# ECOREGION Widely distributed and migratory stocks
# STOCK European eel

**Advice for 2014**

The status of eel remains critical and urgent action is needed. ICES advises that all anthropogenic mortality (e.g. recreational and commercial fishing, hydropower, pollution) affecting production and escapement of silver eels should be reduced to as close to zero as possible, until there is clear evidence of sustained increase in both recruitment and the adult stock.

Restocking under the eel management plans is not expected to have contributed to increased silver eel escapement yet because of the generational lag time. The efficacy of restocking for recovering the stock remains uncertain while evidence of net benefit is lacking.

**Stock status**

The annual recruitment of glass eel to European waters has increased over the last two years, from less than 1% to 1.5% of the 1960–1979 reference level in the 'North Sea' series, and from 5% to 10% in the 'Elsewhere' series.

**Management plans**

A management framework for eel within the EU was established in 2007 through an EC Regulation (EC No. 1100/2007; EC, 2007), but there is no internationally coordinated management plan for the whole stock area. The objective of the EU regulation is the protection, recovery, and sustainable use of the stock. To achieve the objective, Member States have developed eel management plans for their river basin districts, designed 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. ICES has evaluated the conformity of the national management plans with EC Regulation No. 1100/2007 (ICES, 2009a, 2010a) and progress in implementing the Environmental Management Plan (EMP) actions (ICES, 2013a).

In 2007, eel was included in CITES Appendix II that deals with species not necessarily threatened with extinction, but for which trade must be controlled to avoid utilization incompatible with the survival of the species (see http://www.cites.org/eng/disc/how.php). Eel was listed in September 2008 as critically endangered in the IUCN Red List. The CITES listing was implemented in March 2009.

**Biology**

European eel life history is complex. The stock is panmictic and indications point at random mating of adults in the spawning area in the southwestern part of the Sargasso Sea. The newly-hatched leptocephalus larvae drift with the ocean currents to the continental waters of Europe and North Africa where they metamorphose into glass eels; this dispersal is believed to be random.

The growth stage, known as yellow eel, takes place in marine, brackish, or freshwater. This stage may last from as little as two years to several decades prior to metamorphosis to the silver eel stage and maturation. Age-at-maturity varies according to latitude, ecosystem characteristics, and density-dependent processes. The European eel life cycle is shorter for populations in the southern part of their range compared to the north. Silver eels then migrate to the Sargasso Sea where they are believed to spawn and die.

**Environmental influence on the stock**

Environmental conditions at the spawning grounds and during the oceanic phase are likely to affect the stock, but it is unknown whether and to what extent changes in these conditions have influenced the observed stock declines.

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

An increased awareness of contaminants in eel, in relation to safe human consumption limits, is leading to fishery closures to protect consumers. These selective closures may lead to an increased proportion of low quality spawners in the escapement. It is likely that there is a negative relationship between contaminant loads, parasites, and diseases in eels and their spawning success. However, these effects have not been quantified.

**The fisheries and other mortality causes**

The assessment and management of the fisheries and non-fisheries mortality factors are managed by national and regional authorities. Fisheries take place on all available continental life stages throughout the distribution area, although fishing pressure varies from area to area, from almost nil to heavy overexploitation.

The non-fishing anthropogenic mortality factors can be grouped as those due to (a) hydropower, pumping stations, and other water intakes; (b) habitat loss or degradation; and (c) pollution, diseases, and parasites. In addition, anthropogenic actions may affect mortality due to predators, e.g. conservation or culling of predators. In the 2012 EMP Progress Reports, 43 EMPs reported mortality rates for both fishing and non-fishing pressures: the rate due to fishing (F) exceeded that due to non-fishing pressures (H) in 24 eel management units (EMUs), H exceeded F in 15 EMUs, and the rates of F and H were equal in the last four EMUs.

**Effects of the fisheries on the ecosystem**

The current fishery probably has little direct influence on aquatic ecosystems, with the possible exception of local bycatch issues. However, the eel is an important and frequently dominating species in the ecosystem, and its substantial reduction, whether due to fisheries or other causes may have had a more profound effect. There is limited knowledge on the magnitude of these effects.

**Data quality considerations**

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

Many EU Member States have not completely reported stock indicators (22 of 81 EMPs did not report all biomass indicators and 38 did not report all mortality indicators in 2012), and there are inconsistencies in the approaches used to calculate reported stock indicators. The distribution area of the eel extends considerably beyond the EU, and data from countries in these other regions were not available. A complete reporting of indicators covering the range of the European eel is required for a full assessment of the stock. To facilitate this, data collection and analysis should be internationally standardized.

