Advisory Committee on Fishery Management

ICES CM 1997/Assess:5

REPORT OF THE WORKING GROUP ON THE ASSESSMENT OF SOUTHERN SHELF DEMERSAL STOCKS

ICES Headquarters, Copenhagen, Denmark

3–12 September 1996

PART 1 OF 4

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK-1261 Copenhagen K Denmark

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1 INTRODUCTION

1.1 Participants

Mike Pawson (Chairman)	United Kingdom
André Battaglia	France
Robert Bellail	France
Alain Biseau	France
Fatima Cardador	Portugal
Paul Connolly	Ireland
Chris Darby	United Kingdom
Steve Flatman	United Kingdom
Paulino Lucio	Spain
Jean-Claude Mahé	France
Philippe Moguedet	France
Pilar Pereda	Spain
Nélida Pérez	Spain
Valentin Trujillo	Spain
Willie Vanhee	Belgium
Sorcha Wheatley	Ireland

1.2 Terms of Reference

It was decided at the 83rd Annual Science Conference (C.Res. 1995/2:13:11) that the Working Group on the Assessment of Southern Shelf Demersal Stocks (Chairman: Dr M. Pawson, England) would meet at ICES Headquarters from 3–12 September 1996 to:

a) assess the status of and provide catch options for 1997 for stocks of cod, whiting, plaice and sole in Divisions VIIe-k, and sole in Sub-area VIII;

b) provide information on the state of exploitation and, where possible, provide catch and management options for 1997 for hake stocks in Sub-areas III, IV, VI, VII, VIII and IX and for stocks of anglerfish and megrim in Sub-areas VII, VIII and IX;

c) provide estimates of the minimum biological acceptable level of spawning stock biomass (MBAL) for as many stocks as possible, with an explanation of the basis on which the estimates are obtained;

d) prepare medium-term forecasts under different management scenarios, taking into account uncertainties in data and assessments and possible stock-recruitment relationships, and indicate the associated probability of the stocks falling or remaining below MBAL within the stated time period.

The above terms of reference are set up to provide ACFM with the information required to respond to the requests for advice from the North-East Atlantic Fisheries Commission and the European Commission.

1.3 Overview

Last year, the Working Group encountered a major problem with the absence of the French 1994 catch and effort statistics by Division for three major ports of Brittany. For some stocks in the Celtic Sea and Bay of Biscay, the fleets for which catch and effort data were missing usually had a predominant weight in the VPA tuning. However, these data deficiencies have been remedied for both the 1994 and 1995 catch data for these ports and the Group is no longer faced with this problem, see 1.4 below.

The Group has not re-considered the issue of the appropriateness of stock definitions as presently used for assessments, but in view of ACFM's request to consider merging the small "stocks" of cod, whiting, plaice and sole in sub-area VII (ex. VIIa), some relevant information is given in section 2.3. This year, the results of combined assessments for cod and whiting in the Western Channel (Division VIIe) with those for VIIf,g,h are presented.

The SSB of Western Channel sole peaked at a high value in 1980 and declined steadily until 1989, since when it has been relatively stable. Since the strong 1989 year class, only the 1994 year class has been above average, and SSB in 1995 was just below the historical average. Although recruitment appears to be reduced at low SSB levels, both short-term and medium-term predictions indicate a high probability that SSB will remain above the threshold level in the next ten years.

The SSB of Western Channel plaice has been decreasing rapidly from the high values in 1988-90 to well below average, as a result of increasing fishing mortalities and a succession of poor recruitments. Both SSB and landings are, nevertheless, predicted to increase in the short-term at the current level of F. A better control of fishing mortality would be afforded by a specific TAC for this stock which, at present, is regulated by a TAC that combines the much larger Eastern Channel stock.

Catches and SSB of Celtic Sea cod peaked in 1989, due to the contribution of the very strong 1986 year class, and have subsequently remained below average. Although there have been three above average years year classes since 1990, these have been rapidly fished out at the current high level of fishing mortality and SSB is predicted to decline further. A reduction in fishing mortalities on Celtic Sea cod and whiting, which are taken in the same fishery and which now include data for VIIe, is required to maintain SSBs and catch rates above their average levels.

The good 1990, 1991 and 1992 year classes of Celtic Sea whiting resulted in an increase of catches and SSB in the last three years. Fishing mortality has declined steadily since 1983, though poor 1993 and 1994 year classes will result in a decrease of SSB in 1996–1997 to the average level.

Fishing mortality on Celtic Sea sole steadily increased from 1972 to 1990, decreased for two years, and then increased again. SSB has been gradually decreasing to a low value in 1991 (about half the level in the 1970s) then temporarily increased due to the outstanding 1989 year class. Recent recruitments are around average, and SSBs predicted to decrease again in 1997–1998 to an historic low.

The SSB of Celtic Sea plaice has declined since the peak value in 1988 to below average in 1993–1995, but remains above the historic low level. Fishing mortality has fluctuated around the mean for the time series. Recruitment was high between 1982 and 1986, but subsequent year classes have tended to be below average. SSB is predicted to remain just below the mean level in 1996-1998 under *status quo* F. Plaice is taken in mixed fisheries and as by-catch by trawlers targeting sole: management measures should be considered accordingly.

Additional data on cod, whiting, sole and plaice in Divisions VIIb,c,h-k have been made available, which by themselves are still insufficient for assessment purposes. Estimates of F and F_{max} have been made using catch curve and the Thompson Bell method (Ricker, 1975). The results, and information on growth rates, are provided for comparison with those for assessed stocks in VIa, VIIa and VIIf,g,h, which might help ACFM to decide whether an attempt should be made to include data for VIIb,c and/or VIIj,k in combined assessments.

Landings, fishing mortality and recruitment for the northern stock of hake have remained relatively stable over the time series, though SSB has declined consistently since its peak in 1987. Three recent above-average year classes are predicted to enable SSB to increase in 1997–1998 to just below its average level.

The landings and SSB of anglerfish (*Lophius piscatorius*) in Sub-areas VII and VIII decreased steadily from 1985 to 1992, but have increased to 1995. Fishing mortality has decreased since 1990, and was at the series mean level in 1994 and 1995. Recent good year classes are predicted to lead to increased SSB in the short term.

The landings and SSB of *L. budegassa* in Sub-areas VII and VIII have decreased steadily since 1989, though both showed a small recovery in 1995. Recent recruitment has been below average, and SSB is expected to remain stable in the short term at the current level of F.

Fishing mortality on megrim in Sub-areas VII and VIII reached a peak in 1991, and has since fallen below the mean. SSB has been steadily increasing since the low value in 1990 and is predicted to continue in the short term at the current level of F. A large proportion of the catch is discarded, and undersized fish make a large fraction of the landings.

The stock of sole in the Bay of Biscay has supported a continuous increase in fishing mortality since 1980, because the exploitation pattern has been improving in the same time and recruitment was stable. However, the four most recent year classes are below average and, at current levels of F, SSB is expected to decrease in the short-term to the historic lowest level.

The state of the southern stock of hake continues to be a matter of concern. Landings have declined almost continuously since 1983 and, following a sharp decline between 1984 and 1986, SSB has remained at a low level, reaching a new minimum in 1995. Recruitment also tended to decrease until 1992, with a slight improvement in 1992 and 1993. Fishing mortality has to be reduced considerably in order to rebuild SSB.

Age-based assessments of the anglerfish (*Lophius piscatorius* and *L. budegassa*) in Divisions VIIIc and IXa have again failed this year and, given the problems with ageing of these fish, a different modelling approach should be considered. The TACs agreed for these stocks have consistently been beyond actual landings, but this may be largely due to the pattern of quota allocation.

Catches of *Lepidorhombus boscii*, the most abundant of the two species of megrim in Divisions VIIIc and IXa, have been decreasing since 1989, but stabilised in 1993–1994. Recruitment has been decreasing and the 1993 year class recruited in 1994 is exceptionally weak. In the last three years, SSB has been low and is predicted to remain at that level under current levels of F.

The landings and SSB of *Lepidorhombus whiffiagonis* from Divisions VIIIc and IXa have declined consistently since 1990, and recent poor recruitments are associated with a very low level of SSB. Fishing mortality on this species and *L. boscii* were higher in 1995 than over the majority of the time series, and though the SSB of *L. boscii* has not declined so far, the 1993 year class of both species was very weak. The TACs which apply to both species of megrim combined have been far above actual catch possibilities.

Key results of the assessment are summarised in Table 1.3.1.

1.4 Data Deficiencies

Data for 1995 were prepared as far as possible in advance of the meeting, and all revisions to data are discussed in the separate stock sections. The ability of the Group, and in consequence of ACFM, to make assessments and provide advice remains difficult for several stocks. The problem of 1994 data being unavailable for three French ports has now been resolved, and most of the logbooks for 1994 and 1995 have been entered in the French data base. However, as some vessels are not constrained to fill logbooks, they appear in the data base with « unknown » fishing gear and fishing time = « 1 ». When sold at auction, the landings for those boats are registered as being from the fishing area adjacent to the port. In the past, this information was collected by mean of interview with fishing skippers, but this is no longer possible because of the lack of manpower. However, one can assume that all vessels fishing in Divisions VI or VII are completing logbooks, and the problem is mostly restricted to small boats fishing in Division VIII. The consequence is that the effort is underestimated in Division VIII and the corresponding tuning fleet data are biased. It is also difficult to estimate production per Fishery Unit.

Another problem is that a part of the landings is sold directly to the customers and does not appear in the fisheries statistical data base. This practice is in constant progression and it is hard to estimate the quantities involved.

A further cause for concern is the absence of biological sampling data for landings which are made in a second country, and which are not transported in total to a market in the vessels' country of origin, so that the sampling may be biased. This applies particularly to catches by French vessels landing into Britain. It is not always possible to find appropriate length distributions or ALKs with which to estimate the age compositions of these catches. A proposal to the EU to fund and set up a sampling programme for this purpose is being considered.

A working document is available which explains the revisions to the Southern hake catch data.

Sampling levels by country and stock are summarised in Table 1.4.1.

1.5 Methodology and Software

1.5.1 Standard assessment

The stocks within the remit of this Working Group are tabulated in Table 1.5.1, along with the type of assessment carried out and an indication of whether this reflects a change to previous practices.

XSA has been the only method used for VPA tuning in all final assessments, using the version implemented in IFAP. The procedures used to screen the data and to select the tuning options were described in detail in the 1994 meeting report (Anon. 1995/Assess:6) and are not repeated here. Wherever possible, assessments have been carried out using the tuning options chosen last year, but where there are obvious weaknesses in fitting models, other options have been explored. These are discussed in the text. Overall, the time taken at the meeting to finalise assessments is being reduced each year, due to good preparation of data and preliminary assessments in advance of the meeting. This has enabled more time to be devoted to making medium-term predictions and consideration of MBAL for each stock, as requested by ACFM.

Treatment with catchability proportional to stock size

In some instances, the Group has been less restrictive regarding the range of ages for which catchability might be dependent on abundance. Previously, this was confined to the first age in the data, provided it could be based on reliable data. The criteria considered this year were the value of the t-statistics, the improvement of the standard errors, the consistency of survivors estimates and whether there was a significant improvement in the retrospective pattern. Treatment with catchability (q) proportional to stock size was generally avoided when the CPUE series were too short or lacked contrast, except where the data clearly indicated its use.

Tuning period and weighting

The question of whether adopting un-weighted ("flat")10-year tuning rather than the tri-cubic tapered weighting over a longer time period (thus effectively down-weighting the earliest years' data) was explored for all stocks. The consequences of this, and the reasons for accepting the weighting procedure adopted in the final XSA run for each stock, are discussed in the relevant sections. Generally, a tapered weighting was retained where there were doubts about the reliability of early data or knowledge that exploitation patterns are likely to have changed during the last 10 years (e.g., Biscay sole, VIIf,g,h whiting). Otherwise, 10 years un-tapered tuning was used. The use of a shorter series of fleet data will introduce changes to the VPA estimates for the years prior to the tuning period. Minimum and maximum spawning stock biomass and recruitment estimates, used in comparisons with the estimates for the current year, may differ from those presented in earlier reports.

Replacement of recruits in predictions

As last year, the decision on whether to replace the XSA estimate of survivors of recruits in the assessment year - and the same year classes in the current year - was based on how well tuning fleets appeared to contribute to this estimate, backed up by information on relative abundance of these year classes from catch at age data in landings and any surveys not used in tuning. If replacement by an average value was indicated, the geometric mean (GM) of the time series was used where age data were based on actual ageing, and there was no obvious trend or change in the level of recruitment through the series. In other cases, in particular where length-slicing techniques or a common ALK had been used over several early years, a GM value for more recent years was used.

***Status quo* F**

One problem identified by the Group - and commented upon at the November 1995 ACFM meeting - is related to the definition of *status quo* and to the standard practice of scaling the recent exploitation pattern to the mean F in the terminal year. In a sense, the scaling procedure is equivalent to treating the final estimate as exact, and would have had the effect of propagating any error into the prediction, whereas a straight average of recent Fs might have smoothed the error out. Where, however, the fishing mortality on a stock has consistently increased or decreased over recent years, if *status quo* is defined as a mean F value, the short-term advice based on *status quo* predictions reflects an exploitation level which may be considerably different from that in the last year of the assessment. In addition, the resilience of a *status quo* F forecast is reduced by the use of average F, because the link with the estimate of population numbers is weakened. The Group decided, therefore, to continue with its past practice of using the mean exploitation pattern over the three last assessment years, scaled to the F of the final year, when this value was considered to be well estimated.

Proportion of annual mortality when calculating spawning stock biomass

ACFM noted that there was inconsistency between stocks in the proportion of M and F used to calculate spawning stock biomass at spawning time in last year's predictions. This year the SSB calculations for all stocks are at 1st January (proportion of F & M =0).

1.5.2 Risk analyses and medium-term simulations

The contribution of different sources of uncertainty to the variance of predicted SSB and yield was estimated where possible by means of sensitivity analysis. The sensitivity analysis programme developed by Cook (1993) gives estimates of the proportion of the total variance of predicted SSB and catch contributed by different inputs. Table 1.5.2 gives a description of the abbreviated variable names on the Figures which show the results of sensitivity analyses for each stock.

Medium-term predictions were carried out for all stocks for which there was a full analytical assessment. As these stocks were assessed using XSA, the program WGMTERM (Reeves and Cook, 1994) was used. This program reads the output data from the final XSA run and produces a standard ICES style age-structured forecast for a chosen number of years ahead (10 years for all stocks in this report), assuming stochastic recruitment and uncertainty in the initial population sizes. The standard errors of the XSA survivors estimates were input, although the 1996 ICES Comprehensive Fishery Evaluation Working Group (Anon. 1996/Assess:20) recognized that these are likely to over-estimate the precision of the assessment. Where possible, a fitted stock-recruitment model was used to generate annual recruitment residuals for the stochastic projection, otherwise, boot-strap estimates of recruits using the residuals from the long-term geometric mean recruitment were used.

For each F multiplier or catch constraint chosen, the 5th, 25th, 50th, 75th and 95th percentiles of SSB, recruitment, overall F and yield for each fleet were plotted. The probability of SSB falling below a threshold SSB level in the medium term was estimated for each management option investigated.

For one stock (megrim in VII and VIII) an alternative analysis using the Monte-Carlo method (Mesnil, 1993 after Restrepo *et al.*, 1992) was also provided. The technique was described in the 1994 report (Anon. 1995/Assess:6). It considers error on natural mortality, catches at age and on CPUE data. Replicates of the tuning procedure, yield per recruit analysis, short and medium term predictions of landings and SSB with a choice of options for recruitment and level of F are completed with random perturbation of the data. Frequency distributions of the assessments results are obtained for analysis. The method has the advantage of extending the simulation backward in time. The recent improvement of the computer hardware has reduced the time needed for computation (15 min. on a Pentium 90 laptop for 500 simulations). However, an improvement could be made to the software so that the output files include the percentiles of the landings, SSB and recruitment values. The sorting process using a spreadsheet is very time-consuming.

1.6 Safe Biological Limits

The Working Group was asked by ACFM to estimate the minimum biologically acceptable level of spawning stock biomass (MBAL) for as many stocks as possible. As discussed by the Comprehensive Working Group (Anon 1996/Assess:20), responsible harvesting of a stock in accordance with international agreements would imply that the long-term fishing mortality should have only a small probability of exceeding a level which is the lowest of F_{med}, F_{max}, or F_{MSY}. In the time available at the present Working Group meeting, it was not possible to carry out a full analysis of stock and recruitment (S-R) relationships. For this reason F_{MSY} could not be evaluated. Instead, the Group examined the S-R estimates for each stock for indications of reduced recruitment levels at low SSB that could indicate MBAL. All S-R estimates were inspected for recent trends in stock and recruitment which might indicate a shift in productivity of the stock, or provide evidence of systematic mis-reporting. For those stocks where there is clear evidence of a level of SSB below which recruitment tends to be reduced, an appropriate threshold level is indicated in the text. For other stocks, a wide range of recruitment variation was apparent at SSB levels near the lowest recorded. In these cases, the lowest recorded SSB was generally taken as a reference level for evaluating management options. There is understandable concern over the setting of an absolute level of MBAL, given the possible re-scaling of absolute stock estimates following changes in assessment practices. To assist ACFM, equilibrium SSB levels corresponding to fishing mortality reference points - F_{high}, F_{med}, F_{max}, $F_{0.1}$ or F_{95} - are given for each stock, and a comment made on their relevance to the S-R pattern.

For those stocks for which it is not possible to suggest an appropriate SSB threshold level, the Group continued its practice of evaluating the current status of a stock by reference to the following questions:

a) Is there any evidence from stock and recruitment estimates that the number of recruits is diminished at the lowest levels of spawning biomass that have been observed in the historic series?

b) Is the spawning stock currently at the lowest level in the time series?

c) Does SSB show a declining trend that, taken with available evidence on recruitment, might indicate that the historic lowest level will be reached in 1996 or 1997?

d) What level of F in 1996 would be needed to reduce the spawning biomass to an historically low level in 1997? In some cases this question was disregarded due to the depleted state of the stock.

Where appropriate, the probability that SSB will fall or remain below the threshold level, or the historic lowest value, was investigated for a range of fishing mortality multipliers for both the short-term and medium-term.

