8 Plaice in Subarea IV

A Stock Annex is available for North Sea plaice. Therefore only deviations from the stock annex are presented within this Section of the report.

8.1 General

8.1.1 Ecosystem aspects

No new information on ecosystem aspects was presented at the working group in 2011. All available information on ecosystem aspects can be found in the Stock Annex.

8.1.2 Fisheries

No new information on fisheries aspects was presented at the working group in 2011. All available information can be found in the Stock Annex

8.1.3 ICES Advice

The information in this section is taken from the ACOM summary sheet 2011, section 6.4.7:

ICES advises on the basis of the first stage of the EU management plan (Council Regulation No. 676/2007) that landings in 2012 should be no more than 84 410 t. ICES notes that according to the management plan, transitional arrangements to the second stage of the plan should be established since both North Sea plaice and sole have now been within safe biological limits for two consecutive years.

Single-stock exploitation boundaries

Exploitation boundaries in relation to existing management plans

"Following the first stage of the EU management plan would imply increasing F to the target value of 0.3, with a maximum TAC increase of 15%. For 2012 the latter applies, resulting in a TAC of 84 410 t (F = 0.29). This is expected to increase the SSB to 587 600 t in 2013..".

Exploitation boundaries in relation to precautionary limits

"The fishing mortality in 2012 should be no more than Fpa (0.6) corresponding to landings of less than 155 500 t in 2012. This is expected to keep SSB above Bpa in 2013."

Advice for mixed fisheries management

The information in this section is taken from the North Sea Advice overview section 6.3 in the ICES Advisory report 2008. The information has not been updated in 2009 and 2010.

Fisheries in Division IIIa (Skagerrak–Kattegat), in Subarea IV (North Sea), and in Division VIId (Eastern Channel) should in 2009 be managed according to the following rules, which should be applied simultaneously:

Demersal fisheries

- *should minimize bycatch or discards of cod;*
- *should implement TACs or other restrictions that will curtail fishing mortality for those stocks mentioned above for which reduction in fishing pressure is advised;*
- *should be exploited within the precautionary exploitation limits or where appropriate on the basis of management plan results for all other stocks (see text table above);*
- *where stocks extend beyond this area, e.g. into Division VI (saithe and anglerfish) or are widely migratory (Northern hake), should take into account the exploitation of the stocks in these areas so that the overall exploitation remains within precautionary limits;*
- *should have no landings of angel shark and minimum bycatch of spurdog, porbeagle, and common skate and undulate ray.*

Mixed fisheries management options should be based on the expected catch in specific combinations of effort in the various fisheries, taking into consideration the advice given above. The distributions of effort across fisheries should be responsive to objectives set by managers, which is also the basis for the scientific advice presented above.

Key points highlighted in the ACOM 2010 summary sheet

The stock is well within precautionary boundaries. Recruitment has been around long-term average from 2005 onwards.

The overall capacity and effort of North Sea beam trawl vessels has been substantially reduced since 1995, including the decommissioning of 25 vessels in 2008. The current combined sole and plaice long term management plan specifically reduces effort as a management measure and is likely to continue to do so in the immediate future given the slower rate of recovery of the sole stock. This reduction in fishing effort is reflected in reductions in estimated fishing mortality.

The assessment is considered to be uncertain, partly because discards form a substantial part of the total catch and cannot be well estimated from the low number of annual sampling trips, but most importantly due to the large differences in abundance observed in the different regions of the North Sea. The TAC constraint in the EU management plan is designed to allow for the uncertainty in the assessment.

8.1.4 Management

A multiannual plan for plaice and sole in the North Sea was adopted by the EU Council in 2007 (EC regulation 676/2007) describing two stages; of which the first stage should be deemed a recovery plan and its second stage a management plan. ICES has evaluated the plan (Miller and Poos 2010; Simmonds 2010; see section 8.8.2) and found it to be in agreement with the precautionary approach (ICES, 2010). See Section 19 (Management Plan Evaluations) of this report for further details.

8.2 Data available

8.2.1 Catch

Total landings of plaice in the North Sea in 2011 (Table 8.2.1) were estimated by the WG at 67386 t, an increase of 6712 t from the 2010 landings, but 6014 t (8%) less than the 73400 t TAC for 2011.

During the benchmark of the eastern channel (VIId) plaice stock (WKFLAT 2010) it was decided that 50% of Q1 landings taken in the eastern channel are actually plaice form the North Sea stock migrating in and out of the area. The decision was made to remove these landings from the assessment of the eastern channel stock. At the previous assessment working group (WGNSSK 2011) test runs were carried out including these removed landings in the assessment of the North Sea stock. The impact was found to be minimal, given that as a percentage of the total catch, these eastern channel landings, available back to 1980, account for less than 1% each year. From 2012 onwards 50% of the Q1 eastern channel (VIId) plaice landings (table 8.2.5) will be included in the assessment of the North Sea plaice stock. The total catch at age including these are presented in table 8.2.6.

To reconstruct the number of plaice discards at age before 2000, catch numbers at age are calculated from fishing mortality at age corrected for discard fractions, using a reconstructed population and selection and distribution ogives (ICES CM 2005/ACFM:07 Appendix 1). The discards time series used in the assessment was derived from Dutch, Danish, German and UK discards observations for 2000–2009, as is described in the stock annex. The Dutch discards data for 2010 were derived from a combination of the observer programme that has been running since 2000, and a new self-sampling programme. The estimates from both programmes were combined to come up with an overall estimate of discarding by the Dutch beam trawl fleet. For 2011, estimates were derived solely from the self-sampling data. There is an ongoing project within IMARES to validate these estimates by examining matched (same vessel and haul) trips where both observer estimates and self-sampling estimates are derived.

Figure 8.2.1 presents a time series of landings, catches and discards from these different sources.

8.2.2 Age compositions

The landing numbers at age are presented in Table 8.2.2. The discard numbers at age were calculated using the discards raising procedures described in the stock annex. The discard numbers at age are presented in Table 8.2.3. Catch numbers-at-age are presented as the sum of landings numbers at age and discards numbers at age in Table 8.2.4. Catch-at-age, landings-at-age and discards-at-age matrices are presented in figures 8.2.2 and 8.2.3.

8.2.3 Weight at age

Stock weights at age are presented in Table 8.2.7. Stock weight at age has varied considerably over time, especially for the older ages. There has been a long-term decline in the observed stock weight at age (Figure 8.2.4). Discard, landing, and catch weights at age are presented in Table 8.2.8, 8.2.9 and 8.2.10 respectively. Catch weights at age are derived from the discards and landings weights at age according to the relative contributions of each to the overall catch for each age. Figure 8.2.4 presents the stock, discards, landings and catch weights at age.

8.2.4 Maturity and natural mortality

Natural mortality is assumed to be 0.1 for all age groups and constant over time. A fixed maturity ogive (Table 8.2.11) is used for the estimation of SSB in North Sea plaice.

8.2.5 Discard mortality

It is estimated based on experimental studies on board commercial vessels that less than 10% of the plaice and sole discards in the beam trawl fisheries survive the process of discarding (Bult and Schelvis-Smit 2007; Beek et al. 1990; Chopin et al. 1996). We refer to the stock annex for plaice in ICES Area IV for more details on discard mortality.

8.2.6 Catch, effort and research vessel data

Three different survey indices can been used as tuning fleets (Table 8.2.12 and Figure 8.2.5):

- Beam Trawl Survey RV Isis (BTS-Isis)
- Beam Trawl Survey RV Tridens (BTS-Tridens)
- Sole Net Survey in September-October (SNS)

Traditionally, for the Sole Net Survey (SNS & SNSQ2) ages 1 to 3 are used for tuning the North Sea plaice assessment and the 0-group index is used in the RCT3 analysis for recent recruitment estimates. The internal consistency of the survey indices used for tuning appears relatively high for the entire age-range of each individual survey (Figures 8.2.6–8.2.8). However the consistency at young ages is fairly poor for the BTS-Tridens survey.

An additional survey index is used for recruitment estimates (Table 8.2.13):

- Demersal Fish Survey (DFS)

At th eprevious year's assessment working group (WGNSSK 2011) the Belgian data for this index was not available for the estimates in 2010. This year both the 2010 and 2011 Belgian data were available, hence the international index 2010 value has been updated.

Commercial LPUE series (consisting of an effort series and landings-at-age series) that can be used as tuning fleets are (Table 8.2.14):

- The Dutch beam trawl fleet
- The UK beam trawl fleet excluding all flag vessels

Effort has decreased in the Dutch beam trawl fleet since the early/mid 1990s. Up until 2002, the age-classes available in both the Dutch and the UK fleets generally show equal trends in LPUE through time.

The commercial LPUE data of the Dutch beam trawl-fleet, which dominates the fishery, will most likely be biased due to (individual) quota restrictions and increased fuel prices, which caused fishermen to leave productive fishing grounds in the more northern region. A method that corrects for such spatial changes in effort has been developed (WGNSSK 2009 WD 1 Quirijns and Poos). Under the assumption that discarding is negligible for the older ages, the LPUE represents CPUE, and this time series could be used to tune age structured assessment methods. Also, age-aggregated LPUE series, corrected for directed fishing under a TAC-constraint (see Quirijns and Poos 2008, WD 1), by area and fleet component, can be used as indication of stock development. This series has not been updated since 2009 due to discrepancies in the effort data.

Plaice LPUE, corrected for directed fishing under a TAC constraint, of the Dutch fleet shows a substantial decrease in the years 1990–1997, after which overall LPUE remains more or less at the same level. In 2004 the Dutch LPUE in the more northern

and central North Sea has increased substantially. In 2008 an increase in the more southern North Sea also becomes evident The LPUE pattern of the Dutch fleet appears to correspond well with the stock dynamics of the XSA assessment.

WKFLAT 2009 recommended to include the LPUE index in to the assessment process, but to exclude LPUE series the final assessment run upon which management advice is based.

8.2.7 Intercatch

This year, all most countries submitted landings and discard estimates by métier and quarter. Because of time constraints and some incomplete data, InterCatch was only used for raising the landings, while discards were raised following the usual procedure. In future years and new raising scheme will be developed to make the best possible use of the data available by country, métier and quarter.

The use of intercatch as a tool for raising ladings and discards for Plaice in Area IV is summarized in the table below.

Table of Use and Acceptance of InterCatch				
Stock code for each stock of the expert group	**InterCatch used as the:** - **'Only tool'** - **'In parallel with another tool'** - **'Partly used'** - **'Not used'**	**If InterCatch have not been used what is the reason? Is there a reason why InterCatch cannot be used? Please specify it shortly. For a more detailed description please write it in the 'The use of InterCatch' section.**	**Discrepancy between output from InterCatch and the so far used tool:** - **Non or insignificant** - **Small and acceptable** - **significant and not acceptable** - **Comparison not made**	**Acceptance test. InterCatch has been fully tested with at full data set, and the discrepancy between the output from InterCatch and the so far used system is acceptable. Therefore InterCatch can be used in the future.**
Ple-nsea (plaice in area IV)	In parallel with another tool	Another tested tool for international discards raising has been used; We are still getting used to intercatch and need to develop a proper raising scheme for the new level of detail in the data.	Comparison not made	InterCatch has not been properly tested

8.3 Data analyses

The assessment of North Sea plaice by XSA was carried out using the FLR (FLCore v. 2.3 and FLXSA v.2.0) in R version 2.13. All other post-analyses were done using FLR packages.

8.3.1 Reviews of last year's assessment

General comments

The assessment was well done and the report was very thorough.

As pointed out by last year reviewer it would be very helpful to have a brief description of the SCA model in the stock annex or the report's section. For example it is not

clear to me how discard data is used by the model to estimate the discards. Or, are discards estimates only based on tuning indices?

- Full details of this model can be found in Aarts and Poos (2009).

Model diagnostics and sensitivity analyses illustrate some of the problems associated with this stock and the WG does an excellent job explaining possible reasons for these issues.

Technical comments

- Discard uncertainty is still the major issue for this assessment.
- A very thorough technical review of this stock took place at last year's RGNS 2010. The WG addressed all of the comments in an efficient manner and offered solutions moving forward for some of the issues surrounding sampling of effort and discards.
- Given that the splitting of tuning indices has an observed justification, not only the non suitability of the residuals, it would be interesting to analyze the goodness of the fit more in deep, log catchability residuals, retrospective patterns. This run could be a candidate to substitute current assessment.
- Further tests were conducted this year which showed limited improvement in the log catchability residuals. It is proposed that in advance of the next working group, time-tapered weighting should be applied on the SNS and BTS Tridens indices.
- Does SCA estimate uncertainty in discards? Apart of comparing point estimates of SCA with estimates derived from observers- and self-sampling it would be interesting to compare the observers- and self-sampling estimates with the confidence intervals of the SCA estimates.
- Due to time contraints this was not possible at WGNSSK 2012. This will be before the next working group meeting.
- The Annex indicates that "Natural mortality is assumed to be 0.1 for all age groups and constant over time. These values are probably derived from war time estimates." There has to be better method of estimating natural mortality for plaice than an assumption based on estimates from 50+ years ago? What do life history equations based on Tmax (Hoenig 1983, Hewett and Hoenig 2005) and mean size at age (Gislason *et al*. 2010) predict M to be? It seems like some additional support for M other than "probably derived from war time estimates" could be provided very easily.
- This is a topic that will be addressed at the next benchmark of the stock.
- Bolle et al. 2005 indicate that over 50,000 North Sea plaice were tagged in the 20th century. Can any of these data be used within a conventional tag-recovery model to directly estimate natural mortality?
- Can tag returns be used to support the hypothesis that movement of young plaice out of the area of the SNS to the area of the BTS (The WG offers this as a possible explanation for patterns observed in the XSA catchability residuals).
- Unfortunately not, though the latest review of the plaice box (Beare *et al* 2010) provides enough support of this hypothesis.

8.3.2 Exploratory catch-at-age-based analyses

The following exploratory analyses have been carried out:

1. Explore sensitivity to splitting the tuning indices of the Sole Net Survey and the BTS-Tridens.
2. Stock assessment using the statistical catch-at-age model as described in Aarts & Poos (2009).

1. Splitting of SNS and BTS-Tridens tuning indices

In recent years, the XSA catchability residuals exhibit pronounced trends for ages 1-3: they are consistently negative for the SNS and consistently positive for BTS-Tridens. This is likely to be explained by a movement of young plaice out of the area of the SNS into the area of the BTS (Beare et al. 2010). Juvenile plaice have been distributed more offshore in recent years. Surveys in the Wadden Sea have shown that 1-group plaice are almost absent from the area where they were very abundant in earlier years. This could be linked to environmental changes in the productivity or changes in the temperature of the southern North Sea, but these links have not been shown conclusively. The distribution of the SNS overlaps largely with the Wadden Sea, and the SNS receives high weightings in XSA in the tuning of trends of plaice of age groups 1-3 due to its historically stronger correlation with the VPA. The expected net effect of these changes in catchability would be an underestimation of recruitment strength. This is also seen in the retrospective pattern of recruitment in recent assessments of the stock.

Following initial tests at the previous working group, further analyses investigating the sensitivity of the assessment output to this were conducted. Various combinations of division (splitting) of the SNS and BTS-Tridens tuning indices were examined (see text table below). In all cases indices were split at year 200 (<2000 and >=2000) as opposed to year 2004 as done previously. Previous splitting indices were based on the pattern of residuals for the indices, but further examination of available data and the plaice box report (Beare et al.) suggest 2000 to be a more appropriate year to separate present from past distribution of plaice juveniles.

Run name	Description
Original	All three indices in full, following stock annex
SplitSNS	Only the SNS index split*
SplitBoth	Both SNS and BTS-Tridens split*
SplitNew	Both SNS and BTS-Tridens split*, only >=2000 BTS-Tridens index retained
SplitOld	SNS index split*, only ages 4-9 of BTS-Tridens used (no need to split)
SplitOldrecYng	SNS split*, BTS-Tridens divided into two indices: full time series ages 4-9 and >=2000 ages 1-3

***All splits divide indices into <2000 and >=2000**

Assessment runs have been done with these split tuning indices (Figure 8.3.1). Splitting the indices raises SSB slightly in all cases except *SplitOld*. IN this case removing the young ages in the BTS-Tridens index lowers the estimated recruits significantly in the recent period and the general lower level of year class strength leads to lower SSB. In general splitting the indices has a very limited impact on F, though in most cases this leads to an estimation of higher recruitment in the last two years.

It was decided that while splitting the indices is not the ultimate solution to this problem, it remains clear that recruitment is probably underestimated by the model. This will be taken into account when determining the level of recruitment to use in the short term forecast.

1. *Statistical catch at age-model*

The statistical catch at age (SCA) model that can be used to assess the North Sea plaice stock is described in Aarts and Poos (2009). This model uses the same tuning survey indices as the XSA used in the final run. Rather than using the reconstructed discards, the model estimates the discards based on the total mortality that can be estimated from the tuning series, while the fishing mortality can be estimated from the landings, and the background natural mortality is assumed to be constant for all ages and years. The starting values for the optimizer are taken from the Aarts and Poos article, except of course for the recruitment and F estimates in 2009 and 2010. The SCA model estimates similar stock trends compared to the XSA in the final run (figure 8.3.2). As previously, the main difference between the assessment models is in the estimate of the discard levels in recent years (2009-2011), which are estimated to be lower in the SCA model. Consequently, lower estimates of mean F (ages 2-6) are obtained using the SCA model.

Final assessment

The settings for the final assessment that is used for the catch option table is given below:

Year	2011
Catch at age	Landings + (reconstructed) discards based on NL, DK + UK + GE fleets
Fleets (years; ages)	BTS-Isis 1985–2011; 1–8 BTS-Tridens 1996–2011; 1–9 SNS 1982–2011 (excl. 2003); 1–3
Plus group	10
First tuning year	1982
Last data year	2011
Time series weights	No taper
Catchability dependent on stock size for age <	1
Catchability independent of ages for ages >=	6
Survivor estimates shrunk towards the mean F	5 years / 5 years
s.e. of the mean for shrinkage	2.0
Minimum standard error for population estimates	0.3
Prior weighting	Not applied

The full diagnostics are presented in Table 8.3.1. The XSA model converged after 41 iterations. The log catchability residuals for the tuning fleets in the final run are dominated in the younger ages by negative values for the SNS tuning index in the most recent period, and positive values for the BTS-Tridens (Figure 8.3.4). This is potentially due to a shift in the location of juvenile plaice offshore, away from the SNS survey area towards the BTS-Tridens survey area. However, the importance of the SNS survey in estimating recruits in previous years results in this survey still carrying a much higher weighting for age 1 estimates than the BTS-Tridens. The high BTS-Tridens tuning index for 1 year old individuals leads to a high residual in the XSA assessment for this age in the survey in recent years.

Fishing mortality and stock numbers are shown in Tables 8.3.2 and 8.3.3. respectively. The SSB in 2011 was estimated at 476 kt. Mean F(ages 2–6) for 2011 was estimated at 0.23. Recruitment of the 2010 year class, age 1 in 2011, was estimated to be higher than average at 1.266 million in the XSA.

Retrospective analyses of the XSA presented in Figure 8.3.5 indicate that historic estimates for SSB in 2006 and 2007 were much lower compared to the current estimate but since then the retrospective differences have been insignificant. This is reflected correspondingly in the estimates of fishing mortality. This is likely the result of the increase of younger individuals in the more northern region (surveyed by the Tridens but not by the higher weighted SNS), that have aged and therefore only recently have a high impact on the estimation of the stock size. The retrospective pattern of recruits shows a tendency to underestimate recruitment. This too can be explained by the change in distribution of juveniles and the relative weightings given to the different indices for the younger ages (SNS getting a higher weighting than is perhaps appropriate due to historically better representing the level of recruitment).

8.4 Historic Stock Trends

Table 8.4.1. and Figures 8.4.1 and 8.4.2 present the trends in landings, mean F(2–6), F(human consumption, 2–6), F(discards, 2–3), SSB, TSB and recruitment since 1957. Reported landings gradually increased up to the late 1980s and then rapidly declined until 1995, in line with the decrease in TAC. The landings show a general decline from 1987 onwards, increasing slowly but steadily in recent years. Discards were particularly high in 1997 and 1998 (reconstructed), and in 2001 and 2003 (observed), resulting from strong year classes. Fishing mortality increased until the late 1990s and reached its highest observed level in 1997. Since then, the estimates of fishing mortality have been fluctuating strongly. However, overall F has been lower since 2004, rapidly decreasing down to 0.21 in 2009, stable at this level in 2010 and starting to increase (by design, given that both Fmsy and Fmp are higher than this) in 2011 to 0.23. The peaks during 1997–1998 and 2001 have been mainly caused by peaks in F(discards). The F(human consumption) is estimated to decline since 1997, with little inter-annual variability. Over the last five years SSB has been rapidly increasing and is currently (2011) estimated at 476 kt, slightly down from the 501kt estimated for 2010, which was the highest estimate of the whole time series. The inter-annual variability in recruitment is relatively small, except for a limited number of strong year classes. Previously only year classes 1963, 1981, 1985 and 1996 were considered to be strong. Including discard data in the assessment alters the recruitment estimates and indicates that 1984, 1986, 1987 were also relatively strong year classes and that the 1985 year class was by far the strongest year class on record. Recruitment shows a periodic change with relatively poor recruitment in the 1960s and relatively strong recruitment in the 1980s. The recruitment level in the 1990s appears to be somewhat

lower than in the 1980s. The 1996 and 2001 year classes are estimated to be relatively strong, while the year classes since 2002 appear weak to average. Recent recruitment levels have been fluctuating slightly above the long term geometric mean.

The Fishers' North Sea Stock Survey (FNSSS) again took place in 2011. The survey was carried out using a questionnaire circulated to North Sea fishermen in five countries; Belgium, Denmark, England, the Netherlands, and Scotland. The questionnaire had changed slightly since 2010 and fishermen were asked to record their perceptions of changes in their economic circumstances, as well as in the state of selected fish stocks from 2010 to 2011. Most respondents reported similar or higher abundances of fish, although the proportions reporting higher levels were somewhat less than in 2010.

Overall, less than half (44%) reported that plaice overall were 'more' or 'much more' abundant in 2011 than in 2010. This is a large decline from the 68% who reported this last year and is in line with the results of the assessment which suggest a slight decrease in SSB over this period. About one-third reported 'no change' in the abundance of plaice, more than in 2010. About three-quarters of respondents overall reported catching 'all sizes' of plaice in 2011, while of the remainder, twice as many reported 'mostly large' plaice as 'mostly small'. Overall, more than half (61%) of respondents reported 'no change' in the level of discarding of plaice, with about one-quarter each reporting lower and higher levels of discarding. The proportion reporting 'more' or 'much more' discarding of plaice was significantly lower in 2011 than in 2010, a similar trend to that observed last year. The vast majority of respondents overall reported 'moderate' or 'high' levels of recruitment of plaice in 2010. Across individual areas the proportions reporting 'high' levels of recruitment of plaice in 2011 were highest in the central, north and western North Sea (areas 1, 2, 3, 4 in FNSSS). Overall the perceptions of the fishing industry reflect the high abundances of plaice estimated during WGNSSK 2012, as well as the trend of lowering discard ratios.

8.5 Recruitment estimates

Input to the RCT3 analysis is presented in Table 8.5.1. Estimates from the RCT3 analysis of age 1 are presented in Table 8.5.2, and of age 2 in Table 8.5.3. For year class 2011 (age 1 in 2012) the values predicted by the DFS survey in RCT3 differs considerably (an order of magnitude) from the VPA mean and has a high prediction standard error (Table 8.5.2.). Therefore the geometric mean, higher than the RCT3 estimate, was accepted for the short-term forecasts. For year class 2010 (age 2 in 2012), the estimates from SNS 0-group, BTS 1-group and the VPA mean were relatively comparable, received high weightings and had relatively low standard errors. Estimates from the DFS 0-group and SNS 1-group differed from the other predictors, and had higher prediction standard errors, but received lower weightings for the overall mean. However, the WG decided to use the geometric mean rather than the RCT3 estimate for the 2010 year class, as this was higher. This choice for the higher recruitment estimate was influenced by the retrospective upward revisions of recruitment in recent years.

The recruitment estimates from the different sources are summarized in the text table below. Underlined values were used in the forecast.

Year class	At age in 2012	XSA Survivors	RCT3	GM 1957–2009	Accepted estimate
2010	2	**1 033 366**	968 826	680 918	XSA survivors
2011	1		849 355	**922 293**	GM 1957–2009
2012	0			**922 293**	GM 1957–2009

8.6 Short-term forecasts

Short-term prognoses have been carried out in FLR using FLCore (2.3). Weight-at-age in the stock and weight-at-age in the catch are taken to be the average over the last 3 years. The exploitation pattern was taken to be the mean value of the last three years. The proportion of landings at age was taken to be the mean of the last three years, this proportion was used for the calculation of the discard and human consumption partial fishing mortality. Population numbers at ages 2 and older are XSA survivor estimates. Numbers at age 1 and recruitment of the 2010 year class are taken from the long-term geometric mean (1957-2008). Input to the short term forecast is presented in table 8.6.1. The management options are given in Tables 8.6.2A-B. Two management options are considered, each with a different assumed F value in the intermediate year: A) F is assumed to be equal to the estimate for F in the previous year ("F-status quo" or F_{sq}), B) F is set such that the landings in the intermediate year equal the TAC for that year. In previous years $0.9*F_{sq}$ has also been used as an option, matching the planned decrease in F following the management plan. However since F is now below the management plan target and is likely to increase, this option was no longer considered necessary. The table below shows the predicted F values in the intermediate year, SSB for 2012 and the corresponding landings for 2011, given the different assumptions about F in the intermediate year in the two scenarios.