**Scientific basis**

The assessment is based on data from fisheries and scientific surveys, and on national stock indicators. Monitoring trends in recruitment has been the main tool in the recent past for assessing the overall status of the eel stock. Methods based on national stock indicators of biomass and mortality, have been recently developed and have been applied this year.

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|---|---|
| **Assessment type** | Trend analysis; comparison of indicators with management reference points. |
| **Input data** | Glass eel and yellow eel recruitment indices; national stock indicators of biomass and mortality. |
| **Discards and bycatch** | Not included. |
| **Indicators** | See above. |
| **Other information** | Landing statistics incomplete and reporting inconsistent. Stock indicators incomplete from eel management units/countries in the EU. Stock indicators and other data missing from non-EU states. There is no international legislative requirement to collect and provide data for the whole stock area. |
| **Working group report** | Joint EIFAAC/ICES WGEEL (ICES, 2013b). |

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**Reference points**

The EC Regulation sets an escapement target 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.

**Additional considerations**

*Management considerations*

There is evidence that translocated and stocked eel can contribute to yellow and silver eel production in recipient waters, but evidence of contribution to actual spawning is limited by the general lack of knowledge of the spawning of any eel. Internationally coordinated research is required to judge the net benefit of restocking for the overall population, including carrying capacity estimates of glass eel source estuaries as well as detailed mortality estimates at each step of the stocking process.

When stocking to increase silver eel escapement to aid stock recovery, an estimation of the prospective net benefit should be made prior to any stocking activity. Current high prices for glass eel are limiting the ability of EU Member States to meet stocking targets in the eel management plans. Where eel are translocated and stocked, a means must be put in place to evaluate their fate and their contribution to silver eel escapement. This might take the form of batch marking of eel to distinguish groups recovered in later surveys (e.g. recent Swedish and French marking programmes), or implementation of tracking studies of eel of known origin.

**Factors affecting the fisheries and the stock**

*Regulations and their effects*

As eel is a long-lived species and anthropogenic mortalities occur over all of its continental lifespan, the effect of management measures on the eel stock is expected to take several years, up to a decade or more, to be detected (ICES, 2009b). While measures directly increasing the escapement of silver eels (e.g. fisheries closures, trap-and-transport) may result in an increase in glass eel recruitment within two to three years, it will take longer to see the effects of measures affecting glass and yellow eel mortalities. Furthermore, it will take a decade or more for any increases in recruitment to affect subsequent spawner escapement, and when this occurs, the natural variability of these migrations, local site effects, and sampling error will further delay the detection of such changes (ICES, 2011a, 2011b, 2011c). The reporting by Member States to the EC in 2012 is a first step in reviewing progress with the stock recovery, and the present assessment indicates that, in the short term, a major further reduction in anthropogenic mortality is required.

The implementation of the eel management plans have resulted in restrictions on fisheries. Poaching is believed to be widespread in some countries.

*The environment*

Uncertainties remain in the local and international effects of environmental impacts on the stock.

It is not yet possible to integrate eel quality in the quantitative stock assessment. In some areas contamination by hazardous substances is so high that an effect on reproduction may occur, but hard scientific evidence (dose/response studies) is not available. Gaps in knowledge mean that there is a need to better quantify the effects of parasites, diseases, and contaminants on migration and reproduction success. Furthermore, there is a need for standardization of eel quality assessments as different analytical methods and data reporting make comparisons difficult.

The non-native parasite *Anguillicola crassus* that infects the swimbladder of eel is now widespread in Europe and is continuing to spread. As *A. crassus* impacts on the health, energy reserves, and migratory behaviour of the eel, it could hinder recovery of the stock.

**Scientific basis**

*Data and methods*

The assessment methods used for the 2013 assessment are based on analysis of eel recruitment time-series.

Monitoring recruitment is not an obligation in the Water Framework Directive, Data Collection Framework, or Eel Regulation. It is anticipated that eel recruitment monitoring will be included in the Data Collection – Multi-Annual Plans (DC–MAP) from 2015 onwards, as recommended by ICES in 2012 (ICES, 2012).

Some EU Member States now report quantitative estimates of the stock indicators (EMP progress reports 2012, ICES Data Call 2013, Country reports to WGEEL 2013). However, the reporting is incomplete from within the EU, and there is no legislative requirement for the collection and reporting of data from outside the EU. Both limitations need to be addressed.

