ECOREGION Widely distributed and migratory stocks
STOCK European eel

Advice for 2015

The status of eel remains critical and ICES advises that all anthropogenic mortality (e.g. recreational and commercial fishing, hydropower, pumping stations, and pollution) affecting production and escapement of silver eels should be reduced to – or kept as close to – zero as possible.

Stock status

The annual recruitment of glass eel to European waters has increased over the last three years, from less than 1% to 3.7% of the 1960–1979 level in the 'North Sea' series, and from 5% to 12.2% in the 'Elsewhere' series. However, both recruitment indices are still below the 1960–1979 levels and there is therefore no change in the perception of the status of the stock.

In September 2008 and again in 2014, eel was listed in the IUCN Red List as a critically endangered species.

Management plans

A management framework for eel within the EU was established in 2007 through an EU regulation (EC Regulation 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, EU Member States have developed Eel Management Plans (EMP) for their river basin districts, designed to allow at least 40% of the silver eel biomass to escape to the sea with high probability, relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock. ICES has evaluated the conformity of the national management plans with EC Regulation No. 1100/2007 (ICES, 2009a, 2010a) and progress in implementing EMP actions (ICES, 2013b). The EU Member States produced their first progress report in 2012. The next progress reporting is scheduled for 2015.

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. 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 fresh waters. 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, but even in the south, there are ten or more age groups of females in the silver eel run (for the entire distribution the number of age groups exceeds fifty). Silver eels are believed to spawn only once.

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 uncertain 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, all contribute to the anthropogenic stresses and mortality on eels and also affect their reproductive success. It is anticipated that the implementation of the Water Framework 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 carried out by national and regional authorities. Fisheries take place on all available continental life stages throughout the distribution area, although fishing pressure varies from area to area, from almost nil to heavy overexploitation.

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.

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.

In 2012, many EU Member States did not completely report stock indicators (22 of 81 EMPs did not report all biomass indicators, and 38 did not report all mortality indicators), and there are differences in the approaches used to calculate reported stock indicators. The distribution area of 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. The inclusion of the GFCM area is a welcomed development and should improve the coverage of eel stock data and assessment (GFCM, in prep.).

Scientific basis

The assessment is based on data from fisheries and scientific surveys. In the recent past monitoring trends in recruitment has been the main tool for assessing the overall status of the eel stock. Currently, reported biomass and mortality estimates have not been peer-reviewed and are not yet used in the assessment.

Assessment type	Trend analysis.
Input data	Glass eel and yellow eel recruitment indices.
Discards and bycatch	Not included.
Indicators	See above.
Other information	Landing statistics are incomplete and reporting inconsistent. Stock indicators are incomplete from eel management units/countries in the EU. Stock indicators and other data are missing from non-EU states. There is no international legislative requirement to collect and provide data for the entire stock area.
Working group report	Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL; ICES, 2014).

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Reference points

The EC Regulation sets an escapement limit of at least 40% of the silver eel biomass relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock.

Additional considerations

Management considerations

Management measures have been implemented as part of national management plans in the EU, and beyond. These measures should be reinforced and extended throughout the distribution area of eel.

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 determine the net benefit of restocking on 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 and thus aid stock recovery, an estimation of the prospective net benefit should be made prior to any stocking activity. Where eel are translocated and stocked, measures should be taken to evaluate their fate and their contribution to silver eel escapement. Such measures could be batch marking of eel to distinguish groups recovered in later surveys (e.g. recent Swedish, French, and UK marking programmes), or implementing tracking studies of eel of known origin. Marking programmes should be regionally coordinated.

Factors affecting the fisheries and the stock

Regulations and their effects

As eel is a long-lived species and anthropogenic mortalities occur through all of its continental lifespan, the effect of management measures on the eel stock is expected to take several years, even a decade or more, to be detected (ICES, 2009b). While measures directly increasing silver eel escapement (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). The reporting by EU Member States to the EU in 2012 was a first step in reviewing progress with the stock recovery. 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 has 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 methods used for the 2014 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 future developments of the Data Collection Framework, as recommended by ICES in 2012 (ICES, 2012).

