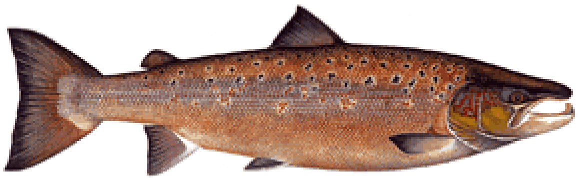
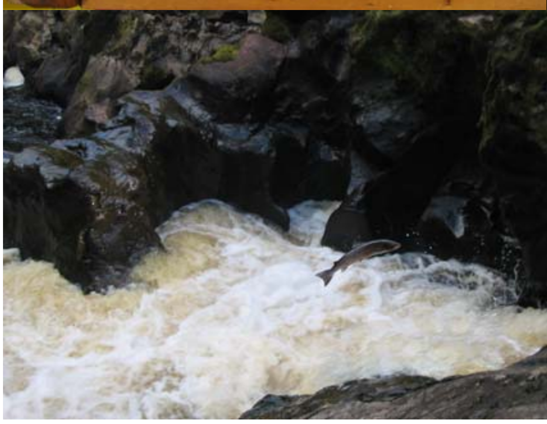
ATLANTIC SALMON AND TROUT POPULATIONS AND FISHERIES



River Finn & Tributaries Catchment Status Report 2007

The Loughs Agency (FCILC)






ATLANTIC SALMON AND TROUT POPULATIONS AND FISHERIES

River Finn and Tributaries Catchment Status Report

Report Reference LA/CSR/09/08

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Cover picture of cock salmon courtesy of Atlantic Salmon Trust

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River Finn and Tributaries Catchment Status Report

1.0 INTRODUCTION

The River Finn and tributaries catchment status report has been updated in 2008 to include results and reviews for 2007. This catchment status report introduces the major issues affecting the fishery resources of the River Finn and its tributaries. It is anticipated that circulation of this report will encourage debate between stakeholders and the Loughs Agency. Feedback would be welcomed and will contribute towards future reports.

The fisheries of the Foyle and Carlingford systems are of great environmental, social and economic importance. It is within this context that the Loughs Agency aims to manage, conserve, protect, improve and develop the inland fishery resources, preserving native biodiversity and contributing towards the sustainable development of the catchments. The River Finn and tributaries catchment status report provides background information on the aquatic environment within the Finn catchment, presents the results of survey work carried out by the Loughs Agency, disseminates catch statistics and outlines planned action.

The primary fish species within the Finn catchment include Atlantic salmon (*Salmo salar* L.), Trout (Sea Trout and resident Brown Trout) (*Salmo trutta* L.), Arctic Charr (*Salvelinus* alpinus), Sea Lamprey (*Petromyzon marinus*), River/Brook Lamprey (*Lampetra sp.*) and European Eel (*Anguila anguila* L.). Flounder (*Platichthys flesus* L.), Twaite Shad (*Alosa fallax* Lacépède) and European Smelt (*Osmerus eperlanus* L.) may be present within the lower tidal River Finn.

Activities that have the potential to contribute negatively on the fishery resources and the habitats that support these populations are outlined and remedial activities presented.

1.1 The Finn Catchment

The River Finn rises in the Bluestack mountain range in central County Donegal, Republic of Ireland and drains in a predominantly easterly direction until its confluence with the tidal River Foyle in the Lifford/Strabane area. The underlying geology of the catchment is dominated by Dalradian schists and gneiss with quartzites forming the hills around Lough Finn.The catchment contains habitats and species of great diversity with blanket bog present throughout much of the upland area along the edges of the rivers and tributaries. Many oligotrophic (nutrient poor) lakes are present throughout the catchment. The dominant land use types include commercial coniferous forestry plantations and upland grazing changing to lowland grazing with arable farmland in the lower reaches.

The River Finn and tributaries have a channel length of approximately 101 km and has a catchment area of 494 km².

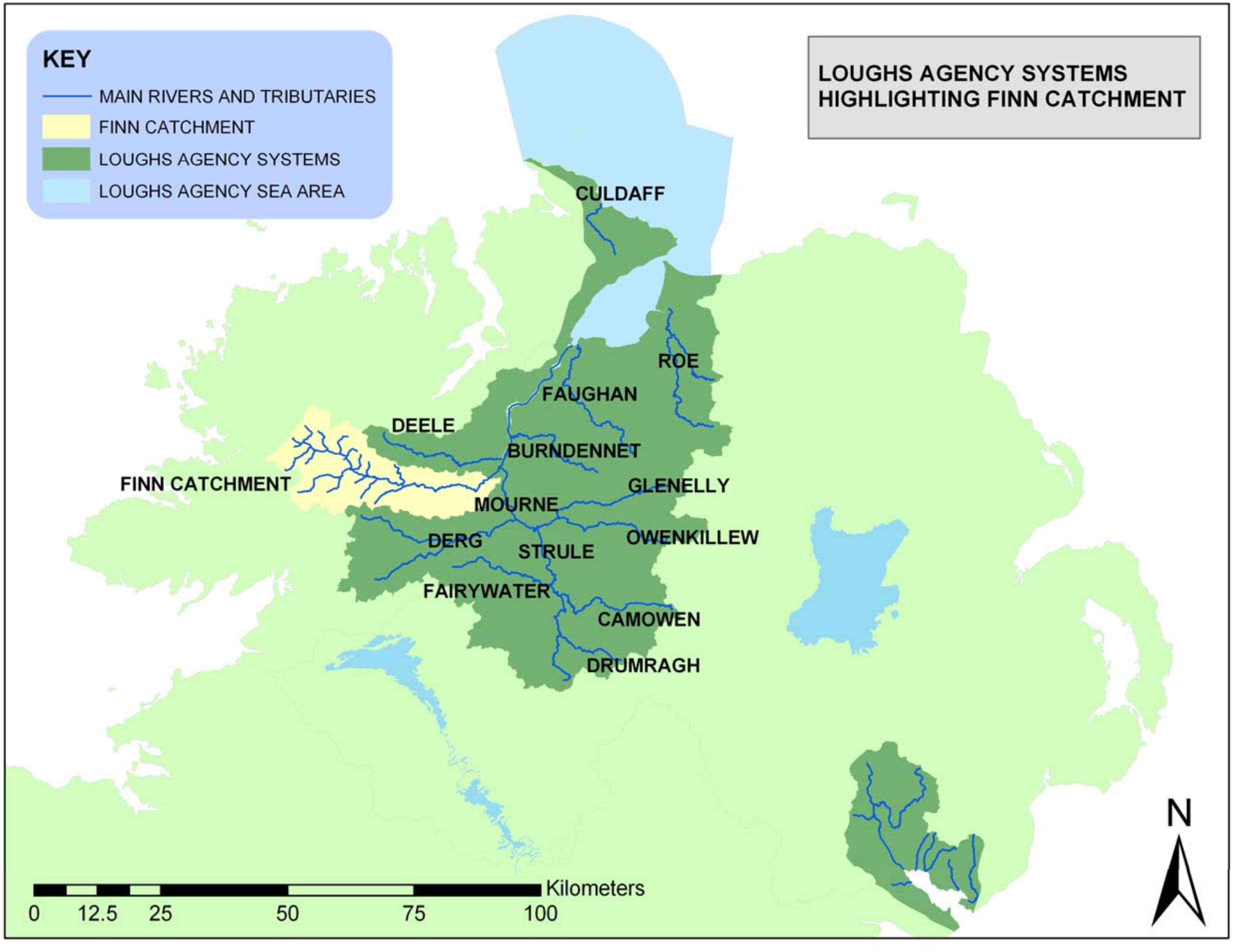
The Finn catchment is impacted upon by a wide range of anthropogenic factors within both the terrestrial and aquatic environments. A diverse array of impacts include amongst others; agriculture, sand and gravel extraction, commercial forestry, commercial and recreational fishing, industry, water abstraction, sewage treatment, diffuse and point source pollution, invasive plant species, urban sprawl and flood defences.

Increasing pressures on the aquatic environment within the Finn catchment requires appropriate monitoring, control and remediation if native biodiversity is to be preserved.

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 native species which inhabit them.

Fig 1.1 Mid section of the River Finn. Picture taken looking downstream from Liscooley Bridge.

Fig 1.11 Upper section of the River Reelan. Picture taken looking downstream from Reelan Bridge.



1.12 Foyle and Carlingford catchments illustrating the main rivers of the systems and highlighting the River Finn and Tributaries

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). In the Foyle system this can occur after one, two or three years. Most Foyle salmon (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 which 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 Finn catchment. At present monitoring is targeted at salmonid species however with obligations under the Water Framework Directive it is envisaged that other non salmonid fish species will be monitored more closely in the future.

Fish species presence and abundance 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 Arctic Charr, European Eel, River/Brook and Sea Lamprey form an important part of the native fisheries biodiversity of the Finn catchment. Non native fish species including Pike and Perch have colonised still waters within the Finn catchment. Maintaining high standards of water quality and appropriate habitat for these species is essential for the overall health of the aquatic ecosystem.

Fig 1.3 Sample of fish from the Foyle estuary

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 within the Foyle system. 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. Table 2.1 shows redd count data for the Finn catchment and the Foyle system. Water flow is of significance when monitoring redds as in high water conditions the ability to see and count redds in rivers is impaired. Figure 2.11 outlines redd counts within the Foyle area and the Finn catchment.

Area	2003/04	2004/05	2005/06	2006/07	2007/08
Foyle System	3163	2478	5354	*1338	3039
Finn Catchment	451	559	684	*221	646
Finn as a % of Foyle	14	23	13	*17	21

Table 2.1 Redd counts for Foyle system and Finn catchment 2003/04 – 2007/08. *Note 2006/07 had extremely poor water conditions for redd counting.

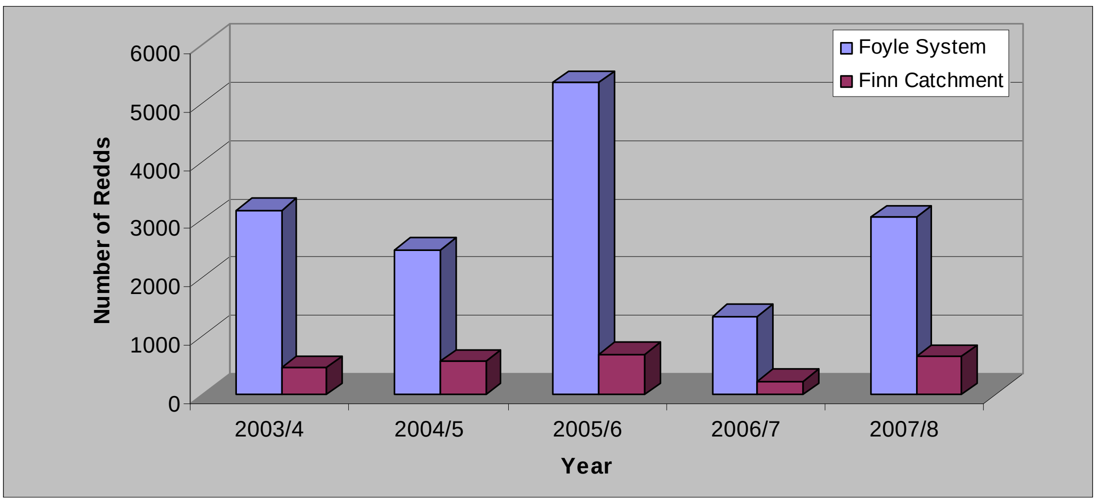


Fig 2.11 Redd counts for Foyle system and Finn catchment 2003/04 – 2007/08

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 years data allowing for change to be monitored, facilitating suitable fishery management practices to be implemented.

In 2007 a total of 487 sites were semi-quantitatively electrofished within the Foyle 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 2.21 to 2.29 outline the salmon 0+ electrofishing results and site classifications for the Finn catchment over recent 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 rational behind them are discussed in greater detail later.

Obligations under the Water Framework Directive will drive future 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

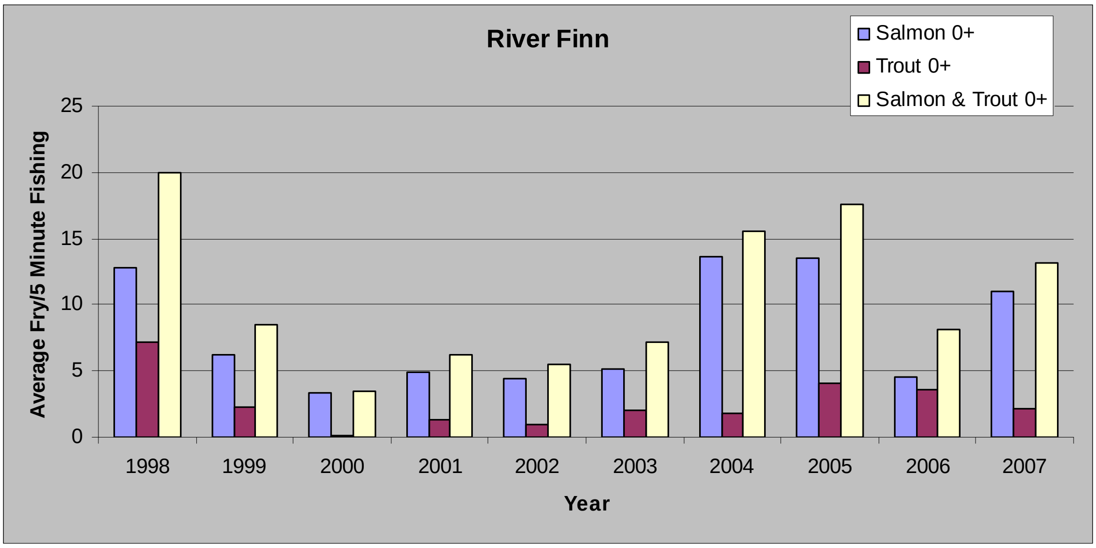


Fig 2.21 River Finn (Foyle area) catchment fry index 1998-2007. Note number of sites surveyed has fluctuated annually from 32 in 1998 to 68 in 2007.

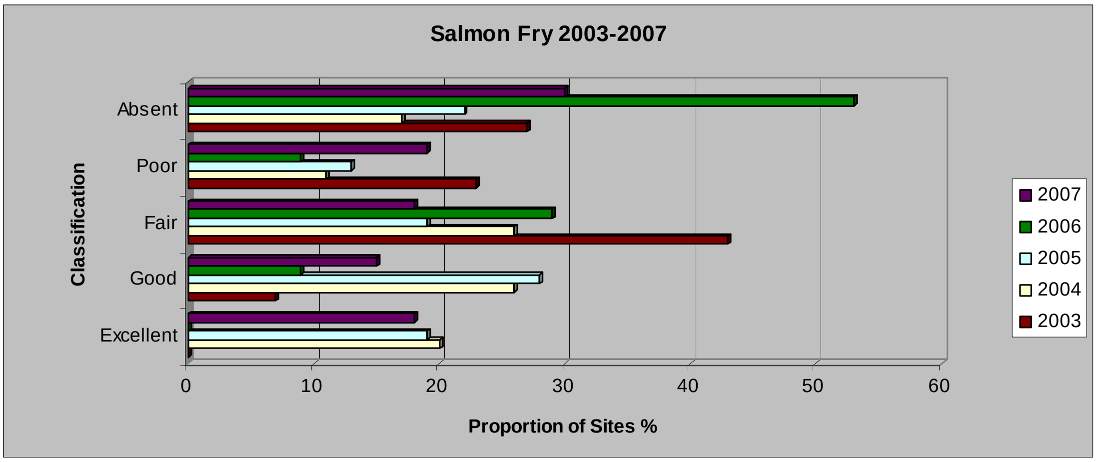


Fig 2.22 Site classifications for Finn catchment salmon 0+ electrofishing as a percentage of all sites fished, 2003 - 2007

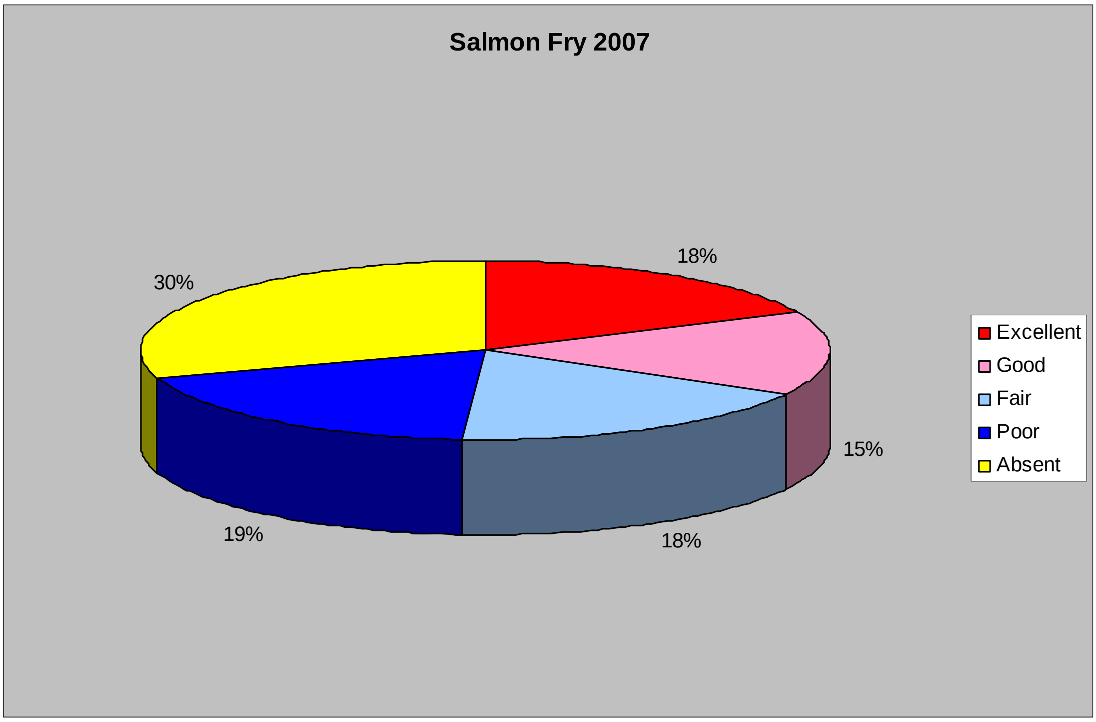


Fig 2.22 Finn catchment salmon 0+ electrofishing site classifications as a percentage of all sites fished in 2007

