4.4 Stock summaries

4.4.1 Cod in Subdivision Vb₁ (Faroe Plateau)

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 unsustainably	Overfished	Above target	Historically lowest SSB

Based on the most recent estimates of SSB (in 2009) and fishing mortality (in 2008), ICES classifies the stock as suffering reduced reproductive capacity and as being harvested unsustainably. Most year classes from 2001 onwards have been around one third of the long-term average.

Management objectives

The management objective is to achieve sustainable fisheries. An effort management system was implemented in the Faroese demersal fisheries in Division Vb in 1996. From the outset the aim of the effort management system was to harvest on average 33% in numbers of the exploitable stock of cod. This translates into an average F of approximately 0.45, above the F_{pa} of 0.35. ICES considers this to be inconsistent with the precautionary approach.

Reference points

	Type	Value	Technical basis
Precautionary approach	B_{lim}	21 000 t	Lowest observed SSB (1998)
	B_{pa}	40 000 t	$B_{lim}e^{1.645\sigma}$, assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.
	F_{lim}	0.68	$F_{pa}e^{1.645\sigma}$, assuming a σ of about 0.40 to account for the relatively large uncertainties in the assessment.
	F_{pa}	0.35	Close to F_{max} (0.34) and F_{med} (0.38) values from the 1998 assessment.
Targets	F_y	~ 0.45	Harvest on average 33% of the exploitable stock in numbers

(unchanged since 1998)

Yield and spawning biomass per Recruit
F-reference points:

	Fish Mort Ages 3-7	Yield/R	SSB/R
Average last 3 years	0.61	1.35	2.75
Fmax	0.25	1.45	5.73
F0.1	0.12	1.31	9.64
Fmed	0.33	1.44	4.65

Candidates for reference points which are consistent with high long-term yields and a low risk of depleting the productive potential of the stock are in the range of $F_{0.1}$–F_{max}.

Single-stock exploitation boundaries

> ICES advises on the basis of the precautionary approach to close the fishery in the fishing season 2009/2010 and to develop a recovery plan aimed at rapidly rebuilding the stock to above B_{pa}.

Exploitation boundaries in relation to existing management plans

The management objective implied in the effort management scheme is to achieve an average exploitation rate equivalent to a fishing mortality of 0.45, compared to the current estimate of 0.76 in 2008, and 0.60 for the last twelve

years. Assuming proportionality between effort and F, adherence to the management plan would imply a 25% reduction in effort for 2010 compared with the average fishing mortality the last five years.

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential, and considering ecosystem effects

The current fishing mortality estimated as 0.76, and the average F for 1997-2008 = 0.60, is well above rates that would support an optimal yield and low risk of stock depletion ($F_{0.1}$ and F_{max}).

Exploitation boundaries in relation to precautionary limits

Taking into account the current perception of the stock abundance and recruitment, fishing at any level will lead to the stock remaining below Bpa in 2011. ICES therefore recommends a closure of the fishery in the fishing season 2009/2010 and a development of a recovery plan aimed at rapidly rebuilding the stock to above B_{pa}.

Short-term implications

Outlook for 2010

Basis: F(2009) = F(2006–2008) = 0.61; SSB(2010) = 21000 t ; landings (2009) = 9000 t.

Rationale	F (2010)	Basis	SSB (2010)	Landings (2010)	SSB (2011)	% change SSB [1]
Zero catch	0	F=0	21	0	32	54
Management target ref. point	0.45	F(management plan)	21	8	24	15
Status quo	0.61	F_{sq}	21	11	22	4
Precautionary limits	0.04	$F_{pa} * 0.1$	21	1	31	51
	0.09	$F_{pa} * 0.25$	21	2	30	45
	0.18	$F_{pa} * 0.5$	21	4	28	37
	0.26	$F_{pa} * 0.75$	21	5	27	30
	0.32	$F_{pa} * 0.90$	21	6	26	25
	0.35	F_{pa}	21	7	25	22
	0.39	$F_{pa} * 1.1$	21	7	25	20
	0.44	$F_{pa} * 1.25$	21	8	24	16

Weights in '000 t. Shaded scenarios are not considered consistent with the precautionary approach.
[1] SSB 2011 relative to SSB 2010.

