

6.4.2 Cod in Subarea IV (North Sea), Division VIIId (Eastern Channel), and Division IIIa (Skagerrak) (See also update 6.4.2b)

6.4.2a

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Reduced reproductive capacity	At risk of being harvested unsustainably	Overexploited	Above target	

ICES classifies the stock as being at risk of being harvested unsustainably and suffering reduced reproductive capacity. SSB is well below the B_{lim} , and at the lowest value in the time-series. Fishing mortality has shown a slight decline since 2000 and is currently estimated to be below F_{lim} but above F_{pa} . The 1999–2004 year classes are all estimated to have been well below average; the 2005 year class is estimated to be more abundant, but well below average levels.

Management objectives

The main objective is to keep SSB above 70 000 tonnes (B_{lim}), and fishing mortality at 0.4. If the stock is below B_{pa} (150 000 t), there is a recovery plan with the aim to increase the SSB to B_{pa} . The recovery plan is still to be fully implemented. For details see text at the end of the document.

ICES has previously concluded that a recovery plan, in order to be precautionary, must include an adaptive element, implying that fisheries for cod remain closed until an initial recovery of the cod SSB has been proven. Such an element is not included in the existing plan. ICES therefore considers the recovery plan as not consistent with the precautionary approach.

Reference points

	Type	Value	Technical basis
Precautionary approach	B_{lim}	70 000 t	B_{loss} (~1995)
	B_{pa}	150 000 t	B_{pa} = Previous MBAL and signs of impaired recruitment below 150 000 t.
	F_{lim}	0.86	$F_{lim} = F_{loss}$ (~1995)
	F_{pa}	0.65	F_{pa} = Approx. 5 th percentile of F_{loss} , implying an equilibrium biomass > B_{pa} .
Targets	F_v	not defined	

F-reference points

ICES has advised in 2005 on the basis of evaluations of harvest control rules for North Sea cod that target fishing mortalities (covering all catches) below 0.4 (ages 2-4) would result in a low risk of SSB falling below the conservation limit B_{lim} and would achieve high long-term yields.

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

B_{lim} cannot be reached with a 30% increase in SSB. The management plan stipulates that in such cases a TAC should be set allowing B_{lim} to be reached within one year. Simulations indicate that this could be achieved with 50% probability if F were reduced to 86% of the F2006, corresponding to total removals (landings, discards, and unaccounted removals) in 2008 of 76 500 t. ICES is unable to translate this figure into a TAC with the required precision.

Exploitation boundaries in relation to precautionary limits

Given the low stock size and recent poor recruitment, the stock cannot be rebuilt to B_{pa} at the start of 2009 even with a zero catch. However, simulations indicate that with the recent poor recruitment, a zero catch in 2008 and 2009 is likely to achieve the rebuilding of the stock to B_{pa} by 2010.

Conclusions regarding exploitation boundaries

Because the existing recovery plan is not considered to be in accordance with the precautionary approach, ICES continues to advise on exploitation boundaries in relation to precautionary limits and recommends that the fisheries for cod be closed until an initial recovery of the cod SSB has been proven. Any catches taken in 2008 will prolong the recovery to B_{pa} , as would a continuation of the increasing rate of discards.

Short-term implications

Median values only are presented in the catch option table.

Basis: $F_{sq} = F_{04-06}$ scaled to $F_{06} = 0.76$; $F_{07} = 0.65 F_{sq}$; R07–09 = re-sampled from 1997–2005 YC, SSB(2008) = 48.6; Removals (2007) = 62.6.

Rationale	Total Removals (2008)	Basis	F total (2008)	SSB (2009)	%SSB change
Zero catch	0.0	F=0	0.0	134.9	+177%
Plan	52.3	$F_{sq} * 0.528$ (Plan)	0.40	90.3	+86%
Status quo	22.1	$F_{sq} * 0.2$	0.15	116.0	+139%
	41.4	$F_{sq} * 0.4$	0.30	99.6	+105%
	57.9	$F_{sq} * 0.6$	0.45	85.5	+76%
	67.7	$F_{sq} * 0.73$	0.55	77.6	+60%
	72.5	$F_{sq} * 0.8$	0.61	73.9	+52%
	76.5	$F_{sq} * 0.86$ (= F_{07})	0.65	70.6	+45%

Weights in '000 t.

Total removal estimates in 2004–2006: 55% are accounted for by official landings, 13% by discards, and 32% are unaccounted removals.

Management considerations

Although the current SSB and fishing mortality are uncertain, it is clear that the stock has been reduced to a level at which productivity is impaired and the biological dynamics of the stock are difficult to predict.

In the past years, emergency measures have been taken and a recovery plan has been implemented with the aim of reversing the declining trend in SSB and increasing the spawning stock above B_{lim} . Even if these measures may have contributed to some reduction in fishing mortality, they have not led to any increase in the spawning stock biomass.

The reported landings in 2006 were 26 700 t and the estimated discards in 2006 were 8100 t, giving a total of 34 800 t. Surveys indicate that the year classes are depleting faster than one would expect from these catches and point to unaccounted removals. There is no documented information on the source of these unaccounted removals; while it is assumed that these removals originate mostly from fishing activities, changes in natural mortality may also have an influence. Their magnitude is difficult to predict in the future. Plausible fishery-based contributions to these unaccounted removals are discards which do not count against quota, and the mis- and underreporting of catches. The recent recorded landings (2003–2006) have fluctuated between 35% and 65% of the total removals. This indicates that the management system does not control the catches effectively.

Assessment estimates and reports from some fisheries indicate that historically, quota restrictions have not been effective in controlling the catch of cod. Since 1992, TACs were set by managers to substantially reduce F and discarding, and were accompanied by an increasing number of technical measures and effort limitations (since 2003) imposed on the fisheries targeting cod. However, effort restrictions in the smaller mesh size fisheries, which have significant discards, have been less stringent. Recent reports from the 2006 fishery indicate that the current restrictions are beginning to control the level of underreporting, but increased levels of discarding are also being recorded. Discarding rates have increased in 2006 with the entry of the 2005 year class to the fishery, and are expected to increase further in 2007. The year-to-year variability in estimates of unaccounted mortality is considerable. If the management plan was to bring SSB to B_{lim} by 2009, this would imply total removals of 52 300 t in 2008. This converts to a range of

possibilities for TACs between 18 300 to 34 000 t, depending on assumptions of unaccounted mortality, discarding, etc. These values may be compared to an amount of 26 700 t official landings for 2006. However, the uncertainty in estimates of these factors then makes the forward projection very unreliable if they are to be used to set a TAC.

During the last five years an average of 83% (87% in 2006) of the international landings in numbers consisted of juvenile cod aged 1–3. Because the fishery is at present so dependent on incoming year classes, fishing mortalities on these year classes is high, and 95% of a year class is taken before it has spawned for the first time. At the same time, the unbalanced age structure of the stock reduces its reproductive capacity even if a sufficient SSB were reached, as first-time spawners reproduce less successfully than older fish. Both factors are believed to have contributed to the reduction in recruitment of cod. Recovery and management plans should take this into consideration.

Cod are taken by towed gears in mixed demersal fisheries, which include haddock, whiting, *Nephrops*, plaice, and sole. They are also taken in directed fisheries using fixed gears. Mixed fishery advice is further elaborated in Section 6.3.

Cod catch in Division VIIId is managed by a TAC for Divisions VIIb–k, VIII, IX, X, and CECAF 34.1.1, (i.e. the TAC covers a small proportion of the North Sea cod stock together with cod in Divisions VIIe–k). Cod taken in Division VIIId should be included in the North Sea cod TAC.

The June advice includes information on several North Sea stocks that would previously only be available in October. This change is intended to allow more time for stakeholder consultations. ICES has introduced this change on an experimental basis and will evaluate the implications in the autumn. Changing the timing of the advice will also have effects on the workplans in the scientific laboratories and in the expert groups. The yield projections are based on data including the 1st quarter of 2007 (e.g. 1st quarter IBTS). For stocks like cod, haddock, plaice and sole there will be new recruitment information from the 3rd quarter surveys. ICES will only issue an updated advice if these surveys provide a very different perspective on the short term developments.

Factors affecting the fisheries and the stock

See Section 6.3 on mixed fisheries.

The effects of regulations

An emergency measure (Council Regulation (EC) 259/2001) involving the closure of a large area of the North Sea was implemented from 14 February to 30 April 2001 to all fishing vessels using gears likely to catch cod. Analysis of the effectiveness of the emergency measures indicated that the closure had an insignificant effect upon the spawning potential for cod in 2001. The redistribution of the fishery, especially along the edges of the box coupled to the increases in proportional landings from January and February appeared to have been able to negate the potential benefits of the box. The box would have to be extended in both space and time to be more effective (see: *ICES Advice*, 2004). This emergency measure has not been adopted after 2001.