Scenario	Assumption	F_{2012}	SSB_{2013}	$Landings_{2012}$
A	$F_{2012} = F_{2011}$ (Fsq)	0.23	628143 t	78501 t
B	$Landings_{2011} = TAC_{2011}$	0.25	618592 t	84410 t

The detailed tables for forecasts based on the two scenarios are given in Table 8.6.3A-B. ICES interprets the F for the intermediate year as the estimate of F for the year in which the assessment is carried out. Using this ICES rule of application scenario A is used as the basis for the forecast for advice.

Yield and SSB, per recruit, under the condition of the current exploitation pattern are given in Figure 8.6.1 and Table 8.6.4. F_{max} is estimated at 0.19.

8.7 Medium-term forecasts

No medium term projections were done for this stock.

8.8 Biological reference points

8.8.1 Precautionary approach reference points

The current precautionary approach reference points were established by the WGNSSK in 2004, when the discard estimates were included in the assessment for the first time. The stock-recruitment relationship for North Sea plaice did not show a clear breakpoint where recruitment is impaired at lower spawning stocks. Therefore,

ICES considered that $\mathbf{B_{lim}}$ can be set at $\mathbf{B_{loss}}$=160 000 t and that $\mathbf{B_{pa}}$ can then be set at 230 000 t using the default multiplier of 1.4 (although the WG acknowledges that, since the noisy discards estimates have been included, the uncertainty of the estimates of stock status is much greater than that, see Dickey-Collas et al. 2008). $\mathbf{F_{lim}}$ was set at $\mathbf{F_{loss}}$ (0.74). $\mathbf{F_{pa}}$ was proposed to be set at 0.6 which is the 5th percentile of $\mathbf{F_{loss}}$ and gave a 50% probability that SSB is around $\mathbf{B_{pa}}$ in the medium term. Equilibrium analysis suggests that F of 0.6 is consistent with an SSB of around 230 000 t.

8.8.2 F_{MSY} reference points

In 2010 ICES implemented the MSY framework for providing advice on the exploitation of stocks. The aim is to manage all stocks at an exploitation rate (F) that is consistent with maximum (high) long term yield while providing a low risk to the stock. In 2010 IMARES provided a thorough simulation Management Strategy Evaluation (MSE) of the EU management plan for sole and plaice in the North Sea (Council Regulation (EC) No 676/2007). This evaluation (Miller and Poos 2010) was approved by ICES as providing high long term yields while posing low risks of the stocks falling out of safe biological limits. This was followed by an STECF evaluation of the same plan (Simmonds et al. 2010) where again the plan was found to be precautionary while providing high long term yields. The report also included an additional equilibrium analysis approach to determining F_{MSY}, taking into account uncertainty in stock recruitment relationships. In light of these analyses revised MSY framework reference points, and ranges, for both sole and plaice in the North Sea were proposed. The WGNSSK concluded that F=0.25 is an appropriate value for F_{MSY} for North Sea plaice as it results in a high long term yield, with low risk to stock. In addition, it seems that any F value on the range 0.2-0.3 produces similarly high yields without increasing the risk to the stock. Therefore it is recommended that while MSY framework advice should be provided on the basis of F_{MSY}=0.25, the stock should be considered to be sustainably fished (e.g. in stock status tables) for any F on the range 0.2-0.3.

No changes to Fmsy reference points have been made this year.

8.9 Quality of the assessment

Large differences are found in the trends in tuning series over the last eight years for age groups 1-3. The more northern BTS-Tridens index indicates more positive trends than BTS-Isis and particularly the SNS. This suggests a large spatial heterogeneity of the stock which is either explained by increased northwards migration or a higher survival in the more northern region due to an overall decrease in fishery induced mortality. The spatial difference of the stock trends is corroborated by the area disaggregated LPUE estimates from the Dutch beam trawl fleet. However, the historic development of the stock abundance as estimated by XSA shows good correspondence with the development of the average commercial LPUE of the Dutch beam trawl fleet.

A strong retrospective analysis of the assessment shows considerable recurring bias (Figure 8.3.4), though this has decreased in the most recent years. This retrospective pattern is the result of the high 2006-2008 tuning indices in general, and the fact that the cohorts being estimated stronger by BTS Tridens than the other surveys now reach the age where the index receives a higher weighting in the assessment.

The assessment presented by the WG incorporates discards. WGNSSK noted in 2002 (ICES 2003) that not considering discard catches in stock assessments could introduce

bias and affect estimates of F and stock biomass, particularly when discard patterns vary over time (see also Dickey-Collas et. al. 2007). Currently fleet level discard estimates are available for the past nine years. However, total sampling effort of the discards is low, and data is sparse. Also, samples may not always be available from relevant fleets and fisheries within a country. Particularly the UK and Dutch >100mm fishery, comprising >20% of the landings is poorly sampled. Discard observation time series are lengthening allowing for better analysis of raising methods for discards data and estimation of previous discards patterns. Also, a new self-sampling discards programme has been initiated by the Dutch in 2009, aiming to improve the overall coverage of discards sampling in the biggest fleet fishing this stock.

8.10 Status of the Stock

SSB in 2010 is estimated around 461 thousand tonnes which is well above Bpa (230 000 t). Fishing mortality is estimated to have remained constant from 2009 to 2010 at a value of 0.24 (both below Fpa = 0.60), and is currently below the long term management target F of 0.30. Fishing mortality of the human consumption part of the catch is estimated to be 0.12. Projected landings for 2012 at Fsq are 71.5 kt, which is higher than to the projected landings for 2011 at Fsq (68.7 kt) which in turn is higher than the estimated landings of 2010 (62 kt). Projected discards for 2012 are somewhat lower than the projected discards for 2011 at Fsq, but this is mainly based on the estimates of the abundance of year classes 2010 and 2011 coming in. Therefore, development of discarding in the next couple of years will depend on the true size of these year classes.

8.11 Management Considerations

Plaice is mainly taken by beam trawlers in a mixed fishery with sole in the southern and central part of the North Sea. There are a number of EC regulations that affect the fisheries on plaice and sole in the North Sea, e.g. as a basis for setting the TAC, limiting effort, minimum landing size and minimum mesh size.

8.11.1 Multiannual plan

A multiannual plan for plaice and sole in the North Sea was adopted by the EU Council in 2007 (EC regulation 676/2007) describing two stages; of which the first stage should be deemed a recovery plan and its second stage a management plan. ICES has evaluated the plan (Miller and Poos 2010; Simmonds 2010; see section 8.8.2) and found it to be in agreement with the precautionary approach (ICES, 2010). This year's assessments confirms that the objectives of stage one are met, despite the fact that the SSB of sole in 2010 was perceived as slightly lower, bringing it just under Bpa (SSB in 2011 and 2012 are perceived at and above 35 kt respectively). Based on agreement between ICES secretariat and the European Commission the WGNSSK interpreted that the stipulated TAC setting procedure in the current plan should be used as the basis for the advice as a transitional measure. At the same time, WGNSSK urges that a process for conducting a full evaluation of the proposed amended management plan commences as soon as possible. See Section 19 (Management Plan Evaluations) for further details on the multi annual plan's objectives, TAC setting methodology and effort limitations.

8.11.2 Effort regulations

Regulated effort restrictions in the EU were introduced in 2003 (annexes to the annual TAC regulations) for the protection of the North Sea cod stock. In addition, a long-

term plan for the recovery of cod stocks was adopted in 2008 (EC regulation 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system (EC regulation 43/2009), in which different amounts of kW-days are allocated within each area by member state to different groups of vessels depending on gear and mesh size. Effort ceilings are updated annually. A minor part of the fleets exploiting sole, i.e. otter trawls (OTB) with a mesh size equal to or larger than 100 mm included in TR1, have since 2009 been affected by the regulation. The beam trawl fleet (BT2) was affected by this regulation only once in 2009 but not afterwards.

The overall fleet capacity and deployed effort of the North Sea beam trawl fleet has been substantially reduced since 1995 (see Table. 10.2.7), likely due to a number of reasons, including the above mentioned effort limitations for the recovery of the cod stock. 25 vessels were decommissioned in 2008.

8.11.3 Technical measures

Plaice is mainly taken by beam trawlers in a mixed fishery with sole in the southern and central part of the North Sea. Technical measures (EC Council Regulation 1543/2000) applicable to the mixed flatfish fishery affect both sole and plaice. The minimum mesh size of 80 mm in the beam trawl fishery selects sole at the minimum landing size (24 cm). However, this mesh size generates high discards of plaice which are selected from 17 cm with a minimum landing size of 27 cm. Recent discards estimates indicate fluctuations around 50% discards in weight. Mesh enlargement would reduce the catch of undersized plaice, but would also result in loss of marketable sole catches. The combination of effort regulations, high oil prices, and the constrained TAC for plaice (due to the 15% limitation in the multiannual plan) and the relatively stable TAC for sole have led to a more southern fishing pattern in the North Sea, where sole has become relatively more abundant. This concentration of fishing effort in the South has resulted in an increase in discarding of juvenile plaice that are mainly distributed in those areas. This process could be aggravated by the movement of juvenile plaice to deeper waters in recent years where they become more susceptible to the fishery.

A closed area has been in operation since 1989 (the plaice box) and since 1995 this area has been closed in all quarters. The closed area applies to vessels using towed gears, but vessels smaller than 300 HP are exempted from the regulation. An additional technical measure concerning the fishing gear is the restriction of the aggregated beam length of beam trawlers to 24 m. In the 12 nautical mile zone and in the plaice box the maximum aggregated beam-length is 9 m. The most recent EU funded evaluation by Beare *et al*. (2010) reported the Plaice Box as having very little negative or positive impact on the plaice stock

Fishing effort has been substantially reduced since 1995. The reduction in fishing effort appears to be reflected in recent estimates of fishing mortality. There are indications that technical efficiency has increased in this fishery, but these may have been counteracted by decreases in fishing efficiency resulting from reduced fishing speed in an attempt to reduce fuel consumption.

The stock dynamics are affected by the occurrence of strong year classes, but increased stock size in the more northern region of the North Sea is most likely the direct consequence of reduced fishing mortality in this region, given that no exceptionally strong year classes have been observed in recent years.

The mean age in the landings is currently around age 4, but used to be nearer to age 5 in the beginning of the time series. This change may be caused by the high exploita-

tion levels, but also by the shift in the spatial distribution of fishing effort towards inshore waters and by the shift in the spatial distribution of the fish. A lower exploitation level is expected to improve the survival of plaice, which could enhance the stability in the catches.

A shift in the age and size at maturation of plaice has been observed (Grift *et al.* 2003): plaice become mature at younger ages and at smaller sizes in recent years than in the past. There is a risk that this is caused by a genetic fisheries-induced change: those fish that are genetically programmed to mature late at large sizes are likely to have been removed from the population before they have had a chance to reproduce and pass on their genes. This results in a population that consists ever more of fish that are genetically programmed to mature early at small sizes. Reversal of such a genetic shift may be difficult. This shift in maturation also leads to mature fish being of a smaller size at age, because growth rate diminishes after maturation.

WGNSSK held a specific plaice sub-group during its 2011 meeting, aiming at clarifying the knowledge base of the identification and connectivity of the various plaice stocks or sub-populations distributed from the Baltic to the English Channel, and suggesting paths towards a more integrated regional assessment. There are indeed clear similarities in the issues experienced in the assessment of plaice stocks in areas VIIe and VIId, and in area IIIa. It is considered that the evaluation of the resident stocks in these small areas is hampered by their connectivity with the much larger stock of plaice in the North Sea (which itself may comprise more than one sub-population), which takes place both through migratory migrations in and out the small areas and through larval drift and homing behavior of juveniles. This issues was addressed, primarily with regards to plaice in the Skaggerak and Kategat, in 2012 at the WKPESTO working group. Stock structure within the North Sea itself remains uncertain.

8.12 References

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Table 8.2.1. North Sea Plaice. Nominal landings

YEAR	Belgium	Denmark	France	Germany	Nether-lands	Norway	Sweden	UK	Others	Total	Un-allocated	WG estimate	TAC
1980	7005	27057	711	4319	39782	15	7	23032		101928	38023	139951	
1981	6346	22026	586	3449	40049	18	3	21519		93996	45701	139697	105000
1982	6755	24532	1046	3626	41208	17	6	20740		97930	56616	154546	140000
1983	9716	18749	1185	2397	51328	15	22	17400		100812	43218	144030	164000
1984	11393	22154	604	2485	61478	16	13	16853		114996	41153	156149	182000
1985	9965	28236	1010	2197	90950	23	18	15912		148311	11527	159838	200000
1986	7232	26332	751	1809	74447	21	16	17294		127902	37445	165347	180000
1987	8554	21597	1580	1794	76612	12	7	20638		130794	22876	153670	150000
1988	11527	20259	1773	2566	77724	21	2	24497	43	138412	16063	154475	175000
1989	10939	23481	2037	5341	84173	321	12	26104		152408	17410	169818	185000
1990	13940	26474	1339	8747	78204	1756	169	25632		156261	-21	156240	180000
1991	14328	24356	508	7926	67945	560	103	27839		143565	4438	148003	175000
1992	12006	20891	537	6818	51064	836	53	31277		123482	1708	125190	175000
1993	10814	16452	603	6895	48552	827	7	31128		115278	1835	117113	175000
1994	7951	17056	407	5697	50289	524	6	27749		109679	713	110392	165000
1995	7093	13358	442	6329	44263	527	3	24395		96410	1946	98356	115000
1996	5765	11776	379	4780	35419	917	5	20992		80033	1640	81673	81000
1997	5223	13940	254	4159	34143	1620	10	22134		81483	1565	83048	91000
1998	5592	10087	489	2773	30541	965	2	19915	1	70365	1169	71534	87000
1999	6160	13468	624	3144	37513	643	4	17061		78617	2045	80662	102000
2000	7260	13408	547	4310	35030	883	3	20710		82151	-1001	81150	97000
2001	6369	13797	429	4739	33290	1926	3	19147		79700	2147	81847	78000
2002	4859	12552	548	3927	29081	1996	2	16740		69705	512	70217	77000
2003	4570	13742	343	3800	27353	1967	2	13892		65669	820	66489	73250
2004	4314	12123	231	3649	23662	1744	1	15284		61008	428	61436	61000
2005	3396	11385	112	3379	22271	1660	0	12705		54908	792	55700	59000
2006	3487	11907	132	3599	22764	1614	0	12429		55933	2010	57943	57441
2007	3866	8128	144	2643	21465	1224	4	11557		49031	713	49744	50261
2008	3396	8229	125	3138	20312	1051	20	11411		47682	1193	48875	49000
2009	3474	N/A*	N/A*	2931	29142	1116	1	13143		N/A*	-	54973	55500
2010	3699	435	383	3601	26689	1089	5	14765		50666	10008	60674	63825
2011	4466	11634	344	3812	29272	1223	3	15169		65923	1463	67386	73400
2012													84410

*** Official estimates not available.**

Table 8.2.2 . North Sea Plaice. landed numbers-at-age

Plaice in IV . landings.n
2012-04-29 12:42:33 units= thousands

year \ age	1	2	3	4	5	6	7	8	9	10
1957	0	4315	59818	44718	31771	8885	11029	9028	4973	10859
1958	0	7129	22205	62047	34112	19594	8178	8000	6110	13148
1959	0	16556	30427	25489	41099	22936	13873	6408	6596	16180
1960	0	5959	61876	51022	21321	27329	14186	9013	5087	15153
1961	0	2264	33392	67906	32699	12759	14680	9748	5996	14660
1962	0	2147	35876	66779	50060	20628	9060	9035	5257	12801
1963	0	4340	21471	76926	54364	31799	12848	6833	7047	16592
1964	0	14708	40486	64735	57408	37091	15819	6595	3980	16886
1965	0	9858	42202	53188	43674	30151	18361	8554	4213	17587
1966	0	4144	65009	51488	36667	27370	16500	10784	6467	14928
1967	0	5982	30304	112917	41383	22053	16175	8004	6728	11175
1968	0	9474	40698	38140	123619	17139	10341	10102	3925	13365
1969	3	15017	45187	36084	35585	102014	10410	6086	8192	16092
1970	76	17294	51174	56153	40686	35074	78886	6311	4185	14840
1971	19	29591	48282	33475	26059	22903	16913	29730	6414	16910
1972	2233	36528	62199	52906	23043	16998	14380	10903	18585	15651
1973	1268	31733	59099	73065	42255	13817	8885	9848	6084	23978
1974	2223	23120	55548	42125	41075	19666	8005	6321	5568	21980
1975	981	28124	61623	31262	25419	21188	11873	5923	4106	19695
1976	2820	33643	77649	96398	13779	9904	9120	6391	2947	12552
1977	3220	56969	43289	66013	83705	9142	5912	5022	4061	9191
1978	1143	60578	62343	54341	50102	35510	5940	3352	2419	7468
1979	1318	58031	118863	48962	47886	39932	24228	4161	2807	9288
1980	979	64904	133741	77523	24974	17982	13761	8458	1864	5377
1981	253	100927	122296	57604	35745	12414	9564	8092	4874	5903
1982	3334	47776	209007	69544	28655	16726	7589	5470	4482	8653
1983	1214	119695	115034	99076	29359	12906	8216	4193	3013	8287
1984	108	63252	274209	53549	37468	13661	6465	5544	2720	6565
1985	121	73552	144316	185203	32520	15544	6871	3650	2698	5798
1986	1674	67125	163717	93801	84479	24049	9299	4490	2733	6950
1987	0	85123	115951	111239	64758	34728	11452	4341	2154	5478
1988	0	15146	250675	74335	47380	25091	16774	5381	3162	6233
1989	1261	46757	105929	231414	52909	19247	10567	7561	2120	5580
1990	1550	32533	97766	110997	159814	26757	8129	4216	3451	3808
1991	1461	43266	83603	116155	72961	77557	14910	5233	3141	5591
1992	3410	43954	85120	72494	72703	33406	29547	6970	3200	6928
1993	3461	53949	98375	72286	51405	29001	13472	11272	3645	5883
1994	1394	45148	101617	80236	38542	20388	15323	6399	5368	5433
1995	7751	36575	81398	78370	36499	17953	9772	4366	2336	3753
1996	1104	42496	64382	46359	32130	14460	10605	4528	2624	4892
1997	892	42855	86948	43669	22541	13518	6362	3632	2179	4181
1998	196	30401	68920	56329	16713	6432	4986	2506	1761	3119
1999	549	8689	155971	39857	24112	6829	2783	2246	1521	3093
2000	2634	15819	39550	164330	14993	9343	2130	1030	940	2097
2001	4509	35886	52480	48238	89949	6836	4418	1127	637	2309
2002	1233	15596	58262	48361	36551	37877	4644	1788	742	1586
2003	694	42594	47802	48894	27126	15999	17069	1608	650	859
2004	543	10317	102332	35165	20527	11293	4787	4555	412	540
2005	2937	16685	26069	82278	17039	9533	5332	2614	2223	613
2006	355	18987	67465	25254	42525	6555	4967	2053	1235	1319
2007	1286	19205	37309	47053	14971	17142	2459	1856	543	1259
2008	380	10970	42865	37970	29476	5700	6752	912	673	896
2009	1492	10726	50436	33911	20969	16551	2987	3967	556	763
2010	2026	17947	39555	58341	21827	11739	9414	1763	2429	1243
2011	238	10354	42255	57233	48186	13549	6561	7055	1238	2816

Table 8.2.3 . North Sea Plaice. Discards numbers-at-age

Plaice in IV . discards.n
2012-05-01 16:53:13 units= thousands

year \ age	1	2	3	4	5	6	7	8	9	10
1957	32356	45596	9220	909	961	25	0	0	0	0
1958	66199	73552	23655	2572	2137	65	0	0	0	0
1959	116086	127771	46402	11407	4737	106	0	0	0	0
1960	73939	167893	44948	997	1067	519	0	0	0	0
1961	75578	144609	89014	538	1612	130	0	0	0	0
1962	51265	181321	87599	21716	799	186	0	0	0	0
1963	90913	136183	129778	9964	2112	188	0	0	0	0
1964	66035	153274	64156	33825	3011	323	0	0	0	0
1965	43708	426021	59262	3404	923	267	0	0	0	0
1966	38496	163125	349358	14399	1402	125	0	0	0	0
1967	20199	133545	87532	152496	623	260	0	0	0	0
1968	73971	72192	46339	26530	22436	58	0	0	0	0
1969	85192	67378	16747	19334	773	2024	0	0	0	0
1970	123569	152480	27747	1287	5061	161	0	0	0	0
1971	69337	96968	42354	2675	426	81	0	0	0	0
1972	70002	55470	33899	5714	567	73	0	0	0	0
1973	132352	49815	4008	673	1289	67	0	0	0	0
1974	211139	308411	3652	285	611	109	0	0	0	0
1975	244969	280130	190536	4807	253	123	0	0	0	0
1976	183879	140921	71054	18013	174	41	0	0	0	0
1977	256628	103696	79317	33552	9317	129	0	0	0	0
1978	226872	154113	27257	10775	1244	570	0	0	0	0
1979	293166	215084	57578	18382	589	310	0	0	0	0
1980	226371	122561	932	687	193	86	0	0	0	0
1981	134142	193241	1850	373	431	55	0	0	0	0
1982	411307	204572	4624	1109	216	98	0	0	0	0
1983	261400	436331	30716	2235	804	72	0	0	0	0
1984	310675	313490	52651	24529	1492	69	0	0	0	0
1985	405385	229208	35566	2221	200	78	0	0	0	0
1986	1117345	490965	48510	26470	1451	146	0	0	0	0
1987	361519	1374202	180969	1427	1348	248	0	0	0	0
1988	348597	608109	459385	61167	882	177	0	0	0	0
1989	213291	485845	193176	85758	7224	115	0	0	0	0
1990	145314	279298	168674	28102	5011	177	0	0	0	0
1991	183126	301575	141567	40739	5528	939	0	0	0	0
1992	138755	219619	94581	34348	4307	880	0	0	0	0
1993	96371	154083	48088	11966	1635	216	0	0	0	0
1994	62122	95703	35703	1038	822	144	0	0	0	0
1995	118863	82676	15753	860	663	120	0	0	0	0
1996	111250	331065	27606	3930	451	116	0	0	0	0
1997	128653	510918	193828	588	271	108	0	0	0	0
1998	104538	646250	191631	53354	297	33	0	0	0	0
1999	127321	208401	231769	54869	278	58	0	0	0	0
2000	103468	171213	51092	64971	1230	241	263	167	0	0
2001	30346	352452	186900	74744	54276	152	45	1	0	0
2002	309822	177574	76246	12113	1571	661	107	1	0	0
2003	67718	517641	52582	19130	3843	386	5751	1	0	0
2004	232936	179561	115746	6614	1047	232	37	1	0	0
2005	93585	324744	43297	19440	4098	5968	147	1	0	0
2006	220501	223814	107163	9129	2324	249	732	194	0	0
2007	77239	203775	66539	8999	736	6972	170	1644	0	0
2008	135339	251389	34997	4568	1644	328	8845	885	0	0
2009	148639	191957	66063	9165	1973	1106	136	3220	0	0
2010	165914	177912	58279	22582	2672	1726	2073	281	0	0
2011	117296	150354	60525	36447	12789	2920	143	2273	0	0

Table 8.2.4 . North Sea Plaice. Catch numbers-at-age

Plaice in IV . catch.n
2012-04-29 12:43:04 units= thousands

year \ age	1	2	3	4	5	6	7	8	9	10
1957	32356	49911	69038	45627	32732	8910	11029	9028	4973	10859
1958	66199	80681	45860	64619	36249	19659	8178	8000	6110	13148
1959	116086	144327	76829	36896	45836	23042	13873	6408	6596	16180
1960	73939	173852	106824	52019	22388	27848	14186	9013	5087	15153
1961	75578	146873	122406	68444	34311	12889	14680	9748	5996	14660
1962	51265	183468	123475	88495	50859	20814	9060	9035	5257	12801
1963	90913	140523	151249	86890	56476	31987	12848	6833	7047	16592
1964	66035	167982	104642	98560	60419	37414	15819	6595	3980	16886
1965	43708	435879	101464	56592	44597	30418	18361	8554	4213	17587
1966	38496	167269	414367	65887	38069	27495	16500	10784	6467	14928
1967	20199	139527	117836	265413	42006	22313	16175	8004	6728	11175
1968	73971	81666	87037	64670	146055	17197	10341	10102	3925	13365
1969	85195	82395	61934	55418	36358	104038	10410	6086	8192	16092
1970	123645	169774	78921	57440	45747	35235	78886	6311	4185	14840
1971	69356	126559	90636	36150	26485	22984	16913	29730	6414	16910
1972	72235	91998	96098	58620	23610	17071	14380	10903	18585	15651
1973	133620	81548	63107	73738	43544	13884	8885	9848	6084	23978
1974	213362	331531	59200	42410	41686	19775	8005	6321	5568	21980
1975	245950	308254	252159	36069	25672	21311	11873	5923	4106	19695
1976	186699	174564	148703	114411	13953	9945	9120	6391	2947	12552
1977	259848	160665	122606	99565	93022	9271	5912	5022	4061	9191
1978	228015	214691	89600	65116	51346	36080	5940	3352	2419	7468
1979	294484	273115	176441	67344	48475	40242	24228	4161	2807	9288
1980	227350	187465	134673	78210	25167	18068	13761	8458	1864	5377
1981	134395	294168	124146	57977	36176	12469	9564	8092	4874	5903
1982	414641	252348	213631	70653	28871	16824	7589	5470	4482	8653
1983	262614	556026	145750	101311	30163	12978	8216	4193	3013	8287
1984	310783	376742	326860	78078	38960	13730	6465	5544	2720	6565
1985	405506	302760	179882	187424	32720	15622	6871	3650	2698	5798
1986	1119019	558090	212227	120271	85930	24195	9299	4490	2733	6950
1987	361519	1459325	296920	112666	66106	34976	11452	4341	2154	5478
1988	348597	623255	710060	135502	48262	25268	16774	5381	3162	6233
1989	214552	532602	299105	317172	60133	19362	10567	7561	2120	5580
1990	146864	311831	266440	139099	164825	26934	8129	4216	3451	3808
1991	184587	344841	225170	156894	78489	78496	14910	5233	3141	5591
1992	142165	263573	179701	106842	77010	34286	29547	6970	3200	6928
1993	99832	208032	146463	84252	53040	29217	13472	11272	3645	5883
1994	63516	140851	137320	81274	39364	20532	15323	6399	5368	5433
1995	126614	119251	97151	79230	37162	18073	9772	4366	2336	3753
1996	112354	373561	91988	50289	32581	14576	10605	4528	2624	4892
1997	129545	553773	280776	44257	22812	13626	6362	3632	2179	4181
1998	104734	676651	260551	109683	17010	6465	4986	2506	1761	3119
1999	127870	217090	387740	94726	24390	6887	2783	2246	1521	3093
2000	106102	187032	90642	229301	16223	9584	2393	1197	940	2097
2001	34855	388338	239380	122982	144225	6988	4463	1128	637	2309
2002	311055	193170	134508	60474	38122	38538	4751	1789	742	1586
2003	68412	560235	100384	68024	30969	16385	22820	1609	650	859
2004	233479	189878	218078	41779	21574	11525	4824	4556	412	540
2005	96522	341429	69366	101718	21137	15501	5479	2615	2223	613
2006	220856	242801	174628	34383	44849	6804	5699	2247	1235	1319
2007	78525	222980	103848	56052	15707	24114	2629	3500	543	1259
2008	135719	262359	77862	42538	31120	6028	15597	1797	673	896
2009	150131	202683	116499	43076	22942	17657	3123	7187	556	763
2010	167940	195859	97834	80923	24499	13465	11487	2044	2429	1243
2011	117534	160708	102780	93680	60975	16469	6704	9328	1238	2816

Table 8.2.5. 50% of Q1 plaice landings in the eastern Channel (VIId). Assumed to be migrants from the North Sea stock (see text). Landing numbers-at-age.

