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Eel Monitoring Programme

2012- 2014

IASCACH INTÍRE ÉIREANN
INLAND FISHERIES IRELAND

IFI Eel Monitoring Report 2012-2014

Executive Summary

In response to advice from ICES that the European eel was critically endangered the EU Council Regulation 11000/2007 for the recovery of the eel stock was created. Under this regulation Ireland compiled a National Eel Management Plan to conserve eel stocks in Ireland, within this plan was a list of monitoring objectives. The aim of the IFI eel monitoring programme is to improve our understanding of the state of the eel stock in Ireland and fulfil the objectives as outlined in the national management plan. As part of the regulation a review of the management plan is due every 3 years. Ireland submitted the first review in June 2012 covering the years 2009 – 2011. This report is an account of monitoring actions taken in the years 2012 – 2014.

Over the course of the 3 years an increase in recruitment has been observed in some locations around Ireland and in Europe as a whole. The latest advice from ICES indicates an increase from 5% in 2011 to 12% of historic levels in 2014. However it remains to be seen if this increase in recruitment is as a result of the management measures put in place since 2009 or is just natural variability in the recruitment indices. IFI plan to continue to monitor the index sites around the country over the coming years.

IFI have successfully reached all monitoring objectives as outlined in the National Management Plan for the reporting season 2012-2014. The EMP programme has strived to monitor the different life stages of the eel where possible (elver, yellow eel and silver eel). In order to determine the level of recruitment of eels within key locations a long term elver monitoring programme was enhanced. Six locations around Ireland are monitored from April to August using a ramp style trap. The traps catch a proportion of the elvers actively migrating into freshwater. The traps are fished consistently on an annual basis in order to record the general trend in recruitment. This data series recorded the general decline in recruitment over the last decade and it is anticipated that the extended data series will record any changes to the trend as a result of the management measures implemented in Europe.

To fulfill objective 2; estimate silver eel escapement, a research silver eel fishery was operated in the Fane catchment on the east coast of Ireland from 2012 to 2014. A mark recapture study has been used to determine the efficiency of the fishing site and to determine the level of escapement of silver eels from the catchment. Due to the presence of three silver eel locations on the west coast (Shannon, Erne and Burrishoole) a second east coast research silver eel fishery was set up in the Barrow catchment in 2014 on a pilot basis. The Barrow is a large riverine dominated catchment in contrast with the other silver eel locations which all have large lake habitat. This location will enable us to investigate if there is a difference in the production and stock structure of silver eels escaping from river dominated habitat compared with lake dominated habitat.

To fulfil the remaining monitoring objectives; surveys of the yellow eel population in key locations were carried out using different survey methodologies. An intensive fyke net survey was carried out in 5 lakes (Lough Key, Ramor, Oughter; Lough Derg and Lough Muckno). A semi quantitative eel specific catchment wide electrofishing survey was carried out in the Fane catchment and in the Kells Blackwater, a subcatchment of the Boyne River. This electrofishing study was to investigate the distribution of eels in the rivers surrounding 2 large lakes (Lough Muckno and Ramor). A fyke net survey was carried out in the freshwater and transitional waters of the River Barrow to compare with historical information available. The brackish lagoon in the South Sloblands was resurveyed due to the presence of historical information available from the Fisheries Research Centre.

To determine parasite prevalence and eel quality a number of eel samples are taken back to the laboratory for further analysis. Parasite prevalence by *Anguillicola crassus* ranges from 48% to 83% in lakes and 68% in the freshwater river section of the River Barrow. An investigation into the extent of the distribution of *A. crassus* in Ireland was undertaken using data from the Eel Monitoring Programme and Water Framework Directive (Becerra Jurado *et al.* 2014). The prevalence and intensity of infections across 234 sites and 93 river basins in Ireland comprising rivers, lakes and transitional waters were analysed. While only 32% of the river basins were affected by this nematode, they correspond to 74% of the total wetted area of Ireland. As a result of this work the group have focussed on monitoring the damage the infection causes to the

swimbladder of eels using 2 methods, The Swimbladder Degenerative Index (SDI; Lefebrve *et al.* 2002) and the Length Ratio Index (LRI; Palstra *et al.* 2007). Initial results from Lough Key and Lough Muckno indicate that the swimbladders of the yellow eels examined have slight to moderate damage. This is encouraging as there are reports in Europe with eels recording severe damage to the swimbladders (Lefebrve *et al.* 2002) however this is preliminary data and needs to be continued in a number locations to get a clear picture of swimbladder health.

The average growth rate of yellow eels examined is 2.75 cm/yr. The yellow eels range in age from 4 – 45 years for female and from 4 – 23 years for males. The average growth rate for silver eels is 2.52 cm/yr. The age of silver eel sampled ranges from 8-50 years for female from 6-27 years for males.

Electrofishing data from 2 catchments have highlighted the importance of habitat in the distribution of eels within catchments. The absence and low density of eels within the rivers and streams around Lough Muckno and Lough Ramor have drawn attention to the danger in assuming eels are widespread and inhabit all waterbodies. This will have knock on effects on attempts to model eel production and escapement from non-surveyed catchments. The importance of habitat and quantifying habitat needs to be addressed in the future.

Preliminary evidence suggests that there could be a change in the stock structure of eels in our lakes and transitional waters. The absence of small eels in the fyke net catches in our lakes and the increase in small eels in the transitional waters compared with historical data suggests a potential reduction in the distribution of eels within our catchments with smaller eels remaining in the transitional waters for longer due to the improved conditions resulting from the decreased density of eels. This data is preliminary and needs to be further investigated.

The IFI monitoring programme has caught 5,042 yellow eels and measured 4,851 silver eels over the three years. Parasite prevalence and intensity and sex differentiation were recorded for 841 eels. From the 6 years of data available (2009 – 2014) 2,057 eels have been aged and growth rates calculated. All of this information will be used to improve our knowledge of the state of the eel stock in Ireland and will be used to update the modelling of eel production and silver eel escapement from Ireland in compliance with the EU Eel Regulation (1100/2007).

As a result of the 6 years of monitoring it is proposed to concentrate work on Eel index catchments in order to determine the extent of eel distribution within catchments as a whole (transitional waters, rivers, lakes and tributaries). This will ensure an even spread of monitoring activities within each River Basin District for all life stages recorded and in all water body types. It is hoped that the data gathered under a long term index catchment monitoring programme will aid in the modelling of eel distribution, production and escapement in the future.

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1 Introduction

1.1 Background

In response to advice from the International Council for the Exploration of the Sea (ICES) that the European eel (*Anguilla anguilla* L.) is endangered and that the fishery is unsustainable the EC Regulation establishing measures for the recovery of the European eel (Council Regulation 11000/2007) was created. This regulation for the recovery of the eel stock required Ireland to establish an eel management plan to reduce eel mortality and ensure an increase in the number of silver eel escaping Ireland to spawn. Ireland's management plan involved closure of the fishery, mitigation of hydropower, ensuring upstream eel migration at barriers and improvement in water quality. In June 2009 the EU accepted Ireland's national plan as an adequate address to the issues raised in the regulation. Under the regulation each member state must report to the commission initially every three years until 2018 and subsequently every six years. In June 2012 Ireland submitted the first review of the National Management Plan covering the years 2009– 2011. All EU member states have submitted a review and these reports were evaluated by an ICES workshop. The next review is due in June 2015.

The cause of the decline in eel stocks is not fully understood but there are a number of factors likely to be the primary cause of the decline along with issues hindering the recovery process. These include: habitat loss; poor water quality; presence of barriers to both upstream and downstream migration (e.g. hydroelectric dams); overfishing; oceanic change/climate change; parasitology and increased abundance of predators. Measures to mitigate these potential causes are covered in the management objectives outlined in the Management plan.

1.2 Monitoring Objectives

The Scientific Eel Group (SEG) was established by the Department of Energy, Communications and Natural Resources in March 2009 and appointed by the Minister. Consultation with the Department of Culture, Arts and Leisure in Northern Ireland ensures the co-operation with Northern Ireland agencies to cover the specific needs of the trans-boundary North Western International River Basin District eel management plan. In 2010 the SEG was reconstituted as a Standing Scientific Committee for Eel (SSCE) under the Inland Fisheries Ireland legislation with a revised Term of Reference. The SSCE comprises scientific advisers drawn from the Marine Institute (MI), Inland Fisheries Ireland (IFI), The Loughs Agency, the Agriculture, Food and Biosciences Institute for Northern Ireland (AFBINI) and the Electricity Supply Board. Although the scientists are drawn from these agencies, the advice from the SSCE is independent of the parent agencies.

In 2009 the IFI eel monitoring programme was initiated to carry out the monitoring objectives outlined in the National Management Plan. These objectives are:

1. Synthesise available information into a model based management advice tool.
2. Estimate silver eel escapement (in collaboration with ESB, NUIG, Marine Institute).
    a. Estimate silver eel escapement indirectly using yellow eels.
3. Monitor the impact of fishery closure on yellow eel stock structure, CPUE, age and growth studies
4. Inter-Calibration with Water Framework Sampling.
5. Compare current and historic yellow eel stocks.
6. Establish baseline data to track changes in eel stock over time.
7. Evaluate impedance of upstream colonisation: migration and water quality effects.
8. Determine parasite prevalence and eel quality (Prevalence of *Anguillicola crassus*, (swimbladder parasite) age and growth analysis).

This report covers the work carried out in the years 2012 – 2014.

1.3 Workshop on Evaluation Progress Eel Management Plans (WKEPEMP)

In June 2012 Ireland submitted a review of the National Management Plan to the EU. In December 2012 the EU DGMARE sent ICES a special request for '*Technical evaluation of the progress reports submitted by the EU Member States to the European Commission in line with Article 9 of the Eel Regulation (1100/2007)*'. In May 2013 the Workshop on Evaluation Progress Eel Management Plan (WKEPEMP) met at ICES Headquarters, Copenhagen, Denmark. There were 17 participants, 7 eel scientists, 7 observers, a representative from DGMARE and 2 representatives of ICES Advisory committee (ACOM). In June 2013 ICES issued advice to the EU based on the report from the Workshop (ICES Advice 9.3.3.3). A report from the Commission on the results of the WKEPEMP will be released with potential amendments or additions to the regulation.

Advice Summary
'In most Eel Management Units (EMUs), depending on EMU conditions, progress has been made in implementing eel-specific management measures for commercial and recreational fisheries, hydropower, pumping stations and obstacles, restocking, management measures on habitat, and in a few cases predator control.

According to the information provided in the EMP progress reports, management measures related to fisheries have most often been fully implemented while other management measures have often been postponed or only partially implemented. Most increases in silver eel escapement since the implementation of management plans have been achieved by management measures addressing the commercial and recreational fisheries on silver eel.

Where management measures have not been fully implemented or where stock indicators show that management targets have not been reached, additional protection could be achieved by i) completing the implementation of the actions already planned, ii) implementing immediately the actions that were postponed or delayed, and iii) taking additional actions directed at the main anthropogenic mortalities. Extending actions that have proven successful, rather than pursuing untried actions or those difficult to implement, will reduce the risk of continued underachievement.'

The workshop compared local stock indicators provided in the 81 Eel Management Plan progress reports or from a subsequent data call. To date the WKEPEMP reported that 17 EMU's have achieved their target of 40% pristine silver eel escapement, 42 are not achieving the target and 22 did not report stock indicators. Of the 17 EMU's that reached their target, 11 are predicted to be in a downward trend. Of the 42 EMU's below target 20 are in an upward trend and will achieve the target in the future. A total of 756 management actions were proposed in the 81 EMPs however few progress reports include data that directly demonstrates the effects of individual management measures on silver eel escapement. Most management measures were directed at commercial and recreational fisheries; the remaining measures concerned hydropower, pumping stations and obstacles and finally habitat, restocking and predator control.

1.4 Data Collection Framework (DCF)/ DC-Multiannual Plan (DC-MAP)

In 2008 the European Council Regulation (EC) No. 199/2008 was implemented. This regulation "concerns the establishment of a Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy".

The EC Regulation No 665/2008 lays down detailed rules for the application of the EC regulation no 199/2008. However the data collected under the Data Collection Framework does not meet the needs of national and international assessments for the recovery of the eel. In addition eel and salmon differ markedly from marine species and the data collection requirements do not fit into the standard approaches used for Marine species. Therefore a workshop on Eel and Salmon DCF data was convened in Copenhagen from 3rd to 6th July 2012. The objectives of the workshop were to

- Determine the data required to support international obligations for the assessment of eel and salmon
- Describe the national monitoring and survey programmes required to meet these data requirements
- Consider options for integrating salmon and eel surveys and monitoring.

The report from the workshop is entitled:
ICES. 2012. Report of the Workshop on Eel and Salmon DCF Data (WKESDCF), 3-6 July 2012, ICES HQ, Copenhagen, Denmark. ICES CM/ ACOM:62. 67pp.

A summary of the findings and recommendations in the report are detailed below.
The commercial fishery monitoring that takes place under DCF fails to supply the extent of data that is needed to assess the eel stocks. Fishery independent monitoring by scientific survey of the stock will provide this data. A detailed list of the DCF data requirements are outlined in the report however the requirements relating to commercial fishing and stocking programmes have been omitted from this summary as they are not applicable to Ireland at this time. A number of the data requirements relating to Ireland are:

- Quantity of glass or yellow eel recruitment, derived from commercial, recreational or fisheries-independent surveys.
- Other anthropogenic impacts (non-fisheries), including type and quantity of impact, e.g. turbines (mortality rate and amount of silver eel killed in tonnes).
- Scientific surveys of stock: abundance of recruitment, yellow eel standing stock, silver eel by sampling method.
- Other biological sampling to inform biological characteristics, e.g. length, weight and growth, parasites and pathogens, contaminants and predators, by sub-catchments, catchments or EMU.

The workshop recommends that the following data should be collected annually for stocks in at least one Eel Index River Basin per EMU as agreed by ICES

- Information on abundance of recruits (glass eel and/or elvers).
- Information on abundance of standing stock (yellow eel).
- Counts or estimates of the number, weight and sex ratio of emigrating silver eel.
- Information on anthropogenic impacts in these systems, on all life stages (e.g. barriers).

The workshop also recommends that the following data is included in the new DC-MAP, estimated at EMU level and at appropriate temporal frequencies

- Growth rates of eel, determined at yellow and silver stages.
- Sex ratio of standing stock and silver eel.
- Infection intensity and abundance of *Anguillicola crassus* and other parasites and diseases as recognised by ICES as having a potential impact on effective spawner stock biomass.
- Tissue concentrations of contaminants as recognised by ICES as having a potential impact on effective spawner stock biomass.

The European Commission has created one fund for the Fisheries Maritime Fund, the European Maritime and Fisheries Fund (EMFF). This EMFF fund aims to achieve the objectives of the Common Fisheries Policy (CFP) and the Integrated Maritime Policy (IMP). This will bring about cost savings and streamlining of the reporting and evaluation structures in line with the review of the

Common Fisheries Policy. The Scientific, Technical and Economic Committee for Fisheries (STECF) have been asked to revise the current Data Collection Framework. A number of meetings by the STECF have been held in 2013 and 2014 to structure the new DC-MAP regulation. The new regulation will address the issues with incorporating eel and salmon into the new data collection programme.

2 Barriers

Under the National Eel Management Plan, objective 7 requires the evaluation of upstream colonisation: migration and water quality effects. Lasne and Laffaille (2008) found that while eels are capable of overcoming a wide array of obstacles the resulting delay in migration can have an impact on the eel distribution in the catchment. Knowledge of what constitutes a barrier for eels (at different life stages) will assist in the estimation of eel population densities and escapement for future management plan reviews.

The EU Habitats Directive (Directive 92/43/EEC) and Water Framework Directive (2000/60/EC) both require the assessment of barriers to fish migration. In order to tackle the issue on a multispecies level IFI established a National Barrier Group in 2011. This group is building on the earlier work to develop a standardised assessment of barriers nationally and is currently evaluating an IFI survey sheet and methodology. The long term aim is to develop a national database of barriers for rating fish pass ability which in turn will provide information to target mitigation measures at the most significant obstructions.

2.1 IFI Barrier assessment/removal/mediation work

2.1.1 2013

Mitigation measures at barriers are being taken including the creation of rubble mats (e.g. Feale tributary at Shanowen), removal of sections of weirs (e.g. Mulkear River) along with remedial works to improve existing fish passes (e.g. Galey River). In summer 2004 and 2005 the River Tolka has had a significant number of man-made weirs modified to open up the river to fish migration. As a result in September 2013 Atlantic salmon have begun to spawn in the River after being absent for at least a century. The work was carried out by Inland Fisheries Ireland, The Office of Public Works and Dublin, Meath and Fingal County Councils. A programme to ease fish passage in the River Dodder is at the planning stage and should be implemented over the coming years in conjunction with Dublin City Councils as part of their flood relief scheme.

Staff in the South Eastern River Basin District (SERBD) have been assessing barriers in the Suir and Barrow catchments with the Suir Main channel, the Multeen and Duag Rivers assessed. A rock ramp fish pass is being designed to facilitate migration past a number of weirs on the Burrin tributary of the River Barrow. Since 2009 in the SERBD fish passage has been improved at a total of 20 bridges, 10 fish passes have been installed and 4 weirs have been removed. The weirs have been removed from the River Urrin (Plate 2-1), Blackwater and River Drish tributaries of the River Suir and the Glenshalane tributary of the River Blackwater (Plate 2-2).

Plate 2-1 Weir on River Urrin, Slaney catchment, side view of weir (left) and upstream view of removal (right). Photo by Alan Cullagh IFI Clonmel


Plate 2-2 Weir on Glenshalane Trib of River Blackwater. Photo by Alan Cullagh IFI Clonmel

2.1.2 2014

A small rock ramp was constructed at a bridge apron on the Tuckmill Stream in County Wicklow to eliminate a vertical barrier of approximately one metre and a slope of approximately one in ten through the bridge (Plate 2-3).

Plate 2-3 Tuckmill Stream

2.1.3 Planned works for 2015

Planning permission has been granted for the removal of the existing fish pass and the construction of a new rock ramp structure at a weir in Castletown, County Laois. A contractor has been appointed, however, due to planning and environmental constraints, construction work will not commence until July 2015 (Plate 2-4).

Plate 2-4 Castletown weir on Castletown River

In cooperation with Waterways Ireland, Inland Fisheries Ireland have issued tender documents for the hire of consulting engineers to design fish passes at six weirs on the River Barrow. These are: Carlow Weir, Ballyellen Lower Weir, Millford Weir, Maganey Weir, Bagenalstown Weir and Lower Tinahich Weir. A consultant engineer has been appointed and work has commenced on the engineering and environmental surveys for the designs. This project will take a number of years to complete, however, it is expected that the design options will be complete and a planning application will be lodged in early 2015.

IFI in conjunction with Tipperary County Council have agreed to replace the Lismalin Bridge on the Kings River and, as part of the construction of a replacement bridge, this structure will be dismantled and the river bed regraded and stabilised to remove this vertical barrier. Environmental and engineering reports have been completed but in-stream works will not take place until July 2015. A number of other projects are also planned for 2015, including, engineering and technical reports for the removal of Clondulane Weir on the River Blackwater.

2.2 Wicklow Bridges Project

IFI were partners in an ecological survey of a selection of culverts and bridges in County Wicklow which were deemed most likely to be impediments to fish passage (Byrne & Beckett 2012). This project was coordinated by Wicklow County Council through the Wicklow Heritage Forum and was part funded by the Heritage Council of Ireland. Within the project Inland Fisheries Ireland assessed the level of risk for fish passage; Birdwatch Ireland concentrated on the usage of bridge sites by nesting birds. National Parks and Wildlife Service (NPWS) focused on the usage of bridge sites by bats along with how other species might be negatively impacted by such watercourse crossings.

The majority of bridge and culvert sites assessed were located on national and non-national roads, the remaining sites were on private roads, farm roadways, forest roadways and railway crossings along with a small number of weir and dam sites assessed. A total of 103 sites were examined in the county. The IFI barrier assessment sheet was used to assess the level of risk associated with a structure. The IFI surveyor assigned each site a risk category based on the measurement taken in the survey, however no account has been taken of the presence or absence of species either upstream or downstream of the structures to date.

Out of the 103 sites examined, 68 were ranked as 'High Risk' for eel, 12 sites were moderate risk and 24 sites were low risk (Figure 2-1). The majority of problems related to scour apron structures. The dominant 'barrier' issue was a function of a number of associated physical factors including water velocity; barrier height and laminar flow. The authors highlighted the potential to alleviate the passage issue while maintenance and repairs works are being carried out on small bridge and culverts. The size and scale of the work required to ensure fish passage at larger sites will require additional funding due to the costs involved.

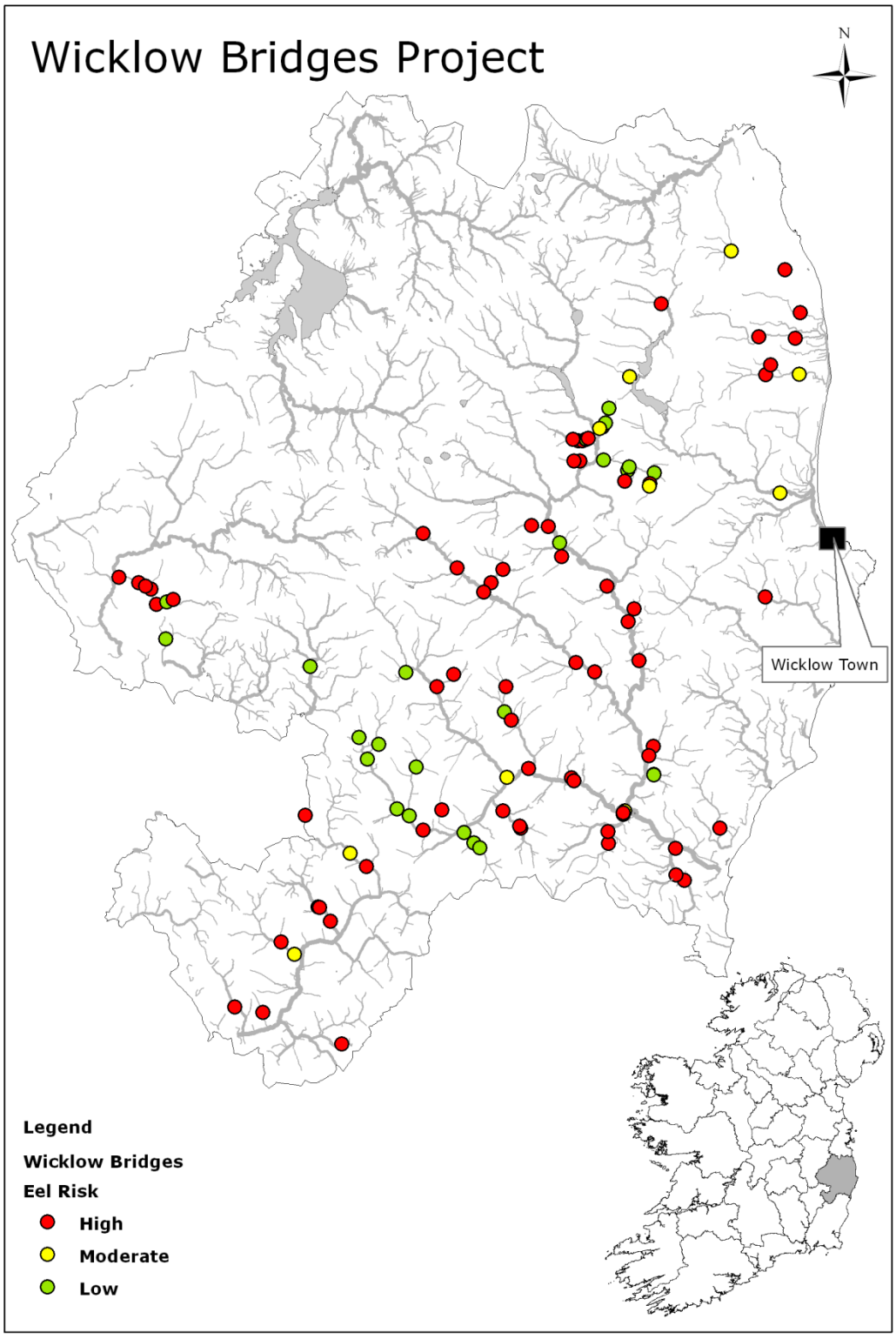

Figure 2-1 Wicklow Bridges Barrier assessments sites

2.3 Shannon Barriers Project

The Shannon Barriers Project was funded by the Salmon Conservation Fund with the aim to identify potential barriers to fish migration in the Shannon River Basin District (ShIRBD). This project has mapped and assessed potential barriers throughout the RBD over the last 2 year. In total, 218 barriers have been assessed, resulting in a large database of potential barriers to fish migration. This data will inform management approaches to dealing with barriers on the Shannon, including the assessment of impacts on migratory fish, cataloguing the types of barriers throughout the catchment and prioritising the remedial works or removal of barriers. Layered with other GIS information, assessments can be made of real or potential impacts to fish migrations. The layers can be used by flood authorities linking with CFRAMS data.

The project also piloted the new IFI Barriers Field Assessment Form and liaised with the IFI barriers group in developing this form. Some of the assessed barriers will be used for comparisons with Northern Ireland SNIFFER methodology. This will help improve techniques for assessing potential fish barriers and ecological impacts of these barriers.

The Shannon has been extensively surveyed from Leitrim village (including the canal network) to south of Lough Derg. The sub-catchments assessed in 2012 were the River Brosna, Little Brosna, Camcor, Inny, Suck, Camlin, River Shannon (Lough Allen outfall to Mount Talbot), Shannon navigation and the Boyle River. In 2013, all of the Lough Ree and Lough Derg sub-catchments have been completed and the assessments have started in the River Fergus, Maigue, and Mulkear catchments. It is proposed to continue the project by completing the Fergus, Mulkear, Maigue and Feale catchments. All sites surveyed have been geo-referenced with photographic links enabling the creation of a map of barriers in GIS for the Shannon River Basin District (Figure 2-2).

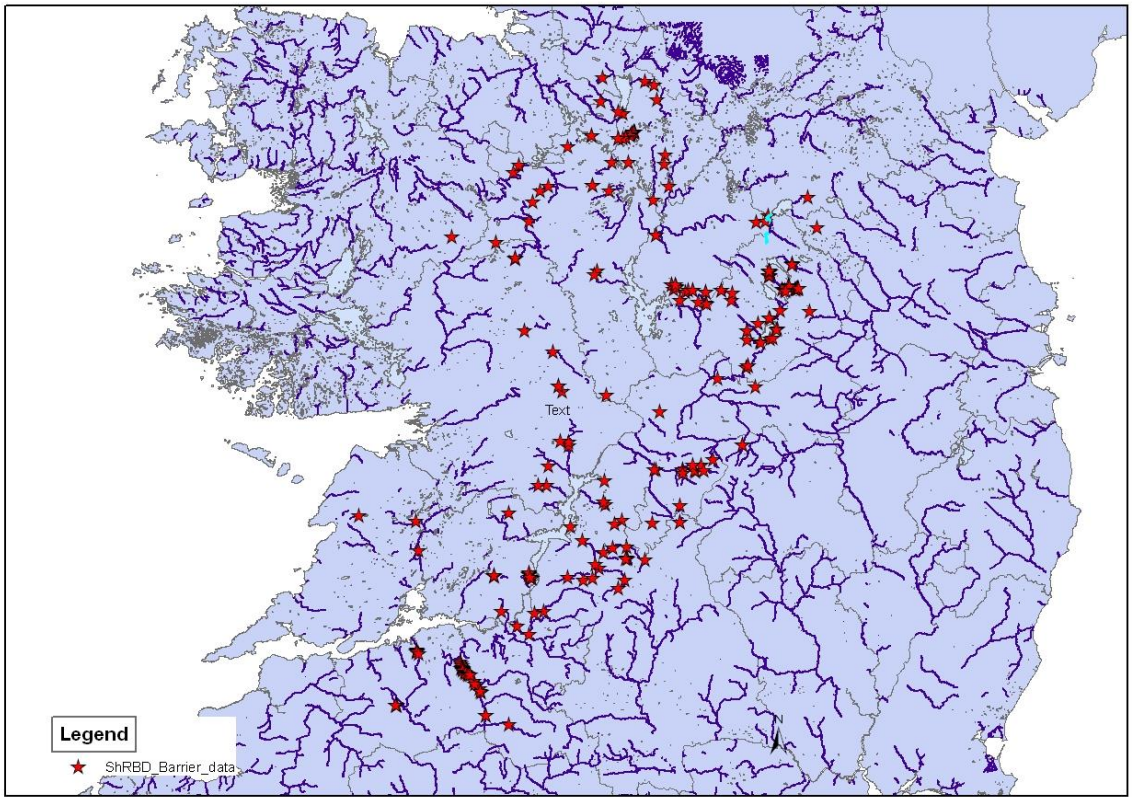

Figure 2-2 Locations where barrier assessments were undertaken in the Shannon RBD

2.4 Monaghan Bridges Project

IFI staff in the Eastern River Basin District and North Western International River Basin District working in County Monaghan received training in the IFI barrier assessment form in 2013. The project is one of the actions in the current Heritage Plan for the county. The aim of the project is to carry out an ecological survey of bridges and culverts in the county to identify any impediments to fish passage and other animals and to identify measures to remedy these impediments. This is a follow up from the successful completion of a similar assessment carried out in County Wicklow in 2012. To date a total of 88 structures have been assessed in the ERBD and NWIRBD. This project is in the final stages and is due to be completed in early 2015.

2.5 Summary

IFI have created a barriers sheet and are in the process of identifying and assessing barriers around the country. The initial IFI barriers identification sheet will be the first step in identifying and locating potential barriers. If a barrier/obstruction is deemed to be an issue a more detailed survey will be carried out using the SNIFFER protocol (fine resolution assessments Level B or C). The SNIFFER protocol is a coarse resolution method to help with prioritisation of barriers for removal or mitigation.

Barrier removal and mitigation measures are being taken on a case by case basis around the country. Successful movement of fish as a result of barrier mitigation works is visible in the River Tolka with the presence of salmon in the river after a long absence and in the Mulkear River with the successful passage of sea lamprey over the Annacotty weir. IFI are committed to the long term objective of ensuring fish passability and re-establishing the connectivity within our wetted areas.

3 Habitat Enhancement

The influence of anthropogenic impacts on the eel population is well documented (Dekker 2000, Moriarty and Dekker 1997; De Lafontaine et al. 2010; Feunteun 2002, Machut et al. 2007, Verreault et al. 2004). The EIFAAC/ICES working group stressed the need for member states to take into account non –fisheries anthropogenic impacts upon the eel stock stating that the decline of eel in Europe is often related to the decline in continental habitat, its accessibility and its quality (ICES WGEEL 2001). Connectivity of our wetted areas can be affected not only by the presence of a barrier but also by poor water quality and loss of habitat. These factors can impact the migration of species from different habitats at different stages in their lifecycles. Feunteun 2002 reported that 50-90% of wetlands have been destroyed during the last century in Europe.

The Ramsar convention (1971) defines wetlands as "*areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters*". There are 5 types of wetland habitats potentially used by eels in Ireland (riverine; lacustrine; marine; estuarine/brackish and palustrine (marshy)). Under the Governments Second National Biodiversity Plan for 2011 – 2016, target 10 outlines a continued rehabilitation or restoration of biodiversity elements. Under this target one task is to develop, adopt and implement restoration programme for salmon, sea trout and eels. Protected areas are central to Ireland's conservation policy enabling us to protect key habitats and species and provide refuges for the movement and migration of species. Special Areas of Conservation (SACs) are areas that have been given special protection under the EU Habitats Directive (92/43/EEC). The EU Habitats Directive, along with the EU Birds Directive (2009/147/EC), constitutes the main European legislation on nature conservation policy. It is based on the Natura 2000 site network and the strict system of species protection. This directive protects over 1,000 animals and plant species and over 200 habitat types which are of European importance. To date there are 423 SAC sites in Ireland, with 80 located in coastal and near shore waters. Ten freshwater species (Atlantic salmon, European brook lamprey, European river lamprey, Sea lamprey, European otter, Freshwater pearl mussel, Nore pearl mussel, Nodding waternymph, Twait shad and White-clawed crayfish) are protected in our SACs. These SACs provide additional protection for the European eel as 47% of sites chosen as SAC's are marine or freshwater with 53% being terrestrial sites (NPWS website).

3.1 Environmental Riverine Enhancement Programme (EREP), 2008-2012

Inland Fisheries Ireland (IFI) has successfully carried out the rehabilitation of numerous freshwater aquatic habitats throughout the country, to reverse the effects of arterial drainage, damage to riparian vegetation, pollution and gravel extraction in spawning areas. The focus has been to promote the recovery of stocks of native salmonid species by developing preserving and enhancing riverine habitat (IFI, 2013). Each year, 100km of OPW channels are identified and divided between a capital works and enhanced maintenance programme. Biological surveys are carried out across a range of these channels, addressing the impacts of works on the river corridor biodiversity and hydro morphology. Support and advice is provided throughout the implementation period, and external audits of machine crews engaged in routine maintenance are applied. The EREP Programme also provides training to OPW staff as required.

Under the EREP Programme a total of 307km of river channel length was successfully restored from 2008-2012. Table 3-1 outlines the individual channel lengths (km) achieved by both capital works and enhanced maintenance programmes during these years. The work was carried out across three OPW regions (i.e. east, west and southwest) comprising 21 catchments in all (Table 3-2). Several of the enhanced catchments included many of those identified as key eel catchments and have been surveyed by the EMP for the different eel life stages (Boyne, Corrib, Feale, Liffey, Maigue, Moy and Shannon). It is hoped that these works will increase the potential habitat quality and range for eel populations in these areas.

The enhancement programme involved the increase of structural diversity within the river corridor to create a more natural physical form. This was achieved through a range of techniques including; construction of in-stream stone structures acting as deflectors, excavating pools, gravel loosening,

building riffles, log tree revetment, bank re-profiling and fencing of river banks to allow vegetation regeneration. The habitat enhancement operation consists of 2 programmes; capital works and enhanced maintenance. On average, capital works can be expected to cover somewhere between 150 and 400m a week whereas; enhanced maintenance would be expected to cover as much as 500 to 1000m a week (Table 3-3).

Table 3-1 Achieved channel lengths for capital works and enhanced maintenance, 2008-2012. (From, Environmental River Enhancement Programme, 5 Year Report, 2008-2012, IFI, Swords)

Programme	2008	2009	2010	2011	2012	Total
Capital Work (km)	3.94	8.6	14.97	25.08	2.15	54.74
Enhanced Maintenance (km)	12.5	39	47.3	75.22	77.84	251.76
Total EREP channel Length (km)	16.44	47.6	62.27	100.3	79.99	306.5

Table 3-2 List of all EREP catchments, 2008-2012 and overlapping EMP surveyed catchments for yellow, silver and/or elver life stages. (Adapted from, Environmental River Enhancement Programme, 5 Year Report, 2008-2012, IFI Swords)

OPW Region	Catchments Capital Works	Catchments Enhanced Maintenance	Key EMP Catchments
West		Bonet	
West		Boyle	
West	Corrib	Corrib	√
West		Deele	
West	Duff	Duff	
West	Mask	Mask	√
West	Moy	Moy	√
East	Boyne	Boyne	√
East	Brosna	Brosna	
East	Dee	Dee	
East		Glyde	
East	Inny	Inny	
East	Liffey		√
East		Owenavorragh	
East		Ward	
Southwest		Deel	
Southwest	Feale	Feale	√
Southwest		Groody (Shannon Lower)	
Southwest	L. Derg (Shannon)	L. Derg (Shannon)	√
Southwest	Maigue	Maigue	√
Southwest	Maine	Maine	

Table 3-3 EREP 'yardage' by OPW Regions, 2009-2011 (values in metres/week). (Adapted from, Environmental River Enhancement Programme, 5 Year Report, 2008-2012, IFI, Swords)

	Enhanced Maintenance				Capital Works			
Region	2009	2010	2011	Average 3 Years	2009	2010	2011	Average 3 Years
East	444	589	714	579	125	385	414	308
West		410	636	523	156	200	484	280
Southwest	377	775	597	577	109	145	200	151
Average	410	588	643		130	243	366	

3.2 Mulkear LIFE

The MulkearLIFE project is a €1.75 million European Commission funded LIFE Nature project working on the restoration of the Lower Shannon Special Area of Conservation (Mulkear River catchment) for Atlantic Salmon, Sea Lamprey and European Otter. Inland Fisheries Ireland (formerly the Shannon Regional Fisheries Board) is the coordinating project partner together with the OPW and Limerick County Council. Additional funding support comes from NPWS and Tipperary County Councils. Other supporters include Coillte, ESB, Department of Agriculture, Teagasc, IFA and ICMSA. MulkearLIFE is one of the first and most important integrated catchment management projects in Ireland and is a flagship EC LIFE Nature project. The Mulkear, together with its principal tributaries (Dead, Bilboa and Newport rivers), drains a catchment area of approximately 650 km² spanning counties Limerick and Tipperary. The Mulkear River is regarded as one of the top five salmon rivers in Ireland and when its relative size is considered it produces a significant annual salmon run. It holds substantial populations of Sea Lamprey and Otters are known to be widespread, however, recent evidence suggests numbers are in decline. The main objective is to restore degraded habitats along stretches of the Mulkear River and its principal tributaries through in-stream rehabilitation works. This work, while beneficial to many species, is targeted at Sea Lamprey, Atlantic salmon and the European Otter.

Key actions:

- Enhancing the populations of Atlantic salmon and Sea lamprey through in-stream rehabilitation work.
- Removing obstacles to the annual adult sea lamprey river upstream migration for spawning and recruitment.
- Monitoring this via radio-tracking of sea lamprey to determine habitat use and how obstacles are approached.
- Improving breeding, resting habitat and food supply for European otters.
- Stopping and reversing the damage caused by invasive exotics (Giant hogweed and Japanese knotweed).
- Addressing local water quality concerns by working with farmers and farming representative bodies (IFA / ICMSA) on alternative solutions to cattle drinks.
- Promoting the MulkearLIFE's work through a range of events at a local and wider community level including illustrated talks, workshops, primary and post primary school visits, presentations and school field trips.

3.2.1 Results

MulkearLIFE has installed 28 rubble mats on 10km of the Mulkear River, utilising over 5,000 tonne of rock, helping to enhance habitat for salmonids and lamprey species, improving instream and riparian biodiversity. It has also enhanced over 15km of river channel through instream measures (random boulders, vortex and stone weirs) on the Clare-Annagh, Killeengarriff, Bilboa and Newport rivers using over 1,500 tonne of rock, with individual random boulders weight between one and three tonnes.

In August 2013, following 15 months of planning and consultation, MulkearLIFE removed a significant section of Ballyclogh weir which was a barrier to salmonid and sea lamprey passage.

The reconfigured weir now allows unhindered passage to the rest of the catchment, where an additional 184km of river channel has been opened. The success of this work was particularly noted in 2014 where the total number of sea lamprey redds recorded in walkover surveys increased from 55 in 2012, 85 in 2013 to 296 redds recorded in 2014.

The installation of rubble mats to facilitate migration over weirs, the removal of sections of weirs and the rehabilitation works carried out on the Mulkear River will all be a benefit to the eel population of the catchment.

The Mulkear Life project was completed by 31st December 2014 and it is currently in the reporting stage.

3.3 Salmon Conservation Fund

Salmon Conservation Funds are generated from the sale of salmon angling and commercial fishing licences which represents a major contribution by licence holders to wild salmon conservation. The revenue generated from the Salmon Conservation Fund is reinvested to promote the recovery of our salmon stocks and habitats taking into account project feasibility, funding availability and value for money considerations.

The fund is being managed by Inland Fisheries Ireland. Fishery Owners, Angling Clubs, Commercial Fishermen and Inland Fisheries Ireland are implementing projects throughout Ireland. Projects are assessed based on the river's conservation limit status, its water quality (Q-value) and the maximum potential project benefits to the river with funding prioritised for those rivers in most need of rehabilitation.

The types of projects funded by the Salmon conservation fund include:

- Fish passage improvement. (E.g. removal of barriers, modification of weirs etc.)
- Spawning enhancement (addition/raking of gravel or cleaning of existing substrates
- Instream structures (weirs, deflectors, rubble mats, random boulders etc.)
- River Bank protection (rock armour, log revetment etc.)
- Fencing (protection of river banks including fences, stiles, cattle drinkers etc.)
- Riparian zone improvement (tree pruning and strategic tree planting)
- Removal and control of exotic invasives (e.g. Rhododendron, Japanese knotweed, Asian Clam)

Since 2009, fifty projects have been funded around Ireland that have resulted in site modifications (including installations and/or modifcations of fish counters, traps and weirs) and enhancement/rehabilitation works (relating to gravel beds, fencing, pruning, removal of invasives etc.; Table 3-4). The target of this work is on enhancing the salmon stocks in Ireland however any works that enhance and return our ecosystems to a natural state will be of benefit to the eel population in these areas.

Table 3-4 Salmon Conservation Fund Project breakdown 2009 - 2013

Year	Enhancement / Rehabilitation	Sites Modifications & Installations	Barrier Assessment	Barrier / Weir Removal	Total
2009	4	3	1	0	8
2010	4	8	0	0	12
2011	2	8	0	1	11
2012	5	2	0	0	7
2013	6	5	1	0	12
Total	21	26	2	1	50

3.4 Summary

The successful protection of our wetlands under the Habitats Directive, and the Birds Directive, the creation of special areas of conservation and the rehabilitation of our river system will be a benefit to the eel population whether eels are the target of the works or not. Managing our wetlands with an ecosystem approach and reducing and mitigating against the anthropogenic impacts will help to conserve all of our endangered species.

4 Recruitment

4.1 Background

There has never been a glass eel or elver fishery in Ireland as the process was banned under the 1959 Fisheries Act. Therefore unlike other countries Ireland does not have a commercial catch time series that can be used to estimate the recruitment of eel each year. A number of recruitment series were undertaken in the catchments controlled by the Electricity Supply Board (Erne, Shannon and in later years the Lee). An elver ramp trap was installed at Ardnacrusha in 1959 with an elver trap installed at Parteen in 1985. In the Erne; the elver ramps were incorporated in the design of the stations but were recommissioned in the 1960's. There was no elver ramp in the Lee until 2008 however a proportion of eels could have used the Borland lift.

In 1975, Dr. Christopher Moriarty (Fisheries Research Centre) reported on efforts to catch elvers as a source of stocking material to supplement the fishing industry (Moriarty 1975). It is recorded in his report that the ESB already take stock from the Maigue and Feale rivers for the River Shannon. An EIFAC technical paper by O'Leary (1971) details the type of elver traps used by ESB in Irish Rivers; this is the first report of the 'Irish elver trap' that is referenced in numerous studies over the intervening years. In the mid 1990's a report by Reynolds *et al.* 1994 commissioned by the ESB investigated different methods for collecting glass eel and elvers as stocking material; this was followed up by a phd thesis in NUI Galway (O'Connor 2003). This was the start of the national recruitment time series using data from the Shannon (Ardnacrusha and Parteen) and Erne from 1985; Feale and Maigue 1994 and from the River Inagh in 1996. These recruitment indexes continued to be monitored by the ESB and by the Shannon Regional Fisheries Board (SHRFB) and recently by Inland Fisheries Ireland until the present day.

As part of the National Eel Management Plan it was intended that trends in runs of glass eel/elvers arriving in Irish waters be monitored quantitatively at sentinel sites, as recommended in the Eel Review (2004). Due to the uncertainty surrounding the glass eel fishery in Europe the EIFAAC/ ICES Eel working group (ICES 2008) has expressed concerns over this European dataset as there is a risk that a large number of the commercial fishery sites used will be discontinued or the effort will be reduced due to quotas on glass eel catch. The Working group have highlighted the importance of fishery independent monitoring programmes and have recommended that Member States protect the long term time series and set up additional programmes. The recruitment index data collected is used in Irelands monitoring report to the EU and is also provided to the EIFAAC/ ICES Eel Working Group where it is analysed and modelled to determine the eel production for Europe.

The aim of this monitoring programme is to continue and expand the existing long-term national elver index data series (Inagh, Maigue and Feale). The elver monitoring programme has been expanded to include locations on the Ballysadare, Corrib and Liffey Rivers as it has proved to be so successful in the Shannon RBD. Monitoring of elvers was ceased at two locations due to lack of suitable monitoring sites, (Barrow and Slaney Rivers). At all locations the catch is separated into elvers and yellow eels (Plate 4-1).

Plate 4-1 Elvers in the River Maigue, 2014

4.2 Elver Monitoring

4.2.1 2012

Due to the unseasonal high rainfall during the summer of 2012, the Inagh and the Maigue sites in the Shannon River Basin District were unable to be monitored in 2012. The Feale site started catching elvers on the 09th April 2012 and fished up to the 2nd June when flood conditions resulted in the trap being unable to fish (Table 4.1). Despite not fishing for most of June and July the catch of elvers has increased compared with 2011. There are two monitoring traps on the Liffey; a second trap was installed on the weir in 2012 due to the low levels of catches in 2010 and in 2011. However in 2012 both traps caught more elvers than in the previous two years. The two traps will be monitored in 2013. An elver trap was installed in the fish pass at Ballysadare Falls in 2012. This site was an experimental site for 2012 while the location of the trap was finalised, this involved moving the trap during the season to ensure it did not impede the working of the fish pass.

Pipe traps were used for monitoring elvers in the Corrib for the last 3 years. The Corrib started catching elvers on the 30th May 2012 until the 19th July when the traps were removed due to interference. A total of 2 kg of elvers were caught compared with 4 kg in 2011 (Table 4-1). A total of 7 kg of yellow eels were caught compared with 24 kg in 2011. This decrease in catch for both elvers and yellows can be explained due to the high waters levels in the summer of 2012 resulting in poor conditions for the traps to operate in. It is concluded that the recorded levels for 2012 are a minimum value and a higher proportion of eels bypassed the traps due to the excessive water levels. As a result of the high water levels in 2012 and the inefficiency of the pipe traps under high water conditions; a ramp style trap will be installed at the Galway weir for 2013.

4.2.2 2013

The pipe traps have been used in the Corrib catchment since 2010 in order to investigate the behaviour of elvers at the Galway weir. In 2013 a fixed ramp trap was installed into the elver pass and was used in conjunction with the pipe traps for the season. A total of 24 kg of elvers and 12kg of yellow eels were trapped from 31st May to the 14th August (Table 4-1).

In Ballysadare a total of 924g of elvers and 4.6kg of yellow eels were trapped from 29th April to the 7th July. Due to the low water levels in the Ballysadare River the fish pass ladder was closed on the 7th July. During some years it is possible to see the elvers in the ladder as they congregate below the closed sluice gate however this was not visible for the 2013 season indicating the run was potentially over by this time. One of the questions outstanding for this site is the influence of the fish pass water levels on the migration of elvers later in the season. The Ballysadare River has a natural falls acting as a potential impediment to elver migration with elvers utilising the fish pass to ascend upstream, it is not known what proportion ascend the falls directly.

The Islandbridge site on the River Liffey saw a marked increase in catches for the 2013 season up from 213g to 2.7kg for the IFI trap and an increase from 454g to 1.1kg for the Marine Institute trap. The IFI trap was operated from 6th May to the 29th July and the Marine Institute trap was operated from the 16th April to the 20th August.

The Maigue River has 2 traps at Adare Manor one on each river bank. The traps were operating from 5th May until the 8th July. The total catch for the Maigue River was 14kg with only 3 yellow eels recorded. This was a large increase from the 2011 catch of 5kg; however the traps did not operate in the 2012 season due to flood water levels in the river for a large part of the season.

The elver site located at Listowel on the River Feale was operated from 1st May until the 16th July. A total catch of 44kg of elvers and 23kg of yellow eels were recorded. This was an increase from 35kg in 2012.

The Inagh River trap was operational from the 6th May until the 30th July. A total catch of 31kg of elvers and 12.5kg of yellow eels were recorded.

4.2.3 2014

The results for the 2014 season reflect the patchy distribution of the recruitment of glass eels and elvers to Irish waters (Table 4.1). A number of locations have recorded high catches such as the ESB Erne and the IFI Maigue traps. The ESB Shannon trap at Ardnacrusha is catching similar quantity of elvers as last year. However the Feale and Corrib Rivers have both had very poor catches despite the warm weather conditions. The month of May was affected by a number of

serious flash flood events which affected the ability of elvers to migrate upstream. Three distinct flood events occurred in the Feale at the end of April, start of May and mid-May resulting in water levels exceeding 0.6m and reaching a maximum of 1.08m on the 21st May (Figure 4-1). The elvers do not migrate during flood conditions due to their inability to swim against strong water flows.

In the Corrib catchment glass eels and elvers were visible in the estuary earlier in the year however due to high water levels and spillage of water at the Galway weir at the start of the elver season the migration of elvers was delayed and elvers were not seen at the Galway weir until June. The overall catch in the Corrib is low compared with the last 2 years.

The Ballysadare and Liffey traps are relatively new traps and require a number of years of data before a baseline can be determined. The catch at Ballysadare is relatively stable for the 2 years of data however the catch at the Liffey trap was lower in 2014 than 2013 but higher than 2012.

The Maigue elver trap recorded a very large run of elvers on one night (10kg) which exceeded the capacity of the elver holding box and resulted in large mortality of elvers. A new larger elver trap and larger holding box are proposed to be installed at this site in 2015.

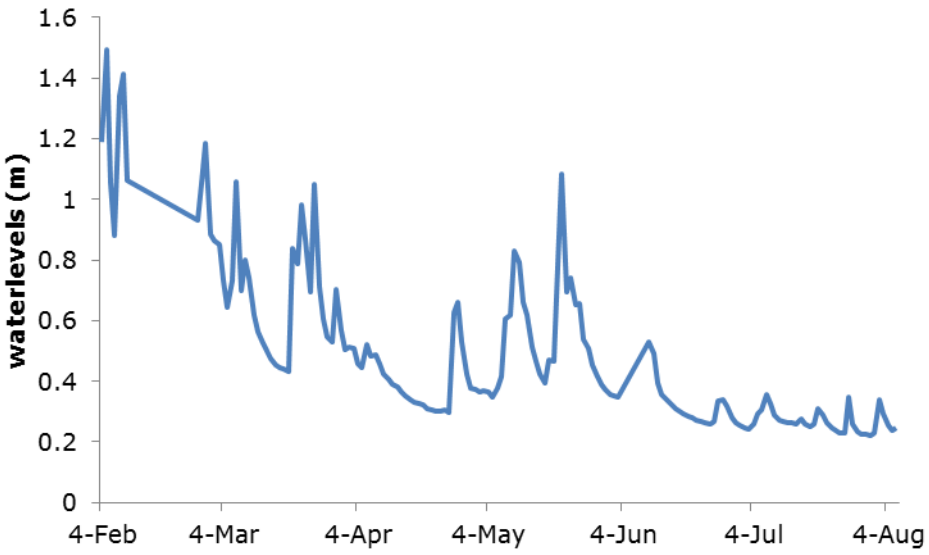

Figure 4-1 Water levels for the River Feale February - August 2014

4.3 Genetic Analysis

IFI have supplied samples of elvers from the Inagh, Maigue and Feale Rivers to the Nicolas Bierne research group working at the University of Montpellier in France. They are undertaking a project aimed at studying the genetic structure of the European eel populations using a large number of Single-nucleotide Polymorphism (SNP) across the genome.

