5 Saithe in Sub-areas I and II (Northeast Arctic)

An update assessment is presented for this stock. The last benchmark assessment was done at WKROUND February 2010 (ICES CM 2010/ACOM: 36).

The 2011 update assessment (ICES CM 2011/ACOM: 05) showed that SSB has been well above B_{pa} since 1995 but has decreased in recent years. Fishing mortality has been well below F_{pa} since 1996, but has increased after 2005 and is approaching F_{pa}.

ICES advised on the basis of the management plan implemented by The Norwegian Ministry of Fisheries and Coastal Affairs that catches in 2012 should be no more than 164,000 t. ICES evaluated the management plan (harvest control rule) in 2007 and again in 2011 due to changes introduced at the 2010 benchmark and concluded that it is consistent with the precautionary approach.

More details and general information is given in (ICES CM 2010/ACOM: 36) and the Stock Annex (Quality Handbook).

5.1 The Fishery (Tables 5.1.1–5.1.2, Figure 5.1.1)

Currently the main fleets targeting saithe include trawl, purse seine, gillnet, hand line and Danish seine. Landings of saithe were highest in 1970-1976 with an average of 239,000 t and a maximum of 265,000 t in 1970. This period was followed by a sharp decline to a level of about 160,000 t in the years 1978-1984, while in 1985 to 1991 the landings ranged from 67,000-123,000 t. After 1991 landings increased and ranged between 136,000 t (in 2000) and 212,000 t (in 2006).

Discarding, although illegal, occurs in the saithe fishery, but is not considered a major problem in the assessment. Due to its near-shore distribution saithe is virtually inaccessible for commercial gears during the first couple of years of life and there are no reports indicating overall high discard rates in the Norwegian fisheries. There are reported incidents of slipping in the purse seine fishery, mainly related to minimum landing size. Observations from non-Norwegian commercial trawlers indicate that discarding may occur when vessels targeting other species catch saithe, for which they may not have a quota or have filled it. However, there are no quantitative estimates of the level of discarding available.

5.1.1 ICES advice applicable to 2011 and 2012

The advice from ICES for 2011 was as follows:

Following the agreed client management plan implies a TAC of 173,000 t in 2011. The SSB is expected to decrease by 9% in 2011 and to remain above B_{pa} at the beginning of 2012.

The advice from ICES for 2012 was as follows:

Following the agreed management plan implies a TAC of 164,000 t in 2012. The SSB is expected to decrease by 11% in 2012 and to remain above B_{pa} at the beginning of 2013.

5.1.2 Management applicable in 2011 and 2012

Management of Saithe in Sub-areas I and II is by TAC and technical measures. Norwegian authorities set the TACs for 2011 and 2012 to 173,000 t and 164,000 t, respectively.

5.1.3 The fishery in 2011 and expected landings in 2012

Provisional figures show that the landings in 2011 were approximately 157,000 t, about 16,000 t less than the TAC of 173,000 t, which also were expected landings in the forecast last year.

Since the WG does not have any prognosis of total landings in 2012 available, the TAC of 164,000 t is used in the projections.

5.2 Commercial catch-effort data and research vessel surveys

5.2.1 Fishing Effort and Catch-per-unit-effort (Tables 5.2.1)

In the Norwegian trawl CPUE indices, all quarters and all days with more than 20 % but less than 80 % saithe in the catches from vessels larger than the median length were included. The 80 % limit was set to get a more consistent time series regarding bycatch or direct saithe fishery (Fotland *et al*., WD 12 WKROUND 2010). Since the 2007 WG double and triple trawl catches have been excluded from the data because such trawls have a much higher efficiency and the use of them have increased over the last few years. The CPUE observations were averaged over each quarter, and then a yearly index was calculated by averaging over the year. The total CPUE index was finally divided on age groups applying yearly catch in numbers and weight at age data from the trawl fishery.

5.2.2 Survey results (Table 5.2.2, Figure 5.2.1)

In autumn 2003 the saithe and coastal cod surveys were combined (Berg *et al*., WD 11 2004). Exploratory XSA runs with an alternative tuning time series from the combined survey were prepared to the benchmark assessment 2010 (Mehl and Fotland, WD 8 WKROUND 2010). The XSA diagnostics and results showed that this tuning series was still too short to perform as well as the one presently used. The estimation of abundance indices is as far as possible done as before the combination of the two surveys. The total index for 2011 (Mehl *et al*. 2011) decreased by almost 40 % compared to 2010, and is the lowest since 1989. The indices for all age groups, especially 2, 3 and 5 year olds (2009, 2008 and 2006-year classes), were well below the 1992-2010 average. The 2006- and 2007 year classes were at or above average level as 3 year olds in 2009 and 2010, respectively, but were considerably reduced to well below average as 4 year olds. This result is supported by the high purse seine catch observed for this age group in 2010. In recent years the proportion of saithe in the southern part of the survey area (sub areas C+D) has increased, from about 30% in 1997-2002 to around 50 % in later years (Figure 5.2.1).

5.2.3 Recruitment indices

Owing to the near-shore distribution of juvenile saithe, obtaining early estimates of recruitment is a common problem in saithe stocks. Attempts at establishing year class strength at ages 0-2 for the Northeast Arctic saithe stock have so far failed. The survey recruitment indices are strongly dependent on the extent to which 2-4 year old saithe have migrated from the coastal areas and become available to the acoustic saithe survey on the banks, and this varies between years. An observer programme for establishing a 0-group index series started in 2000 (Borge and Mehl, WD 21 2002). However, these observations do not seem to reflect the dynamics in year class strength very well and are probably not suitable for improving future recruitment

estimates for this stock (Mehl, WD 6 2007; Mehl, WD 7 to WKROUND 2010). It was therefore decided to terminate the programme in 2010.

5.3 Data used in the Assessment

5.3.1 Catch numbers at age (Table 5.3.1)

Total Norwegian landings by gear in 2010 were updated. For all countries the landings data for 2010 were updated to the official total catch reported to ICES or to Norwegian authorities. These revisions resulted in only minor changes in catch numbers-at-age and weight-at-age.

Age composition data for 2011 were available from Norway and Germany (Subarea II). Russian length composition data for Subarea IIa and IIb was used in ALK for Norwegian trawl. Other areas and countries were assumed to have the same age composition as Norwegian trawlers. The biological sampling of some vessel groups, periods and areas may have become critically low after the termination of the Norwegian port sampling program in 2009. The revised 2010 and new 2011 catch and sample data were uploaded to the InterCatch database, and there were practically no discrepancies between data allocated and aggregated in InterCatch and data from the spreadsheets presently used.

5.3.2 Weight at age (Table 5.3.2)

Constant weights at age values are used for the period 1960-1979. For subsequent years, annual estimates of weight at age in the catches are used. Weight at age in the stock is assumed to be the same as weight at age in the catch. Compared to the previous years, there were only small differences in weight at age for the most important age groups in 2011.

5.3.3 Natural mortality

A fixed natural mortality of 0.2 for all age groups was used both in the assessment and the forecast.

5.3.4 Maturity at age (Table 5.3.3)

A constant maturity ogive was used until the 2005 WG, when these estimates were evaluated. In later years the maturity at age had decreased somewhat, and the WG decided to use a 3-year running average for the period from 1985 and onwards (2-year average for the first and last year). New analyses were only available back to 1985. Table 5.3.3 presents the 3-year running average maturity ogive. Since 2009 a rather large reduction in maturity at age five has been observed.

5.3.5 Tuning data (Table 5.3.4, Figure 5.3.1)

Until the 2005 WG, the tuning was based on three data series: CPUE from Norwegian purse seine and Norwegian trawl and indices from a Norwegian acoustic survey. The 2005 WG found rather large and variable log q residuals and large S.E. log q for the purse seine fleet, as well as strong year effects, and in the combined tuning the fleet got low-scaled weights. The WG decided not to include the purse seine tuning fleet in the analysis. This was confirmed by new analyses at the 2010 benchmark assessment (ICES CM 2010/ACOM:36).

Analyses of the two remaining tuning series done at the 2010 benchmark assessment indicated that there had been a shift in catchability around year 2002. The survey was

redesigned in 2003, and the fishery to a larger degree targeted older ages. Permanent breaks were made in both tuning series in 2002. The following four tuning fleets are used in the present assessment:

Fleet 11: CPUE data from the Norwegian trawl fisheries 1994-2001, age groups 4 to 8, quarter 1-4.

Fleet 12: CPUE data from the Norwegian trawl fisheries 2002-2011, age groups 4 to 8, quarter 1-4.

Fleet 13: Indices from the Norwegian acoustic survey 1994-2001, age groups 3 to 7.

Fleet 14: Indices from the Norwegian acoustic survey 2002-2011, age groups 3 to 7.

Figure 5.3.1a,b presents the tuning data by fleet, year and age for the two periods combined.

5.4 Exploratory runs (Table 5.4.1, Figure 5.4.1)

The settings of the different runs are shown in Table 5.4.1 and the results are given in Figure 5.4.1. The recommendation from the benchmark assessment in 2010 (ICES CM 2010/ACOM: 36) was to run the XSA with a 15+ catch matrix, tuning time series broken in 2002, reduced shrinkage (S.E. of the mean to which the estimate are shrunk increased from 0.5 to 1.5) and no tapered time weighting.

Motivated by some recent discussions in various benchmark groups, about what to do in cases where an XSA does not converge, and also by the considerations made at the WGMG meeting in 2009 (reflected in chapter 5 of that report (ICES CM 2009/RMC: 12)), particular attention was paid to this question this year.

The WGMG in 2009 noted that "It is interesting how earlier advice on the desirability of stopping XSA after 30 iterations in order to check for convergence evolved over time within some Working Groups into a general perception that XSA runs should not be continued at all beyond 30 iterations. This is clearly not what was intended by the original advice, but certainly became the de facto approach for a number of Working Groups using the Lowestoft VPA suite to run XSA." The group further stated that "An unconverged XSA run indicates that something is wrong: either the model is being used incorrectly, or the model is not appropriate to characterizing the available data" (ICES CM 2009/RMC: 12).

In previous years the XSA saithe assessment runs in most cases have failed to converge after 30 iterations, but contrary to the "de facto approach for a number of Working Groups" additional runs with more iterations were made until the XSA converged in such cases. However, in the two last assessments, only 30 iterations were made even though the XSA had not converged. This year, this situation occurred once more, and additional runs were made until convergence occurred. With the settings used in the final run, convergence was reached after 123 and 121 iterations in the Lowestoft VPA suite XSA and the FLXSA respectively. Some exploratory runs were made to determine which settings affected convergence the most. In (ICES CM 2009/RMC: 12) the q-plateau and the plus-group are mentioned as decisive for the convergence behavior. We found that for the NEA saithe assessment, the amount of shrinkage also heavily affected the number of iterations needed; with an FSE = 0.5, 38 iterations (in Lowestoft VPA suite XSA), for FSE = 1.0, 90 iterations and for FSE = 1.5 (final run), 123 iterations were needed to reach convergence.

We followed the recommendation from the WGMG 2009, to run the XSA to convergence, but to check the sensitivity of the assessment for various numbers of iterations. For the 2012 NEA saithe assessment, we concluded that the terminal F and terminal SSB estimates changed very little, and consequently the final assessment was based on the run that converged.

Based on the update of catch statistics for 2010, a SPALY (Same Procedure As Last Year) XSA (run 1) was performed, giving almost the same results as in the 2011 assessment. F_{4-7} in 2010 was estimated to 0.333 in 2011, while the updated run gave a F_{4-7} of 0.336. SSB in 2010 increased from 393,155 t to 393,655 t.

Two single fleet tuning runs were performed with the 2011 data included; one with the Norwegian trawl CPUE (run 2) and one with the Norwegian acoustic survey (run 3). Run 4 was a SPALY analysis with combined fleets, while in the last run (5) the tuning was allowed to converge, which took 123 iterations compared to 30 iterations in runs 1-4.

Figure 5.4.1 compares estimates of SSB and F_{4-7} in 2011 from the two single fleet XSA-runs and the combined tuning runs. The single fleet tuning run based on the CPUE give the lowest F_{4-7} and highest SSB in the last assessment year (2011), while the run based on the acoustic indices gave lower SSB and considerably higher F_{4-7} (0.20 compared to 0.52). The combined runs gave SSB and F_{4-7} values between those from the single fleet runs. Compared to the update of the final run made at the 2011 assessment, F_{4-7} in 2010 is now higher (0.37 compared to 0.33) and SSB lower (383,000 t compared to 393,000 t).

5.5 Final assessment run (Tables 5.5.1–5.5.7, Figures 5.5.1–5.5.4)

Extended Survivors Analysis (XSA) was used for the final assessment with settings shown in Table 5.4.1. The settings are in accordance with the recommendations from the benchmark assessment in February 2010 (ICES CM 2010/ACOM:36), but the tuning was allowed to converge. Full tuning fleet diagnostics are given in Table 5.5.1.

Figure 5.5.1 presents log q residuals for the tuning fleets. In general, there are few year- and age effects and mostly small residuals. The second part of the acoustic survey series seems to perform better then the first part. Figure 5.5.2 presents S.E. log q for the different age groups in the fleets used for tuning. The two tuning series going from 1994 to 2002 have higher S.E. log q, except for age 4 of the trawl CPUE series from 2003 to 2011. The upper panel of Figure 5.5.3 shows estimates of survivors from different fleets, shrinkage and mean survivors, while the bottom panel shows their different weighting in the final XSA-run. The survey series from 2003 to 2011 get the highest weights for age groups 3-7, the CPUE series from 2003 to 2011 get slightly higher weights for the older age groups, while shrinkages only get some weights for ages 12-14. Figure 5.5.4a-b shows plots of the tuning indices versus stock numbers from the XSA.

5.5.1 Fishing mortalities and VPA (Tables 5.5.2–5.5.7, 5.7.1, Figure 5.5.5)

The fishing mortality (F_{4-7}) in 2010 was 0.37, which is above the value of 0.33 from last year's assessment. The fishing mortality (F_{4-7}) in 2011 was 0.35, i.e. a little below the corresponding figure for 2010, and at the F_{pa} of 0.35.

Fishing mortality and stock size have in the last decade been considerably over- and underestimated, respectively, in the last assessment year. Due to the changes made to the assessment following the benchmark assessment workshop in 2010 (ICES CM

2010/ACOM: 36), the retrospective patterns have improved considerably, as is illustrated in Figure 5.5.5, and now shows clear signs of an opposite retrospective trend.

The XSA-estimates of the 2007-2008 year classes are not considered to be reliable and are therefore shaded (Tables 5.5.3 and 5.5.5). In the projections, both were set to the long-term geometrical mean, the value of the 2008-year class at age 4 being obtained by applying Pope's approximation. The figures are given in input data for prediction (Table 5.7.1). The 2002 year class was the most numerous in the landings for several years and is estimated to be the strongest in the time series, above the strong 1989, 1992 and 1999-year classes. The 2003-year class is confirmed to be one of the weakest in the time series, and the 2004-year class is also poor, the 2005-year class is well above average level, the 2006-year class now comes out well below average strength, while the 2007-year class so far is above average, at about the same level as the 2005-year class. Survey indices and purse seine catches in 2011 indicates that the 2008-year class is below average strength and may be weak, while little information is available on the strength of more recent year classes.

The total biomass (ages 3+) has been above the long-term (1960-2011) mean since 1995, reached a maximum in 2005, but is presently declining. The SSB has been above the long-term mean since 2001 and above B_{pa} since 1995 (Tables 5.5.5-5.5.7). It has declined since 2005, but is still estimated to be above B_{pa}.

5.5.2 Recruitment (Table 5.3.1, Figure 5.1.1)

Estimates of the recruiting year classes up to the 2007-year class (4 year olds) from the XSA were accepted. Catches of age group 3 have varied considerably during the period 2006-2011 (Table 5.3.1). Until the 2005 WG, RCT3-runs were conducted to estimate the corresponding year classes, with 2 and 3 year olds from the acoustic survey as input together with XSA numbers. These estimates were, however, strongly weighted towards the mean value of the input XSA-numbers, which due to the short survey time series also contained year classes that were still not converged. It has therefore been stated several times in the ACOM Technical Minutes that it would be more transparent to use the long-term GM (geometric mean) recruitment. The GM recruitment 1960-2010 is 169 million 3 year olds, and this value is used for the 2008-year class.

5.6 Reference points (Figure 5.1.1)

In 2010 the age span was expanded from 11+ to 15+ and important XSA parameter settings were changed (ICES CM 2010/ACOM: 36). This resulted in changes in estimated fishing mortality, spawning stock biomass and recruitment, especially in the last part of the time series. Therefore the LIM reference points were re-estimated at the 2010 WG according to the methodology outlined in ICES CM 2003/ACFM: 15, while the PA reference point estimation was based on the old procedure (ICES CM 1998/ACFM: 10). The results were not very much different from the previous analyses performed in 2005 (ICES CM 2005/ACFM: 20), and since the HCR is based on the PA reference points, it was decided not to change the existing LIM and PA reference points. The re-estimations are presented below.

5.6.1 Biomass reference points

At the 2010 WG, parameter values, including the change-point, were computed using segmented regression on the 1960-2005 time series of SSB-recruitment pairs. The maximum likelihood estimate of the spawning stock biomass at which recruitment is

impaired (change point) was 118,542 t. Applying the "magic formula" $B_{pa} = B_{lim} \exp(1.645*\sigma)$, with a value of 0.3 for σ, gave a B_{pa} of 194,176 t. However, as explained above, it was decided to still use the existing values of B_{lim} = 136,000 t and B_{pa} = 220,000 t.

5.6.2 Fishing mortality reference points (Tables 5.6.1, 5.7.1, Figure 5.1.1)

F_{lim} was set on the basis of B_{lim} (ICES CM 2003/ACFM: 15). The functional relationship between spawner-per-recruit and F gave the F associated with the R/SSB slope derived from the B_{lim} estimate obtained from the segmented regression. Arithmetic means of proportion mature 1960-2009, weight in stock and weight in catch 1980-2009 (weights were constant before 1980), natural mortality and fishing pattern 1960-2009 were at the 2010 WG used for re-calculating the spawner-per-recruit function using ICES Secretariat yield-per-recruit software. R/SSB = 1.48 from the B_{lim} estimation gave SSB/R = 0.676 and a F_{lim} = 0.59. Applying the "magic formula" $F_{pa} = F_{lim} \exp(-1.645*\sigma)$, gave a F_{pa} of 0.36, for a σ of 0.3 . As explained above, it was decided to still use the existing values of F_{lim} = 0.58 and F_{pa} = 0.35.

Yield and SSB per recruit were based on the parameters in Table 5.7.1 and are presented in Table 5.6.1. $F_{0.1}$, Fmax and $F_{35\%SPR}$ were estimated to be 0.14, 0.33 and 0.14, respectively, which is slightly higher than last year's estimates of 0.10, 0.32 and 0.12. The plot of SSB versus recruitment is shown in Figure 5.1.1. These points are F_{MSY} candidates, but the estimates, especially of F_{max}, are unstable for this stock. When the HCR was re-evaluated (see below), the highest long-term yield was obtained for an exploitation level of 0.20.

5.6.3 Harvest control rule (Figures 5.6.1–2)

In 2007 ICES evaluate the harvest control rule for setting the annual fishing quota (TAC) for Northeast Arctic saithe. ICES concluded that the HCR was consistent with the precautionary approach for all simulated data and settings, including a rebuilding situation under the condition that the assessment uncertainty and error are not greater than those calculated from historic data. This also held true when an implementation error (difference between TAC and catch) equal to the historic level was included. The HCR was implemented the same year. It contains the following elements:

- Estimate the average TAC level for the coming 3 years based on $\mathbf{F}_{pa}$. TAC for the next year will be set to this level as a starting value for the 3-year period.
- The year after, the TAC calculation for the next 3 years is repeated based on the updated information about the stock development. However, the TAC should not be changed by more than 15% compared with the previous year's TAC.
- If the spawning stock biomass (SSB) in the beginning of the year for which the quota is set (first year of prediction), is below $\mathbf{B}_{pa}$, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from $\mathbf{F}_{pa}$ at SSB=$\mathbf{B}_{pa}$ to 0 at SSB equal to zero. At SSB levels below $\mathbf{B}_{pa}$ in any of the operational years (current year and 3 years of prediction) there should be no limitations on the year-to-year variations in TAC.

In 2011 the evaluation was repeated taking into account the changes made to the assessment after the 2010 benchmark assessment (ICES CM 2010/ACOM: 36). The

analyses indicate that the HCR still is in agreement with the precautionary approach (Mehl and Fotland, WD 11).

