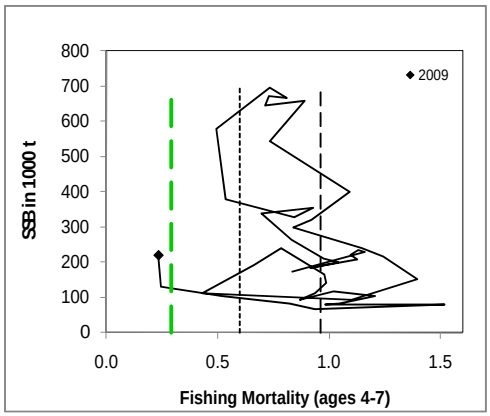
ECOREGION Baltic Sea
STOCK Cod in Subdivisions 25-32

Advice summary for 2011

Management Objective (s)	Landings in 2011
Transition to an **MSY approach** with caution at low stock size	Less than 105 kt
Cautiously avoid impaired recruitment (**Precautionary Approach**)	n/a
Cautiously avoid impaired recruitment and achieve other objective(s) of a **management plan** (e.g., catch stability)	Less than 64 kt

Stock status

Fishing mortality	2007	2008	2009
F_{MSY}	above	below	below
F_{PA}/F_{lim}	below	below	below
Spawning Stock Biomass (SSB)	2008	2009	2010
MSY $B_{trigger}$	undefined	undefined	undefined
B_{PA}/B_{lim}	undefined	undefined	undefined



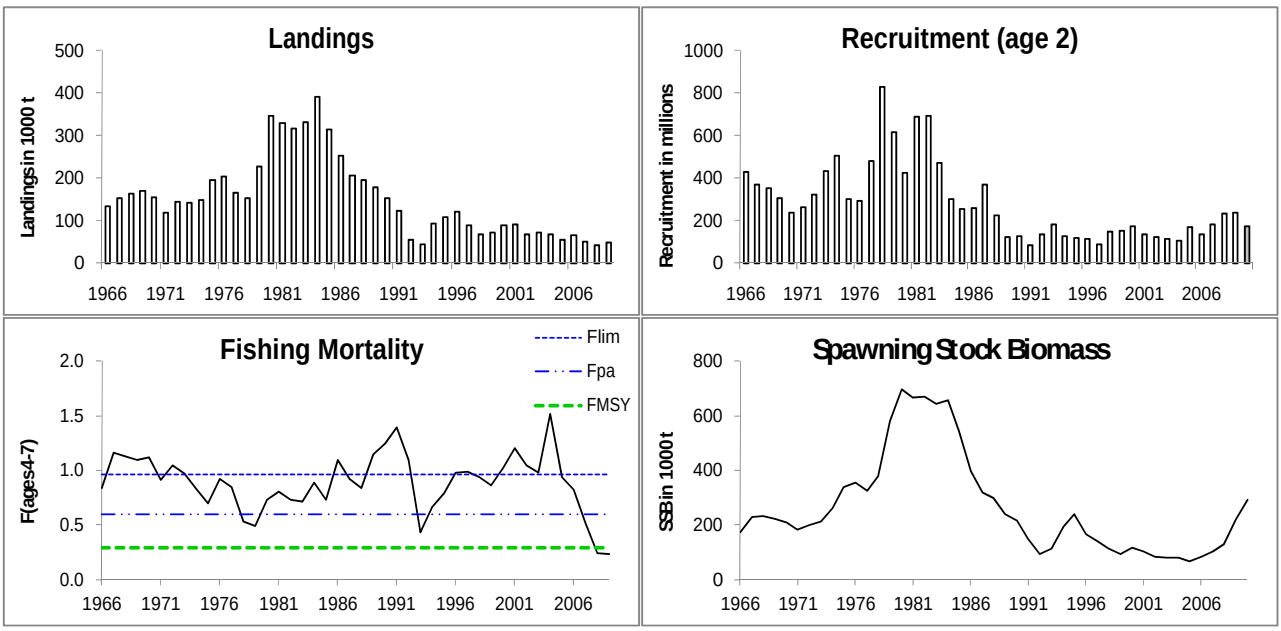


Figure 8.4.2.1. Cod in SD 25–32.Summary of stock assessment (weights in '000 tonnes). Top right: SSB and F over the years.