4.4 Summary

The ICES 2014 working group reported a rise in recruitment to Europe from 10% to 12% of historic levels. However it remains to be seen if this increase in recruitment is as a result of the management measures put in place since 2009 or is just natural variability in the recruitment indices. The recruitment for 2014 showed the patchy distribution of glass eels and elvers around Ireland with some catchments recording record highs and other catchments experiencing poor recruitment. IFI plan to continue to monitor the index sites around the country over the coming years.

The distribution of elver migration around the country will be addressed by increasing the number of monitoring stations around the country. Knights *et al.* 2001 reports on the variable nature of the dispersal of individuals around the coast of the United Kingdom. The west coast and the Severn receive a larger proportion of the migrants with reduced recruitment on the west coast due

to the distance from the migration pathway. The dispersal pattern for Ireland could be similar with reduced recruitment on the East coast compared with the west coast of Ireland. The Shannon catchment is ideally situated with a west–east orientation and large wetted area similar to the Severn catchment in the UK which appears to receive a large proportion of the glass eel arriving in UK waters.

4.4.1 Recommendations

The IFI elver traps were initially installed in 1994/1996 in order to supply elvers to the ESB for stocking into the Shannon River (Plate 4-2). The design of the traps has remained the same since the traps were installed for consistency and to allow comparisons over the years. Over the intervening years progress has been made in improving the durability of the traps and in the holding facilities of the traps. There are trap designs being used in the UK where elvers are stored out of the River in custom built storage containers this would result in safer conditions for both the elvers and the operators of the traps as it would negate the need to enter the river to service the traps. Since the introduction of the National Eel Management Plan in 2009 the importance of the recruitment series has increased and it is felt that improvement in the infrastructure of the traps is required in order to comply with best practice protocols when dealing with an endangered species.

A discussion with the Standing Scientific Committee on Eels (SSCE) over the integrity of the long-term monitoring series was held on the 2nd July 2013 and it was agreed that in the long term improvements to the trap should be made. Where possible it is hoped to calibrate any changes to the traps by running both traps for 1 season. The Environment Agency in the UK have recently published guidelines on installing fish passes and have successfully installed a large number of eel passes and monitoring traps in various locations around the UK over the last 6 years. It is the intention of the Eel Monitoring Programme to replace the existing ramp traps over the next few years starting with the Maigue, Inagh and Feale in the Shannon RBD due to the potential of these traps to capture large number of elvers.

Table 4-1 Elver data from IFI traps * trap did not fish due to weather conditions

Location	Year	Total Wt. Elvers (g)	Est. No. Elvers	Av Wt. Elver (g)	Total Wt. Yellow Eels (g)	Est. Nos Yellow Eels	Av. Wt. Yellow Eel (g)
Ballysadare	2013	924	2,640	0.35	4,612	1,005	4.59
	2014	842	2,148	0.35	873	203	4.51
Corrib pipe trap	2010	29,696	95,254	0.33	7,401	728	9.83
	2011	4,189	11,970	0.35	24,493	3,244	7.55
	2012	2,383	5,168	0.34	7,487	1,143	8.55
C Ramp and pipe	2013	14,260	42,064	0.34	12,520	2,149	5.41
Corrib Ramp trap	2013*	10,168	29,994	0.34			
	2014	2,891	8,998	0.32	374	55	2.46
Feale	2010	20,361	42,161	0.48			
	2011	1,099	3,139	0.35	6,298	834	7.55
	2012	35,975	102,785	0.35	10,860	1,601	5.47
	2013	44,661	71,854	0.62	23,313	6,133	4.31
	2014	3,224	6,466	0.48	1,343	301	4.88
Inagh	2010	1,417	2,931	0.5			
	2011	8,168	23,338	0.35	7,134	945	7.55
	2012	*	*	*	*	*	*
	2013	31,069	88,641	0.35	12,581	4,089	3.07
	2014	34,894	90,153	0.39	4,690	1,152	4.25
Liffey IFI	2012	213	608	0.35			
	2013	2,742	7,849	0.35			
	2014	285	746				
Liffey MI	2012	454	1,298	0.35			
	2013	1,144					
	2014	311	1,402			4	
Maigue	2010	2,772	5,650	0.42			
	2011	5,061	13,678	0.37	54	7	7.55
	2012	*	*	*	*	*	*
	2013	14,032	39,665	0.35	19	3	6.4
	2014	29,020	78,042	0.37			

Plate 4-2 National elver monitoring traps top l-r: Ballysadare; Inagh; Liffey; bottom l-r: Feale; Corrib and Maigue

5 Yellow Eels

5.1 Yellow Eel Lake Surveys, 2012-2014

During the last three year cycle of fieldwork 5 lakes were repeatedly sampled for yellow eels; Lough Muckno, Lough Oughter, Meelick Bay in Lough Derg, Lough Key and Lough Ramor. A 3 year fyke netting survey in the freshwater and transitional water of the River Barrow was undertaken to compare with historical data available. The South Sloblands is a brackish lagoon that was surveyed in 2010 and was resurveyed in 2014 to compare with historic data. A semi quantitative electrofishing survey was undertaken in 2 catchments (Fane and Kells Blackwater) in order to determine the extent of eel distribution in the rivers around Lough Muckno and Lough Ramor (both subject to intensive fyke netting surveys). The yellow eel surveys need to meet a number of objectives, to monitor the impact of fishery closure on yellow eel stock structure, compare with historic eels stocks, establish baseline data set, evaluate impedance of upstream migration and determine parasite prevalence within Ireland.

An additional objective of the yellow eel study was to carry out an indirect estimation of silver eel escapement. A long-term tagging programme was initiated in key lakes sampled since 2009. In Lough Derg and Lough Oughter, all yellow eels captured in the fyke nets were tagged using Trovan Passive Integrated Transponders (PIT tags). The detection of these tagged eels in the silver eel run over subsequent years will provide information regarding the maturation rate of the yellow eel population.

In the field, there are two life stages encountered: the yellow resident stage and the silver stage. Stage determination is based on skin colour: an eel that displays a silver belly well separated from a black dorsal region by the lateral line is considered at the 'silver stage'. However eels are found with intermediate features so additional measurements are recorded (ICES, 2009).

- Eye measurements: horizontal and vertical right eye is measured (not just the iris but the whole visible eye, mm)
- Pectoral fin measurements (corresponds to the tip of the fin to the greatest possible length, mm)
- Total body length (cm)
- Wet body weight (kg)
- State of lateral line (presence of black corpuscles i.e. neuromasts)
- Presence of metallic colouration (i.e. bronze)
- Dorso-ventral colour differentiation

Eels were anaesthetized with a solution of 1,1,1–trichloro-2-methyl-2-propanol-hemihydrate and lake water or a 1:10 solution of clove oil in ethanol dissolved in lake water. For each night's fishing, as many live samples as possible were measured for weight, length, and INDICANG style morphological features associated with silvering. At each location approximately 100 eels (~50 per session) were sacrificed for further analysis in the laboratory. Total length (to nearest cm), weight (to nearest g) and silvering characteristics were determined on site. Otoliths were removed for age evaluation (using a variation of the cracking and burning method - Christensen 1964, Hu & Todd 1981, Moriarty 1983 and Graynoth 1999), gonads for sex determination (macroscopically), swimbladders for evaluation of nematode parasite, *Anguillicola crassus* (Kuwahara, Niimi & Hagaki, 1974) and stomachs for diet composition.

During dissections, each eel is examined for the presence of the swimbladder parasite, with percentage prevalence, mean intensity of infection per eel, maximum burden per eel, maximum weight of infections and total parasite count across the dissected eels, all recorded. In the last two years, two indices for investigating swimbladder tissue health have also been used. The Swimbladder Degenerative Index (SDI) (Lefebrve *et al.* 2002) is a qualitative index which scores, swimbladder tissue transparency, presence of pigment and/or exudate and the thickness of the swimbladder wall (Molnár *et al.* 1994), in order to grade the health of the organ on a scale of 1-6. Slight damage is depicted by scores of 1-2, while moderate damage scores 3-4. Score of 5-6 being the most severely damaged. The second index used is the Length Ratio Index (LRI) (Palstra *et al.* 2007), this index is far more quantitative than SDI and relies on a measurement of the length of the swimbladder during dissection. This value of swimbladder length is divided by the total length of the eel and the resulting score is the length ratio index (LRI). Values range from 0.2 to 0.0, with increasing damage approaching zero. When compared to values of SDI, LRI values of

approximately 0.2 – 0.15 depict slight damage. Values of 0.14 – 0.09 denoted moderate damage. Finally, severe damage is demonstrated in values less than 0.08.

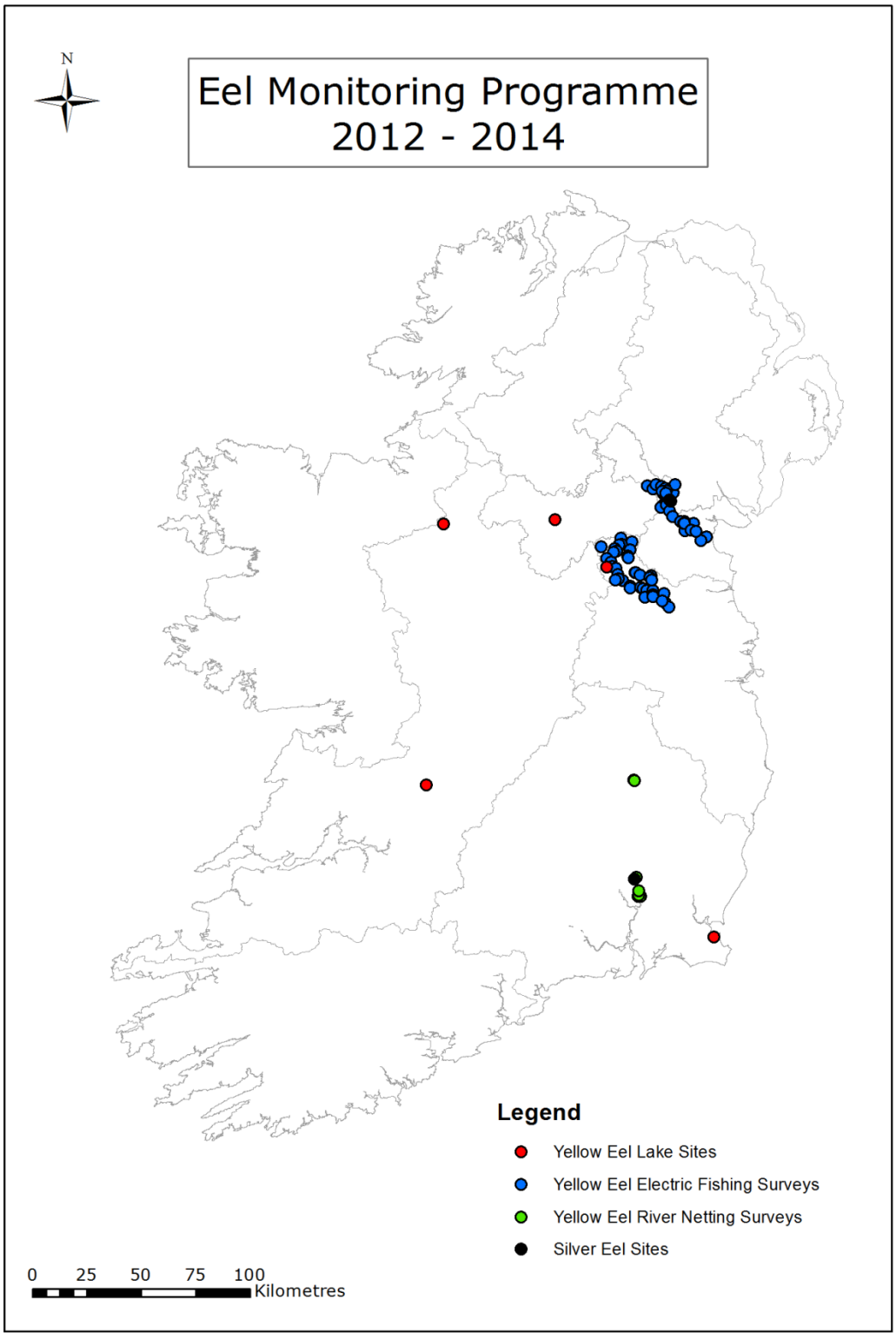

Figure 5-1 Locations of yellow eel lake surveys, yellow eel river catchment netting and electric fishing surveys and silver eel surveys, 2012-2014

5.1.1 Lough Muckno

Lough Muckno is located on the east coast within the Fane catchment. It has a surface area of 325 ha and depths reaching up to 20m. The lake was sampled for the first time by the EMP during the summer of 2012, for 2 nights only, due to poor weather conditions, however the catch was high (Figure 5-2). Fyke nets were set in chains of five. In total, 540 eels were caught with a catch per unit effort (CPUE) of 9.82 (Table 5-2). The eels ranged in length from 24.8 to 91.0 cm and in weight from 0.029 to 2.043 kg, with a total weight of 111.76 kg recorded (Table 5-2 and Figure 5-3).

A repeat survey was carried out in 2013 for 6 nights (Figure 5-2). Fyke nets were again set in chains of five. A total catch of 1,007 eels was recorded with a CPUE of 28.77. Due to the high catch, the full suite of measurements were taken on 667 eels (Table 5-2). The remaining eels caught during this survey were counted, batch weighed and released. The measured eels ranged in length from 26.7 to 82.8cm and in weight from 0.042 to 1.133kg (total weight recorded was 150.33kg; Table 5-2 and Figure 5-3).

The 2014 survey yielded somewhat different results, with lower catches overall but more comparable with other lakes surveyed under the EMP programme. The weather conditions were particularly calm and there was a moderate algal bloom on the lake which may have affected the catch. Over the course of 3 nights fished, with eight chains of five fyke nets, 221 eels were caught presenting a CPUE of 5.53. The eels ranged in length from 32.7 to 76.1cm and in weight from 0.050 to 0.834kg, with a total recorded weight of 52.71kg. No eels were retained for dissection during this survey.

A total of 1,428 eels were measured from the three years of surveys on Lough Muckno. Numbers and CPUEs varied from year to year. This was most likely due weather conditions and other environmental factors impacting the catch. Length and weight ranges were however, similar throughout these surveys (Figures 5-3).

A number of eels were sacrificed and examined in the laboratory during dissection. In 2012, 106 eels were sacrificed from Lough Muckno. From these eels, 94% were female (Table 5-3 and Figure 5-4). It is noted that there is a higher female sex ratio in the yellow eel fyke net population when compared with the silver eel catch.

There was a 48.11% prevalence rate for the swimbladder parasite *A. crassus* and a mean infection intensity of 2.16 parasites per eel. A total of 110 parasites were found in the sample (Table 5-3 and Figure 5-5). In 2013, 100 eels were sacrificed for dissection. Again, 94% were female (Table 5-3 and Figure 5-4). There was a 56% prevalence rate for *A. crassus* and a mean infection intensity of 3.41 parasites per eel. In total, 100 individual parasites were noted among the dissected eels (Table 5-3 and Figure 5.5). These results presented a slight increase in prevalence and intensity of the parasite in Lough Muckno from the previous year, however in relation to other lakes sampled by the EMP; they are below the average for these parameters.

The Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) were applied to the 99 sacrificed eels from Lough Muckno in 2013 in order to assess swimbladder condition. Both indices suggested only slight/moderate damage to the swimbladders, with an SDI modal result of just 1 and an LRI modal of 0.18 (Figures 5-6). Palstra *et al.* (2007) suggested that the ability of eels to complete the spawning migration would decrease with large parasite infections and/or severe swimbladder tissue damage. This suggests that the swimbladders were relatively healthy among the Lough Muckno sampled eels, despite levels of parasite infection. The examinations of stomach contents of the sacrificed eels suggested that chironomid larvae made up the largest element of the diet of the Lough Muckno population in both years, with a supplement of small fish for some larger females.

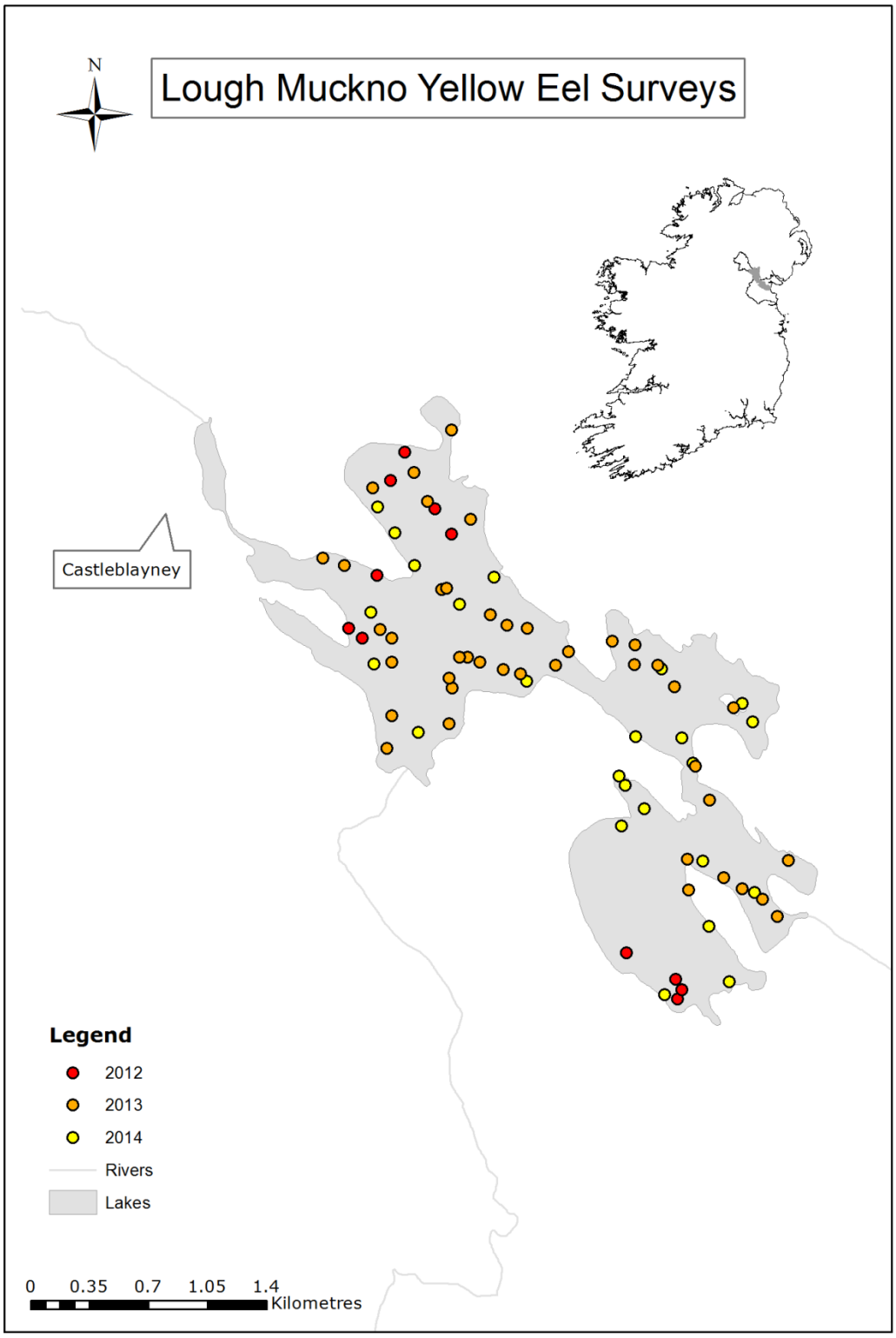

Figure 5-2 Locations of fyke nets sampled on L. Muckno, 2012-2014. (Inset: Map of Ireland with Fane catchment (shaded) and Neagh-Bann International River Basin District (outlined))

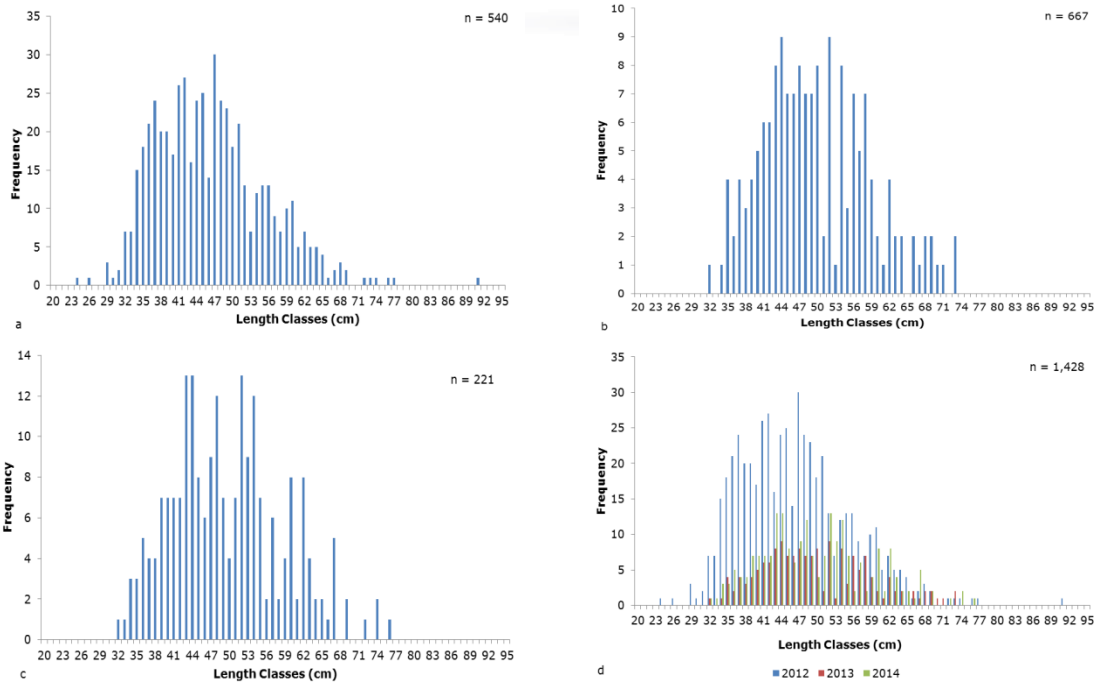

Figure 5-3 Length frequency graphs for yellow eels from Lough Muckno a. 2012, b. 2013, c. 2014, d. all years combined

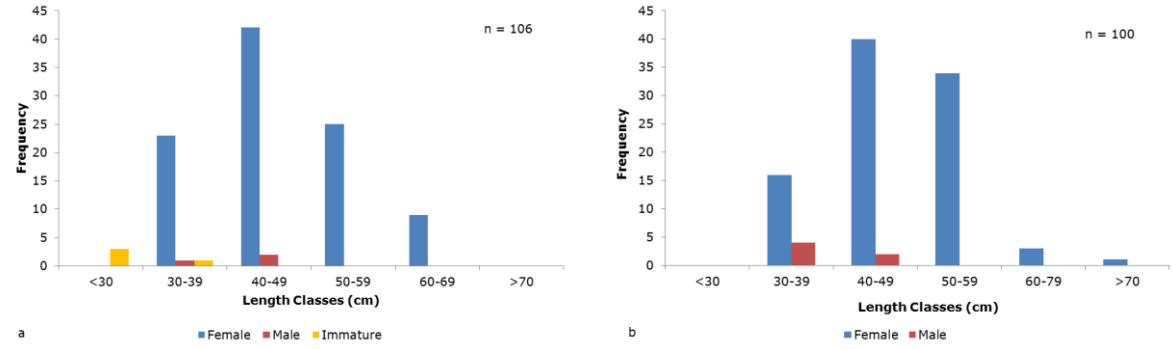

Figure 5-4 Sex distribution of sacrificed yellow eels in L. Muckno, a. 2012; b. 2013

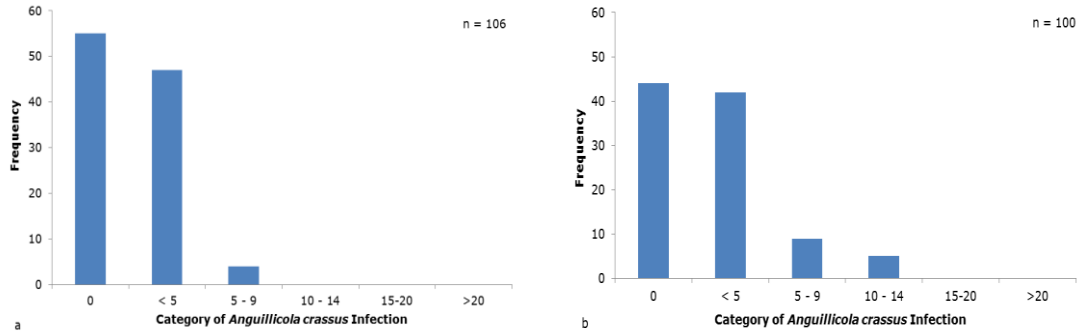

Figure 5-5 *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Muckno, a. 2012; b. 2013

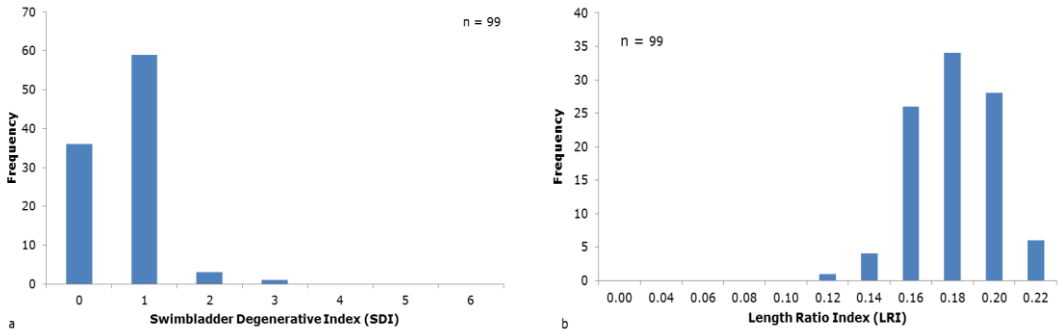

Figure 5-6 a. Swimbladder Degenerative Index (SDI) results for swimbladder condition among sacrificed yellow eels collected from L. Muckno, 2013. b. Length Ratio Index (LRI) results for swimbladder condition among sacrificed yellow eels collected from L. Muckno

5.1.2 Meelick Bay, Lough Derg

Meelick Bay, on Lough Derg, is located near Mountshannon in Co. Clare in the Shannon catchment. The lake has a surface area of 11,857.37ha and a maximum depth of 36m. Meelick Bay was surveyed by the Fisheries Research Centre from 1981–1994. In 2011 the Eel Monitoring Programme repeated the survey using the same locations and methodology setting the fyke nets in chains of 10 nets (Moriarty, 1986 & 1996). Meelick Bay was sampled for 8 nights (3, 2 and 3 nights respectively per session) during the summer of 2012 (Figure 5-7). In total, 745 eels were caught with a CPUE of 2.48 (Table 5-2). The eels ranged in length from 28.5 cm to 69.2 cm and in weight from 0.037 to 0.509kg, with a total weight of 113.4kg (Table 5-2 and Figure 5-8a).

Meelick Bay was sampled for 6 nights during the summer of 2013 (Figure 5-7). In total, 409 eels were caught with a CPUE of 13.63 (Table 5-2). The eels captured ranged in length from 25.3 to 63.8cm and in weight from 0.024 to 0.497kg, with a total weight of 55.4kg (Table 5-2 and Figure 5-8b). These length and weight ranges were similar to previous surveys at this location. No sacrificed eels were retained for these surveys.

5.1.2.1 Mark Recapture Study

From 2011 to 2013, a mark recapture study was carried out in Meelick Bay. The aim of the study was to tag eels for the maturation study in the Shannon catchment, where tagged yellow eels are detected as silver eels migrating downstream. The second aim of the study was to carry out a comparison with the historical data available from the Fisheries Research Centre. A total of 8,093 eels were collected in fyke net survey of Meelick bay from 1981 to 1994.

Over the three years of EMP sampling a total of 1,934 eels were tagged with passive integrated transponders (PIT; Table 5-1). To date, 36 yellow eels were recaptured resulting in a recovery rate of 1.85%. Moriarty (1986) reported on a mark recapture study of the eels in Meelick Bay from 1981–1984. A total of 3,602 eels were tagged with floy tags over four seasons and 44 eels were recaptured giving a recovery rate of 1.22%. Twenty eels were recaptured within 14 days of being tagged. Twenty four eels were recaptured at a greater time interval ranging from 14 days to 1,074 days. The low recapture rate from the FRC and EMP data is mirrored in other IFI Mark Recapture studies in the Waterford Transitional waters and Lough Feeagh (Co. Mayo). Moriarty (1986) reported that the population of Meelick Bay was not resident, and that the population underwent changes throughout the warmer months of the year.

Table 5-1 Summary data from Mark Recapture Study in Meelick Bay 2011 – 2013 and the Fisheries Research Centre (FRC) data from 1981 – 1984

	2011	2012	2013	Total	FRC
No. Eels Tagged	827	715	382	1,924	3,602
Total Recapture	15	19	1	35	44
Years	3	2	1	3	4
Recapture %				1.82%	1.22%
Recaptured 2011	7				
Recaptured 2012	4	15			
Recaptured 2013	4	4	1		
Silver 2011	6				
Silver 2012	2				
Silver 2013	5	2	5		
Silver 2014	3	2	2		

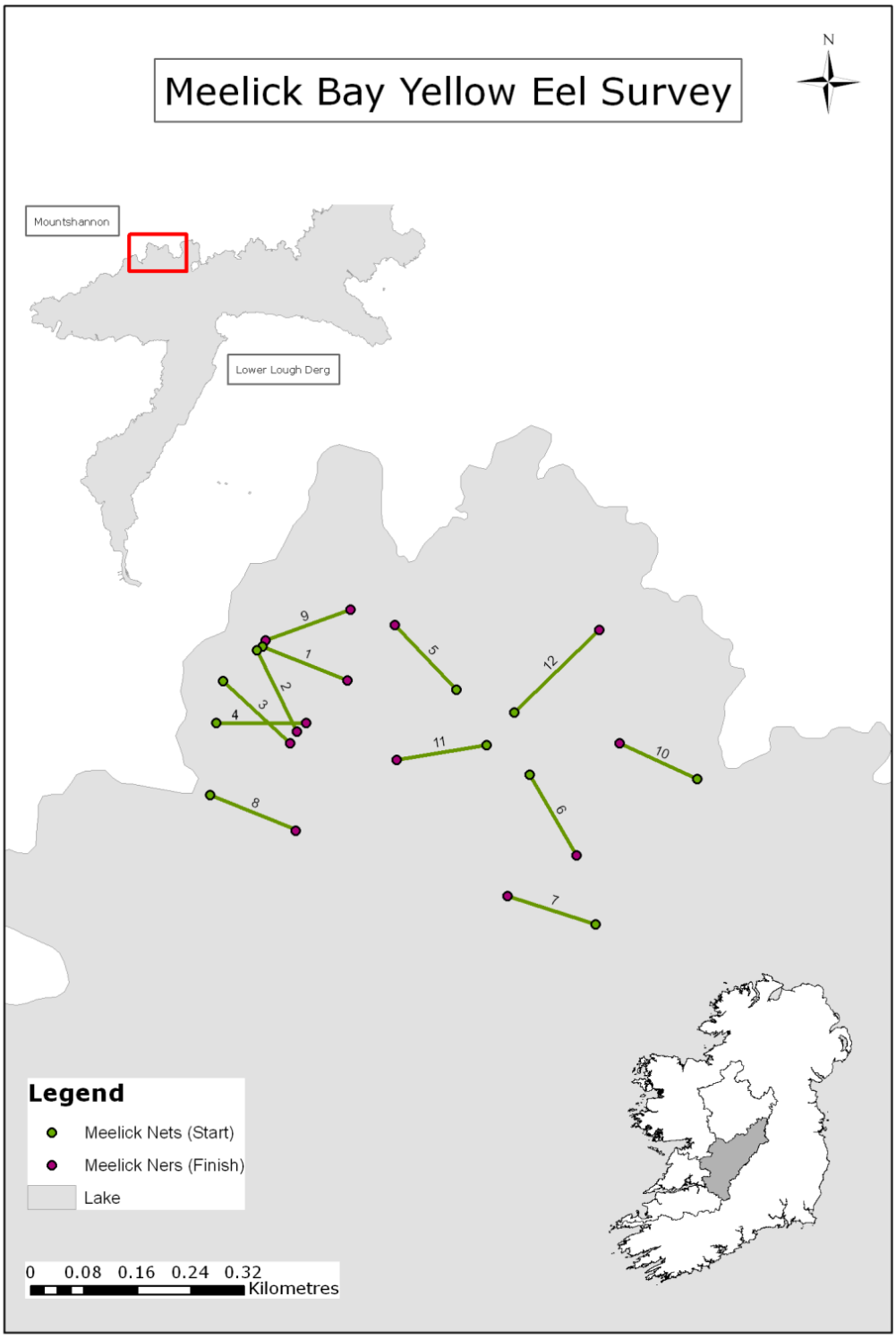

Figure 5-7 Locations of fyke nets sampled on Meelick Bay, L. Derg, 2012 and 2013. (Insets: Location of Meelick Bay on lake (red square), and map of Ireland with Shannon catchment (shaded) and Shannon International River Basin District

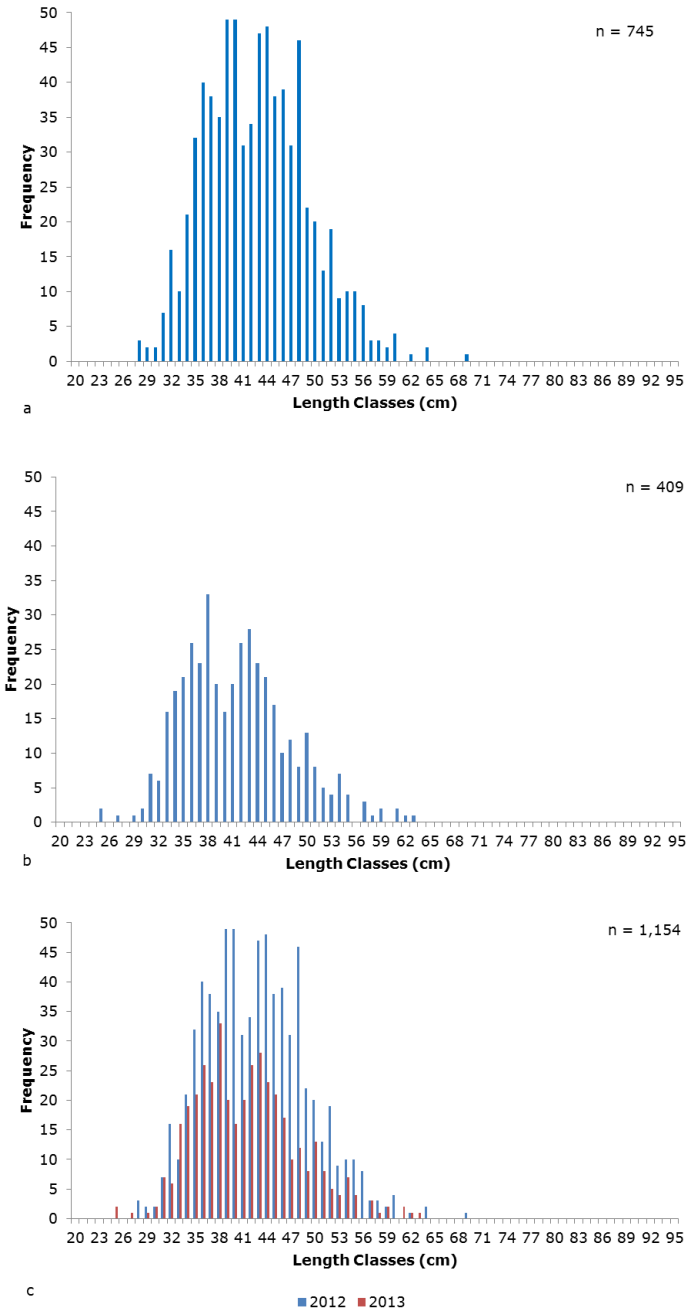

Figure 5-8 Length frequency of yellow eels captured at Meelick Bay, L. Derg, a. 2012, b. 2013,c. 2012 and 2013 combined

5.1.3 Lough Oughter

Lough Oughter is a shallow, upstream lake in the Erne catchment which was sampled by the EMP for 6 nights during the summer of 2012. It is a narrow lake in many sections, with a surface area of 706ha and maximum depths of just over 10m. The data reported below represents the lake sampled during the summer of 2012, which was re-sampled after the 2011 survey showed low catches despite the elver stocking carried out in the area during the 1990s.

Lough Oughter was sampled using fyke nets set in chains of five (Figure 5-9). In total, 267 eels were caught with a CPUE of 1.11 (Table 5-2). The eels ranged in length from 31.1 to 70.2cm and in weight from 0.046 to 0.774kg, with a total catch weight of 62.159kg (Table 5-2 and Figure 5-10). No eels were sacrificed during this survey.

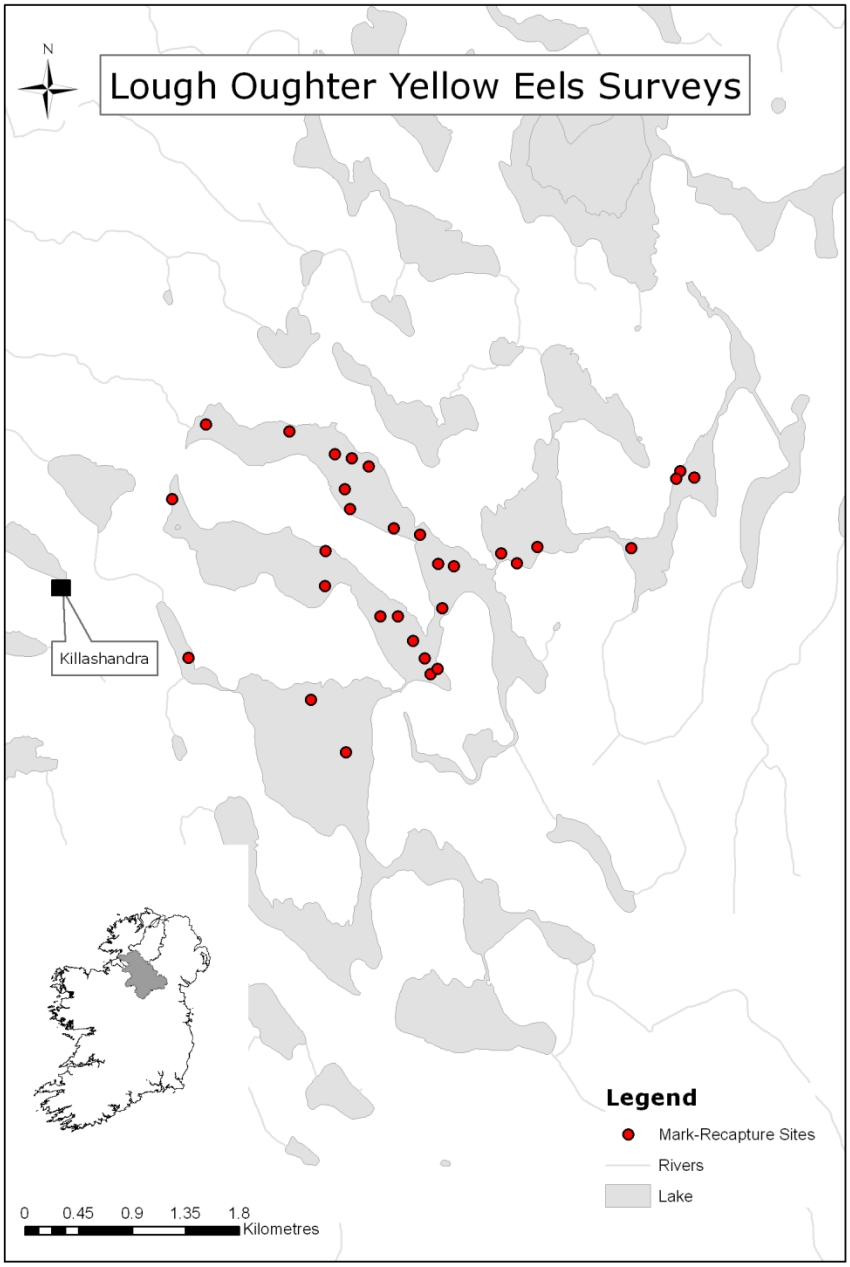

Figure 5-9 Locations of fyke nets sampled on L. Oughter, 2012. (Inset: Map of Ireland with Erne catchment (shaded) and North Western River Basin District (outlined))

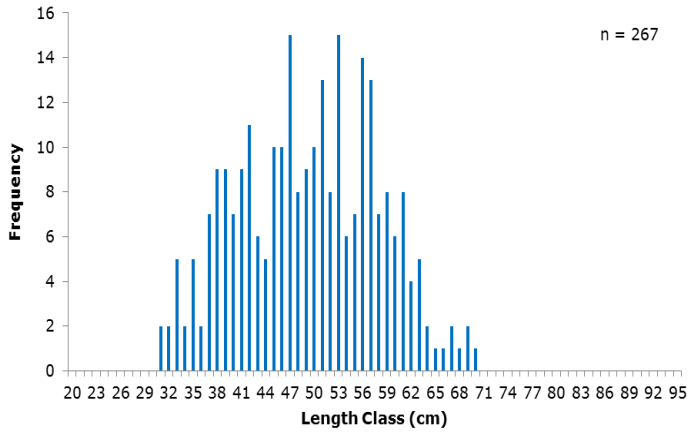

Figure 5-10 Length frequency of yellow eels captured at L. Oughter, 2012

5.1.4 Lough Key

Lough Key is situated in the upper Shannon catchment near Boyle and Carrick-on-Shannon. The lake has a surface area of 890ha, a maximum depth of approximately 22m and has several small islands over its surface. The lake was sampled over 6 nights during the summer of 2013 (Figure 5-11). In total, 375 eels were caught with a CPUE of 10.71 (Table 5-2). The eels ranged in length from 36.9 to 80.2cm and in weight from 0.071 to 0.907kg, with a total weight of 108kg (Table 5-2 and Figure 5-12).

A total of 102 eels were sacrificed during the summer surveys on Lough Key. All of the dissected individuals were female (Figure 5-13). The most common food type noted during stomach content examinations was the water louse, *Asellus* sp. The swimbladder parasite, *A. crassus* was present in Lough Key with a prevalence of 54.9% across the sacrificed eels and a mean intensity of infection of 2.64 per eel (Figure 5-14). A total of 102 individual parasites were noted across the dissections (Table 5-3).

The Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) were applied to the sacrificed eels from Lough Key in order to assess swimbladder condition. A high degree of damage is noted when SDI values reach 5-6, while the LRI demonstrates severe damage in values less than 0.06. However, both indices suggested only slight/moderate damage to the swimbladders, with an SDI modal of 1 and an LRI modal of 0.16 (Figures 5-15). This suggests a relative degree of health in the swimbladders in the sample taken, despite the levels of parasite infection. It is planned to investigate the effect of age on SDI and LRI in a number of locations.

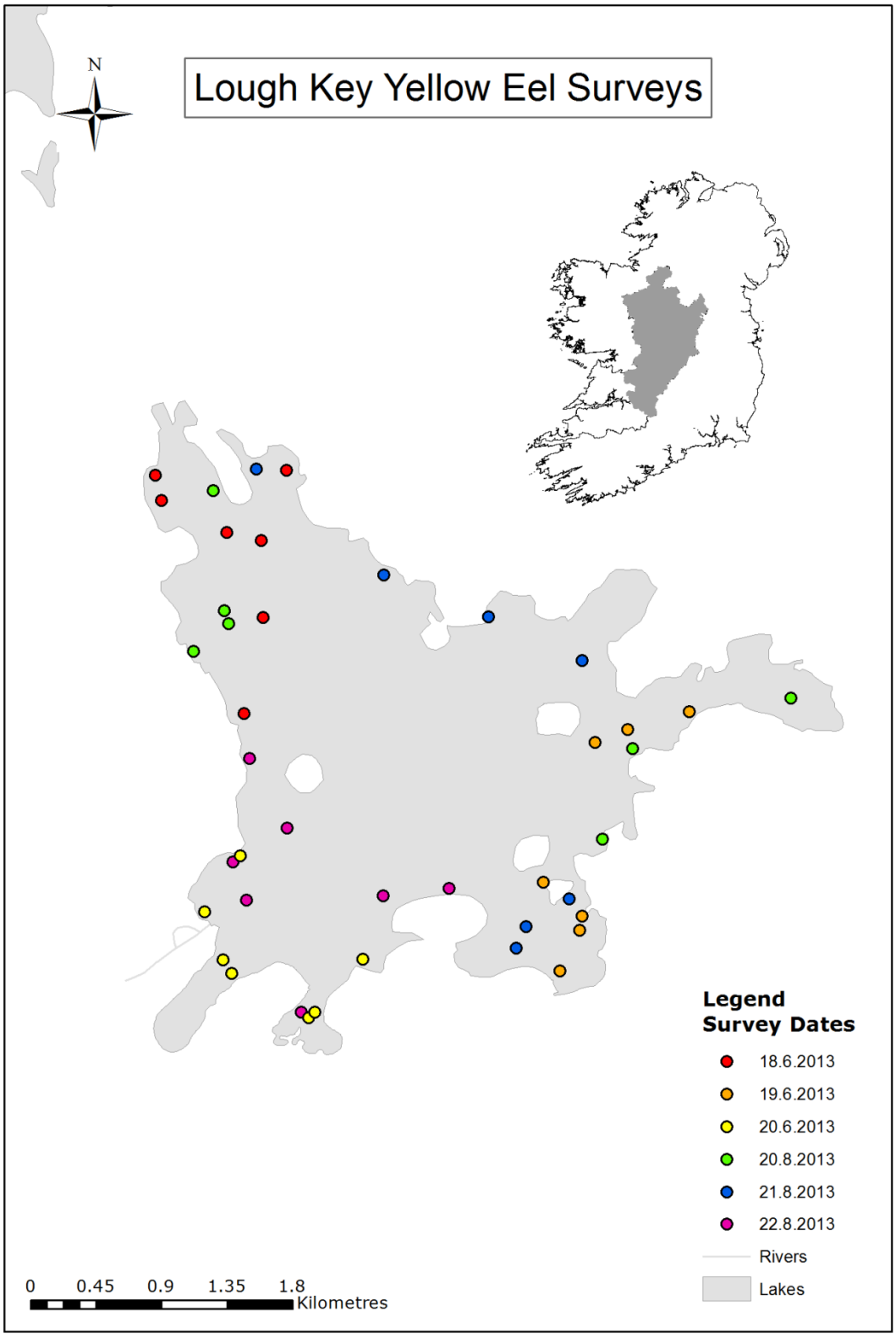

Figure 5-11 Locations of fyke nets sampled on L. Key, 2013. (Inset: Map of Ireland with Shannon catchment (shaded) and Shannon International River Basin District (outlined))

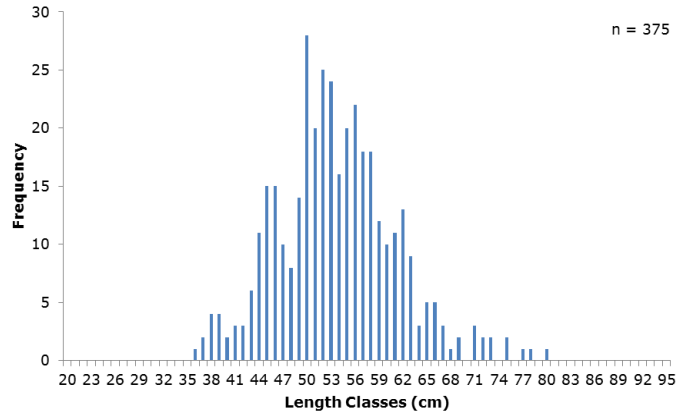

Figure 5-12 Length frequency of yellow eels captured at L. Key, 2013

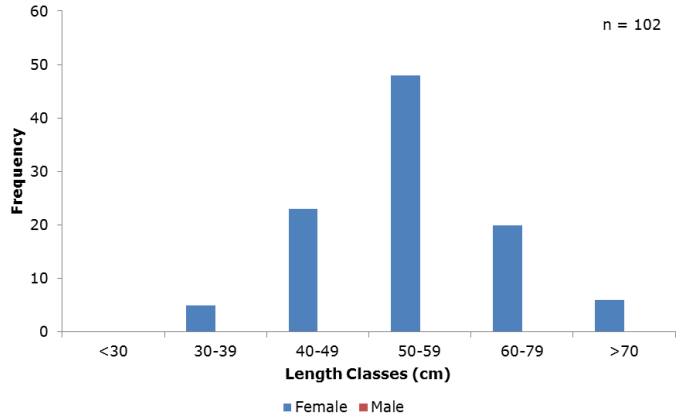

Figure 5-13 Sex distribution of sacrificed yellow eels in L. Key, 2013

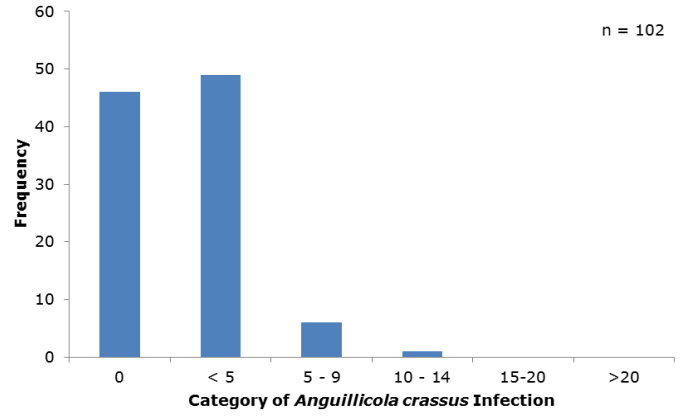

Figure 5-14 *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Key, 2013

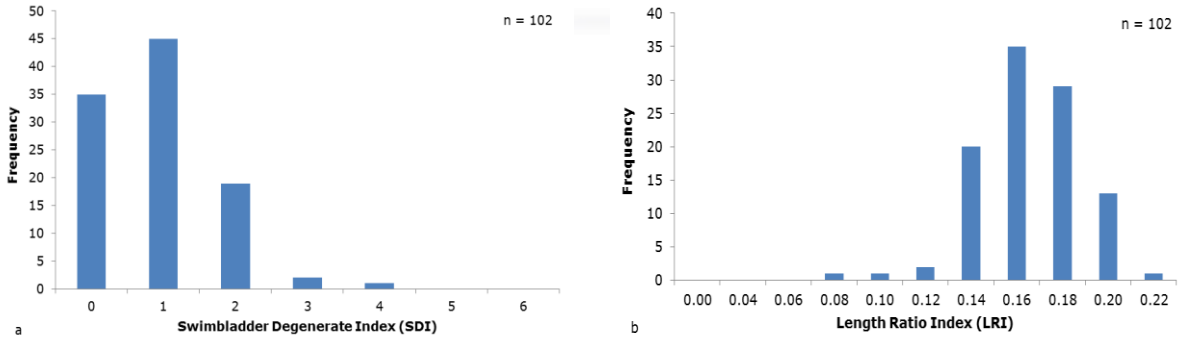

Figure 5-15 a. Swimbladder Degenerative Index (SDI) b. Length Ratio Index (LRI) results for swimbladder condition among sacrificed yellow eels collected from L. Key, 2013

5.1.5 Lough Ramor

Lough Ramor is a shallow glacial lake located near Virginia (Co. Cavan) in the Boyne catchment. It has a surface area of 712ha and a maximum depth of approximately 6m. The outflow of Lough Ramor is the Kells Blackwater River which discharges into the River Boyne. Lough Ramor was sampled for 6 nights during the summer of 2014 (Figure 5-16). In total, 214 eels were caught with a CPUE of 1.78 (Table 5-2). The eels ranged in length from 23.1 to 81.8cm and in weight from 0.050 to 1.141kg, with a total catch weight of 56.2kg (Table 5-2 and Figure 5-17).