In the 2007 simulations (ICES CM 2007/ACFM :16) the highest long-term yield was obtained for an exploitation level of 0.32, i.e. a little below the target F used in the HCR (F_{pa}), and ICES recommended using a lower value in the HCR. In the 2011 simulations (ICES CM 2011/ACOM: 05) the highest long-term yield was obtained for F = 0.20 (Figure 5.6.1), but the curve was almost flat between F=0.15 and F=0.25 and the decrease in long-term yield going from F=0.25 to F=0.35 was rather small (about 5%). However, SSB was reduced by a factor of more than 3 between F=0.1 and F=0.4 and approached B_{pa} (Figure 5.6.2).

5.7 Predictions

5.7.1 Input data (Table 5.7.1)

The input data to the predictions based on results from the final XSA are given in Table 5.7.1. The stock number at age in 2012 was taken from the XSA for age 5 (2007 year class) and older. The recruitment at age 3 in the last assessment year (2011) was calculated as the long-term GM (geometric mean) recruitment 1960-2010 (Section 5.5.2), and the corresponding numbers at age 4 in the intermediate year (2012) was calculated applying a natural mortality of 0.2 and using Pope's approximation (as recommended by the ACOM reviewers in 2008). The GM age 3 recruitment of 169 million was also used for the 2009 and subsequent year classes. The natural mortality of 0.2 is the same as used in the assessment. For exploitation pattern the average of 2009-2011 was used for age groups 3-10, while for age groups 11-15+ the 2009-2011 average for ages 11-13 was applied for all ages. For weight at age in stock and catch the average of the last three years in the XSA was used. For maturity at age the average of the 2010-2011 annual determinations was applied.

5.7.2 Catch options for 2013 (short-term predictions) (Tables 5.7.2–5.7.4)

The management option table (Table 5.7.2) shows that the expected catch of 164,000 t in 2012 will decrease the fishing mortality slightly compared to 2011 from 0.35 to 0.31, which is below the F_{pa} of 0.35. A catch in 2013 corresponding to the $F_{status\ quo}$ level (3-year average 2009-2011) of 0.33 will be 165,000 t, while a catch in 2013 corresponding to the evaluated and implemented HCR (average TAC level for the coming 3 years based on F_{pa}, see Table 5.7.3) is 164,000 t. This catch corresponds to a fishing mortality of 0.32 in 2013.

For a catch in 2012 corresponding to the agreed TAC, i.e. 164,000 t, the SSB is expected to decrease from about 315,000 t at the beginning of 2012 to 302,000 t at the beginning of 2013. At $F_{status\ quo}$ in 2013 SSB is estimated to decrease to 292,000 t at the beginning of 2014 and for a catch corresponding to the HCR it will also decrease to about 292,000 t. Higher fishing mortalities and incoming year classes of below average strength mainly explain this predicted reduction in SSB. Table 5.7.4 presents detailed output for fishing according to the HCR in 2013.

5.7.3 Comparison of the present and last year's assessment

The current assessment estimated the total stock in 2011 to be 5 % higher and the SSB 2 % lower, compared to the previous assessment. The F in 2010 is estimated to be higher than in the previous assessment and the realized F in 2011 is also higher compared to the predicted one based on the TAC.

	Total stock (3+) by 1 January 2011(tonnes)	SSB by 1 January 2011(tonnes)	F_{4-7} in 2011	F_{4-7} in 2010
WG 2011	711210	358114	0.31 (TAC constraint)	0.33
WG 2012	745452	351241	0.35	0.37

5.8 Comments to the assessment and the forecast (Figure 5.5.5).

The retrospective pattern has been a major concern in the assessment, but due to the changes done at the benchmark assessment (ICES CM 2010/ACOM: 36), the assessment has become more stable. The tendency to overestimate F and underestimate SSB in the last assessment year seems to have changed to an opposite situation, but the differences are less than in previous assessments.

The biological sampling may have become critically low after the termination of the Norwegian port sampling program in 2009. This may affect the precision of the catch, weight and maturity at age data.

The assessment is vulnerable since only two tuning series are available. Moreover, in recent years these tuning series have shown increasingly divergent signals, which might influence the perception of the status of the stock. The survey tuning series, showing large reduction in recent years, got the highest weights in the estimation of survivors for the most abundant age groups (Figure 5.3.3), indicating that these follow the trends in the catch-at-age matrix more closely.

Lack of reliable recruitment estimates is still a major problem. Prediction of catches will, to a large extent, be dependent on assumptions of average recruitment, since fish from age four to seven constitute major parts of the catches. Since the saithe HCR is a three-year-rule, the estimation of average F_{pa} catch in the HCR will affect stock numbers up to age seven, and thereby heavily affect the total prognosis of the fishable stock and the quotas derived from it.

5.9 Response to ACOM technical minutes

The major comments made by the five previous reviews were dealt with during the benchmark assessment in February 2010 (ICES CM 2010/ACOM:36).

The 2011 reviewers commented that a section on stock status would be useful, and a few paragraphs have been included in the introduction.

Further it was recommended that as more information is accumulated on the directed fishery for saithe, the directed fishery CPUE should be used, instead of the current basis for CPUE. The WG does not disagree with this, and suggests that the next benchmark assessment could investigate it further.

The reviewers found the information on discards within the assessment to be conflicting: "The assessment stated that discarding, although illegal, occurs in the saithe fishery, but is not considered a major problem in the assessment. Further text on discards indicates that comparisons of scientific samples from non-Norwegian commercial trawlers indicating that discarding may be substantial in certain areas and seasons. Therefore, it is unclear what impact discards may have on the assessment." The discarding from non-Norwegian commercial trawlers may perhaps be substantial in certain areas and seasons, but this represents a minor part of the saithe landings since Norway accounts for more than 90% of the total landings. Therefore discarding is not considered a major problem in the assessment.

Table 5.1.1 Saithe in Sub-areas I and II (Northeast Arctic).

Nominal catch (t) by countries as officially reported to ICES.

Year	Faroe Islands	France	Germany Dem.Rep	Fed.Rep. Germany	Iceland	Norway	Poland	Portugal	Russia3	Spain	UK	Others 5	Total all countries
1960	23	1 700		25 948		96 050					9 780	14	133 515
1961	61	3 625		19 757		77 875					4 595	18	105 951
1962	2	544		12 651		101 895			912		4 699	4	120 707
1963		1 110		8 108		135 297					4 112		148 627
1964		1 525		4 420		184 700			84		6 511	186	197 426
1965		1 618		11 387		165 531			137		6 741	181	185 600
1966		2 987	813	11 269		175 037			563		13 078	41	203 788
1967		9 472	304	11 822		150 860			441		8 379	48	181 326
1968			70	4 753		96 641					8 781		110 247
1969	20	193	6 744	4 355		115 140					13 585	23	140 060
1970	1 097		29 362	23 466		151 759			43 550		15 469		264 924
1971	215	14 536	16 840	12 204		128 499	6 017		39 397	13 097	10 361		241 272
1972	109	14 519	7 474	24 595		143 775	1 111		1 278	13 125	8 223		214 334
1973	7	11320	12 015	30 338		148 789	23		2 411	2 115	6 841		213 859
1974	46	7119	29 466	33 155		152 699	2521		28 931	7 075	3 104	5	264 121
1975	28	3156	28 517	41 260		122 598	3860	6430	13 389	11 397	2 763	55	233 453
1976	20	5609	10 266	49 056		131 675	3164	7233	9 013	21 661	4 724	65	242 486
1977	270	5658	7 164	19 985		139 705	1	783	989	1 327	6 935		182 817
1978	809	4345	6 484	19 190		121 069	35	203	381	121	2 827		155 464
1979	1117	2601	2 435	15 323		141 346			3	685	1 170		164 680
1980	532	1016		12 511		128 878			43	780	794		144 554
1981	236	218		8 431		166 139			121		395		175 540
1982	339	82		7 224		159 643			14		732		168 034
1983	539	418		4 933		149 556			206	33	1 251		156 936
1984	503	431	6	4 532		152 818			161		335		158 786
1985	490	657	11	1 873		103 899			51		202		107 183
1986	426	308		3 470		63 090			27		75		67 396
1987	712	576		4 909		85 710			426		57	1	92 391
1988	441	411		4 574		108 244			130		442		114 242
1989	388	460 [2]		606		119 625			506	506	726		122 817
1990	1207	340 [2]		1 143		92 397			52		709		95 848
1991	963	77 [2]	**Greenland**	2 003		103 283			504 [4]		492	5	107 327
1992	165	1980	734	3 451		119 763			964	6	541		127 604
1993	31	566	78	3 687	3	140 604		1	9 509	4 [2]	415	5 [2]	154 903
1994	67 [2]	557	15	1 863	4 [2]	141 589		1 [2]	1 640 [2]	655 [2]	557	2	146 950
1995	172 [2]	358	53	935		165 001		5	1 148		688	18	168 378
1996	248 [2]	346	165	2 615		166 045		24	1 159	6	707	33	171 348
1997	193 [2]	560	363 [2]	2 915		136 927		12	1 774	41	799	45	143 629
1998	366	932	437 [2]	2 936		144 103		47	3 836	275	355	40	153 327
1999	181	638 [2]	655 [2]	2 473	146	141 941		17	3 929	24	339	32	150 375
2000	224 [2]	1438	651 [2]	2 573	33	125 932		46	4 452	117	454	8 [2]	135 928
2001	537	1279	701 [2]	2 690	57	124 928		75	4 951	119	514	2	135 853
2002	788	1048	1393	2 642	78	142 941		118	5 402	37	420	3	154 870
2003	2056	1022	929 [2]	2 763	80 [2]	150 400		147	3 894	18	265	18 [2]	161 592
2004	3071	255	891 [2]	2 161	319	147 975		127	9 192	87	544	14	164 636
2005	3152	447	817 [2]	2 048	395	162 338		354	8 362	25	630		178 568
2006	1795	899	786 [2]	2 779	255	195 462	89	339 [2]	9 823	21 [2]	532	42	212 822
2007	2048	966	810 [2]	3 019	219	178 644	99	412	12 168	53 [2]	558	12	199 008
2008	2314	1009	503 [2]	2 263	113	165 998	66	348	11 577	33	506	10	184 740
2009	1611 [2]	326	697	2 021	69	144 570	30	204 [2]	11 899	2 [2]	379	45 [2]	161 853
2010	1632	677	954	1 592	109 [2]	174 544	279	93	14 664	8	283	2 [2]	194 837
2011 [1]	112	357	445	1 371	110	143 252		43	10 007	2 [2]	972	15	156 686

1 Provisional figures.

2 As reported to Norwegian authorities.

3 USSR prior to 1991.

4 Includes Estonia.

5 Includes Denmark,Netherlands, Ireland and Sweden

6 As reported by Working Group members

Table 5.1.2 Saithe in Sub-areas I and II (Northeast Arctic).
Landings ('000 tonnes) by gear category.

Year	Purse Seine	Trawl	Gill Net	Others	Total
1977	75.2	69.5	19.3	12.7	176.7 [2]
1978	62.9	57.6	21.1	13.9	155.5
1979	74.7	52.5	21.6	15.9	164.7
1980	61.3	46.8	21.1	15.4	144.6
1981	64.3	72.4	24.0	14.8	175.5
1982	76.4	59.4	16.7	15.5	168.0
1983	54.1	68.2	19.6	15.0	156.9
1984	36.4	85.6	23.7	13.1	158.8
1985	31.1	49.9	14.6	11.6	107.2
1986	7.9	36.2	12.3	8.2	64.6 [2]
1987	34.9	27.7	19.0	10.8	92.4
1988	43.5	45.4	15.3	10.0	114.2
1989	49.5	45.0	16.9	11.4	122.8
1990	24.6	44.0	19.3	7.9	95.8
1991	38.9	40.1	18.9	9.4	107.3
1992	27.1	67.0	22.3	11.2	127.6
1993	33.1	84.9	21.2	15.7	154.9
1994	30.2	82.2	21.1	13.5	147.0 [3]
1995	21.8	103.5	26.9	16.1	168.4 [4]
1996	46.9	72.5	31.6	20.3	171.3
1997	44.4	55.9	24.4	19.0	143.6
1998	44.4	57.7	27.6	23.6	153.3
1999	39.2	57.9	29.7	23.6	150.4
2000	28.3	54.5	29.6	23.5	135.9
2001	28.1	58.1	28.2	21.5	135.9
2002	27.4	75.5	30.4	21.5	154.8
2003	43.3	73.8	25.2	19.3	161.6
2004	41.8	74.6	26.9	21.3	164.6
2005	42.1	91.8	25.6	19.1	178.6
2006	73.5	87.1	29.7	22.5	212.8
2007	41.8	100.7	33.3	23.2	199.0
2008	39.4	91.2	37.0	17.1	184.7
2009	35.5	81.1	33.2	12.1	161.9
2010	54.9	89.8	36.9	13.2	194.8
2011 [1]	45.1	67.4	31.8	12.4	156.7

[1] Provisional figures.

[2] Unresolved discrepancy between Norwegian catch by gear figures and the total reported to ICES for these years.

[3] Includes 4,300 tonnes not categorized by gear, proportionally adjusted.

[4] Reduced by 1,200 tonnes not categorized by gear, proportionally adjusted.

Table 5.2.1 Saithe in Sub-areas I and II (Northeast Arctic).
Norwegian trawl CPUE by agegroup (Catch in numbers per trawlhour).
Shaded area shows indices applied in the assessment.

Year	Agegroup									Total CPUE (kg/h)
	effort	3	4	5	6	7	8	9	10	Quarter 1-4
1994	1	3.4	83.2	280.2	174.0	24.0	5.3	1.7	3.3	575
1995	1	28.1	150.0	208.3	226.3	35.9	5.9	0.2	1.5	656
1996	1	17.0	84.7	113.2	164.7	217.1	24.9	5.3	0.5	628
1997	1	10.7	28.5	148.3	151.1	194.4	122.3	12.9	1.3	670
1998	1	2.4	24.5	41.1	181.6	69.2	42.1	12.1	5.7	379
1999	1	11.0	26.6	74.9	56.8	131.6	30.2	22.1	6.3	359
2000	1	5.4	58.8	62.9	117.9	91.3	122.6	46.4	52.4	558
2001	1	5.4	32.2	176.1	126.8	119.8	50.7	72.3	34.7	618
2002	1	6.9	52.2	84.9	264.3	59.6	61.2	28.0	52.1	609
2003	1	4.0	105.9	161.7	107.3	154.7	99.8	82.6	51.1	767
2004	1	2.4	5.8	141.8	105.4	135.3	169.6	54.5	74.8	690
2005	1	13.4	38.6	103.3	305.7	145.9	82.1	145.8	49.0	884
2006	1	0.3	53.5	99.2	86.9	202.3	116.9	103.9	97.7	761
2007	1	3.5	11.2	206.8	161.8	109.1	165.6	110.7	58.0	827
2008	1	15.8	81.1	46.3	266.0	149.1	90.8	135.6	83.9	868
2009	1	51.1	158.6	134.4	79.0	196.5	55.0	34.0	78.9	787
2010	1	45.4	155.5	179.5	89.8	34.0	161.7	33.4	16.7	716
2011 [1]	1	3.2	50.6	100.1	212.3	126.5	50.3	125.1	47.0	715

[1] Provisional figures.

Table 5.2.2 Saithe in Sub-areas I and II (Northeast Arctic).
Acoustic abundance indices from Norwegian surveys in October-November.
In 1985 - 1991 the area coverage was incomplete. Numbers in millions.
Shaded area shows indices applied in the assessment

Year	Age									
	2	3	4	5	6/6+	7	8	9	10+	Total
1985	3.1	4.9	2.4	0.5	0.0					10.9
1986	19.5	40.8	3.6	1.8	1.8					67.5
1987	1.8	22.0	48.4	1.8	1.7					75.7
1988	15.7	22.5	19.0	7.1	0.6					64.9
1989	24.8	28.4	17.0	10.1	12.4					92.7
1990	99.6	31.9	14.7	5.1	7.4					158.7
1991	87.8	104.0	4.6	4.0	7.1					207.5
1992	163.5	273.6	57.5	6.2	8.8					509.6
1993	106.9	227.7	103.9	12.7	3.2					454.4
1994	35.1	87.1	108.9	41.4	8.1	0.7	1.0	0.5	1.0	283.8
1995	38.4	166.1	86.5	46.5	16.5	2.4	0.0	0.0	1.0	357.5
1996	48.8	122.6	207.4	31.7	15.1	4.0	0.5	0.0	0.0	430.0
1997	5.5	38.0	184.8	79.8	50.6	9.6	1.2	0.0	0.3	369.8
1998	44.0	96.7	202.6	69.3	84.3	6.6	3.8	0.7	0.1	508.1
1999	61.1	233.8	72.9	62.2	21.0	19.2	5.9	1.4	0.4	477.8
2000	164.8	142.5	176.3	11.6	11.5	8.0	4.0	1.0	2.0	521.7
2001	104.7	275.9	45.9	53.8	5.6	6.1	3.2	3.4	1.9	500.5
2002	25.5	230.2	92.6	18.9	10.6	2.2	0.9	0.8	1.2	382.9
2003	31.0	87.5	151.7	26.1	6.2	6.4	1.2	0.7	1.3	312.1
2004	152.2	212.4	118.7	49.1	19.2	4.7	3.0	3.1	3.1	565.5
2005	22.2	228.1	67.2	20.3	16.5	7.7	2.2	1.7	0.9	366.7
2006	98.2	42.6	142.9	19.4	4.6	8.5	5.6	2.1	3.5	327.3
2007	45.4	111.0	27.1	61.1	7.9	5.8	4.1	4.3	1.1	267.9
2008	55.6	97.2	29.2	13.8	11.9	4.0	1.0	1.0	1.6	215.3
2009	52.9	139.8	80.2	7.7	5.2	6.8	0.9	0.7	1.7	295.9
2010	7.8	185.7	31.0	22.2	4.0	1.9	3.3	0.3	1.4	257.7
2011	12.8	46.9	77.7	5.2	5.7	1.0	3.3	2.0	0.1	154.7

Table 5.3.1 Catch numbers at age North-East Arctic saithe

Table 1	Catch numbers at age										Numbers*10**-3
YEAR		1960	1961								
AGE											
	3	13517	25237								
	4	16828	12929								
	5	17422	17707								
	6	6514	5379								
	7	6281	1886								
	8	3088	1371								
	9	1691	736								
	10	956	573								
	11	481	538								
	12	363	275								
	13	260	112								
	14	185	89								
+gp		673	726								
0 TOTALNUM		68259	67558								
TONSLAND		133515	105951								
SOPCOF %		100	100								
YEAR		1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
AGE											
	3	45932	51171	10925	42578	25127	28457	29955	76011	43834	61743
	4	13720	35199	72344	5737	61199	23826	21856	11745	63270	47522
	5	5449	7165	15966	30171	14727	34493	6065	16650	14081	21614
	6	10218	5659	3299	11635	14475	3957	9846	4666	16298	7661
	7	2991	4699	4214	3282	5220	5388	936	4716	5157	7690
	8	1262	1337	3223	2421	1542	2797	2274	1107	8004	2326
	9	1156	1308	1518	3135	1047	1356	1070	1682	2521	3489
	10	556	848	1482	802	1083	1340	686	663	3722	1760
	11	611	550	1282	1136	530	814	465	199	1103	2514
	12	369	467	965	652	628	603	284	138	762	1045
	13	282	399	561	509	670	528	168	30	325	284
	14	224	166	443	802	497	391	156	47	278	186
+gp		643	580	1069	1023	929	1014	314	88	349	373
0 TOTALNUM		83413	109548	117291	103883	127674	104964	74075	117742	159704	158207
TONSLAND		120707	148627	197426	185600	203788	181326	110247	140060	264924	241272
SOPCOF %		100	100	100	100	100	100	100	100	100	100
YEAR		1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AGE											
	3	55351	62938	36884	70255	135592	105935	56505	75819	40303	85966
	4	44490	20793	44149	13502	33159	36703	31946	28545	36202	22345
	5	24752	22199	15714	18901	8618	10845	14396	17280	9100	22044
	6	8650	13224	20476	5123	9448	2205	5232	5384	6302	3706
	7	4769	5868	12182	9018	3725	4633	1694	3550	3161	2611
	8	3012	3246	4815	7841	3483	1557	2132	1178	1322	2056
	9	1584	2368	3267	3365	2905	1718	1082	1659	145	378
	10	1817	2153	2512	2714	1870	1030	1126	536	721	286
	11	1044	1291	1440	2237	1183	495	756	373	406	258
	12	676	653	1448	1438	924	261	786	344	449	91
	13	281	670	433	530	530	226	328	206	254	147
	14	222	365	264	300	152	62	267	272	236	97
+gp		452	259	247	276	334	169	345	264	265	50
0 TOTALNUM		147100	136027	143831	135500	201923	165839	116595	135410	98866	140035
TONSLAND		214334	213859	264121	233453	242486	182817	155464	164680	144554	175540
SOPCOF %		100	100	100	100	100	100	100	100	100	100