EU technical regulations in force in 2003 and 2004 are contained in Council Regulation (EC) 850/98 and its amendments. The regulation prescribes the minimum target species composition for different mesh size ranges. In 2001, cod in the whole of NEAFC region 2 was a legitimate target species for towed gears with a minimum codend mesh size of 100 mm. As part of the cod recovery measures, the EU and Norway introduced additional technical measures from 1 January 2002 (EC 2056/2001). The basic minimum mesh size for towed gears for cod from 2002 was 120 mm, although in a transitional arrangement until 31 December 2002, vessels were allowed to exploit cod with 110-mm codends provided that the trawl was fitted with a 90-mm square mesh panel and the catch composition of cod retained on-board was not greater than 30% by weight of the total catch. From 1 January 2003, the basic minimum mesh size for towed gears targeting cod was 120 mm. The minimum mesh size for vessels targeting cod in Norwegian waters is also 120 mm.

Effort restrictions in the EC were introduced in 2003 (EC 2341/2002, Annex XVII, amended in EC 671/2003). Effort restriction measures were revised for 2004 (EC 2287/2003, Annex V). Preliminary analysis of fishing effort trends in the major fleets exploiting North Sea cod indicates that fishing effort in those fleets has been decreasing since the mid-1990s due to a combination of decommissioning and days-at-sea regulations. The decrease in effort is most pronounced in the years 2002 and beyond.

A cod protection area has been implemented in 2004 (EC 2287/2003, amended in EC 867/2004) which defined the conditions under which certain stocks, including haddock, could be caught in Community waters. A maximum of 35% of the haddock TAC in 2004 could be taken from within the cod protection area. For UK a special permit was required to fish for haddock in the cod protection area. Although this management scheme was proposed to permit additional haddock to be caught in 2004, the requests for special permits were relatively few. This cod protection area was only in force in 2004.

In 2004 agreement was reached within the EU on a formal recovery plan that operated during the TAC and management decision processes of 2004, effectively rendering the plan operational in 2005 (EC 423/2004). Details of the recovery plan are presented above.

The minimum landing size for cod in Subarea IV and Divisions IIIa and VIIId is 35 cm; in Denmark and Belgium it is 40 cm.

Fishing mortality on cod in the North Sea appears to have decreased since the late 1990s.

Changes in fishing technology and fishing patterns

The expected benefits from the increase in mesh size to 120 mm are not apparent from the available data. The effect of this increase is confounded by the transfer of effort from the fleets fishing with mesh sizes >120 mm to fleets fishing with mesh sizes between 70 and 99 mm, i.e. fishing for *Nephrops*. The regulation differentiates between the number of fishing days allowed when fishing for *Nephrops* or when fishing for other demersal species (>120 mm). Fishing for *Nephrops* with the smaller mesh allowed more days at sea than fishing with larger meshes.

Information presented to ICES indicated that the UK large mesh demersal trawl fleet category (>100 mm, 4A) has, in 2005, been reduced by decommissioning and days-at-sea regulations to 40% of the levels recorded in the EU reference year of 2001. There was a movement into the 70–90 mm sector to increase days at sea in 2002 and 2003, but the level of effort stabilised in 2004.

Environmental aspects

At the North Sea scale, there has been a northerly shift in the mean latitudinal distribution of the stock. The evidence for this being a migratory response is however slight or non-existent. More likely, cod in the North Sea are composed of a complex of more or less isolated sub-stocks and the southern units have been subjected to disproportionately high rates of fishing mortality. The contraction in range of the North Sea cod stock can be linked to reduced abundance as well as climate.

The consumption of cod in the North Sea in 2002 by grey seals has recently been estimated (Hammond and Grellier, 2006). For the North Sea it was estimated that in 1985 grey seals consumed 4150 tonnes of cod (95% confidence intervals; 2484–5760 tonnes), and in 2002 the population tripled in size (21 000–68 000 individuals) and consumed 8344 tonnes (95% confidence intervals; 5028–14 941 tonnes). Inclusion of the new grey seal diet data and seal population abundance are expected to reduce slightly the historic estimates of cod consumption in the North Sea by seals, generated from a multispecies model previously used. This suggests that the new estimates of seal predation will not alter the current perception of North Sea cod stock dynamics.

Scientific basis

Data and methods

The age-based assessment model (B-ADAPT) used landings and discards, calibrated with two survey indices (from IBTS quarter 1 and quarter 3 surveys). Because of the low abundance of cod which leads to high variance in the English and Scottish surveys, the IBTS quarter 3 survey (which incorporates these two UK surveys) was considered to provide less noisy indices and has been used in this year's assessment. For ICES Subarea IV and Divisions VIIId, discards were estimated from the Scottish discards sampling program, raised to the total international fleet. Discards in Division IIIa were based on observers' estimates.

The assessment and forecast made use of the 2007 Quarter 1 IBTS survey.

Because of unreliable information on landings and effort, commercial indices were not used in the assessment. Instead, the assessment uses only survey data for calibration. Quantities of additional "unallocated removals" were estimated by the model on the basis of the total mortality indicated by the survey. The unallocated removals estimates could potentially include components due to increased natural mortality and discarding as well as unreported landings. It is, however, assumed that these removals do originate in fishing activities.

A series of medium-term projections were used to evaluate management scenarios: a reduction in fishing mortality by 14% in 2007 (as a consequence of the 14% decrease in the 2007 TAC) followed by constant fishing at the 2007 level or a closure from 2008 onwards (figure 6.4.2.2). The second option is expected to bring SSB above B_{lim} with 95% probability in 2009.

Uncertainties in assessment and forecast

The modelling approach assumes that all unaccounted removals result from fishing mortality, which cannot be verified. Estimating missing removals leads to additional uncertainty in the assessment. It is not possible to split the estimated missing removals into landings and discards in the future because this depends on the management measures that are implemented. The model assumes that the unaccounted removals have the same age composition as the reported landings and estimated discards.

Information from the fishery

Figure 6.4.2.3 shows the relative catch rates of North Sea cod recorded by English trawlers fishing in the first quarter of the year and the 2+ cod biomass as estimated by the 2006 ICES WGNSSK assessment and recorded by the IBTS quarter 1 survey. The English fleet catch rates have exhibited similar trends in time to the survey and assessment estimates of 2+ biomass. In recent years catch rates from all time-series have shown a slight improvement following the recruitment of the 2005 year class of cod. However, current catch rates are still well below the levels recorded during the late 1990s when the stock was closer to safe biological limits.

Comparison with previous assessment and advice

Since 2005 the assessment has used a combined Q3 survey, providing a signal that is less subject to noise due to combined sample numbers being compared to individual surveys for that quarter. Since 2005 the assessment has also incorporated a bootstrapping procedure to reduce the influence of sampling noise on the year-to-year variation in the estimates. Therefore, last year's assessment was considered as a reliable indication of stock size and fishing mortality.

This year's assessment is the same as last year, apart from now also estimating Q1 survey catchability for age 5 instead of assuming it to be equal to age 4 (as was done last year). This change has removed the bias evident at age 5 in the log-catchability residuals, and has resulted in a slightly improved retrospective pattern for a range of model estimates.

The advice is consistent with previous years.

Sources of information

ICES (2007). Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 1–8 May 2007 (ICES CM 2007/ACFM:18).

Landings for each of the three parts of this combined assessment area and for the combined area are given in Table 6.4.2.1.

North Sea (Subarea IV)

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to advice	Predicted catch corresp. to single-stock exploitation boundaries	Agreed TAC	Official landings	ACFM landings
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	112	120
1996	80% of F(94) = 0.7		141		130	104	107
1997	80% of F(95) = 0.65		135		115	100	102
1998	F(98) should not exceed F(96)		153		140	114	122
1999	F = 0.60 to rebuild SSB		125		132	80	78
2000	F less than 0.55		<79		81	62	59
2001	lowest possible catch		0		48.6	42.3	41
2002	lowest possible catch		0		49.3	44.2	44.3
2003	Closure		0		27.3	27.4	NA
2004	Zero catch	Zero catch	0	0	27.3	23.4	NA
2005	Zero catch	Zero catch	0	0	27.3	23.9	NA
2006	Zero catch	Zero catch	0	0	23.2	22.2	NA
2007	Zero catch	Zero catch	0	0	20.0		
2008	Zero catch	Zero catch	0	0			

Weights in '000 t.

Skagerrak (Division IIIa)

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to advice	Predicted catch corresp. Single-Stock Exploitation Boundaries	Agreed TAC ¹	ACFM Landings ¹
1987	F = F_{max}		<21		22.5	20.9
1988	Reduce F				21.5	16.9
1989	F at F_{med}		<23		20.5	19.6
1990	F at F_{med} ; TAC		21.0		21.0	18.6
1991	TAC		15.0		15.0	12.4
1992	70% of F(90)				15.0	14.8
1993	Precautionary TAC				15.0	15.3
1994	No long-term gain in increased F + precautionary TAC				15.5	13.9
1995	If required precautionary TAC; link to North Sea				20.0	12.1
1996	If required precautionary TAC; link to North Sea				23.0	16.4
1997	If required precautionary TAC; link to North Sea				16.1	14.9
1998	If required precautionary TAC; link to North Sea		21.9		20.0	15.3
1999	F = 0.60 to rebuild SSB		17.9		19.0	11.0
2000	F less than 0.55		<11.3		11.6	9.3
2001	lowest possible catch		0		7.0	7.1
2002	lowest possible catch		0		7.1	7.5
2003	Closure		0		3.9	NA
2004	Zero catch	Zero catch	0	0	3.9	NA
2005	Zero catch	Zero catch	0	0	3.9	NA
2006	Zero catch	Zero catch	0	0	3.3	NA
2007	Zero catch	Zero catch	0	0	2.9	
2008	Zero catch	Zero catch	0	0		

¹⁾ Norwegian fjords not included. Weights in '000 t.

