2010

Carlingford Tributaries Catchment Status Report

Loughs Agency of the Foyle

Carlingford and Irish Lights Commission

Report Ref: LA/CSR/C001/11

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Picture of Atlantic salmon Kelt courtesy of Atlantic Salmon Trust

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1.0 INTRODUCTION

Welcome to the 2010 series of Loughs Agency catchment status reports. Written in 2011 and reporting on 2010 the reports provide a review of fisheries and other associated information collected and management measures implemented within the freshwater catchments of the Foyle and Carlingford areas.

This is one of an annual series of catchment status reports produced by the Loughs Agency. The primary objective of the catchment status reports is to disseminate catchment specific information to all interested stakeholders. The reports continue to be consulted widely by a variety of stakeholders including local angling associations, fishery owners, statutory bodies, environmental consultants, students, conservation Non Governmental Organisations and private individuals. The catchment status reports provide summary data which demonstrates the work that the Loughs Agency conducts within specific catchments and outlines catchment specific objectives.

2010 witnessed significant regulatory change within the Foyle area with the implementation of the Foyle Area (Control of Fishing) Regulations 2010. This regulation expanded upon existing regulation governing the in season management of commercial and recreational Atlantic salmon and trout fisheries. The regulation also created a mechanism for regulating fisheries based on an assessment of the attainment of management targets for returning adult Atlantic salmon. In the event that set numbers of fish have not ascended key fish counter sites on the Rivers Roe, Faughan, Mourne and Finn prescribed management actions including suspension of commercial fisheries and recreational fisheries can be made. Additionally if management targets have not been met for a prescribed number of years the recreational fisheries can be made to adhere to compulsory catch and release and the commercial fisheries curtailed until prescribed conditions are met.

Due to the failure of the River Finn in Co Donegal to meet its management target for the prescribed period the commercial fisheries in Lough Foyle and the River Foyle were suspended in 2010 and the recreational game fisheries in the Rivers Foyle and Finn became compulsory catch and release.

Populations of Atlantic salmon are currently experiencing the lowest levels of marine survival on record. The Loughs Agency is continuing to conserve and protect the freshwater resources and habitats of the Foyle and Carlingford areas to ensure optimum conditions are available for all fish populations and the aquatic and riparian ecosystems that they form an integral part of.

The theme for the 2010 series of catchment status reports is fisheries biodiversity, monitoring and conservation. In 2010 the Loughs Agency in partnership with other statutory agencies has developed monitoring programmes for salmonids, lake fish, lampreys and European smelt. A series of individual reports on these surveys are available at www.loughs-agency.org under the publications section.

2010 saw the first specific lamprey surveys which we hope can contribute towards condition monitoring reports under reporting requirements for the European Union Habitats Directive. Baseline surveys of the native European smelt another fish species of conservation importance were also conducted demonstrating the diversity of fish populations within the Foyle and Carlingford areas.

A number of lake fish surveys following sampling methodologies developed under the Water Framework Directive were conducted in addition to the annual Water Framework Directive fish in rivers monitoring programme.

Other partnership programmes were also developed including the Lough Derg, wild trout conservation project.

The increasing diversity of freshwater monitoring programmes within the Foyle and Carlingford areas contributes towards the development of the area for sustainable recreation sympathetic towards the significant biodiversity resources present throughout the catchments.

All these programmes and more are presented and discussed across the 2010 series of fourteen catchment status reports.

Loughs Agency staff have continued to contribute significantly towards the conservation and protection of the fishery and aquatic resources of the Foyle and Carlingford areas, encouraging partnership building and actively engaging in participatory processes designed to ensure the sustainable development of our aquatic resources.

1.1 The Carlingford Catchments

Located in the North East of the island of Ireland and composed of significant areas of County Armagh, County Down and County Louth, the Carlingford catchments cover an area of approx 544 km^2.

The catchments of the Carlingford area can be broadly divided into 4 main landscape types, the Newry basin, Slieve Roosley, Carlingford Lough and Mourne mountains. The Newry basin is characterised by a large scale rolling drumlin landscape (this drift geology is composed of deposits left by retreating glaciers) situated between the Ring of Gullion and the Mourne Mountains. The Newry basin is drained by the Newry/Clanrye River and tributaries. The main land use consists of improved pastures of good condition becoming increasingly rough on the fringes of the Mourne foothills. To the southeast drumlins are displaced by broader ridges separated by narrow, flat-bottomed valleys with ribbon loughs and bogs such as Derryleckagh Lake and Greenan Lough. The underlying solid geology is composed of basalt, sandstones and shales.

The Slieve Roosley landscape lies between Newry and the Mourne Mountains and is characterised by open, exposed hills with a rugged profile, which are dissected by a number of river valleys. The Rostrevor Glen and Killbroney River together form a marked feature along the eastern boundary of the area, which is underlain by a complex geology of igneous and sedimentary rocks. The hills are used for sheep grazing and are characterised by rough, open, unfenced pastures of moorland grasses, gorse, bracken and sedges. The fringes comprise semi-improved pastures of small fields enclosed by stonewalls and gorse hedgerows.

The Mourne Mountains Landscape (particularly associated with the Whitewater River catchment) is characterised by steep rock and scree covered mountain slopes capped with granite torrs, falling to the sea on their eastern edge. It is largely a wild upland landscape composed of exposed heath, thin grass cover, rock and scree slopes with rough grazing for sheep and some cattle. The underlying geology is dominated by granite which is reflected by the characteristic torrs which cap the mountain tops. Rocky mountain streams occupy the steep glens which dissect the mountain ridges.

Carlingford Lough is a low energy estuary filling a structurally controlled (NW-SE fault) glacially scoured depression. The estuary mouth is shallow which allows wave focusing of south westerly storms onto the northern shoreline where erosion has left a number of bays dominated by gravel beaches.

Carlingford Lough supports a range of unusual and rich littoral/shoreline communities, including sheltered sands, muddy sands, muds and boulder shores. It exhibits a good natural transition from lower shore communities, through upper shore saltmarsh to fen vegetation. Mill Bay in particular supports the largest intact block of

saltmarsh in Northern Ireland and the area is internationally important in terms of numbers of wildfowl and waders that over-winter on the site.

The Carlingford area and tributaries are impacted upon by a wide range of anthropogenic influences within both the terrestrial and aquatic environments. A diverse array of impacts include amongst others; agriculture, aquaculture, sand and gravel extraction, quarrying, commercial forestry, commercial and recreational fishing, industry, water abstraction, sewage treatment, diffuse and point source pollution, invasive plant species, urban sprawl, flood defences and heavily modified water bodies. Increasing pressures on the aquatic environments within the Carlingford area and tributaries requires appropriate monitoring, control and remediation if native biodiversity is to be preserved and enhanced. The proximity of some of the Carlingford area and tributaries to a large urban area exacerbates many of these issues.

As the competent authority for fishery issues within the catchment the Loughs Agency are required to fulfil a variety of national and international obligations. European Directives including the Habitats Directive and Water Framework Directive and the transposing national legislation have assisted in creating a legislative framework in which to drive forward sustainable management of riparian and aquatic habitats and the species which inhabit them.

Fig 1.1 Carlingford area looking east from the Newry River estuary towards the mouth of Carlingford Lough

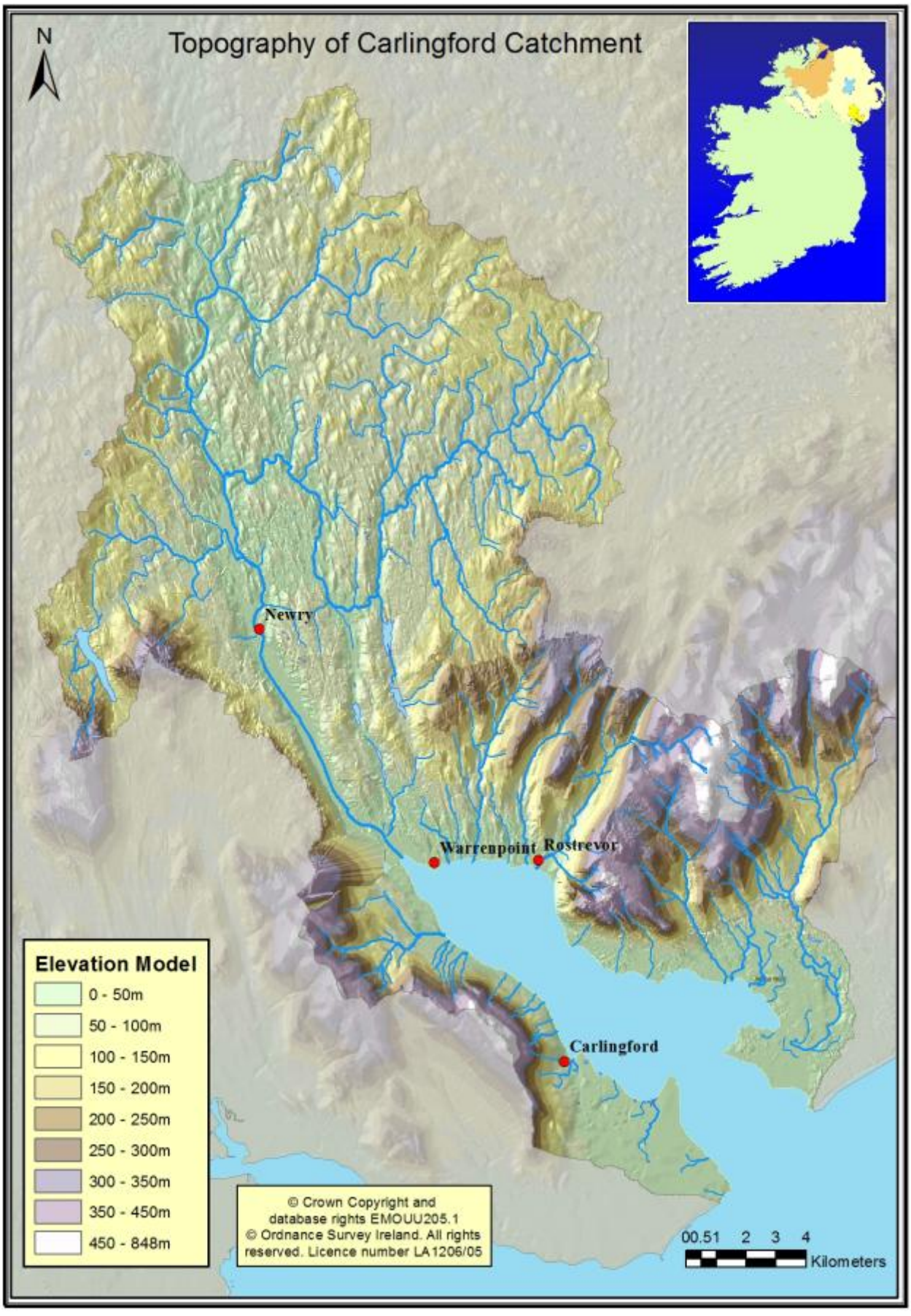

Fig 1.11. Carlingford catchments topographical map with river network.

1.2 Atlantic Salmon and Sea Trout

Salmon and Sea Trout are referred to as being anadromous meaning that they migrate between the freshwater and marine environments returning to freshwater to reproduce. This complex life history exposes them to varied environmental pressures and recreational and commercial fisheries. Adult Atlantic salmon return to their natal rivers where spawning takes place. Sea trout also demonstrate an ability to return to their natal river but their homing instinct may not be as strong as those of the Atlantic salmon. After the eggs hatch the juveniles (initially referred to as fry and then parr) remain in freshwater for up to three years.

Smoltification is the physiological adaptation, which occurs when the juvenile salmon change from the parr stage (freshwater phase) to the smolt stage (marine phase). Smoltification at the latitudes of the Foyle and Carlingford areas tends to occur after one, two or three years. Most salmon from the north of Ireland (referred to as post smolts) will remain after smoltification in the North Atlantic for one year and are referred to on their return to the coast and rivers as grilse. Salmon that stay at sea for longer than one year are referred to as multi sea winter (MSW) salmon.

1.3 Non Salmonid Fish Species

As highlighted earlier populations of other non-salmonid fish species occur within the Carlingford catchments. At present monitoring is targeted at salmonid and to a lesser degree coarse species however with obligations under the Water Framework Directive other non salmonid fish species are being monitored more closely. Fish species presence, abundance and age structure can act as a good environmental/ecological indicator demonstrating the ability of the aquatic habitat to support a diverse array of native species. Populations of the European Eel, Bass, Grey Mullet, River/Brook and possibly Sea Lamprey form an important part of the native fisheries biodiversity of the Carlingford catchments. Maintaining high standards of water quality and appropriate habitat for these species is essential for the overall health of the aquatic ecosystem. In the Carlingford area significant non-native fish species have colonised heavily modified and artificial water bodies such as Newry canal and Camlough. The Loughs Agency recognises the importance of the coarse fish populations in terms of a recreational resource for both local residents and tourists and views the improvement and development of the infrastructure to sustainably exploit this resource as a core responsibility.

Fig 1.3 Bream specimens recovered during a coarse fish survey of Newry Canal in 2002

2.0 ATLANTIC SALMON STOCKS

In order to describe the status of salmon stocks each of the following points need to be considered:

- Redd Counts
- Juvenile abundance
- Marine survival
- Adult abundance
- Exploitation

2.1 Redd Counts

Redds are spawning nests created by salmon or trout. Differentiation between salmon and trout redds can be made as salmon redds tend to be larger in size and trout tend to spawn earlier than salmon. Research within the Foyle system using extensive annual redd count data has highlighted a good relationship between the number of redds and the total annual catch of salmon. Water flow is of great significance when monitoring redds as in high water conditions the ability to see and count redds in rivers is impaired. The Loughs Agency will continue to expand redd counting in the 20010/2011 spawning season on the Whitewater River and sections of the Clanrye River.

2.2 Juvenile Abundance

Within the Loughs Agency jurisdiction trends in abundance of juvenile salmonids are monitored by annual semi-quantitative electrofishing surveys. The numbers, age and species of fish captured during five minute timed electrofishing surveys are compared with previous year's data allowing for change to be monitored, facilitating suitable fishery management practices to be implemented. In 2010 a total of 77 sites were semi-quantitatively electrofished within the Carlingford system. The results for each site for salmon and trout are classified as excellent (>25 fish), good (15-24 fish), fair (5-15 fish), poor (1-4 fish) and absent (0 fish), Table 2.2. Figures 2.22-2.25 outline the salmon 0+ electrofishing results and site classifications for the Carlingford catchments in 2010. Please consult previous status reports for site classifications in other years.

Semi-quantitative electrofishing was developed to monitor 0+ salmonids (fry/young of the year). In order to quantify the abundance of 1+ salmonids (parr and older) fully quantitative electrofishing surveys are required which can be used to calculate fish densities within a defined area. Rivers and tributaries with good environmental quality are more likely to support good populations of each year class. Fish populations can vary considerably over time and location, it is therefore necessary to monitor the populations over a period of years to highlight meaningful

trends before considering remedial activities such as habitat improvement works. These trends are being continually monitored by the Loughs Agency and the most appropriate management options considered.

There are a variety of reasons why electrofishing sites may be perceived to be under producing, these can include, lack of suitable juvenile habitat, the presence of impassable obstacles to migratory fish species on lower sections of a tributary, pollution, inconsiderate channel maintenance, tunnelling by bank side vegetation, stream gradient and poor forestry practices etc. The critical point is to recognise the major factors at play and to investigate all possible reasons for underproduction accepting that there may be inherent reasons as to why production may not be improved upon in certain areas. When the same areas are surveyed for other non salmonid species it may be discovered that they provide habitat more suited to these species. Habitat improvement works and the rationale behind them are discussed in greater detail later. Obligations under the Water Framework Directive are driving quantitative surveys of both salmonid and non salmonid species under proposed Surveillance, Operational, Investigative and Protected Area monitoring programmes.

Symbol	Grade	Number of 0+ Salmonids
	Excellent	>25
	Good	15-24
	Fair	5-14
	Poor	1-4
	Absent	0

Table 2.2 Loughs Agency semi-quantitative electrofishing classification system for 0+ salmon and trout

Fig 2.21 Electrofishing on the Clanrye River and salmon parr

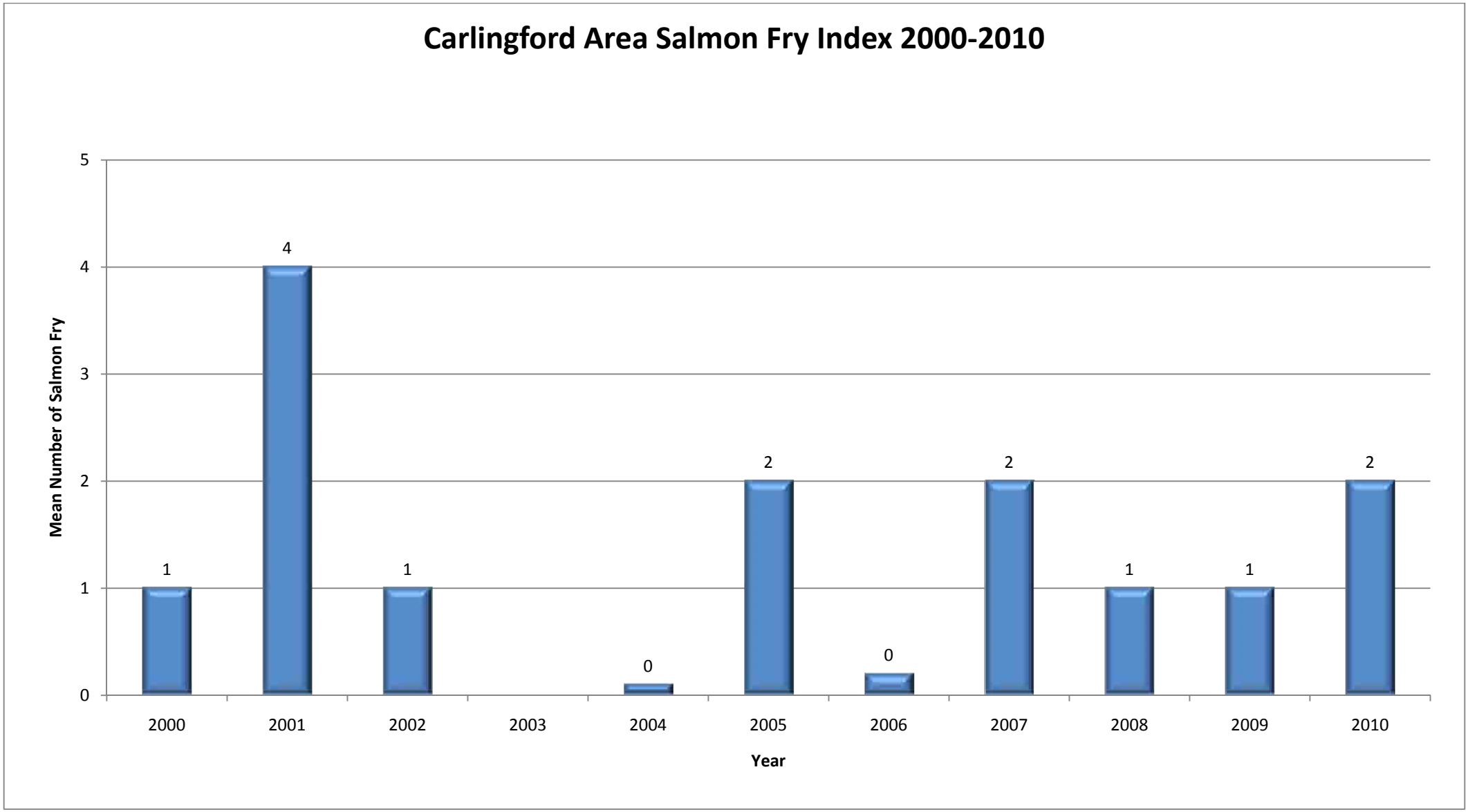

Fig 2.22 Carlingford Area fry index 2000-2010

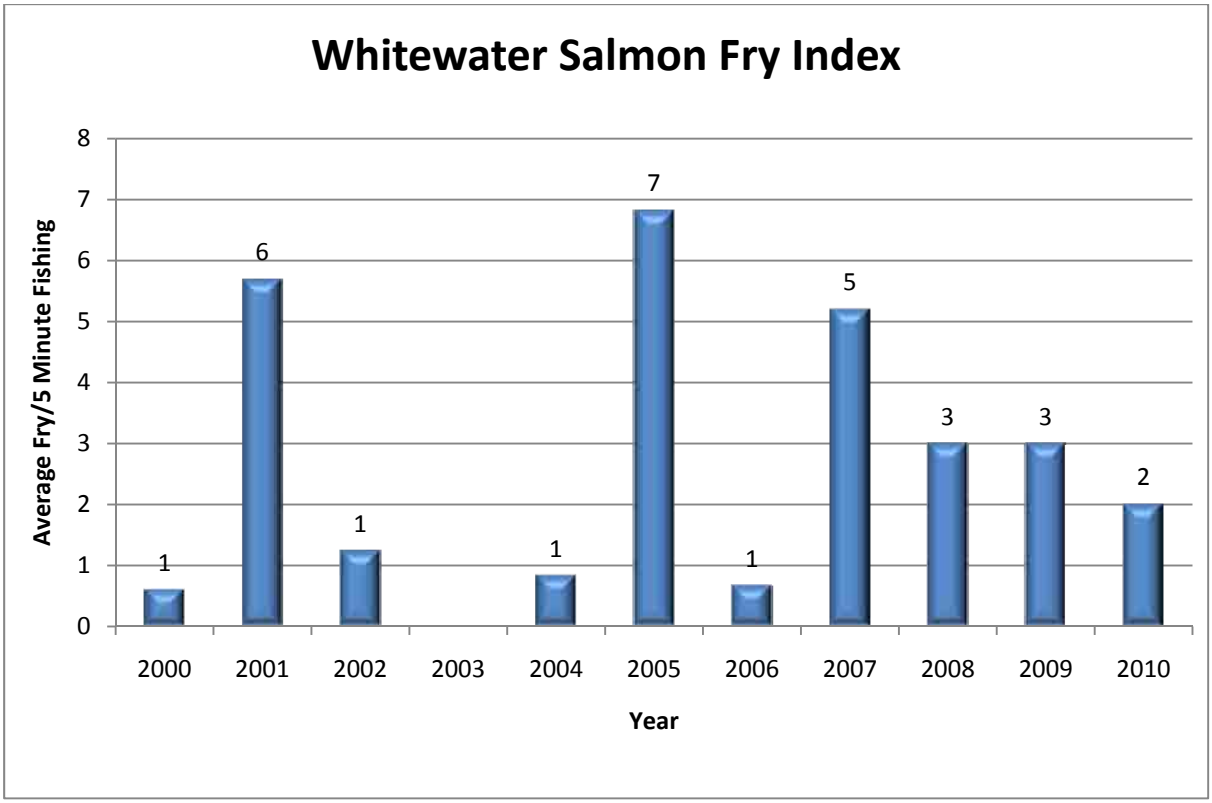

Fig 2.23 White Water catchment fry index 2000-2010.

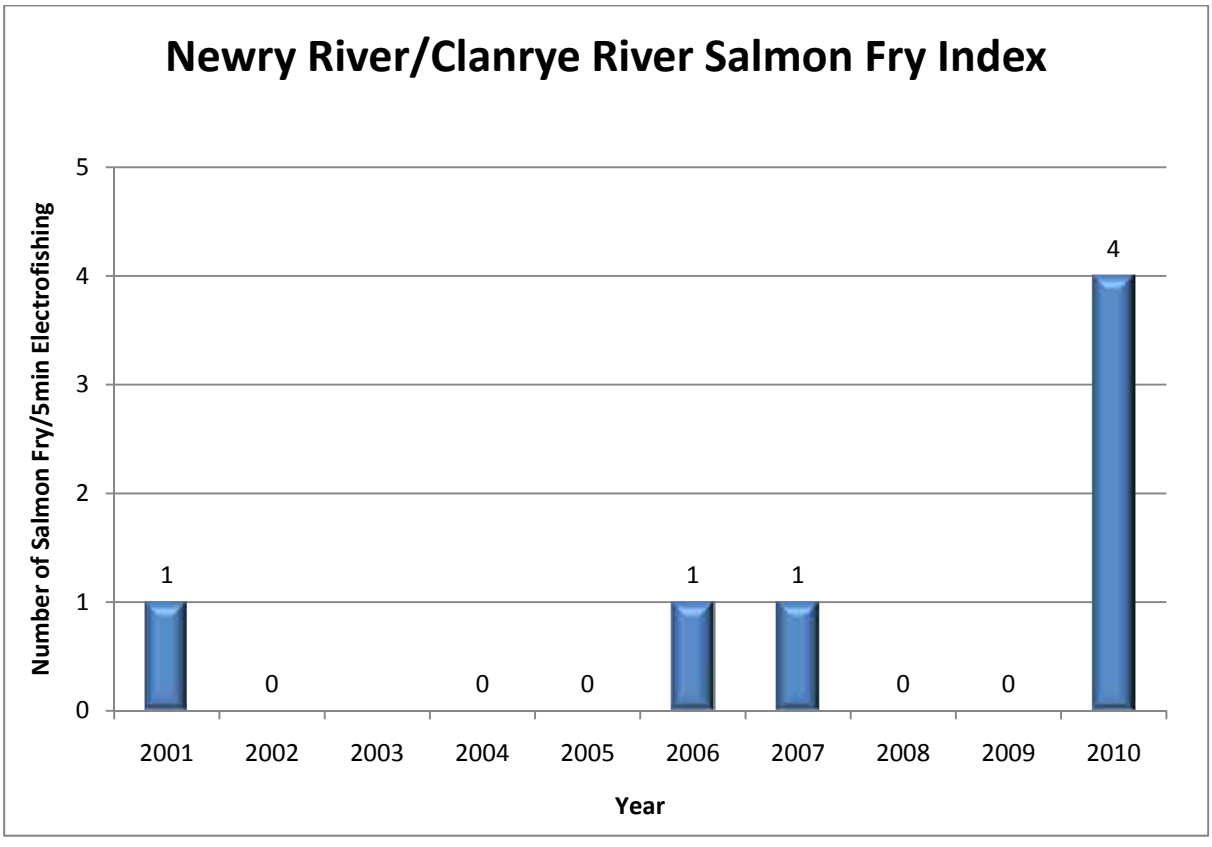

Fig 2.24 Clanrye River catchment fry index 2000-2010

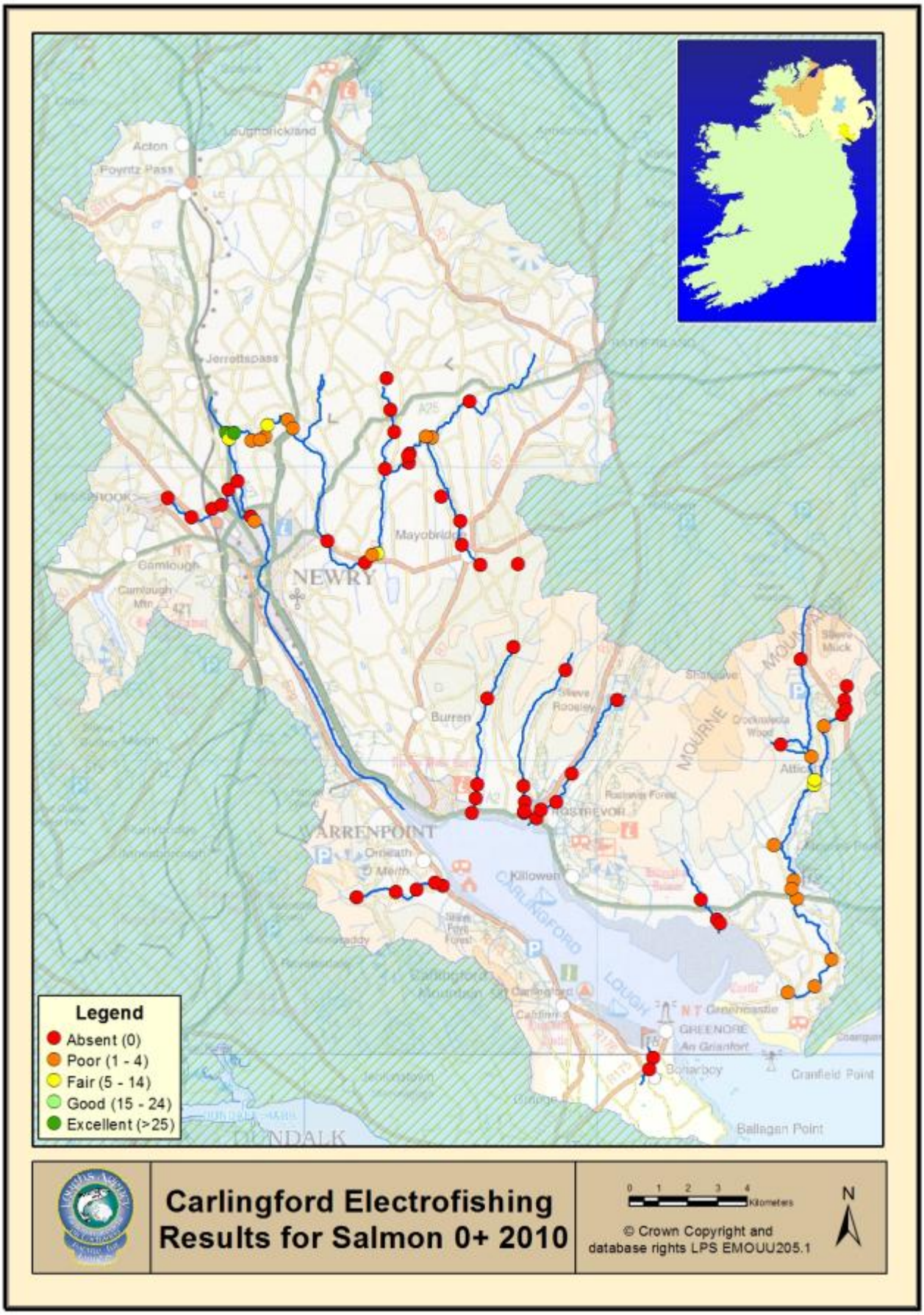

Fig 2.25 Salmon 0+ electrofishing site classification 2010

3.0 TROUT STOCKS

Annual trends in the populations of juvenile trout are also monitored within the Loughs Agency jurisdiction using the same methodology and classification system as those employed for salmon. The semi quantitative electrofishing results for trout fry in the Carlingford catchments and site classifications are displayed in Figures; 3.1 to 3.13.