Table 5.3.1 continue

Table 1 Catch numbers at age					Numbers*10**-3						
YEAR		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
AGE											
	3	35853	18216	43579	48989	21322	18555	8144	12607	23792	68682
	4	67150	25108	34927	11992	12433	51742	35928	19400	16930	13630
	5	13481	34543	12679	7200	5845	4506	32901	33343	9054	5752
	6	8477	3408	11775	5287	4363	3238	4570	18578	10238	4883
	7	1088	3178	1193	3746	2704	3624	2333	1762	7341	3877
	8	1291	1243	1862	776	1349	784	1222	352	1076	2381
	9	476	803	589	879	338	644	968	177	160	383
	10	271	261	585	134	438	267	321	189	112	61
	11	124	215	407	274	123	263	73	1	150	90
	12	116	130	158	214	65	164	12	149	37	68
	13	78	170	123	55	30	154	2	0	31	1
	14	100	99	179	126	54	102	15	36	0	12
+gp		44	188	77	32	3	145	1	20	50	8
0 TOTALNUM		128549	87562	108133	79704	49067	84188	86490	86614	68971	99828
TONSLAND		168034	156936	158786	107183	67396	92391	114242	122817	95848	107327
SOPCOF %		100	100	100	100	100	100	100	105	102	101

YEAR		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AGE											
	3	44627	22812	7063	17178	10510	11789	3091	9655	9175	3816
	4	33294	61931	32671	52109	54886	11698	16215	12236	22768	7946
	5	5987	31102	49410	40145	18499	35011	11946	22872	7747	26960
	6	5412	3747	19058	30451	18357	13567	31818	10347	10676	8769
	7	4751	1759	2058	4177	17834	13452	8376	18930	6123	7120
	8	3176	1378	724	483	2849	7058	5539	3374	8303	3146
	9	1462	1027	421	125	485	812	2873	3343	2530	4687
	10	286	797	278	259	214	55	727	2290	2652	1935
	11	93	76	528	31	148	48	111	419	1022	1406
	12	46	35	92	176	68	42	65	103	151	433
	13	163	1	13	2	196	27	19	24	8	60
	14	0	17	15	42	59	21	0	11	25	8
+gp		141	18	9	43	2	8	198	32	13	27
0 TOTALNUM		99438	124700	112340	145221	124107	93588	80978	83636	71193	66313
TONSLAND		127604	154903	146950	168378	171348	143629	153327	150375	135928	135853
SOPCOF %		105	101	100	100	100	100	100	100	101	100

YEAR		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AGE											
	3	6582	2345	1002	26093	1590	3144	25259	9050	26484	6783
	4	17492	50653	6129	12543	68137	4115	18953	34311	43684	42983
	5	11573	13600	33840	9841	12328	39889	5969	9954	28723	11361
	6	25671	7123	10613	23141	10098	15301	24363	6628	8070	15274
	7	5312	9594	7494	10799	16757	7963	9712	15930	3158	7096
	8	4276	5494	8307	5659	8080	11302	5624	4766	12551	3012
	9	2382	3545	2792	7852	5671	7749	7697	3021	2771	6319
	10	3431	2519	3088	2674	5127	4138	4705	4224	1324	1925
	11	965	2327	2377	713	1815	2157	1606	2471	1220	901
	12	1016	1112	2057	387	1013	505	1163	993	792	649
	13	281	420	338	465	733	254	145	234	400	383
	14	68	170	536	357	506	52	108	96	120	219
+gp		55	111	141	379	277	38	156	103	131	125
0 TOTALNUM		79104	99013	78714	100903	132132	96607	105460	91781	129428	97030
TONSLAND		154870	161592	164636	178568	212822	199008	184740	161853	194837	156686
SOPCOF %		100	100	100	100	100	100	102	100	100	100

Table 5.3.2 Catch weights at age North-East Arctic saithe

Table 2 Catch weights at age (kg)

	YEAR	1960	1961
	AGE		
	3	0.71	0.71
	4	1.11	1.11
	5	1.63	1.63
	6	2.33	2.33
	7	3.16	3.16
	8	4.03	4.03
	9	4.87	4.87
	10	5.63	5.63
	11	6.44	6.44
	12	7.11	7.11
	13	7.82	7.82
	14	8.92	8.92
	+gp	9.5	9.5
0	SOPCOFAC	1	1

	YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	AGE										
	3	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
	4	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
	5	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
	6	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
	7	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
	8	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03
	9	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87
	10	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63
	11	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44
	12	7.11	7.11	7.11	7.11	7.11	7.11	7.11	7.11	7.11	7.11
	13	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82
	14	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92
	+gp	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
0	SOPCOFAC	1.0001	1	1	1	1	1	0.9999	1	1	0.9999
	1										

	YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	AGE										
	3	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.79	0.73
	4	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.27	1.4
	5	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	2.03	2.05
	6	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.55	2.76
	7	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.29	3.3
	8	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.34	4.38
	9	4.87	4.87	4.87	4.87	4.87	4.87	4.87	4.87	5.15	5.95
	10	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.75	6.39
	11	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.11	6.61
	12	7.11	7.11	7.11	7.11	7.11	7.11	7.11	7.11	5.94	6.88
	13	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	6.64	6.75
	14	8.92	8.92	8.92	8.92	8.92	8.92	8.92	8.92	7.73	7.13
	+gp	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.47	7.66
0	SOPCOFAC	1	0.9996	1	1	1	1	1	1	1	0.9999

Table 5.3.2 continue

Table 2 Catch weights at age (kg)

	YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	AGE										
	3	0.77	1.05	0.71	0.75	0.59	0.53	0.62	0.74	0.71	0.68
	4	1.12	1.33	1.26	1.33	1.22	0.84	0.87	0.95	1	1.05
	5	2.02	1.86	2.02	2.07	1.97	1.66	1.31	1.4	1.45	1.85
	6	2.61	2.8	2.7	2.63	2.3	2.32	2.43	1.78	2.09	2.39
	7	3.27	4	3.88	3.28	2.87	2.97	3.87	2.96	2.49	3.08
	8	3.91	4.18	4.47	3.96	3.72	4	5.38	3.73	3.75	3.35
	9	4.69	5.33	5.36	4.54	4.3	4.72	5.83	4.62	3.9	4.48
	10	5.63	5.68	6.06	5.55	4.69	5.44	5.36	4.66	6.74	4.66
	11	7.18	7.31	6.28	6.88	5.84	5.79	6.92	8.34	4.94	5.62
	12	7.21	8.68	6.89	8.14	6.39	6.28	8.72	6.77	4.93	6.3
	13	7	8.54	8.2	6.06	8.11	7.02	7.88	10.04	8.2	6.73
	14	8.03	8.57	9.14	9.66	7.55	8.36	8.94	9.13	8.2	11.55
	+gp	9.44	10.37	6.47	13.72	10.08	8.48	10	11.95	8.59	9.58
0	SOPCOFAC	1	1	0.9999	0.9997	1	0.9999	0.9999	1.0469	1.0235	1.0087

	YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	AGE										
	3	0.67	0.61	0.52	0.56	0.59	0.62	0.68	0.67	0.6	0.75
	4	1.01	0.99	0.76	0.79	0.82	0.95	1	1.05	1.03	1.12
	5	1.92	1.65	1.24	1.19	1.33	1.24	1.48	1.45	1.63	1.54
	6	2.28	2.46	2.12	1.71	1.84	1.72	1.87	1.93	2.1	2.04
	7	2.77	2.85	3.22	2.87	2.48	2.35	2.58	2.27	2.67	2.6
	8	3.2	3.03	3.83	3.78	3.73	3.1	3.07	2.97	3.14	3.14
	9	3.73	3.71	4.69	4.06	4.32	4.19	4.13	3.61	3.81	3.63
	10	6.35	4.49	5.31	5.3	5.34	5.79	5.44	4.1	4.41	4.54
	11	6.9	5.56	5.66	6.86	5.98	6.77	6.7	4.93	5.76	5.05
	12	7.18	6.56	6.91	6.59	6.26	6.62	4.97	6.59	7.3	5.82
	13	6.88	10.56	6.3	7.88	7.36	7.3	5.23	7.52	9.95	6.4
	14	7.5	6.73	9.45	9.16	9.61	9.15	6.8	7.88	10.56	7.88
	+gp	9.14	8.41	8.95	10.53	13.64	11.48	10.1	7.46	11.08	10.84
0	SOPCOFAC	1.0517	1.0107	1	0.999	1.0019	1.0011	1.0015	1.0015	1.0051	1.001

	YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	AGE										
	3	0.69	0.66	0.7	0.59	0.63	0.73	0.63	0.73	0.7	0.7
	4	1.01	0.91	1.03	0.89	0.83	1.08	0.98	1.03	0.99	0.8
	5	1.5	1.42	1.37	1.49	1.43	1.41	1.38	1.65	1.45	1.36
	6	1.97	1.89	1.9	2.09	1.78	1.86	1.92	2	2.14	2.03
	7	2.54	2.54	2.41	2.16	2.27	2.43	2.31	2.37	2.5	2.56
	8	3.25	2.58	2.98	2.99	2.73	2.94	2.83	2.69	3.13	3.11
	9	3.77	3.49	3.44	3.24	3.02	3.35	3.16	3.23	3.34	3.56
	10	4.31	3.75	3.73	3.82	3.9	3.66	3.43	3.38	3.81	4.14
	11	4.91	4.12	4.14	3.92	4.06	4.17	3.82	3.46	3.99	4.79
	12	5.69	5.27	5.09	5.14	5.05	5.04	4.09	4.25	4.33	5.91
	13	6.19	5.94	5.96	6.26	5.79	6.07	5.03	4.88	5.38	5.71
	14	7.56	6.49	5.99	6.76	6.01	5.23	5.97	5.65	8.46	6.8
	+gp	11.71	11.21	7.91	6.62	8.35	9.14	8.56	7.33	6.63	5.89
0	SOPCOFAC	1.001	1.0033	1.0031	1.0026	1.0017	1.0009	1.0155	1.0025	1.0016	1.0034

Table 5.3.3. Saithe in Sub-areas I and II (Northeast Arctic).3-year running average maturity ogive 1985-2011.

Year	3	4	5	6	7	8	9	10	11+	12	13	14	15+
1985		0.02	0.50	0.92	0.99	1.00	1	1	1	1	1	1	1
1986		0.02	0.51	0.94	0.99	1.00	1	1	1	1	1	1	1
1987			0.35	0.98	1.00	1.00	1	1	1	1	1	1	1
1988			0.25	0.96	1.00	1	1	1	1	1	1	1	1
1989			0.15	0.92	1.00	1	1	1	1	1	1	1	1
1990			0.20	0.85	0.99	1.00	1	1	1	1	1	1	1
1991		0.02	0.25	0.84	0.98	1.00	1	1	1	1	1	1	1
1992		0.02	0.30	0.83	0.93	0.92	0.90	0.95	1	1	1	1	1
1993		0.02	0.26	0.88	0.92	0.89	0.87	0.89	1	0.98	1	1	1
1994		0.02	0.26	0.84	0.90	0.82	0.87	0.89	1	0.98	1	1	1
1995		0.02	0.22	0.80	0.92	0.90	0.97	0.94	1	0.98	1	1	1
1996		0.03	0.21	0.65	0.91	0.93	1	1	1	1	1	1	1
1997		0.03	0.14	0.45	0.83	0.94	0.93	0.97	1	1	1	1	1
1998		0.04	0.07	0.33	0.74	0.93	0.92	0.96	1	1	1	1	1
1999			0.08	0.32	0.74	0.92	0.92	0.96	0.99	0.97	1	1	1
2000			0.08	0.46	0.82	0.96	0.98	0.99	0.97	0.94	1	1	1
2001			0.11	0.64	0.93	0.97	0.98	0.99	0.97	0.93	1	1	1
2002			0.13	0.78	0.95	0.98	0.98	0.99	0.98	0.96	1	1	1
2003			0.14	0.82	0.96	0.98	0.98	0.99	1.00	0.98	1	1	1
2004			0.21	0.80	0.97	0.99	1	1	1	1	1	1	1
2005		0.03	0.30	0.82	0.97	0.99	1	1	1	1	1	1	1
2006		0.04	0.40	0.86	0.98	0.99	1	1	1	1	1	1	1
2007		0.05	0.42	0.87	0.97	0.98	1	0.97	1	1	1	1	1
2008		0.05	0.34	0.83	0.95	0.99	0.99	0.97	0.98	0.99	1	1	1
2009		0.03	0.27	0.70	0.91	0.97	0.98	0.97	0.98	0.99	1	1	1
2010		0.02	0.20	0.57	0.84	0.94	0.99	1	0.99	1	0.99	1	1
2011		0.02	0.19	0.46	0.80	0.91	0.98	1	0.99	1	0.99	1	1

Table 5.3.4 Northeast Arctic saithe. Tuning data sets applied in final XSA run

```
North-East Arctic saithe (Sub-areas I and II)
104
FLT11: Nor trawl revised 2010 (Catch: Unknown) (Effort: Un-
known)
1994 2001
1 1 0.00 1.00
4  8
   1     83.2   280.2   174.0    24.0     5.3
   1    150.0   208.3   226.3    35.9     5.9
   1     84.7   113.2   164.7   217.1    24.9
   1     28.5   148.3   151.1   194.4   122.3
   1     24.5    41.1   181.6    69.2    42.1
   1     26.6    74.9    56.8   131.6    30.2
   1     58.8    62.9   117.9    91.3   122.6
   1     32.2   176.1   126.8   119.8    50.7
FLT12: Nor trawl revised 2010 (Catch: Unknown) (Effort: Un-
known)
2002 2011
1 1 0.00 1.00
4  8
   1     52.2    84.9   264.3    59.6    61.2
   1    105.9   161.7   107.3   154.7    99.8
   1      5.8   141.8   105.4   135.3   169.6
   1     38.6   103.3   305.7   145.9    82.1
   1     53.5    99.2    86.9   202.3   116.9
   1     11.2   206.8   161.8   109.1   165.6
   1     81.1    46.3   266.0   149.1    90.8
   1    158.6   134.4    79.0   196.5    55.0
   1    155.5   179.5    89.8    34.0   161.7
   1     50.6   100.1   212.3   126.5    50.3
FLT13: Norway Ac Survey (Catch: Unknown) (Effort: Unknown)
1994 2001
1 1 0.75 0.85
3  7
   1    87.1   108.9    41.4     8.1     0.7
   1   166.1    86.5    46.5    16.5     2.4
   1   122.6   207.4    31.7    15.1     4.0
   1    38.0   184.8    79.8    50.6     9.6
   1    96.7   202.6    69.3    84.3     6.6
   1   233.8    72.9    62.2    21.0    19.2
   1   142.5   176.3    11.6    11.5     8.0
   1   275.9    45.9    53.8     5.6     6.1
FLT14: Norway Ac Survey (Catch: Unknown) (Effort: Unknown)
2002 2011
1 1 0.75 0.85
3  7
   1   230.2    92.6    18.9    10.6     2.2
   1    87.5   151.7    26.1     6.2     6.4
   1   212.4   118.7    49.1    19.2     4.7
   1   228.1    67.2    20.3    16.5     7.7
   1    42.6   142.9    19.4     4.6     8.5
   1   111.0    27.1    61.1     7.9     5.8
   1    97.2    29.2    13.8    11.9     4.0
   1   139.8    80.2     7.7     5.2     6.8
   1   185.7    31.0    22.0     4.0     1.9
   1    46.9    77.7     5.2     5.7     1.0
```

Table 5.4.1. Northeast Arctic saithe. Data and parameter settings of exploratory and final XSA-runs.

Run No.	1	2	3	4	5
Ass. type	UPDATE	SFT	SFT	SPALY	FINAL
Catch data	1960-2010	1960-2011	1960-2011	1960-2011	1960-2011
Age range	3-15+	3-15+	3-15+	3-15+	3-15+
F bar	4-7	4-7	4-7	4-7	4-7
Fleet 11 Norw. trawl	1994-2001 age 4-8 Q1-4	1994-2001 age 4-8 Q1-4		1994-2001 age 4-8 Q1-4	1994-2001 age 4-8 Q1-4
Fleet 12 Norw. trawl	2002-2010 age 4-8 Q1-4	2002-2011 age 4-8 Q1-4		2002-2011 age 4-8 Q1-4	2002-2011 age 4-8 Q1-4
Fleet 13 ac. survey	1994-2001 age 3-7		1994-2001 age 3-7	1994-2001 age 3-7	1994-2001 age 3-7
Fleet 14 ac. survey	2002-2010 age 3-7		2002-2011 age 3-7	2002-2011 age 3-7	2002-2011 age 3-7
Time series weights	No	No	No	No	No
Power model	No	No	No	No	No
Catchability (q) plateau	8	8	8	8	8
Survivor est. shrunk tow. Mean of	5 years 5 oldest ages	5 years 5 oldest ages	5 years 5 oldest ages	5 years 5 oldest ages	5 years 5 oldest ages
SE of mean	1.5	1.5	1.5	1.5	1.5
Min. fleet SE for pop. Est.	0.3	0.3	0.3	0.3	0.3
Prior weight.	None	None	None	None	None
Iterations	30	30	30	30	123 (conv.)

Table 5.5.1. NeA saithe, Tuning diagnostics

Lowestoft VPA Version 3.1
18/04/2012 9:21

Extended Survivors Analysis

North-East Arctic saithe

CPUE data from file flt-split.dat

Catch data for 52 years. 1960 to 2011. Ages 3 to 15.

