Activity Report

of the

Standing Scientific Committee for Eel

2016

Report of the Standing Scientific Committee for Eel to Inland Fisheries Ireland and the Dept. of Communications, Energy and Natural Resources

May 2017

Disclaimer:	**This report includes data and analyses that are supplied by various agencies for the purposes of supporting the implementation of the Eel Management Plans in Ireland. The data will be subject to scientific review for the National Report to the EU in 2018.** **The data and analyses are part of an ongoing scientific assessment and are, therefore, preliminary and may be subject to change, updating or reanalysis. Some data may also be submitted for peer-review publication. The contents of this report should not be reproduced without the prior permission of the Standing Scientific Committee for Eel.**

Glossary of terms

Glass eel	Young, unpigmented eel, recruiting from the sea into continental waters. WGEEL consider the glass eel term to include all recruits of the 0+ cohort age. In some cases, however, also includes the early pigmented stages.
Elver	Young eel, in its first year following recruitment from the ocean. The elver stage is sometimes considered to exclude the glass eel stage, but not by everyone. To avoid confusion, pigmented 0+cohort age eel are included in the glass eel term.
Bootlace, fingerling	Intermediate sized eels, approx. 10–25 cm in length. These terms are most often used in relation to stocking. The exact size of the eels may vary considerably. Thus, it is a confusing term.
Yellow eel (Brown eel)	Life-stage resident in continental waters. Often defined as a sedentary phase, but migration within and between rivers, and to and from coastal waters occurs. This phase encompasses the elver and bootlace stages.
Silver eel	Migratory phase following the yellow eel phase. Eel characterized by darkened back, silvery belly with a clearly contrasting black lateral line, enlarged eyes. Downstream migration towards the sea, and subsequently westwards. This phase mainly occurs in the second half of calendar years, though some are observed throughout winter and following spring.
Assisted Upstream Migration	the practice of trapping and transporting juvenile eel within the same river catchment to assist their upstream migration at difficult or impassable barriers, without significantly altering the production potential (Bbest) of the catchment
Eel River Basin or Eel Management Unit	"Member States shall identify and define the individual river basins lying within their national territory that constitute natural habitats for the European eel (eel river basins) which may include maritime waters. If appropriate justification is provided, a Member State may designate the whole of its national territory or an existing regional administrative unit as one eel river basin. In defining eel river basins, Member States shall have the maximum possible regard for the administrative arrangements referred to in Article 3 of Directive 2000/60/EC [i.e. River Basin Districts of the Water Framework Directive]." EC No. 1100/2007.
River Basin District	The area of land and sea, made up of one or more neighbouring river basins together with their associated surface and groundwaters, transitional and coastal waters, which is identified under Article 3(1) of the Water Framework Directive as the main unit for management of river basins. The term is used in relation to the EU W F D.
Stocking	Stocking (not restocking) is the practice of adding fish [eels] to a waterbody from another source, to supplement existing populations or to create a population where none exists.
Trap & transport	Traditionally, the term trap and transport referred to trapping recruits at impassable obstacles and transporting them upstream and releasing them. Under the EMPs, trap and transport (or catch and carry) now also refers to fishing for downstream migrating silver eel for transportation around hydropower turbines.
EEL REFERENCE POINTS/POPULATION DYNAMIC	
B_0	The amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the stock.
$B_{current}$	The amount of silver eel biomass that currently escapes to the sea to spawn.
B_{best}	The amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the current stock.
ΣF	The fishing mortality rate, summed over the age-groups in the stock, and the reduction effected.
ΣH	The anthropogenic mortality rate outside the fishery, summed over the age-groups in the stock, and the reduction effected.
R	The amount of glass eel used for restocking within the country.
ΣA	The sum of anthropogenic mortalities, i.e. $\Sigma A = \Sigma F + \Sigma H$

Contents

Executive Summary

Introduction

The EC Regulation (Council Regulation 1100/2007) for the recovery of the eel stock required Ireland to establish eel management plans for implementation from 2009. Under the EC Regulation, Ireland is also required to monitor the eel stock, evaluate current silver eel escapement and post-evaluate implemented management actions aimed at reducing eel mortality and increasing silver eel escapement. Each Member State is required to report to the Commission, initially every third year until 2018, and subsequently every six years.

The Irish Eel Management Plan submitted to the EU on the 9th January 2009 and accepted by the EU in June 2009 outlined the main management actions aimed at reducing eel mortality and increasing silver eel escapement to the sea. The first monitoring report was submitted by Ireland in June 2012 and this was accompanied by a scientific assessment report for the period 2009-2011. The second monitoring report (2012-2014) was submitted to the EU in June 2015 and the scientific assessment was included as an annex to that report.

The Irish Eel Management Plan outlines a national programme for sampling catch and surveys of local eel stocks. Appropriate scientific assessment will monitor the implementation of the plans. The Standing Science Committee for Eel (SSCE) 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. 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. The SSCE has also been supported by invited scientists from NUIG, AFBINI and NPWS.

The SSCE is required to compile an annual stock assessment and scientific advice report on the national eel monitoring plan and this also enables the three year report to the EU to be produced in a timely and accurate fashion. The compilation of the annual assessments also highlights any issues and problems which need to be resolved within the three year time frame.

International Advice; ICES - 2017

The International Council for Exploration of the Seas (ICES) is the primary source of scientific advice on the marine ecosystem to governments and international regulatory bodies that manage the North Atlantic Ocean and adjacent seas. The content of scientific advice is solely the Advisory Committees (ACOM) responsibility not subject to modification by any other ICES entity. ACOM has one member from each member country, under the direction of an independent chair appointed by the Council, and works on the basis of scientific analysis prepared in the ICES expert groups and the advisory process includes peer review of the analysis before it can be used as basis for the advice. In the case of eel, the relevant expert group is the joint EIFAAC/ICES/GFCM Working Group on Eel (WGEEL).

ICES considered the updated time-series of relevant stock status indices and issued advice for 2017:

"ICES advises that when the precautionary approach is applied for European eel, all anthropogenic impacts (e.g. recreational and commercial fishing on all stages, hydropower,

pumping stations, and pollution) decreasing production and escapement of silver eels should be reduced to – or kept as close to – zero as possible."

Stock status

"The status of eel remains critical.

The annual recruitment of glass eel to European waters in 2016 remained low at 2.7% of the 1960–1979 level in the "North Sea" series, and 10.7% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters was 21% of the 1960–1979 level. These recruitment indices are well below the 1960–1979 reference levels, and there is no change in the perception of the status of the stock."

National Advice

There were no requests for advice in 2016.

Irish EMP Management Actions 2016

Under the EU Regulation (EC No. 1100/2007) four main management actions were included in the Irish Eel Management Plans aimed at reducing eel mortality and increasing silver eel escapement in Irish waters. These were a cessation of the commercial eel fishery and closure of the market, mitigation of the impact of hydropower, including a comprehensive silver eel trap and transport plan, ensure upstream migration of juvenile eel at barriers and improve water quality including fish health and biosecurity issues.

1. ***Reduction in Fishing***

   All regions confirmed a closure of the eel fishery for the 2016 season with no licences issued and the eel fishery, with the exception of L. Neagh, also remained closed in N. Ireland. Some illegal fishing was reported which led to some seizures of gear in the Shannon IRBD, the South East RBD and the Western RBD.

   No dealers transport trucks were seized in 2016 Reliable trade (import/export) data remains unavailable to the SSCE.

   The Department of Communications, Climate Action and Environment tasked Inland Fisheries Ireland with setting up a network of scientific eel fisheries in collaboration with the former eel fishermen. A number of key locations were earmarked for surveys and a tender process was initiated with applications from interested parties. In 2016 a series of yellow eel surveys were carried out in 5 lakes (Upper and Lower Lough Corrib, Lough Conn, Lough Ramor and Lough Muckno) and 2 transitional waters (Waterford Harbour and Munster Blackwater). To date the programme also consists of an elver monitoring survey and a silver eel fishery on the River Boyne and a glass eel survey of the Shannon Estuary. The purpose of the scientific fisheries is to increase the data and knowledge of eel in Ireland ahead of the 2018 EU review of our national eel management plan.

2. ***Hydropower Impact***

   Mitigation of hydropower involved a comprehensive trap and transport system for migrating silver eels on the Shannon, Erne and Lee, the targets for 2009-2011 were set out in the Eel Management Plans and these were subsequently modified on the Erne for the 2015-2017 period to allow for the transport of 50% of the annual silver eel production and a rolling target based on a 3-year basis allowing shortfalls in one year to be made up the following year. A long-term shortfall should not be carried forward indefinitely.

The total quantity of silver eel released from the three catchments was 54,708kg. The level of fishing mortalities was reported to be low.

In the ***River Shannon*** the trap and transport total of 16,711kg represented 43.28% of silver eel production (using the escapement estimated adjusted to account for nights not fished) and, therefore, exceeded the 30% target, the EMP requirement was met on the basis of the agreed (3 year rolling mean value) protocol.

In the ***River Erne***, the trap and transport annual target (50% of silver eel production) for the River Erne was exceeded in the 2016 season. The quantity (38,264 kg) transported for safe release at Ballyshannon represented 60.9% of the estimated silver eel production (62,871kg) for the river system for the season.

In the ***River Lee***, a total 43.5kg were trapped and transported downstream of the Inniscarra dam. The total catch did not reach the annual target of 500 kg and the 3-year running mean was below target.

The turbine mortality rates are being determined using acoustic tagged and tracked silver eel and these data are reported in the 2012 report to the EU (SSCE 2012). Additional data for the Erne were subsequently reported to the SSCE (McCarthy *et al*. 2014).

For the ***Shannon***, the unusually high discharge conditions during the 2015/16 period of silver eel migration presented problems in estimation of spawner production and escapement. Attempts were made, using Didson surveys at Clonlara, to correct for missing data during the period when fishing could not be undertaken at Killaloe eel weir. However, due to equipment failure associated with local power outages, this was not technically possible. In the 2016/17 season the estimated silver eel mortality at the Ardnacrusha dam was 3,062kg (21.15% HPS passage rate). The discharge conditions were exceptionally low, with very low flow in the old River Shannon channel. The estimates of both silver eel production and escapement were much lower than normal and the peak period of migration was later than has been recorded in recent decades. Taking into account some interrupted fishing days, more appropriate production and escapement estimates were calculated which would infer a an estimated silver eel mortality of 3897kg at Ardnacrusha.

For the ***Erne***, during the 2016/17 silver eel migration season the discharge in the lower was exceptionally low. This impacted directly on the pattern of silver eel migration, causing seasonal delays, and indirectly via the pattern of hydropower generation at the two dams. Nocturnal electricity generation was frequently interrupted due to low water levels, as well as an increasing reliance on wind generation for electricity supply to the national grid. Spillage levels were very low for the entire 2016/17 season. For the 2016/17 season mortality rates applies as follows: ***Cliff HPS*** 0% (no flow or only spillage); 7.9% (Generation plus spillage) and 26.7% (Only generation), ***Cathaleen's Fall HPS***: 0% (no flow or only spillage); 7.7% (spillage plus half generation load); 15.4% spillage plus full generation load); 27.3% (only generation). It was estimated that the cumulative mortality represented 18.3% mortality of the total River Erne silver eel production or 46.7% of the migrating eels reaching the dams during the season. Estimated mortality at the dams was 11,494kg in 2016/'17 calculated using the cumulative mark/recapture method, or 8,204kg when calculated using four individual mark-recapture experiments (see chapter 5.4.2 for full explanation).

3. Obstacles to upstream migration

Obstacles to migration in river systems are one of several factors influencing the decline in the European eel population. Obstacles impede eels from accessing and colonizing large parts of catchments, thus reducing upstream density and additional production of

silver eels. The National Eel Management Plan identified that upstream migrating juvenile eels require modified passage through existing fish passes or any new obstacles to maximise escapement as traditional fish passes are not designed to accommodate eel passage. Barriers or potential obstacles which can be considered under this action include artificial structures such as weirs, hydrodams, fish passes, fish counter structures, millraces, road crossings/bridge aprons and forestry related operations. Over 47% of the available wetted habitat is above major hydropower barriers, although there will be a greater proportion of the potential silver eel production when the differences in relative productivity are taken into account.

The EU Habitats Directive (Directive 92/43/EEC) and Water Framework Directive (2000/60/EC) both require the assessment of barriers to fish migration. IFI established a National Barrier Group in 2011. This group is building on the earlier work to develop a standardised assessment of barriers nationally. 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. To date a number of projects have been undertaken to assess structures in our rivers examples include the Wicklow Bridges Project, Shannon Barriers Project, studies in the Nore catchment and Monaghan county. 1,686 structures have been assessed by IFI under these programmes.

IFI is also involved in the Interreg funded AMBER project which stands for **A**daptive **M**anagement of **B**arriers in **E**uropean **R**ivers which seeks to raise awareness of the problems posed by stream fragmentation, the pressures on freshwater ecosystems and the need for innovative solutions. AMBER, is a €6.2 million Euro multi-disciplinary research project, will see 20 partners from 11 countries, combine citizen science and cutting-edge technology to map the distribution of barriers and assess their effects on freshwater organisms.

Assisted upstream migration of juvenile eel takes place at the ESB Hydropower Stations on the Shannon (Ardnacrusha, Parteen), Erne (Cathaleens Fall), Liffey and Lee. This has been a long-term objective to mitigate against the blockage of the HPSs under ESB Legislation (Sec 8, 1935). On the Erne and Shannon, elvers and bootlace eel were transported upstream from the fixed elver traps.

4. ***Improve Water Quality, fish health and biosecurity***

The improvement of water quality in Ireland is primarily being dealt with under the workprogramme for the implementation of the Water Framework Directive (WFD). The objective of the Water Framework Directive (WFD) is to protect all high status waters, prevent further deterioration of all waters and to restore degraded surface and ground waters to good status by 2015. The WFD reporting and monitoring runs on a six year cycle. The first cycle of the WFD ran from 2009 – 2015, and the second cycle runs from 2016-2021 (www.catchments.ie). A detailed report on the results of the first cycle of WFD monitoring is not available to date (mid 2017). In the interim period, the Environmental Protection Agency (EPA) compile statistics on water quality in Ireland, the most recent of which covers the period 2010-2012. For that period, 53% of rivers, 43% of lakes, 45% of transitional waters, 93% of coastal waters and 99% of groundwater were satisfactory at good or high status. Rivers monitored, using the biological Q value scheme, were in high or good condition along 73% of the monitored river channels. This was up 4% from the last monitoring period (2007-2009), and includes an overall increase in high status sites. Serious pollution of rivers reduced to 17 km from 53 km since last reporting period. There was a 5% reduction (10 lakes) in the high or good status categories, and a corresponding increase in the moderate or worse status category compared to 2007-2009.

The Neagh Bann, Shannon and North western RBD's are transboundary, in that there are portions of them in Northern Ireland. Only a very small portion of the Shannon RBD is in Northern Ireland, while the Neagh Bann RBD is not included in the Irish Eel Management reports. Therefore, the implementation of the WFD in the Northern Irish part of the North western RBD is also of interest in this report, as it is the major international RBD which is considered in this eel management report. The status classification for 2015 for surface waters in NW iRBD shows that 46% are at good or better status. This can be broken down to 46% of rivers, 25% of lakes, and 33% of transitional and coastal water bodies (by numbers) at good or better.

There were 23 reported fish kills in 2015 (IFI 2015). This was about the same number as was reported for 2014 (22).

A number of pesticides, including Mecoprop, MCPA and 2 4-D, were detected at low levels in a significant number of rivers (26%-56%) during routine monitoring. However, apart from two (mercury and Polycyclic aromatic hydrocarbons) ubiquitous PBTs (persistent, bioaccumulative and toxic substances), the amount of non-compliance with the Environmental Quality Standards for priority substances and priority hazardous substances is very low and not of significant concern in Ireland confirming that bioaccumulation of toxins of eels is not a major problem in Ireland.

Anguillicola crassus continues to spread and more than 70% of the wetted area is now infested.

Irish EMP Monitoring Actions

A close link between the management actions and eel-stock targets will be established by implementing a comprehensive monitoring and stock assessment programme. This will allow for a direct feedback to management based on response of the stock to management actions.

Silver Eel Assessment

Silver eels are being assessed by annual fishing stations on the Shannon, Erne, Burrishoole and Fane catchments and pilots in 2016 on the Barrow and the Boyne. Trials will also be carried out at other locations identified in the EMP using coghill nets, mark-recapture and technology options such as electronic counters or DIDSON technology.

Shannon

The Killaloe catch in 2016 was 6,337 kg. Fishing was also undertaken by ESB contracted crews upstream of Killaloe and their catches (10,797kg) were also transported downstream. While fishing commenced on the 19th September 2016, the water flows remained low throughout the winter with much of the catch being taken in February and March 2017. Fishing ceased on the 28th March 2017. Use of the standard protocol, adopted by NUIG, where one cumulative seasonal fishing efficiency value (28.8%) is assumed for all fishing events, resulted in a production estimate of 32,603 kg, an escapement estimate of 29,479 kg and total T&T contribution as a percentage of production of 51.26%.

However, because of the periodically interrupted Killaloe weir fishing during the 2016/2017 season, it was feared that some eels may have migrated downstream undetected. Therefore, by interpolating estimates of (missed fishing night potential catches) an estimated extra Killaloe weir of 1,730 kg catch was included in alternative production and escapement calculations. This resulted in estimates of production, escapement and T&T contribution as follows: Production 38,608 kg, escapement 32,920 kg and T&T contribution is 43.28%. Though, this non-standard methodology is not intended to replace the standard analysis, the results may be more appropriate for management purposes (e.g. discussions on T & T targets).

Burrishoole

Silver eel trapping was continued in Burrishoole in 2016. The main run occurred spread between September (35%), October (17%) and November (30%) with the winter characterised by the lack of major flood events. While water levels remained low, eels continued to migrate throughout the season. The total run amounted to a count of 2723 eels or a production/escapement of 480kg; more than double that of 2015. The run had a mean weight of 0.177kg and was composed of 36.8% male eels.

Erne

In the 2016 season the River Erne conservation fishery and the trap & transport programme were monitored by NUIG in conjunction with studies on silver eel production and escapement. The scientific protocols used in the 2016 season were those described in McCarthy *et al* (2014). However, exceptionally low river discharge and unusual regulated discharge associated with interrupted night-time electricity generation, affected estimation of silver eel production.

The silver eel production was estimated at 62,871 kg, and escapement was estimated to be 51,377 kg (81.7% of production). The trap and transport programme catch of 38,264 kg represents 60.9% of silver eel production (exceeding the 50% of target by 6,829 kg).

Fane

The Fane is a relatively small catchment with the silver eel fishery located in the upper reaches of the system approximately 28 km from the coast. The Fane has a riverine wetted area of 21 ha (84 ha 2012 wetted area) and a lacustrine wetted area of 553 ha. A research silver eel fishery was carried out on the Clarebane River on the outflow of Lough Muckno in the Fane catchment since 2011. The site was at the location of a previous commercial fishery until 2008. In 2016, the fishing commenced in December following low water levels in August through to November. Only 7 nights were fished due to low water levels.

A total catch of 80kg was caught in 2016. Mark recapture was not carried out.

R. 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 was previously 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. 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.

Four nets were fished from openings on the Ballyteiglea Lock gates of the canal section of the River Barrow, upstream of Graiguenamanagh, during the silver eel season.

The Barrow location was fished for a total of 25 nights across September, October, November and December. Weather conditions led to only minor and infrequent flooding events during which silver eels could be captured and monitored. The total number of measured eels processed was 845, with a total measured catch weight of 132.9 kg (175.5 kg including batch weights).

Yellow Eel Assessment

Yellow-eel stock monitoring is integral to gaining an understanding of the current status of local stocks and for informing models of escapement, particularly within transitional waters where silver eel escapement is extremely difficult to measure directly. Such monitoring also provides a means of evaluating post-management changes and forecasting the effects of these changes on

silver eel escapement. The monitoring strategy aims to determine, at a local scale, an estimate of relative stock density, the stock's length, age and sex profiles, and the proportion of each length class that migrate as silvers each year.

2016 Survey

Yellow eel surveys took place in 7 lakes, 3 transitional waters and 1 sub-catchment of the Barrow. The lakes surveyed were Lough Corrib (Upper and Lower), Lough Conn, Lough Muckno, Lough Ramor and Loughs Feeagh and Bunaveela in Burrishoole. The transitional waters were Waterford Estuary, the Munster Blackwater Estuary and Lough Furnace (Burrishoole). A semi-quantitative electric-fishing survey was also undertaken in on the Greese River (Barrow catchment) in order to determine the extent of eel distribution in the rivers around the main channel. The standard procedure for the lake surveys was to set chains of five fyke nets joined end to end, set overnight and lifted the following morning, as described by Moriarty (1975). The sampling process in 2016 consisted of setting approximately 6-8 chains of 5 fyke nets during two or three monthly sessions of two or three nights per session.

Of the lakes sampled in 2016, Upper Lough Corrib had the highest CPUE reported of 7.51 (2,387 eels captured over 8 nights). The greatest yellow eels catches overall during the summer of 2016 were recorded at Waterford Estuary (CPUE: 22.54, 6,988 eels captured with 4,379 measured over three week survey). The Munster Blackwater Estuary presented lower catches of just 521 eels captured (449 measured, CPUE: 1.39). However, the Munster Blackwater Estuary is a far smaller waterbody (Munster Blackwater: approximately 12 km^2 in area; Waterford Estuary is over 400 km^2 in area). A survey of Lower Lough Erne showed a relatively high CPUE (16.5 eels/net/night) consistent with the 2011 and 2014 surveys. Of note in the 2016 survey was a reduction in the proportion of eels less than 40cm in length, portably reflecting poor recruitment over the last decade. Water temperatures were similar between dates of the surveys each year.

The electric-fishing carried out this year on the Greese catchment, recorded no eels on the catchment, with only 2 individuals being recorded across three other small catchments in the vicinity. It is believed that reduced eel numbers has led to reduced competition and therefore fewer eels moving into smaller tributaries of the Barrow. The majority of the population is most likely remaining in the Barrow main channel and canal were productivity is high and competition for food and habitat resources has declined.

Recruitment

The ICES 2016 working group reported that annual recruitment of glass eel to European waters in 2016 remained low at 2.7% of the 1960–1979 level in the "North Sea" series, and 10.7% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters was 21% of the 1960–1979 level. These recruitment indices are well below the 1960–1979 reference levels. In Ireland, recruitment for the 2016 season showed a general increase in the recruitment levels to Ireland in 2016 compared to 2015, particularly on the West coast. There was a marked improvement on the Shannon. However recruitment was poor on the Corrib and on the Liffey.

Monitoring of young yellow eel migrating at Parteen Weir (Shannon) takes place using a fixed brush trap. The catch increased from 301.1kg in 2015 to 854kg in 2016.

A number of significant upgrades have been made to the ESB traps in the Erne in 2015 and will be made before the 2017 season to the ESB traps on the Shannon and the IFI traps on the Feale, Maigue, Inagh and Ballysadare traps. The Liffey trap will also have a new ramp installed before 2017.

1 Introduction

1.1 EU Regulation

The EC Regulation (Council Regulation 1100/2007) for the recovery of the eel stock required Ireland to establish eel management plans for implementation in 2009. Under the EC Regulation, Ireland should monitor the eel stock, evaluate current silver eel escapement and post-evaluate implemented management actions aimed at reducing eel mortality and increasing silver eel escapement.

The Irish Eel Management Plan submitted to the EU on the 9th January 2009 and accepted by the EU in June 2009 outlined the main management actions aimed at reducing eel mortality and increasing silver eel escapement to the sea. The four main management actions were as follows;

- a cessation of the commercial eel fishery and closure of the market
- mitigation of the impact of hydropower, including a comprehensive trap and transport plan to be funded by the ESB
- to ensure upstream migration of juvenile eel at barriers
- to improve water quality

Under the EC Regulation (EC No. 1100/2007), each Member State shall report to the Commission initially every third year until 2018 and subsequently every six years. The most recent, was submitted before 30th June 2015, addressing the following;

- monitoring
- the effectiveness and outcome of the Eel Management Plans
- contemporary silver eel escapement
- non-fishery mortality
- policy regarding enhancement/stocking

1.2 Standing Scientific Committee on Eel

The Irish Eel Management Plan outlines a national programme for sampling catch and surveys of local eel stocks. Appropriate scientific assessment and monitoring by the Fisheries Boards and the Marine Institute will monitor the implementation of the plans. In the Irish plan, provision was made for the establishment of a Scientific Eel Group (SEG) which was established by the Department of Energy, Communications and Natural Resources in March 2009. The SEG in 2009 was nominated by the Dept. of Communications, Energy and Natural Resources and appointed by the Minister and comprises scientific advisers drawn from the Marine Institute (MI), Central Fisheries Board (CFB), The Loughs Agency, the Electricity Supply Board and the Agriculture, Food and Biosciences Institute for Northern Ireland (AFBINI). 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 under Section 7.5 (a) of the 2010 Inland Fisheries Act (Annex 1). The purpose of the committee is to provide independent scientific advice to guide IFI in making the management and policy decisions required to ensure the conservation and sustainable exploitation of the Ireland's eel stocks. IFI shall request the SSCE to provide an annual report on the status of Eel stocks for the purpose of advising IFI on the sustainable management of these stocks. IFI may also request the SSCE to offer scientific advice on the implications of proposed management and policy decisions on eel or seek advice on scientific matters in relation to eel. All scientific advice provided by SSCE will be considered as independent advice by IFI. Although the scientists are drawn from the agencies, the advice from the SSCE is independent of the parent agencies.

1.2.1 Terms of Reference

The EC Regulation (Council Regulation 1100/2007) for the recovery of the eel stock required Ireland to establish eel management plans for implementation in 2009. Under the EC Regulation, Ireland should monitor the eel stock, evaluate current silver eel escapement and post-evaluate implemented management actions aimed at reducing eel mortality and increasing silver eel escapement.

1. The SSCE shall carry out an appropriate assessment of eel stocks (juvenile, brown and silver) in accordance with the EU Regulation and with reference to the monitoring schedule as laid out in the National Eel Management Plan, for each Eel Management Unit and transboundary plan.

The appropriate assessment using internationally accepted best scientific practice should address the following issues:

(a) where possible update the historical silver eel production estimates
(b) estimate contemporary silver eel escapements
(c) establish and advise on biological reference points for monitoring changes in the brown eel stocks due to implementation of management actions, changes in recruitment etc.
(d) review and update long-term data series, such as annual recruitments, silver eel time series

The appropriate assessments for all fishery districts, River Basin Districts and transboundary plans shall take account different habitat types, lakes, rivers and transitional waters.

2. Oversee the updating of the national eel database and quality control of the data.

3. The SSCE shall complete and annual scientific assessment of the implementation of the management measures identified in the National EMP.
   These should include:
   a) Level of fishing, including IUU fishing (illegal, unreported, unregulated)
   b) Escapement estimates for Erne & Shannon
   c) Turbine mortalities and bypass efficiencies
   d) Quantities of silver eels trapped and transported on the Erne, Shannon & Lee
   e) Evaluation of the quality of the released silver eels
   f) Improvements to upstream migration
   g) Reviewing water quality indices collated under the Water Framework Directive

4. Update the national stock assessment framework in line with EU reporting requirements on an annual basis and assess the level of contemporary silver eel escapement with respect to the EU 40% target. Use a framework to facilitate extrapolation from data rich catchments to those with little or no data.

5. Assess possible stocking strategies as a useful tool to aid in the recovery of the stock. Where appropriate include the stocking option as an input to the stock assessment framework.

6. Compile an annual stock assessment and scientific advice report at the end of each year.

1.3 Meeting Activities

The SSCE met four times in 2016/2017 to monitor and report on the 2016 survey year and to prepare for the 2018 reporting to the EU on the progress in implementation of the EMPs;

10th February 2016	Galway
14th April 2016	Ballyshannon
30th January 2017	Galway
8th May 2017	Ballyshannon

2 International Advice from ICES

2.1 Introduction to ICES Advice

The International Council for Exploration of the Seas (ICES) is the prime source of scientific advice on the marine ecosystem to governments and international regulatory bodies that manage the North Atlantic Ocean and adjacent seas. The ICES Council has delegated its advisory authority to the Advisory Committee or ACOM. ACOM has established the mechanisms necessary to prepare and disseminate advice subject to a protocol satisfying the following criteria:

Objectivity and integrity;
Openness and transparency;
Quality assurance and peer review;
Integrated advice – based on an ecosystem approach;
Efficiency and flexibility;
National consensus;

Therefore, ACOM is the sole competent body in ICES for scientific advice in support of the management of coastal and ocean resources and ecosystems. It designs strategies and processes for preparation of advice, manage advisory processes, and create and deliver advice, subject to direction from the Council. The content of scientific advice is solely ACOM's responsibility not subject to modification by any other ICES entity. ACOM has one member from each member country under the direction of an independent chair appointed by the Council ACOM works on the basis of scientific analysis prepared in the ICES expert groups and the advisory process include peer review of the analysis before it can be used as basis for the advice. In the case of eel, the relevant expert group is the Joint EIFAAC/ICES/GFCM Working Group on Eel (WGEEL).

2.2 ICES Advice on Eel 2016

9.3.8 European Eel throughout its natural range (reproduced from the *ICES Advice 2016, Book 9) (October 2016)*

Advice

ICES advises that when the precautionary approach is applied for European eel, all anthropogenic impacts (e.g. recreational and commercial fishing on all stages, hydropower, pumping stations, and pollution) decreasing production and escapement of silver eels should be reduced to – or kept as close to – zero as possible.

Stock status

The status of eel remains critical.

The annual recruitment of glass eel to European waters in 2016 remained low at 2.7% of the 1960–1979 level in the "North Sea" series, and 10.7% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters was 21% of the 1960–1979 level. These recruitment indices are well below the 1960–1979 reference levels, and there is no change in the perception of the status of the stock.

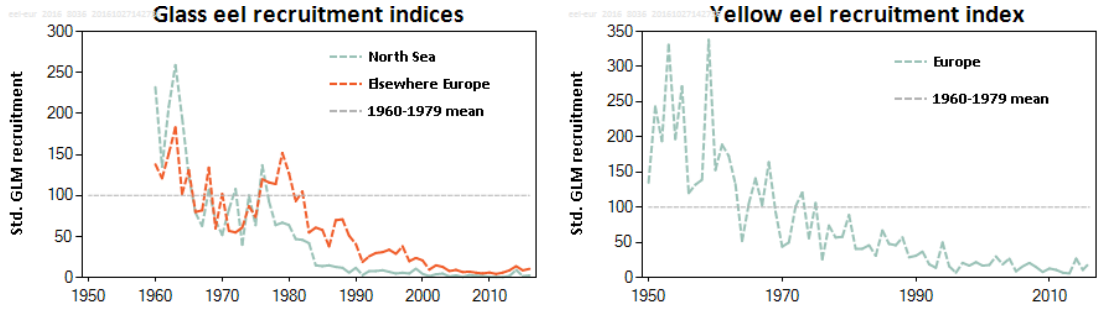


Figure 9.3.8.1: European eel. Left panel: Recruitment indices, geometric mean of estimated (GLM) glass eel recruitment for the continental North Sea and "Elsewhere Europe" series. The GLM (recruit ~ area:year + site) was fitted to 40 time-series, comprising either pure glass eel or a mixture of glass eels and yellow eels and scaled to the 1960–1979 geometric mean. The "North Sea" series are from Norway, Sweden, Germany, Denmark, the Netherlands, and Belgium. The "Elsewhere" series are from UK, Ireland, France, Spain, Portugal, and Italy. Right panel: Geometric mean of estimated (GLM) yellow eel recruitment and smoothed trends for Europe. The GLM (recruit ~ year + site) was fitted to 12 yellow eel time-series and scaled to the 1960–1979 arithmetic mean.

Stock and Exploitation Status

Table 9.3.8.1 European eel. State of the stock and fishery relative to reference points.

		Fishing pressure					Stock size			
		2014	2015	2016			2014	2015	2016	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	$B_{trigger}$	?	?	?	Undefined
Precautionary approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{pa}, B_{lim}	?	?	?	Undefined
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable
Qualitative evaluation	-	?	?	?	Undefined	Recruit-ment	→	→	→	Highly impaired recruitment

Catch Options

Total landings and effort data are incomplete; therefore, ICES does not have the information needed to provide a reliable estimate of total catches of eel. Furthermore, the understanding of the stock dynamic relationship is not sufficient to determine/estimate the impact any catch above zero (at glass, yellow, or silver eel stage) would have on the reproductive capacity of the stock.

Basis of the Advice

The basis for the advice is the Precautionary Approach.

A management framework for eel within the EU was established in 2007 through an EU regulation (EC Regulation No. 1100/2007; EC, 2007), but there is no internationally coordinated management plan for the entire stock area, which extends beyond the EU. The objective of the EU regulation is the protection, recovery, and sustainable use of the stock. To achieve the objective, EU Member States have developed eel management plans (EMPs) for their river basin districts, designed to allow at least 40% of the silver eel biomass to escape to the sea with high probability, relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock. ICES has evaluated the conformity of the national management plans with EC Regulation No. 1100/2007 (ICES, 2009, 2010) and progress in implementing EMP actions (ICES, 2013). The EU Member States produced progress reports in 2012 and 2015. The 2015 reports have not been evaluated by ICES at the time of writing this advice.

The EU Regulation "Recovery plan" has not been evaluated by ICES for its conformity with the precautionary approach and has for this reason not been used as the basis for the advice.

Quality of the Assessment

The advice is based on two glass eel recruitment indices and a yellow eel recruitment index. The indices are based on data from fisheries and scientific surveys, forming the longest and most reliable time-series that constitute an index of abundance. The current advice is based on the fact that the indices used by ICES are still well below the 1960–1979 levels.

Total landings and effort data are incomplete. There is a great heterogeneity among the time-series of landings because of inconsistencies in reporting by, and between, countries, as well as incomplete reporting. Changes in management practices have also affected the reporting of non-commercial and recreational fisheries.

Issues relevant for the advice

In September 2008, and again in 2014, eel was listed in the IUCN Red List as a critically endangered species.

The assessment and management of the fisheries and non-fisheries mortality factors are carried out by national and regional authorities. Fisheries take place on all available continental life stages throughout the distribution area, although fishing pressure varies from area to area, from almost nil to heavy overexploitation. Illegal, unreported, and unregulated (IUU) fishing is believed to occur. The non-fishing anthropogenic mortality factors can be grouped as those due to (a) hydropower, pumping stations, and other water intakes; (b) habitat loss or degradation; and (c) pollution, diseases, and parasites. In addition, anthropogenic actions may affect predation mortality, e.g. conservation or culling of predators.

Impacts on the environment in transitional and fresh waters, which include habitat alteration, barriers to eel passage, deterioration in water quality, and presence of non-native diseases and parasites, all contribute to the anthropogenic stresses and mortality on eels and also affect their reproductive success. It is anticipated that the implementation of the Water Framework (WFD) and the Marine Strategy Framework (MSFD) directives may result in improvements to the continental environment and that this may have a positive effect on the reproductive potential of silver eel.

ICES notes that stocking of eels is a management action in many eel management plans, and that this stocking is reliant on a glass eel fishery catch. There is evidence that translocated and stocked eel can contribute to yellow and silver eel production in recipient waters, but evidence of contribution to actual spawning is missing due to the general lack of knowledge of the spawning of any eel. Internationally coordinated research is required to determine the net benefit of restocking on the overall population, including carrying capacity estimates of glass eel source estuaries as well as detailed mortality estimates at each step of the stocking process.

When stocking to increase silver eel escapement and thus aid stock recovery, an estimation of the prospective net benefit should be made prior to any stocking activity. Where eel are translocated and stocked, measures should be taken to evaluate their fate and their contribution to silver eel escapement. Such measures could be batch marking of eel to distinguish groups recovered in later surveys (e.g. recent Swedish, French, and UK marking programmes), or implementing tracking studies of eel of known origin. Marking programmes should be regionally coordinated.

A management framework for eel within the EU was established in 2007 through an EU regulation (EC Regulation No. 1100/2007; EC, 2007), but there is no internationally coordinated management plan for the whole stock area.

The framework required EU Member States to report on progress in 2012 and 2015. In 2012, many EU Member States did not completely report stock indicators (22 of 81 EMPs did not report all biomass indicators, and 38 did not report all mortality indicators), and there are differences in the approaches used to calculate reported stock indicators. A complete reporting of verified indicators covering the distribution area of the European eel is required for a full assessment of the stock. The 2015 reports have not been evaluated by ICES.

Reference Points

The EC Regulation sets an escapement limit of at least 40% of the silver eel biomass relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock.

Recruitment at the 1960–1979 level is regarded as an unimpaired recruitment level.

ICES has advised the EU CITES Scientific Review Group on reference points for the eel stock that could be used in developing, and reviewing, an application for a non-detriment finding (NDF), under circumstances of any future improvement of the stock (ICES, 2015). These reference points were developed specifically using CITES guiding principles for NDF.

Basis for the assessment

Table 9.3.8.3 European eel. Basis of the assessment.

ICES stock data category	3 (ICES, 2016a).
Assessment type	Trend analysis.
Input data	Glass eel and yellow eel recruitment indices.
Discards and bycatch	Not included.
Indicators	None.
Other information	Landing statistics are incomplete and reporting inconsistent. Stock indicators are incomplete from eel management units/countries in the EU. Stock indicators and other data are missing from non-EU states. There is no international legislative requirement to collect and provide data for the entire stock area.
Working group	Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL; ICES, 2016b).

Information from stakeholders

Data on recruitment collected by stakeholders are included in the assessment where appropriate.

History of advice, catch and management

Table 9.3.8.4 European eel. History of ICES advice.

Year	ICES advice*	Predicted catch corresponding to the advice*	TAC*	ICES catch** Total
1999	A recovery plan	-		
2000	No fishery and a recovery plan	0	-	-
2001	-	-	-	-
2002	No fishery and a recovery plan	0	-	-
2003	All anthropogenic mortality as close to zero as possible and a recovery plan	-	-	-
2004	-	-	-	-
2005	-	-	-	
2006	All anthropogenic mortality as close to zero as possible and a recovery plan	-	-	-
2007	All anthropogenic mortality as close to zero as possible and a recovery plan	-	-	-
2008	All anthropogenic mortality as close to zero as possible.	-	-	-
2009	All anthropogenic mortality as close to zero as possible.	-	-	-
2010	All anthropogenic mortality as close to zero as possible.	-	-	-
2011	All anthropogenic mortality as close to zero as possible.	-	-	-
2012	All anthropogenic mortality as close to zero as possible.	-	-	-
2013	All anthropogenic mortality as close to zero as possible.	-	-	-
2014	All anthropogenic mortality as close to zero as possible.	-	-	-
2015	All anthropogenic mortality as close to zero as possible.	-	-	-
2016	All anthropogenic mortality as close to zero as possible.	-	-	-
2017	All anthropogenic impacts as close to zero as possible.	-	-	-

* No TAC ever for this stock.
** Catch estimates were considered too incomplete to be presented.

History of catch and landings

Catch data were considered too incomplete to be presented.

Summary of the assessment

Table 9.3.8.5 European eel. Recruitment indices, geometric means of estimated (GLM) recruitment for glass eel in the continental North Sea and "Elsewhere Europe", and yellow eel in Europe. The glass eel GLM (recruit ~ area:year + site) was fitted to 40 time-series, comprising either pure glass eel or a mixture of glass eels and yellow eels and scaled to the 1960–1979 geometric mean. The yellow eel GLM (recruit ~ year + site) was fitted to 12 yellow eel time-series and scaled to the 1960–1979 arithmetic mean.

Year	Glass eel recruitment		Yellow eel recruitment
	Elsewhere Europe	North Sea	Europe
1950			135
1951			243
1952			194
1953			331
1954			197
1955			272
1956			120
1957			132
1958			139
1959			338
1960	138	232	153
1961	121	135	189
1962	151	208	173
1963	183	259	133
1964	102	195	52
1965	131	124	105
1966	80	79	141
1967	82	63	103
1968	134	107	164
1969	60	70	94
1970	102	52	44
1971	57	83	50
1972	55	108	101
1973	61	40	121
1974	87	100	56
1975	74	64	106
1976	120	137	26
1977	116	93	74
1978	114	64	57
1979	152	67	58
1980	127	64	89
1981	93	47	41
1982	105	46	41
1983	55	42	46
1984	61	15	31
1985	58	14	67
1986	38	15	48
1987	70	13	46
1988	71	12	57
1989	51	6	29
1990	41	12	31
1991	19	3	37
1992	26	8	19
1993	30	8	14
1994	31	9	50

Year	Glass eel recruitment		Yellow eel recruitment
	Elsewhere Europe	North Sea	Europe
1995	34	7	16
1996	29	5	7
1997	38	6	21
1998	20	5	17
1999	24	11	22
2000	20.9	4.5	17
2001	9.8	1.8	18
2002	15	4	30
2003	13.1	4.9	19
2004	8	1.4	27
2005	9.4	2.8	9
2006	6.7	0.8	16
2007	7.3	3.2	21
2008	6	2.1	15
2009	5.1	2.1	8
2010	6.2	0.9	13
2011	4.5	0.9	11
2012	6.1	0.7	7
2013	8.9	2	6
2014	13.9	9.4	27
2015	8.8	1.7	11
2016	10.7	2.7	21

Sources and references

EC. 2007. COUNCIL REGULATION (EC) No. 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel. Official Journal of the European Union, L 248/17.

http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R1100&from=EN.

ICES. 2009. European eel. *In* Report of the ICES Advisory Committee, 2009. ICES Advice 2009, Book 9, Section 9.4.9.

ICES. 2010. European eel. *In* Report of the ICES Advisory Committee, 2010. ICES Advice 2010, Book 9, Section 9.4.9.

ICES. 2013. European eel. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 9, Section 9.4.7.

ICES. 2015. EU request on criteria for CITES non-detriment finding for European eel (*Anguilla anguilla*). *In* Report of the ICES Advisory Committee, 2015. ICES Advice 2015, Book 9, Section 9.2.3.2.

ICES. 2016a. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

ICES. 2016b. Report of the Working Group on Eels (WGEEL), 15–22 September 2016, Cordoba, Spain. ICES CM 2016/ACOM:19. 106 pp.

3 National Advice

There were no requests for advice in 2016.

Russell Poole gave a presentation to a fishery workshop in Athlone on the 1st April 2016, convened by local political representatives.

Russell Poole, Ciara O'Leary, Dennis Doherty and Kieran McCarthy attended a session of the Shannon Fishery Partnership Committee on the 2nd February 2017.

4 Management Actions – a scientific assessment

4.1 Introduction

There are four main management actions included in the Irish Eel Management Plans aimed at reducing eel mortality and increasing silver eel escapement in Irish waters. These are a cessation of the commercial eel fishery and closure of the market, mitigation of the impact of hydropower, including a comprehensive silver eel trap and transport plan, ensure upstream migration of juvenile eel at barriers and improve water quality including fish health and biosecurity issues.

Every three years, each Member State must submit details of;

- monitoring,
- effectiveness and outcome of Eel Management Plans
- contemporary silver eel escapement
- non-fishery mortality
- Policy regarding enhancement/stocking

4.2 Management Action No. 1 Reduction of fishery to achieve EU target

4.2.1 Introduction

The target set for the Irish Eel Management Plan 2012-2014 was to have zero fishing mortality and reduce illegal capture and trade to as near zero as possible.
In May of 2009 Eamon Ryan, Minister for Communications, Energy and Natural Resources passed two Bye laws closing the commercial and recreational eel fishery in Ireland. The byelaw which prohibited the issuing of licenses was continued. However, on expiry of Bye law C.S. 312 of 2012, a new byelaw was required to prohibit the fishing for eel, or possessing or selling eel caught in a Fishery District in the State for a further period until June 2018.

- Bye-Law No 858, 2009 prohibits the issue of eel fishing licences by the regional fisheries boards in any Fishery District.
- Bye-law No C.S. 303, 2009 prohibits fishing for eel, or possessing or selling eel caught in a Fishery District in the State until June 2012. (revoked).
- Bye-law No C.S. 312, 2012 prohibits fishing for eel, or possessing or selling eel caught in a Fishery District in the State until June 2015. (revoked).
- Bye-law No C.S. 312, 2015 prohibits fishing for eel, or possessing or selling eel caught in a Fishery District in the State until June 2018.

It should be noted that since EU Commission ratification of the Ireland/UK NWIRBD transboundary plan in March 2010, the fishery in the NI portion of the Erne was closed from April 2010.

Following a public consultation in June 2015, Minister McHugh signed a new byelaw (C.S. 319/2015) on the 23rd November 2015 prohibiting fishing for eel, or the possession or sale of eel caught in Ireland (Annex 2).

4.2.2 Action 1a: Report closure of fishery

All management regions confirmed a closure of the eel fishery for the 2016 season with no commercial or recreational licences issued (Annex 3). In the transboundary region, there were no licences issued and no legal fishery in the Foyle and Carlingford areas in 2016.

The eel fishery, with the exception of the strictly managed L. Neagh, also remained closed in N. Ireland in 2016.

4.2.3 Reports of illegal fishing activity

Ireland:

For the complete modelling of silver eel escapement, information is required on the levels of illegal fishing and illegal catch. Therefore, this information is required on an annual basis. A questionnaire was circulated to the IFI Regions and the Loughs Agency (Annex 3: Table 4.1).

Some illegal fishing was reported which led to some seizures of gear in the Shannon IRBD, the South East RBD and the Western RBD (Table 4.1).

No seizures of eel dealers transport trucks have been reported and no illegal activity was reported in relation to the silver eel trap and transport programmes. It is likely, however, that some illicit eel sales may have occurred in the Shannon IRBD given the level of seizures of gear mentioned previously.

The poor quality of the export data currently available to the SSCE makes it difficult to determine the level of illegal catch. There were no instances of seizures of illegal or undocumented eel shipments.

Transboundary:

No illegal activity was reported for the areas of the NWIRBD and Carlingford under the jurisdiction of the Loughs Agency.

No other information was available at report time.

4.2.4 Action 1b: Recreational Fishery

The legislation prohibits the possession of eel caught in Ireland and this extends to cover recreational angling. There was no legal recreational catch and rod angling for eel. Bycatch during angling for other species was on a catch and release basis, although the level of damage and mortality of released eels is unknown but could be high.

4.2.5 Action 1c: Diversification of the Fishery

The Department of Communications, Climate Action and Environment tasked Inland Fisheries Ireland with setting up a network of scientific eel fisheries in collaboration with the former eel fishermen. A number of key locations were earmarked for surveys and a tender process was initiated with applications from interested parties. In 2016 a series of yellow eel surveys were carried out in 5 lakes (Upper and Lower Lough Corrib, Lough Conn, Lough Ramor and Lough Muckno) and 2 transitional waters (Waterford Harbour and Munster Blackwater). To date the programme also consists of an elver monitoring survey and a silver eel fishery on the River Boyne and a glass eel survey of the Shannon Estuary. The purpose of the scientific fisheries is to increase the data and knowledge of eel in Ireland ahead of the 2018 EU review of our national eel management plan.

Table 4-1: Details of illegal activity within the regions and transboundary Northern Ireland, 2016.

	ERBD	LOUGHS AGENCY RoI/NI	NWRBD	SHRBD	SERBD	SWRBD	WRBD
Silver T&T programme	No	No	Yes	Yes	No	Yes	No
Illegal trading related to T&T	No	No	No	No.	No	No	No
Estimated level of illegal fishing	None coarse fishing bycatch	None	None	Medium (L. Allen, Ree, Derg, R. Inny, East Clare)	None	Low	Low
Number of gear seizures	0 (40 IFI survey nets stolen)	0	0	10	0	1	2
Gear types seized	-	-	-	~ 39 Fykes, 45 night & longlines (1440m)	-	1 Eel Pot	8 fyke nets
Number of eel dealer interceptions	0	0	0	0	0	0	0
Estimated tonnage on board:	-	-	-	-	-	-	-
Declared origin of cargos:	-	-	-	-	-	-	-

4.3 Management Action No. 2. Mitigation of hydropower

4.3.1 Action 2a: Trap and Transport

The targets were set for the trap and transport system in the Irish Eel Management Plan 2009-2011 and these were subsequently modified, following the experience of the three year programme, for the 2012-2014 and 2015-2017 periods as follows:

***Shannon*:** Trap and transport 30% of the annual production (unchanged)

***Erne*:** Trap and transport 50% of the annual silver eel production. A rolling target based on a 3-year basis allowing shortfalls in one year to be made up the following year. A consistent longterm shortfall could not be carried forward indefinitely.

***Lee*:** Trap and transport 500kg of the annual escapement (unchanged)

4.3.1.1 2016 Trap and Transport Results

The total amounts of silver eel trapped and transported in each of the three rivers in 2016 are presented in Table 4.3. The separate detail sheets of the amounts transported from each site on each date are presented as an annex to this report (Annex 4).

In the **River Shannon** the trap and transport total of 16,711kg represented 43.28% of silver eel production (using the escapement estimated adjusted to account for nights not fished) and, therefore, exceeded the 30% target, the EMP requirement was met on the basis of the agreed (3 year rolling mean value) protocol.

In the **River Erne**, the trap and transport annual target (50% of silver eel production) for the River Erne was exceeded in the 2016 season. The quantity (38,264 kg) transported for safe release at Ballyshannon represented 60.9% of the estimated silver eel production (62,871kg) for the river system for the season.

In the **River Lee**, in the 2016/17 season the contracted fishing crew was operating on Inniscarra Reservoir in early September. A total of 40 nets were set in ten locations (Fig. 4.1) on the 2nd and lifted after 7 nights on the 9th September (Detail catch distribution in Table 4.2). The total catch was 43.5 kg and did not reach the annual target of 500 kg. The entire catch was observed and measured (N=150). A total of 134 (89.3%) eels were described as potential spawners, 101 of which were females (75.4%). The size frequency distribution is compared with previous years in Figure 4.2.

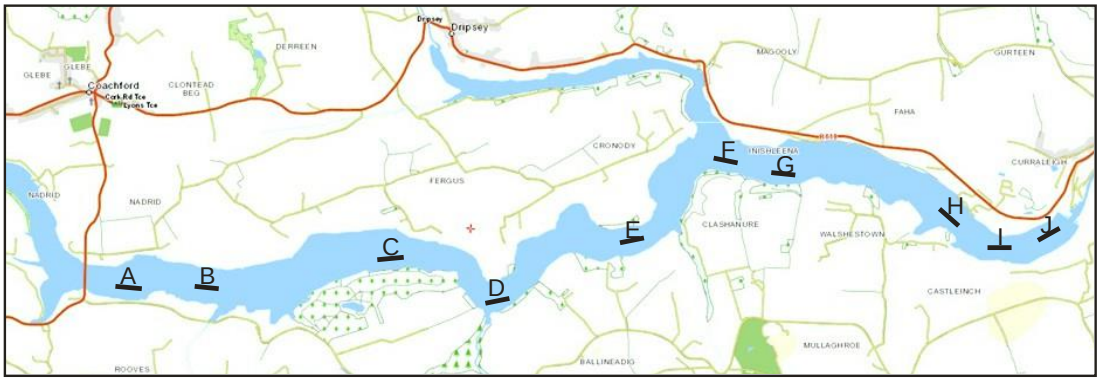


Figure 4-1: Map of fishing sites at Inniscarra Reservoir in 2016/17 season.

Table 4-2: Detail catch distribution in Inniscarra Reservoir in 2016/17 season (fisherman report).

Site	Number of nets	Catch [kg]
A	3	3
B	3	3
C	3	4
D	3	3
E	3	2
F	5	7
G	5	4
H	5	5
I	5	8
J	5	7
N=10	**40**	**46**

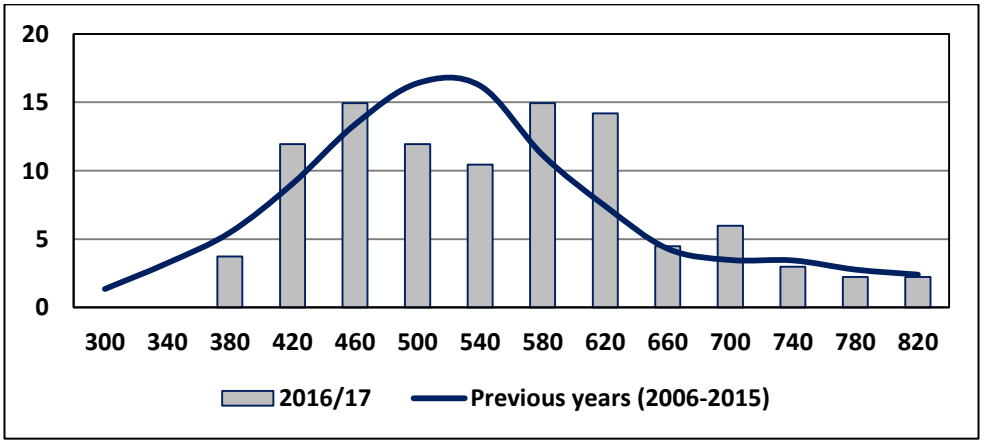


Figure 4-2: Relative size frequency distribution of Inniscarra Reservoir eel.

Table 4-3: Total amounts (t) of silver eel trapped and transported in the Shannon, Erne and Lee, 2009-2016, and the success relative to the targets set in the EMPs. Note change of target on the Erne in 2012.

Catchment	Year	T&T Target	Amount Transported (kg)	Relation to target	Status	3 yr Running Average
R. Shannon	2009	30% of run	23,730	31%	Achieved	31%
R. Shannon	2010	30% of run	27,768	40%	Achieved	36%
R. Shannon	2011	30% of run	25,680	39%	Achieved	37%
R. Shannon	2012	30% of run	24,228	36%	Achieved	38%
R. Shannon	2013	30% of run	22,561	28%	Not achieved	34%
R. Shannon	2014	30% of run	26,438	37%	Achieved	34%
R. Shannon	2015	30% of run	19,957	28%	Flood estimate	31%
R. Shannon	2016	30% of run	16,711	43%	Achieved	36%
R. Erne	2009	22t	9,383	43%	Not achieved	
R. Erne	2010	34t	19,334	57%	Not achieved	47%
R. Erne	2011	39t	25,405	65%	Not achieved	59%
R. Erne	2012	50% of run	34,660	51%	Achieved	51%
R. Erne	2013	50% of run	39,319	54%	Achieved	53%
R. Erne	2014	50% of run	48,126	66%	Achieved	57%[1]
R. Erne	2015	50% of run	43,706	56%	Achieved	59%
R. Erne	2016	50% of run	38,264	61%	Not achieved	61%
R. Lee	2009	0.5t	79	16%	Not achieved	16%
R. Lee	2010	0.5t	278	56%	Not achieved	36%
R. Lee	2011	0.5t	731	146%	Achieved	73%
R. Lee	2012	0.5t	230	46%	Not achieved	83%
R. Lee	2013	0.5t	824	165%	Achieved	119%
R. Lee	2014	0.5t	670	134%	Achieved	115%
R. Lee	2015	0.5t	527	105%	Achieved	135%
R. Lee	2016	0.5t	44	9%	Not achieved	83%

[1] The rolling average was calculated excluding 11,000kg set aside for elver mortality mitigation.

4.3.2 Action 2b: Quantify Turbine Mortality

4.3.2.1 Shannon

The unusually high discharge conditions in the River Shannon during the 2015/16 period of silver eel migration presented problems in estimation of spawner production and escapement. Attempts were made, using Didson surveys at Clonlara, to correct for missing data during the period when fishing could not be undertaken at Killaloe eel weir. However, due to equipment failure associated with local power outages, this was not technically possible.

In the 2016/17 season the estimated silver eel mortality at the Ardnacrusha dam was 3,062kg (21.15% HPS passage rate). The discharge conditions were exceptionally low, with very low flow in the old River Shannon channel. The estimates of both silver eel production and escapement were much lower than normal and the peak period of migration was later than has been recorded in recent decades.

Taking into account some interrupted fishing days, more appropriate production and escapement estimates were calculated which would infer a an estimated silver eel mortality of 3,897kg at Ardnacrusha (see chapter 5.2.2 for full explanation).

4.3.2.2 Erne

During the 2016/17 silver eel migration season the discharge in the lower River Erne was exceptionally low. This impacted directly on the pattern of silver eel migration, causing seasonal delays, and indirectly via the pattern of hydropower generation at the two dams. Nocturnal electricity generation was frequently interrupted due to low water levels, as well as an increasing reliance on wind generation for electricity supply to the national grid. Spillage levels were very low for the entire 2016/17 season.

For the 2016/17 season mortality rates applies as follows: ***Cliff HPS*** 0% (no flow or only spillage); 7.9% (Generation plus spillage) and 26.7% (Only generation), ***Cathaleen's Fall HPS***: 0% (no flow or only spillage); 7.7% (spillage plus half generation load); 15.4% spillage plus full generation load); 27.3% (only generation). It was estimated that the cumulative mortality represented 18.3% mortality of the total River Erne silver eel production or 46.7% of the migrating eels reaching the dams during the season. Estimated mortality at the dams was 11,494kg in 2016/'17 calculated using the cumulative mark/recapture method, or 8,204kg when calculated using four individual mark-recapture experiments (see chapter 5.4.2 for full explanation).

4.3.3 Action 2c: Engineered Solution

Difficulties are increasingly arising in estimation of numbers and biomass of silver eels migrating downstream towards the hydropower stations on the Rivers Erne and Shannon. The significant changes in discharge patterns, that are apparently associated with changing weather conditions, affect seasonality of eel migration. Likewise, with the advent of greatly increased inputs from wind power generation the seasonal and 24hr patterns of hydropower station activity have changed and become much less predictable. For these reasons, research is now focused on alternative silver eel monitoring protocols and on potential use of deflection technologies in new eel conservation measures.

