

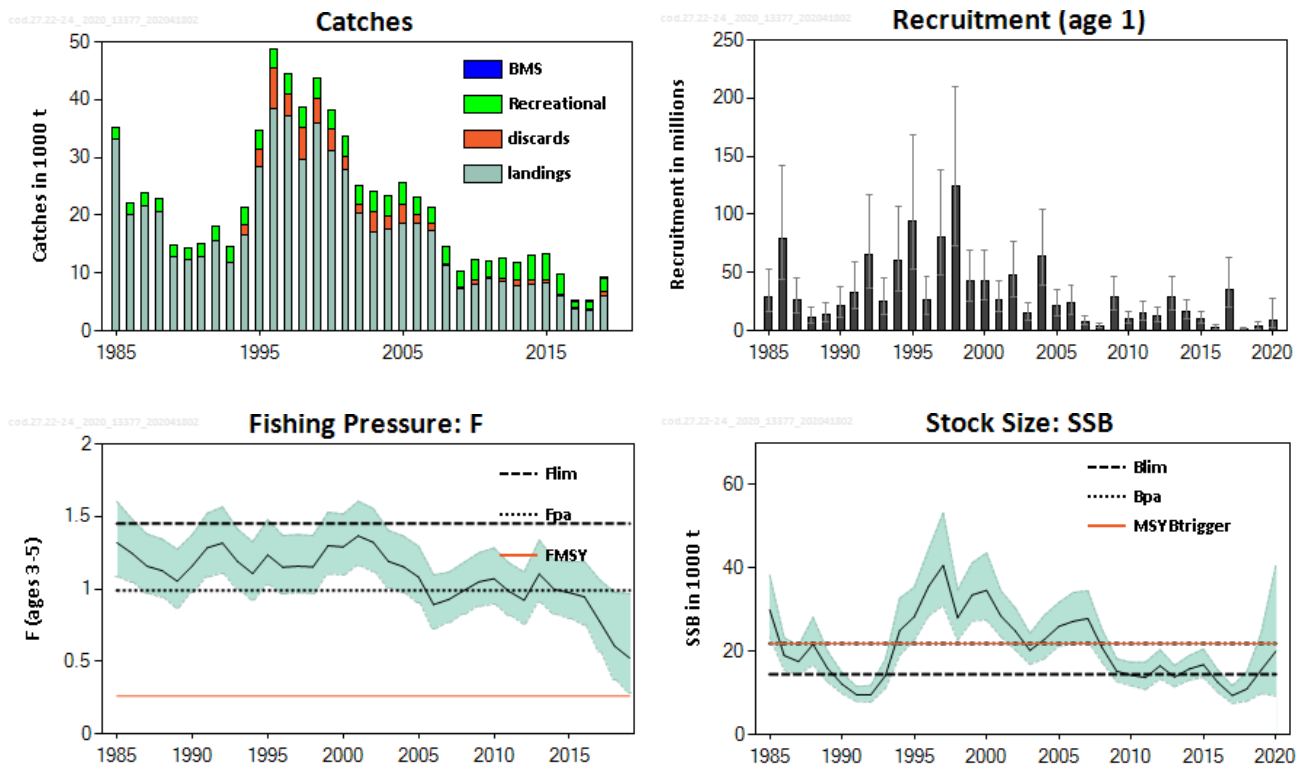
## Cod (*Gadus morhua*) in subdivisions 22–24, western Baltic stock (western Baltic Sea)

### ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the Baltic Sea is applied, catches in 2021 that correspond to the F ranges in the plan are between 4275 tonnes and 9039 tonnes. According to the MAP, catches higher than 5950 tonnes can only be taken under conditions specified in the MAP, whilst the entire range is considered precautionary when applying the ICES advice rule. Assuming recreational catches at 1315 tonnes, this implies a commercial catch at  $F_{MSY}$  of 4635 tonnes, and a range of 2960–7724 tonnes.

