## **ACTIVITY REPORT**

## **OF THE**

# **TECHNICAL EXPERT GROUP ON EEL**

## 2021

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

June 2022

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 2024.
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.

### **Glossary of terms**

•	
Glass eel	Young, unpigmented eel, recruiting from the sea into continental waters. WGEE
	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 i
	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,	Intermediate sized eels, approx. 10-25 cm in length. These terms are most often used in
fingerling	relation to stocking. The exact size of the eels may vary considerably. Thus, it is a
0 0	confusing term.
Yellow eel	Life-stage resident in continental waters. Often defined as a sedentary phase, but
(Brown eel)	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
A societe d I Instruct	following spring.
Assisted Upstream	the practice of trapping and transporting juvenile eel within the same river catchment
Migration	to assist their upstream migration at difficult or impassable barriers, without
	significantly altering the production potential (Bbest) of the catchment
Eel River Basin or	"Member States shall identify and define the individual river basins lying within their
Eel Management	national territory that constitute natural habitats for the European eel (eel river basins)
Unit	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
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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. At a meeting of the EU Fisheries Council in January 2018 it was agreed to continue to report every 3 years until there is scientific evidence of recovery signs for the eel population across Europe.

The Irish Eel Management Plan submitted to the EU on the 9<sup>th</sup> 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, 2018 and 2021. Ireland is due to report again in 2024.

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 - 2021

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 2022:

"ICES advises that when the precautionary approach is applied, there should be zero catches in all habitats in 2022. This applies to both recreational and commercial catches and includes catches of glass eels for restocking and aquaculture.

All other anthropogenic mortalities should be minimized and eliminated where possible."

#### Stock development over time

"The status of European eel remains critical."

"Indices of both glass and yellow eel recruitment strongly declined from 1980 to 2011. Index values correspond to the recruitment as a percentage of the 1960–1979 geometric mean. Glass eel recruitment in the "North Sea" index area, was 0.6% in 2021 (provisional) and 0.9% in 2020 (final). In the "Elsewhere Europe" index series it was 5.4% in 2021 (provisional) and 7.1% in 2020 (final), based on the available

dataseries. For the yellow eel dataseries, recruitment for 2020 was 16% (final) of the 1960–1979 geometric mean; the 2021 data collection for yellow eel is ongoing. Time-series from 1980 to 2021 show that glass eel recruitment remains at a very low level."

#### National Advice

There were no requests for advice in 2021.

#### Irish EMP Management Actions 2021 -2024

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 2021 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 and the NorthWestern RBD. 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 64,784 kg.

In the **River Shannon** the trap and transport total of 18,751 kg represented 78.4% of silver eel production (using the escapement estimate 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 2021 season. The quantity (45,000 kg) transported for safe release at Ballyshannon represented 57% of the estimated silver eel production (78,876 kg) for the river system for the season.

In the 2021/2022 season, fishing took place on the River Lee sequentially at several different locations between 28th September and 28th October 2021. The total catch was 1,033 kg, which exceeds the annual target for the river of 500 kg. This is another good catch following a similar level in in 2019/20 (1,098 kg) and 2020/21 (1,082 kg). Additional effort in fishing was implemented in these years following a particularly low catch in 2018/19 (35kg).

For the *Shannon*, an estimated 21.15% mortality was applied to the 2021 data. The estimated silver eel mortality at Ardnacrusha hydropower station was 1,001 kg.

For the *Erne*, the estimated mortality at the dams was 15,590 kg in the 2021/2022 migration period. Total mortality was estimated to be 8,751 kg at Cliff and 6,839 kg at Cathaleen's Fall. The estimated mortality is 26.2% at Cliff and 27.3% at Cathaleen's Fall.

#### 3. Obstacles to migration

In relation to Management Objective 3 Obstacles to migratrion Ireland continues to identify barriers to migration, with reports of barrier mitigation being carried out around the country.

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

The EPA undertook a review of the monitoring programme used to report on status under the WFD directive.

There were 41 reported fish kills in 2021.

#### **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 2021.

#### Shannon

In 2020/21, conservation eel fishing was conducted at three sites, two at Athlone, and one at Killaloe.

A total of 16,626 kg of eels were caught at Athlone (15,727 kg at the Jolly Mariner site and 899 kg at the Yacht Club site), and a further 2,125 kg were caught at Killaloe, giving an overall trap and transport catch of 18,751 kg.

A total of 18,751 kg of eels were caught at Athlone (11,030 kg at Jolly Mariner and 1,819 kg at Yacht Club), and a further 8,380 kg were caught at Killaloe, giving an overall trap and transport catch of 21,229 kg.

Silver eel production was estimated to have been 23,903kg

#### Burrishoole

Silver eel trapping was continued in Burrishoole in 2021/22 and the total run amounted to 3,026 eels (end of March 2022); the highest since 2014. As in other years, the highest proportion of the total catch (81%) was made in the Salmon Leap trap. Almost 77% of the run was completed by the end of October with 50% of the run in the first 8 days of October.

#### Erne

The total catch contributed to the Trap and Transport programme was 45,000 kg. The silver eel production was estimated to be 78,876 kg with escapement estimated at 63,386 kg, 80.2% of the production.

#### Fane

In 2021, silver eel catches at the Fane Fishery were slightly up on 2020 numbers with a total catch of 550 kg (1,203 eels; Table 5-8) and 22 nights fished. Due to low water levels in September, fishing began in late October and continued until December.

#### R. Barrow

In 2021, after 20 nights of fishing, a total of 195.5 kg of silver eels were captured. This equated to 1,200 eels, with the majority of these (1,076 eels) being caught in October during moderate flood events.

#### Recruitment

For 2021 a value of 62.25 kg was caught at Ardnacrusha. Recruitment for the Erne in 2021 ended with 382 kg of elvers. Recruitment was low for other locations compared with previous year catch. From the ICES advice it appears that glass eel recruitment remains at a very low level for the time-series data from 1980 to 2021.

#### 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 9<sup>th</sup> 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. At a meeting of the EU Fisheries Council in January 2018 it was agreed to continue to report every 3 years until there is scientific evidence of recovery signs for the eel population across Europe. The most recent report, was submitted on the 30<sup>th</sup> August 2021 using the ICES datacall, addressing the following;

- monitoring time series of recruits, yellow eel abundance and silver eel abundance
- Commercial, recreational and other fishery landings
- Releases of eels to other waters
- Aquaculture production
- Overview of Eel management plan
- the effectiveness and outcome of the Eel Management Plans
- biomass indicators
- anthropogenic mortality rates
- use of eel caught of less than 12 cm in length

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 report on the evaluation is <u>available</u> on line. The overall conclusion is presented here:

The adoption of the Eel Regulation has been an important milestone in the long process towards the recovery of the European eel. It remains as relevant now as it was in 2009. Nevertheless, despite notable progress in reducing fishing effort and a concerted attempt to develop a pan-EU management framework, the status of eel remains critical. The Regulation's success in ensuring the recovery of the European eel is still far from certain, as it is widely recognised that the recovery of the European eel will take many decades. In this respect, further ambition is needed to implement the Regulation with a greater focus on non-fisheries related measures.

European Commission, Directorate-General for Maritime Affairs and Fisheries, MacNab, S., Luchetta, G., Nimmo, F., et al., *Evaluation of the Eel Regulation : final report*, Publications Office, 2020, <u>https://data.europa.eu/doi/10.2771/679816</u>

### **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 formed in 2017 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 eel 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 provide 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 the 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 times during the 2021/2022 to monitor and report on the 2021 survey year in addition to email correspondence.

30th November 2021	Zoom
16 <sup>th</sup> February 2022	Zoom
11 <sup>th</sup> April 2022	Zoom
20 <sup>th</sup> May 2022	Zoom
10 <sup>th</sup> June 2022	Zoom

#### 1.4 Impact of Covid-19

Yellow eel monitoring by the Marine Institute was back to normal in Burishoole in 2021. No tagging was carried out. The elver trap was also serviced as usual. Silver eel monitoring in the Burrishoole traps was continued with collection of key biological variables.

#### 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, manages advisory processes, and creates and delivers 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 2022

European Eel throughout its natural range (reproduced from the *ICES Advice* 2021, *ele.*2737.*nea* – *https://doi.org/10.17895/ices.advice.*7752

#### **ICES Advice on fishing opportunities**

ICES advises that when the precautionary approach is applied, there should be zero catches in all habitats in 2022. This applies to both recreational and commercial catches and includes catches of glass eels for restocking and aquaculture.

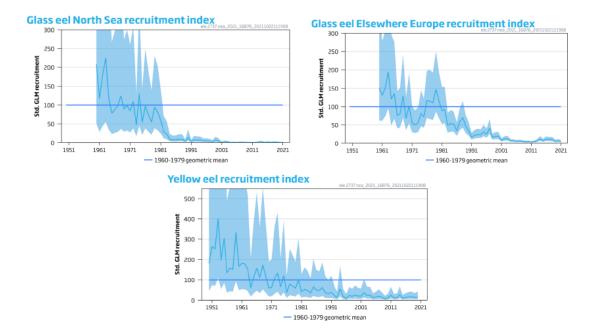
All other anthropogenic mortalities should be minimized and eliminated where possible.

#### Stock development over time

The status of European eel remains critical.

Indices of both glass and yellow eel recruitment strongly declined from 1980 to 2011. Index values correspond to the recruitment as a percentage of the 1960–1979 geometric mean. Glass eel recruitment in the "North Sea" index area, was 0.6% in 2021 (provisional) and 0.9% in 2020 (final). In the "Elsewhere Europe" index series it was 5.4% in 2021 (provisional) and 7.1% in 2020 (final), based on the available dataseries. For the yellow eel dataseries, recruitment for 2020 was 16% (final) of the 1960–1979 geometric mean; the 2021 data collection for yellow eel is ongoing. Timeseries from 1980 to 2021 show that glass eel recruitment remains at a very low level.

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. The 1960–1979 recruitment is considered as a likely limit reference point (Rlim). Given that the current Recruitment estimate has been below Rlim for many years, it is assumed that current biomass is below a likely Blim. Therefore, while stock-size reference points are also undefined, it is considered likely that the stock size is well below potential biological reference points.



**Figure 1 (ICES Advice):** European eel. Indices, geometric mean of estimated (generalized linear model; GLM) glass eel recruitment for the continental "North Sea" (top left panel) and "Elsewhere Europe" (top right panel) series. The GLM was fitted to 56 time-series comprising either pure glass eel or a mixture of glass and yellow eels (26 "North Sea" and 30 "Elsewhere Europe"). The GLM was scaled in percentage to the 1960–1979 geometric mean. The "North Sea" series are from Norway, Sweden, Germany, Denmark, the Netherlands, and Belgium; the "Elsewhere" series are from UK, Ireland, France, Spain, Portugal, and Italy. In the Baltic area, recruitment occurs at the yellow eel stage only, and series are thus not included in the glass eel recruitment index. Bottom panel: estimated (GLM) yellow eel recruitment trends for Europe. The GLM was fitted to 21 yellow eel time-series and scaled in percentage to the 1960–1979 geometric mean. The series are from Denmark, Germany, Ireland, Sweden, and UK.

#### **Basis of the Advice**

Table 1 European eel.	The basis of the advice.
Advice basis	Precautionary approach
Management plan	A management framework for eel within the EU was established in 2007 by Council Regulation (EC) No. 1100/2007 (EU, 2007) and the General Fisheries Commission for the Mediterranean (GFCM) adopted Recommendation GFCM/42/2018/1 (GFCM, 2018), establishing management measures for European eel ( <i>Anguilla anguilla</i> ) in the Mediterranean Sea. These management plans have not been evaluated by ICES for their conformity with the precautionary approach and, for this reason, have not been used as the basis for the advice.

#### **Catch Scenarios**

ICES is not in a position to provide catch scenarios in the absence of accurate catch information.

### **Basis of the Assessment**

Table 2         European eel, Basis of the assessment.							
ICES stock data category	3 ( <u>ICES, 2019b)</u>						
Assessment type Trend analysis, GLM of glass and yellow eel recruitment indices							
Input data	Glass eel and yellow eel recruitment indices (informed by 56 glass eel and 21 yellow eel time-series)						
Discards and bycatch	Not included						
Indicators	None						
Other information	None						
Working group	Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL)						

#### Link to Eel Advice 2021

ICES. 2021. European eel (*Anguilla anguilla*) throughout its natural range. *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, ele.2737. nea, <u>https://doi.org/10.17895/ices.advice.7752</u>.

There were no requests for ad hoc advice in 2021.

The TEGE group recommended that a workshop be held between relevant stakeholders to include DECC, IFI and ESB, etc to review the existing National Management Plan. During the EU review of the regulation held in 2019 it was noted that very few Member States had reviewded the plans in the intervening years.

#### Trade and movement of fish

TEGE reported in 2020 about concerns linked to the suspension of UK Glass eel Trade into Lough Neagh as a result of BREXIT and the consequential likely increase in the imports of French glass eel under the terms afforded by the Norther Ireland Protocol (by which N Ireland effectively remains in the EU for certain elements of Trade). In 2021 Lough Neagh received 2 shipments of glass eel from France; the first in February was 500 kgs from the Gironde, and the second delivery of 471 kgs in March from both the Gironde and the Vendee. This second delivery was noted as containing mortalities on arrival from the Vendee catches. In June 2021 under legal advice and associated UK CITES guidance the UK Govt re-opened internal UK trade in eels and extended the glass eel fishing season in SW England (Severn). A catch of 62 kgs of glass eel were driven to L. Neagh as the delivery had to go via a UK/EU Border Veterinary Inspection post for animal quality in Belfast Harbour, and NI airports are not registered for this. Inspections of this delivery by AFBI found declining water quality & macro-invertebrates (identified as Gammarus spp.) swimming amongst the glass eel raising additional concerns about the eel welfare and biosecurity protocols associated with this mode of. This differed markedly from the normal mode of transit involving the air freight of live glass eel in 1 kg cartons, on ice and devoid of water, which enhanced biosecurity protection significantly. Our concerns in relation to biosecurity and the importation of glass eels into the island of Ireland still stand.

#### 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 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 2021 season with no commercial or recreational licences issued (Appendix 3). The eel fishery, with the exception of the strictly managed L. Neagh, also remained closed in N. Ireland in 2021.

#### 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 and the Loughs Agency (Appendix 3), summarised into Table 4.1. Some illegal fishing was reported which led to some seizures of gear in the Shannon IRBD and the NorthWestIBD (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:

DAERA enforcement officers recovered a string of 3 fyke nets from upper lough erne in August 2021 – judging by the collection of Zebra Mussels on the nets they were belived to have been in situ for at least 4-5 years and not in recent use.

#### 4.2.4 Action 1b: Recreational Fishery

The Bye Law No CS 319 2015 prohibiting the possession of eel caught in Ireland expired in June 2018 and has not been renewed.

#### 4.2.5 Action 1c: Diversification of the Fishery

No update for 2021

Table 4-1 Details of illegal activity within the regions and transboundary Northern Ireland, 2021.

	ERBD	LA	DAERA	NWRBD	SHRBD	SERBD	SWRBD	WRBD Galway	WRBD Ballina
Silver T&T programme	No	No	Yes	Yes	Yes	No	Yes	No	No
Illegal trading related to T&T	No	No	No	No	No	No	No	No	No
Estimated level of illegal fishing	Low		None	Low	High	None	None	None	None
Number of gear seizures	0		1	1	10	0	0	0	0
Gear types seized			fyke	fyke		n.a.	n.a.	n.a.	n.a.
Number of eel dealer interceptions Estimated	0		0	0	0	0	0	0	0
tonnage on board	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Declared origin of cargos	n.a.		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

n.a.=not

applicable

#### 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 – 2021 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 2021 Trap and Transport Results

The total amounts of silver eel trapped and transported in each of the three rivers in 2021 are presented in Table 4-2 to 4-4. The separate detail sheets of the amounts transported from each site on each date are presented as an Appendix to this report (Appendix 4).

In the **River Shannon** the trap and transport total of 18,751 kg represented 78.4% of silver eel production (using the escapement estimate 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 2021 season. The quantity (45,000 kg) transported for safe release at Ballyshannon represented 57% of the estimated silver eel production (78,876 kg) for the river system for the season.

In the 2021/2022 season, fishing took place on the River Lee sequentially at several different locations between 28th September and 28th October 2021. The total catch was 1,033 kg, which exceeds the annual target for the river of 500 kg. This is another good catch following a similar level in in 2019/20 (1,098 kg) and 2020/21 (1,082 kg). Additional effort in fishing was implemented in these years following a particularly low catch in 2018/19 (35kg).

Year	Bbest	Bcurrent	HPS Mort kg	T&T Target	Amount Transported (kg)	Relation to target	3 yr Running Average
2009	74,382	66,788	4,095	30% of run	23,730	31%	31%
2010	68,920	60,170	8,210	30% of run	27,768	40%	36%
2011	65,558	57,885	7,673	30% of run	25,680	39%	37%
2012	67,931	58,836	9,095	30% of run	24,228	36%	38%
2013	79,970	70,775	9,195	30% of run	22,561	28%	34%
2014	70,725	62,980	6,950	30% of run	26,438	37%	34%
2015	70725*	65798*	4,656	30% of run	19,957	28.2%*	31%
2016	38,608	32,920	3,062	30% of run	16,711	43%	36%
2017	34,139	31,191	2,948	30% of run	16,737	49%	40%
2018	32,580	29,613	2,967	30% of run	16,411	50%	47%
2019	38,028	33,011	5,017	30% of run	11,853	31%	44%
2020	41,548	37,810	3,738	30% of run	21,229	51%	44%
2021	23,903	22,902	1,001	30% of run	18,751	78%	53%

Table 4-2: Total amounts (t) of silver eel trapped and transported in the Shannon, 2009-2021, and the success relative to the targets set in the EMPs.

					0 0		
Year	Bbest	Bcurrent	HPS Mort kg	T&T Target	Amount Transported (kg)	Relation to target	3 yr Running Average
2009			20,960	22t	9,383	42.6	
2010	41,232	37,942	3,047	34t	19,334	56.9	46.9
2011	42,855	40,011	2,394	39t	25,405	65.1	59.3
2012	67,666	57,366	10,215	50% of run	34,660	51%	51%
2013	73,330	64,285	8,809	50% of run	39,319	54%	52%
2014	72,493	66,525	5,859	50% of run	48,126	66%	57%
2015	78,034	71,650	6,333	50% of run	54,706	56%	59%
2016	62,871	51,377	11,494	50% of run	38,264	61%	61%
2017	68,810	58,539	10,271	50% of run	43,470	63%	60%
2018	83,033	68,244	14,896	50% of run	47,004	57%	60%
2019	66,175	54,209	11,966	50% of run	39,651	60%	60%
2020	65,263	56,885	8,378	50% of run	46,957	72%	63%
2021	78,876	62,286	15,590	50% of run	45,000	57%	63%

Table 4-3 Total amounts (t) of silver eel trapped and transported in the Erne 2009-2021, and the success relative to the targets set in the EMPs. Note change of target on the Erne in 2012.