Management considerations

The present management has led to a fishing that is not sustainable. Fishing mortalities since 1996 have been well above Fpa and is estimated in 2008 above Flim. SSB estimated in 2009 is the lowest in the time series. Therefore ICES advices to close the cod fisheries; this advice must include all fleets presently not in the fishing days regulations, e.g. the single trawlers. Moreover, ICES recommends a rebuilding plan. A rebuilding plan should take into account that cod is a by-catch in the saithe trawl fishery and that cod and haddock are caught together in longline fisheries. The advice for saithe is not as restrictive as for cod. There can be a fishery for saithe, whereas the fishery for cod (and haddock) should be kept to a minimum. The only way to achieve this goal in the effort management system would be to close more areas for cod and haddock fishing and for a longer time than now, preferably all year round. In order to ensure future recruitment, the nursery areas close land should be closed to all commercial fishing. A recovery plan should include monitoring the trajectory of the stock, clearly stating specified reopening criteria, and monitoring the fishery when it is re-opened.

When considering future management, protection mechanisms should be included to ensure that appropriate action is taken when one or more stocks or fisheries develop in an unfavourable way.

An expected benefit of the effort management system was more stability for the fishing fleet. The fleets were expected to target the most abundant fish species, thus reducing the fishing mortality on stocks that are in bad shape. However, low prices on saithe and haddock and high prices for cod have kept the fishing mortality high on cod. Hence, targeting of cod appears to be influenced by economic factors in addition to the relative abundance of the stocks.

The effort management system needs to consider changes in catchability of the fishery. For baited hook gear, catchability is related to the amount of food available in the ecosystem. Therefore, low ecosystem production may decrease cod production and increase the catchability of longline gear. Also, the ever increasing efficiency in an effort system needs to be carefully monitored.

Factors affecting the fisheries and the stock

Regulations and their effects

An effort management system was implemented 1st of June 1996. Fishing days are allocated to all fleets fishing in shallow waters (< 380 m depth) for the period 1 September–31 August. In addition the majority of the shallow areas (< ca. 200 m) are closed for trawling, and are mainly utilized by longliners. The main spawning areas for cod are closed for nearly all fishing gears during spawning time.

Changes in fishing technology and fishing patterns

The effort management system invites improvement of fishing technology and fishing patterns. Presently, ICES is not able to quantify these changes.

Impacts of the environment on the fish stock

The productivity of the Faroe Shelf ecosystem is important to the cod stock. The recruitment depends both on the stock size and on the productive state of the Faroe Shelf ecosystem. The indices of primary production has been low since 2002 except for 2004 and 2008 when it was estimated above average. The estimate of the primary production in 2009 will not be available until July but preliminary estimates suggest it to be higher than in 2008. It will have little effect on the spawning biomass in 2011, but more effect on the total biomass. The above average primary production in 2008-2009 may also result in a reduction in the fishing mortality since most of the cod catches are taken by longlines, and it has been demonstrated that the primary production and the catchability of longlines are negatively correlated.

Scientific basis

Data and methods

The stock is assessed by an analytical method (XSA) using landings-at-age data and age-disaggregated indices from two surveys .

There are no discard data, but discarding is not considered to be a major problem in this fishery.

Uncertainties in assessment and forecast

Although there has been a tendency to underestimate SSB in recent years, there is no doubt that the stock size is among the lowest observed in the time-series. This is confirmed by the summer survey and commercial biomass indices, but the 2009 spring survey showed an increase, which was due to one extraordinary large haul.

Comparison with previous assessment and advice

The assessment and the advice are the same as last year.

Source of information

Report of the North-Western Working Group, 29 April – 5 May 2009 (ICES CM 2009/ACOM:04).

