

## 4 Faroe Plateau cod

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### Summary

The input data consisted of the catch-at-age matrix (ages 2-10+ years) for the period 1961-2013 and two age-disaggregated abundance indices obtained from the two Faroese groundfish surveys: the spring survey 1994-2014 (shifted back to the previous year) and the summer survey 1996-2013. The maturities were obtained from the spring survey 1983-2014.

The assessment settings were the same as in the 2013 assessment. An XSA was run and tuned with the two survey indices. The fishing mortality in 2012 (average of ages 3-7 years) was estimated at 0.26, which was lower than the preliminary  $F_{msy}$  of 0.32. The total stock size (age 2+) in the beginning of 2013 was estimated at 24 600 tonnes and the spawning stock biomass at 22 600 tonnes, which was slightly above the limit biomass of 21 000 tonnes.

The short term prediction until year 2016 showed a slightly increasing total stock biomass to 27 700 and a spawning stock biomass to 24 500 tonnes.

The recruitment seems to be positively correlated with the total stock size of cod. It is, therefore, advised to reduce the fishing mortality so that the stock increases.

### 4.1 Stock description and management units

Both genetic and tagging data suggest that there are three cod stocks present in Faroese waters: on the Faroe Bank (Division Vb2), on the Faroe Plateau (Division Vb1) and on the Faroe-Iceland Ridge. Cod on the Faroe-Iceland Ridge seem to belong to the cod stock at Iceland, and the WG in 2005 decided to exclude these catches from the catch-at-age calculations. The annex provides more information.

### 4.2 Scientific data

#### 4.2.1 Trends in landings and fisheries

The landings were obtained from the Fisheries Ministry and Statistics Faroe Islands. The landings are presented in Table 4.2.1 and the working group estimates are presented in Table 4.2.2. The catches on the Faroe-Iceland Ridge, i.e. for the large single trawlers and the large longliners were not included in the catch-at-age calculations. In recent years the longliners have taken the majority of the cod catches (Table 4.2.3).

#### 4.2.2 Catch-at-age

Landings-at-age for 2013 are provided for the Faroese fishery in Table 4.2.4. Faroese landings from most of the fleet categories were sampled (Table 4.2.5). The catch-at-age is shown in Table 4.2.6. Catch curves are shown in Fig. 4.2.1. They show atypical patterns in 1996 and to some extent in 2001-2002 when there appears to be an increase over the previous year for ages where a decrease would normally have been expected. This could be due to catchability for longliners depending on fish growth, causing atypical catch curves for longliners.

#### 4.2.3 Weight-at-age

Mean weight-at-age data are provided for the Faroese fishery in Table 4.2.7. These were calculated using the length/weight relationship based on individual

length/weight measurements of samples from the landings. The sum-of-products-check for 2013 showed a discrepancy of 0 %. The weights have increased in recent years (Figure 4.2.2).

#### 4.2.4 Maturity-at-age

The proportion of mature cod by age during the Faroese groundfish surveys carried out during the spawning period (March) are given in Table 4.2.8 and in Figure 4.2.3. Full maturity is generally reached at age 5 or 6, but considerable changes have been observed in the proportion mature for younger ages between years.

#### 4.2.5 Catch, effort and research vessel data

Fisheries independent cpue series

The spring groundfish surveys in Faroese waters with the research vessel *Magnus Heinason* is used as a tuning series. The catch curves showed a normal pattern (Figure 4.2.4), i.e., a decreasing trend after age 5. The stratified mean catch of cod per unit effort (Figure 4.2.5) has been low in the recent years.

The other tuning series used is the Summer Groundfish Survey. The stratified mean catch of cod per unit effort has been low in recent years (Figure 4.2.5). The catch curves (Figure 4.2.6) show that the fish are fully recruited to the survey gear at an age of 4 or 5 years. Both tuning series are presented in Table 4.2.9 and they show that there are few small cod in the stock.

Commercial cpue series

Three commercial cpue series (longliners and pairtrawlers) are also presented (Tables 4.2.10, 4.2.11, and 4.2.12 as well as Figure 4.2.7), although they are not used as tuning series. All these series show that the incoming year classes are small. Note that the small boats (0-25 GRT) operating with longlines and jigging reels close to land have had a relatively higher cpue in recent years compared with the other cpue series and the two tuning series. When that happens, the recruitment of 2-year old cod tends to be low.

### 4.3 Information from the fishing industry

The sampling of the catches is included in the 'scientific data'. The fishing industry has since 1996 gathered data on the size composition of the landings but this information has not been used in this assessment.

### 4.4 Methods

This is an update assessment using XSA and the procedure is described in stock annex and the results of the assessment is mostly data-driven implying that there may be limited need to use other assessment methods.

### 4.5 Reference points

The reference points are dealt with in the general section of Faroese stocks. The PA reference points for Faroe Plateau cod are the following:  $B_{pa} = 40$  kt,  $B_{lim} = 21$  kt,  $F_{pa} = 0.35$  and  $F_{lim} = 0.68$ .

The reference points based on the yield-per-recruit curve are the following:  $F_{max} = 0.25$ ,  $F_{0.1} = 0.11$ ,  $F_{35\%SPR} = 0.17$ ,  $F_{med} = 0.41$ ,  $F_{low} = 0.10$ ,  $F_{high} = 0.97$ .

The group adopted in 2011 following preliminary MSY reference points:  $F_{msy} = 0.32$ , see section 4.8. The  $B_{trigger}$  was set at  $B_{pa} = 40$  kt.

#### 4.6 State of the stock – historical and compared to what is now

Since the current assessment is an update assessment, the same procedure is followed as last year: to use the two surveys for tuning. The commercial series showed a similar overall tendency as the surveys (Figure 4.2.7) but were not used in the tuning. The XSA-run (Table 4.6.1) showed that the fit between the model and the tuning series (logQ residuals, Figure 4.6.1) was rather poor for the young ages and there seemed to be both year class effects and year effects.

The results from the XSA-run shows that fishing mortality (F3-7) has decreased in recent years (down to 0.26 in 2013, Table 4.6.2, Figure 4.6.2), and other measures of fishing mortality have done so as well (Table 4.6.4, Figure 4.6.3). The population numbers, total biomass and spawning stock biomass have been low compared with other years in the series (Table 4.6.3, Table 4.6.4, Figure 4.6.2). The poor state of the stock since 2005 has been due to poor recruitment (not poor individual growth). Prior to that time, extremely weak year classes (< 5 million individuals) were only observed two times, whereas it has happened three times since 2005 (in 2011-2013). There has been a poor relationship between the size of the spawning stock and subsequent recruitment (Figure 4.6.4), since a small spawning stock biomass may be associated with low, as well as high recruitment. The spawning stock biomass in the terminal year was close to  $B_{lim}$  and the fishing mortality below  $F_{msy}$  (Figure 4.6.5).

In order to put the stock status into a wider perspective, we have estimated the stock biomass back to 1906. A cpue series (tonnes per million tonn-hours) for British trawlers 1924-1972 was available from the data presented in Jákupsstovu and Reinert (1994). The cpue series was also used, and explained, in Jones (1966). There was an overlap between the cpue series and the stock assessment for the years 1961-1972. Another cpue series (cwts per day of absence from port, 1 cwt = 50.8 kg) was available for British steam trawlers 1906-1925. The overlap was two years (1924 and 1925) and the 1906-1925 series was scaled to the 1924-1972 series. The results are presented in Figure 4.6.6. There was a decreasing trend in biomass from around 100 thousand tonnes to around 80 tonnes prior to World War II, and since then a decreasing trend from around 100 thousand tonnes to around 50 thousand tonnes. The biomass in 2012-2013 was very low compared with the entire period.

#### 4.7 Short term forecast

##### 4.7.1 Input data

The input data for the short term prediction are given in Table 4.7.1. Note the extremely weak YC2010, YC2011 and YC2012, which were set to the face value from the XSA-run, i.e., according to the Annex. Estimates of stock size (ages 3+) were taken directly from the XSA stock numbers. The exploitation pattern was estimated as the average fishing mortality for 2011-2013 and rescaled to the terminal year (because of the downward trend). The weights at age in the catches in 2014 were estimated from the spring survey (ages 4-6 years). The weights in the catches in 2015 were set to the values in 2014 and the average of 2012-2014 was expected for 2016. The proportion mature in 2013 was set to the 2013 values from the spring groundfish survey, and for 2014-2015 to the average values for 2011-2013.

#### 4.7.2 Results

The landings in 2014 are expected to be 5400 tonnes (Table 4.7.2) (the landings from the Faroe-Icelandic ridge should be added to this figure in order to get the total Faroese landings within the Vb1 area). The spawning stock biomass is expected to be 25 000 tonnes in 2014, 25 000 tonnes in 2015 and eventually 27 000 tonnes in 2016. The current short term prediction is therefore slightly optimistic. The “old” year classes (YC 2008 and YC2009) are still important for the SSB in 2015 and 2016 (Figure 4.7.1).

#### 4.8 Long term forecast

The input to the traditional long term forecast (yield per recruit) is presented in Table 4.8.1 and the result is presented in Table 4.8.2 and Figure 4.8.1.

Single species long term forecasts for Faroe Plateau cod indicated  $F_{msy}$  values lower than  $F_{pa}$ . An FLR procedure (MSE, Management strategy evaluations using FLR standard packages; a simulation of management and stock response over a 20 yr period) for Faroe Plateau cod indicates that  $F_{msy}$  is 0.32. This value (0.32) was adopted by the NWWG 2012 as a preliminary  $F_{msy}$ .

#### 4.9 Uncertainties in assessment and forecast

Since there is no incentive to discard fish or misreport catches under the effort management system, the catch figures are considered adequate, as well as the catch-at-age, although the number of otoliths should have been higher.

There was a clear retrospective pattern (Figure 4.9.1), indicating uncertainties in the assessment.

Steingrund et al. (2010) found that the recruitment of Faroe Plateau cod (age 2) could be rather precisely estimated as the ratio between cod biomass (age 3+) and the amount of cannibalistic cod in nearshore waters in June-October the previous year. This approach showed that the YC2010 and YC2011 were extremely weak (Figure 4.9.2).

#### 4.10 Comparison with previous assessment and forecast

The assessment settings were according to the Annex. The 2014 assessment was much in line with the 2013 assessment and forecast (Figure 4.10.1).

#### 4.11 Management plans and evaluations

There is no explicit management plan for this stock. A management system based on number of fishing days, closed areas and other technical measures was introduced in 1996 with the purpose to ensuring sustainable demersal fisheries in Vb. This was before ICES introduced PA and MSY reference values and at the time it was believed that the purpose was achieved, if the total allowable number of fishing days was set such, that on average 33% of the cod exploitable stock in numbers would be harvested annually. This translates into an average  $F$  of 0.45, above the  $F_{pa}$  of 0.35. ICES considers this to be inconsistent with the PA and MSY approaches. Some work has been done in the Faroes to move away from the  $F_{target}$  of 0.45 to be more consistent with the ICES advice.

#### **4.12 Management considerations**

The cod stock is assessed to be in a very poor state and is predicted to remain so for the next two years due to poor recruitment. Although the environmental conditions have been rather special since 2007 (lots of mackerel) and may partly be responsible for the poor state of the cod stock, it is certainly necessary to protect the cod stock as much as possible. The reason is not only that it may prevent a total collapse of the stock but also that the stock may recover faster in the future.

Hence, the number of fishing days should be considered and further area closures might be necessary.

#### **4.13 Ecosystem considerations**

The effects of the cod-fishery on the ecosystem (e.g. damage on the bottom) are expected to be small since the majority of the cod catch is taken by longlines. Regarding the ecosystem effects on fishing, this issue is partly addressed in the ecological modelling work presented in the overview section for Faroese stocks.

#### **4.14 Regulations and their effects**

There seems to be a poor relationship between the number of fishing days and the fishing mortality because of large fluctuations in catchability. Area restrictions may help to reduce fishing mortality, but they cause practical problems for the fishing fleets (e.g. high concentrations of vessels in certain areas). Area restrictions may be best suited to protect certain fish species/sizes in certain areas, whereas the number of fishing days remains the only tool to reduce the overall fishing mortality, given the effort management system.

The area closure (for commercial longliners close to land) introduced in July 2011 and ending in August 2013 to protect young fish has not yet resulted in strong recruitment, since the 2008 year class is below average size, and the 2009-2011 year classes either poor or exceptionally poor.

#### **4.15 Changes in fishing technology and fishing patterns**

Fishing effort per fishing day may have increased gradually since the effort management system was introduced in 1996, although little direct quantitative information exists. There also seems to have been substantial increases in fishing power when new vessels are replacing old vessels.

The fishing pattern in recent years has changed in comparison to previous years. The large longliners seem to have exploited the deep areas (> 200 m) to a larger extent (ling and tusk) because the catches in shallower waters of cod and haddock have been so poor – which was also observed in the beginning of the 1990s. This could reduce the fishing mortality on cod and haddock, but the small longliners and jiggers still exploit the shallow areas.

#### **4.16 Changes in the environment**

The primary production has been low for a number of years, albeit high in 2008 to 2010, but it is not believed that this has any relationship with a change in the environment. The temperature has been high in recent years, which may have a negative effect on cod recruitment (Planque and Fredou, 1999).

#### 4.17 References

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- Steingrund, P., Mouritsen, R., Reinert, J., Gaard, E., and Hátún, H. 2010. Total stock size and cannibalism regulate recruitment in cod (*Gadus morhua*) on the Faroe Plateau. ICES Journal of Marine Science, 67: 111-124.

**Table 4.2.1. Faroe Plateau cod (sub-division Vb1). Nominal catch (t) by countries, as officially reported to ICES.**

	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK (E/W/N)	UK (Scotland)	United Kingdom	Total
1986	8	34,492	4	8		83	-		-	-	-	34,595
1987	30	21,303	17	12		21	-		8	-	-	21,391
1988	10	22,272	17	5		163	-		-	-	-	22,467
1989	-	20,535	-	7		285	-		-	-	-	20,827
1990	-	12,232	-	24		124	-		-	-	-	12,380
1991	-	8,203	- <sup>1</sup>	16		89	-		1	-	-	8,309
1992	-	5,938	3 <sup>2</sup>	12		39	-		74	-	-	6,066
1993	-	5,744	1 <sup>2</sup>	+		57	-		186	-	-	5,988
1994	-	8,724	-	2		36	-		56	-	-	8,818
1995	-	19,079	2 <sup>2</sup>	2		38	-		43	-	-	19,164
1996	-	39,406	1 <sup>2</sup>	+		507	-		126	-	-	40,040
1997	-	33,556	-	+		410	-		61 <sup>2</sup>	-	-	34,027
1998	-	23,308	-	-		405	-		27 <sup>2</sup>	-	-	23,740
1999	-	19,156	-	39	-	450	-		51	-	-	19,696
2000	-	0	1	2	-	374	-		18	-	-	395
2001	-	29,762	9 <sup>2</sup>	9	-	531	-		50	-	-	30,361
2002	-	40,602	20	6	5	573	-		42	-	-	41,248
2003	-	30,259	14	7	-	447	-		15	-	-	30,742
2004	-	17,540	2	3 <sup>2</sup>		414	-	1	15	-	-	17,975
2005	-	13,556	-			201	-		24	-	-	13,781
2006	-	11,629	7	1 <sup>2</sup>		49	5		1	-	-	11,692
2007	-	9,905	1 <sup>2</sup>			71	7		3	358	-	10,347
2008	-	9,394	1			40				383	-	9,818
2009	-	10,736	1			14	7			300	-	11,058
2010	-	13,878	1			10				312	-	14,201
2011	-	11,348	-								-	11,348
2012	-	8,437	0		28						-	8,465
2013	-	5,706	0		20		2				-	5,728

<sup>1</sup> Preliminary, <sup>2</sup> Included in Vb2, <sup>3</sup> Reported as Vb.

