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i Executive summary

The Joint EIFAAC/ICES/GFCM Working group on eels (WGEEL) met in a split meeting from 09-13 September (online) and 23 September–01 October 2024 (hybrid meeting) in Tirana, Albania to provide the scientific basis for the ICES advice on fishing opportunities and conservation aspects for the European eel and further address requests from EIFAAC and GFCM, if brought to the attention of the group.

WGEEL assessed the state of the European eel and its fisheries (Section 2), collated biometric data, reviewed the implementation of the Workshop on the Future of Eel Advice (WKFEA) roadmap, identified issues for the future benchmark process, reported on any updates to the scientific basis of the advice, new and emerging threats or opportunities.

After high levels in the late 1970s, the recruitment declined dramatically in the 1980s and remains low. Compared to 1960–1979, the recruitment in the "North Sea" index series was 1.1% in 2024 (provisional) and 0.5% in 2023 (updated). In the "Elsewhere Europe" index series, it was 7.2% in 2024 (provisional) and 7.4% in 2023 (updated). For the yellow eel data series, recruitment in 2023 was 11.4%. The time-series from 1980 to 2024 show that glass eel recruitment remains at a very low level.

The trend of reported commercial landings shows a long-term continuing decline, from a level of around 10 000 t in the 1960s and remained above 2 000 t (glass eel + yellow eel + silver eel) in the past decade. The commercial glass eel fishery in 2024 was 56.1 and 54 t in 2023. Spain was the only country allowing a recreational catch of glass eel in 2023, with landings estimated at 1.3 t, but banned recreational fisheries in 2024. Reported landings from yellow and silver eel commercial fisheries (Y, S, YS) add up to 2 366 t in 2022 and 2 027 t in 2023 (provisional data). Reported recreational landings for yellow and silver eel combined was 551 t for 2022 (15 countries reporting) and 84 t for 2023 (10 countries reporting).

Contents of the country reports were reviewed to update the scientific basis of the advice, including any new or emerging threats or opportunities (Section 3). Current threats to the eel population were briefly described within the following categories: hydropower, screening and passage, eel health parameters, climate change and invasive aquatic species. A dedicated section also highlighted the need to consider the risks associated with a prospective closure of the eel lifecycle in captivity (i.e. artificial reproduction). Ongoing eel or eel-related projects were also described in this section.

In 2021, the Workshop on the Future of Eel Advice (WKFEA) defined milestones toward an improved eel assessment targeting a full benchmark process in 2027. The progress towards the implementation of the roadmap established by WKFEA was evaluated and updated accordingly. Issues to be addressed during the future benchmark were defined and described in Section 4. Other tasks carried out during the meeting (Section 5) consisted in: clarifying the process for the integration the WGEEL database into the ICES Data Screening Utility (DATSU), establishing a questionnaire for the next datacall in preparation for the benchmark, and preparing for the technical evaluation of EU Member States' Progress Reports (WKEMP).

ii Expert group information

Expert group name	Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL)
Expert group cycle	Annual
Year cycle started	2024
Reporting year in cycle	1/1
Chair(s)	Caroline Durif, Norway
	Jan-Dag Pohlmann, Germany
Meeting venue(s) and dates	09-13 September 2024, virtual, 23 participants
	23 September – 01 October 2024, Tirana, Albania (hybrid), 54 participants

1 Introduction

1.1 Main Tasks

The **Joint EIFAAC/ICES/GFCM Working Group on Eels** (WGEEL), chaired by Caroline Durif, Institute of Marine Research, Norway and Jan-Dag Pohlmann, Thünen Institute, Germany, met in a split meeting from 09-13 September (online) and 23 September – 01 October 2024 (hybrid meeting) in Tirana, Albania, to address the ToRs in the EG resolution (Annex 2):

The Working Group used data and information provided in response to the Eel data call 2024 (from 23 countries) and 17 Country Reports submitted by participants (Annex 6). The list of acronyms and glossary of terms used within this document is provided in Annex 4.

1.2 Participants

Fifty-four experts attended the meeting, representing 26 countries, along with an observer from the European Commission DG MARE. A list of the meeting participants is provided in Annex 1.

1.3 ICES Code of Conduct

In 2018, ICES introduced a Code of Conduct that provides guidelines to its expert groups on identifying and handling actual, potential or perceived conflicts of interest. It further defines the standard for behaviours of experts contributing to ICES science. The aim is to safeguard the reputation of ICES as an impartial knowledge provider by ensuring the credibility, salience, legitimacy, transparency, and accountability in ICES work. Therefore, all contributors to ICES work are required to abide by the ICES Code of Conduct.

At the 2024 WGEEL meeting, one of the chairs raised the ICES Code of Conduct with all attendees. In particular, they were asked if they would identify and disclose an actual, potential or perceived conflicts of interest as described in the Code of Conduct. No members raised any potential conflicts of interest.

1.4 The European eel: Stock Annex

The Stock Annex has been reviewed and updated in 2023 and is due for another revision in 2027 (ICES, 2023, https://doi.org/10.17895/ices.pub.24517486.v1).

1.5 The European eel: life history and reproduction

During its continental phase, the European eel (*Anguilla anguilla*) is distributed across the majority of coastal countries in Europe and North Africa, with its southern limit in Morocco (30°N), its northern limit situated in the Barents Sea (72°N) and spanning the entire Mediterranean basin.

The European eel is a long-lived, semelparous and widely dispersed species, and has a complex life history. The shared single stock is considered genetically panmictic and data indicate that the spawning area is in the southwestern part of the Sargasso Sea. The newly hatched leptocephalus larvae drift with the ocean currents to the continental shelf of Europe and North Africa,

where they metamorphose into glass eels and enter continental waters. The growth stage, known as yellow eel, may take place in marine, brackish, transitional, or freshwaters. This stage may last typically from two to 25 years, but can exceed 50 years, prior to development into the silver eel stage, maturation and spawning migration. Sexual dimorphism occurs in eels with males maturing at a younger age and smaller size than females. For details on the eel life cycle, see the Stock Annex.

The abundance of glass eel arriving in continental waters declined dramatically in the early 1980s to a historical low in 2011 and has not recovered since. The reasons for this decline are uncertain but anthropogenic impacts and oceanic factors are believed to have major impacts on the stock. These will likely affect local production differently throughout the eel's range. For a detailed description of factors affecting the eel stock, see the Stock Annex. In the planning and execution of measures for the recovery, protection and sustainable use of the European eel, management must therefore account for the diversity of regional conditions.

1.6 The management framework for European eel

1.6.1 EU Member state waters

Within EU Member State waters, the stock, fisheries and other anthropogenic impacts, are currently managed in accordance with Council Regulation (EC) No 1100/2007, "*establishing measures for the recovery of the stock of European eel*" (so-called 'Eel Regulation'). This regulation sets a framework for the protection and sustainable use of the stock of European eel in EU Waters, coastal lagoons, estuaries, and rivers and communicating inland waters of Member States that flow into the seas in ICES Areas 3, 4, 6, 7, 8, 9 or into the Mediterranean Sea. Eel fisheries in EU waters are further regulated in

- Council Regulation (EU) 2024/257 and Council Regulation (EU) 2024/259, fixing 'Fishing Opportunities'
- Regulation (EU) 2023/2124 on 'certain provisions for fishing'
- Commission Implementing Decision (EU) No 2018/1986 'Specific Control and Inspection Programme' (amended by Commission Implementing Decision [EU] 2020/1320) and Commission Implementing Decision (EU) 2023/2376).

Other EU legislations that have specific relevance to the European eel in the context of ICES are

- Directive 2000/60/EC (known as the Water Framework Directive (WFD))
- Directive 2008/56/EC, (known as the Marine Strategy Framework Directive (MSFD))
- Council Regulation (EC) No 338/97 (relates to trade in CITES-listed species)
- Council Directive 92/43/EEC (known as the Habitats Directive)
- EU Nature Restoration Law: Regulation (EU) 2024/1991
- EU Marine Action Plan

1.6.2 General Fisheries Commission of the Mediterranean (GFCM) state waters

Specifically, for the region, work was carried out between 2020 and 2024 towards the development of an adaptive regional management plan for eel in the Region under the auspices of the GFCM. The GFCM Commission in 2023 adopted Recommendation GFCM/46/2023/16 on a long-term management plan for European eel in the Sea, repealing Recommendations GFCM/45/2022/1 and GFCM/42/2018/1 recommendation GFCM/42/2018/1 on a multiannual management plan, in the Sea. To define additional long-term measures to be implemented in

the multiannual management plan and contribute to controlling fishing mortality while maintaining some level of employment/revenue for fishers and ensuring the long-term conservation and long-term sustainable use of this resource in the Sea, a "Roadmap" towards informing the future GFCM long-term management plan for the European eel was outlined and endorsed by the SAC224 and the GFCM 46. The "Roadmap" took place between October 2023 and June 2024, and results were presented at the GFCM expert group on European eel in the (EGEMed), that took place at FAO HQ, Rome, Italy, 04–05 June 2024 (hybrid). Results included the outcomes of a socioeconomic study of European eel fisheries in the Mediterranean Region, that allowed to produce a baseline of regional socioeconomic indicators to capture the status of the fishery, and to advance with a model-based appraisal of management scenarios to ensure eel conservation while maintaining a sustainable level of fisher employment. The overall aim was to provide the SAC25 in 2024 with elements to inform future long-term measures for European eel (*Anguilla anguilla*) in the Mediterranean.

1.6.3 Other countries

WGEEL receives data from both EU and non-EU countries. The Eel Regulation only applies to EU Member States – although other states may engage in the case of transboundary management plans. Some non-EU countries have provided data for many years (e.g. Norway, UK). Others have only recently been involved and further development of assessment procedures and feedback mechanisms might be required to harmonize processes. For details, see Stock Annex.

1.6.4 Other international actors

The European eel was listed in Appendix II of the **Convention on International Trade in Endangered Species of Wild Fauna and Flora** (**CITES**) in 2007. Since 2009, when the listing came into force, any international trade in this species needs to be accompanied by an export permit supported by a Non-Detriment Finding (NDF). Since 2010, export out of and import to the EU is prohibited. The **International Union for the Conservation of Nature** (**IUCN**) listed the European eels as Critically Endangered in 2008 (IUCN, 2024). It was reassessed in both 2013 and 2018, and the status remains unchanged. In 2014, the European eel was added to Appendix II of the **Convention on the Conservation of Migratory Species of Wild Animals** (**CMS**), whereby signatories call for cooperative conservation actions to be developed among Range States (CMS, 2018). The European eel was included on the OSPAR List of threatened and/or declining species and habitats in 2008. In 2014, the **Convention for the Protection of the Marine Environment of the North-East Atlantic** (**OSPAR Convention**) issued a recommendation to strengthen the protection of the European eel at all life stages in order to recover its population and to ensure that it was effectively conserved (OSPAR, 2014). The status of European eel was reassessed within OSPAR in 2022 (OSPAR, 2022). The Baltic Sea Action Plan (BSAP) of the **Baltic Marine Environment Protection Commission (HELCOM**) contains several targets for the European eel (HELCOM, 2021). The overarching objectives of the **Ramsar Convention on Wetlands** of International Importance (the international treaty for the conservation and sustainable use of wetlands) are to stem the loss and progressive encroachment on **wetlands - an important European eel habitat** - now and in the future (UN, 1976). Most EU Member States are Contracting Parties, hence the wetlands protected under this Convention will benefit the eel population. For details, see the Stock Annex.

1.7 Assessment to meet management needs

The European Commission obtains both recurring and *ad hoc* scientific advice from ICES on the state of the eel stock, the management of the fisheries and other anthropogenic factors that impact it, as specified in the Administrative Agreement between European Commission and ICES for 2022 (ICES and EU, 2022a, b). In support of this advice, ICES is asked to provide the European Commission with estimates of catches, fishing mortality, recruitment and spawning stock, relevant reference points for management, information about the level of confidence in parameters underlying the scientific advice, and the origins and causes of the main uncertainties in the information available (e.g. data quality, data availability, gaps in methodology and knowledge). The Commission Implementing Decision (EU) No 2019/909 (Data Collection Framework, DCF; EC, 2019), requires Member States data, collected through this framework, to be made available to end-users, such as ICES.

ICES requests information from national representatives to the WGEEL on stock parameters, landings, restocking, and time-series (e.g. recruitment, yellow eel abundance, silver eel escapement). In May 2024, ICES issued a Data Call to collect this information, and this call was also advertised by EIFAAC and GFCM to their memberships (see below for further details).

The status of eel production in EU and non-EU Eel Management Units (Figure 1.1) is assessed by national or sub-national fishery and/or environment management agencies. The terminology Eel Management Unit (EMU) has been used by WGEEL and others for several years now but with various and unrecorded definitions leading to some confusion. It most often represents a management area for eel, corresponding to a river basin district (RBD) as defined in the WFD (EU, 2000). However, in cases of stock assessments at other spatial scales, and for stock parts lying outside the EU, EMUs have also been defined, either as being the management units used by the country (e.g. Tunisia) or as the whole country. In practice, data provision from some EMUs can be divided into further geographical subunits. This is, for instance, the case for Sweden where the EMU is national, but data can be provided to the WGEEL according to Inland, West and East coasts subunits. The catch from coastal areas does include eels migrating from other countries or parts of the Baltic.

Since UK exited the EU, UK has signed a Memorandum of Understanding (MoU) with ICES, effective as of 2021, which recognizes UK obligations to provide relevant data for ICES to undertake stock assessment and provide advice to the UK relating to the North Atlantic and its adjacent seas, including advice on fishing opportunities for the European eel.

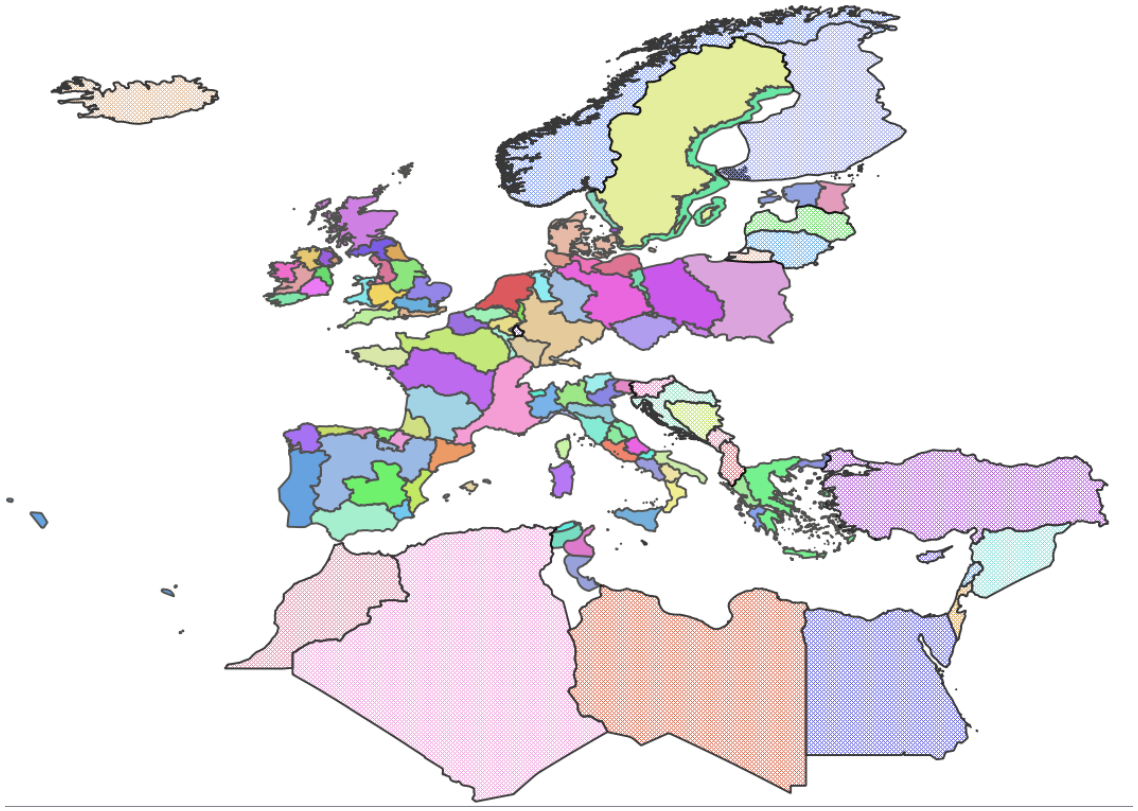

Figure 1.1. Current map of Eel Management Units (EMUs) as reported by countries or corresponding to national entities where no EMU is described at the national level.

Data collection varies considerably between, and sometimes within, countries, depending on management actions taken, anthropogenic impact, and type of assessment procedure. Accordingly, a range of methods may be employed to establish silver eel escapement limits (e.g. the Eel Regulation's ≥ 40% of B_0), management targets for individual rivers, river basins, RBDs, EMUs and nations, and for assessing compliance of current escapement with these limits/targets (e.g. for the Eel Regulation comparing $B_{current}$). These methods require various combinations of data on e.g. landings, recruitment length/age structure, restocking, abundance (as biomass and/or density) or maturity ogives, in order to estimate silver eel biomass, fishing and other anthropogenic mortality rates.

A description of data collection and methods used to establish silver eel escapement and mortality is further detailed in the report on the "technical evaluation of EU member states' progress reports for submission in 2021" (WKEMP 3; ICES, 2022a).

The ICES Study Group on International Post-Evaluation of Eel (SGIPEE) (ICES, 2010; 2011) and WGEEL (FAO and ICES, 2010; 2011) derived a framework for *post-hoc* combination of EMU / national 'stock indicators' of silver eel escapement biomass and anthropogenic mortality rates to an international total.

In 2020/2021, WKFEA (ICES, 2021a) addressed issues with the current advice, considered options for future assessment/advice and drafted a roadmap towards potential new or additional advice on fishing opportunities for the European eel to better suit the management needs. The progress made towards the implementation of the roadmap is described in Section 4.

1.8 Data Call

The WGEEL annually collates data on eel in support of its work. A dedicated Data Call hosted by ICES, EIFAAC, and GFCM and covering all natural range states of the European eel was initiated in 2017 and is considered an effective mechanism to significantly improve the situation of data provision and use. For details, see the Stock Annex.

In the 2024 Data Call, data on recruitment up to 2024, fishery landings, recreational landings, aquaculture production, restocking, yellow eel abundance and silver eel escapement time-series, including biometry were requested. The call also required the provision of associated metadata. In addition, EU Member States were requested to provide information in support of the EU non-recurrent request for the 'Technical evaluation of the EU Member States' progress reports. Finally, all countries were requested to submit a summary indicating which annexes were not provided and why.

The Data Call consists of excel spreadsheets almost all of which are further incorporated in the WGEEL database (Data Call Annexes 1-11) using a shiny data integration tool. Data Call Annex 0 is used to track whether a response has been submitted for each annex and if not to provide justification.

Data Call Annexes 1-3 comprise time series. Recruitment series (Data Call Annex 1) include series made of glass eel (G), a mixture of glass eel and young yellow eel series (GY) and yellow eel migrant (Y) series. Yellow eel (Y) standing stock time series (as opposed to migrant (Y) time series in Data Call Annex 1) are collected in Data Call Annex 2. Silver eel annual time series are collected in Data Call Annex 3. Data Call Annexes 1, 2, and 3 collect annual numbers but also gather information about annual metrics collected for the series (group metrics like average length and weight) and individual data on biometry, parasites and pathogens.

The Data Call also collects information on commercial landings (Data Call Annex 4), recreational landings (Data Call Annex 5), and other landings (Data Call Annex 6). 'Other landings' are used to gather information about eel collection prior to their subsequent release. For instance, eel can be caught or trapped in one EMU and then released in another EMU. Since the release of those eels will be used in the national and foreseen international assessment of the stock, they are also removed from the stock in the EMU of capture. Data Call Annex 6 covers data for those eels when the collection is not covered by commercial landings (which remains the source of most glass eel releases). Data Call Annexes 4, 5, and 6 cover different stages, glass (G), yellow (Y), a mixture of yellow and silver eel (YS) and silver eel data (S).

Release (Data Call Annex 7) covers data about eel releases, the range of stages available is wider than in previous annexes and can cover G, QG (quarantined glass eel), OG (on grown eel), GY (mixture of glass and yellow), Y (yellow), YS (yellow and silver), and S (silver). Aquaculture data are covered in Data Call Annex 8 and analysed by WGEEL as eels are first collected from the stock before going to aquaculture.

Data Call Annex 9 reports data on sampling either from the DCF or other sources. The format of group and individual metrics is the same as in the Data Call Annexes 1 to 3 (time series) but the location of each fish collection, date (possibly rounded to year when not available), and details about the sampling scheme are also provided.

Data Call Annexes 10-17 are used for reporting information on Eel Management Plans (EMPs) every three years as part of national reports. Data Call Annexes 10 and 11 comprise biomass and mortality indicators. Data Call Annex 12 reports the number of recreational fishermen per EMP/country and year. Data Call Annex 13 collects information on assessment and monitoring methods in each EMP as an overview, while Data Call Annex 14 collects data on management, conservation, and other measures. Data Call Annex 15 is submitted only by countries that do not

have an Eel Management Plan to provide data on fishing effort. Data Call Annex 16 covers data about small eel (<12 & 20 cm) utilization, and Data Call Annex 17 collects references on Eel Management Plan evaluation.

1.9 Address the generic EG TORs from ICES, and any requests from EIFAAC or GFCM (ToR a)

a) Conduct an assessment on the stock(s) to be addressed in 2024 using the method (assessment, forecast or trends indicators) as described in the stock annex and documented in TAF; - complete and document an audit of the calculations and results; and produce a brief report of the work carried out regarding the stock, providing summaries of the following where relevant:

i) Where misreporting of catches is significant, provide qualitative and where possible quantitative information and describe the methods used to obtain the information;
See report 2023

ii) For relevant stocks (i.e., all stocks for NEAFC request advice), estimate the percentage of the total catch that has been taken in the NEAFC Regulatory Area in the most recent years
There is no eel fishing in the NEAFC area. NEAFC stretches from southern tip of Greenland, east to the Barents Sea and south to Portugal (from their website) but the map shows that it is only outside the national waters.

iii) For category 2 and 3 stocks requiring new advice in 2024, implement the methods in guidance for harvest control rules and stock assessments for stocks in categories 2 and 3 . Replace the former 2 over 3 advice rule (2 over 5 for elasmobranchs) which is no longer considered precautionary
WGEEL considers that the establishment of an appropriate and effective framework for the advice under the principles of the precautionary approach is a matter of urgency. WKFEA has addressed the issue and provided a roadmap towards a benchmark in 2027, where reference points could be defined.

iv) Evaluate spawning stock biomass, total stock biomass, fishing mortality, catches (projected landings and discards) using the method described in the stock annex;
See Chapter 2 (ICES,2021b) and ICES (2022a)

1) for category 1 and 2 stocks, in addition to the other relevant model diagnostics, the recommendations and decision tree formulated by WKFORBIAS (see Annex 2 of https://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/Fisheries%20Resources%20Steering%20Group/2020/WKFORBIAS_2019.pdf) should be considered as guidance to determine whether an assessment remains sufficiently robust for providing advice.

2) If the assessment is deemed no longer suitable as basis for advice, provide advice using an appropriate Category 2-5 approach as described in ICES technical guidance for harvest control rules and stock assessments for stocks in categories 2 and 3 or in Advice on fishing opportunities (for Cat 5 & 6).

3) If the assessment has been moved to a Category 2-5 approach in the past year, consider what is necessary to move back to a Category 1 and develop proposal for the appropriate benchmark process.

v) Provide all requested catch scenarios for the year(s) beyond the terminal year of the data (These are listed in ICES Guidance for completing single-stock advice)
WGEEL is not in a position to provide catch scenarios in the absence of accurate catch information.

vi) Historical and analytical performance of the assessment and catch options with a succinct description of associated quality issues. For the analytical performance of category 1 and 2 age-structured assessments, report the mean Mohn's rho (assessment retrospective bias analysis) values for time series of recruitment, spawning stock biomass, and fishing mortality rate. The WG report should include a plot of this retrospective analysis. The values should be calculated in accordance with the "Guidance for completing ToR viii) of the Generic ToRs for Regional and Species Working Groups - Retrospective bias in assessment" and reported using the ICES application for this purpose.
As a category 3 stock, there is no analytical assessment of the eel stock. The performance of the current assessment has not been formally reviewed. However, the trends in recruitment indices have been validated using a different analytical approach (GEREM; ICES, 2019). No catch options have been proposed so there is nothing to review.

b) Produce and quality assure a first draft of the advice for each stock according to ACOM guidelines.
A draft of the advice on the European eel stock has been provided to ICES as a separate document.

c) Include non-fisheries conservation considerations in accordance with the "ICES Guidelines on Non-Fisheries Conservation Considerations".
See ICES 2023 advice on European eel throughout its natural range.

d) Review progress on benchmark issues and processes of relevance to the Expert Group.

i) update the benchmark issues lists for the individual stocks in SID;
ii) review progress on benchmark issues and identify potential benchmarks to be initiated in 2025 for conclusion in 2026;
iii) determine the prioritization score for benchmarks proposed for 2025–2026;
iv) as necessary, document generic issues to be addressed by the Benchmark Oversight Group (BOG)

The European eel has not been benchmarked but proposed to take place in 2027 (WKFEA roadmap). A list of issues was drafted during WGEEL 2024 and will be submitted for evaluation in December 2024. A workshop is recommended to be held in 2025 to begin planning for the benchmark.

e) Prepare the data calls for the next year's update assessment and for planned data evaluation workshops;
A workshop will be held in 2025 to develop the data call. The data call was developed in the workshop in 2024.

f) Identify research needs of relevance to the work of the Expert Group
See chapter 4 (ICES, 2021a) and ICES (2021b). In this report see chapter 3 & 4.

g) Review and update information regarding operational issues and research priorities on the Fisheries Resources Steering Group SharePoint site.
Information was updated according to WKFEA roadmap.

h) Update TAF, SAG, ASD (Advice and Scenarios database) and SID with final assessment input and output and advice information.
TAF and SAG are updated. ASD is not updated, because scenarios are not provided for European eel.

i) Consider and comment on Ecosystem and Fisheries Overviews with a focus on:
   i) identifying and correcting mistakes and errors (both in the text, tables and figures), and
   ii) proposing concrete evidence-based input that is considered essential for the advice but is currently under-developed or missing (with references and Data Profiling Tool entries, as appropriate).

This was addressed in chapter 4.1.1. "New and emerging threats" in report 2023. Fisheries and Ecosystem overview data are not used in stock assessments. Specific Ecosystem and Fisheries information is provided in country reports.

2 Report on developments in the state of the European eel (*Anguilla anguilla*) stock, the fisheries on it and other anthropogenic impacts

In the 2024 Data Call, data on recruitment up to 2024, fishery landings, recreational landings, aquaculture production, restocking, biomass and mortality indicators, yellow eel abundance and silver eel escapement time-series, including biometry were requested. The call also required the provision of associated metadata.

2.1 Recruitment

2.1.1 Data sources

In this section, the latest trends in glass and yellow eel recruitment are addressed. The time-series data are derived from fishery-dependent sources (i.e. landings records) and also from fishery-independent surveys across much of the geographic range of European eel. The stages are categorized as:

i. glass eel (G), age 0+cohort,
ii. a mixture of glass eel and yellow eel dominated by recruits from the same year (GY),
iii. and yellow eel (Y) recruiting to continental habitats.

The yellow eel series might consist of yellow eel of several ages. This is certainly the case for all series from the Baltic (mean age up to 6), some Irish sites, and sites located far upstream. The glass eel recruitment time-series have been grouped into two geographical areas: "continental North Sea" (NS) and "Elsewhere Europe" (EE) (Figure 2.1). Previous analyses by the working group (ICES, 2010, p. 19) and Bornarel *et al.* (2017) have shown a different trend between the two sets. This is mostly due to a more pronounced decline of the North Sea series compared to the Elsewhere Europe area during the 1980s.

The WGEEL has collated information on recruitment from 106 time-series. Some of the time-series date back to the beginning of 20th century (yellow eel, Göta Älv, Sweden) or 1920 (glass eel, Loire, France). Among those series, 81 have been selected to calculate the WGEEL recruitment indices; see details on data selection and processing below.

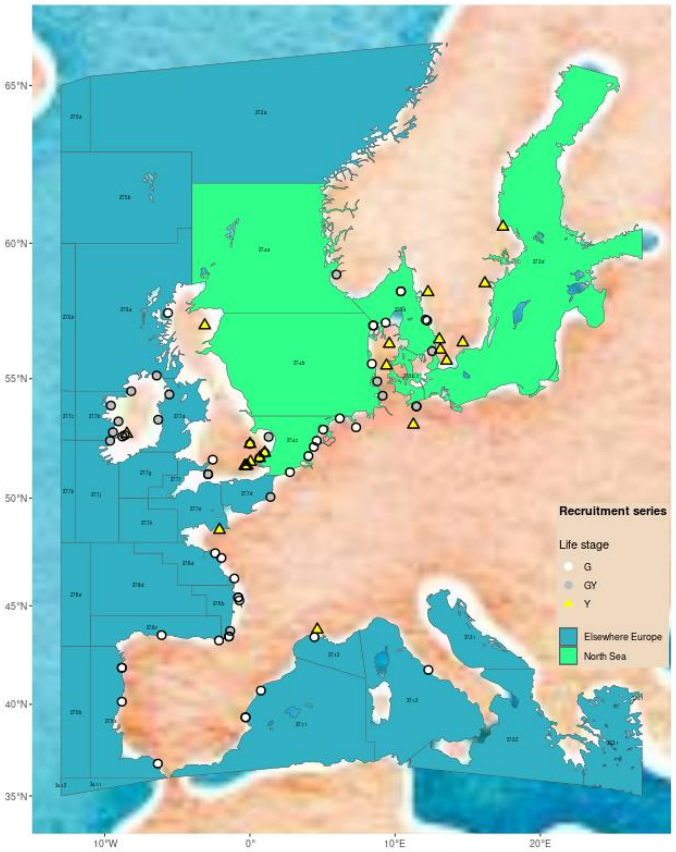

Figure 2.1: Map of recruitment sampling stations currently used to build the GLM trend models: white dots G = glass eel; grey dots GY = glass + yellow eel; yellow triangles Y = yellow eel.

2.1.2 Details on data selection and processing

Out of the 106 series that were compiled in the Data Call, 81 meet the required conditions to be used in the analysis to calculate the recruitment indexes (Annex 9, Tables 1, 2, and 3).

- First, if there are two or more series from the same location, i.e. they are not independent, only one series is kept. For instance, the longer of two series has been kept for the Severn (Severn EA, a total of all the glass eel fisheries for England and Wales) while the second series (Severn HMRC) has been dropped from the list, as it was considered a duplicate being based on the same fishery.
- The second rule is to exclude a series from the analysis when it is less than ten years long. The series are, however, still updated in the database until they are long enough to be included. If there are missing years, or years excluded for data quality reasons, the data series will be included when the total number of "good" years of data meets the 10-year criterion. Within any series, individual annual data point or points can be excluded from the analysis where a one-off problem is identified which negates the value as an index for that year, such as a major reduction in effort (e.g. Covid or other effort related restriction).
- Finally, it was decided to discard recruitment series that were obviously biased by re-stocking (e.g. Farpener Bach in Germany).

The following series have been left out due to the reasons mentioned above: GariG(IT), InagG(IE), LeacG(IT), OrbfG(IT), PogoG(IT), PovoG(IT), TibnG(IT), BeeGY(GB), BroGY(GB), EmsBGY(DE), EmsHG(DE), FarpGY(DE), FlaGY(GB), HoSGY(DE), HHKGY(DE), LangGY(DE), MiSpY(ES), SeHMG(GB), ShiFG(GB), VeAmGY(BE), VeAmY(BE), WaSEY(DE), WaSG(DE).