Fleet	First year	Last year	First age	Last age	Alpha	Beta
FLT11: No	1994	2011	4	8	0	1
FLT12: No	2002	2011	4	8	0	1
FLT13: No	1994	2011	3	7	0.75	0.85
FLT14: No	2002	2011	3	7	0.75	0.85

Time series weights :

Tapered time weighting not applied

Catchability analysis :

Catchability independent of stock 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 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = 1.500

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 123 iterations

1

Regression weights

1 1 1 1 1 1 1 1 1 1

Table 5.5.1. Continued

Fishing mortalities

Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	0.022	0.02	0.007	0.075	0.025	0.032	0.124	0.077	0.129	0.116
4	0.131	0.23	0.066	0.118	0.288	0.082	0.275	0.246	0.64	0.318
5	0.156	0.142	0.237	0.144	0.163	0.272	0.164	0.227	0.336	0.335
6	0.342	0.136	0.157	0.253	0.215	0.314	0.266	0.277	0.291	0.3
7	0.212	0.206	0.207	0.238	0.294	0.263	0.336	0.279	0.206	0.45
8	0.267	0.353	0.276	0.239	0.281	0.331	0.3	0.274	0.37	0.309
9	0.229	0.371	0.305	0.458	0.401	0.479	0.395	0.261	0.253	0.323
10	0.334	0.403	0.65	0.54	0.623	0.579	0.608	0.393	0.174	0.281
11	0.252	0.397	0.85	0.299	0.902	0.587	0.465	0.77	0.186	0.172
12	0.384	0.518	0.748	0.31	0.925	0.689	0.746	0.592	0.605	0.143
13	0.28	0.27	0.29	0.367	1.831	0.628	0.427	0.318	0.507	0.676
14	0.269	0.273	0.659	0.57	0.891	0.605	0.605	0.564	0.267	0.583

XSA population numbers (Thousands)

	AGE									
YEAR	3	4	5	6	7	8	9	10	11	12
2002	3.40E+05	1.58E+05	8.84E+04	9.80E+04	3.08E+04	2.02E+04	1.29E+04	1.34E+04	4.78E+03	3.52E+03
2003	1.32E+05	2.72E+05	1.14E+05	6.19E+04	5.70E+04	2.04E+04	1.26E+04	8.39E+03	7.84E+03	3.04E+03
2004	1.53E+05	1.06E+05	1.77E+05	8.06E+04	4.42E+04	3.80E+04	1.17E+04	7.14E+03	4.59E+03	4.32E+03
2005	3.97E+05	1.24E+05	8.13E+04	1.14E+05	5.64E+04	2.94E+04	2.36E+04	7.08E+03	3.05E+03	1.61E+03
2006	7.23E+04	3.01E+05	9.03E+04	5.77E+04	7.26E+04	3.64E+04	1.90E+04	1.22E+04	3.38E+03	1.85E+03
2007	1.10E+05	5.78E+04	1.85E+05	6.28E+04	3.81E+04	4.43E+04	2.25E+04	1.04E+04	5.37E+03	1.12E+03
2008	2.40E+05	8.71E+04	4.36E+04	1.15E+05	3.76E+04	2.40E+04	2.60E+04	1.14E+04	4.77E+03	2.44E+03
2009	1.35E+05	1.74E+05	5.42E+04	3.03E+04	7.23E+04	2.20E+04	1.45E+04	1.44E+04	5.08E+03	2.45E+03
2010	2.42E+05	1.02E+05	1.11E+05	3.53E+04	1.88E+04	4.48E+04	1.37E+04	9.17E+03	7.93E+03	1.93E+03
2011	6.82E+04	1.75E+05	4.41E+04	6.51E+04	2.16E+04	1.25E+04	2.53E+04	8.69E+03	6.31E+03	5.39E+03

Estimated population abundance at 1st Jan 2012

0.00E+00	4.97E+04	1.04E+05	2.58E+04	3.95E+04	1.13E+04	7.53E+03	1.50E+04	5.38E+03	4.35E+03

Taper weighted geometric mean of the VPA populations:

1.66E+05	1.07E+05	5.99E+04	3.37E+04	1.89E+04	1.07E+04	6.25E+03	3.63E+03	2.02E+03	1.12E+03

Standard error of the weighted Log(VPA populations) :

0.4875	0.5527	0.634	0.7174	0.8026	0.925	1.0443	1.1109	1.2247	1.3603

	AGE	
YEAR	13	14
2002	1.27E+03	3.18E+02
2003	1.96E+03	7.85E+02
2004	1.48E+03	1.23E+03
2005	1.67E+03	9.08E+02
2006	9.65E+02	9.48E+02
2007	6.02E+02	1.27E+02
2008	4.61E+02	2.63E+02
2009	9.49E+02	2.46E+02
2010	1.11E+03	5.65E+02
2011	8.61E+02	5.48E+02

Estimated population abundance at 1st Jan 2012

3.83E+03	3.59E+02

Taper weighted geometric mean of the VPA populations:

6.15E+02	4.15E+02

Table 5.5.1. Continued

Standard error of the weighted Log(VPA populations) :

	1.7804	2.0501
1		

Log catchability residuals.

Fleet : FLT11: Nor trawl rev

Age	1994	1995	1996	1997	1998	1999	2000	2001
3	No data for this fleet at this age							
4	0.21	1.13	-0.05	-0.18	-0.54	-0.17	-0.18	-0.23
5	0.54	0.41	0.21	-0.24	-0.65	-0.18	-0.17	0.09
6	0.86	0.12	-0.1	0.16	-0.36	-0.72	-0.05	0.09
7	0.58	-0.26	0.42	0.25	-0.45	-0.47	-0.14	0.07
8	0.01	0.09	0.21	0.74	-0.55	-0.61	0.21	-0.11

Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	No data for this fleet at this age									
4	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
5	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
6	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
7	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
8	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99

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

Age	4	5	6	7	8
Mean Log	-7.8314	-6.6295	-5.8033	-5.4422	-5.6363
S.E(Log q)	0.5025	0.387	0.455	0.3958	0.4366

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
4	0.73	0.72	8.93	0.55	8	0.38	-7.83
5	0.65	1.569	8.36	0.77	8	0.23	-6.63
6	1.9	-1.032	1.08	0.18	8	0.86	-5.8
7	1.25	-1.139	4.26	0.78	8	0.48	-5.44
8	1.04	-0.243	5.49	0.86	8	0.49	-5.64

Fleet : FLT12: Nor trawl rev

Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	No data for this fleet at this age									
4	-0.11	0.1	-1.94	-0.18	-0.66	-0.67	0.99	0.96	1.65	-0.15
5	-0.35	0.04	-0.49	-0.08	-0.21	-0.14	-0.24	0.63	0.25	0.59
6	0.23	-0.31	-0.58	0.18	-0.41	0.17	0.04	0.16	0.14	0.4
7	-0.42	-0.09	0.04	-0.12	-0.02	0	0.36	-0.05	-0.49	0.79
8	-0.17	0.35	0.22	-0.26	-0.1	0.07	0.07	-0.36	0.05	0.13

Table 5.5.1. Continued

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

Age	4	5	6	7	8
Mean Log	-7.7447	-6.4259	-5.8829	-5.6285	-5.4054
S.E(Log q)	1.0186	0.382	0.3208	0.3651	0.2206

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
4	1.05	-0.072	7.53	0.18	10	1.14	-7.74
5	1.64	-1.746	3.24	0.48	10	0.57	-6.43
6	1.04	-0.143	5.69	0.65	10	0.35	-5.88
7	1.08	-0.255	5.25	0.59	10	0.41	-5.63
8	1	-0.007	5.4	0.78	10	0.23	-5.41
1							

Fleet : FLT13: Norway Ac Sur

Age	1994	1995	1996	1997	1998	1999	2000	2001
3	-0.47	-0.36	0.34	-1.04	0.18	0.28	0.35	0.72
4	-0.4	-0.22	-0.02	0.79	0.68	-0.06	0.02	-0.79
5	-0.35	-0.07	-0.09	0.11	0.83	0.63	-0.92	-0.13
6	-0.01	-0.42	-0.47	1.09	0.91	0.3	-0.38	-1.04
7	0.01	-0.11	-0.65	0.1	0.04	0.47	0.24	-0.09
8	No data for this fleet at this age							

Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
4	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
5	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
6	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
7	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99
8	No data for this fleet at this age									

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

Age	3	4	5	6	7
Mean Log	-7.115	-6.8254	-7.4578	-7.6628	-8.1102
S.E(Log q)	0.575	0.5242	0.5485	0.7289	0.324

Table 5.5.1. Continued

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
3	1.47	-0.501	4.77	0.16	8	0.89	-7.12
4	1.51	-0.628	4.24	0.2	8	0.83	-6.83
5	1.16	-0.245	6.78	0.28	8	0.69	-7.46
6	0.69	0.584	8.71	0.37	8	0.53	-7.66
7	0.97	0.23	8.18	0.88	8	0.34	-8.11

Fleet : FLT14: Norway Ac Sur

Age	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
3	-0.12	-0.14	0.59	-0.24	-0.25	0.29	-0.55	0.35	0.09	-0.03
4	0.08	0.11	0.67	-0.01	-0.01	-0.18	-0.37	-0.07	-0.17	-0.05
5	-0.07	-0.01	0.25	0.07	-0.06	0.46	0.33	-0.42	-0.01	-0.53
6	-0.04	-0.28	0.6	0.18	-0.45	0.09	-0.15	0.37	-0.04	-0.28
7	-0.38	0.07	0.01	0.29	0.18	0.42	0.12	-0.05	-0.04	-0.62
8	No data for this fleet at this age									

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

Age	3	4	5	6	7
Mean Log	-7.003	-7.2554	-8.0923	-8.658	-8.8382
S.E(Log q)	0.3375	0.2738	0.3071	0.3201	0.3067

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
3	1.15	-0.689	6.25	0.72	10	0.4	-7
4	0.9	0.587	7.71	0.82	10	0.26	-7.26
5	0.74	2.084	8.95	0.89	10	0.19	-8.09
6	1.04	-0.151	8.56	0.65	10	0.35	-8.66
7	0.74	1.761	9.3	0.85	10	0.21	-8.84

Terminal year survivor and F summaries :

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

Year class = 2008

Fleet	ES	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	1	0	0	0	0	0	0
FLT13: No	1	0	0	0	0	0	0
FLT14: No	48423	0.354	0	0	1	0.941	0.119
F shrinka	76234	1.5				0.059	0.077

Table 5.5.1. Continued

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
49734	0.34	0.11	2	0.32	0.116

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

Year class = 2007

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	89201	1.068	0	0	1	0.045	0.362
FLT13: No	1	0	0	0	0	0	0
FLT14: No	104660	0.229	0.068	0.3	2	0.924	0.316
F shrinka	107854	1.5				0.031	0.308

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
104013	0.22	0.04	4	0.19	0.318

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

Year class = 2006

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	50292	0.38	0.267	0.7	2	0.251	0.186
FLT13: No	1	0	0	0	0	0	0
FLT14: No	20274	0.197	0.237	1.2	3	0.726	0.41
F shrinka	39031	1.5				0.023	0.234

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
25847	0.18	0.23	6	1.294	0.335

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

Year class = 2005

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	57160	0.254	0.093	0.37	3	0.342	0.217
FLT13: No	1	0	0	0	0	0	0
FLT14: No	32318	0.169	0.108	0.64	4	0.643	0.356
F shrinka	43837	1.5				0.015	0.274

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
39455	0.14	0.12	8	0.853	0.3

Table 5.5.1. Continued

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 2004

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	18974	0.215	0.174	0.81	4	0.359	0.291
FLT13: No	1	0	0	0	0	0	0
FLT14: No	8266	0.153	0.151	0.99	5	0.626	0.575
F shrinka	20108	1.5				0.014	0.277

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
11284	0.12	0.17	10	1.342	0.45

Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 2003

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	7117	0.177	0.138	0.78	5	0.479	0.324
FLT13: No	1	0	0	0	0	0	0
FLT14: No	7934	0.149	0.122	0.82	5	0.51	0.295
F shrinka	7408	1.5				0.011	0.313

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
7526	0.12	0.08	11	0.727	0.309

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 2002

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	14975	0.18	0.049	0.27	5	0.507	0.323
FLT13: No	1	0	0	0	0	0	0
FLT14: No	15150	0.154	0.112	0.73	5	0.474	0.32
F shrinka	13184	1.5				0.018	0.36

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
15022	0.12	0.05	11	0.449	0.323

Table 5.5.1. Continued

Age 10 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 2001

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	4916	0.181	0.149	0.82	5	0.494	0.303
FLT13: No	1	0	0	0	0	0	0
FLT14: No	6049	0.15	0.099	0.66	5	0.485	0.253
F shrinka	2834	1.5				0.021	0.479

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
5375	0.12	0.09	11	0.761	0.281

Age 11 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 2000

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	3925	0.177	0.153	0.86	5	0.471	0.189
FLT13: No	1	0	0	0	0	0	0
FLT14: No	5069	0.148	0.199	1.35	5	0.508	0.149
F shrinka	1021	1.5				0.02	0.587

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
4350	0.12	0.14	11	1.17	0.172

Age 12 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1999

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	3862	0.179	0.096	0.54	5	0.49	0.142
FLT13: No	1	0	0	0	0	0	0
FLT14: No	4425	0.152	0.053	0.35	5	0.472	0.125
F shrinka	559	1.5				0.038	0.718

Weighted prediction :

Survivors at end of	Int s.e	Ext s.e	N	Var Ratio	F
3827	0.13	0.13	11	1.056	0.143

Table 5.5.1. Continued

Age 13 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1998

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	1	0	0	0	0	0	0
FLT12: No	295	0.176	0.107	0.61	5	0.4	0.777
FLT13: No	737	0.61	0	0	1	0.02	0.385
FLT14: No	459	0.162	0.132	0.82	4	0.375	0.562
F shrinka	311	1.5				0.205	0.75

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
359	0.32	0.1	11	0.3	0.676

1

Age 14 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1997

Fleet	E S	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT11: No	199	0.533	0	0	1	0.03	0.69
FLT12: No	200	0.177	0.079	0.45	4	0.412	0.689
FLT13: No	187	0.411	0.569	1.38	2	0.05	0.723
FLT14: No	226	0.19	0.089	0.47	3	0.309	0.63
F shrinka	524	1.5				0.199	0.321

Weighted prediction :

Survivors at end of y	Int s.e	Ext s.e	N	Var Ratio	F
251	0.31	0.14	11	0.452	0.583

Table 5.5.2 Northeast Arctic saithe. Fishing mortality

Run title : North-East Arctic saithe

At 18/04/2012 9:24

Table 8 Fishing mortality (F) at age

YEAR	1960	1961
AGE		
3	0.1764	0.3116
4	0.1981	0.2554
5	0.4885	0.3307
6	0.2605	0.2712
7	0.312	0.1112
8	0.2064	0.1027
9	0.1229	0.0691
10	0.1318	0.0556
11	0.127	0.1019
12	0.0948	0.0994
13	0.1557	0.0382
14	0.1269	0.073
+gp	0.1269	0.073
0 FBAR 4-	0.3148	0.2421

Table 8 Fishing mortality (F) at age

YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
AGE										
3	0.2866	0.2035	0.1355	0.1784	0.2218	0.1719	0.2385	0.34	0.2034	0.3009
4	0.2781	0.3719	0.4937	0.0977	0.4199	0.3391	0.1935	0.1381	0.5305	0.3548
5	0.1622	0.2288	0.2872	0.3933	0.3884	0.4451	0.1341	0.2215	0.2444	0.3453
6	0.3233	0.2528	0.1561	0.3511	0.3318	0.1693	0.2175	0.1448	0.3516	0.2033
7	0.2377	0.2413	0.3033	0.2298	0.262	0.1971	0.0548	0.1533	0.2362	0.2782
8	0.1011	0.1584	0.2595	0.2859	0.1605	0.2182	0.1191	0.0848	0.4207	0.1588
9	0.1181	0.1446	0.2718	0.434	0.1922	0.207	0.121	0.1214	0.2828	0.3264
10	0.0683	0.1192	0.2424	0.2251	0.2604	0.4023	0.1533	0.1024	0.4288	0.3266
11	0.0774	0.0892	0.2661	0.2968	0.2279	0.3189	0.2356	0.0605	0.2473	0.5829
12	0.0941	0.0781	0.2232	0.21	0.2657	0.4395	0.1745	0.1013	0.3448	0.3924
13	0.1402	0.1397	0.127	0.1756	0.3471	0.3748	0.208	0.0249	0.366	0.2075
14	0.0999	0.1145	0.2272	0.2698	0.26	0.3507	0.1792	0.0823	0.336	0.3696
+gp	0.0999	0.1145	0.2272	0.2698	0.26	0.3507	0.1792	0.0823	0.336	0.3696
0 FBAR 4-	0.2503	0.2737	0.3101	0.268	0.3505	0.2876	0.15	0.1644	0.3407	0.2954

Table 8 Fishing mortality (F) at age

YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AGE										
3	0.5092	0.3911	0.5762	0.6076	0.88	0.7566	0.6175	0.5215	0.4996	0.4079
4	0.3696	0.3633	0.5277	0.4283	0.6577	0.6282	0.5388	0.7489	0.5096	0.5778
5	0.316	0.3181	0.5182	0.4517	0.5393	0.4646	0.5427	0.6381	0.5692	0.6817
6	0.2252	0.2777	0.5481	0.3152	0.4286	0.2528	0.4284	0.3992	0.5071	0.4804
7	0.188	0.2347	0.4466	0.4987	0.3991	0.3864	0.3145	0.5857	0.4337	0.4068
8	0.1666	0.1887	0.3081	0.5845	0.3639	0.2883	0.308	0.3768	0.4496	0.5644
9	0.1544	0.1912	0.2947	0.3682	0.4452	0.3071	0.3335	0.4198	0.0713	0.221
10	0.2817	0.3247	0.3189	0.4274	0.3598	0.2782	0.3394	0.2738	0.3242	0.196
11	0.3283	0.3318	0.376	0.5251	0.334	0.1508	0.3391	0.1785	0.3444	0.1832
12	0.3009	0.3523	0.7743	0.8135	0.4284	0.113	0.3794	0.254	0.3388	0.1194
13	0.1718	0.5534	0.4186	0.7395	0.8332	0.1741	0.2029	0.1598	0.3022	0.1759
14	0.2487	0.3529	0.4397	0.5797	0.4838	0.2056	0.3207	0.2585	0.2777	0.1798
+gp	0.2487	0.3529	0.4397	0.5797	0.4838	0.2056	0.3207	0.2585	0.2777	0.1798
0 FBAR 4-	0.2747	0.2985	0.5102	0.4235	0.5062	0.433	0.4561	0.593	0.5049	0.5367

Table 5.5.2 continue

Table 8	Fishing mortality (F) at age									
YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
AGE										
3	0.3942	0.2178	0.7575	0.7822	0.1106	0.1289	0.1193	0.233	0.4508	0.3759
4	0.6549	0.5334	0.8439	0.4793	0.4584	0.4255	0.3937	0.4599	0.5628	0.5085
5	0.8588	0.8703	0.5702	0.4061	0.4558	0.2977	0.5309	0.7915	0.4047	0.3762
6	0.6144	0.5447	0.8622	0.4968	0.4632	0.4955	0.5612	0.6599	0.6026	0.3985
7	0.25	0.4919	0.3705	0.7586	0.514	0.9107	0.8311	0.4378	0.5998	0.4819
8	0.3612	0.5046	0.6064	0.4405	0.6919	0.2718	0.9469	0.2729	0.5271	0.3939
9	0.2414	0.4013	0.4778	0.6555	0.3488	0.8714	0.6367	0.3273	0.1914	0.3591
10	0.2441	0.2019	0.5787	0.1866	0.8292	0.5153	1.8736	0.2386	0.3556	0.1034
11	0.1218	0.3118	0.5554	0.5949	0.2613	2.9415	0.2551	0.0212	0.3028	0.5433
12	0.117	0.1813	0.3981	0.648	0.2685	0.6662	15.8004	1.2885	3.4434	0.2179
13	0.1425	0.2512	0.261	0.2331	0.1697	2.2204	0.0142	0	1.1015	13.5155
14	0.1741	0.271	0.4576	0.4671	0.378	1.4619	3.7668	0.3776	0	2.9899
+gp	0.1741	0.271	0.4576	0.4671	0.378	1.4619	3.7668	0.3776	0	2.9899
0 FBAR 4-	0.5945	0.6101	0.6617	0.5352	0.4729	0.5324	0.5792	0.5873	0.5425	0.4413

Table 8	Fishing mortality (F) at age									
YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AGE										
3	0.1392	0.096	0.0382	0.0545	0.0898	0.0815	0.0292	0.0412	0.0687	0.0216
4	0.315	0.292	0.194	0.432	0.2468	0.1367	0.1539	0.1544	0.1291	0.0782
5	0.4394	0.5489	0.4011	0.3875	0.2669	0.246	0.2018	0.3378	0.1382	0.2222
6	0.7443	0.5478	0.7927	0.4644	0.307	0.3203	0.3704	0.2698	0.2602	0.2293
7	0.8716	0.5773	0.672	0.3912	0.5496	0.3881	0.335	0.3942	0.2535	0.2772
8	0.9664	0.6787	0.4989	0.3211	0.5088	0.4371	0.2724	0.2179	0.2996	0.1997
9	0.4494	1.0305	0.4501	0.1467	0.6245	0.2626	0.3182	0.2624	0.2523	0.2755
10	0.501	0.4745	0.9061	0.5572	0.4009	0.128	0.398	0.4538	0.3435	0.3121
11	0.2267	0.2371	0.6759	0.2242	0.7349	0.1451	0.4103	0.4218	0.3754	0.3085
12	0.5987	0.1244	0.5034	0.4996	1.1191	0.4719	0.2989	0.8555	0.2626	0.2689
13	1.2478	0.022	0.062	0.0175	2.1324	16.8113	0.4053	0.1709	0.1373	0.1575
14	0	0.3802	0.5237	0.2907	1.0138	3.6131	0	0.436	0.2707	0.1982
+gp	0	0.3802	0.5237	0.2907	1.0138	3.6131	0	0.436	0.2707	0.1982
0 FBAR 4-	0.5926	0.4915	0.515	0.4188	0.3426	0.2728	0.2653	0.2891	0.1952	0.2017