Table 4-4 Total amounts (t) of silver eel trapped and transported in the Lee 2009-2021, and the success relative to the targets set in the EMPs.

Year	Bbest	Bcurrent	HPS Mort kg	T&T Target	Amount Transported (kg)	Relation to target	3 yr Running Average
2009				0.5t	79	16%	16%
2010				0.5t	278	56%	36%
2011				0.5t	731	146%	73%
2012				0.5t	230	46%	83%
2013				0.5t	824	165%	119%
2014				0.5t	670	134%	115%
2015				0.5t	527	105%	135%
2016				0.5t	44	9%	83%
2017				0.5t	542	108%	74%
2018				0.5t	35	7%	41%
2019				0.5t	1,098	220%	112%
2020				0.5t	1,082	216%	148%
2021				0.5t	1,033	207%	214%

#### 4.3.1.2 Improvements to T+T programme

No update for 2021

#### 4.3.2 Action 2b: Quantify Turbine Mortality

4.3.2.1 Shannon

No update for 2021

4.3.2.2 Erne

No update for 2021

#### 4.3.3 Action 2c: Engineered Solution

No update for 2021, in the Erne system the ESB have plans for smolt gates and surface deflection gate installation. Following planning and design it is expected construction will take place in 2024. In the lower Shannon an investigation by CDM Smith on mitigating fish passage is in progress, the report is with the Department of Housing, Local Government and Heritage.

#### 4.3.4 Action 2c: Other solutions

No update for 2021

#### 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 73,092 potential barriers, which are being assessed using field surveys and desk-based analysis photographs or video of barrier sites. Using the IFI developed I-BAST application to date 25,868 structures have been assessed, 19,547 were classified as being not a barrier with 6,321 classified as a potential barrier requiring further work. Detailed assessments using the SNIFFER survey have been carried out on 207 structures in advance of mitigation works (Figure 4-1).

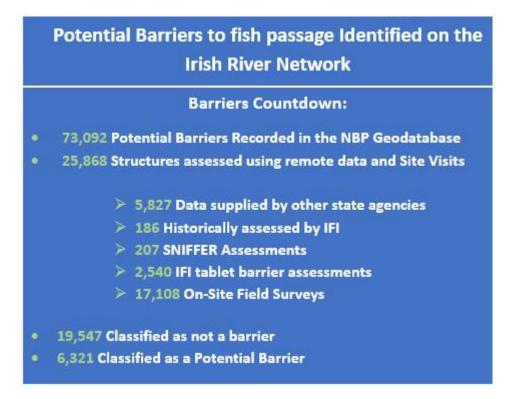


Figure 4-1 Summary description of barrier identification & mitigation.

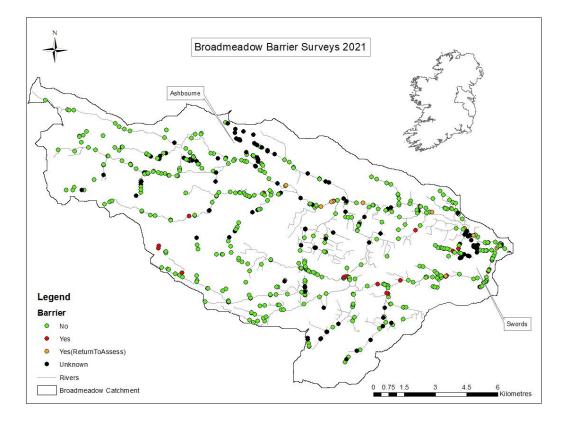
Over the last number of years the IFI Eel Monitoring Programme has assisted the NBP in assessing barriers in the eel index catchments, including the Fane and Kells Blackwater. In 2021, a further collaborative effort saw an assessment of the potential barriers on the River Broadmeadow carried out by the EMP. A total of 637 sites were assessed. Of these 21 were recorded as barriers and were marked for further assessment, the remaining 616 were either not barriers to fish migration (n = 461) or were marked for further assessment at a later date (n = 155), (Figure 4-2).

#### 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 2020. The catches shown in Tables 7.1 and 7-4 were transported upstream. On the Erne, the distribution of elvers throughout the catchment is by cross-border agreement between IFI and DAERA.



### Figure 4-2 Barriers assessed on the Broadmeadow River catchment, 2021. Inset: Map of Ireland, with Eastern River Basin District (ERBD), (outlined) and Broadmeadow catchment (shaded).

#### 4.5 Management Action No. 4 Improve water quality

#### 4.5.1 General water quality – Compliance with the Water Framework Directive

The EPA undertook a <u>review</u> of the national monitoring programme. The purpose of the report is to summarise the main findings of the review and to present the structure and content of the revised national WFD monitoring programme for Ireland for the period 2019-2021.

https://www.epa.ie/publications/monitoring--assessment/freshwater-marine/EPA\_WFD\_MonitoringProgramme\_2019\_2021-(1).pdf

#### 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 <u>http://wfdfish.ie/</u>.

Results from 2020 are reported in section 6.4 of this report.

#### 4.5.3 **Fish Kills**

National fish kills are reported in the IFI annual reports and published online. A review of the data was carried out recently and the numbers in the table will have changed from previous TEGE reports.

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

There were 41 reported fish kills in 2021 (Table 4-5).

Year	No of Fish Kills
2007	18
2008	27
2009	13
2010	34
2011	26
2012	10
2013	36
2014	22
2015	23
2016	30
2017	14
2018	39
2019	20
2020	5
2021	41

#### Table 4-5 Fish kill data 2007 – 2021.

#### 4.5.4 Prevalence of Anguillicola crassus

Considered ubiquitous across Europe and since last reported (Becerra-Jurado et al., 2014) it continues to spread through Irish water courses.

#### 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). Figure 5-1 shows the sampling locations in 2021.

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 and Barrow system by Inland Fisheries Ireland.

Catchment	Priority	2021	2022	2023	Method
Erne	High	$\checkmark$	$\checkmark$	$\checkmark$	Coghill net / Mark-recapture
Shannon	High	$\checkmark$	$\checkmark$	$\checkmark$	Coghill net / Mark-recapture
Burrishoole	High	$\checkmark$	$\checkmark$	$\checkmark$	Trap
Fane	High	$\checkmark$	$\checkmark$	$\checkmark$	Coghill net / Mark-recapture
Barrow	High	$\checkmark$	$\checkmark$	$\checkmark$	Coghill net / Mark-recapture

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

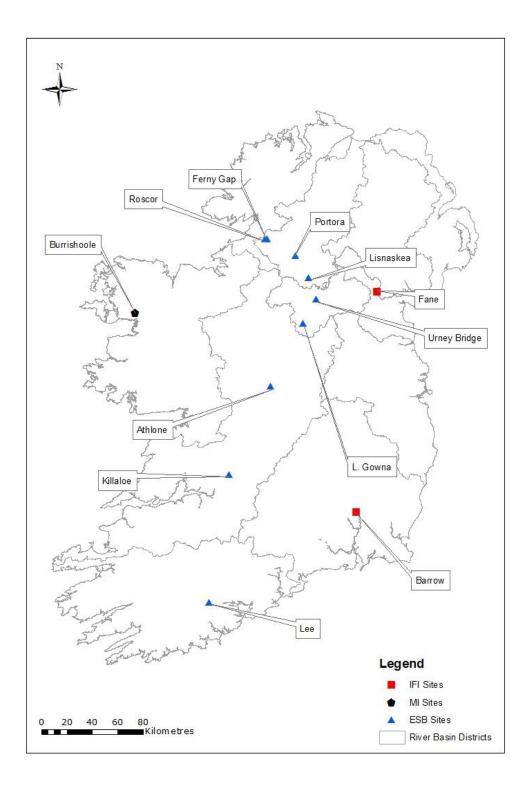


Figure 5-1 Silver eel monitoring locations, 2021. \*Roscor site was not fished for the 2021 season

#### 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 2021/22 conservation eel fishing was conducted at three sites, two at Athlone, and one at Killaloe (Figure 5-2). Fishing began on 30th August 2021 at Athlone and 7th September 2021 at Killaloe. Fishing ceased at Athlone on 12th December 2021, but continued at Killaloe until 12th February 2022. A total of 16,626 kg of eels were caught at Athlone (15,727 kg at the Jolly Mariner site and 899 kg at the Yacht Club site), and a further 2,125 kg were caught at Killaloe, giving an overall trap and transport catch of 18,751 kg (Figure 5-3). The overall trap and transport capture in 2021/22 is similar to captures from the previous 3 years (2020/21 = 21,229 kg, 2019/20 = 11,853 kg, 2018/19 = 16,411 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. Discharge was variable during the season with little spillage. Highest catches were recorded during the new moon in early January 2022, which coincided with a period of relatively high discharge.

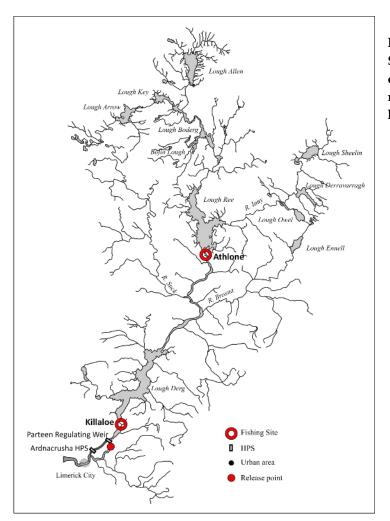


Figure 5-2 Map of River Shannon catchment with conservation fishing sites, release point and hydropower dams indicated.

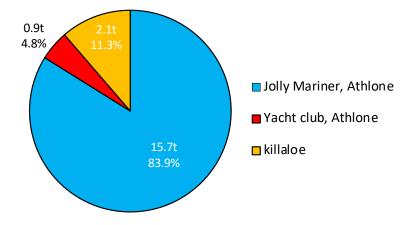


Figure 5-3 The relative quantities of silver eels contributed by fishing crews to the River Shannon T&T during the 2021/2022 season

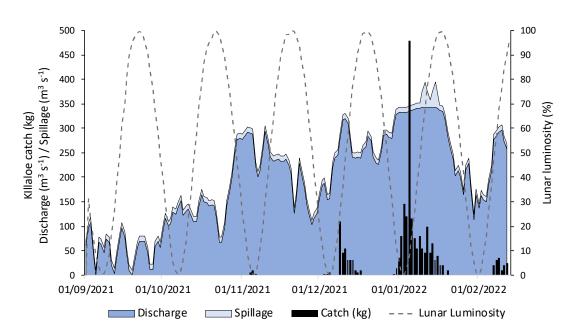


Figure 5-4 The seasonal variation in daily catches at the Killaloe eel weir during the 2021/22 fishing season together with variation in discharge via Ardnacrusha and as spillage to the Old River Shannon channel

#### 5.2.2 Mark Recapture

No update for 2021

#### 5.2.3 **Production and Escapement**

Production and escapement figures for the River Shannon are summarised in the flow diagram (Figure 5-5). Production of 23,903 kg is estimated by the trap and transport catch at

Killaloe using the fishing efficiency rate of 29.2%, together with the catch from the two Athlone sites. This fishing efficiency rate at Killaloe is based on Mark-Recapture experiments (n = 14) conducted by NUIG from 2016/17 – 2019/20. In total 18,751 kg (78.4% of production) was moved beyond the hydropower station through trap and transport. Of the 5,152 kg that moved beyond Killaloe weir, it is estimated that 418 kg (8.1%) migrated via the Old River Channel. This is determined by the amount of spillage to the Old River Channel, using a regression model based on historical telemetry studies of route selection. An estimated 21.15% mortality (1,001 kg) at Ardnacrusha hydropower station of the 4,734 kg that entered the headrace, leaves 3,733 kg progressing downstream. This gives an escapement of 22,902 kg, or 95.8% of production. Current and annual figures for production and escapement for the Shannon are shown in Table 5-2. An explanation of how calculations are carried out is available in Appendix 5 Figure A5-1.

Year	Production (kg)	Escapement (kg)	% of Production	
2021/22	23,903	22,902	95.8	
2020/21	41,548	37,810	91	
2019/20	38,028	33,011	86.8	
2018/19	32,850	29,613	90.9	
2017/18	34,139	31,191	91.4	
2016/17*	38,608	32,920	85.3	

Table 5-2 Production and escapement estimations on the River Shannon from 2016

\*Figure raised to account for gaps in fishing due to flood event

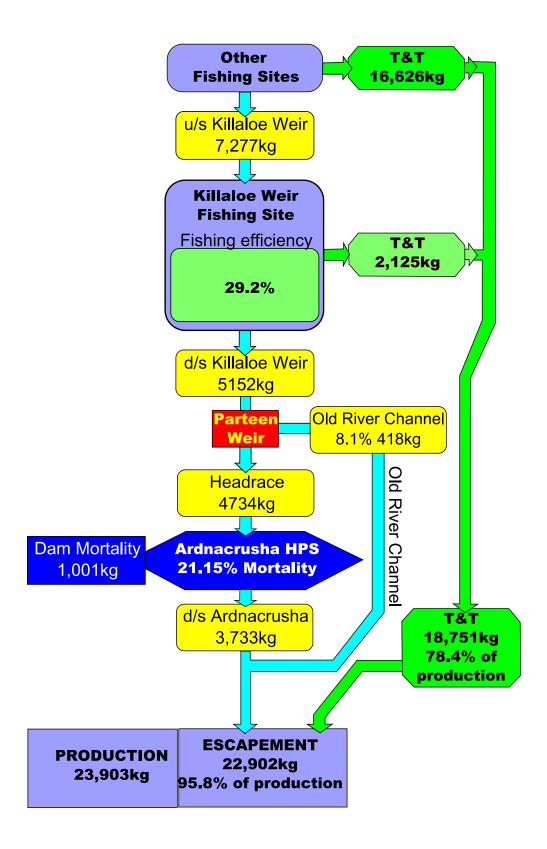


Figure 5-5 A summary of the analysis of silver eel production and escapement in the River Shannon during the 2021/22 eel migration season. See Appendix 5 for further explanation

#### 5.2.4 Length

No length frequencies for 2021

#### 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 5-6). 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).

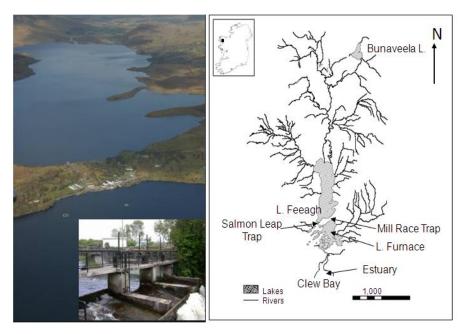


Figure 5-6 An aerial view of the Burrishoole catchment, looking north over the tidal Lough Furnace, in the foreground, and the freshwater Lough Feeagh: inset shows the silver eel downstream trap at the "Salmon Leap". A map of the Burrishoole catchment showing the locations of the traps

#### 5.3.1 Catch

The total run amounted to 3026 eels (to the end of March 2022); the highest count recorded since 2014. As in other years, the highest proportion of the total catch (81%) was made in the Salmon Leap trap. The silver eel season in 2021 opened slowly as there was a long drought through June and July. A large flood in early August initiated the run with a small pulse of eels but further low water levels delayed any further activity until early October. A sequence of small floods facilitated the run in a series of three periods and a final large flood in early December yielded almost no eels (Figure 5-7).

In 2021, the timing of the run was 7% migrating in August, 10% in September and 60% in October (Table 5-3). Almost half of the run occurred in the first eight days of October. Figure 7.1 shows the daily counts of silver eels.

	Salmon Leap	Mill Race	Total	%
May	0	0	0	0.0
June	0	0	0	0.0
July	8	2	10	0.3
August	168	60	228	7.5
September	164	125	289	9.6
October	1533	294	1827	60.4
November	493	71	564	18.6
December	88	12	100	3.3
Jan. 2022	4	0	4	0.1
February	2	1	3	0.1
March	1	0	1	0.0
April			0	0.0
Total	2461	565	3026	

Table 5-3: Timing and numbers of the 2021/2022 silver eel run.

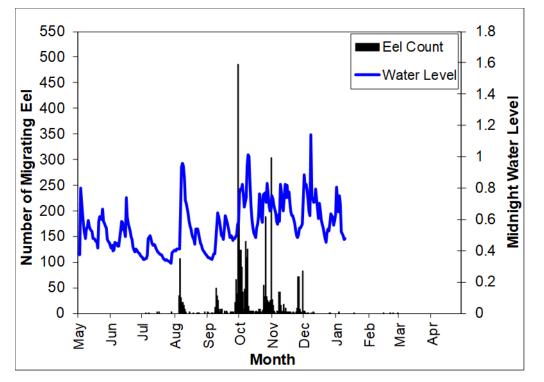


Figure 5-7 Daily counts of downstream migrating silver eel and mid-night water levels (m).

#### 5.3.2 Length, weight & sex

Sampling of individual eels (n = 1165) gave an average length of 41.9cm (range: 29.1 - 99.6cm) and an average weight of 149g and the proportion of male eels was 50.4%. The length frequency is presented in Figure 5-8 along with those 2019 and 2020 for comparison. The lack of eels above 46/47cm was once again notable.

The long-term trend in numbers and average weight is presented in Figure 5-9. The mean weight has dropped to an average of about 166g in the last three years and the sex ratio in 2021 of 50.4% males was the highest recorded since 1990.

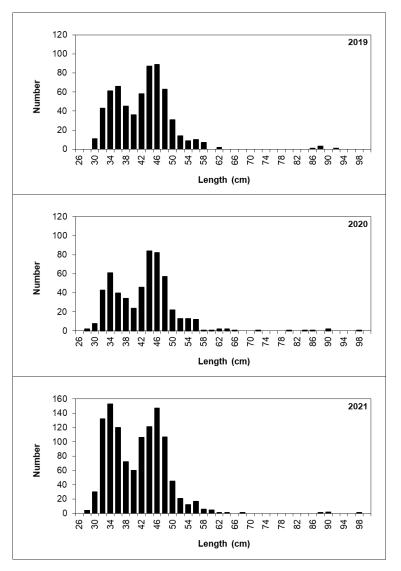


Figure 5-8 Length frequency of samples of silver eels trapped in the Burrishoole downstream traps, 2019 (637), 2020 (555) and 2021 (1165).

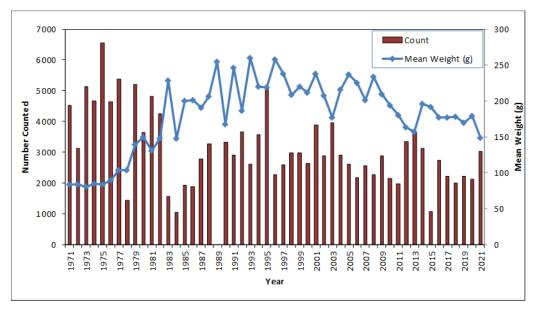


Figure 5-9 Annual number and mean weight of silver eels trapped in the Burrishoole downstream traps.