See Annex 9, Table 4 to check the reason for which the series have been excluded for the recruitment analysis.

Among the recruitment series, 81 have been selected for further analysis (Figures 2.2, 2.3, and 2.4). For the calculation of the glass eel recruitment index, 60 series have been retained, 35 glass eel series and 25 glass and yellow eel mixed series), from which 25 came from NS and 34 from EE (Annex 9, Table 2). For the calculation of the yellow eel recruitment index, 21 yellow eel series have been retained, nine coming from the North Sea, nine from the Baltic Sea, two from the Atlantic region and one from the Mediterranean Sea (Annex 9; Table 3).

Forty-eight time-series were updated for the year 2024 (25 for glass eel, 15 for glass + yellow eel and eight for yellow eel) (Annex 9; Table 5), furthermore 12 and 19 time-series (1 G, 6 GY, and 12) were updated for the year 2023 (Annex 9; Table 6).

In 2024, one new series were added to the recruitment trend analysis: CorGY in Ireland.

Among the time-series based on trap indices, some have reported preliminary data for 2024 as their trapping season had not finished. As usual, the glass eel indices given for 2024 must be considered as provisional.

Eighteen time-series have been stopped or not updated beyond 2023 but are still included in the analysis.

Some have stopped reporting either because of a lack of recruits in the case of the fishery-based surveys (Ems in Germany, stopped in 2001; Vidaa in Denmark, stopped in 1990), a lack of financial support (the Tiber in Italy, 2006) or the introduction of quota from 2008 to 2011 that has disrupted the five fishery-based French time-series.

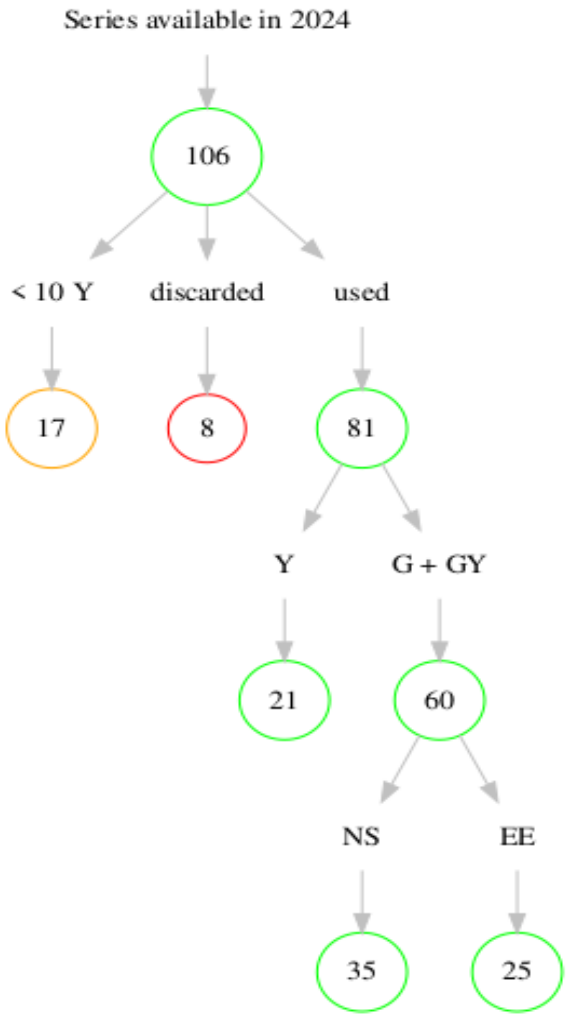

Figure 2.2. Schematic showing the total number of recruitment series received (2024 Data Call – 106 time series) by type and region, and numbers selected for analysis (21 for Y, 35 for NS, 25 for EE). Figures includes all time series, including time series that are not updated anymore. Y = yellow eel, G = glass eel, GY = mixed glass and yellow eel. NS = North Sea (including Baltic) EE = Elsewhere Europe regions.

The number of time series available between regions and life stages is not an even distribution, influenced by factors including variation in the behaviour of eel, traditions of fishery and usage of eel, and the history of scientific investigation and eel management (Figure 2.3 & 2.4). Thus, most of the glass eel series come from the Atlantic while most of the yellow eel series come from the Baltic and the North Sea.

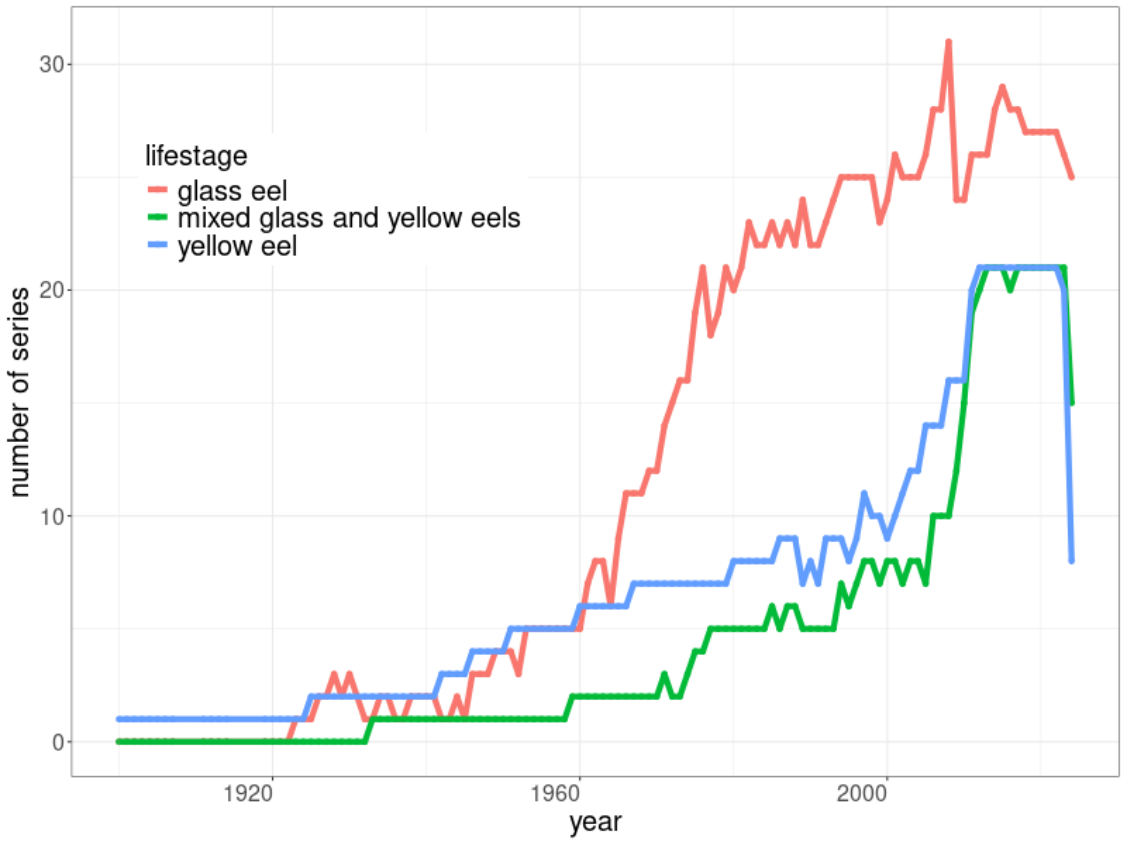

Figure 2.3. Temporal trends in the number of data points (a value provided by a given time series for a given year) that have been kept to perform the recruitment analysis per stage. The number of 2024 series is not final as the year has not yet ended and there are still series to be reported.

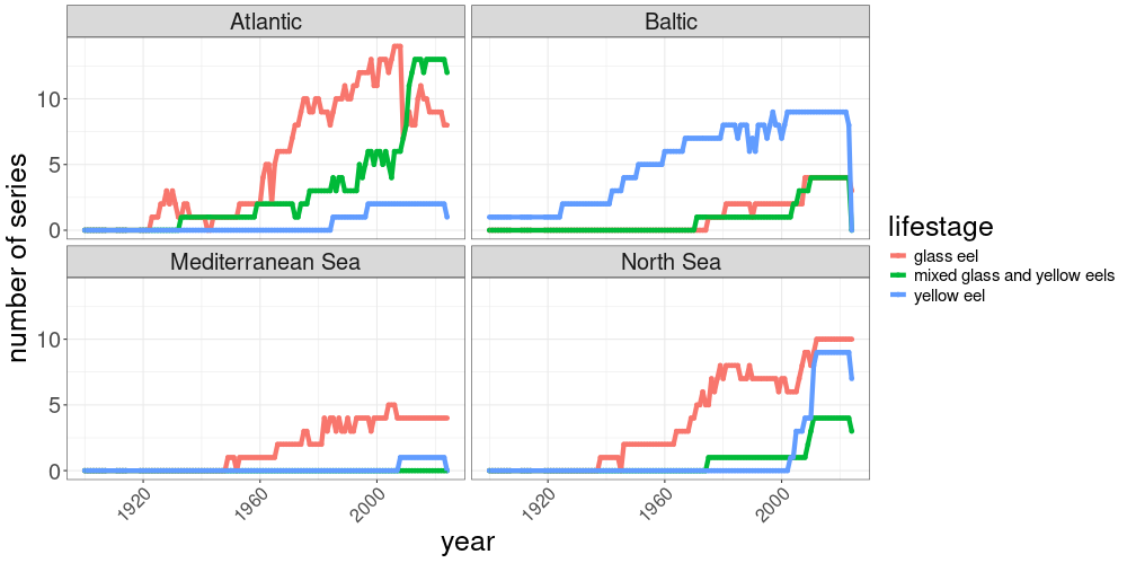

Figure 2.4. Temporal trends in the number of data points (a value provided by a given time series for a given year) that have been kept to perform the recruitment analysis per stage and area. The number of 2024 series is not final as the year has not yet ended and there are still series to be reported.

2.2 GLM based trend

The WGEEL recruitment index used in the ICES Annual Stock Advice is fitted using a GLM with a Gamma distribution and a log link: $glasseel \sim year : area + site$, where:

- $glasseel$ is individual glass eel time-series including both pure G series and those identified as a mixture of glass and yellow eel (G+Y),
- $site$ is the site monitored for recruitment,
- $area$ is either the continental North Sea or Elsewhere Europe, and
- $year$ is the year coded as a categorical value.

For yellow eel time-series, only one estimate is provided: $yellow\ eel \sim year + site$.

The trend is hindcast using the predictions from 1960 onwards for 60 glass eel time-series and from 1950 onwards for 21 yellow eel time-series. Some zero values have been excluded from the GLM analysis: 22 for the glass eel model and 43 for the yellow eel model. This treatment has been tested and has no effect on the trend (ICES, 2017).

The reconstructed values are then aggregated using geometric means of the two reference areas (Elsewhere Europe EE, and North Sea NS). The predictions are given in reference to the geometric mean of the 1960-1979 period.

In the case of the glass eel series, the recruitment of 2023 has been recalculated from 8.8% to 7.4% in the Elsewhere Europe series (Table 2.1, Figure 2.5). For the North Sea, recruitment for 2023 has been recalculated from 0.4% to 0.5%.

Analyses of provisional 2024 data show recruitment as a percentage of 1960-1979 levels at 1.1% in the North Sea-and 7.2% in elsewhere Europe (Table 2.1, Figure 2.5).

Table 2.1. Annual WGEEL recruitment index for the continental North Sea and Elsewhere Europe. The index was estimated using a GLM (glasseel ~ area: year + site) fitted on 60 time-series comprising either pure glass eel or a mixture of glass eels and yellow eels.

	1960		1970		1980		1990		2000		2010		2020	
	EE	NS	EE	NS	EE	NS	EE	NS	EE	NS	EE	NS	EE	NS
0	154	209	102	98	112	86	35	14	19.9	4.5	4.6	0.7	6.7	0.6
1	133	117	55	68	88	62	17	3	8.5	0.9	3.8	0.5	5.3	0.6
2	152	179	50	109	90	32	22	7	13.2	2.5	4.8	0.5	9.8	0.7
3	195	224	55	47	48	26	24	7	12.9	1.7	7.2	1.7	7.4	0.5
4	123	117	82	131	54	10	23	7	7.1	0.6	10.4	2.5	7.2	1.1
5	136	78	71	54	54	8	31	5	7.6	0.9	6.4	0.8		
6	76	88	116	98	33	8	25	5	5.6	0.5	9.6	1.7		
7	81	98	114	78	58	10	42	4	6.4	1.2	10.0	1.0		
8	128	124	109	60	67	9	16	3	5.9	1.1	8.3	1.7		
9	67	90	144	105	43	4	20	6	4.3	0.8	5.8	1.2		

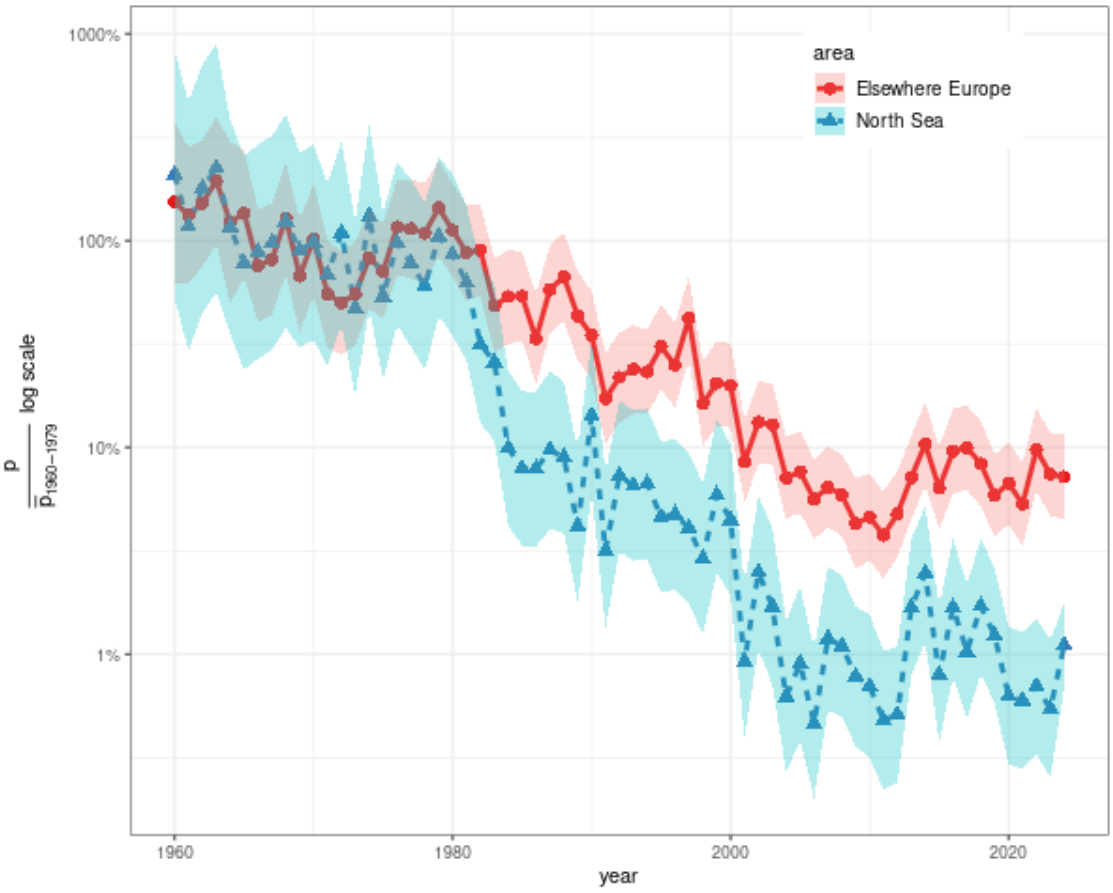

Figure 2.5. WGEEL glass eel recruitment index for the continental North Sea and Elsewhere Europe series with 95% confidence intervals updated to 2024. The index was estimated using a GLM (*glasseel ~ area: year + site*) fitted on 60 time-series comprising either pure glass eel or a mixture of glass eels and yellow eels. Number of series Elsewhere Europe = 35, North Sea = 25. Note the logarithmic scale on the y-axis.

The 2023 yellow eel index is at 11.4% of the 1960-1979 baseline (Figure 2.6, Table 2.2).

Table 2.2. Annual geometric mean of estimated yellow eel recruitment for Europe updated to 2023. The yellow recruitment was estimated using a GLM (*yelloweel ~ year*) fitted to 21 yellow eel time-series *p* and scaled to the 1960-1979 average $p_{1960-1979}$.

1950	1960	1970	1980	1990	2000	2010	2020
176	161	61	100	32	17	13	15
254	178	63	42	37	17	23	12
246	175	108	52	17	37	15	10
387	148	135	47	14	25	16	11
191	61	66	35	55	25	28	
297	114	123	66	13	13	12	
130	152	38	50	10	17	16	
152	113	80	47	21	20	17	
150	174	70	61	17	14	18	
324	117	58	37	21	8	14	

Figure 2.6. Geometric mean of estimated yellow eel recruitment for Europe updated to 2023. The yellow recruitment was estimated using a GLM (yellow eel ~ year) fitted to 21 yellow eel time-series p scaled to the 1960-1979 average p1960–1979. Note the logarithmic scale on the y-axis.

2.3 Conclusion to the recruitment time series analyses

The status of European eel remains critical. After high levels in the late 1970s, the European eel recruitment declined dramatically in the 1980s and currently remains low. 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 1.1% in 2024 (provisional) and 0.5% in 2023 (updated). In the "Elsewhere Europe" index series it was 7.2% in 2024 (provisional) and 7.4% in 2023 (updated). The yellow eel recruitment index for 2023 was 11.4% (updated) of the 1960–1979 geometric mean. Time-series from 1980 to 2024 show that glass eel recruitment remains at a very low level.

2.4 Trends in fisheries

This section presents and describes data from commercial, recreational and non-commercial fisheries, aquaculture production and restocking of eel. Data can be reported by eel life stage (glass, yellow, silver), habitat type (freshwater, transitional, coastal, marine), and by eel management unit (EMU) where possible. Historical series for which these details are not available are reported by country. The current database structure allows aggregation by country or EMU. The landings data presented are those reported to the WGEEL through responses to Data Calls.

2.4.1 Commercial fisheries landings

Care should be taken with the interpretation of the landings as indicators of the stock, since the landings statistics also reflect changes in effort as well as of stock levels. In addition, landings data presented here might be incomplete due to a lack of reporting by countries. In summary, reported commercial landings are declining from a level of around 10 000 t in the 1960s to around 2 080 t in 2023 (glass eel + yellow eel + silver eel).

2.4.1.1 Glass eel

Figure 2.7 presents the time-series up to and including 2024 for total commercial glass eel landings as reported by five countries in the Eel Data call (GB, FR, ES, PT, IT), including reconstructed data to fill data gaps.

Glass eel landings show a sharp decline since 1980 from 2 000 t to around 40-60 t since 2010 onwards. In 2024, the raw (uncorrected) landings data for glass eels is 56.1 t, while it was 54 t in 2023 (Annex 11, Table 1).

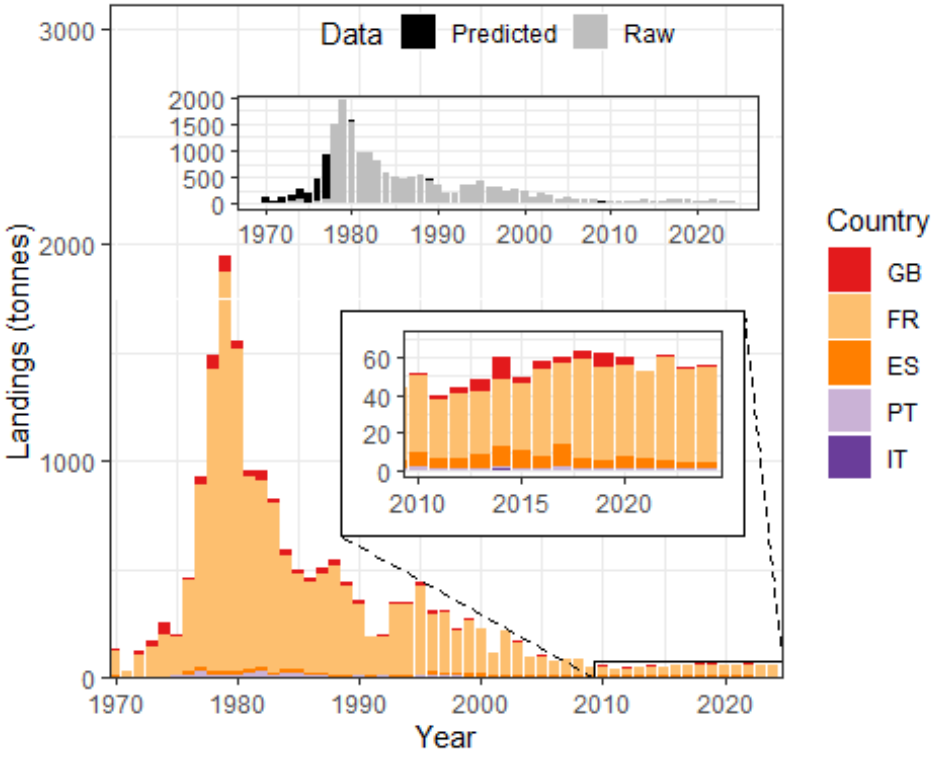

Figure 2.7: Time-series of reported or reconstructed commercial glass eel fishery landings (tonnes) by country. To fill data gaps, non-reported countries/years combinations were reconstructed. United Kingdom (GB), France (FR), Spain (ES), Portugal (PT), Italy (IT) are included, combining information from the Data Call 2024 and the WGEEL database updated to 2024. The inset box shows the proportion of reconstructed landings per year.

2.4.1.2 Yellow and silver eel

Figure 2.8 presents aggregated landings data for yellow and silver eels coming from 23 countries and Figure 2.9 presents the time-series including reconstructed data to fill data gaps. The proportion of "corrected" landings was as high as 50% in the 1950s, but rather low since the mid-1980s. The total landings (including reconstructed) of yellow and silver eels decreased from 18 000–20 000 t in the 1950s to 2 000–3 500 t since 2009. Reported landings from yellow and silver eel commercial fisheries (Y, S, YS) add up to 2 027 t in 2023 and 2 366 t in 2022 (number of

countries reporting 21 and 23). Yellow and silver eel commercial fisheries averaged 2 615 t per year over the five previous years (from 2017 to 2021). In addition to the data shown here, WGEEL received landings data from Egypt, but it has not yet been incorporated in the analyses since it is currently under evaluation. In the Data Call, Egypt stated that there might be a confusion between aquaculture production and landings, which will be processed until next year's assessment. WGEEL notes that the Nile River, and related large lagoons in the Nile Delta, are important eel habitats among the Mediterranean countries (Ciccotti & Morello, 2024).

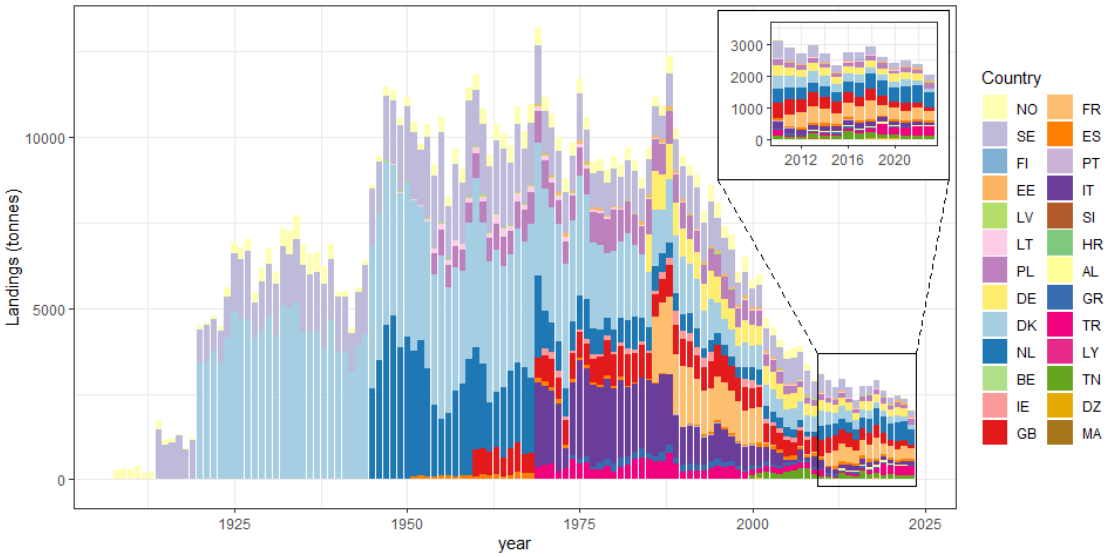

Figure 2.8: Time-series of reported commercial yellow (Y), silver (S) and yellow-silver (YS) eel fishery landings (tonnes) 1908-2023 by country. Norway (NO), Sweden (SE), Finland (FI), Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Germany (DE), Denmark (DK), Netherlands (NL), Belgium (BE), Ireland (IE), United Kingdom (GB), France (FR), Spain (ES), Portugal (PT), Italy (IT), Slovenia (SI), Croatia (HR), Albania (AL), Greece (GR), Turkey (TR), Libya (LY), Tunisia (TN), Algeria (DZ), Morocco (MA), are included, combining information from the Data Call 2024 and the WGEEL database updated to 2023.

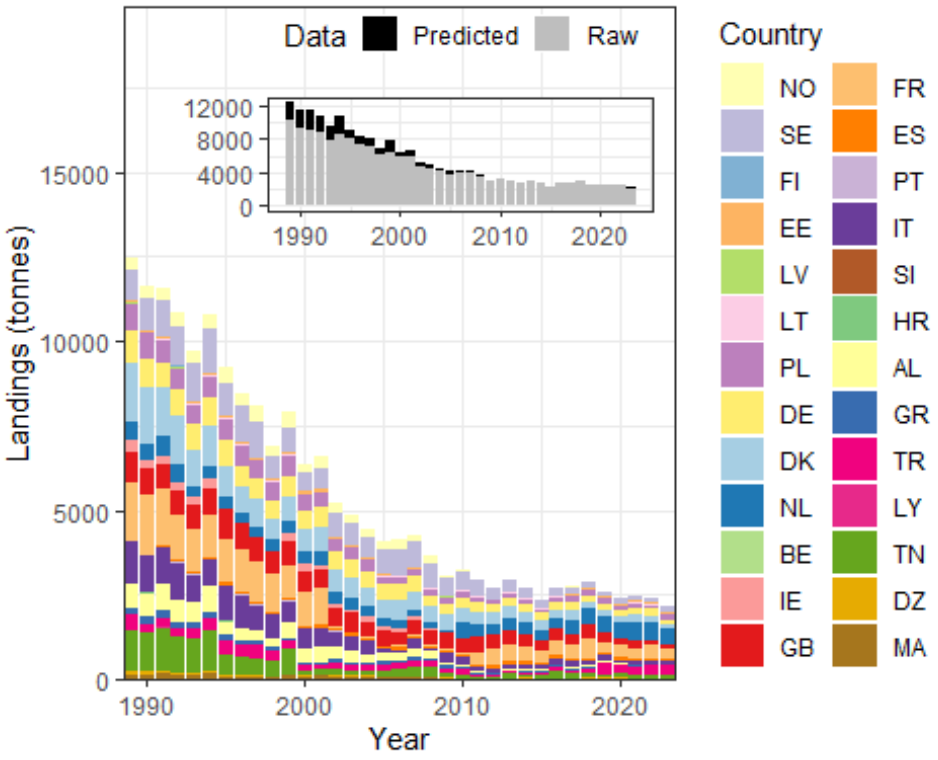

Figure 2.9: Time-series of reported and reconstructed commercial yellow (Y), silver (S) and yellow-silver (YS) eel fishery landings (tonnes) 1989-2023 by country. To fill data gaps, non-reported countries/years combinations were reconstructed. Norway (NO), Sweden (SE), Finland (FI), Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Germany (DE), Denmark (DK), Netherlands (NL), Belgium (BE), Ireland (IE), United Kingdom(GB), France (FR), Spain (ES), Portugal (PT), Italy (IT), Slovenia (SI), Croatia (HR), Albania (AL), Greece (GR), Turkey (TR), Libya (LY), Tunisia (TN), Algeria (DZ), Morocco (MA), are included, combining information from the Data Call 2024 and the WGEEL database updated to 2023. The inset box shows the proportion of reconstructed landings per year.

2.4.2 Recreational fisheries

EU Council Regulation 2023/194 and 2023/195 banned all recreational fisheries in marine areas. The EU Council ban was continued in 2024 by Council Regulation 2024/257 and 2024/259. In the Mediterranean, all recreational fisheries in all habitats were banned since 2024 by EU Council Regulation 2023/2124. In addition, recreational fisheries in some countries were banned completely through local regulations (e.g. Ireland, UK, Portugal, Sweden, Norway) and some countries restricted the season for recreational fishery in freshwater (e.g. Finland, Denmark).

Figure 2.10 presents data available to the WGEEL on recreational landings for glass eel from Spain and France. Recreational fisheries for glass eel were banned in France in 2010. Spain reported 1.3 t landings for glass eel recreational fishery for 2023 but since that recreational glass eel fisheries were banned following the adoption of EU Council regulation 2023/2124.

Figure 2.11 presents the data available on recreational landings of yellow and silver eel combined which summed up to 551 t for 2022 (15 countries reporting) and 84 t for 2023 (10 countries reported). France has provided estimation for all freshwater recreational fisheries in 2006, while for other years, France provided declared catch by recreational fishers with gear in public rivers. Sweden provided estimations for some years based on questionnaires and calculations from *Statistics Sweden*. This implies that total recreational catches for certain years is probably

underestimated. The available data have been considered by the WGEEL jointly with the other series in Europe. The mean yellow and silver eel recreational fisheries for the previous five years (2017–2021) was 521 t. The data for 2023 is incomplete and will change since some countries do not report the landings annually (e.g. Germany).

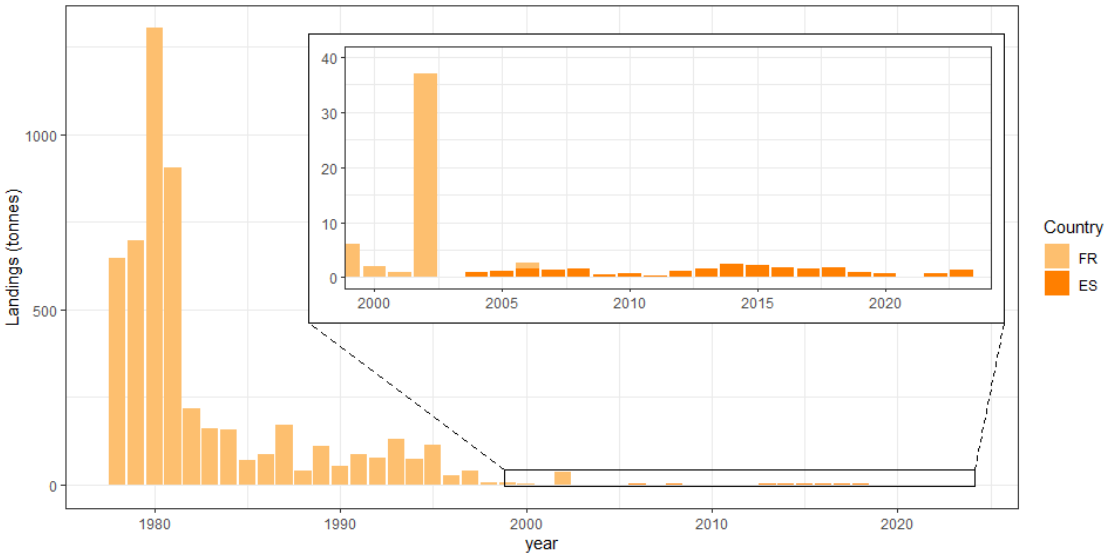

Figure 2.10: Time-series of reported recreational glass eel fishery landings (tonnes), 1978-2024 by country, France (FR), Spain (ES).