1.7 Software

1.7.1 Medium-term projections

Medium-term projection were run for all stocks for which an assessment was carried out. The Group agreed that a Monte Carlo approach similar to the methodology described in Mesnil (1993) would be the most appropriate, especially with regard to concerns about length to age conversion for many of the stocks and the consequent errors introduced to catch numbers at age. This approach was taken for one stock. However, since there has been no ACFM suggested standard software and because of the short time available to the Group for gaining experience with the software, the programs WGTERM and WGFRAN3 were to be used as a last resort.

The following points were noted concerning these programs:

a) The instructions for the running of the programs (Reeves and Cook 1994) were not sufficiently clear to all of the Group members. The Group was heavily reliant on members with experience of the programs gained at other Working Groups, for guidance as to the selection of input options and parameter values.

b) Difficulties were encountered due to the lack of a clear indication as to when the DOS based programs had finished, with some users wasting time by thinking that the programs were "crashing" or "hanging".

c) The program used to create the plot files for the sensitivity analysis appears to run correctly but does not overwrite previous versions of the output files. It was established that these have to be deleted from the directory before a run.

d) Discrepancies were noted between the sensitivity probability percentiles for SSB and yield and those of the medium-term projections in the corresponding years. These were assumed to be due to the assumptions about variability made for the input parameters but with no advice available, the Group were not able to resolve this at the meeting.

e) The program INSENS.EXE used for creating the input data to both the sensitivity and medium-term analyses does not calculate the stock weight for the plus group correctly for some stocks. In the time available, no clear pattern could be established as to the underlying cause. Example data sets illustrating the problem are Celtic Sea Plaice and Sole.

f) No explanation is provided for the large variation between the percentiles for recruitment in the first year of the medium-term projections and later bootstrapped years or how to avoid/account for this. For several stocks the high values of recruitment generated, create pulses of biomass that pass through the time series.

g) There are no guidelines as to the output format required by ACFM or how to interpret the results and therefore highlight problems to ACFM.

The Working Group asks/begs/suggests that if medium-term projections are to be included in the report regularly ACFM give guidance on the use of the programs, the output required by, and its interpretation in a revised version of the "Blue pages".

1.7.2 IFAP

The Group appreciates that several changes in IFAP suggested in its previous reports have been implemented, notably the automatic plotting of stock-recruitment figures and the calculation of SSB/R at F_{med}, etc.

However, the Group's work would be facilitated if the production of standard graphs was made more automatic, notably regarding:

- the plots of log-catchability residuals by fleets from XSA (requested by ACFM);

- the multi-fleet yield-per-recruit and forecasts for landings and discards, including computation of $F_{0.1}$, F_{max} and the corresponding yield and SSB.

In addition to difficulties for setting up the corresponding graphs, performing retrospective analyses in the system remains tedious.

1.8 Hardware

The Group welcomes the initiative by ICES to assign dedicated staff to help with the smooth running of this meeting and a rapid preparation of its report. It must be emphasised, however, that meetings of this size, with a large number of people carrying out stock assessments (14 individuals each with 1 or more stocks), require more networked PCs for IFAP use. Bottlenecks would also help to be minimised if a further two standalone laser printers were available. This situation will be exacerbated if future meetings of assessment working groups are to overlap due to re-scheduling, see below.

1.9 Timing of Meetings

ICES has asked working groups for comments on the timing of meetings, in order to try to avoid the July–August holiday period and have as many reports as possible ready by the annual scientific meeting. Last year, this Group explained in its report why it was necessary to allow a full 10 days for carrying out its single stock assessments, provided that sufficient time was available before the meeting for stock co-ordinators to receive (and chase up) data and make preliminary assessments. Bearing this in mind, and that it is necessary to avoid the period when the Northern Shelf Demersal Working Group meets (several common members), the Group agreed that the meeting date remains essentially the same as this year, though it could be held in June if a change was necessary. Whatever changes are decided, it must be noted that members of the Group arrange their calendar of activities - research surveys, data processing and holidays - around meetings, and there will inevitably be severe disruption in the first year with a new meeting date. Judging by the good attendance at the present meeting and the excellent state of preparedness of all the assessments at its start, a move from the present dates should only be considered as a last resort.

Table 1.3.1

SOUTHERN SHELF DEMERSAL WORKING GROUP : 1996

Summary of stock assessments and catch predictions

STOCK	ASSESSMENT				RECRUITMENT				LONG TERM				STATUS QUO PREDICTION					COMMENTS
		1995			Year-class				AM	Fmed	Fmax	AM	1996		1997		1998	
	BASIS	LAND'GS	F	SSB	1993	1994	1995	1996	Rec			SSB	LAND'S	SSB	LAND'S	SSB	SSB	
COD VIIe	-																	Included with VIIf,g,h
WHITING VIIe	-																	Included with VIIf,g,h
SOLE VIIe	XSA	0.7	0.25	3.2	2.7	4.8	4.0 *	4.0 *	4.3	0.27	0.33	3.5	0.7	2.9	0.7	3.1	3.2	SSB stable (85%AM)
PLAICE VIIe	XSA	1.0	0.68	1.7	3.7	3.8	5.0 *	5.0 *	5.5	0.58	0.30	2.5	1.0	1.5	1.1	1.5	1.7	SSB increasing but low
COD VIIe,f,g,h	XSA	10.0	0.82	7.8	7.8	4.5	2.9 *	2.9 *	4.9	0.79	0.29	11.3	10.3	11.8	8.6	11.0	8.7	Period 1988-95 only.
WHITING VIIe,f,g,h	XSA	16.6	0.86	31.0	28.4	11.5	42.1 *	42.1 *	43.4	1.14	0.37	22.0	11.0	18.4	8.6	16.9	18.6	SSB decreasing
SOLE VIIf,g	XSA	1.2	0.51	2.9	3.5	4.7	4.9 *	4.9 *	5.0	0.32	0.25	3.8	1.0	2.6	0.9	2.4	2.3	ISSB decrease to min
PLAICE VIIf,g	XSA	1.0	0.59	2.0	5.5	4.6	5.2 *	5.2 *	5.8	0.61	0.28	2.2	1.3	2.1	1.3	2.1	2.0	SSB stable jb ave.
COD VIIb,c	-	0.7																No assessment
WHITING VIIb,c	-	2.2																No assessment
SOLE VIIb,c	-	0.1																No assessment
PLAICE VIIb,c	-	0.3																No assessment
COD VIIj-k	-	n/a																No assessment
WHITING VIIj-k	-	n/a																No assessment
SOLE VIIh-k	-	n/a																No assessment
PLAICE VIIh-k	-	n/a																No assessment
HAKE North +d	XSA	56.2	0.24	146.8	392.9	269.4	482.8	333.7 *	344.6	0.22	0.09	185.0	62.3	160.2	65.5	169.3	173.6	Y, SSB increasing
L. PISC. North	XSA	18.4	0.32	43.7	45.3	34.3	19.9 *	19.9 *	24.7	0.47	0.12	44.9	23.5	53.6	27.3	66.8	80.2	Y, SSB increasing
L. BUDE North	XSA	6.6	0.18	35.3	16.1	15.0	18.1 *	18.1 *	17.8	0.12	0.13	45.5	6.8	35.5	7.0	35.7	35.5	SSB stable at low level
MEGRIM North	XSA	15.5	0.25	90.4	433.6	267.0 #	267.0 #	267.0 #	275.4	0.34	0.18	77.8	16.9	97.3	19.1	104.0	105.3	Y, SSB increasing
SOLE VIIIa,b	XSA	6.2	0.64	13.1	21.7	38.3	46.1 #	46.1 #	49.1	0.59	0.17	13.0	5.5	9.7	4.7	8.7	8.9	ISSB decrease nr min.
HAKE South	XSA	11.8	0.30	15.7	115.9	45.0	69.2	93.4 *	91.2	0.21	0.15	30.4	13.4	16.6	12.4	17.2	17.6	ISSB nr. min.
L. PISC. South	-	1.8																Assessment rejected
L. BUDE. South	-	1.8																Assessment rejected
M. WHIFF. South	XSA	0.2	0.54	0.5	0.2	5.2	3.1 #	3.1 #	7.3	0.40	0.19	1.5	0.2	0.5	0.2	0.5	0.5	ISSB decrease to min
M. BOSCII South	XSA	1.7	0.46	4.0	6.4	31.6	23.4 #	23.4 #	32.1	0.35	0.37	4.9	1.9	4.1	1.6	3.4	3.4	SSB decreasing

Notes :

jb ave Just below average

Landings in kt.

n/a not available due to lack of official landings data by Division

+d Discards included in assessment (but landings only given here)

AM recruitment is for the full time series, except where XSA recruitments have been replaced.

Fmax estimates are based on landings only. Stocks with discard estimates have the discard F component added in to give total F.

Recruitment : XSA values unless annotated :

- * Assumed GM
- \+ RCT3 estimate
- \# GM over recent period

Recruits in millions

e:\acfm\wgssds97\t-1-3-1-.xls

Table 1.4.1 Biological sampling levels by stock and country. Number of fish measured and aged from landings in 1995.

		Cod			Whiting			Plaice			Sole			
		VIIb,c	VIIe	VIIf–k	VIIb,c	VIIe	VIIf–k	VIIb,c	VIIe	VIIf–k	VIIb,c	VIIe	VIIf–k	VIIIa,b
Belgium	No. lengths									1280			3000	
	No. ages									250			710	
England and Wales	No. lengths		2489			7751			14299	5630		13468	6489	
	No. ages		393			4			1898	713		1353	877	
France	No. lengths			3540			8796							15616
	No. ages			1260			1542							923
Portugal	No. lengths													
	No. ages													
Republic of Ireland	No. lengths	1504		2643	4644		8797	4276		3367	2457		466	
	No. ages	412		991	404		1423	243		609	200		153	
Scotland	No. lengths													
	No. ages													
Spain	No. lengths													
	No. ages													
Total international landings (thousands)		388	591	4714[1]	6652.4	3868	53220[1]	989	2161	5541[1]	138	1997	6319	28337

[1]Division VIIh catch numbers data included twice.
[2]Sampling data used by Working Group but numbers not known.
[3]Includes pisc. and bud.
[4]Includes whif. and bosc.
[5]Includes VIIId.

continued

Table 1.4.1 (continued)

		Angler (pisc.)		Angler (bud.)		Megrim (whif.)		Megrim (bosc.)	
		VIIb–k & VIIIa,b	VIIIc & IXa	VIIb–k & VIIIa,b	VIIIc & IXa	VIIb–k & VIIIa,b	VIIIc & IXa	VIIb–k & VIIIa,b	VIIIc & IXa
Belgium	No. lengths								
	No. ages								
England and Wales	No. lengths	-[2]		-[2]		-[2]			
	No. ages								
France	No. lengths	17202		6496		14620			
	No. ages	1340		617		1567			
Portugal	No. lengths		966		278				
	No. ages								
Republic of Ireland	No. lengths	2411[3]		-[3]		10120[4]			
	No. ages	0[3]		-[3]		1336[4]			
Scotland	No. lengths								
	No. ages								
Spain	No. lengths	13448	4239	10789	4246	17338	5682	252[5]	17630
	No. ages					1294	651		1004
Total international landings (thousands)		10079	876	6156	1583	69252	1801		17278

continued

Table 1.4.1 (continued)

		Hake	
		IVa+VI & VII & VIIIa,b	VIIIc & IXa
Belgium	No. lengths		
	No. ages		
England and Wales	No. lengths		
	No. ages		
France	No. lengths	28771	
	No. ages	1326	
Portugal	No. lengths		114435
	No. ages		
Republic of Ireland	No. lengths	3327	
	No. ages	100	
Scotland	No. lengths		
	No. ages		
Spain	No. lengths	78988	79112
	No. ages		
Total international landings (thousands)		161039	36091

Table 1.5.1 Summary of past and current practices for stock assessment.

Stock	1995 Working Group	1996 Working Group
Cod VIIe	No assessment	Included in VIIf,g,h assessment
Whiting VIIe	No assessment	Included in VIIf,g,h assessment
Sole VIIe	XSA, standard predictions	XSA, short and medium-term predictions
Plaice VIIe	XSA, standard predictions	XSA, short and medium-term predictions
Cod VIIf,g,h	XSA, standard predictions	XSA, short and medium-term predictions
Whiting VIIf,g,h	XSA, standard predictions	XSA, short and medium-term predictions
Sole VIIf,g	XSA, standard predictions	XSA, short and medium-term predictions
Plaice VIIf,g	XSA, standard predictions	XSA, short and medium-term predictions
Cod VIIb,c and j,k	No assessment	No assessment
Whiting VIIb,c and j,k	No assessment	No assessment
Sole VIIb,c and j,k	No assessment	No assessment
Plaice VIIb,c and j,k	No assessment	No assessment
Northern hake	No assessment-data problems (+discards)	XSA, short and medium-term predictions
Angler-piscatorius VII, VIIIa-b	XSA, standard predictions	XSA, short and medium-term predictions
Angler-budegassa VII, VIIIa-b	XSA, standard predictions	XSA, short and medium-term predictions
Megrim-whiffiagonis VII, VIIIa-b	XSA, standard predictions	XSA, short and medium-term predictions
Megrim-boscii VII, VIIIa-b	No assessment	XSA, short and medium-term predictions
Sole VIII	XSA, short and medium-term predictions (Monte carlo procedure)	XSA, short and medium-term predictions
Southern hake	XSA, standard predictions	XSA, short and medium-term predictions
Angler-piscatorius VIIIc, IXa	No assessmnt-VPA unreliable	No assessmnt-VPA unreliable
Angler-budegassa VIIIc, IXa	No assessmnt-VPA unreliable	No assessmnt-VPA unreliable
Megrim-whiffiagonis VIIIc, IXa	No assessmnt-VPA unreliable	XSA, short and medium-term predictions
Megrim-boscii VIIIc, IXa	XSA, standard predictions	XSA, short and medium-term predictions

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Table 1.5.2 Sensitivity analysis - key to variable names, numerals apply to age groups or, where relevant, years.

N1	population number at age 1 in 1996
WS1	stock weights at age 1 in prediction
WH1	catch weights (landings) at age 1 in prediction
WD1	catch weights (discards) at age 1 in prediction
M1	natural mortality at age 1
MT1	proportion mature at age 1
sH1	selectivity (human consumption fleets) at age 1
sD1	selectivity (discards) at age 1
K95	year effect on natural mortality in prediction
HF95	year effect on (landings and discards) fishing mortality in 1995
R96	recruitment in 1996

2 GENERAL ASPECTS

2.1 Nominal Landings

It is recalled that several stocks assessed by the Group are managed by means of TACs that apply to areas other than those corresponding to individual stocks, notably in Sub-Area VII, or to a combination of species in the cases of anglerfish and megrim. As a consequence, the official landings provided to ICES by statistical offices are of limited relevance for the assessments when they are reported by TAC areas. Therefore, all official figures by species and area have been grouped under this general section and are given in Tables 2.1.1–7. The figures actually used by the Working Group will be given in the relevant section for each stock.

2.2 Fisheries

This Section has been updated from that presented last year, but it should be noted that a full, semi-quantitative description of European fisheries is given in the "Lassen" report (Lassen, 1996). In the Divisions VII b,c,e–k and VIIIa,b,d, 14 métiers have been identified by the ICES Working Group on Fishery Units in Sub-areas VII and VIII (Anon. 1991/Assess:24).

2.2.1 English, Belgium and French fisheries in the western English Channel (Division VIIe)

Main métiers

There are seven main métiers which exploit important demersal fish stocks in the Channel.

Otter trawling accounts for a wide range of target species in season - anglerfish, gurnard, rays, cod, whiting, plaice, sole and lemon sole - and involves boats from France, England, Belgium and the Channel Islands. Mesh sizes in these fisheries are determined by the need to avoid losses of small fish of slow growing species or those with a ready market.

Beam trawling is also important for boats from the 3 former nations, the most important target species being sole, anglerfish and plaice. There is currently very little discarding of sole, which determines the mesh size used in the nets, though undersized plaice, megrim, lemon sole, turbot and brill are taken.

Longlining has been replaced by fixed netting in many parts of the Channel, where several métiers use specific net gears and mesh sizes depending on target species, the most important being with gill nets and trammel nets for sole, cod, ling, pollack, hake, plaice and bass. Where gadoids (and hake) are targeted by fixed nets it is usually the case that mesh sizes tend to be larger than these used in towed gears, which results in a much better exploitation pattern.

Many boats from France and England join a few Channel Islands vessels using scallop dredges, which take a valuable by-catch of sole and anglerfish.

Juvenile gadoids are not found in such readily identifiable nursery areas as are the more important flatfish species. They tend to be more widely distributed and mixed with adult fish, except at spawning time when the adults often congregate in persistent localised areas.

The numbers and fishing power characteristics for 1995 of UK (E+W) vessels working in fishery units in Division VIIe and the Celtic Sea are given in Table 2.2.1.

2.2.2 Fisheries to the north and west of Ireland and in the Celtic Sea and Bay of Biscay (Divisions VIa, VIb,c, VIIf–k and VIIIa,b,d)

In the Celtic Sea, there are four main métiers accounting for 90 % of the total 1991 catch in this area as follows (Anon. 1991/Assess:24):

- benthic trawling (métier 4) with 45 000 tons (in this total are 11 300 tons of hake, 10 000 tons of anglerfish and 12 000 tons of megrim);

- demersal trawling (métier 5) with a total of 29 000 tons consisting mainly of whiting and cod;

- *Nephrops* trawling (métier 8) with 9 400 tons mainly of *Nephrops*, hake, anglerfish, and megrim;

- the long line fishery for hake (métier 1) which takes 9 000 tons mostly hake.

In the Bay of Biscay, there is a total of 6 métiers of which 3 dominate the total catch of 42 000 tons for demersal and benthic species:

- benthic trawling (métier 14) with 12 000 tons represented mainly by hake (7 000 tons) and anglerfish (4 000 tons);

- *Nephrops* fishery (métier 9) with 10 000 tons mostly constituted of *Nephrops* (6 000 tons) and hake (3 000 tons);

- inshore trawlers (métier 10) with 10 000 tons mostly constituted of hake (7 000 tons) and sole.

The northern stock of hake represents the major component of the fisheries of Divisions VIIe–k and VIIIa,b,d though there is particular concern over the catches of undersized fish in northern Biscay (VIIIa,b) and poor enforcement of mesh size and MLS there (Anon. 1994). This is particularly important for métier 14 (benthic trawling in deep and medium water) and in métier 9 (*Nephrops* trawling in shallow and medium depth), where the catch of undersized hake can reach 50–60% (Anon. 1991/Assess:24).