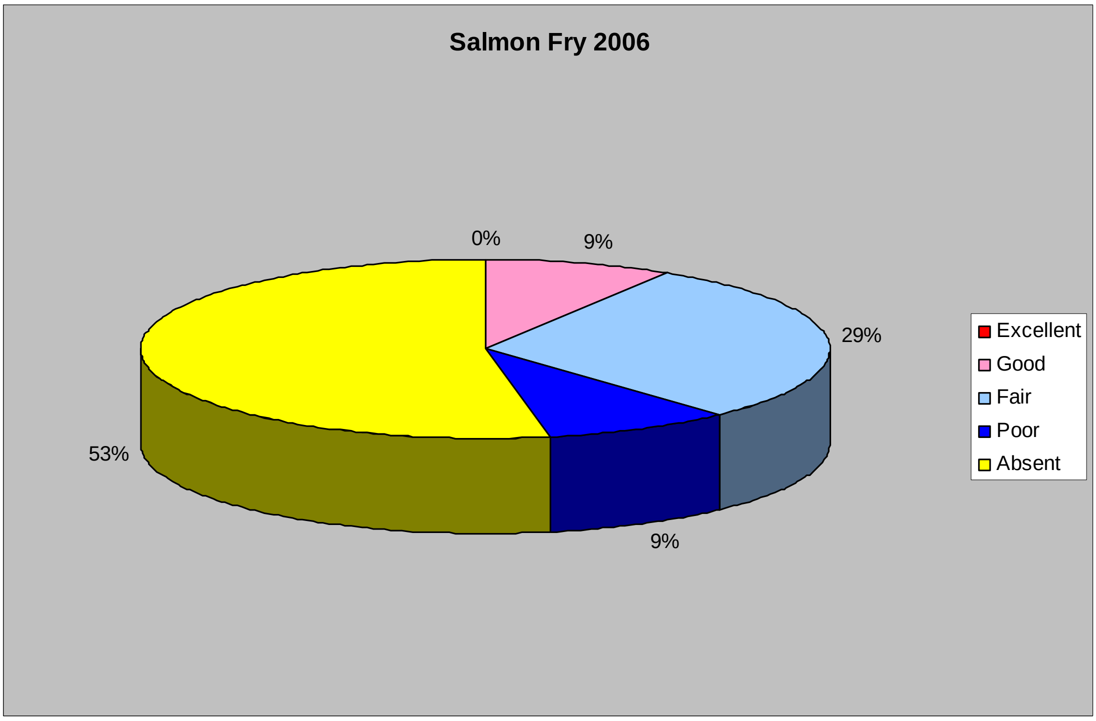


Fig 2.23 Finn catchment salmon 0+ electrofishing site classifications as a percentage of all sites fished in 2006