Eastern Channel (Division VIIId)

Year	ICES	Single-Stock	Predicted catch	Predicted	Agreed	Official	ACFM
	Advice	Exploitation Boundaries	corresp. to advice	catch corresp. to Single-Stock Exploitation Boundaries	TAC ¹	landings	Landings
1987	Not assessed		-		-	9.4	14.2
1988	Precautionary TAC		-		-	10.1	10.7
1989	No increase in F; TAC		10.0 ²		-	n/a	5.5
1990	No increase in F; TAC		9.0 ²		-	n/a	2.8
1991	Precautionary TAC		3.0 ²		-	n/a	1.9
1992	If required, precautionary TAC		5.5 ²		-	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
2003	Closure		0		-	1.3	NA
2004	Zero catch	Zero catch	0	0	-	0.2	NA
2005	Zero catch	Zero catch	0	0	-	0.7	NA
2006	Zero catch	Zero catch	0	0			NA
2007	Zero catch	Zero catch	0	0			
2008	Zero catch	Zero catch	0	0			

Weights in '000 t.

¹⁾ Included in TAC for Subarea VII (except Division VIIa).

²⁾ Including VIIe.

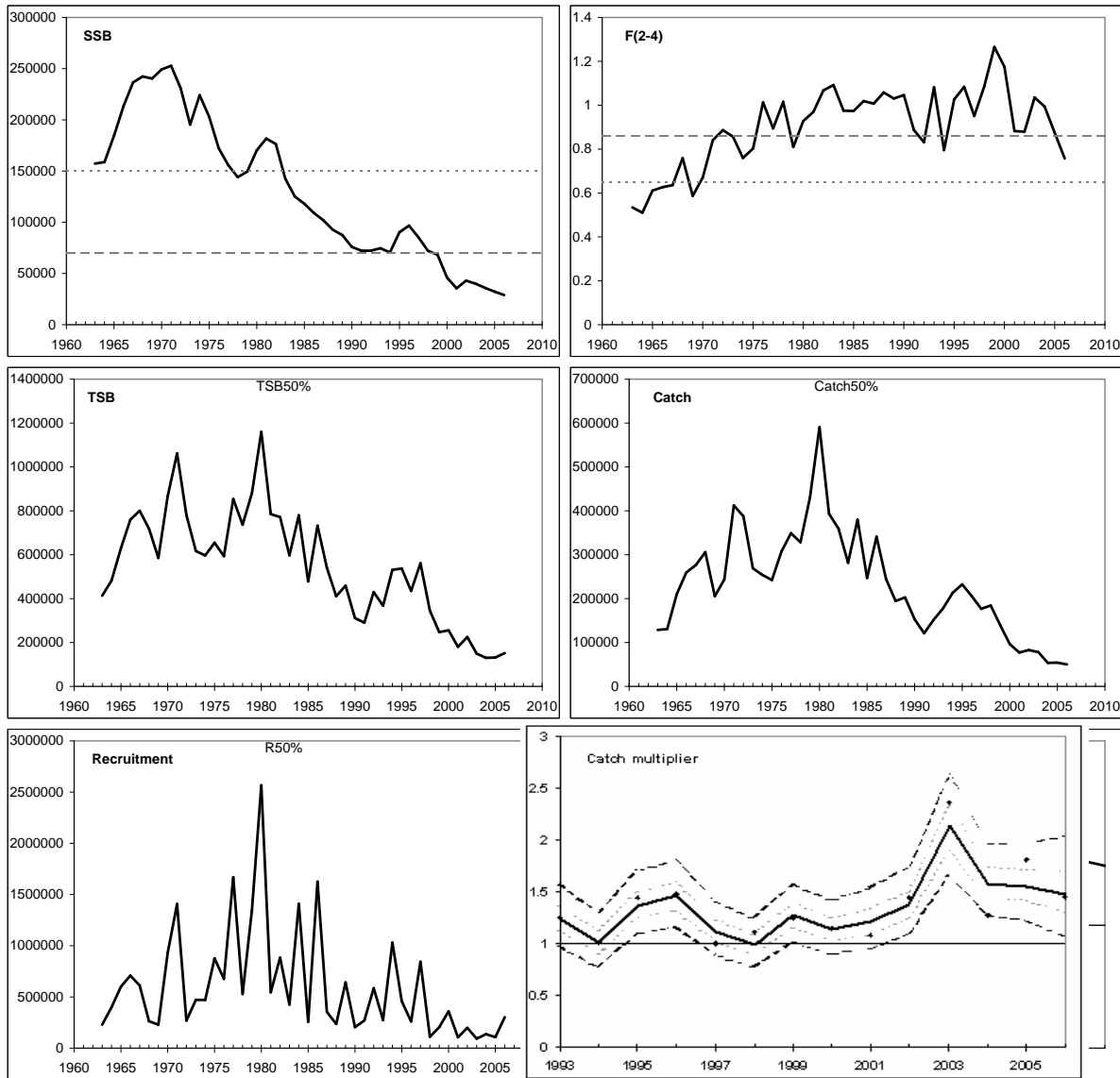


Figure 6.4.2.1 Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIIId. Anti-clockwise from top left: estimated spawning stock biomass (SSB), total stock biomass (TSB), recruitment, the catch multiplier, catch, and mean fishing mortality for ages 2–4 ($F(2-4)$), from the B-ADAPT model applied with smoothing. The lines represent the bootstrap median. The horizontal broken lines in the SSB plot indicate $B_{lim} = 70\,000$ t and $B_{pa} = 150\,000$ t, those in the $F(2-4)$ plot $F_{pa} = 0.65$ and $F_{lim} = 0.86$. The horizontal solid line in the catch multiplier plot indicates a multiplier of 1, the light broken lines indicate the 25th and 75th percentiles and the heavy broken lines the 5th and 95th percentiles. The solid diamonds represent point estimates

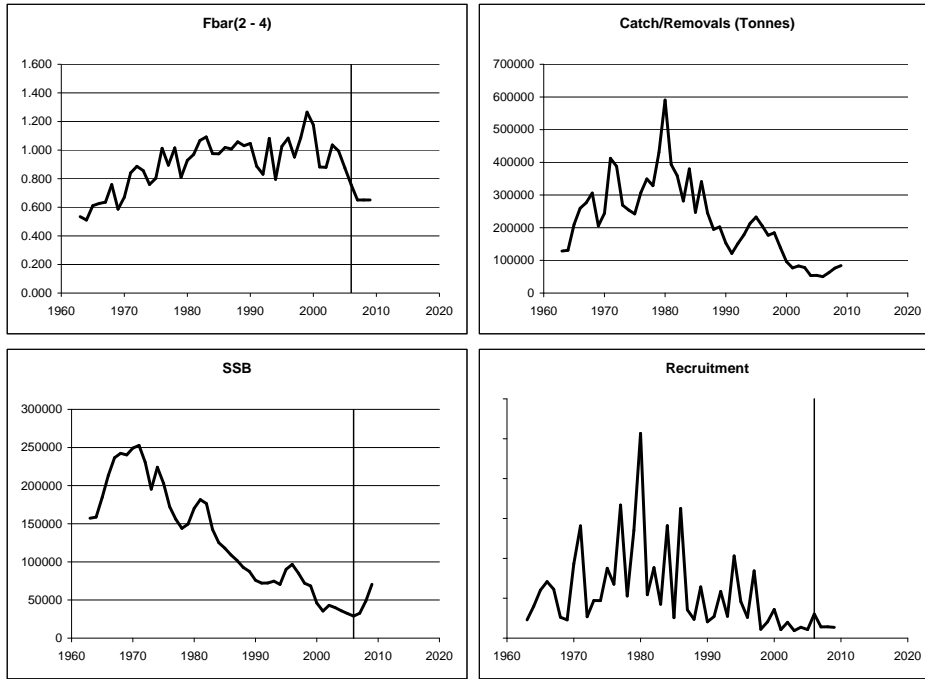


Figure 6.4.2.2.a Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIId. B-ADAPT forecast for a reduction in fishing mortality by 14% in 2007, followed by constant fishing mortality at the 2007 level for 2008 onwards.

