

## 6 Faroe Saithe

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### Summary

The most recent benchmark assessment was completed in 2010.

Nominal landings decreased by more than 25% from 35 kt. in 2012 to 26 kt. in 2013. The corresponding estimate of fishing mortality in 2013 (average of ages 4-8 years) decreased to  $F=0.45$  which is higher than the historical average ( $F=0.36$ ) and well above  $F_{msy}=0.32$  (NWWG 2012) and  $F_{msy}=0.28$  (NWWG2011). The point estimate of the spawning stock biomass in 2013 is around 61 kt., just above  $B_{trigger}=55$ kt. Numbers of the most recent year-class (2010, age 3 in 2013) is estimated at 35 million. Since 2006 recruitment of saithe has remained at low levels compared to the exceptional peaks from 2001 to 2005.

Predicted landings in the last year assessment were at around 47kt while the actual measurement for 2013 was recorded at 26 kt.. However the estimate of  $F_{bar}$  was reasonably accurate from  $F_{bar}=0.48$  in last year assessment and  $F_{bar}=0.45$  in the 2014 assessment. Recruitment strength for 2013 was predicted at 28 million while the estimate for that year in the present assessment reached 35 million. SSB was overestimated by 18%.

Since 2005 both landings and the spawning stock biomass have declined substantially from historical peaks to levels not observed in nearly 20 years due to increasing harvest rates and relatively poor incoming year-classes.

### 6.1 Stock description and management units.

See the stock annex.

### 6.2 Scientific data

#### 6.2.1 Trends in landings and fisheries

Nominal landings of saithe from Faroese grounds (Division Vb) have varied cyclically between 10 000 t and 68 000 t since 1961. After a third high of about 60 000 t in 1990, landings declined steadily to 20 000 t in 1996. Since then landings have increased to 68 000 tonnes in 2005 (Table 6.2.1.1, Figure 6.2.1.1) but has declined to 57 000 tonnes in 2008 and 2009. After a substantial drop in landings in 2011 which was the lowest observed since 1999 (33 000 t) landings increased by 20% in 2012 up to 35 000 t. The total tonnage in 2013 is the lowest observed since 1997. The historical average landings for saithe since 1961 is 37 000 t.

Since the introduction of the 200 miles EEZ in 1977, the saithe fishery has been prosecuted mostly by Faroese vessels. The principal fleet consists of large pair trawlers (>1000 HP), which have a directed fishery for saithe, about 50 - 77% of the reported landings in 1992-2011 (Table 6.2.1.2). The smaller pair trawlers (<1000 HP) and single trawlers (400-1000HP) have a more mixed fishery and they have accounted for about 10-20% of the total landings of saithe in the 1997–2011 period while the percentage of total landings by large single trawlers (>1000 HP) has declined drastically to just 1%. Historically the catch composition by the pair-trawler fleet has accounted for about 75% of the total tonnage for saithe but since 2007 it has increased gradually up to 94% in 2013 due mainly to the gear-shifting of single-trawlers to pair-trawling. The share of catches by the jigger fleet was about 8% in the 1985-1998 period but has de-

creased to less than .5% since 2000 and it now accounts for only 3% of the total domestic landings for saithe in 2013. Foreign catches that have been reported to the Faroese Authorities but not officially reported to ICES are also included in the Working Group estimates. Catches in Subdivision IIa, which lies immediately north of the Faroes, have also been included. Little or no discarding is thought to occur in this fishery.

Cumulative landings of saithe for the domestic fleets since 2000 are shown in Figure 6.2.1.2. The last three years are among the poorest in the time series. The progression of landings in the first three months of 2014 are below monthly averages and suggest a poor fishing year.

### 6.2.2 Catch at age

Catch at age is based on length, weight and otoliths samples from Faroese landings of small and large single and pair trawlers, and landing statistics by fleet provided by the Faroese Authorities. Catch at age is calculated for each fleet by four-month periods and the total is raised by the foreign catches. Minor adjustments were made to the catch-at-age matrix for previous due to revised final catch statistics (Tables 6.2.2.1 and 6.2.2.2). Most of the age-dissagregated catch matrix is comprised of catches of the pair-trawl fleet. Since 2010 catch numbers is mostly comprised of age-groups 4 to 6 whereas in the period from 2005 to 2009 it is mainly composed of age-groups 4 to 8. Only numbers of 6-years old were higher in 2013 than in 2012.

The sampling program and sampling intensity in 2013 as well as the approach used in compiling catch numbers is the same as in preceding years. Sampling levels in both 2012 and 2013 are identical and went down from 8.5% in 2011 to 4.9% (Table 6.2.2.3.) The average amount sampled per tonnes landed since 2000 is 5.7%.

### 6.2.3 Weight at age

Mean weights at age have varied by a factor of about 2 during the 1961–2013 period. Mean weights at age were generally high during the early 1980s and they subsequently decreased from the mid 1980s to the early 1990s (Table 6.2.3.1 and Figure 6.2.3.1). Mean weights increased again in the period 1992-96 but have shown a general decrease thereafter. With the exception of 3-years old saithe all age groups were showing signs of increasing size since 2006. By 2011 age-classes 4 to 8 were approaching or at long term average. This trend seemed to continue for older age groups (7 and older) whereas weight of 4 to 6 years old individuals appeared to decrease again in 2012 and 2013. Mean weight of the 2010 year-class (age 3 in 2013) is estimated at 1.21 kg. which is an increase with respect to that in 2012 (1.03 kg.). Since 2001 all age groups have remained below the historical average with the only exception of 7-years old saithe which reached the long-term mean value (3.785 kg.) in 2012 and 3-years old with size above average in 2009. Mean weights at age in the stock are assumed equal to those in the catch.

### 6.2.4 Maturity at age

Maturity at age data from the spring survey is available from 1983 onward (Steingrund, 2003.) Due to poor sampling in 1988 the proportion mature for that year was calculated as the average of the two adjacent years. At the 2012 working group a model using maturity at age from the Faroese groundfish spring survey was implemented to derive smoothed trends in maturity by age and year. The fitting was done locally and the smoothing level was chosen as a trade-off between retaining the trend

in maturities and reducing the data noise. For 1962 to 1982 the average maturity of predicted ogives of the 1983-2011 period was used (Table 6.2.4.1 and Figure 6.2.4.1.) Maturity ogives were low from the early and mid-1990s up to 2001 where they began to rise considerably and are now well above the historical average.

Faroe saithe begins to mature at 3 years old, 20% are mature at age 4, 50% at 5 years old and 100% are mature at age 9 and onwards.

## 6.2.5 Indices of stock size

### 6.2.5.1 Surveys

There are two annual groundfish surveys conducted in Faroese waters. The spring survey series (FGFS1) are available since 1994, while the summer survey (FGFS2) was initiated in 1996. The design for both bottom-trawl surveys is depth stratified with randomised stations covering the Faroe Plateau area. The total number of stations in the summer and spring is 100 and 200 respectively. Effort is recorded in terms of minutes towed approximately 60 min. Large proportion of saithe is caught in relatively few hauls and the interannual variability of these hauls seems considerable.

Survey catch rates (kg per hour), length composition and age-disaggregated indices are presented in figures 6.2.5.1.1 to 6.2.5.1.5. Both surveys suggest low abundances of saithe in mid- and late 1990's and increasing numbers from 2001 to 2006 caused by the strong 1998 and 1999 year classes entering the stock. The most recent estimate in the spring survey suggest a slightly increase in stock biomass in 2014 but given the uncertainty associated with the index the point estimate ought to be taken with caution.

Given the extreme schooling behaviour of saithe the internal consistency in the spring survey measured by the correlation of numbers in the data matrix for the same year class is reasonably good, with  $R^2$  close to 0.85 for the best defined age groups and below  $R^2 = 0.3$  for some other age classes (Figure 6.2.5.1.6). Internal consistency in the age-disaggregated fall survey is displayed in figure 6.2.5.1.7.

### 6.2.5.2 Commercial CPUE

The CPUE series that has been used in the assessment since 2000 was introduced in 1998 (ICES C.M. 1998/ACFM:19), and consists of saithe catch at age and effort in hours, referred to as the pair trawler series. A GLM model and a survey spatial scaling factor is used to standardised the CPUE series (Stock Annex B.4., Benchmark report, WKROUND 2010.) The benchmark working group regarded this novel approach to developing the commercial series as reasonable (Benchmark report, WKROUND 2010.) Predicted annual CPUEs derived from this approach indicate a sharp downwards trend since 2006 (Figure 6.2.5.1.1)

The correlation between predicted CPUE and the spring and summer surveys is  $R^2=0.53$  and  $R^2=0.65$  respectively.

The age-disaggregated index suggests that stock abundances were low in the 1990s to increase subsequently in the 2000s. The age composition indicates that the pair-trawl fleet targets mostly age groups 4 to 6. (Figure 6.2.5.2.1) There is a good agreement between age-disaggregated indices in the commercial index and indices of the same year class one year later (Figure 6.2.5.2.2) as measured by  $R^2 > 0.35$  for all age-classes.

### 6.2.5.3 Information from the fishing industry

No additional information beyond the landings from the commercial fleet was presented for incorporation in the assessment.

## 6.3 Methods

The assessment model adopted at the benchmark assessment in 2010 is described in the Stock annex (Sec. C) and in the benchmark report (WKROUND 2010.) The 2010 XSA was calibrated with the standardized pair trawlers with catchability independent of stock size for all ages, catchability independent of age for ages  $\geq 8$ , the shrinkage of the SE of the mean = 2.0, and no time tapered weighting. The tunings series used are shown in Table 6.3.1. Commercial catch-at age data (ages 3-14+, years 1961-2013) were calibrated in the XSA model using the commercial pair-trawl fleet (ages 3-11, years 1995-2013). XSA model diagnostics of the spaly run is presented in Table 6.3.2... Patterns in log-catchability residuals from the XSA model are relatively random but with large positive blocks in 2006-2010 for 3 to 5 age-classes (Figure 6.3.1). Residuals from a separable statistical model predicting catch numbers at age and survey data and modelling selectivities over 3 distinct periods are also presented (Figure 6.3.3)

## 6.4 Reference points

### 6.4.1 Biological reference points and MSY framework

In the 2011 assessment for Faroe saithe a Management Strategy Evaluation (MSE) was performed using a harvest control rule in the FLR environment. In the 2012 assessment some changes were included in the simulation framework. Maturity by age and year were modified (and therefore SSB) according to the smoothing technique reported in Section 6.2.4. Extra stochasticity was added to weights at age in the form of autocorrelation and the constraint of running XSAs in the simulations was dropped to reduce the simulation running time. All these changes caused an upward revision of the  $F_{msy}$  point estimate from  $F_{msy}=0.28$  to  $F_{msy}=0.32$ . The simulation framework is explained below.

The MSE approach requires mathematical representations of two systems: a 'true' system and an 'observed' one. The 'true' system is represented by the operating model (OM) that simulates the real world. In contrast, the 'observed' system represents the conventional management procedure (MP), from the data collection through stock assessment to the management implementation. The present MSE evaluation uses the working group stock assessment as the basis for the Operating Model and makes assumptions about the selection pattern of the fishing fleet and its dynamics. The model comprises a single stock that is fished by a single fleet. It implements a harvest control rule through a management procedure that explicitly models the stock assessment process and time lag in implementing the management advice (delay between the gathering of data and making a management decision, i.e. setting the current fishing effort) which explicitly address uncertainty in recent parameter estimates. The stock recruitment relation used is the Hockey-stick or segmented regression with random noise on top of it reflecting the high variability in historical recruitment estimates (CV=0.5). Fishing mortality is estimated from effort, catchability (constant) and the selection pattern. The observed selection pattern since 1996 is used in the simulations which correspond with the implementation of the fishing days quota in the Faroese management system. Maturity-at-age is fixed and taken from the smoothing method implemented in 2012 while stochasticity is in-

cluded in weights-at-age with a  $CV=0.18$  and autocorrelation of  $Rho=0.35$  applied to all age groups to somehow replicate the observed fluctuations pattern. The data sampling of catches and tuning fleets is carried out by multiplying by random errors. Natural mortality is fixed to  $M=0.2$ . Simulations were performed 1000 times on a 40-year forward period with the historical period being replicated in the OM.

Unlike the flat curves obtained from traditional yield-per-recruit calculations simulations curve show a relatively well defined maximum at  $F_{msy}=0.32$ . The reason for this difference is that when fishing mortality is above certain level ( $>0.3$ ) some of the stochastic runs will lead to spawning stock being below the break point in the stock-recruitment function so recruitment and subsequent landings will be reduced. The breakpoint of 55 kt. in the segmented regression or the revised  $B_{pa}=60\ 000$  t. (see Section 2. Demersal stocks in the Faroe Area, Subsection 2.1.7 Faroe saithe) could be candidates for  $B_{trigger}$  the point at which fishing mortality should be reduced according to the MSY framework. The results of the simulations are shown in Figures 6.4.1.1 and 6.4.1.2.

In 2014 at the WKMSYREF2 workshop the EqSim simulation framework was used to explore candidates to  $F_{msy}$ . The work was presented at the NWWG meeting in 2014 and the results agree with the previous simulations (see above) in that estimates of  $F_{msy}$  are in the range of  $F_{msy}=0.30$  and  $F_{msy}=0.34$  and not as the present level of  $F_{msy}=0.28$ . Below it is an excerpt from the WKMSYREF2 report:

The EqSim framework fits three stock-recruit functions (Ricker, Beverton-Holt and Hockey-stick) on the bootstrap samples of the stock and recruit pairs from which approximate joint distributions of the model parameters can be made. The result of this is projected forward for a range of  $F$ 's values and the last 50 years are retained to calculate summaries. Each simulation is run independently from the distribution of model and parameters. Error is introduced within the simulations by randomly generating process error about the constant stock recruit fit, and by using historical variation in maturity, natural mortality, weight at age, etc.

In the EqSim simulations the Hockey-Stick stock-recruit function were used assuming assessment and autocorrelation errors. Figures 6.4.1.3 and 6.4.1.4 illustrate the results of these simulations which suggest that candidates for  $F_{MSY}$  are  $F_{MSY}=0.34$  (median yield) and  $F_{MSY}=0.30$  ( $F$  that gives the maximum mean yield in the long term) lie above the current  $F_{pa}=0.28$  if autocorrelation and assessment errors are included in the simulation framework. If errors are ignored then estimates for  $F_{MSY}$  are predicted to  $F_{MSY}=0.38$  (median yield),  $F_{MSY}=0.35$  (maximum mean yield). No  $B_{lim}$  is defined for faroe saithe but for the purposes of the analysis a value of  $B_{lim}=B_{pa}/1.4$  was set for the simulations. A more detailed information of the simulations are available under <http://www.ices.dk/community/groups/Pages/WKMSYREF2.aspx> A summary is given in the table below.

	<b>F</b>	<b>SSB</b>	<b>Catch</b>	<b>option</b>
Flim	0.34	87327.43	36479.8	ass. Error
Flim	0.37	79116.87	35447.45	ass. Error
Flim	0.46	38905.3	22023.28	ass. Error
MSY:median	0.34	88565.78	36665.24	ass. Error
Maxmeanland	0.3	101372.9	37109.88	ass. Error
FCrash5	0.41	63312	31637.31	ass. Error
FCrash50	0.52	855.73	550.19	ass. Error
Flim	0.4	78435.72	38526.07	No ass. Error
Flim	0.42	73052.08	37660.27	No ass. Error
Flim	0.5	38910.57	24279.75	No ass. Error
MSY:median	0.38	82329.53	38694.43	No ass. Error
Maxmeanland	0.35	90688.34	39167.13	No ass. Error
FCrash5	0.43	69750.99	37114.99	No ass. Error
FCrash50	0.54	2847.53	1910.51	No ass. Error

MSY and revised precautionary reference points (Section 2. Demersal stocks in the Faroe Area, Subsection 2.1.7 Faroe saithe) for faroe saithe are listed below:

<b>Biological reference points</b>	<b>NWWG 2012</b>	<b>NWWG 2011</b>	<b>NWWG2014</b>
Btrigger	55 000 t.		55 000 t.
Blim	not defined.		
Bpa	60 000 t.		
Flim	not defined		
Fpa	0.28		
Fmsy	0.32	0.28	0.30

The SSB-R relation with respect to reference fishing mortalities (Fhigh, Fmed and Flow) is presented in Figure 6.5.1.3 or 6.4.1. while the history of the stock/fishery in relation to the existing four reference points can be seen in Figure 6.5.1.4 or 6.4.2.

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

Recruitment in the 1980s was close to the historical average (32 millions). The strongest year class since 1986 was produced in the 1990s and the average for that decade was about 28 millions (Figures 6.5.1 to 6.5.4. and Tables 6.5.1 to 6.5.3) The 1998 (88 millions) and 1999 (106 millions) are the largest observed in the time series. The 2010 year-class (numbers of age-3 saithe in 2013) is estimated at 35 million below the historical average of 31 million. Since 2006 estimated recruitment has remained at low levels in comparison with the exceptionally high recruitment pulses observed from 2001 to 2005.

Relatively low Fs during the 1960s and recruitment above average in early-1970s caused an increase in SSB well above the historical average around the mid-1970s while landings peaked to almost 58 000 t. in 1973. Increasing Fs since 1980 lead to a decrease in the spawning stock biomass of saithe throughout the mid-1980s although recruitment of the 1983 year class rose to 61 000 millions, i.e. double the average from 1961 to 2013. The historically low SSB persisted in 1992-1998 and this along with low Fs caused landings to steeply decline to around 20 000 tonnes in 1996. The SSB in-

creased since 1999 to above 128 000t in 2005 with the maturation of the 1995, 1996, 1997 and 1999 year classes and decreased to 93 000 t in 2009. The 2013 spaly assessment indicates that the point estimator of SSB in 2013 is 60kt.. Since 2005 SSB has been declining sharply and at present is close to  $B_{trigger}=55\ 000\ t$  The cause for concern is perhaps most graphically illustrated in figure 6.5.6 which shows the numbers of mature fish in the stock at each age from 3 yrs to 14+ yrs for the two years 2006 and 2013. It is quite clear that there has been a substantial reduction in the numbers of mature fish over the age groups 4 to 8.

In 2013 average fishing mortality over age groups 4 to 8 ( $F_{bar}$ ) is estimated at  $F_{bar}=0.45$ . The assessment model suggests a drop in fishing mortality from 2012 to 2013 reflecting the abrupt decline in landings from 35 kt. to 26 kt.  $F$  has been above  $F_{msy}=0.32$  (NWWG 2012) and  $F_{msy}=0.28$  (NWWG 2011) and  $F_{msy}=0.30$  (WKMSYREF2 2014) since 1981.

The relation between stock and recruitment is presented in figure 6.5.7.

PA Precautionary plot is shown in figure 6.5.8

## 6.6 Short term forecast

### 6.6.1 Input data

Population numbers at age 3 for the base short term prediction is calculated as the geometric mean of estimated recruitment strength from 2007 to 2011. Natural mortality is set to constant 0.2. Weight-at-age for 3-years old saithe is predicted by the year class strength (number of 3-years old in the stock) with a 3 year time lag (Eq. 1) whereas weight for ages 4 to 8 is estimated by weight-at-age the previous year from the same year class (Eq. 2) Weight for ages 9 to 14+ is an average of the most 3 recent years. Diagnostics and results of the model are shown in Figures 6.6.1.1 and 6.6.1.2. For older age groups (9 to 14+) a 3-year average is used.

$$W_{3,y} = \alpha N_{3,y-3} + \beta \quad \text{for } a = 3 \quad (\text{Eq. 1})$$

$$W_{a+1,y+1} = \alpha W_{a,y} + \beta \quad \text{for } 4 \leq a \leq 8 \quad (\text{Eq. 2})$$

$$W_{a,y} = (W_{a-3,y} + W_{a-2,y} + W_{a-1,y})/3 \quad \text{for } 9 \leq a \leq 14+ \quad (\text{Eq. 3})$$

Proportion mature for 2014-2016 is taken as the average of predicted maturity ogives from 2012 and 2014 The exploitation pattern used is a 3 year average rescaled to last year reflecting the trend observed in  $F_s$  in recent years..

Spaly short term prognosis (spaly XSA run with calibrated with the commercial pair-trawler fleet)

Input data for the prediction with management options for the spaly scenario are presented in Table 6.6.1.1.

### 6.6.2 Projection of catch and biomass

Results from predictions with management optionis presented in Table 6.6.2.1.

At status quo  $F=0.45$  landings would increase to 33 kt. in 2014 and 36 kt. in 2015 while spawning stock biomass is expected to around 70kt. in 2014 and increase to 76 kt. tonnes in 2015. Landings in 2014 are predicted to rely on the 2008, 2009 and 2009 year classes (73%) while in the SSB these year-classes will contribute to around 69% of the spawning biomass in 2014 (Figure 6.6.2.1a.)

## 6.7 Yield per recruit and medium term forecasts

No medium term projections were performed for faroe saithe.

### Input data to yield per recruit

The input data to long term prediction are shown in Table 6.7.1.1.

Mean weights-at-age for 1981-2013 were used for the long term projection. Natural mortality is set to constant 0.2. Proportion mature-at-age is taken as the average from 1983-2014.

The exploitation pattern was set equal to the average of the last five years (2005-2013) (as suggested from ACFM, 2004). Results from the yield per recruit analysis are shown in Table 6.7.1.2 and Figure 6.7.1.1.

## 6.8 Uncertainties in assessment and forecast

In 2012 and 2013 the amount of catch sampled was almost 5% which is regarded as adequate.

