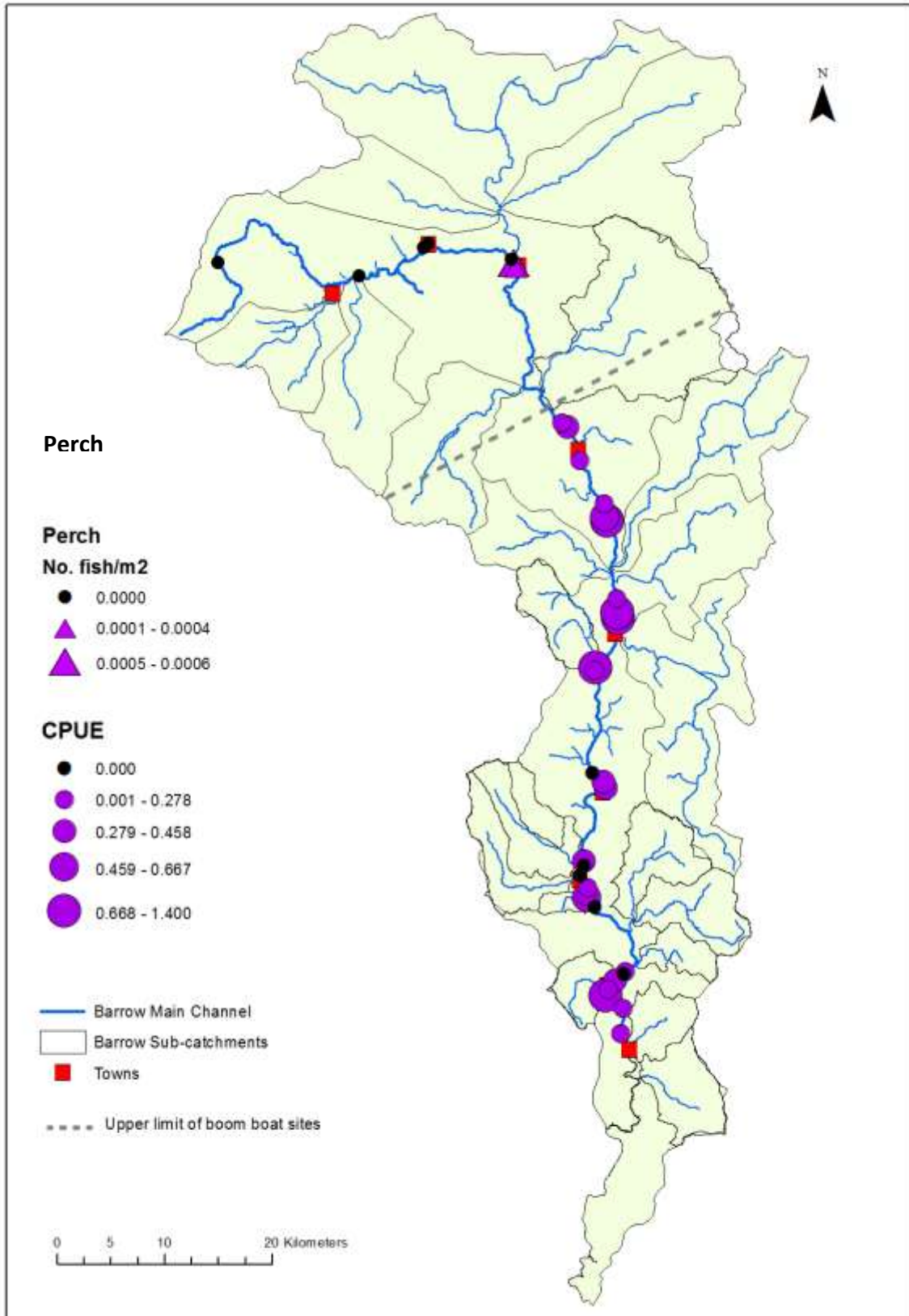


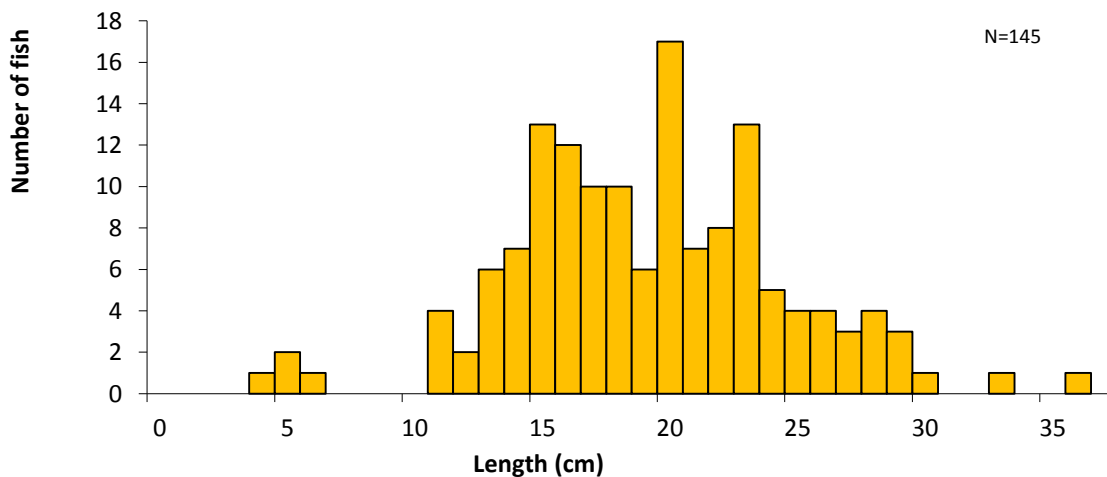
Figure 3.10. Perch distribution at surveyed sites on the River Barrow main channel, June to August 2015. (dashed line denotes a change in sampling method and data analysis).



## **Brown Trout**

Brown trout ranged in length from 4cm to 36 cm with 5 age classes present, ranging in age from 0+ to 4+. While not present in large numbers at any site surveyed the overall population appeared balanced (Fig. 3.11). The largest fish recorded was aged 3+, 36.8cm in length and weighed 575g.

Brown trout were only recorded at 46% of all River Barrow main channel sites surveyed. They were mainly restricted to the non-navigable sections of the river and in particular below weirs. Juvenile 0+ trout were only recorded in the upper Barrow at sites fished using the ADM method and not the sPASE method (Fig. 3.12). Brown trout 1+ and older were most common at the Goresbridge site (Fig. 3.13).



**Figure 3.11. Length frequency of brown trout at surveyed sites on the River Barrow main channel, June to August 2015.**

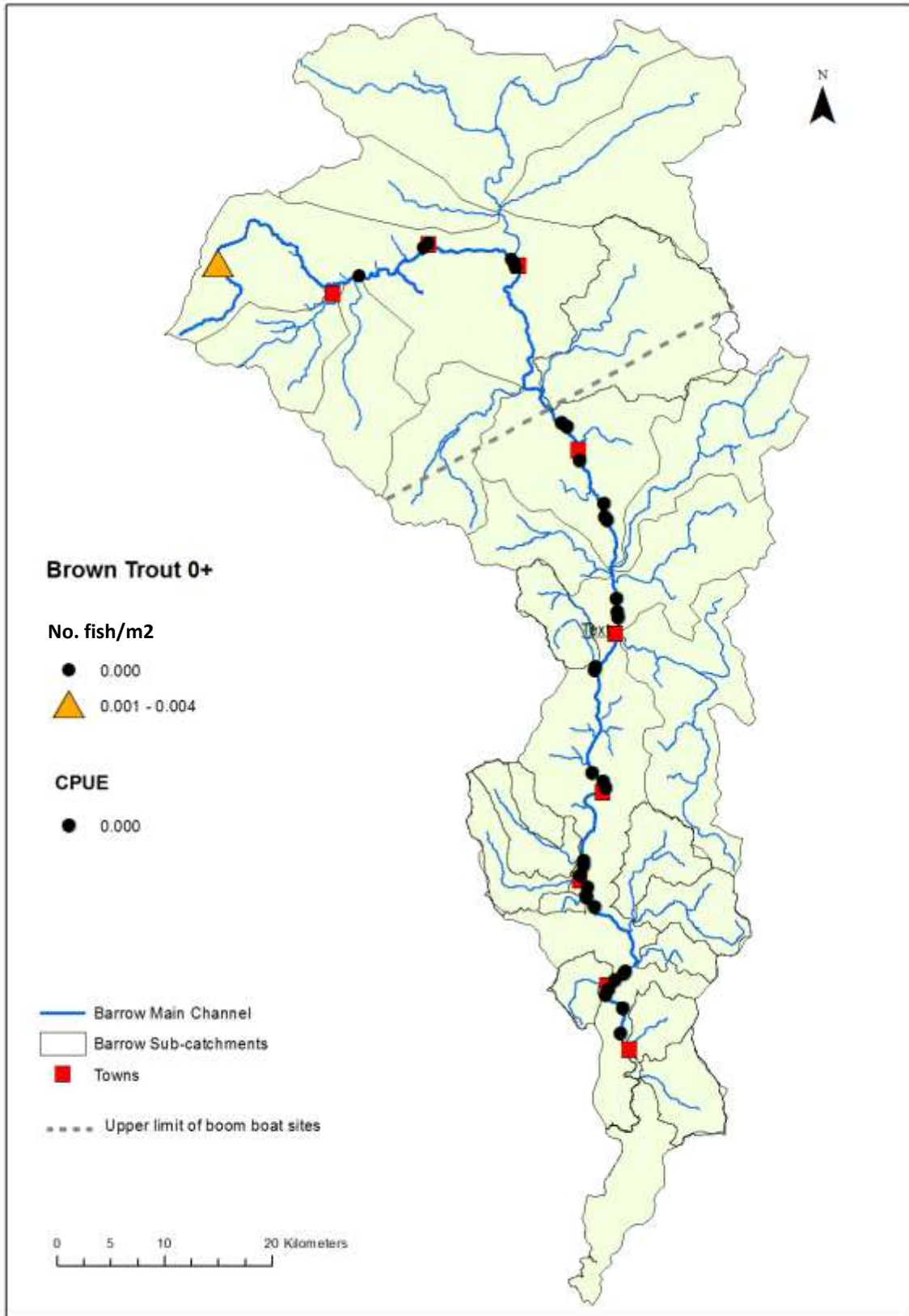


Figure 3.12. Brown trout fry (0+) distribution at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

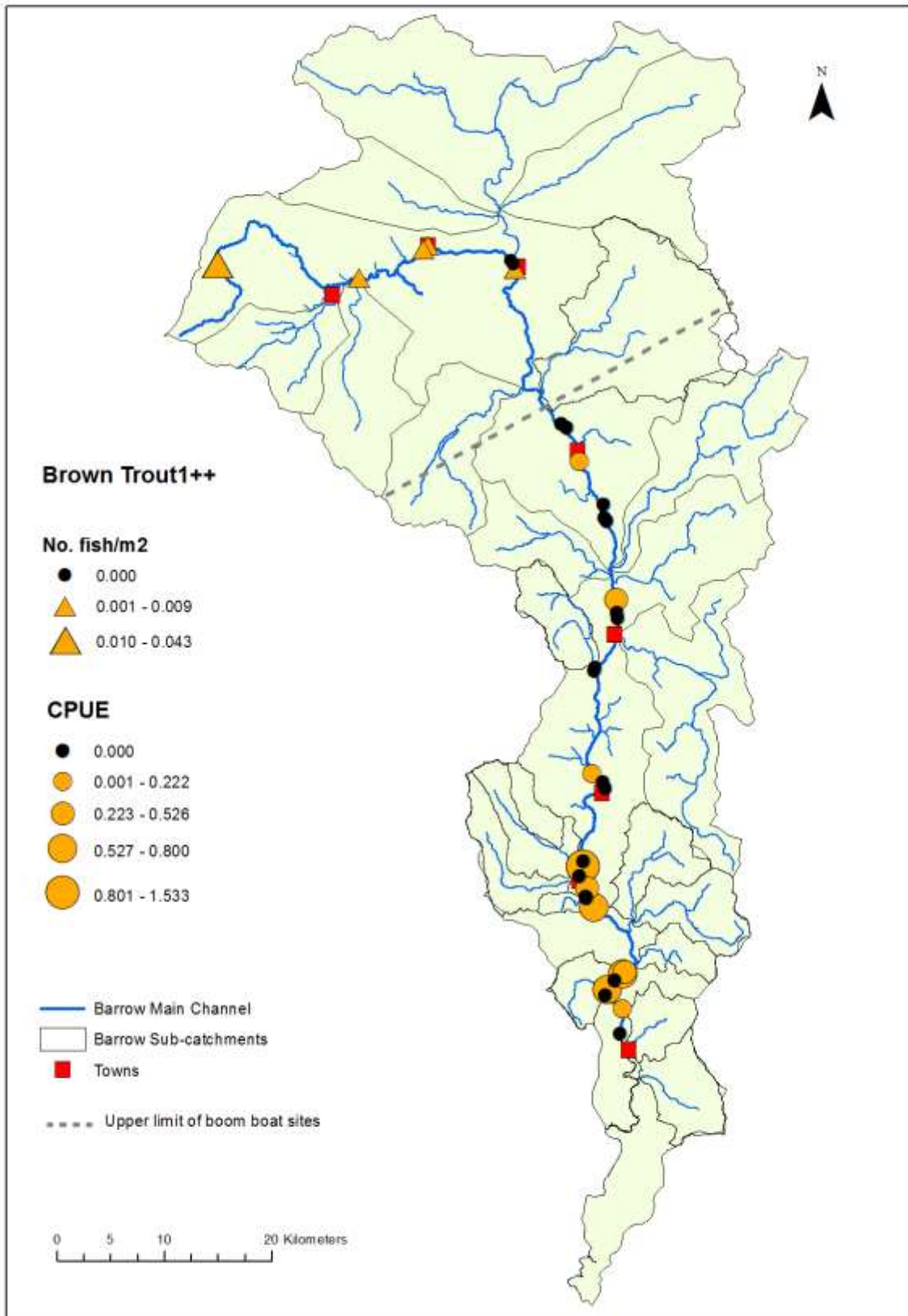
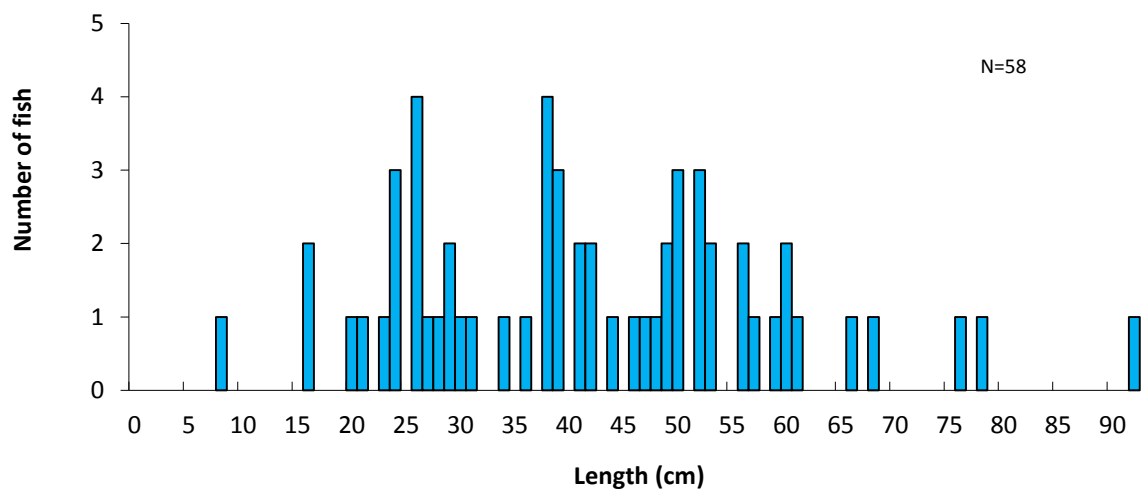


Figure 3.13. Brown trout 1+ & older distribution at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

## Pike

Pike ranged in length from 8 cm to 92 cm with 7 age classes present, ranging in age from 0+ to 6+ (Fig. 3.14).

Pike were present at 54% of sites surveyed along the main channel (Fig. 3.15). The furthest upstream site where pike were recorded was upstream of Portarlinton and the lower most site was Carriglead weir (upstream of St. Mullin's) (Fig. 15). In general the abundance of pike was low. Pike were most common near Monasterevin, Belview and Barrowford sites.



**Figure 3.14. Length frequency distribution of pike at surveyed sites on the River Barrow main channel, June to August 2015.**

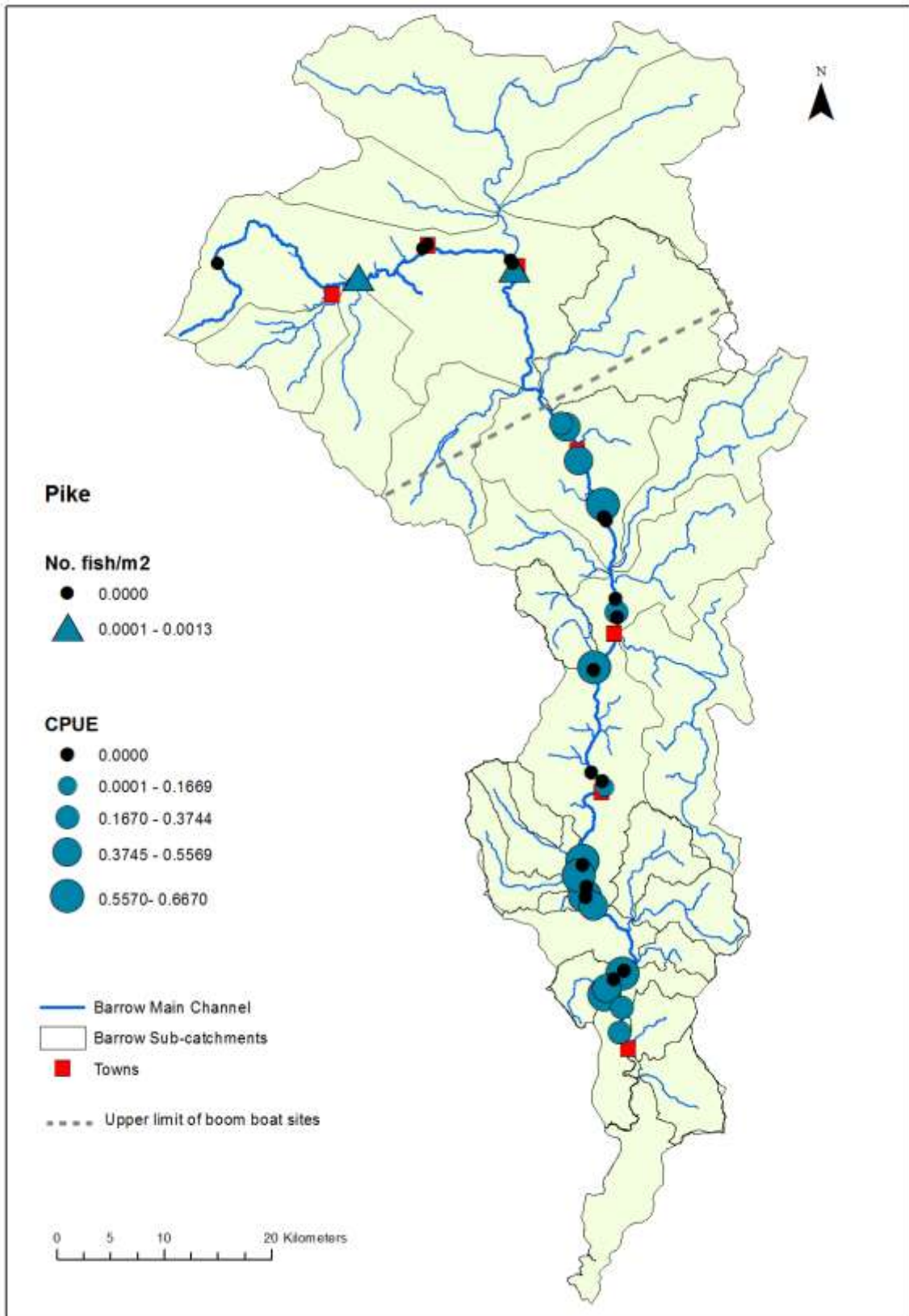
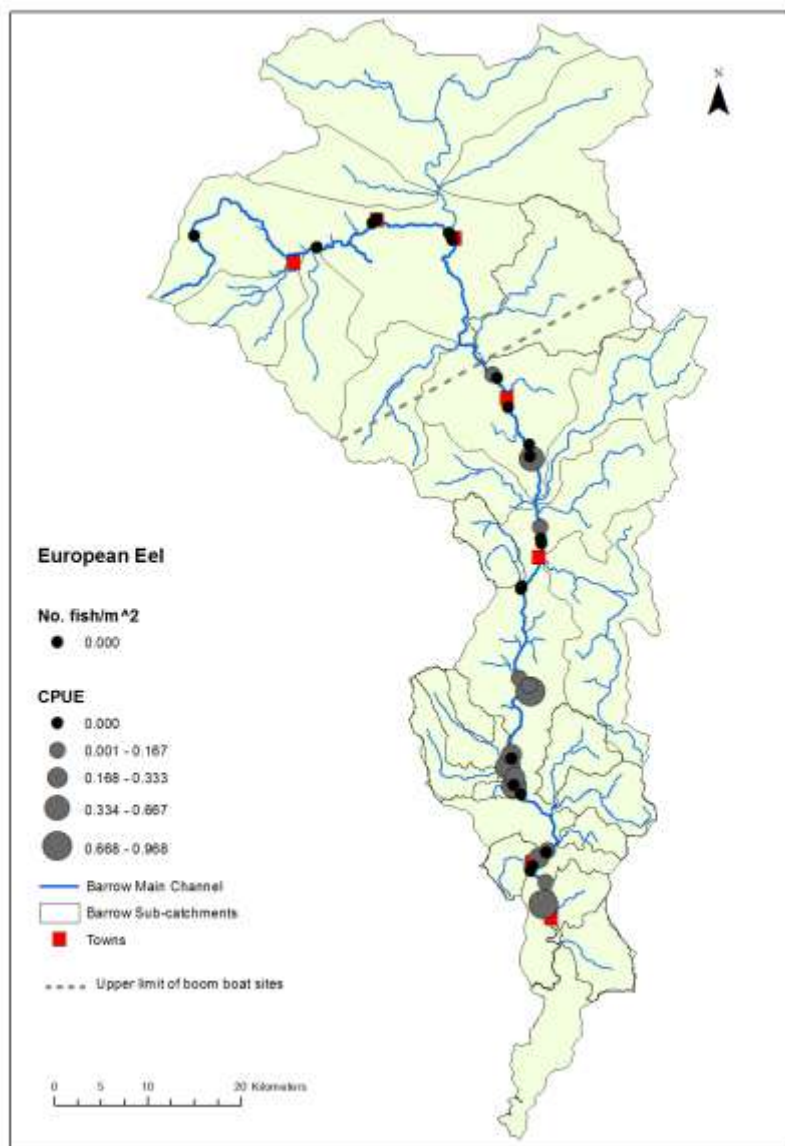


Figure 3.15. Location of pike at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).

### Other fish species

Other fish species recorded during the electrofishing survey of the River Barrow main channel were minnow, gudgeon, European eel, stone loach, roach x bream hybrids, 3 spined stickleback and flounder. Minnow and gudgeon were widely distributed throughout the main channel. European eel were only recorded at 15 sites throughout the main channel; sites where they were present represented slightly faster waters and were centred close to Bagenalstown, Goresbridge and Graiguenamanagh (Fig. 3.16).



