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EU request relating to estimates of stock parameters for European Eel Management Units

Advice summary

ICES has compiled estimates of biomass and mortality in EU waters on an Eel Management Unit (EMU) basis. Gaps were identified for biomass indicators in Croatia, Czech Republic, Denmark (marine waters), Estonia West, Finland, Greece Central and Aegean, Luxembourg, and Sweden East. ICES has filled gaps for B_0 and $B_{current}$ in Croatia, Czech Republic, Finland, Greece Central and Aegean, and Luxembourg using information from the nearest neighbouring EMU. There are no separate biomass estimates available for any Baltic coastal waters, so ICES was unable to fill the gaps in estimates for Denmark (marine waters), Estonia West and Swedish East waters. ICES advises that the sum of biomass estimates provides an indication of stock status, but does not reflect the state of the total stock within the EU due to these continuing gaps.

ICES considers that it is not possible to fill the gaps in mortality rates due to local differences in the types and extent of anthropogenic mortality. As a consequence of this, gaps in B_{best} estimates cannot be filled. ICES notes that B_0 estimates in kg ha^{-1} for some EMUs in France are considerably higher than in similar systems in neighbouring countries. Similarly, $B_{current}$ estimates in kg ha^{-1} for some EMUs in Spain are higher than in similar systems in Spain or in neighbouring countries. ICES found no reason to replace those estimates.

Request

The European Commission requested that ICES carry out an *Independent review of Member State progress reports and, when relevant, update or make new estimates of stock indicators regarding eel.*

The main task of the requested service would be to deliver solid estimates of stock parameters by Eel Management Unit that can be summed in terms of biomass and mortality, to reflect the state of the stock and exploitation status in Europe.

This would require reviewing and standardizing the various approaches: experts should review data provided by MS and methods uses to make new calculations where needed, e.g. based on wetted areas times production by wetted area type and other alternatives.

Elaboration on the advice

Estimates of stock parameters for each European Eel Management Unit (EMU) are provided in Annex 1. The majority of these estimates were provided by EU Member States in their reporting required by the EU Eel Regulation (EU, 2007). ICES also used data and information reported to the European Commission in 2015, to ICES in response to a 2018 data call, in Country Reports provided to ICES for the annual meetings of the joint EIFAAC/ICES/GFCM Working Group on Eel, and provided directly to ICES as part of this review. Austria, Bulgaria, Cyprus, Hungary, Malta, Romania, Slovakia, and Slovenia have a derogation from implementing an Eel Management Plan (EMP).

Overall, B_0 ranged from < 1 to 430 kg ha^{-1}; estimates for some EMUs in France (Loire [FR_Loir], Adour [FR_Adou], and Garonne [FR_Garo] in the Atlantic, Corsica [FR_Cors] and the Rhone [FR_Rhon] in the Mediterranean) were conspicuously higher (>150 kg ha^{-1}) than others (< 80 kg ha^{-1}) in each region. $B_{current}$ estimates ranged from < 1 to 58 kg ha^{-1}, with values for some Spanish EMUs (Basque [ES_Basq] in the Atlantic, Valencia [ES_Vale] and Balearic [ES_Bale] in the Mediterranean) being noticeably higher (>11 kg ha^{-1}) than most others (< 11 kg ha^{-1}) in each region. ICES found no reason to replace high B_0 or $B_{current}$ estimates.

ICES found that, within the EU, gaps in biomass estimates were apparent for some EMUs (Table 1).

Table 1 Gaps in biomass estimates within the EU.

EMU	B_0	B_{best}	$B_{current}$
Croatia total	X	X	X
Czech Republic total	X	X	X
Denmark (marine waters)	X	X	X
Estonia West	X	X	X
Finland total	X	X	X
Greece Central and Aegean	X	X	X
Luxembourg total	X	X	X
Sweden East	X	X	
Spain Navarra		X	

ICES advises that gaps in B_0 and $B_{current}$ should be filled by referring to values of the nearest neighbouring EMU (Table 2).