The assessment of Faroe saithe is relatively uncertain due to lack of good tuning data although the internal consistency in the commercial fleets used to calibrate the XSA model is reasonable considering the nature of the species that is highly schooling, and widely migrating. The retrospective pattern (Figure 6.8.1) reveals some of the assessment uncertainty. It shows periods of over- and underestimation in average fishing mortality and consequently under- and overestimation in spawning stock biomass. Over- and underestimation seem to occur in periods of poor and high abundances respectively. Various factors could explain this phenomena, e.g., by changes in the vertical distribution of the stock or changes in the selection pattern that have been observed in recent years. With respect to recruitment the retrospective trend suggests an overestimation of incoming year-classes. To avoid large year to year fluctuations in the spawning stock biomass (also dependent on age structure) a locally fitting model was implemented in 2012 to reduce variability in maturities.

## 6.9 Comparison with previous assessment and forecast

The 2013 assessment predicted recruitment in 2013 to around 28 million while the observed year-class strength was 35 million (Table 6.9.1). Spawning stock biomass and fishing mortality were overestimated from 72 kt. and  $F=0.48$  to 61 kt. and  $F=0.45$  respectively. Landings for 2013 were predicted at 47 k t. while actual observed catches in that year reached 26 kt an overestimation of 45%..

## 6.10 Management plans and evaluations

No management plan exists for saithe in Division Vb

## 6.11 Management considerations

Management consideration for saithe is under the general section for Faroese stocks.

Unlike the traditional yield-per-recruit curves the simulations carried out at the 2012 assessment (Sec. 6.4.1) show a relatively well defined maximum at  $F_{msy}=0.32$ . Candidates for  $B_{trigger}$  might be set to the breakpoint of 55 kt. in the segmented regression or the revised  $B_{pa}=60\ 000$  t. the point at which fishing mortality should be reduced according to the MSY framework (for more details see Section 6.4.1)



### 6.12 Ecosystem considerations

No evidence is available to indicate that the fishery is impacting the marine environment. A Ph.D. project was initiated in 2008, with the aim of investigate the role of environmental indicators in the dynamics of Faroe saithe. The results and conclusions of the PhD will be available to the working group in future meetings.

### 6.13 Regulations and their effects

It seems to be no relationship between number of fishing days and fishing mortality, probably because of large fluctuations in catchability. Area restriction is an alternative to reduce fishing mortality- and this is used to protect small saithe in Faroese area.

### 6.14 Changes in fishing technology and fishing patterns

See section 6.2.

### 6.15 Changes in the environment

According to existing literature the productivity of the ecosystem clearly affects both cod and haddock recruitment and growth (Gaard *et al.*, 2002), a feature outlined in Steingrund and Gaard (2005). The primary production on the Faroe Shelf (< 130 m depth), over the period May through June, varied interannually by a factor of five, giving rise to low- or high-productive periods of 2-5 years duration (Steingrund and Gaard, 2005). The productivity over the outer areas seems to be negatively correlated with the strength of the Subpolar Gyre (Hátún *et al.*, 2005; Hátún *et al.*, 2009; Steingrund *et al.*, 2010), which may regulate the abundance of saithe in Faroese waters (Steingrund and Hátún, 2008). When comparing a gyre index (GI) to saithe in Faroese waters there was a marked positive relationship between annual variations in GI and the total biomass of saithe lagged 4 years (Figure 6.15.1.)

There is a negative relationship between mean weight-at-age and the stock size of saithe in Faroese waters. This could be due to simple density-dependence, where there is a competition for limited food resources. Stomach content data show that the food of saithe is dominated by blue whiting, Norway pout, and krill, and the annual variations in the stomach fullness are mainly attributable to variations in the feeding on blue whiting. There seems to be no relationship between stomach fullness and weights-at-age for saithe (í Homrum *et al.* WD 2009).

### 6.16 References

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**Table 6.2.1.1. Faroe saithe (Division Vb). Nominal catches (tonnes round weight) by countries, 1988-2013, as officially reported to ICES.**

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Denmark	94	-	2	-	-	-	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-	-	16	-	-	-	-
Faroe Islands	44402	43,624	59,821	53,321	35,979	32,719	32,406	26,918	19,267	21,721	25,995	32,439		49,676
France 3	313	-	-	-	120	75	19	10	12	9	17	-	273	934
Germany	-	-	-	32	5	2	1	41	3	5	-	100	230	667
German Dem. Rep.	-	9	-	-	-	-	-	-	-	-	-	-	-	-
German Fed. Rep.	74	20	15	-	-	-	-	-	-	-	-	-	-	5
Greenland	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-	-	-	-	0	0	0
Netherlands	-	22	67	65	-	-	-	-	-	-	-	160	72	60
Norway	52	51	46	103	85	32	156	10	16	67	53	-	-	-
Portugal	-	-	-	-	-	-	-	-	-	-	-	-	20	1
UK (Eng. & W.)	-	-	-	5	74	279	151	21	53	-	19	67	32	80
UK (Scotland)	92	9	33	79	98	425	438	200	580	460	337	441	534	708
USSR/Russia 2	-	-	30	-	12	-	-	-	18	28	-	-	-	-
Total	45027	43,735	60,014	53,605	36,373	33,532	33,171	27,200	19,949	22,306	26,065	33,207	1,161	52,131
Working Group estimate 4,5	45285	44,477	61,628	54,858	36,487	33,543	33,182	27,209	20,029	22,306	26,421	33,207	39,020	51,786

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Denmark	-	-	-	-	34	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-	-	-	-	-
Faroe Islands	55,165	47,933	48,222	71,496	70,696	64,552	61,117	61,889	46,686	32,056	38,175	28,391
France	607	370	147	123	315	108	97	68	46	135	40	31
Germany	422	281	186	1	49	3	3	0				
Greenland	125	-			73	239	0	1			1	
Ireland	-	-	-	-	-	-	-	-				
Iceland	-	-	-	-	-	-	-	148	-			
Netherlands	0	0	0	0	0	3	0	0	0			
Norway	77	62	82	82	35	81	38	23	28			
Portugal	-	-	5	-	-	-	-	-				
Russia	10	32	71	210	104	159	38	44	3			1
UK (E/W/NI)	58	89	85	32	88	4	-	-				
UK (Scotland)	540	610	748	4,322	1,011	408	400	685				
United Kingdom	-	-	-	-	-	-	-	-	706	19		1
Total	57,004	49,377	49,546	76,266	72,405	65,557	61,693	62,858	47,469	32,210	38,216	28,424
Working Group estimate 4,5,6,7	53,546	46,555	46,355	67,967	66,902	60,785	57,044	57,949	43,885	29,658	35,314	26,262

Table 6.2.1.2. Faroe saithe (Division Vb). Total Faroese landings (rightmost column) and the contribution (%) by each fleet category (1985-2013). Averages for 1985-2013 are given at the bottom.

year	Open boats	Long-line <100 GRT	trawl <400 HP	Gillnet	Jigger	trawl 400-1000 HP	trawl >1000 HP	pair trawl <1000 HP	Pair trawl >1000 HP	Long-line >100 GRT	trawl	Others	weight (tons)
1985	0.2	0.1	0.1	0.0	2.6	6.6	33.7	28.2	28.2	0.1	0.2	0.2	42598
1986	0.3	0.2	0.1	0.1	3.6	2.8	27.3	27.5	36.5	0.1	0.7	0.9	40107
1987	0.7	0.1	0.3	0.4	5.6	4.1	20.4	22.8	44.2	0.1	1.1	0.0	39627
1988	0.4	0.3	0.1	0.3	6.5	6.8	20.8	19.6	43.6	0.1	1.3	0.1	43940
1989	0.9	0.1	0.3	0.2	9.3	5.4	17.7	23.5	41.1	0.1	1.3	0.0	43624
1990	0.6	0.2	0.2	0.2	7.4	3.9	19.6	24.0	42.8	0.2	0.9	0.0	59821
1991	0.6	0.1	0.1	0.6	9.8	1.3	13.9	26.5	46.2	0.1	0.8	0.0	53321
1992	0.4	0.4	0.0	0.0	10.5	0.5	7.1	24.4	55.6	0.1	1.0	0.0	35979
1993	0.6	0.2	0.1	0.0	9.3	0.6	6.5	21.4	60.6	0.1	0.7	0.0	32719
1994	0.4	0.4	0.1	0.0	12.6	1.1	6.8	18.5	59.1	0.2	0.7	0.0	32406
1995	0.2	0.1	0.4	0.0	9.6	0.9	9.9	17.7	60.9	0.3	0.0	0.0	26918
1996	0.0	0.0	0.1	0.0	9.2	1.2	6.8	23.7	58.6	0.2	0.0	0.0	19267
1997	0.0	0.1	0.1	0.0	8.9	2.5	10.7	17.8	58.9	0.4	0.4	0.0	21721
1998	0.1	0.4	0.1	0.0	8.1	2.8	13.8	16.5	57.6	0.3	0.4	0.0	25995
1999	0.0	0.1	0.1	0.0	5.7	1.2	12.6	18.5	60.0	0.2	1.6	0.0	32439
2000	0.1	0.1	0.2	0.0	3.7	0.3	15.0	17.5	62.3	0.1	0.7	0.0	39020
2001	0.1	0.1	0.1	0.0	2.8	0.3	20.2	16.5	58.8	0.2	0.8	0.1	51786
2002	0.1	0.2	0.1	0.0	1.6	0.1	26.5	10.5	60.8	0.1	0.0	0.0	53546
2003	0.0	0.0	1.9	0.0	0.9	0.4	17.4	14.7	64.7	0.1	0.0	0.0	46555
2004	0.1	0.2	3.7	0.0	1.9	0.4	15.1	14.4	63.8	0.2	0.0	0.0	44605
2005	0.2	0.1	4.4	0.0	2.4	0.2	12.7	20.6	59.2	0.2	0.0	0.0	66394
2006	0.2	0.4	0.3	0.0	3.9	0.1	19.8	20.6	54.1	0.6	0.0	0.0	65394
2007	0.2	0.2	0.2	0.0	2.0	0.1	30.4	16.0	50.6	0.3	0.0	0.0	41341
2008	0.2	0.3	1.5	0.0	3.2	0.2	20.4	16.0	57.7	0.5	0.0	0.0	27475
2009	0.4	0.2	3.3	0.0	4.3	0.1	9.6	15.1	66.8	0.2	0.0	0.0	47122
2010	0.1	0.1	1.2	0.0	3.9	2.4	8.3	15.1	68.3	0.6	0.0	0.0	38293
2011	0.1	0.1	0.5	0.0	3.6	1.3	2.6	14.1	77.1	0.5	0.0	0.0	26854
2012	0.2	0.1	1.9	0.0	2.4	0.1	2.2	18.6	73.5	1.0	0.0	0.0	31633
2013	0.1	0.3	1.0	0.0	3.2	0.2	0.6	24.9	69.0	0.5	0.0	0.1	22339
Avg.	0.3	0.2	0.8	0.1	5.5	1.6	14.8	19.5	56.6	0.3	0.4	0.0	39753

**Table 6.2.2.1. Faroe saithe (Division Vb). Catch number at age by fleet categories in 2013 (calculated from gutted weights).**

Age	Jiggers	Single trawl>1000 HP	Pair trawl <1000 HP	Pair trawl>1000HP	Others	Total Division Vb
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	9	2	156	424	17	608
4	121	20	1083	3047	91	4362
5	151	21	852	2462	72	3558
6	74	13	471	1295	38	1891
7	18	3	107	293	9	431
8	5	2	44	122	3	176
9	3	1	26	71	2	103
10	2	1	20	56	2	81
11	6	1	30	83	3	123
12	3	1	16	50	2	71
13	1	0	9	22	1	33
14	1	0	7	19	1	28
15	0	0	1	2	0	3
Total No.	393	65	2822	7946	241	11468
Catch t.	746	135	5562	15412	464	22319

**Table 6.2.2.2. Faroe saithe (Division Vb). Catch number at age (thousands) from the commercial fleet (1961-2013)**

	3	4	5	6	7	8	9	10	11	12	13	14+
1961	183	379	483	403	216	129	116	82	45	27	6	49
1962	562	542	617	495	286	131	129	113	71	29	13	63
1963	614	340	340	415	406	202	174	158	94	169	61	44
1964	684	1908	1506	617	572	424	179	150	100	83	47	44
1965	996	850	1708	965	510	407	306	201	156	120	89	76
1966	488	1540	1201	1686	806	377	294	205	156	94	52	79
1967	595	796	1364	792	1192	473	217	190	97	75	38	27
1968	614	1689	1116	1095	548	655	254	128	89	59	40	88
1969	1191	2086	2294	1414	1118	589	580	239	115	100	36	54

1970	1445	6577	1558	1478	899	730	316	241	86	48	46	38
1971	2857	3316	5585	1005	828	469	326	164	100	54	13	33
1972	2714	1774	2588	2742	1529	1305	1017	743	330	133	28	49
1973	2515	6253	7075	3478	1634	693	550	403	215	103	25	58
1974	3504	4126	4011	2784	1401	640	368	340	197	124	45	96
1975	2062	3361	3801	1939	1045	714	302	192	193	126	64	108
1976	3178	3217	1720	1250	877	641	468	223	141	96	60	131
1977	1609	2937	2034	1288	767	708	498	338	272	129	80	121
1978	611	1743	1736	548	373	479	466	473	407	211	146	178
1979	287	933	1341	1033	584	414	247	473	368	206	136	349
1980	996	877	720	673	726	284	212	171	196	156	261	369
1981	411	1804	769	932	908	734	343	192	92	128	176	717
1982	387	4076	994	1114	380	417	296	105	88	56	49	797
1983	2483	1103	5052	1343	575	339	273	98	98	99	25	416
1984	368	11067	2359	4093	875	273	161	52	65	59	18	176
1985	1224	3990	5583	1182	1898	273	103	38	26	72	41	162
1986	1167	1997	4473	3730	953	1077	245	104	67	33	56	69
1987	1581	5793	3827	2785	990	532	333	81	43	5	11	81
1988	866	2950	9555	2784	1300	621	363	159	27	43	15	2
1989	451	5981	5300	7136	793	546	185	83	55	10	2	27
1990	294	3833	10120	9219	5070	477	123	61	60	18	19	42
1991	1030	5125	7452	5544	3487	1630	405	238	128	77	22	19
1992	521	4067	3667	2679	1373	894	613	123	63	37	52	19
1993	1316	2611	4689	1665	858	492	448	245	54	34	10	8
1994	690	3961	2663	2368	746	500	307	303	150	28	19	2
1995	398	1019	3468	1836	1177	345	241	192	104	73	25	19
1996	297	1087	1146	1449	1156	521	132	77	64	45	29	8
1997	344	832	2440	1767	1335	624	165	71	29	48	29	23
1998	163	1689	1934	3475	1379	683	368	77	32	28	24	21
1999	322	655	3096	2551	4113	915	380	147	24	27	5	37
2000	811	2830	1484	4369	2226	2725	348	186	56	18	2	5
2001	1125	2452	8437	2155	3680	1539	1334	293	90	24	19	13
2002	302	8399	5962	9786	862	1280	465	362	33	36	8	1
2003	330	2432	11152	3994	4287	417	419	304	91	40	3	0

2004	76	2011	8544	8762	2125	1807	265	293	146	100	10	2
2005	454	2948	9486	16606	7099	843	810	32	102	27	3	0
2006	1475	5045	7781	7712	10296	3760	640	282	32	12	12	5
2007	831	3320	11305	6473	3781	4294	1538	406	81	11	9	3
2008	4784	3108	3598	9370	3594	2223	2048	444	159	12	6	0
2009	459	7412	4978	1842	5167	2009	1696	1069	292	41	3	1
2010	2324	2916	5298	1125	1009	2098	1248	832	376	51	22	0
2011	1897	2744	1940	1804	477	530	704	521	439	138	34	4
2012	859	9833	4142	1252	901	304	307	399	229	136	91	21
2013	715	5132	4186	2225	507	207	121	96	145	84	38	36

Table 6.2.2.3. Faroe saithe (Division Vb). Sampling intensity in 2001-2013.

Year		Jiggers	Single trawlers >1000 HP	Pair trawlers <1000 HP	Pair trawlers >1000 HP	Others	Total	Amount sampled pr tons landed (%)
2001	Lengths	1788	4388	5613	30341	0	42130	7.7
	Otoliths	180	450	480	3237	0	4347	
	Weights	180	420	420	3177	0	4197	
2002	Lengths	1197	9235	5049	30761	0	46242	5.8
	Otoliths	120	1291	422	3001	0	4834	
	Weights	120	420	240	2760	0	3540	
2003	Lengths	0	4959	6393	34812	1388	47552	7.0
	Otoliths	0	719	960	3719	180	5578	
	Weights	0	420	239	2999		3658	
2004	Lengths	916	2665	3455	35609	1781	44426	5.9
	Otoliths	180	180	240	3537	240	4377	
	Weights	180	120	120	3357	1364	5141	
2005	Lengths	1048	4266	6183	32046	1564	45107	3.6
	Otoliths	120	413	690	2760	240	4223	
	Weights	340	385	791	3533	1564	6613	
2006	Lengths	1059	7979	8115	23082	1139	41374	3.5
	Otoliths	180	598	1138	2096	60	4072	
	Weights	180	60	1620	5678	812	8350	
2007	Lengths	683	10525	10593	18045	381	40227	4.1
	Otoliths	120	748	960	1977	0	3805	
	Weights	120	697	5603	9884	120	16424	
2008	Lengths	0	6892	3694	13995	234	24815	2.5
	Otoliths	0	690	600	1500	0	2790	
	Weights	0	0	2517	12914	234	15665	

2009	Lengths	511	5273	3695	23352	0	32831	4.1
	Otoliths	97	301	599	2519	0	3516	
	Weights	511	0	3494	19060	0	23065	
2010	Lengths	209	1442	3663	25793	151	31258	6.0
	Otoliths	5	119	480	2459	0	3063	
	Weights	5	0	3060	18749	151	21965	
2011	Lengths	583	18	1874	19990	753	23218	8.5
	Otoliths	60	0	300	2459	60	2879	
	Weights	583	18	1458	14256	753	17068	
2012	Lengths	6	0	1060	24924	211	26201	4.9
	Otoliths	6	0	120	2516	0	2642	
	Weights	6	0	1060	17593	211	18870	
2013	Lengths	0	0	1465	18015	1325	20805	4.9
	Otoliths	0	0	360	1979	120	2459	
	Weights	0	0	1465	13544	1325	16334	



**Table 6.2.3.1. Faroe saithe (Division Vb). Catch weights at age (kg)(equal to stock-weights) from the commercial fleet (1961-2013). The value for 2014 is used for short-term projections.**