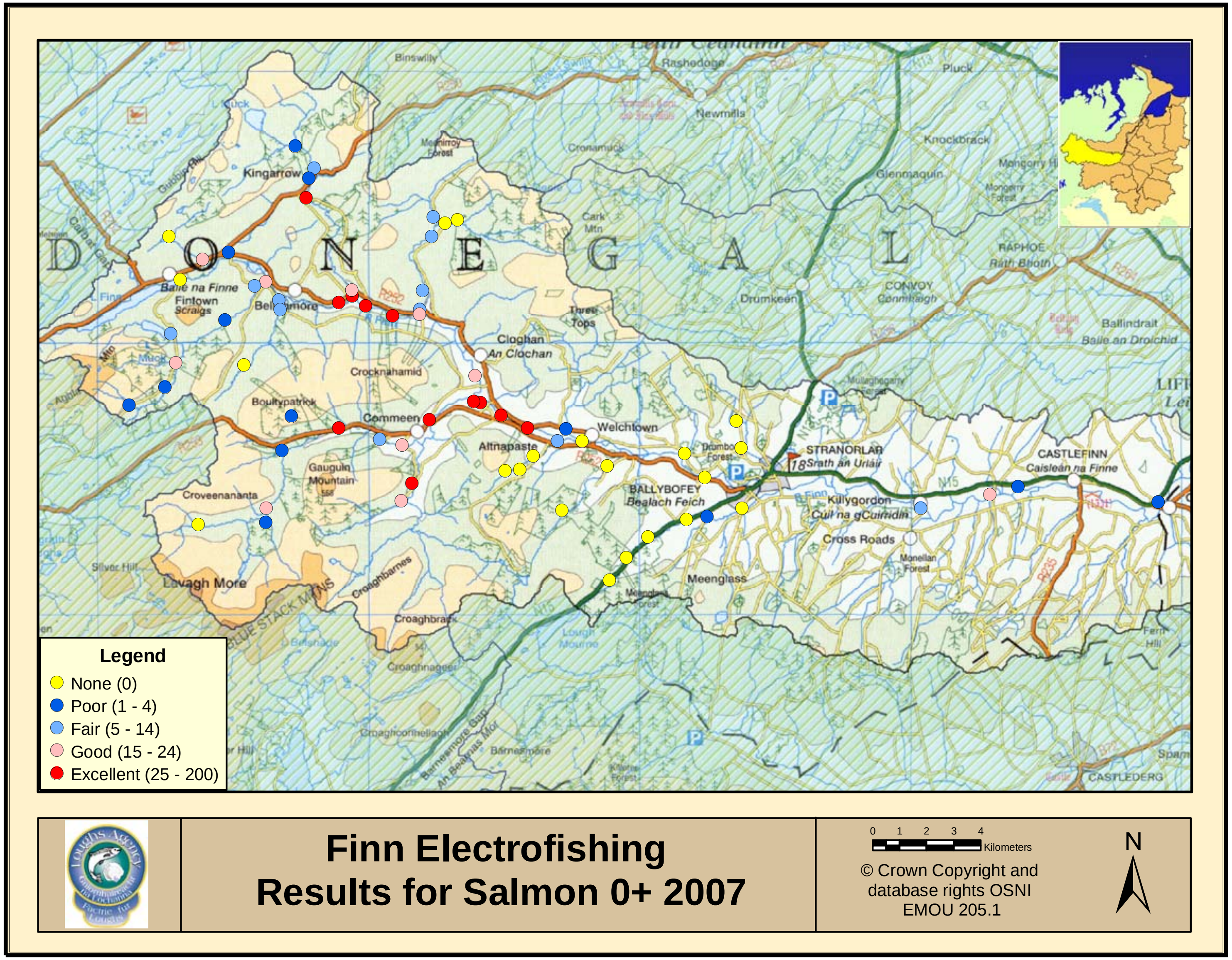


Fig 2.24 Salmon 0+ electrofishing site classification 2007

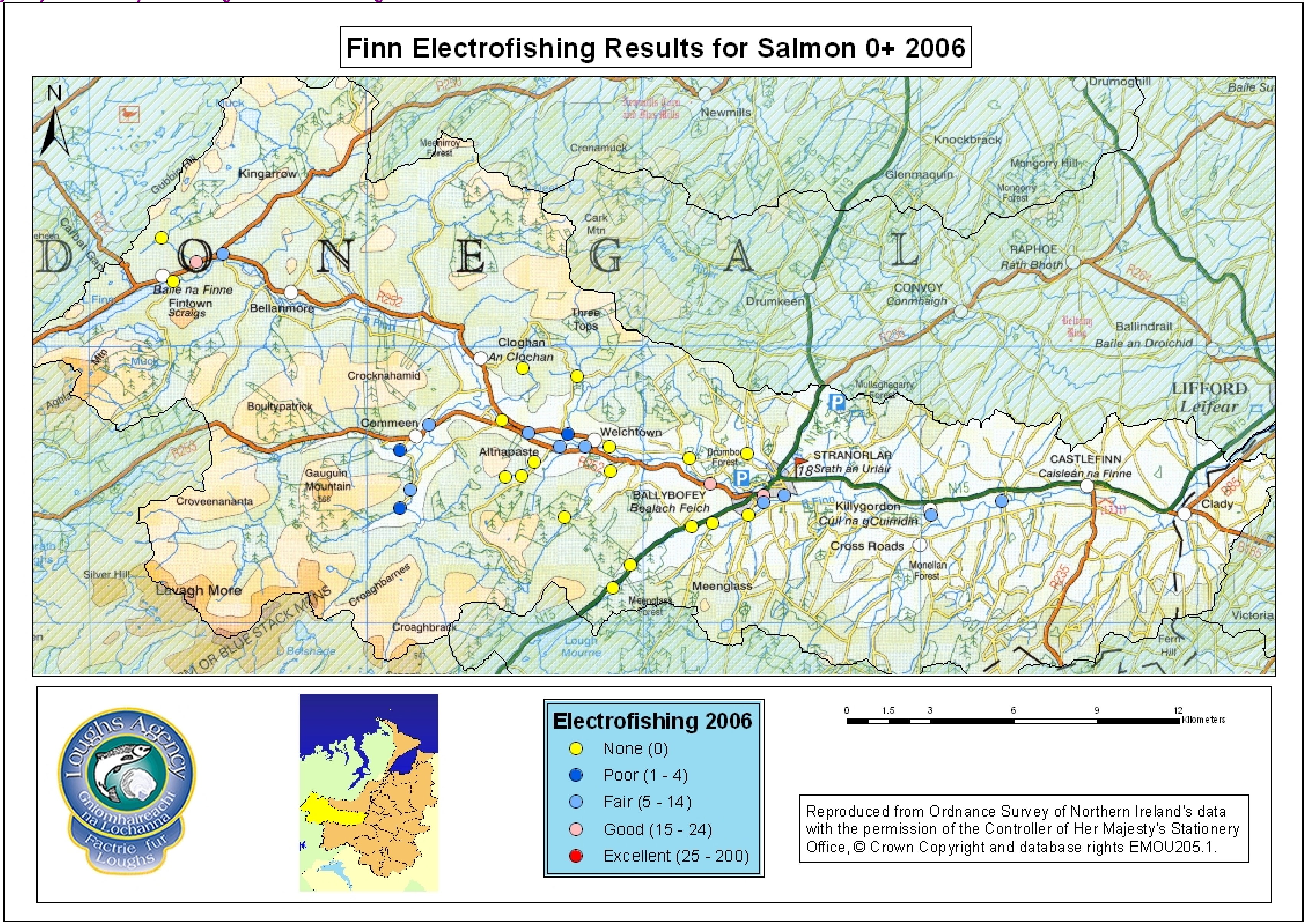


Fig 2.25 Salmon 0+ electrofishing site classification 2006

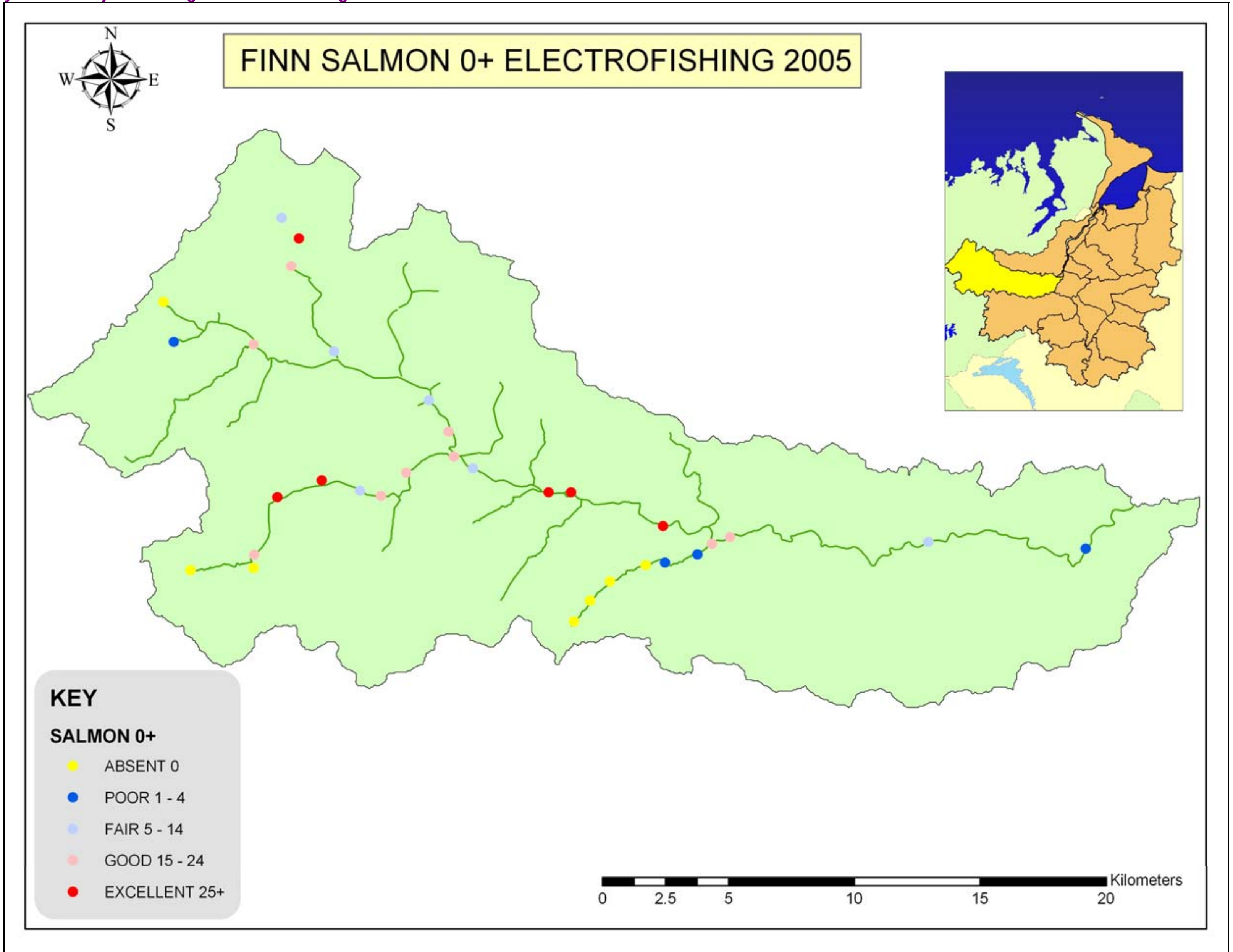


Fig 2.26 Salmon 0+ electrofishing site classification 2005

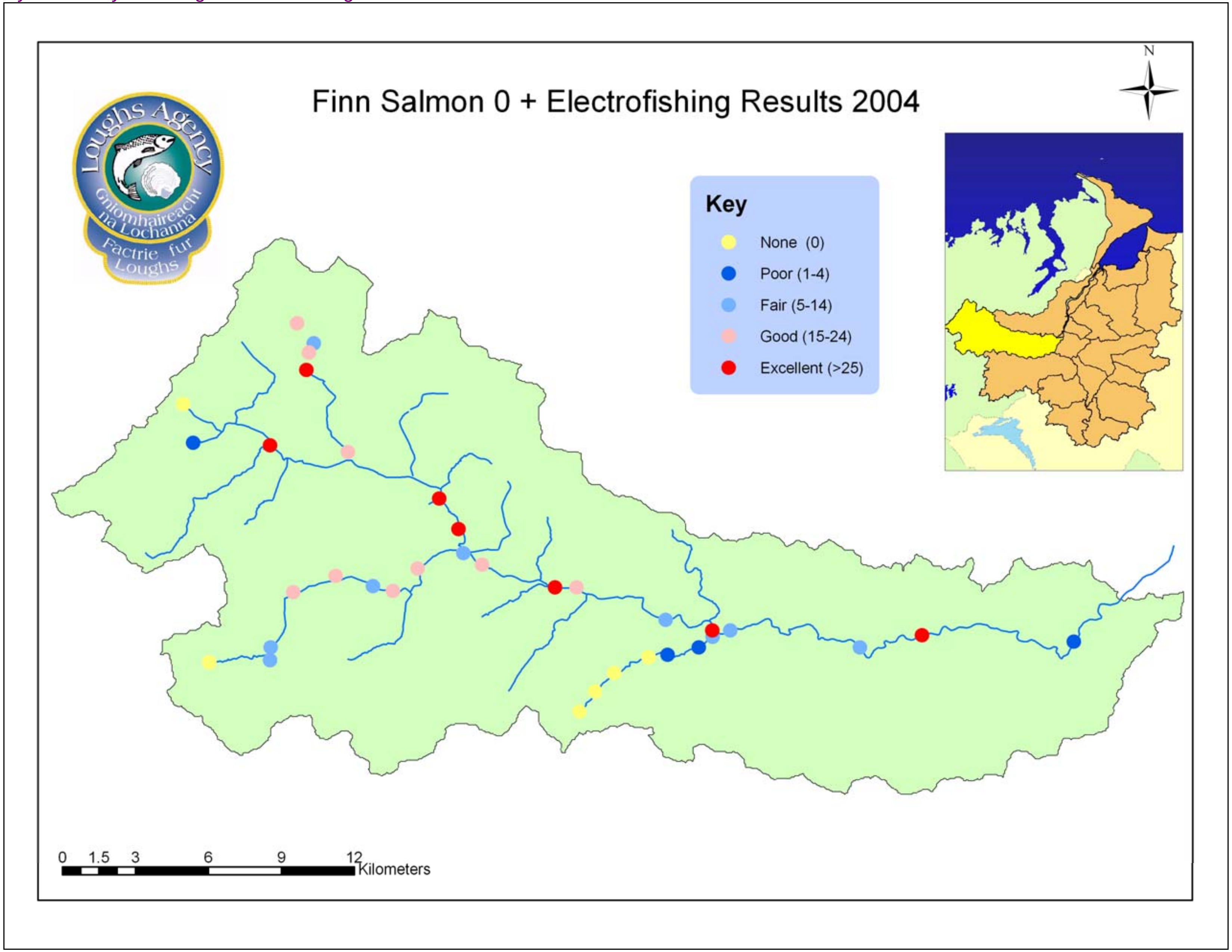


Fig 2.27 Salmon 0+ electrofishing site classification 2004

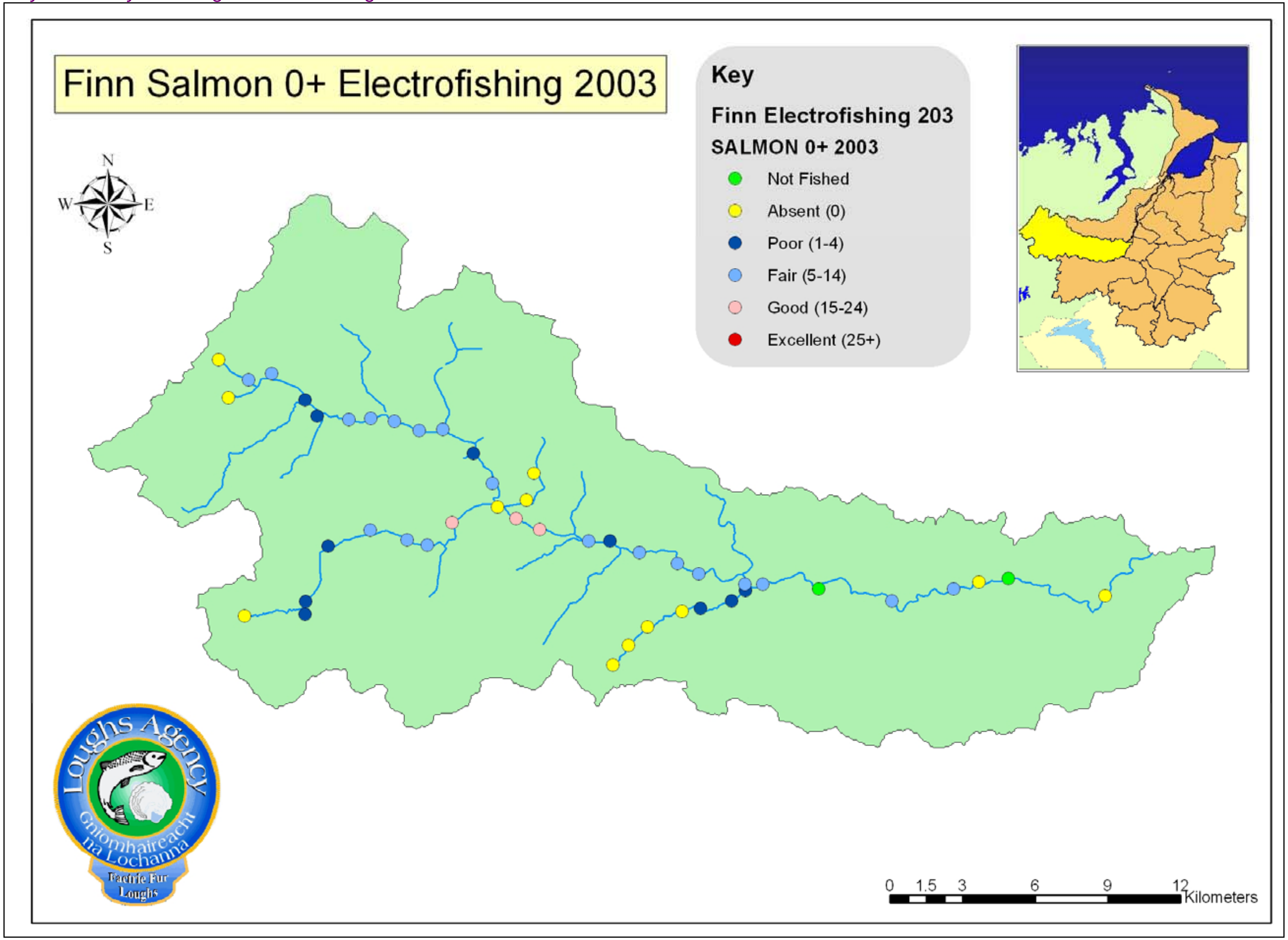


Fig 2.28 Salmon 0+ electrofishing site classification 2003

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 Finn catchment and site classifications are displayed in Figs 3.1, 3.11, 3.12, 3.13, 3.14,3.15, 3.16 and 3.17.

Fig 3 Electrofishing survey and trout parr

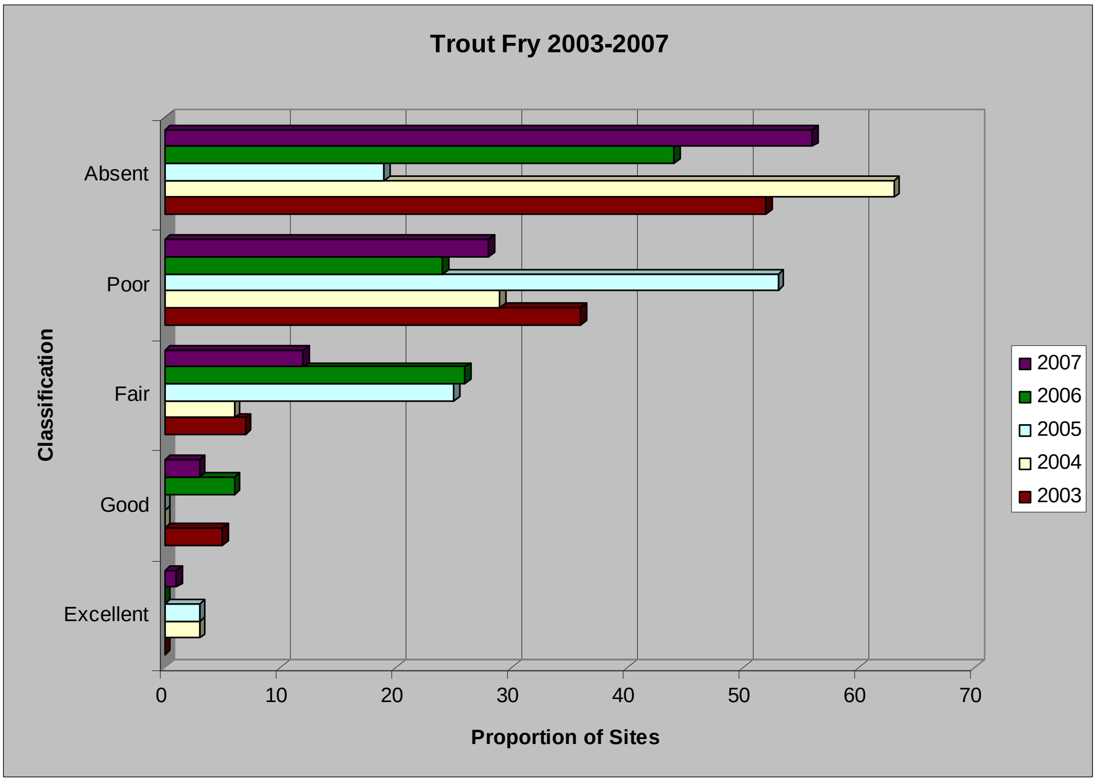


Fig 3.1 Site classifications for Finn catchment trout 0+ electrofishing as a percentage of all sites fished, 2003 – 2007

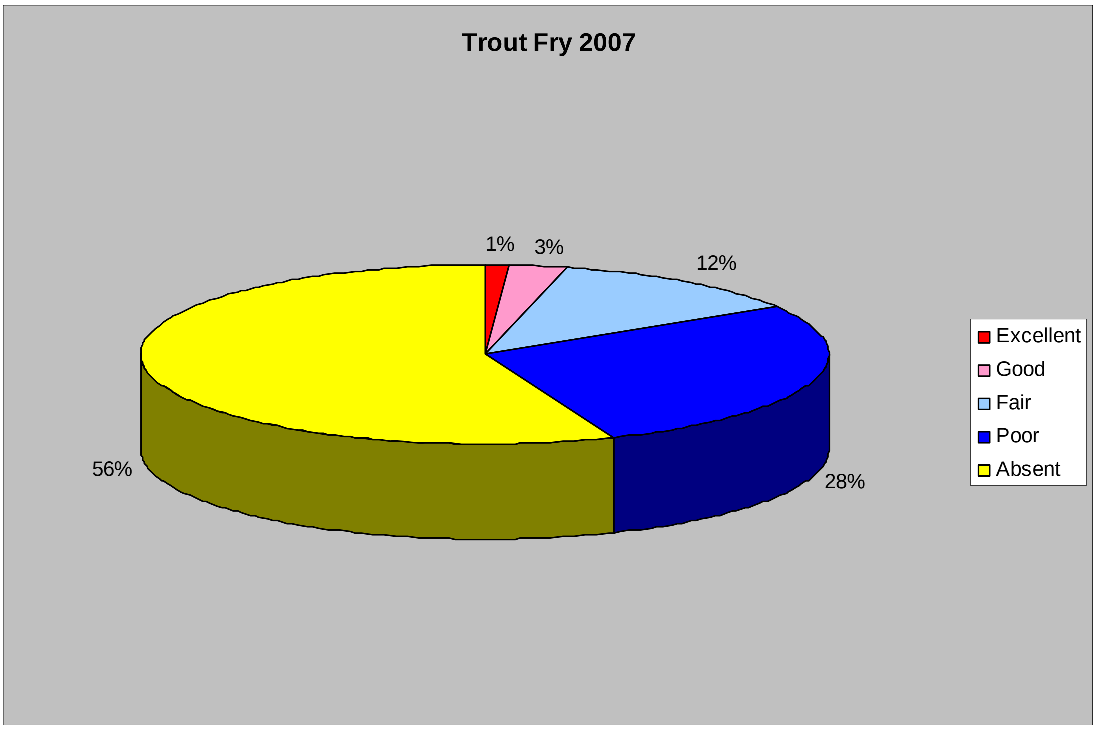


Fig 3.11 Finn catchment trout 0+ electrofishing site classifications as a percentage of all sites fished in 2007

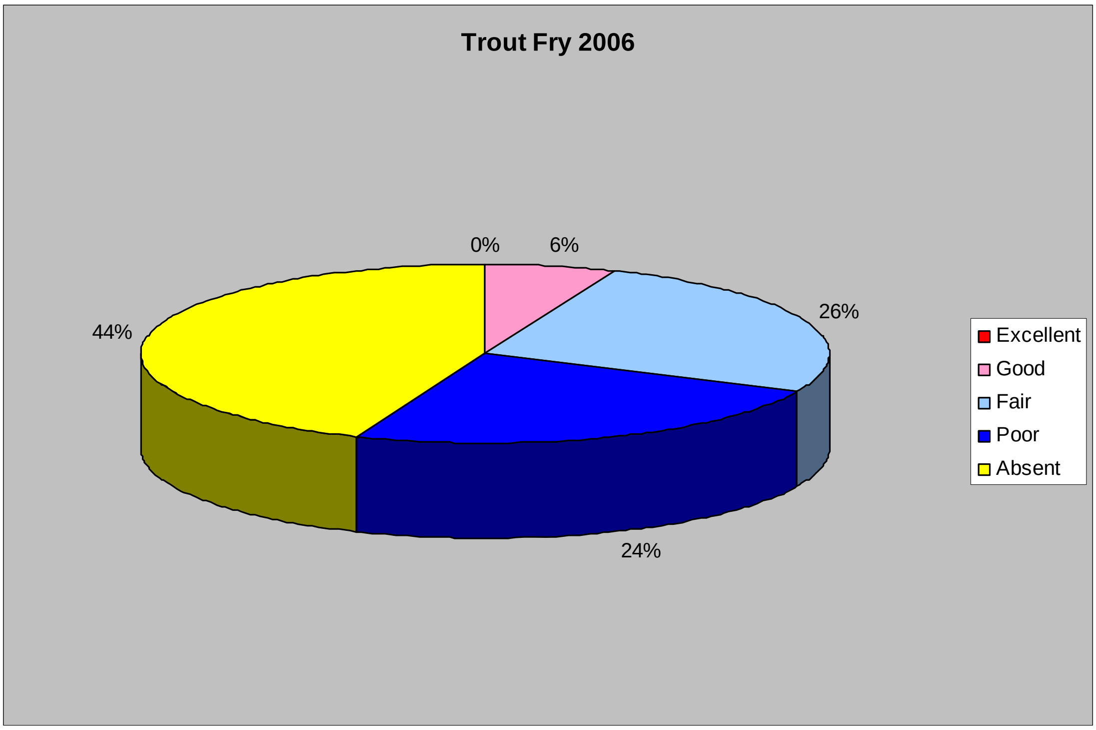


Fig 3.12 Finn catchment trout 0+ electrofishing site classifications as a percentage of all sites fished in 2006

