ICES Advice on fishing opportunities, catch, and effort
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Cod (*Gadus morhua*) in subdivisions 24–32, eastern Baltic stock (eastern Baltic Sea)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in 2021. This advice applies to all catches from the stock in subdivisions 24–32.

Note: This advice is abbreviated due to the Covid-19 disruption. The previous advice issued for 2020 is attached as Annex 1.

Stock development over time

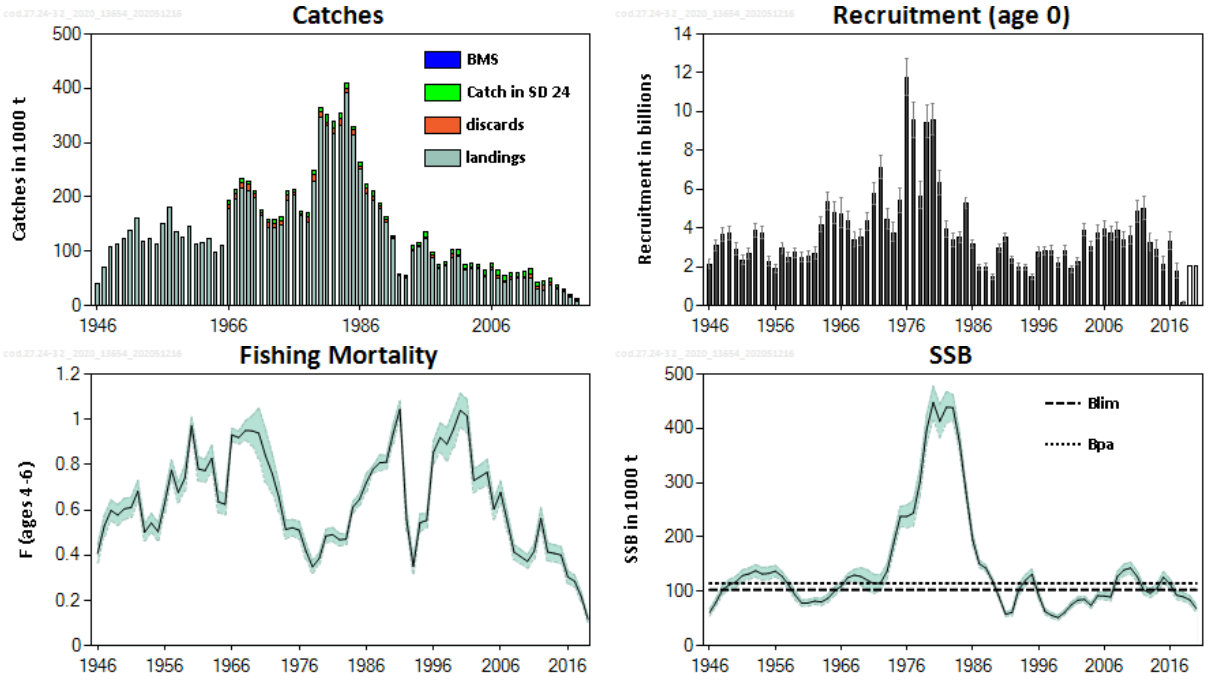

Figure 1 Cod in subdivisions 24–32, eastern Baltic stock. Summary of the stock assessment. R, F, and SSB (spawning-stock biomass at the spawning time) show confidence intervals (90%) in the plot. Assumed R values are unshaded.

Stock and exploitation status

Table 1 Cod in subdivisions 24–32, eastern Baltic stock. State of the stock and the fishery relative to reference points.

		Fishing pressure				Stock size			
		2017	2018	2019		2018	2019	2020	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{trigger}$	?	?	? Undefined
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	✗	✗	✗ Reduced reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable

Catch scenarios

Table 2 Cod in subdivisions 24–32, eastern Baltic stock. Assumptions made for the interim year and in the forecast. Weights are in tonnes. Recruitment is in thousands.

Variable	Value	Notes
$F_{ages\ 4–6}$ (2020)	0.08	F based on catch constraint.
SSB (2020)	68 652	From assessment.
$R_{age\ 0}$ (2019–2022)	2 052 590	Average of 2014–2018.
$M_{ages\ 4–6}$ (2020-2022)	0.71	Natural mortality estimated by the assessment in 2019.
Total catch (2020)	7500	EU TAC 2000 tonnes + Russian quota 5500 tonnes.