A total of 99 eels were sacrificed during the survey, 88% of which were female, 10% were male and 1% was identified as immature (intersexual) individuals (Table 5-3 and Figure 5-18). There was a high prevalence of *A. crassus* with a rate of 83.84% and a mean intensity of 9.66 parasite per eel (Figure 5-19). The total parasite count among the sacrificed eels was 802 individuals. The Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) were applied to the sacrificed eels from Lough Ramor in order to assess swimbladder condition. Both indices however, suggested only slight/moderate damage to the swimbladders, with an SDI modal of 1 and an LRI modal of 0.18 (Figures 5-20). This suggests that swimbladder tissue in the eels examined was relatively healthy despite the high prevalence and mean intensities of infection noted in the lake. Lough Ramor has a lower percentage of eels without the parasite compared with other lakes surveyed (n-16 eels, Table 5-3). As with Lough Muckno, the main food type recorded during stomach content examination was chironomid larvae.

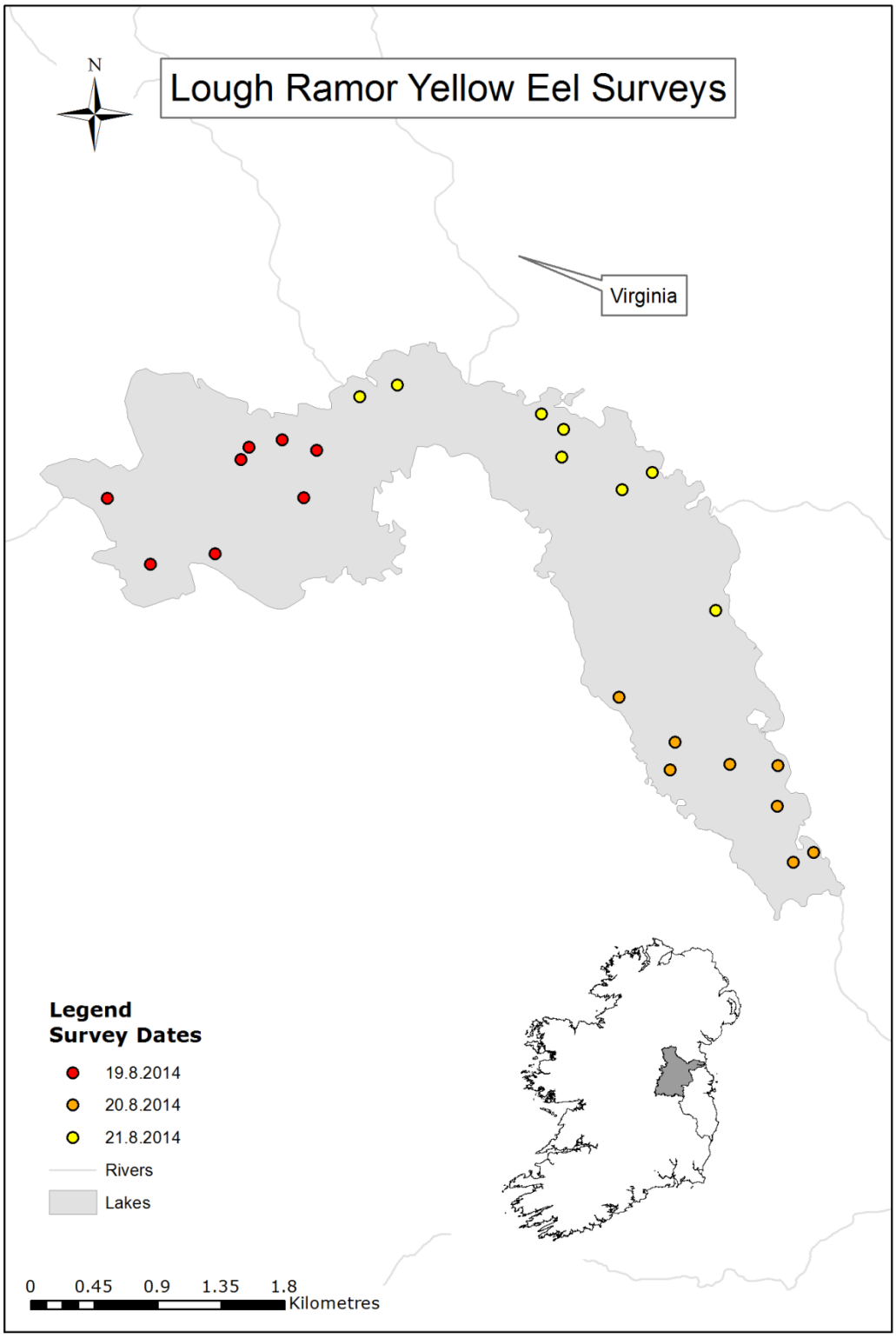

Figure 5-16 Locations of fyke nets sampled on L. Ramor, 2014. (Inset: Map of Ireland with Boyne catchment (shaded) and Eastern River Basin District (outlined))

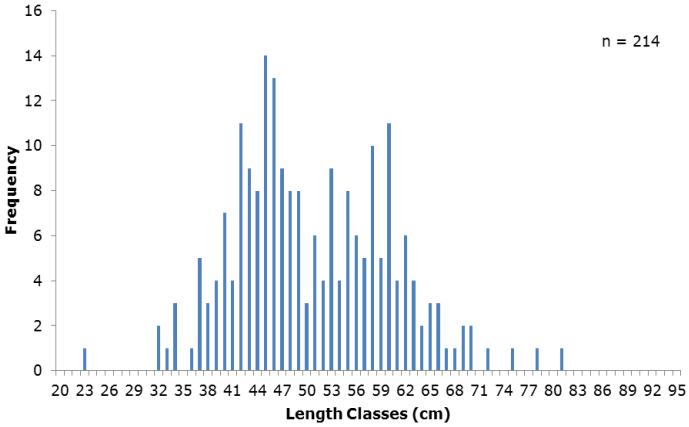

Figure 5-17 Length frequency of yellow eels captured at L. Ramor, 2014

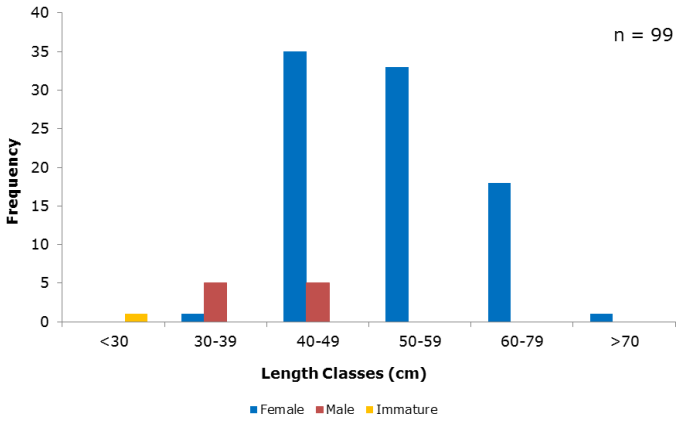

Figure 5-18 Sex distribution of sacrificed yellow eels in L. Ramor, 2014

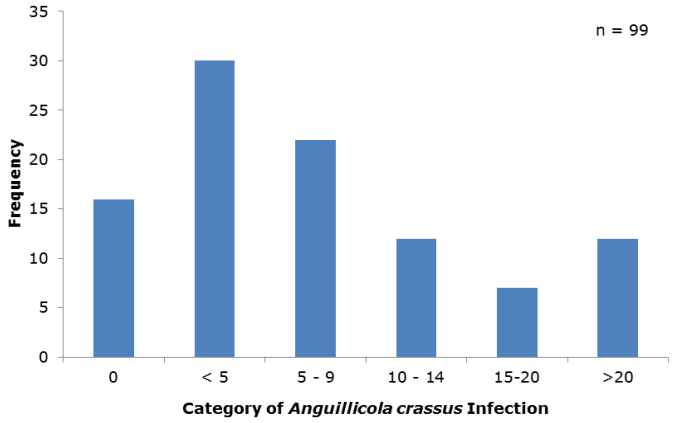

Figure 5-19 *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Ramor, 2014

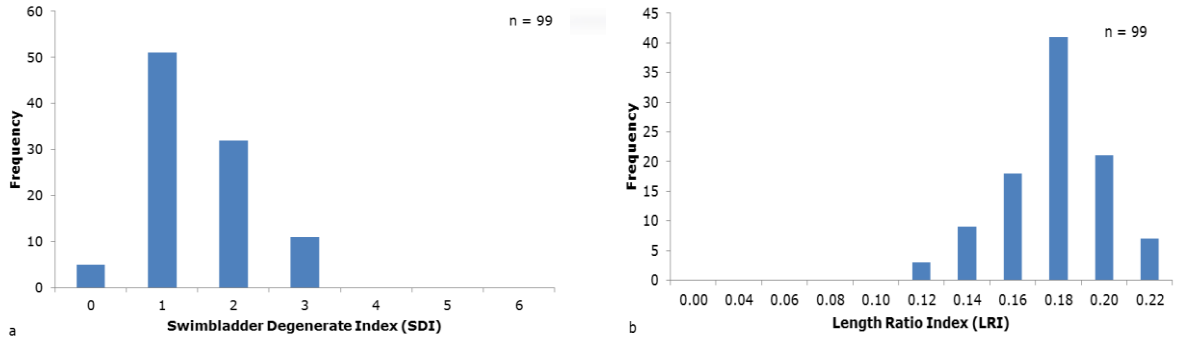

Figure 5-20 a. Swimbladder Degenerative Index (SDI) b. Length Ratio Index (LRI) results for swimbladder condition among sacrificed yellow eels collected from L. Ramor, 2014

5.2 South Sloblands

South Sloblands is a brackish lagoon on southern shores of Wexford Harbour on the Slaney catchment (transitional waters), located near Drinagh and Wexford Town. The sloblands lie below sea level, on flat land covering 1,000 ha. The South Slobland lagoon itself has a surface area of 52.06ha and was particularly shallow, with an average depth at sampling points of 2.7m.

The eel populations of the South Sloblands were previously examined on a regular basis by the Fisheries Research Centre. Moriarty (1972 and 1974) reported that the eels of South Sloblands had been subjected to intense commercial fishing for two successful years, and as a result were showing low stocks and would take years to recover. It was suggested to the fishery owners to abandon fishing for five years to permit recovery. The author went on to report that in 1970, a fyke netting survey of the South Sloblands had yielded a catch of 408 eels. Just two years later (1972), that catch had reduced to 15 eels. In 2010, the South Sloblands were sampled by the EMP for a single night using a total of 30 nets with a catch of 24 eels for 1 night. A repeat survey was carried out in 2014 using 30 fyke nets for two nights (six chains of 5; Figure 5-21). A total of 147 eels were caught, reflecting a CPUE of 5.07. The eels ranged in length from 28.6 to 66.5cm and in weight from 0.032 to 0.708kg, with a total catch weight for the two days of 24.24kg (Table 5-2 and Figure 5-22). No eels were retained for dissection during these surveys.

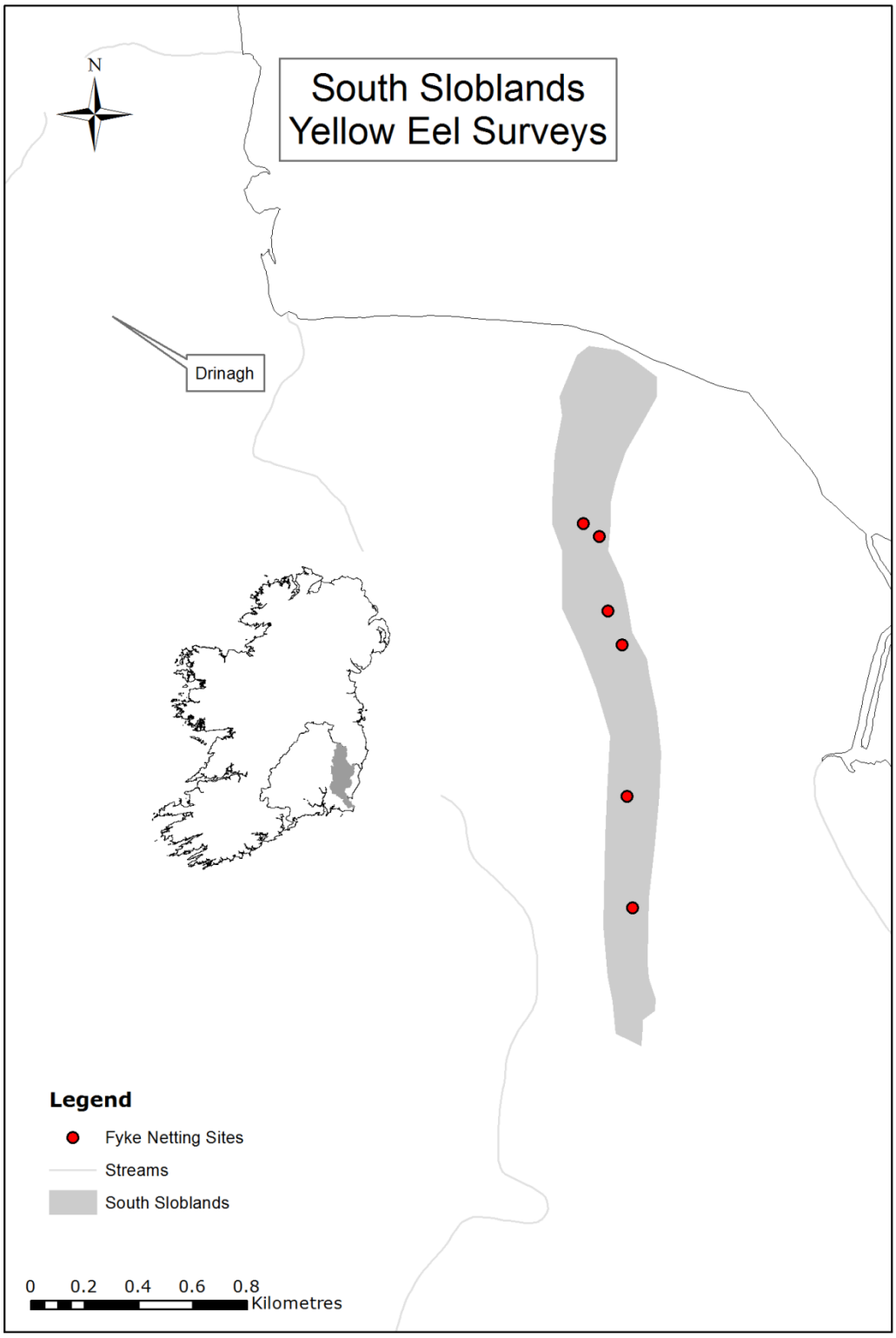

Figure 5-21 Locations of fyke nets sampled on South Sloblands, 2014. (Inset: Map of Ireland with Slaney catchment (shaded) and South Eastern River Basin District (outlined))

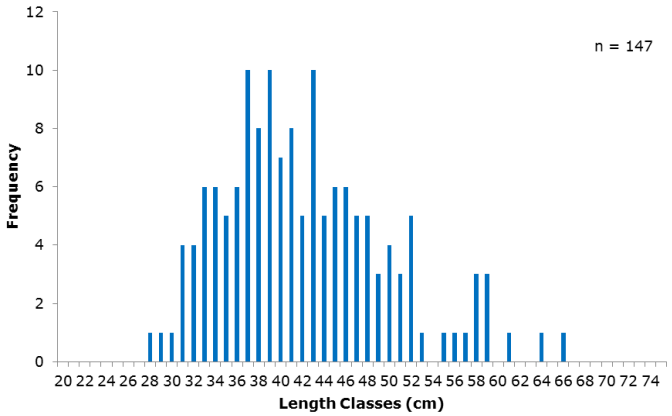

Figure 5-22 Length frequency of yellow eels captured at South Sloblands, 2014

Table 5-2 Catch detail of the yellow eel surveys, 2012 - 2014

Site	Dates	No. Eels	Nets*Nights	CPUE	Total Weight (kg)	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
Lough Muckno*	14/08/2012	434	35	12.40	89.524	46.8	29.4	91.0	0.206	0.039	2.043
	15/08/2012	106	20	5.30	22.241	46.6	24.8	68.0	0.210	0.029	0.635
	2012	**540**	**55**	**8.85**	**111.765**	**46.7**	**24.8**	**91.0**	**0.207**	**0.029**	**2.043**
Lough Muckno	11/06/2013	388 209**	35	11.09	51.018	50.4	32.4	73.6	0.244	0.053	0.902
	12/06/2013	238	35	6.83	50.511	48.3	31.0	82.8	0.212	0.047	1.078
	13/06/2013	157***	35	4.49	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	13/08/2013	86	35	2.46	21.274	50.1	33.5	71.0	0.247	0.058	0.728
	14/08/2013	68	35	1.94	14.147	46.4	32.3	79.0	0.208	0.053	1.133
	15/08/2013	67	35	1.97	13.375	3170.5	26.7	70.4	0.200	0.042	0.710
	2013	**1007**	**210**	**4.80**	**150.325**	**48.9**	**26.7**	**82.8**	**0.225**	**0.042**	**1.133**
Lough Muckno	02/09/2014	121	40	3.03	28.556	50.4	33.7	76.1	0.236	0.059	0.834
	03/09/2014	64	40	1.60	14.831	49.4	32.7	74.9	0.232	0.050	0.758
	04/09/2014	36	40	0.90	9.332	50.8	36.4	72.3	0.259	0.076	0.755
	2014	**221**	**120**	**1.84**	**52.710**	**50.2**	**32.7**	**76.1**	**0.238**	**0.050**	**0.834**
Meelick Bay, Lough Derg∞	01/05/2012	50	40	1.25	8.161	43.4	32.4	60.3	0.163	0.058	0.420
	02/05/2012	50	40	1.25	7.197	41.8	31.6	54.3	0.144	0.061	0.327
	03/05/2012	54	30	1.80	8.365	43.2	31.5	55.7	0.155	0.052	0.324
	31/07/2012	87	40	2.18	13.678	43.5	28.5	60.1	0.157	0.044	0.395

Site	Dates	No. Eels	Nets*Nights	CPUE	Total Weight (kg)	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
	01/08/2012	169	40	4.23	24.367	42.7	28.8	59.8	0.144	0.037	0.390
	28/08/2012	143	40	3.58	21.839	43.6	30.0	64.3	0.153	0.048	0.422
	29/08/2012	130	40	3.25	19.866	43.3	28.6	64.8	0.153	0.040	0.470
	30/08/2012	62	30	2.07	9.764	43.8	32.2	69.2	0.157	0.057	0.509
	2012	**745**	**300**	**2.45**	**113.237**	**43.2**	**28.5**	**69.2**	**0.152**	**0.037**	**0.509**
Meelick Bay, Lough Derg	05/06/2013	40	30	1.33	6.494	44.2	29.1	59.5	0.162	0.040	0.399
	06/06/2013	72	30	2.40	9.971	41.5	25.9	63.8	0.138	0.042	0.497
	07/06/2013	86	30	2.87	12.476	42.7	27.0	62.5	0.145	0.034	0.436
	27/08/2013	48	30	1.60	5.971	41.1	30.7	61.2	0.124	0.048	0.300
	28/08/2013	56	30	1.87	7.295	41.5	30.1	59.2	0.130	0.043	0.376
	29/08/2013	107	30	3.57	13.182	41.3	25.3	61.5	0.123	0.024	0.379
	2013	**409**	**180**	**2.27**	**55.389**	**41.9**	**25.3**	**63.8**	**0.135**	**0.024**	**0.497**
Lough Oughter	15/05/2012	43	40	1.08	10.042	50.7	33.5	69.8	0.241	0.057	0.561
	16/05/2012	37	40	0.93	10.276	52.1	37.0	67.8	0.270	0.076	0.606
	17/05/2012	43	40	1.08	9.797	49.1	36.4	65.4	0.229	0.071	0.544
	03/07/2012	69	40	1.73	14.398	48.4	31.1	64.0	0.209	0.056	0.496
	04/07/2012	30	40	0.75	6.487	48.3	31.2	67.4	0.216	0.046	0.517
	05/07/2012	45	40	1.13	11.159	50.1	33.3	70.2	0.248	0.055	0.774
	2012	**267**	**240**	**1.12**	**62.159**	**49.7**	**31.1**	**70.2**	**0.233**	**0.046**	**0.774**
Lough Key	18/06/2013	78	35	2.23	22.001	54.1	37.5	77.4	0.282	0.089	0.689

Site	Dates	No. Eels	Nets*Nights	CPUE	Total Weight (kg)	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
	19/06/2013	105	35	3.00	32.724	55.1	37.0	73.2	0.312	0.071	0.673
	20/06/2013	39	35	1.11	10.398	53.2	41.5	75.6	0.267	0.115	0.820
	20/08/2013	52	35	1.49	14.761	53.7	39.7	80.2	0.284	0.089	0.907
	21/08/2013	47	35	1.34	13.902	55.1	43.6	72.8	0.296	0.124	0.591
	22/08/2013	54	35	1.54	14.348	52.9	36.9	78.6	0.266	0.075	0.758
	18/06/2013	78	35	2.23	22.001	54.1	37.5	77.4	0.282	0.089	0.689
	2013	**375**	**210**	**1.85**	**108.134**	**54.2**	**36.9**	**80.2**	**0.288**	**0.071**	**0.907**
Lough Ramor	19/8/2014	99	40	2.48	26.645	51.5	23.1	75.5	0.269	0.65	0.912
	20/8/2014	86	40	2.15	22.747	51.7	34.2	81.8	0.265	0.051	1.141
	21/8/2014	29	40	0.73	6.809	48.0	32.8	78.4	0.235	0.059	1.032
	2014	**214**	**120**	**1.79**	**56.201**	**51.1**	**23.1**	**81.8**	**0.263**	**0.051**	**1.141**
South Sloblands	12/8/2014	71	29	2.45	11.437	42.4	29.0	59.8	0.161	0.032	0.533
	13/8/2014	76	29	2.62	12.798	42.9	28.6	66.5	0.168	0.042	0.708
	2014	**147**	**58**	**2.54**	**24.235**	**42.7**	**28.6**	**66.5**	**0.165**	**0.032**	**0.708**

* During Day 1 (14/8/2012) of the Lough Muckno survey, a single net was lifted and later returned. Therefore, the results for Day 1 are from a total of 7 chains (35 nets) as opposed to the usual 8 chains (40 nets). Also, Day 2 (15/8/2012) had only 4 chains (20 nets) set due to weather conditions. Day 3 of the survey was cancelled due to continuing poor weather on Lough Muckno.

**Last 3 chains of fyke nets were batched weighed on11/6/2013. 209 out of 388 eels were measured for all readings.

***All 157 eels caught on 13/6/2013 were counted and batched weighed only. No individual readings were taken from these eels.

∞ The second trip to Meelick Bay was cut short due to weather conditions on the lake. A usual 3-day survey was hence shortened to a 2-day survey (31/7/2012 & 1/8/2012).

Table 5-3 Biological data from the yellow eel lake surveys, 2012-2014

Location	Total Eels	No. Females	No. Males	No. Immature	% Female	% Male	% Immature	% Prevalence *A. crassus*	Mean Intensity *A. crassus*	Preferential Diet from Stomach Contents
Lough Muckno (2012)	106	99	3	4	93.39	2.83	3.77	48.11	2.16	Chironomid larvae Fish Remains
Lough Muckno (2013)	100	94	6	0	94.00	6.00	0.00	56.00	3.41	
Muckno	206	193	9	4	93.69	4.37	1.94			
Lough Key (2013)	102	102	0	0	100.00	0.00	0.00	54.90	2.64	*Asellus* sp.
Lough Ramor (2014)	99	88	10	1	88.90	10.10	1.00	83.84	9.66	Chironomid larvae
Ramor 2011	89	86	1	2	97	1	2	78.7	4.76	Chironomid & Asellus spp

5.3 River and Transitional Waters, Barrow Fyke Netting Surveys, 2012-2014

The River Barrow is a large riverine catchment located on the East coast of Ireland. The catchment area is approximately 14,103ha, and is a recognized Special Area of Conservation (SAC) in Ireland.

In 2012, the river was sampled over 6 nights (4 and 2 nights in two sessions respectively; Figure 5-23) with fyke nets being set in chains of ten. The locations and methodology were chosen to compare with historical data from the Fisheries Research Centre (1975 and 1979). The first session saw sampling carried out at sites in Graiguenamanagh, the Levitstown Canal (near Athy), below the high water mark at St. Mullins and at the confluence of the River Barrow and the Pollmonty Canal. A total of 583 eels were caught during sampling across all sites, with a CPUE of 3.64 (Table 5-4). The eels ranged in length from 23.7 to 83.8cm and in weight from 0.017 to 1.116kg, with a total catch weight of 71.70kg (Table 5-4 and Figure 5-24).

During the summer of 2013, the river was sampled over 3 nights (2 nights and 1 night in two sessions respectively; Figure 5-25) with fyke nets being set in chains of five. The aim of the survey was to capture 10 large eels for a telemetry study using VEMCO acoustic tags. The first session saw sampling carried out at 11 sites (2 nights) just below the high water mark at St. Mullins, with a total of just 17 eels captured. It was concluded that the reduced catches from the previous year were due to the low temperatures at the time of sampling in May. The later trip to Saint Mullins resulted in a catch of 118 eels in 1 night, with 6 out of the 11 sites re-sampled. Across the two trips, a total of 137 eels were caught, with a CPUE of 4.11 (Table 5-2). The eels ranged in length from 21.1 to 67.0 cm and in weight from 0.015 to 0.620kg (Table 5-4 and Figure 5-25). No sacrificed eels were collected during the 2013 sampling survey.

In July 2014, the river was sampled for a single night upstream of New Ross with fyke nets set in chains of five. The aim of the survey was to capture 10 large eels for the telemetry study. A total of 206 eels were captured. The length of the catch ranged from 22.6 to 75.4cm and weight ranged from 0.052 to 1.806kg, with a total catch weight of 60.407kg (Table 5-4 and Figure 5-26). No eels were retained for dissection during this survey.

In total, 94 eels were sacrificed from the Levitstown Canal site in 2012. Of these, 95.7% were female (Table 5-3 and Figure 5-27). There was a 68.09% prevalence rate for *A. crassus* and a mean infection intensity of 4.11 parasites per eel (Table 5-3 and Figure 5-28). A total of 263 individual parasites were recorded in the sample of 94 eels. During examination of the stomach content of these eels, the preferred food type was recorded as the water louse, *Asellus* sp.

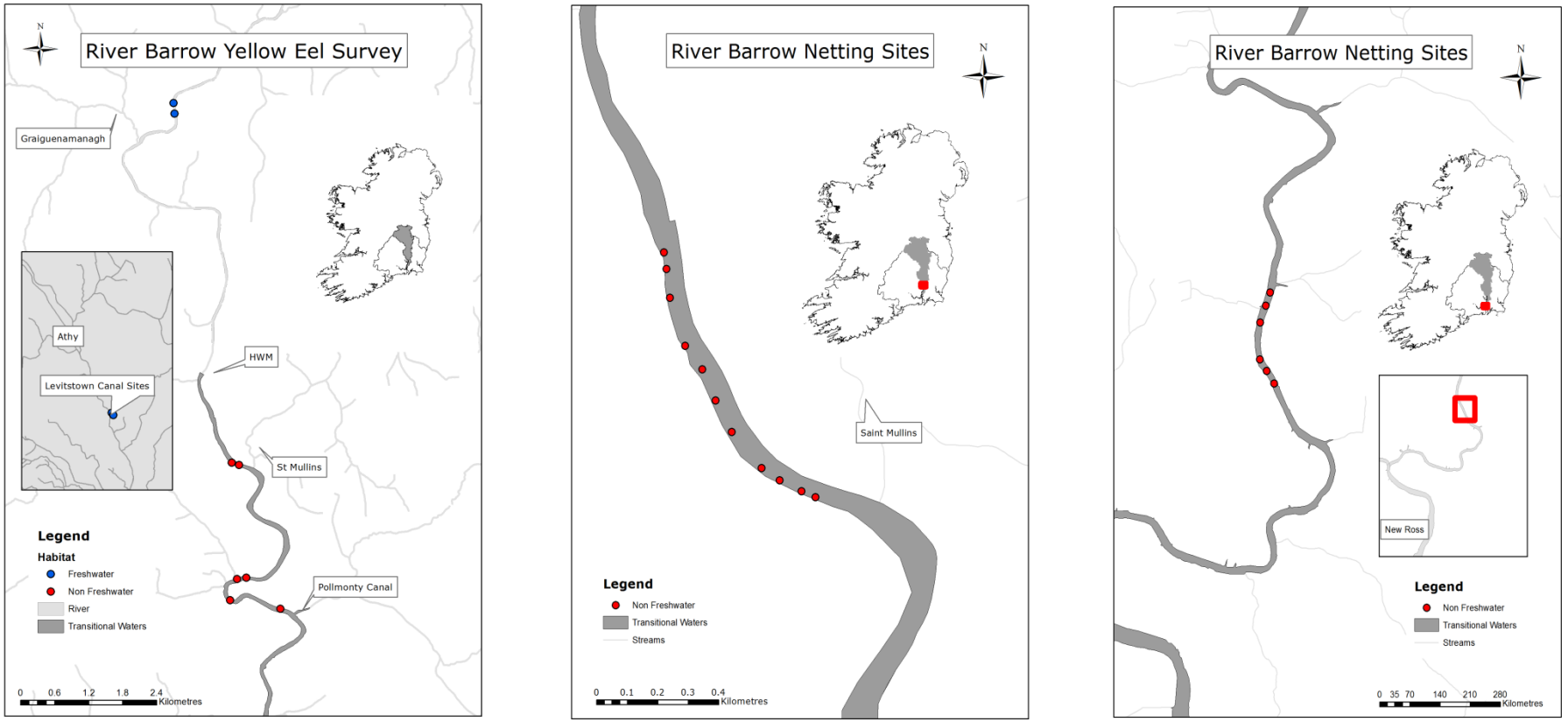

Figure 5-23 Locations of fyke nets sampled on R. Barrow in, a) 2012, b) 2013 and c) 2014. (Insets: Location of sites within catchment (red square), and map of Ireland with Barrow catch)

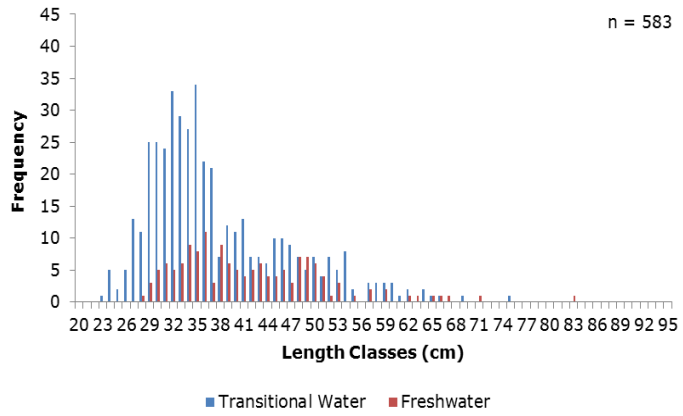

Figure 5-24 Length frequency of yellow eels captured on R. Barrow, 2012

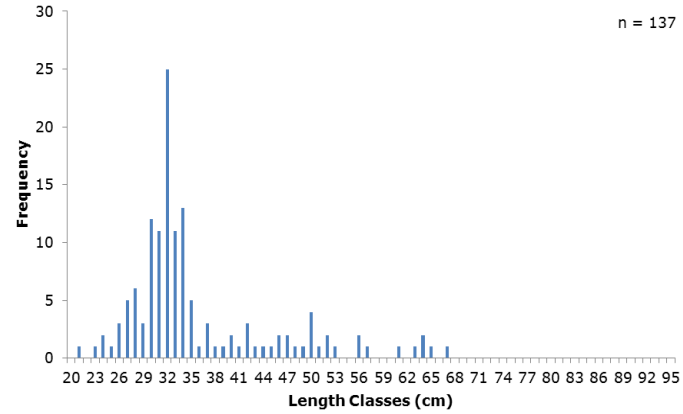

Figure 5-25 Length frequency of yellow eels captured on R. Barrow, 2013 (11 sites downstream of high water mark at St. Mullins)

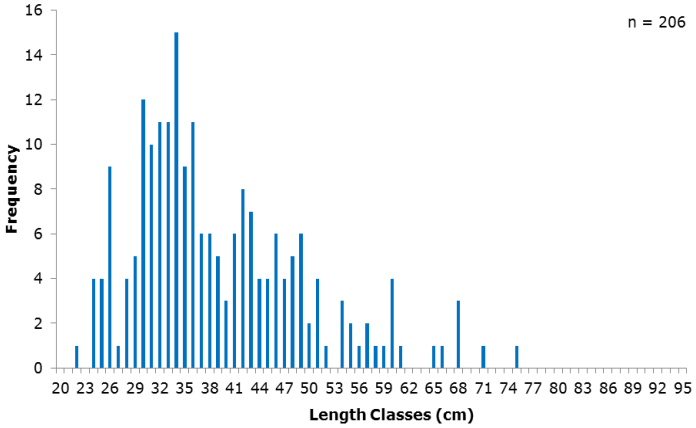

Figure 5-26 Length frequency of yellow eels captured on R. Barrow, 2014 (6 sites upstream of New Ross)

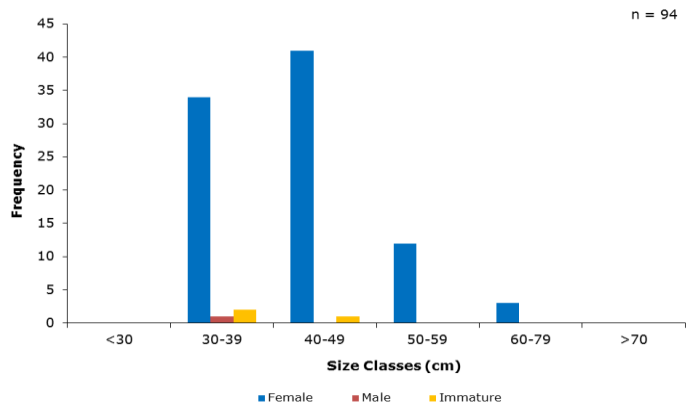

Figure 5-27 Sex distribution of sacrificed yellow eels in Levitstown Canal, (River Barrow), 2012

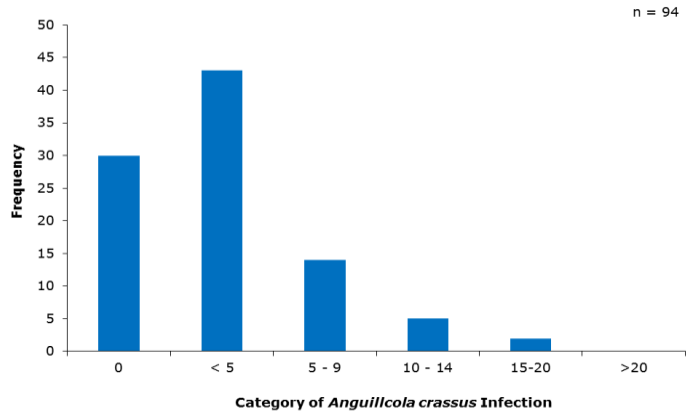

Figure 5-28 *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from Levitstown Canal, (River Barrow), 2012

5.3.1 River Barrow Acoustic Tagging, 2012-2014

During the 2012 survey on the River Barrow, 10 large female eels captured at the St. Mullins and Pollmonty Canal confluence sites, were fitted with acoustic tags in order to track their movements. This was carried out in an attempt to discern if the tagged individuals demonstrated a territorial fidelity to specific stretches of the river, or if movement was over a larger home range. Eight receiver 'listening' stations were previously deployed in locations from above St. Mullins as far downstream as confluence with the Suir River. Early results suggested that 7 of the tagged individuals had remained within the confines of the receiver stations, while 3 eels silvered and were picked up as they migrated to sea.

In 2013, the work was repeated. A further 10 eels were fitted with acoustic tags, and monitoring of movements continued via stationary receivers in combination with mobile detectors (hand-held equipment) in order to locate eels outside the receivers detection range. Once again, early results suggest that the tagged eels (with the exception of silver eels which migrated) were remaining within the stretches of the Barrow, in which they were initially tagged, suggesting a degree of territorial fidelity in the tagged population. Eight of the 10 tagged eels remained in the study area for 8 months. One eel silvered, and, in October 2013 and was recorded migrating downstream. A conservative estimate of home range is 2–12.5ha, with potential riverine distances travelled between 393 and 2,000m. It is believed that the core range is less than 2 ha but smaller distances

could not be confirmed due to the setup of the receivers. These home range estimates comprise eels displaying restricted core activity and outer exploratory behaviour.

In 2014, a second study site was chosen downstream of the 2012/2013 location and upstream of New Ross. The decision to move locations was due to the concern that another 10 large (>55cm) eels would not be found within the initial study site. In the new location additional receivers were installed around 500m apart in order to determine an accurate calculation of distances travelled during the normal core foraging behaviour. Ten large female eels were captured and fitted with acoustic tags and released at the centre of the study site. Monitoring of the movements of these individuals will continue via stationary receivers and mobile detectors in order to further examine site fidelity in this population.

While the majority of eels undertook short foraging activities evidence of exploratory behaviour was detected. In July 2014 one eel (248) left the study site and was detected downstream of Inistioge in the River Nore for 3 hours approximately 17km from the study site (Figure 2). The eel then returned to the study site on the Barrow 9 hours later only to repeat the journey a day later and again return to the study site. The eel 248 left the study site for the final time on the 1st August and hasn't been detected since. Of the remaining eels one of these eels (255) silvered and was detected moving downstream in November 2014. Another eel left the site in July (252) and reappeared within the study site 4 months later in December and January 2015. Two eels moved just outside the study site; one eel 249 moved 1km upstream and the second eel (251) moved 500m downstream. For the 7 eels that remained within the study site there is a large amount of information available on the time and extent of movements both foraging and exploratory behaviour that has to be analysed on completion of the project. The battery in the acoustic tags is expected to expire in April 2015 at which time the study will have taken place over 9 months and 3 seasons.

Table 5-4 Catch detail of the River Barrow yellow eel fyke net surveys, 2012-2014

Site	Dates	No. Eels	Nets* Nights	Average CPUE	Total Weight (kg)	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
Graiguenamanagh	29/05/12	54	20	2.70	8.633	40.5	28.8	83.8	0.160	0.038	1.116
Levitstown	29/05/12	94	20	4.70	14.266	43.3	30.1	65.6	0.152	0.042	0.555
Barrow FW	**2012**	148	40	3.70	23	42.3	28.8	83.8	0.155	0.038	1.116
St Mullins	30/05/12	76	20	3.80	5.835	33.4	23.7	64.7	0.077	0.019	0.501
Pollmounty	31/05/12	222	40	5.55	29.642	40.6	24.4	75.8	0.134	0.023	0.710
St Mullins	07/06/12	28	20	1.40	2.423	34.9	24.1	52.8	0.087	0.017	0.326
Pollmounty	06/06/12	109	40	2.73	10.901	37.2	27.0	55.7	0.100	0.031	0.287
Barrow TW	**2012**	435	120	3.63	49	38.1	23.7	75.8	0.112	0.017	0.710
St Mullins	14/05/13	12	35	0.34	0.651	30.8	21.1	35.4	0.054	0.015	0.076
St Mullins	15/05/13	5	35	0.14	0.283	31.9	28.2	35.4	0.057	0.044	0.084
St Mullins	16/07/13	120	30	4.00	13.225	37.1	23.4	67.0	0.110	0.019	0.620
	2013	**137**	**100**	**4.11**	**14.159**	**36.3**	**21.1**	**67.0**	**0.103**	**0.015**	**0.620**
New Ross	24/07/14	206	30	6.87	60.407	39.5	22.6	75.4	0.293	0.052	1.806

5.4 Electric-Fishing Surveys

Under the National Eel Management Plan 2009, IFI has been tasked with a number of monitoring objectives. These include establishing baseline data sets to track changes in the eel population over time; monitoring the impact of fishery closure on yellow eel stocks; determining the prevalence of parasites and the current quality of the eel stocks. The aim of the electric-fishing study was to carry out a catchment level assessment of the riverine eel population. This approach was carried out on the Fane catchment during the summer of 2013, and the Kells Blackwater subcatchment of the River Boyne in 2014. Due to financial and resource constraints an intensive quantitative electric-fishing survey is not always feasible and as a result a semi-quantitative method was employed. There have been many studies comparing the efficiency of single pass electric-fishing surveys with a multi pass survey (Imbert *et al.* 2008; Kruse *et al.* 1998; Laffaille *et al.* 2005; Mitro & Zale 2000; Reid *et al.* 2009; Vehanen *et al.* 2013). The semi quantitative method has proved adequate for sampling eel, salmon and trout populations in small wadeable streams and rivers.

Baldwin and Aprahamian (2011) concluded that when undertaking depletion passes they found no difference in the catch efficiency between eel specific surveys and multi species surveys. As a result of discussions with members of the Water Framework Directive Rivers team it was decided that the benefit of a single pass electric-fishing programme for eels will not deliver the quantity of eels required. In their opinion, most eels are caught in the second and third pass after being disturbed in the first pass. Therefore, an alternative semi-quantitative method was assessed by using eel specific settings on the electric-fishing equipment.

Broad *et al.* 2001 found that 83% of longfin eels (*Anguilla dieffenbachii,* Gray 1842) were caught within 270mm from the bank. Based on these results, an eel specific survey concentrating on the banks of the river was carried out. The area fished corresponded to the stream lengths surveyed by the WFD team; however no stop nets were used in the semi-quantitative method. The equipment used included a back-pack electric-fishing unit and dip nets for the collection of eels. Eels and any other species collected were held separately and all fish containers were aerated.

Reid (2011) examined the difference in point and transect electric-fishing methods. The author found that the transect sampling captured more eels than the point sampling. The transect method involved a 1m wide transect with 50 transects per site. Each unit was separated by 2m across the channel and 10m along the channel. Each unit would be fished for mean of 49 seconds. The point abundance sampling involves placing the anode on the river bottom for 30 seconds the electrical field would represent an area $1m^2$. This is repeated on average 24 points per river section. A number of papers have reported on the PASE method (Laffaille *et al.* 2005, Lasne *et al.* 2008, developed by Nelva *et al.* 1979).

The WGEEL (ICES 2007) reported that the density of eels assessed at the same site was substantially lower when all species were targeted as opposed to when only eel was the target species. The report also suggests a minimum number of stations (n=16) for a large coefficient of variation (0.8). Therefore, the EMP electric-fishing semi-quantitative (bankside) study targets approximately 30 sites. In order to calibrate with the quantitative electric-fishing method, 10-20% of sites were resurveyed using the 3 pass depletion method.

5.4.1 Fane Catchment

The Fane catchment has an area of approximately 35,696ha, and is comprised of the main Fane channel and several tributaries including the County River and County Water River in the upper reaches of the catchment (on the Monaghan/Armagh borders), which drain into the Drumleek River and into Little Muckno (Milltown Lake) before meeting Lough Muckno, near Castleblayney, Co. Monaghan. The Clarebane River exits Lough Muckno and becomes the main channel of the Fane flowing southeast until it reaches the sea near Blackrock, Co. Louth.

A catchment-wide electric-fishing program was devised, which involved Bankside (semi-quantitative and Depletion (quantitative) electric-fishing. In each site, one bank was randomly selected and fished in a single timed pass and a second pass focuses on the opposite bank. On average, individual passes were between 6 and 8 minutes duration. A total of 29 sites were fished using the Bankside methodology (Figure 5-28) and a further subset of these sites (n=9) were fished using the standard quantitative Depletion fishing method (Figure 5-29) using 3 passes (including the use of stop nets) in order to compare catch results between the two methodologies. The catchment was divided into upper, middle and lower zones and a comparable number of sites were fished in each zone, using each method. All equipment was also biosecured before moving into the next zone. The electric-fishing was carried out using Hans-Grassl™ back-pack equipment (Plate 5-1). The packs were set to the recommended frequency (for catching and not harming eels) of 20Hz (Beaumont *et al.* 2002). Voltage was site dependent and was set between 200-375V (pulsed DC), in order to turn fish in differing conductivity conditions.