**Table 4.2.2. Faroe Plateau cod (sub-division Vb1). Nominal catch (t) used in the assessment.**

	Faroesse catches:				Catches reported as Vb2:		Foreign catches:			Used in the assessment			
	Officially reported	in Vb1	Corrections in Vb1	on Faroe-Iceland ridge	in IA within Faroe area jurisdiction	UK (E/W/N)	UK (Scotland)	UK	French <sup>2</sup>		Greenland <sup>2</sup>	Russia <sup>2</sup>	UK <sup>2</sup>
1986	34595												34595
1987	21391												21391
1988	22467					715							23182
1989	20827					1229			12				22068
1990	12380					1090	-		205	17			13692
1991	8309					351	-		90				8750
1992	6066					154	+		176				6396
1993	5988							1	118				6107
1994	8818							1	227				9046
1995	19164	3330 <sup>3</sup>							551				23045
1996	40040								382				40422
1997	34027								277				34304
1998	23740								265				24005
1999	19696				-1600				210				18306
2000	395	21793 <sup>*</sup>			-1400				245				21033
2001	30361		-1766		-700				288				28183
2002	41248		-2409		-600				218	-			38457
2003	30742		-1795		-4700				254	-			24501
2004	17975		-1041		-4000				244	-			13178
2005	13781		-804		-4200				1129	-			9906
2006	11692		-690		-800				278				10480
2007	10347		-588		-1800				53		6		8018
2008	9818		-557		-1828				32				7465
2009	11058		-637		-487				38			4	10002
2010	14201		-823		-680				54		5		12757
2011	11348		-673		-918						3		9760
2012	8465		-500		-760						5		7210
2013	5728 <sup>*</sup>		-339		-387							0.2	5002

<sup>1</sup> Preliminary, <sup>2</sup> In order to be consistent with procedures used previous years, <sup>3</sup> Reported to Faroesse Coastal Guard, <sup>4</sup> expected misreporting/discard.

**Table 4.2.3. Faroe Plateau cod (sub-division Vb1). The landings of Faroese fleets (in percents) of total catch (t). Note that the catches on the Faroe-Iceland ridge (mainly belonging to single trawlers > 1000 HP) are included in this table, but excluded in the XSA-run.**

Year	Open boats	Longliners <100 GRT	Singletrawl <400 HP	Gill net	Jiggers	Singletrawl 400-1000 HP	Singletrawl >1000 HP	Pairtrawl <1000 HP	Pairtrawl >1000 HP	Longliners >100 GRT	Industrial trawlers	Others	Faroe catch Round.weight
1985	16.0	27.2	6.7	0.6	4.3	7.9	11.2	12.3	5.6	7.5	0.2	0.6	39,422
1986	9.5	15.1	5.1	1.3	2.9	6.2	8.5	29.6	14.9	5.1	0.4	1.3	34,492
1987	9.9	14.8	6.2	0.5	2.9	6.7	8.0	26.0	14.5	9.9	0.5	0.1	21,303
1988	2.6	13.8	4.9	2.6	7.5	7.4	6.8	25.3	15.6	12.7	0.6	0.2	22,272
1989	4.4	29.0	5.7	3.2	9.3	5.7	5.5	10.5	8.3	17.7	0.7	0.0	20,535
1990	3.9	35.5	4.8	1.4	8.2	3.7	4.3	7.1	10.5	19.6	0.6	0.2	12,232
1991	4.3	31.6	7.1	2.0	8.0	3.4	4.7	8.3	12.9	17.2	0.6	0.1	8,203
1992	2.6	26.0	6.9	0.0	7.0	2.2	3.6	12.0	20.8	13.4	5.0	0.4	5,938
1993	2.2	16.0	15.4	0.0	9.0	4.1	3.6	14.2	21.7	12.6	0.8	0.4	5,744
1994	3.1	13.4	9.6	0.5	19.2	2.7	5.3	8.3	23.7	13.7	0.5	0.1	8,724
1995	4.2	17.9	6.5	0.3	24.9	4.1	4.7	6.4	12.3	18.5	0.1	0.0	19,079
1996	4.0	19.0	4.0	0.0	20.0	3.0	2.0	8.0	19.0	21.0	0.0	0.0	39,406
1997	3.1	28.4	4.4	0.5	9.8	5.1	2.9	4.8	11.3	29.7	0.0	0.1	33,556
1998	2.4	31.2	6.0	1.3	6.5	6.3	5.5	3.1	8.6	29.1	0.1	0.0	23,308
1999	2.7	24.0	5.4	2.3	5.4	5.2	11.8	6.4	14.5	21.9	0.4	0.1	19,156
2000	2.3	19.3	9.1	0.9	10.5	9.6	12.7	5.7	13.9	15.7	0.1	0.1	21,793
2001	3.7	28.3	7.4	0.2	15.6	6.4	6.4	5.2	9.2	17.8	0.0	0.0	28,838
2002	3.8	32.9	5.8	0.3	9.9	6.7	6.6	2.5	7.2	24.4	0.0	0.0	38,347
2003	4.9	28.7	4.0	1.5	7.4	3.0	14.4	2.2	7.4	26.5	0.0	0.0	29,382
2004	4.4	31.1	2.1	0.5	6.6	1.6	12.9	2.2	11.7	26.8	0.0	0.0	16,772
2005	3.7	27.5	5.1	0.8	5.4	2.4	28.1	1.7	6.4	18.8	0.0	0.0	15,472
2006	6.2	35.0	3.2	0.2	7.1	1.6	12.9	2.5	6.6	24.7	0.0	0.0	8,636
2007	5.1	28.2	2.6	0.3	6.1	1.7	17.5	1.7	4.8	32.0	0.0	0.0	8,866
2008	5.1	32.7	4.7	0.7	6.4	3.2	14.6	1.0	3.1	28.6	0.0	0.0	7,666
2009	6.9	41.6	4.3	0.3	10.1	2.5	1.9	2.8	6.5	23.0	0.0	0.0	7,146
2010	6.2	31.9	2.7	0.0	12.6	1.3	1.4	3.4	9.6	30.8	0.0	0.0	10,258
2011	3.6	26.5	3.4	0.1	6.7	1.3	1.4	3.1	21.9	31.9	0.0	0.0	9,502
2012	2.7	23.5	4.9	0.0	5.3	1.1	2.6	5.3	21.5	32.9	0.0	0.0	6,378
2013	4.6	26.3	6.3	0.2	8.0	2.3	2.0	4.0	15.9	30.2	0.0	0.0	4,749
Average	4.8	26.1	5.7	0.8	9.1	4.1	7.7	7.8	12.4	21.2	0.4	0.1	

**Table 4.2.4. Faroe Plateau cod (sub-division Vb1). Catch in numbers at age per fleet in terminal year. Numbers are in thousands and the catch is in tonnes, gutted weight.**

Age/Fleet	Open boat	Longliners < 100 GRT	Jiggers	Single trwl 0-399HP	Single trwl 400-1000H	Single trwl > 1000 HP	Pair trwl 700-999 HP	Pair trwl > 1000 HP	Longliners > 100 GRT	Gillnetters	Others (scaling)	Catch-at-age
2	0	51	7	0	3	0	0	3	1	0	-3	62
3	0	137	25	0	19	2	1	9	16	0	-15	194
4	0	178	44	0	42	16	5	55	61	0	-29	372
5	0	296	77	0	88	29	8	99	109	0	-49	657
6	0	66	19	0	22	12	3	38	52	0	-16	196
7	0	11	4	0	6	2	1	7	17	0	-5	43
8	0	10	2	0	2	1	0	2	12	0	-1	28
9	0	5	2	0	2	0	0	2	6	0	0	17
10+	0	1	0	0	0	0	0	1	4	0	0	6
Sum	0	755	180	0	184	62	18	216	278	0	-118	1575
G.weight	0	1323	345	0	366	201	59	680	678	0	854	4506

Others include gillnetters, industrial bottom trawlers, longlining for halibut, foreign fleets, and scaling to correct catch. Gutted total catch is calculated as round weight divided by 1.11.



**Table 4.2.5. Faroe Plateau cod (sub-division Vb1). Number of samples, lengths, otoliths, and individual weights in terminal year.**

Fleet	Size	Samples	Lengths	Otoliths	Weights
Open boats		5	696	180	696
Longliners	<100 GRT	2	389	59	389
Longliners	>100 GRT	15	2,995	420	2,995
Jiggers		0	0	0	0
Gillnetters		0	0	0	0
Sing. traw lers	<400 HP	0	0	0	0
Sing. traw lers	400-1000 HP	17	3,604	540	3,604
Sing. traw lers	>1000 HP	0	0	0	0
Pair traw lers	<1000 HP	2	385	60	385
Pair traw lers	>1000 HP	26	4,815	779	4,252
<b>Total</b>		<b>67</b>	<b>12,884</b>	<b>2,038</b>	<b>12,321</b>

**Table 4.2.6. Faroe Plateau cod (sub-division Vb1). Catch in numbers at age used in the XSA model.**

Year	Age									
	1	2	3	4	5	6	7	8	9	10+
1961	0	3093	2686	1331	1066	232	372	78	29	0
1962	0	4424	2500	1255	855	481	93	94	22	0
1963	0	4110	3958	1280	662	284	204	48	30	0
1964	0	2033	3021	2300	630	350	158	79	41	0
1965	0	852	3230	2564	1416	363	155	48	63	0
1966	0	1337	970	2080	1339	606	197	104	33	0
1967	0	1609	2690	860	1706	847	309	64	27	0
1968	0	1529	3322	2663	945	1226	452	105	11	0
1969	0	878	3106	3300	1538	477	713	203	92	0
1970	0	402	1163	2172	1685	752	244	300	44	0
1971	0	328	757	821	1287	1451	510	114	179	0
1972	0	875	1176	810	596	1021	596	154	25	0
1973	0	723	3124	1590	707	384	312	227	120	97
1974	0	2161	1266	1811	934	563	452	149	141	91
1975	0	2584	5689	2157	2211	813	295	190	118	150
1976	0	1497	4158	3799	1380	1427	617	273	120	186
1977	0	425	3282	6844	3718	788	1160	239	134	9
1978	0	555	1219	2643	3216	1041	268	201	66	56
1979	0	575	1732	1673	1601	1906	493	134	87	38
1980	0	1129	2263	1461	895	807	832	339	42	18
1981	0	646	4137	1981	947	582	487	527	123	55
1982	0	1139	1965	3073	1286	471	314	169	254	122
1983	0	2149	5771	2760	2746	1204	510	157	104	102
1984	0	4396	5234	3487	1461	912	314	82	34	66
1985	0	998	9484	3795	1669	770	872	309	65	80
1986	0	210	3586	8462	2373	907	236	147	47	38
1987	0	257	1362	2611	3083	812	224	68	69	26
1988	0	509	2122	1945	1484	2178	492	168	33	25
1989	0	2237	2151	2187	1121	1026	997	220	61	9
1990	0	247	2892	1504	865	410	298	295	51	26
1991	0	192	451	2152	622	303	142	93	53	24
1992	0	205	455	466	911	293	132	53	30	34
1993	0	120	802	603	222	329	96	33	22	25
1994	0	573	788	1062	532	125	176	39	23	16
1995	0	2615	2716	2008	1012	465	118	175	44	49
1996	0	351	5164	4608	1542	1526	596	147	347	47
1997	0	200	1278	6710	3731	657	639	170	51	120
1998	0	455	745	1558	5140	1529	159	118	28	25
1999	0	1185	993	799	1107	2225	439	59	17	7
2000	0	2091	2637	782	426	674	809	104	7	1
2001	0	3912	3759	2101	367	367	718	437	36	6
2002	0	2079	7283	3372	1671	470	533	413	290	7

Age										
Year	1	2	3	4	5	6	7	8	9	10+
2003	0	678	2128	4572	1927	640	177	91	115	20
2004	0	100	691	1263	2105	736	240	65	42	37
2005	0	494	592	877	1122	823	204	41	19	30
2006	0	1182	1168	499	706	852	355	81	11	3
2007	0	540	1309	771	337	308	273	91	21	3
2008	0	293	776	799	439	191	160	159	58	20
2009	0	875	2267	863	619	297	85	55	43	17
2010	0	2113	2034	861	468	481	178	58	33	38
2011	0	330	2360	1242	367	189	127	50	19	2
2012	0	49	518	1348	556	201	99	69	25	22
2013	0	62	194	372	657	196	43	28	17	6