In spite of the absence of applicable biomass reference points (BRPs), ICES considers the present SSB to be above any candidate for precautionary biomass reference points. The SSB increased rapidly in recent years to 294 000 t in 2010. F in 2009 was estimated to be low (F=0.23) for the second year in a row. The 2006 and 2007 year classes (at age 2) are the strongest year classes since 1987.

Management plans

A multi-annual plan for cod in the Baltic Sea has been agreed by the EU in 2007 ((EC) No 1098/2007). ICES has evaluated the management plan in 2009 and considers it to be in accordance with the precautionary approach. The evaluation is most sensitive to assumptions about implementation error; i.e. TAC and effort overshoot.

Biology

Cod is the main predator on sprat and herring, and as especially the eastern Baltic cod stock has increased lately this would affect the natural mortality of the pelagic stocks. Cod egg predation by clupeids appears to be less import in the more eastern spawning areas. This has been explained by a more limited vertical overlap between predator and prey in these areas. However, as the adult sprat and herring are predating on cod egg and larvae, this can have also a positive effect on the cod stock development.

Environmental influence on the stock

The recruitment of this stock is strongly driven by environmental factors.

Spawning is confined to the deep basins where the water has sufficiently high oxygen content and salinity for eggs to survive. The amount of water with these characteristics depends mainly on the inflow of high salinity water from the North Sea.

The fisheries

The fisheries for cod in eastern Baltic has very little by-catch of other species. There is a large discard of juvenile cod.

Catch by fleet	Total catch (2009) 51.8 kt where 45.2 kt official landings (30%-gillnets, 70% -trawls), 3.2 kt unallocated landings, and 3.3 kt discards.

Effects of the fisheries on the ecosystem

Because sprat and herring are the major prey for cod, the cod fishery can indirectly affect the sprat and herring stocks by decreasing predation mortality on these species. Most of the trawl fishery for cod is now conducted in the water column in the Bornholm Basin, hence the impact of the bottom trawl on the sea floor has been reduced.

Quality considerations

The assessment is based on commercial landings and discards data, one commercial CPUE index, and two survey indices. The longest survey series has a break in 2001 when the survey design was altered. The commercial fleet, which the CPUE index has been based on, has been subject to a new quota regulation system, which might have increased its fishing efficiency in recent years.

Substantial underreporting of catches occurred in 1993–1996, and 2000 to 2007. In this situation, ICES have chosen to include estimates of non-reported landings in the assessment. These estimates are likely to be lower than the actual non-reported landings.

An assessment model shows some of the uncertainty in the assessment. In Figure 8.4.2.3 the 95% confidence intervals for F is shown. Various point estimates calculated with different settings are included for comparison reasons.