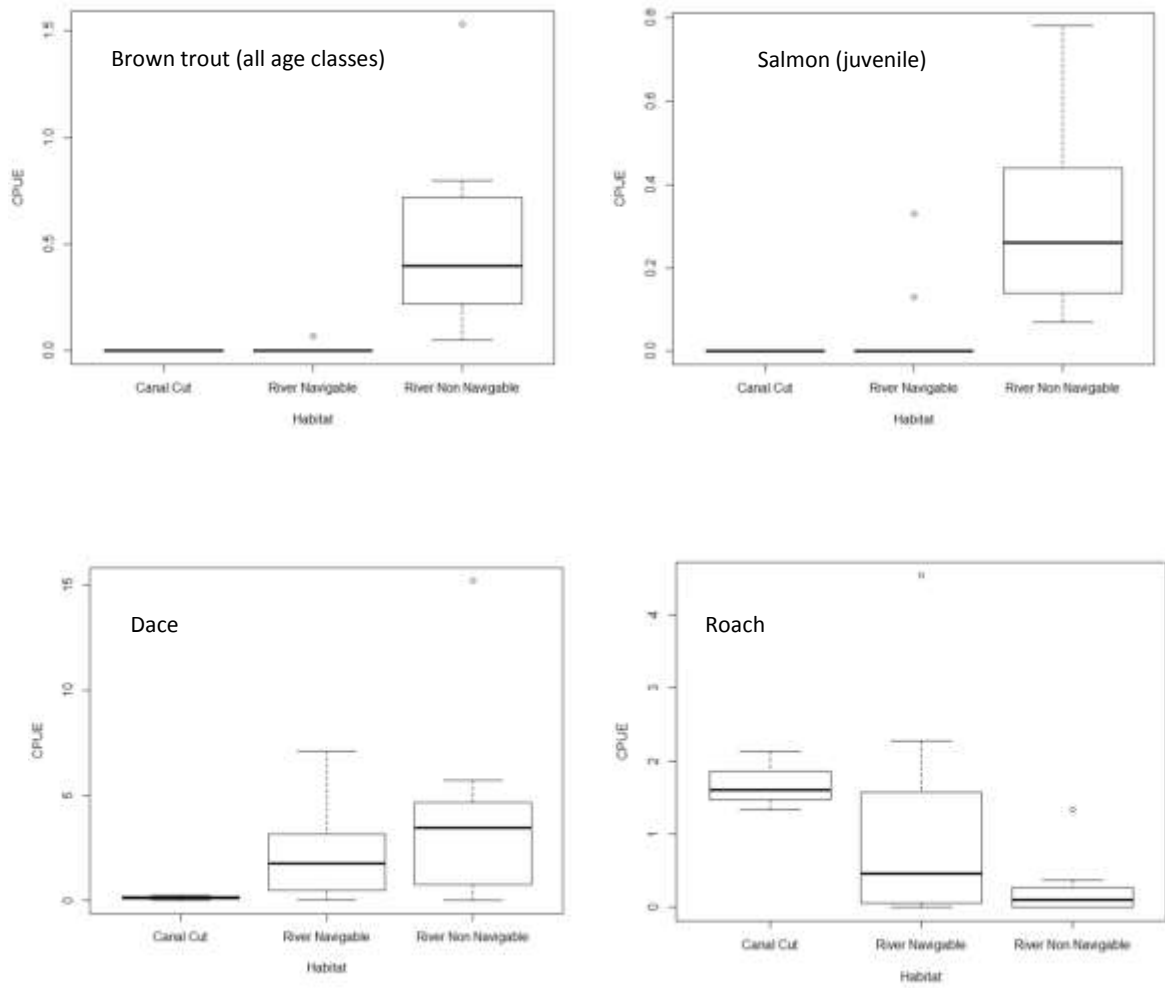
**Figure 3.16. Location of European eel recorded at surveyed sites on the River Barrow main channel, June to August 2015 (dashed line denotes a change in sampling method and data analysis).**

### 3.1.3 *Spatial segregation of fish species in the River Barrow Navigation*

The modifications necessary to facilitate navigation, have created three distinct habitat types on the lower River Barrow, these are:

1. **Navigable River** - that portion of the river which has been impounded upstream of weirs. These are generally deep, slow flowing river sections.
2. **Non-navigable River** - sections of fast flowing, shallow river, generally immediately downstream of the weirs.
3. **Canal Cuts** - these man made navigation channels are typically 12-15m wide, static or very slow flowing. They are open to the river at their upstream junction with the main channel. Navigation locks downstream permit passage of boats around the weirs and faster flowing river sections.

All three habitat types were surveyed during July 2015. Preliminary data analysis using simple linear regressions which modelled CPUE against habitat type for the four most abundant species (brown trout, juvenile Atlantic salmon, dace, and roach) was conducted using the statistical package R (R Core Team, 2015). This analysis revealed differences in habitat preference for the four species (Fig. 3.17). These were most pronounced for brown trout (F- 11.06 DF, df 2 & 25,  $p = 0.0003$ ) and Atlantic salmon (F- 12.08, df 2 & 25,  $p = 0.0002$ ) where these differences were statistically significant. Brown trout and juvenile salmon were effectively restricted to the non-navigable sections of the river downstream of the weirs and entirely absent from the canal cuts (Fig. 3.17). A similar trend was apparent for dace (Fig. 3.17). While this species was found in all habitats surveyed they were recorded in only small numbers in the canal cuts surveyed. This relationship was, not, however, statistically significant (F- 2.322, df 2 & 25,  $p = 0.1188$ ). Roach, however, were more prominent in the canal cut sections compared to the non-navigable river where the overall relationship approached significance (F- 2.729, df 2 & 25,  $p = 0.0847$ ) (Fig. 3.17).

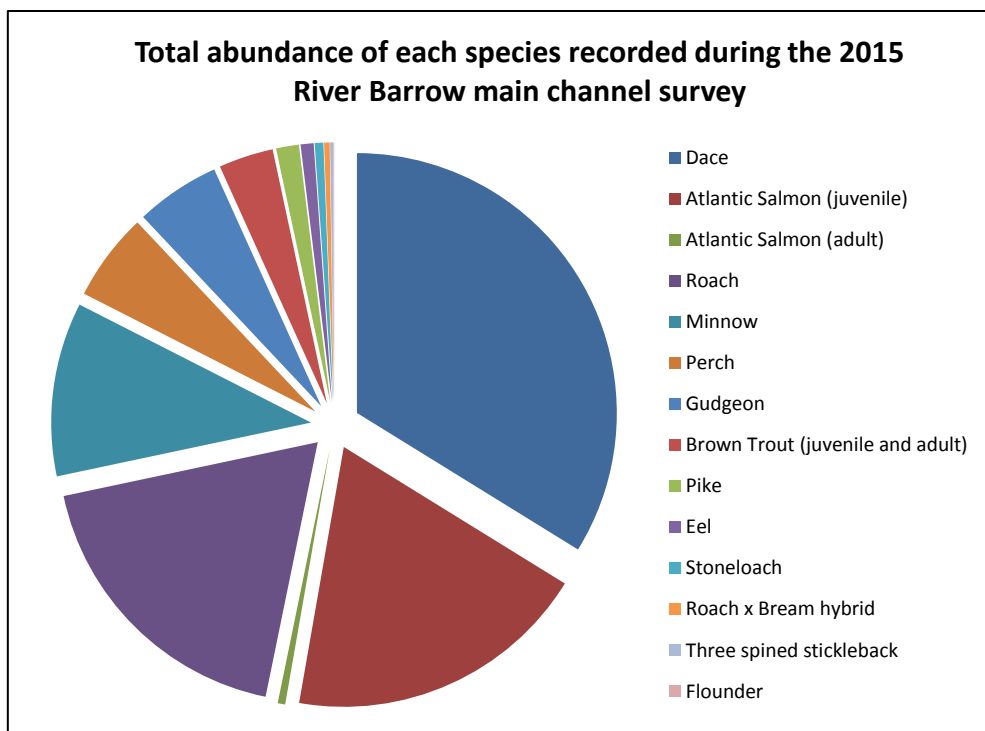


**Figure 3.17. Box and whisker plots of the four most abundant fish species (CPUE) captured in the three habitat types recorded at surveyed sites on the River Barrow main channel, July 2015.**



### 3.1.3 River Barrow main channel and canal sections (cuts) -General findings

- 12 fish species and 1 hybrid species were recorded
- Dace, an invasive species, followed by roach and perch were the most common fish species recorded across all the main channel sites and canal cuts (Fig. 3.18)
- No bream, although present in the river, were recorded at the surveyed sites
- The navigation channel sections were dominated by roach and dace
- The non-navigation channel sections were dominated by salmon, brown trout and dace
- The canal sections were mainly dominated by roach
- Upstream of Mountmellick the River Barrow functions as an excellent salmonid spawning area due to the higher gradient and habitat types present
- Downstream of Mountmellick the River Barrow is suited to coarse fish, pike, dace, adult brown trout and salmon due to the variety of habitat types present.



**Figure 3.18. Total abundance of each fish species recorded during the Barrow main channel survey, June to August 2015.**

### 3.1.4 Water Framework Directive Fish Ecological Status 2015

Fish status for sites surveyed on the Barrow main channel, with the exception of the canal cut sites) is presented below (Table 3.2). In general Good Status was recorded in the upper reaches of the River Barrow main channel and there after downstream of weirs where flow and habitat conditions were more favourable for a larger range of fish species.

**Table 3.2. Ecological status of fish at surveyed sites on the River Barrow Main Channel, June to August 2015**

Site Code	River Name	Site Name	Fish Status
31	Barrow, River	Rathcoffey Br.	G
17	Barrow, River	Clonterry	M
36	Barrow, River	u/s Portarlinton	M
30	Barrow, River	Portarlinton School Br.	M
12	Barrow, River	Belview	M
10	Barrow, River	Barrowford	P
3	Barrow, River	Ardreigh	G
24	Barrow, River	Levitstown	P
8	Barrow, River	Ballyfoyle	P
13	Barrow, River	Bestfield	M
33	Barrow, River	Strawhall A	P
34	Barrow, River	Strawhall B	P
16	Barrow, River	Clogrennan Br.	M
25	Barrow, River	Mortarstown Lower	M
14	Barrow, River	Burgage	M
20	Barrow, River	Goesbridge Graveyard	P
7	Barrow, River	Ballyellin Upper	G
6	Barrow, River	Ballyellin Tomb	G
19	Barrow, River	Fishersgraigue	G
9	Barrow, River	Ballykeen Lock	M
21	Barrow, River	Graiguenamanagh Br.	P
22	Barrow, River	Graiguenamanagh Weir	G
37	Barrow, River	Upper Tinnahinch Lock	M
15	Barrow, River	Carriglead Weir	G

## 3.2 River Barrow Sub-Catchments

Twenty one River Barrow sub-catchments were included in this survey and the results for each are presented here.

### 3.2.1 Owenass Catchment

#### Catchment Details

The Owenass is a small sub-catchment in the Upper River Barrow catchment covering an area of approximately 84km<sup>2</sup> (Fig. 1.1 and Appendix V). This river flows into the River Barrow main channel downstream of Mountmellick (Fig. 1.1). The lower reaches of the main channel form part of the Barrow Drainage. The landuse is mainly pasture with forestry in the upper reaches of the system. The dominant geology is limestone with sandstone underlying in the upper reaches. The lower to middle reaches of the main channel are included in the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3.1.



**Plate 3.1. (a) Owenass River at Owenass Bridge and (b) Owennahalia tributary at Esker Bridge.**

#### Survey Results

Two sites on the Owenass River, one on the Blackwater river and one on the Owennahallia River were surveyed in the Owenass catchment during 2015 (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, lamprey sp., 3 spined stickleback, dace, stone loach and minnow. Brown trout were present at all sites while Atlantic salmon were only recorded at two of the four

sites surveyed (Table 3.3). Brown trout ranged in length from 3.7 cm to 28.2 cm and ranged in age from 0+ to 3+, while salmon ranged in length from 4.0 cm to 13.5 cm and were aged 0+ and 1+. In general salmonid densities at sites surveyed were relatively poor with the exception of two sites; the Owennahallia site which recorded a good density of 0+ trout and the Owenass river at Clonehurk which had a relatively good density of 1+ and older brown trout (Table 3.3 and Figs. 3.19 and 3.20).

**Table 3.3. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Owenass catchment, 2015.**

Site Code	River Name	River site	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
94	Blackwater	Rossnagad	TME	0.056	-	0.011	-
95	Owennahallia	Esker	TME	0.847	0.032	-	-
92	Owenass	Clonehurk	ADM	0.011	0.281	-	-
93	Owenass	Owenass Br.	ADM	-	0.036	0.092	0.003

Dace were recorded at only one of the sites surveyed, i.e. Owenass Bridge site located only a couple of kilometres upstream from the River Barrow main channel confluence, and their density was low (Fig. 3.23). Lamprey, 3 spined stickleback, stone loach and minnow were also present though in very low densities (Table 3.4 and Figs. 3.24 to 3.30).

**Table 3.4. Other species minimum density estimates (No. fish/m<sup>2</sup>), Owenass catchment, 2015.**

Site Code	River Name	Site Name	E/F Method	Species				
				Dace	Lamprey sp.	Minnow	Stone loach	3 spined stickleback
94	Blackwater	Rossnagad	TME	-	0.056	-	-	0.045
95	Owennahallia	Esker	TME	-	-	-	-	-
92	Owenass	Clonehurk	ADM	-	-	-	-	-
93	Owenass	Owenass Br.	ADM	0.003	0.012	0.003	0.006	0.006

### **Fish Ecological Status**

Three of the four sites were assigned less than good status (Table 3.5). Only the upper site on the Owennahallia tributary achieved Good status.

**Table 3.5. Fish ecological status for each electrofishing site in the Owenass catchment, July and August 2015.**

Site code	River Name	Site Name	Fish Status
94	Blackwater Trib.	Rossnagad	M
95	Owennahallia Trib.	Esker	G
92	Owenass River	Clonehurk	M
93	Owenass River	Owenass Br.	P

### 3.2.2 Triogue Catchment

#### Catchment Details

The Triogue catchment covers an area of approximately 115km<sup>2</sup>. The Triogue river joins the River Barrow main channel approximately 2.5km north east of Mountmellick, Co. Laois (Fig. 1.1). It has a number of small tributaries, the most significant is the Cush river situated in the upper catchment. Land use is predominantly pasture; however, the main channel and some tributaries pass through Portlaoise town. The underlying geology is predominantly limestone/shale with some sandstone in the very upper catchment.

#### Survey Results

Four sites were surveyed in the catchment (Fig. 2.2 and Table 3.6). Fish species encountered included dace, brown trout, Atlantic salmon, 3 spined stickleback, stone loach, lamprey, European eel, minnow and gudgeon. Brown trout were present at all sites while Atlantic salmon were captured in only two sites (Table 3.6 and Figs. 3.19 and 3.20). Brown trout ranged in length from 4.9 cm to 27.5 cm and ranged in age from 0+ to 3+, while salmon ranged in length from 4.5 cm to 13.6 cm and were aged 0+ and 1+. In general salmon and brown trout densities were poor relative to other rivers sampled in the River Barrow catchment (Figs. 3.21 and 3.22).

**Table 3.6. Salmonid density estimates (No. fish/m<sup>2</sup>) in the Triogue catchment, 2015.**

Site Code	River name	River site	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
110	Triogue	Kyle Br.	ADM	0.004	0.014	0.03	0.011
112	Triogue trib.	Knocknagroagh	TME	0.177	0.011	-	-
109	Triogue	Eyne Br.	ADM	0.004	0.075	-	-
111	Triogue	Triogue Br.	TME	-	0.026	0.012	-

Dace were recorded at the two lower Triogue river sites in reasonable densities (Table 3.7 and Fig. 3.23). All other species present also had relatively low densities (Table 3.7 and Figs 3.24 to 3.30).

**Table 3.7. All other species minimum density estimates (No. fish/m<sup>2</sup>), Triogue catchment, 2015.**

Site Code	River Name	Site Name	E/F Method	Species					
				Dace	Lamprey sp.	Gudgeon	Minnow	Stone loach	3 spined stickleback
110	Triogue	Kyle Br.	ADM	-	-	-	-	0.011	-
112	Triogue trib.	Knocknagroagh	TME	-	-	-	-	-	-
109	Triogue	Eyne Br.	ADM	0.096	0.013	-	-	0.004	0.029
111	Triogue	Triogue Br.	TME	0.150	-	0.005	0.011	-	0.005

### Fish Ecological Status

All sites surveyed were assigned less than Good status (Table 3.8).

**Table 3.8. Fish ecological status for each electrofishing site in the Triogue catchment, July 2015.**

Site code	River Name	Site Name	Fish Status
110	Triogue River	Kyle Br.	P
112	Triogue Trib.	Knocknagroagh	M
109	Triogue River	Eyne Br.	M
111	Triogue River	Triogue Br.	P

### 3.2.3 *Cushina Catchment*

#### **Catchment Details**

The Cushina is a relatively small River Barrow sub-catchment draining an area of approximately 88.53km<sup>2</sup>. The Cushina along with the Figile and Slate rivers become the Black River before it enters the River Barrow main channel at Monasterevin (Fig. 1.1). Landuse is predominately pasture though with large sections of bog and forestry also present. The underlying geology is mainly limestone. The middle and lower reaches of this sub-catchment are managed by the Barrow Drainage Board. An example of channel form and habitat type is presented in Plate 3.2.



**Plate 3.2. Cushina River at (a) Cushina Bridge and (b) Lords Bridge.**

#### **Survey Results**

Four sites were surveyed in the Cushina sub-catchment during 2015 (Fig. 2.2). Fish species encountered included brown trout, stone loach, dace, Atlantic salmon, minnow, lamprey sp., European eel and 3 spined stickleback.

Brown trout were recorded at all sites surveyed while Atlantic salmon were not present in the two upper sites (Table 3.9 and Figs. 3.19 to 3.22). Brown trout ranged in length from 4.8 cm to 28.8 cm and ranged in age from 0+ to 4+. Salmon ranged in length from 4.5 cm to 13.2 cm and were aged 0+ and +1. Fish density estimates for all species were generally low (Table 3.9). Spawning, nursery and adult habitat types are present within the catchment though were somewhat limited.

**Table 3.9. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Cushina catchment, 2015.**

Site Code	River Name	River site	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
49	Cushina trib.	Kelly's Br.	TME	-	0.032	-	-
47	Cushina	Enaghan	TME	0.098	0.022	-	-
48	Cushina	Lords Br.	ADM	0.006	0.064	0.035	0.006
46	Cushina	Cushina Br.	ADM	0.008	0.031	0.016	0.016

Dace were present at two of the four sites (middle to lower reaches) (Table 3.10 and Fig. 3.23) and ranged in length from 9 cm to 16 cm (age ranged from 1+ to 3+). Poor densities of all other species present were noted (Table 3.10 and Figs 3.24 to 3.30).

**Table 3.10. All other species minimum density estimates (No. fish/m<sup>2</sup>), Cushina catchment, 2015.**

Site Code	River Name	Site Name	E/F Method	Species						
				Dace	Eel	Lamprey sp.	Gudgeon	Minnow	Stone loach	3 spined stickleback
49	Cushina trib.	Kelly's Br.	TME	0.130	-	-	-	-	0.022	-
47	Cushina	Enaghan	TME	-	-	0.022	-	-	-	0.033
48	Cushina	Lords Br.	ADM	0.093	-	0.006	-	0.006	0.035	0.035
46	Cushina	Cushina Br.	ADM	-	0.004	0.004	-	0.043	0.089	-

### **Fish Ecological Status**

All sites surveyed in the Cushina catchment were assigned less than Good status (Table 3.11).

**Table 3.11. Fish ecological status for each site surveyed in the Cushina catchment, July 2015.**

Site code	River Name	Site Name	Fish Status
49	Cushina Trib	Kelly's Br.	P
47	Cushina River	Enaghan	M
48	Cushina River	Lords Br.	M
46	Cushina River	Cushina Br.	M



### 3.2.4 Figile Catchment

#### **Catchment Details**

The Figile is the largest of the Barrow sub-catchments and includes the Philipstown River. It drains an area of approximately 320 km<sup>2</sup>. After its confluence with the Cushina and Slate Rivers it becomes the Black river before it enters the River Barrow at Monasterevin (Fig. 1.1). Geology in the catchment is largely a limestone mix. There is a scattering of forestry tracts throughout the catchment, though on the whole landuse is a mix of pastures and peat bog. The majority of the Figile and Philipstown main channels have been drained and are still managed under the Barrow Drainage Board. An example of channel form and habitat type is presented in Plate 3.3.



**Plate 3.3. Figile River at Andra Br.**

#### **Survey Results**

Six sites were surveyed in the Figile catchment during July 2015 (Fig. 2.2). Fish species encountered included three-spined stickleback, roach, perch, nine-spined stickleback, dace, stone loach, pike, brown trout, roach x bream hybrids, European eel, lamprey sp. and minnow (Tables 3.12 and 3.13).

Salmonid densities and distribution throughout the catchment were poor. Brown trout were only present at two of the survey sites while salmon were absent from all sites (Table 3.12 and Figs 3.19 and 3.20). The lower gradient nature and poor habitat in the river does not provide suitable spawning and nursery areas for salmonids.

**Table 12. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Figile catchment, July and August 2015.**

Site Code	River Name	River site	E/F Method	Brown Trout	
				0+	1++
97	Philipstown	Magheramore	TME	-	0.004
96	Philipstown	Killoneen	TME	-	-
66	Figile	Ticknevin	TME	-	-
65	Figile	Cushaling Br.	ADM	-	0.002
63	Figile	Bog Road	ADM	-	-
64	Figile	Clonbulloge	TME	-	-

Roach were present from the lower to middle reaches of the Figile River and their abundances were the highest recorded of all the sub-catchments surveyed (Fig. 3.30). Dace were recorded at three sites within the lower Figile River main channel. Three spined stickleback was the dominant fish species on the Philipstown River at Magheramore (Fig. 3.29).

**Table 13. All other species minimum density estimates (No. fish/m<sup>2</sup>), Figile catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Species								
				Dace	Eel	9 spined stickleback	Perch	Pike	Roach	Roach x Bream hybrid	Stone loach	3 spined. stickleback
97	Philipstown	Magheramore	TME	-	-	-	-	-	-	-	0.034	1.176
96	Philipstown	Killoneen	TME	-	-	0.004	-	0.069	-	-	-	-
66	Figile	Ticknevin	TME	-	0.011	-	-	-	0.032	-	-	-
65	Figile	Cushaling Br.	ADM	0.005	-	-	0.019	0.002	0.043	0.003	-	-
63	Figile	Bog Road	ADM	0.001	0.001	-	0.005	-	0.010	0.001	-	-
64	Figile	Clonbulloge	TME	0.004	-	-	0.005	0.002	0.005	-	-	-

## **Fish Ecological Status**

All sites surveyed were assigned a fish ecological status of Poor or Bad (Table 3.14).

**Table 3.14. Fish ecological status for each electrofishing site surveyed in the Figile catchment, July and August 2015.**

Site code	River Name	Site Name	Fish Status
97	Philipstown River	Magheramore	P
96	Philipstown River	Killoneen	B
66	Figile River	Ticknevin	P
65	Figile River	Cushaling Br.	P
63	Figile River	Bog Road	B
64	Figile River	Clonbulloge	B

### *3.2.5 Slate Catchment*

#### **Catchment Details**

The Slate River is one of the larger Barrow sub-catchments and covers an area of approximately 214km<sup>2</sup>. This river flows into the Black river 5km north of Monasterevin (Fig. 1.1). It is largely dominated by a single main channel, but also includes a number of small tributaries. Landuse is predominantly pasture and arable land with peat bog relatively abundant in the upper catchment. The underlying geology is primarily carboniferous rock dominated by shale and limestone. The largest tributary drains out of Pollardstown Fen SAC. Examples of channel form and habitat type are presented in Plate 3.4.



**Plate 3.4. Slate river at (a) Agar Br. and (b) Rathangan**

## Survey Results

A diverse range of fish species were recorded in the Slate river, including brown trout, minnow, Atlantic salmon, dace, 3 spined stickleback, stone loach, roach, perch, European eel and lamprey sp. (Tables 3.15 and 3.16). Brown trout were present at all sites while Atlantic salmon and dace were only captured in the lower reaches close to Rathangan (Fig 3.23). Brown trout ranged in length from 5.3 cm to 34.8 cm and ranged in age from 0+ to 4+. In general salmonid abundances were low to moderate with the best densities recorded at the Rathangan and Tannery sites (Table 3.15; Figs. 3.19 to 3.22).