Fishing Year
Year

Fishing Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES Landings
1987	No increase in F	<31		21.4
1988	No increase in F (Revised estimate)	<29 (23)		23.2
1989	No increase in F	<19		22.1
1990	No increase in F	<20		13.5
1991	TAC	<16		8.8
1992	No increase in F	<20		6.4
1993	No fishing	0		6.1
1994	No fishing	0	8.5/12.5[1,2]	9.0
1995	No fishing	0	12.5[1]	23.0
1996	F at lowest possible level	-	20[2]	40.4
1997	80% of F(95)	<24	-	34.3
1998	30% reduction in effort from 1996/97	-	-	24.0
1999	F less than proposed F_{pa} (0.35)	<19		18.3
2000	F less than proposed F_{pa} (0.35)	<20		21.0
2001	F less than proposed F_{pa} (0.35)	<16		28.2
2002	75% of F(2000)	<22		38.5
2003	75% of F(2001)	<32		24.5
2004	25% reduction in effort	-		13.2
2005	Rebuilding plan involving large reduction	-		9.9
2006	Rebuilding plan involving large reduction	-		10.5
2007	Rebuilding plan involving large reduction in effort	-		8.1
2008	No fishing. Development of a rebuilding plan.	0		10.5
2009	No fishing. Development of a rebuilding plan.	0		
2010	No fishing. Development of a rebuilding plan.	0		

Fishing year: 1 September–31 August the following year
Weights in '000 t.
[1] In the quota year 1 September–31 August the following year.
[2] The TAC was increased during the quota year.

Faroe Plateau cod (Sub-division Vb1)

Landings

Fishing Mortality

Recruitment (age 2)