Plaice in IV. 50% of Q1 VIId catches.

year	age 1	2	3	units= 4	thousands 5	6	7	8	9	10
1980	0	237	288	136	127.5	19	12	11.5	1	24
1981	0	219.5	1349	605	75.5	40.5	14	10.5	14.5	46.5
1982	0	124.5	1372	833	198	52.5	26	16.5	5	20.5
1983	0	272	635	1490.5	241.5	58	24.5	31.5	1	23.5
1984	0	167.5	1451.5	710	486.5	136	64	26.5	8.5	23
1985	0	513	1230.5	1231.5	107	156	44.5	25.5	35.5	11.5
1986	0	438	1396.5	924	379	143.5	68.5	18	5	8
1987	0	762.5	1490.5	875.5	326.5	110	119.5	39.5	27.5	18
1988	0	449.5	3735.5	1236	290	138	118.5	32.5	27.5	40
1989	0	326	1435	2384.5	694	150.5	78	46	21	45.5
1990	0	236	1736	1509.5	936	204.5	65.5	52.5	46	53.5
1991	0	525.5	1081.5	1141.5	633	429.5	77	31	29	28.5
1992	0	555.5	883.5	434.5	308.5	267	188.5	52	30	27.5
1993	0	682	758	317.5	141	119.5	90	74	26.5	35.5
1994	0	325.5	1383.5	785	220.5	107	84	69	71	72
1995	0	389	582.5	738.5	239.5	58.5	75	58	31	59.5
1996	0	434.5	716	390.5	373	125	48.5	45.5	42.5	80.5
1997	0	399.5	1458.5	843	274	189.5	124.5	49	28	76.5
1998	0	393.5	1687	868.5	136.5	37.5	43.5	22	15.5	48
1999	0	109	2338.5	1504	267	38.5	22.5	23	8	18
2000	0	191	1236	2603.5	692.5	121	30.5	9.5	14.5	28
2001	0	454.5	1147.5	606	563	82.5	18.5	5.5	3	15
2002	0	1680.5	926.5	414.5	323.5	219.5	55.5	17	5.5	18.5
2003	0	428	983.5	483	116	84	94.5	22.5	13.5	16.5
2004	0	473	1190.5	210.5	111.5	36	34.5	30.5	9	12
2005	0	132.5	702	655.5	122	51	28	24	14.5	12.5
2006	0	340.5	543.5	337.5	211.5	44.5	21	22.5	23	16
2007	0	131	522.5	475	243.5	186.5	51	14.5	5	22
2008	0	366	545.5	455	143.5	75.5	88.5	1.5	2	3
2009	0	373	690	163.5	116.5	53	32	9.5	3	11
2010	0	346.5	603	342	88.5	67.5	24	14	6	9.5
2011	5.5	472.5	699.5	262.5	199	30	6	11	2	8.5

Table 8.2.6. North Sea plaice. Catch numbers-at-age including 50% of Q1 landings in the eastern channel (VIId). Final catch estimates used in the assessment of the stock.

Plaice in IV (+ 50% Q1 VIId) . catch.n
2012-05-01 16:53:27 units= thousands

year \ age	1	2	3	4	5	6	7	8	9	10
1957	32356	49911	69038	45627	32732	8910	11029	9028	4973	10859
1958	66199	80681	45860	64619	36249	19659	8178	8000	6110	13148
1959	116086	144327	76829	36896	45836	23042	13873	6408	6596	16180
1960	73939	173852	106824	52019	22388	27848	14186	9013	5087	15153
1961	75578	146873	122406	68444	34311	12889	14680	9748	5996	14660
1962	51265	183468	123475	88495	50859	20814	9060	9035	5257	12801
1963	90913	140523	151249	86890	56476	31987	12848	6833	7047	16592
1964	66035	167982	104642	98560	60419	37414	15819	6595	3980	16886
1965	43708	435879	101464	56592	44597	30418	18361	8554	4213	17587
1966	38496	167269	414367	65887	38069	27495	16500	10784	6467	14928
1967	20199	139527	117836	265413	42006	22313	16175	8004	6728	11175
1968	73971	81666	87037	64670	146055	17197	10341	10102	3925	13365
1969	85195	82395	61934	55418	36358	104038	10410	6086	8192	16092
1970	123645	169774	78921	57440	45747	35235	78886	6311	4185	14840
1971	69356	126559	90636	36150	26485	22984	16913	29730	6414	16910
1972	72235	91998	96098	58620	23610	17071	14380	10903	18585	15651
1973	133620	81548	63107	73738	43544	13884	8885	9848	6084	23978
1974	213362	331531	59200	42410	41686	19775	8005	6321	5568	21980
1975	245950	308254	252159	36069	25672	21311	11873	5923	4106	19695
1976	186699	174564	148703	114411	13953	9945	9120	6391	2947	12552
1977	259848	160665	122606	99565	93022	9271	5912	5022	4061	9191
1978	228015	214691	89600	65116	51346	36080	5940	3352	2419	7468
1979	294484	273115	176441	67344	48475	40242	24228	4161	2807	9288
1980	227350	187702	134961	78346	25295	18087	13773	8470	1865	5401
1981	134395	294388	125495	58582	36252	12510	9578	8103	4889	5950
1982	414641	252473	215003	71486	29069	16877	7615	5487	4487	8674
1983	262614	556298	146385	102802	30405	13036	8241	4225	3014	8311
1984	310783	376910	328312	78788	39447	13866	6529	5571	2729	6588
1985	405506	303273	181113	188656	32827	15778	6916	3676	2734	5810
1986	1119019	558528	213624	121195	86309	24339	9368	4508	2738	6958
1987	361519	1460088	298411	113542	66433	35086	11572	4381	2182	5496
1988	348597	623705	713796	136738	48552	25406	16893	5414	3190	6273
1989	214552	532928	300540	319557	60827	19513	10645	7607	2141	5626
1990	146864	312067	268176	140609	165761	27139	8195	4269	3497	3862
1991	184587	345367	226252	158036	79122	78926	14987	5264	3170	5620
1992	142165	264129	180585	107277	77319	34553	29736	7022	3230	6956
1993	99832	208714	147221	84570	53181	29337	13562	11346	3672	5919
1994	63516	141177	138704	82059	39585	20639	15407	6468	5439	5505
1995	126614	119640	97734	79969	37402	18132	9847	4424	2367	3813
1996	112354	373996	92704	50680	32954	14701	10654	4574	2667	4973
1997	129545	554173	282235	45100	23086	13816	6487	3681	2207	4258
1998	104734	677045	262238	110552	17147	6503	5030	2528	1777	3167
1999	127870	217199	390079	96230	24657	6926	2806	2269	1529	3111
2000	106102	187223	91878	231905	16916	9705	2424	1207	955	2125
2001	34855	388793	240528	123588	144788	7071	4482	1134	640	2324
2002	311055	194851	135435	60889	38446	38758	4807	1806	748	1605
2003	68412	560663	101368	68507	31085	16469	22915	1632	664	876
2004	233479	190351	219269	41990	21686	11561	4859	4587	421	552
2005	96522	341562	70068	102374	21259	15552	5507	2639	2238	626
2006	220856	243142	175172	34721	45061	6849	5720	2270	1258	1335
2007	78525	223111	104371	56527	15951	24301	2680	3515	548	1281
2008	135719	262725	78408	42993	31264	6104	15686	1799	675	899
2009	150131	203056	117189	43240	23059	17710	3155	7197	559	774
2010	167940	196206	98437	81265	24588	13533	11511	2058	2435	1253
2011	117540	161181	103480	93943	61174	16499	6710	9339	1240	2825

Table 8.2.7. North Sea plaice. Stock weight-at-age

Plaice in IV . stock.wt

2012-05-01 16:53:41 units= kg

	age									
year	1	2	3	4	5	6	7	8	9	10
1957	0.038	0.102	0.157	0.242	0.325	0.485	0.719	0.682	0.844	1.143
1958	0.041	0.093	0.180	0.272	0.303	0.442	0.577	0.778	0.793	1.112
1959	0.045	0.106	0.173	0.264	0.329	0.470	0.650	0.686	0.908	1.042
1960	0.038	0.111	0.181	0.272	0.364	0.469	0.633	0.726	0.845	1.090
1961	0.037	0.098	0.185	0.306	0.337	0.483	0.579	0.691	0.779	1.067
1962	0.036	0.096	0.173	0.301	0.424	0.573	0.684	0.806	0.873	1.303
1963	0.041	0.103	0.176	0.273	0.378	0.540	0.663	0.788	0.882	1.252
1964	0.024	0.113	0.184	0.296	0.373	0.477	0.645	0.673	0.845	1.232
1965	0.031	0.068	0.198	0.294	0.333	0.430	0.516	0.601	0.722	0.909
1966	0.031	0.099	0.127	0.305	0.403	0.455	0.503	0.565	0.581	0.984
1967	0.029	0.104	0.179	0.205	0.442	0.528	0.585	0.650	0.703	0.985
1968	0.055	0.094	0.175	0.287	0.344	0.532	0.592	0.362	0.667	0.887
1969	0.047	0.158	0.188	0.266	0.344	0.390	0.565	0.621	0.679	0.857
1970	0.043	0.113	0.236	0.274	0.369	0.410	0.468	0.636	0.732	0.896
1971	0.051	0.109	0.251	0.344	0.413	0.489	0.512	0.583	0.696	0.877
1972	0.056	0.158	0.218	0.407	0.473	0.534	0.579	0.606	0.655	0.929
1973	0.037	0.134	0.237	0.308	0.468	0.521	0.566	0.583	0.617	0.804
1974	0.049	0.105	0.217	0.416	0.437	0.524	0.570	0.629	0.652	0.852
1975	0.063	0.141	0.187	0.388	0.483	0.544	0.610	0.668	0.704	0.943
1976	0.082	0.169	0.226	0.308	0.484	0.550	0.593	0.658	0.694	0.931
1977	0.064	0.184	0.265	0.311	0.405	0.551	0.627	0.690	0.667	0.938
1978	0.064	0.151	0.319	0.373	0.411	0.467	0.547	0.630	0.704	0.943
1979	0.062	0.179	0.258	0.365	0.414	0.459	0.543	0.667	0.764	1.004
1980	0.049	0.163	0.289	0.428	0.444	0.524	0.582	0.651	0.778	1.058
1981	0.041	0.140	0.239	0.421	0.473	0.536	0.570	0.624	0.707	1.031
1982	0.048	0.128	0.250	0.351	0.490	0.589	0.631	0.679	0.726	0.981
1983	0.045	0.128	0.242	0.381	0.494	0.559	0.624	0.712	0.754	0.917
1984	0.048	0.129	0.216	0.413	0.464	0.571	0.649	0.692	0.787	1.028
1985	0.048	0.146	0.232	0.320	0.452	0.536	0.635	0.656	0.764	1.011
1986	0.043	0.126	0.245	0.311	0.440	0.533	0.692	0.779	0.888	1.092
1987	0.036	0.105	0.200	0.383	0.401	0.503	0.573	0.711	0.747	0.984
1988	0.036	0.097	0.172	0.264	0.426	0.467	0.547	0.644	0.706	0.973
1989	0.039	0.101	0.192	0.247	0.362	0.484	0.553	0.616	0.759	0.883
1990	0.043	0.108	0.176	0.261	0.343	0.422	0.555	0.647	0.701	0.969
1991	0.048	0.131	0.184	0.260	0.342	0.401	0.463	0.633	0.652	0.826
1992	0.043	0.121	0.199	0.270	0.318	0.403	0.500	0.573	0.683	0.833
1993	0.050	0.119	0.208	0.315	0.330	0.391	0.490	0.587	0.633	0.811
1994	0.053	0.141	0.214	0.290	0.360	0.404	0.462	0.533	0.653	0.797
1995	0.050	0.142	0.254	0.336	0.399	0.448	0.509	0.584	0.678	0.804
1996	0.044	0.117	0.229	0.368	0.390	0.462	0.488	0.554	0.660	0.815
1997	0.035	0.115	0.233	0.359	0.439	0.492	0.521	0.543	0.627	0.850
1998	0.038	0.081	0.207	0.333	0.474	0.577	0.581	0.648	0.656	0.809
1999	0.044	0.091	0.150	0.319	0.437	0.524	0.586	0.644	0.664	0.779
2000	0.051	0.106	0.165	0.219	0.408	0.467	0.649	0.695	0.656	0.786
2001	0.061	0.122	0.202	0.233	0.331	0.452	0.560	0.641	0.798	0.830
2002	0.048	0.118	0.213	0.301	0.319	0.403	0.446	0.612	0.685	0.872
2003	0.057	0.111	0.227	0.269	0.344	0.391	0.464	0.600	0.714	0.790
2004	0.047	0.116	0.201	0.306	0.384	0.430	0.489	0.495	0.780	0.876
2005	0.053	0.106	0.216	0.237	0.378	0.422	0.434	0.527	0.621	1.006
2006	0.052	0.130	0.190	0.316	0.354	0.424	0.439	0.506	0.583	0.730
2007	0.047	0.093	0.235	0.238	0.337	0.394	0.458	0.412	0.526	0.548
2008	0.048	0.114	0.196	0.274	0.355	0.429	0.484	0.627	0.598	0.730
2009	0.052	0.114	0.194	0.344	0.373	0.412	0.472	0.540	0.565	0.632
2010	0.053	0.116	0.179	0.340	0.361	0.401	0.448	0.572	0.568	0.644
2011	0.039	0.100	0.187	0.209	0.355	0.483	0.438	0.422	0.530	0.552

Table 8.2.8. North Sea plaice. Landings weight-at-age

Plaice in IV . landings.wt
2012-05-01 16:53:55 units= kg

year	1	2	3	4	5	6	7	8	9	10
1957	0.000	0.183	0.223	0.287	0.392	0.506	0.592	0.654	0.440	1.108
1958	0.000	0.211	0.235	0.275	0.358	0.482	0.546	0.654	0.707	1.055
1959	0.000	0.223	0.251	0.299	0.370	0.483	0.605	0.637	0.766	1.021
1960	0.000	0.201	0.238	0.291	0.389	0.488	0.605	0.688	0.729	1.101
1961	0.000	0.194	0.237	0.307	0.418	0.517	0.613	0.681	0.825	1.088
1962	0.000	0.204	0.240	0.290	0.387	0.523	0.551	0.669	0.751	1.090
1963	0.000	0.258	0.292	0.325	0.407	0.543	0.636	0.680	0.729	1.048
1964	0.000	0.252	0.275	0.314	0.391	0.491	0.633	0.705	0.743	1.012
1965	0.000	0.243	0.284	0.323	0.387	0.474	0.542	0.667	0.730	0.892
1966	0.000	0.236	0.275	0.354	0.444	0.493	0.569	0.635	0.703	0.950
1967	0.000	0.237	0.285	0.328	0.433	0.558	0.609	0.675	0.753	0.998
1968	0.000	0.275	0.307	0.341	0.377	0.532	0.607	0.613	0.706	0.937
1969	0.230	0.311	0.328	0.352	0.380	0.436	0.606	0.693	0.696	0.945
1970	0.307	0.279	0.310	0.347	0.408	0.432	0.486	0.655	0.725	0.869
1971	0.264	0.329	0.368	0.416	0.463	0.531	0.560	0.627	0.722	0.920
1972	0.253	0.304	0.362	0.440	0.507	0.556	0.625	0.664	0.693	0.965
1973	0.286	0.332	0.361	0.426	0.511	0.566	0.636	0.659	0.711	0.884
1974	0.296	0.322	0.367	0.420	0.494	0.574	0.631	0.719	0.733	0.960
1975	0.265	0.319	0.351	0.446	0.526	0.624	0.676	0.747	0.832	1.082
1976	0.272	0.302	0.347	0.385	0.526	0.609	0.657	0.723	0.760	1.005
1977	0.254	0.324	0.354	0.381	0.419	0.557	0.648	0.722	0.716	0.980
1978	0.235	0.304	0.356	0.383	0.422	0.473	0.587	0.662	0.748	0.916
1979	0.235	0.310	0.348	0.387	0.428	0.473	0.549	0.674	0.795	0.959
1980	0.241	0.290	0.349	0.407	0.480	0.553	0.596	0.672	0.783	1.027
1981	0.241	0.279	0.335	0.423	0.514	0.567	0.614	0.653	0.737	1.023
1982	0.280	0.263	0.313	0.426	0.517	0.611	0.667	0.716	0.742	0.988
1983	0.199	0.248	0.298	0.380	0.511	0.599	0.672	0.765	0.809	0.976
1984	0.229	0.259	0.278	0.369	0.483	0.603	0.672	0.713	0.823	1.017
1985	0.242	0.259	0.284	0.330	0.452	0.565	0.664	0.714	0.787	1.000
1986	0.218	0.266	0.300	0.343	0.420	0.482	0.667	0.742	0.843	1.001
1987	0.219	0.246	0.297	0.347	0.397	0.498	0.576	0.720	0.820	0.978
1988	0.217	0.250	0.274	0.346	0.446	0.504	0.598	0.688	0.800	0.998
1989	0.232	0.275	0.304	0.327	0.386	0.524	0.593	0.659	0.779	0.926
1990	0.267	0.280	0.293	0.312	0.360	0.440	0.588	0.681	0.749	0.986
1991	0.219	0.276	0.283	0.295	0.352	0.438	0.509	0.647	0.720	0.887
1992	0.247	0.259	0.285	0.313	0.335	0.418	0.522	0.595	0.703	0.875
1993	0.244	0.267	0.283	0.319	0.348	0.414	0.507	0.617	0.705	0.837
1994	0.223	0.256	0.278	0.330	0.387	0.437	0.489	0.595	0.713	0.881
1995	0.270	0.275	0.299	0.336	0.400	0.451	0.525	0.607	0.730	0.902
1996	0.237	0.276	0.303	0.350	0.414	0.479	0.492	0.581	0.710	0.845
1997	0.206	0.268	0.310	0.360	0.452	0.519	0.597	0.610	0.676	0.913
1998	0.149	0.255	0.305	0.387	0.488	0.596	0.622	0.683	0.688	0.896
1999	0.241	0.248	0.275	0.349	0.447	0.537	0.619	0.670	0.739	0.797
2000	0.221	0.258	0.275	0.304	0.418	0.484	0.662	0.687	0.727	0.858
2001	0.236	0.264	0.289	0.306	0.361	0.477	0.586	0.701	0.787	0.793
2002	0.232	0.259	0.283	0.310	0.341	0.436	0.501	0.678	0.746	0.882
2003	0.227	0.248	0.281	0.319	0.363	0.405	0.477	0.640	0.750	0.838
2004	0.212	0.245	0.280	0.325	0.394	0.433	0.505	0.552	0.789	0.861
2005	0.267	0.262	0.277	0.327	0.385	0.427	0.463	0.545	0.603	0.889
2006	0.257	0.272	0.289	0.338	0.399	0.409	0.475	0.489	0.533	0.754
2007	0.262	0.267	0.303	0.346	0.378	0.452	0.539	0.481	0.591	0.617
2008	0.247	0.265	0.306	0.342	0.403	0.453	0.538	0.726	0.640	0.637
2009	0.183	0.273	0.326	0.375	0.435	0.501	0.553	0.632	0.695	0.824
2010	0.209	0.266	0.307	0.349	0.418	0.470	0.509	0.619	0.679	0.640
2011	0.207	0.215	0.264	0.323	0.393	0.484	0.572	0.492	0.529	0.763