Table 8	Fishing mortality (F) at age										
YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	FBAR *
AGE											
3	0.0216	0.0198	0.0073	0.0755	0.0246	0.0321	0.1236	0.0771	0.1287	0.1164	0.1074
4	0.1305	0.2303	0.066	0.1184	0.2878	0.082	0.2751	0.2462	0.6396	0.3177	0.4012
5	0.1563	0.142	0.2374	0.1436	0.1635	0.2724	0.1642	0.2271	0.336	0.3348	0.2993
6	0.3416	0.136	0.1572	0.2533	0.2151	0.3137	0.266	0.2771	0.2909	0.3003	0.2894
7	0.2116	0.2057	0.2073	0.2377	0.2944	0.2628	0.3364	0.2789	0.2056	0.4504	0.3116
8	0.267	0.3533	0.2764	0.2389	0.2814	0.3312	0.3001	0.274	0.3704	0.309	0.3178
9	0.2287	0.371	0.3052	0.4582	0.4009	0.479	0.3955	0.2609	0.2534	0.3225	0.279
10	0.3335	0.4033	0.6498	0.5405	0.6227	0.5791	0.6083	0.3932	0.1739	0.2807	0.2826
11	0.2525	0.3974	0.8498	0.2985	0.9021	0.5869	0.4649	0.7702	0.1863	0.1718	0.3761
12	0.3841	0.5179	0.7482	0.3097	0.9255	0.6888	0.7461	0.5924	0.6055	0.1428	0.4469
13	0.2804	0.2698	0.2902	0.3673	1.8308	0.6282	0.4271	0.3181	0.5071	0.6762	0.5005
14	0.2694	0.2734	0.6591	0.5698	0.8911	0.6051	0.6051	0.5637	0.2674	0.5827	0.4713
+gp	0.2694	0.2734	0.6591	0.5698	0.8911	0.6051	0.6051	0.5637	0.2674	0.5827	
0 FBAR 4-	0.21	0.1785	0.167	0.1882	0.2402	0.2327	0.2604	0.2573	0.368	0.3508	

Table 5.5.3 Northeast Arctic saithe. Stock number at age

	Table 10	Stock number at age (start of year)		Numbers*10**-3						
	YEAR	1960	1961							
	AGE									
	3	92382	104182							
	4	103487	63406							
	5	49826	69501							
	6	31392	25030							
	7	25900	19808							
	8	18298	15522							
	9	16160	12187							
	10	8556	11701							
	11	4457	6140							
	12	4435	3214							
	13	1993	3303							
	14	1716	1397							
	+gp	6218	11360							
0	TOTA	364820	346749							

	Table 10	Stock number at age (start of year)				Numbers*10**-3					
	YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	AGE										
	3	203732	307190	95252	287982	139613	199107	156042	291446	263215	262608
	4	62462	125240	205205	68100	197253	91569	137266	100652	169838	175840
	5	40213	38725	70689	102548	50565	106122	53412	92608	71780	81803
	6	40881	27994	25222	43428	56659	28073	55675	38242	60756	46027
	7	15625	24225	17799	17665	25028	33291	19404	36674	27088	34995
	8	14511	10087	15582	10759	11493	15768	22381	15040	25759	17512
	9	11468	10738	7048	9841	6618	8015	10379	16267	11312	13847
	10	9312	8343	7608	4397	5220	4471	5335	7530	11796	6980
	11	9061	7121	6063	4888	2874	3294	2448	3747	5565	6290
	12	4540	6866	5332	3804	2974	1874	1961	1584	2888	3558
	13	2382	3383	5199	3493	2525	1867	989	1348	1172	1675
	14	2603	1695	2409	3749	2399	1461	1051	657	1077	665
	+gp	7446	5902	5781	4753	4457	3760	2105	1227	1342	1324
0	TOTA	424236	577509	469190	565407	507680	498674	468448	607022	653587	653124

	Table 10	Stock number at age (start of year)				Numbers*10**-3					
	YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	AGE										
	3	153304	214898	93077	170518	256069	220593	135546	206194	113271	283643
	4	159138	75431	118995	42831	76039	86963	84753	59848	100214	56271
	5	100966	90035	42944	57477	22850	32252	37989	40484	23170	49291
	6	47417	60267	53628	20941	29956	10910	16593	18077	17510	10736
	7	30752	30995	37377	25379	12509	15977	6937	8851	9928	8633
	8	21694	20862	20067	19579	12619	6871	8889	4147	4034	5268
	9	12233	15036	14144	12073	8935	7180	4217	5348	2329	2107
	10	8180	8582	10168	8624	6840	4687	4324	2473	2878	1776
	11	4122	5053	5078	6052	4605	3908	2905	2521	1540	1704
	12	2875	2431	2969	2855	2931	2700	2751	1695	1727	894
	13	1967	1742	1399	1121	1036	1563	1974	1541	1076	1007
	14	1114	1357	820	754	438	369	1075	1319	1076	651
	+gp	2256	955	760	686	953	1000	1380	1273	1200	334
0	TOTA	546018	527645	401426	368888	435780	394973	309333	353772	279953	422316

Table 5.5.3 continue

	Table 10	Stock number at age (start of year)				Numbers*10**-3					
	YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	AGE										
	3	121615	102847	90673	99780	225093	169531	80036	67032	72454	242239
	4	154442	67129	67721	34805	37366	164998	122011	58159	43474	37792
	5	25852	65686	32242	23842	17645	19343	88271	67385	30063	20274
	6	20410	8968	22524	14925	13005	9158	11760	42500	25000	16421
	7	5437	9040	4258	7786	7435	6700	4568	5493	17986	11205
	8	4706	3467	4526	2407	2985	3641	2206	1629	2903	8083
	9	2453	2685	1714	2020	1269	1224	2272	701	1015	1403
	10	1383	1578	1471	870	859	733	419	984	414	686
	11	1195	887	1056	675	591	307	358	53	635	237
	12	1161	866	532	496	305	373	13	227	42	384
	13	649	846	592	292	212	191	157	0	51	1
	14	692	461	539	373	190	147	17	127	0	14
	+gp	303	870	230	94	10	203	1	70	0	9
0	TOTA	340298	265329	228076	188367	306967	376547	312088	244358	194036	338749

	Table 10	Stock number at age (start of year)				Numbers*10**-3					
	YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	AGE										
	3	379449	275340	208334	357793	135206	166453	118881	264486	152720	197163
	4	136183	270286	204788	164179	277393	101188	125613	94535	207807	116735
	5	18609	81371	165254	138105	87268	177447	72261	88171	66327	149536
	6	11395	9818	38479	90591	76746	54710	113602	48353	51493	47294
	7	9026	4432	4648	14259	46616	46224	32517	64220	30226	32499
	8	5665	3091	2037	1943	7895	22029	25673	19044	35450	19206
	9	4463	1765	1284	1013	1154	3886	11650	16008	12539	21511
	10	802	2332	516	670	716	506	2447	6938	10081	7977
	11	507	398	1188	171	314	393	365	1346	3609	5854
	12	113	331	257	495	112	123	278	198	723	2030
	13	253	51	239	127	246	30	63	169	69	455
	14	0	59	41	184	102	24	0	34	117	49
	+gp	0	62	24	187	3	9	0	99	60	165
0	TOTA	566464	649336	627089	769717	633772	573022	503350	603600	571219	600475

	Table 10	Stock number at age (start of year)				Numbers*10**-3								
	YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	GMST 60-**	AMS
	AGE													
	3	339679	132172	152800	396629	72303	109848	240154	134796	242458	68242	0	167935	187107
	4	157971	272150	106091	124195	301123	57758	87091	173766	102173	174544	49734	105729	122551
	5	88384	113508	176985	81314	90333	184885	43565	54155	111222	44125	104013	59539	71867
	6	98036	61891	80627	114283	57670	62804	115278	30267	35331	65071	25847	33279	42268
	7	30787	57037	44227	56409	72628	38079	37574	72337	18783	21625	39455	18805	25170
	8	20166	20399	38017	29429	36412	44301	23971	21975	44811	12521	11284	10362	14600
	9	12878	12641	11730	23609	18974	22501	26044	14537	13680	25331	7526	5985	9048
	10	13371	8388	7142	7078	12225	10403	11410	14358	9169	8693	15022	3504	5531
	11	4780	7843	4589	3053	3375	5370	4773	5085	7934	6309	5375	1925	3169
	12	3521	3040	4315	1606	1855	1121	2444	2455	1927	5392	4350	1076	1925
	13	1270	1963	1483	1672	965	602	461	949	1111	861	3827	406	1156
	14	318	785	1227	908	948	127	263	246	565	548	359	126	757
	+gp	256	510	319	954	511	91	375	261	613	309	392		
0	TOTA	771415	692328	629552	841140	669322	537889	593405	525189	589778	433571	267185		

Table 5.5.4 Northeast Arctic saithe. Spawning stock number at age

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	1960	1961
AGE		
3	0	0
4	1035	634
5	27404	38226
6	26684	21275
7	25382	19412
8	18298	15522
9	16160	12187
10	8556	11701
11	4457	6140
12	4435	3214
13	1993	3303
14	1716	1397
+gp	6218	11360

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
AGE										
3	0	0	0	0	0	0	0	0	0	0
4	625	1252	2052	681	1973	916	1373	1007	1698	1758
5	22117	21299	38879	56401	27811	58367	29377	50934	39479	44991
6	34749	23794	21439	36914	48160	23862	47324	32506	51642	39123
7	15313	23740	17443	17312	24528	32625	19016	35940	26546	34296
8	14511	10087	15582	10759	11493	15768	22381	15040	25759	17512
9	11468	10738	7048	9841	6618	8015	10379	16267	11312	13847
10	9312	8343	7608	4397	5220	4471	5335	7530	11796	6980
11	9061	7121	6063	4888	2874	3294	2448	3747	5565	6290
12	4540	6866	5332	3804	2974	1874	1961	1584	2888	3558
13	2382	3383	5199	3493	2525	1867	989	1348	1172	1675
14	2603	1695	2409	3749	2399	1461	1051	657	1077	665
+gp	7446	5902	5781	4753	4457	3760	2105	1227	1342	1324

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AGE										
3	0	0	0	0	0	0	0	0	0	0
4	1591	754	1190	428	760	870	848	598	1002	563
5	55531	49519	23619	31612	12568	17739	20894	22266	12744	27110
6	40305	51227	45583	17800	25463	9274	14104	15365	14883	9126
7	30137	30375	36630	24872	12259	15657	6799	8674	9730	8461
8	21694	20862	20067	19579	12619	6871	8889	4147	4034	5268
9	12233	15036	14144	12073	8935	7180	4217	5348	2329	2107
10	8180	8582	10168	8624	6840	4687	4324	2473	2878	1776
11	4122	5053	5078	6052	4605	3908	2905	2521	1540	1704
12	2875	2431	2969	2855	2931	2700	2751	1695	1727	894
13	1967	1742	1399	1121	1036	1563	1974	1541	1076	1007
14	1114	1357	820	754	438	369	1075	1319	1076	651
+gp	2256	955	760	686	953	1000	1380	1273	1200	334

Table 5.5.4 continue

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
AGE										
3	0	0	0	0	0	0	0	0	0	0
4	1544	671	677	696	747	0	0	0	0	756
5	14219	36128	17733	11921	8999	6770	22068	10108	6013	5069
6	17348	7623	19145	13731	12225	8975	11289	39100	21250	13793
7	5328	8859	4173	7709	7361	6700	4568	5493	17806	10980
8	4706	3467	4526	2407	2985	3641	2206	1629	2903	8083
9	2453	2685	1714	2020	1269	1224	2272	701	1015	1403
10	1383	1578	1471	870	859	733	419	984	414	686
11	1195	887	1056	675	591	307	358	53	635	237
12	1161	866	532	496	305	373	13	227	42	384
13	649	846	592	292	212	191	157	0	51	1
14	692	461	539	373	190	147	17	127	0	14
+gp	303	870	230	94	10	203	1	70	0	9

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AGE										
3	0	0	0	0	0	0	0	0	0	0
4	2724	5406	4096	3284	8322	3036	5025	0	0	0
5	5583	21157	42966	30383	18326	24843	5058	7054	5306	16449
6	9458	8640	32322	72472	49885	24620	37489	15473	23687	30268
7	8394	4078	4183	13119	42421	38366	24063	47523	24785	30224
8	5212	2751	1670	1749	7342	20707	23876	17520	34032	18630
9	4017	1535	1117	982	1154	3614	10718	14727	12288	21081
10	762	2075	459	630	716	491	2349	6661	9980	7897
11	507	398	1188	171	314	393	365	1332	3500	5678
12	113	324	252	485	112	123	278	192	679	1888
13	253	51	239	127	246	30	63	169	69	455
14	0	59	41	184	102	24	0	34	117	49
+gp	0	62	24	187	3	9	0	99	60	165

Table 11 Spawning stock number at age (spawning time) Numbers*10**-3

YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AGE										
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	3726	12045	2888	4355	5213	2043	3491
5	11490	15891	37167	24394	36133	77652	14812	14622	22244	8384
6	76468	50751	64502	93712	49596	54639	95681	21187	20139	29933
7	29247	54755	42900	54716	71176	36937	35696	65827	15778	17300
8	19762	19991	37637	29135	36048	43415	23732	21316	42122	11394
9	12621	12388	11730	23609	18974	22501	25783	14247	13543	24825
10	13237	8305	7142	7078	12225	10091	11068	13928	9169	8693
11	4684	7843	4589	3053	3375	5370	4678	4983	7854	6246
12	3380	2979	4315	1606	1855	1121	2420	2430	1927	5392
13	1270	1963	1483	1672	965	602	461	949	1100	853
14	318	785	1227	908	948	127	263	246	565	548
+gp	256	510	319	954	511	91	375	261	613	309

Table 5.5.5 Northeast Arctic saithe. Stock biomass at age

Table 12	Stock biomass at age (start of year)		Tonnes							
YEAR	1960	1961								
AGE										
3	65591	73969								
4	114871	70380								
5	81216	113287								
6	73144	58319								
7	81844	62593								
8	73740	62553								
9	78701	59350								
10	48169	65877								
11	28701	39540								
12	31534	22848								
13	15587	25828								
14	15304	12458								
+gp	59070	107924								
0 TOTALI	767473	774927								

Table 12	Stock biomass at age (start of year)				Tonnes					
YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
AGE										
3	144649	218105	67629	204467	99125	141366	110790	206927	186883	186451
4	69332	139017	227777	75591	218951	101642	152366	111724	188520	195182
5	65548	63122	115223	167153	82420	172979	87062	150951	117001	133338
6	95253	65225	58767	101188	132016	65411	129723	89104	141561	107244
7	49376	76551	56244	55822	79090	105200	61317	115889	85598	110586
8	58478	40649	62795	43360	46318	63546	90196	60610	103808	70572
9	55848	52296	34326	47926	32232	39031	50546	79218	55089	67436
10	52425	46971	42835	24757	29391	25174	30035	42391	66412	39299
11	58356	45858	39048	31480	18512	21215	15767	24131	35837	40507
12	32280	48818	37913	27048	21147	13323	13940	11261	20532	25297
13	18629	26457	40655	27312	19743	14599	7731	10543	9164	13097
14	23216	15121	21487	33440	21398	13031	9373	5864	9604	5935
+gp	70741	56068	54923	45150	42344	35722	19999	11657	12748	12577
0 TOTALI	794132	894257	859622	884694	842688	812239	778843	920271	1032756	1007521

Table 12	Stock biomass at age (start of year)				Tonnes					
YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
AGE										
3	108846	152578	66085	121068	181809	156621	96237	146398	89484	207059
4	176643	83729	132084	47543	84403	96529	94075	66431	127271	78779
5	164574	146756	69998	93688	37246	52571	61922	65988	47036	101047
6	110482	140423	124952	48792	69797	25421	38661	42118	44649	29632
7	97176	97945	118112	80198	39529	50487	21922	27969	32664	28490
8	87425	84076	80870	78904	50854	27691	35822	16713	17509	23075
9	59573	73225	68880	58794	43514	34966	20536	26047	11997	12536
10	46054	48317	57244	48552	38507	26388	24343	13925	16547	11348
11	26548	32543	32704	38973	29655	25166	18711	16237	9410	11261
12	20441	17281	21110	20297	20836	19195	19563	12049	10257	6148
13	15386	13624	10941	8764	8102	12225	15438	12055	7146	6800
14	9939	12101	7316	6723	3907	3289	9592	11770	8315	4644
+gp	21428	9076	7225	6513	9055	9500	13109	12094	11367	2560
0 TOTALI	944517	911672	797521	658808	617215	540047	469932	469793	433652	523380

Table 5.5.5 continue

	Table 12	Stock biomass at age (start of year)				Tonnes					
	YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	AGE										
	3	93643	107989	64378	74835	132805	89851	49622	49604	51442	164723
	4	172975	89281	85329	46291	45587	138598	106149	55251	43474	39682
	5	52221	122177	65128	49353	34761	32109	115634	94339	43591	37508
	6	53270	25110	60814	39252	29913	21246	28576	75650	52250	39246
	7	17778	36159	16523	25539	21340	19899	17678	16259	44785	34510
	8	18400	14491	20230	9532	11106	14564	11871	6076	10886	27078
	9	11505	14309	9185	9173	5455	5776	13243	3238	3959	6285
	10	7786	8961	8917	4829	4028	3986	2247	4585	2788	3199
	11	8582	6484	6629	4647	3452	1777	2480	440	3135	1334
	12	8374	7520	3663	4037	1949	2340	116	1539	208	2418
	13	4545	7224	4852	1772	1722	1340	1235	0	421	7
	14	5555	3951	4924	3605	1431	1227	152	1155	0	161
	+gp	2860	9022	1486	1288	105	1725	11	833	0	85
0	TOTALI	457494	452679	352058	274153	293655	334440	349014	308967	256938	356236

	Table 12	Stock biomass at age (start of year)				Tonnes					
	YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	AGE										
	3	254231	167958	108334	200364	79772	103201	80839	177206	91632	147873
	4	137544	267583	155639	129701	227462	96128	125613	99261	214041	130743
	5	35729	134262	204915	164345	116066	220035	106946	127849	108113	230286
	6	25980	24153	81575	154910	141212	94102	212436	93321	108136	96480
	7	25002	12632	14967	40924	115608	108627	83894	145779	80702	84498
	8	18129	9365	7802	7346	29449	68290	78817	56560	111313	60308
	9	16649	6547	6021	4112	4985	16283	48113	57787	47773	78086
	10	5094	10468	2738	3551	3824	2930	13311	28447	44457	36214
	11	3497	2213	6722	1170	1879	2658	2442	6634	20785	29563
	12	810	2170	1776	3260	699	817	1382	1305	5274	11813
	13	1739	536	1507	1002	1809	218	330	1270	686	2912
	14	0	400	384	1686	983	218	0	271	1230	388
	+gp	0	525	216	1971	46	99	0	740	667	1790
0	TOTALI	524403	638812	592596	714343	723795	713605	754123	796429	834810	910951

	Table 12	Stock biomass at age (start of year)				Tonnes					
	YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	AGE										
	3	234378	87233	106960	234011	45551	80189	151297	98401	169721	47769
	4	159551	247656	109274	110534	249932	62379	85349	178979	101151	139636
	5	132577	161182	242469	121158	129176	260688	60120	89355	161271	60010
	6	193130	116975	153191	238852	102653	116815	221334	60534	75609	132094
	7	78198	144873	106588	121843	164866	92532	86797	171440	46958	55360
	8	65538	52630	113290	87994	99405	130244	67839	59114	140258	38940
	9	48551	44117	40353	76493	57302	75377	82298	46956	45690	90180
	10	57628	31457	26640	27037	47676	38077	39138	48531	34932	35987
	11	23469	32312	18997	11969	13704	22391	18234	17593	31655	30218
	12	20033	16022	21966	8255	9366	5651	9998	10434	8345	31864
	13	7861	11661	8839	10466	5586	3653	2319	4631	5980	4918
	14	2405	5098	7351	6140	5698	662	1570	1391	4782	3727
	+gp	2995	5714	2522	6313	4264	836	3213	1915	4066	1822
0	TOTALI	1026314	956930	958438	1061065	935178	889494	829505	789274	830419	672524

Table 5.5.6 Northeast Arctic saithe. Spawning stock biomass at age

	Table 13	Spawning stock biomass at age (spawning time)	Tonnes
	YEAR	1960	1961
	AGE		
	3	0	0
	4	1149	704
	5	44669	62308
	6	62173	49571
	7	80208	61341
	8	73740	62553
	9	78701	59350
	10	48169	65877
	11	28701	39540
	12	31534	22848
	13	15587	25828
	14	15304	12458
	+gp	59070	107924
0	TOTSPE	539004	570302

