

6.3.3 Cod (*Gadus morhua*) in Division IIIa East (Kattegat)

ICES stock advice

ICES advises that when the precautionary approach is applied, catches in 2016 should be no more than 536 tonnes. If this stock is not under the EU landing obligation in 2016 and discard rates do not change from 2014, this implies landings of no more than 130 tonnes.

Stock development over time

The assessment is indicative of trends only and shows that spawning-stock biomass (SSB) has strongly increased since 2009 from a historical low. The mortality has shown a decreasing trend since 2008. The 2012 year class was among the highest in the recent time-series.

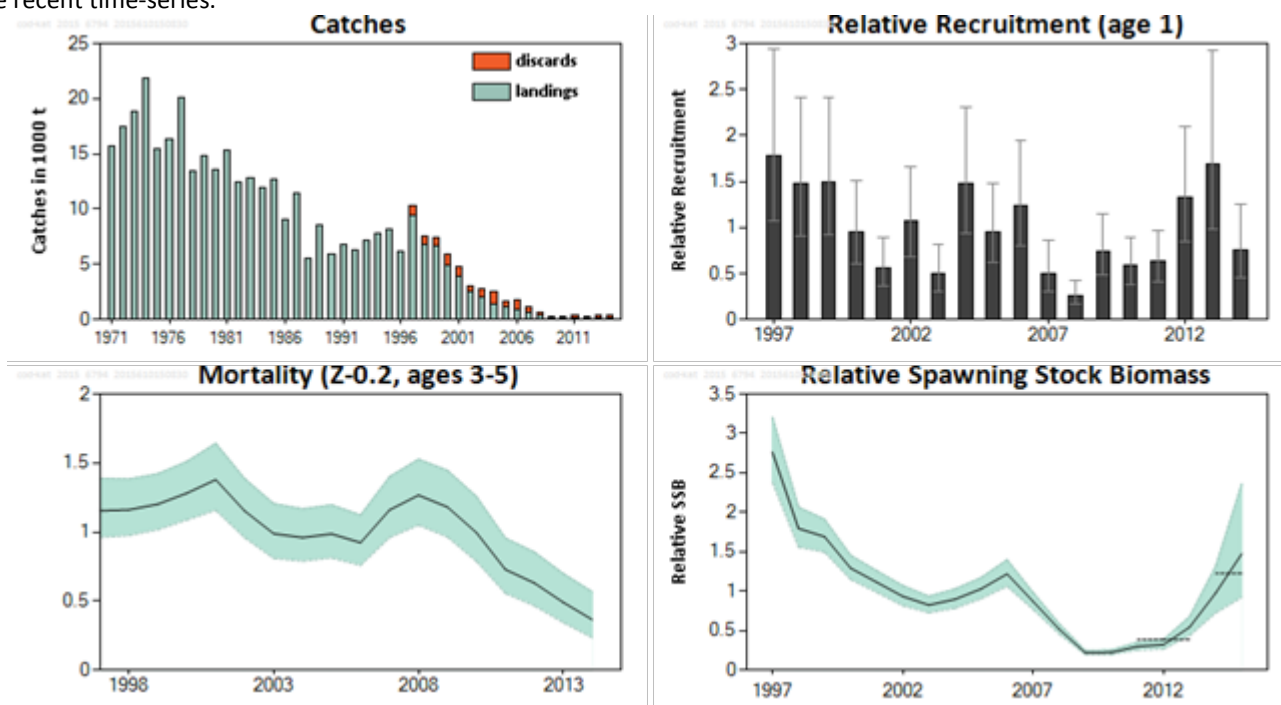


Figure 6.3.3.1 Cod in Division IIIa East. Summary of stock assessment (weights in thousand tonnes). Recruitment, mortality, and SSB are relative in relation to the average of the time-series. Bottom right panel: relative SSB, regarded as an indicator of the recent development of the stock. The dashed lines in the relative SSB plot indicate the average values of the respective years.

Stock and exploitation status

Table 6.3.3.1 Cod in Division IIIa East. State of the stock and fishery, relative to reference points.

		Fishing pressure			Stock size					
		2012	2013	2014	2013	2014	2015			
Maximum Sustainable Yield	F_{MSY}	?	?	?	Undefined	MSY	?	?	?	Undefined
Precautionary approach	F_{pa} F_{lim}	?	?	?	Undefined	B_{pa} , B_{lim}	?	?	?	Unknown
Management plan	F_{MGT}	?	?	?	Unknown	SSB_{MGT}	?	?	?	Unknown
Qualitative evaluation	-	↘	↘	↘	Decreasing	-	↗	↗	↗	Increasing from historical low

Catch options

The ICES framework for category 3 stocks was applied (ICES, 2012a). The SSB trends from the assessment are used as the index of stock development. The advice is based on a comparison of the two latest index values (index A) with the three preceding values (index B), multiplied by the recent landings.

The index is estimated to have increased by more than 20% and thus the uncertainty cap was applied in estimating the catch advice. The stock status relative to candidate reference points is unknown. Considering that the SSB increase is more than 50%, no additional precautionary buffer was applied. Discarding is known to be increasing and the discard ratio has been estimated based on 2014 data.