Fig 3 Electrofishing survey and trout parr

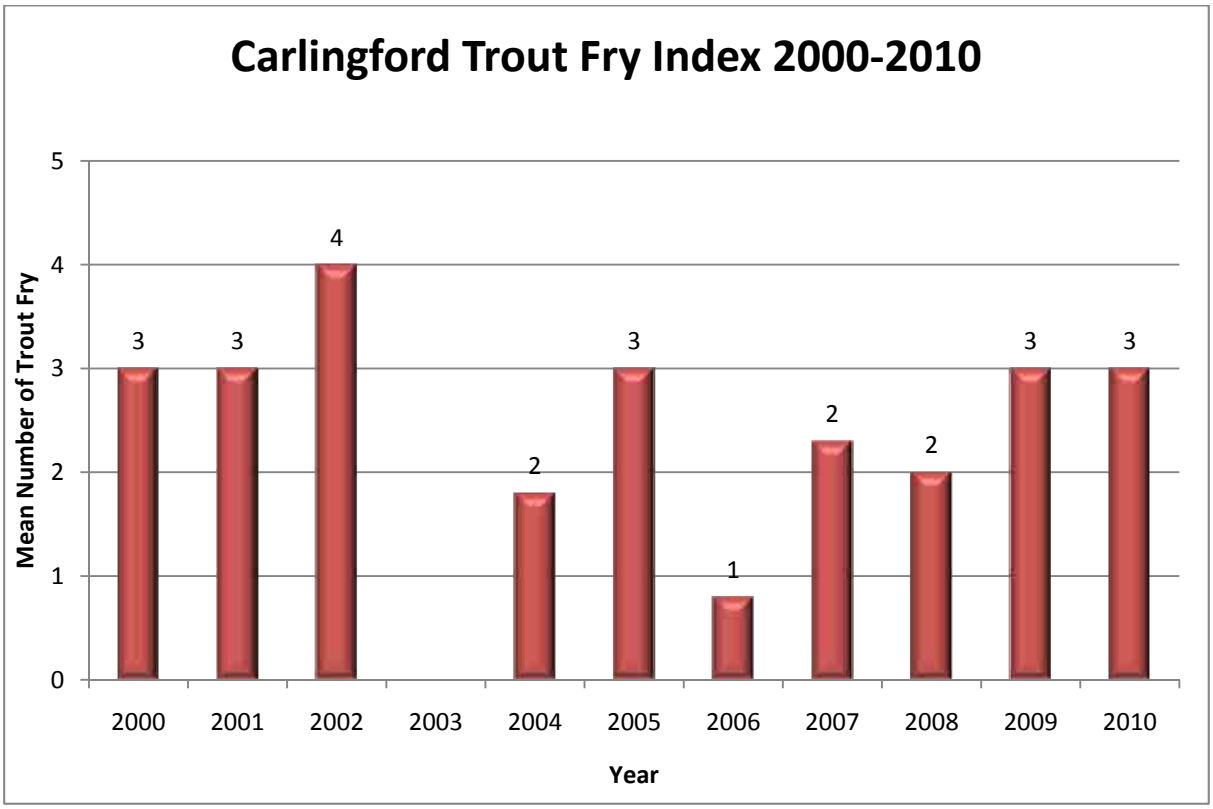

Fig 3.1 Carlingford Area fry index 2000-2010.

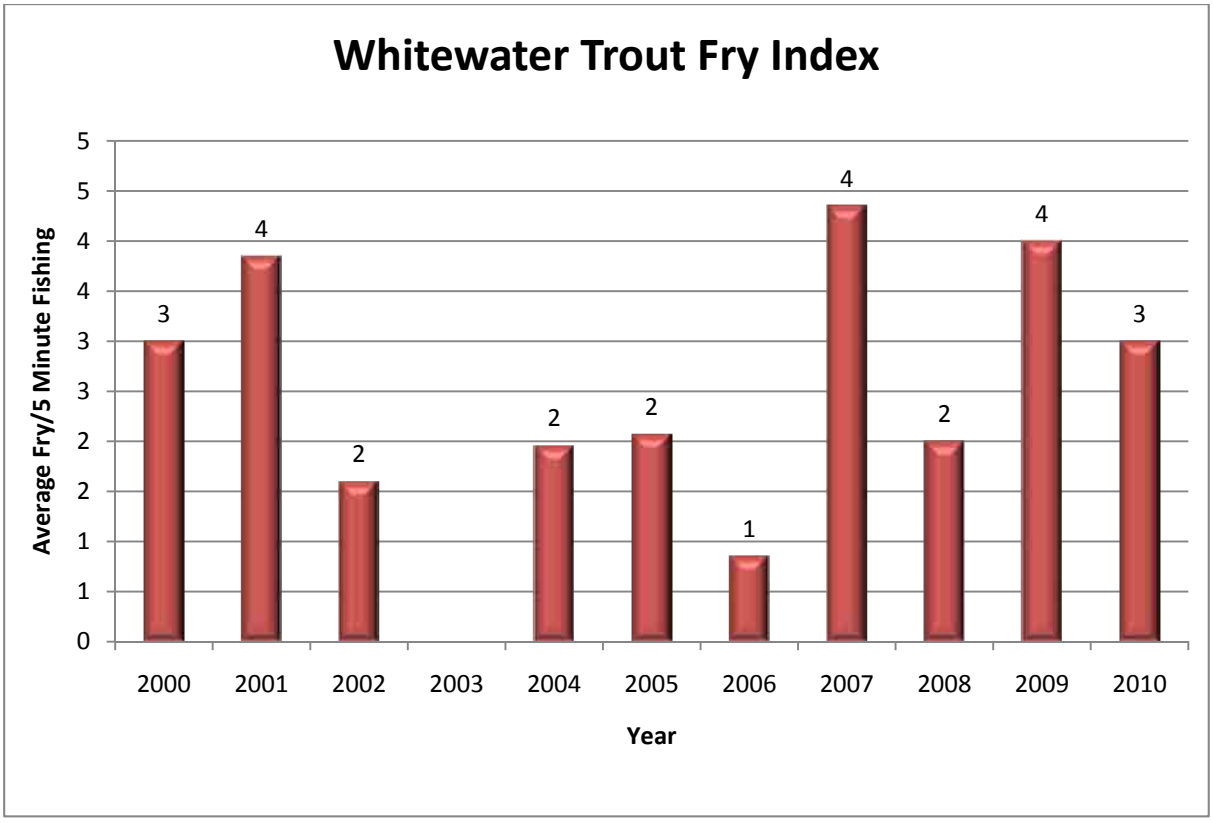

Fig 3.11 Whitewater trout fry index 2000-2010.

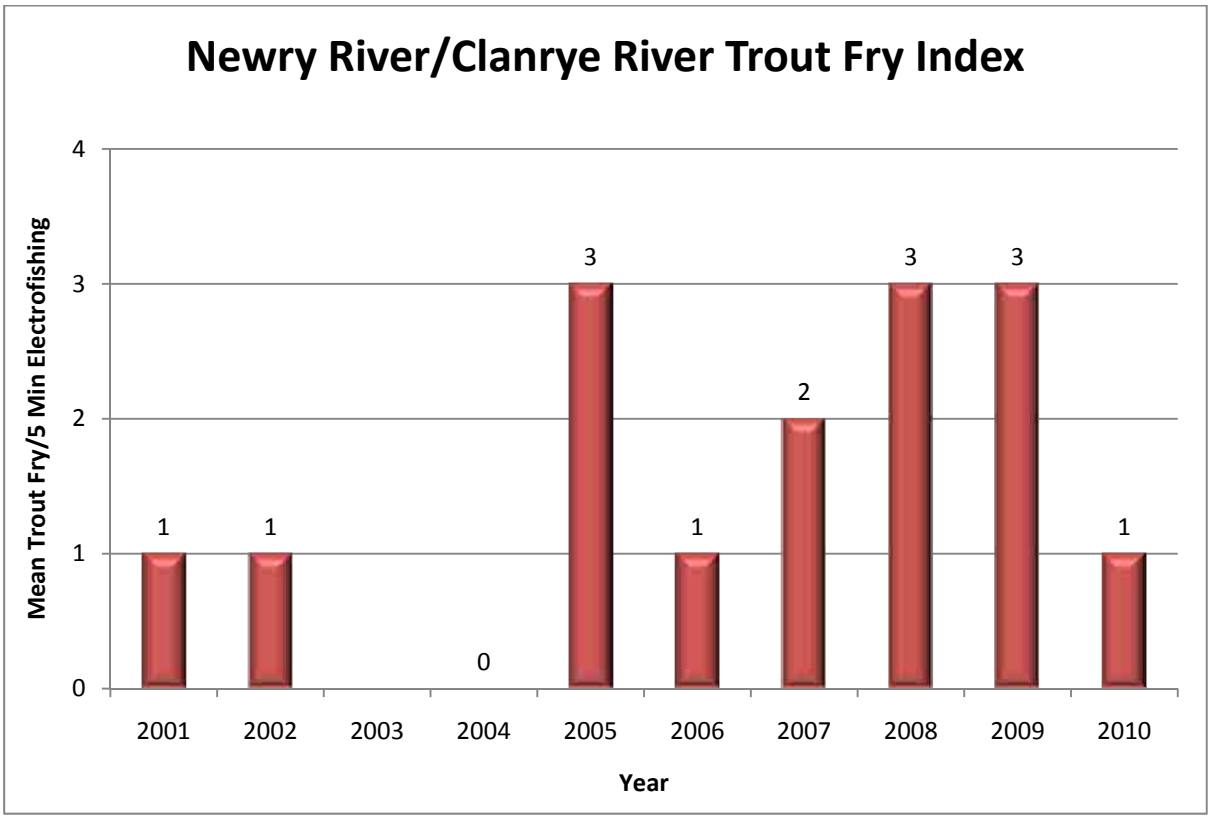

Fig 3.12 Newry River/ Clanrye River trout fry index 2000-2010.

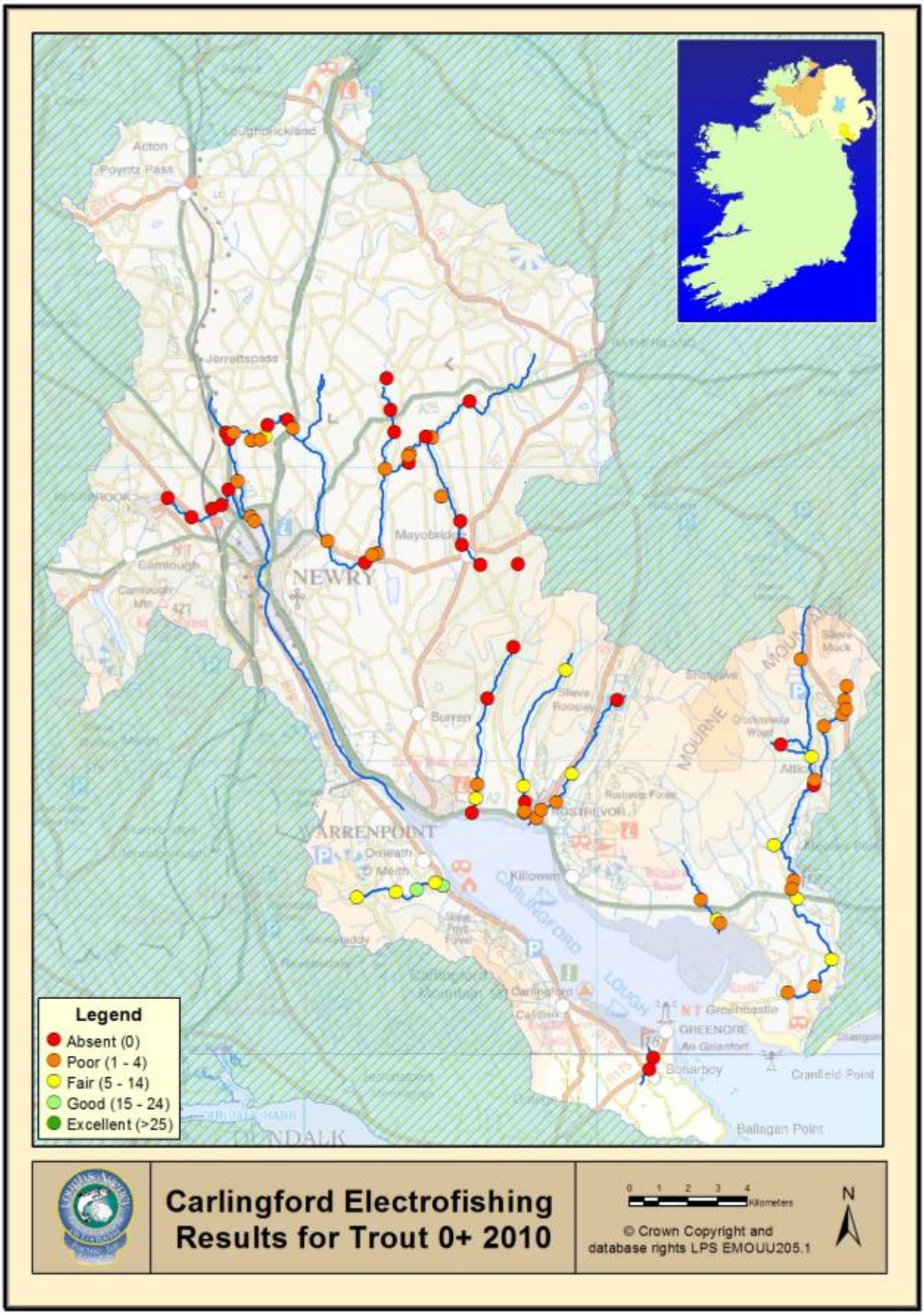

Fig 3.13 Trout 0+ electrofishing site classification 2010

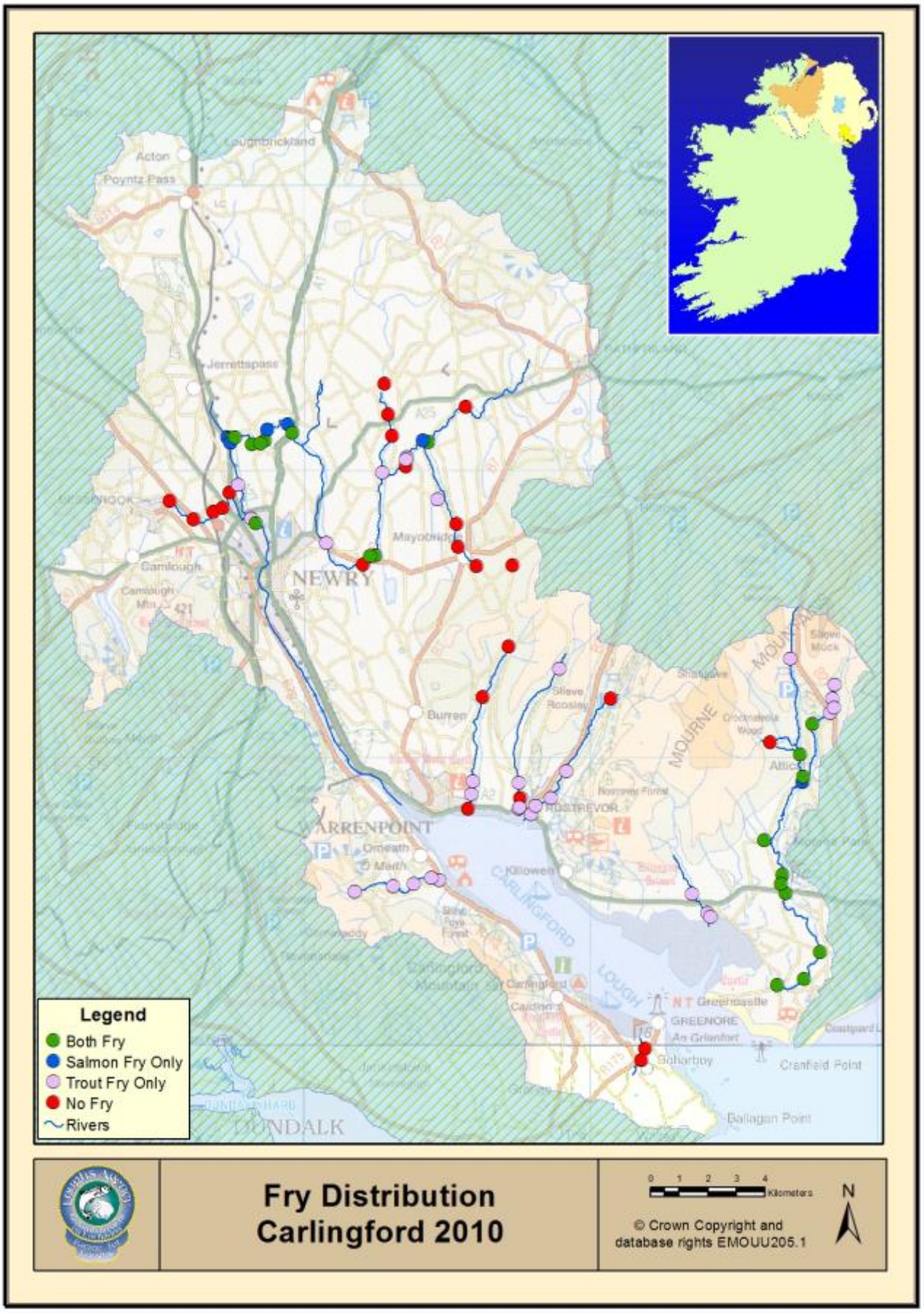

Fig 3.14 Salmon and Trout fry distribution 2010

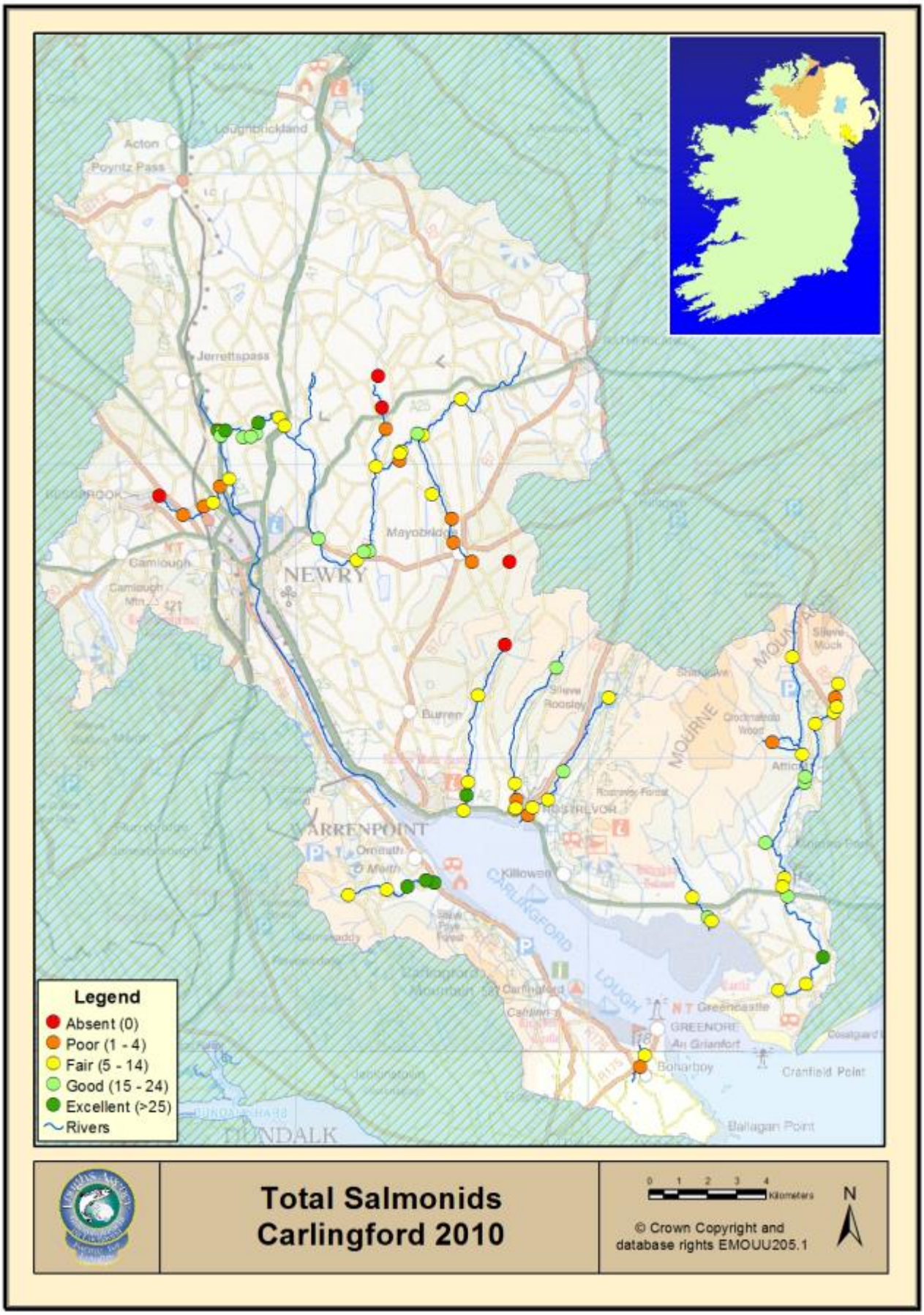

Fig 3.15 Total salmonid (salmon/trout fry and parr) distribution 2010

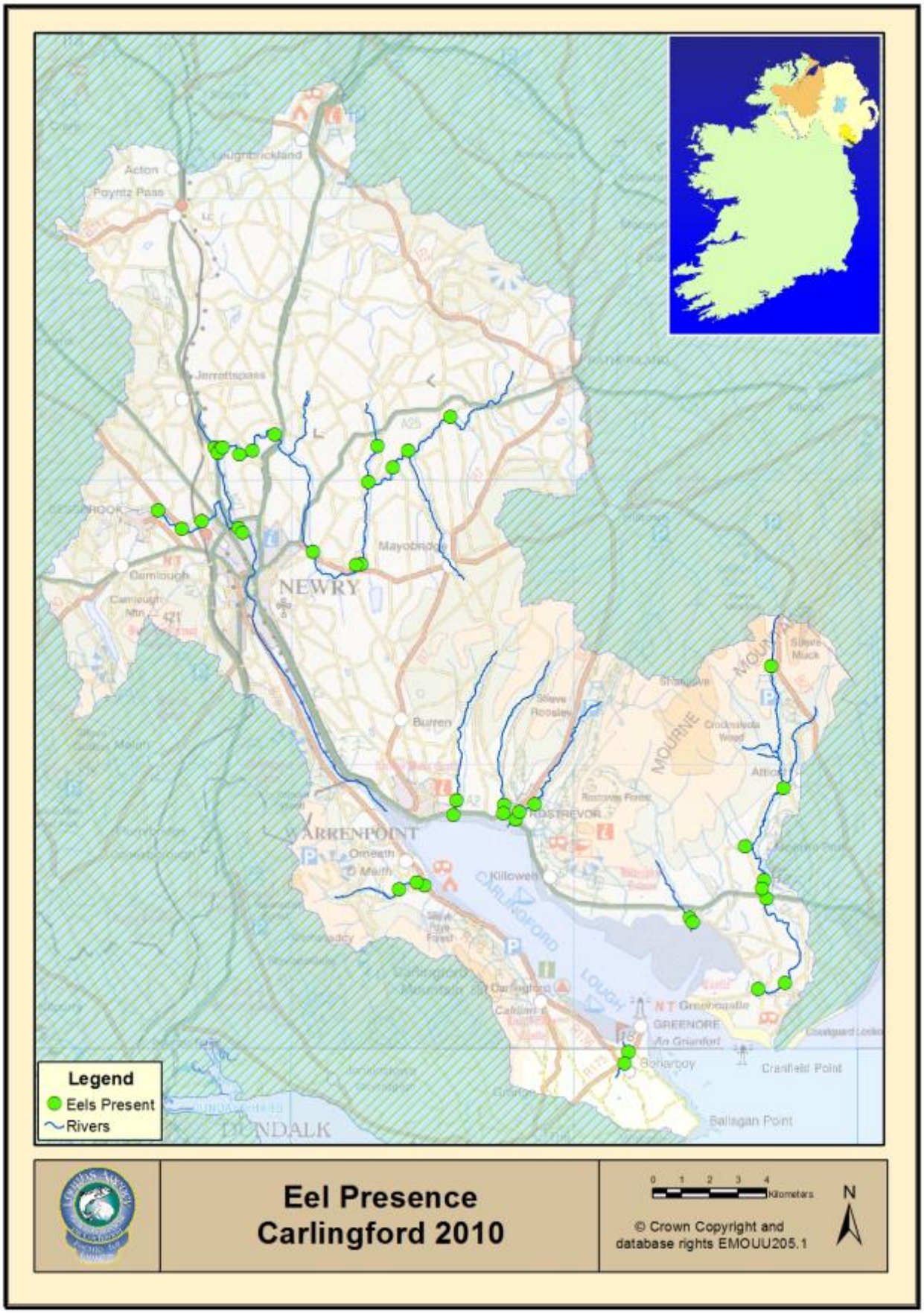

Fig 3.16 Eel presence as recorded during semi quantitative electrofishing surveys 2010. *Note technique used is designed specifically for salmonids.