Table 3 Cod in subdivisions 24–32, eastern Baltic stock. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2021)	F (2021)	SSB (2021)	SSB (2022)	Probability of SSB (2022) > B_{lim} (%)	% SSB change	% Catch change**
ICES advice basis							
F = 0	0	0	61169	67233	< 0.01	10	−100
Other scenarios							
F = 0.05	4133	0.050	59411	64082	< 0.01	8	−65
F = F (2019)	9390	0.117	57155	60033	< 0.01	5	−21
Catch = TAC (2020)	7500	0.097	57914	61204	< 0.01	6	−37
Catch = 0.75 × TAC (2020)	5625	0.072	58711	62717	< 0.01	7	−53
Catch in SD24*	1532	0.019	60504	66005	< 0.01	9	−87

* Due to the mixed fisheries for eastern and western Baltic cod in Subdivision (SD) 24, it would be expected that 1532 tonnes of eastern Baltic cod is harvested in SD 24 in 2021, when the commercial catch of 4635 tonnes is taken from the western Baltic cod stock (see Table 5 in ICES, 2020a). It is assumed that the geographical distribution of commercial catches from the western stock in 2021 is the same as observed in 2019 (26% in SD 24), and the ratio between eastern and western stock in the commercial cod catch in SD 24 is the same as observed in 2019 (1.27).
**Catch in 2021 compared to catch in 2019 (11 938 tonnes).

Quality of the assessment

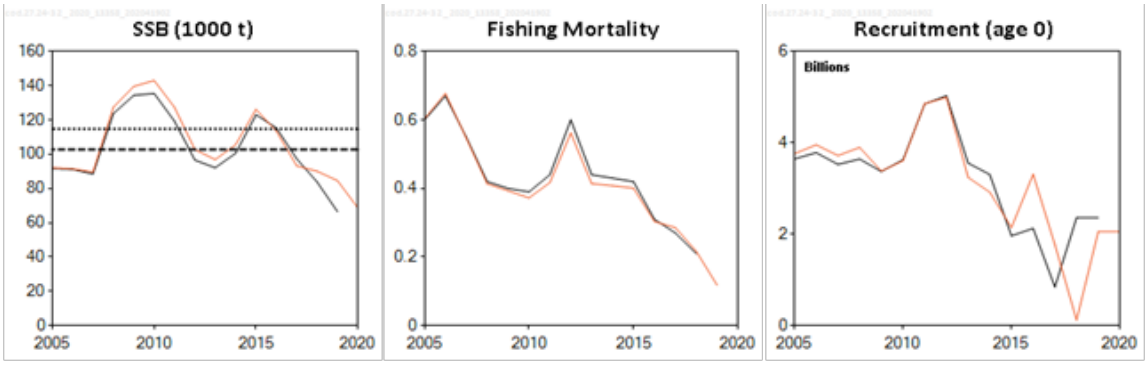

Figure 2 Cod in subdivisions 24–32, eastern Baltic stock. Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2019.

Reference points

Table 4 Cod in subdivisions 24–32, eastern Baltic stock. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	Undefined		ICES (2020b)
	F_{MSY}	Undefined		ICES (2020b)
Precautionary approach	B_{lim}	102 702 t	SSB in 2012 which produced the last strong year-class, in the recent period of low productivity.	ICES (2020b)
	B_{pa}	114 723 t	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.07$	ICES (2020b)
	F_{lim}			
	F_{pa}			
Management plan	SSB_{mgt}			
	F_{mgt}			

History of the advice, catch, and management

Table 5 Cod in subdivisions 24–32, eastern Baltic stock. ICES advice, TACs, ICES landings, and ICES catches. All weights are in tonnes.

