ACTIVITY REPORT

OF THE

STANDING SCIENTIFIC COMMITTEE FOR EEL

2012

REPORT OF THE STANDING SCIENTIFIC COMMITTEE FOR EEL TO INLAND FISHERIES IRELAND AND THE DEPT. OF COMMUNICATIONS, ENERGY AND NATURAL RESOURCES

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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 2015.** **The data and analyses are part of an ongoing scientific assessment and are, therefore, preliminary and may be subject to change, updating or reanalysis. Some data may also be submitted for peer-review publication. The contents of this report should not be reproduced without the prior permission of the Standing Scientific Committee for Eel.**

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 in 2009. Under the EC Regulation, Ireland is 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.

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

Under the EC Regulation (EC No. 1100/2007), each Member State shall report to the Commission initially every third year until 2018 and subsequently every six years. The first report was submitted in June 2012.

The Irish Eel Management Plan outlines a national programme for sampling catch and surveys of local eel stocks. Appropriate scientific assessment will monitor the implementation of the plans. The Standing Science Committee for Eel (SSCE) was established by the Department of Energy, Communications and Natural Resources in March 2009 and appointed by the Minister. Consultation with the Department of Culture, Arts and Leisure in Northern Ireland ensures the co-operation with Northern Ireland agencies to cover the specific needs of the trans-boundary North Western International River Basin District eel management plan. The SSCE comprises scientific advisers drawn from the Marine Institute (MI), Inland Fisheries Ireland (IFI), The Loughs Agency, the Agriculture, Food and Biosciences Institute for Northern Ireland (AFBINI) and the Electricity Supply Board. Although the scientists are drawn from these agencies, the advice from the SSCE is independent of the parent agencies.

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

International Advice; ICES - 2012

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 Working Group on Eel.

ICES considered the updated time-series of relevant stock status indices and repeated the advice from 2011:

"*The status of eel remains critical and urgent action is needed. ICES reiterates its previous advice that all anthropogenic mortality (e.g. recreational and commercial fishing, hydropower, pollution) affecting production and escapement of eels should be reduced to as close to zero as possible until there is clear evidence that both recruitment and the adult stock are increasing.*"

Indications were that the eel stock remained in a critical state in 2012. The recruitment index (five-year average) was at its historical lowest, less than 1% for the North Sea for the years 1960–1979. In 2012, recruitment for the series outside the North Sea ('Elsewhere Europe') increased, but remained less than

6.5% of the 1960–1979 average. Recruitment of young (recruiting yellow eel, usually 8–20 cm in length) yellow eel has shown a continuous declining trend since the 1950s.

National Advice

Glass Eel Imports: A concern was raised in 2012 that glass eels had been imported from the European continent for stocking in Lough Neagh. Traditionally, these were sourced from the Severn UK, but with recent low catches, additional stock was imported from the Biscay area. The SSCE is concerned that both pathogens and other non-native species may be inadvertently introduced with any stocking of live fish, but there is particular concern with introductions from the continent.

The SSCE recommends against any such introductions of live fish to the island of Ireland, especially from the continent, and recommends a risk analysis be undertaken before carrying out any introductions.

The SSCE recommends that in the event of importations taking place, all batches be screened on receipt for pathogens and also for non-native aquatic species. The screening for non-native species is not a veterinary function and should be carried out by specialists and this should include the transport medium (e.g. ice, water, slime).

EU Report (SSCE Report 2012) and Public Consultation: In 2012, Member States were required to report to the European Commission in line with Article 9 of the Eel Regulation (1100/2007) on the progress of the implementation of the eel Management Plans. The reports include the current status of the stock and the levels of anthropogenic mortality.

The SSCE compiled a scientific report detailing the required elements for the Article 9 Progress Report and also information to support the Minister in deciding on the next three years fishery and hydropower programme. The SSCE supported a public consultation in June 2012 with presentations in Clonmel, Athlone, Carrick on Shannon and the Oireachtas.

The SSCE report was also made available to the joint EIFAAC/ICES Working Group on eel (WGEEL).

