ECOREGION Widely Distributed and Migratory Stocks
STOCK European eel

Advice for 2011

ICES reiterates its previous advice that all anthropogenic mortality (e.g. recreational and commercial fishing, barriers to passage, habitat alteration, pollution, etc.) affecting production and escapement of eels should be reduced to as close to zero as possible until there is clear evidence that the stock is increasing. A concerted effort by all European countries to conserve eel habitats is urgently needed.

Given the current record-low abundance of glass eels, ICES reiterates its concern that glass eel stocking programs are unlikely to contribute to the recovery of the European eel stock. This is because (a) there is no surplus anywhere of glass eel to be redistributed to other areas and (b) there is evidence that stocked/translocated eels experience impairment of their navigational abilities.

Stock status

Abundance of the European eel stock continues to decline at an alarming rate. There are indications that recruitment is impaired by the current low level of spawning stock size. Abundance of all stages of eel (glass eel, yellow eel and silver eel) remains at the historical minimum. Recruitment in 2006, 2008, 2009 and 2010 has been especially low (Figures 9.4.9.1 and 9.4.9.2). In 2009, the decrease was sharp, especially in the northern part of the distribution area, with a drop of around 50–60% for glass eel between 2008 and 2009.

All glass eel recruitment series show clear and marked decadal reductions since the early 1980s.

Over the last 5 years glass eel recruitment has averaged between 1% (continental North Sea) and 7% (continental Atlantic) of the 1960–1979 levels (Figures 9.4.9.3 and 9.4.9.4).

A difference in spatial pattern of recruitment is observed at most stations in the North Sea, where the decline is sharper than elsewhere. There is no current clear explanation for that observation, although North Sea and Baltic Sea data are predominantly fisheries independent time series.

Recruitment of continental yellow eel has been declining continuously since the 1950s (Figure 9.4.9.5).

Management plans

A management framework for the eel stock was established in 2007 through an EU Regulation (EU 1100/2007). The objective of this 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 reduce anthropogenic mortalities and increase silver eel biomass. The objective of the eel management plans is to allow in the long term, with high probability, an escapement to the sea of the biomass of silver eel of at least 40%, relative to the best estimate of the theoretical escapement in pristine conditions (i.e. if the stock had been completely free of anthropogenic influences). ICES has evaluated whether individual EMPs by country are in accordance with the Regulation, but ICES could not evaluate whether the overall performance of national management plans are in accordance with the EU Regulation. The reason why ICES could not evaluate the plan was that some important countries had not quantified their plans and that some plans were not accepted.

Biology

European eel spawn in the Sargasso Sea and die after spawning. The larvae are transported by the Gulf Stream to North Africa and Europe and the juvenile eel enter coastal areas and freshwater as glass eel. They quickly transform into yellow eel and stay in Europe for 5–15 years or more. Growth and age at maturity are linked to regional temperature (mature later at colder temperatures). Then they start maturing, become silver eel and migrate back to the Sargasso Sea.

Environmental influence on the stock

Habitat alteration, including barriers to eel passage and deterioration in water quality (contaminants, diseases and parasites) contribute to the anthropogenic stresses on eels and also affect their reproductive success. In some cases, an improvement in water quality has been observed in the 1980s and 1990s and it is anticipated that future improvements

might be expected when the Water Framework and Marine Strategy Framework Directives are fully implemented. Due to bioaccumulation in eels, however, contamination in some areas remains a serious problem.

It is likely that there is a relationship between eel contaminant levels and spawning success. However, this could not be quantified.

The fisheries and other mortality causes

The fisheries target glass eel, yellow eel and silver eel. Both commercial and recreational fisheries are important. A large proportion of the catch is unreported. Many silver eel die in hydropower turbines when they migrate out of freshwater on their way to the Sargasso Sea. Cormorants consume a substantial amount of eel each year.

Effects of the fisheries on the ecosystem

The current eel fishery probably has no or minor influence on the marine ecosystems. However, the exploitation rate on eel may affect the riverine ecosystem through changes in species compositions. There is a limited knowledge on the magnitude of these effects.