Note: This advice sheet 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 22–24, western Baltic stock. Summary of the stock assessment. Recruitment, F, and SSB show confidence intervals (95%) in the plot. BMS landings (fish below the minimum conservation reference size [MCRS]) have been included since 2017.

### Stock and exploitation status

**Table 1** Cod in subdivisions 22–24, western 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	$F_{MSY}$	✗	✗	✗	MSY $B_{trigger}$	✗	✗	✗	Below trigger
Precautionary approach	$F_{pa}, F_{lim}$	✓	✓	✓	$B_{pa}, B_{lim}$	✗	○	○	Increased risk
Management plan	$F_{MGT}$	✗	✗	✗	SSB $MGT$	✗	✗	✗	Below

**Catch scenarios**

**Table 2** Cod in subdivisions 22–24, western Baltic stock. Assumptions made for the interim year and in the forecast. Weights are in tonnes. Recruitment is in thousands.

Variable	Value	Notes
F <sub>ages 3-5</sub> (2020)	0.235	Based on catch constraint in 2020.
SSB (2021)	24488	Based on catch constraint in 2020.
R <sub>age 1</sub> (2020)	9076	From the assessment.
R <sub>age 1</sub> (2021)	9535	Sampled from the last ten years*.
R <sub>age 1</sub> (2022)	9948	Sampled from the last ten years*.
Total catch (2020)	4488	Commercial + recreational catches.
Commercial catches (2020)	3173	Calculated as the 2020 TAC (3806 tonnes), plus an assumed discard ratio as in 2019 (9.7%), and accounting for the proportion of western Baltic cod in commercial catches in subdivisions 22–24 in 2019 (75.3%).
Recreational catches (2020)	1315	Same value as in 2017**.

\* Recruitment is randomly resampled from the assessment estimates of the last ten years and the median of these random draws is used. This will vary slightly every time this is carried out.

\*\* Same management measures in 2020 as in 2017 for the recreational fishery (EU, 2017, 2019).

**Table 3** Cod in subdivisions 22–24, western Baltic stock. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch * (2021)	Recreational catch	Commercial catch	F <sub>total</sub> (2021)	F <sub>commercial</sub> (2021)	SSB (2022)	% SSB change ***	% Advice change
<b>ICES advice basis</b>								
EU MAP**: F <sub>MSY</sub>	5950	1315	4635	0.26	0.20	26412	7.9	-18 <sup>^</sup>
F = F <sub>MSY lower</sub>	4275	1315	2960	0.180	0.125	28429	16	-18 <sup>^^</sup>
F = F <sub>MSY upper</sub>	9039	1315	7724	0.43	0.37	23080	-5.7	-18 <sup>^^^</sup>
<b>Other scenarios</b>								
F <sub>MSY</sub>	5950	1315	4635	0.26	0.20	26412	7.9	-18 <sup>^</sup>
Zero commercial catch	1315	1315	0	0.05	0.0	32442	32	-82 <sup>^</sup>
F = F <sub>pa</sub>	15947	1315	14632	0.99	0.91	14779	-40	120 <sup>^</sup>
F = F <sub>lim</sub>	19679	1315	18364	1.45	1.35	10603	-57	172 <sup>^</sup>
SSB (2022) = B <sub>lim</sub>	16229	1315	14914	1.02	0.89	14500	-41	124 <sup>^</sup>
SSB (2022) = B <sub>pa</sub>	10035	1315	8720	0.49	0.38	21876	-11	39 <sup>^</sup>
SSB (2022) = MSY B <sub>trigger</sub>	10035	1315	8720	0.49	0.38	21876	-11	39 <sup>^</sup>
F <sub>sq</sub> (F = 2019)	10479	1315	9164	0.52	0.47	21356	-13	45 <sup>^</sup>

\* Includes commercial and recreational catch.

\*\* EU Multiannual Plan for the Baltic Sea (EU, 2016a).

\*\*\* SSB 2022 relative to SSB 2021.

<sup>^</sup> Total catch in 2021 relative to total catch corresponding to the advice for 2020 (7245 tonnes, MAP F<sub>MSY</sub>), including commercial and recreational catch.