#### 5.4 Erne Transboundary

The River Erne, a transboundary system, is the second largest river system in Ireland, with an extensive lake habitat. The River Erne conservation fishery and trap and transport (T&T) programme was monitored by researchers from the Agri Food and Biosciences Institute (AFBI) and the National University of Ireland (NUIG) who also undertook mark-recapture experiments at Roscor Bridge.

#### 5.4.1 **Catch**

During the 2021/2022 season, fishing was conducted by conservation fishing crews at five sites, as shown in Figure 5-10. Roscor Bridge, the lowermost site, was not fished during the 2021/22 season. Fishing started at all sites from 30th August 2021 and ceased at all sites on 12th December 2021. The total catch contributed to the Trap and Transport programme was 45,000 kg. The proportions caught at each site are shown in Figure 5-11.

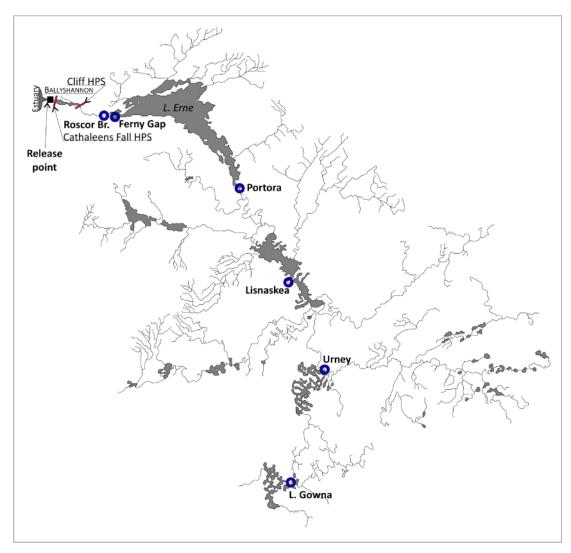


Figure 5-10 Map of River Erne catchment with conservation fishing sites, release point and hydropower dams indicated.

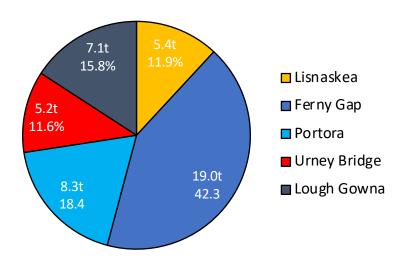


Figure 5-11 Proportions of the River Erne trap and transport catch obtained by each fishing crew in the 2021/2022 season.

The variation in the daily catches at the Ferny Gap fishing site are shown in Figure 5-12, with catch levels (and therefore fish migration) affected by discharge level and lunar cycle stage.

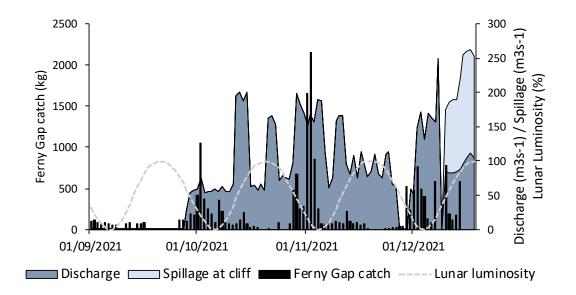


Figure 5-12 Variation in daily catches at Roscor Bridge fishing site, in relation to lunar cycle and discharge during the 2021/22 season

### 5.4.2 **Production and Escapement**

Although not fished during the 2021/22 season, the Roscor Bridge site is vital to the analysis of silver eel migrations and to the calculation of eel production and escapement for the Erne. The site, located 750 metres downstream of the outflow point of lower Lough Erne (Figure 5-10), provides a discrete river section from which it is possible to accurately assess the biomass of uncaptured eels. In previous years this biomass has been estimated based on daily catch records at Roscor Bridge combined with the results of extensive mark–recapture experiments. However, it was noted in previous seasons that Roscor Bridge had limitations as a monitoring site with low discharge and catch levels frequently leading to prolonged periods of fishing crew inactivity. When this occurred, catch records required for the calculation of production were unavailable. This prompted the development of alternative monitoring protocols capable of assisting with the quantification of eel migrations at this site in the absence of T&T catch records.

Lenihan et al. (2021) developed a model (Generalised Additive Model; GAM) that was capable of combining environmental factors (see Lenihan et al. 2021 for details) and catch from the upstream Ferny Gap site to explain 91.7% of the variability in Roscor Bridge catch. Accurate predictions of daily catch were found to be possible (rS = 0.86, p < 0.001). Based on total deviance explained and a strong correlation between predicted and observed catches in the test dataset, it was apparent that this model could be useful for estimating production in the absence of Roscor Bridge catch data by combining estimates of daily catch with known fishing efficiency rates depending on flow conditions. As catch data was unavailable for Roscor Bridge, this model was used in 2021/22 and it was estimated that 4,747 kg of eels would have been caught at the Roscor Bridge fishing site.

45,000 kg of eels were moved by trap and transport from the five fishing sites upstream of Roscor Bridge. Fishing efficiency rates for calculating production and escapement were based on several mark/recapture experiments carried out by NUI Galway at the experimental fishing site at Roscor Bridge from 2010/11 to 2015/16 at low discharge (< 130 m3s-1 = 9.78%) and high

discharge (> 130 m3s-1 = 18.43%). These were used with estimated Roscor Bridge catch (4,747 kg) to calculate the biomass of eels arriving there (33,876 kg) based on the flow conditions throughout the season.

Production and escapement estimates for the River Erne are summarised in the flow diagram (Figure 5\_13). The silver eel production was estimated to be 78,876 kg, and escapement was estimated to be 63,286 kg (80.2% of production). The trap and transport catch of 45,000 kg at the five fishing sites represented 57.1% of the production (exceeding the 50% target by 5,562 kg). An explanation of how calculations are carried out is available in Appendix 5 Figure A5-2.

As no eels were caught at Roscor Bridge, 33,876 kg of eels are estimated to have passed the weir, and moved through the hydropower stations at Cliff and Cathaleen's Fall. Mortality at each station is based on historic telemetry work conducted by NUI Galway at the two stations, depending on the operations of the dams throughout the season. Estimated mortality rates under different flow condition are given in Table 5-4. Total mortality was estimated to be 8,751 kg at Cliff and 6,839 kg at Cathaleen's Fall.

In total, 18,286 kg of eels are estimated to have navigated beyond the hydropower stations, and with the trap and transport quantity of 45,000 kg, a total escapement of 63,286 kg is estimated; 80.2% of the production.

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%
Overall mortality 2019/20	23.9%	25.5%
Overall mortality 2020/21	25.4%	27.3%

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

### 5.4.3 Length Frequency

No length frequencies for 2021

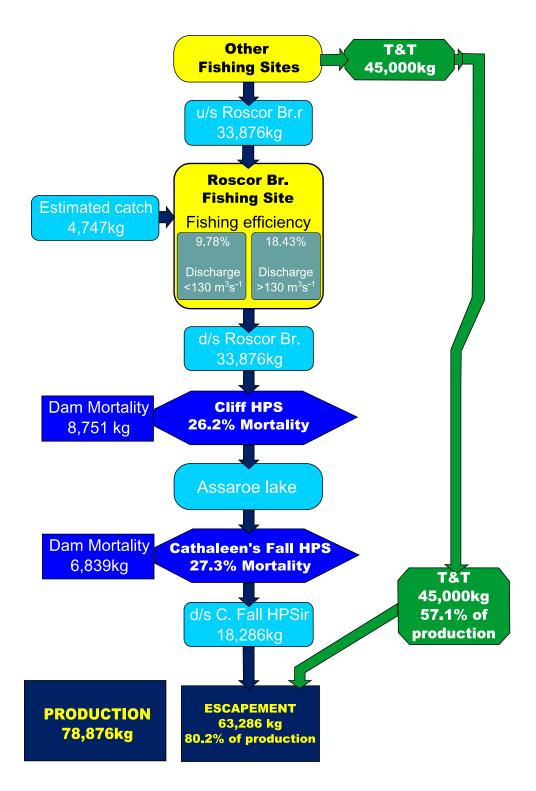


Figure 5-13 A summary of the analysis of silver eel production and escapement in the River Erne during the 2021/2022 eel migration season. See Appendix 5 for further explanation.

# 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 2021. Every eel captured or held in tanks for that respective fishing period was measured. A total of 3,336 eels were measured for length with summary stats presented in Table 5-5. Individual length frequencies for this data set have been provided to the TEGE for necessary production calculations and for storage on the new all Ireland database.

Location	Date	n	Mean Length (mm)	Min	Max
Ferny Gap	8th sept	287	574	360	850
Ferny Gap	5th Oct	298	566	330	905
Ferny Gap	02-Nov	346	586	380	1002
Ferny Gap	07-Dec	305	644	300	930
Portora	06-Sep	382	676	380	950
Portora	4th Oct	330	656	370	910
Portora	01-Nov	310	654	320	920
Portora	30-Nov	326	660	380	880
ULE Lisnaskea	05-Sep	35	665	340	890
ULE Lisnaskea	5th Oct	207	690	510	930
ULE Lisnaskea	31-Oct	239	678	330	970
ULE Lisnaskea	29-Nov	271	680	380	970

Table 5-5 Erne silver eel length measurements and summary stats for 2021 (NI sites only).

### 5.5 Fane

The Fane is a relatively small catchment within the Eastern River Basin District (ERBD) with the silver eel fishery located in the upper reaches of the system approximately 28 km from the coast. The catchment has a riverine wetted area of 84 ha (0.84 km<sup>2</sup>) and a lacustrine wetted area of 553 ha (5.53 km<sup>2</sup>). 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 (Figure 5-14). The site was the location of a commercial fishery until 2008.

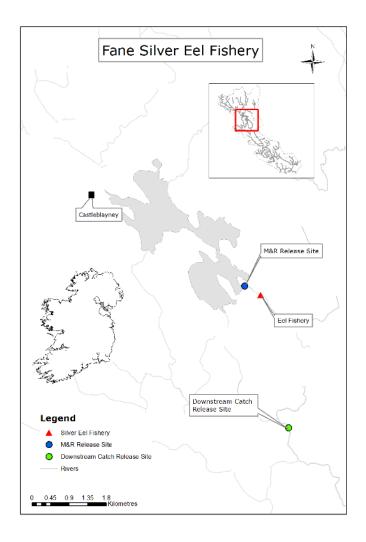


Figure 5-14 Map of silver eel fishing and release locations within the Fane catchment, 2021 (Insets: Map of Ireland with Fane catchment (shaded) and Neagh-Bann River Basin District (outlined) and detail of Fane catchment rivers with sampling location indicated (red box)).

# 5.5.1 Silver Eel Catch

In 2021, silver eel catches at the Fane Fishery were slightly up on 2020 numbers with a total catch of 550 kg (1,203 eels; Table 5-6) and 22 nights fished. Due to low water levels in September, fishing began in late October and continued until December, coinciding with flood events in late October, early November and early December (Figure 5-15). Once water temperature readings declined below 10°C catches dwindled (Figure 5-16).

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	
2019	26	500	1,323	
2020	27	465	996	
2021	22	550	1,203	

Table 5-6 Silver eel catch record for Barrow Fishery, 2011 – 2021.

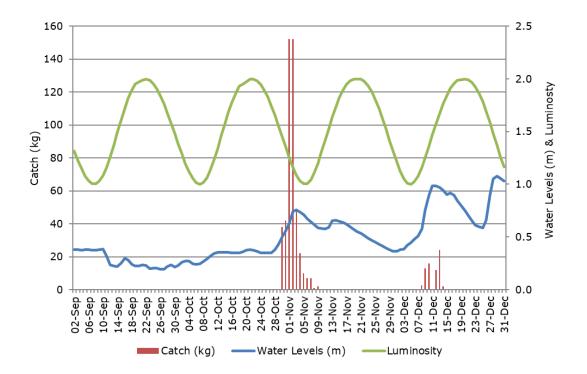


Figure 5-15 Catch (kg), water levels (m) and luminosity for the Fane Fishery, 2021.

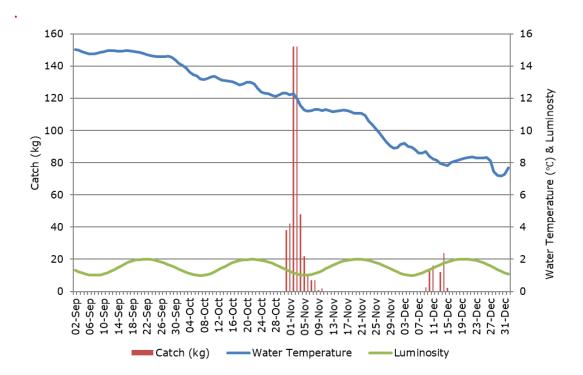


Figure 5-16 Catch (kg), water temperature (°C) and luminosity for the Fane Fishery, 2021.

### 5.5.2 Mark Recapture

Out of the 54 eels PIT tagged during this season, there are no recaptures noted.

### 5.5.3 Eel Biology

The average length of eel was 54.3 cm (ranging from 29.0 cm to 82.7 cm), (Figure 5-17 and 5-18, Table 5-7). The average weight was 0. 352 kg (ranging from 0.035 kg to 1.4 kg), (Table 5-7). The length frequency of the silvers catch shows similar numbers of males to females however the proportion of the catch that was measured was comparatively lower than in previous years (Figure 5-17 and 5-18). Therefore, it may not be a true reflection of length frequency. The usual trend is a high sharp peak depicting male silvers in the 30 cm length classes, followed by a broader, shallower peak depicting females from approximately 45 cm in length onwards to the maximum length recorded for the season. The frequency graph for the 2021 silver season (Figure 5-17, n = 180 eels) instead shows similar height peaks of males and females. Out of the 180 eels measured, 126 had head widths recorded. 22.2% of these were broadhead eels (n = 28), (Figure 5-19).

### 5.5.4 Environmental DNA

In 2020, a pilot study was launched to investigate a potential correlation between eDNA signatures for eels in water samples and the net catches at the Clarebane Weir Fishery. The water samples were taken from locations upstream of the fishing weir and around Lough Muckno. This could be developed into a new methodology for the assessment of the silver eel escapement. The results will be reported once all samples from 2020 and 2021 are processed and analysed.

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	2.200	232
2019	337	50.8	23.4	91.4	0.313	0.052	1.461	106.86
2020	87	50.2	22.0	86.5	0.29	0.057	1.200	25.25
2021	180	54.3	29.0	82.7	0.352	0.035	1.400	63.32

Table 5-7 Length and weight data for processed silver eels from the Fane Fishery, 2011 – 2021.

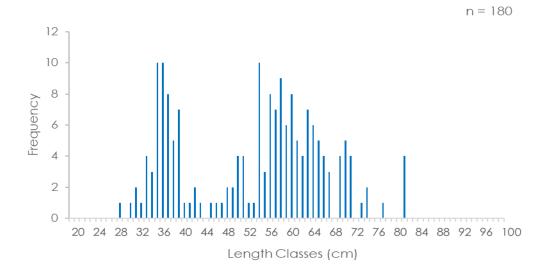


Figure 5-17 Length frequency for silver eels caught at the Fane Fishery, 2021.

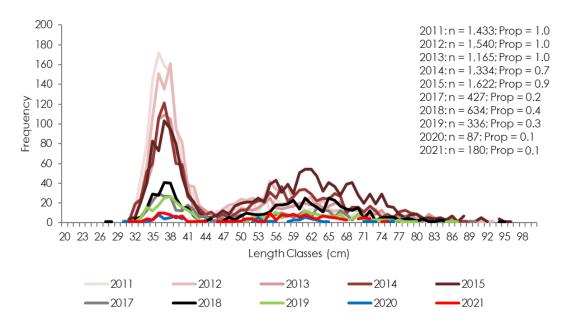


Figure 5-18 Length frequency for silver eels caught at the Fane Fishery, 2011 – 2021.

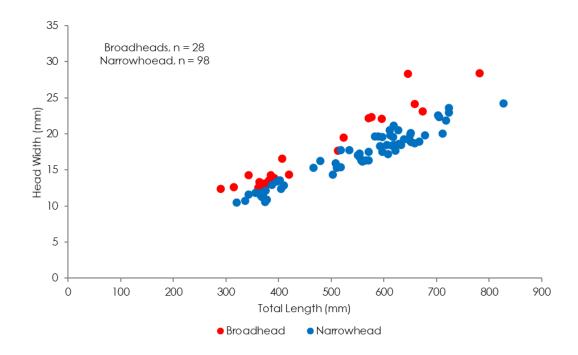


Figure 5-19 Broadhead and narrowhead records for the Fane Fishery, 2021.

### 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 catchment has a riverine wetted area of 72,780 ha (727.8 km<sup>2</sup>). The SERBD is 60% calcareous bedrock which makes it a very productive habitat for eels. There has historically been a commercial fishery on the River Barrow and the presence of historical catch will aid in the assessment of the current silver eel escapement levels from the river. There is also historical research data on the River Barrow from the Fisheries Research Centre which is available to Inland Fisheries Ireland. The assessment of the silver eel stocks from a river dominated catchment will help highlight any difference in production and escapement of eels compared with catchments with large lake/lacustrine wetted areas. The Barrow is the first riverine dominated silver eel index catchment assessed to date.

The fishing location is situated upstream of the town of Graiguenamanagh; approximately 5km upstream from the tidal limit (estuary) in the River Barrow (Figure 5-20). 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.

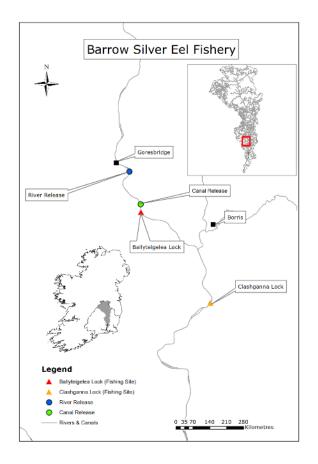


Figure 5-20 Map of silver eel fishing and release locations within the Barrow catchment, 2021 (Insets: Map of Ireland with Barrow catchment (shaded) and South Eastern River Basin District (SERBD) (outlined) and detail of Barrow catchment rivers with sampling location indicated (red box)).

### 5.6.1 Eel catch

In 2021, after 20 nights of fishing, a total of 195.5 kg of silver eels were captured at the Ballyteiglea Lock Barrow Silver Eel Fishery. This equated to 1,200 eels, with the majority of these (1,076 eels) being caught in October during moderate flood events. 551 eels (82.97kg) were measured while a further 649 eels (112.5kg) were batch weighed (Table 5-8).