	3	4	5	6	7	8	9	10	11	12	13	14+
1961	1.430	2.302	3.348	4.287	5.128	6.155	7.060	7.265	7.497	8.198	9.154	9.992
1962	1.273	2.045	3.293	4.191	5.146	5.655	6.469	6.706	7.150	7.903	8.449	9.658
1963	1.280	2.197	3.212	4.568	5.056	5.932	6.259	8.000	7.265	8.551	9.020	9.818
1964	1.175	2.055	3.266	4.255	5.038	5.694	6.662	6.837	7.686	8.348	8.123	9.423
1965	1.181	2.125	2.941	4.096	4.878	5.932	6.321	7.288	8.074	7.878	9.479	9.849
1966	1.361	2.026	3.055	3.658	4.585	5.520	6.837	7.265	7.662	8.123	10.210	9.883
1967	1.273	1.780	2.534	3.572	4.368	5.313	5.812	6.554	7.806	7.591	8.551	9.135
1968	1.302	1.737	2.036	3.120	4.049	5.183	6.238	7.520	8.049	8.654	8.298	9.748
1969	1.188	1.667	2.302	2.853	3.673	5.002	5.714	6.405	6.554	7.591	7.951	9.096
1970	1.244	1.445	2.249	2.853	3.515	4.418	5.444	5.733	6.662	7.310	9.047	9.634
1971	1.101	1.316	1.818	2.978	3.702	4.271	5.388	5.972	6.490	7.173	7.380	9.612
1972	1.043	1.485	2.055	2.829	3.791	4.175	4.808	5.294	6.948	6.727	7.591	9.609
1973	1.306	1.754	1.899	2.700	4.426	5.264	6.156	6.334	8.076	8.777	9.782	11.115
1974	1.615	1.723	2.493	2.824	3.524	5.197	6.279	6.454	7.070	7.773	8.763	10.830
1975	1.293	1.924	2.623	3.621	4.128	4.754	5.952	7.073	8.352	9.032	9.984	11.082
1976	1.162	1.790	3.074	3.291	4.579	4.648	5.116	6.314	7.069	7.069	7.808	9.714
1977	1.223	1.641	2.660	3.790	4.239	5.597	5.350	5.912	6.837	6.727	6.948	9.258
1978	1.493	2.324	3.068	3.746	4.913	4.368	5.276	5.832	6.053	6.706	7.686	8.516
1979	1.220	1.880	2.620	3.400	4.180	4.950	5.690	6.380	7.020	7.260	8.150	9.618
1980	1.230	2.120	3.320	4.280	5.160	6.420	6.870	7.090	7.930	8.070	8.590	10.142
1981	1.310	2.130	3.000	3.810	4.750	5.250	5.950	6.430	7.000	7.470	8.140	9.430
1982	1.337	1.851	2.951	3.577	4.927	6.243	7.232	7.239	8.346	8.345	8.956	10.227
1983	1.208	2.029	2.965	4.143	4.724	5.901	6.811	7.051	7.248	8.292	9.478	10.509
1984	1.431	1.953	2.470	3.850	5.177	6.347	7.825	6.746	8.636	8.467	8.556	10.802
1985	1.401	2.032	2.965	3.596	5.336	7.202	6.966	9.862	10.670	10.460	10.202	13.055
1986	1.718	1.986	2.618	3.277	4.186	5.589	6.050	6.150	9.536	9.823	7.303	12.773
1987	1.609	1.835	2.395	3.182	4.067	5.149	5.501	6.626	6.343	10.245	8.491	10.482
1988	1.500	1.975	1.978	2.937	3.798	4.419	5.115	6.712	9.040	9.364	9.142	10.216
1989	1.309	1.735	1.907	2.373	3.810	4.667	5.509	5.972	6.939	8.543	9.514	10.484
1990	1.223	1.633	1.830	2.052	2.866	4.474	5.424	6.469	6.343	8.418	7.383	8.640
1991	1.240	1.568	1.864	2.211	2.648	3.380	4.816	5.516	6.407	7.395	8.079	8.674
1992	1.264	1.602	2.069	2.554	3.057	4.078	5.012	6.768	7.754	8.303	7.786	9.301
1993	1.408	1.860	2.323	3.131	3.730	4.394	5.209	6.540	8.403	7.275	9.414	9.640
1994	1.503	1.951	2.267	2.936	4.214	4.971	5.657	5.950	6.891	8.752	9.752	7.989
1995	1.456	2.177	2.420	2.895	3.651	5.064	5.440	6.167	7.080	7.736	7.295	7.104
1996	1.432	1.875	2.496	3.229	3.744	4.964	6.375	6.745	7.466	7.284	8.470	10.125
1997	1.476	1.783	2.032	2.778	3.598	4.766	5.982	7.658	7.882	8.539	9.488	10.413
1998	1.388	1.711	1.954	2.405	3.300	4.220	4.999	6.391	6.665	8.214	8.485	8.845
1999	1.374	1.712	1.905	2.396	2.845	4.124	5.256	5.526	6.956	8.030	8.349	8.907
2000	1.477	1.606	2.077	2.360	2.977	3.480	4.851	5.268	6.523	4.727	8.807	8.972
2001	1.330	1.590	1.785	2.586	3.059	3.871	4.374	5.565	6.703	5.776	7.745	7.773
2002	1.142	1.460	1.652	1.969	3.130	3.589	4.513	5.138	6.422	8.026	4.759	11.357
2003	1.123	1.304	1.614	1.977	2.532	3.970	4.834	5.499	6.099	6.987	5.961	0.000
2004	1.143	1.333	1.450	1.789	2.560	3.159	4.154	5.167	6.015	6.186	7.056	9.391
2005	1.148	1.325	1.516	1.672	2.087	2.975	3.790	6.087	6.134	6.651	7.424	0.000
2006	1.126	1.218	1.462	1.790	2.035	2.436	3.861	4.222	5.149	6.437	6.905	5.365
2007	1.058	1.391	1.413	1.824	2.361	2.682	3.278	4.104	4.998	6.331	7.844	7.971
2008	1.146	1.312	1.672	1.816	2.395	2.902	3.100	3.728	4.769	6.072	6.451	0.000
2009	0.938	1.485	1.893	2.411	2.601	3.147	3.634	4.024	5.014	5.828	6.308	9.011
2010	1.429	1.706	2.166	2.551	3.172	3.411	3.972	4.352	5.083	4.941	5.305	0.000
2011	1.111	1.693	2.253	2.918	3.609	4.204	4.531	5.087	5.416	6.087	6.763	7.916
2012	1.029	1.334	1.626	2.709	3.785	4.448	4.799	5.207	5.562	6.018	7.143	6.247
2013	1.208	1.466	1.778	2.069	3.553	4.292	5.191	5.742	5.919	6.417	7.941	7.138
2014	1.280	1.296	1.673	2.033	3.370	4.698	4.840	5.345	5.632	6.174	7.282	7.100

**Table 6.2.4.1. Faroe saithe (Division Vb). Proportion mature at age (1982-2014). Maturities-at-age from 1961 to 1981 are fixed and equal to those in 1982. The value for 2015 is used for short-term prognosis.**

	3	4	5	6	7	8	9	10	11	12	13	14+
1982	0.03	0.22	0.53	0.79	0.92	0.98	1.00	1	1	1	1	1
1983	0.02	0.27	0.61	0.90	1.00	1.00	1.00	1	1	1	1	1
1984	0.04	0.29	0.61	0.88	1.00	1.00	1.00	1	1	1	1	1
1985	0.05	0.29	0.59	0.86	0.97	0.99	1.00	1	1	1	1	1
1986	0.06	0.29	0.58	0.83	0.94	0.98	1.00	1	1	1	1	1
1987	0.06	0.27	0.55	0.80	0.92	0.97	1.00	1	1	1	1	1
1988	0.05	0.25	0.53	0.77	0.90	0.96	1.00	1	1	1	1	1
1989	0.04	0.22	0.50	0.74	0.88	0.96	1.00	1	1	1	1	1
1990	0.03	0.20	0.48	0.73	0.87	0.95	1.00	1	1	1	1	1
1991	0.03	0.18	0.48	0.74	0.88	0.96	0.99	1	1	1	1	1
1992	0.02	0.18	0.49	0.76	0.90	0.98	0.99	1	1	1	1	1
1993	0.01	0.17	0.50	0.79	0.93	1.00	0.99	1	1	1	1	1
1994	0.01	0.17	0.50	0.79	0.93	1.00	0.99	1	1	1	1	1
1995	0.01	0.16	0.48	0.77	0.92	1.00	0.99	1	1	1	1	1
1996	0.01	0.17	0.46	0.73	0.89	0.99	0.99	1	1	1	1	1
1997	0.02	0.17	0.44	0.69	0.86	0.98	0.99	1	1	1	1	1
1998	0.02	0.16	0.41	0.65	0.83	0.96	0.99	1	1	1	1	1
1999	0.02	0.16	0.40	0.62	0.81	0.94	0.99	1	1	1	1	1
2000	0.02	0.17	0.38	0.58	0.78	0.92	0.98	1	1	1	1	1
2001	0.01	0.17	0.37	0.56	0.75	0.90	0.98	1	1	1	1	1
2002	0.01	0.17	0.36	0.55	0.74	0.89	0.98	1	1	1	1	1
2003	0.01	0.18	0.37	0.55	0.74	0.88	0.97	1	1	1	1	1
2004	0.00	0.18	0.38	0.57	0.75	0.88	0.97	1	1	1	1	1
2005	0.00	0.18	0.39	0.59	0.76	0.89	0.97	1	1	1	1	1
2006	0.00	0.18	0.40	0.61	0.78	0.89	0.97	1	1	1	1	1
2007	0.00	0.19	0.41	0.63	0.79	0.90	0.97	1	1	1	1	1
2008	0.00	0.20	0.43	0.66	0.82	0.92	0.97	1	1	1	1	1
2009	0.00	0.21	0.45	0.68	0.84	0.94	0.97	1	1	1	1	1
2010	0.01	0.23	0.47	0.70	0.86	0.95	0.97	1	1	1	1	1
2011	0.03	0.25	0.50	0.72	0.87	0.96	0.98	1	1	1	1	1
2012	0.06	0.29	0.53	0.74	0.89	0.97	0.98	1	1	1	1	1
2013	0.09	0.33	0.57	0.76	0.90	0.97	0.98	1	1	1	1	1
2014	0.12	0.38	0.61	0.79	0.91	0.98	0.98	1	1	1	1	1
2015	0.09	0.33	0.57	0.76	0.90	0.97	0.98	1	1	1	1	1

**Table 6.3.1. Faroe saithe (Division Vb). Effort (hours) and catch in number at age for the commercial pair trawlers (1995-2013)**

year	effort	3	4	5	6	7	8	9	10	11
1995	11409	47	180	577	236	146	49	24	19	14
1996	49311	310	958	821	1119	503	282	133	127	70
1997	36301	199	533	1488	1013	768	333	73	33	10

1998	35905	107	656	1148	1486	730	325	170	40	13
1999	44854	174	487	1554	2016	2024	817	190	83	12
2000	45593	434	1566	913	2700	1333	1604	192	106	31
2001	43518	611	1438	4946	1165	1855	748	618	127	29
2002	43331	133	3976	3964	6888	520	682	246	177	25
2003	40309	141	1494	6560	2373	2263	197	212	124	35
2004	37239	43	1200	5089	5116	1035	762	113	116	53
2005	34064	188	1189	4039	7266	3130	320	291	7	43
2006	26339	140	1176	2410	2584	3700	1376	268	85	14
2007	25884	204	879	2913	1815	1034	1215	435	110	19
2008	26286	796	762	947	2641	1063	726	611	156	51
2009	70994	154	4082	3377	1283	3612	1402	1153	751	195
2010	59911	459	2019	3586	737	657	1325	814	518	245
2011	62984	397	1936	1367	1257	323	356	488	366	310
2012	71953	366	5652	2332	756	554	187	189	252	143
2013	60018	424	3047	2462	1295	293	122	71	56	83

Table 6.3.2. Faroe saithe (Division Vb). Diagnostics from XSA with commercial pair trawler tuning series (spaly)

FLR XSA Diagnostics 2014-03-31 13:22:44

CPUE data from indices

Catch data for 53 years 1961 to 2013. Ages 3 to 14.

fleet first age last age first year last year alpha beta

1 PairTrawlers\_GLM\_SD 3 11 1995 2013 <NA> <NA>

Time series weights :

Tapered time weighting not applied

Catchability analysis :

Catchability independent of size for all ages

Catchability independent of age for ages > 8

Terminal population estimation :

Survivor estimates shrunk towards the mean F

of the final 5 years or the 3 oldest ages.

S.E. of the mean to which the estimates are shrunk = 2

Minimum standard error for population

estimates derived from each fleet = 0.3

prior weighting not applied

Regression weights

year

age 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

all 1 1 1 1 1 1 1 1 1 1

**Fishing mortalities**

year

age	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
3	0.002	0.007	0.078	0.051	0.185	0.040	0.114	0.052	0.022	0.023
4	0.043	0.077	0.104	0.252	0.273	0.487	0.384	0.191	0.410	0.174
5	0.148	0.296	0.297	0.355	0.477	0.950	0.793	0.479	0.491	0.306
6	0.370	0.476	0.418	0.433	0.565	0.481	0.575	0.699	0.662	0.538
7	0.479	0.586	0.620	0.372	0.458	0.716	0.534	0.515	0.959	0.623
8	0.731	0.354	0.725	0.576	0.391	0.506	0.731	0.602	0.744	0.601
9	1.021	0.891	0.500	0.758	0.605	0.589	0.691	0.583	0.878	0.769
10	0.747	0.304	0.945	0.699	0.511	0.754	0.656	0.710	0.793	0.770
11	0.864	0.639	0.569	0.802	0.662	0.767	0.661	0.909	0.809	0.769
12	2.551	0.371	0.138	0.388	0.252	0.351	0.282	0.544	0.822	0.817
13	1.339	0.568	0.279	0.145	0.380	0.092	0.322	0.309	0.874	0.571
14	1.339	0.568	0.279	0.145	0.380	0.092	0.322	0.309	0.874	0.571

**XSA population number (Thousand)**

age

year	3	4	5	6	7	8	9	10	11	12	13	14
2004	53976	52268	68583	31292	6167	3851	458	615	279	120	15	3
2005	69681	44123	40974	48420	17692	3126	1518	135	239	96	8	0
2006	21755	56640	33458	24963	24617	8061	1797	510	82	103	54	23
2007	18501	16477	41808	20352	13460	10838	3198	892	162	38	74	24
2008	31252	14395	10486	24000	10806	7599	4988	1227	363	60	21	0
2009	12852	21259	8974	5329	11171	5595	4210	2231	603	153	38	13
2010	23875	10107	10698	2843	2697	4471	2763	1912	859	229	88	0
2011	41581	17445	5636	3965	1309	1295	1762	1133	813	363	141	17
2012	44345	32327	11800	2859	1614	640	581	806	456	268	173	39
2013	35084	35529	17570	5913	1208	506	249	198	299	166	97	90

**Estimated population abundance at 1st Jan 2014**

age

year	3	4	5	6	7	8	9	10	11	12	13	14
2014	5	28078	24445	10597	2828	530	227	95	75	113	60	45

**Fleet: PairTrawlers\_GLM\_SD**

**Log catchability residuals.**

		year															
age	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	-0.341	0.554	0.096	0.454	-0.815	0.588	0.072	-1.639	-1.006	-1.943	-0.632	0.529	1.072	1.957	0.141	0.818	0.039
4	0.000	-0.687	-0.489	-0.582	-0.132	-0.520	-0.028	0.102	-1.053	-0.684	-0.419	-0.410	0.621	0.607	0.999	1.163	0.436
5	0.463	-0.633	-0.665	-0.414	-0.617	-0.170	0.051	0.417	0.081	-0.460	-0.018	-0.074	-0.064	0.235	0.870	0.859	0.350
6	-0.209	-0.182	-0.096	-0.686	-0.056	0.005	0.331	0.640	0.185	0.029	0.080	-0.060	-0.185	0.068	0.180	0.106	0.310
7	0.124	-0.421	0.191	0.023	-0.194	-0.054	0.298	0.187	0.328	-0.043	0.145	0.254	-0.509	-0.239	0.070	-0.122	-0.168
8	0.081	0.147	0.093	-0.036	0.557	0.262	0.104	0.139	-0.015	0.144	-0.592	0.339	-0.127	-0.385	0.363	0.072	-0.108
9	-0.054	0.394	-0.019	0.242	-0.030	-0.127	0.392	-0.190	-0.170	0.485	0.268	0.108	0.144	-0.042	0.237	0.049	-0.109
10	-0.372	1.058	0.056	0.171	0.208	0.238	0.511	0.282	-0.031	0.102	-1.294	0.407	0.021	-0.045	0.039	-0.050	0.099
11	-0.065	0.150	-0.413	-0.075	-0.569	0.082	0.029	-0.043	-0.359	0.159	0.099	0.279	0.013	0.121	0.006	0.003	0.348

		year	
age	2012	2013	
3	-0.254	0.309	
4	0.858	0.218	
5	0.018	-0.228	
6	-0.020	-0.081	
7	0.217	-0.089	
8	-0.121	-0.192	
9	0.044	0.047	
10	-0.031	0.042	
11	-0.022	0.022	

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

	3	4	5	6	7	8	9	10	11
Mean_Logq	-15.6178	-13.4959	-12.4970	-12.0935	-11.9461	-11.8593	-11.8593	-11.8593	-11.8593
S.E_Logq	0.4584	0.4584	0.4584	0.4584	0.4584	0.4584	0.4584	0.4584	0.4584

Terminal year survivor and F summaries:

,Age 3 Year class =2010

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.81 38243 2010

fshk 0.19 7494 2010

,Age 4 Year class =2009

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.887 30414 2009

fshk 0.113 11044 2009

,Age 5 Year class =2008

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.93 8433 2008

fshk 0.07 4194 2008

,Age 6 Year class =2007

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.963 2607 2007

fshk 0.037 2441 2007

,Age 7 Year class =2006

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.96 485 2006

fshk 0.04 509 2006

,Age 8 Year class =2005

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.961 187 2005

fshk 0.039 228 2005

,Age 9 Year class =2004

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.954 99 2004

fshk 0.046 113 2004

,Age 10 Year class =2003

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.898 78 2003

fshk 0.102 87 2003

,Age 11 Year class =2002

source

scaledWts survivors yrcls

PairTrawlers\_GLM\_SD 0.954 116 2002

fshk 0.046 113 2002

,Age 12 Year class =2001

source

scaledWts survivors yrcls

fshk 1 132 2001

,Age 13 Year class =2000

source

scaledWts survivors yrcls

fshk 1 28 2000

**Table 6.5.1. Faroe saithe (Division Vb). Fishing mortality at age (1961-2013). The value for 2014 is used for short-term prognosis.**

	3	4	5	6	7	8	9	10	11	12	13	14+
1961	0.026	0.058	0.109	0.143	0.120	0.100	0.110	0.106	0.112	0.181	0.134	0.134
1962	0.052	0.101	0.127	0.156	0.143	0.099	0.138	0.149	0.125	0.098	0.124	0.124
1963	0.035	0.040	0.085	0.118	0.185	0.142	0.185	0.250	0.178	0.491	0.308	0.308
1964	0.052	0.144	0.251	0.218	0.236	0.301	0.180	0.241	0.248	0.235	0.243	0.243
1965	0.050	0.085	0.186	0.253	0.283	0.263	0.370	0.316	0.424	0.532	0.427	0.427
1966	0.026	0.103	0.167	0.283	0.348	0.350	0.308	0.456	0.433	0.493	0.464	0.464
1967	0.027	0.053	0.125	0.158	0.332	0.354	0.349	0.335	0.407	0.384	0.378	0.378
1968	0.030	0.099	0.098	0.140	0.156	0.307	0.326	0.358	0.258	0.467	0.363	0.363
1969	0.034	0.136	0.189	0.175	0.207	0.250	0.493	0.586	0.639	0.518	0.586	0.586
1970	0.044	0.262	0.142	0.179	0.160	0.202	0.206	0.390	0.431	0.609	0.480	0.480
1971	0.086	0.135	0.373	0.128	0.144	0.117	0.130	0.157	0.277	0.534	0.325	0.325
1972	0.094	0.070	0.148	0.316	0.293	0.354	0.400	0.490	0.541	0.730	0.592	0.592
1973	0.125	0.325	0.438	0.304	0.315	0.209	0.246	0.272	0.253	0.320	0.283	0.283
1974	0.222	0.311	0.358	0.307	0.192	0.195	0.164	0.237	0.207	0.227	0.225	0.225
1975	0.141	0.345	0.528	0.293	0.180	0.141	0.132	0.120	0.205	0.198	0.175	0.175
1976	0.196	0.340	0.298	0.328	0.208	0.160	0.129	0.137	0.122	0.149	0.136	0.136
1977	0.146	0.281	0.376	0.382	0.344	0.259	0.179	0.130	0.246	0.156	0.178	0.178
1978	0.085	0.233	0.267	0.163	0.180	0.375	0.272	0.259	0.228	0.307	0.266	0.266
1979	0.037	0.180	0.283	0.251	0.261	0.310	0.338	0.490	0.329	0.172	0.333	0.333
1980	0.088	0.153	0.205	0.224	0.281	0.195	0.258	0.415	0.386	0.226	0.344	0.344
1981	0.014	0.227	0.194	0.447	0.533	0.512	0.383	0.394	0.412	0.471	0.429	0.429
1982	0.028	0.184	0.189	0.477	0.329	0.502	0.399	0.191	0.315	0.477	0.330	0.330
1983	0.070	0.103	0.366	0.419	0.486	0.552	0.736	0.221	0.275	0.711	0.405	0.405
1984	0.016	0.498	0.332	0.575	0.535	0.451	0.558	0.292	0.224	0.265	0.262	0.262
1985	0.062	0.236	0.507	0.276	0.579	0.314	0.305	0.243	0.232	0.415	0.298	0.298
1986	0.021	0.138	0.452	0.774	0.375	0.785	0.518	0.578	0.895	0.518	0.670	0.670
1987	0.037	0.138	0.423	0.570	0.476	0.372	0.598	0.320	0.503	0.141	0.323	0.323
1988	0.022	0.089	0.355	0.632	0.576	0.629	0.471	0.650	0.167	1.599	0.814	0.814
1989	0.018	0.203	0.228	0.492	0.366	0.511	0.384	0.184	0.489	0.086	0.254	0.254
1990	0.016	0.203	0.627	0.785	0.801	0.392	0.203	0.209	0.196	0.290	0.233	0.233
1991	0.047	0.415	0.768	0.876	0.800	0.659	0.690	0.757	0.904	0.415	0.699	0.699



	3	4	5	6	7	8	9	10	11	12	13	14+
1992	0.030	0.262	0.596	0.707	0.552	0.484	0.559	0.460	0.455	0.731	0.553	0.553
1993	0.063	0.205	0.547	0.601	0.515	0.389	0.480	0.455	0.375	0.478	0.439	0.439
1994	0.046	0.274	0.334	0.597	0.600	0.652	0.450	0.710	0.564	0.340	0.542	0.542
1995	0.011	0.089	0.411	0.406	0.684	0.624	0.779	0.568	0.568	0.598	0.583	0.583
1996	0.014	0.039	0.137	0.300	0.487	0.757	0.518	0.616	0.373	0.518	0.506	0.506
1997	0.011	0.048	0.115	0.324	0.500	0.534	0.576	0.591	0.498	0.536	0.763	0.763
1998	0.014	0.071	0.150	0.238	0.454	0.520	0.710	0.587	0.586	1.428	0.567	0.567
1999	0.006	0.073	0.181	0.302	0.492	0.628	0.623	0.701	0.362	1.725	1.177	1.177
2000	0.025	0.068	0.235	0.419	0.472	0.722	0.520	0.728	0.640	0.510	0.540	0.540
2001	0.014	0.100	0.294	0.635	0.765	0.712	1.001	1.209	1.001	0.634	1.954	1.954
2002	0.003	0.140	0.373	0.662	0.568	0.670	0.484	0.844	0.391	1.836	0.447	0.447
2003	0.006	0.032	0.279	0.461	0.697	0.601	0.480	0.686	0.523	1.229	0.770	0.770
2004	0.002	0.043	0.148	0.370	0.479	0.731	1.021	0.747	0.864	2.551	1.339	1.339
2005	0.007	0.077	0.296	0.476	0.586	0.354	0.891	0.304	0.639	0.371	0.568	0.568
2006	0.078	0.104	0.297	0.418	0.620	0.725	0.500	0.945	0.569	0.138	0.279	0.279
2007	0.051	0.252	0.355	0.433	0.372	0.576	0.758	0.699	0.802	0.388	0.145	0.145
2008	0.185	0.273	0.477	0.565	0.458	0.391	0.605	0.511	0.662	0.252	0.380	0.380
2009	0.040	0.487	0.950	0.481	0.716	0.506	0.589	0.754	0.767	0.351	0.092	0.092
2010	0.114	0.384	0.793	0.575	0.534	0.731	0.691	0.656	0.661	0.282	0.322	0.322
2011	0.052	0.191	0.479	0.699	0.515	0.602	0.583	0.710	0.909	0.544	0.309	0.309
2012	0.022	0.410	0.491	0.662	0.959	0.744	0.878	0.793	0.809	0.822	0.874	0.874
2013	0.023	0.174	0.306	0.538	0.623	0.601	0.769	0.770	0.769	0.817	0.571	0.571
2014	0.027	0.217	0.358	0.533	0.588	0.546	0.625	0.638	0.698	1.000	1.000	1.000