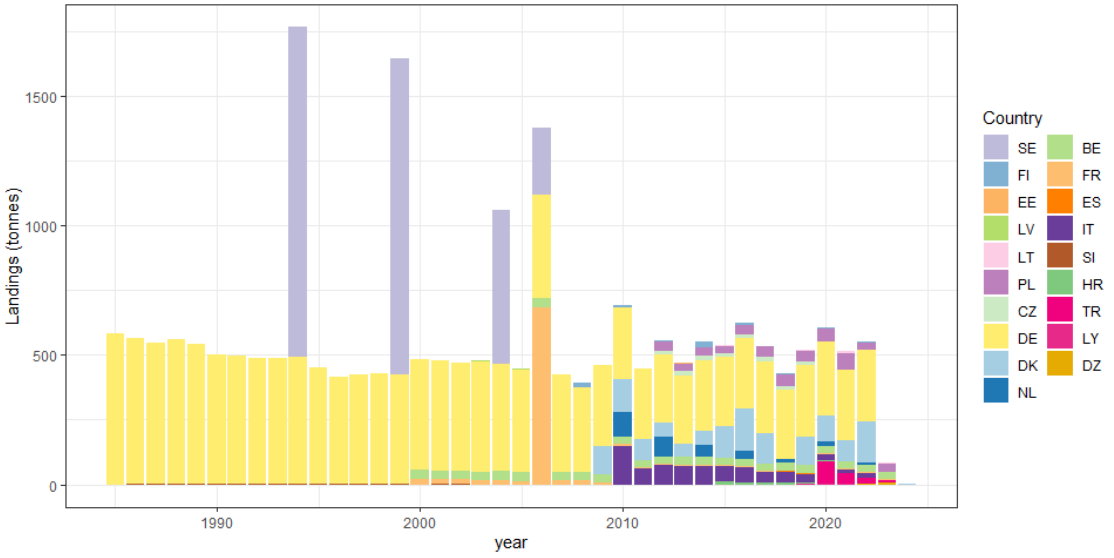

Figure 2.11: Time-series of reported or estimated recreational yellow and silver eel fishery landings (tonnes), by country. Sweden (SE), Finland (FI), Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Czech Republic (CZ), Germany (DE), Denmark (DK), Netherlands (NL), Belgium (BE), France (FR), Spain (ES), Italy (IT), Slovenia (SI), Croatia (HR), Turkey (TR), Libya (LY), Algeria (DZ).

2.4.3 Illegal, unreported and unregulated landings

Illegal, unreported, and unregulated fishing (IUU) is by its nature difficult to quantify, and misreporting may therefore be substantial. Organized illegal glass eel trade is supplied by legally caught and IUU caught eel. This trade is considered high priority by Europol (the European

Union's law enforcement agency) among environmental crimes, due to its economic significance, the poor status of the eel stock, and the large number of organizations affected. Related police action and court decisions have been covered by many news reports during recent years. In addition, illegal eel trade from range states is an issue of concern for CITES (CITES, 2023). To summarize, while IUU fisheries certainly exist for glass, yellow, and silver eel, there are insufficient data available to quantify their effect on the total stock size or status with any level of certainty. Thus, efforts to improve traceability and the scale of demand will assist enforcement but also allow us to better understand what proportion of legal catch enters illegal trade, and thus estimate illegal catch which would inform the characterization of the impacts of all fisheries on the stock.

2.5 Other landings

All other landings, coming neither from professional nor recreational fisheries, were recorded separately. Most of them concern translocation within a river basin and/or an EMU to mitigate the impact of barriers to migration. Glass eel translocations (Annex 11, Table 10) were only reported by Ireland (since 1959, by numbers and mass) and the United Kingdom (since 1996, by mass only). Yellow eel translocations were only reported in Sweden and Ireland (Annex 11, Table 10) and silver eel translocations in five countries: mainly in Sweden, Ireland and Finland, and to a lesser extent in Netherlands and Spain (Annex 11, Table 12).

2.6 Releases

Data have been reported on restocking which includes eels released at the glass eel phase, either directly (G), or after a quarantine (QG), after a period of some months of growth in aquaculture (OG), at the yellow eel (Y) or silver eel (S) stage. Dekker and Beaulaton (2016) establish the start of the eel restocking back to 1840 and provide a review of available data since that date that are not included in this report (based on reported data from countries). They also emphasis the large variety of practices under the term *restocking*.

There are also some releases of mixed life stages: Glass + Yellow eel (G+Y) and Yellow + Silver eel (Y+S) for Ireland and Spain, but they will not be presented in this report. To further complicate the matter, displacements of eel can range from a few meters within the same waterbody (i.e. assisted migration to bypass an obstacle), to eel being moved between waterbodies and/or EMUs. There are still inconsistencies and variations in how countries report these displacements. Therefore, the WGEEL broadly categorizes them as "releases".

2.6.1 Glass eel releases (G + QG)

Restocking of glass eel (G + QG) peaked during 1980s and was followed by a decline to a low level in 2009 (Figure 2.12). The amount of restocked glass eels has increased since 2010 with high numbers in 2014, and from 2018 to 2022. The quantity of glass eels (G + QG) released in 2022 and 2023 was 16 and 9 t (number of countries reporting: 11 and 12).

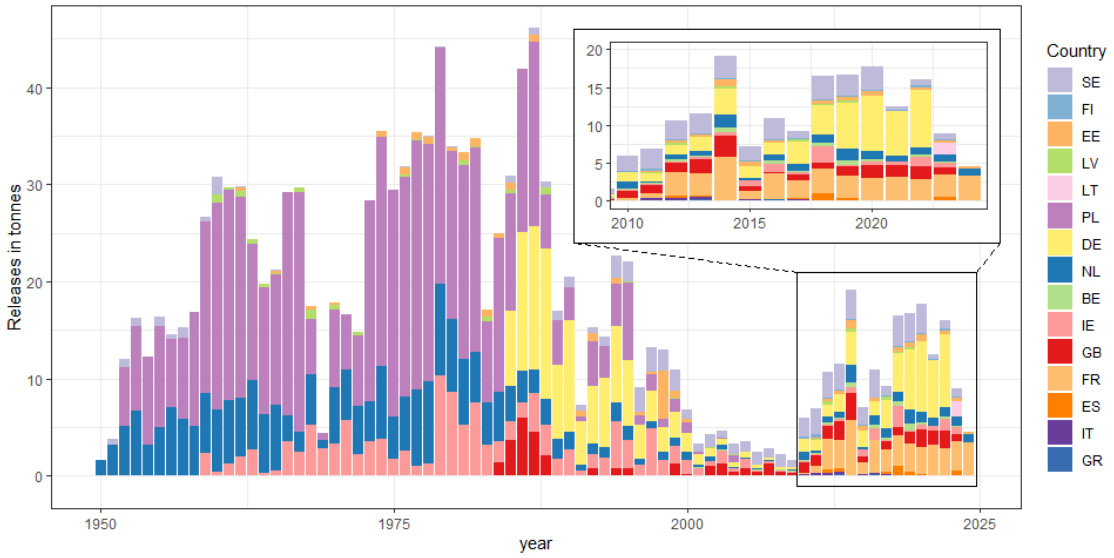

Figure 2.12: Reported releases of glass eel (G + QG, in tonnes) per country Sweden (SE), Finland (FI), Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Germany (DE), Netherlands (NL), Belgium (BE), Ireland (IE), United Kingdom (GB), France (FR), Spain (ES), Italy (IT), Greece (GR). Inset shows years since 2010 in greater resolution. 2024 and 2023 are provisional data (data are missing from 2024 because not all the countries have reported yet and from 2023 because German data have not been reported yet).

2.6.2 Ongrown eel (OG) and yellow eel (Y) releases

Releases of ongrown eels are presented in Figure 2.13. It has constantly increased since 2000 and reached a maximum in 2022.

Releases of yellow eel are represented in Figure 2.14. The quantity of yellow eels (Y) released in 2022 and 2023 was 2 and 1 t (number of countries reporting: 2 and 1).

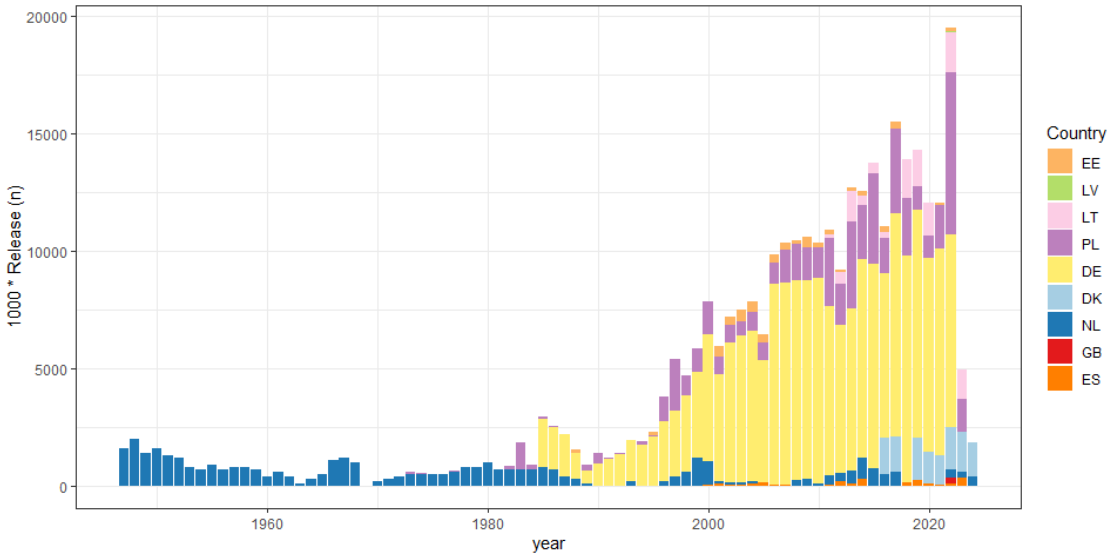

Figure 2.13: Reported releases of ongrown glass eel (OG, in thousands) per country Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Germany (DE), Denmark (DK), Netherlands (NL), United Kingdom (GB), Spain (ES). Data for recent years are provisional or incomplete and may change in future data calls. Data reported in numbers since biomass reporting is incomplete.

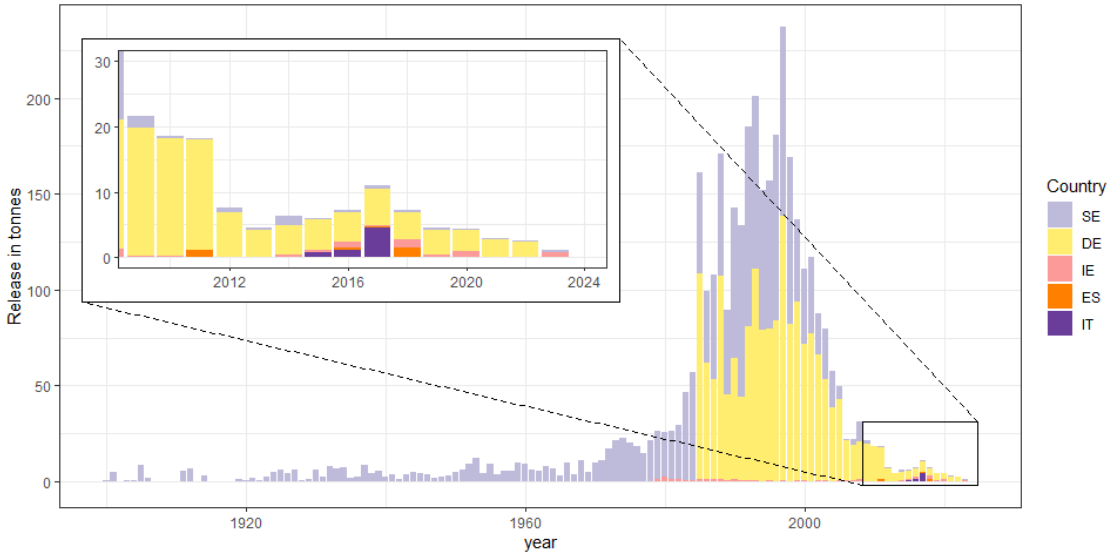

Figure 2.14: Reported releases of yellow eel (in tonnes) per country Sweden (SE), Germany (DE), Ireland (IE), Spain (ES), Italy (IT). Inset shows the last 15 years in more detail. Data for recent years are provisional or incomplete and may change in future data calls.

2.6.3 Silver eel releases

Silver eel conservation fisheries to "trap and transport" silver eels around hydropower and pumping stations take place e.g. in Sweden, Finland, Ireland and the Netherlands. In addition, a certain percentage of silver eels caught by the fishery, and therefore recorded as landings, are later released in the Mediterranean outside the lagoons in Greece (30% of caught silver eels) and France. These are reported as released silvers (Figure 2.15). Spain has made some releases of silver eels from the Encanyissada lagoon. The quantity of silver eels (S) released in 2022 and 2023 is 130 and 130 t (number of countries reporting: 7 and 5).

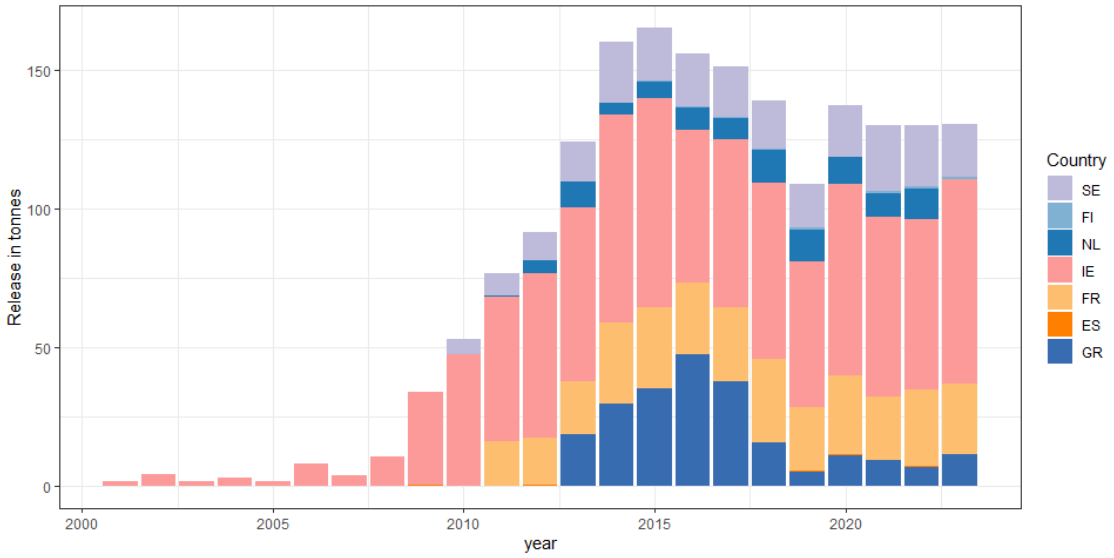

Figure 2.15: Reported releases of silver eel (in tonnes) per country, Sweden (SE), Finland (FI), Netherlands (NL), Ireland (IE), France (FR), Spain (ES), Greece (GR). Note that data from NL is missing for 2023.

2.7 Aquaculture

All aquaculture for eel currently depends upon wild eel for seeding. Aquaculture production data are derived from responses to the data call 2024. Aquaculture production increased from the 1980s, peaking in 2004 at just under 8 600 t. Since then, it has steadily declined to approximately 4 995 t by 2022 (countries reporting: PT, SE, NL, GR, DK, DE, IT, ES, PL) (Figure 2.16). The mean aquaculture production for the five-year period (2017-2021) is 5106 t. Lithuania had one farm in operation from 2017 to 2023 and cannot report production for that period due to confidentiality. Estonia has a similar situation, with less than three eel farms since 2018.

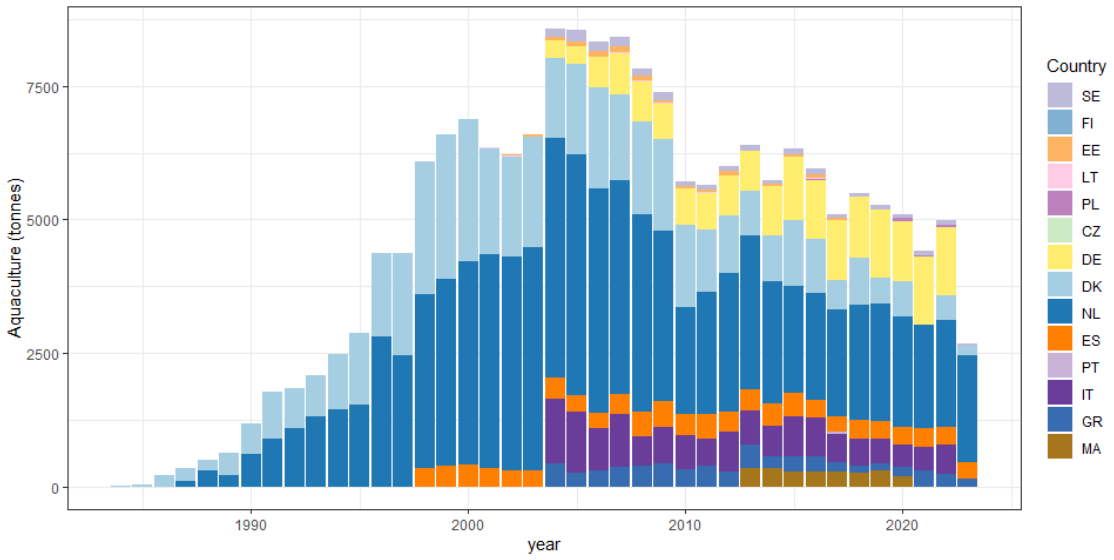

Figure 2.16: Reported aquaculture production of European eel in Europe from 1984 onwards, in tonnes, in Sweden (SE), Finland (FI), Estonia (EE), Lithuania (LT), Poland (PL), Czech Republic (CZ), Germany (DE), Denmark (DK), Netherlands (NL), Spain (ES), Portugal (PT), Italy (IT), Greece (GR), Morocco (MA).

3 Report on updates to the scientific basis of the advice, including any new or emerging threats or opportunities

This section discusses updates in science, relevant for the management and protection of the European eel. New scientific outputs were highlighted alongside updates on previously reported projects based on the 17 Country Reports provided to WGEEL with additional inputs originating from in person contributions at the meeting. However, at the end of the 2024 meeting, it was concluded that the contents of the country reports were not sufficient to reliably update current knowledge. A more systematic literature review will be undertaken during the next WGEEL meeting.

A section on risks associated with the prospective closure of the eel's lifecycle was included based on a presentation given during the meeting (Section **Error! Reference source not found.**) on the recent advances of eel artificial reproduction. This additional section highlights some of the potential threats aquaculture of eels might pose to the natural population. However, this topic is vast and will require further development in the coming WGEEL meetings. In 2019, the Working Group on Eel (WGEEL) launched a rolling program to update the scientific basis for eel conservation. Each year, a subgroup focuses on a specific topic, using updated data and research. Key areas include the impact of hydropower on eel migration, health threats such as the swimbladder parasite *A. crassus*, and the growing issue of microplastics. Climate change, invasive species, and eel conservation projects like LIFEEL and AnguillaMed are also major concerns. Two studies by Höhne et al. (2023, 2024) assessed silver eel escapement models, underscoring the need for regional parameters to improve accuracy. The AZORES project continues to tag eels to track migration.

GFCM's 2024 Roadmap for Mediterranean eel management focused on data integration, socio-economic studies, and habitat analysis, highlighting that current fishery closures are inadequate for protecting escaping eels. ICES workshops addressed stock modeling, historical landings data,

Due to a change of Country Report format post 2016, resulting in the removal of the New and Emerging Threats Section 5 (yet remaining a continuing ICES generic ToR), the subgroup review of this section was noted as being less streamlined. The combination of topics included within this rolling ToR such as new information, projects, and publications under one heading resulted in a reduced collating efficiency.

3.1 Scientific updates from the Country Reports

From the annual reviews of the updates of the scientific basis for the advice a rolling programme of topics was adopted, with a specifically tasked subgroup examining one theme per year beginning in 2019. This subgroup would make use of the most up to date data and new scientific publications presented at WGEEL relevant to the specific theme (see ICES 2023 section 4.1.3).

By way of revisiting this themed topic approach in 2024, WGEEL agreed that they had found this exercise useful, and the outputs to be of direct application. As such members were asked to consider ideas/suggestions they felt would be a relevant topic, which could be undertaken with sufficient rigour given time constraints associated with the additional EMP review reporting on the horizon for 2024. This did not occur, but the group would suggest for 2025:

- Collation of data (from national records, DCF submissions, etc) on the level of scientific eel sampling (by way of assessing impact on the eel stock)

In general, the overall review of recent publications (outside of the selected topics) is based on what is reported in the WGEEL Country Reports and by asking WGEEL participants to provide recent publications. Systematic literature searches were not performed.

3.1.1 Hydropower, Screening and Passage

There is an increasing focus on the impacts of hydropower on eel and other migratory fish species. Several Country Reports (Sweden, Denmark, Netherlands, UK, Belgium, and Lithuania), have highlighted projects researching solutions to the issues of entrainment and of migration barriers. Water is frequently diverted from or into rivers for flood protection, water level management, domestic supply, agriculture, industry and hydropower generation. Fish and eels can be entrained in turbines, pumps and consumptive water intakes, resulting in damage and/or mortality. Further evaluation of Trap and Transport systems for downstream migrating eels have been reported with focus on evaluations of mortality, stress and migration patterns. Potential optimization of Trap and Transport systems has also been suggested and is currently undergoing trials in landlocked waterbodies following a series of successful tagging experiments.

- *REDEEM project (Research and Development of fish and Eel Entrainment Mitigation at pumping stations) Phase 2 - England*

Funding has been provided by Environment Agency (EA), EU European Marine and Fisheries Fund (ENG2130), Internal Drainage Boards, Association of Drainage Authorities and the University of Hull (UoH). This research consortium, now in Phase 2, focusses on understanding fish and eel behaviour to assess the effectiveness of existing and new technologies for minimising entrainment at pumping stations and develop innovative measures to provide applied outcomes. Specifically, the research will focus on understanding the spatial distribution of fish and eels in pumped catchments, the processes that lead to entrainment and the effectiveness of altered operating regimes, fish-friendly pumps and novel downstream bypass channels for minimising entrainment. Phase 2 also includes the assessment of novel hydropower schemes to ensure carbon reducing initiatives do not negatively impact fish populations.

To date the REDEEM project has produced 17 publications, with a further five submitted/under review. Since the project was previously reported in WGEEL 2023, five new publications have been added to the existing 12.

3.1.2 Health Parameters

As stated in previous WGEEL reports (WGEEL 2021 & 2023), the invasive swimbladder parasite, *Anguillicola crassus*, continues to pose a threat to successful eel migration, and therefore re-production. Recent studies highlight the preventative properties of increased salinity on nematode infection and proliferation within eel populations (Tahri, 2023, Tahri and Bensouilah, 2023). Using a 30 year long data series the infection history of A. crassus was assessed for coastal and inland waters in northern Germany, indicating a reduced infection rate in recent years (Unger *et al.* 2024)

A focused update of contaminant research was conducted in WGEEL 2023. However, presence of microplastics in the tissues of fishes is of growing concern due to the multitude of possible genetic, physiological, and behavioural alterations they induce (Triebskorn *et al.*, 2019). Further research is planned into the presence of microplastics in the tissues of both juvenile marine and adult freshwater stages (Hanel *et al.*, 2022, UK Country Report 2024).

3.1.3 Climate change

Global climate change, in particular changes in temperature, have and will continue to both directly and indirectly affect both marine and freshwater habitats, requiring similar considerations given the likelihood of dual impacts on migratory animals such as diadromous fish. The wide range of threats to freshwater fish, including eel, and the associated fisheries are reviewed in Harrod (2016) and Heino *et al.*, (2015). Climate change also continues to be a consistent feature in Country Reports and ICES reports since this specific ToR was first included in 2015 (see ICES 2023, Section 4.51.3.2).

The eel's capacity to respond to changing conditions during their continental phase depends on a multitude of factors such as their individual fitness, local trophic ecology, and habitat quality and connectivity. This is especially relevant in areas susceptible to drought, where further warming could lead to drying of river systems. Upcoming research using eDNA techniques plans to identify eel refugia during periods of drought, with the aim to integrate eel conservation needs into broader water management policy.

Understanding distribution patterns of European eel is crucial. In this regard, Mestav *et al*. (2024) conducted an evaluation to identify potential predictors of future climate change effects on eel distribution patterns in Turkey, utilizing catch data from 1967 to 2020. Considering the panmictic nature of eel stock, local habitat characteristics and climate variability should be considered throughout the entire distribution area to more effectively inform eel conservation measures.

3.1.4 Invasive Aquatic Species

Invasive species within aquatic environments continue to impact native populations, exacerbated by range expansions facilitated by climate change. Several country reports have noted a negative effect of invasive crustaceans on local eel populations in coastal environments. Increasing populations of Atlantic blue crab *Callinectes sapidus* has been reportedly linked to decline of local European eel stocks (Spain Country Report, Tunisia Country Report). Future potential impact of the Chinese mitten crab *Eriocheir sinensis* has also been raised, with the UK country report detailing their ability to actively damage fyke nets to access prey, including yellow eels.

3.1.5 Conservation and Policy

Many country reports have highlighted ongoing updates or submissions of national EMPs in line with the triennial review process given that 2024 was next in the timeline for EMP reviews. Several projects focusing on eel conservation were also highlighted within the GFCM and North Sea regions. In particular, the ongoing MedSea4Fish GFCM programme in Tunisia, several projects in various stages of implementation in Greece including LIFEEL (LIFE19 NAT/IT/000851) and Ecosystem Services Restoration Project in Turkey. These projects aim to coordinate stock management efforts across the Mediterranean and Europe.

- *Ecosystem Services Restoration Project (Turkey) in Lake Bafa and the Büyük Menderes Delta Umbrella species: European eel (A. anguilla)*

Lake Bafa and the Büyük Menderes Delta ecosystems are under pressure from hydrological interventions and pollution. To restore ecosystem services, The European eel (*A. anguilla*) was chosen as an umbrella species with global conservation priority. The first phase of the project has been completed. In this phase, the main aim was to define the main problems in the study area and the key roles of each stakeholder, motivating them to solve any related problem. The project is supported by WWF-Türkiye and Çanakkale Onsekiz Mart University.

- *LIFEEL Project (Greece)*

A third research phase on eel artificial reproduction is underway in the framework of the LIFEEL Project. The University of Bologna has completed the setup of protocols and procedures for artificial reproduction of eels. The research now is focused on growing of eel larvae more than on reproduction. At present, a high number of larvae of good quality can be obtained through spontaneous reproduction in the tanks. Furthermore, a diet to maintain eel larvae up to around 45 days post hatch was identified, and further experimentation is under way.

Additionally, within the LIFEEL Project, an app was developed for the identification of real migrating, silver eels, optimizing the selection of broodstocks for artificial reproduction and for the ministry release programs, for restocking.

- *INTERACTION (2024 – 2028)*

This transdisciplinary project, funded by the French National Research Agency aims to assess the impact of separate or combined biotic and abiotic stresses on the European eel (*Anguilla anguilla*). The targeted biotic contaminant is the parasitic nematode *A. crassus*, which may significantly compromise migration, and the abiotic contaminant is biosphenol S, an emerging pollutant whose effects on aquatic organisms are of growing concern. Using an integrative multi-omics approach, the negative synergistic effect of these two stressors will be tested. This project involves three research units from the Perpignan University (CRIOBE, CEFREM, IHPE), one from the Sorbonne university (BIOM, at Banyuls Sur Mer) and one from Grenoble (IAB).

- *AnguillaMed project (2024 – 2026)*

The Project is funded by the POCTEFA European program aiming to evaluate the health status of European eels (*A. anguilla*) in lagoons and river of Catalunya (Spain) and Pyrénées-Orientales (France). AnguillaMed project also aims to test the efficiency of non-lethal methods (mucus metabolome oxidative stress and microbiome, blood oxidative stress, molecular detection of *A. crassus* in gut washes) to determine eels' health status. Eventually, specific restoration recommendations for lagoons, rivers and eel population would be formulated to address specific anthropogenic sources of contamination. AnguillaMed is a collaborative project involving two research units from Perpignan University (CEFREM and CRIOBE) in France and three research institutes (University of Vic, IRTA and IDEA-CSIC) in Spain.

3.1.6 Evaluation of eel population models

Two recent papers examined the accuracy of currently used methods for the assessment of local eel stock status in terms of silver eel escapement. The first study examined discrepancies between model predictions and actual observations of silver eel escapement in a German river (Höhne *et al.*, 2023). The research focused on the application of the German Eel Model (GEM) and compared its outputs to monitored escapement data, revealing that while model estimates were within the same magnitude as observed data, they often overestimated escapement (Höhne *et al.*, 2023). This was attributed to a lack of locally specific input data, which led to inaccuracies in demographic models that assume uniformity across regions. The study emphasized the need for adapting models to local conditions and highlighted challenges in obtaining precise input parameters, such as eel recruitment and mortality rates, which are crucial for effective management (Höhne *et al.*, 2023).

The second research by Höhne *et al.* (2024) addresses the challenges of using regional stock assessments for species that have broad geographic ranges. The authors argue that regional assessments often ignore the biological and ecological nuances that occur across different areas, which can lead to misleading conclusions about stock health and sustainability (Höhne *et al.* 2024). Widely distributed species, such as eels, face particular challenges because their life stages and behaviours can vary significantly depending on the region. The study advocates for more integrated, cross-regional approaches to stock assessments to better capture the variability in species dynamics, rather than relying on fragmented regional data (Höhne *et al.* 2024). This could improve the accuracy of population estimates and management strategies (Höhne *et al.* 2024).

3.1.7 Silver eel migration

Following research highlighted in ICES 2023 (Section 4.4.1.3.2), several recent publications were reported to WGEEL by Belgium. These projects encompassed research on silver eel migration routes and tag impact on eel swim behaviour (Verhelst *et al.*, 2022a; Verhelst *et al.*, 2022b) and recommendations for silver eel migration surrounding pumping stations (Verhelst *et al.*, 2024).

- *AZORES Project -*

Following updates on the AZORES Project in WGEEL 2022 and 2023, further progress has been reported on this research in 2024. Further tagging of silver eels has been conducted with a total of 78 eels tagged since the project commenced. A new PhD has also been produced by the AZORES Project with research focusing on glass eel recruitment into the Azores and movements of yellow and silver eels around extreme natural barriers with the use of acoustic telemetry project.

3.1.8 Eel ecology and habitat selection

A holistic approach to European eel research provides a deeper understanding of management action impacts in the natural environment. Several scientific outputs regarding ecological research on eel have been reported to WGEEL. Habitat usage and selection by juvenile stages was of particular focus with several projects currently ongoing. Other ecological research on several life stages has been noted including: leptocephali trophic interactions, the potential role of ultra-

violet light and biofluorescence in glass eel shoaling, and broadhead ecotypes (Derbal & Ariba, 2024; Hanel *et al.*, 2023; Moore & Evans *et al.*, 2024).

3.1.9 Artificial reproduction of the European eel and use of artificially produced glass eel larvae

The ToR for this specific topic did not require a review of the techniques or results from the artificial reproduction of European eel, moreover it was the production of a contextual statement to illustrate the current "state of the art" with a view to how progeny could be used.

Closing the reproductive cycle of the European eel remains a challenge, specifically larval survival due to high mortality rates during early feeding stages. However, reproduction of captive European eel has made significant progress in the past decade now targeting completion of the larval stage leading to first production of glass eel, reviewed by Mordenti *et al.*, (2019), Tomkiewicz *et al.* (2019) and Jéhannet *et al.* (2024).