Quality considerations

Total landings data have been found to be unreliable and it is hoped that the implementation of the DCF and eel Regulation/CITES traceability schemes will improve this situation. There was a great heterogeneity among the landings data with incomplete and inconsistent reporting by countries and changes in management practices were found to have also changed the reporting of non-commercial and recreational fisheries

Scientific basis

The advice on stock decline is based on recruitment indices both from surveys and commercial data. While the traceability element of the catch reporting has led to an improvement, particularly for glass eel, yellow and silver eel landings data remain unreliable, incomplete and need to be radically improved. Monitoring recruitment has been the main tool in the past for assessing the overall status of the eel stock. Monitoring recruitment is not an obligation in the WFD, DCF or Eel Regulation and this should be rectified.

Working group report: WGEEL

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Reference points

Exploitation that leaves 30% of the virgin spawning stock biomass is generally considered to be a reasonable target for escapement. Due to the uncertainties in eel management and biology, ICES proposed a limit reference point of 50% for the escapement of silver eels from the continent in comparison to pristine conditions (ICES, 2003). This is higher than the escapement level of at least 40% "pristine" set by the EU Regulation for the escapement of silver eels.

Management plan(s)

The eel stock in Europe is assumed to constitute a single, panmictic stock, jointly exploited and impacted by all countries. Restoration of the stock thus requires that protective measures are taken in all countries (or at least, no single country can presently be excluded without potentially jeopardizing a recovery).

In the Baltic Sea area, major interactions between countries have been identified, questioning the nation-by-nation (river-by-river) approach to management of Eel for this region. Silver eels, emigrating from one country, are being fished on their route towards the outlet; and possibly, young eels on their way into the Baltic Sea might be affected by coastal management in the countries around the inlet. Effective management of eel in the Baltic Sea requires that protective efforts are coordinated between countries, and/or potentially integrated into a single Baltic Sea Eel Management Plan, preferably with the aim of reducing all anthropogenic mortality as much as possible.

In order to rebuild the stocks to sustainable levels, Norway closed all fisheries for eel from January 2010 and onwards, except for a research programme (with a 50 t quota) to monitor the development of the stock in Norwegian waters. A range of management actions have been included in the EC eel management plans ranging from complete fisheries closures and hydropower mitigations (i.e. Ireland) to almost no fisheries restrictions accompanied by restocking programmes (e.g. Germany).

Local fishery closures have also been applied in Belgium and France in order to protect human health from the impact of high contamination levels; such closures interact with the implementation of the eel Regulation.

Additional considerations

Management considerations

In the 1970s, recruitment of glass eels was at an historical maximum level, since records began. This suggests that SSB was not limiting the production of recruits during this period.

The EU-Regulation 1100/2007 includes stocking, amongst many other measures, as one management option to increase silver eel escapement from River Basin Districts. Because there are evidence of impairment of the navigational abilities of stocked/translocated eels, and since there is no surplus of glass eel production which can be redistributed in other areas, countries with EMPs elements based on stocking are urged to revise their EMP accordingly.

It is important that monitoring of stock size and recruitment be continued and further enhanced so that future stock development can be measured and the efficacy of eel management plans can subsequently be quantified and evaluated. Following the implementation of eel management plans in July 2009 (although some have been delayed), national reports from Member States on their implementation practices are expected in 2012. Arrangements must be put in place as a matter of urgency to make monitoring data accessible and compiled in a form for international analysis.

It is recommended that data collection and reporting be co-ordinated at the international level to ensure quality assurance, standardised reporting and inter-calibration between assessment methods be executed to standardise results.

The minimum data requirement for this evaluation on stock status is B_{post} (Biomass of the escapement in the assessment year), B_{best} (estimated biomass in the assessment year based on the recent recruitment and assuming no anthropogenic impacts) and B_0 (biomass of the escapement in the pristine state), or equivalent trios, e.g. B_{post}, ΣA (sum of anthropogenic mortality) and B_0.

The escapement level of at least 40% "pristine" set by the EU regulation is below ICES proposal for a limit reference point of 50% for the escapement of silver eels.

Factors affecting the fisheries and the stock

Regulations and their effects

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

The environment

Recent research has indicated that pollution, diseases, and parasites may seriously impair the quality of individual silver eels, although the impact on the overall stock is unknown. On a pan-European scale, large differences in eel quality occur between areas and the quality of the eels leaving many systems is poor. New information indicates similar high levels of contamination to those which were reported previously in some countries (e.g. Belgium), at sites in other countries (e.g. France, The Netherlands, and Germany). In some cases, levels were so high that immediate actions had to be taken, and fisheries were closed as a human health protection measure.