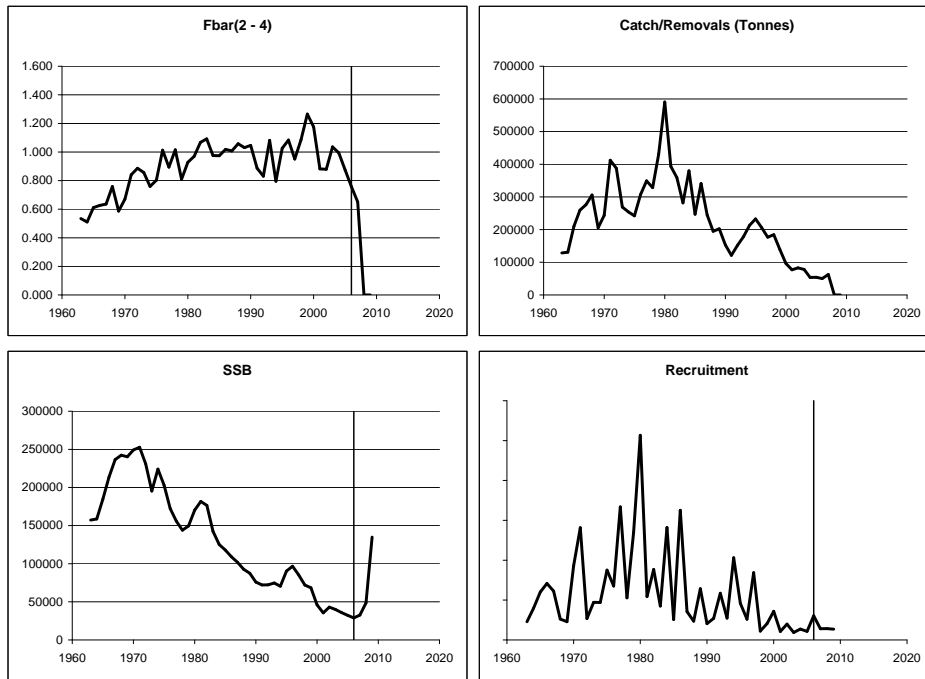


Figure 6.4.2.2.b Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIId. B-ADAPT forecast for a reduction in fishing mortality by 14% in 2007, followed by a further reduction (relative to 2006) in fishing mortality of 100% for 2008 onwards

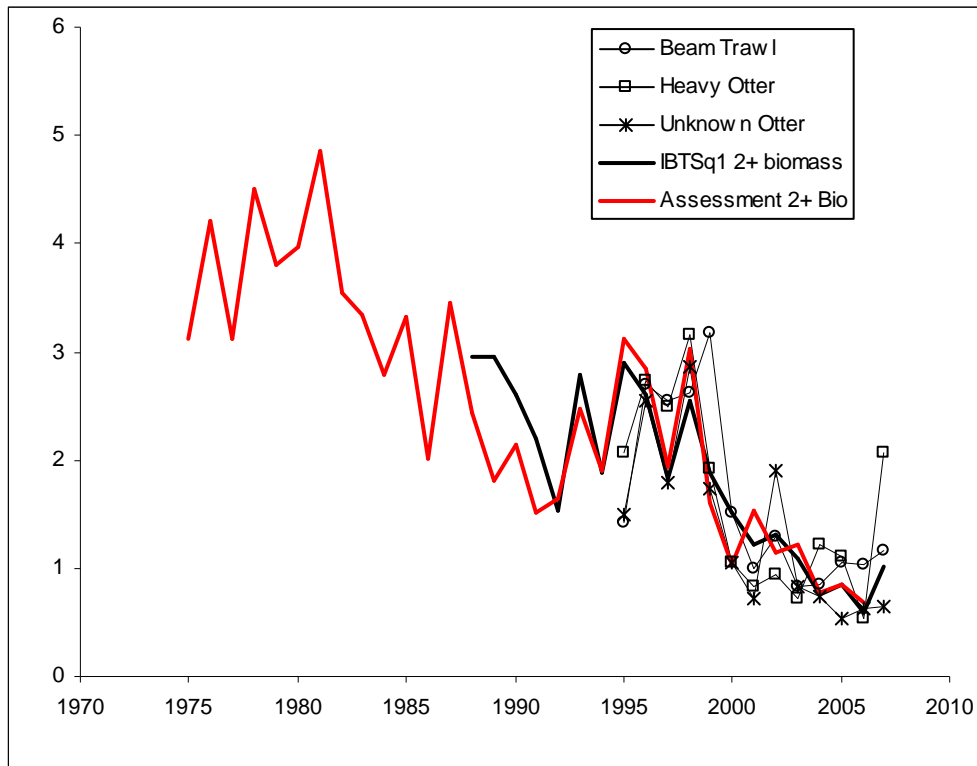


Figure 6.4.2.3 Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIIId: Mean-standardized catch rates of North Sea cod recorded by English trawlers fishing in the first quarter of the year and the 2+ cod biomass as estimated by the 2006 ICES WGNSSK assessment and recorded by the IBTSQ1 survey.

Cod in Sub-area IV, Division VIIId & Division IIIa (Skagerrak)

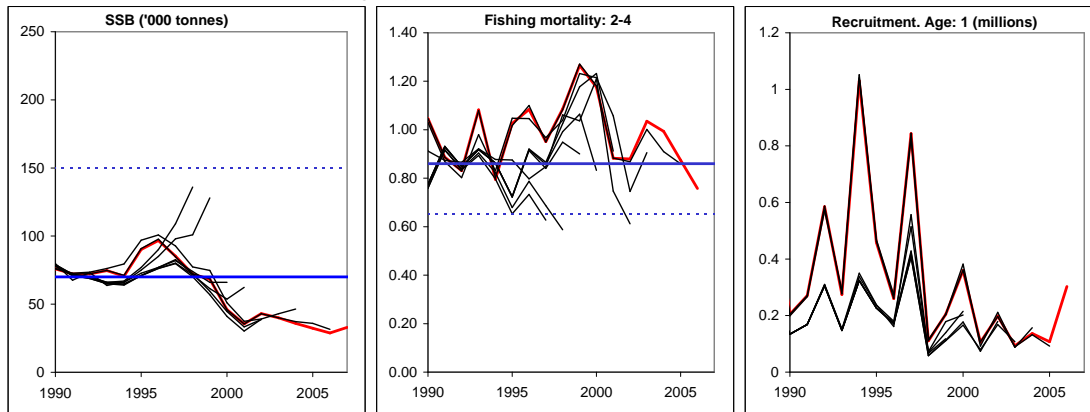


Figure 6.4.2.4 Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIIId. Historical performance of the assessments. Note: some of the previous assessment were presented as indicative of trends only. Ages over which mean fishing mortality is calculated was changed in 2004.

Table 6.4.2.1. Nominal landings (in tonnes) of COD in IIIa (Skagerrak), IV, and VIId, 1987–2006 as officially reported to ICES, and as used by the Working Group.

Sub-area IV										
Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	6,693	5,508	3,398	2,934	2,331	3,356	3,374	2,648	4,827	3,458
Denmark	36,948	34,905	25,782	21,601	18,998	18,479	19,547	19,243	24,067	23,573
Faroe Islands	57	46	35	96	23	109	46	80	219	44
France	8,199	8,323	2,578	1,641	975	2,146	1,868	1,868	3,040	1,934
Greenland									9,457	8,344
Germany	8,230	7,707	11,430	11,725	7,278	8,446	6,800	5,974		
Netherlands	21,347	16,968	12,028	8,445	6,831	11,133	10,220	6,512	11,199	9,271
Norway	5,000	3,585	4,813	5,168	6,022	10,476	8,742	7,707	7,111	5,869
Poland	13	19	24	53	15	-	-	-	-	18
Sweden	688	367	501	620	784	823	646	630	709	617
UK (E/W/NI)	29,960	23,496	18,375	15,622	14,249	14,462	14,940	13,941	14,991	15,930
UK (Scotland)	49,671	41,382	31,480	31,120	29,060	28,677	28,197	28,854	35,848	35,349
United Kingdom										
Total Nominal Catch	166,806	142,306	110,444	99,025	86,566	98,107	94,380	87,457	111,468	104,407
Unallocated landings	15,288	14,253	5,256	5,726	1,967	-758	10,200	7,066	8,555	2,161
WG estimate of total landings	182,094	156,559	115,700	104,751	88,533	97,349	104,580	94,523	120,023	106,568
Agreed TAC	175,000	160,000	124,000	105,000	100,000	100,000	101,000	102,000	120,000	130,000
	1.04	0.98	0.93	1.00	0.89	0.97	1.04	0.93		
Division VIId										
Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Belgium	815	486	173	237	182	187	157	228	377	321
Denmark	-	+	+	-	-	1	1	9	-	-
France	7,541	8,795	n/a	n/a	n/a	2,079	1,771	2,338	3,261	2,808
Netherlands	-	1	1	-	-	2	-	-	-	+
UK (E/W/NI)	1,044	867	562	420	341	443	530	312	336	414
UK (Scotland)	-	-	-	7	2	22	2	+	+	4
United Kingdom										
Total Nominal Catch	9,400	10,149	n/a	n/a	n/a	2,734	2,461	2,887	3,974	3,547
Unallocated landings	4,819	580	-	-	-	-65	-29	-37	-10	-44
WG estimate of total landings	14,219	10,729	5,538	2,763	1,886	2,669	2,432	2,850	3,964	3,503
Division IIIa (Skagerrak)										
Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Denmark	17,824	14,806	16,634	15,788	10,396	11,194	11,997	11,953	8,948	13,573
Sweden	1,924	1,648	1,902	1,694	1,579	2,436	2,574	1,821	2,658	2,208
Norway	152	392	256	143	72	270	75	60	169	265
Germany	-	-	12	110	12	-	-	301	200	203
Others	-	106	34	65	12	102	91	25	134	-
Norwegian coast *	838	769	888	846	854	923	909	760	846	748
Danish industrial by-catch *	491	1,103	428	687	953	1,360	511	666	749	676
Total Nominal Catch	19,900	16,952	18,838	17,800	12,071	14,002	14,737	14,160	12,109	16,249
Unallocated landings	0	0	-141	0	-12	0	0	-899	0	0
WG estimate of total landings	19,900	16,952	18,697	17,800	12,059	14,002	14,737	13,261	12,109	16,249
Agreed TAC	22,500	21,500	20,500	21,000	15,000	15,000	15,000	15,500	20,000	23,000
Sub-area IV, Divisions VIId and IIIa (Skagerrak) combined										
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total Nominal Catch	196,106	169,407	n/a	n/a	n/a	114,843	111,578	104,504	127,551	124,203
Unallocated landings	20,106	14,833	-	-	-	-823	10,171	6,130	8,545	2,117
WG estimate of total landings	216,212	184,240	139,936	125,314	102,478	114,020	121,749	110,634	136,096	126,320
* The Danish industrial by-catch and the Norwegian coast catches are not included in the (WG estimate of) total landings of Division IIIa n/a not available										
Division IIIa (Skagerrak) landings not included in the assessment										
Country	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Norwegian coast *					854	923	909	760	846	748
Danish industrial by-catch					953	1,360	511	666	749	676
Total					1,807	2,283	1,420	1,426	1,595	1,424