**Table 3.15. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Slate catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
102	Slate	Robertstown	TME	-	0.068	-	-
101	Slate	Ballyteige	ADM	-	0.078	-	-
104	Slate	Tannery Park	TME	0.021	0.063	0.032	0.028
103	Slate	Rathangan	ADM	0.065	0.079	0.047	0.018

Moderate densities of 3 spined stickleback were recorded at the Robertstown site, though in general densities of all non salmonid species present were low (Table 3.16, Figs 3.23 to 3.30).

**Table 3.16. All other species minimum density estimates (No. fish/m<sup>2</sup>), Slate catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Species									
				Dace	Eel	Lamprey sp.	Minnow	Perch	Pike	Roach	Roach x Bream hybrid	Stone loach	3 spined stickleback
102	Slate	Robertstown	TME	-	-	-	-	-	-	-	-	-	0.310
101	Slate	Ballyteige	ADM	-	-	0.005	0.050	0.005	-	0.005	-	0.005	0.014
104	Slate	Tannery Park	TME	0.053	-	-	0.077	-	-	-	-	-	0.004
103	Slate	Rathangan	ADM	0.043	0.004	-	0.007	-	-	-	-	0.007	-

### Fish ecological status

Two sites were classified as Good status, while two were classified as Moderate status (Table 17).

**Table 3.17. Fish ecological status for each electrofishing site surveyed in the Slate catchment, July and August 2015.**

Site Code	River Name	Site Name	Fish Status
102	Slate	Robertstown	M
101	Slate	Ballyteige	M
104	Slate	Tannery Park	G
103	Slate	Rathangan	G

### 3.2.6 *Stradbally Catchment*

#### Catchment Details

The Stradbally catchment drains an area of approximately 118km<sup>2</sup>. The Stradbally River joins the River Barrow main channel approx. 1.5km southwest of Vicarstown (Fig. 1.1). It has a number of significant tributaries including the Crooked and Timahoe rivers. Landuse is predominantly pasture and arable land with peat bog relatively abundant in the upper catchment. The underlying geology consists primarily of limestone/shale with some sandstone in the upper catchment. The lower reaches fall within the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3.5.



**Plate 3.5. River Stradbally at Timogue Br.**

## Survey Results

Four sites were surveyed in the Stradbally river catchment (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, stone loach, lamprey sp. and minnow. Brown trout were present at all sites while Atlantic salmon were limited to the Clone Bridge site in the lower reaches (Table 3.18; Figs. 3.19 to 3.22). Brown trout ranged in length from 3.9 cm to 30.1 cm and were aged 0+ to 5+, while salmon ranged in length from 4.0 cm to 14.1 cm and were aged 0+ and 1+. Salmon and trout densities were mixed with relatively good abundances recorded at Clone Bridge and Timogue Bridge, whereas they were poor elsewhere (Table 3.18).

**Table 3.18. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Stradbally catchment, July 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
108	Stradbally Trib.	Timahoe Village	TME	0.046	-	-	-
107	Stradbally Trib.	Clopook	TME	0.197	0.007	-	-
106	Stradbally	Timogue Br.	ADM	-	0.286	-	-
105	Stradbally	Clone Br.	ADM	0.300	0.132	0.597	0.029

All other species recorded were poorly represented at the four sites surveyed (Table 3.19 and Figs. 3.23 to 3.30).

**Table 3.19. All other species minimum density estimates (No. fish/m<sup>2</sup>), Stradbally catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species			
				Lamprey sp.	Minnow	Stone loach	3 spined stickleback
108	Stradbally Trib	Timahoe Village	TME	-	0.011	0.057	0.092
107	Stradbally Trib	Clopook	TME	-	-	0.021	-
106	Stradbally	Timogue Br.	ADM	-	-	0.014	0.007
105	Stradbally	Clone Br.	ADM	0.004	-	0.004	0.004

### Fish ecological status

The Clone Bridge site downstream of Stradbally was assigned Good status in 2015, while all other sites upstream were assigned Moderate status (Table 3.20).

**Table 3.20. Fish ecological status for each electrofishing site surveyed in the Stradbally catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
108	Stradbally Trib	Timahoe Village	M
107	Stradbally Trib	Clopook	M
106	Stradbally	Timogue Br.	M
105	Stradbally	Clone Br.	G

### 3.2.7 Tully Catchment

#### Catchment Details

The Tully river catchment is another relatively large River Barrow sub-catchment with a catchment area of approximately 208km<sup>2</sup>. The Tully stream drains into the River Barrow main channel approximately five kilometres northwest of Athy, Co. Kildare (Fig. 1.1). It has one significant tributary, the Finnerly stream. Land use is predominantly pasture and arable land. The underlying geology is dominated by limestone. Examples of channel form and habitat type are presented in Plate 3.6.



**Plate 3.6. (a) Tully stream at Nurney and (b) Finnerly stream (Gorteen bridge)**

## Survey Results

Six sites were surveyed in the Tully catchment during 2015 (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, European eel, dace, stone loach and perch. Brown trout were present at all sites, while Atlantic salmon were generally limited to the Gorteen and Kilboggan sites on the Finnelly river (Table 3.21, Figs 3.19 to 3.22). Brown trout ranged in length from 4.0 cm to 32.0 cm and ranged in age from 0+ to 5+. Salmon ranged in length from 4.8 cm to 17.8 cm and were aged 0+ and 1+. In general the abundance of salmonids was poor with the exception of the Gorteen site on the Finnelly stream (Table 3.21).

**Table 3.21. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Tully catchment, July and August 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
118	Finnelly Trib	Kilboggan	TME	0.185	0.082	-	0.021
117	Finnelly Trib	Gorteen Br.	ADM	0.103	0.179	0.028	0.004
116	Finnelly Trib	Clarey	TME	-	0.077	-	-
115	Tully	Soomeragh Br.	TME	-	0.130	-	-
113	Tully	Nurney	ADM	0.013	0.085	-	-
114	Tully	Pullagh	TME	0.067	0.059	-	-

Dace were recorded at one site, the Finnelly river at the Clarey site. These fish were age 4+ and ranged in length from 16.2 cm to 22.2 cm. Other species present were poorly represented (Table 3.22, Figs. 3.23 to 3.30).

**Table 3.22. All other species minimum density estimates (No. fish/m<sup>2</sup>), Tully catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Species					
				Dace	Eel	Lamprey sp.	Perch	Stone loach	3 spined stickleback
118	Finnelly Trib	Kilboggan	TME	-	-	-	-	-	-
117	Finnelly Trib	Gorteen Br.	ADM	-	-	0.004	-	0.004	0.012
116	Finnelly Trib	Clarey	TME	0.064	-	-	0.006	-	0.013
115	Tully	Soomeragh Br.	TME	-	-	0.008	-	-	-
113	Tully	Nurney	TME	-	0.030	-	-	-	0.022
114	Tully	Pullagh	TME	-	-	0.007	-	-	-



### **Fish ecological status**

All three sites in the Tully stream failed to achieve Good ecological status for fish; however two of the three sites sampled in the Finnelly stream were assigned Good status (Table 23), these were located in the upper catchment.

**Table 3.23. Fish ecological status for each electrofishing site surveyed in the Tully catchment, July and August 2015.**

Site Code	River Name	Site Name	Fish Status
118	Finnelly Trib	Kilboggan	G
117	Finnelly Trib	Gorteen Br.	G
116	Finnelly Trib	Clarey	M
115	Tully	Soomeragh Br.	M
113	Tully	Nurney	M
114	Tully	Pullagh	M

### *3.2.8 Greese Catchment*

#### **Catchment Details**

The Greese river catchment covers an area of approximately 141km<sup>2</sup>. The dominant geology type is sandstone with a short band of limestone present along the lower reaches. Landuse is mostly pasture with some arable lands. Only the middle reaches of the Greese river main channel were drained and maintained by the Barrow Drainage Board. The Greese river flows into the River Barrow main channel approximately 5km upstream of Carlow town (Fig. 1.1). The underlying geology is dominated by limestone. Examples of channel form and habitat type are presented in Plate 3.7.



**Plate 3.7. Greese River at (a) Greese Bridge and (b) Spratstown.**

## Survey Results

Five sites were surveyed in the Greese catchment (Fig. 1.1). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, minnow, lamprey sp., European eel and stone loach. Brown trout ranged in length from 2.0 cm to 32.4 cm and ranged in age from 0+ to 4+. There were three age classes of juvenile salmon present (0+ to 2+) and these ranged in length from 3.0 cm to 15.0 cm. In general the 0+ age cohort was the dominant age class for both brown trout and salmon (Table 3.24).

The abundance and distribution of salmonids was particularly good throughout all the sites surveyed in the Greese catchment (Table 3.24, Figs 3.19 to 3.22) suggesting good spawning opportunities are available throughout this system for salmon and trout.

**Table 3.24. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Greese catchment, July 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
76	Greese	Ballynure Park	TME	0.257	0.010	0.238	0.019
75	Greese	Ballycore	TME	1.303	0.039	0.053	0.013
78	Greese	Colbinstown	TME	0.367	0.019	0.290	-
79	Greese	Spratstown Br.	ADM	0.085	0.175	0.025	-
77	Greese	Br. NE of Belan	ADM	0.336	0.148	0.602	0.017

Relatively high densities of three spined stickleback were recorded at two of the five sites surveyed (Table 3.25, Figs. 3.23 to 3.30).

**Table 3.25. All other species minimum density estimates (No. fish/m<sup>2</sup>), Greese catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species			
				Eel	Lamprey sp.	Minnow	3 spined stickleback
76	Greese	Ballynure Park	ADM	-	-	-	0.324
75	Greese	Ballycore	TME	-	-	-	-
78	Greese	Colbinstown	TME	-	-	-	-
79	Greese	Spratstown Br.	ADM	-	-	-	0.120
77	Greese	Br. NE of Belan	TME	0.003	0.009	0.110	0.049

### **Fish ecological status**

Four sites were assigned Good status and one site achieved a score of High status (Table 3.26).

**Table 3.26. Fish ecological status for each electrofishing site surveyed in the Greese catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
76	Greese	Ballynure Park	G
75	Greese	Ballycore	G
78	Greese	Colbinstown	G
79	Greese	Spratstown Br.	G
77	Greese	Br. NE of Belan	H

### *3.2.9 Douglas Catchment (Laois)*

#### **Catchment Details**

The Douglas catchment is another relatively small Barrow sub-catchment at approximately 66 km<sup>2</sup>. It enters the River Barrow main channel upstream of Carlow (Fig. 1.1). The underlying geology type is mostly limestone in the mid to lower catchment and sandstone/shale in the mid to upper catchment. Landuse in the catchment is predominately pasture. The lower reaches of the Douglas catchment were drained and are still maintained by the Barrow Drainage Board.

#### **Survey Results**

Four sites were surveyed during 2015 (Fig. 2.2). Fish species encountered included Atlantic salmon, brown trout, minnow, 3 spined stickleback, stone loach and lamprey sp. Atlantic Salmon and brown trout were present at each of the four sites surveyed. Brown trout ranged in length from 4.6 cm to 31.1 cm (0+ to 3+) and salmon ranged in length from 4.7 cm to 17.6 cm (0+ to 2+). Salmon 0+ dominated at each of the three main channel sites while 0+ brown trout was the dominant age class on the tributary (Table 3.27). The abundance of 1+ and older salmonids was generally low with the exception of the Gales bridge site (middle reaches) (Table 3.27, Figs. 3.19 to 3.22). This would suggest a paucity of suitable salmonid nursery habitat but good spawning grounds. A small number of adult brown trout were also present at the Gales bridge site.

**Table 3.27. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Douglas catchment, July 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
57	Douglas Trib	Fuer Br.	TME	0.394	0.012	0.012	0.012
54	Douglas	Castletown Br.	TME	0.135	-	0.264	-
56	Douglas	Gales Br.	ADM	0.203	0.129	0.718	0.108
55	Douglas	Clonagh Br.	ADM	0.007	-	0.030	-

Relatively moderate densities of 3 spined stickleback were recorded at one site surveyed in the upper catchment on the tributary, all other non salmonid species were present in low numbers (Table 3.28, Figs. 3.23 to 3.30).

**Table 3.28. All other species minimum density estimates (No. fish/m<sup>2</sup>), Douglas catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species			
				Lamprey sp.	Minnow	Stone loach	3 spined stickleback
57	Douglas Trib	Fuer Br.	TME	-	-	0.012	0.167
54	Douglas	Castletown Br.	TME	-	0.014	0.021	-
56	Douglas	Gales Br.	ADM	-	0.008	0.029	0.012
55	Douglas	Clonagh Br.	ADM	0.003	0.024	0.017	0.003

### Fish ecological status

Fish ecological status for the sites surveyed was mixed with two sites achieving Good status and two assigned Moderate status (Table 3.29).

**Table 3.29. Fish ecological status for each electrofishing site surveyed in the Douglas catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
57	Douglas Trib	Fuer Br.	G
54	Douglas	Castletown Br.	M
56	Douglas	Gales Br.	G
55	Douglas	Clonagh Br.	M

### 3.2.10 Lerr Catchment

#### **Catchment Details**

The Lerr is another relatively small River Barrow sub-catchment and drains an area approximately 55km<sup>2</sup>. It joins the River Barrow main channel upstream of Carlow town (Fig. 1.1). The dominant geology type is Granite. Landuse is mostly pastures with some arable lands noted. The Lerr main channel and a small number of tributaries were drained and maintained by the Barrow Drainage Board. A short section of the main channel, downstream of Castledermot, Co. Kildare is within the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3.8.



**Plate 3.8. Lerr river at (a) Green Br. and (b) Gotham Br (not surveyed).**

#### **Survey Results**

Four sites were surveyed on the Lerr River during July 2015 (Fig. 2.2). Fish species encountered were brown trout, Atlantic salmon, lamprey sp., 3 spined stickleback and stone loach. Brown trout were recorded at all sites, while salmon were absent from the upper most site (Alymerstown Bridge) (Table 3.30, Figs 3.19 to 3.22). Brown trout ranged in length from 3.2 cm to 25.5 cm and were aged 0+ to 3+. Two age classes of juvenile salmon were present and these ranged in length from 4.5 cm to 13.9 cm. Reasonable densities of trout fry (0+) were present at the majority of sites (Table 3.30 and Fig. 3.19). Lamprey sp. were present in good numbers at one site (Prumplestown) in the upper reaches of the main channel (Table 3.31, Fig. 3.26).

**Table 3.30. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Lerr catchment, July 2015.**

Site Code	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
80	Lerr	Alymerstown Br.	ADM	0.536	0.013	-	-
81	Lerr	Grangeford Br.	TME	0.453	0.020	0.098	-
82	Lerr	Mullarney	TME	0.085	0.091	0.049	0.018
83	Lerr	Prumplestown Br.	ADM	0.181	0.069	0.279	-

**Table 3.31. All other species minimum density estimates (No. fish/m<sup>2</sup>), Lerr catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species		
				Lamprey sp.	Stone loach	3 spined stickleback
80	Lerr	Alymerstown Br.	ADM	0.013	-	0.140
81	Lerr	Grangeford Br.	TME	0.433	-	-
82	Lerr	Mullarney	TME	-	0.006	0.012
83	Lerr	Prumplestown Br.	ADM	0.004	-	0.004

### **Fish ecological status**

All sites were assigned Good status apart from the site in the lower reaches at Prumplestown Bridge which achieved only Moderate status (Table 3.32).

**Table 3.32. Fish ecological status for each electrofishing site surveyed in the Lerr catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
80	Lerr	Alymerstown Br.	G
81	Lerr	Grangeford Br.	G
82	Lerr	Mullarney	G
83	Lerr	Prumplestown Br.	M

### 3.2.11 Burren Catchment

#### **Catchment Details**

The River Burren catchment area is approximately 176km<sup>2</sup>. Landuse is predominately arable and pasture. The underlying geology is granite. As part of the Barrow Arterial Drainage Scheme the Burren River was drained during the 1930's and is managed by the Barrow Drainage Board which undertakes routine drainage maintenance annually. The Burren enters the River Barrow main channel east of Carlow town (Fig. 1.1). An example of channel form and habitat type is presented in Plate 3.8.



**Plate 3.8. Burren River at Rathoe Br.**

#### **Survey Results**

Five sites were electrofished within this sub-catchment (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, minnow, stone loach, lamprey sp. and European eel. Salmonids were the dominant fish species at all sites. Salmon were absent from only one site; while trout were present at all sites (Table 3.33 and Figs. 3.19 to 3.22). Brown trout ranged in length from 4.7 cm to 24.6 cm and were aged 0+ to 3+. Salmon were age 0+ and 1+ and ranged in length from 2.8 cm to 15.2 cm. The 0+ age cohort was dominant for both salmon and trout (Table 3.33).

In general salmonid fry (0+) densities were modest and those for 1+ salmonids less so. Good densities of salmon 0+ were recorded within the lower reaches of the river while no particular pattern was evident with the 0+ trout.

**Table 3.33. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Burren catchment, July and August 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
40	Burren	Coolsneactha	TME	0.172	0.090	-	-
43	Burren	Ullard Br.	ADM	0.293	0.021	0.041	-
39	Burren	Ballynunnery Br.	TME	0.099	0.006	0.192	0.006
41	Burren	Rathoe Br.	ADM	0.175	-	0.810	0.024
42	Burren	Staplestown	TME	0.161	0.043	0.425	0.009

In general other fish species present were recorded in low densities with the exception of 3 spined stickleback at the Rathoe site (Table 3.34, Figs. 3.23 to 3.30).

**Table 3.34. All other species minimum density estimates (No. fish/m<sup>2</sup>), Burren catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Species				
				Eel	Lamprey sp.	Minnow	Stone loach	3 spined stickleback
40	Burren	Coolsneactha	TME	-	-	-	-	-
43	Burren	Ullard Br.	ADM	-	-	-	0.036	0.026
39	Burren	Ballynunnery Br.	TME	0.006	-	-	0.006	-
41	Burren	Rathoe Br.	ADM	-	0.016	0.079	0.024	0.250
42	Burren	Staplestown	TME	-	-	0.004	0.009	0.009



### Fish ecological status

Fish ecological status for the three sites in the upper reaches of the catchment was Moderate and the two lower sites were assigned Good status (Table 3.35).

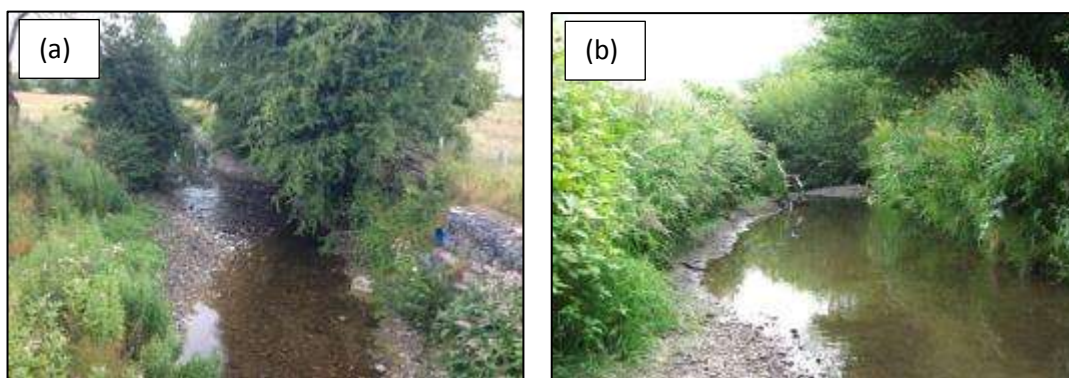
**Table 3.35. Fish ecological status for each electrofishing site surveyed in the Burren catchment, July and August 2015**

Site Code	River Name	Site Name	Fish Status
40	Burren	Coolsneactha	M
43	Burren	Ullard Br.	M
39	Burren	Ballynunnery Br.	M
41	Burren	Rathoe Br.	G
42	Burren	Staplestown	G

### 3.2.12 Fushoge catchment

#### Catchment Details

The Fushoge River catchment area is approximately 41km<sup>2</sup>. The river enters the River Barrow main channel downstream of Carlow town (Fig 1.1). Geology type is typically shale and sandstone. Landuse is mainly pasture. Forestry cover is also present in the upper reaches of the tributaries. A large section of the Fushoge river main channel falls within the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3.9.



**Plate 3.9. Fushoge River at (a) Coolrain and (b) Olderrig br.**

## Survey Results

Four sites were electrofished within this catchment (Fig. 2.2). Fish species encountered included Atlantic salmon, brown trout, lamprey sp., minnow, 3 spined stickleback, stone loach, gudgeon and European eel. On the main channel salmonids were the dominant species, in particular salmon fry (0+) (Table 3.36, Figs 3.19 to 3.22). Only one brown trout 1+ fish was recorded at the Killeshin tributary site. Salmon were age 0+ and 1+ and ranged in length from 3.9 cm to 11.4 cm. Brown trout ranged in length from 4.8 cm to 21.3 cm and were aged 0+ to 3+. The 0+ age cohort was dominant for both salmon and trout (Table 3.36).

**Table 3.36. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Fushoge catchment, July 2015.**

Site Code	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
70	Fushoge Trib	Killeshin	TME	-	0.012	-	-
67	Fushoge	Coolrain	TME	0.195	-	0.098	-
69	Fushoge	Olderrig Br.	ADM	0.209	-	0.353	-
68	Fushoge	Fushoge Br.	ADM	0.016	0.016	0.155	-

Survey results for all other species are presented in Table 3.37 and Figs. 3.23 to 3.30. Good numbers of lamprey were also present at two sites within the sub-catchment (Table 3.37, Fig. 3.26).

**Table 3.37. All other species minimum density estimates (No. fish/m<sup>2</sup>), Fushoge catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species					
				Eel	Gudgeon	Lamprey sp.	Minnow	Stone loach	3 spined stickleback
70	Fushoge Trib	Killeshin	TME	0.037	-	-	-	-	0.050
67	Fushoge	Coolrain	TME	-	-	-	0.015	-	0.008
69	Fushoge	Olderrig Br.	ADM	-	-	0.331	-	-	0.086
68	Fushoge	Fushoge Br.	ADM	0.004	0.012	0.012	0.163	0.012	0.008

## Fish ecological status

Only one site on the Fushoge achieved Good Status, all others were assigned Moderate or Poor status (Table 3.38).

**Table 3.38. Fish ecological status for each electrofishing site surveyed in the Fushoge catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
70	Fushoge Trib	Killeshin	P
67	Fushoge	Coolrain	M
69	Fushoge	Olderrig Br.	G
68	Fushoge	Fushoge Br.	M

### 3.2.13 Gowran catchment

#### **Catchment Details**

The Gowran river catchment area is approximately 42.09km<sup>2</sup>. The river enters the River Barrow main channel downstream of Carlow , close to Goresbridge, Co. Kilkenny(Fig. 1.1). Geology type is typically shale and sandstone in the upper reaches and predominantly limestone in the middle and lower reaches. Landuse is mainly pasture with smaller amounts of arable also present. Forestry cover is limited within the catchment. An example of channel form and habitat type is presented in Plate 3.10.



**Plate 3.10. Gowran River at Gowran Village, Co. Kilkenny**

#### **Survey results**

Four sites were electrofished within this catchment (Fig 2.2). Fish species encountered included brown trout, 3 spined stickleback, stone loach, Atlantis salmon, lamprey sp. and European eel.

Brown trout were present at all four sites, Atlantic salmon at three sites (Table 3.39). Brown trout ranged in length from 5 cm to 31 cm and were aged 0+ to 3+. Salmon were age 0+ and 1+ and ranged in length from 4.9 cm to 12.5 cm. The 0+ age cohort was dominant for both trout and salmon at the Grangehill and Gowran village sites (Table 3.39).