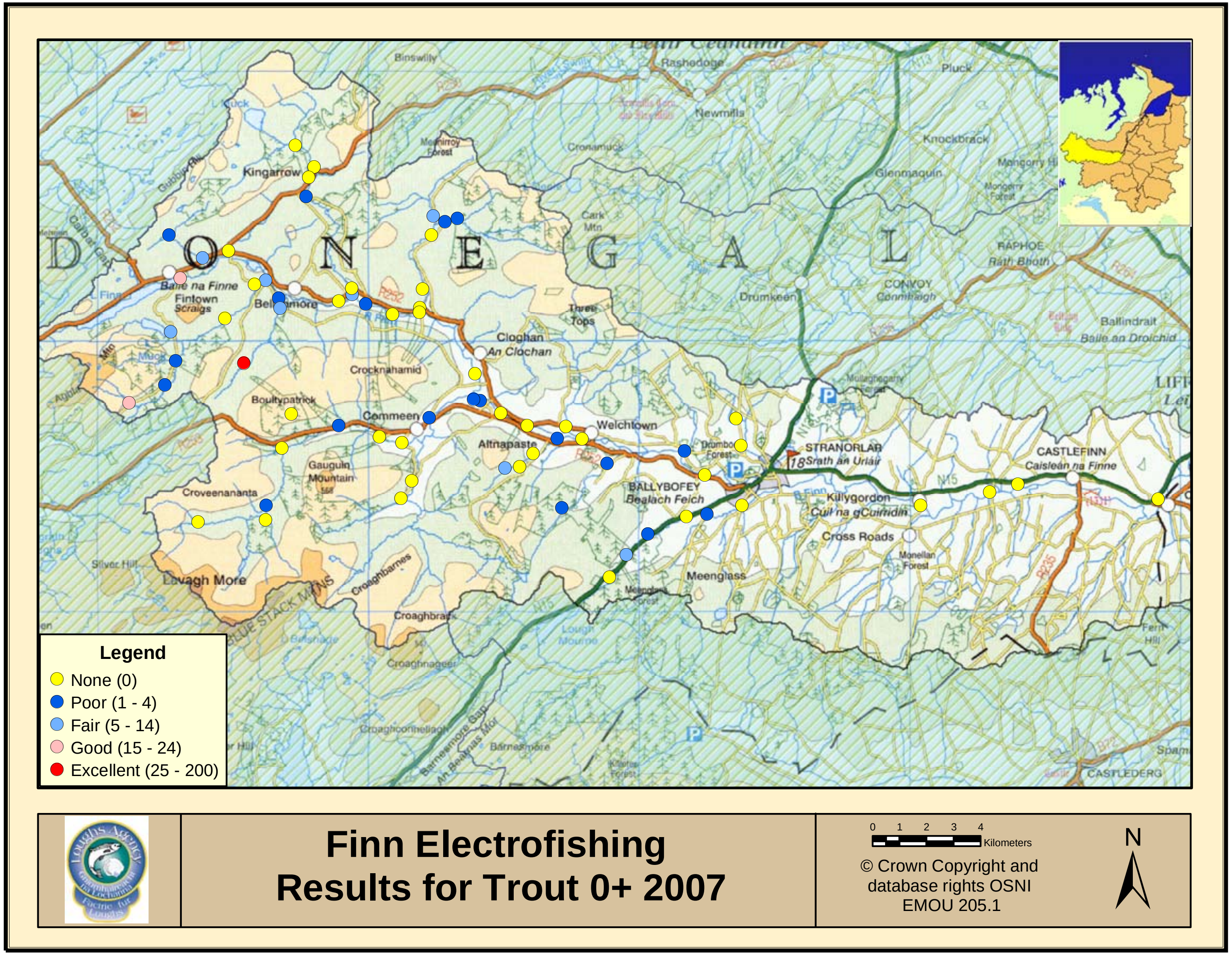


Fig 3.13 Trout 0+ electrofishing site classification 2007

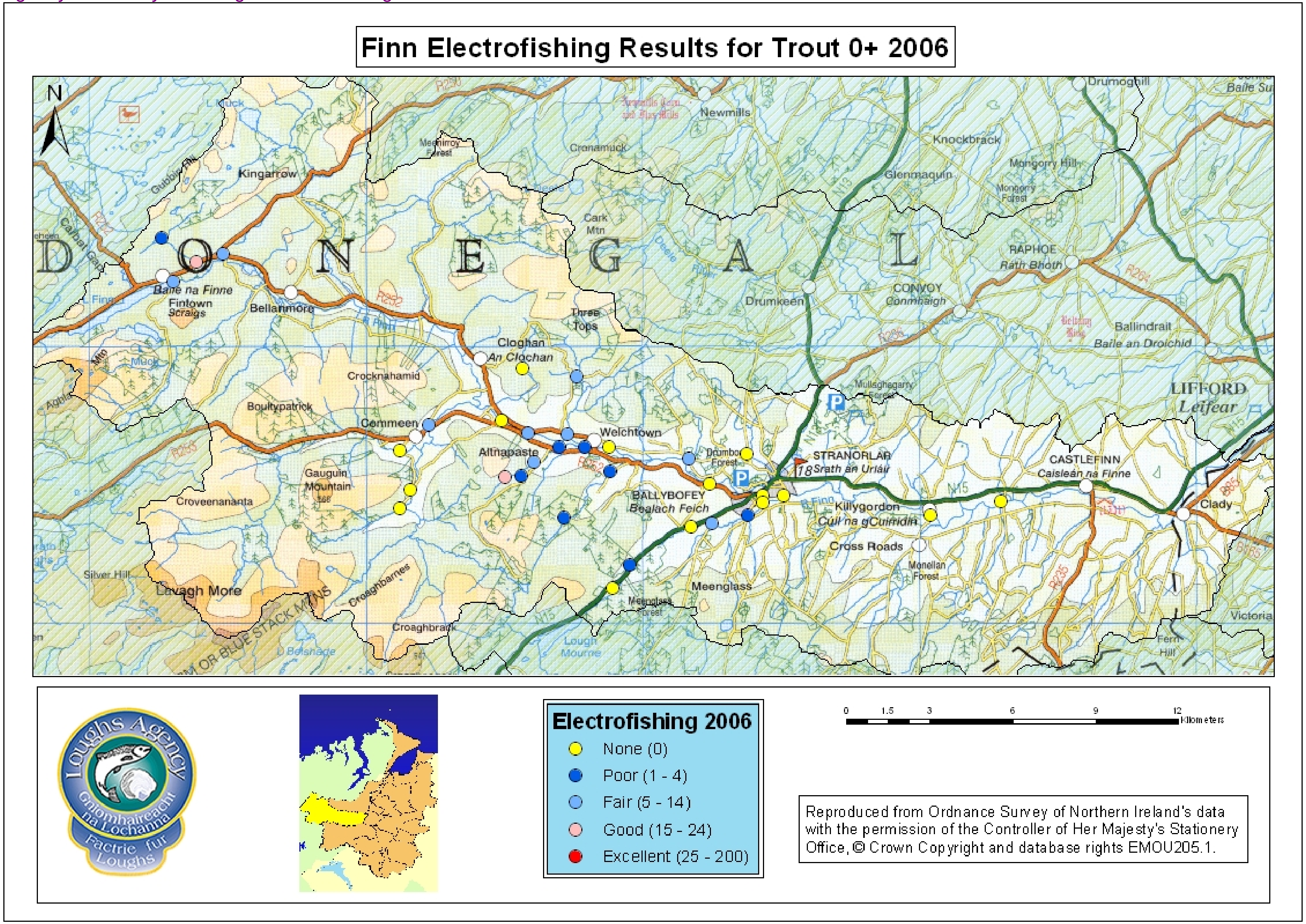


Fig 3.14 Trout 0+ electrofishing site classification 2006

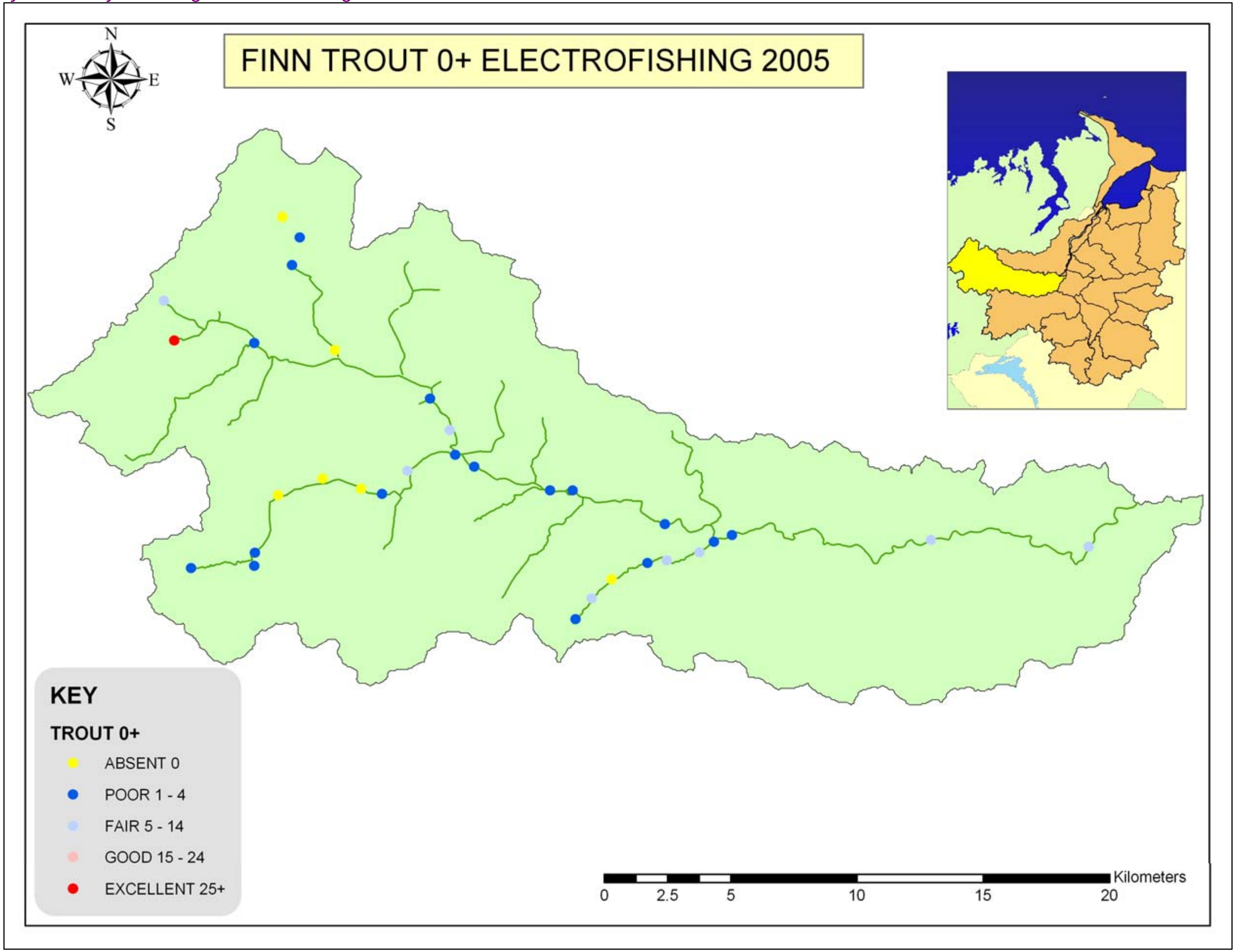


Fig 3.15 Trout 0+ electrofishing site classification 2005

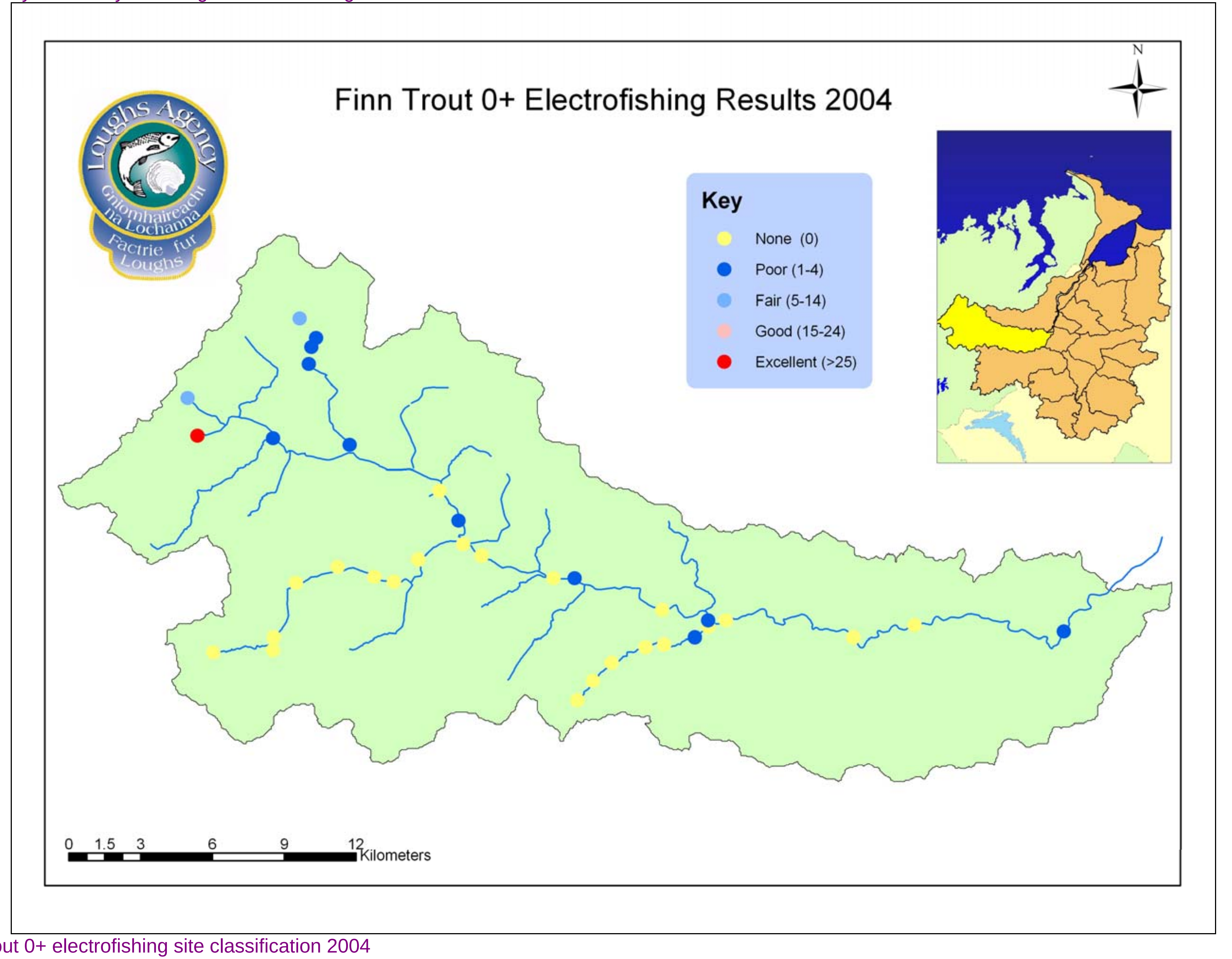


Fig 3.16 Trout 0+ electrofishing site classification 2004

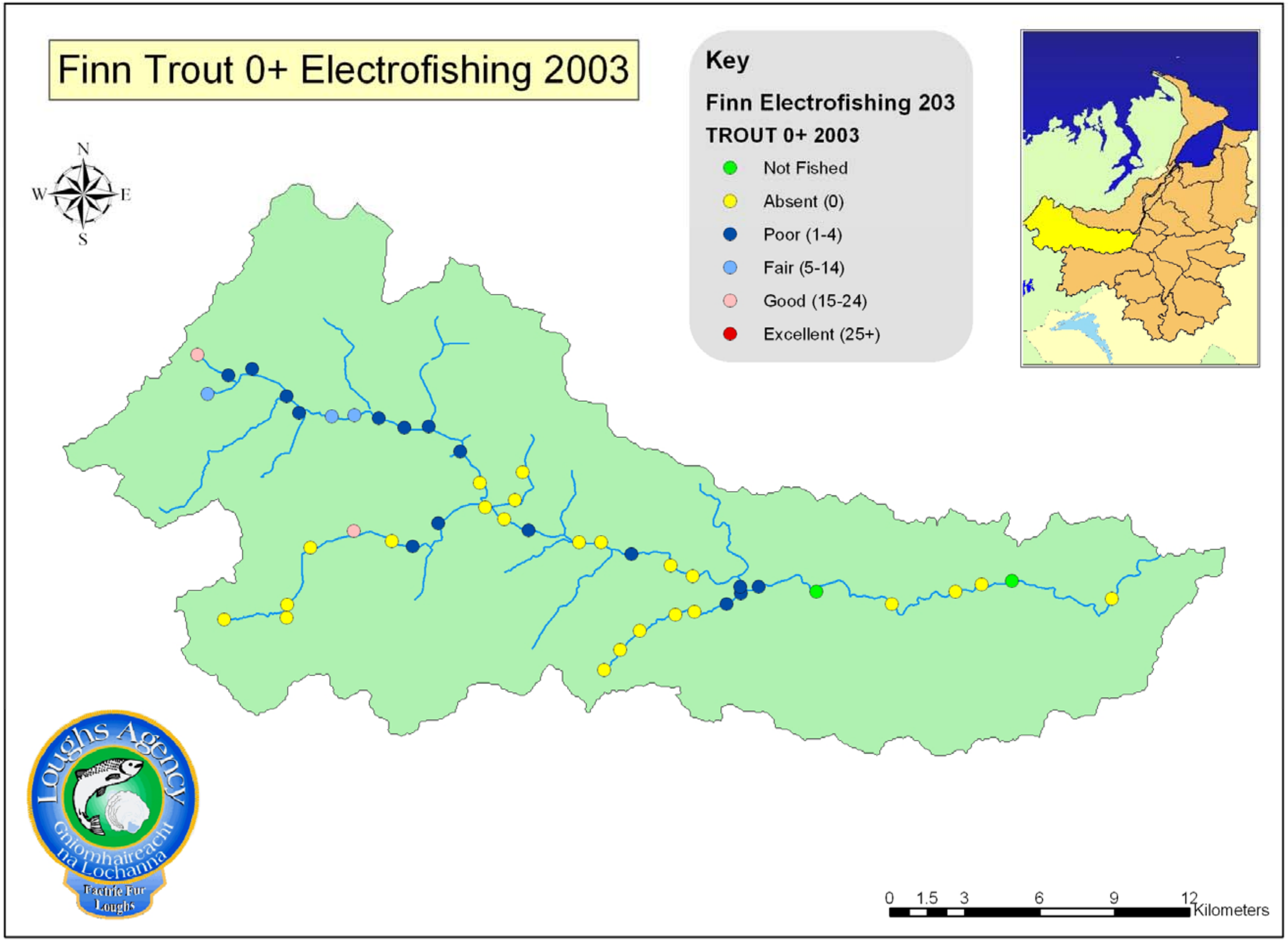


Fig 3.17 Trout 0+ electrofishing site classification 2003

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 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 20%
2002	2003	5.9
2003	2004	4.3
2004	2005	4.6
2005	2006	4.2
2006	2007	13.0

Table 4 Marine survival rates for the River Bush of 1SW grilse (after exploitation at sea) pre 1996 and 2002-2006 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 to collect the necessary data to answer the questions listed above. Over 426 post smolts were caught by the two Irish cruises and 363 post smolts caught by the Faroese in the areas highlighted below. Further information and project details can be found at: http://www.nasco.int/sas/salsea.htm

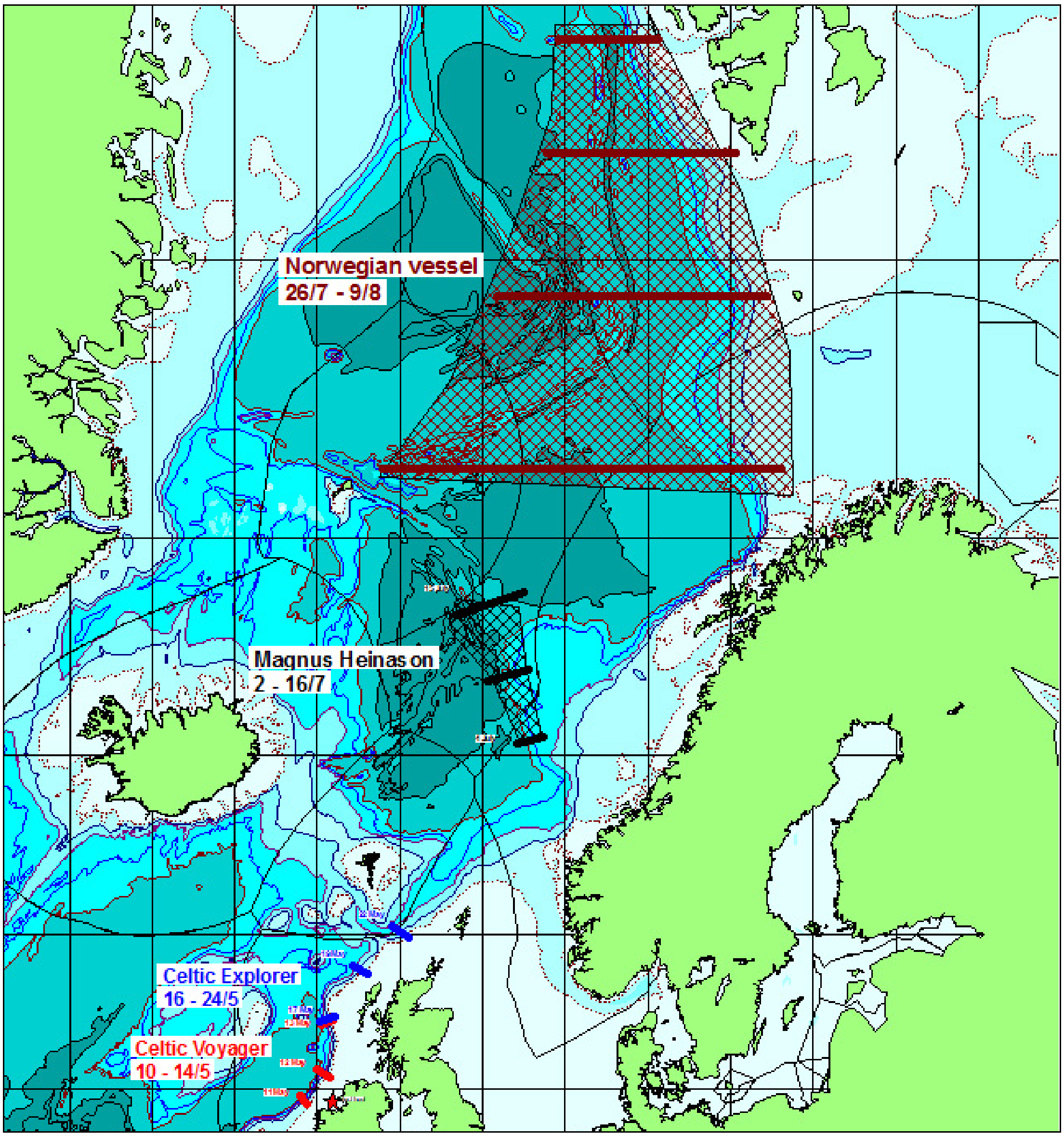


Fig 4 Proposed marine survey areas for salmon in 2008


Fig 4a RV Celtic Explorer

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

Since 2002 partial smolt trapping including CWT tagging has been conducted in the Finn catchment using a rotary screw trap, Fig 4.

Figure 4c Rotary screw trap in position on the River Finn directly below the adult trap at Killygordon fish counting station.

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.

Tables 4.1 and 4.12 outline numbers of salmon smolts tagged from 2002-2006 (no tagging took place in 2007) and recapture data for 2003 and 2007.

Year	No of Salmon Smolts Tagged	Average Length (mm)	Average Weight (g)
2002	690	125	19.8
2003	2252	127	20.2
2004	773	127	20.31
2005	390	129	20.5
2006	779	120	19.29

Table 4.1 Numbers and average weight and length of salmon smolts tagged on the River Finn 2002-2006. 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
2002	2003	10	Donegal Coast, North Coast, Mayo, Galway
	2004	1	River
2003	2004	25	Donegal, Mayo, Kerry, River
2004	2005	8	Foyle Area and River
2005	2006	1	Torr
2006	2007	8	Ballycastle, River Finn, Foyle Area

Table 4.12 Recapture data from River Finn CWT programme.

