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 2021.

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 Subdivision 21. Summary of the stock assessment. Catches (weights in thousand tonnes). Recruitment, mortality, and SSB are relative to the average of the time-series; 95% confidence intervals are shown in the plots.

Stock and exploitation status

Table 1 Cod in Subdivision 21. 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}	?	?	? Undefined
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable
Qualitative evaluation	-	→	↗	→	Stable total mortality	-	↘	✗	✗ Below possible reference points

Catch scenarios

The SSB has declined since 2015, reaching a historically low level in 2020. ICES is not able to identify any catch level that is likely to rebuild the stock; thus, the advice is zero catch for 2021.

History of the advice, catch, and management

Table 2 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	< 13000		15500	11491	
1988	Reduction in F	< 15000		15000	5527	
1989	TAC	10000		12500	8590	
1990	TAC	7000		8500	5936	
1991	TAC	6300		6650	6834	
1992	30% reduction in fishing effort	-		6650	6271	
1993	Limit fishing effort to 70% of 1991 effort	-		6800	7170	
1994	Reduction in catch from 1991–1992	< 6800		6700	7802	
1995	Precautionary TAC based on recent catches	6000–7000		6700	8164	
1996	30% reduction in fishing effort from 1994 level	-		7700	6126	
1997	Fishing effort should not exceed 70% of the 1994 level	-		8500	9460	10341
1998	Fishing effort should not exceed 70% of the 1994 level	-		7500	6835	7499
1999	F = 0.6	4500		6300	6608	7372
2000	At least 40% reduction in F	6400		7000	4897	5550
2001	$F = F_{pa} = 0.6$	4700		6200	3960	4617
2002	No fishery	0		2800	2470	3290
2003	No fishery	0		2300	2045	2661
2004	No fishery	0		1363	1403	2488
2005	No fishery	0		1000	1070	1964
2006	No fishery	0		850	876	1738
2007	No fishery	0		731	645	1269
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
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		
2021	Precautionary approach		0			

Summary of the assessment

Table 3 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 spawning-stock biomass			Landings	Discards	Relative mortality (Z − 0.2)		
	age 1	High	Low	Relative SSB	High	Low	tonnes		ages 3–5 *	High*	Low*
1997	2.7	3.9	1.92	3.2	3.9	2.6	9461	881	1.04	1.23	0.88
1998	2.1	3.1	1.47	2.4	2.8	1.98	6835	664	1.15	1.33	0.99
1999	1.98	2.8	1.39	2.2	2.6	1.93	6608	764	1.18	1.37	1.02
2000	1.13	1.62	0.79	1.70	1.98	1.46	4897	653	1.28	1.47	1.11
2001	1.04	1.49	0.73	1.47	1.70	1.26	3960	657	1.35	1.55	1.17
2002	1.83	2.6	1.28	1.46	1.69	1.25	2470	820	1.14	1.33	0.98
2003	0.46	0.68	0.31	1.23	1.41	1.07	2045	616	1.02	1.20	0.87
2004	2.6	3.7	1.77	1.05	1.23	0.90	1402	1086	1.01	1.18	0.86
2005	1.22	1.79	0.83	1.22	1.41	1.04	1070	624	1.05	1.23	0.89
2006	1.13	1.71	0.74	1.20	1.42	1.01	876	862	1.05	1.22	0.90
2007	0.30	0.48	0.192	0.81	0.94	0.69	645	624	1.22	1.42	1.05
2008	0.186	0.28	0.123	0.49	0.57	0.42	449	156	1.44	1.67	1.25
2009	0.58	0.87	0.38	0.182	0.21	0.156	197	67	1.34	1.55	1.16
2010	0.49	0.73	0.33	0.154	0.181	0.132	155	170	1.00	1.24	0.81
2011	0.61	0.93	0.40	0.21	0.25	0.175	145	211	0.67	0.85	0.53
2012	1.34	1.99	0.91	0.30	0.37	0.24	94	157	0.54	0.70	0.41
2013	1.76	2.7	1.16	0.53	0.64	0.43	92	355	0.42	0.55	0.32
2014	0.59	0.88	0.40	0.72	0.85	0.61	108	348	0.40	0.51	0.31
2015	0.42	0.62	0.29	1.18	1.43	0.97	103	481	0.55	0.67	0.44
2016	0.149	0.23	0.098	1.00	1.22	0.82	299	222	0.82	1.01	0.66
2017	0.59	0.90	0.38	0.60	0.71	0.51	294	258	0.81	1.01	0.66
2018	0.112	0.173	0.072	0.42	0.50	0.35	212	72	1.20	1.46	0.99
2019	0.184	0.36	0.093	0.20	0.27	0.152	83	40	1.18	1.68	0.82
2020	0.49	2.0	0.120	0.129	0.23	0.072					

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

Sources and references

ICES. 2020. Baltic Fisheries Assessment Working Group (WGBFAS). ICES Scientific Reports, 2:45. 632 pp. http://doi.org/10.17895/ices.pub.6024.