Index Silver Eel Sites: The SSCE expresses concern over the state of two key index sites indentified in the Irish Eel Management Plan as vital to evaluating the annual production and escapement of silver eels from Irish waters. The Galway Fishery has been closed due to structural defects and the Killaloe Fishery requires considerable maintenance. The SSCE recommends that both these fisheries are maintained as index scientific sites for eel assessment.

Irish EMP Management Actions

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

The target set for the Irish Eel Management Plan 2009-2012 was extended for a further three years. The bye-law enacted in 2009 which prohibited the issuing of licenses was continued and a new byelaw was passed and the fishing for eel, or possessing or selling eel caught in a Fishery District in the State until June 2015. All regions confirmed a closure of the eel fishery for the 2012 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 in four regions which led to some seizures of gear. Overall, illegal activity in

2012 was thought to be relatively low. No dealers transport trucks were seized in 2012. Reliable trade (import/export) data remains unavailable to the SSCE.

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 which were set out in the Eel Management Plans. The total quantity released from the three catchments was 58,890kg. The level of fishing mortalities was reported to be low. Catches were transported as soon as possible using a series of custom made fibreglass fish transport tanks with a bottled gas aeration system. The release sites were located downstream of each of the rivers systems lowermost hydroelectric power stations.

A total of 24.228t were trapped and transported on the Shannon, including 12.475t at Killaloe. This exceeds the target set of 30% of the estimated escapement. NUIG estimate the production to be 67.9t or the escapement to be 58.8t. The estimated production in the EMP was 74t. Therefore the T&T amount is likely to have been 35.7% of the silver eel production.

On the Erne, a total catch of 34.66t of silver eel were trapped and transported to the estuary. The target (50% of production) was, therefore, met in 2012 (51.3%).

The R. Lee was fished at one locations (Inniscarra Reservoir, Carrigadrohid Reservoir and Lough Allua) and a total of 0.202t was captured and transported downstream as viable silver eel migrants. The target (500kg) was not met in 2012.

The turbine mortality rates are being determined using acoustic tagged and tracked silver eel and these data are reported in the 2012 report (SSCE 2012). Additional data for the Erne were reported to the SSCE in 2012 (McCarthy *et al*. 2013).

For the Shannon, summarising the annual data gives mortality ranges of 16.6% to 25% and an overall average mortality of 21.15 $\pm$ 8% for 104 tagged eel arriving at Ardnacrusha HPS (SSCE 2012). In the Eel Management Plan, a figure of 30% was used to account for the amount of eel potentially using the bypass route down the old river channel and around Ardnacrusha HPS. For 2009 – 2011, the actual amount of eels estimated to bypass were used in determining the escapement (59%, 4.4% & 12.5% respectively) and 1.6% was estimated for 2012. A general figure for eels estimated to use the bypass in recent years is 17.8% (SSCE, 2012).

For the Erne, the 2012 silver eel migration season was characterized by an almost complete absence of spillage at Cliff dam. In contrast, at Cathaleen's Fall dam high spillage occurred throughout much of the migration season. Planned telemetry experiments, which were intended to provide estimates of eel mortality during periods in which the hydropower stations were on full load, had to be postponed to 2013. Because of the limited spillage, a pre-cautionary estimate of mortality (25%) at the Cliff HPS dam was used in the calculation of silver escapement in the 2012 season. Telemetry results from previous research were used for estimation of the hydropower passage mortality rate (8%) at the Cathaleen's Fall HPS dam.

3. Obstacles to upstream migration

Obstacles to migration in river systems are one of several factors influencing the decline in the European eel population. Obstacles impede eels from accessing and colonizing large parts of catchments, thus reducing upstream density and additional production of silver eels. The National Eel Management Plan identified that upstream migrating juvenile eels require modified passage through existing fish passes or any new obstacles to maximise escapement as traditional fish passes are not designed to accommodate eel pas-

sage. Barriers or potential obstacles which can be considered under this action include artificial structures such as weirs, hydrodams, fish passes, fish counter structures, millraces, road crossings/bridge aprons and forestry related operations. Over 47% of the available wetted habitat is above major hydropower barriers, although there will be a greater proportion of the potential silver eel production when the differences in relative productivity are taken into account.