<sup>^^</sup> Total catch in 2021 relative to total catch corresponding to the advice for 2020 for F<sub>MSY lower</sub> (5205 tonnes, MAP F<sub>MSY lower</sub>), including commercial and recreational catch.

<sup>^^^</sup> Total catch in 2021 relative to total catch corresponding to the advice for 2020 for F<sub>MSY upper</sub> (11 006 tonnes, MAP F<sub>MSY upper</sub>), including commercial and recreational catch.

**Issues relevant for the advice**

**Table 4** Cod in subdivisions 22–24, western Baltic stock. The scenarios illustrate various examples of how to determine an area-based TAC for the western Baltic (WB) management area, under different assumptions for bycatches of the eastern Baltic (EB) cod in Subdivision (SD) 24, and with a recreational catch of 1315 tonnes in 2021. Weights are in tonnes.

Area	Commercial catch WB cod stock			Commercial catch EB cod stock			Commercial catch of cod by management area (TAC)			
	A	B	C	D	E	F	G		H	
	Advice total	SDs 22–23	SD 24	Total	SD 24	SDs 25–32	SDs 22–24	% TAC change (SDs 22–24)*	SDs 25–32	% TAC change (SDs 25–32)**
<b>a. Assuming no catch of EB cod in the western Baltic management area, total TAC is taken in SDs 22–23</b>										
Calculation		= A × 1.0	= A × 0.0		= C × 1.27 ^^	= D - E	= B + C + E		= F	
EU MAP: F <sub>MSY</sub>	4635	4635	0	0	0	0	4635	22	0	-100
<b>b. Assuming no change in western Baltic historical catch distribution by area, and status quo catch of EB cod</b>										
Calculation		= A × 0.74^	= A × 0.26^		= C × 1.27 ^^	= D - E	= B + C + E		= F	
EU MAP: F <sub>MSY</sub>	4635	3430	1205	7500	1532	5968	6167	62	5968	-20
<b>c. Assuming EB cod catches in SD 24 limited to 10% of the total EBC status quo catch</b>										
Calculation		= A - C	= E/1.27		10% of total EBC catch^^^	= D - E	= B + C + E		= F	
EU MAP: F <sub>MSY</sub>	4635	4045	590	7500	750	6750	5385	41	6750	-10

\* Compared to the 2020 TAC for subdivisions 22–24 (3806 tonnes).

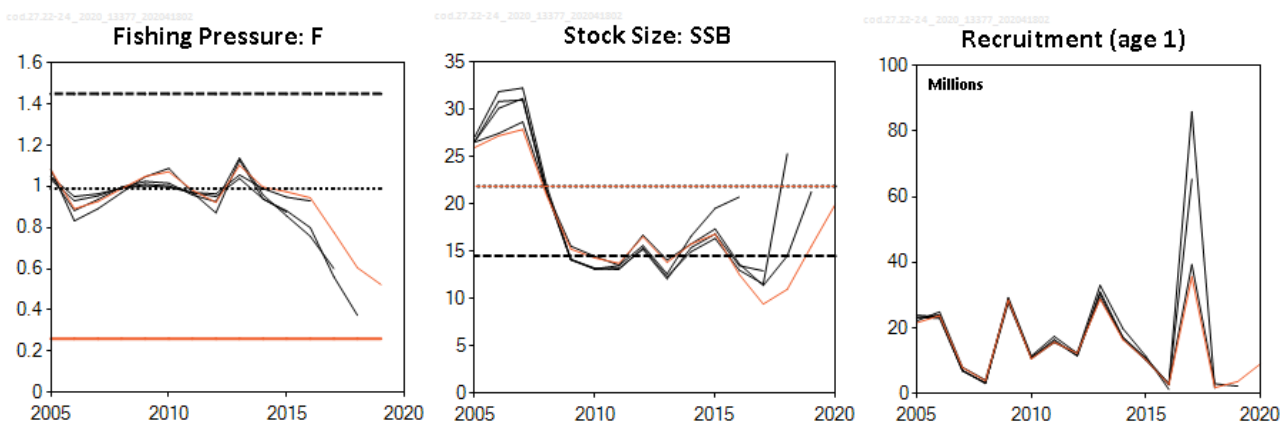
\*\* Compared to the 2020 TAC for subdivisions 25–32 (7500 tonnes, Russia + EU).