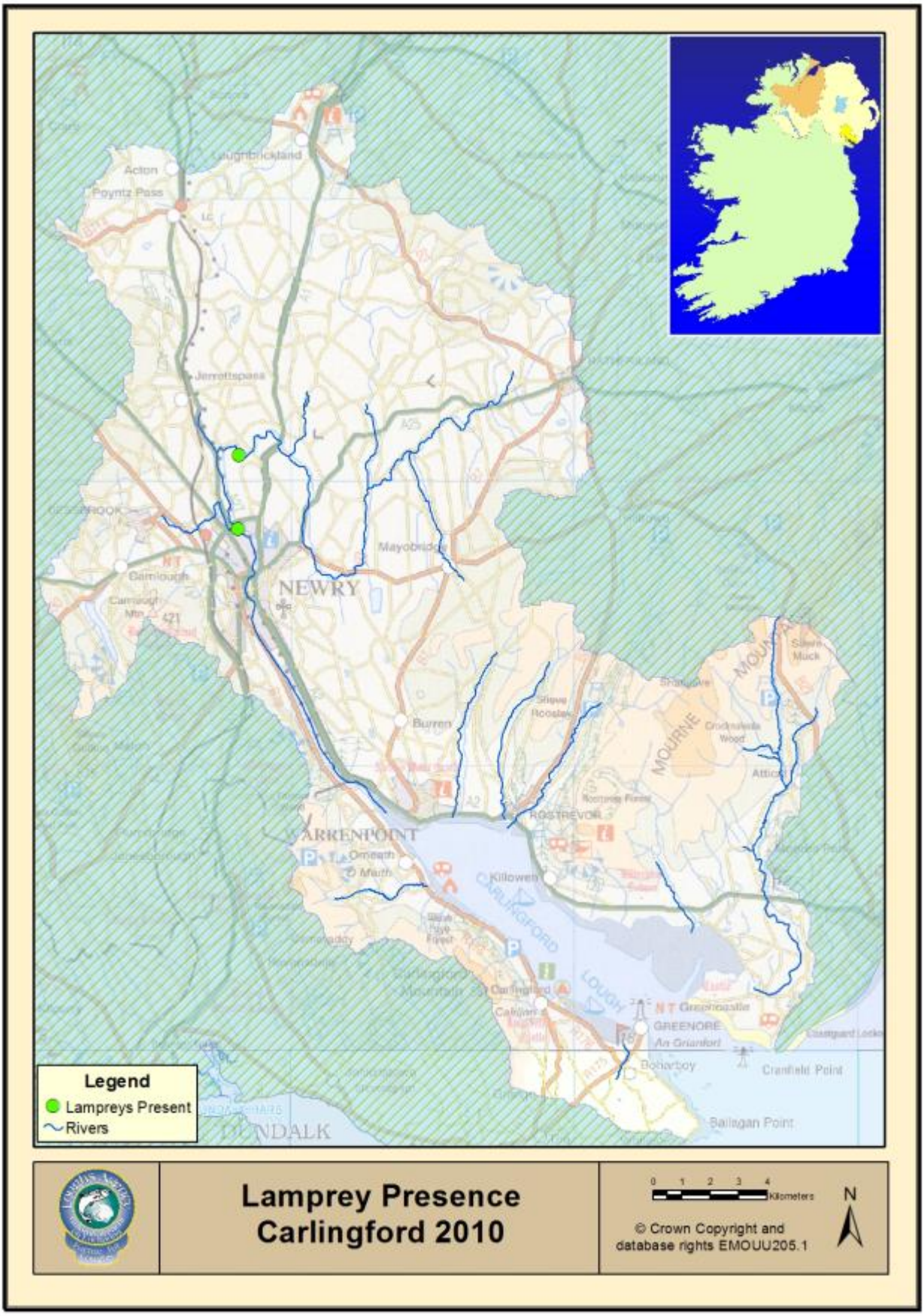

Fig 3.17 Lamprey presence as recorded during semi quantitative electrofishing surveys 2010. *Note technique used is designed specifically for salmonids. Further surveys will be required to accurately monitor lamprey populations.

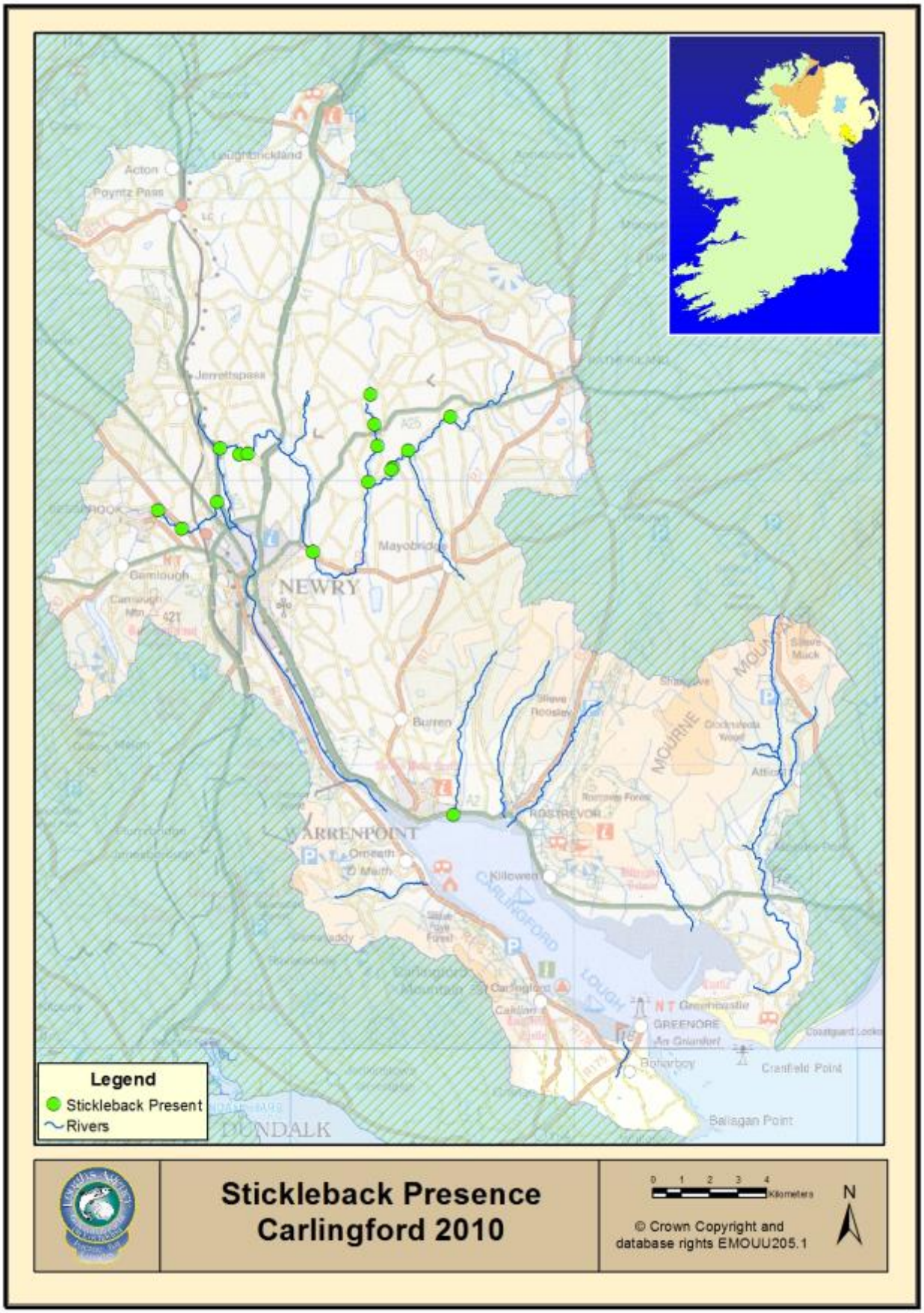

Fig 3.18 Stickleback presence as recorded during semi quantitative electrofishing surveys 2010. *Note technique used is designed specifically for salmonids.

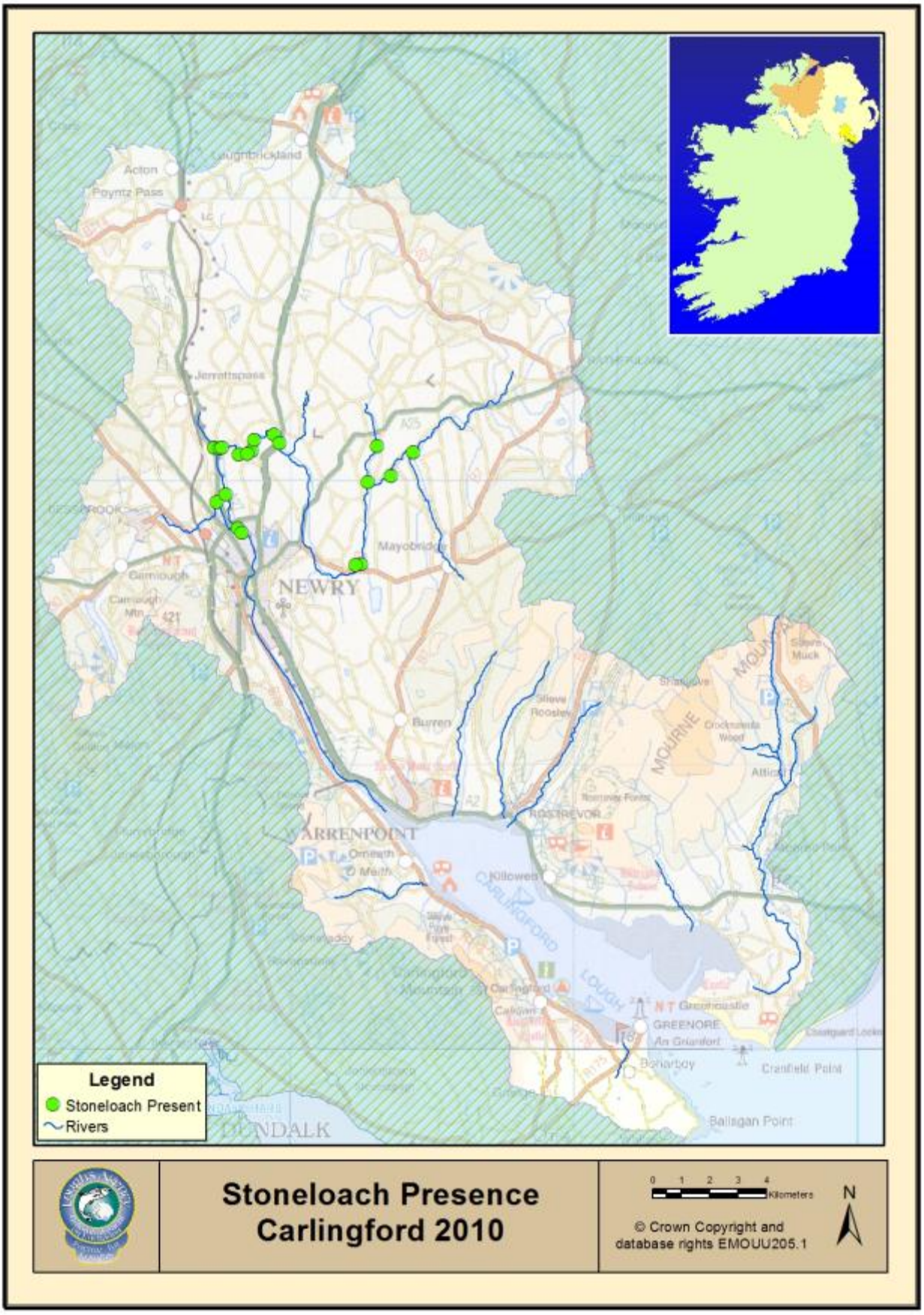

Fig 3.18 Stoneloach presence as recorded during semi quantitative electrofishing surveys 2010. *Note technique used is designed specifically for salmonids.

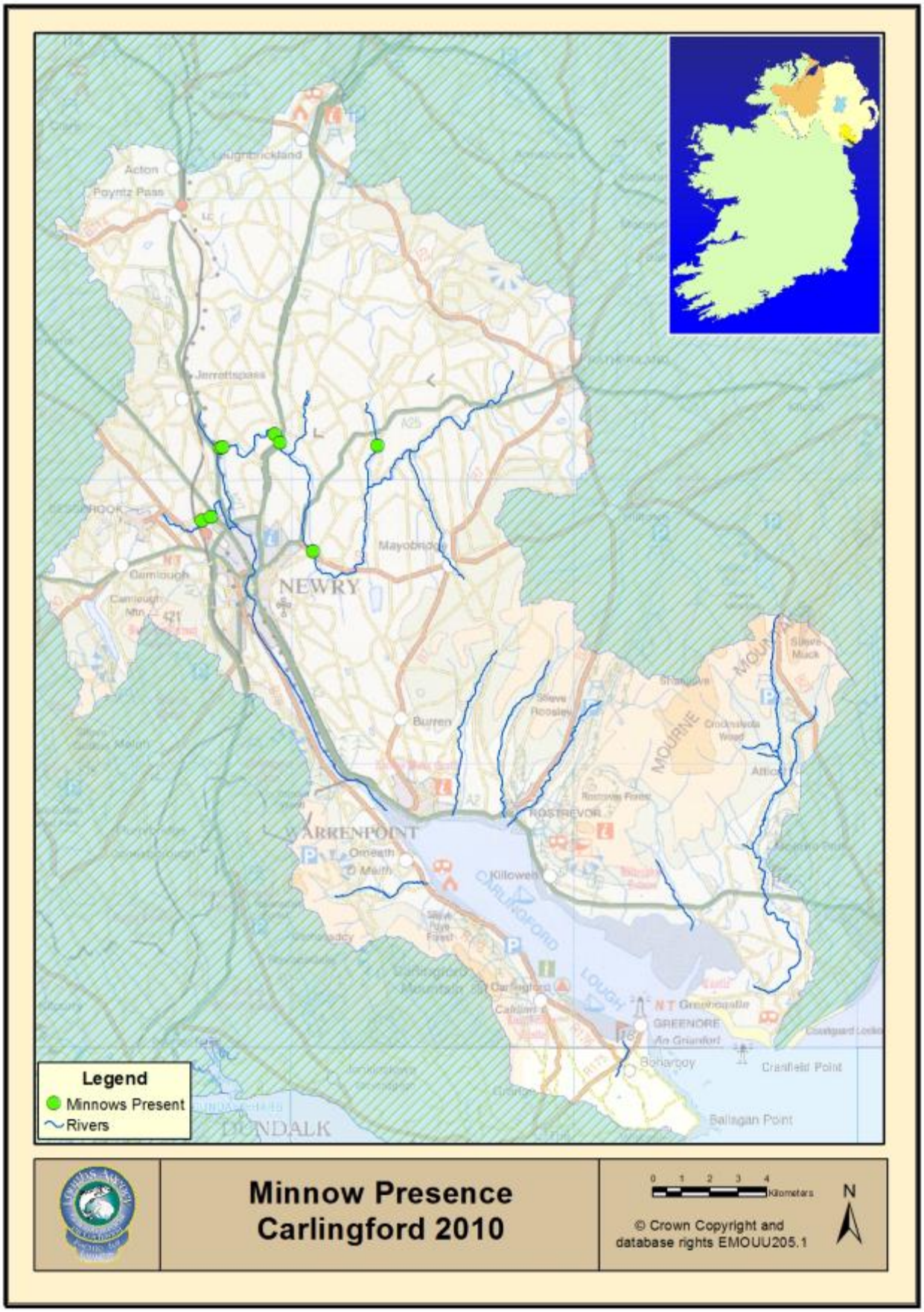

Fig 3.19 Minnow presence as recorded during semi quantitative electrofishing surveys 2010. *Note technique used is designed specifically for salmonids.

4.0 MARINE SURVIVAL

The numbers of salmon that survive to return to the freshwater environment are greatly influenced by conditions in the marine environment. Climate change leading to changes in sea surface temperatures, prey abundance, high seas fishing, marine pollution, sub lethal levels of pollution and predation all have an effect on the Atlantic salmon and indeed other migratory fish species chances of survival.

Marine survival trends are monitored on a number of index rivers in the North East Atlantic where total trapping facilities are available for both migrating juvenile and adult populations. Total trapping allows for an accurate count of all migrant smolts (total freshwater production) and returning adults to be made and therefore an accurate estimate of marine survival. These projects are facilitated by the use of Coded Wire Tags (CWT). Coded wire tags are small (2-3mm long) micro tags that are injected automatically by a CWT device into the snout cartilage of anaesthetised fish remaining there for the duration of the life of the fish. CWT fish also have their adipose fin (small fin between the dorsal fin and caudal fin (tail fin)) removed so that they can be identified in the various fisheries that may intercept them. In Ireland a comprehensive screening programme is conducted at all major landing ports and markets. This programme is important in monitoring the effect of the remaining salmon fisheries on salmon stocks from rivers both within and outside of the island of Ireland.

Trends in marine survival for the River Bush (nearest index river to the Foyle system) confirm patterns observed elsewhere on the southern stocks of North Eastern Atlantic salmon, which indicate that marine survival can be variable between stocks and years. In the River Bush marine survival has decreased considerably over recent years as outlined in Table 4.

Year of Smolt Cohort	Year of Returning 1SW Grilse	Marine Survival %
Pre 1996	Pre 1998	Circa 30%
2002	2003	5.9
2003	2004	4.3
2004	2005	4.6
2005	2006	4.2
2006	2007	13.0
2007	2008	7.5
2008	2009	3.3
2009	2010	4.9

Table 4 Marine survival rates for the River Bush of 1SW grilse (after exploitation at sea) pre 1996 and 2002-2009 smolt cohort. Data supplied by Agri Food and Bioscience Institute, River Bush Salmon Research Station

The figures outlined in table 4 are mirrored by those for other index rivers monitoring the southern stocks of North Eastern Atlantic salmon populations. These figures suggest that salmon are facing increased pressure for survival at sea. A major new international research project called SALSEA - Merge has been developed by scientists from the North Atlantic Salmon Conservation Organisation (NASCO) parties and its research wing the International Atlantic Salmon Research Board (IASRB). There are twenty consortium members in total including the Loughs Agency. SALSEA aims to monitor how Atlantic salmon use the ocean; where they go; how they use ocean currents, and the ocean's food resources, and what factors influence migration and distribution at sea. Research cruises commenced in 2008 and continued in 2009 to collect the necessary data to answer the questions listed above. In 2008 426 post smolts were caught by the two Irish cruises and 363 post smolts caught by the Faroese in the areas highlighted below. In 2009 464 post smolts were captured during the two Irish Research cruises which concentrated on the continental shelf edge to the north west of Ireland and on the North Norwegian sea. Further information and project details can be found at: http://www.nasco.int/sas/salsea.htm

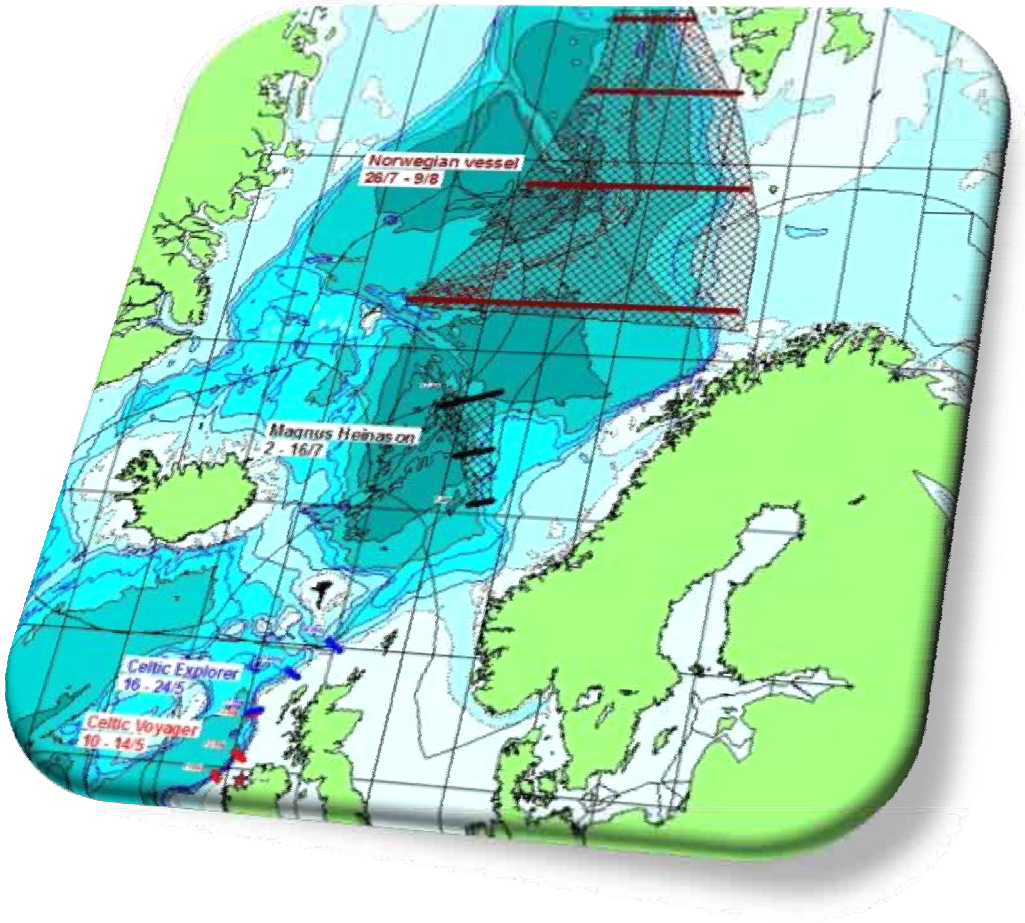

Fig 4 Marine survey areas for salmon in 2008

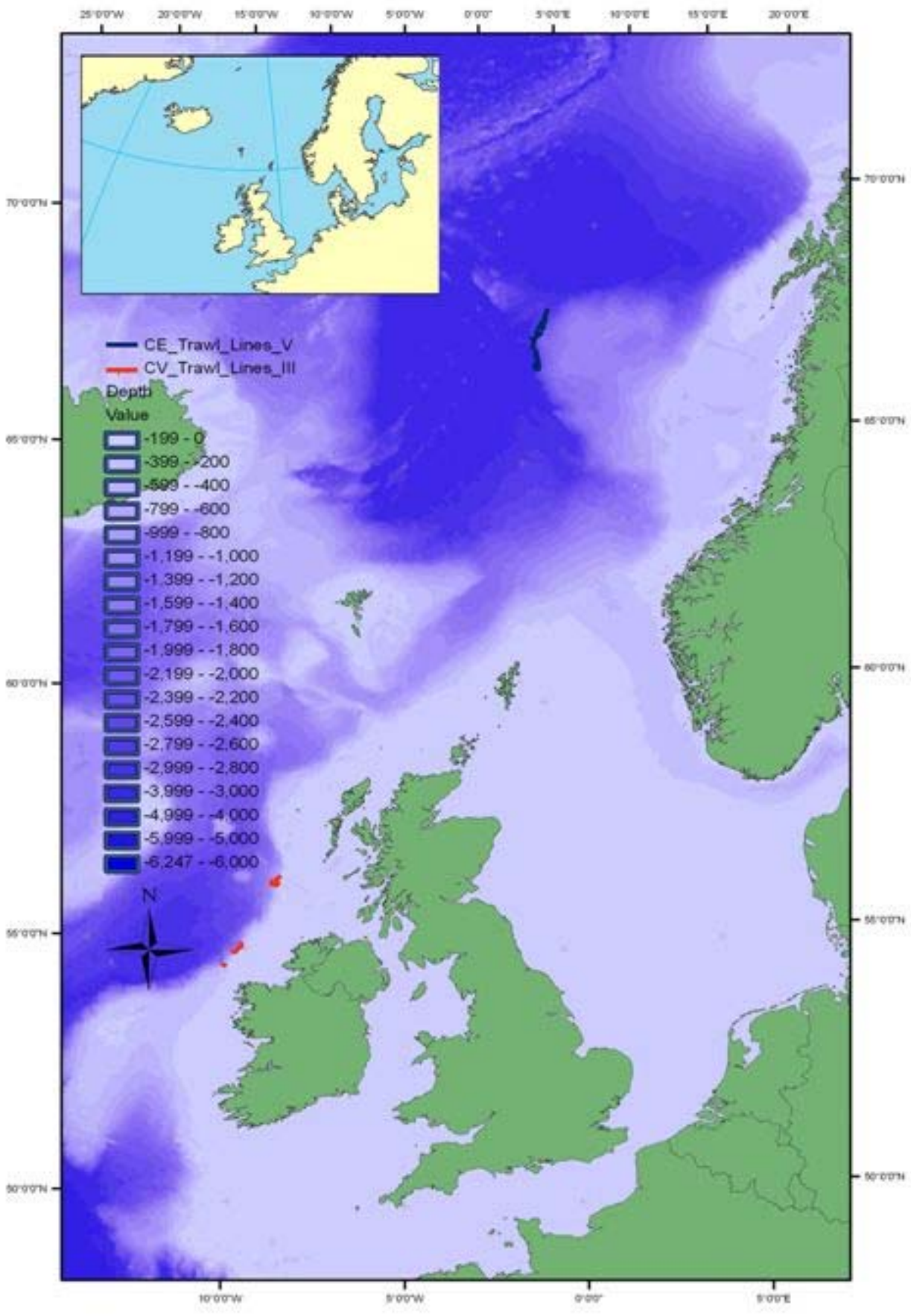

Fig 4.1 Marine survey areas for salmon in 2009

Fig 4a RV Celtic Explorer SALSEA research cruise

Figure 4b Picture from the Irish Research Vessel Celtic Explorer taken during the second SALSEA research cruise 16-24th May 2008

Since 2003 partial smolt trapping including CWT tagging has been conducted in the Faughan catchment using a rotary screw trap, Fig 4c.

Figure 4c Rotary screw trap in position on the River Faughan directly below the fish pass at Campsie barrage.

Smolt trapping can have a number of objectives including the monitoring of both salmonid and non salmonid species. Sampling of the age composition, obtaining information on run timing and recording length/weight data is conducted in tandem with the tagging programme. As mentioned above total counts of migrating smolts can be made on rivers. Where this is unfeasible due to the absence of total trapping facilities, total smolt migration can be estimated by means of a mark-recapture experiment.

In 2004 an estimate of total smolt production for the Faughan catchment was made by a mark-recapture study resulting in a minimum run size estimate of 33,854 migrating salmon smolts. The estimate was a minimum due to a number of high water events that prevented the smolt trap from fishing for a period of time during the peak smolt migration period. Tables 4.1 and 4.12 outline numbers of salmon smolts tagged from 2003-2008 and recapture data for 2003 and 2004.

Year	No of Salmon Smolts Tagged	Average Length (mm)	Average Weight (g)
2003	2113	149	33.45
2004	2500	134	24.6
2005	2210	133	23.6
2006	1025	133	25.36
2007	2062	135	27.1
2008	1865	130	22.1
2009	561	134	24.4

Table 4.1 Numbers and average weight and length of salmon smolts tagged on the River Faughan 2003-2009. Coded Wire Tagging equipment was purchased by the Loughs Agency in 2005 with funding secured from the European Regional Development Fund through the INTERREG IIIA Programme, administered by the Environment and Heritage Service, on behalf of the Department of Environment.