Table 8.2.9. North Sea plaice. Discards weight-at-age

Plaice in IV . discards.wt
2012-05-01 16:54:09 units= kg

year	age 1	2	3	4	5	6	7	8	9	10
1957	0.044	0.104	0.146	0.181	0.206	0.244	0.244	0.231	0	0
1958	0.047	0.096	0.158	0.188	0.200	0.244	0.000	0.000	0	0
1959	0.051	0.107	0.155	0.186	0.197	0.231	0.000	0.000	0	0
1960	0.045	0.112	0.159	0.188	0.204	0.212	0.244	0.000	0	0
1961	0.044	0.100	0.160	0.194	0.204	0.220	0.220	0.000	0	0
1962	0.042	0.098	0.155	0.193	0.213	0.221	0.221	0.231	0	0
1963	0.048	0.105	0.156	0.188	0.205	0.231	0.221	0.231	0	0
1964	0.032	0.114	0.160	0.192	0.204	0.221	0.244	0.231	0	0
1965	0.038	0.072	0.166	0.192	0.212	0.221	0.231	0.000	0	0
1966	0.038	0.101	0.125	0.194	0.205	0.231	0.231	0.244	0	0
1967	0.036	0.105	0.158	0.169	0.220	0.220	0.244	0.244	0	0
1968	0.060	0.096	0.156	0.191	0.192	0.244	0.220	0.000	0	0
1969	0.052	0.146	0.162	0.186	0.211	0.212	0.000	0.231	0	0
1970	0.049	0.114	0.179	0.189	0.196	0.000	0.220	0.231	0	0
1971	0.057	0.110	0.183	0.200	0.212	0.000	0.000	0.231	0	0
1972	0.061	0.147	0.173	0.211	0.211	0.244	0.000	0.000	0	0
1973	0.043	0.131	0.179	0.195	0.211	0.244	0.000	0.000	0	0
1974	0.054	0.106	0.173	0.212	0.220	0.231	0.244	0.000	0	0
1975	0.068	0.136	0.162	0.206	0.221	0.244	0.244	0.000	0	0
1976	0.085	0.153	0.176	0.195	0.220	0.000	0.244	0.000	0	0
1977	0.069	0.160	0.186	0.196	0.198	0.220	0.000	0.000	0	0
1978	0.069	0.143	0.197	0.205	0.211	0.213	0.231	0.000	0	0
1979	0.066	0.158	0.185	0.204	0.220	0.231	0.221	0.244	0	0
1980	0.055	0.149	0.191	0.212	0.231	0.000	0.000	0.000	0	0
1981	0.048	0.135	0.179	0.212	0.220	0.000	0.000	0.000	0	0
1982	0.054	0.126	0.182	0.203	0.231	0.244	0.244	0.000	0	0
1983	0.051	0.126	0.180	0.205	0.211	0.244	0.000	0.000	0	0
1984	0.053	0.127	0.172	0.211	0.205	0.000	0.244	0.000	0	0
1985	0.054	0.139	0.177	0.197	0.231	0.244	0.000	0.000	0	0
1986	0.049	0.124	0.181	0.196	0.220	0.244	0.244	0.000	0	0
1987	0.043	0.105	0.166	0.205	0.220	0.231	0.000	0.000	0	0
1988	0.043	0.098	0.153	0.185	0.220	0.244	0.000	0.000	0	0
1989	0.046	0.102	0.163	0.181	0.196	0.000	0.000	0.000	0	0
1990	0.051	0.111	0.157	0.186	0.212	0.231	0.000	0.000	0	0
1991	0.055	0.130	0.161	0.185	0.203	0.221	0.231	0.231	0	0
1992	0.050	0.122	0.167	0.188	0.204	0.212	0.231	0.244	0	0
1993	0.056	0.121	0.171	0.197	0.211	0.231	0.244	0.000	0	0
1994	0.060	0.140	0.175	0.194	0.213	0.244	0.244	0.221	0	0
1995	0.058	0.141	0.186	0.201	0.220	0.232	0.232	0.244	0	0
1996	0.052	0.122	0.179	0.205	0.221	0.232	0.000	0.000	0	0
1997	0.044	0.117	0.178	0.203	0.221	0.244	0.000	0.000	0	0
1998	0.047	0.086	0.170	0.199	0.220	0.000	0.244	0.000	0	0
1999	0.053	0.097	0.143	0.197	0.220	0.000	0.000	0.000	0	0
2000	0.059	0.110	0.151	0.174	0.244	0.000	0.203	0.000	0	0
2001	0.068	0.122	0.167	0.178	0.197	0.244	0.000	0.244	0	0
2002	0.056	0.119	0.172	0.193	0.198	0.220	0.000	0.000	0	0
2003	0.064	0.113	0.176	0.187	0.203	0.211	0.221	0.000	0	0
2004	0.054	0.117	0.167	0.194	0.198	0.220	0.204	0.000	0	0
2005	0.061	0.108	0.172	0.179	0.221	0.206	0.221	0.231	0	0
2006	0.060	0.128	0.163	0.196	0.199	0.204	0.212	0.220	0	0
2007	0.055	0.097	0.179	0.179	0.196	0.199	0.231	0.200	0	0
2008	0.056	0.116	0.165	0.188	0.189	0.231	0.220	0.191	0	0
2009	0.060	0.116	0.164	0.200	0.203	0.212	0.211	0.220	0	0
2010	0.060	0.117	0.158	0.199	0.188	0.197	0.211	0.231	0	0
2011	0.047	0.103	0.162	0.171	0.191	0.196	0.199	0.211	0	0

Table 8.2.10. North Sea plaice. Catch weight-at-age

Plaice in IV . catch.wt
2012-05-01 16:54:23 units= kg

year	age 1	2	3	4	5	6	7	8	9	10
1957	0.044	0.111	0.213	0.284	0.387	0.506	0.592	0.654	0.440	1.108
1958	0.047	0.106	0.195	0.272	0.349	0.481	0.546	0.654	0.707	1.055
1959	0.051	0.120	0.193	0.264	0.352	0.482	0.605	0.637	0.766	1.021
1960	0.045	0.115	0.205	0.289	0.380	0.483	0.605	0.688	0.729	1.101
1961	0.044	0.101	0.181	0.306	0.408	0.514	0.613	0.681	0.825	1.088
1962	0.042	0.099	0.180	0.266	0.384	0.520	0.551	0.669	0.751	1.090
1963	0.048	0.110	0.175	0.309	0.399	0.541	0.636	0.680	0.729	1.048
1964	0.032	0.126	0.205	0.272	0.382	0.488	0.633	0.705	0.743	1.012
1965	0.038	0.076	0.215	0.315	0.384	0.471	0.542	0.667	0.730	0.892
1966	0.038	0.104	0.149	0.319	0.435	0.492	0.569	0.635	0.703	0.950
1967	0.036	0.111	0.191	0.237	0.430	0.554	0.609	0.675	0.753	0.998
1968	0.060	0.117	0.226	0.279	0.348	0.531	0.607	0.613	0.706	0.937
1969	0.052	0.176	0.283	0.294	0.376	0.432	0.606	0.693	0.696	0.945
1970	0.049	0.131	0.264	0.343	0.385	0.430	0.486	0.655	0.725	0.869
1971	0.057	0.161	0.281	0.400	0.459	0.529	0.560	0.627	0.722	0.920
1972	0.067	0.209	0.295	0.418	0.500	0.555	0.625	0.664	0.693	0.965
1973	0.045	0.209	0.350	0.423	0.502	0.565	0.636	0.659	0.711	0.884
1974	0.057	0.121	0.355	0.419	0.490	0.573	0.631	0.719	0.733	0.960
1975	0.069	0.153	0.208	0.414	0.523	0.621	0.676	0.747	0.832	1.082
1976	0.088	0.182	0.265	0.355	0.522	0.607	0.657	0.723	0.760	1.005
1977	0.071	0.218	0.245	0.318	0.397	0.552	0.648	0.722	0.716	0.980
1978	0.070	0.188	0.307	0.353	0.417	0.469	0.587	0.662	0.748	0.916
1979	0.067	0.190	0.295	0.337	0.426	0.471	0.549	0.674	0.795	0.959
1980	0.056	0.198	0.348	0.405	0.478	0.550	0.596	0.672	0.783	1.027
1981	0.048	0.184	0.332	0.422	0.510	0.565	0.614	0.653	0.737	1.023
1982	0.056	0.152	0.310	0.423	0.515	0.609	0.667	0.716	0.742	0.988
1983	0.052	0.152	0.273	0.376	0.503	0.598	0.672	0.765	0.809	0.976
1984	0.053	0.149	0.261	0.320	0.472	0.600	0.672	0.713	0.823	1.017
1985	0.054	0.168	0.263	0.328	0.451	0.564	0.664	0.714	0.787	1.000
1986	0.049	0.141	0.273	0.311	0.416	0.481	0.667	0.742	0.843	1.001
1987	0.043	0.113	0.217	0.345	0.394	0.496	0.576	0.720	0.820	0.978
1988	0.043	0.102	0.196	0.274	0.442	0.502	0.598	0.688	0.800	0.998
1989	0.047	0.117	0.213	0.288	0.363	0.521	0.593	0.659	0.779	0.926
1990	0.053	0.129	0.208	0.287	0.356	0.439	0.588	0.681	0.749	0.986
1991	0.056	0.148	0.207	0.267	0.341	0.436	0.509	0.647	0.720	0.887
1992	0.055	0.145	0.223	0.273	0.328	0.413	0.522	0.595	0.703	0.875
1993	0.063	0.159	0.246	0.302	0.344	0.412	0.507	0.617	0.705	0.837
1994	0.064	0.177	0.252	0.328	0.383	0.436	0.489	0.595	0.713	0.881
1995	0.071	0.183	0.281	0.335	0.397	0.450	0.525	0.607	0.730	0.902
1996	0.054	0.140	0.266	0.339	0.411	0.477	0.492	0.581	0.710	0.845
1997	0.045	0.129	0.219	0.358	0.450	0.517	0.597	0.610	0.676	0.913
1998	0.047	0.094	0.206	0.296	0.484	0.593	0.622	0.683	0.688	0.896
1999	0.054	0.103	0.197	0.262	0.444	0.533	0.619	0.670	0.739	0.797
2000	0.063	0.123	0.206	0.268	0.405	0.472	0.612	0.592	0.727	0.858
2001	0.090	0.135	0.194	0.229	0.300	0.472	0.580	0.701	0.787	0.793
2002	0.057	0.131	0.221	0.287	0.335	0.433	0.490	0.678	0.746	0.882
2003	0.066	0.123	0.227	0.282	0.343	0.401	0.413	0.640	0.750	0.838
2004	0.054	0.124	0.220	0.304	0.385	0.429	0.503	0.551	0.789	0.861
2005	0.067	0.116	0.212	0.299	0.353	0.342	0.457	0.544	0.603	0.889
2006	0.060	0.139	0.212	0.301	0.388	0.401	0.441	0.466	0.533	0.754
2007	0.058	0.112	0.224	0.319	0.370	0.380	0.520	0.350	0.591	0.617
2008	0.057	0.122	0.243	0.326	0.392	0.441	0.359	0.463	0.640	0.637
2009	0.061	0.125	0.235	0.338	0.415	0.483	0.538	0.448	0.695	0.824
2010	0.062	0.131	0.219	0.308	0.393	0.435	0.455	0.566	0.679	0.640
2011	0.047	0.111	0.204	0.264	0.351	0.433	0.565	0.424	0.529	0.763

Table 8.2.11. North Sea plaice. Natural mortality at age and maturity ate age vector used in assessments

age	1	2	3	4	5	6	7	8	9	10
natural mortality	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
maturity	0	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 8.2.12 North Sea plaice. Survey tuning indices.

North Sea plaice. Survey tuning indices

2012-05-01 16:46:56[1] units= NA

BTS-Isis (ages 1-8 used in assessment)

	Effort	1	2	3	4	5	6	7	8	9
1985	1	137	173.9	36.06	11.00	1.273	0.973	0.336	0.155	0.091
1986	1	667	131.7	50.17	9.21	3.780	0.400	0.418	0.147	0.070
1987	1	226	764.2	33.84	4.88	1.842	0.607	0.252	0.134	0.078
1988	1	680	147.0	182.31	9.99	2.810	0.814	0.458	0.036	0.112
1989	1	468	319.3	38.66	47.30	5.850	0.833	0.311	0.661	0.132
1990	1	185	146.1	79.34	26.35	5.469	0.758	0.189	0.383	0.239
1991	1	291	159.4	33.95	13.57	4.313	5.659	0.239	0.204	0.092
1992	1	361	174.5	29.25	5.96	3.748	2.871	1.186	0.346	0.050
1993	1	189	283.4	62.78	8.27	1.128	1.130	0.584	0.464	0.155
1994	1	193	77.1	34.46	10.59	2.667	0.600	0.800	0.895	0.373
1995	1	266	40.6	13.22	7.53	1.110	0.806	0.330	1.051	0.202
1996	1	310	206.9	21.47	4.47	3.134	0.838	0.044	0.161	0.122
1997	1	1047	59.2	17.18	2.67	0.257	0.358	0.157	0.111	0.000
1998	1	348	402.7	44.96	8.29	1.224	0.339	0.149	0.213	0.072
1999	1	293	121.6	171.25	3.39	1.956	0.127	0.130	0.027	0.030
2000	1	267	69.3	29.35	22.36	0.570	0.162	0.502	0.027	0.012
2001	1	207	72.2	17.84	9.17	8.716	0.270	0.131	0.038	0.040
2002	1	519	44.5	14.90	4.99	2.539	1.321	0.085	0.128	0.000
2003	1	133	159.1	10.06	5.55	1.426	1.133	0.638	0.111	0.096
2004	1	234	39.6	61.91	6.15	2.464	1.492	0.952	2.842	0.000
2005	1	163	66.2	6.76	12.79	1.084	1.164	0.290	0.152	0.492
2006	1	129	36.4	18.11	2.98	5.890	0.867	0.757	0.040	0.269
2007	1	312	67.2	19.71	14.42	2.942	6.085	0.684	0.831	0.156
2008	1	222	120.7	30.11	9.07	7.205	0.618	1.715	0.292	0.229
2009	1	409	105.2	45.98	13.01	4.029	3.474	0.574	2.128	0.278
2010	1	261	84.3	34.24	20.18	4.662	2.162	3.464	0.207	2.547
2011	1	486	148.2	55.30	20.07	12.904	3.945	2.243	2.263	0.232

BTS-Tridens (all ages used in assessment)

	Effort	1	2	3	4	5	6	7	8	9
1996	1	1.643	6.02	4.45	2.90	2.04	1.57	0.721	0.415	0.190
1997	1	0.221	7.12	9.13	3.25	2.10	1.52	0.401	0.819	0.354
1998	1	0.228	32.25	9.57	4.87	2.20	1.27	0.929	0.762	0.304
1999	1	2.692	7.71	35.23	5.56	2.50	1.93	0.633	0.761	0.309
2000	1	4.795	13.45	12.91	16.96	2.88	1.72	0.933	0.805	0.218
2001	1	2.154	8.61	9.90	6.68	7.36	1.05	0.592	0.418	0.505
2002	1	18.553	12.91	9.54	6.41	4.18	4.42	0.743	0.741	0.394
2003	1	3.975	41.69	13.38	9.06	5.08	2.81	3.920	0.703	0.740
2004	1	5.985	15.78	31.49	9.43	4.32	2.44	1.242	2.500	0.409
2005	1	6.876	23.37	12.23	17.67	2.82	6.87	1.565	0.567	3.574
2006	1	6.725	32.19	25.73	11.37	10.92	1.99	3.897	0.864	0.723
2007	1	26.571	23.73	19.55	23.18	4.90	10.15	1.974	3.786	0.323
2008	1	17.467	50.46	25.59	18.39	18.97	6.24	12.747	2.657	6.749
2009	1	12.110	41.69	43.33	19.13	12.05	11.77	3.081	10.119	1.567
2010	1	26.180	35.72	34.56	30.09	13.41	5.70	12.234	2.744	6.362
2011	1	41.881	71.48	41.59	28.46	31.67	14.28	5.501	11.881	1.172

Table 8.2.12 North Sea plaice. Survey tuning indices. (Cont'd)

SNS (ages 1-3 from 1982 onwards used in the assessment)

	Effort	1	2	3	4	5
1970	1	9311	9732	3273	770	170
1971	1	13538	28164	1415	101	50
1972	1	13207	10780	4478	89	84
1973	1	65643	5133	1578	461	15
1974	1	15366	16509	1129	160	82
1975	1	11628	8168	9556	65	15
1976	1	8537	2403	868	236	0
1977	1	18537	3424	1737	590	213
1978	1	14012	12678	345	135	45
1979	1	21495	9829	1575	161	17
1980	1	59174	12882	491	180	24
1981	1	24756	18785	834	38	32
1982	1	69993	8642	1261	88	8
1983	1	33974	13909	249	71	6
1984	1	44965	10413	2467	42	0
1985	1	28101	13848	1598	328	17
1986	1	93552	7580	1152	145	30
1987	1	33402	32991	1227	200	30
1988	1	36609	14421	13153	1350	88
1989	1	34276	17810	4373	7126	289
1990	1	25037	7496	3160	816	422
1991	1	57221	11247	1518	1077	128
1992	1	46798	13842	2268	613	176
1993	1	22098	9686	1006	98	60
1994	1	19188	4977	856	76	23
1995	1	24767	2796	381	97	38
1996	1	23015	10268	1185	45	47
1997	1	95901	4473	497	32	0
1998	1	33666	30242	5014	50	10
1999	1	32951	10272	13783	1058	17
2000	1	22855	2493	891	983	17
2001	1	11511	2898	370	176	691
2002	1	30809	1103	265	65	69
2003	1	NA	NA	NA	NA	NA
2004	1	18202	1350	1081	51	27
2005	1	10118	1819	142	366	8
2006	1	12164	1571	385	52	54
2007	1	14175	2134	140	52	0
2008	1	14706	2700	464	179	34
2009	1	14860	2019	492	38	20
2010	1	11947	1812	529	56	10
2011	1	18349	1143	308	75	60

Table 8.2.13. North Sea plaice. DFS index catches (numbers per hour), used only for RCT3. Note: a 10 year average previously used as an estimate for the 2010 Belgian data has been replaced with the now available data (i.e. 2010 value has been revised).

DFS

	Effort	age 0	age 1
1981	1	605.96	169.78
1982	1	433.67	299.36
1983	1	431.72	163.53
1984	1	261.80	124.19
1985	1	716.29	103.27
1986	1	200.11	288.27
1987	1	516.84	195.87
1988	1	318.36	116.45
1989	1	435.70	125.72
1990	1	465.47	130.13
1991	1	498.49	152.35
1992	1	351.59	137.08
1993	1	262.26	75.16
1994	1	445.66	30.60
1995	1	184.51	37.74
1996	1	572.80	116.89
1997	1	149.19	209.92
1998	1	NA	NA
1999	1	NA	NA
2000	1	183.83	11.31
2001	1	500.43	5.90
2002	1	210.70	17.79
2003	1	359.59	11.31
2004	1	243.15	14.97
2005	1	129.25	NA
2006	1	232.28	NA
2007	1	175.65	NA
2008	1	186.87	NA
2009	1	235.55	NA
2010	1	195.35	NA
2011	1	161.19	NA

Table 8.2.14 North Sea plaice. Commercial tuning fleets (not used in the final assessment)

North Sea plaice. Commercial tuning fleets (not used in the final assessment)
2011-05-07 14:04:10[1]

NL Beam Trawl

	2	3	4	5	6	7	8	9
1989	72.5	557.8	1016	1820	318.1	132.9	72.3	37.45	13.06
1990	71.1	308.8	844	701	1076.2	171.4	51.8	25.18	16.33
1991	68.5	401.5	619	776	448.1	497.7	100.4	28.53	16.60
1992	71.1	341.4	623	448	382.1	171.9	133.4	34.66	13.97
1993	76.9	358.3	605	407	256.2	142.8	78.5	46.96	13.33
1994	81.4	370.9	591	441	188.8	97.5	75.8	35.21	23.70
1995	81.2	277.3	536	417	178.0	81.0	42.1	19.08	11.47
1996	72.1	368.9	383	290	193.9	73.7	50.5	18.95	13.09
1997	72.0	320.8	634	252	95.6	60.2	28.0	13.54	6.39
1998	70.2	217.8	463	381	91.0	32.6	19.4	9.53	4.47
1999	67.3	64.5	1134	271	164.3	44.6	14.8	12.38	7.52
2000	64.6	138.9	263	1118	89.6	60.1	11.4	5.20	3.31
2001	61.4	264.3	367	321	664.6	44.7	28.6	6.35	3.19
2002	56.7	177.0	575	383	250.8	292.2	18.5	9.96	2.75
2003	51.6	372.8	387	406	186.4	103.8	129.1	6.03	5.02
2004	48.1	102.5	925	228	150.5	73.8	30.6	44.51	1.95
2005	49.1	154.2	222	727	96.2	59.2	34.1	14.81	23.54
2006	44.1	245.7	593	190	452.9	45.9	50.7	16.30	28.55
2007	42.9	201.6	416	464	109.7	208.1	23.1	26.62	7.53
2008	30.2	186.9	624	420	337.4	44.6	80.9	11.69	5.86

English Beam trawl excl Flag-vessels

	4	5	6	7	8	9	10	11	12
1990	102.3	27.0	92.7	17.46	11.08	7.06	8.23	2.45	1.662	0.958
1991	123.6	21.9	28.6	53.39	10.72	6.77	3.45	4.94	1.828	1.481
1992	151.5	19.2	29.3	18.40	24.25	6.39	3.68	3.20	3.281	1.096
1993	146.6	23.4	20.9	17.26	6.30	12.80	4.33	2.73	2.435	1.739
1994	131.4	23.1	22.0	13.49	9.53	4.51	6.47	3.28	1.438	1.218
1995	105.0	34.0	15.8	14.05	9.71	5.90	3.16	3.60	2.733	1.362
1996	82.9	13.3	19.0	10.74	10.08	6.55	4.68	2.50	3.305	1.966
1997	76.3	16.4	11.1	13.97	7.85	8.99	6.62	2.77	1.940	3.001
1998	68.8	23.6	13.0	8.97	8.69	5.04	6.03	4.61	1.948	1.599
1999	68.6	14.7	15.2	6.66	4.77	5.35	3.76	3.27	2.813	1.429
2000	57.8	63.2	15.0	9.95	4.41	2.44	3.48	1.87	1.782	2.526
2001	54.1	14.7	45.0	8.89	6.21	2.48	1.72	2.07	0.906	1.682
2002	30.6	23.4	20.8	29.61	5.13	4.12	1.41	1.73	1.503	1.340

Table 8.2.15. North Sea Plaice. Numbers-at-age (x1000) and weights-at-age (kilograms) in the landings by quarter.

	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Age	numbers	weight	numbers	weight	numbers	weight	numbers	weight
1	0.0	--	0.0	--	381.1	0.241	484.9	0.265
2	304.4	0.216	1453.0	0.238	8203.3	0.286	4284.9	0.285
3	2458.9	0.289	9241.4	0.276	13900.8	0.315	12427.0	0.330
4	13444.7	0.299	18712.3	0.316	14788.6	0.365	13875.5	0.421
5	7754.7	0.361	7047.0	0.395	3830.1	0.457	4123.9	0.526
6	5155.4	0.401	3036.5	0.463	1682.0	0.553	2231.8	0.595
7	4912.2	0.448	2028.4	0.513	976.5	0.557	1830.8	0.650
8	873.9	0.572	423.7	0.578	153.2	0.962	319.3	0.699
9	1019.9	0.568	796.6	0.524	246.6	0.981	418.3	1.055
10	225.0	0.655	69.0	0.803	7.4	0.952	215.4	0.433
11	198.7	0.517	121.6	0.435	0.0	--	26.1	0.965
12	51.1	0.893	15.4	1.250	20.4	0.886	20.5	1.213
13	30.5	1.107	3.9	1.716	0.0	--	10.2	1.711
14	171.5	0.594	3.9	0.583	85.5	0.511	13.1	1.972
15+	3.6	1.052	3.9	2.016	0.0	--	0.0	--

Table 8.3.1. North Sea plaice. XSA diagnostics from final run

```
FLR XSA Diagnostics 2012-05-01 16:56:24

CPUE data from indices

Catch data for 55 years. 1957 to 2011. Ages 1 to 10.

        fleet first age last age first year last year alpha beta
1    BTS-Isis         1        8       1985      2011  0.66 0.75
2 BTS-Tridens         1        9       1996      2011  0.66 0.75
3         SNS         1        3       1982      2011  0.66 0.75


 Time series weights :

   Tapered time weighting not applied

Catchability analysis :

    Catchability independent of size for all ages

    Catchability independent of age for ages >=   6

Terminal population estimation :

    Survivor estimates shrunk towards the mean F
    of the final   5 years or the  5 oldest ages.

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

    Minimum standard error for population
    estimates derived from each fleet =  0.3

   prior weighting not applied

Regression weights
     year
age   2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
  all    1    1    1    1    1    1    1    1    1    1


 Fishing mortalities
    year
age   2002  2003  2004  2005  2006  2007  2008  2009  2010  2011
  1  0.210 0.146 0.215 0.141 0.285 0.073 0.152 0.164 0.211 0.103
  2  0.590 0.624 0.662 0.490 0.548 0.458 0.330 0.315 0.299 0.286
  3  0.528 0.621 0.469 0.481 0.444 0.425 0.256 0.214 0.221 0.227
  4  0.632 0.492 0.501 0.370 0.412 0.222 0.276 0.196 0.202 0.303
  5  0.682 0.689 0.252 0.452 0.245 0.300 0.165 0.209 0.146 0.206
  6  0.466 0.622 0.523 0.257 0.227 0.181 0.160 0.119 0.163 0.124
  7  0.529 0.490 0.330 0.449 0.127 0.117 0.153 0.104 0.095 0.102
  8  0.266 0.303 0.151 0.268 0.299 0.097 0.097 0.087 0.083 0.094
  9  0.172 0.132 0.106 0.092 0.176 0.097 0.022 0.035 0.035 0.059
  10 0.172 0.132 0.106 0.092 0.176 0.097 0.022 0.035 0.035 0.059

 XSA population number (Thousand)
      age
year         1       2      3      4      5      6      7      8     9    10
  2002 1729930  459528 347048 136577  81732 109472  12302   8138  4982 10669
  2003  528876 1269420 230450 185192  65661  37383  62187   6558  5646  7437
  2004 1270058  413472 615300 112096 102403  29843  18160  34472  4382  5738
  2005  770698  927104 193057 348171  61486  72030  16006  11809 26828  7495
  2006  937388  605542 513974 108035 217657  35413  50381   9245  8175  8659
  2007 1168187  638099 316633 298434  64726 154081  25528  40146  6206 14488
  2008 1014800  982324 365146 187221 216264  43393 116303  20549 32982 43901
  2009 1040634  789129 638932 255814 128508 165945  33458  90314 16882 23359
  2010  929247  798796 520880 466656 190339  94345 133307  27273 74873 38501
  2011 1265612  681068 536143 377676 344946 148837  72494 109671 22720 51714


 Estimated population abundance at 1st Jan  2012
      age
year   1       2      3      4      5      6      7     8     9    10
  2012 0 1033388 462953 386712 252390 253947 118989 59219 90362 19381
```