Several European research groups are currently working on larval European eel rearing, with recent information of up to 300 days post hatch (dph) of larval survival, although at very low rates (Glasaal Volendam pers. comm.). Reported maximal larval lengths (at about day 150 to 180) are 22 mm. The duration of larval rearing required to promote metamorphosis to the glass eel stage remains unclear. These challenges will need to be addressed in order to successfully close the European eel lifecycle in captivity.

This contrasts with the advances made in Japanese eel artificial reproduction where the first glass eel production was reported in 2003. The completion of its life cycle under laboratory conditions was first achieved in 2010 (Ijiri *et al.*, 2011). Techniques for glass eel production of Japanese eels have recently progressed. New protocols for gonadal developments using recombinant gonadotropins have been established. A new larval diet that is mainly composed of hen egg yolk, milk protein, and fish protein hydrolysate has been developed. In addition, a new scaled-up rearing tank was developed to provide growth and survival rates that are equivalent to those of small experimental tanks (Sudo, 2024). The present target is the establishment of large-scale commercial production, so far not achieved, of seedlings for aquaculture to meet the high market demand. The total annual production of Japanese eel 15 years after the successful completion of its life cycle under laboratory conditions is 10 000 (Sudo, 2024, pers. comm.).

When placed in the wider context of European eel aquaculture, this small-scale production of artificially reared juveniles is unlikely to replace wild caught juveniles in the near future.

The question around the ultimate destination (or end use) of glass eel developed from successful artificial reproduction has repeatedly been discussed at WGEEL and includes (but is not restricted to) the following considerations:

- the panmictic nature of eel recruitment;
- its potential influence on the genetic diversity of this stock;
- predation naivety of farm reared larvae;
- behaviour of artificially reared eel in the wild; and
- spread of diseases.

Ultimately these considerations are highlighted as reasons to avoid the use of such derived larvae/glass eels for direct release into the wild. However, it is suggested that their use could be

more appropriate for aquaculture thus reducing further the impact on the harvest of the wild glass eel stock, given that all eel aquaculture is reliant upon this source as seed stock.

Yet, the use of artificially reproduced and reared progeny of fish in stock enhancement of wild fish and the inadvertent escapes of fish from culture are known to have serious negative effects on wild stocks. Genetic introgression between wild and farmed stocks has been shown to have a significant impact on wild stocks, for example, in wild Atlantic Salmon, where widespread escapes and negative impacts of interbreeding on wild fish have been widely reported. The Working Group suggests that a review of this topic be undertaken with a view to providing advice in relation to the use of artificially produced eel – maybe to be undertaken by an independent group such as ICES Working Group on the Application of Genetics for Fisheries and Aquaculture (WGAGFA).

From 2011 to 2016 WGEEL carried out extensive analyses into the fate of glass eel harvested from fisheries across Europe, in terms of ultimate destination and fate. From these analyses the current group examined those countries that purchased glass eels and the quantities that then went on to be used for aquaculture. For the most recent data the values used directly for aquaculture ranged in proportion from 10 to 89% (ICES, 2016) of the countries glass eel purchase, with a combined European aquaculture need totalling 10 t in 2015 and approx. 12 t in 2016.

Based on mean quantity of 3 000 glass eels per kg this equated to the total number needed for aquaculture to approx. 30-35 million individuals. Given the huge quantity of glass eel required, and the experiences and developmental timelines described for Japanese eel thus far, the fulfilment of this aquaculture need will require years or decades of further research and development.

3.2 Presentations

- **Presentation 1; Eleonora Ciccoti & Leander Hohne**

Title: "Roadmap towards informing the future GFCM long-term management plan for European eel in the Mediterranean – 2023-2024".

Aims and results of last year's work within the GFCM Roadmap 2023-2024 were presented. The roadmap involved Scientific Partners and National Focal Points from nine Countries in the Mediterranean region. The overall aim was to provide the SAC25 in 2024 with elements to inform future long-term measures for European eel in the Mediterranean to ensure eel conservation while maintaining a sustainable level of fisher employment.

Specifically, the roadmap foresaw the integration and update of data and databases from the first phase RP (on eel habitats, eel fisheries, life history traits of local stocks, management measures in place), a socioeconomic study on the eel fishery in the Mediterranean, and an advancement of the model-based appraisal of management scenarios.

The socioeconomic study relied on data from 719 fishers interviewed from 141 sites. The study provided crucial socioeconomic indicators, including the value of European eel landings by habitat, cost structure, gross cash flow, and demographic information. The socioeconomic study also included open-ended interviews aimed at gathering Local Ecological Knowledge (LEK) from the fishers. Information, data, and opinions derived from the LEK study allowed to obtain an overview of the type of involvement in eel fishing, their level of awareness of the critical issues concerning eels and the main critical issues concerning the habitat on the sites where they operate, as well as evaluating their capacity and willingness to take part in the decision-making process and contribute to future management strategies for the eel resource.

A specific objective of the roadmap was to implement the Habitat DB with additional habitat-related information, to obtain an overview of the geographical distribution and location of sites where the main environmental critical issues in eel habitat are present, based on descriptors which included landscape and basin use, trophic status, anoxia and dystrophic events, climate change effects, presence of non-indigenous species. Also, specific issues directly affecting the European eel were considered, such as the presence of piscivorous birds and criticalities in the connectivity between the open sea and transitional waters, and within freshwater aquatic systems. This allowed to widen the list of potential management measures to be implemented for eel conservation by including measures addressing eel habitat, based on the need to envisage a holistic approach to eel management.

A picture of the regional stock status of eel in the Mediterranean was provided, by exploring recruitment time series available for the region. Time series were also used to produce tentatively a specific Mediterranean Recruitment index, following the approach and methods used by ICES. Results show a trend of the MED Index recruitment obtained consistent with the trend known for the rest of Europe and demonstrate that eel recruitment remains at a very low level in the Mediterranean.

Current (Bcurrent) and historic silver eel escapement biomass (B0) was assessed in 131 data-rich sites by the ESAM 3.0 model, an age-structured, demographic model developed for the use in Mediterranean local stock assessment (especially lagoons), but purposely reviewed and updated within the tasks of the roadmap. Sites assessed account for 60% of current wet-ted areas of eel habitat in the Med, and results highlight that most current silver eel escapement in biomass occurs from lagoon habitats.

Results of all tasks converged in a multi-objective assessment of alternative management measures. Herein, 11 single management measures and three combinations of measures were defined based on scientific reasoning, stakeholder input, and modelling feasibility. Any of these measures were evaluated against four objectives: the predicted silver eel escapement by 2030 (B2030), B2030 relative to B0 (both conservation-related objectives), together with the predicted total economic profit (economic objective) and stakeholder's sentiment (social objective, derived from interviews). A key result of this exercise suggested that the six-month fishery closures as currently implemented by Mediterranean countries ranked rather low in comparison against other measures, suggesting slow progress towards the target reference point of contemporary eel management under the EU-Eel regulation (i.e. a Bcurrent / B0 ratio of 40%). A hypothetical scenario of seasonal closures tuned as to maximize the temporal overlap with the actual silver eel escapement season would result in much higher conservation value (at the cost of increased economic losses). This result indicates that currently implemented seasonal closures provide low protection for the escaping silver eel stage and will unlikely increase the arrival of spawners at Sargasso Sea substantially.

- **Presentation 2; Cedric Briand**

Title: Workshop on the development of a spatial database and model for Eels - 2023

The results of the workshop on the development of spatial model and database for eel were presented. The stage structured global stock model, the regional models to produce abundance estimates at the yellow and silver eel stages were presented. The development of a common GIS database of eel habitats using the CCM, the hydro Atlas and national GIS was addressed. Finally, the development of databases of electrofishing and dams was outlined. These developments begun in the DIASPARA project, and in some external projects (i.e. AMBER) should help the development of a common set of databases and tools to support the work at the national level.

- **Presentation 3; Laurent Beaulaton**

Title: Presentation and discussion WKLANDEEL (eel landings data)

The Workshop for the Reconstruction of Eel Landings Statistics (WKLANDEEL) met to provide a method to evaluate the total landings of European eel from available data. European eel landings data are assumed to be deficient, heterogeneous, incomplete and not well documented. This workshop aimed at reviewing available data and their reliability, at identifying missing information, and at developing a modelling framework for using available data at different scales (site, eel management unit, country) to estimate total landings of European eel.

Expert judgements were sought on the level of completeness of the data already stored in the working group on eels' database. These data were also compared to data available in the main international databases. While the data for some fisheries was found to be almost complete especially in recent years, other fisheries still lack data, particularly recreational fisheries.

An initial modelling framework, from data compilation and correction to reconstruction, has been designed and illustrated with examples of the data available to feed it.

- **Presentation 4; Arjan Palstra (Chair-invited speaker)**

Presentation and discussion EEL SUPPORT – " Solving bottlenecks in eel reproduction to support sustainable aquaculture", presentation by COST Action chair Arjan Palstra- Website: https://www.wur.nl/en/show/solving-bottlenecks-in-eel-reproduction-to-support-sustainable-aquaculture.htm

This COST Action (2023-2027) aims to expand the current knowledge on European eel reproduction and develop methods for successful maturation and production of offspring. The reproduction of eels in captivity has become an important research topic due to the severe decline of natural populations. Worldwide, eel populations have decreased strongly in numbers since the 1970s. Eels – like many other fish species – do not reproduce in captivity. Eel farms still depend on catches of wild juvenile eels, or 'glass eels', which are then raised to market size. However, only a restricted number of glass eels is available for aquaculture and societal concerns exist about the unsustainable level of their harvesting. Successful propagation in captivity could supply aquaculture with glass eels and close the production cycle. EEL SUPPORT uses available networking tools to share new knowledge and identify knowledge gaps, to develop collaborative strategies to fill these gaps, and to synthesize and review this knowledge in order to: 1) design optimal protocols for broodstock conditioning from glass eel to an eel in early puberty, or 'silver eel'; 2) design optimal protocols to artificially mature and propagate the eel to produce larvae; and 3) design hatchery technology for rearing larvae to the glass eel stage.

4 Review implementation of the roadmap proposed by WKFEA

The Workshop on the Future of Eel Advice (WKFEA, ICES 2021) had identified milestone toward an improved eel assessment and advice and proposed a roadmap accordingly. This section reviews the progress done in past years in the implementation of this roadmap and prepares for the benchmark, that is the last milestone identified by WKFEA.

4.1 Benchmark of eel assessment

4.1.1 ICES benchmark process

"ICES uses a 'benchmark process' as a means to peer-review and incorporate new science (new knowledge, data, analyses, and assessment methods) for use in provision of recurrent advice in response to regular annual requests." (ICES, 2023 - guidelines).

Even though the WGEEL report and advice are based on best available science, the data and method used by WGEEL have never been peer-reviewed through the benchmark process.

There are three levels of benchmark (Expert Group, Review and Full benchmark). The full benchmark procedure is more relevant as a full review of both data and methods are needed. To better identify the topics covered by the benchmark, it is necessary to list the issues identified and prioritize those that will be part of the benchmark. This list will ultimately be available in the ICES Stock Information Database (https://sid.ices.dk).

4.1.2 Identified issues

4.1.2.1 Review of Existing data series

The existing data series have never been reviewed externally, only evaluated within the group for suitability for modelling Currently the WGEEL database has a 'series info' table which captures the following information:

a) the location of the trap;
b) sampling type (commercial catch, commercial CPUE, scientific estimate, trapping all, trapping partial);
c) unit of measurement (number or weight);
d) lifestage (G, Y, GY);
e) habitat (F, T, C, MO);
f) gear type (FAO list provided);
g) method (list provided);
h) Distance to sea (km);
i) Latitude/Longitude (decimal degrees); and
j) Influenced by restocking (true, false).

Some time series have been operating for decades with improved data collection practices and improved trap efficiencies. Some data series are pooled stocks glass (G) and yellow eels (Y), whereas the data allows the separation of G and Y, which would improve the accuracy of the modelling analysis. How to address these changes in the series needs to be documented.

Other possible biases in data series are restocking, which may have changed over time, i.e. started or ceased and changes in effort/method. Some series, while the method may have changed, have continued reporting the original time series in an attempt to maintain consistency, while not reporting the whole available dataset for the site.

4.1.2.2 Weight/numbers

Currently provided data may reflect the abundance in numbers or in weight. What is not currently captured is if data owners apply any standard values to convert numbers to weight or weight to numbers (or both depending on the catch size during the season). Biometry data are asked for but how this relates to the overall catch calculation is not clear, i.e. if conversions are based on the recent weight data (group or individual metrics) or on an agreed reference weight (e.g. 0.3 g per individual glass eel). Furthermore, given the variation of mean weight inside and between seasons, the influence of having some series given in weight and others in numbers has never been evaluated.

4.1.2.3 New data series

There is a requirement for the creation of a rulebook for adding new data series to the recruitment analysis.

Currently time series are included in the analysis if they fulfil the following criteria:

a) The time-series is at least ten years old.
b) If two series come from the same location, only one is used.
c) The series is not biased by restocking.

More statistical analysis may be required before the new time series can be included in the recruitment analysis.

4.1.2.4 GLM/GEREM

The WGEEL recruitment index used in the ICES Annual Stock Advice (ICES, 2023 - advice) is fitted using a generalized linear model (GLM) with a Gamma distribution and a log link for glass eel (North Sea & Elsewhere series; glass eel ~ year: area + site) and yellow eel recruitment series (yellow eel ~ year + site) (ICES, 2023 - WGEEL). In addition, an alternative model has been explored, Glass Eel Recruitment Estimation Model (GEREM) (Drouineau *et al.*, 2016 ; Bornarel *et al.*, 2018, ICES, 2023 - WGEEL), a Bayesian model aiming at estimating glass eel recruitment at different nested spatial scales (e.g. overall recruitment, sub-regions/zone, river basins), thus allowing for relative importance of different series in terms of biomass to be accounted for, especially in the current situation where data are not evenly distributed across the distribution area. The aim is to evaluate current methods used to assess recruitment index (GLM, GEREM) and any other potential methods.

The work required for GLM includes evaluation of the current division into North Sea and Elsewhere regions (existence of several trends and the lack of data in some regions) for glass eel, added value of yellow eel recruitment index (compared to glass eel), issues arising from the mix of eel of different years in yellow eel recruitment series, spatial and temporal coverage of existing series and ways to deal with missing information and determining the minimal number of data series needed for the model to run. For GEREM specifically, it is required to assess the split by zones, currently we are using six zones and this is needs to be assessed. GEREM needs data on absolute number of recruits for each zone. These data should be reviewed. Finally, the most appropriate model will be chosen.

The recruitment data series also needs to be evaluated for spatial distribution, we are currently lacking series in the extremes of the distribution range which could be influencing the

assessment. The minimal requirement for spatial and temporal coverage, including minimum number of series by zone, has never been assessed.

4.1.2.5 Biological reference point

The recruitment geometric mean between 1960–1979 is considered as a likely limit reference point for European eel (Rlim). However, formally no reference points have been defined for the European eel (ICES, 2023 – advice) and the choice of reference period has never been benchmarked.

4.1.2.6 Uncertainty

Currently the data series as provided do not capture uncertainty around the values. Some data series have widely fluctuating values which can be influenced by environmental variables experienced at the trap locations. These variables are not reported in the WGEEL database but possibly recorded locally. The possibility to include this uncertainty within the assessment model should be evaluated.

4.1.2.7 Full assessment

The recurrent ICES advice is based on a trend analysis of recruitment time-series. However, to provide a more holistic advice framework, other indicators could be derived to complement the recruitment analysis, such as trends in silver and yellow eel abundances and trends in anthropogenic mortalities. Thus, the aim is to the develop a new spatial stock assessment model accounting for spatial heterogeneity traits in eel life history to be able to provide spatially disaggregated estimates.

The work required includes many steps from the WKFEA road map (ICES, 2021), including development of biological models to account for spatial variability in life history parameters, model yellow and silver eel production and fisheries and non-fisheries mortalities (e.g. habitat loss, dams). Finally, developing the spatial stock assessment model will be required, as well as evaluating the robustness of this model and reference points to all sources of uncertainty that were not accounted for due to lack of knowledge.

Data for costal and marine open waters, as well as lakes are currently lacking (e.g. yellow eel series, biological parameters etc.). Therefore, it is strongly encouraged to establish new or report existing data from those habitats and/or find ways to address those limitations. Also missing are methods to determine abundance, or even relative abundance, in these deep and/or open water habitats. This becomes an issue, for example, where a model is developed using electrofishing density data of shallow water habitats.

There have been regionally dedicated projects focusing on data collation and development of regional eel models, specifically SUDOANG (Spain, Portugal and France; https://sudoang.eu/en/) and GFCM eel research project (Mediterranean countries; Albania, Algeria, Egypt, France, Greece, Italy, Spain, Tunisia and Turkey ; Ciccotti and Morello, 2023). However, no such models exist for other regions.

The SUDOANG project developed a spatially explicit model of eel production at a regional level, Eel Density Analysis (EDA; Mateo *et al.*, 2022), which considers local recruitment, yellow eel standing stock and pre-migratory silver eels, as well as habitat characteristics including the barriers to migration, and the flow conditions that influence mortality at such barriers.

Within the GFCM project, first data on eel habitats and fisheries were collected for the Mediterranean region. In addition, the Eel Stock Assessment Model (ESAM; Schiavina *et al.*, 2015), particularly adapted to lagoons, has been further developed and used for an assessment of the Mediterranean fraction of the stock, and for evaluating the potential of different management

strategies. This model could be one of the regional models used to feed the data to the future global stock model for eel (ICES, 2023 - WKSMEEL).

Projects developing regional models that may be included in the overall spatial model would be welcome.

4.1.3 Eel benchmark

The current ICES advice on fishing opportunities for eel is based on a statistical analysis of several time-series on recruitment (glass eel and or a mixture of glass + yellow eels, and of young yellow eel time-series). Most of issues identified in the previous section are related to either recruitment data or to recruitment analysis. Even though WKFEA (ICES, 2021) advocates against having two successive benchmarks, the workload identified in the issues and updated road map is too much for one benchmark process and it is advocated that the process is split into two. The eel recruitment benchmark is scheduled for the next few years.

4.2 Roadmap status and updates

The current roadmap for improving future advice on the European eel stock (ICES 2021 - WKFEA) outlines the necessary issues to develop tools and models for the final Spatial Stock Assessment Model that can be used in ICES advice. These issues are categorized as follows:

a) Time-series of yellow and silver eels and biological parameters (2022);
b) Landing reconstruction workshop (2023);
c) Habitat assessment, WFD data and HP/P mortality–Project 1 (2023–2025);
d) Design a population model–Project 2 (2023–2026); and
e) Data compilation meeting and benchmark (2026–2027).

The WKFEA roadmap (ICES 2021) states that "Getting these tasks done will require both international coordination and research time" … "As a consequence, the road map time frame is just indicative." Currently, while some tasks are completed, others show no progress or require additional steps before constructing and benchmarking the spatial model (Table 4.1).

The WKFEA roadmap identifies two additional projects (Project 1 and 2) needed to complete the process. Project 1 (Habitat - Electrofishing WFD – Hydropower/migration barriers) is partially covered by the WKSMEEL (ICES 2023) and the DIASPARA project which will work on designing database templates (Table 4.1, Figure 4.1). Currently, there are no projects for creating models on yellow/silver eel production or mortality (Table 4.1). Such modeling could start post-2026, after DIASPARA ends and a data call is issued, contingent on funding. Project 2 (Spatial stock assessment) has not started due to a lack of funding.

Due to the delay in starting the population model project and the additional work required for reconstructing landings data as noted in the WKLANDEEL workshop, the current WKFEA roadmap goals (ICES 2021) cannot be achieved within the planned schedule. Therefore, an updated roadmap is presented (Table 4.1, Figure 4.1). Below, each section is explained in more detail.

Recruitment model benchmark

Since the necessary steps to create a spatial model have not been met, the benchmark process will begin with the recruitment model only. Thus, Benchmark 1 will proceed as originally

scheduled (Figure 4.1). If funding is secured and projects proceed according to the new schedule, an updated Benchmark 2 with the spatial model can follow in 2030-2031 (Figure 4.1).

A workshop in the spring 2025 will prepare a data call for the benchmark. The benchmark data call will be issued later in 2025. In addition to designing the data call, the workshop will work on the benchmark issues. A timeline will be prepared to start the benchmark process in 2026

Time series - Biological parameters

Time series analysis and biological data were included in the data call in 2022. WGEEL have run preliminary analysis on the data in 2022 and 2023 (ICES, 2022 and 2023 – WGEEL). The data are available, and more analysis can be done when creating a spatial stock assessment model.

Landings reconstruction

Workshop 1 (WKLANDEEL) was held in 2024. The workshop proposed a modelling framework to reconstruct landings (ICES 2024 - WKLANDEEL; Table 4.1). A two-year project, with additional funding, is needed to implement this framework (ICES 2024 – WKLANDEEL). This may not be required if this reconstruction is handled internally by the spatial stock assessment model.

Data structures: Habitat / Electrofishing (WFD) / Migration barriers / Model parameters

In 2023, Workshop II (ICES, 2024 - guidelines) was held, and a data questionnaire was sent to understand the available datasets (Table 4.1). WKSMEEL recommended building databases and issuing a data call once ready (ICES, 2024 - guidelines). A new project DIASPARA (https://diaspara.bordeaux-aquitaine.inrae.fr/) has started in May 2024, and one of the work packages of the project is to build the needed databases structures.

Spatial stock assessment model

The plan to reach the spatial stock assessment model is dependent on the above steps and additional project funding. Spatial stock assessment model project will use the data collected and (pre)analysed as described in the previous steps and it will have the database structures available from the DIASPARA project. In the WKFEA (ICES 2021) road map, modelling was planned to be done in a habitat project, but because DIASPARA will create the database structures and form a basis for the analysis also, all habitat related modelling (i.e. yellow/silver eel production, hydropower mortality & habitat loss) are now planned to be done in a larger Spatial stock assessment project. The new project will focus on testing all available data, choosing the datasets, and creating and implementing the modelling framework.

Spatial stock assessment model benchmark

When all the proposed steps are done, Benchmark 2 processes can be started with the spatial stock assessment model. Reaching this goal will require additional project funding. The two projects required before Benchmark 2 are: 1) population model project, and 2) landings project.

Table 4.1. Status and updates of the different tasks listed in the WKFEA roadmap (ICES 2021). Italic = new step in the roadmap

Task	Status	Notes	Project/Working group/Workshop
Recruitment model benchmark			
Annual data call – time series	In progress		ICES
Benchmark process 1, incl. workshop	Not started		ICES
Time series - Biological parameters			
DC - Update time series and biological parameters	Completed		WGEEL
Biological data collection (before WGEEL)	Completed	Included in annual data call	WGEEL
Time series analysis	Partially completed	Preliminary analysis done	WGEEL 2022 and 2023
Biological data model	Partially completed	Preliminary analysis done	WGEEL 2022
Landings reconstruction			
Workshop 1 - Landing data improvement	Completed	Proposed a modelling framework to reconstruct landings	WKLANDEEL
Project - Reconstruction of eel landings statistics	Not started	Using results from WKLANDEEL	No funding call identified
Data structures: Habitat / Electrofishing (WFD) / Migration barriers / Model parameters			
Workshop – availability of data	Partially completed	Questionnaire was carried out for the design of the data call	WKSMEEL, WGEEL
Design databases	In progress		DIASPARA
Data call - WFD series	Not started	Pending deliverables from DIASPARA	WGEEL
Data call - Habitat data	Not started	Pending deliverables from DIASPARA	WGEEL
Data call for migration barriers	Not started	Pending deliverables from DIASPARA	WGEEL
Spatial stock assessment model			
Kick of Meeting - Define steps required	Not started	Using results from GFCM/Sudoang/DIASPARA	No funding call identified
Model development and robustness tests	Not started		No funding call identified
Spatial stock assessment model benchmark			
Benchmark process 2, incl. data call	Not started	Pending spatial stock assessment model project	ICES

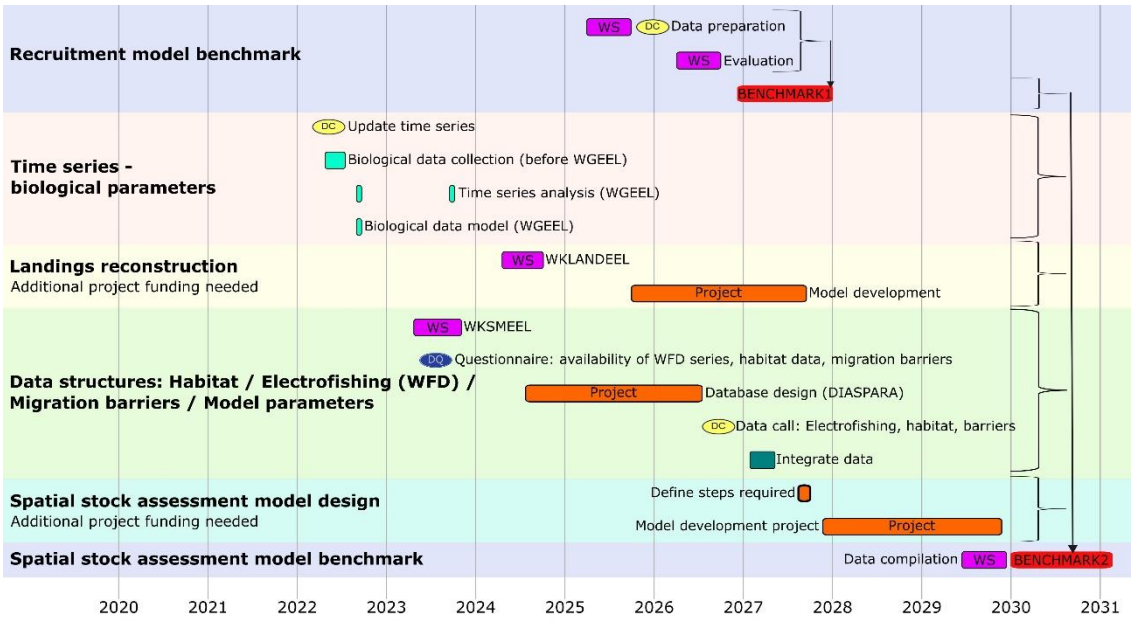

Figure 4.1. Updated roadmap. DC: Data Call, WS: workshop, DQ: data questionnaire

5 Data Management

5.1 DATSU: ICES Data Screening Utility

Discussion with ICES data centre on the integration into DATSU indicated that it will require the inclusion of specific vocabularies (EMU, life stages, etc.) and adapting WGEEL vocabulary to ICES vocabulary.

The data check which is currently in the first step of data integration through the Shiny app will be shifted to DATSU, so the data call will progressively be streamlined with ICES protocols. These changes in procedures will be progressively integrated into the shiny data integration tool, starting with data from Data Call Annexes 4 to 8 (landings, release, and aquaculture). A database report was produced for the ICES data centre. Assessment of table structure and columns is required to facilitate the understanding of the database structure by external users. The exchange between ICES data centre and the stock coordinator should continue after the working group meeting.

5.2 Quality survey for the upcoming benchmark

A questionnaire was developed for consideration for the upcoming WKEELDATA6 to identify possible bias in recruitment time-series to improve this data for the upcoming benchmark (Annex 7).

5.3 Preparation for the Workshop for the technical evaluation of EU Member States' Progress Reports for Submission in 2024 (WKEMP)

Quality control of reported biomass and mortality indicators was conducted to prepare for WKEMP. This included comparisons between reported and existing data in the database and identification of missing data. Data providers for EMUs with non-reported indicators were contacted for additional information.

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Annex 2: Resolutions

2024/AT/FRSG13 The **Joint EIFAAC/ICES/GFCM Working Group on Eels** (WGEEL), chaired by Caroline Durif, Institute of Marine Research, Norway and Jan-Dag Pohlmann, Thünen Institute, Germany, will meet in a split meeting from 9–13 September (virtually) and 23 September–01 October 2024 in Tirana Albania, to:

i. Address the generic EG ToRs from ICES, and any requests from EIFAAC or GFCM;

ii. Report on developments in the state of the European eel (*Anguilla anguilla*) stock, the fisheries on it and other anthropogenic impacts;

iii. Report on updates to the scientific basis of the advice, including any new or emerging threats or opportunities;

iv. Identify and address Mediterranean-specific issues on European eel

v. Implement the roadmap proposed by WKFEA

Material and data relevant for the meeting must be available to the group on the dates specified in the 2024 ICES data call.

WGEEL will report by Date, 1 November 2024 for the attention of ACOM, WGDIAD, FRSG and FAO, EIFAAC and GFCM.

