

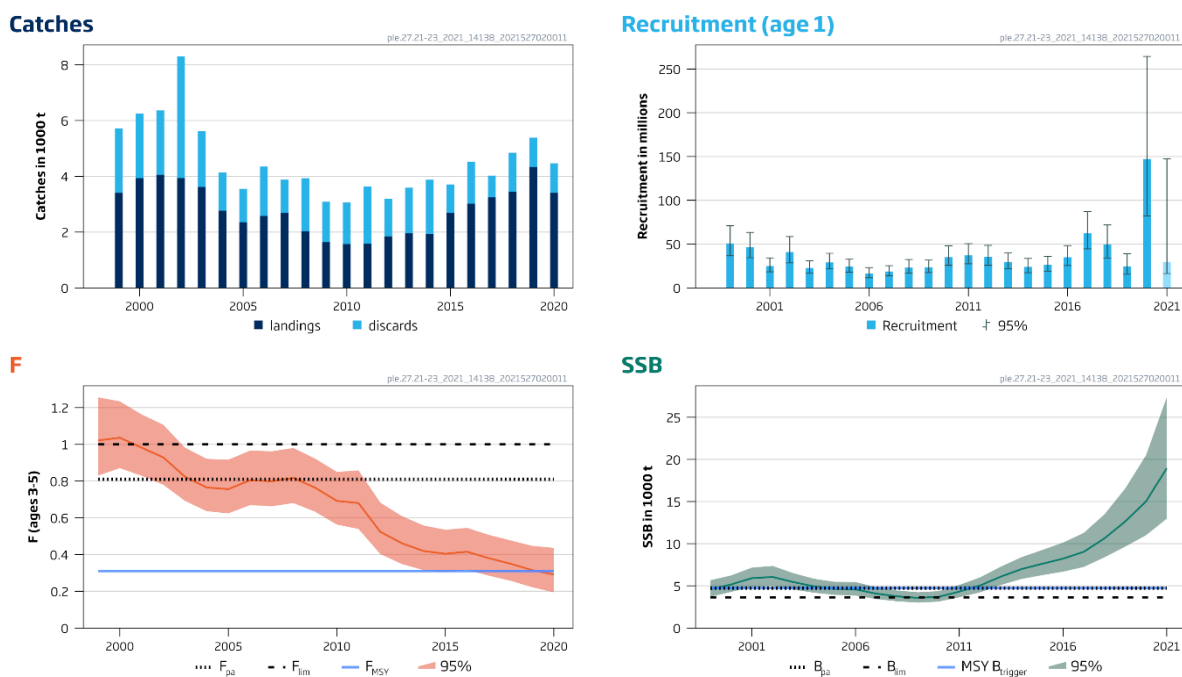
## Plaice (*Pleuronectes platessa*) in subdivisions 21–23 (Kattegat, Belt Seas, and the Sound)

### ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2022 should be no more than 8821 tonnes.

### Stock development over time

Fishing pressure on the stock is below  $F_{MSY}$  and spawning-stock size is above MSY  $B_{trigger}$ ,  $B_{pa}$ , and  $B_{lim}$ .



**Figure 1** Plaice in subdivisions 21–23. Summary of the stock assessment. Weights in thousand tonnes. The assumed recruitment value for 2021 is shaded in a lighter colour.

### Catch scenarios

**Table 1** Plaice in subdivisions 21–23. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 3-5}$ (2021)	0.29	$F_{ages\ 3-5}$ in 2020.
SSB (2022)	22 837	Short-term forecast; tonnes.
$R_{age\ 1}$ (2021, 2022)	29 435	Median resampled from the entire time-series of recruitment; thousands.
Total catch (2021)	6706	Short-term forecast using $F_{2021}$ . tonnes.
Projected landings (2021)	4832	Short-term forecast; assuming average landings ratio by age in 2018–2020; tonnes.
Projected discards (2021)	1874	Short-term forecast; assuming average discard ratio by age 2018–2020; tonnes.

**Table 2** Plaice in subdivisions 21–23. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2022)	F (2022)	SSB (2023)	% SSB change *	% Advice change **
ICES advice basis					
MSY approach = $F_{MSY}$	8821	0.31	24764	8.4%	70%
Other scenarios					
F = 0	0	0.00	31884	40%	–100%
$F_{MSY}$ lower	5404	0.18	27372	20%	4.40%
$F_{MSY}$ upper	14913	0.59	19728	–14%	180%

Basis	Total catch (2022)	F (2022)	SSB (2023)	% SSB change *	% Advice change **
$F = F_{pa}$	18725	0.81	16624	-27%	262%
$F = F_{lim}$	21537	1.00	14370	-37%	316%
$SSB (2023) = B_{lim}$	35681	3.20	3645	-84%	589%
$SSB (2023) = B_{pa}$	34121	2.70	4725	-79%	559%
$SSB (2023) = MSY_{B_{trigger}}$	34121	2.70	4725	-79%	559%
$SSB (2023) = SSB (2022)$	11167	0.409	22820	0%	116%
$F = F_{2021}$	8328	0.29	25012	9.5%	61%

\* SSB 2023 relative to SSB 2022.