Table 6.4.2.1. cont., Nominal landings (in tonnes) of COD in IIIa (Skagerrak), IV, and VIId, 1987–2006 as officially reported to ICES, and as used by the Working Group.

Sub-area IV										
Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	4,642	5,799	3,882	3,304	2,470	2,616	1,482	1,615	1,715	1,316
Denmark	21,870	23,002	19,697	14,000	8,358	9,022	4,676	5,889	6,291	5,104
Faroe Islands	40	102	96		9	34	36		15	4
France	3,451	2,934	1,750	1,222	717	1,777	617		515	227
Germany	5,179	8,045	3,386	1,740	1,810	2,018	2,048	2,212	2,648	2,526
Greenland							1,352			
Netherlands	11,807	14,676	9,068	5,995	3,574	4,707	2,305	1,728	1,659	1,585
Norway	5,814	5,823	7,432	6,410	4,383	4,994	4,518	3,205	2,886	2,733
Poland	31	25	19	18	18	39	35			
Sweden	832	540	625	640	661	463	252	226	306	309
UK (E/W/NI)	13,413	17,745	10,344	6,543	4,087	3,112	2,213	1,889	1,364	
UK (Scotland)	32,344	35,633	23,017	21,009	15,640	15,416	7,852	6,644	6,667	
United Kingdom										8341.1
Total Nominal Catch	99,423	114,324	79,316	60,881	41,727	44,198	27,386	23,408	24,065	22,144
Unallocated landings	2,746	7,779	-924	-1,114	-754	102	-1,539	141	-194	49
WG estimate of total landings	102,169	122,103	78,392	59,767	40,973	44,300	25,847	23,549	23,870	22,193
Agreed TAC	115,000	140,000	132,400	81,000	48,600	49,300	27,300	27,300	27,300	23,205
Division VIId										
Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	310	239	172	110	93	51	54	47	50	80
Denmark	-	-	-	-	-	-	-	-	-	-
France	6,387	7,788		3,084	1,677	1,361	1,127		467	668
Netherlands	-	19	3	4	17	6	36	14	9	9
UK (E/W/NI)	478	618	454	385	249	145	121	100	179	
UK (Scotland)	3	1	-	-	-	-	-			
United Kingdom										269.4
Total Nominal Catch	7,178	8,665	629	3,583	2,036	1,563	1,338	161	705	1,026
Unallocated landings	-135	-85	6,229	-1,258	-463	1,534	-104	646	328	101
WG estimate of total landings	7,043	8,580	6,858	2,325	1,573	3,097	1,234	807	1033	1127
Division IIIa (Skagerrak)										
Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	12,164	12,340	8,734	7,683	5,901	5,526	3,071	3,039	3,613	3,054
Sweden	2,303	1,608	1,909	1,350	1,035	1,716	509	495	824	688
Norway	348	303	345	301	134	146	193	133	120	101
Germany	81	16	54	9	32	83	-	-	-	82
Others	-	-	-	-	-	-	-	-	-	47
Norwegian coast *	911	976	788	624	846	n/a	n/a	720	759	524
Danish industrial by-catch *	205	97	62	99	687	n/a	n/a	10	18	9
Total Nominal Catch	14,896	14,267	11,042	9,343	7,102	7,471	3,773	3,667	4,557	3,972
Unallocated landings	50	1,064	-68	-66	-16	-3	18	120	-752	-606
WG estimate of total landings	14,946	15,331	10,974	9,277	7,086	7,468	3,791	3,787	3,805	3,366
Agreed TAC	16,100	20,000	19,000	11,600	7,000	7,100	3,900	3,900	3,900	3,315
Sub-area IV, Divisions VIId and IIIa (Skagerrak) combined										
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total Nominal Catch	121,497	137,256	90,987	73,807	50,865	53,232	32,497	27,236	29,327	27,142
Unallocated landings	2,661	8,758	5,238	-2,438	-1,233	1,633	-1,625	907	-618	-457
WG estimate of total landings	124,158	146,014	96,225	71,369	49,632	54,865	30,872	28,143	28,708	26,686
* The Danish industrial by-catch and the Norwegian coast catches are not included in the (WG estimate of) total landings of Division IIIa n/a not available										
Division IIIa (Skagerrak) landings not included in the assessment										
Country	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Norwegian coast *	911.00	976.00	788.00	624.00	846.00	n/a	n/a	720	759	524
Danish industrial by-catch	205.00	97.00	62.00	99.00	687.00	n/a	n/a	10	18	9
Total	1,116.00	1,073.00	850.00	723.00	1,533.00	0.00	0.00	730.00	777.00	533.00

Table 6.4.2.2. COD in IIIa (Skagerrak), IV, and VIId. Landings, discards, and estimated total removals.

	Landings	Discards	Catch (L+D)	Total estimated removals
1985	214.6	31.5	246.1	247.0
1986	204.1	139.1	343.1	341.0
1987	216.2	27.8	244.1	244.8
1988	184.2	10.7	195.0	194.8
1989	139.9	62.1	202.1	202.6
1990	125.3	27.0	152.3	153.0
1991	102.5	18.6	121.0	121.2
1992	114.0	36.9	150.9	151.8
1993	121.7	21.9	143.6	179.3
1994	110.6	99.6	210.2	212.9
1995	136.1	32.2	168.3	245.1
1996	126.3	14.3	140.6	208.4
1997	124.2	33.6	157.8	157.8
1998	146.0	40.5	186.5	205.8
1999	96.2	14.2	110.4	137.1
2000	71.4	13.7	85.1	97.8
2001	49.7	13.9	63.6	68.6
2002	54.9	5.7	60.6	87.3
2003	30.9	6.4	37.2	86.3
2004	28.2	5.8	34.0	43.2
2005	28.7	6.3	35.0	63.0
2006	26.8	8.1	34.8	49.2

Table 6.4.2.3 Cod 347d: B-ADAPT median stock and management metrics.
Run title: North Sea/Skagerrak/Eastern Channel Cod

