

## EU request for technical evaluation of the Eel Management Plan progress reports

### Advice summary

ICES has evaluated the EU Member States' progress reports against the escapement biomass target defined in Regulation (EU, 2007; also referred to as the Eel Regulation) and the theoretical lifetime anthropogenic mortality threshold implied by the escapement target. ICES notes major limitations in reporting with biomass and mortality indicators being reported for less than 50% of eel management units (EMUs).

No overall progress has been made in achieving the EU-defined biomass escapement target: the target was met or exceeded in only 23% of the reporting EMUs (as compared to 41% in the first year of reporting), and a consistently increasing trend in escapement was detected in only one EMU.

No clear patterns for mortalities were observed. Mortality was lower in 59% of the reporting EMUs compared to the first year of reporting, but it increased in 29% of them.

Given the limited number of cases in which the situation is significantly improving, ICES is unable to identify which measure types should be advised in order to progress towards the objectives of the Eel Regulation. The effectiveness could not be evaluated for the majority of individual measures either because they were not designed to be evaluated directly by biomass and/or mortality indicators and because associated metrics were insufficiently monitored.

ICES advises that while the number of measures implemented and the number of EMUs meeting the management targets is certainly useful to evaluate the level of implementation of the Eel Regulation in the EU, it is considered as insufficient to assess the effects of the Eel Regulation on the whole eel stock.

ICES provides a suite of suggestions to improve: i) reporting, ii) measuring progress, and iii) evaluation of reference points. Efforts in implementing measures should be focused on those that by definition have a high probability of reducing mortality and increasing escapement.

### Request

*ICES is requested to:*

- 1) *To assess the 2021 Member States' progress reports on the implementation of the Eel Regulation via the measures established and implemented under the eel management plans (EMPs). Those progress reports in line with Article 9(1) of the Regulation are to consist of the biological data required under the Eel Regulation and the general information outlining monitoring, effectiveness and outcome.*
- 2) *To include the biological data required under Article 9(1)a-d, as well as the estimates of the number of commercial fishermen (if available) under Article 11(1), and the estimates of the number of recreational fishermen and their catches under Article 11(2)-(3) in the regular ICES data call on eels, which is done every year to support recurrent advice on eels, to make the process of submitting data more efficient.*
- 3) *To forward the Commission the biological data required under Article 9(1)a-d submitted by Member States in usable format since countries must submit to the Commission their progress reports with such data, as well as the estimates of the number of commercial fishermen (if available) under Article 11(1), and the estimates of the number of recreational fishermen and their catches under Article 11(2)-(3).*
- 4) *In order for the Commission to strengthen the implementation of conservation measures for the recovery of the stock, we need to know from ICES: a) which measures are delivering results; b) which measures are not; c) which need to be improved.*
- 5) *To provide the Commission with the advice in April 2022 on the evaluation of the Member States progress reports on the eel management plans implementation. This can be delivered by a dedicated workshop with two meetings to be held in late 2021 and early 2022, followed by separate Advice in 2022.*

## Elaboration on the advice

### *Assessing Member States' progress reports on the implementation of the Eel Regulation via the measures established and implemented under the EMPs.*

For this advice, EU Member States' (MS) progress was evaluated against the escapement target of 40% of the pristine escapement as defined in the Eel Regulation (EU, 2007) and the theoretical lifetime anthropogenic mortality threshold of  $\Sigma A = 0.92$  implied by the target. Noting that neither the Eel Regulation nor the implied theoretical mortality threshold has been evaluated by ICES for its conformity with the precautionary approach; the advice therefore solely assesses compliance with a management target and not scientifically evaluated reference points.

Reporting in response to ICES eel data call (ICES, 2021a) was not complete (Table 1), with 11 out of 18 MS with eel management plans (EMPs) reporting both mortality and biomass indicators. On the EMU level, out of 84 (99 including UK and Norway) estimates of biomass indicators ( $B_{\text{current}}$  and  $B_0$ ) were reported for 39 (53) EMUs, estimates of  $\Sigma A$  for 34 (49) EMUs, and both values were reported for 34 (48) EMUs. Reported values covered a period of at least five years (as necessary for trend analysis) for 35 (48) EMUs for biomass indicators and 31 (45) EMUs for  $\Sigma A$ .