**Table 3.39. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Gowran catchment, July 2015.**

Site Code	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
74	Gowran	Grangehill	TME	0.482	0.010	-	0.021
72	Gowran	Gowran Village	ADM	0.113	0.083	0.041	-
73	Gowran	Grange Lower	TME	0.019	0.125	-	-
71	Gowran	Goresbridge	ADM	-	0.066	0.026	0.010

Survey results for all other species are presented in Table 3.40 and Figs. 3.23 to 3.30.

**Table 3.40. All other species minimum density estimates (No. fish/m<sup>2</sup>), Gowran catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species			
				Eel	Lamprey sp.	Stone loach	3 spined stickleback
74	Gowran	Grangehill	TME	-	-	0.021	0.226
72	Gowran	Gowran Village	ADM	-	0.008	-	0.072
73	Gowran	Grange Lower	TME	0.010	-	-	0.010
71	Gowran	Goresbridge	ADM	0.015	-	0.117	-

### **Fish ecological status**

Only the upper Gowran site achieved Good status, all other sites were assigned Moderate status (Table 3.41).

**Table 3.41. Fish ecological status for each electrofishing site surveyed in the Gowran catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
74	Gowran	Grangehill	G
72	Gowran	Gowran Village	M
73	Gowran	Grange Lower	M
71	Gowran	Goresbridge	M

### 3.2.14 Smaller Barrow Main Channel Tributaries

#### Catchment Details

This group of tributaries includes the Madlin, Monefelim and Barrowmount rivers (Fig. 1.1). All three tributaries flow in to the western side of the River Barrow main channel between Carlow and Goresbridge. Geology type is typically limestone in the mid to lower reaches and sandstone in the upper reaches of all but the Barrowmount system. Here geology type is limestone in the lower reaches and slate/schist in the mid to upper reaches. Landuse is again very similar amongst all tributaries with pastures the dominant type and some arable lands also present. Forestry cover is also present in the upper reaches of both the Madlin and Monefelim systems. The Madlin River and lower reaches of the Monefelim and Barrowmount are included as part of the Barrow SAC.

#### Survey Results

In total five sites were surveyed in these three small catchments during 2015 (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, minnow, stone loach, lamprey sp. and European eel. Brown trout and Atlantic salmon were present at all sites electrofished though densities recorded varied greatly, but in all cases were better for 0+ salmonids than for 1+ salmonids, suggesting reasonable potential for spawning (Table 3.42, Figs 3.19 to 3.22). Brown trout ranged in length from 4.8 cm to 28.1 cm and were aged 0+ to 2+. Salmon were age 0+ and 1+ and ranged in length from 3.5 cm to 13.7 cm. The 0+ age cohort was dominant for both trout and salmon (Table 3.42).

**Table 3.42. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Madlin, Monefelim and Barrowmount catchments, July 2015.**

Site Code	River name	River site	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
84	Madlin R. Trib.	Ballynolan Br.	ADM	0.684	0.008	0.032	-
85	Monefelim R	Garryduff	TME	0.182	0.033	0.108	0.025
86	Monefelim R	Monefelim	TME	0.116	0.097	0.930	0.136
87	Monefelim R	Barraghcore Br.	ADM	0.062	0.024	0.250	0.014
38	Barrowmount R	Johnville Br.	ADM	0.259	-	0.035	0.026

Minnow and 3 spined stickleback were the dominant fish species recorded at the Madlin river site (Table 3.43, Figs. 3.23 to 3.30).

**Table 3.43. All other species minimum density estimates (No. fish/m<sup>2</sup>), Madlin, Monefelim and Barrowmount catchments, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species				
				Eel	Lamprey sp.	Minnow	Stone loach	3 spined stickleback
84	Madlin R. Trib.	Ballynolan Br.	ADM	0.008	0.048	0.493	0.215	0.715
85	Monefelim R	Garryduff	TME	0.025	0.033	-	0.017	0.058
86	Monefelim R	Monefelim	TME	0.019	-	-	-	0.019
87	Monefelim R	Barraghcore Br.	ADM	-	0.003	-	-	0.099
38	Barrowmount R	Johnville Br.	ADM	0.017	0.043	-	-	0.009

### Fish ecological status

All sites on the Monefelim are at Good or High; however the Madlin and Barrowmount river sites were assigned less than Good status (Table 3.44).

**Table 3.44. Fish ecological status for each electrofishing site surveyed in the Madlin, Monefelim and Barrowmount catchments, July 2015.**

Site Code	River Name	Site Name	Fish Status
84	Madlin R. Trib.	Ballynolan Br.	M
85	Monefelim R	Garryduff	H
86	Monefelim R	Monefelim	H
87	Monefelim R	Barraghcore Br.	G
38	Barrowmount R	Johnville Br.	M

### 3.2.15 Mountain Catchment

#### **Catchment Details**

The Mountain catchment drains an area of approximately 102km<sup>2</sup>. It enters the River Barrow main channel in its mid to lower reaches, near Borris, Co. Carlow (Fig. 1.1). The Mountain sub-catchment includes two significant tributaries the Dinin and the Aughnabrisky. Dominant landuse within the catchment is pasture with peat bog more pronounced in the mountainous upper reaches. Forestry plots are well scattered throughout the catchment. There are two geology types present granite and slate/schist. All of the Mountain river main channel and the Aughnabrisky tributary are listed as part of the Barrow SAC and are designated *Margaritifera* catchments (freshwater pearl mussel) (Appendix II). Examples of channel form and habitat type are presented in Plate 3.11.



**Plate 3.11. Mountain River at (a) Killedmond Br. and (b) Owlbeg.**

#### **Survey Results**

Eight sites were surveyed throughout the Mountain river sub-catchment (Fig. 2.2). Fish species encountered were brown trout, Atlantic salmon, European eel, lamprey sp. and 3 spined stickleback. Brown trout were present at all sites; however no salmon were recorded in the Dinin system or the upper reaches of the Mountain and Aughnabrisky (Table 3.45). The absence of salmon in the Dinin can be attributed to a barrier impeding upstream passage of adult salmon which is located a short distance upstream of the confluence with the Mountain river in the village of Borris, Co. Carlow. The Mountain catchment is an important salmonid spawning system and data collected indicate good brown trout nursery waters in the lower reaches of the main channel (Figs 3.19 to 3.22).

**Table 3.45. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Mountain and Dinin catchments, June and July 2015.**

Site code	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
88	Aughnabrisky	Spearpoint	TME	0.142	0.173	-	-
91	Mountain	Rathanna Br.	TME	0.017	0.154	-	-
89	Mountain	Earthworks	ADM	0.096	0.090	0.371	0.090
90	Mountain	Owlbeg	ADM	0.180	0.074	0.352	0.079
53	Dinin trib.	Corries Confl.	TME	0.070	0.040	-	-
52	Dinin trib.	Ballinree Br.	TME	0.307	0.193	-	-
50	Dinin	Corries Br.	ADM	0.083	0.180	-	-
51	Dinin	Kilclony Br.	ADM	0.026	0.280	-	-

All other fish species present were poorly represented at the sites surveyed (Table 3.46, Figs 3.23 to 3.30).

**Table 3.46. All other species minimum density estimates (No. fish/m<sup>2</sup>), Mountain and Dinin catchments, June and July 2015.**

Site Code	River Name	Site Name	E/F Method	Species		
				Eel	Lamprey sp.	3 spined stickleback
88	Aughnabrisky	Spearpoint	TME	-	-	-
91	Mountain	Rathanna Br.	TME	-	-	-
89	Mountain	Earthworks	ADM	-	-	-
90	Mountain	Owlbeg	ADM	0.008	0.005	-
53	Dinin trib.	Corries Confl.	TME	-	-	-
52	Dinin trib.	Ballinree Br.	TME	-	-	-
50	Dinin	Corries Br.	ADM	0.011	-	0.004
51	Dinin	Kilclony Br.	ADM	0.010	0.016	-

### ***Fish ecological status***

Fish status was mixed throughout the catchment (Table 3.47). The lower and upper Mountain sites were assigned good to high status, while the middle site, at Rathanna bridge, was only assigned Moderate status. Three of the sites in the lower reaches of the Dinin were assigned Moderate status.



**Table 3.47. Fish ecological status for each electrofishing site in the Mountain and Dinin catchments, June and July 2015**

Site Code	River Name	Site Name	Fish Status
88	Aughnabrisky	Spearpoint	G
91	Mountain	Rathanna Br.	M
89	Mountain	Earthworks	G
90	Mountain	Owlbeg	H
53	Dinin trib.	Corries Confl.	G
52	Dinin trib.	Ballinree Br.	M
50	Dinin	Corries Br.	M
51	Dinin	Kilclony Br.	M

### 3.2.16 Clashganny

#### **Catchment Details**

The Clashganny is a small River Barrow sub-catchment draining an area of approximately 33km<sup>2</sup>. The river enters the Barrow mid-way between Borris and Graiguenamanagh at Clashganny (Fig. 1.1). Geology type is granite. The dominant landuse is pasture with some peat bog found in the upper mountainous regions. The Clashganny main channel up to Ballymurphy forms part of the Barrow and Nore SAC and is a designated freshwater pearl mussel river (Appendix II). An example of channel form and habitat type is presented in Plate 3.12.



**Plate 3.12. Clashganny river at Ballyroughan Little, Co. Carlow**

## Survey Results

Two sites were sampled on the Clashganny River (Fig. 2.2). Fish species recorded included brown trout, Atlantic salmon, lamprey sp., dace, European eel, gudgeon, minnow, stone loach and 3 spined stickleback. Brown trout and Atlantic salmon were present at each site though brown trout were the dominant species both in terms of 0+ and 1+ fish (Table 3.48, Figs. 3.19 to 3.22).

**Table 3.48. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Clashganny catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
44	Clashganny	Ballymurphy	TME	0.457	-	-	0.018
45	Clashganny	Ballyroughan Little	ADM	0.065	0.155	0.030	0.065

Good densities of lamprey were recorded at the upper site at Ballymurphy (Table 3.49). The abundance of all other species was poor (Table 3.49, Figs. 3.23 to 3.30).

**Table 3.49. All other species minimum density estimates (No. fish/m<sup>2</sup>), Clashganny catchment, July and August 2015.**

Site Code	River Name	Site Name	E/F Method	Species				
				Dace	Eel	Gudgeon	Lamprey sp.	3 spined stickleback
44	Clashganny	Ballymurphy	TME	-	-	-	0.352	0.018
45	Clashganny	Ballyroughan Little	ADM	0.009	0.004	0.004	-	-

## Fish ecological status

The two sites on the Clashganny river were assigned Good status (Table 3.50).

**Table 3.50. Fish ecological status for each electrofishing site surveyed in the Clashganny catchment, July and August 2015**

Site Code	River Name	Site Name	Fish Status
44	Clashganny	Ballymurphy	G
45	Clashganny	Ballyroughan Little	G

### 3.2.17 Duiske Catchment

#### **Catchment Details**

The Duiske river catchment drains approximately 24km<sup>2</sup> and flows into the River Barrow main channel immediately downstream of Graiguenamanagh, Co. Kilkenny (Fig. 1.1). The underlying geology type is mainly slate and schist. The dominant landuse is pasture, while forestry plantations are found in the upper reaches of the catchment. The Duiske River from its mid to lower reaches forms part of the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3.13.



**Plate 3.13: Duiske River (a) Well Lane and (b) Peg Washingtons Lane, Graiguenamanagh, Co. Kilkenny**

#### **Survey Results**

Five sites were included in the electrofishing survey programme (Fig. 2.2). Fish species encountered included Atlantic salmon, brown trout, European eel and lamprey sp. All sites recorded brown trout. Atlantic salmon were only absent from the very upper site (at Raheendonore) (Table 3.51, Figs. 3.19 to 3.22). Brown trout ranged in length from 4.4 cm to 22.5cm across the five sites and were aged from 0+ to 2+. Juvenile salmon ranged in length from 3.3 cm to 14cm and were aged 0+ and 1+. Habitat conditions favoured salmon over trout with relatively modest density estimates recorded for salmon 1+ (Table 3.51).

**Table 3.51. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Duiske catchment, June and July 2015.**

Site Code	River Name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
60	Duiske	Raheendenore	TME	0.186	-	-	-
61	Duiske	Tikerlevan	TME	0.026	-	0.438	0.155
59	Duiske	Priestsvalley	ADM	0.220	0.110	0.009	0.376
62	Duiske	Well Lane	ADM	0.298	0.037	0.122	0.213
58	Duiske	Peg's Lane	TME	0.011	0.176	0.033	0.209

With the exception of lamprey at the Well Lane site all other species recorded were present in low numbers (Table 3.52, Figs. 3.23 to 3.30).

**Table 3.52. All other species minimum density estimates (No. fish/m<sup>2</sup>), Duiske catchment, June and July 2015.**

Site Code	River Name	Site Name	E/F Method	Species	
				Eel	Lamprey sp.
60	Duiske	Raheendenore	TME	-	-
61	Duiske	Tikerlevan	TME	-	-
59	Duiske	Priestsvalley	ADM	-	0.009
62	Duiske	Well Lane	ADM	0.016	0.069
58	Duiske	Peg's Lane	TME	0.011	-

### Fish ecological status

Fish ecological status was Good at 4 of the 5 sites surveyed (Table 3.53).

**Table 3.53 . Fish ecological status for each electrofishing site surveyed in the Duiske River, June and July 2015.**

Site Code	River Name	Site Name	Fish Status
60	Duiske	Raheendenore	G
61	Duiske	Tikerlevan	M
59	Duiske	Priestsvalley	G
62	Duiske	Well Lane	G
58	Duiske	Peg's Lane	G

### 3.2.18 Aughavaud Catchment

#### **Catchment Details**

The Aughavaud is a relatively small sub-catchment (approximately 31km<sup>2</sup>) in the River Barrow catchment. Landuse is dominated by pasture with discrete areas of coniferous forestry also present. The underlying geology is granite. The Aughavaud river enters the Barrow main channel in its upper tidal reaches at St. Mullin's, Co. Carlow (Fig. 1.1). Most of the Aughavaud main channel falls within the Barrow SAC (Appendix II). An example of channel form and habitat type is presented in Plate 3.14.



**Plate 3.14. Aughavaud River at Bauck Hill (St. Mullin's, Co. Carlow), July 2015.**

#### **Survey Results**

Two sites were surveyed within this catchment (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, European eel, 3 spined stickleback and flounder. Brown trout ranged in length from 4.7 cm to 24.9 cm and were aged 0+ to 3+; while salmon ranged in length from 4.3 cm to 13.1 cm (0+ to 2+). Salmonids dominated the fish community at both sites, in particular 1+ year old salmon and trout (Table 3.54, Figs. 3.19 to 3.22), indicating the presence of nursery waters for both salmon and trout. Density estimates for 0+ salmonids were generally poor suggesting limited spawning potential at these two sites.

**Table 3.54. Salmonid minimum density estimates (No. fish/m<sup>2</sup>), Aughavaud catchment, July 2015.**

Site ID	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
1	Aughavaud	Turra Br.	ADM	0.042	0.185	-	0.016
2	Aughavaud	Bauck Hill	ADM	0.042	0.108	0.062	0.179

Relatively good densities of eels were recorded within the Aughavaud catchment, in particular at the Bauck Hill site, which is close to the confluence with the River Barrow main channel (Table 3.55, Fig 3.24). The Aughavaud is the only catchment where flounder were recorded (Table 3.55) outside of the River Barrow main channel.

**Table 3.55. All other species minimum density estimates (No. fish/m<sup>2</sup>), Aughavaud catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species		
				Eel	Flounder	3 spined stickleback
1	Aughavaud	Turra Br.	ADM	0.037	-	0.016
2	Aughavaud	Bauck Hill	ADM	0.075	0.008	-

### **Fish ecological status**

The upper site was classified as Moderate status, while the lower site was assigned Good status (Table 3.56).

**Table 3.56. Fish ecological status for each electrofishing site surveyed in the Aughavaud catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
1	Aughavaud	Turra Br.	M
2	Aughavaud	Bauck Hill	G

### 3.2.19 Pollmounty Catchment

#### **Catchment Details**

The Pollmounty catchment covers an area of approximately 48km<sup>2</sup>. This river flows into the River Barrow main channel approximately 3km downstream of St. Mullin's, Co. Carlow (Fig. 1.1). It has two main tributaries, the Aughananagh and Aughnacrew Rivers. Landuse is predominantly pasture with forestry more prevalent in the upper reaches of the Aughananagh river. The upper Pollmounty and Aughnacrew rivers are located on silt/schist geology, whereas the Aughananagh and lower Pollmounty are on granite. The lower to middle reaches of the Pollmounty main channel are included in the Barrow SAC. Examples of channel form and habitat type are presented in Plate 3. 15.



**Plate 3.15. Pollmounty river (a) Templeudigan site and (b) Curraun site, downstream of a water abstraction site, July 2015.**

#### **Survey Results**

Three sites on the Pollmounty and Aughnacrew Rivers were included in the survey programme (Fig. 2.2). Fish species encountered included brown trout, Atlantic salmon, 3 spined stickleback, European eel, and lamprey sp. Brown trout were present at all sites while Atlantic salmon were only recorded in the lower reaches at the Curraun site (Table 3.57, Figs. 3.19 to 3.22). Brown trout ranged in length from 3.8 to 21.7 cm and were aged 0+ to 3+, while two age classes of salmon were present (0+ and 1+) and ranged in length from 3.8 cm to 13.7 cm.

Salmonid densities were mixed with moderate to good densities recorded in the Pollmounty river main channel and poorer densities recorded in the Aughnacrew river at Ballywilliam (Table 3.57, Figs 3.19 to 3.22). The Curraun site was notable for supporting relatively good numbers of brown trout and salmon fry. No salmon or eels were recorded upstream of Curraun (Tables 3.57 and 3.58, Fig.

3.24). There is a water abstraction unit immediately upstream of this site (Plate 3.16) which may be impacting on fish migration upstream, along with other noted hydromorphological pressures. All other fish species recorded were present in low densities (Table 3.58, Figs. 3.23 to 3.30).

**Table 3.57. Salmonid Minimum Density Estimates (No. fish/m<sup>2</sup>), Pollmounty catchment, July 2015.**

Site code	River name	Site name	E/F Method	Brown Trout		Atlantic Salmon	
				0+	1++	0+	1++
98	Aughnacrew	Ballywilliam	TME	0.008	0.033	-	-
100	Pollmounty	Templeudigan	ADM	0.371	0.085	-	-
99	Pollmounty	Curraun	ADM	0.582	0.164	0.683	0.091

**Table 3.58. All other species minimum density estimates (No. fish/m<sup>2</sup>), Pollmounty catchment, July 2015.**

Site Code	River Name	Site Name	E/F Method	Species		
				Eel	Lamprey sp.	3 spined stickleback
98	Aughnacrew	Ballywilliam	TME	-	-	0.042
100	Pollmounty	Templeudigan	ADM	-	-	-
99	Pollmounty	Curraun	ADM	0.024	0.005	0.014



**Plate 3.16. Abstraction site on the Pollmounty at Curraun, July 2015.**



### Fish ecological status

Only the lower site, situated at Curraun achieved satisfactory fish status (Table 3.59).

**Table 3.59. Fish ecological status for each electrofishing site surveyed in the Pollmounty catchment, July 2015.**

Site Code	River Name	Site Name	Fish Status
98	Aughnacrew	Ballywilliam	P
100	Pollmounty	Templeudigan	M
99	Pollmounty	Curraun	H

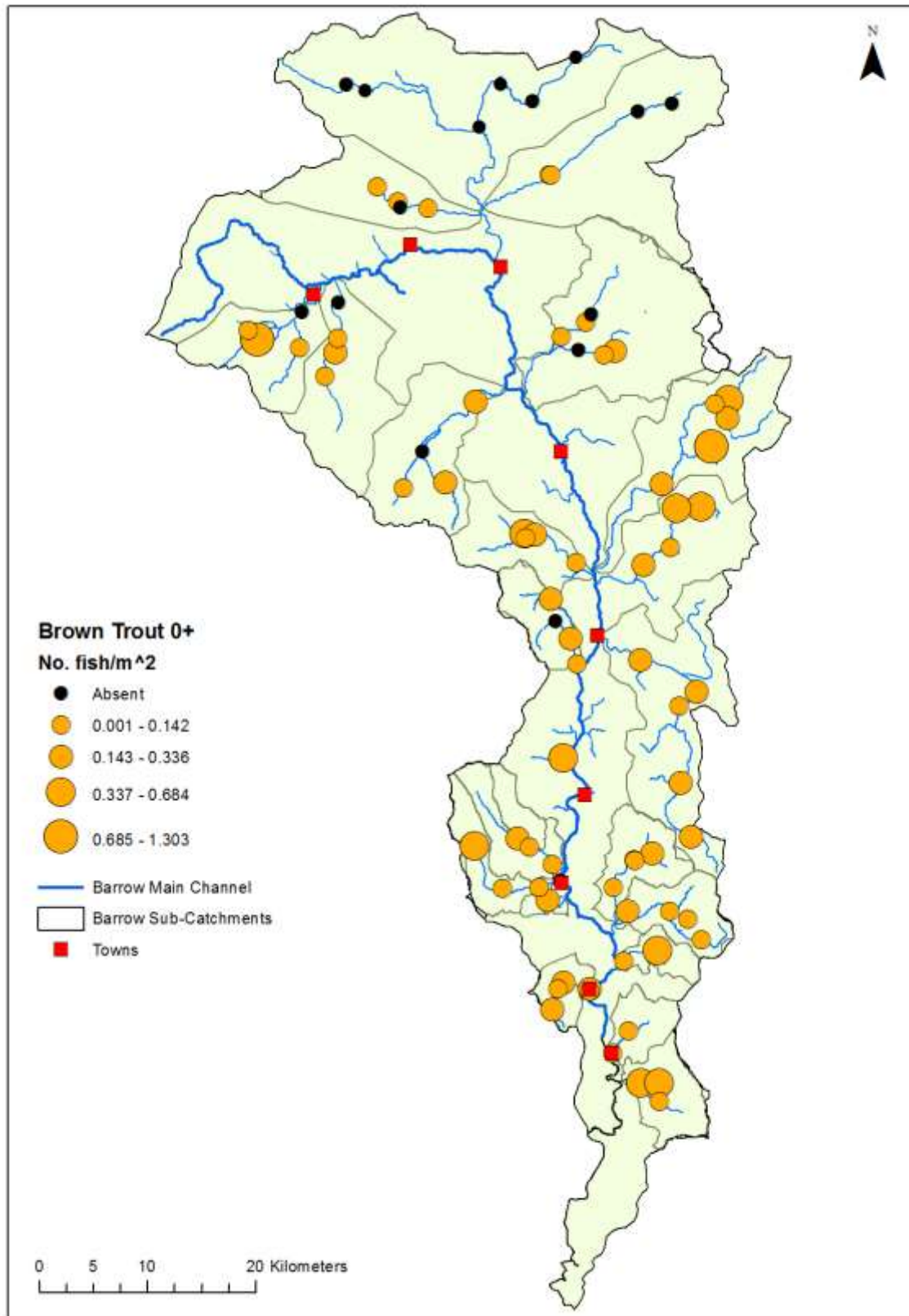


Figure 3.19. Distribution of brown trout 0+ at surveyed sites, River Barrow sub-catchments 2015.