^ Same proportions of the WB cod stock commercial catch that has been harvested in subdivisions 22–23 and Subdivision 24 in the most recent data year (2019).

^^ The EB cod catch / WB cod commercial catch ratio is similar to that observed in Subdivision 24 in the most recent data year (2019).

^^^ Same commercial catch ratio between subdivisions 24 and 25–32 as in 2019.

**Quality of the assessment**



**Figure 2** Cod in subdivisions 22–24, western Baltic stock. Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2019.

**History of the advice, catch, and management**

**Table 5** Cod in subdivisions 22–24, western Baltic stock. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Total catch from the stock corresponding to the advice	Commercial catch corresponding to the advice*	Agreed TAC**	ICES estimated total commercial landings subdivisions 22–24 (eastern and western Baltic cod stocks)
1987	TAC		9000		28566
1988	TAC		16000		29159
1989	TAC		14000	220000	18516
1990	TAC		8000	210000	17780
1991	TAC		11000	171000	16693
1992	Substantial reduction in F		-	100000	17996
1993	F at lowest possible level		-	40000	21228
1994	TAC		22000	60000	30695
1995	30% reduction in fishing effort from 1994 level		-	120000	33895
1996	30% reduction in fishing effort from 1994 level		-	165000	50845
1997	Fishing effort should not be allowed to increase above the level of recent years		-	180000	43624
1998	20% reduction in F from 1996		35000	136950	34216
1999	At or below $F_{sq}$ with 50% probability		38000	126000	42155
2000	Reduce F by 20%		44600	105000	38347
2001	Reduce F by 20%		48600	105000	34244
2002	Reduce F to below 1.0		36300	76000	24158
2003	Reduce F to below 1.0		***22600 or 28800	75000	24624
2004	Reduce F to below 1.0		< 29600	29600	20854
2005	Reduce F to below 0.92		< 23400	24700	22045
2006	Management plan		< 28400	28400	22751
2007	Keep SSB at $B_{pa}$		< 20500	26700	23736
2008	Rebuild SSB to $B_{pa}$		< 13500	19200	20082
2009	Rebuild SSB to $B_{pa}$		< 13700	16300	15549
2010	Management plan		< 17700	17700	14120
2011	See scenarios		-	18800	16332
2012	Management plan		21300	21300	17072
2013	Management plan		20800	20000	12968
2014	Management plan		17037	17000	13538
2015	MSY approach		8793	15900	13418
2016	MSY approach (F = 0.23)	≤ 7797		12720	10629
2017	MSY approach (F = 0.15)	≤ 3475	≤ 917	5597	5865^
2018	MAP F ranges: $F_{lower}$ to $F_{MSY}$ adjusted by $SSB_{2018}/MSY B_{trigger}$ (F = 0.11–0.188)	3130–5295	1376–3541	5597	5850^
2019	MAP range: $F_{MSY} F_{lower}$ to $F_{upper}$ (F = 0.15–0.45)	9094–23992	5867–22238	9515	7701
2020	MAP range: $F_{MSY} F_{lower}$ to $F_{upper}$ (F = 0.18–0.43)	5205–11006	3065–8866	3806	
2021	Management Plan	5950 (range 4275–9039)	4635 (range 2960–7724)		

\* Values since 2016 are for the western Baltic cod stock only, whereas in earlier years they are for the area of subdivisions 22–24 and include a fraction of the eastern Baltic cod stock.

\*\* Included in TAC for total Baltic, until and including 2003.

\*\*\* Two options based on implementation of the adopted mesh regulation.

^ Including BMS.

## Summary of the assessment

**Table 6** Cod in subdivisions 22–24, western Baltic stock. Assessment summary. Weights are in tonnes. Recruitment in thousands. High and low refer to 95% confidence intervals.