	Table 13	Spawning stock biomass at age (spawning time)	Tonnes							
	YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	AGE										
	3	0	0	0	0	0	0	0	0	0	0
	4	693	1390	2278	756	2190	1016	1524	1117	1885	1952
	5	36051	34717	63372	91934	45331	95139	47884	83023	64351	73336
	6	80965	55441	49952	86010	112214	55599	110264	75739	120326	91157
	7	48389	75020	55119	54705	77508	103096	60090	113571	83886	108374
	8	58478	40649	62795	43360	46318	63546	90196	60610	103808	70572
	9	55848	52296	34326	47926	32232	39031	50546	79218	55089	67436
	10	52425	46971	42835	24757	29391	25174	30035	42391	66412	39299
	11	58356	45858	39048	31480	18512	21215	15767	24131	35837	40507
	12	32280	48818	37913	27048	21147	13323	13940	11261	20532	25297
	13	18629	26457	40655	27312	19743	14599	7731	10543	9164	13097
	14	23216	15121	21487	33440	21398	13031	9373	5864	9604	5935
	+gp	70741	56068	54923	45150	42344	35722	19999	11657	12748	12577
0	TOTSPE	536072	498806	504704	513878	468328	480490	457349	519126	583641	549539

	Table 13	Spawning stock biomass at age (spawning time)	Tonnes							
	YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
	AGE										
	3	0	0	0	0	0	0	0	0	0	0
	4	1766	837	1321	475	844	965	941	664	1273	788
	5	90516	80716	38499	51528	20485	28914	34057	36294	25870	55576
	6	93910	119359	106209	41473	59328	21608	32862	35801	37952	25187
	7	95233	95986	115750	78594	38739	49477	21484	27410	32011	27920
	8	87425	84076	80870	78904	50854	27691	35822	16713	17509	23075
	9	59573	73225	68880	58794	43514	34966	20536	26047	11997	12536
	10	46054	48317	57244	48552	38507	26388	24343	13925	16547	11348
	11	26548	32543	32704	38973	29655	25166	18711	16237	9410	11261
	12	20441	17281	21110	20297	20836	19195	19563	12049	10257	6148
	13	15386	13624	10941	8764	8102	12225	15438	12055	7146	6800
	14	9939	12101	7316	6723	3907	3289	9592	11770	8315	4644
	+gp	21428	9076	7225	6513	9055	9500	13109	12094	11367	2560
0	TOTSPE	568220	587140	548068	439590	323825	259383	246457	221057	189652	187844

Table 5.5.6 continue

	Table 13	Spawning stock biomass at age (spawning time)				Tonnes					
	YEAR	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	AGE										
	3	0	0	0	0	0	0	0	0	0	0
	4	1730	893	853	926	912	0	0	0	0	794
	5	28722	67197	35820	24677	17728	11238	28909	14151	8718	9377
	6	45279	21343	51692	36112	28118	20821	27433	69598	44413	32966
	7	17423	35436	16192	25284	21126	19899	17678	16259	44337	33820
	8	18400	14491	20230	9532	11106	14564	11871	6076	10886	27078
	9	11505	14309	9185	9173	5455	5776	13243	3238	3959	6285
	10	7786	8961	8917	4829	4028	3986	2247	4585	2788	3199
	11	8582	6484	6629	4647	3452	1777	2480	440	3135	1334
	12	8374	7520	3663	4037	1949	2340	116	1539	208	2418
	13	4545	7224	4852	1772	1722	1340	1235	0	421	7
	14	5555	3951	4924	3605	1431	1227	152	1155	0	161
	+gp	2860	9022	1486	1288	105	1725	11	833	0	85
0	TOTSPE	160760	196833	164444	125880	97133	84694	105373	117873	118864	117525

	Table 13	Spawning stock biomass at age (spawning time)				Tonnes					
	YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	AGE										
	3	0	0	0	0	0	0	0	0	0	0
	4	2751	5352	3113	2594	6824	2884	5025	0	0	0
	5	10719	34908	53278	36156	24374	30805	7486	10228	8649	25331
	6	21563	21254	68523	123928	91788	42346	70104	29863	49742	61747
	7	23252	11621	13470	37651	105203	90160	62082	107876	66176	78583
	8	16679	8335	6398	6611	27387	64193	73300	52035	106861	58498
	9	14984	5696	5238	3988	4985	15143	44264	53164	46818	76524
	10	4839	9317	2437	3338	3824	2842	12779	27309	44013	35852
	11	3497	2213	6722	1170	1879	2658	2442	6567	20162	28676
	12	810	2126	1741	3195	699	817	1382	1266	4958	10986
	13	1739	536	1507	1002	1809	218	330	1270	686	2912
	14	0	400	384	1686	983	218	0	271	1230	388
	+gp	0	525	216	1971	46	99	0	740	667	1790
0	TOTSPE	100832	102283	163026	223290	269802	252383	279192	290589	349961	381287

	Table 13	Spawning stock biomass at age (spawning time)				Tonnes					
	YEAR	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	AGE										
	3	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	3316	9997	3119	4267	5369	2023	2793
	5	17235	22565	50918	36348	51670	109489	20441	24126	32254	11402
	6	150642	95919	122553	195858	88281	101629	183708	42374	43097	60763
	7	74288	139078	103390	118187	161569	89756	82457	156010	39445	44288
	8	64227	51578	112157	87114	98411	127639	67161	57341	131842	35436
	9	47580	43235	40353	76493	57302	75377	81475	46016	45233	88376
	10	57052	31142	26640	27037	47676	36934	37964	47075	34932	35987
	11	23000	32312	18997	11969	13704	22391	17870	17242	31338	29916
	12	19231	15702	21966	8255	9366	5651	9898	10329	8345	31864
	13	7861	11661	8839	10466	5586	3653	2319	4631	5920	4869
	14	2405	5098	7351	6140	5698	662	1570	1391	4782	3727
	+gp	2995	5714	2522	6313	4264	836	3213	1915	4066	1822
0	TOTSPE	466516	454004	515685	587497	553524	577136	512341	413820	383279	351241

Table 5.5.7 Northeast Arctic saithe. XSA summary

Table 16 Summary (without SOP correction)

	REC	TOTALBI	TOTSPBI	LANDIN(	YIELD/SS	FBAR 4- 7
	Age 3					
1960	92382	767473	539004	133515	0.2477	0.3148
1961	104182	774927	570302	105951	0.1858	0.2421
1962	203732	794132	536072	120707	0.2252	0.2503
1963	307190	894257	498806	148627	0.298	0.2737
1964	95252	859622	504704	197426	0.3912	0.3101
1965	287982	884694	513878	185600	0.3612	0.268
1966	139613	842688	468328	203788	0.4351	0.3505
1967	199107	812239	480490	181326	0.3774	0.2876
1968	156042	778843	457349	110247	0.2411	0.15
1969	291446	920271	519126	140060	0.2698	0.1644
1970	263215	1032756	583641	264924	0.4539	0.3407
1971	262608	1007521	549539	241272	0.439	0.2954
1972	153304	944517	568220	214334	0.3772	0.2747
1973	214898	911672	587140	213859	0.3642	0.2985
1974	93077	797521	548068	264121	0.4819	0.5102
1975	170518	658808	439590	233453	0.5311	0.4235
1976	256069	617215	323825	242486	0.7488	0.5062
1977	220593	540047	259383	182817	0.7048	0.433
1978	135546	469932	246457	155464	0.6308	0.4561
1979	206194	469793	221057	164680	0.745	0.593
1980	113271	433652	189652	144554	0.7622	0.5049
1981	283643	523380	187844	175540	0.9345	0.5367
1982	121615	457494	160760	168034	1.0452	0.5945
1983	102847	452679	196833	156936	0.7973	0.6101
1984	90673	352058	164444	158786	0.9656	0.6617
1985	99780	274153	125880	107183	0.8515	0.5352
1986	225093	293655	97133	67396	0.6938	0.4729
1987	169531	334440	84694	92391	1.0909	0.5324
1988	80036	349014	105373	114242	1.0842	0.5792
1989	67032	308967	117873	122817	1.0419	0.5873
1990	72454	256938	118864	95848	0.8064	0.5425
1991	242239	356236	117525	107327	0.9132	0.4413
1992	379449	524403	100832	127604	1.2655	0.5926
1993	275340	638812	102283	154903	1.5144	0.4915
1994	208334	592596	163026	146950	0.9014	0.515
1995	357793	714343	223290	168378	0.7541	0.4188
1996	135206	723795	269802	171348	0.6351	0.3426
1997	166453	713605	252383	143629	0.5691	0.2728
1998	118881	754123	279192	153327	0.5492	0.2653
1999	264486	796429	290589	150375	0.5175	0.2891
2000	152720	834810	349961	135928	0.3884	0.1952
2001	197163	910951	381287	135853	0.3563	0.2017
2002	339679	1026314	466516	154870	0.332	0.21
2003	132172	956930	454004	161592	0.3559	0.1785
2004	152800	958438	515685	164636	0.3193	0.167
2005	396629	1061065	587497	178568	0.3039	0.1882
2006	72303	935178	553524	212822	0.3845	0.2402
2007	109848	889494	577136	199008	0.3448	0.2327
2008	240154	829505	512341	184740	0.3606	0.2604
2009	134796	789274	413820	161853	0.3911	0.2573
2010	242458	830419	383279	194837	0.5083	0.368
2011	169149	745452	351241	156686	0.4461	0.3508
Arith. Mean	187826	701769	352107	162954	0.5903	0.3727
0 Units	(Thousar	(Tonnes)	(Tonnes)	(Tonnes)		

Table 5.6.1 Northeast arctic saithe. Yield per recruit

MFYPR version 2a
Run: ypr2
Time and date: 13:04 22.04.2012
Yield per results

FMult	Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJ	SSBJan	SpwnNosS	SSBSpwn
0	0	0	0	5.5167	14.1874	2.7426	10.9495	2.7426	10.9495
0.1	0.0325	0.1294	0.345	4.8721	11.1993	2.172	8.0998	2.172	8.0998
0.2	0.0651	0.2242	0.5397	4.4006	9.1937	1.7693	6.2213	1.7693	6.2213
0.3	0.0976	0.2974	0.6546	4.0372	7.7665	1.4701	4.9111	1.4701	4.9111
0.4	0.1302	0.3559	0.7243	3.7468	6.7062	1.2396	3.9588	1.2396	3.9588
0.5	0.1627	0.4041	0.7672	3.5084	5.8919	1.0573	3.2442	1.0573	3.2442
0.6	0.1952	0.4445	0.7934	3.3088	5.2498	0.9102	2.6944	0.9102	2.6944
0.7	0.2278	0.4789	0.8092	3.1389	4.7325	0.7896	2.2627	0.7896	2.2627
0.8	0.2603	0.5086	0.8181	2.9925	4.3083	0.6895	1.918	0.6895	1.918
0.9	0.2928	0.5346	0.8224	2.865	3.9553	0.6054	1.6389	0.6054	1.6389
1	0.3254	0.5574	0.8236	2.753	3.6578	0.5343	1.4101	0.5343	1.4101
1.1	0.3579	0.5777	0.8227	2.6538	3.4043	0.4737	1.2207	0.4737	1.2207
1.2	0.3905	0.5959	0.8204	2.5654	3.1863	0.4217	1.0626	0.4217	1.0626
1.3	0.423	0.6122	0.8172	2.4862	2.9972	0.3767	0.9294	0.3767	0.9294
1.4	0.4555	0.6269	0.8133	2.4147	2.8321	0.3377	0.8166	0.3377	0.8166
1.5	0.4881	0.6403	0.809	2.35	2.6869	0.3038	0.7204	0.3038	0.7204
1.6	0.5206	0.6525	0.8045	2.2911	2.5584	0.274	0.6379	0.274	0.6379
1.7	0.5531	0.6637	0.7998	2.2374	2.4442	0.2479	0.5668	0.2479	0.5668
1.8	0.5857	0.6739	0.7951	2.1882	2.3421	0.2249	0.5052	0.2249	0.5052
1.9	0.6182	0.6834	0.7904	2.1429	2.2505	0.2045	0.4517	0.2045	0.4517
2	0.6508	0.6922	0.7858	2.1011	2.1679	0.1864	0.4051	0.1864	0.4051

Reference	F multiplie	Absolute F
Fbar(4-7)	1	0.3254
FMax	1.0022	0.3261
F0.1	0.433	0.1409
F35%SPR	0.4158	0.1353

Weights in kilograms

Table 5.7.1 Northeast arctic saithe. Prediction input data

MFDP version 1a
Run: F1
Time and date: 11:35 22.04.2012
Fbar age range: 4-7

2012

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	169149	0.2	0	0	0	0.710	0.1074	0.710
4	132350	0.2	0.02	0	0	0.940	0.4012	0.940
5	104013	0.2	0.19	0	0	1.487	0.2993	1.487
6	25847	0.2	0.46	0	0	2.057	0.2894	2.057
7	39455	0.2	0.80	0	0	2.477	0.3116	2.477
8	11284	0.2	0.91	0	0	2.977	0.3178	2.977
9	7526	0.2	0.98	0	0	3.377	0.2789	3.377
10	15022	0.2	1	0	0	3.777	0.2826	3.777
11	5375	0.2	0.99	0	0	4.080	0.4412	4.080
12	4350	0.2	1	0	0	4.830	0.4412	4.830
13	3827	0.2	0.99	0	0	5.323	0.4412	5.323
14	359	0.2	1	0	0	6.970	0.4412	6.970
15	392	0.2	1	0	0	6.617	0.4412	6.617

2013

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	169149	0.2	0	0	0	0.710	0.1074	0.710
4	.	0.2	0.02	0	0	0.940	0.4012	0.940
5	.	0.2	0.19	0	0	1.487	0.2993	1.487
6	.	0.2	0.46	0	0	2.057	0.2894	2.057
7	.	0.2	0.80	0	0	2.477	0.3116	2.477
8	.	0.2	0.91	0	0	2.977	0.3178	2.977
9	.	0.2	0.98	0	0	3.377	0.2789	3.377
10	.	0.2	1	0	0	3.777	0.2826	3.777
11	.	0.2	0.99	0	0	4.080	0.4412	4.080
12	.	0.2	1	0	0	4.830	0.4412	4.830
13	.	0.2	0.99	0	0	5.323	0.4412	5.323
14	.	0.2	1	0	0	6.970	0.4412	6.970
15	.	0.2	1	0	0	6.617	0.4412	6.617

2014

Age	N	M	Mat	PF	PM	SWt	Sel	CWt
3	169149	0.2	0	0	0	0.710	0.1074	0.710
4	.	0.2	0.02	0	0	0.940	0.4012	0.940
5	.	0.2	0.19	0	0	1.487	0.2993	1.487
6	.	0.2	0.46	0	0	2.057	0.2894	2.057
7	.	0.2	0.80	0	0	2.477	0.3116	2.477
8	.	0.2	0.91	0	0	2.977	0.3178	2.977
9	.	0.2	0.98	0	0	3.377	0.2789	3.377
10	.	0.2	1	0	0	3.777	0.2826	3.777
11	.	0.2	0.99	0	0	4.080	0.4412	4.080
12	.	0.2	1	0	0	4.830	0.4412	4.830
13	.	0.2	0.99	0	0	5.323	0.4412	5.323
14	.	0.2	1	0	0	6.970	0.4412	6.970
15	.	0.2	1	0	0	6.617	0.4412	6.617

Input units are thousands and kg - output in tonnes

Table 5.7.2 Northeast Arctic saithe. Short term prediction

MFDP version 1a
Run: F1
North-East Arctic saithe
Time and date: 11:35 22.04.2012
Fbar age range: 4-7

2012				
Biomass	SSB	FMult	FBar	Landings
734156	314684	0.9587	0.3119	164000

2013					2014	
Biomass	SSB	FMult	FBar	Landings	Biomass	SSB
712083	301760	0	0	0	874561	405598
.	301760	0.1	0.0325	19030	852249	392370
.	301760	0.2	0.0651	37456	830673	379587
.	301760	0.3	0.0976	55300	809807	367235
.	301760	0.4	0.1302	72581	789625	355298
.	301760	0.5	0.1627	89318	770105	343762
.	301760	0.6	0.1952	105531	751222	332613
.	301760	0.7	0.2278	121236	732956	321838
.	301760	0.8	0.2603	136451	715284	311424
.	301760	0.9	0.2928	151193	698186	301357
.	301760	1	0.3254	165477	681642	291627
.	301760	1.1	0.3579	179319	665634	282221
.	301760	1.2	0.3905	192734	650142	273129
.	301760	1.3	0.423	205736	635148	264339
.	301760	1.4	0.4555	218339	620637	255841
.	301760	1.5	0.4881	230557	606590	247625
.	301760	1.6	0.5206	242401	592993	239682
.	301760	1.7	0.5531	253885	579830	232002
.	301760	1.8	0.5857	265021	567085	224576
.	301760	1.9	0.6182	275820	554745	217396
.	301760	2	0.6508	286294	542797	210452

Input units are thousands and kg - output in tonnes

Table 5.7.3. Northeast arctic saithe. Short term projection output HCR landings

MFDP version 1a
Run: TAC13n
TAC13MFDP Index file 22.04.2012
Time and date: 13:13 24.04.2012
Fbar age range: 4-7

2012						
Biomass	SSB	FMult	FBar	Landings		
734156	314684	0.9587	0.3119	164000		
2013						
Biomass	SSB	FMult	FBar	Landings		
712083	301760	0.9935	0.3233	164568		
2014					2015	
Biomass	SSB	FMult	FBar	Landings	Biomass	SSB
682695	292246	0	0	0	844515	384002
.	292246	0.1	0.0325	17970	823389	371719
.	292246	0.2	0.0651	35378	802950	359840
.	292246	0.3	0.0976	52243	783175	348353
.	292246	0.4	0.1302	68584	764041	337243
.	292246	0.5	0.1627	84418	745526	326499
.	292246	0.6	0.1952	99762	727609	316108
.	292246	0.7	0.2278	114632	710270	306057
.	292246	0.8	0.2603	129044	693487	296336
.	292246	0.9	0.2928	143015	677243	286932
.	292246	1	0.3254	156557	661519	277836
.	292246	1.1	0.3579	169686	646297	269038
.	292246	1.2	0.3905	182415	631561	260526
.	292246	1.3	0.423	194758	617293	252291
.	292246	1.4	0.4555	206727	603478	244325
.	292246	1.5	0.4881	218335	590100	236618
.	292246	1.6	0.5206	229593	577145	229161
.	292246	1.7	0.5531	240514	564598	221946
.	292246	1.8	0.5857	251107	552445	214965
.	292246	1.9	0.6182	261385	540674	208210
.	292246	2	0.6508	271356	529271	201673

	Fpa (0.35) landings	SSB
2013	175989	301760
2014	162960	284482
2015	154755	264304
Average	164568	

Input units are thousands and kg - output in tonnes

Table 5.7.4. Northeast arctic saithe. Detailed short term projection output HCR landings

MFDP version 1a
Run: TAC13
Time and date: 12:20 22.04.2012
Fbar age range: 4-7

Year:		2012	F multiplie	0.9587	Fbar:	0.3119				
Age	F		CatchNos	Yield	StockNos	Biomass	SSNos(Jan	SSB(Jan)	SSNos(ST)	SSB(ST)
	3	0.103	15026	10668	169149	120096	0	0	0	0
	4	0.3846	38547	36234	132350	124409	2647	2488	2647	2488
	5	0.2869	23628	35127	104013	154633	19762	29380	19762	29380
	6	0.2775	5702	11727	25847	53159	11890	24453	11890	24453
	7	0.2987	9281	22985	39455	97717	31564	78174	31564	78174
	8	0.3047	2700	8036	11284	33589	10268	30566	10268	30566
	9	0.2674	1608	5428	7526	25413	7375	24905	7375	24905
	10	0.2709	3246	12259	15022	56733	15022	56733	15022	56733
	11	0.423	1692	6904	5375	21930	5321	21711	5321	21711
	12	0.423	1369	6614	4350	21011	4350	21011	4350	21011
	13	0.423	1205	6413	3827	20372	3789	20169	3789	20169
	14	0.423	113	788	359	2502	359	2502	359	2502
	15	0.423	123	817	392	2594	392	2594	392	2594
Total			104239	164000	518949	734156	112740	314684	112740	314684