Spawning Stock Biomass
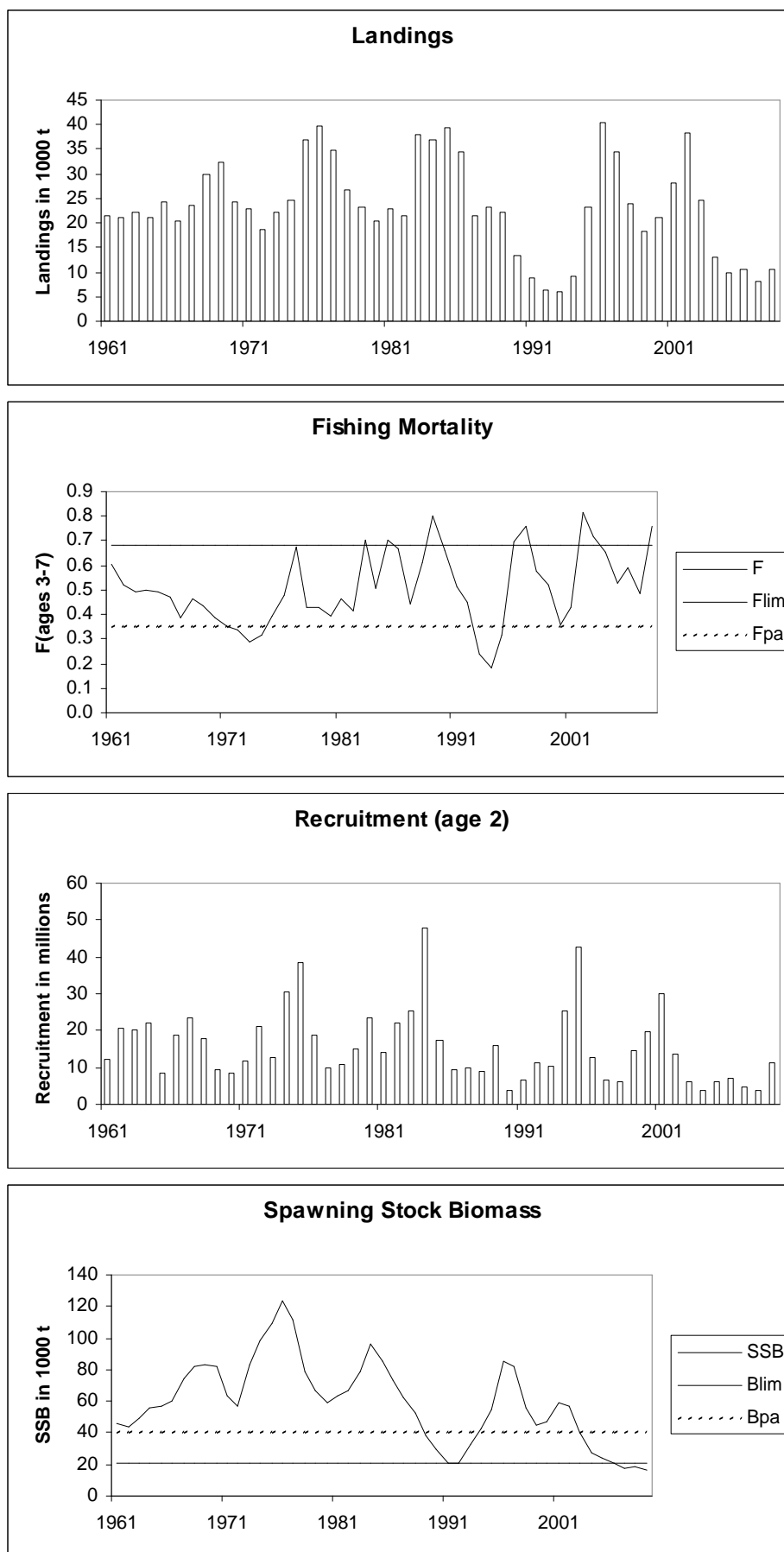

Figure 4.4.1.1   Faroe Plateau cod (Subdivision Vb₁). Landings, fishing mortality, recruitment, and SSB.
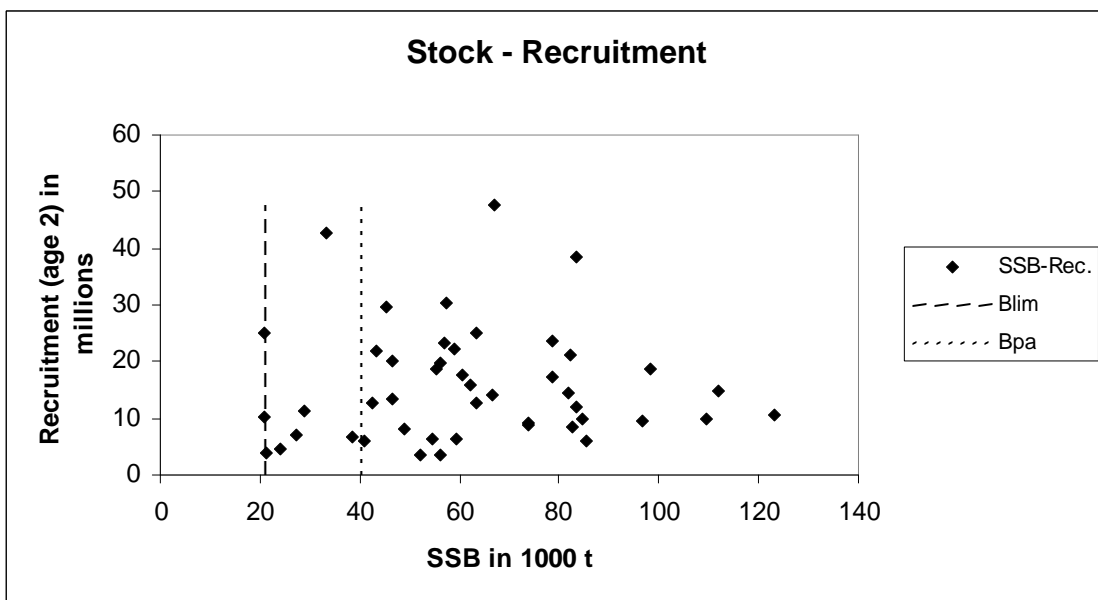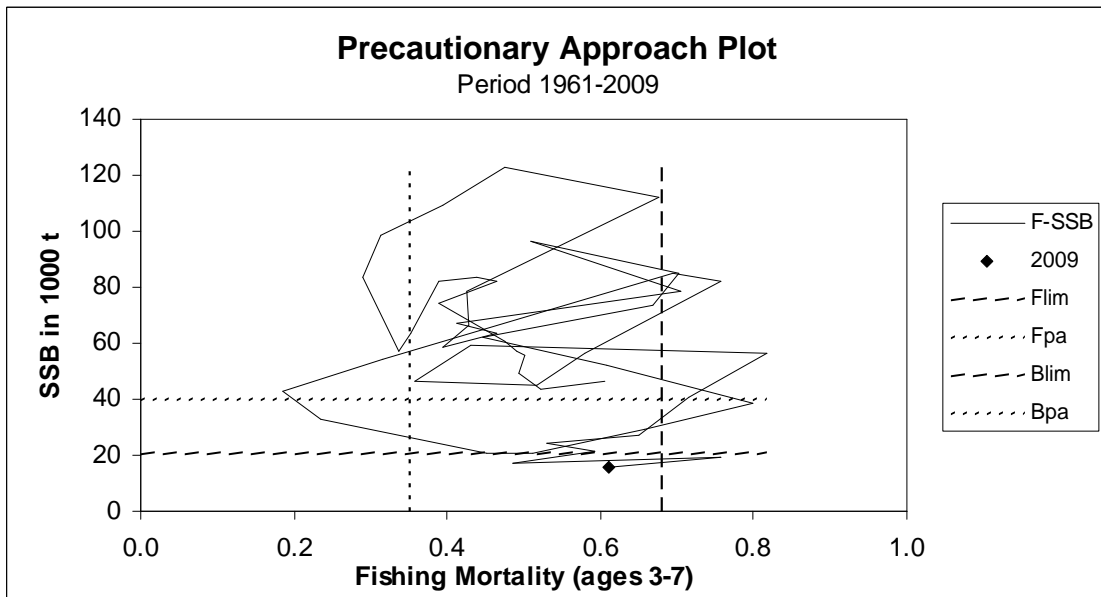