

Cod (*Gadus morhua*) in Subdivision 21 (Kattegat)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in 2023.

Stock development over time

ICES cannot assess the stock and exploitation status relative to MSY and precautionary approach (PA) reference points because the reference points are undefined. SSB is considered to be below possible biomass reference points.



Figure 1 Cod in Subdivision 21. Summary of the stock assessment. Recruitment, mortality, and SSB are relative to the average of the time-series. Landings since 2018 include landings below minimum conservation reference size (BMS). Relative mortality refers to fishing mortality plus unaccounted removals, including migration and additional natural mortality.

Catch scenarios

SSB has declined since 2014, reaching a historically low level in 2020. SSB in 2022 is still at a very low level. ICES is not able to identify any catch level that is likely to rebuild the stock; thus, the advice is zero catch for 2023.

Basis of the advice

Table 1 Cod in Subdivision 21. The basis of the advice.

Advice basis	Precautionary approach
Management plan	ICES is not aware of any agreed precautionary management plan for cod in this area

Quality of the assessment

Sampling of landings and discards was reduced in 2020 and 2021 due to the COVID-19 disruption. However, this is considered to have had only a minor effect on the quality of the assessment of Kattegat cod.

Reported landings and discard estimates in recent years, based on observer trips, did not represent total removals from the stock. Unreported catches have historically been a concern for this stock and up to year 2010 have been estimated as part of the unaccounted removals from 2011 onwards within the assessment model. ICES concluded the catch data to be of reasonable quality from 2011 onwards (ICES, 2017). The unaccounted removals estimated in the model from 2011 onwards only include North Sea cod that use the Kattegat area as nursery grounds and migrate back to the North Sea for spawning, as well as possible increased natural mortality from seal predation.

The advice is based on an assessment indicative of trends. The current absolute level of fishing mortality is still unknown because the assessment model estimates total removals from the stock. This estimate is a combination of fishing mortality, natural mortality, and migration out from the Kattegat area. It is not possible at present to estimate the relative contribution of these three processes. The level of fishing mortality therefore remains unknown.

Issues relevant for the advice

So far, management measures taken such as area closure, effort restriction, and bycatch quota have not been sufficient to ensure the recovery of the stock.

There is no targeted cod fishery in Kattegat at present, and cod is mainly taken as bycatch in the Norway lobster fishery. This implies that the fishing mortality of the stock is linked to effort directed to the Norway lobster fishery (ICES, 2021). Discards are high.

The fishing effort regulation as part of the cod long-term management plan has not been in place since 2016. The Swedish sorting grid has a bycatch of less than 1.5% of cod in the Norway lobster fishery (Valentinsson and Ulmestrand, 2006) and has been extensively used in previous years. The removal of the effort system, however, reduced the incentives to use sorting grids.

Reference points

No reference points are defined for this stock.

Basis of the assessment

Table 2 Cod in Subdivision 21. Basis of assessment and advice.

ICES stock data category	3 (ICES, 2022a)
Assessment type	Age-based analytical assessment (SAM), considered indicative of trends only (ICES, 2022b)
Input data	Commercial catches (international landings, age distribution from catch sampling), four bottom trawl survey indices (IBTS-Q1 [G1022], IBTS-Q3 [G2829], BITS-Q1 [G2916], and CODS_Q4 [G7026]), and annual maturity data from survey (IBTS-Q1). Natural mortalities fixed at 0.2.
Discards and bycatch	Included in the assessment; data series from the majority of the fleets
Indicators	None
Other information	Benchmarked in 2017 (ICES, 2017)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

History of the advice, catch, and management

Table 3 Cod in Subdivision 21. ICES advice, TAC, and ICES catch estimates. All weights are in tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Landings (ICES estimates)	Catch (ICES estimates)
1987	Reduction in F	< 13 000		15 500	11 491	
1988	Reduction in F	< 15 000		15 000	5 527	
1989	TAC	10 000		12 500	8 590	
1990	TAC	7 000		8 500	5 936	
1991	TAC	6 300		6 650	6 834	