- The white anglerfish (*Lophius piscatorius*) occurs across the total area of Divisions VIIe-k and VIIIa,b,d and is a valuable part of the landings of the two main métiers exploiting it; benthic trawling in medium to deep water in the Celtic Sea (métier 4) and benthic trawling in deep to medium depth in the Bay of Biscay (métier 14). Black angler (*L. budegassa*) is also an important part of the landings of the two métiers identified for the white angler. Due to this species low selectivity, and the low survival of discards, catches of small fish are difficult to eradicate because the juveniles are living on the same grounds as the adults.

- Megrim (*Lepidorhombus whiffiagonis*) is important in the catches of métiers 4, 14, and 8 (*Nephrops* trawlers). The major concern for this species is the high level of discarding of fish under MLS of 25 cm (Celtic Sea) and 20 cm (Bay of Biscay) (Charuau and Biseau, 1989).

- Whiting and cod are mainly caught by demersal trawling in shallow to medium water of the Celtic Sea (VIIfg, métier 5). Discards of undersized whiting (MSL = 23 cm) could be important in some years (Charuau and Biseau, 1989), though there has been an increase in the number of French boats using a larger mesh size (80 mm min.) in recent years. Discards of cod occur for only a short period due to the speed of growth of the species up to the MSL (30 cm) at 1 year old.

Sole are the main contributors to the catch in métier 13 (fixed nets) and inshore trawlers (métier 10) in the Bay of Biscay (ICES Divisions VIIIa,b,d). However, there is significant discarding of sole (MLS = 24 cm) by inshore trawlers (métier 10) and shrimp trawlers (minimum mesh size of 20 mm) in the estuaries of main rivers of Bay of Biscay (Anon. 1991/Assess:24), which has not been well estimated in recent years among trawlers.

2.2.2.1 French fleet

General trends in French effort and mean characteristics of vessels are given in Table 2.2.2. for Sub-areas VII and VIII respectively with a distinction between trawlers and other gear.

The first set of data shows the total number of vessels which have fished at least once each year in a particular area. The second set gives the number of vessels present in the fishery for more than 10% of their fishing time. In both cases, fishing effort and the relevant mean vessel characteristics are shown.

It should be noted that each vessel could be counted several times if it fishes in several areas and/or uses several gears.

The last set of data gives the characteristics of the mean vessel in the fishery (i.e. the average of individual characteristics of a vessel weighted by the time spent fishing in the fishery). These figures provide the best estimates of fishing intensity in a fishery, despite the fact that the total number of vessels cannot be estimated precisely.

In Sub-area VII (VIIa and VIId excluded), the fishing effort reached a record high level in 1990–1992 and has been declining since then to a level similar to what it was in 1988. In Sub-area VIII, the fishing effort of trawlers increased over the period 1986–1992 and has decreased since then (though the decrease in recent years may be due to a misrecording of the activity of the inshore fleets). As reported in previous years, the total number of vessels has been decreasing since 1990, especially in the Bay of Biscay, mostly due to MAGP-induced cuts.

Figure 2.2.1 shows the fishing effort by métier, using a procedure based on thresholds applied to the proportions of different target species in the catch (Anon. 1994/Assess:3). It should be noted that effort in the Western Approaches for anglerfish and megrim (benthic target) has decreased sharply (-31%) since 1990 to a lowest level in 1994, but is reported to have increased slightly in 1995 because the fishery is aware of the availability of (small) anglerfish.

The effort devoted to gadoids reached a record high level in 1989, which was related to the abundance of cod and whiting, and has remained stable at a lower level (-27% compared to the period 1989–1991) with a slight decreasing trend in recent years. However, the effort devoted to *Nephrops* has increased steadily during the same period (+60%) and has slightly decreased since 1992. This is mostly due to the decrease of trips directed to both *Nephrops* and benthic species, while those directed to both *Nephrops* and Gadoids has increased. It should be noted that effort directed to *Nephrops* only (i.e. without any other target species reaching the thresholds) accounts for about one third of the total *Nephrops* effort (nearly 50% for trips directed to both *Nephrops* and benthic species).

In the Bay of Biscay, fishing effort directed to *Nephrops* reached a peak in 1992 and has declined since then. Figures for the last two years should be treated with caution due to the misrecording problem mentioned above. Furthermore, for some years, trends in this area may also reflect the fluctuation of the number of ports covered by the national statistical system.

Table 2.2.3 shows the average characteristics of vessels for each métier (weighted by the fishing time for each métier). In the Western Approaches, the average 'Gadoids trawler' has the highest values of engine power (492 kW in 1995) and of length (25m), although these mean values have decreased since 1987 (-16% and -15% respectively). The engine power of the mean 'Benthic trawler' has remained stable over the whole period at the lower level of 419 kW, but the mean length has slightly decreased (21.7m in 1995), while both mean power and length of '*Nephrops*' vessels have steadily increased to reach the values of 360kW and 20m in 1995. The 'Gadoid fleet' is mostly composed of vessels about 11 years old but, since the oldest vessels targeting gadoids were sold or decommissioned in recent years, the mean age of the remaining vessels has decreased.

Benthic vessels are the most new overall but, since 1992, the proportion of recently built vessels has decreased (mean age of 6.5 years in 1991, 9.6 years in 1995). The '*Nephrops* trawlers' have remained relatively stable in age over the whole period (between 8 and 9 years old), indicating a steady rate of replacement, except in 1995 (10.6).

Vessels in the Bay of Biscay are generally smaller (14–16 m), older (14–15 years old) and less powerful (220–290kW) than those in the Western Approaches, with no clear trends.

2.2.2.2 Spanish fleets

Spanish vessels can be assigned to four Fishery Units as defined by the ICES Working Group on Fisheries Units in Sub-areas VII and VIII (Anon. 1991/Assess:24):

Unit 1	Longlines in medium-deep waters, in Sub-area VII
Unit 4	Non-*Nephrops* trawl in medium-deep waters, in Sub-area VII
Unit 12	Longlines in medium-deep waters in Sub-area VIII
Unit 14	Non-*Nephrops* trawl in medium-deep waters, in Sub-area VIII

The number of Spanish vessels by fishery unit is difficult to estimate with precision: many vessels change fishing area within a year, in order to comply with the official licenses allocated for one or another Sub-area, and, in some cases, gear changes also occur over the years. The sum of the number of vessels in the fishery units may therefore often be higher than the actual number of vessels, because some of them may have been counted several times if they fished in several fishery units, even if only for a very short period. For this reason, the total number of "operative" Spanish vessels may appear to be more than the figure of 300, which is the fixed number of Spanish nominal vessels ("base list") allowed to fish in the Sub-areas VI, VII (except in the "Irish Box") and Divisions VIIIa,b,d, since the accession of Spain to the EC/UE, in 1986. Only 150 of these vessels are licensed to fish simultaneously, according to the following rates in the different sea areas: 23 vessels in Division Vb and Sub-area VI, 70 in Sub-area VII and 57 in Divisions VIIIa,b,d.

The Spanish fleets in the northern demersal fisheries are composed of trawlers and longliners. The duration of their trips varies considerably, depending mainly on the fishing area, but also on the gear and the base port. The usual trip duration of some ships working in Sub-area VI (about 21 days, of them 7 or 8 for travel) has changed (about 7 days), because they have began to land the catches in the northern ports and to transport them by trucks to the own base ports. Some longliners working in Divisions VIIIa,b,d change target species in the last part of the year from hake to species of deeper waters. Mean trip duration in Divisions VIIIa,b,d is about 5–7 days for trawlers and 12 days for long liners (of which 1–3 days are spent steaming to and from the fishing grounds) and about 17 days in Sub-area VII (4–6 days for travel).

Since 1986, more than 40 vessels have been destroyed and only a very few vessels have been launched/ constructed to replace them.

Trawl fleet

Traditionally, the bottom trawl fleet is composed of vessels that fish individually ("bacas" and "bous") and those that fish in pairs ("parejas"). In 1994, the proportion of each of these three trawl fleet component was: 86% of "bacas", 10% of "bous" and 4% of "parejas". The target species for trawlers are hake, megrim, anglerfish and, at a lesser level, *Nephrops*.

The main differences between "bacas" and "bous" is the higher net mouth in the "bous", which fish in deeper waters and nearer to the edge of the shelf, and are more focused and restricted, fishing for hake. The mean over-all length, engine power and tonnage tend to be larger in the "bous".

The use of traditional bottom pair trawlers (usually composed of two old "bacas") has disappeared in recent years, but the relative importance of the new fleet of bottom pair trawlers working in Divisions VIIIa,b,d from the Basque Country ports is increasing (one pair in 1993 to 8 pairs in 1995). These vessels achieve a high vertical aperture in the net mouth and they are very efficient for their target species (hake). In 1993 bottom pair trawl hake landings represented about 4% of the hake total landings from Divisions VIIIa,b,d in the Basque Country ports, increasing to almost 45% of total hake landings in 1995. From preliminary on board sampling of this fleet indicates that no hake discards are produced and the majority of the landings are composed of medium size hake (≥ 27 cm length) (Lucio, pers. com.). The origin of these pair trawlers in 1995 was: old "bacas" trawlers (10), old "bous" trawlers (4) and only 2 ships of new construction after decommissioning old ships. The fishing effort of the new pair trawlers is not comparable with that of the traditional pair trawlers.

Effort data related to the ports which are most representative of fleets operating in Sub-area VII, Divisions VIIIa,b,d and Division VIIIc are usually employed to tune the VPAs for demersal stocks. The evolution of the fishing effort of Spanish trawler fleets is presented in Table 2.2.4. In 1995, these fleets represented more than 80% of total Spanish trawl vessels fishing in Sub-area VII, about 20% of trawlers in Divisions VIIIa,b,d and approximately 90% of trawlers in Division VIIIc. In general, the effort of trawlers ("bous" and "bacas") fishing in Sub-Areas VI, VII and Divisions VIIIa,b,d show a constant decrease, which is consistent with the reduction in the number of boats. In relation to the inshore trawl fleets in Division VIIIc, despite the variation between the ports, overall effort appears to have decreased since 1991.

Longline fleet

This fleet targets hake and has three components: the typical offshore fleet that always fishes in Divisions VIIIa,b,d or in Sub-areas VI and VII; an inshore fleet that usually fishes in Spanish coastal waters of Division VIIIc, but temporarily operates in Divisions VIIIa,b,d; the artisanal fleet that works in the Spanish waters of Division VIIIb.

The "typical offshore" longliner vessels are larger and more powerful (HP); they are registered in the "300 base list" and can fish in Sub-area VII or Divisions VIIIa,b,d. The trip duration varies between 12 and 21 days (4–8 days are required to travel) depending on the location of the fishing area. Some longliners working in Divisions VIIIa,b,d have changed target species in the last part of the year from hake to deepwater species.

The "temporary offshore" longliner fleet is composed of vessels that may differ in number and identity between years. They are smaller in engine power, tonnage and length-over-all, and are restricted to fish in Divisions VIIIa,b,d. The trip duration in the fishing area is shorter, about 7 days.

In addition, a number of inshore longline (artisanal) vessels fish all year in the Spanish coastal waters of Division VIIIb. These vessels are characterised by their smaller dimensions and by the short duration of their trips (always less than one day).

Last year's Working Group gave a description of the 'total' operative long-line Spanish fleet (Anon. 1996/Assess:5).

2.2.2.3 Irish fleets

Since the Irish fleet was described in the Gulland Report (Gulland, 1989), there has been a substantial increase in the polyvalent nature (multi-purpose vessels; periodically switching gears, areas of operation and target species) of the Irish fleet. The demersal fleet has been defined (Lassen, 1996) in relation to one group of vessels which can be clearly identified as fishing with a specific gear, the beam trawl, and a large polyvalent fleet partitioned into vessels of less than 15 m, 15–20 m and greater than 20 m overall length. Vessels under 15 m make up the bulk of this fleet (71%).

The beam trawl fleet is the smallest segment, with 7 vessels engaged in beam trawling for several years. Most of the fishing activity is in VIIg, where the target species are sole, plaice, angler and megrim, and in VIIa for sole.

It is very difficult to break down the polyvalent fleet into exclusive segments in terms of target species, gear types or areas of operation, due to its dynamic nature. One approach has been to define the segments based on the total length of vessels. This gives three broad categories:

- Inshore artisanal, which contains 873 vessels of less than 15 m total length, engaged in potting, dredging, fixed netting and trawling for mostly non-TAC species, but including cod, whiting and haddock in waters close to the Irish shore.

- There are 216 inshore multi-purpose vessels in the length range 15 to 20 m engaged in demersal and pelagic trawling and using fixed gears for cod, haddock, whiting, plaice, sole, hake, megrim, angler and some non-TAC species in inshore and sometimes offshore waters.

- Some 132 offshore multi-purpose vessels greater than 20 m total length are engaged in demersal and pelagic trawling, beam trawling and using fixed lines and nets to take the same range of species as above, plus cod in Division IIa, deep water species and tuna in season.

The Irish fleet operating in Divisions VIIb,c targets hake, angler, megrim, cod, whiting, plaice and sole. Fishing in Divisions VIIb,c is carried out mainly in inshore waters (west of the Aran Islands), though the seasonal *Nephrops* fishery is located in the Porcupine Bank area. The main fishing gear used is otter trawl with twin rig trawl and gillnetting forming less important modes of fishing. Fishing activity by the Irish fleet in Divisions VIIj,k and VIa is similar to that in VIIb,c. However, seining is used to a small extent by the Irish fleet in both VIIj,k and VIa. The Irish fleet activity in Divisions VIIg is similar, using the same gear (otter trawl) and mainly targets cod, whiting and *Nephrops*, with whiting, plaice and sole forming an important by-catch. There is a small Irish fleet of beam trawlers operating in this Division but their contribution to total landings of flatfish is small.

2.2.3 Fisheries in southern Bay of Biscay and off Spain and Portugal (Divisions VIIIc and IXa)

2.2.3.1 Spanish fleets

This résumé of the Spanish fleets involved in catching mainly hake in Divisions VIIIc and IXa is taken from the report of the Southern Hake Task Force (SHTF) held in Lisbon, Portugal, in October 1994 (Anon. 1994). The fleets are mainly composed of trawlers, fixed netters, longliners and purse seiners. The duration of their trips is usually less than one day. A summary of the main characteristics of the vessels involved in demersal fisheries was given in last year's Working Group report.

Trawl fleet

The trawl fleet in Divisions VIIIc and northern part of Division IXa (southern Galicia) is composed of bottom trawlers ("bacas") and pair bottom trawlers, catching demersal fish in the shelf area down to a depth of 500 m. The number of trawlers has decreased since the early 1980s.

Hake was the main target species of trawlers in the 1970s, but has declined to about 6% of total weight landed in recent years, though it is still the main species by value (about 23%).

A numerous fleet of bottom trawlers is present in the southern part of Division IXa (Gulf of Cadiz). These vessels are smaller than the trawlers of the northern part of Divisions IXa and VIIIc and they sometimes fish in Northern African waters.

Fixed nets

In Division VIIIc and the northern part of Division IXa (southern Galicia), there are three kinds of fixed nets, distinguished by mesh size and height of panels: "betas" (60 mm mesh size), "volantas" (90 mm) and "rascos" (280 mm). The vessels using these gears are currently subject to a restricted entry system.

The fleet using "betas" is composed of 249 small boats that operate in shallow waters close to the coast and alternate their activity with other types of artisanal gears. Hake represents only 9% of the total landings.

Gillnetters with "volantas" (129 boats) are directed at hake on the shelf. Gillnetters using "rascos" (181 boats) target anglerfish and fish on the shelf edge.

In the southern part of Division IXa (Gulf of Cadiz), 13 "volantas" vessels are directed at hake.

Longlines fleet

This fleet is composed of 687 boats and operates mainly in Division VIIIc, either on the shelf or on the shelf edge. The most important species in weight landed by this fleet is mackerel (48%), although hake is the second most important species in weight (18%), it is first in value (54%).

2.2.3.2 Portuguese fleets

The Portuguese fishery for demersal species in Division IXa involves trawl fleet and polyvalent fleet.

Trawl fleet

Between 1991 and 1995, the total number of Portuguese trawlers catching demersal fish decreased from 148 units to 114. In 1995, there were 2 units between 5 and 15 m, 32 between 15 and 24 m, and 80 larger vessels. The average values of their GRT and engine power were: 22 GRT and 110 Kw; 78 GRT and 311 Kw; and 158 GRT and 551 Kw, respectively. This fleet comprises two components, one fishing for demersal fish and another fishing for crustaceans.

The demersal fleet operates along the whole coast of Portugal throughout the year. Their engine power ranges from 88 to 1140 kw (mean value of 153 kw), with a mean length-over-all of around 31 m and a mean age of 24 years. This fleet uses a minimum of 40 mm mesh size. The average fish catch composition of this fleet shows that in recent years horse-mackerel and hake are the most important species, representing 39% and 3.2% of the total catch in weight, respectively.

The Portuguese crustacean trawl fleet started to operate in 1983 with 35 trawlers, fishing with a 55 mm mesh size in deep waters (200–750 m), mainly off the Southwest and South coast. The average number operating in the period 1989–1995 was 37, with an average engine power of 409 kw (240–510 kw) and overall length of 24 m. Part of the fleet originates from sardine purse seiners that were transformed to trawlers. The most important fish species in weight landed are anglerfish and hake, their average (1989–1993) catch composition being 13.4% and 10.4%, respectively.

Updated data for the total effort (fish plus crustacean trawlers), measured in fishing hours, indicate that the 1994 estimate was the lowest observed during the period 1988–1994, representing around 75% of the highest levels recorded in 1988 and 1993.

Polyvalent fleet

This fleet has two components, one operating in coastal waters and the other in offshore waters, and uses several types of gears during the year. The smaller vessels are not required to complete logbooks and it is difficult to identify the catch taken by each gear. On the South coast some boats fishing with gillnets operate in deep waters (up to 750 m). Since the 1980s, longlines have become less common in Portuguese waters.

The total number of boats in the polyvalent fleet decreased from 11467 units in 1991 to 9172 units in 1995 (in the ratio approx. 1:10 offshore to inshore). In 1995, 3407 units had an overall length of less than 5 m (mean GRT 0.9 and engine power 4 Kw), 5483 units were between 5 and 15 m (mean GRT 3.2 and engine power 18.3 Kw), 234 units were between 15 and 24 m (mean GRT 38.5 and engine power 171 Kw), and 48 larger units (mean GRT 126 and engine power 408 Kw).

