Sole in VIId - Medium term forecasts

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Method

Medium term stochastic stock and catch forecasts for sole in ICES Subdivision VIId were calculated using the short term projection program, CS5, used previously by STECF to provide evaluation of harvest control rules. The program uses equivalent methodology to that applied by STECF in its June report. However, as the starting population assumptions used by the STECF (2015) for forecasts were not published there will be slight differences in the probabilities of achieving target outcomes. **Also, note that the STECF analysis (Page 46) incorrectly uses 0.31 as Fmsy in comparison with fishing mortalities achieved in future years; Fmsy as defined by ICES is 0.3.**

Population and fishing mortality estimates at age used in the forecasts are presented in Annex 1 to allow review of the starting assumptions, all are taken from the ICES 2015 assessment of the stock used as the basis of the 2015 ICES advice. Future recruitment is modelled as a log normal distribution with no trend with no adjustment for a low recruitment scenario, as the weaker recruitments recorded in 2012 and 2103 have been followed by a stronger cohort.

Previously scenarios assuming a constant catch at 3000, 2900 and 2800 tonnes until Fmsy is achieved, followed by Fmsy in the following years, have been presented to the AC. In addition a scenario in which a 15% reduction in TAC in 2016 (equivalent a reduction in fishing mortality to Fpa, 0.4) followed by Fmsy in the following years was suggested. In this paper the scenarios are repeated with the addition in the tables of the probability of achieving fishing mortalities of Fmsy or below in each year of the forecast time series.

Results

The scenario in which the TAC (Table 1, Figure 1) is held constant at 3000 tonnes has a 64% probability of achieving FMSY by 2019 (lower than that stated by STECF due to the use of the wrong Fmsy value), and a 95% probability by 2020 if recruitment varies around the historic mean.

If the TAC is held constant at 2900 tonnes (Table 2, Figure 2) there is an 88% probability of achieving FMSY by 2019 and a 99% probability by 2020. Holding the TAC at 2900 results in a continued reduction in fishing mortality as the stock rebuilds and thereby a continued increase in the probability of achieving Fmsy. A 15% reduction in the TAC (as for previous Council agreements) results in a TAC of 2960 in 2016, which if followed by further TAC of 2900 tonnes would be equivalent to Table 2 and Figure 2.

If the TAC is held constant at 2750 tonnes as noted by STECF (Table 3, Figure 3) there is a very [high] probability of achieving FMSY by 2018/2019 but the median fishing mortality is reduced to 30% below Fmsy to achieve that high probability.

If fishing mortality is stabilised at Fmsy when it is achieved, as agreed for other stocks the catch increases as the stock rebuilds (Table 4). Note that maintaining fishing mortality at around Fmsy implies variation about that level and hence a 50% probability of being above and below Fmsy (Figure 4).

Tighter constraints in the distribution of fishing mortality will be achieved when TACs are set annually based on a stock assessment due to more information on the recruitment abundance being available from surveys, and therefore the stochastic scenarios presented by STECF and in this paper cannot be used to infer the probability of keeping fishing mortality at the target only the likely outcome of achieving it in the short term.

Risk to the stock

As noted in previous papers submitted to the AC and within the STECF report, SSB remains above Bpa in all scenarios and therefore substantially above any candidate Blim, consequently there is no increased risk to the stock; the priority for management approach to reducing F below the current value close to Flim and achieving Fmsy.

Reference

STECF (2015) SCIENTIFIC, TECHNICAL AND ECONOMIC COMMITTEE FOR FISHERIES –

49th PLENARY MEETING REPORT (PLEN-15-02)
http://stecf.jrc.ec.europa.eu/documents/43805/1099561/2015-07_STECF+PLEN+15-02_JRC97003.pdf

Table 1 VIId sole – the forecast development of fishing mortality SSB and catch at a constant TAC 3000 tonnes

	2015	2016	2017	2018	2019	2020	2021
Fmult	1.01	0.80	0.68	0.61	0.54	0.48	0.42
Fbar	0.51	0.40	0.34	0.31	0.27	0.24	0.21
SSB	8171	8289	9411	10675	12067	13490	14915
Catch	3483	3000	3000	3000	3000	3000	3000
Probability	0.00	0.00	0.09	0.31	0.64	0.95	1.00