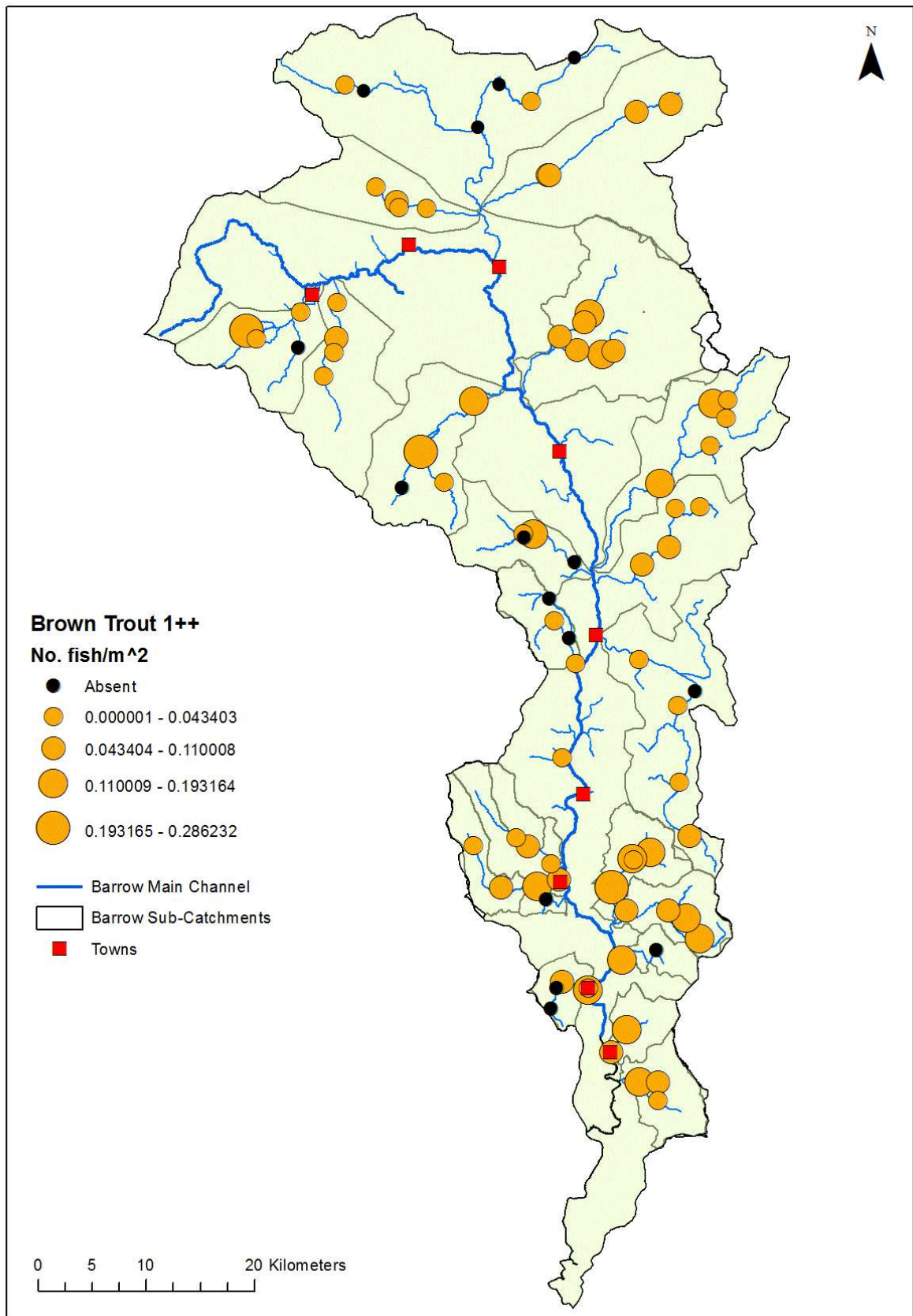


Figure 3.20. Distribution of brown trout 1++ at surveyed sites, River Barrow sub-catchments 2015.

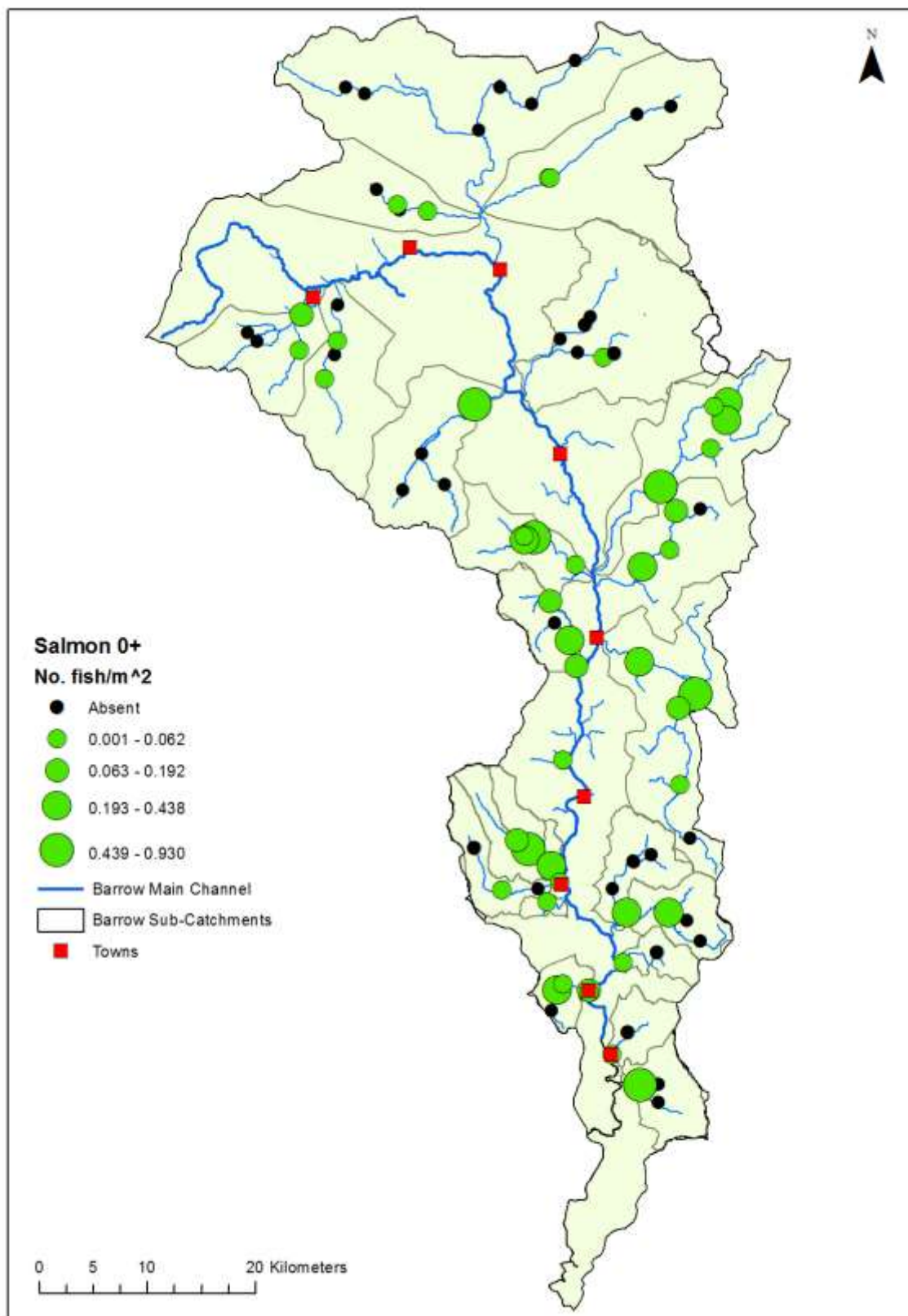


Figure 3.21. Distribution of salmon 0+ at surveyed sites, River Barrow sub-catchments 2015.

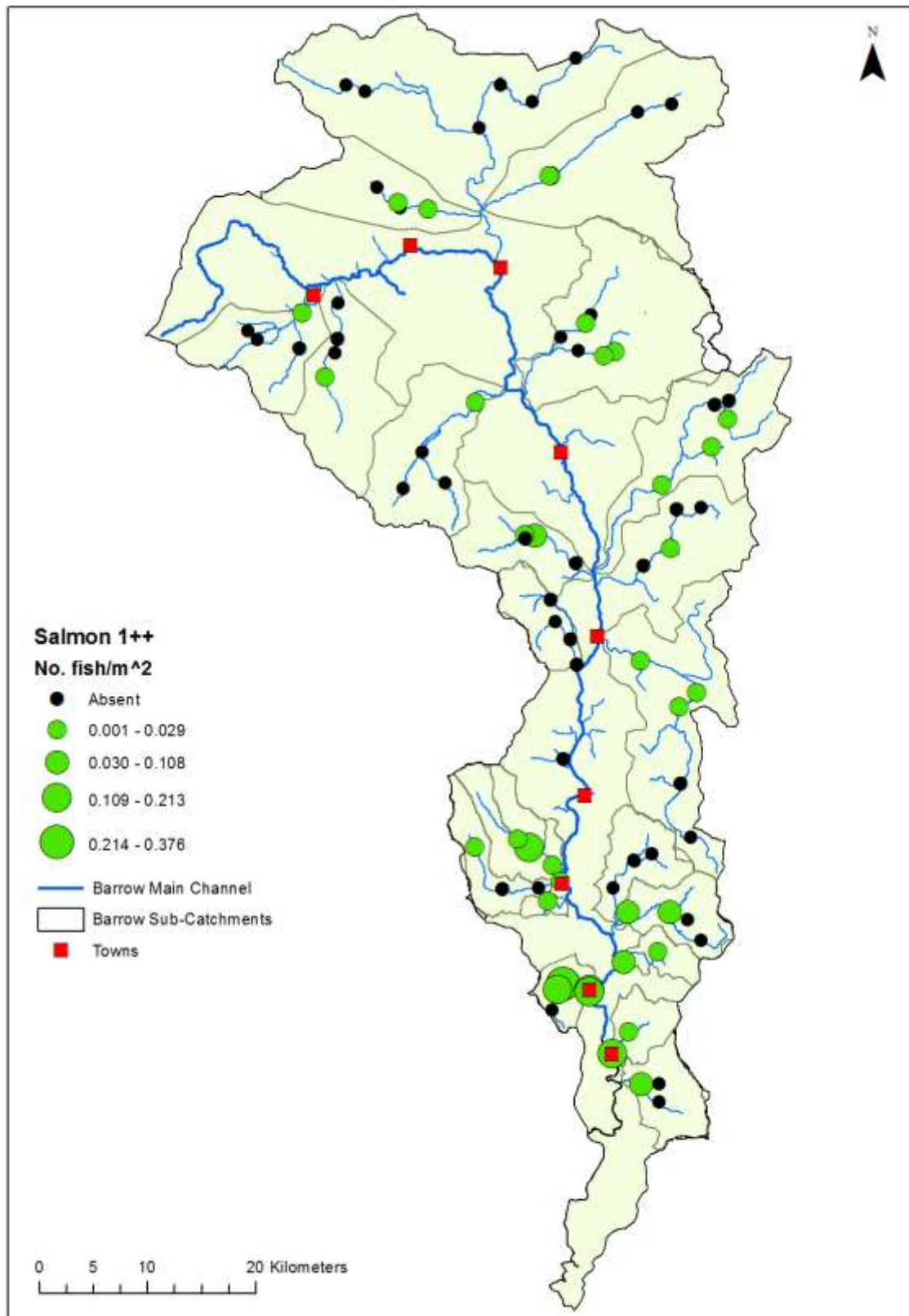


Figure 3.22. Distribution of salmon 1++ at surveyed sites, River Barrow sub-catchments 2015

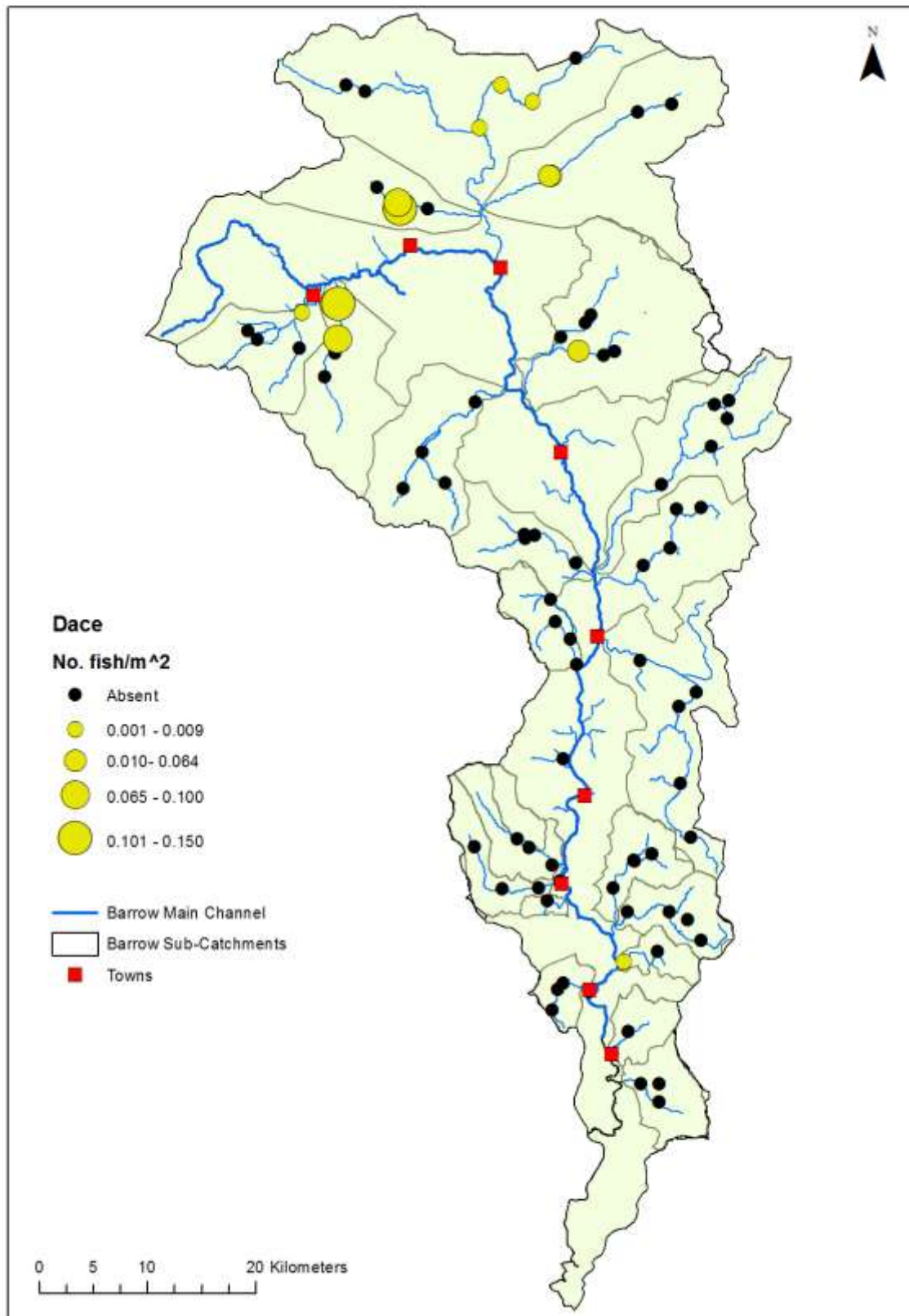


Figure 3.23. Distribution of Dace at surveyed sites, River Barrow sub-catchments 2015.

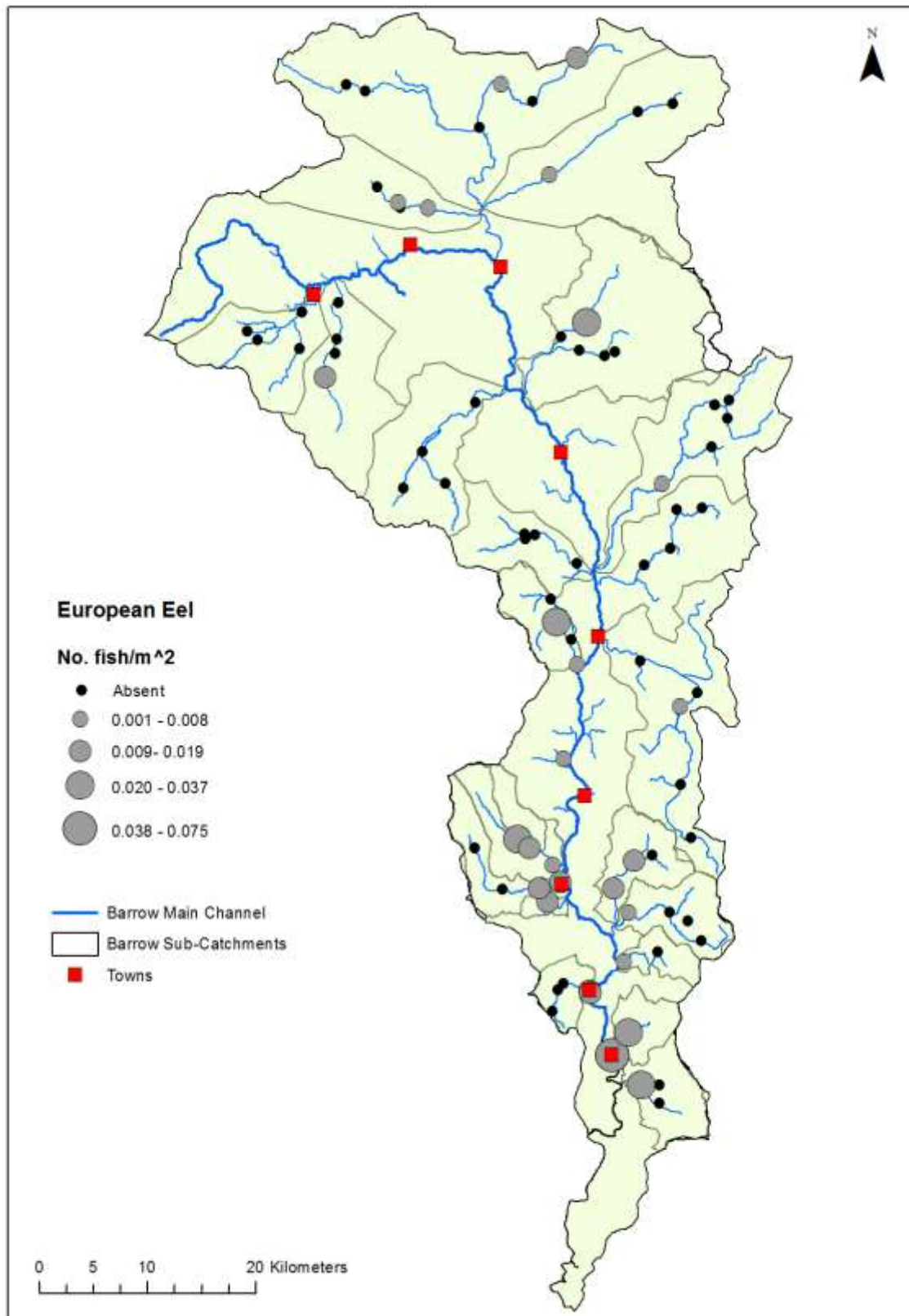


Figure 3.24. Distribution of European eel at surveyed sites, River Barrow sub-catchments 2015.

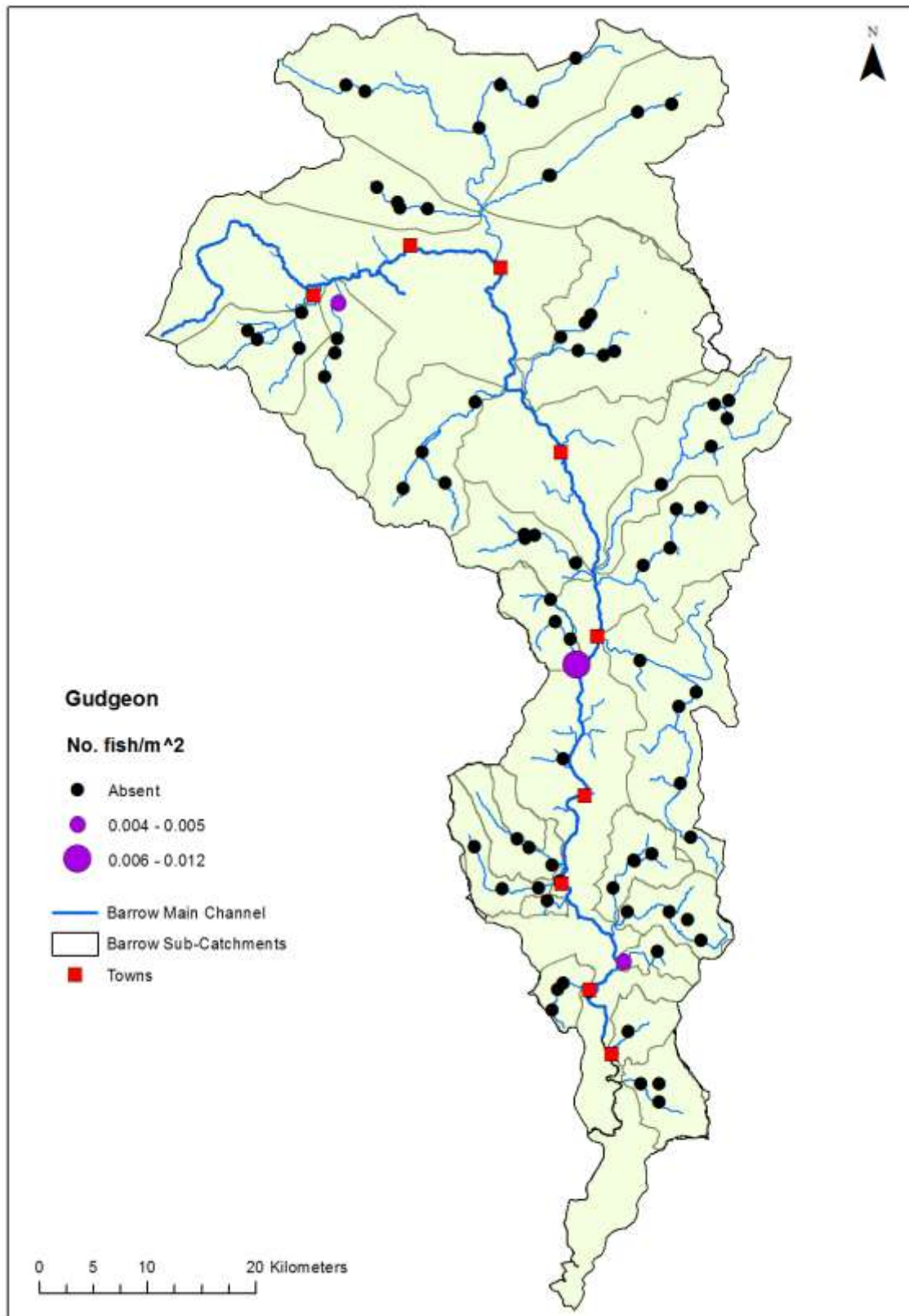


Figure 3.25. Distribution of gudgeon at surveyed sites, River Barrow sub-catchments 2015.



