Summary of ICES advice on the exploitation of Baltic Sea fish stocks in 2018

1 June 2017

On 31 May 2017, the International Council for the Exploration of the Sea (ICES) published advice regarding the exploitation of the Baltic Sea fish stocks for 2018[1] Here we provide a summary of the ICES advice and the status of the Baltic stocks.

[1] Full ICES advice is available at http://www.ices.dk/publications/library/Pages/default.aspx

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SUMMARY TABLE

Table showing ICES advice for 2018 including the total catch in tonnes, percentage difference from advice for 2017, and the 2018 EU quota corresponding to ICES advice.

N.B. In the advice where ranges are provided, ICES has restated the intent of the new Baltic Multiannual Plan (MAP) that "catches higher than those corresponding to FMSY...can only be utilized under conditions specified in the MAP." No such justification has been provided, thus the corresponding commercial ranges in this table terminate at the upper end of the permitted range, FMSY, as described in the Baltic MAP.

Stock by management area and subdivision	Advised total catch (FMSY) for 2018, across the stock's full range & including third country catch, in tonnes	Change from ICES advice for 2017 (%)	EU commercial quota ranges corresponding to ICES advice for 2018, adjusted for management areas and reduced by third country quotas
Cod, Western Baltic, 22–24	5 295*	+52%	1 376–3 541
Cod, Eastern Baltic, 25–32	26 071	-3%	22 242–23 786***++^
Herring, Western Baltic Spring Spawners, 20–24	34 618	-39%	17 309**
Herring, Central Baltic, 25–29 & 32	267 745	+24%	177 134–238 229***^
Herring, Gulf of Riga, 28.1	24 919	+8%	23 476–28 999***
Herring, Gulf of Bothnia, 30–31	95 566	-32%	95 566++
Sprat, Baltic, 22–32	291 715	-7%	197 061–262 310^
Plaice, Kattegat, Belts & Sound, 21–23	5 405	-35%	6 272***
Plaice, Baltic, 24–32	3 104	+20%	
Salmon, Baltic, 22–31 (*individual fish*)	116 000	0%	78 400+
Salmon, Gulf of Finland, 32 (*individual wild/reared fish*)	0 / 11 800	0%	0 / 9 558+
Sea trout, Baltic, 22–32	0	0%	Not quota managed
Brill, Baltic, 22–32	11.5	-36%	
Dab, Baltic, 22–32	2 762	-10%	
Flounder, Belt Sea & Sound, 22–23	4 030	+10%	
Flounder, Southern Baltic, 24–25	41 628	+20%	
Flounder, Eastern Gotland & Gulf of Gdansk, 26 & 28	1 617	-36%	
Flounder, Northern Baltic, 27 & 29–32 (*landings*)	395	+20%	
Turbot, Baltic, 22–32 (*landings*)	186	-4%	

* Total catch includes commercial + recreational
** Reflects TAC splitting procedure in negotiated agreement for Baltic catch (SD 22–24)
*** Adjusted for the relative quota shares of each stock caught in the adjacent management area
\+ After deducting estimated unreported, misreported and discarded catch
++ These stocks do not yet have F-ranges under the Baltic Multiannual Plan
^ Based on prior EU-Russia TAC sharing agreement

INTRODUCTION

The International Council for the Exploration of the Sea (ICES) provides scientific advice to clients within the context of international agreements on fisheries, conservation, and sustainable development. Within this framework, ICES responds to policy needs such as regular EU requests for advice related to the goals of the Common Fisheries Policy (CFP), including Maximum Sustainable Yield.[2] Beginning with the advice for 2018, ICES also provides advice based on the multiannual plan for cod, herring and sprat in the Baltic Sea (Baltic MAP), developed to support the goals of the CFP at a regional level.[3]

Total catch, total commercial catch and Total Allowable Catch (TAC)

Readers of ICES advice must understand that "total catch" and "total commercial catch" are not always synonymous with the management term used for catch allocation in the EU: Total Allowable Catch (TAC).

The ICES advises the total catch for a stock whenever possible. Total catch represents the total fishing mortality for a stock from all stakeholders and across the stock's full range, possibly across multiple management areas. Total commercial catch represents fishing mortality only from commercial fishing.

For fisheries covered by the EU landing obligation, the corresponding TAC (or EU quota, if the TAC reflects third country catches) represents total commercial catch. For fisheries not yet under the landing obligation, the corresponding TAC represents only commercial landings. As of 1 January 2017, all catches of plaice in the Baltic are included in the landing obligation in addition to herring, sprat, salmon and cod.[4]

Differences between ICES total catch and regulatory TAC or quota

	Total catch	Total Allowable Catch (TAC) or quota
Framework	scientific	management, informed by science
Constraint	stock range	management area
Stakeholder	all	commercial
Fishing Mortality	total	dependent on landing obligation

ICES may highlight issues related to stock mixing, interspecies relationships or management area mismatches, but holds no preference for any distribution method excepting those which could exceed the advised total catch. For example, ICES highlights stock mixing between the eastern and western Baltic cod stocks in subdivision (SD) 24, and

[2] Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy (OJ L354/22, 28.12.2013)
[3] Regulation (EU) 2016/1139 of the European Parliament and of the Council of 6 July 2016 establishing a multiannual plan for the stocks of cod, herring and sprat in the Baltic Sea and the fisheries exploiting those stocks (OJ L191/1, 15.7.2016)
[4] Commission Delegated Regulation (EU) No 1396/2014 of 20 October 2014 establishing a discard plan in the Baltic Sea (OJ L 370/40, 30.12.2014)

indicates that their advice is specific to commercial catches only, reduced by known recreational catches. Readers must examine ICES advice closely and be familiar with the management of a relevant stock to determine what portion of the advised total catch represents the advised TAC.

Definitions and basis of ICES advice

Maximum Sustainable Yield (MSY), at its core, is a fisheries exploitation concept which seeks the largest long-term stable catch possible. Global use and interpretation of the MSY approach has evolved in complexity since the early 20th century but the basic concept remains the same: an overfished population is unable to support MSY.

The current EU policy interpretation of MSY uses the surplus production concept. This assumes that from an abundant fish population in a stable environment, fisheries can sustain a maximum stable and predictable catch. This is the foundation of the MSY approach which the European Union adopted in 2013, as part of the reform of the CFP, and which ICES has developed into its own MSY approach when providing advice on fishing opportunities. MSY estimates are inherently flawed due to assumptions of stability (equilibrium) in an ecosystem and a fishable biomass. Appreciating this flaw, ICES "considers MSY estimates to be valid only in the short term".[5]

Key metrics used in the MSY approach, based on EU requests, include spawning stock biomass (SSB) and fishing mortality rate. Fishing mortality (F) represents the rate at which individual fish are killed by fishing, as a proportion of the total fish in a year class. This should not be confused with fishing effort (f), which is a measure of fishing intensity.

Within ICES advice, F is averaged annually across the dominant year classes harvested. The fishing mortality rate in line with the MSY approach (F_{MSY}) is estimated to maximise the average long-term catch. Fishing at this rate depends on a resilient fishable population and extreme confidence in scientific data. Fish age, size, condition, growth rate, distribution and SSB are just some of the factors that determine if a fish population can support a given fishing mortality rate, in addition to numerous other ecosystem factors and interspecies interactions. These biological data are inherently uncertain in fisheries and precaution is necessary.

