

6.3.4 Cod (*Gadus morhua*) in Subarea IV and Divisions VIIId and IIIa West (North Sea, Eastern English Channel, Skagerrak)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2016 should be no more than 49 259 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 40 419 tonnes.

Stock development over time

Fishing mortality (F) declined from 2000 but is estimated to be above F_{MSY} . Spawning-stock biomass (SSB) has increased from the historical low in 2006 to a level above B_{lim} and remains below MSY $B_{trigger}$. Recruitment since 1998 has been poor.

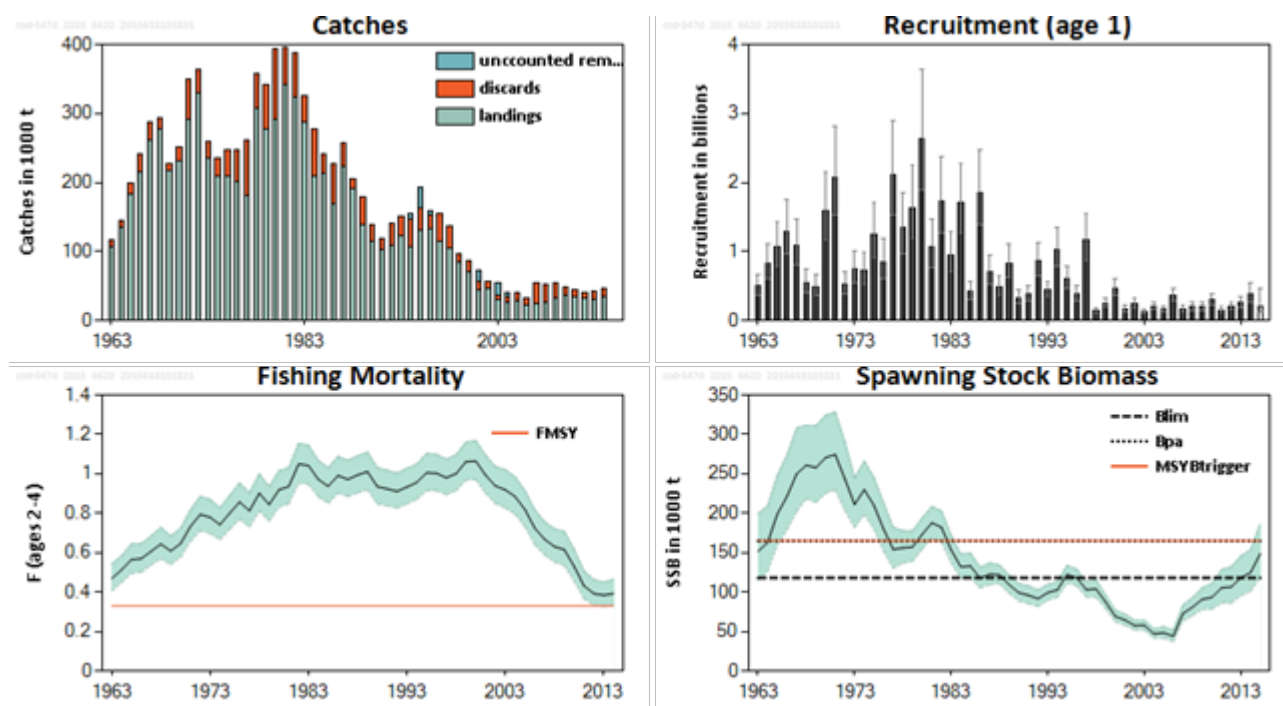


Figure 6.3.4.1 Cod in Subarea IV and Divisions VIIId and IIIa West. Summary of stock assessment with point-wise 95% confidence intervals. Catch is estimated and adjusted for unaccounted removals (from 1993 to 2005). Predicted values are not shaded.

Stock and exploitation status

Table 6.3.4.1 Cod in Subarea IV and Divisions VIIId and IIIa West. 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}	✗	✗	✗ Above	MSY	✗	✗ Below trigger
Precautionary approach	F_{pa} , F_{lim}	?	?	? Undefined	$B_{trigger}$	✗	✗
Management plan	F_{MGT}	✓	✓	✓ At F_{MS} -upper	B_{pa} , B_{lim}	○	○ Increased risk
					SSB_{MGT}	✗	✗ Below SSB_{MS} -upper

Catch options

The ICES MSY approach sets $F = F_{MSY} = 0.33$ when SSB at the beginning of the TAC year (i.e. year 2016) is at or above MSY $B_{trigger}$, with a linear decrease in F to zero when this SSB is between MSY $B_{trigger}$ and zero.

The long-term phase of the EU–Norway management strategy applies a sliding rule, where F is set to 0.2 when SSB at the beginning of the intermediate year (i.e. year 2015) is below 70 000t (ICES previous value of B_{lim}), and to 0.4 when this SSB is above 150 000t (ICES previous value of B_{pa}), with a linear increase from 0.2 to 0.4 for values of SSB between 70 000t and 150 000t. Annual TAC changes are restricted to no more than 20%.

ICES has updated its estimates of B_{lim} and B_{pa} ; if EU–Norway wish to be consistent with the new reference levels, a revision of the EU–Norway management strategy should be considered.

Table 6.3.4.2 Cod in Subarea IV and Divisions VIIId and IIIa West. The basis for the catch options.

Variable	Value	Source	Notes
F ages 2–4 (2015)	0.4	ICES (2015a)	= F ages 2–4 (2014), assuming effort similar to 2014
SSB (2016)	163565 t	ICES (2015a)	
R_{age1} (2015)	204 million	ICES (2015a)	Recruitment resampled from 1998–2014
R_{age1} (2016)	204 million	ICES (2015a)	R_{age1} (2015)
Catch (2015)	54121 t	ICES (2015a)	Assuming a <i>status quo</i> F
Landings (2015)	42394 t	ICES (2015a)	Assuming 2014 landings fraction by age
Discards (2015)	11727 t	ICES (2015a)	Assuming 2014 discard fraction by age

Table 6.3.4.3 Cod in Subarea IV and Divisions VIIId and IIIa West. The catch options. All weights in tonnes.

