ACTIVITY REPORT

OF THE

TECHNICAL EXPERT GROUP ON EEL

2018

REPORT OF THE TECHNICAL EXPERT GROUP ON EEL TO THE NORTH-SOUTH STANDING SCIENTIFIC COMMITTEE ON INLAND FISHERIES (NSSSCIF)

July 2019

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 2021.** **The data and analyses are part of an on going 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 Technical Expert Group on Eel.**

The Technical Expert Group on Eel would like
to note the sad passing of Dr. Kieran McCarthy

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. $\Sigma A = \Sigma F + \Sigma H$

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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. Three monitoring reports have been submitted by Ireland in June 2012, 2015 and 2018.

The TEGE was 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 - 2018

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 2019:

"ICES advises that when the precautionary approach is applied for European eel, all anthropogenic impacts (e.g. caused by recreational and commercial fishing on all stages, hydropower, pumping stations, and pollution) that decrease production and escapement of silver eels should be reduced to – or kept as close to – zero as possible in 2019."

Stock status

"The status of eel remains critical.

Indices of both glass and yellow eel recruitment strongly declined from 1980 to about 2010, and have remained at a low level since. The annual recruitment of glass eel to European waters in 2018 is 2.1% of the 1960–1979 level in the "North Sea" series and 10.1% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters in 2018 was 29% of the 1960–1979 level.

National Advice

There were no requests for advice in 2018.

Irish EMP Management Actions 2018

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 2018 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 North West RBD and the Western RBD

   No dealers transport trucks were seized in 2018. Reliable trade (import/export) data remains unavailable to the TEGE.

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 63,450kg. The level of fishing mortalities was reported to be low.

In the **River Shannon** the trap and transport total of 16,411 kg represented 50.4% 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 2018 season. The quantity (47,004 kg) transported for safe release at Ballyshannon represented 56.6% of the estimated silver eel production (83,033 kg) for the river system for the season.

In the **River Lee**, in the 2018/19 season, fishing took place on the R. Lee with nets placed at several locations for one night each between August 22nd and August 31st 2018 (Figure 1). The total catch was 35 kg, and did not reach the annual target of 500 kg.

Improvements to the fishing efficiency of sites in the Shannon and Erne and new monitoring protocols have been developed over the last number of years to improve the T+T programme.

AFBI undertook a turbine mortality study in the Erne catchment in December 2018 with a repeat study planned for 2019.

For the **Shannon**, a mortality rate, used in previous years when no spillage took place at the hydropower dam, of 21.15% was applied to the 2018 data. The estimated silver eel mortality at the Ardnacrusha dam was 2.967t or 9.1% of production.

For the ***Erne***, the 2018/2019 the estimated mortality at the dams was 14,896 t in the 2018/2019 migration period. It was estimated that the cumulative mortality represented 17.8% mortality of the total River Erne silver eel production or 41% of the migrating eels reaching the dams during the season. Total mortality was estimated to be 7,095 kg at Cliff and 7,801 kg at Cathaleen's Fall.

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, hydro dams, 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.

IFI established a National Barriers Programme to advance the above remit and this will be in train over the period 2018 – 2021. To date 12,541 structures have been assessed using remote data and site visits.

Assisted upstream migration of juvenile eel takes place at the ESB Hydropower Stations on the Shannon (Ardnacrusha, Parteen), Erne (Cathaleen's 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

No new information on water quality since reporting in 2018

There were 40 reported fish kills in 2018 (Table 4-7). This is an increase on numbers recorded for 2017 (14) and 2016 (31) and likely to be due to the low water levels and high temperatures experienced in the summer of 2018.

The parasite prevalence of Lough Conn was 50% in 2018 up from 37% in 2016 but similar to the 52% value recorded in 2009. The mean intensity was 2.62 in 2018 compared with 4.62 in 2016; both years show a drop in intensity from the 7.86 recorded in 2009. Parasite samples were taken from Lough Muckno and Lough Ramor in 2018 as part of a parasite study and will be reported at a later date.

The mean prevalence of *A. crassus* across the zones in Lower Lough Erne was 63%, an increase of 21% from 2016, (mean prevalence in 2011 and 2014 was 72 and 73% respectively).

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, Fane and Barrow catchments in 2018.

Shannon

In 2018/19 the conservation eel fishing was conducted at three sites, two at Athlone, and one at Killaloe (Figure 8).

The total T&T catch in the River Shannon was 16,411 kg. A total of 9,391 kg of eels were caught at Athlone (7.9 tonnes at Jolly Mariner, and 1.5 tonnes at Yacht Club), and a further 7,020 kg were caught at Killaloe. This is consistent with captures in 2017/18 (16,737 kg) and 2016/17 (16,711 kg) but down on the two years before that (2015/16: 19,957 kg; 2014/15: 26,438 kg).

Silver eel production, was estimated to have been 32,850t. This low production level, which was comparable to the previous year, suggests that a collapse of the Shannon eel stock may be occurring though further years of monitoring would be needed to confirm such a trend.

Burrishoole

Silver eel trapping was continued in Burrishoole in 2018. The total run amounted to 1,997 eels (end of April 2019); lower than recorded in 2016 or 2017. As in other years, the highest proportion of the total catch (84%) was made in the Salmon Leap trap. In 2018, the timing of the run was 15% migrating in August, 42% in September and 30% in October. Almost 90% of the run was completed by the end of October.

Erne

The total catch contributed to the Trap and Transport programme was 47,004 kg. Fishing started from 1st September to 15th January 2019. The silver eel production is estimated to be 83 t, and escapement was estimated to be 68t (81.7% of production). The trap and transport catch of 47t at the six fishing sites represented 56.6% of the production (exceeding the 50% target by 5,502.5 kg).

Fane

Silver eel catches at the Fane Fishery were high in 2018 with a total catch of 725 kg (1,974 eels; Table 6-1) and 34 nights fished. An unusually dry September and October resulted in no fishing, increasing rainfall levels in November (Figure 6-3), led to high flows and the first catches. High catches continued with increasing water flow levels through December.

R. Barrow

A very dry September and October resulted in a very late silver eel season in the Barrow. The total catch for the season over 29 nights was 391 kg (2,808 eels) caught in November and December.

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.

2018 Survey

Of the lakes sampled in 2018 the lowest CPUE was in Bunaveela and the highest CPUE was in Upper lough Corrib where 4,249 eels were caught in 320 net nights giving a CPUE of 13.28. The survey of Lower Lough Erne resulted in a catch of 2,112 eels.

Fyke surveys in freshwater resulted in different results with a good number of eels present above Clondulane Weir on the Munster Blackwater River in contrast to the limited numbers in the estuary. In the Barrow low numbers of eels were found at Athy and Gragiuenamanagh in contrast to the large numbers found at St Mullins and at Waterford Harbour downstream.

A monthly fyke net survey in Waterford estuary resulted in 1,041 eels in 135 net nights giving a CPUE of 7.71. The abundance in the Waterford estuary is in contrast with the depleted numbers recorded in the subcatchments and main channel of the River Barrow upstream. In L. Furnace, 91 eels were caught with a catch per unit effort (CPUE) of 1.01 eels/net/night and a total weight of 11.19kg. In the Lower Lough Furnace, only 6 eels were caught with a catch per unit effort (CPUE) of 0.2 eels/net/night, with a total weight of 1.44 kg caught.

Recruitment

The annual recruitment of glass eel to European waters in 2018 is 2.1% of the 1960–1979 level in the "North Sea" series and 10.1% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters in 2018 was 29% of the 1960–1979 level. In Ireland the 2018 season showed a mixture with a marked increase in the Erne and the Liffey, but less so in the Shannon and the Burrishoole. (Note the Shannon young yellow eel recruitment increased. In 2018, extreme drought and low water levels may have increased the efficiency of some traps where weirs dried and made the trapping location more attractive to young eels, such as on the Liffey.

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

The European Commission's Directorate-General for Maritime Affairs and Fisheries (DG MARE) has commissioned an external Study on the evaluation of the Eel Regulation. The purpose of the evaluation is to assess the measures to protect European eel under the Eel Regulation, and in particular the contribution of the national Eel Management Plans established and implemented under this Regulation to the recovery of the stock of European eel. The review is to run from September 2018 to March 2019.

1.2 Technical Expert Group on Eel (TEGE)

An expert group on eel has been in existence since 2010 formerly known as the Standing Scientific Committee on Eel and since 2017 as the Technical Expert Group on Eels.

1.2.1 Background

The North-South Standing Scientific Committee for Inland Fisheries (NSSSCIF) was recently formed to support the provision of scientific advice relating to the conservation and sustainable exploitation of the inland fisheries resource with advice provided in response to requests from Department of Communications, Climate Action and Environment (DCCAE) and its agency Inland Fisheries Ireland (IFI) from Ireland (IRL), the Department of Agriculture, Environment and Rural Affairs (DAERA) from Northern Ireland (NI) and the Loughs Agency (LA) a North-South Implementation Body. This group was also tasked to give consideration to the coordination and effective use of scientific resources for data collection and research projects linked to the above. The NSSSCIF Term of Reference (TOR) facilitates the formation of Expert Groups drawn from within the membership of the Committee, or additional invitees as required, to advise and contribute on any particular species, aquatic habitat or biosecurity issues. To this end the NSSSCIF has established an expert group to provide scientific advice to

guide the NSSSCIF and IFI management in the decisions and policy development aimed at ensuring the recovery of Ireland's eel stocks as outlined in Ireland's National Eel Management plan.

1.2.1.1 Purpose

The NSSSCIF requests the Expert Group on Eel to provide a report, details outlined in Appendix A, on the status of eel stocks for the purpose of reporting to the EU in line with the Eel Regulation (EC1100/2007). The NSSSCIF may also request the Expert Group on Eel to offer scientific advice on the implications of proposed management decisions or policies on eel or seek advice on scientific matters in relation to eel. All scientific advice provided by Expert Group on Eel will be considered by the NSSSCIF and presented as independent advice.

1.2.2 Term of Reference

1. The technical group shall carry out an appropriate assessment of eel stocks (juvenile, yellow and silver eel) in accordance with the EU Regulation for each Eel Management Unit and transboundary plan.

a. Update the national stock assessment framework in line with EU reporting requirements and assess the level of contemporary silver eel escapement with respect to the EU 40% target.

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

2. The technical group shall complete a scientific assessment of the implementation of the relevant monitoring and management objectives identified in the National EMP, in line with the reporting requirements for the regulation (see Appendix I for National Management plan objectives)

3. Compile a stock assessment report and scientific advice as required in support of the report to the EU in line with the timeframes outlined in the eel regulation.

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

a. This should include the long term data series

i. National recruitment time series

ii. Silver eel index sites

5. Address any requests for scientific advice received from NSSSCIF.

1.3 Meeting Activities

The TEGE met three times during the 2018/2019 to monitor and report on the 2018 survey year; a number of proposed meetings were cancelled due to unforeseen circumstances.

27th September 2018	Galway
13th March 2019	Galway
12th June 2019	Galway

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 2018

European Eel throughout its natural range (reproduced from the *ICES Advice 2018,*

https://doi.org/10.17895/ices.pub.4601 ***(November 2018)***

Advice

ICES advises that when the precautionary approach is applied for European eel, all anthropogenic impacts (e.g. caused by recreational and commercial fishing on all stages, hydropower, pumping stations, and pollution) that decrease production and escapement of silver eels should be reduced to – or kept as close to – zero as possible in 2019.

Stock development over time

The status of eel remains critical.

Indices of both glass and yellow eel recruitment strongly declined from 1980 to about 2010, and have remained at a low level since. The annual recruitment of glass eel to European waters in 2018 is 2.1% of the 1960–1979 level in the "North Sea" series and 10.1% in the "Elsewhere Europe" series. The annual recruitment of young yellow eel to European waters in 2018 was 29% of the 1960–1979 level.

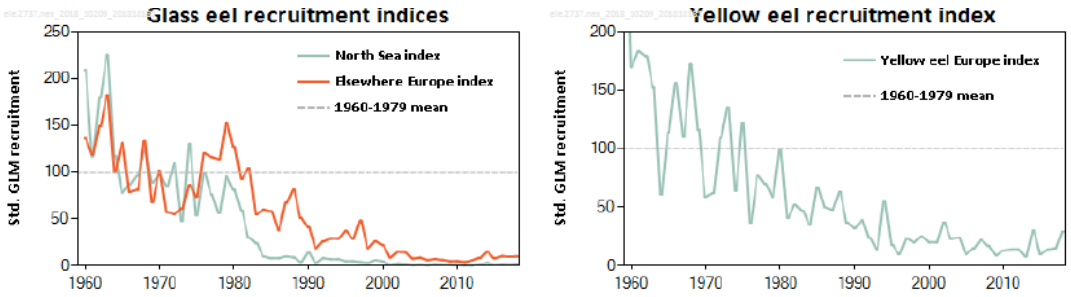

Figure 1 European eel. Left panel: indices, geometric mean of estimated (Generalised Linear Model – GLM) glass eel recruitment for the continental "North Sea" and "Elsewhere Europe" series. The GLM was fitted to 46 time-series comprising either pure glass eel or a mixture of glass + yellow eels. The predictions were then scaled to the 1960–1979 average $\overline{p}_{1960-1979}$. In the Baltic area, recruitment occurs at the yellow eel stage only. 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 trends for Europe. The GLM was fitted to 14 yellow eel time-series and scaled to the 1960–1979 average $\overline{p}_{1960-1979}$.

Stock and Exploitation Status

ICES cannot assess the exploitation status relative to the maximum sustainable yield (MSY) and precautionary approach (PA) reference points, because the reference points are undefined. While stock size reference points are also undefined, it is considered that stock size is likely well below potential biological reference points.

Table 1 European eel. State of the stock and fishery relative to reference points.

	Fishing pressure					Stock size			
		2015	2016	2017			2016	2017	2018
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{trigger}$	⊗	⊗	⊗ Below potential reference points
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	⊗	⊗	⊗ Below potential reference points
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable
Qualitative evaluation	-	?	?	?	Unknown	-	→	→	→ Highly impaired recruitment

Catch Scenarios

Total landings and effort data are incomplete. In addition, there is great heterogeneity among the time-series of landings due to inconsistencies in reporting by, and between, countries. Changes in management practices have also affected the reporting of commercial and non-commercial/recreational fisheries. 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 level of impact that fisheries (at the glass, yellow, or silver eel stage) 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; EU, 2007), but there is no internationally coordinated management plan for the whole 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 reduce mortality to a level that allows 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, 2013a, 2013b, 2018a in progress). The EU Member States produced progress reports in 2012, 2015, and 2018. The 2015 and 2018 reports have not been post-evaluated at the time of writing this advice.

Work is on going towards the development of an adaptive regional management plan for eel in the Mediterranean Region under the auspices of the General Fisheries Commission for the Mediterranean (GFCM).

The EC Regulation of 2007 (EU, 2007), establishing measures for the recovery of the stock of European eel, 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

An eel data call was issued for the first time in 2017, which has substantially improved the coverage and completeness of the data being reported to ICES. A new call was issued in 2018, building on the previous call (ICES, 2018b), which included the stock indicators and associated data as reported to the EU in the 2018 progress reports. However, data on fisheries and other anthropogenic impacts remain incomplete.

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, and form the longest and most reliable time-series that constitute an index of abundance. The quality of the underlying recruitment data is variable and needs further investigation. The current advice is based on the fact that the indices used by ICES are still well below the 1960–1979 levels.

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 European eel (*Anguilla anguilla*) is listed in CITES Appendix II (species that are not necessarily now threatened with extinction, but that may become so unless trade is closely controlled) and in the EU implementation of CITES rules (Annex B to Council Regulation (EC) No 338/97; EU, 1996) since 13 March 2009. Since 2010, import and export of eel from the EU has been prohibited.

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 known 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; (c) pollution, diseases, and parasites; and (d) other management actions that may affect levels of predation, e.g. conservation vs. control of predators. Climate change may have impacts, but these have not been quantified.

Environmental impacts in marine, 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 considered a management action in the EU regulation and 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 information on contribution to actual spawning is missing due to the general lack of knowledge of the spawning of eel. Internationally coordinated research is required to determine any net benefit of restocking on the overall population, including carrying capacity estimates of glass eel source estuaries, detailed mortality estimates at each step of the stocking process, and performance estimates of stocked vs. non-stocked eels.

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. Stocking should take place only where survival to silver eel escapement is high, and should not be used as an alternative to reducing anthropogenic mortality. Where eel are translocated and stocked, measures should be taken to evaluate their fate and their contribution to silver eel escapement. Such measures should include regionally coordinated mass marking of eels to distinguish stocked eels from natural recruits in future scientific surveys.

A management framework for eel within the EU was established in 2007 through an EU Regulation (EC Regulation No. 1100/2007; EU, 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, 2015, and 2018. In 2012, many EU Member States did not completely report stock indicators (22 of 81 eel management plans 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 were not requested to be evaluated by ICES and the reports for 2018 are currently being evaluated and should be reported soon.

Reference Points

The EC Regulation (EU, 2007) specifies that mortality should be reduced to allow 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 currently 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 3 European eel. Basis of the assessment.

ICES stock data category	3 (ICES, 2018c).
Assessment type	Trend analysis, GLM of glass and yellow eel recruitment indices.
Input data	Glass eel and yellow eel recruitment indices.
Discards and bycatch	Not included.
Indicators	None.
Other information	Landing statistics, while improved by the Data calls in 2017 and 2018, remain incomplete and reporting inconsistent. Stock indicators are incomplete from eel management units/countries in the EU and from non-EU countries. 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).

Information from stakeholders

Data on recruitment collected by stakeholders are included in the assessment where appropriate. No additional information is available.

History of advice, catch and management

Table 4 European eel. History of ICES advice.

Year	ICES advice	Predicted catch corresponding to the advice	TAC *	ICES catch **
1999	A recovery plan	-		
2000	No fishery and a recovery plan	0	-	-
2001	A recovery plan should be implemented for the eel stock and fishing mortality should be reduced to the lowest possible level until such a plan is agreed upon and implemented	-	-	-
2002	Exploitation should be reduced to the lowest possible level until a recovery plan is agreed upon and implemented	0	-	-
2003	All anthropogenic mortality as close to zero as possible, until a recovery plan is agreed upon and implemented	-	-	-
2004	-	-	-	-
2005	-	-	-	
2006	All anthropogenic mortality as close to zero as possible, until a recovery plan is agreed upon and implemented	-	-	-
2007	All exploitation and other anthropogenic impacts should be reduced to a level as close to zero as possible and a recovery plan for the whole stock should be implemented urgently	-	-	-
2008	All exploitation and other anthropogenic impacts should be reduced to as low as possible, until there are clear signs of recovery	-	-	-
2009	All exploitation and other anthropogenic impacts should be reduced to as close to zero as possible	-	-	-
2010	All anthropogenic impacts should be reduced to as close to zero as possible until stock recovery is achieved	-	-	-
2011	All anthropogenic mortality as close to zero as possible until there is clear evidence that the stock is increasing	-	-	-
2012	All anthropogenic mortality as close to zero as possible until there is clear evidence that both recruitment and the adult stock are increasing	-	-	-
2013	All anthropogenic mortality as close to zero as possible until there is clear evidence that both recruitment and the adult stock are increasing	-	-	-
2014	All anthropogenic mortality as close to zero as possible, until there is clear evidence of sustained increase in both recruitment and the adult stock	-	-	-
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	-	-	-
2018	All anthropogenic impacts as close to zero as possible	-	-	
2019	All anthropogenic impacts as close to zero as possible	-		

* There has never been a TAC for this stock.
** Catch estimates considered too incomplete to be presented.

History of catch and landings

Landings data are not complete for the entire natural range of the European eel. However, Tables 5, 6, 8, and 9 present the landings reported to ICES, the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC), and GCFM, either through responses to the 2018 Data call (ICES, 2018b), in Country Reports, or integrated by ICES in 2017 (ICES, 2017) using data from its previous reports. Table 7 contains landings data reported to FAO for countries where data were not available to the working group (FAO, 2017). Not all countries have reported all their landings, so the values given here should be considered as a minimum. Care should also be taken with the interpretation of the landings as indicators of the stock, since the catch statistics now reflect the status of reduced fisheries activity as well as of stock levels.

Data deficiencies in reports for recreational fisheries (Tables 8–9) were described by ICES (ICES, 2016). Though improvements have been evidenced since then, overall, the impact of

recreational fisheries on the eel stock remains largely unquantified, being likely at the same order of magnitude as the commercial fisheries.

Information on fishing effort and the capacity of the fisheries is lacking, but is necessary to fully interpret the changes to the landings data over the years. The wide variety of fisheries and gear types makes this challenging.

Few countries reported the level of misreporting and illegal fisheries to ICES, EIFAAC, and GCFM, i.e. seizure of illegal nets as well as illegal trade of glass eels, from countries both inside and outside the EU. There are indications from customs seizures, however, that the illegal export of glass eel could be very substantial, potentially exceeding the legal market.

[The Tables 5-9 referred to here are available in the online version on the ICES website]

Summary of the assessment

Table 10 European eel. Recruitment indices – geometric means of estimated (GLM) recruitment for glass eel in the continental "North Sea" and "Elsewhere Europe", and recruitment of yellow eel in Europe. The glass eel GLM (predicting recruitment as a function of area, year and site) was fitted to 43 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 (predicting recruitment as a function of year and site) was fitted to 14 yellow eel time-series and scaled to the 1960–1979 arithmetic mean. These indices are updated on an annual basis and, as they are presented in relative terms, these updates may change the historical values.

Year	Glass eel recruitment		Yellow eel recruitment
	Elsewhere Europe	North Sea	Europe
1960	136	209	170
1961	119	117	183
1962	149	180	179
1963	182	225	152
1964	101	117	61
1965	131	78	114
1966	79	87	156
1967	81	96	110
1968	133	123	172
1969	68	89	116
1970	101	97	59
1971	57	85	62
1972	55	109	109
1973	61	48	135
1974	86	130	64
1975	74	54	122
1976	120	99	37
1977	116	76	77
1978	114	56	70
1979	153	95	59
1980	127	81	99
1981	93	59	41
1982	104	30	52
1983	55	24	47
1984	60	10	35
1985	58	8	67
1986	38	8	50
1987	67	10	48
1988	81	9	63
1989	51	4	37
1990	41	14	32
1991	19	3	39
1992	26	8	24
1993	29	7	14
1994	29	7	55
1995	37	5	18
1996	29	5	10
1997	48	4	23
1998	19	3	20
1999	26	6	25
2000	21.9	4.8	20
2001	9.1	1	20
2002	14.7	2.6	37
2003	14.3	2	23
2004	7.7	0.6	24
2005	8.8	1.2	10
2006	6.2	0.5	15
2007	7.2	1.7	22
2008	6.3	1.1	17
2009	5	0.8	9
2010	5.1	0.6	13
2011	4.1	0.4	14
2012	5.9	0.4	14
2013	8.4	1.5	8
2014	14.6	3.3	30
2015	8	0.9	10
2016	10.2	1.8	14
2017	9.6	1.4	15
2018	10.1	2.1	29

Sources and references

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ICES. 2018. Report of the Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL), 5-12 September 2018, Gdansk, Poland. ICES CM 2018/ACOM:15. 151 pp.

3 National Advice

There were no requests for ad hoc advice in 2018.

The Group completed the Technical Stock Assessment 2015-2017 and this was included as an annex to the Ireland Report to the EU, 2018.

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.

In late 2018 the Department of Communications, Climate Change and Energy announced the creation of a Support Scheme for Former Eel Fisherpersons to address the hardship experienced by commercial eel fisherpersons.

Conservation of Eel byelaw No. C.S. 319, 2015 ceased to have effect on 30 June 2018 and has not yet been renewed.

4.2.2 Action 1a: Report closure of fishery

All management regions confirmed a closure of the eel fishery for the 2018 season with no commercial or recreational licences issued (Appendix 4). The eel fishery, with the exception of the strictly managed L. Neagh, also remained closed in N. Ireland in 2018.

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 Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland (Appendix 4), summarised into Table 4.1. Some illegal fishing was reported which led to some seizures of gear in the Shannon IRBD, the North West 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. The poor quality of the export data currently available to the TEGE makes it difficult to determine the level of illegal catch. There were no instances of seizures of illegal or undocumented eel shipments.

Transboundary:

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 Scientific Eel Fishery operated by Inland Fisheries Ireland in collaboration with former eel fishers ran from 2016 to 2018 and is now complete.

Table 4-1: Details of illegal activity within the regions and transboundary Northern Ireland, 2018.

	ERBD	LOUGHS AGENCY RoI/NI	NWRBD	SHRBD	SERBD	SWRBD	WRBD
Silver T&T programme	No	Yes	Yes	Yes	No	Yes	No
Illegal trading related to T&T	No	No	No	No.	No	No	No
Estimated level of illegal fishing	Low	None	Low	High	None	None	Low
Number of gear seizures	3	0	1	13	0	0	6
Gear types seized	Home Made Traps / Nets	na	1 fyke net	48 fyke net & 2 Longlines	na	na	6 fyke net
Number of eel dealer interceptions	0	0	0	0	0	0	0
Estimated tonnage on board:	na	na	na	na	na	na	na
Declared origin of cargos:	na	na	na	na	na	na	na

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 and 2018 – 2024 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 long-term shortfall could not be carried forward indefinitely.

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

4.3.1.1 2018 Trap and Transport Results

The total amounts of silver eel trapped and transported in each of the three rivers in 2018 are presented in Table 4-2. The separate detail sheets of the amounts transported from each site on each date are presented as an Appendix to this report (Appendix 5).

In the **River Shannon** the trap and transport total of 16,411 kg represented 50.4% 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 2018 season. The quantity (47,004 kg) transported for safe release at Ballyshannon represented 56.6% of the estimated silver eel production (83,033 kg) for the river system for the season.

In the **River Lee**, in the 2018/19 season, fishing took place on the R. Lee with nets placed at several locations for one night each between August 22nd and August 31st 2018 (Figure 4-1). The total catch was 35 kg, and did not reach the annual target of 500 kg.

The size- frequency distributions are shown in Figure 4-2. The mean length of eels measured from the river Lee was 477 mm (n=181, standard deviation (SD) = 86mm). The mean length for males was 393 mm (n = 66, SD = 32 mm) and for females was 523 mm (n = 115, SD = 71 mm).

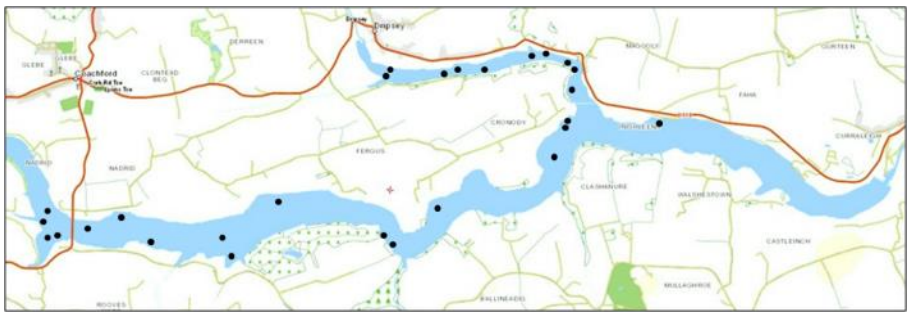


Figure 4-1 Map of fishing sites on River Lee in 2018/19 season

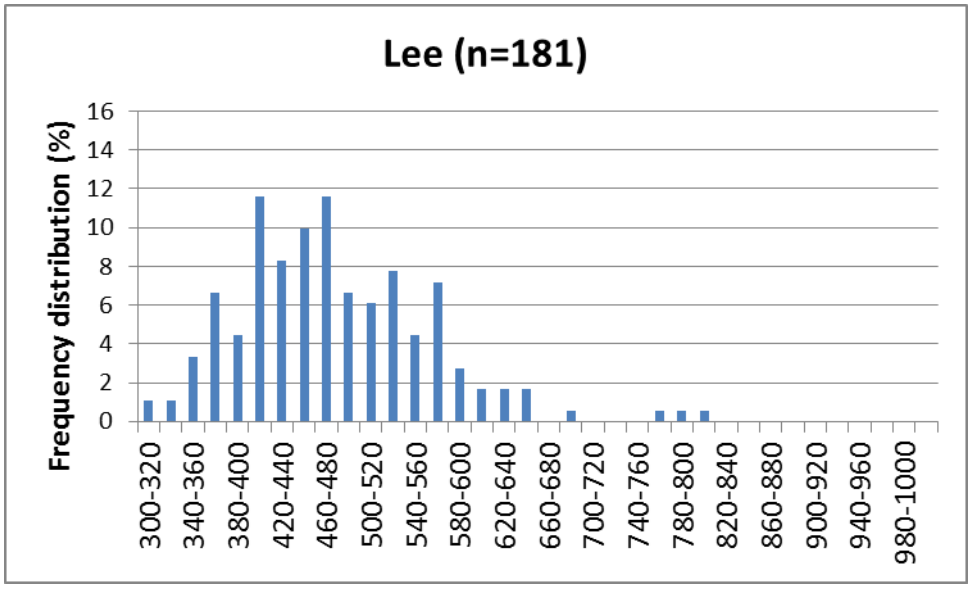


Figure 4-2 Relative size–frequency distribution of eels from the R. Lee.

Table 4-2: Total amounts (t) of silver eel trapped and transported in the Shannon, Erne and Lee, 2009-2018, 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. Shannon	2017	30% of run	16,737	49%	Achieved	40%
R. Shannon	2018	30% of run	16,411	50%	Achieved	47%
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%	Achieved	61%
R. Erne	2017	50% of run	43,470	63%	Achieved	60%
R. Erne	2018	50% of run	47,004	57%	Achieved	60%
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%
R. Lee	2017	0.5t	542	108%	Achieved	74%
R. Lee	2018	0.5t	35	7%	Not achieved	41%

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

4.3.1.2 Improvements to T+T programme

Modelling daily catch - Complete catch records from Roscor Bridge on the Erne and Killaloe on the Shannon are required for the accurate calculation of silver eel production and

escapement in these catchments. At both sites, gaps in fishing records have occurred for various reasons. Following the development of a Generalised Additive Model (GAM) for Roscor Bridge in 2017/18, a model has this year been developed for Killaloe. These models (Generalised Additive Models; GAMS) are able to predict catch at these weirs and are based on environmental factors and (in the Roscor Bridge model) catch from upstream sites.