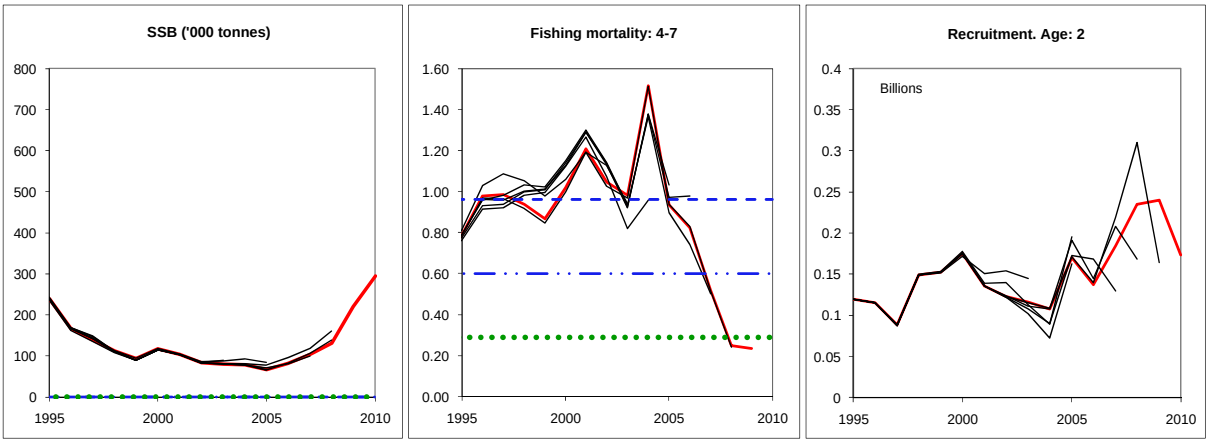


Figure 8.4.2.2 Cod in Subdivisions 25– 32. Historical performance of the assessments.

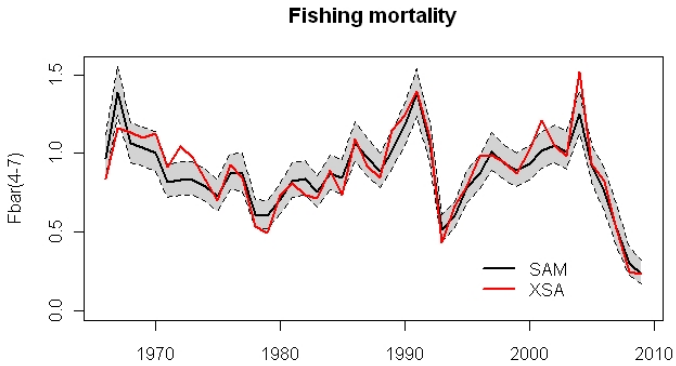


Figure 8.4.2.3 Cod in Subdivisions 25–32. SAM compared to XSA.

Sampling for discards is insufficient.

Scientific basis

Assessment type	Age structured analytical assessment (XSA)
Input data	2 survey (BITS Q1&4) 5 indices (two BITS Q1_3-9_backshifted, two BITS Q1_2_raw) commercial indices (Den_Trawl_>90mm)
Discards and by-catch	Included in the assessment (since 2002)
Indicators	None
Other information	benchmark done in 2009
Working Group Report	WGBFAS

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Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$		Undefined, under development
	F_{MSY}	0.30	based on stochastic simulations and close to F_{max}
Precautionary Approach	B_{lim}	undefined	
	B_{pa}	undefined	
	F_{lim}	0.96	F_{med} (estimated in 1998)
	F_{pa}	0.60	5th percentile of F_{med}
Management plan	F-target	0.30	EU management plan based on stochastic simulations

(changed in 2010)

Yield and spawning biomass per Recruit F-reference points):*

	Fish Mort **Ages** 4-7	**Yield/R**	**SSB/R**
Average last 3 years	0.33	0.628	2.192
$\mathbf{F}_{max}$ [*]	0.29	0.629	1.993
$\mathbf{F}_{0.1}$	0.17	0.582	3.624
$\mathbf{F}_{med}$	0.758	0.60	0.866

)* Obtained from standard graphs calculations

Outlook for 2011

Basis: F(2010) = TAC constraint = 0.17; SSB (2011) = 386.4kt; HC landings (2010) =56.1kt; Discards (2010) = 3.9kt.

Rationale	**Human Consumption landings (2011)**	**Basis**	**F Total (2011)**	**F HC (2011)**	**F Disc (2011)**	**Catch Total (2011)**	**Discards (2011)**	**SSB (2012)**	**%SSB change 1)**	**%TAC change 2)**
MSY framework	105	F_{MSY}	0.30	0.29	0.012	110.0	5.4	404	4%	46%
MSY transition	No transition needed as Fsq below FMSY									
Management plan	64	F = 0.17	0.17	0.16	0.01	67.7	3.3	453	15%	15%
Zero catch	0	F = 0	0	0	0	0	0	533	38%	-100%
Status quo	68	F_{sq}*0.8	0.18	0.17	0.007	72	3.5	449	14%	18%
	76	F_{sq} *0.9	0.20	0.19	0.008	80	3.9	439	12%	26%
	83	F_{sq} *1.0	0.22	0.21	0.009	88	4.3	430	10%	33%
	91	F_{sq} *1.1	0.25	0.24	0.010	95	4.7	421	8%	38%
	98	F_{sq} *1.2	0.27	0.26	0.011	103	5.0	412	6%	43%
	105	F_{sq} *1.3	0.29	0.28	0.012	110	5.4	403	4%	47%
	112	F_{sq} *1.4	0.31	0.30	0.013	118	5.8	395	2%	50%
	119	F_{sq} *1.5	0.34	0.32	0.014	125	6.2	387	0%	53%