Rationale	Total catch (2016)	Wanted catch* (2016)	Unwanted catch* (2016)	Basis	F _{total} (2016)	F _{wanted} (2016)	F _{unwanted} (2016)	SSB (2017)	%SSB Change**	% TAC Change wanted catch***
MSY approach	49259	40419	8840	$F_{MSY} \times \frac{SSB_{2016}}{B_{trigger}}$	0.33	0.23	0.10	187263	14	15
EU–Norway MS with previous reference points	51165	42073	9092	Long-term phase	0.34	0.24	0.10	184261	13	20
EU–Norway MS with new reference points	49778	40848	8930	Long-term phase	0.33	0.23	0.10	186640	14	17
Zero catch	0	0	0	F = 0	0.00	0.00	0.00	244123	49	-100
Other options	49648	40741	8907	F _{MSY}	0.33	0.23	0.10	186796	14	16
	34093	28049	6044	TAC ₂₀₁₅ – 20%	0.22	0.15	0.07	203741	25	-20
	36226	29802	6424	TAC ₂₀₁₅ – 15%	0.23	0.16	0.07	201332	23	-15
	38358	31555	6803	TAC ₂₀₁₅ – 10%	0.25	0.18	0.07	198785	22	-10
	40492	33308	7184	TAC ₂₀₁₅ – 5%	0.26	0.19	0.07	196308	20	-5
	42625	35061	7564	Constant TAC	0.28	0.20	0.08	193984	19	0
	44761	36814	7947	TAC ₂₀₁₅ + 5%	0.29	0.21	0.08	191717	17	5
	46896	38567	8329	TAC ₂₀₁₅ + 10%	0.31	0.22	0.09	189192	16	10
	49030	40320	8710	TAC ₂₀₁₅ + 15%	0.33	0.23	0.10	186562	14	15
	51165	42073	9092	TAC ₂₀₁₅ + 20%	0.34	0.24	0.10	184261	13	20
	58006	47608	10398	F ₂₀₁₅	0.40	0.28	0.12	177257	8	36
<i>Mixed-fisheries options – minor differences in the calculation above can occur because of the different methodology used (ICES, 2015b).</i>										
Maximum	101154			A	0.87			114022	-30	
Minimum	29047			B	0.19			192961	18	
Cod	47128			C	0.33			172550	5	
SQ effort	54726			D	0.39			164079	0	
Value	63388			E	0.47			154506	-6	
Effort_Mgt	46069			F	0.32			173736	6	

*“Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on discard rates estimates for 2014.

**SSB 2017 relative to SSB 2016.

***Wanted catch in 2016 relative to TACs 2015 (North Sea 29 189 + Skagerrak 4171 + Eastern English Channel 1701 = 35 061 t).

Mixed-fisheries assumptions

(note: “fleet’s stock share” is used to describe the share of the fishing opportunities for each particular fleet, which has been calculated based on the single-stock advice for 2016 and the historical proportion of the stock landings taken by the fleet):

- A. Maximum scenario: Each fleet stops fishing when its last stock share is exhausted.
- B. Minimum scenario: Each fleet stops fishing when its first stock share is exhausted.
- C. Cod scenario: Each fleet stops fishing when its cod stock share is exhausted.
- D. SQ effort scenario: The effort of each fleet in 2015 and 2016 is as in 2014.
- E. Value scenario: The effort of each fleet is equal to the weighted average of the efforts required to catch the fleet’s quota share of each of the stocks, where the weights are the relative catch values of each stock in the fleet’s portfolio.
- F. Effort management scenario: Effort reductions according to cod and flatfish management plans.

Basis of the advice

Table 6.3.4.4 Cod in Subarea IV and Divisions VIIId and IIIa West. The basis of the advice.

Advice basis	MSY approach
Management plan	<p>The EU–Norway management strategy was updated in December 2008. The EU has adopted a long-term plan with the same aims (EU management plan; EU, 2008). ICES evaluated the management strategy in 2009 and concluded that it is in accordance with the precautionary approach if implemented and enforced adequately. The management strategy was considered by ICES to switch from the recovery phase to the long-term phase in 2013.</p> <p>Changes to the stock assessment and reference points in 2015 imply a need to re-evaluate the management strategy to ascertain if it can still be considered precautionary under the new stock perception. Until such an evaluation can be conducted, the ICES advice is based on the MSY approach.</p>

Quality of the assessment

The overall reporting of catch data provided to ICES has improved during 2012–2014 through such aspects as the fully documented fisheries (FDF) programme and increased coverage by the Scottish industry/science observer sampling scheme.

Unaccounted removals are no longer estimated for 2006 onwards.

The assessment was updated during a benchmark in 2015, resulting in changes to the input data structure (catch revisions, maturity, natural mortality, survey indices, and model settings (ICES, 2015a, 2015c). The biggest impact of changes to the assessment has been the introduction of an annually varying maturity ogive, resulting in an increase of SSB compared to previous assessments (Figure 6.3.4.2). The settings of the new model have been changed to allow a change in the exploitation pattern of the oldest ages; this also contributes to the change in the stock perception.

Because of the data and model changes, reference points have had to be re-estimated. The rationale for B_{lim} has been changed to reflect the SSB that led to the last reasonably-sized year class (1996), which ensures that the reproductive potential of the stock is maintained. B_{pa} has been calculated as $1.4 \times B_{lim}$.