Year	ICES advice	Catches corresp. to advice	Landings corresp. to advice	Agreed TAC	ICES landings (SDs 25–32)	ICES eastern Baltic stock catches (SDs 24 and 25–32)
1987	Reduce towards F_{max}		245000		207000	223295
1988	TAC		150000		194000	210527
1989	TAC		179000	220000*	179000	188361
1990	TAC		129000	210000*	153000	163276
1991	TAC		122000	171000*	123000	129020
1992	Lowest possible level		-	100000*	55000**	59110
1993	No fishing		0	40000*	45000**	56154
1994	TAC		25000	60000*	100856**	109984
1995	30% reduction in fishing effort from 1994 level		-	120000*	107718**	115843
1996	30% reduction in fishing effort from 1994 level		-	165000*	124189	136788
1997	20% reduction in fishing mortality from 1995 level		130000	180000*	88600	99251
1998	40% reduction in fishing mortality from 1996 level		60000	136950*	67428	74940
1999	Proposed F_{pa} (= 0.6)		88000	126000*	72995	81653
2000	40% reduction in F from 1996–1998 level		60000	105000*	89289**	102833
2001	Fishing mortality of 0.30		39000	105000*	91328**	102402
2002	No fishing		0	76000*	67740**	74824
2003	70% reduction in F		See option table	75000	69476**	78093
2004	90% reduction in F		< 13000	45400	68578**	75276
2005	No fishing		0	42800	55032**	64495
2006	Develop management plan		< 14900	49200	65532**	77086
2007	No fishing		0	44300	50843**	64656
2008	No fishing		0	42300***	42235**	55578
2009	Limit (total) landings to 48 600 tonnes		≤ 48600	49380***	48439**	60513
2010	Follow management plan		56800	56100***	50277	60400
2011	See scenarios		-	64500***	50368	62245
2012	Follow management plan		74200	74200***	51225	67024
2013	Follow management plan		65900	68700***	31355	42977
2014	Follow management plan		70301	73400***	28909	45289
2015	20% reduction in catches	29085		55800***	38079	50008
2016	Precautionary approach^	≤ 29220		46900***	29313	37438
2017	Precautionary approach^	≤ 26994		36957***	25496	30965
2018	Precautionary approach^	≤ 26071		34288***	15907	21605
2019	Precautionary approach^	≤ 16685		29912***	8383	11938

Year	ICES advice	Catches corresp. to advice	Landings corresp. to advice	Agreed TAC	ICES landings (SDs 25–32)	ICES eastern Baltic stock catches (SDs 24 and 25–32)
2020	Precautionary approach^	0		7500***		
2021	Precautionary approach^	0				

* For the total Baltic Sea until and including 2003.
** The reported landings in 1992–1995 and 2000–2009 are likely to be minimum estimates due to incomplete reporting.
*** TAC is for SDs 25–32 and is calculated as EU + Russian autonomous quotas.
^ ICES provides stock-based advice (for the eastern Baltic cod stock).

Summary of the assessment

Table 6 Cod in subdivisions 24–32, eastern Baltic stock. Assessment summary. Weights are in tonnes, recruitment in thousands. High and Low refer to 90% confidence intervals.