**Table 4.2.7. Faroe Plateau cod (sub-division Vb1). Mean weight at age (kg) in the catches.**

Age										
Year	1	2	3	4	5	6	7	8	9	10+
1961	0	1.080	2.220	3.450	4.690	5.520	7.090	9.910	8.030	10.270
1962	0	1.000	2.270	3.350	4.580	4.930	9.080	6.590	6.660	10.270
1963	0	1.040	1.940	3.510	4.600	5.500	6.780	8.710	11.720	10.820
1964	0	0.970	1.830	3.150	4.330	6.080	7.000	6.250	6.190	14.390
1965	0	0.920	1.450	2.570	3.780	5.690	7.310	7.930	8.090	11.110
1966	0	0.980	1.770	2.750	3.510	4.800	6.320	7.510	10.340	11.650
1967	0	0.960	1.930	3.130	4.040	4.780	6.250	7.000	11.010	10.690
1968	0	0.880	1.720	3.070	4.120	4.650	5.500	7.670	10.950	9.280
1969	0	1.090	1.800	2.850	3.670	4.890	5.050	7.410	8.660	14.390
1970	0	0.960	2.230	2.690	3.940	5.140	6.460	10.310	7.390	9.340
1971	0	0.810	1.800	2.980	3.580	3.940	4.870	6.480	6.370	10.220
1972	0	0.660	1.610	2.580	3.260	4.290	4.950	6.480	6.900	11.550
1973	0	1.110	2.000	3.410	3.890	5.100	5.100	6.120	8.660	7.570
1974	0	1.080	2.220	3.440	4.800	5.180	5.880	6.140	8.630	7.620
1975	0	0.790	1.790	2.980	4.260	5.460	6.250	7.510	7.390	8.170
1976	0	0.940	1.720	2.840	3.700	5.260	6.430	6.390	8.550	13.620
1977	0	0.870	1.790	2.530	3.680	4.650	5.340	6.230	8.380	10.720
1978	0	1.112	1.385	2.140	3.125	4.363	5.927	6.348	8.715	12.229
1979	0	0.897	1.682	2.211	3.052	3.642	4.719	7.272	8.368	13.042
1980	0	0.927	1.432	2.220	3.105	3.539	4.392	6.100	7.603	9.668
1981	0	1.080	1.470	2.180	3.210	3.700	4.240	4.430	6.690	10.000
1982	0	1.230	1.413	2.138	3.107	4.012	5.442	5.563	5.216	6.707
1983	0	1.338	1.950	2.403	3.107	4.110	5.020	5.601	8.013	8.031
1984	0	1.195	1.888	2.980	3.679	4.470	5.488	6.466	6.628	10.981
1985	0	0.905	1.658	2.626	3.400	3.752	4.220	4.739	6.511	10.981
1986	0	1.099	1.459	2.046	2.936	3.786	4.699	5.893	9.700	8.815
1987	0	1.093	1.517	2.160	2.766	3.908	5.461	6.341	8.509	9.811
1988	0	1.061	1.749	2.300	2.914	3.109	3.976	4.896	7.087	8.287
1989	0	1.010	1.597	2.200	2.934	3.468	3.750	4.682	6.140	9.156

Year	Age									
	1	2	3	4	5	6	7	8	9	10+
1990	0	0.945	1.300	1.959	2.531	3.273	4.652	4.758	6.704	8.689
1991	0	0.779	1.271	1.570	2.524	3.185	4.086	5.656	5.973	8.147
1992	0	0.989	1.364	1.779	2.312	3.477	4.545	6.275	7.619	9.725
1993	0	1.155	1.704	2.421	3.132	3.723	4.971	6.159	7.614	9.587
1994	0	1.194	1.843	2.613	3.654	4.584	4.976	7.146	8.564	8.796
1995	0	1.218	1.986	2.622	3.925	5.180	6.079	6.241	7.782	8.627
1996	0	1.016	1.737	2.745	3.800	4.455	4.978	5.270	5.593	7.482
1997	0	0.901	1.341	1.958	3.012	4.158	4.491	5.312	6.172	7.056
1998	0	1.004	1.417	1.802	2.280	3.478	5.433	5.851	7.970	8.802
1999	0	1.050	1.586	2.350	2.774	3.214	5.496	8.276	9.129	10.652
2000	0	1.416	2.170	3.187	3.795	4.048	4.577	8.182	11.895	13.009
2001	0	1.164	2.076	3.053	3.976	4.394	4.871	5.563	7.277	12.394
2002	0	1.017	1.768	2.805	3.529	4.095	4.475	4.650	6.244	7.457
2003	0	0.820	1.362	2.127	3.329	4.092	4.670	6.000	6.727	6.810
2004	0	1.037	1.154	1.693	2.363	3.830	5.191	6.326	7.656	9.573
2005	0	0.986	1.373	1.760	2.293	3.138	5.287	8.285	8.703	9.517
2006	0	0.839	1.304	1.988	2.386	3.330	4.691	7.635	9.524	11.990
2007	0	0.937	1.324	1.970	3.076	3.529	4.710	6.464	9.461	9.509
2008	0	1.209	1.478	2.104	2.714	3.804	4.669	5.915	7.233	9.559
2009	0	0.805	1.431	2.287	2.723	3.435	5.081	6.281	8.312	9.959
2010	0	1.049	1.642	2.400	3.212	3.678	4.774	5.973	7.094	9.800
2011	0	0.815	1.367	2.413	3.493	4.525	5.076	6.631	6.863	10.089
2012	0	1.007	1.315	1.893	3.102	4.279	5.573	5.871	7.482	9.206
2013	0	1.011	1.527	2.528	3.18	4.672	6.776	6.966	9.028	10.324

**Table 4.2.8. Faroe Plateau cod (sub-division Vb1). Proportion mature at age. From 1961-1982 the average from 1983-1996 is used (as it was used in the 1990s).**

Year	Age									
	1	2	3	4	5	6	7	8	9	10+
1961	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1962	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1963	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1964	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1965	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1966	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1967	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1968	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1969	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1970	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1971	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1972	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1973	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1974	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1975	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1976	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1977	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1978	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1979	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1980	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1981	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1982	0.00	0.17	0.64	0.87	0.95	1.00	1.00	1.00	1.00	1.00
1983	0.00	0.03	0.71	0.93	0.94	1.00	1.00	1.00	1.00	1.00
1984	0.00	0.07	0.96	0.98	0.97	1.00	1.00	1.00	1.00	1.00
1985	0.00	0.00	0.50	0.96	0.96	1.00	1.00	1.00	1.00	1.00
1986	0.00	0.00	0.38	0.93	1.00	1.00	0.96	0.94	1.00	1.00
1987	0.00	0.00	0.67	0.91	1.00	1.00	1.00	1.00	1.00	1.00
1988	0.00	0.06	0.72	0.90	0.97	1.00	1.00	1.00	1.00	1.00
1989	0.00	0.05	0.54	0.98	1.00	1.00	1.00	1.00	1.00	1.00
1990	0.00	0.00	0.68	0.90	0.99	0.96	0.98	1.00	1.00	1.00
1991	0.00	0.00	0.72	0.86	1.00	1.00	1.00	1.00	1.00	1.00
1992	0.00	0.06	0.50	0.82	0.98	1.00	1.00	1.00	1.00	1.00
1993	0.00	0.03	0.73	0.78	0.91	0.99	1.00	1.00	1.00	1.00
1994	0.00	0.05	0.33	0.88	0.96	1.00	0.96	1.00	1.00	1.00
1995	0.00	0.09	0.35	0.33	0.66	0.97	1.00	1.00	1.00	1.00
1996	0.00	0.04	0.43	0.74	0.85	0.94	1.00	1.00	1.00	1.00
1997	0.00	0.00	0.64	0.91	0.97	1.00	1.00	1.00	1.00	1.00
1998	0.00	0.00	0.62	0.90	0.99	0.99	1.00	1.00	1.00	1.00
1999	0.00	0.02	0.43	0.88	0.98	1.00	1.00	1.00	1.00	1.00
2000	0.00	0.02	0.39	0.69	0.92	0.99	1.00	1.00	1.00	1.00
2001	0.00	0.07	0.47	0.86	0.94	1.00	1.00	1.00	1.00	1.00

Year	Age									
	1	2	3	4	5	6	7	8	9	10+
2002	0.00	0.04	0.37	0.76	0.97	0.93	0.97	1.00	1.00	1.00
2003	0.00	0.00	0.29	0.79	0.88	0.98	1.00	1.00	1.00	1.00
2004	0.00	0.00	0.51	0.78	0.92	0.89	0.87	1.00	1.00	1.00
2005	0.00	0.05	0.66	0.90	0.93	0.98	0.92	1.00	1.00	1.00
2006	0.00	0.04	0.59	0.80	0.99	0.99	1.00	1.00	1.00	1.00
2007	0.00	0.00	0.47	0.78	0.91	0.99	0.97	1.00	1.00	1.00
2008	0.00	0.10	0.78	0.91	0.90	0.95	1.00	1.00	1.00	1.00
2009	0.00	0.09	0.61	0.81	0.96	0.94	0.96	1.00	1.00	1.00
2010	0.00	0.08	0.61	0.77	0.94	0.97	1.00	1.00	1.00	1.00
2011	0.00	0.06	0.51	0.69	0.84	0.93	0.98	1.00	1.00	1.00
2012	0.00	0.00	0.63	0.85	0.94	0.97	1.00	1.00	1.00	0.83
2013	0.00	0.24	0.82	0.95	0.98	1.00	1.00	1.00	1.00	1.00

**Table 4.2.9. Faroe Plateau cod (sub-division Vb1). Summer survey tuning series (number of individuals per 200 stations) and spring survey tuning series (number of individuals per 100 stations) used as tuning series in the XSA model.**

FAROE PLATEAU COD (ICES SUBDIVISION VB1) Surveys\_revised.TXT

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SUMMER SURVEY

1996 2013

1 1 0.6 0.7

2 8

200	707	6576.5	3705.1	1298.1	701.5	233.1	48.5
200	512.7	1500.7	6754.6	1466.6	178.4	137.8	30.1
200	524.9	505.1	979.4	3675.2	902.6	50	37
200	373.3	1256.8	753.1	675.3	1422.5	238	40.4
200	1364.1	1153.3	673.8	309.6	436.9	600.8	35.4
200	3422.1	2458.7	1537.8	415.9	234.8	283	242
200	2326	5562.9	1816.5	810.8	147.7	83.3	69.5
200	354	1038.8	2209.2	565.9	123.4	17.6	11.9
200	437	839.9	1080.2	1550.2	344.2	80.2	25.7
200	616.5	735.1	872.1	1166.3	756	142.5	44.8
200	978.4	684.2	349.3	312	256.6	123	28.2
200	234.1	448.7	314.2	179.7	134.5	75.9	30.9
200	68.8	370.1	328	401.2	160.1	52.4	27.5
200	428.2	1980.6	817.7	551.4	393.1	132.1	47.8
200	1239.3	1543.9	1012	363.4	243.6	148.9	41.5
200	301.7	1373.6	1084.2	380.1	160.6	104.6	37.4
200	22.1	230.8	1081.8	511.7	88.4	35.8	19.5
200	101.7	205.9	209.3	888.4	542.5	104.2	43.9

SPRING SURVEY (shifted back to december)

1993 2013

1 1 0.9 1.0

1 8

100	612.5	336.9	912.8	508.5	129.7	187.2	28.6	0.1
100	623.2	845.7	1528.4	1525.2	1191.4	285.6	350.8	48.9
100	215.5	4043.9	3984.4	1892.1	1372	420.8	82.8	169.7
100	72.5	834.4	5398.3	2359.5	333.9	227	58.8	5.3
100	69.7	425.2	1572.1	4919.3	1136	82.3	40.7	35.2

100	704.7	674.9	991.3	1225.2	2079.2	252.1	25.2	13.4
100	316	1432.4	746.1	441	506.7	836.7	63.8	3.1
100	938.4	2387.8	1993.8	456.2	324.4	578.6	128.6	3.9
100	383	4564.1	2892.1	1579.7	331.9	231.8	178.9	131.9
100	90.2	719	3915	1260.4	528.7	67.4	51.7	39.7
100	609.5	575.8	844.6	1175.1	292.9	66	22.2	11.9
100	383.1	438.2	1151.7	1440.2	844.5	140.6	14	3.8
100	167.5	156.7	177.3	360.1	292	95	15.5	4
100	41.1	270.9	286.6	155.2	170.4	105.1	37.8	14.4
100	176.6	474.5	851.9	479.2	151.5	83.9	39.4	13.3
100	307.8	475.5	977.7	1159.1	427.3	73.7	31.6	24.9
100	697.6	1318.8	745.6	538.1	381	98.9	41	17.2
100	148.4	1319	1240.3	562.4	300.2	237.8	85.2	21.9
100	41.1	273.8	1303.8	326.7	73.6	27	23.7	6.2
100	68	377.6	1699.8	2053.2	295.6	32.6	22.4	17.7
100	130.9	113.4	159.6	419.7	333	74.8	22	13.6



**Table 4.2.10. Faroe Plateau cod (sub-division Vb1). Pair trawler abundance index (number of individuals per 1000 fishing hours). This series was not used in the tuning of the XSA. The season is June – December. The otoliths are selected from deep (> 150 m) locations.**

Year	Age							
	2	3	4	5	6	7	8	9
1989	1200	1638	1783	1381	928	719	297	194
1990	116	2856	2057	834	465	419	200	0
1991	8	148	1401	869	329	225	65	93
1992	84	487	696	1234	760	353	129	62
1993	51	1081	2192	746	1062	398	67	107
1994	1314	2129	1457	2208	697	1241	461	53
1995	577	3645	5178	4199	2769	543	539	106
1996	242	10608	16683	7985	4410	194	0	723
1997	28	674	6038	9375	2413	944	113	0
1998	80	731	1805	5941	4904	801	286	0
1999	444	2082	1933	3008	5136	2220	218	4
2000	3478	3956	1737	956	1003	1694	382	0
2001	3385	6700	3009	555	415	797	862	25
2002	571	6409	5019	1235	432	400	41	228
2003	63	1341	4450	3630	870	270	152	145
2004	23	0	278	2534	2831	1733	274	184
2005	42	399	655	1766	2171	860	148	70
2006	93	135	699	755	1580	612	787	71
2007	64	916	1767	1392	802	656	206	46
2008	54	295	418	573	387	456	487	182
2009	11	734	801	756	448	247	147	105
2010	1578	2917	1787	543	603	190	0	81
2011	22	1487	4078	1967	622	441	95	25
2012	0	95	1531	1789	950	223	40	107
2013	35	102	761	1583	670	103	57	36

**Table 4.2.11. Faroe Plateau cod (sub-division Vb1). Longliner abundance index (number of individuals per 100 000 hooks). This series was not used in the tuning of the XSA. The age composition was obtained from all longliners > 100 GRT. The area was restricted to the area west of Faroe Islands at depths between 100 and 200 m.**

Year	Age							
	1	2	3	4	5	6	7	8
1993	405	2610	9306	3330	806	2754	847	258
1994	101	8105	14105	7863	4659	962	1187	71
1995	0	15249	23062	2895	2505	1568	708	1073
1996	0	2269	18658	13265	4153	8435	4513	1147
1997	0	1738	5837	26368	18089	2805	2807	402
1998	1892	4490	2025	2565	11738	2732	131	19
1999	849	10968	3811	985	1891	3759	548	109
2000	2695	10983	6710	998	780	1473	2136	109
2001	287	12999	7409	2660	515	1135	1808	2545
2002	105	6862	20902	10819	7759	1561	1945	1265
2003	16	2099	6057	15910	7778	1830	708	650
2004	59	510	1773	2438	3214	1059	293	71
2005	297	2169	1543	2313	2327	1360	170	13
2006	151	5813	5319	674	2205	2352	1148	56
2007	274	3578	6383	2778	1927	1159	1118	134
2008	1270	2243	4449	4773	2564	1133	816	716
2009	294	2670	15107	6308	3028	2491	683	132
2010	23	20287	16914	8733	2595	4780	1878	864
2011	160	2817	28218	14391	4295	2207	1252	195
2012	0	1833	9562	8309	2364	1296	403	197
2013	0	53	214	2946	5237	2709	1247	366

**Table 4.2.12. Longliner abundance index (number of individuals per day) for longliners < 25 GRT operating mainly near shore. This series was not used in the tuning of the XSA. The age composition was obtained from all longliners.**