The SSB, commonly measured in tonnes, represents only those fish mature enough to reproduce. In the context of MSY and additional surplus production assumptions, SSB_{MSY} (or simply B_{MSY}) is the SSB that would support F_{MSY}. B_{MSY} in reality is a moving target dependent on a wide range of natural factors in addition to fishing mortality. Additionally, the productivity of year classes within a SSB can vary greatly, and overall SSB productivity can change dramatically over time.

[5] Pg 4 *in* ICES. 2016. General context of ICES advice. Available at: http://www.ices.dk/community/advisory-process/Pages/Basis-for-ICES-Advice.aspx

These factors introduce uncertainty when SSB is considered in isolation, as is currently the case in the setting of fishing opportunities within the EU Council. The developing interpretation of the Marine Strategy Framework Directive should integrate more comprehensive factors for what constitutes a healthy stock and sustainable fishing mortality, resulting in more robust EU requests for advice and a move away from the surplus production concept.

Precaution and the MSY approach

While the two metrics F and SSB are not directly related, changes in F over time will influence SSB. Within the MSY approach and equilibrium assumptions, ICES therefore created $B_{trigger}$ as a precautionary SSB reference level intended to trigger a management response to lower F. ICES describes $B_{trigger}$ as the lower bound of SSB fluctuations around B_{MSY} when a stock is fished at F_{MSY}. $B_{trigger}$ is similar to minimum stock size thresholds used in other fisheries management plans, such as those in the United States.

The ICES has published new technical guidelines outlining the method for determining the reference points, including $B_{trigger}$, for stocks meeting certain data requirements. [6] Technical guidelines for some data limited stocks are also being drafted. The advice for 2018 summarized in this report reflects this new guidance.

In data limited situations ICES may use proxies for both B_{MSY} and F_{MSY}, using the ratio B/B_{MSY} and F/F_{MSY}. Using a definition from the surplus production concept, that $B_{trigger} = 0.5\ B_{MSY}$, these proxies may then be used to determine, quantitatively, the relative status of a stock when absolute values are considered uncertain.

In extreme cases stocks could be depressed through natural or fishing mortality to the lowest reference point for spawning stock biomass, B_{lim}. This represents the SSB below which recruitment in a fish stock is impaired, risking full stock collapse. The fishing exploitation rate that leads to B_{lim} is termed F_{lim}. Fishing a stock to such a low level is disastrous for the fish population and for dependent fishing communities. Recognising this danger, coupled with fisheries stock assessment uncertainty, ICES developed a precautionary SSB reference point called B_{pa}. A slightly larger SSB than B_{lim}, B_{pa} provides managers response time to reduce fishing mortality when the risk of collapse is lower. In cases where ICES has not calculated $B_{trigger}$ using any other means, they substitute B_{pa}, though the two concepts have a different basis.

In 2012, ICES developed a framework for quantitative advice regarding data-limited stocks. The framework places all stocks into six different categories, from data-rich to data-poor. Data-limited advice is based on a combination of biomass indices and landings data (depending on what is available) and a ±20 % "uncertainty cap" applied to the previous years' advice or so-called *status quo* landings. Although ICES considers all data categories

[6] ICES. 2017. 12.4.3.1 ICES fisheries management reference points for category 1 and 2 stocks. Available at: http://ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/12.04.03.01_Reference_points_for_category_1_and_2.pdf

precautionary, ICES references the precautionary approach specifically when providing advice on data limited stocks, and the MSY approach when providing advice on data-rich stocks.

Integrating the Baltic multiannual plan into ICES advice

The Baltic MAP includes rules the EU must follow when setting fishing opportunities for Baltic stocks. In this plan, the EU introduces ranges of fishing mortality around the point value of F_{MSY}, the upper called MSY F_{upper} and the lower called MSY F_{lower}, developed in part from an EU special request for ICES advice.[7] The Baltic MAP uses the biomass reference levels $B_{trigger}$ and B_{lim} to indicate when different management actions are necessary. Of particular importance in the new plan, under certain circumstances fishing opportunities may be set above F_{MSY} up to a fishing exploitation rate MSY F_{upper}.

There are three circumstances provided in the Baltic MAP when fishing opportunities may be set to exceed F_{MSY}. All depend on a stock's SSB being above the lower precautionary biomass level $B_{trigger}$. The three reasons are as follows:

> *(a) if, on the basis of scientific advice or evidence, it is necessary for the achievement of the objectives laid down in Article 3 in the case of mixed fisheries;*
> *(b) if, on the basis of scientific advice or evidence, it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; or*
> *(c) in order to limit variations in fishing opportunities between consecutive years to no more than 20 %.*[8]

If setting fishing opportunities above F_{MSY}, the European Council must also "explain by a reference" why they have exceeded F_{MSY}, instead of following the policy for setting fishing opportunities below F_{MSY} as central in the CFP. Readers should be aware that the Baltic MAP allows the European Council to use other evidence in addition to scientific advice to justify implementation of a higher fishing exploitation rate. What constitutes other evidence is presently unclear, but may include advice from the Scientific, Technical and Economic Committee for Fisheries, the Baltic Sea Advisory Council, or other sources.

In the scientific advice on ranges contributing to those in the Baltic MAP, ICES included a description of the risks involved with setting fishing opportunities at or above F_{MSY}. Given the increased risk incorporated into the new plan, it is worthwhile to restate a portion of the ICES advice:

> *There are considerations other than average long-term yield for fishing above or below F_{MSY}. In a single-species context, fishing above F_{MSY} implies reduced stock biomass and this*

[7] ICES. 2016. 6.2.3.1 EU request to ICES to provide FMSY ranges for selected North Sea and Baltic Sea stocks, version 6. Available at: https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_FMSY_ranges_for_selected_NS_and_BS_stocks.pdf

[8] Article 4 of Regulation (EU) 2016/1139.

may be substantial where F_{upper} is much higher than F_{MSY}. So in utilizing F_{MSY} ranges there are more advantages to fishing between F_{MSY} and F_{lower} than between F_{MSY} and F_{upper}.

With higher fishing mortalities the following occurs:

- *A need for increased fishing effort;*
- *Higher dependence of stock and yield on recruiting year classes and increased variability on catch opportunities;*
- *The size of the fish in the stock and the catch will be smaller on average;*
- *Greater probability of SSB being less than MSY $B_{trigger}$; and*
- *A lower probability of density-dependent effects such as reduced growth or increased cannibalism.*

For some mixed fisheries it may be difficult to reconcile the Fs on different stocks. An approach for maximizing long-term yield could be to attempt to reconcile F on a mixed fishery using Fs between F_{lower} and F_{MSY}. If this cannot be accomplished, F between F_{MSY} and F_{upper} could also be used in the short term. However, using $F > F_{MSY}$ for the same stock in the long term implies that there are structural changes required in the fishery to avoid the consequences listed above. Moreover, in line with the request, F_{MSY} and the upper and lower ranges are calculated based on current fishery selectivity with the possibility of higher yields if selectivity is altered through changes in gear design, fishing area, or season.[9]

What happens next?