The available information indicates that no overall progress has been made in achieving the EU-defined management target of 40% of pristine silver eel escapement ( $B_{\text{current}}/B_0 > 0.4$ ) across the whole EU. Escapement biomass indicators, as reported by Member States, suggest that the escapement target is met or exceeded in nine reporting EMUs (ten including UK and Norway), which is less than in their first year of reporting when it was met or exceeded in 16 (20) EMUs. While estimates of  $B_0$  are difficult to compare between EMUs (and thus also  $B_{\text{current}}/B_0$ ), estimates of  $B_{\text{current}}$  are more robust in terms of relative trends within the EMUs. In 28 (41) of the reporting EMUs,  $B_{\text{current}}$  is lower today as compared to the first year of reporting.

In 20 EMUs (25 including UK and Norway)  $\Sigma A$  is lower currently than in the first year of reporting. An increase was reported for ten (19) EMUs, and four (five) EMUs showed no change (but mortalities were reported as zero in these). A total of 28 (38) reporting EMUs remain below a mortality threshold of  $\Sigma A = 0.92$  as compared to 23 (35) in the first year of reporting. Only nine (ten) EMUs, reporting both mortality and biomass indicators, currently have escapement biomass  $> 40\%$  and mortality rates below a mortality threshold of  $\Sigma A = 0.92$  (i.e. the desired state in both indicators). Another 19 (27) EMUs have  $\Sigma A$  below 0.92 but with escapement biomass below the management target. The remaining six (11) reporting EMUs have  $\Sigma A$  above 0.92 and escapement biomass below the management target (one EMU only reported mortality, which was below 0.92).

A trend analysis was carried out to test for a consistent increasing or decreasing trend in mortality and biomass indicators over the reported time period. The analysis showed no overall progress towards the escapement target with a significant downwards trend in 18 EMUs (22 including UK and Norway) and an increase in escapement for a single EMU only. For mortality,  $\Sigma A$  showed no downward trend in the majority of EMUs, it consistently increased in six (nine) EMUs, while a consistent decrease was detected in nine (ten). Given the limited number of cases in which the situation is significantly improving, it is difficult to statistically detect what specific management measures could be associated with progress towards the objectives of the Eel Regulation.

In 2021, MS reported a total of 1019 measures related to: i) commercial fisheries, ii) eel trade and marketing, iii) habitat improvements, iv) hydropower and obstacles, v) recreational fisheries, vi) scientific monitoring, vii) restocking, and viii) eel governance (Table 2). Measures related to commercial fisheries, recreational fisheries, and hydropower and obstacles were the most abundant accounting for about 63% of the measures reported across all EMUs. Across measures, 56% are reported fully implemented and 19% as partially implemented, while about 8% of the measures were not implemented or were stopped. It is often not clear to what extent these measures are interlinked and mutually supportive. A large proportion of measures related to fisheries (commercial and recreational) were fully implemented while more than half of those related to hydropower and obstacles were either only partially implemented or not implemented. Counting the number of measures by category is an indication of management activity/success but does not provide information on how successful management is/will be in eel conservation and rebuilding.

The number of EMUs in MS that meet the targets of the Eel Regulation cannot be taken as an indicator of the state of the eel stock. Even if the targets of the Eel Regulation are fully met in all MS, the situation remains unclear in EMUs located outside the EU. In addition, the size of the eel stock contained in the different EMUs varies, with those (larger) EMUs containing more eels, presumably having a relatively bigger influence on the overall condition of eel stock. Thus, even in the case of a large proportion or all EU EMUs meeting the targets of the Eel Regulation, the eel stock as a whole could still be in a critical state.

**Table 2** Implementation of eel management measures by category.

Measure category	Fully implemented	Partially implemented	Not implemented	Not pertinent	Stopped	No data	Total number
Commercial fisheries	60.8% (206)	7.7% (26)	0.9% (3)	15.0% (51)	10.9% (37)	4.7% (16)	339
Eel trade and marketing	85.7% (42)	12.2% (6)	2.0% (1)	0% (0)	0% (0)	0% (0)	49
Habitat improvement	24.7% (20)	27.2% (22)	6.2% (5)	28.4% (23)	0% (0)	13.6% (11)	81
Hydropower and obstacles	37.9% (67)	39.0% (69)	10.7% (19)	9.6% (17)	1.1% (2)	1.7% (3)	177
Recreational fisheries	57.1% (72)	23.8% (30)	1.6% (2)	15.1% (19)	0.8% (1)	1.6% (2)	126
Scientific monitoring	73.1% (98)	16.4% (22)	1.5% (2)	6.0% (8)	2.2% (3)	0.8% (1)	134
Restocking	61.7% (50)	13.6% (11)	4.9% (4)	14.8% (12)	4.9% (4)	0% (0)	81
Eel governance	37.5% (12)	18.8% (6)	0% (0)	34.4% (11)	0% (0)	9.4% (3)	32
Total number	567	192	36	141	47	36	1019

#### *Evaluation of the effectiveness of conservation measures reported by the Member States*

In many instances, conservation measures were not designed to be evaluated directly by biomass and mortality indicators. For this reason, and explicitly related to a lack of monitoring and/or associated metrics, it has not been possible to determine the effectiveness for the majority of reported measures (nearly 70% of cases). It was not possible to identify particularly effective measure types through a systematic approach; this does, however, not imply that there are no differences but is rather attributed to the limited data availability and more so the mostly missing effects.