At 6/05/2007 9:33

B-ADAPT median values

	RECRUITS Age 1 ('000)	TSB (tons)	SSB (tons)	CATCH (tons)	YIELD/SSB	FBAR 2-4
1963	228540	413071	157257	128686	0.818	0.534
1964	399443	482315	158695	130740	0.824	0.510
1965	600416	630354	184554	210237	1.139	0.611
1966	708510	759390	213361	259416	1.216	0.626
1967	612282	800508	236547	276387	1.168	0.636
1968	262676	718662	242373	305911	1.262	0.759
1969	228850	585188	240302	205510	0.855	0.587
1970	930946	866955	249236	243867	0.978	0.671
1971	1407998	1062013	252747	412264	1.631	0.841
1972	268139	780669	230917	387737	1.679	0.886
1973	471632	617157	195341	269139	1.378	0.857
1974	470719	596439	224052	253989	1.134	0.760
1975	876154	654859	202909	242349	1.194	0.803
1976	675946	593758	172324	307102	1.782	1.013
1977	1668615	854151	155895	349038	2.239	0.894
1978	528504	737068	144003	328585	2.282	1.015
1979	1350162	880983	149493	430688	2.881	0.810
1980	2566638	1159434	170284	590678	3.469	0.928
1981	544678	785346	181697	393451	2.165	0.970
1982	883780	771573	176435	359372	2.037	1.068
1983	425491	596833	142449	281696	1.978	1.092
1984	1409447	779630	125187	379974	3.035	0.975
1985	256979	478359	118027	247031	2.093	0.974
1986	1626330	732364	109156	341047	3.124	1.019
1987	354531	540579	101932	244809	2.402	1.007
1988	236222	410920	92695	194798	2.101	1.058
1989	641956	459327	87468	202639	2.317	1.031
1990	204361	311284	75957	153021	2.015	1.046
1991	270445	290227	72180	121204	1.679	0.887
1992	585389	429853	72237	151755	2.101	0.831
1993	274241	367392	74666	178144	2.386	1.082
1994	1030371	531481	70514	213237	3.024	0.795
1995	458661	536897	90233	232543	2.577	1.026
1996	260113	434980	96735	205805	2.128	1.084
1997	843449	561458	85274	176741	2.073	0.951
1998	110729	344917	72051	184313	2.558	1.086
1999	204314	247460	68355	139527	2.041	1.265
2000	359762	255340	46030	96419	2.095	1.176
2001	105788	180463	35537	77099	2.170	0.882
2002	198187	224879	43049	82831	1.924	0.879
2003	93222	149425	40032	78107	1.951	1.035
2004	136414	130191	35904	53532	1.491	0.994
2005	107697	131546	32294	54076	1.675	0.874
2006	302547	151787	28921	50143	1.734	0.757
2007			32677			

Annex 6.4.2

EU – Norway management plan

In 2005 the EU and Norway renewed their initial agreement from 1999 and “agreed to implement a long-term management plan for the cod stock, which is consistent with the precautionary approach and is intended to provide for sustainable fisheries and high yield.

Once the stock of cod has been measured for the current year and for the previous year as no longer being at risk of reduced reproductive capacity, the plan will come into operation on 1 January of the subsequent year.

The plan shall consist of the following elements:

1. Every effort shall be made to maintain a minimum level of Spawning Stock Biomass (SSB) greater than 70,000 tonnes (B_{lim}).
2. Where the SSB is estimated to be above 150,000 tonnes the parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate that maximises long term yield. The parties agreed to use $F=0.4$ on appropriate age groups.
3. Where the rule in paragraph 2 would lead to a TAC which deviates by more than 15% from the TAC for the preceding year, the Parties shall fix a TAC that is neither more than 15% greater nor 15% less than the TAC of the preceding year.
4. Should the SSB of cod fall below 150 000t (B_{pa}) the Parties shall decide on a TAC that is lower than that corresponding to the application of the rules in paragraphs 2 and 3.
5. The Parties may where considered appropriate reduce the TAC by more than 15% compared to the TAC of the preceding year.
6. This plan shall be subject to triennial review, the first of which will take place before 1 January 2009, including appropriate adaptations to the target mortality rate specified in paragraph 2.

The main changes between this and the plan of 1999 is the reduction of a target F to 0.4, and a limitation of the change of the TAC between years of 15%. ICES has not evaluated the consistency of the new management plan with the precautionary approach.

EU Recovery plan

The recovery plan adopted by the EU Council in 2004 still remains to be fully implemented. Details of it are given in the Council Regulation (EC) 423/2004:

Article 1. This Regulation establishes a recovery plan for the following cod stocks (hereinafter referred to as "depleted cod stocks"):

- (a) cod in the Kattegat;
- (b) cod in the North Sea, in the Skagerrak and the eastern Channel;
- (c) cod to the west of Scotland;
- (d) cod in the Irish Sea.

Article 2. Definitions of geographical areas

For the purposes of this Regulation, the following definitions of geographical areas shall apply:

- (a) "Kattegat" means that part of division III a, as delineated by ICES, that is bounded on the north by a line drawn from the Skagen lighthouse to the Tistlarna lighthouse, and from this point to the nearest point on the Swedish coast, and on the south by a line drawn from Hasenore to Gnibens Spids, from Korshage to Spodsbjerg and from Gilbjerg Hoved to Kullen;
- (b) "North Sea" means ICES subarea IV and that part of ICES division III a not covered by the Skagerrak and that part of ICES division II a which lies within waters under the sovereignty or jurisdiction of Member States;
- (c) "Skagerrak" means that part of ICES division III a bounded on the west by a line drawn from the Hanstholm lighthouse to the Lindesnes lighthouse and on the south by a line drawn from the Skagen lighthouse to the Tistlarna lighthouse and from that point to the nearest point on the Swedish coast;
- (d) "eastern Channel" means ICES division VII d;

(e) "Irish Sea" means ICES division VII a;

(f) "west of Scotland" means ICES division VI a and that part of ICES division V b which lies within waters under the sovereignty or jurisdiction of Member States.

Article 3. Purpose of the recovery plan: The recovery plan (...) shall aim to increase the quantities of mature fish to values equal to or greater than 150 000 t (Cod in the North Sea, Skagerrak and eastern Channel)

Article 4: Reaching of target levels. Where the Commission finds, on the basis of advice (...), that for two consecutive years the target level for any cod stock concerned has been reached, the Council shall decide by (...) to remove that stock from the scope of this Regulation (...)

Article 5: Setting of TACs. A TAC shall be set in accordance with Article 6 where the quantities of mature cod have been estimated by the STECF, in the light of the most recent report of ICES, to be equal to or above the minimum level of 70 000 t (Cod in the North Sea, Skagerrak and eastern Channel).

Article 6: Procedure for setting TACs. (1.) Each year, the Council shall decide (...) on a TAC for the following year for each of the depleted cod stocks. (2.) The TACs shall not exceed a level of catches which a scientific evaluation (...) has indicated will result in an increase of 30 % in the quantities of mature fish in the sea at the end of the year of their application, compared to the quantities estimated to have been in the sea at the start of that year. (3.) The Council shall not adopt a TAC whose capture is predicted (...) to generate in its year of application a fishing mortality rate greater than 0.65 (Cod in the North Sea, Skagerrak and eastern Channel). (4.) (...) (5.) Except for the first year of application of this Article: (a) where the rules provided for in paragraphs 2 or 4 would lead to a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which shall not be more than 15 % greater than the TAC of that year; or (b) where the rules provided for in paragraphs 2 or 4 would lead to a TAC which is more than 15 % less than the TAC of the preceding year, the Council shall adopt a TAC which is not more than 15 % less than the TAC of that year.

Article 7: Setting TACs in exceptional circumstances. Where the quantities of mature fish of any of the cod stocks concerned have been estimated by the STECF, in the light of the most recent report of the ICES, to be less than the quantities set out in Article 5, the following rules shall apply: (a) Article 6 shall apply where its application is expected to result in an increase in the quantities of mature fish at the end of the year of application of the TAC to a quantity equal to or greater than the quantity indicated in Article 5; (b) where the application of Article 6 is not expected to result in an increase in the quantities of mature fish at the end of the year of application of the TAC to a quantity equal to or greater than the quantity indicated in Article 5, the Council shall decide (...) on a TAC for the following year that is lower than the TAC resulting from the application of the method described in Article 6.

Article 8. Fishing effort limitations and associated conditions. (1.) The TACs referred to in Chapter III shall be complemented by a system of fishing effort limitation based on the geographical areas and groupings of fishing gear, and the associated conditions for the use of these fishing opportunities specified in Annex V to Council Regulation (EC) No 2287/2003 of 19 December 2003 fixing for 2004 the fishing opportunities and associated conditions for certain fish stocks and groups of fish stocks, applicable in Community waters and, for Community vessels, in waters where catch limitations are required. (2.) Each year, the Council shall decide by a qualified majority, on the basis of a proposal from the Commission, on adjustments to the number of fishing days for vessels deploying gear of mesh size equal to or greater than 100 mm in direct proportion to the annual adjustments in fishing mortality that are estimated by ICES and STECF as being consistent with the application of the TACs established according to the method described in Article 6.

6.4.2b Cod in Subarea IV (North Sea), Division VII d (Eastern Channel), and Division III a (Skagerrak)

Update October 2007

New information available

The updated advice on North Sea cod is based on the IBTS Q3 survey which has changed the estimated size of the 2005 year class and the estimate of fishing mortality in 2006.

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to highest yield	Fishing mortality in relation to agreed target	Comment
Reduced reproductive capacity	Harvested sustainably	Overexploited	Above target	

The updated assessment indicates that the fishing mortality in 2006 is lower than previously assumed and that SSB is higher.

Management plan objectives

The North Sea cod fishery is managed through a multi-annual plan aiming at the recovery of cod stocks (EU Reg. No. 423/2004). The recovery plan specifies that once recovery has been achieved, the EU Commission should propose follow-up measures on the conservation and sustainable exploitation of fisheries resources under the common fisheries policy. The current agreement between Norway and EU includes a plan for managing the stock after the rebuilding target has been reached. This agreement includes a fishing mortality of 0.4 and a 15% constraint on annual changes in TAC. This agreement is to be revised before January 1st, 2008.