In June, the Commission publishes a policy statement describing the general principles they will apply when proposing fishing opportunities, or TACs and quotas, for the coming year. Specific Commission quota proposals come later in the year following consideration of scientific advice. The Baltic Sea Advisory Council also considers the scientific advice for Baltic fish stocks, other comments from its membership, and produces its own advice.

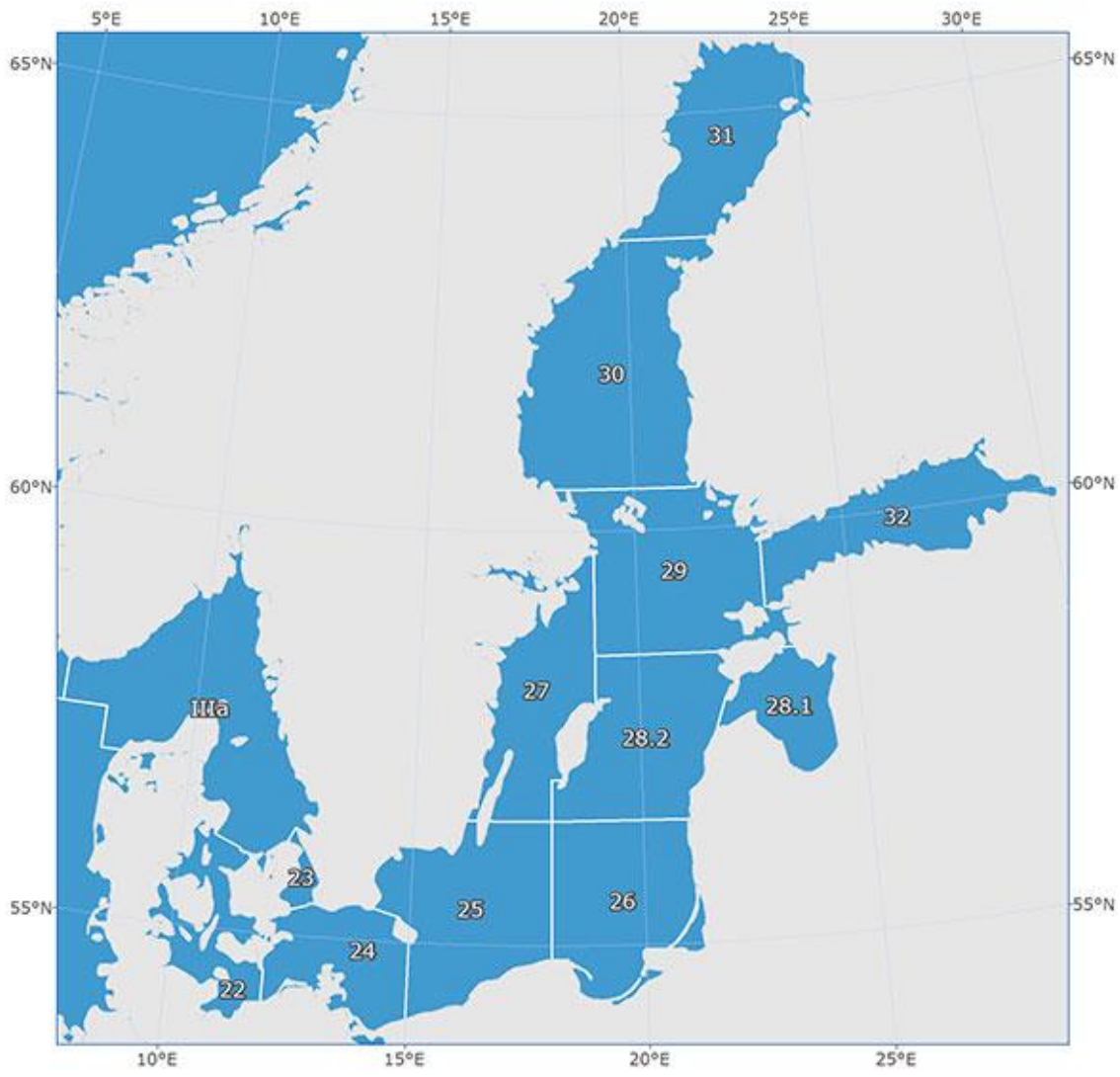
The Commission will most likely publish its proposal for Baltic fishing quotas in September. Subsequently, European Council working groups will discuss the Commission's proposal prior to the Council's October meeting, where it will negotiate the 2018 fishing quotas. The regional Member State organization BALTFISH will also make joint recommendations to the European Council ahead of the October Council meeting.

[9] Pg 2-3 *in* ICES. 2016.§

DETAILED SUMMARY OF ICES ADVICE

N.B. ICES provides total catch advice applicable to a stock across its full range. The Commission applies a TAC to a stock by management area.

Map of the Baltic Sea showing management subdivisions[10]



[10] FAO. 2016. [FAO major fishing areas] Available at: http://www.fao.org/fishery/area/Area27/en

Cod in Subdivisions 22–24, Western Baltic

Western Baltic cod (*Gadus morhua*) is severely overfished. The SSB peaked in the early 1980s and reached a record low in 2013. The short-term forecast estimates that the SSB in 2017 is the second-lowest in the time series. Overall fishing mortality is, and has consistently been, well above F_{MSY}, F_{pa}, and is currently fluctuating around F_{lim}. The most recent stock assessment has again revised the SSB downward and the fishing mortality rate upward. This stock has not grown as expected in the previous assessment, and the SSB has remained below B_{lim}, outside of safe biological limits and near collapse, for nearly a decade. Recruitment to the fishable stock in 2016 was the lowest in the 1994–present time series, though recruitment in 2017 is relatively one of the highest.

The projected growth for 2018 noted in the advice depends both on the recruitment in 2017, which is still uncertain and based on a few data points, and an assumption that the fishing exploitation rate on the stock, from all sources, will be 0.37 for 2017. This is very likely an underestimate of the true fishing mortality. Reasons include uncertainty from unaccounted fishing mortality and to a lesser extent stock mixing with eastern Baltic cod. In addition, the model used has repeatedly and consistently revised the biomass downward and the fishing exploitation rate upward, for several years. ICES sees this as a matter of concern and is now investigating possible underlying reasons.

Unless the cut in quota for 2017 is strictly applied across all commercial fisheries, the fishing exploitation rate for 2017 will likely remain at a similar level to that historically recorded. Significant changes in the fisheries capturing this stock are necessary to curb the long-term sources of mortality, including a commitment by Member States to implement existing regulations. Caution is necessary for all further exploitation of this stock to ensure that the recruitment in 2017 has the opportunity to help repopulate the stock.

An additional indicator of poor stock status is age-truncation, a reduction in the age when fish become mature.[11] The proportion mature at age 2 in 1994 was 35%. The most recent estimate for 2016 is more than twice that proportion, with 71% mature at age 2.[12] Similar to data from the eastern Baltic stock showing fish maturing at smaller sizes, this age-truncation is a result of overfishing over the long term, including larger, more fecund 'mother' cod selected out through relatively unselective mobile fishing methods. However, integrating stock data from SD 24 into the assessment may change this outlook.