ICES could not fill gaps in mortality rates as local differences in the types and extent of anthropogenic mortality between EMUs mean that extrapolation of estimates from nearest neighbours would not be appropriate. ICES did not attempt to ascertain if EU Member States have quantified the effects of all anthropogenic mortality that may have a significant effect on silver eel escapement in their territories. ICES was not able to fill the gaps for B_{best}. By definition B_{best} is $B_{current}$ plus anthropogenic mortalities and because it is not possible to fill the gaps for mortalities, it is axiomatic that it is not possible to fill the gaps for B_{best}.

Table 2 Nearest neighbouring EMU values for Croatia, Czech Republic, Finland, Greece Central and Aegean, and Luxembourg.

EMU	B_0 (kg ha^{-1})	$B_{current}$ (kg ha^{-1})
Croatia total	18.7	4.2
Czech Republic total	7.8	0.4
Finland total	0.1	0.0
Greece Central and Aegean	1.7	0.4
Luxembourg total	8.7	3.5

There are no separate biomass estimates available for any Baltic coastal waters, so ICES was unable to fill the gaps in estimates for Denmark (marine), Estonia West and Swedish East waters. Eel in these areas is a combination of those eels produced in inland and saline waters of countries surrounding the Baltic Sea and those in the Baltic Sea itself. This is an important gap as the reported $B_{current}$ estimates from countries surrounding the Baltic Sea (about 3551 tonnes) may account for 25% of the current total reported escapement.

Suggestions

Due to recent and current low recruitment the biomass targets in several EMUs are unlikely to be met in the foreseeable future, even if all anthropogenic mortality were removed. Rebuilding may take decades or centuries rather than years. Explicit mortality targets, corresponding to the time schedule requirement and the biomass target of the EU Eel Regulation, might prove more useful. ICES would be willing to develop such targets.

The EU Eel Regulation needs to be 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 $\Sigma A = 0.92$.

Data collection and analysis would be simplified and improved by further automation of the reporting process. At present each EU Member State is submitting information in the form of an Excel spreadsheet. An online submission system (with guidance) would help ensure that all relevant information, including methods used to estimate all biomass and mortality rates, was submitted by EU Member States, and this would simplify quality assurance and analysis. A well designed system would also avoid duplication in data requests to EU Member States. ICES would be willing to work with the European Commission to develop and manage such a system.

Biomass and mortality rates should be regularly and consistently estimated (between EMUs) for all waters producing European eel and not just, as at present, for those with EMUs. In some cases EMUs do not consistently cover all relevant waters, and eels are also produced in waters beyond the EU.

Basis of the advice

Background

According to the request: *Regulation 1100/2007 (the Eel Regulation) puts upon MS an obligation to prepare and implement eel management plans and regularly report to the Commission on the progress thus achieved. The next MS progress reports are due by 30 June 2018 and shall contain various biological indicators and in particular the best available estimates of the proportion of the silver eel biomass that escapes to the sea to spawn, or the proportion of the silver eel biomass leaving the territory of that MS as part of the seaward migration to spawn; the level of fishing effort that catches eel each year and the reduction effected; the level of fishing mortality and the level of mortality factors outside the fishery and the reduction effected.*

ICES analysis of previous progress reports submitted by MS revealed that many MS have not reported stock indicators and that there are inconsistencies in the approaches used to calculate the indicators. An independent review and, when relevant, update or new estimation of stock indicators regarding eel is required in order to provide reliable estimation of total mortality and the status of the adult stock of eel and correctly assess the effectiveness of the Eel Regulation.

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.
$B_{current}$	The amount of silver eel biomass that currently escapes to the sea to spawn.
B_{best}	The amount of silver eel biomass that would have existed if no anthropogenic influences had impacted the current stock, hence only natural mortality operating on stock, i.e. excluding restocking practices.
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. It refers to mortalities summed over the age groups in the stock.