4.4 Management Actions No. 3. Ensure upstream migration at 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. To date a number of projects have been undertaken to assess structures in our rivers examples include the Wicklow Bridges Project, Shannon Barriers Project, studies in the Nore catchment and Monaghan county. IFI is also involved in the Interreg funded AMBER project, **A**daptive **M**anagement of **B**arriers in **E**uropean **R**ivers. This project seeks to raise awareness of the problems posed by stream fragmentation, the pressures on freshwater ecosystems and the need for innovative solutions.

An initial desk study is carried out on a selected catchment using geographical information systems (GIS) with digital 6" maps highlighting potential weirs marked on the map, aerial photographs and satellites imagery are used to confirm the presence or absence of structures. This is followed up by snapping the road network with the river channel so each time a river and road intercept a point is created. This exercise results in a large number of points for a catchment that are then ground truthed in the field. Ground truthing involves walking stretches of a river and its tributaries to determine if the potential barriers identified in the desk study from maps and aerial photographs are indeed barriers to fish. Each barrier undergoes an initial assessment with a number of key measurements taken. If deemed a substantial barrier, it then undergoes a more indepth SNIFFER assessment, and is assessed in terms of removal, or mitigation in some form to allow future ease of passage for fish species.

4.4.1 Action 3a: Existing barriers (inc. small weirs etc.)

4.4.1.1 Update on Key Eel Catchments

In 2011, a desktop study by the EMP highlighted potential barriers in the lower 20kms of key eel catchments. A total of 126 potential barriers were located. Through the barrier assessment work currently carried out by IFI, a total of 27 of those barriers have been examined and assessed as obstacles to date (c. 21%), (Table 4.4). In the case of the Boyne, 14 out of 17 sites identified by EMP have been assessed (82%). And, on the Barrow 12 out of 24 have been assessed as barriers (50%).

4.4.1.2 IFI Barrier mitigation work to 2016

As of the end of 2016 approximately 1,686 structures have been assessed and identified as barriers in our river systems with many more potential structures ruled out. Table 4.5 highlights the proportion of barriers identified per river basin district and Figure 4.3 displays where those assessed barriers are located, and where they fall into key eel catchments.

In 2017, barriers will continue to be assessed both on a regional scale (RBD's) and national scale (AMBER).

Table 4-4: Number of barriers highlighted by EMP desktop study 2011 in the lower 20kms, and the numbers of those currently assessed by barrier programme.

District	Name	RBD	EMU	Prod kgs	Number of potential obstacles	Number of obstacles assessed
Limerick	Shannon (River)	SHIRBD	SHIRBD	207,019	30	2
Ballyshannon	Erne (RoI NI)	NWIRBD	NWIRBD	107,388	2	2
Galway	Corrib (River)	WRBD	WRBD	105,700	2	0
Ballina	Moy (River)	WRBD	WRBD	46,445	1	0
Drogheda	Boyne (River)	ERBD	EEMU	11,997	17	14
Ballyshannon	Drowes (River)	NWIRBD	NWIRBD	11,587	5	0
Kerry	Laune (River)	SWRBD	SWRBD	11,522	4	0
Dublin	Liffey (River)	ERBD	EEMU	11,121	12	1
Sligo	Garvogue (River)	WRBD	WRBD	9,609	5	3
Sligo	Ballysadare (River)	WRBD	WRBD	8,513	2	0
Waterford	Suir (River)	SERBD	SERBD	5,303	3	1
Loughs Agency	Foyle (RoI NI)	NWIRBD	NWIRBD	5,295	2	0
Bangor	Owenmore (River)	WRBD	WRBD	4,559	2	0
Waterford	Nore (River)	SERBD	SERBD	4,234	0*	0
Waterford	Barrow (River)	SERBD	SERBD	4,040	24	12
Lismore	Blackwater (River)	SWRBD	SWRBD	3,953	1	1
Limerick	Fergus (River)	SHIRBD	SHIRBD	3,712	5	1
Cork	Lee (River)	SWRBD	SWRBD	3,438	4	4
Connemara	Ballynahinch (River)	WRBD	WRBD	3,211	2	0
Kerry	Currane (River)	SWRBD	SWRBD	3,208	3	0

* One impassable barrier located downstream of the high water mark think it should be on tributary and not on main channel but point not snapped to wetted area.

Number of Obstacles Assessed marked as "0" means that the potential obstacles were either not assessed or were assessed and not deemed to be barriers on inspection, this distinction is not captured in the existing file and requires further investigation.

Table 4-5: Number of barriers to fish species identified in RBD's

River Basin District	Number of catchments accessed	Number of structures accessed
Eastern	9	322
South Eastern	12	758
South Western	12	76
Shannon	10	216
West	20	170
North Western	19	60
Neagh Bann	4	84
Total	**86**	**1686**

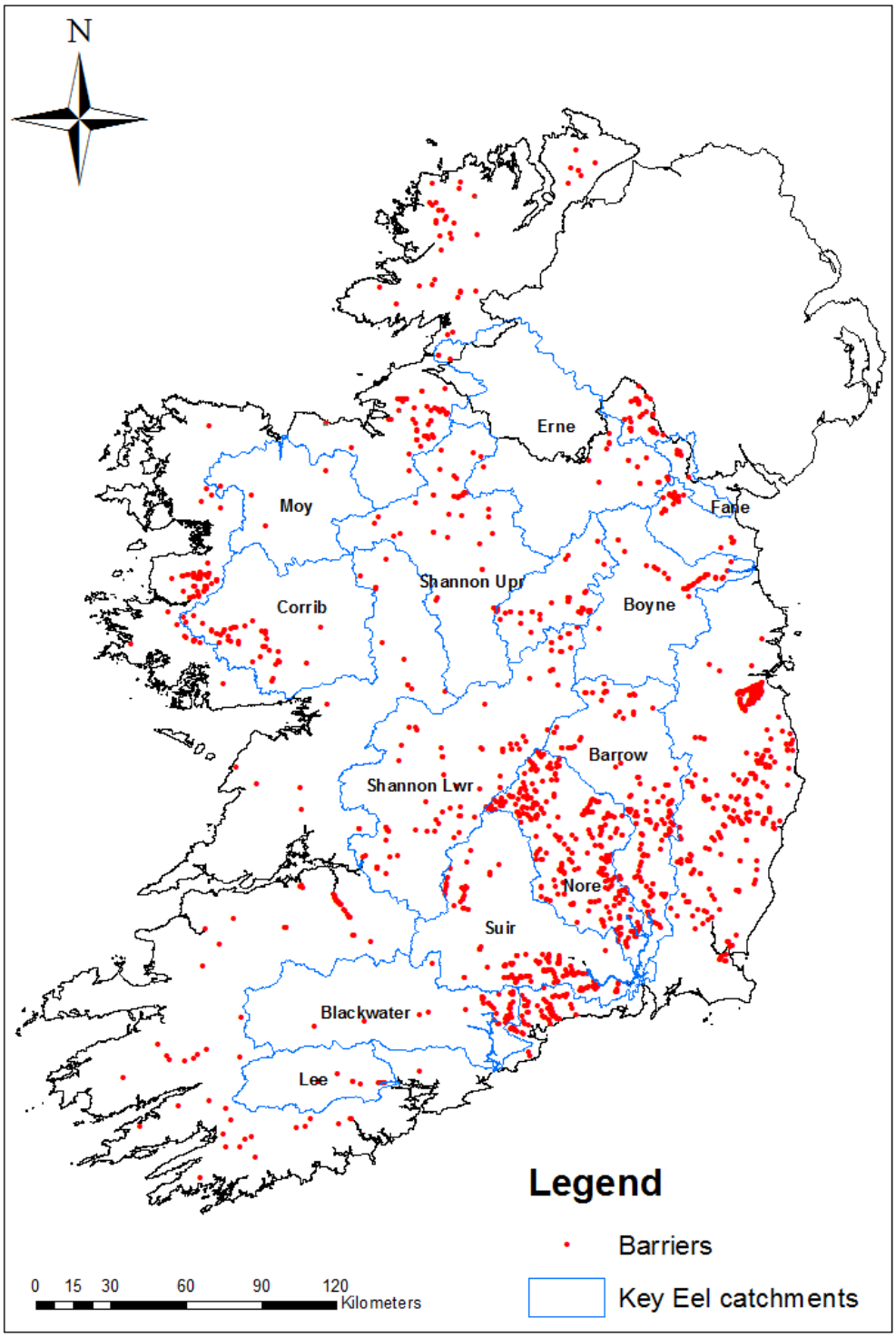


Figure 4-3: Map detailing the locations of all currently identified and assessed barriers in Ireland.

4.4.2 Action 3b: New potential barriers

There is no new information since the 2012 report, '*Guidelines for Small Scale Hydro Schemes*'.

4.4.3 Action 3c: Assisted migration and stocking

Assisted upstream migration takes place at the ESB Hydropower Stations on the Shannon (Ardnacrusha, Parteen), Erne (Cathaleens Fall), Liffey and Lee. This has been a long-term objective to mitigate against the blockage of the HPSs under ESB Legislation (Sec 8, 1935). On the Erne and Shannon, elvers and bootlace eel are transported upstream from the fixed elver traps. These programmes outlined in the EMP were continued in 2016. The catches shown in Tables 7.1-7.2 were transported upstream. On the Erne, the distribution of elvers throughout the catchment is by cross-border agreement between the ESB, IFI and DCAL.

4.5 Management Action No. 4 Improve water quality

4.5.1 General water quality – Compliance with the Water Framework Directive

The improvement of water quality in Ireland is primarily being dealt with under the workprogramme for the implementation of the Water Framework Directive (WFD). The objective of the Water Framework Directive (WFD) is to protect all high status waters, prevent further deterioration of all waters and to restore degraded surface and ground waters to good status by 2015 (www.wfdireland.ie). The first cycle of the WFD ran from 2009 – 2015, and the second cycle runs from 2016-2021 (www.catchments.ie). National regulations for implementing the directive were put in place in 2003. A major monitoring programme began in Dec 2006, to inform the first cycle of the WFD. The WFD reporting and monitoring runs on a six year cycle. A detailed report on the results of the first cycle of WFD monitoring is not available to date (mid 2017). In the interim period, the Environmental Protection Agency (EPA) compile statistics on water quality in Ireland, the most recent of which covers the period 2010-2012 (Bradley *et al*., 2015). For that period, 53% of rivers, 43% of lakes, 45% of transitional waters, 93% of coastal waters and 99% of groundwater were satisfactory at good or high status. Rivers monitored, using the biological Q value scheme, were in high or good condition along 73% of the monitored river channels. This was up 4% from the last monitoring period (2007-2009), and includes an overall increase in high status sites. Serious pollution of rivers reduced to 17 km from 53 km since last reporting period. There was a 5% reduction (10 lakes) in the high or good status categories, and a corresponding increase in the moderate or worse status category compared to 2007-2009.

Before the publication of the interim reports, much of the monitoring data is available through the www.catchments.ie data portal, including the monitoring data for the period 2010-2015. The extended results for the period 2010-2015 are roughly similar to those reported for 2010-2012 (Bradley *et al*., 2015). Most rivers, lakes and coastal waters are classified as having good status, and most transitional waters are classified as moderate (Table 4.6, Fig. 4.4). The results from 2010-2015 are fairly similar to those recorded in 2007-2009, with 45% of surface waters being classified as having good ecological status (Table 4.7, Fig. 4.5).

The Irish EPA data (summarised above) refer to waterbodies within seven RBD's (Eastern, Neagh Bann, North Western, South Eastern, Shannon, South Western, Western). The Neagh Bann, Shannon and North western RBD's are transboundary, in that there are portions of them in Northern Ireland. Only a very small portion of the Shannon RBD is in Northern Ireland, while the Neagh Bann RBD is not included in the Irish Eel Management reports. Therefore, the implementation of the WFD in the Northern Irish part of the North western RBD is also of interest in this report, as it is the major international RBD which is considered in this eel management report. The status classification for 2015 for surface waters in NW iRBD shows that 46% are at good or better status. This can be broken down to 46% of rivers, 25% of lakes, and 33% of transitional and coastal water bodies (by numbers) at good or better (NIEA 2015).

Table 4-6: Status of Irish surface waters for the period 2010-2015. Data accessed from https://www.catchments.ie/data (April 2017).

Status of Irish Waters	High	Good	Moderate	Poor	Bad
River	10%	46%	25%	18%	0%
Lake	11%	35%	33%	12%	8%
Transitional	13%	19%	49%	15%	5%
Coastal	23%	56%	16%	5%	0%

Table 4-7: Trend in surface water quality over the first cycle of the WFD monitoring program. Data accessed from https://www.catchments.ie/data (April 2017).

Period	High	Good	Moderate	Poor	Bad
SW 2007-2009	13%	44%	27%	14%	1%
SW 2010-2012	14%	44%	26%	15%	1%
SW 2010-2015	11%	45%	27%	17%	1%

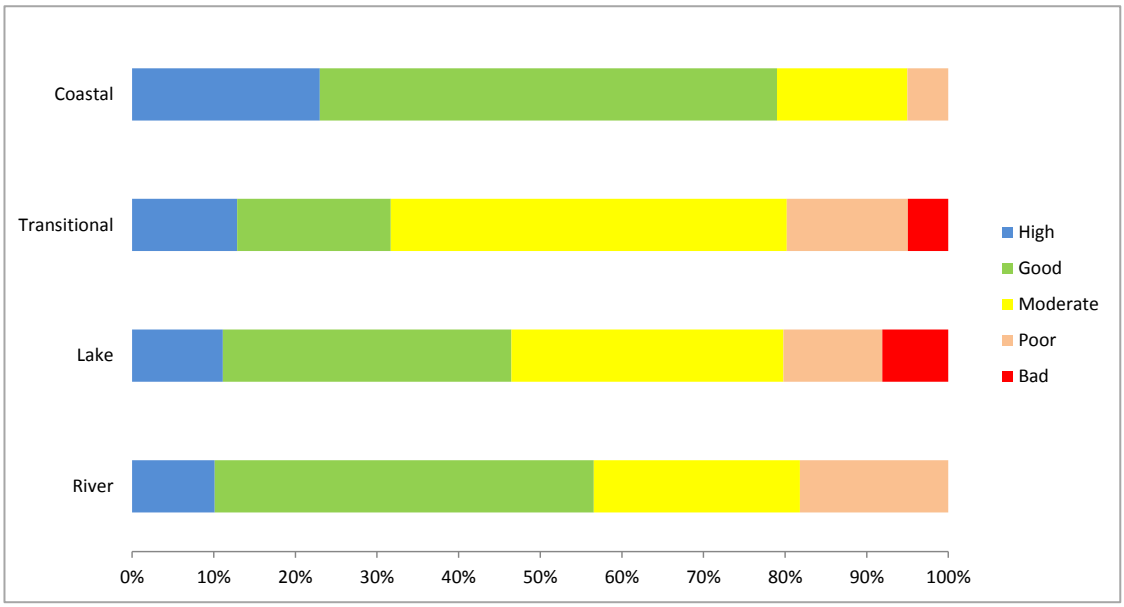


Figure 4-4: Status of Irish surface waters for the period 2010-2015. Data accessed from https://www.catchments.ie/data (April 2017).

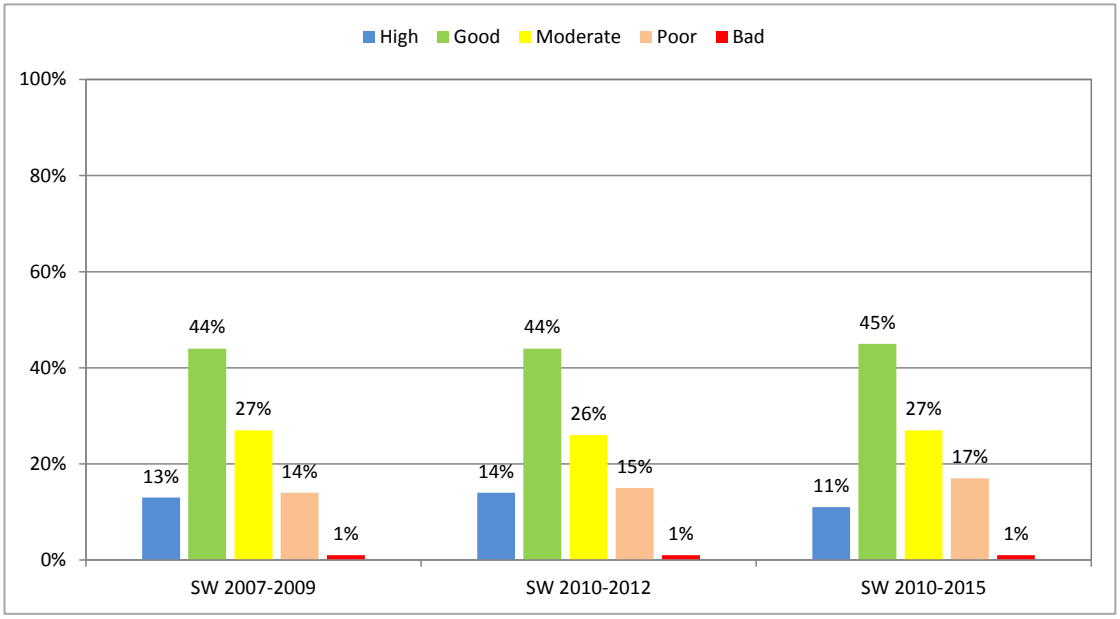


Figure 4-5: Trend in surface water quality over the first cycle of the WFD monitoring program. Data accessed from https://www.catchments.ie/data (April 2017).

4.5.2 WFD monitoring – fish

Inland Fisheries Ireland is responsible for delivering the fish monitoring element of the WFD in Ireland. Eel are included in the WFD (fish) monitoring of rivers, lakes and transitional waters. While this data will be included in the overall assessment of the second cycle of WFD reporting for 2015, summary reports are available (www.wfdfish.ie). The most recent of these summary reports is the report for 2014 (Kelly *et al*. 2015). In 2014, a comprehensive fish surveillance monitoring programme was conducted, with 68 river sites, 27 lakes and 7 transitional waters successfully surveyed throughout the country (Table 4.8). Eel are ubiquitous across all sites, and were found in 96.2% of lakes surveyed and 55.7% of rivers.

Table 4-8: Interim assessment of Irish waterbodies according to fish metrics, measured in 2014 as part of the WFD monitoring program carried out by Inland Fisheries Ireland (Kelly *et al.* 2015).

Period		No. of sites surveyed	High	Good	Moderate	Poor	Bad
2014	Rivers	68	3%	38%	25%	2%	0%
	Lakes	27	5%	11%	6%	3%	2%
	Transitional water	7	0%	3%	3%	0%	1%

4.5.3 Fish Kills

There were 23 reported fish kills in 2015 (IFI 2015). This was about the same number as was reported for 2014 (22).

4.5.4 Eel Contaminants

A number of pesticides, including Mecoprop, MCPA and 2 4-D, were detected at low levels in a significant number of rivers (26%-56%) during routine monitoring (Bradley *et al*, 2015). However, apart from two (mercury and Polycyclic aromatic hydrocarbons) ubiquitous PBTs (persistent, bioaccumulative and toxic substances), the amount of non-compliance with the Environmental Quality Standards for priority substances and priority hazardous substances is very low and not of significant concern in Ireland (Bradley *et al*, 2015). This data confirms that bioaccumulation of toxins of eels in Ireland is likely to be less significant than in other EU countries.

We note that two ICES workshops have taken place in the last three years which have relevance to this section. WKPGMEQ (Workshop of a Planning Group on the Monitoring of Eel Quality under the subject "Development of standardized and harmonized protocols for the estimation of eel quality") took place in January 2015 in Brussels. Ireland (compiled by T. K. McCarthy, NUIG and R. Poole, MI) supplied a country report to this workshop, which contained some preliminary observations on eel quality recorded in Ireland. This can be viewed here: http://ices.dk/sites/pub/Publication Reports/Expert Group Report/SSGEPD/2015/01 WKPGMEQ - Report of the Workshop of a Planning Group on the Monitoring of Eel Quality.pdf

The first meeting of WKBECEEL (Workshop of the Working Group on Eel and the Working Group on Biological Effects of Contaminants) took place in January 2016 in Norway, with the specific objective of determining whether contaminants in eels are contributing to their decline. This was a joint working group, bringing together members of WGBEC (Working Group on Biological Effects of Contaminants) and WGEEL (Working Group on Eel), and the main conclusion was that contaminants have probably contributed to the collapse of eel stocks, although many gaps in our scientific knowledge exist. The full report can be accessed here: http://www.ices.dk/sites/pub/Publication Reports/Expert Group Report/SSGEPD/2015/01 WKBECEEL - Report of the Workshop of the Working Group on Eel and Working Group on Biological Effects of Contaminants.pdf

4.5.5 Prevalence of *Anguillicola crassus*

The percentage prevalence of *A. crassus* in Upper Lough Corrib stayed similar to what was found in 2010, 47% in 2016 and 50% in 2010. In Lower Lough Corrib, percentage prevalence in 2016 was 72%. Lough Conn showed a drop in parasites prevalence from 52% in 2009 to 37% in 2016. The Suir River in Waterford Estuary was sampled in 2016 for *A.crassus* giving a percentage prevalence of 61%. Despite parasite presence at the sites, the Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) demonstrated only slight/moderate damage for all yellow eels sampled.

In 2016, the percentage prevalence of *A. crassus* in the River Barrow Silver eels was 67%, this is an increase from 56% in 2015 but less than the 2014 values of 73%. The swimbladder health indices, SDI and LRI, were applied to the sample of silver eels from the Barrow River. Despite the 56% percentage prevalence, both the Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI) returned results of only moderate swimbladder damage due to *A. crassus* infections.

5 Silver Eel Assessment, 2016

(refers to Ch. 7.2.1 of the National EMP Report, 2008)

5.1 Introduction

The Council Regulation (EC) No 1100/2007 sets a target for silver eel escapement to be achieved in the long-term - 40% escapement of silver eels compared to the pristine level of escapement (pre 1980's). Ireland is therefore required to provide an estimate of contemporary silver eel escapement. The Regulation also requires post-evaluation of management actions by their impact directly on silver eel escapement. Quantitative estimates of silver eel escapement are required both to establish current escapement and to monitor changes in escapement relative to this benchmark. Furthermore, the sex, age, length and weight profile of migrating silver eels are important for relating recruitment or yellow eel stocks to silver eel escapement. Quantifying migrating silver eel between September and December, or even January/February the following year, annually is a difficult and expensive process but it is the only way of ultimately calibrating the outputs of the assessments.

Silver eels are being assessed by annual fishing of index stations on the Erne, Shannon, Burrishoole and Fane catchments (Table 5.1). A pilot study was carried out on the Barrow in 2014. It is proposed to survey a series of additional index locations on a three year rolling basis. Figure 5.1 shows the sampling locations in 2016.

There are three monitoring objectives in relation to silver eels:

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

In Ireland escapement and mortality is calculated for two ESB catchments by the National University of Ireland Galway (Shannon, Erne), for the Burrishoole system by the Marine Institute and for the Fane system by Inland Fisheries Ireland. The Fane is the only east coast catchment currently being monitored for silver eels and the Barrow in the South East.

Table 5-1: The locations where silver eel escapement will be assessed.

Catchment	Priority	2015	2016	2017	Method
Erne	High	√	√	√	Coghill net / Mark-recapture
Shannon	High	√	√	√	Coghill net / Mark-recapture
Burrishoole	High	√	√	√	Trap
Fane	High	√	√	√	Coghill net / Mark-recapture
Barrow	High	√	√	√	Coghill net / Mark-recapture
Boyne				√	Trial Site/River Fyke

The locations identified in the 2009 National Management Plan that have been excluded from the current programme shown in Table 5.1 are the Waterville site where it was proposed to use a resistivity fish counter to determine silver eel escapement. This will be re-evaluated once there is clear evidence of this technology being suitable for silver eel. The other site excluded from the programme is Lough Mask. This site was fished in 2010 and it was found to be difficult 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.

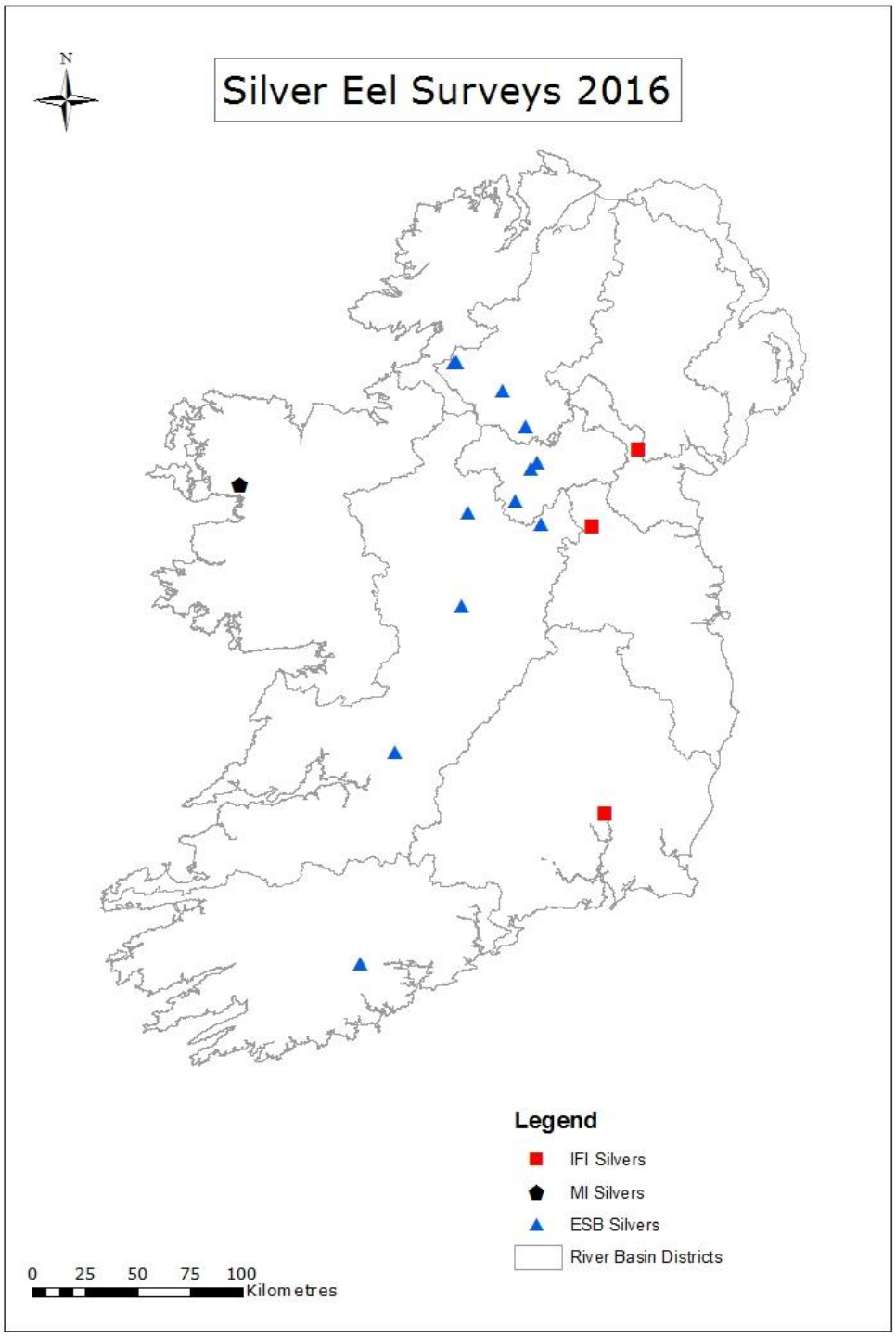


Figure 5-1: Silver eel monitoring locations, 2016.

5.2 Shannon

The Shannon, Ireland's largest river, and its lake ecosystems include some of the country's best eel habitats. It is one of the better-known river systems in Europe in respect to eel population studies, due to long-term fishery records, on-going research and monitoring of the trap and transport programme (e.g. MacNamara and McCarthy, 2013). National University of Ireland (NUIG) monitored the silver eel fishing activity and conducted scientific research, which formed the basis for calculation of production and escapement rates of the river system. However, the detailed scientific analyses undertaken annually for estimation of silver eel production and escapement rates for the river system were not possible in 2015 because of a prolonged period of eel weir fishery closure at Killaloe during the extreme flood conditions. It was hoped that it might be possible to compensate for the loss of daily catch data from Killaloe weir by use of a Didson camera downstream. However, due to technical problems caused by local power outages, it has not been possible to complete the analysis as planned.

During the 2016/2017 silver eel migration season the discharge patterns were very atypical, with very low rainfall and river levels, and this was associated with unusual patterns of hydroelectricity generation. Night-time generation was regularly curtailed and spillage levels at Parteen regulating weir were minimal. The eel research workers from the National University of Ireland (NUIG) monitored silver eel fishing activity at conservation fishing sites and they conducted research at Killaloe Eel Weir , which formed the basis for calculation of production and escapement rates of the river system.

5.2.1 Catch

The conservation eel fishing season began on 19th September 2016 with five contracted fishing crews (Fig. 5.2). Four sites were assigned fishing quotas and two had reached the designated catch quota. The most down-stream site, Killaloe, was a designated scientific site and had no quota. The most up-stream site, Finea, located on the outlet of Lough Sheelin, exceeded its 1 tonne quota with a catch of 1,073 kg and finished fishing on 31st December 2016. The next down-stream site, Rooskey, located below Lough Bofin, with a quota of 1.5 t but only reached a total catch of 933 kg and finished fishing on 5th January 2017. The next two sites are located below Lough Ree on the boundaries of Athlone town. The upper site, Yacht Club, almost reached its quota of 2 t, with a catch of 1,905 kg. The lower Athlone site, Jolly Mariner, with a quota of 8 t, only achieved a catch of 6,886 kg. Fishing at both sites was terminated on 11th February. At Killaloe weir the total catch was 6,337 kg; 5,914 kg of which was the contribution to the T&T program, with the remaining 423 kg used for scientific mark/recapture experiments. The final catch at Killaloe was obtained on 28th March.

The total T&T catch in the River Shannon system was 16,711 kg, which is 3,246 kg less than in previous year and 9,727 kg less than in the 2014/15 season. The variation in seasonal catches during the last three seasons was a reflection of the range of weather conditions, that resulted in either very high (2015/16) or very low (2016/17) discharge conditions (Fig. 5.3). The T&T catch contribution from the five Shannon system fishing sites is summarised in Figure 5.4.

The pattern of downstream migration at Killaloe in this season was reflected in the daily catches recorded at the eel fishing weir. This data is graphically presented, in relation to variation in discharge and to the lunar cycle, in Figure 5.5. Most of the catch (5,482 kg) at Killaloe was obtained during the higher discharge conditions in 33 fishing events. The remaining 913 kg was caught in lower discharge conditions during 56 fishing events.

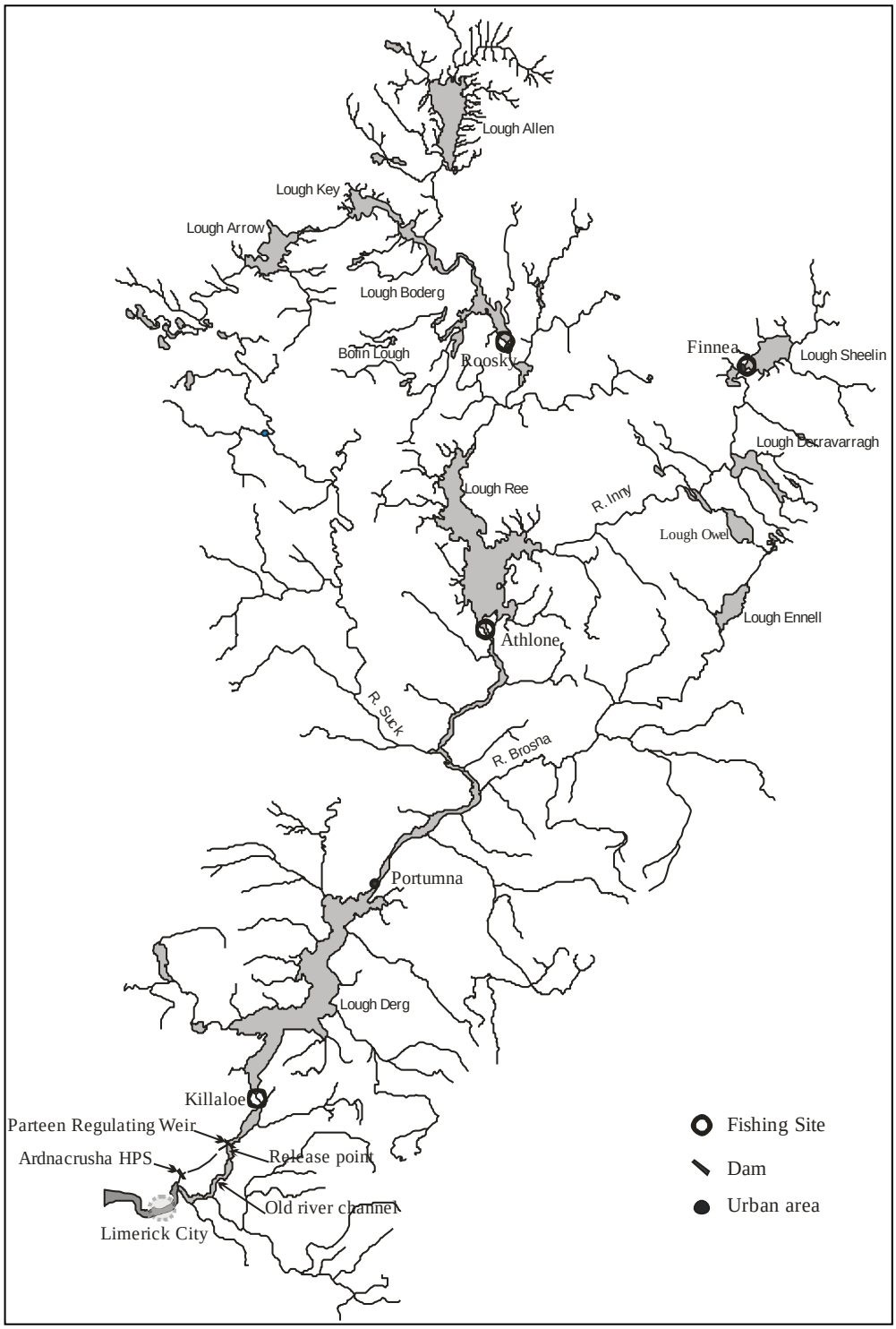


Figure 5-2: The River Shannon, with silver eel fishing sites and release point indicated.

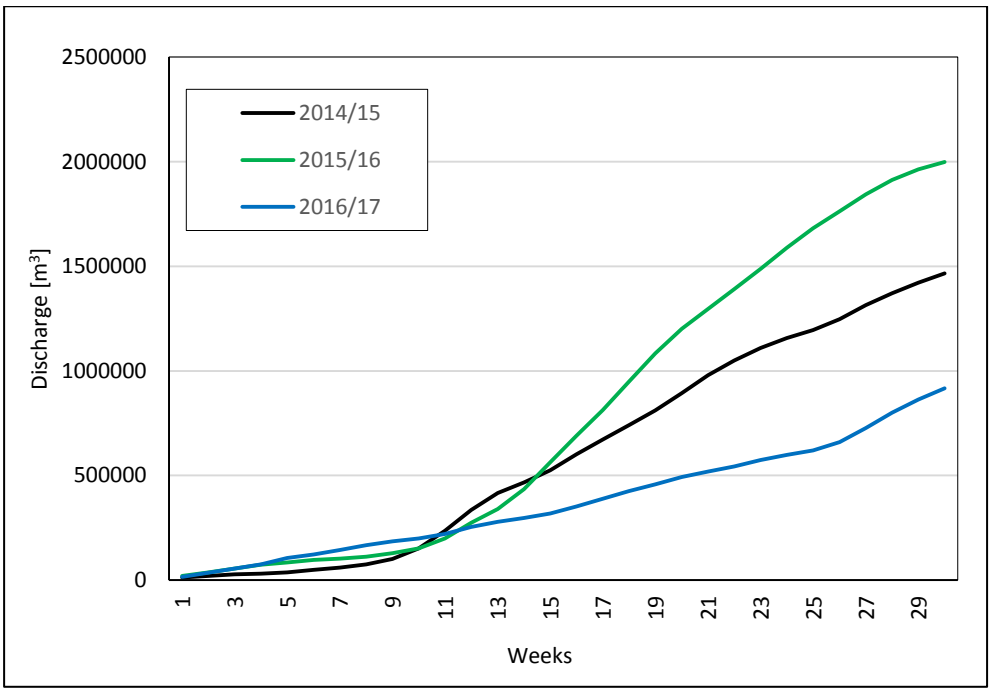


Figure 5-3: River Shannon cumulative weekly discharge during last three fishing seasons. 2014/15 season represents the most typical discharge conditions during silver eel fishing period.

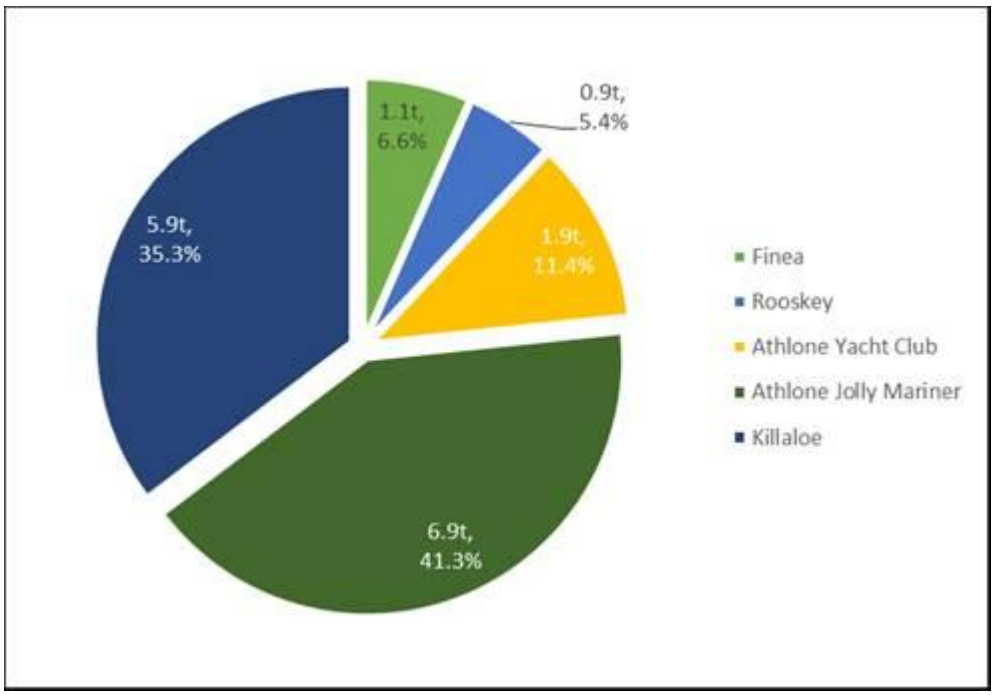


Figure 5-4: Proportion of annual Trap and Transport caught at the five River Shannon fishing sites.

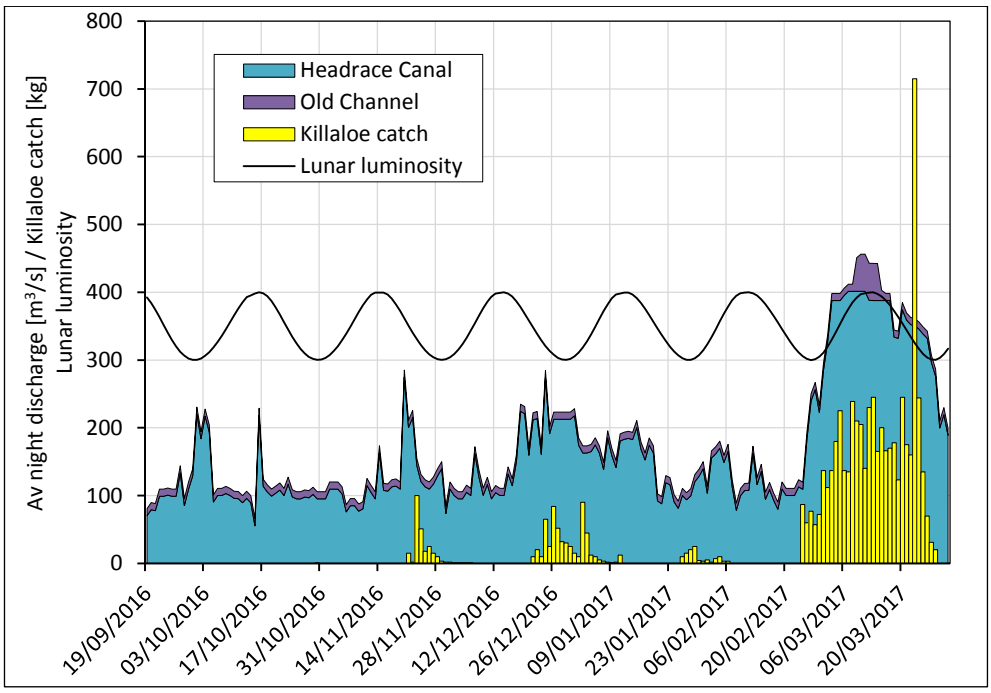


Figure 5-5: Killaloe weir eel catch, discharge pattern and lunar cycles during 2016/17 season.

5.2.2 Production and Escapement

During the 2015/ 2016 estimation of River Shannon silver eel production was adversely affected by closure of the Killaloe eel weir, for health and safety reasons, during an extended period of flooding. It was hoped that it might be possible to compensate for the loss of daily catch data from Killaloe weir by use of a Didson camera downstream. However, due to technical problems caused by local power outages, it has not been possible to complete the analysis as planned.

The River Shannon discharge pattern during the 2016/17 fishing season was much lower than in previous years (Fig. 5.3). Low rain fall levels, general mild weather and low discharge conditions seem to have reduced silver eel migration at the Killaloe fishing site. NUIG carried out series of six mark/recapture experiments and a total of 633 tagged eels were released up-stream of the nets to establish Killaloe weir fishing efficiency. In Table 5.2 a summary of the individual mark/recapture experiments results are presented. The overall percentage recapture rate was 28.80%.

Use of the standard protocol, adopted by NUIG, where one cumulative seasonal fishing efficiency value (28.8%) is assumed for all fishing events, resulted in a production estimate of 32,603 kg, an escapement estimate of 29,479 kg and total T&T contribution as a percentage of production of 51.26% (Fig. 5.6). This is less than 50% of the mean value estimated for the previous six years (71,405 kg; 2009-2014), in which the discharge patterns were higher and more constant at night throughout the season.

Because of the periodically interrupted Killaloe weir fishing during the 2016/2017 season, it was feared that some eels may have migrated downstream undetected. Therefore, by interpolating estimates of (missed fishing night potential catches) an estimated extra Killaloe weir of 1,730 kg catch was included in alternative production and escapement calculations. This resulted in estimates of production, escapement and T&T contribution as follows:

Production 38,608 kg, escapement 32,920 kg and T&T contribution is 43.28%. Though, this non-standard methodology is not intended to replace the scientific analysis presented in Figure 5.6, the results may be more appropriate for management purposes (e.g. discussions on T & T targets).

Table 5-2: Results of 2016/17 season mark/recapture experiments.

Date	Release [N=]	Recapture [N=]	Efficiency [%]	Discharge conditions
31/01/2017	152	12	7.89	Half night generation
24/02/2017	80	21	26.25	Interrupted generation
27/02/2017	100	35	35	Interrupted generation
02/03/2017	100	32	32	Constant generation
07/03/2017	100	39	39	Constant generation
13/03/2017	101	33	32.67	Constant generation
Total	633	172	28.8	

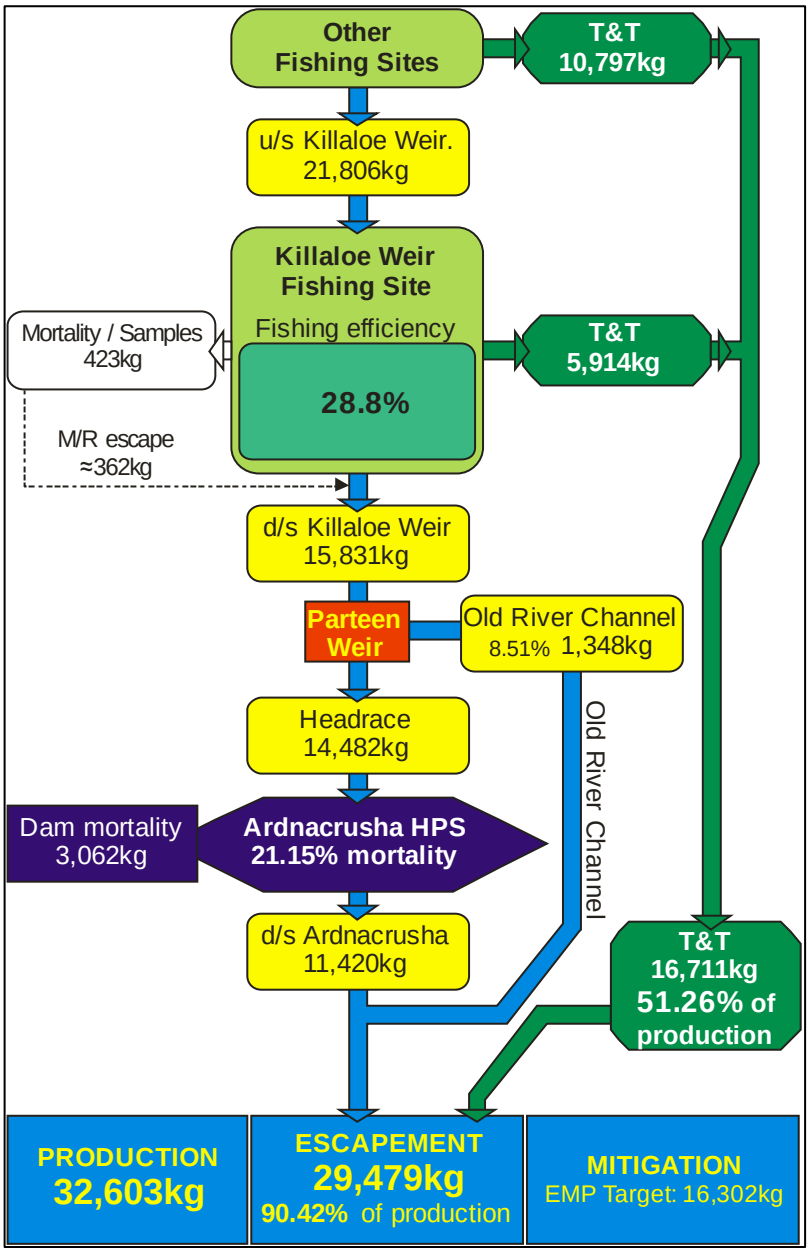


Figure 5-6: A summary of the NUIG analyses of silver eel production and escapement in the River Shannon during the 2016/17 eel migration season, based on one weir fishing efficiency value (28.8%), actual catch and normal calculation protocols.

5.2.3 Length

Size frequency distribution of eels sampled in Athlone and Killaloe during 2016/17 season, are consistent with those reported in previous years (Fig. 5.7).

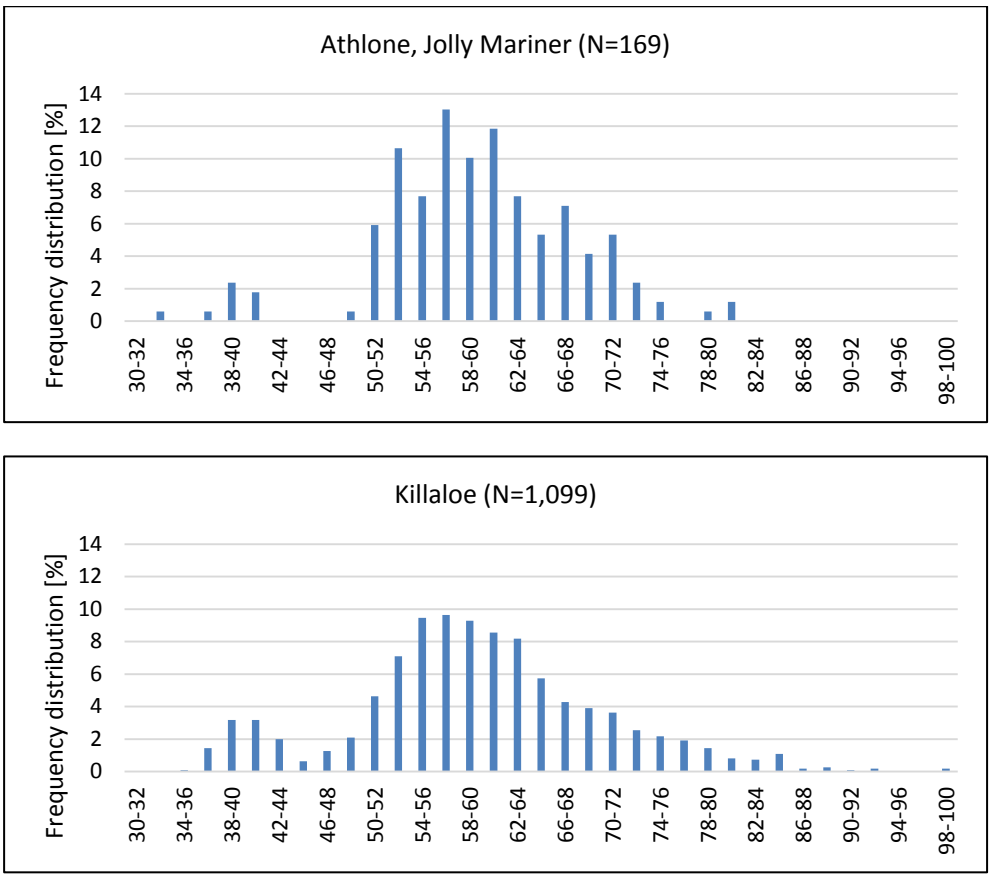


Figure 5-7: Relative size frequency distribution of eels sampled by NUIG, at Athlone and Killaloe in 2016/17 season.

5.3 Burrishoole

The only total silver eel production and escapement data available in Ireland is for the Burrishoole catchment in the Western RBD, a relatively small catchment (0.3% of the national wetted area), in the west of Ireland. The Burrishoole consists of rivers and lakes with relatively acid, oligotrophic, waters (Fig. 5.8). The catchment has not been commercially fished for yellow eels, not been stocked and there are no hydropower turbines.

The eels have been intensively studied since the mid-1950s; total silver eel escapement from freshwater was counted since 1970 (Poole *et al*., 1990; Poole, data unpublished); and an intensive baseline survey was undertaken in 1987-88 (Poole, 1994). The detailed nature of the Burrishoole data makes it suitable for model calibration and validation (e.g. Dekker *et al.* 2006; Walker *et al*. 2011).

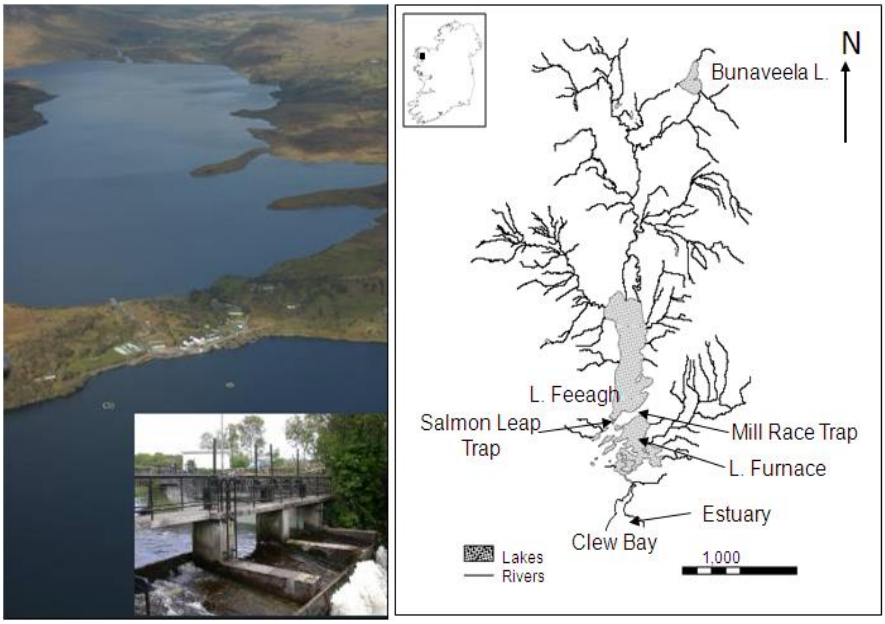


Figure 5-8: An aerial view of the Burrishoole catchment, looking north over the tidal Lough Furnace, in the foreground, and the freshwater Lough Feeagh: inset shows the silver eel downstream trap at the "Salmon Leap". A map of the Burrishoole catchment showing the locations of the silver eel traps at the lower end of the freshwater catchment.

5.3.1 Catch

Silver eel trapping was continued in 2016. The timing of the run was different to the general observed pattern. The silver eel season in 2016 was characterised by the lack of any major floods or storm events. The eels migrated on small floods and flow rates were easy to manage. The highest floods of the year were in February and March 2017 once the main migration was over (Table 5.3). Figure 5.9 shows the daily counts of silver eels.

The total run amounted to 2728 eels, more than double that recorded in 2015. As in other years, the highest proportion of the total catch (80%) was made in the Salmon Leap trap.

Table 5-3: Timing and numbers of the 2016/'17 silver eel run.

	Salmon Leap	Mill Race	Total	%
May 2016	0	0*	0	0.0
June	9	3	12	0.4
July	51	19	70	2.6
August	168	57	225	8.2
September	677	283	960	35.2
October	399	61	460	16.9
November	741	86	827	30.3
December	127	26	153	5.6
Jan. 2017	4	1	5	0.2
February	8	2	10	0.4
March	5	1	6	0.2
April	0	0	0	0.0
Total	2189	539	2728	

* Mill Race closed for reconstruction 24th May to 17th June 2016

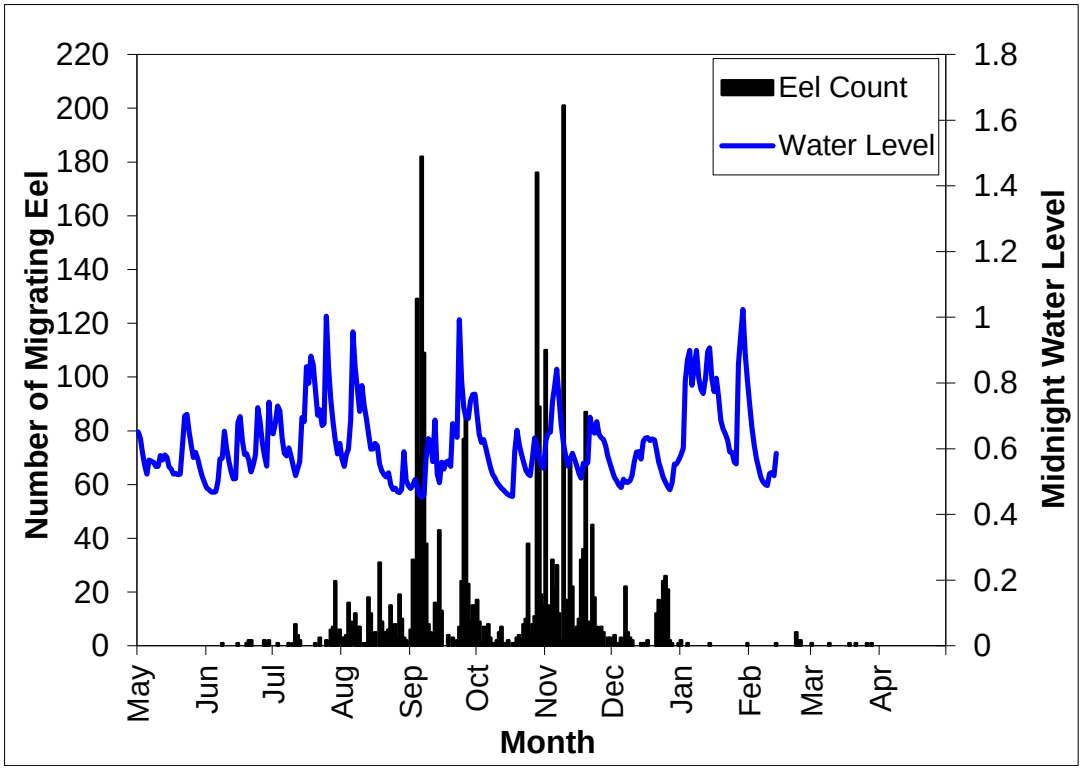


Figure 5-9: Daily counts of downstream migrating silver eel and mid-night water levels (m).

5.3.2 Length, weight & sex

Sampling of individual eels (n = 554) gave an average length of 44.0 cm (range: 30.2 – 97.5cm) and an average weight of 177.2g and the proportion of male eels was 36.8%. The length frequency is presented in Figure 5.10, along with those for 2014 and 2015 for comparison.

Counts of silver eel between the years 1971 (when records began) and 1982 averaged 4,400, fell to 2,200 between 1983 and 1989 and increased again to above 3,000 in the '90s (Fig. 5.10). There was an above average count in 1995, possibly contributed to by the exceptionally warm summer. The count in 2001 of 3875 eel was the second highest recorded since 1982. The average weight of the eels in the samples has been steadily increasing from 95 g in the early 1970s to 216 g in both the 1990s and the 2000s (Fig. 5.12).