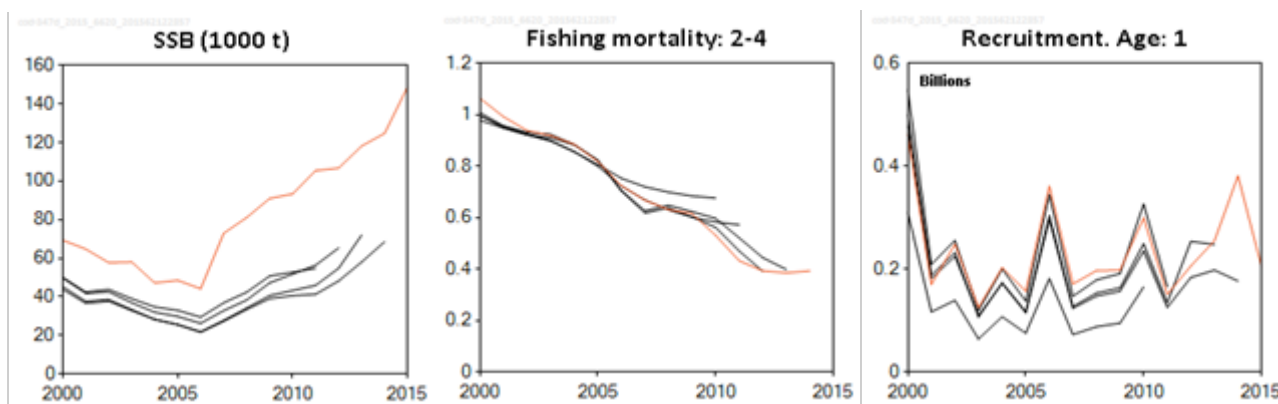


Figure 6.3.4.2 Cod in Subarea IV and Divisions VIIId and IIIa West. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

ICES evaluated the EU–Norway management strategy for North Sea cod in 2009 and concluded that it is in accordance with the precautionary approach if implemented and enforced adequately. Since then, the basis of the ICES advice has been the EU–Norway management strategy. However, the recent changes to the stock assessment and reference points imply a need to re-evaluate the management strategy in order to ascertain if it can still be considered precautionary under the new stock perception. Until such an evaluation can be conducted, the ICES advice is based on the MSY approach.

The EU–Norway management strategy is based on B_{lim} and B_{pa} as part of the sliding rule. With the ICES revision of these reference points an update of the strategy consistent with these reference points could be considered.

The EU cod management plan (EU, 2008) has the same aims as the EU–Norway management strategy and additionally complements the TAC with an effort regime. Following Article 12 of the plan, the maximum allowable effort for the relevant effort groups would be adjusted by the same percentage as the fishing mortality. The adjustment in F according to the EU cod management plan catch option from 2015 to 2016 is a 15% reduction.

Since the implementation of the management plan, fishing mortality rates have been reduced and the stock has increased since 2006, in spite of continued low recruitment. Furthermore, there has been an increase in the number of older fish in the population in recent years due to decreased F (Figure 6.3.4.3). Recent recruitments have been low, possibly influenced by changes in the availability of food resources for cod larvae and increasing predation pressure. Multispecies model runs estimate an increase in cannibalism rates with increasing stock levels, and also high predation from grey gurnard. Seal predation on ages 2 and 3 has increased slightly over the years due to an increase in seal abundance. Harbour porpoises also take a substantial amount of cod up to age 2 (ICES, 2015a).

Cod is widely distributed throughout the North Sea, but there are indications of subpopulations inhabiting different regions of the North Sea (e.g. from genetic studies). The inferred limited degree of mixing suggests slow recolonization in areas where subpopulations are depleted.

The change in spatial distribution of cod in combination with the relative stability criteria used to allocate the quota and other economic considerations has changed the availability of the resource to different fisheries, and leads to a mismatch between available quotas and fishing opportunities. This mismatch would make compliance with the forthcoming landings obligation more difficult.

Mixed-fisheries considerations are of primary importance for the sustainable exploitation of North Sea species, including cod. Current single-species management causes discarding in mixed fisheries. As such, a TAC of cod may be exhausted before the TAC of other species. Results from a North Sea mixed-fisheries analysis are presented in ICES (2015d). Assuming fishing patterns and catchability in 2015 and 2016 are unchanged from those in 2014, and in the case of a strictly implemented discard ban, North Sea whiting and *Nephrops* FU6 (if it was managed with an own TAC for the FU) would be the most limiting stocks, constraining 46% and 34% of the 2014 effort respectively. Results for the cod stock are also included as additional rows in the catch options table of this advice sheet.

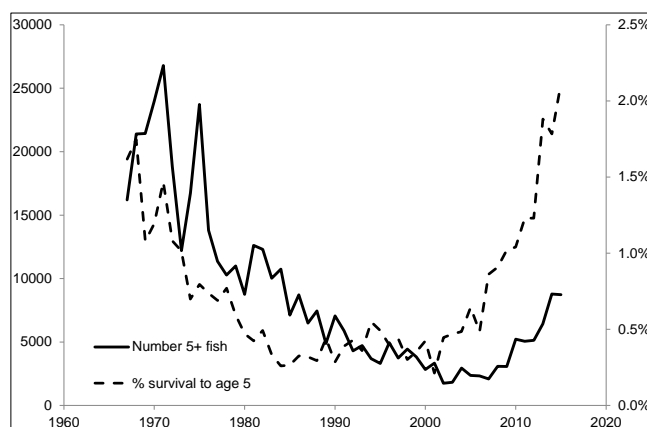


Figure 6.3.4.3 Cod in Subarea IV and Divisions VIIId and IIIa West. Estimates of the number of 5-year-old and older cod in the population (solid line; thousands) and the percentage of 1-year-olds by number that have survived to age 5 in the given year (dashed line).

Reference points

Table 6.3.4.5 Cod in Subarea IV and Divisions VIIId and IIIa West. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	165000 t	B_{pa}	
	F_{MSY}	0.33	EQSim analysis based on recruitment period 1988–2014	ICES (2015a)
Precautionary approach	B_{lim}	118000 t	SSB associated with the last above-average recruitment (1996 year class)	ICES (2015a)
	B_{pa}	165000 t	B_{lim} multiplied by 1.4	
	F_{lim}		Not defined	
	F_{pa}		Not defined	
EU–Norway management strategy	$SSB_{MS-lower}$	70000 t	Former B_{lim}	EU–Norway management strategy
	$SSB_{MS-upper}$	150000 t	Former B_{pa}	
	$F_{MS-lower}$	0.2	Fishing mortality when $SSB < SSB_{MS-lower}$	
	$F_{MS-upper}$	0.4	Fishing mortality when $SSB > SSB_{MS-upper}$	

Basis of the assessment

Table 6.3.4.6 Cod in Subarea IV and Divisions VIIId and IIIa West. The basis of the assessment.