For management purposes it is essential to understand the quality of eels present in European River Basin Districts (RBDs) in order to evaluate the reproductive potential of the silver eels leaving those systems and to compare eel quality between systems. However, there are many uncertainties and comparing the effects of different 'quality' pressures might not be appropriate. Little is known about the eel's sensitivity towards parasites, diseases, and contaminants under field conditions with respect to reproduction, and information will be required on setting threshold values for various contaminants.

A possible approach to this developed by the ICES in 2010 is an Eel Quality Index (EQI) which uses threshold values in a quality rating as demonstrated in Figure 9.4.9.6. It should be noted that this approach is not based on ecotoxicological data from dose-effect studies, but from environmental concentrations in the field. Nevertheless, they may provide a practical tool for classifying the intensity of contaminants in eels. As an example, the EQI values have been calculated in eels on the basis of their Sum 7 PCBs using recent data from case studies in Scotland, France, the Netherlands and Belgium. It should be stated that in most of the cases (Scotland, France, and the Netherlands) sample sites may not be representative of the quality of eels across the whole country. Furthermore, the sampling strategy was not standardised (e.g. length classes) and this could give rise to additional variation in contaminant levels. Figure 9.4.9.6 is an illustration of a 'traffic light' system that could be applied in the future to classify eel quality, based on standardised sampling programmes.

Anguillicoloides parasite continues its spread over Europe and occurs now in all countries. Infection levels are less in brackish water systems. Overall, the levels tend to decrease slightly. The quality of spawners also varies with biological characteristics such as fat content.

None of these quality parameters are currently included in the assessment of stock status, or in setting management targets. However, these quality parameters have impacts on the condition and behaviour of individual eels and may impact their reproductive success.

Scientific basis

Data and methods

Most EU Member States now have quantitative estimates of pristine and current silver eel production, although the quality of these data has not yet been fully evaluated. Estimates of current anthropogenic mortality have only been made by some, but this information will be required for reporting under the Regulation in 2012.

Uncertainties in assessment and forecast

The varying degrees of uncertainty in the estimates of pristine silver eel production make evaluation of progress toward the 40% recovery level (called for in the EU Regulation) difficult. The lack of spatial and process information on the effect of reduced spawner quality makes it challenging to quantify its impact on effective spawner biomass.

Reduced spawner quality and climate and ocean affects probably influence spawning success and recruitment to the continent, but these processes are not yet well understood. Under the precautionary approach, the absence of full knowledge and control of these factors strengthen the need to reduce all anthropogenic impacts to as close to zero as possible.

The implementation of the EU Regulation has the potential of improving data in the future. However, several long time-series have ceased or may be jeopardised in the near future due to changes in the local eel fisheries under the Eel Management Plans. Given the poor state of the stock and the high anthropogenic impacts, it is critically important that the existing fisheries-independent time series of recruitment be continued and supplemented. For all existing fisheries, effort and yield need to be monitored. Improved spatial coverage is needed to adequately characterize the quality of eels over the species area of distribution.

Current data collection programmes (EMPs, DCF, WFD, etc) need to be extended, co-ordinated, and integrated as a priority to support enhanced eel assessment and management. It is recommended that an international workshop be convened as a matter of urgency to achieve this.

Data collection, analysis and reporting needs to be co-ordinated at the international level and reporting of data should be standardised and quality assured. This integrated and internationally co-ordinated approach is particularly important in the Baltic Sea area where a joint management action is necessary. Procedures and assessments need to be in place and tested before 2012.

Comparison with previous assessment and catch options

There is no change in the perception of the stock: the status remains critical and shows no sign of recovery. The advice remains that urgent actions are needed to avoid further depletion of the stock.

Sources of information

EC. 2007. Council Regulation (EC) N° 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel.

ICES. 2003. Report of the ICES Advisory Committee on Fishery Management 2002. ICES Cooperative Research Report, 255: 938–947.

FAO/ICES. 2009. Report of the EIFAC/ICES Working Group on Eels, Goteborg (Sweden), 7–12 September 2010.