**Table 6.3.2. Faroe saithe (Division Vb). Stock number at age (start of year) (Thousands)(1961-2013). The value for 2014 is used for short-term prognosis.**

	3	4	5	6	7	8	9	10	11	12	13	14+
1961	7827	7422	5158	3352	2114	1494	1233	905	468	180	53	431
1962	12256	6243	5734	3786	2379	1535	1107	904	666	343	123	593
1963	19837	9526	4621	4136	2652	1689	1138	789	638	481	254	182
1964	14812	15686	7492	3476	3011	1804	1200	775	503	437	241	224
1965	22363	11508	11116	4771	2287	1947	1093	821	498	322	283	240
1966	21229	17408	8653	7555	3033	1411	1226	618	490	267	155	233
1967	24898	16939	12859	5998	4660	1754	814	738	321	260	134	94
1968	22879	19846	13149	9294	4194	2737	1008	470	432	175	145	317
1969	39799	18176	14720	9755	6618	2938	1648	595	269	273	90	133
1970	37092	31507	12994	9976	6708	4407	1872	825	271	116	133	109
1971	38447	29061	19844	9229	6831	4678	2948	1247	457	144	52	131
1972	33424	28892	20793	11194	6647	4843	3406	2118	873	284	69	120
1973	23622	24910	22050	14682	6684	4058	2784	1868	1062	416	112	258
1974	19421	17064	14737	11651	8873	3993	2696	1782	1165	675	247	525
1975	17327	12730	10238	8436	7020	5997	2691	1874	1151	776	440	740
1976	19709	12320	7381	4943	5152	4802	4264	1930	1361	768	521	1133
1977	13106	13261	7176	4487	2916	3425	3352	3068	1378	986	542	816
1978	8333	9274	8200	4035	2508	1693	2163	2293	2206	882	691	837
1979	8686	6270	6016	5142	2808	1716	953	1350	1450	1438	531	1354
1980	13075	6852	4289	3712	3276	1770	1030	557	677	854	991	1390
1981	33145	9804	4816	2860	2430	2025	1192	652	301	377	558	2253
1982	15675	26765	6394	3248	1498	1168	994	666	360	163	193	3113
1983	40830	12483	18225	4336	1651	883	579	546	450	215	83	1368
1984	26074	31182	9223	10350	2335	831	416	227	358	280	86	840
1985	22330	21015	15516	5416	4771	1120	434	195	139	234	176	690
1986	61853	17175	13595	7651	3365	2188	670	262	125	90	127	154
1987	48610	49585	12254	7083	2889	1893	817	327	120	42	44	322
1988	44846	38368	35355	6570	3279	1470	1068	368	194	60	30	4
1989	28600	35933	28744	20300	2860	1509	642	546	157	134	10	132
1990	20710	23008	24008	18738	10164	1624	741	358	372	79	101	222

	3	4	5	6	7	8	9	10	11	12	13	14+
1991	24971	16690	15369	10499	7000	3734	898	496	238	250	48	41
1992	19563	19512	9028	5840	3579	2576	1582	369	190	79	135	49
1993	23779	15546	12295	4073	2358	1688	1300	741	191	99	31	25
1994	16875	18278	10365	5824	1828	1154	937	659	385	107	50	5
1995	38971	13192	11381	6077	2625	822	492	489	265	179	63	47
1996	24326	31547	9879	6180	3314	1085	361	185	227	123	81	22
1997	33492	19648	24845	7051	3748	1667	417	176	82	128	60	47
1998	12743	27110	15333	18133	4174	1861	800	192	80	41	61	53
1999	58805	10286	20667	10804	11702	2170	906	322	87	36	8	58
2000	35803	47854	7829	14120	6537	5859	948	398	131	50	5	13
2001	87986	28579	36619	5067	7607	3338	2331	462	157	56	24	16
2002	105930	71019	21180	22347	2198	2898	1340	702	113	47	25	3
2003	64205	86455	50546	11946	9442	1020	1215	677	247	62	6	0
2004	53976	52268	68583	31292	6167	3851	458	615	279	120	15	3
2005	69681	44123	40974	48420	17692	3126	1518	135	239	96	8	0
2006	21755	56640	33458	24963	24617	8061	1797	510	82	103	54	23
2007	18501	16477	41808	20352	13460	10838	3198	892	162	38	74	24
2008	31252	14395	10486	24000	10806	7599	4988	1227	363	60	21	0
2009	12852	21259	8974	5329	11171	5595	4210	2231	603	153	38	13
2010	23875	10107	10698	2843	2697	4471	2763	1912	859	229	88	0
2011	41581	17445	5636	3965	1309	1295	1762	1133	813	363	141	17
2012	44345	32327	11800	2859	1614	640	581	806	456	268	173	39
2013	35084	35529	17570	5913	1208	506	249	198	299	166	97	90
2014	28152	28072	24443	10593	2827	530	227	95	75	113	60	86

**Table 6.3.3. Faroe saithe (Division Vb). Summary table (1961-2013). Values for 2014-2016 are estimates.**

<b>year</b>	<b>Recruits (age 3)</b>	<b>SSB (tonnes)</b>	<b>Yield (tonnes)</b>	<b>Yield/SSB</b>	<b>Fbar(4-8)</b>
1961	7827	68639	9592	0.13	0.106
1962	12256	73051	10454	0.153	0.125
1963	19837	76590	12693	0.173	0.114
1964	14811	81173	21893	0.272	0.23
1965	22362	85017	22181	0.283	0.214
1966	21229	87577	25563	0.299	0.25
1967	24897	85686	21319	0.24	0.204
1968	22879	94206	20387	0.212	0.16
1969	39798	103791	27437	0.274	0.191
1970	37092	109980	29110	0.275	0.189
1971	38446	122330	32706	0.244	0.179
1972	33424	138383	42663	0.307	0.236
1973	23621	131083	57431	0.438	0.318
1974	19420	134334	47188	0.351	0.272
1975	17327	135715	41576	0.306	0.297
1976	19709	129311	33065	0.256	0.267
1977	13106	122418	34835	0.273	0.328
1978	8332	105467	28138	0.265	0.243
1979	8686	96193	27246	0.276	0.257
1980	13074	96358	25230	0.264	0.211
1981	33144	85199	30103	0.369	0.382
1982	15675	94576	30964	0.34	0.336
1983	40829	97964	39176	0.4	0.385
1984	26074	105540	54665	0.518	0.478
1985	22329	110195	44605	0.43	0.382
1986	61852	93587	41716	0.473	0.505
1987	48610	95294	40020	0.437	0.396
1988	44846	102233	45285	0.446	0.456
1989	28600	105133	44477	0.436	0.36
1990	20710	101702	61628	0.618	0.562
1991	24970	76133	54858	0.725	0.703
1992	19563	60736	36487	0.572	0.52
1993	23779	59601	33543	0.553	0.451
1994	16875	57762	33182	0.561	0.491
1995	38971	54632	27209	0.488	0.443
1996	24325	59706	20029	0.325	0.344
1997	33492	68667	22306	0.325	0.304
1998	12743	74420	26421	0.347	0.287
1999	58805	79584	33207	0.41	0.335
2000	35803	81424	39020	0.472	0.383
2001	87985	83758	51786	0.617	0.501
2002	105929	80773	53546	0.663	0.482

2003	64204	96838	46555	0.48	0.414
2004	53976	112362	46355	0.411	0.354
2005	69681	127416	67967	0.534	0.358
2006	21754	126255	66902	0.532	0.433
2007	18500	118881	60785	0.513	0.398
2008	31252	103392	57044	0.547	0.433
2009	12851	92055	57949	0.622	0.628
2010	23875	67055	43885	0.654	0.603
2011	41580	54076	29658	0.548	0.497
2012	44344	51900	35314	0.68	0.653
2013	35084	60727	26262	0.432	0.448
2014	28152	69868	33423		0.448
2015	28152	76304	35864		0.448
2016	28152	78437			
Avg.	31342	92771	37238	0.41	0.36

**Table 6.6.1.1a. Faroe saithe (Division Vb). Input data for prediction with management options for the SPALY assessment .**

<b>2014</b>								
Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	28152	0.2	0.09	0	0	1.280	0.027	1.280
4	28072	0.2	0.33	0	0	1.296	0.217	1.296
5	24443	0.2	0.57	0	0	1.673	0.358	1.673
6	10593	0.2	0.76	0	0	2.033	0.533	2.033
7	2827	0.2	0.90	0	0	3.370	0.588	3.370
8	530	0.2	0.97	0	0	4.698	0.546	4.698
9	227	0.2	0.98	0	0	4.840	0.625	4.840
10	95	0.2	1.00	0	0	5.345	0.637	5.345
11	75	0.2	1.00	0	0	5.632	0.698	5.632
12	113	0.2	1.00	0	0	6.174	1.000	6.174
13	60	0.2	1.00	0	0	7.282	1.000	7.282
14	86	0.2	1.00	0	0	7.100	1.000	7.100

<b>2015</b>								
Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	28152	0.2	0.09	0	0	1.280	0.027	1.280
4	-	0.2	0.33	0	0	1.296	0.217	1.296
5	-	0.2	0.57	0	0	1.673	0.358	1.673
6	-	0.2	0.76	0	0	2.033	0.533	2.033
7	-	0.2	0.90	0	0	3.370	0.588	3.370

8	-	0.2	0.97	0	0	4.698	0.546	4.698
9	-	0.2	0.98	0	0	4.840	0.625	4.840
10	-	0.2	1.00	0	0	5.345	0.637	5.345
11	-	0.2	1.00	0	0	5.632	0.698	5.632
12	-	0.2	1.00	0	0	6.174	1.000	6.174
13	-	0.2	1.00	0	0	7.282	1.000	7.282
14	-	0.2	1.00	0	0	7.100	1.000	7.100

**2016**

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	28152	0.2	0.09	0	0	1.280	0.027	1.280
4	-	0.2	0.33	0	0	1.296	0.217	1.296
5	-	0.2	0.57	0	0	1.673	0.358	1.673
6	-	0.2	0.76	0	0	2.033	0.533	2.033
7	-	0.2	0.90	0	0	3.370	0.588	3.370
8	-	0.2	0.97	0	0	4.698	0.546	4.698
9	-	0.2	0.98	0	0	4.840	0.625	4.840
10	-	0.2	1.00	0	0	5.345	0.637	5.345
11	-	0.2	1.00	0	0	5.632	0.698	5.632
12	-	0.2	1.00	0	0	6.174	1.000	6.174
13	-	0.2	1.00	0	0	7.282	1.000	7.282
14	-	0.2	1.00	0	0	7.100	1.000	7.100

Input units are thousands and kg - output in tones

**Table 6.6.2.1a. Faroe saithe (Division Vb). Prediction with management option for SPALY assessment.**

<b>2014</b>						
Biomass	SSB	FMult	FBar	Landings		
150622	69868	1.000	0.448	33423		
<b>2015</b>						
Biomass	SSB	FMult	FBar	Landings	<b>2016</b>	
					Biomass	SSB
150399	76304	0.0000	0.0000	0	192929	115255
.	76304	0.1000	0.0448	4320	187559	110715
.	76304	0.2000	0.0897	8452	182434	106392
.	76304	0.3000	0.1345	12406	177542	102276
.	76304	0.4000	0.1794	16189	172873	98356
.	76304	0.5000	0.2242	19811	168414	94623
.	76304	0.6000	0.2690	23279	164156	91067
.	76304	0.7000	0.3139	26601	160088	87678
.	76304	0.8000	0.3587	29783	156201	84449
.	76304	0.9000	0.4036	32833	152486	81371
.	76304	1.0000	0.4484	35756	148936	78437
.	76304	1.1000	0.4932	38559	145540	75640
.	76304	1.2000	0.5381	41247	142293	72972
.	76304	1.3000	0.5829	43826	139188	70427
.	76304	1.4000	0.6278	46301	136216	67999
.	76304	1.5000	0.6726	48676	133372	65682
.	76304	1.6000	0.7174	50957	130649	63471
.	76304	1.7000	0.7623	53148	128043	61361
.	76304	1.8000	0.8071	55252	125546	59346
.	76304	1.9000	0.8520	57274	123155	57422
.	76304	2.0000	0.8968	59218	120864	55584

Input units are thousands and kg - output in tonnes

Table 6.7.1.1. Faroe saithe (Division Vb). Yield per recruit input data.

Yield per recruit								
Input data								
	Age	M	Mat	PF	PM	SWt	Sel	CWt
	3	0.2	0.027	0	0	1.303	0.073	1.303
	4	0.2	0.214	0	0	1.672	0.320	1.672
	5	0.2	0.472	0	0	2.055	0.583	2.055
	6	0.2	0.705	0	0	2.624	0.587	2.624
	7	0.2	0.858	0	0	3.423	0.634	3.423
	8	0.2	0.950	0	0	4.329	0.596	4.329
	9	0.2	0.985	0	0	5.127	0.686	5.127
	10	0.2	1.000	0	0	5.915	0.699	5.915
	11	0.2	1.000	0	0	6.825	0.763	6.825
	12	0.2	1.000	0	0	7.499	0.511	7.499
	13	0.2	1.000	0	0	7.892	0.425	7.892
	14	0.2	1.000	0	0	9.354	0.425	9.354
Weights in kilograms								

Table 6.7.1.2. Faroe saithe (Division Vb). Yield per recruit, summary table.

Yield per recruit results									
FMult	Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJ	SSBJan	SpwnNosS	SSBSpwn
0.0	0	0	0	5.499954	20.86934	17.0528	17.0528	17.0528	17.0528
0.1	0.0543833	0.176886	0.673957	4.631463	15.00857	11.32016	11.32016	11.32016	11.32016
0.2	0.1087667	0.290327	0.993563	4.071219	11.57432	8.000213	8.000213	8.000213	8.000213
0.3	0.16315	0.368478	1.149763	3.684888	9.428589	5.956948	5.956948	5.956948	5.956948
0.4	0.2175333	0.425492	1.227171	3.403432	8.008875	4.629516	4.629516	4.629516	4.629516
0.5	0.2719167	0.469025	1.265223	3.18905	7.021078	3.725203	3.725203	3.725203	3.725203
0.6	0.3263	0.503491	1.283106	3.019816	6.303264	3.083239	3.083239	3.083239	3.083239
0.7	0.3806833	0.531579	1.290495	2.882332	5.761931	2.611104	2.611104	2.611104	2.611104
0.8	0.4350667	0.555006	1.292411	2.768024	5.340681	2.253233	2.253233	2.253233	2.253233
0.9	0.48945	0.57492	1.291518	2.671171	5.004104	1.974921	1.974921	1.974921	1.974921
1.0	0.5438333	0.592114	1.289251	2.587817	4.729134	1.753707	1.753707	1.753707	1.753707
1.1	0.5982167	0.607154	1.286391	2.51514	4.500234	1.57457	1.57457	1.57457	1.57457
1.2	0.6526	0.620455	1.283358	2.451066	4.306615	1.427166	1.427166	1.427166	1.427166
1.3	0.7069833	0.63233	1.280379	2.394039	4.140579	1.304178	1.304178	1.304178	1.304178
1.4	0.7613667	0.64302	1.277565	2.342862	3.996495	1.200311	1.200311	1.200311	1.200311
1.5	0.81575	0.652711	1.274968	2.296602	3.870159	1.111648	1.111648	1.111648	1.111648
1.6	0.8701333	0.661553	1.272605	2.254518	3.758369	1.035237	1.035237	1.035237	1.035237
1.7	0.9245167	0.669665	1.270473	2.216013	3.658646	0.968821	0.968821	0.968821	0.968821
1.8	0.9789	0.677146	1.26856	2.180603	3.569041	0.910644	0.910644	0.910644	0.910644
1.9	1.0332833	0.684075	1.266849	2.147888	3.488002	0.859324	0.859324	0.859324	0.859324
2.0	1.0876667	0.690521	1.26532	2.117535	3.41428	0.813762	0.813762	0.813762	0.813762
Reference point	Absolute F	Absolute F							
Fbar(4-8)	0.5438	0.543833							
FMax	0.4895	0.48945							
F0.1	0.1632	0.16315							
Flow	0.1214	0.121412							
Fmed	0.3056	0.305613							
Fhigh	0.7180	0.718							



**Table 6.9.1. Faroe saithe (Division Vb). Comparison between the current assessment and predictions from last year.**

	<b>NWWG2013 PREDICTION</b>	<b>NWWG2014 OBSERVED</b>
Recruitment	28 mill.	35 mill.
SSB	72 000 t.	61 mill.
Fishing mortality	0.48	0.45
Landings	47 000 t.	26 000 t.

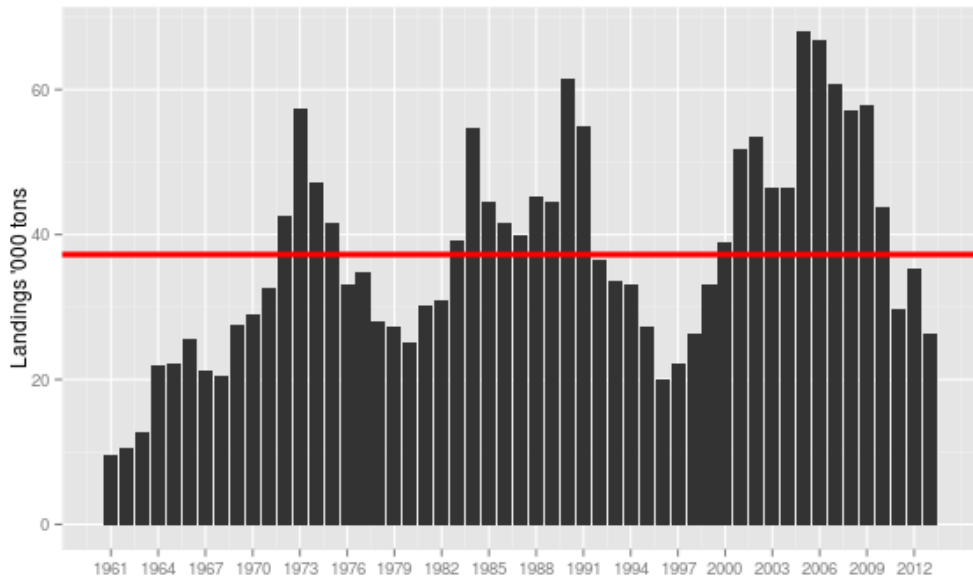


Figure 6.2.1.1. Faroe saithe (Division Vb). Landings in 1000 tonnes (1961-2013). Horizontal line represents historical average landings.

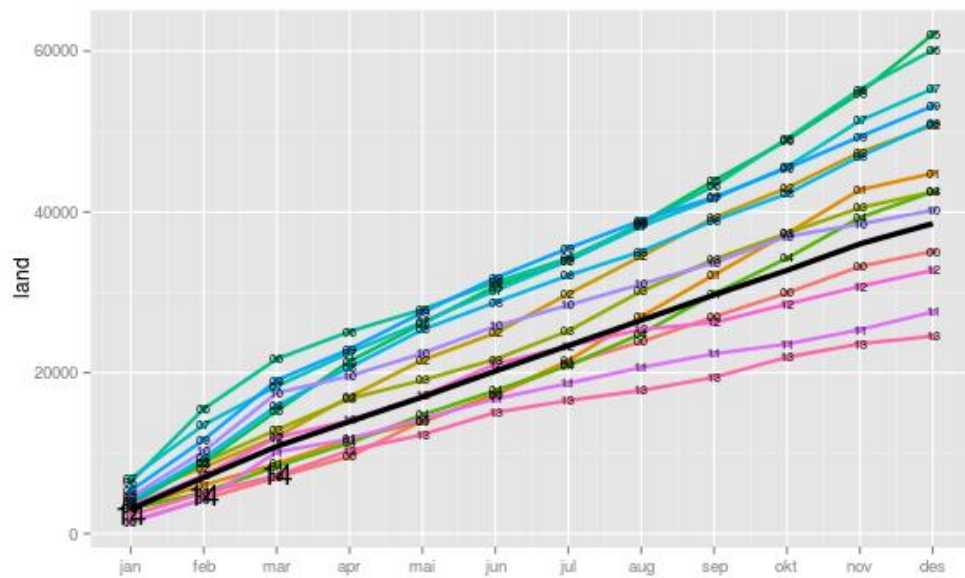


Figure 6.2.1.2. Saithe in the Faroes (Division Vb). Cumulative domestic landings (2000-2014).