ICES stock data category	1 (ICES, 2015e).
Assessment type	Age-based analytical assessment (SAM; ICES, 2015a) that uses catches in the model and in the forecast. Estimates of unaccounted removals are used for 1993–2005 (Nielsen and Berg, 2014).
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling by métier), two survey indices (IBTS Q1, IBTS Q3) derived by Delta-GAM approach assuming a stationary spatial model with ship effect. Smoothed annually varying maturity data from IBTS Q1 (1978–2013). Annually varying natural mortalities from multispecies model (1974–2013). Norwegian coastal cod data have been removed from all catch data used in the assessment.
Discards and bycatch	Discards included, data series from the main fleets (in 2014 covering 69% of the landings by weight in Subarea IV, 75% in Division IIIa–Skagerrak, and 83% in Division VIIId).
Indicators	NS-IBTS biomass indices by subregion.
Other information	Benchmarked in 2015 [ICES (2015c) and Annex 9 of ICES (2015a)].
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), Working Group on Mixed Fisheries Advice (WGMIXFISH-NS).

Information from stakeholders

Comparison between the stock trends as recorded by the fishers’ North Sea stock survey (Napier, 2014; Figure 6.3.4.4) and the IBTS survey data has shown, as in previous years, that the time-series are broadly in agreement in recording a stable overall stock abundance during 2001–2005, followed by a more recent strong increase. The latest fishers’ survey reports continued strong increases in stock abundance in all areas apart from the south, in which an increase occurred until 2011 followed by a levelling off and in some areas a slight decline.

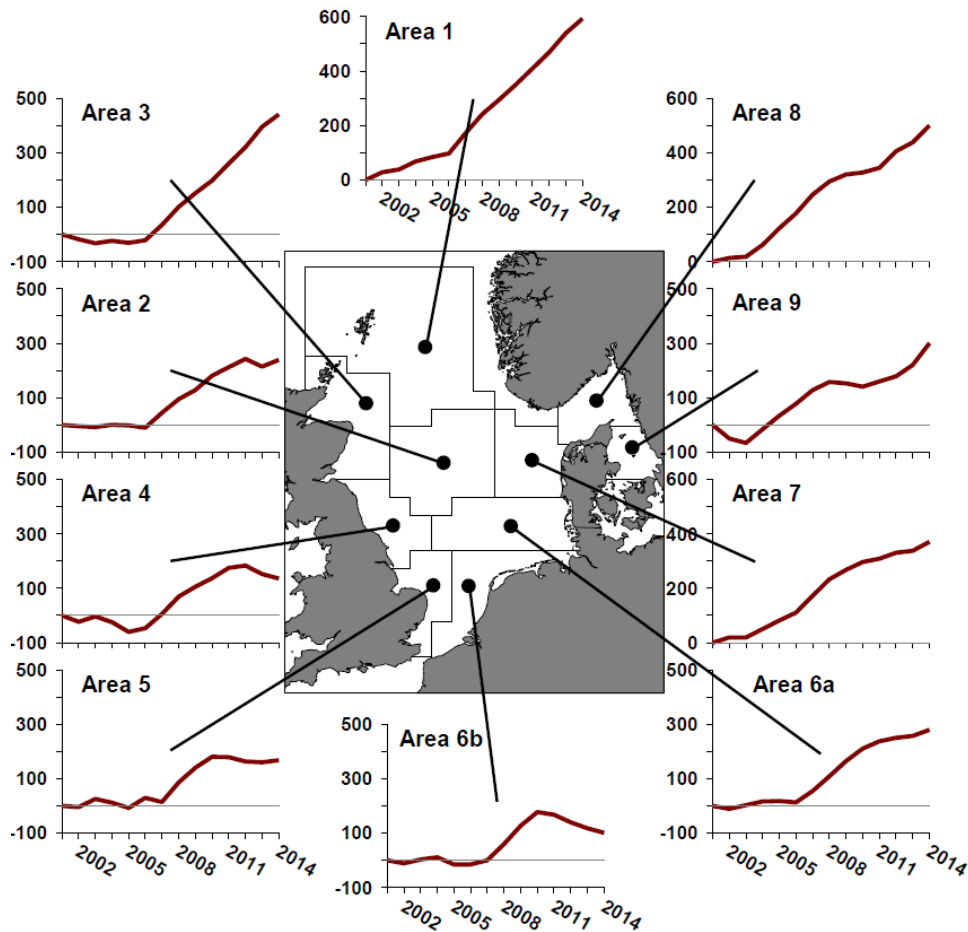


Table 6.3.4.4 Cumulative time-series of index of perceptions of abundance of cod, by area (see page 14 of Napier (2014) for an explanation of the index).

History of advice, catch, and management

Table 6.3.4.7 Cod in Subarea IV and Divisions VIIId and IIIa West. History of ICES advice, the agreed TAC, and ICES estimates of landings. All weights are in thousand tonnes.

North Sea (Subarea IV)

Year	ICES advice	Predicted landings corresponding to advice	Predicted catch corresponding to advice	Agreed TAC	Official landings*	ICES landings**	ICES discards
1987	SSB recovery; TAC	100–125		175	167	182	
1988	70% of F(86); TAC	148		160	142	157	
1989	Halt SSB decline; protect juveniles; TAC	124		124	110	116	
1990	80% of F (88); TAC	113		105	99	105	
1991	70% of effort (89)			100	87	89	
1992	70% of effort (89)			100	98	97	
1993	70% of effort (89)			101	94	105	
1994	Significant effort reduction			102	87	95	
1995	Significant effort reduction			120	111	120	
1996	80% of F(94) = 0.7	141		130	107	107	
1997	80% of F(95) = 0.65	135		115	102	102	
1998	F(98) should not exceed F(96)	153		140	122	122	
1999	F = 0.60 to rebuild SSB	125		132	78	78	
2000	F less than 0.55	< 79		81	60.9	59	
2001	lowest possible catch	0		48.6	41.7	41	
2002	lowest possible catch	0		49.3	44.4	42.2	7.2
2003	Closure	0		27.3	25.9	24.1	2.6
2004	Zero catch	0		27.3	23.8	22.5	5.0
2005	Zero catch	0		27.3	22.5	22.9	5.2
2006	Zero catch	0		23.2	23.1	21.1	5.2
2007	Zero catch	0		20.0	20.8	19.1	22.4
2008	Exploitation boundaries in relation to precautionary limits. Total removals < 22 000 t	< 22		22.2	22.3	21.7	20.7
2009	Zero catch	0		28.8	27.4	27.6	13.5
2010	Management plan F (65% of F ₂₀₀₈)	< 40.3 ***		33.6	31.7	31.0	10.1
2011	See scenarios	-		26.8	27.8	26.7	6.1
2012	Management plan F (45% of F ₂₀₀₈)	< 31.8		26.5	27.6	26.6	6.5
2013	Management plan (TAC –20%)	< 25.441		26.5	26.3	25.3	8.4
2014	Management plan long-term phase	< 28.809		27.8	29.4	28.5	7.9
2015	Management plan long-term phase	< 26.713		29.2			
2016	MSY approach		≤ 49.259				