*Standardization*

Regional or international coordination and standardization will facilitate data collection, and allow the international integration towards stock-wide assessment and advice.

*Uncertainties in assessment and forecast*

The assessments are limited by the incomplete spatial and temporal coverage of the available data. Quantifying the impact of reduced eel quality on the reproductive potential of spawners should be pursued.

*Considerations regarding the quality of the advice*

Advice derived from the available recruitment data is robust to the uncertainties in these data.

**Comparison with previous assessment and advice**

The assessment is based on examination of recruitment trends as before. The recruitment has recently increased, to 1.5% of the 1960–1979 reference level in the 'North Sea' series, and to 10% in the 'Elsewhere' series. This might affect escapement biomass in several years. Therefore, there is no change in the perception of the status of the stock.

**Sources of information**


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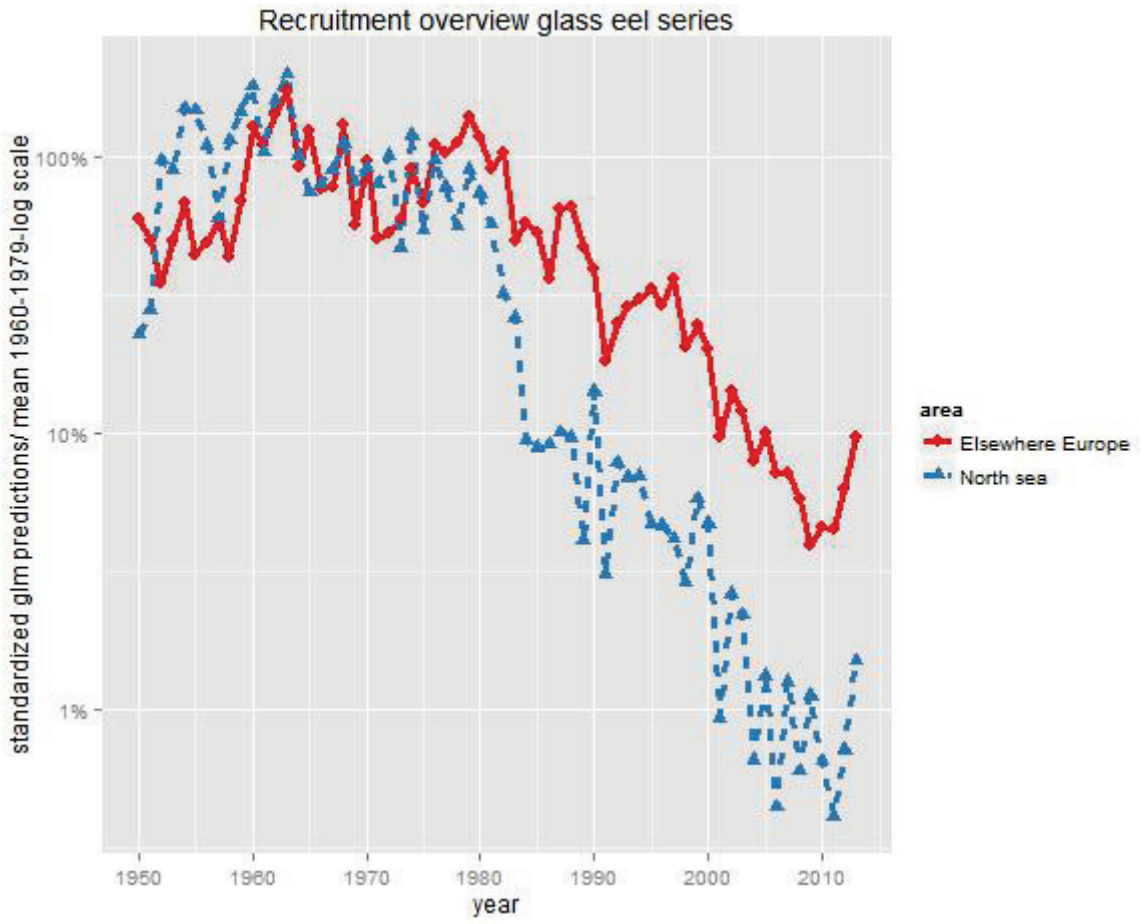


**Figure 9.4.7.1** WGEEL recruitment index: mean of estimated (GLM) glass eel recruitment for the North Sea and elsewhere in Europe updated to 2013. The GLM (recruit = area:year + site) was fitted on 34 series glass eel series comprising either pure glass eel or a mixture of glass eels and young-of-year yellow eels and scaled to the 1960–1979 average. No series for glass eel are available in the Baltic area. Note the logarithmic scale on the y-axis. The North Sea series are from Norway, Sweden, Germany, Denmark, Netherlands, and Belgium. The Elsewhere series are from UK, Ireland, France, Spain, Portugal, and Italy.