Year	Age							
	1	2	3	4	5	6	7	8
1983	0.9	7.5	4.7	3.8	1.6	0.9	0.5	0.2
1984	0	33.3	32.1	13.2	5.8	6.3	1	0.7
1985	0	3.4	45.8	32.1	23.2	12.9	17.9	5.3
1986	0	5.4	40.4	23.3	14.9	6.6	6	2.1
1987	0	6.2	10.3	15.2	25.2	11.3	4.8	0.8
1988	0	2.5	5.1	10.5	6.9	15.4	5.2	2.1
1989	0	30.9	15.1	14.5	9.8	5.3	11.4	1.6
1990	0	6.4	32.6	7	9.9	5.2	6.3	3.4
1991	0	0	4.5	23.4	7.6	3.4	2.1	0.6
1992	0	5.8	15.9	6.4	3.6	3.4	1.7	1.3
1993	0.4	4.8	20	7.5	1.5	1.4	0.3	1.3
1994	0	13.1	16.2	13.6	5.8	1.8	2.3	0.4
1995	0	44.7	39.9	10.2	7	4.3	1.6	2.6
1996	0	5.8	75	51.2	12.9	28.3	14.1	4.1
1997	0	4.4	15.8	68.3	51.8	7.5	7.3	0.8
1998	4.8	10.1	4.7	6.8	27.6	8.2	0.3	0.3
1999	0.2	23.2	7.9	3.7	5.5	12.6	2	0
2000	5.4	22.5	13.1	0.7	0.7	1.3	2.3	0.3
2001	0.5	82.8	41.7	14.6	2.5	4.9	10.8	11.1
2002	0.1	38.5	78.7	35.2	24.3	5.9	9.3	5.5
2003	0	14.8	31.6	89.8	49.9	10.9	3.4	1.3
2004	0	5.2	16.1	15.7	23.2	6.1	0.2	0
2005	0.4	8.9	12.5	11.2	19.9	9.4	0.9	0
2006	1.4	40.7	32.6	6.3	7.3	9.5	2.8	0.3
2007	0.1	8.8	18.2	7	3.3	3.8	2.8	0.5
2008	0.3	3	14.2	18.4	12.5	2.9	1.3	1.8
2009	1.1	11.4	52.7	19.6	11.6	8	3.3	2
2010	1.4	72.9	79	33.5	14.7	15.3	4.6	1
2011	0	17.9	142.3	59.1	22.9	14.1	7.7	1.8
2012	0.3	4.6	39.3	59.0	15.1	5.2	2.6	1.3
2013	0.1	2.8	4.1	10.8	9.9	1.3	0.5	0.0

**Table 4.6.1. Faroe Plateau cod (sub-division Vb1). The XSA-run.**

Lowestoft VPA Version 3.1

22/04/2014 7:26

Extended Survivors Analysis

COD FAROE PLATEAU (ICES SUBDIVISION Vb1)  
 COD\_ind\_Surveys\_revised

CPUE data from file Surveys\_revised\_1replacedvalue.TXT

Catch data for 53 years. 1961 to 2013. Ages 1 to 10.

Fleet	First year	Last year	First age	Last age	Alpha	Beta
SUMMER SURVEY	1996	2013	2	8	.600	.700
SPRING SURVEY (shift	1993	2013	1	8	.900	1.000

Time series weights :

Tapered time weighting not applied

Catchability analysis :

Catchability independent of stock size for all ages

Catchability independent of age for ages  $\geq 6$

Terminal population estimation :

Survivor estimates shrunk towards the mean F

of the final 5 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = 2.000

Minimum standard error for population

estimates derived from each fleet = .300

Prior weighting not applied

Tuning had not converged after 30 iterations

Total absolute residual between iterations

29 and 30 = .00010

Final year F values

Age	1	2	3	4	5	6	7	8	9
Iteration 29	.0000	.0423	.2079	.2742	.2731	.2452	.2920	.3392	.5751
Iteration 30	.0000	.0423	.2079	.2742	.2731	.2452	.2920	.3391	.5752

Regression weights

1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Fishing mortalities

Age	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
2	.031	.093	.188	.124	.051	.112	.193	.106	.038	.042
3	.186	.256	.332	.328	.263	.677	.412	.344	.242	.208
4	.298	.381	.357	.382	.341	.525	.596	.479	.338	.274
5	.755	.472	.609	.438	.390	.486	.611	.551	.409	.273
6	.987	.773	.819	.592	.478	.501	.901	.537	.678	.245
7	1.135	.844	.952	.686	.719	.406	.647	.638	.606	.292
8	1.064	.581	1.030	.689	1.206	.584	.539	.375	.898	.339
9	2.061	1.132	.298	.844	1.481	1.484	.869	.337	.325	.575

XSA population numbers (Thousands)

YEAR	AGE								
	1	2	3	4	5	6	7	8	9
2004	7.49E+03	3.65E+03	4.50E+03	5.42E+03	4.39E+03	1.30E+03	3.91E+02	1.10E+02	5.32E+01
2005	9.32E+03	6.13E+03	2.90E+03	3.06E+03	3.30E+03	1.69E+03	3.96E+02	1.03E+02	3.10E+01
2006	6.26E+03	7.63E+03	4.57E+03	1.83E+03	1.71E+03	1.68E+03	6.39E+02	1.39E+02	4.71E+01
2007	8.00E+03	5.13E+03	5.18E+03	2.69E+03	1.05E+03	7.61E+02	6.08E+02	2.02E+02	4.07E+01
2008	1.11E+04	6.55E+03	3.71E+03	3.05E+03	1.50E+03	5.55E+02	3.45E+02	2.51E+02	8.30E+01
2009	1.62E+04	9.10E+03	5.10E+03	2.34E+03	1.78E+03	8.32E+02	2.82E+02	1.37E+02	6.15E+01
2010	4.42E+03	1.33E+04	6.66E+03	2.12E+03	1.13E+03	8.95E+02	4.13E+02	1.54E+02	6.28E+01
2011	1.77E+03	3.62E+03	8.96E+03	3.61E+03	9.57E+02	5.03E+02	2.98E+02	1.77E+02	7.34E+01

2012 2.02E+03 1.45E+03 2.67E+03 5.20E+03 1.83E+03 4.51E+02 2.41E+02  
1.29E+02 9.96E+01

2013 5.98E+03 1.66E+03 1.14E+03 1.71E+03 3.04E+03 9.96E+02 1.88E+02  
1.08E+02 4.30E+01

Estimated population abundance at 1st Jan 2014

0.00E+00 4.90E+03 1.30E+03 7.60E+02 1.07E+03 1.89E+03 6.38E+02 1.15E+02  
6.28E+01

Taper weighted geometric mean of the VPA populations:

1.42E+04 1.18E+04 9.15E+03 5.83E+03 3.21E+03 1.55E+03 6.95E+02 2.83E+02  
1.15E+02

Standard error of the weighted Log(VPA populations):

.7442 .7343 .6740 .6151 .5962 .6192 .6669 .7137 .8232

Log catchability residuals.

Fleet : SUMMER SURVEY

Age 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003

1 No data for this fleet at this age  
2 99.99 99.99 -.17 .20 .34 -.88 .12 .65 1.09 -.08  
3 99.99 99.99 .15 -.20 -.58 .54 -.40 .08 .62 -.34  
4 99.99 99.99 .22 .35 -.56 -.09 .10 .14 .13 .14  
5 99.99 99.99 .68 -.05 .27 -.67 -.76 -.09 .15 -.31  
6 99.99 99.99 .16 -.18 .60 .14 -.63 -.57 -.32 -.70  
7 99.99 99.99 .29 -.04 -.37 .54 .06 -.30 -.40 -1.38  
8 99.99 99.99 -.15 -.28 .11 .41 -.25 -.03 -.45 -1.06

Age 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

1 No data for this fleet at this age  
2 .61 .47 .78 -.30 -1.81 -.27 .46 .29 -1.45 -.05  
3 .06 .41 -.07 -.62 -.52 1.11 .42 -.03 -.67 .04  
4 -.16 .25 -.17 -.64 -.75 .55 .90 .36 -.09 -.67  
5 .46 .28 -.29 -.47 -.05 .16 .28 .45 .01 -.04  
6 .28 .67 -.38 -.38 .04 .55 .25 .18 -.22 .52  
7 .12 .50 -.06 -.67 -.45 .48 .37 .34 -.54 .57  
8 .21 .52 .04 -.46 -.46 .29 .01 -.34 -.33 .29

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

Age	2	3	4	5	6	7	8
Mean Log q	-7.8773	-6.7854	-6.4250	-6.1828	-6.1379	-6.1379	-6.1379
S.E(Log q)	.7532	.4884	.4447	.3912	.4399	.5239	.4056

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
2	.77	1.330	8.11	.67	18	.57	-7.88
3	.92	.564	6.94	.76	18	.46	-6.79
4	.91	.677	6.61	.77	18	.41	-6.42
5	.96	.318	6.26	.77	18	.38	-6.18
6	.96	.234	6.18	.70	18	.44	-6.14
7	1.01	-.068	6.19	.61	18	.54	-6.19
8	1.31	-1.593	6.55	.62	18	.49	-6.24

Fleet : SPRING SURVEY (shift

Age	1993
1	-.09
2	-.94
3	-.66
4	-.56
5	-.52
6	-.66
7	-.30
8	-4.57

Age	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	-.60	-.47	-.87	-.82	.61	-.51	.17	.08	-.62	1.83
2	-.92	.17	-.25	-.23	.36	.24	.46	.73	-.28	.19
3	-.02	.08	-.07	-.19	.07	.03	.17	.28	.34	-.53
4	-.01	.59	-.05	.20	-.21	-.50	-.13	.34	-.01	-.25
5	.81	.44	-.07	.31	.25	-.50	-.28	.14	.33	-.36

6	.92	.56	-.05	.00	.29	.45	.39	.16	-.22	-.41
7	.31	.21	-.11	-.19	-.18	.19	-.67	.09	.18	-.23
8	.77	-.01	-1.45	.93	.09	-1.27	-1.56	.20	.00	-.13

Age	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	.85	-.20	-1.20	.01	.24	.68	.43	.06	.43	.00
2	.36	-1.13	-.71	.19	-.12	.63	.33	-.03	1.14	-.19
3	.36	-1.01	-.91	.05	.46	.26	.25	-.06	1.32	-.23
4	.26	-.48	-.83	-.06	.65	.33	.54	-.65	.69	.15
5	.44	-.60	-.35	-.15	.49	.30	.63	-.67	-.06	-.58
6	.33	-.54	-.39	-.03	.04	-.04	1.14	-.81	-.37	-.75
7	-.64	-.83	-.31	-.48	-.10	.07	.65	-.31	-.19	-.26
8	-.74	-1.09	.32	-.46	.45	.09	.17	-1.39	.48	-.14

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

Age	1	2	3	4	5	6	7	8
Mean Log q	-8.2374	-6.8673	-5.9585	-5.7143	-5.7907	-6.0251	-6.0251	-6.0251
S.E(Log q)	.6896	.5791	.5059	.4437	.4515	.5231	.3842	1.2852

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
1	1.19	-.914	8.05	.54	21	.83	-8.24
2	1.09	-.548	6.67	.65	21	.64	-6.87
3	1.00	.020	5.97	.70	21	.52	-5.96
4	.93	.526	5.91	.73	21	.42	-5.71
5	.89	.834	6.02	.74	21	.40	-5.79
6	.88	.742	6.16	.66	21	.46	-6.03
7	.95	.462	6.18	.80	21	.34	-6.17
8	.64	1.536	6.04	.48	21	.74	-6.47

Terminal year survivor and F summaries :



Age 1 Catchability constant w.r.t. time and dependent on age

Year class = 2012

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
SUMMER SURVEY		1.	.000	.000	.00	0	.000 .000
SPRING SURVEY (shift	4898.	.706	.000	.000	.00	1	1.000 .000
F shrinkage mean	0.	2.00				.000	.000

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
4898.	.71	.00	1	.000	.000

Age 2 Catchability constant w.r.t. time and dependent on age

Year class = 2011

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
SUMMER SURVEY		1232.	.774	.000	.00	1	.246 .045
SPRING SURVEY (shift	1389.	.454	.305	.67	2	.715	.040
F shrinkage mean	531.	2.00				.038	.100

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
1300.	.38	.18	4	.481	.042

Age 3 Catchability constant w.r.t. time and dependent on age

Year class = 2010

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
SUMMER SURVEY		514.	.421	.674	1.60	2	.390 .294
SPRING SURVEY (shift	1011.	.341	.429	1.26	3	.588	.160
F shrinkage mean	368.	2.00				.022	.390

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
760.	.26	.32	6	1.218	.208

## Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 2009

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		619.	.313	.229	.73	3	.441 .434
SPRING SURVEY (shift		1691.	.276	.305	1.10	4	.543 .182
F shrinkage mean		578.	2.00			.016	.459

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		
1067.	.21	.25	8	1.230	.274

## Age 5 Catchability constant w.r.t. time and dependent on age

Year class = 2008

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		1847.	.256	.070	.28	4	.499 .279
SPRING SURVEY (shift		1979.	.248	.277	1.12	5	.488 .263
F shrinkage mean		932.	2.00			.013	.493

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		
1893.	.18	.14	10	.761	.273

## Age 6 Catchability constant w.r.t. time and dependent on age

Year class = 2007

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		855.	.238	.123	.52	5	.529 .189
SPRING SURVEY (shift		471.	.244	.200	.82	6	.458 .319
F shrinkage mean		204.	2.00			.014	.625

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		
638.	.17	.14	12	.846	.245

Age 7 Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 2006

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		161.	.259	.213	.82	6	.440 .216
SPRING SURVEY (shift		89.	.255	.113	.44	7	.543 .361
F shrinkage mean		46.	2.00				.016 .608

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		
115.	.18	.14	14	.745	.292

Age 8 Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 2005

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		71.	.245	.137	.56	7	.599 .307
SPRING SURVEY (shift		55.	.246	.166	.67	8	.383 .380
F shrinkage mean		24.	2.00				.019 .727

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		
63.	.18	.11	16	.605	.339

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 6

Year class = 2004

Fleet	Estimated	Int	Ext	Var	N	Scaled	Estimated
	Survivors	s.e	s.e	Ratio	Weights	F	
SUMMER SURVEY		17.	.260	.138	.53	7	.580 .635
SPRING SURVEY (shift		21.	.259	.199	.77	8	.358 .547
F shrinkage mean		46.	2.00				.062 .286

Weighted prediction :

Survivors	Int	Ext	N	Var	F
at end of year	s.e	s.e	Ratio		

20.	.22	.12	16	.567	.575
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**Table 4.6.2. Faroe Plateau cod (sub-division Vb1). Fishing mortality at age from the XSA model.**