Weights in '000 t.
[1)] SSB 2012 relative to SSB 2011.
[2)] Human Consumption landings 2011 relative to TAC 2010.
Discards proportions in the projections were assumed to be the average proportions discarded per age in 2007–2009 (fishing pattern partitioned in landings and discards and scaled to 2009).

MSY approach

Following the ICES MSY framework implies fishing mortality should be 0.30 resulting in landings of 105 kt in 2011. This is expected to lead to an SSB of 404 kt in 2012.

PA approach

As B_{pa} is not defined for this stock the catch corresponding to the PA approach cannot be calculated.

Management plan

Following the EU Management plan implies a fishing mortality of 0.3. This results in a TAC change of more than two times as compared with TAC in 2010. Therefore the 15% maximum TAC change applies, resulting in a TAC of 64.4 kt (TAC EU+Russia) in 2011. This is expected to lead to a decrease in fishing mortality to 0.17 and to an increase in SSB to 453 kt.

Management considerations

Following the management plan, F in 2010 is predicted to be at 0.17 which is 67% of F estimated for 2009. No direct effort reduction is required according the management plan, as F in both 2009 and 2010 are predicted to be below the target F of 0.3. This leads to a discrepancy between available effort and catching opportunities. In addition the 2006 and 2007 year classes appear to be strong. These factors may lead to an increased risk for highgrading and discarding. To address these risks, the management has from 2010 onwards prohibited highgrading and improved selectivity of gears.

In 2008 and 2009 the available information suggests that unreported landings were only 6% compared to the range of 30–40% in 2000–2006. Actions in progress to improve the enforcement and control (Copenhagen declaration on combating unreported cod fishery in the Baltic Sea, 28 March 2007) have been successful. Unreported catches have been included in the assessment, and the advice also refers to the total landings. In view of the uncertainty about the 2008 and 2009 catches and the sensitivity to assessment assumptions, the estimated F for 2009 is considered to be rather uncertain, but there is strong support for a declining trend in F. It will take a few years to be confident that fishing mortality has actually declined to the extent indicated in last two years' assessment.

Removals of cod in recreational fisheries in the Baltic are currently not consistently and completely sampled, and therefore not included in the assessment.

Management plan evaluations

ICES has evaluated the EC management plan in March 2009 and concluded that this management plan is in accordance with the precautionary approach. During the evaluation ICES assumed that the annual effort reduction is fully achieved until the target F is achieved. The plan appeared to be most sensitive against implementation error, i.e. TAC or effort overshot. Provided this implementation error is unbiased (i.e. no systematic misreporting) and below 10%, the stock would be likely to reach full reproduction potential before 2015.

The target F was reached within one year and the present SSB is estimated well above any potential candidate of SSB for full reproduction capacity.

Factors affecting the fisheries and the stock

Regulations and their effects

The stock is managed through TAC, effort, and seasonal fisheries restrictions.

The EC Council Regulation for the Baltic TAC in 2009 involved reductions in the effort in terms of number of fishing days per year, resulting in a maximum 160 days of fishing in Subdivisions 25–28.2 in 2009. No further reduction in fishing days was required in 2010. The cod fisheries in the Eastern Baltic are also regulated by a seasonal closure during 1 July to 31 August to protect spawning fish. A closure of a central part of the main spawning area in the Bornholm Deep has been implemented and enforced during the main spawning seasons since the mid-1990s for all fisheries. A year-round area closure for all fisheries in specific areas of the Bornholm Deep, the Gotland Basin, and the Gdansk Deep was introduced in 2005 aimed at reducing fishing mortality. Since 2006, area closures have been enforced from 1 May to 31 October.