#### *Delivery of data*

Data delivery has been answered via separate provision, with the data supporting this advice is available at: <https://doi.org/10.17895/ices.data.19869373>

### **Suggestions**

ICES is unable to advise on the specifics of these for most/all the conservation measures listed in EMPs because (1) not all the EMU were reported on, or reported on fully, and/or (2) in many instances measures were not designed to be evaluated directly by biomass and mortality indicators.

#### **1. Deficiencies in reporting**

- Reporting is mandatory and fully specified in the data call. However, there is still incomplete reporting of stock indicators, and inconsistent/incorrect treatment of restocking in estimating those indicators. The EU and MS should find a mechanism to ensure complete and consistent reporting and correct treatment of restocking.
- Transboundary EMUs should report a single set of indicators representing the entire EMU.
- Using common methods to estimate anthropogenic mortalities would aid confidence and comparability in these rates.

#### **2. Measuring progress**

Measuring progress should be considered in terms of changes in (i) the eel population and in (ii) the success of managers tasked with implementing the EMPs.

i) Progress of the eel population

- The effect of many individual conservation measures is not expected to be directly and immediately detected in changes in biomass or mortality; for example, a reduction in glass eel catches would take several years to translate into increased silver eel escapement biomass. Progress in these conservation measures can only be assessed in terms of changes in biomass and mortality indicators for the whole EMU.
- Except for fisheries, hydropower turbines, and pumps measures, most interventions that have been implemented among MS are not expected to have a direct or quantifiable impact on increasing biomass and escapement, and/or reducing mortality. Efforts in implementing measures should be focused on those measures that by definition have a high probability of reducing mortality and increasing escapement.
- The estimates of  $B_0$  need to be fully reviewed to ensure they are correct and in turn to enable consistent comparability of the biomass management target between MS and EMUs.
- In order to reduce mortalities in EMUs and for the whole stock, and to be internally consistent with the Eel Regulation's escapement biomass target, time-bound mortality limits need to be defined. These need to be lower when escapement biomass is below the target (considering both EMU and whole stock level).

ii) Progress of management

- Counting the number of measures by category is an indication of management activity but does not provide information on how successful management is or will be in eel conservation and rebuilding. The suggestion is not to stop examining this metric but to consider it for what it really is: a metric of the management process.

### 3. Regional coordination

- Regional coordination of management measures is recommended to avoid that eel escaping from an EMU in one MS is affected by anthropogenic mortalities in an EMU in another MS along their migration route. For example, for the Baltic Sea a unified stock assessment could be built using a single model including the data coming from the different EMUs.

### 4. Reference points

- The Eel Regulation has not been evaluated for conformity with the precautionary approach. An evaluation would consider the appropriateness of the biomass target of 40%  $B_0$  and of the corresponding limit total anthropogenic mortality of  $\Sigma A = 0.92$ .

## Basis of the advice

### Background

A management framework for eel within the EU was established in 2007 by Regulation (EU) No. 1100/2007 (EU, 2007; also referred to as the Eel Regulation). The objective of the Eel Regulation is the protection, recovery, and sustainable use of the stock. To achieve that objective, EU MS have developed EMPs for their river basin districts. These are designed to reduce anthropogenic mortalities, permitting 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

### Methods

The evaluation is based on stock indicators of biomass and mortality, as reported by MS and other eel-range states (UK and Norway) for their individual EMUs in response to ICES 2021 eel data call (ICES, 2021a). These indicators were derived using a broad variety of data and methods. In addition, MS were asked to provide data on the number of recreational fishers, the fishing effort, method descriptions for data collection and assessment of biomass and mortality indicators, the final use of eels caught that are under 12 cm, and the implementation of measures listed in EMPs.

**Table 1** Count of EMUs in EU Member States (numbers in parentheses include Member States, UK, and Norway\*) in terms of reporting and compliance with the aims of the Eel Regulation.