Mixing between western and eastern Baltic cod in SD 24 complicates quota setting for the Management Area (SD 22–24). Reallocating a portion of the TAC for eastern Baltic cod to SD 24 would account for this naturally occurring stock mixing, but introduces an additional risk to overfishing western Baltic cod. ICES therefore highlights the need to protect the weaker western Baltic cod stock when considering any such reallocation.

[11] Marteinsdottir G, & Begg G.A. 2002. Essential relationships incorporating the influence of age, size and condition on variables required for estimation of reproductive potential in Atlantic cod *Gadus morhua*. Marine Ecology Progress Series, 235: 235–256.
[12] ICES. 2017. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 19–26 April, 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:11. 503pp.

Incorporating recreational catches in the stock assessment has added additional uncertainties to the advice. Only German recreational fishery data are included, as data on Danish and Swedish recreational fisheries is still too uncertain to include in the assessment. Recreational catches are generally not restricted through Council decisions on fishing opportunities. For 2018, ICES has deducted the estimated recreational catch first to arrive at advice specific to commercial catch only.

Contrary to anecdotal discussion, ICES data on German recreational fisheries shows that the vast majority of the recreational catch (86%) consists of cod age 3 and younger, and not a proportionally high number of older, larger cod.

The landing obligation became effective in the Baltic in 2015, but discarding still occurs. Experts in the field and fishers both agree that the ICES estimate of discarding is an underestimate due to non-compliance. ICES also notes that discarding will increase as fishers capture the new larger year class.

The Baltic Sea Advisory Council unanimously advised in 2015 that the "Bacoma" and "T90" regulated cod-ends to fishing trawls are ineffective and that to achieve the objectives of the CFP and the landing obligation fishers must be able to modify their gears for improved selectivity. Neither the Baltic Member States nor the Commission have taken any action on this advice.

The commercial catch advice range for western Baltic cod, based on the Baltic MAP, is from 1 376 tonnes to 3 541 tonnes. This catch advice is a portion of the total catch represented in ICES advice, which is no more than 5 295 tonnes. To arrive at the total commercial catch advice, ICES deducted an estimated 1 754 tonnes of recreational catch.

Accounting for the ratio of eastern Baltic cod in SD 24, the *'status quo'* allocation within the adjusted F-ranges in the Baltic MAP could include from 981 tonnes to 2 525 tonnes of additional quota, with the Eastern Baltic Management Area quota reduced by the same amount. This would result in a potential range for the Western Baltic Management Area quota of 2 357 to 6 066 tonnes.

In accordance with the Baltic MAP, ICES advises that the commercial catch of western Baltic cod should not exceed the range 1 376 tonnes to 3 541 tonnes. The TAC corresponding to ICES advice may include a portion of eastern Baltic cod, as long as the weaker western stock is protected from overexploitation.

Cod in Subdivisions 25–32, Eastern Baltic

Due to favourable environmental conditions and strong year classes towards the end of the 1970s, the eastern Baltic cod stock reached its highest recorded biomass levels in 1980–1982. From an early 1980s high of approximately 640 000 tonnes, high fishing mortality and poor environmental conditions resulted in a stock decline to only 87 000 tonnes by

1992. Fishing mortality remained high on this depressed stock through the 2000s. The Helsinki Commission and the International Union for Conservation of Nature eventually classified eastern Baltic cod as "vulnerable" due to the threat of synergistic effects of eutrophication and climate change.[13]

Following the 2015 ICES benchmarking exercise, ICES determined that eastern Baltic cod is a data-limited stock, and they could not complete an analytical assessment. Key issues in the analytical assessment include the failure to confidently age cod, or quantify changes in cod growth and natural mortality. These issues, among others, increase uncertainty to such a degree that an analytical assessment is not meaningful. Thus, there are no available reference points for biomass and fishing mortality of eastern Baltic cod.

New in the advice for 2018, ICES has applied a model for data limited stocks, using proxies for MSY reference points, and believes the stock biomass to be above $B_{trigger}$ by 7% and above F_{MSY} by 153%.[14]

Additional data on the stock, such as the small fish index and length at maturity, are useful to understand stock status. In particular for considering fisheries-relevant components of the Marine Strategies Framework Directive, descriptor 3 in Annex I, that a fished population exhibit "a population age and size distribution that is indicative of a healthy stock."[15]

The small fish index shows a steady decline in the amount of small fish in the stock, which may also indicate a fall in recruitment. Similar to western Baltic cod, eastern Baltic cod are maturing at record-setting smaller sizes, and what is assumed younger ages (since age cannot be verified in the eastern stock). The length at which eastern Baltic cod first mature has fallen by half, from near 40 cm in the early 1990s to 20 cm in 2016–2017. When seen in other cod stocks, this kind of stunted stock development has been associated with poor stock resilience, but the impact on reproductive capacity in the Baltic is still unknown. Combining these two elements, a decline in small fish and fish maturing at smaller sizes, suggests the stock is in an unhealthy state.

Lacking an analytical assessment, ICES develops catch advice based on the ICES data limited framework. The new Baltic MAP also supports the application of the precautionary approach when reference points are not available. Comparing trawl survey data from the last five years, ICES estimates that the Eastern Baltic cod stock size has decreased by less than 20%. This has been converted into a total catch advice for eastern Baltic cod of 26 071 tonnes, including catches in both the eastern and western Baltic cod management areas.

[13] HELCOM. 2013. Species Information Sheet Gadus Morhua: http://www.helcom.fi/baltic-sea-trends/biodiversity/red-list-of-species/red-list-of-fish-and-lamprey-species
[14] ICES. 2017. Annex 7.7 - Eastern Baltic Cod assessment using seasonal data and SPiCT.
[15] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (OJ L164/19, 25.6.2008)

Cod in the eastern Baltic is also harvested by Russia. According to recent communication with the Commission, the Russian share is calculated to be 5% of the total TAC, in line with a previously negotiated TAC sharing arrangement. The Russian fishery is exclusively on the eastern Baltic cod stock in the area of Kaliningrad, thus the corresponding EU quota for eastern Baltic cod should be reduced in line with the agreement to 24 767 tonnes.

As described in the section on western Baltic cod, stock mixing occurs between the western and eastern cod stocks in SD 24. Accounting for the ratio of eastern Baltic cod believed to be in SD 24, the *'status quo'* allocation for the Western Baltic Management Area could include an additional quota of 981–2 525 tonnes. This would result in a reduced Eastern Baltic Management Area quota from 22 242 tonnes to 23 786 tonnes (after deducting the Russian TAC). As stated above, ICES notes the need to protect the weaker western Baltic cod stock when considering any reallocation of the eastern Baltic cod quota to SD 24, as a higher TAC increases the pressure on the western Baltic stock.

The Commission's request for advice for 2018 specified the use of *'status-quo'* fishing effort distribution, although this distribution can vary widely. This explains the softening of the ICES advice from 2017 to 2018, when ICES was explicit about the need to create separate management areas in order to ensure that the weakest component of the western Baltic cod stock in SD 22 was protected.