The landings from this fleet are composed of a variety of species, with hake (11%), anglerfish, pouting and octopus being the most important in economic terms, while megrim contribute only 0.1 %.

2.3 Considerations of Combining Stock Units for Assessment Purposes

In principle, the definition of a "biological" stock appropriate for assessment purposes is that it is that part of a species' population for which parameters describing the vital processes (natural mortality, growth and reproduction, recruitment, migrations, etc.) are recognised to be relatively homogeneous. However, when a stock is also viewed as a management unit, it may be sufficient that it responds in an homogeneous manner to exploitation and to regulatory measures.

In 1995, ACFM requested that this Group considers the validity of merging some of the small "stocks" in sub-area VII. An examination of the available information (Anon. 1996/Assess:5) did not allow any firm decisions, but it was agreed that an attempt should be made to add VIIe data for whiting and cod to their respective assessments in Divisions VIIf,g,h. The results of a preliminary examination of separate assessments for cod in VIIe and VIIf,g,h indicated that there are sufficient similarities in fishing mortality and recruitment patterns for a combined assessment of cod in VIIe,f,g,h to be attempted. The results are presented in Section 4.1.

There are few length data, and no age data, for whiting in VIIe, though annual landings are available for the Division. These data have been incorporated in an XSA run based on the final VIIf,g,h whiting assessment, to see if there is any deterioration in its reliability. Essentially, this is just a scaling exercise. The results are presented in Section 4.2.

Since 1993, length and age data have been collected for cod, whiting, plaice, and sole in Divisions VIIb,c,j,k, and though this is an insufficiently long time series to permit analytical assessments to be carried out for these stocks, estimates have been made of the level of mortality (using catch curves) and F_{max} (Thompson Bell approach). Data are also available on weight at age, and these allow comparisons with information on growth and exploitation characteristics of assessed stocks in neighbouring regions; i.e. VIa, VIIa and VIIf,g. The results, presented in Section 4.5, may provide a basis for deciding whether to use data for VIIb,c or VIIj,k in one of these assessments.

Table 2.1.1 Nominal landings of COD as reported to ICES (tonnes).

French Statistics as Officially Reported for 1989–1995

COD VIIb,c,d,e,f,g-k

Country	1989*	1990*	1991*	1992*	1993*	1994*	1995*
France[1]	27,342	16,366	8,807	10,373	12,058	11,497	13,524

*Preliminary. [1]Includes VIII, IX, X, COPACE (EC).

COD VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	591			------------See top table------------				
Germany, Fed. Rep.	-	1	-	-	-	-	-	-*
Ireland	388	915	795	612	507	357	289	282
Norway	2	9	29	11	39	+*	7*	3*
UK (England & Wales)[1]	23	7	12	33	62	17	29	25
UK (Scotland)[1]	5	34	300	177	148	73	93	66
Total	1,009							

*Preliminary. [1]1989-1993 revised.

COD VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	12	19	6	6	2	5	1	12
Denmark	+	+	5	-	1	1[1]	2	-*
France	1,758			------------See top table------------				
UK (England & Wales)[2]	850	727	610	408	365	274	309	348
UK (Scotland)[2]	-	-	-	-	1	2	-	-
Total	2,620							

*Preliminary. [1]Includes VIId. [2]1989-1993 revised.

COD VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	440	662	550	262	122	250	281	258
France	2,255			------------See top table------------				
Ireland	-	-	155	73	69	-	-	-
UK (England & Wales)[1]	278	311	403	357	384	353	308	300
UK (Scotland)[1]	-	-	1	-	+	1	+	-
Total	2,973							

*Preliminary. [1]1989-1994 revised.

COD VIIg

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium[a)]	...	...	...	...	...	...	...	...
Denmark[a)]	...	-	-	...	-	-	-	-*
France	7,500		-------------See top table-------------					
Ireland	725	387	221	115	130	390	822	322
Norway[a)]	-	...	...	-	-	...	...	...
UK (England & Wales)[1]	73	70	155	157	189	174	114	110
UK (N. Ireland)[1]	12							
UK (Scotland)[1]	-	1	14	4	9	3	4	-
Total	8,310							

*Preliminary. [a)]See table Cod VIIg-k. [1]1989-1993 revised. N. Ireland included with England & Wales.

COD VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	102	229	86	51	81	136	115	129
Denmark	+	-	-	+	-	-	-	-*
France	9,460		-------------See top table--------------					
Ireland	1,593	1,244	1,285	1,528	1,002	825	1,472	1,467
Norway	-	13	20	-	-	-*	-*	-*
UK (England & Wales)[1]	177	197	347	345	467	327	313	397
UK (N. Ireland)[1]	12							
UK (Scotland)[1]	2	1	141	24	22	7	10	8
Total	11,346							

*Preliminary. [1]1989-1994 revised. N. Ireland included with England & Wales.

Table 2.1.2 Nominal landings of WHITING as reported to ICES (tonnes).

WHITING VIIb,c,d,e,f,g-k

Country	1989*	1990*	1991*	1992*	1993*	1994*	1995*
France	19,771	19,348	10,006	15,526	13,697	18,614	18,081

*Preliminary.

WHITING VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	113			-------------See top table------------				
Germany, Fed. Rep.	+	-	-	-	-	-	-	-
Ireland	922	1,199	770	540	730	826	1,042	1,894
UK (England & Wales)[1]	12	2	2	14	14	23	18	24
UK (N. Ireland)[1]	+							
UK (Scotland)[1]	+	32	36	80	155	147	117	71
Total	1,047							

*Preliminary. [1]1989-1993 revised. N. Ireland included with England & Wales.

WHITING VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	4	3	4	2	1	2	2	3
Denmark	-	+	+	-	-	+[1]	+	-*
France	1,439			-------------See top table-------------				
UK (England & Wales)[2]	1,183	923	1,393	1,452	931	1,240	1,028	1,058
UK (Scotland)[2]	-	-	-	-	+	6	-	-
Total	2,626							

*Preliminary. [1]Includes VIId. [2]1989-1992 revised.

WHITING VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	136	253	246	259	63	68	176	150
France	1,579			-------------See top table-------------				
Ireland	-	-	110	75	100	-	-	-
UK (England & Wales)[1]	174	239	278	308	150	172	225	217
UK (Scotland)[1]	-	-	+	-	+	1	-	-
Total	1,889							

*Preliminary. [1]1989-1992 revised.

WHITING VIIg

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium[a)]	...	...	...	...	...	...	...	...
Denmark[a)]	-	...	-	-	-	-	-	-*
France	7,152			-------------See top table-------------				
Germany, Fed. Rep.[a)]	-	-	...	-	14	-	-	-
Ireland	265	168	350	260	320	653	1,344	884
UK (England & Wales)[1]	147	48	114	160	144	153	94	135
UK (N. Ireland)[1]	19							
UK (Scotland)	-	-	+	20	12	22	10	1
Total	7,583							

*Preliminary. [a)]See table Whiting VIIg-k. [1]1989-1993 revised. N. Ireland included with England & Wales.

WHITING VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	19	39	67	43	47	75	50	52
Denmark	-	+	-	-	-	-	-	-*
France	7,929			-------------See top table-------------				
Germany, Fed. Rep.	-	-	+	-	14	-	-	-
Ireland	2,036	1,651	1,654	1,328	1,775	3,630	5,053	6,077
UK (England & Wales)[1]	256	164	158	263	312	364	371	528
UK (N. Ireland)[1]	19							
UK (Scotland)	1	-	33[2]	32	20	34	16	23
Total	10,260							

*Preliminary. [1]1989-1993 revised. N. Ireland included with England & Wales. [2]Revised.

Table 2.1.3 Nominal landings of PLAICE as reported to ICES (tonnes).

PLAICE VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	9	1[*]	11[*]	9[*]	3[*]	5[*]	2[*]	4[*]
Ireland	157	159	130	179	180	191	200	239
UK (England & Wales)	2	1[1]	2[1]	+	6	1	2	1
UK (Scotland)	+	13	90[1]	3	3	2[1]	3	1
Total	168							

[*]Preliminary. [1]Revised.

PLAICE VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	90	89	82	57	25	56	10	13
Denmark	-	+	2	-	+	+[1]	-[*]	-[*]
France	584	3,713[1*]	4,739[1*]	4,082[1*]	419[*]	2,598[1*]	3,044[1*]	2,610[1*]
UK (England & Wales)[2]	1,654	1,708	1,885	1,323	1,102	1,078	996	855
UK (Scotland)[2]	-	-	-	-	14	24	-	-
Total	2,328							

[*]Preliminary. [1]Includes VIId. [2]1989-1993 revised.

PLAICE VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	372	440	493	584	125	198	153	111
France	142	1,089[1*]	767[1*]	444[1*]	118[*]	370[1*]	328[1*]	284[1*]
Ireland	-	-	-	-	-	2	-	-
UK (England & Wales)	516	381	410[2]	326[2]	221[2]	219	194	211
UK (Scotland)	-	-	-[2]	-[2]	3	6	1	-
Total	1,030							

[*]Preliminary. [1]Includes VIIg. [2]Revised.

PLAICE VIIg

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium[a)]	...	...	...	...	...	...	...	...
Denmark[a)]	...	...	-	...	-	+	-	-*
France	579	...[1*]	...[1*]	...[1*]	386*	...[1*]	...[1*]	...[1*]
Ireland	226	180	160	155	180	87	82	70
UK (England & Wales)[2]	113	90	87	66	81	71	57	73
UK (N. Ireland)[2]	1							
UK (Scotland)	-	-	1	+	2	3	-	2
Total	919							

*Preliminary. [a)]See table Plaice VIIg-k. [1]Included in VIIf. [2]1989-1992 revised. N. Ireland included with England & Wales.

PLAICE VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	245	403	301	252	246	344	197	235
Denmark	+	+	-	+	-	+	-	+*
France	714	229[1*]	77[1*]	173[1*]	90[2*]	84[1*]	46[1*]	50[1*]
Ireland	595	634	498	633	657	470	353	391
UK (England & Wales)	546	163[3]	175[3]	353[3]	345[3]	289	315	355
UK (N. Ireland)[3]	1							
UK (Scotland)	1	-	2	+	8[3]	10	1	6
Total	2,102							

*Preliminary. [1]Reported as VIIh,j,k. [2]Reported as VIIh,j. [3]Revised. N. Ireland included with England & Wales.

Table 2.1.4 Landings of SOLE as reported to ICES (tonnes).

SOLE VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	2	+*	-*	5*	2*	2*	2*	
Ireland	34	38	41	46	43	59	60	
UK (England & Wales)	1	+[1]	-	-	-[1]	-	+	
UK (Scotland)	-	+[1]	+	+[1]	+	-	-	
Total	37							

*Preliminary. [1]Revised.

SOLE VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	67	69	41	35	41	59	33	21
Denmark	-	-	+	-	-	-	-	-*
France	98	112*	81*	325*	267*	220*	261*	283*
Netherlands	-	6	-	-	-	-	-	-
UK (England & Wales)[1]	784	610	632	477	457	479	546	562
UK (Scotland)[1]	-	-	-	-	9	18	-	-
Total	949							

*Preliminary. [1]1989-1993 revised.

SOLE VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	451	431	363	624	231	258	281	330
France	11	87[1]*	130[1]*	80[1]*	11*	102[1]*	120[1]*	80[1]*
Ireland	-	-	-	-	-	2	-	-
UK (England & Wales)	284	154	273[2]	337[2]	245	223	200	224
UK (Scotland)	-	-	-[2]	-	4	8	8	-
Total	746							

*Preliminary. [1]Includes VIIg. [2]Revised.

SOLE VIIg

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium[a)]	...	...	...	...	...	...	...	...
France	99	...[1*]	...[1*]	...[1*]	130*	...[1*]	...[1*]	...[1*]
Ireland	72	18	40	32	45	49	37	20
UK (England & Wales)	33	49	80	65[2]	80	62	64	70
UK (N. Ireland)[2]	+							
UK (Scotland)	-	-	+	+[2]	2	3	-	-
Total	204							

*Preliminary. [a)]See table Sole VIIg-k. [1]Included in VIIf. [2]Revised. N. Ireland included with England & Wales.

SOLE VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	254	252	353	358	312	317	338	433
France	152	84[1*]	66[1*]	55[1*]	43[2*]	49[1*]	41[1]*	50[1*]
Ireland	254	224	306	338	300	286	221	263
UK (England & Wales)	199	226	224	299[3]	295[3]	271	236	262
UK (N. Ireland)[3]	+							
UK (Scotland)	-	-	+[3]	-	4[3]	8	2	-
Total	859							

*Preliminary. [1]Reported as VIIh,j,k. [2]Reported as VIIh,j. [3]Revised. N. Ireland included with England & Wales.

SOLE VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	135	311	301	389	440	400	466	546
France	4,309	5,471[1*]	5,231[1*]	4,315[1*]	5,919[1*]	5,622[1*]	6,413[1]*	5,258[1*]
Portugal	7	8	5	3	1	-	-	-*
Spain	+	22	22	13				
UK (England & Wales)	-	-	-	-	-	1	-	+
Total	4,451							

*Preliminary. [1]Reported as VIIIa,b.

Table 2.1.5 Nominal landings of HAKE as reported to ICES (tonnes).

HAKE IIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	5	3	13	15	15	5	4	2
Denmark	576	952	1,584	1,623	1,546	1,188	780	536
Germany, Fed. Rep.	-	-	-	-	-	1	+	-
Netherlands	1	-	-	-	-	-	-	-
Norway	60	56	113	115	154	121*	58*	30
Sweden	38	50	98	103	141	162	121	32
Total	680	1,061	1,808	1,856	1,856	1,477	963	600

*Preliminary.

HAKE IVa

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	+	+	+	+	1	1	1	2
Denmark	232	245	336	343	322	478	237	96
Faroe Islands	-	-	-	-	-	6	4*	11
France	380	585[1]*	748[1]*	134[1]*	109*	151[1]*	77[1]*	81[1]
Germany, Fed. Rep.	30	29	9	19	28	70	51	66
Netherlands	+	8	1	4	18	4	+	+
Norway	202	269	420	505	442	459*	241*	178
Sweden[a)]	33	24	41	138	60	38	30	15
UK (England & Wales)[2]	67	2	7	8	16	5	3	5
UK (N. Ireland)[2]	3							
UK (Scotland)[2]	353	191	237	365	417	460	316	288
Total	1,300							

*Preliminary. [a)]Includes IVb 1988-1993. [1]Includes IIa(EC) and IVb,c. [2]1989-1994 Revised. N. Ireland included with England and Wales.

HAKE IVb

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	32	25	78	115	116	69	55	32
Denmark	790[1]	860[2]	934[3]	1,374[4]	1,500	1,512	1,111[5]	854
France	1	...[a)*]	...[a)*]	...[a)*]	12*	...[a)*]	...[a)*]	...[a)]
Germany, Fed. Rep.	8	5	13	11	22	48	28	35
Netherlands	149	117	89	81	162	135	74	75
Norway	2	2	2	8	2	+*	4*	4
Sweden[a)]	...	...	...	...	...	...	19	8
UK (England & Wales)[6]	18	16	17	27	49	30	33	16
UK (N. Ireland)[6]	-							
UK (Scotland)[6]	34	31	29	53	37	21	27	12
Total	1,034							

*Preliminary. [a)]Included in IVa 1988-1993. [1]Includes 12 t reported as Sub-area IV. [2]Includes 4 t reported as Sub-area IV. [3]Includes 11 t reported as Sub-area IV. [4]Includes 7 t reported as Sub-area IV. [5]Includes 3 t reported as Sub-area IV.
[6]1989-1994 Revised. N. Ireland included with England and Wales.

HAKE IVc

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	6	5	1	2	1	2	1	1
Denmark	+	+	1	1	+	+	+*	+
France	-	...[1*]	...[1*]	...[1*]	1*	...[1*]	...[1*]	...[1]
Germany, Fed. Rep.	-	-	-	-	-	+	+	-
Netherlands	4	-	1	1	2	1	1	2
UK (England & Wales)	2	1	+[2]	1	4	+	1	1
UK (Scotland)	-	-	-[2]	+	+	+	-	-
Total	12							

*Preliminary. [1]Included in IVa. [2]Revised

HAKE VIa

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
Belgium	2	2	-	+	-	1	+	+
Denmark	+	+	+	+	+	1	+	1
France	1,909	9,417[1*]	6,539[1*]	3,162[1*]	1,197[*]	3,261[1*]	2,500[1*]	2,431[1]
Germany, Fed. Rep.	2	2	+	+	+	1	+	-
Ireland	265	730	207	151	241	251	244	350
Netherlands	-	-	14	3	-	-	-	-
Norway	5	1	+	+	+	+[*]	1[*]	+
Spain	1,340	840	647	1,217				
UK (England & Wales)[2]	1,169	492	257	659	627	642	508	419
UK (N. Ireland)[2]	83							
UK (Scotland)[2]	1,329	1,493	1,559	1,841	1,454	1,393	1,079	1,167
Total	6,104							

[*]Preliminary. [1]Includes Vb(EC), VIb and VII. [2]1989-1994 Revised. N. Ireland included with England and Wales.

HAKE VIb

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
France	-	...[1*]	...[1*]	...[1*]	-[*]	...[1*]	...[1*]	...[1]
Ireland	-	-	115	76	102	1	+	-
Norway	-	-	+	1	-	+[*]	+[*]	-
Spain	1,336	930	1,029	749				
UK (England & Wales)[2]	75	8	15	3	7	38	22	40
UK (N. Ireland)[2]	-							
UK (Scotland)[2]	5	6	13	16	8	19	25	18
Total	1,416							

[*]Preliminary. [1]Included in VIa. [2]1989-1994 Revised. N. Ireland included with England and Wales.

HAKE VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
Belgium	17	19	16	6	10	7	5	3
France	187	...[1*]	...[1*]	...[1*]	61[*]	...[1*]	...[1*]	...[1]
Ireland	237	321	106	85	122	242	225	116
UK (England & Wales)[2]	186	1,244	1,466	1,121	816	768	542	482
UK (Isle of Man)	2	6[3]	7[3]	11[3]	6[3]	7	25	
UK (N. Ireland)[2]	523							
UK (Scotland)[2]	202	183	107	67	54	54	52	19
Total	1,354							

[*]Preliminary. [1]Included in VIa. [2]1989-1994 revised. N. Ireland included with England and Wales. [3]Revised.

