11.2.1 EU request to ICES on additional catch options for the western Baltic cod (*Gadus morhua*) stock (subdivisions 22–24)

ICES response

ICES has provided additional catch options for the western Baltic cod stock for the years 2017 and 2018.

Request

ICES is requested to explore, by means of short-term projections, the likely consequences in 2017 and 2018 according to staged reductions in fishing mortality, i.e. a reduction of X% from 2016 to 2017 and a further X% from 2017 to 2018 (for X = 20%, 40%, 50%, 60%, 80%, 90%) and of zero cod catches in 2017 and 2018 for (a) the commercial catches, and (b) the total out-take. The extent of dependence on assumed values of recruitment in 2017 should be explained.

Consequences should be expressed in terms of stock size, risk to further recruitment, fishing mortality rate and catches in the commercial and recreational fisheries (in 2017, in 2018, and the total of both years).
For clarity, these options are set out in the following table.

	Description	2017		2018	
		Commercial F	Recreational F	Commercial F	Recreational F
1	20% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.8	catch=2558t	F(2016)*0.8*0.8	catch=2558t
2	40% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.6	catch=2558t	F(2016)*0.6*0.6	catch=2558t
3	50% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.5	catch=2558t	F(2016)*0.5*0.5	catch=2558t
4	60% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.4	catch=2558t	F(2016)*0.4*0.4	catch=2558t
5	80% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.2	catch=2558t	F(2016)*0.2*0.2	catch=2558t
6	90% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F(2016)*0.1	catch=2558t	F(2016)*0.1*0.1	catch=2558t
7	100% F reduction in each of 2017 and 2018, no reduction in recreational fishing	F=0	catch=2558t	F=0	catch=2558t
8	20% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.8	F(2016)*0.8	F(2016)*0.8*0.8	F(2016)*0.8*0.8
9	40% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.6	F(2016)*0.6	F(2016)*0.6*0.6	F(2016)*0.6*0.6
10	50% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.5	F(2016)*0.5	F(2016)*0.5*0.5	F(2016)*0.5*0.5
11	60% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.4	F(2016)*0.4	F(2016)*0.4*0.4	F(2016)*0.4*0.4
12	80% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.2	F(2016)*0.2	F(2016)*0.2*0.2	F(2016)*0.2*0.2
13	90% F reduction in each of 2017 and 2018, applies to commercial and recreational	F(2016)*0.1	F(2016)*0.1	F(2016)*0.1*0.1	F(2016)*0.1*0.1
14	100% F reduction in each of 2017 and 2018, applies to commercial and recreational	F=0	F=0	F=0	F=0

Elaboration on the response

Catch options for 2017 and 2018

The short-term forecast presented in this technical service is based on the same assumptions about stock biology and fishery selection pattern in 2017 and 2018 as those used in the catch options table for 2017, provided in May 2016 (ICES, 2016a). As in this May advice, the recreational catches reflect only German catches (as these are the only recreational catches included in the stock assessment) and a TAC constraint has been applied for the intermediate year (2016).

New catch options are now included for 2017 and the short-term forecast has been extended to 2018. The new catch options requested refer to different reductions in the commercial and recreational fisheries. The short-term forecast assumes the same selection pattern and weight of fish in both fisheries, as was the case in the forecast for 2017 provided in May 2016 (ICES, 2016a).

Recruitment in the short-term forecast is randomly sampled from the last ten assessment years (2007–2016), in order to represent the recent situation. The most recent recruitment estimated from the assessment (age 1 cod in 2016) is the lowest in the time-series and less than 10% of the average recruitment of the last decade. The development of the stock from its current low level is strongly dependent on the size of future recruitment. ICES has not been able to evaluate the risk to future recruitment within the time frame available to respond to this request. Catch options resulting in SSB below B_{pa} (38 400 t) imply a higher than 5% probability of the stock remaining below B_{lim} (27 400 t, the SSB associated with reduced reproductive capacity).

Table 11.2.1.1   Cod in subdivisions 22–24 (western Baltic cod). The basis for the forecast.