Figure 1. VIId sole – the forecast annual development of the probability profile of fishing mortality from 2015 (right) to 2020 (left, black) at a constant TAC of 3000 tonnes. Red vertical line Fmsy

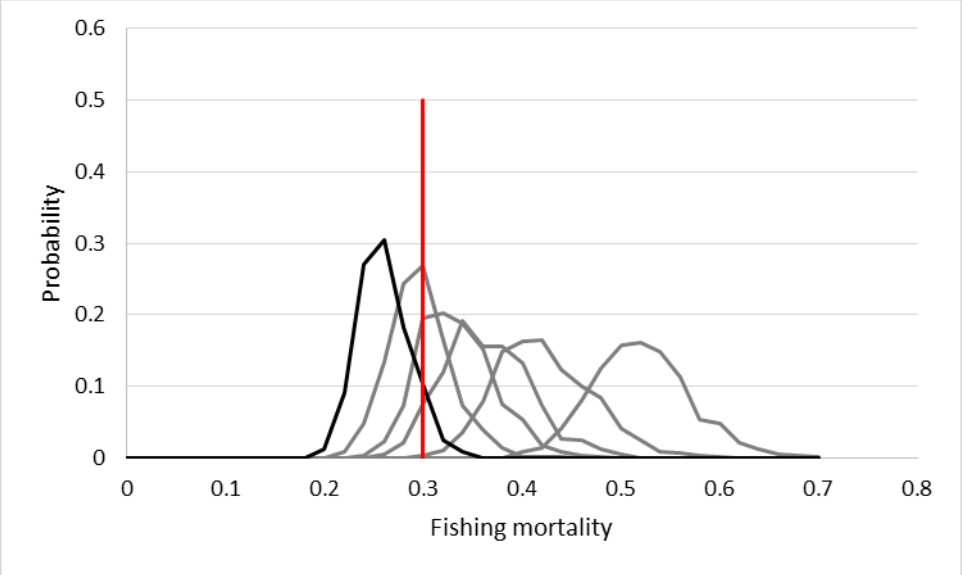


Table 2 VIId sole – the forecast development of fishing mortality SSB and catch at a constant TAC 2900 tonnes

	2015	2016	2017	2018	2019	2020	2021
Fmult	1.01	0.77	0.64	0.58	0.51	0.44	0.39
Fbar	0.51	0.39	0.32	0.29	0.26	0.22	0.19
SSB	8171	8289	9518	10894	12406	13952	15496
Landings	3483	2900	2900	2900	2900	2900	2900
Probability	0.00	0.01	0.19	0.49	0.88	0.996	1.00

Figure 2. VIId sole – the forecast annual development of the probability profile of fishing mortality from 2015 (right) to 2020 (left, black) at a constant TAC of 2900 tonnes. Red vertical line Fmsy