FAO/ICES. 2010. Report of the EIFAC/ICES Working Group on Eels, Hamburg (Germany), 9–14 September 2010.

ICES. 2010. Report of the Workshop on Baltic Eel, Stockholm (Sweden), 2–4 November 2010. ICES CM 2010/ACOM:59. *In prep*.

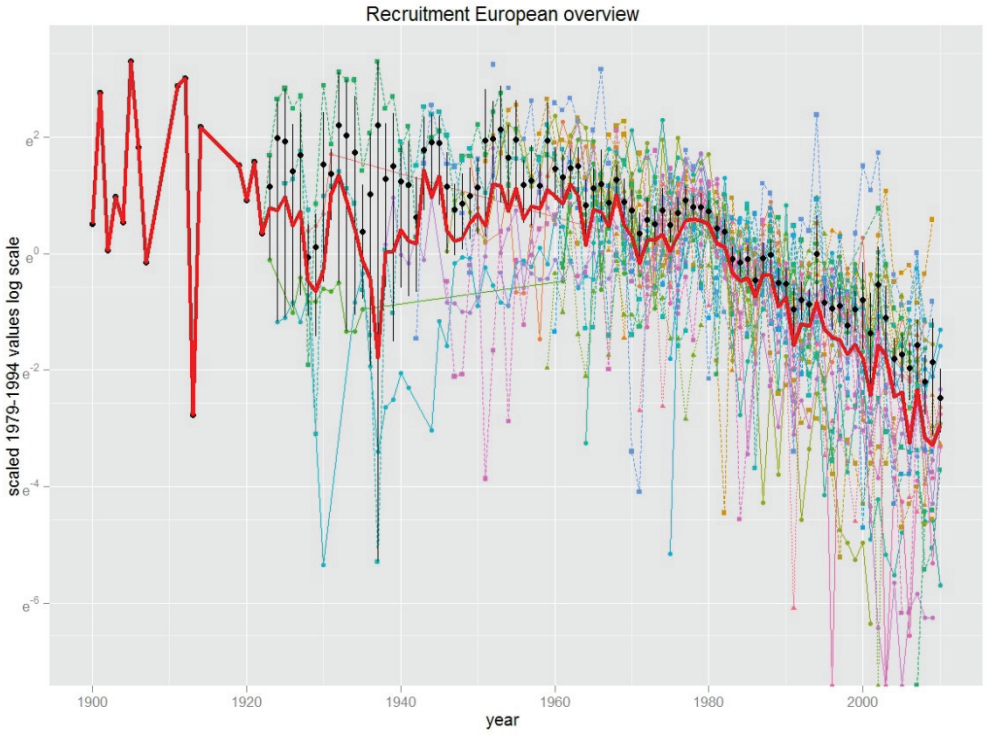

Figure 9.4.9.1 Time-series of monitoring glass eel and yellow eel recruitment in European rivers with data series > 35 years (26 rivers). Each series has been scaled to its 1979–1994 average. Note the logarithmic scale on the y-axis. The mean values and their bootstrap confidence interval (95%) are represented as black dots and bars. Note: for practical reasons, not all series are presented in this graph, whereas the following analysis is done on all series. Geometric means are presented in red.