High-grading has been prohibited since 1st January 2010 in all Baltic fisheries.

All of these measures have contributed to the marked decline in the fishing mortality on this stock.

A 'Bacoma' codend with a 120 mm mesh was introduced by IBSFC in 2001 in parallel to an increase in diamond mesh size to 130 mm in traditional codends. The expected effect of introducing the Bacoma 120 mm exit window was nullified by compensatory measures in the industry. This was to some extent explained by the mismatch between the selectivity of the 120 mm Bacoma trawl and the minimum landing size. In October 2003, the regulation was changed to a 110 mm Bacoma window. This was expected to enhance the compliance and to be in better accordance with the minimum landing size, which was changed from 35 to 38 cm in the same year. 1st of March 2010 the Bacoma 120 mm was re-introduced along with a extended Bacoma window (5.5 m), to further decrease discard and the minimum landing size was kept at 38 cm.

Changes in fishing technology and fishing patterns

Cod in the Eastern Baltic are taken primarily by trawlers and gillnetters. There was a substantial increase in the use of gill nets in the 1990s. In 2009, gillnet catches accounted for about 30% of the total catch.

Scientific basis

Data and methods

The assessment is based on commercial landings and discards data, one commercial CPUE index, and two survey indices. The longest survey series has a break in 2001 when the survey design was altered.

Substantial underreporting of catches occurred in 1993–1996, and also from 2000 to 2007. In this situation, ICES have chosen to include mis - and non-reported landings in the assessment. Estimates of the amount of misreporting are available from the national industries and control agencies and indicated that total catches during 2000–2007 were about 32–45% higher than the reported figures. By nature this information is highly uncertain and incomplete and no data were available for some countries where misreporting was suspected to occur. ICES considers that in 2008 and 2009 the enforcement of fishing control led to significant reduction of non-reporting; the available information suggests that unreported landings in 2009 were only 6% of the reported landings. Although the adjusted landings values derived by ICES are the best possible estimates, they are likely to be minimum estimates.

Discard data have been available since 1996 and are applied in the assessment as yearly proportions discarded per age-group. Before 1996, an average proportion discarded per age-group estimated for 1996–2003 was applied. From 2004 onwards, annual estimates of discards have been derived from the biological sampling of catches. The season and area coverage of discard sampling still requires improvement. Due to changes in technical regulations (e.g. increase in minimum landing size; the introduction of different codend sizes; and various fishery closures), discard rates have been variable.

Information from the fishing industry

Some of the information on mis- and underreporting came from industry sources, indicating that the estimates used in the assessment are minimum values.

Uncertainties in assessment and forecast

Uncertainties in assessment are mainly due to problems with underreporting, discarding and age-reading. The estimate of F in 2009 is uncertain because of the uncertainty of the level of the total landings in 2009.

Sampling for discards is insufficient and raising procedures have been problematic in the recent past. This led to revisions in this year's assessment of the strength of incoming year classes this year. Additionally, assumptions had to be made on the levels of discards of illegal catches. Predicted discards for 2010 are based on the 2008 values, and strong year-classes are entering the fishery from 2010 onwards. This may lead to increased discarding of juveniles.

Large inconsistencies exist in age determinations for the Eastern Baltic cod stock owing to the lack of clear growth rings in the otoliths. In 2008, the quantity of landings with no age information was very high (28%). This results in poor quality catch-at-age and survey data, and a likely underestimation of fishing mortality. ICES attempted to resolve the inconsistencies in age determinations for this stock, but no consensus was reached on the age determinations. An EU-funded study initiated in 2007 (project DECODE) has taken a different approach to deliver validated aging data for the assessment, but this method is not fully developed.