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

Projects have been initiated on the Shannon and in Wicklow to assess the level of obstruction to fish migration by barriers. The assessments on the upper Shannon will be continued in 2013. In Wicklow, out of the 103 sites examined, 68 were ranked as 'High Risk' for eel, 12 sites were moderate risk and 24 sites were low risk. The majority of problems related to scour apron structures. The dominant 'barrier' issue was a function of a number of associated physical factors including water velocity; barrier height and laminar flow. There is potential to alleviate the passage issue while maintenance and repairs works are being carried out on small bridge and culverts.

Within the FCILC area the Loughs Agency has been involved in the development of a migration barriers assessment tool under the WFD with SNIFFER and SEPA. As part of this development a number of barriers have been assessed and it is intended to continue this process where appropriate.

The 'Guidelines on the planning, design, construction and operation of small scale hydro electric schemes and fisheries' was published in 2007. Due to changes in legislation and improved knowledge of successful and unsuccessful installations this report was updated in 2012. A number of additions were made to the report in relation to eel taking into account changes in legislation, the inclusion of examples of elver and eel passes that aid the migration of elvers/ eels over and around barriers and the report recommends that these should be incorporated into the design of all fish passes where required.

The guidelines for screening to protect downstream migrants state that 'where eel and other fish species are present additional site specific measures including screening design, size and duration may be required to protect downstream migrants'.

4. Improve Water Quality, fish health and biosecurity

The improvement of water quality in Ireland is primarily being dealt with under the workprogramme for the implementation of the Water Framework Directive (WFD). The objectives of the Water Framework Directive (WFD) are to protect all high status waters, prevent further deterioration of all waters and to restore degraded surface and ground waters to good status by 2015. A major programme is under way to achieve this target, with monitoring since 2006. The WFD reporting and monitoring will run on a six year cycle, so the next opportunity to assess whether water quality is improving will be with the publication of the second River Basin Management Plans (RBMP) in 2015.

In the interim period, the EPA compile statistics on water quality in Ireland, the most recent of which covers the period 2007-2009 (McGarrigle, Lucey & Ó Cinnéide, 2011). This has previously been reported in the 2012 SSCE annual update, and there are no new up-

dates to date. However, it is noted that 60% of rivers, 81% of lake area, all transitional waters and all coastal waterbodies, will need to have their status improved to meet the requirements of the WFD. In 2011, a comprehensive fish surveillance monitoring programme was conducted, with 65 river sites, 30 lakes and 2 transitional waters successfully surveyed throughout the country. Eel are fairly ubiquitous across all sites, and were found in 100% of lakes surveyed and 60% of rivers.

Upper and Lough Erne in Northern Ireland are classified as a heavily modified water body under the EU Water Framework Directive due to the altered hydrology created by the presence of hydropower stations on the out flowing river Erne where is exits through County Donegal, Irish Republic, and due to regulated levels in upper Lough Erne by control gates at Enniskillen. Therefore, rather than good ecological status its WFD target is good ecological potential (**GEP**). Fish Scores are brought downward from good by the high abundances of cyprinids and near absence from upper lough surveys of native salmonids. Composite classification results for all WFD parameters for 2010, 2011 and 2012 indicate that Lough Erne can be classified as having ***moderate ecological potential*** (MEP).

There was no new information on fish kills or on eel contamination. *Anguillicoloides crassus* continues to spread and more than 70% of the wetted area is now infested.

Irish EMP Monitoring Actions

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

Silver Eel Assessment

The Council Regulation (EC) No 1100/2007 sets a target for silver eel escapement to be achieved in the long-term. 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. Quantifying migrating silver eel each year 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 Shannon, Erne, Burrishoole and Fane catchments. Trials will also be carried out at other locations identified in the EMP using coghill nets, mark-recapture and technology options such as electronic counters or DIDSON technology.

Corrib

Due to health and safety issues over the structure of the Galway weir, it was not possible to undertake an estimate of escapement in 2012.