Variable	Value	Source	Notes
$F_{ages\ 3-5}$ Total (2016)	0.58	ICES (2016b)	Based on catch constraint for 2016.
$F_{ages\ 3-5}$ Commercial (2016)	0.44	ICES (2016b)	Based on catch constraint for 2016.
$F_{ages\ 3-5}$ Recreational (2016)	0.14	ICES (2016b)	Based on catch constraint for 2016.
SSB (2017)	22470 t	ICES (2016b)	
R_{age1} (2017)	13605 thousand	ICES (2016b)	Sampled from the last ten years.
R_{age1} (2018)	13062 thousand	ICES (2016b)	Sampled from the last ten years.
R_{age1} (2019)	13118 thousand	ICES (2016b)	Sampled from the last ten years.
Total catch (2016)	10327 t	ICES (2016b)	Based on catch constraint. Calculated as the 2016 TAC (12 720 t) plus an assumed discard ratio as in 2015 (5.1%), accounting for the proportion of western Baltic cod in commercial catches in subdivisions 22–24 in 2013–2015 (58%) and the mean recreational catch of 2013–2015 (2558 t).
Commercial landings (2016)	7373 t	ICES (2016b)	Based on total catch minus recreational catch. The 2015 discard ratio (5.1%) was used to split the commercial catch into landings and discards.
Commercial discards (2016)	396 t	ICES (2016b)	Based on total catch minus recreational catch. The 2015 discard ratio (5.1%) was used to split the commercial catch into landings and discards.
Recreational catches (2016)	2558 t	ICES (2016b)	Average of the estimates for 2013–2015.

Table 11.2.1.2   Cod in subdivisions 22–24 (western Baltic cod). The forecast and catch options for 2017. Weights in tonnes.

Option	Rationale	Total catch 2017	Comm. catch 2017	Rec. catch 2017	Basis	F_{total} 2017	F_{comm} 2017	F_{rec} 2017	SSB 2018	%SSB change (SSB_{2018} relative to SSB_{2017})
1	20% F reduction in each of 2017 and 2018, no reduction in recreational fishing	9562	7004	2558	$F_{comm}=F_{comm}$ (2016)*0.8 and Rec. Catch = 2558	0.48	0.35	0.13	23442	4
2	40% F reduction in each of 2017 and 2018, no reduction in recreational fishing	7917	5359	2558	$F_{comm}=F_{comm}$ (2016)*0.6 and Rec. Catch = 2558	0.38	0.26	0.12	25606	14
3	50% F reduction in each of 2017 and 2018, no reduction in recreational fishing	7215	4657	2558	$F_{comm}=F_{comm}$ (2016)*0.5 and Rec. Catch = 2558	0.34	0.22	0.12	26512	18
4	60% F reduction in each of 2017 and 2018, no reduction in recreational fishing	6295	3737	2558	$F_{comm}=F_{comm}$ (2016)*0.4 and Rec. Catch = 2558	0.29	0.17	0.12	27695	23
5	80% F reduction in each of 2017 and 2018, no reduction in recreational fishing	4525	1967	2558	$F_{comm}=F_{comm}$ (2016)*0.2 and Rec. Catch = 2558	0.2	0.09	0.11	30022	34
6	90% F reduction in each of 2017 and 2018, no reduction in recreational fishing	3475	917	2558	$F_{comm}=F_{comm}$ (2016)*0.1 and Rec. Catch = 2558	0.15	0.04	0.11	31375	40
7	100% F reduction in each of 2017 and 2018, no reduction in recreational fishing	2558	0	2558	F_{comm} 0 and Rec. Catch = 2558	0.11	0.00	0.11	32560	45
8	20% F reduction in each of 2017 and 2018, applies to commercial and recreational	9309	7003	2306	$F_{comm}=F_{comm}$ (2016)*0.8 and $F_{rec}=F_{rec}$ (2016)*0.8	0.46	0.35	0.11	23762	6
9	40% F reduction in each of 2017 and 2018, applies to commercial and recreational	7358	5535	1823	$F_{comm}=F_{comm}$ (2016)*0.6 and $F_{rec}=F_{rec}$ (2016)* 0.6	0.35	0.26	0.09	26320	17
10	50% F reduction in each of 2017 and 2018, applies to commercial and recreational	6295	4736	1559	$F_{comm}=F_{comm}$ (2016)*0.5 and $F_{rec}=F_{rec}$ (2016)*0.5	0.29	0.22	0.07	27695	23
11	60% F reduction in each of 2017 and 2018, applies to commercial and recreational	5171	3890	1281	$F_{comm}=F_{comm}$ (2016)*0.4 and $F_{rec}=F_{rec}$ (2016)*0.4	0.23	0.17	0.06	29165	30
12	80% F reduction in each of 2017 and 2018, applies to commercial and recreational	2731	2055	676	$F_{comm}=F_{comm}$ (2016)*0.2 and $F_{rec}=F_{rec}$ (2016)*0.2	0.12	0.09	0.03	32290	44
13	90% F reduction in each of 2017 and 2018, applies to commercial and recreational	1403	1055	348	$F_{comm}=F_{comm}$ (2016)*0.1 and $F_{rec}=F_{rec}$ (2016)*0.1	0.06	0.05	0.01	33979	51
14	100% F reduction in each of 2017 and 2018, applies to commercial and recreational	0	0	0	F=0	0	0.00	0.00	35793	59

Table 11.2.1.3　　Cod in subdivisions 22–24 (western Baltic cod). The forecast and catch options for 2018. Weights in tonnes.