\*\* Catches in 2022 relative to ICES advised catch for 2021 (5176 tonnes).

The advised catch has increased for 2022, as the SSB continues to increase and there is a strong 2019 year class that will be entering the fishery in 2021–2022.

### Basis of the advice

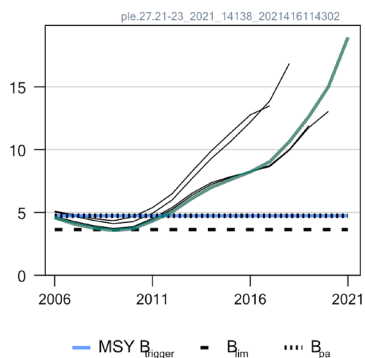
**Table 3** Plaice in subdivisions 21–23. The basis of the advice.

Advice basis	MSY approach
Management plan	The EU multiannual plan for the Baltic Sea (EU, 2016, 2019) applies to bycatches of this stock taken when fishing for the target stocks described in the plan. Catches taken in the Kattegat (Subdivision 21) are covered by the North Sea multiannual plan (EU, 2018).

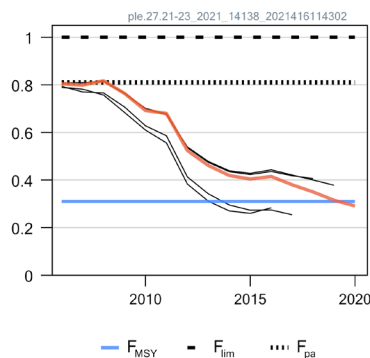
### Quality of the assessment

There are no concerns over the quality of this assessment. Stock development and fishing mortality show a consistent pattern over the last three assessments.

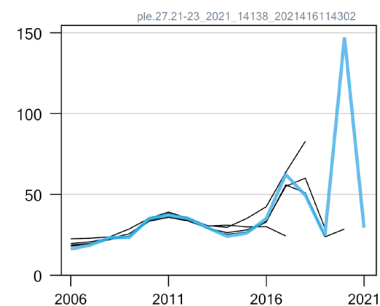
#### SSB (1000 t)



#### F



#### Rec (age 1; Millions)



**Figure 2** Plaice in subdivisions 21–23. Historical assessment results. The final recruitment estimate of each assessment is the median of the corresponding time-series. The reference points were revised in 2019 following a review, and only the last three assessment results should be compared to the reference points indicated.

### Issues relevant for the advice

In Subdivision (SD) 22, landings of plaice have increased from 2015–2019 and remain high in 2020, in parallel to a decrease in the discard ratio for this area. This, in conjunction with reduced fishing opportunities for cod, suggests that plaice in this subdivision may now be predominantly a targeted fishery.

The management areas for plaice in the Baltic Sea (i.e. SDs 21 and 22–32) are different from the stock areas (i.e. SDs 21–23 and 24–32). As for the plaice stock in SDs 24–32 (ICES, 2021c), this section provides an option for calculating TACs by management area, based on the catch distribution observed in 2020. The catch ratio between SDs 21 and 22–23 in 2020 was used to calculate a split of the advised catches for the stock in SDs 21–23 for 2022. The advised catch for the stock in SDs 24–32 was added to the calculated catch for SDs 22–23 in order to obtain plaice catches by management area that

would be consistent with ICES advice for the two stocks. The details of this calculation are presented in Table 4. This results in catches of no more than 1695 tonnes in SD 21, and 11 082 tonnes in SDs 22–32.

**Table 4** Plaice in subdivisions (SDs) 21–23. Calculation of TACs by management area based on the catch distribution observed in 2020. Weights are in tonnes. Landings including BMS.