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Annex 4: Abbreviations, acronyms and glossary

Abbreviation/Acronym	Definition
AA	Administrative Agreement, typically the recurring agreement between ICES and the EC
ACFM (ICES)	Advisory Committee on Fisheries Management
ACOM (ICES)	Advisory Committee on Management
ADGEEL	Advice drafting group on eel, for ICES
AIC	Akaike Information Criterion
AngHV-1	Anguillid herpes virus 1
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BERT	Bayesian Eel Recruitment Trend model
BIC	Bayesian Information Criterion
CCM	Catchment Characterization and Modelling
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COMM	European Commission, also EC is used.
CPUE	Catch per unit of effort
CR	Country Report
C&R	Catch and release
CUSUM	Cumulative Sum Control Chart
DAERA	Department of Agriculture, Environment and Rural Affairs (N. Ireland)
DBEEL	Database on Eel (from EU POSE project)
DCF	Data Collection Framework of the European Union
DEMCAM	Demographic Camargue Model
DG-MARE	Directorate-General for Maritime Affairs and Fisheries, European Commission
DLS	Data-Limited Stocks
EC	European Commission, also COMM is used.
EDA	Eel Density Analysis (model, France)

Abbreviation/Acronym	Definition
e-DNA	Environmental DNA
EIFAAC	European Inland Fisheries & Aquaculture Advisory Commission
EIFAC	European Inland Fisheries Advisory Commission – became EIFAAC in 2008
EFF	European Fisheries Fund
EMU	Eel Management Unit
EMFF	European Maritime and Fisheries Fund
EMP	Eel Managment Plan
EQD	Eel Quality Database
EROD	Ethoxyresorufin-O-deethylase
ESAM	Eel Stock Assessment Model
EU	European Union
EU MAP	The European Multi-Annual Plan, previously the DCF
EVEX	Eel Virus European X
FAO	Food and Agriculture Organization
FEAP	The Federation of European Aquaculture Producers
GAM	Generalized Additive Model
GEM	German Eel Model
GFCM	General Fisheries Commission of the Mediterranean
GIS	Geographic Information Systems
GLM	Generalized Linear Model
GlobAng	French Model of Eel Population Dynamics
GST	Glutathione-S-transferase
HPS	Hydropower Station
ICES	International Council for the Exploration of the Sea
IMESE	Irish model for estimating silver eel escapement
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported and Unregulated fisheries
IYFS	International Young Fish Survey
LAM	Lifetime anthropogenic mortalities

Abbreviation/Acronym	Definition
LHT	Life History Trait
LVPA	Length-based Virtual Population Assessment
L50	L50 = the length (L) at which half (50%) of a fish species may be able to spawn
MS	Member State, typically used in reference to EU Member States but not only
MSY	Maximum Sustainable Yield
NAO	North Atlantic Oscillation
NA	Not applicable
NC	Not collected, code to explain an empty data value cell
ND	No data, code to explain an empty data value cell
NDF	Non-detriment Finding
NP	Not pertinent, code to explain an empty data value cell
NR	Not recorded, code to explain an empty data value cell
POSE	Pilot projects to estimate potential and actual escapement of silver eel (EU project)
RBD	River Basin District, typically as defined according to the EU Water Framework Directive
RGMAREEL	Workshop on Fisheries Related Impacts on Silver eels 2017
RG-TEMPP	Review of the Trans-border management plan for European eel, *Anguilla anguilla*, in the Polish-Russian zone of the Pregola River basin and Vistula Lagoon
RS_EMP	Review Service – Evaluation of Eel management Plans 2010
SAC	The GFCM Scientific and Advisory Committee on Fisheries
SCICOM	The Science Committee of ICES
SGAESAW	Study Group on anguillid eels in saline waters 2009
SGIPEE	Study Group on International Post-Evaluation on Eels 2010, 2011
SLIME	Restoration the European Eel population; pilot studies for a scientific framework in support of sustainable management (EU project)
SMEP II	Scenario-based Model for Eel Populations, vII (model applied in England and Wales, UK)
SPR	Estimate of spawner production per recruiting individual.
SQL	Special purpose programming language for managing data
SRG	Scientific Review Group of the European Commission
SSB	Spawning–Stock Biomass

Abbreviation/Acronym	Definition
STECF	Scientific, Technical and Economic Committee for Fisheries, European Commission
ToR	Terms of Reference
VPA	Virtual Population Analysis
WFD	Water Framework Directive, European Directive
WG	Working Group
WGEEL	Joint EIFAAC/ICES/GFCM Working Group on Eels
WGRFS	Working Group on Recreational Fisheries Surveys
WKBALTEEL	Workshop on Baltic Eel 2010
WKBECEEL	Working Group on Biological Effects of Contaminants in Eel 2016
WKEELCITES	Workshop on Eel and CITES 2015
WKEELDATA	Workshop on Designing an Eel Data Call 2017
WKEELDATA2	Second Workshop on designing an Eel Data Call 2019
WKEELMIGRATION	Workshop on the Temporal Migration patterns of European Eels 2020
WKEMP	Workshop on Evaluating Management Plans – 2018
WKEPEMP	The Workshop on Evaluating Progress with Eel Management Plans 2013
WKESDCF	Workshop on Eels and Salmon in the Data Collection Framework 2012
WKFEA	Workshop on the future of eel advice 2021
WKLIFE	Workshop on the Development of Assessments based on LIFE-history traits and Exploitation Characteristics
WKPGMEQ	Workshop of a Planning Group on the Monitoring of Eel Quality under the subject “Development of standardized and harmonized protocols for the estimation of eel quality”
WKSTOCKEEL	Workshop on Eel Stocking 2016
WKTEEL	Workshop on Tools for Eel 2018
YFS1	Young Fish Survey: North Sea Survey location

GLOSSARY

Term	Definition
Anthropogenic	Caused by humans.
Assisted migration	The practice of trapping and transporting juvenile eel within the same river catchment to assist their upstream migration at difficult or impassable barriers, without significantly altering the production potential (B_{best}) of the catchment
Bootlace, fingerling	Intermediate sized eels, approx. 10–25 cm in length. These terms are most often used in relation to restocking. The exact size of the eels may vary considerably. Thus, it is a confusing term.
Carrying Capacity	The average maximum biomass of eel that can be supported by a given habitat.
Catch	The WGEEL uses the term catch(es) to mean fish that are caught but not necessarily landed. See landings below
Depensation	The effect on a population when a decrease in spawners leads to a faster decline in the number of offspring than in the number of adults.
Eel River Basin or Eel Management Unit	"Member States shall identify and define the individual river basins lying within their national territory that constitute natural habitats for the European eel (eel river basins) which may include maritime waters. If appropriate justification is provided, a Member State may designate the whole of its national territory or an existing regional administrative unit as one eel river basin. In defining eel river basins, Member States shall have the maximum possible regard for the administrative arrangements referred to in Article 3 of Directive 2000/60/EC [i.e. River Basin Districts of the Water Framework Directive]." EC No. 1100/2007.
Elver	Young eel, in its first year following recruitment from the ocean. The elver stage is sometimes considered to exclude the glass eel stage, but not by everyone. To avoid confusion, pigmented 0+cohort age eel are included in the glass eel term.
Escapement	The quantity of eel that leaves (escapes) a water body, after taking account of all natural and anthropogenic losses. Most commonly used with reference to silver eel – silver eel escapement.
Glass eel	Young, unpigmented eel, recruiting from the sea into continental waters. WGEEL consider the glass eel term to include all recruits of the 0+ cohort age group, including some pigmented eel.
Landings	The WGEEL uses the term Landings to mean fish that are brought ashore.
Leptocephalus	Flat and transparent marine larval stage of eel, on migration from spawning ground to continental waters, between pre-Leptocephalus and metamorphosis to glass eel
Lifestage	Defined stage in the lifecycle of eel, whether leptocephalus, glass eel, yellow eel, or silver eel.
Limit Reference Point	A Limit Reference Point indicates a state of a fishery and/or a resource which is considered to be undesirable and which management action should avoid.
Non-Detriment Finding (NDF)	In relation to CITES, the competent scientific authority has advised in writing that the capture or collection of the specimens in the wild or their export will not have a harmful effect on the conservation status of the species or on the extent of the territory occupied by the relevant population of the species.
Ongrown eels	Eels that are grown in culture facilities for some time before being restocked. Whether the time is to meet quarantine requirements, for the receiving environment conditions to be suitable, or as part of the culture and grading purpose.

Term	Definition
Pre-leptocephalus	First larval stage of eel, between hatching from ovum and leptocephalus
Production	The amount of fish produced from a waterbody. Sometimes referred to for silver eel in terms as escapement + anthropogenic losses, or production – anthropogenic losses = escapement.
River Basin District (RBD)	The area of land and sea, made up of one or more neighbouring river basins together with their associated surface and groundwaters, transitional and coastal waters, which is identified under Article 3(1) of the Water Framework Directive as the main unit for management of river basins. The term is used in relation to the EU Water Framework Directive.
Restocking	The practice of adding fish [eels] to a waterbody from another source, to supplement existing populations or to create a population where none exists
Silver eel	Migratory phase following the yellow eel phase. Eel in this phase are characterized by darkened back, silvery belly with a clearly contrasting black lateral line, enlarged eyes. Silver eel undertake downstream migration towards the sea, and subsequently westwards. This phase mainly occurs in the second half of calendar years, although some are observed throughout winter and following spring.
Target Reference Point	A Target Reference Point indicates to a state of fishing and/or a resource which is considered to be desirable and at which management action, whether during development or stock rebuilding, should aim. FAO, 1995.
To silver (silvering)	Silvering is a requirement for downstream migration and reproduction. It marks the end of the growth phase and the onset of sexual maturation. This true metamorphosis involves a number of different physiological functions (osmoregulatory, reproductive), which prepare the eel for the long return trip to the Sargasso Sea. Unlike smoltification in salmonids, silvering of eels is largely unpredictable. It occurs at various ages (females: 4 – 20 years; males 2 – 15 years) and sizes (body length of females: 50 – 100 cm; males: 35 – 46 cm) (Tesch, 2003).
Trap and Transport	Capturing downstream migrating silver eel for transportation around hydropower turbines
Yellow eel	Life-stage resident in continental waters. Often defined as a sedentary phase, but migration within and between rivers, and to and from coastal waters occurs and therefore includes young pigmented eels (‘elvers’ and bootlace).

STOCK REFERENCE POINTS and DATA CALL TERMS

Term	Definition
Age	The age of eel in years, with part years as plus growth (e.g, 0+, 1+), starting at recruitment to coastal waters. Glass eel are defined as 0+.
Aggregate habitat (AL)	Data Call term for aggregrated habitats where data is combined across habitat categories
A_{lim}	Limit anthropogenic mortality: Anthropogenic mortality, above which the capacity of self-renewal of the stock is considered to be endangered and conservation measures are requested (Cadima, 2003).
A_{pa}	Precautionary anthropogenic mortality: Anthropogenic mortality, above which the capacity of self-renewal of the stock is considered to be endangered, taking into consideration the uncertainty in the estimate of the current stock status.
Aquaculture production	The biomass of eel harvested from aquaculture during a time frame; e.g., a year.
Baltic region	The countries bordering the Baltic Sea; sometimes other countries in the catchment are also included.
bio_age	mean age
bio_g_in_gy	proportion (in %) of glass eel [100 for only glass eel ; 0 for only yellow eel ; the proportion if mix of glass and yellow eel]
bio_length	mean length in mm
bio_sex_ratio	sex ratio express as a proportion of female; between 0 (all males) and 100 (all females)
bio_year	year during which biological samples where collected
bio_weight	mean individual weight in g
$B_{current}$ or B_{curr}	The Current escapement biomass: The amount of silver eel biomass that currently escapes to the sea to spawn, corressponding to the assessment year.
B_{best}	The amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the current stock, included re-stocking practices, hence only natural mortality operating on stock. The Best achievable escapement biomass under present conditions: escapement biomass corresponding to recent natural recruitment that would have survived if there was only natural mortality and no restocking, corressponding to the assessment year.
B_0	The amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the stock. Reference point for the theoretical maximum quantity of silver eel expressed as biomass that would have escaped from a defined eel producing area, in the absence of any anthropogenic impacts.
B_{lim}	Limit spawner escapement biomass, below which the capacity of self-renewal of the stock is considered to be endangered and conservation measures are requested (Cadima, 2003).
B_{MSY}	Spawning stock biomass (SSB) that is associated with the Maximum Sustainable Yield.
$B_{MSY\text{-}trigger}$	Value of spawning–stock biomass (SSB) which triggers a specific management action, in particular: triggering a lower limit for mortality to achieve recovery of the stock.

Term	Definition
B_{pa}	Precautionary spawner escapement biomass: The spawner escapement biomass, below which the capacity of self-renewal of the stock is considered to be endangered, taking into consideration the uncertainty in the estimate of the current stock status.
Commercial Fisheries	Fisheries with sale of catch for commercial gain
Coastal waters	WFD coastal waters
das_comment	Comment (including comments about data quality for this year)
das_effort	Effort (if used)
das_value	Value
das_year	Year
Eel management unit (EMU)	Eel management unit defined in an Eel Management Plan under the Eel Regulation 1100/2007.
EFF	European Fisheries Fund
EMFF	European Maritime and Fisheries Fund
F	Fishing mortality rate
FAO areas	See http://www.fao.org/fishery/area/search/en
F_{lim}	F_{lim} is the fishing mortality which in the long term will result in an average stock size at B_{lim}.
F_{pa}	ICES applies a precautionary buffer F_{pa} to avoid that true fishing mortality is above F_{lim}.
F-rec	recreational fishing mortality, per reporting year, in kg
Fresh waters	Waters with zero salinity
F_{MSY}	F_{MSY} is estimated as the fishing mortality with a given fishing pattern and current environmental conditions that gives the long-term maximum yield.
G	Code in Data Call for data comprising Glass eel only as defined in Glossary
G+Y	Code in Data Call for data comprising a Glass eel with yellow eel mix
GEE-n	Glass eel equivalents in numbers – the quantity of eel expressed as equivalent number of glass eel. Method provided in ICES (2013) report p103.
Glass eel recruitment series	Time series enumerating glass eel recruiting from the sea into continental waters.
GLM	Generalized Linear Model (used by ICES to predict and fill in gaps in the data)
Habitat	Waters occupied by eel, whether fresh, transitional, coastal or marine
ICES statistical rectangles	See http://gis.ices.dk/sf/index.html?widget=StatRec
Inland waters	Fresh waters, not under the jurisdiction of Marine fisheries management (i.e. the CFP).

Term	Definition
Landings from fisheries	Commercial landings include any eel taken from the water and landed on the market. Recreational landings include any eel taken from the water by recreational fisheries. Other landings include eel caught for assisted migration, translocation,
Length in mm	Total length measured from tip of nose to tip of tail (TL)
Longitude	x (longitude) EPSG:4326. WGS 84 (Google it)
Latitude	y (latitude) EPSG:4326. WGS 84 (Google it)
M	Natural Mortality
North Sea	For the purposes of ICES eel management, taken as ICES sea areas IV_a, IV_b, IV_c and inflowing fresh water systems
Marine waters	(Abbreviated MO) Open marine waters
q_aqua_kg	Aquaculture production (kg) in reporting year
q_aqua_n	Aquaculture production (number of eel) in reportng year
Fisheries - Recreational	Recreational (= non-commercial) fishing is the capture or attempted capture of living aquatic resources mainly for leisure and/or personal consumption
Releases	Eel released to the wild after capture
R_{target}	The Geometric Mean of observed recruitment between 1960 and 1979, periods in which the stock was considered healthy
R(s)	The amount of eel (<20 cm) restocked into national waters annually
S	Code in Data Call for data comprising Silver eel
Sea region (division)	ICES Sea area statisitical rectangle. Where required for freshwater eel habitats, is the sea area the River basin drains to
SEE–n	Silver eel equivalents in numbers – the quantity of eel expressed as equivalent number of silver eel
SEE_com	Commercial fishery silver eel equivalents
SEE rec	Recreational fishery silver eel equivalents)
SEE_hydro	Mortility in hydropower, pumps and water intakes etc expressed as Silver eel equivalents
SEE_habitat	Silver eel equivalents relating to anthropogenic influences on habitat (quantity/quality)
SEE_release	Silver eel equivalents relating to release activity
SEE_other	Silver eel equivalents from `other` sources
ser_nameshort	short name of the recruitment series, this must be 4 letters + stage name, e.g. VilG, LiffGY, FremS, the first letter is capitalized and the stage name too
ser_namelong	long name of the recuitment series eg `Vilaine estuary` for the Vilaine;

Term	Definition
ser_typ_id	type of series 1= recruitment series, 2 = yellow eel standing stock series, 3 silver eel series
ser_effort_uni_code	unit used for effort, it is different from the unit used in the series, for instance some of the Dutch series rely on the number hauls made to collect the glass eel to qualify the series, see units sheet
ser_comment	This comment should at least include a short description of the methods, give an idea on the size of the eels and the proportion of glass eel, whether it is mixed (e.g. glass and yellow) or not, possible biases (e.g. by restocking) and a mention if the series is special in any way (e.g. very old/long) Note that this text will be displayed as a description of the series in the shiny app, thus consider the "readability"
ser_uni_code	Units used in the series, see tr_units_uni sheet
ser_lfs_code	Lifestage see tr_lifestage_lfs sheet
ser_hty_code	Habitat type see tr_habitattype_hty (F=Freshwater, MO=Marine Open,T=transitional, AL=aggregate...)
ser_locationdescription	This should provide a description of the site, e.g. if ist far inland, in the middle of a river, near a dam etc. Also please specify the adjectant marine region (Baltic, North Sea) etc. (e.g. "Bresle river trap 3 km from the sea" or IYFS/IBTS sampling in the Skagerrak-Kattegat" Note that this text will be displayed as a description of the site in the shiny app, thus consier the "readability"
ser_emu_nameshort	The codes of the emu (emu_nameshort) in sheet tr_emu_emu. In case you provide data for each EMU separately then you don't need to fill in for AL and vice versa
ser_cou_code	The cou_code in the tr_country_cou table
ser_area_division	FAO code of sea region (division level) see tr_fao_area (column division)(https://github.com/ices-eg/WGEEL/wiki). These codes are for use only in the case of Coastal and Marine Open waters – otherwise you can leave it blank. ICES statistical rectangles (http://gis.ices.dk/sf/index.html?widget=StatRec) and FAO areas map (http://www.fao.org/fishery/area/search/en)
ser_tblcodeid	This should refer to the id of the series once inserted in ICES station table, currently void : ignore
ser_x	x (longitude) EPSG:4326. WGS 84
ser_y	y (latitude) EPSG:4326. WGS 84
ser_sam_id	The sampling type corresponds to trap partial, trap total, see tr_samplingtype_sam (sam_id)
Silver eel abundance series	Time series of abundance of silver eel determined by consistent regular count or survey (usually by capturing migrating silver eel)
Skagerrak-Kattegat	For the purposes of ICES eel management, taken as ICES Sea areas III_b, III_c and inflowing fresh water systems
SPR	Spawner per recruit: estimate of spawner production per recruiting individual
%SPR	Ratio of SPR as currently observed to SPR of the pristine stock, expressed in percentage. %SPR is also known as Spawner Potential Ratio

Term	Definition
Standing stock	The total stock of eel present in a waterbody at a point in time, expressed as a number of individuals or total biomass
sumA	total Anthropogenic mortality, per reporting year, in kg
sumF	total Fishing Mortality per reporting year, in kg
sumH	total non fishing Anthropogenic mortality, per reporting year in kg
sumF_com	Mortality due to commercial fishery, summed over age groups in the stock
SumF_rec	Mortality due to recreational fishery, summed over age groups in the stock
SumH_hydro	Mortality due to hydropower (plus water intakes etc) summed over the age groups in the stock (rate)
SumH_habitat	Mortality due to anthropogenic influence on habitat (quality/qauntity) summed over the age groups in the stock (rate)
SumH_other	Mortality due to other anthropogenic influence summed over the age groups in the stock (rate)
SumH_release	Mortality due to release summed over the age groups in the stock (rate: negative rate indicates positive effect of release)
Transitional waters	WFD transitional waters, implies reduced salinity
Transport/relocation operations	When eels have been collected somewhere in traps and transported to other places where they appear as "release" for the purposes of data recording
ΣF	The fishing mortality rate, summed over the age-groups in the stock
ΣH	The anthropogenic mortality rate outside the fishery, summed over the age-groups in the stock.
ΣA	The sum of anthropogenic mortalities, i.e. ΣA = ΣF + ΣH.
Y	Code in Data Call for data comprising yellow eel only
Yellow eel abundance series	Time series of abundance of yellow eel determined by consistent regular count or survey
Yellow eel recruitment series	Time series enumerating yellow eel where this life stage is first observed at a site or is the stage at which eel enter freshwaters
Yellow eel standing stock series	Time series of abundance of yellow eel determined by consistent regular count or survey
"3Bs & ΣA"	Refers to the 3 biomass indicators (B_0, B_{best} and $B_{current}$) and anthropogenic mortality rate (ΣA).
40% EU Target	From the Eel regulation (1100/2007): "The objective of each Eel Management Plan shall be to reduce anthropogenic mortalities so as to permit with high probability the escapement to the sea of at least 40% of the silver eel biomass relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock". The WGEEL takes the EU target to be equivalent to a reference limit, rather than a target.

Annex 5: Meeting agendas

Part 1:

Monday 9th September

10:00-11:15 Welcome & Introduction (Jan Dag)

11:15:12:15 Demonstration of data integration on the shiny app (Cedric)

12:15-12:45 Issues reporting on the GIThub (Cedric)

12:45-13:00 Questions, assignment of volunteers to help with integration process

13:00-13:45 Lunch

13:45-16:15 Breakout: Data integration (solo sessions) – Check data in accession (Caroline)

Tuesday 10th September

10:00-13:00 Breakout: Data integration (solo sessions)

13:00-13:45 Lunch

13:45-16:45 Breakout: Data integration (solo sessions)

Wednesday 11th September

10:00-13:00 Breakout: Data integration (solo sessions)

13:00-13:45 Lunch

13:45-16:45 Breakout: Data integration (solo sessions)

Thursday 12th September

10:00-13:00 Breakout: Data integration (solo sessions)

13:00-13:45 Lunch

13:45-16:45 Breakout: Data integration (solo sessions)

Friday 13th September

10:00-13:00 Breakout: Data integration (solo sessions)

13:00 Meeting ends

13:00 – 15:00 Core group only: Planning ahead

Part 2

Agenda (All times in GMT+2) – WGEEL annual meeting 2024
Tirana (Albania), Agricultural University
23.09 - 01.10.2024
Time slots in red correspond to online plenary sessions

Monday 23th September
10:00-11:00 Welcome & Introduction / Agree on agenda / Tour de table
11:00-12:30 Presentation of SG and assignments
12:30-13:30 Lunch
13:30-14:00 Mediterranean project presentation and discussion
14:00-17:00 SG breakouts

Tuesday 24th September
9:00-10:00 SG breakouts
10:00-10:30 Morning plenary
10:30-11:00 Presentation and discussion WKSMEEL (Cedric Briand)
10:00-12:30 SG breakouts
12:30-13:30 Lunch
13:30-17:00 SG breakouts

Wednesday 25th September
9:00-10:00 SG breakouts
10:00-10:30 Morning plenary
10:30-11:00 Presentation and discussion WKLANDEEL (Laurent Beaulaton)
10:00-12:30 SG breakouts
12:30-17:00 Field trip to Kruja – Bus pick-up at the University

Thursday 26th September
9:00-10:00 SG breakouts
10:00-10:30 Morning plenary
10:30-11:00 Presentation and discussion EELSUPPORT (Arjan Palstra)
11:00-12:30 SG breakouts
12:30-13:30 Lunch
13:30-17:00 SG breakouts

Friday 27th September
9:00-10:00 SG breakouts
10:00-10:30 Morning plenary
10:30-12:30 Advice discussion
12:30-13:30 Lunch
13:30-16:30 SG breakouts
17:00 Meet up at the Rogner for social and day wrap-up

Saturday 28th September

9:00-10:00 SG breakouts
10:00-10:30 Morning plenary
10:30-11:30 Discussion: Issues list and revised roadmap
10:30-12:30 SG breakouts
12:30-13:30 Lunch
12:30-15:00 SG breakouts
15:00 DEADLINE for uploading your chapter in the Report folder
19:00 Dinner at Bosco Restaurant

Sunday 29th September

Report reading (individual)

Monday 30th September

10:00-10:30 Advice agreement
10:30-12:30 Report group reading
12:30-13:30 Lunch
13:30-17:00 Report group reading

Tuesday 1st October

10:00-12:30 Report agreement
12:30 Meeting ends

Annex 6: Country reports

The country reports will be published alongside this report as working documents. Please follow the links listed below to pull up the corresponding country report directly.

- Albania – Click here to access the country report
- Denmark – Click here to access the country report
- Estonia – Click here to access the country report
- Finland – Click here to access the country report
- Germany – Click here to access the country report
- Greece – Click here to access the country report
- Ireland – Click here to access the country report
- Lithuania – Click here to access the country report
- Netherlands – Click here to access the country report
- Norway – Click here to access the country report
- Poland – Click here to access the country report
- Portugal – Click here to access the country report
- Spain – Click here to access the country report
- Sweden – Click here to access the country report
- Tunisia – Click here to access the country report
- UK – Click here to access the country report

Annex 7: Questionnaire regarding possible biases in recruitment series

Questionnaire to identify possible biases in recruitment time-series

To identify possible bias in the recruitment time-series, questions were developed, which are proposed to be included in future data-calls (in ser_method column) and which need to be answered for each timeseries. The questions are:

Describe (and for which time period) if there have been:

i) Changes in effort?
ii) Changes in sampling period, fishing season?
iii) Changes in trap/gear/sampling method?
iv) Changes in barriers/dams/sluices/river management?

Is there a conversion from weight to numbers? If yes, describe how and possible biases

Has the ratio, length- or age-structure changed? - If yes, does it cause any bias to the time series?

Are there any other sources of bias you could think of affecting the time-series?

Example answers for the recruitment time-series Vilaine (VilG):

Change in effort:

The total catch of the fishery has never been affected by the number of boats. All the glass eels are caught, and variations in fishing effort only affect the CPUE.

Change in sampling period, fishing season:

The fishing season was gradually shortened from 2000 to 2011, these changes have only affected a small percentage of the catch, and this bias has been corrected by the inclusion of an estimated value for late arrival by marking recapture.

Changes in trap/gear/sampling method:

A trap was installed in 1996, with an annual catch from 5 kg to 1400 kg. Another trap, much less effective was installed in the right bank from 2007. It can be assumed that the escapement to the fishery was nearly zero before the first trap was built as the season extended to May and the fishery was and remains very efficient at that site. After 2000 the series is corrected from the escapement by the monitoring of the glass eel ladder installed on the dam as some fishery restrictions are negotiated in March and April. The efficiency of this ladder is estimated by marking recapture operations and some percent are added to the estimated recruitment value.

Changes in barriers/dams/sluices/river management:

The fishery changed substantially at the closure of the Arzal dam in 1970 when the catch surged from 5-10 tons to nearly a 100 ton. Values before the closure of the dam are not included in the series (should they be with a qal_id 3 ?). No change since 1970.

Is there a conversion from weight to numbers? If yes, describe how and possible biases:

No

Has the ratio, length- or age-structure changed? - If yes, does it cause any bias to the time series:

No it's only (very fresh) glass eel (stages <VIA1)

Is there any other sources of bias you could think of affecting the time-series:

No

Annex 8: Quality of the assessment

Retrospective analysis

A retrospective analysis assesses whether the outcomes of an assessment are sensitive to the inclusion of a new year of data.

Figure 1 shows the variations of the GLM through time. Several causes explain such variations: when the model is run in a given year, the latest values of many time series are not available yet (they are only provided the following year). As such, the estimate for the terminal year is based on a provisional dataset. Moreover, some values are revised every year, particularly the ones for the terminal year. Finally, the GLM is recalculated integrating the new times series every year following time series selection rules (see section 2.1.2).

The Mohn's rho index is largely used in ICES assessments to quantify its robustness to the addition of new annual data (Mohn 1999; ICES 2023b). Traditionally, the Mohn's rho index is fitted after iteratively fitting the model to truncated datasets where the data for the most recent years are sequentially removed. A Monh's rho of 0 indicates that the assessment is unaffected by the addition of new years, while a positive (conversely negative) rho indicates that the assessment tends to provide a positively (conversely negatively) biased assessment. Given that the eel assessment is based on a GLM with "year" treated as a factor, the respective "year" effect is estimated almost independently and removing the terminal year has almost no effect on the estimation of the previous year. As such, this would mechanically (and artificially) lead to Mohn's rho close to 0. Therefore, we carried out the Monh's rho analysis based on the dataset effectively used for each assessment year, to quantify the potential variability due to latter data revision of new times series integration. It was computed for each of the recruitment index using the assessment of WGEEL 2020 to 2024: - Elsewhere Europe: 4% - North Sea: -20% - Yellow eel: 23%

The Elsewhere Europe is more stable than the two other indices. This is likely related to the higher number of time series included in the index that buffers potential revision of data points or inclusion of new time series. The Mohn's rho index for the North Sea and Yellow eel are greater than 20%, which is generally considered as a threshold of concern for long-lived species (ICES 2023b). However, this is likely related to:

- the lower number of time series included in the two corresponding GLM, making the results more sensitive to latter revisions or integration of new time series,
- to the low values of the North-Sea index (Mohn's rho is a relative index and North Sea recruitment is below 1%, so even a revision from 1.5 to 1% implies a change of 50%
- to the natural stochasticity of recruitment.

Despite these high Mohn's rho indices, the retrospective diagrams do not display specific patterns (i.e. a situation in which assessment are systematically above or below the previous assessments) and the trends are very consistent between assessment years, indicating that the assessment is robust (Figure 1).

The yellow eel series (Figure 1, lower panel) produces slightly more variation than the glass eel series (Figure 1, upper and central panels). This is possibly due to a lower number of sites leading to undue influence of incomplete reporting in the current year. Moreover, because "Yellow" eel recruitment corresponds to 2-3 age classes, this series is more susceptible of being affected by local environmental conditions, along with density pressures, than the arrival of glass eel (0+),

and this may increase the level of inter-annual variability beyond that observed for the glass eel "class of the year".

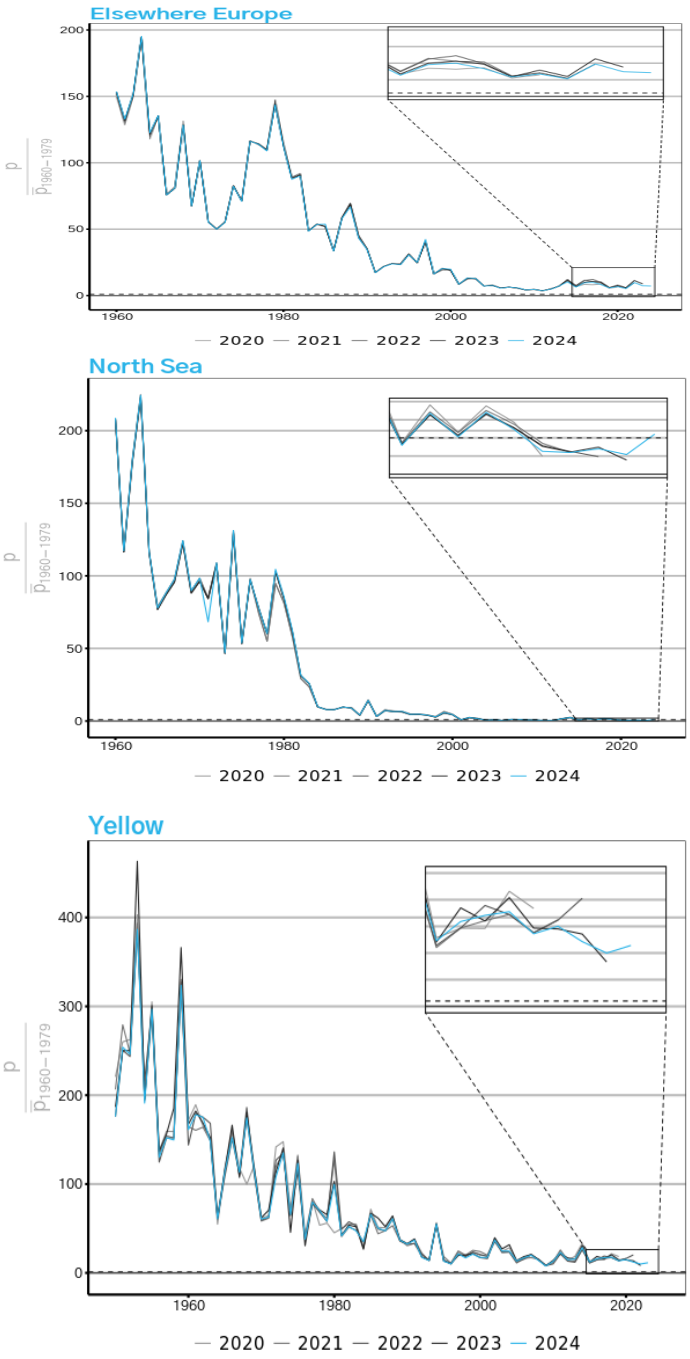

Figure 1: Retrospective analysis of the assessment model. Each line corresponds to an assessment for a given year. For "Yellow" eels, contrary to the other two indices, the assessment year Y only provides estimates until year Y-1 due to data availability when the assessment takes place.

Sensitivity to individual time series

To check the influence of each time series in the models, the GLMs were fitted while removing each time series one at a time. The effect of removing the time series was quantified through the sum of square of the model with all time series and the model without the corresponding time series (Figure 2). Unsurprisingly, the longest time series have the largest influence on the model results (e.g. AlbuG or EbroG), but the results are also sensitive to series that were introduced more recently (e.g. MolY or StraGY). This type of analysis might be relevant in the future before integrating any new time series.