Fleet: BTS-Isis

Log catchability residuals.

age	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1	-1.221	-0.567	-0.814	0.404	0.417	-0.409	0.221	0.578	0.320	0.480	-0.194	-0.161	0.523	0.504	0.265	-0.020	0.281	0.146	-0.078	-0.340	-0.252	-0.584	-0.067	-0.213
2	0.334	-0.270	0.585	-0.267	0.608	0.132	0.398	0.652	1.224	0.314	-0.226	0.460	-0.748	0.418	0.317	-0.385	-0.298	-0.334	-0.051	-0.293	-0.709	-0.840	-0.343	-0.278
3	-0.053	0.400	-0.249	0.527	-0.283	0.513	0.001	0.064	0.941	0.413	-0.129	0.478	-0.490	0.634	0.797	-0.005	-0.217	-0.567	-0.485	0.244	-0.804	-0.824	-0.268	-0.106
4	-0.290	-0.140	-0.543	-0.110	0.490	0.571	0.092	-0.385	0.134	0.527	0.296	0.180	-0.190	0.502	-0.146	0.016	0.243	-0.070	-0.367	0.244	-0.250	-0.506	-0.080	-0.039
5	-0.560	0.020	-0.353	0.288	0.670	-0.350	-0.003	0.233	-0.660	0.307	-0.328	0.835	-1.238	0.365	0.502	-0.518	0.486	0.366	0.013	-0.192	-0.362	-0.079	0.478	0.072
6	0.299	-0.630	-0.701	-0.021	0.165	-0.328	0.816	0.547	0.205	-0.171	0.164	0.517	-0.167	0.046	-0.911	-0.990	-0.348	-0.389	0.642	1.073	-0.243	0.151	0.596	-0.439
7	0.066	0.103	-0.224	-0.232	-0.262	-0.675	-0.740	-0.058	-0.579	0.799	-0.015	-1.928	-0.440	-0.345	-0.436	0.922	-0.653	-0.902	-0.534	0.985	0.006	-0.408	0.163	-0.409
8	-0.111	-0.051	-0.413	-1.150	0.859	0.538	0.104	0.402	-0.481	0.194	1.871	0.016	-0.272	0.453	-1.472	-1.659	-1.334	-0.265	-0.165	1.311	-0.464	-1.532	-0.109	-0.486

age	2009	2010	2011
1	0.384	0.081	0.317
2	-0.207	-0.453	0.262
3	-0.272	-0.357	0.097
4	-0.047	-0.205	0.072
5	0.042	-0.249	0.217
6	-0.082	0.040	0.157
7	-0.292	0.117	0.297
8	0.014	-1.122	-0.114

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

	1	2	3	4	5	6	7	8
Mean_Logq	-8.0387	-8.4229	-9.0464	-9.6308	-10.1946	-10.5375	-10.5375	-10.5375
S.E_Logq	0.4509	0.4968	0.4686	0.3097	0.4624	0.5107	0.5912	0.8380

Fleet: BTS-Tridens

Log catchability residuals.

age	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-1.438	-3.976	-2.862	-0.462	-0.077	-0.318	0.778	0.378	-0.041	0.546	0.429	1.434	1.210	0.828	1.744	1.829
2	-1.372	-1.162	-0.403	-0.736	-0.320	-0.720	0.134	0.314	0.491	-0.045	0.742	0.321	0.554	0.572	0.393	1.237
3	-0.516	-0.543	-0.332	-0.204	-0.246	-0.225	-0.432	0.381	0.148	0.369	0.108	0.305	0.312	0.250	0.233	0.393
4	-0.479	-0.220	-0.257	0.121	-0.488	-0.301	-0.047	-0.104	0.444	-0.154	0.605	0.167	0.441	0.111	-0.032	0.194
5	-0.416	0.045	0.132	-0.074	0.282	-0.503	0.045	0.462	-0.452	-0.225	-0.283	0.167	0.220	0.318	-0.013	0.294
6	-0.171	-0.031	0.058	0.496	0.058	-0.297	-0.494	0.236	0.252	0.219	-0.334	-0.205	0.561	-0.175	-0.305	0.131
7	-0.445	-0.815	0.173	-0.166	0.229	-0.458	-0.046	-0.031	-0.062	0.379	-0.082	-0.090	0.284	0.076	0.066	-0.119
8	-0.350	0.414	0.415	0.554	0.423	-0.248	0.178	0.368	-0.130	-0.460	0.228	0.094	0.410	0.260	0.149	0.231
9	-0.280	0.248	0.071	0.067	-0.243	0.224	-0.029	0.449	0.091	0.436	0.086	-0.499	0.816	0.035	-0.053	-0.535

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

               1       2       3       4       5       6       7       8       9
Mean_Logq -12.0026 -10.1274 -9.6268 -9.4035 -9.3743 -9.2248 -9.2248 -9.2248 -9.2248
S.E_Logq    1.5961   0.7253  0.3450  0.3225  0.2994  0.3046  0.3028  0.3033  0.3487


 Fleet:  SNS

 Log catchability residuals.

   year
age  1982   1983  1984   1985   1986   1987   1988  1989  1990  1991  1992  1993  1994
1995   1996   1997  1998  1999   2000   2001   2002 2003   2004   2005   2006   2007
  1 0.432  0.145 0.507 -0.373 -0.102 -0.294 -0.087 0.233 0.019 1.024 0.965 0.604 0.601 -
0.136 -0.332  0.563 0.600 0.509 -0.049 -0.176 -0.249   NA -0.462 -0.602 -0.512 -0.728
  2 0.691  0.380 0.547  0.878 -0.051  0.517  0.485 0.796 0.236 0.820 1.191 0.921 0.647
0.172  0.531 -0.257 0.903 0.920 -0.636 -0.440 -0.957   NA -0.599 -1.229 -0.908 -0.718
  3 0.370 -1.099 0.419  0.386  0.181 -0.011  1.453 1.093 0.845 0.448 1.062 0.363 0.273 -
0.120  1.136 -0.478 1.996 1.833  0.056 -0.537 -1.041   NA -0.249 -1.112 -1.120 -1.660
   year
age   2008   2009   2010   2011
  1 -0.496 -0.501 -0.574 -0.529
  2 -1.004 -1.086 -1.219 -1.529
  3 -0.723 -1.254 -0.972 -1.538


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

              1       2       3
Mean_Logq -3.5613 -4.5891 -5.6939
S.E_Logq   0.5037  0.8241  1.0039


 Terminal year survivor and F summaries:


Age =  1 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2010

Fleet =  BTS-Isis
                     1
Survivors   1418986.000
Raw weights       4.279


Fleet =  BTS-Tridens
                     1
Survivors   6437111.000
Raw weights       0.333


Fleet =  fshk
                    1
Survivors   576619.00
Raw weights      0.25


Fleet =  SNS
                     1
Survivors   608553.000
Raw weights      3.439


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "1418986"    "0.459"   "Inf"     "Inf"     "1" "0.515"     "0.076"
[2,] "BTS-Tridens" "6437111"    "1.645"   "Inf"     "Inf"     "1" "0.04"      "0.017"
[3,] "fshk"        "576619"     "1.9"     "Inf"     "Inf"     "1" "0.03"      "0.177"
[4,] "SNS"         "608553"     "0.512"   "Inf"     "Inf"     "1" "0.414"     "0.169"


 Weighted prediction:

     Suvivors  Int.s.e. Ext.s.e. Var.Ratio F
[1,] "1033388" ""       ""       ""        "0.103"
```

```
Age =  2 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2009

Fleet =  BTS-Isis
                     2          1
Survivors   601760.000 501755.000
Raw weights      2.935      2.885


Fleet =  BTS-Tridens
                      2           1
Survivors   1595689.000 2649304.000
Raw weights       1.344       0.225


Fleet =  fshk
                    2
Survivors   320105.00
Raw weights      0.25


Fleet =  SNS
                      2          1
Survivors   100363.000 260875.000
Raw weights      1.069      2.319


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "549912"     "0.342"   "0.091"   "0.266"   "2" "0.528"     "0.246"
[2,] "BTS-Tridens" "1715933"    "0.683"   "0.178"   "0.261"   "2" "0.142"     "0.086"
[3,] "fshk"        "320105"     "1.733"   "Inf"     "Inf"     "1" "0.023"     "0.391"
[4,] "SNS"         "192976"     "0.439"   "0.444"   "1.011"   "2" "0.307"     "0.585"


 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "462953" ""       ""       ""        "0.286"


Age =  3 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2008

Fleet =  BTS-Isis
                    3         2          1
Survivors   426275.0 245797.00 567455.000
Raw weights      3.5      2.31      2.379


Fleet =  BTS-Tridens
                     3          2          1
Survivors   572830.000 572929.000 884769.000
Raw weights      6.301      1.058      0.185


Fleet =  fshk
                    3
Survivors   267898.00
Raw weights      0.25


Fleet =  SNS
                     3          2          1
Survivors   83082.000 114327.000 234270.000
Raw weights     0.765      0.842      1.911


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "396571"     "0.282"   "0.228"   "0.809"   "3" "0.42"      "0.222"
[2,] "BTS-Tridens" "578993"     "0.318"   "0.048"   "0.151"   "3" "0.387"     "0.157"
[3,] "fshk"        "267898"     "1.786"   "Inf"     "Inf"     "1" "0.013"     "0.313"
[4,] "SNS"         "157513"     "0.409"   "0.316"   "0.773"   "3" "0.18"      "0.485"


 Weighted prediction:
```

```
     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "386712" ""       ""       ""        "0.227"


Age =  4 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2007

Fleet =  BTS-Isis
                    4          3         2          1
Survivors   271238.000 176650.000 2.052e+05 203869.000
Raw weights      7.425      2.598 1.687e+00      1.759


Fleet =  BTS-Tridens
                    4          3          2          1
Survivors   306550.000 318564.000 446993.000 846323.000
Raw weights      6.682      4.678      0.772      0.137


Fleet =  fshk
                   4
Survivors   297962.00
Raw weights      0.25


Fleet =  SNS
                    3         2          1
Survivors   95502.000 85155.000 153753.000
Raw weights     0.568     0.614      1.414


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "232302"     "0.215"   "0.103"   "0.479"   "4" "0.471"     "0.325"
[2,] "BTS-Tridens" "322184"     "0.232"   "0.079"   "0.341"   "4" "0.429"     "0.245"
[3,] "fshk"        "297962"     "1.719"   "Inf"     "Inf"     "1" "0.009"     "0.262"
[4,] "SNS"         "120464"     "0.409"   "0.191"   "0.467"   "3" "0.091"     "0.555"


 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "252390" ""       ""       ""        "0.303"


Age =  5 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2006

Fleet =  BTS-Isis
                    5          4          3          2          1
Survivors   315437.000 206867.000 193542.000 192284.000 237457.000
Raw weights      3.669      6.682      2.355      1.507      1.699


Fleet =  BTS-Tridens
                    5          4          3         2           1
Survivors   340859.000 245812.000 325936.000 441927.00 1064914.000
Raw weights      8.539      6.014      4.241      0.69       0.132


Fleet =  fshk
                   5
Survivors   244561.00
Raw weights      0.25
Fleet =  SNS
                    3         2          1
Survivors   72485.000 93004.000 122586.000
Raw weights     0.515     0.549      1.366


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "227536"     "0.198"   "0.094"   "0.475"   "5" "0.416"     "0.228"
[2,] "BTS-Tridens" "310565"     "0.188"   "0.094"   "0.5"     "5" "0.513"     "0.172"
[3,] "fshk"        "244561"     "1.804"   "Inf"     "Inf"     "1" "0.007"     "0.213"
[4,] "SNS"         "103039"     "0.407"   "0.151"   "0.371"   "3" "0.064"     "0.448"
```

```
 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "253947" ""       ""       ""        "0.206"


Age =  6 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2005

Fleet =  BTS-Isis
                      6         5          4          3         2         1
Survivors   139231.000 92738.000 113504.000 107010.000 84454.000 66337.000
Raw weights      3.267     3.443      6.312      2.134     1.201     1.097


Fleet =  BTS-Tridens
                      6          5          4          3         2          1
Survivors   135654.000 117468.000 132918.000 162484.000 164094.00 182655.000
Raw weights      8.959      8.014      5.681      3.843      0.55      0.085


Fleet =  fshk
                     6
Survivors   84424.00
Raw weights     0.25


Fleet =  SNS
                      3         2         1
Survivors   57715.000 58030.000 71290.000
Raw weights     0.466     0.438     0.881


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "106582"     "0.191"   "0.085"   "0.445"   "6" "0.374"     "0.137"
[2,] "BTS-Tridens" "133444"     "0.163"   "0.048"   "0.294"   "6" "0.582"     "0.111"
[3,] "fshk"        "84424"      "1.88"    "Inf"     "Inf"     "1" "0.005"     "0.171"
[4,] "SNS"         "64145"      "0.421"   "0.074"   "0.176"   "3" "0.038"     "0.219"


 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "118989" ""       ""       ""        "0.124"


Age =  7 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2004

Fleet =  BTS-Isis
                      7         6         5         4         3         2         1
Survivors   79667.000 61601.000 61764.000 56974.000 45303.000 25566.000 46010.000
Raw weights     2.201     2.834     2.805     4.744     1.354     0.696     0.734


Fleet =  BTS-Tridens
                      7         6         5         4         3          2          1
Survivors   52576.000 43663.000 81345.000 91999.000 80307.000 124375.000 102176.000
Raw weights     8.779     7.774     6.528     4.269     2.437      0.319      0.057


Fleet =  fshk
                     7
Survivors   50302.00
Raw weights     0.25


Fleet =  SNS
                      3         2        1
Survivors   11263.000 23873.000 32443.00
Raw weights     0.296     0.254     0.59


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "57573"      "0.193"   "0.095"   "0.492"   "7" "0.328"     "0.105"
[2,] "BTS-Tridens" "62341"      "0.151"   "0.121"   "0.801"   "7" "0.643"     "0.097"
[3,] "fshk"        "50302"      "1.9"     "Inf"     "Inf"     "1" "0.005"     "0.119"
[4,] "SNS"         "23023"      "0.419"   "0.311"   "0.742"   "3" "0.024"     "0.245"
```

```
 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "59219"  ""       ""       ""        "0.102"


Age =  8 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2003

Fleet =  BTS-Isis
                 8         7        6        5        4        3        2        1
Survivors   80581.00 101576.000 83220.000 97076.000 83388.000 39650.000 44471.000 64316.000
Raw weights     1.18      2.019     2.717     2.811     5.018     1.406     0.767     0.751


Fleet =  BTS-Tridens
                   8         7         6         5         4         3         2         1
Survivors   113841.000 96533.000 75857.000 112557.000 106807.000 100617.000 86340.000 86733.000
Raw weights      7.212     8.051     7.453      6.542      4.516      2.532     0.351     0.058


Fleet =  fshk
                    8
Survivors   62673.00
Raw weights     0.25


Fleet =  SNS
                     3         2         1
Survivors   29491.000 26437.000 56918.000
Raw weights     0.307     0.279     0.603


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "78802"      "0.187"   "0.102"   "0.545"   "8" "0.304"     "0.107"
[2,] "BTS-Tridens" "98966"      "0.139"   "0.056"   "0.403"   "8" "0.67"      "0.086"
[3,] "fshk"        "62673"      "1.908"   "Inf"     "Inf"     "1" "0.005"     "0.133"
[4,] "SNS"         "40118"      "0.419"   "0.252"   "0.601"   "3" "0.022"     "0.2"


 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "90362"  ""       ""       ""        "0.094"


Age =  9 .  Catchability constand w.r.t. time and dependant on age
 Year class =  2002

Fleet =  BTS-Isis
                 8         7         6         5         4        3         2         1
Survivors   6307.000 14477.000 12499.000 31241.000 11686.000 8670.000 14452.000 17929.000
Raw weights    1.124     1.906     2.463     2.226     3.286    0.887     0.408     0.427


Fleet =  BTS-Tridens
                   9          8          7          6          5          4          3
2         1
Survivors      11345.000  22499.000  20910.000  33975.000  22910.000  35491.000  28040.000
31655.000 28269.000
Raw weights      7.105      6.874      7.604      6.756      5.181      2.957      1.598
0.187     0.033
```

```
Fleet =  fshk
                   9
Survivors   6525.00
Raw weights    0.25


Fleet =  SNS
                    3         2
Survivors   6375.000 10649.000
Raw weights    0.194     0.148


     Fleet         Est.Suvivors Int. s.e. Ext. s.e. Var Ratio N   Scaled Wgts Estimated F
[1,] "BTS-Isis"    "13754"      "0.201"   "0.168"   "0.836"   "8" "0.247"     "0.082"
[2,] "BTS-Tridens" "22050"      "0.136"   "0.131"   "0.963"   "9" "0.742"     "0.052"
[3,] "fshk"        "6525"       "1.942"   "Inf"     "Inf"     "1" "0.005"     "0.166"
[4,] "SNS"         "7963"       "0.683"   "0.254"   "0.372"   "2" "0.007"     "0.138"


 Weighted prediction:

     Suvivors Int.s.e. Ext.s.e. Var.Ratio F
[1,] "19381"  ""       ""       ""        "0.059"
```

Table 8.3.2. North Sea plaice. Fishing mortality estimates in final XSA run

Plaice in IV . harvest
2012-05-01 16:55:55 units= f

year \ age	1	2	3	4	5	6	7	8	9	10
1957	0.077	0.229	0.255	0.304	0.347	0.208	0.274	0.314	0.290	0.290
1958	0.105	0.250	0.302	0.358	0.374	0.321	0.268	0.291	0.323	0.323
1959	0.152	0.310	0.355	0.376	0.412	0.383	0.350	0.309	0.367	0.367
1960	0.108	0.318	0.353	0.384	0.366	0.419	0.383	0.359	0.383	0.383
1961	0.097	0.289	0.344	0.357	0.417	0.330	0.361	0.437	0.381	0.381
1962	0.096	0.319	0.373	0.398	0.434	0.426	0.362	0.350	0.395	0.395
1963	0.149	0.364	0.418	0.434	0.423	0.474	0.450	0.452	0.448	0.448
1964	0.032	0.399	0.448	0.469	0.540	0.488	0.403	0.390	0.459	0.459
1965	0.068	0.267	0.397	0.412	0.355	0.508	0.417	0.352	0.410	0.410
1966	0.071	0.356	0.388	0.430	0.477	0.343	0.506	0.409	0.435	0.435
1967	0.054	0.352	0.405	0.408	0.476	0.504	0.310	0.435	0.428	0.428
1968	0.197	0.287	0.344	0.361	0.366	0.323	0.410	0.289	0.351	0.351
1969	0.149	0.313	0.327	0.341	0.315	0.428	0.295	0.399	0.356	0.356
1970	0.223	0.435	0.492	0.505	0.462	0.504	0.594	0.261	0.467	0.467
1971	0.196	0.332	0.388	0.388	0.407	0.395	0.428	0.412	0.407	0.407
1972	0.232	0.381	0.401	0.413	0.419	0.443	0.408	0.478	0.434	0.434
1973	0.113	0.394	0.433	0.542	0.545	0.413	0.387	0.480	0.475	0.475
1974	0.221	0.399	0.491	0.515	0.596	0.452	0.394	0.465	0.486	0.486
1975	0.355	0.501	0.531	0.557	0.600	0.618	0.477	0.503	0.553	0.553
1976	0.333	0.407	0.426	0.432	0.383	0.433	0.518	0.452	0.445	0.445
1977	0.323	0.471	0.495	0.499	0.665	0.420	0.441	0.533	0.513	0.513
1978	0.304	0.428	0.464	0.471	0.461	0.519	0.461	0.426	0.469	0.469
1979	0.424	0.636	0.664	0.673	0.683	0.707	0.703	0.605	0.677	0.677
1980	0.237	0.466	0.664	0.622	0.508	0.517	0.493	0.501	0.530	0.530
1981	0.178	0.482	0.577	0.602	0.581	0.450	0.505	0.534	0.536	0.536
1982	0.241	0.516	0.692	0.676	0.603	0.520	0.481	0.538	0.566	0.566
1983	0.236	0.518	0.568	0.750	0.606	0.528	0.459	0.476	0.566	0.566
1984	0.299	0.549	0.584	0.606	0.641	0.545	0.486	0.571	0.572	0.572
1985	0.261	0.472	0.492	0.701	0.484	0.507	0.509	0.493	0.541	0.541
1986	0.283	0.606	0.633	0.636	0.720	0.713	0.567	0.651	0.745	0.745
1987	0.214	0.637	0.677	0.732	0.772	0.642	0.790	0.502	0.675	0.675
1988	0.231	0.608	0.657	0.675	0.714	0.678	0.653	0.975	0.743	0.743
1989	0.210	0.578	0.590	0.616	0.642	0.622	0.597	0.613	1.278	1.278
1990	0.161	0.472	0.572	0.538	0.670	0.586	0.511	0.449	0.562	0.562
1991	0.237	0.604	0.660	0.698	0.586	0.696	0.666	0.642	0.625	0.625
1992	0.212	0.551	0.653	0.674	0.790	0.485	0.543	0.674	0.942	0.942
1993	0.219	0.483	0.604	0.648	0.748	0.703	0.316	0.363	0.811	0.811
1994	0.162	0.484	0.610	0.715	0.637	0.648	0.896	0.218	0.264	0.264
1995	0.121	0.457	0.646	0.767	0.746	0.600	0.656	0.616	0.103	0.103
1996	0.096	0.545	0.685	0.735	0.744	0.656	0.764	0.646	0.838	0.838
1997	0.065	0.791	0.927	0.752	0.790	0.717	0.602	0.576	0.661	0.661
1998	0.153	0.492	0.994	1.082	0.638	0.470	0.549	0.440	0.537	0.537
1999	0.173	0.475	0.519	1.173	0.655	0.508	0.337	0.453	0.461	0.461
2000	0.120	0.365	0.334	0.592	0.568	0.515	0.296	0.211	0.310	0.310
2001	0.070	0.725	0.984	0.891	0.815	0.436	0.421	0.196	0.148	0.148
2002	0.210	0.590	0.528	0.632	0.682	0.466	0.529	0.266	0.172	0.172
2003	0.146	0.624	0.621	0.492	0.689	0.622	0.490	0.303	0.132	0.132
2004	0.215	0.662	0.469	0.501	0.252	0.523	0.330	0.151	0.106	0.106
2005	0.141	0.490	0.481	0.370	0.452	0.257	0.449	0.268	0.092	0.092
2006	0.285	0.548	0.444	0.412	0.245	0.227	0.127	0.299	0.176	0.176
2007	0.073	0.458	0.425	0.222	0.300	0.181	0.117	0.097	0.097	0.097
2008	0.152	0.330	0.256	0.276	0.165	0.160	0.153	0.097	0.022	0.022
2009	0.164	0.315	0.214	0.196	0.209	0.119	0.104	0.087	0.035	0.035
2010	0.211	0.299	0.221	0.202	0.146	0.163	0.095	0.083	0.035	0.035
2011	0.103	0.286	0.227	0.303	0.206	0.124	0.102	0.094	0.059	0.059

Table 8.3.3. North Sea plaice. Stock number estimates in the final XSA runs

Plaice in IV . stock.n

2012-05-01 16:56:08 units= NA

year	age 1	2	3	4	5	6	7	8	9	10
1957	457973	256778	322069	182986	117504	49780	48438	35192	20763	45210
1958	698110	383614	184865	225749	122171	75186	36568	33338	23255	49887
1959	863386	568706	270362	123650	142799	76063	49331	25309	22555	55137
1960	757299	670799	377298	171551	76786	85609	46907	31440	16805	49877
1961	860577	614899	441591	239780	105744	48183	50972	28949	19875	48420
1962	589154	706790	416674	283132	151856	63044	31337	32158	16921	41052
1963	688367	484324	465010	259569	172010	89026	37245	19737	20503	48075
1964	2231503	536381	304565	276886	152215	101919	50127	21480	11359	47991
1965	694575	1956333	325548	176043	156783	80258	56631	30309	13162	54735
1966	586779	586901	1355542	198053	105458	99441	43686	33776	19288	44345
1967	401297	494321	371939	832387	116532	59210	63824	23833	20304	33590
1968	434281	343895	314558	224455	500707	65485	32351	42364	13952	47349
1969	648875	322590	233486	201832	141579	314126	42895	19436	28724	56233
1970	650583	506087	213515	152353	129910	93521	185269	28911	11797	41653
1971	410282	471057	296432	118125	83216	74031	51105	92600	20156	52939
1972	366625	305265	305843	182007	72497	50104	45123	30154	55508	46557
1973	1312107	263024	188704	185327	108926	43139	29097	27151	16913	66366
1974	1132775	1060140	160423	110717	97549	57140	25827	17877	15199	59733
1975	864859	822021	643892	88844	59840	48613	32892	15755	10163	48505
1976	693092	548602	450575	342757	46079	29725	23715	18468	8621	36569
1977	989338	449542	330345	266247	201308	28422	17436	12783	10631	23948
1978	914118	648015	253933	182282	146201	93666	16898	10153	6790	20871
1979	895153	610233	382127	144538	102995	83446	50432	9640	5999	19730
1980	1133652	529846	292367	177927	66724	47083	37226	22586	4765	13732
1981	868626	809508	300877	136166	86470	36313	25398	20582	12380	14994
1982	2035162	658124	452443	152870	67483	43758	20958	13870	10916	20994
1983	1312130	1447072	355336	204870	70323	33410	23540	11720	7331	20111
1984	1263687	937458	780198	182275	87586	34708	17830	13460	6585	15816
1985	1853892	847805	489719	393652	89984	41728	18216	9923	6880	14550
1986	4775439	1291741	478644	270836	176736	50195	22748	9904	5482	13840
1987	1970104	3256552	637528	229890	129779	77818	22266	11672	4673	11700
1988	1776234	1438737	1557771	293001	100008	54235	37037	9140	6394	12492
1989	1189264	1275608	708536	730546	135049	44307	24907	17444	3120	8111
1990	1039262	872002	647281	355228	357053	64337	21529	12411	8548	9392
1991	918015	800662	492173	330587	187672	165398	32399	11685	7169	12640
1992	781976	655070	395946	230119	148799	94549	74582	15060	5566	11889
1993	532656	572330	341484	186489	106175	61091	52684	39199	6947	11120
1994	445836	387004	319331	168947	88296	45484	27371	34770	24676	24910
1995	1167369	342990	215884	157003	74813	42239	21523	10111	25308	40717
1996	1296449	935840	196546	102373	65993	32115	20972	10108	4940	9145
1997	2160323	1066201	491027	89659	44422	28366	15075	8842	4795	9197
1998	777736	1831514	437593	175830	38226	18235	12525	7470	4499	7979
1999	845152	604098	1013198	146502	53937	18278	10314	6548	4354	8822
2000	987140	643092	340005	545725	41024	25350	9950	6663	3767	8357
2001	544499	792274	403801	220252	273197	21029	13706	6698	4881	17694
2002	1729930	459528	347048	136577	81732	109472	12302	8138	4982	10669
2003	528876	1269420	230450	185192	65661	37383	62187	6558	5646	7437
2004	1270058	413472	615300	112096	102403	29843	18160	34472	4382	5738
2005	770698	927104	193057	348171	61486	72030	16006	11809	26828	7495
2006	937388	605542	513974	108035	217657	35413	50381	9245	8175	8659
2007	1168187	638099	316633	298434	64726	154081	25528	40146	6206	14488
2008	1014800	982324	365146	187221	216264	43393	116303	20549	32982	43901
2009	1040634	789129	638932	255814	128508	165945	33458	90314	16882	23359
2010	929247	798796	520880	466656	190339	94345	133307	27273	74873	38501
2011	1265612	681068	536143	377676	344946	148837	72494	109671	22720	51714

Table 8.4.1. North Sea plaice. Stock summary table.

	recruits	ssb	catch	landings	discards	fbar2-6	fbar hc2-6	fbar dis2-3	Y/ssb
1957	457973	273010	78443	70563	7880	0.27	0.22	0.12	0.26
1958	698110	287066	88191	73354	14837	0.32	0.24	0.19	0.26
1959	863386	296272	109164	79300	29864	0.37	0.24	0.24	0.27
1960	757299	307214	117334	87541	29793	0.37	0.27	0.23	0.28
1961	860577	319935	118474	85984	32490	0.35	0.24	0.27	0.27
1962	589154	371317	125375	87472	37903	0.39	0.25	0.29	0.24
1963	688367	368352	148376	107118	41258	0.42	0.27	0.36	0.29
1964	2231503	361210	147571	110540	37031	0.47	0.30	0.32	0.31
1965	694575	343910	140223	97143	43080	0.39	0.28	0.25	0.28
1966	586779	359196	166552	101834	64718	0.40	0.24	0.34	0.28
1967	401297	412585	163365	108819	54546	0.43	0.25	0.32	0.26
1968	434281	400993	139521	111534	27987	0.34	0.21	0.22	0.28
1969	648875	376358	142820	121651	21169	0.34	0.25	0.17	0.32
1970	650583	332878	159982	130342	29640	0.48	0.35	0.28	0.39
1971	410282	314682	136939	113944	22995	0.38	0.29	0.22	0.36
1972	366625	316599	142475	122843	19632	0.41	0.33	0.19	0.39
1973	1312107	266580	143783	130429	13354	0.47	0.41	0.13	0.49
1974	1132775	278457	157485	112540	44945	0.49	0.41	0.20	0.40
1975	864859	291454	195235	108536	86699	0.56	0.37	0.43	0.37
1976	693092	307725	166917	113670	53247	0.42	0.30	0.27	0.37
1977	989338	314439	176689	119188	57501	0.51	0.34	0.31	0.38
1978	914118	301354	159639	113984	45655	0.47	0.36	0.22	0.38
1979	895153	295823	213282	145347	67935	0.67	0.49	0.36	0.49
1980	1133652	270485	171485	140405	31080	0.56	0.49	0.15	0.52
1981	868626	261847	173596	140565	33031	0.54	0.47	0.16	0.54
1982	2035162	262324	204508	155381	49127	0.60	0.51	0.22	0.59
1983	1312130	314080	219386	144903	74483	0.59	0.48	0.26	0.46
1984	1263687	322798	227848	157032	70816	0.59	0.43	0.28	0.49
1985	1853892	345749	221419	160870	60549	0.53	0.44	0.23	0.47
1986	4775439	372196	296472	166519	129953	0.66	0.50	0.34	0.45
1987	1970104	450011	345628	155104	190524	0.69	0.48	0.51	0.34
1988	1776234	391842	312684	156261	156423	0.67	0.40	0.51	0.40
1989	1189264	417266	279112	171319	107793	0.61	0.38	0.45	0.41
1990	1039262	381455	229016	157791	71225	0.57	0.38	0.39	0.41
1991	918015	351693	230278	149343	80935	0.65	0.41	0.47	0.42
1992	781976	286209	183326	126277	57049	0.63	0.42	0.40	0.44
1993	532656	249472	153043	118027	35016	0.64	0.50	0.28	0.47
1994	445836	227759	135227	111442	23785	0.62	0.52	0.24	0.49
1995	1167369	220049	121063	99235	21828	0.64	0.55	0.21	0.45
1996	1296449	182046	134647	82598	52049	0.67	0.52	0.34	0.45
1997	2160323	207638	184297	84152	100145	0.80	0.52	0.68	0.41
1998	777736	228183	176282	72531	103751	0.74	0.39	0.60	0.32
1999	845152	203386	152696	81720	70976	0.67	0.38	0.38	0.40
2000	987140	230353	126783	82472	44311	0.47	0.33	0.26	0.36
2001	544499	270908	183182	82873	100309	0.77	0.32	0.71	0.31
2002	1729930	198554	125777	71387	54390	0.58	0.38	0.42	0.36
2003	528876	226326	144964	67172	77792	0.61	0.38	0.45	0.30
2004	1270058	206665	116536	62070	54466	0.48	0.29	0.44	0.30
2005	770698	243515	110133	56257	53876	0.41	0.21	0.38	0.23
2006	937388	252277	120299	58453	61846	0.38	0.19	0.39	0.23
2007	1168187	259858	89783	50348	39435	0.32	0.16	0.34	0.19
2008	1014800	359399	95309	49434	45875	0.24	0.14	0.22	0.14
2009	1040634	400115	100671	55446	45225	0.21	0.11	0.21	0.14
2010	929247	500793	106980	61163	45817	0.21	0.11	0.20	0.12
2011	1265612	476063	108523	67963	40560	0.23	0.11	0.20	0.14

Table 8.5.1. North Sea plaice. Input table for RCT3 analysis.

Plaice	NorthSea							
	Age1	Age2	SNS0	SNS1	SNS2	BTS1	BTS2	DFS0
1972	1312107	1060140	7757.5	65642.5	16508.9	-11	-11	-11
1973	1132775	822021	7183	15366.4	8168.4	-11	-11	-11
1974	864859	548602	568.1	11628.2	2402.6	-11	-11	-11
1975	693092	449542	314.4	8536.5	3423.8	-11	-11	-11
1976	989338	648015	1166	18536.7	12678	-11	-11	-11
1977	914118	610233	372.5	14012	9828.8	-11	-11	-11
1978	895153	529846	267.5	21495.4	12882.3	-11	-11	-11
1979	1133652	809508	29058.1	59174.2	18785.3	-11	-11	-11
1980	868626	658124	210.4	24756.2	8642	-11	-11	-11
1981	2035162	1447072	35506.4	69993.3	13908.6	-11	-11	606
1982	1312130	937458	24401.9	33974.2	10412.8	-11	-11	433.7
1983	1263687	847805	32941.9	44964.5	13847.8	-11	173.9	431.7
1984	1853892	1291741	7918.3	28100.5	7580.4	136.8	131.7	261.8
1985	4775439	3256552	47256.4	93551.9	32991.1	667.4	764.2	716.3
1986	1970104	1438737	8819.9	33402.4	14421.1	225.8	147	200.1
1987	1776234	1275608	21334.9	36608.6	17810.2	680.2	319.3	516.8
1988	1189264	872002	15669.7	34276.3	7496	467.9	146.1	318.4
1989	1039262	800662	24585.3	25036.6	11247.2	185.3	159.4	435.7
1990	918015	655070	368.5	57221.3	13841.8	291.4	174.5	465.5
1991	781976	572330	7256.7	46798.2	9685.6	360.9	283.4	498.5
1992	532656	387004	472.5	22098.3	4976.6	189	77.1	351.6
1993	445836	342990	234.3	19188.4	2796.4	193.3	40.6	262.3
1994	1167369	935840	26781.3	24767	10268.2	265.6	206.9	445.7
1995	1296449	1066201	12541.3	23015.4	4472.7	310.3	59.2	184.5
1996	2160323	1831514	84041.8	95900.9	30242.2	1046.8	402.7	572.8
1997	777736	604098	7344.1	33665.7	10272.1	347.6	121.6	149.2
1998	845152	643092	5521.6	32951.3	2493.4	293.3	69.3	-11
1999	987140	792274	9262.3	22855	2898.5	267.5	72.2	-11
2000	544499	459528	4213.5	11510.5	1102.7	206.5	44.5	183.8
2001	1729930	1269420	99628	30809.2	-11	519.2	159.1	500.4
2002	528876	413472	1202	-11	1349.7	132.8	39.6	210.7
2003	1270058	927104	-11	18201.6	1818.9	233.7	66.2	359.6
2004	770698	605542	3537.2	10118.4	1571	163	36.4	243.2
2005	937388	638099	7390.6	12164.2	2133.9	128.6	67.2	129.3
2006	1168187	982324	1124.2	14174.5	2700.4	312	120.7	232.3
2007	1014800	789129	40580.9	14705.8	2018.7	221.6	105.2	175.7
2008	-11	-11	50179.3	14860	1811.5	409	84.3	186.9
2009	-11	-11	53258.8	11946.9	1142.515	261	148.2	235.6
2010	-11	-11	49347.24	18348.6	-11	486	-11	195.4
2011	-11	-11	-11	-11	-11	-11	-11	161.2

Table 8.5.2. North Sea plaice. RCT3 results for age 1.

```
Analysis by RCT3 ver4.0

Plaice
Data for 6 surveys over 40 years : 1972 - 2011
Regression type = C
Tapered time weighting not applied
Survey weighting not applied
Final estimates not shrunk towards mean
Estimates with S.E.'S greater than that of mean included
Minimum S.E. for any survey taken as    .00
Minimum of   3 points used for regression

Forecast/Hindcast variance correction used.

yearclass:2011
    index  slope intercept     se rsquare  n indices prediction se.pred WAP.weights
     SNS0 0.3851    10.597 0.5464  0.4305 35      NA         NA      NA          NA
     SNS1 1.1769     1.931 0.5935  0.3739 35      NA         NA      NA          NA
     SNS2 0.7842     6.996 0.5708  0.4027 35      NA         NA      NA          NA
     BTS1 1.6632     4.529 0.7386  0.3548 24      NA         NA      NA          NA
     BTS2 0.9012     9.614 0.4609  0.5754 25      NA         NA      NA          NA
     DFS0 2.1783     1.390 0.9244  0.2601 25   5.083      12.46   1.022      0.1698
 VPA Mean     NA        NA     NA      NA 36      NA      13.90   0.462      0.8302

                  WAP logWAP int.se
yearclass:2011 849355  13.65  0.421
```

Table 8.5.3. North Sea plaice. RCT3 results for age 2.

```
Analysis by RCT3 ver4.0
Plaice
Data for 6 surveys over 40 years : 1972 - 2011
Regression type = C
Tapered time weighting not applied
Survey weighting not applied
Final estimates not shrunk towards mean
Estimates with S.E.'S greater than that of mean included
Minimum S.E. for any survey taken as    .00
Minimum of   3 points used for regression

Forecast/Hindcast variance correction used.
 yearclass:2010
    index  slope intercept     se rsquare  n indices prediction se.pred WAP.weights
     SNS0 0.3568   10.5324 0.4726  0.5034 35  10.807      14.39  0.5039     0.27778
     SNS1 1.1605    1.7886 0.5774  0.3907 35   9.817      13.18  0.6060     0.19209
     SNS2 0.8478    6.1307 0.6457  0.3457 35      NA         NA      NA          NA
     BTS1 1.5414    4.9394 0.6663  0.3887 24   6.186      14.48  0.7256     0.13399
     BTS2 0.8936    9.3693 0.4710  0.5490 25      NA         NA      NA          NA
     DFS0 2.1994    0.9803 0.9474  0.2377 25   5.275      12.58  1.0280     0.06674
 VPA Mean     NA        NA     NA      NA 36      NA      13.59  0.4627     0.32940

                  WAP logWAP int.se

yearclass:2010 968826  13.78 0.2656
```

Table 8.6.1. North Sea plaice. Input to the short term forecast (F values presented are for Fsq)

	age	year	f	f.disc	f.land	stock.n	catch.wt	landings.wt	discards.wt	stock.wt	mat	M
1	1	2012	0.170	0.17	0.00	922294	0.06	0.20	0.06	0.05	0.0	0.1
2	2	2012	0.319	0.30	0.02	1033366	0.12	0.25	0.11	0.11	0.5	0.1
3	3	2012	0.235	0.14	0.10	462935	0.22	0.30	0.16	0.19	0.5	0.1
4	4	2012	0.249	0.07	0.18	386689	0.30	0.35	0.19	0.30	1.0	0.1
5	5	2012	0.199	0.03	0.17	252374	0.39	0.42	0.19	0.36	1.0	0.1
6	6	2012	0.144	0.02	0.13	253930	0.45	0.48	0.20	0.43	1.0	0.1
7	7	2012	0.107	0.01	0.10	118979	0.52	0.54	0.21	0.45	1.0	0.1
8	8	2012	0.094	0.03	0.07	59212	0.48	0.58	0.22	0.51	1.0	0.1
9	9	2012	0.046	0.00	0.05	90351	0.63	0.63	0.00	0.55	1.0	0.1
10	10	2012	0.046	0.00	0.05	63486	0.74	0.74	0.00	0.61	1.0	0.1
11	1	2013	0.170	0.17	0.00	922294	0.06	0.20	0.06	0.05	0.0	0.1
12	2	2013	0.319	0.30	0.02	NA	0.12	0.25	0.11	0.11	0.5	0.1
13	3	2013	0.235	0.14	0.10	NA	0.22	0.30	0.16	0.19	0.5	0.1
14	4	2013	0.249	0.07	0.18	NA	0.30	0.35	0.19	0.30	1.0	0.1
15	5	2013	0.199	0.03	0.17	NA	0.39	0.42	0.19	0.36	1.0	0.1
16	6	2013	0.144	0.02	0.13	NA	0.45	0.48	0.20	0.43	1.0	0.1
17	7	2013	0.107	0.01	0.10	NA	0.52	0.54	0.21	0.45	1.0	0.1
18	8	2013	0.094	0.03	0.07	NA	0.48	0.58	0.22	0.51	1.0	0.1
19	9	2013	0.046	0.00	0.05	NA	0.63	0.63	0.00	0.55	1.0	0.1
20	10	2013	0.046	0.00	0.05	NA	0.74	0.74	0.00	0.61	1.0	0.1
21	1	2014	0.170	0.17	0.00	922294	0.06	0.20	0.06	0.05	0.0	0.1
22	2	2014	0.319	0.30	0.02	NA	0.12	0.25	0.11	0.11	0.5	0.1
23	3	2014	0.235	0.14	0.10	NA	0.22	0.30	0.16	0.19	0.5	0.1
24	4	2014	0.249	0.07	0.18	NA	0.30	0.35	0.19	0.30	1.0	0.1
25	5	2014	0.199	0.03	0.17	NA	0.39	0.42	0.19	0.36	1.0	0.1
26	6	2014	0.144	0.02	0.13	NA	0.45	0.48	0.20	0.43	1.0	0.1
27	7	2014	0.107	0.01	0.10	NA	0.52	0.54	0.21	0.45	1.0	0.1
28	8	2014	0.094	0.03	0.07	NA	0.48	0.58	0.22	0.51	1.0	0.1
29	9	2014	0.046	0.00	0.05	NA	0.63	0.63	0.00	0.55	1.0	0.1
30	10	2014	0.046	0.00	0.05	NA	0.74	0.74	0.00	0.61	1.0	0.1

Table 8.6.2A. North Sea plaice. Results from the short term forecast assuming $F_{2012} = F_{2011}$ (rescaled)