In 2014 and 2015 the Baltic experienced several significant inflows of oxygen-rich sea water, ending a decade-long stagnation in the central Baltic Sea.[16] While the inflows appear to have had a positive impact on cod condition, previous expectations that the inflow would benefit cod productivity and recruitment have not yet materialized.

Discarding of cod is considered to be a more substantial issue in the eastern Baltic than in the western Baltic. Limited observer data indicates that undersized cod represents nearly 11% of the total catch in tonnes, or 20% in numbers (11 million individuals), while in landings data undersized cod represents less than 2%. This mismatch, due to discarding of undersized cod in circumvention of the landing obligation, is itself likely to be an underestimate of the true discard rate. Scientific observers in some Member States were previously unable to board and observe fishing activities. According to information provided during the Advice Drafting Group, this has been resolved. ICES has obtained information that fishers are illegally modifying their gear to increase catch rates of all cod, subsequently discarding the undersized catch.

In accordance with the precautionary approach, and the adjustments noted above, the EU portion of the TAC corresponding to ICES advice should not exceed a range of 22 242 tonnes to 23 786 tonnes.

[16] Mohrholz V., Naumann M., Nausch G., Krüger S. and U. Gräwe. 2015. Fresh oxygen for the Baltic Sea – An exceptional saline inflow after a decade of stagnation. Journal of Marine Systems, 148: 152–166; Karnicki, S., BSAC General Assembly, 26 April 2016.

Herring in Subdivisions 20–24, Western Baltic Spring Spawners

Western Baltic spring spawning herring (*Clupea harengus*) is one of the more complex stocks to assess. Interannual variability in the migration patterns, migrations between the Baltic and North Sea management areas, catch distribution among fisheries and stock mixing with central Baltic herring all add to the complexity.

The stock biomass declined substantially from the early 1990s amid increased fishing mortality and reduced recruitment, reaching its lowest estimated SSB in 2011. Since then, relative reductions in fishing mortality appear to have permitted moderate growth in the SSB though recruitment remains low. The current assessment has revised the biomass downward and recent historical fishing exploitation rates upward. The stock is now considered overfished, below $B_{trigger}$, and fishing pressure is above F_{MSY}.

Appreciating the variability in historic assessments, the perception of the stock has changed due to uniformly low survey indices from all 2016 surveys.[17] Due to the revision in the assessment, the total catch advised across the range of this stock is 34 618 tonnes.

This stock is subject to a TAC setting procedure in annually negotiated agreements between the EU and Norway.[18] The interpretation of this TAC rule allocates half of the advised catch, or 17 309 tonnes, to the Baltic SD 22–24 and the other half to the North Sea.

The Baltic MAP also includes F-ranges for the Western Baltic herring stock. The remaining component of the stock-complex in the North Sea is managed through the EU-Norway management strategy, which for 2018 forms the basis of ICES advice. Therefore ICES advice is based on its existing MSY approach and has reduced the advice according to the ICES advice rule. The Baltic MAP range is provided under 'other options' and does not form the basis of ICES advice, thus readers should be aware that the range values in this 'other options' table have not been adjusted according to the Baltic MAP advice rule for stocks below $B_{trigger}$.

In accordance with the MSY approach and the quota split noted above, the Baltic quota corresponding to ICES advice would be no more than 17 309 tonnes.

Herring in Subdivisions 25–29 & 32, Central Baltic Sea, excluding Gulf of Riga

This is the largest of the Baltic herring stocks, composed of a number of local populations. Following a SSB decline to below B_{lim} in the late 1990s, the stock has shown a steady increase and is now well above MSY $B_{trigger}$. Fishing mortality has remained below F_{MSY} since 2004.

[17] Surveys include two acoustic surveys, two trawl surveys, and one larval survey.
[18] Industry & Fisheries Ministry, Norway. 3 December, 2016. Press Release. Kvoteavtale med EU for 2017. Available at: https://www.regjeringen.no/no/aktuelt/kvoteavtale-med-eu-for-2017/id2522649/

The 2014 year-class of herring, recruiting to the fishery in 2015, is remarkably high compared to all other years in the time series, making it the highest since the time series began in 1974. This is an improvement on the previous year's assessment, which assumed the 2014 year class to be the fourth-largest in the time series.

ICES advises that total catches in 2018 should be no more than 267 745 tonnes (Baltic MAP F_{MSY}). Stock mixing with Gulf of Riga herring, and accounting for the Russian quota share, results in a different corresponding EU portion of the TAC.

A previously negotiated TAC sharing agreement with Russia provides their herring fisheries with 9.5% of the total TAC, or 25 048 tonnes, leaving 242 309 tonnes of EU quota in line with ICES advised total catch. The assumed 2018 commercial catch of this stock in the Gulf of Riga, outside of the Central Baltic, is 4 340 tonnes, and the assumed catch of Gulf of Riga herring in the Central Baltic is 260 tonnes. The resulting total EU quota according to the range incorporated in the Baltic MAP would be from 177 134 tonnes to 295 937 tonnes. The adjusted EU quota at Baltic MAP F_{MSY} would be 238 229 tonnes.

Any EU quota, with adjustments, set above the F_{MSY} value in this range is only permissible according to the Baltic MAP if certain conditions are met. There is no evidence provided in the ICES advice to justify exceeding the F_{MSY} point value.

Discards are considered negligible. Due to the introduction of the Landing Obligation, interspecies quota transfers of up to 9 % are legally permitted, within conservation constraints. The ICES advice does not consider any of these transfers, and notes that any future transfers should not result in overall harvests exceeding scientific advice.

In accordance with the Baltic MAP and the adjustments noted above, and lacking justification in the Baltic MAP to exceed F_{MSY}, the EU portion of the TAC corresponding to ICES advice would be within the range of 177 521 tonnes to 238 229 tonnes.

Herring in Subdivision 28.1, Gulf of Riga

The Gulf of Riga is a semi-enclosed ecosystem of the Baltic Sea with lower salinity than the main basin, with the smallest and slowest growing individual herring in the Baltic. Herring is the dominant marine species in the Gulf, with few natural predators. Fishing mortality has generally been above F_{MSY}, and has increased steadily since 2015 according to the current assessment.

Recruitment of Gulf of Riga herring is highly dependent on environmental conditions, particularly water temperature and zooplankton abundance. Since 1989 the majority of winters have been mild, favouring herring reproduction. Current recruitment appears roughly average, although there has been high variation within the time series.
ICES advises that total catches in 2018 should be no more than 24 919 tonnes (Baltic MAP F_{MSY}). Stock mixing with Central Baltic herring results in a different corresponding TAC

for the Gulf of Riga management area. The assumed 2018 commercial catch of this stock in the Central Baltic, outside of the Gulf of Riga, is 260 tonnes, and the assumed 2018 commercial catch of Central Baltic herring in the Gulf of Riga is 4 340 tonnes.

The corresponding TAC for this management area, recognising stock mixing, would be no more than 28 999 tonnes (Baltic MAP F_{MSY}). While a larger figure than the advised total catch for the whole stock, the corresponding TAC reflects fishing levels no greater than F_{MSY} before adjustments. The possible TAC according to the F-range incorporated in the Baltic MAP would be from 23 476 tonnes to 33 275 tonnes. Discards are considered negligible.