Value	$\Sigma A$	$B_{\text{current}}/B_0$
Total number of EMUs	84 (99)	84 (99)
Total number of reporting EMUs	34 (49)	39 (53)
Total number of EMUs reporting more than five values	31 (45)	35 (48)
Compliance with biomass/mortality threshold (most recent reported year)	28 (38)	9 (10)
Compliance with biomass/mortality threshold (earliest reported year 2007**)	23 (35)	16 (20)
Increased since first reporting	10 (19)	8 (9)
Decreased since first reporting	20 (25)	28 (41)
Unchanged since first reporting	4 (5)	3 (3)
Consistent increase over reported time period***	6 (9)	1 (1)
Consistent decrease over reported time period***	9 (10)	18 (22)
No significant trend over reported time period***	16 (26)	16 (25)

\* Norway is considered a single EMU.

\*\* Earliest year of reporting differed between countries (2007–2018).

\*\*\* Mann Kendall test, minimum of five values required, significance level  $\alpha = 0.1$ .

*The reporting regime applied by the Commission specifies three biomass and three mortality reference points:*

$B_0$	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 if no anthropogenic influences had impacted the stock.
$B_{\text{current}}$	The current escapement biomass: the amount of silver eel biomass that currently escapes to the sea to spawn, corresponding to the assessment year
$\Sigma F$	The subtotal fishing mortality rate, summed over the age groups in the stock for all fishery types
$\Sigma H$	The subtotal anthropogenic mortality rate outside the fishery, summed over the age groups in the stock
$\Sigma A$	The sum of anthropogenic mortalities, i.e. $\Sigma A = \Sigma F + \Sigma H$ ; refers to mortalities summed over the age groups in the stock.

*Further acronyms and terms, and their definitions used in this advice:*

EMP	Eel Management Plan
EMU	Eel management unit; defined in an Eel Management Plan under the EU Eel Regulation 1100/2007
Escapement	The amount 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
40% $B_0$ 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”.

### Additional information

$B_0$  is a common concept in standard population dynamics models for marine fish; it refers to the unfished equilibrium spawning biomass, and the true value is rarely known. It is generally calculated from population models as the long-term average biomass in the absence of fishing. In production models,  $B_0$  corresponds to the carrying capacity of the environment. For most EMUs,  $B_0$  was calculated by Member States from data prior to the start of the observed decline in recruitment, i.e. between 1960 and 1980. Fisheries on eel, other anthropogenic mortalities, and impediments to eel migration existed in most EMUs for a long time prior to those dates. Therefore, most available estimates correspond to the silver eel biomass that would have existed prior to the recruitment decline and not to the biomass that would have existed if no anthropogenic influences had impacted the stock.

There is no standardization for deriving estimates of biomass indicators between EMUs, associated with e.g. consideration of density dependence, definition of the pristine situation, and use of historical data versus modelling. This leads to different methods and assumptions per EMU, and  $B_0$  can therefore not be compared between EMUs. Using a commonly agreed approach would ensure that the ratio between  $B_{\text{current}}$  and  $B_0$  is comparable among EMUs and MS.

### Sources and references

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Recommended citation: EU request for technical evaluation of the Eel Management Plan progress reports. In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sr. 2022.07. <https://doi.org/10.17895/ices.advice.19902958>. The data outputs can be accessed at <https://doi.org/10.17895/ices.data.19869373>

## Annex

**Table A1** Summary of stock indicators reported to ICES by Member States and other eel-range states (UK and Norway) in 2021, and the change of stock indicators between the first reporting after 2007 and the most recent reported year (time period may differ between countries and stock indicators, for details see Section 4.3.2 in ICES [2022]). Colour indicates whether stock indicators comply with the management target for biomass ( $B_{\text{current}}/B_0 > 0.4$ ) or the suggested threshold for the sum of anthropogenic mortalities ( $\Sigma A < 0.92$ ), or whether it has improved with respect to these targets since implementation (Green = compliance/improved; red = no compliance/not improved; light grey = threshold for mortality is uncertain since escapement biomass is below 40% of pristine escapement; dark grey = data not available). More details about the derivation of these estimates is provided in ICES (2022) and national reports.