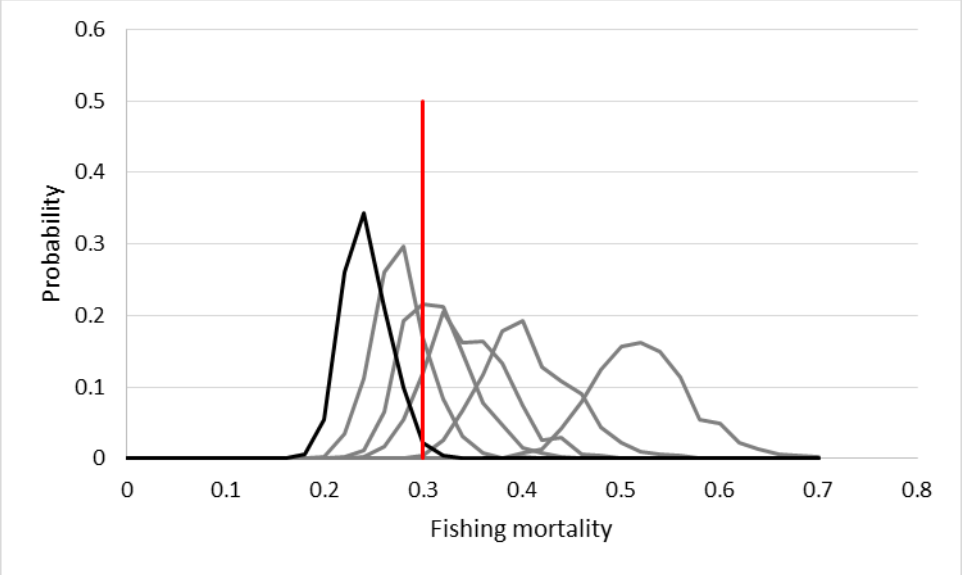


Table 3 VIId sole – the forecast development of fishing mortality SSB and catch at a constant TAC 2750 tonnes

	2015	2016	2017	2018	2019	2020	2021
Fmult	1.01	0.72	0.59	0.52	0.46	0.39	0.34
Fbar	0.51	0.36	0.30	0.26	0.23	0.20	0.17
SSB	8171	8289	9679	11224	12915	14643	16362
Landings	3483	2750	2750	2750	2750	2750	2750
Probability	0.00	0.04	0.51	0.87	0.99	1.00	1.00

Figure 3. VIId sole – the forecast annual development of the probability profile of fishing mortality from 2015 (right) to 2020 (left, black) at a constant TAC of 2750 tonnes. Red vertical line Fmsy

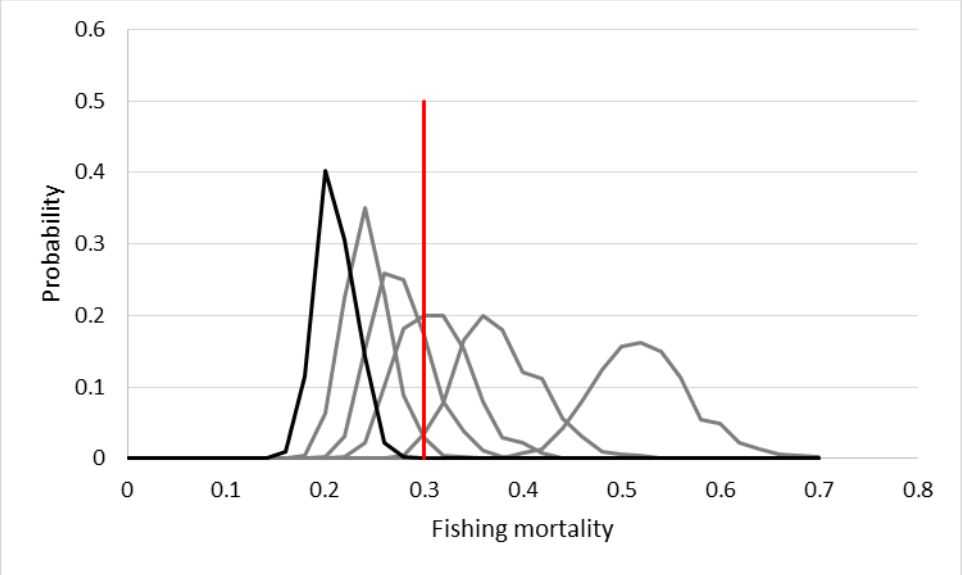
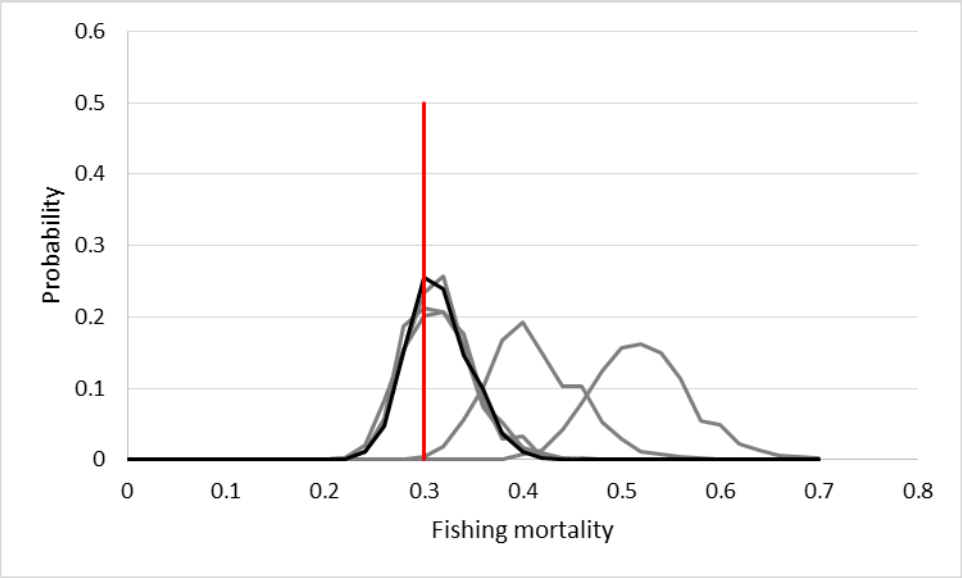