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Annex 1

ICES Advice on fishing opportunities, catch, and effort
Greater North Sea Ecoregion
Published 28 June 2019
Version 2: 26 July 2019

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 2020.

Stock development over time

The assessment is indicative of trends only. Spawning-stock biomass (SSB) has decreased since 2015 and it is at the historically low level in 2019. The mortality F has increased since 2015. Recruitment (R) in the last six years has been below average, and the last two year classes are the lowest level observed.

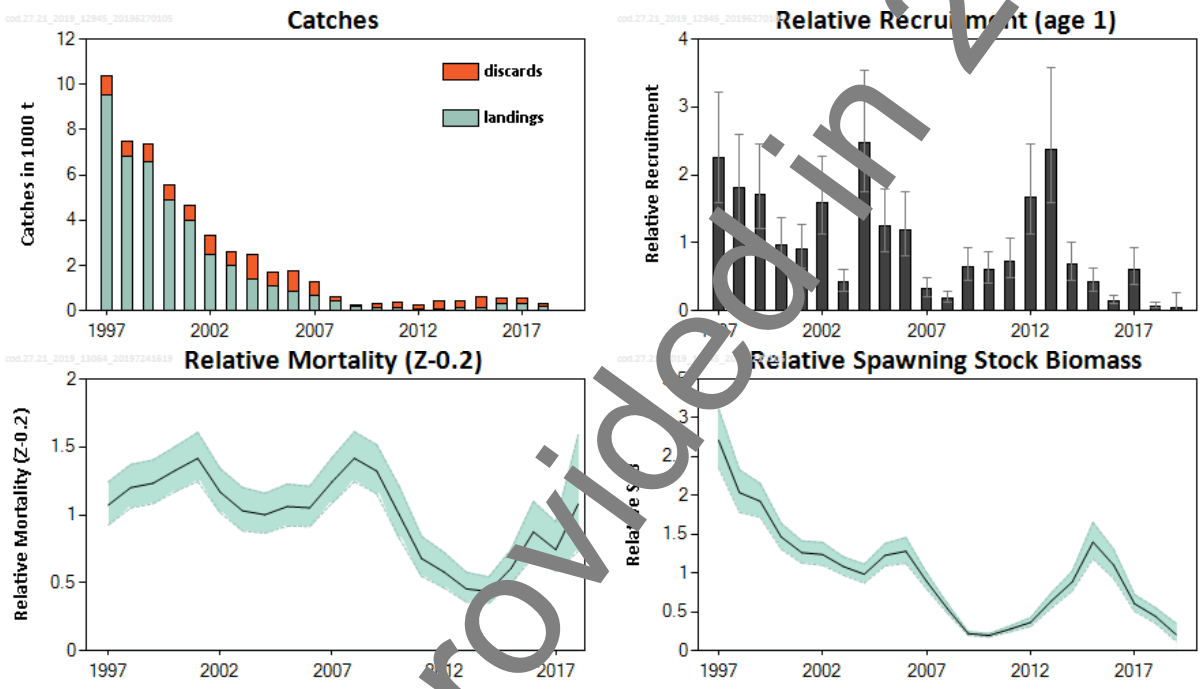

Figure 1* Cod in Subdivision 21. Summary of the stock assessment. Catches (weights in thousand tonnes). Recruitment, mortality, and SSB are relative to the average of the time-series and 95% confidence intervals are shown in the plot.

Stock and exploitation status

ICES cannot assess the stock and exploitation status relative to maximum sustainable yield (MSY) and precautionary approach (PA) reference points, because the reference points are undefined.

Table 1 Cod in Subdivision 21. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2016	2017	2018		2017	2018	2019	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{trigger}$	?	?	? Undefined
Precautionary approach	F_{pa},F_{lim}	?	?	?	Undefined	B_{pa},B_{lim}	?	?	? Undefined
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable
Qualitative evaluation	-	↗	↘	↗	Increasing total mortality	-	↘	↘	✗ Below possible reference points

* Version 2: Relative Mortality plot updated (the year 2019 was removed from the plot)

Please note that Table 1 refers to fishing pressure, but the evaluation is for total mortality.