Any TAC, with adjustments, set above the F_{MSY} value in this range is only permissible according to the Baltic MAP if certain conditions are met. There is no evidence provided in the ICES advice to justify exceeding the F_{MSY} point value.

In accordance with the Baltic MAP and the adjustments noted above, and lacking justification in the Baltic MAP to exceed F_{MSY}, the TAC corresponding to ICES advice would be within the range of 23 476 tonnes to 28 999 tonnes.

Herring in Subdivision 30-31, Gulf of Bothnia

Previously treated as separate stocks in ICES advice, Bothnian Sea and Bothnian Bay herring have been combined into a single advice reflecting the TAC management area. ICES has calculated new F-Ranges for this combined stock. Until the new ranges are defined and agreed within the Baltic MAP, ICES provides advice based on the ICES MSY approach.

Due to low salinity and low mean temperature, herring in the Gulf of Bothnia is slow-growing and relatively small. The spawning stock biomass of Bothnian Sea herring tripled in the late 1980s, only to then drop by 40% by 1999. Since 2003, this stock's SSB has grown to the highest levels assessed in 20 years, with decreases noted since the 2014 peak.

While the SSB is still relatively high, ICES dramatically revised the stock's estimated SSB downward in 2015. This was due to a necessary change in the assessment to handle ongoing uncertainty regarding the recent acoustic survey recruitment estimates. These concerns should diminish over time as the acoustic survey time-series grows.

The ICES advice for 2018 is that catches should not exceed 95 566 tonnes. Discarding is considered negligible.

The fishing exploitation rate and total catch from this stock have steadily increased and are the highest in the 1980–present time series. The fishing exploitation rate has historically remained below F_{MSY}, but since 2015 it has been above F_{MSY}.

In accordance with the MSY approach, the TAC corresponding to ICES advice would be no more than 95 566 tonnes.

Sprat, Baltic Subdivisions 22-32

Sprat (*Sprattus sprattus*) is managed as a single stock across the Baltic Sea. Declining to below B_{lim} in the early 1980s, sprat then recovered to well above $B_{trigger}$, reaching a maximum assessed SSB in 1996 of 1.9 million tonnes. Sprat stocks have since fluctuated above $B_{trigger}$, corresponding to relative changes in fishing mortality.

Eastern Baltic cod and sprat stocks share a strong predator-prey relationship. Higher cod SSB in the early 1980s contributed to lower sprat populations. As cod declined, sprat recovered. The assessment correlates natural mortality via predation on sprat with eastern Baltic cod biomass and cod stomach content analysis.

ICES estimates a decreasing fishing mortality from 2013 to the present, falling to sustainable levels, below F_{MSY}, in 2016. This is the first time fishing mortality is within long-term sustainable levels since 1994. The resulting total catch advice for 2018, reflecting increasing SSB and decreasing fishing mortality, is 291 715 tonnes (Baltic MAP F_{MSY}).

A previously negotiated TAC sharing agreement with Russia provides their sprat fisheries with 10.08% of the total TAC, or 29 405 tonnes. The resulting EU quota according to the range incorporated in the Baltic MAP would be from 197 061 tonnes to 271 308 tonnes. The adjusted EU quota at Baltic MAP F_{MSY} would be 262 310 tonnes.

Any EU quota, with adjustments, set above the F_{MSY} value in this range is only permissible according to the Baltic MAP if certain conditions are met. There is no evidence provided in the ICES advice to justify exceeding the F_{MSY} point value. Discarding is considered negligible.

In addition to advice on total catch, ICES has repeatedly advised that a spatial management plan be considered for the fisheries that catch sprat. This is based on the need to improve the overall condition of eastern Baltic cod. Recent detailed research further supports this advice.[19] Decreasing fishing effort on sprat in SD 25 and 26 would make more sprat available as feed for cod, potentially improving cod condition.

At present, sprat is more abundant in areas outside of the cod's range in SD 25 and 26. Increasing effort northward in the Baltic to SD 27–32, through restrictions on sprat catches in the main cod area, would also optimize the yield and growth of sprat (and herring, with similar density-dependence traits, though less critical for cod condition) by reducing competition within these stocks for prey.

In accordance with the Baltic MAP and the adjustments noted above, and lacking justification in the Baltic MAP to exceed F_{MSY}, the EU portion of the TAC corresponding to ICES advice would be within the range of 197 061 tonnes to 262 310 tonnes.

[19] Casini, M., Käll, F., Hansson, M., Plikshs, M., Baranova, T, Karlsson, O., *et al*. 2016. Hypoxic areas, density-dependence and food limitation drive the body condition of a heavily exploited marine fish predator. Royal Society Open Science, 3: 160416. 15 pp.

Salmon in the Baltic Sea

ICES advises on Baltic salmon (*Salmo salar*) catch within two management areas: the Main Basin and the Gulf of Bothnia (SD 22–31), and the Gulf of Finland (SD 32). Within these management areas Baltic salmon exist in a large number of river-specific populations ranging from healthy to vulnerable.

The last Baltic-wide agreement on a management plan for Baltic salmon came to an end in 2010. The European Commission proposed a new plan in 2011 (COM(2011)470), but negotiations on this stalled early on. Currently salmon stocks are managed through a combination of EU quotas agreed by the European Council on an annual basis and individual Member State management of local salmon rivers. However, the lack of an approved long-term management plan for Baltic salmon is particularly serious as Baltic salmon is listed under the Habitats Directive, obliging Member States to ensure 'favourable conservation status'.[20] Salmon management targets are also included in the Water Framework Directive, the Marine Strategy Framework Directive, the Baltic Sea Action Plan and the HELCOM Copenhagen Ministerial Declaration.[21]

Baltic salmon are particularly vulnerable to environmental conditions in their home spawning rivers. Hydropower dams and other forms of habitat destruction can prevent salmon from spawning at all. In many parts of the Baltic Sea region, particularly in the South, natural salmon populations have declined or disappeared.[22]

In some larger rivers, hydropower companies are obliged to carry out major restocking programs, releasing salmon smolt (young salmon), in order to compensate for the loss of habitat and migration obstacles resulting from hydropower installations. The process of restocking is costly and ineffective. Today, reared fish die in high numbers before maturing to spawning adults. Although 4.2 million reared salmon smolts were released in 2015, compared to 3.1 million produced in the wild, salmon catches consist of between 65% and 87% wild fish.

Despite some positive developments, such as improved habitats in both spawning and nursery areas and subsequent increases in natural reproduction, the wild salmon in several rivers have not recovered. Juvenile salmon suffer higher than expected mortality. The reasons for this low survival are still largely unknown.

[20] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L206/7, 22.7.92)
[21] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327/1 22.12.2000); Directive 2008/56/EC; HELCOM. 2007. Baltic Sea Action Plan. HELCOM Ministerial Meeting, Krakow, PL, 15 November 2007. 101pp; HELCOM. 2013. Copenhagen Ministerial Declaration, 3 October 2013. 20pp.
[22] HELCOM. 2011. Salmon and Sea Trout Populations and Rivers in the Baltic Sea – HELCOM assessment of salmon (Salmo salar) and sea trout (Salmo trutta) populations and habitats in rivers flowing to the Baltic Sea. Baltic Sea Environment Proceedings No. 126A. 79pp.