Plate 5-1 Bankside electric-fishing of a small stream on the upper Fane Catchment, 2013

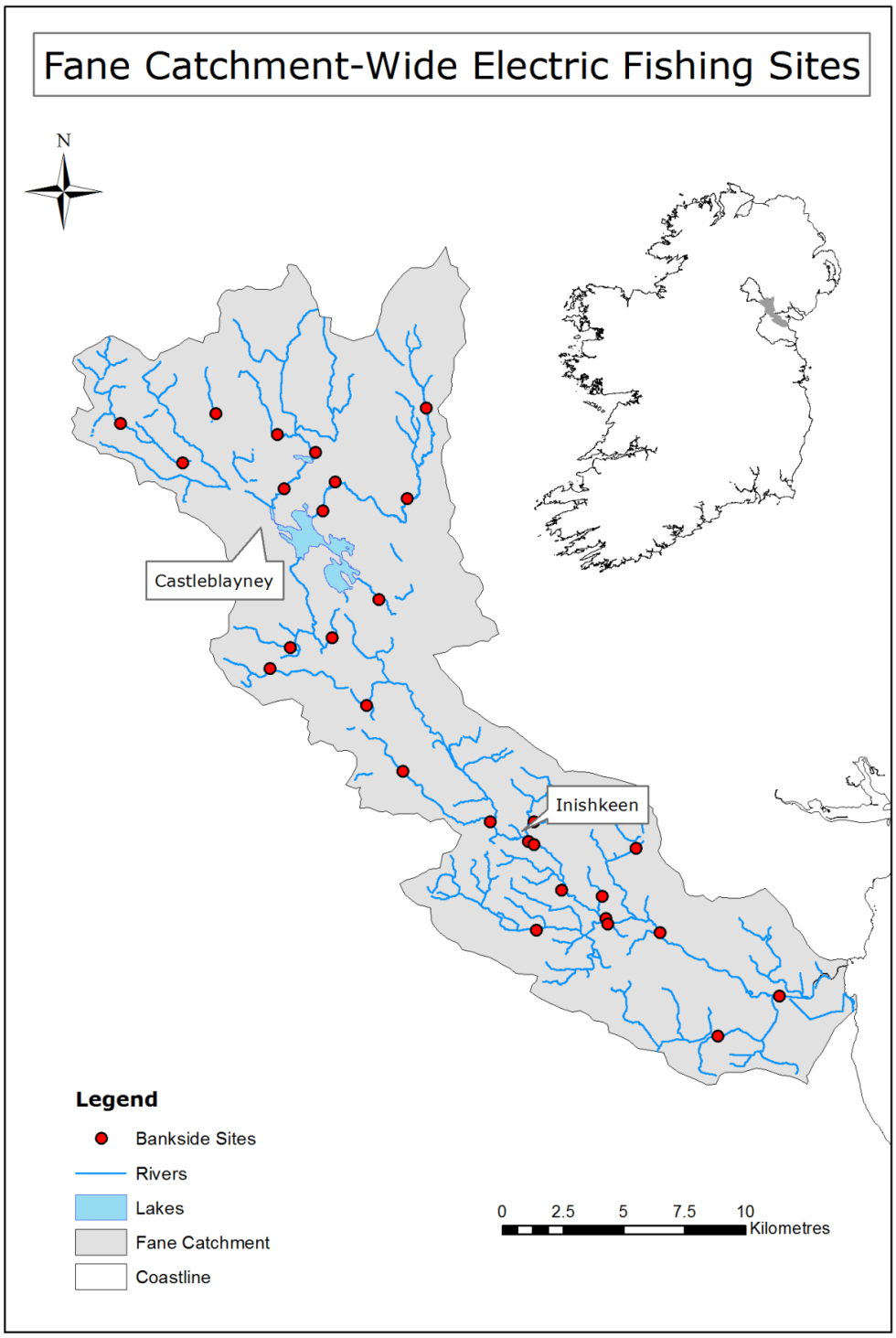

Figure 5-29 Locations of semi-quantitative (Bankside) electric-fishing sites sampled on Fane catchment, 2013. (Inset: Map of Ireland with Fane catchment (shaded) and Neagh-Bann International River Basin District (outlined))

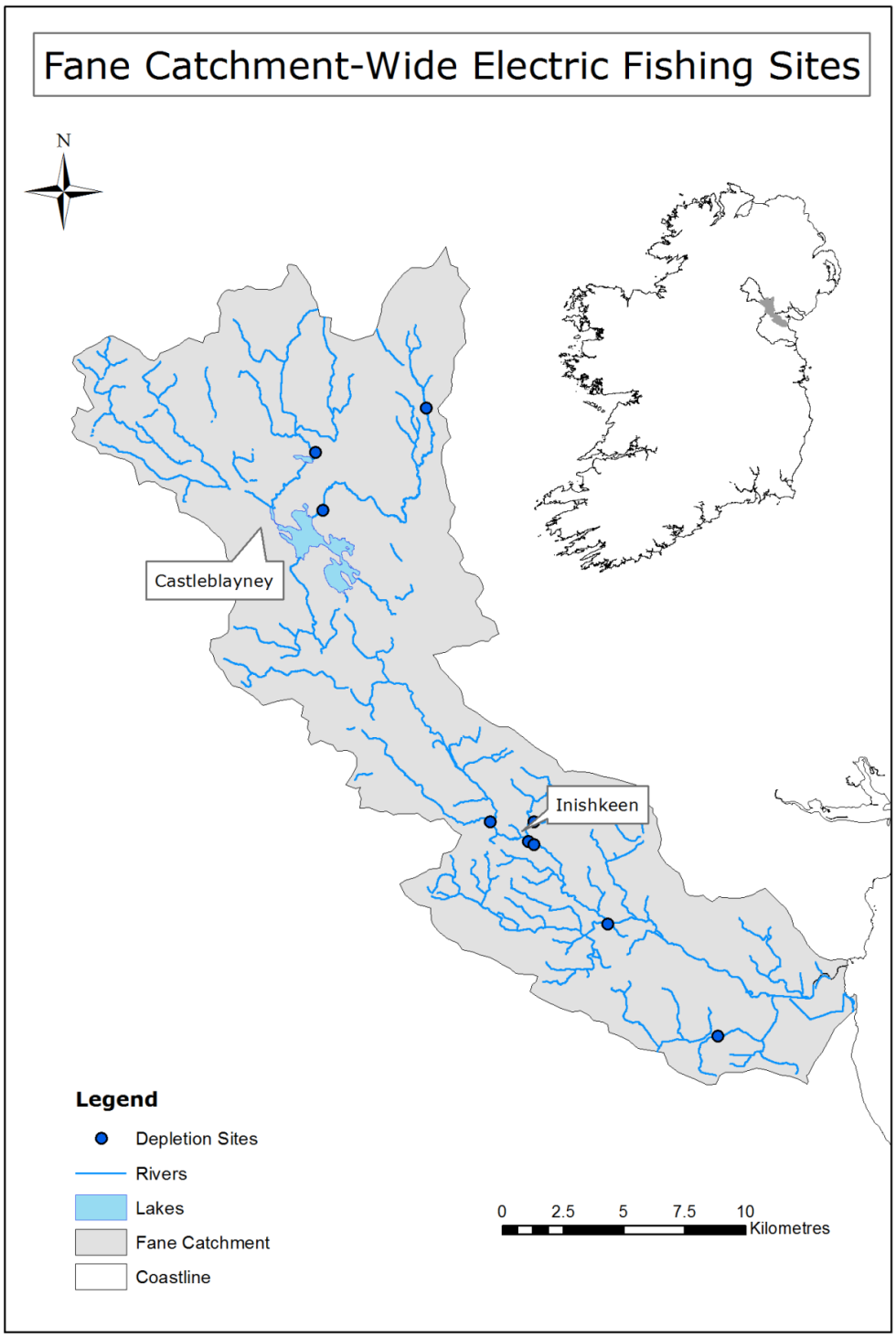

Figure 5-30 Locations of quantitative (Depletion) electric-fishing sites sampled on Fane catchment, 2013. (Inset: Map of Ireland with Fane catchment (shaded) and Neagh-Bann International River Basin District (outlined))

5.4.1.1 Fane Catchment Electric-Fishing Results

Catches along the catchment were generally quite low and it is most likely that eels use the main channel of the Fane as a corridor to Lough Muckno, which is known to support a high population of eels based on previous EMP lake surveys. In total, 97 eels were captured using the combined electric-fishing methods in 38 sites. Of these, 36 eels were caught using the bankside fishing methodology. The remaining 61 eels were captured across the 9 depletion fished sites. The size class of eels captured by electric-fishing ranged from 9.4 to 43.5cm the proportion of eels below 30cm (i.e. juveniles) was 67% (Figure 5-30). Eels of 14cm were caught in the river above Lough Muckno a distance of approximately 38km from the tidal limit. No sacrificed eels were taken during the Fane catchment-wide electric-fishing survey.

The catches of eels were lowest in the lower reaches of the catchment with only 6 eels captured in the bankside electric-fishing method (Figure 5-31). The absence of eels from these sites could be due to the absence of good eel habitat with the presence of silty muddy river beds. The number of eels caught, were also low in the upper catchment areas above Milltown Lake (Little Muckno) and Lough Muckno. This is most likely due to potential barrier effects, poor habitat in the upper reaches and the presence of a large productive wetted area in Lough Muckno. Catch numbers increased slightly on the inflows and outflows of Milltown Lake and Lough Muckno. The majority of sites with eels were in the middle reaches of the catchment and along the main channel.

Overall, eels were absent at 62% of sites; 18 of the 29 sites sampled in the Fane catchment. Eels were present at 11 sites. The sites where eels were absent were on average narrower channels (average 3.9m) with a smaller area sampled (average 79.2m^2) compared with the wider sites were eels were present (average width 7.3m; average area 125.4m^2).

There were no significant differences in total catch between the 2 methods (bankside and depletion fishing; Paired t-Test, $p>0.05$, $df=7$, $n=9$). A similar result was noted between the catches for the bankside method and the first pass of the depletion fishing only (Paired t-Test, $p>0.05$, $df=7$, $n=9$). However, it should be noted, that while catches of eels were similar for sites located on small streams and minor tributaries off the main channel; the catches recorded using the two methods at sites located on the main channel itself were markedly different (Figure 5-33), with the depletion method recording higher numbers in each instance. In the smaller channels, the whole channel is effectively surveyed by the bankside method however in the larger channels the middle reaches are not covered. Therefore larger catches are expected in a single pass of the depletion method due to the larger area surveyed. One important result from this survey is where eels were absent both methods resulted in a zero catch. As a tool to record the presence, absence and minimum density of eels over a whole catchment the semi-quantitative (bankside) method shows promising results.

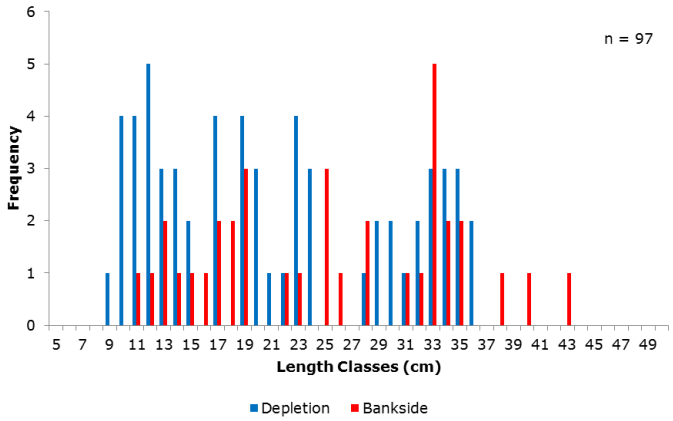

Figure 5-31 Comparison of length frequencies of yellow eels captured at quantitative (depletion) and semi-quantitative (bankside) sites during Fane catchment-wide electric-fishing, 2013

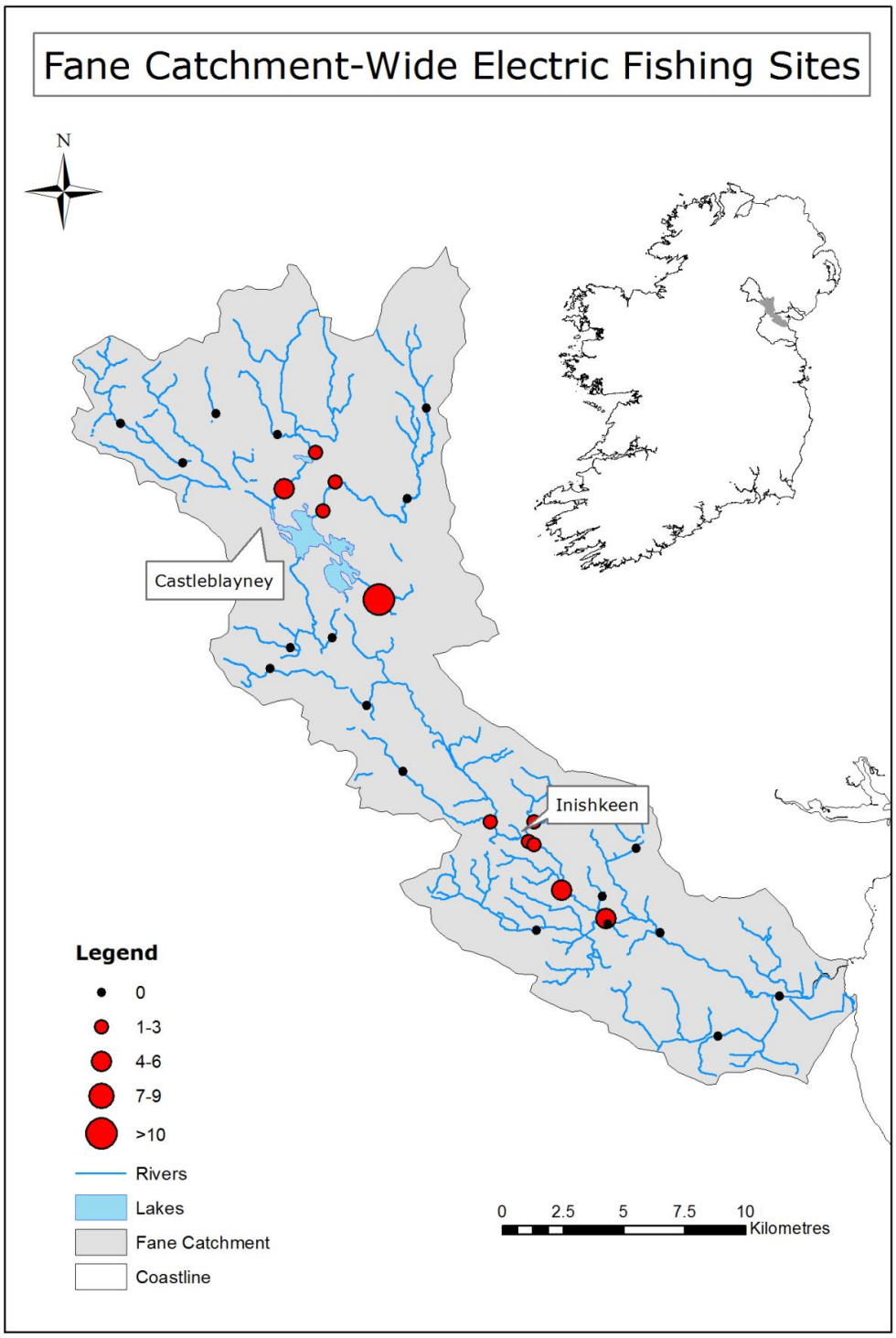

Figure 5-32 Locations and catches of eels for semi-quantitative (bankside) electric-fishing sites sampled on Fane catchment, 2013. (Inset: Map of Ireland with Fane catchment (shaded) and Neagh-Bann International River Basin District (outlined))

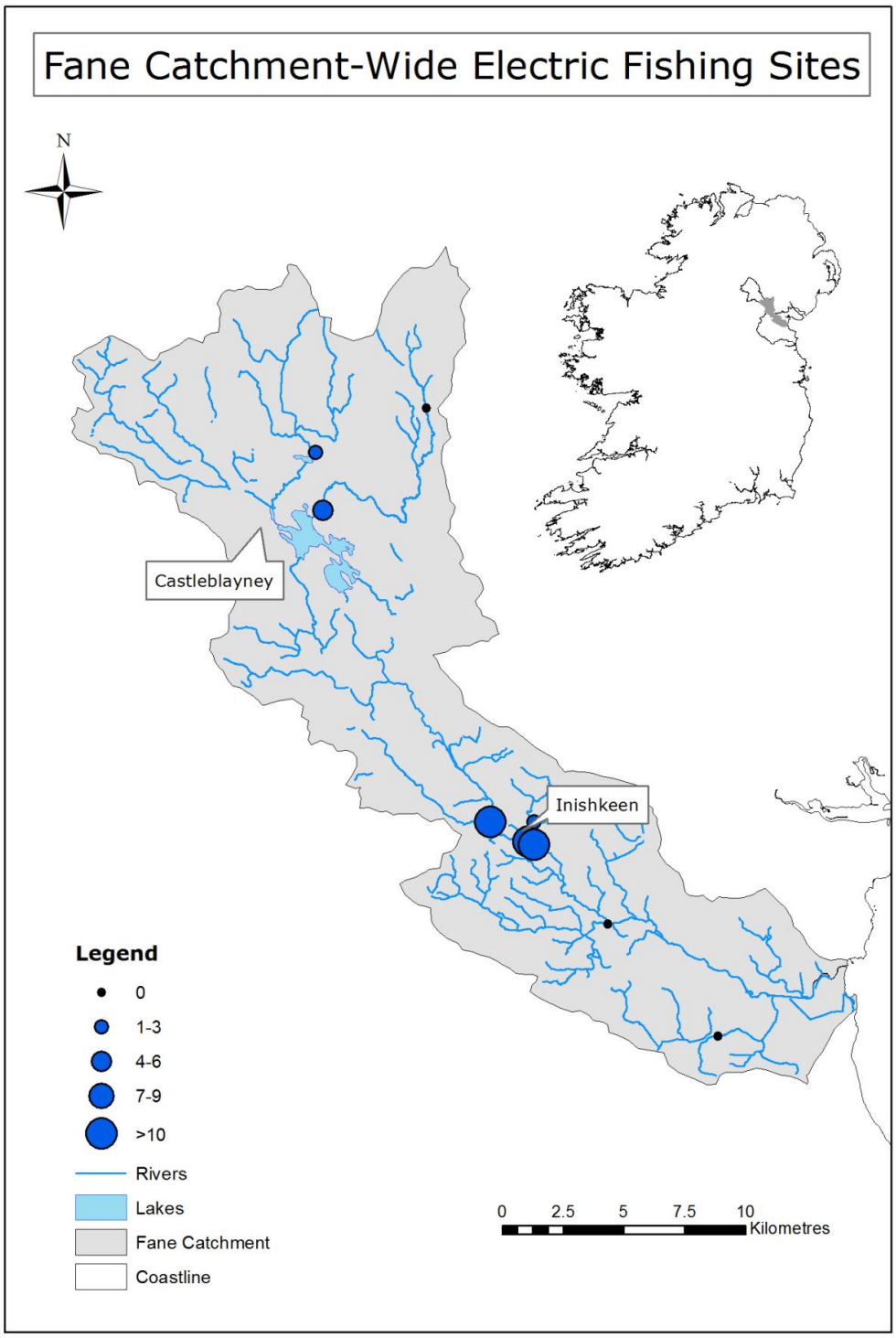

Figure 5-33 Locations and catches of eels for quantitative (depletion) electric-fishing sites sampled on Fane catchment, 2013. (Inset: Map of Ireland with Fane catchment (shaded) and Neagh-Bann International River Basin District (outlined))

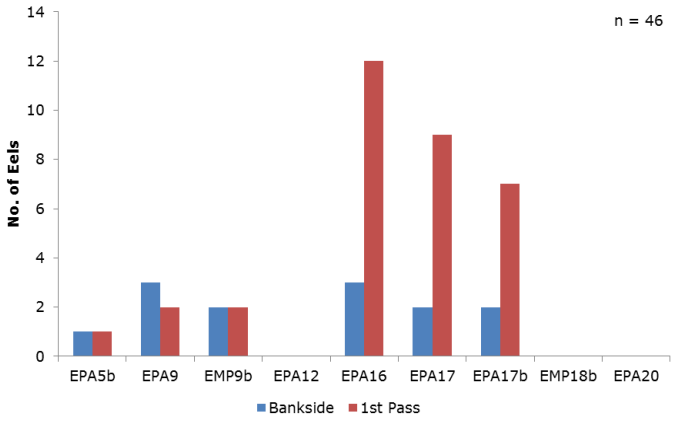

Figure 5-34 Semi-quantitative catches for sites fished using bankside and 1st pass depletion electric-fishing methods on Fane catchment, 2013

5.4.2 Kells Blackwater Catchment

The Kells Blackwater has an area of approximately 72,779ha, and is comprised of the main Blackwater channel and several tributaries including, the River Lear near Baileborough and the Deerpark Stream in the upper reaches of the catchment. The main channel flows in a south-westerly direction and drains into Lough Ramor (the largest lake in the system) near Virginia, Co. Cavan. From here, the main channel exits the lake on the western side of the catchment, and is joined by tributaries including the Cross Water River and the Yellow River as it flows southeast, before passing through Navan town and discharing downstream into the Boyne River. The eastern side of the catchment hosts the Barora River, which flows south east and joins the Moynalty River. It later turns south and meets the Blackwater main channel near Bloomsbury (just upstream of Bloomsbury Bridge) before it moves through Navan town.

A catchment-wide electric-fishing program was devised, which involved Bankside (semi-quantitative and Depletion (quantitative) electric-fishing. In each site a 30m stretch of river is fished, one bank was randomly selected and fished in a single timed pass and a second pass focuses on the opposite bank. On average, individual passes were between 3 and 9 minutes duration. A total of 38 sites were fished using the Bankside methodology (Figure 5-34) and a further subset of these sites (n= 9) were fished using the standard quantitative Depletion fishing method (Figure 5-35) using 3 passes (including the use of stop nets) in order to compare catch results between the two methodologies. The catchment was divided into upper, middle and lower zones and a comparable number of sites were fished in each zone, using each method. All equipment was biosecured before moving into the next zone. The survey electric-fishing was carried out using Hans-Grassl™ back-pack equipment (Plate 5-2). The packs were set to the recommended frequency for catching and not harming eels of 20Hz (Beaumont *et al.* 2002). Voltage was site dependent and was set between 200-375V (pulsed DC), in order to turn fish in differing conductivity conditions.

Plate 5-2 Electrofishing the Moynalty River in 2014

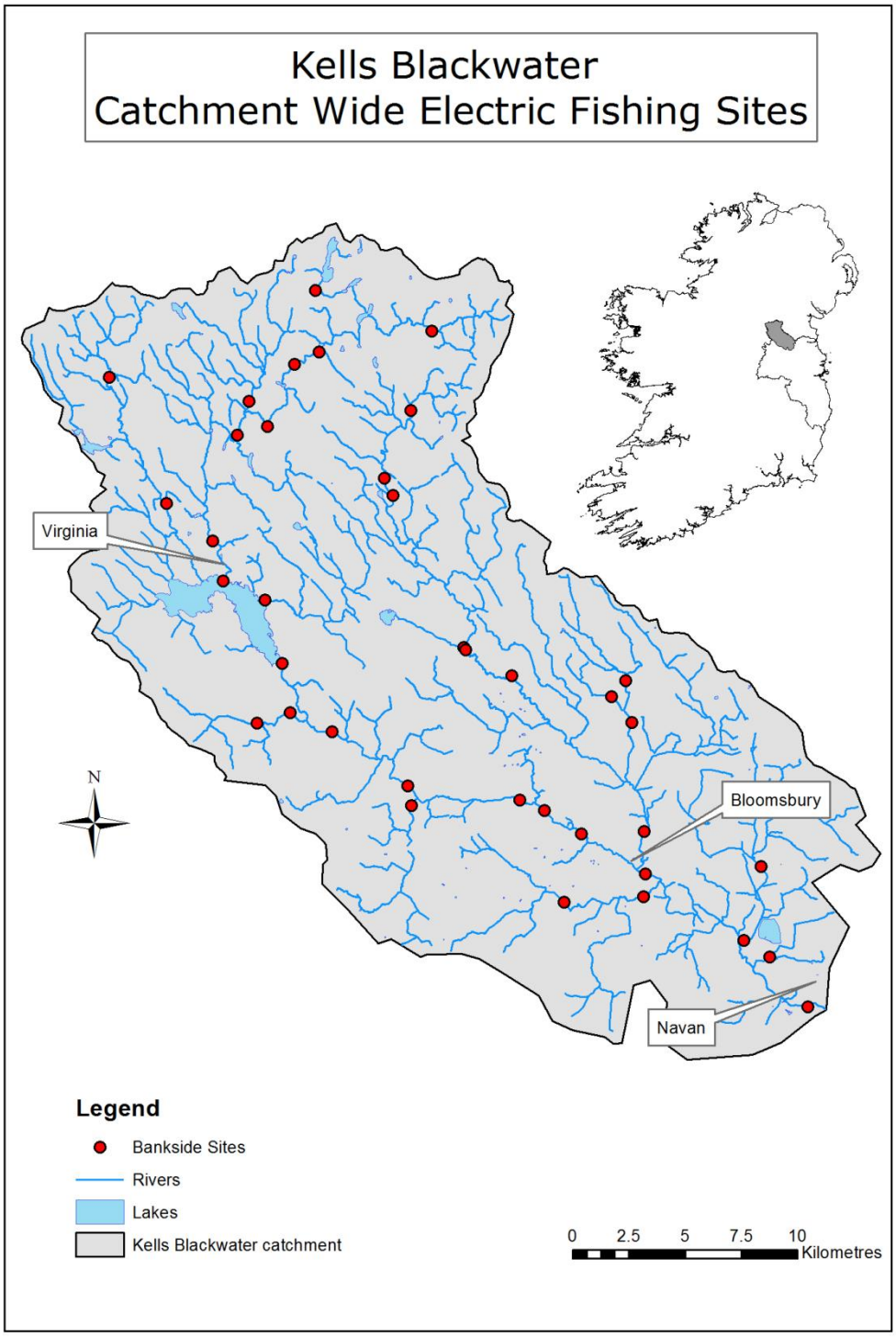

Figure 5-35 Locations of semi-quantitative (Bankside) electric-fishing sites sampled on Kells Blackwater catchment, 2014. (Inset: Map of Ireland with Kells Blackwater catchment (shaded) and Eastern River Basin District (outlined))

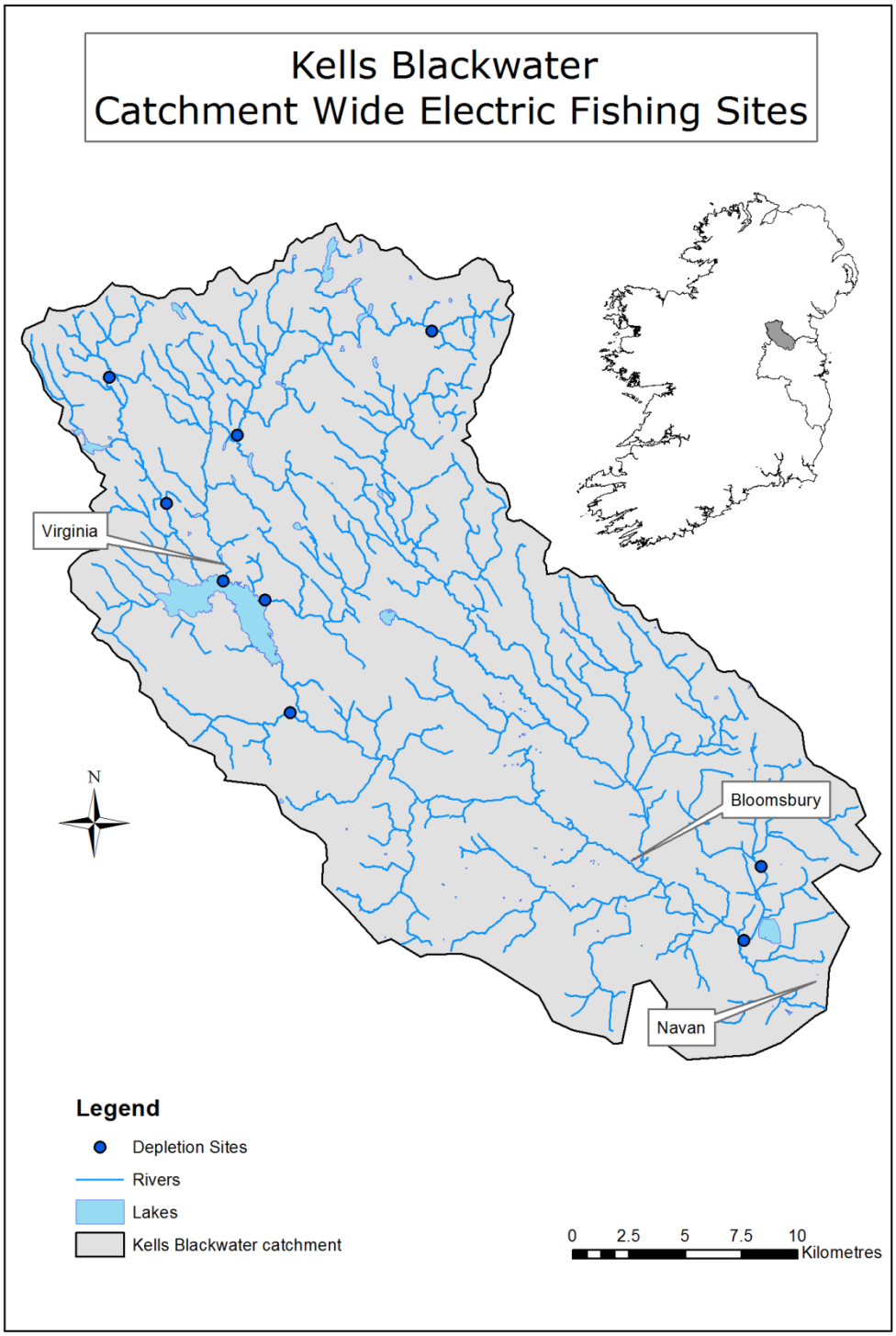

Figure 5-36 Locations of quantitative (Depletion) electric-fishing sites sampled on Kells Blackwater catchment, 2014. (Inset: Map of Ireland with Kells Blackwater catchment (shaded) and Eastern River Basin District (outlined))

5.4.2.1 Kells Blackwater Catchment Electric-Fishing Results

The numbers of eels captured during electric-fishing in the Kells Blackwater catchment were relatively low and it is most likely that eels use the main channel as a corridor to Lough Ramor, which is known to support a high population of eels. However, a small number of semi-quantitative sites did yield higher catches than seen in the Fane catchment in 2013. These sites were located just downstream of weirs on the main channel, and it was likely that the clustered populations of eels sampled at these locations represented a 'bottleneck effect' of eels being captured as they moved upstream to Lough Ramor (e.g. Site 13–Nine Eyes Bridge, Stramatt, n=41 eels. Site 22–Headford Bridge, near Kells, n=14 and Site 29–Navan Industrial Park, n=6).

In total, 94 eels were captured using the combined electric-fishing methods at 47 sites. Of these, 83 eels were caught using the bankside fishing methodology. The remaining 11 eels were captured across the 9 depletion fished sites. The size class of eels captured by electric-fishing ranged from 11.1 to 67.6cm and the proportion of eels below 30cm (i.e. juveniles) was 78.7% (Figure 5-36). The smallest eel captured in the study was an 11.1cm yellow eel caught in the main channel outflow of Lough Ramor (Site 13–Nine Eyes Bridge, Stramatt), a distance of approximately 56kms from the tidal limit of the Boyne River. No sacrificed eels were taken during the Kells Blackwater catchment-wide electric fishing survey.

The catches of eels were lowest in tributary streams off the main channel. The Barora and Moynalty Rivers on the eastern side of the catchment yielded particularly low catches. In fact, only one eel was noted in this area (Site 32-Christy's Bridge). As a result of the poor catches on this side of the catchment, these tributaries were not sampled as part of the depletion study. The low catches in other areas were most likely due to poor habitat availability for eels, or potential barrier effects.

Overall, eels were absent at 60.5% of sites; 23 of the 38 sites sampled in the Kell Blackwater catchment. Eels were present at 15 sites (Figure 5-37 and 5-38).

There were no significant differences in total catch between the 2 methods (bankside and depletion fishing), (Paired t-Test, $P>0.05$, $df=7$, $n=9$). A similar result was noted between the catches for the bankside method and the first pass of the depletion fishing only (Paired t-Test, $P>0.05$, $df=7$, $n=9$). However, it should be noted, that eels were only captured in 3 out of the 9 sites assessed using the quantitative (depletion) method. These three sites included two main channel locations (one upstream of Lough Ramor, Site 7; and a second was the main channel inflow to the lake, Site 11) and one smaller tributary to the lake, known locally as the Deerpark Stream (Site 9).

During the electric-fishing work on the Fane catchment in the summer of 2013, there was a concern that main channel and tributary sites often yielded differing results when using the bankside method. This was due to the width of the channels. While most of the tribuarties were quite narrow, the main channel sites were often far wider, and it was felt that the bankside method caught considerably fewer eels than the depletion method in these wider channels, as the centre of the river was not fished (Figure 5-39). Despite this, there was no significant difference in the numbers of eels caught with either method in the Kells Blackwater surveys (Paired t-Test, $P>0.05$, $df=7$, $n=9$).

Again, as with the Fane results, an important result from this survey is where eels were absent. There was only 1 site (site 9; Figure 5-39) which recorded no eels during the bankside survey but 1 eel was recorded during the depletion survey. As a tool to record the presence, absence and minimum density of eels over a whole catchment, the semi-quantitative (bankside) method continues to show promising results.

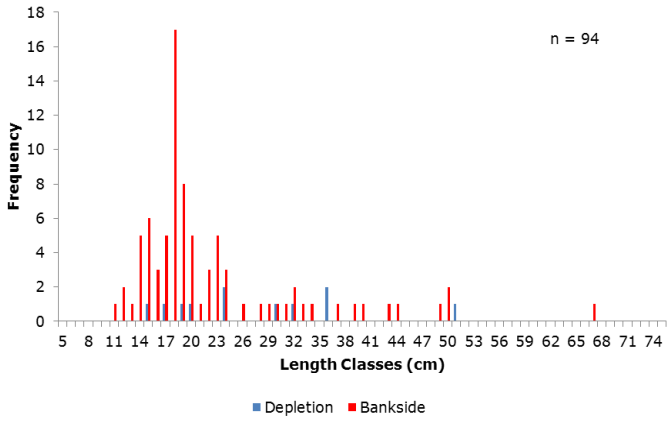

Figure 5-37 Comparison of length frequencies of yellow eels captured at quantitative (depletion) and semi-quantitative (bankside) sites during Kells Blackwater catchment-wide electric-fishing, 2014

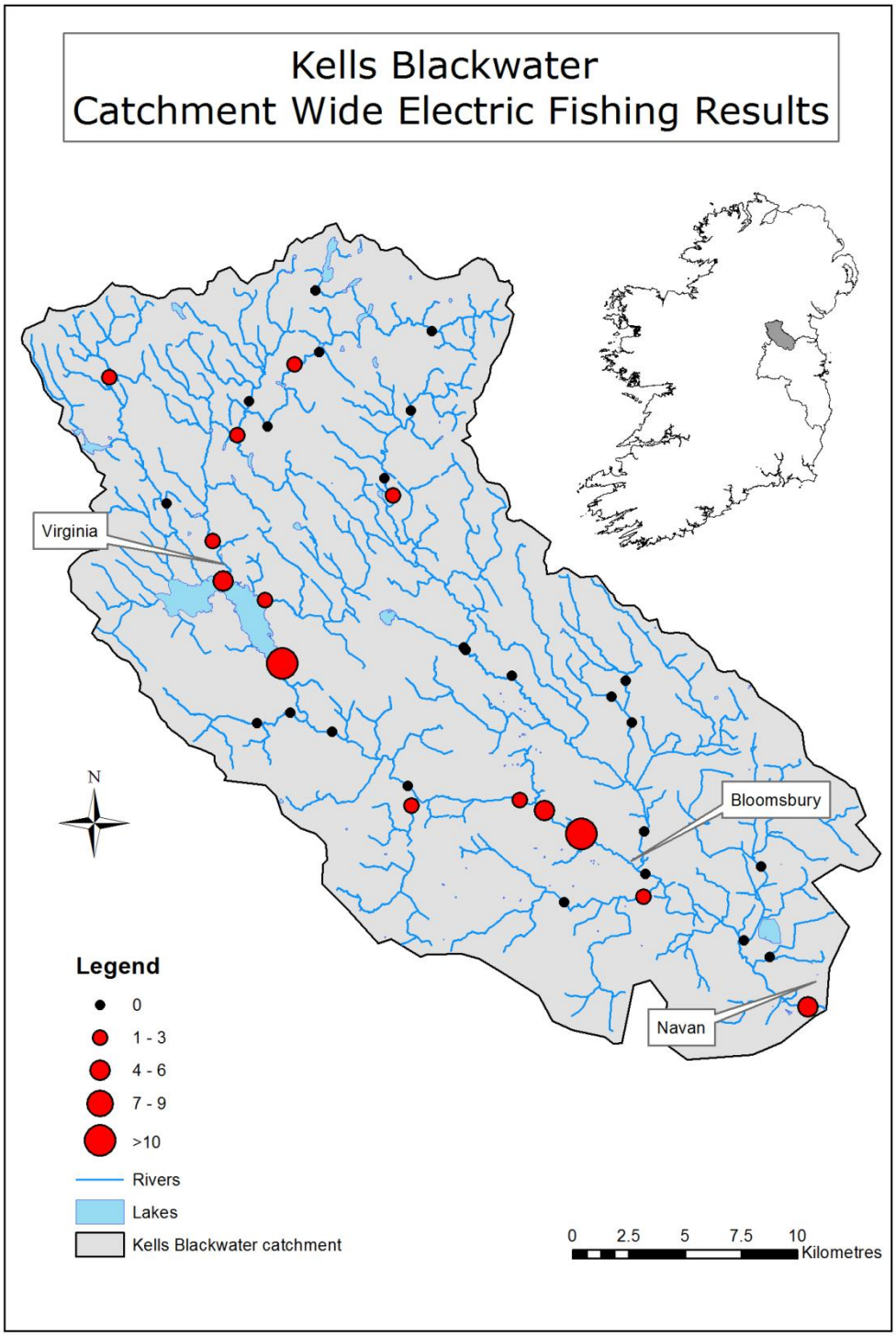

Figure 5-38 Locations and catches of eels for semi-quantitative (bankside) electric-fishing sites sampled on Kells Blackwater catchment, 2014. (Inset: Map of Ireland with Kells Blackwater catchment (shaded) and Eastern River Basin District (outlined))

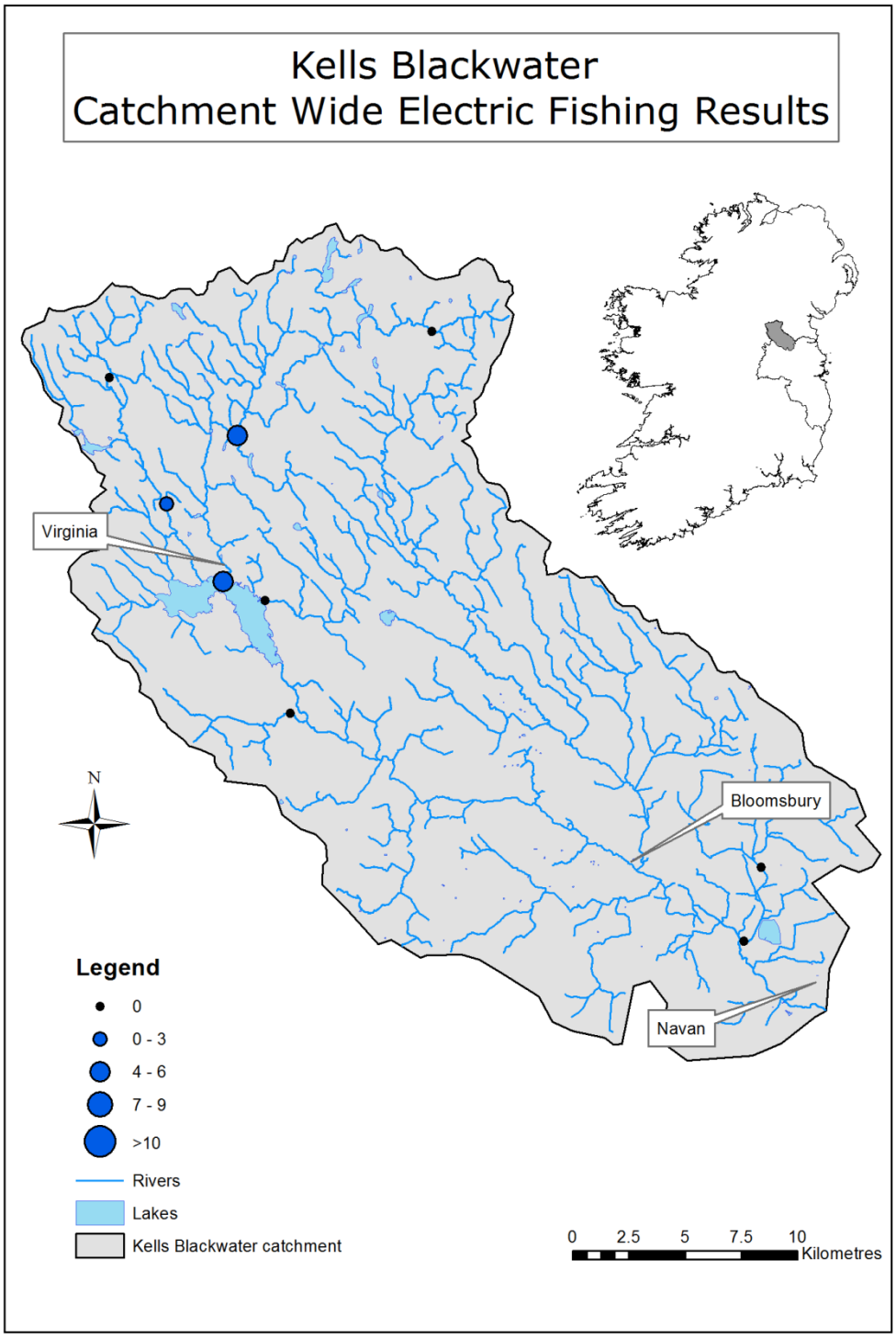

Figure 5-39 Locations and catches of eels for quantitative (depletion) electric-fishing sites sampled on Kells Blackwater catchment, 2014. (Inset: Map of Ireland with Kells Blackwater catchment (shaded) and Eastern River Basin District (outlined))

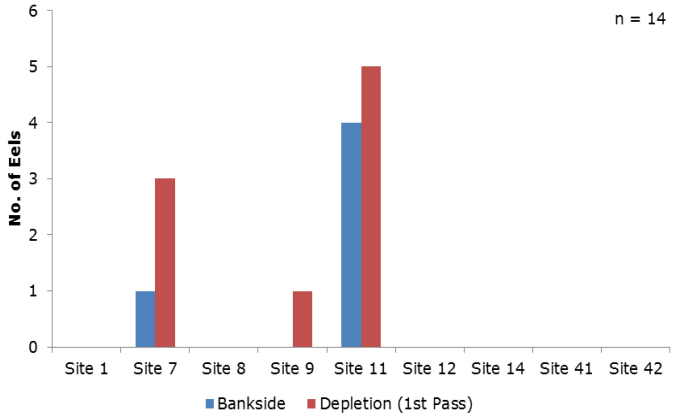

Figure 5-40 Semi-quantitative catches for sites fished using bankside and 1st pass depletion electric-fishing methods on Kells Blackwater catchment, 2014

5.4.3 Summary

The electric-fishing surveys are supplying a lot of detailed information on the distribution of eels within the catchments surveyed. This information is not available without an extensive number of sites covering the area in question and being representative of the catchment. This style of survey is not feasible using the quantitative depletion method due to limiting resources such as time constraints and resources. There is a need to repeat this method in a riverine catchment without the potential influence of a lake on the distribution of eels within the catchment.

5.5 Bacterial Infection

Bacterial infection in eels can be evidenced through the presence of red spots or blotches of varying size and shape, often occurring on the ventral and lateral surfaces of the fish (Plate 5-3). This form of infection can be caused by bacteria such as *Aeromonas hydrophila* (bacterial haemorrhagic scepticaemia) and *Vibrio anguillarum* (Vibriosis). In some cases, the condition can also lead to swollen and dark lesions that ulcerate. The EMP has qualitatively recorded the presence of red spots over the past three years of monitoring (2011-2014), and more recently looked for signs of other bacterial, viral and fungal infections (e.g. red fins, anal inflammation, fin rot, hemorrhaging and white to brown cottony growth on gills, fins and skin).

Plate 5-3 Red spots (sign of bacterial infection) on yellow eels captured at Lough Derg, 2010

5.6 Summary: Yellow Eel, 2012-2014

Of the lakes sampled by EMP during this three year cycle, Lough Muckno (summer 2013) had the highest CPUE and catch numbers recorded (CPUE of 28.77 with 1,007 eels caught. On average, Lough Muckno (summer 2012) also had the highest length and largest weight of any eel recorded (a female yellow eel of 91cm and 2.043kg).

Sacrificed eels were taken at Lough Muckno in 2012 and 2013 (n=106 and 100 eels, respectively), Lough Key 2013 (n=102) and Lough Ramor 2014 (n=99). Of these locations, Lough Ramor showed the highest percentage prevalence of *A. crassus* of 83.84% (mean intensity 9.66 parasites per eel). The total parasite count in the Ramor sample was 802 individual nematode worms. This number is a concern, considering that, Lough Muckno 2012, 2013, and Lough Key 2013 had total parasite counts of 110, 100 and 102 individual worms, respectively. Despite such high parasite loading, the Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) for Lough Ramor, demonstrated only slight/moderate damage. This result was also noted for the sacrificed eels from Lough Key and Lough Muckno in 2013.

While monitoring is on-going, early results of acoustic tagged eels on the River Barrow show that the tagged yellow eels (with the exception of silver eels which migrated from the catchment to sea) are remaining within the stretches of the Barrow in which they were initially tagged, suggesting a degree of site fidelity in the tagged population. A conservative estimate of home range is 2–12.5ha, with potential riverine distances travelled between 393 and 2,000m. It is believed that the core range is less than 2ha but smaller distances could not be confirmed due to the setup of the receivers. These home range estimates comprise eels displaying restricted core activity and outer exploratory behaviour.

The Fane and Kells Blackwater electric-fishing surveys suggested that riverine eel populations use the main channels of these systems in order to reach the productive lake habitat within the catchments. The results showed that the greatest catches were on the inflows and outflows the main lakes in the system (i.e. Lough Muckno and Lough Ramor, respectively), along with several locations on the main channels. In the case of the Kells Blackwater, the main channel catches were further increased by the presence of weirs just upstream of several sampling locations, creating a potential 'bottleneck effect' for eels which were attempting to travel upstream to Lough Ramor.

Low catches in other areas (including the smaller tributaries, such as the County River and County Water River upstream on the Fane Catchment, and the River Lear upstream on the Kells Blackwater) may have been due to a combination of potential barriers and poor eel habitat. Many eels may also have remained in the lakes and not continued upstream migration having found a suitable habitat. The lower reaches of the Fane catchment had

low catches most likely due to silty/muddy stream beds as the river approached its estuary. This led to difficult sampling conditions and potentially reduced catches.

It is believed that within these catchments, eels may have been following chemical and/or biological cues in order to locate the most productive, and/or the most highly eel populated regions. This may explain (for example), the extremely low number of eels captured on the Barora and Moynalty Rivers on the eastern side of the Kells Blackwater (n=1 eel), despite the presence of suitable habitats and conditions. Eels were instead following the main channel of the Blackwater to reach the highly populated, and largely productive wetted area of Lough Ramor upstream. The bankside electric-fishing approach proved to be useful on small tributaries, with no differences in catch noted between the two methods for small streams. However, the depletion method often yielded greater catches on larger (main) channels.

6 Stock Structure

6.1 Introduction

Neumann and Allen (2007) reported that the size structure of a fish population at any one time is a snapshot that reflects the interactions of the dynamic rates of recruitment, growth and mortality. However changes to the stock structure can highlight inconsistent size class strength, slow growth and excessive mortality (Anderson & Neumann 1996). One of the monitoring objectives of the national eel management plan is to examine the stock structure of the eel population and determine if there are any changes as a result of the fishery closure. It is possible to examine the changes to the structure of the eel population over the last 4 decades with the availability of historical data from the Fisheries Research Centre dating from the 1960's.

It is expected that the stock structure of the eel population will have changed as a result of the reduced recruitment for the last 30 years. Density dependence influences the population structure with an increase in female eels recorded with decreasing density (Bark *et al.* 2007). It is also anticipated to see changes in the stock structure due to the closure of the fishery in Ireland in 2009 with eels remaining in the system that would have been removed historically by the fishery. However it remains to be seen over what time scale these changes will occur and if the changes will be detected by the survey methods employed in the programme. An increase in recruitment as a result of increased silver eel escapement may not be visible in Ireland due to the panmictic nature of the species and crediting the increase in recruitment visible over the last 2-3 years to management measures is difficult to quantify.

Bark *et al.* 2007 suggest that changes in length frequency distribution as a result of changes in recruitment or fishing pressure may be more sensitive and easier to detect and corroborate statistically than changes in biomass.

6.2 Methods and Results

6.2.1 Freshwater Lakes

In the 2012 eel monitoring report there was a section on comparing current and historical data. The general conclusion was that the eels caught in fyke nets in the recent surveys have a greater average length and weight compared with the eels caught in fyke nets in the 1960s and 1970s (Figure 6-1). A second analysis showed no significant change in the length weight relationship for eels in the lakes surveyed. The fyke nets are size selective but as seen in the transitional waters, if smaller eels are present in the area then they are caught in the nets. The catch of small eels is not reflective of the population due to their ability to escape the nets however the absence of these small eels in the recent surveys of key lakes is of concern.

The dataset available for examining the change in length structure of eels in a fyke net survey of key lakes has increased since the 2012 report. Historical data from the 1960s, 1980s and 1990s were available for 5 lakes surveyed by the Eel Monitoring Programme over the years 2009–2014 (Lough Conn, Inchiquin, Ree, Upper and Lower Lough Corrib) Lough Derg was not included in the analysis due to the limited location of sites within the lake (Meelick Bay) and the unbalanced sample size. An analysis into changes in the length frequency of eels caught by fyke nets over the decades was investigated.

The data was pooled together to determine if a statistically significant difference in length is observed across all lakes through time (Conn, Corrib Upper, Corrib Lower, Inchiquin and Ree). The data was not normally distributed and despite transformations a Levanes test and Kolmogorov Smirnov test indicated deviations from normality. Therefore a non-parametric Kruskal Wallis test was performed on the length data by decade.

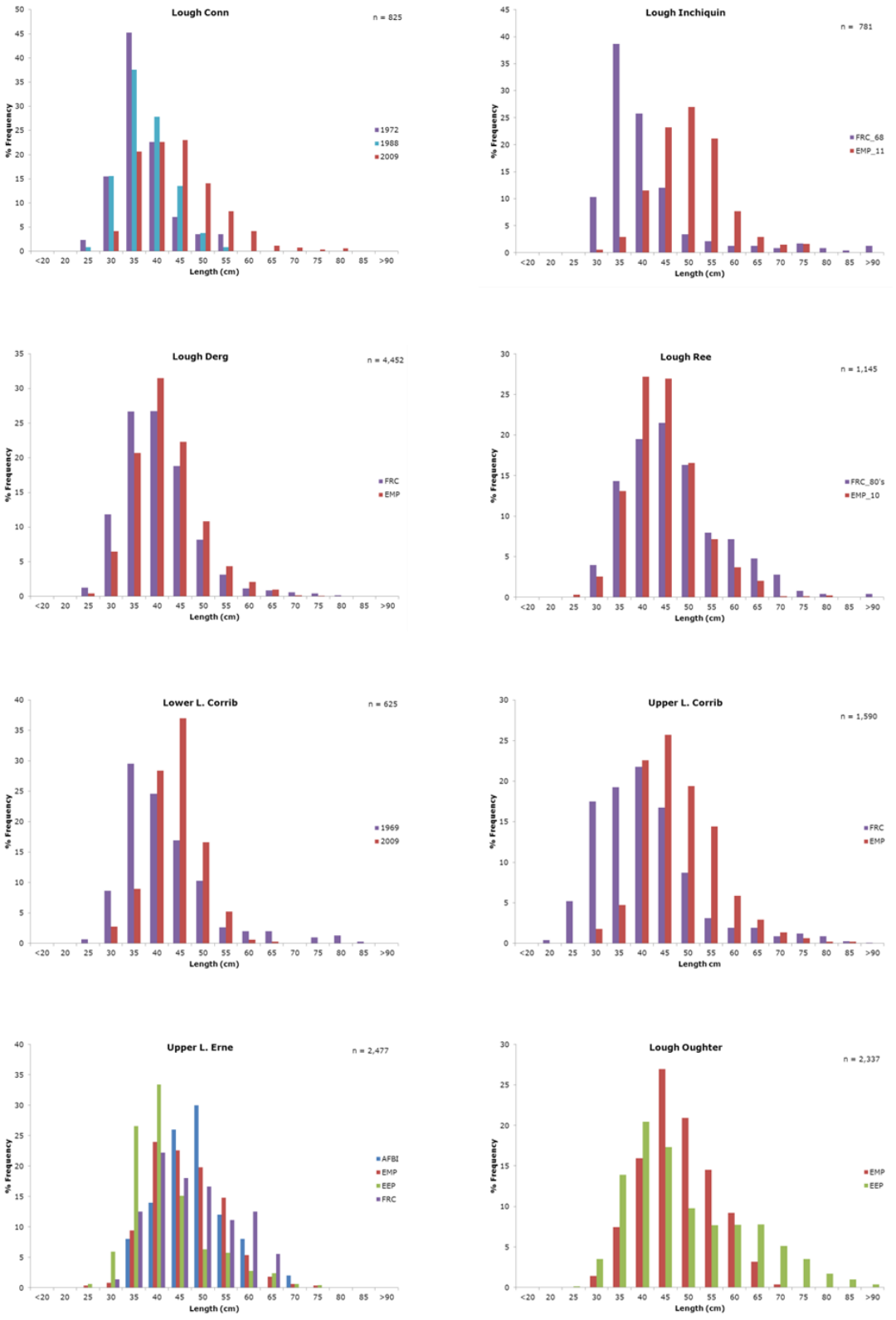

Figure 6-1 length frequency of selected lakes

6.2.2 Results

A significant difference in length was found for the Kruskal Wallis test (test statistic X=739.390, df=3, p<0.001; Table 6-1). A post hoc Mann Whitney test was carried out to determine where the significant difference in length was occurring.