The Barrow site is normally an early fishing location but 2021 resulted in no fishing until the end of October. Despite later flooding events occurring in both November and December, the catch numbers tapered off considerably until several nights of zero catch were recorded in both November and December, signaling the end of the migration runs (Figures 5-21). Declines in water temperature, (particularly those in late November) would have further reduced catches at this time (Figure 5-22). The catch details at this location since its inception in 2014 to the current sampling in 2021 are highlighted in Table 5-8.

Year	No. Days Fished	No. Days Fished Catch (kg)	
2014	22	174	1,223
2015	20	128	687
2016	25	193	880
2017	24	273	1,388
2018	28	391	2,808
2019	24	183	1,329
2020	29	238	1,163
2021	20	196	1,200

# Table 5-8 Silver eel catch record for Barrow Fishery, 2014 – 2021.

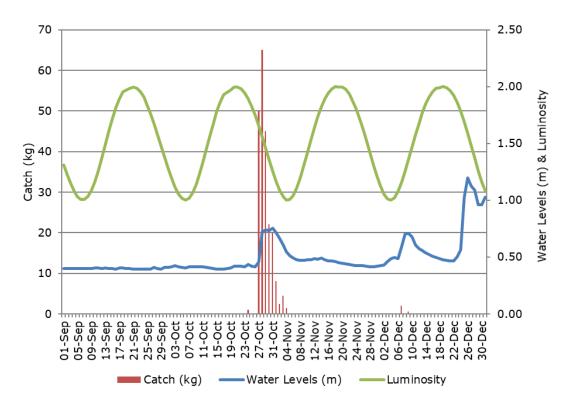


Figure 5-21 Catch (kg), water levels (m) and luminosity for the Barrow Fishery, 2021.

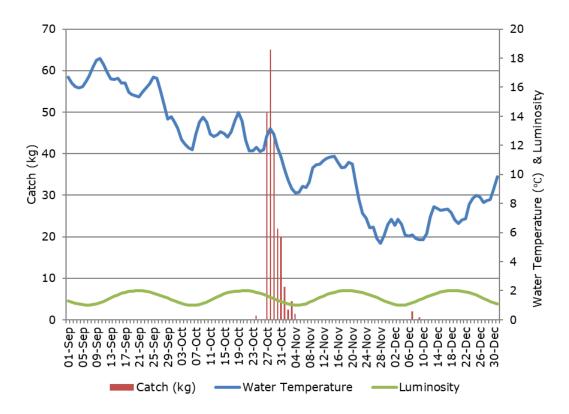


Figure 5-22 Catch (kg), water temperatures (°C) and luminosity for the Barrow Fishery, 2021.

# 5.6.2 Mark Recapture

Out of the 99 eels PIT tagged during this season, there was a single recapture giving a recapture rate of 1.01%. No recaptures from previous years were noted.

### 5.6.3 Eel Biology

The average length of eel captured was 41.3 cm (ranging from 30.4 cm to 79.2 cm), (Figure 5-23). The average weight of eels was 0.151 kg (ranging from 0.052 kg to 0.983 kg), (Table 5-9).

The length frequency for 2021 shows a moderate number of small/male eels in the catch which is an increase from some previous years (e.g. 2020, 2019 and 2017). The number of males in the current year was similar to that of 2016 with only 2014, 2015 and 2018 showing higher numbers of males (Figures 5-23 and 5-24). Each progressive year shows a pattern of further declines of small/male eels in the catch. The fishing in 2018 appears to break this trend with higher numbers of small eels captured, however the trend of decline then returned in 2019 and 2020 until the rise in the current silver eel season in 2021(Figure 5-24). Out of the measured eels, 119 had head width measurements recorded. 26% of these were broadhead eels (n = 31), (Figure 5-25).

#### 5.6.4 Environmental DNA

A pilot study was launched in 2020 in order to investigate a potential correlation between eDNA signatures for eels in water samples and the net catches from Ballyteiglea Lock. The water samples taken from locations upstream of the fishing lock. This could be developed into a new methodology for the assessment of the silver eel escapement. The results will be presented in a later report once all samples from 2020 and 2021 are processed and analysed.

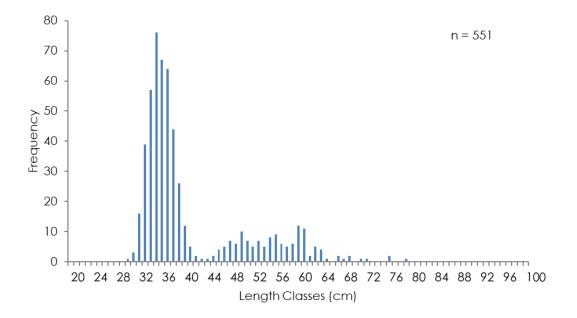


Figure 5-23 Length frequency for measured silver eels caught on Barrow Fishery, 2021.

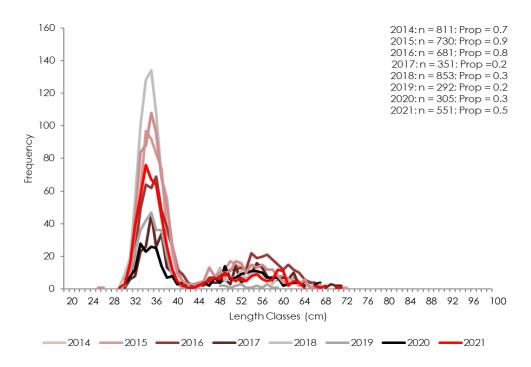


Figure 5-24 Length frequency for measured silver eels caught on Barrow Fishery, 2014 – 2021.

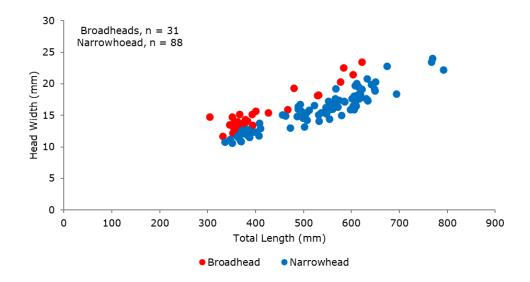


Figure 5-25 Broadhead and narrowhead eels from Barrow Fishery, 2021.

Year	No. of 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	113.578
2015	730	41.8	31.5	77.4	0.149	0.050	0.873	108.730
2016	681	45.2	32.0	77.8	0.195	0.052	0.860	132.983
2017	351	45.5	26.2	81.8	0.203	0.025	1.078	71.337
2018	853	39.5	21.3	72.3	0.1212	0.0100	0.7390	103.379
2019	292	38.2	31.6	69.3	0.1084	0.0520	0.6830	31.538
2020	305	45.6	31.4	75.8	0.2070	0.051	0.849	63.233
2021	551	41.3	30.4	79.2	0.151	0.052	0.983	82.970

Table 5-9 Length and weight data for processed silver eels from the Barrow Fishery, 2014 – 2021.

# 6 Yellow Eel Stock Assessment

This section 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 2018 - 2020 period.

Fyke net surveys carried out between 1960 and 2008 by State Fisheries Scientists will provide a useful benchmark 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, gillnets 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 2018 – 2020 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.

# 6.1 Surveys 2021

Yellow eel surveys took place in 1 lake, 1 transitional water? and 1 riverine catchment (Figure 6-1). The lake surveyed wwas Lough Feeagh by MI, Lower Lough Erne by AFBI and Queens University. The transitional water was Lough Furnace in Burrishoole (by MI) and river electric-fishing was carried out in the Kells Blackwater in 2021 by IFI along with a detailed River Hydromorphology Assessment Technique (RHAT) survey of the Kells Blackwater subcatchment in conjunction with the electrofishing.

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 eel 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 analyses include age, growth, sex determination, parasite prevalence and diet.

RBD	Location	Water	Life	2021	2022	2023
SHIRBD	ESB Shannon	<b>body</b> Catchment	<b>stage</b> Silver		V	
				N N	N	N N
NWIRBD	ESB Erne	Catchment	Silver		N	,
WRBD	Burrishoole	Catchment	Silver	N	N	
SERBD	Barrow	River	Silver		N	
ERBD/NBRBD	Fane	River	Silver		N	
NWIRBD	Erne	Lake	Silver		V	
SHIRBD	Ardnacrusha	River	Elver		V	
SHIRBD	Maigue	River	Elver		V	V
SHIRBD	Feale	River	Elver		$\checkmark$	
SHIRBD	Inagh	River	Elver		$\checkmark$	
NWIRBD	Erne	River	Elver	$\checkmark$	$\checkmark$	
ERBD	Liffey	River	Elver		$\checkmark$	
WRBD	Ballysadare	River	Elver			
WRBD	Corrib	River	Elver	$\checkmark$	$\checkmark$	$\checkmark$
WRBD	Burrishoole	River	Elver	$\checkmark$	$\checkmark$	$\checkmark$
SHIRBD	Parteen	River	Yellow	$\checkmark$	$\checkmark$	$\checkmark$
NWIRBD	Erne	Lake	Yellow	$\checkmark$	$\checkmark$	
ERBD	Boyne	River	Yellow	$\checkmark$		
SWRBD	M Blackwater	River	Yellow		$\checkmark$	
SERBD	Barrow	River		$\checkmark$	$\checkmark$	
ERBD	Muckno	Lake	all	$\checkmark$	$\checkmark$	
SHIRBD	Owel	Lake	all	$\checkmark$	$\checkmark$	
WRBD	Shramore/Burrishoole	River	Yellow		$\checkmark$	$\checkmark$
WRBD	Lough Feeagh	Lake	Yellow	$\checkmark$	$\checkmark$	$\checkmark$
WRBD	Lough Furnace	T. water	Yellow	$\checkmark$	$\checkmark$	$\checkmark$
Ireland	WFD Rivers	Rivers	Yellow		$\checkmark$	$\checkmark$
Ireland	WFD Lakes	Lakes	Yellow	$\checkmark$	$\checkmark$	
Ireland	WFD Transitional	T. water	Yellow	$\checkmark$	$\checkmark$	$\checkmark$

### Table 6-1 Monitoring Programme 2021 - 2023

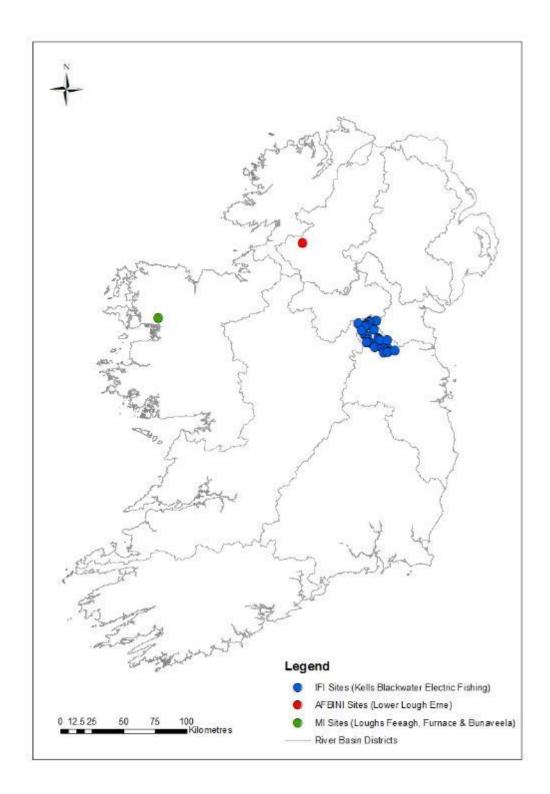


Figure 6-1 Locations of yellow eel surveys carried out in 2021.

#### 6.1.1 Burrishoole

Bunaveela Lough is located in the upper reaches of the catchment (Figure 6-2). It has a surface area of 42ha and a maximum depth of 23m. Bunaveela L. was not fished in 2020 due to COVID-19. All four locations were fished in 2021, Bunaveela, Feeagh, Furnace (Transitional) and lower Furnace, (Transitional)

Bunaveela Lough is located in the upper reaches of the catchment. It has a surface area of 42ha and a maximum depth of 23m. Bunaveela L. was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2021 (25 August 2021), with chains of 10 nets fished at three sites. In total 27 eels were caught with a catch per unit of effort of 0. 90 eels/net/night (Table 6-

5). The average length was 44.2cm and ranged in length from 33.5cm to 54.8cm, and a total weight of 4.11 kg caught. No eels were PIT tagged and two 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). L. Feeagh was fished in the traditional style (sets of 10 nets perpendicular to the shore) in 2021 (31 July – 1 August 2021), with chains of 10



nets fished at six sites for one night each. In total, 66 eels were caught with a catch per unit effort (CPUE) of 1.10 eels/net/night (Table 6-5). The average length of eels was 41.0cm and ranged in length from 30.7cm to 68.3cm, with a total weight of 9.1 kg caught in the two nights (Figure 6-3). No eels were PIT tagged and three previously tagged eels were recorded. No eels were sacrificed in the survey.

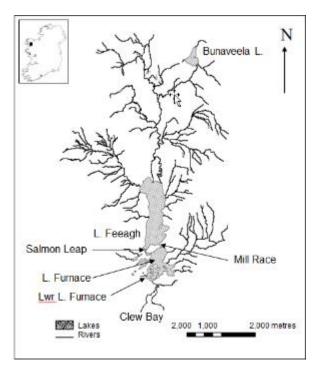


Figure 6-2 Map of Burrishoole showing the lakes surveyed.

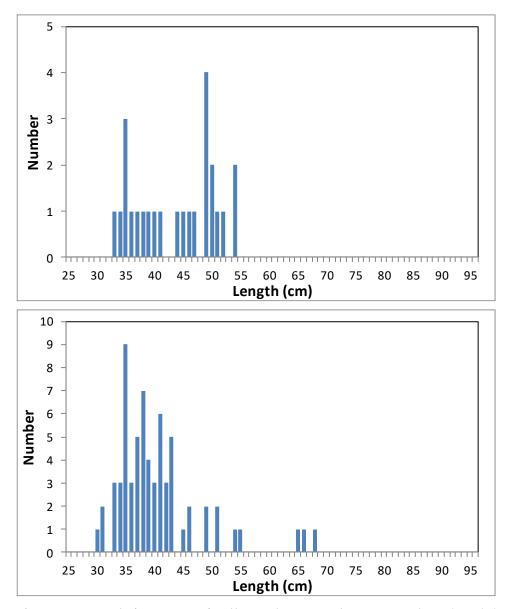


Figure 6-3 Length frequency of yellow eels captured at Bunaveela L. (n=25) (top), and L. Feeagh (n=66) (bottom), in 2021.

### 6.1.2 IFI lake surveys 2021

There were no yellow eel lake surveys carried out by EMP in 2021 due to Covid-19 restrictions.

# 6.1.3 Kells Blackwater river electric-fishing survey, 2021

A catchment-wide electric-fishing program was devised, utilising bankside electric-fishing (without the use of stop nets). The bankside approach was used as it is believed to be a useful method of catching and estimating minimum eel densities along stretches of river and is a semi-quantative approach. In each site, one bank is randomly selected and fished in a single timed pass and a second pass focuses on the opposite bank. On average, individual passes were between 4 and 13 minutes duration. A total of 31 sites were fished in 2021 using this methodology (Figure 6-4). Eight sites were dropped from the 2014 number as they were either overgrown, or not accessible and therefore no longer suitable for electric-fishing.

The Kells Blackwater catchment was divided into upper, middle and lower zones and a comparable number of sites were fished in each zone. The survey electric fishing was carried out using Hans- Grassl<sup>TM</sup> back-pack equipment. The packs were set to the recommended frequency for catching eels of 20Hz (hertz). Voltage was site dependent and was set between 200-375V (volts), (pulsed DC), in order to turn fish in differing conductivity conditions.

#### 6.1.3.1 Results

During this survey, only 4 eels were successfully captured over the 31 sites. This compares to the 93 eels that were captured in the original survey in 2014 (a decline in catch by 95%!), (Figure 6-4). In 2021, one eel was caught at site "Kells 11" (40.6 cm and 0.105kg) while employing the bankside method (Figure 6-4, left), and another was caught at the same site during depletion fishing (25.5cm and 0.055kg), (Figure 6-4, right). A further 3 eels were sighted during the depletion fishing at "Kells 11" however, they could not be captured. Their presence was noted for the record. The remaining 2 captured eels were found during depletion fishing of site "Kells 12" (31.0cm, 0.114kg and 26.6cm, 0.023kg), (Figure 6-5, right).

Both of these sites were inflows into Lough Ramor ("Kells 11", Virginia, main channel inflow, next to the school and "Kells 12", Lislea Stream, near Burrencarragh and the Lakeside Manor Hotel). Based on the length of these eels, it is clear that there were a range of age classes in the area from older yellow eels (40.6cm in length) to comparatively juvenile eels (25.5cm). All captured eels were released after biometrics were taken and no eels were returned to the laboratory for analyses from this survey.

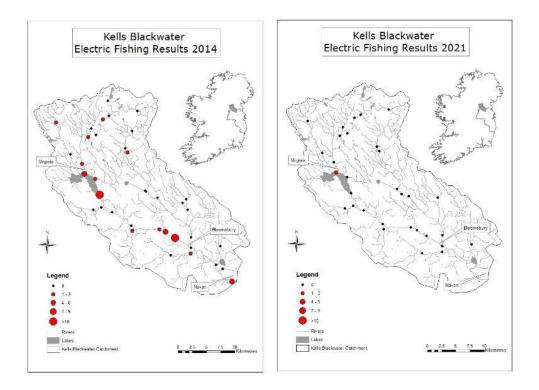


Figure 6-4 Kells Blackwater bankside electric-fishing catch results, left: 2014 and right: 2021. Insets: Map of Ireland with Eastern River Basin District (ERBD) (outlined) and Kells Blackwater catchment (shaded).

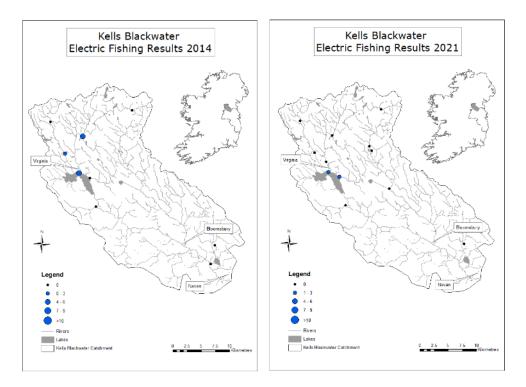


Figure 6-5 Kells Blackwater depletion electric-fishing catch results, left: 2014 and right: 2021. Insets: Map of Ireland with Eastern River Basin District (ERBD) (outlined) and Kells Blackwater catchment (shaded).