ICES advises that management of salmon fisheries should be based on the status of individual river stocks, and that fisheries on mixed stocks should be reduced as they present particular threats to stocks that do not have a healthy status.

Salmon in Subdivisions 22–31, Baltic Sea excluding the Gulf of Finland

ICES assesses 29 river populations divided into 5 assessment units based on salmon biology and genetics. Since 1997 wild smolt production has increased substantially from very low values, particularly in the North. Smolt production in the Southeast shows no signs of improvement. Increases in smolt production are mainly due to increases in 2–3 rivers. The situation in the southernmost rivers is unchanged or deteriorating.

The target for rebuilding stocks is to reach at least 75%[23] of the estimated potential smolt production for each river. As an interim objective for weak stocks, 50% of the potential smolt production is used. Potential salmon habitat may still be underestimated in a number of salmon rivers such as the Pite River resulting in an incorrect potential smolt production. Out of 29 stocks assessed, only 6 rivers show a high probability of reaching the 75 % target in the near future, 11 rivers show a less-than-high probability, and 12 rivers are less than 30 % likely to reach this goal. Of those 12 rivers, 8 are less than 30% likely to meet even the interim goal.

The rivers Rickleån, Kågeälven, and Testeboån in the Gulf of Bothnia, Emån in southern Sweden, and several other rivers in the Southeastern Main Basin are especially weak and desperately in need of longer-term stock-specific rebuilding measures.

Although not incorporated into the assessment, recent data suggests that M74 syndrome is increasing again. M74 syndrome is caused by an unbalanced salmon diet predominantly based on young sprat, which lack adequate thiamine for the salmon's reproduction cycle. This deficiency is passed onto salmon eggs and young salmon fry causing high mortality.[24] In addition to other sources already considered in the ICES working group on Salmon, preliminary data from the Swedish power company Vattenfall indicates a clear increase in M74 in 2017.[25] Local estimates from Vattenfall indicate an increase of M74 syndrom from 10% to 25-58% in female salmon, with increasing ratios in southern rivers such as Dalävalen (58%). Vattenfall will voluntarily begin thiamine treatments in 2017 on affected reared populations, though the positive effect of these treatments is uncertain. Wild populations cannot be treated. The anticipated high mortality will result in a need for greater precaution when setting fishing opportunities for 2018.

[23] In the HELCOM Baltic Sea Action Plan and Finland, the target is 80 % of potential smolt production.
[24] Keinänen, M., Uddström, A., Mikkonen, J., Casini, M., Pönni, J., Myllylä, T., Aro, E., and Vuorinen, P. J. 2012. The thiamine deficiency syndrome M74, a reproductive disorder of Atlantic salmon (*Salmo salar*) feeding in the Baltic Sea, is related to the fat and thiamine content of prey fish. ICES Journal of Marine Science, 69: 516–528.
[25] Personal communication, Lidström, M. Vattenfall, 30 May 2017.

ICES advises a total commercial catch at sea of 116 000 individual fish. ICES estimates the fishery will correctly report only 68% the total commercial salmon catch, with an additional 16% misreported, 7% unreported, and 9% unwanted. Thus the estimated misreported, unreported, and unwanted catch must be deducted from the total commercial catch to determine the EU quota.

The proportion of the total catch estimated as misreported, wanted catch for 2018 has more than doubled in the last year. This is due to an estimated increase in misreported catch from 4 300 in 2015 to 16 990 in 2016 through increases in Polish offshore longline and gillnet fishing. The total catch advice remains the same, though the quota corresponding to ICES advice reflects this change.

In accordance with the MSY approach and representing the wanted, reported catch, the EU quota corresponding to ICES advice would be no more than 78 400 individual fish.[26]

Salmon in Subdivision 32, Gulf of Finland

This area contains a few small, wild populations mixed with reared salmon in some rivers. The wild salmon populations are genetically distinct from each other, which indicate that these still are original salmon stocks, meaning that they have not reproduced with reared salmon. Reared salmon are easily identified by their missing adipose fin. This fin is removed before releasing a reared salmon into the wild, in order to separate them from wild populations. TAC management alone has been insufficient to improve the condition of wild salmon in the Gulf of Finland.

ICES considers salmon stocks in the Gulf of Finland data-limited and advises using the precautionary approach. Very little data on wild smolt production is available for the assessment, consisting mainly of limited electrofishing surveys. Recreational sea and river catch is uncertain. In ICES expert judgement, all wild salmon rivers in the Gulf of Finland are well below the 75% potential smolt production target and generally not showing signs of recovery.

TACs have not been set in line with ICES advice since 2011. According to ICES, a reduction in the TAC alone would most likely not safeguard wild populations from exploitation. Instead, ICES advises the development of additional effort controls, more selective harvesting methods that target reared salmon, and improved enforcement to reduce illegal catches.

[26] The International Baltic Sea Fisheries Commission implemented a Baltic TAC sharing agreement between the EU and Russia in 1993, including a Russian salmon TAC share of 1.9% in SD 22-31 and 9.3% in SD 32. However there is no targeted fishery for salmon in Russia and relatively minor bycatch in the sea and coastal fisheries. While a shared stock, no reduction to the EU quota appears necessary.

Assuming a similar amount of restocking to previous years, ICES advises a total commercial catch at sea of 11 800 reared salmon, including a revised 2016 estimate of 81% wanted, reported catch, 16% unwanted catch and 3% unreported catch. The historic catch table clarifies that all unwanted catch was discarded in 2016, despite the implemented landing obligation, thus the amounts of unreported and unwanted catch must be deducted from the total commercial catch to determine the EU quota.

In accordance with the precautionary approach and representing the wanted, reported catch, the EU quota corresponding to ICES advice would be no more than 9 558 individual reared fish. ICES advises no targeted fishing for wild salmon and that bycatch of wild salmon should be minimised.

Sea trout

The Baltic Sea region contains approximately 630 sea trout stocks (*Salmo trutta*), of which 511 are thought to remain wild populations, not mixed with reared fish. The status of the stocks varies considerably, as does the quality of their habitats in the rivers.

Sea trout is caught in rivers, coastal areas and the open sea. It does not migrate as extensively as salmon, but longer migrations do occur within the Baltic main basin. Nominal commercial catches of sea trout in the main basin have declined from around 1 000 tonnes in 2002 to 232 tonnes in 2016. Nominal recreational catches have varied greatly between 2001 and 2016, and are considered a substantial underestimate. The data on recreational catches is incomplete, and catches could be as much as three times the estimated commercial catch.

The majority of the catches target mixed stocks, which is problematic for the weaker stocks. Discards of undersized sea trout take place mainly in the coastal fisheries, particularly in the gillnet fishery, but there are no clear estimates available for any fisheries. There are also strong indications that significant amounts of salmon are misreported as sea trout.

There is no TAC set for sea trout, but national regulations include *inter alia* minimum landing size, local and seasonal closures, and minimum mesh sizes for the gillnet fishery. Minimum mesh sizes, reduction of fishing effort, minimum legal landing sizes, as well as temporal and spatial closures are all viable options to reduce trout bycatch. Existing fishing restrictions should be maintained and habitat improvements are needed in many rivers. Fishing mortality should particularly be reduced in the Gulf of Bothnia and portions of the southern Baltic Sea.