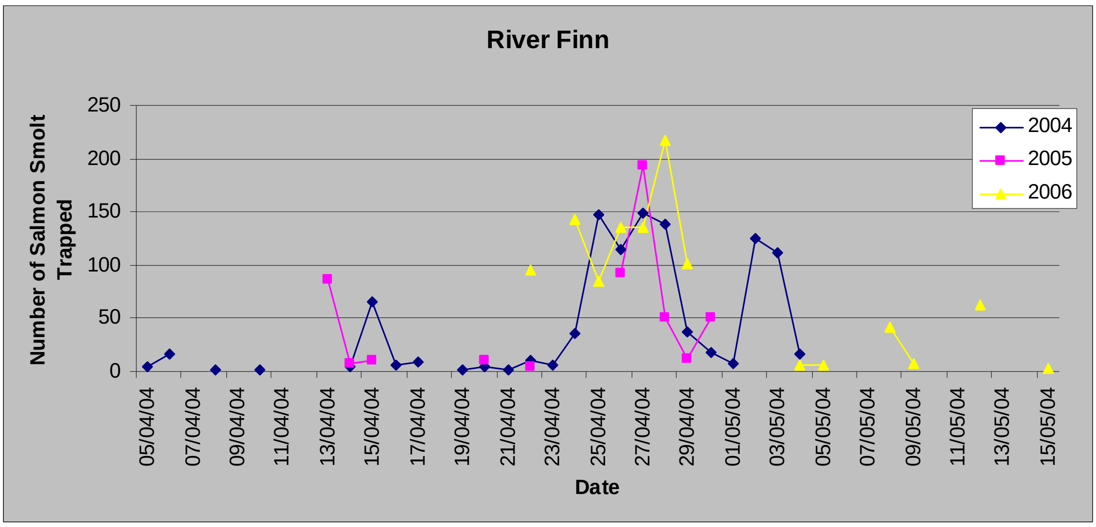


Figure 4d Salmon smolt run timing and abundance from rotary screw trap sub sample, River Finn 2004-2006. Breaks in data are due to closure of trap during high water conditions

All micro-tagged fish have had their adipose fin removed (small fin between dorsal fin and tail), if any fisher catches a salmon or grilse without this fin a bounty is payable on the return of the fish head to Loughs Agency

Headquarters in Prehen, please include location and date fish was caught, length, weight and scale sample.

Fig 4e From top to bottom, Atlantic salmon smolts from the Finn Catchment, sea lamprey, brook lamprey and river lamprey also caught in the River Finn 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

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.

Year	Declared Catch Finn Catchment (Salmon)	Declared Catch Finn Catchments (Sea Trout)
2001	1162	66
2002	2263	295
2003	590	50
2004	627	5
2005	1128	26
2006	780	71
2007	805	52

Table 5.11 Declared catch from the Finn catchment for salmon and sea trout 2001-2007

Fig 5.12 Recreational fisher on the River Reelan. Photograph by Gardiner Mitchell

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 rest of 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.

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	5558	6031	11589
*2007	*2598	*2774	*5372

Table 5.2 Declared catch from the commercial salmon fisheries 1998-2007. Note 100% rate of catch returns. *Reduced numbers of commercial nets operating in the Foyle area from 2007.

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. The Killygordon fish counting station (Fig 5.31) counts fish destined for all tributaries of the River Finn located upstream of this point. A time series of counts for the Killygordon fish counting station on the River Finn is outlined in table 5.32.

Fig 5.31 Fish counting facilities at Killygordon, River Finn

Year	Number of fish >45cm
2002	5768
2003	6461
2004	3778
2005	8571
2006	5770
2007	3278

Table 5.32 Killygordon fish counter figures 2002-2007

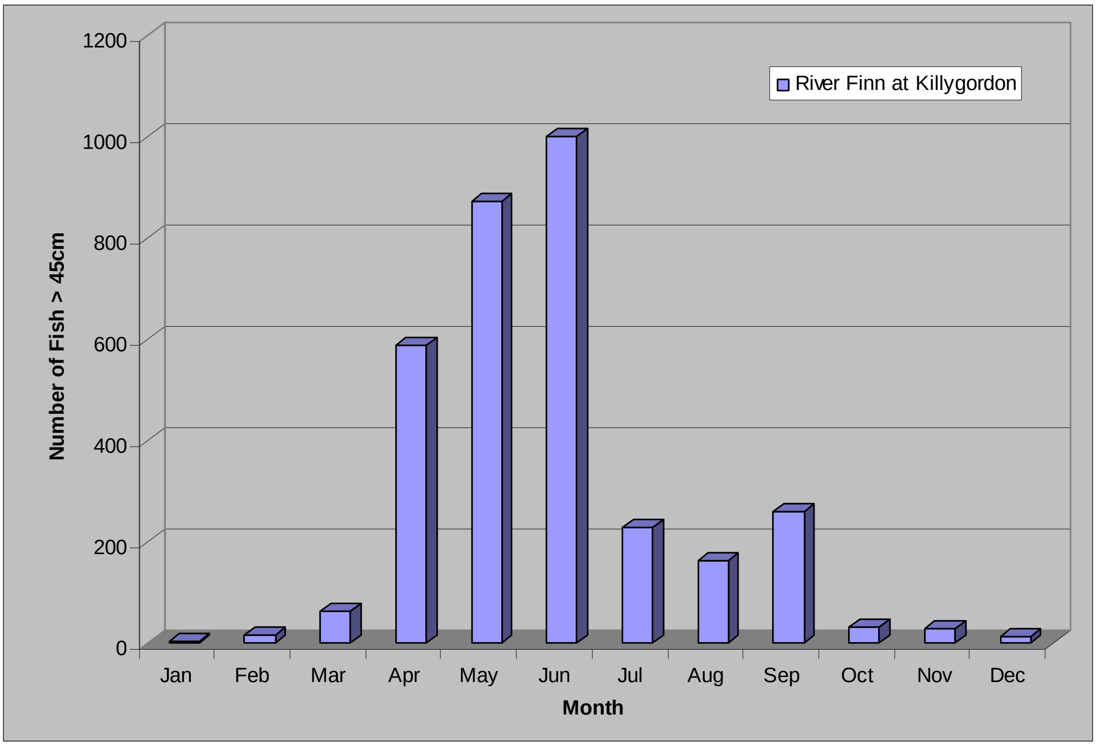


Fig 5.33 Monthly fish count at Killygordon in 2007

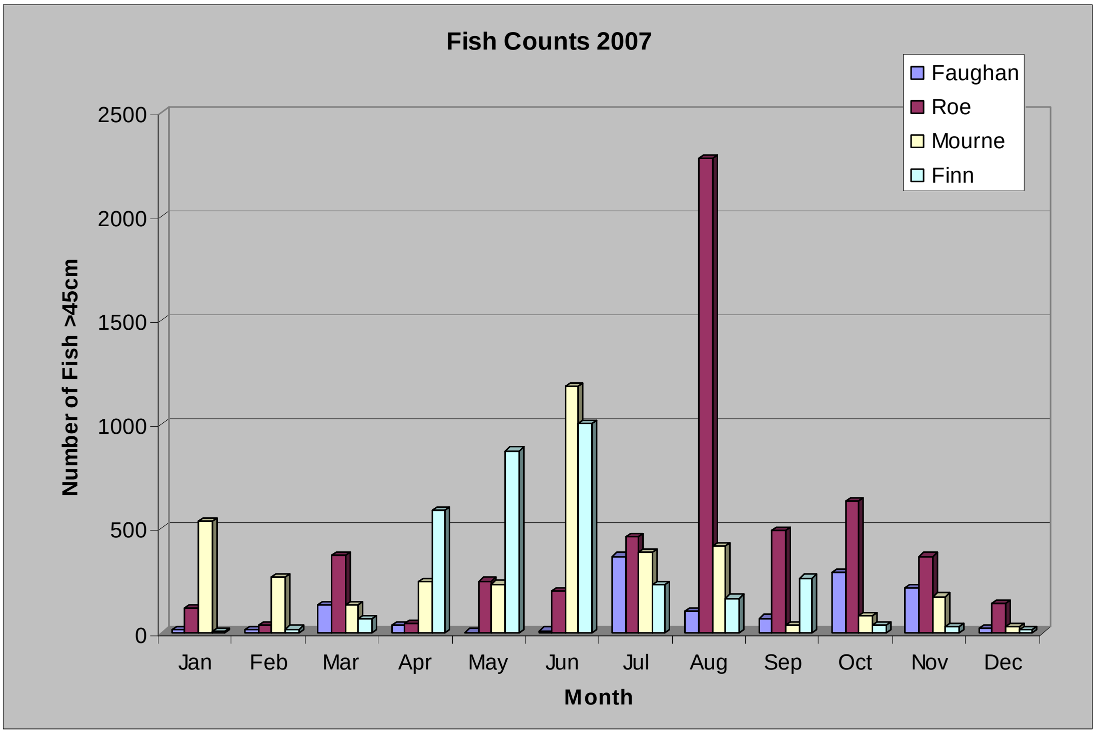


Fig 5.34 Monthly fish counts on the River Finn (Killygordon), River Roe, River Faughan and River Mourne at Sion Mills in 2007

5.4 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. In the Foyle system the 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 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.

Year	No of Fish Across Counter	Declared Rod Catch (Salmon)	Declared Rod Catch as a % of Fish Over Counter
2002	5768	2263	39
2003	6461	590	9
2004	3778	627	17
2005	8571	1128	13
2006	5770	780	14
2007	3278	805	25

Table 5.4 River Finn declared salmon rod catch as a % of fish over the fish counter

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. A management target of 5410 adult Atlantic salmon has been set for the Finn Catchment, this equates to a conservation limit/spawning target of 4328.

Year	No of Fish Across Counter	Estimated Egg Deposition
2002	5768	6,489,000
2003	6461	7,268,625
2004	3778	4,250,250
2005	8571	9,642,375
2006	5770	6,491,250
2007	3278	3,687,750

Table 5.41 River Finn estimated egg deposition 2002-2007

6.0 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.

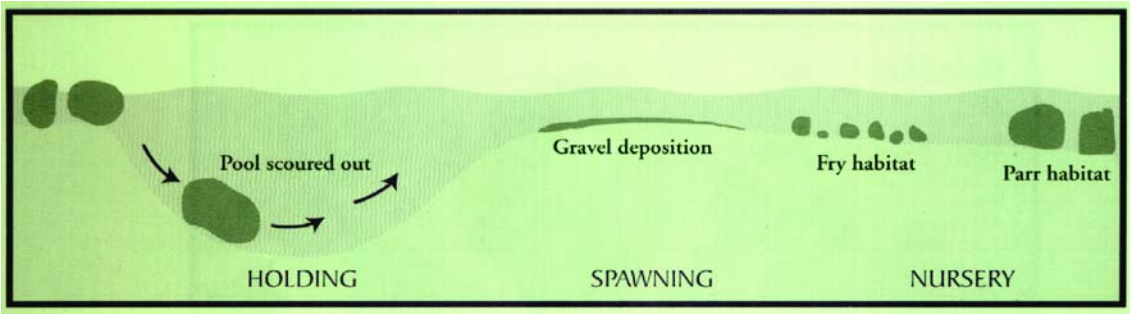


Fig 6 Life cycle unit depicting the type of habitat found in spawning, nursery and holding zones