HAKE VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
France	478	...[1*]	...[1*]	...[1*]	69[*]	...[1*]	...[1*]	...[1]
Germany, Fed. Rep.	-	-	-	-	-	-	5	-
Ireland	128	89	219	133	196	424	250	215
Netherlands	-	-	-	7	-	4	-	-
Norway	-	-	+	+	1	-[*]	-[*]	+
Spain	4,033	901	450	843				
UK (England & Wales)[2]	859	189	145	221	589	486	373	304
UK (N. Ireland)[2]	2							
UK (Scotland)[2]	8	21	34	51	125	172	142	96
Total	5,508							

[*]Preliminary. [1]Included in VIa. [2]1989-1994 revised. N. Ireland included with England and Wales.

HAKE VIId

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
Belgium	26	1	1	2	3	1	2	1
Denmark	-	-	-	-	+	-	+[*]	-
France	4	...[1*]	...[1*]	...[1*]	4[*]	...[1*]	...[1*]	...[1]
UK (England & Wales)	2	3	3	3	1	1	5	3
UK (Scotland)	-	-	-	-	+	+	+	-
Total	32							

[*]Preliminary. [1]Included in VIa.

HAKE VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995[*]
Belgium	3	3	1	+	+	1	+	+
Denmark	-	-	-	-	-	-	+[*]	-
France	1,185	...[1*]	...[1*]	...[1*]	503[*]	...[1*]	...[1*]	...[1]
Ireland	-	-	-	11	11	-	-	+
Spain	-	-	-	47				
UK (England & Wales)	329	353	449[2]	506	293	266	253	134
UK (Scotland)	-	1	-[2]	-	+	1	-	-
Total	1,517							

[*]Preliminary. [1]Included in VIa. [2]Revised.

HAKE VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	30	35	28	10	12	10	11	9
France	551	...[1*]	...[1*]	...[1*]	296*	...[1*]	...[1*]	...[1]
Ireland	-	-	26	16	30	-	-	-
Spain	-	-	-	2				
UK (England & Wales)	505	519[2]	305[2]	275[2]	174	295	235	157
UK (Scotland)	-	-[2]	-[2]	+[2]	-	+	-	-
Total	1,086							

*Preliminary. [1]Included in VIa. [2]Revised.

HAKE VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	16	29	19	8	11	13	9	10
Denmark	+	-	+	+	-	-	-	-
France	3,332	...[1*]	...[1*]	...[1*]	1,579*	...[1*]	...[1*]	...[1]
Ireland	1,331	965	1,593	1,301	1,812	1,621	1,456	1,505
Netherlands	-	4	-	15	-	-	-	-
Norway	-	-	+	-	-	-*	-*	-
Spain	5,229	6,672	5,073	6,502				
UK (England & Wales)[2]	2,539	1,198	1,493	2,364	2,736	2,331	2,233	2,176
UK (N. Ireland)[2]	+							
UK (Scotland)[2]	1	3	38	180	169	302	267	199
Total	12,448							

*Preliminary. [1]Included in VIa. [2]1989-1994 revised. N. Ireland included with England and Wales.

HAKE VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Belgium	2	15	8	12	13	7	18	17
Denmark	-	-	-	-	+	-	-*	-
France	13,853	13,678[1*]	12,979[2*]	15,607[3*]	11,426[4*]	8,972[5*]	11,854[6*]	11,630[7]
Ireland	-	2	-	-	-	-	-	
Netherlands	-	-	28	-	-	-	-	
Portugal	23	21	20	23	37	16	45	70
Spain	13,630	10,359	10,405	12,084				
UK (England & Wales)	2	-	+[8]	1[8]	+	-	-	-
Total	27,510							

*Preliminary. [1]VIIIa,b,d,e 13,663 t; VIIIc, IX, X, COPACE(EC) 15 t. [2]VIIIa,b,d,e 12,977 t; VIIIc, IX, X COPACE (EC) 2 t. [3]VIIIa,b,d,e 15,591 t; VIIIc, IX, X, COPACE(EC) 16 t. [4]VIIIa,b 11,284 t, VIIIc 19 t, VIIId 119 t and VIIIe 4 t. [5]VIIIa,b,d,e 8,957 t; VIIIc, IX, X, COPACE(EC) 15 t. [6]VIIIa,b,d,e 11,688 t; VIIIc, IX, X, COPACE(EC) 166 t. [7]VIIIa,b,d,e 11,553 t VIIIc, IX, X, COPACE(EC) 77 t. [8]Revised.

HAKE IX

Country	1988	1989	1990	1991	1992	1993	1994	1995*
Portugal	5,469	3,111	3,074	3,564	4,582	3,257[1]	2,640[1]	3,039
Spain	6,060	651	608	578				
Total	11,529	3,762	3,682	4,142				

*Preliminary. [1]Revised.

Table 2.1.6 Nominal landings of ANGLERFISH (species combined) as reported to ICES (tonnes).

ANGLER VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	52	130	103	28	61	65	139	177
France	134	...[1]*	...[1]*	...[1]*	97*	...[1]*	...[1]*	...[1]*
Ireland	417	1,418	87	80	103	450	385	541
UK (England & Wales)[2]	209	889	560	326	444	491	309	342
UK (Isle of Man)[2]	9	27	36	32	-	-	22	27
UK (N. Ireland)[2]	356							
UK (Scotland)[2]	42	421	443	137	146	321	115	117
Total	1,219							

*Preliminary. [1]Included in VIIg-k. [2]1989-1993 revised. N. Ireland included with England & Wales.

ANGLER VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
Faore Islands	-	-	-	-	-	-	-	3
France	308	...[1]*	...[1]*	...[1]*	165*	...[1]*	...[1]*	...[1]*
Germany, Fed. Rep.	-	-	-	-	-	87	53	19*
Ireland	173	146	473	686	467	284	409	215
Netherlands	-	-	-	3	-	-	-	-
Norway	-	1	2	1	3	-*	2*	+*
Spain	779	255	239	389				
UK (England & Wales)[2]	331	50	137	416	559	331	258	264
UK (N. Ireland)[2]	1							
UK (Scotland)[2]	13	127	224	90	218	256	165	113
Total	1,605							

*Preliminary. [1]Included in VIIg-k. [2]1990-1993 revised. N. Ireland included with England & Wales.

ANGLER VIId

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	102	120	47	35	19	23	30	33
Denmark	-	-	-	-	+	-	+*	-*
France	63	...[1]*	...[1]*	...[1]*	16*	...[1]*	...[1]*	...[1]*
Netherlands	3	-	-	-	-	-	-	-
UK (England & Wales)	49	120	76	40	80	71	49	48
UK (Scotland)	-	-	-	-	2	+	+	+
Total	217							

*Preliminary. [1]Included in VIIg-k.

ANGLER VIIe

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	133	189	43	4	5	12	14	40
Denmark	-	+	-	-	+	-	-*	+*
France	1,879	...[1*]	...[1*]	...[1*]	1,908*	...[1*]	...[1*]	...[1*]
Ireland	-	-	-	-	-	-	-	5
UK (England & Wales)	1,786	2,104[2]	1,325[2]	639	536	601	696[2]	974
UK (Scotland)	-	-[2]	-[2]	-	-	-	-	-
Total	3,798							

*Preliminary. [1]Included in VIIg-k. [2]Revised.

ANGLER VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	130	268	121	39	42	100	224	235
Denmark	1	1	-	-	+	-	-	-*
France	183	...[1*]	...[1*]	...[1*]	155*	...[1*]	...[1*]	...[1*]
Ireland	-	-	28	36	38	-	12	-
UK (England & Wales)	461	489[2]	371[2]	384[2]	372	470	351[2]	241
UK (Scotland)	-	-	-[2]	-	-[2]	-	-	-
Total	775							

*Preliminary. [1]Included in VIIg-k. [2]Revised.

ANGLER VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	86	343	114	26	56	152	348	541
Denmark	15	9	7	10	2	1	-	1*
France	6,791	11,445[1*]	10,921[1*]	8,818[1*]	5,271*	6,976[1*]	8,455[1*]	9,998[1*]
Germany, Fed. Rep.	-	-	-	-	-	40	38	25*
Ireland	1,239	948	1,897	1,748	1,972	1,104	1,291	1,314
Norway	-	2	1	-	-	-*	-*	-*
Spain	576	1,005	824	1,103				
UK (England & Wales)[2]	2,038	1,610	1,780	1,896	2,130	1,738	1,240	1,359
UK (N. Ireland)[2]	1							
UK (Scotland)[2]	3	-	30	75	104	101	96	110
Total	10,749							

*Preliminary. [1]Includes VIIa-VIIf. [2]1989-1993 revised. N. Ireland included with England & Wales.

ANGLER VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	12	124	28	13	10	29	95	100
France	6,274	5,442[1*]	6,268[1*]	4,516[1*]	3,256[2*]	3,212[1*]	4,053[1*]	4,975[1*]
Germany, Fed. Rep.	-	-	-	-	-	-	2	36[*]
Ireland	-	2	-	-	-	-	-	-
Portugal	2	+	1	1	1	-	1	1[*]
Spain	5,691	2,330	1,619	2,110				
UK (England & Wales)	2	2	-	2	1	+	-	27
Total	11,981							

[*]Preliminary. [1]Excluding VIIIe, including IX, X, COPACE(EC). [2]VIIIa,b 3,151 t, VIIIc 16 t and VIIId 89 t.

ANGLER IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	1,920	1,673	1,943	1,965	1,892	208[1]	88[1]	92[*]
Spain	3,042	723	870	766				
Total	4,962	2,396	2,813	2,731				

[*]Preliminary. [1]Revised.

Table 2.1.7 Nominal landings of MEGRIM (species combined) as reported to ICES (tonnes).

MEGRIM VIIa

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	11	13	18	4	6	3	6	13
France	39	...[1*]	...[1*]	...[1*]	50[*]	...[1*]	...[1*]	...[1*]
Ireland	168	813	143	180	179	346	187	201
UK (England & Wales)[2]	53	27	13	18	86	71	51	44
UK (N. Ireland)[2]	27							
UK (Scotland)	3	98[3]	79	60	51	70	54	45
Total	301							

[*]Preliminary. [1]Included in VIIg-k. [2]1989-1993 revised. N. Ireland included with England & Wales. [3]Revised.

MEGRIM VIIb,c

Country	1988	1989	1990	1991	1992	1993	1994	1995
France	111	...[1*]	...[1*]	...[1*]	46[*]	...[1*]	...[1*]	...[1*]
Germany, Fed. Rep.	+	-	-	-	-	-	-	-[*]
Ireland	203	212	364	370	381	479	616	756
Netherlands	-	-	-	1	-	-	-	-
Spain	1,288	1,115	1,027	944				
UK (England & Wales)[2]	183	25	28	91	187	208	178	175
UK (N. Ireland)[2]	2							
UK (Scotland)[2]	6	37	53	39	70	70	70	56
Total	1,793							

[*]Preliminary. [1]Included in VIIg-k. [2]1989-1993 revised. N. Ireland included with England & Wales.

MEGRIM VIId

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	1	8	2	2	+	+	1	1
France	-	...[1*]	...[1*]	...[1*]	-[*]	...[1*]	...[1*]	...[1*]
Ireland	-	-	-	-	-	-	7	-
UK (England & Wales)	2	11	2	1	1	1	8	7
UK (Scotland)	-	-	-	-	2[2]	-	-	-
Total	3							

[*]Preliminary. [1]Included in VIIg-k. [2]Revised.

MEGRIM VIIe

Country	1988	1989	1990	1991	1992	1993	1994[*]	1995
Belgium	7	12	1	+	+	1	1	1
France	303	...[1*]	...[1*]	...[1*]	168[*]	...[1*]	...[1]	...[1*]
Ireland	-	-	-	10	10	-	-	11
UK (England & Wales)	371	288[2]	289[2]	306[2]	220	218	355[2]	352
Total	681							

[*]Preliminary. [1]Included in VIIg-k. [2]Revised.

MEGRIM VIIf

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	92	108	72	15	26	14	39	45
France	104	...[1*]	...[1*]	...[1*]	89[*]	...[1*]	...[1*]	...[1*]
Ireland	-	-	84	70	81	-	-	-
UK (England & Wales)	83	108	119[2]	122[2]	158	162	176[2]	163
Total	279							

[*]Preliminary. [1]Included in VIIg-k. [2]Revised.

MEGRIM VIIg-k

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	71	148	68	16	26	25	76	152
France	3,498	4,705[1*]	4,047[1*]	2,683[1*]	2,915[*]	3,119[1*]	2,656[1*]	2,914[1*]
Ireland	1,638	1,654	1,970	1,914	2,040	1,716	1,763	2,219
Spain	2,050	2,228	2,048	2,686				
UK (England & Wales)[2]	1,329	1,034	860	1,104	1,428	1,589	1,601	1,972
UK (N. Ireland)[2]	2							
UK (Scotland)[2]	5	-	2	16	25	36	35	53
Total	8,593							

[*]Preliminary. [1]Includes VIIa-VIIf. [2]1989-1993 revised. N. Ireland included with England & Wales.

MEGRIM VIII

Country	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	3	33	6	1	+	+	2	5
France	1,178	1,109[1*]	955[1*]	1,091[1*]	905[2*]	746[1*]	727[1*]	1,293[1*]
Ireland	-	1	-	-	-	-	-	-
Portugal	2	-	2	2	2	1	2	2[*]
Spain	4,060	1,298	1,170	1,395				
UK (England & Wales)	-	-	-	1	1	-	-	-
Total	5,243							

[*]Preliminary. [1]Including IX, X, COPACE(EC). [2]VIIIa,b 886 t, VIIIc 1 t and VIIId 18 t.

MEGRIM IX

Country	1988	1989	1990	1991	1992	1993	1994	1995
Portugal	306	410	329	226	218	18[1]	11	51[*]
Spain	3,506	563	497	388				
Total	3,812	973	826	614				

[*]Preliminary. [1]Revised.

Table 2.2.1 The quarterly number and mean GRT and HP of UK (E & W) vessels in ICES Divisions VIIe–k.

England + Wales: - Mean GRT and HP by Fishery Unit for 1995

Fishery unit	No vessels	Quarter 1 Mean GRT	Mean HP	No. vessels	Quarter 2 Mean GRT	Mean HP	No. vessels	Quarter 3 Mean GRT	Mean HP	No. vessels	Quarter 4 Mean GRT	Mean HP
1	11	210	773	12	210	755	11	219	770	10	223	784
2	11	39	234	14	33	243	25	16	170	20	32	185
3	123	45	276	133	52	280	115	56	294	113	60	319
4	44	231	863	52	213	846	47	231	874	53	241	902
5	176	30	235	184	31	257	170	33	250	168	34	255
6	93	89	570	96	89	556	91	89	565	90	93	588

Table 2.2.2 Trends in fishing effort and in mean technical caracteristics of French vessels in Sub-Areas VII and VIII

SUB AREA VII (VIIa and VIId excluded)

TRAWLERS	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995***
Total number of vessels	359	340	350	387	398	396	395	380	366	348	330
Mean tonnage (GRT)	128	128	125	115	119	121	125	129	122	122	113
Mean power (kW)	468	477	479	459	469	470	484	489	476	480	458
Mean length (m)	25	25	24	23	24	24	24	24	24	24	23
Mean age	11	10	10	10	10	9	10	10	10	11	11
Hours fishing (00')	7288	7465	7587	7928	8818	8991	8700	9056	8788	7958	7945
Hours corrected (100h*10(	32079	34345	33755	34712	38462	39179	39212	40647	39012	35801	34154
Number of vessels (>10%)	302	304	297	320	325	324	318	309	307	293	268
Mean tonnage (GRT)	97	102	105	106	109	101	107	117	111	114	103
Mean power (kW)	397	420	436	439	445	424	443	471	454	464	440
Mean length (m)	23	23	23	23	23	23	23	24	23	24	23
Mean age	10	10	10	9	9	9	9	10	10	11	11
Hours fishing (00')	7225	7419	7539	7830	8715	8897	8624	8990	8715	7910	7882
Hours corrected (100h*10(	31711	34111	33524	34239	37839	38683	38844	40313	38664	35566	33831
Caracteristics of the average vessel											
Mean tonnage (GRT)	116	122	113	108	109	107	110	110	107	109	99
Mean power (kW)	440	460	445	438	436	436	451	449	444	450	430
Mean length (m)	24	25	24	23	23	23	23	23	23	23	22
Mean age	10	10	10	9	9	9	9	9	10	10	10

OTHER GEARS	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995***
Total number of vessels	38	44	81	84	107	96	76	84	96	59	85
Mean tonnage (GRT)	50	53	54	58	65	73	62	70	72	77	70
Mean power (kW)	247	228	239	237	283	307	306	326	333	337	330
Mean length (m)	18	17	18	18	19	19	19	20	20	20	20
Mean age	14	16	16	18	15	15	12	12	13	12	13
Hours fishing (00')	104	143	165	170	302	278	174	217	292	106	140
Hours corrected (100h*10(	291	417	484	509	1507	1558	712	800	1360	402	533
Number of vessels (>10%)	21	25	43	48	63	54	38	47	49	28	33
Mean tonnage (GRT)	48	57	58	50	58	65	63	68	71	82	64
Mean power (kW)	220	235	243	208	242	271	288	320	304	301	307
Mean length (m)	17	17	18	17	18	19	19	20	20	20	19
Mean age	16	13	15	19	18	17	13	13	17	14	15
Hours fishing (00')	79	126	129	141	244	242	138	183	240	81	106
Hours corrected (100h*10(	212	375	368	417	1293	1405	576	646	1183	293	391
Caracteristics of the average vessel											
Mean tonnage (GRT)	58	65	66	65	146	175	96	86	135	92	86
Mean power (kW)	281	292	293	299	498	560	409	369	465	380	380
Mean length (m)	19	19	19	18	24	26	22	21	24	21	21
Mean age	13	14	15	14	13	13	12	12	16	11	12

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Table 2.2.2 (cont'd)