Table 4 VIId sole – the forecast development of fishing mortality SSB and catch following a 15% reduction in TAC in 2016 and setting the TAC at Fmsy thereafter

	2015	2016	2017	2018	2019	2020	2021
Fmult	1.01	0.79	0.60	0.60	0.60	0.60	0.60
Fbar	0.51	0.40	0.30	0.30	0.30	0.30	0.30
SSB	8171	8289	9454	11026	12395	13449	14144
Landings	3483	2960	2714	3041	3349	3664	3918
Probability	0.00	0.00	0.46	0.47	0.45	0.47	0.47

Figure 4. VIId sole – the forecast annual development of the probability profile of fishing mortality from 2015 (right) to 2020 (left, black) following a 15% reduction in TAC in 2016 and setting the TAC at Fmsy thereafter. Red vertical line Fmsy



Annex 1 Sole in VIId - Input data to the CS5 short term stochastic forecast

Starting year, Last year, first age, last age
2015, 2025, 1, 11

N	se	Bias	M	Mat	Sel	Ret	WEST	WECA	WEDC
25489	0.4	1	0.1	0	0	1	0.090	0.090	0
22255	0.3	1	0.1	0	0.1786	1	0.130	0.150	0
10611	0.24	1	0.1	1	0.7539	1	0.160	0.190	0
4596	0.22	1	0.1	1	1.1309	1	0.230	0.240	0
5307	0.15	1	0.1	1	0.9127	1	0.280	0.280	0
6933	0.15	1	0.1	1	1.0516	1	0.320	0.310	0
2225	0.15	1	0.1	1	1.1508	1	0.360	0.370	0
844	0.15	1	0.1	1	1.7262	1	0.400	0.400	0
93	0.15	1	0.1	1	1.0119	1	0.370	0.430	0
477	0.15	1	0.1	1	0.9524	1	0.460	0.430	0
638	0.15	1	0.1	1	0.9524	1	0.500	0.530	0

SRR parameters (if the last no. is -1 then use Ockham, otherwise Shepherd/Ricker – GM recruitment, SSB breakpoint, 0,0,)
25489 7600 0.0 0.0 0.4 -1
HCR % change (up, down), Fsq, SSBincr%
1000, 1000, 0.4, 1000
Spawning Time as fraction of year
0.0
Catch in StartingYear-1
3483
Catch in the starting year, or (if negative) F constraint (F sq = 0.247)
-0.51
Ages for calculating reference F
3 7
Reference Biomass to calculate probabilities
8000
SSB in StartingYear-1
8171
Method For each year after starting year Rule, Target (1 - apply harvest rule, 2 - fixed F, 3 - Fixed TAC)

2	0.504	2015
3	2960	2016
3	2900	2017
3	2900	2018
3	2900	2019
3	2900	2020
3	2900	2021
3	2900	2022
3	2900	2023
3	2900	2024
3	2900	2025