There was a significant difference in average length between the eels caught in the 1960s compared with the recent surveys (U=1432007, p<0.001; p<0.0125bc; r=0.326). A medium effect size was calculated for this analysis, supporting the significant difference in length from the 1960s and present data surveys. A significant difference in length was calculated for eels surveyed in 1960s and in the 1990s (U=1402787.5, p<0.01; p<0.0125bc, r=0.25). There is a small to medium effect size for this analysis indicating that the result is not as pronounced as it is in the 2010 surveys.

A significant difference was also found for the eels measured in 1990 and 2010 however the effect size is low (U=279950, p<0.001, r=0.09). A similar significant result was found when analysing the length of eels from 1960s and 1980s; a significant result was calculated but the effect size is low (U=668620, z=-2.758, r=0.05). The change in stock structure of the eels has been changing gradually since the 1960s and is only showing a medium effect size when the 2 extreme time periods are examined (1960s and 2010s; Figure 6-2).

Table 6-1 Summary data of eel length and decade

Length	1960	1980	1990	2010
Mean	43.4	42.1	47.3	48.4
Median	41.6	40	46.1	47.5
Minimum	23	28	29.2	28.2
Maximum	97.8	94	85.6	87.5
Count	1721	833	2297	2713

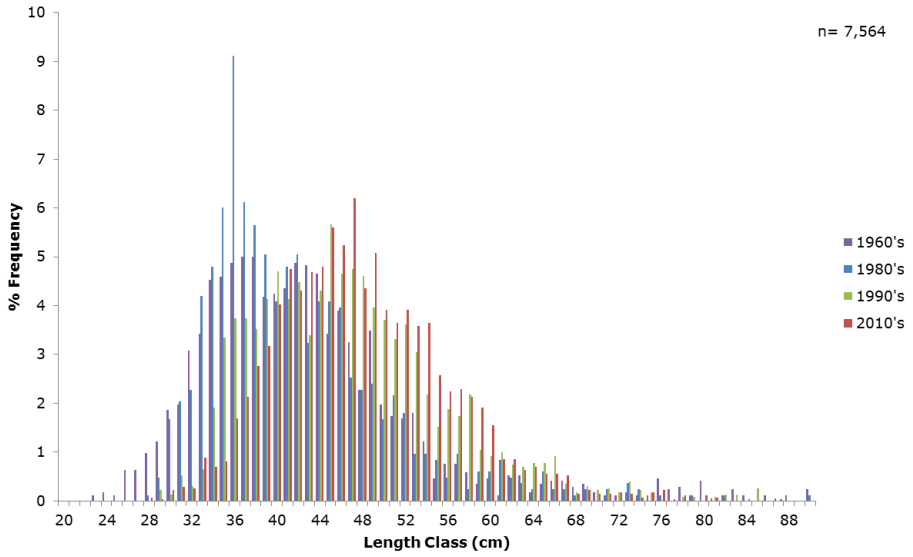

Figure 6-2 Length frequency of eel length by decade

6.2.3 Barrow River and Transitional Waters

For the Barrow catchment historical data is available for a number of locations in the freshwater and the upper transitional waters.

An examination of the historical and current data from the River Barrow indicates no significant difference in the length frequency for the eels in the freshwater sites (Figure 6-3). However there is an indication that there are a greater number of smaller eels present in the transitional waters in the recent surveys (Figure 6-4). A significant difference in length of eels between the 1970s and 2010s was observed for the Barrow transitional waters however it is in the opposite direction to that observed in the lakes ($U=35833.5$, $p<0.001$, $r=0.19$, Figure 6-4). The average length for the 1970s eels is 46.57cm compared with 42.27 for the 2012 survey. This difference in length could be an artefact of the unequal sample size and the fact that the 2010's sample is from 1 location and 1 nights fishing however it does indicate an increase in the smaller size class of eels. This could be a result of the reduced density present in the transitional waters following the extended period of poor recruitment; with enough space for eels to stay in the estuary rather than move into freshwater. This is preliminary data and needs further investigation.

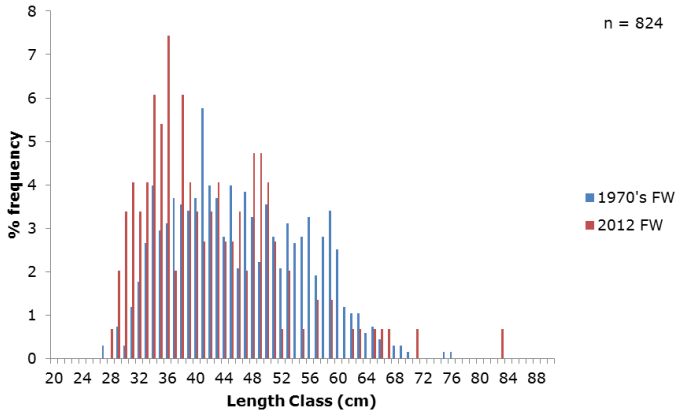

Figure 6-3 Length Frequency River Barrow Freshwater sites

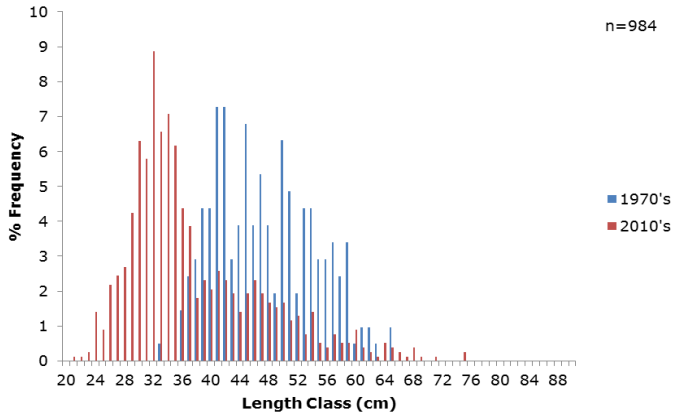

Figure 6-4 Length Frequency Upper Barrow transitional waters

6.2.4 South Sloblands

The length frequency for the South Sloblands from 1970s and 2010s show a return of the smaller eels in the recent survey compared with the 1970s (Figure 6-5). However the data set is very unbalanced, with 1,989 eels measured for the 1970s and 171 eels for the 2010s survey therefore no statistical analysis was carried out.

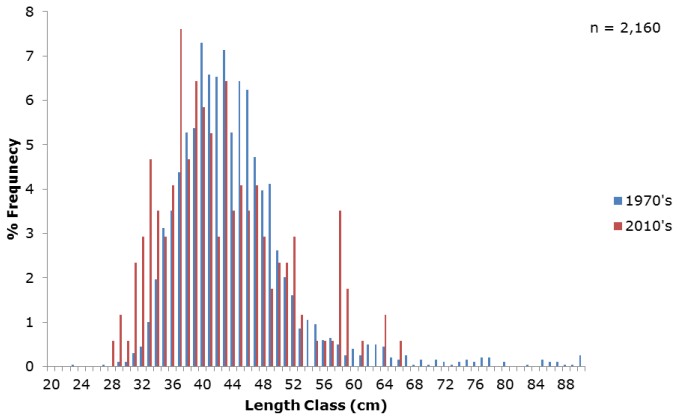

Figure 6-5 Length Frequency South Sloblands

6.3 Discussion

The data from the lake fyke net surveys indicate a decrease in the proportion of small eels being caught by the fyke nets compared with the 1960s and 1980s. Within the data there is a gradual progression from the 1960s to 1980s and the 1990s to the 2010s of an increase in the average length of eels in our freshwater lakes. The proportion of smaller eels has been declining since the 1980s and corresponds to the dramatic decline in recruitment. It must be taken into account that the fyke nets are size selective and eels smaller than 30cm can escape the nets however the data does suggest a trend that should be investigated further. Is there a reduction in the dispersion of eels within a catchment? Are more eels remaining in the transitional waters due to the reduced density present?

The data series from commercial fisheries might not show this trend due to the restrictions such as lower size limit where fisheries must put back eels below a certain threshold. The fishery independent nature of the work carried out over the last 6 years and the availability of historical data from 1960s, 1970s, 1980s and 1990s coupled with the broad range of lakes surveyed enable us to investigate the effects on the population structure of eels.

It is important to note that this change in length structure is not observed in all lakes. The difference in length frequency in Meelick Bay (L. Derg; Figure 6-1) is not as pronounced as it is in other lakes. This could be the result of the modified nature of the Shannon Catchment with the presence of a hydro scheme affecting the natural recruitment of eels upstream and the assisted migration programme. The effect in Lough Ree, while significant, is again not as pronounced, but this could be an artefact of the distance to sea as Lough Ree has the greatest distance to sea compared with the other lakes in this analysis.

In order to observe any change in population structure as a result of the reduced fishing mortality coupled with changes in the recruitment levels as seen in the last 2-3 years, it is necessary to continue to monitor the stock structure of yellow and silver eels in key

locations into the future. While looking at population structure it is necessary to look at all water bodies – estuaries, rivers and lakes. The use of index catchments with all life stages monitored will take into account the density dependence issue with the potential of eels to remain in the transitional waters with delayed migration into freshwater due to the reduced density and this influence on the stock structure of eels in our rivers and lakes upstream.

The fishing mortality on eel in Ireland has been reduced to as close to zero as possible for the last 6 years. There is a long timeframe before a change in the stock structure within the yellow eel population and in the corresponding silver eel fishery will be detected. As the spawning stock biomass is based on a mixed cohort and as age and length are not correlated, it is difficult to observe a change as a result of the reduced mortality following the closure of the fishery.

Neumann and Allen (2007) recommended that the analysis of stock structure should be coupled with catch, effort, age and growth analysis, recruitment analysis, mortality and body condition.

7 Otolith Ageing and Growth: Preliminary analysis

7.1 Introduction

Otoliths were extracted during all dissections of sacrificed eels collected during surveys by the Eel Monitoring Programme. To date, all otoliths from 2009, 2010 and 2011 surveys have been prepared, aged and subjected to quality control checks in-house. These QC checks were devised after the Otolith Workshop with Russell Poole in the Marine Institute (Newport) in early 2010. The QC methodology developed at the workshop was applied to a subset of the total specimens. This comprises over 80% of the otoliths extracted during dissections by the EMP from 2009 to the present time. Work on otolith burning and ageing to date has seen a total of 2,490 specimens processed. This includes 1,462 yellow eels from lake, canal and transitional water sites and a further 1,028 silver eels representing up to nine sites in four catchments.

7.2 Methodology

7.2.1 Extraction

Otoliths are extracted from eels during dissection by opening the brain case with a scalpel and removing otoliths with a forceps from both sides of the exposed brain cavity (Plate 7-1). The otoliths were rinsed, cleaned and allowed to dry before being stored in carefully labelled scale envelopes. The dried otoliths were later prepared and slide mounted for ageing.

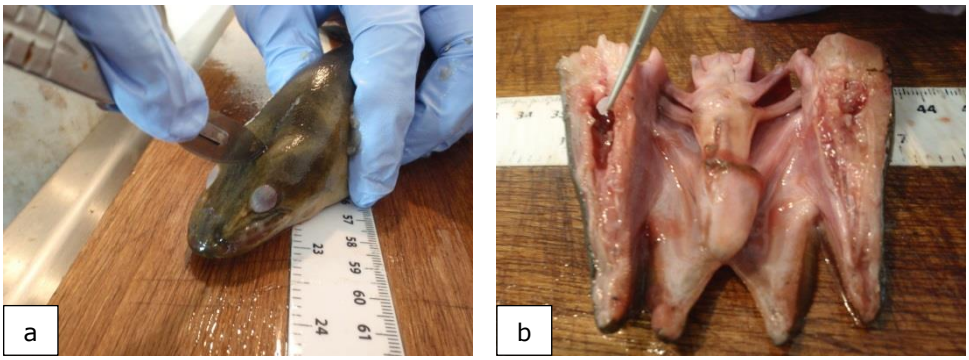

Plate 7-1 a) Opening the brain case and b) extracting otoliths from the brain cavities (Photos: R. Cruikshanks)

7.2.2 Cut and Burn

The Cut and Burn method (Graynoth, 1999 & Annex 5: ICES Workshop Manual on Age Reading for European and American Eel, Version 2, April 2011) involves cutting the otolith along the short axis (along its frontal plane) through the nucleus, while it is lying flat on its convex side (i.e. concave side facing up), (Plate 7-2a). Each half of the otolith is then individually placed on a scalpel blade and held in a flame of a Bunsen burner until the otolith itself has turned an ashen grey colour (Plate 7-2b). The burned otolith can then be placed (reading surface facing down) onto a clear resin bead upon a microscope slide. The final placement is carried out under light microscopy to ensure clear positioning of the otolith for ageing purposes (Plate 7-2c) When each slide of otoliths is completed, the specimens are sealed by a final layer of clear resin.

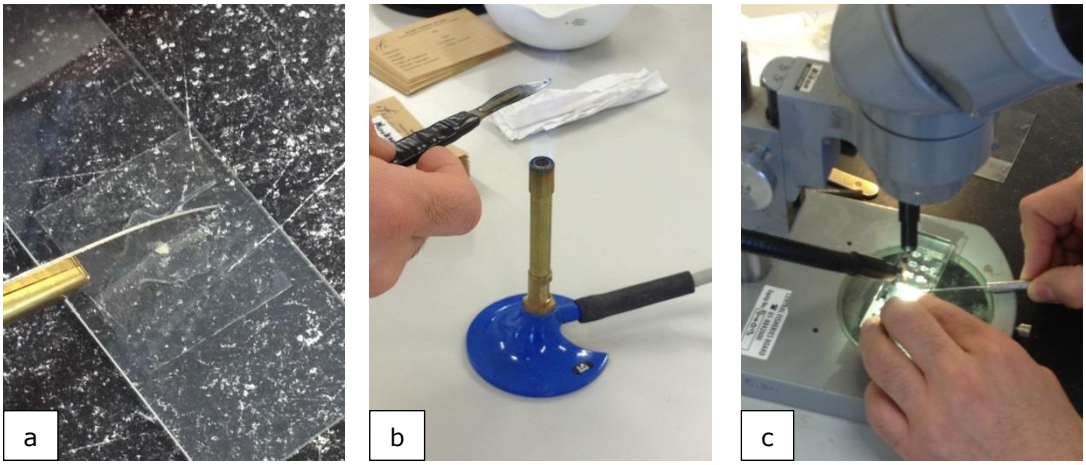

Plate 7-2 a) Cutting an otolith, b) burning over the Bunsen flame and c) mounting a burned half of an otolith in resin (Photos: R. Cruikshanks)

7.2.3 Ageing and Growth Analysis

The otoliths are aged using the ImagePro™ Plus imagery analysis computer package (Media Cybernetics). Individual otoliths are aged and the growth increments per year are marked and measured in order to calculate an observed length at age (which can later be compared to the predicted length at age data generated by von Bertalanffy calculations). In the case of predicted growth calculations, a linear growth model is assumed for eels (Poole & Reynolds, 1996). An average growth rate (cm/year) is also generated for any meta-population of eels examined. Eels are aged in accordance with a calendar which takes into account the potential future growth of the eel until the end of the year. As such, eels caught from January 1st to September 30th *do not* have the edge of the otolith included in growth and the age is denoted with a + mark. Eels caught between October 1st and December 31st *will* have the edge of the otolith marked and included in growth calculations (i.e. an eel caught during the Summer of 2010 may be 12+ years of age, while the same eel if caught after October 1st that year, would be a 13 year old eel, see Plate 7-3 and Plate 7-4). When ageing silver eels, the edge is *always* marked.

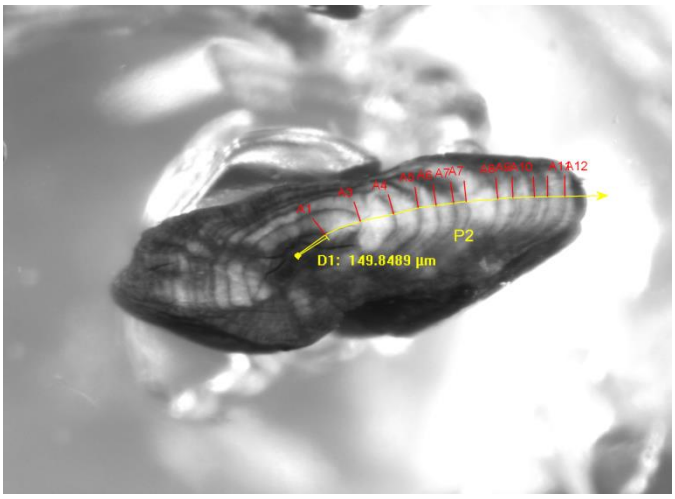

Plate 7-3 Ageing otoliths in ImagePro™ Plus. An 11+ year old yellow eel (UPERNE/YE/038), from Upper Lough Erne, sampled during summer 2010

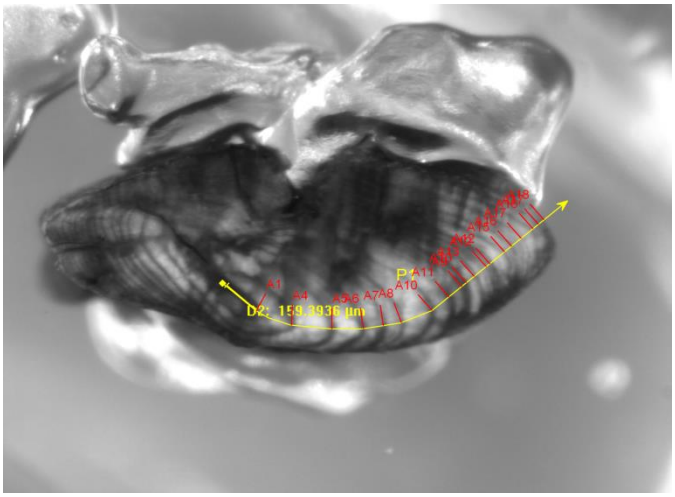

Plate 7-4 Ageing otoliths in ImagePro™ Plus. An 18 year old silver eel (SIL/CORR/114), from the Corrib catchment, sampled at Moycullen (Lower Lough Corrib) during autumn 2010

7.3 Preliminary Results

Early results suggest that transitional water sites (with higher productivity in comparison to inland waters) present the highest mean (and fastest) growth rates (Table 7-1). On average, the eels aged from 2009 to present demonstrate a growth rate of 2.65cm/year. Yellow eels average at 2.75cm/year, while silvers demonstrated lower growth in later years which led to an average growth rate of 2.52cm/year. The growth rates and descriptive statistics for growth for all eels currently aged are presented in Table 7-1.

When considering yellow eels, the average growth rate was 2.75cm/year (n=1,462). The fastest growth rate recorded was for the eels captured from the Waterford Barrow Estuary (4.07cm/year, n=65). The Barrow Estuary also had the lowest mean age of 9 years (±2 years). In contrast, the slowest yellow eel growth rate was noted at Lough Ballynahinch (1.57cm/year, n=81), where the highest mean age for yellow eels to date was also

recorded (mean 21+ years, ± 6 years). This site also presented some of the oldest yellow eels so far (45+ yrs.). The low growth rate here may be linked to the acid-sensitive nature of the catchment (Table 7-1 and Figure 7-1).

Silver eel growth rates were more uniform. Lower growth rates in later years, led to an overall lower average among silvers as opposed to yellows. The average growth rate was 2.52cm/year (n=1,028). The highest growth rates were recorded for eels captured at sites on the Erne catchment (Oughter: 3.50cm/year, n=21 and Lower Lough Erne (Portora): 3.39 cm/year, n=20). The lowest mean age was also found among Erne silver eels (Oughter: 15 years, ±3 years). The lowest growth rate was recorded among the Fane silvers sampled in the autumn of 2011, which presented an average growth rate of 1.95 cm/year (n=140). The highest mean age for silvers of 30 years (± 5 years) was noted at Lough Mask (Cong) (Table 7-1 and Figure 7-2).

Table 7-1 Growth rates for sacrificed eels, 2009-present (n = 2,490 eels)

Location	Year	Life stage	No. Of Eels	Growth Rate (cm/yr.)	Mean Age (Years)	Standard Deviation
Waterford Estuary	2009	Yellow	65	4.07	8.74	2.15
Lough Cullen	2009	Yellow	81	3.37	11.26	2.61
Lough Conn	2009	Yellow	95	2.88	13.54	4.19
Lough Corrib Lower	2009	Yellow	1	3.06	13.00	-
Lough Corrib Upper	2010	Yellow	83	2.39	17.33	5.49
Lough Ree *	2010	Yellow	82	2.92	12.62	3.02
Lough Erne Upper	2010	Yellow	76	3.08	13.27	2.83
Lough Derg °	2009 & 2010	Yellow	139	2.25	16.16	4.61
Barrow Canal	2010	Yellow	39	2.01	15.95	4.58
Grand Canal	2011	Yellow	32	2.41	16.03	5.65
Lough Inchiquin	2011	Yellow	89	2.59	17.73	5.93
Lough Ramor	2011	Yellow	80	2.61	14.94	3.93
Lough Ballynahinch	2011	Yellow	81	1.57	21.04	6.28
Lough Oughter	2011	Yellow	99	3.65	12.37	3.79
Lough Muckno	2012	Yellow	91	2.23	17.71	3.96
Lough Ramor	2014	Yellow	92	2.74	16.13	3.90
Corrib (Galway Weir)	2009	Silver	91	2.45	16.48	6.19
Corrib (Moycullen) ∞	2010 & 2011	Silver	127	2.50	18.67	5.70
Mask (Cong)	2010	Silver	92	2.02	30.60	5.33
Killaloe ♦	2009 & 2010	Silver	114	2.20	17.87	5.52
Athlone	2010	Silver	87	2.24	24.12	7.52
Erne (Ballyshannon/Ferny Gap)✖	2009 & 2010	Silver	140	2.50	17.59	5.68
ERNE LLE (Portora)	2010	Silver	20	3.39	15.70	2.90
ERNE (Oughter Seized Eels)	2010	Silver	21	3.50	14.62	3.11
Fane (Muckno)	2011	Silver	140	1.95	18.29	4.42

* Upper and Lower Lough Ree were sampled in two separate surveys in summer 2010 and are pooled above.

° Lower and Upper Lough Derg were surveyed in summers of 2009 and 2010 respectively, and are pooled above.

∞ Corrib silvers sampled at Moycullen (Lower Lough Corrib) using fyke nets in the autumn of 2010 and 2011 are pooled above.

♦ Killaloe silver eels fished at the weir in autumn 2009 and 2010 are pooled above.

✖ Erne silver eels sampled at Ballyshannon (Ferny Gap) in autumn 2009 and 2010 are pooled above.

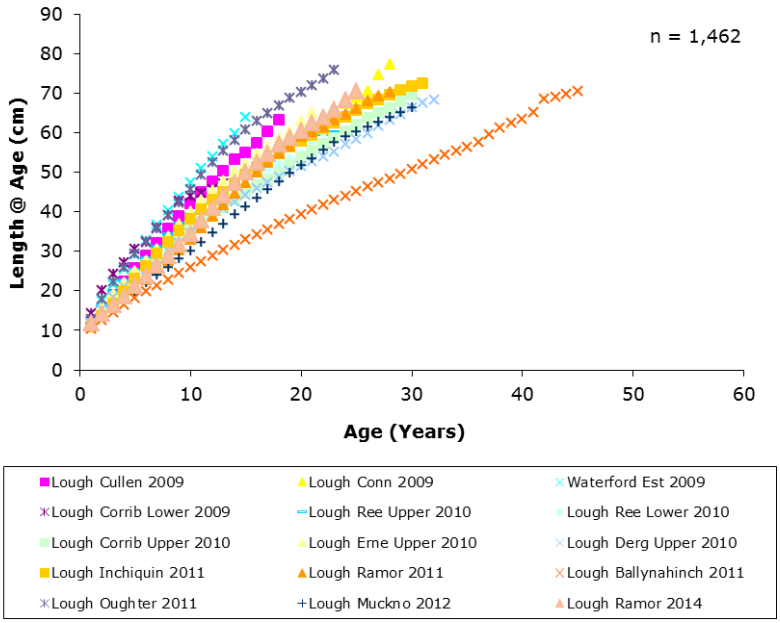

Figure 7-1 Observed growth rates (length at age) for yellow eels surveyed from 2009-present (n=1,462)

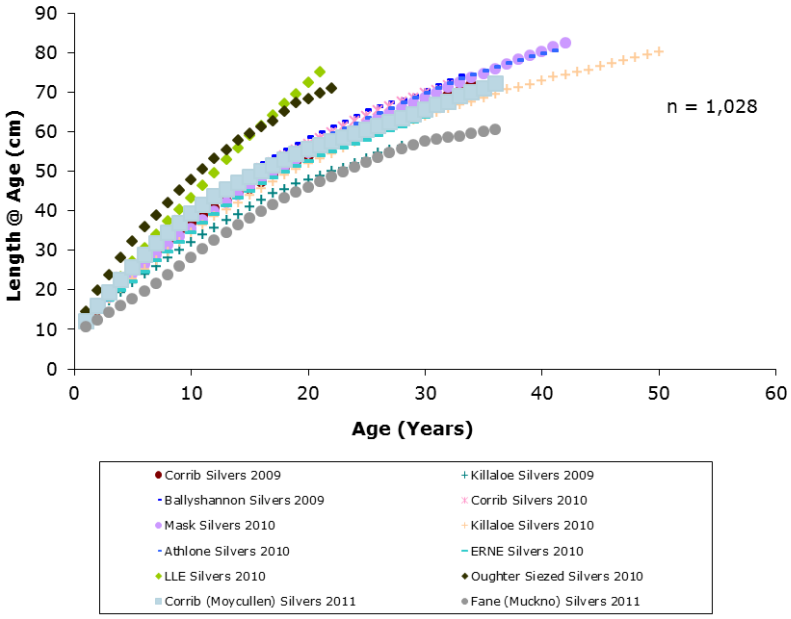

Figure 7-2 Observed growth rates (length at age) for silver eels surveyed from 2009-present (n=1,028)

7.4 Progress

Currently, the otoliths from selected sites from the 2009 to 2014 surveys have been prepared, aged and subjected to quality control checks in-house (n=2,490). This comprises over 80% of the otoliths extracted during dissections by the EMP from 2009 to the present day.

Work continues on the cutting, burning and ageing of otoliths from the more recent surveys. Table 7-2 shows the progress to date in terms of completed work and the sites still to be processed for ageing.

Table 7-2 Progress with otolith work to date

Year	Location	Life stage	Completed (✓/✗)
2009	Lough Conn	Yellow	✓
2009	Lough Cullin	Yellow	✓
2009	Waterford Estuary	Yellow	✓
2009	Lough Corrib Lower	Yellow	✓
2009	Lough Derg Lower	Yellow	✓
2009	Erne (Ballyshannon)	Silver	✓
2009	Corrib (Galway Weir)	Silver	✓
2009	Killaloe	Silver	✓
2010	Lough Ree Lower	Yellow	✓
2010	Lough Ree Upper	Yellow	✓
2010	Lough Derg Upper	Yellow	✓
2010	Lough Erne Upper	Yellow	✓
2010	Lough Corrib Upper	Yellow	✓
2010	Barrow Canal	Yellow	✓
2010	Erne (Ferny Gap)	Silver	✓
2010	Erne (Portora)	Silver	✓
2010	Erne (L. Oughter)	Silver	✓
2010	Lough Mask	Silver	✓
2010	Corrib (Moycullen)	Silver	✓
2010	Killaloe	Silver	✓
2010	Athlone	Silver	✓
2011	Lough Inchiquin	Yellow	✓
2011	Lough Ramor	Yellow	✓
2011	Lough Ballynahinch	Yellow	✓
2011	Lough Oughter	Yellow	✓
2011	Grand Canal	Yellow	✓
2011	Fane (Muckno)	Silver	✓
2011	Corrib (Moycullen)	Silver	✓
2012	Lough Muckno	Yellow	✓
2012	Fane (Muckno)	Silver	✗
2013	Lough Key	Yellow	✗
2013	Lough Muckno	Yellow	✗
2013	Fane (Muckno)	Silver	✗
2014	Lough Ramor	Yellow	✓
2014	River Barrow	Silver	✗

8 Water Framework Directive

8.1 Introduction

In December 2000, the European Union introduced the Water Framework Directive (WFD) (2000/60/EC)-as part of a standard approach for all countries to manage their water resources and to protect aquatic ecosystems. The fundamental objectives of the WFD are to protect and maintain the status of waters that are already of good or high quality, to prevent any further deterioration and to restore all waters that are impaired so that they achieve at least good status by 2015.

A key step in the WFD process is for EU Member States to assess the health of their surface waters through national monitoring programmes. Monitoring of all biological elements including fish is the main tool used to classify the status (high, good, moderate, poor and bad) of each water body. The responsibility for monitoring fish has been assigned to Inland Fisheries Ireland. A national fish stock surveillance monitoring programme has been initiated at specified locations in a 3 year rolling cycle. WFD eel information collected for Rivers in 2011 is not presented in this report due to a modification of the site coding system.

8.2 WFD Sampling Programme Methods

8.2.1 Lakes

Lakes are surveyed between June and September. Standard multi-mesh monofilament survey gill nets were used to sample the fish population. Surface floating nets, "Dutch" fyke nets and benthic braided single panel (62.5 mm mesh knot to knot) gill nets were used to supplement the gillnetting effort. Survey locations were randomly selected using a grid placed over the map of the lake and portable GPS instruments were used to mark the precise location of each net. All nets were set between 3 and 6 pm, fished overnight and lifted between 10.00am and 12.00 midday in order to ensure that the activity peaks of each fish species were included.

8.2.2 Rivers

Electric fishing is the method of choice for WFD surveillance monitoring of fish in rivers to obtain a representative sample of the fish assemblage at each sampling site. The standard methodology includes fish sampling, hydrochemistry sampling, and a physical habitat survey.

A macrophyte survey was also carried out at selected sites. Surveys were carried out between July and early October (to facilitate the capture of 0+ salmonids) when stream and river flows were moderate to low. Three fishing's were carried out in a contained area. In small shallow channels (<0.5-0.7m in depth), a portable (bank based) landing net (anode) connected to a control box and portable generator (bank-based) or electric fishing backpack was used to sample in an upstream direction. In larger deeper channels (>0.5-1.5m), fishing was carried out from flat-bottomed boat(s) in a downstream direction using a generator, control box and a pair of electrodes. All habitats, in wadeable and deeper sections, were sampled (i.e. riffle, glide, pool).

8.2.3 Transitional Waters

A multi-method approach is used for sampling the transitional waters. Beach seining using a 30m fine-mesh net is used to capture fish in littoral areas. Beam trawling is used for specified distances (100–200m) in open water areas adjacent to beach seining locations. Fyke nets were set overnight in selected areas adjacent to beach seining locations.

8.3 Results

The water framework programme works on a 3 year rolling programme Figure 8-1 shows the distribution of locations surveyed around the country in each of the different water bodies.

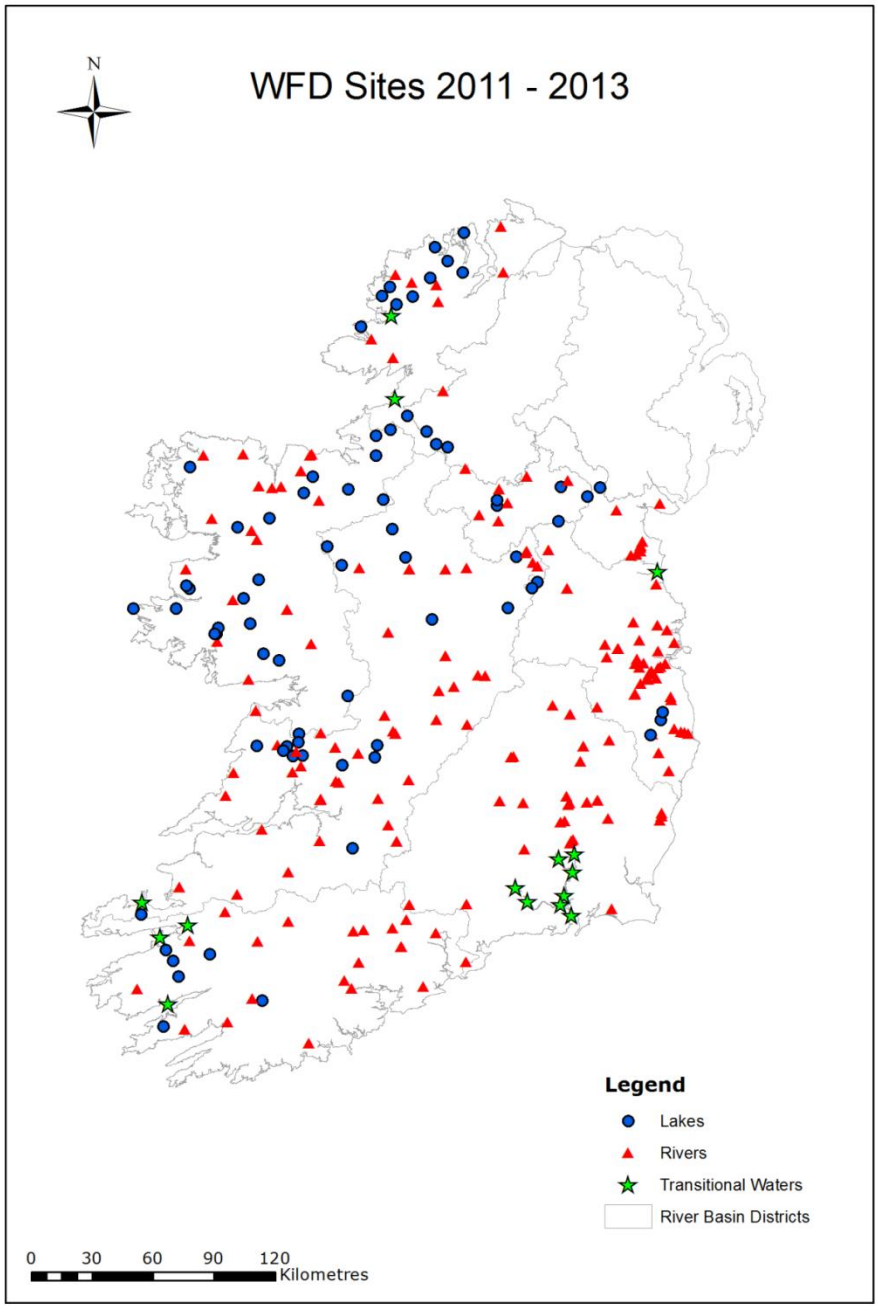

Figure 8-1 Location of WFD survey sites, 2011-2013

8.3.1 2011

Locations for WFD sampling sites are shown for lakes, rivers and transitional waters for the 2011 sampling period (Figure 8-2). Summary tables detailing the surveys carried out by the WFD team are provided in WFD Appendix 2011 Table 1-1 – 1-8. A total of 30 lakes, 65 rivers and two transitional water sites were sampled by the WFD team. Eels were present in all of the 30 lakes, 41 river sites and at the two transitional waters sampled in 2011.

Length frequency for the lakes from 2011 sampling is shown in Figure 8-3. The WFD river surveys have supplied vital information on the smaller eels (<30cm) rarely encountered by the fyke net surveys. Due to changes in the reporting structure for the WFD Rivers data being undertaken at his time the WFD Rivers data is not reported at this time.

Another benefit of the national survey undertaken by the WFD team is the identification of the spread of *Anguillicola crassus* around the country. Figure 8-4 and Figure 8-5 show the prevalence and mean intensity of the parasite in eels captured at the WFD lake sites in 2011. The distribution of infection has shown to be uneven across the country with several areas appearing to be in early stages and advanced stages of *Anguillicola* invasion; while others are parasite free (O'Leary *et al.* 2011). There is a need to ensure that the parasite is contained to infected areas and that parasite free locations remain uninfected.

Anguillicola crassus was present in four out of seven lakes sampled in 2011, with two lakes showing a prevalence of 50% or greater. The lowest prevalence recorded was 25% for Lough Rea (n=4) eels (Appendix WFD 2011 Table 1-3, Figure 8-4). The mean intensity of the infection was variable for the lakes sampled, but ranged between 6.66 in Lough O'Flynn (n=5 eels) to 2.00 in Lough Corglass (n=4 eels) and Lough Owel (n=4 eels) (Appendix WFD 2011 Table 1-3, Figure 8-5). The total number of eels dissected from WFD sampled lakes in 2011 was 50. In 2011, no eel were retained for dissection from the WFD sampled transitional waters.

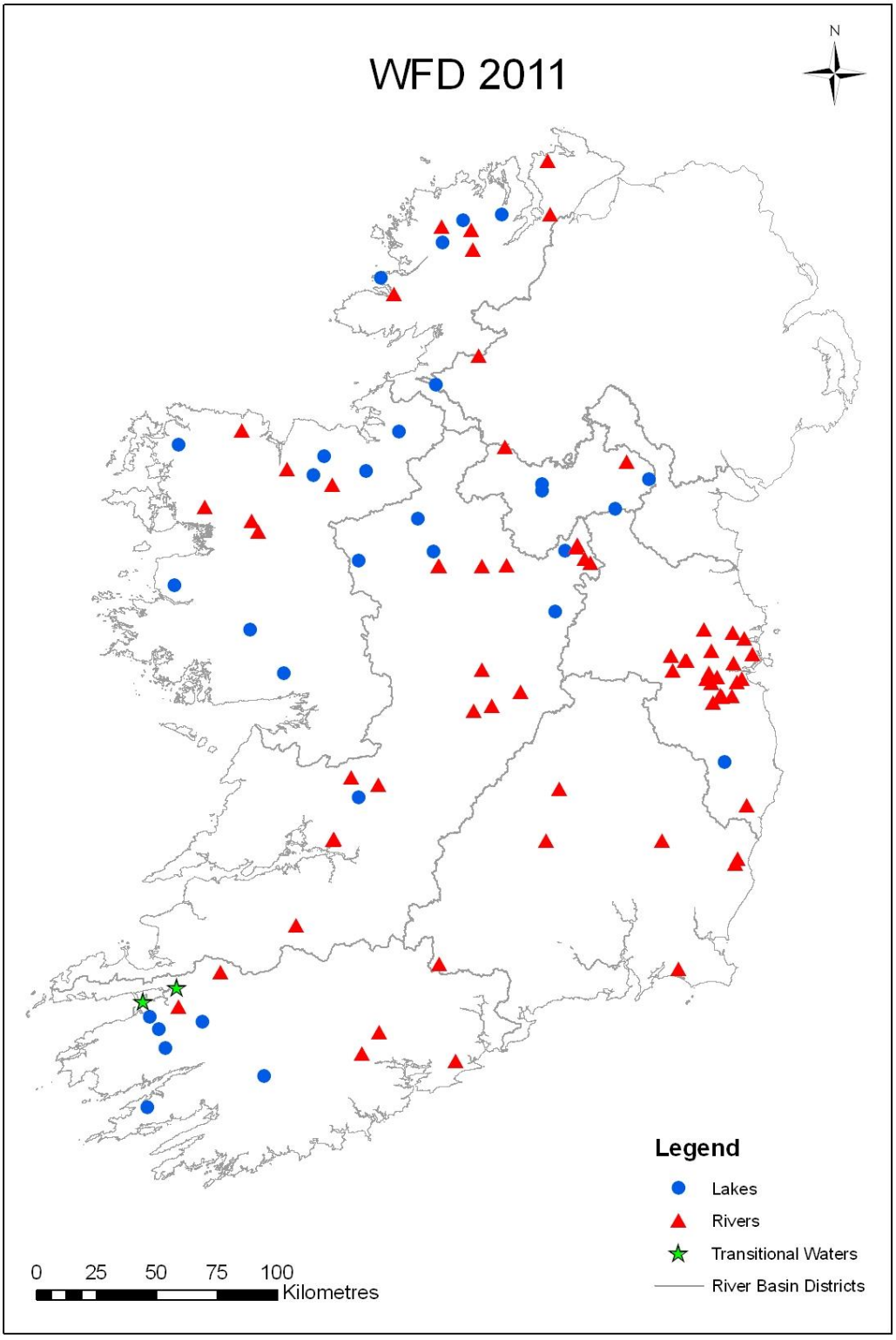

Figure 8-2 Location of WFD survey sites, 2011

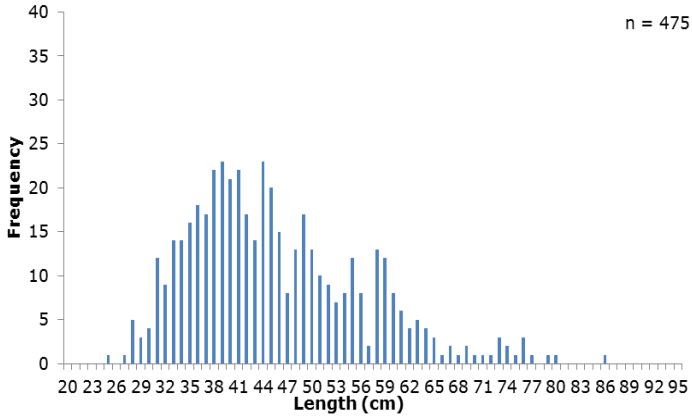

Figure 8-3 Length Frequency for WFD lake sites, 2011

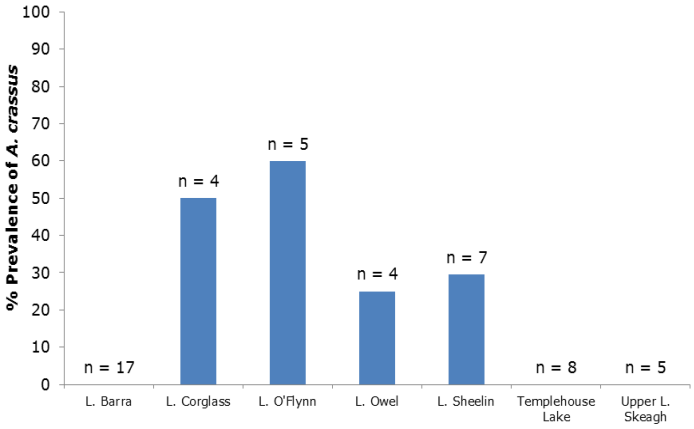

Figure 8-4 Prevalence of *Anguillicola crassus* in WFD sampled lakes, 2011

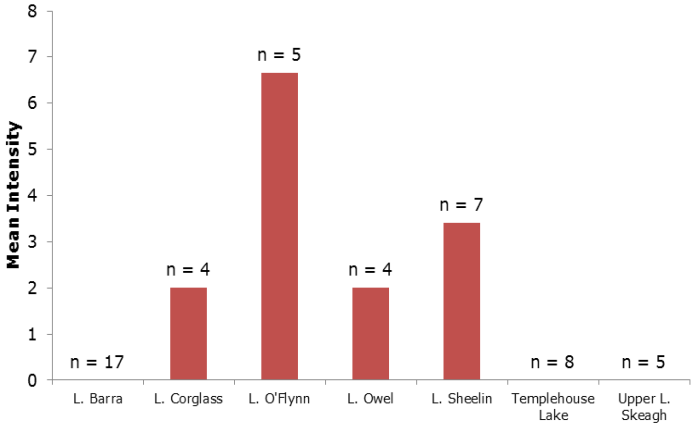

Figure 8-5 Mean intensity of *Anguillicola crassus* infection in WFD sampled lakes, 2011

8.3.2 2012

Locations for WFD sampling sites are shown for lakes, rivers and transitional waters for the 2012 sampling period (Figure 8-6). Summary tables detailing the surveys carried out by the WFD team are provided in Appendix WFD 2012 Tables 2-1 – 2-7. A total of 23 lake, 58 river and three transitional water sites were sampled by the WFD team. Eels were present in 22 lakes and 2 transitional waters sampled in 2012 (Appendix WFD 2012 Table 2-1 and 2-6). No eels were recorded in the Erne estuary. Eels were present at 71% of all river sites (Appendix WFD 2012 Table 2-3).

A mean Catch per Unit Effort value of 1.118 was found across all lake sites. While the highest values were found in Lough Cullin (CPUE=3.722), Lough Anure (CPUE=2.556) and Lough Derg (CPUE=2.083), the lowest values were found in Lough Muckanagh (CPUE=0.111), Lough Carra (CPUE=0.111) and Lough Alewnaghta (CPUE=0.444). The CPUE for the two transitional water sites sampled were 1.185 and 0.567 in the Boyne and Gwebarra estuaries, respectively.

Length frequency for the eels sampled in the lake, river and transitional waters from 2012 sampling is shown in Figure 8-7; 8-8 and 8-9. A peak in the lake length frequency was found for eels L_T = 40-46cm. The WFD river surveys have supplied vital information on the smaller eels (<30cm) rarely encountered by the fyke net surveys. Length frequency across all river sites revealed three distinctive peaks of differing frequency values. The first peak was found for eels L_T = 6-10cm. A second peak was found for eels L_T = 15-20cm, followed by a smaller third peak for eels L_T = 29-33cm.

Another benefit of the national survey undertaken by the WFD team is the identification of the spread of *Anguillicola crassus* around the country. A comprehensive scientific paper on the distribution, prevalence and intensity of *A. crassus* in Ireland has recently been published in the *Journal of Fish Biology*. The abstract is included below:

"This study is the first comprehensive documentation of the geographical range of *Anguillicola crassus* in its host, the European eel *Anguilla anguilla* in the Republic of Ireland. The prevalence and intensity of infections across 234 sites and 93 river basins in Ireland comprising rivers, lakes and transitional waters (estuaries) were analysed. While only 32% of the river basins were affected by this nematode, they correspond to 74% of the total wetted area. Significant differences in infection levels among water body types were found with lakes and transitional waters yielding the highest values, which can be attributed to the proportions of juvenile (LT < 300 mm) *A. anguilla* caught. There were no significant differences in infection levels between water body types for adult *A. anguilla* or between sexes for any water body type. Prevalence was significantly lower in juvenile compared to adult *A. anguilla* captured in rivers and a positive correlation between infection levels and host size-classes was found. Future efforts should focus on monitoring the spread of *A. crassus* infections and assessing the swimbladder health of *A. anguilla* in Ireland."

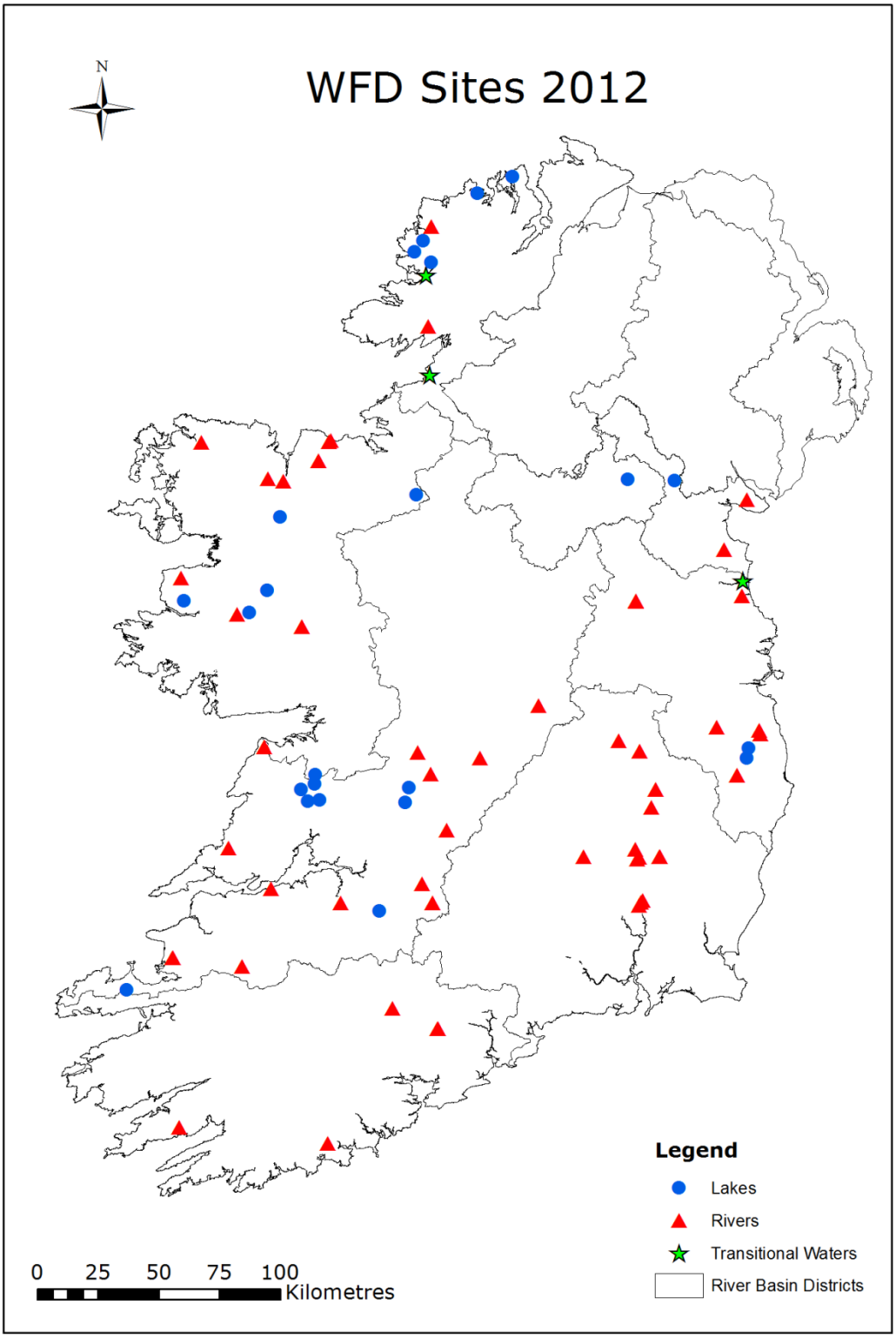

Figure 8-6 Location of WFD survey sites, 2012

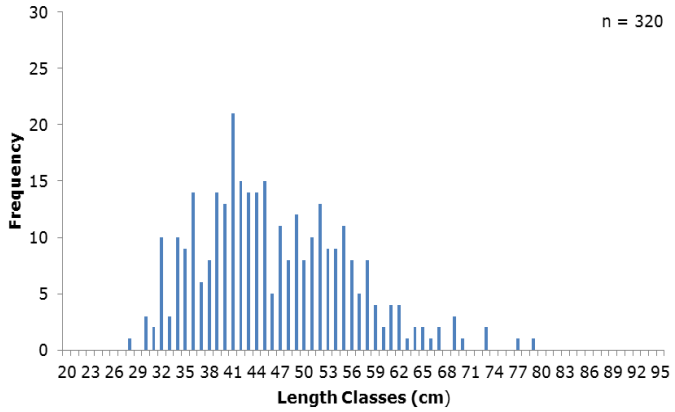

Figure 8-7 Length frequency for WFD lake sites, 2012

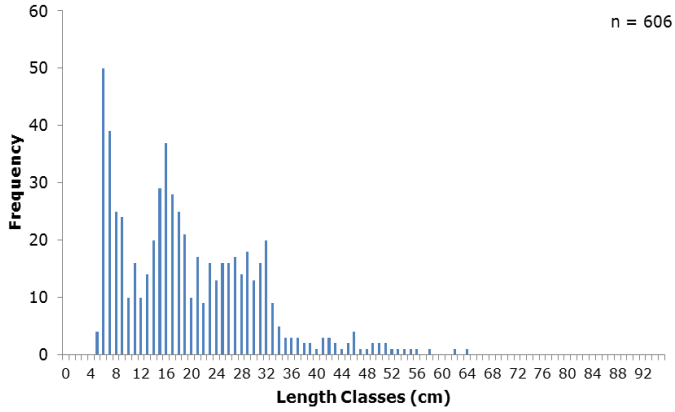

Figure 8-8 Length frequency for WFD river sites, 2012

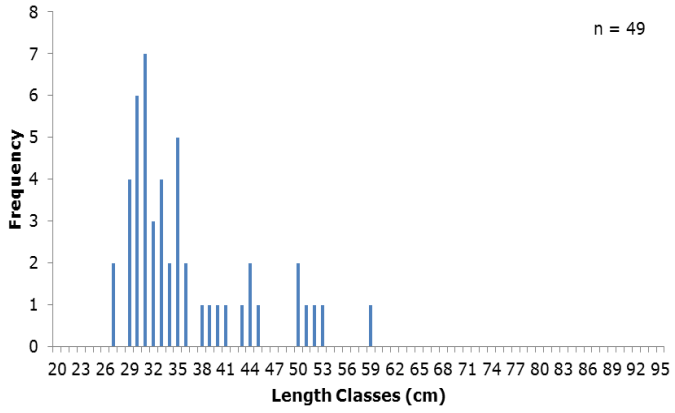

Figure 8-9 Length Frequency of eels caught during WFD Transitional Water Surveys, 2012

8.3.3 2013

Locations for WFD sampling sites for 2013 surveys are shown for lakes, rivers and transitional waters (Figure 8-10). Summary tables detailing the surveys carried out by the WFD team are provided in Appendix WFD 2013 Table 3-1 – 3-7. A total of 24 lakes (spanning 17 catchments), 75 river sites (31 catchments) and 10 transitional waters (from 5 catchments) were sampled by the WFD team in 2013. Eels were present in 20 sampled lakes (83% of sites), 54 river sites (72%) and 8 transitional waters (80%) sampled.