Year	Recruitment			SSB			Biomass fish ≥ 35 cm	Landings*	Discards	Catch in SD 24	Fishing mortality		
	Recruitment (age 0)	High	Low	SSB	High	Low					F (ages 4–6)	High	Low
1946	2121700	2381953	1889883	61104	67696	54511	88826	40985			0.41	0.45	0.37
1947	3083430	3397443	2798440	80460	87963	72957	121219	71831			0.53	0.58	0.48
1948	3647870	3993712	3331977	103496	112198	94794	172362	107104			0.60	0.64	0.55
1949	3734020	4083400	3414534	111881	121778	101984	191237	112735			0.58	0.62	0.53
1950	2918160	3228164	2637926	117596	127777	107415	199373	124509			0.60	0.65	0.56
1951	2334190	2616851	2082060	129241	139556	118926	218719	137815			0.61	0.65	0.57
1952	2682560	2991359	2405638	132384	142957	121811	239649	161103			0.68	0.73	0.63
1953	3885230	4249901	3551850	137908	149336	126480	230074	118132			0.50	0.54	0.46
1954	3746480	4095539	3427171	132019	143874	120164	227103	123947			0.54	0.58	0.50
1955	2267440	2536891	2026608	133137	144671	121603	215805	114415			0.50	0.54	0.46
1956	1880490	2122784	1665852	137334	147459	127209	237408	151985			0.63	0.67	0.59
1957	2930820	3211722	2674486	127961	136775	119147	248301	181366			0.78	0.82	0.73
1958	2472010	2727821	2240188	111976	120639	103313	211319	136301			0.68	0.72	0.63
1959	2724370	2987891	2484091	93023	101505	84541	177269	126033			0.74	0.80	0.68
1960	2460990	2721856	2225126	78529	84331	72726	162717	145408			0.97	1.01	0.93
1961	2519200	2797443	2268632	78880	84855	72905	144834	112034			0.78	0.83	0.73
1962	2691080	3002934	2411612	82265	88375	76156	151481	115553			0.77	0.82	0.72
1963	4178300	4595227	3799201	80550	87094	74005	154319	123047			0.83	0.89	0.77
1964	5357260	5847919	4907769	87482	94967	79998	149524	97788			0.63	0.68	0.59
1965	4773510	5367374	4245353	100522	108842	92202	165944	109809			0.62	0.67	0.58
1966	4725570	5543227	4028522	109504	116280	102728	204655	177318	8735	6624	0.93	0.96	0.90
1967	4379750	4872120	3937138	125250	132528	117972	234399	195446	11733	6899	0.92	0.95	0.89
1968	3402100	3837222	3016318	129940	140388	119492	255664	216353	9700	8614	0.95	0.99	0.91
1969	3503860	3916800	3134455	127506	143610	111402	253761	212160	10654	5980	0.95	1.02	0.88
1970	4336760	4813106	3907557	120599	139631	101567	244185	198451	7625	5720	0.94	1.05	0.83
1971	5750870	6320434	5232632	113719	131034	96404	220495	164840	5426	6586	0.84	0.96	0.72
1972	7111350	7755097	6521041	115754	130321	101187	209436	143833	8490	7307	0.76	0.85	0.67

* Landings since 2017 include landings below minimum conservation reference size or BMS

Year	Recruitment			SSB			Biomass fish ≥ 35 cm	Landings*	Discards	Catch in SD 24	Fishing mortality		
	Recruitment (age 0)	High	Low	SSB	High	Low					F (ages 4–6)	High	Low
1973	4449970	4987323	3970513	137581	151768	123394	227293	143164	7491	7320	0.65	0.72	0.59
1974	3754460	4268040	3302680	189358	205120	173596	285591	147815	7933	6923	0.51	0.55	0.47
1975	5409470	6068077	4822346	238145	256106	220184	383724	194649	9576	5676	0.52	0.56	0.48
1976	11725200	12728157	10801274	237914	258665	217163	418534	203303	4341	6972	0.51	0.55	0.47
1977	9532210	10482528	8668045	244151	267826	220476	395517	164792	2978	6643	0.42	0.46	0.38
1978	5656850	6413229	4989679	302127	328119	276135	416227	154009	9875	6553	0.35	0.38	0.32
1979	9460860	10363964	8636451	398005	425562	370448	575247	227699	14576	7745	0.39	0.41	0.36
1980	9574980	10425491	8793854	447717	477375	418059	727404	347619	8544	7721	0.49	0.51	0.46
1981	6310890	6967388	5716250	413034	443442	382626	703748	331642	6185	13759	0.49	0.52	0.46
1982	3918480	4377934	3507245	438851	467502	410200	688658	316052	11548	12239	0.47	0.50	0.44
1983	3351990	3707428	3030629	438149	461963	414335	730168	332148	10998	9853	0.47	0.49	0.45
1984	3503470	3796147	3233358	374175	392341	356009	710047	391952	8521	8709	0.61	0.64	0.59
1985	5248970	5544798	4968926	281607	295153	268061	553327	315083	8199	6971	0.65	0.67	0.62
1986	3179640	3403524	2970483	195008	206811	183205	404329	252558	3848	6604	0.72	0.76	0.68
1987	1984940	2147326	1834834	150848	157623	144073	302689	207081	9340	6874	0.78	0.79	0.76
1988	2008720	2157886	1869866	142784	148795	136773	277549	194787	7253	8487	0.81	0.84	0.77
1989	1481330	1610205	1362769	119434	124622	114246	255084	179178	3462	5721	0.81	0.84	0.78
1990	2964900	3176673	2767245	89758	94633	84883	201232	153546	4187	5543	0.94	0.98	0.89
1991	3521850	3751231	3306495	57757	61371	54142	144481	122517	2741	3762	1.04	1.08	1.01
1992	2382010	2564734	2212304	61420	67829	55012	96921	54882	1904	2324	0.56	0.61	0.51
1993	2003650	2163237	1855836	103428	113869	92987	128028	50711	1558	3885	0.35	0.38	0.32
1994	1969950	2123749	1827289	120209	130783	109635	198281	100856	1956	7172	0.54	0.58	0.50
1995	1473190	1611957	1346369	131609	141235	121983	213116	107718	1872	6253	0.55	0.58	0.52
1996	2765110	2998141	2550191	93180	100312	86049	187933	124189	1443	11156	0.85	0.90	0.81
1997	2810900	3065591	2577369	62740	68249	57230	124971	88600	3462	7189	0.92	0.98	0.85
1998	2854730	3116788	2614706	55725	60707	50744	84415	67428	2299	5213	0.89	0.96	0.82
1999	2191670	2440845	1967932	51891	56668	47115	79933	72995	1838	6820	0.96	1.04	0.88
2000	2839640	3094429	2605830	61631	66449	56813	97727	89289	6019	7525	1.04	1.12	0.96
2001	1885830	2079278	1710379	75266	80656	69875	102180	91328	2891	8183	1.02	1.09	0.94
2002	2289100	2499220	2096646	84111	89830	78392	96278	67740	1462	5622	0.73	0.78	0.68
2003	3893320	4196135	3612358	85225	90913	79536	101926	69477	2024	6592	0.75	0.80	0.70
2004	3048680	3335112	2786848	74205	79837	68574	94229	68578	1201	5497	0.77	0.82	0.71