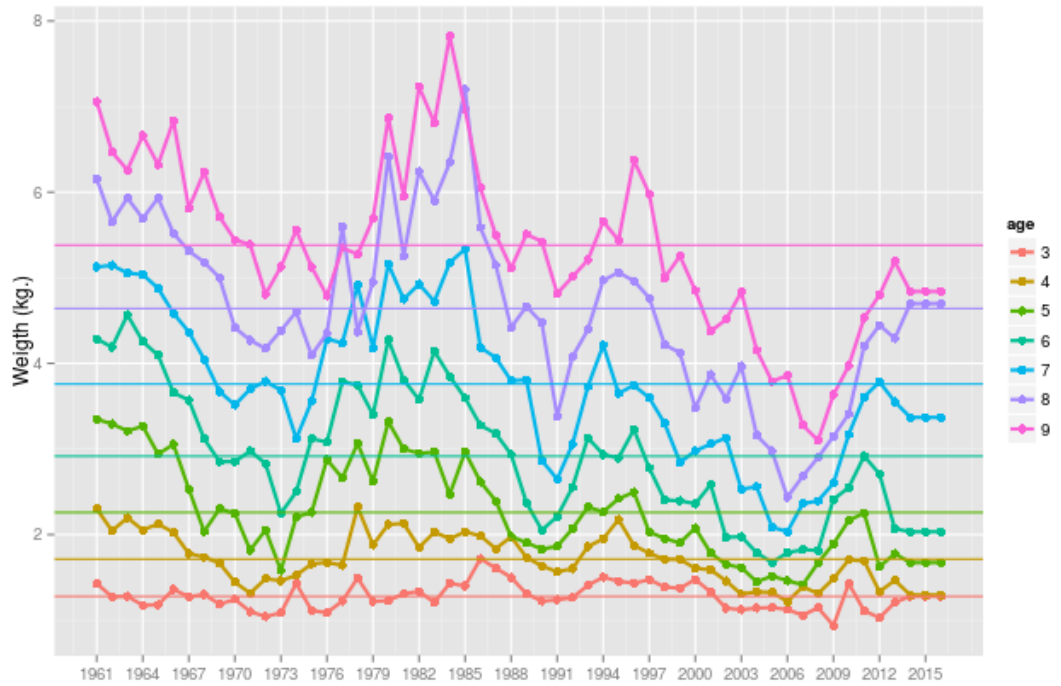


Figure 6.2.3.1. Faroe saithe (Division Vb). Mean weight at age (kg) in commercial catches (ages 3-9) (1961-2013). 2014 to 2016 values are estimates. Horizontal lines show historical average.

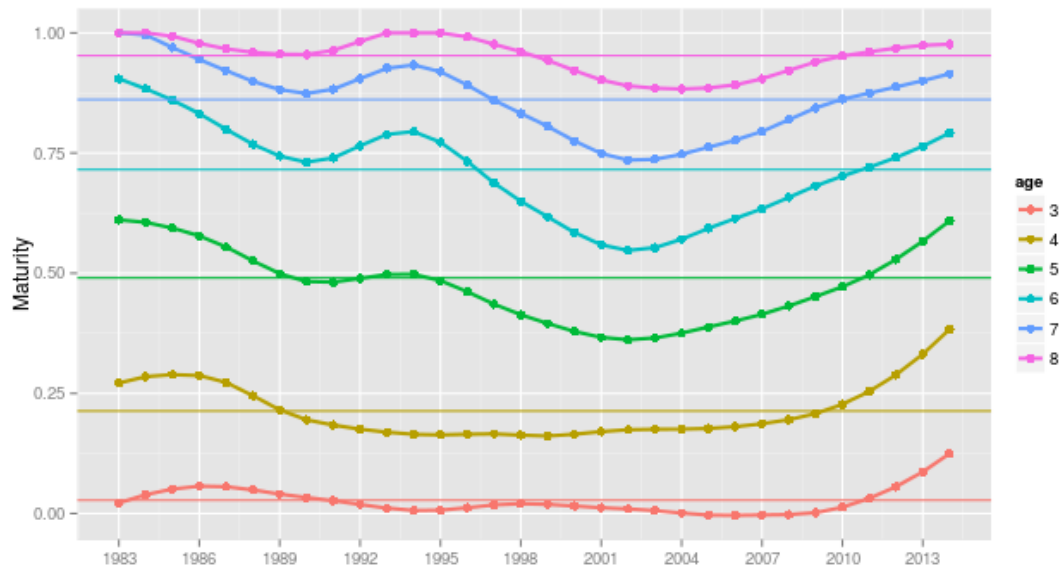


Figure 6.2.4.1. Faroe saithe (Division Vb). Smoothed maturity ogives (ages 3-8)(1983-2014). Horizontal lines show historical average.

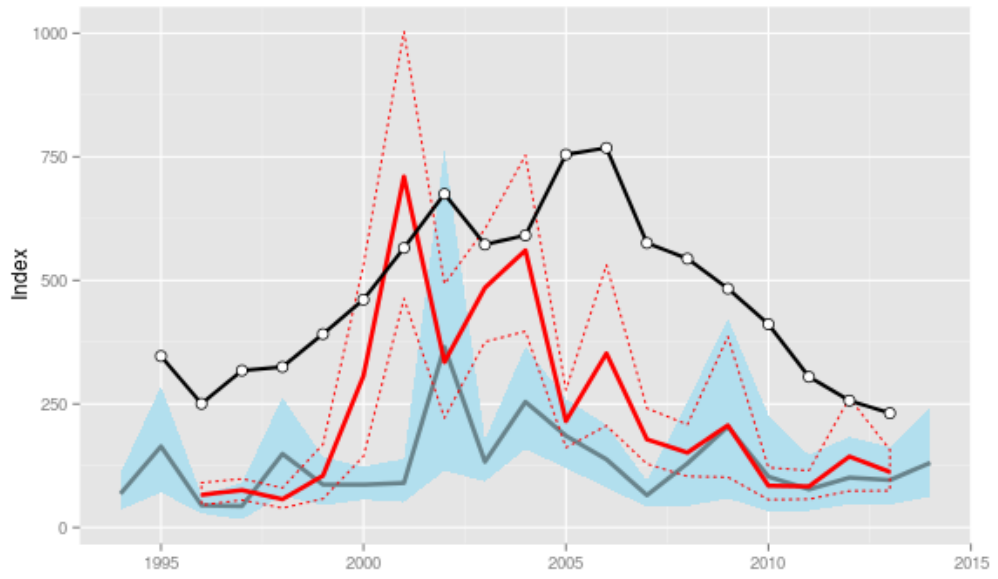


Figure 6.2.5.1.1. Faroe saithe (Division Vb). Predicted catch rates from the commercial fleet (pair-trawlers) used for tuning the assessment (black line). Catch rates (kg/hour) (right-vertical axis) from the Faroese bottom-trawl fall (1996-2013)(red line) and spring survey (1994-2014)(blue line). Dotted lines and shade areas show standard errors in the estimation of indices.

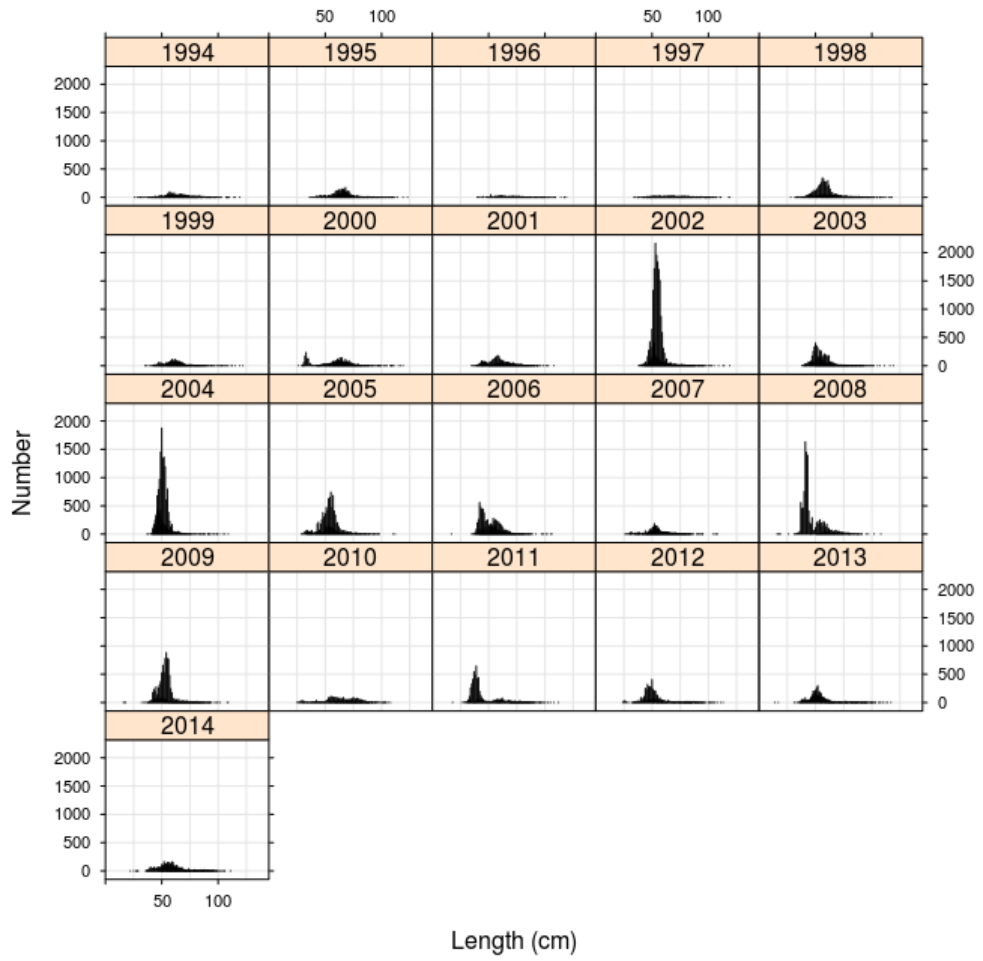


Figure 6.2.5.1.2. Faroe saithe (Division Vb). Length composition from the Faroese bottom-trawl spring survey (1994-2014)

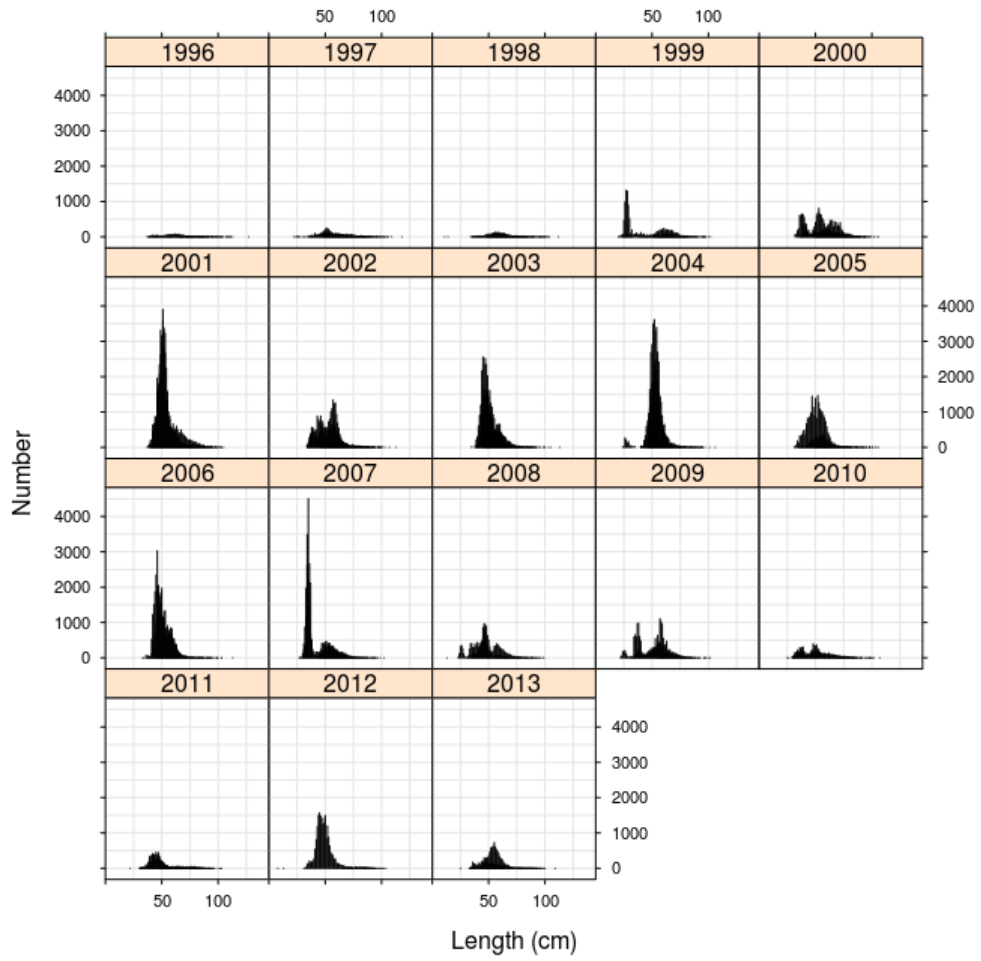


Figure 6.2.5.1.3. Faroe saithe (Division Vb). Length composition from the Faroese bottom-trawl summer survey (1996-2013)

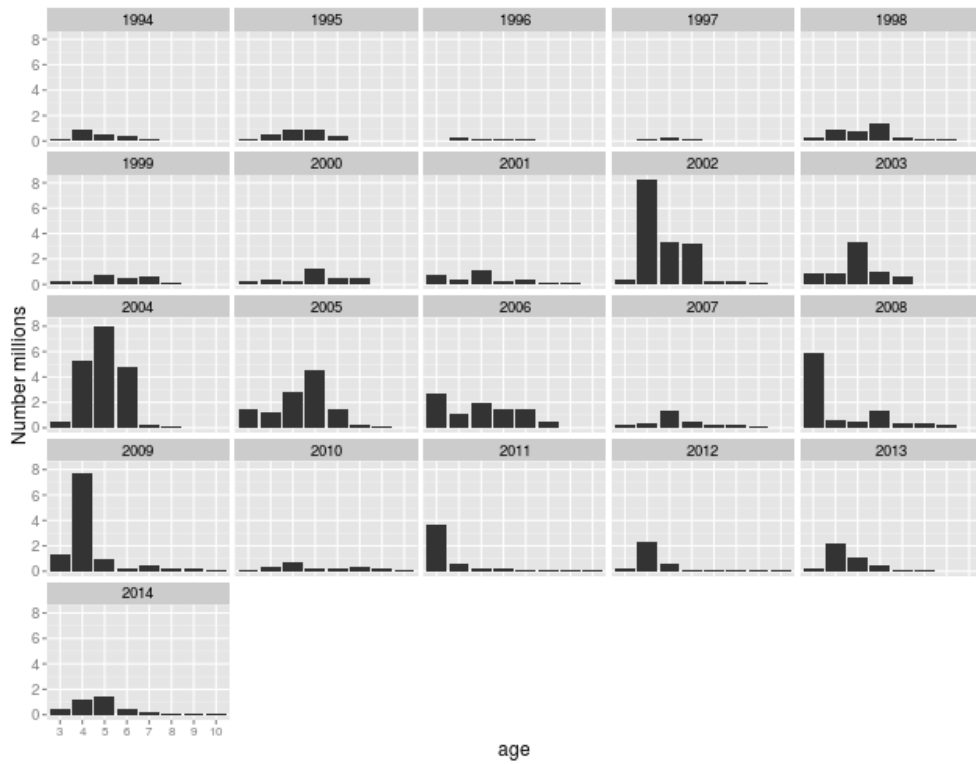


Figure 6.2.5.1.4. Faroe saithe (Division Vb). Age-disaggregated indices in the Faroese bottom-trawl spring survey (ages 3-10, years 1994-2014)

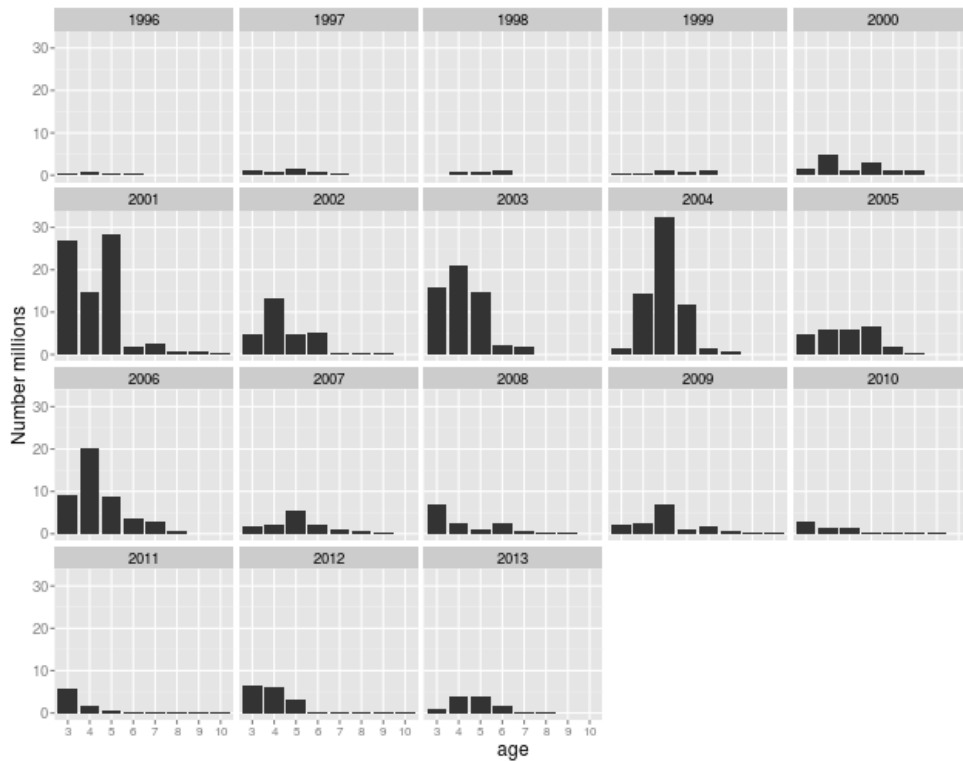


Figure 6.2.5.1.5. Faroe saithe (Division Vb). Age-disaggregated indices in the Faroese bottom-trawl fall survey (ages 3-10, years 1996-2013)





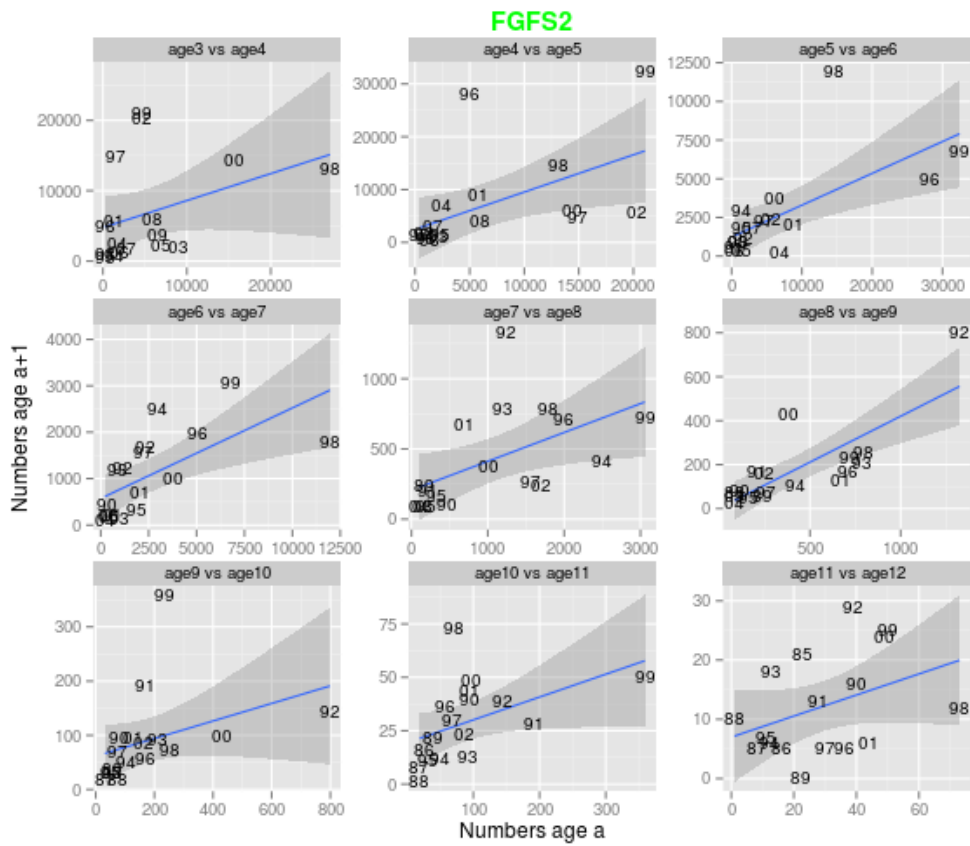


Figure 6.2.5.1.7. Faroe saithe (Division Vb). Indices from summer survey plotted against catch numbers the same year class one year later. The letters in the figure represent year classes.