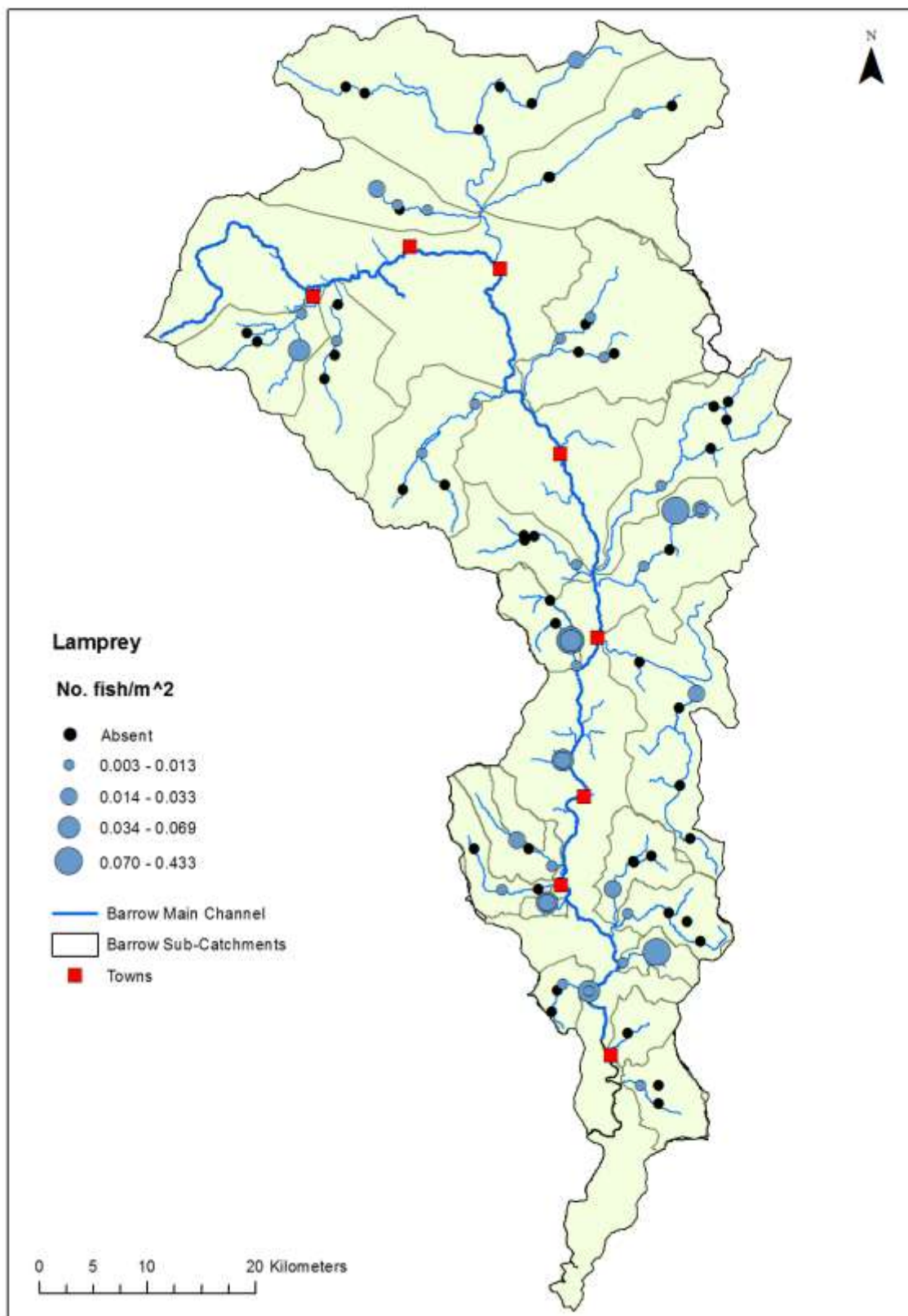


Figure 3.26. Distribution of juvenile lamprey at surveyed sites, River Barrow sub-catchments 2015.

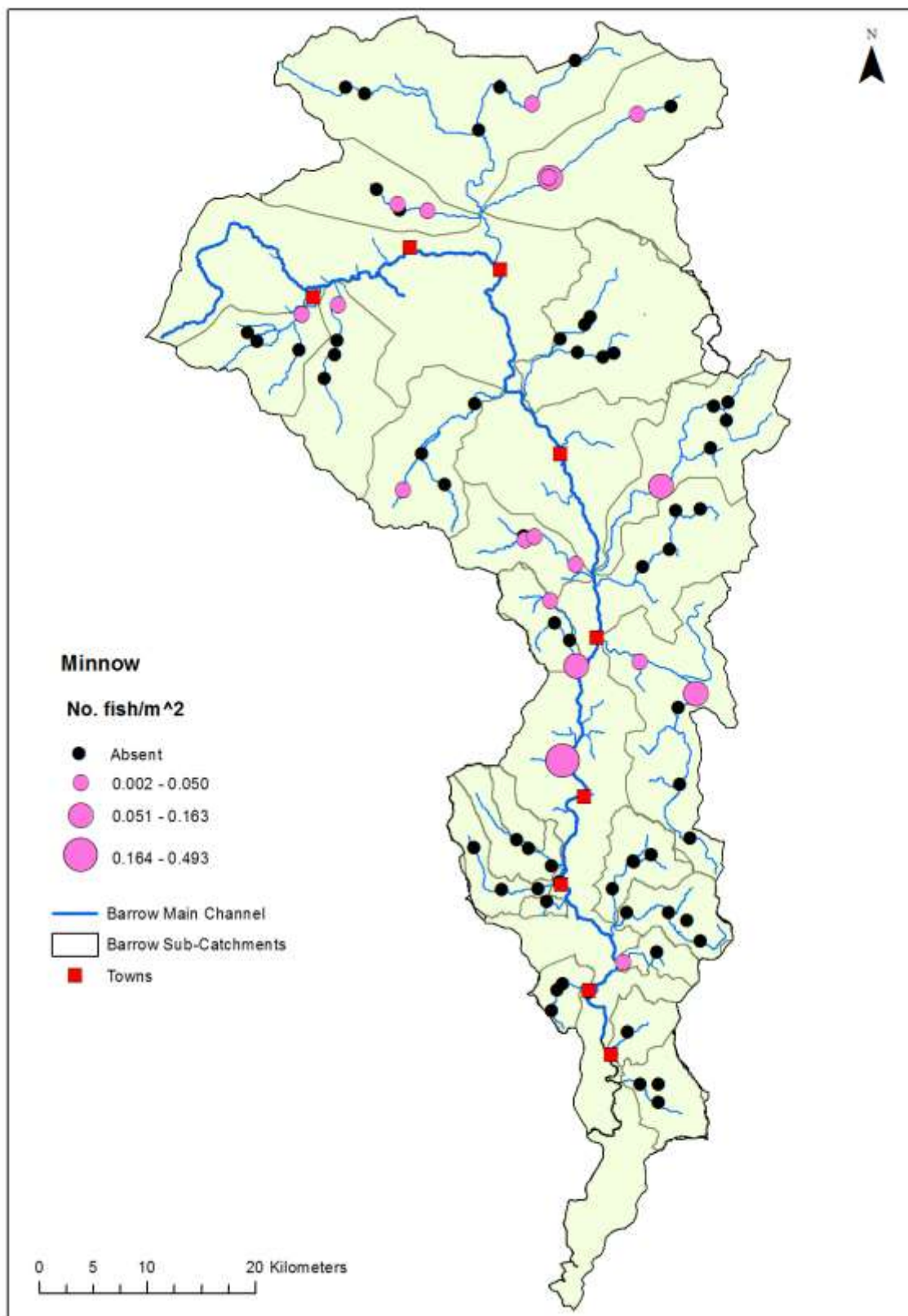


Figure 3.27. Distribution of minnow at surveyed sites, River Barrow sub-catchments 2015.

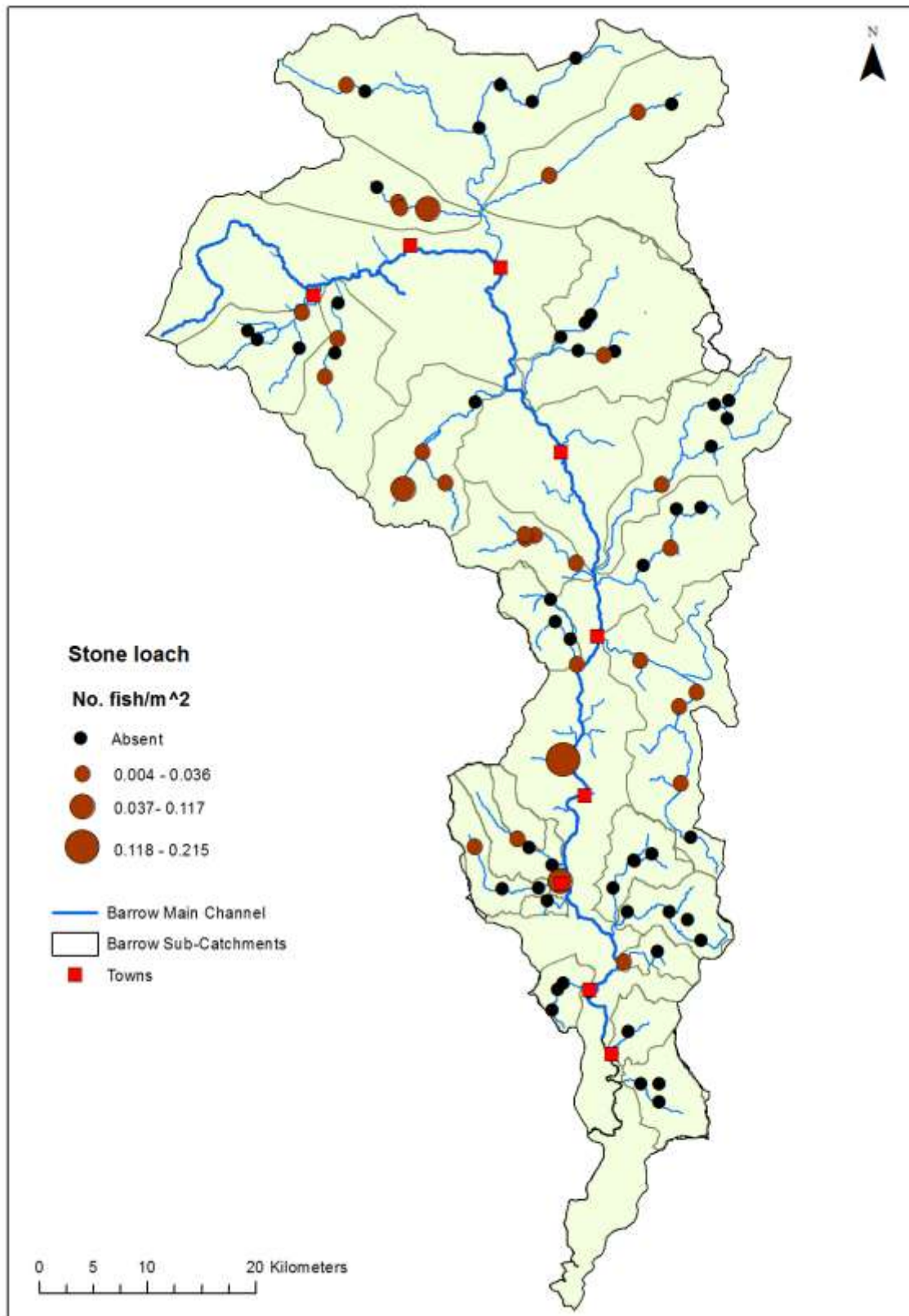


Figure 3.28. Distribution of stone loach at surveyed sites, River Barrow sub-catchments 2015

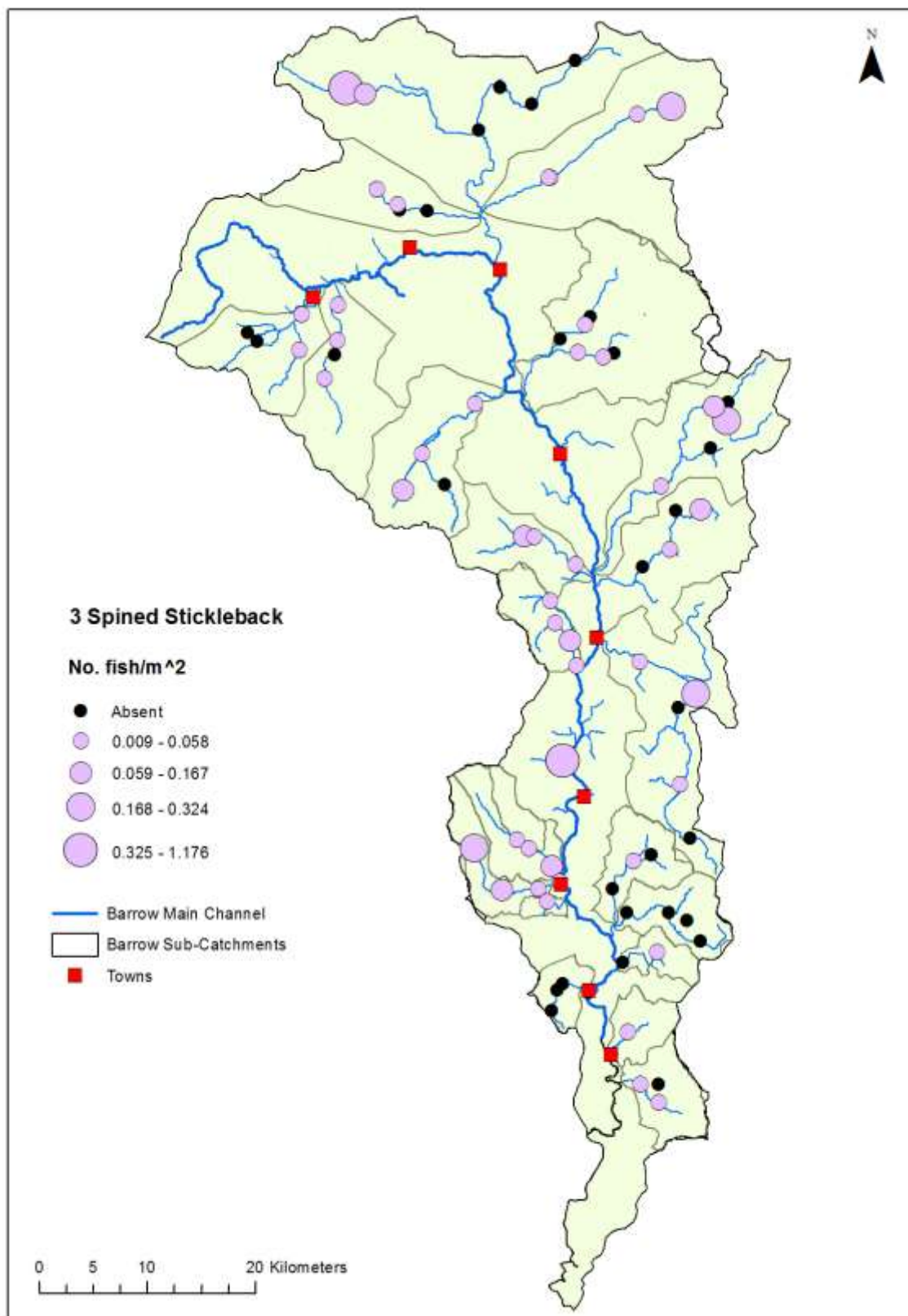


Figure 3.29. Distribution of 3 spined stickleback at surveyed sites, River Barrow sub-catchments 2015.

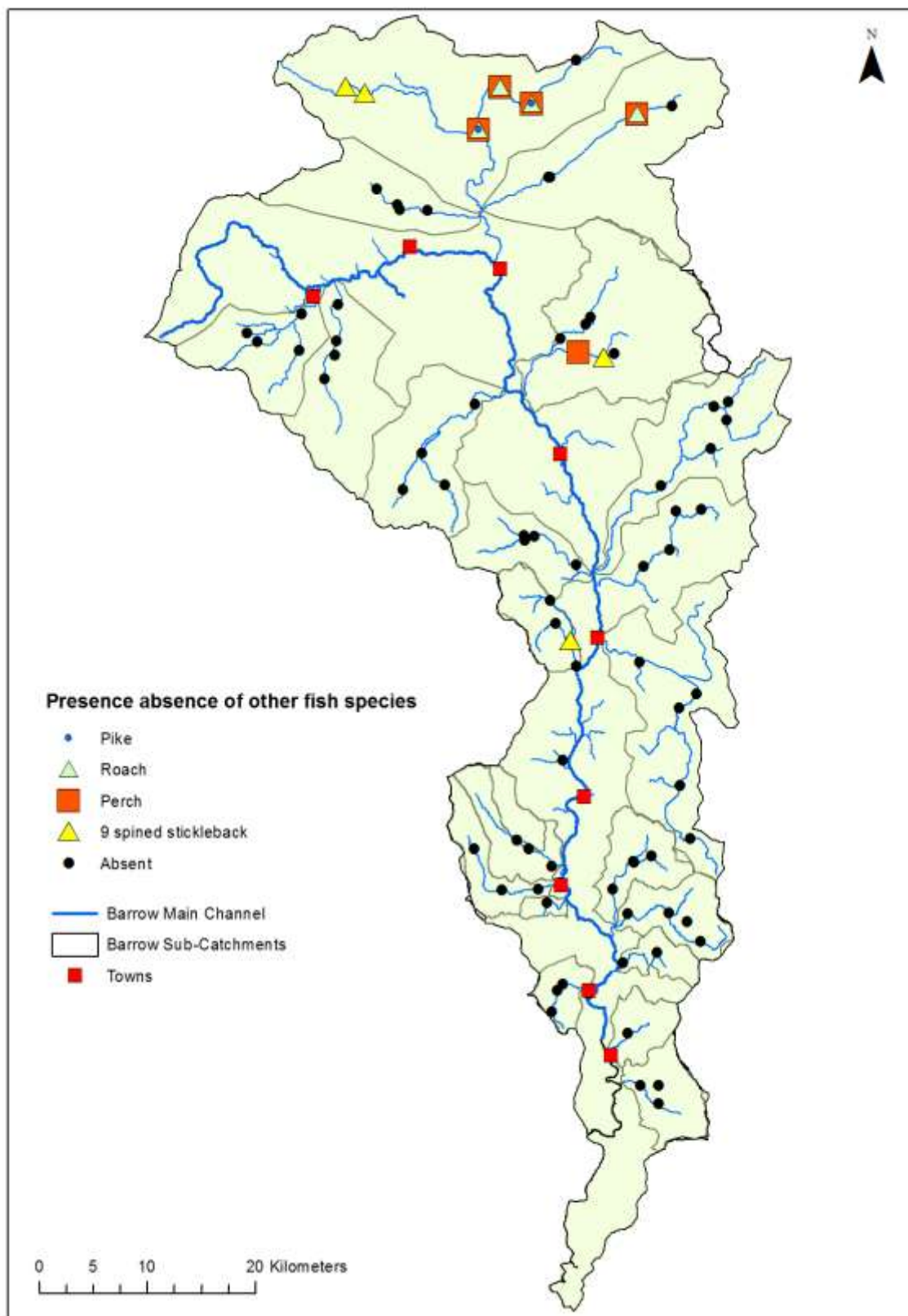
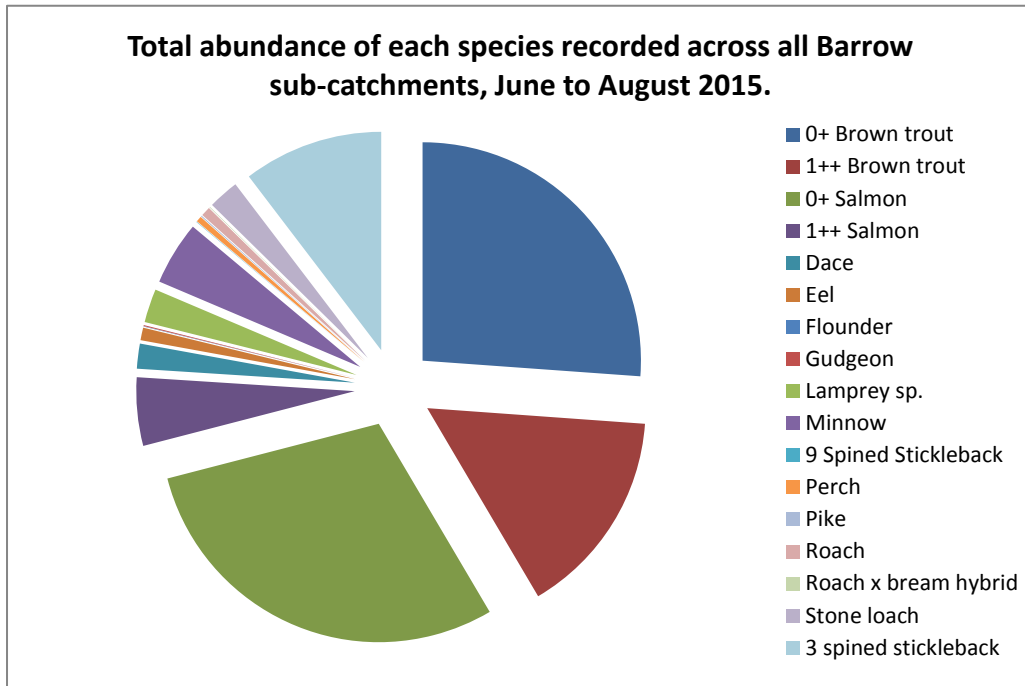


Figure 3.30. Presence/absence of other fish species recorded at surveyed sites, River Barrow sub-catchments 2015.

### 3.2.20 River Barrow sub-catchments overview

- 14 fish species and 1 hybrid species were recorded across the 83 sites surveyed in the sub-catchments (Fig. 3.31).
- Brown trout and Atlantic salmon were the most common fish species recorded in the sub-catchments. Brown trout were well distributed across the catchment, but salmon had a sparser distribution (Figs. 3.19 to 3.22).
  - Overall, the Pollmounty, Lerr, Owenass, Greese and Douglas (Laois) sub-catchments had relatively high densities of 0+ brown trout (suggesting good spawning potential). The highest densities of 0+ brown trout at individual sites were recorded on the Greese (Ballycore) ( $1.303/m^2$ ), Owenass (Esker Bridge) ( $0.847/m^2$ ) and the Madlin (Balynolan) ( $0.683/m^2$ ) sites. Brown trout fry (0+) were not recorded at 16 sites, mainly in the upper catchment (e.g. Cushina tributary, Figile and Philipstown, Fushoge tributary, Owenass, Slate, Stradbally (Timogue), Triogue and Tully), but poor densities were also recorded in many sites across the sub-catchments (Fig. 3.19).
  - Overall the Dinin, Mountain and Stradbally sub-catchments had relatively good densities of 1+ and older brown trout (suggesting that good nursery areas are present in these rivers). The highest densities of 1+ and older brown trout at individual sites were recorded on the Stradbally (Trimoge) ( $0.29/m^2$ ), Owenass (Clonehurk) ( $0.28/m^2$ ) and Dinin (Kilclony sites) ( $0.28/m^2$ ). Brown trout 1+ and older were not recorded at 15 sites (e.g. Barrowmount, Burren (Rathoe), Clashganny (Ballymurphy), Douglas (Laois) four sites, Duiske River (Raheendenore and Tykerlevan), Fushoge River (Fig. 3.20). Many of these sites were too shallow at the time of surveying to hold 1+ and older trout (e.g. Duiske (Raheendenore), Clashganny, etc.); however, some such as the Philipstown (Killoneen and Magheramore) also have poor water quality.
  - Brown trout ranged in age from 0+ to 5+ across all the sub-catchments. The largest trout captured in the tributary rivers was 37.1cm and aged 3+ in the Figile River at Cushaling Bridge.
  - Overall the Monefelim, Burren, Douglas (Laois), Greese and Pollmounty, sub-catchments had relatively high densities of 0+ salmon (suggesting good spawning potential). Individual sites of interest were the Monefelim (Monefelim) ( $0.93/m^2$ ), Burren (Rathoe) ( $0.81/m^2$ ) and Douglas (Gales br.) ( $0.72/m^2$ ) and Pollmounty

- (0.68/m<sup>2</sup>) (Fig. 3.21). Salmon fry (0+) not recorded at 38 of the 83 sites surveyed (Fig. 3.21).
- The Duiske, Aughavaud and Monefelim were notable sub-catchments for 1+ and older salmon (suggesting good nursery potential). Three sites on the Duiske river had the highest densities of 1+ salmon (Pegs Lane, Well Lane and Priestsvalley, 0.209, 0.213 and 0.376/m<sup>2</sup> respectively) (Fig. 3.22). 1+ and older salmon were not recorded at 48 sites across the sub-catchments (Fig. 3.22).
  - Juvenile salmon in the sub-catchments ranged in length from 2.8 to 17.8cm and were aged 0+ and 2+. Only four 2+ salmon were recorded in the sub-catchments indicating that most juvenile salmon in the River Barrow catchment move into the main channel at age 1+.
  - Overall the most unproductive sub-catchments for salmonids, based on the survey results, were the Figile (and Philipstown) and the Slate. Poor water quality and poor habitat are the two main reasons for this.
- Dace distribution was mainly concentrated in the lower parts of the sub-catchments in the upper catchment such as the Triogue, Cushina, Slate, Figile, Owenass and Tully (Fig. 3.23).
  - Coarse fish along with pike and perch were poorly represented within the sub-catchments (Fig. 3.30)
  - Lamprey sp. had a reasonably good distribution pattern, they were recorded in 18 sub-catchments. Relatively good numbers were recorded within the Lerr, Clashganny and Fushoge sub-catchments (Fig. 26).
  - European eel distribution was good with the species recorded within 17 of the 21 sub-catchments surveyed; however numbers were generally low, with the exception of the Aughavaud sub-catchment (Fig. 3.24).
  - The highest densities of minnow were recorded within the Madlin, Fushoge and Greese sub-catchments. High densities of minnow in a river can be indicative of water quality problems (Kelly *et al.*, 2007).
  - The highest densities of 3 spined stickleback were at sites in the Figile, Madlin, Greese and Slate sub-catchments. Similar to minnow, high densities of this species in a river can also be indicative of poor water quality (Kelly *et al.*, 2007).