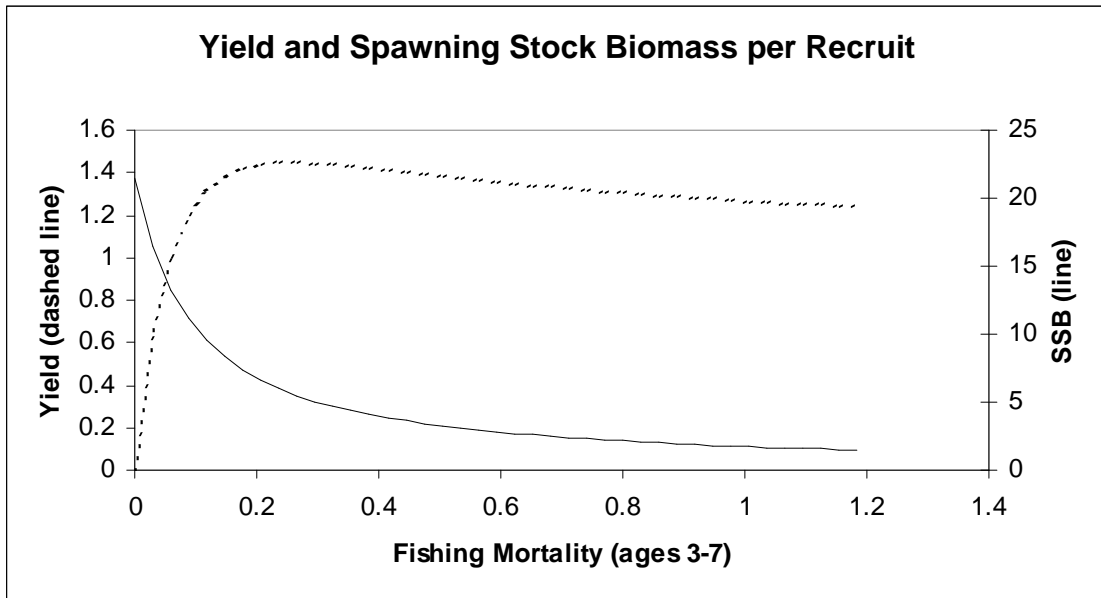
Figure 4.4.1.2   Faroe Plateau cod (Subdivision Vb1). Stock and recruitment. Yield and SSB; precautionary approach.
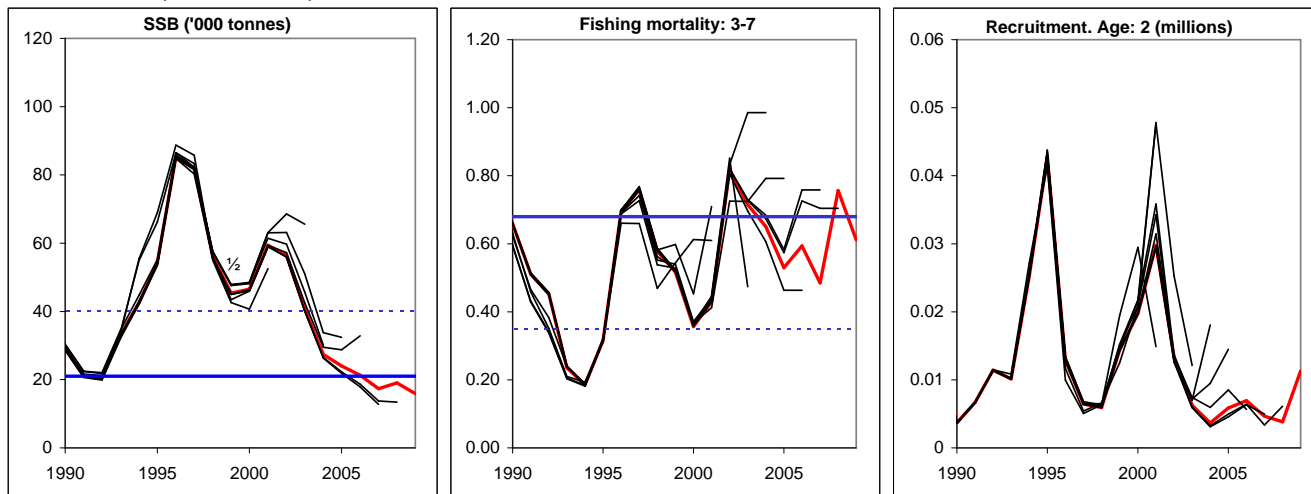
Faroe Plateau cod (Sub-division Vb1)