Year	Recruitment			Stock size			Landings	Discards	Fishing pressure			Recreational catch
	R (age 1)	High	Low	SSB	High	Low			F (ages 3–5)	High	Low	
1985	29009	53081	15853	29993	38260	23512	33188		1.32	1.60	1.08	2075
1986	78631	141558	43678	19010	23265	15533	20088		1.25	1.48	1.05	2078
1987	25969	45953	14675	17567	21438	14395	21692		1.16	1.38	0.97	2081
1988	11383	20372	6360	21709	28117	16761	20672		1.13	1.34	0.94	2082
1989	13787	24416	7785	15940	20028	12686	12795		1.05	1.27	0.87	2083
1990	21350	37802	12059	12124	14868	9886	12237		1.16	1.37	0.98	2085
1991	33402	59141	18864	9617	11569	7995	12931		1.28	1.52	1.08	2087
1992	65814	117206	36956	9606	11826	7803	15672		1.32	1.56	1.11	2420
1993	25729	45708	14483	14148	18063	11081	11815		1.19	1.41	1.00	2752
1994	59886	106376	33714	25014	32798	19078	16642	1614	1.11	1.32	0.92	3088
1995	94217	167909	52867	28310	35376	22655	28310	3016	1.23	1.48	1.03	3417
1996	25898	46737	14351	35655	44538	28544	38505	6868	1.15	1.37	0.97	3419
1997	80922	137881	47493	40633	53198	31035	37077	3981	1.16	1.37	0.97	3420
1998	124123	209488	73544	28052	34731	22658	29634	5575	1.15	1.37	0.97	3410
1999	42343	69613	25756	33554	41210	27321	35934	4378	1.30	1.53	1.10	3416
2000	43222	69676	26812	34650	43638	27512	31132	3738	1.29	1.52	1.10	3432
2001	25895	42278	15861	28454	34485	23478	27781	2449	1.37	1.60	1.16	3427
2002	47301	77186	28987	24845	30367	20327	20410	1395	1.32	1.55	1.12	3437
2003	14617	24002	8901	20235	24296	16853	17205	3473	1.19	1.40	1.01	3448
2004	64204	104329	39511	22881	28675	18258	17686	2189	1.15	1.36	0.98	3445
2005	21539	34859	13308	25982	31723	21280	18493	3265	1.08	1.29	0.91	3771
2006	23741	38749	14546	27216	34137	21698	18503	1686	0.89	1.10	0.73	2923
2007	7886	12819	4852	27886	34553	22505	17384	1325	0.93	1.12	0.77	2782
2008	3839	6786	2172	20878	25129	17346	11302	336	0.99	1.18	0.83	3039
2009	28498	47137	17229	15238	18226	12741	7313	351	1.05	1.25	0.88	2648
2010	10530	17041	6507	14293	17353	11773	8007	838	1.07	1.28	0.90	3367
2011	15635	25566	9561	13739	17425	10833	9107	299	0.98	1.18	0.82	2595
2012	12264	19732	7622	16536	20393	13408	8622	370	0.92	1.12	0.76	3661
2013	28818	47027	17660	13813	16619	11481	7697	1007	1.10	1.34	0.91	3106
2014	16354	26600	10054	15760	18961	13100	8083	837	1.00	1.20	0.83	4044
2015	10255	16658	6313	16812	20550	13754	8390	432	0.97	1.19	0.80	4568
2016	2733	4570	1634	12559	15498	10177	6122	143	0.95	1.19	0.75	3505
2017	35586	62977	20108	9410	11766	7525	3861**	180	0.78	1.06	0.57	1315
2018	1777	3250	972	10975	15007	8026	3555**	157	0.61	0.98	0.37	1600
2019	3636	7604	1739	15542	24422	9890	6103**	655	0.52	0.97	0.28	2573
2020	9076*	27316*	2939*	19992*	40481*	9329*						

\*Output from SAM analysis based on survey data.

\*\*Includes BMS.

## Sources and references

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