**Figure 3.31. Total abundance of each fish species recorded across all Barrow sub-catchments surveyed, June to August 2015.**



## **4. General over-view and conclusions**

The current survey is the first time that systematic point abundance sampling (sPASE) using boom boat electrofishing equipment has been used on large rivers in Ireland. Therefore, it is not possible as yet to compare CPUE of fish species from the current main channel survey to data collected during previous surveys on the River Barrow or other similar large rivers. It is intended that this method will be used in many large rivers in the future and once a significant database is compiled it may be possible to develop a classification index for the various fish species using this new dataset.

### **4.1 Brown trout and Atlantic salmon**

Information collected during the course of this survey on the different life stages of brown trout and salmon has provided information on the main spawning and nursery areas for each of the two species in the River Barrow catchment. Key sub-catchments for brown trout spawning would appear to be the Pollmounty, Lerr, Owenass and Greese, but notable spawning was also observed at a site in the Madlin river. Important brown trout nursery sub-catchments, as highlighted by a relatively high density of 1+ and older fish, include the Dinin, Mountain, Stradbally and Aughavaud rivers but there was also a notable site on the Owenass River.

The most productive systems for Atlantic salmon spawning, as highlighted by the presence of salmon fry (0+), were the Monefelim, Burren, Douglas (Laois) and lower reaches of the Pollmounty. Salmon nursery waters include the Duiske, Aughavaud and Monefelim rivers. The most unproductive sub-catchments for brown trout and salmon were the Figile and Philipstown rivers. Poor water quality and poor habitat and possibly competition from coarse fish species, particularly dace are the main reasons for this.

Brown trout were only recorded at 46% of all River Barrow main channel sites surveyed. They were mainly restricted to the non-navigable sections of the river and in particular below weirs. The main channel, in general did not support high densities of brown trout or juvenile salmon with the exception of the upper most site at Rathcoffey which is an important area for salmon spawning.

Brown trout on the main channel ranged in length from 4cm to 36.8cm with five age classes present, ranging in age from 0+ to 4+. While not present in large numbers at any site surveyed the overall population appeared balanced but abundance was relatively low. Approximately 14% of brown trout captured were 25cm or greater in length. The largest fish recorded was aged 3+, 36.8cm in length and weighed 575g. Lengths of brown trout were similar to those recorded in previous surveys on the River Barrow and the River Nore in recent surveys (Kelly *et al*, 2011, 2013 and 2017);

however they were smaller than those recorded previously in the River Suir (O' Grady and Delanty, 2006)..

## **4.2 Coarse fish and pike**

Coarse fish were dominant on the main channel of the River Barrow. A total of five coarse fish species or hybrid varieties were recorded, these were dace, roach, roach x bream hybrids, perch and pike.

Dace and roach were both typically abundant and wide spread throughout the main channel and canal cuts occurring in 91% and 80% of all sites surveyed respectively. Together, they accounted for in excess of 52% of all fish captured during the survey on the main channel. Both species were typically dominated by smaller/younger individuals, with few fish over 25cm in length captured.

Perch were also widespread and were recorded in 74% of all sites surveyed. In common with dace and roach, perch stocks were dominated by smaller fish. However, a number of much larger fish in excess of 30cm were also captured.

Pike were recorded throughout the main channel. While not recorded in very large numbers, this may reflect their position as an apex predator. The population appeared balanced with seven age classes represented in the sample and several larger specimens captured.

No bream were recorded during the survey. Furthermore, a total of just 14 roach x bream hybrids were recorded from six sites on the main channel. Roach x bream hybrids ranged in length from 7.5cm to 35.8cm. Juvenile fish ( $\leq 2+$ ) were recorded from the site upstream of Athy at Belview and at the most downstream site at St. Mullin's Canal cut. Roach x bream hybrid recruitment requires spawning between both parent species (Hayden *et al.*, 2010). The proliferation of hybrids evident in Irish lakes (Hayden *et al.*, 2014), is not, however, repeated here. Whether this reflects a degree of ecological separation of the two species in the riverine environments, or is indicative of a greatly reduced bream populations is unclear.

Bream had a widespread but localised distribution during a qualitative electrofishing survey of the navigable river and associated canal cuts in 2001(CFB, 2002). The absence of bream in the current survey may in some part reflect the sampling strategy which was devised to provide an extensive coverage of the catchment and main stem and may therefore have simply missed the shoals of bream. Downstream drift of larval juveniles is important in dispersal of riverine coarse fish populations (e.g. Reichardt *et al.*, 2004). While no bream were recorded during this survey, the

presence of juvenile hybrids throughout the main channel suggests that spawning populations of bream are still present. More extensive sampling within localised areas might provide further information into the status of this important coarse angling species in the River Barrow.

#### 4.2.1 *Distribution of Dace.*

Dace, an invasive species, have been present in the River Barrow since 1992 (Caffrey *et al.*, 2007). Dace are now established throughout the River Barrow catchment, dominating fish assemblages on the main channel from the estuary at St. Mullin's to Mountmellick approximately 170km upstream.

During the current study dace were both widespread and abundant throughout the main channel representing in excess of 33% of all fish captured during the survey. Dace were recorded as far upstream as Clonterry (downstream of Mountmellick). The only main channel site (excluding two navigation canals) where dace were not recorded was the uppermost site on the main channel at Rathcoffey Bridge. This was the only site on the main channel that did not require a boat to survey, it was dominated by juvenile salmon, and thus not typical of the other sites surveyed. Furthermore, dace were also recorded from tributary streams upstream of that site. Dace were more patchily distributed throughout the sub-catchments surveyed. During the current survey dace were largely found only in those lowland, predominantly drained catchments north of Athy (e.g. Owenass Triogue, Cushina, Figile and Tully rivers). Dace have previously also been recorded in the Greese and Lerr rivers in 2012 during WFD surveys of those rivers (Kelly *et al.*, 2013). Additional records exist from catchment wide electrofishing of salmon fry from the Stradbally, Douglas, Fushoge and Monefelim Rivers (IFI unpublished data).

### **4.3 Spatial segregation of fish species on the main channel and canal cuts**

The modifications brought about to render the river navigable have resulted in three distinct habitat types on the river between Athy and St. Mullin's. A degree of spatial segregation, revealed by simple linear modelling, amongst the four main fish species (dace, roach, juvenile salmon and brown trout) captured in the navigable river was evident during the survey. Principally, this has resulted in brown trout and juvenile salmon being largely confined to the faster flowing, non-navigable river sections downstream of the weirs. While the situation is less clear cut for roach and dace, the former species was more prevalent in the canal cuts. There was also a generalised trend for increasing dace numbers in the riverine sections with fewer recorded in the canal cuts.

#### **4.4 European Eel**

The European eel had a widespread distribution throughout the River Barrow catchment. It was recorded within almost all the sub-catchments and smaller systems surveyed. Exceptions to this were the Stradbally, Douglas and Lerr catchments. However, abundances of eel encountered at any one site were relatively quite low. The highest density of eel was observed in the Aughavaud sub-catchment, though only in the lower reaches and a small number of the lower main channel Barrow sites from Goresbridge downstream. Interestingly while the barrier on the Dinin River (Mountain sub-catchment) in Borris is a barrier to salmon it is not a complete barrier for eel migration.

Scientific advice from the International Council for the Exploration of the Sea (ICES) concerning eel is that the stock is outside safe biological limits (DCENR, 2008) and are classified as critically endangered in the Irish Red List (King *et al.*, 2011). Recruitment of juvenile eels into Irish waters has declined dramatically. A pan European decline in glass eel returning from the sea in the early 1980s has been observed and glass eels are at <7% of pre 1980s averages, i.e. beyond safe biological limits and therefore fisheries are unsustainable (ICES, 2010). The cause of the decline is not fully understood but there are a number of factors likely to be the primary cause of the decline including habitat loss, poor water quality, presence of barriers to both upstream and downstream migration, overfishing, oceanic change/climate change, parasites and increased abundance of predators (O' Leary *et al.*, 2012). The swim bladder parasite, *Anguillicola crassus* has been found in eels from 74% of the total wetted area in the Republic of Ireland and there is concern that it may hinder the recovery of the stock (Becerra-Jurado *et al.*, 2014). Due to the shared nature of the eel stock, continental threats also impact on recruitment of eel to Ireland (King *et al.*, 2011).

The EC Regulation (Council Regulation 1100/2007) for the recovery of the eel stock required Ireland to establish Eel Management Plans for implementation in 2009. Ireland moved quickly to implement its Eel management plan by banning commercial fishing of eel in 2009 and initiating a national monitoring programme (O' Leary *et al.*, 2012). A significant programme of turbine mitigation is also underway (DCENR, 2008). An attempt is also being made to implement the remaining two main actions, i.e. ensure upstream migration of juvenile eel at barriers and improvement of water quality.

#### **4.5 Lamprey**

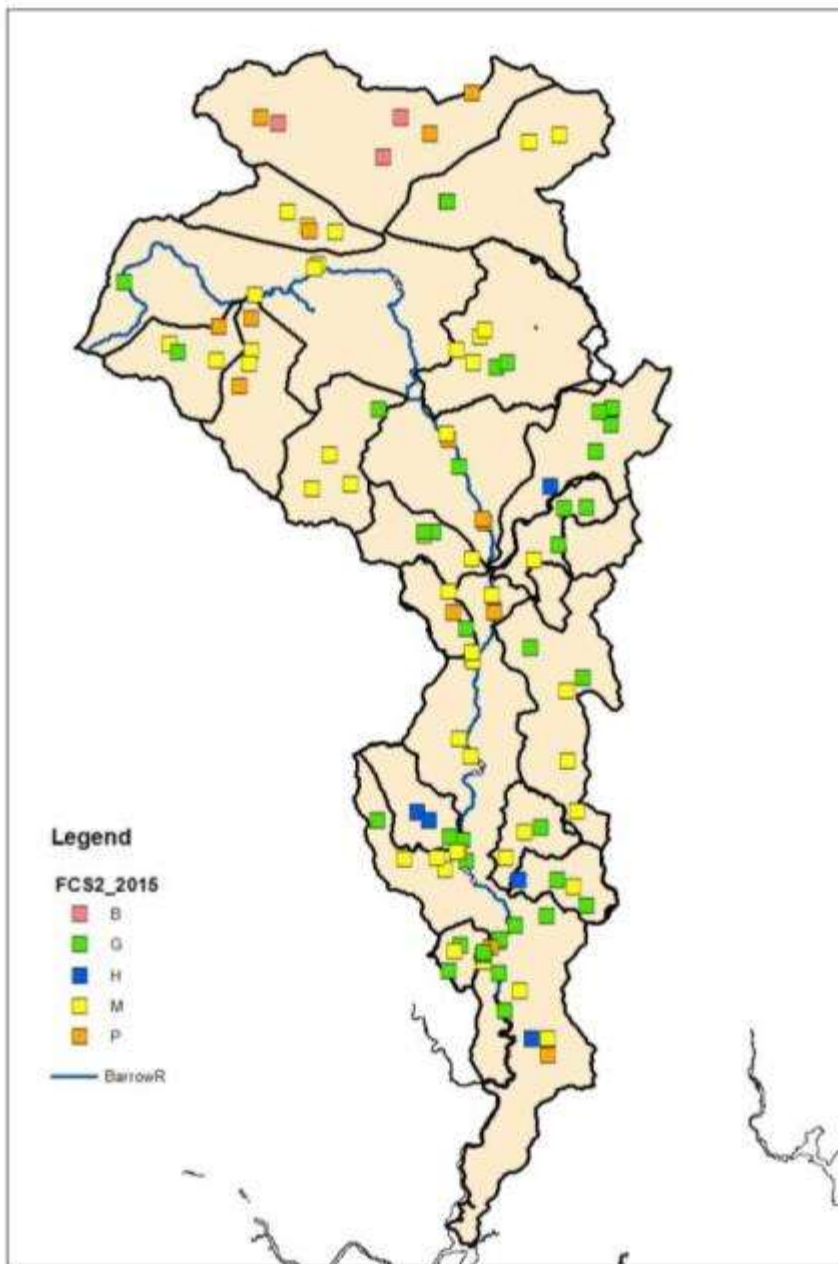
All three lamprey species (sea lamprey, river and brook lamprey) are protected under Annex II of the EU Habitats Directive, (sea, river and brook). During the current study juvenile lamprey were recorded in 18 sub-catchments but not in the main channel. Relatively good numbers of lamprey were recorded within the Lerr, Clashganny and Fushoge rivers. While no lamprey were recorded

along the Barrow main channel this may be more due to the electrofishing/survey method used and survey timing rather than being absent from the river. Although a different survey method was used in a study by King (2003) these results are similar to this earlier study, i.e. population density was low in many of the tributaries, they were not recorded at over 50% of the sites surveys and a high proportion of the negative sites were recorded in tributaries discharging to the River Barrow between Monasterevin and Carlow. A further study to assess the status of the lamprey in the catchment is being undertaken in 2017 by Inland Fisheries Ireland (King, IFI, pers. comm.).

#### **4.6 Fish Ecological Status**

In general the trend in fish ecological status was that many of the sites in the lower half of the River Barrow catchment were assigned Good or better status while sites in the upper catchment were Moderate or worse. High fish status was only assigned to five of the 153 sites (3%) surveyed in the entire catchment, i.e. the Greese (NE of Belan House), Monefelim (Garryduff and Monefelim), Mountain (Owlbeg) and Pollmounty (Curraun) (Fig. 3.32). Overall more than 50% of the surveyed sites were assigned Moderate status or less. The main reasons for failures were poor water quality, poor habitat, the presence of artificial barriers impeding migratory fish passage and possibly competition from the invasive dace.

This trend mirrors the overall trend for ecological status in the catchment based on all biological elements and physico-chemical parameters (EPA, 2016).



**Fig. 3.32: Fish ecological status at sites surveyed in the River Barrow catchment, July and August 2015.**

#### 4.7 Gaps in knowledge and future research

The long-term conservation of important aquatic resources, such as fish requires the maintenance of healthy and ecologically sustainable ecosystems. Most freshwater catchments in Ireland such as the River Barrow catchment are long linear ecosystems and are particularly vulnerable to fragmentation. A number of human activities have the potential to disrupt the ecological integrity of waterbodies in a variety of ways, some of these are:

1. Water pollution/eutrophication
2. Land management practices (e.g. land reclamation and overgrazing)
3. Introduction of invasive non-native species
4. Hydromorphological changes – e.g. restricting or preventing the movement of aquatic fauna to their habitats by barriers (e.g. impoundments, weirs, dams, etc.), arterial drainage, siltation, water abstraction-water balance (water quantity), etc.
5. Global warming/climate change

Physical factors primarily determine the distribution of fish species and community composition along a river corridor from high to low gradient (Huet, 1959; Welcomme, 1985; Cowx and Welcomme, 1998; Kelly *et al.*, 2007). Nonetheless fish populations will change because of external anthropogenic pressures (e.g. pollution, enrichment, abstractions, species introductions, stocking, translocations) independent of physical factors. In most cases these pressures have resulted in changes in the abundance of fish stocks; however, in a number of cases it has led to the extinction of one or more species locally. This is apparent from the occurrence of fish kills following severe pollution events and the lack of fish in chronically polluted sites that are otherwise hydromorphologically suitable (Champ, 2000).

The current study is the first large scale catchment wide survey undertaken in the River Barrow catchment to assess the status of all fish species. In total 15 fish species and one type of coarse fish hybrid were recorded during the survey. Brown trout and Atlantic salmon were the dominant fish species in the sub-catchments, while coarse fish (in particular dace) were dominant in many main channel sites. The study identified some of the main spawning streams and nursery areas for brown trout and Atlantic salmon in the catchment. It has also revealed that brown trout and juvenile salmon are mainly located in the non-navigable sections of the main channel below weirs, apart from the most upstream area of the main channel near its source. Dace and roach were both abundant and wide spread throughout the main channel and canal cuts. Perch were also widespread and were recorded in 74% of all sites surveyed. Pike were recorded throughout the

main channel in low numbers. No bream were recorded during the survey and only 14 roach x bream hybrids were recorded from six sites on the main channel.

However there are still some knowledge gaps in relation to certain fish species in the River Barrow catchment and their performance in relation to pressures. These are as follows:

### **1. Brown trout and sea trout**

It is not known if any particular tributary stream in the River barrow catchment contributes more brown trout to the main channel than any other stream, or if there are any unique strains of brown trout in the catchment. It is also not known what tributary streams contribute sea trout to the system or if there is any evidence of hatchery genes in the catchment. It is also not known how arterial drainage schemes have impacted on the diversity of brown trout populations within the upper catchment.

The wild brown trout (*Salmo trutta*) displays a remarkable level of variation in its external appearance, behaviour, ecology, biology and many other aspects of its life-history. The realisation that much of this variation has a genetic basis, has led scientists to also study the genetic composition of brown trout in the recognition that there is enormous genetic diversity within and among brown trout populations, which is of great importance for both management and conservation of the species. Since 2006 Inland Fisheries Ireland (IFI) have collaborated with universities on a number of genetic based studies of brown trout, to address similar questions to those posed above, in selected catchments across Ireland to understand more about how genetic diversity is distributed among populations in order to assist in making the correct and most cost effective management decisions (e.g. IFI, 2014a; Massa-Gallucci and Mariani, 2011a and b; Delanty *et al.*, 2016). This research is providing IFI with valuable information for fisheries management purposes. Many of these projects will be finalised in late 2017 and the information produced may assist IFI in managing brown trout and sea trout populations in Irish river and lake catchments (including the River Barrow catchment) in the future.

### **2. Invasive species (e.g. Dace or Asian clam) and brown trout interactions**

An invasive, non-native, alien or exotic species is one that has been intentionally or accidentally released into an environment outside its native geographical range of habitat (Barton and Heard, 2005). The introduction and spread of non-native species in freshwater and marine environments is a worldwide problem that is increasing in frequency (ICAIS, 2006). Invasive alien species are recognised as one of the leading threats to biodiversity and also impose enormous costs on



agriculture, forestry, fisheries and other human enterprises (Wittenberg and Cock, 2001). There are numerous alien invertebrate, fish and plant species that are being introduced through various pathways and are causing significant damage to coastal and freshwater ecosystems and to the economies that depend on them (ICAIS, 2006). This damage can range from the displacement of native plants and/or animals as a result of competition for space, light and food or to a more direct effect where some introduced species prey on local fauna (Barton and Heard, 2005).

New introductions create an ecological imbalance (e.g. competing for food and space) and therefore can contribute to the downgrading of waterbodies, even though waterbodies are otherwise of high and good quality in terms of water quality, habitat or other biotic elements. One of the main threats posed by the invasive dace in Irish rivers is the impact on native salmonids. Dace, trout and salmon have similar habitat preferences and all spawn over gravels in fast flowing water. This not only limits the breeding grounds available to salmonids but also increases the number of dace present, through successful spawning of the latter. During the summer months the dace feeds heavily on the same aerial insects as juvenile salmon and trout. Due to the high densities in which dace are found, this can create a substantial drain on the food available to salmonids. Similarly, large shoals of dace will actively compete with the coarse fish already resident in the river. Indeed the apparent preference that roach have for canal cut habitats on the main channel might indicate a degree of competition between dace and roach. There are a number of advantages and disadvantages to the invasion of non-native species such as dace and roach in Irish waters. These fish add to the amenity value of the angling product for coarse anglers, providing added diversity and year-round sport. However, some species such as dace will readily take a lure cast for a trout and are considered a nuisance by game anglers.

Specimens of the invasive Asian clam were (*Corbicula fluminea*) recorded in the tidal stretch of the River Barrow near St. Mullin's for the first time in 2010. This species has the ability to become highly invasive in a short period of time and at high densities it can alter the food web and compete with native species. In the US this clam causes an estimated \$1 billion in damages annually. IFI surveys on the River Barrow downstream of St. Mullin's detected densities of up to 9636 clams/m<sup>2</sup> in 2012. This gives an indication of the potential of this invasive to radically alter the environment.

The link between species invasions and the extinction of natives is widely accepted by scientists as well as conservationists, but available data supporting invasion as a cause of extinctions are, in many cases, anecdotal, speculative and based upon limited observation (Gurevitch and Padilla, 2004). Greater clarity in our understanding of the impacts of alien/non-natives on native fish populations would help us to focus on the most effective ways to reduce or mitigate extinction threats from invasive species.

Feedback from anglers in the River Barrow catchment points to a deterioration in brown trout stocks and angling in the main channel since the introduction of the invasive dace; however the interactions between brown trout and dace, or other invasive species such as the Asian clam and resident fish species, are not fully understood. It is not known what impact the introduction of the invasive dace has had on the brown trout population or if the Asian clam will compete with the resident fish populations and cause a deterioration in coarse, pike and salmonid angling if they spread further upstream. Further studies on the population dynamics and interactions between dace and brown trout or Asian clam and resident fish species may be beneficial for ongoing and future management of the river.

### **3. Reasons for less than good fish status in the catchment?**

Overall more than 50% of the sites surveyed were assigned Moderate fish status or worse across the catchment. This was mainly due to the absence of age classes of the main indicator fish species, i.e. brown trout and salmon. The reason for the absence at many sites can be attributed to unsuitable/poor habitat and poor water quality. This warrants further investigation prior to mitigation measures being introduced. Measures that could be put in place include, e.g. improvements in water quality, habitat enhancement works to improve spawning or nursery areas, tree planting to provide cover, etc.

#### **3(a) Artificial barriers**

An additional factor causing the absence of salmon, eels and lamprey sp. in the River Barrow catchment is the presence of artificial barriers impeding migration upstream on both the main channel and into some of the tributaries. It is known that there are barriers impeding fish passage in the Burren, Cushina, Dinin, Owenass, and Stradbally sub-catchments. Fish, including coarse fish species, require obstruction-free passage for reproduction, growth, food and shelter. Many different types of fish need to pass barriers in the river and need suitable habitat for their whole life cycle. It is important to understand what types of fish the river would naturally support when assessing barriers, these might be purely freshwater fish moving to feed or to spawn or migratory fish such as sea trout, salmon, eels, lamprey, etc. The most familiar human-caused barriers are dams and weirs but road crossings and culverts are also of concern in altering habitats and disrupting river and stream continuity. The scale of disturbance to river continuity caused by obstacles in rivers varies according to their height and situation – from the mouth to the source – and according to the accumulated effect of a series of such obstacles. Therefore a major impact could be caused by a single, very damaging obstacle/structure or the accumulated effects throughout the length of the river of a series of small structures which individually have only a small impact. During 2015 over

2000 potential barriers were identified in a desk study of the River Barrow catchment. A subset of these barriers is being assessed for passability of migratory fish species in a parallel project by Inland Fisheries Ireland (*J. King, IFI, pers. comm*). A project has recently been funded by the EPA (Reconnect; initiated January 2016) to assist in filling some of these knowledge gaps in relation to barriers in freshwater (Kelly and Harrison, 2016). The overall objective of the project is to develop a methodology for prioritising selection of barriers for modification or removal to improve hydromorphology and connectivity in Irish freshwaters. One of the deliverables of the project will be a spatial GIS layer of barrier locations across the country which will then be used to refine fish ecological status in the rivers classification tool (FCS2). In addition, the project also aims to assess the impacts of obstacles on fish, macroinvertebrates and macrophytes and assess the impact of barrier removal/modification and of different mitigation measures; one of these obstacles is located in the River Burren subcatchment in Carlow town.