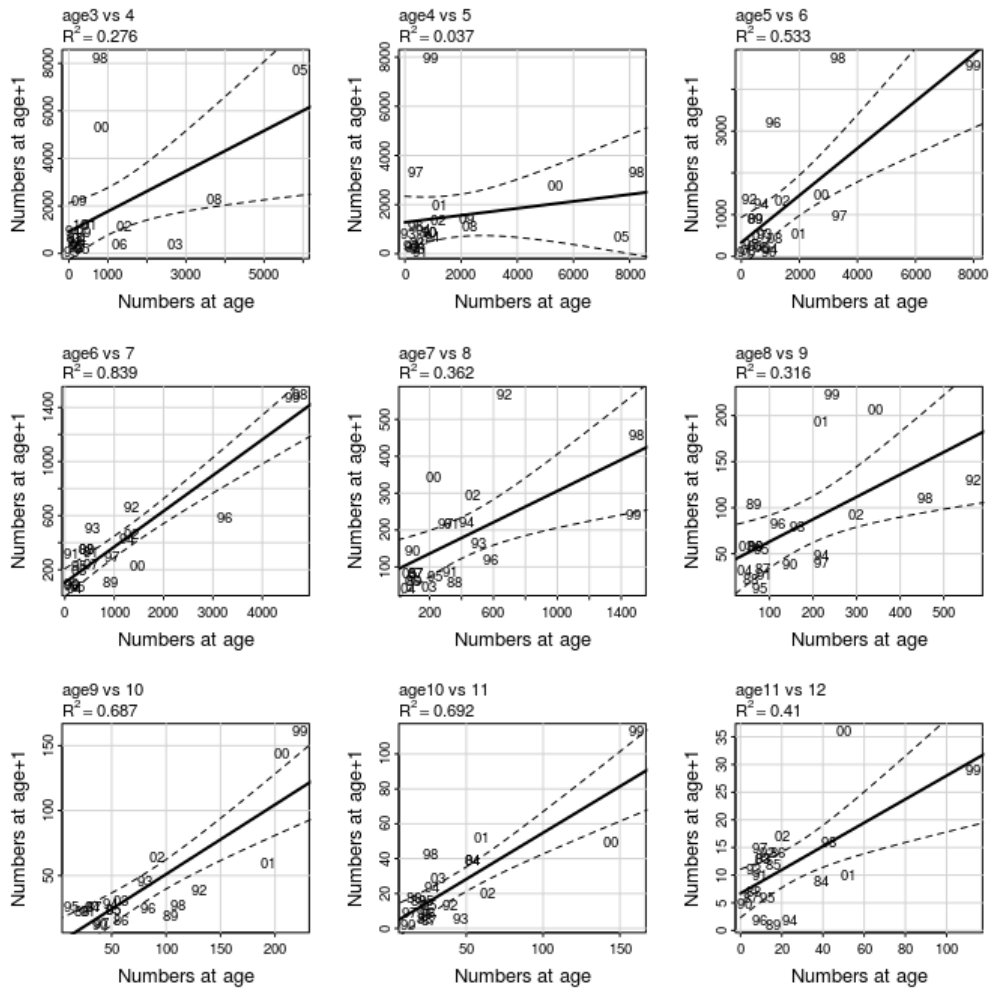


Figure 6.2.5.1.8. Faroe saithe (Division Vb). Indices from spring survey plotted against indices of the same year class one year later. The letters in the figure are year classes.

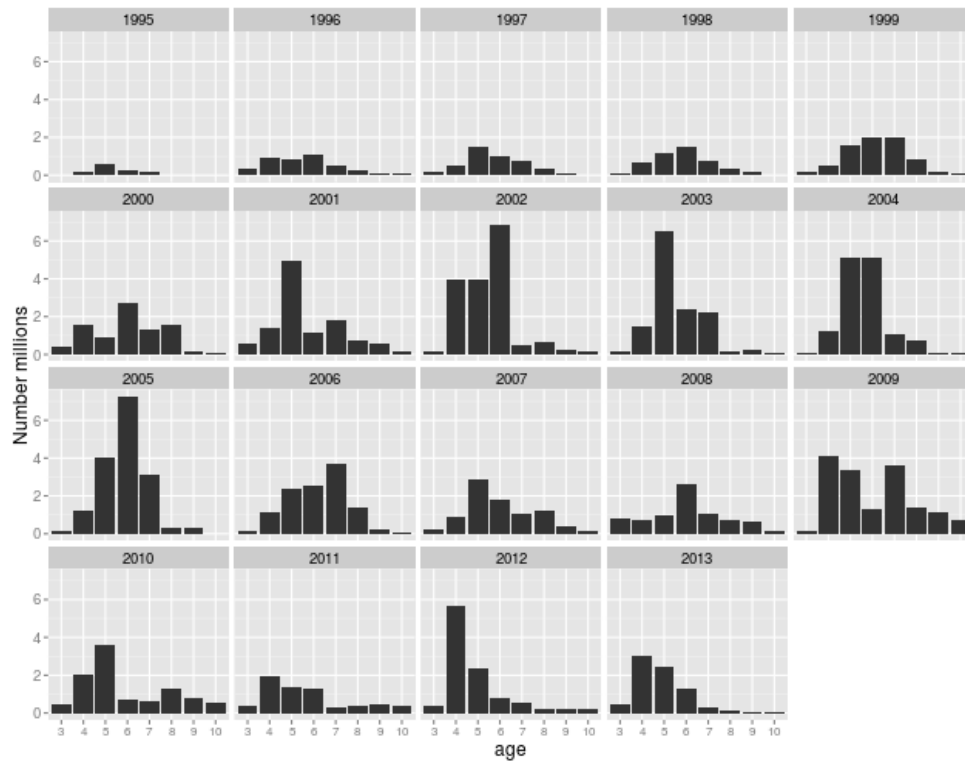


Figure 6.2.5.2.1. Faroe saithe (Division Vb). Age-disaggregated indices in the commercial pair-trawl fleet (ages 3-11, years 1995-2013)

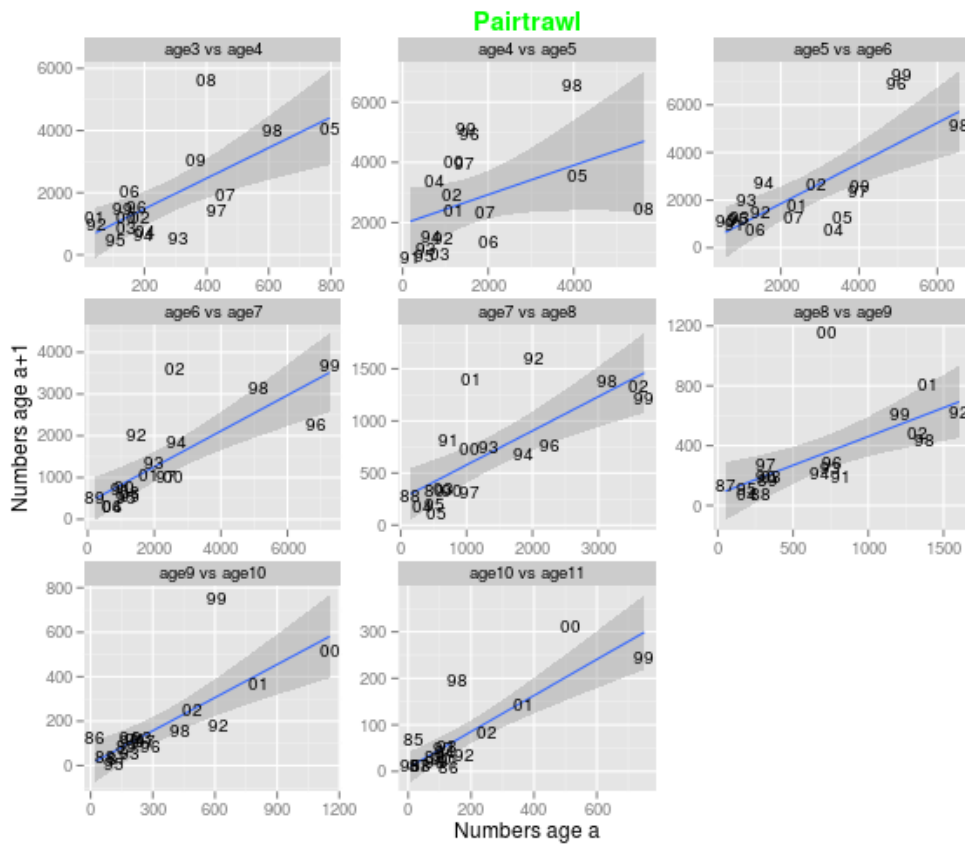


Figure 6.2.5.2. Faroe saithe (Division Vb). Indices from spring survey plotted against indices of the same year class one year later in the commercial pair-trawl fleet. The letters in the figure represent year classes.

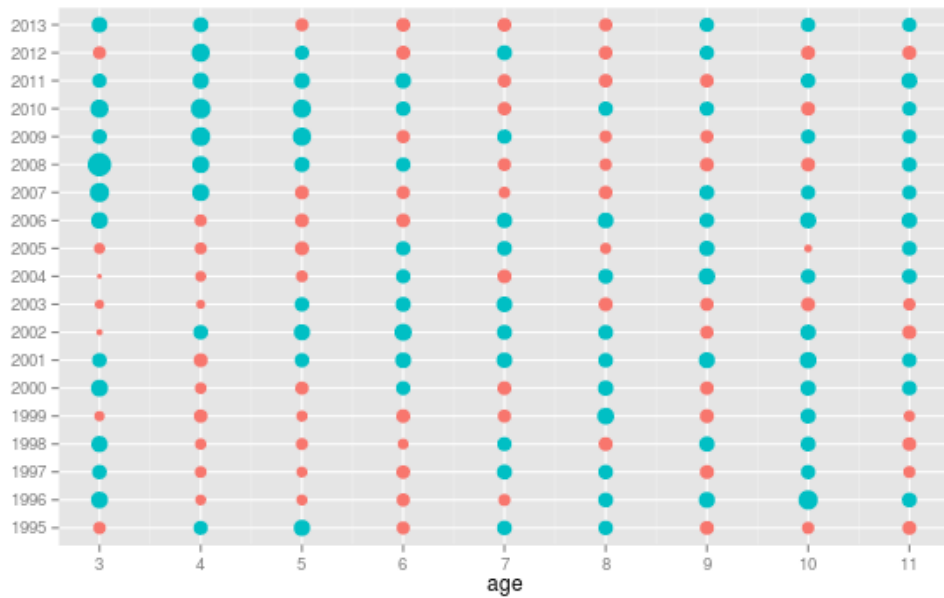


Figure 6.3.1. Faroe saithe (Division Vb). Log-catchability residuals of the XSA calibrated with the commercial series (ages 3-11, years 1995-2013)

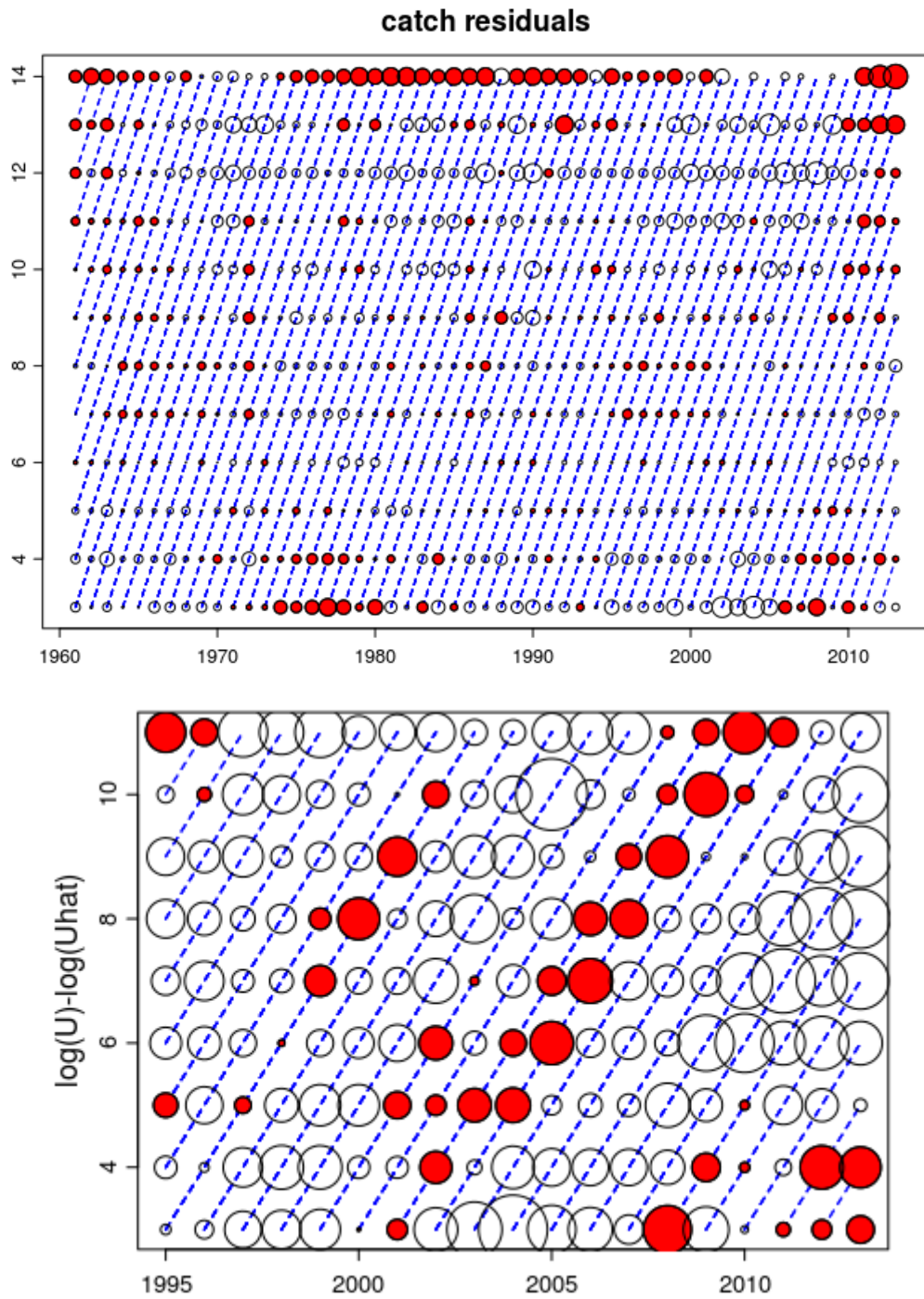


Figure 6.3.3. Faroe saithe (Division Vb). Catch- (ages 3-14+, years 1961-2013) and survey-at-age (ages 3-11, years 1995-2013) residuals from a statistical separable model using three different selection periods.

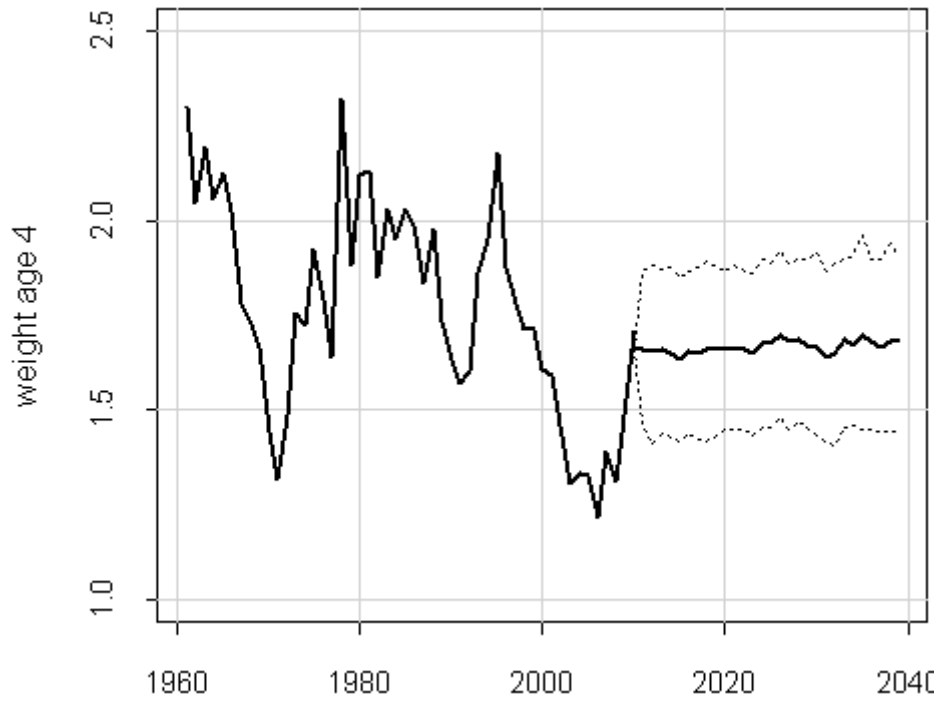


Figure 6.4.1.1. Faroe saithe (Division Vb). Development of weights (age 4) in the MSY simulations. Solid and discontinuous lines represent mean weight and 25% and 75% percentiles respectively.

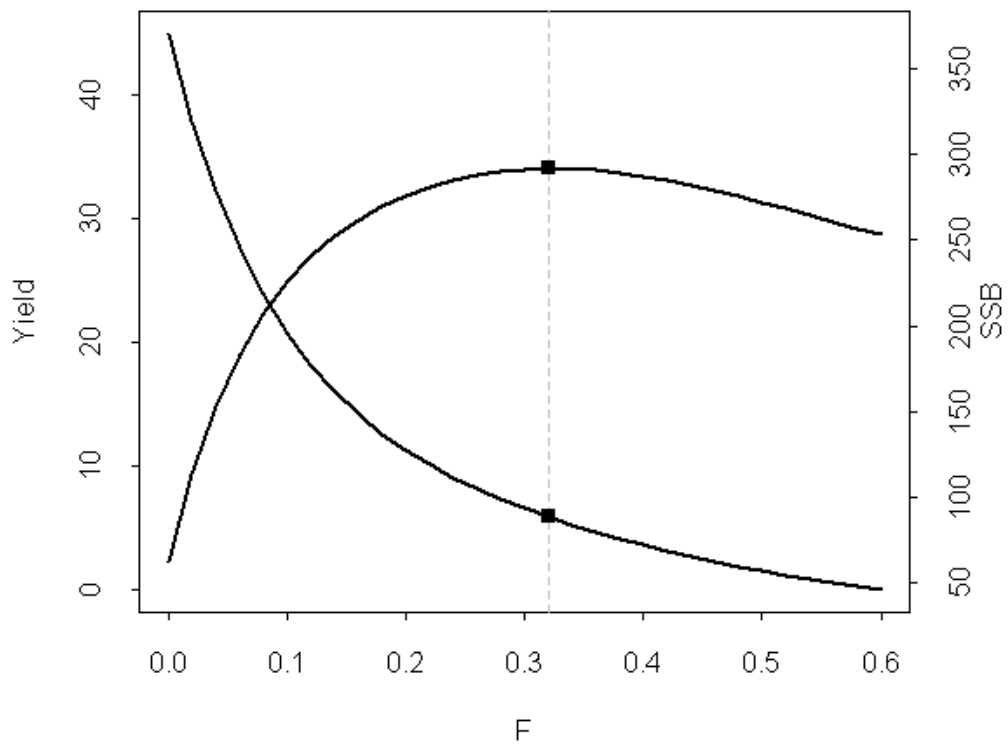


Figure 6.4.1.2. Faroe saithe (Division Vb). Yield and spawning per-recruit from the simulations.  $F_{msy}=0.32$ ,  $Y_{msy}=34$  kt. and  $SSB_{msy}=89$  kt.

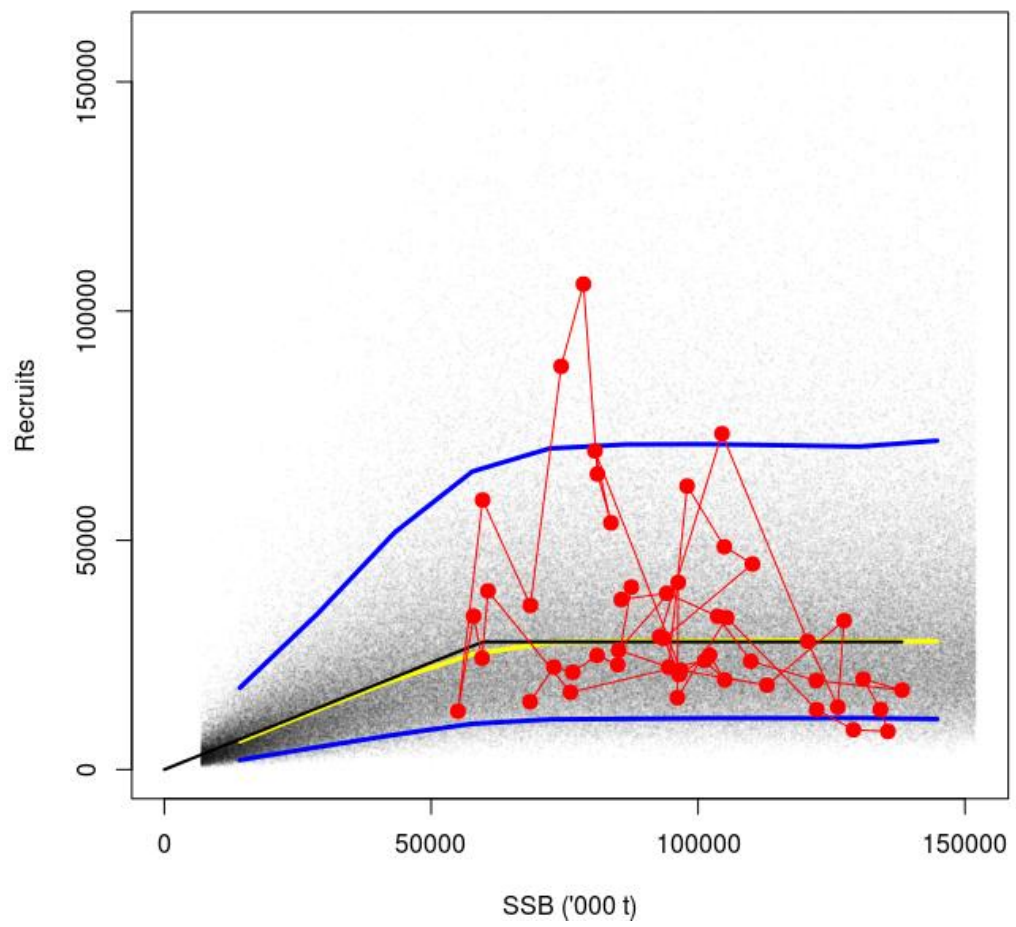


Figure 6.4.1.3. Faroe saithe (Division Vb). EqSim simulation. Stock-recruitment function used in the simulations (Hockey-stick).