Results, conclusions, and methods

B_0 is a common concept in standard population dynamics models for marine fish; it refers to the unfished equilibrium spawning biomass and the 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. In practice, for most EMUs, B_0 was calculated by EU 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 have 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, not to the biomass that would have existed if no anthropogenic influences had impacted the stock. There are many challenges to estimating a true B_0, not least describing the available habitat in inland, transitional, and marine waters under conditions unaffected by human activities, and taking account of the influence of density dependence on eel population dynamics.

ToR *a)* *Collate the Eel Management Unit biomass and mortality rates from EU Member State (MS) Eel Management Plan (EMP) Progress Reports as submitted to the European Commission by 30th June 2018.*

ICES found that most reporting of biomass and mortality rates of eels to the European Commission was complete, but several countries reported late or not at all (Annex 1). While submitting the information in the form of Excel spreadsheets is an improvement over submitting in paper form or in Word files, data verification, compilation, and analysis would be greatly facilitated if the data were input to an online database and quality assured before being analysed.

ToR *b)* *Review EMP methods and results to confirm whether or not they appropriately reflect the (present and target) status of eel biomass and mortality rates across Europe.*

ICES collated the data and information reported to the European Commission. Croatia, Luxembourg, and Portugal did not report at all; Czech Republic, Finland, and Ireland provided a description but no data tables, and France and Poland did not

provide all seven data tables; Czech Republic, Finland, Greece, Ireland, Latvia, Poland, and Spain reported after the deadline (Annex 2). ICES also used data and information reported to the European Commission in 2015, to ICES in response to a 2018 data call, Country Reports provided to ICES for the annual meetings of the joint EIFAAC/ICES/GFCM Working Group on Eel, and provided directly to ICES as part of this review.

ICES noted that approaches to estimate biomass reference points are consistent with the EU Eel Regulation. Few reports provided detailed information on exactly how biomass and mortality estimates were derived; most referred to other documents or primary publications where details were provided. EU Member States were asked by the European Commission to provide information on the methods used in a summary table, but the information provided in response was highly variable and very rarely complete.

ToR *c)* *Where there are gaps in results, or estimates are identified as not being appropriate, derive alternative estimates based on a standardized view of eel biomass and mortality.*

There were few gaps for biomass (in 7–9 of 95 EMUs). Two approaches for filling the gaps were tested; nearest neighbouring EMU or average for a regional catchment (i.e. Baltic, North Sea, Atlantic, Mediterranean). The nearest neighbouring EMU provided more plausible values due to large standard deviations around the means for regional catchments.

There is no estimate of B_0 for Denmark (marine waters), Estonia West (EE_West), and Sweden East (SE_East). There are no biomass estimates available for other Baltic coastal fisheries, and none for the Baltic region, so there are no values to apply.

For the nearest neighbouring EMU approach, the Italy Venezia–Giulia (IT_Vene) EMU is the nearest neighbouring EMU to Croatia. The German Elbe (DE_Elbe) and Polish Oder (PL_Oder) EMUs border the Czech Republic and so the average biomass estimates of these two EMUs were selected as the nearest neighbouring EMU estimates. Sweden Inland (SE_Inla) waters is selected as the nearest neighbouring EMU to Finland. The Greece North Western (GR_NorW) EMU is selected as the nearest neighbouring EMU to the Central and Aegean (GR_CeAe) EMU because the Greek EMP presented eel landings from lakes in both these EMUs, but not in the other Greek EMUs. The German Rhine (DE_Rhei) was selected as the nearest neighbouring EMU to Luxembourg because a tributary river (the river Mosel) flows along the border between the two countries.

Gaps were apparent for some saline waters within the EU. Some of these waters are outside EMUs, but there is insufficient knowledge of eel abundance and production in saline waters to fill these gaps at present.