Environmental conditions

Cod distribution in the Baltic is affected by environmental conditions, specifically lack of oxygen. This is taken into account in the way the survey results are raised, assuming that no cod occurs in oxygen depleted areas. As a consequence, two (the Gotland basin and Gdansk basin) out of three spawning areas have ceased to significantly contribute to the reproduction of the eastern Baltic cod.

The high cod recruitment during the mid-1970s reflected a relatively high frequency of major inflows of high salinity water from the North Sea, leading to high oxygen concentrations in the cod spawning areas and hence to high egg survival and good recruitment. Since the mid-1980s, there have been few major inflows from the North Sea, leading to poor conditions for egg survival, and much reduced recruitment. A reduction in the size of potential spawning areas in the Central Eastern Baltic has also been noted. Successful spawning now only occurs in the Bornholm Basin. Since 1992, the salinity has continuously increased in the Gotland Basin and has recently reached the level observed at the end of the 1960s. This has increased the probability of Gotland Basin to be a suitable habitat for cod spawning. The reduced salinity in the past and increased sprat population has led to reduced abundance of the main larval food of cod, the copepod *Pseudocalanus* sp. An inflow in 1993 led to some improvement in egg survival, but this did not result in improved recruitment as larval survival was limited by food supply at this time. A major inflow in early 2003 led to a substantial increase in the volume of water suitable for cod egg survival, which is consistent with the appearance of a relatively strong 2003, 2005 and 2006 year classes (compared to the past 20 years) in BITS surveys.

Comparison with previous assessment and advice

The current perception of the status of the Eastern Baltic cod stock in terms of development trends is similar to that from the 2008 assessment (SSB has been increasing and F declining over the past 3 years). The estimate of SSB in 2008 has been revised downwards by 5.4% and the F in 2008 upwards by 2.4% (see Figure 8.4.2.2). The benchmark workshop in 2009 identified problems with the commercial tuning fleets. In the recent assessment the commercial tuning fleets have been revised and a new standardized Danish trawler tuning fleet is used as the only commercial index.

The basis for the advice is the same as last year but extended by MSY considerations.

Sources

ICES. 2010. Report of the Baltic Fisheries Assessment Working Group. ICES Headquarters, 15–22 April 2010. ICES CM 2010/ACOM:10.

Table 8.4.2.1 **Cod in Subdivision 25-32**. Single stock exploitation boundaries (advice), management and landings, discards, catches

Year	ICES Advice	Predicted landings corresp. to advice	Agreed TAC[1]	ICES landings (25–32)	ICES landings (22–32)
1987	Reduce towards $\mathbf{F}_{max}$	245		207	236
1988	TAC	150		194	223
1989	TAC	179	220	179	198
1990	TAC	129	210	153	171
1991	TAC	122	171	123	140
1992	Lowest possible level	-	100	55[2]	73[2]
1993	No fishing	0	40	45[2]	66[2]
1994	TAC	25	60	93[2]	124[2]
1995	30% reduction in fishing effort from 1994	-	120	108[2]	142[2]
1996	30% reduction in fishing effort from 1994	-	165	122	173
1997	20% reduction in fishing mortality from 1995	130	180	89	132
1998	40% reduction in fishing mortality from 1996	60	140	67	102
1999	Proposed F_{pa} (= 0.6)	88	126	73	115
2000	40% reduction in F from 96–98 level	60	105	89[2]	128
2001	Fishing mortality of 0.30	39	105	91[2]	126
2002	No fishing	0	76	68[2]	92
2003	70% reduction in F	See option table	75	69[2]	94
2004	90% reduction in F	< 13.0	45.4	68[2]	*
2005	No fishing	0	42.8	55[2]	*
2006	Develop Management plan	< 14.9	49.2	66[2]	*
2007	No fishing	0	44.3	51[2]	*
2008	No fishing	0	42.3[3]	42[2]	*
2009	Limit (total) landings to 48 600 t	≤ 48.6	49.38[3]	48[2]	*
2010	Follow management plan	56.8	56.1[3]		
2011	See scenarios	-			

Weights in '000 t.
[1] For total Baltic until and including 2003.
[2] The reported landings in 1992–1995 and 2000–2008 are likely to be minimum estimates due to incomplete reporting.
[3] TAC is calculated as EU + Russian autonomous quotas.
* Separate management for western and eastern Baltic cod since 2004

Table 8.4.2.1 Cod in Subdivisions 25–32. Total landings (tonnes) by country.