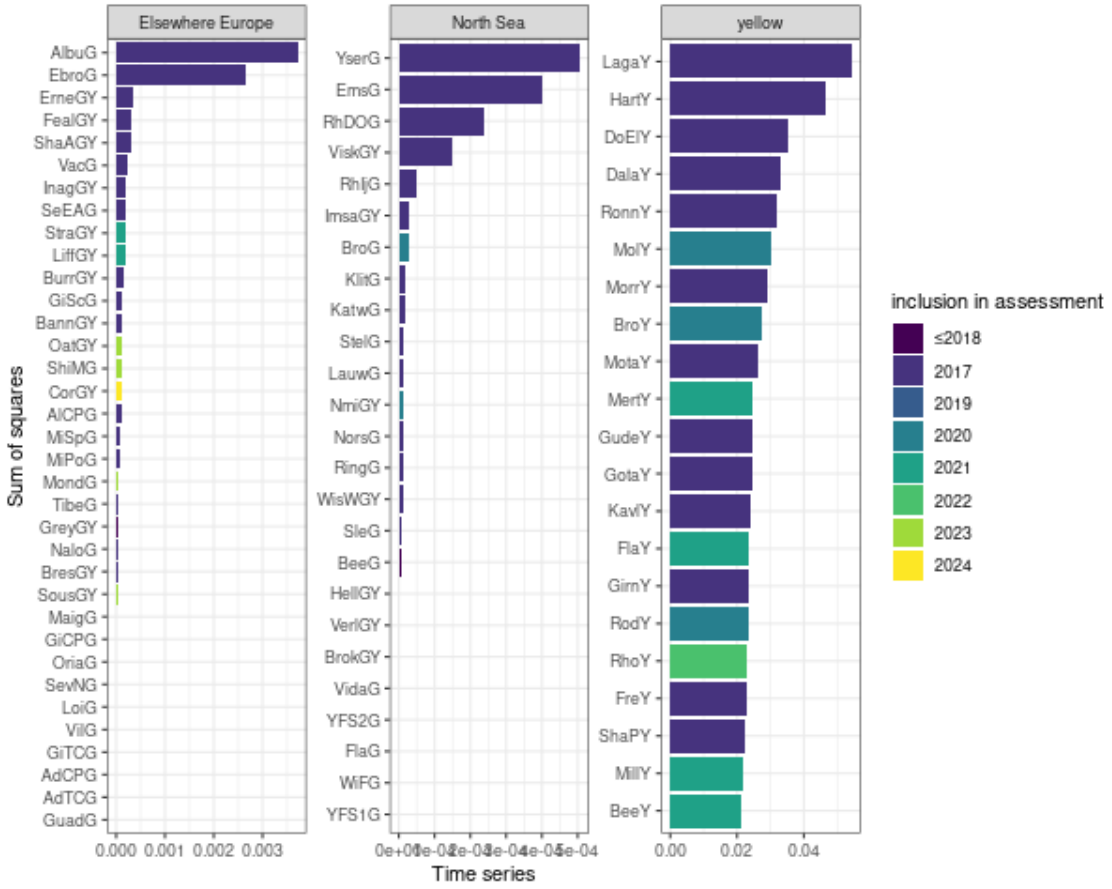

Figure 2: Influence of each time series on the final index. The influence is quantified as the sum of square difference between a model with all data and a model without the corresponding time series. The colour indicates the year when the time series was used in the assessment for the first time.

Annex 9: Recruitment series tables

Table 1: Summary of the number of series that have been received (2024 Data Call) and incorporated (kept) for the determination of the recruitment index by area and stage. Life stage: GY = glass eel and yellow eel, G = glass eel, Y = yellow eel Area: EE = Elsewhere Europe, NS = North Sea.

Life-stage	Area	Submitted	Kept
G	EE	32	22
	NS	20	17
	Total	52	39
GY	EE	13	13
	NS	16	8
	Total	29	21
Y	**Total**	25	21
TOTAL		106	81

Table 2: Short description of the 60 Glass and Glass and eel yellow mixed series that have been used in the recruitment index calculation updated to 2024. EE: Elsewhere Europe, NS: North Sea. Min and max indicate the first year and last year in the records, and the values are given in the n+ and n- columns, indicate the number of years with values and the number of years when there are missing data within the series. Life stage: G = glass eel and GY = glass eel and yellow eel, G. Unit for the data collected is given (nr = number; index = calculated value following a specified protocol, nr/m2 = number per square metre, nr/h = number per hour, kg/boat/d = kg per boat per day). Habitat: C = coastal water (according to the EU Water Framework Directive, WFD), F = freshwater, MO = marine water (open sea), T = transitional water with lower salinity (according to WFD).

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
AdCPG	EE	1928	2008	81	40	G	com. cpue	kg/boat/d	T	1
AdTCG	EE	1986	2008	23	0	G	com. catch	t	T	1
AlbuG	EE	1949	2024	76	6	G	com. catch	kg	F	1
AlCPG	EE	1982	2024	43	7	G	com. cpue	kg/boat/d	F	1
EbroG	EE	1966	2024	59	3	G	com. catch	kg	T	1
GiCPG	EE	1961	2008	48	1	G	com. cpue	kg/boat/d	T	1
GiScG	EE	1994	2024	31	0	G	sci. surv.	index	T	1
GiTCG	EE	1923	2008	86	28	G	com. catch	t	T	1
GuadG	EE	1998	2007	10	0	G	sci. surv.	index	T	1
LoiG	EE	1924	2008	85	6	G	com. catch	kg	T	1
MaigG	EE	1994	2022	29	5	G	trap	kg	F	1
MiPoG	EE	1974	2024	51	0	G	com. catch	kg	T	1
MiSpG	EE	1975	2024	50	0	G	com. catch	kg	T	1
MondG	EE	1989	2024	36	28	G	sci. surv.	nr/h	T	1
NaloG	EE	1953	2024	72	0	G	com. catch	kg	T	1
OriaG	EE	2006	2024	19	6	G	sci. surv.	nr/m3	T	1
SeEAG	EE	1972	2020	49	2	G	com. catch	t	T	1
SevNG	EE	1962	2008	47	25	G	com. cpue	kg/boat/d	T	1
ShiMG	EE	2014	2024	11	0	G	trap	nr	T	1
TibeG	EE	1975	2006	32	0	G	com. catch	t	T	1
VacG	EE	2004	2024	21	0	G	trap	nr	T	1
VilG	EE	1971	2015	45	3	G	trap	t	T	1
BeeG	NS	2006	2024	19	0	G	trap	nr	F	1
BroG	NS	2011	2024	14	2	G	trap	nr	F	1

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
EmsG	NS	1946	2001	56	0	G	com. catch	kg	T	1
FlaG	NS	2007	2024	18	1	G	trap	nr	F	1
KatwG	NS	1991	2024	34	2	G	sci. surv.	index	T	1
KlitG	NS	2008	2024	17	0	G	sci. surv.	nr/m2	F	1
LauwG	NS	1976	2024	49	6	G	sci. surv.	nr/h	T	1
NorsG	NS	2008	2024	17	0	G	sci. surv.	nr/m2	F	1
RhDOG	NS	1938	2024	87	1	G	sci. surv.	index	T	1
RhIjG	NS	1969	2022	54	5	G	sci. surv.	index	T	1
RingG	NS	1981	2023	43	0	G	sci. surv.	index	C	1
SleG	NS	2008	2024	17	0	G	sci. surv.	nr/m2	F	1
StelG	NS	1971	2024	54	0	G	sci. surv.	index	T	1
VidaG	NS	1971	1990	20	0	G	com. catch	kg	T	1
YFS1G	NS	1975	1989	15	0	G	sci. surv.	index	MO	1
YFS2G	NS	1992	2024	33	1	G	sci. surv.	index	MO	1
YserG	NS	1964	2024	61	3	G	sci. surv.	kg	T	1
BannGY	EE	1933	2024	92	11	GY	trap	kg	F	1
BresGY	EE	2003	2024	22	0	GY	trap	nr	F	1
BurrGY	EE	1987	2024	38	18	GY	trap	kg	F	1
CorGY	EE	2012	2024	13	1	GY	trap	kg	F	1
ErneGY	EE	1980	2024	45	0	GY	trap	kg	F	1
FealGY	EE	1985	2024	40	14	GY	trap	kg	F	1
GreyGY	EE	2009	2024	16	0	GY	trap	nr	F	1
InagGY	EE	1996	2024	29	5	GY	trap	kg	F	1
LiffGY	EE	2012	2024	13	0	GY	trap	kg	F	1
OatGY	EE	2013	2023	11	2	GY	trap	nr	F	1
ShaAGY	EE	1977	2024	48	0	GY	trap	kg	F	1
SousGY	EE	2013	2023	11	0	GY	trap	nr	F	1
StraGY	EE	2012	2024	13	0	GY	trap	nr	F	1
BrokGY	NS	2012	2024	13	1	GY	trap	nr	T	1

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
HellGY	NS	2010	2023	14	0	GY	sci. surv.	nr	T	1
ImsaGY	NS	1975	2023	49	0	GY	trap	nr	F	1
NmiGY	NS	2009	2024	16	0	GY	trap	nr	F	1
VerlGY	NS	2010	2024	15	0	GY	trap	nr	T	1
ViskGY	NS	1971	2023	53	0	GY	trap	kg	F	1
WiFG	NS	2006	2023	18	0	GY	trap	nr	T	1
WisWGY	NS	2004	2023	20	0	GY	trap	nr	F	1

Table 3: Short description of the 21 yellow series that have been used in the recruitment index calculation updated to 2023. Min and max indicate the first year and last year in the records, and the values are given in the n+ and n- columns, indicate the number of years with values and the number of years when there are missing data within the series. Unit for the data collected is given (nr = number; index = calculated value following a specified protocol, nr/m2 = number per square metre, nr/h = number per hour, kg/boat/d = kg per boat per day). Habitat: C = coastal water (according to the EU Water Framework Directive, WFD), F = freshwater, MO = marine water (open sea), T = transitional water with lower salinity (according to WFD).

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
FreY	EE	1997	2023	27	0	Y	trap	nr	F	1
RhoY	EE	2008	2023	16	0	Y	trap	nr	F	1
ShaPY	EE	1985	2024	40	0	Y	trap	kg	F	1
BeeY	NS	2011	2024	14	0	Y	trap	nr	F	1
BroY	NS	2011	2024	14	2	Y	trap	nr	F	1
DalaY	NS	1951	2023	73	3	Y	trap	kg	F	1
DoElY	NS	2003	2023	21	2	Y	trap	nr	F	1
FlaY	NS	2012	2024	13	0	Y	trap	nr	F	1
GirnY	NS	2008	2023	16	1	Y	trap	nr	F	1
GotaY	NS	1900	2017	118	14	Y	trap	kg	F	1
GudeY	NS	1980	2023	44	0	Y	trap	kg	F	1
HartY	NS	1967	2023	57	0	Y	trap	kg	F	1
KavlY	NS	1992	2023	32	0	Y	trap	kg	F	1
LagaY	NS	1925	2023	99	0	Y	trap	kg	F	1
MertY	NS	2012	2024	13	0	Y	trap	nr	F	1
MillY	NS	2011	2022	12	1	Y	trap	nr	F	1
MolY	NS	2005	2024	20	1	Y	trap	nr	F	1
MorrY	NS	1960	2016	57	0	Y	trap	kg	F	1
MotaY	NS	1942	2023	82	0	Y	trap	kg	F	1
RodY	NS	2005	2024	20	2	Y	trap	nr	F	1
RonnY	NS	1946	2018	73	9	Y	trap	kg	F	1

Table 4: Short description of the sampling sites for European eel recruitment data that have been excluded in the recruitment index calculation in 2024. Kept: 0 = excluded because the series was < 10 years, 3 = not used due to poor quality, EE: Elsewhere Europe, NS: North Sea. Min and max indicate the first year and last year in the records, and the values are given in the n+ and n- columns, indicate the number of years with values and the number of years when there are missing data within the series. Life stage: GY = glass eel and yellow eel, G = glass eel, Y = yellow eel. Unit for the data collected is given (nr = number; index = calculated value following a specified protocol, nr/m2 = number per square metre, nr/h = number per hour, kg/boat/d = kg per boat per day). Habitat: C = coastal water (according to the EU Water Framework Directive, WFD), F = freshwater, MO = marine water (open sea), T = transitional water with lower salinity (according to WFD).

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
GariG	EE	2017	2018	2	0	G	trap	index	T	0
InagG	EE	2010	2024	15	0	G	trap	kg	F	0
LeacG	EE	2017	2018	2	0	G	trap	index	T	0
MiScG	EE	2018	2024	7	0	G	sci. surv.	nr/h	T	0
OrbfG	EE	2019	2020	2	0	G	trap	index	T	0
PogoG	EE	2019	2023	5	0	G	trap	index	T	0
PovoG	EE	2019	2023	5	0	G	trap	index	T	0
SeHMG	EE	1979	2020	42	4	G	com. catch	t	T	3
ShiFG	EE	2017	2022	6	1	G	trap	nr	F	0
TibnG	EE	2022	2023	2	0	G	trap	index	T	0
EmsHG	NS	2014	2023	10	0	G	trap	nr	T	0
VeAmG	NS	2017	2024	8	1	G	trap	kg	T	0
WaSG	NS	2015	2023	9	0	G	sci. surv.	nr	T	0
BeeGY	NS	2011	2024	14	0	GY	trap	nr	F	3
BroGY	NS	2011	2024	14	2	GY	trap	nr	F	3
EmsBGY	NS	2013	2023	11	0	GY	trap	nr	F	3
FarpGY	NS	2007	2023	17	0	GY	trap	nr	F	3
FlaGY	NS	2007	2024	18	2	GY	trap	nr	F	3
HHKGY	NS	2010	2013	4	0	GY	trap	nr	T	3
HoSGY	NS	2010	2010	1	0	GY	trap	nr	T	0
LangGY	NS	2015	2024	10	0	GY	trap	nr	T	0

code	area	min	max	n+	n-	life stage	sampling type	unit	habitat	kept
MiSpY	EE	2019	2020	2	0	Y	trap	kg	T	0
MeusY	NS	1992	2023	32	6	Y	trap	nr	F	3
VeAmY	NS	2017	2024	8	1	Y	trap	nr	T	0
WaSEY	NS	2015	2023	9	0	Y	sci. surv.	nr	T	0

Table 5: Series updated to 2024. Codes for stages are G = glass eel, GY = glass eel + yellow eel, Y = yellow eel, Area NS = North Sea, EE = Elsewhere Europe, Division = FAO marine division. Series ordered by stage and from North to South

Site	Name	Coun.	Stage	Area	Division	Kept
YFS2G	IYFS2 scientific estimate	SE	G	NS	27.3.a	1
KlitG	Klitmoeller A	DK	G	NS	27.3.a	1
NorsG	Nors A	DK	G	NS	27.3.a	1
SleG	Slette A	DK	G	NS	27.4.b	1
RhIjG	Rhine Ijmuiden scientific estimate	NL	G	NS	27.4.c	1
KatwG	Katwijk scientific estimate	NL	G	NS	27.4.c	1
StelG	Stellendam scientific estimate	NL	G	NS	27.4.c	1
RhDOG	Rhine DenOever scientific estimate	NL	G	NS	27.4.c	1
LauwG	Lauwersoog scientific estimate	NL	G	NS	27.4.b	1
YserG	IJzer Nieuwpoort scientific estimate	BE	G	NS	27.4.c	1
BeeG	Beeleigh_Glass_<80mm	GB	G	NS	27.4.c	1
BroG	Brownshill_Glass_<80mm	GB	G	NS	27.4.c	1
FlaG	Flatford_GE_<80mm	GB	G	NS	27.4.c	1
SeEAG	Severn EA commercial catch	GB	G	EE	27.7.f	1
ShiMG	Shieldaig river mouth scientific estimate	GB	G	EE	27.6.a	1
VacG	Vaccares	FR	G	EE	37.1.2	1
GiScG	Gironde scientific estimate	FR	G	EE	27.8.b	1
OriaG	Oria scientific monitoring	ES	G	EE	27.8.b	1
MiSpG	Minho spanish part commercial catch	ES	G	EE	27.9.a	1
AlbuG	Albufera de Valencia commercial catch	ES	G	EE	37.1.1	1
NaloG	Nalon Estuary commercial catch	ES	G	EE	27.8.c	1
EbroG	Ebro delta lagoons	ES	G	EE	37.1.1	1
AlCPG	Albufera de Valencia commercial CPUE	ES	G	EE	37.1.1	1
MondG	Mondego estuary	PT	G	EE	27.9.a	1
MiPoG	Minho portuguese part commercial catch	PT	G	EE	27.9.a	1
VerlGY	Verlath Pumping Station	DE	GY	NS	27.4.b	1
BrokGY	Broklandsau Pumping Station	DE	GY	NS	27.4.b	1

Site	Name	Coun.	Stage	Area	Division	Kept
InagGY	River Inagh	IE	GY	EE	27.7.b	1
LiffGY	Liffey	IE	GY	EE	27.7.a	1
FealGY	River Feale	IE	GY	EE	27.7.j	1
BurrGY	Burrishoole	IE	GY	EE	27.7.b	1
ShaAGY	Shannon Ardnacrusha trapping all	IE	GY	EE	27.7.b	1
CorGY	Corrib Galway Weir	IE	GY	EE	27.7.b	1
ErneGY	Erne Ballyshannon trapping all	IE	GY	EE	27.7.b	1
StraGY	Strangford	GB	GY	EE	27.7.a	1
GreyGY	Greylake_Elvers/Yellow (mainly yellow>120mm with 20-25% elvers <120mm)	GB	GY	EE	27.7.g	1
OatGY	Oath Lock predominantly glass eel and elvers (<120mm)	GB	GY	EE	27.7.d	1
BannGY	Bann Coleraine trapping partial	GB	GY	EE	27.6.a	1
NmiGY	New Mills Elvers/Yellow >80mm	GB	GY	NS	27.4.c	1
BresGY	Bresle	FR	GY	EE	27.7.d	1
ShaPY	Shannon Parteen trapping partial	IE	Y	EE	27.7.b	1
BeeY	Beeleigh_Yellow_121mm+	GB	Y	NS	27.4.c	1
BroY	Brownshill_Yellow_>120mm	GB	Y	NS	27.4.c	1
MertY	Thames - Wandle - Merton Abbey Mills	GB	Y	NS	27.4.c	1
MillY	Thames - Hogsmill Middle Mill	GB	Y	NS	27.4.c	1
MolY	Thames-Molesey weir	GB	Y	NS	27.4.c	1
RodY	Thames - Roding	GB	Y	NS	27.4.c	1
FlaY	Flatford Yellow eel >120mm	GB	Y	NS	27.4.c	1

Table 6: Series updated to 2023 see table 4 for codes. Series ordered from North to South

Site	Name	Coun.	Stage	Area	Division
RingG	Ringhals scientific survey	SE	G	NS	27.3.a
ImsaGY	Imsa Near Sandnes trapping all	NO	GY	NS	27.4.a
ViskGY	Viskan trapping all	SE	GY	NS	27.3.a
WiFG	Frische Grube	DE	GY	NS	27.3.b, c
WisWGY	Wallensteingraben	DE	GY	NS	27.3.b, c
HellGY	Hellebaekken	DK	GY	NS	27.3.a
SousGY	Souston glass and yellow eel trap	FR	GY	EE	27.8.b
LagaY	Lagan trapping all	SE	Y	NS	27.3.a
MorrY	Mörrumsån trapping all	SE	Y	NS	27.3.d
KavlY	Kävlingeån trapping all	SE	Y	NS	27.3.b, c
RonnY	Rönne Å trapping all	SE	Y	NS	27.3.a
DalaY	Dalälven trapping all	SE	Y	NS	27.3.d
MotaY	Motala Ström trapping all	SE	Y	NS	27.3.d
DoElY	Dove Elde eel ladder	DE	Y	NS	27.4.b
HartY	Harte trapping all	DK	Y	NS	27.3.b, c
GudeY	Guden AA… Tange trapping all	DK	Y	NS	27.3.a
GirnY	Girnock Burn trap scientific estimate	GB	Y	NS	27.4.b
FreY	Fremur	FR	Y	EE	27.7.e
RhoY	Rhone_Beaucaire	FR	Y	EE	37.1.2

Annex 10: Additional recruitment figure

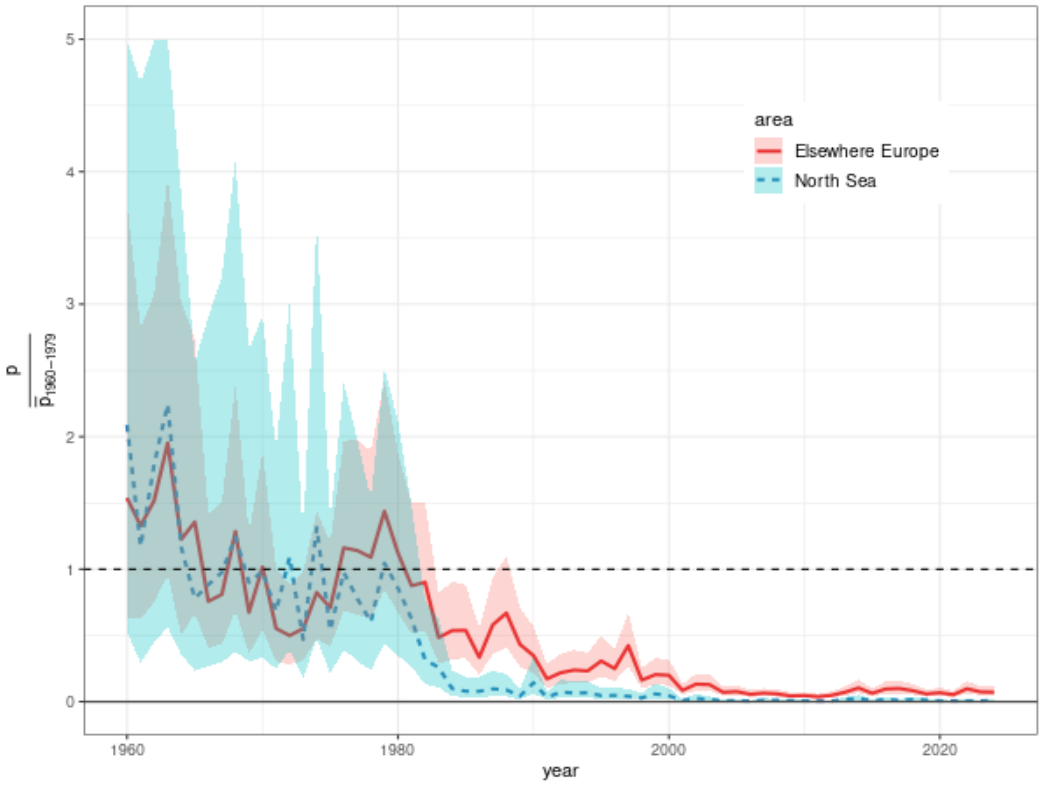

Figure 1. WGEEL glass eel recruitment index for the continental North Sea and Elsewhere Europe series with 95% confidence intervals updated to 2024. The index was estimated using a GLM (*glasseel ~ area : year + site*) fitted on 58 time-series comprising either pure glass eel or a mixture of glass eels and yellow eels. The predictions *p* have been scaled to the 1960-1979 average $\bar{p}_{1960-1979}$. Number of series Elsewhere Europe = 34 and North Sea = 26. Same as Figure 2.5 but with a natural scale.

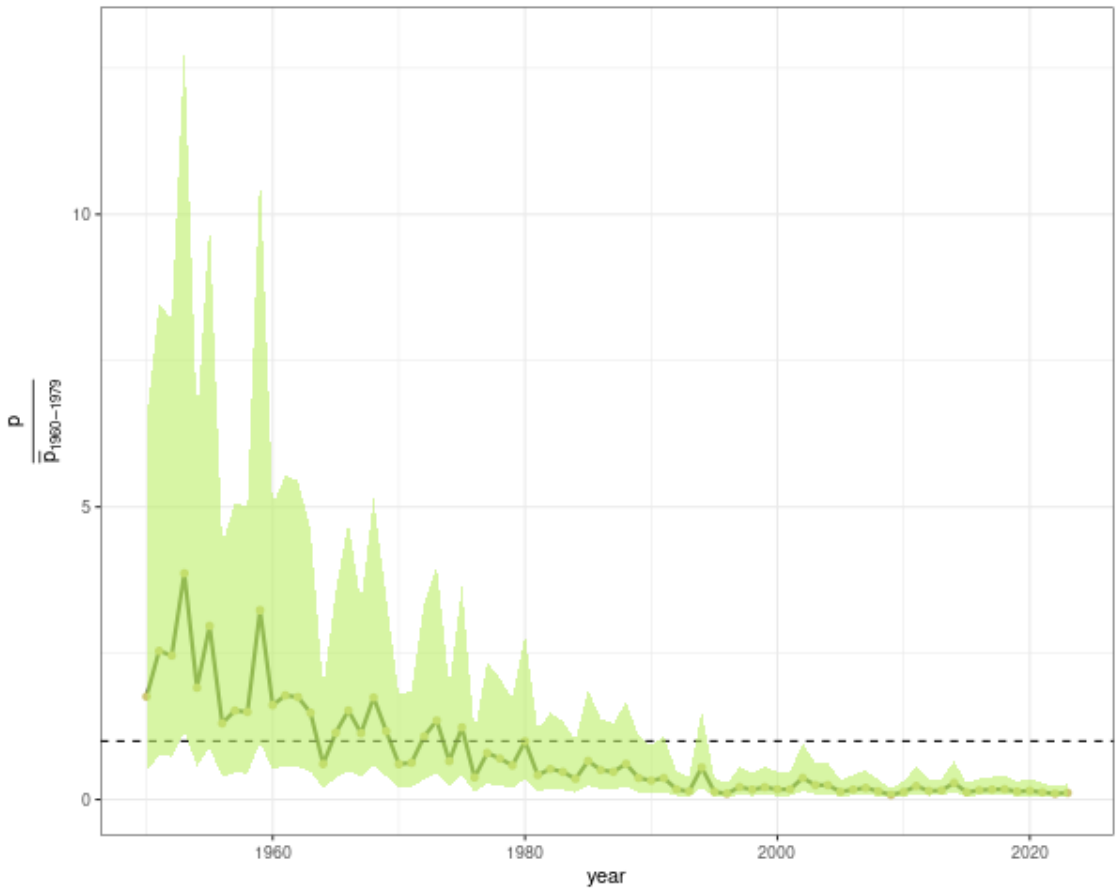

Figure 2. Geometric mean of estimated yellow eel recruitment for Europe updated to 2021. The yellow recruitment was estimated using a GLM (*yelloweel* ~ *year*) fitted to 21 yellow eel time-series *p* scaled to the 1960-1979 average $p_{1960-1979}$. Same as Figure 2.6 but with a natural scale.

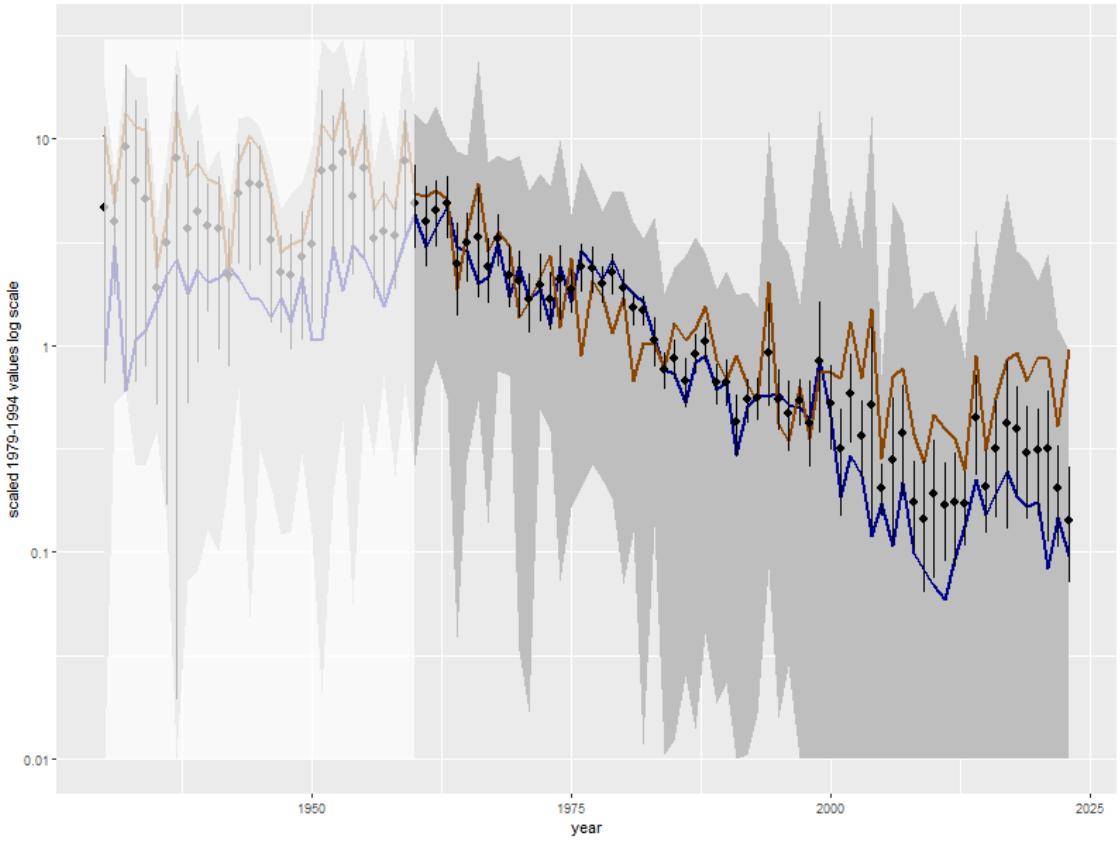

Figure 3. Time-series of glass eel and yellow eel recruitment in Europe with 81 time-series out of the 106 available to the working group. Each time-series has been scaled to its 1979-1994 average. The mean arithmetic values of the combined yellow and glass eel time-series and their bootstrap confidence interval (95%) are represented as black dots and bars. The brown line represents the mean value for yellow eel and the blue line represents the mean value for glass eel time-series. The range of these time-series is indicated by a grey shade. Note that individual time-series from Figure 6 were removed to make the mean value clearer. Also note the logarithmic scale.

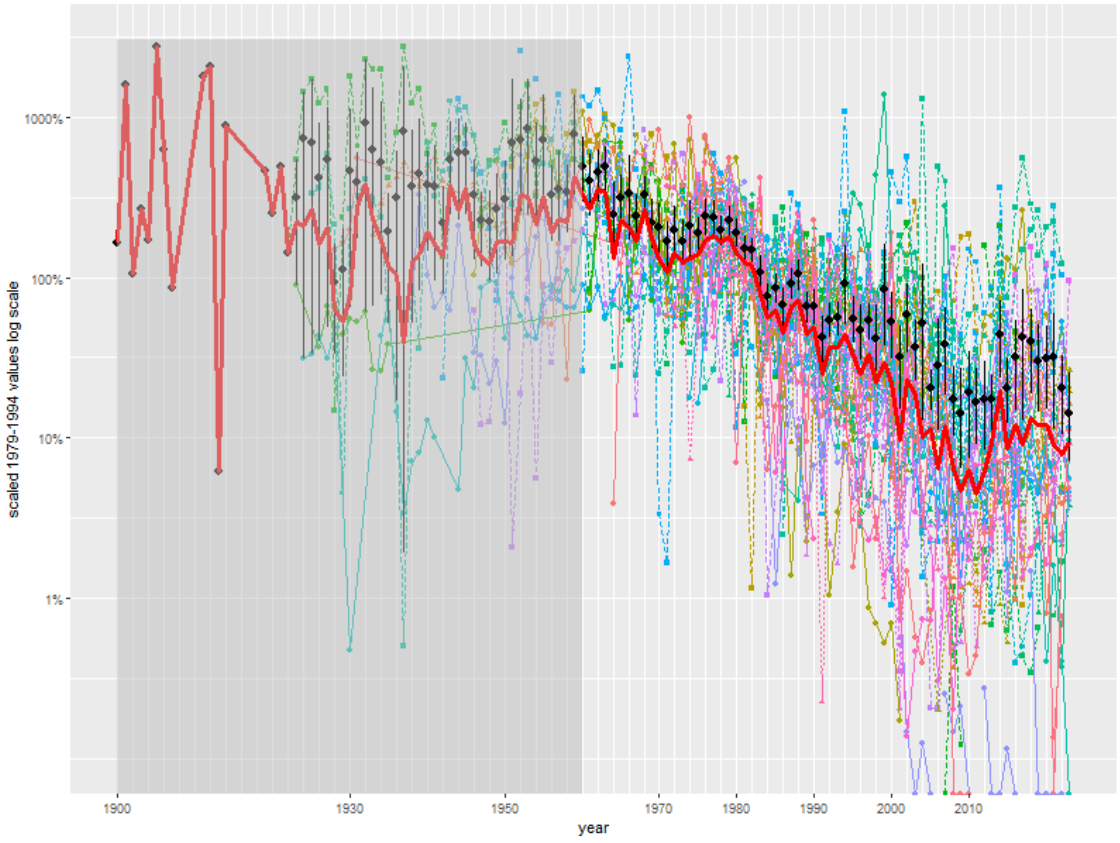

Figure 4. Time-series of glass eel and yellow eel recruitment in European rivers with time-series having data for the 1979-1994 period (45 sites). Each time-series has been scaled to its 1979-1994 average. Note the logarithmic scale on the y-axis. The mean arithmetic values and their bootstrap confidence interval (95%) are represented as black dots and bars. Geometric means are presented in red.