Some EU Member States now report quantitative estimates of the stock indicators (EMP progress reports 2012 [EU, 2014; ICES, 2013c], ICES Data Call 2013, individual country reports to WGEEL [ICES, 2013a, 2014]). However, the reporting is incomplete from within the EU, and there is no legislative requirement for the collection and reporting of data or indicators from outside the EU. Both limitations need to be addressed although the inclusion of information from the GFCM area is a welcomed development and should improve the coverage of eel stock data and assessment.

Standardization

Regional or international coordination and standardization will facilitate data collection, allowing for 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, but the biomass and mortality indicators are less so.

Comparison with previous assessment and advice

The assessment is based on examination of recruitment trends as before. The recruitment indices have recently increased, to 3.7% of the 1960–1979 level in the 'North Sea' series, and to 12.2% in the 'Elsewhere' series. This might affect escapement biomass for several years.

However, both recruitment indices are still below the reference levels and there is therefore no change in the perception of the status of the stock.

Sources of information

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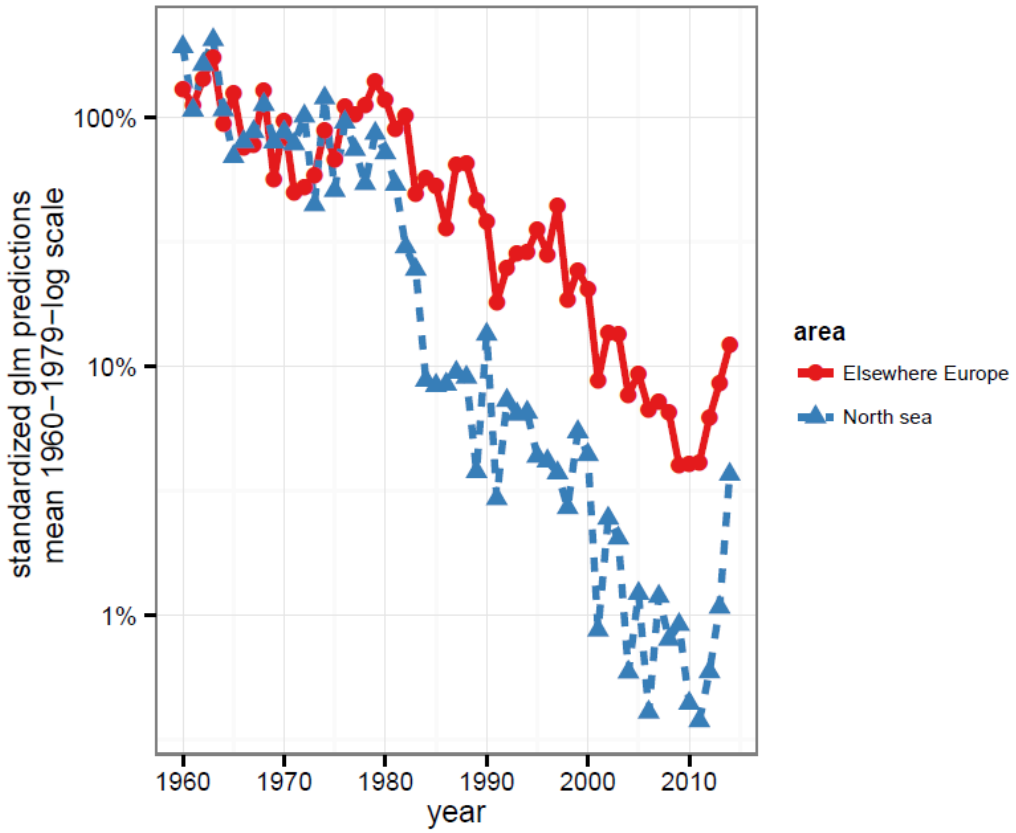

Figure 9.3.7.1 WGEEL recruitment index: mean of estimated (GLM) glass eel recruitment for the continental North Sea and elsewhere in Europe, updated to 2014 (ICES, 2014). No series are available for glass eel in the Baltic area. Note the logarithmic scale on the y-axis. The "North Sea" series are from Norway, Sweden, Germany, Denmark, the Netherlands, and Belgium. The "Elsewhere" series are from UK, Ireland, France, Spain, Portugal, and Italy.