Year Tagged	Year Recaptured	Numbers Recaptured	Recapture Location
2003	2004	12	Greencastle, Burtonport, Malin Head, Belmullet and Torr Head
2004	2005	16	Greencastle, Malin Head, Donegal and Galway Bay
2005	2006	3	Greencastle
2006	2007	2	Greencastle and Ballycastle
2007	2008 2009	2 1	Greencastle Greencastle

Table 4.12 Recapture data from River Faughan CWT programme. No recaptures of fish tagged in 2008 were made in 2009. Data for fish tagged in 2009 and recovered in 2010 will not be available until 2011. It should also be noted that no commercial fishery has operated in the Foyle area since 2009. Screening of the commercial fishery produced the majority of tag recoveries in the Foyle area.

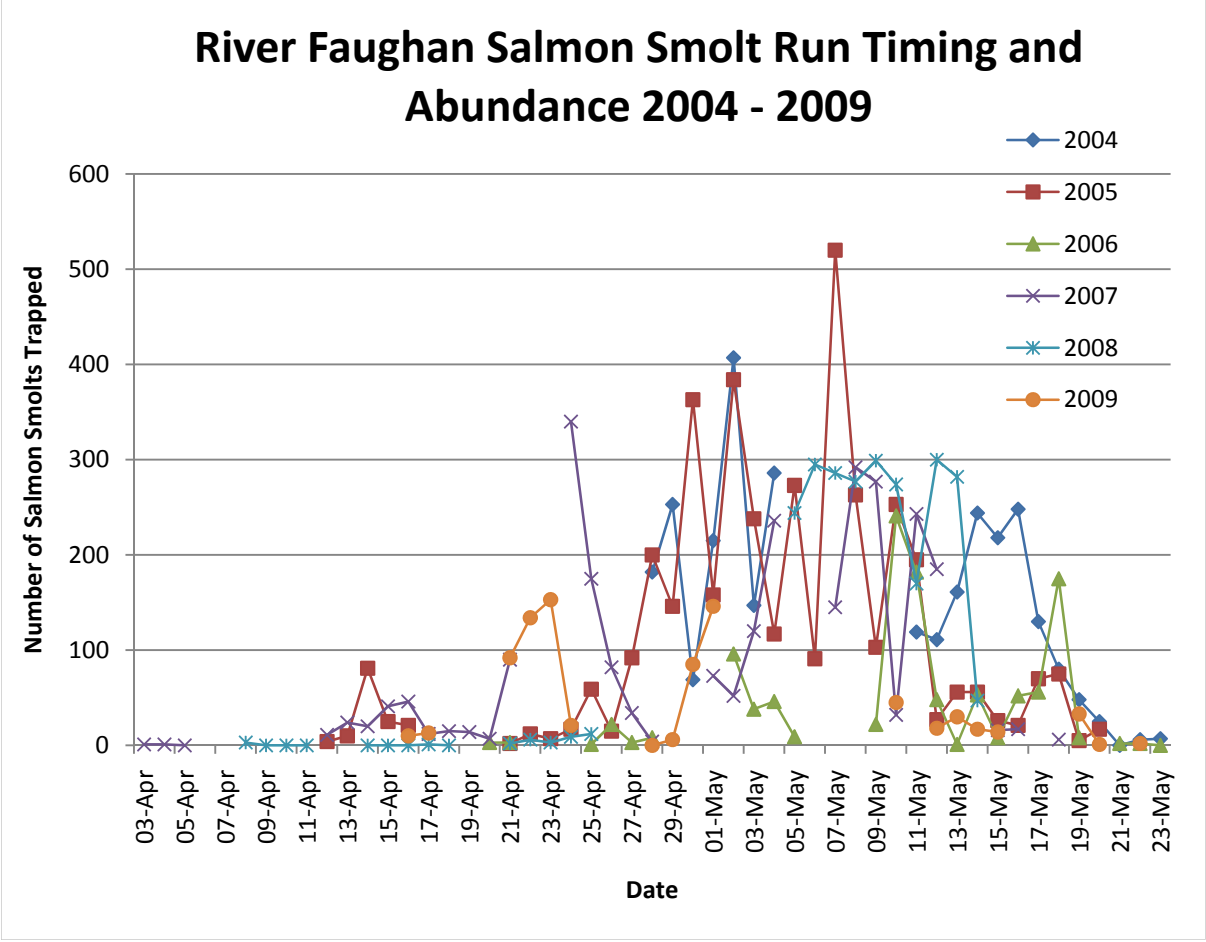

Figure 4d Salmon smolt run timing and abundance from rotary screw trap sub sample, River Faughan 2004-2009. Breaks in data are due to closure of trap during high water conditions.

In 2004 a detailed examination was carried out on the age class of migrating salmon smolts in the Faughan catchment, Table 4.13.

Age at Smolting	%
1	13
2	83
3	4

Table 4.13 Age class of salmon smolts migrating from the Faughan catchment in 2004

Fig 4.14. From top to bottom, Atlantic salmon smolts from the Faughan Catchment, brook lamprey, river lamprey and sea lamprey also caught in the River Faughan smolt trap

5.0 ADULT ABUNDANCE

Adult Atlantic salmon abundance is assessed in three ways: directly by using commercial netting/recreational rod catches and fish counters and indirectly by reference to conservation limits/spawning targets.

Using catch data as a measure of population status is a well established and extensively used technique. In the Foyle system annual commercial and recreational catch data has been recorded since the establishment of the Foyle Fisheries Commission in 1952, with some data available before this period. The relationship between catch and stock is complex and care should be applied in interpretation. A more precise measure of catch incorporates fishing effort (number of licences issued or the amount of time fished) and is referred to as catch per unit effort (CPUE).

5.1 Recreational Fisheries

One problem encountered when analysing catch data is unreported catch. All recreational fishers are required by law to make catch returns. This information facilitates management decision making and therefore it is vitally important that all catch returns are accurate and made promptly at the seasons end.

Year	Declared Rod Catch Salmon	Declared Rod Catch Sea Trout	Returns as a % of Licences Issued
1999	1022	679	3.74
2000	723	417	2.55
2001	3188	450	17.68
2002	5117	1010	27.93
2003	1844	361	15.5
2004	2285	75	13.99
2005	4084	413	25.77
2006	3476	469	37
2007	4929	379	22.11
2008	4060	815	54.94
2009	2923	*550	43.88
2010	4234	329	55.75

Table 5.1 Declared rod catch returns for salmon and trout in the Foyle and Carlingford areas. Note figures include the Clanrye and Whitewater in the Carlingford area from 2001 onwards. Carcass tagging was introduced in 2001. *Denotes all trout.

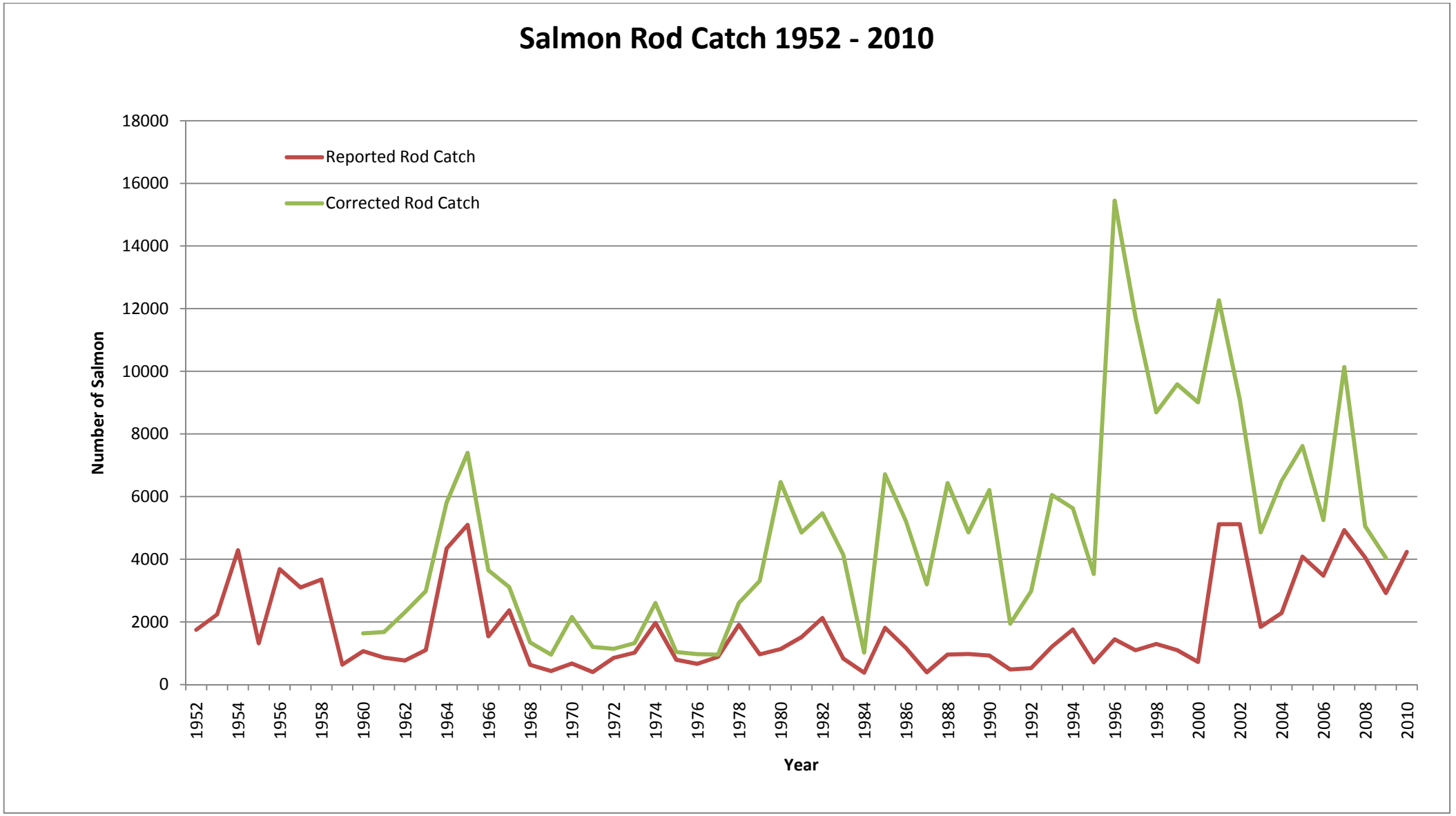

Figure 5.1 Declared salmon rod catch

Year	Declared Catch Carlingford System (Salmon)	Declared Catch Carlingford System (Trout)
2003	0	0
2004	17	3
2005	0	33
2006	3	8
2007	44	46
2008	62	45
2009	29	84
2010	29	26

Table 5.1 Declared catch from the Carlingford system for salmon and trout 2001-2010

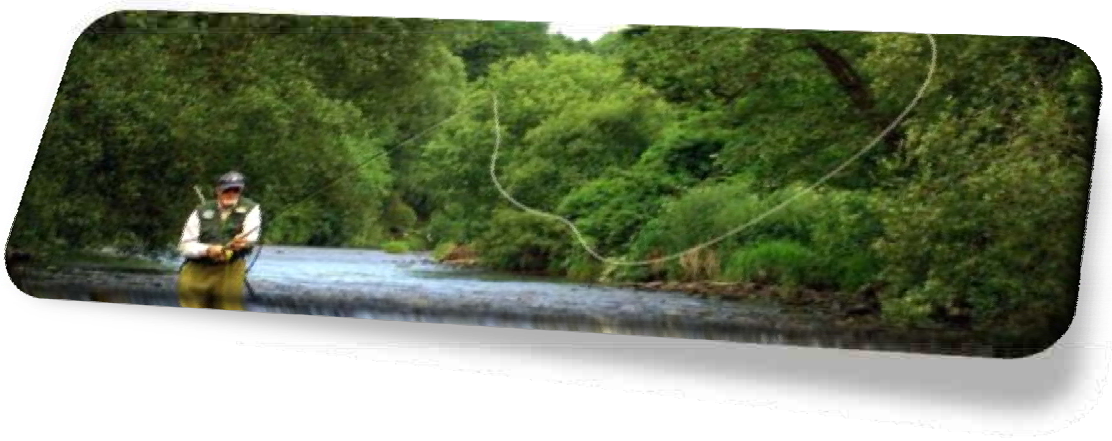

Fig 5.11 Angler on the upper reaches of the Faughan River

5.2 Commercial Fisheries

Commercial fisheries have traditionally operated within the Foyle sea area, Lough Foyle and tidal River Foyle. The drift net and draft net fisheries as well as the rod fisheries have been closely regulated with a real time management regime in place to monitor the numbers of fish migrating up key rivers. If predetermined numbers of fish have not been counted by the strategically placed electronic fish counters at Sion Mills weir (River Mourne), Campsie Barrage (River Faughan) and the Plumb Hole (River Roe) then specified closures of the commercial and/or recreational fisheries are enforced.

In 2007 new regulations were introduced to reduce the number of commercial nets operating within the Foyle area and all mixed stock interceptory drift nets seaward of Lough Foyle were curtailed. This decision was made to comply with the EU Habitats Directive, similar curtailment of mixed stock fisheries were introduced in the Republic of Ireland. Within the Foyle area this was achieved through a voluntary hardship scheme. 18 out of 112 drift nets remain in Lough Foyle, those remaining have been reduced in size from 900m to 500m and 10 out of 50 draft nets remain. This

represents a significant reduction of netting effort. Regulations were also introduced to limit the numbers of fish which could be retained by the recreational rod fishery throughout the Foyle and Carlingford areas. In 2010 The Foyle Area (Control of Fishing) Regulations 2010 were introduced which prescribes conditions for the suspension of the remaining commercial fisheries and the enforcement of catch and release on the recreational fisheries if pre determined numbers of fish are not recorded at key fish counting sites and attainment of prescribed management targets are not met against listed criteria.

Year	Drift Catch	Draft Catch	Total Drift and Draft
1998	31296	11141	42437
1999	15397	7893	23290
2000	22333	10339	32672
2001	13500	9476	22976
2002	28851	11917	40768
2003	15741	16991	32732
2004	12800	9490	22290
2005	13391	12143	25534
2006	6145	6031	12176
***2007**	2598	2774	5372
2008	1248	2916	4164
2009	611	1326	1937

Table 5.2 Declared catch from the commercial salmon fisheries 1998-2009. Note 100% rate of catch returns. * Reduced numbers of commercial nets operating in the Foyle area from 2007. No commercial Atlantic salmon fisheries have been pursued in the Foyle area since 2009 as a result of the enforcement of The Foyle Area (Control of Fishing) Regulations 2010, this does not prevent the reinstatement of commercial fisheries if prescribed conditions are met in the future.

Fig 5.21 Commercial Fishing. Draft netting on the tidal River Foyle and drift netting in Lough Foyle

5.3 Counters

Within the Foyle system a number of river catchments have electronic fish counting facilities that provide estimates on the run timing and abundance of fish >45cm. A Logie resistivity fish counter has been installed on the Newry River within the Carlingford system (figure 5.3), this facility has been operational since September 2007. The new counting facilities will provide valuable information on the run timing and abundance of fish in the Newry/Clanrye River and will facilitate future fisheries management decision making. Counts for the Newry River catchment within the Carlingford area are outlined in table 5.3 and figure 5.31.

Fig 5.3 Fish Pass and counter construction on the Newry River.

Year	Number of fish >45cm
*2007	*32
2008	268
2009	223
2010	536

Table 5.3 Newry/Clanrye River fish counter figures. *Note the Newry/Clanrye fish counter was installed in September 2007. The figures reported are indicative and for the initial output from the commissioning phase of the counter installation.

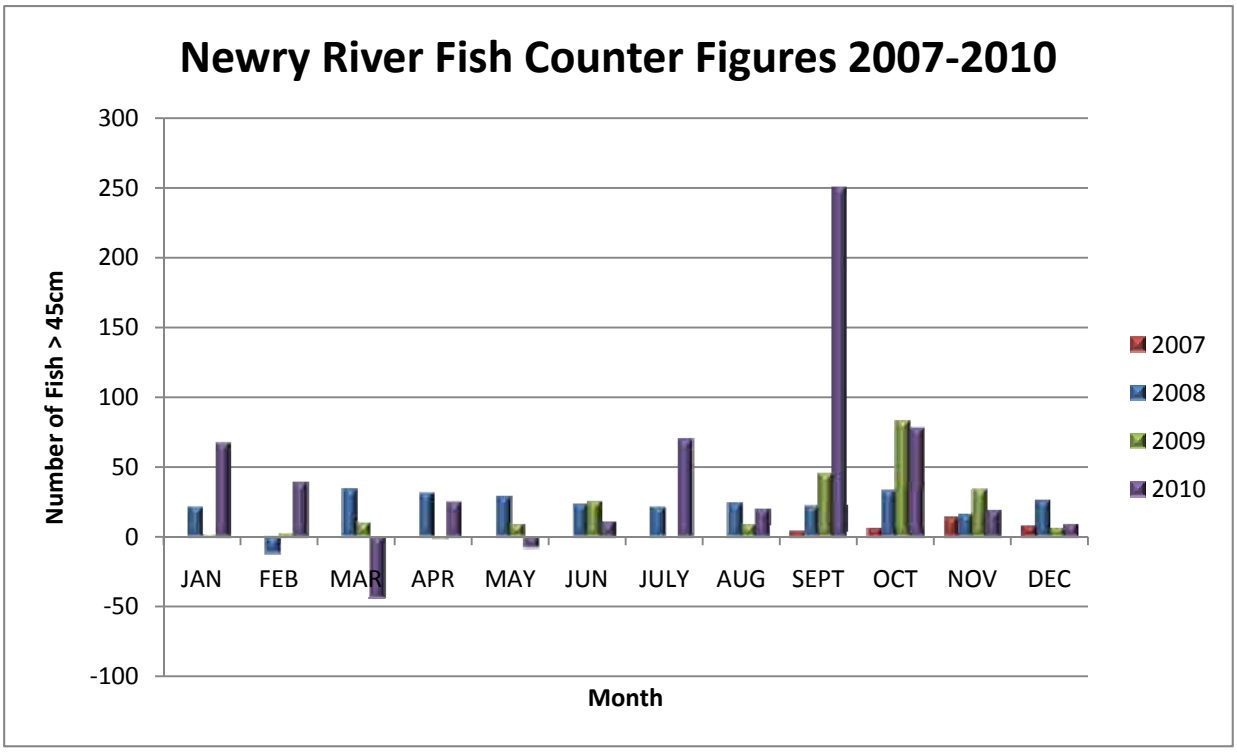

Fig 5.31 Monthly fish counts on the Newry River Sep 2007-2010

5.2 Conservation Limits/Spawning targets

Another way to assess adult salmon stock status is to monitor run sizes on rivers and to compare them with predefined reference points called conservation limits. Conservation limits define a level of spawning that optimises the sustainable catch by commercial and recreational fisheries. If exploitation rates increase above the sustainable catch levels the catch may increase in the short-term but the stock will eventually reduce. Conservation limits demarcate the undesirable spawning stock level at which recruitment would begin to decline significantly (NASCO). The real time management regime incorporating the setting of management targets and spawning targets implemented in the Foyle aims to manage the fisheries and

spawning populations in a sustainable manner. The management and spawning targets are set for the various river catchments based on the amount and quality of nursery habitat present. River habitat surveys are carried out along each stretch of river and graded according to the type and quality. Egg deposition levels are set according to the quality grading of each section of nursery habitat.

There are four grades of nursery habitat, however for the purpose of setting egg deposition levels only grades 1-3 are utilised. Grade 1 denotes the best quality habitat. The egg deposition rate/carrying capacity is set as follows. Grade 1 = 10 eggs per m^2, grade 2 = 5 eggs per m^2 and grade 3 2.5 eggs per m^2. The total number of eggs is calculated by multiplying the area of each grade of nursery habitat by the appropriate density of eggs per m^2. 25% is deducted from the management target allowing for loss of salmon by angling (15%) and poaching and predation (10%). The remaining figure is referred to as the conservation limit/spawning target.

Once the number of eggs required for each river has been established this can be converted to a total number of fish required to achieve the management targets and conservation limit/spawning targets. The average fecundity (number of eggs produced per female) of Foyle salmon has been estimated at 2500 and the ratio of female to male salmon estimated at 60:40. When combined with the amount of nursery habitat of the various grades this equates to the conservation limit/spawning target.

In the Carlingford area targets can be set and monitored once adequate information has been collated from both fish counting facilities and recreational catch returns from the salmon fisheries. Where necessary catchments which do not meet their targets may have fishery conservation measures imposed and or fish stock rebuilding programmes instigated.

6.0 COARSE FISH STOCKS

Coarse fish species differ significantly from most salmonid species in that their lifecycle is completed solely in freshwater. Coarse species also utilise differing habitat types than salmonid species preferring slower moving deeper water. Newry canal and Camlough are good examples of coarse fish habitat within the Carlingford area. The coarse fish species present within the Carlingford area are not native to the island of Ireland but have been introduced over the last few hundred years as a source of food, for sport and by escaping from fish farms. Irelands natural water courses are defined primarily as salmonid waters however artificial water bodies such as canals and reservoirs provide ideal habitat for a variety of coarse fish species. These artificial or heavily modified water bodies facilitated the colonisation by coarse fish species providing suitable habitat for spawning, nursery areas for juveniles and appropriate conditions and feeding opportunities for adult populations.

The Loughs Agency aims to provide sustainable social, economic and environmental benefits through the conservation, protection and development of the coarse fisheries of the Foyle and Carlingford areas by promoting the sustainable exploitation of the resource to achieve maximum benefit to local communities.

In 2008 the Loughs Agency in collaboration with the Agri Food and Bioscience Institute (AFBI) conducted a survey of Derryleckagh Lough which discharges into the Clanrye River. The aims of the survey were to chart the bathymetry/depth of the lough and to identify the fish species present.

Derryleckagh Lough is a 30 hectare eutrophic lake situated in County Down, Northern Ireland. It has a maximum depth of 9.0m and an average depth of 2.0m, with much of the southern end of the lake being <2m deep. The lake contains pike and eels, and one small perch specimen was captured in this survey.

At the time of the survey, water temperatures did not differ greatly among depths with a difference of <2°C between the surface and 7m. All depth strata within the lake had sufficient dissolved oxygen to support fish, ranging from 97.9% at the surface to 73.9% at 7m (Figure DL 1). Total Phosphorous recorded at the time of the survey was 59µgl^{-1}, classifying the lake as eutrophic.

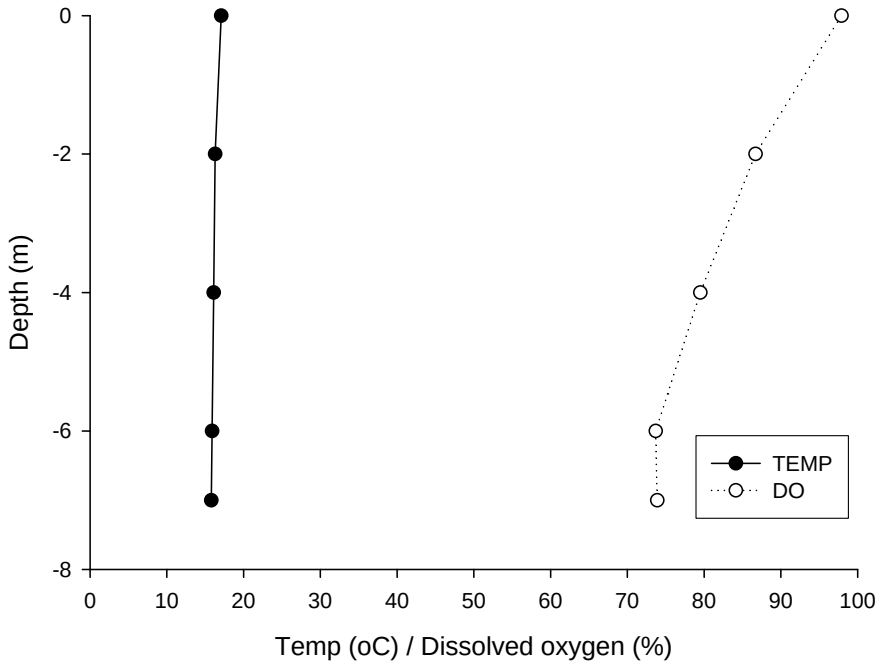

Figure DL 1. Temperature/DO profile in Derryleckagh Lough

This brief report provides a summary of the fish survey on Derryleckagh Lough, undertaken from 28-29th August 2008, including species, number, length frequency, age and locations of fish captured.

***Lake*:** Derryleckagh Lough

***Irish Grid Reference*:** J128 256

***Survey date*:** 28-29.08.08

***Weather*:** Cloudy, dry, light SSE wind

***Air temperature*:** 18°C

***Surface water temperature*:** 17.1°C

***Bank type*:** Stones, reeds, grass, overhanging trees

***Net types (number)*:**

Lundgrens Norden, 30m, 12 panel multimesh monofilament gill nets (8)

Lundgrens, 30m, 75mm fixed mesh monofilament gill net (1)

Lundgrens, 30m, 60mm fixed mesh monofilament gill net (1)

50cm x 10m fyke nets, chains of 3 (3)

Results and Discussion

A total of only 12 fish were captured during this survey; 8 pike, 3 eels and 1 perch. Net locations and the number of fish caught in each net are summarised in Figure 2 and Table DL 1 below. Although few fish were captured overall, it might have been expected to capture more pike in the shallower nets than the deeper set nets. This proved not to be the case however, with most of the pike being captured in nets >3m deep. Pike ranged in size from 16 to 42cm (Figure 3) and age from 0+ to 2+ years. One eel was captured in each of the three fyke nets, ranging in size from 41 to 55cm (Figure 4). Only one small perch was captured, 5.7cm in length. With small perch being a shoaling fish, this is very surprising. The possibility exists that the fish was captured in a previously surveyed lake and was already present in the gillnet before it was set, however this is unlikely as it would be easily seen whilst setting. It could be, however, without the presence of perch as a prey species, that the lake contains a population of mainly cannibalistic pike with a small number of large individuals preying on, and to an extent ‘controlling’, the number of smaller pike in the population. Such large pike would not likely be captured using the monofilament gillnets adopted for this survey.

A concurrent hydro-acoustic survey conducted at night-time showed very few fish tracks in general, and none in the open water pelagic zone. This would support the idea of a lake containing only pike (and eels), as shoals of perch generally disperse at night-time and are easily detected using horizontal hydro-acoustics if present.

Further surveys would be required to ascertain the presence/absence or size of any perch population within the lake; however evidence from this survey certainly suggests that if a population does exist it is likely to be very small.