Catch scenarios

Since the SSB is estimated to be at a historically low level in 2019 and the last two year classes are the lowest observed, SSB is likely to decline further in 2020. ICES is not able to identify any catch level that is likely to rebuild the stock, thus the advice is zero catch for 2020.

While the previous advice was based on the ICES framework for category 3 stocks, the present advice is based on the precautionary approach.

Basis of the advice

Table 2 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

Reported landings and the discard estimates in recent years, based on observer trips, did not represent the total removals from the stock. Unreported catches have historically been a concern for this stock, and 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 now estimated in the model include North Sea cod, which use the area as nursery 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 assesment model is estimating 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 processes. The level of fishing mortality, therefore, remains unknown.

Issues relevant for the advice

Management measures taken so far 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 on the stock is linked to effort directed to the Norway lobster fishery.

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 this gear. There are also gears available that successfully reduce cod bycatches from flatfish catches; however, these gears are not in use at present.

Reference points

No reference points are defined for this stock.

Basis of the assessment

Table 3 Cod in Subdivision 21. Basis of assessment and advice.

ICES stock data category	3 (ICES, 2018).
Assessment type	Age-based analytical assessment (SAM), considered indicative of trends only (ICES, 2019).
Input data	Commercial catches (international landings, age distribution from catch sampling), four bottom trawl survey indices (IBTS-Q1, IBTS-Q3, BITS-Q1, and CODS_Q4), 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 (covering 97% of the landings).
Indicators	None.
Other information	Benchmarked in 2017 (ICES, 2017).
Working group	Baltic Fisheries Assessment Working Group (WGBFAS).

Information from stakeholders

There is no additional available information for this stock.

History of the advice, catch, and management

Table 4 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	< 13000		15500	11491	
1988	Reduction in F	< 15000		15000	5527	
1989	TAC	10000		12500	8590	
1990	TAC	7000		8500	5936	
1991	TAC	6300		6650	6834	
1992	30% reduction in fishing effort	-		6650	6271	
1993	Limit fishing effort to 70% of 1991 effort	-		6800	7170	
1994	Reduction in catch from 1991–1992	< 6300–6800		6700	7802	
1995	Precautionary TAC based on recent catches	6000–7000		6700	8164	
1996	30% reduction in fishing effort from 1994 level	-		7700	6126	
1997	Fishing effort should not exceed 70% of the 1994 level	-		8500	9460	10341
1998	Fishing effort should not exceed 70% of the 1994 level	-		7500	6835	7499
1999	F = 0.6	4500		6300	6608	7372
2000	At least 40% reduction in F	6400		7000	4897	5550
2001	$F = F_{pa} = 0.6$	4700		6200	3960	4617
2002	No fishery	0		2800	2470	3290
2003	No fishery	0		2300	2045	2661
2004	No fishery	0		1363	1403	2488
2005	No fishery	0		1000	1070	1964
2006	No fishery	0		850	876	1738
2007	No fishery	0		731	645	1269
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

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Landings (ICES estimates)	Catch (ICES estimates)
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 last year	0		100	103	584
2016	Precautionary approach (increase recent landings by no more than 20%)	≤ 130	≤ 536	370	299	521
2017	Precautionary approach (increase recent catch advice by no more than 20%)	≤ 129	≤ 643	525	291	552
2018	Precautionary approach (increase recent catch advice by no more than 20%)	≤ 254	≤ 772	630	212	284
2019	Precautionary approach		≤ 494	567		
2020	Precautionary approach		0			

History of the catch and landings

Table 5 Cod in Subdivision 21. Catch distribution by fleet in 2018 as estimated by ICES.

Catch (2018)	Landings		Discard
284 tonnes	Active gears 87%	Passive gears 13%	72 tonnes
	212 tonnes		