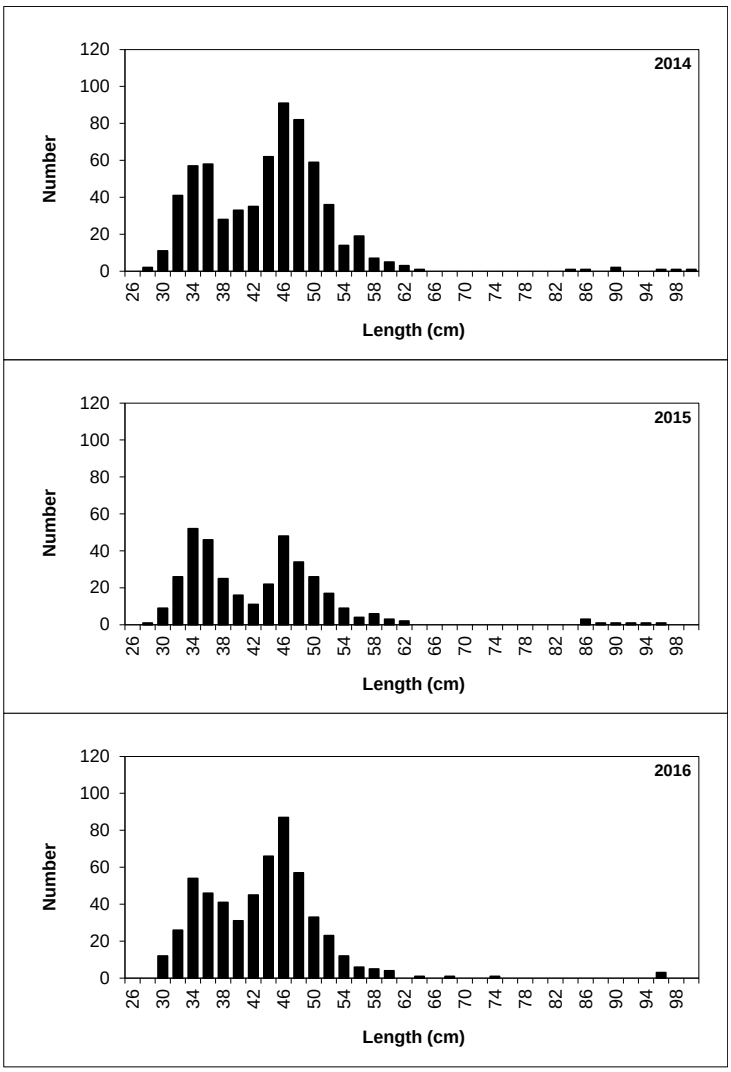


Figure 5-10: Length frequency of sub-samples of silver eels trapped in the downstream traps, 2014 (n=650), 2015 (n=365) and 2016 (n=554). Note change of y-axis scales.

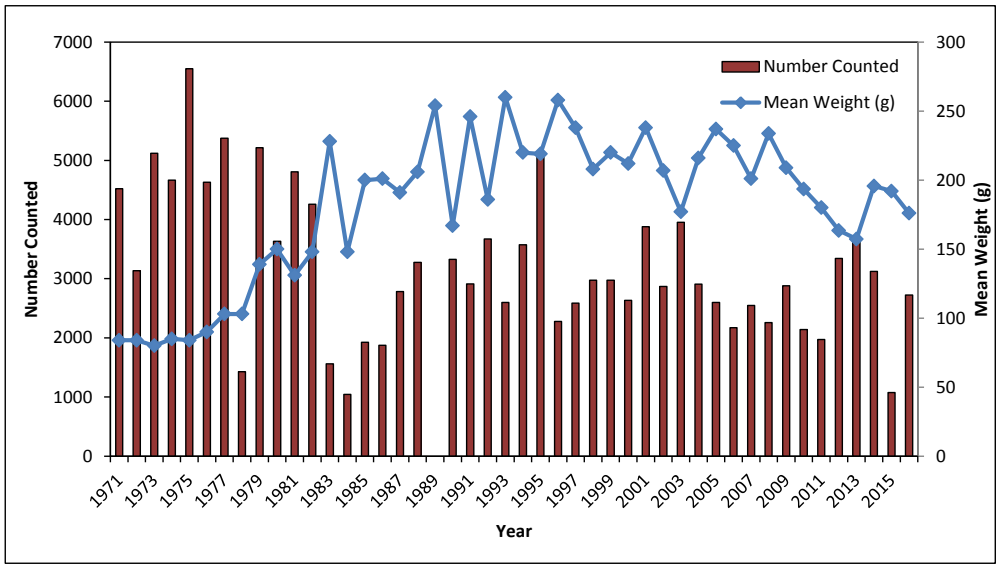


Figure 5-11: Annual number and mean weight of silver eels trapped in the Burrishoole downstream traps.

5.4 Erne Transboundary

The River Erne, a transboundary system, is the second largest river system in Ireland, with an extensive lake habitat. In 2016/17, silver eel season estimates of production and escapement, as well as analysis of downstream population dynamics, followed protocols established in previous years (2010-2015) (e.g. McCarthy *et al* 2015). However, exceptionally low river discharge and unusual regulated discharge associated with interrupted night-time electricity generation, affected estimation of silver eel population dynamics. The River Erne conservation fishery and trap and transport (T&T) programme was monitored by researchers from the National University of Ireland (NUIG) who also undertook mark-recapture experiments at Roscor Bridge.

5.4.1 Catch

In the 2016/17 season, six conservation fishing crews were operating on the River Erne system (Fig. 5.12). The fishing period extended from 19th September 2016 until 10th January 2017, with the exception of two sites: Urney and Roscor Bridge which continued fishing until 8th February. The total catch contributed to the T&T programme was 38,264 kg. The proportions of the catch obtained by each fishing crew are presented in Figure 5.13. The variation in the Roscor Bridge experimental fishing weir daily catches is illustrated (Fig. 5.14) in relation to lunar cycles and variation in discharge. The fishing season at Roscor Bridge extended from 29th September 2016 to 8th February 2017, with a total of 85 nights being fished. The cumulative discharge level (Fig. 5.15) observed during the fishing season was much lower (50%) than in previous seasons, which significantly influenced catch levels and seasonal catch distribution.

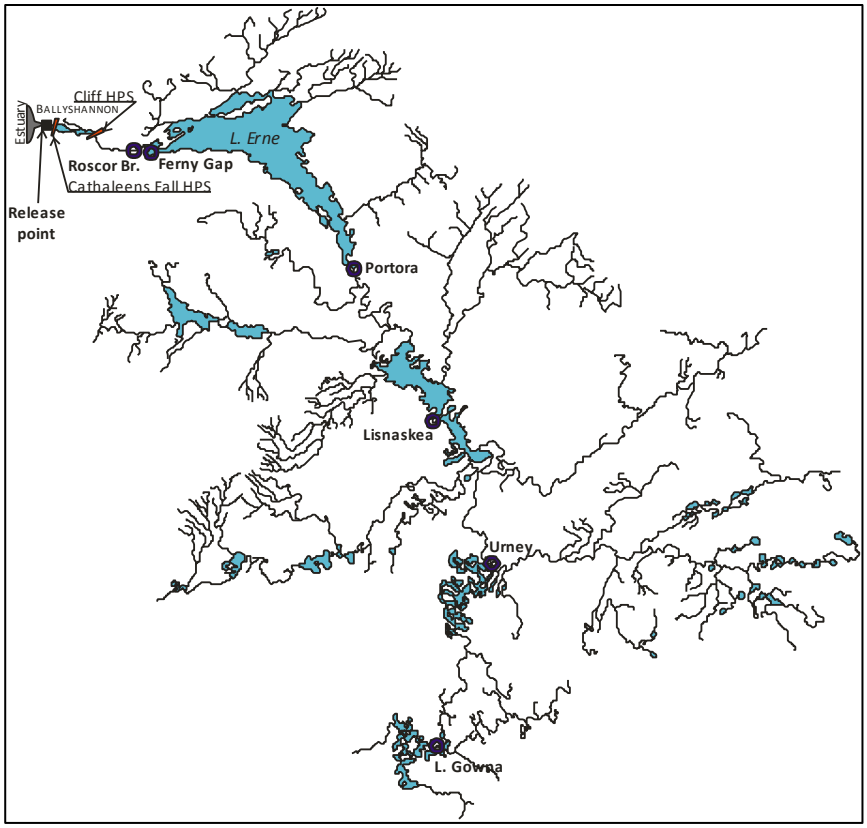


Figure 5-12: Map of River Erne catchment with conservation fishing sites, release point and hydropower dams indicated.

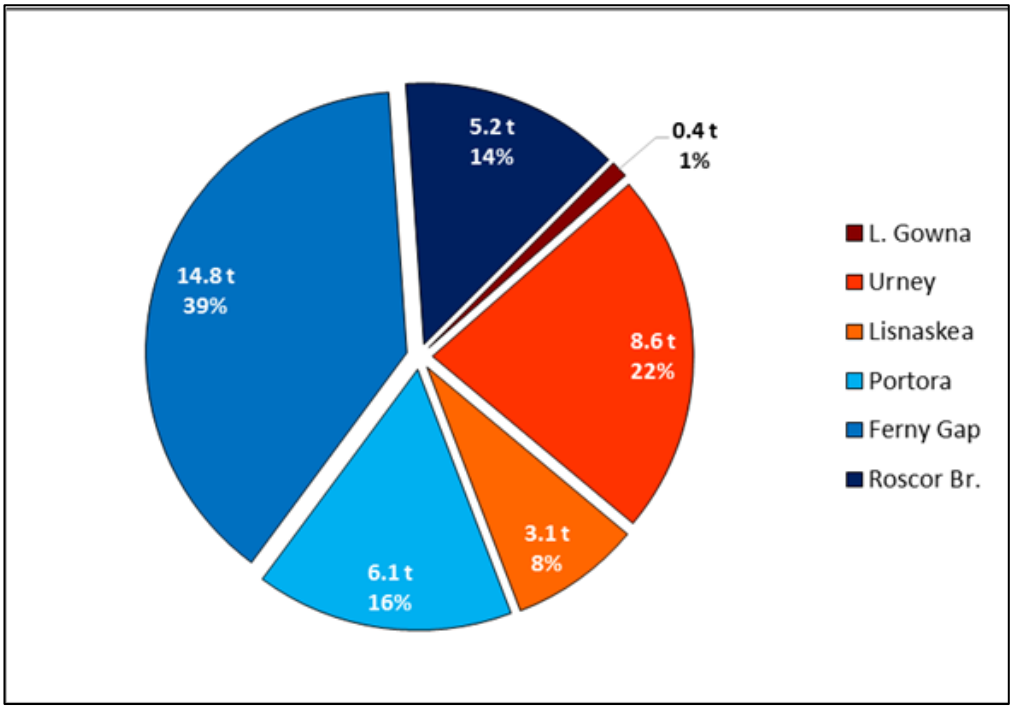


Figure 5-13: Proportions of the River Erne trap and transport catch obtained by each fishing crew in the 2016/17 season.

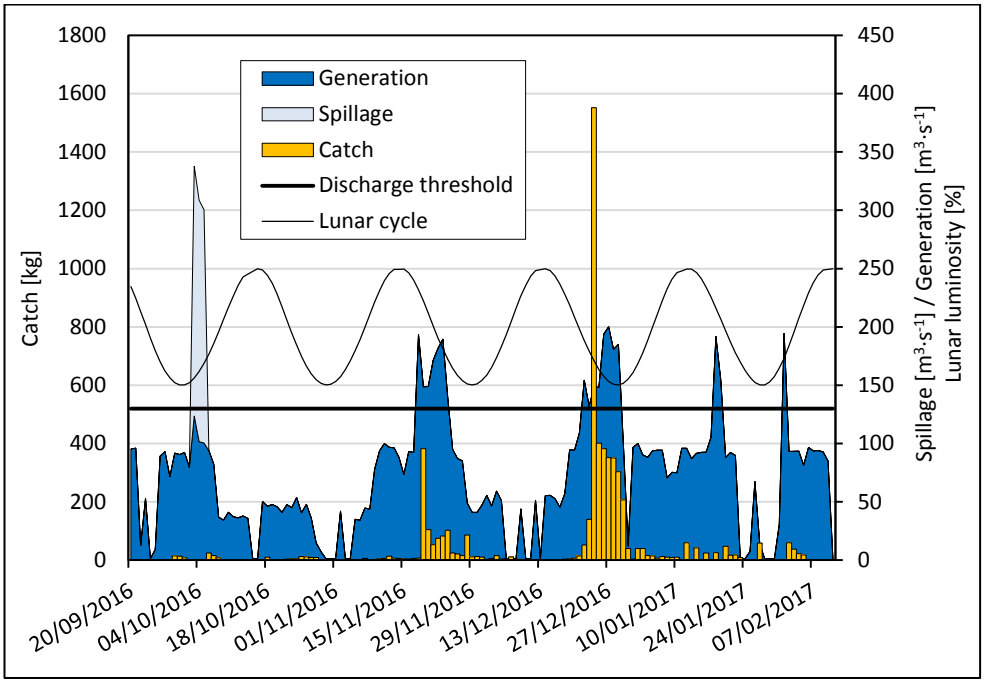


Figure 5-14: Variation in daily catches at the Roscor Bridge eel weir, in relation to lunar cycle and discharge during the 2016/17 season (the threshold discharge of 130 m^{3s-1} used in population analyses is indicated by a black line).

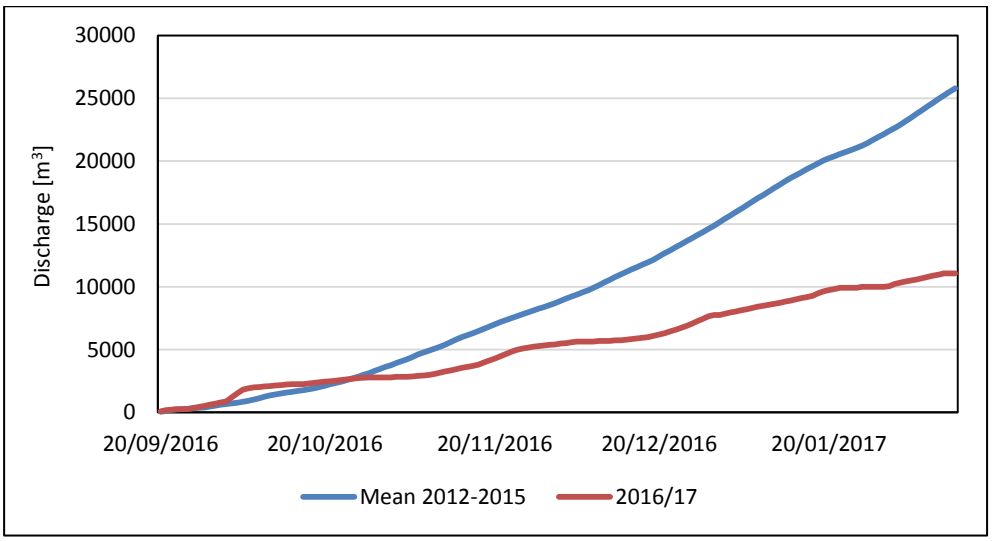


Figure 5-15: Cumulative discharge during the 2016/17 fishing period in relation to mean cumulative discharge observed during the previous seasons (2012-2015).

5.4.2 Production and Escapement

The NUIG silver eel population study results are summarized in Figure 5.16. The silver eel production was estimated at 62,871 kg, and escapement was estimated to be 51,377 kg (81.7% of production). The trap and transport programme catch of 38,264 kg represents 60.9% of silver eel production (exceeding the 50% of target by 6,829 kg).

The 2016/17 season calculations are based on the production estimations at Roscor Bridge, as in NUIG protocol described in the 2012 report. Four mark/recapture experiments were conducted by NUIG researchers, two in high (>130 m3/s) and two in low (<130 m3/s) discharge conditions, indicating fishing weir efficiency to be 23.17% and 13.85% respectively. Use of these limited mark/recapture experimental results would estimate production to have been 55,827 kg (T&T 68.5%; Escapement 47,623kg).

However, because the Roscor Bridge weir fishing techniques and equipment used has remained consistent, it was decided that use of cumulative mark/recapture results obtained at this site since the 2010 season (Table 5.4) would enable a more robust analysis to be undertaken. These cumulative fishing efficiency estimates were used to estimate the production results presented in Figure 5.16. The cumulative mark/recapture fishing efficiency estimates were used, together with index nets catch and hydrometric data, to calculate the biomass of eels approaching Roscor Bridge for each fishing date. Overall HPS (both dams) mortality rate for the season was 20% higher than in previous years. This was a result of minimal water spillage throughout the fishing season.

Table 5-4: Cumulative Roscor Bridge mark/recapture results obtained in seven subsequent fishing seasons, from 2010/11 to 2016/17.

Low Flow Conditions [< 130 $m^3 \cdot s^{-1}$]		High Flow Conditions [> 130 $m^3 \cdot s^{-1}$]	
No. of M/R experiments	6	No. of M/R experiments	27
No. of fish tagged	526	No. of fish tagged	2720
No. of recaptures	53	No. of recaptures	495
Fishing efficiency	**9.78%**	Fishing efficiency	**18.43%**

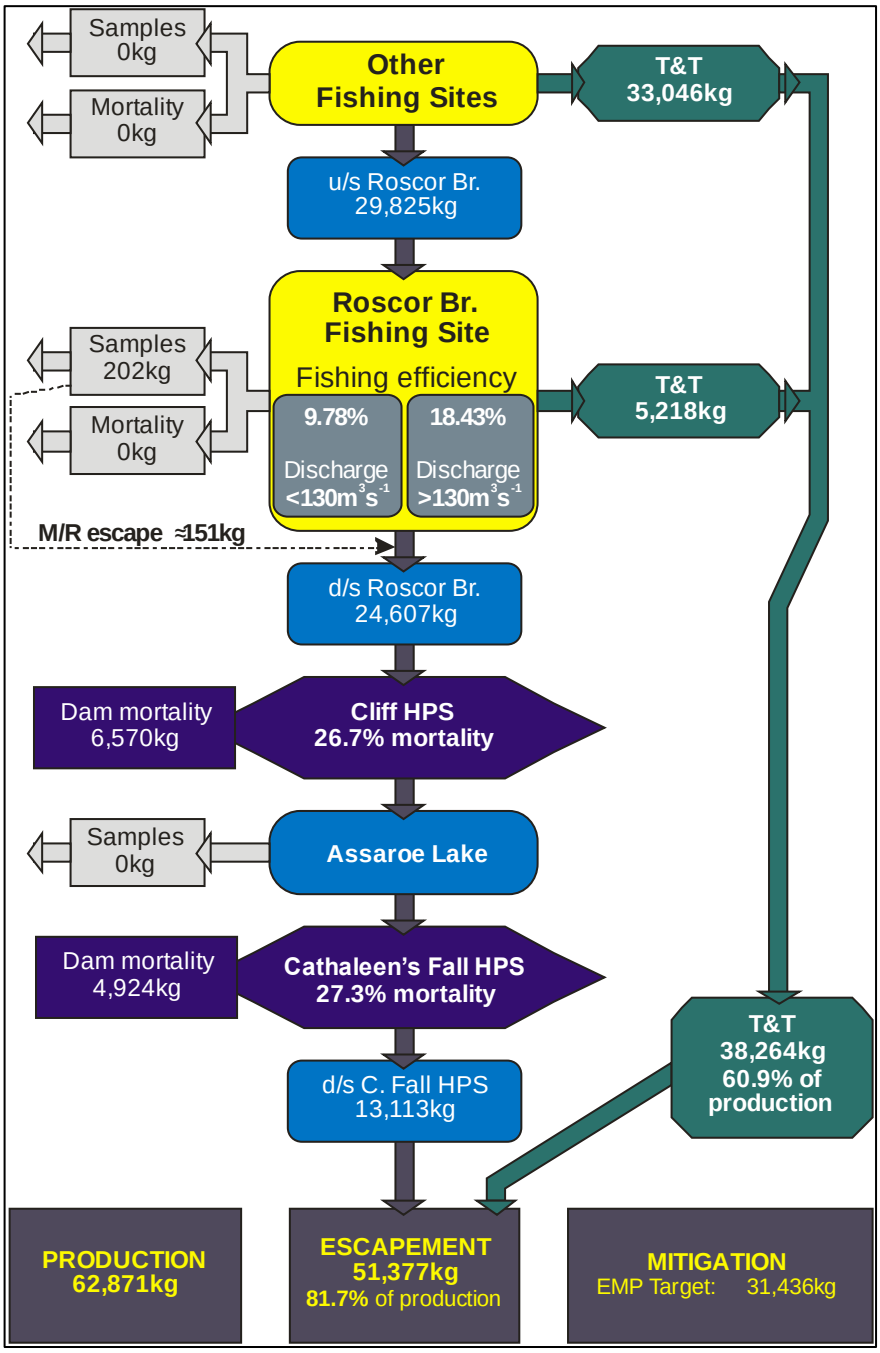


Figure 5-16: A summary of the analysis of silver eel production and escapement in the River Erne during the 2016/17 eel migration season.

5.4.3 Length and weight

Information compiled during the 2016/17 season on size frequency distributions of catches at two River Erne conservation fishing sites are summarized in Figure 5.17. An unusually high proportion of male silver eels, also noted in 2011-2015, in upper catchment sites, as well as at Roscor Bridge, was observed in 2016 (Fig. 5.17).

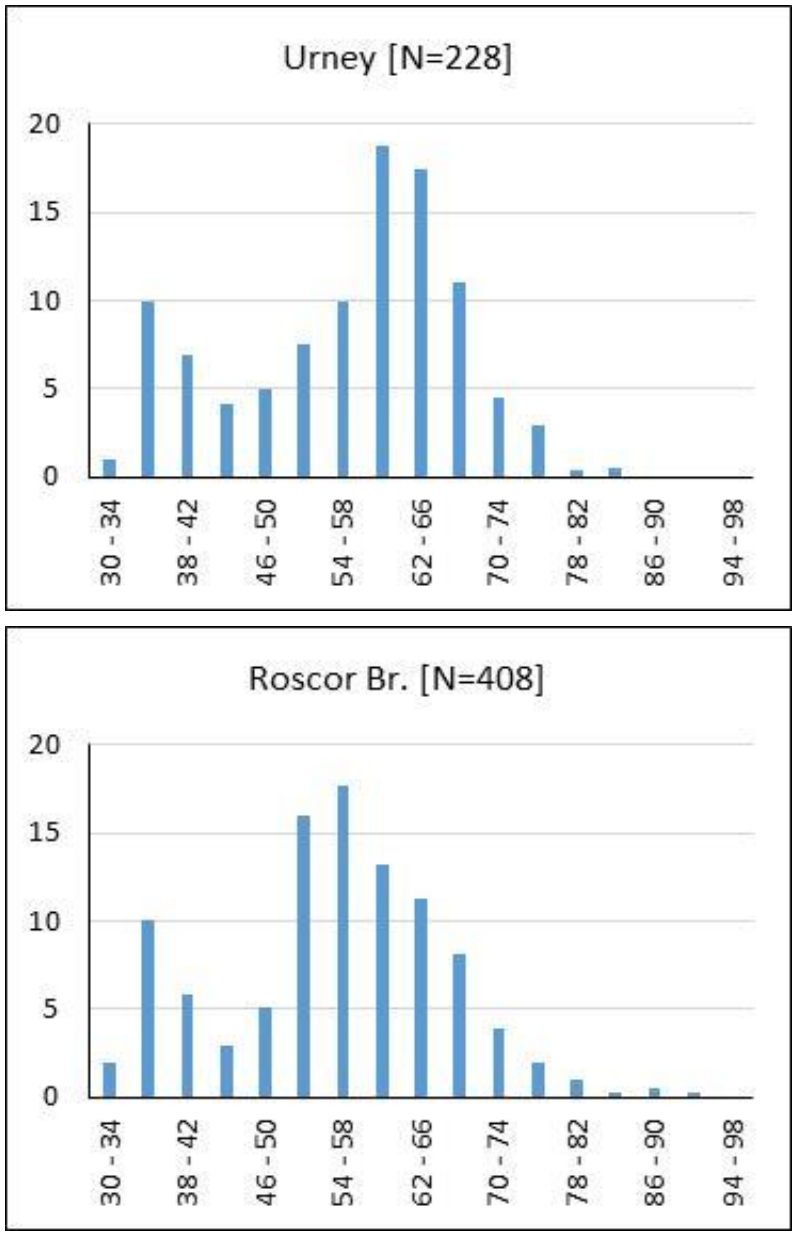


Figure 5-17: Relative size frequency distribution of eels from two conservation fishing sites, Urney (upper Erne system) and Roscor Bridge (lower Erne system).

5.5 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 from 2011 to the present (Fig. 5.18 & 5.19). The site was the location of a commercial fishery until 2008. In 2015, a new depth gauge was added to the fishery to gain on-site depth readings during eel fishing (Fig. 5.20).

5.5.1 Silver Eel Catch

The Fane silver eel fishery is dependent on water levels in the river 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. Silver eel catches at the Fane Fishery were low in the 2016 season due to unfavourable conditions for fishing. The heavy rainfall required to flood the site and float the coghill nets for fishing was absent during the autumn and winter months (Fig. 5.21). This may be attributable to the strong El Niño affect during the sampling season of 2015 which continued into 2016. The result was a comparatively warm and dry autumn, which would be uncharacteristic of weather in Ireland at that time of year. Figure 5-21 depicts the water flow (and moon phases) for the Fane Fishery in 2016.

In total, only 7 nights were fished in December during the 2016 season, with a total catch of approximately 80 kg. Due to the poor fishing conditions and the low catch recorded, no mark-recapture study was carried out for the 2016 silver eel season. Therefore, no catch biological or parasite results are reported.

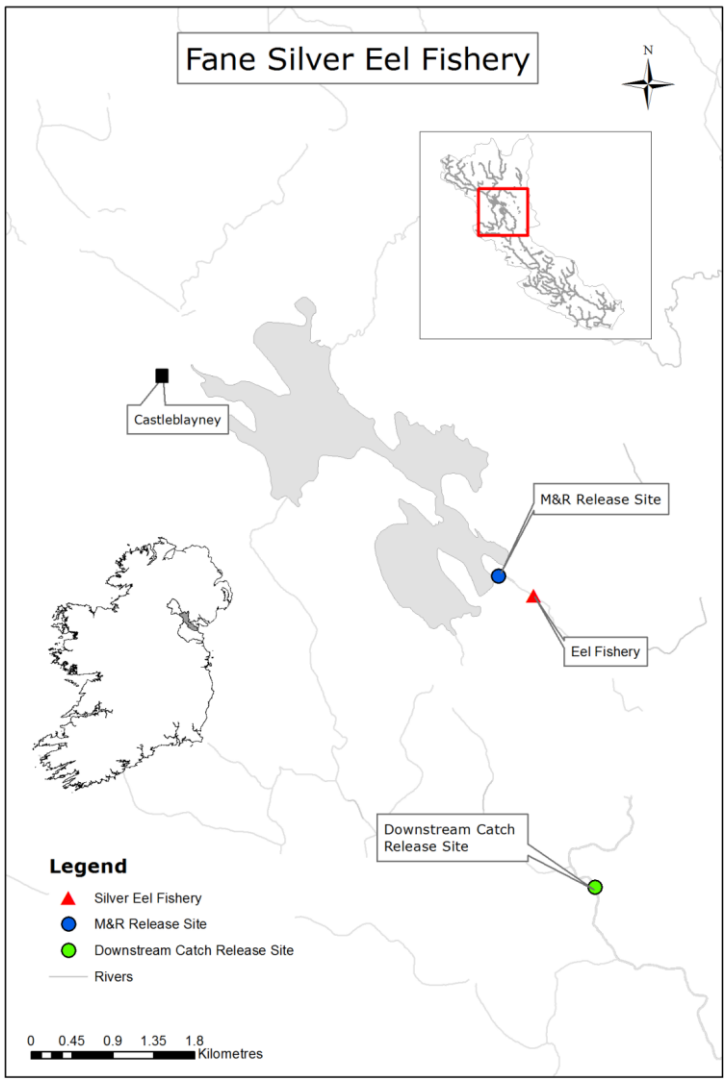


Figure 5-18: Location of Silver eel fishery on the Clarebane River (Fane).

Figure 5-19: Coghill net fishing for silver eels in the Clarebane River, 2013 (Photo: C. O'Leary)

Figure 5-20: Depth gauge installed at silver eel weir on Clarebane River, 2015, pictured at 0.5 metres depth on November 6th (left) and 1.3 metres depth on November 20th (right), (Photos: R. Cruikshanks)

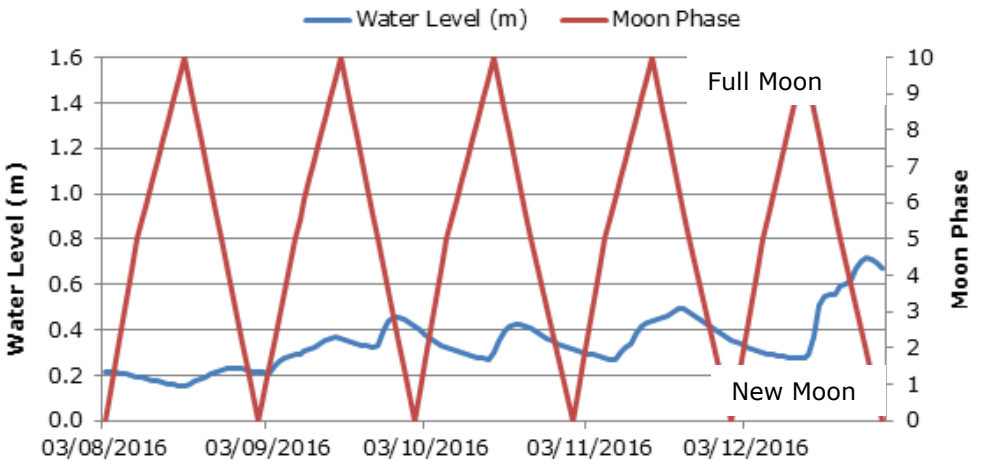


Figure 5-21: Clarebane River water levels and moon phase for 2016 silver eel season.

5.6 River 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 is the first riverine dominated silver eel index catchment assessed to date.

Four nets were fished from openings on the Ballyteiglea Lock gates of the canal section of the River Barrow during the silver eel season (Fig. 5.22). The location fished is upstream of the town of Graiguenamanagh; approximately 5km upstream from the tidal limit (estuary) in the River Barrow. A second site was available at Clashganna Lock, further downstream from Ballyteiglea Lock, but was not fished in the 2015 season (Fig. 5-23). The location of the Ballyteiglea Lock 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.

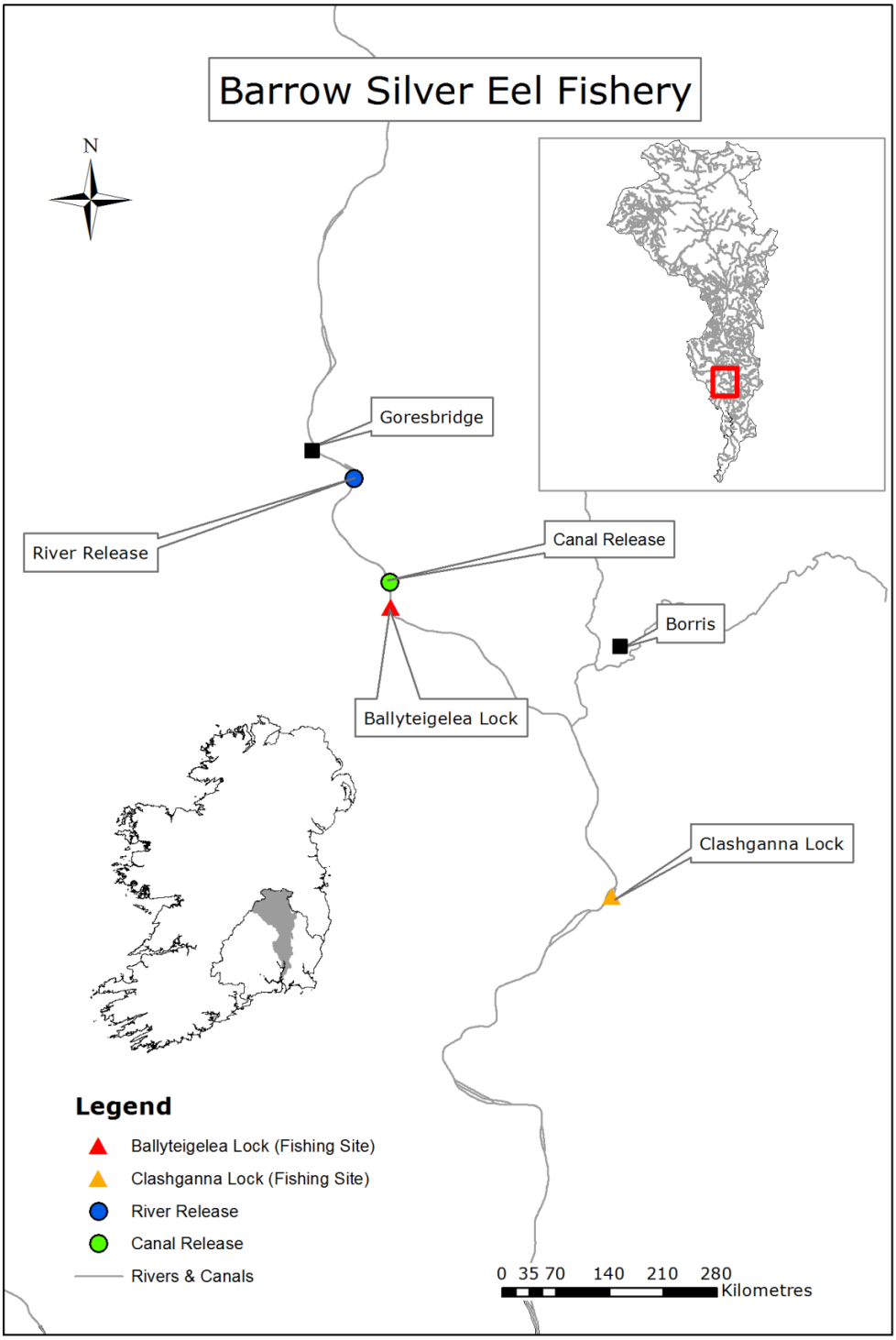


Figure 5-22: Map of silver eel fishing and release locations within the Barrow Catchment, 2016 (Insets: Map of Ireland with Barrow catchment (shaded) and South Eastern River Basin District (outlined) and detail of Barrow Catchment rivers))

Figure 5-23: Ballyteigelea Lock - location of research silver eel fishery on Barrow canal (Photo: C. O'Leary)

5.6.1 Eel catch

The Barrow location was fished for a total of 25 nights across September, October, November and December. Weather conditions led to only minor and infrequent flooding events during which silver eels could be captured and monitored (Fig. 5.24). The total number of measured eels processed was 845, with a total measured catch weight of 132.9 kg (175.5 kg including batch weighs), (Tables 5.5 & 5.7).

Table 5-5: Barrow Silver Eel Fishery Catches, 2016.

Month	Eel Numbers	Catch (kg)
September	0	0.0
October	116	11.7
November	213	37.4
December	516	126.3
Total	845	175.4

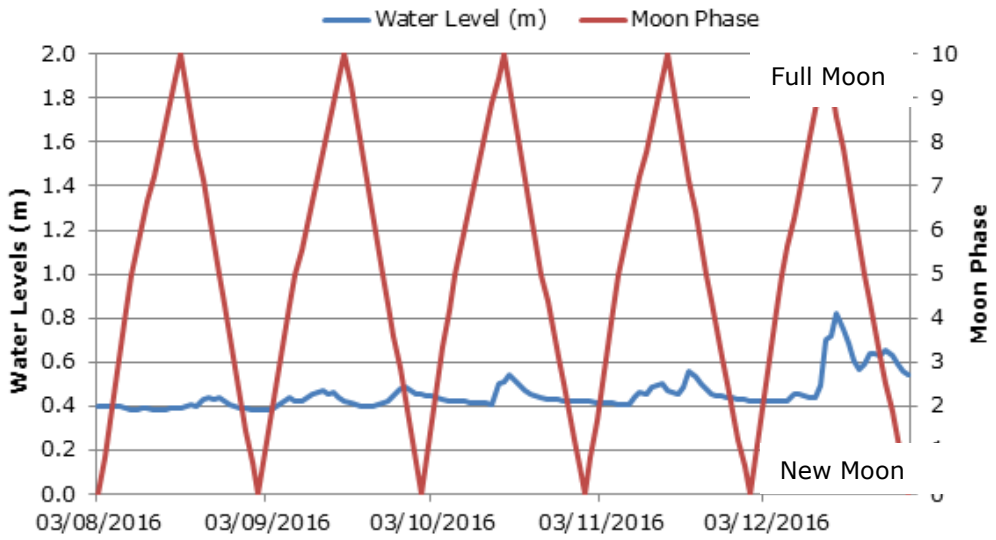


Figure 5-24: Barrow water levels and moon phase for the 2016 silver eel season.

5.6.2 Mark Recapture

In order to determine the efficiency of the fishing site 48 eels were released into the canal 150m upstream of the fishing site. Twenty one eels were recaptured giving a recapture rate of 43.75% (Table 5.6). Due to the environmental conditions of low flows over the sampling season (Fig. 5.24) only one mark recapture survey was undertaken in 2016. The aim will be to repeat this MR survey over the next few years. The tagging session reported a high recapture rate with the majority of eels recaptured 2 days after release.

The weir upstream of the fishing lock holds back the water keeping the flow and depth in the canal, this resulted in good catches of eel at the lock gates however as the season progresses and the water level rises the spill over into the main channel increases and the catch at the lock decreases.

Table 5-6: Mark Recapture Preliminary Results for Barrow River, 2014 - 2016

Year	Location	No. Tagged	No. Recaptured	% Recapture
2014	River_1	202	7	3
2015	River_1	60	16	52
	River_2	76	2	3
	River_3	91	2	2
	Canal	50	21	42
2016	Canal	48	21	44

5.6.3 Eel Biology

Morphometric measurements were taken on 681 eels in 2016. The average length was 45.2 cm (range 32.0 – 77.8 cm), the average weight was 0.195 kg (range from 0.052 to 0.860 kg). The population structure for 2016 is in line with what was caught in 2015 and 2014 (Figs. 5.25 & 5.26).

During the 2016 sampling, a total of 103 eels were retained for further analysis in the laboratory. Of these 60% were male and 40% were female (Fig. 5.27; Table 5.8). The sex ratio in 2015 and 2014 was 65% and 61% male respectively and similar to the current year of sampling.

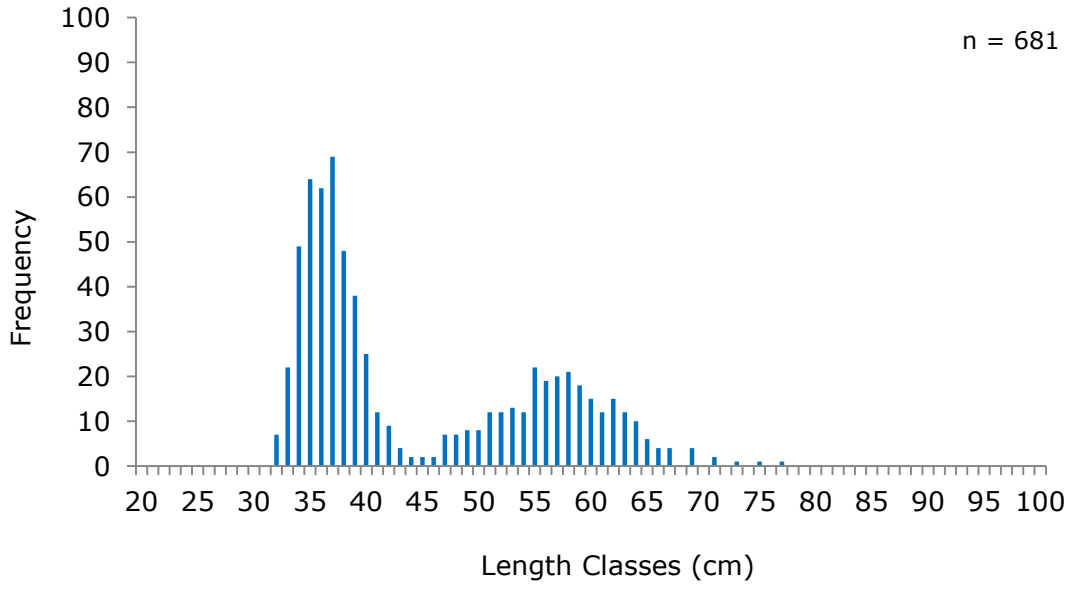


Figure 5-25: Length frequency for silver eels caught on Barrow catchment, 2016

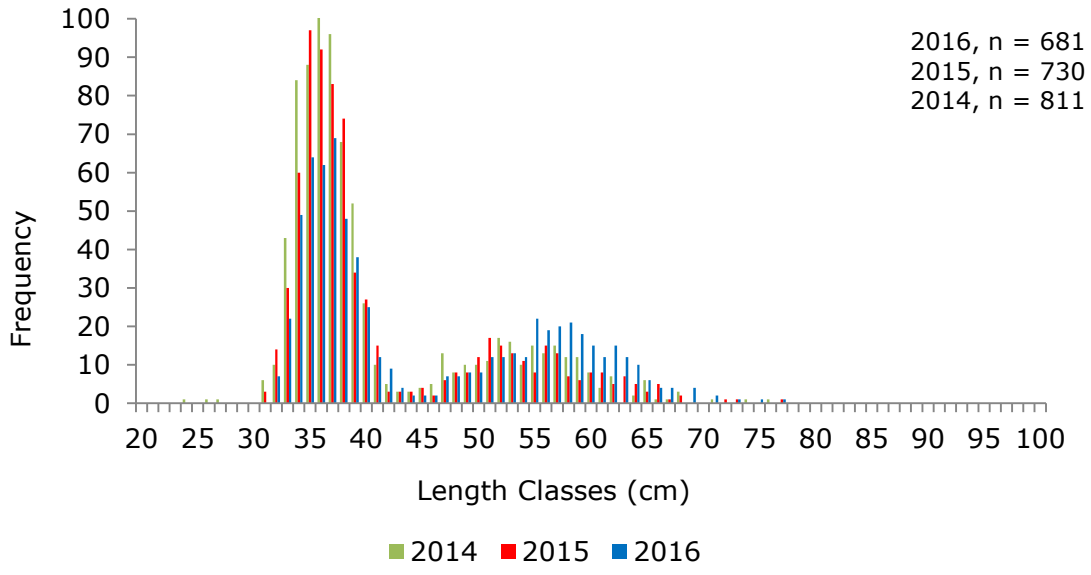


Figure 5-26: Length frequency for silver eels caught on Barrow catchment, 2014 – 2016

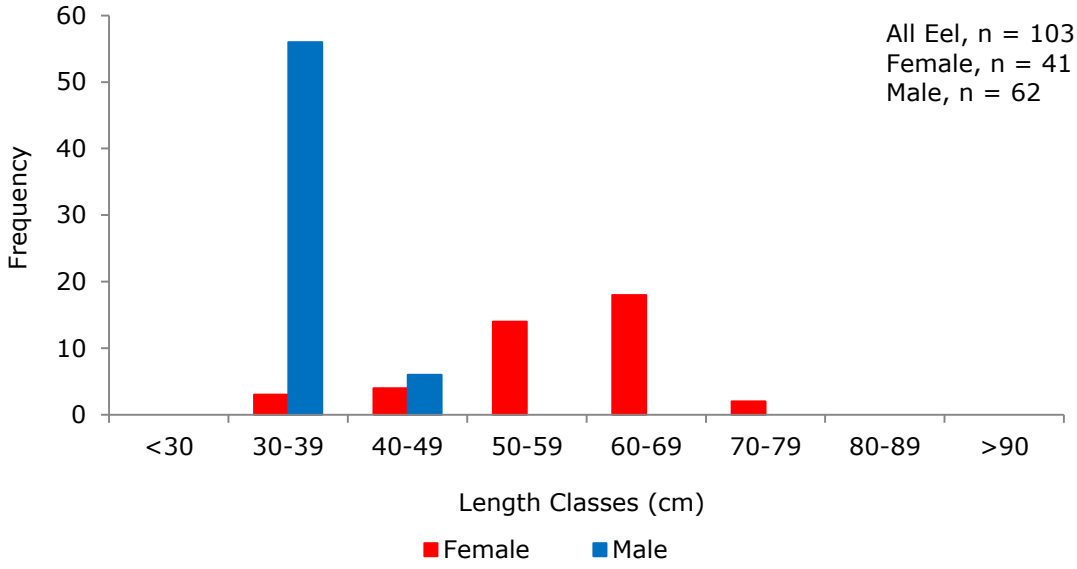


Figure 5-27: Sex distribution of sacrificed silver eels collected from Barrow River, 2016

5.6.3.1 *Anguillicola crassus* and Swimbladder Health Indices

In 2016, percentage prevalence of *A. crassus* was 67% with a mean infection intensity of 4.20 (with a total parasite count across the sample of 290 worms (n = 103 eels)). In 2015, percentage prevalence was 56% with a mean infection intensity of 5.16 (total parasite count across the sample of 160 worms (n = 55 eels)). The 2014 values were 73% and 6.11, respectively (with a total parasite count across the sample of 226 worms (n = 51 eels)), (Table 5.8). The majority of infected eels had <5 parasites in the swimbladder, with higher intensity infections being rarer in the sample (e.g. only 7 eels presented with between 10 and 14 parasites in the swimbladder and only 1 eel presented an infection of >20 parasites. (Fig. 5.28).

The swimbladder health indices, SDI and LRI, were applied on the sample of silver eels from the Barrow River. Despite the 56% percentage prevalence, both the Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI) returned results of only moderate swimbladder damage arising due to *A. crassus* infections (Figs. 5.29 - 5.30).

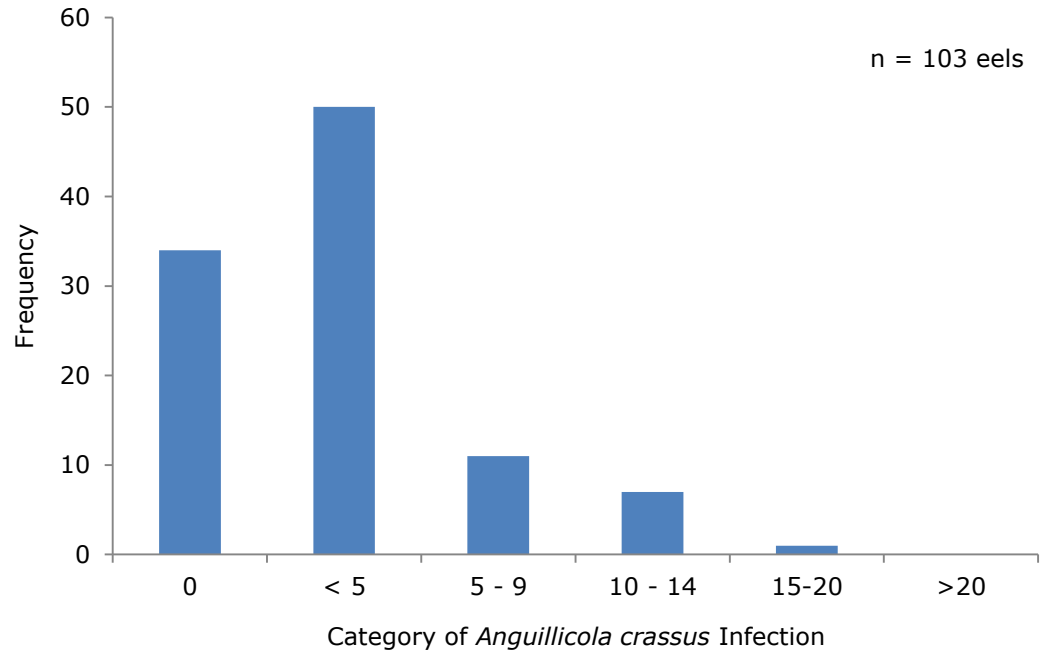


Figure 5-28: *Anguillicola crassus* infection intensity for sacrificed silver eels collected from Barrow catchment, 2016

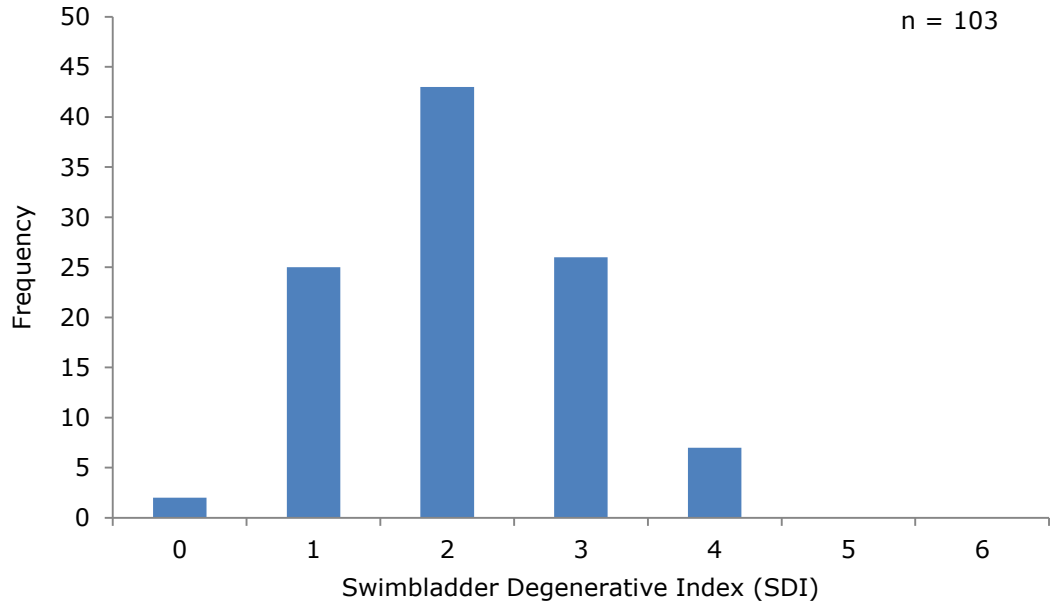


Figure 5-29: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from Barrow catchment, 2016

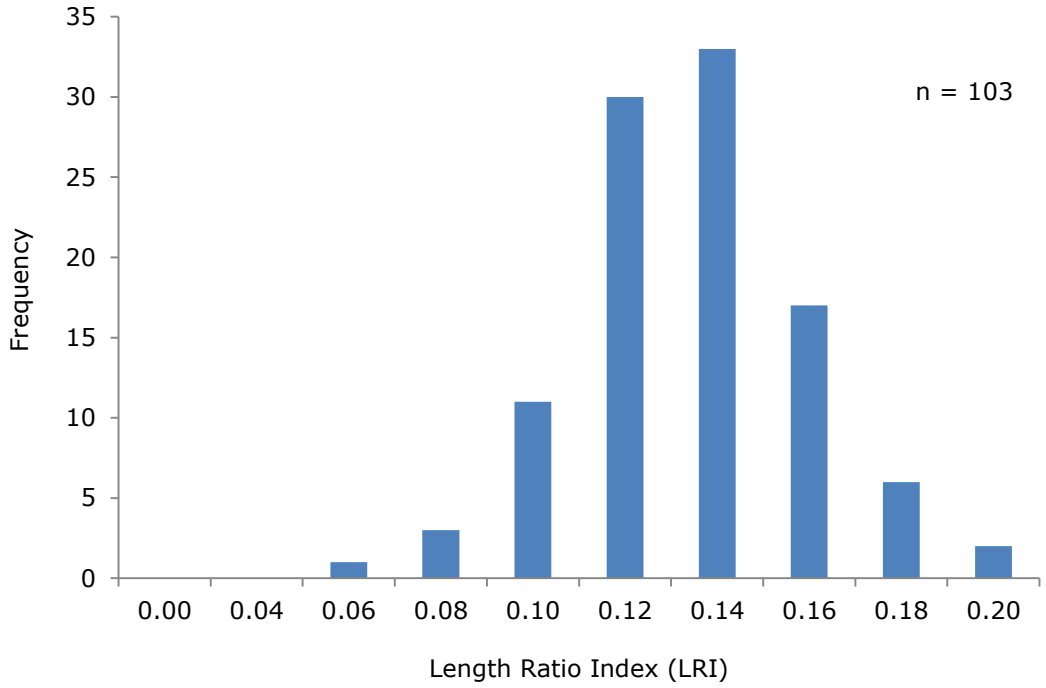


Figure 5-30: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from Barrow catchment, 2016

Table 5-7: Length and weight data for silver eels from the Barrow catchment, 2014 - 2016

Year	No. Eels	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
2016	681	45.2	32.0	77.8	0.195	0.052	0.860	132.98
2015	730	41.8	31.5	77.4	0.149	0.050	0.873	108.73
2014	811	41.4	27.6	76.2	0.140	0.033	0.742	113.58

Table 5-8: Biological data from silver eels from the Barrow catchment, 2014 - 2016

Year	No. Eels	No. Females	No. Males	% Female	% Male	% Prevalence *A. crassus*	Mean Intensity *A. crassus*	Count *A. crassus*
2016	109	41	62	40	60	67	4.20	290
2015	55	19	36	35	65	56	5.16	160
2014	51	20	31	39	61	73	6.11	226

5.7 Boyne

The Boyne catchment is a large catchment located on the east coast of Ireland in the Eastern River Basin District (SERBD). There has historically been a commercial fishery on the River Boyne and the presence of historical catch will aid in the assessment of the current silver eel escapement levels from the river. The fishing site selected on the Boyne was located at O'Dalys Bridge on the main channel of the Kells Blackwater River (Fig. 5.31). The location fished is 5 km downstream of Lough Ramor and upstream of the town of Kells; approximately 50 km upstream from the tidal limit (estuary) in the River Boyne. A large river fyke net was fished from O'Dalys Bridge during the 2016 silver eel season.

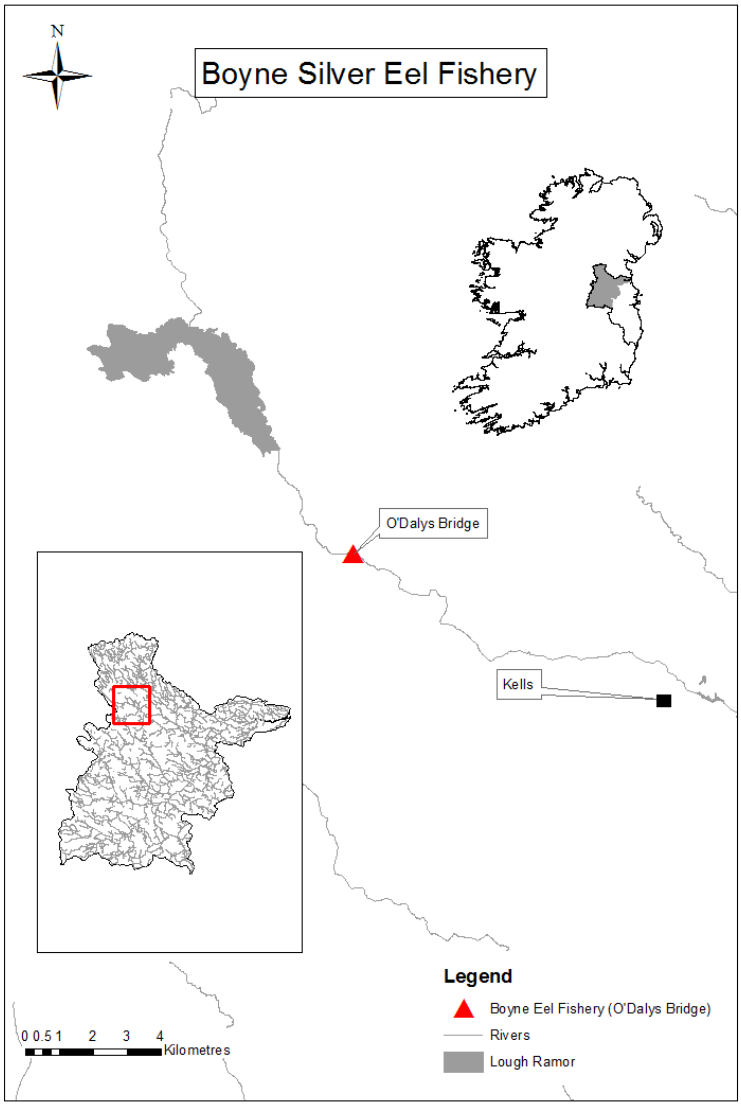


Figure 5-31: Map of silver eel fishing location (O'Dalys Bridge) within the Boyne Catchment, 2016 (Insets: Map of Ireland with Boyne catchment (shaded) and Eastern River Basin District (outlined) and detail of Boyne Catchment rivers)

5.7.1 Silver Eel Catch

Figure 5.32 shows the water flow (and moon phases) for the Boyne Fishery in 2016.

Due to poor fishing conditions and generally low flows, only two nights were fished during the 2016 season, with no eels being captured. As a consequence, no mark-recapture study was carried out in 2016 and no eels were sacrificed for biological or parasite analysis.