The **DIDSON acoustic camera** was again deployed in 2018/19 at Clonlara on the headrace to Ardnacrusha dam on the River Shannon. The aim of this study was to estimate the number of eels swimming down the headrace and old river channel in various spillage conditions, by reference to Killaloe eel weir catches. Based on this it will be possible to calculate the biomass of eels migrating down the natural "old river channel" (ORC) of the Shannon, and validate the figure used in the flow diagram for river Shannon. Eels which enter the headrace canal must invariably migrate to the sea via Ardnacrusha, and are exposed to its potential mortality. Therefore this method will provide a means of assessing route selection at Parteen weir, escapement via the ORC and mortality at the dam.

The **removal or depletion method** for estimating population size is based on the principle that successive removals, in sequential nets, of individuals will cause catches to decline at a rate indicative of initial population abundance. This method is generally used in small to medium sized rivers. Following a preliminary analysis in 2017/18 a fuller study at the Ferny Gap on Lower L. Erne was undertaken in 2018/19. Catches from various nets were recorded and compared to environmental factors; tagging was undertaken to estimate net efficiencies and multiple size-frequencies were carried out from various nets to assess net size-selectivity. A good depletion series was established based on 34 nights' catch and showed that this method has potential for calculating production above this site. Depletion analysis was also undertaken at Athlone (N = 30 nights) on the Shannon with paired nets fished to determine population size above this point. Production on the Shannon appears to be undergoing a further decline; this study aims to establish production in the upper catchment and will help to identify the extent of this reduction and if it is limited to the lower catchment or is affecting the entire catchment.

4.3.2 Action 2b: Quantify Turbine Mortality

4.3.2.1 Shannon

No update for 2019

4.3.2.2 Erne

AFBI undertook a turbine mortality study in December 2018. Sixty silver eels were tagged and released in December. The taggings and associated releases were in 2 separate batches of 30 to coincide with low flow (6/12/18) and high flow (19/12/18) regimes out of the system. The study will be repeated in 2019.

4.3.3 Action 2c: Engineered Solution

No update for 2019

4.3.4 Action 2c: Other solutions

Light deflection experiment at Killaloe weir

Killaloe eel weir is an important capture location for the River Shannon trap and transport programme, contributing approximately 50% of the total biomass released below the hydropower dam. Any modifications or improvements that increase the capture efficiency will be beneficial, both in terms of contributing to the quantity of eels released, and also reducing the number of eels passing downstream via the hydropower station. Eight of 13 arches (including Navigation arch) of Killaloe eel weir have nets (Figure 4-3). Arch 8 in particular catches a high proportion of the nightly catch (26% of catch). During November and December 2018, the catch across the weir was recorded by arch on selected nights with the lights off (n=15 nights). This provided a control against which to compare lights on (treatment, n=19 nights). Differences in the proportion of catch in each arch during control and treatment periods were assessed using χ^2 tests. The percentage of the catch in each net is presented below (Figure 14) with significant differences in catch marked (*) for lights on and off. Significantly fewer eels were caught in the arch with lights (Arch 8), while catch in nets 5, 6, 7 and the navigation channel significantly increased when the lights were deployed (Figure 4-4).

The size of eels captured in arches 8 and 9, sampled during lights-off periods, were not significantly different (K-W test; $P = 0.386$). During the lights-on periods, the mean size of eels in arch 8 was significantly different to those captured in arch 9 (M-W test; $P < 0.001$). Mean size of eels caught in arch 8 when the lights were on was significantly smaller than lights off, suggesting larger individuals were strong enough to swim back upstream, while smaller individuals were washed into nets. This shows that lights can be used to increase the catch of eels at the weir by "blocking" paths which have no nets.

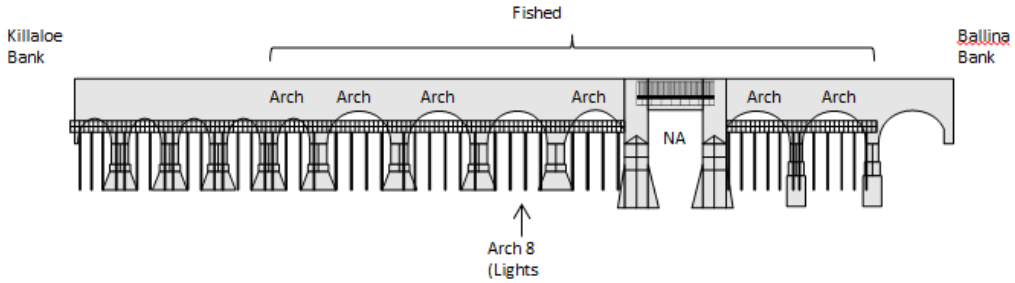


Figure 4-3 Schematic drawing of Killaloe eel weir seen from downstream. The arches fished and the arch with the light array is marked.

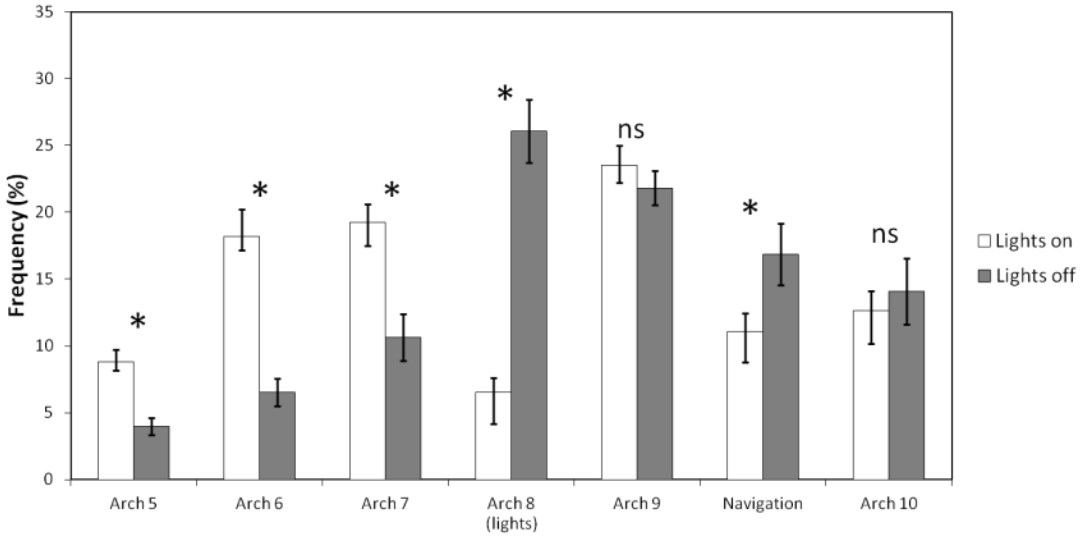


Figure 4-4 Catch pattern in arches across the weir with lights off (grey) and on (white). Significant differences in catches per arch are denoted by *. ns=not significantly different.

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.

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

To fulfil its remit to produce a georeferenced database of barriers to fish passage on the Irish river network, the National Barriers Programme (NBP) team has performed a desk-based survey to identify potential barriers at a national scale, collating significant volumes of geospatial data from state agencies, such as the OPW, OSi, TII, Waterways Ireland, and Irish Rail, as well as historic IFI barrier surveys. This has produced a geodatabase of 72,560 potential barriers, which are being assessed using field surveys and desk-based analysis photographs or video of barrier sites.

In 2018, the NBP undertook 40 SNIFFER surveys on large rivers, focusing on Special Area of Conservation (SAC) catchments: the Boyne, Slaney, Barrow, Nore, Suir and Munster Blackwater (Figure 4-5). In 2019, the NBP will complete barrier surveys in these catchments and undertake SNIFFER surveys on the main channel of the River Shannon.

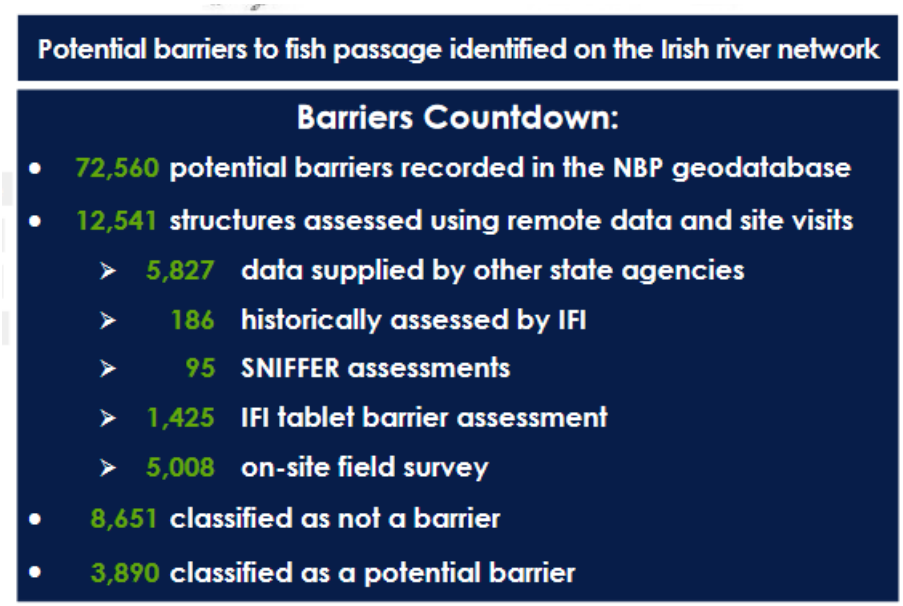


Figure 4-5 Summary description of barrier identification & mitigation

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 (Cathaleen's 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 2018. 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

No new information since reporting in 2018

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. Summary reports are available for all sites surveyed (www.wfdfish.ie). All reports are uploaded to the website http://wfdfish.ie/. Results from 2017 are reported in section 6.6 of this report

4.5.3 Fish Kills

National fish kills are reported in the IFI annual reports and published online.

http://www.fisheriesireland.ie/Corporate/corporate-publications.html

There were 40 reported fish kills in 2018 (Table 4-3). This is an increase on numbers recorded for 2017 (14) and 2016 (31) and likely to be due to the low water levels and high temperatures experienced in the summer of 2018.

Table 4-3 Fish kill data 2007 - 2018

Year	No of Fish Kills
2007	22
2008	34
2009	16
2010	34
2011	31
2012	10
2013	52
2014	22
2015	23
2016	31
2017	14
2018	40

4.5.4 Eel Contaminants

No new data for 2018

4.5.5 Prevalence of *Anguillicola crassus* update for 2018

The parasite prevalence of Lough Conn was 50% in 2018 up from 37% in 2016 but similar to the 52% value recorded in 2009. The mean intensity was 2.62 in 2018 compared with 4.62 in 2016; both years show a drop in intensity from the 7.86 recorded in 2009. Parasite samples were taken from Lough Muckno and Lough Ramor in 2018 as part of a parasite study and will be reported at a later date. The mean prevalence of *A. crassus* across the zones in Lower Lough Erne was 63%, an increase of 21% from 2016, (mean prevalence in 2011 and 2014 was 72 and 73% respectively).

5 Silver Eel Assessment, 2017

(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, Barrow and Fane catchments (Table 5-1). A pilot study was carried out on the Boyne in 2017. Figure 5-1 shows the sampling locations in 2017.

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. An assessment site on the River Barrow in the South East river basin district has been monitored since 2014 however as it does not have 5 years of data it is not included in current assessment.

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

Catchment	Priority	2018	2019	2020	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

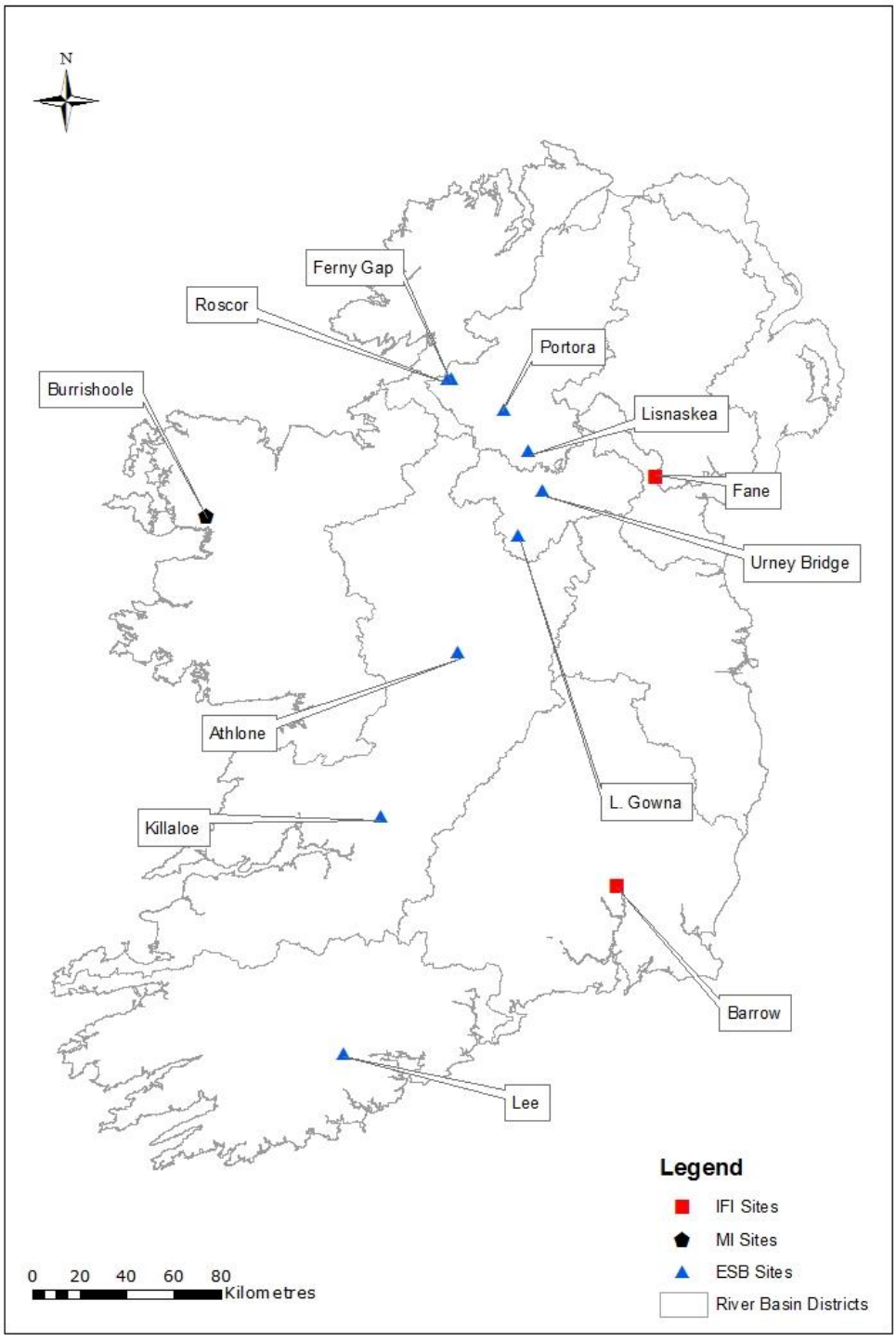


Figure 5-1: Silver eel monitoring locations, 2018.

5.2 Shannon

The River Shannon is Ireland's largest river, and its extensive lake ecosystems offer some of the country's best eel habitat. It has been the focus of much of the eel population studies in Ireland to date.

5.2.1 Catch

In 2018/19 the conservation eel fishing was conducted at three sites, two at Athlone, and one at Killaloe (Figure 5-2). Fishing began on September 25th, however only very small catches were recorded before the season started in earnest on December 1st. Fishing ceased at Athlone on 15th of January, but continued at Killaloe until March 28th 2019. A total of 9,391 kg of eels were caught at Athlone (7.9 tonnes at Jolly Mariner, and 1.5 tonnes at Yacht Club), and a further 7,020 kg were caught at Killaloe, giving an overall trap and transport catch of 16,411 kg (Figure 5-3). The quotas for the two sites at Athlone were 8 tonnes (Jolly Mariner) and 2 tonnes (Yacht Club); Killaloe operates without a quota as a designated fishing site. This is consistent with captures in 2017/18 (16,737 kg) and 2016/17 (16,711 kg) but down on the two years before that (2015/16: 19,957 kg; 2014/15: 26,438 kg).

Daily catch rates at Killaloe are shown in Figure 5-4, along with variation in discharge along the old river channel and the headrace canal leading to Ardnacrusha hydropower station. As reported previously, most of the catch was obtained under high discharge conditions.

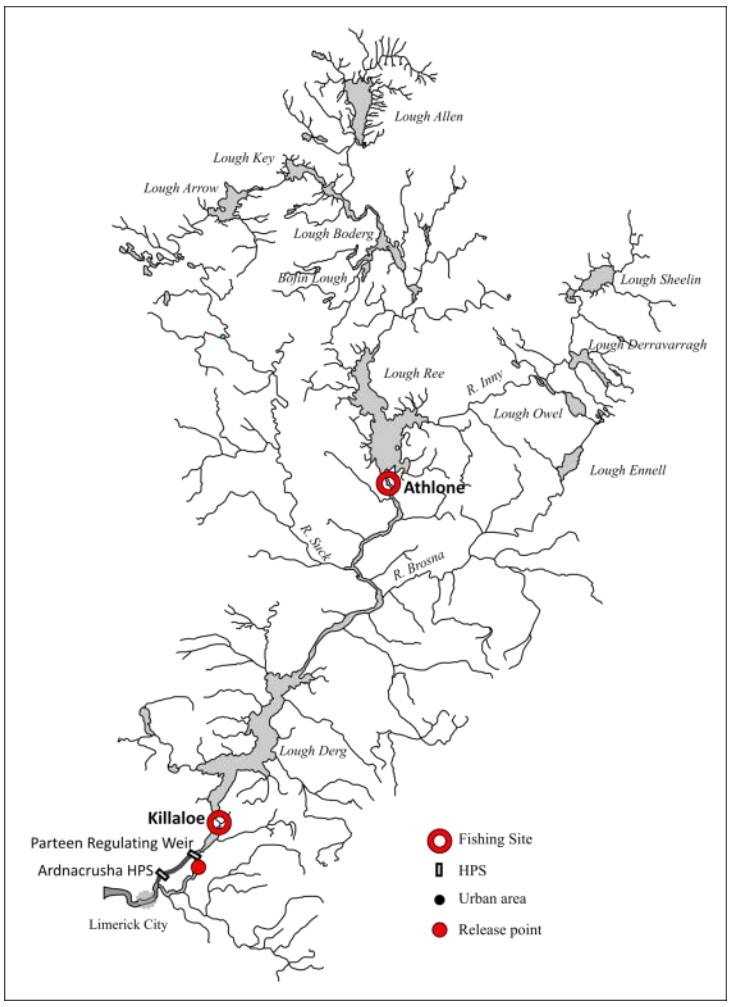


Figure 5-2 Map of River Shannon catchment with conservation fishing sites, release point and hydropower dams indicated

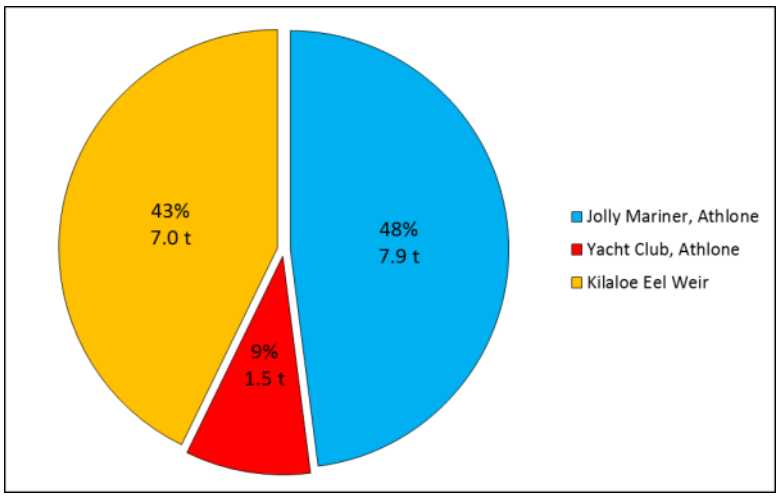


Figure 5-3 the relative quantities of silver eels contributed by fishing crews to the River Shannon T&T during the 2017/2018 season

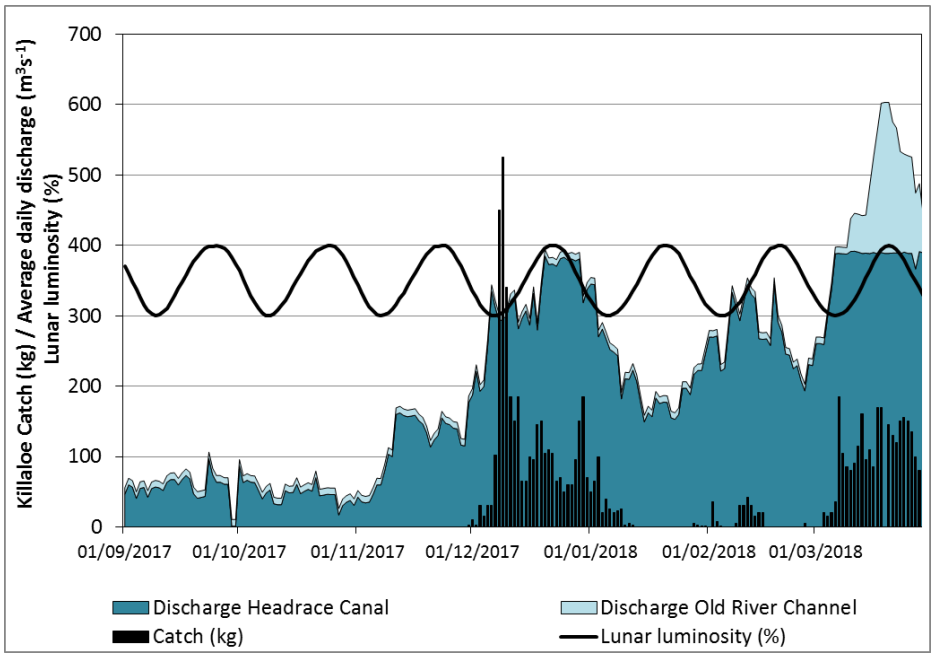


Figure 5-4 The seasonal variation in daily catches at the Killaloe eel weir during the 2018/2019 fishing season together with variation in discharge via Ardnacrusha and as discharge to the Old River Shannon channel.

5.2.2 Mark Recapture

NUIG carried out a series of four mark/recapture experiments, with a total of 400 tagged eels released up-stream of the nets to establish Killaloe weir efficiency. This overall percentage recapture rate, a measure of fishing efficiency, was 12.25%. This figure is lower than in previous years, however all four mark/recapture experiments occurred on nights with half night generation discharge conditions. In previous years similarly low level efficiency figures have been gained under these conditions (e.g. 7.89% under half night generation compared to 28.80% overall in 2016/17). Rather than use the efficiency from these mark/recapture experiments (which gives inflated production and escapement figures of

68,072kg and 58,598kg respectively), a fishing efficiency rate of 31% has been used, which is the average of mark recapture rates from experiments at Killaloe over the last three years.

5.2.3 Production and Escapement

Production and escapement figures for the river Shannon are summarised in the flow diagram (Figure 5-4). Production of 32,580 kg is estimated by the trap and transport catch at Killaloe using the fishing efficiency rate from mark recapture experiments over the last three years. In total 16,411 kg (50.4% of production) was moved beyond the hydropower station through trap and transport. Of the 16,170 kg that moved beyond Killaloe weir, it is estimated 2,141 kg migrated via the old River Channel. Historical telemetry studies of eels on the Shannon showed that route selection is significantly influenced by the amount of spillage to the old river channel, and a regression model was developed to allow the prediction of route selection by eels migrating downstream from Killaloe. This is used, along with analyses of daily Killaloe weir catches and hydrometric data, to evaluate the extent to which the old river channel contributes to safe silver eel migration. An estimated 21.15% mortality at Ardnacrusha of the 14,029 kg that entered the headrace, leaves 11,062 kg progressing downstream of the hydropower station. This gives an escapement of 29,613 kg of eels, or 90.9% of production (Figure 5-5). This compares with figures from 2016/17 and 2018/19 as shown in Table 5-2.

Table 5-2 Production and escapement estimations on the river Shannon in 2018/19, and corresponding values for 2017/18 and 2016/17

Year	Production (kg)	Escapement (kg)	% of Production
2018/19	32,850	29,613	90.9
2017/18	34,139	31,191	91.4
2016/17	32,603	29,479	90.4

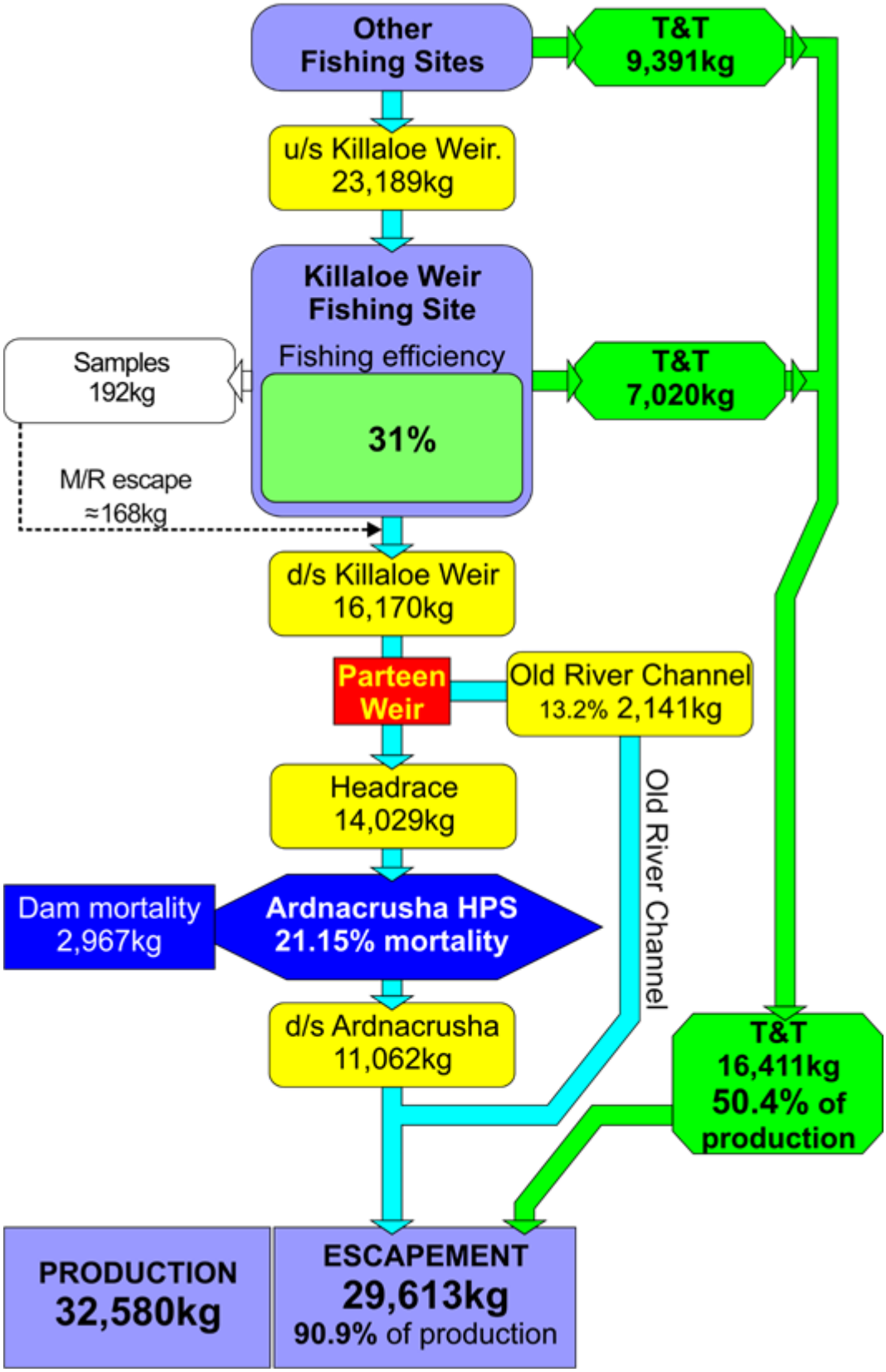


Figure 5-5 A summary of the analysis of silver eel production and escapement in the River Erne during the 2018/2019 eel migration season.

5.2.4 Length

Size frequencies of 620 eels measured at Killaloe are shown in Figure 5-6; 84.2% of the eels measured were determined to be female, based on their size. The mean length of eels measured from the river Shannon was 561 mm (n = 620, standard deviation (SD) = 103 mm). The mean length for males was 387 mm (n = 98, SD = 24 mm) and for females was 593 mm (n = 522, SD = 77). No length frequencies were taken at Athlone in 2018/19 season.

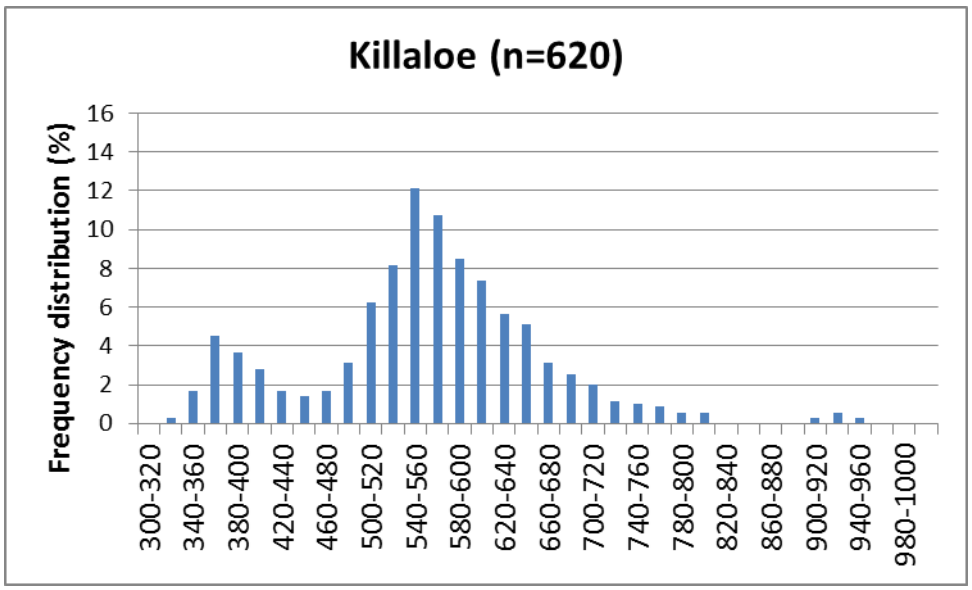


Figure 5-6 Relative size–frequency distribution of eels from Killaloe.