ICES advice for sea trout in 2018 is the same as for 2017 and 2016. New data has not changed ICES perception of the stock. The advice issued for 2018 also applies to 2019.

Based on precautionary considerations, ICES advises that catches in the Gulf of Bothnia (SD 30 & 31) and in SD 22, 24, and 26 should be reduced to the extent

possible, if a complete cessation of fishing is not feasible, to safeguard the remaining wild populations in the region. ICES also advises that habitat improvements and reducing barriers to migration are necessary in trout spawning rivers around the Baltic Sea.

Flatfishes in the Baltic Sea

Five flatfish species are found in the Baltic Sea: Baltic flounder (*Platichtys flesus*), turbot (*Scophthalmus maximus*), brill (*Scophthalmus rhombus*), plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*). The fisheries capturing these species are mostly for human consumption, although a large part of the flatfish caught in the Baltic today is bycatch in the trawl fishery for cod. There are currently no management plans for flatfishes in the Baltic, and Plaice is the only species under TAC management. All but dab are however mentioned in the Baltic MAP, which provides opportunity for certain technical measures to protect these flatfish stocks if remedial measures are necessary. The knowledge concerning most stocks is limited.

Plaice, dab, and brill have a limited distribution in the Baltic Sea, mainly confined by their tolerance of low salinity. Plaice is common in the western Baltic and extends eastwards to the Gulf of Gdansk and northwards to the Gotland area. Dab has a similar, somewhat more westerly distribution, whereas brill is almost exclusively found in SD 22–24. There are at least two plaice populations and indications of three different dab populations in the region. According to the annual scientific trawl survey, plaice stocks appear to be increasing strongly. The dab stock size has also increased over the last decade, whereas brill seems to fluctuate considerably between years and no significant trends can be detected.

Plaice

Plaice is the only flatfish species in the Baltic Sea subject to EU quota management. The landing obligation now applies to plaice catches, thus total catch advice will correspond to a TAC for the Baltic management area. ICES advice identifies a western stock (SD 21–23) and an eastern, or Baltic, stock (SD 24–32).

For the western stock, ICES applies the MSY approach for the 2018 advice resulting in a total catch not exceeding 5 405 tonnes. ICES estimates that 41.4% of western plaice (2 237 tonnes) is caught in SD 21. The corresponding Baltic TAC must be reduced by plaice catch in SD 21.

ICES categorises the eastern Baltic plaice stock as data-limited, and provides advice in line with its precautionary approach. The resulting advice for eastern Baltic plaice given the estimated increase in SSB is 3 104 tonnes. Adding the remaining plaice catch in SD 22-23 (3 168 tonnes) results in a Baltic TAC corresponding to advice of 6 272 tonnes.

The overall reduction in advice for 2018 is due to uncertainty in the assessment, including both age reading problems in plaice and the short time-series of the assessment.

Both plaice stocks are subject to high levels of discarding as bycatch, which should now be landed with the implementation of the landing obligation starting in 2017. ICES is clear that discard estimates used in the assessment are underestimates. However, the discard data for 2016 revealed a significant jump in discarding of the eastern Baltic stock, representing a conservative estimate of 67 % of the catch discarded. This data is linked specifically to Danish trawl fisheries in SD 25.

In accordance with the precautionary approach and adjustments for the combined management areas of eastern and western Baltic plaice (SD 22-32), the TAC corresponding to ICES advice would be no more than 6 272 tonnes.

Turbot

Turbot is found throughout the Baltic Sea in limited amounts. The species is sedentary and does not migrate to spawn, which makes local populations sensitive to high fishing pressure. Landings across the Baltic increased from several dozen tonnes in the 1960s to over 1000 tonnes in the mid-1990s, then declined steadily to a few hundred tonnes today.

The survey is highly uncertain, with very low catches in survey assessments. Within a precautionary framework, ICES finds the turbot stock stable for the last nine years. More than half of the reported turbot landings come from SD 22, with relatively substantial landings in SD 24-25. ICES is unable to estimate discarding due to poor catch data, though believes discarding is substantial.

In accordance with the precautionary approach, ICES advises that turbot landings should not exceed 186 tonnes.

Dab

ICES categorises the dab stock as data-limited, with minor change from last year according to the indexed trawl surveys.

For the 2018 advice, ICES used a length-based analysis to determine that fishing mortality is below a proxy value for F_{MSY}. The absolute value of F_{MSY} for this stock is still unknown.

The bulk of the dab catch is taken as bycatch in other fisheries. According to conservative estimates, roughly one-third of dab are discarded.

In accordance with the precautionary approach, ICES advises that the total catch of dab should not exceed 2 762 tonnes.

Flounder

Flounder is the most widespread and abundant flatfish in the Baltic Sea. ICES provides advice for four different stocks of flounder. However, the exact number of stocks is uncertain. Most commercial flounder landings are bycatch in fisheries for cod, although there are some targeted flounder fisheries, particularly in subdivisions 24 and 25.

Recreational catch is substantial relative to commercial catch in the northern Baltic Sea (SD 27 & 29-32). ICES estimates that recreational catches exceed commercial catches in Sweden and Finland. Estonian recreational catch is estimated to be almost a third of the commercial catch. However the data quality on recreational fishing is low and could not be included in the assessment.

ICES categorises all four flounder stocks as data-limited. This year, ICES could estimate discard rates for all stocks except for the northern Baltic Sea stock, permitting advice based on total catch. ICES advises landings only for the northern Baltic sea stock, though discarding does occur.

ICES used a length-based analysis to determine that fishing mortality for most of the flounder stocks is below a proxy value for F_{MSY}. Input data for the flounder stock in SD 26 & 28 was too uncertain to provide a reliable estimate and the stock status is unknown relative to any proxy value.

The advice issued for 2018 will apply again in 2019.

In accordance with the precautionary approach, ICES advises that:

- **total catch of flounder in the Belt Seas and the Sound (SD 22-23) should not exceed 4 030 tonnes in 2018 and 4 030 tonnes in 2019;**
- **total catch of flounder in the southern Baltic Sea (SD 24-25) should not exceed 41 628 tonnes in 2018 and 41 628 tonnes in 2019;**
- **total catch of flounder in the waters east of Gotland and the Gulf of Gdansk (SD 26 & 28) should not exceed 1 617 tonnes in 2018 and 1 617 tonnes in 2019;**
- **flounder landings in the northern Baltic Sea (SD 27 & 29-32) should not exceed 395 tonnes in 2018 and 395 tonnes in 2019.**

Brill

ICES categorises the brill stock as data-limited. As in previous years, brill shows an decrease in biomass exceeding 20%. The survey is highly uncertain, with very low catches in survey assessments. The relative decrease in advice is limited to 20%, according to the ICES data-limited framework, resulting in the catch advice for 2018.

The advice issued for 2018 will apply again in 2019.

In accordance with the precautionary approach, ICES advises that the total catch of brill should not exceed 11.5 tonnes in 2018 and 11.5 tonnes in 2019.