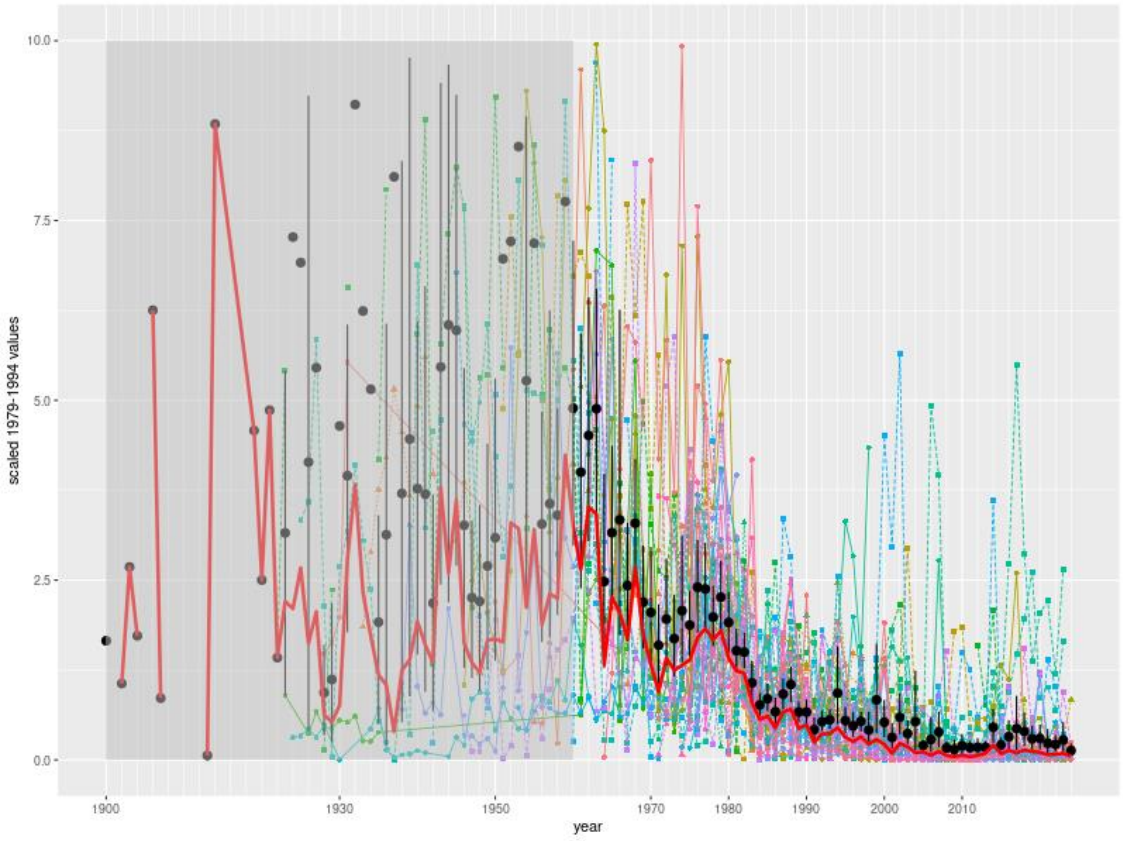

Figure 5. Time-series of glass eel and yellow eel recruitment in European rivers with time-series having data for the 1979-1994 period (45 sites). Each time-series has been scaled to its 1979-1994 average. The mean arithmetic values and their bootstrap confidence interval (95%) are represented as black dots and bars. Geometric means are presented in red. Same as Figure 1, but with a natural scale.

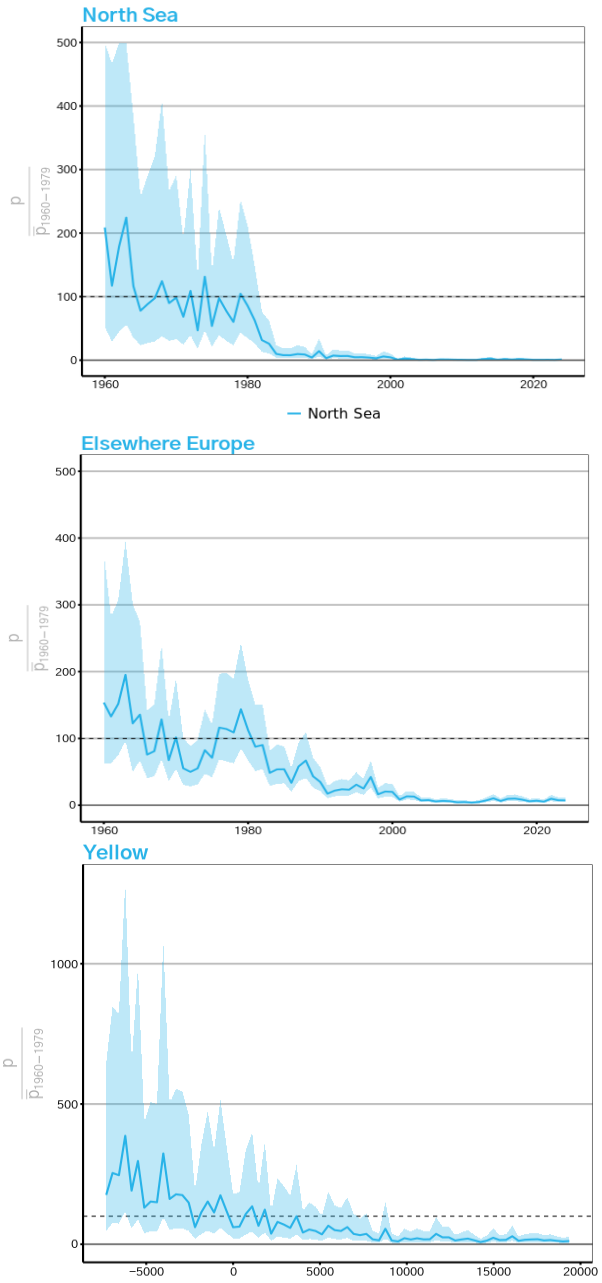

Figure 6. European eel. Indices, geometric mean of estimated glass eel recruitment for the continental "North Sea" (top figure) and "Elsewhere Europe" (figure in the middle) series. A statistical model was fitted to 60 time-series comprising either pure glass eel or a mixture of glass and yellow eels (35 "North Sea" and 25 "Elsewhere Europe"). The results were scaled in percentage to the 1960–1979 geometric mean. The "North Sea" series are from Norway, Sweden, Germany, Denmark, the Netherlands, UK, 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 yellow eel recruitment trends for Europe. A statistical model 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, France, and UK. The horizontal blue line on each panel represents the likely Rlim (calculated from the 1960–1979 geometric mean). Ribbons show 95% prediction interval of the GLM (1.96 × standard error).

Annex 11: Trends in landings, releases, and aquaculture

Table 1: Glass eel commercial fisheries landings (in tonnes) from 1984 to 2024, reported by countries: GB United Kingdom, FR France, ES Spain, PT Portugal, IT Italy, and total.

Year	GB	FR	ES	PT	IT	total
1945			119.2			119.2
1946			71.9			71.9
1947			100.1			100.1
1948			110.6			110.6
1949			9.3			9.3
1950			3.8			3.8
1951			2.1			2.1
1953			2.5			2.5
1954			5.9			5.9
1955			0.9			0.9
1956			0.9			0.9
1957			2.8			2.8
1958			0.4			0.4
1959			6.6			6.6
1960			9.5			9.5
1961			16.7			16.7
1962			11.1			11.1
1963			8			8
1964			11			11
1965			4			4
1966			6			6
1967			5			5
1968			4			4
1969			4			4

Year	GB	FR	ES	PT	IT	total
1970			5			5
1971			1			1
1972	16.7		1			17.7
1973	28.2		1			29.2
1974	57.5		2	1.6		61.1
1975	10.5		2.6	5.6		18.7
1976	13.1		11.6	12.5		37.2
1977	38.6		17.5	22.6		78.7
1978	61.2	1393	21.6	7.3		1483.1
1979	67	1850	17.3	8.8		1943.1
1980	40.1	1491	15.4	10.1		1556.6
1981	36.9	890	13	18		957.9
1982	48	866	19.3	22.2		955.5
1983	16.9	791	10.3	6.7		824.9
1984	25	528	16.4	16.1		585.5
1985	20	444	18.3	14.8		497.1
1986	19	423	6.4	7		455.4
1987	21.3	461	9.4	9.5		501.2
1988	21.4	504	9.9	2.6		537.9
1989	20.6	410	9.9	2.8		443.3
1990	20.9	325	5.3	4.5		355.7
1991	1.1	179	6.8	2.8		189.7
1992	5	183	3.7	4.5		196.2
1993	5.7	329	5.2	3.6		343.5
1994	9.5	329	2.4	2.9		343.8
1995	11.9	413	4.9	5.3		435.1
1996	18.8	262	14.5	8.7		304
1997	8.7	287	12	4.4		312.1
1998	11.2	195	14.1	4.5		224.8

Year	GB	FR	ES	PT	IT	total
1999		242	13.9	3.6		259.5
2000		206	11	3		220
2001	0.8	101	12	1.1		114.9
2002	0.5	202	8.6	0.8		211.9
2003	1.7	151	10	1.4		164.1
2004	1	89	5.1	0.8		95.9
2005	1.7	89	6.4	1.2		98.3
2006	1.3	67	4.1	2.7		75.1
2007	2.1	77	5.2	0.9		85.2
2008	0.8	79	5.1	0.8		85.7
2009	0.3		3.7	1.4		5.4
2010	1.3	41	6.5	2.4		51.2
2011	2.3	31.3	5.2	1.1		39.9
2012	2.8	34.3	5.3	0.8		43.2
2013	5.9	33.6	7.2	1.1		47.8
2014	12	35.3	11.3	1.2	0.4	60.2
2015	2.8	36.1	8.8	1.3	0.2	49.2
2016	4	46.4	6.6	0.4	0.1	57.5
2017	3.3	43.2	11.1	2.2	0.1	59.9
2018	4.2	53.4	4.5	1	0.2	63.3
2019	6.6	50	4.3	0.6	0.2	61.7
2020	3.4	48.7	6.3	0.9		59.3
2021	0.1	46.6	4.5	1.2		52.4
2022	1.1	53.9	4.7	0.9		60.6
2023	0.9	49	3.6	0.5		54
2024	1.4	50.9	3.3	0.5		56.1

Table 2: Part a Commercial fisheries landings (in tonnes) for yellow eel and silver eel from 1908 to 2023 (part a), reported by countries : Albania(AL), Belgium(BE), Germany(DE), Denmark(DK), Algeria(DZ), Estonia(EE), Spain(ES), Finland(FI), France(FR), United Kingdom(GB), Greece(GR) (to be continued for other countries in next table).

Year	AL	BE	DE	DK	DZ	EE	ES	FI	FR	GB	GR
1908											
1909											
1910											
1911											
1912											
1913											
1914											
1915											
1916											
1917											
1918											
1919											
1920				3413							
1921				3443							
1922				3760							
1923				3396							
1924				4130							
1925				4880							
1926				4726							
1927				4648							
1928				4117							
1929				4375							
1930				4773							
1931				4195							
1932				5088							
1933				5014							
1934				5171							

Year	AL	BE	DE	DK	DZ	EE	ES	FI	FR	GB	GR
1935				4316							
1936				4332							
1937				4329							
1938				3849							
1939				4662							
1940				3709							
1941				3717							
1942				3140							
1943				3917							
1944				4245							
1945				4169							
1946				4269							
1947				4784							
1948				4386							
1949				4492							
1950				4500							
1951				4400			90				
1952				3900			102.2				
1953				4300			80.2				
1954				3800			97.7				
1955				4800			102.9				
1956				3700			106.1				
1957				3600			80				
1958				3300			115				
1959				4000			100				
1960				4937			98			771.7	
1961				4110			153.8			768.4	
1962				4122			114.9			696.1	
1963				4166			136.9			787.8	

Year	AL	BE	DE	DK	DZ	EE	ES	FI	FR	GB	GR
1964				3505		3	91.5			548.9	
1965				3402		0.3	130.4			783.8	
1966				3901		1.9	191.5			881	14.9
1967				3679		2.7	163.8			568.7	19
1968				4476		2.9	175.6			585.6	4.9
1969				3878		49	136.4			605.6	2.9
1970				3558		61.5	119.4			752.1	0
1971				3378		59.5	107.4			842.2	0
1972				3429		73.4	119.4			632.6	4.3
1973				3656		69	100.2			723.2	15.5
1974				2977		51.1	93.4			765	129.8
1975				3485		82.1	78			762.2	133.8
1976				3054		71.6	82.7			621.7	158.7
1977				2502		65.8	79.9			690.5	89.2
1978				2492		63.2	67			823.6	225.3
1979				1904		28.5	96.8			1045	185.5
1980				2288		25.7	89.8			912.2	226.9
1981				2227		21.9	97.7			907.1	250.6
1982				2541		13.9	19.9			942.5	255.2
1983				2119		28.8	18.4			866.4	200.8
1984				1871		72.2	11			973.4	285.4
1985			1096.7	1630		75.1	16.5			750	189.6
1986			1118.7	1672		61.1	13.4		1944	650.8	151.6
1987			1031	1279		66.7	21.2		2062	684.1	266.3
1988			1018	1878		109.7	13.9		2265	933.6	268.1
1989			963.6	1696		54.8	5.3		1746	874.7	155.6
1990			829.7	1675		61.3	8.7		1778	783.9	194.2
1991			724.7	1465		52.4	49.8		1645	736.9	209.4
1992			761.7	1451		39.4	54.3		1321	715.4	184.8

Year	AL	BE	DE	DK	DZ	EE	ES	FI	FR	GB	GR
1993			790.1	1080		59.2	66.5		1280	670.7	181.9
1994			833.1	1200		46.9	50.7		1280	777.8	200.5
1995			777.9	892		45.4	69.4		1280	899.6	201.4
1996			603	751.5		55.1	61.7		1280	805.2	151.3
1997			616.2	797		59.1	61.5		1223	730.7	136.5
1998			566.9	597		44.2	43.6		1150	693.4	87.6
1999			645.1	717	20.4	64.8	48.3		1005	667.8	80.7
2000		2.9	591.2	628	17.2	67	55.3		1008.8	587.2	88.1
2001		2.9	569	707	44.5	67	130.2		1024.1	582.7	93.4
2002		2.9	543.9	614	25.4	49.9	105.6		30.4	551.1	136.3
2003		2.9	497.9	648	25.2	48.6	95.6		21.4	552.3	76.5
2004		2.9	475.3	546	29	39.2	85.3		12.5	471.7	58.1
2005		2.9	454.8	534	7.6	30.7	88		7.8	477.2	116.1
2006			472.2	596	2.7	33.4	115.6		15	383.5	77.1
2007			423.6	537	14.6	31.1	82.1		26.1	450.4	89.7
2008			352.8	466	13.9	30.6	65.6	1	31.4	400.6	71.1
2009			311.6	467	14.2	22.1	89.2	1.8	42	462.4	78.5
2010			318.5	422	3.4	18.9	76.1	2.3	20.2	461.1	58.6
2011			287	370		16.2	61.6	1.5	368	455.9	83.2
2012			246.9	317	0.4	17.7	85.4	1.5	472.6	415.1	55.2
2013	47		265.9	356	3	17.4	86.7	1.3	504.1	426.5	38
2014	43		231.1	346	6	16.7	91.6	1	434.4	392.8	58.3
2015	50		213.7	282	3	14.2	63.7	0.6	356.9	341	60.2
2016	41		208.8	265	2	15.2	83	1.3	442.6	347.2	60.9
2017	47	0	244.3	257.3	10.6	15.7	76.7	1.1	434.1	321.8	48.3
2018	60		228.6	181.8	33	18.3	64.1	1.1	617.4	366.9	42.8
2019	70		209.7	183.3	25.2	21.7	57.6	0.4	309.6	295.6	20.4
2020	40		228.9	182.2	18	38.8	81.7	0.4	347.4	182.2	27.9
2021	22		223.4	233.7	4.7	47.9	69.6	0.4	309.4	244	19.2

Year	AL	BE	DE	DK	DZ	EE	ES	FI	FR	GB	GR
2022	17		207.8	163.1	7.6	52.4	66.1	2.3	376.2	166.7	17.5
2023	20			125.2	3.4	59.5	69.5		308.4	104.7	19.4

Table 2: Part b Commercial fisheries landings (in tonnes) for yellow eel and silver eel from 1908 to 2023 (part b), reported by countries: Croatia(HR), Ireland(IE), Italy(IT), Lithuania(LT), Latvia(LV), Libya(LY), Morocco(MA), Netherlands(NL), Norway(NO), Poland(PL), Portugal(PT) (to be continued for other countries in next table).

Year	HR	IE	IT	LT	LV	LY	MA	NL	NO	PL	PT
1908									268.1		
1909									326.6		
1910									303.1		
1911									383.8		
1912									187.3		
1913									212.7		
1914									282		
1915									143		
1916									117		
1917									44		
1918									35		
1919									64		
1920									80		
1921									79		
1922									94		
1923									140		
1924									290		
1925									325		
1926									341		
1927									354		
1928									325		
1929									425		
1930									450		
1931									329		
1932									518		
1933									694		
1934									674		

Year	HR	IE	IT	LT	LV	LY	MA	NL	NO	PL	PT
1935									564		
1936									631		
1937									603		
1938									526		
1939									434		
1940									143		
1941									174		
1942									131		
1943									136		
1944									150		
1945								2668	102		
1946								3492	167		
1947				8	10			4502	268		
1948				14	10			4799	293		
1949				21	50			3873	214		
1950				29	10			4152	282		
1951				32	10			3661	312		
1952				39	10			3978	178		
1953				80	20			3157	371		
1954				147	20			2085	327	609	
1955				163	40			1651	451	732	
1956				131	20			1817	293	656	
1957				168	20			2509	430	616	
1958				149	20			2674	437	635	
1959				155	24			3413	409	566	
1960				165	37			2999	430	733	
1961				139	43			2452	449	640	
1962				155	41			1443	356	663	
1963				260	56			1618	503	762	

Year	HR	IE	IT	LT	LV	LY	MA	NL	NO	PL	PT
1964				225	37			2068	440	884	
1965				125	35			2268	523	682	
1966				238	33			2339	510	804	
1967				153	39			2524	491	906	
1968				165	28			2209	569	943	
1969			2469	134	36			2389	522	935	
1970		200	2300	118	29			1111	422	847	
1971		200	2113	124	29			853	415	722	
1972		200	1997	126	25			857	422	696	
1973		91	588	120	27			823	409	644.7	
1974		67	2122	86	20			840	368	691.1	
1975		79	2886	114	19			1000	407	809.7	
1976		150	2596	88	24			1172	386	760.5	
1977		108	2390	68	16			783	352	867.8	
1978		76	2172	70	18			719	347	910.4	
1979		110	2354	57	21			530	374	978.9	
1980		75	2198	45	9			664	387	1214	
1981		94	2270	27	10			722	369	943.5	
1982		144	2025	28	12			842	385	911.3	
1983		117	2013	23	9			937	324	868	
1984		88	2050	27	12			691	310	819.4	
1985		87	2135	29	18			679	352	1022.5	
1986		87	2134	32	19			721	272	920.7	
1987		230	2265	20	25			538	282	886.6	
1988		215	2027	23	15			425	513	943.3	
1989		400	1243	21	13			526	313	812.8	13.5
1990		256	1088	19	13			472	336	768.1	13
1991		245	1097	16	14			573	323	669.7	23.5
1992		234	1084	12	17			548	372	638.2	29.7

Year	HR	IE	IT	LT	LV	LY	MA	NL	NO	PL	PT
1993		260	782	10	19			293	340	568	33.9
1994		300	771	12	19			330	472	635.1	26.6
1995			1047	9.4	38			354	454	641.9	23.7
1996			953	8.6	24			300	353	629	25.6
1997			727	10.7	25			285	467	526	24.7
1998			666	17.1	30			323	331	544.4	23.3
1999		250	634	17.9	26			357	447	599.1	23.1
2000		250	588	22	13.7			370.1	281	443.6	21.8
2001		98	520	23	17.4			439.5	304	434.5	15
2002		123	415	25.6	9.6			370.2	311	372.9	26.9
2003		111	446	23.5	10.3			309.8	240	365.5	10.6
2004		136	379	32	11.3			310.2	237	337.2	8.8
2005		101	75	44.6	10.3			255.2	249	219.9	7
2006		133	56	31.6	7.9			240.3	293	184.4	10.1
2007		114	277	29.8	9.6			197	194	180.7	10.5
2008		108.3	56	27	12.9			147.6	211	159.7	7
2009		0	289.9	17.2	4.9			108	69	160.6	8.2
2010		0	225.1	37.6	8.9			445	32	173.2	11
2011		0	149.7	22.6	6			370.6	0	118.8	5.9
2012		0	142.4	15.8	6.3			351.7	0	119.3	3.8
2013		0	129.8	28.4	4.7		23	318.9	0	137.4	2.7
2014	0.5	0	144.4	15.4	4.4		23	320.3	0	116.8	3.3
2015	0.1	0	129.2	11.8	5.2		4	293	0	102.4	2.9
2016	0.6	0	166.9	28.4	4.2		7	312.5	3	138.4	2.4
2017	0.6	0	165	24.3	8.6		2	421.3	10.9	172.6	1.5
2018	0.6	0	121.9	20.3	5.8		2	476.9	3.4	146.5	3.6
2019	0.4	0	126.6	4.6	6.1	1.3		484	4	167.5	1.9
2020	0.4	0	95.7	6.8	6.7	1.9		475.5	4	103.6	3.2
2021	0.4	0	82.9	9.9	6.4	0.2		523.7	5	126.6	2.4

Year	HR	IE	IT	LT	LV	LY	MA	NL	NO	PL	PT
2022	0.5	0	112.5	11.6	6.1	2.1		538.1	4	115.3	1.7
2023	0.5	0	85.8	6.3	5	0.9		456.3	5	192.8	2.8

Table 2: Part c Commercial fisheries landings (in tonnes) for yellow eel and silver eel from 1908 to 2023 (part c), reported by countries: Netherlands(NL), Norway(NO), Poland(PL), Portugal(PT), Sweden(SE), Slovenia(SI), Tunisia(TN), Türkiye(TR), and total.

Year	NL	NO	PL	PT	SE	SI	TN	TR	total
1908		268.1							268.1
1909		326.6							326.6
1910		303.1							303.1
1911		383.8							383.8
1912		187.3							187.3
1913		212.7							212.7
1914		282			1460.6				1742.6
1915		143			996.9				1139.9
1916		117			1078.2				1195.2
1917		44			1283.6				1327.6
1918		35			884.4				919.4
1919		64			1145.4				1209.4
1920		80			969.6				4462.6
1921		79			1072.4				4594.4
1922		94			925.9				4779.9
1923		140			947.7				4483.7
1924		290			1201.1				5621.1
1925		325			1714.2				6919.2
1926		341			1707.3				6774.3
1927		354			2011.5				7013.5
1928		325			1040.1				5482.1
1929		425			1393.7				6193.7
1930		450			1528.8				6751.8
1931		329			1531.4				6055.4
1932		518			1723.7				7329.7
1933		694			1546.2				7254.2
1934		674			1844.9				7689.9

Year	NL	NO	PL	PT	SE	SI	TN	TR	total
1935		564			1950.9				6830.9
1936		631			1654.5				6617.5
1937		603			1725.1				6657.1
1938		526			1870.5				6245.5
1939		434			1774.4				6870.4
1940		143			1625.7				5477.7
1941		174			1629				5520
1942		131			1131.6				4402.6
1943		136			1546				5599
1944		150			2001.6				6396.6
1945	2668	102			1673.4				8612.4
1946	3492	167			1516.6				9444.6
1947	4502	268			1914.4				11486.4
1948	4799	293			1866.5				11368.5
1949	3873	214			1902				10552
1950	4152	282			2192				11165
1951	3661	312			1933				10438
1952	3978	178			1600				9807.2
1953	3157	371			2381				10389.2
1954	2085	327	609		2113				9198.7
1955	1651	451	732		2656				10595.9
1956	1817	293	656		1537				8260.1
1957	2509	430	616		2228				9651
1958	2674	437	635		1757				9087
1959	3413	409	566		2797				11464
1960	2999	430	733		1648				11818.7
1961	2452	449	640		2079				10834.2
1962	1443	356	663		1911				9502
1963	1618	503	762		2107				10396.7

Year	NL	NO	PL	PT	SE	SI	TN	TR	total
1964	2068	440	884		2304				10106.4
1965	2268	523	682		1823				9772.5
1966	2339	510	804		1975				10889.3
1967	2524	491	906		1623				10169.2
1968	2209	569	943		1817				10976
1969	2389	522	935		1690			342	13188.9
1970	1111	422	847		1209			441	11168
1971	853	415	722		1391			460	10694.1
1972	857	422	696		1204			220	10005.7
1973	823	409	644.7		1212			315	8793.6
1974	840	368	691.1		1034			588	9832.4
1975	1000	407	809.7		1391			448	11694.8
1976	1172	386	760.5		935			499	10599.2
1977	783	352	867.8		989			282	9283.2
1978	719	347	910.4		1076			283	9342.5
1979	530	374	978.9		954			396	9034.7
1980	664	387	1214		1112			224	9470.6
1981	722	369	943.5		887			374	9200.8
1982	842	385	911.3		1161	0.8		424	9705.6
1983	937	324	868		1212	0.7		588	9325.1
1984	691	310	819.4		963	1.2		616	8790.6
1985	679	352	1022.5		1029	2.5		583	9694.9
1986	721	272	920.7		841.1	2.7		517	11158.1
1987	538	282	886.6		718.1	1.6		543	10919.6
1988	425	513	943.3		965.5	1.5		756	12370.6
1989	526	313	812.8	13.5	928.4	1.3		472	10240
1990	472	336	768.1	13	941.6	1.9		230	9469.4
1991	573	323	669.7	23.5	1084.4	1.4		262	9192.2
1992	548	372	638.2	29.7	1181.8	0.1		245	8889.4

Year	NL	NO	PL	PT	SE	SI	TN	TR	total
1993	293	340	568	33.9	1145.9	0.1		261	7841.3
1994	330	472	635.1	26.6	1297.7	0.7		329	8582.1
1995	354	454	641.9	23.7	971.4	0		390	8095.1
1996	300	353	629	25.6	1053.3	0		342	7396.3
1997	285	467	526	24.7	1073.4	0		400	7162.8
1998	323	331	544.4	23.3	649.3	0		300	6066.8
1999	357	447	599.1	23.1	701.6			200	6504.8
2000	370.1	281	443.6	21.8	532	0	109.9	176	5853.8
2001	439.5	304	434.5	15	643.2	0	144.1	122	5981.5
2002	370.2	311	372.9	26.9	666.7	0	204.4	147	4731.8
2003	309.8	240	365.5	10.6	628.6		171.7	158	4443.4
2004	310.2	237	337.2	8.8	613.6		132.5	165	4082.6
2005	255.2	249	219.9	7	714.2	0	197	176	3768.3
2006	240.3	293	184.4	10.1	771.2	0	266.3	162	3851.3
2007	197	194	180.7	10.5	761.9	0	296.5	179	3904.6
2008	147.6	211	159.7	7	727	0	316.7	171	3377.2
2009	108	69	160.6	8.2	519	0	122.2	158	2945.8
2010	445	32	173.2	11	525.3	0	92.6	182	3113.8
2011	370.6	0	118.8	5.9	457	0	79.6	28.3	2881.9
2012	351.7	0	119.3	3.8	336.5	0	55	38	2680.6
2013	318.9	0	137.4	2.7	356.5	0	149.6	48.2	2945.1
2014	320.3	0	116.8	3.3	302	0	83.6	56	2690.6
2015	293	0	102.4	2.9	228.7	0	81.4	71	2315
2016	312.5	3	138.4	2.4	261.8	0	250.4	75	2717.6
2017	421.3	10.9	172.6	1.5	227.7		153	81	2725.4
2018	476.9	3.4	146.5	3.6	231.6		166.3	111	2903.9
2019	484	4	167.5	1.9	156.1		107	330	2583
2020	475.5	4	103.6	3.2	185.5		129.9	232.8	2393.5
2021	523.7	5	126.6	2.4	166.8		105.3	267.3	2471.2

Year	NL	NO	PL	PT	SE	SI	TN	TR	total
2022	538.1	4	115.3	1.7	117.1		105	275.8	2366.5
2023	456.3	5	192.8	2.8	174.8		105	281.9	2027.2

Table 3: Part a, Recreational fisheries landings (in tonnes) for yellow eel and silver eel from 1980 to 2024 (part a), reported by countries: Sweden(SE), Finland(FI), Estonia(EE), Latvia(LV), Lithuania(LT), Poland(PL), Czech republic(CZ), Germany(DE), Denmark(DK), Netherlands(NL), Belgium(BE) (to be continued for other countries in next table).

Year	SE	FI	EE	LV	LT	PL	CZ	DE	DK	NL	BE
1980											
1981											
1982											
1983											
1984											
1985								581.6			
1986								562.8			
1987								546.3			
1988								558.5			
1989								542.5			
1990								501.3			
1991								498.1			
1992								488.5			
1993								485.6			
1994	1273.3							492.9			
1995								452.2			
1996								416.3			
1997								423.7			
1998								430.5			
1999	1218							424.8			
2000				1.7				428.9			33.6
2001				1.2				425.9			33.6
2002				1.1				417.3			33.6
2003				0.4				427.9			33.6
2004	594			0.7				413.9			33.6
2005			1.7	2.6				398.1			33.6
2006	259.9		1	0.3				399.1			33.6

Year	SE	FI	EE	LV	LT	PL	CZ	DE	DK	NL	BE
2007			1	0.3				375.4			33.6
2008		17	1.1	0.2				326.4			33.6
2009			1.4	0.7				309.8	108		33.6
2010		10	1.1	0.3				276.7	125.5	95	30
2011			1	0.4				272	79.5		30
2012		5	0.6	0.4	1.4	32.4	17.1	262.3	52.3	77	30
2013			0.6	0.7	3	26.7	15.4	265.4	50.3		30
2014		20	0.5	0.5	1.8	29.5	18.8	270.3	57	46	30
2015			0.7	0.5	5	26.5	12.4	270.5	118.3		29.5
2016		8	0.6	0.2	1.6	34.2	12.4	273.9	164.3	29	29.5
2017			0.6	0.5	3	39.7	17.3	275.5	117.1		29.5
2018		2	0.6	0.2	0.6	45.3	11.5	271.1		13	29.7
2019			0.6	0.3	6	42.1	12.3	276	110		29.7
2020		2	1.1	0.5	1.2	49.8		285.5	98.9	18	29.7
2021			0.5	0.3	6.8	65.4		272.9	79		29.6
2022		5	0.4	0.2		25.9		274.7	160	10	29.5
2023				0.1	2.5	33.7					29.5
2024									4.1		

Table 3: Part b, Recreational fisheries landings (in tonnes) for yellow eel and silver eel from 1980 to 2024 (part b), reported by countries: Ireland(IE), France(FR), Spain(ES), Italy(IT), Slovenia(SI), Croatia(HR), Türkiye(TR), Libya(LY), Algeria(DZ), and total.