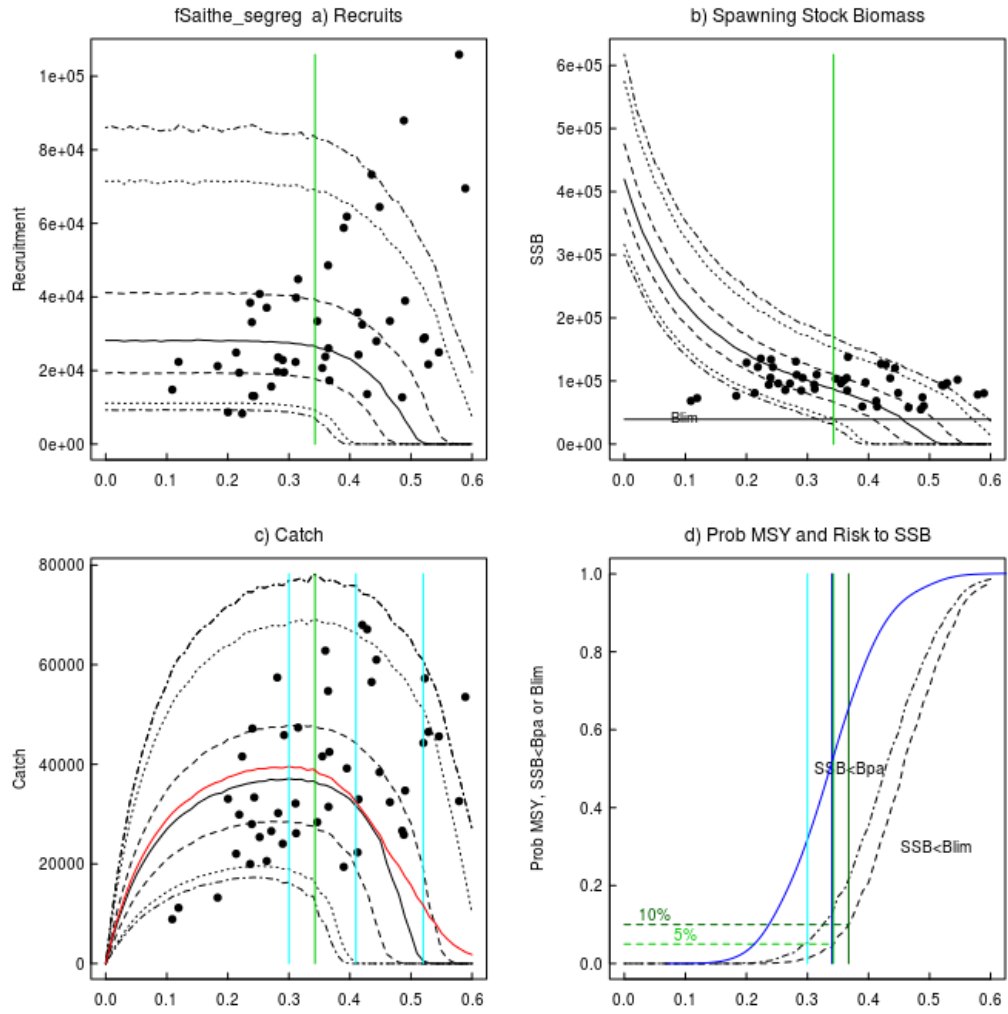


Figure 6.4.1.4. Faroe saithe (Division Vb). EqSim simulation outputs with assessment errors and Hockey-stick function. Blim is undefined but was set as  $Blim = Bpa / 1.4$ .



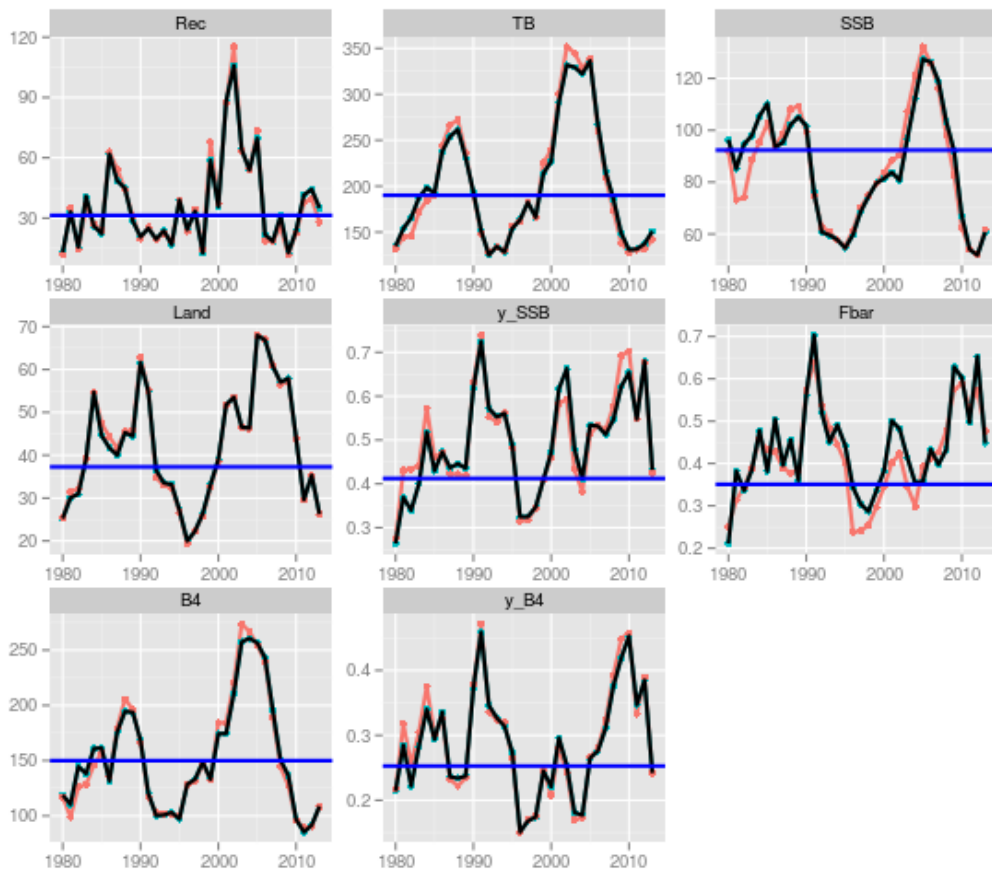


Figure 6.5.1. Faroe saithe (Division Vb). Recruitment (age 3) in millions (top-left), total stock biomass (thousand tonnes)(top-middle), spawning stock biomass (thousand tonnes) (bottom-left), landings (thousand tonnes)(middle-left), landings SSB ratio (middle-middle), Fbar (ages 4 to 8)(middle-right), reference biomass (B4+) (thousand tonnes) (bottom-left) and landings B4+ ratio (bottom-right). Black line represents the spaly run and red lines shows the result from a separable statistical model. Horizontal blue lines represent historical averages.

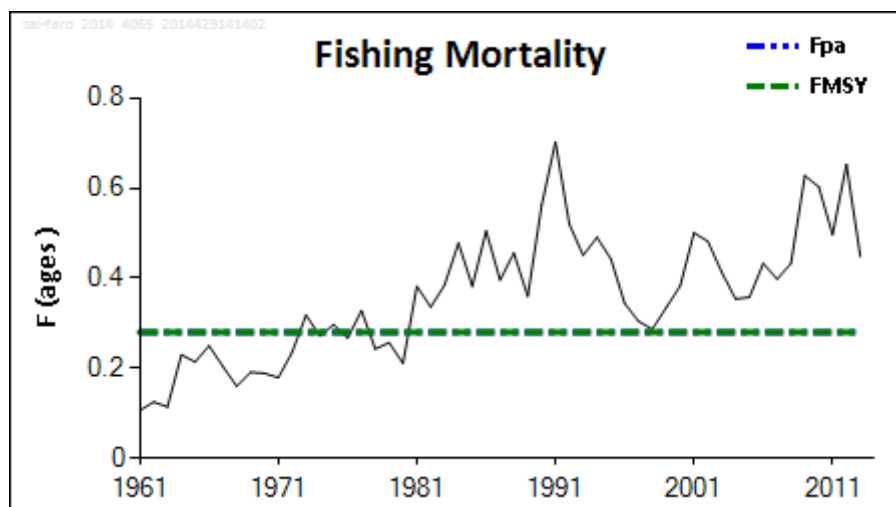


Figure 6.5.2. Faroe saithe (Division Vb). Fishing mortality (average over ages 4-8)(1961-2013)

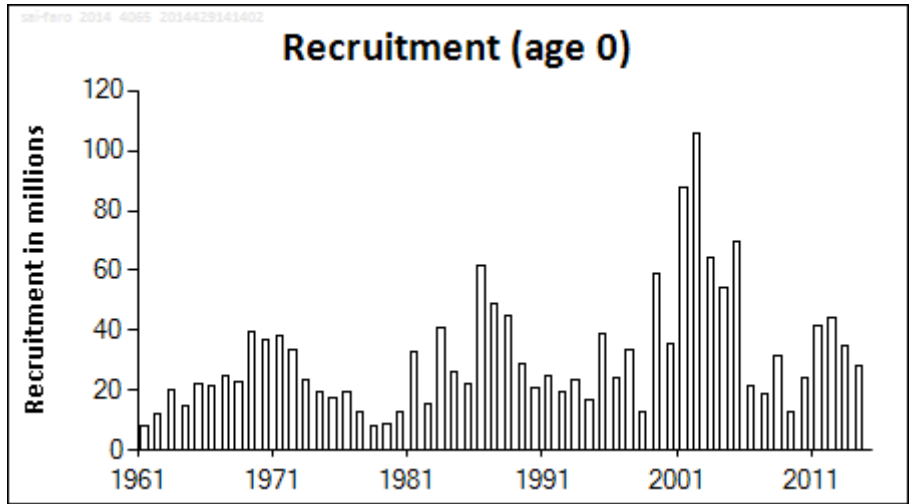


Figure 6.5.3. Faroe saithe (Division Vb). Recruitment at age 3 (tousands)(1961-2012).

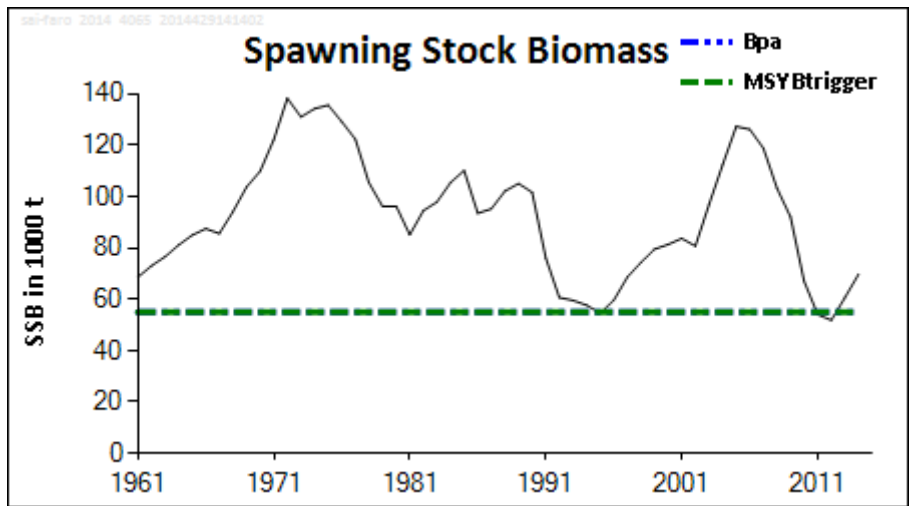


Figure 6.5.4. Faroe saithe (Division Vb). Spawning stock biomass (tonnes)(1961-2013).

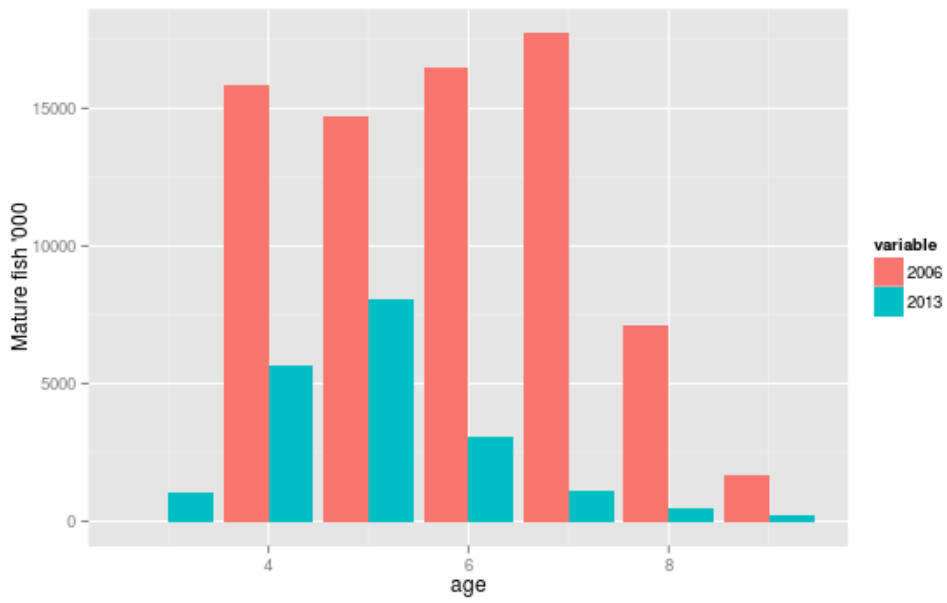


Figure 6.5.6. Faroe saithe (Division Vb). Numbers of mature fish in the stock at each age (3-14+) for 2006 and 2013.

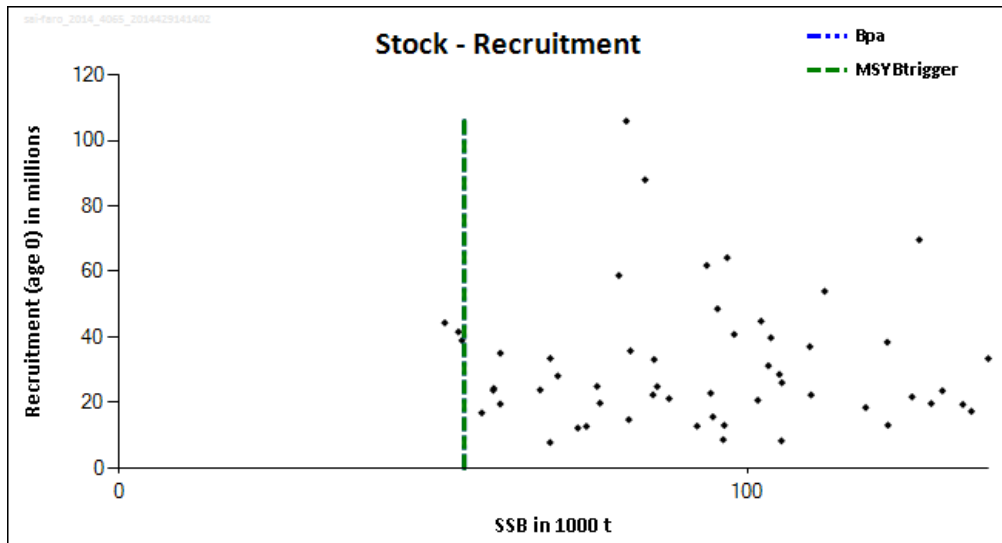


Figure 6.5.7. Faroe saithe (Division Vb). SSB - Recruitment (age 3) plot. Btrigger=55 000 t and Blim=45 000 t.

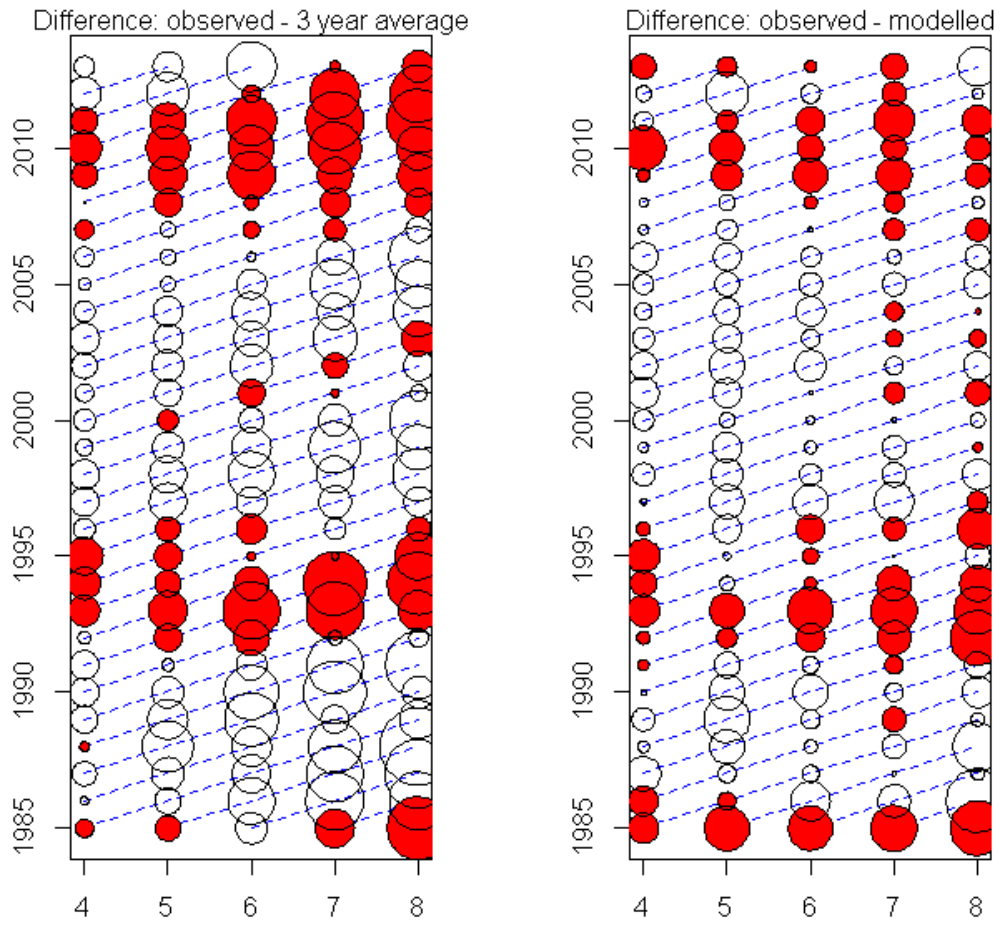


Figure 6.6.1.1. Faroe saithe (Division Vb). Residual plots from a 3-year average weight model and the predicted weight from previous year in the same year class model.

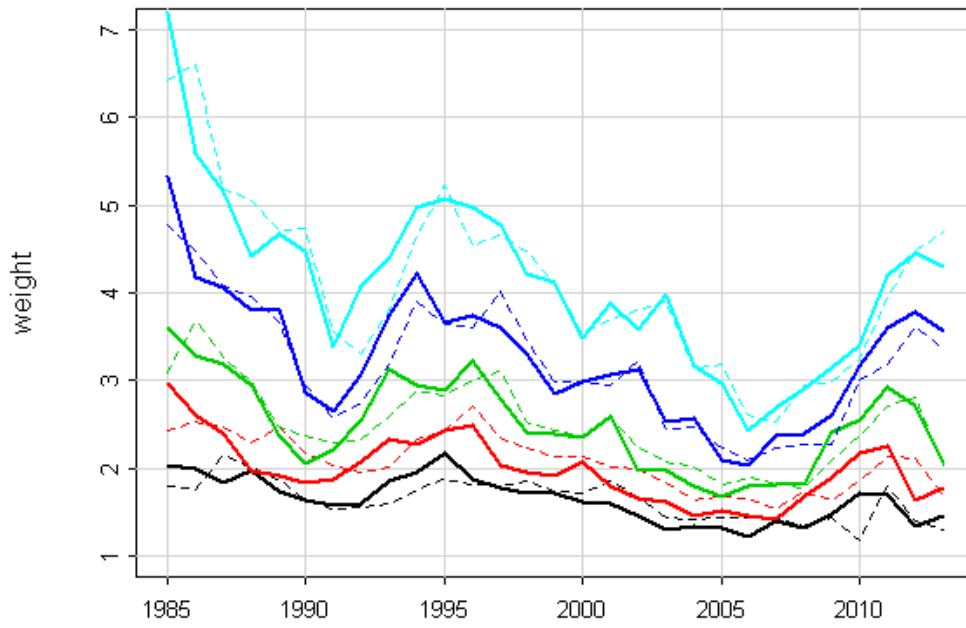


Figure 6.6.1.2. Faroe saithe (Division Vb). Observed (stapled lines) and predicted weights (aes 4-8, years 1985-2013)

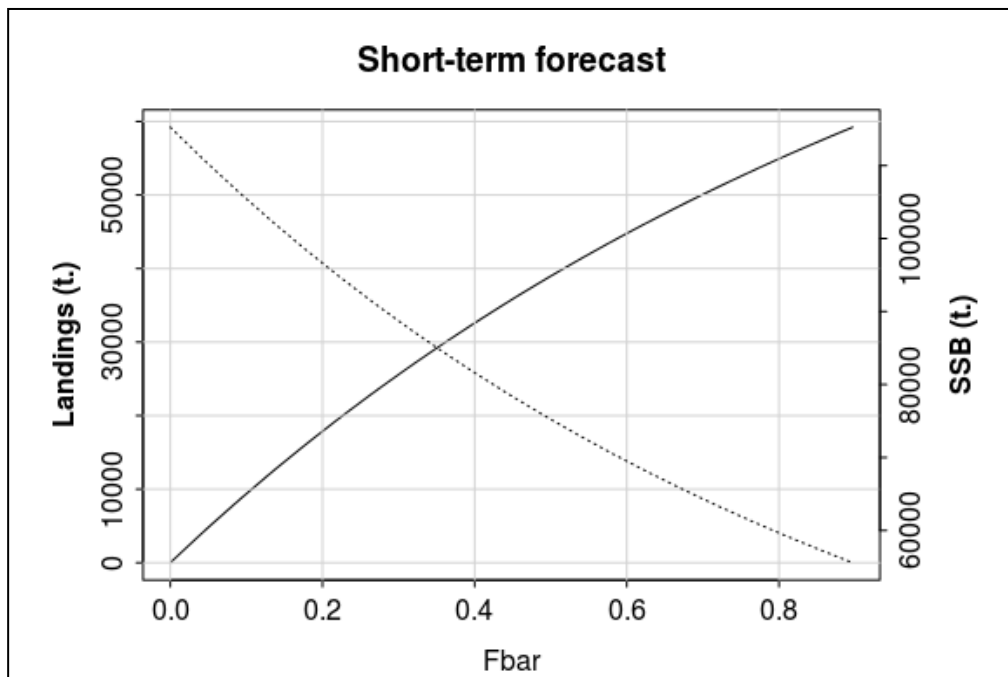


Figure 6.6.2.1a. Faroe saithe (Division Vb). Prediction output from spaly assessment.