```
   year fmult  f2-6 f_dis2-3 f_hc2-6 landings discards  catch ssb2012
25 2012     1 0.229     0.22    0.12    78501    51192 129797  589341
   year fmult  f2-6 f_dis2-3 f_hc2-6 landings discards  catch    ssb ssb2014
2  2013   0.2 0.046     0.04    0.02    17952    10121  28098 628143  792171
5  2013   0.3 0.069     0.06    0.04    26679    14993  41709 628143  778131
8  2013   0.4 0.092     0.09    0.05    35244    19744  55036 628143  764386
11 2013   0.5 0.115     0.11    0.06    43651    24377  68087 628143  750931
14 2013   0.6 0.138     0.13    0.07    51903    28894  80867 628143  737758
17 2013   0.7 0.160     0.15    0.08    60003    33300  93384 628143  724860
20 2013   0.8 0.183     0.17    0.10    67954    37597 105643 628143  712232
23 2013   0.9 0.206     0.19    0.11    75760    41788 117651 628143  699867
26 2013   1.0 0.229     0.22    0.12    83424    45876 129412 628143  687760
29 2013   1.1 0.252     0.24    0.13    90948    49862 140933 628143  675904
32 2013   1.2 0.275     0.26    0.14    98336    53751 152220 628143  664293
35 2013   1.3 0.298     0.28    0.16   105590    57545 163277 628143  652923
38 2013   1.4 0.321     0.30    0.17   112713    61246 174110 628143  641787
41 2013   1.5 0.344     0.32    0.18   119707    64856 184724 628143  630880
44 2013   1.6 0.367     0.35    0.19   126577    68378 195125 628143  620198
47 2013   1.7 0.390     0.37    0.20   133323    71815 205316 628143  609734
50 2013   1.8 0.413     0.39    0.21   139948    75168 215303 628143  599484
53 2013   1.9 0.436     0.41    0.23   146456    78439 225091 628143  589444
56 2013   2.0 0.458     0.43    0.24   152848    81632 234684 628143  579607
```

Table 8.6.3A. North Sea plaice. Detailed STF table by age, assuming $F_{2012} = F_{2011}$, rescaled.

age	year	f	f.disc	f.land	stock.n	catch.wt	landings.	discards.	stock.wt	mat	M	catch.n	catch	landings.	landings	discards.	discards	SSB	TSB
1	2012	0.17	0.17	0	922294	0.06	0.2	0.06	0.05	0	0.1	137058	7783	1100	220	135958	7568	0	44270
2	2012	0.319	0.3	0.02	1E+06	0.12	0.25	0.11	0.11	0.5	0.1	269524	32877	19322	4852	250202	28023	56835	113670
3	2012	0.235	0.14	0.1	462935	0.22	0.3	0.16	0.19	0.5	0.1	92440	20267	38804	11600	53636	8653	43207	86415
4	2012	0.249	0.07	0.18	386689	0.3	0.35	0.19	0.3	1	0.1	81178	24616	57425	20055	23753	4513	115105	115105
5	2012	0.199	0.03	0.17	252374	0.39	0.42	0.19	0.36	1	0.1	43432	16784	37593	15619	5839	1133	91612	91612
6	2012	0.144	0.02	0.13	253930	0.45	0.48	0.2	0.43	1	0.1	32477	14622	28504	13819	3973	801	109698	109698
7	2012	0.107	0.01	0.1	118979	0.52	0.54	0.21	0.45	1	0.1	11510	5977	10572	5758	938	194	53858	53858
8	2012	0.094	0.03	0.07	59212	0.48	0.58	0.22	0.51	1	0.1	5040	2415	3650	2121	1390	307	30277	30277
9	2012	0.046	0	0.05	90351	0.63	0.63	0	0.55	1	0.1	3856	2445	3856	2445	0	0	50085	50085
10	2012	0.046	0	0.05	63486	0.74	0.74	0	0.61	1	0.1	2709	2011	2709	2011	0	0	38665	38665
1	2013	0.17	0.17	0	922294	0.06	0.2	0.06	0.05	0	0.1	137058	7783	1100	220	135958	7568	0	44270
2	2013	0.319	0.3	0.02	704391	0.12	0.25	0.11	0.11	0.5	0.1	183720	22410	13171	3307	170549	19101	38741	77483
3	2013	0.235	0.14	0.1	679435	0.22	0.3	0.16	0.19	0.5	0.1	135671	29745	56951	17025	78719	12700	63414	126828
4	2013	0.249	0.07	0.18	331158	0.3	0.35	0.19	0.3	1	0.1	69520	21081	49179	17175	20342	3865	98575	98575
5	2013	0.199	0.03	0.17	272864	0.39	0.42	0.19	0.36	1	0.1	46958	18147	40646	16888	6313	1225	99050	99050
6	2013	0.144	0.02	0.13	187129	0.45	0.48	0.2	0.43	1	0.1	23933	10776	21006	10184	2928	590	80840	80840
7	2013	0.107	0.01	0.1	198922	0.52	0.54	0.21	0.45	1	0.1	19243	9992	17675	9627	1568	325	90045	90045
8	2013	0.094	0.03	0.07	96722	0.48	0.58	0.22	0.51	1	0.1	8233	3945	5962	3465	2270	501	49457	49457
9	2013	0.046	0	0.05	48789	0.63	0.63	0	0.55	1	0.1	2082	1320	2082	1320	0	0	27045	27045
10	2013	0.046	0	0.05	132957	0.74	0.74	0	0.61	1	0.1	5674	4213	5674	4213	0	0	80975	80975
1	2014	0.17	0.17	0	922294	0.06	0.2	0.06	0.05	0	0.1	137058	7783	1100	220	135958	7568	0	44270
2	2014	0.319	0.3	0.02	704391	0.12	0.25	0.11	0.11	0.5	0.1	183720	22410	13171	3307	170549	19101	38741	77483
3	2014	0.235	0.14	0.1	463135	0.22	0.3	0.16	0.19	0.5	0.1	92480	20275	38821	11605	53659	8657	43226	86452
4	2014	0.249	0.07	0.18	486030	0.3	0.35	0.19	0.3	1	0.1	102033	30940	72178	25207	29855	5672	144675	144675
5	2014	0.199	0.03	0.17	233679	0.39	0.42	0.19	0.36	1	0.1	40215	15541	34809	14462	5406	1049	84825	84825
6	2014	0.144	0.02	0.13	202322	0.45	0.48	0.2	0.43	1	0.1	25877	11650	22711	11011	3165	638	87403	87403
7	2014	0.107	0.01	0.1	146592	0.52	0.54	0.21	0.45	1	0.1	14181	7364	13025	7095	1156	239	66357	66357
8	2014	0.094	0.03	0.07	161711	0.48	0.58	0.22	0.51	1	0.1	13764	6596	9968	5793	3796	838	82688	82688
9	2014	0.046	0	0.05	79696	0.63	0.63	0	0.55	1	0.1	3401	2156	3401	2156	0	0	44178	44178
10	2014	0.046	0	0.05	157078	0.74	0.74	0	0.61	1	0.1	6704	4977	6704	4977	0	0	95666	95666

Table 8.6.3B. North Sea plaice. Detailed STF table by age, forecast assuming a F for 2012 such that the landings in 2012 equal the TAC for 2012

age	year	f	f.disc	f.land	stock.n	catch.wt	landings.wt	discards.wt	stock.wt	mat	M	catch.n	catch	landings.n	landings	discards.n	discards	SSB	TSB
1	2012	0.184	0.18	0	922294	0.06	0.2	0.06	0.05	0	0.1	147521	8377	1184	237	146337	8146	0	44270
2	2012	0.346	0.32	0.02	1033366	0.12	0.25	0.11	0.11	0.5	0.1	288471	35188	20681	5193	267790	29993	56835	113670
3	2012	0.255	0.15	0.11	462935	0.22	0.3	0.16	0.19	0.5	0.1	99248	21759	41662	12454	57586	9291	43207	86415
4	2012	0.269	0.08	0.19	386689	0.3	0.35	0.19	0.3	1	0.1	87112	26416	61623	21521	25489	4843	115105	115105
5	2012	0.216	0.03	0.19	252374	0.39	0.42	0.19	0.36	1	0.1	46695	18045	40417	16793	6277	1218	91612	91612