Table 6 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	11748	3962	22	15732		
1972	13451	3957	34	17442		
1973	14913	3850	74	18837		
1974	17043	4717	120	21880		
1975	11749	3642	94	15485		
1976	12986	3242	47	16275		
1977	16668	3400	51	20119		
1978	10293	2893	204	13390		
1979	11045	3763	22	14830		
1980	9265	4206	38	13509		
1981	10693	4380	284	15337		
1982	9320	3087	58	12465		
1983	9149	3625	54	12828		
1984	7590	4091	205	11886		
1985	9052	3640	14	12706		
1986	6930	2054	112	9096		
1987	9396	2006	89	11491		
1988	4054	1359	114	5527		
1989	7056	1483	51	8590		
1990	4715	1186	35	5936		
1991	4664	2006	104	6834		
1992	3406	2771	94	6271		
1993	4464	2549	157	7170		
1994	3968	2836	1	7802 **		
1995	3789	2704	71	8164 ***		
1996	4028	2334	6	6126 ^		
1997	6099	3303	8	9460 ^^	881	10341
1998	4207	2509	38	6835	664	7499
1999	4029	2540	39	6608	764	7372
2000	3285	1568	45	4897	653	5550
2001	2752	1191	16	3960	657	4617
2002	1726	714	3	2470	820	3290
2003	1441	603	1	2045	616	2661
2004	827	575	1	1403	1086	2489
2005	608	452	10	1070 ^^^	624	1694
2006	540	315	21	876	862	1738
2007	390	247	7	645	624	1269
2008	296	152	1	449	156	605
2009	134	62	0.3	197	67	264
2010	117	38	0.3	155	170	325
2011	102	42	1.4	145	211	356
2012	63	31	0.0	94	157	251
2013	60	32	0.0	92	355	447
2014	75	32	0.0	108	348	456
2015	65	38	0.0	106	481	587
2016	185	114	0.0	299	222	521
2017	208	85	0.0	294	258	552
2018	175	37	0.0	212	72	284

*Landings statistics incompletely split on the Kattegat and Skagerrak.
**Including 900 t reported in Skagerrak.
***Including [illegible] misreported by area.
^Excluding [illegible]00 t taken in subdivisions 22–24.
^^Including 1700 t reported in Subdivision 23.
^^^Including 116 t reported as pollack.
#The catch reported to the EU exceeds the catch reported to the Working Group (shown in the table) by 40%.

Summary of the assessment

Table 7 Cod in Subdivision 21. Assessment summary. High and low refers to 95% confidence limits. R, SSB, and mort. lit. are relative to the average of the time-series.

Year	Relative recruitment (age 1)	Relative recruitment High	Relative recruitment Low	Relative SSB†	Relative SSB High†	Relative SSB Low†	Landings (tonnes)	Discards (tonnes)	Relative mortality (Z-0.2; ages 3–5) *, †	Relative mortality High*, †	Relative mortality Low*, †
1997	2.3	3.2	1.58	2.7	3.1	2.4	9500	880	1.07	1.24	0.93
1998	1.81	2.6	1.26	2.0	2.3	1.78	6800	660	1.20	1.37	1.05
1999	1.72	2.5	1.20	1.93	2.2	1.72	6600	760	1.23	1.40	1.08
2000	0.96	1.36	0.67	1.47	1.64	1.31	4900	650	1.33	1.50	1.17
2001	0.90	1.27	0.63	1.26	1.41	1.1	4000	660	1.42	1.61	1.25
2002	1.60	2.3	1.13	1.24	1.40	1.10	2500	820	1.17	1.34	1.02
2003	0.42	0.61	0.29	1.08	1.21	0.97	2000	620	1.03	1.20	0.88
2004	2.5	3.5	1.74	0.99	1.12	0.87	1400	1090	1.00	1.16	0.87
2005	1.24	1.79	0.86	1.23	38	1.09	1070	620	1.06	1.23	0.92
2006	1.19	1.76	0.81	1.28	1.46	1.13	880	860	1.05	1.21	0.91
2007	0.31	0.48	0.21	0.89	1.00	0.80	650	620	1.24	1.42	1.09
2008	0.190	0.28	0.129	0.54	0.61	0.49	450	156	1.42	1.61	1.25
2009	0.64	0.93	0.44	0.22	0.25	0.197	197	67	1.32	1.52	1.16
2010	0.60	0.87	0.41	0.197	0.22	0.174	155	170	1.00	1.21	0.83
2011	0.72	1.07	0.49	0.2	0.32	0.24	145	210	0.68	0.84	0.55
2012	1.66	2.4	1.13	0.37	0.43	0.31	94	157	0.58	0.73	0.46
2013	2.4	3.6	1.58	0.64	0.75	0.55	92	360	0.46	0.58	0.36
2014	0.68	1.01	0.4	0.89	1.02	0.77	108	350	0.44	0.54	0.35
2015	0.43	0.62	0.29	1.40	1.65	1.18	103	480	0.61	0.75	0.49
2016	0.145	0.22	0.094	1.10	1.30	0.93	300	220	0.87	1.10	0.70
2017	0.60	0.93	0.38	0.61	0.72	0.51	290	260	0.74	0.95	0.58
2018	0.065	0.123	0.034	0.44	0.56	0.35	212	72	1.08	1.59	0.73
2019	0.034	0.27	0.0040	0.21	0.35	0.122					

* Includes unaccounted removals.

† Version 2: numbers updated.

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