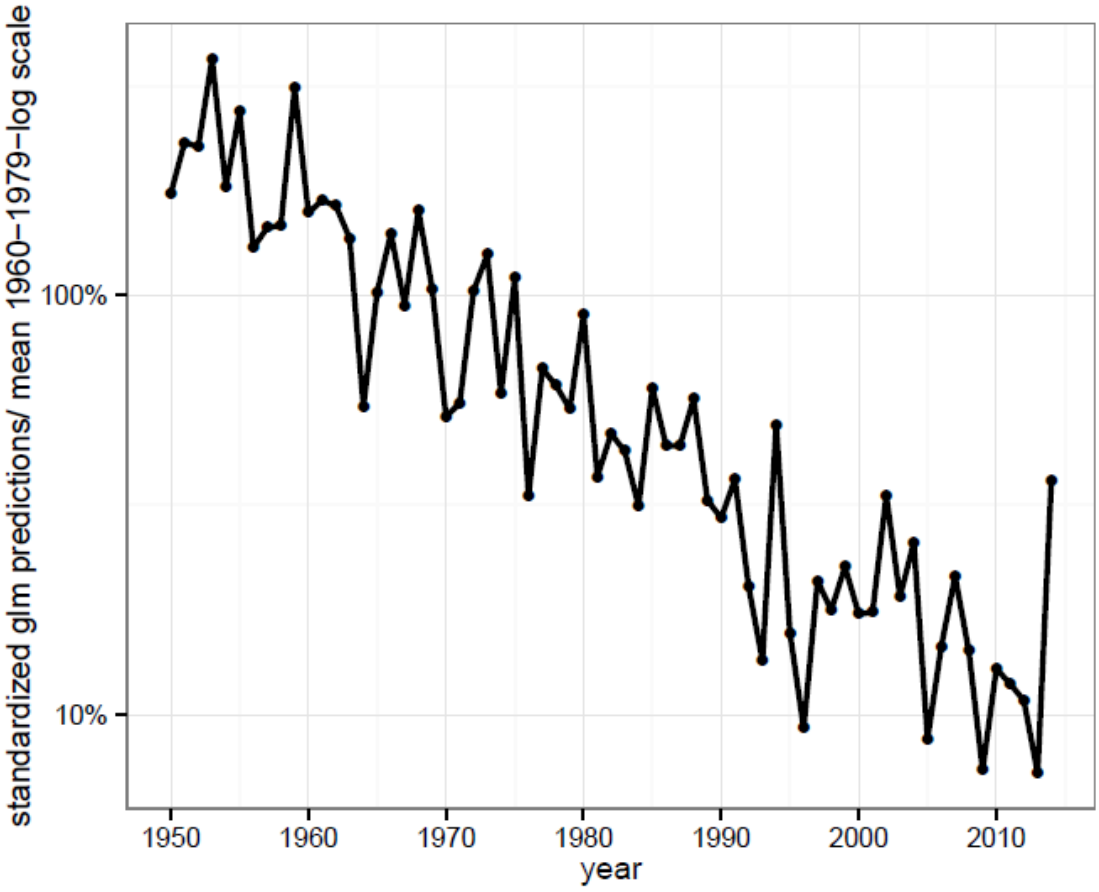

Figure 9.3.7.2 Mean of estimated (GLM) yellow eel recruitment and smoothed trends for Europe updated to 2014 (ICES, 2014. Note the logarithmic scale on the y-axis. These time-series are from Sweden, Denmark, and Belgium.