Additional information

Eels in saline waters

Eel management plans recognize three habitat types: fresh, transitional, and coastal. In addition, the EMP overview template provided to EU Member States by the European Commission also recognize marine open waters. Most of the information provided by EU Member States was for freshwater habitat (82 of 87 EMU reports), some for transitional waters (59/87), and very few for coastal habitat (22/87) or marine open waters (4/87). ICES notes that not every EMU covers all four habitat types, but most do and as it was not always obvious in the overview template whether a habitat type was present or not, it is assumed here that all EMUs cover all habitat types.

Information on coastal habitat is important because eels commonly use saline waters as rearing areas, and eel demographic parameters in saline waters may differ from those in freshwater. In particular, growth may be substantially more rapid in saline water than in freshwater. Eel fisheries near Denmark occur in EU waters that are outside any EMU, but there have been no reports of biomass or mortality rates.

Density-dependence, habitat loss, and B_0 estimation

As noted above, estimated silver eel biomass in the absence of anthropogenic impacts (both positive and negative) is referred to as B_0. The method of estimating B_0 varies between, and in some cases within, EU Member States. B_0 is most often calculated by reference to the relative abundance of eels at the yellow and silver stages prior to 1980 (Denmark,

France, Germany, UK), or at the glass eel stage (Italy, Poland, Spain). B_0 has also been estimated from habitat carrying capacity (Netherlands, Spain) or with reference to similar river systems (ES_Vale).

Density-dependent effects could introduce systematic errors in the estimation of silver eel equivalents from historical measures of the abundance of earlier stages. In one study, the mortality rate of a high-density eel population was estimated to be about three times greater than the mortality rate of a low-density population. Under a scenario of density-dependence and declining recruitment, silver eel abundance is thus likely to decrease less rapidly than glass eel abundance. It is therefore possible that B_0 estimated from decreases in glass eel abundance would be overestimated.

Density also influences eel sex ratio, with high densities associated with high proportions of males and low densities associated with high proportions of females. Domination of a population by males will not only depress B_0 because male silver eels are much smaller than female silver eels, but will also reduce the egg production per unit biomass.

However, pristine biomass is potentially underestimated in countries where habitat that is unreachable due to human actions (e.g. dam building) is not taken into account when calculating B_0 and B_{best}.

Further comments on EU Member State progress reports are presented in the 2018 Report of the Workshop for the Review of Eel Management Plan Progress Reports (ICES, 2018a).

Sources and references

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ICES. 2018b. Report of the Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL). 5–12 September 2018, Gdańsk, Poland. ICES CM 2018/ACOM:15. 150 pp.

Annexes

Annex 1. Estimates of biomass and fishing mortality on an EMU basis for EU countries with a reporting obligation, and Norway. Numbers are for the most recent year reported. Italicized red numbers are values derived by ICES.

Austria, Bulgaria, Cyprus, Hungary, Malta, Romania, Slovakia, and Slovenia have a derogation from reporting and are not listed. No information was available from other range states of the European Eel: Algeria, Belarus, Egypt, Iceland, Israel, Lebanon, Libya, Morocco, Russia, Syria, Tunisia, and Turkey. EMU = Eel Management Unit. Regions: Med = Mediterranean, NS = North Sea. WA = wetted area (pristine and current shown). Cells with missing values are left blank (i.e. 0 means zero recorded).