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Landings (ICES estimates)	Catch (ICES estimates)
1992	30% reduction in fishing effort	-		6 650	6 271	
1993	Limit fishing effort to 70% of 1991 effort	-		6 800	7 170	
1994	Reduction in catch from 1991–1992	< 6 800		6 700	7 802	
1995	Precautionary TAC based on recent catches	6 000–7 000		6 700	8 164	
1996	30% reduction in fishing effort from 1994 level	-		7 700	6 126	
1997	Fishing effort should not exceed 70% of the 1994 level	-		8 500	9 460	10 341
1998	Fishing effort should not exceed 70% of the 1994 level	-		7 500	6 835	7 499
1999	$F = 0.6$	4 500		6 300	6 608	7 372
2000	At least 40% reduction in F	6 400		7 000	4 897	5 550
2001	$F = F_{pa} = 0.6$	4 700		6 200	3 960	4 617
2002	No fishery	0		2 800	2 470	3 290
2003	No fishery	0		2 300	2 045	2 661
2004	No fishery	0		1 363	1 403	2 488
2005	No fishery	0		1 000	1 070	1 694
2006	No fishery	0		850	876	1 738
2007	No fishery	0		731	645	1 269
2008	No catch	0		673	449	605
2009	No catch	0		505	197	264
2010	No catch	0		379	155	325
2011	No directed fisheries; minimize bycatches	0		190	145	356
2012	No directed fisheries; minimize bycatch and discards	0		133	94	251
2013	No directed fisheries; minimize bycatch and discards	0		100	92	447
2014	Same advice as for 2013	0		100	108	456
2015	Same advice as in 2014	0		100	103	584
2016	Precautionary approach (increase recent landings by no more than 20%)	≤ 130	≤ 536	370	299	521

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Landings (ICES estimates)	Catch (ICES estimates)
2017	Precautionary approach (increase recent catch advice by no more than 20%)	≤ 129	≤ 643	525	294	552
2018	Precautionary approach (increase recent catch advice by no more than 20%)	≤ 254	≤ 772	630	212	284
2019	Precautionary approach		≤ 494	567	83	123
2020	Precautionary approach		0	130	36	97
2021	Precautionary approach		0	123	24	50
2022	Precautionary approach		0	97		
2023	Precautionary approach		0			

History of the catch and landings

Table 4 Cod in Subdivision 21. Catch distribution by fleet in 2021 as estimated by ICES.

Catch	Landings*		Discards
50 tonnes	Active gears 91%	Passive gears 9%	26 tonnes
	24 tonnes		

*Landings since 2018 include landings below minimum conservation reference size (BMS) <1 tonnes

Table 5 Cod in Subdivision 21. History of commercial catch and landings; the official landings for each country participating in the fishery and ICES catch and discard estimates are presented. All weights are in tonnes (t).

Year	Denmark	Sweden	Germany*	Total landings	Discard	Catch
1971	11 748	3 962	22	15 732		
1972	13 451	3 957	34	17 442		
1973	14 913	3 850	74	18 837		
1974	17 043	4 717	120	21 880		
1975	11 749	3 642	94	15 485		
1976	12 986	3 242	47	16 275		
1977	16 668	3 400	51	20 119		
1978	10 293	2 893	204	13 390		
1979	11 045	3 763	22	14 830		
1980	9 265	4 206	38	13 509		
1981	10 693	4 380	284	15 337		
1982	9 320	3 087	58	12 465		
1983	9 149	3 625	54	12 828		
1984	7 590	4 091	205	11 886		
1985	9 052	3 640	14	12 706		
1986	6 930	2 054	112	9 096		
1987	9 396	2 006	89	11 491		
1988	4 054	1 359	114	5 527		
1989	7 056	1 483	51	8 590		
1990	4 715	1 186	35	5 936		
1991	4 664	2 006	104	6 834		

Year	Denmark	Sweden	Germany*	Total landings	Discard	Catch
1992	3 406	2 771	94	6 271		
1993	4 464	2 549	157	7 170		
1994	3 968	2 836	98	7 802**		
1995	3 789	2 704	71	8 164***		
1996	4 028	2 334	64	6 126^		
1997	6 099	3 303	58	9 460^^	881	10 341
1998	4 207	2 509	38	6 835	664	7 499
1999	4 029	2 540	39	6 608	764	7 372
2000	3 285	1 568	45	4 897	653	5 550
2001	2 752	1 191	16	3 960	657	4 617
2002	1 726	744	3	2 470	820	3 290
2003	1 441	603	1	2 045	616	2 661
2004	827	575	1	1 403	1 086	2 489
2005	608	336	10	1 070^^^	624	1 694
2006	540	315	21	876	862	1 738
2007	390	247	7	645	624	1 269
2008	296	152	1	449	156	605
2009	134	62	0.30	197	67	264
2010	117	38	0.30	155	170	325
2011	102	42	1.40	145	211	356
2012	63	31	< 0.1	94	157	251
2013	60	32	0.50	92	355	447
2014	75	32	< 0.1	108	348	456
2015	65	38	< 0.1	103	481	584
2016	185	114	0	299	222	521
2017	208	85	0.10	294	258	552
2018	175	37	0.70	212	72	284
2019	66	17	1	83	40	123
2020	26	11	0.10	36	61	97
2021	19	4	0.80	24	26	50

* Landings statistics incompletely split on the Kattegat and Skagerrak.