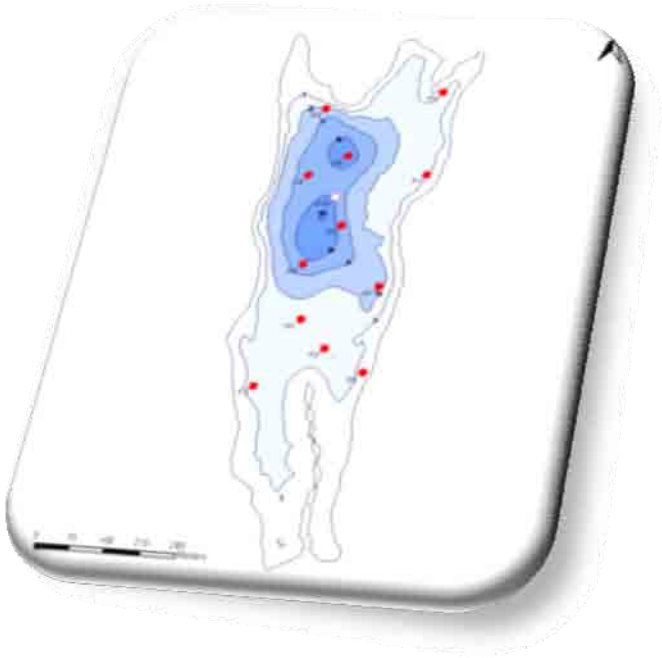

Figure DL 2. Location of benthic gillnets (red circles), floating gillnet (white circle) and fyke nets (red squares) in Derryleckagh Lough

Net (type)	Mesh size (mm)	Depth	Perch	Eels	Pike	Total
G1 (Norden 12 panel gill)	5 - 55	0-3m	1			1
G2 (Norden 12 panel gill)	5 - 55	0-3m			1	1
G3 (75mm fixed mesh gill)	75	0-3m				
G4 (60mm fixed mesh gill)	60	3-6m				
G5 (Norden 12 panel gill)	5 - 55	6-12m			2	2
G6 (Norden 12 panel gill)	5 - 55	6-12m				
G7 (Norden 12 panel gill)	5 - 55	3-6m			4	4
G8 (Norden 12 panel gill)	5 - 55	3-6m				
G9 (Norden 12 panel gill)	5 - 55	3-6m			1	1
G10 (Norden 12 panel gill)	5 - 55	Floating				
F1 (fyke)		0-3m		1		1
F2 (fyke)		0-3m		1		1
F3 (fyke)		0-3m		1		1
			1	3	8	**12**

Table DL 1. Number of fish caught in each net in Derryleckagh Lough

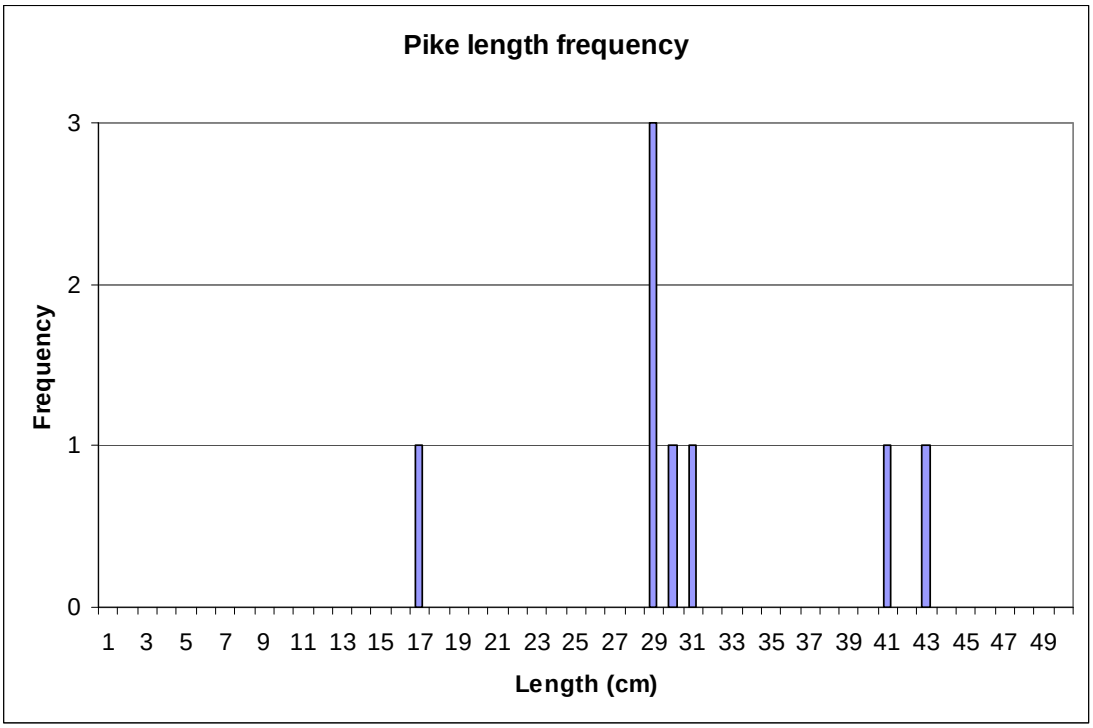

Figure DL 3. Length frequency of pike in Derryleckagh Lough

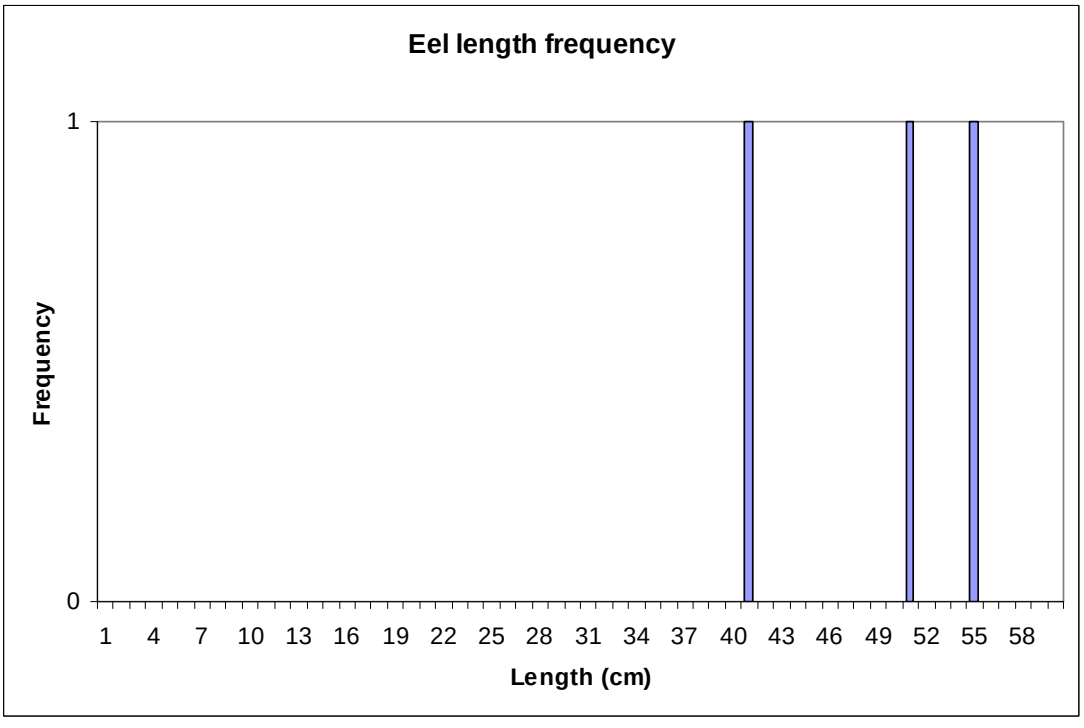

Figure DL 4. Length frequency of eels in Derryleckagh Lough

Figure DL 5. Derryleckagh Lough survey 2008

In 2007 a resurvey of the coarse fish populations of the Newry Canal was conducted by the Loughs Agency in collaboration with the Agri Food and Biosciences Institute and the Central Fisheries Board. The 2007 survey consisted of both netting and horizontal hydro-acoustic techniques during day time and night time hours. The hydro-acoustic method results in fewer gill nets being set and records data passively. The full report on the Newry Canal Fish Stock Assessment can be downloaded from the Loughs Agency website www.loughs-agency.org . The canal was surveyed from the Albert Basin to Victoria Lock. Table 6 outlines summary results from the 2007 survey.

Species	Number Caught	Length Range (cm)
Roach	144	8-26
Bream	1	21
Roach x Bream	16	8-30
Pike	5	44-75
Perch	36	9.7-27
Tench	4	26

Table 6 Fish survey results from Newry canal 2007. Eel and Flounder were also recorded.

Fig 6 Newry Canal fish stock assessment 2007

In 2001 and 2002 the Loughs Agency in collaboration with the Central Fisheries Board conducted baseline surveys of the fish species present within Newry canal between the town of Newry and Victoria Lock. This was designed to assess the population status of the fish stocks. Gill and fyke nets were used to capture fish with a proportion of all fish being measured, weighed and scaled for subsequent age analysis. Tables 6.1 and 6.2

Species	Number Caught	Length Range (cm)	Weight Range (kg)
Pike	118	13-96	0.03-7.5
Roach	207	12.5-25	0.1-0.3
Bream	26	15-38	0.05-0.9
Roach x Bream	9	26-29	Average 0.95
Tench	2	34 & 37.5	0.9 & 0.95
Eels	>250	N/A	>0.5-1.4
Brown Trout	1	23.5	0.2

Table 6.1 Fish survey results from Newry canal 2001

Species	Number Caught	Length Range (cm)	Weight Range (kg)
Roach	437	5-27	Up to 0.43
Bream	36	20-46	Up to 1.8
Roach x Bream	58	26-35	0.35-0.85
Pike	40	35-73	Up to 3.45

Table 6.2 Fish survey results from Newry canal 2002. Perch, Brown trout and Eels were also caught in 2002

Fig 6.1 Left to right Perch, Pike and Bream

7.0 HABITAT MONITORING

The Loughs Agency has carried out extensive habitat surveys on all the major rivers and tributaries within the Foyle and Carlingford catchments. Habitat surveys are carried out on foot. Although time consuming this is at present the best method for classifying the various grades of habitat. Habitat is classified into one of three life cycle units Fig 6, the presence and order of which is essential to the productive capacity of a salmonid river. Other non salmonid species also benefit from diverse in-channel habitat. The life cycle unit categories include spawning, nursery and holding habitat. Each category is then graded on a scale of 1-4, 1 representing the best quality attainable and 4 the worst. Other data collected during these surveys include channel width and impassable barriers to migratory fish species.

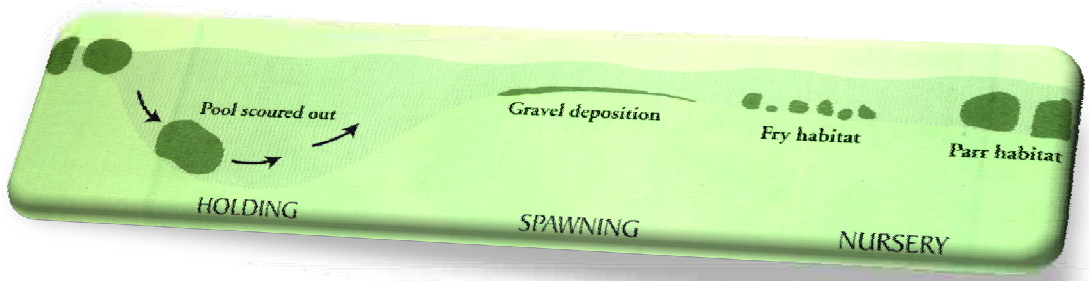

Fig 7 Life cycle unit depicting the type of habitat found in spawning, nursery and holding zones

Fig 7.1 Examples of spawning, nursery and holding habitat

8.0 LAND USE

Land use classification is an important tool when assessing the potential impacts within a particular river catchment or indeed when looking at specific land use and land management practices. Land use impacts could have either a positive or negative impact on rivers and tributaries. A good understanding of the land use within a catchment is therefore imperative in managing at a catchment scale.

Land use in Northern Ireland has been captured using satellite imaging technology and classified to type. The following figures outline the broad land use classification within the Carlingford Area.

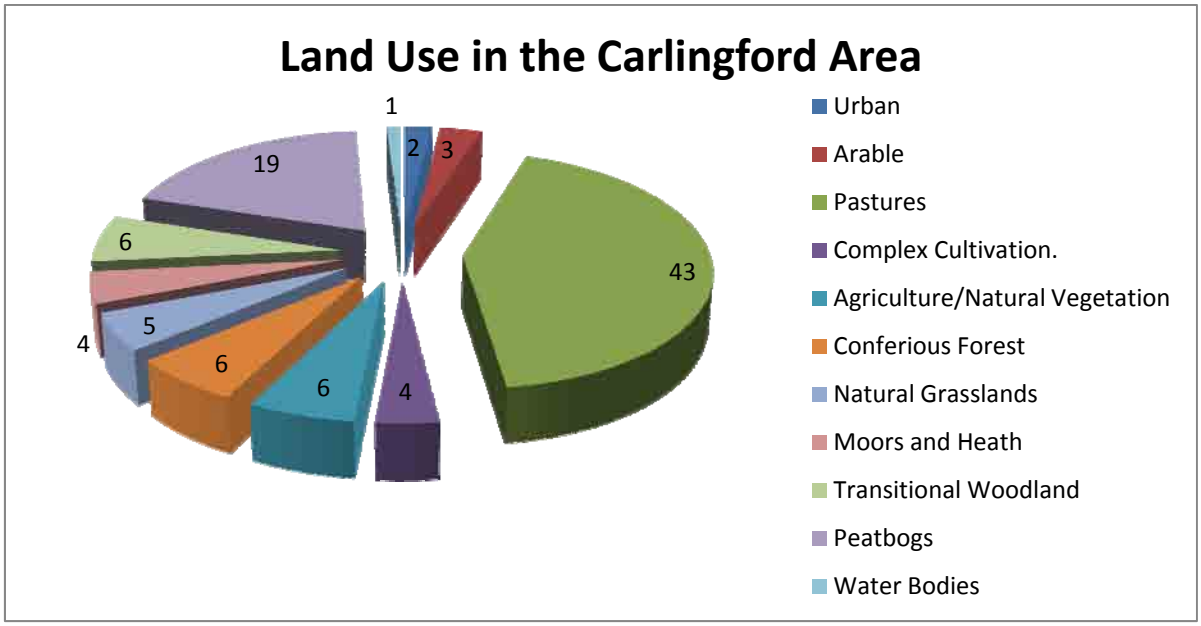

Fig 8 Carlingford Area land use classification

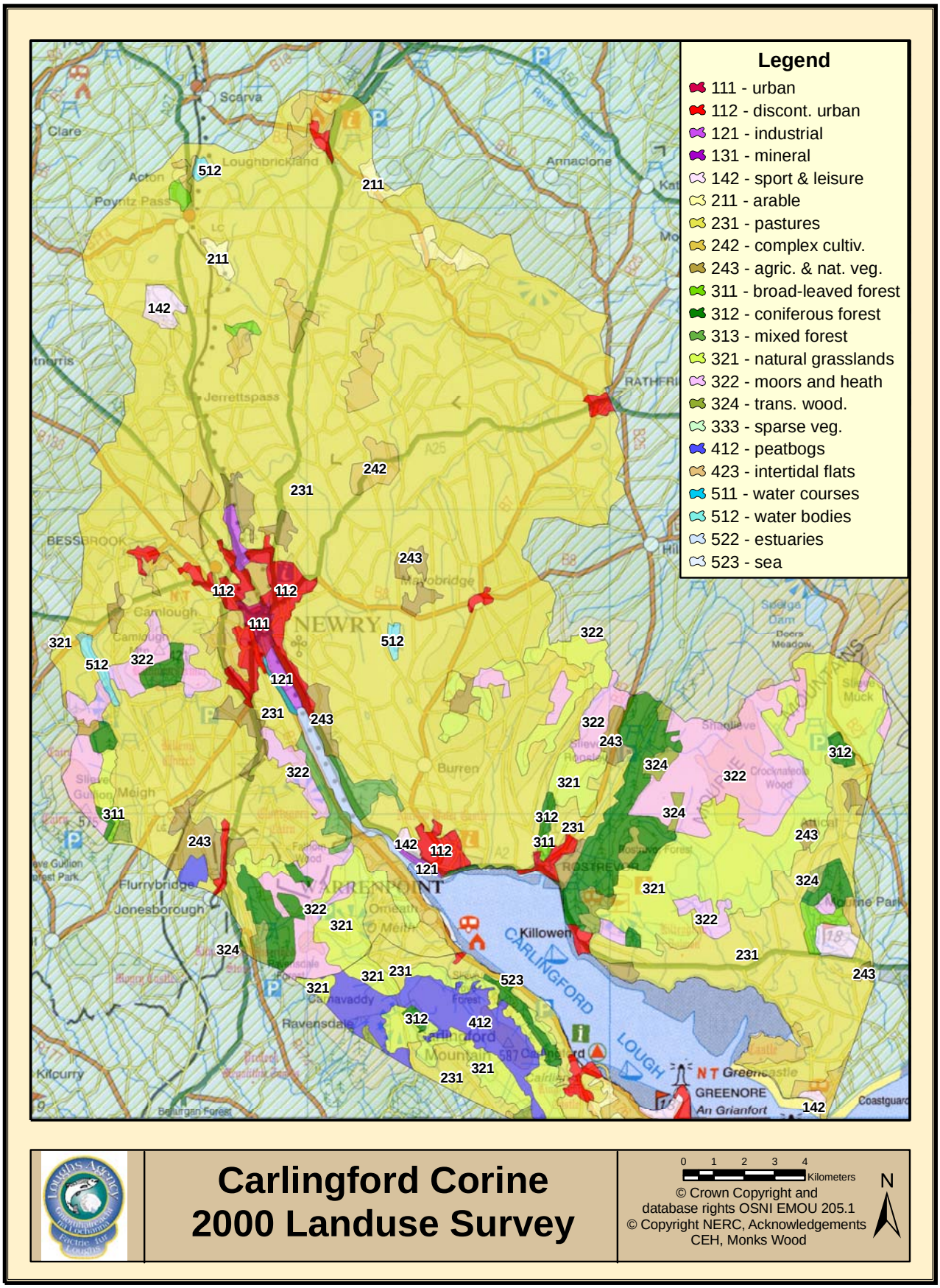

Fig 8.1 Carlingford Area land use classification map

4.0 9.0 WATER QUALITY

The Northern Ireland Environment Agency (NIEA) in Northern Ireland and the Environmental Protection Agency in the Republic of Ireland are the designated competent authorities for implementation of the Water Framework Directive (WFD).

The WFD is a pan European directive designed to ensure that all waters reach good ecological status by 2015. Extensive monitoring is conducted on all water bodies to facilitate this aim.

In addition to the routine river monitoring carried out by the NIEA and the County Councils for WFD monitoring the Loughs Agency conducts proactive and reactive pollution investigations to investigate or highlight problems or potential problems which may have an effect on the aquatic environment and ultimately on the fish species and aquatic habitats.

In 2007 the Loughs Agency instigated a programme of monitoring at the tributary level for assessments of chemical and biological water quality. Tributaries within the Carlingford area are monitored for chemical water quality parameters including Biological Oxygen Demand (BOD), Suspended Solids, Ammonia and Phosphorous. Biological water quality was assessed using the Biological Monitoring Working Party (BMWP) a biotic scoring index.

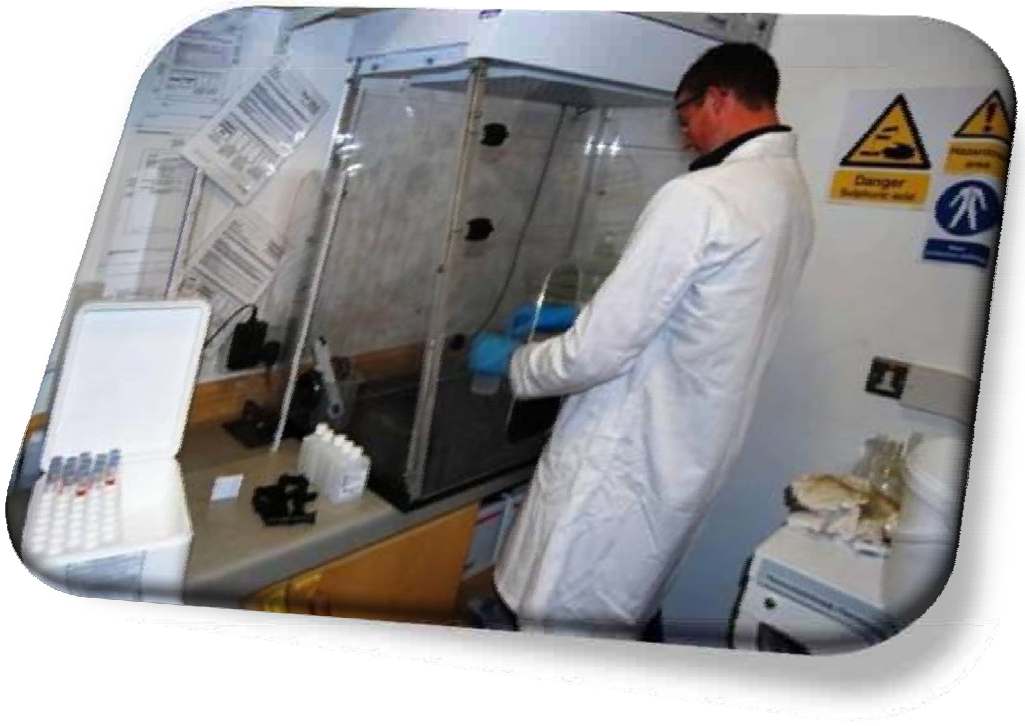

Fig 9.0 Loughs Agency chemical water quality testing in the laboratory

The Loughs Agency also maintains a mobile pollution response unit containing aerating equipment and absorbent and non absorbent booms for oil and chemical spills. The unit can be rapidly deployed to the site of a pollution incident.

Water Quality Parameters

The following water quality parameters are monitored through the Loughs Agency monitoring programme and determined from water samples in the laboratory:

- Biochemical Oxygen Demand (BOD)
- Ammonia
- Phosphorus
- Suspended Solids

BOD

Any organic matter discharged into a river provides an immediate source of food for bacteria. These bacteria will break down the organic matter eventually into simple compounds such as carbon dioxide and water. Biochemical Oxygen Demand or Biological Oxygen Demand (BOD) is a chemical procedure for determining how fast biological organisms use up oxygen in a body of water. It is considered as an indication of the quality of a watercourse

Ammonia (NH_3)

Ammonia is generally found in small amounts in rivers and streams. This is due to microbiological activity and the resultant reduction of compounds containing nitrogen. High levels of ammonia can occur as a result from sewage pollution and have detrimental impacts on fish species.

Phosphorus (PO_4)

The over-loading of nutrients such as phosphorus in watercourses often leads to a process known as eutrophication. Eutrophication is a major environmental issue in Irish rivers and lakes. Sources of phosphorus include agricultural fertilizers and household detergents.

Suspended Solids

Particulate matter may be organic or inorganic in nature. Organic solids may consist of algal growths, indicative of eutrophic conditions. Inorganic solids generally are the result of discharge washings from sand and gravel extraction activities or quarries. Suspended solids can affect plant growth and fish habitats.

The following parameters are also recorded at each sample station by means of an electronic measuring probe:

- pH
- Temperature
- Dissolved Oxygen
- Conductivity

pH

This is a measure of the hydrogen ion concentration of a solution and therefore an indication of whether a liquid is acid or alkaline. The pH scale ranges from 0 (very acid) to 14 (very alkaline), with results generally influenced by geological conditions. Fish can be susceptible to changes in pH. Low pH levels are generally found in catchments with high forestry operation impacts.

Temperature

The effect of changes in temperature on living organisms, such as fish, can be critical. Thermal discharges from urban and industrial sources can lead to temperature increases in watercourses and increased stress on aquatic habitats and associated species.

Dissolved Oxygen

Sufficient levels of oxygen saturation in fresh waters are generally an indication of good ecological status and ideal for fish life. The main point to remember about oxygen solubility is that it has an inverse relationship with temperature. This helps explain why DO levels are generally lowest during summer low flow conditions, increasing the risk of pollution from discharges at this time.

Conductivity

The conductivity or electrical conductivity of a watercourse is a measure of its ability to conduct an electric current. Electrical conductivity estimates the amount of total dissolved salts, or the total amount of dissolved ions in the water. Electrical Conductivity is controlled by geology and any variations may be sourced to increased ions from wastewater from sewage treatment plants or urban run-off from roads.