* Official landings for Norway include Norwegian fjords.

** Norwegian fjords not included from 2002 onwards.

*** From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIIId (Eastern Channel) and IIIa West (Skagerrak).

Skagerrak (Division IIIa West)

Year	ICES advice	Predicted landings corresponding to advice	Predicted catch corresponding to advice	Agreed TAC*	Official landings	ICES landings*	ICES discards
1987	F = F _{max}	< 21		22.5	19.9	20.9	
1988	Reduce F			21.5	17.0	16.9	
1989	F at F _{med}	< 23		20.5	18.7	19.6	
1990	F at F _{med} ; TAC	21.0		21.0	17.8	18.6	
1991	TAC	15.0		15.0	12.1	12.4	
1992	70% of F(90)			15.0	14.0	14.8	
1993	Precautionary TAC			15.0	14.7	15.3	
1994	No long-term gain in increased F + precautionary TAC			15.5	15.1	13.9	
1995	If required precautionary TAC; link to North Sea			20.0	19.8	12.1	
1996	If required precautionary TAC; link to North Sea			23.0	17.9	16.4	
1997	If required precautionary TAC; link to North Sea			16.1	15.7	14.9	
1998	If required precautionary TAC; link to North Sea	21.9		20.0	15.6	15.3	
1999	F = 0.60 to rebuild SSB	17.9		19.0	11.8	11.0	
2000	F less than 0.55	< 11.3		11.6	9.9	9.3	
2001	lowest possible catch	0		7.0	7.7	7.1	
2002	lowest possible catch	0		7.1	7.1	6.9	4.2
2003	Closure	0		3.9	4.5	4.0	1.2
2004	Zero catch	0		3.9	4.5	3.9	3.6
2005	Zero catch	0		3.9	4.3	4.0	4.6
2006	Zero catch	0		3.3	3.9	3.3	6.4
2007	Zero catch	0		2.9	3.7	3.0	5.9
2008	Exploitation boundaries in relation to precautionary limits. Total removals less than 22 000 t	< 22		3.2	3.8	3.4	2.7
2009	Zero catch	0		4.1	4.0	3.8	2.9
2010	Management plan F (65% of F ₂₀₀₈)	< 40.3**		4.8	4.2	4.1	2.0
2011	See scenarios	-		3.8	4.1	4.0	2.1
2012	Management plan F (45% of F ₂₀₀₈)	< 31.8		3.8	4.4	4.3	2.1
2013	Management plan (TAC -20%)	< 25.441		3.8	4.2	4.2	1.8
2014	Management plan long-term phase	< 28.809		4.0	4.7	4.7	2.2
2015	Management plan long-term phase	< 26.713		4.2			
2016	MSY approach		≤ 49.259				

* Norwegian fjords not included.

** From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIId (Eastern Channel) and IIIa West (Skagerrak).

Eastern Channel (Division VIId)

Year	ICES Advice	Predicted landings corresponding to advice	Predicted catch corresponding to advice	Agreed TAC*	Official landings	ICES landings	ICES discards
1987	Not assessed	-	-	-	9.4	14.2	
1988	Precautionary TAC	-	-	-	10.1	10.7	
1989	No increase in F; TAC	10.0**	-	-	n/a	5.5	
1990	No increase in F; TAC	9.0**	-	-	n/a	2.8	
1991	Precautionary TAC	3.0**	-	-	n/a	1.9	
1992	If required, precautionary TAC	5.5**	-	-	2.7	2.7	
1993	If TAC required, consider SSB decline	-	-	-	2.5	2.4	
1994	Reduce F + precautionary TAC	-	-	-	2.9	2.9	
1995	Significant effort reduction; link to North Sea	-	-	-	4.0	4.0	
1996	Reference made to North Sea advice	-	-	-	3.5	3.5	
1997	No advice	-	-	-	7.2	7.0	
1998	Link to North Sea	4.9	-	-	8.7	8.6	
1999	F = 0.60 to rebuild SSB	4.0	-	-	n/a	6.9	
2000	F less than 0.55	< 2.5	-	-	3.6	2.3	
2001	lowest possible catch	0	-	-	2.0	1.6	
2002	lowest possible catch	0	-	-	1.6	3.1	0.5
2003	Closure	0	-	-	1.9	2.1	0.2
2004	Zero catch	0	-	-	1.0	1.0	0.2
2005	Zero catch	0	-	-	1.2	1.3	0.3
2006	Zero catch	0	-	-	1.5	1.5	0.4
2007	Zero catch	0	-	-	2.1	2.1	2.1
2008	Exploitation boundaries in relation to precautionary limits. Total removals less than 22 000 t	< 22	-	-	1.7	1.6	1.7
2009	Zero catch	0	-	1.7	2.0	1.9	4.5
2010	Management plan F (65% of F ₂₀₀₈)	< 40.3***	-	2.0	1.8	1.7	0.3
2011	See scenarios	-	-	1.6	1.3	1.3	0.6
2012	Management plan F (45% of F ₂₀₀₈)	< 31.8	-	1.5	1.1	1.1	0.1
2013	Management plan (TAC -20%)	< 25.441	-	1.5	0.9	0.9	0.1
2014	Management plan long-term phase	< 28.809	-	1.6	1.5	1.4	0.6
2015	Management plan long-term phase	< 26.713	-	1.7			
2016	MSY approach		≤ 49.259				

* Until 2008 this area was included in the TAC for Subarea VII (except Division VIIa). From 2009 a separate TAC is set.