Year:		2013	F multiplie	0.9935	Fbar:	0.3233				
Age	F		CatchNos	Yield	StockNos	Biomass	SSNos(Jan	SSB(Jan)	SSNos(ST)	SSB(ST)
	3	0.1067	15543	11036	169149	120096	0	0	0	0
	4	0.3986	37472	35223	124938	117441	2499	2349	2499	2349
	5	0.2974	17281	25691	73760	109656	14014	20835	14014	20835
	6	0.2875	14545	29914	63916	131454	29401	60469	29401	60469
	7	0.3096	3889	9632	16035	39712	12828	31770	12828	31770
	8	0.3157	5911	17594	23961	71324	21804	64905	21804	64905
	9	0.2771	1501	5069	6812	23002	6676	22542	6676	22542
	10	0.2808	1051	3970	4716	17811	4716	17811	4716	17811
	11	0.4383	3039	12400	9380	38271	9286	37888	9286	37888
	12	0.4383	934	4511	2883	13924	2883	13924	2883	13924
	13	0.4383	756	4024	2333	12420	2310	12296	2310	12296
	14	0.4383	665	4635	2053	14306	2053	14306	2053	14306
	15	0.4383	131	863	403	2665	403	2665	403	2665
Total			102717	164562	500338	712083	108873	301760	108873	301760

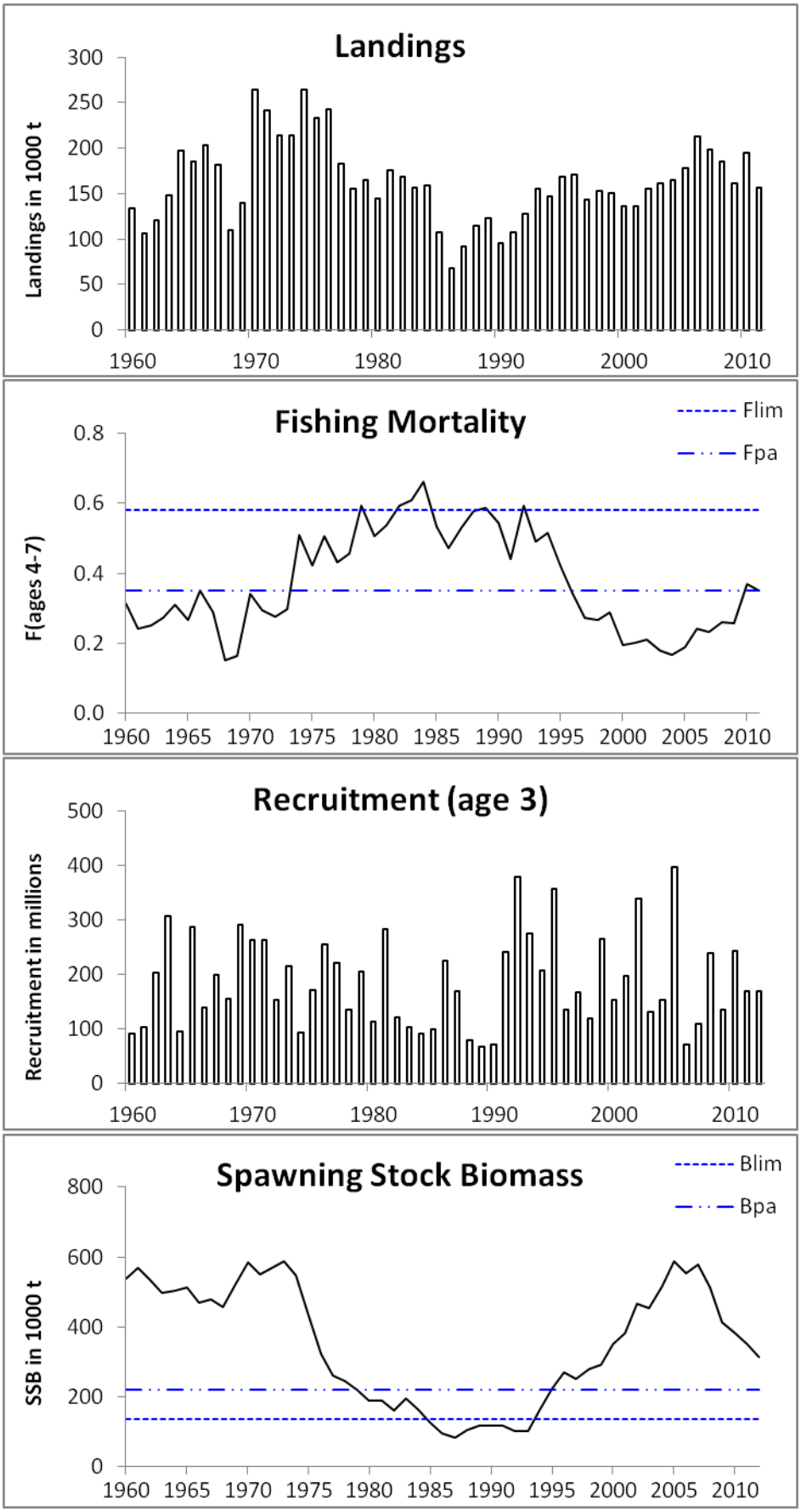
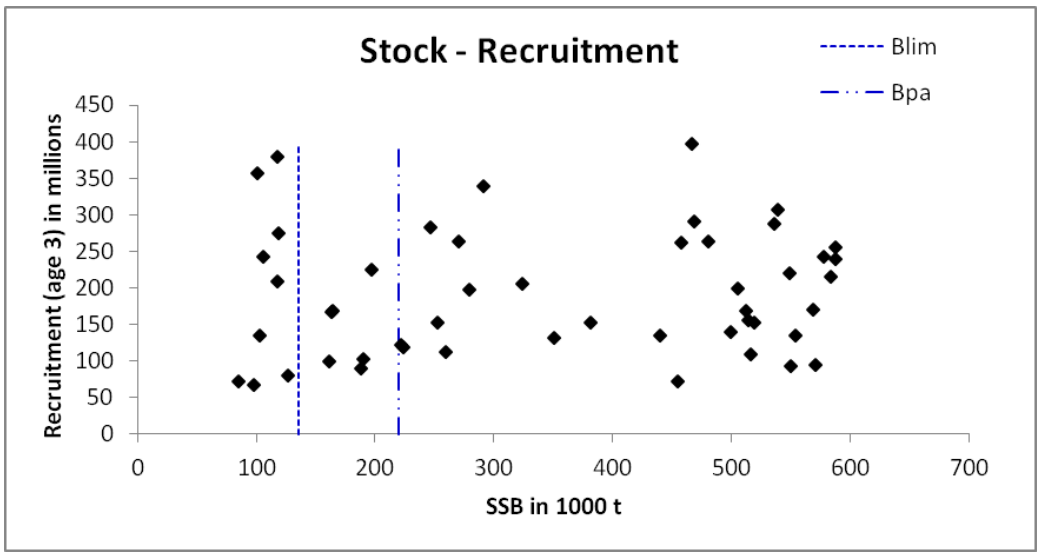
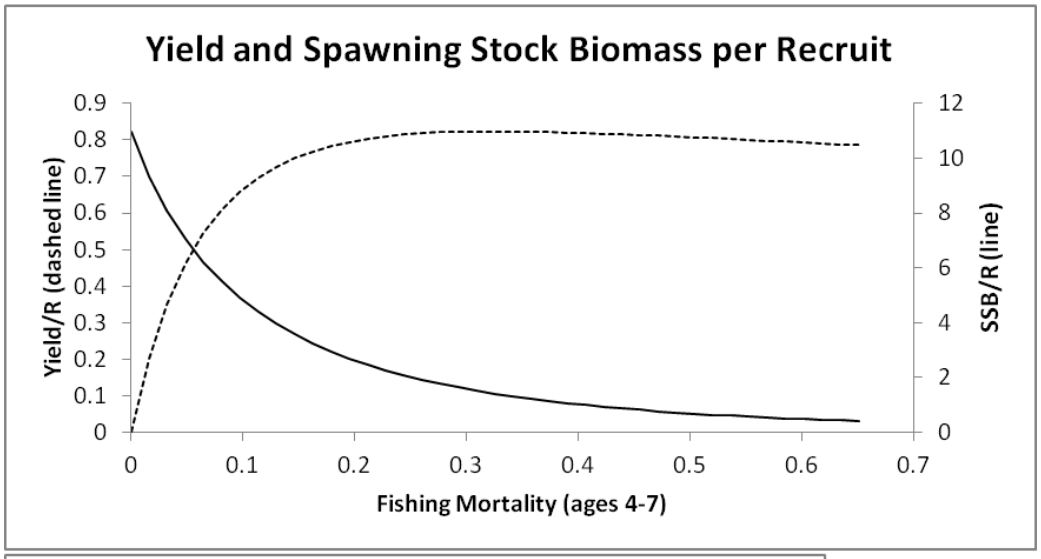


Figure 5.1.1 Northeast Arctic saithe (Subareas I and II)





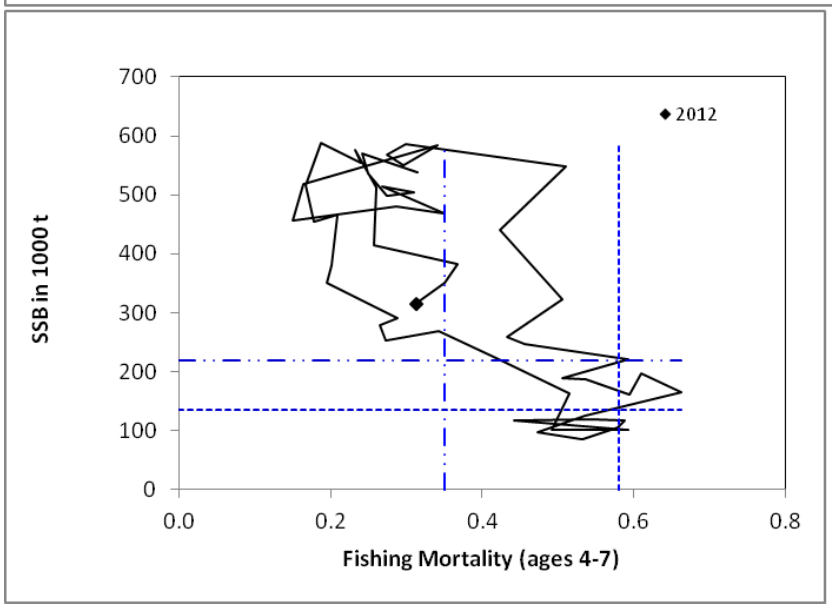


Figure 5.1.1 continued

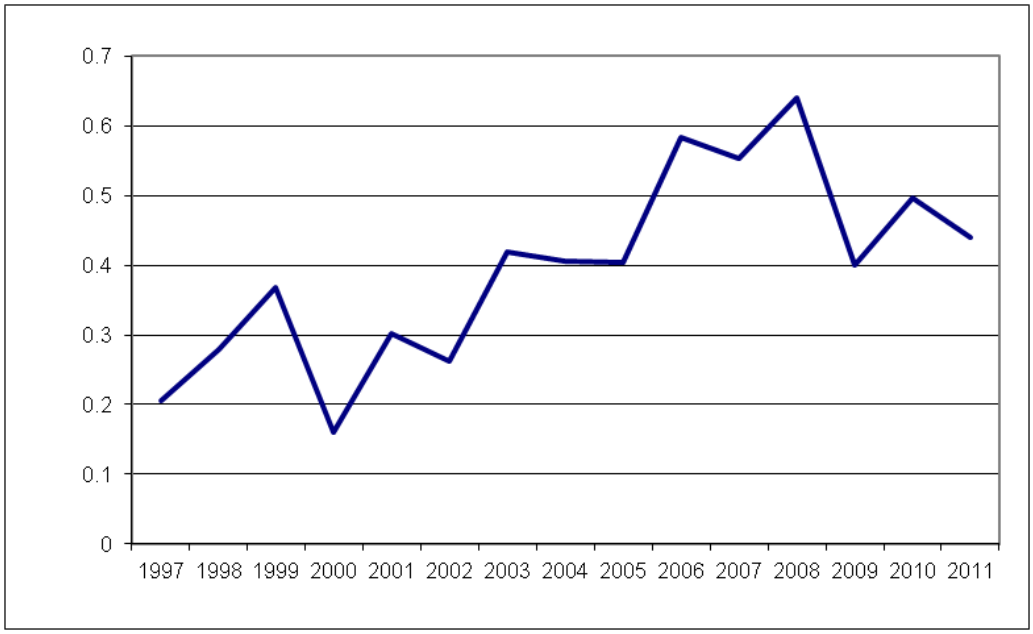


Figure 5.2.1. Northeast Arctic saithe. Proportion of saithe in the southern half of the survey area (sub area C+D).

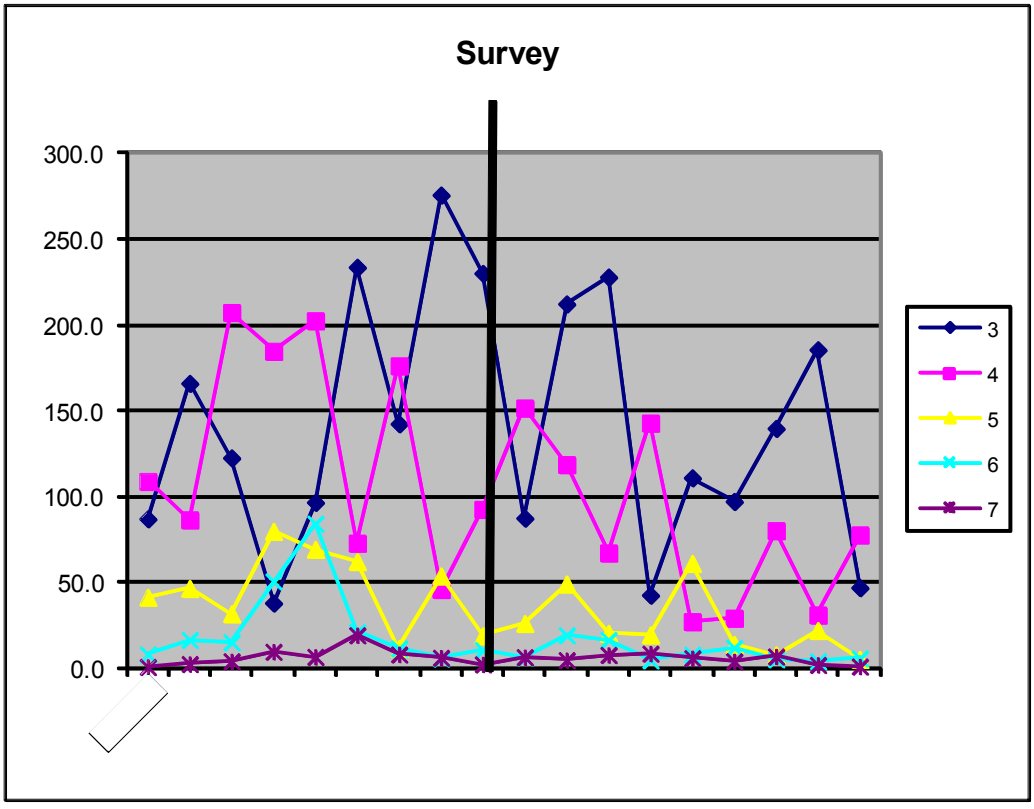


Figure 5.3.1a Northeast Arctic saithe, acoustic survey tuning indices, break in 2002 black line

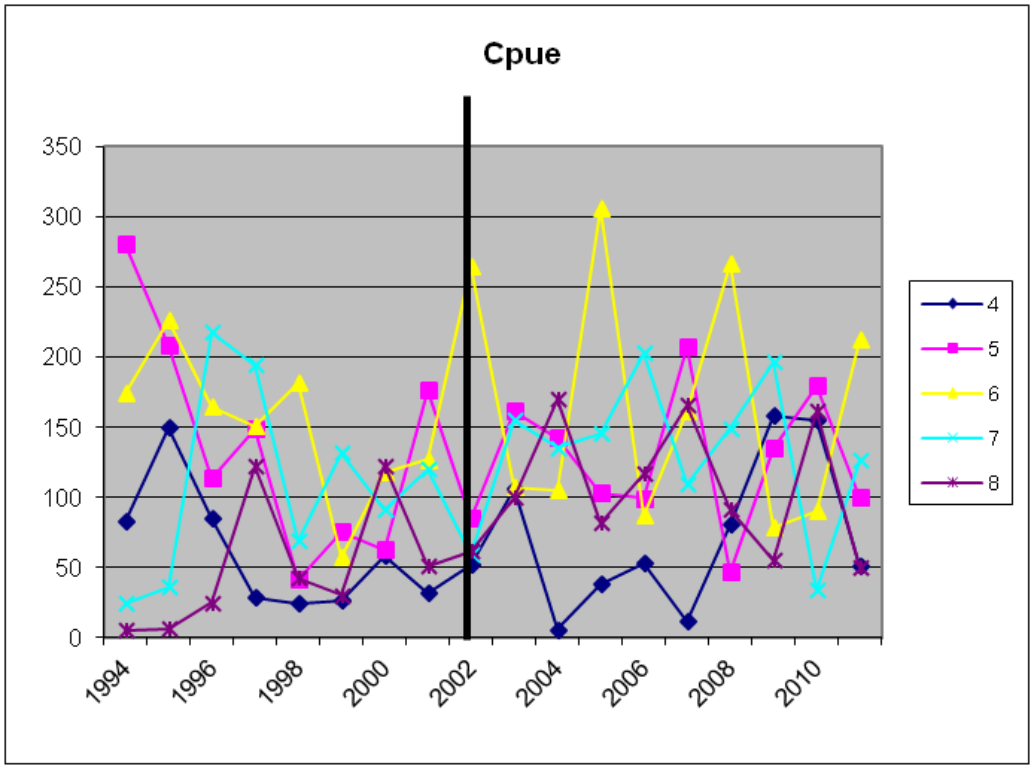


Figure 5.3.1b Northeast Arctic saithe, CPUE tuning indices, break in 2002 black line

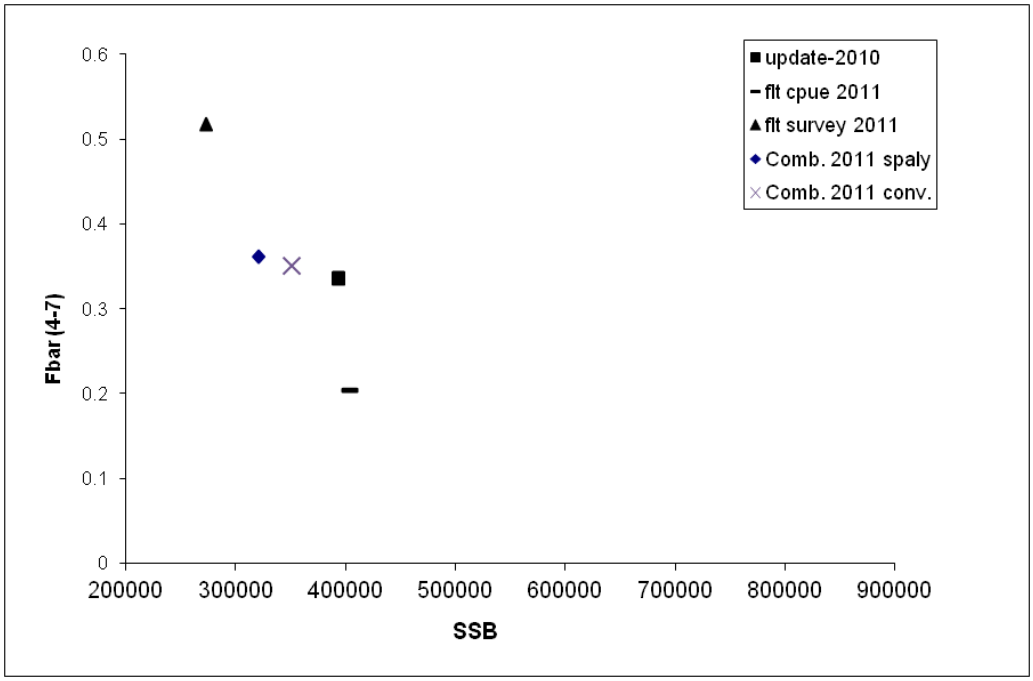


Figure 5.4.1 Northeast Arctic saithe. Comparison of SSB and F_{4-7} in 2011 from single fleet and combined XSA runs. SSB and F_{4-7} in 2010 from an updated 2010 SPALY run is also presented.