#### 6.1.4 Kells Blackwater catchment RHAT surveys, 2021

A total of 27 out of the 31 Kells Blackwater electric-fishing sites were RHAT surveyed using the spot check methodology. The results of these surveys showed that the majority of the sites fell in to "Moderate" and "Good" status (37 and 52% of the total sites respectively), (Figure 6-6). One site was reported as having "High" status and 2 sites were noted as being "Poor" in terms of the hydromorphological assessment of available habitat. The were not "Bad" category sites noted in the results.

The "High" status site ("Kells 10", Murmod Bridge, main channel, Kells Blackwater) was noted as having particularly good substrate condition and a high degree of floodplain connectivity, along with good bank structure and stability on both the left and right hands banks, and no barriers to continuity (Figure 6-7).

The 2 "Poor" status sites ("Kells 22", Headford Bridge, main channel, Kells Blackwater and "Kells 41", Yellow River upstream of Moortown Bridge, near Moortown), (Figure 6-7) were downgraded in the surveys due to (for example) a high degree of impoundment at the weir reducing flow conditions and excessive siltation reducing substrate conditions, respectively.

These results suggest that the low numbers of eel catch were not related to poor hydromorphological habitat status, as the majority of sites fell into the "Moderate" and "Good" categories of classification. This relates the likely scenario being a reduction in overall elver recruitment and limited dispersal from the estuarine habitat or from the lake. This theory has been highlighted during previous electric-fishing surveys in other (sub-)catchments by the Eel Monitoring Programme.

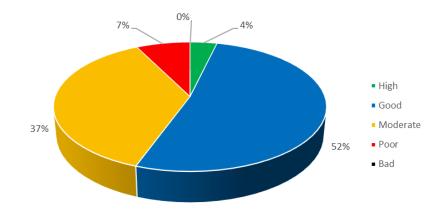
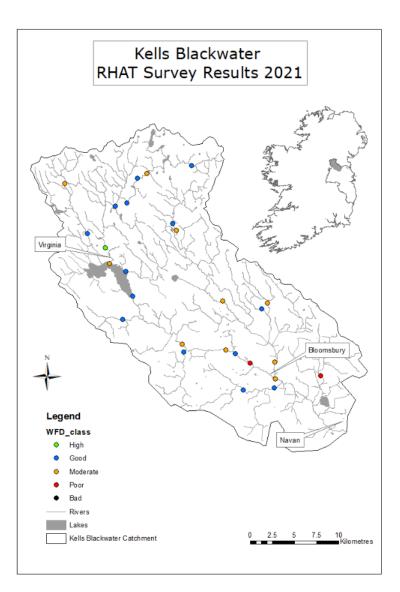


Figure 6-6 Kells Blackwater RHAT survey results, 2021.



# Figure 6-7 Kells Blackwater RHAT survey results, 2021. Inset: Map of Ireland with Eastern River Basin District (ERBD) (outlined) and Kells Blackwater catchment (shaded).

### 6.1.4.1 Summary

The bankside semi-quantitative method enabled the whole catchment to be assessed for the presence and absence of eels. 82 eels were captured in the bankside electric-fishing survey in 2014 at 13 of the 38 sites fished compared with 1 eel captured at 1 out of 31 sites fished in 2021. The depletion fishing method caught 11 eels in 2014 in comparison to 3 eels in 2021. In 2014, the survey took place over 2 weeks in June and July and over 2 weeks in July in 2021, making the timing of surveys comparable.

Overall, in 2014 the eel population in the Kells Blackwater catchment is widely dispersed with a number of the smaller tributaries not utilised by eels possibly due to the habitat conditions present. The majority of the catch was in the inflows and outflow of Lough Ramor. While the catches were again noted in the inflows in

2021, all other sites depicted a complete paucity of eels. However, the RHAT surveys carried out in 2021 effectively removed the possibility of poor habitat being responsible for the underutilisation of sites by eels.

The 2021 survey resulted in far fewer eels. This may have been an indication of reduced population and lower recruitment in the years between the two surveys. As competition for resources would be reduced due to lower population, there is likely also a limited dispersal of elvers from the Boyne estuary, as young eels are remaining in the highly productive habitat and not continuing upstream into the rivers. Those that do travel upstream are likely to remain in the most product area available, such as Lough Ramor, and not frequent the main channel and tributaries of the Kells Blackwater.

# 6.2 Transboundary Yellow Eel

A yellow eel survey was commissioned by Queen's University Belfast and carried out from 2<sup>nd</sup> to 6<sup>th</sup> August 2021 in conjunction with AFBI. This survey was carried out to supplement the data gathered during the biennial AFBI Lower Lough Erne (LLE) yellow eel survey program. The results from this survey and other recent LLE yellow eel surveys are being used in a QUB PhD to assess ecological changes in LLE and the yellow eel community over the last 20 years. Comparisons of ecological and yellow eel data from recent LLE yellow eel surveys will be drawn from the Erne Eel Enhancement program. As a result, below is a brief overview of the major findings with a more detailed output to be followed by a thesis submission.

To ensure data consistency and to enable trends to be compared across years the same commercial fishermen were employed using the same methodology as in previous LLE yellow eel surveys. The survey sites chosen in each of these surveys (Figure 6-8) are an attempt to revisit 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 survey needs.

Each day 6 gangs of 5 Dutch fyke nets with a 12mm mesh size were set in a zone of the lake established during the previous LLE yellow eel surveys (Figure 6-8). The nets were retrieved the following morning with all eel catch being returned to shore for processing. Any bycatch was recorded and returned immediately. Lengths of every eel captured was recorded to the nearest cm with a sub sample of 25 being held each day (100 total) for more detailed analysis. This consisted of measuring length, weight, fat content, removal of digestive tract for stomach content analysis and parasite burden and removal of otoliths for age analysis. The total number of the invasive parasite *A. crassus* in each swim bladder was also recorded. A 10mm section of gonad was removed and stored in 70% ethanol from a total of 60 eels spread across both narrow head (n = 30) and broad head (n = 30) individuals. This section of gonad will be weighed to enable comparison of gonadal development between narrow and broad head eels.

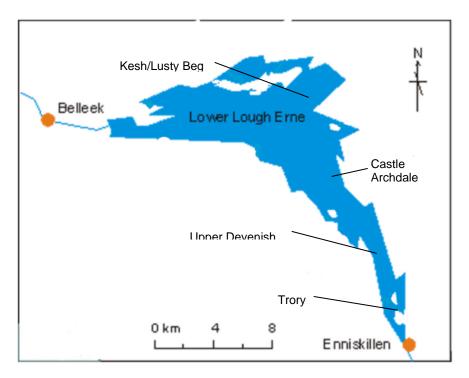


Figure 6-8 Four zones surveyed during the Lower Lough Erne yellow eel survey.

# 6.2.1 **Results**

# 6.2.1.1 Total Catch

An overview of the results of this survey are presented below. Stomach contents and age profiles for yellow eel samples from 2021 are currently being processed and are therefore not included in the report. However, this has been carried out for the samples taken during August 2020 and an overview of stomach contents has been included.

During the 5-day survey a total of 1,862 eels were caught and measured, a drop of 267 eels from 2020 yellow eel survey. Of the 1,862 eels caught and measured 196 (10.5%) were classified as broad head with 1,666 being narrow headed. The mean CPUE for 2021 was 15.5, slightly down on the mean CPUE of 18.3 from the previous 4 surveys covering 6 years (Table 6-2).

Zones	2014	2016	2018	2020	2021	Zonal average
Trory	3.23	8.73	10	12.5	7.7	8.4
Upper Devenish	18.23	13.76	14.1	18.3	12.23	15.3
Castle Archdale	28.3	30.77	25.6	27.5	13	25.0
Kesh/Lusty	25	12.76	30.7	12.7	29.07	22.1
Yearly average	18.7	16.5	20.1	17.8	15.5	

Table 6-2 Catch per unit effort from lower Lough Erne yellow eel surveys.

Zonal CPUE trends started out in a similar pattern to previous years with Trory being the lowest followed by Upper Devenish. However, Castle Archdale had a relatively low CPUE compared with previous years with Kesh having the highest CPUE significantly higher than its zonal average although its zonal CPUE does fluctuate highly from survey to survey.

#### 6.2.1.2 Size Classes

Size classes of eels captures during the 2021 yellow eel survey followed a similar trend to previous years (Figure 6-9).

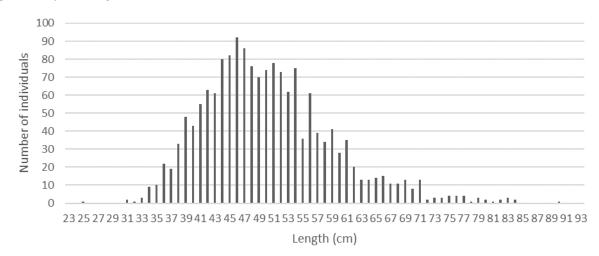


Figure 6-9 Size classes from the 2021 LLE yellow eel survey (n = 1862).

#### 6.2.1.3 Undersize catch

The 2021 LLE yellow eel survey saw another drop in the mean percentage of catch that was under 40cm (Table 6- 3). This has been falling since surveys began in 2011 despite the closure of the commercial fishery. The falling numbers of catches under 40cm is unsurprising given the poor levels of recruitment.

Zones	2011	2014	2016	2018	2020	2021
Trory	35.1	21.7	10	9.3	9.1	10
Upper						
Devenish	31.8	22.5	13	11.3	9.8	9.3
Castle						
Archdale	34.3	23.7	16	10	12.1	9.2
Kesh/Lusty	23.4	33	12	22.8	6.8	7.2
Mean	31.2	25.2	12.8	13.4	9.5	8.9

Table 6-3 Percentage of catch under 40cm from each year of the LLE yellow eel survey.

#### 6.2.1.4 By catch

Only four species were caught as by catch during the 2021 yellow eel survey with Perch making up over 80% of the catch (Figure 6-10). Roach, Roach/Bream hybrids and pike made up the rest of the by catch respectively.

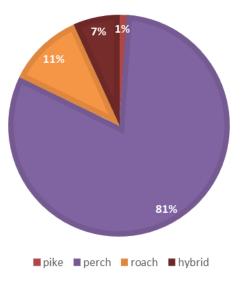
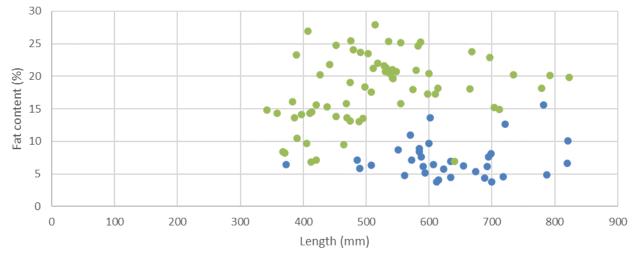


Figure 6-10 Total by catch caught during the 2021 lower Lough Erne yellow eel survey

# 6.2.1.5 Fat content

Fat content measurements from the 2021 survey show a similar pattern to previous survey results. Figure 6-11 below shows a clear divide of fat content with head shape with broad head individuals consistently displaying lower fat contents, often in single figures. Fulton's condition factor corresponds with fat readings with broad head individuals having a lower average condition factor of 0.16 compared to an average of 0.18 for narrow head individuals. It is expected after analysis of gonadal development it will show reduced gonadal development among broad head individuals also.







### 6.2.1.6 Stomach Contents

Analysis of stomach contents from the 2021 yellow eel survey is currently being carried out however a summary of stomach contents from the 2020 Erne yellow eel survey is presented below. Of the 100 digestive tracts that were examined 47% were empty. The percentage

occurrence of different food items is shown below in Figure 6-12. Fish were found exclusively in broad head individuals and often in high numbers with up to 6 individual fish in one case. Broad head individuals also had a lower percentage of empty stomachs than narrow head individuals, possibly as a consequence of longer digestion times.

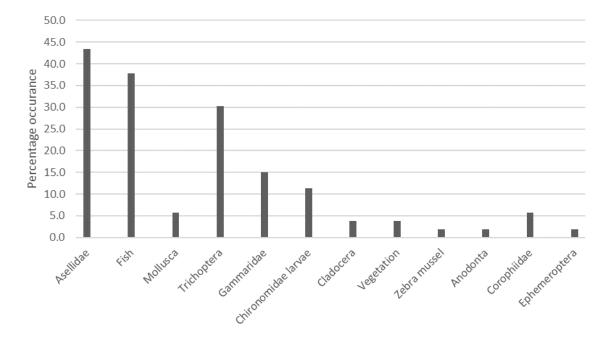


Figure 6-12 Percentage occurrence of food items in stomach contents from yellow eel survey 2020.

### 6.2.1.7 Anguillicola crassus

Prevalence and intensity of infections with the invasive swim bladder nematode *Anguillicola crassus* was also examined during the 2021 yellow eel survey. Table 6-4 below shows mean prevalence of the parasite across each zone over the previous 7 years. Zonal prevalence for 2021 follows a similar pattern to previous years however overall prevalence still shows a gradual decline as is often reported in literature after initial infection.

Zone	2014	2016	2018	2020	2021
Trory	80	68	80	64	64
Upper					
Devenish	80	51	60	68	56
Castle					
Archdale	60	40	56	56	48
Kesh/Lusty	73	15	56	52	56
Mean	73.3	43.5	63	60	56

Table 6-4 Prevalence of the invasive swim bladder parasite A crassus from lower LoughErne yellow eel surveys.

# 6.3 Transitional Waters

# 6.3.1 Burrishoole Transitional Waters

Lough Furnace, the tidal lough, has a surface area of 125ha north of Nixon's Island and 16ha between Nixon's Island and the mouth of the estuarine river (Lower Lough Furnace)(Figure 6-13). 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 2021 (1,2,3,17 June 2021), with chains of 10 nets fished at 12 sites in one night each. Two chains of nets were fished at the Back of the House (9 September 2021), which is a shallow tidal area between the lough and the estuarine river.

In L. Furnace, 43 eels were caught with a catch per unit effort (CPUE) of 0.38 eels/net/night (Table 6-6). The average length was 39.6cm ranging from 29.6cm to 67.7cm. A total weight of 4.95kg was caught.

In the Lower Lough Furnace, 127 eels were caught with a catch per unit effort (CPUE) of 6.35 eels/net/night (Table 6-6). The eels average length was 44.6cm ranging in length from 31.9cm to 70.3cm, with a total weight of 21.22kg caught (Figure 6-14). No eels were PIT tagged and released and six previously tagged eels were recorded. No eels were sacrificed in this survey from Lower Lough Furnace.

26 eels were sacrificed in this survey from Lough Furnace. 14 of the 26 (53.8%) of the eels contained *A. crassus* with an infection intensity of 3.6. *A. crassus* has been established in the lough since about 2011.

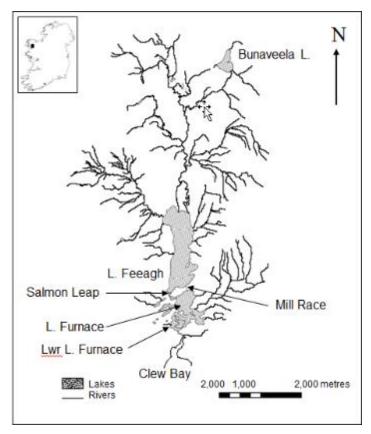
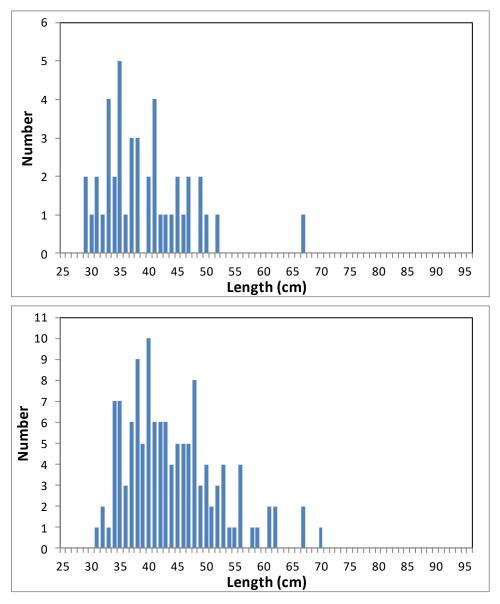


Figure 6-13 Location of Lough Furnace in Burrishoole catcment.



**Figure 6-14**: Length frequency of yellow eels captured at Lough Furnace (n = 43) (top) and lower Lough Furnace (n = 127) (bottom), in 2021.

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)
Bunaveela L.	Aug '21	27	30	0.90	4.11	44.2	33.5	54.8	152	60	275
L. Feeagh	Aug/Sept '21	66	60	1.10	9.09	41.0	30.7	68.3	138	45	665
Lower L. Erne	Aug '21	1,862									

 Table 6-5 Catch detail from yellow eel lakes surveys 2021.

# Table 6-6 Transitional Waters yellow eel survey data 2020.

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. Furnace	June '21	43	120	0.36	4.95	39.6	29.6	67.7	115	45	520
Lwr L. Furnace	Sept '21	127	20	6.35	21.22	44.6	31.9	70.3	167	50	675

# 6.4 Water Framework Directive

# 6.4.1 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 programme has been initiated at specified locations in a 3-year rolling cycle.

Locations for WFD sampling sites for 2020 surveys are shown for lakes, rivers and transitional waters (Figure 6-15).

# 6.4.2 2020 Results

# 6.4.2.1 Lakes:

A total of 11 lakes (spanning 9 catchments), were sampled with eels present in 11 lakes (100% of sites). A total of 66 eels were caught during lake surveys. They ranged in length from 30 to 80 cm. A mean CPUE of 0.66 was found across all lake sites. While the highest CPUE value for eels was found in Fern Lough (Leannan, CPUE = 1.5) the lowest were noted in Loughs Bofin (Corrib, CPUE = 0.1), Glenbeg (Coastal, CPUE = 0.1), Glencar (Drumcliff, CPUE = 0.1) and Talt (Moy, CPUE = 0.1). (Appendix 6 WFD, Tables A6 1 and A6 2).

# 6.4.2.2 Rivers:

A total of 263 river sites (across 15 catchments) were covered in the 2020 surveys. The WFD river sites had a 17% eel presence rate, 100% of sites with eels have  $\leq$ 5 eels. The highest catch at any site was 4 eels on the Nanny (Meath) river at Knockisland. A total of 47 eels were caught, ranging from 7.2 to 55 cm (Appendix 6 WFD, Tables A6 3, A6 4 and A6 5). Densities ranged from 0.0002 eels per m<sup>2</sup> in the Slate River (Glenaree\_A) to 0.02998 eels per m<sup>2</sup> in the Clashganny River (Ballymurphy\_A).