Year	Age									Fbar 3-7
	2	3	4	5	6	7	8	9	10+	
1961	0.335	0.514	0.499	0.574	0.486	0.957	0.812	0.672	0.672	0.606
1962	0.270	0.498	0.484	0.708	0.557	0.366	0.683	0.564	0.564	0.523
1963	0.253	0.414	0.517	0.512	0.541	0.488	0.327	0.481	0.481	0.494
1964	0.109	0.300	0.452	0.523	0.566	0.668	0.353	0.516	0.516	0.502
1965	0.121	0.252	0.450	0.562	0.660	0.531	0.435	0.532	0.532	0.491
1966	0.083	0.197	0.255	0.450	0.502	0.968	0.852	0.611	0.611	0.474
1967	0.079	0.239	0.269	0.344	0.578	0.520	1.044	0.556	0.556	0.390
1968	0.101	0.232	0.395	0.534	0.447	0.713	0.333	0.488	0.488	0.464
1969	0.110	0.306	0.381	0.418	0.571	0.512	0.846	0.550	0.550	0.438
1970	0.053	0.208	0.365	0.341	0.371	0.656	0.421	0.434	0.434	0.388
1971	0.031	0.134	0.223	0.385	0.557	0.465	0.753	0.480	0.480	0.353
1972	0.046	0.148	0.207	0.250	0.606	0.469	0.246	0.358	0.358	0.336
1973	0.066	0.232	0.305	0.281	0.253	0.372	0.326	0.309	0.309	0.289
1974	0.082	0.157	0.205	0.295	0.380	0.533	0.305	0.346	0.346	0.314
1975	0.077	0.319	0.436	0.413	0.454	0.350	0.449	0.424	0.424	0.395
1976	0.093	0.172	0.367	0.557	0.517	0.762	0.643	0.574	0.574	0.475
1977	0.048	0.304	0.475	0.753	0.733	1.114	0.778	0.778	0.778	0.676
1978	0.059	0.190	0.429	0.429	0.485	0.597	0.567	0.505	0.505	0.426
1979	0.043	0.262	0.431	0.505	0.491	0.448	0.690	0.517	0.517	0.427
1980	0.054	0.239	0.370	0.434	0.518	0.412	0.644	0.479	0.479	0.395
1981	0.052	0.288	0.341	0.437	0.564	0.694	0.502	0.512	0.512	0.465
1982	0.059	0.223	0.360	0.389	0.405	0.693	0.553	0.483	0.483	0.414
1983	0.099	0.467	0.559	0.641	0.784	1.078	0.942	0.809	0.809	0.706
1984	0.107	0.371	0.579	0.661	0.453	0.476	0.479	0.534	0.534	0.508
1985	0.066	0.354	0.508	0.613	0.923	1.108	1.320	0.904	0.904	0.701
1986	0.025	0.354	0.622	0.703	0.826	0.840	0.541	0.713	0.713	0.669
1987	0.029	0.221	0.475	0.485	0.556	0.489	0.622	0.530	0.530	0.445
1988	0.067	0.353	0.564	0.549	0.773	0.798	0.864	0.716	0.716	0.607
1989	0.162	0.440	0.761	0.761	0.961	1.056	1.099	0.938	0.938	0.796
1990	0.078	0.324	0.639	0.801	0.712	0.849	1.132	0.835	0.835	0.665
1991	0.032	0.198	0.428	0.601	0.745	0.578	0.713	0.618	0.618	0.510
1992	0.020	0.100	0.324	0.323	0.642	0.888	0.442	0.528	0.528	0.455
1993	0.013	0.102	0.187	0.252	0.184	0.446	0.574	0.331	0.331	0.234
1994	0.026	0.113	0.191	0.250	0.220	0.142	0.327	1.077	1.077	0.183
1995	0.070	0.162	0.465	0.280	0.361	0.333	0.205	0.762	0.762	0.320
1996	0.031	0.194	0.453	0.810	0.906	1.141	0.919	0.798	0.798	0.701
1997	0.035	0.149	0.414	0.835	1.049	1.404	1.357	1.017	1.017	0.770
1998	0.089	0.176	0.273	0.653	1.059	0.795	1.180	0.868	0.868	0.591
1999	0.096	0.284	0.290	0.318	0.667	1.080	0.800	0.505	0.505	0.528
2000	0.125	0.319	0.380	0.248	0.327	0.547	0.827	0.195	0.195	0.364
2001	0.157	0.345	0.456	0.308	0.350	0.698	0.654	0.786	0.786	0.431
2002	0.190	0.490	0.600	0.823	0.829	1.364	1.236	1.382	1.382	0.821
2003	0.128	0.304	0.664	0.852	0.909	0.900	0.935	1.773	1.773	0.726

Year	Age									Fbar 3-7
	2	3	4	5	6	7	8	9	10+	
2004	0.031	0.186	0.298	0.755	0.987	1.135	1.064	2.061	2.061	0.672
2005	0.093	0.256	0.381	0.472	0.773	0.844	0.581	1.132	1.132	0.545
2006	0.188	0.332	0.358	0.609	0.819	0.952	1.030	0.298	0.298	0.614
2007	0.124	0.328	0.382	0.438	0.592	0.686	0.689	0.844	0.844	0.485
2008	0.051	0.263	0.341	0.390	0.478	0.719	1.206	1.481	1.481	0.438
2009	0.112	0.677	0.525	0.486	0.502	0.406	0.584	1.484	1.484	0.519
2010	0.193	0.412	0.596	0.611	0.901	0.648	0.539	0.869	0.869	0.633
2011	0.106	0.344	0.479	0.551	0.537	0.638	0.375	0.337	0.337	0.510
2012	0.038	0.242	0.338	0.409	0.678	0.606	0.898	0.325	0.325	0.454
2013	0.042	0.208	0.274	0.273	0.245	0.292	0.339	0.575	0.575	0.259

**Table 4.6.3. Faroe Plateau cod (sub-division Vb1). Stock number at age from the XSA model.**

Year	Age									Total
	2	3	4	5	6	7	8	9	10+	
1961	12019	7385	3747	2699	666	668	155	66	0	52630
1962	20654	7042	3616	1863	1245	335	210	56	0	59804
1963	20290	12907	3503	1825	752	584	190	87	0	66807
1964	21834	12893	6986	1710	895	358	294	112	0	55183
1965	8269	16037	7823	3639	830	416	151	169	0	60009
1966	18566	5999	10207	4085	1698	351	200	80	0	69829
1967	23451	13990	4034	6475	2133	842	109	70	0	72579
1968	17582	17744	9020	2525	3757	980	410	31	0	63439
1969	9325	13012	11522	4976	1212	1967	393	240	0	53161
1970	8608	6840	7843	6447	2682	561	965	138	0	48654
1971	11928	6684	4548	4456	3754	1516	238	519	0	59683
1972	21320	9469	4788	2981	2483	1760	779	92	0	59029
1973	12573	16664	6689	3187	1901	1109	902	499	400	81153
1974	30480	9639	10816	4037	1969	1209	626	533	342	106456
1975	38319	23000	6747	7217	2460	1103	581	378	476	102968
1976	18575	29035	13683	3572	3908	1279	636	304	466	83665
1977	9995	13853	20010	7765	1676	1909	489	274	18	69116
1978	10748	7799	8372	10190	2993	659	513	184	154	59931
1979	14998	8298	5282	4463	5433	1509	297	238	103	69424
1980	23583	11759	5226	2811	2206	2723	789	122	52	66371
1981	14001	18286	7580	2957	1491	1076	1477	339	150	74385
1982	22128	10878	11228	4413	1564	694	440	732	348	83160
1983	25162	17087	7128	6412	2450	854	284	207	200	118131
1984	47770	18656	8768	3339	2765	916	238	91	174	103878
1985	17325	35133	10539	4023	1412	1439	466	121	146	82224
1986	9515	13281	20183	5194	1784	459	389	102	81	63099
1987	9915	7600	7629	8868	2106	640	162	185	69	47825
1988	8720	7885	4990	3884	4471	989	321	71	53	51621
1989	16568	6679	4536	2325	1837	1690	365	111	16	38593
1990	3656	11541	3522	1735	890	575	481	100	50	30692
1991	6666	2770	6832	1523	638	357	202	127	57	33091
1992	11396	5284	1860	3646	684	248	164	81	91	35789
1993	10099	9145	3915	1101	2161	295	84	86	97	57723
1994	25168	8160	6762	2659	701	1472	154	39	26	97069
1995	42516	20087	5968	4575	1696	461	1046	91	100	92249
1996	12862	32443	13988	3069	2830	968	270	698	93	75106
1997	6455	10213	21890	7283	1117	936	253	88	204	55675
1998	5924	5104	7205	11850	2587	320	188	53	47	50788
1999	14335	4438	3505	4489	5051	735	118	47	19	56813
2000	19710	10664	2735	2147	2674	2122	204	44	6	76573
2001	29692	14246	6345	1532	1372	1579	1006	73	12	72053
2002	13260	20770	8262	3294	922	791	643	428	10	56008

<b>Year</b>	<b>Age</b>									<b>Total</b>
	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10+</b>	
2003	6244	8975	10415	3713	1185	330	166	153	26	35661
2004	3647	4499	5423	4390	1297	391	110	53	45	27342
2005	6130	2895	3058	3297	1690	396	103	31	48	26966
2006	7629	4572	1835	1710	1684	639	139	47	13	24533
2007	5129	5177	2686	1051	761	608	202	41	6	23657
2008	6547	3711	3054	1502	555	345	251	83	28	27186
2009	9097	5095	2336	1777	832	282	137	61	24	35861
2010	13279	6656	2120	1132	895	413	154	63	71	29206
2011	3622	8960	3609	957	503	298	177	73	8	19977
2012	1449	2667	5200	1831	451	241	129	100	87	14178
2013	1656	1142	1715	3038	996	188	108	43	15	14883



**Table 4.6.4. Faroe Plateau cod (sub-division Vb1). Summary table from the XSA model. The results from the short term prediction are shown in bold.**

	<b>Recruits</b>	<b>Totalbio</b>	<b>Totspbio</b>	<b>Landings</b>	<b>Yield/SSB</b>	<b>Fbar 3-7</b>
Age 2						
1961	12019	65428	46439	21598	0.465	0.606
1962	20654	68225	43326	20967	0.484	0.523
1963	20290	77602	49054	22215	0.453	0.494
1964	21834	84666	55362	21078	0.381	0.502
1965	8269	75043	57057	24212	0.424	0.491
1966	18566	83919	60629	20418	0.337	0.474
1967	23451	105289	73934	23562	0.319	0.390
1968	17582	110433	82484	29930	0.363	0.464
1969	9325	105537	83487	32371	0.388	0.438
1970	8608	98398	82035	24183	0.295	0.388
1971	11928	78218	63308	23010	0.364	0.353
1972	21320	76439	57180	18727	0.328	0.336
1973	12573	110713	83547	22228	0.266	0.289
1974	30480	139266	98434	24581	0.250	0.314
1975	38319	153664	109566	36775	0.336	0.395
1976	18575	161260	123077	39799	0.323	0.475
1977	9995	136212	112057	34927	0.312	0.676
1978	10748	96227	78497	26585	0.339	0.426
1979	14998	85112	66723	23112	0.346	0.427
1980	23583	85038	58887	20513	0.348	0.395
1981	14001	88412	63562	22963	0.361	0.465
1982	22128	98964	67033	21489	0.321	0.414
1983	25162	123257	78543	38133	0.486	0.706
1984	47770	152164	96775	36979	0.382	0.508
1985	17325	131249	84791	39484	0.466	0.701
1986	9515	99286	73701	34595	0.469	0.669
1987	9915	78380	62255	21391	0.344	0.445
1988	8720	66188	52143	23182	0.445	0.607
1989	16568	59443	38440	22068	0.574	0.796
1990	3656	38729	29569	13692	0.463	0.665
1991	6666	29136	21456	8750	0.408	0.510
1992	11396	36250	21287	6396	0.301	0.455
1993	10099	51792	33794	6107	0.181	0.234
1994	25168	84675	43250	9046	0.209	0.183
1995	42516	144966	55059	23045	0.419	0.320
1996	12862	142931	85775	40422	0.471	0.701
1997	6455	96488	81226	34304	0.422	0.770
1998	5924	65860	55506	24005	0.433	0.591
1999	14335	64672	44671	18306	0.410	0.528
2000	19710	90723	45793	21033	0.459	0.364
2001	29692	109594	58700	28183	0.480	0.431



Table 4.7.2. Faroe Plateau cod (sub-division Vb1). Management option table.

2014						
Biomass	SSB	FMult	FBar	Landings		
29941	25399	1.0000	0.2585	5356		
2015					2016	
Biomass	SSB	FMult	FBar	Landings	Biomass	SSB
29395	25453	0.0000	0.0000	0	34480	31142
.	25453	0.1000	0.0258	647	33714	30393
.	25453	0.2000	0.0517	1278	32969	29664
.	25453	0.3000	0.0775	1892	32244	28954
.	25453	0.4000	0.1034	2490	31538	28264
.	25453	0.5000	0.1292	3073	30851	27592
.	25453	0.6000	0.1551	3640	30182	26937
.	25453	0.7000	0.1809	4193	29531	26301
.	25453	0.8000	0.2068	4732	28896	25681
.	25453	0.9000	0.2326	5257	28279	25078
.	25453	1.0000	0.2585	5768	27678	24490
.	25453	1.1000	0.2843	6266	27092	23918
.	25453	1.2000	0.3102	6752	26522	23362
.	25453	1.3000	0.3360	7225	25967	22820
.	25453	1.4000	0.3619	7686	25427	22292
.	25453	1.5000	0.3877	8135	24900	21779
.	25453	1.6000	0.4136	8572	24387	21278
.	25453	1.7000	0.4394	8999	23888	20791
.	25453	1.8000	0.4653	9415	23402	20317
.	25453	1.9000	0.4911	9820	22928	19855
.	25453	2.0000	0.5170	10216	22466	19406

Input units are thousands and kg - output in tonnes

Table 4.8.1. Faroe Plateau cod (sub-division Vb1). Input to yield per recruit calculations (long term prediction).

	Expl. pattern	Weight at age	Prop mature
Age	Average 2002-2013 Not rescaled	Average 1978-2013	Average 1983-2014
2	0.108	1.038	0.08
3	0.337	1.557	0.57
4	0.436	2.267	0.84
5	0.556	3.068	0.94
6	0.687	3.873	0.98
7	0.766	4.935	0.99
8	0.790	6.112	1.00
9	1.047	7.660	1.00
10+	1.047	9.569	0.99

Table 4.8.2. Faroe Plateau cod (sub-division Vb1). Output from yield per recruit calculations (long term prediction).