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 (Figure 5-7). The catchment has not been commercially fished for yellow eels, has 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; Sandlund *et al.*, 2017; 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).

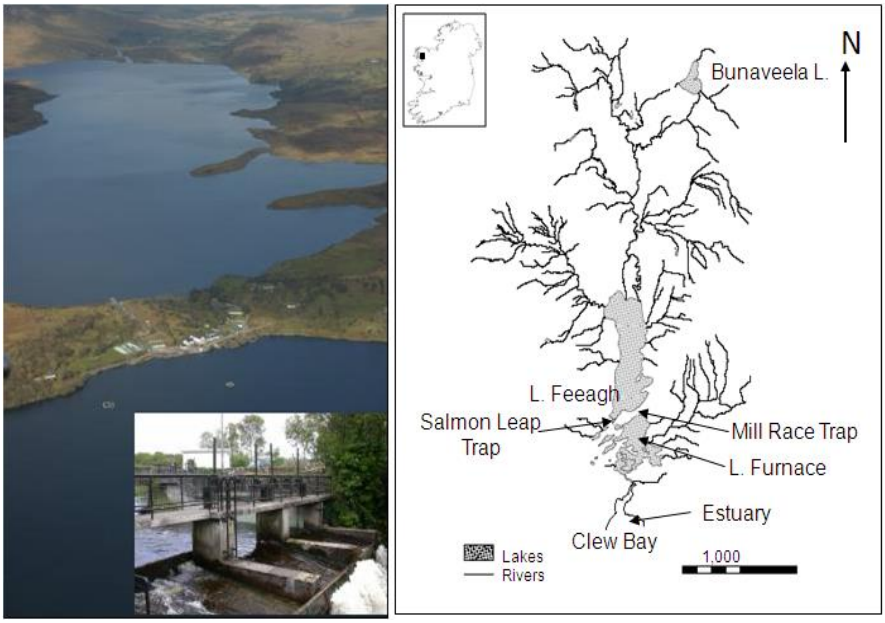


Figure 5-7: An aerial view of the Burrishoole catchment, looking north over the tidal Lough Furnace, in the foreground, and the freshwater Lough Feeagh: inset shows the silver eel downstream trap at the "Salmon Leap". A map of the Burrishoole catchment showing the locations of the silver eel traps at the lower end of the freshwater catchment.

5.3.1 Catch

The total run amounted to 1997 eels (end of April 2019); lower than recorded in 2016 or 2017 (Figure 5-8). As in other years, the highest proportion of the total catch (84%) was made in the Salmon Leap trap. There were two large flood events in the silver eel season in 2018

In 2018, the timing of the run was 15% migrating in August, 42% in September and 30% in October (Table 5-3). Almost 90% of the run was completed by the end of October. Figure 5-9 shows the daily counts of silver eels.

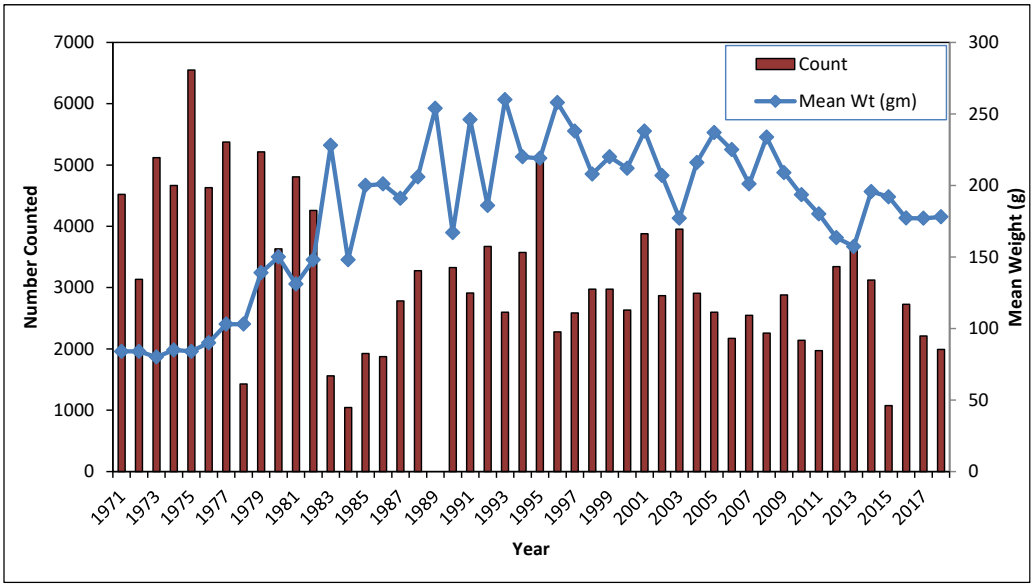


Figure 5-8: Annual number and mean weight of silver eels trapped in the Burrishoole downstream traps.

Table 5-3: Timing and numbers of the 2018/'19 silver eel run.

	Salmon Leap	Mill Race	Total	%
May	1	0	1	0.1
June	2	0	2	0.1
July	1	17	18	0.9
August	241	62	303	15.2
September	680	166	846	42.4
October	537	63	600	30.0
November	175	14	189	9.5
December	31	0	31	1.6
Jan. 2019	3	0	3	0.2
February	1	0	1	0.1
March	2	0	2	0.1
April	1	0	1	0.1
Total	1675	322	1997	

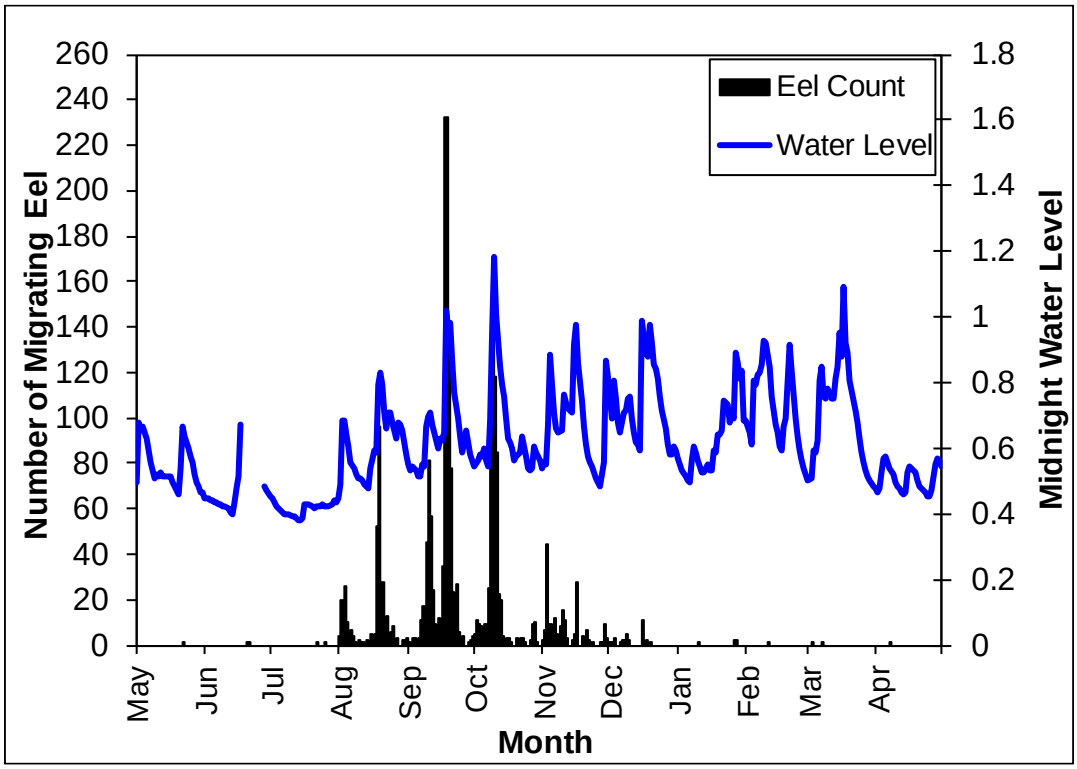


Figure 5-9: Daily counts of downstream migrating silver eel and mid-night water levels (m) with water level.

5.3.2 Length, weight & sex

Sampling of individual eels (n = 573) gave an average length of 43.8 cm (range: 30.7 – 96.4 cm) and an average weight of 178g and the proportion of male eels was 40.8%. The length frequency is presented in Figure 5-10 along with those for 2016 and 2017 for comparison. The lack of eels above 46/47cm was once again notable.

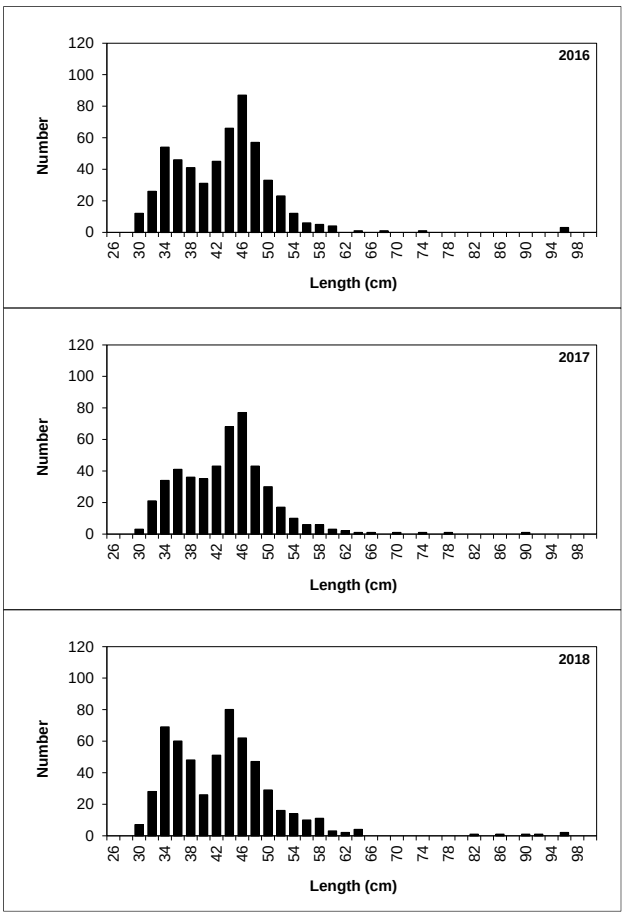


Figure 5-10: Length frequency of sub-samples of silver eels trapped in the downstream traps, 2016 (n=554), 2017 (n=481) and 2018 (573).

5.4 Erne Transboundary

The River Erne, a transboundary system, is the second largest river system in Ireland, with an extensive lake habitat. 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

During the 2018/19 season, fishing was conducted by conservation fishing crews on six sites, as shown in Figure 5-11. Fishing started at all sites from 1st September, except for Roscor Bridge, where fishing commenced on 1st October. Fishing ceased at the four upstream sites on 16th December, but was extended at Ferny Gap and Roscor Bridge to 15th January. The total catch contributed to the Trap and Transport programme was 47,004 kg. The proportions caught at each site are shown in Figure 5-12.

The variation in the daily catches at the experimental fishing site at Roscor Bridge are shown in Figure 5-13, with catch levels (and therefore fish migration) affected by both lunar cycle and discharge level.

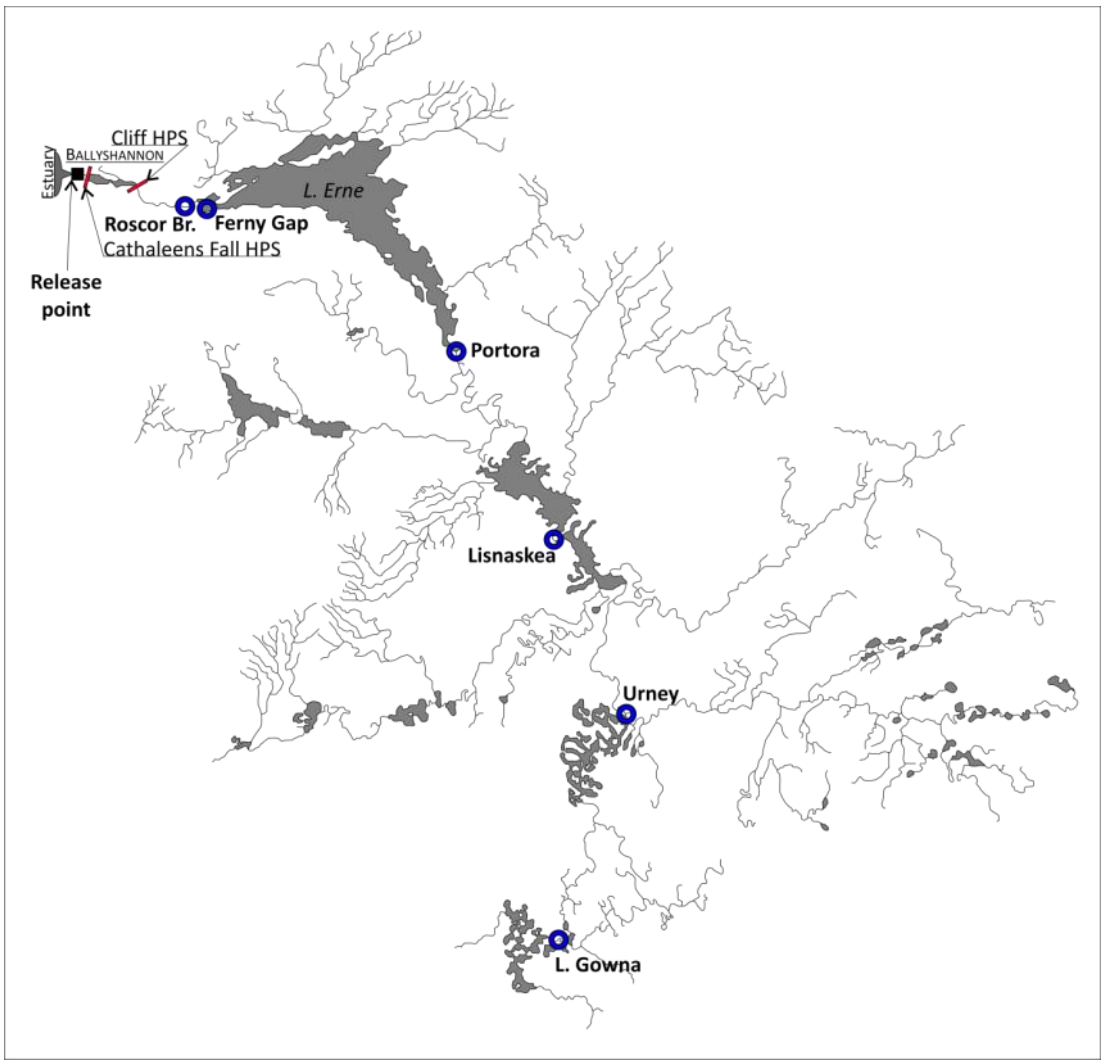


Figure 5-11 Map of River Erne catchment with conservation fishing sites, release point and hydropower dams indicated

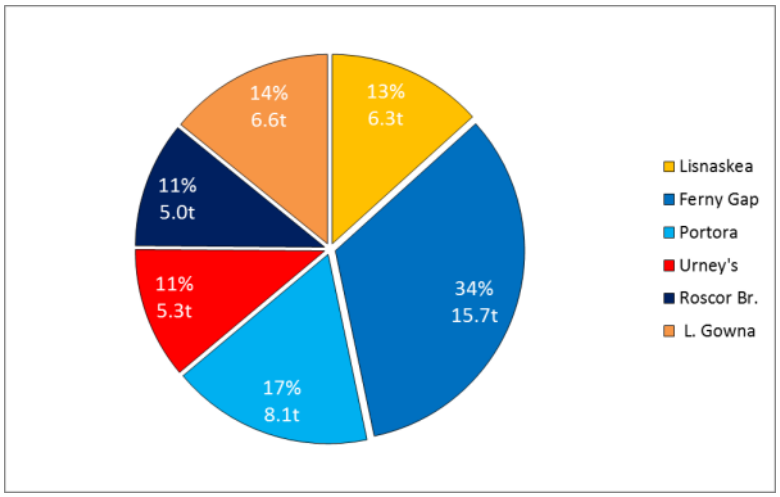


Figure 5-12 Proportions of the River Erne trap and transport catch obtained by each fishing crew in the 2018/2019 season

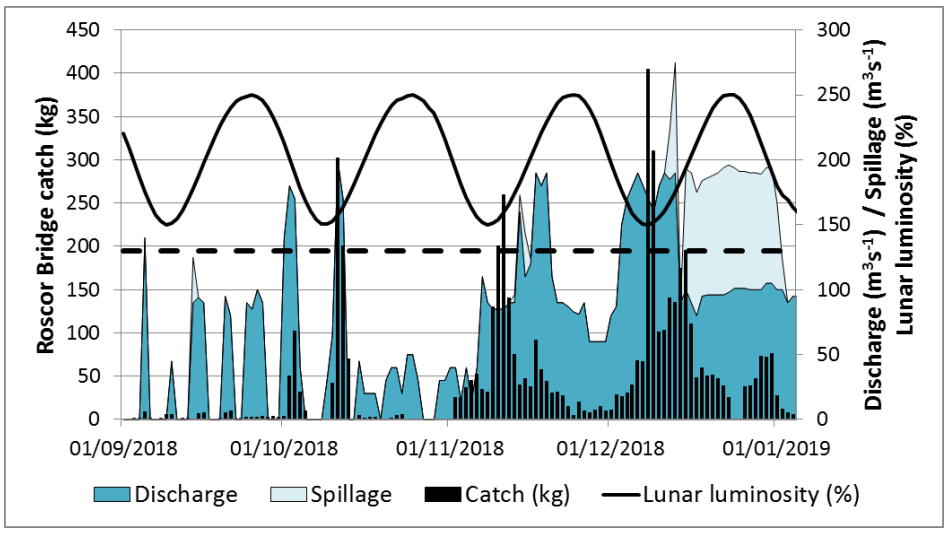


Figure 5-13 Variation in daily catches at Roscor Bridge fishing site, in relation to lunar cycle and discharge during the 2018/2019 season (the threshold discharge of 130 m^3s^{-1} used in population analyses is indicated by a dashed black line). "Catch" values in September are predicted values modelled from Ferny Gap captures.

5.4.2 Production and Escapement

Production and escapement estimates for the River Erne are summarised in the flow diagram (Figure 5-14). The silver eel production is estimated to be 83,033 kg, and escapement was estimated to be 68,244 kg (81.7% of production). The trap and transport catch of 47,004 kg at the six fishing sites represented 56.6% of the production (exceeding the 50% target by 5,502.5 kg).

A total of 41,995 kg of eels were moved by trap and transport from the 5 fishing sites upstream of Roscor Bridge. Two mark/recapture batches experiments carried out at Ferny Gap, as part of experiments looking at catch depletion in a series of nets, gave fishing efficiency rates of 9 and 10% respectively at Ferny Gap. These experiments were both conducted in low discharge conditions (<130 m3/s). Fishing efficiency rates for Roscor Bridge for calculating production and escapement were based on cumulative mark/recapture experiments carried out by NUI Galway at the experimental fishing site from 2010/11 to 2015/16 at low discharge (9.78%) and high discharge (18.43%) conditions. These were used to calculate the biomass of eels arriving at Roscor Bridge based on the flow conditions throughout the season, and the trap and transport catch. The estimate for eels that passed through Roscor Bridge in September, before fishing commenced, is modelled from Ferny Gap catches at the time and environmental variables, using the GAM model developed in 2017/18. It is estimated an additional 72 kg would have been caught, had fishing commenced in September, representing a production of 722 kg for the month.

A value of 36,136 kg of eels are estimated to have passed Roscor Bridge, and moved through the hydropower stations at Cliff and Cathaleen's Fall. Mortality at each station is estimated from historic telemetry work conducted by NUIG at the two stations, depending on the operations of the dams throughout the season. Estimated mortality rates under different flow conditions are given in Table 5-4. Total mortality was estimated to be 7,095 kg at Cliff and 7,801 kg at Cathaleen's Fall.

In total, 21,240 kg of eels are estimated to have navigated beyond the hydropower stations, and with the trap and transport quantity of 47,004 kg, a total escapement of 68,244 kg is estimated; 82.2% of the production.

Table 5-4 Mortality rates (based on unpublished NUIG telemetry results) at two hydropower stations, depending on station operation.

Operation	Cliff	Cathaleen's Fall
No flow	0%	0%
Generation & Spillage	7.9%	7.7% (half load) 15.4% (full load)
Generation only (no spillage)	26.7%	27.3%
Overall mortality 2018/19	19.6%	26.8%

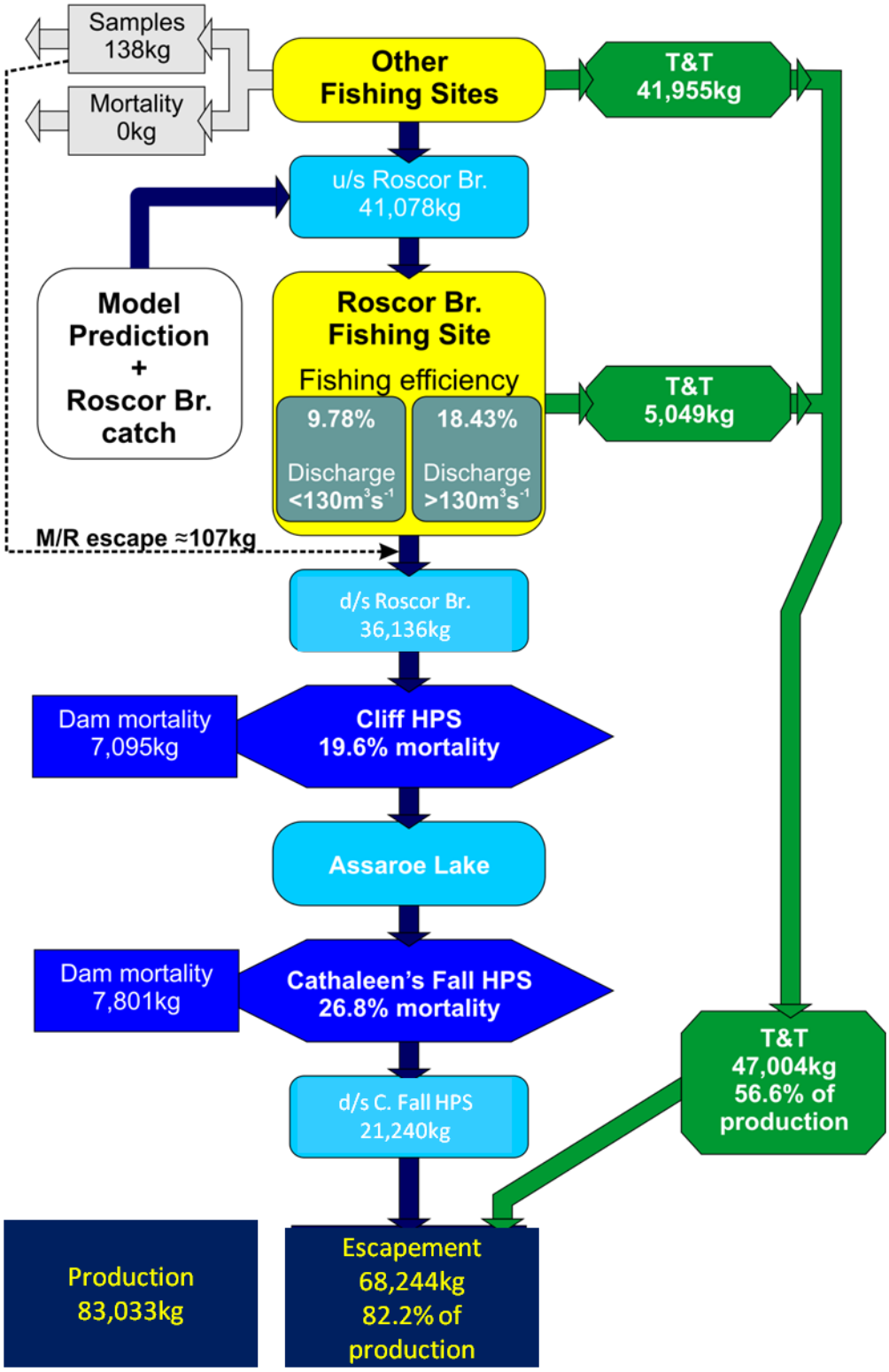


Figure 5-14 A summary of the analysis of silver eel production and escapement in the River Erne during the 2017/2018 eel migration season.

5.4.3 Length and weight

Size-frequency distributions for 475 eels measured at the Ferny Gap fishing site are shown in Figure 5-15; 87.6% of these fish (n = 416) were determined to be female, based on the size frequencies. The mean length of eels measured from the river Erne was 548 mm (n = 475, standard deviation (SD) = 92 mm). The mean length for males was 383 mm (n = 59, SD = 24 mm) and for females was 571 mm (n = 416, SD = 73 mm).

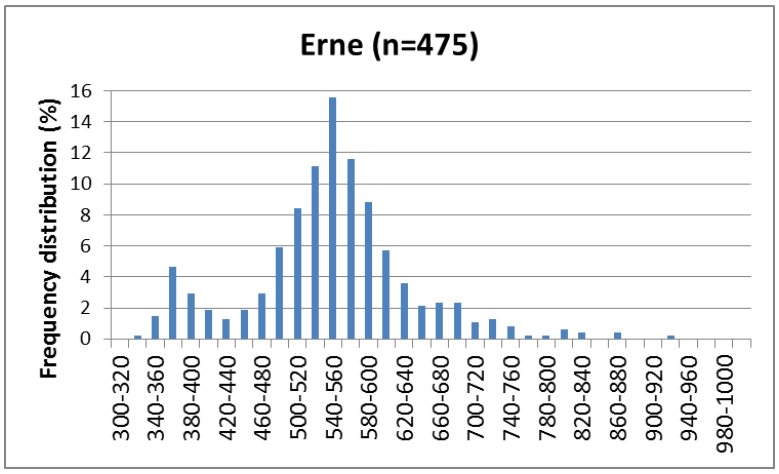


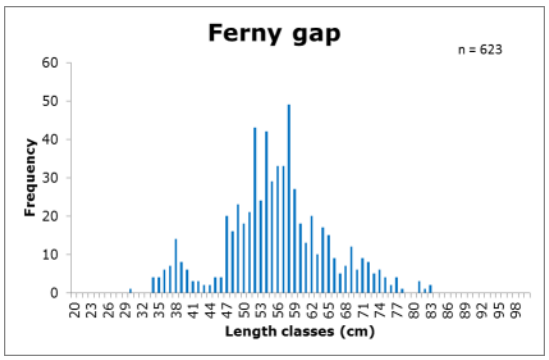
Figure 5-15 Relative size–frequency distribution of eels from Ferny Gap fishing site.

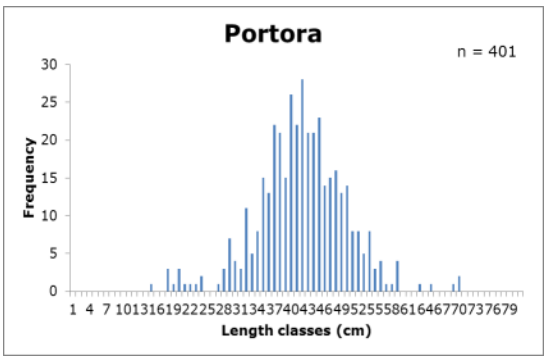
5.4.4 AFBI Length Frequency

By way of the request from EU COMM and TEGE for additional data to enhance the calculations of silver eel production from those EMU's impacted by hydro and operated under T&T fisheries This data has been a requirement under the EMP, but is now also required to fill out the eel data calls for eels being released – i.e. to convert from biomass to numbers. AFBI undertook a season long effort to measure the length frequencies of the silver eel caught at the Erne T&T sites within NI jurisdiction.

- Ferny Gap
- Portora
- Lady Craigavon Bridge (ULE).

These analyses were focused on the key lunar darks throughout autumn and winter of 2018 up until the point that fishing ceased mid-December. Every eel captured or held in tanks for that respective fishing period was measured. A total of 1,087 eels were measured for length with summary stats presented in Figure 5-16.





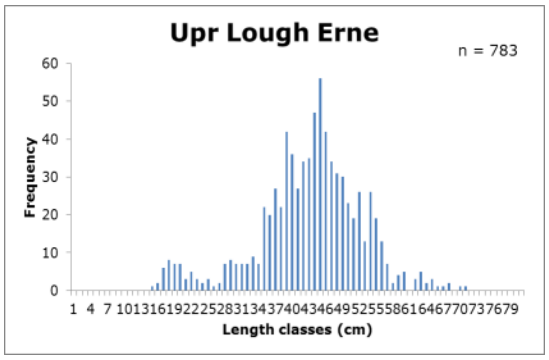


Figure 5-16 length frequencies for locations around Lough Erne

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 553 ha. 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 (Figures 5-17). The site was the location of a commercial fishery until 2008.

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 high in 2018 with a total catch of 725 kg (1,974 eels; Table 5-5) and 34 nights fished. An unusually dry September and October resulted in no fishing, increasing rainfall levels in November (Figure 5-18), led to high flows and the first catches. High catches continued with increasing water flow levels through December.