Basis		Catch 2020	Landings 2020	ICES stock advice 2022 (catch)
Stock area-based	SDs 21–23	4469	3409	8821
	SDs 24–32	1247	1024	3956
Total advised catch, 2022 (SDs 21–32)				12777
Management area-based	SD 21	859	283	
	SDs 22–23	3610	3126	
	SDs 24–32	4857	4150	
Calculation				Result
Share of SD 21 of the total catch in SDs 21–23 in 2020		= 859/4469 (catch in 2020 SD 21/catch in 2020 SDs 21–23)		0.192
Catch in 2022 for SD 21		= 8821 * 0.192 (ICES stock advice in 2022 [catch] for SDs 21–23 × share)		1695
Catch in 2022 for SDs 22–32		= 12777–1695 (total advised catch in 2022 SDs 21–32–catch SD 21)		11082
Share of SD 21 of the total landings in SDs 21–23 in 2020		= 283/3409 (landings in 2020 SD 21 / landings in 2020 SDs 21–23)		0.083

### Reference points

**Table 5** Plaice in subdivisions 21–23. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4730	$B_{pa}$ ; in tonnes	ICES (2019a)
	$F_{MSY}$	0.31	Stochastic simulations (EqSim) with segmented regression	ICES (2019a)
Precautionary approach	$B_{lim}$	3635	$B_{loss}$ in 2009, from the 2019 assessment; in tonnes	ICES (2019a)
	$B_{pa}$	4730	$B_{lim} \times e^{1.645 \cdot \sigma}$ , $\sigma = 0.16$ ; in tonnes	ICES (2019a)
	$F_{lim}$	1.00	The F that on average leads to $B_{lim}$	ICES (2019a)
	$F_{pa}$	0.81	The F that provides a 95% probability for SSB to be above $B_{lim}$ ( $F_{P05}$ ).	ICES (2021b)
Management plan	$SSB_{mgt}$	Not defined		
	$F_{mgt}$	Not defined		

### Basis of the assessment

**Table 6** Plaice in subdivisions 21–23. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2021a)
Assessment type	Age-based analytical assessment SAM (ICES, 2021b) that uses catches in the model and in the forecast
Input data	Commercial catches; two combined survey indices (NS-IBTSQ1 [G1022] and BITS-Q1 [G2916], NS-IBTS-Q3 [G2829] and BITS-Q4 [G8863]); mean maturity data for the modelled period (Q1 surveys); natural mortalities are fixed and assumed to be 0.1 except for age 1, which has 0.2
Discards and bycatch	Discard information is available from 1999 from the main fleets and is included
Indicators	None
Other information	The stock was last benchmarked in 2015 (ICES, 2015) and revised in 2019 (ICES, 2019)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

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

**Table 7** Plaice in subdivisions (SDs) 21–23. ICES advice, TACs, and ICES catches. All weights are in tonnes.

Year	ICES advice	Catch corresp. to advice for SDs 21–23	Catch corresp. to advice for Skagerrak and Kattegat combined	TAC Kattegat (SD 21)	TAC Baltic Sea (SDs 22–32)	ICES landings (SDs 21–23) <sup>^^</sup>	Discards (SDs 21–23) <sup>^^</sup>
1992	TAC		14 000	2 800		2 700	
1993	Precautionary TAC		-	2 800		1 700	
1994	If required, precautionary TAC		-	2 800		2 100	
1995	If required, precautionary TAC		-	2 800		2 100	
1996	If required, precautionary TAC		-	2 800		3 500	
1997	No advice		-	2 800		3 400	
1998	No increase in F from the present level		11 900	2 800		2 900	
1999	No increase in F from the present level		11 000	2 800		3 400	2 313
2000	$F < F_{pa}$		11 800	2 800		3 900	2 313
2001	$F < F_{pa}$		9 400	2 350		4 100	2 313
2002	$F < F_{pa}$		8 500*	1 600**		3 900	4 357
2003	$F < F_{pa}$		18 400	3 000		3 400	2 004
2004	$F < F_{pa}$		***	1 800		2 600	1 368
2005	$F < F_{pa}$		< 9 500	1 900		2 400	1 197
2006	No increase in F		< 9 600	1 900		2 400	1 769
2007	Maintain current TAC		< 9 600	2 100		2 600	1 190
2008	No increase in catch		< 9 400	2 300		2 000	1 901
2009	Same advice as last year		< 9 400	2 300		1 700	1 447
2010	Same advice as last year		< 9 400	2 300		1 500	1 488
2011	Last three years' (2007–2009) average landings		< 8 000	1 988	3 041	1 600	2 045
2012	Reduce catch		-	1 988	2 889	1 800	1 350
2013	Increase catch by 16%, transition to $F_{MSY}$	< 1 800 <sup>^</sup>		1 800	3 409	2 000	1 637
2014	Increase landings by 20%	2 224 <sup>^</sup>		2 160	3 409	1 931	1 946
2015	Increase catch by 20%	4 031		2 626	3 409	2 687	1 021
2016	MSY approach	≤ 8 639		2 347	4 034	3 020	1 501
2017	MSY approach	≤ 8 333		2 343	7 862	3 253	988
2018	MSY approach	≤ 5 405		1 483	7 076	3 459	1 387