6	2012	0.156	0.02	0.14	253930	0.45	0.48	0.2	0.43	1	0.1	34991	15754	30711	14889	4280	863	109698	109698
7	2012	0.116	0.01	0.11	118979	0.52	0.54	0.21	0.45	1	0.1	12419	6449	11407	6213	1012	210	53858	53858
8	2012	0.101	0.03	0.07	59212	0.48	0.58	0.22	0.51	1	0.1	5441	2607	3940	2290	1500	331	30277	30277
9	2012	0.05	0	0.05	90351	0.63	0.63	0	0.55	1	0.1	4171	2644	4171	2644	0	0	50085	50085
10	2012	0.05	0	0.05	63486	0.74	0.74	0	0.61	1	0.1	2931	2176	2931	2176	0	0	38665	38665
1	2013	0.17	0.17	0	922294	0.06	0.2	0.06	0.05	0	0.1	137058	7783	1100	220	135958	7568	0	44270
2	2013	0.319	0.3	0.02	694472	0.12	0.25	0.11	0.11	0.5	0.1	181133	22095	12986	3261	168148	18833	38196	76392
3	2013	0.235	0.14	0.1	661528	0.22	0.3	0.16	0.19	0.5	0.1	132095	28961	55450	16576	76645	12365	61743	123485
4	2013	0.249	0.07	0.18	324712	0.3	0.35	0.19	0.3	1	0.1	68167	20671	48221	16841	19946	3790	96656	96656
5	2013	0.199	0.03	0.17	267247	0.39	0.42	0.19	0.36	1	0.1	45992	17773	39809	16540	6183	1199	97011	97011
6	2013	0.144	0.02	0.13	184038	0.45	0.48	0.2	0.43	1	0.1	23538	10598	20659	10016	2879	581	79505	79505
7	2013	0.107	0.01	0.1	196538	0.52	0.54	0.21	0.45	1	0.1	19013	9873	17463	9512	1550	321	88966	88966
8	2013	0.094	0.03	0.07	95860	0.48	0.58	0.22	0.51	1	0.1	8159	3910	5909	3434	2250	497	49016	49016
9	2013	0.046	0	0.05	48408	0.63	0.63	0	0.55	1	0.1	2066	1310	2066	1310	0	0	26834	26834
10	2013	0.046	0	0.05	132448	0.74	0.74	0	0.61	1	0.1	5653	4196	5653	4196	0	0	80665	80665
1	2014	0.17	0.17	0	922294	0.06	0.2	0.06	0.05	0	0.1	137058	7783	1100	220	135958	7568	0	44270
2	2014	0.319	0.3	0.02	704391	0.12	0.25	0.11	0.11	0.5	0.1	183720	22410	13171	3307	170549	19101	38741	77483
3	2014	0.235	0.14	0.1	456614	0.22	0.3	0.16	0.19	0.5	0.1	91177	19990	38274	11442	52903	8535	42617	85235
4	2014	0.249	0.07	0.18	473220	0.3	0.35	0.19	0.3	1	0.1	99344	30125	70275	24543	29068	5523	140862	140862
5	2014	0.199	0.03	0.17	229130	0.39	0.42	0.19	0.36	1	0.1	39432	15238	34131	14181	5301	1028	83174	83174
6	2014	0.144	0.02	0.13	198157	0.45	0.48	0.2	0.43	1	0.1	25344	11411	22244	10784	3100	625	85604	85604
7	2014	0.107	0.01	0.1	144171	0.52	0.54	0.21	0.45	1	0.1	13947	7242	12810	6978	1137	235	65261	65261
8	2014	0.094	0.03	0.07	159773	0.48	0.58	0.22	0.51	1	0.1	13599	6517	9849	5724	3750	828	81697	81697
9	2014	0.046	0	0.05	78986	0.63	0.63	0	0.55	1	0.1	3371	2137	3371	2137	0	0	43784	43784
10	2014	0.046	0	0.05	156309	0.74	0.74	0	0.61	1	0.1	6671	4953	6671	4953	0	0	95197	95197

Table 8.6.4. North Sea plaice. Yield and spawning biomass per recruit reference points following 2012 assessment.

	Fish Mort	Yield/R	SSB/R
	Ages 2-6		
Average last 3 years	0.22	0.10	1.01
Fmax	0.19	0.10	1.19
F0.1	0.14	0.09	1.62

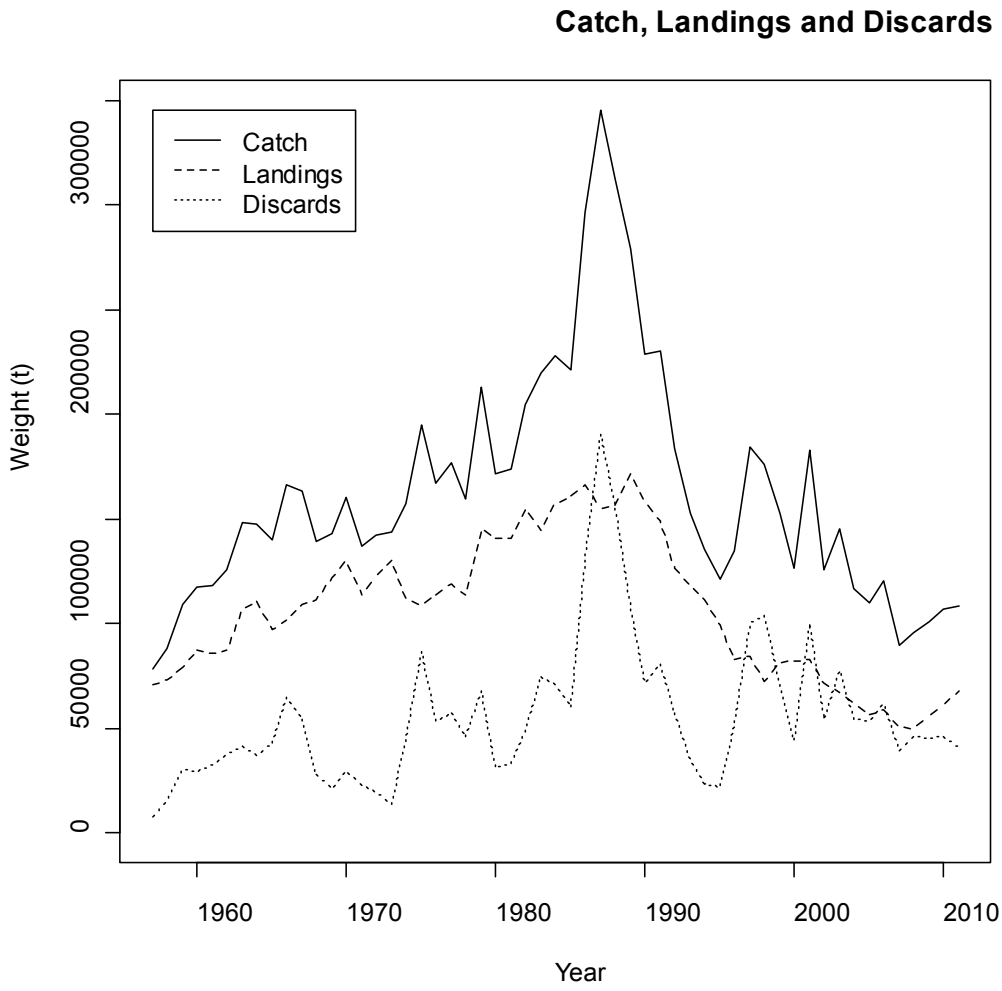

Figure 8.2.1 North Sea plaice. Time series of catch (solid line), landings (dashed line) and discards (dotted line) estimates.

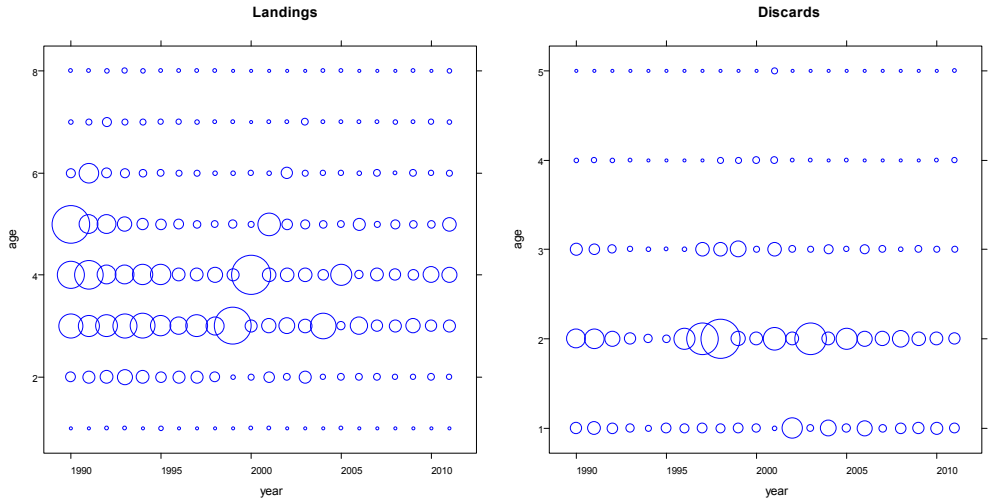

Figure 8.2.2 North Sea plaice. Landing numbers-at-age (left) and discards numbers-at-age (right).

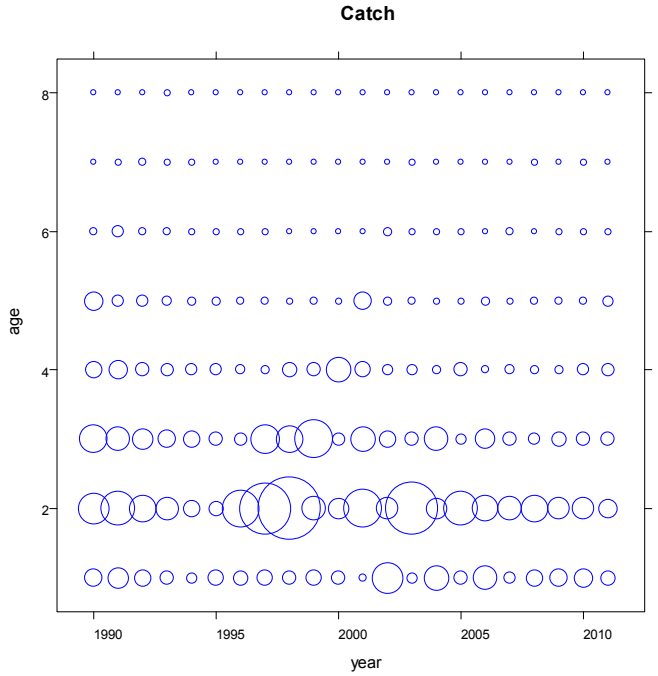

Figure 8.2.3 North Sea plaice. Catch numbers-at-age.

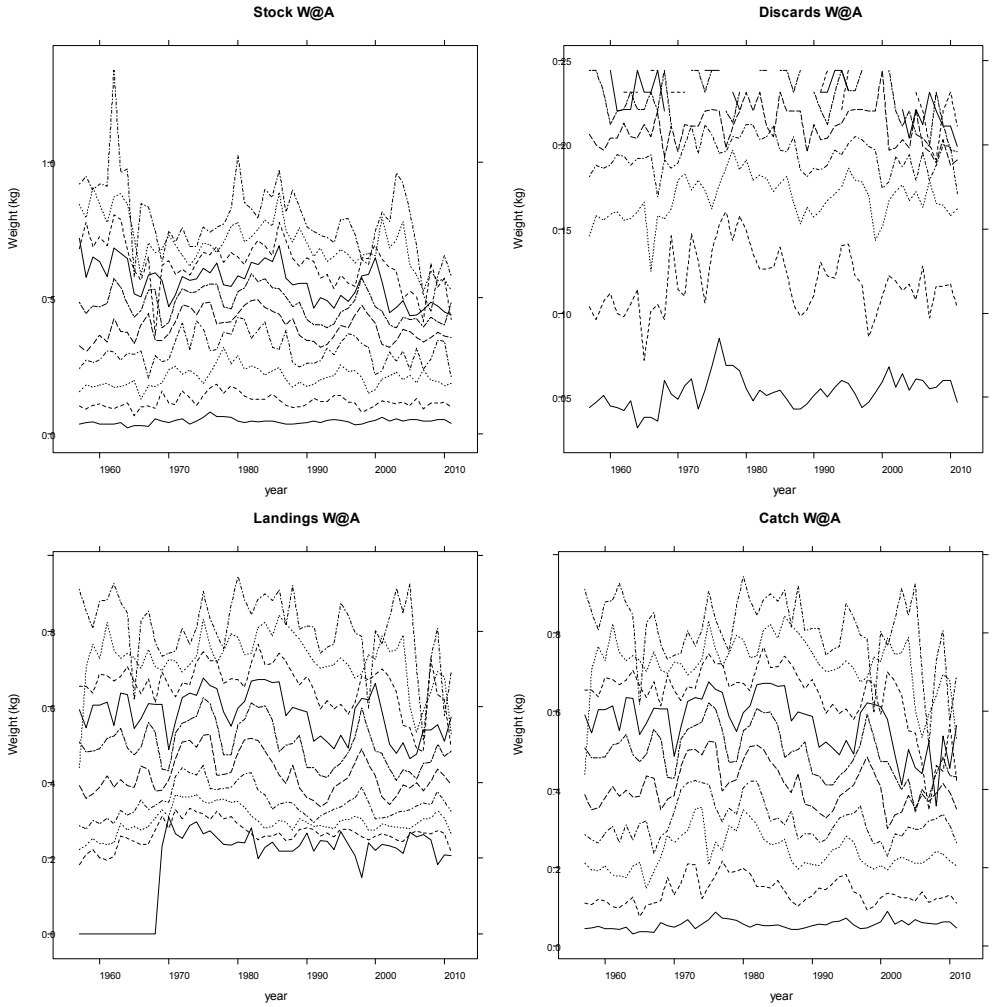

Figure 8.2.4 North Sea plaice. Stock weight-at-age (top left), discards weight-at-age (top right), landings weight-at-age (bottom left) and catch weight-at-age (bottom right)..

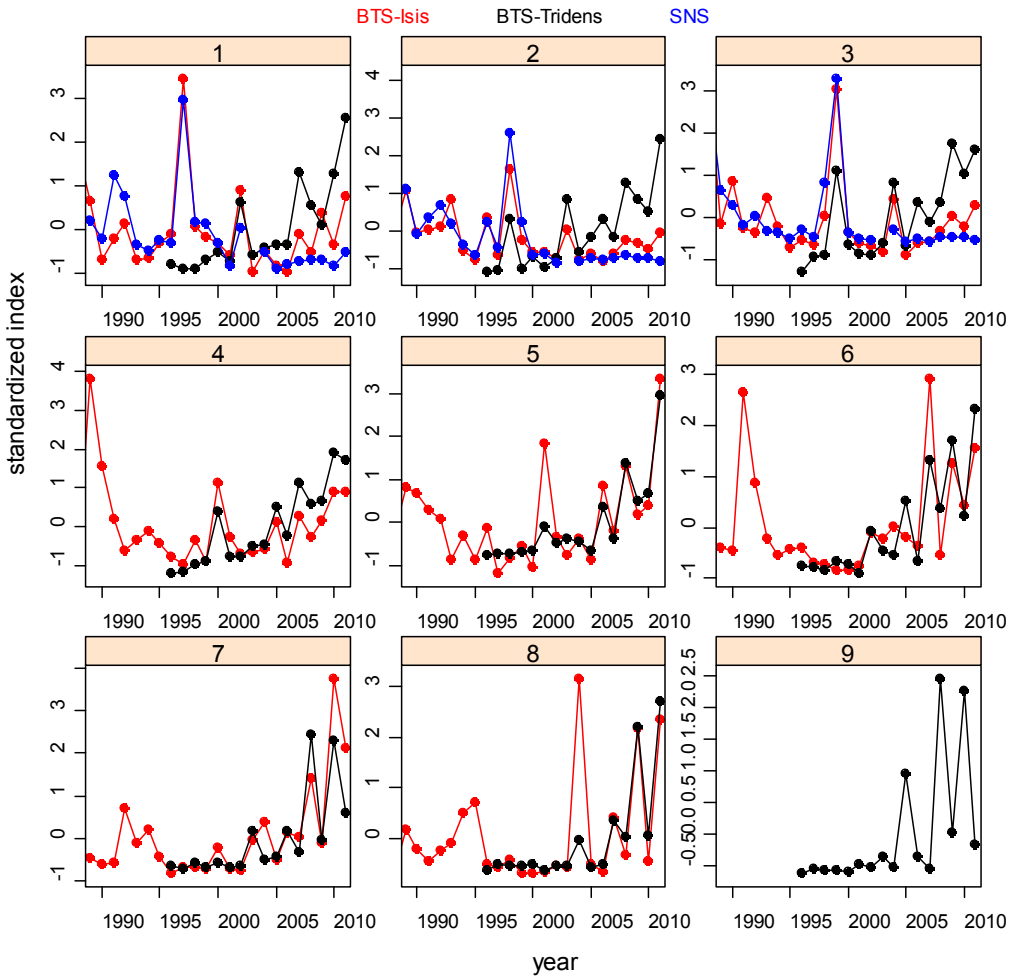

Figure 8.2.5 North Sea plaice. Standardized survey tuning indices used for tuning XSA: BTS-Isis (red), BTS-Tridens (black) and SNS (blue). Note: only ages used in the assessment are presented.

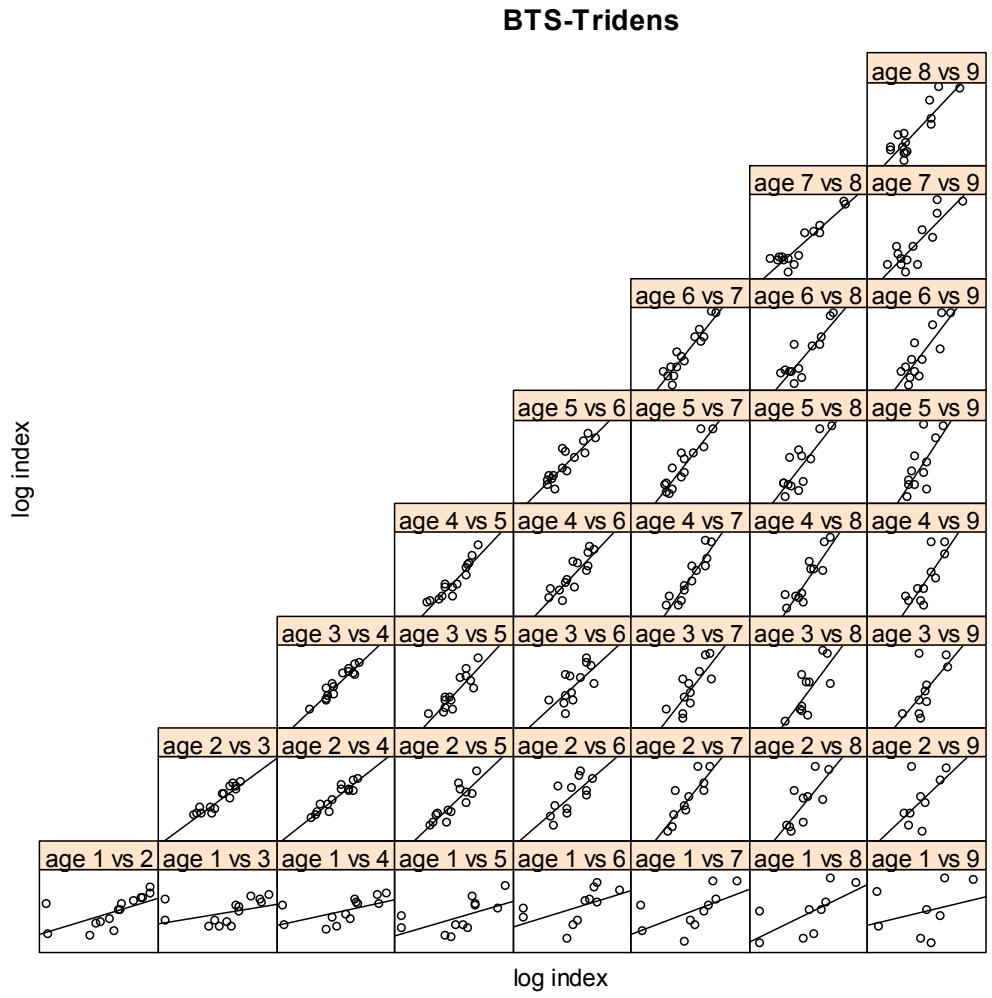

Figure 8.2.6 North Sea plaice. Internal consistency plot for the BTS-Tridens survey.

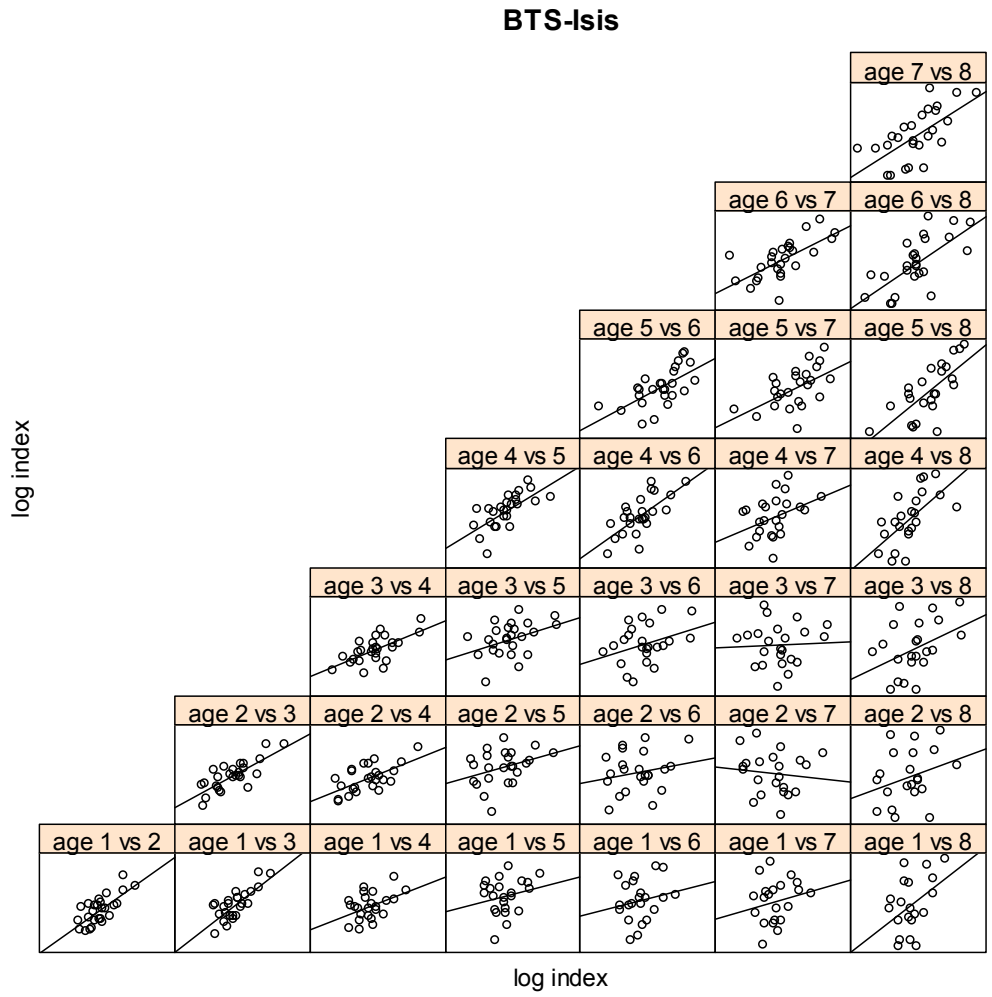

Figure 8.2.7. North Sea plaice. Internal consistency plot for the BTS-Isis survey.

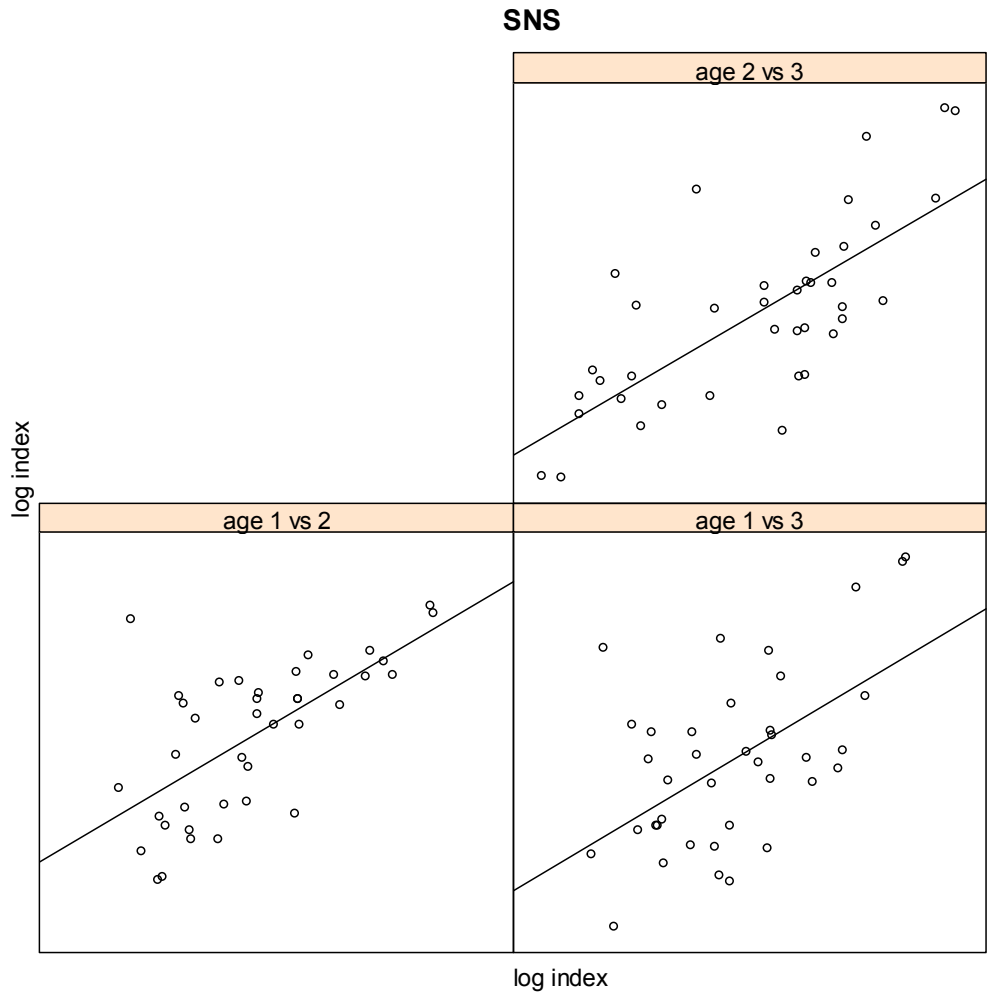

Figure 8.2.8. North Sea plaice. Internal consistency plot for the SNS survey.

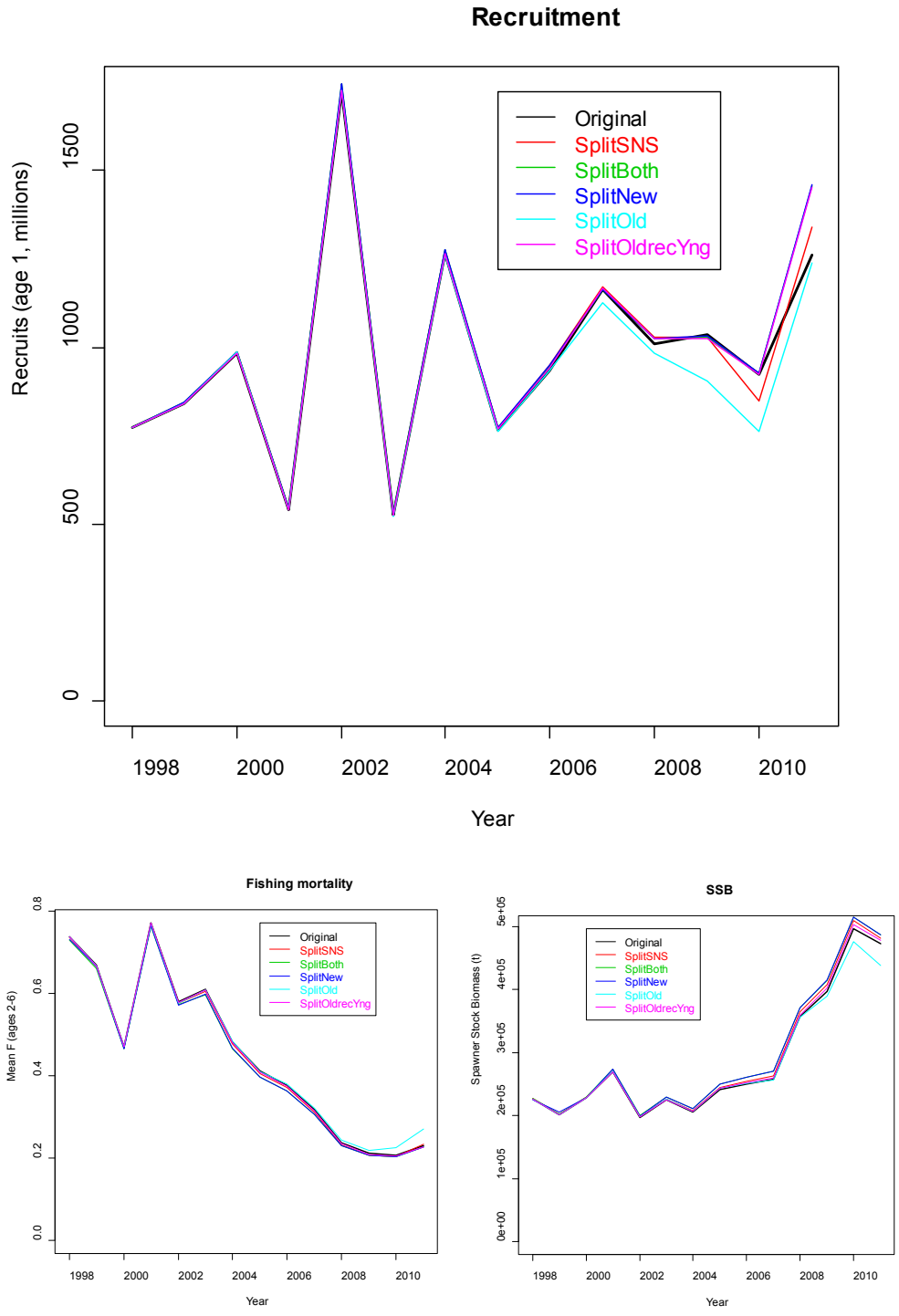

Figure 8.3.1. North Sea plaice. Sensitivity of the assessment with respect to assumptions on catchability of indices over time (by splitting the SNS and/or BTS Tridens indices at the year 200 – see text for details). XSA results with respect to recruitment (top), F (bottom left) and SSB (bottom right) estimates. Note: some lines may be hidden due to near identical outputs.

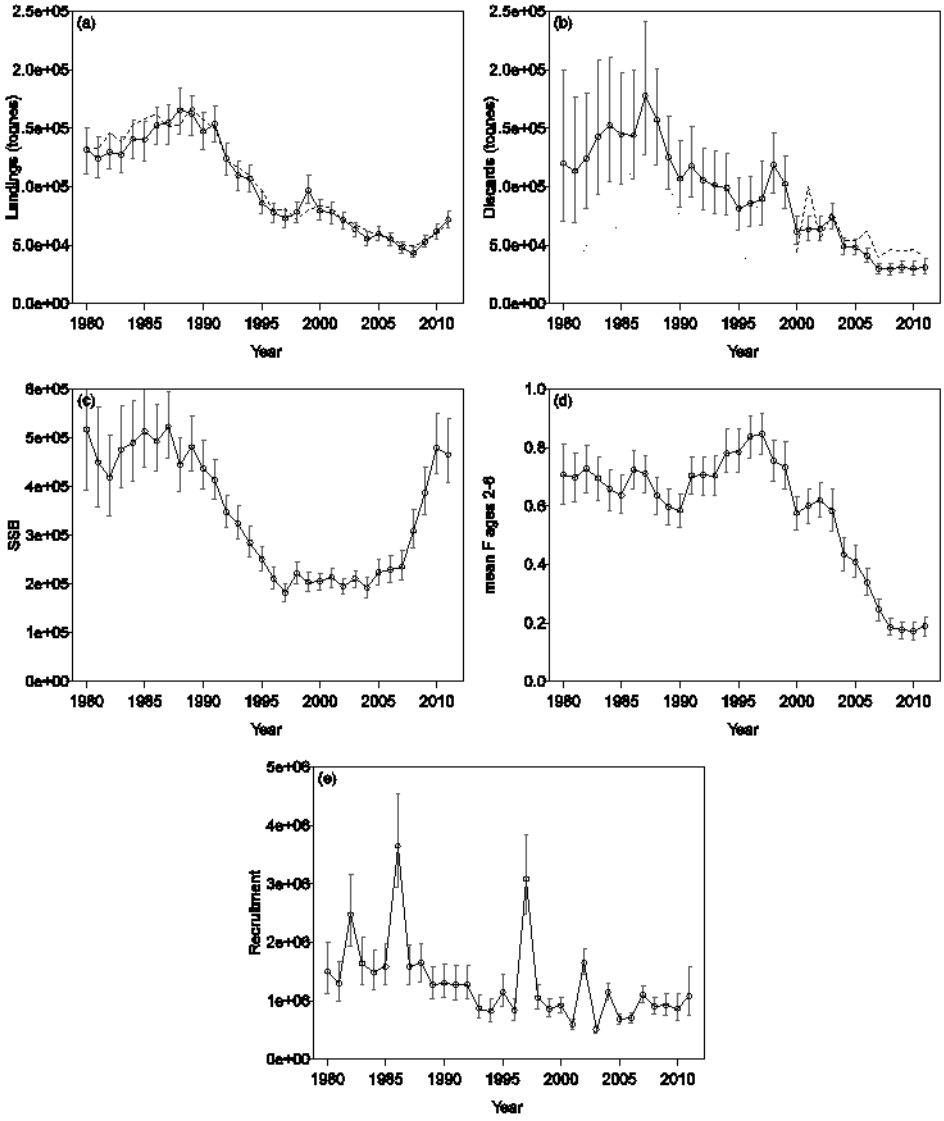

Figure 8.3.2 North Sea plaice. SCA (see Aarts & Poos 2009) assessment results: (a) Estimated Landings, (b) Discard estimates, (c) SSB, (d) Mean F (ages 2-6), and (e) Recruitment. Horizontal bars indicate 95% confidence levels.

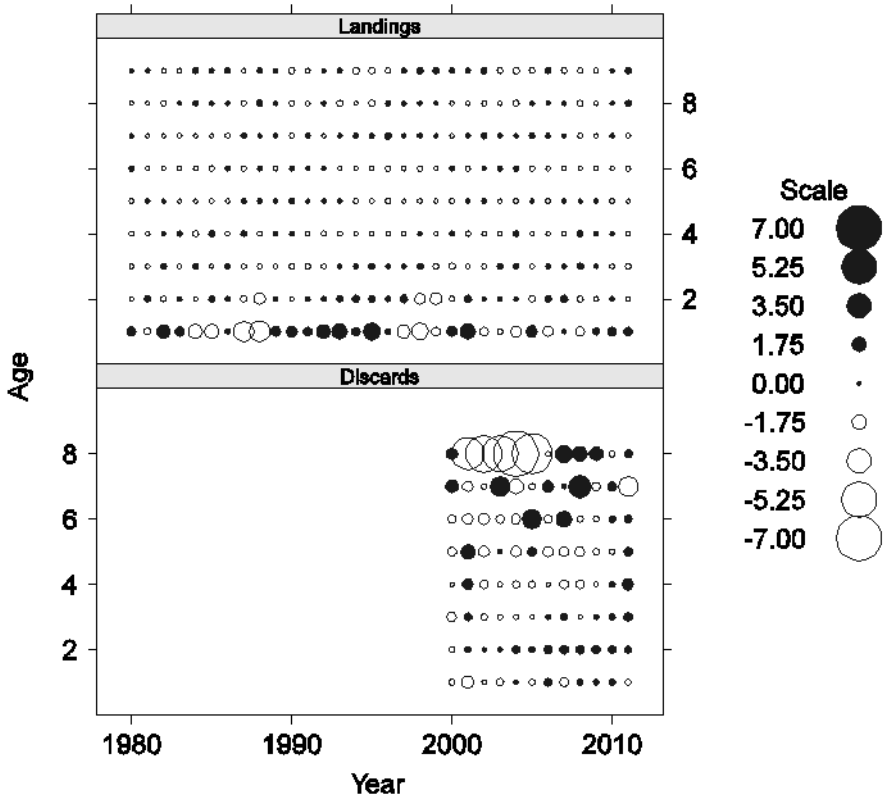

Figure 8.3.3. North Sea plaice. Log catchability residuals for the landings and discard estimates from the SCA model (Aarts and Poos 2009).

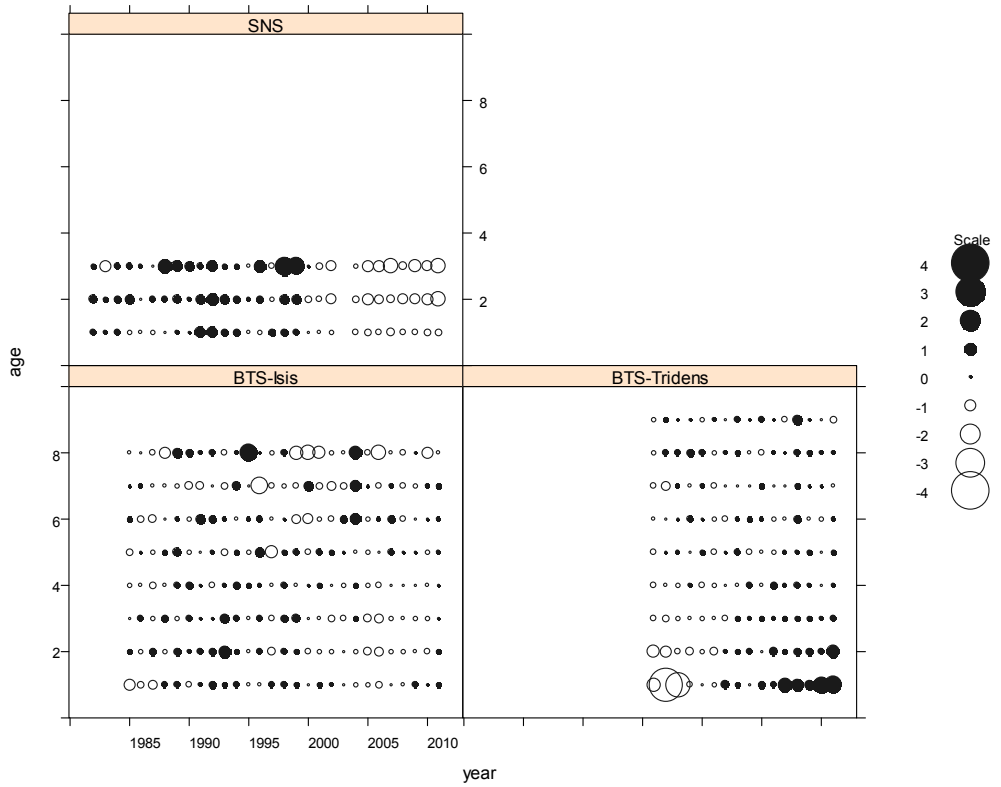

Figure 8.3.4. North Sea plaice. Log catchability residuals for the final XSA run from the three tuning series.

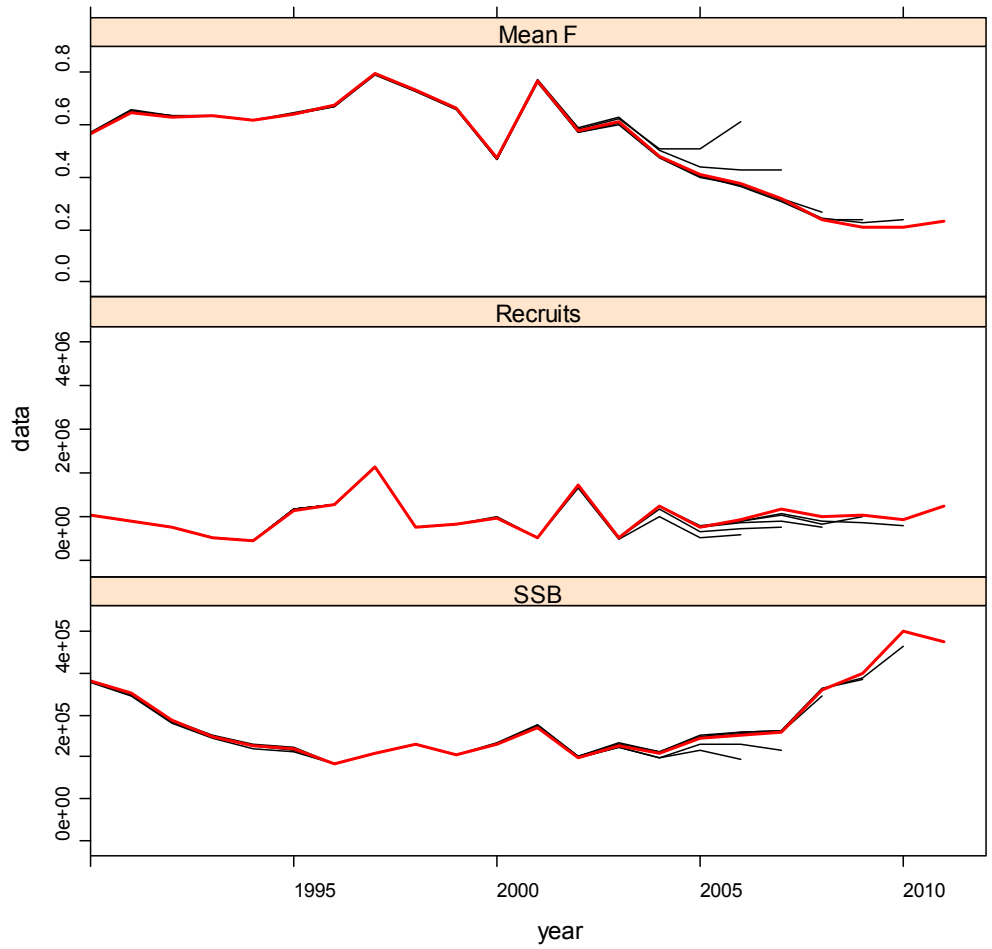

Figure 8.3.5. North Sea plaice. Retrospective pattern of the final XSA run with respect to SSB, recruitment and F.

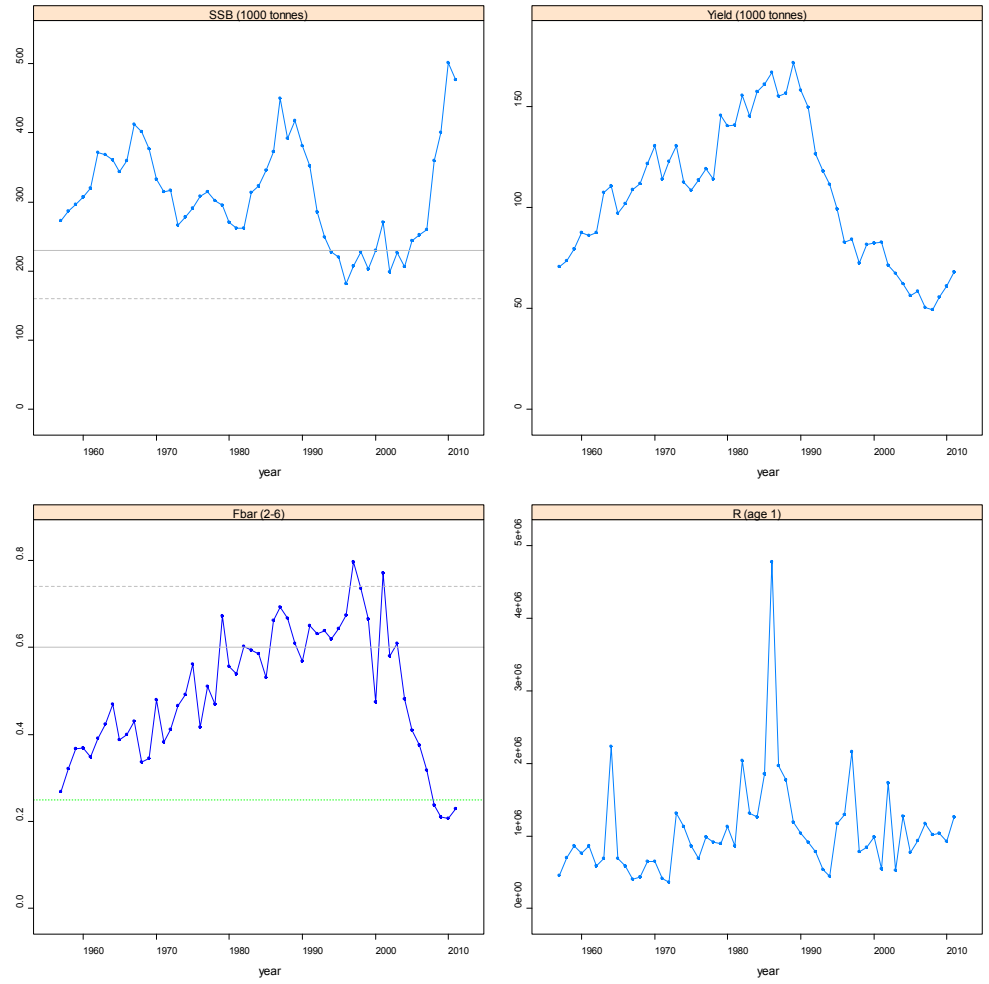

Figure 8.4.1. North Sea plaice. Stock summary figure, time series on SSB (drawn line indicates B_{pa}, dashed line indicates B_{lim}), Yield, Fishing mortality (drawn grey line indicates F_{pa}, dashed grey line indicates F_{lim}, green dashed line indicates MP target F), and recruitment at age 1.

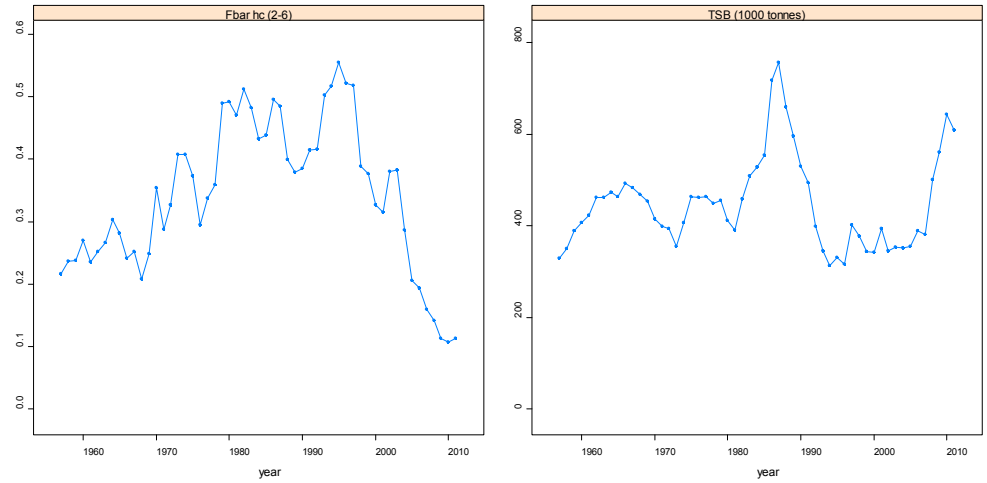

Figure 8.4.2. North Sea plaice. Stock summary figure. Time series on human consumption (left) fishing mortality and total stock biomass (right)

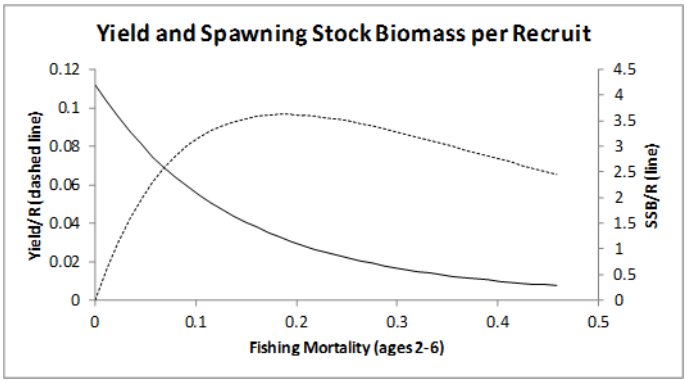

Figure 8.6.1 North Sea plaice. Yield and SSB per recruit following the latest assessment of the stock.