Fig 6.1 Examples of spawning, nursery and holding habitat

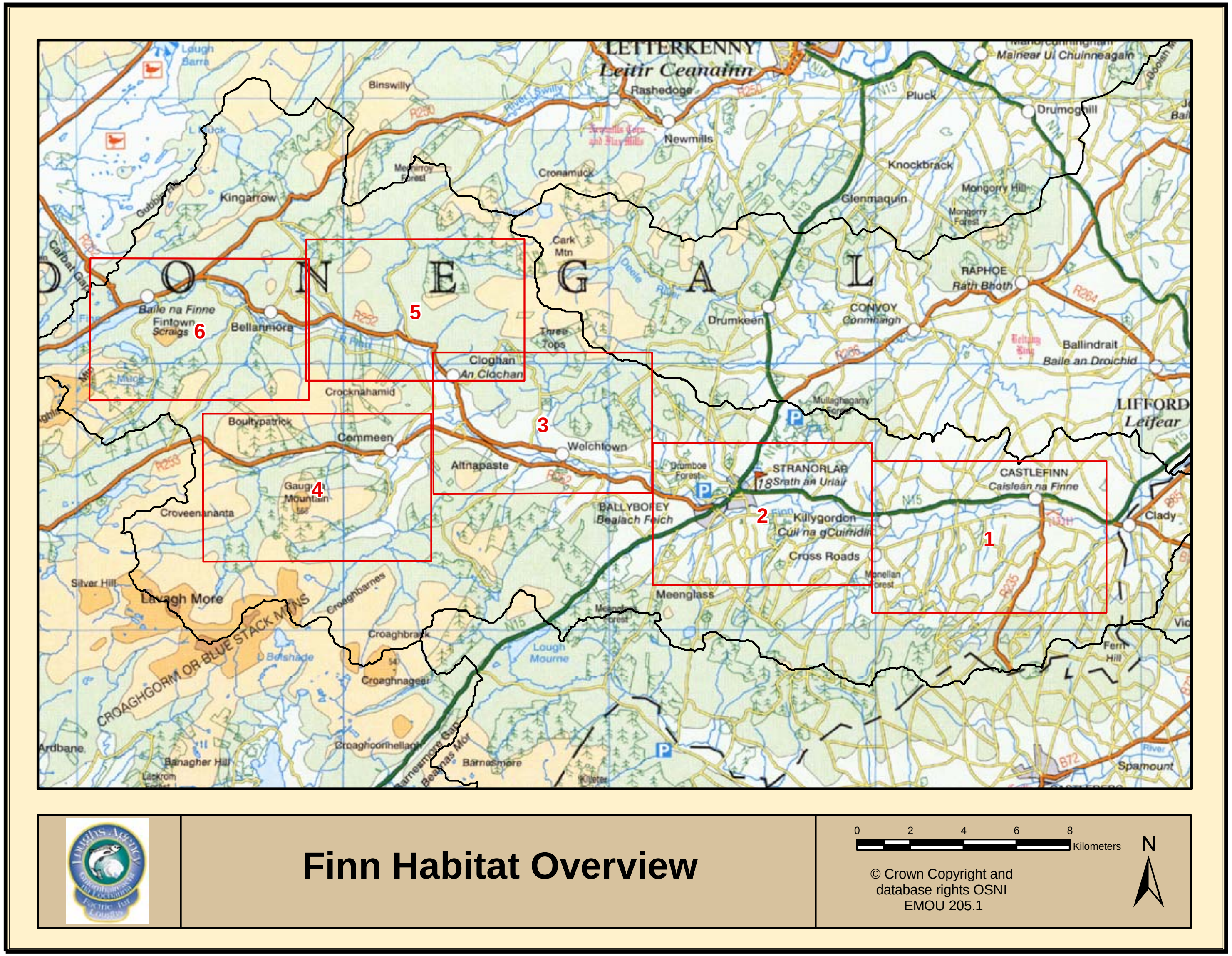


Fig 6.11 Habitat overview key for Finn catchment

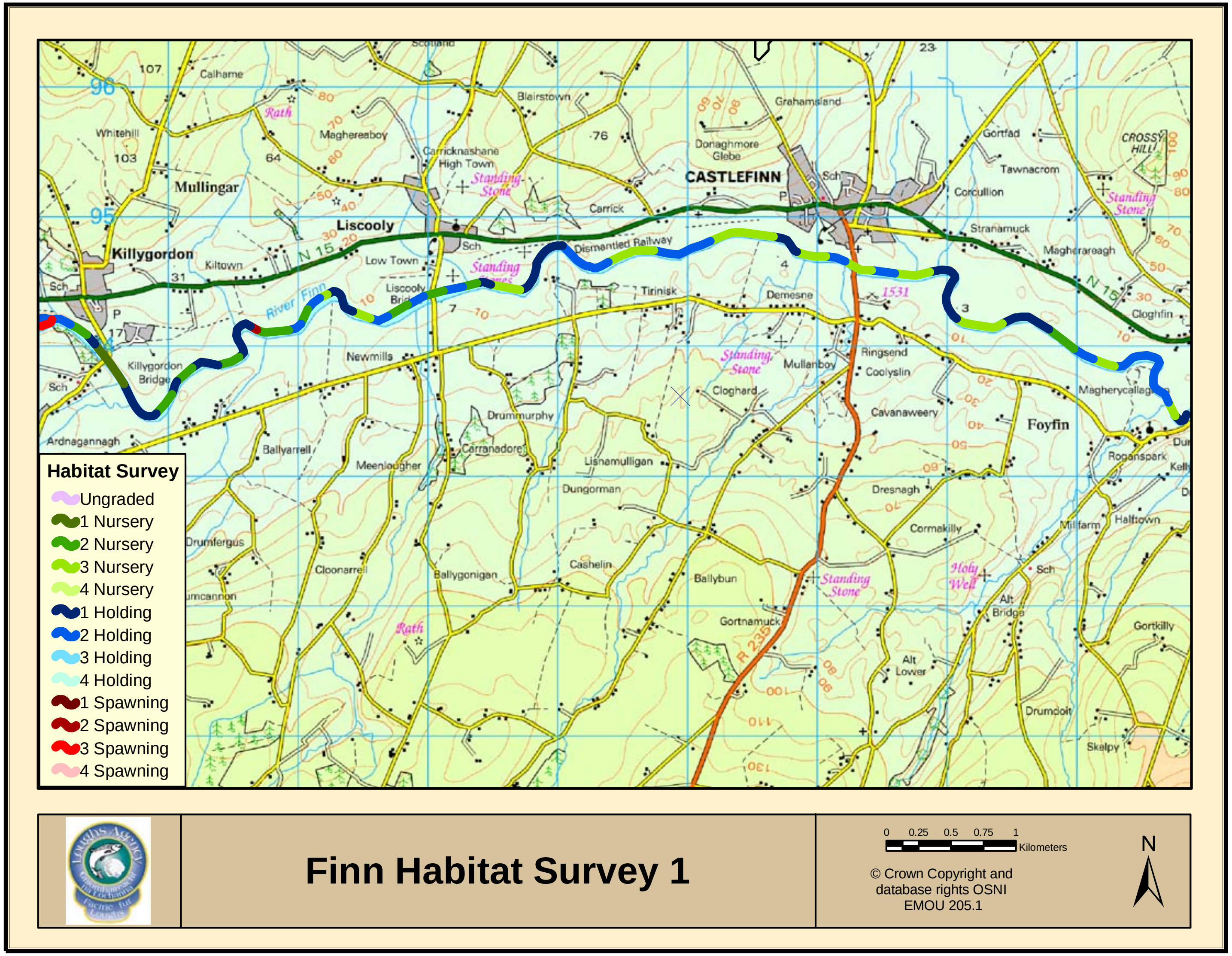


Fig 6.12 Finn catchment habitat survey map 1

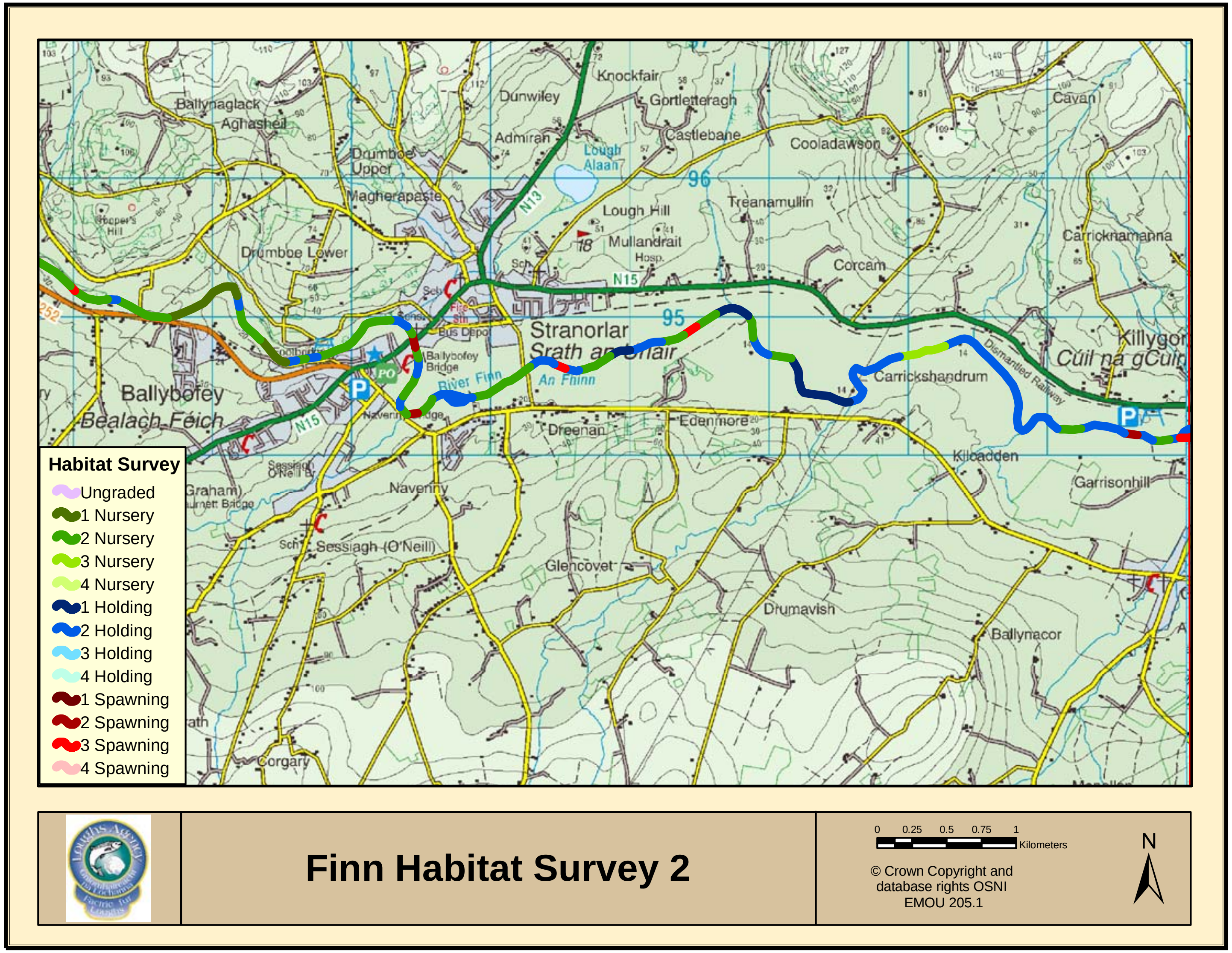


Fig 6.13 Finn catchment habitat survey map 2

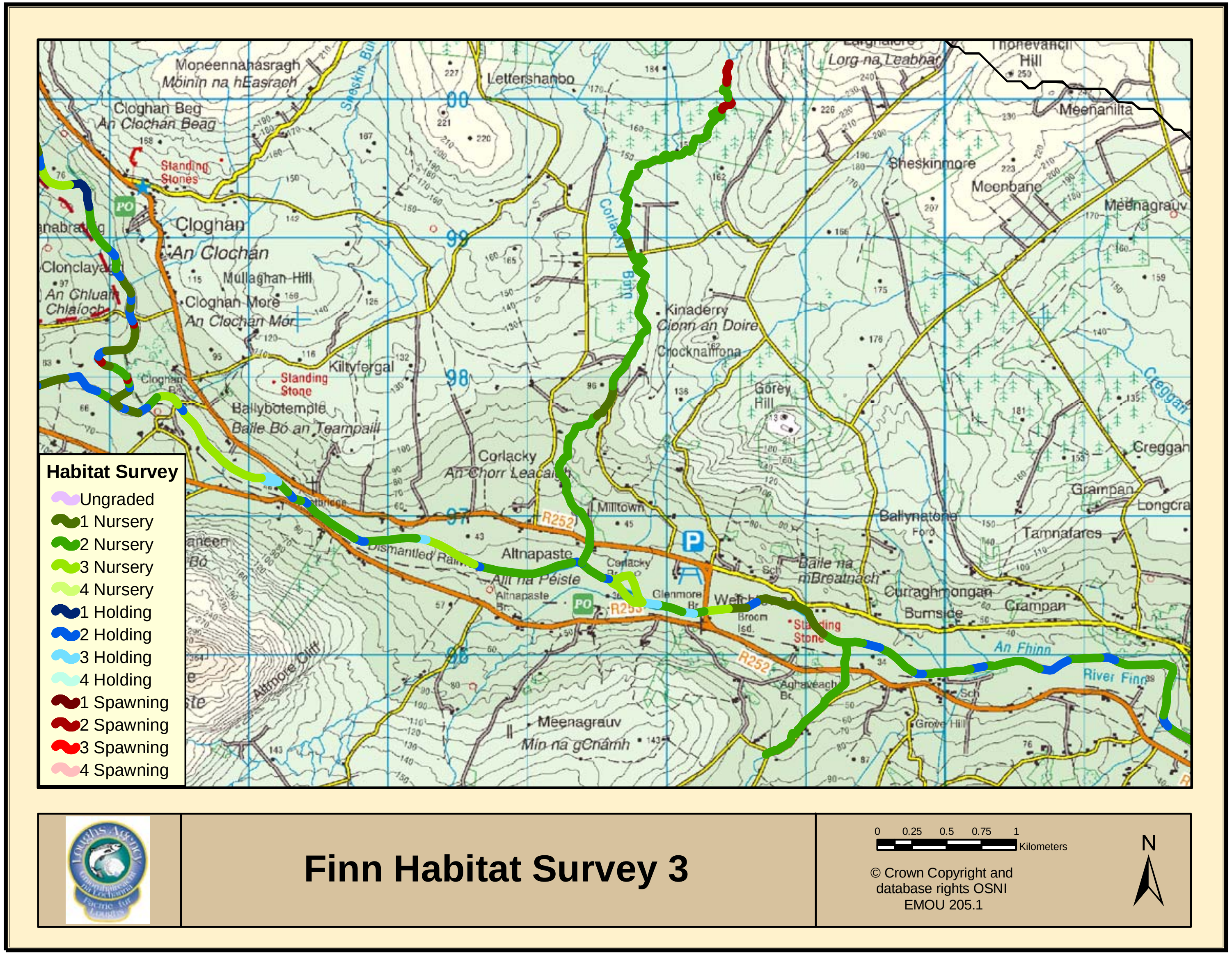


Fig 6.14 Finn catchment habitat survey map 3

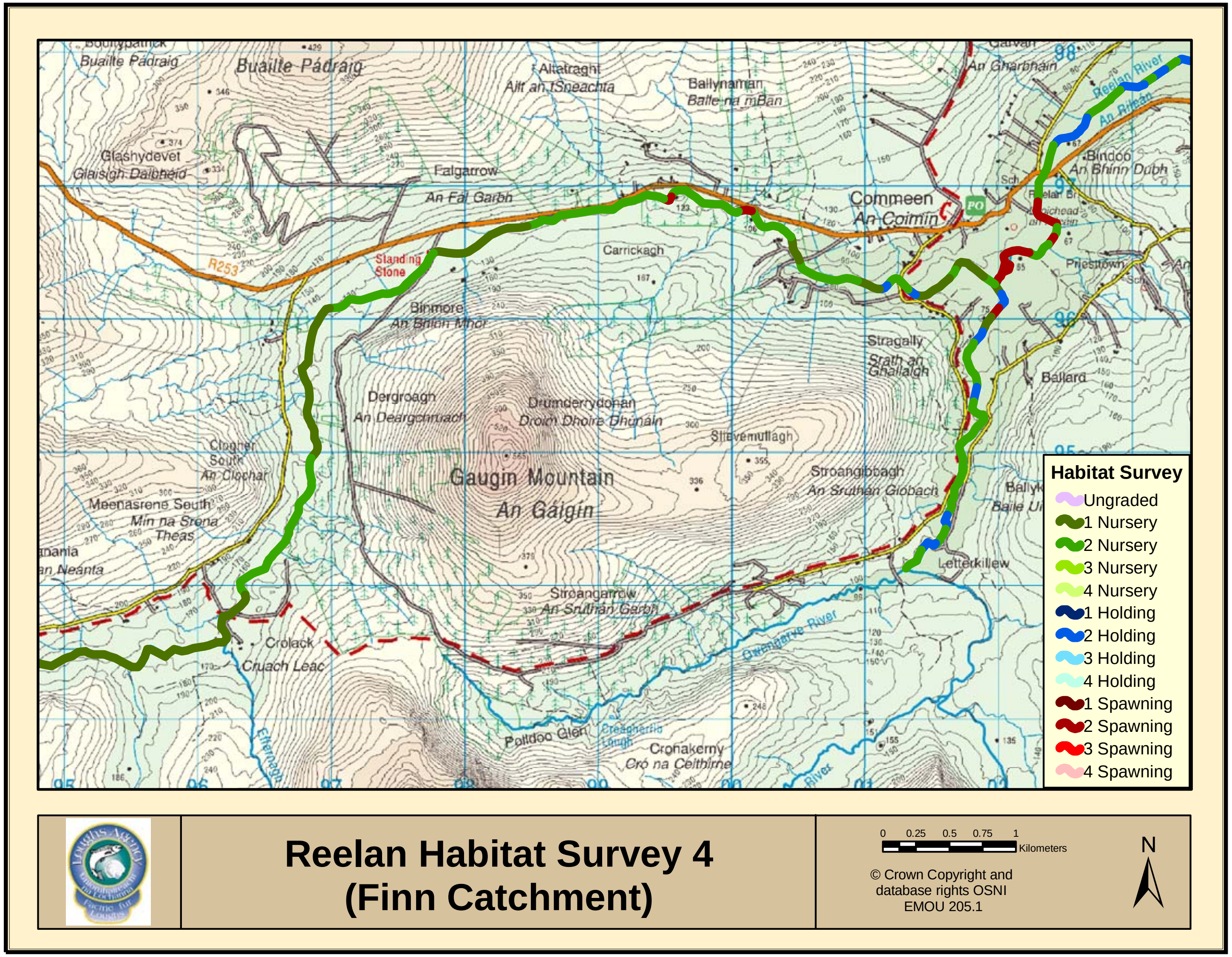


Fig 6.15 Finn catchment habitat survey map 4

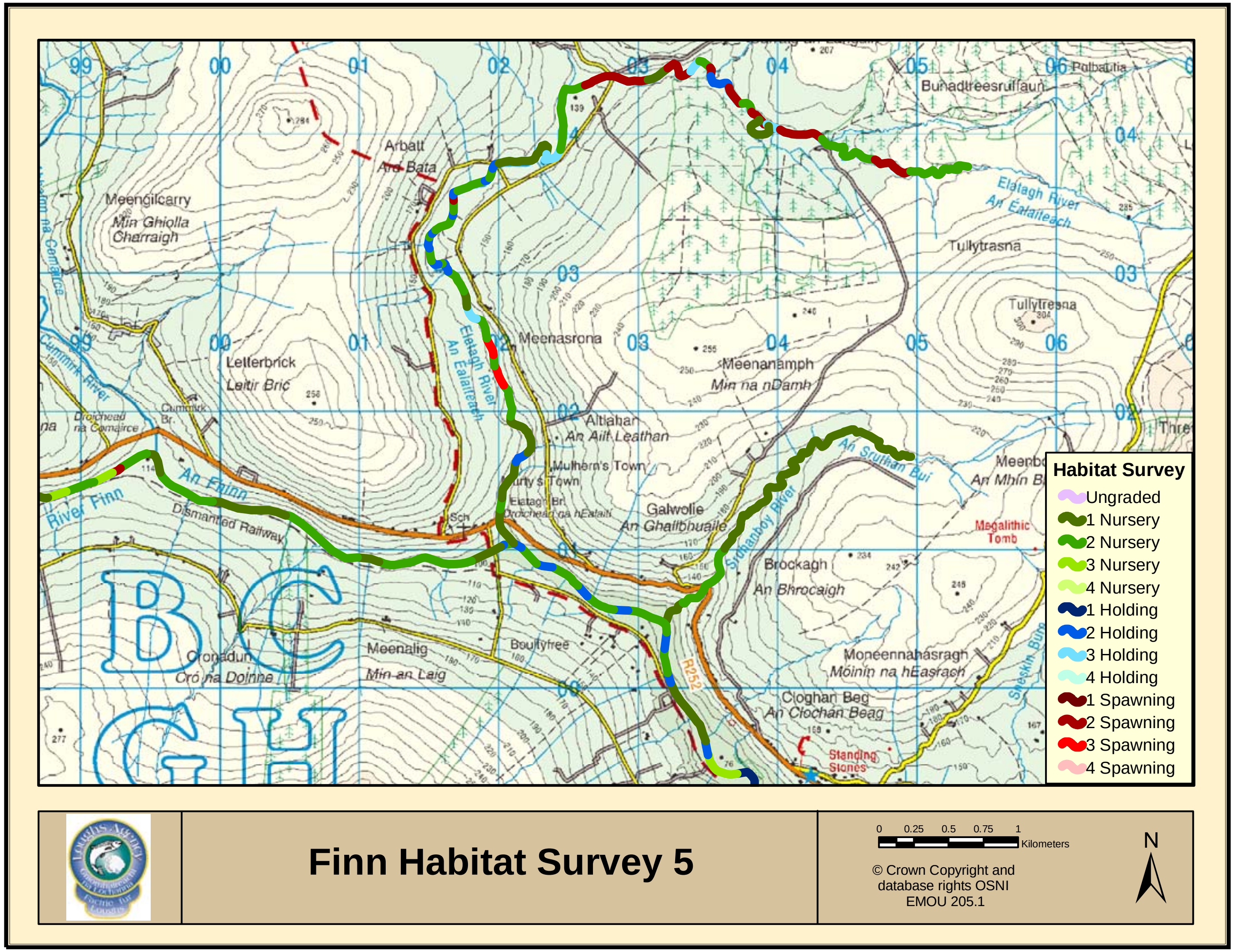


Fig 6.16 Finn catchment habitat survey map 5

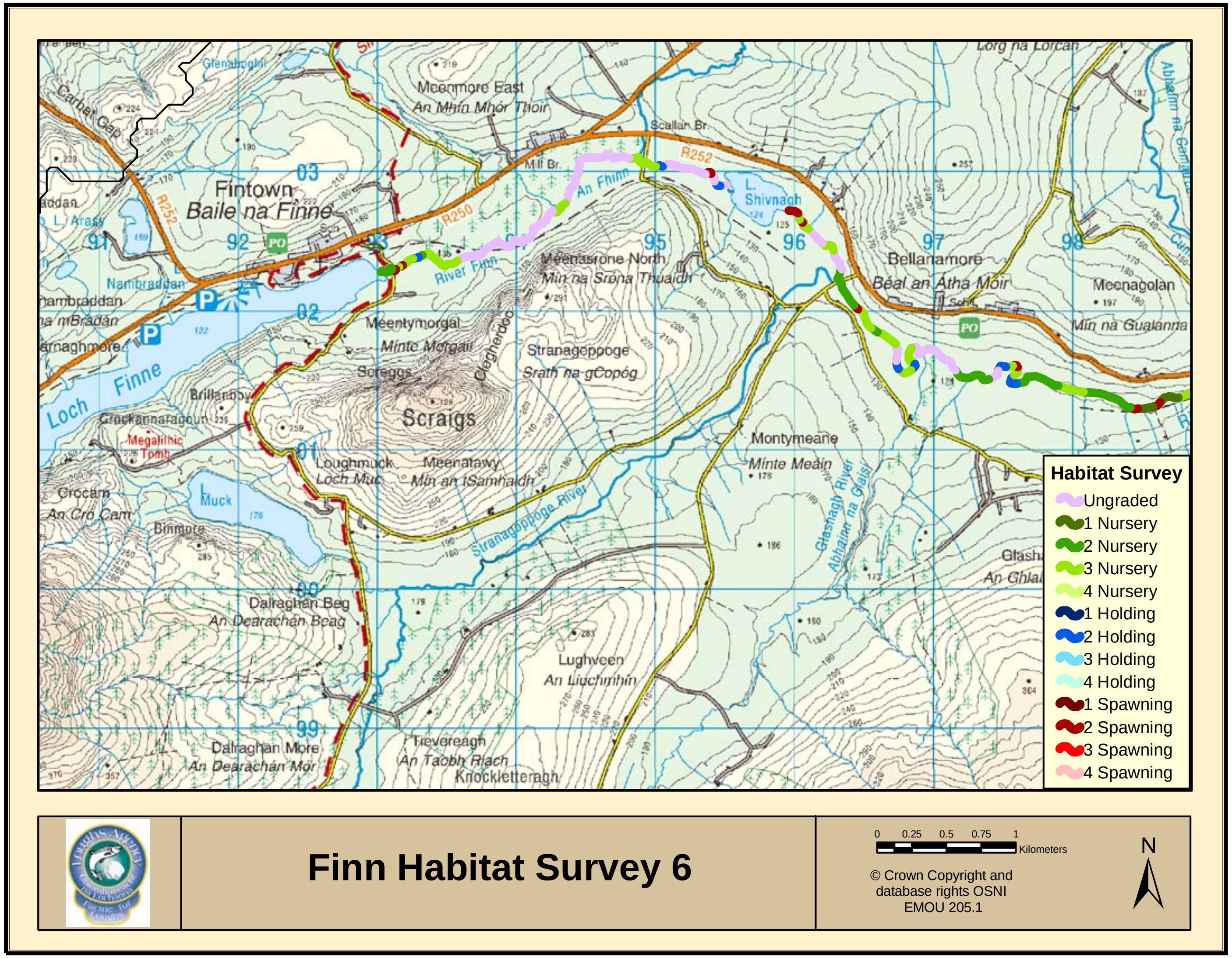


Fig 6.17 Finn catchment habitat survey map 6

7.0 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 Finn Catchment.