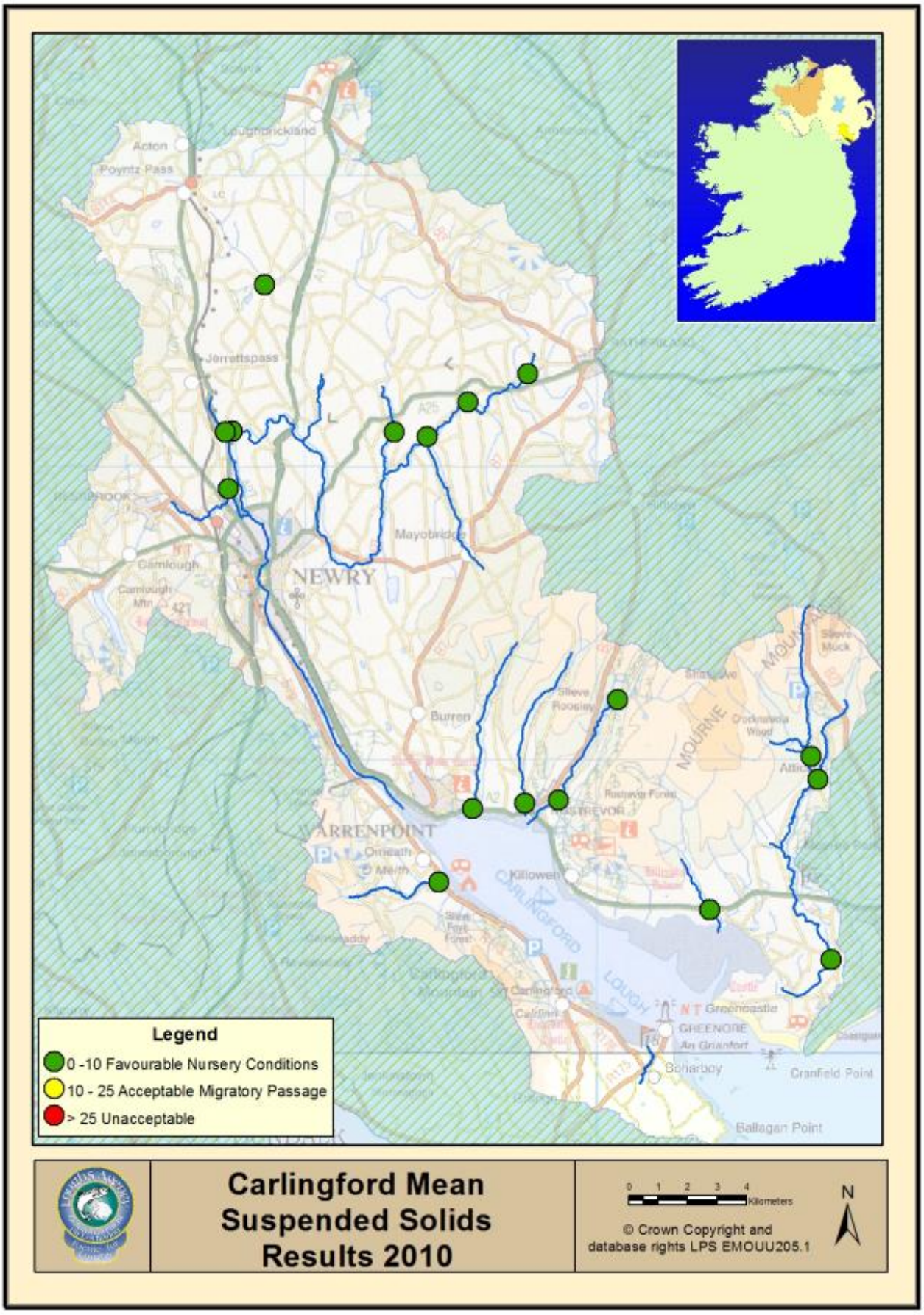

Fig 9.1 Carlingford area average suspended solids results 2010. Values are in mg/l

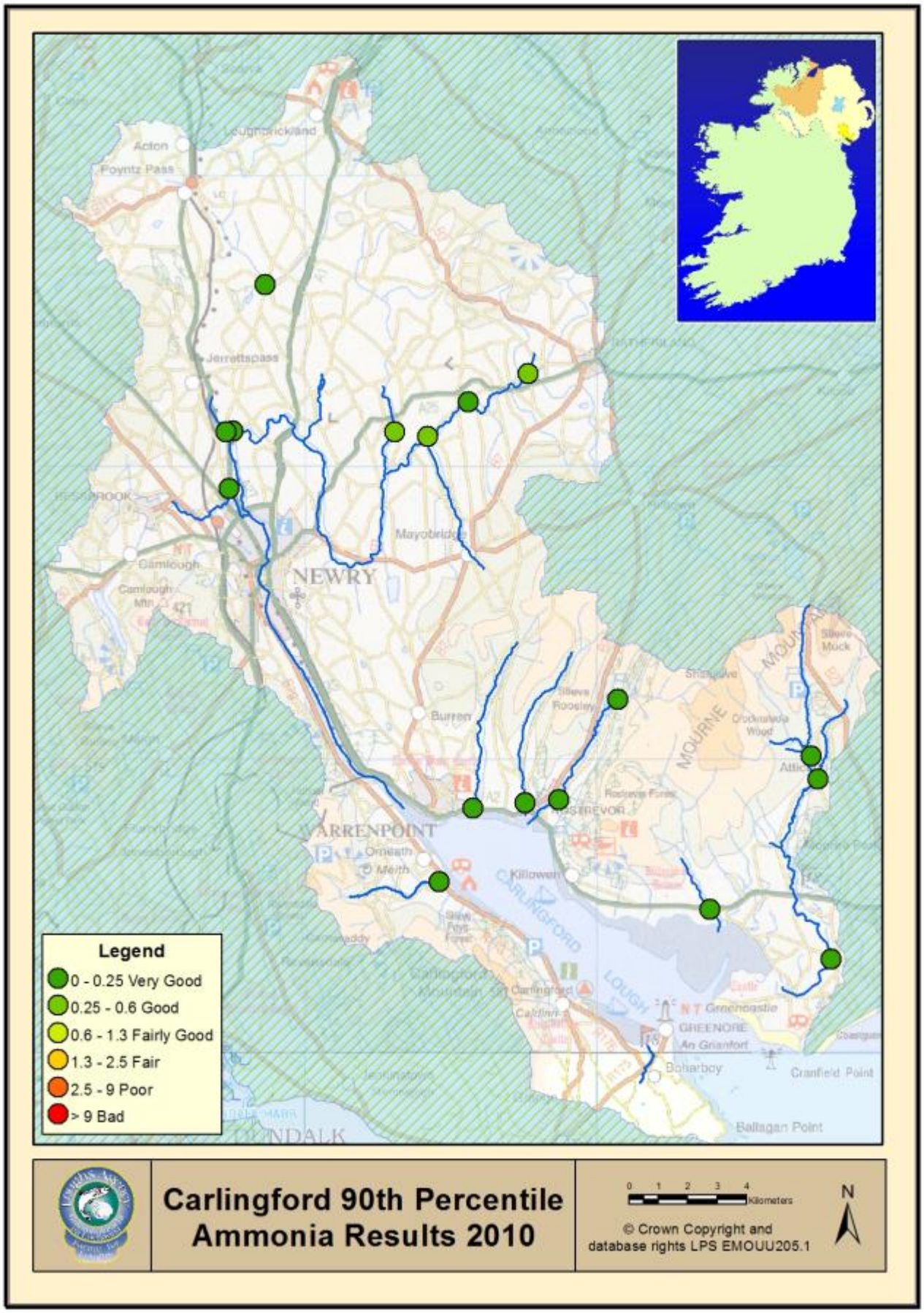

Fig 9.2 Carlingford area Ammonia results 2010. Values are in mg/l

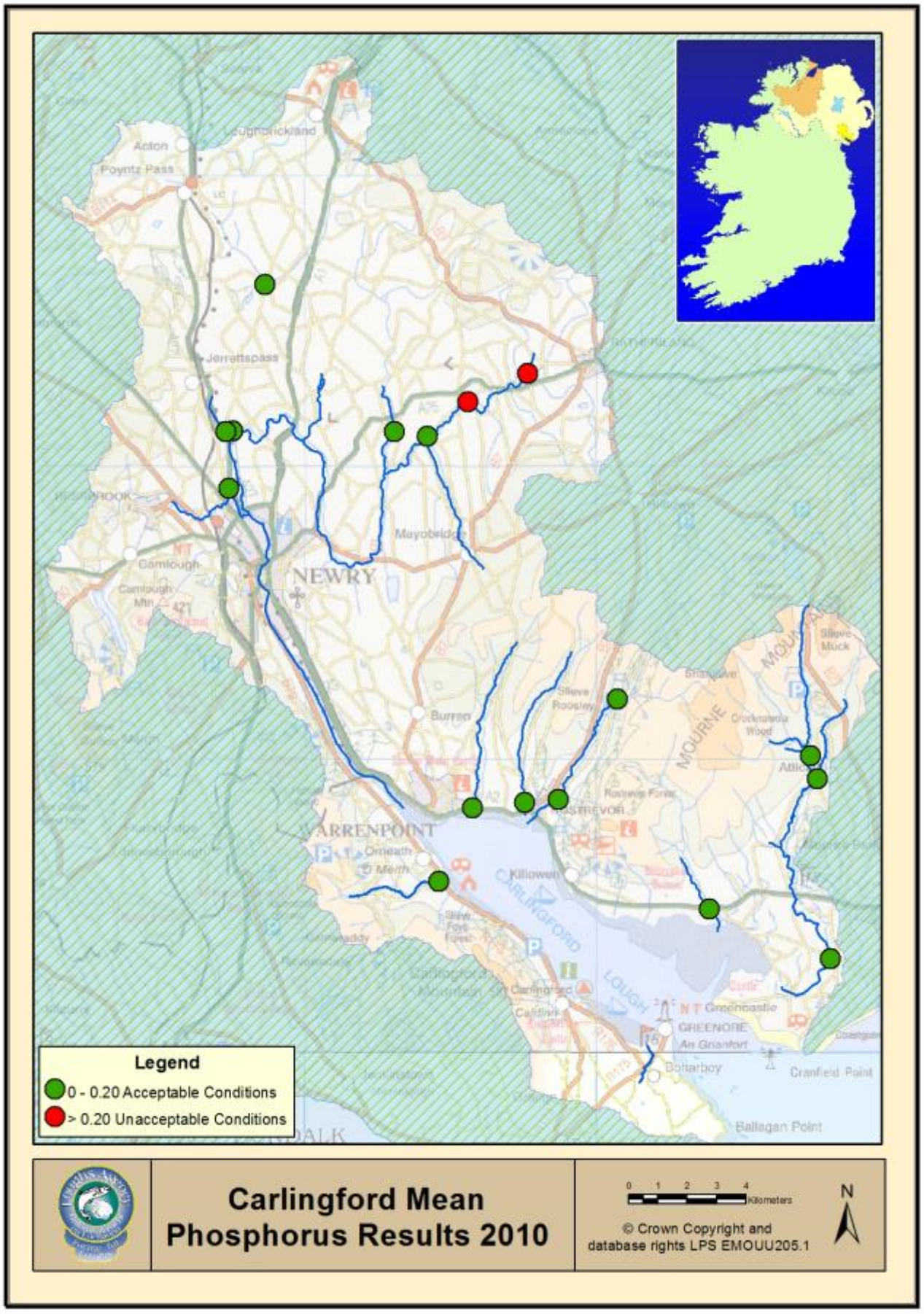

Fig 9.3 Carlingford area phosphorous results 2010. Values are in mg/l

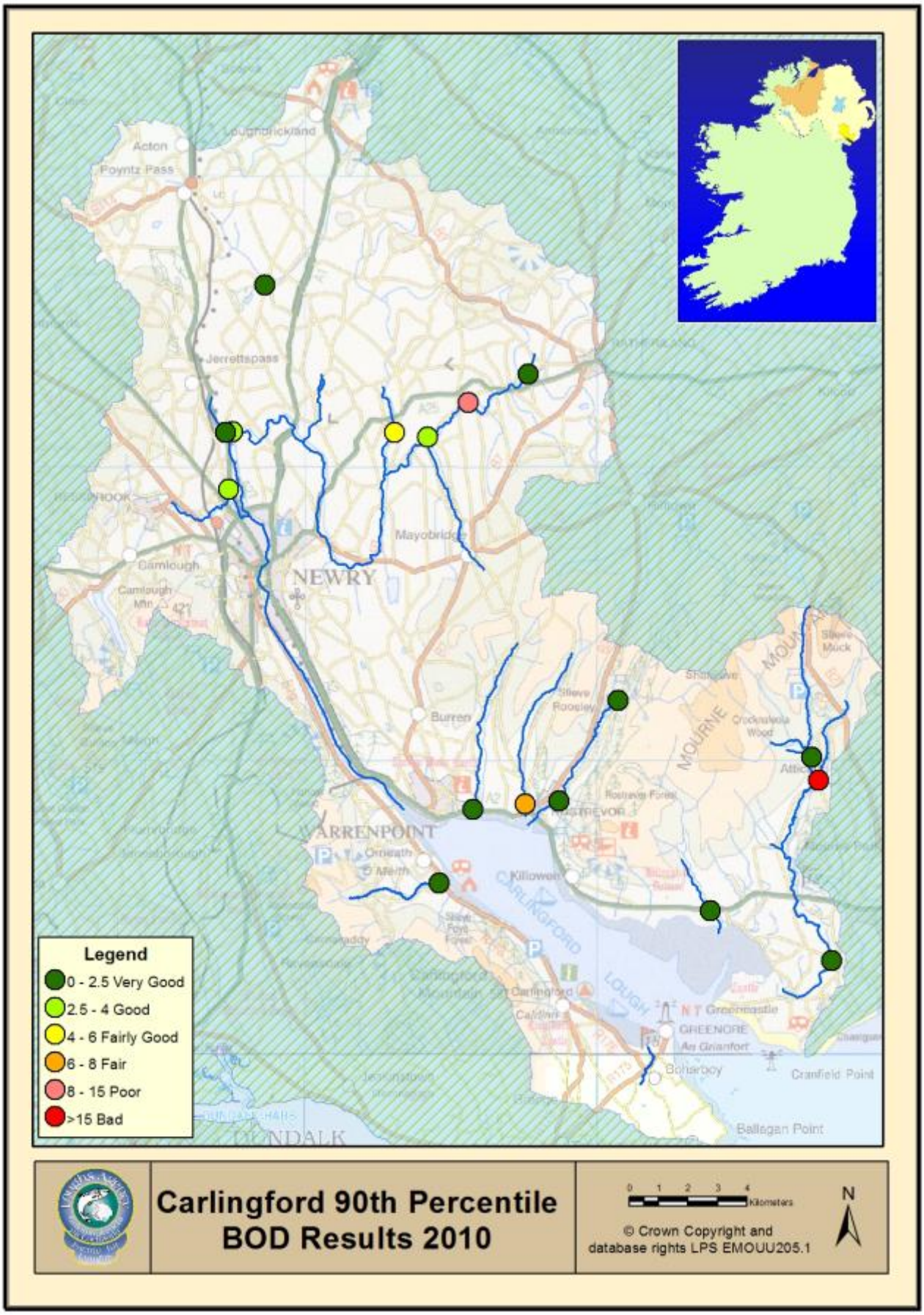

Fig 9.4 Carlingford area Biological Oxygen Demand (BOD) results 2010. Values are in mg/l

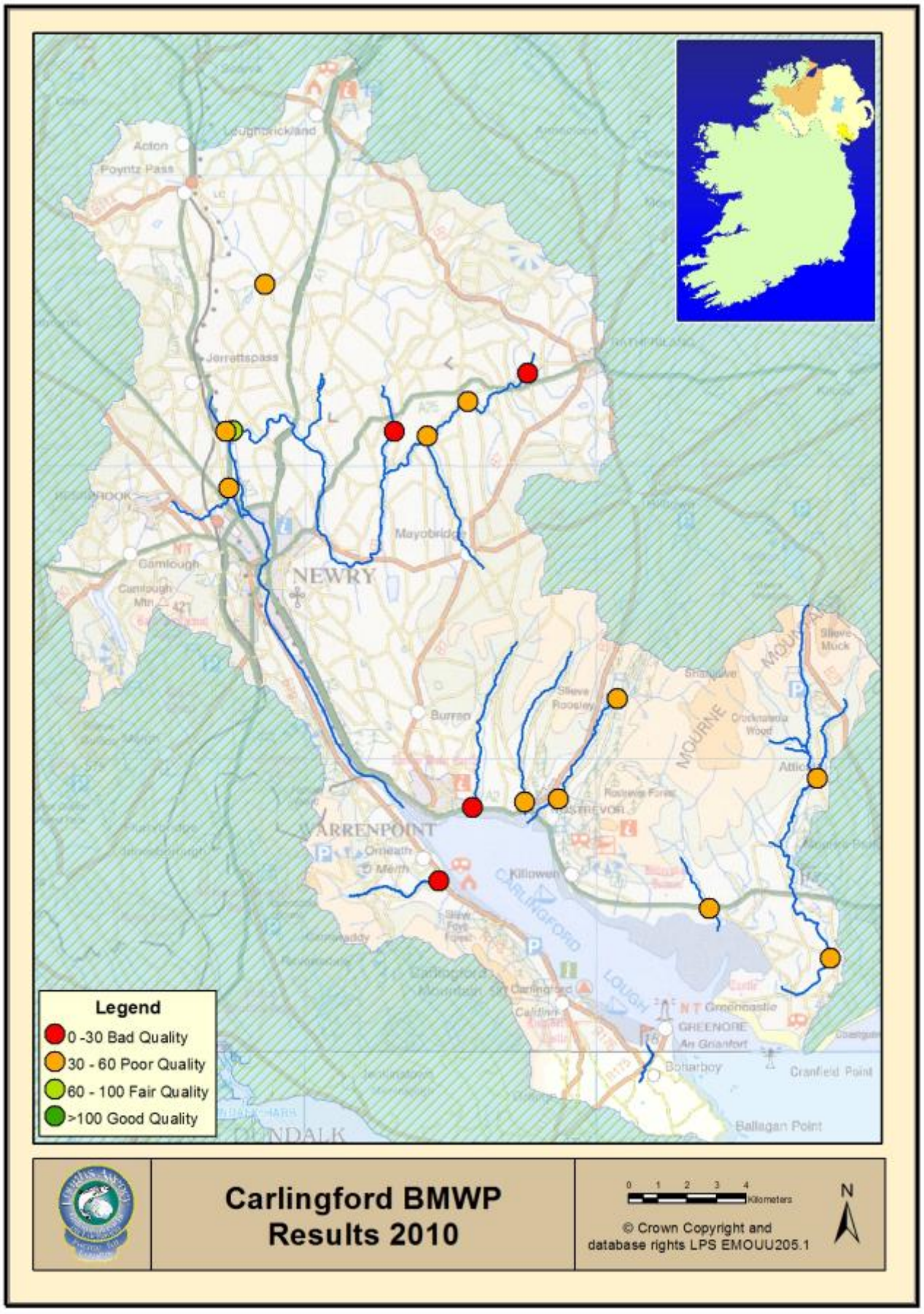

Fig 9.5 Carlingford area Biological Monitoring Working Party results 2010

Prior to 2008 NIEA employed the General Quality Assessment (GQA) system to classify and monitor the chemical and biological water quality of the rivers of Northern Ireland. With the implementation of the Water Framework Directive a new approach to freshwater classification has been adopted following the United Kingdom Technical Advisory Group (UKTAG) guidelines developed for WFD implementation.

An overall classification status for a water body is obtained by the amalgamation of biological, chemical and physical elements. Fig. 9.06 details how these elements combine to create ecological and chemical statuses which are then combined to create the overall surface water status.

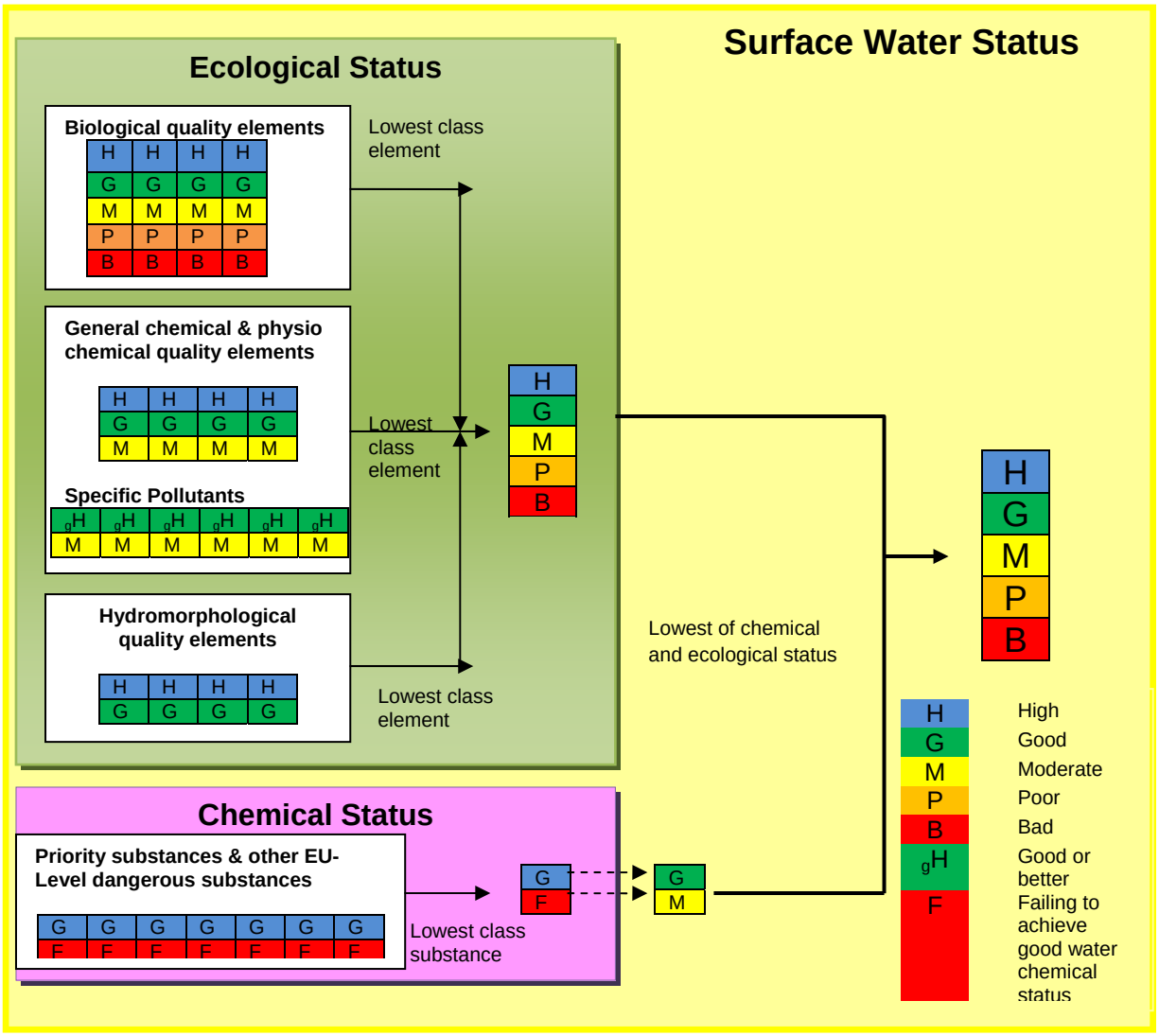

Fig. 9.06: How the different water quality element results are combined to classify ecological status, chemical status and the overall surface water status: Adapted from the 'Recommendations on Surface Water Classifications Schemes for the purposes of the Water Framework Directive' UKTAG 2006.

The ecological status is determined primarily by the lowest class of the biological component. The general and physiochemical element can lower the status to moderate only. If both these elements are classified as high the hydromorphological element can only lower the overall ecological status to good. Whilst the ecological

status has five classes (High, Good, Moderate, Poor and Bad), the chemical status has two (High and Moderate). The lowest status of the two determines the overall surface water status. This is termed the 'one out – all out' principle.

Ecological Status: Classification of Quality Elements

The various elements monitored for ecological classification are listed in table 1.

Biological	General/Physiochemical	Hydromorphological
1. Macroinvertebrates 2. Macrophytes 3. Phytobenthos 4. Fish	1. Dissolved Oxygen (% Saturated) 2. Soluble Reactive Phosphorus (SRP) 3. pH 4. Specific Pollutants (includes ammonia)	1. Quantity & dynamics of water flow 2. Connection to groundwater 3. River continuity 4. River depth & width variation 5. Structure & substrate of the river bed. 6. Structure of the riparian zone

Table 9.07. Quality elements which are monitored for the ecological status.

Biological Quality Elements

Macro-invertebrates

Different species of macro invertebrates are more sensitive to specific forms of pollution and therefore environmental quality ratios (EQRs) based on biological results may be used to assess water quality. Macro invertebrates are also the dominant prey of both salmonid and some non salmonid fish species. The measure of diversity of a macro invertebrate community can be a more reliable indicator of the pollution pressures within a catchment than relying solely on an assessment of chemical water quality. The impacts of pollution on a macro invertebrate community are longer lasting and can highlight intermittent pollution impacts that may be missed through chemical water quality monitoring.

RIVPACS had been previously used to classify the biological quality of a site in terms of Macroinvertebrates. This has since been updated to meet WFD requirements and is called the **R**ivers **I**nvertebrate **C**lassification **T**ool (RICT). RICT utilises the same principle of a biotic scoring system to produce the EQRs on which the classes are based:

$$\text{EQR Taxa} = \frac{\text{BMWP Observed number of Taxa}}{\text{BMWP Predicted number of Taxa (As derived from RICT)}}$$

$$\text{EQR ASPT} = \frac{\text{BMWP Observed ASPT (Average Score Per Taxon)}}{\text{BMWP Predicted ASPT (As derived from RICT}}$$

Class	ASPT EQR	NTAXA EQR
High	0.97	0.85
Good	0.86	0.71
Moderate	0.75	0.57
Poor	0.63	0.47

Table 9.08. Environmental Quality Ratio classifications for ASPT and NTaxa.

Macrophytes

Macrophytes (aquatic vegetation) have been included in the classification as a measure of the effects of nutrient enrichment. The tool employed is Leafpacs which assesses species composition, diversity and abundance.

Diatoms

Diatom (microscopic organisms) species presence and relative abundance are also indicative of nutrient enrichment in both rivers and lakes. To assess the effect of these on the ecological status the **D**iatoms **A**ssessment for **R**ivers and **L**akes **E**cological **Q**uality (DARLEQ) tool has been developed which classifies on levels of nutrient sensitivity and tolerance. The higher the EQR the more sensitive diatom species present. A minimum of three samples over several years is necessary for this classification resulting in few water bodies being classified at present.

Class	Diatoms EQR	Macrophytes EQR
High	0.93	0.8
Good	0.78	0.6
Moderate	0.52	0.4
Poor	0.26	0.2
Bad	0	0

Table 9.09. Environmental Quality Ration Classifications for Diatoms and Macrophytes.

Fish

At present there is no tool available for the classification of fish. It has been determined by expert judgement based on the quantitative electrofishing surveys undertaken by the Loughs' Agency (Foyle and Carlingford Areas) and AFBI (for other rivers in Northern Ireland).

General Chemical and Physiochemical Quality Elements

The general chemical elements required for WFD purposes are Dissolved Oxygen (% saturated), pH, and Soluble Reactive Phosphorus (SRP). Notably BOD is no longer used to classify a water body. It is still being monitored for investigative purposes where DO standards are not being met. In addition to these elements a number of 'specific pollutants' were also to be identified from a WFD list. These are pollutants which are being discharged in significant quantities. Of particular importance from a fishery aspect is Ammonia. There are 18 other pollutants listed

(Full list detailed in NIEA's Rationale for Water Framework Directive Freshwater Classification).

Class	DO (% saturation) (10 – percentile)	pH	SRP (µg/l) (annual mean)	Ammonia (mg/l)
High	80	(5 & 95 percentile) >=6 to <=9	20	0.2
Good	75		40	0.3
Moderate	64	4.7 (10 percentile)	150	0.75
Poor	50	4.2 (10 percentile)	500	1.1

Table 9.10. Classification for General Chemical & Physiochemical Quality Elements.

Hydromorphological Elements

Hydromorphological elements have been incorporated into the classification system to assess the impact that morphological alterations (e.g. sediment removal and channelisation) have on the ecological status of a river. The procedure employed to classify these elements is based on the previous NS Share method, **R**apid **A**ssessment **T**echnique (RAT). The new method is the **R**iver **H**ydromorphological **A**ssessment **T**echnique (RHAT) and has been developed to be fully compliant with the WFD.

Chemical Status: Classification of Quality Elements.

Although chemical elements are already being assessed for the ecological status, the Chemical Status refers solely to those chemicals which have been defined as priority substances which are *'those which present a significant risk to or via the aquatic environment'*. These include Pentachlorophenol, Carbon Tetrachloride, Aldrin, Isodrin and Napthalene. The full list and their Environmental Quality Standards (EQS) are detailed in the framework's 'daughter' Directive 2008/105/EC.

The principal objective of the Water Framework Directive is to achieve good surface water status in all water bodies by 2015. The classification of the water bodies are to be published in the River Basin Management Plans, the first of which was published in Dec 2009.

The directive has separate classification schemes for heavily modified water bodies, and protected areas. Heavily modified water bodies have been classified on their ecological potential, details of which are available on the NIEA website (www.ni-environment.gov.uk/wfd). For protected areas (e.g. River Foyle and its tributaries) maps are to be included in the River Basin Management Plans to indicate whether the objectives, established through legislation to define these areas, have been achieved.

The Habitat's Directive (92/43/EEC) indicates that the water quality in these protected areas should achieve targets that are necessary for the designated species. The favourable conditions specific for salmonid rivers have been based on

publications from Conserving Natura 2000 Rivers, the European Life Series, Ecology Series; No 7 Ecology of the Atlantic Salmon, *Salmo Salar* L (Table 9.11).