Country	EMU	Region	Wetted area		Biomass			Biomass density			Mortality		
			WA pristine	WA current	B_0 (kg)	B_{best} (kg)	$B_{current}$ (kg)	B_0 (kg ha^{-1})	B_{best} (kg ha^{-1})	$B_{current}$ (kg ha^{-1})	ΣA	ΣF	ΣH
Belgium[1]	BE_Meus	NS	1204	1204	32157	17949	2331	26.71	14.91	1.94	0.189	0.085	0.094
Belgium	BE_Sche	NS	18591	18591	207123	27109	23429	11.14	1.46	1.26	0.149	0.092	0.052
Croatia	HR_total	Med						*18.73*		*4.20*			
Czech Republic	CZ_total	NS						*7.76*		*0.43*			
Denmark	DK_Inla	NS/Baltic	60000	60000	1110000	168971	125311	18.50	2.82	2.09	0.222	0.163	0.059
Denmark		NS/Baltic											
Estonia	EE_Narv	Baltic	1887800	1887800	90000	77001	41581	0.05	0.04	0.02	0.61	0.06	0.4
Estonia	EE_West	Baltic	3650000	3650000									
Finland[2]	FI_total	Baltic						*0.09*		*0.01*			
France	FR_Adou	Atlantic	20296	20296	5874000	1102000	64000	289.42	54.30	3.15	0.75	0.73	0.02
France	FR_Arto	NS	21941	21941	1418000	269000	73000	64.63	12.26	3.33	0.45	0.43	0.02
France	FR_Bret	Atlantic	64822	64822	5627000	1059000	197000	86.81	16.34	3.04	0.5	0.5	0.01
France	FR_Cors	Med	4180	4180	663000	125000	75000	158.61	29.90	17.94	0.11	0.11	0
France	FR_Garo	Atlantic	135816	135816	21658000	4082000	475000	159.47	30.06	3.50	0.62	0.6	0.02
France	FR_Loir	Atlantic	93701	93701	40337000	7598000	405000	430.49	81.09	4.32	0.77	0.76	0.01
France	FR_Meus	NS	4230	4230	40000	7000	4000	9.46	1.65	0.95	0.21	0.11	0.1
France	FR_Rhin	NS	8652	8652	176000	33000	9000	20.34	3.81	1.04	0.39	0.36	0.03
France	FR_Rhon	Med	108008	108008	19279000	3628000	2453000	178.50	33.59	22.71	0.09	0.09	0
France	FR_Sein	Atlantic	71587	71587	5541000	1054000	278000	77.40	14.72	3.88	0.45	0.43	0.02
Germany	DE_Eide	NS	468783	468783	1708219	589804	570606	3.64	1.26	1.22	0.025	0.012	0.013
Germany	DE_Elbe	NS	201019	201019	1553273	32945	127315	7.73	0.16	0.63	1.27	1.002	0.268
Germany	DE_Ems	NS	44088	44088	820395	70895	128944	18.61	1.61	2.92	0.131	0.118	0.013
Germany	DE_Maas	NS	892	892	9298	69	65	10.42	0.08	0.07	0.734	0.627	0.107

[1] Belgium (both EMUs): The biomass values reported to EU and ICES differed. These figures are from the EU report.
[2] Finland: plan on restocking only, no data.