Reference point	F multiplier	Absolute F
Fbar(3-7)	1.0000	0.5563
FMax	0.4433	0.2466
F0.1	0.2024	0.1126
F35%SPR	0.3129	0.1741
Fhigh	2.0025	1.1141
Fmed	0.6177	0.3436
Flow	0.1949	0.1085

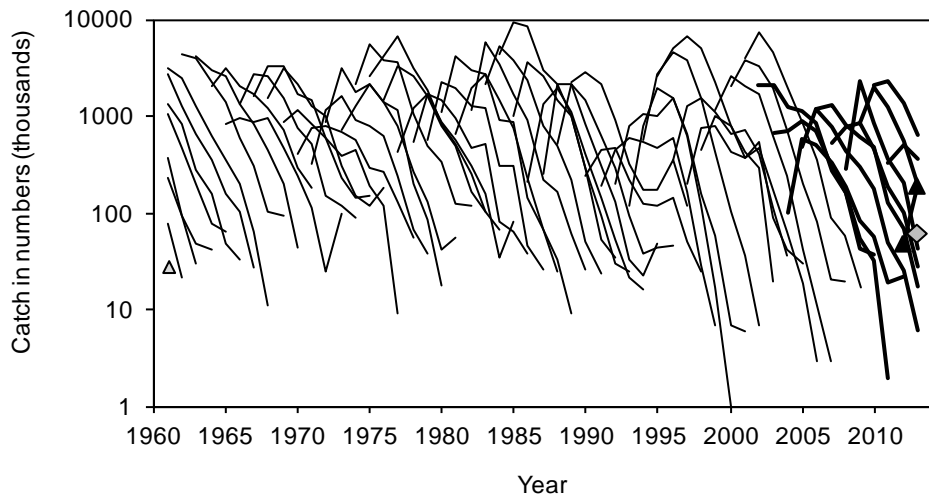


Figure 4.2.1. Faroe Plateau cod (sub-division Vb1). Catch in numbers at age shown as catch curves.

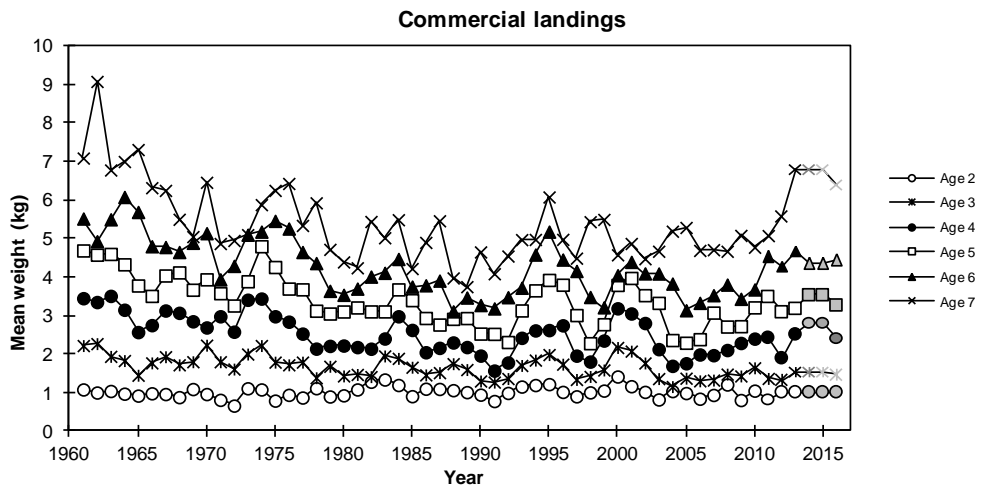


Figure 4.2.2. Faroe Plateau cod (sub-division Vb1). Mean weight at age. The predicted weights are also shown.

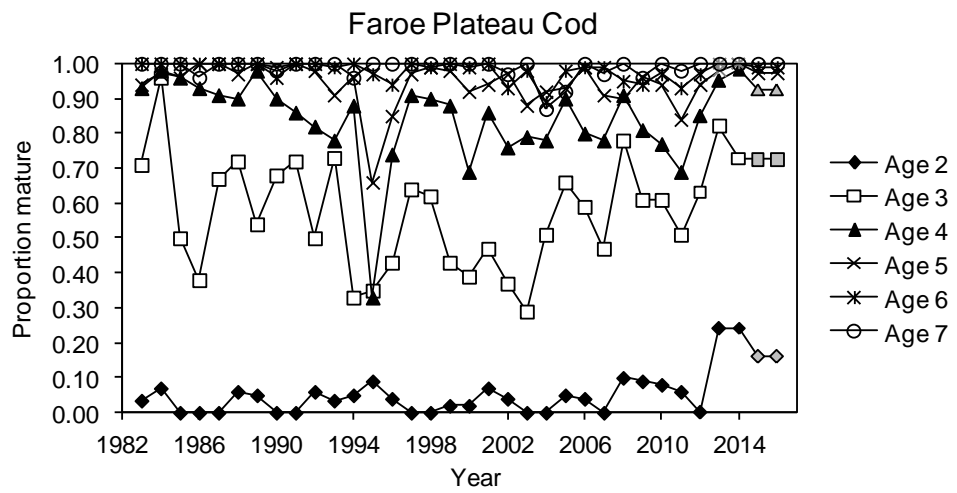


Figure 4.2.3. Faroe Plateau cod (sub-division Vb1). Proportion mature at age as observed in the spring groundfish survey. The predicted values are shown in grey.

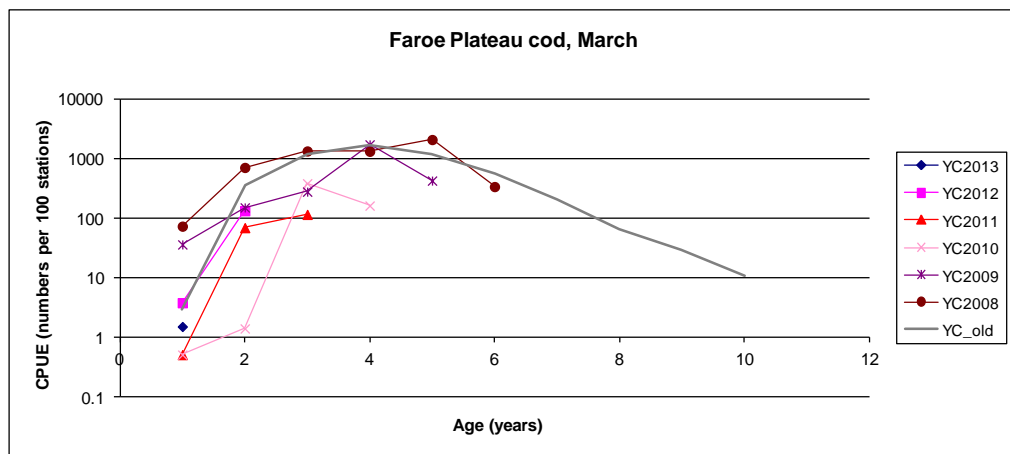


Figure 4.2.4. Faroe Plateau cod (sub-division Vb1). Catch curves from the spring groundfish survey.

### Faroe Plateau cod

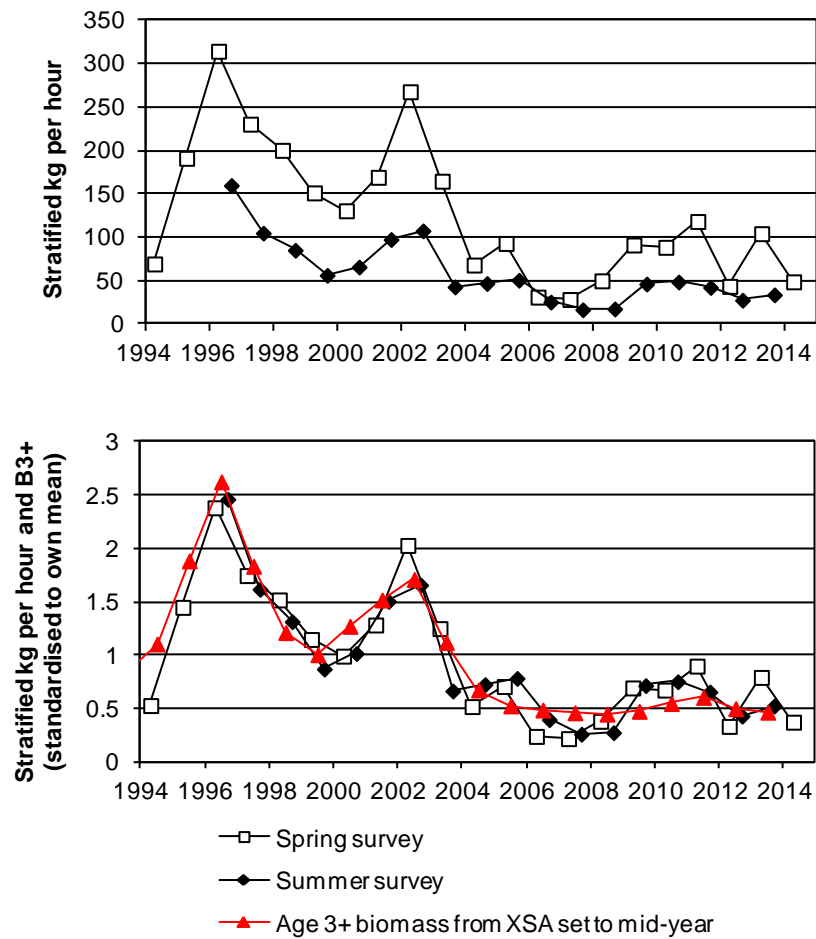


Figure 4.2.5. Faroe Plateau cod (sub-division Vb1). Stratified kg/hour in the spring and summer surveys (upper figure). The age 3+ biomass obtained from the assessment is also included as an index.

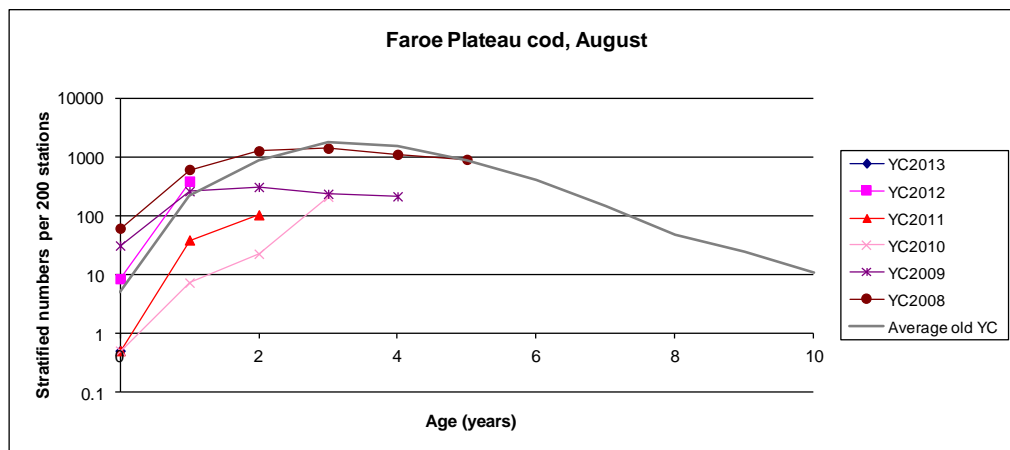


Figure 4.2.6. Faroe Plateau cod (sub-division Vb1). Catch curves from the summer groundfish survey.

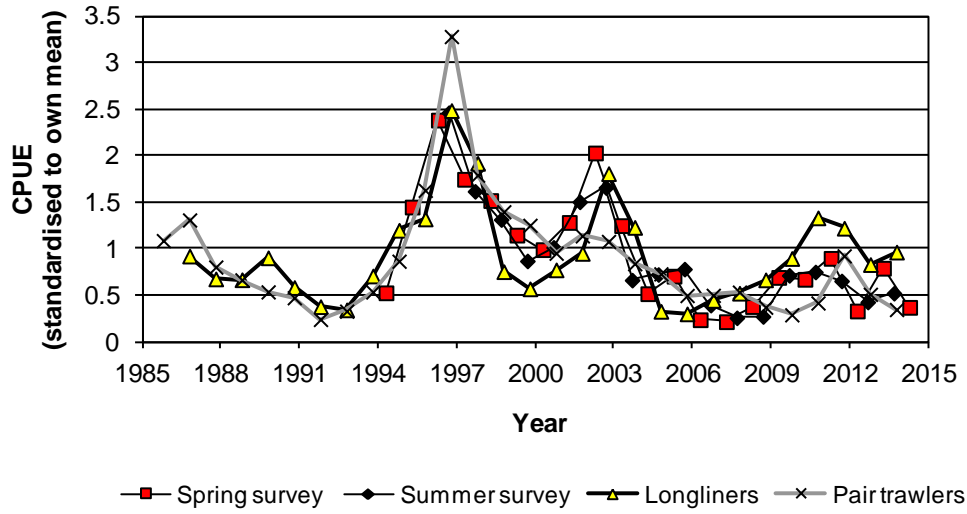


Figure 4.2.7. Faroe Plateau cod (sub-division Vb1). Standardised catch per unit effort for pair trawlers and longliners. The two surveys are shown as well.

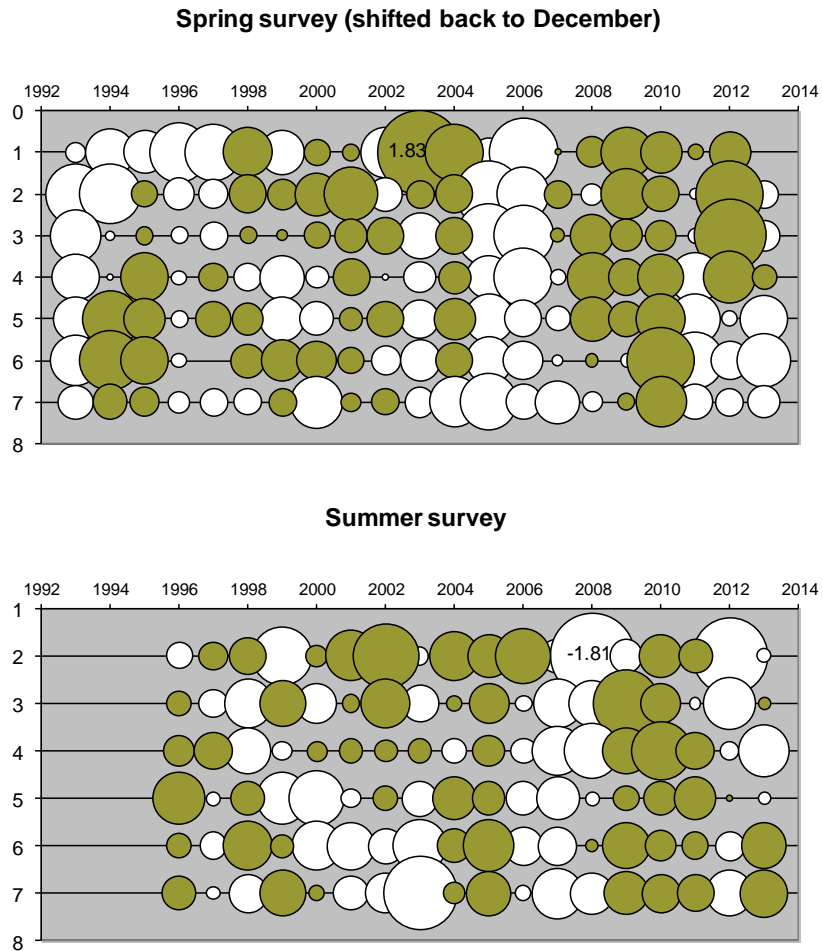


Figure 4.6.1. Faroe Plateau cod (sub-division Vb1). Log catchability residuals for age 2 to 7 for the spring (upper figure) and summer survey. The residuals for age 8 are not presented because some values were off scale. White bubbles indicate negative residuals.