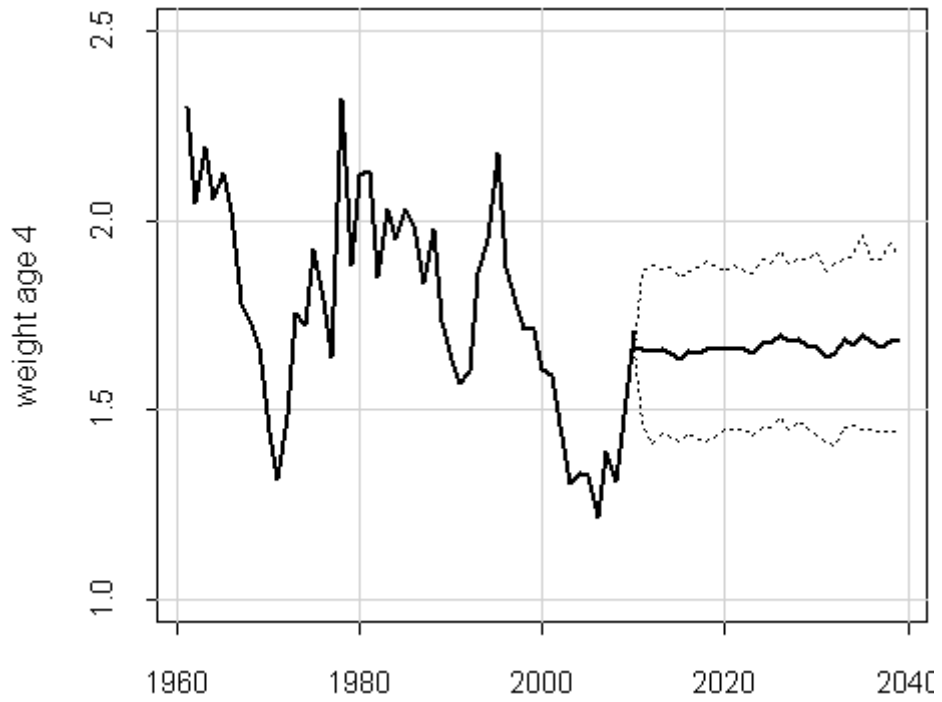


Figure 6.4.2.1. Faroe saithe (Division Vb). Development of weights (age 4) in the MSY simulations. Solid and discontinuous lines represent mean weight and 25% and 75% percentiles respectively.

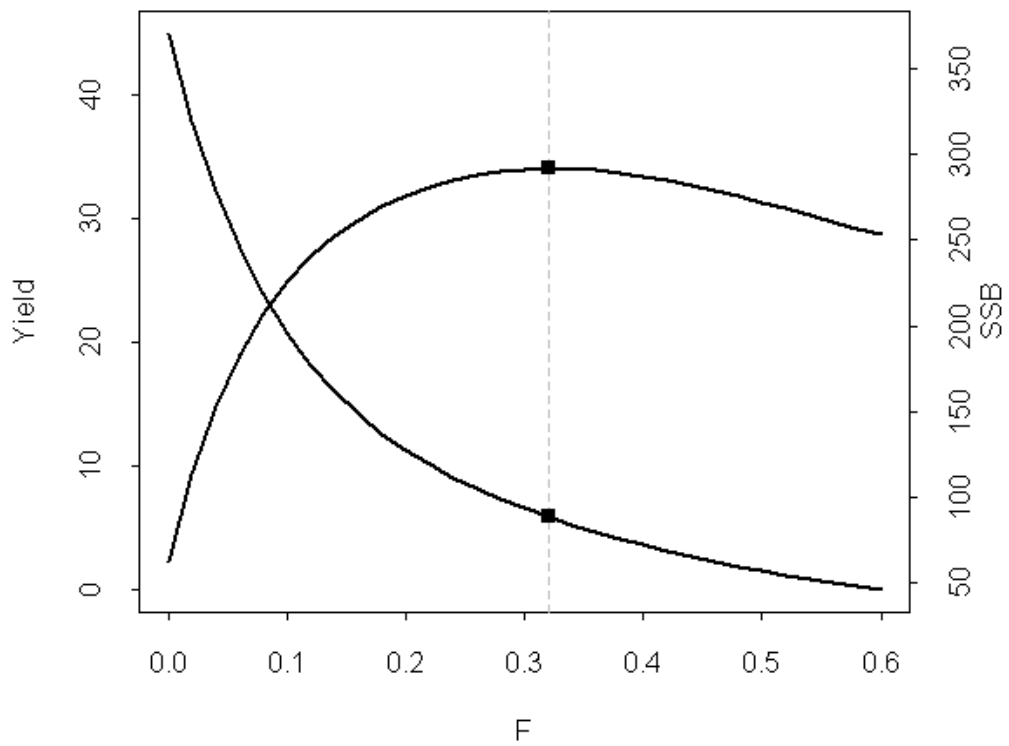


Figure 6.4.1.2. Faroe saithe (Division Vb). Yield and spawning per-recruit from the simulations.  $F_{msy}=0.32$ ,  $Y_{msy}=34$  kt. and  $SSB_{msy}=89$  kt.

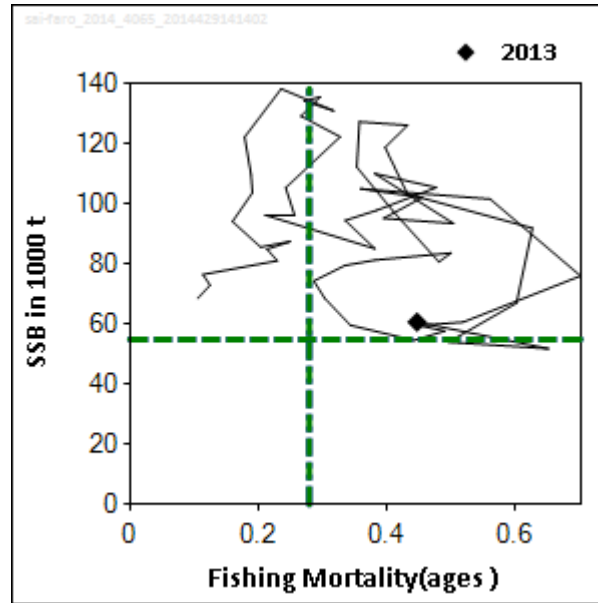


Figure 6.5.8. Faroe saithe (Division Vb). Precautionary approach plot, period 1961-2013. The history of the stock/fishery in relation to the four reference points.

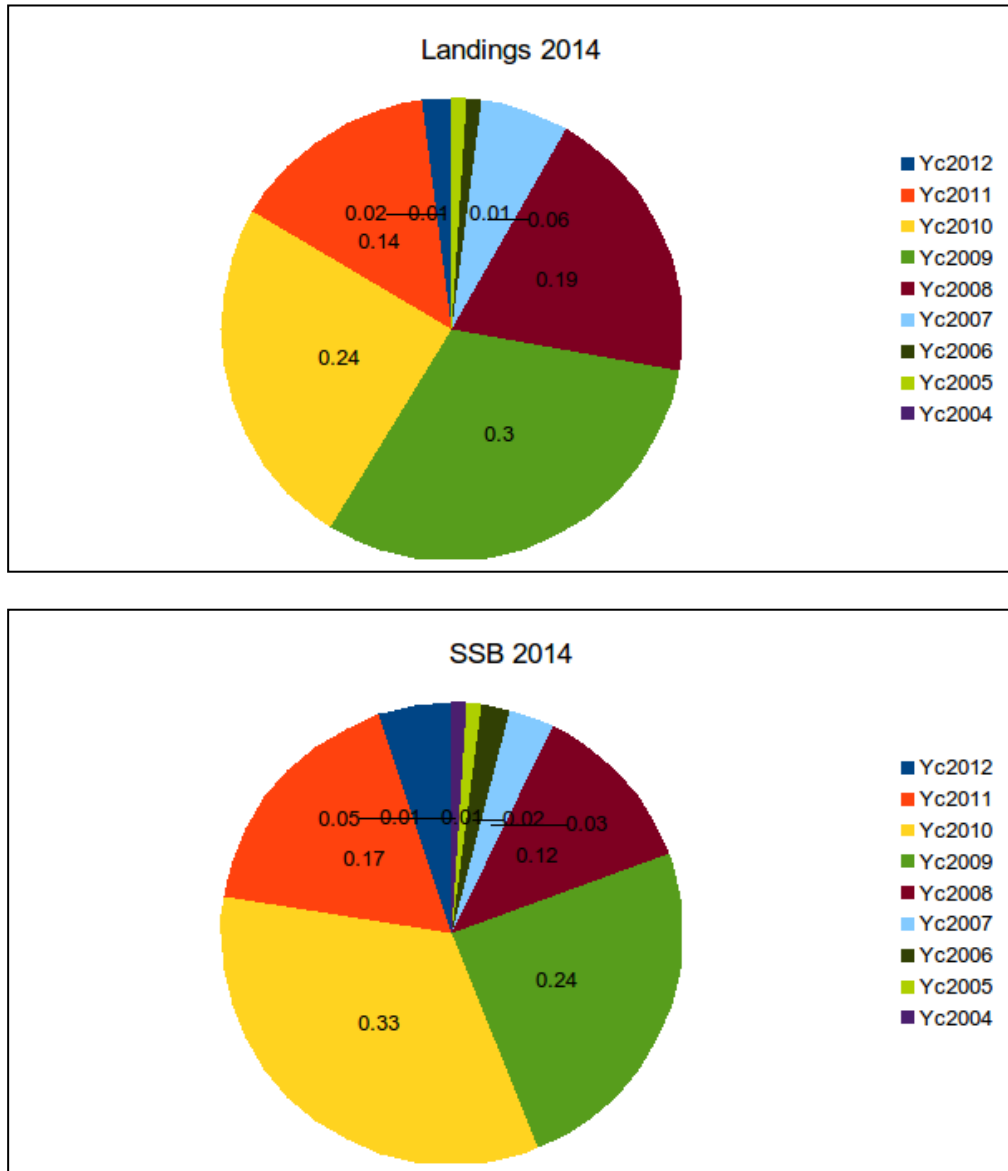


Figure 6.6.2.1a Faroe saithe (Division Vb). Composition in landings (upper figure) and SSB (lower figure) by year classes in 2014.



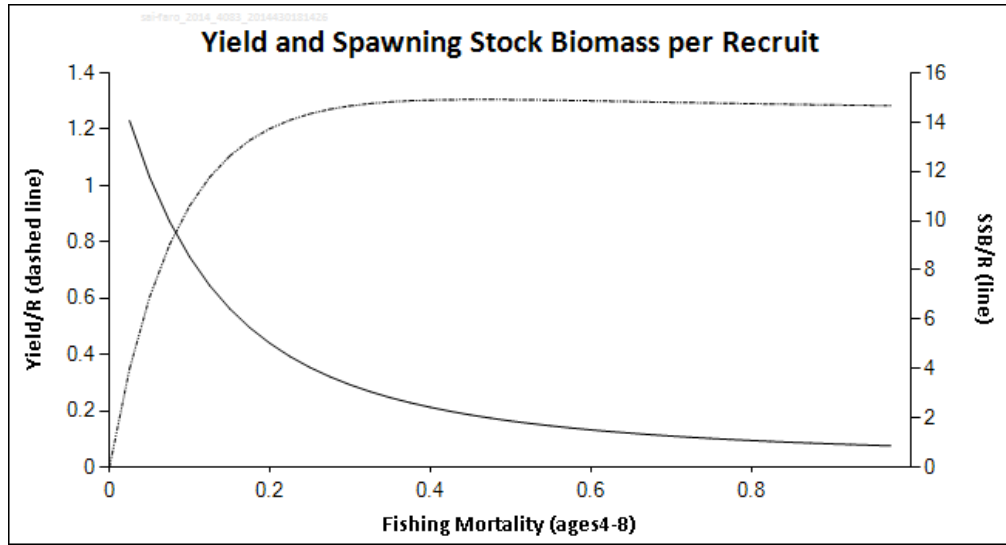


Figure 6.7.1.1. Faroe saithe (Division Vb). Yield and spawning per-recruit calculations.

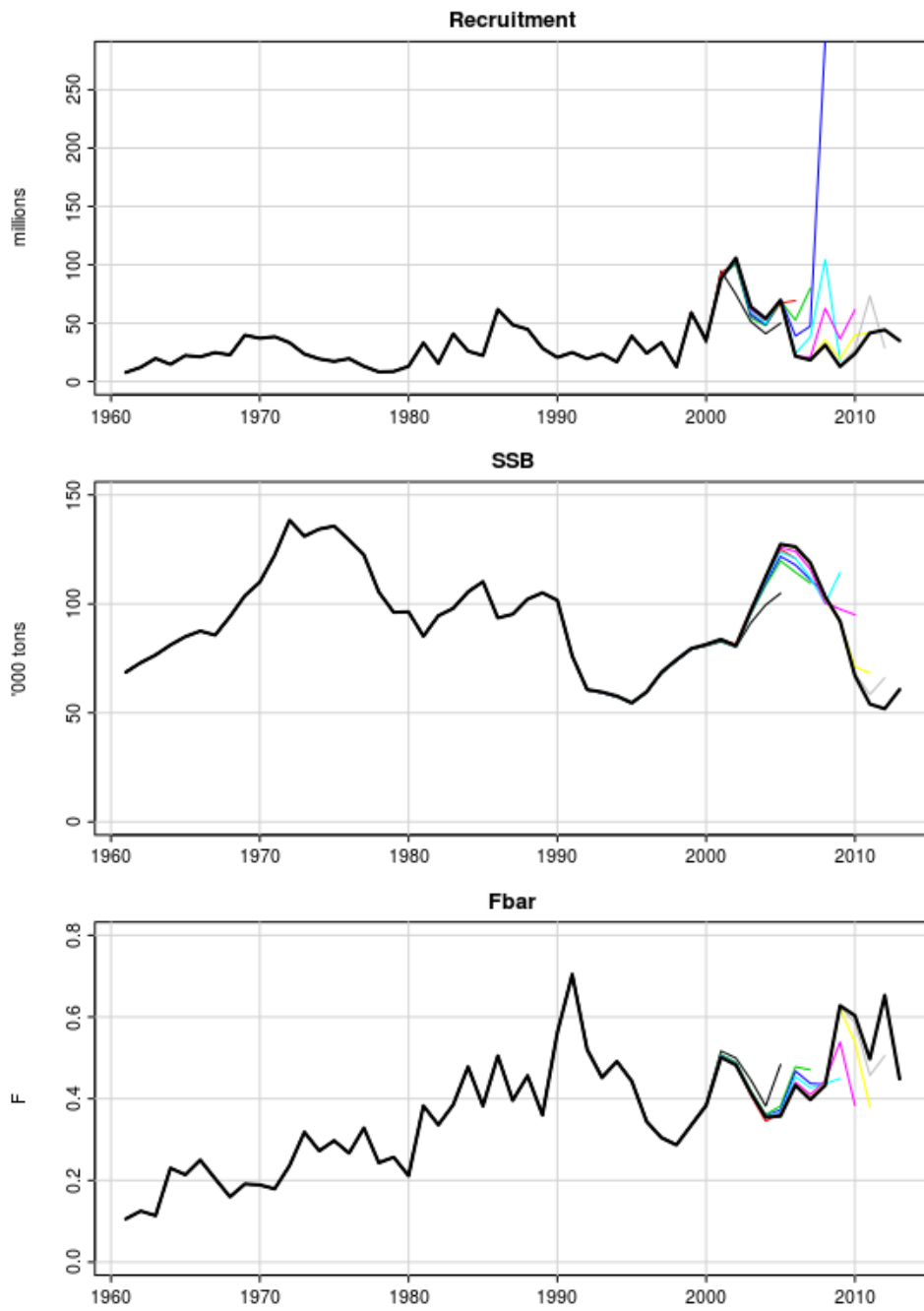


Figure 6.8.1. Faroe saithe (Division Vb). Retrospective analysis of recruitment at age 3, spawning stock biomass and average fishing mortality over age groups 4-8 from the spaly assessment.

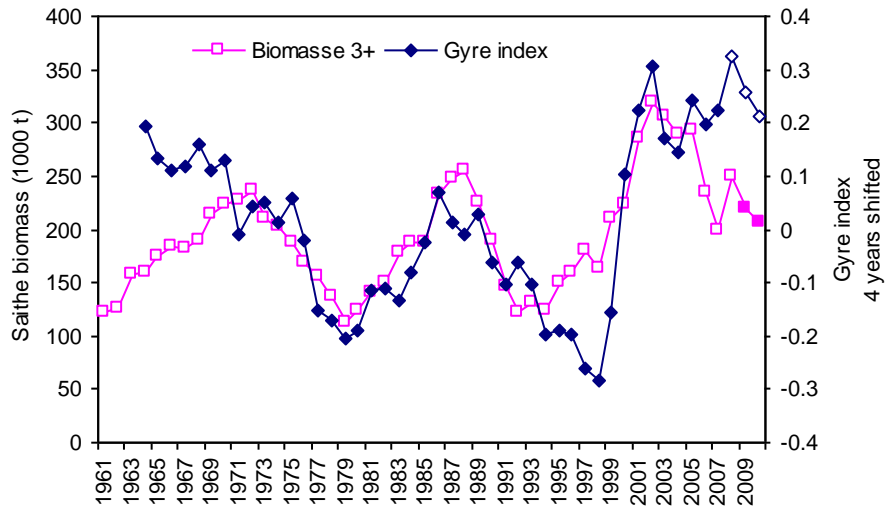


Figure 6.15.1. Faroe saithe (Division Vb). Relationship between the Gyre index (4 years shifted) and saithe biomass (age 3+) in Faroese waters.

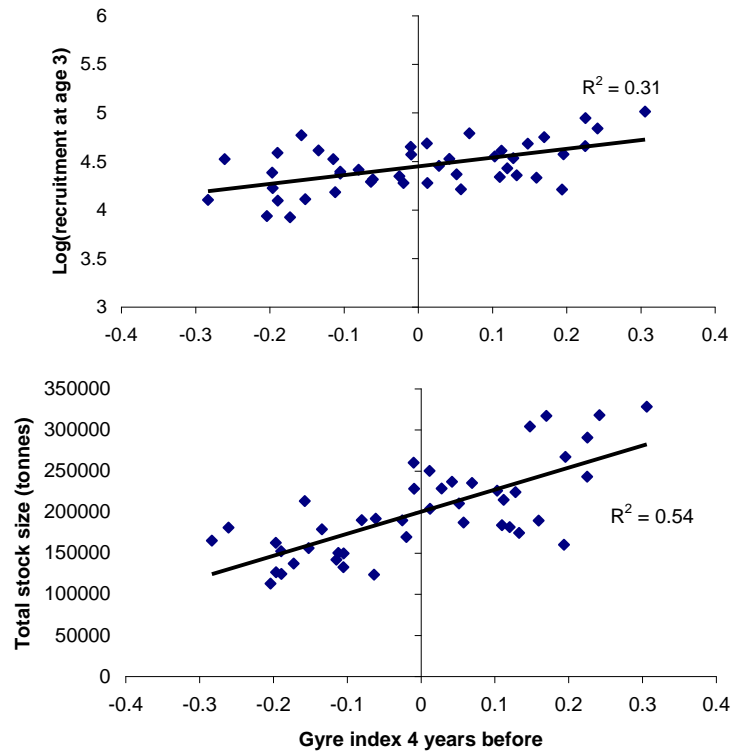


Figure 6.15.2. Relationship between the gyre index and both recruitment (top figure) and total stock biomass estimates (bottom figure.) Note that a large gyre index indicates a small subpolar gyre, and, consequently, a large influx of plankton-rich warmer-than-average water to the outer areas (bottom depth > 150 m) around the Faroes, where saithe typically are found.