SUB AREA VIII

TRAWLERS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995*
Total number of vessels	N/A	998	1055	1145	1199	1313	1183	1111	1018	913	866
Mean tonnage (GRT)	N/A	26	28	30	29	32	33	35	34	34	34
Mean power (kW)	N/A	163	184	193	187	201	211	216	220	219	220
Mean length (m)	N/A	13	13	14	14	14	14	14	14	14	14
Mean age	N/A	15	14	14	14	14	14	14	15	16	16
Hours fishing (00')	N/A	11053	13838	15861	16862	18679	18349	18811	16973	13108	12577
Hours corrected (100h*10(	N/A	17860	21088	24196	26342	30782	31818	32658	31292	23322	22664
Number of vessels (>10%)	N/A	896	967	1018	1082	1188	1068	1014	944	838	782
Mean tonnage (GRT)	N/A	22	26	26	26	27	30	31	32	32	31
Mean power (kW)	N/A	152	176	183	178	186	199	206	213	212	211
Mean length (m)	N/A	12	13	13	13	13	14	14	14	14	14
Mean age	N/A	16	14	15	14	14	15	15	15	16	16
Hours fishing (00')	N/A	10975	13760	15767	16789	18544	18220	18733	16903	13053	12497
Hours corrected (100h*10(	N/A	17689	20940	23986	26212	30512	31481	32450	31135	23202	22491
Caracteristics of the average vessel											
Mean tonnage (GRT)	N/A	24	22	21	22	23	25	25	27	25	24
Mean power (kW)	N/A	162	152	153	156	165	173	174	184	178	180
Mean length (m)	N/A	12	12	12	12	12	12	12	13	12	12
Mean age	N/A	14	13	14	13	13	13	13	14	15	15

OTHER GEARS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995*
Total number of vessels	N/A	1114	1342	1602	1623	1738	1615	1798	1669	1619	1554
Mean tonnage (GRT)	N/A	11	10	11	12	11	11	12	12	13	13
Mean power (kW)	N/A	78	76	86	88	92	93	97	100	105	110
Mean length (m)	N/A	9	9	9	9	9	10	10	10	10	10
Mean age	N/A	17	16	16	16	15	16	16	16	18	17
Hours fishing (00')	N/A	5408	5459	7620	8284	8804	8438	9687	8826	7384	6948
Hours corrected (100h*10(	N/A	5842	6231	9275	9914	11510	11785	13363	12312	10128	9938
Number of vessels (>10%)	N/A	1010	1247	1477	1515	1658	1538	1686	1563	1525	1410
Mean tonnage (GRT)	N/A	10	10	10	9	10	10	10	11	11	11
Mean power (kW)	N/A	75	73	79	79	87	88	89	92	99	97
Mean length (m)	N/A	9	9	9	9	9	10	9	9	9	9
Mean age	N/A	17	16	16	16	15	16	16	17	18	18
Hours fishing (00')	N/A	5348	5409	7537	8201	8757	8377	9630	8756	7343	6889
Hours corrected (100h*10(	N/A	5777	6170	9164	9789	11435	11668	13269	12148	10052	9849
Caracteristics of the average vessel											
Mean tonnage (GRT)	N/A	17	18	19	19	19	21	21	20	20	20
Mean power (kW)	N/A	108	114	122	120	131	140	138	139	137	143
Mean length (m)	N/A	11	11	11	11	11	12	11	11	11	11
Mean age	N/A	15	15	15	15	15	15	15	15	17	16

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Table 2.2.3

Effort and main characteristics of French bottom trawlers in Sub-areas VII and VIII
With distinction between the main metiers

WESTERN APPROACHES — Division VII (-VIIa-VIId-VIIe)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Hours fished (000)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Benthic	270.5	305.2	259.7	252.9	286.9	306.9	301.8	268.4	218	196.7	222
Gadoids	112.1	143.4	177.2	252.3	285	224.4	209.2	209.9	228.5	198	189.4
Benthic+Gadoids	67.1	55.5	39.7	49.1	68.1	62.6	32.4	31.5	37.9	34.4	54.5
Nephrops	245.3	197.2	219.4	192.9	194.6	246.8	246.6	309.6	309.7	301.7	285.9
Others	36	45.1	60.4	43.9	41.4	55.9	75.4	82.3	81.5	64.1	39.2
Mean Power (kW)											
Benthic	398.1	414.6	417.7	412.3	417.6	419	422.3	424.6	420.7	419.5	419.2
Gadoids	546	553.7	584	576.7	568.6	554.5	551.6	539.2	513.5	522.5	491.7
Benthic+Gadoids	509.3	498.6	461.2	435.2	471	498.7	459	430.2	407	419.6	400.3
Nephrops	321	320.6	332.7	336.5	343.9	346.7	350.4	353.9	354.8	356.5	360.1
Others	490.1	497.9	492.2	445	460.7	434.5	485.9	587.8	559.8	639.1	657.5
Mean Length (m)											
Benthic	22.7	23.2	22.9	21.9	21.9	21.9	22.1	21.9	21.7	21.6	21.7
Gadoids	29.8	29	29.5	29.1	28.9	29	28.6	28.3	26.8	26.8	25.1
Benthic+Gadoids	28.8	27.4	25.5	23.4	25	26.2	23.7	21.8	21.1	21.6	21.1
Nephrops	19	19.1	19.2	19.4	19.6	19.7	19.9	20.1	20	20.1	20.1
Others	27.4	26.6	26.2	24.1	24.3	23.1	24.6	27	26.3	28.8	29
Mean Age (year)											
Benthic	9	9	8.1	6.8	6.5	6.5	6.5	7.4	8.4	9	9.6
Gadoids	11.4	11.6	11.4	10.7	11.1	11.5	11.7	12.3	11.6	11.5	10.9
Benthic+Gadoids	10.5	9.6	9.1	6.8	7.6	8.3	7	6.7	7.7	8.6	9.9
Nephrops	9.4	9.5	9.3	9	8.7	8.9	9.2	8.6	9.2	9.7	10.3
Others	11.1	10.4	9.4	9.5	8.9	8	8.7	9.2	8.3	9.4	10.6

BAY OF BISCAY — Division VIII

	1987	1988	1989	1990	1991	1992	1993	1994	1995
Hours fished (000)									
Benthic	257.8	205.2	229.2	251.3	259	225.6	193.2	180.4	181.4
Nephrops	462.7	492	540.4	574.6	594.8	675.7	639.9	431.6	460.8
Others	424.8	593.6	588.3	642.4	495.2	559.4	522.7	428.3	389.5
Mean Power (kW)									
Benthic	305.1	302	291.8	308.3	304.1	299.9	291.1	296.3	293.5
Nephrops	212.3	211.6	196	205.7	210.1	215.6	220.6	219	226.7
Others	191	191.2	197.8	205.2	214.3	221.6	227.6	221.6	221.1
Mean Length (m)									
Benthic	17.6	17.4	16.7	17.2	17	16.9	16.7	16.8	16.7
Nephrops	14.1	14.1	14.2	14.2	14.1	14.1	14.3	14.2	14.3
Others	14	13.8	14	13.9	14.1	14.3	14.6	14.2	14.2
Mean Age (year)									
Benthic	8.9	9.6	9	9.5	10.3	10.9	12.4	13.5	14.2
Nephrops	13	13.4	13.2	13.6	13.8	13.4	14	15.2	15.4
Others	13	13	12.8	12.5	12.6	11.9	12.4	13.2	14.2

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Table 2.2.4 Operative fishing effort evolution in some representative ports of the Spanish fleets operating in Sub-area VII, Bay of Biscay (Divisions VIIIa,b,d) and Division VIIIc, as they are used in the VPA's of different southern demersal stocks. (Effort is expressed in number of fishing days per 100 HP).

1) Trawler Fleet ('Bacas') in Sub-area VII (Unit 4)

Year	Vigo	La Coruña	Cantabrico	Total
1982	75194	137883	16552	229629
1983	75233	107643	16411	199287
1984	76448	113535	10600	200583
1985	71241	115331	11553	198125
1986	68747	95269	12620	176636
1987	66616	104530	13552	184698
1988	65466	108856	13874	188196
1989	75853	104825	19707	200385
1990	80207	96299	11580	188086
1991	78218	85220	20845	184283
1992	63398	58516	23826	145740
1993	59879	50007	22125	132011
1994	56546	49880	18650	125076
1995	50697	44030	21503	116230

2) Trawler Fleet ('Bous') in Divisions VIIIa,b,d (Unit 14)

Year	Pasajes
1980	163373
1981	90002
1982	73158
1983	63510
1984	30237
1985	41155
1986	46719
1987	50664
1988	42160
1989	47193
1990	50776
1991	47844
1992	56228
1993	55195
1994	42228
1995	32819

3) Trawler Fleet ('Bacas' & 'Pairs') in Division VIIIc

	Aviles	Santander	La Coruña		
Year	'Bacas'	'Bacas'	'Bacas'	'Pairs'	Total
1986	10845	18153	39810	25630	94438
1987	8309	14995	34680	29820	87804
1988	9047	16660	42180	12980	80867
1989	8063	17607	44440	15240	85350
1990	8497	20469	44430	18250	91646
1991	7681	22391	40440	30530	101042
1992	n/a	22833	38910	26670	88413
1993	7635	21370	44504	21349	94858
1994	9620	22772	39589	20732	92713
1995	6146	14046	41452	28988	90632

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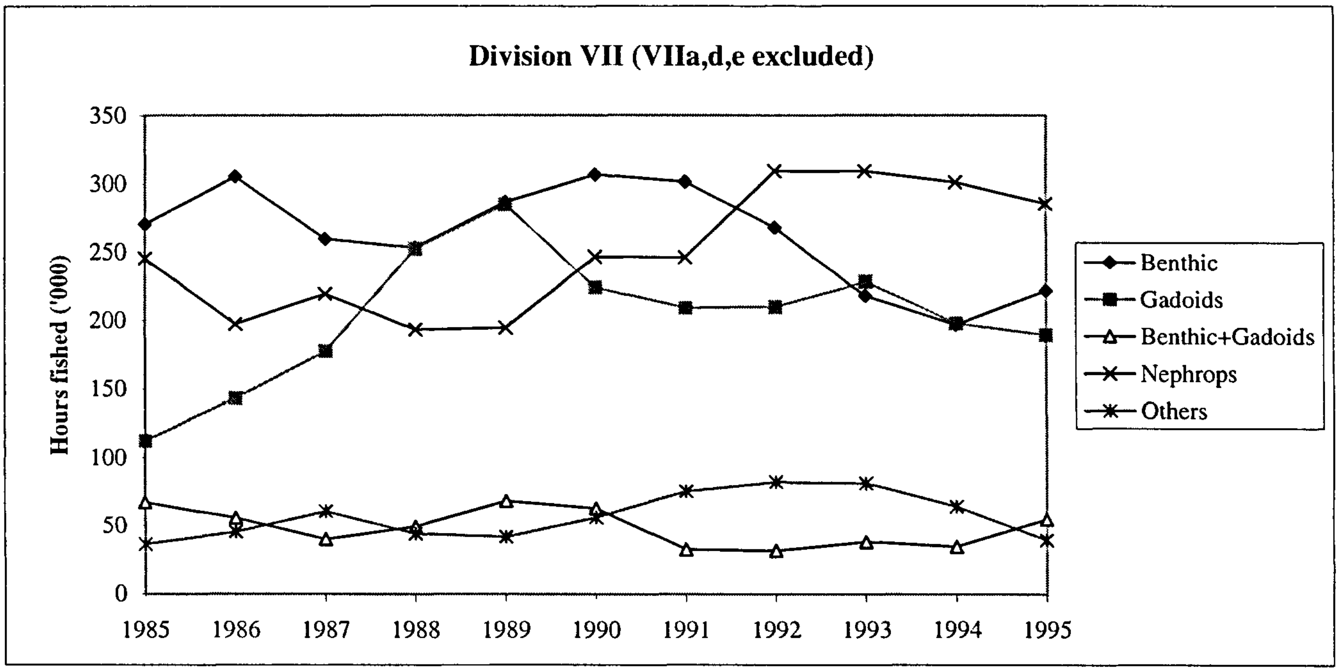

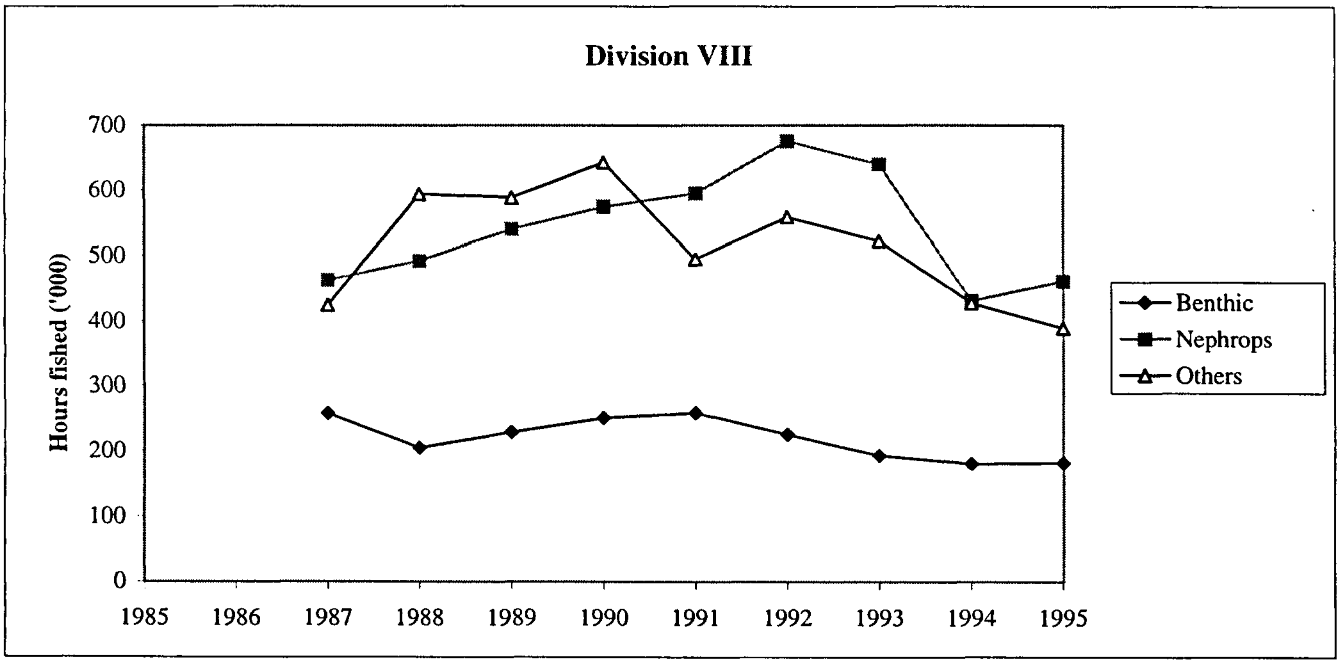

Figure 2.2.1 Fishing effort by metier for French bottom trawlers in Divisions VII and VIII

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3 WESTERN CHANNEL STOCKS

3.1 Western Channel Cod (Division VIIe)

3.1.1 Assessment data

Landings as officially reported to ICES are given in Table 2.1.1, and nominal catches used by the Working Group are given with those of Celtic Sea cod in Table 4.1.1. No data were available on discarding. France and the UK account for virtually all of the landings.

Quarterly and annual length compositions and age compositions are available in recent years for UK (England and Wales), but no length or age compositions were available for other countries. In view of the inadequate set of age composition data, no assessment has been carried out for VIIe cod in previous years, but the data have been used this year in a combined VIIe,f,g,h assessment, presented in Section 4.1.

3.2 Western Channel Whiting (Division VIIe)

3.2.1 Landings

Landings as officially reported to ICES are given in Table 2.1.2, and nominal catches used by the Working Group are given with those of Celtic sea whiting in Table 4.2.1. As with cod, France and the UK account for most of the landings and no data are available on discarding. Quarterly and annual length compositions are available in recent years for UK (England and Wales), but no age compositions are available. In view of the inadequate data, no assessment has been carried out for VIIe whiting in previous years, but the data have been used this year in a combined VIIe,f,g,h assessment whiting, presented in Section 4.2.

3.3 Sole in The Western Channel (Division VIIe)

3.3.1 Catch trends

National landings data reported to ICES and as used by the Working Group are given in Table 3.3.1. Total international landings in 1995 as used by the Working Group were 724 t, 24% less than the TAC of 950 t, but 9% greater than the landings of 660 t predicted last year based on *status quo* F. Revision of national landings for 1994 resulted in an 8 t increase in total landings to 678 t. Landings reached a peak level above 1,400 t in 1982 and 1983, boosted initially by high recruitment in the late 1970s, followed by an increase in exploitation. Landings declined between 1989 and 1991, following the recruitment of 3 below-average year classes (1986–1988); since 1991 they have consistently been around 700 t.

As in previous years, the UK (E and W) vessels were subject to monthly catch controls throughout the year, and fishing was suspended for non sector vessels in December. No other national fleet was subject to restrictions in 1995.

3.3.2 Commercial catch-effort data and research vessel surveys

Effort and CPUE data were available from UK beam trawlers and a UK autumn beam-trawl survey. "Total VIIe", "inshore" and "offshore" CPUE and effort series are given in Table 3.3.2.

UK beam-trawl effort decreased in 1995 by 15% and is currently 30% below the average level observed for the period 1983–1994. Effective effort by all UK gears combined (corrected by a GRT/fishing power relationship) increased by 6% from last year.

The beam-trawl CPUE series for the whole of Division VIIe shows a decrease in 1995 of around 3%. This is caused mainly by a reduction in the CPUE of beam trawlers fishing offshore (down by 6%). The autumn beam-trawl survey CPUE for 1995 is 7% lower than that for 1994. The survey CPUE has been decreasing since 1992, the decline being evident both inshore and offshore.

All available CPUE series continue to indicate that absolute levels of stock remain low relative to those observed before the mid-1980s.

3.3.3 Age and length compositions and mean weights at age

Annual length compositions for 1995 are given, by fleet, in Table 3.3.3.

An 8 t adjustment to the national landings resulted in minor revisions to the age compositions for 1994.

Quarterly age compositions for 1995 were available from the UK only, they represent 78% of the total international landings. Quarterly catch data were available from France & Belgium and the UK quarterly age compositions were raised to the total international landings (including the Channel Islands). Annual catch numbers at age are given in Table 3.3.4.