Year	ICES advice	Catch corresp. to advice for SDs 21–23	Catch corresp. to advice for Skagerrak and Kattegat combined	TAC Kattegat (SD 21)	TAC Baltic Sea (SDs 22–32)	ICES landings (SDs 21–23) <sup>^^</sup>	Discards (SDs 21–23) <sup>^^</sup>
2019	Precautionary approach	≤ 15 237		1 705	10 122	4 334	1 054
2020	Precautionary approach	≤ 10 636		1 141	6 894	3 409	1 061
2021	MSY approach	≤ 5 176		414	7 240		
2022	MSY approach	≤ 8 821					

\* In March 2002 ICES revised its advice to 11 600 tonnes for both areas combined.

\*\* The TAC for the two areas combined was adjusted to 11 200 tonnes in mid-2002.

\*\*\* The exploitation of this stock should be conducted in the context of mixed fisheries.

<sup>^</sup> Landings.

<sup>^^</sup> On 1/1/2017 the EU landing obligation was introduced for plaice in SDs 22–32. In 2017, landings include below minimum size (BMS) landings, while for 2019 and 2020 in Denmark and Sweden below minimum size catches are included in discards.

### History of the catch and landings

**Table 8** Plaice in subdivisions 21–23. Catch distribution by fleet in 2020 as estimated by ICES.

Catch (2020)	Landings		Discards
	Active gears 68%	Passive gears 32%	
4469 tonnes	3409 tonnes		1061 tonnes

**Table 9** Plaice in subdivisions (SDs) 21–23. History of commercial catch and landings. ICES estimated landings by area and country, estimated discards, and officially reported BMS. All weights are in tonnes. Missing values indicate no reported catch; zeros represent either zero reported catch or the rounding down of catch of below one tonne.

Year and SD	Denmark		Germany		Sweden		Aggregate BMS	Total Catches
	Discards	Landings	Discards	Landings	Discards	Landings		
2002	3877	3654	22	39	458	246		8296
27.3.a.21	3314	1880	0		446	204		5844
27.3.b.23	178	75	0		13	42		308
27.3.c.22	385	1699	22	39		0		2145
2003	1635	3308	17	31	353	279		5623
27.3.a.21	1235	2132	0		351	253		3971
27.3.b.23	23	105	0		1	26		155
27.3.c.22	377	1071	17	31	0	0		1496
2004	1195	2540	48	54	126	173		4136
27.3.a.21	711	1454	0		119	137		2421
27.3.b.23	48	137	0		7	35		227
27.3.c.22	435	949	48	54		0		1486
2005	1048	2171	37	48	113	135		3552
27.3.a.21	617	1145	0		108	100		1970
27.3.b.23	37	152	0		4	34		227
27.3.c.22	394	874	37	48		0		1353
2006	1593	2321	25	45	152	214		4350
27.3.a.21	1165	1400	0		149	175		2889
27.3.b.23	17	180	0		3	39		239
27.3.c.22	410	742	25	45		0		1222
2007	962	2376	56	75	173	241		3883
27.3.a.21	641	1244	0		170	172		2227
27.3.b.23	42	199	0		2	69		312
27.3.c.22	279	933	56	75		0		1343
2008	1807	1754	16	92	79	182		3930
27.3.a.21	1471	899	0		76	137		2583
27.3.b.23	39	120	0		3	45		207
27.3.c.22	297	735	16	92		0		1140
2009	1332	1317	16	191	99	127		3082
27.3.a.21	1033	589	0		99	84		1805
27.3.b.23	10	144	0		0	42		196
27.3.c.22	289	585	16	191		0		1081
2010	1212	1262	149	226	127	83		3059
27.3.a.21	388	428	5	5	127	66		1019
27.3.b.23	5	59	0		1	17		82
27.3.c.22	819	775	144	221		0		1959
2011	1823	1224	127	310	95	51		3630
27.3.a.21	1042	327	0		94	40		1503
27.3.b.23	27	46	0		1	11		85
27.3.c.22	754	851	127	310		0		2042
2012	1192	1439	119	365	39	41		3195
27.3.a.21	277	196	0		39	30		542
27.3.b.23	1	54	0		1	12		68
27.3.c.22	914	1189	119	365		0		2587
2013	1423	1561	111	320	104	74		3593
27.3.a.21	756	232	3	1	103	60		1155
27.3.b.23	1	76	0		1	14		92
27.3.c.22	666	1252	109	319		0		2346
2014	1750	1497	100	321	96	113		3877
27.3.a.21	525	343	1	1	94	68		1032
27.3.b.23	5	57	0		2	45		109
27.3.c.22	1220	1097	99	320		0		2736