Table 6.3.3.2 Cod in Division IIIa East. The basis for the catch options. For stocks in ICES data categories 3–6, one catch option is provided.

Index A (2014, 2015)		1.23
Index B (2011, 2012, 2013)		0.39
Index ratio (A/B)		3.16
Uncertainty cap	Applied	1.2
Recent landings (2014)		108 t
Discard rate (2014)		0.76
Precautionary buffer	Not applied	-
Landings corresponding to the catch advice		130 t
Catch advice*		536 t

*(recent landings × cap)/(1 – discard rate).

Basis of the advice

Table 6.3.3.3 Cod in Division IIIa East. The basis of the advice.

Advice basis	Precautionary approach.
Management plan	A multi-annual plan has been agreed by the EU in 2008 (EU, 2008). ICES evaluated this plan in 2009 and concluded it was in accordance with the precautionary approach if implemented and enforced adequately; however, this evaluation is not expected to be realistic in a situation of high unaccounted removals as estimated by the present assessment model. Therefore, the management plan is not used as basis for the advice.

Quality of the assessment

In recent years, reported landings and the discard estimates based on observer trips do not represent total removals from the stock. At present, the relative proportion of unallocated removals due to fishing and biology-driven factors (e.g. migration) cannot be quantified. This year's advice is based on an assessment indicative of trends and including for the first time a new survey targeting cod. This new survey improved the quality of the assessment. The current level of mortality is still unknown due to a pronounced difference between the catch data (landings plus discards estimated from observer data) and the total removals from the stock estimated within the model based on survey data.

Issues relevant for the advice

The assessment results indicate that the SSB of the stock has increased since 2012 and that the total mortality of the stock has declined substantially since 2008. However, the increase in SSB should be considered in the historical light of a much higher SSB during the seventies (ICES, 2012b).

The EU cod management plan (EU, 2008) is based on setting TACs complemented with an effort regime. Given the lack of a short-term forecast for this stock, application of the plan would correspond to a 15% decrease in the TAC and a 15% reduction in the maximum allowable fishing effort for the relevant effort groups (Articles 9 and 12 of the management plan).

ICES is not using the management plan as basis for the advice because it is unknown whether the plan is applicable in the current situation of high unaccounted removals.

There is not a directed cod fishery in Kattegat. Cod is mainly taken as bycatch in the *Nephrops* fishery. The rate of discarding has increased in recent years; consequently, the final-year (2014) landings and discards estimates have been used to determine catch advice. Catches of juvenile cod should be reduced to the minimum possible to promote stock recovery. The stock is still considered to be in a poor state.

Reference points

Table 6.3.3.4 Cod in Division IIIa East. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	Not defined		
	F_{MSY}	Not defined		
Precautionary approach	B_{lim}	6400 t	Lowest observed SSB before the late 1990s.	ICES (2009)
	B_{pa}	10500 t	$B_{lim} \times \exp(1.645 \times 0.3)$.	ICES (2009)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	$SSB_{MS-lower}$	6400 t		EU (2008)
	$SSB_{MS-upper}$	10500 t		EU (2008)
	F_{MGT}	0.4		EU (2008)

Basis of the assessment

Table 6.3.3.5 Cod in Division IIIa East. The basis of the assessment.

ICES stock data category	3.2.0 (ICES, 2015a).
Assessment type	Age-based analytical assessment (stochastic state–space model SAM), considered indicative of trends only (ICES, 2015b).
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); five bottom trawl survey indices (IBTS-Q1; IBTS-Q3; Havfisker-Q1; Havfisker-Q4: cod survey 2008–2014); 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 87% of the landings).
Indicators	None.
Other information	Last benchmarked in 2009 (ICES, 2009) and is planned to be benchmarked in 2017.
Working group	Baltic Fisheries Assessment Working Group (WGBFAS).

Information from stakeholders

Discard estimates from observer schemes as applied in the current assessment are considered to be conservative by the fishing industry.

History of advice, catch, and management

Table 6.3.3.6 Cod in Division IIIa East. History of ICES advice, the agreed TAC, and ICES estimates of landings. Weights in thousand tonnes.