The WFD river sites have a 72% eel presence rate, 35% of sites have ≤5 eels, 9% of sites caught between 5 and 10 eels and 28% had ≥10 eels.

A total of 422 eels were caught during lake surveys (with 407 eels processed for length and weight). They ranged in length from 29.7 to 84.2 cm (Appendix WFD 2013 Table 3-2, Figure 8-11). The river surveys caught a total of 653 eels, ranging from 6.9 to 67.0 cm (Appendix WFD 2013 Table 3-5, Figure 8-12). The transitional water surveys caught a total of 428 eels however the catch was not processed at a number of sites. The length frequency data for 171 eels measured ranged from 22 to 78 cm (Appendix WFD 2013 Table 3-7, Figure 8-13).

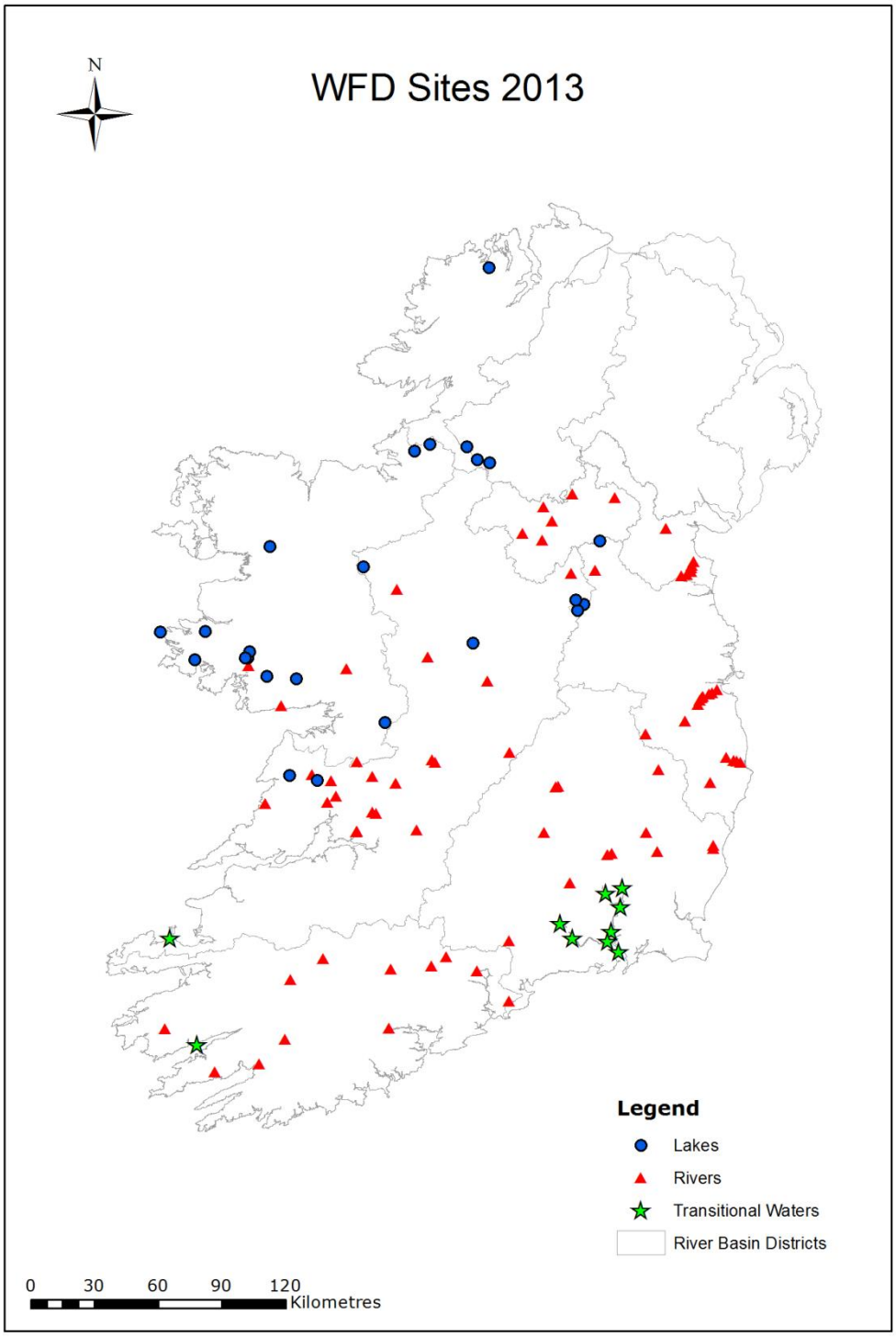

Figure 8-10 Location of WFD survey sites, 2013

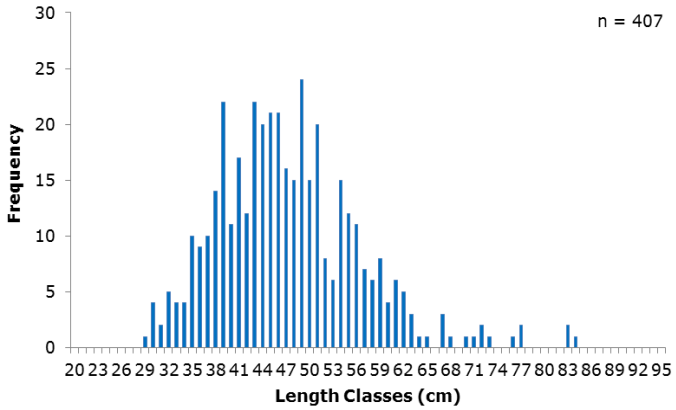

Figure 8-11 Length Frequency of eels caught during WFD Lake Surveys, 2013

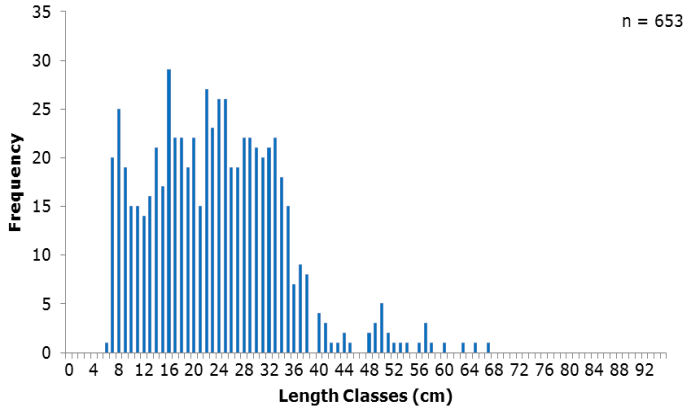

Figure 8-12 Length Frequency of eels caught during WFD River Surveys, 2013

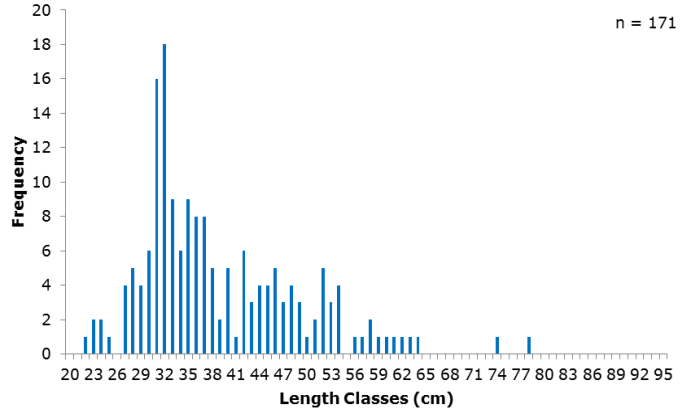

Figure 8-13 Length Frequency of eels caught during WFD Transitional Water Surveys, 2013

9 Silver Eel Escapement

The main requirement of the Eel Regulation 1100/2007 is to ensure that there is a 40% escapement of silver eels calculated on the pristine level of escapement (pre 1980s). In order to achieve this level of escapement a number of management actions were put in place. The commercial eel fishery was suspended in 2009. The ESB have implemented a Trap and Transport Programme in order to move silver eels and bypass the hydroelectric stations thereby reducing the impact of the turbine mortality.

There are three monitoring objectives in relation to silver eels.

- Synthesise available information into a model based management advice tool.
- Estimate silver eel escapement (in collaboration with ESB, NUIG, Marine Institute) and
- Estimate silver eel escapement indirectly using yellow eels.

In Ireland silver eel escapement is calculated for three ESB catchments (Shannon, Erne and the Lee), for the Burrishoole system by the Marine Institute and for the Fane and Barrow system by Inland Fisheries Ireland.

9.1 Fane

The Fane is a relatively small catchment with the silver eel fishery located in the upper reaches of the system approximately 28km from the coast. The Fane has a riverine wetted area of 84 ha and a lacustrine wetted area of 553ha. A research silver eel fishery was carried out on the Clarebane River on the outflow of Lough Muckno in the Fane catchment in 2011, 2012 and 2013 (Figure 9-1 and Plate 9-1). The site was the location of a commercial fishery until 2008.

9.1.1 Silver Eel Catch

9.1.1.1 2012

Five nights were fished during the August darkness with a catch of 55kg, 3 nights were fished in September and 73kg were caught. Nine nights were fished during the October darkness with a catch of 227 kg, and 4 nights were fished in November with a catch of 32.5kg. The December darkness was not fished due to low water levels. A total catch of 448kg was caught for the 2012 season compared with 290kg in 2011 (Table 9-1).

The Fane silver eel fishery is dependent on water levels in order for the nets to be set. As the fishing site is located downstream of Lough Muckno and a water abstraction site there is a delay due to the lake absorbing rainfall before a rise in river water levels is observed in the Clarebane River. Despite the high rainfall for the summer 2012 the water levels for the Clarebane River were variable for the silver eel season (Figure 9-2). Hydrometric data courtesy of the Office of Public Works was collected for the Clarebane River.

9.1.1.2 2013

Low water levels in August and September prevented the site from fishing (Figure 9-3). Three nights were fished in October with a catch of 28kg following a rise in the water levels (Table 9-1). A flood event occurred before the November new moon phase so the nets were set and continued to fish through the flood and into the November dark. A catch of 1,123kgs was caught over 16 nights. The nets were not set in December as the River water levels dropped to below that required to float the nets. The water levels for the Clarebane River were very variable for the silver eel season but despite this the increase in silver eels caught in 2013 was almost 2 and a half times that caught in 2012 season.

9.1.1.3 2014

The Fane silver eel fishery did not fish in August or September 2014 due to low water levels (Figure 9-4). An increase in water levels resulted in 6 nights of fishing in October resulting in a catch of 190kg. A flood in early November (outside the moon phase) resulted in a catch of 60kg for 4 nights fishing. The second flood of the month occurred on the 12th November and the nets were set for 15 consecutive nights resulting in a catch of 547kg. This catch is less than the catch recorded in 2013 but is higher than the catch of 2011 and 2012. The flood during the November dark was greater than the 2013 flood with higher water levels recorded however the catch was not as high.

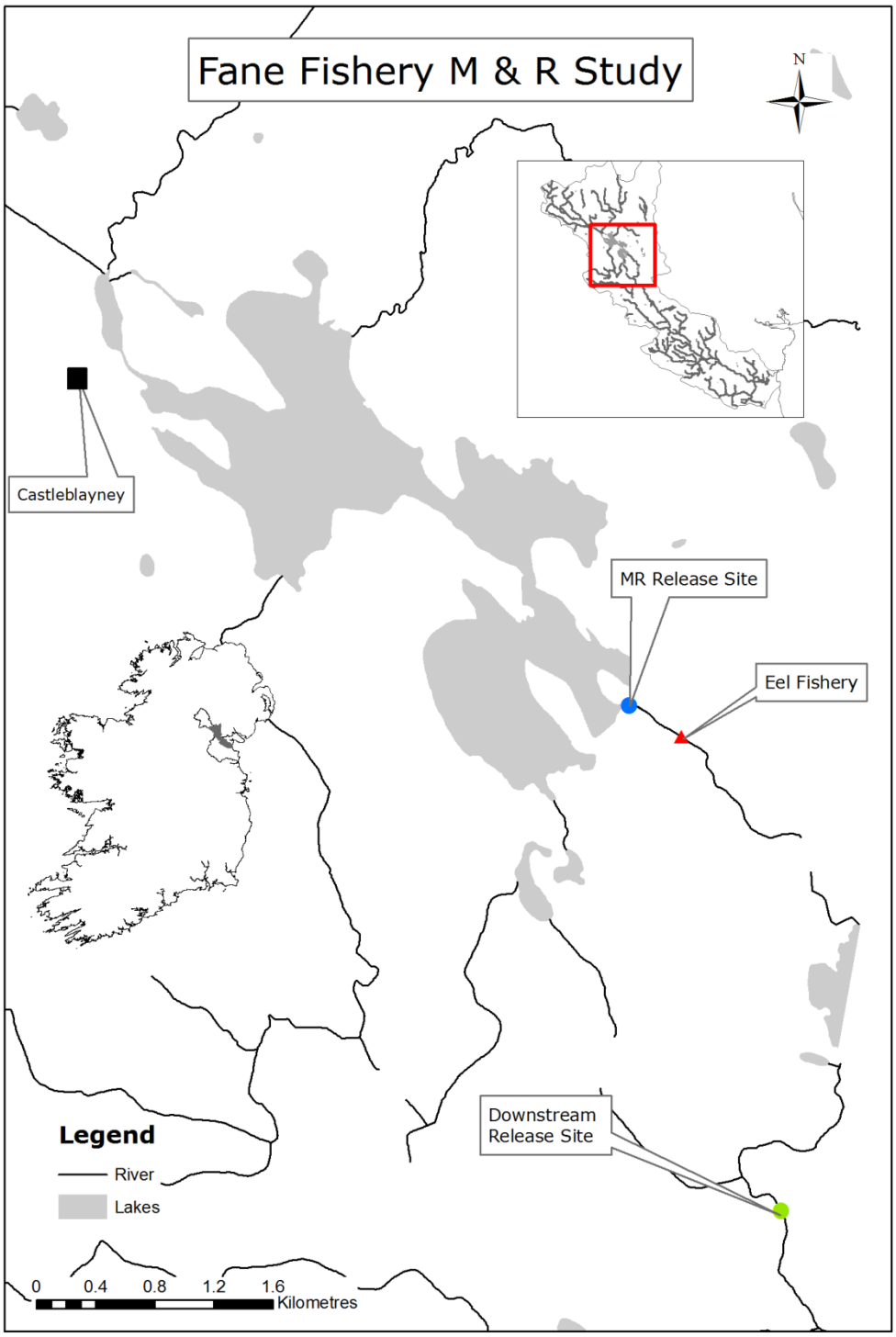

Figure 9-1 Location of Silver eel fishery

Plate 9-1 Coghill net fishing for silver eels in the Clarebane River, 2013

Table 9-1 Fane Silver eel fishery catch data 2011 - 2013

Year	Month	Nights Fished	Weight eels (kg)
2011	October	9	277
	December	4	13
	Total	**13**	**290**
2012	August	5	65
	September	3	79
	October	9	253
	November	4	44
	December	1	7
	Total	**22**	**448**
2013	October	3	28
	November	16	1123
	Total	**19**	**1151**
2014	October	6	190
	November	19	607
	Total	**25**	**797**

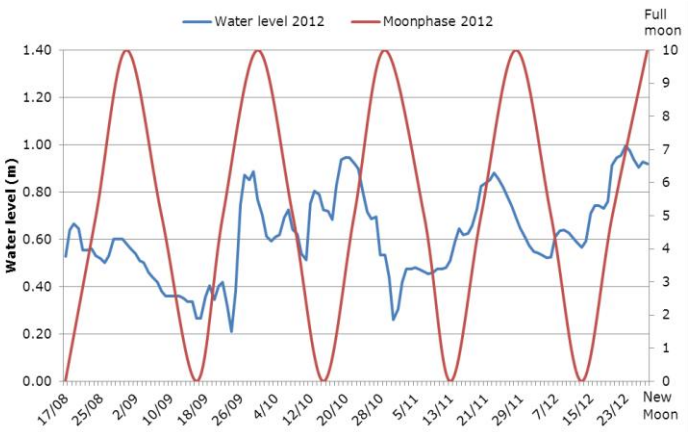

Figure 9-2 Water levels and moon phase for the 2012 silver eel season

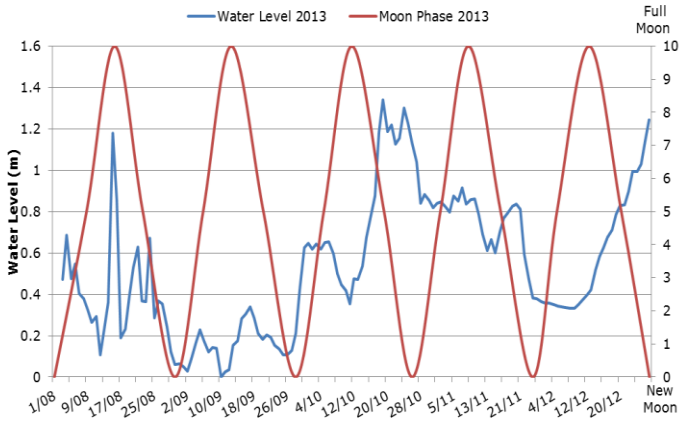

Figure 9-3 Water level and moon phase for the 2013 silver eel season

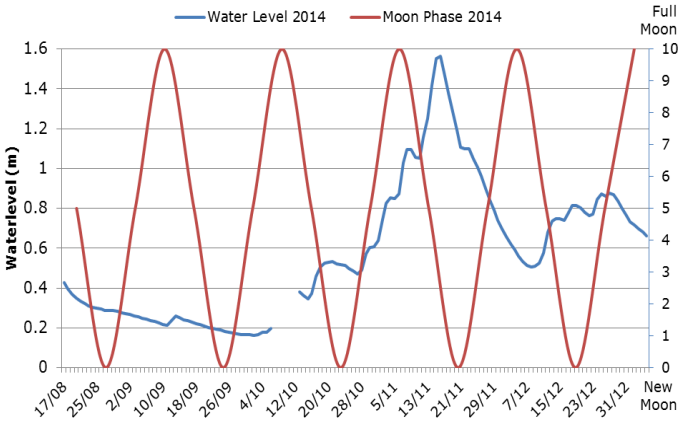

Figure 9-4 Water level and moon phase for the 2014 silver eel season

1.1.1 Mark Recapture

In order to determine the efficiency of the fishing site a mark recapture study (MR study) is undertaken. The aim of the study is to estimate what proportion of the eel population is not caught at the fishing site.

In 2012 three release sites were assessed in order to determine the efficiency of the silver eel fishery. The first location was in the Clarebane River, 150 metres upstream of the nets (Figure 9-5). The second location was in the Fane River, flowing into Lough Muckno. The third location was in the lake by Whites Island. The second and third locations were also used in 2011.

Recapture rates for the 3 sites were low for 2012 with a number of eels remaining within the system and migrating the following month and year. The average within year mark recapture rate is 9% (8%, 10% and 8% for the three locations, Table 9-2). This increases to 21% when eels that migrated the following year are included in the analysis. The within year mark recapture percentage is adjusted to remove the eels that migrated the following year from the preceding years calculation. The overall recapture rate includes all eels tagged and all eels recaptured irrespective of year.

In 2013 and 2014, a new release location was chosen as a result of the 2 year MR study undertaken in 2011 and 2012. This location is at the mouth of the Clarebane River as it leaves Lough Muckno, approximately 450m from the fishing site. For the 2013 season, it was decided to close the free gap by diverting the eels into the nets on either side as it was not possible to add an additional net to the gap. This measure was taken as a result of the low mark recapture rate for 2012 season (9%) and the potential of eels to bypass the nets by using the free gap.

A higher mark recapture result was recorded for the new location over the 2 years with a preliminary within year mark recapture rate of 26% and an overall recapture rate of 30%. The response of selected eels to cease migration and remain in the area until the next dark could be a result of the 'startle response' reported by Richkus and Dixon (2003). They found that when eels tagged with acoustic tags encountered an obstacle they would swim upstream. Some eels might delay migration as a result of handling stress, the effects of the anaesthetic and stress associated with their capture in the fishing nets. Currently we do not know the proportion of eels displaced during the tagging study that delayed migration compared with the eels that managed to bypass the nets on the second meeting. Further investigation is needed and will be carried out over the next few years. Therefore the MR results reported here are subject to change as tagged eels are recaptured over the coming years.

Table 9-2 Mark Recapture preliminary results 2011 – 2014

Location	Year	Tagged	Recaptured within Yr.	within Yr. MR %	Total Recapture	Overall MR %
u/s fishery	2012	470	34	8%	92	20%
River	2011	173	47	29%	57	33%
River	2012	286	26	10%	52	18%
Lake	2011	160	23	15%	34	21%
Lake	2012	119	8	8%	28	24%
Mouth River	2013	303	61	22%	91	30%
Mouth River	2014	272	80	29%		
	Average MR	% all locations		18%		24%
	Average MR	% Mouth River		26%		30%

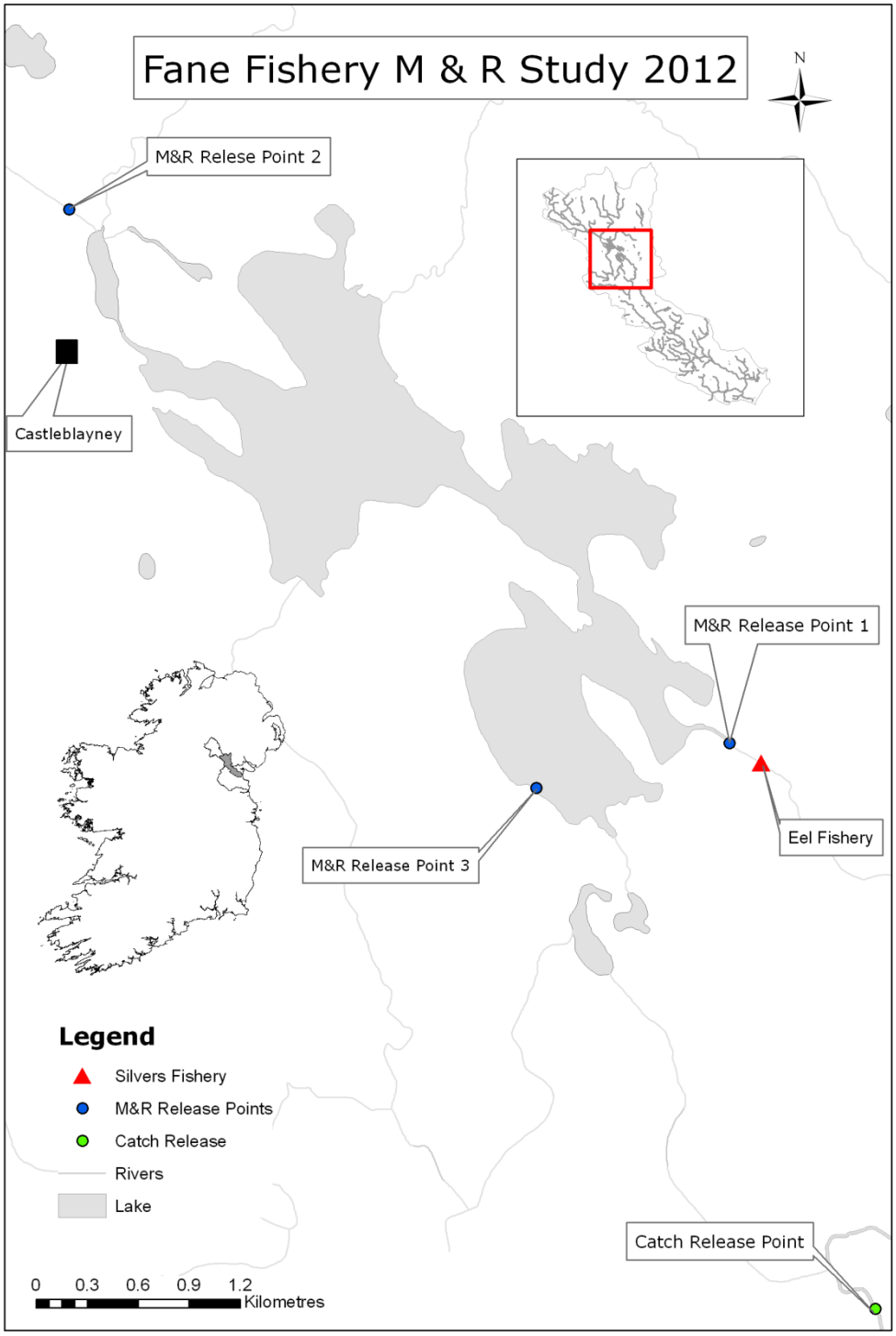

Figure 9-5 Mark Recapture release points for 2012 silver eel season

1.1.2 Eel Biology

9.1.1.4 2012

Morphometric measurements were taken on 1,177 eels (>75% of the total catch). The length of eels caught during the season ranged from 31.4cm to 96cm with an average length of 47.1cm (Table 9-4). The weight ranged from 0.05kg to 2.09kg with an average weight of 0.251kg. There was no difference in the population structure of eels caught over the 2 years (Figure 9-6).

In total, 212 silver eels were sexed out of 273 specimens sacrificed from the Fane Fishery in 2012. Of those, 56% were female and 44% were male, averaged for 3 months (August, September and October). For October and November 2011 the sex ratio was 30% female and 70% male (Table 9-5 and Figure 9-7).

The 212 sacrificed eels were examined for the presence of the swimbladder parasite, *Anguillicola crassus*, and a prevalence of 27% was noted with a mean intensity of infection of 3.66. Parasite results were therefore relatively stable when compared to the 2011 results of 29% and 3.71 respectively (Table 9-5 and Figure 9-8). The yellow eels caught in Lough Muckno had a higher prevalence rate of 48%.

9.1.1.5 2013

Morphometric measurements were taken on 1,165 eels. The average length was 49.2cm (range 30.8 – 96.6 cm), the average weight was 0.289kg (range from 0.03kg to 1.952 kg; Table 9-4)). The population structure for 2013 is in line with what was caught in 2012 and 2013 (Figure 9-6).

A total of 153 eels were retained for further analysis in the laboratory. Sixty eight percent of the eels retained were male, with 32% female (Table 9-5, Figure 9-9). A parasite prevalence rate of 53% with a mean intensity of 3.94 was recorded for 2013 (Figure 9-10). The parasite prevalence has increased for 2013 from 28% in 2012 to 53% for 2013.

9.1.1.6 2014

Morphometric measurements were taken on 1,177 eels (>75% of the total catch). The length of eels caught during the season ranged from 31.4cm to 96cm with an average length of 47.1cm (Figure 9-6). The weight ranged from 0.05kg to 2.09kg with an average weight of 0.251kg. There was no difference in the population structure of eels caught over the 4 years (Figure 9-6).

9.1.1.7 Swimbladder Health Indices

The swimbladder health indices were applied on samples of silver eels however there appears to be discrepancies between the two methods. To date, one index seems to depict greater swimbladder damage in the silver eel sample than the other. This difference in the two indices has been reported previously when applying them to silver eels (Lefebvre *et al*. 2011). It is likely that, physiological changes occurring in the swimbladder tissue during the silvering process are effecting the application of the indices. Until these differences can be properly examined, the results from the swimbladder health indices will not be reported for silver eels.

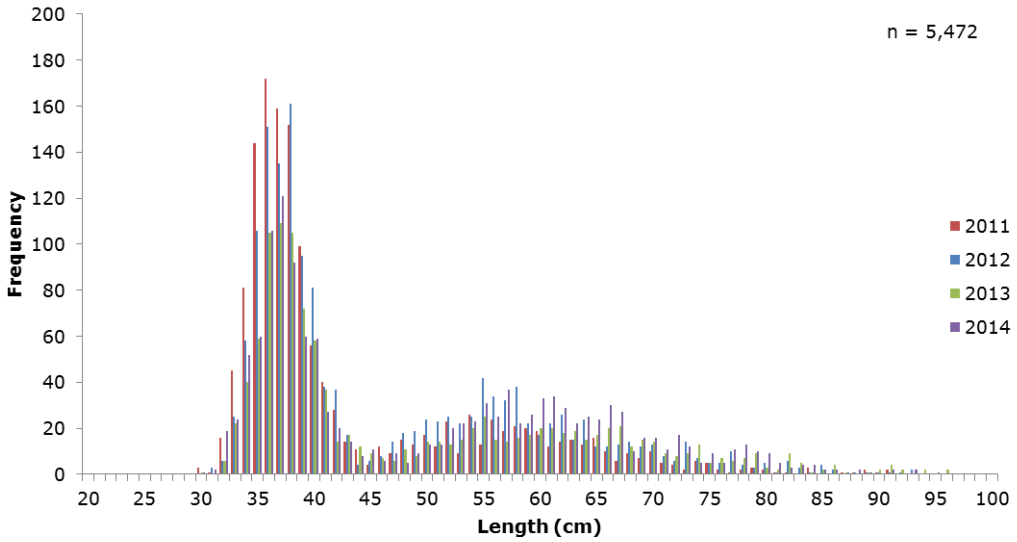

Figure 9-6 Length Frequency of silver eels for 4 years in the Fane catchment

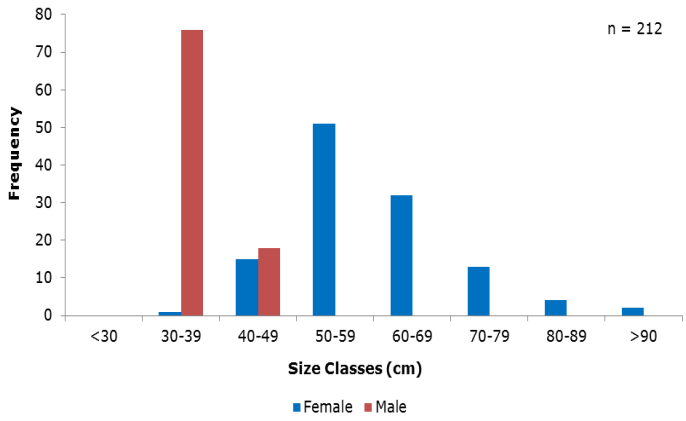

Figure 9-7 Sex distribution of sacrificed silver eels collected from Clarebane River, Fane Fishery, 2012

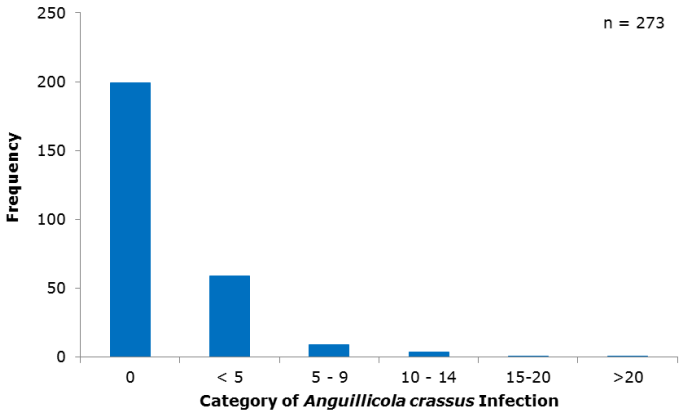

Figure 9-8 *Anguillicola crassus* infection intensity for sacrificed silver eels collected from Clarebane River, Fane Fishery, 2012

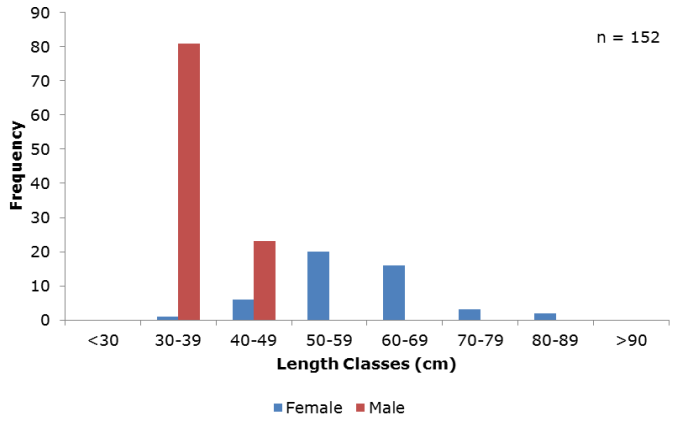

Figure 9-9 Sex distribution of sacrificed silver eels collected from Clarebane River, Fane Fishery, 2013

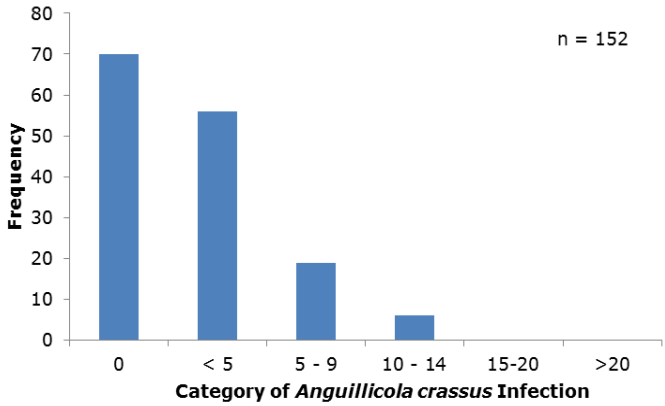

Figure 9-10 *Anguillicola crassus* infection intensity for sacrificed silver eels collected from Clarebane River, Fane Fishery, 2013

Table 9-3 Length and Weight data for Silver eels from the Fane catchments

Year	No. eels	Av Length (cm)	Min Length (cm)	Max Length (cm)	Av weight (kg)	Min Weight (kg)	Max Weight (kg)
2014	1334	50.39	30.4	95	0.292	0.045	1.721
2013	1165	49.2	30.8	96.6	0.289	0.03	1.952
2012	1541	47.1	31.4	96.0	0.251	0.050	2.090
2011	1433	43.8	30.4	91.7	0.187	0.044	1.709
2005	200	45.7	31.0	90.0	0.174	.060	1.063

Table 9-4 Biological data for silver eels from Fane catchment

Year	Total eels	No. females	No. males	% female	% male	% prevalence *A. crassus*	Mean Intensity *A. crassus*	Count *A. crassus*
2014	19	4	15	21	79	68	7.92	103
2013	152	48	104	32	68	53	3.94	319
2012	212	118	94	56	44	27 (n=273)	3.66 (n=273)	271 (n=273)
2011	158	47	110	30	70	28	3.7	167
2005	100	27	73	27	73	nr	nr	nr

9.2 Barrow

The Barrow catchment is a large riverine catchment located on the East coast of Ireland in the South Eastern River Basin District (SERBD). The SERBD is 60% calcareous bedrock which makes it a very productive habitat for eels. There has historically been a commercial fishery on the River Barrow and the presence of historical catch will aid in the assessment of the current silver eel escapement levels from the river. There is also historical research data on the River Barrow from the Fisheries Research Centre which is available to Inland Fisheries Ireland. The assessment of the silver eel stocks from a river dominated catchment will help highlight any difference in production and escapement of eels compared with catchments with large lake/lacustrine wetted areas. The Barrow will be the first riverine dominated silver eel index catchment assessed to date.

Four nets will be fished from openings on the lock gates of the canal section of the River Barrow during the silver eel season (Figure 9-11 and Plate 9-2). The location fished is upstream of the town of Graiguenamanagh; approximately 5km upstream from the tidal limit (estuary) in the River Barrow, a 2nd site is available but was only fished for 1 night during the 2014 season. The location of the fishing site means that over 99% of the River Barrow freshwater wetted area is above the fishing site. Due to the size of the River Barrow, it is currently not possible to fish the entire freshwater channel, however through a mark recapture study it is hoped to assess the efficiency rate of the fishing site and estimate what proportion of the run is bypassing the nets.

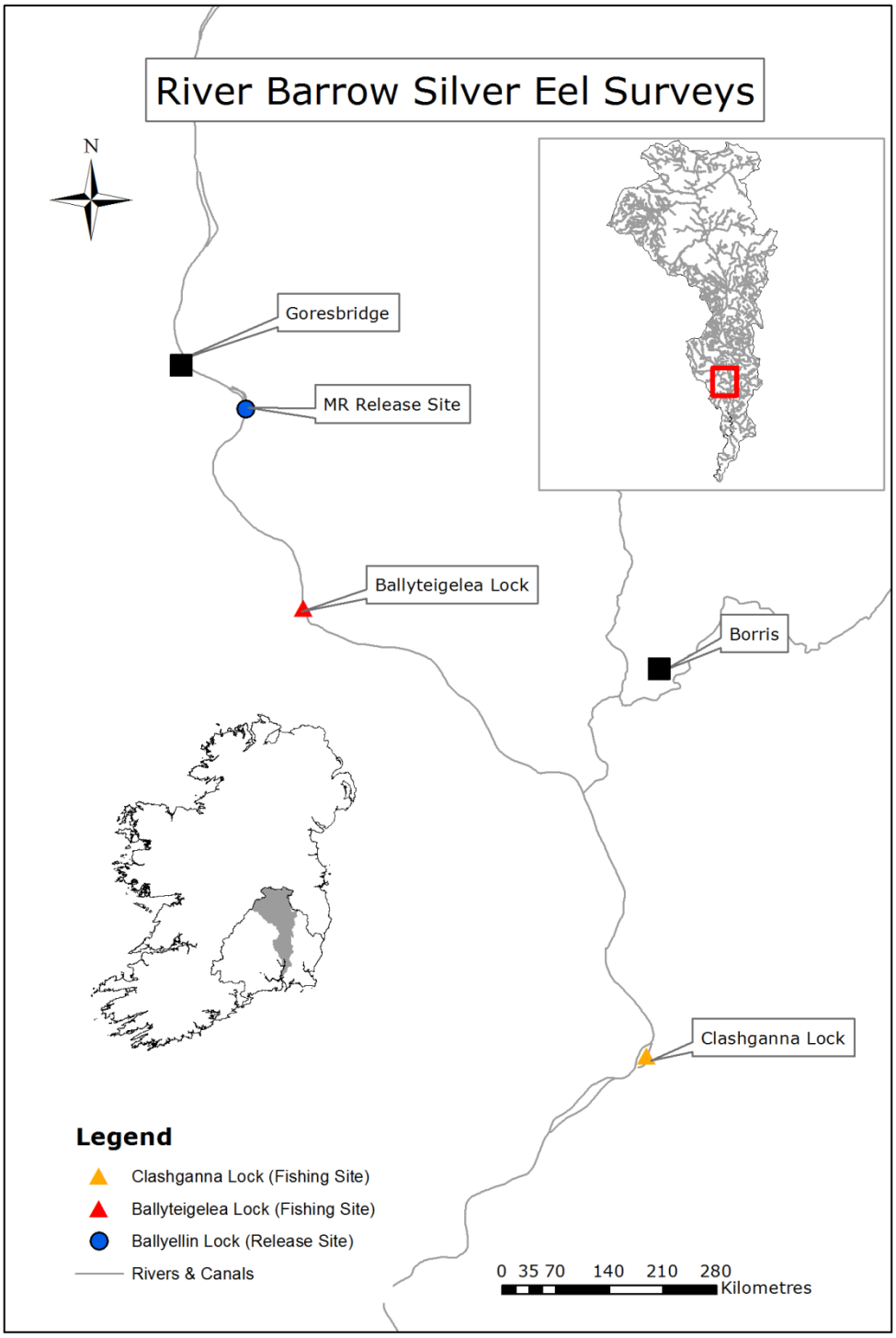

Figure 9-11 Map of fishing locations within the Barrow Catchment for 2014

Plate 9-2 Location of research silver eel fishery on Barrow canal

9.2.1 Eel catch

The new location was fished for 2014 as a pilot study to determine catch levels. The fishery was fished for 22 nights with a total catch of 174kg (Table 9-5). The location of the nets on the lock gates means the fishery is operated by fishing the flood waters as opposed to concentrating on the nights of the new moon.

Table 9-5 Barrow silver eel catch for 2014

Session	Count	Catch (kg)
August	2	0.28
Oct_1_flood	110	12.647
Oct_2_moon	646	86.078
Oct_Nov_3_flood	425	67.129
Nov_4_flood	40	7.759
Total	**1223**	**173.893**

9.2.2 Mark Recapture

A mark recapture survey was carried out at the site. Two hundred and two eels were tagged with floy tags and released 2km upstream of the fishing site into the River Barrow with eels having an opportunity to migrate down the river channel or down the canal section. Seven eels were recaptured giving a recapture rate of 3.5%. Four of the recaptures eels were caught on the night of release and 3 of the eels were caught 9 days later. It was planned to repeat the mark recapture study again within the season however this did not materialise due to the nature of the site and distribution of the catch within the season. A second Mark recapture study will be undertaken in 2015 with eels released with the canal section to determine how many eels are caught by the nets on the lock gates.

9.2.3 Eel Biology

The size structure of the catch consisted of a large number of small eels. The contracted fisherman commented that the size of eels had changed around 2007–2008 with an increase in smaller eels being caught in the fishery. There was a pilot stocking project in 1990 and 1991 with elvers from the River Feale being stocked in the River Barrow. The time scale would fit with the maturation of these stocked elvers changing the length structure in 2007. The average age of a silver eel in Ireland is 18 years; in 2007 the stocked elvers would have been 16/17 years in freshwater and by 2014 the stocked eels would be 24/25. Age data from the catch will clarify the potential of the stocked eels influencing the catch. The silver eels ranged in length from 33cm to 76cm with an average length of 44cm, the eels ranged in weight from 0.06kg to 0.613kg with an average weight of 175g (Figure 9-12 and Table 9-6).

Preliminary data shows a 61% male, 39% female breakdown however the sample size is small n=51 (Table 9-7 and Figure 9-13). The prevalence rate of *A. crassus* is high at 73% with an infection intensity of 6 nematodes per eel. In 2012; 94 yellow eels from Levitstown canal upstream of our fishing site were brought back to the laboratory for further analysis. The sex ratio was 96% female, 1% male and 3% young eel. The prevalence rate for *A. crassus* was 68% with a mean intensity of 4.11 nematodes per worm.

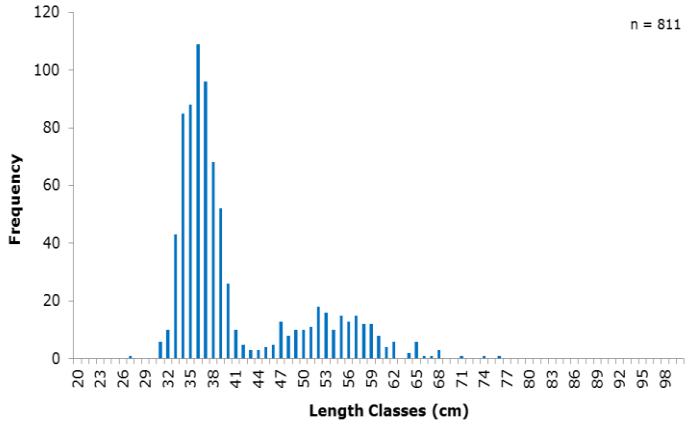

Figure 9-12 Length frequency of silver eels caught on River Barrow, 2014

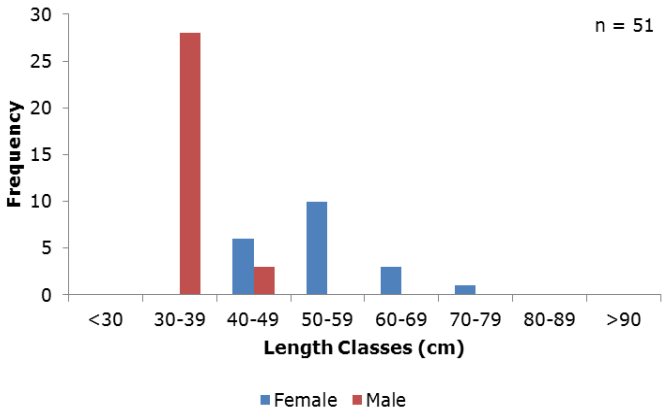

Figure 9-13 Sex distribution of sacrificed silver eels collected from Barrow River, 2014

Table 9-6 Length and weight data for silver and yellow eels from the Barrow catchment

Location	Year	Life stage	No. Eels	Mean length (cm)	Min. length (cm)	Max. length (cm)	Mean weight (Kg)	Min. weight (Kg)	Max. weight (Kg)
Freshwater	2014	Silver	811	41.4	27.6	76.2	0.140	0.033	0.742
Estuarine	2009	Yellow	100	42.5	22.5	65	0.2	0.021	0.980
Freshwater	2012	Yellow	94	43.3	30.1	65.6	0.152	0.042	0.555

Table 9-7 Biological data from silver and yellow eels from the Barrow catchment

Location	Year	Life stage	No. females	No. males	No. immature	% female	% male	% immature	% prevalence *A. crassus*	Mean Intensity *A. crassus*	Count *A. crassus*
Freshwater	2014	Silver	20	31	0	39	61	0.00	72.55	6.11	226
Estuarine	2009	Yellow	67	33	0	67	33	0	60.6	4.5	270
Freshwater	2012	Yellow	90	1	3	96	1	3	68.09	4.11	263

10 National Management Plan: Monitoring objectives

The SSCE will approve a monitoring programme for the next 3 year reporting programme (2015–2017). It is essential that the field work agreed for the next 3 years are in line with the objectives outlined in the national management plan 2009.

The Monitoring Objectives (2009) are:

1. Synthesise available information into a model based management advice tool.
2. Estimate silver eel escapement (in collaboration with ESB, NUIG, Marine Institute).
   2.1 Estimate silver eel escapement indirectly using yellow eels.
3. Monitor the impact of fishery closure on yellow eel stock structure, CPUE, age and growth studies.
4. Inter-Calibration with Water Framework Sampling.
5. Compare current and historic yellow eel stocks.
6. Establish baseline data to track changes in eel stock over time.
7. Evaluate impedance of upstream colonisation: migration and water quality effects.
8. Determine parasite prevalence and eel quality (Prevalence of *Anguillicola crassus*, (swimbladder parasite) age and growth analysis).

10.1 WKESDCF recommendations

There was an ICES workshop on incorporating eel and salmon into the EU–Data Collection Framework (WKESDCF). The data collection suggestions that relate to Ireland are listed below:

- Quantity of glass or yellow eel recruitment, derived from commercial, recreational or fisheries-independent surveys.
- Other anthropogenic impacts (non-fisheries), including type and quantity of impact, e.g. turbines (mortality rate and amount of silver eel killed in tonnes).
- Scientific surveys of stock: abundance of recruitment, yellow eel standing stock, silver eel by sampling method.
- Other biological sampling to inform biological characteristics, e.g. length, weight and growth, parasites and pathogens, contaminants and predators, by sub-catchments, catchments or EMU.

The workshop recommends that the following data should be collected annually for stocks in at least one Eel Index River Basin per EMU as agreed by ICES

- Information on abundance of **recruits** (glass eel and/or elvers).
- Information on abundance of **standing stock** (yellow eel).
- Counts or estimates of the number, weight and sex ratio of emigrating **silver eel**.
- Information on anthropogenic **impacts** in these systems, on all life stages (e.g. barriers).