Using the same procedure as in previous years, total international catch and stock weights at age for 1995 were calculated as the weighted mean of the annual weight at age data (weighted by catch numbers), and smoothed using a quadratic fit:

$$Wt = 0.0251 + 0.0707*Age - 0.0018 * Age^2 \; (R^2 = 0.9)$$

where catch weights at age are mid-year values, and stock weights at age are 1 January values. Catch weights at age have been scaled to give a SOP of 100%, and the same scaling has been applied to the stock weights at age. Catch and stock weights at age are given in Tables 3.3.5 and 3.3.6.

3.3.4 Natural mortality and maturity at age

Natural mortality was assumed constant over ages and years at 0.1, and maturity was assumed to be knife-edged at age 3, as in previous assessments. The SSB is calculated at the 1 of January.

3.3.5 Catch at age analysis

General approaches and methods are described in Section 1.5.1.

Data screening

The age range used in the assessment was 1–10+. A preliminary inspection of the quality of international catch-at-age data was carried out using separable VPA, with a reference age of 4, terminal F = 0.4 and terminal S = 1.0 (results in ICES stock files). The log-catch ratio residuals for the fully recruited ages (3 and older) did not show any large values or patterns.

VPA tuning data (Table 3.3.7) were available from UK vessels fishing "inshore" and "offshore" (1973–1995), and a UK autumn beam-trawl survey (1984–1995). Tuning fleet catch numbers-at-age are derived by applying one ALK to independent length compositions.

The tuning data were examined for trends in catchability by carrying out L/S tuning runs without shrinkage, using data for each fleet individually (results in ICES stock files). As in previous years, fishing mortalities at age 9 were calculated using mean F_{6-8} and a scaling ratio of 0.9. High residuals result from the fit to the beam trawl survey data at age 1. Subsequent XSA runs revealed that this resulted from the inappropriate use of the constant catchability model.

Exploratory XSA runs

Last year, a comprehensive analysis to establish which parameter values produced the best fit of the XSA model to the data for this stock, showed that ages 1 to 6 should be treated as having catchability dependent on population size with catchability constant for older ages. This year, trial runs were used to examine the sensitivity of the fit to the time series weighting and the minimum threshold for the standard errors used for weighting the estimates contributing to the terminal populations.

A comparison was made between XSA fits using the 20 year tri-cubic time series weighting and the data from the last 10 years with no time series weighting. The exclusion of data prior to 1986 removes a high residual value at age 2 from the UK inshore fleet time series, thus reducing the standard error of the catchability regression. The slope is estimated to be significantly lower than 1.0 at the 5% level, and is consistent with the other ages fitted with the population-dependent model for this fleet. The standard errors for the offshore fleet are reduced at all ages, ages 3 and 6 are significant at the 5% level, and age 4 at 10%. All ages in the survey catches have slopes that are consistently less than 1.0, with relatively low standard errors and high t values. The removal of two data years reduces the level of significance of the t value for age 6 from 5% to 10%, ages 3 and 4 are significant at 5% and age 2 at 10%.

The fitting of a model allowing catchability to vary with year class strength for the majority of ages, is consistent with the changes in effort in this fishery. Variations in effort occur as the more mobile vessels in the fleets move from area to area dependent on prevailing catch rates.

For both the inshore and offshore fleets, all of the ages to which the catchability proportional to population size model is applied, have regression standard errors which are lower than the minimum threshold value used in last year's XSA fit (0.3). Reducing the threshold to 0.1 gives greater weight to the estimates from the fleets and reduces the contribution from the survey. The overall result is a reduction in the fishing mortalities at the older ages. These higher rates of population decline for the older ages, estimated from the survey data alone, are consistent with the known pattern of offshore migration of older fish, away from the survey area.

The low standard errors in the tuning diagnostics (Table 3.3.8) indicate that the terminal population estimates will not be sensitive to F shrinkage unless a SE of less then 0.3 (30% c.v.) is used for the specified weight. Treatment of the first 6 ages as catchability proportional to population size introduces population shrinkage at these ages. At age 1 the population mean contributes 40% of the overall weight, for ages 2–6 the contribution is less than 10%. The fleet tuning data contribute the greatest proportion of information used in the estimation of the terminal values, at all ages. Retrospective analyses were used to compare the terminal estimates of Fbar(3-7), SSB and recruitment at age 1 from a time series of XSA runs. The results, presented in Figure 3.3.1 show a small over-estimation bias in recruitment and under-estimation bias for Fbar. The greater variation in the estimated values of SSB and Fbar in the early years of the series results form the reduced year range for the survey data and does not affect the perception of the stock's historical trends.

All main parameter settings have now been reviewed for this stock. Next year's assessment should not require such detailed analysis.

Final XSA run

The final XSA run was made with 10 years tuning data, no time series weighting, ages 1 to 6 treated as catchability dependent on population size, q plateau set to age 7, a standard error threshold of 0.1 and an F shrinkage SE of 1.0. This ensures that the terminal populations of cohorts outside the tuning range were estimated using a mean of the F values from the 3 younger ages. The diagnostics from this run are given in Table 3.3.8.

The log catchability residuals from the final XSA fit are plotted for each fleet in Figure 3.3.2. The residuals for the fit at ages 1 to 6 show close agreement between the VPA and tuning data, with a noticeable improvement at age 2 of the inshore fleet, which exhibited extreme values last year.

Estimates of fishing mortalities and stock numbers from the final VPA are given in Tables 3.3.9 and 3.3.10 and are summarised in Table 3.3.11 and Figure 3.3.3. Fishing mortality in 1995 (mean F3–7, 0.25) was estimated to be 20% above that in 1994 (0.21). Last year's assessment estimated F94 at 0.24.

3.3.6 Estimating recruiting year class abundance

The 1993 year class is estimated to have been 2.7 million 1 year olds, 33% below the GM (4.0 million, 1969–1993). It is 30% below last year's estimate of the 1993 year class.

The 1994 year class is estimated to have been 4.8 million 1 year olds, and is 19% above GM. It is determined by the UK survey (60%) and shrinkage to the population mean (40%) and was accepted.

GM recruitment at age 1 was assumed for the 1995 and subsequent year classes.

3.3.7 Historic trends in biomass, fishing mortality and recruitment

A full summary of the XSA estimated time series is presented in Table 3.3.11 and Figure 3.3.3.

SSB increased to a peak value of 5,560 t in 1980, declined steadily until 1989, and subsequently has been relatively stable. The 1995 estimate of SSB, at 3,190 t, is 10% below the historical average.

F increased sharply from 1976 to the late 1980s and has subsequently decreased in line with landings. F95 is at a level equivalent to that estimated for 1991 and 1992.

Recruitment to the stock showed an increasing trend between 1969 and 1980. Since 1980 it has showed a declining trend and the 1992 and 1993 year classes are estimated to be two of the lowest in the time series.

3.3.8 Short-term catch predictions

Input data for the catch predictions are given in Table 3.3.12. Stock numbers were taken to be the XSA estimated values for ages 2 and above. GM (4.0 million) was used for the age 1 recruitment. The F-at-age vector was the mean for the period 1993–1995 re-scaled to the 1995 level (F3–7 = 0.25). Weights at age in the catch and the stock were averaged for the last three data years. Table 3.3.13 gives the management options and Table 3.3.14 the detailed output by age group for a *status quo* F in 1996. The results are shown graphically in Figure 3.3.4d.

The predictions are for landings in 1996 of 670 t (TAC 700t) and an SSB of 2930 t, similar to the level in 1995 (3190 t). For continued fishing at the same level in 1997, landings of 690 t and an SSB of 3140 t are predicted with SSB increasing slightly to 3230 t in 1998.

The proportions which the 1992–1996 year classes will contribute to the catch in 1997 and to the spawning stock biomass in 1998 are given in Table 3.3.15. Four percent of the catch for 1997 and 19% of the SSB for 1998 rely on year classes for which GM recruitment has been assumed.

The sensitivity of predictions made for SSB in 1998 and yield in 1997 was investigated using the program developed by Cook (1993), see Section 1.5.2. The input data are presented in Table 3.3.16. Table 1.5 gives a description of the abbreviated variable names on Figure 3.3.5 . Probability profiles of expected yield and SSB are given in Figure 3.3.6. The 90% confidence intervals of the expected *status quo* yield in 1997 are 550 t and 875 t. The probability that SSB in 1998 will fall below its lowest observed value of 2040 t is less than 5%.

3.3.9 Yield and biomass per recruit

Results for yield per recruit and SSB per recruit, conditional on the present exploitation pattern, are given in Table 3.3.17 and Figure 3.3.4c. F_{max} is poorly determined at 0.33 which is 30% above the 1995 level of F (0.26). The stock-recruitment relationship is shown in Figure 3.3.7. F_{high} is estimated to be 0.42, F_{med} 0.27, and F_{low} 0.16. F95 is just below F_{med}. Assuming *status quo* F, the current exploitation pattern and GM recruitment, long-term yield and SSB are estimated to be 790 t and 3,490 t respectively.

3.3.10 Estimation of MBAL

The approach taken by the Group to evaluate the current status of the stock with respect to safe biological limits is described in Section 1.5.2. The equilibrium SSB values calculated using GM and the SSB/R at the standard fishing mortality reference points, are given below:

Reference point	F95	F_{med}	F_{max}	$F_{0.1}$
Reference F(3-7)	0.25	0.27	0.33	0.14
Equilibrium SSB	3500	3400	2700	5600

Examination of the estimates of spawning stock and recruitment for this stock (Figure 3.3.7) indicates that there is a positive relationship between SSB and recruitment for this stock, with a diminished level of recruitment below an SSB of 3000 t.

With the exception of the SSB at F_{max} (which is poorly defined for this stock), all of the reference point equilibrium SSBs are greater than the SSB at which recruitment is reduced (3000 t). The SSB at $F_{0.1}$ is higher than any of the values in the time series estimated for this stock: the equilibrium SSB at F95 is close to F_{med}. However, it should be noted that, due to a recent series of poor recruitments, the estimated SSB for 1995 (3200 t) is actually below the equilibrium value and the prediction for 1996 is for a further decrease to 2930 t.

On the basis of a consideration of all of the available information concerning target SSB values and possible safe biological limits, the Group proposes a 3000 t SSB as the threshold level for this stock. This value is conditional on the assessment data sets, especially the maturity ogive which is currently knife edge at age 3.

3.3.11 Medium-term predictions

Medium-term stock predictions were made for a period of 10 years using 500 simulations (see Section 1.5.2 for the approach used). *Status quo* fishing mortality was assumed for the entire forecast and recruitment was assumed to vary about a Beverton and Holt stock and recruitment relationship fitted to the estimates derived from XSA (coefficient of determination 0.28, Table 3.3.18). The results are presented in Figure 3.3.8, which shows the fitted recruitment relationship and the percentiles of the predicted yield and SSB. A gradual recovery of SSB is predicted to occur at current F levels, such that by the year 1998 there is a 75% probability that SSB will be above the threshold level of 3000 t.

Figure 3.3.9 shows the 5th, 25th, median, 75th and 95th percentiles of SSB in the tenth year for different F factors. The results indicate a 95% probability that the SSB will be above 3000t in 2005. A reduction of the current fishing mortality by 5% is required to give a 95% probability that the SSB will not be below the limit threshold level in 2005.

3.3.12 Comments on the assessment

Mean F on ages 3–7 is estimated to have been 0.25 in 1995 and 0.21 in 1994 (11% lower than estimated in last year's assessment (F94 = 0.24). Mean F over the period 1991 to 1994 is now estimated to have been 7% lower than estimated in last year's assessment. F95 is at a level equivalent to that estimated for 1991 and 1992.

In last year's report it was shown that by applying the catchability proportional to population abundance model to ages 1–6, the severe over-estimation bias in the estimates of recruitment and SSB, resulting from the fitting of a constant catchability model, was still present, but considerably reduced.

Although some doubts remain about the accuracy of the landings data for sole from Division VIIe, biological sampling data are good. Tuning data from a beam trawl survey provide fishery-independent estimates for cross-validation of the commercial data series, and are helping to improve the estimates of recruitment. Several estimates have been revised compared to those obtained last year, as a consequence of the addition of a new data year and changes to the parameter selections within XSA.

3.3.13 Management considerations

For this stock there is strong evidence of a reduced level of recruitment at low SSB levels. Based on this the Working Group has adopted a SSB threshold level of 3000 t in considering safe biological limits.

Following the recruitment of the 1992 and 1993 year classes which were both below average SSB in 1996 (2900 t) is estimated to be below the threshold level, but above the levels observed during 1969–1974 and 1989–1992. The strong 1989 year class did not produce an increase in SSB.

The medium-term predictions for *status quo* fishing mortality are for a gradual increase in yield and a recovery of the spawning stock to levels above the newly defined SSB threshold level.

3.4 Plaice in the Western Channel (Division VIIe)

3.4.1 Catch trends

National landings data reported to ICES, and Working Group estimates of total landings, are given in Table 3.4.1. There were no revisions to landings for 1994.

Estimated total international landings in 1995 were 1017 t, 12% below 1994 landings, and 15 % below the value predicted by last year's assessment (*status quo* F: 1203 t). Landings increased during the latter half of the 1980s, when the stock benefited from a series of good recruitments in 1986, 1987 and 1988, but landings have recently returned to the level of the early 1980s.

UK vessels were subject to monthly landings quotas throughout 1995, but vessels belonging to other nations fishing for plaice were unrestricted during 1995. There is no separate TAC for this stock, but a combined one for plaice in VIId and VIIe (8000 t in 1995).

There is no information on the level of misreporting on this stock.

3.4.2 Commercial catch-effort data and research vessel surveys

Effort and CPUE data sets for Division VIIe were available for UK beam and otter trawl fleets, fishing in Northern, Western or Southern sectors of VIIe; and a UK autumn survey, using twin 4 m beam trawls from a chartered commercial vessel (Table 3.4.2).

Both otter trawl CPUE series have declined considerably since the peak in 1988. In 1995, CPUE was 10% higher for the West sector, and 19% lower for the North sector, than in 1994. Beam trawl CPUE declined in the North and South sectors by 31% and 17% respectively, whilst that in the West remained at the same level as in 1994. CPUE given by the survey (which is in the North sector of VIIe) has declined since the peak in 1988, and in 1995 was again at a new low for the series, 10% below the 1994 level. Overall reported effort (GRT-corrected) for the otter-trawl fleet has declined by 10% from the 1994 level. Beam trawl effort has remained at the 1994 level.

3.4.3 Age and length compositions and mean weights at age

Annual length compositions are provided in Table 3.4.3.

Quarterly age compositions for 1995 were available only from UK landings, but these accounted for 84% of total international landings. The total international age composition was obtained by raising the UK age composition (including Channel Isles landings) to include the French and Belgian landings. Catch numbers at age are given in Table 3.4.4.

Using the same procedure as in previous years, total international catch and stock weights at age for 1995 were calculated as the weighted mean of the annual weight at age data supplied (weighted by catch numbers), and smoothed using a quadratic fit:

$$Wt = 0.1301+(0.0676*Age)+(0.0019*(Age^2)) \qquad (R^2 = 0.93)$$

where catch weights at age are mid-year values (age = 1.5, 2.5 etc.), and stock weights at age are 1 January values (age = 1.0, 2.0 etc.). Catch weights at age have been scaled to give a SOP of 100%, and the same scaling has been applied to stock weights at age. Catch and stock weights at age are given in Tables 3.4.5 and 3.4.6.

3.4.4 Natural mortality and maturity at age

As in earlier assessments, natural mortality was assumed constant over ages and years at 0.12. The maturity ogive used was the same as in previous assessments:

Age	1	2	3	4	5 and older
Maturity	0.00	0.15	0.53	0.96	1.00

As in last year's assessment, the proportions of F and M before spawning have both been set to zero.

3.4.5 Catch at age analysis

See Section 1.5.1 for the general approach adopted at the Working Group. The age range for the analysis was 1–10+, as in earlier assessments.

Data screening

For catch data screening, a separable VPA was carried out using a reference age of 4, F of 0.7 and S set to 0.8, as last year. The results (in ICES stock files) show no unusual patterns of residuals, and only occasional high values on the partially-exploited younger ages.

The tuning data for this assessment comprise the beam trawl survey data, UK(E+W) otter trawl fleet data and UK(E+W) beam trawl fleet data, as described in last year's report (Anon. 1996/Assess:5). Note that the commercial effort data have been scaled to thousands of hours, to avoid potential numerical precision problems with low CPUE values (Table 3.4.7).

L/S tuning runs (unshrunk) were carried out on data from each fleet individually to screen the tuning data for catchability trends and exceptional residuals. For these runs, fishing mortalities at age 9 were calculated as 0.8 of the mean F on ages 6–8, with tricubic weighting over 20 years, as in previous assessments. The results (in ICES stock files) show no consistent trends, but, as noted in earlier assessments, there is evidence of lower catchabilities on most ages in the beam trawl data in 1988. Age 2 results from both commercial fleets were noisier than the other ages, but still acceptable. As last year, survey data for ages 6 and older were excluded.

Since the L/S method gives no indication of q residuals in the final year (by definition), single fleet XSA runs were also performed, using the same settings as last year but a lighter F shrinkage (SE = 1.1) and no time taper. Results from these runs (in ICES stock files) were very similar to the L/S results, except for age 2 in the commercial fleets and ages 1 and 2 in the survey: residuals from the otter trawl and survey fleets were lower with XSA, but those from age 2 in the beam trawl fleet were much higher.

Exploratory XSA runs

Last year the selected XSA parameters were: tricubic taper over 20 years, catchability dependent on stock size for ages 1–3, q plateau set to ages 7 and older, and an F shrinkage of 0.8 over 5 years and 4 ages.

XSA trials last year focused on the effects of varying the number of ages with q dependent on stock size, and the F shrinkage level. At the November 1995 meeting, ACFM expressed concern over the use of q proportional to stock size with relatively short time series of tuning data. The relationship between log population numbers and log CPUE has been examined for ages 1–3 in this assessment, and found to be appropriate for all three ages in the survey data and age 3 in both commercial data sets (plots in ICES files). The Working Group therefore retained last year's approach in this respect.