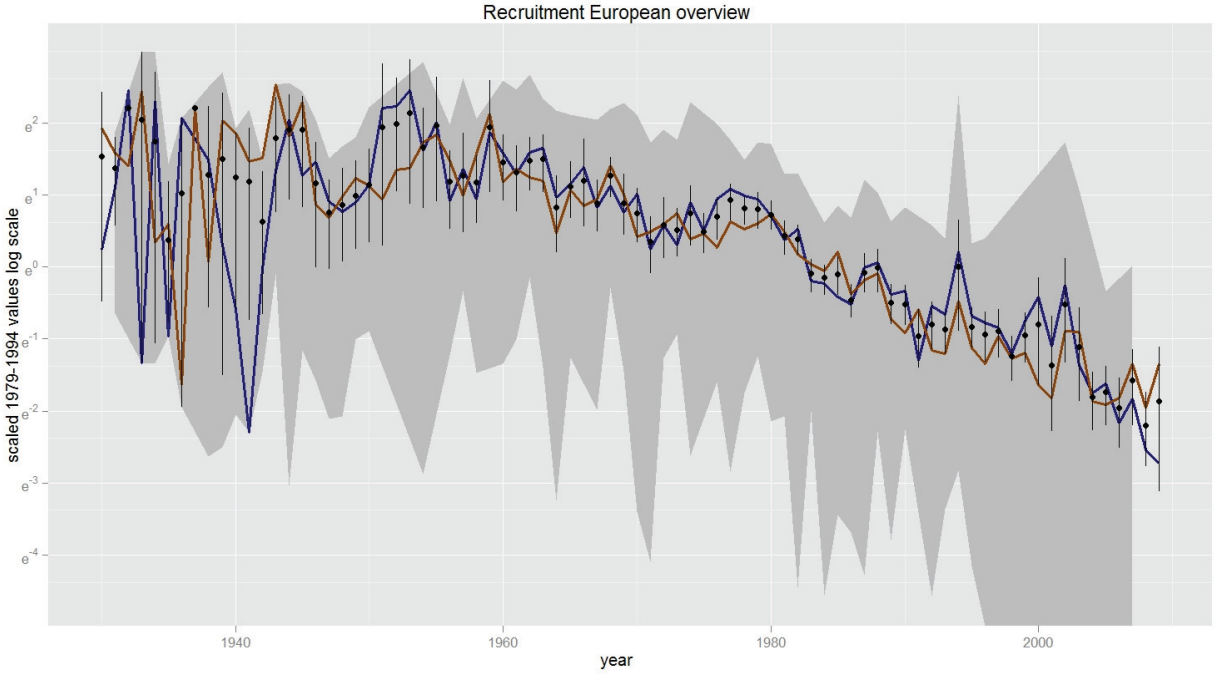

Figure 9.4.9.2 Time-series of monitoring glass eel and yellow eel recruitment in European rivers with data series > 35 years (24 rivers). Each series has been scaled to its 1979–1994 average. Note the logarithmic scale on the y-axis. The mean values and their bootstrap confidence interval (95%) are represented as black dots and bars. The brown line represents the mean value for yellow eel while the blue line represents the mean value of the glass eel series. The range of the series is indicated by grey shading.

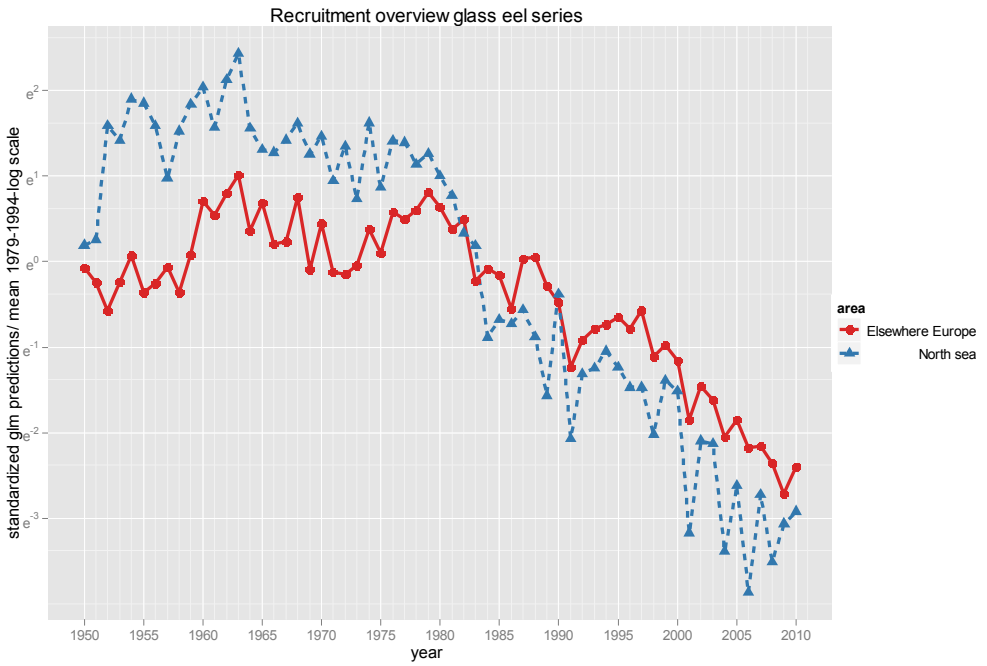

Figure 9.4.9.3 Mean of estimated (GLM) glass eel recruitment for each area in Europe. The GLM (recruit=area:year+site) was fitted to all glass eel series available and scaled to the 1960-1979 average. No series for glass eel are available in the Baltic Sea area. Note logarithmic scale.