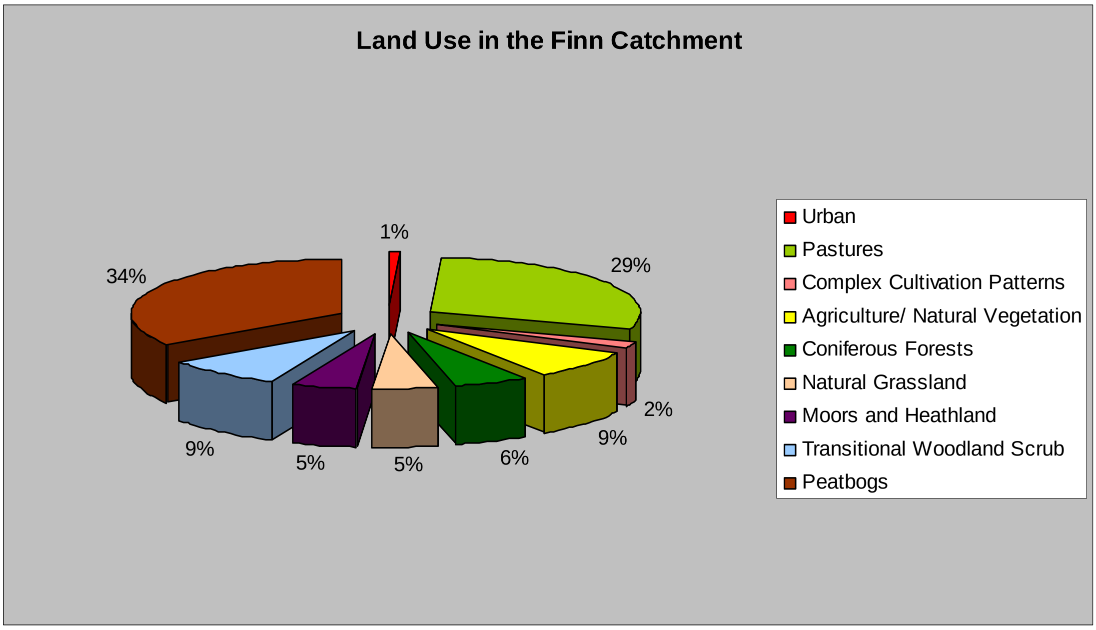


Fig 7 Finn catchment land use classification

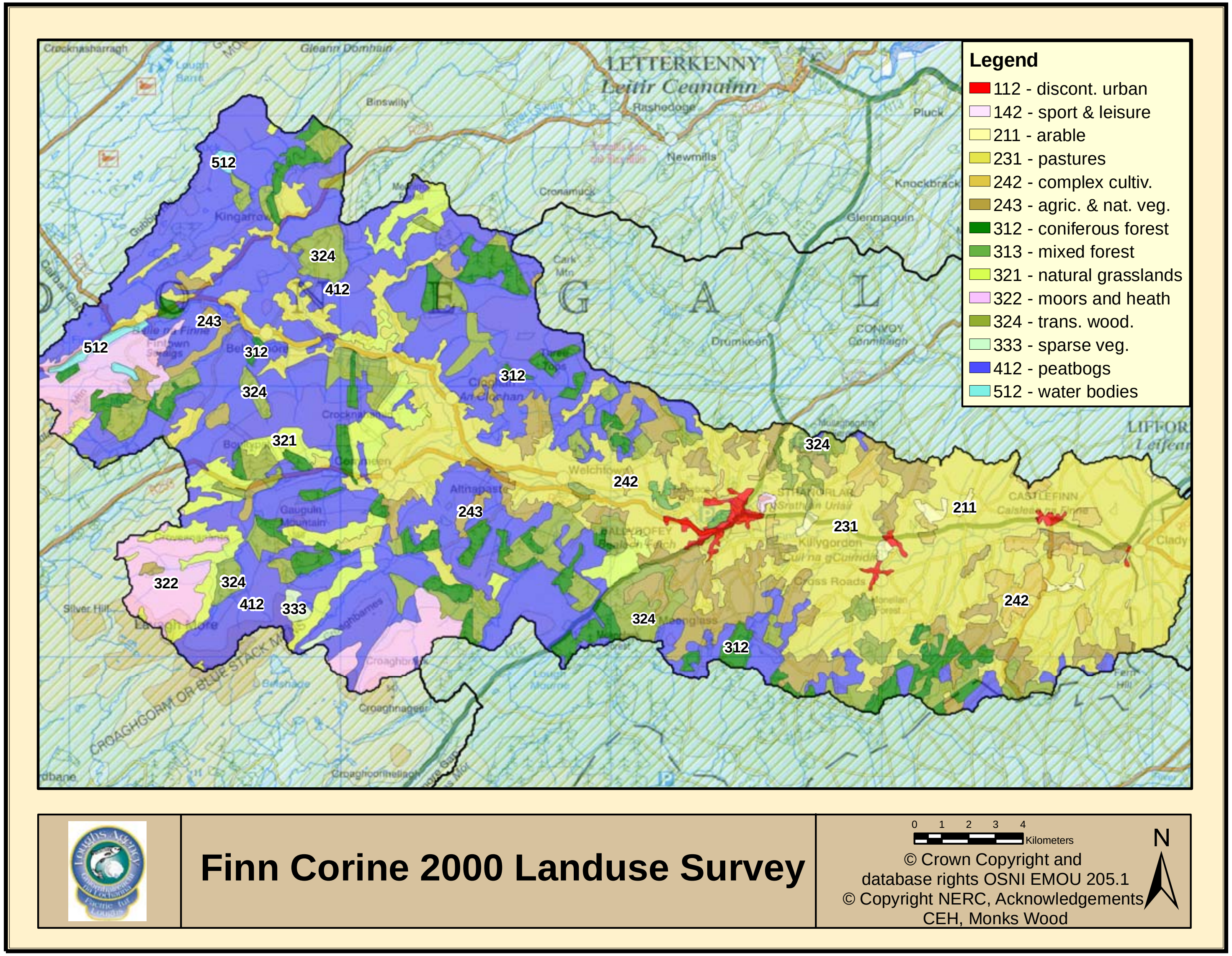


Fig 7.1 Finn catchment land use classification map

8.0 WATER QUALITY

Routine water quality monitoring within the Foyle and Carlingford areas is conducted by the Northern Ireland Environment Agency (NIEA) of the Department of the Environment for Northern Ireland and the Environmental Protection Agency (EPA) in conjunction with the County Councils in the Republic of Ireland (Donegal County Council and Louth County Council). Sampling is conducted for both chemical and biological Quality Assessments. In the Finn catchment chemical water quality monitoring is conducted by Donegal County Council and biological monitoring is conducted by the Environmental Protection Agency.

In addition to the routine river monitoring carried out by the NIEA and the County Councils 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. Twelve stations on tributaries of the River Finn were 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 8.0 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.

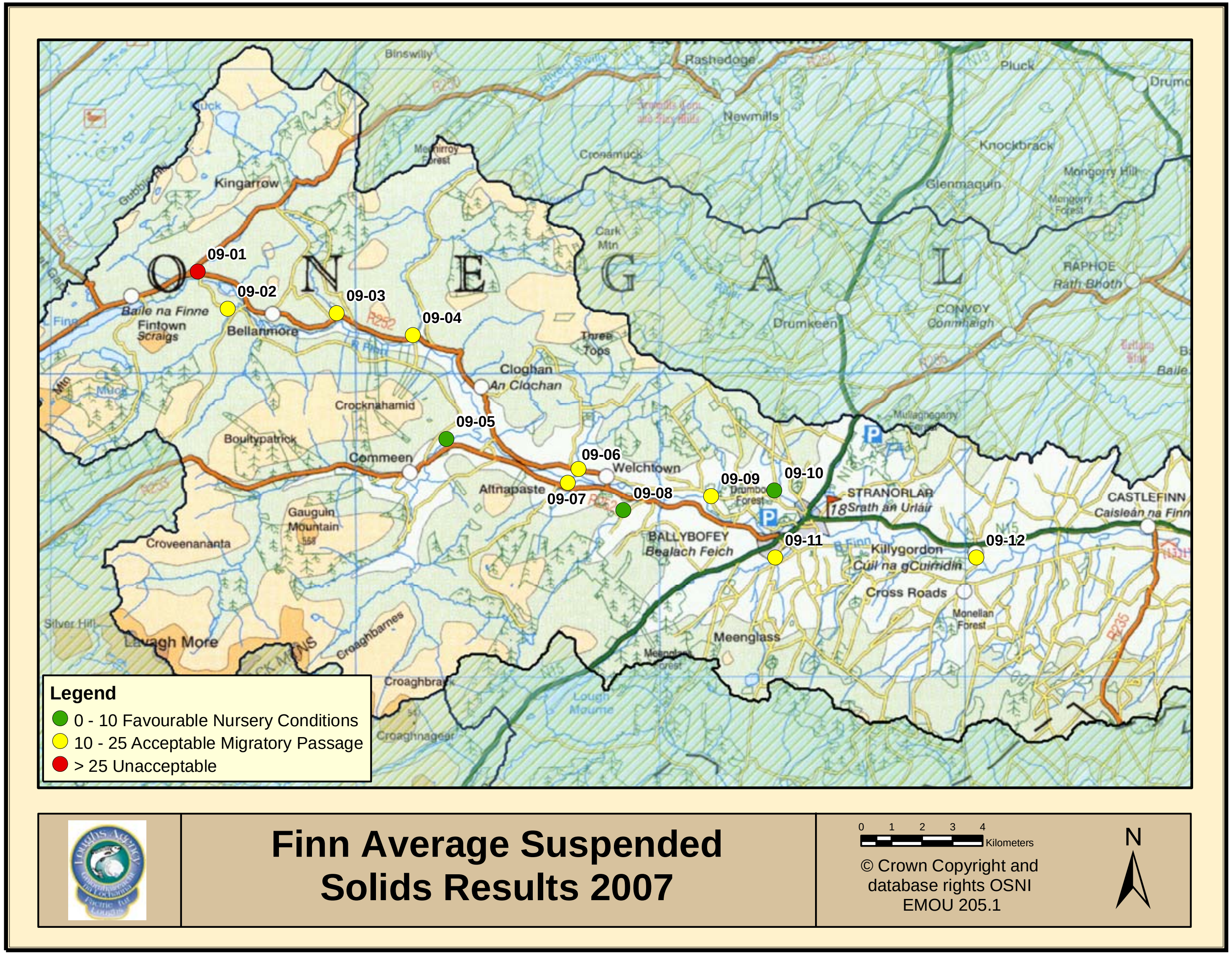


Fig 8.01 Finn catchment average suspended solids results 2007. Values are in mg/l