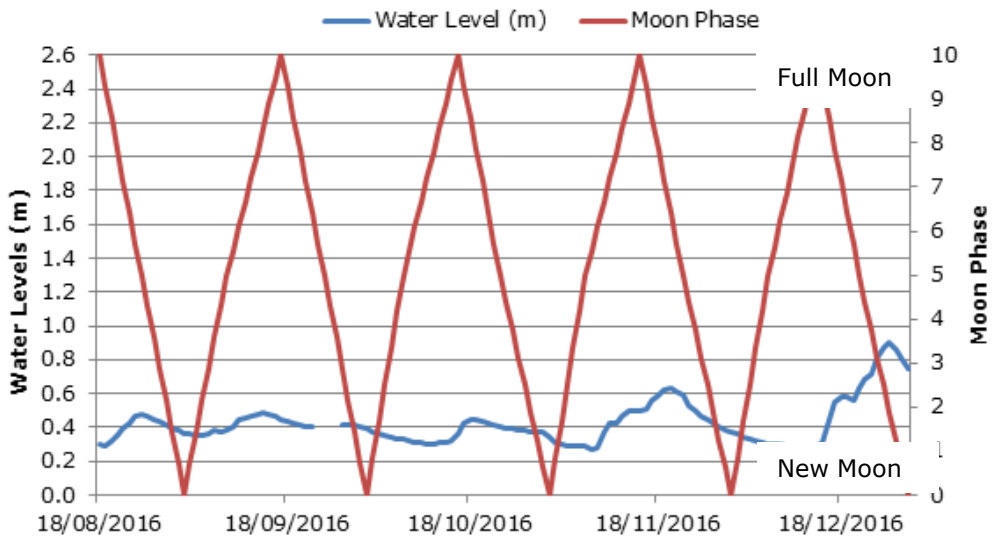


Figure 5-32: Boyne water levels and moon phase for the 2016 silver eel season

6 Yellow Eel Stock Assessment

(refers to Ch. 7.2.2 of the National EMP Report, 2008)

Yellow-eel stock monitoring is integral to gaining an understanding of the current status of local stocks and for informing models of escapement, particularly within transitional waters where silver eel escapement is extremely difficult to measure directly. Such monitoring also provides a means of evaluating post-management changes and forecasting the effects of these changes on silver eel escapement. The monitoring strategy aims to determine, at a local scale, an estimate of relative stock density, the stock's length, age and sex profiles, and the proportion of each length class that migrate as silvers each year. Furthermore, individuals from this sample will be used to determine levels of contaminants and parasites to assess spawner quality. Two classes of survey methodologies will be employed; eel specific surveys and multi-species surveys, mainly involving standardised fyke netting and electro-fishing. Table 6.1 gives the locations for eel specific lake and transitional waters to be surveyed in the 2015 period.

Fyke net surveys carried out between 1960 and 2008 by State Fisheries Scientists will provide a useful bench mark against which to assess the changes in stock. The yellow eel monitoring strategy will rely largely on the use of standard fyke nets. Relative density will be established based on catch per unit (scientific-survey) effort.

Water Framework Directive general fish surveys were undertaken on lakes (fyke nets, gill-nets and hydroacoustics), rivers (electro-fishing and fyke nets) and transitional waters (fyke nets, seine nets & beam trawls) in 2012 which adds significantly to the national eel specific programme. The WFD is being undertaken on a three year rolling cycle by Inland Fisheries Ireland. The National programme of yellow eel monitoring in 2012, as laid out in the EMPs, was undertaken by Inland Fisheries Ireland with additional support from the Marine Institute (Table 6-1).

Under the Irish Eel Management Plan a number of key monitoring objectives were outlined. A monitoring programme for the years 2015 – 2017 will aim to meet these objectives:

2.1 Estimate silver eel escapement using indirect assessment from yellow eel stocks.

3. Monitor the impact of fishery closure on yellow eel stock structure.

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.

8. Determine parasite prevalence and eel quality.

Table 6-1: Monitoring Programme 2015-2017.

RBD	Location	Water body	Life stage	1	2	2.1	3	4	5	6	7	8	2015	2016	2017	Notes
SHIRBD	ESB Shannon	Catchment	Silver	√	√		√		√	√			√	√	√	Scan for tagged eels
NWIRBD	ESB Erne	Catchment	Silver	√	√		√		√	√			√	√	√	Scan for tagged eels
WRBD	Burrishoole	Catchment	Silver	√	√				√	√			√	√	√	Scan for tagged eels
SERBD	Barrow	River	Silver	√	√		√			√			√	√	√	20 nights fishing; MR
ERBD/NBRBD	Fane	River	Silver	√	√		√			√			√	√	√	20 nights fishing; MR
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	√			√	√	√	√			√	√		WFD
NWIRBD	Erne	Catchment	Yellow	√		√	√		√	√	√	√	√	√		PIT tag
SHIRBD	Inchiquin	Lake	Yellow	√					√	√	√	√	√			parasite study
WRBD	Ballynahinch	Lake	Yellow	√		√			√	√	√	√	√			parasite study
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	T. water	Yellow	√				√		√	√	√	√	√	√	Growth & parasite
WRBD	Lough Feeagh	Lake	Yellow	√			√		√	√		√	√	√	√	
WRBD	Lough Furnace	T. water	Yellow	√			√		√	√		√	√	√	√	

6.1 Yellow Eel Survey 2016

Yellow eel surveys took place in 7 lakes, 3 transitional waters and 1 sub-catchment of the Barrow. The lakes surveyed were Lough Corrib (Upper and Lower), Lough Conn, Lough Muckno and Lough Ramor by IFI, lower Lough Erne (by AFBINI) and two lakes in Burrishoole (by MI). The transitional waters were Waterford Estuary, the Munster Blackwater Estuary (by IFI) and Lough Furnace in Burrishoole (by MI).. A semi-quantitative electric-fishing survey was also undertaken in on the Greese River (Barrow catchment) in order to determine the extent of eel distribution in the rivers around the main channel. This electrofishing study is looking at any potential differences in eel distribution in the two forms of catchments found in Ireland, catchments with lakes and riverine catchments.

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 surveys, establish baseline data set, evaluate impedance of upstream migration and determine parasite prevalence within Ireland.

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, where appropriate). For each night's fishing, as many live samples as possible were measured for length, weight, and INDICANG style morphological features associated with silvering (see above). 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. Since 2012, 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 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.

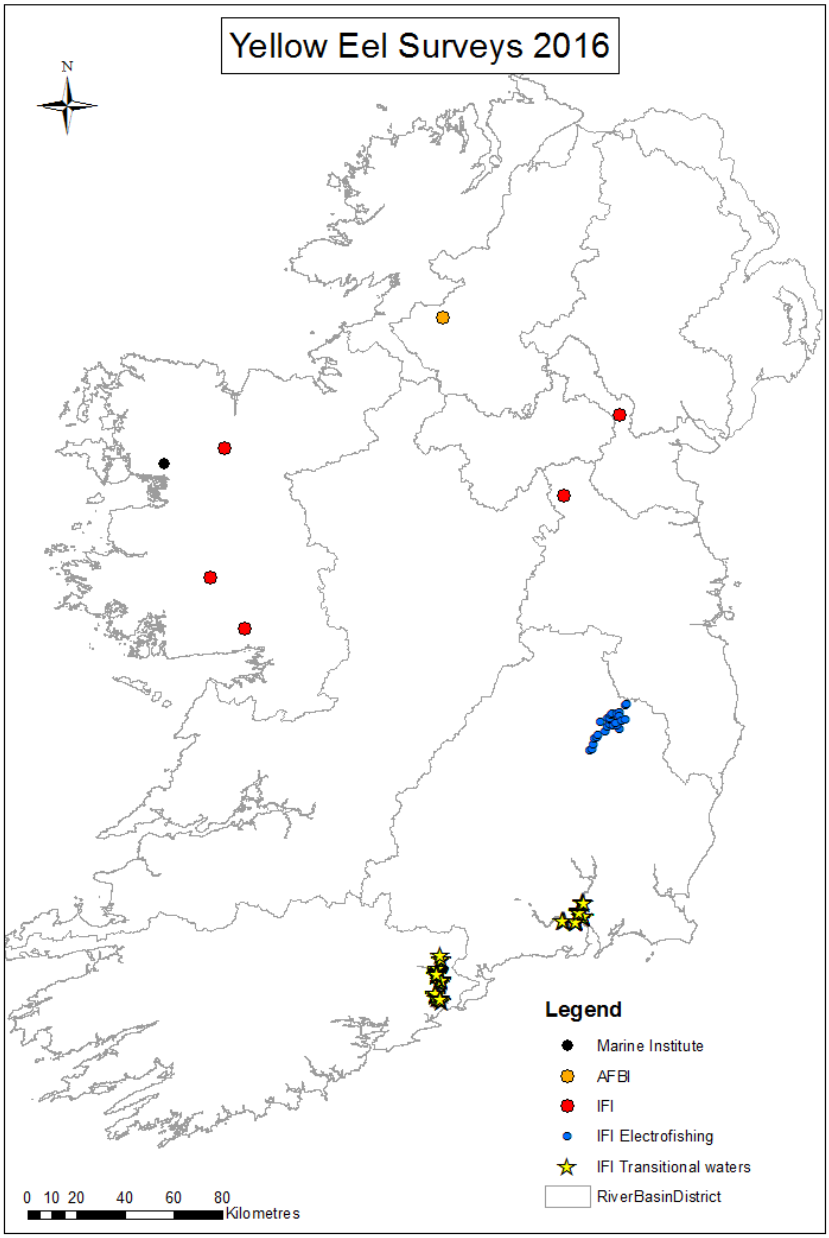


Figure 6-1: Locations of yellow eel lake and estuary surveys, electric-fishing surveys and silver eel surveys carried out by the Eel Monitoring Programme and Scientific Eel Fishery, 2016.

6.1.1 Upper Lough Corrib

Lough Corrib is situated in Co. Galway in the Corrib catchment. The lake has a total surface area of 16,438.72 ha and a maximum depth of approximately 39m. It is divided in two for surveying purposes. Both upper and lower Lough Corrib were sampled in 2016.

An intensive fyke net survey was carried out over 8 nights (4 nights in July and 4 nights in August, with 8 chains of 5 fyke nets set per night), (Fig. 6.2). A total of 2,387 eels were captured giving a catch per unit effort of 7.51 (Table 6.5). While this catch was very high, the majority of these eels (1,970) were captured in a single bay in the northeast of the lake, where 2 chains of fykes (i.e 10 nets) were set each night for 4 nights. The bay was surveyed to investigate the local eel fishermans knowledge that the greatest numbers of eels were to be captured here during the August dark moon phase. All eels captured and processed ranged in length from 33.4 cm to 77.4 cm and in weight from 0.060 kg to 0.933 kg, with a total catch weight of 178.5 kg (Table 6.5; Fig. 6.3). The Upper Corrib survey was hampered on the second sampling occasion by high winds, with 6 chains of nets being left in for 2 nights due to poor weather conditions. Upper Lough Corrib was sampled by the Eel Monitoring Programme in 2010 during which the survey captured 445 eels with a CPUE of 1.57 (50 nets per night for 6 nights) (Table 6.5).

The 2016 survey retained eels for dissection (n = 105) the sample taken was 99% female and 1% immature (intersexual) eel (Fig. 6.4). The parasite prevalence was 47% (Mean Infection Intensity of 2.51 and total parasite count of 123), (Table 6.6; Fig. 6.5). The 2011 survey retained a sample of eels for dissection (n = 103) which was 100% female and showed a 50% prevalence of *Anguillicola crassus* (Mean Infection Intensity 2.90 and total parasite count 148). The main diet preferences were for *Asellus* sp. and *Gammarus* sp.

The *A. crassus* status of Upper Lough Corrib appears to be relatively stable. Despite the moderately high prevalence and infection intensity values, both the Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI) returned results of only slight /moderate swimbladder damage arising from *A. crassus* infections (Figs. 6.6 – 6.7). The main diet preference in 2016 was for *Asellus* sp.

During the 2016 survey, the greatest catch of eels was from the nets set in the bay near The Derries in the northeast Upper Lough Corrib which resulted in particularly high catches (ranging from 152 to 437 eels in a single chain of five nets) which were not representative of the catches from nets set in other areas of the lake on the same nights (<100 eels per net per night). The local eel fisherman believes that such great numbers are always caught in this area at this time of year as eels move from the drying up drains and ditches in the local bogs in the Cross/Kilmaine area down into the bay. This phenomenon will be examined in 2017.

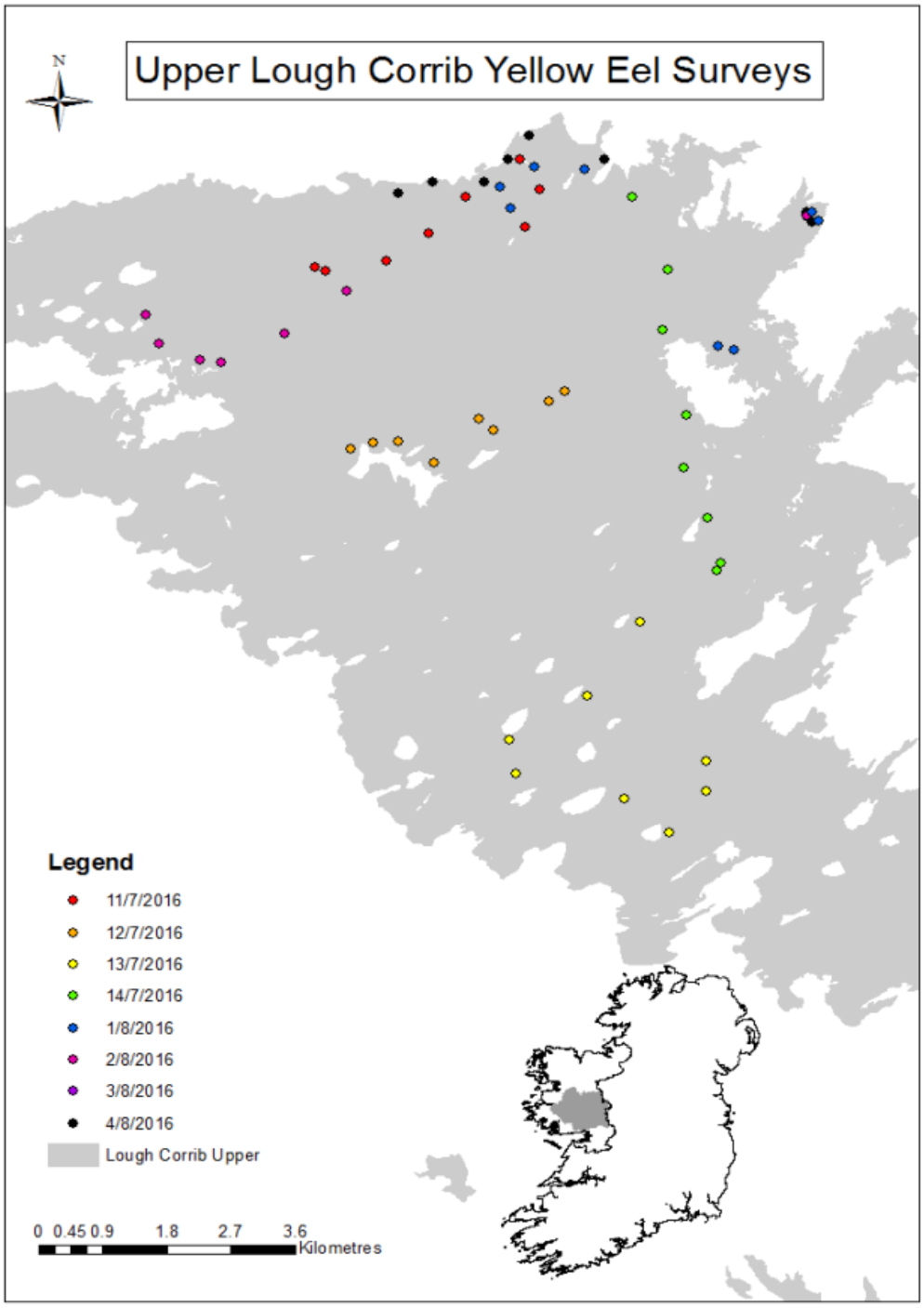


Figure 6-2: Locations of fyke nets sampled on L. Corrib Upper, 2016. (Inset: Map of Ireland with Corrib catchment (shaded) and Western River Basin District (outlined))

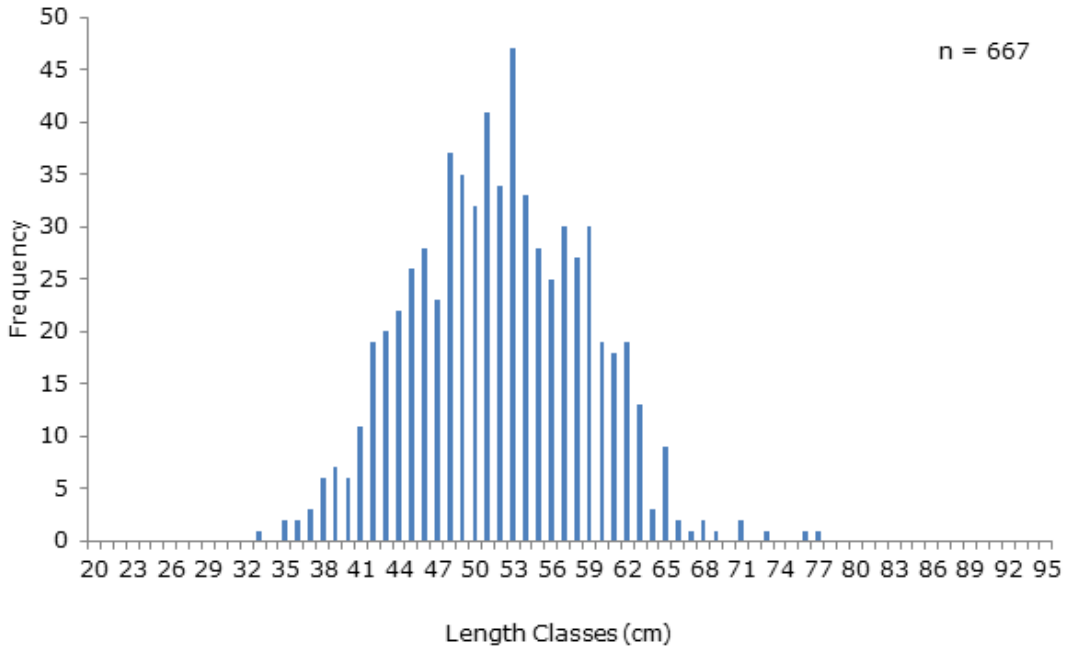


Figure 6-3: Length frequency of yellow eels captured at L. Corrib Upper (n = 667 measured eel), 2016

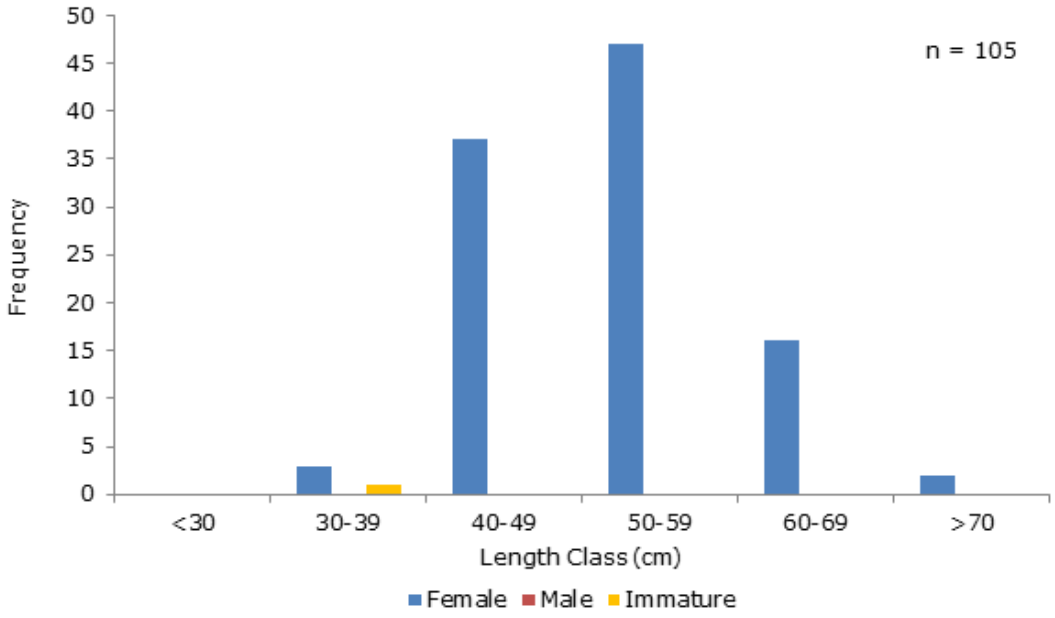


Figure 6-4: Sex distribution of sacrificed yellow eels in L. Corrib Upper, 2016

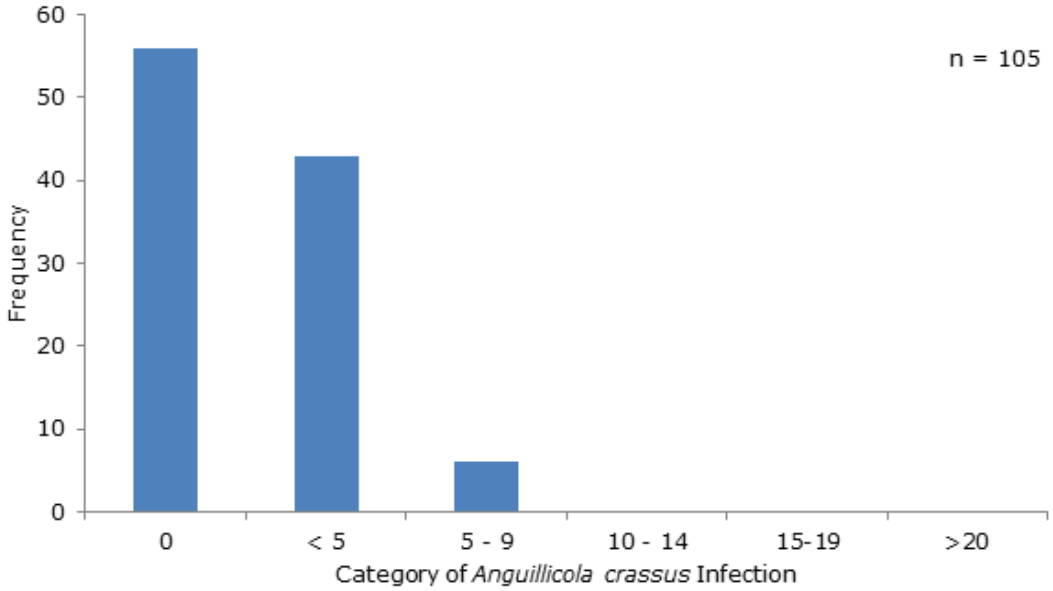


Figure 6-5: *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Corrib Upper, 2016

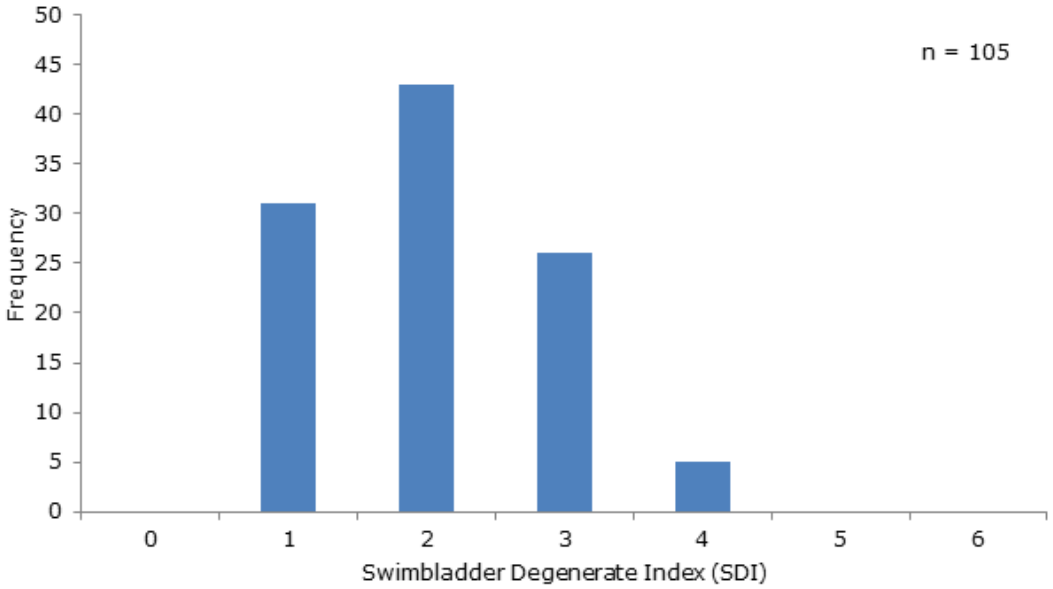


Figure 6-6: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from L. Corrib Upper, 2016

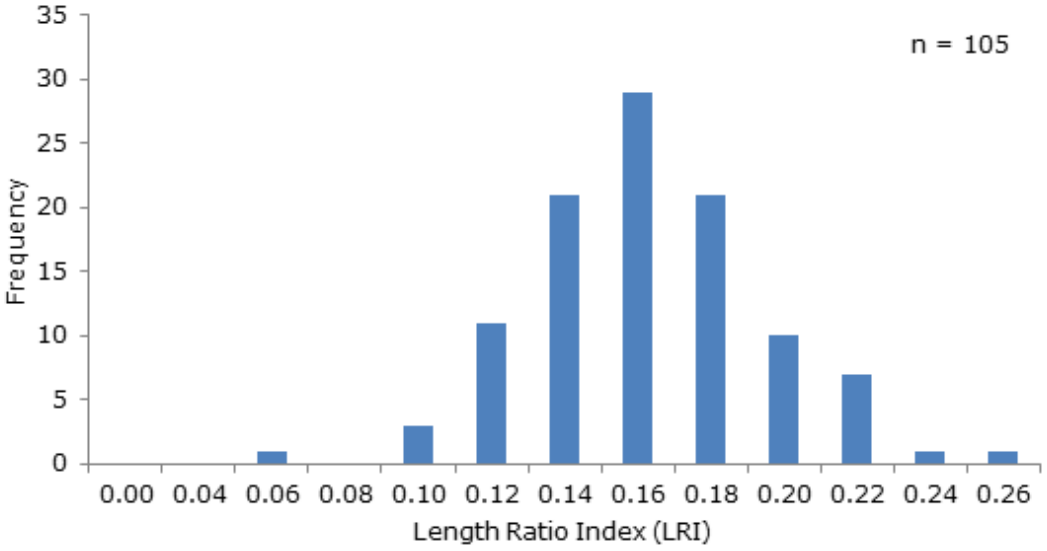


Figure 6-7: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from L. Corrib Upper, 2016.

6.1.2 Lower Lough Corrib

Lough Corrib is situated in Co. Galway in the Corrib catchment. The lake has a total surface area of 16,438.72 ha and a maximum depth of approximately 39m. It is divided in two for surveying purposes. Both upper and lower Lough Corrib were sampled in 2016.

An intensive fyke net survey was carried out over 8 nights (4 nights in July and 4 nights in August, with 8 chains 5 fyke nets set per night), (Fig. 6.8). A total of 576 eels were captured (including batch weighed eels) giving a catch per unit effort of 1.80 (Table 6.5). The eels ranged in length from 28.9 cm to 73.2 cm and in weight from 0.050 kg to 0.629 kg, with a total catch weight of 103.95 kg (Table 6.5; Fig. 6.9). Lower Lough Corrib was last sampled by the Eel Monitoring Programme in 2009 during which the survey captured 316 eels with a CPUE of 1.05 (50 nets per night for 6 nights).

The 2016 survey retained a sample of eels for dissection (n = 92) which was 98% female and 1% were male with 1% immature (intersexual) eel. The sampled eels showed a 72% prevalence of *Anguillicola crassus* (Mean Infection Intensity 4.53 and total parasite count, 299) (Table 6.6). Despite the moderately high % prevalence and infection intensity values, both the Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI) returned results of only slight/moderate swimbladder damage arising from *A. crassus* infections (Figs. 6.12-6.13). The main diet preference in 2016 was for *Asellus* sp.

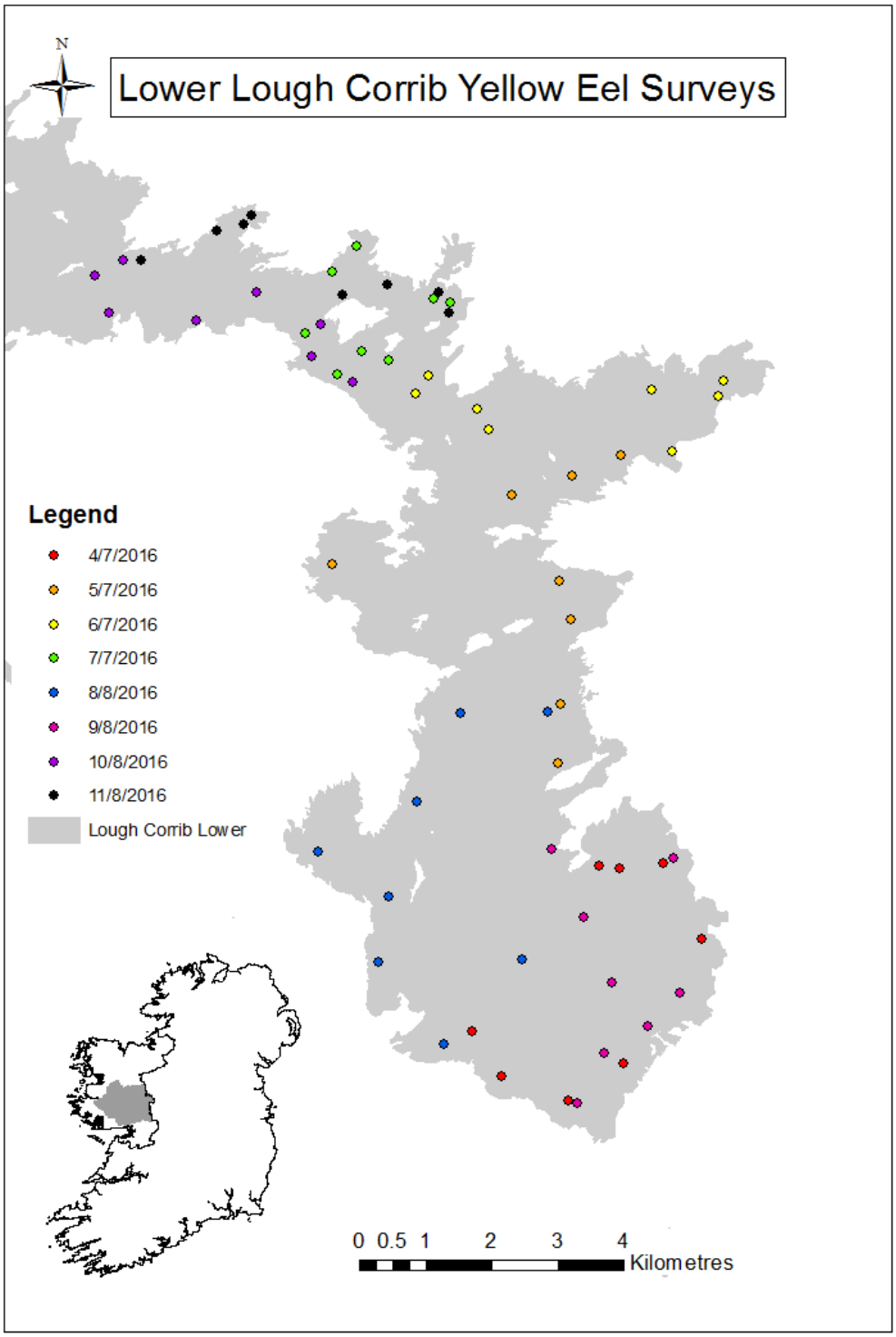


Figure 6-8: Locations of fyke nets sampled on L. Corrib Lower, 2016. (Inset: Map of Ireland with Corrib catchment (shaded) and Western River Basin District (outlined))

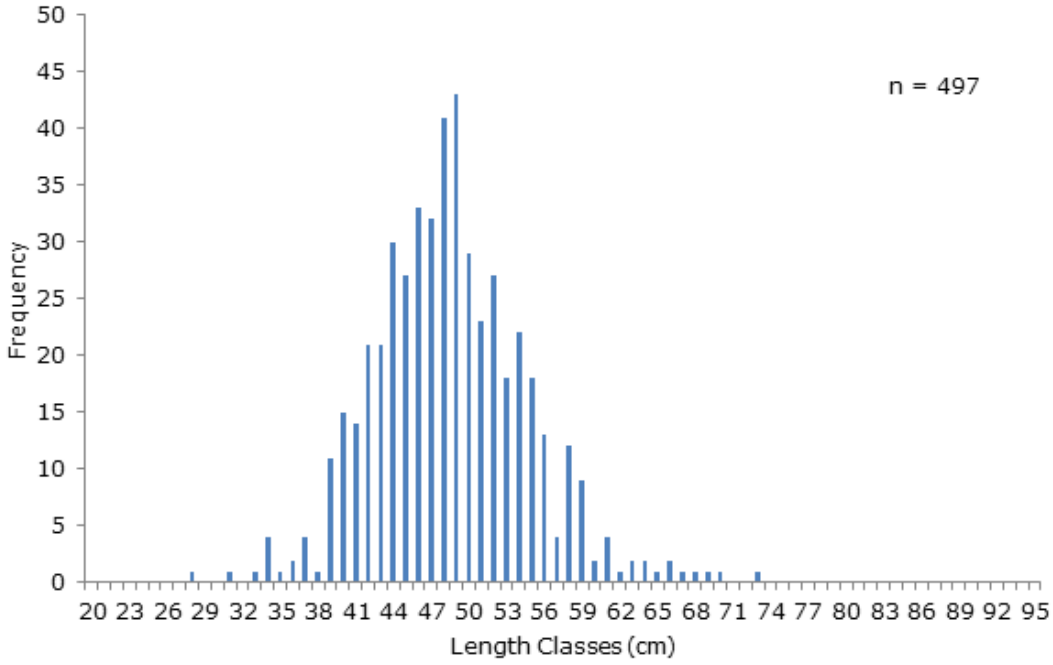


Figure 6-9: Length frequency of yellow eels captured at L. Corrib Lower, 2016

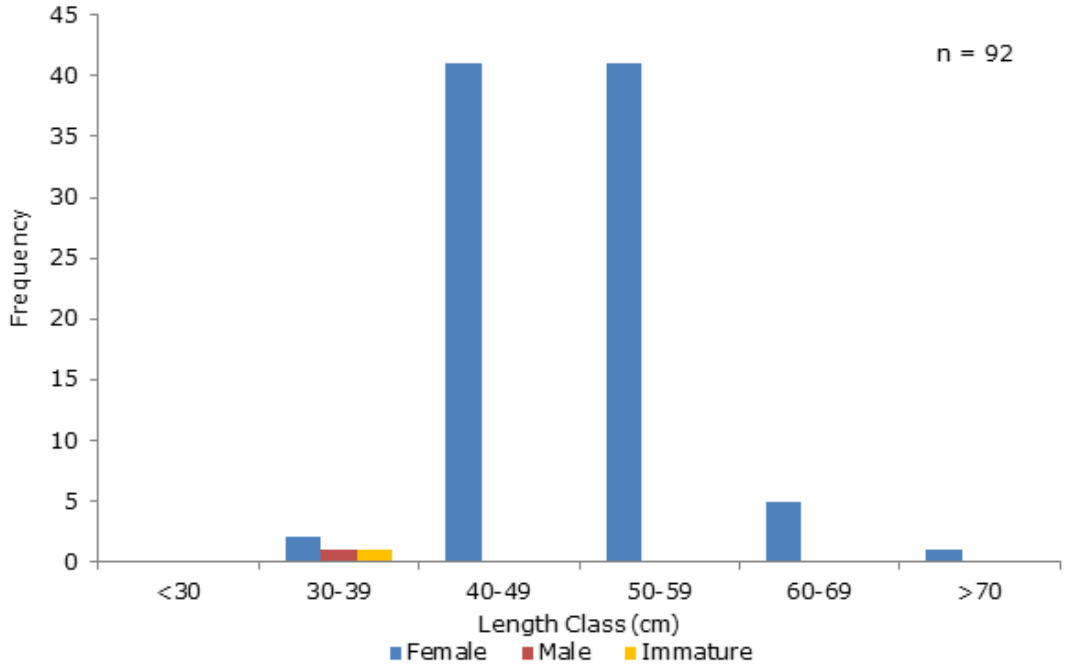


Figure 6-10: Sex distribution of sacrificed yellow eels in L. Corrib Lower, 2016

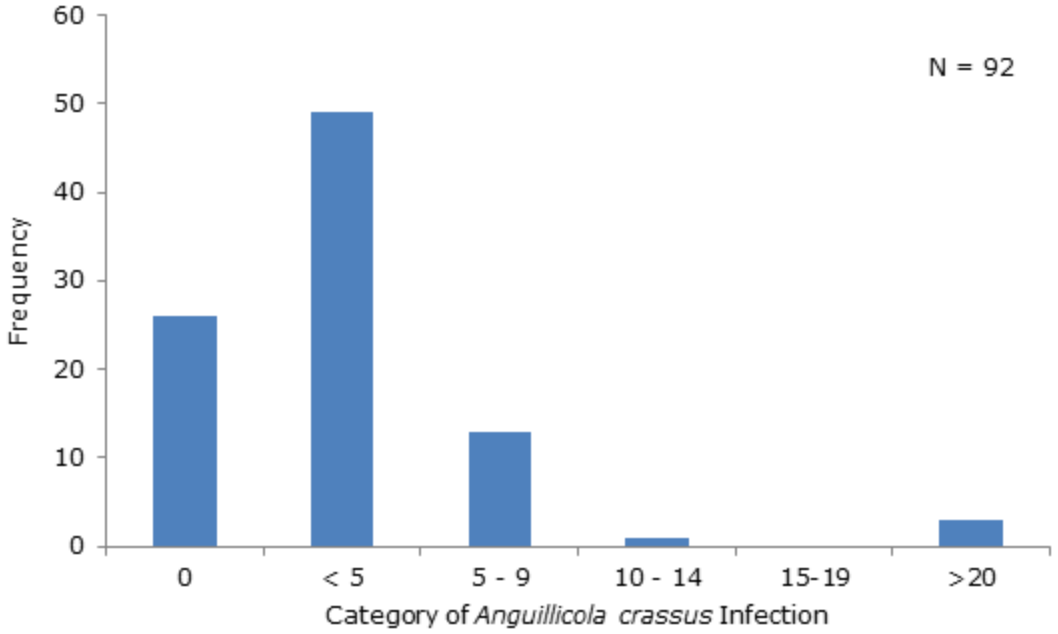


Figure 6-11: *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Corrib Lower, 2016

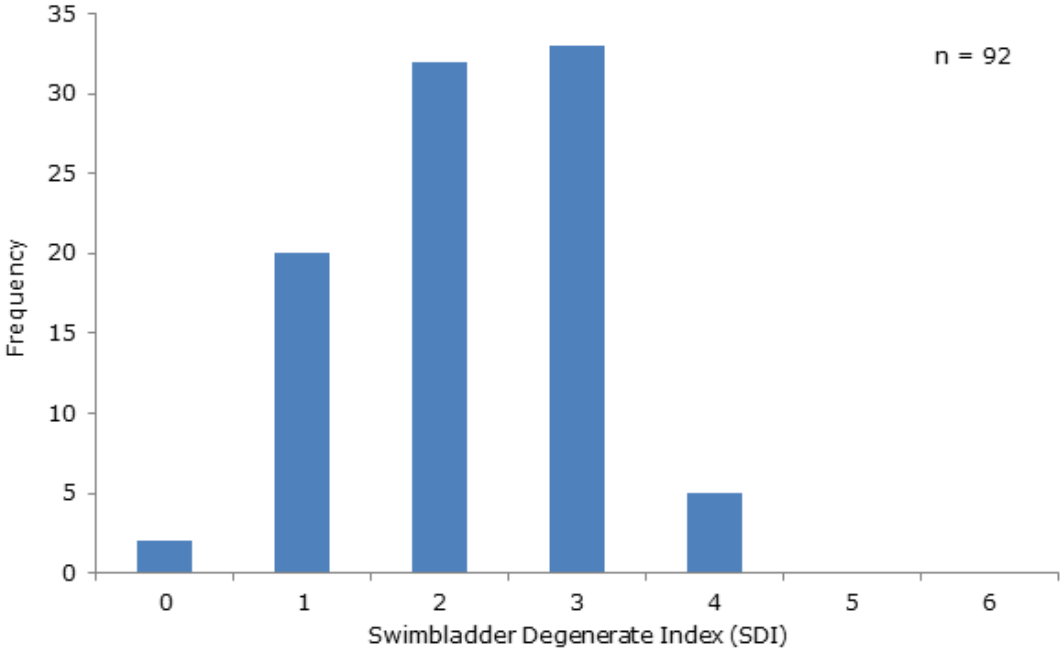


Figure 6-12: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from L. Corrib Lower, 2016

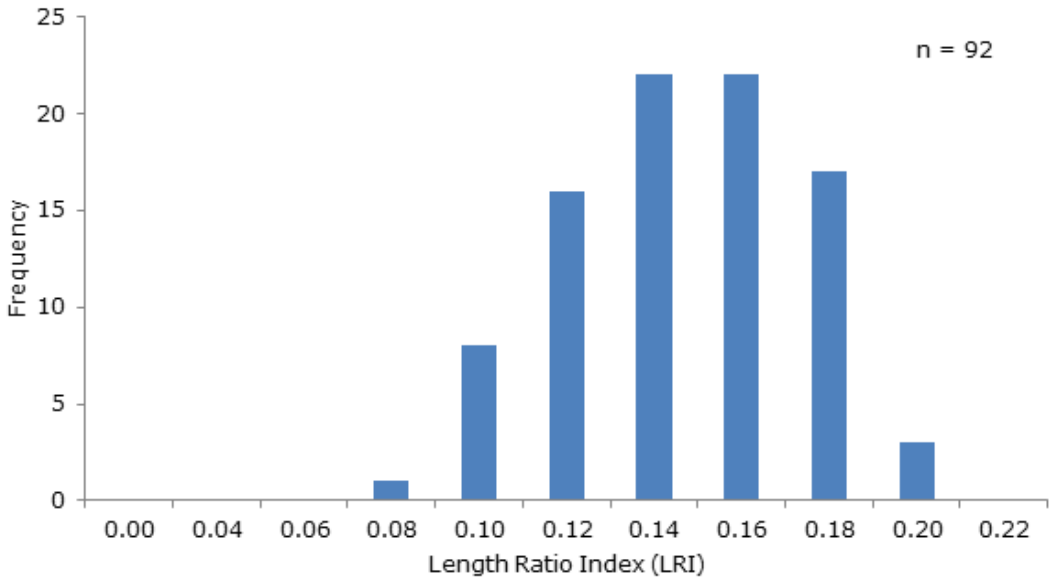


Figure 6-13: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from L. Corrib Lower, 2016

6.1.3 Lough Conn

Lough Conn is located in Co. Mayo on the Moy catchment, with a surface area of 4,704 ha. The lake was sampled over 8 nights (4 nights in July and 4 nights in August, with 8 chains of 5 fyke nets set per night), (Fig. 6.14). A total of 857 eels were captured (including batched weighed eels) giving a catch per unit effort of 2.68 (Table 6.5). The captured eels ranged in length from 31.0 cm to 82.6 cm and in weight from 0.053 kg to 1.069 kg, with a total catch weight of 87.87 kg (Table 6.5; Fig. 6.15). A similar result was notedduring the EMP 2009 survey of Lough Conn with 600 eels captured and a CPUE of 2.40.

In 2016, a total of 100 eels were sacrificed from this lake, 98% of which were female and 2% were male (Table 6.6; Fig. 6.16). There was a parasite prevalence of 37% recorded (Mean Infection Intensity 4.32, total parasite count 160), (Table 6.6; Fig. 6.17). Both the Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI) returned results of only slight swimbladder damage on average due to *A. crassus* infections (Figs. 6.18-6.19). The diet preference on that sampling occasion was for *Asellus* sp.

At the last survey of this lake in 2009, the dissected sample of eels (n = 110) was 97% female and 3% male. There was a prevalence rate of 52% infection of *A. crassus* across these eels, with a mean infection intensity of 7.86 (total count of parasites 448). The diet preferences recorded were for *Asellus* sp., *Gammarus* sp. and the mayfly *Ephemera danica*.

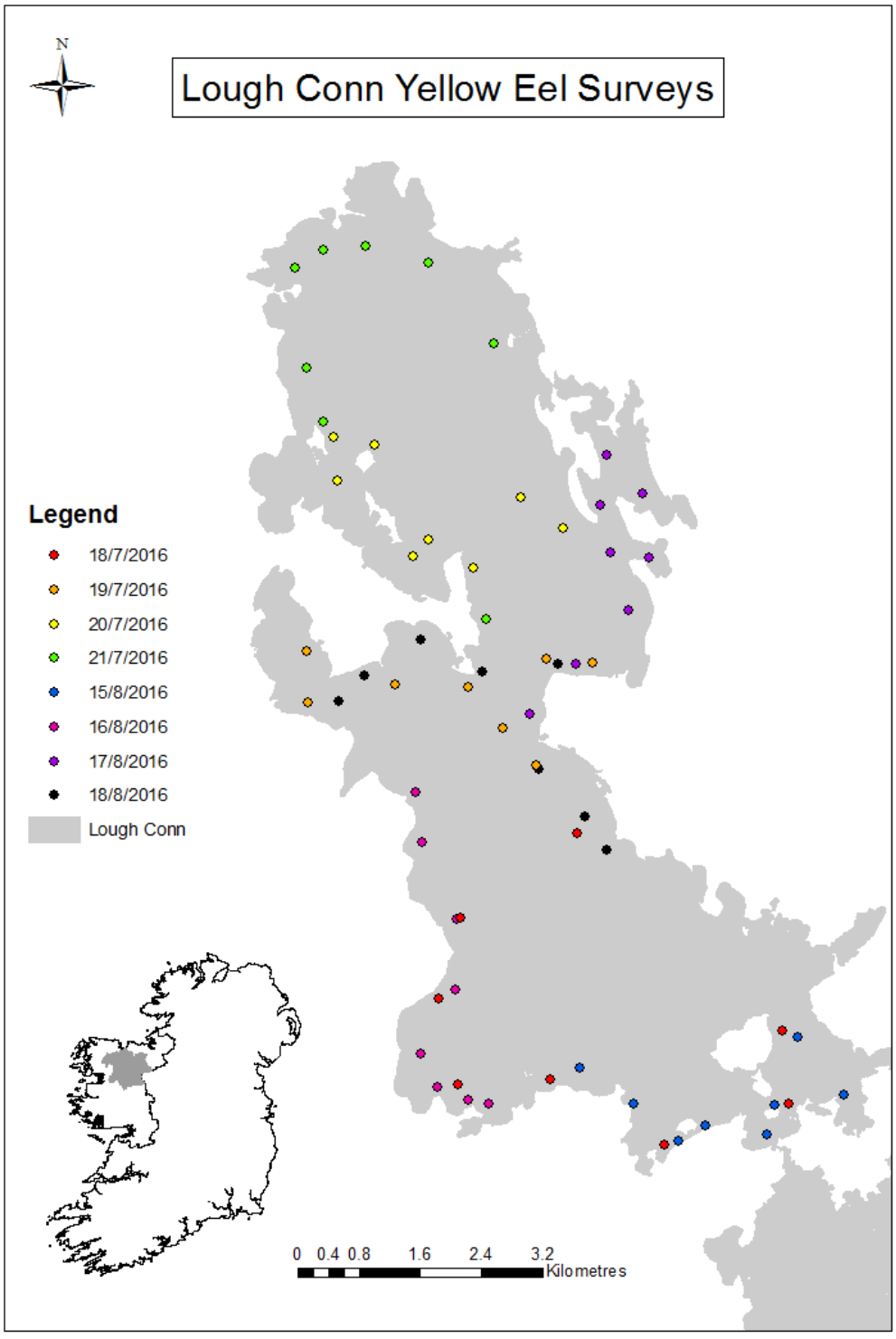


Figure 6-14: Locations of fyke nets sampled on L. Conn, 2016. (Inset: Map of Ireland with Moy catchment (shaded) and Western River Basin District (outlined))

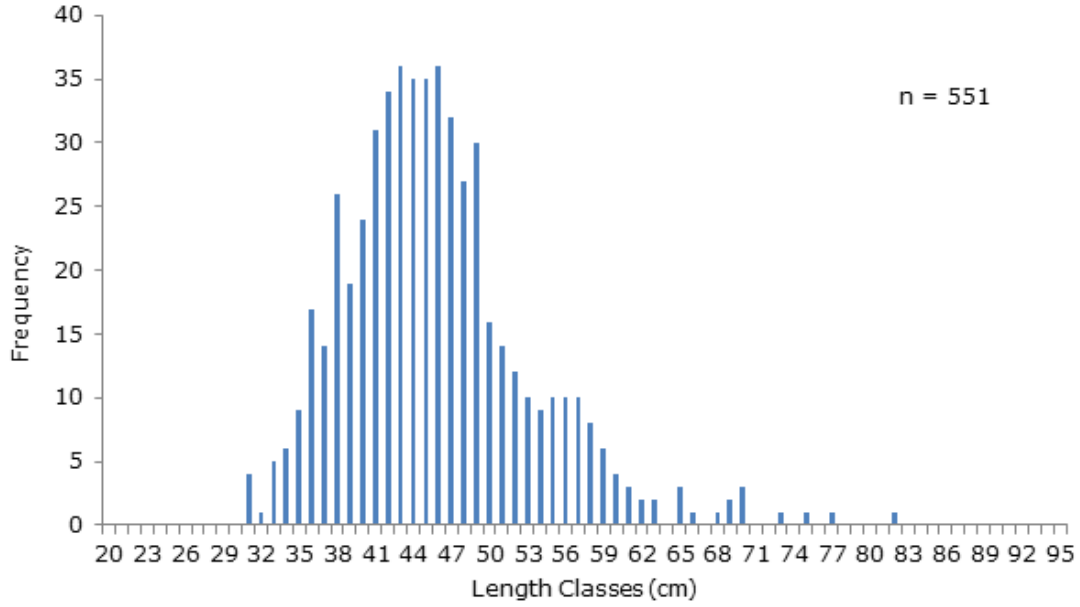


Figure 6-15: Length frequency of yellow eels captured at L. Conn, 2016

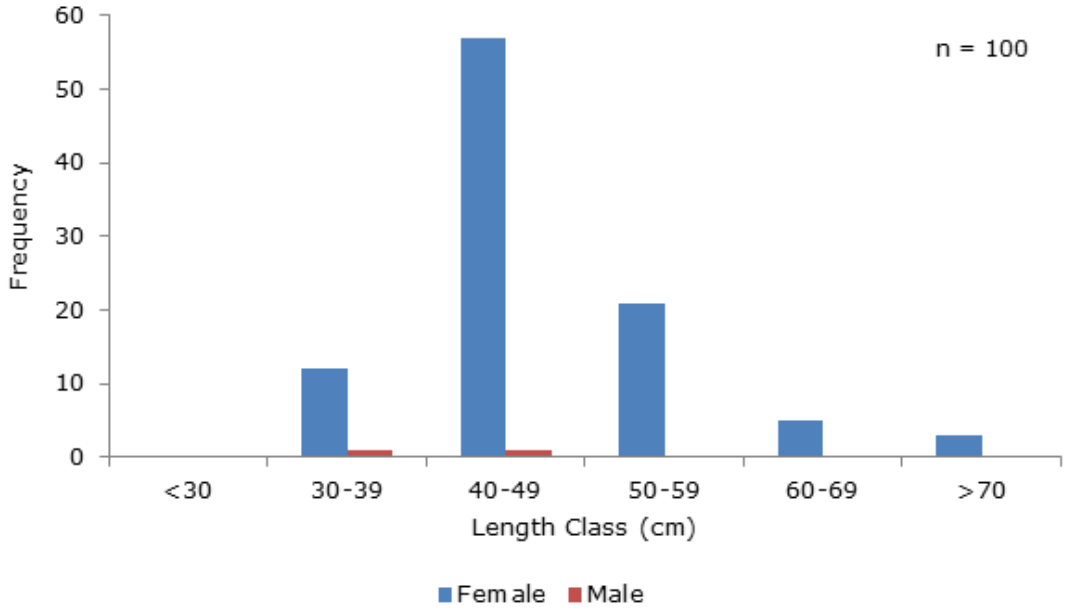


Figure 6-16: Sex distribution of sacrificed yellow eels in L. Conn, 2016

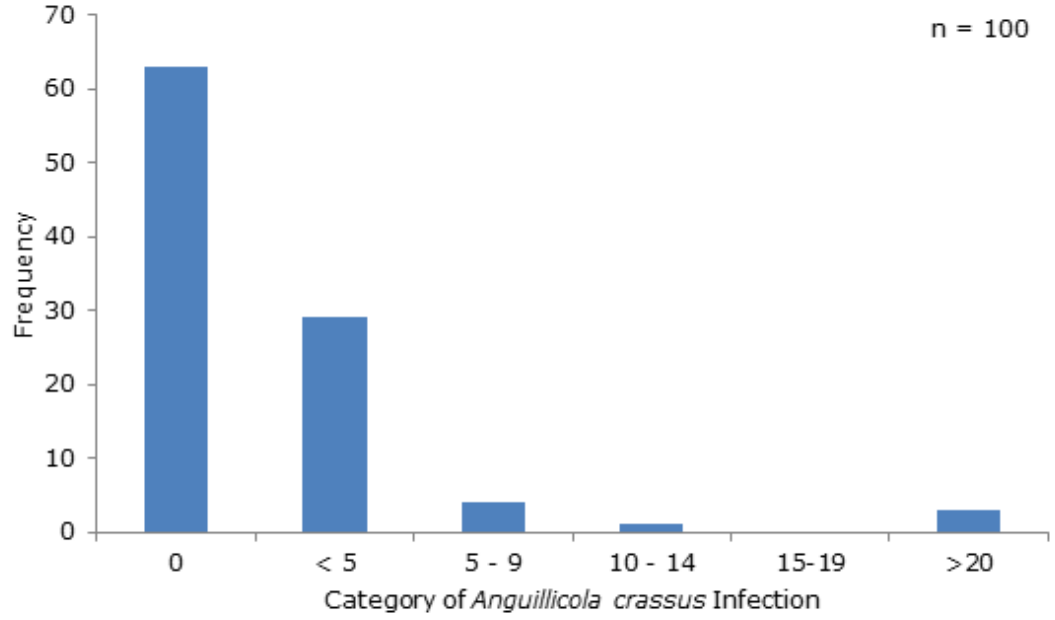


Figure 6-17: *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Conn, 2016

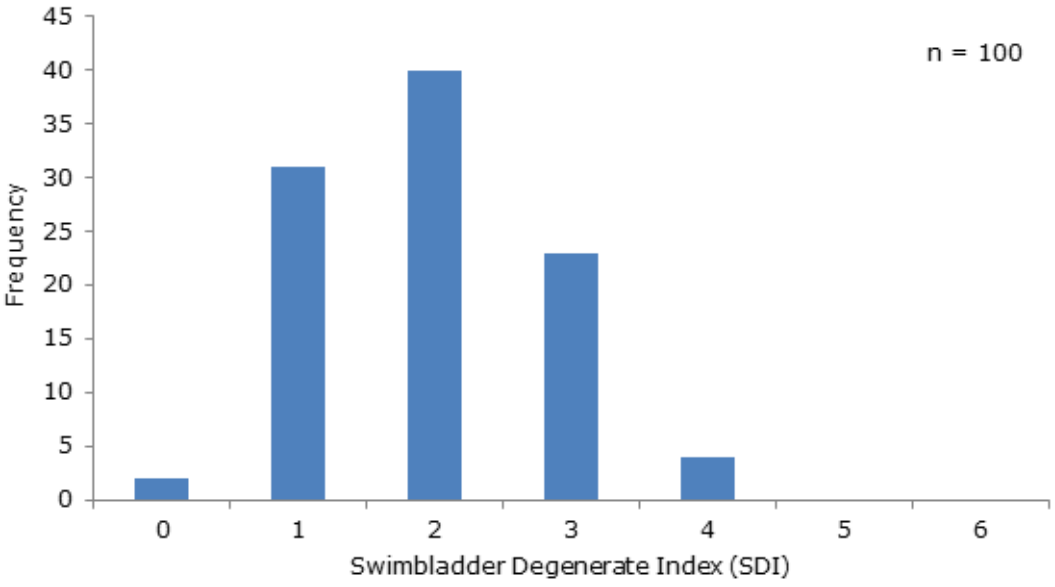


Figure 6-18: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from L. Conn, 2016

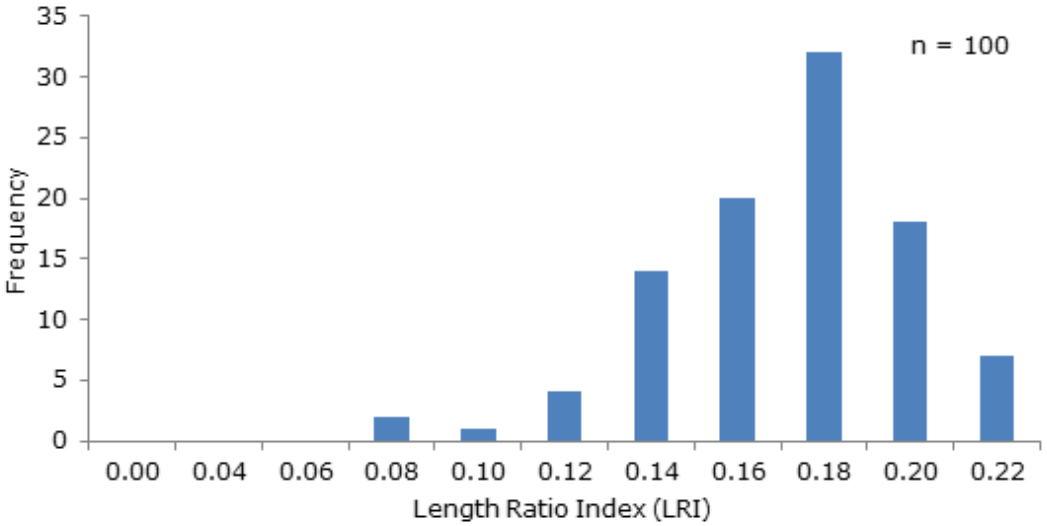


Figure 6-19: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from L. Conn, 2016

6.1.4 Lough Ramor

Lough Ramor is a shallow glacial lake located near Virginia (Co. Cavan) in the Boyne catchment. It has a surface area of 712 ha. The outflow of Lough Ramor is the Kells Blackwater River which discharges into the River Boyne. Lough Ramor was sampled for 3 nights during the summer of 2016, (one night in August and 2 nights in September, with 8 chains of 5 fyke nets set per night), (Fig. 6.20). In total, 401 eels were caught with a CPUE of 3.34 (Table 6.5). The eels ranged in length from 34.3 to 84.2cm and in weight from 0.058 to 1.320kg, with a total catch weight of 109.7 kg (Table 6.5; Fig. 6.21). In addition to the fyke net survey a bathymetry survey was carried out on Lough Ramor in 2016 and a detailed depth contour map has been created (Figure 4-22).