Country	EMU	Region	Wetted area		Biomass			Biomass density			Mortality		
			WA pristine	WA current	B_0 (kg)	B_{best} (kg)	$B_{current}$ (kg)	B_0 (kg ha^{-1})	B_{best} (kg ha^{-1})	$B_{current}$ (kg ha^{-1})	ΣA	ΣF	ΣH
Germany	DE_Oder	Baltic	80366	80366	372875	82203	91250	4.64	1.02	1.14	0.206	0.203	0.002
Germany	DE_Rhei	NS	61065	61065	532339	7680	213971	8.72	0.13	3.50	0.875	0.241	0.634
Germany	DE_Schl	Baltic	333790	333790	4205010	1855563	1892253	12.60	5.56	5.67	0.037	0.036	0.001
Germany	DE_Warn	Baltic	368309	368309	1367272	1488313	1444632	3.71	4.04	3.92	0.063	0.063	0
Germany	DE_Wese	NS	55472	55472	729845	41217	106303	13.16	0.74	1.92	0.567	0.368	0.199
Greece	GR_CeAe	Med	23090	23090				*1.70*		*0.36*			
Greece	GR_EaMT	Med	26850	26850	72240	2411	2830	2.69	0.09	0.11			
Greece	GR_NorW	Med	60199	60199	100297	53275	21749	1.67	0.88	0.36			
Greece	GR_WePe	Med	11076	11076	5300	22218	8952	0.48	2.01	0.81			
Ireland	IE_East	Atlantic	12977	12977	34780	17186	17011	2.68	1.32	1.31	0.013	0	0.013
Ireland	IE_NorW	Atlantic	49794	49794	171290	103670	93336	3.44	2.08	1.87	0.134	0	0.134
Ireland	IE_Shan	Atlantic	70317	70317	284844	90441	87493	4.05	1.29	1.24	0.072	0	0.072
Ireland	IE_SouE	Atlantic	13216	13216	53324	32392	32392	4.03	2.45	2.45	0	0	0
Ireland	IE_SouW	Atlantic	27266	27266	66171	25701	25522	2.43	0.94	0.94	0.014	0	0.014
Ireland	IE_West	Atlantic	63244	63244	230482	138896	138896	3.64	2.20	2.20	0	0	0
Italy[3]	IT_Abru	Med	602.44	235.5	1928	473	406	3.20	2.01	1.72	0.129	0.011	0.118
Italy	IT_Basi	Med	724.39	218.3	2318	714	557	3.20	3.27	2.55	0.219	0.011	0.208
Italy	IT_Cala	Med	493.72	191.8	1580	486	389	3.20	2.53	2.03	0.176	0.03	0.146
Italy	IT_Camp	Med	1924	1057.4	14339	6021	5552	7.45	5.69	5.25	0.215	0.028	0.188
Italy	IT_Emil	Med	31045	27026	458236	114056	83359	14.76	4.22	3.08	0.489	0.489	0
Italy	IT_Frio	Med	16185	15715.3	293033	72982	71479	18.11	4.64	4.55	0.173	0.145	0.028
Italy	IT_Lazi	Med	6895	3402.2	71054	31097	14129	10.31	9.14	4.15	1.26	0.838	0.421
Italy	IT_Ligu	Med	526.12	344.1	1684	714	628	3.20	2.07	1.83	0.094	0.024	0.07
Italy	IT_Lomb	Med	17336	6162.66	65561	11761	6673	3.78	1.91	1.08	1.016	0.002	1.014
Italy	IT_Marc	Med	1098.72	227.7	3516	862	623	3.20	3.79	2.74	0.286	0.018	0.268
Italy	IT_Moli	Med	282.07	72.5	903	277	206	3.20	3.82	2.84	0.264	0.011	0.253
Italy	IT_Piem	Med	4610	780	15632	2801	575	3.39	3.59	0.74	1.372	0.006	1.366
Italy	IT_Pugl	Med	12121	11947.3	399772	124085	110137	32.98	10.39	9.22	0.052	0.011	0.041
Italy	IT_Sard	Med	9250	8560.9	210387	89376	28077	22.74	10.44	3.28	2.16	2.015	0.145
Italy	IT_Sici	Med	1000	516.3	7871	3342	2936	7.87	6.47	5.69	0.275	0.031	0.244
Italy	IT_Tosc	Med	5521	3764	75404	31563	4705	13.66	8.39	1.25	3.363	3.363	0
Italy	IT_Tren	Med	2111	370	7195	1288	105	3.41	3.48	0.28	1.772	0.006	1.766
Italy	IT_Umbr	Med	13915	12800	3569	639	0	0.26	0.05	0.00		0.013	

[3] Italy: variously reported mortality rates for fresh and transitional water separately, but only larger estimates are reported here.