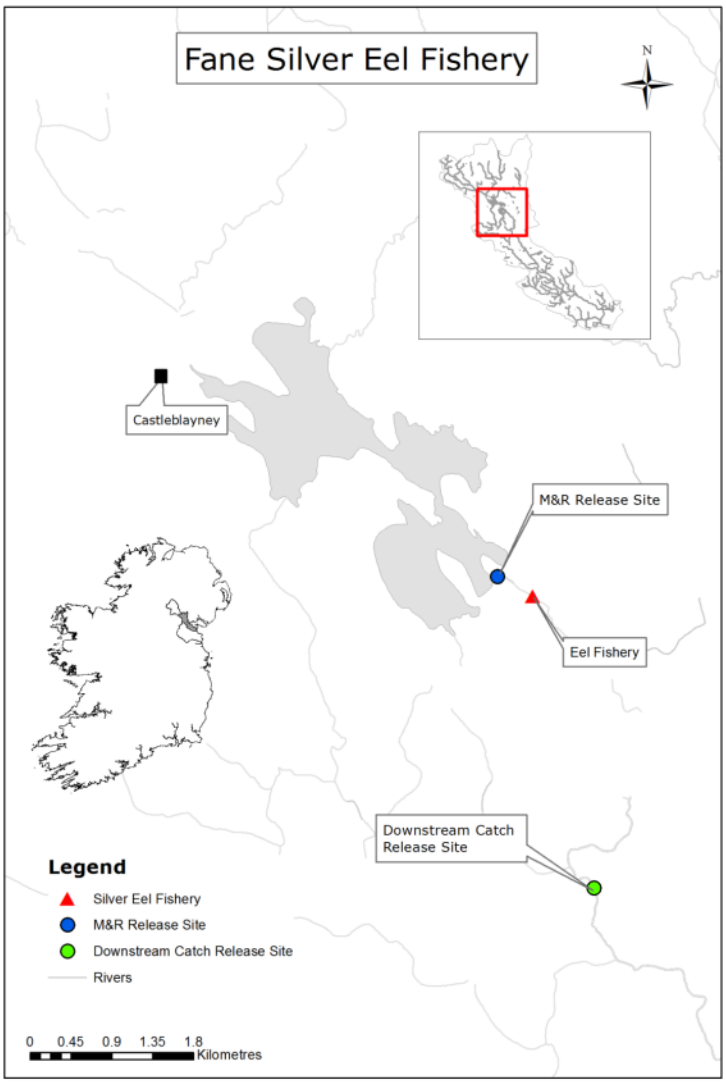


Figure 5-17: Location of Silver eel fishery on the Clarebane River (Fane).

Table 5-5 Fane Silver eel catch record 2011 – 2018

Year	No. Days Fished	Catch (kg)	No of Eels
2011	13	268	1,433
2012	21	448	1,195
2013	19	1,151	3,097
2014	25	797	2,542
2015	23	730	1,810
2016	9	76	206
2017	20	770	2,376
2018	34	725	1,974

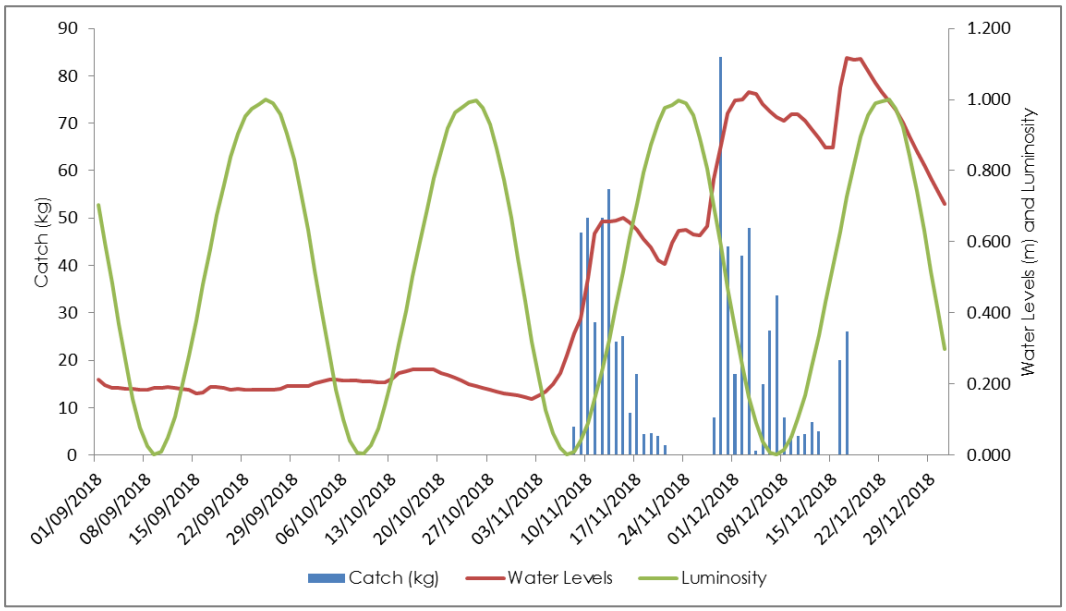


Figure 5-18 Catch, water levels and luminosity for the Fane fishery, 2018

5.5.2 Mark Recapture

Of the 365 tags deployed at the Fane fishery during the 2018 silver eel season, 46 of those tagged silver eels were recaptured leading to a recapture rate of 13% (Table 5-6). Other tagged recaptures included silvers from 2017 and yellow eels tagged on Lough Muckno in 2018, 2017, 2016 and one from 2012.

Table 5-6 Mark Recapture study 2012 – 2017

Year	No. Tagged	No. Recaptured	% Recapture
2014	272	80	29
2015	296	100	34
2016	0	0	0
2017	126	26	20.6
2018	365	46	12.6
Average	212	50	19

5.5.3 Eel Biology

The average length of eel was 54 cm (ranging from 27.5 cm to 95.5 cm), (Figure 5-19, and Table 5-7). The average weight was 0.367 kg (ranging from 0.042 kg to 2.200 kg). Changes to the length frequency of eels in the Fane catchment are apparent from 2011 to present with a drop in the proportion of male eels to female eels (Figure 5-20.). A total of 68 eels were returned to the laboratory for analysis with 38% of the retained catch was female and 62% were male (Table 5-7 and Figure 5-21). The majority of the eels measured during the silver eel season were female with a 30:70 split of male to female. There was a parasite prevalence of 82% with a mean infection intensity of 7.82 and a total count of 438 parasites removed from sampled eels (Figure 5-22). Swimbladder health indices recorded only slight to moderate damage among the sampled eels (Figures 5-23 and 5-24). Out of 188 eels which had head width measurements recorded, 50% were recorded as being broad heads and 50% as narrow heads (Figure 5-25).

Table 5-7 Length and weight data for processed silver eels from the Fane catchment, 2011 - 2017

Year	No. Eels	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
2011	1433	43.8	30.4	91.7	0.187	0.044	1.709	268
2012	1541	47.1	31.4	96.0	0.251	0.050	2.090	387
2013	1165	49.2	30.8	96.6	0.289	0.030	1.952	337
2014	1334	50.4	30.4	95.0	0.292	0.045	1.721	389
2015	1622	54.0	31.2	96.6	0.370	0.030	2.045	599
2017	427	51.9	30.9	94.7	0.332	0.014	1.751	142
2018	634	54.1	27.5	95.5	0.367	0.042	2.2	232

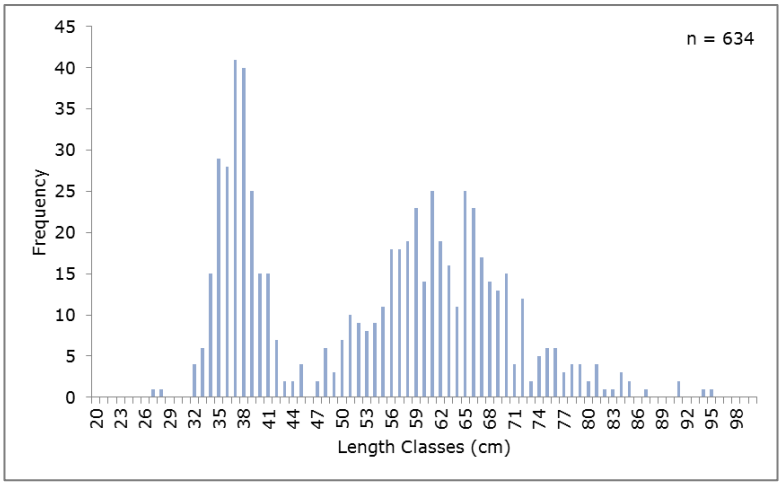


Figure 5-19 Length frequency for silver eels caught at the Fane fishery, 2018

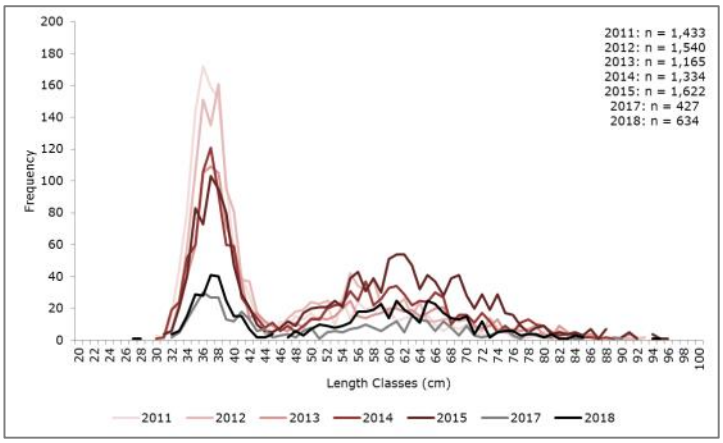


Figure 5-20 Length frequency for silver eels caught at the Fane fishery, 2011 – 2018

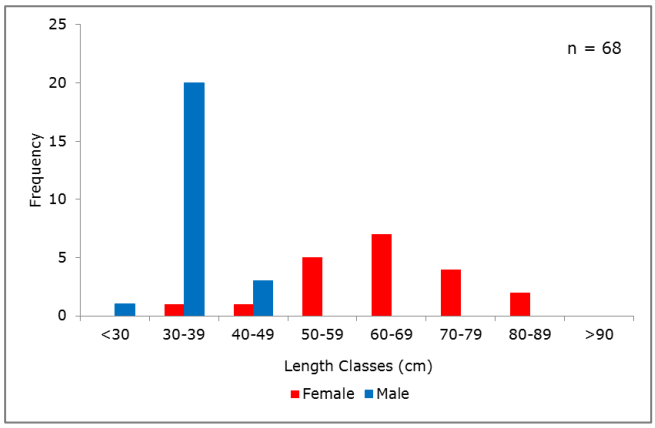


Figure 5-21 Sex distribution of sacrificed silver eels collected from the Fane fishery, 2018

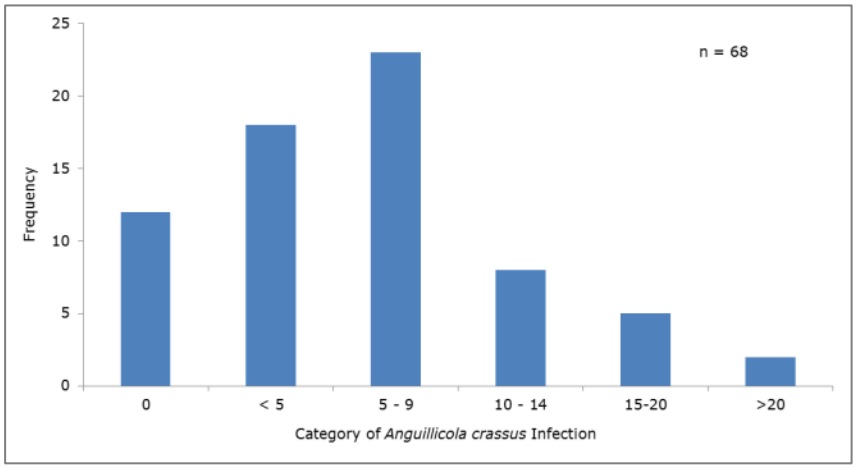


Figure 5-22 *Anguillicola crassus* infection intensity for sacrificed silver eels collected from the Fane fishery, 2018

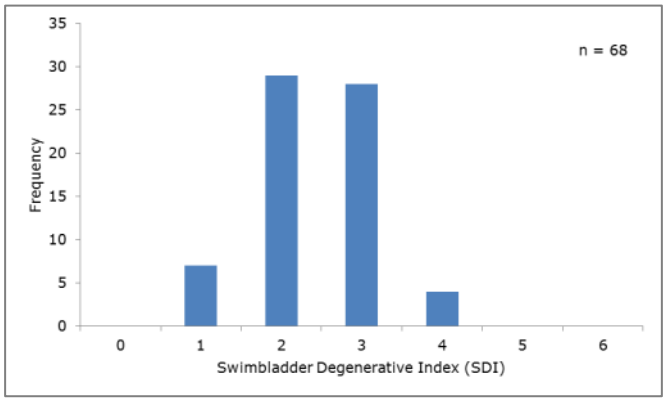


Figure 5-23 Swimbladder Degenerative Index (SDI) results for swimbladder health among sacrificed eels collected from the Fane fishery, 2018

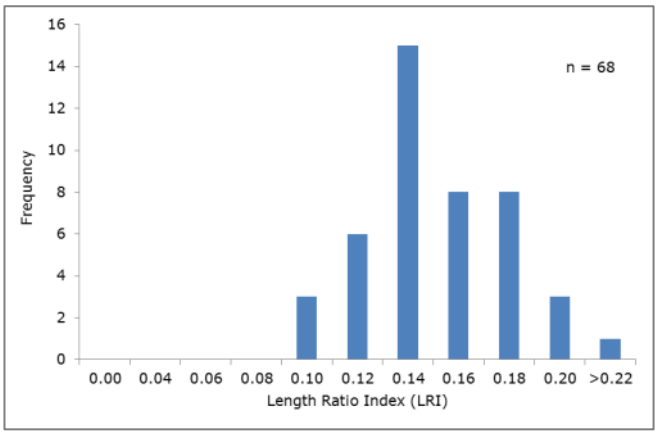


Figure 5-24 Length Ratio Index (LRI) results for swimbladder health among sacrificed eels collected from the Fane fishery, 2018

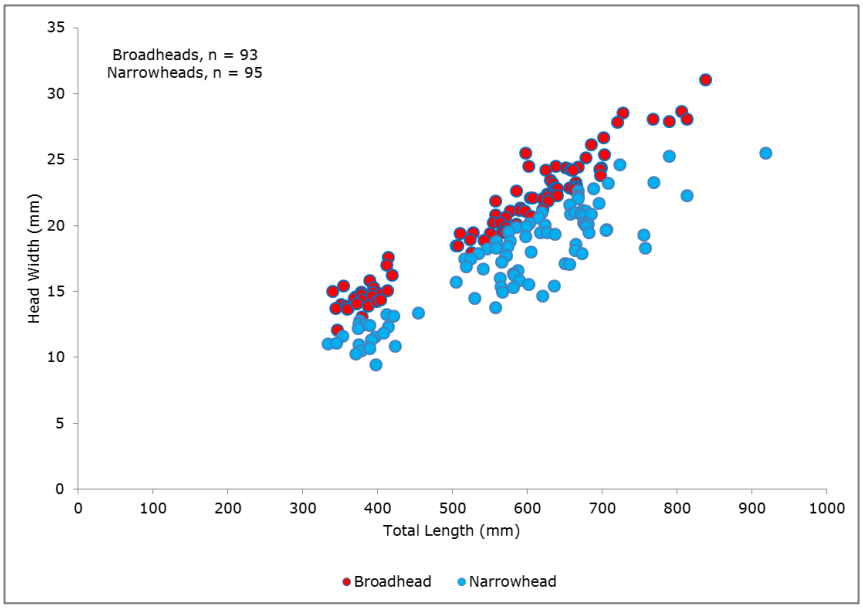


Figure 5-25 Broad head and narrow head records for the Fane fishery, 2018 (n = 188 eels)

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. 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 fishing location is situated upstream of the town of Graiguenamanagh; approximately 5km upstream from the tidal limit (estuary) in the River Barrow (Figure 5-26). The location of the Ballyteiglea Lock fishing site means that over 99% of the River Barrow freshwater wetted area is above the fishing site. Four nets were fished from openings on the Ballyteiglea

Lock gates of the canal section of the River Barrow during the silver eel season. Historically the commercial fishery in the River Barrow concentrated effort on the canal lock gates.

Exploratory monitoring took place on the main channel of the River Barrow during the silver eel season of 2018. This location was immediately adjacent to the Ballyteiglea Lock site. This section was fished with a large winged fyke net to investigate the proportion of eels utilising the main channel compared with the canal system.

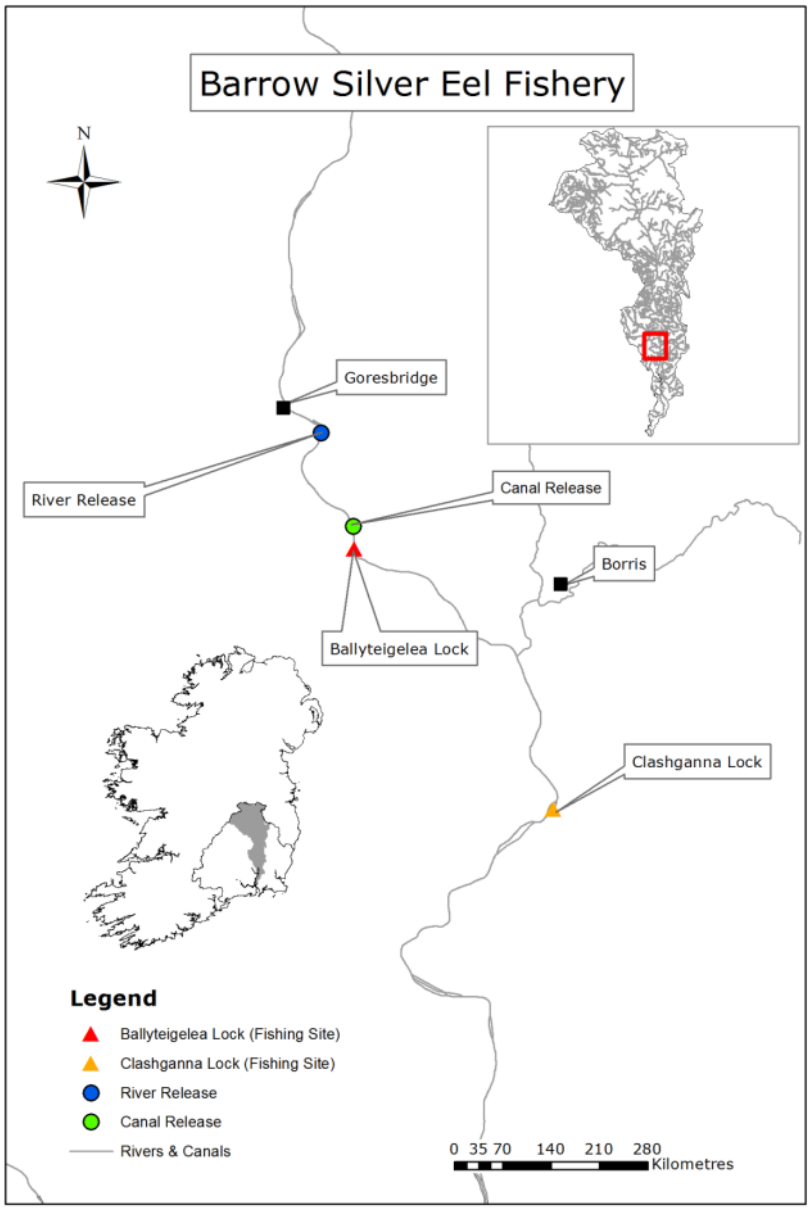


Figure 5-26: Map of silver eel fishing and release locations within the Barrow Catchment, 2016 (Insets: Map of Ireland with Barrow catchment (shaded) and South Eastern River Basin District (outlined) and detail of Barrow Catchment rivers))

5.6.1 Eel catch

An initial modest rise in water levels in October began the season. This small increase in flow led to the first six fishing nights and a catch of 933 eels (473 eels measured over two processing days). Increasing rainfall levels in November (Figure 5-27) lead to larger catches (1,874 eels). Despite continuing rainfall and increasing flow conditions, the run of eels abruptly ended in December. The total catch for the season over 29 nights was 391 kg (2,808 eels). Table 5-8 summarises the catches at the Barrow fishery over several years.

The new location fished on the main channel did not yield high catches. Only 162 eels were captured at this location in total and this represents just over 5% of the total catch for the season between the main channel and canal sites. This may suggest that eels are moving along the canal habitat to a greater extent during downstream migration.

Table 5-8 Silver eel catch record for Barrow 2014 – 2017

Year	No. Days Fished	Catch (kg)	No of Eels
2014	22	174	1,223
2015	20	128	687
2016	25	193	880
2017	24	273	1,388
2018	29	391	2,808

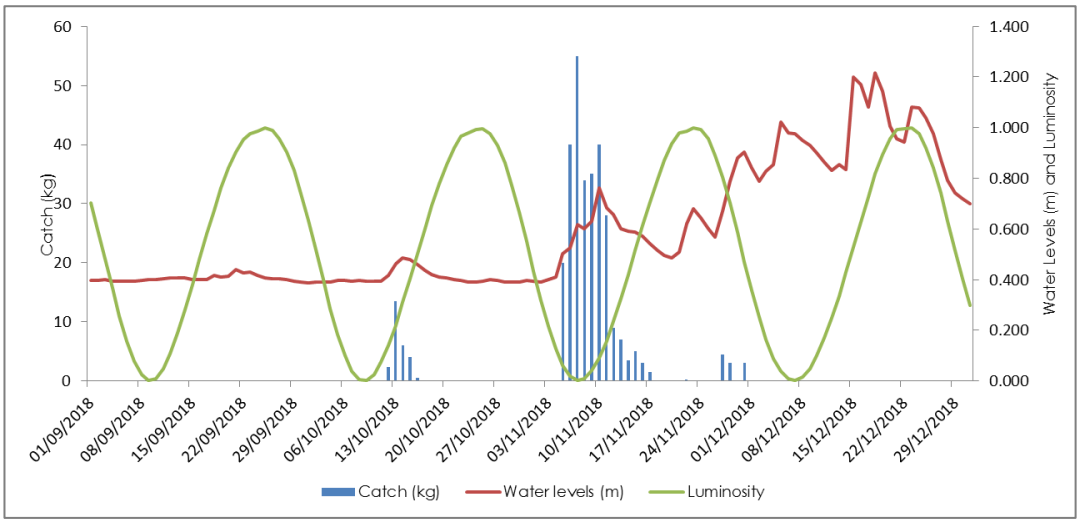


Figure 5-27 Catch, water levels and luminosity for the Barrow fishery, 2018

5.6.2 Mark Recapture

Out of a total of 432 tags deployed during the silver eel season on the Barrow, 61 tagged fish were recaptured (Table 5-9). This gives a recapture percentage of just over 14%. All but three of these eels were recaptured at the Ballyteiglea Lock site. The remaining three recaptures were recorded at the main channel fishing site. These eels were originally tagged as part of

catches at the canal location, and later recaptured on the main channel. Once again, this result suggests a greater use of the canal over the main channel during downstream migration events. This is the first year where passive integrated transponders were used this will allow assessment of whether any tagged eels delayed migration as a result of the procedure.

Table 5-9 Mark Recapture Preliminary Results for Barrow Fishery, 2015 – 2017

Year	No. Tagged	No. Recaptured	% Recapture
2015	279	41	14.7
2016	48	21	43.7
2017	51	8	15.7
2018	432	61	14.1
Average	202	30	22

5.6.3 Eel Biology

The average length of eel captured was 39.5 cm (ranging from 21.3 cm to 72.3 cm), (Figure 5-28, Table 5-10). The average weight of eels was 0.121 kg (ranging from 0.01 kg to 0.7390 kg). A large number of small male eels were noted in the 2018 catches. This number was up on previous years which had begun to depict an overall decline of males, suggesting a decline in population (Figure 5-29). However, the 2018 male numbers are the highest recorded for the canal site since fishing began in 2014. There was only a single mortality at the Barrow fishery in 2018 and no samples were otherwise retained for laboratory analysis. However, this single individual was a 52.3 cm female, weighing 0.243 kg, in good condition. The swimbladder held a high intensity *Anguillicola crassus* infection of 13 parasites. This eel showed only a slight/moderate level of damage to its swimbladder due to swimbladder parasite infections. Out of 217 eels which had head width measurements recorded, 29% were recorded as being broad heads (Figure 5-30).

Table 5-10 Length and weight data for silver eels from the Barrow catchment, 2014 - 2017

Year	No. Eels	Mean Length (cm)	Min. Length (cm)	Max. Length (cm)	Mean Weight (kg)	Min. Weight (kg)	Max. Weight (kg)	Total Weight (kg)
2014	811	41.4	27.6	76.2	0.140	0.033	0.742	114
2015	730	41.8	31.5	77.4	0.149	0.050	0.873	109
2016	681	45.2	32.0	77.8	0.195	0.052	0.860	133
2017	351	45.5	26.2	81.8	0.203	0.025	1.078	71

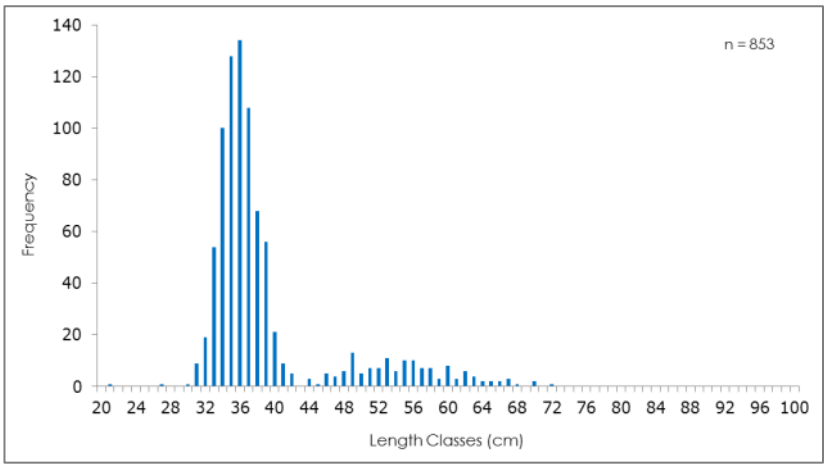


Figure 5-28 Length frequency for silver eels caught on Barrow fishery, 2018

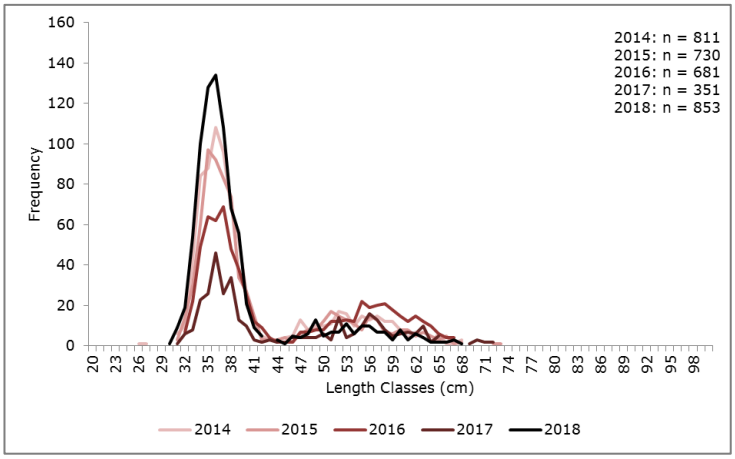


Figure 5-29 Length frequency for silver eels caught on Barrow fishery, 2014 – 2018

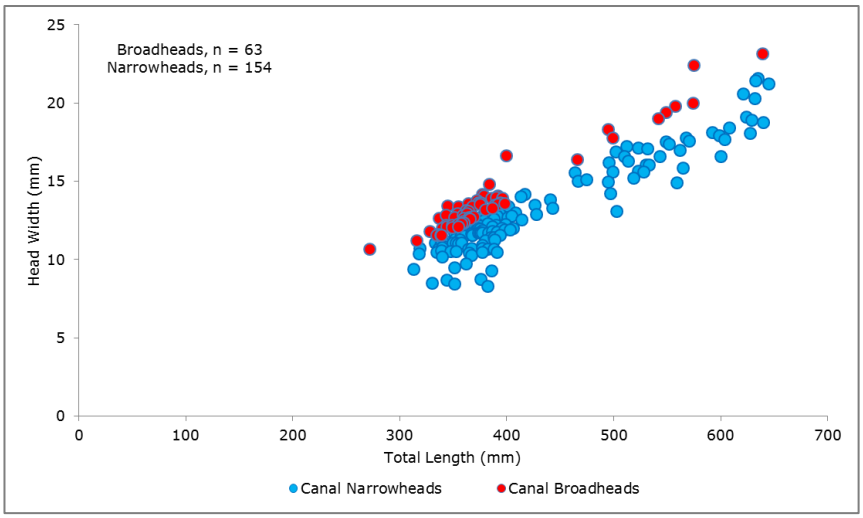


Figure 5-30 Broad head and narrow head records for Barrow fishery, 2018 (n = 217),

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 hydro acoustics), rivers (electro-fishing and fyke nets) and transitional waters (fyke nets, seine nets & beam trawls) in 2017 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 2017, 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 2018-2020.