Salmon are now managed on a river by river basis as opposed to a national or district basis. A scheme of rehabilitation of rivers was introduced with priority given to rivers which were below the conservation limit in areas of SAC's funded through the introduction of a salmon conservation component on all angling and commercial licence sales (Salmon Conservation Fund). The goal is to encourage the recovery of stocks in those rivers not yet meeting their conservation limits and to manage all rivers in compliance with the Habitats Directive. In the face of decreasing marine survival, the challenge is to show an improvement in stocks in those rivers over the next few years through investment in habitat improvements and other initiatives.

Article 11 of the WFD requires Member States to establish programmes of measures that are needed to achieve the environmental objectives of the Directive. There are several ways to eliminate or at least reduce the negative impacts caused by these structures. To support a natural fish population the complete removal of obstacles like dams is normally the most preferable option because it removes the obstruction and the impounding effects on habitat upstream. However, if the water levels above dams/weirs have to be preserved, dams/weirs can be replaced by nature-like submerged weirs. Rock ramps can be constructed as a part of a dam/weir. Fish passes and bypass channels are other alternatives and are constructed around obstacles.



**Plate 4.1: An example of a barrier within the River Barrow catchment (Cushina River at Lords Bridge)**

### **3(b) Drainage and other physical modifications**

Many rivers and lakes in Ireland have been physically modified by human activities over time. While these alterations have allowed the provision of drinking water, flood protection, land drainage, hydropower, navigation and transport they can create adverse impacts on the natural conditions of our waterbodies in some places. This in turn can affect aquatic ecosystems and species. It has been estimated that almost 40% of rivers in Ireland are affected by some form of physical modification (SWIMI, 2015). There is little understanding of the hydromorphological conditions necessary to support good ecological status when compared to the biological indicators as the subject is complex, but work is ongoing. Drainage (channelisation) and instream dredging in rivers can lead to significant physical changes and reduce biodiversity and damage habitats. These works alter natural river flow and can give rise to the accumulation of sediment due to channel widening or erosion of the bed and banks as a result of channel deepening (SWIMI, 2015). Arterial drainage has impacted negatively on fish stocks in Ireland. This work involved the widening and deepening of natural channels to contain flood flows within channel banks and to improve drainage from low-lying lands (O' Grady *et al.*, 2008). The negative effects of these programmes on salmonid populations include: reducing spawning opportunities for fish, lowering of salmonid nursery habitat in small channels and a reduction in the number of lies for adult fish (O' Grady *et al.*, 2008). A series of RHAT (river

hydromorphological assessment technique) surveys to assess habitat in a subset of the rivers surveyed during this study is being proposed by IFI for 2017 with the aim of assessing hydromorphological quality (King, IFI, pers. comm).

Considerable fisheries enhancement programmes have been carried out by Inland Fisheries Ireland (previously Central and Regional Fisheries Boards) to address this problem. In addition the Office of Public Works have been addressing the negative impacts of drainage programmes on fish stocks (e.g. Kelly and Bracken, 1998; McCreesh *et al.*, 2000 and IFI, 2011).

### **3(c) Water quality**

Many sites across the catchment, particularly in the Upper catchment were less than Good fish status. This trend mirrored the overall trend for ecological status in the catchment based on all EPA the EPA Q-values and water quality monitoring (EPA, 2016). The most widespread water quality problem in Ireland is elevated nutrient concentrations arising from human activities such as agriculture and waste water discharges to water from human settlements (SWIMI, 2015). There are two nutrients of concern, nitrogen and phosphorus. Excessive nutrient concentration can lead to accelerated growth of algae and plants (as observed at numerous sites in the River Barrow catchment) leading to ecological impacts in rivers and lakes such as reduced oxygen levels and loss of sensitive species, such as salmonids and increased incidences of fish kills. The long-term effects of such pollution are often more serious than dramatic discharges which result in instantaneous fish kills. Prolonged exposure of fish to sub-lethal pollution may reduce growth rates, inhibit reproductive functions and possibly alter the habitat as to render it uninhabitable for certain fish species. Most native fish species in Ireland require clean cold water to survive and also require clean gravels in shallow water for spawning purposes. Many salmonids are particularly sensitive to changes brought on by eutrophication processes.

Although water quality was not assessed during the current survey IFI staff did observe and record some issues related to water quality at some of the surveyed sites. Further investigations are required and mitigation measures put in place once sources are identified.

### **4. Bream**

Bream were not recorded in the current survey. The reason for this is unclear; however a small number of roach x bream hybrids were recorded. Roach x bream hybrids require spawning between both parent species (Hayden *et al.*, 2010). In a previous qualitative survey of the navigable river and associated canal cuts bream had a widespread but localised distribution during a qualitative

electrofishing survey in 2001 (CFB, 2002). While no bream were recorded during this survey, the presence of juvenile hybrids throughout the main channel suggests that spawning populations of bream are still present. More extensive sampling within localised areas might provide further information into the status of this important coarse angling species in the River Barrow.

#### **5. Habitat preferences of fish species**

Simple linear modelling revealed that roach were the dominant species in the canal cuts and that dace were present in all three habitat types of the main channel (navigable river, non-navigable river and canal cuts) but seem to have a preference for the two former habitats. Brown trout and juvenile salmon had a general preference for the non-navigable faster waters downstream of weirs.

A further study (seasonal), examining the habitat preferences of various fish species using point abundance sampling, could be undertaken to reveal information for management of habitat for certain fish species. Data analyses using a mixed modelling approach could potentially provide greater resolution surrounding the spatial ecology and habitat preferences of fish species on the main channel of the River Barrow and reveal some insights into the population dynamics and competition between the species, particularly the introduced invasive dace and salmonids.

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## THE RIVER BARROW

A poem by Rachel Kelly, Age 10 (2014)

*The River Barrow is not so narrow,*

*People go fishing,*

*While the water is swishing,*

*People go sailing,*

*They need to put up some railings.*

*Minnow swimming in and out,*

*People trying to catch some trout,*

*I love the river very much,*

*And everybody loves it such.*

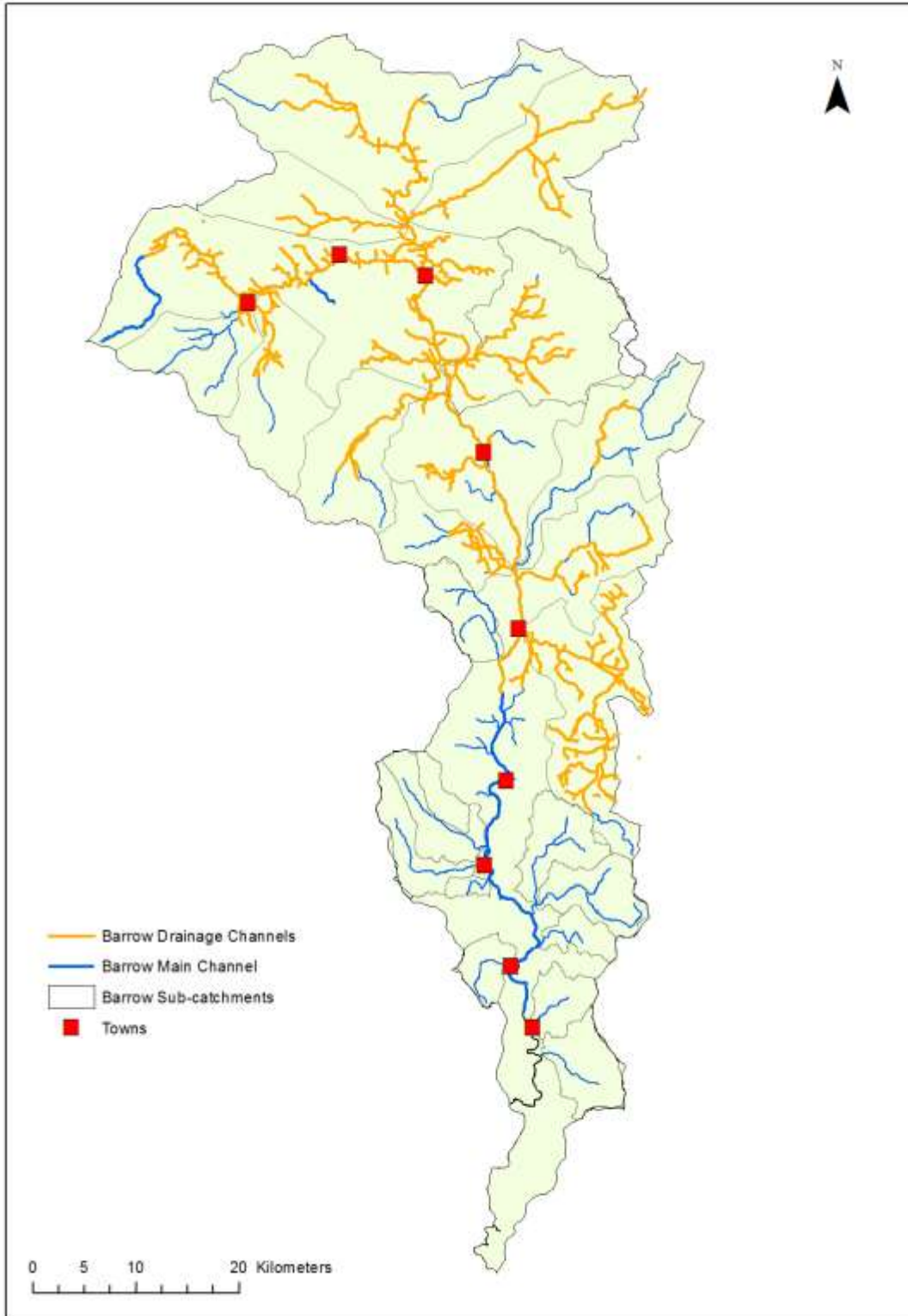
*We have to try to keep it clean,*

*Or else the fish will not be seen, we have to try to stop pollution,*

*So somebody think of a good solution*

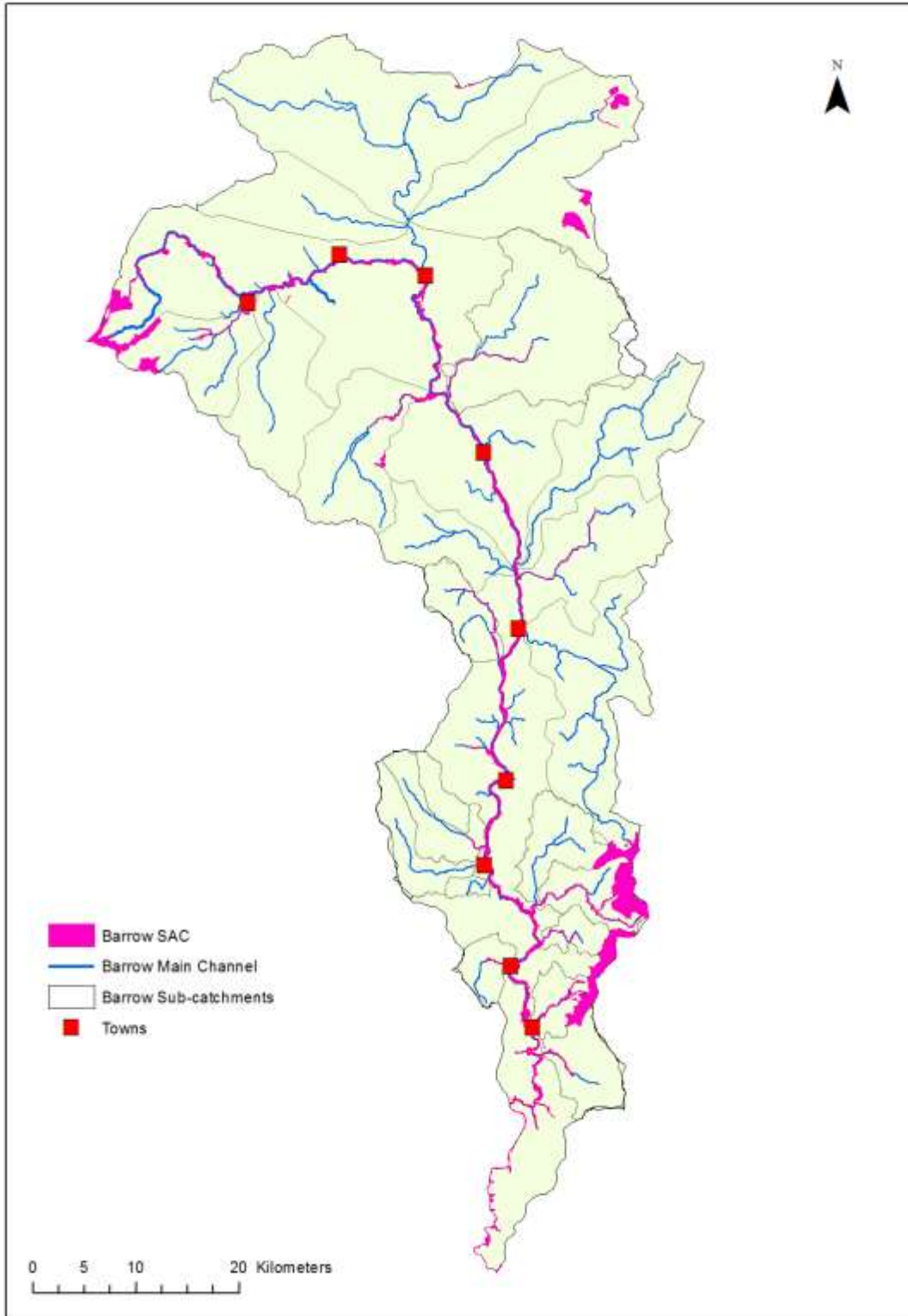
# Appendix I

## Barrow Drainage Map



# Appendix II

## Barrow SAC



### APPENDIX III

Barrow and main tributary catchment areas, and expressed as a % of over-all catchment.

River	Catchment area (Km <sup>2</sup> )	% of whole catchment
Barrow (whole catchment)	3010.69	
Figile	319.70	10.62
Slate	214.04	7.11
Tully	208.48	6.92
Burren	176.42	5.86
Greese	141.03	4.68
Stradbally	118.43	3.93
Triogue	115.49	3.84
Mountain (including Dinin)	102.21	3.39
Cushina	88.53	2.94
Owenass	83.79	2.78
Douglas	66.16	2.20
Monefelim	59.68	1.98
Lerr	54.71	1.82
Pollmounty	48.25	1.60
Gowran	42.09	1.40
Fushoge	41.36	1.37
Clashganny	33.36	1.11
Aughavard	31.05	1.03
Barrowmount	27.67	0.92
Duiske	24.43	0.81
Madlin	20.24	0.67



## Appendix IV

### Details of Electrofishing Sites, Barrow 2015

ID	River name	Site name	Easting	Northing	Area (m <sup>2</sup> )	E/F Type
1	Aughavaud River	Bauck Hill	272982	137867	61	Handset
2	Aughavaud River	Turra Br.	274471	139904	85	Handset
31	Barrow, River	Rathcoffey Br.	234721	211089	235	Handset
17	Barrow, River	Clonterry	247677	209841	1525	Boat
36	Barrow, River	u/s Portarlinton	253726	212325	2775	Boat
30	Barrow, River	Portarlinton School Br.	254056	212701	3724	Boat
3	Barrow, River	Ardreigh	268362	192724	3072	Boom boat
4	Barrow, River	Bagenalstown	270718	162288	7990	Boom boat
5	Barrow, River	Ballyellin Canal	268677	155481	4873	Boom boat
6	Barrow, River	Ballyellin Tomb	269094	152984	2013	Boom boat
7	Barrow, River	Ballyellin Upper	268728	155061	3430	Boom boat
8	Barrow, River	Ballyfoyle	270870	187163	5824	Boom boat
9	Barrow, River	Ballykeenan Lock	272413	144955	6516	Boom boat
10	Barrow, River	Barrowford	267129	195840	19289	Boom boat
11	Barrow, River	Barrowmount	268882	152202	5874	Boom boat
12	Barrow, River	Belview	266636	196237	21720	Boom boat
13	Barrow, River	Bestfield	271795	179841	6340	Boom boat
14	Barrow, River	Burgage	269506	163681	6055	Boom boat
15	Barrow, River	Carriglead Weir	272358	141732	3808	Boom boat
16	Barrow, River	Clogrennan Br.	269787	173556	6372	Boom boat
18	Barrow, River	Dunleckny	270545	162839	10559	Boom boat
19	Barrow, River	Fishersgraique	272531	145216	3924	Boom boat
20	Barrow, River	Goresbridge Graveyard	268331	154067	6277	Boom boat
21	Barrow, River	Graigenamanagh Br.	271638	144376	7663	Boom boat
22	Barrow, River	Graigenamanagh Weir	270957	143532	6575	Boom boat
23	Barrow, River	Levitstown Canal	270568	188698	3828	Boom boat
24	Barrow, River	Levitstown	270667	187497	8412	Boom boat
25	Barrow, River	Mortarstown Lower	269742	173191	5382	Boom boat
26	Barrow, River	Mountloftus Lock	269738	151151	4662	Boom boat
27	Barrow, River	Mountloftus	269018	152035	9504	Boom boat
28	Barrow, River	Pass Br. A	262038	211272	6300	Boat
29	Barrow, River	Pass Br._B	262295	210936	7332	Boat
32	Barrow, River	St. Mullins Canal	272127	139441	4968	Boom boat
33	Barrow, River	Strawhall A	271828	178595	13142	Boom boat
34	Barrow, River	Strawhall_B	271881	178147	8171	Boom boat
35	Barrow, River	u/s Black R. confl.	261740	211564	3733	Boat
37	Barrow, River	Upper Tinnahinch Lock	270736	142987	8508	Boom boat
38	Barrowmount River	Johnville Br.	267004	152056	95	Handset
39	Burren River	Ballynunnery Br.	279194	170040	161	Handset

ID	River name	Site name	Easting	Northing	Area (m <sup>2</sup> )	E/F Type
40	Burren River	Coolsneachta	280277	157946	134	Handset
41	Burren River	Rathoe Br.	280805	171359	202	Handset
42	Burren River	Staplestown	275547	174324	230	Handset
43	Burren River	Ullard Br.	279291	162916	172	Handset
44	Clashganny River	Ballymurphy	277197	147378	57	Handset
45	Clashganny River	Ballyroughan Little	274016	146414	129	Handset
46	Cushina River	Cushina Br.	255906	216195	259	Handset
47	Cushina River	Enaghan	251172	218182	92	Handset
48	Cushina River	Lords Br.	253078	216763	171	Handset
49	Cushina River (Trib)	Kelly's Br.	253339	216316	93	Handset
50	Dinin River	Corries Br.	274963	155820	124	Handset
51	Dinin River	Kilclony Br.	273073	153240	172	Handset
52	Dinin River [Trib]	Ballinree Br.	276660	156361	88	Handset
53	Dinin River [Trib]	Corries Confl.	275064	155772	100	Handset
54	Douglas River	Castletown Br.	264891	185655	140	Handset
55	Douglas River	Clonagh Br.	269655	183343	158	Handset
56	Douglas River	Gales Br.	265813	185969	156	Handset
57	Douglas River (Trib)	Fuer Br.	264818	186043	84	Handset
58	Duiske River	Peig's Lane	270909	143587	91	Handset
59	Duiske River	Priestsvally	268469	144430	46	Handset
60	Duiske River	Raheendenore	267398	141910	38	Handset
61	Duiske River	Tikerlevan	267958	143866	39	Handset
62	Duiske River	Well Lane	270854	143841	82	Handset
63	Figile River	Bog Road	262663	227635	1224	Boat
64	Figile River	Clonbulloge	260662	223730	1680	Boat
65	Figile River	Cushaling Br.	265589	226092	633	Boat
66	Figile River	Ticknevin	269661	230136	93	Handset
67	Fushoge River	Coolrain	267299	180012	133	Handset
68	Fushoge River	Fushoge Br.	269680	173965	191	Handset
69	Fushoge River	Olderrig Br.	269144	176287	117	Handset
70	Fushoge River (Trib)	Killeshin	267753	177928	80	Handset
71	Gowran River	Goresbridge	268159	153880	126	Handset
72	Gowran River	Gowran Village	262812	153195	195	Handset
73	Gowran River	Grange Lower	266177	153257	104	Handset
74	Gowran River	Grangehill	260196	157035	98	Handset
75	Greese River	Ballycore	282158	194142	76	Handset
76	Greese River	Ballynure Park	283630	196747	105	Handset
77	Greese River	Br. NE of Belan	277568	190660	346	Handset
78	Greese River	Colbinstown	283792	198461	104	Handset

ID	River name	Site name	Easting	Northing	Area (m <sup>2</sup> )	E/F Type
79	Greese River	Spratstown Br.	282474	198052	200	Handset
80	Lerr River	Alymerstown Br.	281271	188480	78	Handset
81	Lerr River	Grangeford Br.	278960	188364	51	Handset
82	Lerr River	Mullarney	278374	184751	164	Handset
83	Lerr River	Prumplestown Br.	275888	183171	233	Handset
84	Madlin River (Trib)	Ballynolan Br.	268429	165232	49	Handset
85	Monefelim River	Garryduff	264200	157822	121	Handset
86	Monefelim River	Monefelim	265311	157011	52	Handset
87	Monefelim River (Acore Trib)	Barraghscore Br.	267430	155401	154	Handset
88	Mountain (Augnabrisky) River	Spearpoint	281206	148418	64	Handset
89	Mountain River	Earthworks Br.	278267	151045	119	Handset
90	Mountain River	Owlbeg	274419	151006	186	Handset
91	Mountain River	Rathanna Br.	279968	150289	59	Handset
92	Owenass River	Clonehurk	239202	204877	185	Handset
93	Owenass River	Owenass Br.	244198	206598	336	Handset
94	Owenass River	Rosnagad	243998	203243	89	Handset
95	Owenass River (Owennahallia Trib)	Esker	240084	204056	93	Handset
96	Philipstown River (Figile)	Killoneen	250119	227104	263	Handset
97	Philipstown River (Figile)	Magheramore	248310	227637	206	Handset
98	Pollmounty (Aughnacrew) River	Ballywilliam	277315	133421	120	Handset
99	Pollmounty River	Curraun	275662	135103	82	Handset
100	Pollmounty River	Templeudigan	277329	135077	59	Handset
101	Slate River	Ballyteige	275359	225141	218	Handset
102	Slate River	NW of Robertstown	278537	225900	103	Handset
103	Slate River	Rathangan	267119	219263	278	Handset
104	Slate River	Tannery Park	267287	219283	286	Handset
105	Stradbally River	Clone Br.	260262	198250	273	Handset
106	Stradbally River	Timogue Br.	255406	193683	276	Handset
107	Stradbally River (Crooked Trib)	Clopook	257476	190789	142	Handset
108	Stradbally River (Trib)	Timahoe Village	253599	190294	87	Handset
109	Triogue River	Eyne Br.	247481	204128	240	Handset
110	Triogue River	Kyle Br.	246372	200624	271	Handset
111	Triogue River	Triogue Br.	247571	207473	187	Handset
112	Triogue River (Trib)	Knocknagroagh	247287	202820	90	Handset
113	Tully Stream	Nurney	270541	205621	133	Handset
114	Tully Stream	Pullagh	268211	204340	135	Handset
115	Tully Stream	Soomeragh Br.	270996	206343	123	Handset
116	Tully Stream (Finnery Trib)	Clarey	269869	203075	156	Handset
117	Tully Stream (Finnery Trib)	Gorteen Br.	272234	202596	229	Handset
118	Tully Stream (Finnery Trib)	Kilboggan	273227	202962	142	Handset

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