Lough Ramor has been sampled by the eel monitoring programme in 2011, 2014 and 2016. The sample from 2011 was 97% female eels (n = 89, 1 % male and 2% immature/intersexual eels). The prevalence of *A. crassus* was 79% (mean infection intensity, 4.76; Parasite Count, 333). The sample from 2014 was 88% female, 10% were male and 1% was identified as an immature (intersexual) individual. There was a high prevalence of *A. crassus* with a rate of 84% and a mean intensity of 9.66 parasite per eel. The total parasite count among the sacrificed eels was 802 individuals.

Despite the obvious increases in prevalence and intensity between the sampling years, both the SDI and LRI indices of swimbladder health, suggested only slight/moderate damage to the swimbladders for the 2014 sample. The main food type recorded during stomach content examination was chironomid larvae. No eels were retained from the 2016 surveys.

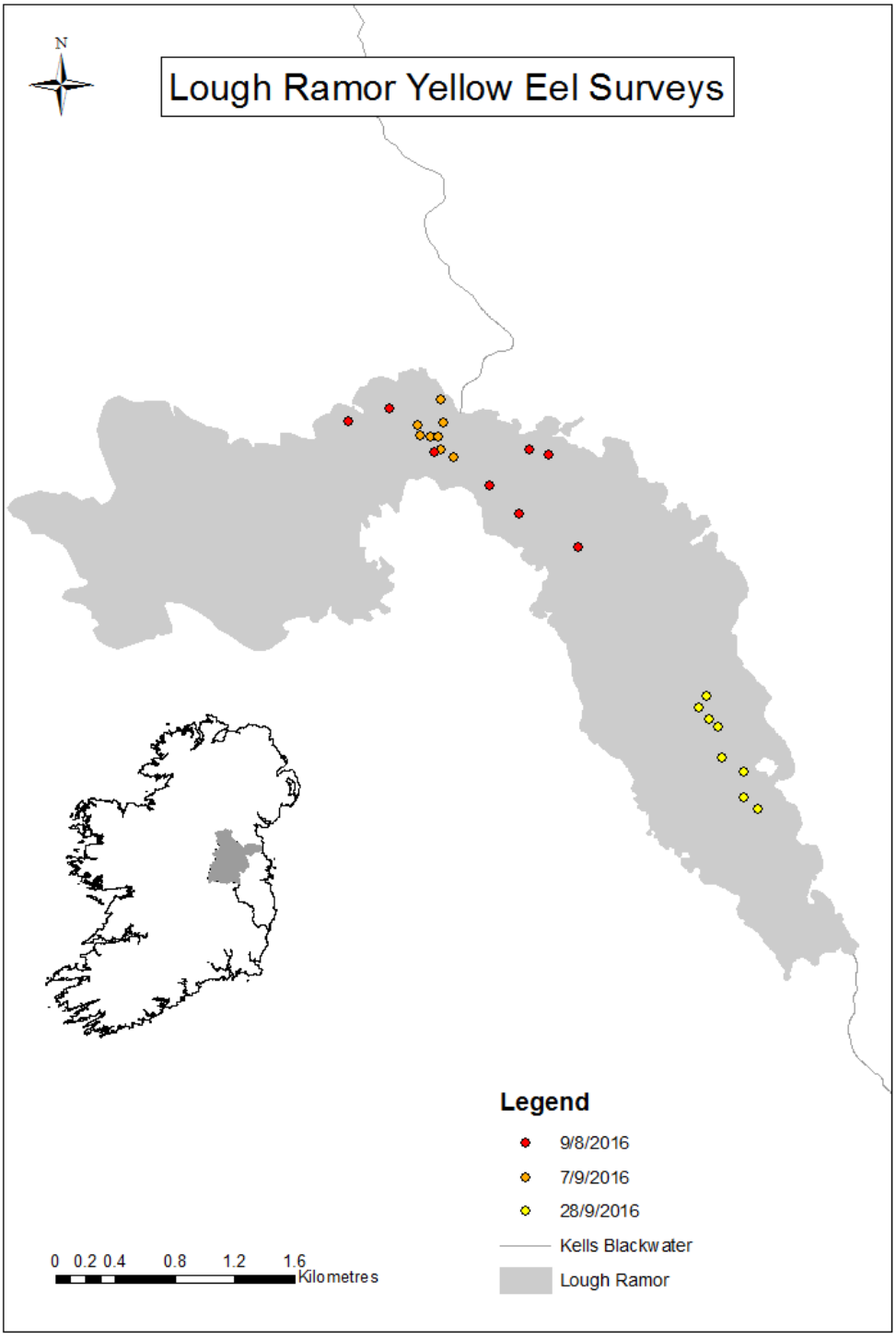


Figure 6-20: Locations of fyke nets sampled on L. Ramor, 2016. (Inset: Map of Ireland with Boyne catchment (shaded) and Eastern River Basin District (outlined))

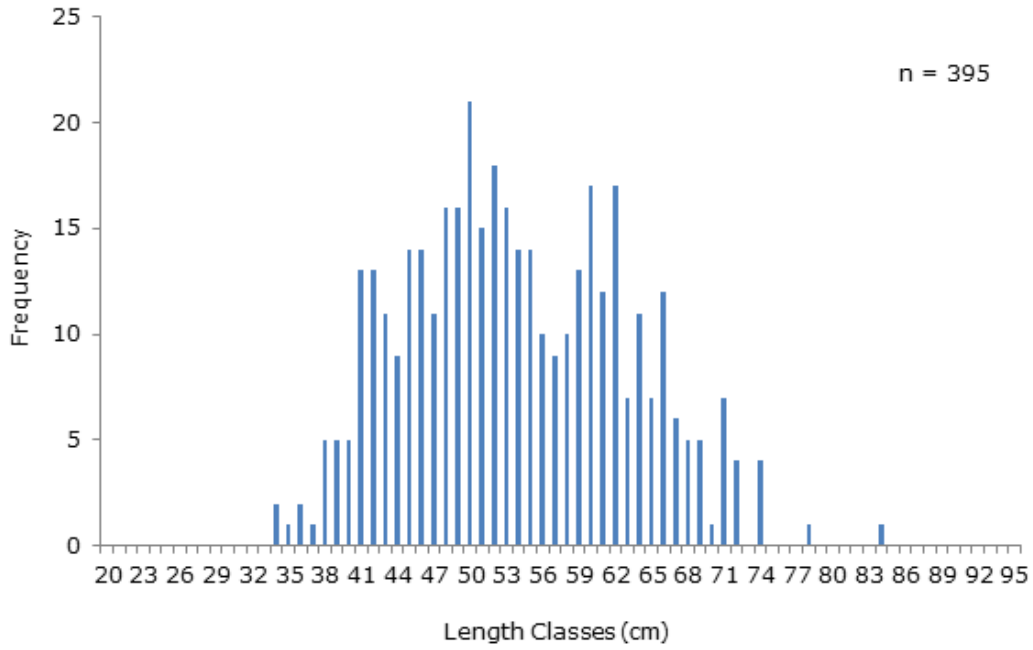


Figure 6-21: Length frequency of yellow eels captured at L. Ramor (n = 395 eels measured), 2016

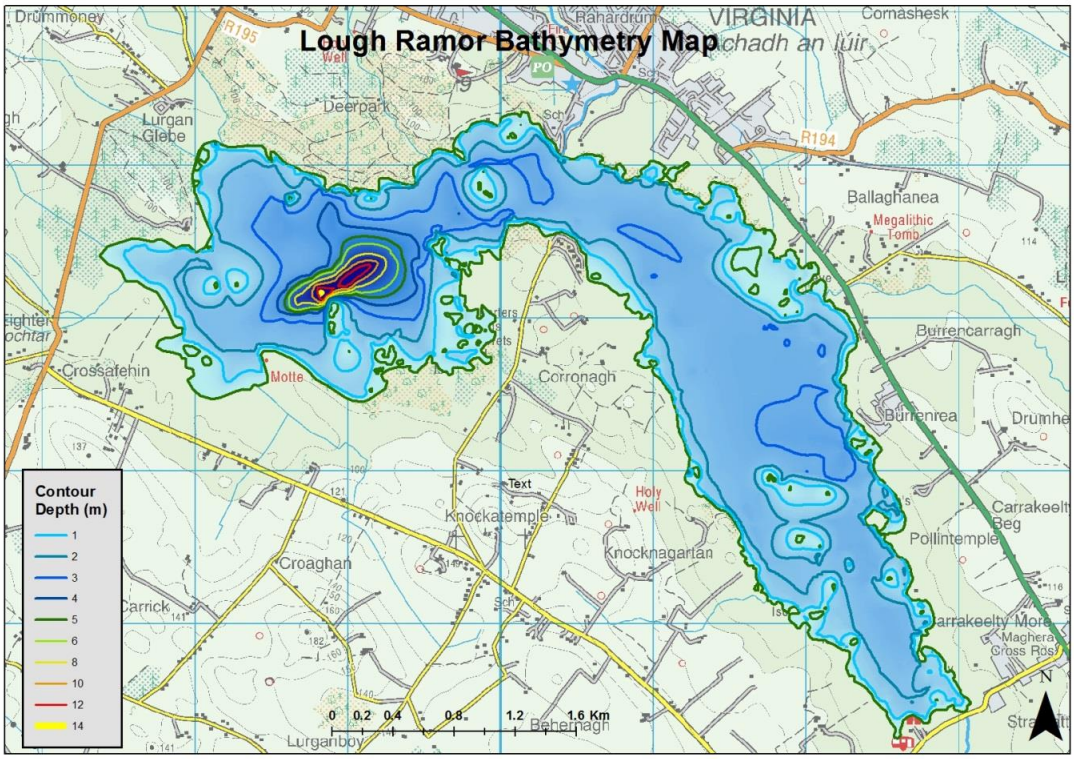


Figure 6-22: Bathymetry map of Lough Ramor

6.1.5 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 had been sampled by the EMP in 2012, 2013 and 2014 before the most recent survey in 2016, which included a full mark-recapture study.

In 2016, a mark recapture study was undertaken within a bay of Lough Muckno. The bay within the lake was repeatedly sampled for 9 nights over 3 weeks during the summer of 2016, (July and August, with 8 chains of 5 fyke nets set per night), (Fig. 6.23). In total, 2,611 eels were caught with a CPUE of 7.25 (Table 6.5). The eels ranged in length from 27.2 to 83.8 cm and in weight from 0.026 to 1.076 kg, with a total catch weight of 455.65 kg (Table 6.5; Fig. 6.24).

The mark recapture study was undertaken to investigate the population estimate of the bay and to investigate the silvering maturation rate of yellow eels. Over the 9 nights 1,914 eels were tagged with 124 eels recaptured giving a recapture rate of 6%. These data will be reviewed with the aim of producing a population density estimate.

A sample of eels (n = 106) was also retained during the 2012 survey, 93% were female, 3% male and 4% immature eel. The parasite prevalence was 48% with a mean infection intensity of 2.16 (total parasite count, 110). In 2013, 100 eels were retained with 94% female and 6% male eels. Parasite prevalence was noted as 56% with a mean infection intensity of 3.41 (total parasite count, 100).

Water temperature is an important consideration when looking at prevalence of parasite infection, as the development and activity of *A. crassus* are increased in temperatures greater than 10°C (Knopf *et al*., 1998). In both 2013 and 2016, the Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) depicting swimbladder health status highlighted only slight/moderate damage to the swimbladder tissues of Lough Muckno eels (Fig. 6.7-6.8).

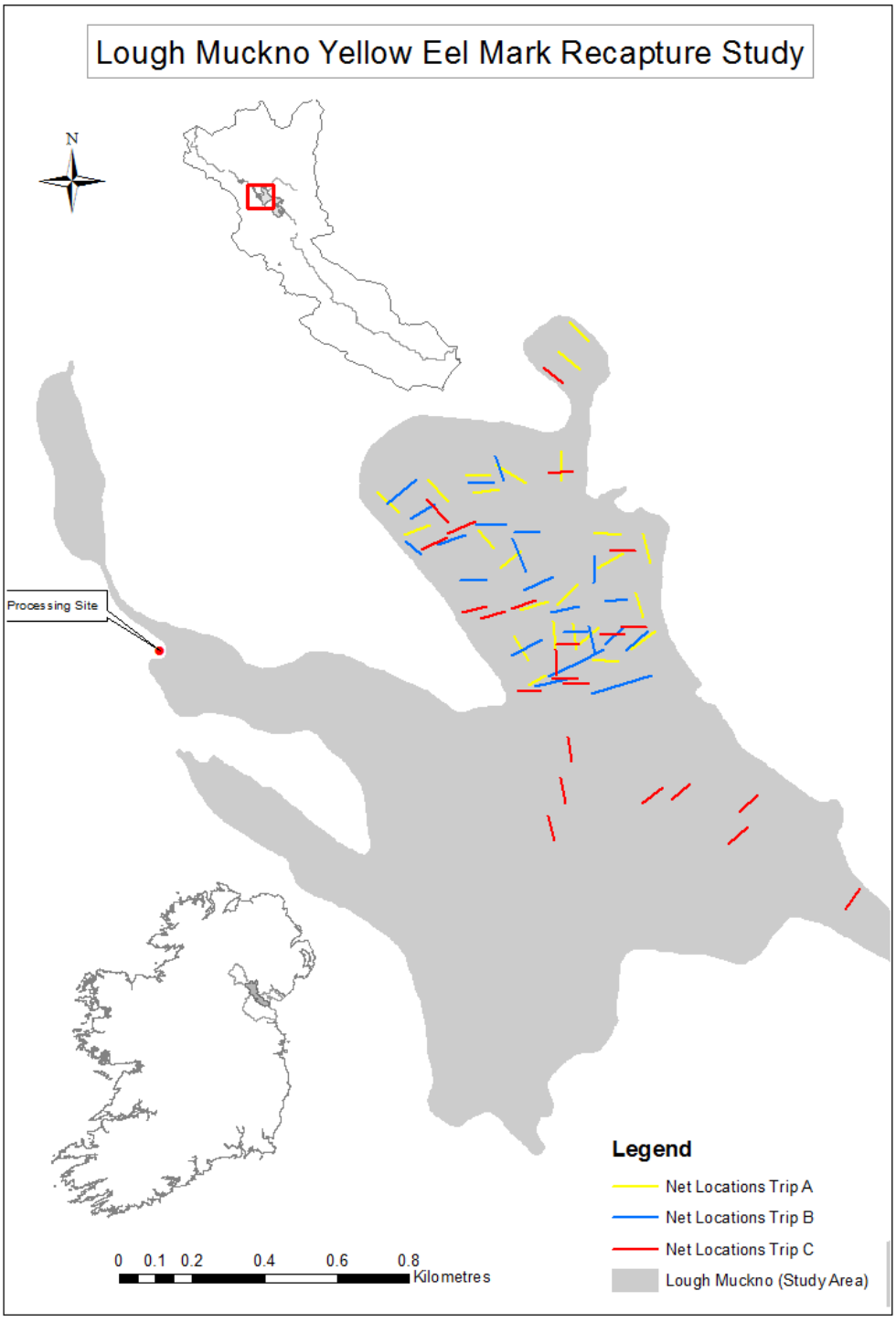


Figure 6-23: Locations of fyke nets sampled on L. Muckno, 2016. (Inset: Map of Ireland with Fane catchment (shaded) and Eastern River Basin District (outlined)), red square denotes study area

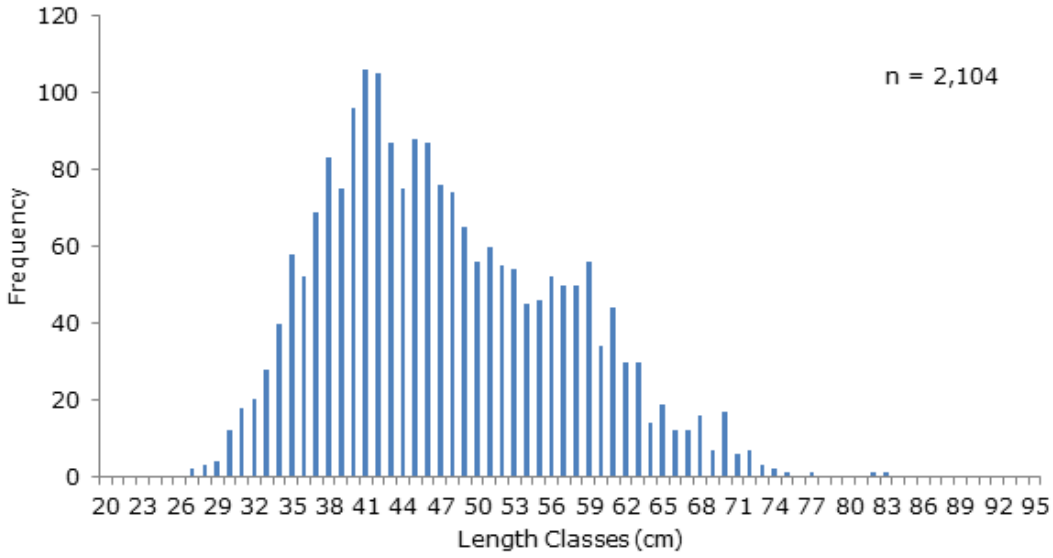


Figure 6-24: Length frequency of yellow eels captured at L. Muckno, 2016

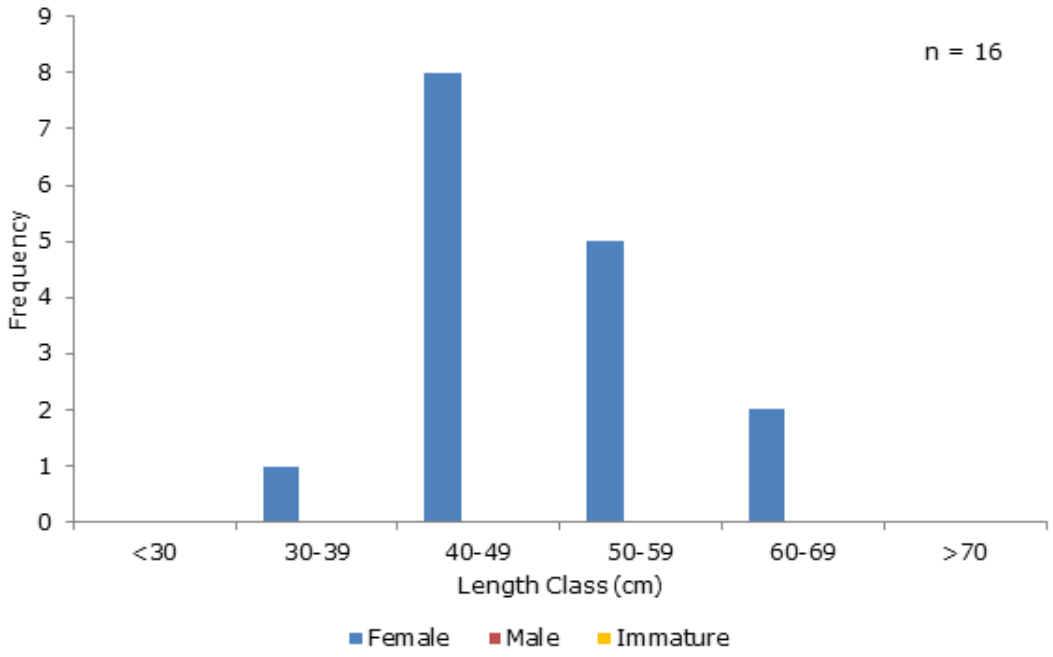


Figure 6-25: Sex distribution of sacrificed yellow eels in L. Muckno, 2016

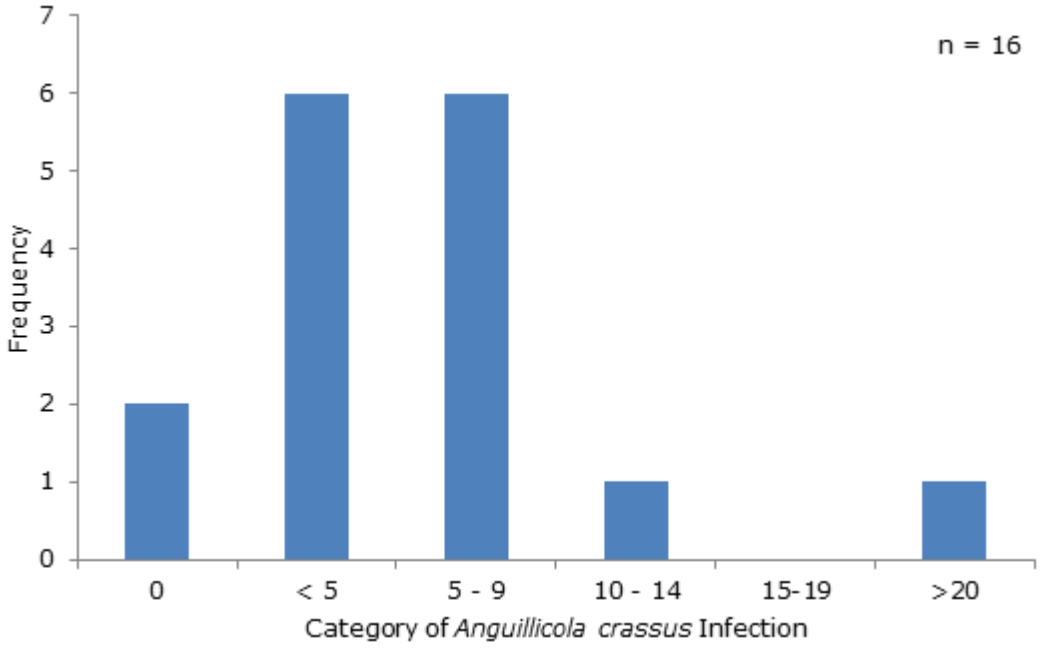


Figure 6-26: *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from L. Muckno, 2016

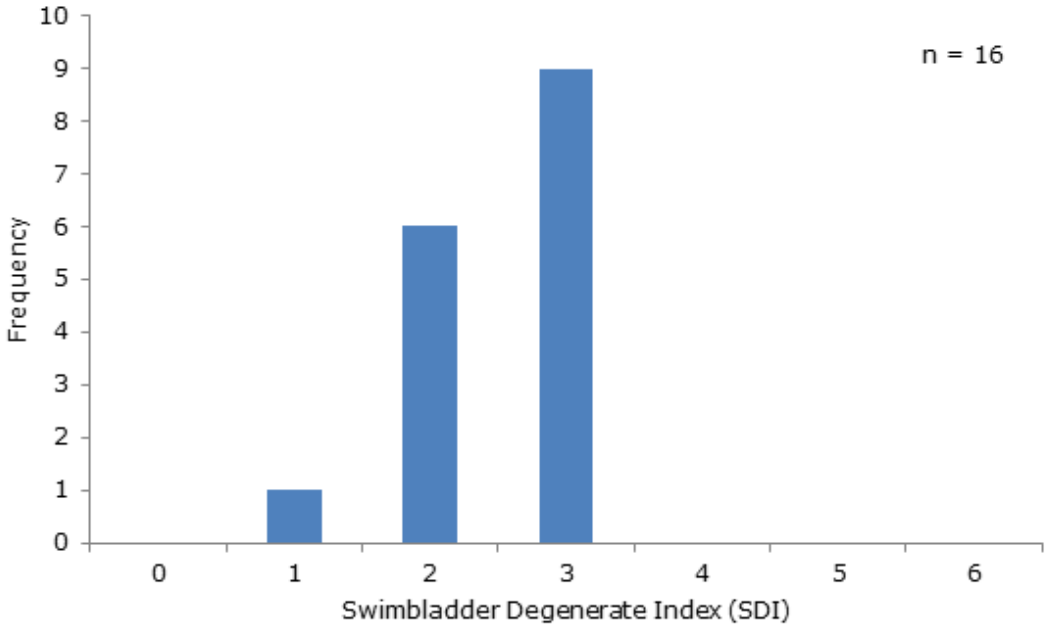


Figure 6-27: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from L. Muckno, 2016

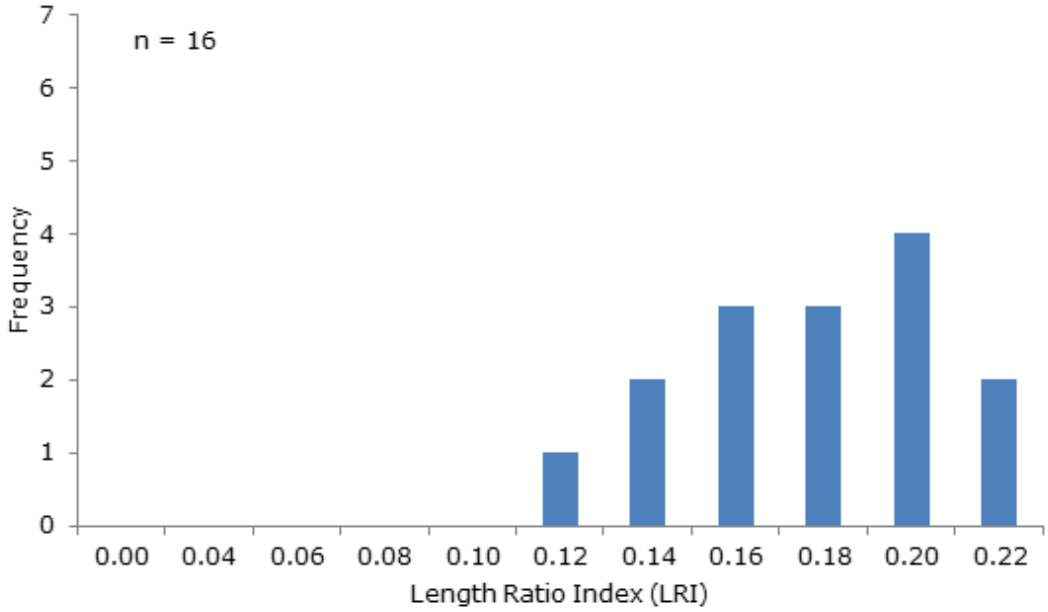


Figure 6-28: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from L. Muckno, 2016

6.1.6 Burrishoole

Bunaveela Lough is located in the upper reaches of the catchment (Fig. 6.29). It has a surface area of 42ha and a maximum depth of 23m. Bunaveela L. was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2016 (5 July 2016), with chains of 10 nets fished at three sites. In total 10 eels were caught with a catch per unit of effort of 0.33 eels/net/night (Table 6.5). The average length was 39.6cm and ranged in length from 34.8cm to 44.6cm. Ten eels were PIT tagged and no recaptures were made.

Lough Feeagh has a surface area of 395ha and an average depth of 14.5m (with several areas >35m in depth). L. Feeagh was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2016 (12-13 July 2016), with chains of 10 nets fished at six sites for one night each. In total, 87 eels were caught with a catch per unit effort (CPUE) of 1.45 eels/net/night (Table 6.5). The eels average length was 42.6cm and ranged in length from 28.5cm to 79.4cm (Fig. 6.30), with a total weight of 14.52kgs caught in the two nights. Most of the catch (86) was PIT tagged and three previously tagged eels were recorded.

No eels were sacrificed in this survey and therefore no data are available on the parasite status.

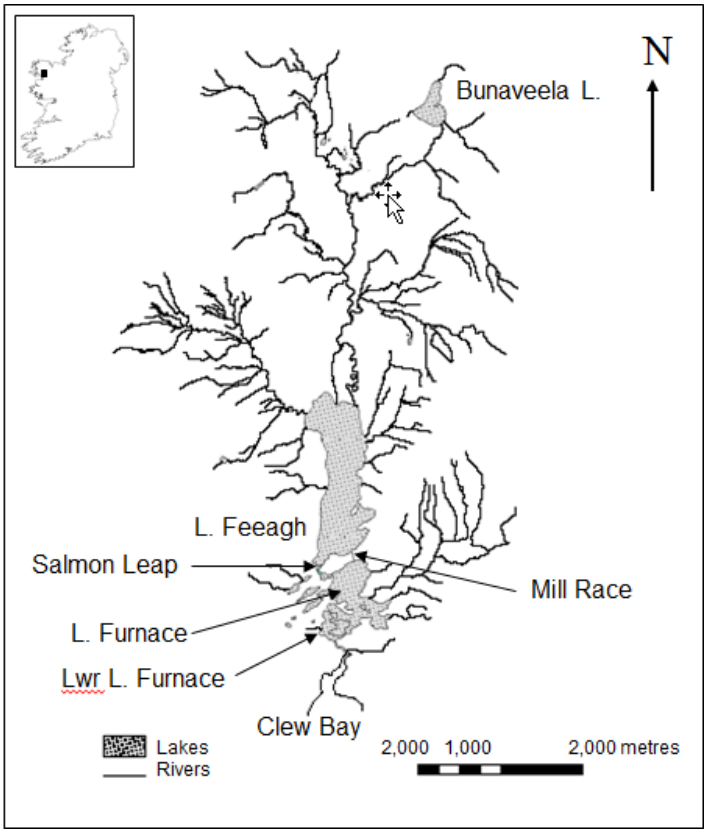


Figure 6-29: Map of Burrishoole showing the lakes surveyed.

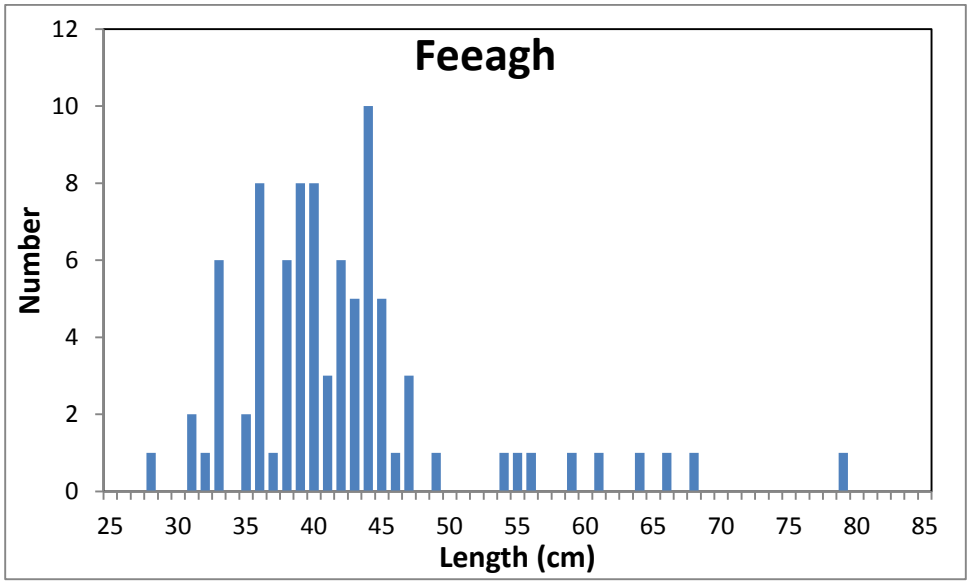


Figure 6-30: Length frequency of yellow eels captured at L. Feeagh, 2016.

6.2 Transboundary Yellow Eel

6.2.1 Lower Lough Erne 2016

AFBI have carried out surveys of the Lower Lough Erne yellow eel stock (following the closure of the commercial fishery in 2010) in 2011 and 2014. The main findings of the previous surveys were the increases noted in CPUE from 2011 to 2014, reflecting the closure of the commercial yellow eel fishery.

The survey sites chosen in each of these surveys (Fig. 6.31) are an attempt to resurvey sites fished during the intensive sampling regime devised during the Erne Eel Enhancement Programme (from 1998-2000).

The recent surveys have commissioned former commercial fishermen who would have fished in these areas and as such their local knowledge and records from the time of commercial harvests were used to provide additional metadata, or simple anecdotal recollections as the surveys commenced and subsequently progressed over the years. Since 2011 the number of former commercial fishermen used has fallen from 5 to 2 as individuals have aged, or moved from the area.

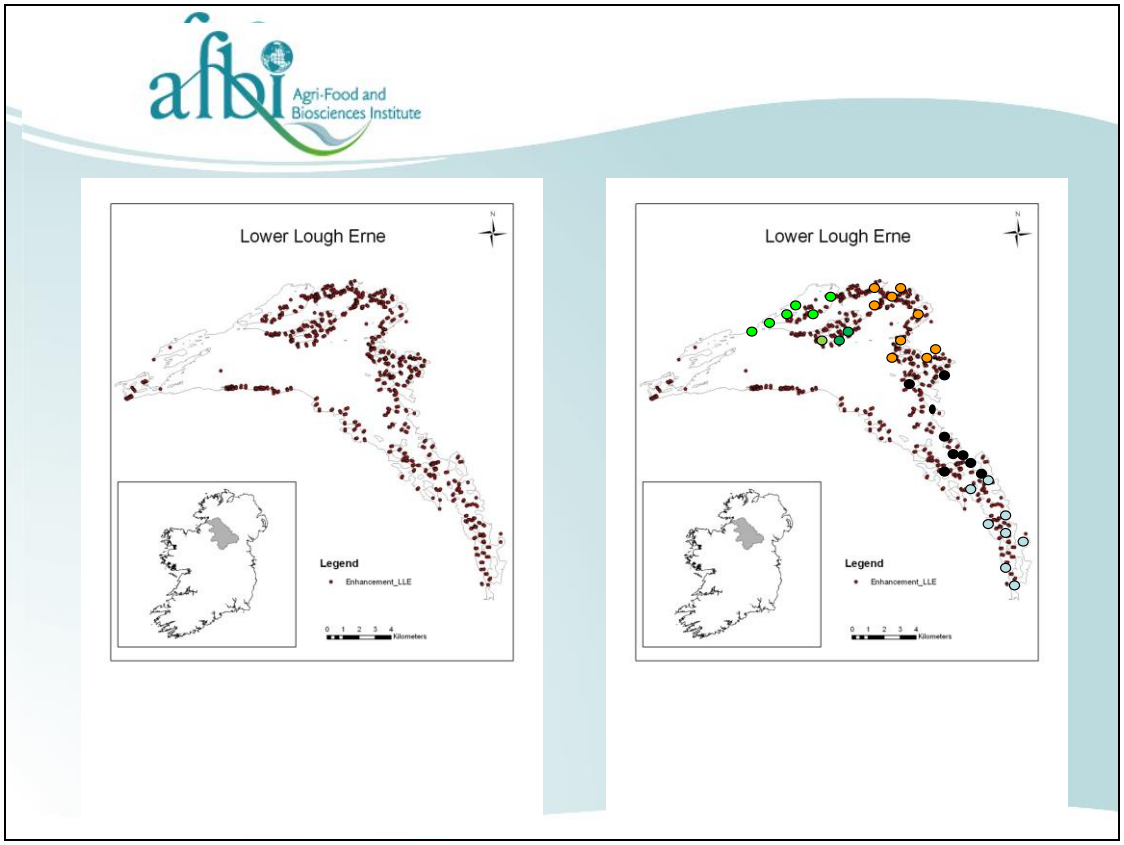


Figure 6-31: Yellow eel fyke net survey sites on Lower Lough Erne.

6.2.1.1 Methods

From the 5th to 8th July 2016, two individuals (operating as one crew as in 2014) and were provided with 30 standard Dutch fyke nets. The survey areas for LLE were divided into 4 zones (moving downstream and westward in the Lough (Fig. 6.31). Overall survey coverage was reduced from previous years (which then included western and southern edge of LLE), due to lack of available fishermen, but the key areas from before were focused on in 2016 and based on:

1 Trory

2 Upper Devenish

3 Castlearchdale

4 Kesh Bay/Lusty Beg.

Within each zone sites were fished in chains of 5 fyke nets at the pre-arranged locations (Fig. 6.31). As in previous surveys nets were lifted daily with the 4 nights survey, producing 120 net night fishings.

The total catch of eel from each site was counted, each eel was measured for length and a sample of 25 eels was retained from each zone for more detailed analysis to include:

- individual length,
- weight,
- A. *crassus* prevalence and mean intensity,
- age.
- fat content using Distell fish fat meter (Fig. 6.32)
- stomach content,
- endohelminth analysis

Bycatch and the appearance of any silver eels within the catch were also noted.

6.2.1.2 Results

A total of 1981 eels were caught (2014 caught 4510 eels). Eels ranged in length from 292mm to 684mm with a mean of 46.9mm across the 4 zones fished (Table 6.2). A slight increase in mean length compared with the other zones was noted in the Trory zone and this is commonly noted both locally and in previous surveys as a prime eel habitat which may account for the difference.

Table 6-2: Summary of the catch statistics from the LLE 2016 and 2014 yellow eel surveys.

zones	Ac	mean lt	% u size '16	% u size '14	CPUE '16	CPUE '14
Trory	68	47.7	10	21.7	8.73	3.23
Upper Devenish	52	46.9	13	22.5	13.76	18.23
Castlearchdale	40	46	16	23.7	30.77	28.3
Kesh/Lusty	16	46.8	12	33	12.76	25

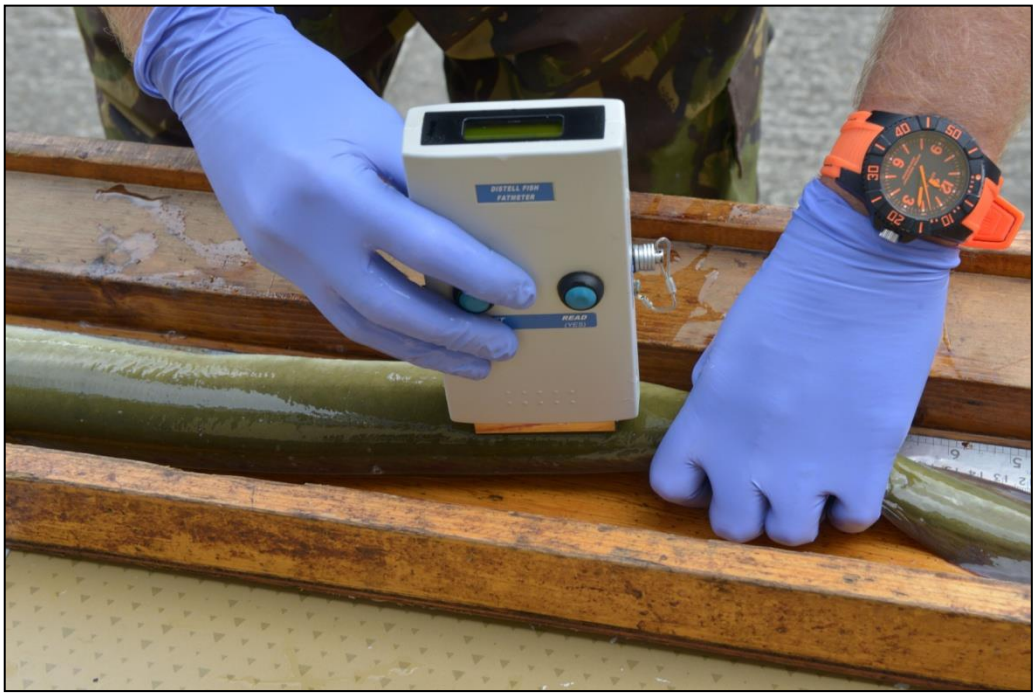


Figure 6-32: Using the Distell fish fat meter to measure % fat content in LLE yellow eel.

In terms of the number of eels caught per night the CPUE for the 2 mid regions of the survey were similar to that found in the 2014 survey, however at the inner and outer most zones CPUE was effectively half of that recorded in 2014 (Table 6.2). When taken as a mean across the 4 zones fished CPUE has only changed marginally from 2014 to 2016 from 17.43 to 16.50 respectively (Table 6.3).

Table 6-3: Comparison of LLE survey derived CPUE data 2011-2016.

2011 survey	2014 survey	2016 survey
CPUE mean 14.9	CPUE mean 17.43	CPUE mean 16.50

While CPUE and the length frequency distribution of the catches were similar to those of 2014 (Figs. 6.33 – 6.34 4), the most noticeable difference was the reduction in the number of eels <400mm in length (former minimum commercial landing size). It was apparent that in every zone the % of this size class had fallen markedly, being upwards of half of what it was in 2014. These findings would be consistent with known (poor) recruitment history to the Erne over the preceding 8-10 years and echo the modelling based scenarios of future output from the Erne from these year classes. Water temperatures at the time of the survey were compared with the preceding 10 years average for that date and were found not to be different than the mean for that period, thereby likely discounting any (minor changes) in CPUE due to temp effects.

These findings will be compared against former and contemporary ageing data for the 2018 NWIRBD EMP Review.

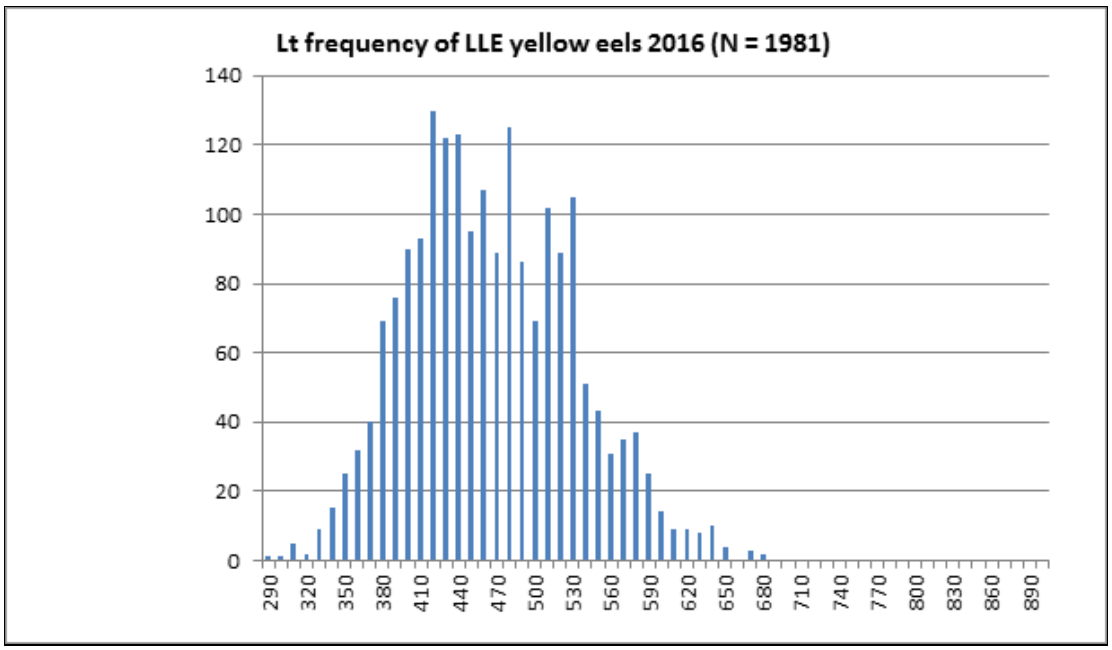


Figure 6-33: Length frequencies of yellow eels caught in LLE 2016.

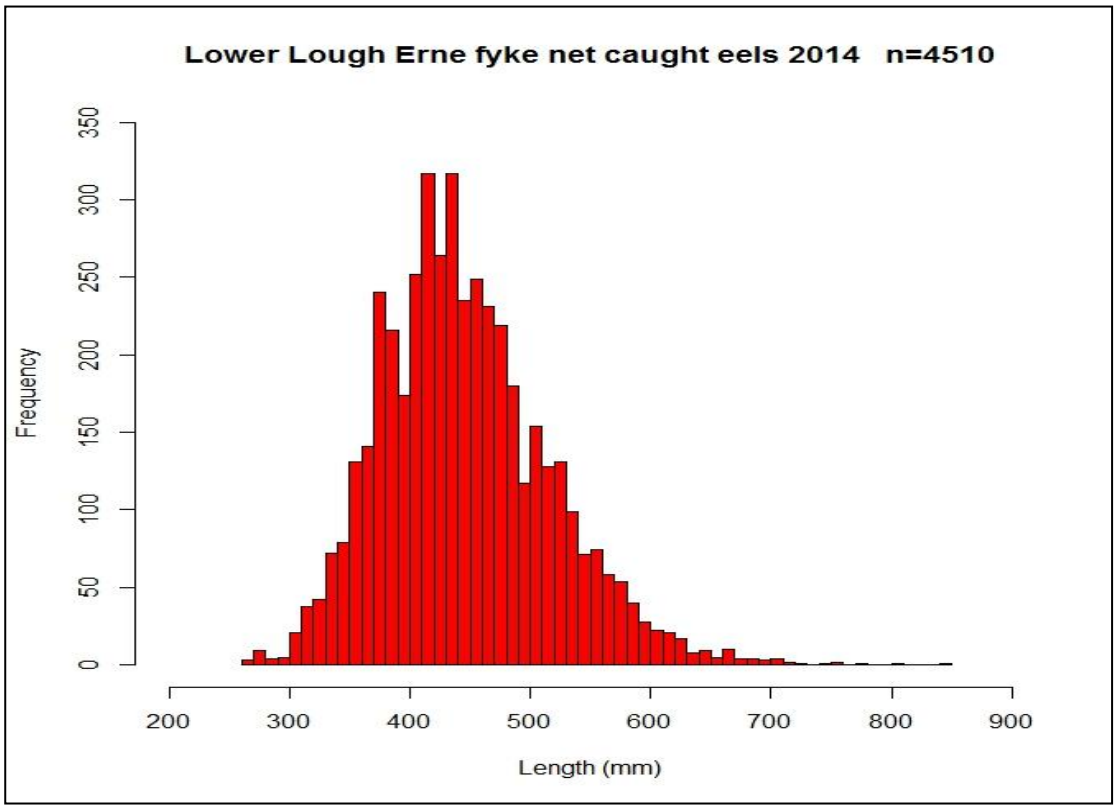


Figure 6-34: Length frequencies of yellow eels caught in LLE 2014.

6.2.1.3 *Anguillicola crassus*

The mean prevalence of *A. crassus* across the zones surveyed was 44% although this was not truly representative of the zones examined which showed a high degree of variation (becoming less prevalent) moving westward (Fig. 6.35). Mean prevalence in 2011 and 2014

was 72 and 73% respectively. The recorded prevalence of 16% from Kesh/Lusty is one of the lowest recorded across all LLE surveys since *A. crassus* was first introduced in the late 1990's. This, combined with the overall mean of 44%, may be an indication that the infection has established itself at typical background levels (40-50%) noted elsewhere across Europe. The differential patterns noted in infection parameters within the Erne maybe a useful indicator of eel density as also denoted by the changing CPUE's.

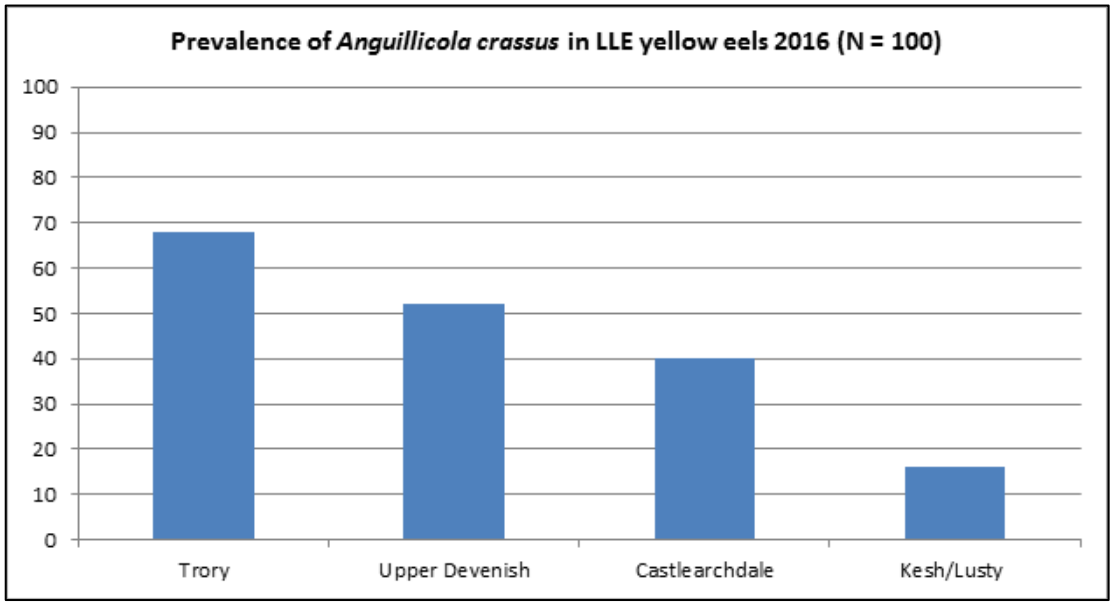


Figure 6-35: The distribution of *A. crassus* prevalence across the 4 zones of LLE surveyed in 2016

6.2.1.4 Fat Content

2016 was the first time that any measurements of fat content had been taken in Erne eels (Fig. 6.36). Of the 100 eels sampled mean fat content was 19.2% (L. Neagh yellow is mean of 23.2%), though this had a wide range varying from 6.1 to 33%. However there was a positive trend that % body fat in LLE eels increased with length. Lough Erne is known to produce a component of broad headed eel (Fig. 6.37), which typically feed on fish. Such eels are known to be low in fat and this was reflected in a component of those eels sampled with large (typically 500mm+) broad head eels containing fat content between 6.1 and 9.9%.

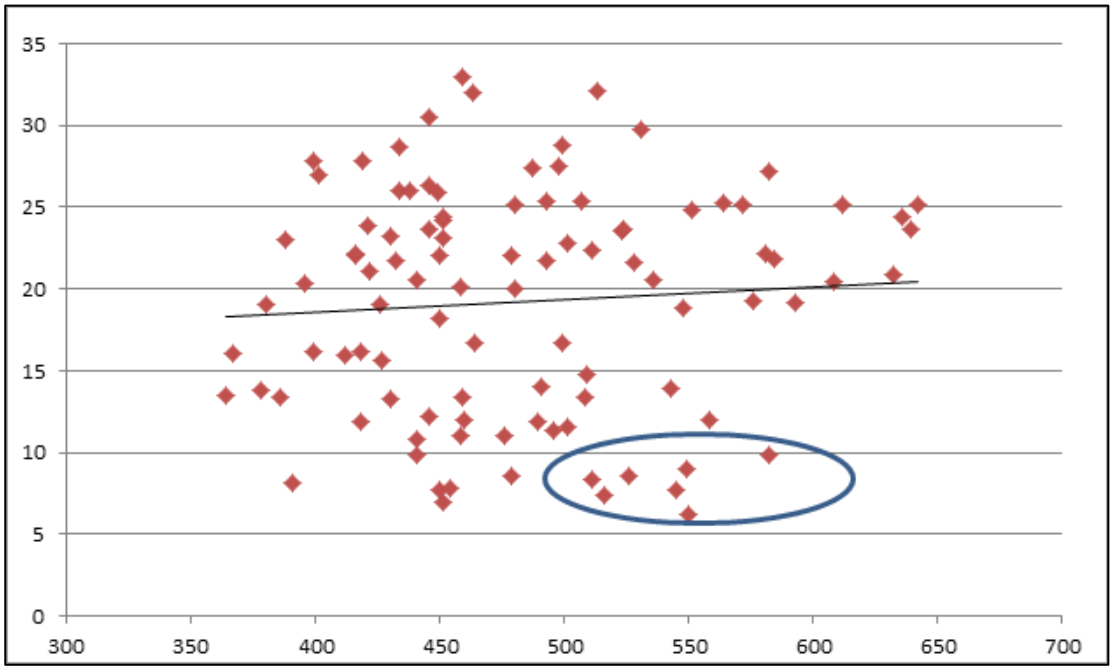


Figure 6-36: % Fat content of LLE yellow eels measured against respective length (mm) with broad head eel component circled.

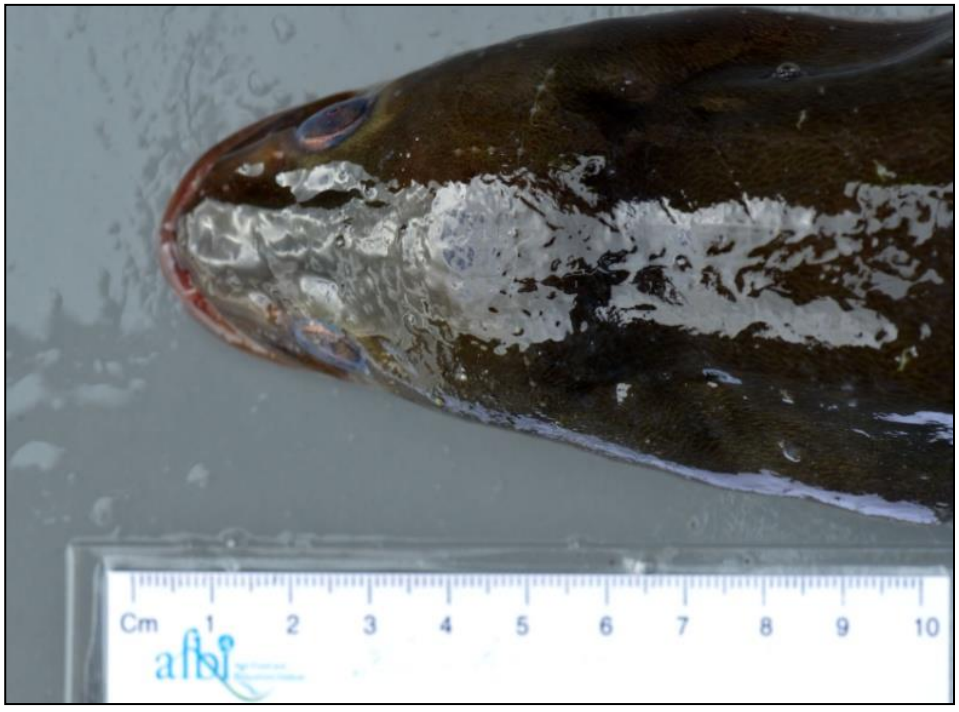


Figure 6-37: Typical broad headed eel morphology seen in LLE eels, associated with <10% body fat though above 500mm length

6.2.1.5 Stomach content and endohelminth analysis

These components of the yellow eel samples have formed part of a QUB Hons project which is not yet available but can be submitted to the group in future if required.

6.2.1.6 Ageing

This work is current but scheduled for completion and analysis by the end of May.

6.2.1.7 Bycatch

In 2014, 28 silver eels were noted amongst the yellow eel survey catch. In 2016 not a single silver eel was noted in the catch from any of the zones fished.

Across the 4 nights fished bycatch totalled 7 hybrids, 9 perch and 2 pike all of which were released alive at the point of capture. Bycatch was significantly higher in 2014 and most noted by their absence in 2016 was Roach which made up almost half of the bycatch in 2014.

6.3 Transitional Waters

6.3.1 Burrishoole Transitional Waters

Lough Furnace, the tidal lough, has a surface area of 125ha north of Nixon's Island and 16ha between Nixon's Island and the mouth of the estuarine river (Lower Lough Furnace). The main lough has a maximum depth of 21.5m. Furnace is heavily stratified with significant areas of deoxygenated water in the main basin. L. Furnace was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2016 (14-15 June, 28-29 June, 18-19 July 2016), with chains of 10 nets fished at six sites in one night each and one night (26 July 2016) with two chains of nets at the Back of the House, which is a shallow tidal area between the lough and the estuarine river.

In L. Furnace, 69 eels were caught with a catch per unit effort (CPUE) of 0.69 eels/net/night (Table 6.5). The average length was 39.7cm and ranged in length from 28.7cm to 61.6cm (Fig. 6.38).

In the Lower Lough Furnace, only 5 eels were caught with a catch per unit effort (CPUE) of 0.25 eels/net/night (Table 6.5). The eels average length was 37.0cm and ranged in length from 34.8cm to 39.9cm, with a total weight of 0.41 kg caught.

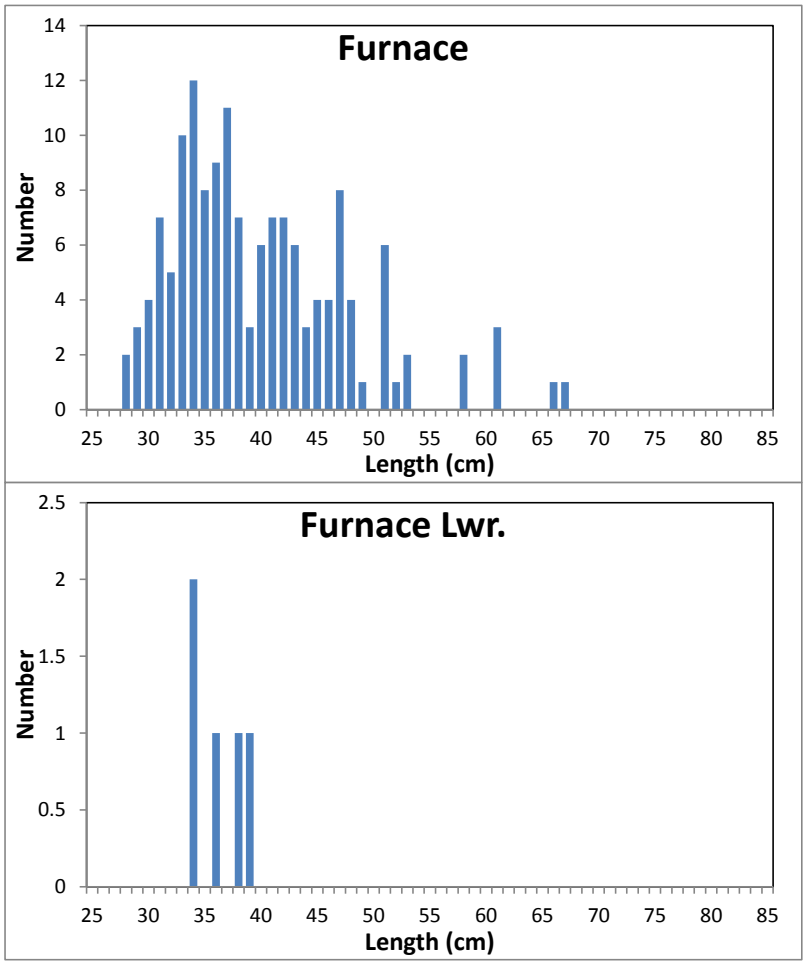


Figure 6-38: Length frequency of yellow eels captured at L. Furnace and L. Furnace Lower, 2016

6.3.2 Waterford Estuary

The Waterford Estuary comprises the estuarine habitat of the Barrow, Suir and the Nore rivers. An area of approximately 70 km^2 was fished over the three week long survey (15 days) comprising five Zones of intensive fishing (Fig. 6.39). A combination of baited pot and fyke nets were used, the baited pots were used during the full and new moon phases where the tides are stronger with the fyke nets used in the slacker tides.