RBD	Location	Water body	Life stage	1	2	2.1	3	4	5	6	7	8	2018	2019	2020	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	√			√	√	√	√			√			
NWIRBD	Erne	Catchment	Yellow	√		√	√		√	√	√	√	√			
SWRBD	Blackwater	Catchment	Yellow	√			√		√	√	√	√	√	√		
ERBD	Ramor	Lake	Yellow	√		√	√	√	√	√	√	√	√			
WRBD	Corrib	Catchment	Yellow	√		√	√	√	√	√	√	√	√			
WRBD	Moy	Lake	Yellow	√		√	√	√	√	√	√	√	√			
SERBD	Barrow	Catchment	Yellow	√			√		√	√	√		√	√		
ERBD/NBRBD	Fane	Catchment	Yellow	√			√	√		√	√		√	√		
Ireland	IFI/NRSP lakes	Lakes	Yellow	√				√		√	√	√	√	√	√	
Ireland	IFI/ NRSP Rivers	Rivers	Yellow	√				√		√	√		√	√	√	

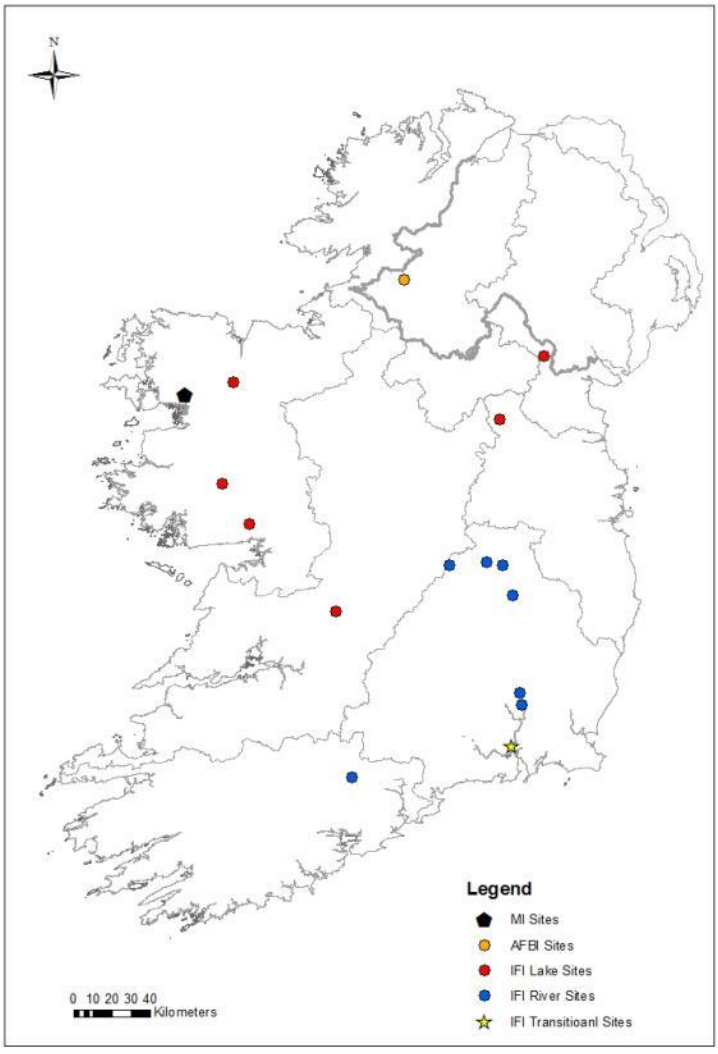
RBD	Location	Water body	Life stage	1	2	2.1	3	4	5	6	7	8	2018	2019	2020	Notes
Ireland	IFI Transitional	T. water	Yellow	√				√		√	√	√	√	√	√	
WRBD	Lough Feeagh	Lake	Yellow	√			√		√	√		√	√	√	√	
WRBD	Lough Furnace	T. water	Yellow	√			√		√	√		√	√	√	√	

6.1 Lake Survey 2018

Yellow eel surveys took place in 6 lakes, 2 transitional waters and 2 riverine catchment (Figure 6-1). The lakes surveyed were Lough Corrib (Upper and Lower), Lough Conn, Lough Derg, Lough Muckno and Lough Ramor by IFI, and two lakes in Burrishoole (by MI). Lower Lough Erne was surveyed by AFBI in July 2018 with the pit tagging of eels carried out by IFI staff. The transitional water was Waterford Estuary. River fyke netting was carried out in the Barrow main channel in 2019 in conjunction with a semi-quantitative electric-fishing survey in the upper shallow reaches of the main channel. A repeat fyke net survey was carried out at Clondulane weir on the River Blackwater to estimate the eel population in the impounded section behind the weir.

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. Samples of eels are measured for length, weight, and INDICANG style morphological features associated with silvering (eye measurements, pectoral fin measurements, and pigmentation). At selected locations eels are retained for further analysis in the laboratory. These analysis include age, growth, sex determination, parasite prevalence and diet.

Figure 6-1: Locations of yellow eel surveys carried out in 2018.



6.1.1 Burrishoole

Bunaveela Lough is located in the upper reaches of the catchment. It has a surface area of 42ha and a maximum depth of 23m (Figure 6-2). Bunaveela L. was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2018 (27-28 June 2018), with chains of 10 nets fished at six sites. In total 13 eels were caught with a catch per unit of effort of 0.22 eels/net/night (Table 6-6). The average length was 44.2cm and ranged in length from 32.8cm to 59.6cm. Thirteen eels were PIT tagged and no recaptures were made of previously tagged fish.

Lough Feeagh has a surface area of 395ha and an average depth of 14.5m (with several areas >35m in depth, Figure 6-2). L. Feeagh was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2018 (3-4, 31 July 2018), with chains of 10 nets fished at six sites for one night each and 3 sites repeated later in the month. In total, 83 eels were caught with a catch per unit effort (CPUE) of 0.92 eels/net/night (Table 6-6). The average length of eels was 45.2cm and ranged in length from 29.1cm to 96.1cm (Figure 6-3), with a total weight of 17.97 kg caught in the three nights. Most of the catch (77) was PIT tagged and eight previously tagged eels were recorded. Six eels were sacrificed in this survey. Four of the six (66.7%) of the eels contained *A. crassus* with an infection intensity of 4.0.

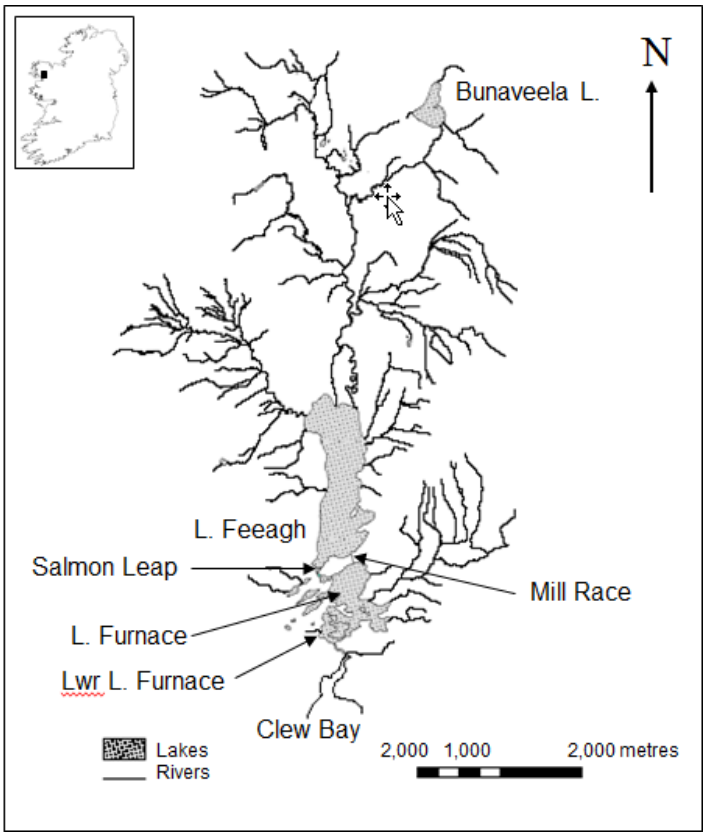


Figure 6-2 Map of Burrishoole showing the lakes surveyed.

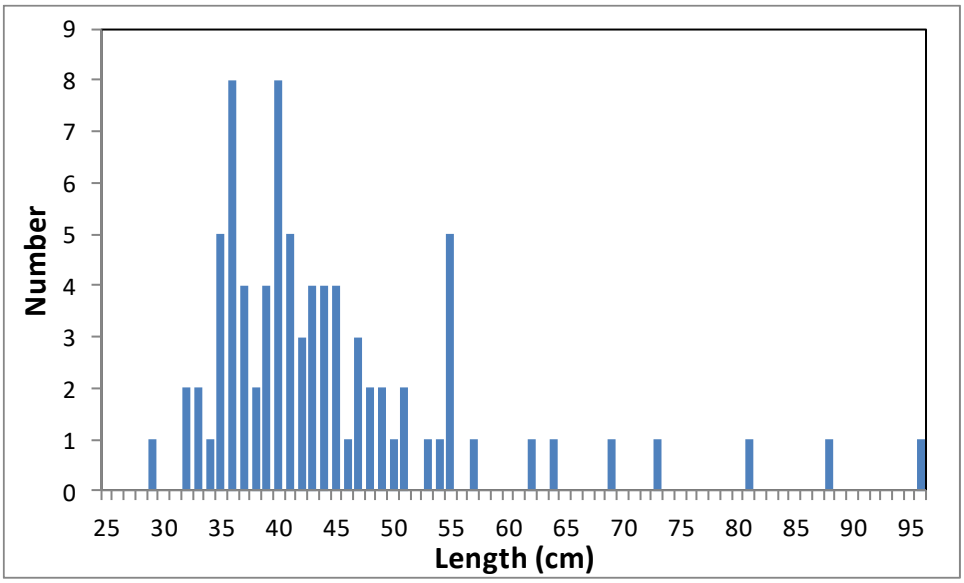


Figure 6-3 Length frequency of yellow eels captured at L. Feeagh, 2018 (n=83).

6.1.2 IFI lake surveys 2018

Fyke net results are displayed in Table 6-6. All eels were processed as per standard protocol, the details of which can be read in previous year's reports (O'Leary *et al.*, 2018)).

The following graphs (Figure 6-4) display the length frequency distributions of the eel lake populations surveyed during the 2018 survey season. This gives a snapshot of the status of the population in the area. Table 6-6 displays the minimum, maximum and average lengths for all lakes surveyed.

6.2 River Survey 2018

6.2.1 River Fyke Net Survey

The netting survey of the River Barrow resulted in a catch of 121 eels for the season (Table 6-7). The majority of these eels (n = 83) were captured in St. Mullins at the top of the tidal mark and 38 captured at Athy and Graiguenamanagh. This survey will be repeated in 2019 to determine if the drought conditions present in the summer of 2018 influenced the fyke net catch. Two nights of fyke netting the River Munster Blackwater resulted in 139 eels captured and 18 recaptures (Table 6-7).

The following series of graphs (Figure 6-5) display the length frequency distributions of the yellow eel river populations surveyed during the 2018 survey season. The Munster Blackwater length frequency is very similar to what could be found in a lake. This is due to the section of river surveyed being heavily impounded by the Clondulane weir below and the Fermoy weir above the survey site, essentially creating a productive lake-like environment for any eels present. This resulted in larger number of mid-40 to mid-50 cm eels being captured. Recruitment into the system is visible, displayed by a peak in the 30 to 40 cm length range. Table 6-7displays the minimum, maximum and average lengths for all rivers surveyed.

The length frequency for the River Barrow shows very low number of eels in the middle and upper reaches of the system with the majority of the catch caught at St Mullins which is located at the high tide mark. The fyke survey of the River Barrow will be repeated in 2019 to determine if the drought conditions affected the abundance of eels present in the nets.

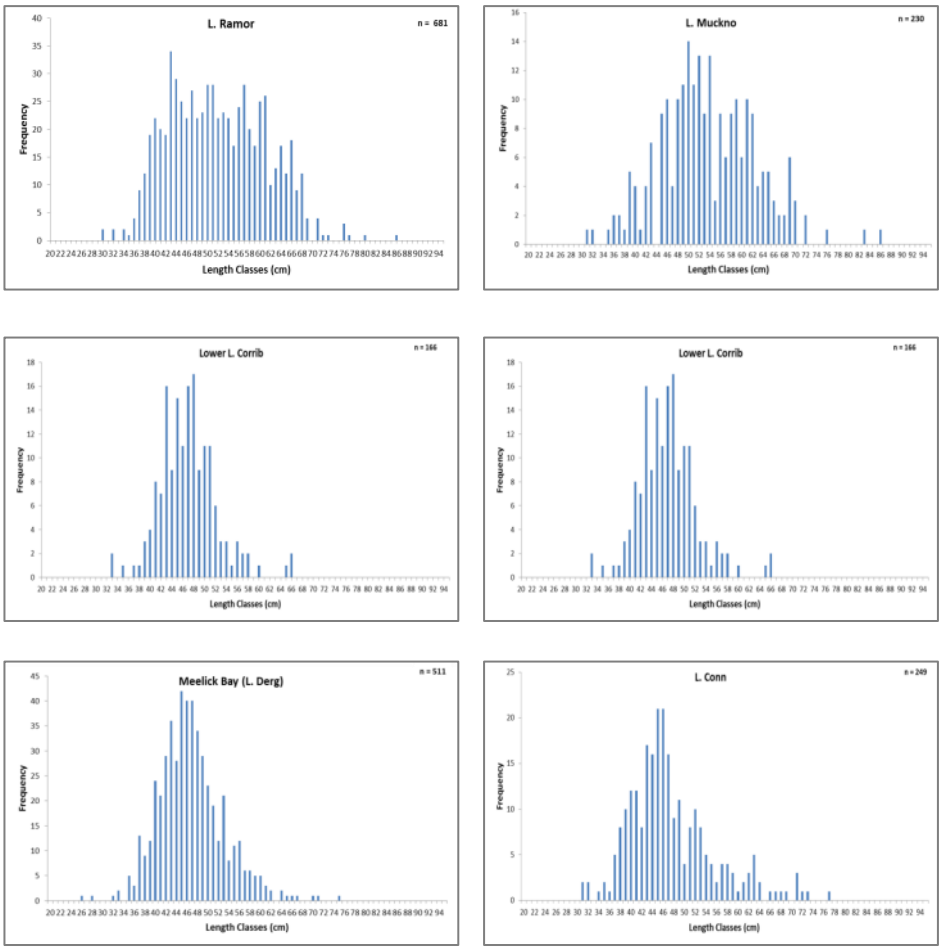


Figure 6-4 Length frequency of yellow eels captured on top left. L. Ramor, L. Muckno, middle row, left Lower L. Corrib, Upper L. Corrib, lower left Meelick Bay (L. Derg), L. Conn, 2018

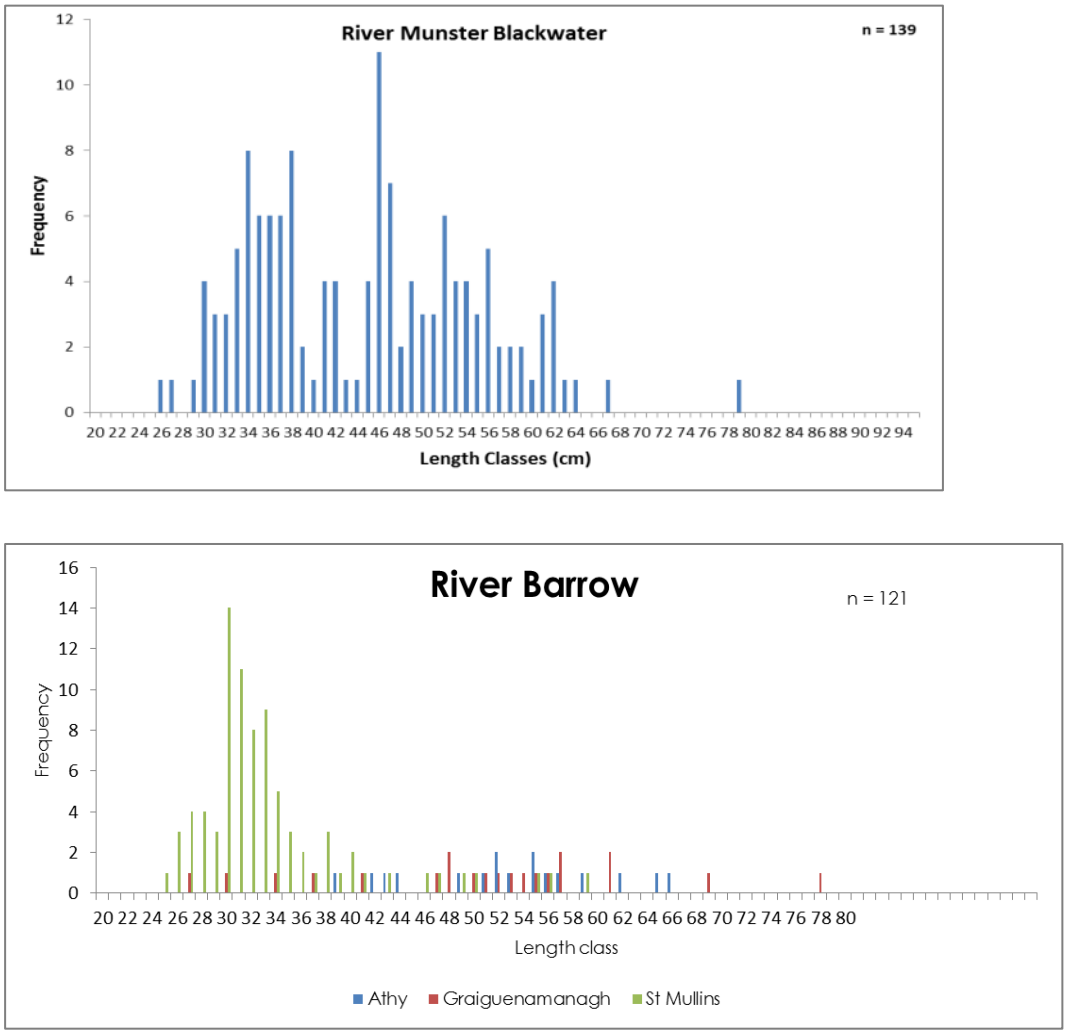


Figure 6-5 Length frequency of yellow eels captured on River Munster Blackwater (top) and River Barrow (Bottom), 2018

6.2.2 River electric fishing surveys

Electric fishing surveys were conducted on the upper reaches of the main River Barrow channel at Portarlington and Monasterevin. No eels were captured during any of the surveys. The electrofishing survey of the Upper Barrow will be repeated in 2019 to determine if the drought conditions affected the distribution of eels in 2018.

6.3 Transboundary Yellow Eel

AFBI have been tasked with carrying out surveys of the Lower Lough Erne yellow eel stock (following the closure of the commercial fishery in 2010) in 2011 and 2014 and biennially since then up to this current 2018 survey.

The surveys and their findings form part of the UK's Data Collection Framework (DCF) commitments submitted to the EU, with various components of the conservation fisheries within the NWIRBD eel management unit reported annually in the DAERA Digest of statistics for salmon and inland fisheries in the DAERA jurisdiction 2018

https://www.daera-ni.gov.uk/publications/digest-statistics-salmon-and-inland-fisheries-daera-jurisdiction-2018

The main findings of the previous surveys were the increases noted in CPUE from 2011 to 2014, reflecting the relatively recent closure of the commercial yellow eel fishery at that time. But from this period onwards and in conjunction with known historic drops in recruitment average CPUE across the sites fished in 2016 remained somewhat stable, the notable difference being the drop in length frequency for those captured eels being <400mm length. 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 (recorded minima) recruitment history to the Erne over the preceding 8-10 years (Figure 6-6) and echo the modelling based scenarios of future output from the Erne from these year classes (Figure 6-7).

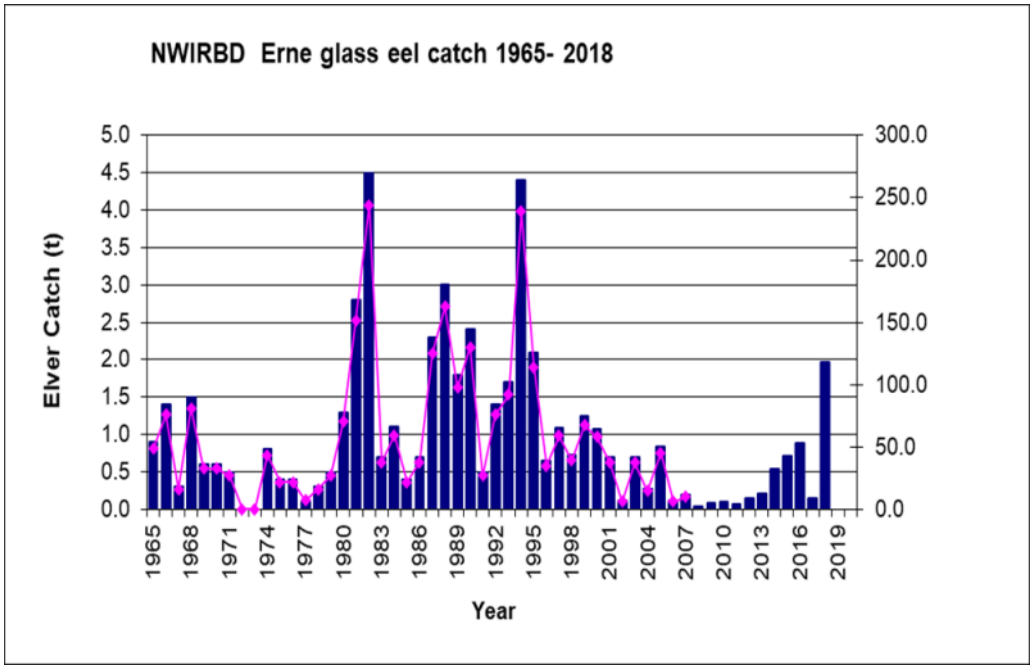


Figure 6-6 The long term dataset reflecting the glass eel/elver capture protocols established on the Erne and the quantity of glass eels (t) caught at Cathleen's Falls Hydroelectric dam and moved upstream into the Erne lake system (1965-2018).

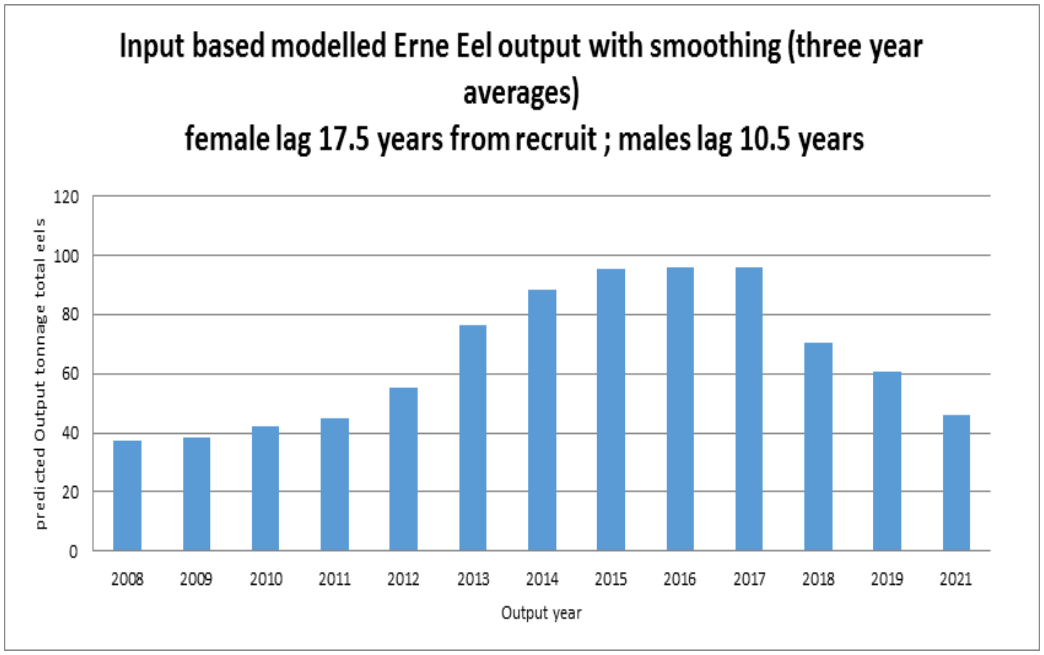


Figure 6-7 Model of predicted Erne outputs based on known (declining) input data.

6.3.1 Current Survey

The survey sites chosen in each of these surveys (Figure 6-8) are an attempt to resurvey sites fished during the intensive sampling regime devised during the Erne Eel Enhancement Programme (from 1998-2000) and to maintain a harmonised series of sites for the biennial DCF survey needs. 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 2014 the number of former commercial fishermen used has remained at 2.

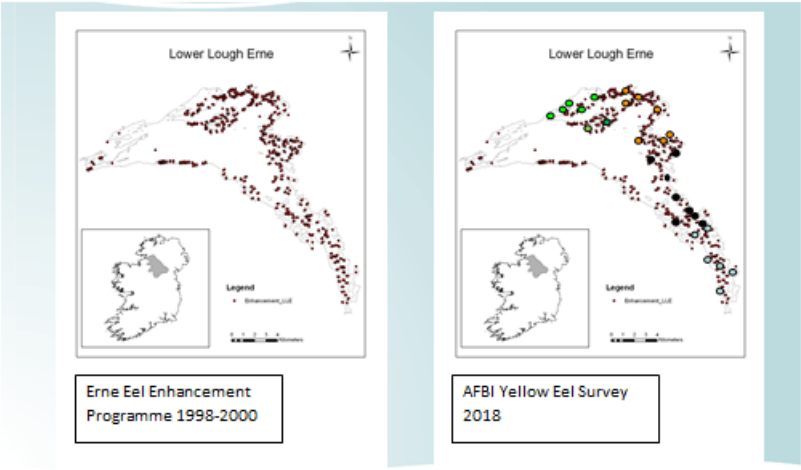


Figure 6-8 Yellow eel fyke net survey sites on Lower Lough Erne (from EEEP inception 1998-2000 & current 2018 survey).

6.3.1.1 Methods

From the 10th to 13th July 2018, 2 individuals (operating as 1 crew as in 2016) 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 Figure 6-6). Overall survey coverage reflected that from 2016 covering the key areas 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 (Figure 6-8). 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 (mm)
- weight ()
- *A. crassus* prevalence and mean intensity
- age
- fat content using Distell fish fat meter (fig. 3)
- stomach content
- endohelminth analysis

Bycatch and the appearance of any silver eels within the catch was also noted as the nets were cleared.

6.3.2 Results

6.3.2.1 Catch metrics

A total of 2,012 eels were caught (2014 caught 4,510 eels; 2016 caught 1,981). Eels ranged in length from 289 mm to 837 mm with a mean of 473 mm across the 4 zones fished (Table 6-2). A slight increase in mean length compared with previous surveys was noted in the Trory zone and this is commonly known 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 2018 yellow eel survey.

Zones	Mean Length	% undersized '18	% undersized '16	% undersized '14	CPUE '18	CPUE '16	CPUE '14
Trory	47.6	9.3	10	21.7	10	8.73	3.23
Upper Devenish	48.4	11.3	13	22.5	14.1	13.76	18.23
Castlearchdale	48.1	10.3	16	23.7	25.6	30.77	28.3
Kesh/Lusty	45.2	22.8	12	33	30.7	12.76	25

6.3.2.2 CPUE

In general few notable differences were found between the catch metrics from 2016 -2018, with both CPUE and the % undersize remaining similar (stabilized) or dropping slightly, once again all linked to the relevant recruitment periods for those cohorts. However the one marked difference was the increase in catches from Zone 4 (Kesh/Lusty) which were dominated by a high proportion of small eels, a finding not recorded in any of the other zones (Table 6-3 and Figure 6-9). The catches of these smaller eels and the significant increase in local CPUE, are likely to have influenced the rise in overall CPUE for L. Erne as presented in Table 6-3.

Table 6-3 Comparison of LLE survey derived CPUE data 2011-2018.

Year	Mean CPUE
2011	14.9
2014	17.43
2016	16.5
2018	20.1

6.3.3 Length frequency

The distribution of length frequenceis across simalr numbers of eels measured in 2016 and 2018 match closely (Figure 6-10) with the most apparent feature being fewer eels across most of the 2018 length classes, and the distribution extending out to the right hand side with more larger (older) eels caught in 2018. Such older eels will have come from the 2016 age classes noted from 600mm upwards, and are likely benefiting from the long term closure of the commerciial yellow eel fishery.

However, the length frequency distribution illustrates very clearly the reduction of larger yellow eels from the size classes 500mm and above which would be the major components of the silver eel production in the short term over the next 5 years. This correlation continues the downward trend in production predicted in the model in figure 3.

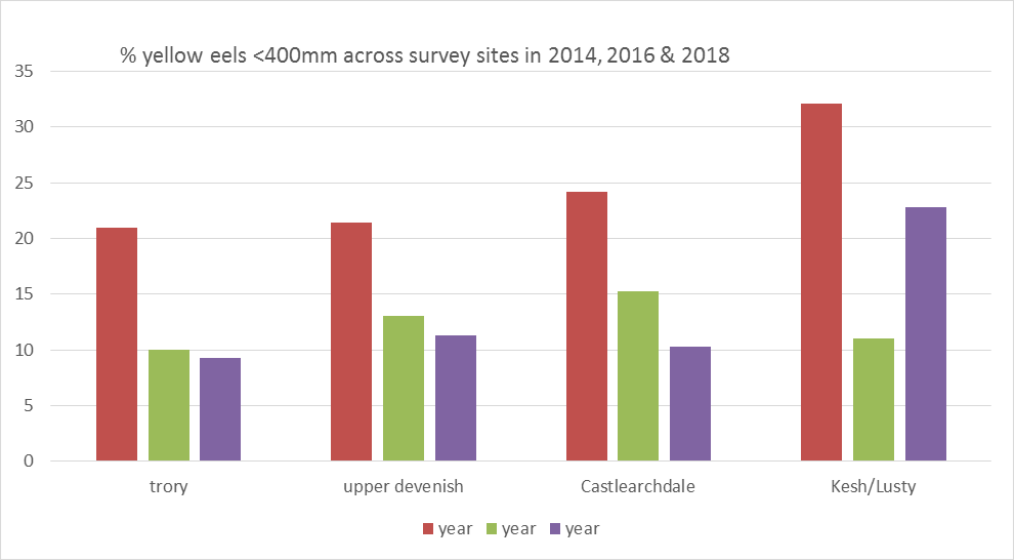


Figure 6-9 Comparison of the % undersized eel (<400mm length) caught between the sampled zones in 2014, 2016 & 2018

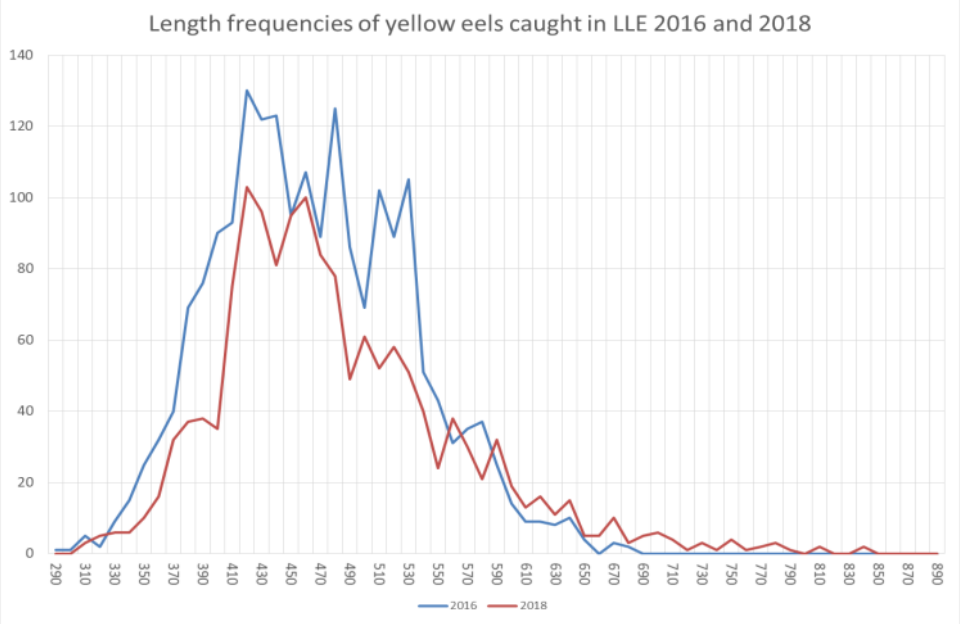


Figure 6-10 Length frequencies of yellow eels caught in LLE 2016 and 2018 surveys

6.3.4 *Anguillicola crassus*

The mean prevalence of *A. crassus* across the zones surveyed was 63%, an increase of 21% from 2016, (mean prevalence in 2011 and 2014 was 72 and 73% respectively) and as noted previously this figure was not truly representative of the frequency of the infection across the 4 zones examined which showed a degree of variation (becoming less prevalent) moving westward (Figure 6-11).