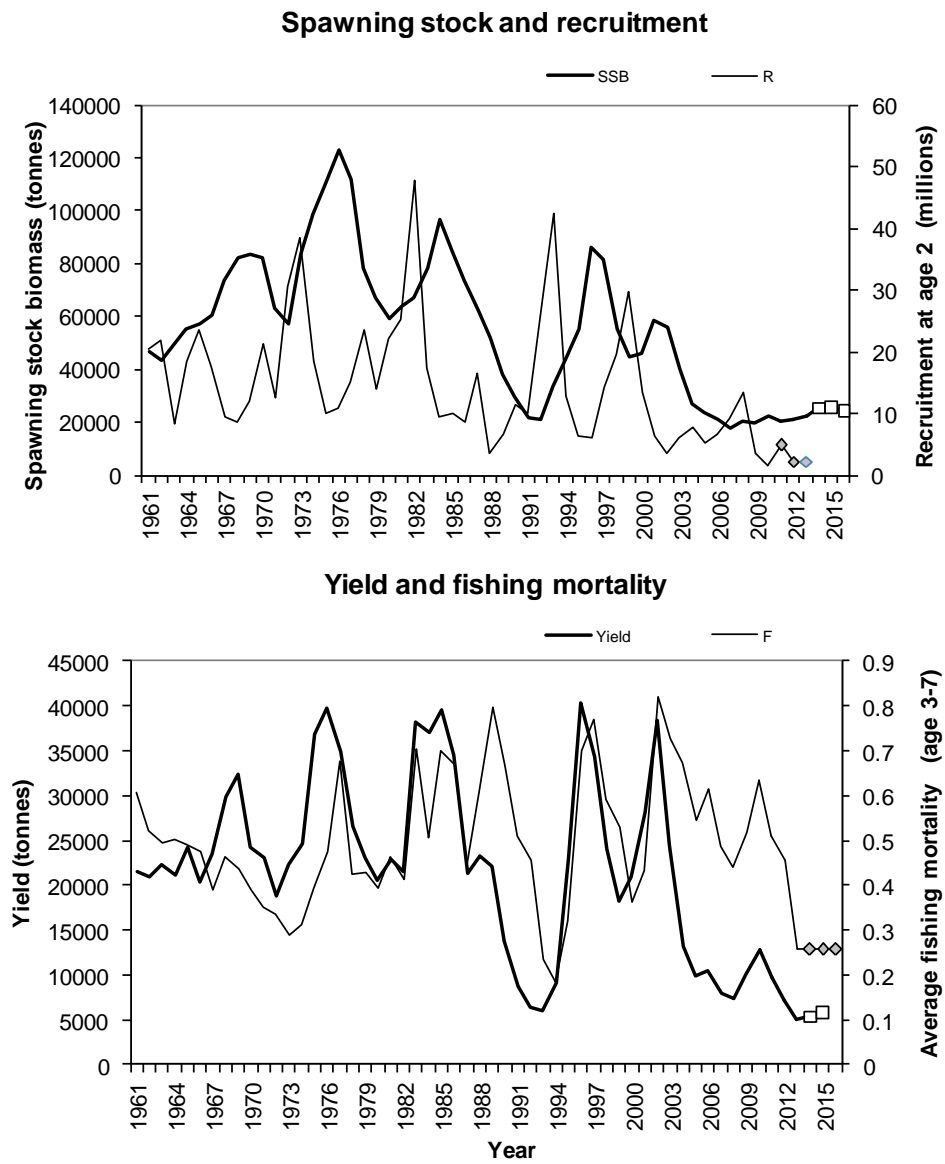


Figure 4.6.2. Faroe Plateau cod (sub-division Vb1). Spawning stock biomass (SSB) and recruitment (year class) versus year (upper figure) and yield and fishing mortality versus year. Points (white and grey) are taken from the short term projections.

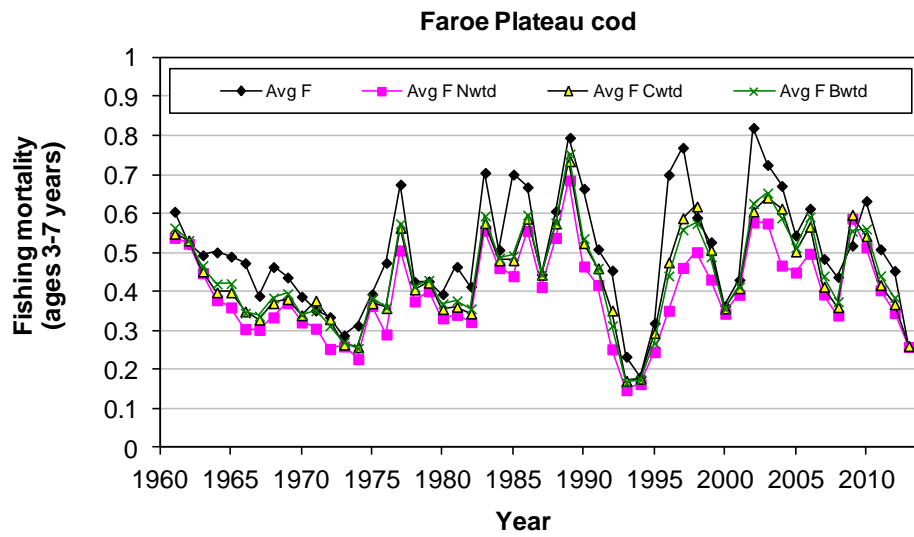


Figure 4.6.3. Faroe Plateau cod (sub-division Vb1). Different measures of fishing mortality: straight arithmetic average (Avg F), weighted by stock numbers (Nwtd), weighted by stock biomass (Bwtd) or weighted by catch (Cwtd).

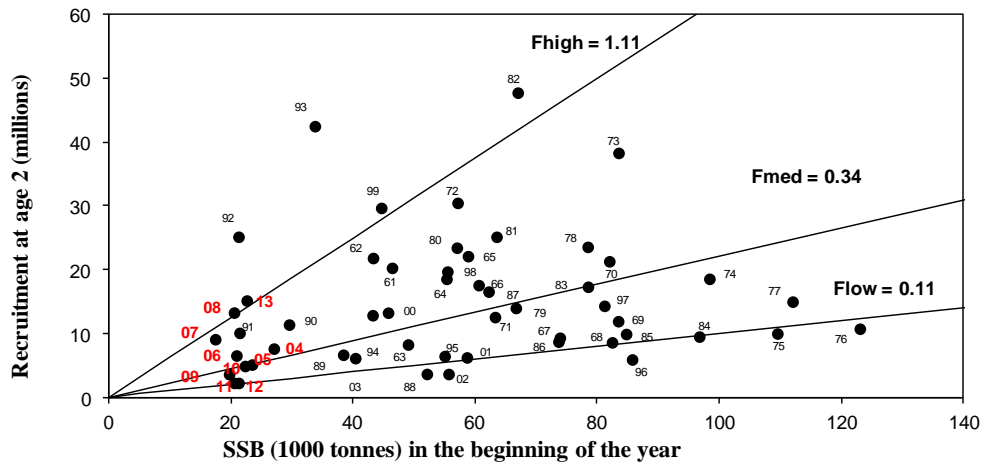


Figure 4.6.4. Faroe Plateau cod (sub-division Vb1). Spawning stock – recruitment relationship. Years are shown at each data point.

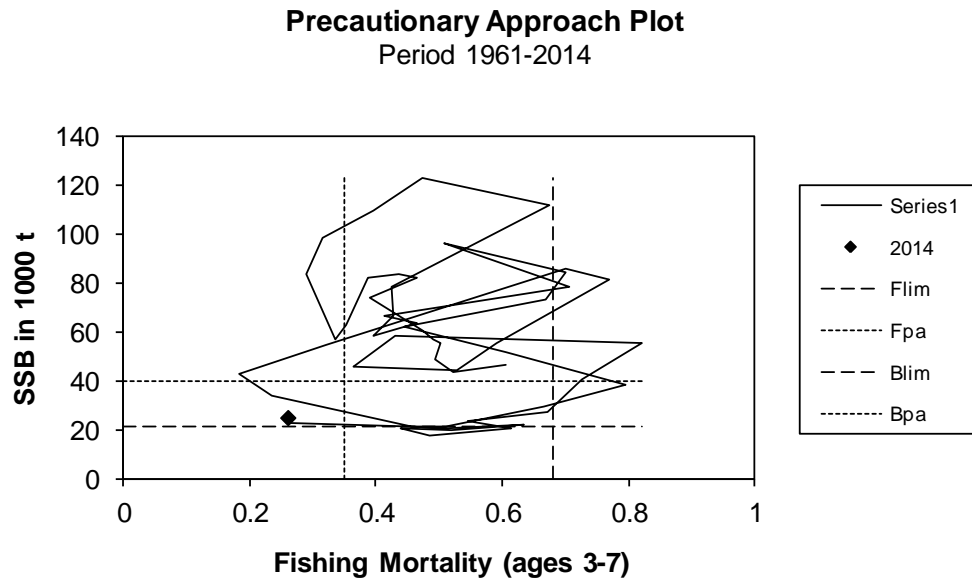


Figure 4.6.5. Faroe Plateau cod (sub-division Vb1). Spawning stock biomass versus fishing mortality.

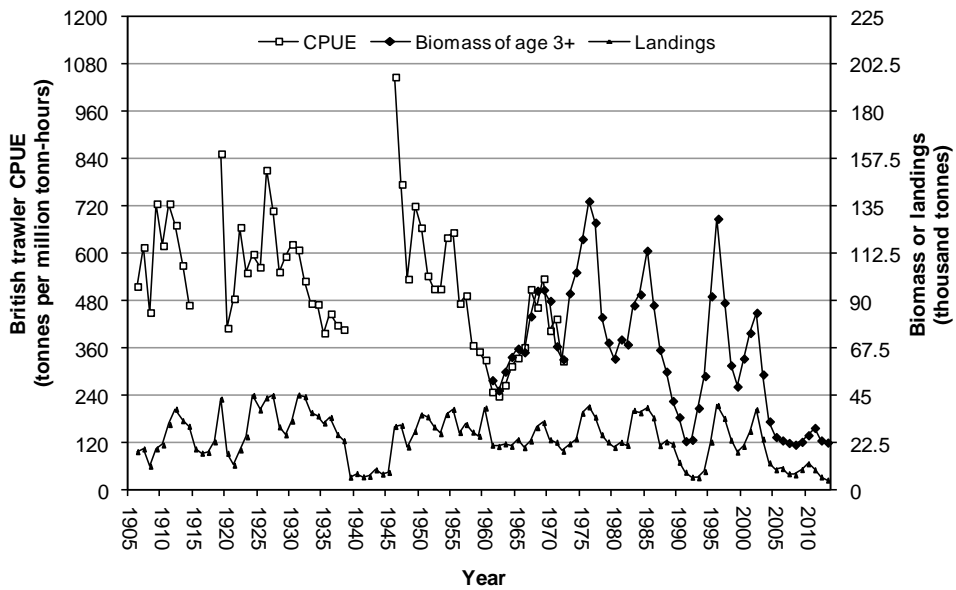
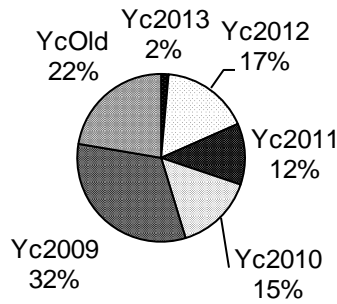


Figure 4.6.6. Faroe Plateau cod (sub-division Vb1). Stock development based on cpues from british steam trawlers (1906-1925: cwts per days of absence from port), cpues from british trawlers (1924-1972: tonnes per million tonn hours) and the XSA-estimates (1961-2010: absolute biomass). The 1906-1925 series was scaled to the 1924-1972 series and the CPUEs refer to the first (left) axis while the XSA-estimates refer to the second axis.

SSB 2015



SSB 2016

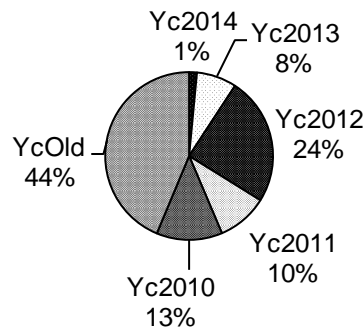


Figure 4.7.1. Faroe Plateau cod (sub-division Vb1). Predictions of the contribution of various year classes to the spawning stock biomass in terminal year +1(upper figure) and terminal year +2 (lower figure).

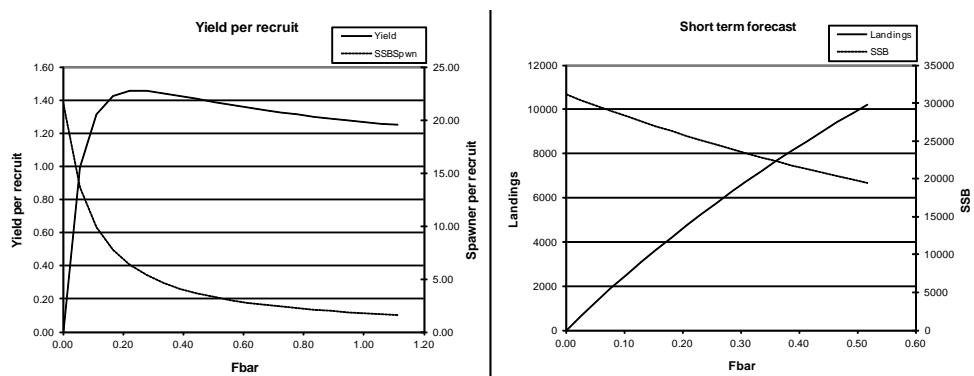


Figure 4.8.1. Faroe Plateau cod (sub-division Vb1). Yield per recruit and spawning stock biomass (SSB) per recruit versus fishing mortality (left figure). Landings and SSB versus Fbar (3-7) (right figure).