A mark recapture study was undertaken to estimate population size and determine movement of eels between the 5 different zones on the Barrow and Suir Rivers. Zone 1 is located at the confluence between the Barrow and Suir at Cheekpoint and was the main location were tagging was undertaken with 6 nights fishing at this location. There were 2 fishing zones located upstream on the Suir River and 2 zones located upstream on the Barrow River. Eels tagged at zone 1 could potentially move into either channel and be recaptured during the study period. (Fig. 6.39). Zone 2 and 3 were 2-3km from zone 1 and were fished for 3 and 4 nights respectively. Zone 4 and 5 were 10 and 7 kms from zone 1 respectively and were fished for 1 night at the end of the 3 week survey. All eels were scanned for pit tags.

Table 6.4 contains a breakdown of fishing effort for Waterford Harbour for the three week study.

Table 6-4: Breakdown of fishing effort in Waterford Estuary

Week	Method	Zone Fished	No. Nights	Dates Fished
1	Baited Pots	1	3	20, 21, 22 June
1	Baited Pots	2	2	23, 24 June
2	Fyke Nets	1	2	27, 28 June
2	Fyke Nets	3	3	29, 30 June & 1 July
3	Baited Pots	1	1	4 July.
3	Baited Pots	2	1	5 July.
3	Baited Pots	3	1	6 July.
3	Baited Pots	4	1	7 July.
3	Baited Pots	5	1	8 July.

The baited pots (Weeks 1 & 3) caught a total of 5,971 eels (964.56 kg) giving a CPUE of 37.32. Of these, 3,476 eels were measured. The length of eels caught in baited pots ranged in length from 18.7 to 73.5 cm and in weight from 0.009 to 0.908 kg (Figure 3-29, Table 6.5).

The fyke net fishing in Week 2 yielded lower numbers. In total 1,017 eels were caught (138.15 kg) giving a CPUE of 6.78. Of these 903 eels were measured. The length of the fyke net caught eels ranged from 23.7 to 70.2 cm and their weights ranged from 0.02 to 0.65 kg (Fig. 6.40, Table 6.5).

Therefore, it can be noted that the two fishing methods were quite similar in the size range of eels which they captured. The baited pot method captured smaller eels than the fyke net method. The smallest eel captured in pots was 18.7 cm while the smallest eel captured in fyke net catches was 23.7 cm (Figure 6.41, separated length freqs). Baited pots captured greater numbers of eels overall as they attracted eels in to the area towards the nets. In 15 trapping occasions 4,152 eels were tagged and 314 eels were recaptured giving a recapture rate of 8%. This study will be repeated in 2017.

During the three week long survey, 120 eels were sacrificed from the study area. Most of the sample was collected from Zone 4 (Middle Suir Estuary just downstream of Waterford Bridge). Of these (out of 119 successfully sexed eels) 49% were female, 4% were male and there were 47% immature eels (Fig.6.42). There was a parasite prevalence of 61% among the sample with a mean infection intensity of 4.16 (total parasite count, 337), (Fig. 6.43). Both of the indices applied to examine swimbladder health status (Swimbladder Degenerative Index (SDI) and the Length Ratio Index (LRI)) on average showed only slight/moderate damage to the swimbladder tissues of Waterford Estuary eels. However, the LRI did depict several eels with 'severe damage' with values of 0.06 and below (Fig. 6.44). However, this was not mirrored in the SDI results, which showed no values of 5 or above denoting 'severe damage' (Fig. 6.45).

The unusual LRI result may be due to human error in applying the index. Further sampling will be required to assess this in more depth. The pots were baited with sprat and it was therefore difficult to assess the normal diet preference of the eels, however among the expected partially digested fish remains, there was also a high proportion of shrimp noted (Table 6.6).

In 2009, the EMP sampled the estuary and retained a sample of 100 eels. Of these 67% were female and the remainder were male. There was a 61% prevalence of the *A. crassus* parasite (mean infection intensity, 4.50; Parasite Count, 270). This suggests that the parasite levels at the site have not altered significantly between 2009 and 2016.

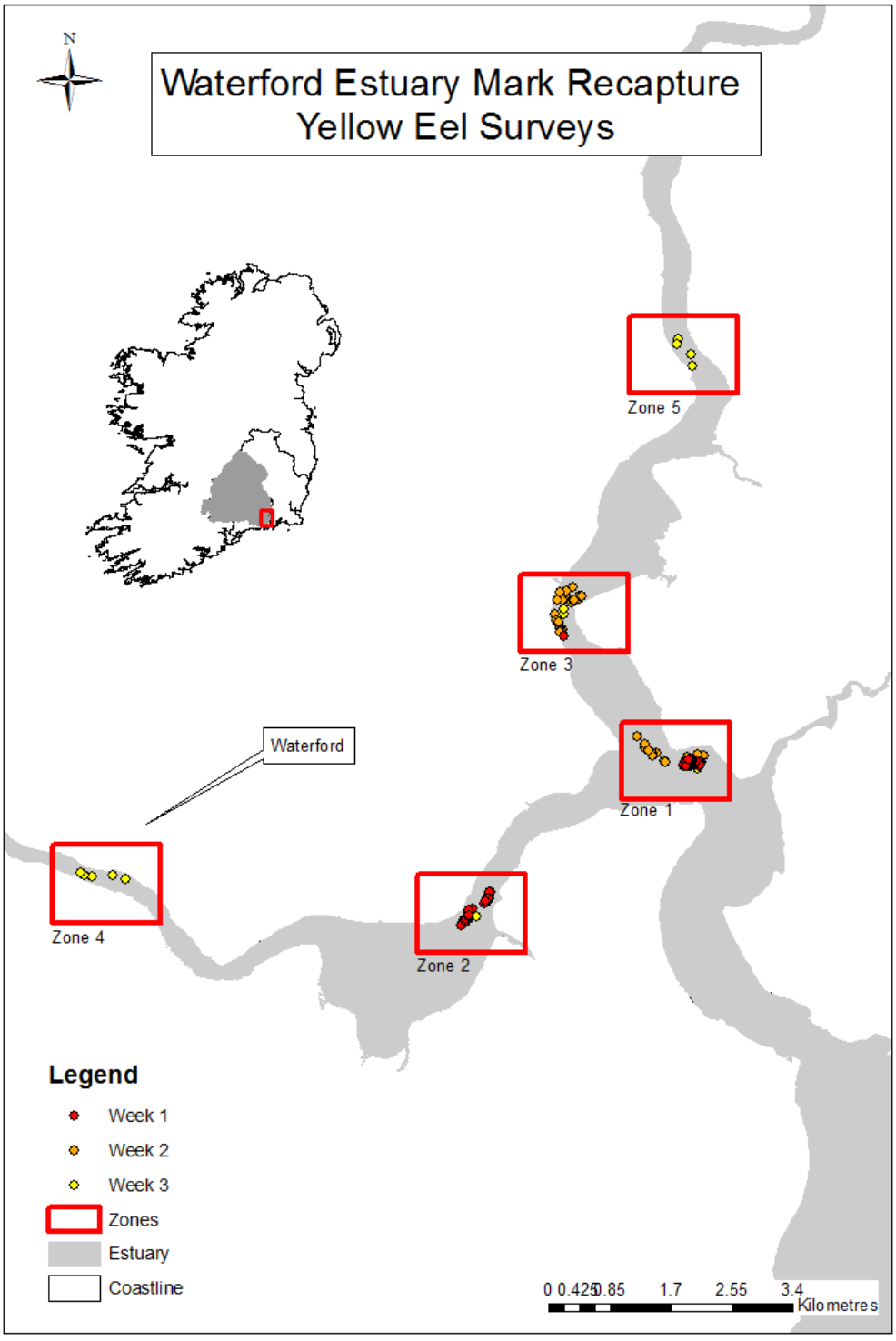


Figure 6-39: Locations of fyke nets and pots sampled on Waterford Estuary, 2016. (Inset: Map of Ireland with Barrow and Suir catchments (shaded) and South Eastern River Basin District (outlined)), red squares denotes study zones.

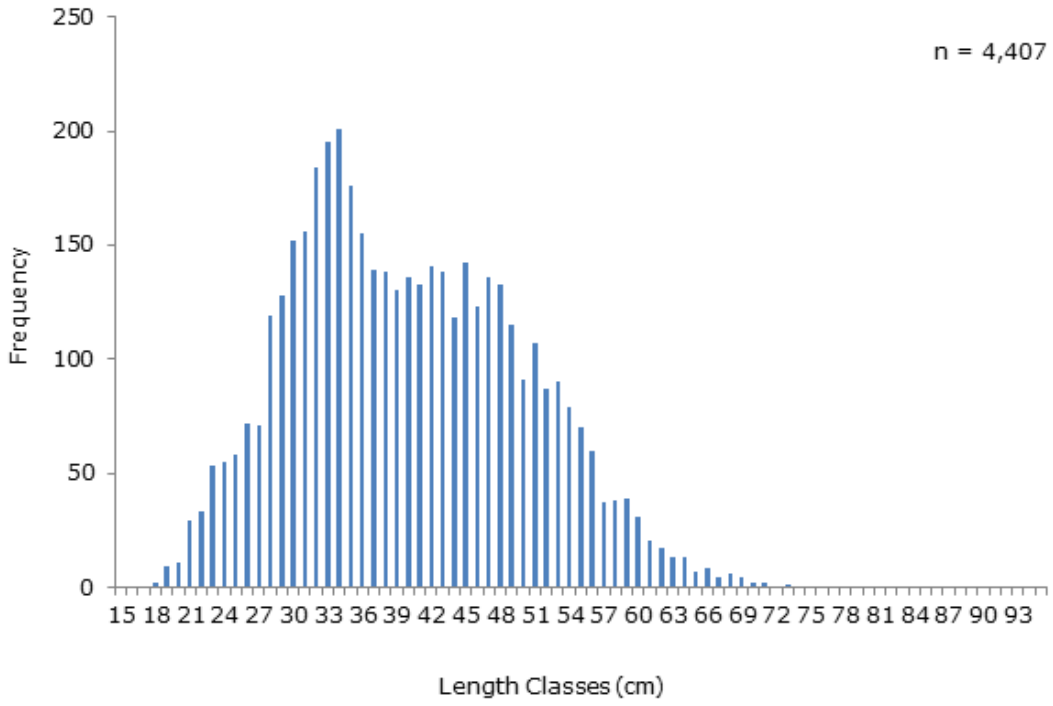


Figure 6-40: Length frequency of yellow eels captured on the Waterford Estuary, 2016 (representing total catch using baited pots and fyke nets)

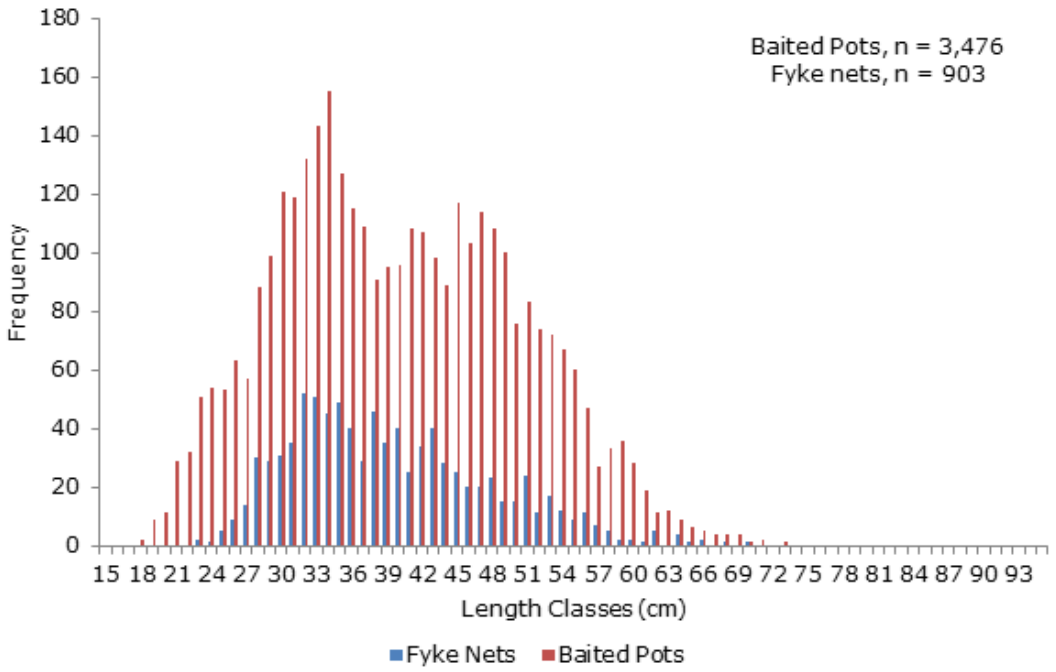


Figure 6-41: Length frequency of yellow eels captured on the Waterford Estuary, 2016 (separating total catch using baited pots and fyke nets)

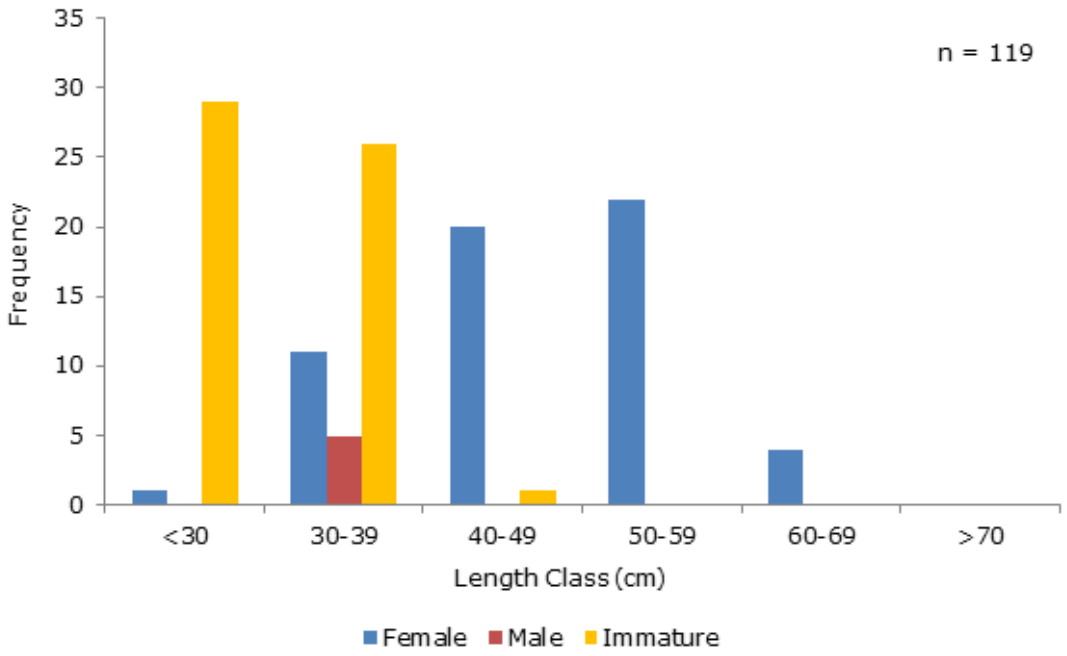


Figure 6-42: Sex distribution of sacrificed yellow eels at Waterford Estuary, 2016

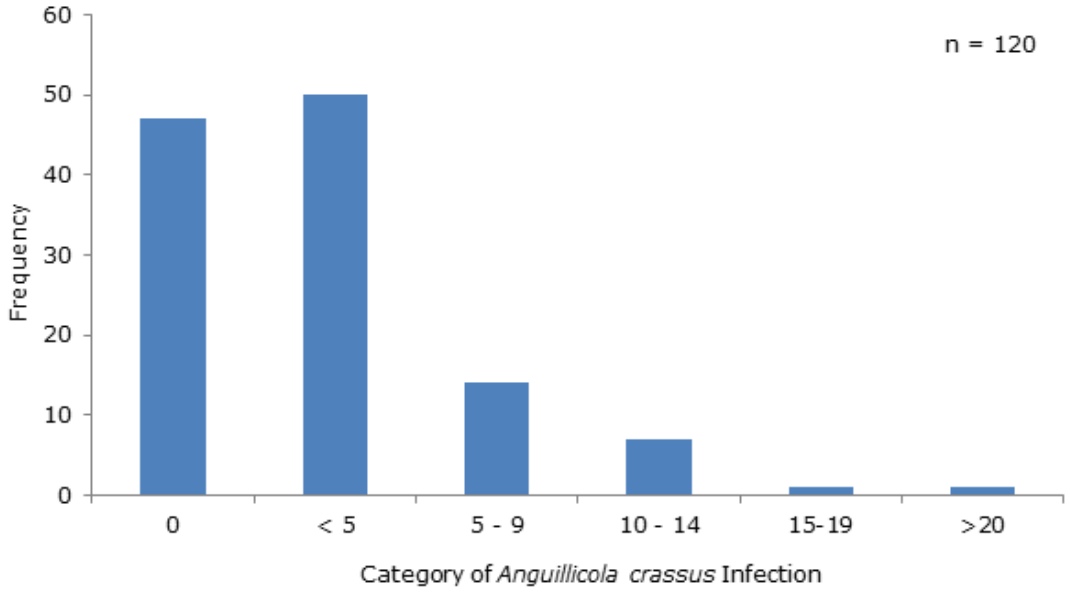


Figure 6-43: *Anguillicola crassus* infection intensity for sacrificed yellow eels collected from Waterford Estuary, 2016.

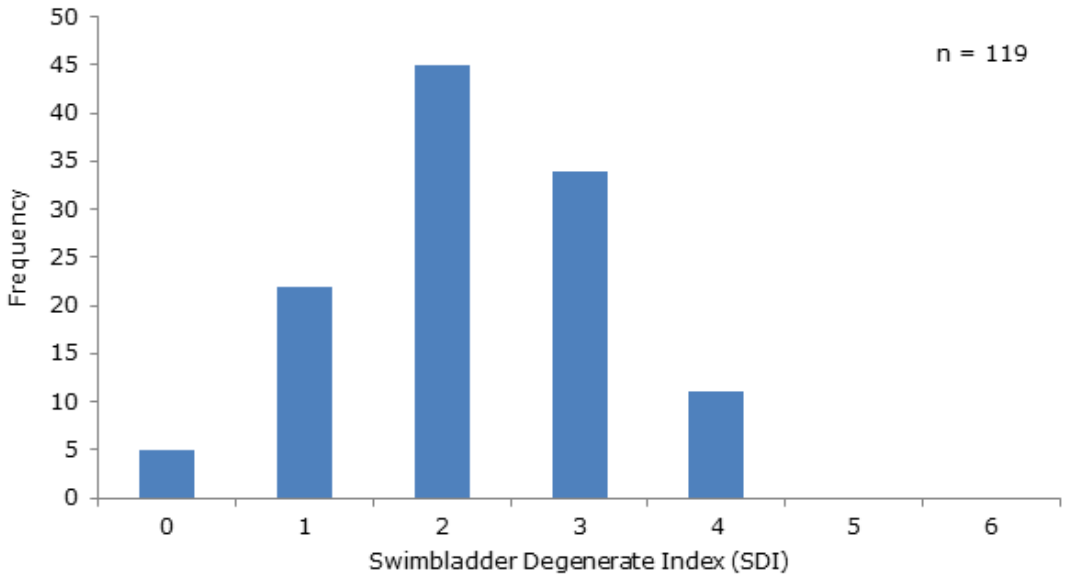


Figure 6-44: Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from Waterford Estuary, 2016

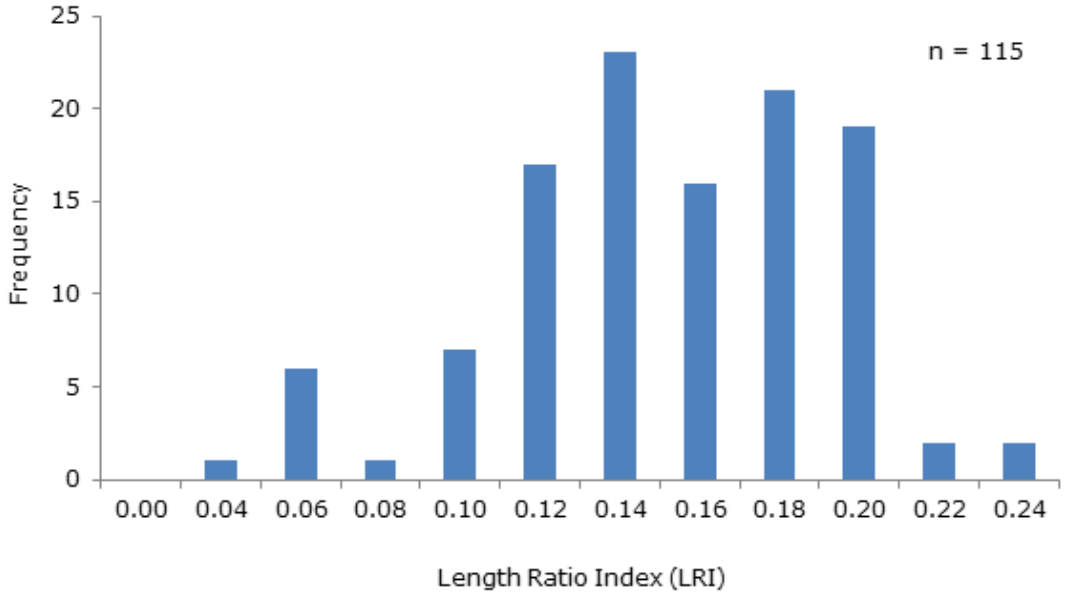


Figure 6-45: Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from Waterford Estuary, 2016

6.3.3 Munster Blackwater Estuary

The Munster Blackwater joins the sea in Youghal on the southern coast of Ireland. The eustrine habitat has an approximate area of 1,298 ha, and was fished over a three week long survey (15 days, 11th to 29th July 2016) comprising five Zones of intensive fishing (Fig. 6.46). Zone 1 was located directly near Cappoquin. Zone 2 was a distance of approximately 4 km

downstream near Villierstown. Zone 3 was approximately 2 km further downstream between Villierstown and Ballinaclash. Zone 4 was located 4.5 km downstream of Ballinaclash near Cooney (Strangly Castle). Finally, Zone 5 was situated just downstream of Youghal Bridge entering the open estuary (approximately 20 km from Zone 1), (Fig. 6.46).

Five chains of pots were set on each night of the survey. Each chain had five pots, giving a total of 25 pots set per night. Catches along the estuary were generally quite low across all three weeks of the survey period. During Week 1 (11th-15th July, Zones 2 & 3) only 63 eels were captured. The numbers improved during Week 2 (18th-22nd July, Zones 1, 2 & 3) with 252 eels caught and 206 eels were captured in Week 3 (25th-29th July, Zones 2, 3, 4 & 5). This gives a total of 521 eels over the sampling period yielding a total weight of 99.9 kg (of which 449 were measured). The length frequency for the catch is presented in Figure 6.47. The eels ranged in length from 13.3 to 88.4 cm and in weight from 0.0035 to 1.4475 kg. A CPUE of 1.39 was recorded for the Munster Blackwater Estuary surveys (375 net nights) (Table 6.5).

During the surveys, a total of 8 eels were recorded as mortalities and retained for laboratory analyses. Of these, 7 were female and 1 was immature (unsexed), (Fig. 6.48). There was a 50% prevalence of *Anguillicola crassus* across the sample with a mean infection intensity of 10.25 (total parasite count was 41) (Fig. 6.49). The preferential diet was mayfly and *Gammarus* (Table 6.6).

A mark recapture study was undertaken in the Munster Blackwater to determine population estimates and to determine the extent of movement of eels between zones within the estuary. A total of 521 eels were caught, 311 were tagged and 38 eels were recaptured within the study giving a recapture rate of 11%. Figure 6.50 shows the fragmented distribution of eels within the estuary over the three weeks of the survey. The first week returned very low numbers of eels, this increased in week 2 and week 3 by returning to key locations where the eels were found this included downstream of the River Bride at Villierstown and at Ballinatray.

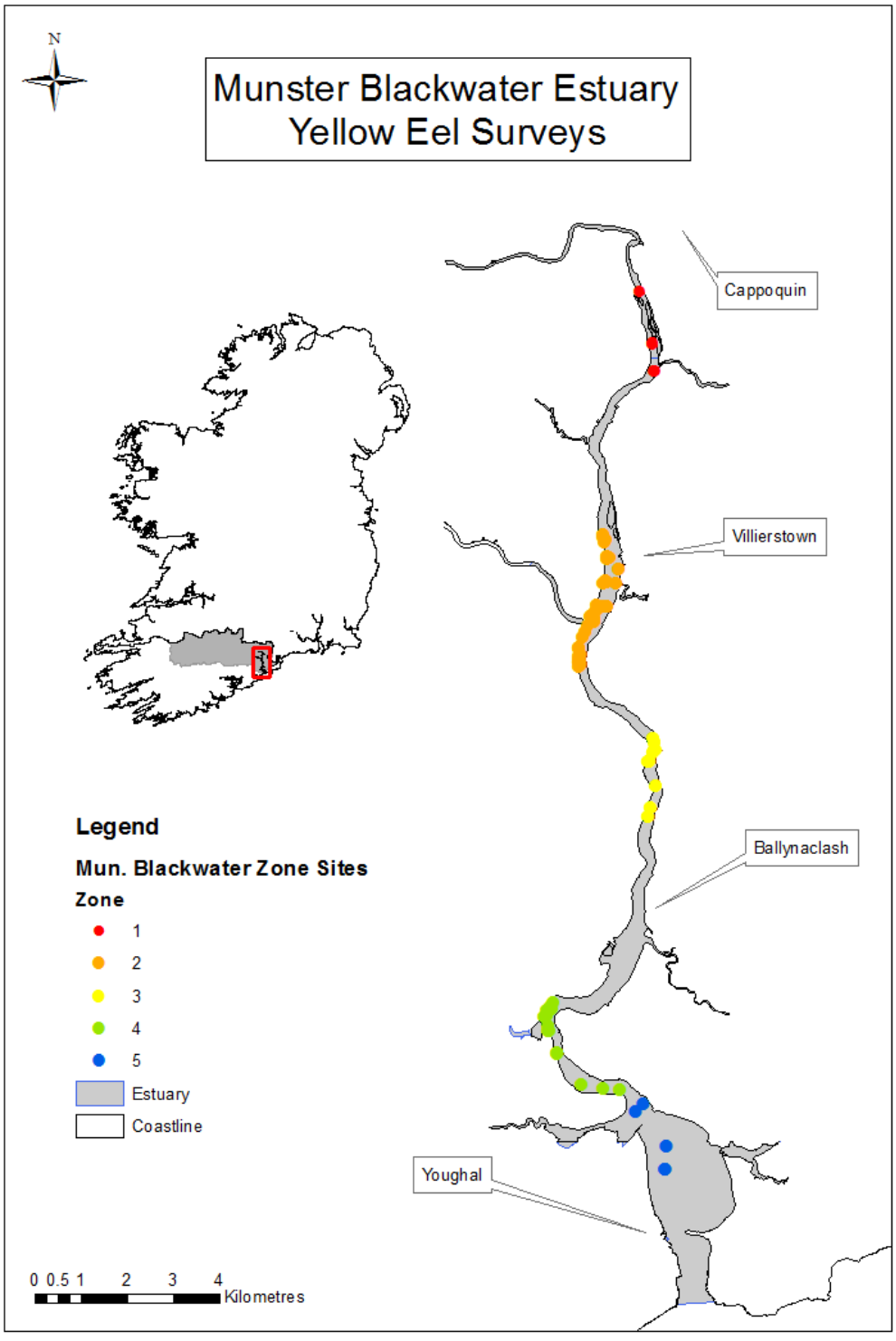


Figure 6-46: Locations of fyke nets sampled on Munster Blackwater Estuary, 2016. (Inset: Map of Ireland with Munster Blackwater catchment (shaded) and South Western River Basin District (outlined)), red square denotes study area

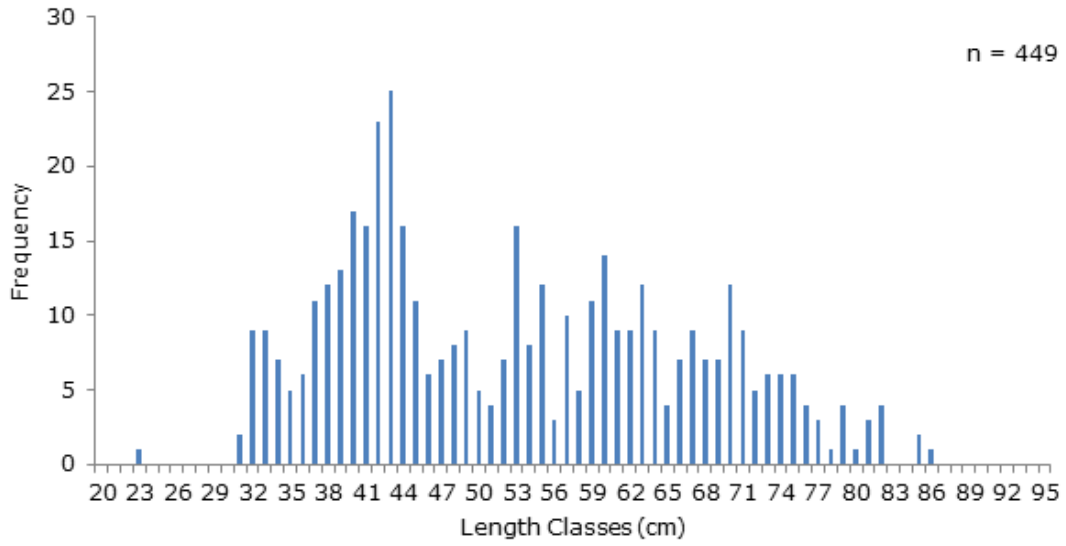


Figure 6-47: Length frequency of yellow eels captured on the Munster Blackwater Estuary, 2016

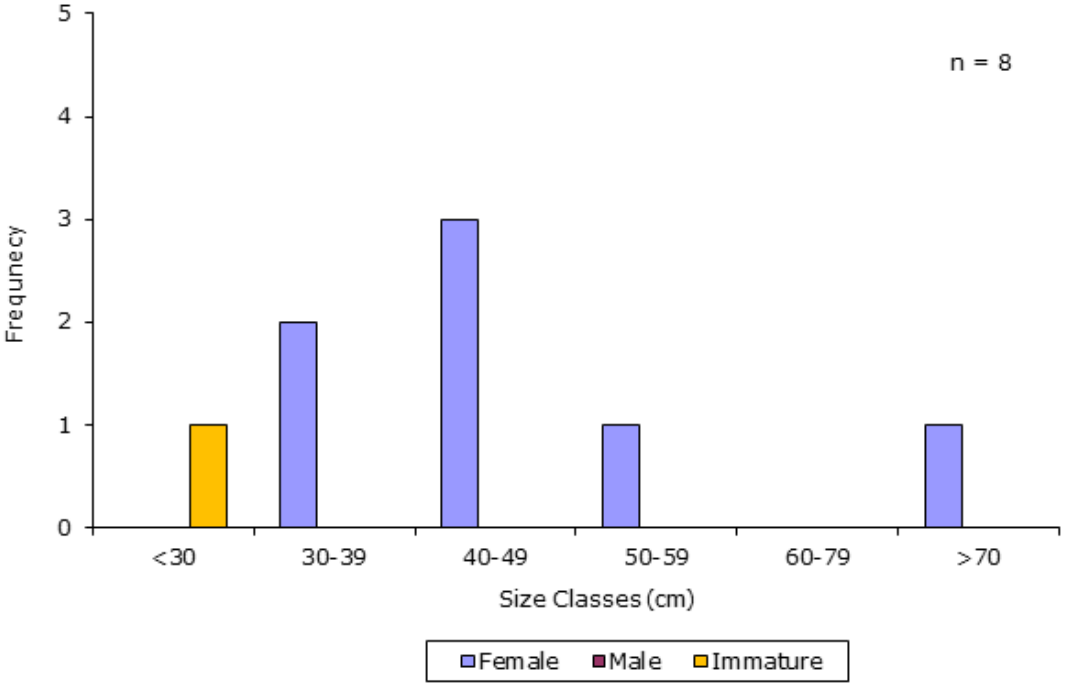


Figure 6-48: Sex distribution of sacrificed yellow eels at Munster Blackwater Estuary, 2016

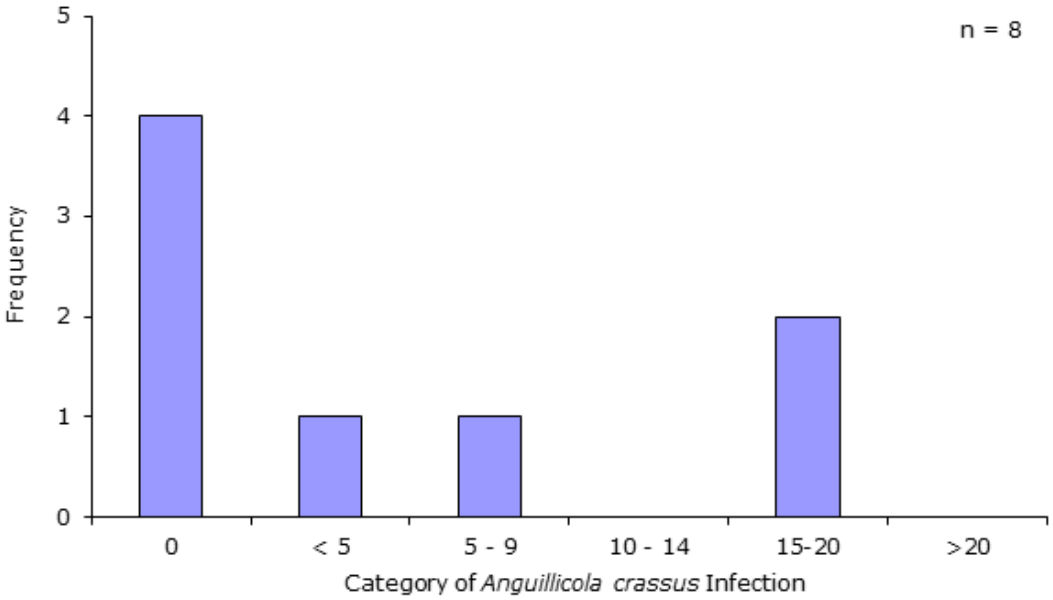


Figure 6-49: ***Anguillicola crassus*** **infection intensity for sacrificed yellow eels collected from Munster Blackwater Estuary, 2016.**

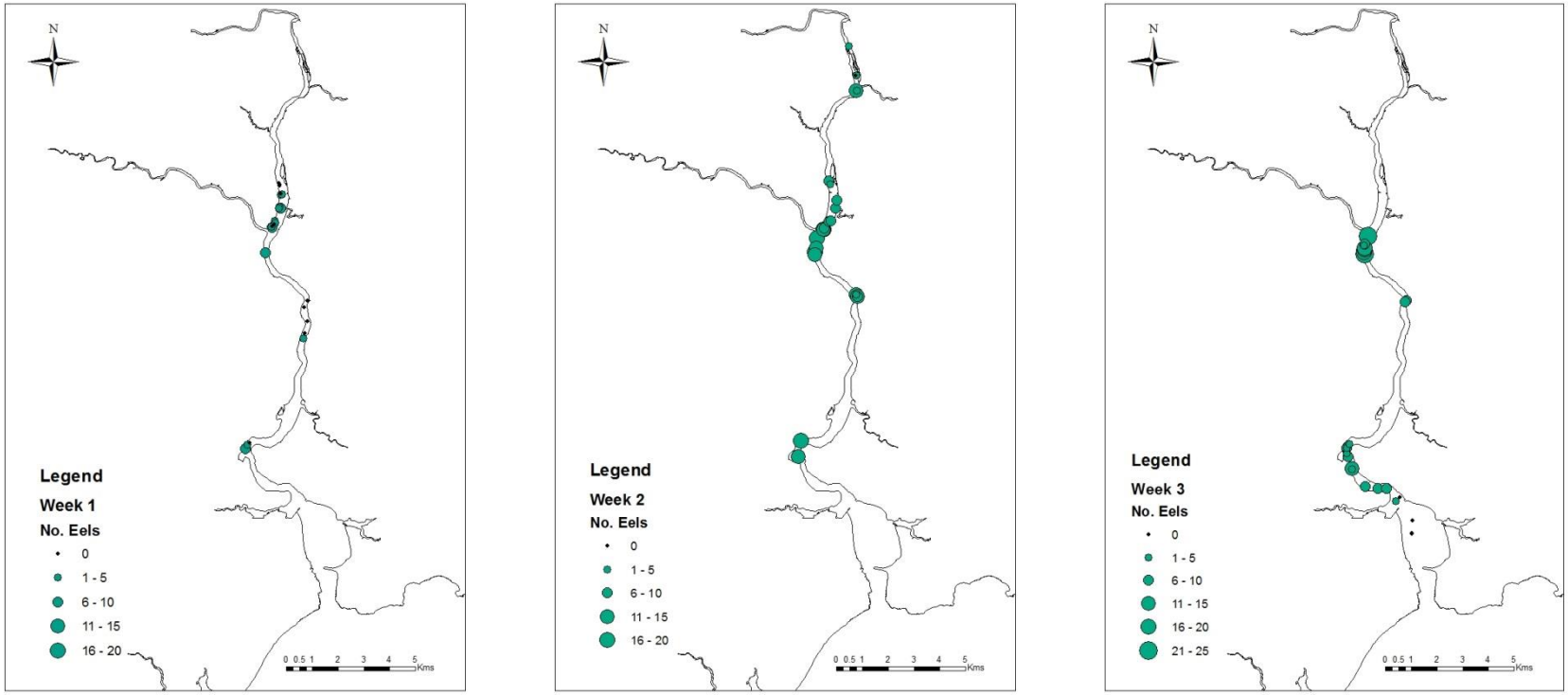


Figure 6-50: Bubble plots of eel catches in the Munster Blackwater.

Table 6-5: Catch detail from yellow eel lake surveys, 2016.

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)
Upper L.	12/07/2016	54	40	1.35	11.611	49.2	37.5	68.8	0.215	0.090	0.688
Corrib	13/07/2016	35	40	0.85	7.723	49.7	35.4	76.3	0.221	0.077	0.827
	14/07/2016	35	39	0.92	10.473	54.2	35.8	73.5	0.291	0.076	0.774
	15/07/2016	42 °	39	1.08	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	02/08/2016	674 (356 weighed)	40	16.85	96.508	52.5	33.4	71.5	0.271	0.060	0.684
	03/08/2016	516 (4 weighed)	10	51.60	0.847	47.6	44.3	51.9	0.212	0.149	0.305
	04/08/2016*	53	60	5.89	11.289	49.6	40.1	77.4	0.213	0.094	0.933
	04/08/2016	359 (129 weighed)	10	35.90	40.104	55.1	38.9	69.4	0.311	0.087	0.626
	05/08/2016	619 °	40	15.48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2016	**2,387** (667 weighed)	**318**	**7.51**	**178.555**	**52.4**	**33.4**	**77.4**	**0.268**	**0.060**	**0.933**
Lower L.	05/07/2016	121	40	3.03	24.768	49.3	33.5	73.2	0.205	0.065	0.629
Corrib	06/07/2016	18	40	0.45	3.214	45.9	37.2	61.7	0.1786	0.077	0.433
	07/07/2016	32	40	0.80	7.916	50.1	31.9	70.0	0.247	0.050	0.724
	08/07/2016	38 °	40	0.95	9.000	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	09/08/2016	80	40	2.00	18.719	49.9	28.9	69.2	0.234	0.060	0.620
	10/08/2016	198	40	4.95	39.425	48.4	34.7	65.4	0.199	0.064	0.548

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)
	11/08/2016	48	40	1.20	9.913	49.2	36.6	60.1	0.2065	0.07	0.443
	12/08/2016	41 °	40	1.03	11.200	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2016	**576**	**320**	**1.80**	**103.955**	**49.0**	**28.9**	**73.2**	**0.209**	**0.050**	**0.629**
L. Conn	19/07/2016	91	40	2.28	15.160	44.6	32.8	77.7	0.147	0.053	0.912
	20/07/2016	100	40	2.50	10.551	45.0	31.0	65.8	0.145	0.068	0.544
	21/07/2016	61	40	1.53	9.508	45.2	34.0	75.3	0.143	0.059	0.732
	22/07/2016	53 °	40	1.33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	16/08/2016	106	40	2.65	17.492	43.2	33.7	82.6	0.113	0.066	1.067
	17/08/2016	75	40	1.88	12.600	44.0	31.7	70.4	0.143	0.053	0.601
	18/08/2016	118	40	2.95	22.556	47.2	34.8	69.6	0.175	0.073	0.669
	19/08/2016	303 °	40	7.58	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2016	**857**	**320**	**2.68**	**87.867**	**46.3**	**31.0**	**82.6**	**0.179**	**0.053**	**1.069**
L. Ramor	10/08/2016	284 (278 weighed)	40	7.10	78.863	54.4	34.3	78.2	0.284	0.058	1.017
	08/09/2016	115	40	2.88	30.883	53.4	38.0	84.2	0.269	0.068	1.320
	29/09/2016	2	40	0.05	0.666	57.4	52.3	62.5	0.333	0.223	0.443
	2016	**401** (395 weighed)	**120**	**3.34**	**109.746**	**54.2**	**34.3**	**84.2**	**0.279**	**0.058**	**1.320**

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)
L. Muckno	26/07/2016	383	40	9.58	85.742	48.2	30.0	74.2	0.224	0.039	0.873
	27/07/2016	262 (258 weighed)	40	6.55	61.041	49.3	31.5	82.9	0.237	0.052	1.076
	28/07/2016	514 (500 weighed)	40	12.85	112.060	48.4	28.4	77.4	0.224	0.037	1.044
	03/08/2016	279	40	6.98	57.313	47.0	30.3	83.8	0.205	0.043	1.037
	04/08/2016	202	40	5.05	42.238	47.2	27.4	72.3	0.209	0.026	0.725
	05/08/2016	188	40	4.70	37.530	46.2	29.8	71.7	0.200	0.043	0.697
	16/08/2016	156	40	3.90	32.102	47.1	27.2	73.0	0.206	0.026	0.858
	17/08/2016	138	40	3.45	27.627	46.6	28.6	70.3	0.200	0.042	0.752
	18/08/2016	489 °	40	12.23	85.742	48.2	30.0	74.2	0.224	0.039	0.873
	2016	**2,611** (2,104 weighed)	**360**	**7.25**	**455.653**	**47.8**	**27.2**	**83.8**	**0.217**	**0.026**	**1.076**
Bunaveela L.	**5/07/16**	**10**	**30**	**0.33**	**1.13**	**39.6**	**34.8**	**44.6**	**0.113**	**0.074**	**0.162**
L. Feeagh	**12-13/07/16**	**87**	**60**	**1.45**	**14.52**	**42.6**	**28.5**	**79.4**	**0.169**	**0.040**	**1200**
L. Furnace	**2016**	**69**	**100**	**0.69**	**7.50**	**39.7**	**28.7**	**61.6**	**0.123**	**0.035**	**0.460**
Lwr Furnace	**26/07/16**	**5**	**20**	**0.25**	**0.41**	**37.0**	**34.8**	**39.9**	**0.081**	**0.070**	**0.100**
Waterford Estuary	20/06/2016	119	16	7.44	18.9706	42.1	21.8	62.2	0.1594	0.0155	0.4420

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)
(Baited Pots)	21/06/2016	561	16	35.06	83.7458	39.8	18.7	64.7	0.1506	0.0120	0.6100
	22/06/2016	231	16	14.44	38.3330	41.2	18.9	70.0	0.1681	0.0120	0.9080
	23/06/2016	524	16	32.75	80.6478	41.3	22.1	69.3	0.1545	0.0160	0.7035
	24/06/2016	409	16	25.56	58.1460	40.2	19.3	71.5	0.1429	0.0150	0.7710
	04/07/2016	320	16	20.00	53.7474	41.4	19.0	67.7	0.1680	0.0100	0.7060
	05/07/2016	686	16	42.88	104.950	40.9	20.7	73.5	0.1559	0.0130	0.8470
	06/07/2016	1988	16	124.3	59.2547	39.1	19.1	67.0	0.1323	0.0090	0.6390
	07/07/2016	520	16	32.50	28.6310	39.0	19.1	71.1	0.1424	0.0130	0.7090
	08/07/2016	613 °	16	38.31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2016	**5,971**	**160**	**37.32**	**526.427**	**40.5**	**18.7**	**73.5**	**0.1515**	**0.0090**	**0.9080**
Waterford Estuary	27/06/2016	48 (47 weighed)	30	1.60	7.6790	41.2	25.4	64.0	0.1634	0.0230	0.5640
(Fyke Nets)	28/06/2016	29 (28 weighed)	30	0.97	4.7190	42.1	27.5	62.0	0.1685	0.0330	0.4080
	29/06/2016	279 (278 weighed)	30	9.30	38.4110	40.7	23.7	70.2	0.1382	0.0200	0.6500
	30/06/2016	214 (213 weighed)	30	7.13	29.9160	40.7	27.1	65.2	0.1405	0.0320	0.5850
	01/07/2016	447 (337 weighed)	30	14.90	37.5899	38.4	23.8	68.6	0.1115	0.0220	0.6200
	2016	**1,017** (903 weighed)	**150**	**6.78**	**118.315**	**39.9**	**23.7**	**70.2**	**0.1310**	**0.0200**	**0.6500**

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)
Munster Blackwater	11/07/2016	11	25	0.44	4.6730	54.2	24.1	68.7	0.4248	0.0230	0.7520
Estuary	12/07/2016	9	25	0.36	2.3140	50.4	36.2	60.7	0.2571	0.0850	0.5090
(Baited Pots)	13/07/2016	17	25	0.68	4.3810	44.7	24.9	72.8	0.2577	0.0250	0.7390
	14/07/2016	13	25	0.52	3.4287	49.9	34.1	58.8	0.2637	0.0257	0.4650
	15/07/2016	13	25	0.52	3.8020	50.9	38.7	69.6	0.2925	0.1050	0.7870
	18/07/2016	46	25	1.84	8.7650	38.4	13.3	75.3	0.1905	0.0035	0.9445
	19/07/2016	59	25	2.36	17.1492	44.5	21.0	88.4	0.2907	0.0160	1.4475
	20/07/2016	56	25	2.24	12.7065	45.5	22.2	72.3	0.2269	0.0210	0.7305
	21/07/2016	24	25	0.96	3.8350	40.2	25.7	71.0	0.1598	0.0265	0.7390
	22/07/2016	67	25	2.68	16.2530	44.1	22.8	76.6	0.2426	0.0210	1.0650
	25/07/2016	23	25	0.92	2.2170	35.9	22.7	53.7	0.0964	0.0190	0.2890
	26/07/2016	37	25	1.48	4.6100	38.4	23.9	59.3	0.1246	0.0210	0.3790
	27/07/2016	3	25	0.12	0.5510	39.0	22.3	58.8	0.1837	0.0180	0.4490
	28/07/2016	71	25	2.84	15.2210	44.3	21.1	66.3	0.2144	0.0170	0.7160
	29/07/2016	72 °	25	2.88	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	2016	**521**	**375**	**1.39**	**99.9064**	**43.4**	**13.3**	**88.4**	**0.2225**	**0.0035**	**1.4475**

° Batch weighed eels only

* 6 chains from Upper L. Corrib on 04/08/2016 were fished for 2 nights and are considered separately from those fished for one night

Table 6-6: Biological data from yellow eel lake surveys, 2016

Location	Total Eels	No. Females	No. Males	No. Immature	% Female	% Male	% Immature	% Prevalence *A. crassus*	Mean Intensity *A. crassus*	Preferential Diet from Stomach Contents
Upper L. Corrib	105	104	0	1	99	0	1	47	2.51	*Asellus* sp.
Lower L. Corrib	93	91	1	1	98	1	1	72	4.53	*Asellus* sp.
L. Conn	100	98	2	0	98	2	0	37	4.32	*Asellus* sp.
L. Ramor	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
L. Muckno	16	15	0	0	100	0	0	88	6.93	Empty
Waterford Est.	120 (119 sexed)	58	5	56	49	4	47	61	4.16	Fish Remains
Munster Blackwater Est.	8	7	0	1	88	0	12	50	10.25	Mayfly & *Gammarus*

6.4 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 at IFI, 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.

6.4.1 Barrow, Greese Catchment

The Greese catchment has an area of approximately 1,410 ha, and is comprised of the main Greese channel and several tributaries including, the Bothoge, Glebe, Ballintore and Moneymore streams. The main channel mostly flows southwest through before draining into

the Barrow main channel near Levitstown. There are no lakes in the system and no eels were retained from the electric-fishing.

A catchment-wide electric-fishing program was devised, which involved Bankside (semi-quantitative and Depletion (quantitative) electric-fishing. The electric-fishing survey was carried out using Hans-Grassl™ back-pack equipment (Fig. 6.51). 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. 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 28 sites were fished using the Bankside methodology (Fig.6.52) and a further subset of these sites (n = 9) were fished using the standard quantitative Depletion fishing method (Fig. 6.53) 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 to avoid the spread of diseases and/or invasive species when present.

Figure 6-51: Bankside electric-fishing survey (Photo: K. Kelly)

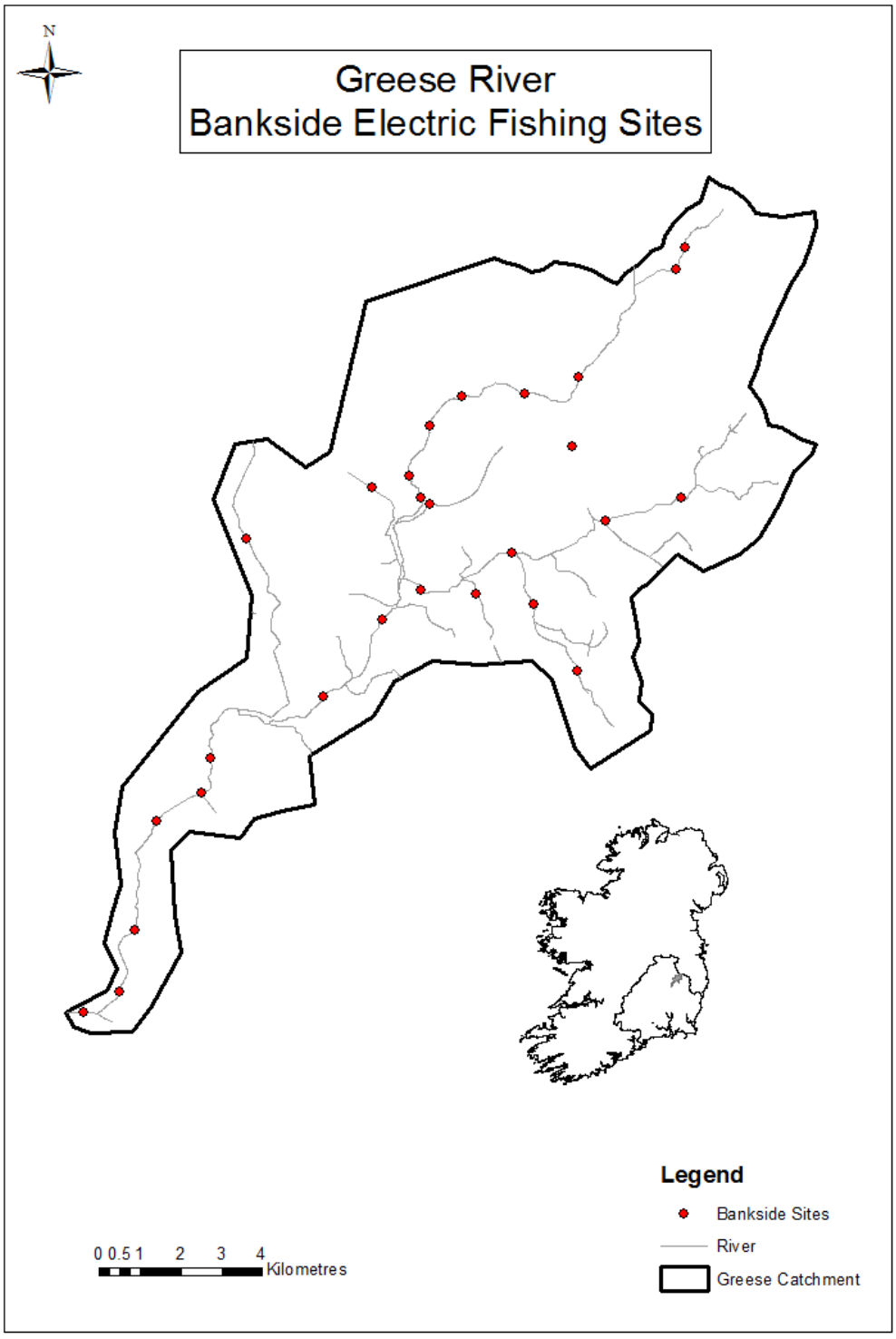


Figure 6-52: Locations of semi-quantitative (Bankside) electric-fishing sites sampled on Greese catchment, 2016 (Inset: Map of Ireland with Greese catchment (shaded) and South Eastern River Basin District (outlined))

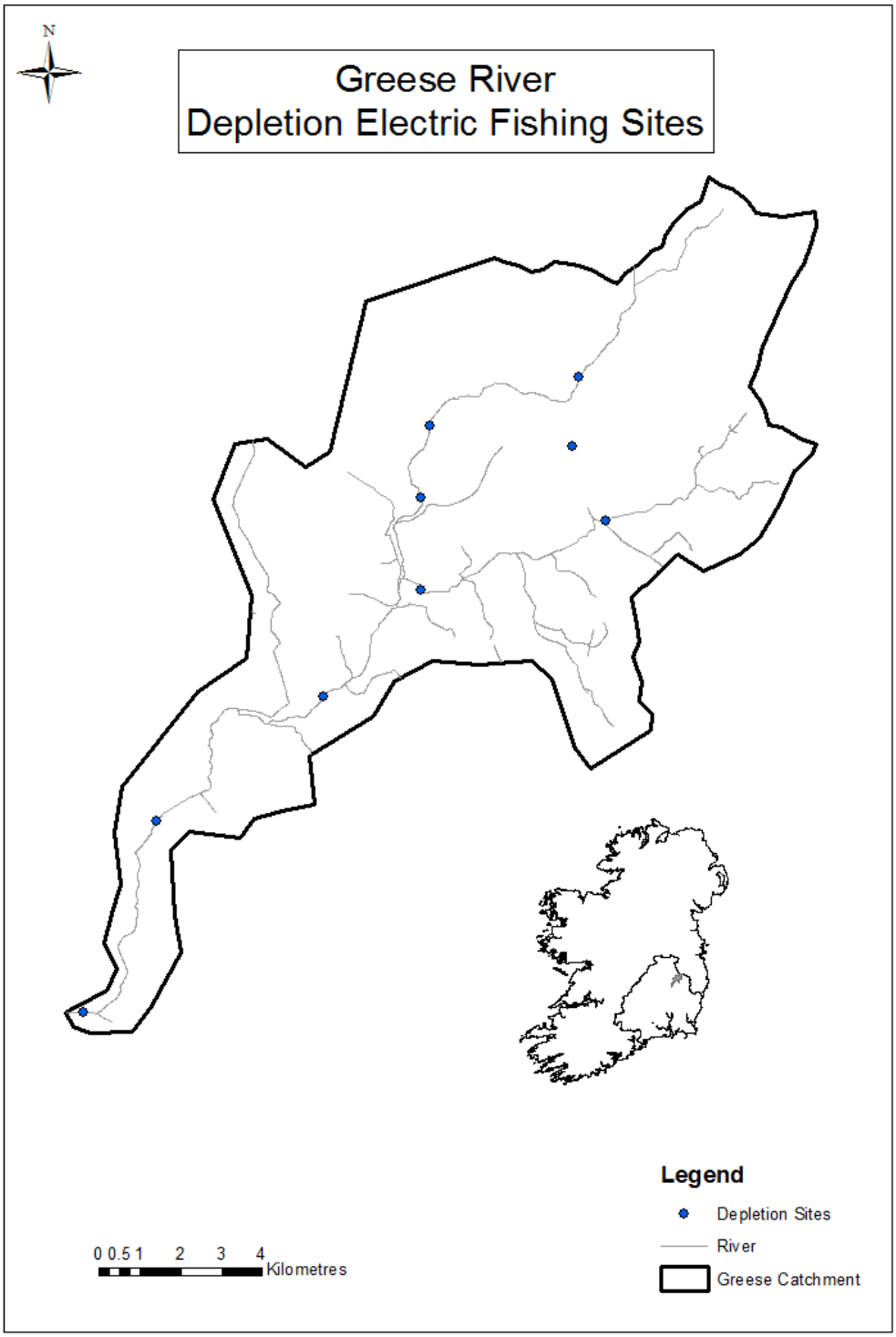


Figure 6-53: Locations of quantitative (Depletion) electric-fishing sites sampled on Greese catchment, 2016 (Inset: Map of Ireland with Greese catchment (shaded) and South Eastern River Basin District (outlined)).