The workshop also recommends that the following data is included in the new DC-MAP, estimated at EMU level and at appropriate temporal frequencies

- **Growth rates** of eel, determined at yellow and silver stages.
- **Sex ratio** of standing stock and silver eel.
- Infection intensity and abundance of ***Anguillicola crassus*** and other parasites and diseases as recognised by ICES as having a potential impact on effective spawner stock biomass.
- Tissue concentrations **of contaminants** as recognised by ICES as having a potential impact on effective spawner stock biomass.

10.2 Proposed Structure

Based on this advice, IFI plan to adapt the monitoring programme to ensure that resources are used efficiently and the required data is being collected. The plan is to monitor one Eel index catchments per River Basin District. The benefits of this are

- Currently there is very little eel specific data from the South West and South East River Basin District and data from other RBDS are being used to model eel production and escapement. The presence of an eel index catchment within each RBD will ensure that at least 1 catchment used in the modelling will be representative of the location.

- Focussing on one catchment will allow a number of different methodologies be applied such as
    - Fyke nets surveys (lakes, large rivers, transitional waters (size specific)
    - Eel specific semi quantitative electrofishing (smaller rivers, tributaries; catches smaller eels missed by fyke nets)
    - All this data will strengthen any models being created and allow extrapolation to unsurveyed catchments with the use of WFD and other data available within IFI)
- Long term monitoring programme to determine the extent of migration between transitional waters and freshwaters
    - Is there a reduction in distribution of eels due to reduced density dependence in the lower reaches of a catchment?

10.2.1 Meeting monitoring objectives

The field work schedule for the last 6 years has met the monitoring objectives as outlined in the national management plan 2009 (Table 10-1).

These include:

10.2.1.1 Objective 1

Synthesize available information into a model based management advice tool. Data from yellow and silver eel surveys have been used to update the Irish model and have fed into studies looking at applying alternative eel production/escapement models to Ireland (EDA for example – a French Electrofishing Density model). This work is on-going and will be further investigated in the future.

- Need to continue to gather information from different life stages and water bodies to further this task

10.2.1.2 Objective 2 – estimate silver eel escapement.

Silver eel escapement is assessed at a number of catchments; Burrishoole, Shannon, Erne, Fane and Barrow. Additional biological information is recorded which include length frequency, age, growth, sex ratios, parasite prevalence.

There are a large number of fish counters installed in Irish rivers around the country. While these counters are designed to count salmon it was proposed to investigate the potential of using these counters to assess the silver eel escapement. The Environment Agency in the UK undertook a similar investigation into using a resistivity counter to monitor silver eel escapement in 2010. It was decided to await the publication of this report before implementing a programme in Ireland, in order to learn from their experiences. The implementation of a similar programme in Ireland will be dependent on staff resources as the data analysis is time consuming as reported by NUIG who undertook a similar investigation using DIDSON technology.

Little is known about escapement of silver eel from transitional waters (estuaries, embayment's etc.). Improved assessment of transitional water stock density and distribution is required to allow the determination of transitional water silver eel escapement. Methodologies are currently lacking in Europe and a significant effort will be made to develop appropriate methodologies in conjunction with the ICES Working Group on Eel. A number of transitional waters were surveyed for yellow eels (South Sloblands, Barrow Estuary, Lough Furnace (Marine Institute)). An acoustic tagging study was initiated in the upper transitional waters of the River Barrow in order to determine the extent of movement of yellow eels under normal foraging activities. This information is required when determining population estimates and designing mark recapture studies.

- Continue monitoring existing silver eel index sites

10.2.1.3 Objective 2.1 – 9

The data collected by the yellow eel surveys (fyke and electrofishing surveys) and silver eel surveys provides valuable biological information on the different populations of eels around the country fulfilling objectives 2.1 - 9.
This data includes:

- Catch Per Unit of Effort (CPUE)/Density

- Length Frequency
- Length Weight relationship
- Age
- Growth rates
- Sex ratio
- Parasite Prevalence, intensity
- Swimbladder health
- Mark Recapture; population estimates
- Maturation rate
- Morphometric measurements for life stage identification (Durif *et al.* 2005)

10.2.1.4 Objective 2.1 indirect silver eel escapement

Length frequency, age, sex ratios and Morphometric data from yellow eel surveys are used for estimating silver eel escapement. The data can also be applied to the EDA model.

10.2.1.5 Objective 3 Changes to Stock Structure from Fishery Closure

Length frequency, length weight relationship, age, sex ratios and Morphometric data from yellow eel surveys are required in order to observe any changes to the stock structure of eels in our different water bodies.

10.2.1.6 Objective 4 Intercalibrate with WFD

A number of locations are surveyed by the eel monitoring programme and by the WFD programme and an intercalibration analysis will be carried out on the 6 years of data available. The locations include, Lough Derg, Lough Ree, Upper and Lower Lough Corrib, Lough Muckno, Lough Cullin.

- This work is in progress, awaiting repeated sampling by the WFD programme in order to increase the sample size.

10.2.1.7 Objective 5 Compare current and historic

The locations surveyed over the last 6 years corresponded to locations with historic data (Lough Conn, Upper and Lower Lough Corrib, Lough Inchiquin, Upper Lough Erne, Lough Oughter, Lough Derg and Lough Ree).

Historical data is available for the Index catchments scheduled to be surveyed in 2015-2017; Munster Blackwater, Corrib, Shannon, Erne and the Barrow.

10.2.1.7.1 Objective 6 Baseline Dataset

The baseline dataset consists of data surveys outlined above

Future

- Continue to gather information on yellow eels (fyke and e/fishing data) from a wide range of catchments
- Focus on key index catchments, looking at all water bodies (Rivers, Lakes, T. waters)
- Expand work on transitional waters
- Request funding for the creation of a user friendly interface for eel database for storing this additional data.

10.2.1.8 Objective 7 – evaluate impedance –

This monitoring objective is to 'assess barriers' by using the yellow eel surveys to highlight any potential issues with migration.

- Collate all available data to determine where eels are absent and investigate if there is an obvious reason for it (obstacle on river channel) using Google Maps and GIS 6 inch maps.
- Evaluate specific structures that have been identified as being possible barriers to upstream migration

10.2.1.9 Objective 9 parasite prevalence and Eel Quality

Data on parasite prevalence from intensive eel specific surveys and the WFD surveys carried out have resulted in the publication of a comprehensive scientific paper on the distribution, prevalence and intensity of *A. crassus* in Ireland. The abstract is included below:

"This study is the first comprehensive documentation of the geographical range of *Anguillicola crassus* in its host, the European eel *Anguilla anguilla* in the Republic of Ireland. The prevalence and intensity of infections across 234 sites and 93 river basins in Ireland comprising rivers, lakes and transitional waters (estuaries) were analysed. While only 32% of the river basins were affected by this nematode, they correspond to 74% of the total wetted area. Significant differences in infection levels among water body types were found with lakes and transitional waters yielding the highest values, which can be attributed to the proportions of juvenile (LT < 300 mm) *A. anguilla* caught. There were no significant differences in infection levels between water body types for adult *A. anguilla* or between sexes for any water body type. Prevalence was significantly lower in juvenile compared to adult *A. anguilla* captured in rivers and a positive correlation between infection levels and host size-classes was found. Future efforts should focus on monitoring the spread of *A. crassus* infections and assessing the swimbladder health of *A. anguilla* in Ireland."

Future:

- Continue to gather information on parasite prevalence and intensity around Ireland,
- Continue to investigate the swimbladder health indices,
- Monitor the 'at risk' catchments and low infection catchments,
- In conjunction with the Fish Health Unit, monitor for other diseases such as 'EVE-X'.

Table 10-1 Eel Monitoring Locations 2012 – 2014. † indicates locations not surveyed

Location	Water body	Life stage	1	2.1	3	4	5	6	7	8	2012	2013	2014
Meelick Bay, L. Derg	Lake	Yellow	√	√	√	√	√	√	√	√	√	√	
Erne	Lake & River	Yellow	√	√	√	√	√	√	√	√	√	ULE WFD	
Barrow R.	River	Yellow	√	√	√	√	√	√	√	√	√	√	√
Blackwater	River	Yellow	√		√		√	√		√		†	
Nore R.	River	Yellow	√		√		√	√		√		†	
L. Ramor	Lake	Yellow	√		√			√		√			√
Kells Blackwater Catchment	River	Yellow	√	√	√			√	√	√			√
L. Ree	Lake	Yellow	√	√	√	√	√	√		√		WFD	
L. Feeagh	Lake	Yellow	√	√		√	√	√		√			
L. Gill	Lake	Yellow	√		√	√	√	√		√			WFD
L. Inchiquin	Lake	Yellow	√				√	√		√	†		
L. Key	Lake	Yellow	√	√	√		√	√		√		√	
Dromore L. (Fergus)	Lake	Yellow	√		√	√	√	√		√			†
L. Bunny	Lake	Yellow	√		√	√	√	√		√	WFD		
L. Arrow	Lake	Yellow	√		√	√	√	√		√	WFD		
South Sloblands	Lagoon	Yellow	√		√		√	√		√			√
Lady's Island	Lagoon	Yellow	√		√		√	√		√			†
Lough Furnace	Brackish lagoon	Yellow	√	√			√	√		√	√		
Blackwater Estuary	T. water	Yellow	√				√	√		√			†
Fane	River & Lake	Yellow	√	√	√			√	√	√	√	√	√
Cullin	Lake	Yellow	√								WFD		
Derg	lake	Yellow	√								WFD		

10.3 Proposed National Eel Survey Locations 2015-2017

A breakdown of the proposed eel survey locations for the third three year period 2015 - 2017.

10.3.1 Silver

The list of locations where silver eels will be assessed for escapement is outlined in Table 10-2. It is proposed to continue the research silver eel fishery in the Fane Catchment on the outflow of Lough Muckno. This research fishery has been in existence since 2011 and has been fished consistently for the last 4 years. A second east coast research silver eel fishery was established in 2014 in the lower reaches of the Barrow River upstream of Graiguenamanagh. The 2014 season was considered a pilot survey in order to determine the quantity of eels using the canal channels in the River Barrow and the feasibility of running a consistent research fishery. It is proposed to continue this research fishery for a second year in 2015 and if successful for successive years after that.

The Barrow silver eel study will require a detailed mark recapture study in order to determine the efficiency of the fishing site and to determine the proportion of the run using the canal compared with the main channel.

Benefits of running the partial silver eel fishery on the River Barrow

- The partial fishery on the River Barrow will catch a proportion of the main run from a large Riverine catchment.
    - The length frequency, sex ratios, parasite prevalence will all be indicative of the main run and will be available for modelling and extrapolation to other catchments.
- The fishery will be fished as a research fishery and therefore will fish nights when experienced fishermen would not fish due to the small returns.
- The location was a commercial fishery in the past, therefore there is historic data available.
- The location of a research fishery on a tributary of the Barrow would only be indicative of the tributary and not the main channel.
- There is the potential to add an additional fishing location for selected nights
    - Fish weir downstream
    - Fish main channel

Weaknesses of running the partial silver eel fishery on the River Barrow

- Partial trapping programme, the majority of the run will be going down the main channel
- Operational protocol – requires certain environmental conditions to fish (i.e. flood conditions

Table 10-2 Silver eel locations 2015-2017

Institute	RBD	Catchment	Method	Coast
IFI	ERBD	Fane	Coghill/MR	East
IFI	SERBD	Barrow	Coghill/MR	East
IFI	WRBD	Corrib – suspended H&S	Coghill/MR	West
Marine Institute	WRBD	Burrishoole	Trap	West
ESB	ShIRBD	Shannon	Coghill/MR	West
ESB	NWIRBD	Erne	Coghill/MR	West
ESB	SWRBD	Lee	Coghill/MR	Southeast

10.3.1.1 Changes to silver eel locations

The locations from the 2009 National Management Plan that have been excluded from the table are the Waterville site where it was proposed to use a fish counter to determine silver eel escapement. This has not been done in the last 6 years due to concern over the use of fish counters for assessing silver eel escapement. Once evidence of successful use of fish counters is available in the literature this methodology will be re-evaluated by IFI for use in the national eel monitoring programme. The second site excluded from the table is the Lough Mask site. This site was fished in 2010 and it was found that there was a number of escape routes for eels to escape Lough Mask due to the geology of the region. With the suspension of the Galway Fishery on the outflow of the Corrib catchment any further work on Lough Mask has also been postponed with the redistribution of resources to the east coast.

10.3.2 Elvers

As part of the National Eel Management Plan it was intended that trends in runs of glass eel/elver arriving in Irish waters be monitored quantitatively at sentinel sites, as recommended in the Eel Review (2004). Table 10-3 contains a list of all elver monitoring locations within Ireland. It was not possible to find suitable locations in the Barrow and Slaney catchments on the East coast and these locations were discontinued. IFI will investigate the potential to add elver monitoring into the new eel index catchments (Munster Blackwater, Fane and Barrow) if suitable locations can be found.

The IFI elver traps are biological monitoring traps aimed at giving an indication of the recruitment into a river. They are not full trapping installations and therefore cannot be used as such. However as they will be monitored as consistently as is possible on an annual basis, any changes to the recruitment levels should be indicative of a change in the overall recruitment to Ireland. The long term data series is aimed at capturing the general trend in recruitment, over the last number of years the data series has shown the general decreasing trend in recruitment to Ireland as mirrored in the rest of Europe. It is hoped that over the next 5-10 years a general increasing trend will be visible in the data series. The distribution of the locations around Ireland should identify any differences between the different coasts as highlighted by Deelder 1984 and Naismith and Knights 1988.

Table 10-3 Elver monitoring locations 2015 - 2017

Institute	RBD	Catchment	Method	Coast
IFI	ShIRBD	Maigue	Partial Trap	West
IFI	ShIRBD	Feale	Partial Trap	West
IFI	ShIRBD	Inagh	Partial Trap	West
IFI	WRBD	Corrib	Partial Trap	West
IFI	ERBD	Liffey	Partial Trap	East
IFI	WRBD	Ballysadare	Partial Trap	West
Marine Institute	WRBD	Burrishoole	Partial Trap	West
ESB	ShIRBD	Shannon - Ardnacrusha	Trap	West
ESB	ShIRBD	Shannon - Parteen weir	Trap	West
ESB	NWIRBD	Erne	Trap	West
ESB	SWRBD	Lee	Trap	South East

10.3.3Yellow Eels

The yellow eel programme for the 3 years 2015–2017 contains key locations as outlined in the National Management Plan developed in 2009 (Table 10-4). Due to reduced resources the number of location surveyed per year has been reduced. The Munster Blackwater will be surveyed for the first time; this catchment has historical data available from the Fisheries Research Centre and is a large riverine catchment located in the South West River Basin District.

A workshop on incorporating eel and salmon into the new Data collection Framework programme (that is yet to be finalised (DC_MAP)) has recommended the use of Index Catchments in each River Basin District for efficient use of resources with a good return on information (WKESDCF 2012). Taking this advice on board we have structured the next 3 years of field work with the DCF/DC-MAP proposals in mind. Catchments were selected based on the presence of a silver eel fishery, the existence of current and historical data on yellow eel populations and with the proposition of one catchment per River Basin District.

IFI have classified the following catchments as Eel Index catchments as part of the national eel monitoring programme 2015-2017. All monitoring work undertaken over the next 3 years will be concentrated on monitoring the different eel life stages and the different water bodies available where possible.

- ERBD/EEMU Fane catchment
- NWIRBD Erne catchment
- SHIRBD Shannon Catchment
- SWRBD Munster Blackwater
- SERBD Barrow
- WRBD Burrishoole/Corrib

There is a need to improve our understanding of eel production in transitional waters. Over the last 3 years telemetry work in the upper Barrow estuary has improved our knowledge of eel movement and site fidelity. This research needs to be progressed over the next few years taking into account eel movement in the larger lower areas of the transitional waters and quantifying the available habitat. It has proved difficult to estimate the eel population within estuaries due to the conditions present and new techniques will need to be developed and fine-tuned in order to answer the question of eel production and escapement in transitional waters.

Ballynahinch and Lough Inchiquin will be resurveyed due to the low prevalence rate of the parasite *Anguillicola crassus* recorded in 2011 (13.4% and 1% respectively). These 2 lakes will be resurveyed in 2015 to investigate any change in the distribution, prevalence and intensity of *A. crassus* since the last survey in 2011. Cooperation with the water framework directive team to take samples of eels from lakes where the parasite is absent will enable IFI to keep track of the progression of infection.

10.3.3.1 Methodology

1. There will be 2 types of fyke nets surveys
    - Intensive survey to enable population estimates, assess population structure
        - Labour intensive, large effort over at least 2 time periods
        - Mark Recapture study to assess population estimates and maturation rate
    - Surveys to recover samples for further analysis in the laboratory
        - Less intensive to enable an increase in the number of locations as key question is to get samples for analysis in the laboratory (n = 100 – 200)
2. Semi quantitative electrofishing surveys of catchments/sub catchments coupled with ground thruthing using the depletion electrofishing method
3. Sampling of transitional waters will be with a combination of fyke nets and new methods to be developed.
4. Modelling of all the yellow eel data (in particular the river electrofishing data including WFD data) using the French EDA model is progressing and will be further developed in the next three years. Methods to quantify and incorporate fyke net data into the model are urgently required and will be worked on at the local and international levels.

Table 10-4 Proposed locations for yellow eel monitoring 2015-2017

RBD	Location	Water body	Silver Eel Fishery Present	Index catchment	2015	2016	2017
SHIRBD	Shannon	Catchment	√	√	√	√	
NWIRBD	Erne	Catchment	√	√	√	√	
SHIRBD	Inchiquin	Lake			√		
WRBD	Ballynahinch	Lake			√		
SWRBD	Blackwater	Catchment		√	√	√	
ERBD	Broadmeadow	T. water				√	
WRBD	Corrib	Catchment		√		√	√
SERBD	Barrow	Catchment	√	√			√
EEMU	Fane	Catchment	√	√			√
WRBD	Burrishoole	Catchment	√	√	√	√	√
Ireland	WFD Parasite Free	Lakes			√	√	√
Ireland	WFD Alkaline lakes	Lake			√	√	√
Ireland	WFD Rivers	Rivers			√	√	√

10.3.4 National monitoring objectives

The monitoring objectives as outlined in the National Management Plan 2009 are listed below:

1. Synthesise available information into a model based management advice tool.
2. Estimate silver eel escapement.
    a. Estimate silver eel escapement indirectly using yellow eels.
3. Monitor the impact of fishery closure on yellow eel stock structure, CPUE, age and growth studies
4. Inter-Calibration with Water Framework Sampling.
5. Compare current and historic yellow eel stocks.
6. Establish baseline data to track changes in eel stock over time.
7. Evaluate impedance of upstream colonisation: migration and water quality effects.
8. Determine parasite prevalence and eel quality (Prevalence of *Anguillicola crassus*, (swimbladder parasite) age and growth analysis).

Table 10-5 contains the new proposed eel locations and the monitoring objectives they will contribute to.

Table 10-5 Proposed eel survey locations and the monitoring objectives (see National EMP Chapter 8) they will fulfil

RBD	Location	Water body	Life stage	1	2	2.1	3	4	5	6	7	8	2015	2016	2017
SERBD	Barrow	River	Silver	√	√		√			√			√	√	√
ERBD/NBRBD	Fane	River	Silver	√	√		√			√			√	√	√
SHIRBD	Maigue	River	Elver	√						√			√	√	√
SHIRBD	Feale	River	Elver	√						√			√	√	√
SHIRBD	Inagh	River	Elver	√						√			√	√	√
ERBD	Liffey	River	Elver	√						√			√	√	√
WRBD	Ballysadare	River	Elver	√						√			√	√	√
WRBD	Corrib	River	Elver	√						√			√	√	√
SHIRBD	Shannon	Catchment	Yellow	√			√	√	√	√			√	√	
NWIRBD	Erne	Catchment	Yellow	√		√	√		√	√	√	√	√	√	
SHIRBD	Inchiquin	Lake	Yellow	√					√	√	√	√	√		
WRBD	Ballynahinch	Lake	Yellow	√		√			√	√	√	√	√		
SWRBD	Blackwater	Catchment	Yellow	√			√		√	√	√	√	√	√	
ERBD/NBRBD	Broadmeadow	T. water	Yellow	√					√	√	√			√	
WRBD	Corrib	Catchment	Yellow	√		√	√	√	√	√	√	√		√	√
SERBD	Barrow	Catchment	Yellow	√			√		√	√	√				√
ERBD/NBRBD	Fane	Catchment	Yellow	√			√	√		√	√				√
Ireland	WFD Parasite Free Lakes	Lakes	Yellow	√				√		√	√	√	√	√	√
Ireland	WFD Alkaline lakes	Lakes	Yellow	√				√		√	√	√	√	√	√
Ireland	WFD Rivers	Rivers	Yellow	√				√		√	√		√	√	√
Ireland	WFD Transitional Waters	T. water	Yellow	√				√		√	√	√	√	√	√

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1 Appendix WFD 2011

Table 1-1 WFD Lake summary data.

RBD	Catchments	Lake Name	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
ERBD	Boyne	Skeagh, Upr. Lough	1	9	5	0.56	58.0	49.0	68.4	0.322	0.180	0.490	1.609
ERBD	Ovoca	Upper Lake	1	9	21	2.33	47.5	28.5	86.0	0.303	0.043	1.580	6.366
NWRBD	Coastal	Kiltooris, Lough	1	6	5	0.83	36.7	32.5	43.5	0.087	0.057	0.117	0.435
NWRBD	Drowes	Melvin, Lough	1	24	76	3.17	42.1	29.0	62.0	0.141	0.046	0.509	10.729
NWRBD	Erne	Corglass, Lough	1	9	4	0.44	58.5	54.2	61.1	0.371	0.285	0.461	1.483
NWRBD	Erne	Derrybrick Lough	1	6	11	1.83	55.9	40.0	67.0	0.363	0.123	0.640	3.992
NWRBD	Erne	Egish Lough	1	3	1	0.33	64.0	64.0	64.0	0.453	0.453	0.453	0.453
NWRBD	Lackagh	Beagh, Lough	1	6	4	0.67	38.6	32.5	49.2	0.116	0.064	0.202	0.463
NWRBD	Leannan	Fern, Lough	1	6	9	1.50	34.6	31.0	39.5	0.076	0.040	0.128	0.683
NWRDB	Gweebara	Barra, Lough	1	9	58	6.44	38.8	30.0	65.5	0.122	0.049	0.646	6.968
SHIRBD	Inny	Owel, Lough	1	6	4	0.67	47.7	45.5	49.4	0.159	0.144	0.188	0.634
SHIRBD	Inny	Sheelin, Lough	1	9	7	0.78	62.2	45.0	79.0	0.540	0.133	1.077	3.781
SHIRBD	Lower Shannon	Meelagh, Lough	1	9	3	0.33	56.1	50.0	63.4	0.361	0.318	0.440	1.083
SHIRBD	Suck	O'Flynn, Lough	1	6	9	1.50	64.6	53.8	76.0	0.467	0.250	0.721	4.206
SHIRBD	Upper Shannon	Annaghmore, Lough	1	3	2	0.67	75.8	75.3	76.2	0.904	0.899	0.909	1.808
SHIRBD	Upper Shannon	Cavetown, Lough	1	6	2	0.33	55.2	52.3	58.0	0.329	0.250	0.407	0.657
SWRBD	Blackwater	Brin, Lough	1	6	2	0.33	47.0	46.0	48.0	0.2340	0.2280	0.2400	0.4680

RBD	Catchments	Lake Name	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SWRBD	Caragh	Caragh, Lough	1	6	16	2.67	43.8	30.3	56.0	0.1654	0.0520	0.3530	2.6470
SWRBD	Caragh	Acoose, Lough	1	9	6	0.67	45.0	39.0	52.5	0.1631	0.0980	0.2468	0.9788
SWRBD	Coastal	Glenbeg Lake	1	6	7	1.17	51.0	42.0	69.0	0.2873	0.1420	0.6810	2.0110
SWRBD	Laune	Leane, Lough	1	18	32	1.78	39.9	27.2	58.5	0.1369	0.0360	0.4040	4.3820
SWRBD	Lee	Allua, Lough	1	3	1	0.33	58.0	58.0	58.0	0.3140	0.3140	0.3140	0.3140
WRBD	Ballysadare	Templehouse, Lake	1	6	15	2.50	58.2	42.3	73.5	0.3808	0.1160	0.6560	5.7120
WRBD	Bundorragha	Glencullin, Lough	1	6	18	3.00	46.6	35.2	73.2	0.2122	0.0840	0.7990	3.8190
WRBD	Corrib	Corrib Lwr., Lough	1	15	21	1.40	49.4	36.5	59.5	0.2379	0.0830	0.3880	4.9966
WRBD	Corrib	Corrib Upr., Lough	1	18	50	2.78	51.0	36.0	63.2	0.2357	0.0570	0.4650	11.7845
WRBD	Easky	Easky, Lough	1	9	15	1.67	43.6	33.0	62.5	0.1702	0.0770	0.4683	2.5523
WRBD	Garvogue	Gill, Lough	1	15	30	2.00	45.4	33.0	65.0	0.1869	0.0680	0.5100	5.6080
WRBD	Moy	Talt, Lough	1	9	9	1.00	59.5	40.2	77.0	0.5332	0.1240	1.0660	4.7990
WRBD	Owenmore	Carrowmore, Lake	1	12	32	2.67	38.6	25.2	71.3	0.1465	0.0360	0.9110	4.6885

Table 1-2 WFD Lake length frequency data.

RBD	Catchments	Lake Name	No. Eels	20-29 cm	30-39 cm	10-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Boyne	Skeagh, Upr. Lough	5	0	0	1	2	2	0	0
ERBD	Ovoca	Upper Lake	21	1	4	10	2	2	0	2
NWRBD	Coastal	Kiltooris, Lough	5	0	4	1	0	0	0	0
NWRBD	Drowes	Melvin, Lough	76	2	27	38	7	2	0	0
NWRBD	Erne	Corglass, Lough	4	0	0	0	3	1	0	0
NWRBD	Erne	Derrybrick Lough	11	0	0	2	5	4	0	0
NWRBD	Erne	Egish Lough	1	0	0	0	0	1	0	0
NWRBD	Lackagh	Beagh, Lough	4	0	3	1	0	0	0	0
NWRBD	Leannan	Fern, Lough	9	0	9	0	0	0	0	0
NWRDB	Gweebara	Barra, Lough	58	0	40	15	2	1	0	0
SHIRBD	Inny	Owel, Lough	4	0	0	4	0	0	0	0
SHIRBD	Inny	Sheelin, Lough	7	0	0	2	1	2	2	0
SHIRBD	Lower Shannon	Meelagh, Lough	3	0	0	0	2	1	0	0
SHIRBD	Suck	O'Flynn, Lough	9	0	0	0	2	4	3	0
SHIRBD	Upper Shannon	Annaghmore, Lough	2	0	0	0	0	0	2	0
SHIRBD	Upper Shannon	Cavetown, Lough	2	0	0	0	2	0	0	0
SWRBD	Blackwater	Brin, Lough	2	0	0	2	0	0	0	0
SWRBD	Caragh	Caragh, Lough	16	0	5	7	4	0	0	0
SWRBD	Caragh	Acoose, Lough	6	0	3	1	2	0	0	0
SWRBD	Coastal	Glenbeg Lake	7	0	0	4	2	1	0	0
SWRBD	Laune	Leane, Lough	32	3	14	12	3	0	0	0
SWRBD	Lee	Allua, Lough	1	0	0	0	1	0	0	0
WRBD	Ballysadare	Templehouse, Lake	15	0	0	1	7	6	1	0
WRBD	Bundorragha	Glencullin, Lough	18	0	4	9	3	1	1	0
WRBD	Corrib	Corrib Lwr., Lough	21	0	2	8	11	0	0	0

RBD	Catchments	Lake Name	No. Eels	20-29 cm	30-39 cm	10-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
WRBD	Corrib	Corrib Upr., Lough	50	0	4	20	23	3	0	0
WRBD	Easky	Easky, Lough	15	0	6	6	2	1	0	0
WRBD	Garvogue	Gill, Lough	30	0	7	16	5	2	0	0
WRBD	Moy	Talt, Lough	9	0	0	2	3	1	3	0
WRBD	Owenmore	Carrowmore, Lake	32	4	17	8	0	1	2	0

Table 1-3 WFD Lake; summary eel quality data.

RBD	Catchment	Lake	No. Eels	No. females	No. males	No. immature	% female	% male	% immature	% prevalence *A. crassus*	Mean Intensity *A. crassus*	Count *A. crassus*	Preferential Diet from Stomach Contents
ERBD	Boyne	Skeagh, Upper Lough	5	5	0	0	100	0	0	0	0.00	0	*Asellus* spp. & Chironomids
NWRBD	Erne	Corglass, Lough	4	4	0	0	100	0	0	50	2.00	4	*Asellus* spp. and snails
NWRDB	Gweebara	Barra, Lough	17	13	3	1	76	18	6	0	0.00	0	*Asellus* spp. & Worms
SHIRBD	Inny	Owel, Lough	4	4	0	0	100	0	0	25	2.00	2	EMPTY STOMACHS
SHIRBD	Suck	O'Flynn, Lough	5	5	0	0	100	0	0	60	6.66	20	Crayfish
SHIRBD	Inny	Sheelin, Lough	7	7	0	0	100	0	0	29	3.40	17	*Asellus* spp. and snails
WRBD	Ballysadare	Templehouse, Lake	8	8	0	0	100	0	0	0	0.00	0	*Asellus* spp. and caddis

Table 1-4 Summary data from WFD Rivers Survey 2011.

RBD	Catchment	Site	No. Sets	No. Runs	Area(m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
ERBD	Avoca	Avoca River (Woodenbridge)	4	1	567.00	0.0018	1	0.0010
ERBD	Liffey	Baltracey River (Fraynes Br.)	1	3	137.87	0.0000	0	0
ERBD	Liffey	Brittas River	1	3	226.80	0.0000	0	0
ERBD	Broadmeadow	Broadmeadow River (Lispopple Br.)	3	3	410.25	0.0975	40	0.7885
ERBD	Liffey	Camac River (Riverside Estate Br.)	2	3	151.37	0.0198	3	0.5270
ERBD	Liffey	Camac River (Moneenalion Commons Br.)	1	3	155.17	0.0000	0	0
ERBD	Liffey	Dodder, River (Beaver Row)	3	3	625.88	0.0655	41	1.0985
ERBD	Liffey	Dodder, River (Mt. Carmel Hosp.)	3	3	406.70	0.0074	3	0.3910
ERBD	Liffey	Dodder, River (Bohernabreena)	3	3	273.77	0.0037	1	0.0710
ERBD	Liffey	Piperstown Stream (Trib at Corrareen)	1	1	85.38	0.0000	0	0
ERBD	Liffey	Griffeen River (Griffeen Ave. Br.)	1	3	163.53	0.0122	2	0.0965
ERBD	Liffey	Griffeen River (Grange Castle Ind. Est.)	1	3	79.80	0.0000	0	0
ERBD	Liffey	Lyreen River (Angling Centre)	2	3	171.33	0.0058	1	0.3210
ERBD	Mayne	Mayne River (Wellfield Br.)	1	3	79.80	0.0877	7	0.0235
ERBD	Liffey	Owendoher River (Cruagh Road Br.)	1	3	164.25	0.0000	0	0
ERBD	Tolka	Pinkeen River (West)	1	3	123.33	0.0000	0	0
ERBD	Broadmeadow	Ratoath Stream (Broadmeadow)	1	3	107.40	0.0279	3	0.0070
ERBD	Liffey	Rye Water (Kildare Br.)	3	3	288.40	0.0069	2	n/a
ERBD	Liffey	Rye Water (Balfeaghan Br.)	2	3	151.88	0.0000	0	0
ERBD	Tolka	Tolka River (Violet Hill Dr.)	3	3	339.95	0.0118	4	0.6650
ERBD	Broadmeadow	Ward River (nr. Scotchstone Br.)	1	3	162.00	0.3210	52	0.7275
SERBD	Nore	Ballyroan River (Gloreen Br.)	2	3	188.73	0.0371	7	0.3325
SERBD	Owenavorragh	Banoge River (Owenavorragh R. Conflu.)	2	3	333.75	0.1648	55	1.0950
SERBD	Slaney	Douglas River (Ballon, Sragh Br.)	2	3	364.50	0.0027	1	0.0985
SERBD	Suir	Duag, River (Br. u/s Pollyporeen)	2	3	189.00	0.0000	0	0
SERBD	Duncormick	Duncormick River (nr Rly St.)	2	2	180.00	0.0722	13	0.1345

RBD	Catchment	Site	No. Sets	No. Runs	Area(m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
SERBD	Nore	Nuenna RiverBr (d/s Clomantagh)	2	3	232.47	0.0000	0	0
SERBD	Owenavorragh	Owenavorragh River (Br N of Ballinamona)	1	2	1679.00	0.0000	0	0
SHIRBD	Shannon Upr	Boor RiverBr (NW of Kilbillaghan)	2	3	213.00	0.0047	1	0.0815
SHIRBD	Shannon Lwr	Bow River (Bow River Br)	2	3	240.00	0.0333	8	0.4450
SHIRBD	Shannon Upr	Camlin River (Br. W. of Lisnabo)	2	3	1133.00	0.0000	0	0
SHIRBD	Shannon Upr	Camlin River (Br. just S of Killoe)	3	3	236.40	0.0000	0	0
SHIRBD	Shannon Lwr	Clodiagh River (Tullamore, Br. At Rahan)	1	3	1253.33	0.0000	0	0
SHIRBD	Shannon Est Sth	Deel (Newcastlewest), Br. near Balliniska	3	3	383.25	0.0000	0	0
SHIRBD	Bunratty	Gourna River (Beside railway bridge)	2	3	219.27	0.1824	40	0.8300
SHIRBD	Bunratty	Gourna RiverBr u/s Owenogarney R confl	2	3	188.25	0.1116	21	0.3285
SHIRBD	Shannon Lwr	Graney River (Caher Br.)	2	3	213.43	0.0000	0	0
SHIRBD	Inny	Inny River (Br. 1 km S of Oldcastle)	1	3	130.00	0.0000	0	0
SHIRBD	Inny	Inny River (Tully)	2	3	220.02	0.0000	0	0
SHIRBD	Shannon Lwr	Little River (Cloghan)	1	3	264.02	0.0038	1	0.0455
SHIRBD	Inny	Mountnugent River (Mountnugent Br.)	3	3	309.47	0.0000	0	0
SHIRBD	Inny	Mountnugent River (Racaveen)	3	3	208.45	0.0000	0	0
SHIRBD	Shannon Upr	Scramoge River (Br. N.E. of Riverdale)	2	3	1652.00	0.0024	4	0.6975
SHIRBD	Shannon Upr	Scramoge River (Carrowclogher)	1	2	648.00	0.0015	1	0.1840
SHIRBD	Shannon Lwr	Silver (Kilcormac)Lumcloon Br	1	3	938.00	0.0000	0	0
SWRBD	Glashaboy	Glashaboy River (Ballyvorisheen Br.)	2	3	166.50	0.0060	1	0.0740
SWRBD	Laune	Gweestin River (Gweestin Br.)	3	3	270.87	0.0074	2	0.0425
SWRBD	Lee	Martin, River (Bawnafinny Br.)	3	3	306.00	0.0033	1	n/a
SWRBD	Maine	Shanowen River (Ford (Br) u/s Maine R confl)	3	2	289.33	0.0726	21	0.2620
SWRBD	Womanagh	Womanagh River (ATV farmers land)	2	3	310.50	0.0837	26	0.5545
WRBD	Ballinglen	Ballinglen River (Ballinglen Br.)	2	3	415.80	0.0385	16	n/a
WRBD	Moy	Behy River (Behy Bridge)	3	3	291.20	0.0172	5	0.0620
WRBD	Moy	Castlebar River (Br. 2.5 km d/s Castlebar)	3	3	335.20	0.4714	158	2.9390

RBD	Catchment	Site	No. Sets	No. Runs	Area(m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
WRBD	Moy	Clydagh River (Castlebar) Br. NW Ardvarney	1	3	256.07	0.4061	104	n/a
WRBD	Srahmore	Glennamong River (Br. u/s Lough Feeagh)	3	3	531.25	0.0282	15	0.3495
WRBD	Moy	Tobercurry River (Br. just u/s Moy River)	2	3	123.93	0.0161	2	n/a
NWIRBD	Clonmany	Ballyhallan River (Br. u/s Clonmany River)	2	3	182.67	0.0164	3	n/a
NWIRBD	Burnfoot	Burnfoot River (Br. in Burnfoot)	2	3	195.00	0.0462	9	0.1490
NWIRBD	Clady	Cronaniv Burn (Br. u/s Dunlewy Lough)	2	3	252.00	0.0000	0	0.0000
NWIRBD	Erne	Dromore River (Drummuck)	2	4	227.33	0.0000	0	0.0000
NWIRBD	Leannan	Glaskeelan River (Br. W. of Roshin)	2	3	255.20	0.0000	0	0.0000
NWIRBD	Owentocker	Owentocker River (500 m d/s Bridge in Ardara)	3	3	354.20	0.0706	25	0.5270
NWIRBD	Erne	Swanlinbar River (nr Swanlinbar Br)	3	3	393.30	0.0051	2	0.1810
NWIRBD	Swilly	Swilly, RiverSwilly Br	2	3	340.50	0.0059	2	0.0315
NWIRBD	Erne	Waterfoot River (Letter Br.)	3	3	335.13	0.0149	5	0.5150

Table 1-5 Summary length and weight data from WFD Rivers Surveys 2011

RBD	Catchment	Site	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
ERBD	Avoca	Avoca River (Woodenbridge)	10.5	10.5	10.5	0.0010	0.0010	0.0010
ERBD	Broadmeadow	Broadmeadow River (Lispopple Br.)	20.7	8.0	34.2	0.0197	0.0010	0.0690
ERBD	Liffey	Camac River (Riverside Estate Br.)	42.5	29.8	63.4	0.1757	0.0400	0.4200
ERBD	Liffey	Dodder, River (Beaver Row)	23.9	12.0	35.2	0.0275	0.0025	0.0770
ERBD	Liffey	Dodder, River (Mt. Carmel Hosp.)	35.8	8.6	50.3	0.1303	0.0010	0.2185
ERBD	Liffey	Dodder, River (Bohernabreena)	36.4	36.4	36.4	0.0710	0.0710	0.0710
ERBD	Liffey	Griffeen River (Griffeen Ave. Br.)	41.5	41.5	41.5	0.0965	0.0965	0.0965
ERBD	Liffey	Lyreen River (Angling Centre)	58.4	58.4	58.4	0.3210	0.3210	0.3210
ERBD	Mayne	Mayne River (Wellfield Br.)	10.2	7.6	23.2	0.0034	0.0005	0.0205
ERBD	Broadmeadow	Ratoath Stream (Broadmeadow)	12.8	12.2	13.5	0.0023	0.0020	0.0030
ERBD	Tolka	Tolka River (Violet Hill Dr.)	31.3	10.2	56.0	0.1663	0.0200	0.5590
ERBD	Broadmeadow	Ward River (nr. Scotchstone Br.)	18.4	7.8	31.9	0.0140	0.0005	0.0545
SERBD	Nore	Ballyroan River (Gloreen Br.)	29.1	19.5	43.7	0.0475	0.0095	0.1510
SERBD	Owenavorragh	Banoge River (Owenavorragh R. Conflu.)	20.4	9.1	41.5	0.0199	0.0010	0.1335
SERBD	Slaney	Douglas River (Ballon, Sragh Br.)	40.2	40.2	40.2	0.0985	0.0985	0.0985
SERBD	Duncormick	Duncormick River (nr Rly St.)	17.4	7.7	28.1	0.0112	0.0005	0.0350
SHIRBD	Shannon Upr	Boor River (Br. NW of Kilbillaghan)	39.5	39.5	39.5	0.0815	0.0815	0.0815
SHIRBD	Shannon Lwr	Bow River (Bow River Br)	31.4	23.0	48.2	0.0556	0.0140	0.1850
SHIRBD	Bunratty	Gourna River (Beside railway bridge)	21.6	8.9	34.5	0.0218	0.0010	0.0725
SHIRBD	Bunratty	Gourna RiverBr u/s Owenogarney R confl	19.8	7.5	31.4	0.0156	0.0005	0.0530
SHIRBD	Shannon Lwr	Little River (Cloghan)	31.5	31.5	31.5	0.0455	0.0455	0.0455
SHIRBD	Shannon Upr	Scramoge River (Br. N.E. of Riverdale)	46.9	41.6	58.1	0.1744	0.1110	0.3325
SHIRBD	Shannon Upr	Scramoge River (Carrowclogher)	51.5	51.5	51.5	0.1840	0.1840	0.1840
SWRBD	Glashaboy	Glashaboy River (Ballyvorisheen Br.)	36.2	36.2	36.2	0.0740	0.0740	0.0740
SWRBD	Laune	Gweestin River (Gweestin Br.)	22.4	16.7	28.1	0.0213	0.0075	0.0350

RBD	Catchment	Site	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)
SWRBD	Maine	Shanowen River (Ford (Br) u/s Maine R confl)	18.3	11.4	33.4	0.0125	0.0020	0.0605
SWRBD	Womanagh	Womanagh River (ATV farmers land)	21.0	8.4	32.9	0.0213	0.0010	0.0760
WRBD	Moy	Behy River (Behy Bridge)	19.8	14.4	26.6	0.0155	0.0075	0.0295
WRBD	Moy	Castlebar River (Br. 2.5 km d/s Castlebar)	21.2	12.3	37.0	0.0190	0.0030	0.0895
WRBD	Srahmore	Glennamong River (Br. u/s Lough Feeagh)	23.1	11.1	31.9	0.0233	0.0020	0.0550
NWIRBD	Burnfoot	Burnfoot River (Br. in Burnfoot)	22.5	17.2	26.1	0.0166	0.0085	0.0280
NWIRBD	Owentocker	Owentocker River (500 m d/s Bridge in Ardara)	21.2	9.1	37.9	0.0211	0.0010	0.0875
NWIRBD	Erne	Swanlinbar River (nr Swanlinbar Br)	40.5	35.5	45.4	0.0905	0.0760	0.1050
NWIRBD	Swilly	Swilly, RiverSwilly Br	20.0	17.4	21.8	0.0105	0.0070	0.0140
NWIRBD	Erne	Waterfoot River (Letter Br.)	38.9	27.5	48.6	0.1030	0.0265	0.1815

Table 1-6 Length Frequency data from WFD River Surveys, 2011.

RBD	Catchment	Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Avoca	Avoca River (Woodenbridge)	1	0	1	0	0	0	0	0	0	0
ERBD	Broadmeadow	Broadmeadow River (Lispopple Br.)	40	4	14	16	6	0	0	0	0	0
ERBD	Liffey	Camac River (Riverside Estate Br.)	3	0	0	1	1	0	0	1	0	0
ERBD	Liffey	Dodder, River (Beaver Row)	41	0	15	16	10	0	0	0	0	0
ERBD	Liffey	Dodder, River (Mt. Carmel Hosp.)	3	1	0	0	0	1	1	0	0	0
ERBD	Liffey	Dodder, River (Bohernabreena)	1	0	0	0	1	0	0	0	0	0
ERBD	Liffey	Griffeen River (Griffeen Ave. Br.)	2	0	0	0	0	1	0	0	0	0
ERBD	Liffey	Lyreen River (Angling Centre)	1	0	0	0	0	0	1	0	0	0
ERBD	Mayne	Mayne River (Wellfield Br.)	7	6	0	1	0	0	0	0	0	0
ERBD	Broadmeadow	Ratoath Stream (Broadmeadow)	3	0	3	0	0	0	0	0	0	0
ERBD	Tolka	Tolka River (Violet Hill Dr.)	4	0	1	1	1	0	1	0	0	0
ERBD	Broadmeadow	Ward River (nr. Scotchstone Br.)	52	7	25	17	3	0	0	0	0	0
SERBD	Nore	Ballyroan River (Gloreen Br.)	7	0	1	3	2	1	0	0	0	0
SERBD	Owenavorragh	Banoge River (Owenavorragh R. Conflu.)	55	2	25	20	6	2	0	0	0	0
SERBD	Slaney	Douglas River (Ballon, Sragh Br.)	1	0	0	0	0	1	0	0	0	0
SERBD	Duncormick	Duncormick River (nr Rly St.)	13	1	7	5	0	0	0	0	0	0
SHIRBD	Shannon Upr	Boor River (Br. NW of Kilbillaghan)	1	0	1	0	0	0	0	0	0	0
SHIRBD	Shannon Lwr	Bow River (Bow River Br)	8	0	0	3	4	1	0	0	0	0
SHIRBD	Bunratty	Gourna River (Beside railway bridge)	40	2	15	17	5	0	0	0	0	0
SHIRBD	Bunratty	Gourna RiverBr u/s Owenogarney R confl	21	2	10	7	2	0	0	0	0	0
SHIRBD	Shannon Lwr	Little River (Cloghan)	1	0	0	0	1	0	0	0	0	0
SHIRBD	Shannon Upr	Scramoge River (Br. N.E. of Riverdale)	4	0	0	0	0	2	1	0	0	0
SHIRBD	Shannon Upr	Scramoge River (Carrowclogher)	1	0	0	0	0	0	1	0	0	0
SWRBD	Glashaboy	Glashaboy River (Ballyvorisheen Br.)	1	0	0	0	1	0	0	0	0	0
SWRBD	Laune	Gweestin River (Gweestin Br.)	2	0	1	1	0	0	0	0	0	0
SWRBD	Maine	Shanowen River (Ford (Br) u/s Maine R confl)	21	0	15	5	1	0	0	0	0	0
SWRBD	Womanagh	Womanagh River (ATV farmers land)	26	1	9	12	4	0	0	0	0	0

RBD	Catchment	Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
WRBD	Moy	Behy River (Behy Bridge)	5	0	3	2	0	0	0	0	0	0
WRBD	Moy	Castlebar River (Br. 2.5 km d/s Castlebar)	158	0	90	49	19	0	0	0	0	0
WRBD	Srahmore	Glennamong River (Br. u/s Lough Feeagh)	15	0	4	8	3	0	0	0	0	0
NWIRBD	Burnfoot	Burnfoot River (Br. in Burnfoot)	9	0	2	7	0	0	0	0	0	0
NWIRBD	Owentocker	Owentocker River (500 m d/s Bridge in Ardara)	25	1	13	7	4	0	0	0	0	0
NWIRBD	Erne	Swanlinbar River (nr Swanlinbar Br)	2	0	0	0	1	1	0	0	0	0
NWIRBD	Swilly	Swilly, RiverSwilly Br	2	0	1	2	0	0	0	0	0	0
NWIRBD	Erne	Waterfoot River (Letter Br.)	5	0	0	1	2	2	0	0	0	0

Table 1-7 WFD Transitional Waters summary data

RBD	Catchment	Estuary	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)
SWRBD	Coastal	Cromane	1	4	1	0.25	48.2	48.2	48.2
SWRBD	Maine	Castlemaine Harbour	1	6	5	0.83	40.2	29.5	67.0

Table 1-8 WFD transitional waters length frequency data.

RBD	Catchment	Estuary	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
SWRBD	Coastal	Cromane	1	0	0	0	0	1	0	0	0	0
SWRBD	Maine	Castlemaine Harbour	5	0	1	3	0	0	1	0	0	0

2 Appendix WFD 2012

Table 2-1 WFD Lake Summary Data 2012 (n/a not applicable).

RBD	Catchment	Lake	No Eels	No. Nights	No. Nets	CPUE	Mean length (cm)	Min. length (cm)	Max. length (cm)	Mean weight (Kg)	Min. weight (Kg)	Max. weight (Kg)	Total weight (kg)
ERBD	Ovoca	Dan, Lough	8	1	9	0.889	52.2	40.3	60.2	0.213	0.101	0.376	1.7
ERBD	Ovoca	Tay, Lough	0	1	9	0.000	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NBIRBD	Fane	Muckno, Lough	6	1	9	0.667	50.5	40.5	69.8	0.312	0.120	0.928	1.872
NWIRBD	Coastal	Dunglow Lough	5	1	9	0.556	43.1	33.0	60.0	0.165	0.059	0.398	0.825
NWIRBD	Coastal	Kindrum Lough	16	1	9	1.778	40.0	30.5	54.3	0.126	0.050	0.258	2.023
NWIRBD	Coastal	Sessaigh, Lough	8	1	6	1.333	42.5	32.4	53.5	0.130	0.052	0.263	1.04
NWIRBD	Erne	White, Lough (Ballybay)	9	1	9	1.000	52.5	41.0	59.2	0.264	0.093	0.392	2.377
NWIRBD	Gweedore	Anure, Lough	23	1	9	2.556	45.3	30.9	70.3	0.201	0.049	0.767	4.627
NWIRBD	Owenamarve	Nasnahida, Lough	5	1	6	0.833	41.6	28.5	51.6	0.139	0.039	0.244	0.697
SHIRBD	Fergus	Cullaun, Lough	7	1	9	0.778	48.9	35.5	58.1	0.220	0.083	0.363	1.539
SHIRBD	Fergus	Dromore Lough	16	1	9	1.778	50.1	42.0	58.1	0.217	0.102	0.323	3.468
SHIRBD	Fergus	Muckanagh Lough	1	1	9	0.111	58.7	58.7	58.7	0.339	0.339	0.339	0.339
SHIRBD	Owencashla	Caum, Lough	3	1	6	0.500	38.9	32.6	43.0	0.099	0.064	0.117	0.296
SHIRBD	Shannon	Alewnaghta, Lough	4	1	9	0.444	46.5	33.6	54.8	0.190	0.062	0.297	0.758
SHIRBD	Shannon	Derg, Lough	75	1	36	2.083	47.4	32.3	100.3	0.233	0.052	2.720	17.467
SHIRBD	Shannon	Gur, Lough	5	1	9	0.556	63.9	57.0	79.4	0.548	0.317	1.059	2.742
SHIRBD	Shannon	Inchicronan Lough	10	1	9	1.111	56.7	47.0	73.0	0.333	0.177	0.733	3.334
WRBD	Ballysadare	Arrow, Lough	22	1	9	2.444	50.2	34.5	65.8	0.239	0.047	0.506	5.261
WRBD	Bundorragha	Lough, Doo	5	1	6	0.833	44.0	37.5	49.5	0.148	0.089	0.218	0.739
WRBD	Corrib	Carra, Lough	10	1	9	1.111	57.4	45.2	73.4	0.374	0.111	0.741	3.74
WRBD	Corrib	Mask, Lough	14	1	27	0.519	56.7	44.1	63.6	0.342	0.147	0.507	4.781
WRBD	Fergus	Bunny, Lough	1	1	9	0.111	44.8	44.8	44.8	0.158	0.158	0.158	0.158
WRBD	Moy	Cullin, Lough	67	1	18	3.722	39.7	30.4	58.4	0.123	0.046	0.329	7.998

Table 2-2 WFD Lake length frequency data

RBD	Catchment	Lake	No. of eels weighed	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Ovoca	Dan, Lough	8	0	0	0	0	3	4	1	0	0
NBIRBD	Fane	Muckno, Lough	6	0	0	0	0	3	2	1	0	0
NWIRBD	Coastal	Dunglow Lough	5	0	0	0	2	2	0	1	0	0
NWIRBD	Coastal	Kindrum Lough	16	0	0	0	7	8	1	0	0	0
NWIRBD	Coastal	Sessaigh, Lough	8	0	0	0	3	4	1	0	0	0
NWIRBD	Erne	White, Lough (Ballybay)	9	0	0	0	0	2	7	0	0	0
NWIRBD	Gweedore	Anure, Lough	23	0	0	0	7	11	2	2	1	0
NWIRBD	Owenamarve	Nasnahida, Lough	5	0	0	1	0	3	1	0	0	0
SHIRBD	Fergus	Cullaun, Lough	7	0	0	0	1	2	4	0	0	0
SHIRBD	Fergus	Dromore Lough	16	0	0	0	0	6	10	0	0	0
SHIRBD	Fergus	Muckanagh Lough	1	0	0	0	0	0	1	0	0	0
SHIRBD	Owencashla	Caum, Lough	3	0	0	0	1	2	0	0	0	0
SHIRBD	Shannon	Alewnaghta, Lough	4	0	0	0	1	1	2	0	0	0
SHIRBD	Shannon	Derg, Lough	75	0	0	0	13	38	20	2	1	1
SHIRBD	Shannon	Gur, Lough	5	0	0	0	0	0	3	1	1	0
SHIRBD	Shannon	Inchicronan Lough	10	0	0	0	0	1	7	1	1	0
WRBD	Ballysadare	Arrow, Lough	22	0	0	0	2	9	9	2	0	0
WRBD	Bundorragha	Lough, Doo	5	0	0	0	2	3	0	0	0	0
WRBD	Corrib	Carra, Lough	10	0	0	0	0	4	1	4	1	0
WRBD	Corrib	Mask, Lough	14	0	0	0	0	3	5	6	0	0
WRBD	Fergus	Bunny, Lough	1	0	0	0	0	1	0	0	0	0
WRBD	Moy	Cullin, Lough	65	0	0	0	40	22	5	0	0	0

Table 2-3 Summary data from WFD Rivers Survey 2012.