Country	EMU	$B_{\text{current}}/B_0$ (current)	$\Sigma A$ (current)	Change in $B_{\text{current}}/B_0$ since implementation	Change in $\Sigma A$ since implementation	$B_{\text{current}}/B_0$ (initial)	$\Sigma A$ (initial)
Belgium	BE_Meus	0.021	3.204	-0.052	1.163	0.072	2.041
	BE_Sche	0.099	0.173	-0.014	0.027	0.113	0.146
Germany	DE_Eide	0.239	0.035	-0.629	-0.006	0.867	0.041
	DE_Elbe	0.147	0.582	-0.032	-0.730	0.180	1.312
	DE_Ems	0.113	0.094	-0.335	-0.019	0.448	0.113
	DE_Maas	0.014	0.176	-0.080	-1.156	0.094	1.332
	DE_Oder	0.213	0.178	-0.082	-0.080	0.295	0.258
	DE_Rhei	0.332	0.753	-0.365	-0.092	0.697	0.845
	DE_Schl	0.523	0.034	-0.027	-0.027	0.550	0.061
	DE_Warn	0.657	0.180	-0.471	0.047	1.128	0.133
DE_Wese	0.196	0.390	-0.235	-0.082	0.430	0.472	
Denmark	DK_Inla	0.278	0.168	-0.082	-0.016	0.360	0.184
Estonia	EE_Narv	0.744	0.280	-0.218	0.110	0.962	0.170
Spain	ES_Anda	0.021	0.883	0.005	-0.245	0.017	1.128
	ES_Astu	0.075	0.819	-0.010	-0.122	0.085	0.941
	ES_Bale	0.419	0.000	-0.236	-0.013	0.654	0.013
	ES_Basq	0.073		-0.102		0.174	
	ES_Cant	0.147		-0.200		0.347	
	ES_Cast	0.000	0.000	0.000		0.000	0.000
	ES_Cata	0.113		-0.054		0.166	
	ES_Gali	0.085	1.784	-0.067	0.629	0.152	1.155
	ES_Inne	0.000	0.000	0.000		0.000	0.000
	ES_Minh	0.137	1.690	0.115	-2.030	0.023	3.720
	ES_Nava	0.002		-0.176		0.178	
ES_Vale	0.265	0.233	-0.144	0.105	0.409	0.128	
UK	GB_Angl	0.065	0.974	-0.285	0.444	0.349	0.530
	GB_Deer	0.015	0.728	-0.029	0.234	0.044	0.494
	GB_Humb	0.027	2.445	-0.183	1.214	0.210	1.231
	GB_Neag	0.398	0.599	-0.037	-0.497	0.435	1.096
	GB_NorE	0.135	0.000	-0.112		0.247	0.000
	GB_Nort	0.126	0.608	-0.544	0.207	0.669	0.401
	GB_NorW	0.023	0.853	-0.028	0.385	0.050	0.468
	GB_Scot	0.614	0.204	0.130	-0.009	0.484	0.213
	GB_Seve	0.022	2.585	-0.146	1.980	0.168	0.605
	GB_Solw	0.058	0.260	-0.004	0.001	0.062	0.259
	GB_SouE	0.194	0.441	-0.446	-0.006	0.639	0.447
	GB_SouW	0.004	3.678	-0.042	3.091	0.047	0.587
	GB_Tham	0.226	1.044	-0.004	-0.089	0.230	1.133
GB_Wale	0.027	0.331	-0.013	0.020	0.040	0.311	
Ireland	IE_East	0.458	0.010	-0.062	-0.001	0.521	0.011
	IE_NorW	0.523	0.090	0.109	-0.039	0.414	0.129
	IE_Shan	0.319	0.040	-0.147	0.010	0.465	0.030
	IE_SouE	0.571	0.000	-0.101		0.672	0.000
	IE_SouW	0.367	0.000	-0.057	-0.014	0.424	0.014
IE_West	0.567	0.000	0.119		0.447	0.000	

Country	EMU	B <sub>current</sub> /B <sub>0</sub> (current)	ΣA (current)	Change in B <sub>current</sub> /B <sub>0</sub> since implementation	Change in ΣA since implementation	B <sub>current</sub> /B <sub>0</sub> (initial)	ΣA (initial)
Lithuania	LT_Lith	0.057	0.495	-0.294	0.250	0.351	0.245
Latvia	LV_Latv	0.023		0.010		0.013	
Netherlands	NL_total	0.094	0.790	0.033	-0.990	0.061	1.780
Norway	NO_total		0.077		-0.018		0.095
Poland	PL_Oder	0.035	0.930	-0.001	-0.890	0.036	1.820
	PL_Vist	0.067	1.220	0.039	-1.690	0.028	2.910
Portugal	PT_Port	0.527	0.445	0.266	0.061	0.261	0.384
Sweden	SE_Inla	0.249	1.251	-0.548	0.635	0.797	0.616
	SE_West	0.010	0.000	0.000	-1.910	0.010	1.910