Year	Denmark	Estonia	Finland	German Dem.Rep.[2]	Germany, Fed. Rep.	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Faroe Islands[4]	Norway	Unallo-cated[3]	Total
1965	35 313		23	10 680	15 713			41 498		21 705	22 420				147 352
1966	37 070		26	10 589	12 831			56 007		22 525	38 270				177 318
1967	39 105		27	21 027	12 941			56 003		23 363	42 980				195 446
1968	44 109		70	24 478	16 833			63 245		24 008	43 610				216 353
1969	44 061		58	25 979	17 432			60 749		22 301	41 580				212 160
1970	42 392		70	18 099	19 444			68 440		17 756	32 250				198 451
1971	46 831		53	10 977	16 248			54 151		15 670	20 910				164 840
1972	34 072		76	4 055	3 203			57 093		15 194	30 140				143 833
1973	35 455		95	6 034	14 973			49 790		16 734	20 083				143 164
1974	32 028		160	2 517	11 831			48 650		14 498	38 131				147 815
1975	39 043		298	8 700	11 968			69 318		16 033	49 289				194 649
1976	47 412		287	3 970	13 733			70 466		18 388	49 047				203 303
1977	44 400		310	7 519	19 120			47 702		16 061	29 680				164 792
1978	30 266		1 437	2 260	4 270			64 113		14 463	37 200				154 009
1979	34 350		2 938	1 403	9 777			79 754		20 593	75 034	3 850			227 699
1980	49 704		5 962	1 826	11 750			123 486		29 291	124 350	1 250			347 619
1981	68 521		5 681	1 277	7 021			120 901		37 730	87 746	2 765			331 642
1982	71 151		8 126	753	13 800			92 541		38 475	86 906	4 300			316 052
1983	84 406		8 927	1 424	15 894			76 474		46 710	92 248	6 065			332 148
1984	90 089		9 358	1 793	30 483			93 429		59 685	100 761	6 354			391 952
1985	83 527		7 224	1 215	26 275			63 260		49 565	78 127	5 890			315 083
1986	81 521		5 633	181	19 520			43 236		45 723	52 148	4 596			252 558
1987	68 881		3 007	218	14 560			32 667		42 978	39 203	5 567			207 081
1988	60 436		2 904	2	14 078			33 351		48 964	28 137	6 915			194 787
1989	57 240		2 254	3	12 844			36 855		50 740	14 722	4 520			179 178
1990	47 394		1 731		4 691			32 028		50 683	13 461	3 558			153 546
1991	39 792	1 810	1 711		6 564	2 627	1 865	25 748	3 299	36 490		2 611			122 517
1992	18 025	1 368	485		2 793	1 250	1 266	13 314	1 793	13 995		593			54 882
1993	8 000	70	225		1 042	1 333	605	8 909	892	10 099		558		18 978	50 711
1994	9 901	952	594		3 056	2 831	1 887	14 335	1 257	21 264		779		44 000	100 856
1995	16 895	1 049	1 729		5 496	6 638	4 513	25 000	1 612	24 723		777	293	18 993	107 718
1996	17 549	1 338	3 089		7 340	8 709	5 524	34 855	3 306	30 669		706	289	10 815	124 189
1997	9 776	1 414	1 536		5 215	6 187	4 601	31 396	2 803	25 072		600			88 600
1998	7 818	1 188	1 026		1 270	7 765	4 176	25 155	4 599	14 431					67 428
1999	12 170	1 052	1 456		2 215	6 889	4 371	25 920	5 202	13 720					72 995
2000	9 715	604	1 648		1 508	6 196	5 165	21 194	4 231	15 910				23 118	89 289
2001	9 580	765	1 526		2 159	6 252	3 137	21 346	5 032	17 854				23 677	91 328
2002	7 831	37	1 526		1 445	4 796	3 137	15 106	3 793	12 507				17 562	67 740
2003	7 655	591	1 092		1 354	3 493	2 767	15 374	3 707	11 297				22 147	69 476
2004	7 394	1 192	859		2 659	4 835	2 041	14 582	3 410	12 043				19 563	68 578
2005	7 270	833	278		2 339	3 513	2 988	11 669	3 411	7 740				14 991	55 032
2006	9 766	616	427		2 025	3 980	3 200	14 290	3 719	9 672				17 836	65 532
2007	7 280	877	615		1 529	3 996	2 486	8 599	3 383	9 660				12 418	50 843
2008	7 374	841	670		2 341	3 990	2 835	8 721	3 888	8 901				2 673	42 235
2009[1]	8 295	623			3 665	4 588	2 789	10 625	4 482	10 182				3 189	48 439