Country	EMU	Region	Wetted area		Biomass			Biomass density			Mortality		
			WA pristine	WA current	B_0 (kg)	B_{best} (kg)	$B_{current}$ (kg)	B_0 (kg ha^{-1})	B_{best} (kg ha^{-1})	$B_{current}$ (kg ha^{-1})	ΣA	ΣF	ΣH
Italy	IT_Vall	Med	338.2	0	1082	194	0	3.20	0.00	0.00		0.013	
Italy	IT_Vene	Med	94666	92633.4	1773133	441266	388711	18.73	4.76	4.20	0.199	0.105	0.094
Latvia	LV_total	Baltic	114001	114001	259600	12160	3398	2.28	0.11	0.03			
Lithuania[4]	LT_total	Baltic	60000	60000	87000	8581	0	1.45	0.14	0.00	1	1	0.05
Luxembourg								*8.72*		*3.50*			
Netherlands	NL_total	NS	378700	378700	10400000	2647000	1365000	27.46	6.99	3.60	0.662	0.542	0.12
Norway	NO_total	NS	24600	24600		281000	276600	0.00	11.42	11.24			0
Poland	PL_Oder	Baltic	183200	183200	1426000	150000	40812	7.78	0.82	0.22	1.742	1.232	0.511
Poland	PL_Vist	Baltic	231700	231700	1386000	125000	18009	5.98	0.54	0.08	2.004	1.205	0.799
Portugal/Spain	ES_Minh	Atlantic	1823.69	1823.69	36474	36474	4278	20.00	20.00	2.35	2.73	2.73	0
Portugal	PT_Port	Atlantic	135487.1	135487.1	1364571	1026094	698826	10.07	7.57	5.16		0.384	
Spain	ES_Anda	Med	126477	60767	6057545	310599	128456	47.89	5.11	2.11	0.879	0.885	-
Spain	ES_Astu	Atlantic	3774	2591	63495	81143	29466	16.82	31.32	11.37	1.012	1.01	0.002
Spain	ES_Bale	Med	4253	4253	330883	138556	138586	77.80	32.58	32.59	0.001	0	0
Spain	ES_Basq	Atlantic	4050	3991	245040	161787	127071	60.50	40.54	31.84	0.242	0.242	
Spain	ES_Cant	Atlantic	1936	615	9680	6579	1723	5.00	10.70	2.80	1.34	1.465	-
Spain	ES_Cast	Med	1174	0	23488	0	0	20.01	0.00	0.00	0	0	0
Spain	ES_Cata	Med	9895	5567	364607	196371	95415	36.85	35.27	17.14	1.05	1.05	
Spain	ES_Gali	Atlantic	5535	4548	110700	103785	12785	20.00	22.82	2.81	2.141	2.087	0.054
Spain	ES_Inne	Med	66868	0	2420205	0	0	36.19	0.00	0.00	0	0	0
Spain	ES_Murc	Med	13719	13500	26270	54445	8095	1.91	4.03	0.60	1.9	1.9	0
Spain	ES_Nava	Atlantic	272	231	5448		1134	20.03	0.00	4.91			
Spain	ES_Vale	Med	18217	6630	698026	419444	385175	38.32	63.26	58.10	0.091	0.088	0.003
Sweden	SE_East[5]	Baltic	1784300	1784300			3627000	0.00	0.00	2.03	0.02	0.02	0
Sweden	SE_Inla with stocking[6]	Baltic	3276300	3276300	563538	314295	119657	0.17	0.10	0.04	1.023	0.244	0.778
Sweden	SE_Inla excluding stocking[7]	Baltic	3276300	3276300	300000	50757	19324	0.09	0.02	0.01	1.023	0.244	0.778
Sweden	SE_West	Baltic			1154000	1154000	12000				0	0	0
United Kingdom	GB_Angl	NS	54373	54373	341084	123715	67785	6.27	2.28	1.25	0.602	0.171	0.43
United Kingdom	GB_Dee	Atlantic	14130	14130	636166	28336	16224	45.02	2.01	1.15	0.521	0.019	0.503
United Kingdom	GB_Humb	NS	57853	57853	137859	49581	4463	2.38	0.86	0.08	2.408	0.011	2.397

[4] Lithuania: B_0 for transitional waters, but all other results for freshwater.
[5] Note that the A and F are for the Swedish fishery only. They do not take account of earlier mortality rates from other parts of the Baltic, so these are not Lifetime rates.
[6] Used for mortality rates, but not for biomass.
[7] Used for biomass since B_0 is without stocking.