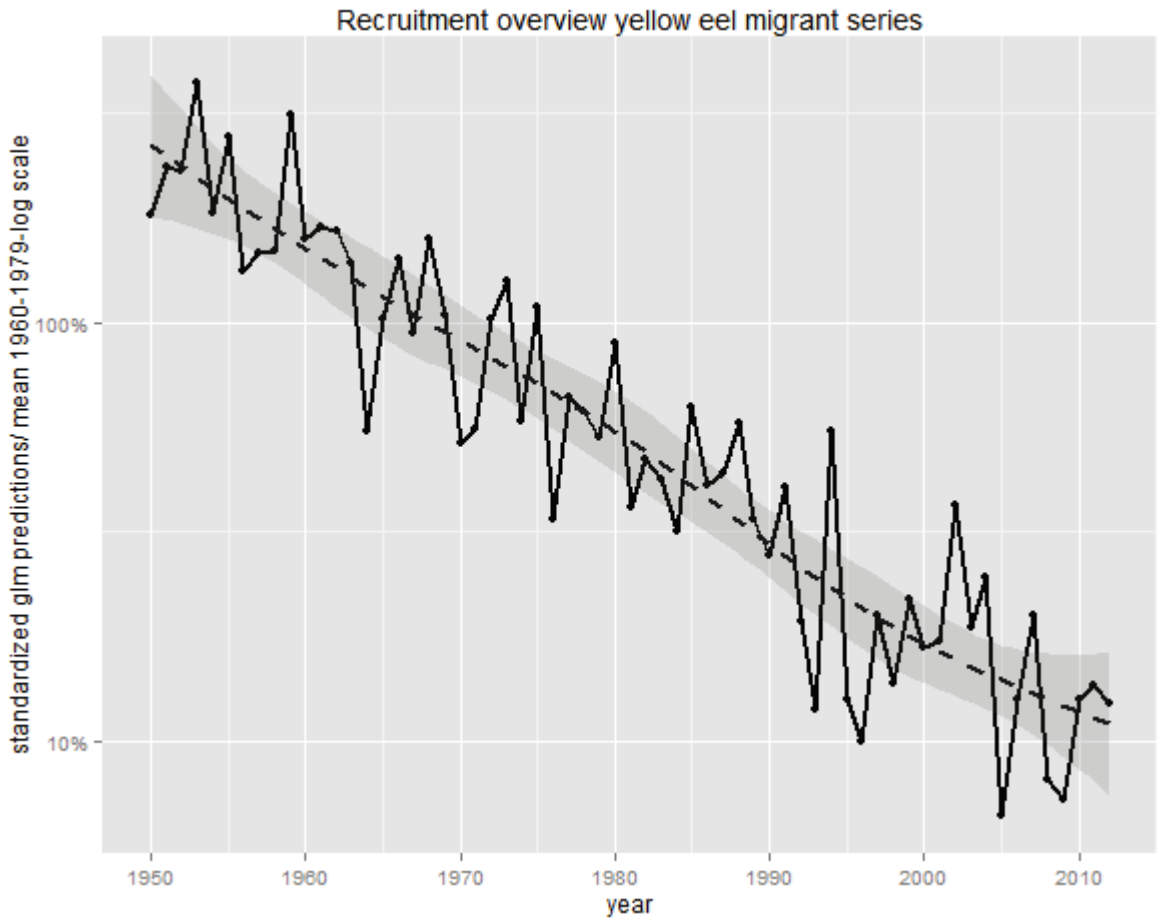


**Figure 9.4.7.2** Mean of estimated (GLM) yellow eel recruitment and smoothed trends for Europe updated to 2013. The GLM (recruit = year + site) was fitted to ten yellow eel series and scaled to the 1960–1979 average. Note the logarithmic scale on the y-axis. The grey band shows the 95% point-wise confidence interval of the smoothed trend. These time series are from Sweden, Denmark, and Belgium.