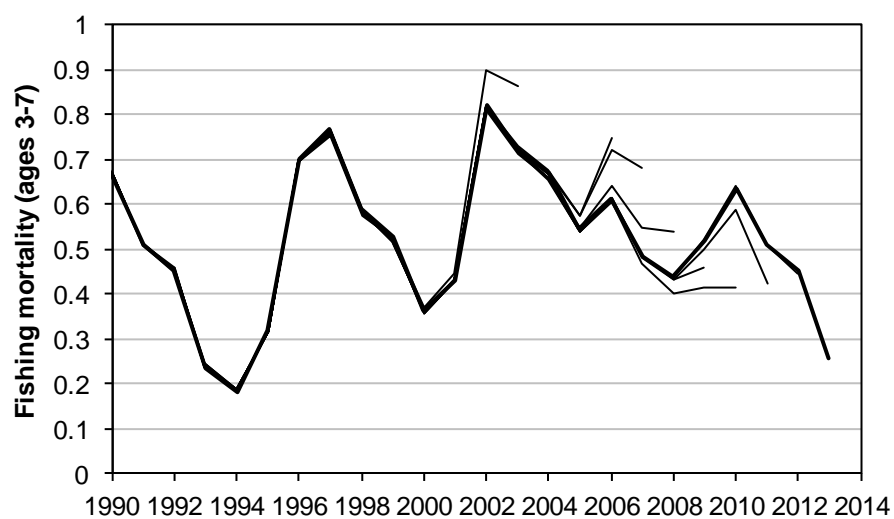


Figure 4.9.1. Faroe Plateau cod (sub-division Vb1). Results from the XSA retrospective analysis of fishing mortality (ages 3-7).

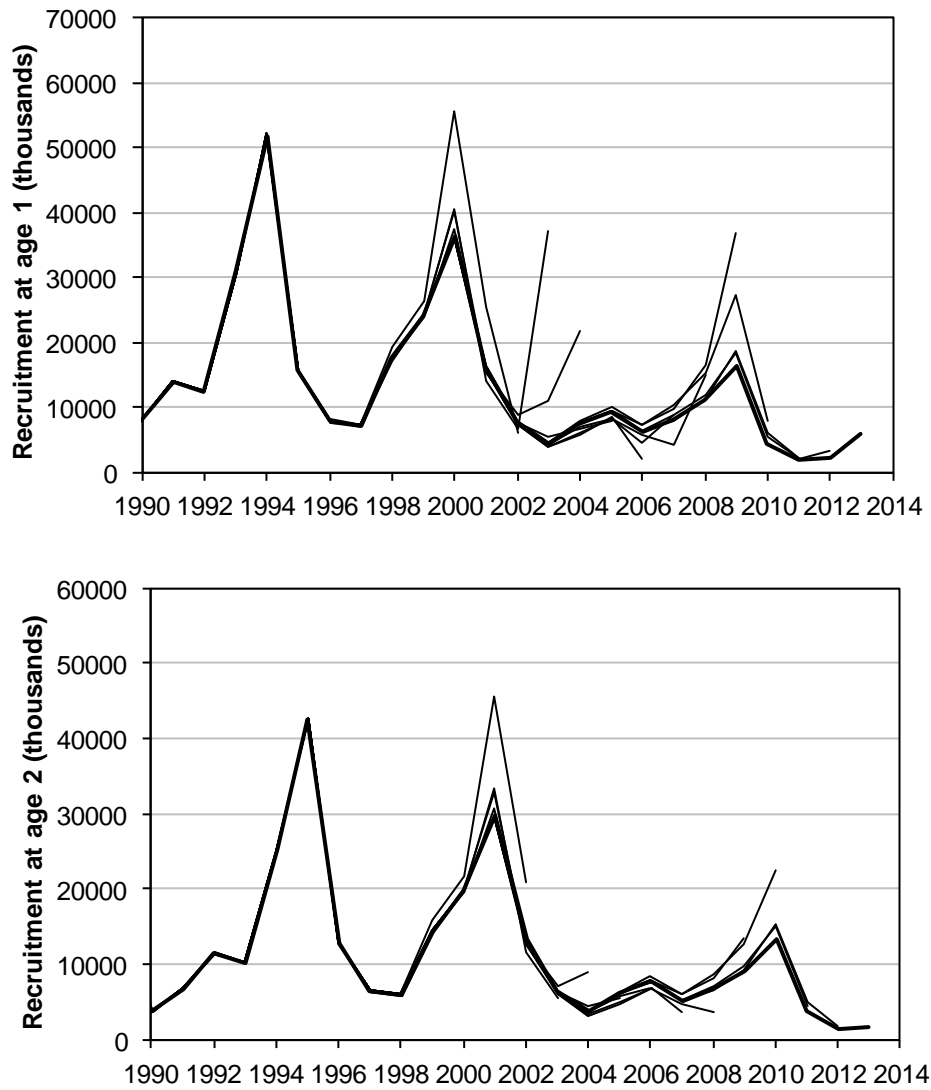


Figure 4.9.1. Faroe Plateau cod (sub-division Vb1). Results from the XSA retrospective analysis (continued). Recruitment at age 1 (upper figure) and at age 2.

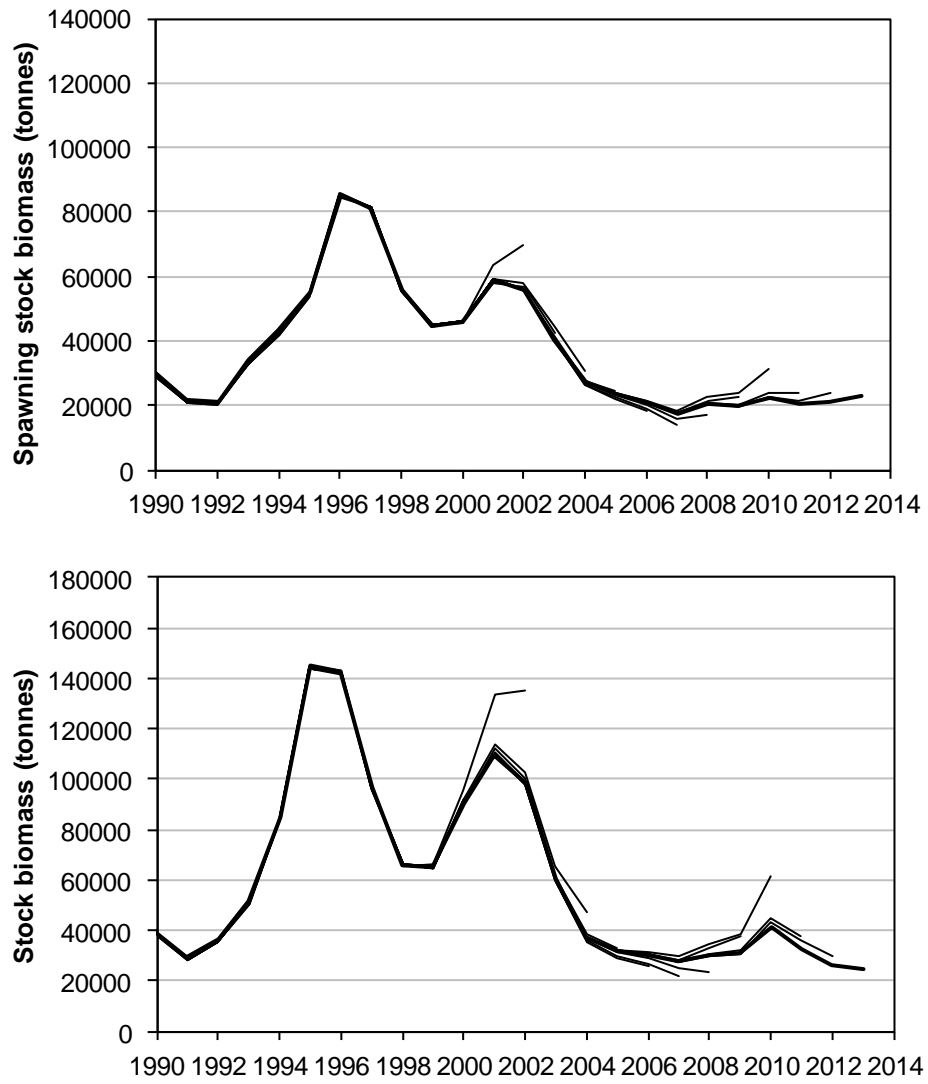


Figure 4.9.1. Faroe Plateau cod (sub-division Vb1). Results from the XSA retrospective analysis (continued). Spawning stock biomass (upper figure) and total stock biomass.

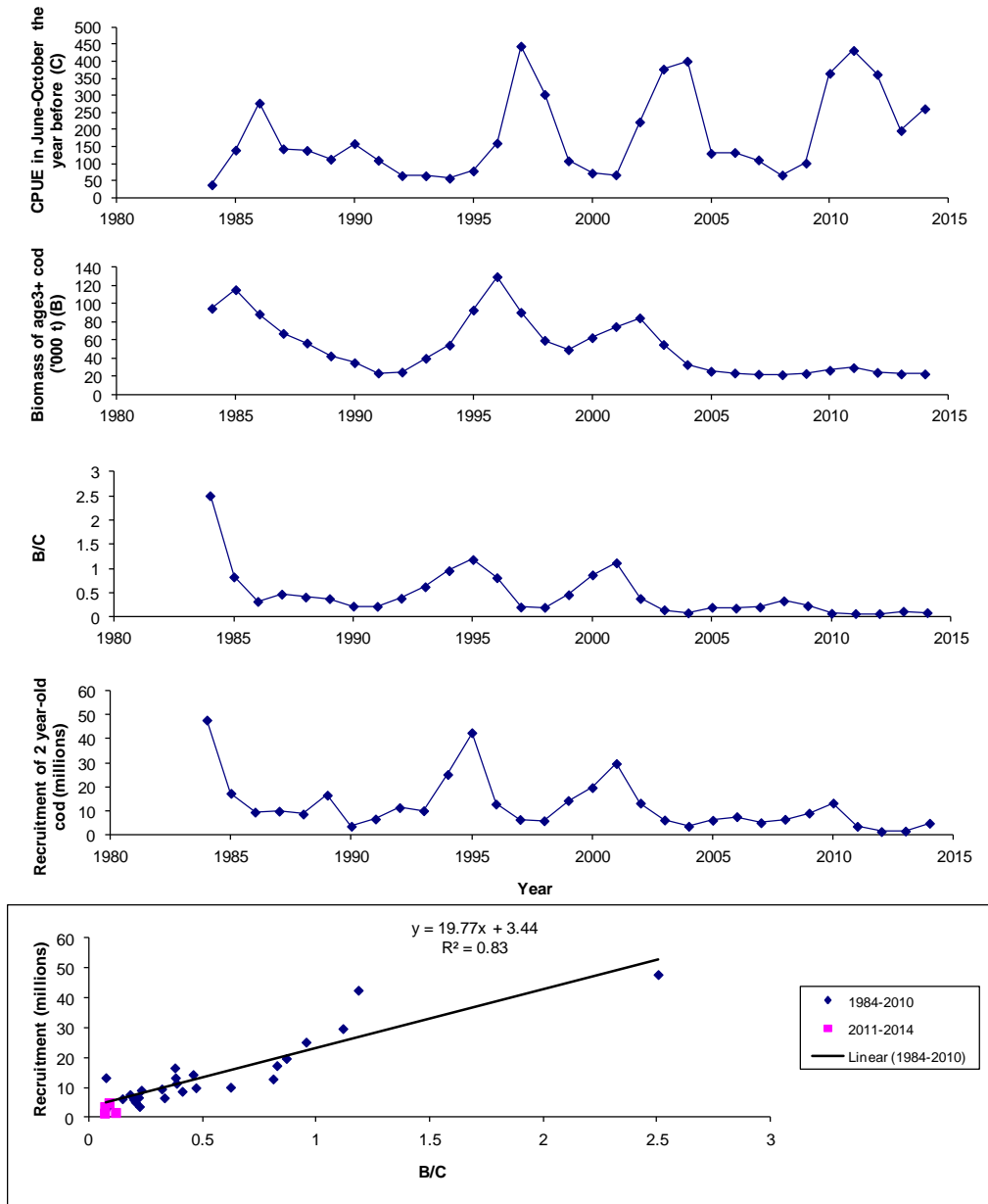


Figure 4.9.2. Faroe Plateau cod (sub-division Vb1). Modelling cod recruitment in three steps. First, the catch-per-unit –effort of cod (C) for small boats operating close to land, as being indicative of the amount of cannibalistic cod. Second, the amount of cod (older than the recruiting cod) (B), as being indicative of e.g. the amount of schools to which recruiting cod can join and hide in. Third, the ratio between B and C, as indicative of recruitment success. Fourth and fifth, a comparison with observed recruitment. Note that the model predicts that the recruitment in 2011-2014 (YC 2009 to 2012) is very poor.



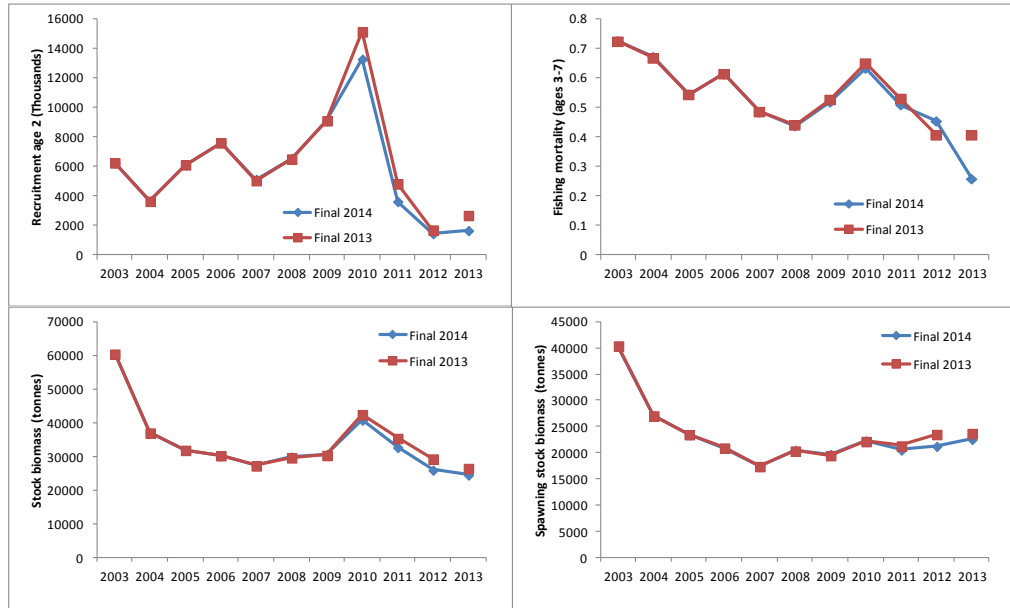


Figure 4.10.1. Faroe Plateau cod (sub-division Vb1). Comparison between the results from the current assessment (Final 2014) and last year final (Final 2013) for recruitment (upper left), fishing mortality (upper right), stock biomass (lower left) and spawning stock biomass (lower right).