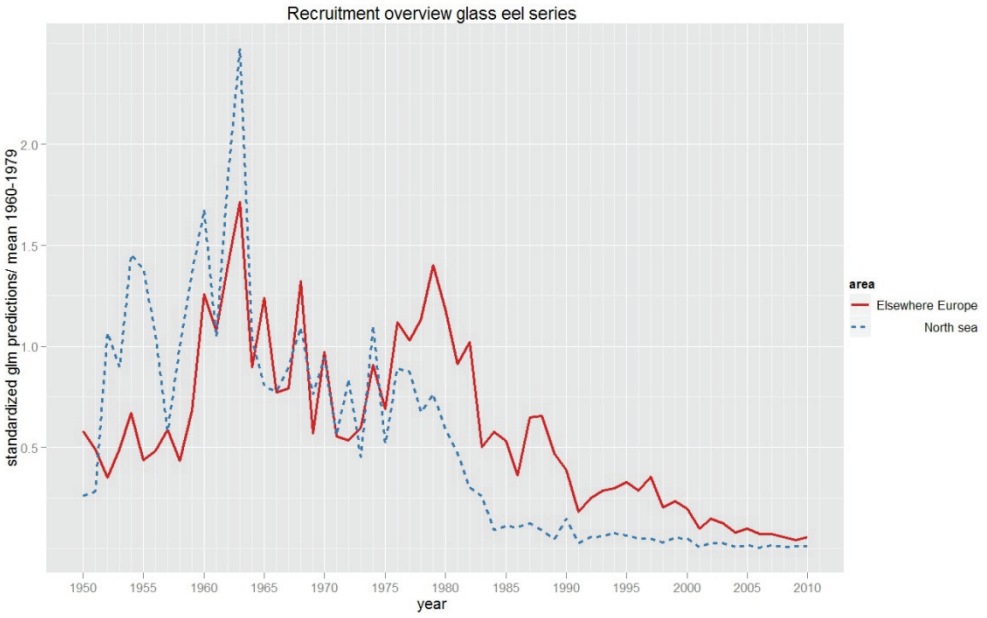

Figure 9.4.9.4 Mean of estimated (GLM) glass eel recruitment for each area in Europe. The GLM (recruit=area:year+site) was fitted to all glass eel series available and scaled to the 1960–1979 average. No series for glass eel are available in the Baltic Sea area. Note linear scale.