6.4.1.1 Greese Catchment Electric-Fishing Results

In 2012 fyke netting survey in the Barrow Canal at Levitstown indicated a healthy population of eels in the area. No eels were captured during the electric-fishing survey of the Greese subcatchment. As the Greese joins the Barrow main channel (and canal) near Levitstown it was thought that this stream would be a good target area to examine the distribution of eels in the small riverine catchment and compare eel catches with those of small lacustrine catchments (e.g. Fane catchment). However, after bankside (semi-quantitative) fishing at 28 sites and depletion (quantitative fishing) at a subset of 9 of these sites, there was a complete paucity of eels recorded in the catchment.

Consultation with several land owners during the survey suggested that eels were historically present in the area. One site just downstream of Moone Bridge near Athy was locally known as the "Eel Pool" due to the numbers of which had gathered there just in front of a small weir as they prepared to climb it. Previous EMP electric fishing in the Kells Blackwater (2014) has shown that when fishing a site a few metres downstream of the weir, a good number of eels can be captured. The weir acts as a temporary bottleneck to eels as they work upstream, and many are slowed on their upstream movement while getting over the barrier. Such a spot can be an ideal location for catching eels during electric fishing (as it was at several sites with upstream weirs on the Kells Blackwater). However, this was not the case on the Greese.

The IFI Barrow Intercalibation study carried out in 2015 captured an eel at only one site on the Greese (near Belan House). The same site was included in the present study, however no eels were found. The Greese catchment presents ideal habitat and conditions for eels to frequent the area however, they were not recorded eels across all sites. Water quality status was good and there were no major obstacles to migration up or downstream in the system. Several small obstacles were noted during the survey however all appeared to have sufficient 'fringe effects' to allow eel passage upstream.

After the fishing on the Greese presented negative results it was decided to electric fish other small catchments in that vicinity. Therefore, the Tully, the Burren and the Douglas were all examined using the Bankside method. Three to four sites were electric-fished on each sub-catchment in ideal habitat settings for eels. However, only two eels were recorded across the three catchments. Each of these catchments were free of major obstacles, and had good/moderate water quality and eel habitat conditions.

The reasons for the lack of eels in these small tributaries remains unclear, however one possible explanation is the general decline in eel numbers in recent years. Historically, eels would have been present in these small streams having moved upstream from the main Barrow channel in search of resources (food and habitat), thus avoiding the intra-specfic competition that comes from high numbers of individual eels in the productive main channel and canal. However, as numbers have declined there may now be no longer any need for eels to migrate into the smaller tributaries to such a degree as previously recorded. Instead, the eels may be remaining within the main channel and canal where competition for resources has decreased due to reduced numbers.

6.5 Summary: Yellow Eel, 2016

Of the lakes sampled in 2016, Upper Lough Corrib had the highest CPUE reported of 7.51 (2,387 eels captured over 8 nights). The greatest yellow eels catches overall during the summer of 2016 were recorded at Waterford Estuary (CPUE: 22.54, 6,988 eels captured with 4,379 measured over three week survey). The Munster Blackwater Estuary presented far

lower catches of just 521 eels captured (449 measured, CPUE: 1.39). However, the Munster Blackwater Estuary is a far smaller waterbody (Munster Blackwater: approximately 12 km^2 in area; Waterford Estuary is over 400 km^2 in area).

Sacrificed eels were taken at several sites. The highest percentage prevalence of *A. crassus* was noted at Lower Lough Corrib with 72% recorded (mean infection intensity 4.53). The lowest recorded was at Lough Conn of 37% (mean infection intensity, 4.32). The majority of samples taken from sites were comprised of female eels and the most common diet preference noted from stomach contents was *Asellus* sp.

Despite parasite presence at the sites, the Swimbladder Degenerative Index (SDI) and Length Ratio Index (LRI) demonstrated only slight/moderate damage. Palstra *et al.* 2007 noted that severe swimbladder damage and high infection intensities may hamper the ability of the eels to complete migration to spawning grounds. Therefore, the indication is that while parasite prevalences and infection intensities may be variable across Ireland, the damage to eel swimbladders is comparatively low in relation to values from mainland Europe, and suggests that Irish eels maintain relatively healthy swimbladders which should be capable of the long migration.

The electric-fishing carried out this year on the Greese catchment, recorded no eels on the catchment, with only 2 individuals being recorded across three other small catchments in the vicinity. It is believed that reduced eel numbers has led to reduced competition and therefore fewer eels moving into smaller tributaries of the Barrow. The majority of the population is most likely remaining in the Barrow main channel and canal where productivity is high and competition for food and habitat resources is lower.

6.6 Water Framework Directive

6.6.1 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.

6.6.2 WFD Sampling Programme Methods

6.6.2.1 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 10.00 am and 12.00 midday in order to ensure that the activity peaks of each fish species were included.

6.6.2.2 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 fishings were carried out in a contained area. In small shallow channels (<0.5 - 0.7 m 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 - 1.5 m), 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).

6.6.2.3 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 – 200 m) in open water areas adjacent to beach seining locations. Fyke nets were set overnight in selected areas adjacent to beach seining locations.

6.6.3 Results 2015

The Water Framework Directive programme works on a 3 year rolling programme. Summary tables detailing the work carried out by the WFD team in 2015 are provided in Appendix 1 (Annex 5). Locations for WFD sampling sites for 2015 surveys are shown for lakes, rivers and transitional waters (Fig. 6.54).

A total of 22 lakes (spanning 16 catchments), were sampled with eels present in 18 lakes sampled (82% of sites). A total of 144 eels were caught during lake surveys. They ranged in length from 27.6 to 78 cm (Annex 5). A mean CPUE of 0.63 was found across all lake sites. While the highest CPUE value for eels was found in Lough Muckno (Fane, CPUE = 2.11) the lowest were noted in Lough Owel (Inny, CPUE = 0.06) and Lough Gur (Shannon Est Sth, CPUE = 0.11). No eels were captured in Loughs Alewnaghta (Shannon Lwr), Lough Dan (Ovoca), Lough Muckanagh (Fergus) and Lough Nasnahida (Owenamarve).

Lough Dan and Lough Muckanagh have both shown decreses in eel captures from the 2009 to 2012 surveys, resulting in no captures in the 2015 survey, while Lough Alewnaghta and Nasnahida showed similar numbers in the 2009 and 2012 surveys with no captures in 2015 (Kelly *et al*., 2016). With no major obstacles to the eels getting into these lakes the lack of captures maybe due to the decrease in the overall eel density as recruitment numbers decline allowing the species to fall back into the major rivers and lakes, being no longer pushed up into the margins or the extremeties of a catchment to survive.

A total of 77 river sites (across 15 catchments) were covered in the 2015 surveys. The WFD river sites had a 94% eel presence rate, 71% of sites have ≤5 eels, 10% of sites caught between 5 and 10 eels and 16% had ≥10 eels. A total of 400 eels where caught, ranging from 4.2 to 61

cm (Annex 5). Densities ranged from 0.00005 to 0.14316 eels per m^2 in the Barrow River (Belview_A) and Vartry River (Newrath Br._A), respectively.

A total of 50 eels were captured in the transitional water surveys (87.5 % of sites) across 7 of the 8 locations, covering 7 of the 8 catchments surveyed. They ranged in length from 2.8 to 63 cm. CPUE values for transitional water sites ranged from 0.06 (Camus Bay and Erne Estuary) to 0.67 (Avoca Estuary) (Annex 5). No eels were captured in Kinvera Bay.

Length frequencies for the lake, river and transitional water sites from 2015 sampling are shown in Figures 4-2, 4-3, 4-4 and 4-5, respectively. A peak in the lake length frequency was found for eels of length equal to 43 - 54 cm. The WFD river surveys have supplied vital information on juvenile eels (<30cm) rarely encountered by the fyke net surveys. Length frequency across all river sites revealed a peak frequency for eels at 4 – 15 cm. The peak in transitional water eel length frequencies ranged between 27 and 36 cm.

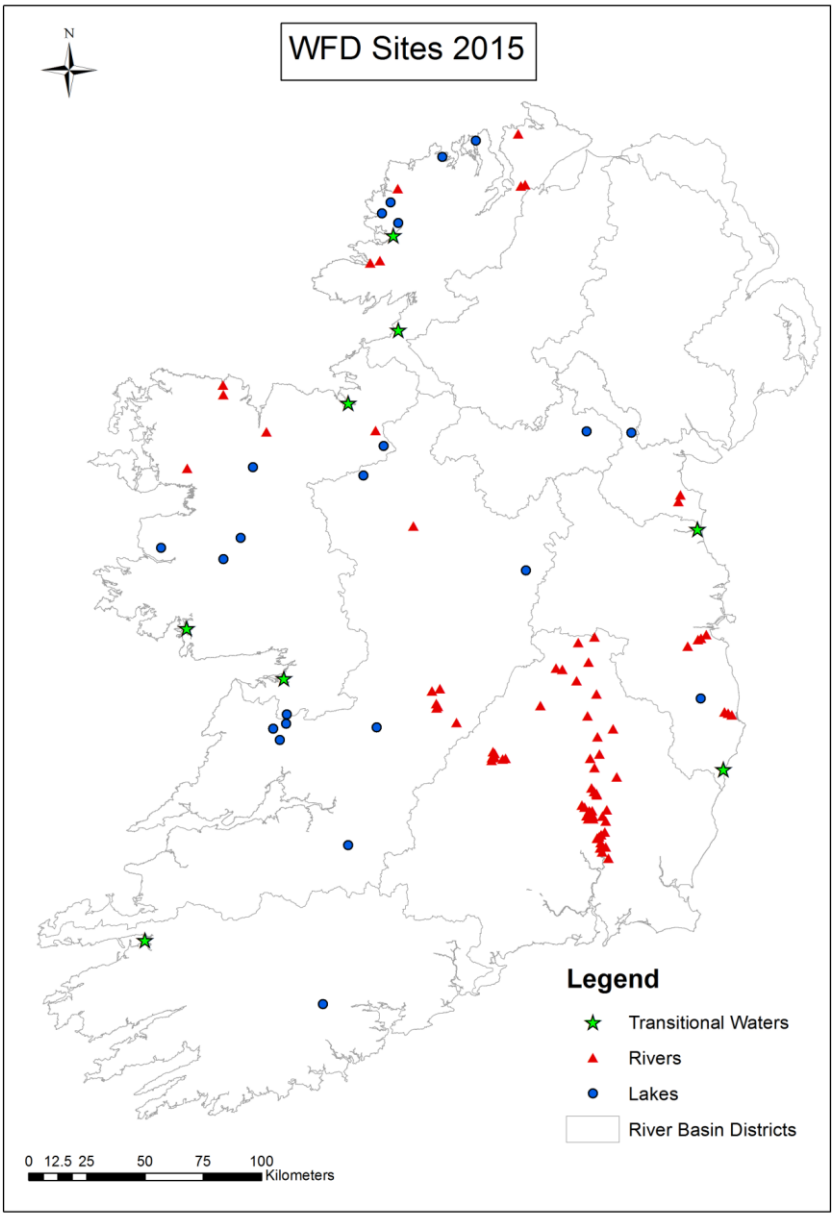


Figure 6-54: Location of WFD survey sites, 2015.

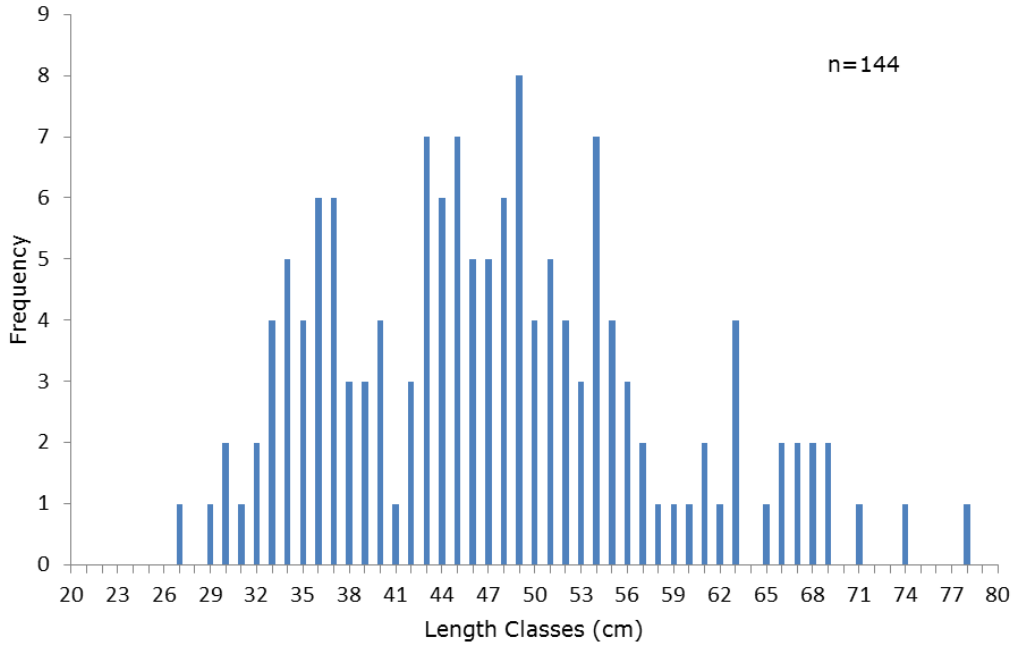


Figure 6-55: Length frequency for WFD lake sites, 2015

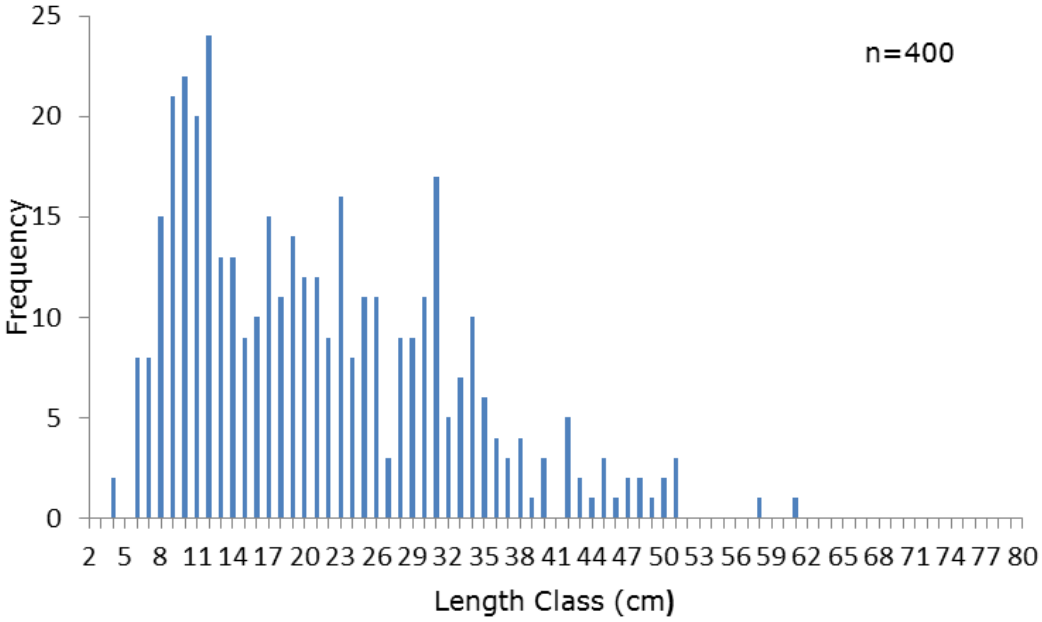


Figure 6-56: Length frequency for WFD river sites, 2015

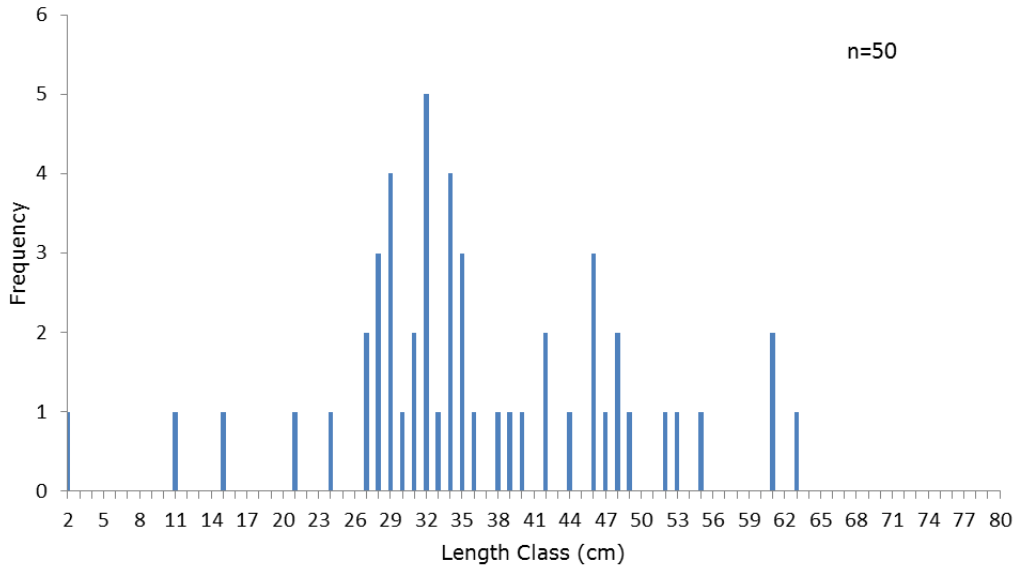


Figure 6-57: Length frequency for WFD transitional water sites, 2015

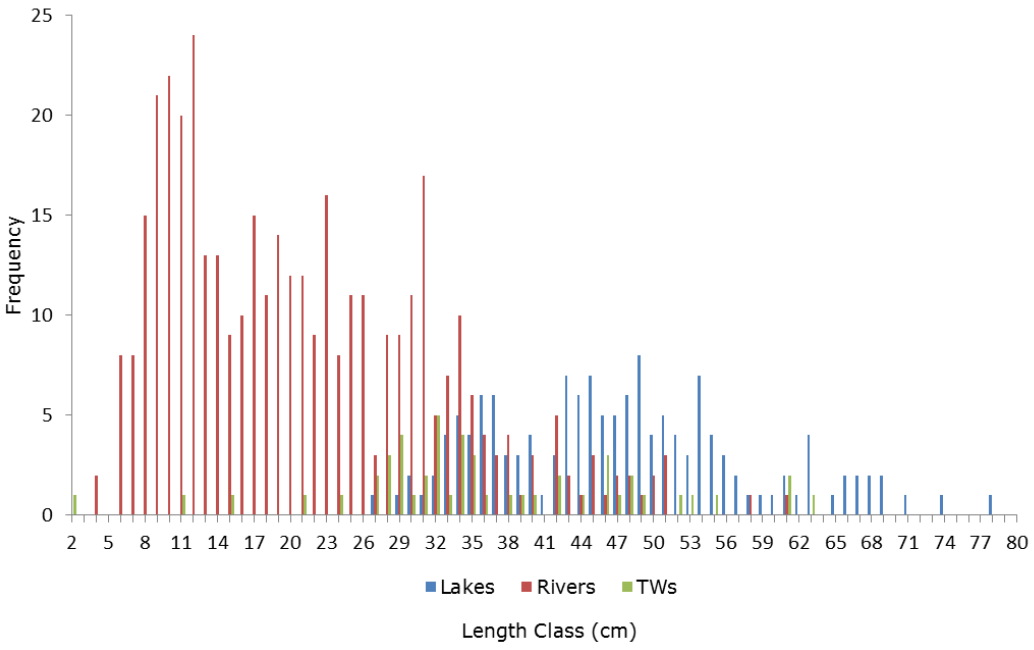


Figure 6-58: Length frequencies for WFD lakes, rivers and transitional water sites, 2015.

7 Recruitment

(refers to Ch. 7.3 of the National EMP Report, 2008)

7.1 Introduction

Changes in recruitment of glass eel / elver to Ireland will partly depend on Europewide management actions and will not provide a resource to directly post-evaluate Irish management actions. However, monitoring of recruitment is critical to evaluating the overall success of the eel regulation and is required by the joint EIFAAC/ICES/GFCM WGEEL for stock assessment. This information is also required to project forward in modelling the recovery in Irish eel stocks.

The sites monitored are shown in Figure 7.1.

The elver traps used on the Erne and the Shannon by the ESB are permanent brush ladders, based on the fixed ramp style traps designed by O'Leary and reported in an EIFAC technical paper on 'Eel Fishing gear and techniques in 1971, leading to holding boxes fitted with freshwater supplies. They are sited at the main hydro installations at Ardnacrusha and Parteen on the Shannon, Cathaleen's Fall on the Erne and Iniscarra Dam on the Lee. Trapping on the Erne and Shannon can be considered to be total traps as they are located at whole river barriers.

The elver traps used by IFI are also based on the fixed ramp style traps but are not total traps, giving only a relative index of quantity. They have been cited in various studies with modifications being made to the traps (Gollock *et al.* 2011; Jessop 1995; Jessop 2000, Moriarty 1986, Naismith and Knights 1988). Elvers and young yellow eels will encounter the ramp and ascend due to the flow of water attracting them upstream. The elver migration season extends from April to August, with migration influenced by water temperature and river discharge. White and Knights (1997) reported not catching juveniles eels in any numbers until temperatures rose above 15-16°C in mid-June /early July, peaking at >20°C. The pattern of distribution across a season has been described as waves of runs of short duration but repeated over the season (Jessop 2000). Where possible the traps are located downstream of a structure (e.g. weir or waterfalls) in order to get a flow of water to feed the traps. The structure also acts as a bottleneck restricting the ability of elvers utilising the whole river to ascend.

The aim of the long term monitoring programme is to set up a number of sites as an index of recruitment in order to get an understanding of changes to recruitment since the implementation of the Eel Regulation. It is not intended to make assumptions on the whole catch entering the river as the proportion of elvers avoiding the traps is not known and is difficult to quantify. The elver traps sample a proportion of the elver migration in a standardised way and when operating for a number of years a trend in recruitment is recorded.

There is no authorised commercial catch of juvenile eel in Ireland, but some fishing has been authorised in the past under Sec. 18 of the Fisheries Act for enhancement of the fisheries. Catches are made at impassable barriers and this is reported in the relevant Regional Eel Management Plans.

The 2016 elver monitoring program consisted of the six national index catchments: Ballysadare, Corrib, Inagh, Maigue, Feale and the Liffey; the locations can be seen on the map below (Fig. 7.1).

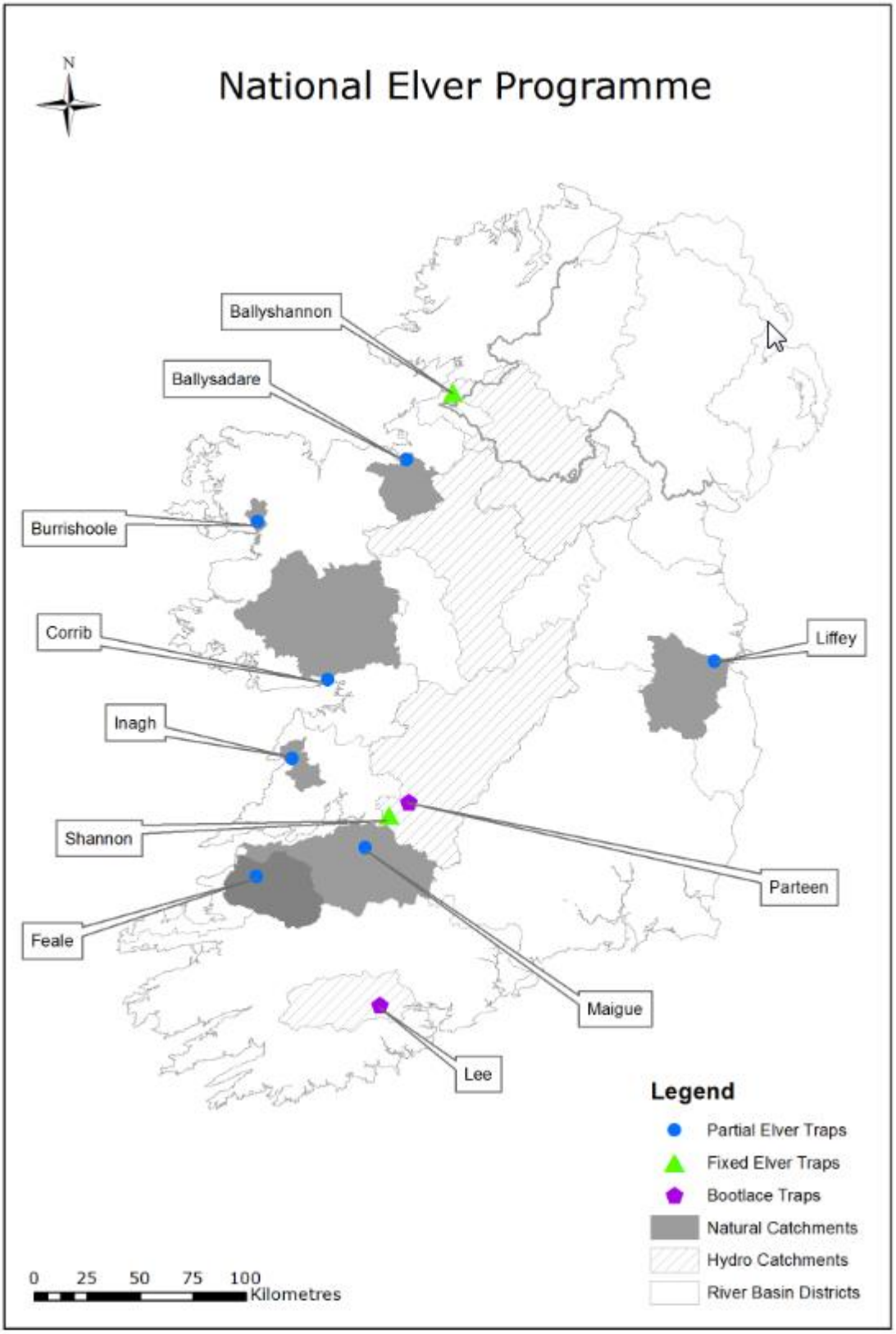


Figure 7-1: Location of recruitment monitoring stations in Ireland.

7.2 0+ Recruitment

There is no authorised commercial catch of juvenile eel in Ireland, but some fishing has been authorised in the past under Sec. 18 of the Fisheries Act for enhancement of the fisheries. Catches are made at impassable barriers and this is reported in the relevant Regional Eel Management Plans.

Long-term monitoring of elver migrating at Ardnacrusha (Shannon) and Cathaleen's Fall (Erne) is undertaken by the ESB (Fig. 7.1). In the Erne recruitment has shown an increase each year since 2011 with the highest catch in 2016.

Major refurbishment of the elver traps was undertaken in early 2015 and this may have improved the efficiency of the Erne traps thereby likely introducing a discontinuity into the time series. A third new trap was also installed and the data for this trap are being handled and reported separately in order to preserve the original time series. The changes on the Erne effectively reinstate the three traps that were previously in existence and reported on in Dekker *et al*. (2002) & Matthews *et al*. (2001).

Data for the Ardnacrusha Shannon trap have been low in recent years. 2016 saw a marked improvement in recruitment in the Shannon in both glass eel (elvers) and young yellow eel.

Long-term monitoring of elver migrating at Ardnacrusha (Shannon) and Cathaleen's Fall (Erne) is undertaken by the ESB (Fig. 7.2). In the Erne recruitment has shown an increase each year since 2011 with the highest catch in 2016.

Major refurbishment of the elver traps was undertaken in early 2015 and this may have improved the efficiency of the Erne traps thereby likely introducing a discontinuity into the time series. A third new trap was also installed and the data for this trap are being handled and reported separately in order to preserve the original time series.

Data for the Ardnacrusha Shannon trap have been low in recent years. 2016 saw a marked improvement in recruitment in the Shannon in both glass eel (elvers) and young yellow eel.

7.2.1 Other Locations

Long-term monitoring of migrating elvers also takes place at on the Feale, Inagh and Maigue Rivers and fishing was also previously undertaken in the Shannon Estuary for glass eels (Tables 7.1-7.2).

Additional elver monitoring is shown in Table 7.2 for sites on the Ballysadare and the Corrib, and Table 7.2 also gives summary data on length and weight for all the locations monitored by IFI.

Due to the unseasonal high rainfall during the summer of 2015, some of the trapping sites experienced difficulties with high water levels. High water levels also assisted elvers to cross partial barriers reducing the trapping efficiency at those sites (e.g. Liffey, Ballysadare). No elvers were trapped in Ballysadare in 2015, probably due to consistently high water levels.

The two elver traps on the **Maigue** were installed (one on each bank) on the 25th April; water levels for the first 3 weeks of the month were too high to install the traps safely. The first catch of elvers was on the 11th May with a water temperature of 14°C and continued on until the 5th June; no elvers were recorded since. The run in the Maigue occurred over a very limited number of days this year coinciding with period of very warm weather 15 - 18°C. The trap is still in the water as of the 23/08/2016, it will be taken out shortly. A total catch of 28.9kgs of elvers and .165kgs of yellow eels were recorded. The trap was operating for 90 days to date. A new elver trap was installed upstream of the old traps on the 13th July.

The **Inagh** trap was installed on the 16th March; the first elvers were recorded on the 16th April coinciding with a period of warm weather with temperatures reaching a max of 12.8°C with an average of 10°C for the last 2 weeks of April. The last recorded large catch was 40g on the 19th June, since then single numbers of elvers have been recorded. A total catch of 45kgs was recorded for the season and 5.68kgs of yellow eels. The old trap was removed on the 14th July and a new design trap installed on the 15th. The original trap operated for 65 days from the first capture of eels.

The **Feale** trap was installed on the 12th March, the first yellow eels were recorded on the 25th April and the first elvers were recorded on the 07th May with a water temperature of 12°C. The total catch for the season is 20.5kgs of elvers and 6.5kgs of yellow eels with the largest catches occurring when the water was between 18°C and 20 °C. The last catch of elvers was the 1st August. On the 17th and 18th May, pipe traps were set around the elver trap and on the opposite bank (left) to investigate the distribution of elvers in the River Feale. While the trap caught 200g of elvers no elvers were caught in the pipe traps over the 2 nights and none were visible migrating upstream or under rocks. The trap was operating for 93 days from catch of the first yellow eel to the 1st August. The Feale elver trap will be upgraded before next season.

A full description of all upgrades to traps, and the consequences for time series data, will be included in the 2017 report.

7.2.2 Summary of 2016 Season

Recruitment for the 2015 season indicated that there was a general decrease in the recruitment levels to Ireland in 2015 compared to 2014. The Erne was the only location to show an increase but it should be noted that this site also received considerable refurbishment of the traps.

Recruitment for the 2016 season showed a general increase in the recruitment levels to Ireland in 2016 compared to 2015, particularly on the West coast. There was a marked improvement on the Shannon. However recruitment was poor on the Corrib with low water temperatures recorded during the summer, a very late run of eels was noticed in October during the very low water levels experienced at that time of year. It is not known if this late run of eels is a normal occurrence but water levels obscure the run or if the unseasonably low water levels triggered the migration run. There was little change in the catch in the Liffey traps on the East coast.

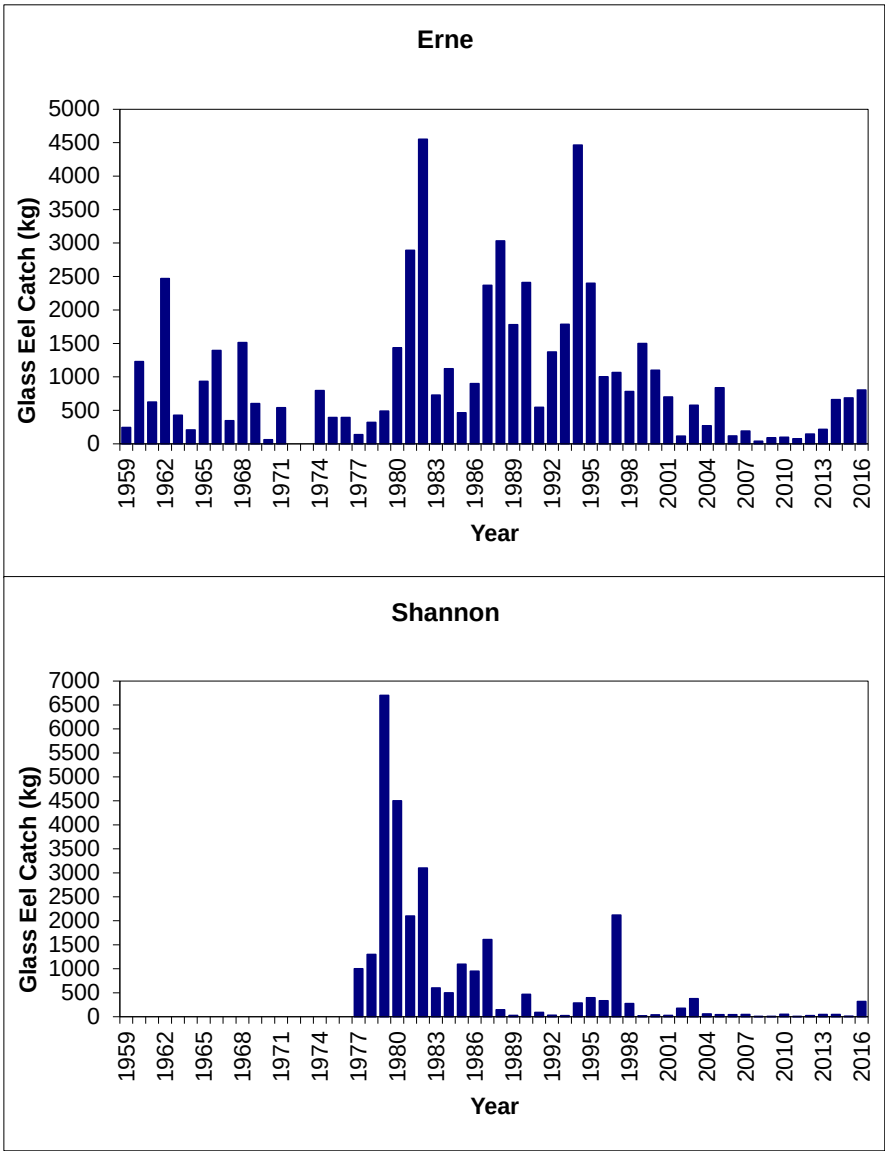


Figure 7-2: Annual elver catches (t) in the traps at Ardnacrusha (Shannon) and Cathaleen's Falls (Erne) – data from ESB. Full trapping of elvers took place on the Erne from 1980 onwards.

Table 7-1: Glass eel catches (kg), 1985 to 2016 (blanks = not fished).

Year	Erne Estuary	Moy Estuary	R Feale	R Maigue	Inagh R	Sh. Estuary Glass Eels	R. Liffey Fish Pass	R. Liffey Weir
1985			503					
1986								
1987								
1988								
1989								
1990								
1991								
1992								
1993								
1994			70	14				
1995			0	194				
1996			0	34	140			
1997			407	467	188	616		
1998	46		81	8	11	484		
1999	441		135	0	0	416		
2000	188		174	0	120	43		
2001		13	58	2	18	1		
2002		21	116	5		37		
2003		36	36	72	111	147		
2004		0	0	0	24	1		
2005		14	0	1	0	41		
2006		0	1	0	4	3		
2007		0	0	0	39	12		
2008		0	0	0	83	2		
2009		1	42					
2010		7	20	3	1.3	3		
2011		0	5	5	8			
2012		0	55		*		0.5	0.2
2013			68	14	43		1.1	2.7
2014			5	29**	40		0.3	0.3
2015			3	15	25		0.2	0.2
2016			21	29	45		0.1	

* trap flooded, ** partial trapping effort to avoid mortality due to large run

Table 7-2: Recruitment data for the years 2010 – 2016.

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	0.924	2,640	0.35	4,612	1,005	4.59
	2014	0.842	2,148	0.35	873	203	4.51
	2015	0	0		0	0	
	2016	0.6	1,714	0.35	327	72	4.57
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	14.26	42,064	0.34	12,520	2,149	5.41
Corrib Ramp trap	2013*	10.168	29,994	0.34	0	0	-
	2014	2.891	8,998	0.32	374	55	2.46
	2015	12.321	38,502	0.32			
	2016						
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
	2015	0.712	1,468	0.46	1,900	471	4.57
	2016	20.452	10,411		6,493	1,833	
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
	2015	20.131	67,132	0.3	4,775	1,582	2.98
	2016	45.138	150,327		5,684	1,907	
Liffey Weir	2012	0.213	608	0.35	-	-	-
	2013	2.742	7,849	0.35	-	-	-
	2014	0.285	746				
	2015	0.27	629	*0.43*	-	-	-
	2016	0.022	72				
Liffey Fishpass	2012	0.454	1,298	0.35	-	-	-
	2013	1.144					
	2014	0.311	1,402			4	
	2015	0.159	690			0	
	2016	0.083	360			0	
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	29.02	78,042	0.37	-	-	-
	2015	15.05	40,229	0.37	173	20	8.69
	2016	28.883	96277		165	59	

7.3 Young Yellow Eel Recruitment

Monitoring of juvenile yellow eel migrating at Parteen Regulating Weir (Shannon) and Inniscarra on the R. Lee takes place using fixed brush traps.

The data for Parteen is presented in Figure 7.3. In 2009 and 2010, due to maintenance work by ESB at the Parteen regulating weir the discharge patterns were less favourable than in 2008. This may partly account for the poor catches recorded in 2009 & 2010. However, catches in the original Parteen hatchery trap continued to decline in 2011, 2012 and 2013. The catch in 2015 was 301.1kg and in 2016 it was 854kg.

A new trap was installed in 2012 on the Shannon at Parteen, on the opposite bank (Co. Clare). The catch was 6.6kg and 6.8kg in 2013 and 7.8kg in 2014. The Co. Clare trap and a new one installed in 2015 near the hatchery (Tipperary) trapped 26.95kg in 2015 and 22.8kg in 2016.

In 2010, less than one kg was recorded in the Inniscarra trap on the River Lee and in 2011, 48kg were recorded. The catch has declined since 2011 with only 0.6kg recorded in 2014 and 0.94kg in 2015. The catch remained low in 2016.

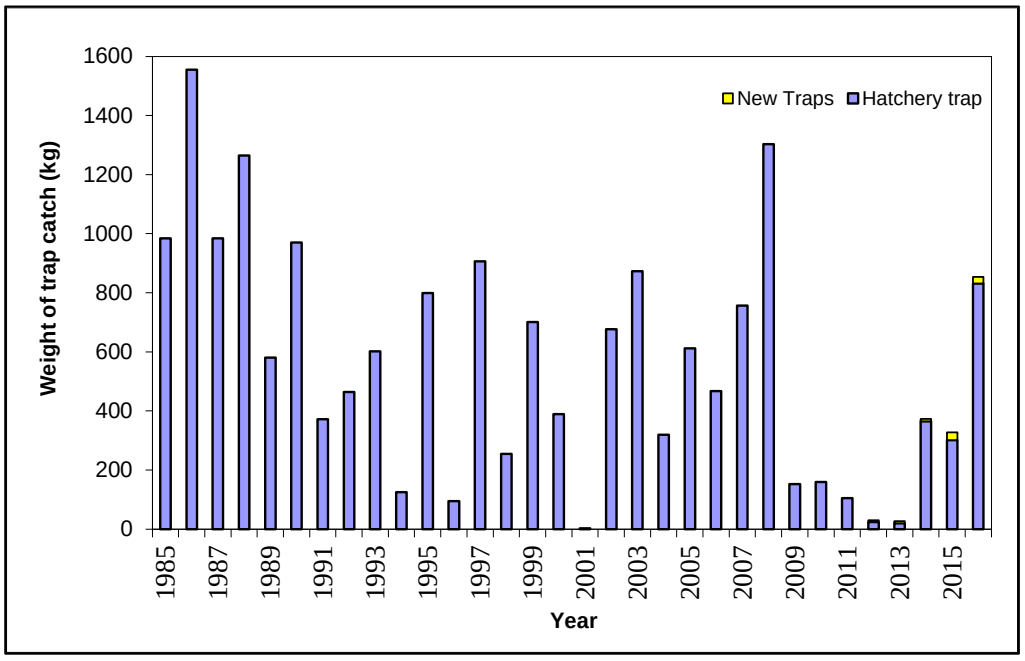


Figure 7-3: Juvenile yellow eel catches (kg) at Parteen Weir, 1985 to 2016. From 2012, a second trap was installed on the opposite bank (Clare) and in 2015 near the hatchery (Tipperary) and these data are included in the graph as separate bars.

7.4 Feale Elver Pipe Trap Study

7.4.1 Introduction

Scratleigh Weir on the River Feale is the Listowel public water supply abstraction point and is considered to be a substantial barrier to fish passage. To help mitigate against this a fish pass was installed within the weir to enable ease of passage for salmonids. The weir

currently does not seem to be a major obstacle for elvers on their yearly upstream migration from April through to August.

Currently the right hand bank below the weir holds an elver ramp trap which has been in place since 1994, the information from this feeds into the national elver trend analysis. It was decided to investigate if the current location for the trap was still indeed the best place for monitoring purposes. As a result an elver pipe trap survey of both banks was undertaken to determine where the elvers were within the river. The investigation took place between the 17th-19th May on both river banks upstream and downstream of the weir. Figures 7.4 & 7.5 below set out where the pipe traps were set each night in relation to the weir and the riverbanks. The traps were set for the first night at 3pm on the 17th May and retrieved and processed between 10.30am to 12pm on the 18th May. The traps were again reset for the night of the 18th May and retrieved on the 19th May between 10-11am. During the survey the elver ramp trap fished as normal with the elver collection bag attached. A third nights survey was not completed as numbers of elvers in the ramp trap had dropped off as well as temperature and heavy rain showers were forecasted for the following days.

7.4.2 Results

The elver ramp trap captured 513 elvers on the first night compared with 3 elvers in the 20 pipe traps (Table 7.3 and 7.4). The elver ramp trap captured 93 elvers on the second night compared with 2 elvers in the pipe traps (Table 7.3 and Table 7.5). The figures below 7.6 & 7.7 depict the location of the pipe traps on each night's survey along with indicating by use of green which traps captured eels.

Figure 7-4: Scartleigh Weir, River Feale, Listowel, May 2016 during low flow from L.H.B (Photos: S. Healy)

Figure 7-5: Setting locations of some of the pipe traps for 1st night's survey on the L.H.B at Scartleigh Weir (Photos: S. Healy)

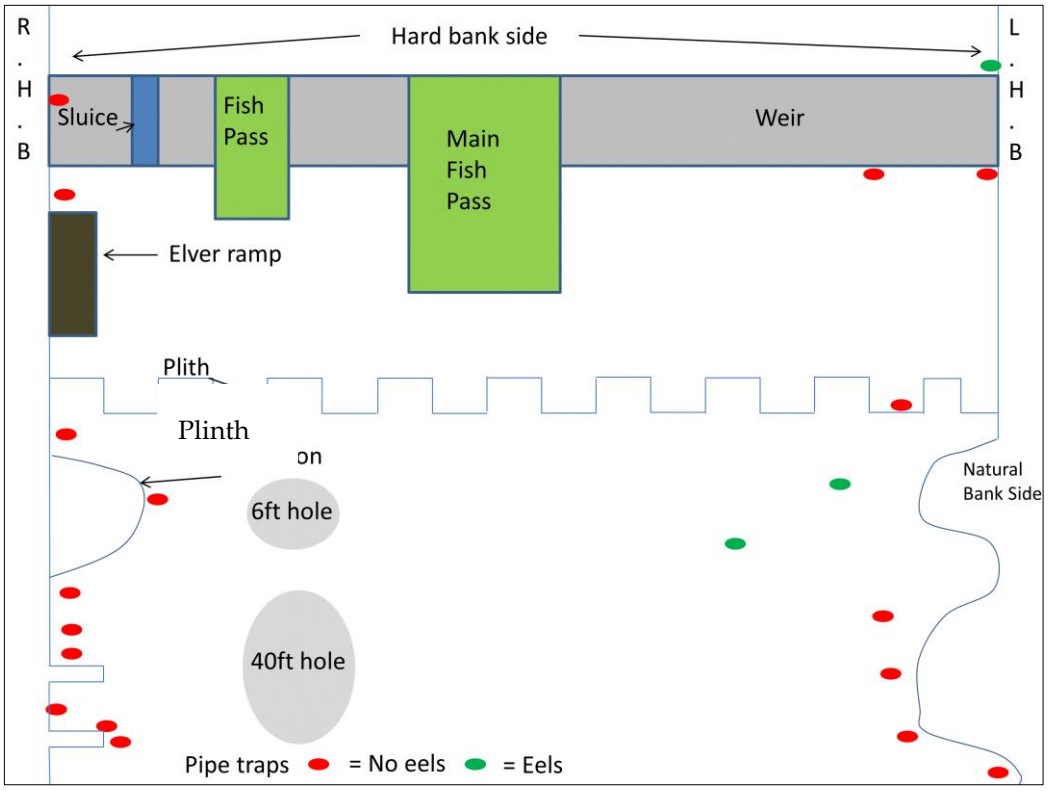


Figure 7-6: Layout of pipe traps at Scartleigh Weir during first night's survey on the 17th May 2015.

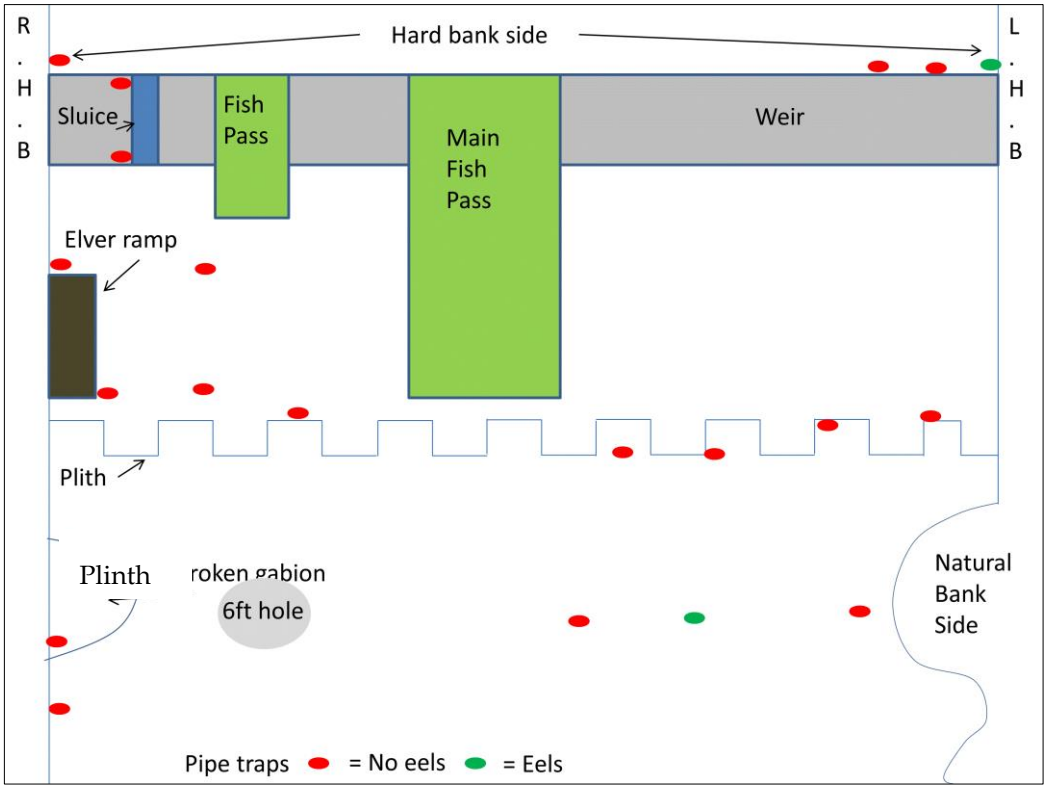


Figure 7-7: Layout of pipe traps at Scartleigh Weir during second night's survey on the 18th May 2016.

Table 7-3: Table showing catch in ramp trap during pipe trap survey.

Date	Number of Elvers	Number of Yellows
18/05/2017	518	3
19/05/2017	93	5

Table 7-4: Table showing first nights catch on 17-5-17.

Pipe trap ID	Bank Side	Number of Elvers	Number of Yellows	Comments
B1	R.H.B	0	0	
B2	R.H.B	0	0	
B3	R.H.B	0	0	
B4	R.H.B	0	0	
B5	R.H.B	0	0	
B6	R.H.B	0	0	
B7	R.H.B	0	0	
B8	R.H.B	0	0	
B9	R.H.B	0	0	1 snail
B10	R.H.B	0	0	
C1	L.H.B	3	0	
C2	L.H.B	0	0	
C3	L.H.B	0	0	
C4	L.H.B	0	0	
C5	L.H.B	0	1	140mm in length
C6	L.H.B	0	1	150mm in length
C7	L.H.B	0	0	
C8	L.H.B	0	0	
C9	L.H.B	0	0	2 sticklebacks
C10	L.H.B	0	0	

Table 7-5: Table showing first nights catch on 18-5-17.

Pipe trap ID	Bank Side	Number of Elvers	Number of Yellows	Comments
B1	R.H.B	0	0	
B2	R.H.B	0	0	
B3	R.H.B	0	0	
B4	R.H.B	0	0	
B5	R.H.B	0	0	
B6	R.H.B	1	1	Weight of yellow 2g
B7	R.H.B	0	0	
B8	R.H.B	0	0	
B9	R.H.B	0	0	
B10	R.H.B	0	0	
Spare trap	R.H.B	0	0	Set at mouth of ramp trap
C1	L.H.B	1	0	
C2	L.H.B	0	0	
C3	L.H.B	0	0	
C4	L.H.B	0	0	
C5	L.H.B	0	0	
C6	L.H.B	0	0	
C7	L.H.B	0	0	
C8	L.H.B	0	0	
C9	L.H.B	0	1	Length of yellow 14cm
C10	L.H.B	0	0	

7.4.3 Summary – Feale

During the survey the ramp trap was catching a reasonable number of elvers, numbers dropped off on the second night, indicating that the run was starting to slack off for that period, which coincides with the slight drop in water temperature.

Though the pipe traps set around the ramp trap only captured 1 elver and 1 yellow during the survey, the numbers captured in the ramp trap itself during the same period, does seem to indicate that the trap is currently placed in an optimal location for monitoring purposes. However the route that elvers are taking to get to the trap is still in question. No eels were captured along the wall leading up to the trap as you expect on the R.H.B.

All the elvers trapped on the LHB were at the top of the weir indicating that they had no trouble navigating the weir face and below the weir plinth out in the river channel. The weir face itself on the L.H.B has only a trickle of water and is covered in moss giving plenty of leverage to the elvers to climb the weir. However access to this bank side is extremely hazardous to access with the weir too dangerous to cross itself, and the river only crossable during periods of low flow approximately 1 km downstream from the weir, also supporting the current traps location.

To accurately summarize the exact path the elvers take before entering the ramp trap on the R.H.B, a repeat of the survey needs to be undertaken. Preferably when water temperatures are injunctive to elver migration and good numbers of elvers are steady appearing in the ramp trap over a period of at least a week. This will help us to understand better how elvers migrate the Scarthleigh Weir.

8 References

Baldwin, L. and Aprahamian, M. (2011). An evaluation of electric fishing for assessment of resident eel in rivers. *Fisheries Research,* Vol 123 – 124, pp 4-8

Beaumont, W. R. C.; Taylor, A. A. L.; Lee, M. J. and Welton, J. S. (2002). Guidelines for Electric Fishing Best Practice. R&D Technical Report, W2-054/TR.

Bradley, C. *et al*., (2015). Water Quality in Ireland 2010-2012. 170 pp. Environmental Protection Agency, Wexford. http://www.epa.ie/pubs/reports/water/waterqua/waterqualityinireland2010-2012report.html

Broad, T. L.; Townsend, C. R.; Closs, G. P. and Jellyman, D. J. (2001). Microhabitat use by longfin eels in New Zealand streams with contrasting riparian vegetation. *Journal of Fish Biology,* 59: 1385- 1400.

Christensen, J.M. (1964). Burning of otoliths, a technique for age determination of soles and other fish. *Journal du Conseil Permanent International pour l'Exploration de la Mer*, **29**: 73-81.

DCENR (2007). Guidelines on the Planning, Design, Construction and Operation of small-scale hydro-electric schemes and fisheries. October 2007.; 52pp.

Dekker W., Pawson M., Walker A., Rosell R., Evans D., Briand C., Castelnaud G., Lambert P., Beaulaton L., Åström M., Wickström H., Poole R., McCarthy T.K., Blaszkowski M., de Leo G. and Bevacqua D. (2006). Report of FP6-project FP6-022488, Restoration of the European eel population; pilot studies for a scientific framework in support of sustainable management: SLIME. 19 pp. + CD.

Dekker, W (ed) (2002). Monitoring of glass eel recruitment. *Netherlands Institute of Fisheries research, Report* C007/02-WD, 262pp.

Gollock, M., Curnick, D. & Debney, A. (2011). Recruitment trends of juvenile eels in tributaries of the River Thames. *Hydrobiologia*, 672: 33-37.

Graynoth, E. (1999). Improved otolith preparation, ageing and back-calculation techniques for New Zealand freshwater eels. *Fisheries Research* 42: 137-146.

Hu, L.C., Todd, P.R., (1981). An improved technique for preparing eel otoliths for aging. *New Zealand J. Mar. Freshw. Res*. **15**, 445 -446.

ICES (2007). Report of the 2007 session of the joint EIFAC/ICES Working Group on Eels. Bordeaux, France from 3 – 7 September 2007. EIFAC Occasional Paper. No. 39. ICES CM 2007/ACFM: 23. Rome, FAO/Copenhagen, ICES. 2008. 138p.

ICES, (2009) Report of the 2009 session of the Joint EIFAC/ICES Working Group on Eels. Göteborg, Sweden, from 7 to 12 September 2009. EIFAC Occasional Paper. No. 45. ICES CM 2009/ACOM:15. Rome, FAO/Copenhagen, ICES. 2010. 540p. (Online).

IFI. 2015. Annual Report. 92 pp. Inland Fisheries Ireland, Dublin, Ireland.

Imbert, H.; de Lavergne, S.; Gayou, F.; Rigaud, C. and Lambert, P. (2008) Evaluation of relative distance as new descriptor of yellow Eureopean eel spatial distribution. *Ecology of Freshw. Fish* 17:520 – 527.

Jessop, B.M., (1995). Justification for and status of American eel elver fisheries in Scotia-Fundy Region. DFO Atl. Fish. Res. D c, 95/2, 10 p.

Jessop B.M., (2000). Estimates of population size and instream mortality rate of American eel elvers in a Nova Scotia river. *Trans. Am. Fish. Soc*., 129, 514:526.

Kelly, F.L., Connor, L., Matson, R., Feeney, R., Morrissey, E., Coyne, J. and Rocks, K. (2015) Sampling Fish for the Water Framework Directive - Summary Report 2014. 132 pp. Inland Fisheries Ireland, Citywest Business Campus, Dublin 24, Ireland. http://wfdfish.ie/wp-content/uploads/2010/05/WFD_Report_2014_FINAL.pdf

Kruse, C. G.; Hubert, W. A. and Rahel, F. J. (1998). Single-pass electrofishing predicts Trout abundance in Mountain Streams with Sparse Habitat. *N. American Journal of Fisheries Management,* 18: 940-946.

Kuwahara, A.; Niimi, H. and Itagaki, H. (1974). Studies on a nematode parasitic in the air bladder of the eel I. Descriptions of *Anguillicola crassus* n. sp. (Philometridea, Anguillicolidae). *Japanese Journal for Parasitology* 23 (5): 275–279.

Laffaille, P.; Briand, C.; Fatin, D.; Lafage, D. and Lasne, E. (2005). Point sampling the abundance of European eel (*Anguilla anguilla*) in freshwater areas. *Arch. Hydrobiol.*, 162 (1); 91-98.

Lasne, E. and Laffaille, P. (2008). Analysis of distribution patterns of yellow European eels in the Loire catchment using logistic models based on presence-absence of different size –classes. *Ecol. Freshwater Fish*: 17:30-37.

Lefebvre, F., Contournet, P., Priour, F., Soulas, O. & Crivelli, A. J. (2002). Spatial and temporal variation in Anguillicola crassus counts: results of a 4 year survey of eels in Mediterranean lagoons. *Diseases of Aquatic Organisms* **50**, 181-188.

MacNamara, R. & McCarthy, T.K. (2013). Silver eel (*Anguilla anguilla*) population dynamics and production in the River Shannon, Ireland, Ecology of Freshwater Fish **23** (2), 181-192.

McCarthy, T.K., Nowak, D., Grennan, J., Bateman, A., Conneely, B. & MacNamara, R. (2014). Spawner escapement of European eel (*Anguilla anguilla*) from the River Erne, Ireland. *Ecology of Freshwater Fish* **23** (1), 21-32.

Matthews M., Evans D., Rosell R., Moriarty C. & Marsh, I. (2001). Erne Eel Enhancement Programme. EU Programme for Peace & Reconciliation Project No. EU 15. Northern Regional Fisheries Board, Donegal; 348pp.

Mitro, M. G. and Zale, A. V. (2000). Predicting fish abundance using single-pass removal sampling. *Canadian Journal of Fisheries and Aquatic Sciences*, 57 (5)951-961.

Molnár, K., Szekely, C.S. and Perenyi, M. (1994). Dynamics of *Anguillicola crassus* (Nematoda: Dracunculoidea) infection in eels of Lake Balaton, Hungry. *Folia Parasitologica,* 41, 193-202.

Moriarty, C. (1975). Eel Research in 1974.

Moriarty, C., (1983). Age determination and growth rates of eels Anguilla anguilla (L). *J. Fish. Biol*. **23**, 257 - 264.

Moriarty, C. (1986). Observations on the Eels of Meelick Bay, Lough Derg, 1981 – 1984. *Vie Milieu*, 36 (4) 279- 283.