New single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

In May 2007, the exploitation boundaries in relation to the existing management plan were based on the fact that " B_{lim} cannot be reached within a 30% increase in SSB". With the new information available, it is expected that B_{lim} can in fact be reached with a 30% increase in SSB. Therefore the recovery plan defines a maximum +15% change in TAC from 2007 to 2008. Given that applying the recovery plan procedure for setting TACs requires some understanding of how a change in TAC relates to changes in total removals, ICES is unable to advise on the consequences of a TAC consistent with the recovery plan for 2008. The recovery plan implies a level of control in total removals that is not present in the management of the fishery.

Exploitation boundaries in relation to precautionary limits

Despite the low stock size and recent poor recruitment, it is estimated that the stock can be rebuilt to B_{pa} (with a 50% probability) at the beginning of 2009 with a fishing mortality less than 0.13, corresponding to total removals (landings, discards, and unaccounted removals) of 22 000 t. ICES is unable to translate this figure for removals into a TAC with the required precision.

Conclusions regarding exploitation boundaries

Because the existing recovery plan is not considered to be in accordance with the precautionary approach, ICES continues to advise on exploitation boundaries in relation to precautionary limits.

Short-term implications

Median values only are presented in the catch option table.

Basis: $F(2007) = 14\%$ reduction on $F_{04-06} = 0.54$; R_{07-09} = re-sampled from 1997–2005 YC (median of ~140 million) ; $SSB(2008) = 62.3$; $Removals(2007) = 60.7$.

Rationale	Total Removals (2008) ¹	Basis	F total (2008)	SSB (2009)	%SSB change ²
Zero catch	0.0	$F=0$	0.00	167.4	+169%
<i>Status quo</i> options	22.2	$F_{sq} * 0.2$	0.13	147.8	+137%
	42.1	$F_{sq} * 0.4$	0.25	130.2	+109%
	59.6	$F_{sq} * 0.6$	0.38	115.0	+84%
	75.2	$F_{sq} * 0.8$	0.50	101.4	+63%
	79.6	$F_s * 0.86 (= F_{2007})$	0.54	97.6	+57%

Weights in '000 t.

Shaded scenarios are considered inconsistent with the precautionary approach.

¹ Total removal estimates in 2004–2006: 56% are accounted for by official landings, 13% by discards, and 31% are unaccounted removals. For 2006 only these figures are 61%, 18%, and 21% respectively.

² SSB 2009 relative to SSB 2008.

Management considerations

While the spawning biomass is still below B_{lim} in 2008, the stock is projected to increase to above B_{lim} by 2009 in all management options provided in the forecast. The forecast also indicates that it is possible to achieve B_{pa} in 2009 with a very low fishing mortality. Despite the fact that recovery measures have been in place since 2002, the potential for rebuilding the stock in recent years has been poor because of very low recruitment. The 2005 year class is somewhat larger and provides a rebuilding opportunity.

The 2005 year class is below average but large enough to provide potential for an increase in SSB in 2009. A year class of this magnitude was last observed six years ago. Previously, the appearance of such year classes has not led to recovery, primarily because fishing mortality has been too high. If fishing mortality is not sufficiently constrained, the 2005 year class will not survive to rebuild the SSB.

In a situation where a stronger year class enters the stock, the available fishable biomass will increase. If fisheries continue in the same way and landing regulations are restrictive, this could result in increases in discards and unaccounted removals. Managers should consider a range of options that result in a better control of the fishery such as better enforcement of the regulations and incentives for demonstrably reducing the catch rates of cod.

Following the precautionary approach advice to reduce catches to less than half their current levels will require a tightening of the management regime so as to ensure that total removals do not exceed intended levels. In determining TAC levels for 2008, reasonable assumptions will have to be made on the additional removals as these have been a significant portion of the total mortality in the recent past.

Although there is a potential for SSB to reach B_{pa} in 2009, for a number of reasons (the age structure, fewer spawning components, environmental differences) the reproductive potential of North Sea cod at B_{pa} may not be as good as expected for a spawning biomass of this size. Considerations for future management of cod should include the effects of these factors.

Scientific basis

Data and methods

The updated assessment and advice have included the Q3 2007 survey information. The new survey information has been included into a new assessment and a new forecast.

Information from the fishery

Results from the North Sea Fishers' Survey (Laurenson, 2007) indicate that the abundance of cod has remained relatively stable in the south and has increased in the central to western areas in compared to 2006. In the northeastern to northern areas the abundance has shown a year by year increase. Responses showed that recruitment in 2007 was

high for half of the areas. This is much more positive than in 2006 where only one area was described as having high recruitment. .

Additional information was also available in the UK (England and Wales) Fisheries Science Partnership project interim report: "North Sea Codwatch". The project, which is scheduled for completion in March 2008, aims at describing the fine-scale distribution and abundance of the 2005 and 2006 year classes and developing a better understanding of the spatial and temporal distribution of cod aggregations. ICES reviewed the interim report and is supportive of the project.

Comparison with previous assessment and advice

The October 2007 estimate of fishing mortality for 2006 was 0.63 compared with 0.76 estimated in May 2007. The current assessment includes the results of the IBTS third quarter surveys, which provide additional measurements on the size of the stock and indicate that the 2005 year class is 10% higher than previously assumed. The 2005 year class is now estimated to be 56% of the long-term average recruitment.

The advice is different compared to May 2007 because the new forecast indicates that the stock may be rebuilt to B_{pa} in 2009 by applying a low fishing mortality.

Source of information

ICES. 2007. Annex to the Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, September 2007 (ICES CM 2007/ACFM:18).

Laurenson, C. H. 2007. North Sea Stock Survey 2007. NAFC Marine Centre, Shetland, UK.

**North Sea (Subarea IV)
Skagerrak (Division IIIa)¹
Eastern Channel (Division VIId) ²**

Year	ICES Advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to single-stock exploitation boundaries	Agreed TAC	Official landings	ACFM Landings
2008	Exploitation boundaries in relation to precautionary limits	Total removals less than 22 000 t	< 22			

Weights in '000 t.

¹ Norwegian fjords not included.

² TAC included TAC for Subarea VII (except Division VIIa).