Shannon

Eels have been fished on the Shannon in both historic and more recent times. Commercial fishing was initially established by the ESB in 1937. The ESB control the fishing rights as a result of the Shannon Fisheries Acts of 1935 and 1938. In 2009, commercial silver eel fishing ceased on the Shannon. The pre-EMP pilot trap and transport system of fishing at Killaloe has been continued as part of the EMP and the catch, along with that of the four contracted fishermen was transported downstream of Ardnacrusha HEP. The Killaloe catch in 2012 was 12.475t. Fishing was also undertaken by ESB contracted crews upstream of Killaloe and their catches (11.753t) were also transported downstream.

Following adoption of new analytical protocols for estimation of Shannon silver eel production by MacNamara and McCarthy (2013), it has been decided to also present the 2012 production/escapement results as part of the new time series. The production and escapement estimates obtained following the new protocols were 67.5t and 58.5t (with 21.15% turbine mortality).

Burrishoole

Silver eel trapping was continued in Burrishoole in 2012. The main runs occurred in September, November and less so in October. The total run amounted to 3335 individual eels or a production/escapement of 545kg.

The average weight of the eels in the samples has been steadily increasing from 95 g in the early 1970s to 216 g in both the 1990s and the 2000s. The annual count and average weight in 2010 and 2011 were both below the mean for the last decade and the average weight fell again in 2012. In 2012, the majority of the eel run was sampled (n=3317; 99.5%). The run increased from 1969 eels in 2011 to 3335 eels in 2012 and the average weight decreased from 180g to 163.5g. The sex ratio changed from 24% to 45% over the past five years. Male eels have remained the same length over the past 15 years (36cm) whereas the females have changed on average from 53cm (1997-2005) to 50cm (2008-2012) and they were 49.2cm in 2012.

Erne

The analysis of downstream migrating silver eel population dynamics was complicated in 2009 by: Lack of reliable historical fishery data for the River Erne system; delayed fishery closure in part of the system; difficulties in establishing an effective monitoring site in the lower part of the system and development of research protocols. Following establishment in 2010 of an experimental fishing weir, which was scientifically monitored by NUIG, at Roscor Bridge significant progress became possible. Estimates of both silver eel production and escapement rates were possible in the 2010 and 2011 seasons and these have been reported previously (SSCE 2012). In both the 2010 and 2011 season's estimation of eel mortalities associated with downstream passage at the two hydropower dams (Cliff HPS and Cathaleen's Fall HPS) was undertaken by means of acoustic telemetry. In 2012 it was possible to adapt protocols developed in 2009-2011 and to refine the methodology used for calculation of silver eel production in the River Erne system. The 2012 season was characterised by unusual weather and discharge patterns. These were reflected in the eel migration patterns and in the catches obtained in the conservation fishing undertaken during the ESB trap and transport programme. In addition to an experimental fishery established by NUIG at Roscor Bridge, seven sites were fished by ESB contract crews on the Erne system during 2012/2013. All sites contributed catches to the ESB silver eel trap and transport system.

The silver eel production was estimated as 67.7t and escapement was estimated to be 57.4 t (84.8% of production). The trap and transport total (34.7 t) represented 51.3% of silver eel production and exceeded the target (50%) by 0.8 t. The 2012 calculations were based on estimations of production at Roscor Bridge and use of alternative capture efficiency rates for discharges above and below a $130 m^3.s^{-1}$ threshold. A series of 5 mark-recapture experiments (batches of 100 PIT-tagged eels) were undertaken at Roscor Bridge. The combined Cliff HPS and Cathaleen's Fall hydropower mortalities were estimated provisionally as 10.2t (15.1% of production).

Fane

The Fane is a relatively small catchment with the silver eel fishery located in the upper reaches of the system approximately 28 km from the coast. The Fane has a riverine wetted area of 21 ha (84 ha 2012 wetted area) and a lacustrine wetted area of 553 ha. A research silver eel fishery was carried out on the Clarebane River on the outflow of Lough Muckno in the Fane catchment in 2011 and 2012. The site was at the location of a previous commercial fishery until 2008. For the

2012 season, the fishing commenced earlier than in 2011 in order to capture any early runs of silvers eels leaving the Fane catchment.