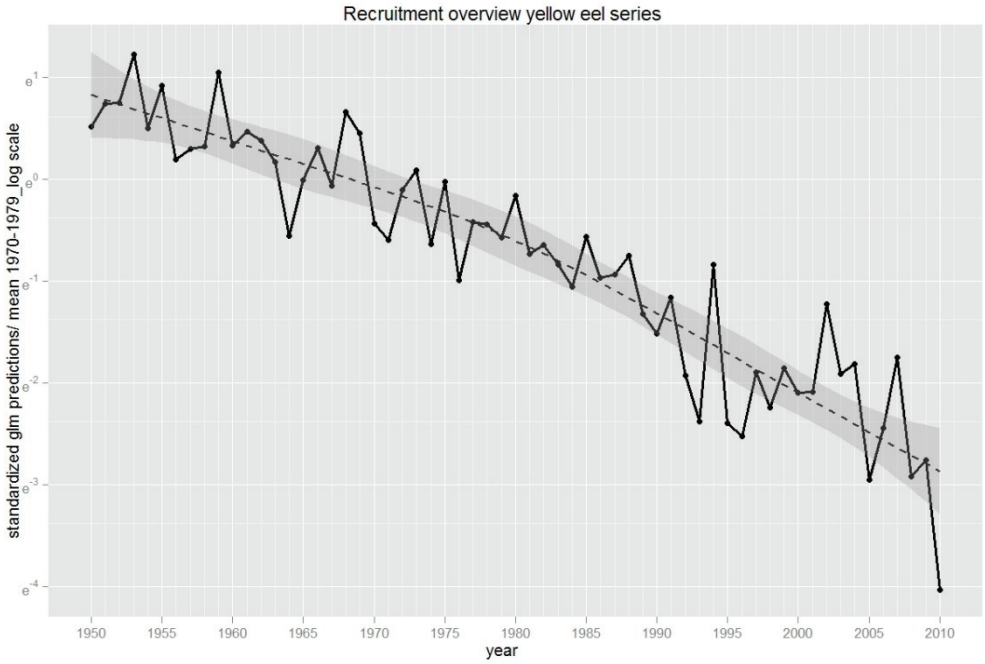

Figure 9.4.9.5 Mean of estimated (GLM) yellow eel recruitment and smoothed trends for Europe. The GLM (recruit=area:year) was fitted to all yellow eel series available and scaled to the 1960–1979 average. Note logarithmic scale. Band show 95% point-wise confidence interval of the smoothed trend.

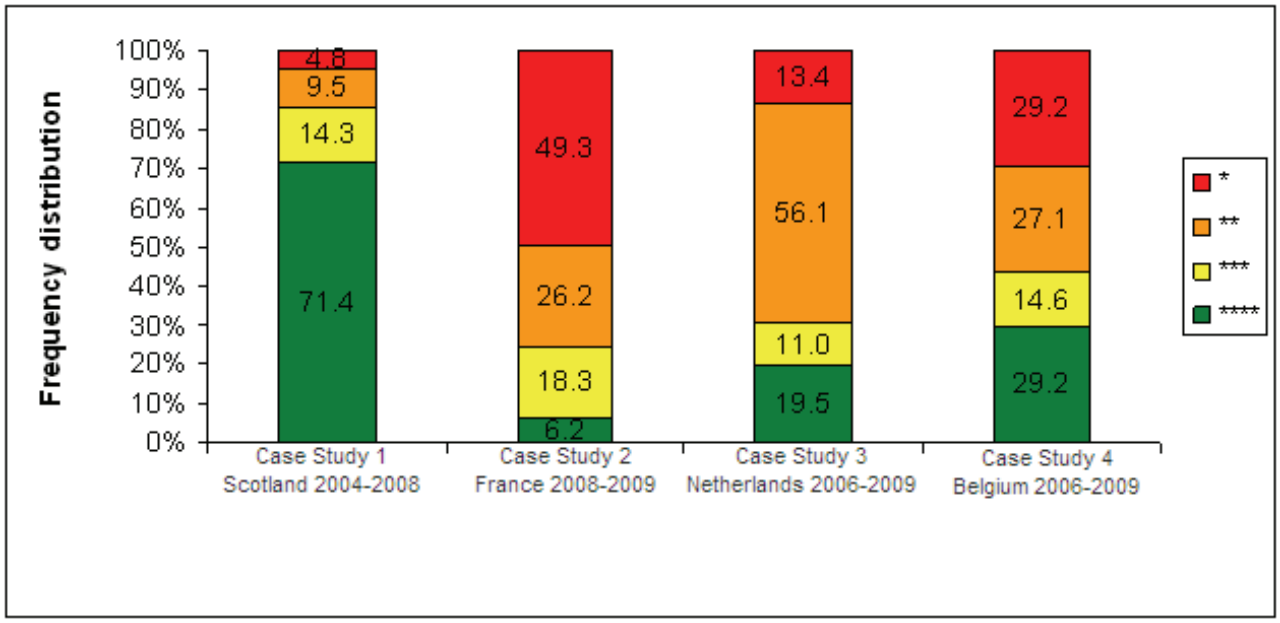

Figure 9.4.9.6 Demonstration Eel Quality Index (EQI) based on the ICES 7PCBs from recent data provided in the EEQD. Care should be taken when interpreting this as many of the samples were targeted at known pollution sites with non-uniform sampling strategies and may not be representative of wider scales. Four stars (green) represent unpolluted or low polluted eel. Eel with a slight to moderate pollution level are classified as three (yellow) or two (orange) star eel. The more polluted sites are assigned as 2 (polluted) or 1 (strongly polluted) star eel (red). This classification system is not based on ecotoxicological data from dose-effect studies, but from environmental concentrations in the field.