Year	Recruitment			SSB			Biomass fish ≥ 35 cm	Landings*	Discards	Catch in SD 24	Fishing mortality		
	Recruitment (age 0)	High	Low	SSB	High	Low					F (ages 4–6)	High	Low
2005	3761230	4121903	3432117	92100	98435	85764	88187	55032	1670	7793	0.60	0.65	0.56
2006	3955220	4349370	3596789	91452	98123	84780	105702	65531	4644	6911	0.68	0.73	0.63
2007	3720100	4117847	3360772	89606	96808	82404	104504	50843	4146	9667	0.55	0.59	0.50
2008	3899100	4330245	3510883	127427	137044	117810	106285	42234	3746	9598	0.41	0.45	0.38
2009	3379590	3802748	3003520	139592	150114	129070	122584	48438	3328	8747	0.39	0.42	0.36
2010	3605750	4072888	3192190	143031	153777	132285	132009	50276	3543	6581	0.37	0.40	0.34
2011	4855190	5447818	4327030	127333	137209	117457	124118	50368	3850	8027	0.42	0.45	0.38
2012	4993910	5612196	4443740	102702	111301	94103	99579	51225	6795	9004	0.56	0.61	0.51
2013	3242640	3717697	2828287	96851	105111	88590	71591	31355	5020	6602	0.41	0.45	0.37
2014	2918140	3359716	2534601	105503	114390	96616	66745	28909	9627	6753	0.41	0.45	0.37
2015	2145850	2530387	1819750	126145	136559	115731	74919	38079	5970	5959	0.40	0.44	0.36
2016	3310880	3812158	2875518	113509	122858	104160	76913	29313	3279	4847	0.30	0.33	0.28
2017	1769730	2198230	1424757	93161	100972	85350	66370	25496	3238	2231	0.29	0.31	0.26
2018	118322	193664	72291	90045	97744	82346	55423	15907	3103	2595	0.22	0.24	0.20
2019	2052590**			84527	92110	76944	50205	8383	1337	2219	0.117	0.129	0.106
2020	2052590**			68652	76250	61053	53661						

*BMS included since 2017.†
**Average of 2014–2018.

† Version 2: footnote included.

Sources and references

ICES. 2020a. Cod (*Gadus morhua*) in subdivisions 22–24, western Baltic stock (western Baltic Sea). *In* Report of the ICES Advisory Committee, 2020, cod.27.22-24, https://doi.org/10.17895/ices.advice.5942.

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