** Including Division VIIe.

*** From 2010 onwards, the advice is for Subarea IV (North Sea) and Divisions VIId (Eastern Channel) and IIIa West (Skagerrak).

History of catch and landings**Table 6.3.4.8** Cod in Subarea IV and Divisions VIId and IIIa West. Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Landings					Discards
	66% demersal trawls and seines >100 mm	13% gillnets	9% demersal trawls 70–99 mm	5% beam trawls	7% other gears	
45410 t	34670 t					10740 t

Table 6.3.4.9 Cod in Subarea IV and Divisions VIIId and IIIa West. History of commercial catch and landings, both official and ICES estimated values are presented by area for each country participating in the fishery.

Subarea IV										
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	4827	3458	4642	5799	3882	3304	2470	2616	1482	1627
Denmark	24067	23573	21870	23002	19697	14000	8358	9022	4676	5889
Faroe Islands	219	44	40	102	96	-	9	34	36	37
France	3040	1934	3451	2934	.	1222	717	1777	620	294
Germany	9457	8344	5179	8045	3386	1740	1810	2018	2048	2213
Greenland	.	.	.	.	.	.	.	.	.	.
Netherlands	11199	9271	11807	14676	9068	5995	3574	4707	2305	1726
Norway	7111	5869	5814	5823	7432	6410	4369	5217	4417	3223
Poland	-	18	31	25	19	18	18	39	35	-
Sweden	709	617	832	540	625	640	661	463	252	240
UK (E/W/Nl)	14991	15930	13413	17745	10344	6543	4087	3112	2213	1890
UK (Scotland)	35848	35349	32344	35633	23017	21009	15640	15416	7852	6650
Others	0	0	0	0	0	0	0	0	0	0
Danish industrial bycatch *	.	.	.	.	.	.	.	105	22	17
Norwegian coast *	2479	1916	2166	1802	2058	2128	1596	1419	1053	738
Total nominal catch	111468	104407	99423	114324	77566	60881	41713	44526	25958	23806
Unallocated landings	8555	2161	2746	7779	826	-1114	-740	-226	-111	-1277
WG estimate of total landings	120023	106568	102169	122103	78392	59767	40973	44300	25847	22529
Agreed TAC	120000	130000	115000	140000	132400	81000	48600	49300	27300	27300
Division VIIId										
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	377	321	310	239	172	110	93	51	54	47
Denmark	-	-	-	-	-	-	-	-	-	-
France	3261	2808	6387	7788	.	3084	1677	1361	1730	810
Netherlands	-	-	-	19	3	4	17	6	36	14
UK (E/W/Nl)	336	414	478	618	454	385	249	145	121	103
UK (Scotland)	< 0.5	4	3	1	-	-	-	-	-	-
Total nominal catch	3974	3547	7178	8665	629	3583	2036	1563	1941	974
Unallocated landings	-10	-44	-135	-85	6229	-1258	-463	1534	-707	40
WG estimate of total landings	3964	3503	7043	8580	6858	2325	1573	3097	1234	1014
Division IIIa (Skagerrak)**										
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Denmark	15888	14573	12159	12339	8681	7684	5900	5525	3067	3038
Germany	285	259	81	54	54	54	32	83	49	99
Norway	1039	1046	1323	1293	1146	926	762	645	825	856
Sweden	2483	1986	2173	1900	1909	1293	1035	897	510	495
Others	134	-	-	-	-	-	-	-	27	24
Danish industrial bycatch *	749	676	205	97	62	99	687	20	5	4
Norwegian coast *	846	748	911	976	788	624	846	.	.	720
Total nominal catch	19829	17864	15736	15586	11790	9957	7729	7170	4483	4516
Unallocated landings	-7720	-1615	-790	-255	-816	-680	-643	298	-692	-602
WG estimate of total landings	12109	16249	14946	15331	10974	9277	7086	7468	3791	3914
Agreed TAC	20000	23000	16100	20000	19000	11600	7000	7100	3900	3900

Table 6.3.4.9 (cont.)

Subarea IV, Divisions VIId and IIIa (Skagerrak) combined										
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total nominal catch	135271	125818	122337	138575	89985	74421	51478	53260	32382	29296
Unallocated landings	825	502	1821	7439	6240	-3052	-1846	1605	-1510	-1839
WG estimate of total landings	136096	126320	124158	146014	96225	71369	49632	54865	30872	27457
Division IV and IIIa (Skagerrak) landings not included in the assessment										
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Norwegian coast *	3325	2664	3077	2778	2846	2752	2442	1419	1053	1458
Danish industrial bycatch *	749	676	205	97	62	99	687	126	27	21
Total	4074	3340	3282	2875	2908	2851	3129	1545	1080	1479
Subarea IV										
Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Belgium	1722	1309	1009	894	946	666	653	862	1076	1252
Denmark	6291	5105	3430	3831	4402	5686	4863	4803	4536	5457
Faroe Islands	34	3	0	16	45	32	0	0	0	.
France	664	354	659	573	950	781	619	368	287	639
Germany	2648	2537	1899	1736	2374	2844	2211	2385	1921	2257
Greenland	35	23	17	17	11	0	0	0	0	.
Netherlands	1660	1585	1523	1896	2649	2657	1928	1955	1344	1379
Norway	2900	2749	3057	4128	4234	4496	4898	4601	4079	4575
Poland	-	0	1	2	3	0	2	0	0	.
Sweden	319	309	387	439	378	363	315	472	332	401
UK (E/W/Nl)	1270	1491	1587	1546	2384	2554	2169	1630	2129	.
UK (Scotland)	4936	6857	6511	7185	9052	11567	10141	10565	10619	.
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13410
Others	0	786	0	0	0	0	0	0	0	0
Danish industrial bycatch	21	11	23	1	72	12	0	0	2	24
Norwegian coast *	717	770	718	720	620	572	1081	813	645	620
Norwegian industrial bycatch *	.	48	101	22	4	201	1	.	.	.
Total nominal catch	22500	23119	20103	22264	27500	31658	27799	27641	26325	29393
Unallocated landings	356	-2041	-1046	-607	134	-678	-1124	-1014	-1010	-846
WG estimate of total landings	22855	21078	19056	21657	27634	30980	26675	26627	25315	28547
Agreed TAC	27300	23205	19957	22152	28798	33552	26842	26475	26475	27799
Division VIId										
Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Belgium	51	80	84	154	73	57	56	40	53	71
Denmark	-	-	.	.	.	.	.	.	.	.
France	986	1124	1743	1326	1779	1606	1078	885	768	1244
Netherlands	9	9	59	30	35	45	51	40	38	50
UK (E/W/Nl)	184	267	174	144	133	127	125	99	100	.
UK (Scotland)	-	1	12	7	3	1	1	0	0	.
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	155
Total nominal catch	1230	1481	2072	1661	2023	1836	1311	1064	959	1521
Unallocated landings	29	-2	75	-32	-136	-128	8	56	-43	-84
WG estimate of total landings	1259	1479	2147	1629	1887	1708	1319	1120	916	1436
Agreed TAC					1678	1955	1564	1543	1543	1620