[1]Provisional data. [2]Includes landings from Oct.-Dec. 1990 of Fed.Rep.Germany.
[3]Working group estimates. No information available for years prior to 1993.
[4] For 1997 landings not officially reported, estimated by the WG.

Table 8.4.2.2 Cod in Subdivisions 25–32.

	RECRUITS Age 2	TOTALBIO	TOTSPBIO	LANDINGS	DISCARDS	FBAR 4-7
1966	430264	355416	172018	134867	8735	0.837
1967	370921	436280	228679	152378	11733	1.1587
1968	354063	422232	233958	164472	9700	1.1303
1969	306727	395953	222659	169909	10654	1.0962
1970	240011	351666	208842	154492	7625	1.1241
1971	264787	314516	184181	118217	5426	0.9133
1972	322278	350280	198996	143833	8490	1.0434
1973	432140	394362	211991	143164	7491	0.9732
1974	506893	500395	262952	147815	7933	0.8311
1975	303683	575916	339545	194649	9576	0.6955
1976	293397	535740	355564	203303	4341	0.9261
1977	479002	533503	326914	164792	2978	0.844
1978	829398	712485	379201	154009	9875	0.5358
1979	615355	983040	579671	227699	14576	0.4952
1980	425886	1026484	696743	347619	8544	0.7342
1981	689813	984216	666132	330742	6185	0.8091
1982	693590	1057369	670941	316052	11548	0.7301
1983	472374	1003058	645258	332148	10998	0.7124
1984	302921	920299	657667	391952	8521	0.8896
1985	253078	737752	544911	315083	8199	0.7334
1986	260215	547641	399372	252558	3848	1.0936
1987	368093	492369	320471	207081	9340	0.9196
1988	224305	462425	299276	194787	7253	0.84
1989	122505	352920	240279	179178	3462	1.1477
1990	128384	271641	216040	153546	4187	1.2431
1991	82875	193256	151625	122517	2741	1.3952
1992	137342	133675	93003	54882	1904	1.099
1993	182715	172930	113197	45188	1558	0.431
1994	128315	267540	192897	93380	1956	0.6641
1995	119872	313984	239268	107712	1872	0.7862
1996	115527	226919	166196	121877	1443	0.9792
1997	88548	200287	140029	88600	3462	0.9865
1998	149049	179709	113107	67429	2299	0.9369
1999	152123	183866	93888	72989	1838	0.8675
2000	175065	216063	117296	89168	6019	1.0199
2001	135510	171266	104435	91325	2891	1.2071
2002	122704	141371	83846	67740	1462	1.0467
2003	115846	136152	80077	71386	2024	0.9831
2004	107654	131626	79432	67768	1201	1.5165
2005	170297	122640	66236	55254	1670	0.9357
2006	137724	156405	82870	65532	4644	0.8236
2007	184230	172422	104646	50843	4146	0.5195
2008	235130	215564	131816	42235	3746	0.2467
2009	239795	348858	220502	48439	3328	0.2331
2010	173198	406797	294330			
Arith. Mean	280969	417984	265132	152696	5714	0.8894
Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)	(Tonnes)	