However, a significant increase in the proportion of *A. crassus* infected eels was recorded in the Kesh Bay zone rising from a prevalence of 15% to 56%. This could be linked to the

increase in eels captured in this zone (particularly <400mm length) as illustrated in figure 4 above, possibly helping vector additional *A. crassus* into this infra-population given the feeding habits of smaller eels.

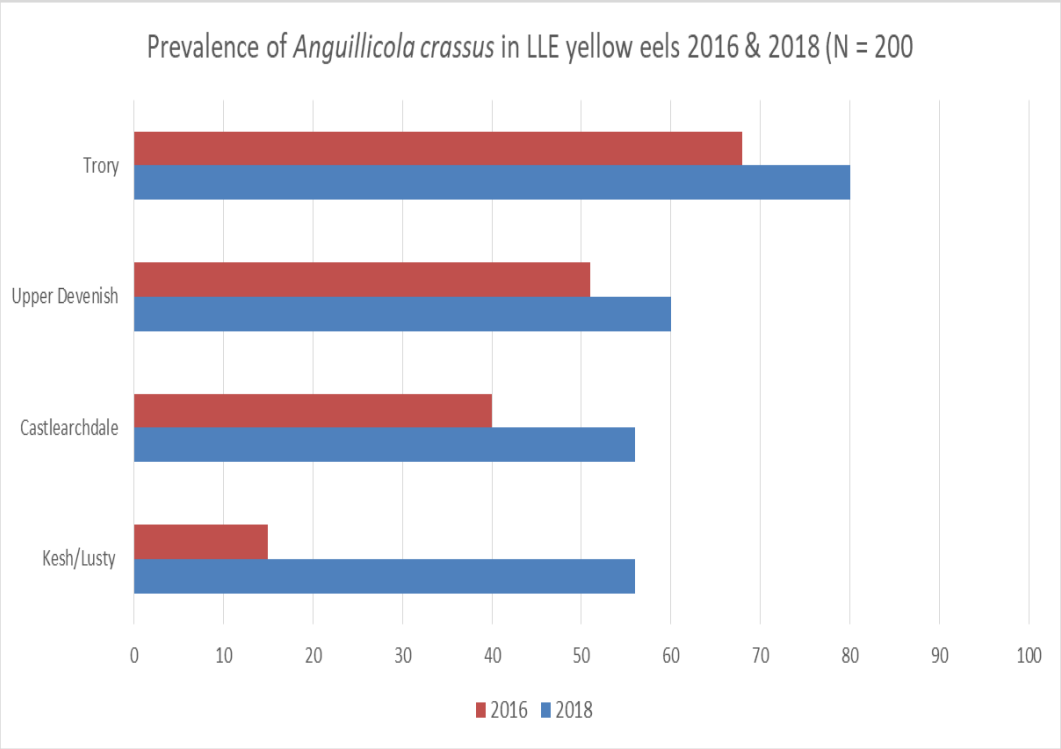


Figure 6-11 Distribution and prevalence of A. crassus in the 4 zones of LLE surveyed in 2016 and 2018

6.3.5 Eel Fat Content

2016 was the first time that any measurements of fat content using the Distell fat metre (Plate 6-1) had been taken in Erne eels with a mean fat content of 19.2% (L. Neagh yellow is mean of 23.2%).

2018 analyses recorded a lower mean fat content of 16.3% and within the 100 eels sampled 21% of eel >500 Lt had fat levels below 12%, a level consistent with their noted broad head morphology (Figure 6-12).

Unlike 2016, there was a negative trend that % body fat in LLE eels decreased with length though it's likely that this was influenced by the higher proportion than previous surveys found of broad head/low % body fat eels, the bulk of which were captured at Zone 1.

Lough Erne is known to produce a component of broad headed eel, 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 4.8 and 10.4% (Figure 6-13).

When more closely compared with sympatric narrow headed eels, only 2 broad heads had fat above 15%, whilst 2 individuals as long as 700mm contained only 5.2% and 9.8% respectively (Figure 6-13). Upon ageing the sub set of 21 broad head eels had a mean length of 612mm, age of 17.4 years and body fat composition of 8.3%. The longest individual at

794mm had a fat level of 10% and was 21 years old, this in comparison with a similar sized narrow head eel of 817mm length, 21.9% fat and 22 years old.

Plate 6-1 Using the Distell fish fat meter to measure % fat content in LLE yellow eel.

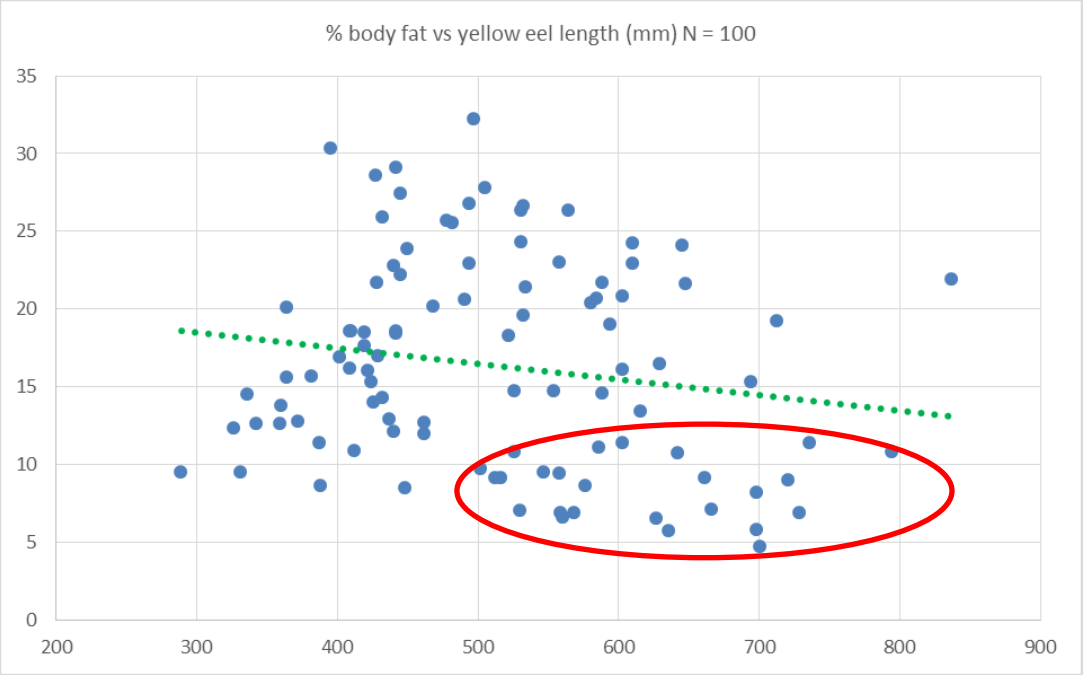


Figure 6-12 Percentage fat content of LLE yellow eels measured against respective length (mm) with recorded broad head eel component circled.

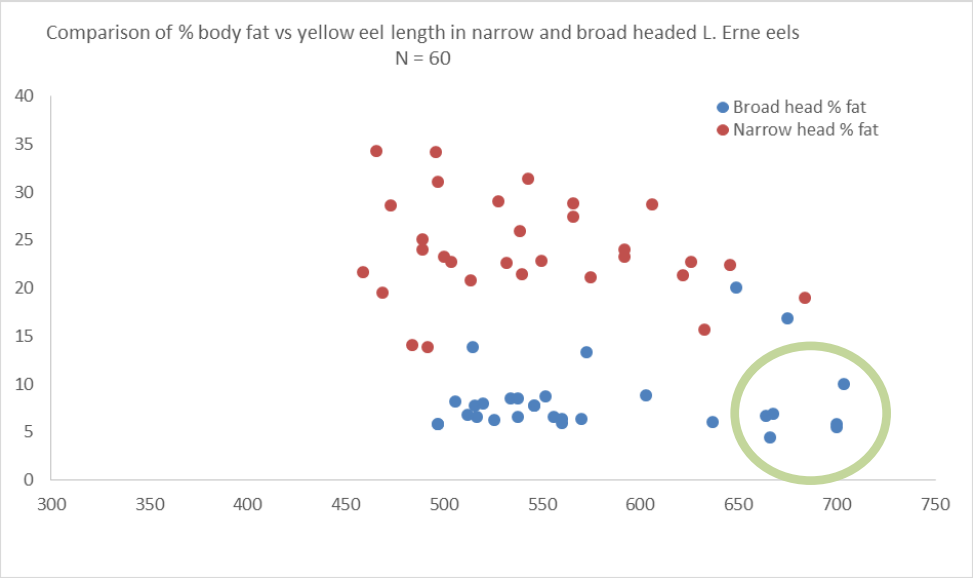


Figure 6-13 Comparison of % body fat vs yellow eel length in narrow and broad headed L. Erne eels

With our current knowledge of the effect of sufficient fat content beyond an 18% threshold evoking a "silvering" response in older yellow eels, these data present questions as to the reproductive potential and/or contribution of such eels when one considers that a migrating female silver eel from L. Neagh is on average 648mm length, 18 years old and with a fat content of 24.7%. While examining these 2 yellow eel morphs we noted differences in ovarian development for eels of similar length, with broad headed eels having markedly smaller and less dense ovaries (Table 6-4). Analysing 30 samples of similar sized eels from each morph we measured length, fat content, then removed and weighed the mass of a 10mm strip of ovary opposite the bifurcation of the alimentary tract. This data was used to calculate a gonado-somatic index (of ovarian mass multiplied by % fat) against which eel length could be plotted to examine any correlation between these metrics (Figure 6-14).

Table 6-4 Mean values for length (mm), % fat and the mass of 10mm strip of ovary in broad head (BH) and narrow head (NH) yellow eels from L. Erne (N = 60).

Morph	Broadhead	Narrowhead
Mean Length (cm)	55.7	54.9
Mean Fat (%)	8.2	23.9
Mean Ovarian mass (10 mm)	0.117	0.235

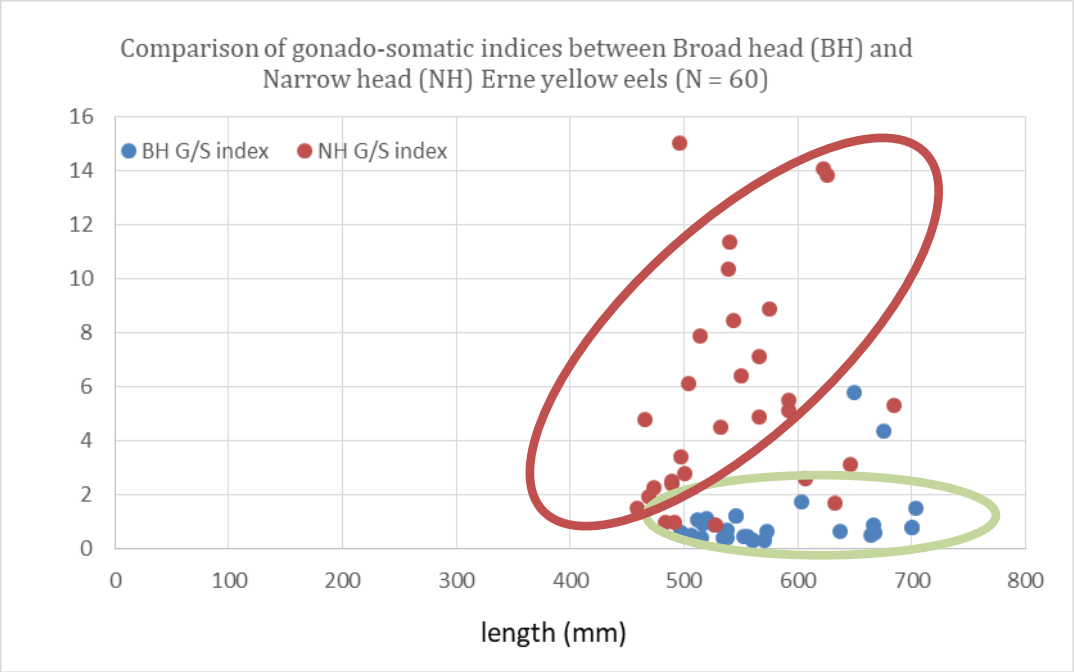


Figure 6-14 Gonado-somatic index vs length between broad head (BH) and narrow head (NH) eels from L. Erne illustrating the separate clustering of the 2 morphs (N = 60).

This observation and follow up analysis provided additional queries as to the reproductive potential of these large (and old) female eels. Not only are there questions as to them possessing the metabolic capacity for a transatlantic migration in terms of sub optimal lipid reserves (apart from having sufficient levels to stimulate silvering in the first instance), but in Figure 10's comparison of length for length, broad headed eels are significantly underdeveloped in terms of ovarian gametogenic maturation when compared with their narrow head counterparts from the same lake (and often the same survey zone).

6.3.6 Ageing

The 2018 findings are consistent with those of previous ageing work for Erne yellow eels caught using fyke net (which tend to be selective for a length upwards of 300mm) and produced age ranges from 6 – 22 years with an average age of 14.6 years (Figure 6-15).

However both figures 6-15 and 6-16 highlight the known (poor) recruitment history to the Erne over the preceding years, in particular the very low years from 2004 onwards (Figure 6-6), and the consequential reduction in the 14 year old year class in Figure 6-15. Likewise the same graphs also illustrate the reduced cohorts across the length range 300-400mm, equating to 6 - 10/11 years of age, and the corresponding years of historic recruitment minima. The length frequencies recorded in Figure 6-10 also demonstrated that the 2018 survey caught half the number of eels in the 350 - 420mm size range compared to 2016.

All of these ages related/recruitment hindcasting findings are useful in advising future policy and conservation management on the Erne but will additionally have implications as to the

future production and target compliances for the silver eel Trap and Truck conservation fisheries.

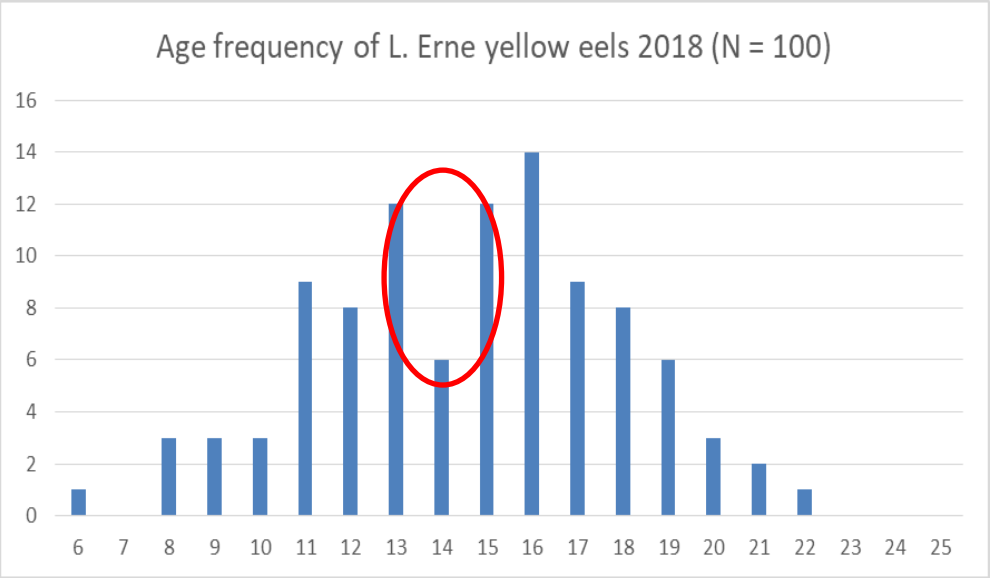


Figure 6-15 Age frequency of L. Erne yellow eels surveyed in 2018

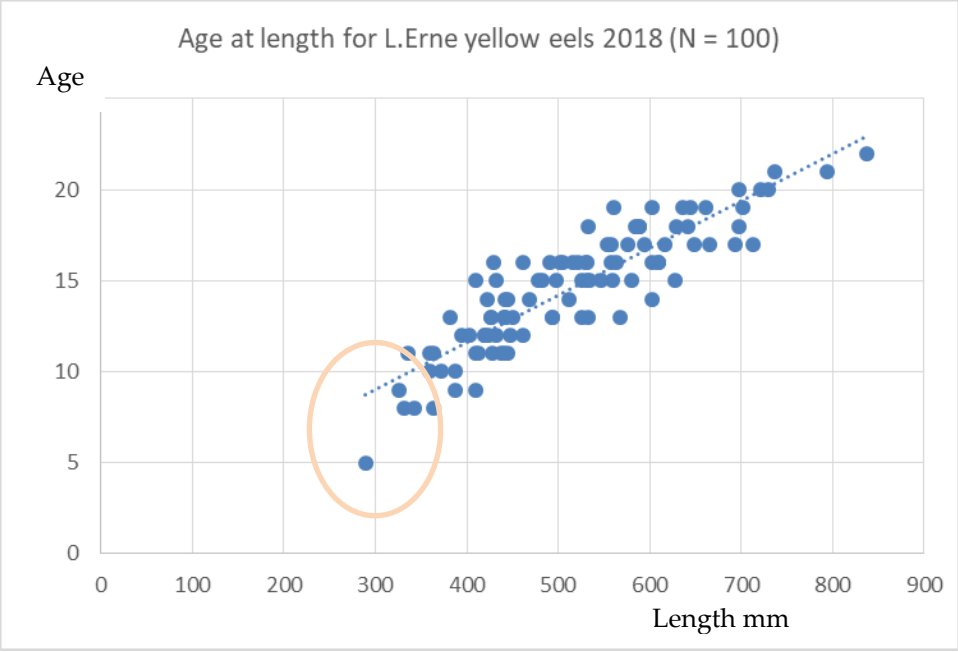


Figure 6-16 Age at length across the size range of Erne yellow eels analysed in 2018

6.3.7 Bycatch

6.3.7.1 Silver eels

In 2018, 22 silver eels were noted amongst the yellow eel survey catch with 82% of these caught within the fyke nets set at Zone 1, Trory.

6.3.7.2 Coarse Fish

Across the 4 nights fished bycatch totalled 101 fish which was dominated by perch (67.3%) and roach (22.7%) (Table 6-5). The distribution and occurrence of Perch, Roach & RoachxBream hybrids were similar across all 4 sites, whilst pike were only caught in Trory zone.

Table 6-5 Frequency and distribution of bycatch across the 4 zones surveyed in Lower L. Erne in 2018

bycatch	10-Jul	11-Jul	12-Jul	13-Jul	Total
perch	22	17	15	14	68
roach	4	6	7	6	23
hybrid	1	1	3	3	8
pike				2	2

6.3.7.3 Salmonids

No Salmonids were caught during the time of the survey, a common feature of many of the previous surveys and a not uncommon finding when using fyke nets as a survey tool which salmonids seem able to avoid.

6.4 Transitional Waters

6.4.1 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 2018 (10-11 July), with chains of 10 nets fished at six sites in one night each and one night (3 August). Three chains of nets were fished at the Back of the House (20 June), which is a shallow tidal area between the lough and the estuarine river.

In L. Furnace, 91 eels were caught with a catch per unit effort (CPUE) of 1.01 eels/net/night (Table 6-8). The average length was 40.1cm and ranged in length from 28.1cm to 70.7cm (Figure 6-17). A total weight of 11.19kg was caught.

In the Lower Lough Furnace, only 6 eels were caught with a catch per unit effort (CPUE) of 0.2 eels/net/night (Table 6-8). The eels average length was 51.4cm and ranged in length from 33.7cm to 59.9cm (Figure 6-17), with a total weight of 1.44 kg caught.

One night was fished in the estuary, with three chains of 10 nets set (19 June 2018). This was the first survey at this location since 1988. Six eels were caught with a catch per unit effort (CPUE) of 0.2 eels/net/night. The average length was 38.8cm and ranged in length from 33.7cm to 49.0cm. A total weight of 0.56kg was caught.

Six eels were sacrificed in this survey from Lough Furnace. One of the six (16.7%) of the eels contained *A. crassus* with an infection intensity of 13. *A. crassus* has been established in the lough since about 2011.

Six eels were sacrificed in this survey from Lower Lough Furnace. Five of the six (83.3%) of the eels contained *A. crassus* with an infection intensity of 7.6.

Five eels were sacrificed in this survey from the estuary. One of the five (20.0%) of the eels contained *A. crassus* with an infection intensity of 5.

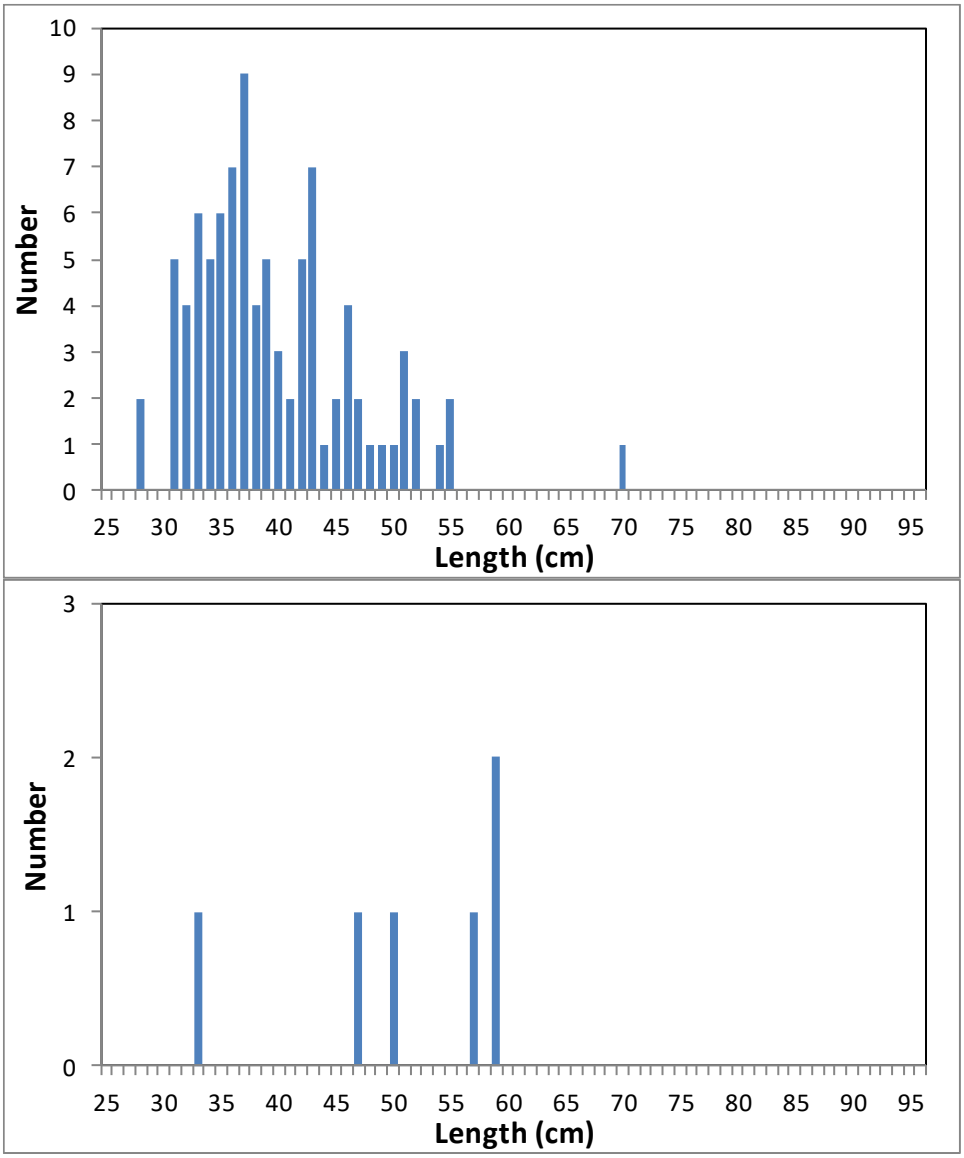


Figure 6-17 Length frequency of yellow eels captured at L. Furnace (n = 91) (top) and L. Furnace Lower (n = 6) (bottom), 2018

6.4.2 Waterford Estuary

In 2018 the Waterford estuary was surveyed monthly from June to September. A total catch of 1,041 eels were processed and a mark recapture study carried out to complement surveys from 2016 and 2017 (Table 6-8).

The following graph (Figure 6-18) displays the length frequency distribution of the yellow eels surveyed in Waterford Estuary during the 2018 survey season. The length frequency displays a peak in the 28 to 40cm length range. These small eels are absent from length

frequencies from fyke net samples in lakes. Table 6-8 displays the minimum, maximum and average lengths for Waterford Estuary.

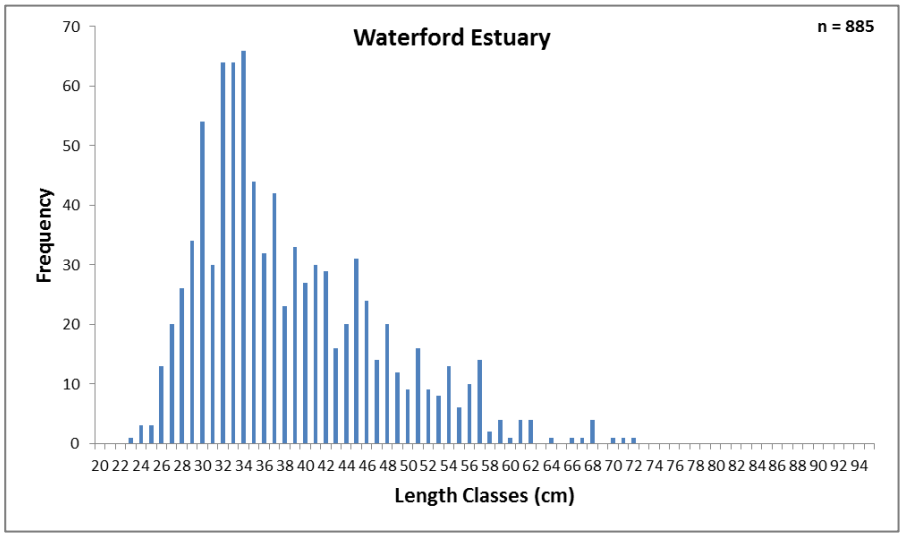


Figure 6-18 Length frequency of yellow eels captured in Waterford Estuary, 2018

Table 6-6 Catch detail from yellow eel lakes surveys 2018

Site	Months	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. Ramor	April, May, September, October	681	200	3.41	165.4	54.5	30.2	86.8	0.272	0.033	1.128
L. Muckno	April, September	234	240	0.98	69.4	54.2	31.7	86.1	0.302	0.046	1.369
Meelick Bay	July, August	524	220	2.38	100.6	47.2	26.5	75.6	0.197	0.059	1.041
Upper L. Corrib	June, August	4249	320	13.28	2142.2	50.3	32.3	86.9	0.233	0.069	1.35
Lower L. Corrib	June	492	160	3.08	104.2	47.4	33	66.2	0.184	0.065	0.547
L. Conn	June, July, August	627	265	2.37	128.8	47.9	31.3	77.4	0.206	0.051	0.745
L. Feeagh	July	83	90	0.92	17.97	45.2	29.1	96.1			
L. Bunaveela	June	13	60	0.22		44.2	32.8	59.6			
Lower Lough Erne											

Table 6-7 Catch detail from yellow eel rivers surveys 2018

Site	Months	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)
Barrow (Fykes)	June, August	121	100	1.21	16.6	39.7	25.1	78.6	0.138	0.026	0.859
Barrow (E-fishing)	June, August	0	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Munster Blackwater	July	139	30	4.63	56.5	45.2	26	79.4	0.406	0.066	1.86

Table 6-8 Transitional Waters yellow eel survey data 2018

Site	Months	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)
Waterford Estuary	June, July, August, September	1041	135	7.71	121.9	38.9	23.7	72.3	0.119	0.022	0.679
Lough Furnace	July, August	91		1.01	11.19	40.1	28.1	70.7			
Lower Lough Furnace		6		0.2	1.44	51.4	33.7	59.9			
**Estuary		6	30	0.2	0.56	38.8	33.7	49.0			

6.5 Summary: Yellow Eel, 2018

Of the lakes sampled in 2018 the lowest CPUE was in Bunaveela and the highest CPUE was in Upper lough Corrib where 4249 eels were caught in 320 net nights giving a CPUE of 13.28. The survey of Lower Lough Erne resulted in a catch of 2,112 eels.

Fyke surveys in freshwater resulted in different results with a good number of eels present above Clondulane Weir on the Munster Blackwater River in contrast to the limited numbers in the estuary. In the Barrow low numbers of eels were found at Athy and Gragiuenamanagh in contrast to the large numbers found at St Mullins and at Waterford Harbour downstream.