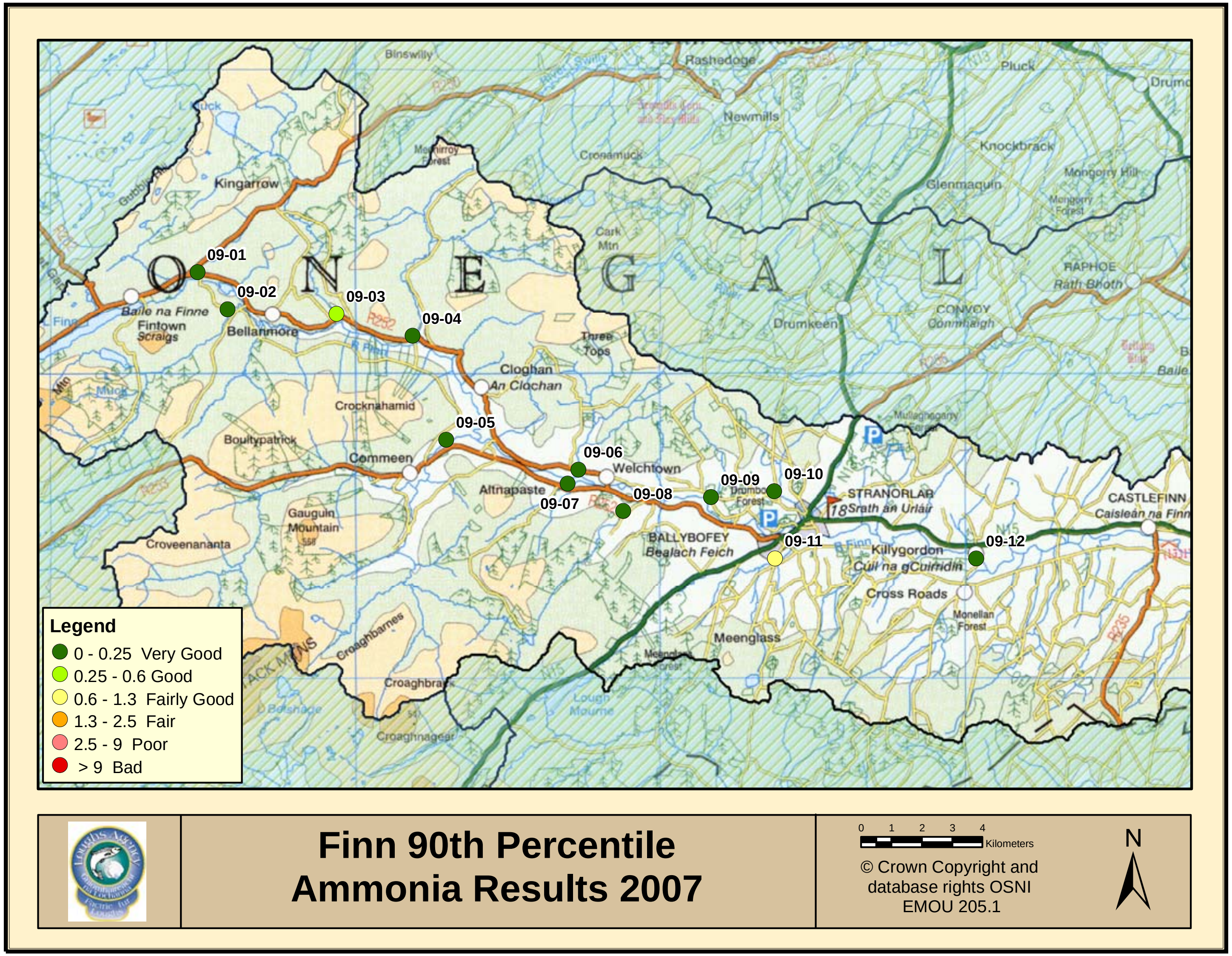


Fig 8.02 Finn catchment Ammonia results 2007. Values are in mg/l

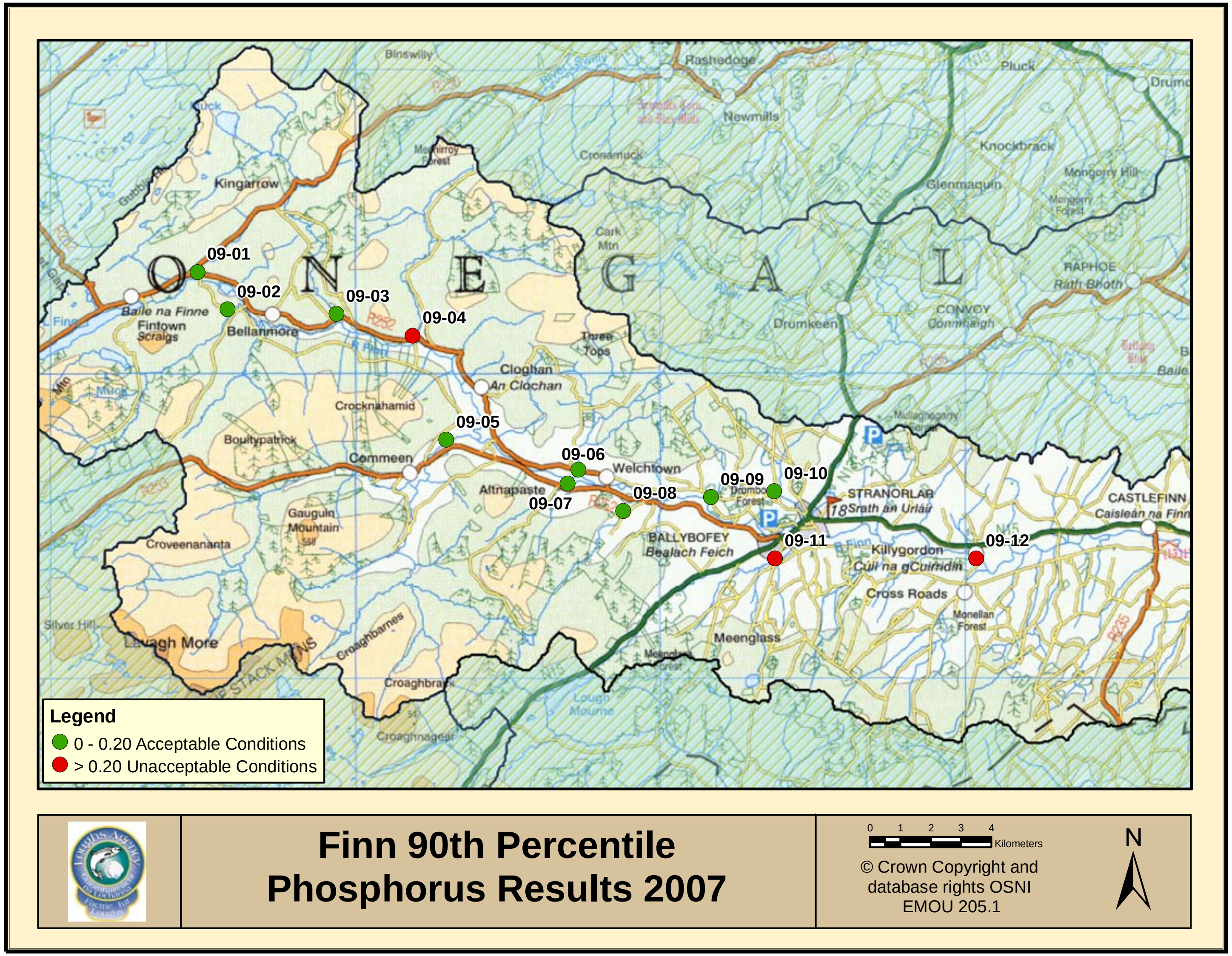


Fig 8.03 Finn catchment phosphorous results 2007. Values are in mg/l

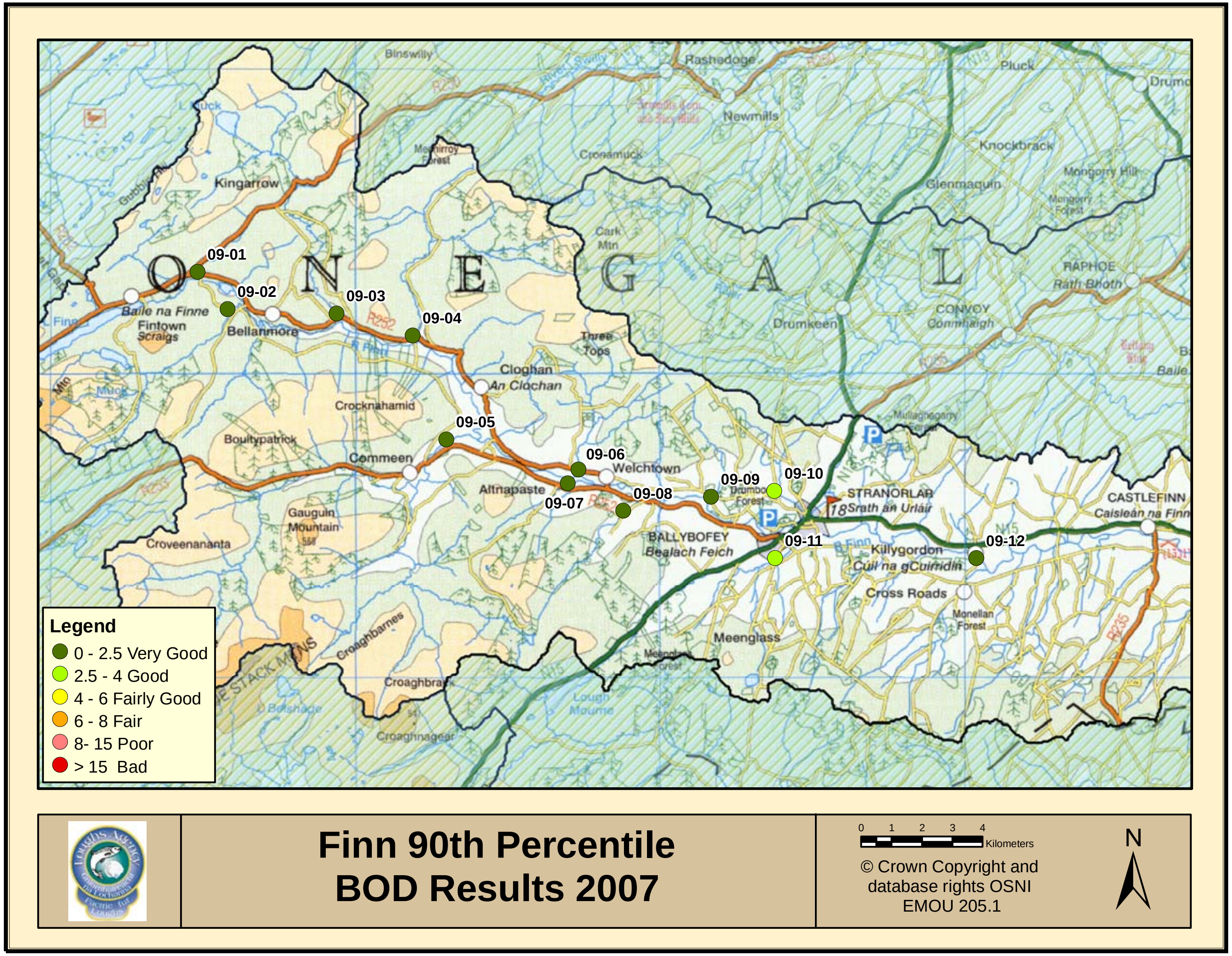


Fig 8.04 Finn catchment Biological Oxygen Demand (BOD) results 2007. Values are in mg/l

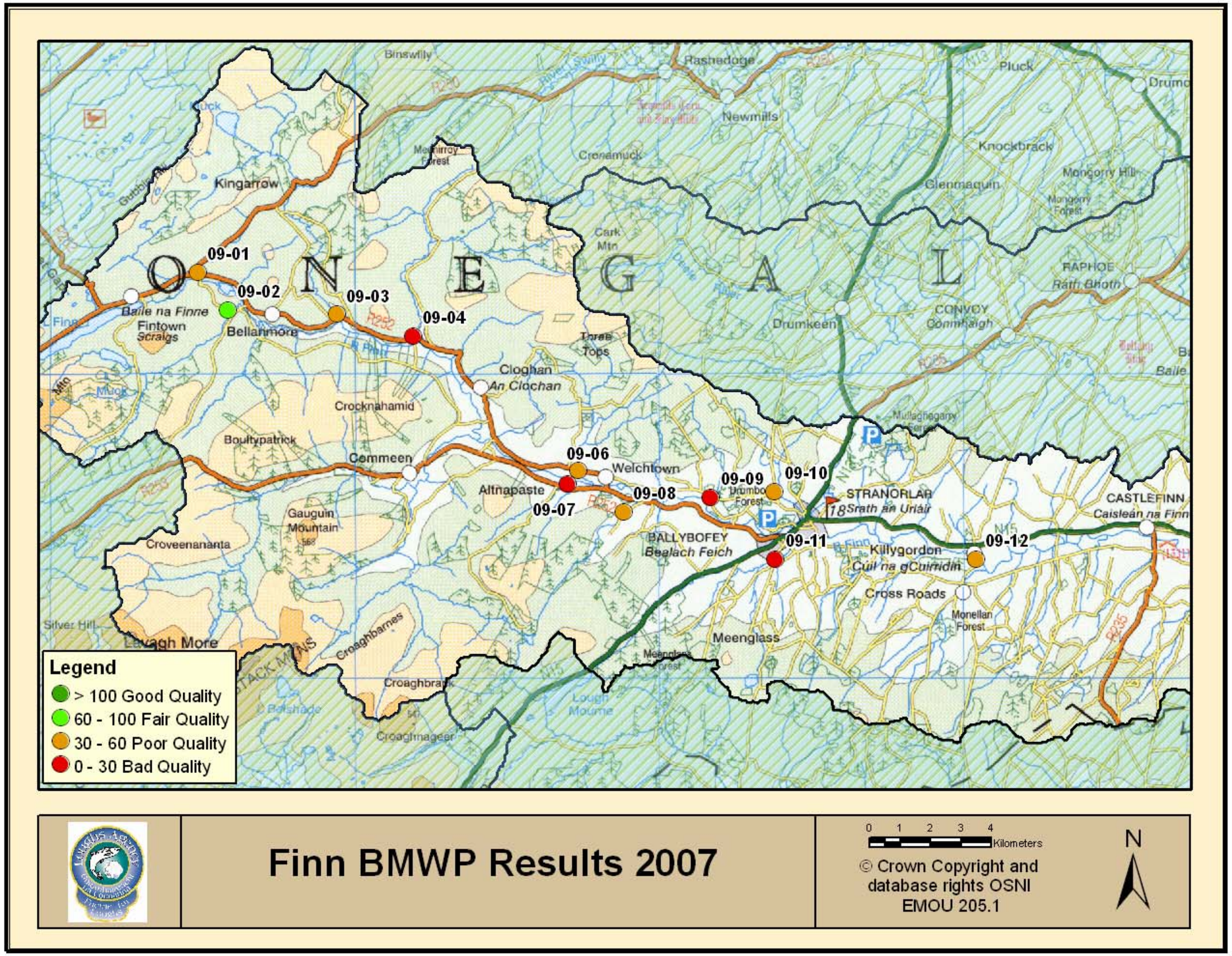


Fig 8.05 Finn catchment Biological Monitoring Working Party results 2007 * Note Loughs Agency invertebrate monitoring was conducted during the summer months of 2007

The Loughs Agency is in the process of obtaining chemical water quality data from Donegal County Council. These results will be presented in the status reports when available.

Biological water quality assessments conducted by the Environmental Protection Agency are based on the composition of the macroinvertebrate communities which inhabit rivers and streams. The macroinvertebrate communities are mainly comprised of immature aquatic stages of insects, crustacea (freshwater shrimps), mollusca (snails and bivalves), oligochaeta (worms) and hirudinea (leeches). Riffle sections (shallow, fast flowing, well aerated reaches), of a river are sampled as they are the most representative area of a river in relation to the water quality status.

The assessment used divides the macroinvertebrate communities into four groups, sensitive, less sensitive, tolerant and very tolerant forms. The relative proportions of the various organisms in a sample are determined and the water quality status is then inferred by comparison with the expected ratios in unpolluted habitats of the same type as those being investigated.

The assessment also takes into account the intensity of algal/weed development, water turbidity, bottom siltation, nature of the substratum, water velocity and water depth. This information is then all condensed into a five point biotic index (Q values) in which macroinvertebrate community composition and water quality are related.

Biotic Index (Q value)	**Water Quality**
5 (diversity high)	
4 (diversity slightly reduced)	Good
3 (diversity significantly reduced)	Fair
2 (Diversity low)	Poor
1 (diversity very low)	Bad

Table 8.01 Biological Q values

Intermediate values e.g. Q3-4 or Q1-2, are used to describe conditions where appropriate. If toxic influences are suspected the suffix 0 is appended to the relevant Q rating, e.g. Q1-2/0. Four main classes of water quality have been defined, relating to the Q value scale and indicate the degree of pollution as follows:

Quality Ratings	**Category of River Water Quality**
Q5, Q4-5, Q4	Unpolluted
Q3-4	Slightly polluted
Q3, Q2-3	Moderately polluted
Q2, Q1-2, Q1	Seriously polluted

Table 8.02 Biological water quality ratings

Figure 8.03 Flattened mayfly nymph from the order *ephemeroptera*. Photograph by Gardiner Mitchell.

European Council Directive 92/43/EEC of the 21st of May 1992 on the Conservation of Natural Habitats and on Wild Flora and Fauna (Also known as the Habitats Directive) was enacted in Ireland under the European Natural Habitats Regulations, 1997.

This indicates that those areas designated as areas of nature conservation designated for salmon should strive to achieve the water quality targets that are necessary for the designated species.

While it is current government policy for all rivers to meet national water quality standards, the Agency feels that favourable condition standards as detailed below should be the water quality targets for all salmonid rivers within its jurisdiction.

8.1 Favourable condition tables, target levels

The publication, Conserving Natura 2000 Rivers, the European Life Series, Ecology Series; No 7 Ecology of the Atlantic Salmon, *Salmo Salar* L. have indicated that there are specific favourable conditions for this species.

An annual mean of less than 10 milligrams per litre suspended solids for nursery grounds, and annual mean of less than 25 milligrams per litre for migratory passage and the setting of soluble reactive phosphorous targets in relation to river reach types which should be as near background levels.

Parameter	Level	Percentile
BOD mg/l	2.5	90
Ammonia mg/l	0.25	90
Dissolved Oxygen % Saturation	80	10
Unionised Ammonia mg/l	0.025	95
Suspended solids mg/l **Nursery grounds** **Migratory passage**	 10 25	
Soluble Reactive Phosphorous mg/l	Background	-

Table 8.1 Favourable condition targets for Atlantic salmon

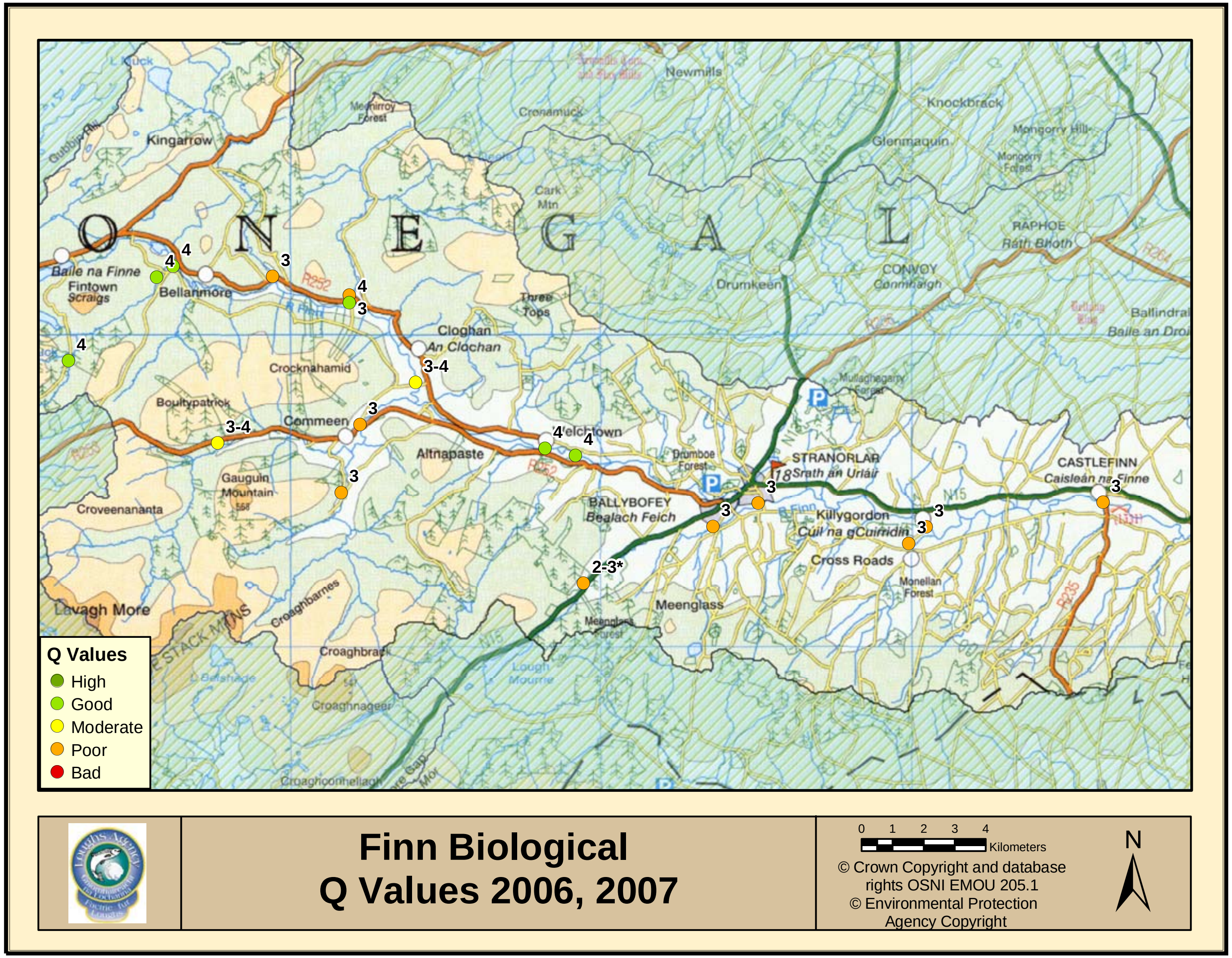


Fig 8.11 Finn Biological Q values 2006 & 2007. Data supplied by Environmental Protection Agency

9.0 CONSERVATION AND PROTECTION

The Loughs Agency continues to carry out an active fishery protection role throughout the catchments of the Foyle and Carlingford areas including the sea area, River Foyle and on all tributaries. Tables 8 and 8.1 outline the number of patrols and some duties carried out by the Loughs Agency staff in the Finn catchment and seizures for the Foyle area.

A team of Fishery Officers are responsible for the Finn catchment dividing their time between the Deele catchment, Culdaff catchment and the standing waters within the Loughs Agency western zone. This is in addition to regular fishery protection patrols on the River Foyle.

Year	Patrol Hours	No of Licence Checks	Joint Patrols	On-site Inspections
2006	2457	395	3	18
2007	164 (Patrols)	463 (+Deele)	1	74

Table 9 Breakdown of conservation and protection duties, Finn catchment 2006 & 2007

Year	2007	2006	2005	2004	2003	2002
Nets	100	97	114	181	198	207
Salmon	56	91	118	130	155	94
Rod&Reel	85	26	10	16	12	22
Vehicles	0	2	1	1	0	0

Table 9.01 Seized nets, salmon, rod/reels and vehicles in the Foyle system 2002-2007

Year	Nets	Salmon	Rod/Reel	Vehicles	Boats
2006	19	24	1	1	0
2007	18	4	5	0	0

Table 9.02 Seizures in the Finn catchment 2006-2007

10.0 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.

11.0 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 including the River Finn.
The River Finn SAC includes almost the entire freshwater element of the Finn and its tributaries, the Corlacky, the Reelan sub-catchment, the Sruhamboy, Elatagh, Cummirk and Glashagh, and also includes Lough Finn. The River Finn has been selected as an SAC for its active blanket bog, lowland oligotrophic lakes (low level of nutrients), wet heath and transition mires all habitats listed in Annex I of the EU Habitats Directive. The site has also been selected for its populations of Atlantic salmon and Otter both species listed in Annex II of the same directive.

Oligotrophic lakes within the Finn catchment include Lough Finn at the rivers headwaters.

"Lough Finn holds a population of Arctic Charr (Salvelinus alpinus). This fish is a relative of salmon and trout and represents an arctic-alpine element in the Irish fauna. In Ireland this fish occurs only in a few cold, stoney, oligotrophic lakes. It is listed in The Irish Red Data Book as threatened in Ireland. The Charr in Lough Finn are unusual in that they are dwarfed. Dwarfed Charr only occur in one other Lough in Ireland, Lough Coornasahom, Co. Kerry and they are therefore of national importance. Charr are very sensitive to water quality and therefore changes in the catchment such as afforestation should be avoided to maintain this population."

National Parks and Wildlife Service (NPWS)

12.0 GENETIC STUDY

A baseline genetic survey was carried out in the Foyle system in 2003 and a resurvey conducted between 2006 and 2008 to analyse the populations of Atlantic salmon present within the Foyle catchment. Results 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.

13.0 POLLUTION MONITORING

The Loughs Agency has a statutory obligation to monitor the pollution of watercourses. In conjunction with Donegal County Council and the Environmental Protection Agency all reported pollution incidents are investigated.

14.0 ACTIONS FOR 2008

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

The Loughs Agency has stated in its corporate plan 2008-2010 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 local angling associations will continue to be consulted regarding any proposed works and stakeholder input sought.

14.1 Foyle and Carlingford Areas Ongoing Actions for 2008

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 2008.

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 are contributing towards the development and implementation of invasive species codes of practice.

14.2 Finn Catchment Specific Actions for 2008

- Continue to play an active role in the multi agency group convened to monitor water quality and potential sources of pollution within the upper Finn catchment

- 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.

- Chart the location of significant discreet spawning habitats and protect from disturbance using appropriate means including fencing to prevent stock access.

- Conserve and protect aquatic and riparian habitats from anthropogenic impacts ensuring obligations under the Habitats Directive are met.

- Monitor forestry operations adjacent to watercourses or areas likely to impact on watercourses.
- Encourage native forestry in riparian and upland areas following best practice methods
- Report all observed fly tipping to Donegal County Council
- Monitor all referred development proposals.
- Conduct ongoing water quality monitoring and investigate areas highlighted as being of concern.
- Assist with Water Framework Directive fish monitoring programme.
- Conduct annual fish population surveys and spawning specific habitat surveys.
- Monitor all sand and gravel extraction sites and onsite water management practices.
- Ensure all fish passes, dams and mill races meet required standards.