** Including 900 t reported in Skagerrak.

*** Including 1600 t misreported by area.

^ Excluding 300 t taken in subdivisions 22–24.

^^ Including 1700 t reported in Subdivision 23.

^^^ Including 116 t reported as pollack.

+ Includes landings below minimum conservation reference size (BMS).

Summary of the assessment

Table 6 Cod in Subdivision 21. Assessment summary. High and low refer to 95% confidence limits. Recruitment, spawning-stock biomass (SSB), and mortality are relative to the average of the time-series.

Year	Relative recruitment			Relative SSB			Landings	Discards	Relative mortality (Z-0.2)		
	Age 1	High	Low	Relative SSB	High	Low			Ages 3-5 *	High*	Low*
							tonnes				
1997	2.5	4.3	1.49	2.9	3.4	2.5	9 461	881	0.96	1.18	0.78
1998	2.2	3.7	1.27	2.2	2.5	1.97	6 835	664	1.06	1.28	0.88
1999	2.00	3.3	1.19	2.1	2.4	1.87	6 608	764	1.10	1.32	0.92
2000	1.15	1.93	0.69	1.61	1.79	1.45	4 897	653	1.18	1.41	0.99
2001	1.03	1.69	0.63	1.39	1.56	1.24	3 960	657	1.25	1.50	1.05
2002	1.83	2.9	1.13	1.33	1.52	1.17	2 470	820	1.04	1.27	0.86
2003	0.44	0.72	0.27	1.21	1.36	1.07	2 045	616	0.95	1.17	0.77
2004	2.6	4.2	1.61	1.09	1.25	0.96	1 402	1 086	0.93	1.13	0.76
2005	1.30	2.1	0.81	1.35	1.52	1.20	1 070	624	0.98	1.19	0.80
2006	1.45	2.3	0.89	1.43	1.63	1.25	876	862	0.95	1.16	0.78
2007	0.43	0.73	0.25	0.99	1.10	0.89	645	624	1.11	1.35	0.91
2008	0.23	0.35	0.146	0.60	0.67	0.53	449	156	1.33	1.59	1.10
2009	0.61	0.92	0.41	0.21	0.24	0.184	197	67	1.31	1.56	1.09
2010	0.54	0.83	0.36	0.160	0.182	0.141	155	170	1.09	1.39	0.86
2011	0.52	0.81	0.33	0.22	0.26	0.185	145	211	0.69	0.92	0.51
2012	1.40	2.3	0.86	0.28	0.35	0.22	94	157	0.52	0.72	0.38
2013	1.74	2.8	1.07	0.55	0.68	0.45	92	355	0.39	0.55	0.28
2014	0.82	1.25	0.54	0.94	1.17	0.76	108	348	0.36	0.51	0.25
2015	0.62	0.93	0.41	1.85	2.4	1.44	103	481	0.50	0.69	0.36
2016	0.21	0.36	0.119	1.64	2.2	1.21	299	222	0.77	1.00	0.59
2017	1.00	1.52	0.66	0.81	0.95	0.70	294	258	0.78	1.03	0.59
2018	0.087	0.136	0.056	0.57	0.70	0.47	212	72	1.38	1.63	1.16
2019	0.26	0.40	0.164	0.180	0.20	0.162	83	40	1.47	1.74	1.25
2020	0.54	0.85	0.34	0.093	0.103	0.084	36	61	1.33	1.62	1.10
2021	0.22	0.37	0.134	0.119	0.137	0.103	24	26	1.57	2.1	1.16
2022	0.30	1.12	0.078	0.102	0.195	0.054					

* Includes unaccounted removals (including migration and additional natural mortality).

Sources and references

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Recommended citation: ICES. 2022. Cod (*Gadus morhua*) in Subdivision 21 (Kattegat). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, cod.27.21. <https://doi.org/10.17895/ices.advice.19447865>.