Option	Rationale	Total catch 2018	Comm. catch 2018	Rec. catch 2018	Basis	F_{total} 2018	F_{comm} 2018	F_{rec} 2018	SSB 2019	%SSB change (SSB_{2019} relative to SSB_{2018})
1	20% F reduction in each of 2017 and 2018, no reduction in recreational fishing	8389	5831	2558	$F_{comm}=F_{comm}(2016)*0.8*0.8$ and Rec. Catch = 2558	0.41	0.28	0.13	25683	10
2	40% F reduction in each of 2017 and 2018, no reduction in recreational fishing	6415	3857	2558	$F_{comm}=F_{comm}(2016)*0.6*0.6$ and Rec. Catch = 2558	0.27	0.16	0.11	30719	20
3	50% F reduction in each of 2017 and 2018, no reduction in recreational fishing	5311	2753	2558	$F_{comm}=F_{comm}(2016)*0.5*0.5$ and Rec. Catch = 2558	0.21	0.11	0.10	33059	25
4	60% F reduction in each of 2017 and 2018, no reduction in recreational fishing	4333	1775	2558	$F_{comm}=F_{comm}(2016)*0.4*0.4$ and Rec. Catch = 2558	0.16	0.07	0.09	35516	28
5	80% F reduction in each of 2017 and 2018, no reduction in recreational fishing	3293	735	2558	$F_{comm}=F_{comm}(2016)*0.2*0.2$ and Rec. Catch = 2558	0.11	0.02	0.09	39222	31
6	90% F reduction in each of 2017 and 2018, no reduction in recreational fishing	2573	15	2558	$F_{comm}=F_{comm}(2016)*0.1*0.1$ and Rec. Catch = 2558	0.08	0.00	0.08	41831	33
7	100% F reduction in each of 2017 and 2018, no reduction in recreational fishing	2558	0	2558	$F_{comm}= 0$ and Rec. Catch = 2558	0.08	0.00	0.08	43362	33
8	20% F reduction in each of 2017 and 2018, applies to commercial and recreational	7826	5887	1939	$F_{comm}=F_{comm}(2016)*0.8*0.8$ and $F_{rec}=F_{rec}(2016)*0.8*0.8$	0.37	0.28	0.09	26832	13
9	40% F reduction in each of 2017 and 2018, applies to commercial and recreational	5252	3951	1301	$F_{comm}=F_{comm}(2016)*0.6*0.6$ and $F_{rec}=F_{rec}(2016)*0.6*0.6$	0.21	0.16	0.05	32909	25
10	50% F reduction in each of 2017 and 2018, applies to commercial and recreational	3955	2975	980	$F_{comm}=F_{comm}(2016)*0.5*0.5$ and $F_{rec}=F_{rec}(2016)*0.5*0.5$	0.15	0.11	0.04	35992	30
11	60% F reduction in each of 2017 and 2018, applies to commercial and recreational	2734	2057	677	$F_{comm}=F_{comm}(2016)*0.4*0.4$ and $F_{rec}=F_{rec}(2016)*0.4*0.4$	0.09	0.07	0.02	38976	34
12	80% F reduction in each of 2017 and 2018, applies to commercial and recreational	775	583	192	$F_{comm}=F_{comm}(2016)*0.2*0.2$ and $F_{rec}=F_{rec}(2016)*0.2*0.2$	0.02	0.02	0.00	45222	40
13	90% F reduction in each of 2017 and 2018, applies to commercial and recreational	214	161	53	$F_{comm}=F_{comm}(2016)0.1*0.1$ and $F_{rec}=F_{rec}(2016)*0.1*0.1$	0.01	0.01	0.00	47894	41
14	100% F reduction in each of 2017 and 2018, applies to commercial and recreational	0	0	0	F=0	0	0.00	0.00	50411	41

Sources and references

ICES. 2016a. Cod (*Gadus morhua*) in subdivisions 22–24, western Baltic stock (western Baltic Sea). *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 8, Section 8.3.4.

ICES. 2016b. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 12–19 April 2016, ICES Headquarters, Copenhagen, Denmark. ICES CM 2016/ACOM:11.