Parameter	Level	Percentile	Reason
BOD (mg/l)	2.5	90	High Status
Ammonia (mg/l)	0.25	90	High Status
Dissolved Oxygen % Saturation	80	10	High Status
Unionised Ammonia (mg/l)	0.025	95	Favourable Conditions Habitat Forming
Suspended Solids (mg/l)			Specific for Atlantic Salmon
Nursery Grounds	10	-	
Migratory Passage	25	-	
Soluble Reactive Phosphorus (mg/l)	Background	-	Specific for Atlantic Salmon

Table 9.11. Favourable condition targets for Atlantic salmon

Figure 9.12. Flattened mayfly nymph from the order *ephemeroptera* high scoring macro invertebrate indicative of good water quality

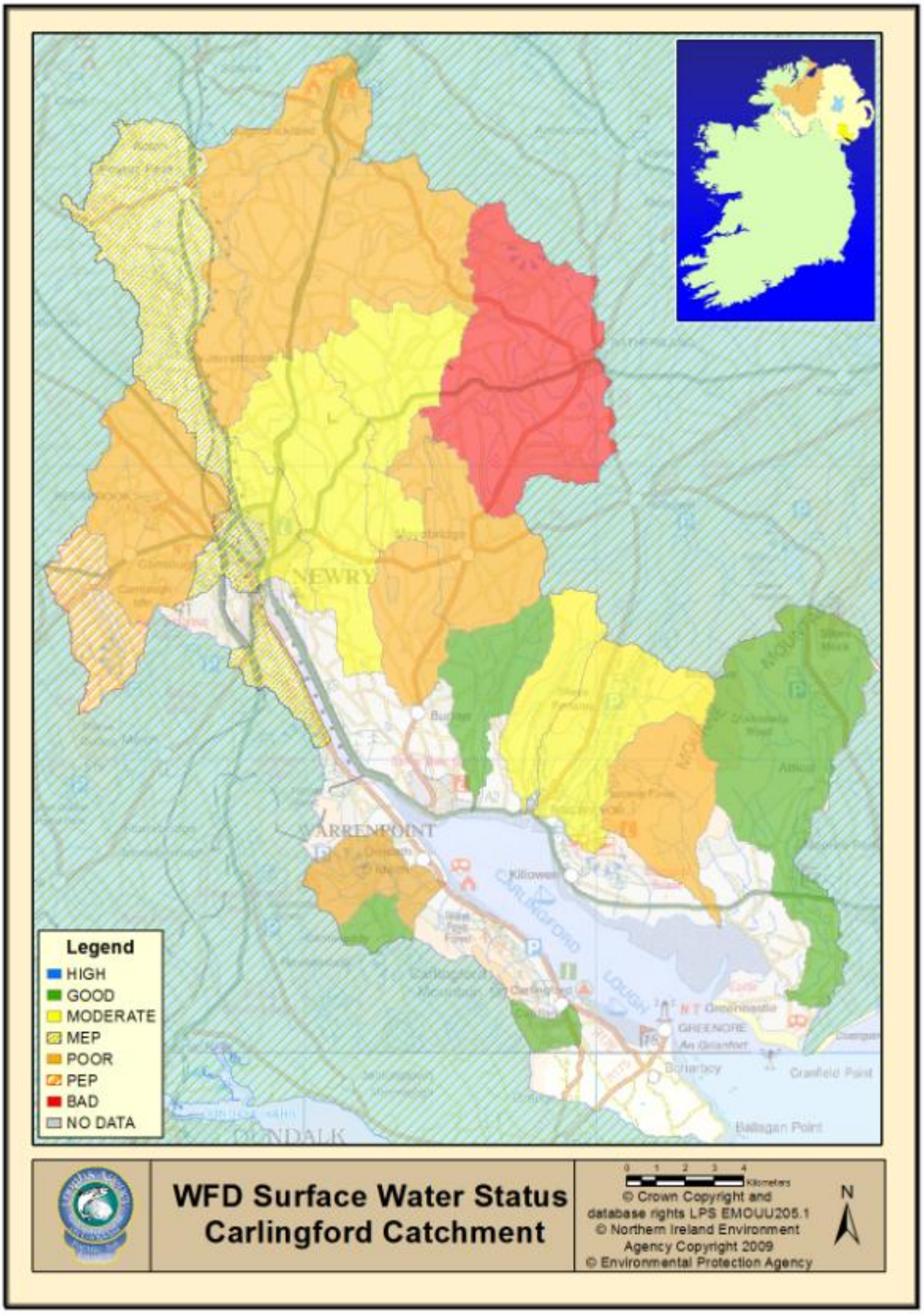

Figure 9.13. Overall WFD surface water status for the Carlingford area 2010.

9.1 WFD Fish Classifications 2010

The Loughs Agency is monitoring freshwater fish within the Foyle and Carlingford areas for reporting under the WFD. Working under the direction of the Northern Ireland WFD Fish Group (composed of NIEA, Loughs Agency, AFBI and DCAL personnel) surveillance monitoring stations are surveyed for fish populations once during each WFD reporting cycle.

Eight Water Framework Directive fish surveillance monitoring stations were surveyed within the Loughs Agency jurisdiction in 2010, Five in NI and three in ROI. 100% were classified as good status

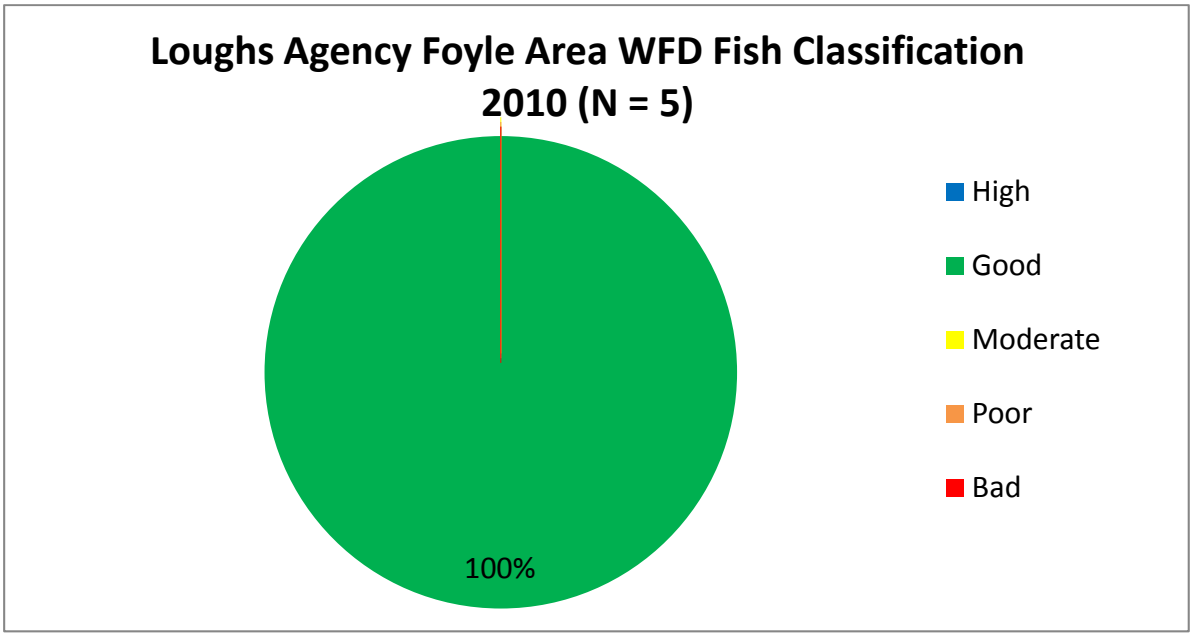

Figure 9.11. LA fish classification 2010 based on seven sites surveyed within the Foyle area. * Note no WFD sites were surveyed in the Carlingford area in 2010. Three additional sites were surveyed in Co Donegal, these are not included in the above classification.

In the absence of a finalised fish in rivers classification tool (currently under development) professional judgement has been used to classify selected river sites for fish. These have then been incorporated into ecological status classifications and final surface water classifications.

Data collection was conducted in the field during the summer of 2009 and involved the use of a quantitative electrofishing methodology commonly used for wadable rivers. This technique requires the netting off of a small section of river approximately 100m² using stop nets.

Removal sampling is then conducted utilising electrofishing equipment with the numbers, age class and species of each fish being recorded for each pass. After an appropriate depletion has been achieved, which facilitates a density estimation to be made all fish are returned alive to the river.

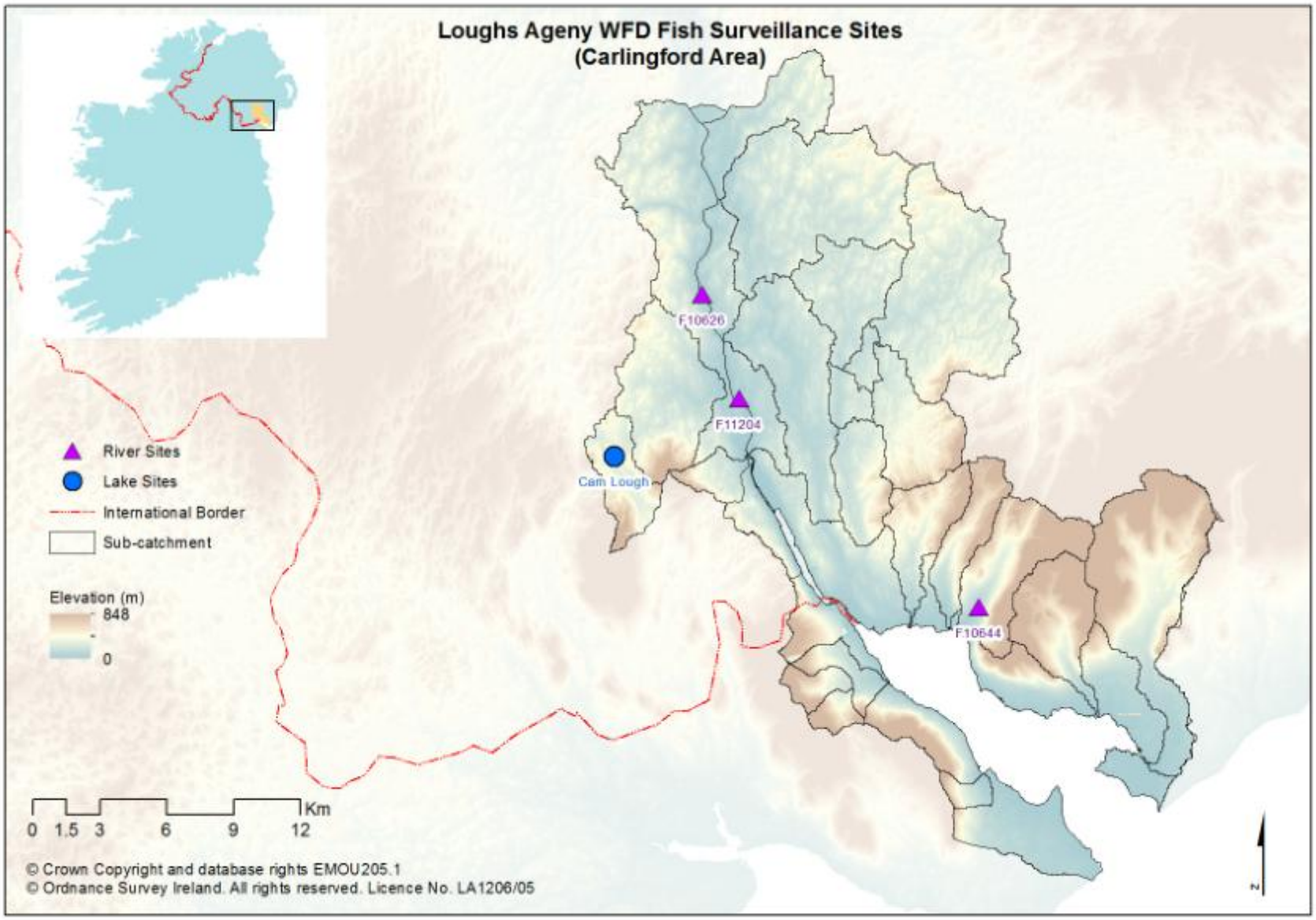

Figure 9.12. WFD fish surveillance monitoring stations in the Carlingford system

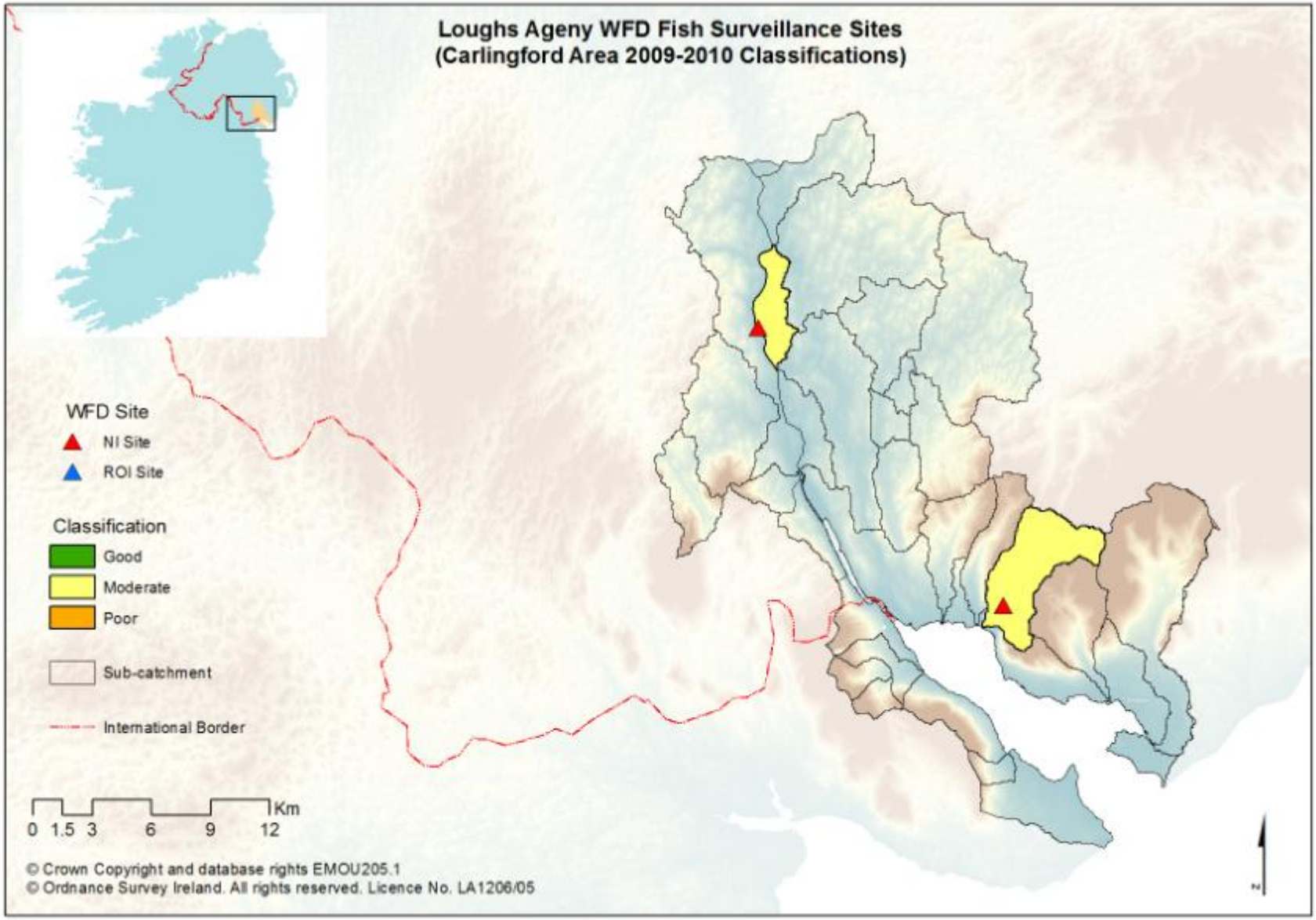

Figure 9.13. WFD fish classifications in the Carlingford system

In addition to directed WFD fish surveillance monitoring the Loughs Agency has collated other suitable fishery data collected from 2005-2009 and derived WFD fish classifications from this. An example of WFD fish data collected in 2009 is outlined below

Fishing	Trout 0+	Trout 1+	Stickleback	Stone Loach	Eel	Total
1st	5	34	2	27	15	83
2nd	0	5	0	14	12	31
3rd	0	2	0	11	6	19
Total	5	41	2	52	33	133

Table 9.14 Depletion sampling results from quantitative electrofishing survey on the Jerrettspass River 2009

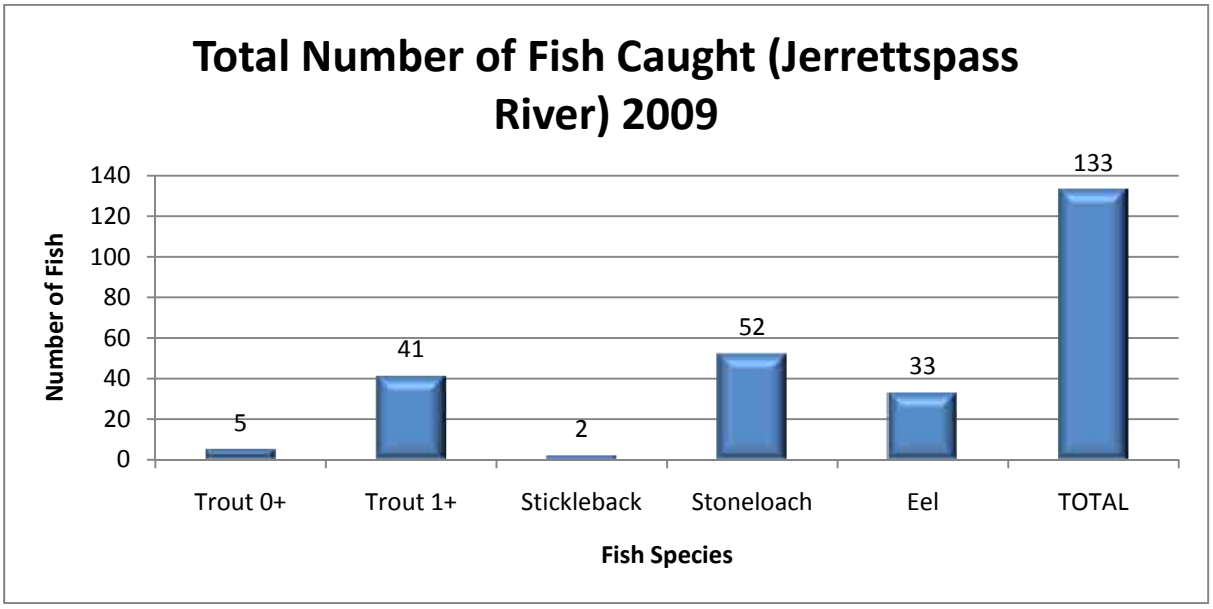

Table 9.15 Species and numbers caught

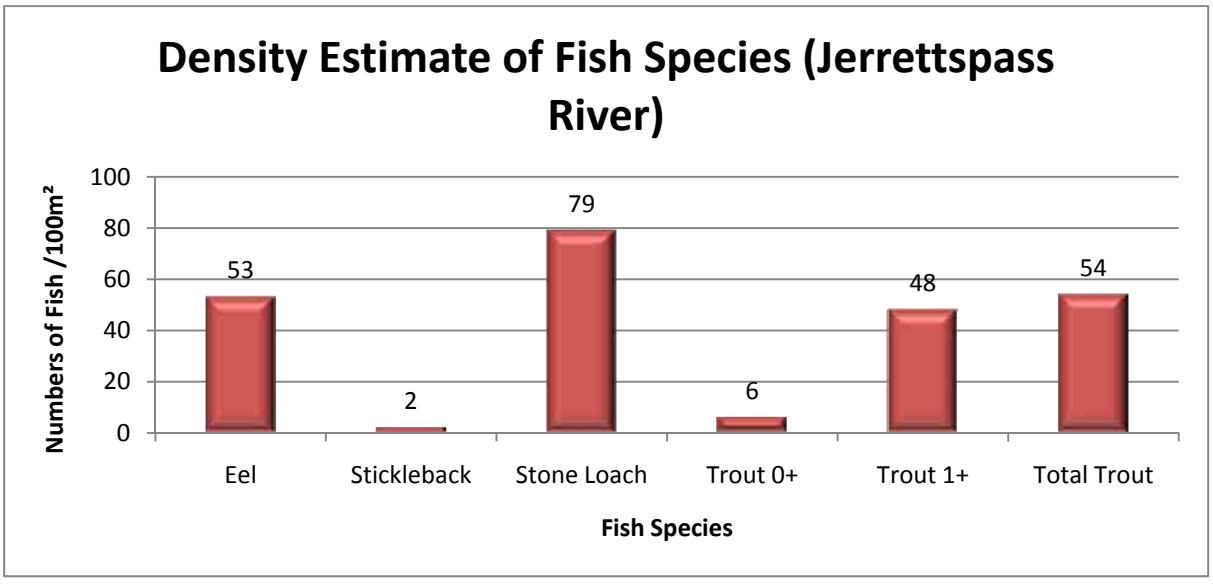

Table 9.16 Density of species by age class per 100m^2

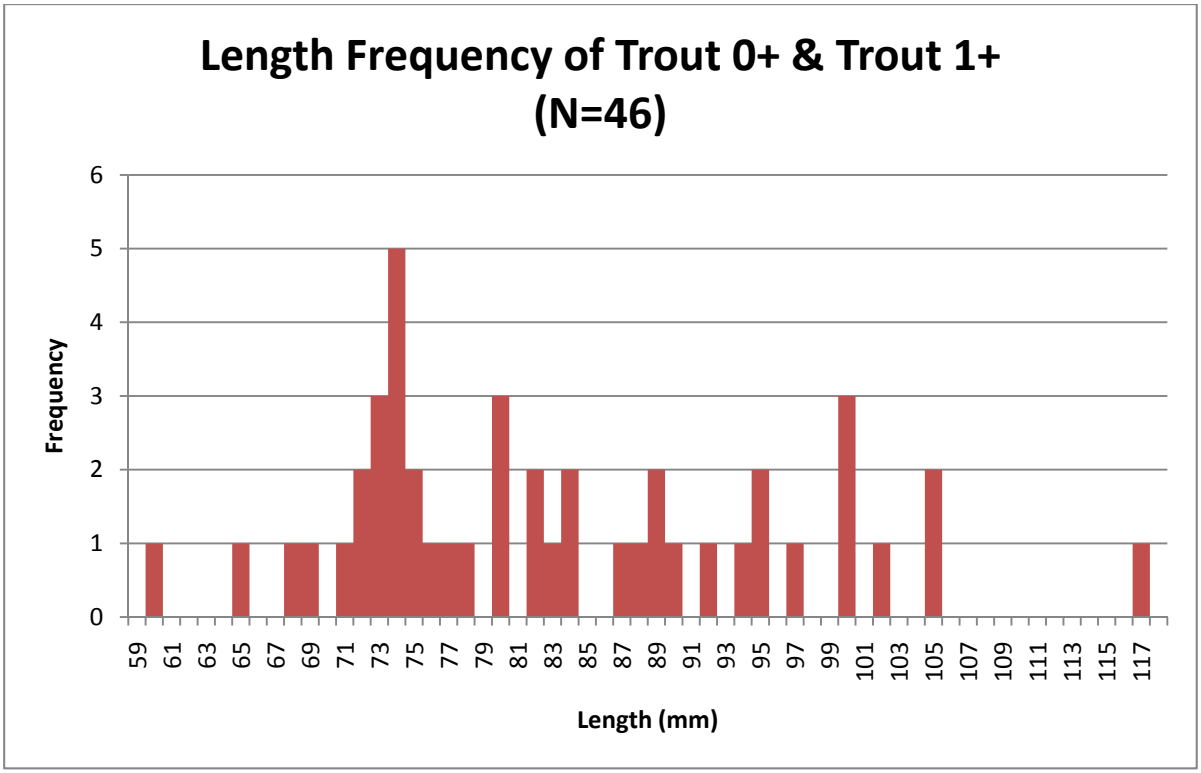

Figure 9.17 Length frequency distribution of juvenile trout

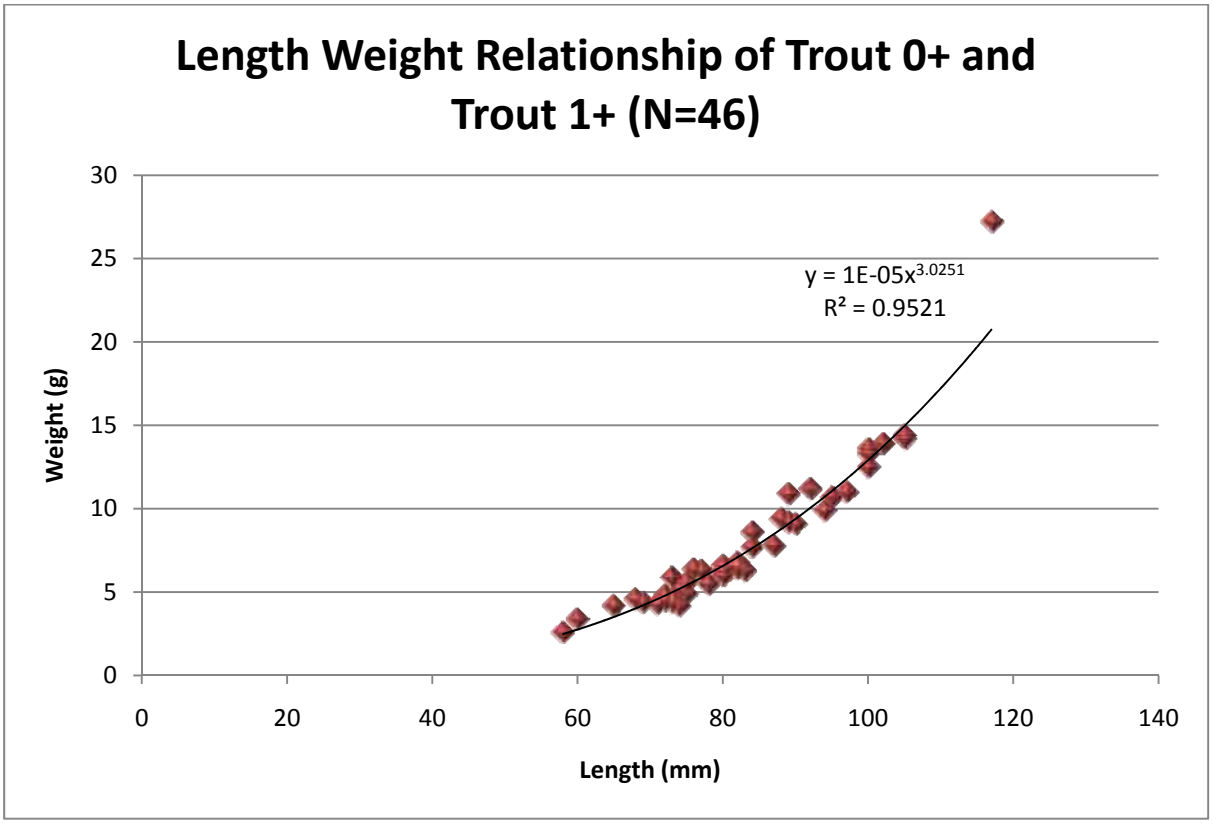

Figure 9.18 Length weight relationship of juvenile trout

Figure 9.19 WFD fish monitoring on the Jerrettspass River 2009

10.0 CONSERVATION AND PROTECTION

The Loughs Agency continues to carry out an active fishery protection role throughout the catchments of the Carlingford area including the sea area and on all tributaries. Tables 10 and 10.1 outline the number of patrols and some duties carried out by the Loughs Agency staff in the Carlingford area and seizures for the Foyle and Carlingford areas.

A team of Fishery Officers based in Carlingford are responsible for the catchments within the Carlingford area. In addition to fishery protection duties the team is responsible for conducting sampling within Carlingford Lough.

Year	No of Licence Checks	Joint Patrols	On-site Inspections
2005	786	3	230
2006	550	4	267
2007	410	0	110
2008	447	0	37
2009	501	3	14
2010	640	2	12

Table 10. Breakdown of conservation and protection duties in the Carlingford area catchment 2005-2010. Note policy changed in 2008 in relation to onsite inspections.

Year	2010	2009	2008	2007	2006	2005	2004	2003
Nets	138	128	114	100	97	114	181	198
Salmon	106	6	92	56	91	118	130	155
Rod & Reel	87	96	136	85	26	10	16	12
Vehicles	0	0	1	0	2	1	1	0

Table 10.1 Seized nets, salmon, rod/reels and vehicles in the Foyle and Carlingford areas 2003-2010

Year	Nets	Rod/Reel	Salmon
2010	2	21	2
2009	0	16	0
2008	2	23	0
2007	2	12	0

Table 10.2 Seizures in the Carlingford area 2007-2010

10.1 Habitat Improvement Works

In addition to the traditional protection duties carried out by the Loughs Agency staff conservation and improvement of habitat has been increasing over recent years.