Country	EMU	Region	Wetted area		Biomass			Biomass density			Mortality		
			WA pristine	WA current	B_0 (kg)	B_{best} (kg)	$B_{current}$ (kg)	B_0 (kg ha^{-1})	B_{best} (kg ha^{-1})	$B_{current}$ (kg ha^{-1})	ΣA	ΣF	ΣH
United Kingdom	GB_Neag	Atlantic	40000	40000	500000	569810	247000	12.50	14.25	6.18	1.09	1.21	-0.12
United Kingdom	GB_NorE	Atlantic	5000	5000	4000	989	989	0.80	0.20	0.20	0	0	0
United Kingdom	GB_Nort	NS	11816	11816	60876	10243	4970	5.15	0.87	0.42	0.723	0	0.723
United Kingdom	GB_NorW	Atlantic	46783	46783	865449	47753	19806	18.50	1.02	0.42	0.737	0.178	0.559
United Kingdom	GB_Scot	NS/Atl	214241	214241	267717	255510	203521	1.25	1.19	0.95	0.227	0	0.227
United Kingdom	GB_Seve	Atlantic	75071	75071	899687	707732	81252	11.98	9.43	1.08	1.162	0.763	0.399
United Kingdom	GB_Solw	Atlantic	87496	87496	1473755	59460	45801	16.84	0.68	0.52	0.261	0	0.261
United Kingdom	GB_SouE	NS	11443	11443	121340	62932	49096	10.60	5.50	4.29	0.248	0.019	0.229
United Kingdom	GB_SouW	Atlantic	35850	35850	1327684	548510	7881	37.03	15.30	0.22	2.924	2.667	0.256
United Kingdom	GB_Tham	NS	42811	42811	251699	60336	14397	5.88	1.41	0.34	1.433	0.082	1.351
United Kingdom	GB_Wale	Atlantic	26570	26570	429944	43564	30826	16.18	1.64	1.16	0.299	0.103	0.196

Annex 2. Summary of Member States reporting in their 2018 EMP Progress Reports supplied to the European Commission, noting those EU Member States that had derogations from reporting and those that reported after the 30 June 2018 deadline. Note that the Description of the Methodology was requested in **Ares(2018)504014-29/01/2018** (with templates and guidance), but not in **Ares(2018)1830726-05/04/2018** (cover letter and excel templates).

EU Member State	Data tables 1–7	Description of the methodology	Comment
Austria			Derogation 2/4/09
Belgium	Y	Y	
Bulgaria			Derogation 4/4/08
Croatia	N	N	Did not report
Cyprus			Derogation 2/4/09
Czech Republic	N	Y	Reported late 4/7/18
Denmark	Y	Y	
Estonia	Y	Y	
Finland	N	Y	Reported late 5/7/18
France	Y, missing Tables 3, 7	Y	
Germany	Y	Y	
Greece	Y	Y	Reported late 11/7/18
Hungary			Derogation 4/4/08
Ireland	N	Y	Reported late 13/11/18
Italy	Y	Y	
Latvia	Y	Y	Reported late 2/7/18
Lithuania	Y	Y	
Luxembourg	N	N	Did not report
Malta			Derogation 2/4/09
Netherlands	Y	Y	
Poland	Y, missing Table 3	Y	Reported late 2/7/18
Portugal	N	N	Did not report
Romania			Derogation 2/4/09
Slovakia			Derogation 2/4/09
Slovenia			Derogation 24/9/09
Spain	Y	N	Reported late 17/8/18
Sweden	Y	N	
United Kingdom	Y	Y	