Figure 4.4.1.3   Faroe Plateau cod (Subdivision Vb$_1$). Historical performance of the assessments.

Table 4.4.1.1.   Faroe Plateau cod (Subdivision Vb₁).

Year	Recruitment Age 2 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1961	12019	46439	21598	0.6059
1962	20654	43326	20967	0.5226
1963	20290	49054	22215	0.4944
1964	21834	55362	21078	0.5017
1965	8269	57057	24212	0.4909
1966	18566	60629	20418	0.4743
1967	23451	73934	23562	0.3900
1968	17582	82484	29930	0.4642
1969	9325	83487	32371	0.4375
1970	8608	82035	24183	0.3882
1971	11928	63308	23010	0.3526
1972	21320	57180	18727	0.3358
1973	12573	83547	22228	0.2886
1974	30480	98434	24581	0.3139
1975	38319	109566	36775	0.3947
1976	18575	123077	39799	0.4749
1977	9995	112057	34927	0.6757
1978	10748	78497	26585	0.4259
1979	14997	66722	23112	0.4273
1980	23582	58886	20513	0.3945
1981	14000	63561	22963	0.4648
1982	22127	67031	21489	0.4138
1983	25157	78539	38133	0.7057
1984	47755	96761	36979	0.5082
1985	17314	84768	39484	0.7015
1986	9506	73664	34595	0.6694
1987	9904	62198	21391	0.4457
1988	8699	52070	23182	0.6085
1989	15979	38319	22068	0.7989
1990	3694	29045	13487	0.6584
1991	6685	21060	8750	0.5111
1992	11421	20749	6396	0.4527
1993	10129	33114	6107	0.2357
1994	25200	42583	9046	0.1860
1995	42798	54367	23045	0.3166
1996	12874	85325	40422	0.6949
1997	6458	81986	34304	0.7582
1998	5934	56096	24005	0.5786
1999	14373	45330	18306	0.5170
2000	19743	46517	21033	0.3567
2001	29783	59394	28183	0.4298
2002	13372	56355	38457	0.8166
2003	6266	40718	24501	0.7151
2004	3666	27434	13178	0.6506
2005	5875	23998	9906	0.5293
2006	6940	21328	10480	0.5936
2007	4663	17372	8009	0.4848
2008	3835	19063	10523	0.7562
2009	11321	15877		
Average	15685	59178	23017	0.5107