A monthly fyke net survey in Waterford estuary resulted in 1,041 eels in 135 netnights giving a CPUE of 7.71. The abundance in the Waterford estuary is in contrast with the depleted numbers recorded in the subcatchments and main channel of the River Barrow upstream. In L. Furnace, 91 eels were caught with a catch per unit effort (CPUE) of 1.01 eels/net/night and a total weight of 11.19kg. In the Lower Lough Furnace, only 6 eels were caught with a catch per unit effort (CPUE) of 0.2 eels/net/night, with a total weight of 1.44 kg caught.

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.

Locations for WFD sampling sites for 2017 surveys are shown for lakes, rivers and transitional waters (Figure 6-19).

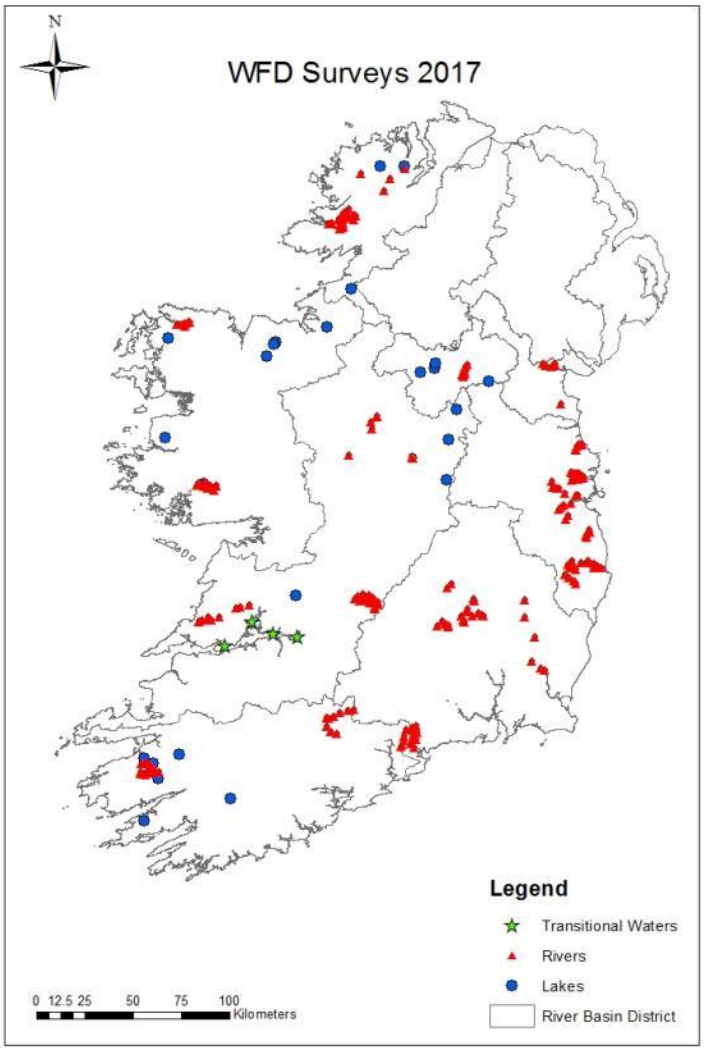


Figure 6-19 Location of WFD survey sites, 2017

6.6.2 2017 Results

6.6.2.1 Lakes:

A total of 24 lakes (spanning 19 catchments), were sampled with eels present in 20 lakes (83% of sites). A total of 190 eels were caught during lake surveys (Appendix 6-1 and Appendix 6-2). They ranged in length from 22 to 82 cm. A mean CPUE of 0.85 was found across all lake sites. While the highest CPUE value for eels was found in Upper Skeagh (Boyne, CPUE = 2.11) the lowest were noted in Lough Talt (Moy, CPUE = 0.11) and Lough Ennell (Shannon, CPUE = 0.11). No eels were captured in Loughs Caragh, Allua, Glasshouse and Sheelin.

6.6.2.2 Rivers:

A total of 221 river sites (across 27 catchments) were covered in the 2017 surveys. The WFD river sites had a 18% eel presence rate, 5% of sites with eels have ≤5 eels, 8% of sites caught between 5 and 10 eels and 7% had >10 eels. A total of 145 eels where caught, ranging from 7 to 60 cm (Appendix 6 -3, A6-4 and Appendix 6 -5). Densities ranged from 0.00016 to 0.1095

eels per m2 in the Tolka River (St Mobhi Drive_A) and Vartry River (Newrath Br._A), respectively.

6.6.2.3 Transitional Waters:

The Shannon Estuary was surveyed in 2017, split into 3 zones (Fergus Estuary, Limerick Dock and the Upper Shannon Estuary). A total of 26 eels were captured ranging in length from 10.5 to 55 cm. CPUE values for transitional water sites ranged from 1.66 (Fergus Estuary) to 4 (Limerick Dock) (Appendix 6-6 and Appendix 6-7). It should be noted that the last survey of the Shannon Estuary in 2014 yielded over 100 eels, however the fishing effort in 2014 was significantly higher than the 2017 survey.

7 Recruitment

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

7.1 Introduction

Many studies have focused on sampling the active phase of elver migration into freshwater (Gollock *et al*., 2011; Jessop 2000; Knights and White 1998; Moriarty 1986, Naismith and Knights 1988; O'Connor 2003; Piper *et al.,* 2012; Reynolds *et al.,* 1994). Elvers exhibit counter current behaviour once they start actively migrating upstream. This means that instead of moving with the current as they do in the estuary, they now avoid the river current which will carry them downstream. To avoid the current, the elvers tend to migrate along the banks of the river and seek out slack water. At this time the elvers are congregated in schools near the bank of the river where they can be trapped.

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 Inniscarra Dam on the Lee. They are described in more detail in the Irish SSCE reports.

The elver traps used by IFI are also based on the fixed ramp style traps. 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.

Elver traps on the Burrishoole (IE_West) and the Liffey (IE_East) are O'Leary type bristle ramp traps with gravity fed water supplies.

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.

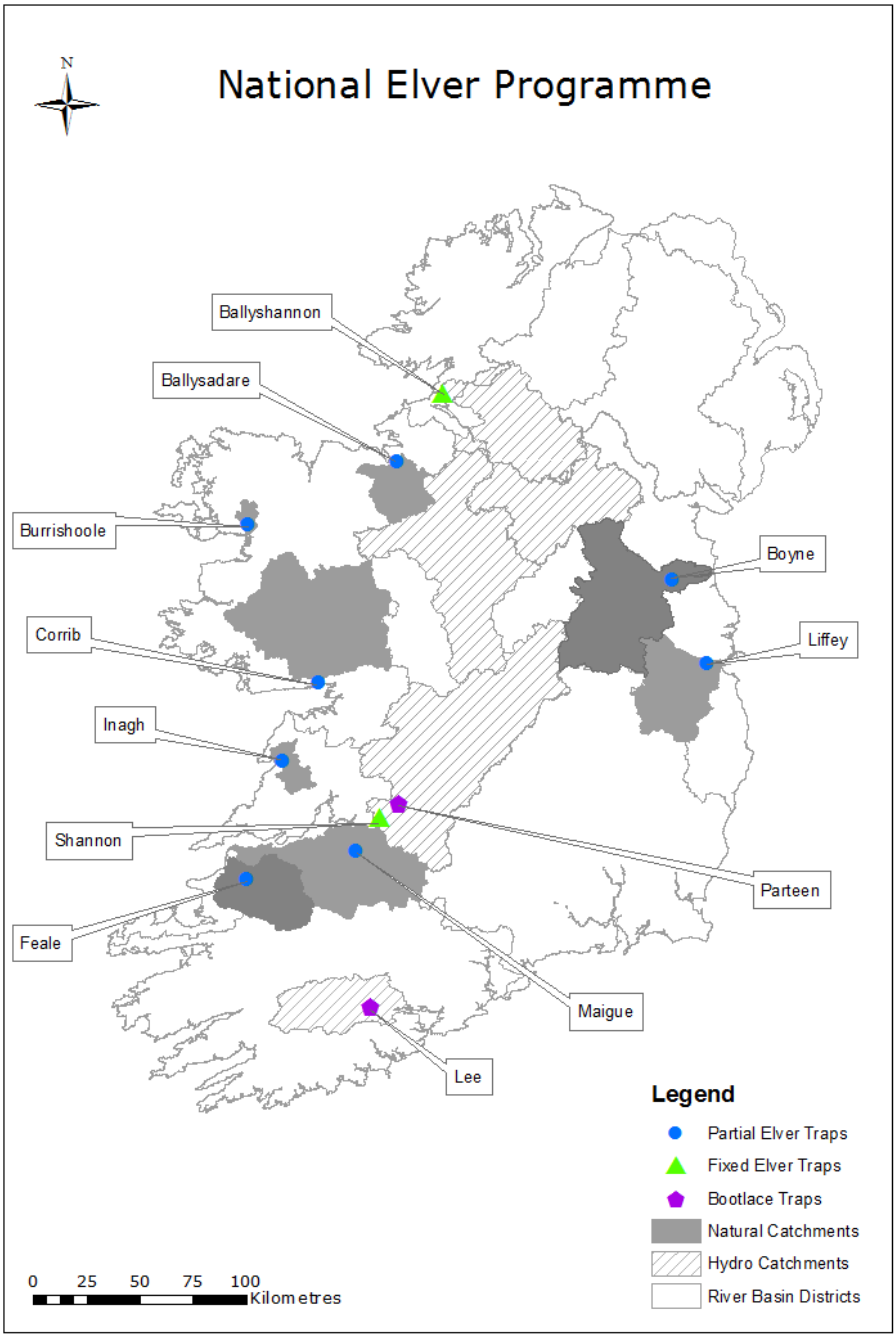


Figure 7-1: Location of recruitment monitoring stations in Ireland.

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.

7.2.1 Shannon & Erne

Long-term monitoring of elver migrating at Ardnacrusha (Shannon) and Cathaleen's Fall (Erne) is undertaken by the ESB (Figure 7-2).

In the Erne recruitment has shown an increase each year since 2011 with the highest catch in 2018 since 1995.

Major refurbishment of the Erne 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. Major refurbishment of the Shannon Ardnacrusha trap took place in early 2017 with a new water supply and brushes on the ladder. The increase seen in the Shannon in 216 was not repeated in 2017 or 2018.

7.2.2 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 5.2 also gives summary data on length and weight for all the locations monitored by IFI.

Note: Data were not available for the Feale, Maigue and Inagh for 2018.

7.2.3 Summary of 2018 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. There was little change in the catch in the Liffey traps on the East coast.

Recruitment for the 2017 season showed a general drop in the recruitment levels to Ireland in 2017 compared to 2016, in spite of many of the elver traps receiving upgrades, new climbing media etc.

Recruitment for the 2018 season showed a mixture with a marked increase in the Erne and the Liffey, but less so in the Shannon and the Burrishoole. (Note the Shannon young yellow eel recruitment increased – See Chapter 5.2).

In 2018, extreme drought and low water levels may have increased the efficiency of some traps where weirs dried and made the trapping location more attractive to young eels, such as on the Liffey.

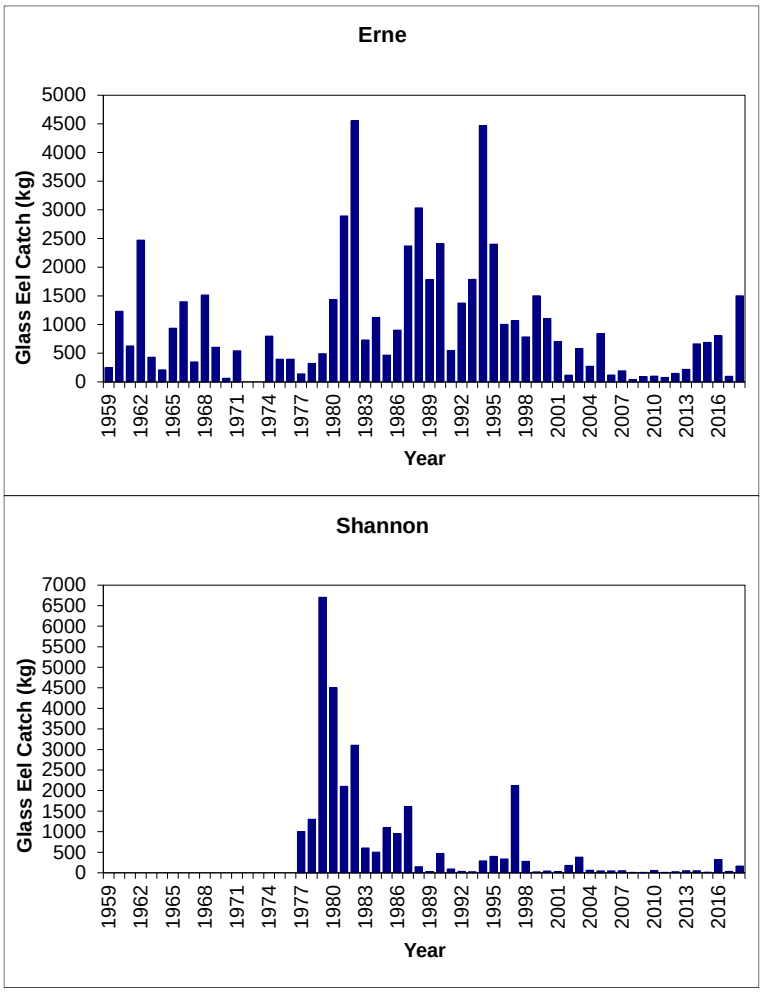


Figure 7-2: Annual elver catches (t) in the traps at Ardnacrusha (Shannon) and Cathaleen's Fall (Erne) – data from ESB. Full trapping of elvers took place on the Erne from 1980 onwards indicated by the arrow. Erne 2015 onwards does not include the additional new trap.

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

Year	Erne	Shannon Ardnacrusha	R Feale	R Maigue	Inagh R	Sh. Estuary Glass Eels	R. Liffey Fish Pass	R. Liffey Weir
1985	463	1093	503					
1986	898	948						
1987	2367	1610						
1988	3033	145						
1989	1781	27						
1990	2409	467						
1991	546	90						
1992	1371	32						
1993	1785	24						
1994	4463	287	70	14				
1995	2400	398	0	194				
1996	1000	332	0	34	140			
1997	1065	2120	407	467	188	616		
1998	782	275	81	8	11	484		
1999	1500	18	135	0	0	416		
2000	1100	39	174	0	120	43		
2001	699	27	58	2	18	1		
2002	113	178	116	5		37		
2003	576	378	36	72	111	147		
2004	269	58.126	0	0	24	1		
2005	838	41.36	0	1	0	41		
2006	118	42	1	0	4	3		
2007	189	45	0	0	39	12		
2008	38.7	7	0	0	83	2		
2009	88.3	7.75	42					
2010	96.6	49.7	20	3	1	3		
2011	74.34	7.239	7	5	15			
2012	145.71	22.525	47		*		0.5	0.2
2013	214.7	46.615	68	14	44		1.1	2.7
2014	659.37	45.085	5	29**	40		0.3	0.3
2015	686.17	11.42	3	15	25		0.2	0.2
2016	803.73	317.2	30.5	29	51		0.4	
2017	94.95	29.7	15	9	20		0.5	
2018	1499	165.2	n/a	n/a	n/a		6.0	

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

Table 7-2: Recruitment data for the years 2010 – 2017.

Location	Year	Total Wt. Elvers (g)	Est. No. Elvers	Av Wt. Elver (g)	Total Wt. Yellow Eels (g)	Est. No. Yellow Eels	Av. Wt. Yellow Eel (g)
Ballysadare Old Trap	2013	924	2,640	0.35	4,612	1,005	4.59
	2014	842	2,148	0.35	873	203	4.51
	2015						
	2016	600	1,714	0.35	327	72	4.57
Ballysadare new Trap	2017	16,128	30,897	0.522	22,278	4,170	5.343
Corrib pipe trap	2010	29,696	95,254	0.33	7,401	728	9.83
	2011	4,189	11,970	0.35	24,493	3,244	7.55
	2012	2,383	5,168	0.34	7,487	1,143	8.55
C Ramp and pipe	2013	14,260	42,064	0.34	12,520	2,149	5.41
Corrib Ramp trap	2013	10,168	29,994	0.34	0	0	-
	2014	2,891	8,998	0.32	374	55	2.46
	2015	12,321	38,502	0.32			
	2016						
	2017						
Feale Old Trap	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	712	1,468	0.46	1,900	471	4.57
	2016	20,452	10,411		6,493	1,833	
Feale New Trap	2017	6,441	7,906	0.468	8,212	1,732	4.602
Inagh Old Trap	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	
Inagh New Trap	2017	19,192	54,834	0.35	1,134	431	
Liffey	2013	1,144					
	2014	311	1,402			4	
	2015	159	690				
	2016	83	360				
	2017	11	49	0.23	507	106	4.78
Maigue Old Trap	2010	2,772	5,650	0.42	-	-	-
	2011	5,061	13,678	0.37	54	7	7.55
	2012						
	2013	14,032	39,665	0.35	19	3	6.4
	2014	29,020	78,042	0.37	-	-	-
	2015	15,050	40,229	0.37	173	20	8.69
	2016	28,883	96277		165	59	
	2017	9,105	30,350	0.3	155		
Maigue New	2017	19	63				

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 and the electronic tables. 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 890kg.

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 23.1kg in 2016.

In Parteen in 2017, the main catch was 121 kg and the new traps catch was 15kg.

In Parteen in 2018, the main catch was 1338 kg and the new traps catch was 2.4kg.

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 (1.1kg) and in 2017 it was 13.8kg.

In 2018, the Inniscarra trap only trapped 0.8kg, likely due to low water levels and closure of the fish pass.

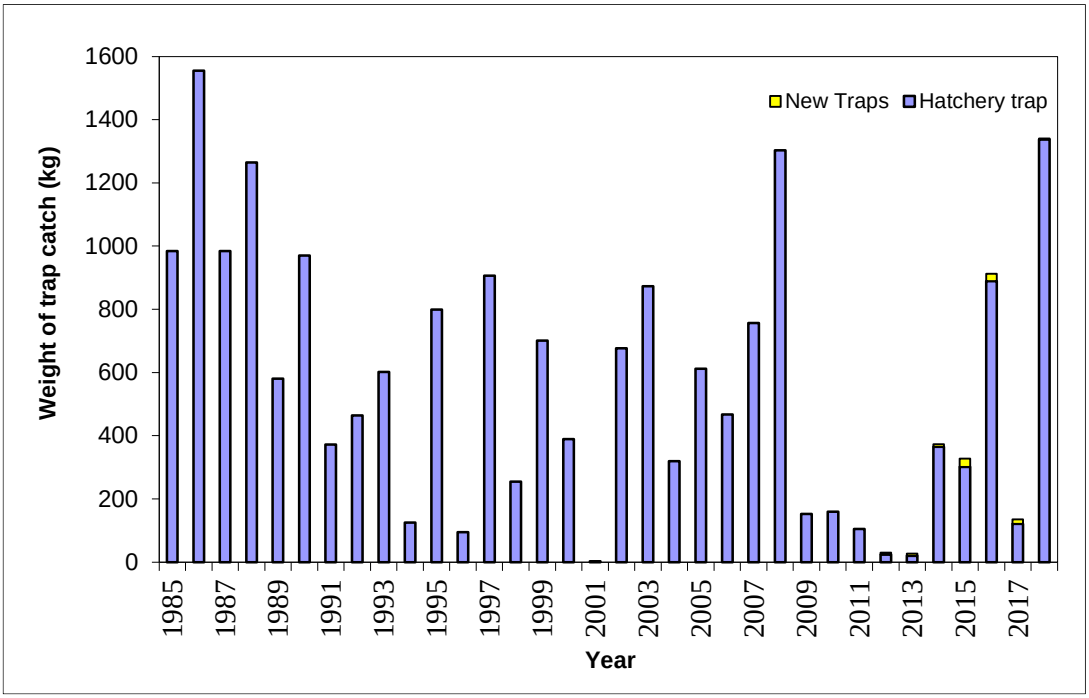


Figure 7-3: Juvenile yellow eel catches (kg) at Parteen Weir, 1985 to 2018.. From 2012, a second trap was installed on the opposite bank (Clare) and in 2015 near the hatchery (Tipperary) and these data are included in the graph as separate bars.

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Appendix 1: Members of the Standing Scientific Eel Committee 2017

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 – 2017

Dr. Derek Evans	Agri-Food & Bioscience Institute, N. Ireland
Dr. Kieran McCarthy	NUI Galway

Appendix 2: Members of the Technical Expert Group on Eel 2018

The TEGE is comprised of the following representatives:

Dr. Russell Poole	Marine Institute
Dr. Paddy Boylan	Loughs Agency
Dr. Denis Doherty	Electric Ireland
Dr. Paddy Gargan	Inland Fisheries Ireland
Dr. Ciara O'Leary	Inland Fisheries Ireland
Dr. Colm Fitzgerald	Inland Fisheries Ireland
Dr. Derek Evans	Agri-Food & Bioscience Institute, N. Ireland

Appendix 3: 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.

Appendix 4: Reports on Fisheries closures, illegal fishing and other management actions from the IFI RBD's and Loughs Agency.

Eel Management Information 2018

River District Basin: **Eastern / Neagh Bann (International) River Basin Districts**

Date: **1 Jan- 31 Dec 2018**

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 (International) RBD remained closed throughout 2018.

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 (International) RBD during 2018.

IFI RESEARCH DIVISION

IFI licences were issued to trap eels relating to research activity in IFI Dublin again in 2018 (covering both Eastern / Neagh Bann (International) River Basin Districts). Ex-commercial eel fishermen were contracted by IFI Research Division to undertake surveys. Results are awaited from IFI research Division.

Estimated level of illegal fishing:

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred:

The level of illegal activity was low for 2018 in the IFI Dublin area. Illegal activity targeting eels was recorded at a very low level. Patrols concentrated on lakes / rivers throughout the RBD.

Number of gear seizures: 3 Gear types seized: Home Made Traps / Nets

Insert quantity/length of gear seized

Photograph 1. Trap seized from the River Boyne just upstream of Obelisk Bridge (September).

Photograph 2. One of two traps seized on the River Boyne at Oldbridge during October 2018.

Photograph 3. Lough Ross seizure (October 2018)

Number of Eel Dealer Interceptions:

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 crayfish traps / nets (however very few eels found in any nets in 2018)

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)?:

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

(List any sites etc where barriers were removed or elver access improved etc)

All applications for infrastructural and other developments 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

(List any sites or actions which have significantly improved WQ to the benefit of eels)

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.

Eel Management Information 2018

River District Basin: **N.W. River Basin District**

Date: **1 Jan- 31 Dec 2018**

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 2018. However Conservation of Eel byelaw No. C.S. 319, 2015 ceased to have effect on 30 June 2018 and has not yet been renewed.

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

No eel fishing licenses were issued by the NWRBD during 2018.

Estimated level of illegal fishing: **Very low.**

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred:

One 25m illegal fyke net was seized on the shores of Lough Melvin

There was a credible report of illegal fishing with fyke nets at Lough Sillan, but no illegal activity was observed following intensive surveillance during early December.

Number of gear seizures: **1** Gear types seized: **One fyke net**

Insert quantity/length of gear seized

One 25m illegal fyke net was seized on the shores of Lough Melvin

---

Number of Eel Dealer Interceptions: **Nil**

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:

Protection staff believe the level of illegal activity is low. Only one report of illegal activity concerning eel fishing was received in the Cavan (Upr Erne) district.

Management Action 2. Trap & Transport

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

11,933 kg of silver eels were captured and transported from the Upr Erne (Cavan District).

In the Ballyshannon district 27,735kg of Eels were released from Lower & Upper Lough Erne. The Eels were caught at (1) Roscor bridge, (2) Ferny Gap 2km east of Roscor bridge, and (3) Portora Lock. Eels were transported to Ballyshannon into the Tailrace below Cathaleen's Falls hydro station.

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

Upr Erne 11,933 kg

Roscor bridge 3,946 kg

Portora gates 8,090 kg

Ferny gap 15,699 kg

Total 39,668 kg

What was the total catch transported (kg)?

39,668 kg - Lwr Erne

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

No

General impression of the programme:

The programme worked well at our two sites. There was good communication and co-operation between ESB, DAERA, IFI and the licenced eel fishermen.

Management Action 3. Ensure Upstream Migration at Barriers

(List any sites etc. where barriers were removed or elver access improved etc.)

A significant capital project was undertaken in July 2018 to provide elver passage facilities at the R. Lackagh salmon Logie counter and crump weir in north Donegal (see photos).

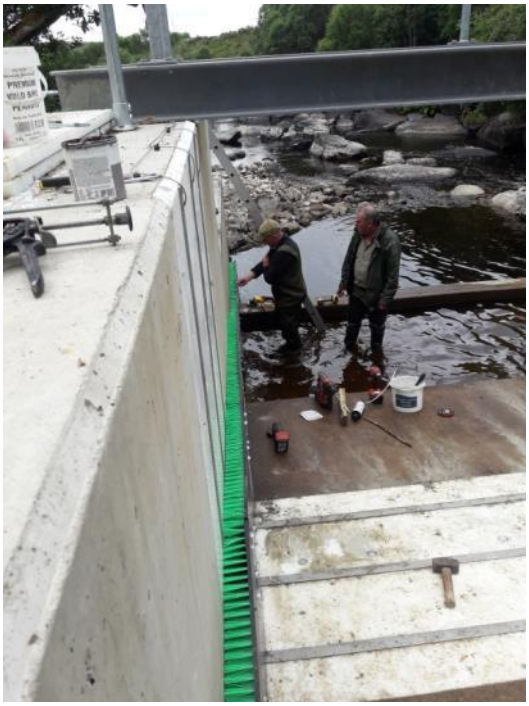
Elver passage improvement works at the two remaining salmon counter sites in the NWRBD on the Eske and Eany rivers will be completed in 2019.

Management Action 4. Improve Water Quality

Staff continued to monitor water quality throughout the NWRBD on an ongoing basis and appropriate action was taken where indicated.

Many thanks for taking the time to respond.

Setting Coghill nets at Urney at confluence of Erne and Annalee Rivers (November 2018)



Installation of elver bristle matting at R. Lackagh salmon counter in Co. Donegal (July 2018)

Eel Management Information 2018

River District Basin: **_Shannon_River Basin District**

Date: **1 Jan- 31 Dec 2018**

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 Shannon RBD remained closed throughout 2018.

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 Shannon RBD during 2018.

Estimated level of illegal fishing:

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred: North Kerry, Lough Derg, Derravaragh, Ree and Ennell.

Number of gear seizures: Gear types seized:

Insert quantity/length of gear seized

Lough Derg	Fyke Net	4	40	Freshwater
Lough Derravaragh	Fyke Net	14	350	Freshwater
Lough Derg	Fyke net	1	12	Freshwater
Lough Ree	Long-line	1	800	Freshwater
Lough Ree	Fyke Net	2	24	Freshwater
Lough Ree	Fyke Net	2	24	Freshwater
Lough Ree	Fyke Net	3	36	Freshwater
Lough Ree	Fyke Net	1	9	Freshwater
Lough Ree	Fyke Net	5	60	Freshwater
Lough Ree	Long Line	1	0	Freshwater
Lough Ennell	Fyke Net	1	5	Freshwater

River Shannon	Fyke Net	10	120	Freshwater
L Derravaragh	Fyke Net	5	75	Freshwater

Number of Eel Dealer Interceptions: **Nil**

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 is illegal activity ongoing on Lough's Ree, Ennell Derravaragh and Rooskey complex of lakes. There are reports of netting on the lower River Suck. Illegal longlining was observed on Lough Ree and a number of fykes seized on Ree, Ennell and Derravaragh.

On Lough Derg and the east Clare lakes while the seizures were down this year it is unlikely that the illegal activity has decreased also as there have been a number of incidents of unusual behavior by former licensed eel fishermen who have been encountered pike fishing on the lake.

Photo: 14 Fyke nets out to dry having been recovered from Lough Derravarragh


Photo: Seized Drum and Fyke nets L. Ree shoreline and Illegal longline seized L.Ree shoreline.



Photos: Surveillance of Lough Ree for illegal activity and recovering 10 Fyke nets from the River Shannon.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? Yes

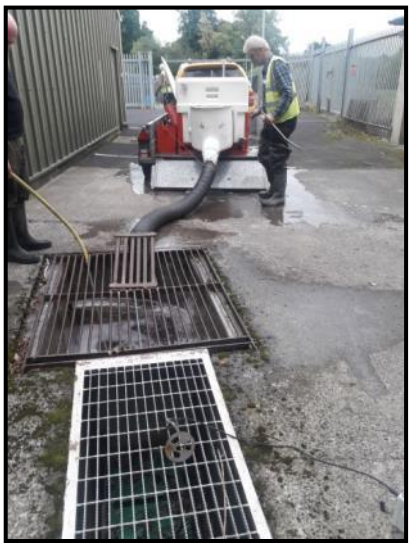
(If 'Yes', please insert quantity transported).

Athlone 7,872kgs (Jolly Mariner)

1,519kgs (yacht club)

Kilalloe 7,020kg (Kilalloe)

Total 16,411 kgs



Photos: Eel release at Parteen on the 17th October 2018.

What was the total catch transported (kg)?:

Yes – 16,411kgs – this covers the T&T program from Sept 2018 to March 2019

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

No

General impression of the programme:

The terms & conditions of the contracts need to be strictly adhered to regarding notifications of fishings, labelling of nets with ESB T&T and storage of nets in predetermined location. ESB need to provide terms of contracts (with relevant redactions if necessary), locations and storage maps **each** year, regardless of repetiton.

Management Action 3. Ensure Upstream Migration at Barriers

(List any sites etc where barriers were removed or elver access improved etc)

Rock ramp installed on the River Bunowen (Suck Catchment) at Ahascragh, Co. Galway.

Management Action 4. Improve Water Quality

(List any sites or actions which have significantly improved WQ to the benefit of eels)

IFI v Irish Water re Ballina WWTP

Many thanks for taking the time to respond.

Eel Management Information 2018

River District Basin: _____**SERBD**

Date: **1 Jan- 31 Dec 2018**

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 2018.