Table 6.3.4.9 (cont.)

Division IIIa (Skagerrak)**										
Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Denmark	3019	2513	2246	2553	3024	3286	3118	3179	3033	3430
Germany	86	84	67	52	55	56	60	78	69	84
Norway	759	628	681	779	440	375	421	615	575	527
Sweden	488	372	370	365	459	458	518	520	529	568
Others	21	373	385	13	2	26	0	0	33	.
Danish industrial bycatch	2	3	2	7	2	10	0	1	1	5
Norwegian coast *	759	524	494	498	342	369	342	467	378	395
Total nominal catch	4375	3973	3751	3769	3982	4211	4117	4393	4240	4614
Unallocated landings	-376	-715	-731	-376	-188	-154	-161	-66	-86	73
WG estimate of total landings	3998	3258	3020	3393	3794	4057	3956	4327	4154	4687
Agreed TAC	3900	3315	2851	3165	4114	4793	3835	3783	3783	3972
Subarea IV, Divisions VIId and IIIa (Skagerrak) combined										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total nominal catch	28104	28573	25926	27694	33505	37706	33227	33098	31524	35528
Unallocated landings	9	-2759	-1703	-1015	-190	-960	-1277	-1024	-1139	-858
WG estimate of total landings	28113	25815	24223	26679	33315	36746	31950	32074	30386	34670
Division IV and IIIa (Skagerrak) landings not included in the assessment										
Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Norwegian coast *	1476	1294	1212	1218	962	941	1423	1280	1023	1014
Norwegian industrial bycatch *	.	48	101	22	4	201	1	.	.	.
Total	1476	1342	1313	1240	966	1142	1424	1280	1023	1014

* The Danish industrial bycatch (up to 2001) and the Norwegian coast catches are not included in the (WG estimate of) total landings of Division IIIa.

** Skagerrak/Kattegat split derived from national statistics.

. Magnitude not available - Magnitude known to be nil < 0.5 Magnitude less than half the unit used in the table n/a Not applicable

Summary of the assessment

Table 6.3.4.10 Cod in Subarea IV and Divisions VIIId and IIIa West. Assessment summary with weights (in tonnes).