Table 4.4.1.2.   Faroe Plateau cod (Subdivision Vb_1). Nominal catch statistics.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	8	30	10	-	-	-	-	-	-	-	-	-	-
Faroe Islands	34,492	21,303	22,272	20,535	12,232	8,203	5,938	5,744	8,724	19,079	39,406	33,556	23,308
France	4	17	17	-	-	-[1]	3[2]	1[2]	-	2[2]	1[2]	-	-*
Germany	8	12	5	7	24	16	12	+	2[2]	2	+	+	-
Norway	83	21	163	285	124	89	39	57	36	38	507	410	405
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-
UK (E/W/NI)	-	8	-	-	-	1	74	186	56	43	126	61[2]	27[2]
UK (Scotland)	-	-	-	-	-	-	-	-	-	-	-	-	-
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,040	34,027	23,740

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
Denmark	-									
Faroe Islands	19,156		29,762	40,602	30,259	17,540	13,556	11,629	9,905	9,293
France	-*	1	9[2]	20	14	2	-	7	1[2]	
Germany	39	2	9	6	7	3[2]		1[2]		
Iceland	-	-	-	5	-					
Norway	450	374	531*	573	447	414	201	49	71	43
Greenland	-	-	-		-			5		
Portugal						1				
UK (E/W/NI)[2]	51	18	50	42	15	15	24	1	3	
UK (Scotland)[1]	-	-	-	-	-	-	-	-	358	
United Kingdom										439
Total	19,696	395	30,361	41,248	30,742	17,975	13,781	11,692	10,338	9,775

* Preliminary
[1] Included in Vb2.
[2] Reported as Vb.

Table 4.4.1.3.   Faroe Plateau cod (Subdivision Vb_1).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Officially reported	34,595	21,391	22,467	20,827	12,380	8,309	6,066	5,988	8,818	19,164	40,040	34,027	23,740
Faroese catches in IIA within Faroe area jurisdiction			715	1,229	1,090	351	154						
Expected misreporting/discard										3330			
French catches as reported to Faroese authorities				12	17								
Catches reported as Vb2:													
UK (E/W/NI)					-	-	+	1	1	-	-	-	-
UK (Scotland)					205	90	176	118	227	551	382	277	265
Used in the assessment	34,595	21,391	23,182	22,068	13,487	8,750	6,396	6,107	9,046	23,045	40,422	34,304	24,005

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008 [*]
Officially reported	19,696	395	30,361	41,248	30,742	17,975	13,781	11,692	10,338	9,775
Faroese catches in Vb1		21,793 [*]								
Correction of Faroese catches in Vb1 [1]			-1,766	-2,409	-1,795	-1,041	-804	-690	-588	-749
Correction of Faroese catches in Vb1 [2]										3,325
Faroese catch on the Faroe-Iceland ridge [3]	-1,600	-1,400	-700	-600	-4,700	-4,000	-4,200	-800	-1,800	-1,828
Greenland [3]									6	
France [3]										
Catches reported as Vb2:										
UK (E/W/NI)	-	-	-	-	-	-				
UK (Scotland)	210	245	288	218	254	244	1,129	278	53	
United Kingdom				-	-	-	-			
Used in the assessment	18,306	21,033	28,183	38,457	24,501	13,178	9,906	10,480	8,009	10,523

[*] Preliminary

[1] In order to be consistent with procedures used previous years.

[2] Data from the Coastal Guard (CG) regarded more reliable than the preliminary Statlant: 12608 - 9293 = 3325.

CG catch Vb1+Vb2 = 12756 t. CG catch Vb2 = 148 t, i.e. CG catch Vb1 = 12756-148 = 12608 t.

[3] Reported to Faroese Coastal Guard.