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 2018.

Estimated level of illegal fishing: **Nil**

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred:

Number of gear seizures: **Nil**

Gear types seized:

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions:NIL

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: **Nil**

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?

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

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

(List any sites etc where barriers were removed or elver access improved etc)

Management Action 4. Improve Water Quality

(List any sites or actions which have significantly improved WQ to the benefit of eels)

Many thanks for taking the time to respond.

Eel Management Information 2018

River District Basin: **South Western River Basin District (SWRBD)**

Date: **1 Jan- 31 Dec 2018**

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 South Western RBD remained closed throughout 2018.

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 South Western RBD during 2018.

Estimated level of illegal fishing:

Insert No. of alleged or confirmed reports : **Nil**

Main catchments where illegal activity occurred:

Number of gear seizures:

Nil

Gear types seized:

Insert quantity/length of gear seized : **Nil**

Number of Eel Dealer Interceptions: **Nil**

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:

No activity detected or suspected.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? **YES**

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

ESB reported 58 eels (no weights) transported to River Bride, plus a total of 790 gr of eels over 2 dates; also 9 dates when eels were reported in tank but no weights recorded.

What was the total catch transported (kg)? **Unknown**

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

(List any sites etc where barriers were removed or elver access improved etc): None

Management Action 4. Improve Water Quality

(List any sites or actions which have significantly improved WQ to the benefit of eels): None

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Many thanks for taking the time to respond.

Eel Management Information 2018

River District Basin: **Western River Basin District**

Date: **1 Jan- 31 Dec 2018**

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 2018.

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 2018.

Estimated level of illegal fishing: There was some evidence of low level of illegal eel fishing during 2018 in the WRBD.

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred: Lough Corrib at Moycullen Bay,11 May 2018 and on 1 June 2018 at Inisdooras, Cornamona area. Two Eels were also seized from anglers involved in recreational angling on the Cong River in July and a fyke net which was not fishing was also seized in the Cong area.

Number of gear seizures:

6

Gear types seized:

Insert quantity/length of gear seized

6 Fyke nets – 90m

Number of Eel Dealer Interceptions: Nil

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:

Overall, apart from the occasional fyke net, there has been very little evidence of any significant illegal eel fishing activity in the WRBD since the cessation of the commercial fishery.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? N/A

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

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

(List any sites etc where barriers were removed or elver access improved etc) N/A

Improvements to elver passage and counting facilities which had been installed at the Galway (Corrib), Moy and Ballisodare fisheries were operated during 2018.

Management Action 4. Improve Water Quality

(List any sites or actions which have significantly improved WQ to the benefit of eels)

Staff continued to monitor water quality throughout the WRBD on an ongoing basis and appropriate action was taken where indicated.

Many thanks for taking the time to respond.

Eel Management Information 2018

River District Basin: ERNE River Basin District

Date: 1 Jan- 31 Dec 2018

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 ERNE RBD remained closed throughout 2018.

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, NONE in ERNE RBD during 2018.

Estimated level of illegal fishing:

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred: No detections were made in respect of eel fishing in the Erne Catchment. (N.I)

Number of gear seizures: None Gear types seized: N/A

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions: None

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:

No reports have been received regarding illegal eel fishing activity in the Erne catchment (N.I). Enforcement staff have carried out targeted patrols to coincide with the silver eel migration and nothing untoward has been found.

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? Yes.

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

What was the total catch transported (kg)?: 46 436kg

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

None

General impression of the programme:

The programme appears to be operating successfully, with excellent working relationships with our colleagues in the RoI and commercial nets men.

Management Action 3. Ensure Upstream Migration at Barriers

(List any sites etc where barriers were removed or elver access improved etc)

None

Management Action 4. Improve Water Quality

(List any sites or actions which have significantly improved WQ to the benefit of eels)

None – NIEA WMU can advise on overall status.

Many thanks for taking the time to respond.

Appendix 5: Silver Eel Trap and Transport Tables: Erne, Shannon and Lee

Appendix 5- 1 River Shannon Silver Eel Weekly Collection Sheet 2018/19

River Shannon Silver Eel Weekly Collection Sheet 2018/19

Wk No.	Week Ending	Jolly Mariner, Athlone	Yacht Club, Athlone	Kilaloe Eel Weir	Others (see comment)	Total for Week
Catch Quota		8 Tonnes	2 Tonnes	No Quota		
1	01/09/18	0	0	Not Fishing		0
2	08/09/18	0	0	Not Fishing		0
3	15/09/18	0	0	Not fishing		0
4	22/09/18	334	0	Not Fishing		334
5	29/09/18	0	0	0		0
6	06/10/18	272	227	0		499
7	13/10/18	0	0	0		0
8	20/10/18	530	452	0		982
9	27/10/18	0	0	0		0
10	03/11/18	0	0	0		0
11	10/11/18	403	128	0		531
12	17/11/18	0	0	0		0
13	24/11/18	498	289	N/F		787
14	01/12/18	0	0	0		0
15	08/12/18	847	100	223		1170
16	15/12/18	450	0	1745		2195
17	22/12/18	1881	323	940		3144
18	29/12/18	0	N/F	400		400
19	05/01/19	1897	N/F	620		2517
20	12/01/19	0	N/F	164		164
21	19/01/19	760	N/F	N/F		760
22	26/01/19	N/F	N/F	N/F		0
23	02/02/19	N/F	N/F	0		0
24	09/02/19	N/F	N/F	54		54
25	16/02/19	N/F	N/F	89		89
26	23/02/19	N/F	N/F	0		0
27	02/03/19	N/F	N/F	0		0
28	09/03/19	N/F	N/F	280		280
29	16/03/19	N/F	N/F	840		840
30	23/03/19	N/F	N/F	820		820
31	30/03/19	N/F	N/F	845		845
Total (kgs)		**7872**	**1519**	**7020**	**0**	**16411**

Appendix 5- 2 River Erne Silver Eel Weekly Collection Sheet 2018/19

River Erne Silver Eel Weekly Collection Sheet 2018/19

Week No.	Week Ending	Lisnaskea	Ferny Gap	Portora	Urney Bridge	Roscor Bridge	Lough Gowna	Total for Week
1	**01/09/2018**	0	0	0	0	0	0	0
2	**08/09/2018**	0	512	388	0	0	0	900
3	**15/09/2018**	416	600	340	0	0	0	1356
4	**22/09/2018**	268	706	542	0	0	0	1516
5	**29/09/2018**	165	217	517	0	0	0	899
6	**06/10/2018**	0	1188	0	263	0	0	1451
7	**13/10/2018**	0	1880	0	0	0	0	1880
8	**20/10/2018**	389	1037	1698	185	876	0	4085
9	**27/10/2018**	0	0	0	0	0	0	0
10	**03/11/2018**	353	0	0	0	0	0	353
11	**10/11/2018**	359	4022	1200	275	183	0	6039
12	**17/11/2018**	1525	3039	1894	2330	704	2462	11954
13	**24/11/2018**	981	416	522	832	291	1272	4314
14	**01/12/2018**	190	1321	191	0	0	0	1702
15	**08/12/2018**	0	460	368	426	261	0	1515
16	**15/12/2018**	941	301	357	601	883	1073	4156
17	**22/12/2018**	666	0	173	353	748	1841	3781
18	**29/12/2018**	N/F	0	N/F	N/F	0	N/F	0
19	**05/01/2019**	N/F	0	N/F	N/F	535	N/F	535
20	**12/01/2019**	N/F	411	N/F	N/F	57	N/F	468
21	**19/01/2019**							
Total to Date(kgs)		**6253**	**16110**	**8190**	**5265**	**4538**	**6648**	**47004**

Appendix 5- 3 River Lee Silver Eel Weekly Collection Sheet 2018/19

Week No.	Week Ending	Inniscarra Reservoir	Comment
1	**31/08/2018**	35	Released at Iniscarra Graveyard
Total to Date(kg)		**35**	

Appendix 6: Water Framework Directive

Appendix 6-1 WFD Lake summary data, 2017

RBD	Catchments	Lake name	No. Night	No. Net	No. Eels	CPUE	Average Length	Min Length (cm)	Max Length (cm)	Average weight (kg)	Min weight (kg)	Max Weight (kg)	Total Weight (kg)
SWRBD	Caragh	Acoose, Lough	2	9	6	0.67	42.45	33.7	51.4	0.138	0.058	0.232	0.828
WRBD	Owenriff	Agraffard, Lough	2	9	3	0.33	67.43	61.3	72.5	0.571	0.46	0.653	1.713
SWRBD	Lee	Allua, Lough	2	9	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NWIRBD	Lackagh	Beagh, Lough	2	9	11	1.22	41.56	33	49.3	0.125	0.062	0.207	1.378
WRBD	Owenriff	Bofin, Lough	2	9	3	0.33	68	61.5	72	0.573	0.436	0.653	1.72
SHIRBD	Fergus	Bridget, Lough	2	9	7	0.78	49.40	35	60.5	0.234	0.063	0.392	1.639
SWRBD	Blackwater	Brin, Lough	1	6	5	0.83	51.06	43.2	68.7	0.273	0.122	0.7	1.37
SWRBD	Caragh	Caragh, Lough	2	9	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WRBD	Owenmore	Carrowmore, Lake	2	18	13	0.72	39.53	30.30	60.5	0.122	0.055	0.375	1.590
NWIRBD	Erne	Corglass, Lough	2	9	2	0.22	56.25	49.00	63.5	0.348	0.219	0.477	0.696
SHIRBD	Inny	Derravaragh, Lough	3	18	6	0.33	66.38	56	72.8	0.563	0.324	0.812	3.380
NWIRBD	Owenmore	Derrybrick, Lough	1	6	2	0.33	61.8	59.7	63.9	0.487	0.486	0.489	0.975
WRBD	Easky	Easky, Lough	1	9	7	0.78	45.71	33	82	0.239	0.069	0.927	1.674
SHIRBD	Shannon	Ennell, Lough	3	18	2	0.11	51	48	54	0.242	0.202	0.283	0.485
NWIRBD	Leannan	Fern, Lough	2	9	13	1.44	35.93	30	51.2	0.089	0.043	0.248	1.166
WRBD	Garvogue	Gill, Lough	3	18	22	1.22	48.15	34.00	62.5	0.210	0.078	0.433	4.629
NWIRBD	Erne	Glasshouse, Lough	2	9	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SWRBD	Coastal	Glenbeg Lough	2	9	13	1.44	41.89	30.10	50.4	0.121	0.050	0.195	1.579
WRBD	Bundorragha	Glencullin, Lough	1	6	11	1.83	48.4	38.60	68	0.226	0.098	0.544	2.489
SWRBD	Laune	Leane, Lough	3	18	18	1	40.65	28.3	61	0.128	0.036	0.385	2.311
NWIRBD	Drowes	Melvin, Lough	3	24	26	1.08	39.2	22	52.1	0.11	0.041	0.244	2.868

RBD	Catchments	Lake name	No. Night	No. Net	No. Eels	CPUE	Average Length	Min Length (cm)	Max Length (cm)	Average weight (kg)	Min weight (kg)	Max Weight (kg)	Total Weight (kg)
ERBD	Boyne	Skeagh (Upper), Lough	2	9	19	2.11	48.02	36.5	59	0.188	0.073	0.403	3.573
SHIRBD	Inny	Sheelin, Lough	5	36	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WRBD	Moy	Talt, Lough	2	9	1	0.11	56	56	56	1.91	1.91	1.91	1.91

Appendix 6-2 WFD Lake length frequency data, 2017

RBD	Catchments	Lake name	No. Eels	20-29cm	30-39cm	40-49cm	50-59cm	60-69cm	70-79cm	>80cm
SWRBD	Caragh	Acoose, Lough	6	0	2	2	2	0	0	0
WRBD	Owenriff	Agraffard, Lough	3	0	0	0	0	2	1	0
SWRBD	Lee	Allua, Lough	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NWIRBD	Lackagh	Beagh, Lough	11	0	5	6	0	0	0	0
WRBD	Owenriff	Bofin, Lough	3	0	0	0	0	1	2	0
SHIRBD	Fergus	Bridget, Lough	7	0	1	2	3	1	0	0
SWRBD	Blackwater	Brin, Lough	5	0	0	4	0	1	0	0
SWRBD	Caragh	Caragh, Lough	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WRBD	Owenmore	Carrowmore, Lake	13	0	8	4	0	1	0	0
NWIRBD	Erne	Corglass, Lough	2	0	0	1	0	1	0	0
SHIRBD	Inny	Derravaragh, Lough	6	0	0	0	1	2	3	0
NWIRBD	Owenmore	Derrybrick, Lough	2	0	0	0	1	1	0	0
WRBD	Easky	Easky, Lough	7	0	4	2	0	0	0	1
SHIRBD	Shannon	Ennell, Lough	2	0	0	1	1	0	0	0
NWIRBD	Leannan	Fern, Lough	13	0	11	1	1	0	0	0
WRBD	Garvogue	Gill, Lough	22	0	3	11	7	1	0	0
NWIRBD	Erne	Glasshouse, Lough	0	0	6	5	2	0	0	0
SWRBD	Coastal	Glenbeg Lough	0	0	0	0	0	0	0	0
WRBD	Bundorragha	Glencullin, Lough	11	0	2	6	0	3	0	0
SWRBD	Laune	Leane, Lough	18	1	8	7	1	1	0	0
NWIRBD	Drowes	Melvin, Lough	26	1	13	11	1	0	0	0
ERBD	Boyne	Skeagh (Upper), Lough	19	0	4	8	7	0	0	0
SHIRBD	Inny	Sheelin, Lough	0	0	0	0	0	0	0	0

RBD	Catchments	Lake name	No. Eels	20-29cm	30-39cm	40-49cm	50-59cm	60-69cm	70-79cm	>80cm
WRBD	Moy	Talt, Lough	1	0	0	0	1	0	0	0

Appendix 6-3 Summary data from WFD Rivers Survey, 2017

RBD	Catchment	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
ERBD	Broadmeadow	Broadmeadow	Balheary Demesne Br._A	1[t]	1[t]	246	0.0081	2	n.a.
ERBD	Broadmeadow	Broadmeadow	Lispopple Br._B	1[t]	1[t]	285	0.0035	1	n.a.
SWRBD	Caragh	Caragh (Caraghbeg) River	Carraghbeg Br_A	1[t]	1[t]	371	0.0027	1	n.a.
SWRBD	Caragh	Caragh River	Dromteewakeen_A	1[t]	1[t]	159	0.0063	1	n.a.
NBIRBD	Castletown	Castletown (Balregan) River	Killin Church_A	1[t]	1[t]	121	0.0165	2	n.a.
NBIRBD	Castletown	Castletown (Kilcurry) River	Kilcurry_A	1[t]	1[t]	292	0.0034	1	n.a.
NBIRBD	Castletown	Castletown River	Fords Br._A	1[t]	1[t]	329	0.0304	10	n.a.
NBIRBD	Castletown	Castletown River	Hackballs Cross_A	1[t]	1[t]	224	0.0045	1	n.a.
SERBD	Colligan	Colligan (Knockanpower) River	Knockanpower Lower_A	1[t]	1[t]	85	0.0118	1	n.a.
SERBD	Colligan	Colligan River	Br. nr Killadangan_A	1[t]	1[t]	187	0.0160	3	n.a.
SERBD	Colligan	Colligan River	Colliganwood_A	1[t]	1[t]	172	0.0407	7	n.a.
SERBD	Colligan	Colligan River	Glennaneane_A	1[t]	1[t]	146	0.0068	1	n.a.
SHIRBD	Creegh	Creegh River	Clooneenagh_A	1[t]	1[t]	112	0.0089	1	n.a.
SHIRBD	Creegh	Creegh River	Cragnashingaun_A	1[t]	1[t]	82	0.0122	1	n.a.
SHIRBD	Creegh	Creegh River	Drumellihy Br._A	1[t]	1[t]	211	0.0190	4	n.a.
SHIRBD	Creegh	Creegh River	Drumellihy North_A	1[t]	1[t]	64	0.0156	1	n.a.

RBD	Catchment	River Name	River Site	No. Sets	No. Runs	Area (m^2)	Density (no./m^2)	No. Eels	Total Weight (kg)
ERBD	Delvin	Delvin River	d/s M1 Br._A	1[t]	1[t]	218	0.0046	1	n.a.
ERBD	Delvin	Delvin River	Knocknagin_A	1[t]	1[t]	213	0.0047	1	n.a.
ERBD	Delvin	Delvin River	Stamullin_A	1[t]	1[t]	209	0.0096	2	n.a.
ERBD	Delvin	Delvin River	Tobertaskin_A	1[t]	1[t]	106	0.0094	1	n.a.
SERBD	Nore	Dinin (Douglas) River	Corbetstown_A	1[t]	1[t]	144	0.0069	1	n.a.
SWRBD	Blackwater	Finisk River	Modelligo Br._A	1[t]	1[t]	297	0.0067	2	n.a.
WRBD	Glenamoy	Glenamoy (Gortleatilla) River	Bunalty East_A	1[t]	1[t]	63	0.0159	1	n.a.
WRBD	Glenamoy	Glenamoy (Srahnaplaia) River	Srahnaplaia_A	1[t]	1[t]	168	0.0179	3	n.a.
WRBD	Glenamoy	Glenamoy River	Glenamoy Village_A	1[t]	1[t]	489	0.0041	2	n.a.
ERBD	Ovoca	Glenealo River	Br. d/s upper lake_A	1[t]	1[t]	241	0.0041	1	n.a.
SHIRBD	Fergus	Inch (Kilmaley) River	Kilmaley Br_A	1[t]	1[t]	234	0.0043	1	n.a.
NWIRBD	Leannan	Leannan River	Aghawoney_A	1[t]	1[t]	533	0.0038	2	n.a.
NWIRBD	Owentocker	Owentocker River	Lurganboy_A	1[t]	1[t]	134	0.0075	1	n.a.
NWIRBD	Swilly	Swilly River	Swilly Br. (near Breenagh)_A	2	3	262	0.0076	2	n.a.
ERBD	Tolka	Tolka River	St Mobhi Drive_A	1[t]	1[t]	636	0.0016	1	n.a.
ERBD	Tolka	Tolka River	Violet Hill Drive_A	1[t]	1[t]	249	0.0040	1	n.a.
SERBD	Urrin	Urrin River	Mangan Lane_A	1[t]	1[t]	333	0.0030	1	n.a.
SERBD	Urrin	Urrin River	Tomduff SW_A	1[t]	1[t]	296	0.0034	1	n.a.
ERBD	Vartry	Vartry (Carrick) River	Monduff_A	1[t]	1[t]	80	0.0125	1	n.a.
ERBD	Vartry	Vartry River	Ashford Br._A	1[t]	1[t]	363	0.0523	19	n.a.
ERBD	Vartry	Vartry River	Newrath Br._A	1[t]	1[t]	338	0.1095	37	n.a.
ERBD	Vartry	Vartry River	Nun's Cross Br._A	1[t]	1[t]	326	0.0613	20	n.a.
ERBD	Ward	Ward River	Mill Br._A	1[t]	1[t]	181	0.0221	4	n.a.
ERBD	Ward	Ward River	Westerleave SW_A	1[t]	1[t]	165	0.0061	1	n.a.

Appendix 6-4 Length frequency data from WFD River Surveys, 2017

RBD	Catchments	River Name	River Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Broadmeadow	Broadmeadow	Balheary Demesne Br._A	2	0	2	0	0	0	0	0	0	0
ERBD	Broadmeadow	Broadmeadow	Lispopple Br._B	1	0	1	0	0	0	0	0	0	0
SWRBD	Caragh	Caragh (Caraghbeg) River	Carraghbeg Br_A	1	0	0	0	0	1	0	0	0	0
SWRBD	Caragh	Caragh River	Dromteewakeen_A	1	0	0	0	1	0	0	0	0	0
NBIRBD	Castletown	Castletown (Balregan) River	Killin Church_A	2	1	0	1	0	0	0	0	0	0
NBIRBD	Castletown	Castletown (Kilcurry) River	Kilcurry_A	1	0	0	0	1	0	0	0	0	0
NBIRBD	Castletown	Castletown River	Fords Br._A	10	1	4	4	1	0	0	0	0	0
NBIRBD	Castletown	Castletown River	Hackballs Cross_A	1	0	0	0	0	0	0	1	0	0
SERBD	Colligan	Colligan (Knockanpower) River	Knockanpower Lower_A	1	0	0	1	0	0	0	0	0	0
SERBD	Colligan	Colligan River	Br. nr Killadangan_A	3	0	1	1	1	0	0	0	0	0
SERBD	Colligan	Colligan River	Colliganwood_A	7	1	4	2	0	0	0	0	0	0
SERBD	Colligan	Colligan River	Glennaneane_A	1	0	0	1	0	0	0	0	0	0
SHIRBD	Creegh	Creegh River	Clooneenagh_A	1	0	0	1	0	0	0	0	0	0
SHIRBD	Creegh	Creegh River	Cragnashingaun_A	1	0	1	0	0	0	0	0	0	0
SHIRBD	Creegh	Creegh River	Drumellihy Br._A	4	0	3	0	1	0	0	0	0	0
SHIRBD	Creegh	Creegh River	Drumellihy North_A	1	0	0	1	0	0	0	0	0	0
ERBD	Delvin	Delvin River	d/s M1 Br._A	1	0	1	0	0	0	0	0	0	0
ERBD	Delvin	Delvin River	Knocknagin_A	1	0	0	1	0	0	0	0	0	0

RBD	Catchments	River Name	River Site	No. Eels	5-9 cm	10-19 cm	20-29 cm	30-39 cm	40-49 cm	50-59 cm	60-69 cm	70-79 cm	>80 cm
ERBD	Delvin	Delvin River	Stamullin_A	2	0	1	0	1	0	0	0	0	0
ERBD	Delvin	Delvin River	Tobertaskin_A	1	0	0	1	0	0	0	0	0	0
SERBD	Nore	Dinin (Douglas) River	Corbetstown_A	1	0	0	0	1	0	0	0	0	0
SWRBD	Blackwater	Finisk River	Modelligo Br._A	2	0	1	1	0	0	0	0	0	0
WRBD	Glenamoy	Glenamoy (Gortleatilla) River	Bunalty East_A	1	0	1	0	0	0	0	0	0	0
WRBD	Glenamoy	Glenamoy (Srahnaplaia) River	Srahnaplaia_A	3	0	0	2	1	0	0	0	0	0
WRBD	Glenamoy	Glenamoy River	Glenamoy Village_A	2	1	1	0	0	0	0	0	0	0
ERBD	Ovoca	Glenealo River	Br. d/s upper lake_A	1	0	0	0	1	0	0	0	0	0
SHIRBD	Fergus	Inch (Kilmaley) River	Kilmaley Br_A	1	0	0	0	1	0	0	0	0	0
NWIRBD	Leannan	Leannan River	Aghawoney_A	2	0	2	0	0	0	0	0	0	0
NWIRBD	Owentocker	Owentocker River	Lurganboy_A	1	0	1	0	0	0	0	0	0	0
NWIRBD	Swilly	Swilly River	Swilly Br. (near Breenagh)_A	2	0	2	0	0	0	0	0	0	0
ERBD	Tolka	Tolka River	St Mobhi Drive_A	1	0	0	1	0	0	0	0	0	0
ERBD	Tolka	Tolka River	Violet Hill Drive_A	1	0	0	1	0	0	0	0	0	0
SERBD	Urrin	Urrin River	Mangan Lane_A	1	0	1	0	0	0	0	0	0	0
SERBD	Urrin	Urrin River	Tomduff SW_A	1	0	1	0	0	0	0	0	0	0
ERBD	Vartry	Vartry (Carrick) River	Monduff_A	1	0	1	0	0	0	0	0	0	0
ERBD	Vartry	Vartry River	Ashford Br._A	19	6	10	3	0	0	0	0	0	0
ERBD	Vartry	Vartry River	Newrath Br._A	37	4	31	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
ERBD	Vartry	Vartry River	Nun's Cross Br._A	20	0	9	8	3	0	0	0	0	0
ERBD	Ward	Ward River	Mill Br._A	4	0	1	2	1	0	0	0	0	0
ERBD	Ward	Ward River	Westerleave SW_A	1	0	0	1	0	0	0	0	0	0

Appendix 6-5 Summary length and weight data from WFD Rivers Surveys, 2017

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	Broadmeadow	Broadmeadow	Balheary Demesne Br._A	11	11	11	n.a	n.a	n.a	n.a
ERBD	Broadmeadow	Broadmeadow	Lispopple Br._B	16	16	16	n.a	n.a	n.a	n.a
SWRBD	Caragh	Caragh (Caraghbeg) River	Carraghbeg Br_A	43.5	43.5	43.5	n.a	n.a	n.a	n.a
SWRBD	Caragh	Caragh River	Dromteewakeen_A	34	34	34	n.a	n.a	n.a	n.a
NBIRBD	Castletown	Castletown (Balregan) River	Killin Church_A	15.5	9	22	n.a	n.a	n.a	n.a
NBIRBD	Castletown	Castletown (Kilcurry) River	Kilcurry_A	31	31	31	n.a	n.a	n.a	n.a
NBIRBD	Castletown	Castletown River	Fords Br._A	22.08	7.7	37	n.a	n.a	n.a	n.a
NBIRBD	Castletown	Castletown River	Hackballs Cross_A	60	60	60	n.a	n.a	n.a	n.a
SERBD	Colligan	Colligan (Knockanpower) River	Knockanpower Lower_A	29	29	29	n.a	n.a	n.a	n.a
SERBD	Colligan	Colligan River	Br. nr Killadangan_A	23.3	14	32	n.a	n.a	n.a	n.a
SERBD	Colligan	Colligan River	Colliganwood_A	16.42	9	26	n.a	n.a	n.a	n.a
SERBD	Colligan	Colligan River	Glennaneane_A	25	25	25	n.a	n.a	n.a	n.a
SHIRBD	Creegh	Creegh River	Clooneenagh_A	29.5	29.5	29.5	n.a	n.a	n.a	n.a
SHIRBD	Creegh	Creegh River	Cragnashingaun_A	16.5	16.5	16.5	n.a	n.a	n.a	n.a
SHIRBD	Creegh	Creegh River	Drumellihy Br._A	17.25	11	31	n.a	n.a	n.a	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)
SHIRBD	Creegh	Creegh River	Drumellihy North_A	21	21	21	n.a	n.a	n.a	n.a
ERBD	Delvin	Delvin River	d/s M1 Br._A	11	11	11	n.a	n.a	n.a	n.a
ERBD	Delvin	Delvin River	Knocknagin_A	20	20	20	n.a	n.a	n.a	n.a
ERBD	Delvin	Delvin River	Stamullin_A	23.5	10	37	n.a	n.a	n.a	n.a
ERBD	Delvin	Delvin River	Tobertaskin_A	25	25	25	n.a	n.a	n.a	n.a
SERBD	Nore	Dinin (Douglas) River	Corbetstown_A	30.9	30.9	30.9	n.a	n.a	n.a	n.a
SWRBD	Blackwater	Finisk River	Modelligo Br._A	23	19.5	26.5	n.a	n.a	n.a	n.a
WRBD	Glenamoy	Glenamoy (Gortleatilla) River	Bunalty East_A	19	19	19	n.a	n.a	n.a	n.a
WRBD	Glenamoy	Glenamoy (Srahnaplaia) River	Srahnaplaia_A	27	24	31	n.a	n.a	n.a	n.a
WRBD	Glenamoy	Glenamoy River	Glenamoy Village_A	9.75	9.3	10.2	n.a	n.a	n.a	n.a
ERBD	Ovoca	Glenealo River	Br. d/s upper lake_A	37.5	37.5	37.5	0.079	0.079	0.079	0.079
SHIRBD	Fergus	Inch (Kilmaley) River	Kilmaley Br_A	31.3	31.3	31.3	0.083	0.083	0.083	0.083
NWIRBD	Leannan	Leannan River	Aghawoney_A	15.5	15	16	n.a	n.a	n.a	n.a
NWIRBD	Owentocker	Owentocker River	Lurganboy_A	17	17	17	n.a	n.a	n.a	n.a
NWIRBD	Swilly	Swilly River	Swilly Br. (near Breenagh)_A	16.25	15.5	17	n.a	n.a	n.a	n.a
ERBD	Tolka	Tolka River	St Mobhi Drive_A	29	29	29	n.a	n.a	n.a	n.a
ERBD	Tolka	Tolka River	Violet Hill Drive_A	20.5	20.5	20.5	n.a	n.a	n.a	n.a
SERBD	Urrin	Urrin River	Mangan Lane_A	10	10	10	n.a	n.a	n.a	n.a
SERBD	Urrin	Urrin River	Tomduff SW_A	11	11	11	n.a	n.a	n.a	n.a
ERBD	Vartry	Vartry (Carrick) River	Monduff_A	12	12	12	n.a	n.a	n.a	n.a
ERBD	Vartry	Vartry River	Ashford Br._A	13.06	7.8	26	n.a	n.a	n.a	n.a
ERBD	Vartry	Vartry River	Newrath Br._A	13.05	8	22	n.a	n.a	n.a	n.a
ERBD	Vartry	Vartry River	Nun's Cross Br._A	20.1	10.5	34	n.a	n.a	n.a	n.a
ERBD	Ward	Ward River	Mill Br._A	25.75	19	31	n.a	n.a	n.a	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)
ERBD	Ward	Ward River	Westerleave SW_A	28	28	28	n.a	n.a	n.a	n.a

Appendix 6-6 WFD Transitional Waters summary data, 2017

RBD	Catchments	Transitional Water	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)
ShIRBD	Shannon Estuary	Shannon Estuary, Upper	3	4	9	2.25	41.26	31	55
ShIRBD	Shannon Estuary	Fergus Estuary	3	3	3	1	42.83	41	44
ShIRBD	Shannon Estuary	Limerick Dock	1	2	8	4	36.96	30.2	43

Appendix 6-7 WFD transitional waters length frequency data, 2017

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
ShIRBD	Shannon Estuary	Shannon Estuary, Upper	9	0	0	0	4	3	2	0	0	0
ShIRBD	Shannon Estuary	Fergus Estuary	3	0	0	0	0	3	0	0	0	0
ShIRBD	Shannon Estuary	Limerick Dock	8	0	0	0	5	3	0	0	0	0