# 6.4.2.3 Transitional Waters:

A total of 10 estuaries (across 8 catchments) were covered in the 2020 surveys. A total of 17 eels were captured ranging in length from 5.7 to 68 cm. CPUE values for transitional water sites ranged from 0.08 (Colligan Estuary and Ardigeen Estuary) to 0.38 (Bandon Estuary Lower). (Appendix 6 WFD, Tables A6 6 and A6 7).

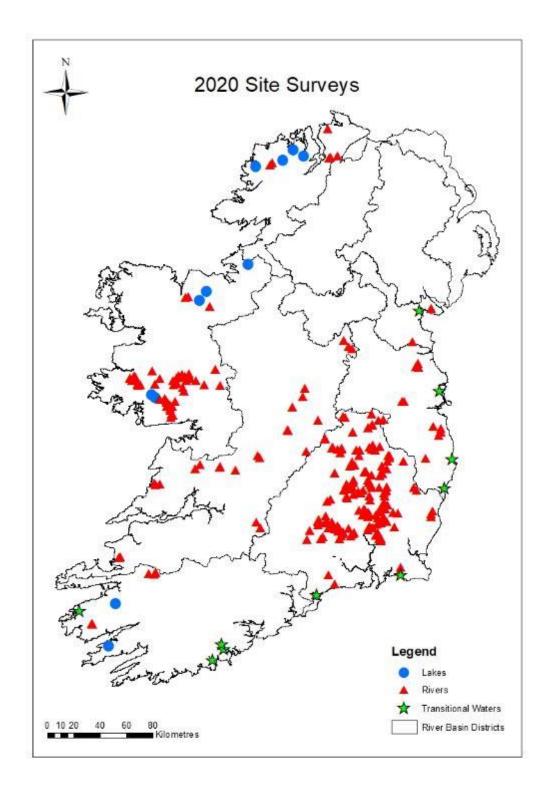


Figure 6-15 Location of WFD survey sites, 2020.

# 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 juvenile 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 relative abundance of 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 observed.

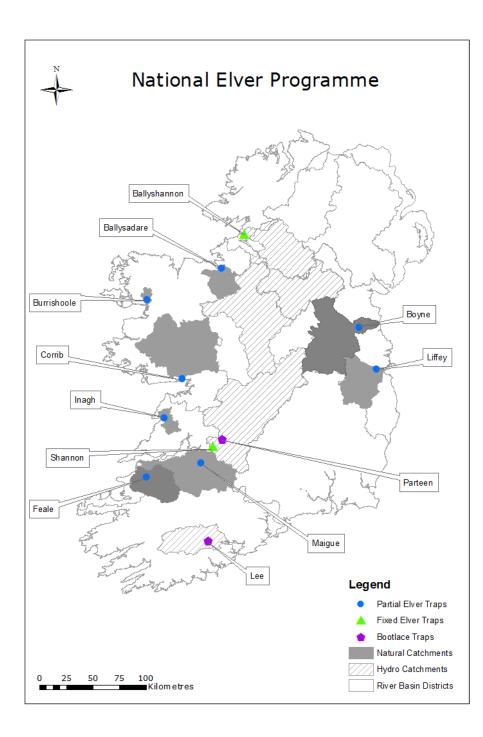


Figure 7-1 Location of recruitment monitoring stations in Ireland.

# 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) is undertaken by the ESB and at Cathaleen's Fall (Erne) by th ESB in conjunction with DAERA and AFBI (Figure 7-2).

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

Recruitment for the Erne in 2021 ended with 382 kg of elvers, whilst in comparison the run to the Bann totalled 117 kg. Both the long term annual and 3 year running averages for recruitment to the Erne and Bann rivers are following the stock wide trend seen elsewhere with recent numbers only slightly better than the historic minima recorded 2010-2011.

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. The data for 2020 was low with 0.112 kg captured at Ardnacrusha.

For 2021 a value of 62.25 kg was caught at Ardnacrusha.

#### 7.2.2 **Other Locations**

Long-term monitoring of migrating elvers also takes place at on the Feale, Inagh and Maigue Rivers and in Burrishoole (Table 7-1).

The Ballysadare elver trap was not operational for the 2021 season due to the impacts of Covid-19. The trap on the Corrib is located within the elver pass of the Galway weir. The trap caught 69 kgs of elvers in 2021 and operated from May until September. The Feale trap at Listowel ran from May to September. A total of 409 g of elvers and 69 g of yellow eels were caught for the entire season with the highest catch in July. The elver trap on the River Inagh in Ennistymon ran from April to September. The total catch of elvers for the season was 564 g, 122 g of yellow eels were also caught during the survey period. The Maigue trap in Adare ran from April to August. The total catch of elvers for the season was 1.15 kg, 805 g of yellow eels were also caught during the survey period. Apart from the Maigue and Corrib all sites caught less eels than 2020.

In Burrishoole, a small O'Leary style elver trap was installed in 2007 in the outflow of the large release pond in Furnace. This provides some indicative data of the relative annual abundance of young eel recruitment. By numbers, the catch is predominantly zero age class glass eel ("elvers") of various levels of pigmentation, but by weight the young yellow eels moving out of Lough Furnace make a more significant contribution. These young yellow eels are predominantly ages one to four. Figure 7.3 gives the annual weight of recruits trapped and compares with catches in a similar trap in the 1980s. These current levels are about 10 times lower than those of the 1980s in the same location. 2020 was the 3<sup>rd</sup> highest year over the last decade.

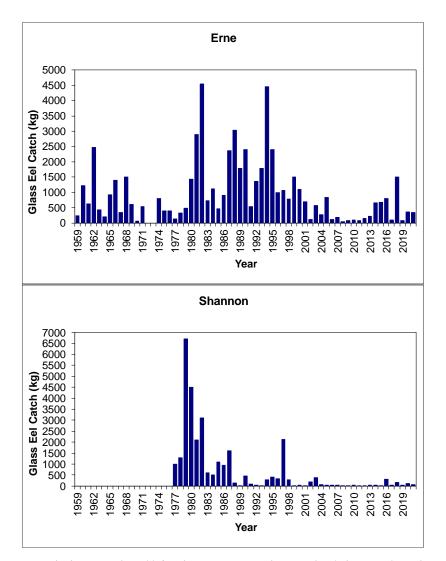


Figure 7-2 Annual elver catches (t) in the traps at Ardnacrusha (Shannon) and Cathaleen's Fall (Erne) – data from ESB. Full trapping of elvers took place on the Erne from 1980 onwards indicated by the arrow. Erne 2015 onwards does not include the additional new trap.

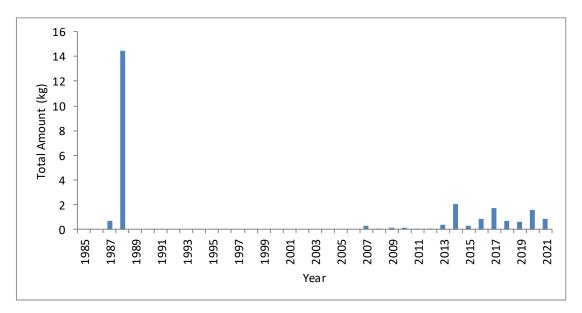


Figure 7-3 Total quantities (kg) of recruits in the Burrishoole index trap, including all ages.

Year	Erne	Shannon Ardnacrusha	R Feale	R Maigue	R Inagh	Sh. Estuary Glass Eels	R. Liffey Fish Pass	Burrishoole
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		0.259
2008	38.7	7	0	0	83	2		0.028

Table 7-1: Glass eel catches (kg), 1985 to 2020 (blanks = not fished).

Year	Erne	Shannon Ardnacrusha	R Feale	R Maigue	R Inagh	Sh. Estuary Glass Eels	R. Liffey Fish Pass	Burrishoole
2009	88.3	7.75	42					0.089
2010	96.6	49.7	20	3	1	3		0.094
2011	74.34	7.239	7	5	15			0.084
2012	145.71	22.525	47		*		0.5	0.053
2013	214.7	46.615	68	14	44		1.1	0.393
2014	659.37	45.085	5	29**	40		0.3	2.000
2015	686.17	11.42	3	15	25		0.2	0.300
2016	805.06	317.2	30.5	29	51		0.4	0.870
2017	94.95	29.7	15	9	20		0.5	1.691
2018	1508.4	165.2	3.2	n/a	5.4		6.3	0.697
2019	83.99	34.6	7.6	n/a	2.12		1.5	0.569
2020	358	112	0.915	0.254	5.26		1.8	1.591
2021	382	62.25	0.409	1.15	0.564		2.7	0.876

### 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 7-4. 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 301.1 kg and in 2016 it was 890 kg.

A new trap was installed in 2012 on the Shannon at Parteen, on the opposite bank (Co. Clare). The catch was 6.6 kg and 6.8 kg in 2013 and 7.8 kg in 2014. The Co. Clare trap and a new one installed in 2015 near the hatchery (Tipperary) trapped 26.95 kg in 2015 and 23.1 kg in 2016.

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

In Parteen in 2018, the main catch was 1339 kg and the new traps catch was 2.4 kg.

In Parteen in 2019, the main catch was much lower at 374 kg and the new traps catch was 2.1 kg.

In Parteen in 2020 the main catch was 1 051 kg and the new trap catch was 8.7 kg

In Parteen in 2021 the main catch was 56.16 kg and the newtrap catch was 6.09 kg.

In 2010, less than one kg was recorded in the Inniscarra trap on the River Lee and in 2011, 48 kg were recorded. The catch has declined since 2011 with only 0.6 kg recorded in 2014 and 0.94 kg in 2015. The catch remained low in 2016 (1.1 kg) and in 2017 it was 13.8 kg.

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

In 2019, the Inniscarra trap only trapped 0.8 kg, likely due to low water levels and closure of the fish pass.

In 2020 the trap operated from the 16<sup>th</sup> March until the 27<sup>th</sup> September. Like previous years, the catches were largely recorded for the period early June to the end of August.

The trap operated from 15<sup>th</sup> March until 7<sup>th</sup> September 2021. The catches were released into the mid catchment of the River Bride which enters the River Lee below Iniscarra station. A total of 0.445 kg of elver were caught in 2021.

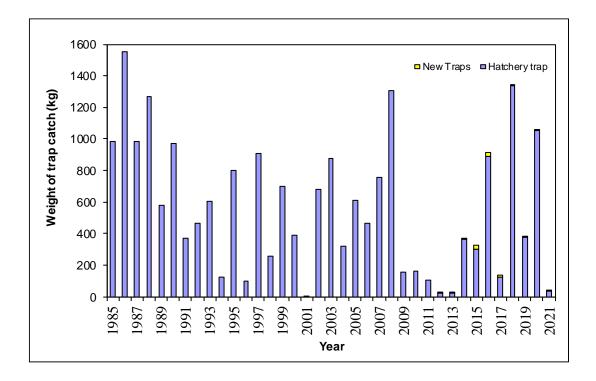


Figure 7-4 Juvenile yellow eel catches (kg) at Parteen Weir, 1985 to 2021. From 2012, a second trap was installed on the opposite bank (Clare) and in 2015 near the hatchery (Tipperary) and these data are included in the graph as separate bars.

Becerra-Jurado, G., Cruikshanks, R., O'Leary, C., Kelly, F., Poole, R. and Gargan, P. (2014). Distribution,

prevalence and intensity of Anguillicola crassus (Nematoda) in Anguilla aguilla in the Republic of

Ireland. Journal of Fish Biology, 84(4), 1046-1062.

- Dekker W., Pawson M., Walker A., Rosell R., Evans D., Briand C., Castelnaud G., Lambert P., Beaulaton L., Åström M., Wickström H., Poole R., McCarthy T.K., Blaszkowski M., de Leo G. and Bevacqua D. (2006). Report of FP6-project FP6-022488, Restoration of the European eel population; pilot studies for a scientific framework in support of sustainable management: SLIME. 19 pp. + CD.
- Gollock, M., Curnick, D. & Debney, A. (2011). Recruitment trends of juvenile eels in tributaries of the River Thames. *Hydrobiologia*, 672: 33-37.
- Jessop, B.M., (1995). Justification for and status of American eel elver fisheries in Scotia-Fundy Region. DFO Atl. Fish. Res. D c, 95/2, 10 p.
- Jessop B.M., (2000). Estimates of population size and instream mortality rate of American eel elvers in a Nova Scotia river. *Trans. Am. Fish. Soc.*, 129, 514:526.

Knights, B. and White, E. M. (1998). Enhancing immigration and recruitment of eels: the use of passes and associated trapping systems. Fisheries Management and Ecology 5: 459-471.

- Lasne, E. and Laffaille, P. (2008). Analysis of distribution patterns of yellow European eels in the Loire catchment using logistic models based on presence-absence of different size –classes. *Ecol. Freshwater Fish*: 17:30-37.
- Moriarty, C. (1986). Observations on the Eels of Meelick Bay, Lough Derg, 1981 1984. *Vie Milieu*, 36 (4) 279-283.
- Naismith, I. A. and Knights, B. (1988). Migrations of elver and juvenile European eels, *Anguilla anguilla* L., in the River Thames. Journal of Fish Biology 33 (Supplement A), 166-175.
- O'Connor, W. (2003). Biology and management of the European eel in the Shannon estuary, Ireland. Unpublished Ph.D. thesis. In Faculty of Science, Department of Zoology: National University of Ireland, Galway.
- Piper, A. T.; Wright, R. W. and Kemp, P. S. (2012). The influence of attraction flow on upstream passage of European eel (*Anguilla anguilla*) at intertidal barriers. Ecological Engineering 44: 329-336.
- Poole, W.R. (1994). A population study of the European Eel (*Anguilla anguilla* (L.)) in the Burrishoole System, Ireland, with special reference to growth and movement. *PhD, Dublin University*; 416pp.
- Poole, W.R., Reynolds, J.D.R. & Moriarty, C. (1990). Observations on the silver eel migrations of the Burrishoole river system, Ireland. 1959 to 1988. *Int. Revue Ges Hydrobiol.* 75 (6); 807-815.
- Reynolds, J. D.; Donnelly, R.; Molloy, S. and Walsh, T. (1994). ESB Shannon Eel Management Group. River Shannon Glass Eel /Elver Management Programme. Final Report July 1994.
- Sandlund, O.T., Diserud, O. H., Poole, R., Bergersen, K., Dillane, M., Rogan, G., Durif, C., Thorstad, E. B., and Vøllestad, L. A. (2017). Timing and pattern of annual silver eel migration in two European watersheds are determined by similar cues. *Ecology and Evolution*, DOI:10.1002/ece3.3099; 11pp.
- Walker, A.M., Andonegi, E., Apostolaki, P., Aprahamian, M., Beaulaton, L., Bevacqua, P., Briand, C., Cannas, A., De Eyto, E., Dekker, W., De Leo, G., Diaz, E., Doering-Arjes, P., Fladung, E., Jouanin, C.11, Lambert, P., Poole, R., Oeberst, R. & Schiavina, M. (2011). Report of Studies and Pilot Projects for carrying out the Common Fisheries Policy; LOT 2: Pilot projects to estimate potential and actual escapement of silver eel; POSE. DGMARE Contract: SI2.539598.
- White, E. M. and Knights, B. (1997). Environmental factors affecting migration of the European eel in the River Severn and Avon, England. *Journal of Fish Biology* 50:1104-1116.

## Appendix 1: Members of the Technical Expert Group on Eel 2018 - 2020

The TEGE is comprised of the following representatives:

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

The following experts were invited to attend relevant meetings.

Dr. Colin Lawton	National University of College Galway
Dr. Eamonn Lennihan	National University of College Galway
Dr. Milton Matthews	Inland Fisheries Ireland
Ferghail Armstrong	Queens University

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

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

(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.

 (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

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

# **Eel Management Information 2021**

River District Basin: Eastern / Neagh Bann River Basin District

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the EASTERN / NEAGH BANN RBD remained closed throughout 2021.

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

No eel fishing licences were issued by the EASTERN / NEAGH BANN RBD during 2021.

No commercial eel fishing licences were issued by the EASTERN / NEAGH BANN RBD during 2020. Scientific licences issued to trap eels relating to research activity in IFI Dublin (details TBC by Ciara O'Leary) (covering both Eastern / Neagh Bann (International) River Basin Districts). Ex-commercial eel fishermen were contracted by IFI Research Division to undertake surveys.

Estimated level of illegal fishing: Very low. The estimated level of illegal activity was very low for 2021 in the IFI Dublin area. Illegal activity targeting eels was not recorded. Patrols concentrated on lakes / rivers throughout the ERBD.

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred:

Number of gear seizures: 0 Fyke Nets

Gear types seized:

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions: NIL

Estimated tonnage on board: NIL

Declared origin(s) of cargos: NIL

Describe Action taken: NIL

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 / seized in nets (however very few eels found in any nets in 2021). 9 set lines were seized in 2021 which would be capable of catching eels but which were targeting other species (coarse fish)

Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? NIL

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

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

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

General impression of the programme: NIL

#### Management Action 3. Ensure Upstream Migration at Barriers

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

IFI staff work proactively to remove blockages to the free migration of fish in surface water systems. Natural debris barriers to upstream migration arising from floods etc were removed in at least 20 locations during 2021.

Some examples of small-scale works follow:



Photographs 1&2. Whitegate river blockages cleared (before and after pictured above, January 2021)



Photographs 3&4. During a patrol of the Garr River at Ballyboggan in February 2021, a bad blockage was found, made worse by timber and weeds floating downstream from drain clearance by the OPW further up the system. It was preventing fish from moving. This blockage, and another one in the making further upstream, were cleared.

#### **Management Action 4. Improve Water Quality**

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

IFI's environmental function focuses on water quality / habitat improvement and can broadly be broken into 3 main themes – a. regulatory & enforcement (planning / licensing / compliance / responsive enforcement action); b. collaboration / liaison / industry expert; c. stewardship and advocacy. IFI field staff respond to and investigate what can be termed 'water pollution' complaints received by IFI on a 24/7/365 basis. Investigations are often carried out in co-operation and close liaison with staff in Local Authorities, the E.P.A., Waterways Ireland or other bodies / agencies. Investigations can extend to pollution incidents on cross-border rivers, where close cooperation with staff from relevant agencies in Northern Ireland is required. Typical regulatory nonemergency complaints include poor quality discharges to watercourses, illegal dumping, and issues relating to developments beside or close to rivers. IFI's goal is to protect and conserve all fish populations and their habitats.

Local Authorities and other agencies are obliged under legislation to notify and engage Inland Fisheries Ireland on certain planning matters where an impact on the fisheries resource is possible. These agencies also require stakeholders (under their statutory powers) to consult with Inland Fisheries Ireland, and subsequently submit proof of compliance with Inland Fisheries Ireland's requirements as a component of the national formal planning system. Beyond local pre-planning and planning a constant demand exists for input to Local Authority Development Plans, Screening and Scoping on Strategic Environmental Assessments (SEA) relating to major plans and national policies, Regional Planning Guidelines, Local Area Plans etc. SAC, SPA and NHA catchment plans and projects are subject to Appropriate Assessment (AA) where Inland Fisheries Ireland are also prescribed and notifiable.