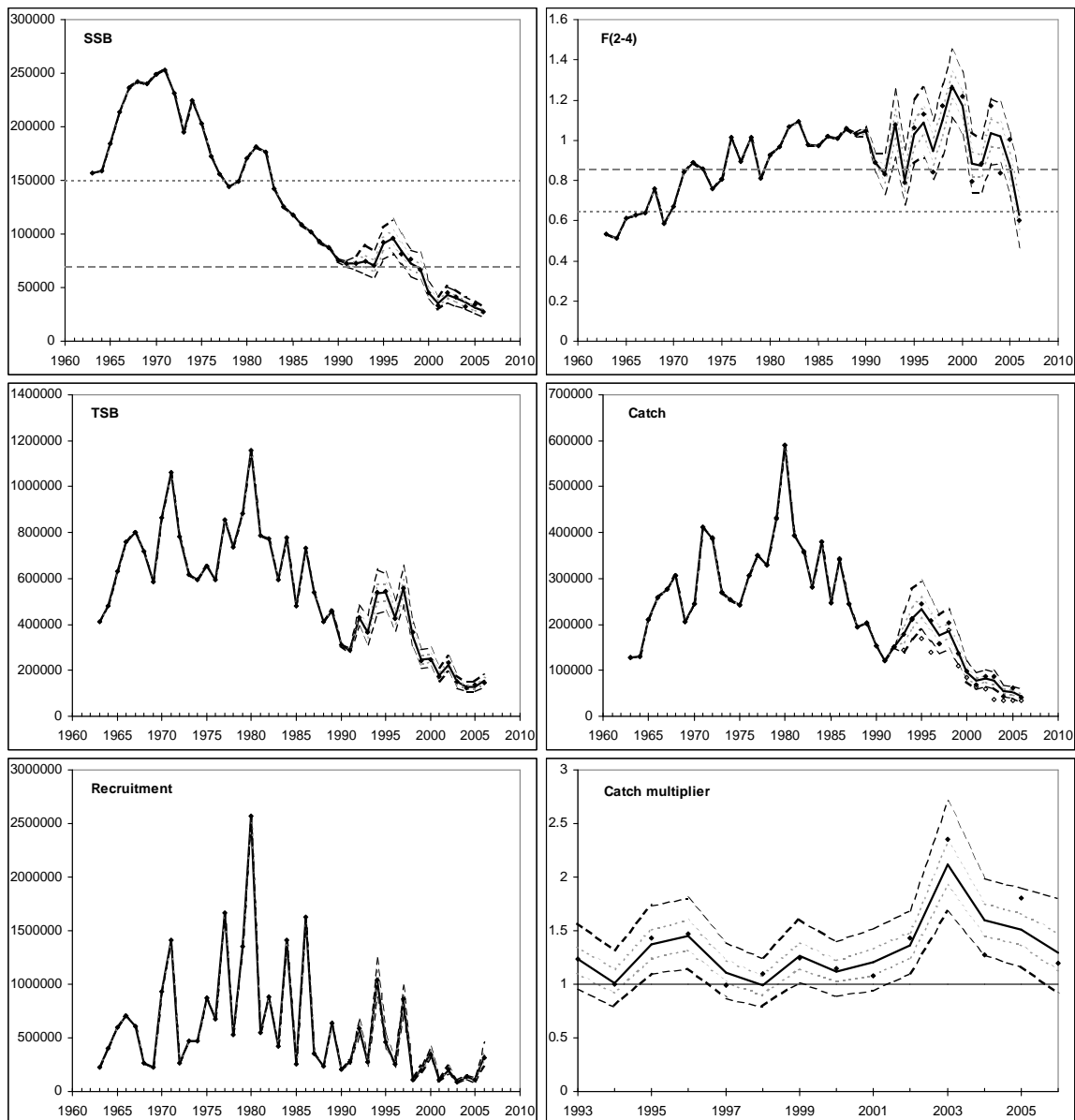


Figure 6.4.2.5 Updated summary for Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIId (October 2007). Anti-clockwise from top left: estimated spawning-stock biomass (SSB), total stock biomass (TSB), recruitment, the catch multiplier, catch, and mean fishing mortality for ages 2–4 ($F(2-4)$), from the B-ADAPT model applied with smoothing. The lines represent the bootstrap median. The horizontal broken lines in the SSB plot indicate $B_{lim} = 70\,000$ t and $B_{pa} = 150\,000$ t, those in the $F(2-4)$ plot $F_{pa} = 0.65$ and $F_{lim} = 0.86$. The horizontal solid line in the catch multiplier plot indicates a multiplier of 1, the light broken lines indicate the 25th and 75th percentiles and the heavy broken lines the 5th and 95th percentiles. The solid diamonds represent point estimates.

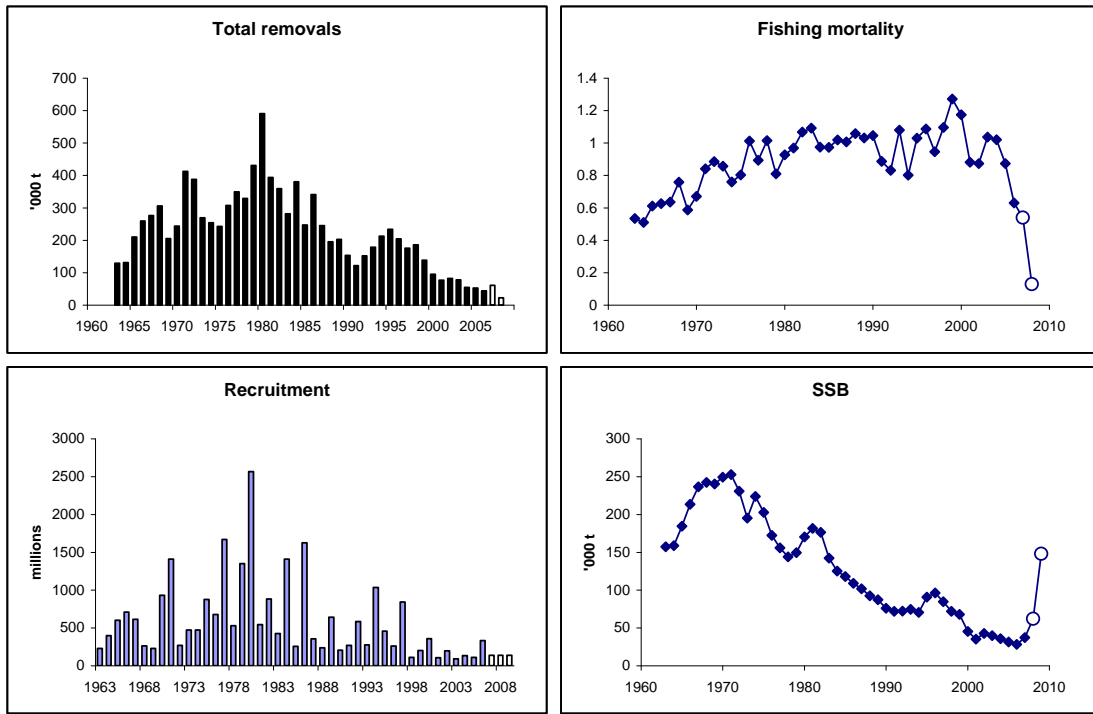


Figure 6.4.2.6 Updated summary for Cod in Subarea IV and Divisions IIIa (Skagerrak) and VIId (October 2007) including forecast and advice. Median values. Open circles and open bars indicate the predicted years.

Table 6.4.2.4. Cod in IIIa (Skagerrak), IV, and VIIId. Landings, discards, and estimated total removals.

	Landings	Discards	Catch (L+D)	Median removals
1985	214.6	31.5	246.1	247.0
1986	204.1	139.1	343.1	341.0
1987	216.2	27.8	244.1	244.8
1988	184.2	10.7	195.0	194.8
1989	139.9	62.1	202.1	202.6
1990	125.3	27.0	152.3	153.0
1991	102.5	18.6	121.0	121.2
1992	114.0	36.9	150.9	151.8
1993	121.7	21.9	143.6	178.4
1994	110.6	99.6	210.2	212.5
1995	136.1	32.2	168.3	233.7
1996	126.3	14.3	140.6	204.1
1997	124.2	33.6	157.8	175.5
1998	146.0	40.5	186.5	185.4
1999	96.2	14.2	110.4	138.6
2000	71.4	13.7	85.1	95.0
2001	49.7	13.9	63.6	76.9
2002	54.9	5.7	60.6	82.2
2003	30.9	6.4	37.2	77.3
2004	28.2	5.8	34.0	54.4
2005	28.7	6.3	35.0	52.5
2006	26.8	8.1	34.8	43.9

Table 6.4.2.5 Updated Cod 347d: B-ADAPT median stock and management metrics.

Run title: North Sea/Skagerrak/Eastern Channel Cod
 Tuning data. INCLUDES DISCARDS
 At 1/10/2007 12:02

B-ADAPT median values

	RECRUITS Age 1 ('000)	TSB (tons)	SSB (tons)	CATCH (tons)	YIELD/SSB	FBAR 2-4
1963	228540	413071	157257	128686	0.818	0.534
1964	399443	482315	158695	130740	0.824	0.510
1965	600416	630354	184554	210237	1.139	0.611
1966	708510	759390	213361	259416	1.216	0.626
1967	612282	800508	236547	276387	1.168	0.636
1968	262676	718662	242373	305911	1.262	0.759
1969	228850	585188	240302	205510	0.855	0.587
1970	930946	866955	249236	243867	0.978	0.671
1971	1407998	1062013	252747	412264	1.631	0.841
1972	268139	780669	230917	387737	1.679	0.886
1973	471632	617157	195341	269139	1.378	0.857
1974	470719	596439	224052	253989	1.134	0.760
1975	876154	654859	202909	242349	1.194	0.803
1976	675946	593758	172324	307102	1.782	1.013
1977	1668615	854151	155895	349038	2.239	0.894
1978	528504	737068	144003	328585	2.282	1.015
1979	1350162	880983	149493	430688	2.881	0.810
1980	2566638	1159434	170284	590678	3.469	0.928
1981	544678	785346	181697	393451	2.165	0.970
1982	883780	771573	176435	359372	2.037	1.068
1983	425491	596833	142449	281696	1.978	1.092
1984	1409447	779630	125187	379974	3.035	0.975
1985	256979	478359	118027	247031	2.093	0.974
1986	1626329	732363	109156	341047	3.124	1.019
1987	354530	540578	101932	244809	2.402	1.007
1988	236220	410917	92695	194798	2.102	1.058
1989	641944	459317	87467	202639	2.317	1.031
1990	204371	311267	75954	153021	2.015	1.046
1991	270410	290224	72173	121204	1.679	0.887
1992	585735	430043	72222	151755	2.101	0.832
1993	275172	367341	74645	178447	2.391	1.080
1994	1035248	534321	70530	212460	3.012	0.802
1995	457388	539814	90757	233656	2.575	1.030
1996	259189	431677	96414	204140	2.117	1.087
1997	840465	559737	84646	175474	2.073	0.947
1998	110224	345744	72177	185388	2.569	1.096
1999	202799	246784	67860	138560	2.042	1.272
2000	359295	253098	45517	94982	2.087	1.174
2001	105635	180218	35398	76935	2.173	0.882
2002	196850	223504	42759	82218	1.923	0.874
2003	92257	148999	39914	77322	1.937	1.037
2004	134210	129581	35987	54385	1.511	1.021
2005	111368	129845	31432	52502	1.670	0.873
2006	332785	156429	28481	43856	1.540	0.630
2007			37193			