A total catch of 0.448t was caught for the 2012 season compared with 0.290t in 2011. The estimated pristine production of silver eels from the Fane catchment is 2.679t with an estimated current production (2009-2011) of 1.264t.

In 2012, if a recapture rate of 8% is used to determine the efficiency of the fishing site then a production of 5,600 kg is estimated. When a recapture rate of 23% is used then the estimated production is 1.948t. The estimated production for 2011 was 0.936t with 31% recapture rate and 1.933t for a 15% escapement rate.

The length of eels caught during the season ranged from 31.4 cm to 96 cm with an average length of 47.1 cm. In total, 212 silver eels were sexed out of 273 specimens sacrificed from the Fane Fishery in 2012. Of those, 56% were female and 44% were male, averaged for 3 months (August, September and October). For October and November 2011 the sex ratio was 30% female and 70% male.

Yellow Eel Assessment

Yellow-eel stock monitoring is integral to gaining an understanding of the current status of local stocks and for informing models of escapement, particularly within transitional waters where silver eel escapement is extremely difficult to measure directly. Such monitoring also provides a means of evaluating post-management changes and forecasting the effects of these changes on silver eel escapement. The monitoring strategy aims to determine, at a local scale, an estimate of relative stock density, the stock's length, age and sex profiles, and the proportion of each length class that migrate as silvers each year. A second objective of the yellow eel study was to carry out an indirect estimation of silver eel escapement.

2012 Fyke net Survey

In 2012 intensive sampling of yellow eels took place at four locations (Lough Derg (Meelick Bay), Lough Oughter, Lough Muckno, at several site locations in the Barrow catchment and in the Burrishoole catchment. Additional lakes and rivers were sampled in conjunction with the Water Framework Directive (Lough Derg, Lough Cullin, Lough Arrow and Rivers in the WRBD). The standard procedure in the field was to set chains of five fyke nets joined end to end, set overnight and lifted the following morning, as described by Moriarty (1975). The sampling process in 2012 consisted of setting approximately 50 chains of 5 fyke nets during two or three monthly sessions of two or three nights per session.

Of the lakes sampled, Lough Muckno had the highest CPUE (9.82). Lough Muckno also had the greatest length and largest weight of any eel recorded during 2012 sampling (90.1 cm and 2.043 kg, respectively). It is proposed to carry out an intensive fyke net survey of Lough Muckno in 2013. Lough Muckno is located in the Fane catchment, which has been proposed as an index catchment for the Eastern Eel Management Unit (EEMU). Sacrificed eels were taken at Lough Muckno (n=106) and Levitstown Canal (n=94). Levitstown showed the highest prevalence of *A. crassus* of 68% (mean intensity 4.11 parasites per eel). Lough Muckno demonstrated a moderate parasite percentage prevalence of 48% (mean infection intensity of 2.16 parasites per eel).

Eels were present in all 30 lakes and both estuaries surveyed under the Waterframework Directive.

Transboundary

The INTERREG funded DOLMANT (Development of lake models) project has funded some lake surveys for fish using CEN protocols during 2011 and 2012. The data (catch in individuals per unit metre of fyke net (10m per net) in a one night survey) showed that eels were

widespread in these catchments and reach even high mountain lakes. These data, along with the data from the National survey and the WFD, will be valuable for future modelling of the stock.

Recruitment

Recruitment of glass eel / elver to Ireland will depend on European wide management action and will not provide a resource to post-evaluate Irish management actions specifically. However, monitoring of recruitment is critical to evaluating the overall success of the eel regulation and is required by ICES for stock assessment. This information is also required to assess and model changes in the future Irish eel stocks.

In 2012, 10 sites were monitored by the Electricity Supply Board and Inland Fisheries Ireland. High water levels in spring made monitoring difficult at some locations. Monitoring of glass eel (elver) migrating at Ardnacrusha (Shannon) and Cathaleens Fall (Erne) showed that while recruitment appeared it increase in 2012, levels remained relatively low. This was supported by information from the other sites and from N. Ireland.

Monitoring of young yellow eel migrating at Parteen Weir (Shannon) takes place using a fixed brush trap. The catch in 2012 was the second lowest on record..