Year and SD	Denmark		Germany		Sweden		Aggregate BMS	Total Catches
	Discards	Landings	Discards	Landings	Discards	Landings		
2015	784	2014	115	560	122	113		3708
27.3.a.21	345	807	0	0	122	87		1361
27.3.b.23	6	103	0		0	26		135
27.3.c.22	434	1103	115	560		0		2212
2016	1223	2199	145	681	133	141		4522
27.3.a.21	633	984	1	1	131	121		1871
27.3.b.23	17	107	0		2	20		146
27.3.c.22	573	1108	144	680		0		2505
2017	583	2198	126	936	54	110	4	4011
27.3.a.21	396	703	0	1	52	97		1249
27.3.b.23		70	0		3	13		86
27.3.c.22	187	1424	126	936		0		2673
2018	969	2300	365	1073	65	65	8	4845
27.3.a.21	777	482	1	1	61	51	0	1373
27.3.b.23	42	111	0		5	13		171
27.3.c.22	151	1708	364	1072	0	0	8	3303
2019	839	2775	166	1498	33	52	25	5388
27.3.a.21	345	332	4	4	29	28	6	748
27.3.b.23	24	102	0		4	24	0	154
27.3.c.22	470	2342	162	1494	0	0	19	4487
2020	846	2551	154	820	53	31	14	4469
27.3.a.21	522	264	8	2	46	17	1	860
27.3.b.23	29	87	0		7	14	1	138
27.3.c.22	296	2201	146	818		0	12	3473

### Summary of the assessment

**Table 10** Plaice in subdivisions 21–23. Assessment summary. Weights are in tonnes; recruitment is in thousands. High and low refers to 95% confidence intervals.

Year	Recruitment			SSB			Landings	Discards	Fishing mortality		
	Age 1	High	Low	SSB	High	Low			Ages 3–5	High	Low
1999	50839	70771	36520	4580	5666	3702	3406	2313	1.02	1.26	0.83
2000	46637	63250	34387	5161	6229	4277	3935	2313	1.04	1.23	0.87
2001	24938	34072	18253	5906	7159	4872	4054	2313	0.98	1.16	0.83
2002	40845	58564	28488	6054	7365	4976	3939	4357	0.93	1.11	0.78
2003	22591	30719	16613	5444	6504	4557	3618	2004	0.82	0.98	0.69
2004	29123	39402	21526	4940	5840	4179	2766	1369	0.77	0.92	0.64
2005	24237	32790	17916	4637	5472	3929	2354	1197	0.76	0.92	0.62
2006	16214	23056	11403	4574	5450	3839	2580	1770	0.80	0.97	0.67
2007	18634	25343	13701	4074	4839	3430	2691	1191	0.80	0.96	0.66
2008	23208	32248	16702	3749	4443	3163	2028	1902	0.82	0.98	0.68
2009	23430	31626	17358	3573	4241	3010	1635	1448	0.76	0.92	0.63
2010	35041	48053	25552	3695	4370	3125	1570	1489	0.69	0.85	0.56
2011	37150	50414	27376	4311	5110	3637	1584	2045	0.68	0.86	0.54
2012	35190	48489	25539	5033	5998	4222	1845	1351	0.52	0.68	0.40
2013	29435	39990	21665	6090	7270	5101	1956	1638	0.46	0.61	0.35
2014	24039	33602	17197	6987	8400	5812	1931	1946	0.42	0.56	0.32
2015	26038	35711	18985	7616	9253	6268	2687	1021	0.40	0.54	0.31
2016	34988	48155	25421	8223	10125	6678	3020	1501	0.42	0.55	0.32
2017	62277	87200	44478	9035	11277	7239	3247	778	0.38	0.51	0.28
2018	49402	71694	34042	10634	13486	8385	3446	1400	0.35	0.48	0.26
2019	24517	38938	15437	12637	16552	9648	4334	1054	0.32	0.45	0.22
2020	147261	264270	82059	15011	20481	11001	3409	1061	0.29	0.44	0.194
2021	29435*	147261*	16214*	18946	27365	12960					

\* Median and confidence intervals of resampled recruitment from the entire time-series.

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