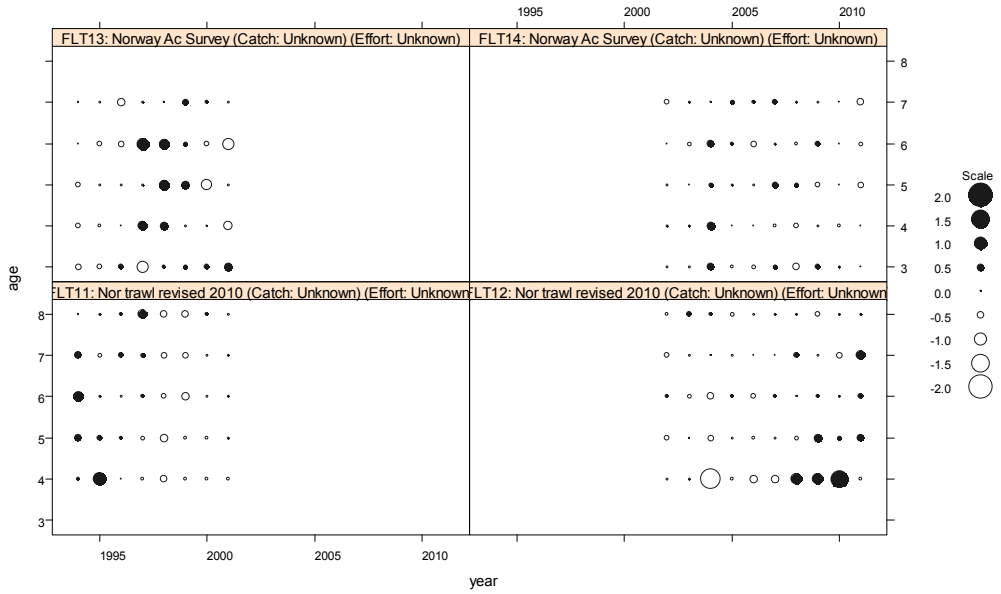


Figure 5.5.1. Northeast Arctic saithe. Final run log Q residuals.

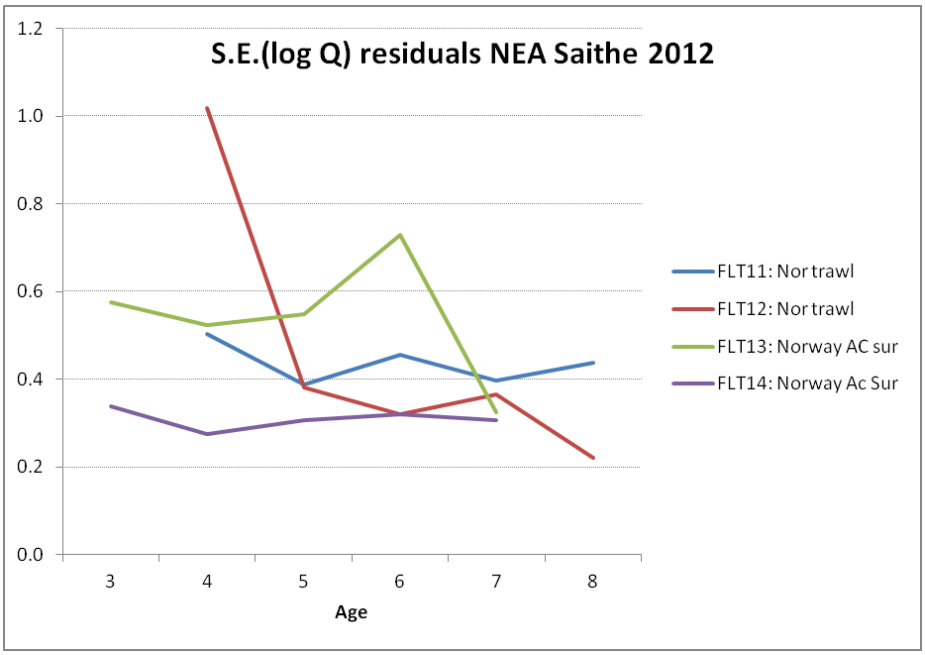


Figure 5.5.2. Northeast arctic saithe. S.E log. Catchability from the four XSA fleet tuning series, final run.

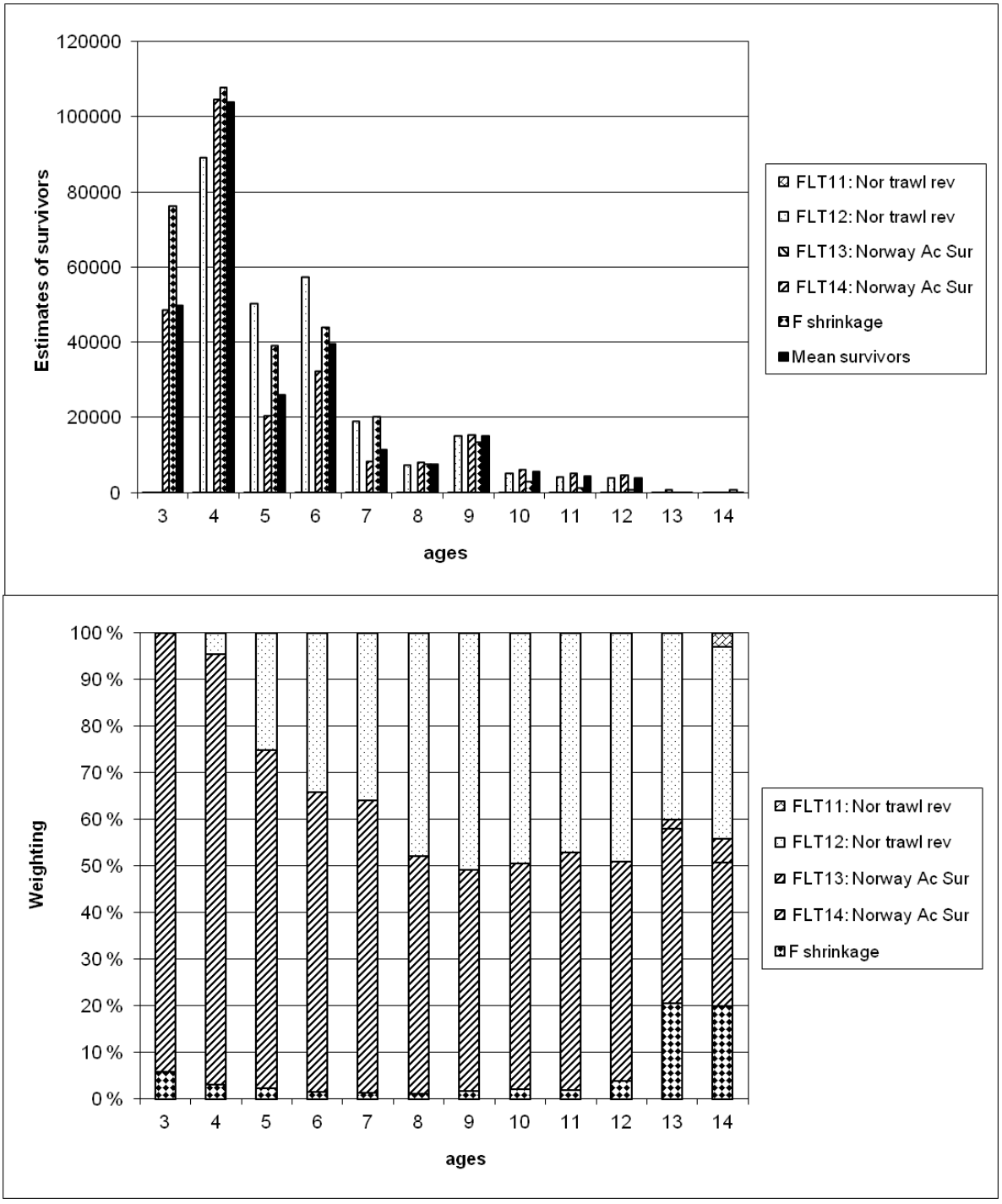


Figure 5.5.3 Northeast Arctic saithe. Estimates of survivors from different fleets and shrinkage and weighting in the final XSA-run.

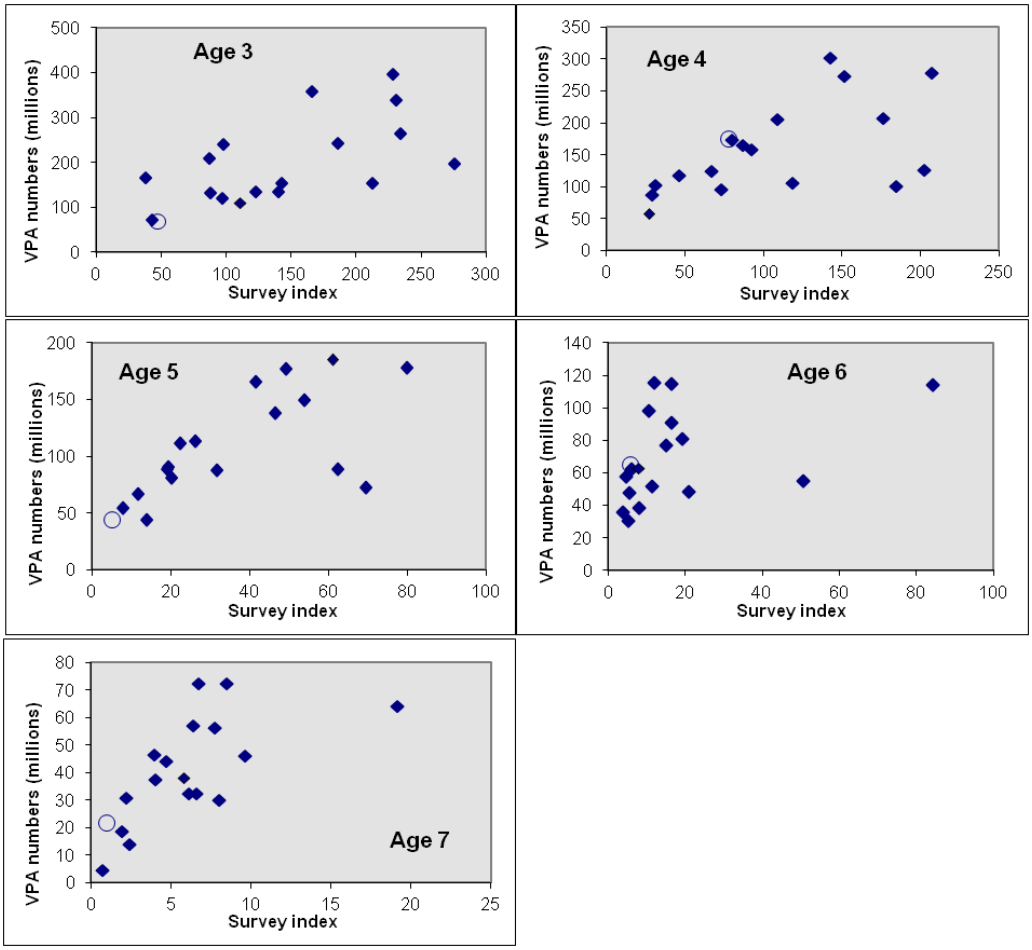


Figure 5.5.4A. NEA Saithe - Acoustic survey vs. VPA, circle shows last data year.

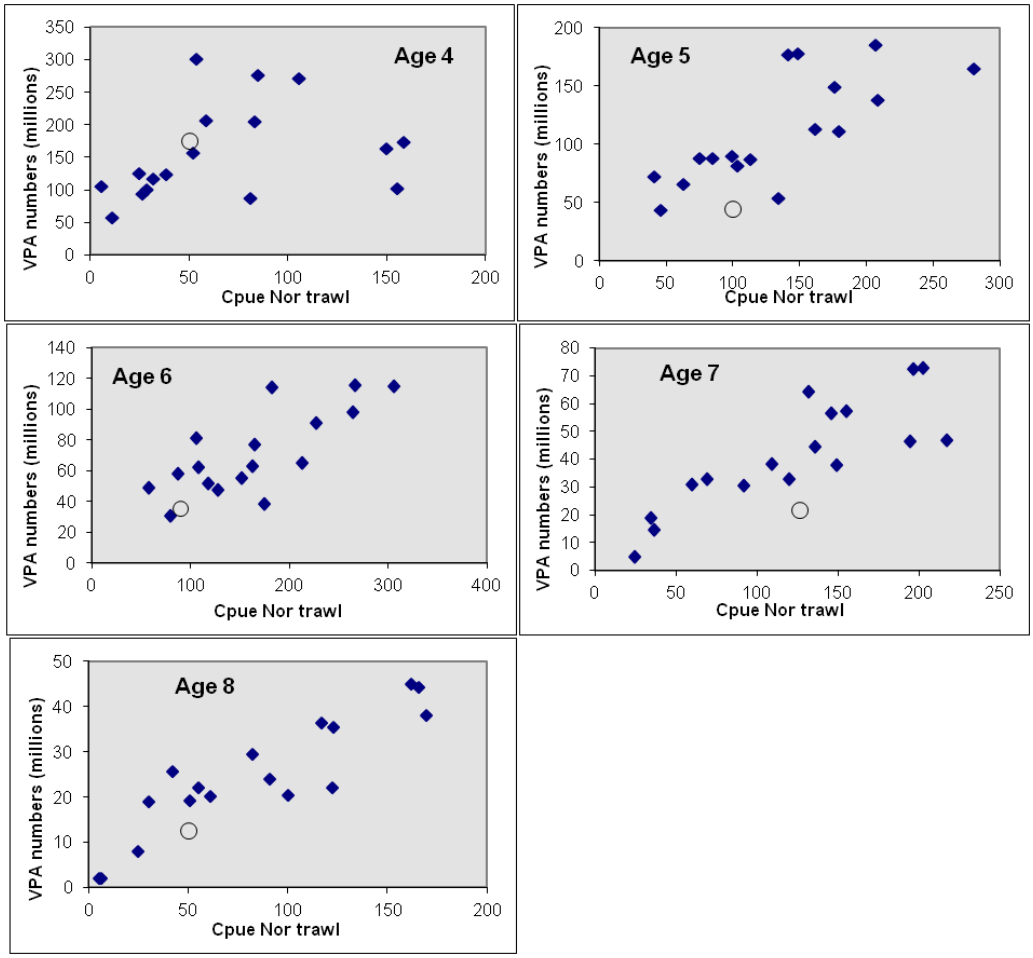


Figure 5.5.4B. NEA Saithe - Acoustic survey vs. VPA, circle shows last data year.

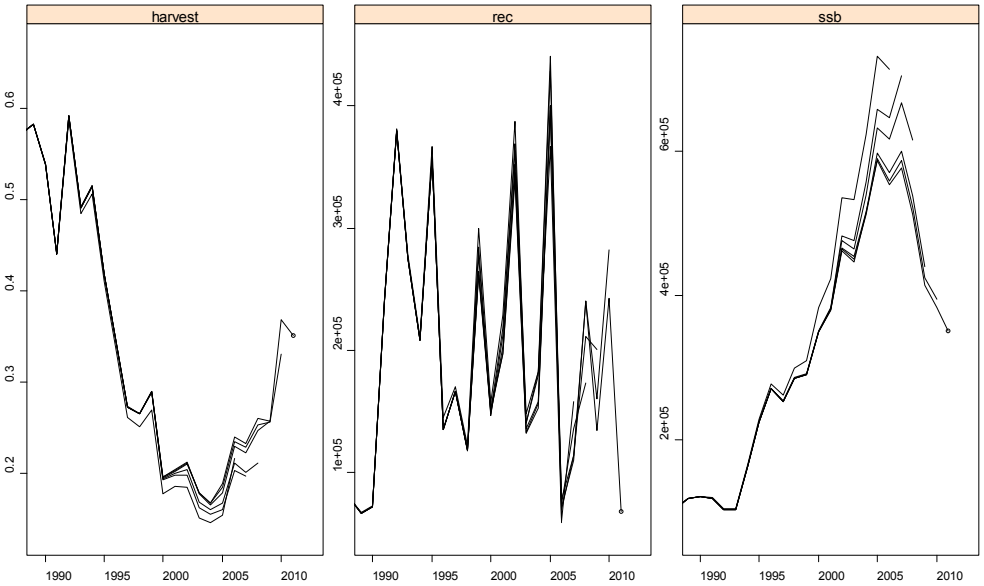


Figure 5.5.5 Saithe in Sub-areas I and II (Northeast Arctic) RETROSPECTIVE XSA F4-7, recruits and SSB for all fleets.

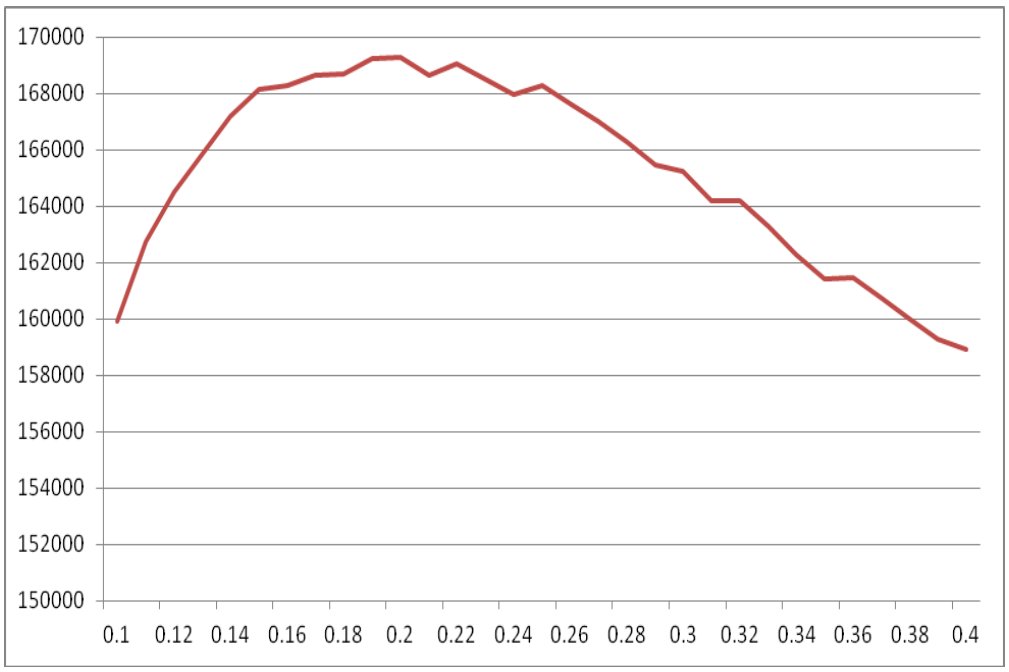


Figure 5.6.1. Long-term yield versus exploitation level in Northeast Arctic saithe simulations

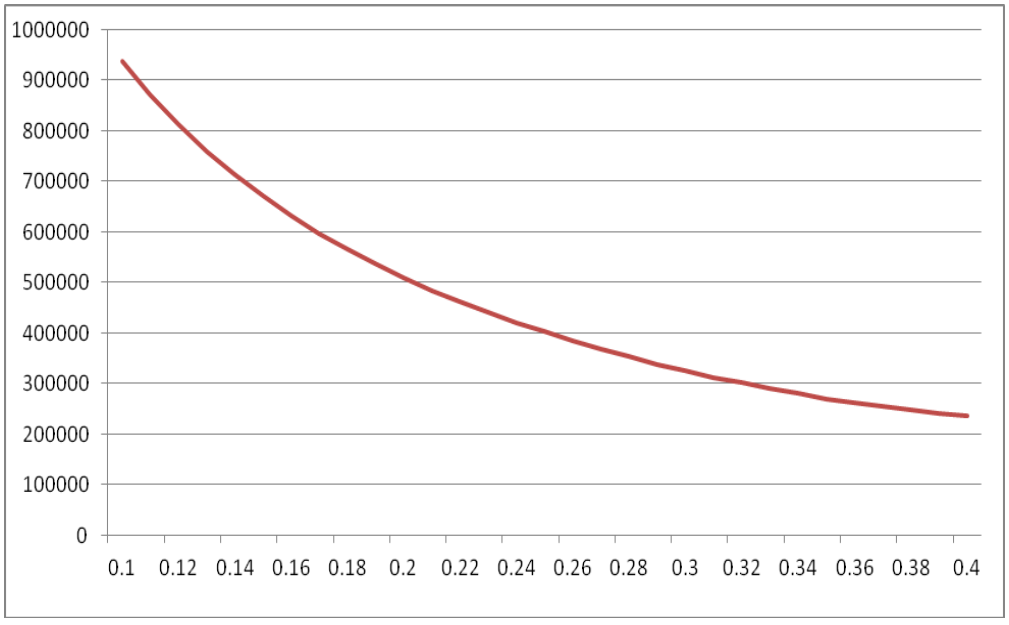


Figure 5.6.2. SSB versus exploitation level in Northeast Arctic saithe simulations