Year	Recruits age 1 (thousands)	Low	High	TSB (tonnes)	Low	High	SSB (tonnes)	Low	High	Fbar 2-4	Low	High	Landings	Discards	Catch	Unaccounted	Total Removals	Low	High
1963	496332	365551	673902	516588	441948	603832	151752	115310	199710	0.469	0.406	0.542	106724	10739	117477		117477	104059	132626
1964	818313	603813	1109012	669978	570126	787318	162918	126766	209379	0.513	0.45	0.584	134996	9679	144640		144640	130890	159834
1965	1058115	782994	1429907	841549	723900	978320	199187	160005	247964	0.565	0.496	0.644	182225	16880	198988		198988	177392	223214
1966	1292385	957652	1744119	1006511	866689	1168889	221461	179143	273774	0.57	0.502	0.646	214486	26030	240386		240386	214942	268842
1967	1093616	809442	1477556	1061295	923590	1219530	249946	202663	308260	0.607	0.538	0.685	260407	26476	286932		286932	256079	321502
1968	553491	409233	748600	886468	789349	995535	260928	218576	311486	0.644	0.57	0.728	276509	17031	293608		293608	266350	323655
1969	489432	360137	665145	741181	655057	838628	257816	213897	310752	0.609	0.541	0.685	216858	9591	226387		226387	208955	245273
1970	1586435	1172279	2146910	1206218	1001032	1453461	270493	225585	324339	0.646	0.577	0.723	232118	19766	251954		251954	221162	287032
1971	2069878	1522615	2813838	1346474	1138315	1592698	274581	229687	328248	0.733	0.658	0.817	292143	57989	350109		350109	300341	408124
1972	517622	380172	704765	929126	822145	1050029	243288	203661	290625	0.794	0.712	0.886	329062	34579	363669		363669	318000	415897
1973	746387	548367	1015915	742665	658006	838215	211082	182134	244630	0.78	0.699	0.87	234685	25109	259886		259886	236266	285868
1974	727959	533706	992915	712119	629674	805358	230038	198733	266275	0.742	0.666	0.828	209400	26291	235861		235861	210429	264368
1975	1242952	902695	1711465	809361	689078	950639	210239	180142	245365	0.801	0.721	0.89	209609	36680	246225		246225	213865	283481
1976	850007	612767	1179098	637940	559920	726832	180052	152235	212951	0.857	0.77	0.954	201793	44534	246225		246225	213170	284405
1977	2101160	1524108	2896692	990535	807033	1215760	154199	130586	182083	0.813	0.731	0.904	181861	79063	260928		260928	213493	318902
1978	1342441	970785	1856382	1131438	942384	1358419	156061	136995	177780	0.902	0.813	1	307737	49316	357182		357182	292668	435917
1979	1638022	1188972	2256668	1041320	886049	1223801	157157	139249	177368	0.844	0.761	0.935	278173	62944	341124		341124	290844	400094
1980	2626073	1896764	3635801	1256700	1041772	1515970	173338	154745	194165	0.919	0.832	1.016	290977	102130	392778		392778	324219	475834
1981	1059174	766661	1463293	1038201	897667	1200737	187775	169208	208379	0.936	0.849	1.031	341465	54394	395933		395933	336992	465183
1982	1732368	1269533	2363939	1134837	949009	1357053	182225	163598	202974	1.05	0.954	1.155	323838	64280	388093		388093	327598	459758
1983	951695	708185	1278937	888242	763320	1033610	153584	137335	171755	1.042	0.948	1.145	288082	37609	325462		325462	276708	382805
1984	1701465	1269229	2280898	906186	760075	1080385	132058	117569	148334	0.972	0.884	1.068	210029	68050	278173		278173	235529	328539
1985	417901	307872	567253	586542	518792	663140	133119	118599	149417	0.937	0.851	1.031	212990	28029	240867		240867	208452	278323
1986	1852414	1384514	2478440	815862	670104	993324	117712	105495	131345	0.991	0.903	1.088	168721	58924	227521		227521	189809	272727
1987	709986	532309	946967	747882	643181	869626	122639	109680	137130	0.972	0.885	1.068	223910	32370	256273		256273	215891	304210
1988	488454	365675	652457	550730	481277	630206	122149	111046	134363	0.994	0.905	1.091	190995	14654	205870		205870	182257	232542
1989	826537	616430	1108258	555709	469930	657145	109535	98794	121444	1.011	0.92	1.11	138829	40296	179154		179154	153846	208625
1990	330050	247801	439600	373622	328791	424566	99310	89025	110782	0.935	0.847	1.031	115151	23133	138275		138275	120657	158466
1991	378511	286027	500899	345933	301725	396618	96182	85586	108090	0.924	0.839	1.018	102642	15886	118539		118539	104988	133840
1992	858550	652378	1129878	538746	449929	645096	91766	82074	102603	0.911	0.827	1.003	108771	31351	140225		140225	117908	166765
1993	438888	336388	572621	418738	368155	476270	99310	89766	109868	0.933	0.848	1.027	129592	28428	158126	-8634	149492	128692	173655
1994	1024792	777936	1349980	534453	451838	632175	102950	93770	113029	0.956	0.871	1.049	106092	41734	147866	6951	154817	133002	180211
1995	601391	459135	787722	570918	492743	661494	122272	111652	133901	1.005	0.916	1.103	130236	31860	162121	30408	192529	164431	225428
1996	379648	290989	495320	428052	377937	484813	118302	108387	129125	1.003	0.915	1.099	132037	21398	153405	4067	157472	139415	177866
1997	1162403	874896	1544391	648229	530195	792541	103053	94128	112825	0.98	0.895	1.074	132458	45253	177730	-23068	154662	129057	185348
1998	143918	109402	189325	332701	292778	378068	104193	93961	115540	1.001	0.915	1.096	146460	43153	189759	-52586	137173	117513	160123
1999	252963	194351	329252	230038	205969	256919	87466	79590	96121	1.061	0.969	1.161	96675	13723	110317	-14327	95990	87642	105133
2000	461852	354704	601367	293021	249746	343795	69355	62516	76943	1.065	0.972	1.168	73092	16289	89454	-3806	85648	73978	99159
2001	170076	130653	221394	201995	178906	228064	64731	58254	71929	0.993	0.902	1.094	44389	11387	55756	17083	72839	64124	82737
2002	248451	191189	322862	171442	150724	195007	57699	51846	64213	0.939	0.85	1.036	53450	11321	64764	-7810	56954	51446	63052
2003	125242	96055	163296	145074	130012	161881	58047	52306	64417	0.919	0.827	1.021	31113	4730	35860	18208	54068	48441	60349

Year	Recruits age 1 (thousands)	Low		High		TSB (tonnes)	Low		High		Fbar 2-4	Low		High		Landings	Discards	Catch	Unaccounted	Total Removals	Low		High	
		Low	High	Low	High		Low	High	Low	High		Low	High											
2004	202805	156364	263040	125744	110173	143515	47193	41792	53292	0.885	0.795	0.985	27270	7489	34771	5044	39815	36183	43812					
2005	156686	119534	205385	141351	123083	162330	48485	41958	56027	0.819	0.733	0.915	29988	11440	41421	-1125	40296	35572	45647					
2006	361132	278808	467764	148896	125485	176673	44179	37577	51941	0.724	0.641	0.817	22652	9167	31825		31825	28188	35931					
2007	170928	132386	220691	198392	174622	225398	72911	63618	83562	0.668	0.59	0.757	24101	29407	53477		53477	46697	61240					
2008	197008	152430	254623	208981	182893	238791	81064	70576	93111	0.631	0.553	0.721	27092	25362	52418		52418	47580	57747					
2009	197600	152802	255531	225258	196979	257596	90944	78295	105636	0.616	0.536	0.707	33290	21716	54995		54995	49636	60933					
2010	299539	230849	388668	241832	208161	280950	93340	78603	110839	0.531	0.457	0.616	36279	12659	48923		48923	44349	53968					
2011	150693	116271	195305	230960	198972	268091	105451	86423	128668	0.432	0.368	0.507	34441	10528	44981		44981	40512	49943					
2012	205870	159006	266545	206695	176859	241564	106724	86281	132011	0.393	0.334	0.463	32728	7665	40376		40376	37279	43731					
2013	254995	192683	337459	263814	224066	310613	118184	95770	145845	0.385	0.329	0.451	30915	10869	41773		41773	38278	45587					
2014	381170	264882	548510	332369	270736	408032	124742	101387	153476	0.393	0.333	0.465	34822	11122	45936		45936	41116	51321					
2015	204338*	125242	461852				148896	118991	186316															

* Provisional.

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