Over time man has imposed significant changes on the natural courses of many rivers and flood plains. The driving forces behind these changes have included amongst others; arterial drainage schemes to provide more suitable land for agricultural purposes, urban sprawl, infrastructure expansion (roads etc.), flood defences, water abstraction and hydro power generation. All have had a significant impact on the natural meanderings and discharges of rivers and tributaries resulting in faster runoff of floodwaters ultimately leading to a change in the morphology and flow regime of rivers and resultant impacts on fisheries.

While all these processes have had some impact within the Foyle and Carlingford systems, they are still considered to be relatively natural systems with natural river structure present in the catchments headwaters. In areas that have been altered methods for reinstating lost habitat are investigated and where appropriate action taken.

In July/August 2008 the Loughs Agency, in conjunction with the Kilbroney Angling Club co-funded a project on the Kilbroney River in the Fairy Glen area. Surveying had identified that there was a lack of holding water between the mouth of the river and the top of the Glen and many of the stone weirs that were in place were in need of repair.

In-stream works were carried out to address these issues and reinstate/create pools and some spawning habitat. The works were impacted by a serious flood event which occurred in mid August but the damage was repaired by club members at their own expense.

Fig 10.4 Reinstatement of pool with some repair work to a weir on the Kilbroney

Fig 10.5 Creation of spawning habitat on the Kilbroney

Fig 10.6 Repair of weirs on the Kilbroney

Fig 10.7Repair of damaged weir on the Kilbroney

Fig 10.8 Trimming of overhead cover and pool reinstatement on the Kilbroney

Fig 10.8 Grading of bank on the Kilbroney

Fig 10.9 Pool excavation and repair of weir on the Kilbroney

Fig 10.10 Repair of weir on the Kilbroney

Fig 10.11 Repair of weir and reinstatement of pool on the Kilbroney

Figure 10.12. Bank protection works conducted by the Kilkeel Angling Association on the Whitewater River in 2009

In 2010 The Agency in partnership with Lagan Ferrovial (a civil engineering company) carried out the construction of low level deflector groynes to improve salmonid habitat in a canalised section of the Clanrye River upstream of the Carnbane Industrial Estate in Newry.

Fig 10.13 and 10.14 Low level deflector groynes to improve salmonid habitat in a canalised section of the Clanrye River.

Also in 2010 the Carlingford crew supervised the removal of the temporary crossings on the Bessbrook and Clanrye Rivers including in channel habitat improvement.

Fig 10.15 and 10.16 Top before and bottom after removal of temporary river crossing on the Clanrye River

In September 2010 the Carlingford crew worked with a local land owner on a small scale habitat improvement scheme on a tributary of the Moygannon. This involved the removal of tunnelling vegetation and the construction of deflectors and pools.

11.0 ENVIRONMENTAL ISSUES

Some environmental issues affecting water quality have already been outlined previously. The following list presents some of the main habitat pressures to salmonids within the Foyle system:

- Agricultural activities – enrichment from natural and artificial fertilisers often make their way into watercourses, enhancing problems with eutrophication.
- Forestry activities – planting and felling operations can lead to increased loading of suspended solids in watercourses. Established forestry as a major upland land use has been attributed to increased acidification.
- Barriers to migration – a range of natural and anthropogenic features on rivers can lead to barriers for migrating salmonids and other fish species. These can include weirs and hydro-electric schemes.
- Gravel removal – gravel is extremely important for the creation of redds for spawning fish. Removal of gravel from the river bed in sensitive areas can destroy potential spawning and nursery habitat.
- Quarrying activities – the extraction of aggregates such as rock, sand and gravel has the potential to cause increased levels of suspended solids in nearby watercourses. Sufficient mitigation measures should be in place at such sites to trap increased sediment loads entering rivers and streams.
- Abstraction – water abstraction from watercourses for a range of uses is increasing throughout the Foyle and Carlingford catchments. Unless appropriately assessed and licenced, these activities have the potential to reduce residual flow levels and alter the ecological status of our rivers. This is even more concerning in the light of climate change.
- Peat harvesting – Peat harvesting still occurs in small upland pockets throughout the Foyle system. It has the potential to increase sediment loading in receiving waters.
- Sewage treatment – sewage and waste water treatment works are under considerable pressure with the increase in urban development in our towns and villages. Several inadequate systems throughout the Foyle system continue to pollute rivers.
- Hydropower – small-scale hydropower schemes are beginning to appear on rivers throughout the Foyle and Carlingford catchments. Baseline fishery data must be provided to allow for sufficient assessment of any proposed scheme, unless located above an impassable fish barrier.
- Urban development – the expansion of large-scale housing developments and the associated pressures on waste water and sewage treatment works are a potential source of water pollution in the event of overflows.
- Drainage and canalisation – these have direct impacts on the quality of available fishery habitat within the catchments. Canalisation in particular can lead to the removal of important spawning, nursery or holding areas of rivers.

- Industrial discharges – larger urban areas with industrial discharges have the potential to cause pollution through toxic discharges and can alter the temperature of the watercourse.
- Septic tanks – a proliferation of single dwellings and their septic tanks is an ongoing area of concern. Initial research from parts of the Foyle system indicate that this is major contributor to decreased water quality and local increases in suspended solids.

12.0 DESIGNATED AREAS

The European Commission Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (EU Habitats Directive 92/43/EEC) requires that all member states designate Special Areas of Conservation (SACs) in order to protect threatened habitats and species. The European Commission Directive on the Conservation of Wild Birds (Birds Directive 79/409/EEC) also requires the designation of Special Protected Areas (SPA's). Together the designated SAC's and SPA's create the NATURA 2000 network of protected sites. A number of rivers have been designated as SAC's both in Northern Ireland and in the Republic of Ireland however no rivers within the Carlingford area have been designated.

NATURA 2000 sites within the Carlingford area include Derryleckagh SAC, Rostrevor Wood SAC, Slieve Gullion SAC, Carlingford Mountain SAC, Carlingford Shore SAC and Carlingford Lough SPA.

The Mourne Area of Outstanding Natural Beauty lies partially within the Carlingford area as does the Ring of Gullion AONB. The area is also covered by a variety of nationally designated sites including Areas of Special Scientific Interest (ASSI) and National Nature Reserves (NNR).

Designated sites are required to attain high environmental quality standards set at both the European and national scale. The maintenance of a network of sites represents great opportunities for co-ordinated environmental management with issues such as water quality and habitat conservation having a direct link to the quality of the fisheries resource.

13.0 GENETIC STUDY

A baseline genetic survey of the Atlantic salmon population was carried out in the Whitewater catchment in 2008. It is expected that findings of this study will be produced during 2011. The results from a similar survey conducted in the Foyle area confirmed the existence of genetically distinct populations between and within the rivers and tributaries of the Foyle area. An understanding of these genetically

differentiated populations is required to facilitate appropriate management of conservation measures and the commercial/recreational fisheries.

The report concluded that genetic diversity is high between and within the various salmon populations present in the Foyle system. Each population has evolved over time creating distinct populations (with some gene flow from straying fish) that are best suited to the conditions present in a particular river or tributary. The non-uniform nature of the populations adds to the diversity of life history strategies exercised by Foyle salmon. Distinct differences such as run-timing and age at smolting can act as natures insurance policy to any catastrophic events which would threaten a homogenous population.

The report stated that the current genetic structure and diversity of Foyle salmon is representative of what might be regarded as the native structure of wild salmon populations. The maintenance of genetic diversity is a core requirement for the long-term sustainability of wild populations, preserving the biodiversity of the wild salmonids of the Foyle system is therefore a primary objective of the Loughs Agency.

14.0 POLLUTION MONITORING

The Loughs Agency has a statutory obligation to monitor the pollution of watercourses. In conjunction with the Environment and Heritage Service and Louth County Council all reported pollution incidents are investigated.

15.0 CARLINGFORD AREA FISHERY OFFICERS REPORT 2010

- February: The Loughs Agency stocked approx 6000 bream into the Newry Ship Canal.

- April: The Agency completed the first leg of the “Hatchery in the Classroom” pilot exchange programme with the release of trout fry into the Kilbroney River by pupils from Kilbroney Integrated Primary School Rostrevor and Scoil Phadraig Naofa, Kilcurry, Co Louth. The project involved placing trout eggs donated by the Kilbroney Angling Club into a classroom based hatchery facility at Scoil Phadraig Naofa. The eggs were cared for by 5th and 6th class students until they hatched. The resulting fry were then released into the river by students from both schools.

- April: The Loughs Agency in cooperation with The Newry and District Angling Association carried out stocking of the Clanrye River. The Agency and Association co-funded the purchase of eggs which were raised in the Association’s hatchery facility over the winter. The cold weather did delay the hatching of the eggs but thanks to the work of hatchery volunteers, almost all survived. The resulting fry were stocked into various points throughout the Clanrye system.

- The Loughs Agency legislation enacted prohibiting angling in an area around the Newry Fish Counter weir on the Clanrye River.

- June/July: In partnership with Laganferrovial (a civil engineering company) carried out the construction of low level deflector groynes to improve salmonid habitat in a canalised section of the Clanrye River upstream of the Carnbane Industrial Estate in Newry.

- August: Carlingford crew supervised the removal of the temporary crossings on the Bessbrook and Clanrye Rivers.

- Summer 2010: Crew continued to be involved in the genetics sampling of trout/sea trout in a number of rivers throughout the catchment as part of the Celtic Sea Trout Project

- September: Carlingford crew worked with local land owner on small scale habitat improvement scheme on a tributary of the Moygannon. This involved the removal of tunnelling vegetation and the construction of deflectors and pools.

- There was an observed increase in suspected poaching activity/reports in the catchment.

- Seal surveying/scat sampling continued and resulted in the production of an interim internal report on the seal population in the lough, unfavourable wind conditions throughout the year had an impact on the seal surveying and the overall number of days at sea

- The Agency continues its consultation relationship with DCAL and Rivers Agency regarding proposed drainage works, etc.

- Members of the crew continued their involvement in the Agency's development activities working at events such as the Agency's Angling Fair, the CLA Game Fair and an International Tourism Fair in Utrecht in Holland with DCAL and Tourism Ireland.

- Routine monitoring of river sites continued over the summer

- October/December: Carlingford staff facilitated work by RSPB on behalf of NIEA with the installation and recovery of monitoring equipment on Green Island (Carlingford Lough) to attempt to identify the cause of the total decline of the island's tern population.

- The Agency commissioned a study on a section of the Clanrye River between Ryans Bridge and Barnmeen. An interim report has already been produced and the final report will recommend a number of specific habitat enhancement projects which will improve salmonid habitat by addressing the sand issue and contribute to the 5 year management plan for the catchment.

16.0 WHITEWATER RIVER SALMONID POPULATION SURVEY 2008

In September 2008 a quantitative electrofishing survey was conducted on the Whitewater River downstream of Ballyardle Bridge. This area is known to be stocked with fry and ova from the Whitewater hatchery. It is hoped that in future years that both stocked and non stocked sites will be able to be surveyed to provide an insight into the impact of stocking and the impact of natural recruitment on salmonid survival and growth. Basic biological data including densities, lengths and weights have been recorded and will provide a basis for comparison over coming years.

All rivers have a natural carrying capacity which means that above a certain threshold natural limiting factors such as food availability and size of feeding territories impact on the rivers ability to sustain more fish numbers. This is an extremely important factor when considering stocking locations and densities. Carrying capacities will vary depending on the type and location of the river. It is vital that any stocking if deemed necessary should be conducted in areas where no natural recruitment has taken place as this will increase the competition with naturally spawned fish which may be genetically “fitter”.

It was also noted in 2008 that there appears to be a bottleneck in natural production within the Whitewater River that is potentially caused by the disconnection of in-channel habitat caused by the significant numbers of weirs. The impact of these weirs could be two fold, firstly they can impact on migration as some are quite high with insufficient depth in the pool immediately downstream and secondly weirs act as a barrier to the recruitment of substrate from upstream. Rivers in their natural state will erode and accrete providing clean silt free gravel and nursery stones which will ultimately provide ideal habitat for salmonids and other native fish species.

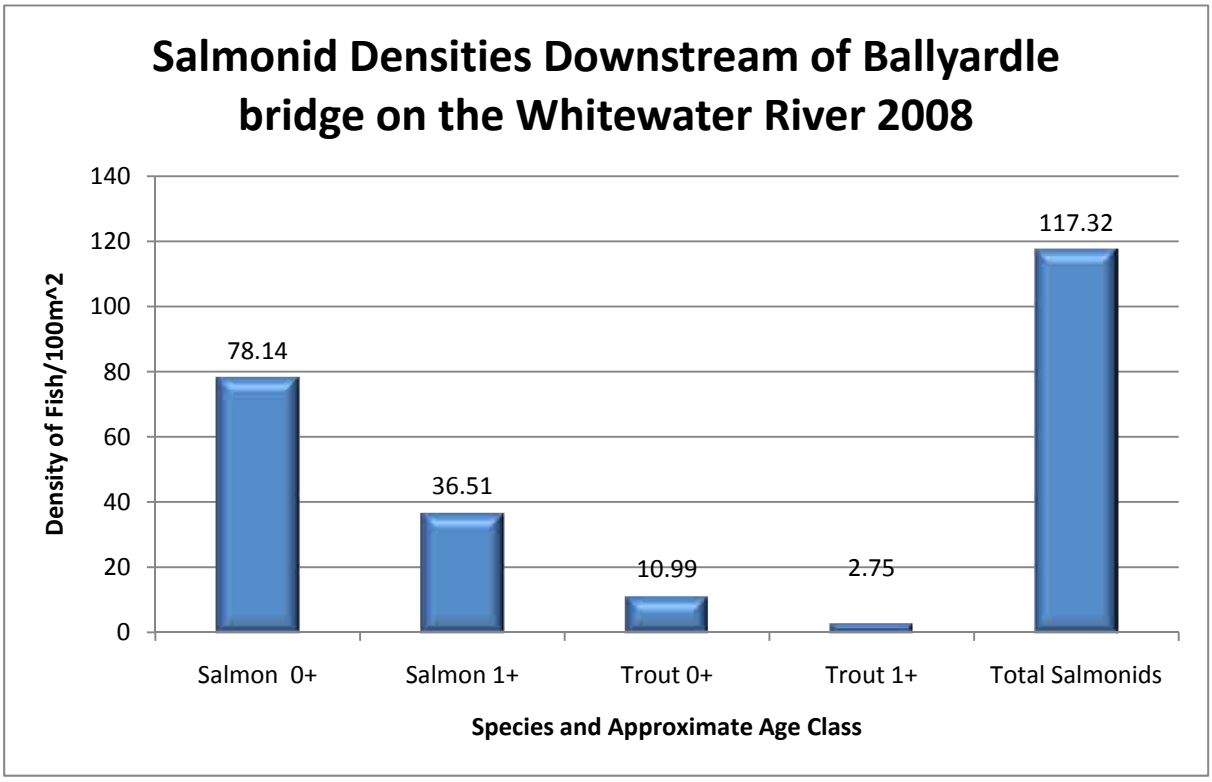

Fig 16 Salmonid densities at Ballyardle Bridge 2008

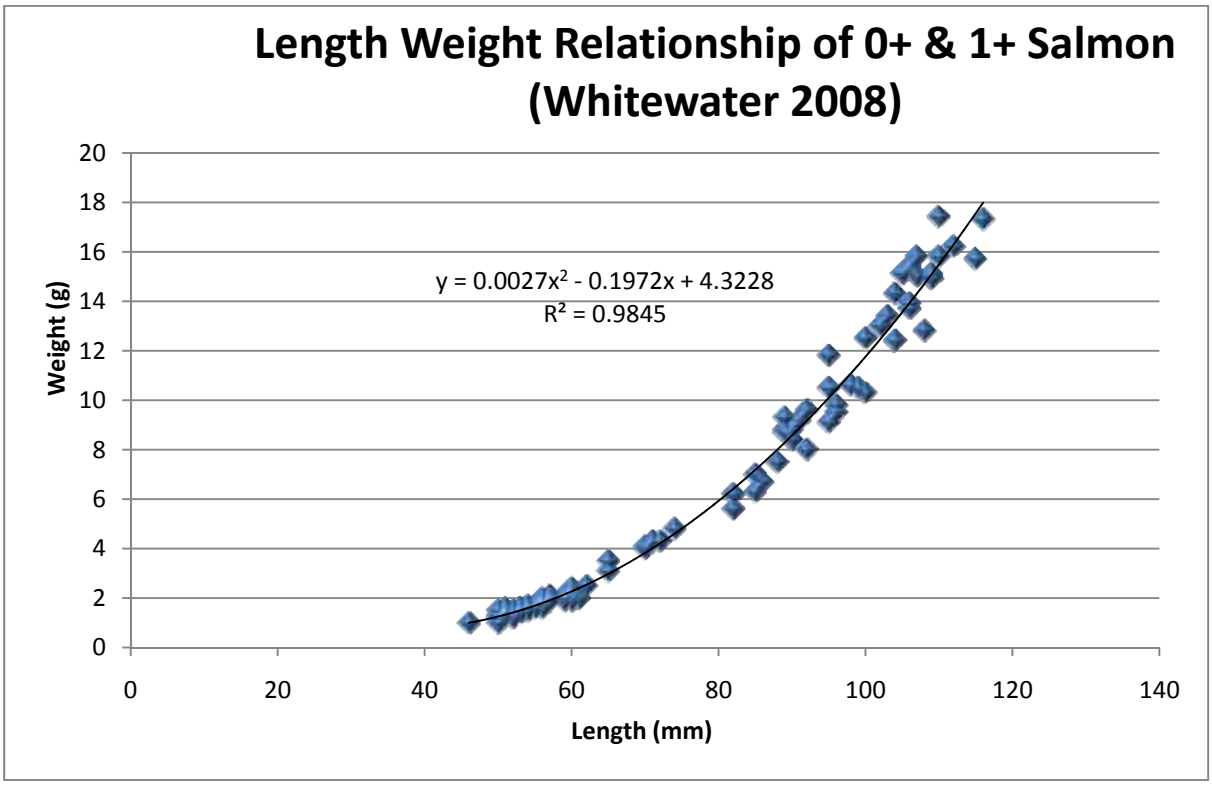

Fig 16.1 Salmon fry and parr length weight relationships at Ballyardle bridge 2008 N = 89

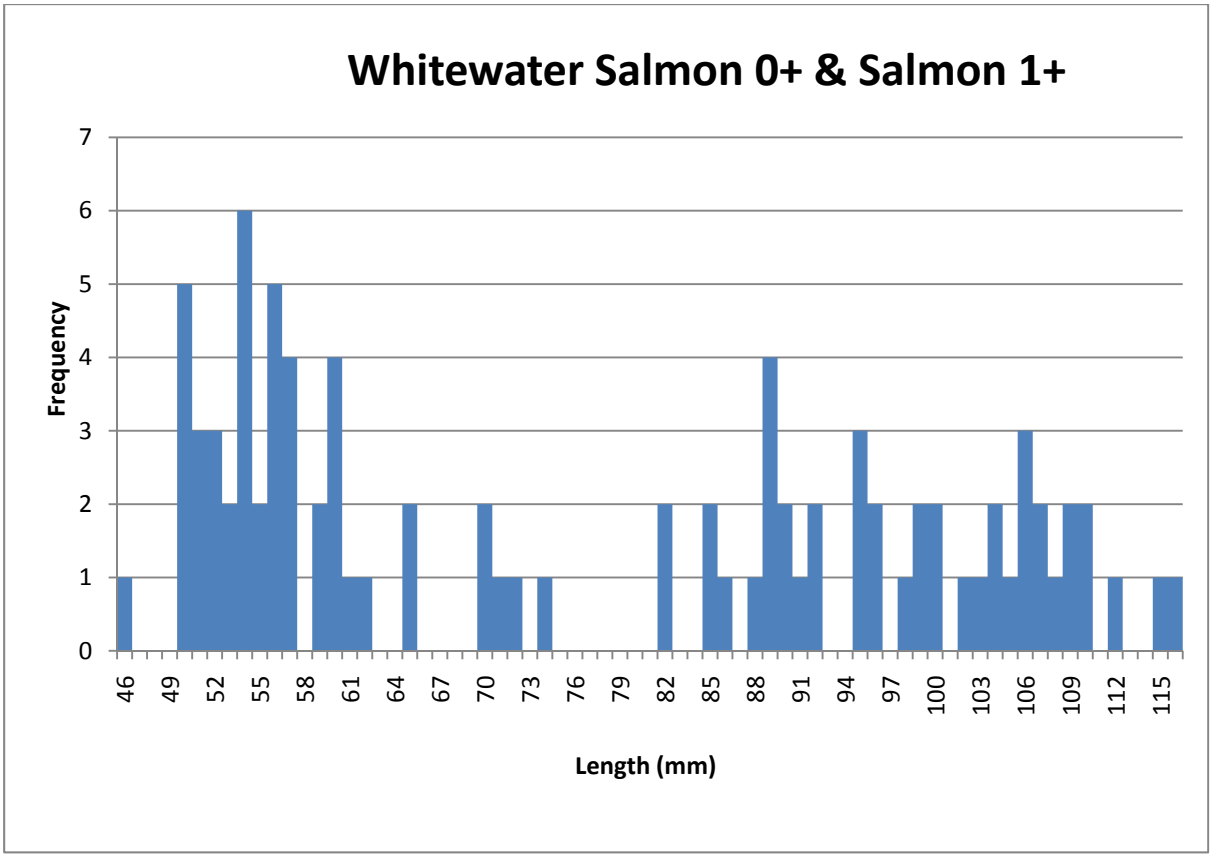

Fig 16.2 Length Frequency distribution of Whitewater salmon fry and parr in 2008 N = 89

17.0 ACTIONS FOR 2011

In order to fully utilise the extensive data resources collected and held by the Loughs Agency on the fish populations and habitats of the Carlingford area it is necessary to focus attention on specific management objectives.

The Loughs Agency has stated in its corporate plan 2011-2013 that it will conserve, protect, manage and improve the fisheries of the Foyle and Carlingford areas. By way of fulfilling these objectives a targeted series of actions utilising data collected over recent years will be implemented. Fishery owners and Faughan Anglers Ltd will continue to be consulted regarding any proposed works and stakeholder input sought.

17.1 Foyle and Carlingford Areas Ongoing Actions for 2011

Good water quality is essential for the conservation of productive aquatic ecosystems. Fish populations rely on unpolluted water for survival and feeding. The Loughs Agency is committed to ensuring deleterious matter does not enter any watercourse. Routine monitoring is conducted throughout the Foyle and Carlingford areas. Proactive pollution visits and water quality monitoring will continue in 2009.

Water quantity is becoming an increasingly important issue from a fisheries management perspective with continuing demand from a variety of sources including industry, hydro power generation and abstraction for meeting the ever growing needs of industry and the wider population. The Loughs Agency are aware of the conflicting needs of aquatic environments and water resource users and comment on development issues which may have an impact on the important aquatic resources of the Foyle and Carlingford areas with reference to national and international obligations.

In-channel and riparian habitat improvement projects provide an important mechanism by which to improve and protect valuable fishery resources. Over recent years the Loughs Agency has developed a number of projects designed to improve the survival and production of robust populations of juvenile salmonid and other native fish species. These programmes will continue where funding is available, The Loughs Agency also encourages local stakeholder groups to source appropriate funding to develop collaborative habitat improvement projects. The Loughs Agency can provide advice and recommendations for in-channel and riparian improvements and are eager to facilitate the development of such programmes.

Work is continuing to assess and record all **Barriers to Migration** within the catchments of the Foyle and Carlingford areas and these will be incorporated into the Loughs Agency Geographical Information System (GIS). Where finances are available the removal of artificial barriers will be investigated.

Predation by cormorants and seals of economically important fish species continues to be a contentious issue. The Loughs Agency will continue to promote the development of a management strategy incorporating economic, social and environmental factors.

The Loughs Agency will continue to monitor the salmon and inland fishery resources of the Foyle and Carlingford areas, utilising best practice methods including fish counters, juvenile population surveys and catch returns. The importance of the Atlantic salmon resource has been further highlighted by recent genetic studies which have identified the presence of genetically distinct populations of salmon between and within main river catchments. This information will be utilised when developing habitat improvement programmes to ensure the presence of a diverse resource capable of withstanding change.

Invasive species in both aquatic and riparian habitats have become an important issue in fisheries management and in wider environmental management. Invasive species have the potential to significantly alter ecosystems and their function. The Loughs Agency is contributing towards the development and implementation of invasive species codes of practice.

4.2 Carlingford Catchments Potential Habitat Improvement Schemes for 2011

- Proposal to carry out cleaning/raking of gravel put into sections where enhancement was carried out in 2006 between Glenny's Bridge and Croan's Bridge on the Clanrye. Electrofishing results seemed to improve after the works but the 2009 figures seemed to have dropped a little. Additional gravel could be put into the river upstream of Hawkins Bridge towards Bankside which may help improve electrofishing results. This can tie into the proposed 5 year plan.

- **Removal of impassable barrier on the Clanrye River.**

On the Clanrye River, close to the town of Mayobridge there is a concrete pipe approximately 3 foot in diameter, used to allow access for people/machinery etc, however it does not seem heavily used. During normal or low flows there is approximately a foot drop from the pipe to the level of the river, as the river is quite shallow directly below the pipe, therefore acting as a barrier to migrating fish. This is shown in the photographs below; the first photo was taken in summer 2009, while the second was taken early 2011. During this period a number of floods have washed some of the right-hand bank and 'fill' away. It also appears that the land is being used and accessed less often, possibly allowing for the complete removal of the pipe. Possible mitigation measures may include;

- Completely removing the pipes
- Replacing the pipes with a correctly engineering bridge
- Creation of small downstream pool
- Fish pass
- Repositioning the pipe so it is half buried

- Moygannon River: A migration barrier is in place approximately 6km from the river's estuary area and if removed should improve the productivity of the river. This barrier has been acknowledged by Rivers Agency and is located at Ballyvally Bridge. More recently works carried out at Moygannon ford caused a partial up stream migration barrier, possibly preventing the passage of fish up stream in conditions other than flood situations.

17.3 Carlingford Area Specific Actions for 2011

- To monitor and where necessary enforce the new coarse fish legislation and closed section of the Clanrye
- To continue to be vigilant regarding the impact of construction/development works (authorised and unauthorised) in and around watercourses
- To implement a 5 year plan to address habitat improvement on the Clanrye River
- To monitor the success of the Newry Canal stocking exercise
- To continue trout genetics surveying in support of the Celtic Sea Trout Project
- To continue the “Hatchery in the Classroom” project.
- Target all areas/individuals brought to Loughs Agency attention
- Conduct annual fish population surveys and spawning surveys
- Conduct ongoing water quality monitoring and investigate areas highlighted as being of concern
- Develop potential habitat improvement projects including riparian buffer zone creation, fencing, native species planting and in-channel habitat improvements including spawning bed and nursery habitat improvement and identify resources
- Monitor forestry operations adjacent to watercourses or areas likely to impact on watercourses
- Assist with Water Framework Directive fish monitoring programme
- Monitor all sand and gravel extraction sites and onsite water management practices
- Ensure all fish passes, dams and mill races meet required standards
- Investigate habitat connectivity on the Whitewater River
- Complete revised habitat survey on the Whitewater River and Clanrye/Newry River

- Make preparations and seek permissions for Lake fish survey on Camlough and Newry canal in 2012