RBD	Catchment	River	Site	No. Sets	No. Runs	Area (m2)	Density (no./m2)	No. Eels captured
ERBD	Boyne	Athboy River	Br. nr Clonleasan Ho_A	2	3	212	0.0000	0
ERBD	Boyne	Athboy River	Br. nr Clonleasan Ho_B	2	3	249	0.0040	1
ERBD	Liffey	Liffey, River	500 m d/s Ballyward Br._A	2	1	4228	0.0000	0
ERBD	Dargle	Dargle River	Bahana_A	2	3	311	0.0000	0
ERBD	Avoca	Glenealo River	Br. d/s Upper Lake_B	2	3	276	0.0254	7
ERBD	Nanny	Nanny (Meath), River	Br. at Julianstown_A	3	3	456	0.0526	24
ERBD	Dargle	Glencree River	Br. u/s Dargle R confl_A	3	3	401	0.0025	1
ERBD	Avoca	Glenealo River	Br. d/s Upper Lake_A	3	2	242	0.0000	0
NBIRBD	Castletown	Big River (Louth)	Ballygoly Br._A	2	3	209	0.0192	4
NBIRBD	Dee	White River (Louth)	Coneyburrow Br._B	3	3	358	0.0028	1
NWIRBD	Clady	Clady River (Donegal)	Bryan's Br._A	3	3	380	0.0079	3
NWIRBD	Eany water	Eany Water	Just d/s Eany Beg/More confl_A	2	1	7849	0.0004	3
SERBD	Nore	Dinin River	Dinin Br._A	3	3	667	0.0030	2
SERBD	Burren	Lerr River	Prumplestown Br._A	2	3	225	0.0000	0
SERBD	Burren	Greese, River	Br. NE of Belan House_A	3	3	307	0.0033	1
SERBD	Burren	Greese, River	Br. NE of Belan House_B	3	3	258	0.0039	1
SERBD	Barrow	Burren River	Ullard Br._A	2	3	159	0.0126	2
SERBD	Barrow	Burren River	Ullard Br._B	2	3	216	0.0000	0
SERBD	Barrow	Tully Stream	Soomeragh Br._A	1	3	163	0.0000	0
SERBD	Barrow	Tully Stream	Soomeragh Br._B	1	3	102	0.0099	1
SERBD	Barrow	Barrow, River	Pass Br._B	2	1	10951	0.0006	7
SERBD	Barrow	Barrow, River	Upper Tinnahinch Lock_A	2	1	20645	0.0007	15
SERBD	Barrow	Barrow, River	Ballykeenan Lock_A	2	1	11143	0.0013	14
SERBD	Barrow	Barrow, River	Graiguenamanagh Br._A	2	1	15549	0.0007	11
SERBD	Barrow	Barrow, River	Bagenalstown (Slipway to lock)_A	1	1	16377	0.0007	12
SERBD	Barrow	Barrow, River	Dunleckny (Swimming pool)_A	2	1	25531	0.0004	9
SERBD	Barrow	Barrow, River	Leighlinbridge Lord Bagenal Hotel_A	1	1	16380	0.0002	3

RBD	Catchment	River	Site	No. Sets	No. Runs	Area (m2)	Density (no./m2)	No. Eels captured
SHIRBD	Shannon Lwr	Tullamore River	Br. SW of Ballycowen Br._A	2	3	786	0.0000	0
SHIRBD	Shannon Lwr	Little Brosna River	Riverstown Br._A	2	3	1646	0.0000	0
SHIRBD	Shannon Lwr	Kilcrow River	Ballyshrule Br._A	2	3	1720	0.0012	2
SHIRBD	Creegh	Creegh River	Drumellihy Br._A	1	3	1071	0.0019	2
SHIRBD	Shannon Lwr	Ballyfinboy River	Ballinderry Br._A	2	3	254	0.0000	0
SHIRBD	Shannon Lwr	Nenagh River	Ballysoilshaun Br._A	2	3	980	0.0000	0
SHIRBD	Feale	Owveg River (Kerry)	Owveg Br._B	2	3	344	0.0000	0
SHIRBD	Shannon Est sth	Owvane River (Limerick)	Br. u/s (SE of) Loghill_A	3	3	609	0.3171	193
SHIRBD	Tyshe	Tyshe River	West br. Ardfert at Friary_A	1	3	92	0.1740	16
SHIRBD	Tyshe	Tyshe River	West br. Ardfert at Friary_B	1	3	170	0.2235	38
SHIRBD	Shannon Lwr	Bilboa River	Br. u/s Blackboy Br. - Bilboa Br._A	4	3	553	0.0000	0
SHIRBD	Caher	Caher River	Br. 2 km d/s Formoyle_A	2	3	223	0.0045	1
SHIRBD	Shannon Lwr	Dead River	Pope's Br._A	2	3	161	0.0000	0
SHIRBD	Shannon Lwr	Dead River	Pope's Br._B	2	3	250	0.0080	2
SHIRBD	Shannon Est Sth	Maigue, River	Castleroberts Br._A	2	1	13148	0.0008	10
SWRBD	Blackwater	Awbeg River (Buttevant)	Kilcummer Br._A	3	1	3910	0.0026	10
SWRBD	Blackwater	Bride (Waterford), River	Footbr. N of Ballynella_A	3	1	3126	0.0003	1
SWRBD	Blackwater	Bride (Waterford), River	Footbr. N of Ballynella_B	3	1	2806	0.0000	0
SWRBD	Argideen	Argideen River	Ballinoroher Ford_B	3	3	430	0.1651	71
SWRBD	Adrigole	Adrigole River	0.5km d/s of Glashduff Adrigole confluence_A	2	3	430	0.0419	18
WRBD	Glenamoy	Glenamoy River	Glenamoy Village_A	3	2	419	0.0597	25
WRBD	Moy	Deel River (Crossmolina)	Bridge at Castle Gore_A	3	3	4085	0.0022	9
WRBD	Bunowen	Bunowen River (Louisburgh)	Tully Br._A	3	3	334	0.0120	4
WRBD	Corrib	Black River (Shrule)	Br. at Kilshanvy_A	2	3	262	0.0115	3
WRBD	Corrib	Black River (Shrule)	Br. at Kilshanvy_B	2	3	206	0.0145	3
WRBD	Corrib	Owenbrin River	Br. u/s L. Mask_A	3	3	339	0.0088	3
WRBD	Easky	Gowlan River	Track west of Lough Black_A	2	3	205	0.0292	6
WRBD	Easky	Gowlan River	Track west of Lough Black_B	2	3	257	0.0194	5

RBD	Catchment	River	Site	No. Sets	No. Runs	Area (m2)	Density (no./m2)	No. Eels captured
WRBD	Dunneill	Dunneill River	Donaghintraine Br._A	3	3	389	0.1647	64
WRBD	Dunneill	Dunneill River	Dromore West_A	2	3	468	0.0278	13
WRBD	Moy	Moy, River	U/s Ardnaree Br._A	1	1	17861	0.0001	1

Table 2-4 Summary length and weight data from WFD Rivers Surveys 2012.

RBD	Catchments	River Name	River Site	No. Eel	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
ERBD	Boyne	Athboy River	Br. nr Clonleasan Ho_B	1	22	22	22	0.014	0.014	0.014	0.014
ERBD	Avoca	Glenealo River	Br. d/s Upper Lake_B	7	24.4	19.7	32.1	0.025	0.011	0.062	0.178
ERBD	Nanny	Nanny (Meath), River	Br. at Julianstown_A	24	23.4	9.2	48	0.031	0.002	0.215	0.721
ERBD	Dargle	Glencree River	Br. u/s Dargle R confl_A	1	38.8	38.8	38.8	0.092	0.092	0.092	0.092
NBIRBD	Castletown	Big River (Louth)	Ballygoly Br._A	4	26.9	11.2	33.6	0.043	0.002	0.065	0.172
NBIRBD	Dee	White River (Louth)	Coneyburrow Br._B	1	17.2	17.2	17.2	0.009	0.009	0.009	0.009
NWIRBD	Clady	Clady River (Donegal)	Bryan's Br._A	3	37.3	31.7	45	0.105	0.061	0.167	0.314
NWIRBD	Eany water	Eany Water	Just d/s Eany Beg/More confl_A	3	24.7	17.2	30.7	0.023	0.007	0.037	0.07
SERBD	Nore	Dinin River	Dinin Br._A	2	32.5	32.5	32.5	0.061	0.06	0.062	0.122
SERBD	Burren	Greese, River	Br. NE of Belan House_A	1	65.7	65.7	65.7	0.575	0.575	0.575	0.575
SERBD	Burren	Greese, River	Br. NE of Belan House_B	1	63.1	63.1	63.1	0.512	0.512	0.512	0.512
SERBD	Barrow	Burren River	Ullard Br._A	2	50.5	50.3	50.6	0.253	0.251	0.256	0.506
SERBD	Barrow	Tully Stream	Soomeragh Br._B	1	29.8	29.8	29.8	0.04	0.04	0.04	0.04
SERBD	Barrow	Barrow, River	Pass Br._B	7	45	26.7	56.5	0.186	0.013	0.366	1.303
SERBD	Barrow	Barrow, River	Upper Tinnahinch Lock_A	15	34.4	15.3	52.5	0.092	0.008	0.265	1.374
SERBD	Barrow	Barrow, River	Ballykeenan Lock_A	14	26.8	10	47.3	0.065	0.004	0.185	0.71
SERBD	Barrow	Barrow, River	Graiguenamanagh Br._A	11	24.7	8.5	59.8	0.138	0.044	0.487	0.826
SERBD	Barrow	Barrow, River	Bagenalstown (Slipway to lock)_A	12	37.6	24.5	46.6	0.098	0.022	0.208	1.171
SERBD	Barrow	Barrow, River	Dunleckny (Swimming pool)_A	9	39.4	31.5	55.2	0.098	0.053	0.235	0.784
SERBD	Barrow	Barrow, River	Leighlinbridge Bagenal Hotel_A	3	28.7	22.3	33.7	0.038	0.014	0.063	0.115
SHIRBD	Shannon Lwr	Kilcrow River	Ballyshrule Br._A	2	52.4	47.8	57	0.187	0.187	0.187	0.187
SHIRBD	Creegh	Creegh River	Drumellihy Br._A	2	29	28	30	0.056	0.054	0.057	0.111
SHIRBD	Shannon Est sth	Owvane River (Limerick)	Br. u/s (SE of) Loghill_A	193	16	6.9	35.6	0.012	0.001	0.086	2.272
SHIRBD	Tyshe	Tyshe River	West br. Ardfert at Friary_A	16	18.1	8.7	34.5	0.014	0.001	0.08	0.218
SHIRBD	Tyshe	Tyshe River	West br. Ardfert at Friary_B	38	10.6	6.6	22.1	0.002	0.001	0.021	0.086

RBD	Catchments	River Name	River Site	No. Eel	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SHIRBD	Caher	Caher River	Br. 2 km d/s Formoyle_A	1	18.6	18.6	18.6	0.012	0.012	0.012	0.012
SHIRBD	Shannon Lwr	Dead River	Pope's Br._B	2	34.9	33.8	36	0.073	0.063	0.083	0.146
SHIRBD	Shannon Est Sth	Maigue, River	Castleroberts Br._A	10	26.5	12.2	33.9	0.038	0.003	0.072	0.383
SWRBD	Blackwater	Awbeg River (Buttevant)	Kilcummer Br._A	10	21.7	10.5	51	0.044	0.002	0.291	0.441
SWRBD	Blackwater	Bride (Waterford), River	Footbr. N of Ballynella_A	1	23.2	23.2	23.2	0.024	0.024	0.024	0.024
SWRBD	Argideen	Argideen River	Ballinoroher Ford_B	71	17.6	8	37.8	0.014	0.001	0.086	0.992
SWRBD	Adrigole	Adrigole River	Adrigole confluence_A	18	23	12	30.8	0.02	0.002	0.04	0.356
WRBD	Glenamoy	Glenamoy River	Glenamoy Village_A	25	15.1	7.2	30	0.009	0.001	0.045	0.229
WRBD	Moy	Deel River (Crossmolina)	Bridge at Castle Gore_A	9	33.1	22.4	53.5	0.076	0.02	0.271	0.604
WRBD	Bunowen	Bunowen River (Louisburgh)	Tully Br._A	2	10	8.1	11.9	0.002	0.001	0.003	0.004
WRBD	Corrib	Owenbrin River	Br. u/s L. Mask_A	1	33.9	33.9	33.9	0.059	0.059	0.059	0.059
WRBD	Easky	Gowlan River	Track west of Lough Black_A	5	29.2	21.6	34.4	0.045	0.018	0.073	0.227
WRBD	Easky	Gowlan River	Track west of Lough Black_B	4	31.6	27.3	37.5	0.053	0.034	0.084	0.211
WRBD	Dunneill	Dunneill River	Donaghintraine Br._A	64	21.3	9.1	34.1	0.018	0.001	0.065	1.138
WRBD	Dunneill	Dunneill River	Dromore West_A	**13**	32	20.5	52.1	0.061	0.012	0.182	0.791
WRBD	Moy	Moy, River	U/s Ardnaree Br._A	1	34.3	34.3	34.3	0.078	0.078	0.078	0.078

Table 2-5 Length Frequency data from WFD River Surveys, 2012.

RBD	Catchment	Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Boyne	Br. nr Clonleasan Ho_B	1	0	0	1	0	0	0	0	0	0
ERBD	Avoca	Br. d/s Upper Lake_B	7	0	2	4	1	0	0	0	0	0
ERBD	Nanny	Br. at Julianstown_A	24	2	8	10	2	2	0	0	0	0
ERBD	Dargle	Br. u/s Dargle R confl_A	1	0	0	0	1	0	0	0	0	0
NBIRBD	Castletown	Ballygoly Br._A	4	0	1	0	3	0	0	0	0	0
NBIRBD	Dee	Coneyburrow Br._B	1	0	1	0	0	0	0	0	0	0
NWIRBD	Clady	Bryan's Br._A	3	0	0	0	2	1	0	0	0	0
NWIRBD	Eany water	Just d/s Eany Beg/More confl_A	3	0	1	1	1	0	0	0	0	0
SERBD	Nore	Dinin Br._A	2	0	0	0	2	0	0	0	0	0
SERBD	Burren	Br. NE of Belan House_A	1	0	0	0	0	0	0	1	0	0
SERBD	Burren	Br. NE of Belan House_B	1	0	0	0	0	0	0	1	0	0
SERBD	Barrow	Ullard Br._A	2	0	0	0	0	0	2	0	0	0
SERBD	Barrow	Soomeragh Br._B	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Pass Br._B	7	0	0	1	1	3	2	0	0	0
SERBD	Barrow	Upper Tinnahinch Lock_A	15	0	2	0	9	3	1	0	0	0
SERBD	Barrow	Ballykeenan Lock_A	14	0	5	1	6	2	0	0	0	0
SERBD	Barrow	Graiguenamanagh Br._A	11	2	3	2	3	0	1	0	0	0
SERBD	Barrow	Bagenalstown (Slipway to lock)_A	12	0	0	1	5	6	0	0	0	0
SERBD	Barrow	Dunleckny (Swimming pool)_A	9	0	0	0	6	1	2	0	0	0
SERBD	Barrow	Leighlinbridge Lord Bagenal Hotel_A	3	0	0	1	2	0	0	0	0	0
SHIRBD	Shannon Lwr	Ballyshrule Br._A	2	0	0	0	0	1	1	0	0	0
SHIRBD	Creegh	Drumellihy Br._A	2	0	0	1	1	0	0	0	0	0
SHIRBD	Shannon Est sth	Br. u/s (SE of) Loghill_A	193	68	71	45	9	0	0	0	0	0
SHIRBD	Tyshe	West br. Ardfert at Friary_A	16	2	9	3	2	0	0	0	0	0
SHIRBD	Tyshe	West br. Ardfert at Friary_B	38	23	14	1	0	0	0	0	0	0
SHIRBD	Caher	Br. 2 km d/s Formoyle_A	1	0	1	0	0	0	0	0	0	0
SHIRBD	Shannon Lwr	Pope's Br._B	2	0	0	0	2	0	0	0	0	0
SHIRBD	Shannon Est Sth	Castleroberts Br._A	10	0	2	2	6	0	0	0	0	0
SWRBD	Blackwater	Kilcummer Br._A	10	0	5	3	1	0	1	0	0	0
SWRBD	Blackwater	Footbr. N of Ballynella_A	1	0	0	1	0	0	0	0	0	0
SWRBD	Argideen	Ballinoroher Ford_B	71	9	44	13	5	0	0	0	0	0
SWRBD	Adrigole	0.5km d/s of Glashduff Adrigole confluence_A	18	0	6	11	1	0	0	0	0	0

RBD	Catchment	Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
WRBD	Glenamoy	Glenamoy Village_A	25	9	9	6	1	0	0	0	0	0
WRBD	Moy	Bridge at Castle Gore_A	9	0	0	4	3	1	1	0	0	0
WRBD	Bunowen	Tully Br._A	2	1	1	0	0	0	0	0	0	0
WRBD	Corrib	Br. u/s L. Mask_A	1	0	0	0	1	0	0	0	0	0
WRBD	Easky	Track west of Lough Black_A	5	0	0	3	2	0	0	0	0	0
WRBD	Easky	Track west of Lough Black_B	4	0	0	2	2	0	0	0	0	0
WRBD	Dunneill	Donaghintraine Br._A	64	2	28	30	4	0	0	0	0	0
WRBD	Dunneill	Dromore West_A	13	0	0	4	8	0	1	0	0	0
WRBD	Moy	U/s Ardnaree Br._A	1	0	0	0	1	0	0	0	0	0

Table 2-6 Summary data from WFD Transitional Waters 2012.

RBD	Catchment	Estuary	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)
ERBD	Boyne	Boyne Estuary	1	27	32	1.185	35.9	27.0	59.5
NWIRBD	Gweebarra	Gweebarra Estuary	1	30	17	0.567	36.8	29.0	51.0

Table 2-7 WFD transitional waters length frequency data.

RBD	Catchment	Transitional Water	No. Eels	<20 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm
ERBD	Boyne	Boyne Estuary	32	0	5	20	3	4	0	0
NWIRBD	Gweebarra	Gweebarra Estuary	17	0	1	11	3	2	0	0

3 Appendix WFD 2013

Table 3-1 Summary data from WFD Lake Surveys, 2013. (n.r. not recorded, n.a. not applicable).

RBD	Catchments	Lake Name	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
ERBD	Boyne	Bane, Lough	1	3	5	1.67	66.3	54.5	76.5	0.5232	0.298	0.77	2.616
ERBD	Boyne	Lene, Lough	1	6	5	0.83	70.4	51.5	84.2	0.6996	0.223	1.151	3.498
ERBD	Upper Boyne	Annagh (White) Lough	1	3	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NWIRBD	Ballintra	Glen Lough	1	3	15	5	n.r.	n.r.	n.r.	0.0458	0.0349	0.0551	0.6873
NWIRBD	Melvin	Lattone Lough	1	2	15	7.5	48.7	39.8	56.5	0.1871	0.096	0.295	2.807
NWIRBD	Erne	Macnean Lower	1	3	1	0.33	60.6	60.6	60.6	0.399	0.399	0.399	0.399
NWIRBD	Erne	Macnean Upper	1	3	16	5.33	56.5	38	71.9	0.3659	0.084	0.724	5.854
NWIRBD	Erne	Mushlin Lough	1	3	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHIRBD	Fergus	Atedaun, Lough	1	3	4	1.33	62	46.9	83	0.503	0.185	1.143	2.012
SHIRBD	Inagh	Lickeen	1	2	9	4.5	44.4	38.4	50.2	0.1442	0.091	0.204	1.298
SHIRBD	Shannon	Ree, Lough	1	12	116	9.67	49.3	32.2	68.5	0.2186	0.078	0.732	25.352
SHIRBD	Shannon Up.	Urlaur, Lough	1	3	4	1.33	62.1	50.5	77.5	0.4798	0.178	0.9	1.919
WRBD	Coastal	Ardderry Lough	1	3	1	0.33	39.9	39.9	39.9	0.118	0.118	0.118	0.118
WRBD	Coastal	Aughrusbeg Lough	1	3	28	9.33	38.5	30	46.5	0.1028	0.051	0.184	2.879
WRBD	Newport	Beltra, Lough	1	3	28	9.33	41.1	29.7	83	0.1575	0.042	1.149	4.41
WRBD	Garvogue	Glenade Lough	1	3	1	0.33	62	62	62	0.416	0.416	0.416	0.416
WRBD	Drumcliff	Glencar Lough	1	3	33	11	43.3	31.5	54.2	0.1401	0.055	0.359	4.624
WRBD	Dawros	Kylemore Lough	1	3	12	4	43.4	35.2	51.8	0.1473	0.066	0.29	1.768
WRBD	Corrib	Lettercraffroe Lough	1	3	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WRBD	Coastal	Nambrackmore Lough	1	3	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WRBD	Corrib	Maumwee Lough	1	2	3	1.5	49.7	39.5	54.8	0.2197	0.091	0.331	0.659
WRBD	Kilcolgan	Rea, Lough	1	3	115	38.33	47.8	35.4	73.5	0.1995	0.066	0.674	22.937

RBD	Catchments	Lake Name	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
WRBD	Corrib	Ross Lake	1	3	4	1.33	46.4	30.1	56.9	0.1683	0.044	0.274	0.673
WRBD	Coastal	Shindilla, Lough	1	3	7	2.33	40.1	32.6	50.8	0.1079	0.058	0.192	0.755

Table 3-2 Length Frequency data from WFD Lake Surveys, 2013. (n.r. not recorded).

RBD	Catchments	Lake Name	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Boyne	Bane, Lough	5	0	0	0	0	0	1	2	2	0
ERBD	Boyne	Lough Lene	5	0	0	0	0	0	1	1	2	1
NWIRBD	Melvin	Lattone Lough	15	0	0	0	1	9	5	0	0	0
NWIRBD	Erne	MacNean Lower	1	0	0	0	0	0	0	1	0	0
NWIRBD	Erne	MacNean Upper, Lough	16	0	0	0	1	4	4	5	2	0
SHIRBD	Fergus	Atedaun, Lough	4	0	0	0	0	1	2	0	0	1
SHIRBD	Inagh	Lickeen Lough	9	0	0	0	2	6	1	0	0	0
SHIRBD	Shannon	Ree, Lough	116	0	0	0	12	55	40	9	0	0
SHIRBD	Shannon Up.	Urlaur Lough	4	0	0	0	0	0	2	1	1	0
WRBD	Coastal	Ardderry Lough	1	0	0	0	1	0	0	0	0	0
WRBD	Coastal	Aughrusbeg, Lough	28	0	0	0	17	11	0	0	0	0
WRBD	Newport	Beltra Lough	28	0	0	1	15	9	2	0	0	1
WRBD	Garvogue	Glenade Lough	1	0	0	0	0	0	0	1	0	0
WRBD	Drumcliff	Glencar Lough	33	0	0	0	8	20	5	0	0	0
WRBD	Dawros	Kylemore Lough	12	0	0	0	4	5	3	0	0	0
WRBD	Corrib	Maumwee, Lough	3	0	0	0	1	0	2	0	0	0
WRBD	Kilcolgan	Rea, Lough	115	0	0	0	17	55	38	4	1	0
WRBD	Corrib	Ross, Lough	4	0	0	0	1	2	1	0	0	0
WRBD	Coastal	Shindilla, Lough	7	0	0	0	4	2	1	0	0	0

Table 3-3 Summary data from WFD River Surveys, 2013. * indicates number of boats used. All other sites were fished using bankside generator sets.

RBD	Catchments	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (No./ m^2)	No. Eels
ERBD	Boyne	Blackwater (Kells), River	Just u/s L. Ramor_A	3	3	391	0.05375	21
ERBD	Liffey	Dodder, River	Bushy Park_A	3	3	385	0.0052	2
ERBD	Liffey	Dodder, River	D/s Piperstown Stream, Bohernabreena_A	3	3	274	0	0
ERBD	Liffey	Dodder, River	Firhouse_A	2	3	238	0.0042	1
ERBD	Liffey	Dodder, River	Footbr. Beaver Row_B	3	3	514	0.11861	61
ERBD	Liffey	Dodder, River	Knocklyon_A	2	3	264	0.00379	1
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	3	3	339	0.00885	3
ERBD	Liffey	Dodder, River	Oldbawn_A	3	3	311	0.00322	1
ERBD	Liffey	Liffey, River	500 m d/s Ballyward Br._A	2*	3	4228	0	0
ERBD	Liffey	Liffey, River	Kilcullen Br._A	4*	1	8688	0.00012	1
ERBD	Ovoca	Avonbeg River	Greenan Br._A	3	3	313	0	0
ERBD	Vartry	Vartry River	Annagolan Br._A	2	3	231	0	0
ERBD	Vartry	Vartry River	Ashford Br._A	3	3	378	0.02383	9
ERBD	Vartry	Vartry River	Newrath Br._A	3	3	347	0.03742	13
ERBD	Vartry	Vartry River	Nun's Cross Br._A	3	3	369	0.07588	28
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	3	3	500	0.126	63
NBIRBD	Dee	White River (Louth)	Athclare_A	2	3	212	0.00944	2
NBIRBD	Dee	White River (Louth)	Coneyburrow Br._B	3	3	294	0.00681	2
NBIRBD	Dee	White River (Louth)	Dunleer_A	2	3	212	0.05189	11
NBIRBD	Dee	White River (Louth)	Gibber's Br._A	1	3	123	0.00816	1
NBIRBD	Dee	White River (Louth)	Martinstown Br. _A	1	3	103	0	0
NBIRBD	Fane	Fane River	Br. d/s of Inniskeen_A	3	2	336	0.04165	14
NWIRBD	Erne	Annalee River	0.2km d/s Cavan R confl_A	4*	3	3300	0.00182	6

RBD	Catchments	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (No./ m^2)	No. Eels
NWIRBD	Erne	Cullies River	Br. nr Kilbrackan House_A	2	3	227	0	0
NWIRBD	Erne	Dromore River	Drummuck_A	2	3	252	0	0
NWIRBD	Erne	Erne, River	Bellahillan Br._A	2*	3	2921	0.00034	1
NWIRBD	Erne	Erne, River	Kilconny Belturbet (RHS)_A	4*	1	5304	0.00094	5
NWIRBD	Erne	Finn River (Monaghan)	Cumber Br._A	2	3	2835	0	0
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	1	3	171	0.02339	4
SERBD	Barrow	Gowran River	Grange Lower_A	2	3	205	0	0
SERBD	Nore	Ballyroan River	Ballydine Br._A	2	3	163	0.00612	1
SERBD	Nore	Ballyroan River	Gloreen Br._D	1	3	163	0	0
SERBD	Nore	Glory, River	Br. E of Raheen_A	2	3	320	0.00937	3
SERBD	Nore	Nuenna River	Br. d/s Clomantagh_B	2	3	207	0	0
SERBD	Owenavorragh	Banoge River	Br. u/s Owenavorragh R confl_A	2	3	219	0.07306	16
SERBD	Owenavorragh	Banoge River	d/s of N11 bridge_A	2	3	223	0.01796	4
SERBD	Slaney	Clody, River	Ford (Br.) 3km u/s Bunclody_B	3	3	300	0.00333	1
SERBD	Slaney	Douglas River (Ballon)	Sragh Br._B	2	3	177	0	0
SERBD	Slaney	Slaney, River	Waterloo Br._A	3	3	477	0.01468	7
SERBD	Suir	Nier, River	Br. ENE of Ballymacarby_A	4	3	662	0.02115	14
SHIRBD	Annagh	Glendine River (Clare)	Knockloskeraun Br. S of M_A	1	1	153	0.01961	3
SHIRBD	Bunratty	Broadford River	Br. u/s Doon Lough_A	2	3	203	0	0
SHIRBD	Bunratty	Broadford River	Broadford (Village)_A	2	3	216	0.00926	2
SHIRBD	Bunratty	Gourna River	Beside railway br._A	2	3	233	0.11578	27
SHIRBD	Bunratty	Gourna River	Br. u/s Owenogarney R confl_C	2	3	182	0.03841	7
SHIRBD	Burrishoole	Newport River	Rossaguile Br._A	3	3	380	0	0
SHIRBD	Fergus	Fergus, River	Br. near Clonroad House_A	4*	1	5487	0.00346	19
SHIRBD	Fergus	Fergus, River	Poplar Br._B	3	3	318	0.06918	22

RBD	Catchments	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (No./ m^2)	No. Eels
SHIRBD	Fergus	Moyree River	Br. u/s Fergus River_A	3	3	347	0.00288	1
SHIRBD	Fergus	Spancelhill River	Br. NW, near Spancelhill_A	1	3	115	0.0087	1
SHIRBD	Inny	Mountnugent River	Mountnugent Br._A	3	3	309	0	0
SHIRBD	Shannon Lw.	Ballyfinboy River	Ballinderry Br._A	2	3	254	0	0
SHIRBD	Shannon Lw.	Ballyfinboy River	Br. just u/s L. Derg_A	2	3	209	0.01439	3
SHIRBD	Shannon Lw.	Bow River	Bow River Br._A	2	3	240	0	0
SHIRBD	Shannon Lw.	Glenafelly River	Br. 3km E of Longford_A	1	3	128	0	0
SHIRBD	Shannon Lw.	Graney River	Caher Br. S of L.Graney_A	2	3	228	0	0
SHIRBD	Shannon Up.	Boor River	Br. NW of Kilbillaghan_B	2	3	214	0.01401	3
SHIRBD	Suck	Suck, River	Ballyforan Br._A	4*	1	7896	0.00013	1
SHIRBD	Suck	Suck, River	Cloondacarra Br._A	2*	3	2195	0.00046	1
SWRBD	Adrigole	Adrigole River	0.5km d/s of Glashduff Adrigole confluence_A	3	3	401	0.06739	27
SWRBD	Bandon	Blackwater (Munster), River	Killavullen Br._A	4*	1	10704	0.00159	17
SWRBD	Bandon	Blackwater (Munster), River	Lismore Br._A	4*	1	8712	0.00161	14
SWRBD	Bandon	Blackwater (Munster), River	Nohaval Br._A	2*	3	2029	0	0
SWRBD	Blackwater	Dalua River	Footbr. SW of Liscongill_A	3	3	456	0.01536	7
SWRBD	Blackwater	Funshion, River	Br. u/s Blackwater R confl_A	2*	1	2537	0.00355	9
SWRBD	Blackwater	Licky River	Br. NE of Glenlicky_A	2	3	267	0.03745	10
SWRBD	Colligan	Araglin River	Elizabeth's Br._A	3	3	560	0.03571	20
SWRBD	Cummeragh	Cummeragh River	Footbr. u/s Owengarriff confl_A	2	3	255	0.00785	2
SWRBD	Lee	Lee (Cork), River	Inchinossig Br._A	3	3	428	0	0
SWRBD	Lee	Lee (Cork), River	Lee Fields_A	4*	1	10656	0.0045	48
SWRBD	Owvane	Owvane River (Cork)	Lisheen / Piersons Br. (LHS)_A	3	3	614	0.0765	47
WRBD	Corrib	Abbert River	Bridge at Bullaun_A	3	3	351	0.00285	1
WRBD	Kinvarra	Owendalluleegh River	Br. SE Killafeen_A	3	3	387	0.06724	26

RBD	Catchments	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (No./ m^2)	No. Eels
WRBD	Owenboliska	Owenboliska River	Caravan Park_A	3	3	441	0.05672	25
WRBD	Screeb	Screeb River	L. Aughawoolia_A	3	3	282	0.04973	14

Table 3-4 Summary data from WFD River Surveys, 2013. (n.r. not recorded).

RBD	Catchments	River Name	River Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
ERBD	Boyne	Blackwater (Kells), River	Just u/s L. Ramor_A	23.5	13.3	44.5	0.0247	0.003	0.129	0.518
ERBD	Liffey	Dodder, River	Bushy Park_A	20.3	16.8	23.7	0.0143	0.0085	0.02	0.0285
ERBD	Liffey	Dodder, River	Firhouse_A	23.7	23.7	23.7	0.02	0.02	0.02	0.02
ERBD	Liffey	Dodder, River	Footbr. Beaver Row_B	20.5	11.1	32.4	0.0164	0.002	0.061	0.967
ERBD	Liffey	Dodder, River	Knocklyon_A	33	33	33	0.057	0.057	0.057	0.057
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	45.7	37	52	n.r.	n.r.	n.r.	n.r.
ERBD	Liffey	Dodder, River	Oldbawn_A	38	38	38	0.096	0.096	0.096	0.096
ERBD	Liffey	Liffey, River	Kilcullen Br._A	44.6	44.6	44.6	0.124	0.124	0.124	0.124
ERBD	Vartry	Vartry River	Ashford Br._A	23.3	16.6	34.3	n.r.	n.r.	n.r.	n.r.
ERBD	Vartry	Vartry River	Newrath Br._A	21.3	14.8	29	0.0156	0.005	0.038	0.1715
ERBD	Vartry	Vartry River	Nun's Cross Br._A	23.7	14.6	37	n.r.	n.r.	n.r.	n.r.
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	11.2	6.9	30.2	0.0032	0.0005	0.0475	0.1985
NBIRBD	Dee	White River (Louth)	Athclare_A	35.9	34.1	37.7	n.r.	n.r.	n.r.	n.r.
NBIRBD	Dee	White River (Louth)	Coneyburrow Br._B	27.8	26	29.5	0.031	0.024	0.038	0.062
NBIRBD	Dee	White River (Louth)	Dunleer_A	25.1	15.1	38.9	0.0448	0.006	0.1185	0.179
NBIRBD	Dee	White River (Louth)	Gibber's Br._A	19	19	19	n.r.	n.r.	n.r.	n.r.
NBIRBD	Fane	Fane River	Br. d/s of Inniskeen_A	24.9	12.7	35.2	0.0283	0.0065	0.0645	0.3115
NWIRBD	Erne	Annalee River	0.2km d/s Cavan R confl_A	36.2	24.6	51	0.0907	0.0215	0.198	0.544
NWIRBD	Erne	Erne, River	Bellahillan Br._A	65	65	65	0.6	0.6	0.6	0.6
NWIRBD	Erne	Erne, River	Kilconny Belturbet (RHS)_A	50.4	37	58	0.2345	0.0765	0.366	1.1725
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	37.6	30.6	51.2	0.0931	0.0365	0.219	0.3725
SERBD	Nore	Ballyroan River	Ballydine Br._A	29	29	29	0.0385	0.0385	0.0385	0.0385

RBD	Catchments	River Name	River Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SERBD	Nore	Glory, River	Br. E of Raheen_A	22.8	16	31.6	0.0245	0.0065	0.053	0.0735
SERBD	Owenavorragh	Banoge River	Br. u/s Owenavorragh R confl_A	18.7	11.4	33.1	0.0167	0.002	0.07	0.2665
SERBD	Owenavorragh	Banoge River	d/s of N11 bridge_A	23.4	17.7	34	0.0285	0.004	0.0855	0.114
SERBD	Slaney	Clody, River	Ford (Br.) 3km u/s Bunclody_B	17.5	17.5	17.5	0.063	0.063	0.063	0.063
SERBD	Slaney	Slaney, River	Waterloo Br._A	30.3	16.7	50.5	0.0604	0.006	0.239	0.8455
SERBD	Suir	Nier, River	Br. ENE of Ballymacarby_A	24.8	16.8	34.3	0.0275	0.006	0.075	0.385
SHIRBD	Annagh	Glendine River (Clare)	Knockloskeraun Br. S of M_A	26.3	17.1	32	0.0384	0.0005	0.396	9.4395
SHIRBD	Bunratty	Broadford River	Broadford (Village)_A	28.3	18	38.5	0.0568	0.0075	0.106	0.1135
SHIRBD	Bunratty	Gourna River	Beside railway br._A	21.7	9.1	33.4	0.0233	0.001	0.067	0.605
SHIRBD	Bunratty	Gourna River	Br. u/s Owenogarney R confl_C	17.7	11.8	28.9	0.0148	0.005	0.037	0.074
SHIRBD	Fergus	Fergus, River	Br. near Clonroad House_A	36.7	10.2	67	0.1312	0.001	0.625	2.361
SHIRBD	Fergus	Fergus, River	Poplar Br._B	29.6	19	41.1	0.0464	0.01	0.101	0.975
SHIRBD	Fergus	Moyree River	Br. u/s Fergus River_A	35	35	35	0.073	0.073	0.073	0.073
SHIRBD	Fergus	Spancelhill River	Br. NW, near Spancelhill_A	28	19.4	33.3	0.045	0.012	0.096	0.315
SHIRBD	Shannon Lw.	Ballyfinboy River	Br. just u/s L. Derg_A	39	23	53	0.1517	0.024	0.33	0.455
SHIRBD	Shannon Up.	Boor River	Br. NW of Kilbillaghan_B	42	34.5	48	0.1133	0.052	0.172	0.34
SHIRBD	Suck	Suck, River	Ballyforan Br._A	41.5	41.5	41.5	0.103	0.103	0.103	0.103
SHIRBD	Suck	Suck, River	Cloondacarra Br._A	57.4	57.4	57.4	0.396	0.396	0.396	0.396
SWRBD	Adrigole	Adrigole River	0.5km d/s of Glashduff Adrigole confluence_A	26.6	14	50.5	0.031	0.004	0.1675	0.5265
SWRBD	Bandon	Blackwater (Munster), River	Killavullen Br._A	26.5	12.9	35.5	0.053	0.017	0.0915	0.318
SWRBD	Bandon	Blackwater (Munster), River	Lismore Br._A	22.2	7.4	38	0.0294	0.0005	0.0975	0.411

RBD	Catchments	River Name	River Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SWRBD	Blackwater	Dalua River	Footbr. SW of Liscongill_A	24	16	34.3	0.0273	0.006	0.0715	0.191
SWRBD	Blackwater	Funshion, River	Br. u/s Blackwater R confl_A	29.7	17.9	49.8	0.0674	0.008	0.2995	0.5395
SWRBD	Blackwater	Licky River	Br. NE of Glenlicky_A	18	9.7	32.7	0.0131	0.001	0.067	0.1305
SWRBD	Colligan	Araglin River	Elizabeth's Br._A	23.5	12.1	33.5	0.0254	0.002	0.0675	0.507
SWRBD	Cummeragh	Cummeragh River	Footbr. u/s Owengarriff confl_A	29.5	18.1	40.9	n.r.	n.r.	n.r.	n.r.
SWRBD	Lee	Lee (Cork), River	Lee Fields_A	30.3	7.4	60.6	0.0711	0.009	0.381	3.1295
SWRBD	Owvane	Owvane River (Cork)	Lisheen / Piersons Br. (LHS)_A	30.6	21.6	50.5	0.034	0.0005	0.396	3.74
WRBD	Corrib	Abbert River	Bridge at Bullaun_A	22	22	22	0.019	0.019	0.019	0.019
WRBD	Kinvarra	Owendalluleegh River	Br. SE Killafeen_A	22.4	7	37	0.0257	0.0005	0.093	0.6415
WRBD	Owenboliska	Owenboliska River	Caravan Park_A	24.8	16.8	34.3	0.0275	0.006	0.075	0.385
WRBD	Screeb	Screeb River	L. Aughawoolia_A	12.2	7.4	32.6	0.0061	0.0005	0.056	0.262

Table 3-5 Length Frequency data from WFD River Surveys, 2013.

RBD	Catchments	River Name	River Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Boyne	Blackwater (Kells), River	Just u/s L. Ramor_A	21	0	7	11	2	1	0	0	0	0
ERBD	Liffey	Dodder, River	Bushy Park_A	2	0	1	1	0	0	0	0	0	0
ERBD	Liffey	Dodder, River	Firhouse_A	1	0	0	0	1	0	0	0	0	0
ERBD	Liffey	Dodder, River	Footbr. Beaver Row_B	61	0	33	21	7	0	0	0	0	0
ERBD	Liffey	Dodder, River	Knocklyon_A	1	0	0	0	1	0	0	0	0	0
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	3	0	0	0	1	1	1	0	0	0
ERBD	Liffey	Dodder, River	Oldbawn_A	1	0	0	0	1	0	0	0	0	0
ERBD	Liffey	Liffey, River	Kilcullen Br._A	1	0	0	0	0	1	0	0	0	0
ERBD	Vartry	Vartry River	Ashford Br._A	9	0	3	5	1	0	0	0	0	0
ERBD	Vartry	Vartry River	Newrath Br._A	13	0	7	6	0	0	0	0	0	0
ERBD	Vartry	Vartry River	Nun's Cross Br._A	28	0	9	15	4	0	0	0	0	0
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	63	30	31	1	1	0	0	0	0	0
NBIRBD	Dee	White River (Louth)	Athclare_A	2	0	0	0	2	0	0	0	0	0
NBIRBD	Dee	White River (Louth)	Coneyburrow Br._B	2	0	0	2	0	0	0	0	0	0
NBIRBD	Dee	White River (Louth)	Dunleer_A	11	0	3	4	4	0	0	0	0	0
NBIRBD	Dee	White River (Louth)	Gibber's Br._A	1	0	1	0	0	0	0	0	0	0
NBIRBD	Fane	Fane River	Br. d/s of Inniskeen_A	14	0	2	8	4	0	0	0	0	0
NWIRBD	Erne	Annalee River	0.2km d/s Cavan R confl_A	6	0	0	3	0	2	1	0	0	0
NWIRBD	Erne	Erne, River	Bellahillan Br._A	1	0	0	0	0	0	0	1	0	0
NWIRBD	Erne	Erne, River	Kilconny Belturbet (RHS)_A	5	0	0	0	1	1	3	0	0	0
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	4	0	0	0	3	0	1	0	0	0
SERBD	Nore	Ballyroan River	Ballydine Br._A	1	0	0	1	0	0	0	0	0	0

RBD	Catchments	River Name	River Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
SERBD	Nore	Glory, River	Br. E of Raheen_A	3	0	1	1	1	0	0	0	0	0
SERBD	Owenavorragh	Banoge River	Br. u/s Owenavorragh R confl_A	16	0	10	5	1	0	0	0	0	0
SERBD	Owenavorragh	Banoge River	d/s of N11 bridge_A	4	0	1	2	1	0	0	0	0	0
SERBD	Slaney	Clody, River	Ford (Br.) 3km u/s Bunclody_B	1	0	1	0	0	0	0	0	0	0
SERBD	Slaney	Slaney, River	Waterloo Br._A	7	0	1	2	4	0	0	0	0	0
SERBD	Suir	Nier, River	Br. ENE of Ballymacarby_A	14	0	5	6	3	0	0	0	0	0
SHIRBD	Annagh	Glendine River (Clare)	Knockloskeraun Br. S of M_A	3	0	1	1	1	0	0	0	0	0
SHIRBD	Bunratty	Broadford River	Broadford (Village)_A	2	0	1	0	1	0	0	0	0	0
SHIRBD	Bunratty	Gourna River	Beside railway br._A	27	2	9	10	6	0	0	0	0	0
SHIRBD	Bunratty	Gourna River	Br. u/s Owenogarney R confl_C	7	0	5	2	0	0	0	0	0	0
SHIRBD	Fergus	Fergus, River	Br. near Clonroad House_A	19	0	1	3	11	1	1	2	0	0
SHIRBD	Fergus	Fergus, River	Poplar Br._B	22	0	1	9	10	2	0	0	0	0
SHIRBD	Fergus	Moyree River	Br. u/s Fergus River_A	1	0	0	0	1	0	0	0	0	0
SHIRBD	Fergus	Spancelhill River	Br. NW, near Spancelhill_A	1	0	0	0	0	1	0	0	0	0
SHIRBD	Shannon Lw.	Ballyfinboy River	Br. just u/s L. Derg_A	3	0	0	1	0	1	1	0	0	0
SHIRBD	Shannon Up.	Boor River	Br. NW of Kilbillaghan_B	3	0	0	0	1	2	0	0	0	0
SHIRBD	Suck	Suck, River	Ballyforan Br._A	1	0	0	0	0	1	0	0	0	0
SHIRBD	Suck	Suck, River	Cloondacarra Br._A	1	0	0	0	0	0	1	0	0	0
SWRBD	Adrigole	Adrigole River	0.5km d/s of Glashduff Adrigole confluence_A	27	0	5	18	2	0	2	0	0	0
SWRBD	Bandon	Blackwater (Munster), River	Killavullen Br._A	17	0	3	7	7	0	0	0	0	0
SWRBD	Bandon	Blackwater (Munster), River	Lismore Br._A	14	1	6	3	4	0	0	0	0	0
SWRBD	Blackwater	Dalua River	Footbr. SW of Liscongill_A	7	0	3	2	2	0	0	0	0	0
SWRBD	Blackwater	Funshion, River	Br. u/s Blackwater R confl_A	9	0	1	4	3	1	0	0	0	0
SWRBD	Blackwater	Licky River	Br. NE of Glenlicky_A	10	1	5	3	1	0	0	0	0	0

RBD	Catchments	River Name	River Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
SWRBD	Colligan	Araglin River	Elizabeth's Br._A	20	0	7	10	3	0	0	0	0	0
SWRBD	Cummeragh	Cummeragh River	Footbr. u/s Owengarriff confl_A	2	0	1	0	0	1	0	0	0	0
SWRBD	Lee	Lee (Cork), River	Lee Fields_A	48	1	1	23	19	1	2	1	0	0
SWRBD	Owvane	Owvane River (Cork)	Lisheen / Piersons Br. (LHS)_A	47	26	15	5	1	0	0	0	0	0
WRBD	Corrib	Abbert River	Bridge at Bullaun_A	1	0	0	1	0	0	0	0	0	0
WRBD	Kinvarra	Owendalluleegh River	Br. SE Killafeen_A	26	0	0	13	12	0	1	0	0	0
WRBD	Owenboliska	Owenboliska River	Caravan Park_A	25	4	6	9	6	0	0	0	0	0
WRBD	Screeb	Screeb River	L. Aughawoolia_A	14	0	3	3	7	0	1	0	0	0

Table 3-6 Summary data from WFD Transitional Water Surveys, 2013. (n.r. not recorded).

RBD	Catchments	Transitional Water	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SERBD	Barrow	Barrow Est., Up.	1	6	36	6	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Barrow	Barrow Nore Est., Up.	1	2	59	29.5	37.1	24.6	74.4	0.1331	0.028	0.994	7.852
SERBD	Barrow	Barrow Suir Nore Est.	1	4	0	0	-	-	-	-	-	-	-
SERBD	Barrow	New Ross Port	1	4	21	5.25	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Nore	Nore Estuary	1	4	73	18.25	38.5	23.2	61.8	0.1211	0.022	0.398	8.838
SERBD	Suir	Suir Estuary, Lower	1	4	62	15.5	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Suir	Suir Estuary, Middle	1	6	141	23.5	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Suir	Suir Estuary, Upper	1	2	0	0	-	-	-	-	-	-	-
SWRBD	Coastal	Drongawn Lough	1	6	33	5.5	33	30	78	n.r.	n.r.	n.r.	n.r.
SWRBD	Coastal	Gill, Lough	1	6	3	0.5	27.8	24	30.4	n.r.	n.r.	n.r.	n.r.

Table 3-7 Length Frequency data from WFD Transitional Water Surveys, 2013. (n.r. not recorded).

RBD	Catchments	Transitional Water	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
SERBD	Barrow	Barrow Est., Up.	36	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Barrow	Barrow Nore Est., Up.	59	0	0	8	34	11	3	2	1	0
SERBD	Barrow	New Ross Port	21	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Nore	Nore Estuary	73	0	0	8	41	15	8	1	0	0
SERBD	Suir	Suir Estuary, Lower	62	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SERBD	Suir	Suir Estuary, Middle	141	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
SWRBD	Coastal	Drongawn Lough	33	0	0	0	9	12	9	2	1	0
SWRBD	Coastal	Gill, Lough	3	0	0	2	1	0	0	0	0	0