Year	ICES advice / 2005 onwards: Single-stock exploitation boundaries	Predicted landings corresp. to advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES catch estimates
estimates 1987	Reduction in F	< 13.0		15.5	11.5	
1988	Reduction in F	< 15.0		15	5.5	
1989	TAC	10		12.5	8.6	
1990	TAC	7		8.5	5.9	
1991	TAC	6.3		6.65	6.8	
1992	30% reduction in fishing effort	-		6.65	6.3	
1993	Limit fishing effort to 70% of 1991 effort	-		6.8	7.2	
1994	Reduction in catch from 1991– 1992	< 6.3–6.8		6.7	7.8	
1995	Precautionary TAC based on recent catches	6–7		6.7	8.2	
1996	30% Reduction in fishing effort from 1994 level	-		7.7	6.1	
1997	Fishing effort should not exceed 70% of the 1994 level	-		8.5	9.5	10.341
1998	Fishing effort should not exceed 70% of the 1994 level	-		7.5	6.8	7.499
1999	F = 0.6	4.5		6.3	6.6	7.372
2000	At least 40% reduction in F	6.4		7	4.9	5.889
2001	$F = F_{pa} = 0.6$	4.7		6.2	3.9	4.783
2002	No fishery	0		2.8	2.3	3.047
2003	No fishery	0		2.3	2	2.795
2004	No fishery	0		1.363	1.4	2.466
2005	No fishery	0		1	1.1	1.645
2006	No fishery	0		0.85	0.9	1.725
2007	No fishery	0		0.731	0.6	1.222
2008	No catch	0		0.673	0.45	0.614
2009	No catch	0		0.505	0.197	0.274
2010	No catch	0		0.379	0.155	0.322
2011	No directed fisheries, minimize bycatches	0		0.190	0.145	0.361
2012	No directed fisheries, minimize bycatch and discards	0		0.133	0.094	0.236
2013	No directed fisheries, minimize bycatch and discards	0		0.1	0.092	0.443
2014	Same advice as for 2013.	0		0.1	0.108	0.447
2015	Same advice as last year	0		0.1		
2016	Precautionary approach (increase recent landings by no more than 20%)	≤ 0.130	≤ 0.536			

History of catch and landings

Table 6.3.3.8 Cod in Division IIIa East. Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Landings		Discards
447 t	78 % trawlers	22 % passive gears	339 t
	108 t		

Table 6.3.3.9 Cod in Division IIIa East. History of commercial landings, both official and ICES estimated values are presented by country. Weights in tonnes.

Year	Denmark	Sweden	Germany*	Total landings	Discards
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	98	7802**	
1995	3789	2704	71	8164***	
1996	4028	2334	64	6126^	
1997	6099	3303	58	9460^^	881
1998	4207	2509	38	6835	664
1999	4029	2540	39	6608	764
2000	3285	1568	45	4897	992
2001	2752	1191	16	3960	823
2002	1726	744	3	2470	577
2003	1441	603#	1	2045	750
2004	827	575	1	1403	1063
2005	608	336	10	1070^^^	575
2006	540	315	21	876	849
2007	390	247	7	645	577
2008	296	152	1	449	165
2009	134	62	0.3	197	77
2010	117	38	0.3	155	167
2011	102	42	1.4	145	216
2012	63	31	0.0	94	142
2013	60	32	0.0	92	351
2014	75	32	0.0	108	339

* 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.

The catch reported to the EU exceeds the catch reported to the WG (shown in the table) by 40%.

Summary of the assessment

Table 6.3.3.9 Cod in Division IIIa East. Assessment summary (weights in tonnes).

Year	Relative Recruitment (Age 1)	Relative High	Relative Low	Relative SSB	Relative High	Relative Low	Landings	Discards	Relative Mean F (Ages 3–5)	Relative High	Relative Low
1997	1.78	2.946	1.076	2.763	3.207	2.38	9460	881	1.154	1.39	0.96
1998	1.475	2.408	0.903	1.794	2.066	1.559	6835	664	1.161	1.384	0.974
1999	1.488	2.419	0.916	1.69	1.912	1.494	6608	764	1.201	1.422	1.016
2000	0.955	1.502	0.607	1.292	1.455	1.147	4897	992	1.281	1.511	1.086
2001	0.566	0.894	0.359	1.113	1.26	0.984	3960	823	1.379	1.643	1.157
2002	1.069	1.662	0.687	0.934	1.071	0.815	2470	577	1.153	1.387	0.958
2003	0.498	0.816	0.303	0.824	0.936	0.725	2045	750	0.988	1.206	0.809
2004	1.473	2.308	0.94	0.897	1.028	0.782	1403	1063	0.96	1.168	0.789
2005	0.957	1.479	0.619	1.029	1.171	0.903	1100	575	0.986	1.197	0.812
2006	1.244	1.937	0.799	1.218	1.399	1.061	900	849	0.923	1.123	0.758
2007	0.504	0.855	0.297	0.869	0.984	0.768	600	577	1.16	1.401	0.96
2008	0.262	0.421	0.163	0.518	0.587	0.457	450	165	1.267	1.528	1.049
2009	0.746	1.14	0.489	0.219	0.249	0.193	197	77	1.181	1.447	0.963
2010	0.582	0.886	0.382	0.223	0.257	0.195	155	167	0.995	1.257	0.787
2011	0.627	0.966	0.408	0.299	0.353	0.254	145	216	0.728	0.956	0.555
2012	1.326	2.095	0.84	0.322	0.388	0.267	94	142	0.631	0.855	0.465
2013	1.689	2.927	0.974	0.544	0.68	0.435	92	351	0.489	0.698	0.343
2014	0.759	1.25	0.46	0.977	1.317	0.724	108	339	0.365	0.567	0.234
2015				1.474	2.36	0.92					

Sources and references

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