Infrastructural elements impacting on surface waters (e.g. schemes such as wastewater/water treatment plants, water abstractions for potable supply, flood relief schemes, roads projects, housing, commercial waterside development) are evaluated and assessed from a fisheries legislative perspective. From design through to construction, Inland Fisheries Ireland environmental staff are involved in close liaison with the relevant parties (often public agencies and bodies), their design teams and the various contractors 'on the ground' to ensure habitat protection, control of pollution and conservation of the fisheries resource.

# **Eel Management Information 2021**

<b>River District Basin:</b>	North-western River Basin District

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the NWRBD remained closed throughout 2021.

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

No eel fishing licences were issued by the NWRBD during 2021.

1

Estimated level of illegal fishing:

The estimated level of illegal activity was very low for 2021 on the Erne Catchment. One member of the public contacted IFI about the possibility of illegal eel fishing activity on Lough MacNean in August/September. Boat patrols were conducted and areas of the lake was dragged for nets, but no illegal activity was detected. Eel protection patrols were concentrated in the Upper Erne catchment, mainly around the Lough Gowna and Lough Oughter and the River Erne.

Number of gear seizures:

Gear types seized: fyke net

One Fyke net (12 m Long)

Number of Eel Dealer Interceptions: None

Estimated tonnage on board:

Declared origin(s) of cargos:

Describe Action taken:

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

Consistently low Levels of suspected illegal activity

#### Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD? -Yes

12,641 kg silver eel was trap& trucked from the Upper Erne (Cavan District)

IFI Ballyshannon district staff also assisted at eel lifts on the lower reaches of the catchment in conjunction with DAERA staff.

What was the total catch transported (kg)?

12,641 kg

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

There was no evidence of any illegal activity with the Trap & Transport programme. IFI staff conducted a number of overnight surveillance operations in the vicinity of the ESB conservation silver eel fishing sites during October, November and December.



Figure 1. - Night time patrol of eel fishing sites on Lough Oughter

General impression of the programme:

Worked well during the year.

### Management Action 3. Ensure Upstream Migration at Barriers

DAERA staff continued upstream trap & transport of elvers captured at Cathaleen's Fall HP station during 2021.

A total catch of ~370 kgs of elver was taken for the year.

<u>Barriers</u>- NWRBD staff have completed >90% of preliminary barriers assessments throughout the region (comprising the Letterkenny, Ballyshannon and Cavan districts).

#### **Management Action 4. Improve Water Quality**

There were no issues of note recorded during the year regarding water quality or pollution events which impacted eels.

# **Eel Management Information 2021**

River District Basin: Shannon River Basin District

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015: The above Bye law expired on 30 June 2018 and has not been renewed The eel fishery in the ShRBD remained closed throughout 2021. 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 ShRBD during 2021. Estimated level of illegal fishing: Probably smaller than in previous years, reflected by less seizures. No seizures on Lough Derg so illegal activity perceived to be less than other years. Main catchments where illegal activity occurred: The main area is Lough Ree and possibly River Suck, Lough Ennell, Strokestown Lakes Number of gear seizures: 10 Gear types seized: fyke nets Insert quantity/length of gear seized Number of Eel Dealer Interceptions:0 Estimated tonnage on board: Declared origin(s) of cargos:

Describe Action taken:

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

Management Action 2. Trap & Transport Was trap & transport undertaken in your RBD? Yes (*If 'Yes', please insert quantity transported*). 18,751kgs

What was the total catch transported (kg)?: 18,751kgs

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/ tabulate any sites etc where barriers were removed or elver access improved etc)

Any key photos ?

Management Action 4. Improve Water Quality

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

# **Eel Management Information 2021**

River District Basin:South Eastern River Basin DistrictDate:1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the South Eastern RBD remained closed throughout 2021.

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 Eastern RBD during 2021.

Estimated level of illegal fishing: Nil – none detected, a local heritage fisherman regularly sends emails about his wish to fyke net for eels in order to prove his beliefs that there are high densities of eels in Waterford estuary and it should be open for commercial fishing. The area was investigated, and no nets or activity was observed.

An illegal fish trap was seized, although this was most likely designed to take salmon and sea trout, it may have the potential to catch eels as it acts like a fyke net. The net/trap was seized from the River Colligan, an important coastal river. These traps are designed to take fish by baiting the cage that can only be accessed by fish entering a funnel from which they cannot escape. There is a door at the top of the trap which can be opened to take the fish out.



Figure 1 Fish trap seized from the River Colligan

Insert No. of alleged or confirm Main catchments where illegal Nil		d:
Number of gear seizures:	Nil	Gear types seized: Insert quantity/length of gear seized
Number of Eel Dealer Intercept	ions: Nil	
Estimated tonnage on board: Describe Action taken:	N/A	Declared origin(s) of cargos:
General impression of levels of	illegal activity s	since the cessation of the commercial fishery:
There was no illegal activity de to suspicions that any was occu	0	e year and no intelligence gathered to give rise

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)?: N/A

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

General impression of the programme:

### Management Action 3. Ensure Upstream Migration at Barriers

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

#### Brook Lodge Bridge (Barrow tributary)

SERBD staff worked closely with Carlow County council to remove a major barrier at Brook Lodge Bridge on the Mountain River in Borris Co. Carlow. NPWS were also involved due to the presence of Pearl Mussel. The existing old bridge was removed and replaced it with a clear span structure. This will improve access for eels and other species to approx. 40km of habitat upstream. The bridge used to be blocked constantly with debris and formed a barrier.



Figure 2 Brook Lodge Bridge pre works Figure 3 Bridge under construction

## **Tipperary Co-Op**

As part of a new EPA licence agreement informed by IFI, Tipperary Co Op have removed two barriers downstream of their outfalls in Tipperary Town on the River Ara.



Figure 4 Removal of weirs at Co-op Tipperary town

### Instream works

SERBD staff carried out an extensive amount of instream work on tributaries of both the River Nore and River Barrow. Blockages and temporary barriers were removed, these blockages can have impacts on the migration and movement of all species and flow of water, by removing these impassable blockages it can help open and create more habitat. These small projects can help improve fish populations and create more habitat.



Figure 5 Instream work on River Cappagh, impassable blockage removed

### Management Action 4. Improve Water Quality

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

### <u>Tipperary Co-op</u>

Following an investigation on the River Ara downstream of the WWTP high levels of ammonia were detected in the river. This was eventually traced to three separate discharges from Tipperary Co-op. The EPA was informed of these findings and a report sent to them. The EPA were met onsite by IFI and shown the separate discharges. The EPA are dealing with the issue and water quality is at the fore.



# **Eel Management Information 2021**

River District Basin: South West River Basin District

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the SWRBD remained closed throughout 2021.

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

No eel fishing licences were issued by the SWRBD during 2021.

Estimated level of illegal fishing: NIL

## Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred: N/A

Number of gear seizures: NIL

Gear types seized:

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions: NIL

Estimated tonnage on board:N/A

Describe Action taken:

Declared origin(s) of cargos:

General impression of levels of illegal activity since the cessation of the commercial fishery: No evidence of illegal eel fishing detected on the Lee in 2021

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)?: 1,033 Kg

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

NIL

General impression of the programme:

No issues arose.

Management Action 3. Ensure Upstream Migration at Barriers

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

### Any key photos ?

Management Action 4. Improve Water Quality

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

# **Eel Management Information 2021**

River District Basin: Western River Basin District (Galway)

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the WRBD (G) remained closed throughout 2021.

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 WRBD(G) during 2021.

Estimated level of illegal fishing:

Insert No. of alleged or confirmed reports

Main catchments where illegal activity occurred: NIL

Number of gear seizures: NIL

Gear types seized:

Insert quantity/length of gear seized

Number of Eel Dealer Interceptions: NIL

Estimated tonnage on board: NIL

Describe Action taken:

Declared origin(s) of cargos:

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

## Management Action 2. Trap & Transport

Was trap & transport undertaken in your RBD?

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

N/A

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/ tabulate any sites etc where barriers were removed or elver access improved etc)

Any key photos ?

N/A

Management Action 4. Improve Water Quality

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

N/A

# **Eel Management Information 2021**

River District Basin: Western River Basin District - Ballina

Date: 1 Jan- 31 Dec 2021

Management Action 1. Reduction of Fishery to achieve EU target

Confirm fishery ceased under Conservation of Eel Fishing Bye-law No. C.S. 319, 2015:

The above Bye law expired on 30 June 2018 and has not been renewed

The eel fishery in the WRBD- Ballina remained closed throughout 2021.

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 WRBD- Ballina during 2021.

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

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/ tabulate any sites etc where barriers were removed or elver access improved etc)

Any key photos ? None specific to eel access

Management Action 4. Improve Water Quality

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

None Specific to Eels

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

Wk No.	Week Ending	Jolly Mariner, Athlone	Yacht Club, Athlone	Kilaloe Eel Weir	Total for Week
1	04/09/21	0	0	Not Fishing	0
2	11/09/21	0	0	Not Fishing	0
3	18/09/21	0	0	Not Fishing	0
4	25/09/21	1254	150	Not Fishing	1404
5	02/10/21	0	0	Not Fishing	0
6	09/10/21	1146	0	0	1146
7	16/10/21	0	0	0	0
8	23/10/21	1223	191	0	1414
9	30/10/21	0	0	0	0
10	06/11/21	1834	0	0	1834
11	13/11/21	2268	398	0	2666
12	20/11/21	1871	0	0	1871
13	27/11/21	0	0	0	0
14	04/12/21	0	0	0	0
15	11/12/21	3673	160	0	3833
16	18/12/21	2458	0	353	2811
17	25/12/21	Not Fishing	Not Fishing	Not Fishing	0
18	01/01/22	Not Fishing	Not Fishing	0	0
19	08/01/22	Not Fishing	Not Fishing	1122	1122
20	15/01/22	Not Fishing	Not Fishing	420	420
21	22/01/22	Not Fishing	Not Fishing	90	90
22	29/01/22	Not Fishing	Not Fishing	Not Fishing	0
23	05/02/22	Not Fishing	Not Fishing	0	0
24	12/02/22	Not Fishing	Not Fishing	140	140
25	19/02/22	Not Fishing	Not Fishing		0
26	26/02/22	Not Fishing	Not Fishing		0
27	05/03/22	Not Fishing	Not Fishing		0
28	12/03/22	Not Fishing	Not Fishing		0
29	19/03/22	Not Fishing	Not Fishing		0
30	26/03/22	Not Fishing	Not Fishing		0
31	02/04/22	Not Fishing	Not Fishing		0
Total to I	Date(kgs)	15727	899	2125	18751

## Appendix 4- 1 River Shannon Silver Eel Weekly Collection Sheet 2021/22

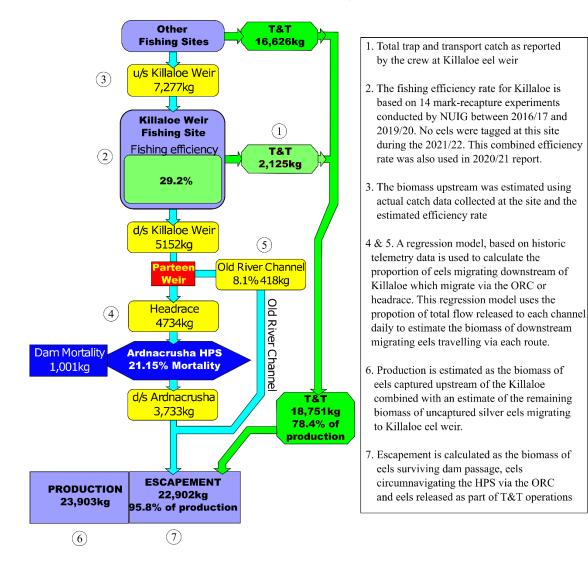
Week			Ferny	D. (	Urney	Roscor	Lough	Total for
No.	Week Ending	Lisnaskea	Gap	Portora	Bridge	Bridge	Gowna	Week
1	04/09/2021	0	0	0	0	Not Fishing	0	0
1	04/09/2021	0	0	0	0	Not	0	0
2	11/09/2021	0	498	414	0	Fishing	0	912
						Not		
3	18/09/2021	672	553	484	0	Fishing	0	1709
						Not		
4	25/09/2021	0	0	0	0	Fishing	0	0
_		o <b>-</b>	0001	100	4	Not	0	0.44
5	02/10/2021	85	2221	180	155	Fishing	0	2641
6	09/10/2021	0	1390	996	156	Not Fishing	0	2542
0	03/10/2021	0	1570	770	150	Not	0	2042
7	16/10/2021	957	825	835	1163	Fishing	0	3780
						Not		
8	23/10/2021	231	0	0	0	Fishing	0	231
						Not		
9	30/10/2021	0	1548	0	0	Fishing	0	1548
10	06/11/2021	1007	F107	2220	1057	Not Fishing	2722	15100
10	06/11/2021	1897	5187	2339	1957	Not	3722	15102
11	13/11/2021	0	0	0	0	Fishing	0	0
		-	-	-		Not		
12	20/11/2021	0	1068	0	0	Fishing	1826	0
						Not		
13	27/11/2021	771	121	706	262	Fishing	934	0
14	04/10/0001	0	2(28	792	0	Not	0	0
14	04/12/2021	0	2628	783	0	Fishing	0	0
15	11/12/2021	0	1909				0	
16	18/12/2021	738	1066	1557	1525		641	
17	25/12/2021							
18	01/01/2022							
19	08/01/2022							
20	15/01/2022							
21	22/01/2022							
22	29/01/2022							
23	05/02/2022							
24	12/02/2022							
Total	to Date(kgs)	5351	19014	8294	5218	0	7123	45000

Appendix 4- 2 River Erne Silver Eel Weekly Collection Sheet 2020/21

Date	Location	Total Weight of Catch	Total to Date
28/09/2021	Boat Centre Iniscarra	90	90
29/09/2021	Boat Centre Iniscarra	145	235
30/09/2021	Boat Centre Iniscarra	190	425
01/10/2021	Boat Centre Iniscarra	164	589
19/10/2021	Boat Centre Iniscarra	85	674
20/10/2021	Boat Centre Iniscarra	47	721
21/10/2021	Boat Centre Iniscarra	35	756
22/10/2021	Boat Centre Iniscarra	93	849
27/10/2021	Boat Centre Iniscarra	138	987
28/10/2021	Boat Centre Iniscarra	46	1033
Total Catch for Season			1033

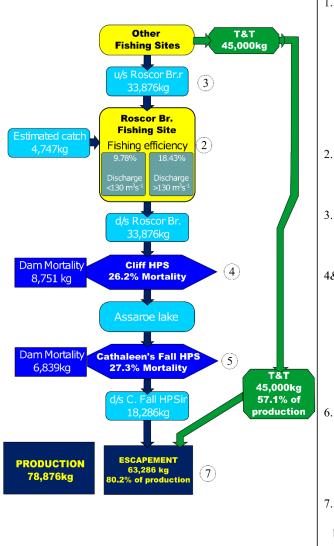
 Table 4-3 River Lee Silver Eel Weekly Collection Sheet 2021

### Appendix 5: Silver eel flow diagram explanation



### Shannon Flow Diagram

Figure A5-1 Flow diagram explanation for the Shannon catchment



## Erne Flow Diagram

1. Daily estimates of catch were made using a Generalized Additive Model (GAM) developed in previous seasons by NUIG (see Lenihan et al., 2021). A similar model was previously used in 2017/18 to complete catch records at Roscor Bridge. The model uses daily catch records from Ferny Gap upstream of Roscor Bridge and environmental variables to estimate the biomass which would have been captured each day.

- 2. Fishing efficiency rates are base on a series of historic mark-recapture experiments conducted by NUIG.
- 3. In the 2021/22 season, the previous establised efficiency rates were applied to daily estimates of Roscor Bridge catch made using the GAM
- 4&5. Dam mortality rates are based on historic telemetry results which apply different mortality rates depending on daily dam operation (No flow, generation only, generation and spillage). These daily mortality rates are applied to estimates of the biomass of eels migrationg downstream of Roscor Bridge daily. The mortality rate displayed is the mean daily mortality rate recorded during the season.
- 6. Production was estimated as the biomass of eels captured upstream of the Roscor Bridge combined with an estimate of the remaining biomass of uncaptured silver eels migrating to Roscor eel weir.
- 7. Escapement is calculated as the biomass of eels surviving dam passage combined with the biomass of eels released as part of T&T operations

Figure A5-2 Flow diagram explanation for Erne catchment

RBD	Catchments	Lake name	Project	No. Night	No. Net	No. Eels	CPUE	Average Length (cm)	Min Length (cm)	Max Length (cm)	Average weight (kg)	Min weight (kg)	Max Weight (kg)	Total Weight (kg)
SWRBD	Caragh	Acoose, Lough	NRSP	2	9	4	0.44	53.1	48.0	61.0	0.253	0.179	0.340	1.014
WRBD	Corrib	Agraffard, Lough	NRSP	2	9	2	0.22	63.8	61.6	66.0	0.491	0.463	0.519	0.983
NWIRBD	Gweedore	Anure, Lough	NRSP	2	9	8	0.89	48.9	42.0	61.5	0.209	0.116	0.387	1.676
NWIRBD	Lackagh	Beagh, Lough	NRSP	3	9	8	0.89	41.4	38.0	44.8	0.115	0.080	0.139	0.919
WRBD	Corrib	Bofin, Lough	NRSP	2	9	1	0.11	40.0	40.0	40.0	0.117	0.117	0.117	0.117
WRBD	Easky	Easky, Lough	NRSP	2	9	8	0.89	50.2	38.0	79.5	0.281	0.100	1.079	2.254
NWIRBD	Leannan	Fern, Lough	NRSP	1	9	14	1.56	36.8	30.0	48.5	0.097	0.051	0.203	1.367
NWIRBD	Lackagh	Glen Lough	NRSP	2	9	9	1.00	42.5	32.5	58.0	0.153	0.065	0.339	1.385
SWRBD	Coastal	Glenbeg Lough	NRSP	2	9	10	1.11	51.9	38.2	80.0	0.285	0.081	0.848	2.857
WRBD	Drumcliff	Glencar Lough	NRSP	2	9	1	0.11	55.0	55.0	55.0	0.291	0.291	0.291	0.291
NWIRBD	Moy	Talt, Lough	NRSP	3	9	1	0.11	60.0	60.0	60.0	0.373	0.373	0.373	0.373

## Table A61 Summary data from WFD Lakes Survey, 2020.

RBD	Catchments	Lake name	No. Eels	20-29cm	30-39cm	40-49cm	50-59cm	60-69cm	70-79cm	>80cm
SWRBD	Caragh	Acoose, Lough	4	0	0	2	1	1	0	0
WRBD	Corrib	Agraffard, Lough	2	0	0	0	0	2	0	0
NWIRBD	Gweedore	Anure, Lough	8	0	0	5	2	1	0	0
NWIRBD	Lackagh	Beagh, Lough	8	0	2	6	0	0	0	0
WRBD	Corrib	Bofin, Lough	1	0	0	1	0	0	0	0
WRBD	Easky	Easky, Lough	8	0	1	4	2	0	1	0
NWIRBD	Leannan	Fern, Lough	14	0	10	4	0	0	0	0
NWIRBD	Lackagh	Glen Lough	9	0	5	2	2	0	0	0
SWRBD	Coastal	Glenbeg Lough	10	0	2	3	3	0	1	1
WRBD	Drumcliff	Glencar Lough	1	0	0	0	1	0	0	0
NWIRBD	Moy	Talt, Lough	1	0	0	0	0	1	0	0

Table A6 2 Length frequency data from WFD Lakes Surveys, 2020.