Year	IE	FR	ES	IT	SI	HR	TR	LY	DZ	total
1980					0					0
1981					0					0
1982					0					0
1983					0					0
1984					0					0
1985					0					581.6
1986					0.1					562.9
1987					0.1					546.4
1988					0.1					558.6
1989					0.1					542.6
1990					0.1					501.4
1991					0.1					498.2
1992					0.1					488.6
1993					0.1					485.7
1994					0					1766.2
1995					0					452.2
1996					0.1					416.4
1997					0.2					423.9
1998					0.1					430.6
1999					0					1642.8
2000		20.9			0					485.1
2001		19.9			0					480.6
2002		19			0					471
2003		14.7			0					476.6
2004		16.8			0					1059
2005		12.9			0					448.9
2006		683.9			0					1377.8

Year	IE	FR	ES	IT	SI	HR	TR	LY	DZ	total
2007		14.6			0					424.9
2008		14.9			0					393.2
2009		7.1			0					460.6
2010		4.9		149.5	0					693
2011		3.2		60.6	0					446.7
2012		4.6		73.6	0					556.7
2013		4.7	1	69.7	0					467.5
2014		4.3	1	69.8	0					549.5
2015		3.5	1	60.2	0	10.1				538.2
2016		3.1	0.8	56.8	0	8.9				623.3
2017		2.9	0.1	41.3		7.6				535.1
2018		3.6	0.9	42.3		6.8				427.6
2019		2.3	2.2	33.7		5.7		0.1		521
2020		2		24.5		5	87.2	0.1		605.5
2021		3.3		12.6		1.9	41.7	0		514
2022	0	1.7		17.1		1.3	24.2	0.2	0.9	551.1
2023	0	3.5		0.8			8.1	0.1	6	84.3
2024	0									4.1

Table 4: Raw recreational landings (tonnes) for glass eels (1978 - 2023) for FR,ES, and total.

Year	FR	ES	total
1978	647		647
1979	697		697
1980	1303		1303
1981	904		904
1982	219		219
1983	161		161
1984	156		156
1985	71		71
1986	87		87
1987	172		172
1988	40		40
1989	110		110
1990	54		54
1991	87		87
1992	77		77
1993	130		130
1994	74		74
1995	113		113
1996	25		25
1997	39		39
1998	6		6
1999	6		6
2000	2		2
2001	1		1
2002	37		37
2004		0.9	0.9
2005	0	1.2	1.2
2006	1	1.7	2.7

Year	FR	ES	total
2007	0	1.3	1.3
2008	0	1.6	1.6
2009	0	0.4	0.4
2010	0	0.8	0.8
2011	0	0.4	0.4
2012	0	1.1	1.1
2013	0	1.6	1.6
2014	0	2.4	2.4
2015	0	2.3	2.3
2016	0	1.7	1.7
2017	0	1.5	1.5
2018	0	1.7	1.7
2019	0	0.9	0.9
2020	0	0.7	0.7
2022		0.7	0.7
2023		1.3	1.3

Table 5: Part a: Release of glass eel (G) and quarantined glass eel (QG) in millions from 1950 to 2024), reported by countries Sweden(SE), Finland(FI), Estonia(EE), Latvia(LV), Lithuania(LT), Poland(PL), Germany(DE) (to be continued for other countries in next table).

Year	SE	FI	EE	LV	LT	PL	DE
1950							
1951	0.1						
1952	0.1					18	
1953	0.2					26	
1954						27	
1955	0.2					31	
1956	0.1		0.2			21	
1957	0.2					25	
1958	0					35	
1959	0.1					53	
1960	0.3		0.1	3.2		64	
1961	0			1		65	
1962	0		0.9	2.6		62	
1963				1.9		42	
1964	0		0.2	1.3		39	
1965	0		0.7	0.7		40	
1966						69	
1967				1.8		74	
1968			1.4	3.6		17	
1969						2	
1970	0		1	1.8		24	
1971						17	
1972	0		0.1	1.1		22	
1973	0					61.9	
1974			1.8			71	
1975						70	
1976	0.2		2.6	0.9		68	

Year	SE	FI	EE	LV	LT	PL	DE
1977			2.1	0.5		77	
1978	0.3		2.7			73	
1979	0.2					73	
1980	0.1		1.3			51.8	
1981			2.7	1.8		60	
1982	0		3	0.3		63.2	
1983			2.5	1.9		25.1	
1984			1.8			47.6	
1985	0.6		2.4	1.5		36.3	22.6
1986	0.1					50.2	39.5
1987	0.6		2.5	0.3		56.9	41.4
1988	0.6			2.9		16.7	42.4
1989	0.9					14	21
1990	1.1					10.2	31.9
1991	0.6		2			1.7	13.2
1992	0.7		2.5			13.8	17.5
1993	1					9.7	20.5
1994	2.3		1.9			13.1	22.8
1995	2			0.6		23.7	19.9
1996	2.5		1.4			2.8	10.7
1997	2.5		0.9			5.1	9.5
1998	2.2		0.5			2.5	7.9
1999	3.2		2.3	0.3		4	8.5
2000	1.6		1.1			3.1	6.1
2001	0.9					0.7	3.3
2002	1.4			0.3			2.9
2003	0.7					0.5	2
2004	1.1			0.1		2.2	1.6
2005	1			0.1			1.9

Year	SE	FI	EE	LV	LT	PL	DE
2006	1.3			0			1.1
2007	1			0			1
2008	1.4						0.5
2009	0.8						0.8
2010	1.9	0.2					5
2011	2.6	0.3	0.7	0.3			3.4
2012	2.6	0.2	0.9	1			4
2013	2.7	0.2	0.9				5.1
2014	3	0.1	3	1.4			10.4
2015	1.9	0.1	1.9				6
2016	2.9	0.1	0.9				5
2017	0.9	0.1		1			9.8
2018	3.1	0.1	1.4	0.7			13.5
2019	2.9	0.1	1.6	0.7			21.5
2020	3.1	0.1	2	0			24.4
2021	0.4	0.2		0			19.3
2022	0.8	0.1	1.1				24.8
2023	0.8	0.1	1.1		3.1	0	
2024			1.1				

Table 5: Part b: Release of glass eel in millions from 1950 to 2024), reported by countries: Netherlands(NL), Belgium(BE), Ireland(IE), United Kingdom(GB), France(FR), Spain(ES), Italy(IT), Greece(GR), and total.

Year	NL	BE	IE	GB	FR	ES	IT	GR	total
1950	5.1								5.1
1951	10.2								10.3
1952	16.9								35
1953	21.9								48.1
1954	10.5								37.5
1955	16.5								47.7
1956	23.1								44.4
1957	19								44.2
1958	16.9								51.9
1959	20.1		6.6						79.8
1960	21.1		1						89.7
1961	21		3.7						90.7
1962	19.8		5.6						90.9
1963	23.2		7.8						74.9
1964	20		0.7						61.2
1965	22.5		1.3						65.2
1966	8.9		10						87.9
1967	6.9		6.9						89.6
1968	17		15						54
1969	2.7		8.2						12.9
1970	19		9.3						55.1
1971	17		16.4						50.4
1972	16.1		6.3						45.6
1973	13.6		10						85.5
1974	24.4		10.9						108.1
1975	14.4		4.8						89.2
1976	18		7.4						97.1
1977	25.8		2.9						108.3

Year	NL	BE	IE	GB	FR	ES	IT	GR	total
1978	27.7		3.7						107.4
1979	30.6		29.6						133.4
1980	24.8		26.1						104.1
1981	22.3		17.5						104.3
1982	17.2		26.4						110.1
1983	14.1		9.9						53.5
1984	16.6		7.6	4					77.6
1985	11.8		6.1	11					92.3
1986	10.5		5.4	17.8					123.5
1987	7.9		13.9	13.7					137.2
1988	8.4		12.5	6.3					89.8
1989	6.8		6.9	0					49.6
1990	6.1		10.2	0					59.5
1991	1.9		2.2	0					21.6
1992	3.5		5.7	2.4					46.1
1993	3.8		7.2	0					42.2
1994	6.2		18.9	2.3					67.5
1995	4.8		11.3	2.1					64.4
1996	1.8		3.9	0.1					23.2
1997	2.3		15	0.2					35.5
1998	2.5		5.7	0.1					21.4
1999	2.9		7.7	3.6					32.5
2000	2.8		5.8	0.4					20.9
2001	0.9	0.2	3	0					9
2002	1.6		1.4	3					10.6
2003	1.6	0.3	4.2	3.9					13.2
2004	0.3		1.4	1.2					7.9
2005	0.1		3.7	2.4					9.2
2006	0.6	0.3	0.6	1					4.9

Year	NL	BE	IE	GB	FR	ES	IT	GR	total
2007	0.2		1	3.6					6.8
2008	0	0.4	0.4	1.3					4
2009	0.3	0.5	0.4	0.7			0		3.5
2010	2.7	0.4	0.4	3.1	0.6		0.3		14.6
2011	0.5	0.5	0.3	3.3	2.4		0.9		15.2
2012	2.3	0.6	0.6	4	9.3	1.2	0.9		27.6
2013	1.9	0.4	1	5.8	8.8	1.2	0.9	0.4	29.3
2014	5.7	1.6	2.2	8.3	17	0.1		0.2	53
2015	0.9		2.9	1.9	3.5	0	0.4	0	19.5
2016	3	1.2	4.5	0.1	10.3	0	0.2	0.5	28.7
2017	3	0.7	0.7	2.5	7	0.8	0.4	0.1	27
2018	3.6	1.6	8.4	2.3	9.5	3.6		0.1	47.9
2019	4.7	2	0.5	3.8	9.7	1.2		0	48.7
2020	2.9	0.9	2	5.1	9.2				49.7
2021	2.4	0	1.7	4.6	10.3		0.2	0	39.1
2022	2.7	0.9	4.2	5.3	8		0.2	0	48.1
2023	2.3	0.4	2.7	2	7.3	1.9		0.2	21.9
2024	2.1	0			8				11.2

Table 6: Releases for yellow eel from 1900 to 2023 in millions, reported by countries Sweden(SE), Germany(DE), Ireland(IE), Spain(ES), Italy(IT), and total.

Year	SE	DE	IE	ES	IT	total
1900	0.1					0.1
1901	0.5					0.5
1902	0					0
1903	0.1					0.1
1904	0					0
1905	0.7					0.7
1906	0.1					0.1
1907	0					0
1909	0					0
1911	0.4					0.4
1912	0.5					0.5
1913	0					0
1914	0.2					0.2
1917	0					0
1918	0					0
1919	0.1					0.1
1920	0.1					0.1
1921	0.1					0.1
1922	0.1					0.1
1923	0.2					0.2
1924	0.3					0.3
1925	0.6					0.6
1926	0.3					0.3
1927	0.5					0.5
1928	0					0
1929	0.1					0.1
1930	0.9					0.9
1931	0.5					0.5

Year	SE	DE	IE	ES	IT	total
1932	1					1
1933	0.9					0.9
1934	0.9					0.9
1935	0.2					0.2
1936	0.2					0.2
1937	0.7					0.7
1938	0.5					0.5
1939	0.5					0.5
1940	1					1
1941	0.7					0.7
1942	0.6					0.6
1943	1.8					1.8
1944	1.6					1.6
1945	1.7					1.7
1946	1.3					1.3
1947	0.7					0.7
1948	1.1					1.1
1949	1.2					1.2
1950	1.3					1.3
1951	0.8					0.8
1952	1.3					1.3
1953	3.4					3.4
1954	1					1
1955	1.7					1.7
1956	1.7					1.7
1957	1					1
1958	1.4					1.4
1959	1.9					1.9
1960	1.4					1.4

Year	SE	DE	IE	ES	IT	total
1961	1.2					1.2
1962	1					1
1963	0.8					0.8
1964	0.5					0.5
1965	0.3					0.3
1966	0.8					0.8
1967	0.3					0.3
1968	1.3					1.3
1969	0.6					0.6
1970	0.6					0.6
1971	0.7					0.7
1972	1					1
1973	2.1					2.1
1974	0.7					0.7
1975	1.2					1.2
1976	1.9					1.9
1977	2.7					2.7
1978	2					2
1979	2		0.1			2.1
1980	1		0.3			1.3
1981	1.7		0.1			1.8
1982	1.8		0.1			1.9
1983	1.5		0.1			1.6
1984	0.8		0			0.8
1985	1.6	3	0.1			4.7
1986	0.9	2	0.2			3.1
1987	1.1	1.8	0.1			3
1988	1.4	2.5	0.1			4
1989	0.7	1.5	0.1			2.3

Year	SE	DE	IE	ES	IT	total
1990	1	1.8	0.1			2.9
1991	1.3	1.3	0			2.6
1992	1.4	1.8	0			3.2
1993	1.1	2.3	0.1			3.5
1994	1.1	1.9	0			3
1995	0.9	1.9	0.1			2.9
1996	1.2	1.9	0			3.1
1997	1.2	3.1	0.1			4.4
1998	1.1	2	0			3.1
1999	0.6	2.3	0.1			3
2000	0.5	1.9	0			2.4
2001	0.5	2.1	0			2.6
2002	0.5	1.6	0.1			2.2
2003	0.5	1.4	0.1			2
2004	0.3	1.2	0			1.5
2005	0.2	1.2	0.1			1.5
2006	0.1	0.7	0			0.8
2007	0.2	0.7	0.1			1
2008	0.2	0.5	0.1	0		0.8
2009	0.1	0.5	0	0		0.6
2010	0.1	0.4	0	0		0.5
2011	0.1	0.2	0	0		0.3
2012	0.1	0.1	0	0		0.2
2013	0.1	0.1	0	0		0.2
2014	0.3	0.1	0	0		0.4
2015	0.1	0.1	0		0.1	0.3
2016	0.2	0.1	0.1	0.2	0.1	0.7
2017	0.4	0.1	0	0.1	0.2	0.8
2018	0.4	0.1	0.1	0.2		0.8

Year	SE	DE	IE	ES	IT	total
2019	0.5	0.1	0			0.6
2020	0.2	0.1	0.1			0.4
2021	0.2	0.1	0			0.3
2022	0.1	0.1	0			0.2
2023	0.3		0.1			0.4

Table 7: Releases for silver eel from 2001 to 2023 in millions, reported by countries SE Sweden, FI Finland, NL Netherlands, IE Ireland, Fr France, ES Spain, GR Greece and total. NL data missing for 2023.

Year	SE	FI	NL	IE	FR	ES	GR	total
2001				0				0
2002				0				0
2003				0				0
2004				0				0
2005				0				0
2006				0				0
2007				0				0
2008				0.1				0.1
2009				0.2		0		0.2
2010	0			0.2				0.2
2011	0		0	0.2	0.1			0.3
2012	0		0	0.2	0.1	0		0.3
2013	0		0	0.2	0.1		0	0.3
2014	0	0	0	0.3	0.2		0.1	0.6
2015	0	0	0	0.3	0.2		0.1	0.6
2016	0	0	0	0.2	0.2		0.1	0.5
2017	0	0	0	0.2	0.2		0.1	0.5
2018	0	0	0	0.2	0.2		0	0.4
2019	0	0	0	0.2	0.2	0	0	0.4
2020	0	0	0	0.2	0.2	0	0	0.4
2021	0	0	0	0.2	0.1		0	0.3
2022	0	0	0	0.2	0.1	0	0	0.3
2023	0	0		0.2	0.1		0	0.3

Table 8: Releases for ongrown glass eel from 1947 to 2024 in millions, reported by countries: EE Estonia, LV Latvia, LT Lithuania, PL Poland, DE Germany, DK Denmark, ES Spain.

Year	EE	LV	LT	PL	DE	DK	NL	GB	ES
1947							1.6		
1948							2		
1949							1.4		
1950							1.6		
1951							1.3		
1952							1.2		
1953							0.8		
1954							0.7		
1955							0.9		
1956							0.7		
1957							0.8		
1958							0.8		
1959							0.7		
1960							0.4		
1961							0.6		
1962							0.4		
1963							0.1		
1964							0.3		
1965							0.5		
1966							1.1		
1967							1.2		
1968							1		
1969							0		
1970							0.2		
1971							0.3		
1972							0.4		
1973				0.1			0.5		
1974				0			0.5		

Year	EE	LV	LT	PL	DE	DK	NL	GB	ES
1975							0.5		
1976							0.5		
1977				0			0.6		
1978							0.8		
1979							0.8		
1980				0			1		
1981							0.7		
1982				0.1			0.7		
1983				1.1			0.7		
1984				0.2			0.7		
1985				0.1	2		0.8		
1986				0	1.8		0.7		
1987				0	1.8		0.4		
1988	0.2			0	1.1		0.3		
1989				0.2	0.5		0.1		
1990				0.4	0.9		0		
1991				0	1.1		0		
1992				0.1	1.3		0		
1993				0	1.7		0.2		
1994				0.1	1.7		0		
1995	0.1			0	2.1		0		
1996				1	2.5		0.2		
1997				2.2	2.8		0.4		
1998				0.8	3.2		0.6		
1999				1	3.6		1.2		
2000				1.4	5.4		1		0
2001	0.4			0.8	4.6		0.1		0.1
2002	0.4			0.8	6		0.1		0
2003	0.5			0.6	6.3		0.1		0

Year	EE	LV	LT	PL	DE	DK	NL	GB	ES
2004	0.4			0.8	6.4		0.1		0.1
2005	0.4			0.7	5.2		0		0.1
2006	0.4			0.9	8.6		0		0
2007	0.3			1.4	8.6		0		0
2008	0.2			1.5	8.5		0.2		
2009	0.4			1.4	8.4		0.3		
2010	0.2			1.3	8.8		0.1		
2011	0.2		0.2	2.9	7.2		0.4		0
2012	0.1		0.5	1.7	6.3		0.4		0.2
2013	0.1		1.3	3.7	6.9		0.5		0.1
2014	0.2		0.4	2.3	8.4		0.9		0.3
2015			0.4	3.8	8.7		0.7		
2016	0.2		0.3	1.5	7	1.5	0.5		
2017	0.3		0	3.6	9.5	1.5	0.6		
2018		0	1.6	2.4	9.6				0.1
2019			1.6	1	9.7	1.8			0.2
2020			1.4	0.9	8.3	1.3			0.1
2021	0.1	0	0	1.8	8.8	1.2			0
2022	0.1	0	1.7	6.9	8.2	1.8	0.4	0.3	0.1
2023		0	1.3	1.4		1.7	0.3		0.3
2024						1.4	0.4		

Table 9: Part a Aquaculture for all stages in tonnes from 1984 to 2023 reported by countries: SE Sweden, FI Finland, EE Estonia, LT Lithuania, PL Poland, DE Germany, DK Denmark (to be continued for other countries in next table).

Year	SE	FI	EE	LT	PL	CZ	DE
1984							
1985							
1986							
1987							
1988							
1989							
1990							
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998				2			
1999				2			
2000				1			
2001				5			
2002			20	17			
2003			40	20			
2004	158		50	9			328
2005	222		80	8			329
2006	191		100	12			567
2007	175		100	13			774
2008	124.4		90	10.6			749.4
2009	142.6		60	12			667
2010	92.8		40	8.3			681

Year	SE	FI	EE	LT	PL	CZ	DE
2011	91.4		50	12.6			692
2012	93.4		70	3.5		0.5	744
2013	91.7	0		3.4		0.4	758
2014	64.4	0.5	55.7	7.1		0.2	926
2015	104.3	0.5	52.5	0.2	0.6	4.9	1176
2016	117.1		60.9	36.4	1	2.3	1099
2017	75		50		2.8	0.4	1111
2018	64.6				3.1	0.7	1132
2019	81					1.1	1286
2020	73.9				61.8		1125
2021	89.2				7.8		1285
2022	95.7				45.1		1285
2023	44.2						

Table 9: Part b Aquaculture for all stages in tonnes from 1984 to 2023 reported by countries: DK Denmark, NL Netherlands, ES Spain, PT Portugal, IT Italy, GR Greece, MA Morocco, and total.

Year	DK	NL	ES	PT	IT	GR	MA	total
1984	18							18
1985	40							40
1986	200							200
1987	240	100						340
1988	195	300						495
1989	430	200						630
1990	586	600						1186
1991	866	900						1766
1992	748	1100						1848
1993	782	1300						2082
1994	1034	1450						2484
1995	1324	1540						2864
1996	1568	2800						4368
1997	1913	2450						4363
1998	2483	3250	347.1					6082.1
1999	2718	3500	383.1					6603.1
2000	2674	3800	411.1					6886.1
2001	2000	4000	339.1					6344.1
2002	1880	4000	295.1					6212.1
2003	2050	4200	292					6602
2004	1500	4500	377		1220	429		8571
2005	1700	4500	321		1131	261		8552
2006	1900	4200	275		807	290		8342
2007	1617	4000	369		1000	365		8413
2008	1740	3700	460		550.7	396		7821.1
2009	1707	3200	493		677.4	428		7387
2010	1537	2000	392	0.3	647.2	320		5718.6
2011	1156	2300	468	0.6	509.3	377		5656.9

Year	DK	NL	ES	PT	IT	GR	MA	total
2012	1093	2600	373	0.9	737	281		5996.3
2013	824	2900	393	1.4	642.1	432	340	6386
2014	842	2300	406	0.9	571.9	220	350	5744.7
2015	1234	2000	454	0.9	750	270.9	280	6328.8
2016	1033	2000	330	1.1	710.1	289.5	282	5962.4
2017	549.6	2005	292.3	33	528.6	184.3	274	5106
2018	893.9	2155	346.2	0.5	509.4	128	257.4	5490.8
2019	490.3	2200	318.9	0.8	464	146.4	289.2	5277.7
2020	659	2065	338	0.1	406.6	184.4	183	5096.8
2021		1950	339.7	0	443.1	297.1		4411.9
2022	462.7	2000	335.1	0	550	221.2		4994.8
2023	172.7	2000	302			152.4		2671.3

Table 10: Other landings (nb in millions) of glass eels (G and OG) (1959 - 2023) for Ireland IE.

Year	IE
1959	6.6
1960	1
1961	3.7
1962	5.6
1963	7.8
1964	0.7
1965	1.3
1966	10
1967	6.9
1968	15
1969	8.2
1970	9.3
1971	16.4
1972	6.3
1973	10
1974	10.9
1975	4.8
1976	7.4
1977	2.9
1978	3.7
1979	29.6
1980	26.1
1981	17.5
1982	26.4
1983	9.9
1984	7.6
1985	6.1
1986	5.4

Year	IE
1987	13.9
1988	12.5
1989	6.9
1990	10.2
1991	2.2
1992	5.7
1993	7.2
1994	18.9
1995	11.3
1996	3.9
1997	15
1998	5.7
1999	7.7
2000	5.8
2001	3
2002	1.4
2003	4.2
2004	1.4
2005	3.7
2006	0.6
2007	1
2008	0.4
2009	0.4
2010	0.4
2011	0.3
2012	0.6
2013	1
2014	2.8
2015	2.9

Year	IE
2016	4.5
2017	0.7
2018	8.4
2019	0.5
2020	2
2021	1.7
2022	4.2
2023	2.7

Table 11: Other landings for yellow eel from 1979 to 2023 in millions, reported by for Ireland IE.

Year	IE
1979	0.1
1980	0.3
1981	0.1
1982	0.1
1983	0.1
1984	0
1985	0.1
1986	0.2
1987	0.1
1988	0.1
1989	0.1
1990	0.1
1991	0
1992	0
1993	0.1
1994	0
1995	0.1
1996	0
1997	0.1
1998	0
1999	0.1
2000	0
2001	0
2002	0.1
2003	0.1
2004	0
2005	0.1
2006	0

Year	IE
2007	0.1
2008	0.1
2009	0
2010	0
2011	0
2012	0
2013	0
2014	0
2015	0
2016	0.1
2017	0
2018	0.1
2019	0
2020	0.1
2021	0
2022	0
2023	0.1

Table 12: Other landings for silver eel from 2001 to 2023 in millions, reported by countries SE Sweden, IE Ireland, and total.

Year	SE	IE	total
2001		0	0
2002		0	0
2003		0	0
2004		0	0
2005		0	0
2006		0	0
2007		0	0
2008		0.1	0.1
2009		0.2	0.2
2010	0	0.2	0.2
2011	0	0.2	0.2
2012	0	0.2	0.2
2013	0	0.2	0.2
2014	0	0.3	0.3
2015	0	0.3	0.3
2016	0	0.2	0.2
2017	0	0.2	0.2
2018	0	0.2	0.2
2019	0	0.2	0.2
2020	0	0.2	0.2
2021	0	0.2	0.2
2022	0	0.2	0.2
2023	0	0.2	0.2

Annex 12: Audit

Audit of European Eel (*Anguilla anguilla*)

Date: 29-30 Sept 2024

Auditor: Russell Poole, Janis Kolangis

General

The European eel is regarded a single panmictic stock, spread all over Europe and the Mediterranean. ICES has provided advice on European Eel on precautionary grounds. Trends in recruitment are considered to be indicative for the whole stock.

For single stock summary sheet advice:

1) **Assessment type:** Update, to be able to provide annual advice
2) **Assessment**: Trends in recruitment, for both glass eel and yellow eel combined (dominated by recruits from the current year – referred to as the Glass eel Trend, and, separately, for yellow eel recruitment trend, which is often dominated by recruits from the previous year and earlier and continuing multiple age classes – referred to as Yellow Eel Trend
3) **Forecast**: Not assessed or presented
4) **Assessment model**: A GLM is applied to describe trends in recruitment – as described in the Stock Annex. *The trends in recruitment indices have been validated using a different analytical approach (GEREM) (Bournarel, 2021).* The 1960–1979 geometric mean recruitment is considered a likely limit reference point (R_{lim}). Given that the current recruitment estimate has been below R_{lim} for many years, it is assumed that current biomass is below B_{lim}. Therefore, while stock-size reference points are also undefined, it is considered that the stock size is well below potential biological limit reference points.

   The audit notes that a two-step Benchmark is proposed for eel, first for the current assessment of recruitment trends, and second, for a new stockwide assessment approach. It is anticipated that these benchmarks will led to better standardization of data collection across the range.

5) **Data issues:** Data are available as described in stock annex and in Chapter 2 of the WGEEL Report. Timing of data call and meeting means that some data series on glass and yellow eel recruitment are not complete for the present year. Therefore, each year the recruitment index is updated when the complete data from the previous year is available.

   In 2024, the WGEEL carried out a retrospective analysis, including a Mohn's Rho index, of the quality of the assessment (See Annex 3 of the WGEEL Report 2024) which

concluded, there were no specific patterns in the data and the trends were consistent among assessment years, suggesting that the assessment is robust

Some late reporting of some data, by up to 5 years, may be an issue for some data series – e.g. landings, recreational catches. There also appears to be a lack of reporting of biomass and mortality (datacall Annexes 10 & 11) by a number of countries. WGEEL reports compliance issues to the ICES Datacall secretariat to the extent possible. Given the complexity and size of the data call, systematically identifying compliance issues is, however, challenging and WGEEL is continuously working on improving this process. In 2024, specifically addressing issues with the reporting of biomass indicators and mortality (Datacall Annex 10 & 11), in order to address these prior to WKEMP in November 2024.

6) **Consistency**: Same assessment method as last year and as described in the Stock Annex: GLM. Incomplete reporting of some data (usually just in the current year where fishing seasons are not complete by the time of the data call) means the last few years get recalculated on an annual basis, but the overall trend remains largely similar. The retrospective analysis (see #5 above) supports this view.

7) **Stock status**: The status of European eel remains critical. After high levels in the late 1970s, the European eel recruitment declined dramatically in the 1980s and currently remains low. 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 1.1% in 2024 (provisional) and 0.5% in 2023 (updated). In the "Elsewhere Europe" index series it was 7.2% in 2024 (provisional) and 7.4% in 2023 (updated). The yellow eel recruitment index for 2023 was 11.4% (complete data) of the 1960–1979 geometric mean.

   Time-series from 1980 to 2024 show that glass eel recruitment remains at a very low level.

8) **Management Plan**: The Council Regulation (EC) 1100/2007 obliges EU Member States to produce Eel Management Plans (EMP), report national stock indicators, to take management measures and to report progress. Non-EU countries have no such legal obligation, but the same aspirations are necessary to provide a whole-stock assessment and management.

   Significant progress has been made in the GFCM area towards a stock assessment and a multi-objective assessment of alternative management measures. Current (Bcurrent) and historic silver eel escapement biomass (Bo) was assessed in 131 data-rich sites by the ESAM 3.0 model, an age-structured, demographic model. Sites assessed account for 60 % of current wetted areas of eel habitat in the Med, and results highlight that most current silver eel escapement (in biomass) in the region occurs from lagoon habitats. Also, results indicate that currently implemented seasonal closures provide low protection for the escaping silver eel stage and will unlikely substantially increase spawning stock biomass.

   The Working Group provides EIFAAC, ICES and the GFCM countries with support in implementing and improving such actions. The EU has requested recurring scientific advice on the European eel in support of the Eel Regulation and in line with triennial reporting. Management Plans related to the EC Eel Regulation were not evaluated by

ICES. Next reporting of bioindicators and mortality to the EU and in the datacall was in 2024. 14 countries have complied with the provision of Datacall Annex 10 (biomass indicators) and 15 countries with the provision of Annex 11 (mortalities) which will be required in advance of the WKEMP in November 2024.

General comments

This was a well-documented, well-ordered chapter (Ch 2) and overall report. Keeping the same format from previous years, and in the Stock Annex, assists in the continuity of the advice. Some issues have been highlighted above relating to apparent non-compliance and delayed or non-reporting of data by some Member States in the datacall. Feedback to countries on compliance with the datacalls would considerably improve the quality of the assessment and the advice and would also support accurate figures and graphs for stakeholders.

A new item came to the attention of the audit, in relation to the potential for artificially produced eel bred in captivity. While this is some time away, the potential for closed loop aquaculture is welcome as it would remove that pressure from the wild stock. However, lessons should be learnt from other species also reared in captivity, such as Atlantic salmon, to avoid using these fish in wild restocking and also to avoid inadvertent releases or escapes. This is to avoid any genetic introgression and loss of fitness in the wild stock. A special joint workshop is suggested, maybe under a ToR in WGAGFA.

Technical comments

- There is some confusion in the report between the "Number of Series" used in the analysis and the "number of data points" reported in the recent years. It is also not clear if missing data in the current and/or previous year is not reported or is a genuine zero. An approach needs to be developed to solve this and to aid in feedback on compliance with the datacalls.
- Page 19: 2.4.1.2 Yellow and Silver Eel: It says the number of countries reporting was 21/23 – there are 26 listed on the figure. Is the 21/23 referring to those that report landings and are 4 reporting closed fisheries – e.g. zero landings or are some not reporting?
- 2.4.2 Recreational landings graph for yellow/silver eel; the 2023 data are either incomplete or there has been a big drop in landings in 2023. Why is it so? – it was 2023 and was therefore requested in the datacall. In plenary, it transpired that Germany had not reported and Denmark had closed its fisheries (landings = 0). This should be mentioned in the Figure caption and the text.
- There is confusion in the Releases chapter (2.5) which needs to be sorted out. Translocated stocked eel are being confused with those trapped and released in assisted migrations around barriers within rivers.

  This general confusion about what catches should be included in Other Landings, and consequentially, what catches should then be included in Releases needs to be clarified.

  The graph of releases of ongrown eel in Ch 2.6.2 shows a marked drop in 2023 and 2024 – is this a real drop or a lack of reporting of data?

Conclusions

The stock assessment of recruitment trend has been performed correctly.

The audit notes a need for clarity on compliance with data reporting, and making clear the differences between no data reported, and zero. This is unclear in many of the data figures.

The audit notes the need for a benchmark of the recruitment analysis, and a later benchmark of a new assessment framework.