Naismith, I. A. and Knights, B. (1988). Migrations of elver and juvenile European eels, Anguilla anguilla L., in the River Thames. Journal of Fish Biology 33 (Supplement A), 166-175.

Nelva A., Persat H., Chessel D., (1979). Une nouvelle méthode d'étude des peuplements ichthyologiques dans les grands cours d'eau par échantillonnageponctuelle d'abondance. CR Acad. Sci., 289, 1295-1298.

NIEA 2015. North Western River Basin Management Plan Summary. 75pp. NIEA, Lisburn, Northern Ireland. https://www.doeni.gov.uk/sites/default/files/publications/doe/water-report-north-western-river-basin-plan-2015.pdf

Palstra, A., Heppener, D. F. M., Van Ginneken, V. J. T., Székely, C. & Van den Thillart, G. E. E. J. M. (2007). Swimming performance of silver eels is severely impaired by the swim-bladder parasite *Anguillicola crassus*. *Journal of Experimental Marine Biology and Ecology* **352**, 244-256.

Poole, W.R. (1994). A population study of the European Eel (*Anguilla anguilla* (L.)) in the Burrishoole System, Ireland, with special reference to growth and movement. *PhD, Dublin University*; 416pp.

Poole, W.R., Reynolds, J.D.R. & Moriarty, C. (1990). Observations on the silver eel migrations of the Burrishoole river system, Ireland. 1959 to 1988. *Int. Revue Ges Hydrobiol*. **75** (6); 807-815.

Reid, S. M.; Yunker, G. and Jones, N. E. (2009). Evaluation of single pass backpack electric fishing for stream fish community monitoring. *Fisheries Management and Ecology*, 16: 1-9.

Reid, S. M. (2011). Comparison of point and transect based electrofishing to sample American eel (*Anguilla rostrata*) in wadeable riverine habitats. *Aquatic Living Resources*, 24:79-83.

SSCE (2012). Report on the Status of the Eel Stock in Ireland, 2009-2011. DCENR, 204pp.

SSCE (2015). Report on the Status of the Eel Stock in Ireland, 2012-2015. Annex to the National Report to the European Commission. DCENR, 95pp.

Vehanen, T.; Sutela, T.; Jounela, P.; Huusko, A. and Maki-Petays, A. (2013). Assessing electric fishing sampling effort to estimate stream fish assemblage attributes. *Fisheries Management and Ecology*, 20 (1):10-20.

Walker, A.M., Andonegi, E., Apostolaki, P., Aprahamian, M., Beaulaton, L., Bevacqua, P., Briand, C., Cannas, A., De Eyto, E., Dekker, W., De Leo, G., Diaz, E., Doering-Arjes, P., Fladung, E., Jouanin, C.11, Lambert, P., Poole, R., Oeberst, R. & Schiavina, M. (2011). Report of Studies and Pilot Projects for carrying out the Common Fisheries Policy; LOT 2: Pilot projects to estimate potential and actual escapement of silver eel; POSE. DGMARE Contract: SI2.539598.

White, E. M. and Knights, B. (1997). Environmental factors affecting migration of the European eel in the River Severn and Avon, England. *Journal of Fish Biology* 50:1104-1116.

Annex 1: Members of the Standing Scientific Eel Committee 2016

The SSCE is comprised of the following representatives:

Dr. Russell Poole (Chair)	Marine Institute
Dr. Paddy Boylan	Loughs Agency
Dr. Denis Doherty	Electric Ireland
Dr. Elvira de Eyto	Marine Institute
Dr. Paddy Gargan	Inland Fisheries Ireland
Dr. Milton Matthews	Inland Fisheries Ireland
Dr. Ciara O'Leary (Secretary)	Inland Fisheries Ireland
Dr. Sam Shepard	Inland Fisheries Ireland
Dr. Robert Rosell	Agri-Food & Bioscience Institute, N. Ireland
	(for issues relating to the transboundary plans)

Invited Contributors – 2016

Dr. Derek Evans	Agri-Food & Bioscience Institute, N. Ireland
Dr. Kieran McCarthy	NUI Galway
Dr. Karen Gaynor	National Parks & Wildlife

Annex 2: Conservation of Eel Fishing Bye-law No. C.S. 319, 2015

I, Joe McHugh, Minister of State at the Department of Communications, Energy and Natural Resources, in exercise of the powers conferred on me by section 57 of the Inland Fisheries Act 2010 (No. 10 of 2010) and the Energy and Natural Resources (Delegation of Ministerial Functions) Order 2014(S.I. No. 585 of 2014), at the request of Inland Fisheries Ireland, and for the purpose of giving full effect to the State's Eel Management Plan under Council Regulation (EC) No. 1100/2007 of the 18 September 2007[1], hereby make the following bye-law:

1. (1) This Bye-law may be cited as the Conservation of Eel Fishing Bye-law No. C.S. 319, 2015.

(2) This Bye-law comes into operation on the day after the day of its making and ceases to have effect on 30 June 2018.

2. (1) Notwithstanding anything contained in any bye-law fixing the annual close season, it is prohibited for a person -

(a) to take, or attempt to take, or to fish for or to attempt to fish for, or to aid or assist in the taking or fishing for, eel, or

[1] OJ No. L248, 22.09.2007, p.17.

(b) to be in possession of or sell or offer for sale or reward, or to purchase eel caught or taken by any means,

in any fishery district.

(2) In this Article "eel" means eel of the species *Anguilla anguilla*.

3. The Conservation of Eel Fishing Bye-Law No. C.S. 312, 2012 is revoked.

GIVEN under my hand,

23 November 2015.

JOE MCHUGH

Joe McHugh,

Minister of State at the Department of Communications,

Energy and Natural Resources.

EXPLANATORY NOTE

(This is not part of the Bye-law and does not purport to be a legal interpretation).

This Bye-law prohibits the taking, or attempting to take, fishing for or attempting to fish for, aiding or assisting the taking of or fishing for, eel in any fishery district in the State. It also prohibits being in possession of, selling or offering for sale or reward, or purchasing eel caught or taken by any means in any fishery district in the State.

FOOTNOTE

Section 57 (7) of the Inland Fisheries Act, 2010 provides that any person aggrieved by this Bye-law may within 28 days after its publication in the Iris Oifigiúil, appeal against same to the High Court.

Annex 3: Reports on Fisheries closures, illegal fishing and other management actions from the IFI RBD's and Loughs Agency.

1. IE_East

River District Basin: **Eastern/Neagh Bann River Basin District**

Date: **1 Jan- 31 Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the Eastern/Neagh Bann RBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the Eastern/Neagh Bann RBD during 2016.

IFI RESEARCH DIVISION

Two IFI licences were issued to trap eels relating to research activity in IFI Dublin in 2016 (covering both Eastern / Neagh Bann (International) River Basin Districts). Ex-commercial eel fishermen were contracted by IFI Research Division to undertake a survey of Lough Ramor and Lough Muckno. The Muckno survey was intended to be a small mark recapture study centred around a small bay in the lake and was planned to involve 3 sessions of 3 nights fishing with all eels tagged. The Ramor survey was planned to be a survey of the lake population (2 sessions of 4 nights fishing). Results are awaited from IFI research Division.

If you have any questions please don't hesitate to ask.

Estimated level of illegal fishing:

The level of illegal activity was low for 2016 in the IFI Dublin area. Illegal activity targeting eels was not recorded. Patrols concentrated on lakes throughout the Region. It is however notable that all IFI Research Division's eel fyke nets (40 in total) were stolen from Lough Ramor during an eel survey. Despite intensive surveillance operations all efforts to retrieve the stolen items have been unsuccessful to date.

Insert No. of alleged or confirmed reports **0**

Main catchments where illegal activity occurred: River Boyne (Lough Ramor) – IFI Research Division nets stolen.

Number of gear seizures: 0 Gear types seized: NA

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions: None

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

Low levels of illegal activity recorded; Any eels recorded were a by-product when coarse fish were found in nets (however very few eels found in any nets in 2016).

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: No

(If 'Yes', please insert quantity transported).

What was the total catch transported (kg)?: NA

Was there any evidence of illegal trading of eel in conjunction with the T&T programme: NA

General impression of the programme: NA

Management Action 3. Ensure Upstream Migration at Barriers

All applications for infrastructural and other developments etc which could impact on upstream migrations are reviewed and submissions are made to ensure that the free passage of fish is maintained. Natural barriers to upstream migration arising from floods etc were removed.

Management Action 4. Improve Water Quality

Extensive and well documented water and habitat protection and improvement measures are ongoing as a component of IFI's core remit.

Many thanks for taking the time to respond.

2. IE_NorW

River District Basin: **NWIRBD River Basin District IE_NorW**

Date: **Jan-Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the NWRBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the NWRBD office of the NWRBD during 2016.

Estimated level of illegal fishing:

Low.- there were no reports or detections of illegal eel fishing activity during 2016.

Main catchments where illegal activity occurred:

None

Number of gear seizures: Gear types seized:

None

Number of Eel Dealer Interceptions: **None**

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

There has been little evidence of illegal eel fishing activity in the NWRBD since the closure of the commercial eel fishery.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **Yes.**

In the Ballyshannon district (lower Erne system) 26,194kg of silver eels were captured from sites at (1) Roscor bridge, (2) Ferny Gap 2km east of Roscor bridge, and (3) Portora Lock and transported to Ballyshannon for release into the Tailrace below Cathleen's Falls hydro station.

In the Cavan district (Upper Erne system) 9,387 kg of silver eels were captured and transported for release to sea.

What was the total catch transported (kg)?: **35,581 kg**

Was there any evidence of illegal trading of eel in conjunction with the T&T programme: **No**

General impression of the programme: **The programme again worked well with good co-operation between contracted fishermen, ESB, DCAL and IFI staff.**

Management Action 3. Ensure Upstream Migration at Barriers

Significant investment and upgrading of elver collection facilities (3 traps and entrane ramps) have been completed by ESB at Cathleen's Fall Station, Ballyshannon over the past few seasons.

Recently upgraded elver collection trap on right bank of Erne tailrace

Management Action 4. Improve Water Quality

Many thanks for taking the time to respond to this.

3. IE_Shan

River District Basin: **ShRBD River Basin District**

Date: **Jan-Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the ShRBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the Limerick office of the ShRBD during 2016.

Estimated level of illegal fishing:

Upper Shannon - Both silver and yellow eel illegal activity occurring in the upper Shannon.

Medium for mid and Lower Shannon - reports of suspicious activity on Lough Derg were received but often reports weren't of good quality to proceed with an action. Many patrols were done dragging areas for sunken nets. On Doon Lake short night lines were seized which are not the traditional eel fishing longlines.

23 alleged reports were received directly relating to possible eel fishing.

Main catchments where illegal activity occurred: Lough Derg, Doon lake, Inny (Derravarag), Lough Ennell, River Brosna, Lough Ree, Lough Na blahy/Clonahee (Strokestown), Main River Shannon south of Athlone.

Number of gear seizures: **10** Gear types seized: See tables below

Lough Derg	Fyke net	1 measuring 23m
Lough Derg	Fyke net	3 measuring 30m
River Clodiagh	Night lines	18
Doon lake	Night line	2 in number
Lough NaBlahy, Elphin Co Roscommon	Long lines	22 measuring 1440m
Lough Ennell, Mullingar	Fyke Nets	2 sets of 8 measuring 200m (contained 200 eels)
Lough Derravarragh	Fyke Nets	1 set of 10 measuring 120m (contained 40 eels and 5 dead Pike)
River Shannon	Fyke Nets	1 set of 4 measuring 40m
River Newport	Night lines	3
River Brosna, out fall from Ennell	Fyke nets	5 measuring 30m

Number of Eel Dealer Interceptions: **0**

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

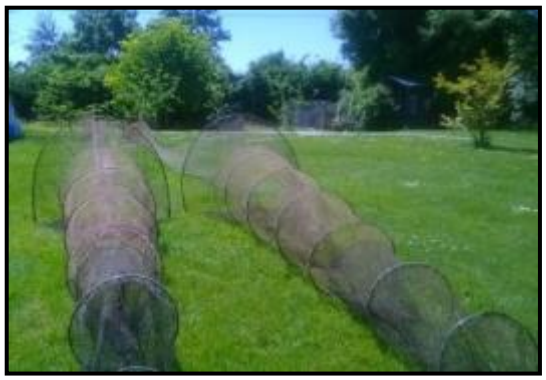
General impression of levels of illegal activity since the cessation of the commercial fishery:

There continues to be an illegal fishing effort for eels despite the fishery being closed and the market effectively closed in Republic of Ireland.

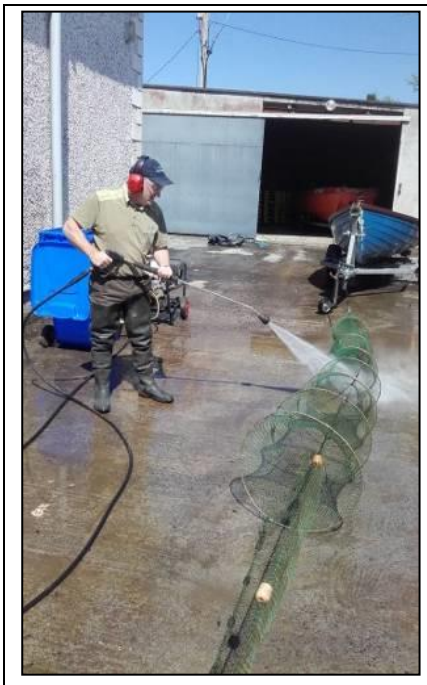
Both silver and yellow eel illegal activity occurring in the upper Shannon. Gear seized at locations listed above. By all accounts illegal activity is regular on the main lakes and reports are indicating eels are being transported north.

For 2016 it appeared that the greatest illegal activity was during the brown eel season again. No seizures were taken in the silver eel season but this is likely to be because of those sites being less conspicuous. Eel patrols are not confined to Lough Derg and a lot of the East Clare lakes have been dragged also but this year there was no evidence of illegal activity found.

Photos: Fyke net seized from Lough Derg



Photos: Fyke nets seized on L Derg and releasing eels from the net



Photos: Fyke Nets being power washed after being seized on Lough Ennell.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **Yes**

What was the total catch transported (kg)?:

5,739Kg – all for the 2016/2017 season as flooding prevented fishing in early 2016 for the end of the 2015/2016 season.

Finnea: 517kg

Athlone: 6,300kg

Rooskey:933kg

Month	Weight	Trap Transport season
January	0	2015/2016 stopped due to flooding
February	0	2015/2016 stopped due to flooding
March	0	no TT
April	0	no TT
May	0	no TT
June	0	no TT
July	0	no TT
August	0	no TT
September	0	2016/2017
October	2,503	2016/2017
November	1,771	2016/2017
December	1,465	2016/2017
Total	5,739	

Was there any evidence of illegal trading of eel in conjunction with the T&T programme:

No.

General impression of the programme:

Working well but 2016 didn't have large quantities transported due to low water levels in the Shannon for the whole winter period. Efficient, good communication, prompt and professional collection of eels at source

The condition of the silver eels being released into the release site of the Kilmastulla River isn't being assessed. Large numbers of Cormorants was noted by staff in the river during releases. Generally the conditions of the eels were good but as they are released into fast water it was not possible to confirm any mortalities/stressed eels.

Management Action 3. Ensure Upstream Migration at Barriers

Ongoing work at Bunowen Weir, Ahsacragh (Bunowen River, Suck catchment). Design option is for a rock ramp. Estimated construction period is summer 2017.

Photo: The defunct sluice/mill on the Bunowen River at Ahascragh.

Upgraded Elver traps at three index site locations; River Feale, River Inagh, River Maigue

Management Action 4. Improve Water Quality

Many thanks for taking the time to respond to this.

4. IE_SouE

River District Basin: **SE River Basin District**

Date: **1 Jan- 31 Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the SERBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the SERBD during 2016.

Estimated level of illegal fishing:

None known / reported

Main catchments where illegal activity occurred:

Number of gear seizures: **0**

Gear types seized:

N/A

Number of Eel Dealer Interceptions: **None**

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

None noted or reported

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **No**

What was the total catch transported (kg)?:

Was there any evidence of illegal trading of eel in conjunction with the T&T programme:

No

General impression of the programme: **n/a**

Management Action 3. Ensure Upstream Migration at Barriers

Management Action 4. Improve Water Quality

Many thanks for taking the time to respond to this.

5. IE_SouW

River District Basin: South West River Basin District - IE_SouW

Date: Jan-Dec 2016

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the SWRBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the SWRBD during 2016.

Estimated level of illegal fishing: **Negligible.**

Main catchments where illegal activity occurred: **River Maine, Co. Kerry, 1 incident**

Number of gear seizures: **1**

Gear types seized: **Eel Pot (seized)**

Number of Eel Dealer Interceptions: **None**

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery: **Minimal, no sign of commercial illegal eel activity, the 1 trap taken was most likely for personal use.**

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **Yes**

What was the total catch transported (kg)?:

N/A

Was there any evidence of illegal trading of eel in conjunction with the T&T programme: **No**

General impression of the programme:

Management Action 3. Ensure Upstream Migration at Barriers

Projects are at planning stages at 2 weirs at Fermoy and Clondulane. Clondulane Weir expected to be decommissioned 2017; Fermoy by-pass channel estimated 2018 at earliest.

Management Action 4. Improve Water Quality

N/A

Many thanks for taking the time to respond to this.

6. IE_West

River District Basin: **Western River Basin District - IE_West**

Date: **Jan-Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the Western RBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the Western RBD during 2016.

Estimated level of illegal fishing: **Generally low though there was evidence of some illegal rod fishing for eel on the Bonet River but not on a commercial basis. The seizures made at Lough Conn and lower Lough Corrib were thought to be for personal use rather than any commercial fishing.**

Main catchments where illegal activity occurred: **It is thought that the fykes seized from the shore of Lough Conn may have been used during 2015, possibly to catch all species i.e. eels, tench, roach and rudd. The Inspector is of the view that these nets were not used specifically to capture eels on a commercial basis.**

The one incident which occurred on Lough Corrib, appears as if it may have been for personal use, rather than a commercial operation.

The rod fishing for eel detected on the River Bonet was not commercial.

Number of gear seizures: **2** Gear types seized: **Fyke nets (8)**

2 x fyke nets approx. 60m in total length were found hidden along the shores of L Conn

6 x fyke nets approx. 100 metres in length seized form Lower Lough Corrib at Annaghdon

Number of Eel Dealer Interceptions: **0**

Estimated tonnage on board: **N/A** Declared origin(s) of cargos: **N/A**

Describe Action taken: **N/A**

General impression of levels of illegal activity since the cessation of the commercial fishery:

There has been very little illegal eel fishing in the WRBD since the closure of the commercial fishery. The detections and seizures relate to individuals most likely fishing for personal use rather than any commercial operations. However, the fact that fykes are still being detected suggests that there is an ongoing very low level of illegal eel fishing which continues to persist.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **No**

What was the total catch transported (kg)?: **N/A**

Was there any evidence of illegal trading of eel in conjunction with the T&T programme: **N/A**

General impression of the programme: **N/A**

Management Action 3. Ensure Upstream Migration at Barriers

Management Action 4. Improve Water Quality

Many thanks for taking the time to respond to this.

IE_East Carlingford – Loughs Agency

River District Basin: **Neagh Bann River Basin District**

Date: 1 Jan- 31 Dec 2016

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the Loughs Agency part of the NBRBD remained closed throughout 2016.

(The Foyle Area and Carlingford Area (Conservation of Eels) Regulations 2009)

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the Loughs Agency in the NBRBD during 2016.

Estimated level of illegal fishing:

No seizures or illegal fishing reported in 2016

Main catchments where illegal activity occurred:

Number of gear seizures:

Gear types seized:

Number of Eel Dealer Interceptions: 0

Estimated tonnage on board:

Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

Low

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **No**

What was the total catch transported (kg)?:

Was there any evidence of illegal trading of eel in conjunction with the T&T programme:

General impression of the programme:

Management Action 3. Ensure Upstream Migration at Barriers

All applications for infrastructural and other developments which could impact on upstream migrations are reviewed and submissions made to ensure that the free passage of fish is maintained. Natural barriers to upstream migration arising from floods were removed.

Management Action 4. Improve Water Quality

The Loughs Agency monitors water quality within the Foyle and Carlingford areas and will seek prosecutions in the event of a pollution incident.

Many thanks for taking the time to respond to this

IE_NWIRBD – Loughs Agency

River District Basin: **NW River Basin District (Loughs Agency area)**

Date: **1 Jan- 31 Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the Loughs Agency part of the NWRBD remained closed throughout 2016.

(The Foyle Area and Carlingford Area (Conservation of Eels) Regulations 2009

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by the Loughs Agency in the NWRBD during 2016.

Estimated level of illegal fishing:

No seizures or illegal fishing reported in 2016

Main catchments where illegal activity occurred:

Number of gear seizures: Gear types seized:

0

Number of Eel Dealer Interceptions: **0**

Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

Low

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **No**

What was the total catch transported (kg)?:

Was there any evidence of illegal trading of eel in conjunction with the T&T programme:

General impression of the programme:

Management Action 3. Ensure Upstream Migration at Barriers

All applications for infrastructural and other developments which could impact on upstream migrations are reviewed and submissions made to ensure that the free passage of fish is maintained. Natural barriers to upstream migration arising from floods were removed.

Management Action 4. Improve Water Quality

The Loughs Agency monitors water quality within the Foyle and Carlingford areas and will prosecute in the event of a pollution incident.

Many thanks for taking the time to respond to this.

IE_NWIRBD – DAERA

River District Basin: **Dept. of Agriculture, Environment & Rural Affairs (DAERA)**

(Northern Ireland portion of the R. Erne catchment)

Date: **1 Jan- 31 Dec 2016**

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under **Conservation of Eel Fishing Bye-law No. C.S. 312, 2012**:

The eel fishery in the NWRBD remained closed throughout 2016.

Confirm no licences issued in 2009 under Conservation of Eel Fishing (Prohibition on Issue of Licences) Bye-law No. 858, 2009:

No eel fishing licences were issued by DAERA for the R. Erne eel fishery during 2016.

Estimated level of illegal fishing:

There were no reports or detections of illegal eel fishing activity during 2016.

Main catchments where illegal activity occurred:

None

Number of gear seizures: Gear types seized:

None

Number of Eel Dealer Interceptions: **None**

Estimated tonnage on board:

n/a

Declared origin(s) of cargos:

Describe Action taken:

General impression of levels of illegal activity since the cessation of the commercial fishery:

There were no detections and no reports of illegal eel fishing activity.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?: **Yes**

What was the total catch transported (kg)?: **9,387 kg**

Was there any evidence of illegal trading of eel in conjunction with the T&T programme:

No

General impression of the programme:

The programme again worked well with good co-operation between ESB and contracted fishermen.

Management Action 3. Ensure Upstream Migration at Barriers

Management Action 4. Improve Water Quality

Many thanks for taking the time to respond

Annex 4: Silver Eel Trap and Transport Tables: Erne, Shannon and Lee

River Shannon Silver Eel Weekly Collection Sheet 2016/17

Wk No.	Week Ending	Jolly Mariner, Athlone	Yacht club, Athlone	Rooskey	Finea	Kilaloe Eel Weir	Total for Week
Catch Quota per Location		8 Tonnes	2 Tonnes	1.5 Tonnes	1 Tonne	No Quota	
1	01/10/16	1132	0	0	0	nf	1132
2	08/10/16	490	206	0	517	nf	1213
3	15/10/16	0	0	0	0	nf	0
4	22/10/16	78	80	0	0	nf	158
5	29/10/16	0	0	0	0	0	0
6	05/11/16	420	498	0	0	0	918
7	12/11/16	0	0	0	0	0	0
8	19/11/16	628	225	0	0	nf	853
9	26/11/16	0	0	0	0	0	0
10	03/12/16	609	75	0	0	240	924
11	10/12/16	0	0	0	0	0	0
12	17/12/16	0	0	119	0	nf	119
13	24/12/16	62	0	0	0	47	109
14	31/12/16	0	0	0	0	313	313
15	07/01/17	2193	606	814	556	187	4356
16	14/01/17	634	0	nf	nf	8	642
17	21/01/17	0	0	nf	nf	nf	0
18	28/01/17	135	47	nf	nf	0	182
19	04/02/17	0	0	nf	nf	0	0
20	11/02/17	505	168	nf	nf	30	703
21	18/02/17	nf	nf	nf	nf	nf	0
22	25/02/17	nf	nf	nf	nf	nf	0
23	04/03/17	nf	nf	nf	nf	nf	0
24	11/03/17	nf	nf	nf	nf	1727	1727
25	18/03/17	nf	nf	nf	nf	1096	1096
26	25/03/17	nf	nf	nf	nf	2010	2010
27	01/04/17	nf	nf	nf	nf	256	256
28	08/04/17	nf	nf	nf	nf	nf	0
Total to Date(kgs)		**6886**	**1905**	**933**	**1073**	**5914**	**16711**

River Erne Silver Eel Weekly Collection Sheet 2016/17

Week No.	Week Ending	Lisnaskea	Ferny Gap	Portora Gates	Urney Bridge	Roscor	Lough Gowna	Total for Week
1	**01/10/2016**	0	1852	476	0	0	0	2328
2	**08/10/2016**	297	1165	208	478	0	0	2148
3	**15/10/2016**	0	472	130	170	176	0	948
4	**22/10/2016**	0	0	0	0	0	0	0
5	**29/10/2016**	193	2841	259	201	67	0	3561
6	**05/11/2016**	0	0	0	0	0	0	0
7	**12/11/2016**	0	487	276	0	0	0	763
8	**19/11/2016**	269	337	681	227	30	0	1544
9	**26/11/2016**	250	2896	1125	714	852	0	5837
10	**03/12/2016**	98	1527	40	326	108	0	2099
11	**10/12/2016**	0	0	0	0	0	0	0
12	**17/12/2016**	0	140	12	212	21	0	385
13	**24/12/2016**	374	207	475	1135	0	0	2191
14	**31/12/2016**	1369	1872	1803	2275	3405	0	10724
15	**07/01/2017**	200	641	554	2520	272	352	4539
16	**14/01/2017**	99	383	60	0	34	0	576
17	**21/01/2017**	Not Fishing	Not Fishing	Not Fishing	0	0	Not Fishing	0
18	**28/01/2017**	Not Fishing	Not Fishing	Not Fishing	45	134	Not Fishing	179
19	**04/02/2017**	Not Fishing	Not Fishing	Not Fishing	0	0	Not Fishing	0
20	**11/02/2017**	Not Fishing	Not Fishing	Not Fishing	0	0	Not Fishing	0
21	**18/02/2017**	Not Fishing	Not Fishing	Not Fishing	323	119	Not Fishing	442
22	**25/02/2017**							0
Total (kgs)		**3149**	**14820**	**6099**	**8626**	**5218**	**352**	**38264**

Annex 5: Water Framework Directive

Table a-0-1 WFD Lake summary data, 2015

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)
SHIRBD	Shannon Lwr	Alewnaghta, Lough	2	9	0	0.00	n.a	n.a	n.a	n.a	n.a	n.a	n.a
NWIRBD	Gweedore	Anure, Lough	2	9	6	0.67	43.9	42.0	45.0	0.1452	0.1160	0.1780	0.8710
WRBD	Ballysadare	Arrow, Lough	2	9	8	0.89	46.1	37.5	56.0	0.1671	0.0560	0.2635	1.3370
SHIRBD	Fergus	Bunny, Lough	2	9	6	0.67	52.2	42.0	61.5	0.2668	0.1300	0.4420	1.6010
WRBD	Corrib	Carra, Lough	1	9	4	0.44	62.1	49.0	74.0	0.3865	0.1890	0.7280	1.5460
SHIRBD	Fergus	Cullaun, Lough	1	6	4	0.67	57.1	52.0	61.5	0.3118	0.2210	0.4090	1.2470
WRBD	Moy	Cullin, Lough	3	18	26	1.44	41.7	30.0	66.0	0.1459	0.0430	0.5000	3.7925
ERBD	Ovoca	Dan, Lough	2	9	0	0.00	n.a	n.a	n.a	n.a	n.a	n.a	n.a
SHIRBD	Fergus	Dromore Lough	1	9	8	0.89	50.7	45.5	65.0	0.2556	0.1570	0.5915	2.0450
NWIRBD	Coastal	Dunglow Lough	1	9	14	1.56	47.9	29.0	78.0	0.2356	0.0950	0.8240	3.2980
SHIRBD	Shannon Upr	Gara	3	15	8	0.53	61.3	54.0	69.1	0.3771	0.2360	0.5680	3.0170
SHIRBD	Shannon Est Sth	Gur, Lough	1	9	1	0.11	41.7	41.7	41.7	0.0990	0.0990	0.0990	0.0990
SWIRBD	Lee	Inniscarra, Reservoir	1	18	10	0.56	49.8	27.6	71.0	0.2459	0.0370	0.6410	2.4590
NWIRBD	Coastal	Kindrum Lough	1	9	9	1.00	35.1	30.0	48.5	0.0876	0.0500	0.1855	0.7885
WRBD	Bundorragha	Lough, Doo	1	3	3	1.00	49.6	36.5	57.4	0.2252	0.0755	0.3110	0.6755
WRBD	Corrib	Mask, Lough	3	27	7	0.26	59.1	43.4	67.0	0.3863	0.1340	0.6010	2.7040
SHIRBD	Fergus	Muckanagh Lough	1	9	0	0.00	n.a	n.a	n.a	n.a	n.a	n.a	n.a
NBIRBD	Fane	Muckno, Lough	2	9	19	2.11	45.8	32.5	63.2	0.1940	0.0645	0.4400	3.6855
NWIRBD	Owenamarve	Nasnahida, Lough	1	6	0	0.00	n.a	n.a	n.a	n.a	n.a	n.a	n.a
SHIRBD	Inny	Owel, Lough	1	18	1	0.06	40.0	40.0	40.0	0.0895	0.0895	0.0895	0.0895
NWIRBD	Coastal	Sessaigh, Lough	1	9	6	0.67	38.2	32.5	45.0	0.1018	0.0620	0.1540	0.6105
NWIRBD	Erne	White, Lough (Ballybay)	1	9	4	0.44	54.2	51.0	62.0	0.2995	0.2230	0.4870	1.1980

Table a-0-2 WFD Lake length frequency data, 2015

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
SHIRBD	Shannon Lwr	Alewnaghta, Lough	0	0	0	0	0	0	0	0
NWIRBD	Gweedore	Anure, Lough	6	0	0	6	0	0	0	0
WRBD	Ballysadare	Arrow, Lough	8	0	3	2	3	0	0	0
SHIRBD	Fergus	Bunny, Lough	6	0	0	1	4	1	0	0
WRBD	Corrib	Carra, Lough	4	0	0	1	1	1	1	0
SHIRBD	Fergus	Cullaun, Lough	4	0	0	0	2	2	0	0
WRBD	Moy	Cullin, Lough	26	0	13	9	3	1	0	0
ERBD	Ovoca	Dan, Lough	0	0	0	0	0	0	0	0
SHIRBD	Fergus	Dromore Lough	8	0	0	6	1	1	0	0
NWIRBD	Coastal	Dunglow Lough	14	1	1	8	3	0	1	0
SHIRBD	Shannon Upr	Gara	8	0	0	0	4	4	0	0
SHIRBD	Shannon Est Sth	Gur, Lough	1	0	0	1	0	0	0	0
SWIRBD	Lee	Inniscarra, Reservoir	10	1	1	5	1	1	1	0
NWIRBD	Coastal	Kindrum Lough	9	0	8	1	0	0	0	0
WRBD	Bundorragha	Lough, Doo	3	0	1	0	2	0	0	0
WRBD	Corrib	Mask, Lough	7	0	0	1	2	4	0	0
SHIRBD	Fergus	Muckanagh Lough	0	0	0	0	0	0	0	0
NBIRBD	Fane	Muckno, Lough	19	0	6	7	5	1	0	0
NWIRBD	Owenamarve	Nasnahida, Lough	0	0	0	0	0	0	0	0
SHIRBD	Inny	Owel, Lough	1	0	0	1	0	0	0	0
NWIRBD	Coastal	Sessaigh, Lough	6	0	3	3	0	0	0	0
NWIRBD	Erne	White, Lough (Ballybay)	4	0	0	0	3	1	0	0

Table a-0-3 Summary data from WFD Rivers Survey, 2015

RBD	Catchment	River Name	Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
SERBD	Barrow	Aughnavaud River	Bauck Hill_A	3	3	302	0.06623	20	0.2355
SERBD	Barrow	Aughnavaud River	Turra Br._A	2	3	189	0.03708	7	0.2975
WRBD	Ballinglen	Ballinglen River	Ballinglen Br._B	2	3	352	0.03977	14	0.2895
WRBD	Ballinglen	Ballinglen River	New Br._A	3	3	402	0.03486	14	0.1915
SERBD	Clonmany	Ballyhallan River	Br. u/s Clonmany River_A	2	3	168	0.02382	4	n.a
SERBD	Barrow	Barrow, River	Bagenalstown (Slipway to lock)_A	1*	1	7990	0.00025	2	n.a
SERBD	Barrow	Barrow, River	Ballyellin Canal_A	1*	1	4873	0.00021	1	0.1170
SERBD	Barrow	Barrow, River	Ballyellin Tomb_A	1*	1	2013	0.00099	2	n.a
SERBD	Barrow	Barrow, River	Ballyfoyle_A	1*	1	5824	0.00017	1	n.a
SERBD	Barrow	Barrow, River	Belview_A	1*	1	21720	0.00005	1	n.a
SERBD	Barrow	Barrow, River	Bestfield_A	1*	1	6340	0.00032	2	n.a
SERBD	Barrow	Barrow, River	Burgage_A	1*	1	6055	0.00033	2	n.a
SERBD	Barrow	Barrow, River	Carriglead Weir_A	1*	1	3808	0.00105	4	0.1283
SERBD	Barrow	Barrow, River	Dunleckny (Swimming pool)_A	1*	1	10963	0.00018	2	n.a
SERBD	Barrow	Barrow, River	Fishersgraigue RHS_A	1*	1	3924	0.00051	2	n.a
SERBD	Barrow	Barrow, River	Goresbridge Graveyard_A	1*	2	12555	0.00048	6	0.2242
SERBD	Barrow	Barrow, River	Graiguenamanagh Br._A	1*	1	7189	0.00014	1	n.a
SERBD	Barrow	Barrow, River	Mountloftus RHS_A	1*	1	9504	0.00011	1	n.a
SERBD	Barrow	Barrow, River	Pass Br._A	1*	1	12630	0.00008	1	n.a
SERBD	Barrow	Barrow, River	St. Mullins Canal_A	1*	1	4968	0.00060	3	n.a
SERBD	Barrow	Barrowmount River	Johnville Br._A	1	3	116	0.01725	2	0.0655
NWIRBD	Moy	Behy River	Behy Br._A	2	3	309	0.04859	15	0.4355
NWIRBD	Burnfoot	Burnfoot River	Br. in Burnfoot_B	2	3	105	0.08582	9	0.0660
NWIRBD	Burnfoot	Burnfoot River	Glen_A	2	3	180	0.13889	25	0.3665
SERBD	Barrow	Burren River	Ballynunnery Br._A	1	1	161	0.00621	1	0.1190
SHIRBD	Shannon Lwr	Carrig River	Carrig Br._A	1	1	80	n.a	0	n.a

RBD	Catchment	River Name	Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
SHIRBD	Shannon Lwr	Carrig River	Cronekill_A	1	1	80	n.a	0	n.a
SHIRBD	Shannon Lwr	Carrig River [Trib]	Loughkeen_A	1	1	80	n.a	0	n.a
NWIRBD	Clady	Clady River (Donegal)	Bryan's Br._A	3	3	302	0.03640	11	n.a
SERBD	Barrow	Clashganny River	Ballyroughan Little_A	2	3	232	0.00431	1	0.0030
SERBD	Barrow	Cushina River	Cushina Br._A	2	3	259	0.00387	1	0.2130
SERBD	Barrow	Cushina River	Lords Br._A	1	1	143	0.00698	1	0.0330
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	3	3	497	0.07448	37	0.1077
SERBD	Barrow	Dinin River	Corries Br._A	1	4	391	0.01023	4	0.1235
SERBD	Barrow	Dinin River	Kilclony Br._A	2	2	307	0.00978	3	0.1785
ERBD	Liffey	Dodder, River	Bushy Park_A	3	3	327	0.00612	2	n.a
ERBD	Liffey	Dodder, River	Footbr. Beaver Row_B	3	3	538	0.04458	24	0.4189
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	3	3	329	0.01217	4	0.2450
ERBD	Liffey	Dodder, River	Oldbawn_A	3	3	324	0.00308	1	0.1400
SERBD	Barrow	Duiske River	Peig's Lane_A	1	1	91	0.01099	1	0.0150
SERBD	Barrow	Duiske River	Well Lane_A	3	4	270	0.01481	4	0.1718
SHIRBD	Nore	Erkina River	Beleady Br._A	2	2	138	0.01449	2	n.a
SHIRBD	Nore	Erkina River	Carrick Br._A	3	3	250	0.00400	1	n.a
SHIRBD	Nore	Erkina River	Clarneyball Br._A	2	3	184	0.02174	4	n.a
SHIRBD	Nore	Erkina River	Coolkerry Br._A	3	2	289	0.03458	10	n.a
SHIRBD	Nore	Erkina River	Donaghmore Br._A	2	1	n.a	n.a	2	n.a
SHIRBD	Nore	Erkina River	Donaghmore museum_A	1	2	115	0.00871	1	n.a
SHIRBD	Nore	Erkina River	Harristown_Br._A	1	2	84	0.07143	6	n.a
SHIRBD	Nore	Erkina River	Rathsaran Br._A	1	2	172	0.02326	4	n.a

RBD	Catchment	River Name	Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
SERBD	Barrow	Figile River	Bog Road_A	1**	4	3174	0.00063	2	n.a
SERBD	Barrow	Figile River	Ticknevin_A	1	1	93	0.01075	1	n.a
SERBD	Barrow	Fushoge River	Fushoge Br._A	1	3	252	0.00397	1	0.045
SERBD	Barrow	Fushoge River (TRIB)	Killeshin_A	1	1	80	0.03746	3	0.1565
SHIRBD	Shannon Lwr	Glasderry River	Agnadouglas_A	1	1	60	n.a	0	n.a
NWIRBD	Srahmore	Glennamong River	Br. u/s Lough Feeagh_B	2	3	407	0.01229	5	n.a
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	1	2	196	0.01531	3	0.0805
SERBD	Barrow	Gowran River	Grange Lower_A	1	1	104	0.00959	1	0.155
SERBD	Barrow	Greese, River	Br. NE of Belan House_A	2	3	346	0.00289	1	0.0595
SHIRBD	Shannon Lwr	Little Brosna River	Derrinsallow_A	4	3	545	0.00551	3	n.a
SERBD	Barrow	Madlin River (Trib)	Ballynolan Br._A	1	3	126	0.00795	1	0.05
SERBD	Barrow	Monefelim River	Garryduff_A	1	1	121	0.02488	3	0.078
SERBD	Barrow	Monefelim River	Monefelim_A	1	1	52	0.01938	1	n.a
SERBD	Barrow	Monefelim River (Acore Trib)	Barraghcore Br._A	1	1	154	0.00651	1	0.065
SERBD	Barrow	Mountain River	Owlbeg_A	3	3	366	0.00820	3	0.0495
NWIRBD	Owentocker	Owentocker River	500 m d/s Br. in Ardara_A	3	3	418	0.03825	16	0.5712
NWIRBD	Owentocker	Owentocker River	Crockaslowra_A	3	3	364	0.00823	3	0.028
SHIRBD	Shannon Lwr	Pallas River	Pallas Br._A	1	1	80	n.a	0	n.a
SERBD	Barrow	Pollmounty River	Curraun abstraction_A	2	3	208	0.02405	5	0.1935
SHIRBD	Shannon Upr	Scramoge River	Carrowclogher_A	1**	3	691	0.00145	1	n.a
SERBD	Barrow	Slate River	Rathangan_A	2	2	278	0.00360	1	n.a
SERBD	Barrow	Triogue River	Kyle Br._A	1	1	161	0.01246	2	0.121
SERBD	Barrow	Tully Stream	Nurney_A	1	1	133	0.02999	4	0.132
WRBD	Ballysadare	Unshin River	Along road at Fidwog_A	3	3	346	0.00289	1	0.1695

RBD	Catchment	River Name	Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
ERBD	Vartry	Vartry River	Ashford Br._A	3	3	403	0.03724	15	n.a
ERBD	Vartry	Vartry River	Newrath Br._A	3	3	328	0.14316	47	n.a
ERBD	Vartry	Vartry River	Nun's Cross Br._A	3	3	438	0.01826	8	n.a
NBIRBD	Dee	White River (Louth)	Dunleer_A	2	3	245	0.00815	2	0.0295

* Boom boat - fishing in periodic bursts

** Boats used as opposed to handsets in runs

Table a-0-4 Summary length and weight data from WFD Rivers Surveys, 2015

RBD	Catchment	River	Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SERBD	Barrow	Aughnavaud River	Bauck Hill_A	14.6	6.3	30.8	0.0294	0.0030	0.0500	0.2355
SERBD	Barrow	Aughnavaud River	Turra Br._A	27.9	21.2	34.0	0.0425	0.0135	0.0870	0.2975
WRBD	Ballinglen	Ballinglen River	Ballinglen Br._B	20.8	12.2	35.2	0.0207	0.0035	0.0930	0.2895
WRBD	Ballinglen	Ballinglen River	New Br._A	16.0	9.0	35.0	0.0147	0.0005	0.0800	0.1915
SERBD	Clonmany	Ballyhallan River	Br. u/s Clonmany River_A	22.9	10.5	31.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Bagenalstown (Slipway to lock)_A	31.2	30.3	32.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Ballyellin Canal_A	33.2	33.2	33.2	0.1170	0.1170	0.1170	0.1170
SERBD	Barrow	Barrow, River	Ballyellin Tomb_A	25.3	17.0	33.6	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Ballyfoyle_A	28.0	28.0	28.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Belview_A	45.0	45.0	45.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Bestfield_A	21.5	20.0	23.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Burgage_A	29.7	22.3	37.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Carriglead Weir_A	23.4	14.9	34.9	0.0321	0.0050	0.0829	0.1283
SERBD	Barrow	Barrow, River	Dunleckny (Swimming pool)_A	31.4	28.2	34.5	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Fishersgraigue RHS_A	39.2	33.4	45.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Goresbridge Graveyard_A	28.9	19.0	34.8	0.0374	0.0125	0.0690	0.2242
SERBD	Barrow	Barrow, River	Graiguenamanagh Br._A	12.6	12.6	12.6	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Mountloftus RHS_A	24.0	24.0	24.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	Pass Br._A	48.5	48.5	48.5	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrow, River	St. Mullins Canal_A	25.4	11.9	32.9	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Barrowmount River	Johnville Br._A	25.5	23.0	27.9	0.0328	0.0180	0.0475	0.0655
NWIRBD	Moy	Behy River	Behy Br._A	22.6	10.3	34.1	0.0290	0.0020	0.0790	0.4355
NWIRBD	Burnfoot	Burnfoot River	Br. in Burnfoot_B	14.9	4.2	23.5	0.0073	0.0015	0.0185	0.0660
NWIRBD	Burnfoot	Burnfoot River	Glen_A	19.3	12.1	34.0	0.0147	0.0020	0.0760	0.3665
SERBD	Barrow	Burren River	Ballynunnery Br._A	42.6	42.6	42.6	0.1190	0.1190	0.1190	0.1190
NWIRBD	Clady	Clady River (Donegal)	Bryan's Br._A	32.9	23.0	45.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Clashganny River	Ballyroughan Little_A	11.5	11.5	11.5	0.0030	0.0030	0.0030	0.0030
SERBD	Barrow	Cushina River	Cushina Br._A	48.5	48.5	48.5	0.2130	0.2130	0.2130	0.2130
SERBD	Barrow	Cushina River	Lords Br._A	28.5	28.5	28.5	0.0330	0.0330	0.0330	0.0330
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	11.3	4.4	17.4	0.0032	0.0005	0.0090	0.1077
SERBD	Barrow	Dinin River	Corries Br._A	34.4	28.7	40.0	0.0618	0.0410	0.0825	0.1235
SERBD	Barrow	Dinin River	Kilclony Br._A	34.1	31.0	35.7	0.0595	0.0450	0.0800	0.1785

RBD	Catchment	River	Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
ERBD	Liffey	Dodder, River	Bushy Park_A	17.3	12.7	21.9	0.0000	0.0000	0.0000	n.a
ERBD	Liffey	Dodder, River	Footbr. Beaver Row_B	20.3	10.7	31.5	0.0175	0.0015	0.0650	0.4189
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	26.6	12.7	42.5	0.1225	0.1050	0.1400	0.2450
ERBD	Liffey	Dodder, River	Oldbawn_A	42.7	42.7	42.7	0.1400	0.1400	0.1400	0.1400
SERBD	Barrow	Duiske River	Peig's Lane_A	22.3	22.3	22.3	0.0150	0.0150	0.0150	0.0150
SERBD	Barrow	Duiske River	Well Lane_A	27.5	19.2	34.5	0.0430	0.0145	0.0743	0.1718
SHIRBD	Nore	Erkina River	Beleady Br._A	21.0	18.0	24.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Carrick Br._A	23.0	23.0	23.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Clarneyball Br._A	37.3	19.0	51.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Coolkerry Br._A	26.9	18.0	42.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Donaghmore Br._A	24.0	21.0	27.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Donaghmore museum_A	31.0	31.0	31.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Harristown_Br._A	35.2	21.0	61.0	0.0000	0.0000	0.0000	n.a
SHIRBD	Nore	Erkina River	Rathsaran Br._A	26.5	20.0	32.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Figile River	Bog Road_A	53.8	49.5	58.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Figile River	Ticknevin_A	47.0	47.0	47.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Fushoge River	Fushoge Br._A	30.2	30.2	30.2	0.0450	0.0450	0.0450	0.0450
SERBD	Barrow	Fushoge River (TRIB)	Killeshin_A	30.0	20.9	37.7	0.0522	0.0145	0.0790	0.1565
NWIRBD	Srahmore	Glennamong River	Br. u/s Lough Feeagh_B	21.1	9.3	33.2	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	25.7	21.6	31.6	0.0268	0.0160	0.0430	0.0805
SERBD	Barrow	Gowran River	Grange Lower_A	44.5	44.5	44.5	0.1550	0.1550	0.1550	0.1550
SERBD	Barrow	Greese, River	Br. NE of Belan House_A	34.1	34.1	34.1	0.0595	0.0595	0.0595	0.0595
SHIRBD	Shannon Lwr	Little Brosna River	Derrinsallow_A	40.3	37.0	46.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Madlin River (Trib)	Ballynolan Br._A	31.5	31.5	31.5	0.0500	0.0500	0.0500	0.0500
SERBD	Barrow	Monefelim River	Garryduff_A	25.2	23.0	26.5	0.0260	0.0200	0.0330	0.0780
SERBD	Barrow	Monefelim River	Monefelim_A	40.0	40.0	40.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Monefelim River (Acore Trib)	Barraghcore Br._A	31.2	31.2	31.2	0.0650	0.0650	0.0650	0.0650
SERBD	Barrow	Mountain River	Owlbeg_A	22.1	19.5	24.6	0.0165	0.0085	0.0260	0.0495
NWIRBD	Owentocker	Owentocker River	500 m d/s Br. in Ardara_A	23.3	10.5	51.5	0.0357	0.0020	0.2290	0.5712
NWIRBD	Owentocker	Owentocker River	Crockaslowra_A	19.7	15.0	23.0	0.0093	0.0060	0.0125	0.0280
SERBD	Barrow	Pollmounty River	Curraun abstraction_A	26.4	16.5	32.5	0.0387	0.0085	0.0730	0.1935
SHIRBD	Shannon Upr	Scramoge River	Carrowclogher_A	50.0	50.0	50.0	0.0000	0.0000	0.0000	n.a
SERBD	Barrow	Slate River	Rathangan_A	51.1	51.1	51.1	0.0000	0.0000	0.0000	n.a

RBD	Catchment	River	Site	Average Length (cm)	Min. Length (cm)	Max. Length (cm)	Average Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
SERBD	Barrow	Triogue River	Kyle Br._A	37.7	35.0	40.4	0.0605	0.0370	0.0840	0.1210
SERBD	Barrow	Tully Stream	Nurney_A	25.5	14.0	39.0	0.0330	0.0030	0.0850	0.1320
WRBD	Ballysadare	Unshin River	Along road at Fidwog_A	47.7	47.7	47.7	0.1695	0.1695	0.1695	0.1695
ERBD	Vartry	Vartry River	Ashford Br._A	13.9	7.6	29.2	0.0000	0.0000	0.0000	n.a
ERBD	Vartry	Vartry River	Newrath Br._A	10.6	6.9	17.8	0.0000	0.0000	0.0000	n.a
ERBD	Vartry	Vartry River	Nun's Cross Br._A	22.4	8.5	32.5	0.0000	0.0000	0.0000	n.a
NBIRBD	Dee	White River (Louth)	Dunleer_A	21.7	18.4	25.0	0.0148	0.0085	0.0210	0.0295

Table a-0-5 Length frequency data from WFD River Surveys, 2015

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	Barrow	Aughnavaud River	Bauck Hill_A	20	11	2	5	2	0	0	0	0	0
SERBD	Barrow	Aughnavaud River	Turra Br._A	7	0	0	4	3	0	0	0	0	0
WRBD	Ballinglen	Ballinglen River	Ballinglen Br._B	14	0	10	2	2	0	0	0	0	0
WRBD	Ballinglen	Ballinglen River	New Br._A	14	1	10	2	1	0	0	0	0	0
SERBD	Clonmany	Ballyhallan River	Br. u/s Clonmany River_A	4	0	1	2	1	0	0	0	0	0
SERBD	Barrow	Barrow, River	Bagenalstown (Slipway to lock)_A	2	0	0	0	2	0	0	0	0	0
SERBD	Barrow	Barrow, River	Ballyellin Canal_A	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Barrow, River	Ballyellin Tomb_A	2	0	1	0	1	0	0	0	0	0
SERBD	Barrow	Barrow, River	Ballyfoyle_A	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Barrow, River	Belview_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Barrow, River	Bestfield_A	2	0	0	2	0	0	0	0	0	0
SERBD	Barrow	Barrow, River	Burgage_A	2	0	1	1	0	0	0	0	0	0
SERBD	Barrow	Barrow, River	Carriglead Weir_A	4	0	2	1	1	0	0	0	0	0
SERBD	Barrow	Barrow, River	Dunleckny (Swimming pool)_A	2	0	0	1	1	0	0	0	0	0
SERBD	Barrow	Barrow, River	Fishersgraigue RHS_A	2	0	0	0	1	1	0	0	0	0
SERBD	Barrow	Barrow, River	Goresbridge Graveyard_A	6	0	1	2	3	0	0	0	0	0
SERBD	Barrow	Barrow, River	Graiguenamanagh Br._A	1	0	1	0	0	0	0	0	0	0
SERBD	Barrow	Barrow, River	Mountloftus RHS_A	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Barrow, River	Pass Br._A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Barrow, River	St. Mullins Canal_A	3	0	1	0	2	0	0	0	0	0
SERBD	Barrow	Barrowmount River	Johnville Br._A	2	0	0	2	0	0	0	0	0	0
NWIRBD	Moy	Behy River	Behy Br._A	15	0	6	6	3	0	0	0	0	0
NWIRBD	Burnfoot	Burnfoot River	Br. in Burnfoot_B	9	1	6	2	0	0	0	0	0	0
NWIRBD	Burnfoot	Burnfoot River	Glen_A	25	0	16	6	3	0	0	0	0	0
SERBD	Barrow	Burren River	Ballynunnery Br._A	1	0	0	0	0	1	0	0	0	0
NWIRBD	Clady	Clady River (Donegal)	Bryan's Br._A	11	0	0	4	5	2	0	0	0	0
SERBD	Barrow	Clashganny River	Ballyroughan Little_A	1	0	1	0	0	0	0	0	0	0
SERBD	Barrow	Cushina River	Cushina Br._A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Cushina River	Lords Br._A	1	0	0	1	0	0	0	0	0	0
NBIRBD	Dee	Dee, River	Br. at Drumcar_A	37	14	23	0	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	Barrow	Dinin River	Corries Br._A	4	0	0	1	2	1	0	0	0	0
SERBD	Barrow	Dinin River	Kilclony Br._A	3	0	0	0	3	0	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	Footbr. Beaver Row_B	24	0	12	10	2	0	0	0	0	0
ERBD	Liffey	Dodder, River	Mount Carmel Hospital_A	4	0	2	0	1	1	0	0	0	0
ERBD	Liffey	Dodder, River	Oldbawn_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Duiske River	Peig's Lane_A	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Duiske River	Well Lane_A	4	0	1	1	2	0	0	0	0	0
SHIRBD	Nore	Erkina River	Beleady Br._A	2	0	1	1	0	0	0	0	0	0
SHIRBD	Nore	Erkina River	Carrick Br._A	1	0	0	1	0	0	0	0	0	0
SHIRBD	Nore	Erkina River	Clarneyball Br._A	4	0	1	0	1	1	1	0	0	0
SHIRBD	Nore	Erkina River	Coolkerry Br._A	10	0	2	4	3	1	0	0	0	0
SHIRBD	Nore	Erkina River	Donaghmore Br._A	2	0	0	2	0	0	0	0	0	0
SHIRBD	Nore	Erkina River	Donaghmore museum_A	1	0	0	0	1	0	0	0	0	0
SHIRBD	Nore	Erkina River	Harristown_Br._A	6	0	0	3	1	0	1	1	0	0
SHIRBD	Nore	Erkina River	Rathsaran Br._A	4	0	0	3	1	0	0	0	0	0
SERBD	Barrow	Figile River	Bog Road_A	2	0	0	0	0	1	1	0	0	0
SERBD	Barrow	Figile River	Ticknevin_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Fushoge River	Fushoge Br._A	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Fushoge River (TRIB)	Killeshin_A	3	0	0	1	2	0	0	0	0	0
NWIRBD	Srahmore	Glennamong River	Br. u/s Lough Feeagh_B	5	1	1	2	1	0	0	0	0	0
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	3	0	0	2	1	0	0	0	0	0
SERBD	Barrow	Gowran River	Grange Lower_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Greese, River	Br. NE of Belan House_A	1	0	0	0	1	0	0	0	0	0
SHIRBD	Shannon Lwr	Little Brosna River	Derrinsallow_A	3	0	0	0	2	1	0	0	0	0
SERBD	Barrow	Madlin River (Trib)	Ballynolan Br._A	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Monefelim River	Garryduff_A	3	0	0	3	0	0	0	0	0	0
SERBD	Barrow	Monefelim River	Monefelim_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Monefelim River (Acore Trib)	Barraghcore Br._A	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Mountain River	Owlbeg_A	3	0	1	2	0	0	0	0	0	0
NWIRBD	Owentocker	Owentocker River	500 m d/s Br. in Ardara_A	16	0	8	4	2	1	1	0	0	0
NWIRBD	Owentocker	Owentocker River	Crockaslowra_A	3	0	1	2	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	Barrow	Pollmounty River	Curraun abstraction_A	5	0	1	1	3	0	0	0	0	0
SHIRBD	Shannon Upr	Scramoge River	Carrowclogher_A	1	0	0	0	0	0	1	0	0	0
SERBD	Barrow	Slate River	Rathangan_A	1	0	0	0	0	0	1	0	0	0
SERBD	Barrow	Triogue River	Kyle Br._A	2	0	0	0	1	1	0	0	0	0
SERBD	Barrow	Tully Stream	Nurney_A	4	0	1	2	1	0	0	0	0	0
WRBD	Ballysadare	Unshin River	Along road at Fidwog_A	1	0	0	0	0	1	0	0	0	0
ERBD	Vartry	Vartry River	Ashford Br._A	15	5	7	3	0	0	0	0	0	0
ERBD	Vartry	Vartry River	Newrath Br._A	47	20	27	0	0	0	0	0	0	0
ERBD	Vartry	Vartry River	Nun's Cross Br._A	8	1	2	4	1	0	0	0	0	0
NBIRBD	Dee	White River (Louth)	Dunleer_A	2	0	1	1	0	0	0	0	0	0

Table a-0-6 WFD Transitional Waters summary data, 2015

RBD	Catchments	Transitional Water	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)
ERBD	Ovoca	Avoca Estuary	2	18	12	0.67	12	29.4	63
SWRBD	Laune	Castlemaine Harbour	3	30	19	0.63	30.74	2.8	49
WERBD	Coastal	Camus Bay	3	36	2	0.06	17.24	11	34
WERBD	Ballysadare	Ballysadare Estuary	3	27	6	0.22	37.8	15.5	55.5
WERBD	Kinvara	Kinvara Bay	2	18	0	0.00	n.a	n.a	n.a
ERBD	Boyne	Boyne	3	21	4	0.19	29.86	6.7	48
NWIRBD	Erne	Erne Estuary	2	18	1	0.06	44	44	44
NWIRBD	Gweebarra	Gweebarra Estuary	3	24	6	0.25	41.25	29.5	53

Table a-0-7 WFD transitional waters length frequency data, 2015

RBD	Catchment	Estuary	No. Eels	0-9 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	Avoca Estuary	12	0	0	3	4	2	0	3	0	0
SWRBD	Laune	Castlemaine Harbour	19	1	0	7	8	3	0	0	0	0
WERBD	Coastal	Camus Bay	2	0	1	0	1	0	0	0	0	0
WERBD	Ballysadare	Ballysadare Estuary	6	0	1	0	2	2	1	0	0	0
WERBD	Kinvara	Kinvara bay	0	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
ERBD	Boyne	Boyne	4	0	0	0	2	2	0	0	0	0
NWIRBD	Erne	Erne Estuary	1	0	0	0	0	1	0	0	0	0
NWIRBD	Gweebarra	Gweebarra Estuary	6	0	0	1	2	1	2	0	0	0