RBD	Catchment	River Name	River Site	Methodology	No. Sets/Boats	No. Runs	Area (m²)	Density (no./m²)	No. Eels
SHIRBD	Shannon	Ballyfinboy River	Br. just u/s L. Derg_A	TEF (Handset)	1	1	133.80	0.00747	1
SERBD	Nore	Little Arrigle River	Goat's BrA	TEF (Handset)	1	1	144.40	0.00693	1
SERBD	Nore	Little Arrigle River	Ballylowra North_A (Folio 2546)	TEF (Handset)	1	1	190.09	0.01578	3
SERBD	Suir	Anner River	Drumman BrA (SQL_DB_IFI_1864)	TEF (Handset)	1	1	196.10	0.00510	1
SERBD	Nore	Dinin (Douglas) River	Corbetstown_A	TEF (Handset)	1	1	126.94	0.00788	1
SERBD	Nore	Dinin (Gloshia) River	East of Seven C/R_A	TEF (Handset)	1	1	122.60	0.02447	3
SERBD	Nore	Dinin River	Corries BrA	TEF (Handset)	1	1	120.38	0.00831	1
SERBD	Barrow	Dinin (Seskinnamadra) River	Ballinree BrA	TEF (Handset)	1	1	91.00	0.02198	2
SERBD	Barrow	Dinin River	Kilcloney BrB	TEF (Handset)	1	1	269.70	0.00371	1
SERBD	Ballyteigue	Duncormick River	Cullen's Cross Roads_A	TEF (Handset)	1	1	103.70	0.00964	1
WRBD	Corrib	Corrib (Ballynalty) River	u/s of Ballynalty Bay_A	TEF (Handset)	1	1	120.70	0.00829	1
SERBD	Barrow	Glasha River	Rosnamullane_A	TEF (Handset)	1	1	125.18	0.00799	1
WRBD	Corrib	Failmore	Knocknagur_B	TEF (Handset)	1	1	244.00	0.00410	1
NWRBD	Burnfoot	Burnfoot River	Glen_A	TEF (Handset)	1	1	178.60	0.00560	1
NWRBD	Clonmany	Ballyhallan River	Br. u/s Clonmany River_B	TEF (Handset)	1	1	153.80	0.00650	1
SERBD	Slaney	Derry River	Curravanish_A	TEF (Handset)	1	1	174.00	0.00575	1
SHIRBD	Feale	Tyshe River	West Br. Ardfert at Friary_C	TEF (Handset)	1	1	77.20	0.01295	1
SHIRBD	Feale	Tyshe River	Abbeylands BrA	TEF (Handset)	1	1	166.74	0.00600	1
SHIRBD	Feale	Tyshe River	Sackville BrA	TEF (Handset)	1	1	104.33	0.01917	2
SWRBD	Bride	Shanowen (Cloone) River	Kilquane North_A	TEF (Handset)	1	1	120.40	0.00831	1
SWRBD	Waterville	Cummeragh (Owengarriff) River	Owengarriff Path_A	TEF (Handset)	1	1	161.80	0.01236	2
SERBD	Nore	Glory River	Br. E of Raheen_A	TEF (Handset)	1	1	265.20	0.00377	1
WRBD	Corrib	Corrib (Larragan) River	Pollagh_A	TEF (Handset)	1	1	77.80	0.02571	2
ERBD	Devlin	Nanny (Bellewstown) River	Johnstown East_A	TEF (Handset)	1	1	143.60	0.01393	2
ERBD	Devlin	Nanny (Meath) (Hurley) River	Boolies Little_A	TEF (Handset)	1	1	183.90	0.01088	2
ERBD	Devlin	Nanny (Meath) River	Knockisland_A	TEF (Handset)	1	1	319.80	0.01251	4
NBIRBD	Castletown	Big River (Louth)	Balygoly Southeast_A	TEF (Handset)	1	1	148.70	0.01345	2
SERBD	Slaney	Clody, River	Ford (Br.) 3km u/s Bunclody_B	TEF (Handset)	1	1	214.70	0.00466	1
SERBD	Owenavorragh	Banoge River	Br. u/s Owenavorragh R confl_A	TEF (Handset)	1	1	285.60	0.00350	1
SERBD	Nore	King's (Kilkenny)(Stoneyford) River	Stonyford BrA	TEF (Handset)	1	1	66.60	0.01502	1
SERBD	Barrow	Aughnavaud River	Bauck Hill_A	TEF (Backpack)	1	1	144.00	0.00694	1
SERBD	Barrow	Barrowmount River	Johnville BrA	TEF (Backpack)	1	1	128.80	0.00776	1

Table A6 3 Summary data from WFD Rivers Survey, 2020.

RBD	Catchment	River Name	River Site	Methodology	No. Sets/Boats	No. Runs	Area (m²)	Density (no./m²)	No. Eels
SERBD	Barrow	Clashganny River	Ballymurphy_A	TEF (Backpack)	1	1	100.06	0.02998	3
SERBD	Barrow	Duiske River	Peig's Lane_A	TEF (Backpack)	1	1	94.80	0.01055	1
SERBD	Barrow	Duiske River	Priestsvalley_A	TEF (Backpack)	1	1	51.20	0.01953	1
SERBD	Barrow	Duiske River	Well Lane_A	TEF (Backpack)	1	1	97.20	0.02058	2
SERBD	Barrow	Monefelim (Acore) River	Barraghcore BrA	TEF (Backpack)	1	1	250.40	0.00399	1
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	TEF (Backpack)	1	1	117.60	0.00850	1
SERBD	Barrow	Gowran River	Grange Lower_A	TEF (Backpack)	1	1	116.35	0.02578	3
SERBD	Barrow	Monefelim River	Monefelim_A	TEF (Backpack)	1	1	82.50	0.01212	1
SERBD	Barrow	Mountain River	Rathanna BrA	TEF (Backpack)	1	1	97.50	0.01026	1
SHIRBD	Shannon	Bow River	Bow River BrC	TEF (Handset)	1	1	158.50	0.00631	1
SERBD	Barrow	Fushoge River	Fushoge BrA	TEF (Handset)	1	1	184.40	0.00542	1
SERBD	Barrow	Slate River	Agar BrA	TEF (Backpack)	1	1	209.70	0.00477	1
SERBD	Barrow	Burren River	Coolsneachta_B	TEF (Backpack)	1	1	153.50	0.00651	1
SERBD	Barrow	Slate River	Glenaree_A	TEF (Backpack)	1	1	423.90	0.00236	1

1	12	

SERBD

Slaney

Clody, River

No. RBD 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 Catchments **River name** River site name Eels SHIRBD Ballyfinboy River Br. just u/s L. Derg A Shannon SERBD Nore Little Arrigle River Goat's Br.\_A Ballylowra North\_A SERBD Nore Little Arrigle River (Folio 2546) Drumman Br. A SERBD Anner River Suir (SQL\_DB\_IFI\_1864) SERBD Nore Dinin (Douglas) River Corbetstown\_A SERBD Nore Dinin (Gloshia) River East of Seven C/R\_A SERBD Corries Br.\_A Dinin River Nore Dinin (Seskinnamadra) SERBD Barrow Ballinree Br. A River SERBD Dinin River Kilcloney Br.\_B Barrow SERBD Ballyteigue Duncormick River Cullen's Cross Roads\_A WRBD Corrib Corrib (Ballynalty) River u/s of Ballynalty Bay A SERBD Barrow Glasha River Rosnamullane A WRBD Corrib Failmore Knocknagur\_B NWRBD Burnfoot Burnfoot River Glen A NWRBD Br. u/s Clonmany River\_B Clonmany Ballyhallan River SERBD Slaney Derry River Curravanish\_A West Br. Ardfert at SHIRBD Feale Tyshe River Friary\_C SHIRBD Feale Tyshe River Abbeylands Br.\_A SHIRBD Feale Tyshe River Sackville Br. A SWRBD Shanowen (Cloone) River Bride Kilquane North A Cummeragh (Owengarriff) SWRBD Waterville Owengarriff Path\_A River SERBD Nore Glory River Br. E of Raheen\_A WRBD Corrib Corrib (Larragan) River Pollagh\_A ERBD Devlin Nanny (Bellewstown) River Johnstown East A Nanny (Meath) (Hurley) ERBD Devlin Boolies Little\_A River ERBD Devlin Nanny (Meath) River Knockisland\_A NBIRBD Balygoly Southeast\_A Castletown Big River (Louth) Ford (Br.) 3km u/s

Bunclody\_B

#### Table A5 4 Length frequency data from WFD River Surveys, 2020.

SERBD	Owenavorragh	Banoge River	Br. u/s Owenavorragh R confl_A	1	0	0	1	0	0	0	0	0	0
		King's											
SERBD	Nore	(Kilkenny)(Stoneyford) River	Stonyford BrA	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Aughnavaud River	Bauck Hill_A	1	1	0	0	0	0	0	0	0	0
SERBD	Barrow	Barrowmount River	Johnville BrA	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Clashganny River	Ballymurphy_A	3	0	1	2	0	0	0	0	0	0
SERBD	Barrow	Duiske River	Peig's Lane_A	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Duiske River	Priestsvalley_A	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Duiske River	Well Lane_A	2	0	0	1	0	1	0	0	0	0
SERBD	Barrow	Monefelim (Acore) River	Barraghcore BrA	1	0	0	0	1	0	0	0	0	0
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Gowran River	Grange Lower_A	3	0	1	2	0	0	0	0	0	0
SERBD	Barrow	Monefelim River	Monefelim_A	1	0	0	0	3	0	0	0	0	0
SERBD	Barrow	Mountain River	Rathanna BrA	1	0	1	0	0	0	0	0	0	0
SHIRBD	Shannon	Bow River	Bow River BrC	1	0	0	0	0	1	0	0	0	0
SERBD	Barrow	Fushoge River	Fushoge BrA	1	0	1	0	0	0	0	0	0	0
SERBD	Barrow	Slate River	Agar BrA	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Burren River	Coolsneachta_B	1	0	0	1	0	0	0	0	0	0
SERBD	Barrow	Slate River	Glenaree_A	1	0	0	0	1	0	0	0	0	0

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	Shannon	Ballyfinboy River	Br. just u/s L. Derg_A	55.0	55.0	55.0	n.a	n.a	n.a	n.a
SERBD	Nore	Little Arrigle River	Goat's BrA	19.0	19.0	19.0	n.a	n.a	n.a	n.a
SERBD	Nore	Little Arrigle River	Ballylowra North_A (Folio 2546)	21.0	13.0	29.0	n.a	n.a	n.a	n.a
SERBD	Suir	Anner River	Drumman BrA (SQL_DB_IFI_1864)	50.0	50.0	50.0	n.a	n.a	n.a	n.a
SERBD	Nore	Dinin (Douglas) River	Corbetstown_A	27.5	27.5	27.5	n.a	n.a	n.a	n.a
SERBD	Nore	Dinin (Gloshia) River	East of Seven C/R_A	30.8	25.5	37.0	n.a	n.a	n.a	n.a
SERBD	Nore	Dinin River	Corries BrA	22.5	22.5	22.5	n.a	n.a	n.a	n.a
SERBD	Barrow	Dinin (Seskinnamadra) River	Ballinree BrA	27.3	17.5	37.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Dinin River	Kilcloney BrB	41.0	41.0	41.0	n.a	n.a	n.a	n.a
SERBD	Ballyteigue	Duncormick River	Cullen's Cross Roads_A	35.0	35.0	35.0	n.a	n.a	n.a	n.a
WRBD	Corrib	Corrib (Ballynalty) River	u/s of Ballynalty Bay_A	21.0	21.0	21.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Glasha River	Rosnamullane_A	36.0	36.0	36.0	n.a	n.a	n.a	n.a
WRBD	Corrib	Failmore	Knocknagur_B	43.0	43.0	43.0	n.a	n.a	n.a	n.a
NWRBD	Burnfoot	Burnfoot River	Glen_A	32.5	32.5	32.5	n.a	n.a	n.a	n.a
NWRBD	Clonmany	Ballyhallan River	Br. u/s Clonmany River_B	10.5	10.5	10.5	n.a	n.a	n.a	n.a
		Derry River	Curravanish_A				n.a	n.a	n.a	n.a
SERBD	Slaney	Tyshe River	West Br. Ardfert at Friary C	34.0	34.0	34.0				
SHIRBD	Feale	5	5 -	12.5	12.5	12.5	n.a	n.a	n.a	n.a
SHIRBD	Feale	Tyshe River Tyshe River	Abbeylands BrA Sackville BrA	12.5	12.5	12.5	n.a	n.a	n.a	n.a
SHIRBD SWRBD	Feale Bride	Shanowen (Cloone) River	Kilquane North_A	24.9 16.2	23.6 16.2	26.2 16.2	n.a n.a	n.a n.a	n.a n.a	n.a n.a
SWRBD	Waterville	Cummeragh (Owengarriff) River	Owengarriff Path_A	33.8	32.5	35.0	n.a	n.a	n.a	n.a
SERBD	Nore	Glory River	Br. E of Raheen_A	18.0	18.0	18.0	n.a	n.a	n.a	n.a
WRBD	Corrib	Corrib (Larragan) River	Pollagh_A	24.0	23.0	25.0	n.a	n.a	n.a	n.a
ERBD	Devlin	Nanny (Bellewstown) River	Johnstown East_A	20.0	14.0	26.0	n.a	n.a	n.a	n.a
ERBD	Devlin	Nanny (Meath) (Hurley) River	Boolies Little_A	24.5	18.0	31.0	n.a	n.a	n.a	n.a

Table A6 5 Summary length and weight data from WFD Rivers Surveys, 2020.

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	Devlin	Nanny (Meath) River	Knockisland_A	14.3	11.0	18.1	n.a	n.a	n.a	n.a
		Big River (Louth)	Balygoly Southeast_A				n.a	n.a	n.a	n.a
NBIRBD	Castletown			18.5	14.0	23.0				
SERBD	Slaney	Clody, River	Ford (Br.) 3km u/s Bunclody_B	18.0	18.0	18.0	n.a	n.a	n.a	n.a
SERBD Owenavorragh		Banoge River	Br. u/s Owenavorragh R confl_A	20.5	20.5	20.5	n.a	n.a	n.a	n.a
SERBD	Nore	King's (Kilkenny)(Stoneyford) River	Stonyford BrA	35.0	35.0	35.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Aughnavaud River	Bauck Hill_A	7.2	7.2	7.2	n.a	n.a	n.a	n.a
SERBD	Barrow	Barrowmount River	Johnville BrA	31.0	31.0	31.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Clashganny River	Ballymurphy_A	20.0	14.0	24.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Duiske River	Peig's Lane_A	23.0	23.0	23.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Duiske River	Priestsvalley_A	32.0	32.0	32.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Duiske River	Well Lane_A	31.0	22.0	40.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Monefelim (Acore) River	Barraghcore BrA	33.0	33.0	33.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Gowran River	Br. N of Goresbridge (S Channel)_A	48.0	48.0	48.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Gowran River	Grange Lower_A	20.0	15.0	25.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Monefelim River	Monefelim_A	34.0	34.0	34.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Mountain River	Rathanna BrA	19.0	19.0	19.0	n.a	n.a	n.a	n.a
SHIRBD	Shannon	Bow River	Bow River BrC	41.0	41.0	41.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Fushoge River	Fushoge BrA	17.0	17.0	17.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Slate River	Agar BrA	20.0	20.0	20.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Burren River	Coolsneachta_B	20.0	20.0	20.0	n.a	n.a	n.a	n.a
SERBD	Barrow	Slate River	Glenaree_A	35.0	35.0	35.0	n.a	n.a	n.a	n.a

RBD	Catchments	Transitional Water	No. Nights	No. Nets	No. Eels	CPUE	Average Length (cm)	Min. Length (cm)	Max. Length (cm)
NBIRBD	Castletown	Castletown Estuary	1	12	2	0.17	24.8	16.0	33.5
ERBD	Broadmeadow	Broadmeadow Water	1	12	0	n.a.	n.a.	n.a.	n.a.
ERBD	Vartry	Broad Lough	1	12	0	n.a.	n.a.	n.a.	n.a.
ERBD	Ovoca	Avoca Estuary	1	12	2	0.17	8.1	5.7	10.5
SERBD	Bridgetown	Bridgetown Estuary	1	12	2	0.17	28.3	23.5	33.0
SERBD	Colligan	Colligan Estuary	1	12	1	0.08	48.5	48.5	48.5
SWRBD	Bandon	Bandon Estuary, Lower	2	18	7	0.39	52.9	41.0	68.0
SWRBD	Bandon	Bandon Estuary, Upper	1	6	2	0.33	43.5	42.0	45.0
SWRBD	Argideen	Argideen Estuary	1	12	1	0.08	60.0	60.0	60.0
SWRBD	Ferta	Ferta Estuary	1	12	0	n.a.	n.a.	n.a.	n.a.

Table A6 6 Summary data from WFD Transitional Waters Surveys, 2020.

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
NBIRBD	Castletown	Castletown Estuary	2	0	1	0	1	0	0	0	0	0
ERBD	Broadmeadow	Broadmeadow Water	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ERBD	Vartry	Broad Lough	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ERBD	Ovoca	Avoca Estuary	2	1	1	0	0	0	0	0	0	0
SERBD	Bridgetown	Bridgetown Estuary	2	0	0	1	1	0	0	0	0	0
SERBD	Colligan	Colligan Estuary	1	0	0	0	0	1	0	0	0	0
SWRBD	Bandon	Bandon Estuary, Lower	7	0	0	0	0	3	3	1	0	0
SWRBD	Bandon	Bandon Estuary, Upper	2	0	0	0	0	2	0	0	0	0
SWRBD	Argideen	Argideen Estuary	1	0	0	0	0	0	0	1	0	0
SWRBD	Ferta	Ferta Estuary	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table A6 7 Length frequency	data from WFD	Transitional Wate	rs Surveys, 2020.