This year's trials focused on the effects of varying the SE threshold and removing the time taper. Since tuning data are available for the last 10–12 years only, the tricubic time taper over 20 years appears redundant (and in any case was found to have little effect). Several series of XSA runs were carried out to review the parameters for the current assessment. Examination of the XSA diagnostics revealed that reducing the threshold SE marginally reduced the SE of survivors estimates given by the survey, and slightly increased the SEs of estimates from the beam trawl fleet, but the overall effect was small. The effect of removing age 2 from the beam trawl fleet data set, and increasing the F shrinkage SE, was also examined. Age 2 data from the beam trawl fleet consistently showed high SEs of survivor estimates in all trial runs, and were therefore excluded from the later stages of analysis. The removal of age 2 had little effect on the results. Decreasing the strength of F shrinkage, from 0.8 to 1.1 then 1.5, had little effect on mean F and SSB but changed the most recent recruitment estimate. F is very variable on the youngest (partially-recruited) age, so the inclusion of strong F shrinkage is not appropriate here. Reducing the F shrinkage strength to a very low level (1.5) improved the consistency of survivors estimates for age 1 without affecting those of the older ages. Retrospective XSA results for an F shrinkage of 1.5 show more consistent recruit estimates than for the run with 0.8, although a tendency to overestimate F and recruits remains (Figures 3.4.1 and 3.4.2). All trial runs and plots used by the Working Group in determining the final run parameters are in ICES stock files.

All main parameter settings have now been reviewed for this stock, so next year's assessment should not require further trials.

Final XSA run

Table 3.4.8 presents the full diagnostics for the final run accepted by the Working Group (untapered 10-year tuning period, q proportional to stock size for ages 1–3, q plateau at age 7, F shrinkage of 1.5 over 5 years and 4 ages). The UK beam trawl survey contributes strongly to the estimates of survivors for ages 1–5, and estimates for ages 4 and older are higher from the beam-trawl fleet than those from the other two fleets. Nevertheless, SEs of survivor estimates from all three fleets are reasonable and consistent for ages 4 and older. The plots of fleet catchabilities at age are shown in Figure 3.4.3.

Fishing mortalities and population numbers from the final run are given in Tables 3.4.9 and 3.4.10. Fishing mortality in 1995 (mean F_{3-7}, 0.68) was estimated to be at a similar level to that in 1994 (0.66). Last year's assessment estimated F_{94} at 0.78.

3.4.6 Estimating recruiting year class abundance

The 1993 year class is estimated to have been 3.7 million 1 year-olds, 26% below the GM (1976–1993) value of 5.0 millions, and 20% below last year's estimate of this year class.

The 1994 year class is estimated to have been 3.8 million 1 year-olds. This estimate is based mainly on the survey data (64% of the weight), with 31% given to the P shrinkage value and only 5% to that for F shrinkage. The survey appears to provide consistent estimates of year-class strength at age 1 compared to subsequent estimates at older ages (given in the full XSA diagnostic output in ICES files), so the Working Group accepted the XSA estimate.

1995 and subsequent year classes were taken as GM (1976–1993) in the predictions.

3.4.7 Historic trends in biomass, fishing mortality and recruitment

A full summary of the time series of XSA results is given in Table 3.4.11 and Figure 3.4.4. Spawning stock biomass (SSB) was stable during the period 1981–1987, increased during 1988–1990 following good recruitments in the mid-1980s, and has recently declined to the level observed in 1979/1980. The 1995 SSB is estimated to be 33% below the average for the series. Fishing mortality has shown an increasing trend over the time series, and has remained close to the peak observed in 1993. A succession of below-average recruitments since 1988 has contributed to the decline in yield and SSB.

3.4.8 Short-term catch predictions and sensitivity analysis

Input values for the catch forecast are given in Table 3.4.12. Stock numbers were obtained from the XSA values for ages 2 and above, and GM recruitment (5.0 million) assumed at age 1. The F at age vector was the mean of the period 1993–1995, scaled to the level of F95. Catch and stock weights at age were the mean for the period 1993–1995. The results of a *status quo* F forecast are given in Tables 3.4.13 (management option) and 3.4.14 (detailed results), and are shown graphically in Figure 3.4.5d. The *status quo* F predicted catch for 1996 is 1,000 t, with SSB rising from 1,500 t in 1997 to 1,700 t in 1998. Comparison of UK(E+W) landings statistics for January–July indicates that landings so far this year are some 10% below those for the same period in 1995. (The VIId+VIIe TAC for 1996 is 7,530 t.) Maintaining the 1995 level of fishing mortality implies a catch in 1997 of 1,100 t.

Proportions which the 1992–1996 year classes will contribute to catches and SSB in 1997–1998 are given in Table 3.4.15. Some 15% of the predicted catch for 1997, and around 43% of the predicted SSB for 1998, rely on year classes for which GM recruitment has been assumed.

A sensitivity analysis (method in Section 1.5.2) was carried out to examine the contribution of different sources of uncertainty to the variance of predicted SSB and yield. Table 1.5.2 gives a description of the abbreviated variable names in Table 3.4.16, which gives the input data, and in Figure 3.4.6, which presents the results of the analysis.

Probability profiles of expected yield and SSB are given in Figure 3.4.7. The 90% confidence intervals of the expected *status quo* yield in 1997 are 800 t and 1500 t. The probability that SSB in 1998 will fall below its lowest observed value of 1300 t is less than 20%.

3.4.9 Yield and biomass per recruit

Results for yield and SSB per recruit, conditional on the recent exploitation pattern, are given in Table 3.4.17 and Figure 3.4.5c. F_{max} is given by a reference F of 0.30, 44% of F95, and similar to last year's result (0.29). Long-term yield and SSB (at current F and assuming GM recruitment) are given as 1400 t and 2000 t respectively.

The stock-recruit relationship is shown in Figure 3.4.8, where it appears that the two highest recruitments were associated with average SSBs. Otherwise, there is no compelling evidence that recruitment is reduced at low SSB levels. F_{high} was estimated to be 1.27, F_{med} 0.58 and F_{low} 0.26. F95 (0.68) is estimated to be 17% above F_{med}.

3.4.10 Estimation of MBAL

The approach taken by the Group to evaluate the current status of the stock with respect to safe biological limits is described in Section 1.5.2. Estimates of equilibrium SSB corresponding to F_{med}, F_{high}, F_{max} and $F_{0.1}$ and assuming GM recruitment (4969, 1 year-olds), are given in the following table:

	F_{med}	F_{high}	F_{max}	$F_{0.1}$
ref F	0.58	1.27	0.30	0.13
SSB t	2321	1067	4723	9999

Examination of the stock and recruitment plot, Figure 3.4.8, indicates that the SSB corresponding to F_{med} is above the levels associated with above-average recruitment, and that there is no indication of reduced recruitment at SSB levels observed during the time series. For the purposes of the medium term predictions a threshold SSB value equal to the lowest observed level (1300 t) has been used.

3.4.11 Medium-term predictions

Medium-term predictions were made for a period of 10 years to estimate percentiles of the distribution of the predicted yields, SSB and recruitment at a *status quo* level of fishing. Future recruitments were generated by bootstrapping the VPA estimates of recruitment (see Section 1.5.2 for methodology). The model was run with 500 simulations (Figure 3.4.9).

Results indicate that SSB will gradually increase as the influence of recent low recruitments lessens, giving a 25% percentile of about 1700 t in 2005, which is about 30% above the lowest level observed in the time series. The 5% and 95% confidence levels of yield in 2005 are predicted to be 1000 t and 2200 t respectively.

Figure 3.4.10 gives the 5th, 25th, 50th, 75th and 95th percentile of SSB in the tenth year (2005) for different F factors. This indicates a 95% probability that continuing at the present level of fishing mortality will result in a SSB just above the series low in ten years time.

3.4.12 Comments on the assessment

Sampling data for this stock are considered reasonable, and there are no age reading difficulties. Under-reporting and misreporting of catches by ICES Division may have taken place in the most recent years, but no information is available on the magnitude of the problem. The inclusion of survey data in the tuning analysis adds resilience to the assessment, and its contribution to estimates of recruiting year classes has reduced the reliance on GM assumptions in the predictions.

The sampling levels, for those countries supplying sampling information, are shown in Table 1.4.1.

This year's assessment has altered the perception of the strength of the 1992 and 1993 year classes, both being 20% lower than estimated last year. Estimates of the level of F in 1993 and 1994 have been reduced by 10% and 15% respectively.

3.4.13 Management considerations

According to the "biologically safe limits" previously used by this Group:

1) There is no evidence that recruitment is reduced at low SSB levels (Figure 3.4.8).

2) SSB in 1996 (1,500 t) is close to the lowest recorded value of 1,300 t.

3) SSB is expected to remain around 1,500 t in 1997 (assuming *status quo* F in 1996), and increase to 1,700 t in 1998.

4) A 60% increase in fishing mortality would be required to reduce the SSB in 1998 to the lowest recorded level.

The medium-term prediction indicates a 95% probability that SSB in 2005 will be above the threshold level (1300 t), given the current level of fishing mortality.

Table 3.3.1 Division VIIe SOLE. Nominal landings (tonnes), 1972-1995 used by the Working Group.

Year	Belgium	France	UK (Engl. & Wales)	Other	Total Reported	Unallocated[2]	Total as used by WG
1972	6	230[1]	201	-	437	-	437
1973	2	263[1]	194	-	459	-	459
1974	6	237	181	-	424	3	427
1975	3	271	217	-	491	-	491
1976	4	352	260-	-	616	-	616
1977	3	331	271	-	606	-	606
1978	4	384	453	20	861	-	861
1979	1	515	665	-	1,181	-	1,181
1980	45	447	764	13	1,269	-	1,269
1981	16	415	788	1	1,220	-5	1,215
1982	98	321	1,028	-	1,447	-1	1,446
1983	47	405	1,043	3	1,498	-	1,498
1984	48	421	901	-	1,370	-	1,370
1985	58	130	911	-	1,099	310	1,409
1986	62	467	840	127	1,496	-128	1,368
1987	48	432	632	-	1,112	47	1,159
1988	67	98	784	-	949	401	1,350
1989	69	112[3]	611	7	799	362	1,161
1990	41	81[3]	634	1	757	325	1,082
1991	35	111[2]	480	1	627	104	731
1992	41	122[2]	456	1	620	149	769
1993	59	223	480	-	747	-	762
1994	33	261	546	-	840	-162	678
1995[3]	21	283	562	-	866	-142	724

[1]Estimated from Division VIId,e total by the Working Group.
[2]Estimated by the Working Group.
[3]Provisional

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Table 3.3.2 Division VIIe SOLE. CPUE and effective effort indices.

Year	CPUE (kgs/hr) UK > 40' beam trawl			UK autumn beam trawl survey (kgs/10 km)
	Total VIIe	Inshore	Offshore	
	Whole Year	Whole Year		
1972	16.27	16.27	-	-
1973	9.82	9.96	-	-
1974	9.98	10.65	-	-
1975	8.8	10.98	-	-
1976	12.45	15.1	-	-
1977	11.34	12.56	-	-
1978	11.97	13.4	-	-
1979	12.52	14.06	-	-
1980	10.41	11.65	9.44	-
1981	10.16	10.98	9.53	-
1982	10.86	12.48	9.21	-
1983	9.01	10.57	7.57	-
1984	9.19	9.23	9.17	-
1985	8.64	9.66	7.7	10.3
1986	9.74	8.81	10.3	13.0
1987	7.58	7.33	7.72	9.6
1988	7.5	7.48	7.51	7.4
1989	4.6	4.75	4.51	6.9
1990	5.61	5.39	5.59	4.4
1991	5.56	6.14	4.94	7.3
1992	6.18	6.19	6.08	7.8
1993	6.66	7.37	6.07	5.0
1994	6.32	6.54	6.12	4.1
1995[1]	6.13	6.71	5.78	3.8

Year	Effective effort ('000 hrs) UK > 40' beam trawl[2]			UK - all gears[3]		
	Inshore	Offshore	Total VIIe	Inshore	Offshore	Total VIIe
	Whole Year		Whole year			
1972	6.2	-	6.2	12.4	-	12.4
1973	10.2	0.2	10.4	15.8	5.6	21.4
1974	9.4	2.5	11.9	12.6	6.7	19.3
1975	7.2	4.0	11.2	12.8	13.9	26.7
1976	3.4	3.5	6.9	12.6	7.4	20.0
1977	4.9	6.3	11.2	14.0	9.9	23.9
1978	10.2	10.6	20.8	22.3	14.5	36.8
1979	21.9	15.5	37.4	31.2	20.4	51.6
1980	37.7	22.0	59.7	42.4	28.2	70.6
1981	37.3	25.8	63.1	46.4	28.8	75.2
1982	41.8	31.5	73.3	51.7	39.8	91.5
1983	32.0	43.9	75.9	51.1	66.4	117.5
1984	23.7	41.9	65.6	47.0	48.3	95.3
1985	31.6	37.8	69.4	54.9	47.3	102.2
1986	26.3	34.6	60.9	53.5	34.7	88.2
1987	23.6	45.0	68.6	35.6	47.4	83.0
1988	27.4	51.3	78.7	43.2	60.7	103.9
1989	29.3	44.8	74.2	62.5	69.0	131.5
1990	24.9	38.6	63.5	63.6	51.2	114.8
1991	23.4	41.0	64.3	36.2	47.8	84.0
1992	28.5	30.0	58.6	38.3	32.4	70.7
1993	22.2	24.5	46.7	34.2	36.2	70.4
1994	20.9	32.6	53.5	42.3	41.7	84.0
1995[1]	12.7	32.6	45.3	42.5	46.4	88.9

[1]Provisional data.
[2]Measured effort.
[3]Derived effort (Landings/CPUE).

Table 3.3.3

WESTERN CHANNEL SOLE.
Annual length distributions by fleet 1995.

UK (England & Wales)

Length (cm)*	Beam trawl	All gears bar beam & dredge
21		22
22	277	23
23	1458	421
24	7581	1400
25	20868	3537
26	38504	4757
27	63877	8223
28	87785	10476
29	113294	11234
30	103138	11957
31	100764	11287
32	110774	11001
33	85789	10253
34	86727	8442
35	74263	7091
36	61375	6170
37	48434	4393
38	38617	4029
39	29458	3376
40	22065	2373
41	16372	1295
42	15113	1942
43	11710	1357
44	7201	853
45	5286	797
46	4292	679
47	2028	328
48	1881	239
49	1163	173
50	540	39
51	611	45
52	587	0
53	0	185
54	0	
55	58	
56	29	
Total	1161919	128397

* Lower limit for UK

NO DATA FOR UK(E+W) DREDGE

Table 3.3.4 Western Channel sole catch numbers at age.

Run title : Sole in VIIe (run: XSACDD01/X01)

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Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE							
1,	0,	0,	1,	0,	0,	0,	10,
2,	89,	53,	51,	146,	71,	45,	82,
3,	322,	232,	201,	412,	396,	349,	567,
4,	80,	322,	246,	167,	433,	220,	170,
5,	149,	90,	198,	115,	89,	178,	199,
6,	210,	83,	65,	113,	99,	71,	115,
7,	21,	112,	80,	14,	120,	80,	28,
8,	50,	13,	156,	25,	17,	43,	53,
9,	26,	35,	10,	134,	52,	32,	26,
+gp,	92,	187,	202,	198,	170,	185,	217,
TOTALNUM,	1039,	1127,	1210,	1324,	1447,	1203,	1467,
TONSLAND,	353,	391,	432,	437,	459,	427,	491,
SOPCOF %,	100,	100,	100,	100,	100,	100,	98,

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	8,	2,	0,	0,	0,	0,	0,	0,	13,	0,
2,	167,	426,	250,	227,	175,	245,	128,	91,	333,	287,
3,	419,	318,	1123,	803,	559,	806,	1451,	753,	663,	1700,
4,	472,	384,	347,	811,	497,	651,	916,	1573,	826,	756,
5,	161,	206,	214,	250,	630,	467,	553,	583,	758,	469,
6,	135,	103,	189,	229,	126,	389,	352,	351,	325,	585,
7,	92,	70,	103,	174,	183,	179,	240,	267,	204,	179,
8,	47,	74,	72,	103,	140,	126,	136,	294,	129,	97,
9,	59,	10,	77,	90,	65,	76,	113,	119,	152,	103,
+gp,	278,	214,	269,	422,	528,	324,	435,	371,	337,	239,
TOTALNUM,	1838,	1807,	2644,	3109,	2903,	3263,	4324,	4402,	3740,	4415,
TONSLAND,	616,	606,	861,	1181,	1269,	1215,	1446,	1498,	1370,	1409,
SOPCOF %,	100,	100,	99,	101,	100,	100,	101,	100,	100,	101,

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	0,	1,	20,	14,	49,	13,	2,	0,	0,	0,
2,	240,	445,	421,	379,	292,	493,	302,	183,	77,	73,
3,	1559,	729,	1323,	739,	740,	351,	1194,	587,	539,	262,
4,	937,	963,	538,	1025,	461,	399,	356,	917,	467,	530,
5,	408,	382,	659,	388,	459,	215,	247,	303,	478,	365,
6,	311,	192,	345,	382,	190,	174,	102,	191,	98,	350,
7,	326,	211,	144,	185,	211,	76,	100,	128,	93,	113,
8,	81,	206,	154,	94,	121,	90,	50,	67,	43,	86,
9,	74,	42,	102,	91,	87,	48,	61,	53,	50,	53,
+gp,	278,	222,	246,	303,	339,	176,	124,	141,	171,	165,
TOTALNUM,	4214,	3393,	3952,	3600,	2949,	2035,	2538,	2570,	2016,	1997,
TONSLAND,	1368,	1159,	1350,	1161,	1082,	731,	769,	762,	678,	724,
SOPCOF %,	100,	100,	100,	99,	100,	99,	99,	100,	100,	100,

Table 3.3.5 Western Channel sole catch weights at age.

Run title : Sole in VIIe (run: XSACDD01/X01)

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Table 2 Catch weights at age (kg)

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE							
1,	.0000,	.0000,	.1130,	.0000,	.0000,	.1440,	.1420,
2,	.1880,	.1870,	.1510,	.1940,	.2030,	.1830,	.1810,
3,	.2450,	.2230,	.2220,	.2270,	.2240,	.2240,	.2140,
4,	.3320,	.2940,	.2960,	.2720,	.2620,	.2810,	.2990,
5,	.3290,	.3140,	.3670,	.3690,	.3100,	.3790,	.3580,
6,	.3670,	.3540,	.3500,	.4080,	.3810,	.4340,	.4030,
7,	.5220,	.4340,	.3590,	.4580,	.4140,	.3720,	.4350,
8,	.4550,	.4980,	.4310,	.4950,	.4590,	.4640,	.4970,
9,	.4630,	.4420,	.4550,	.4020,	.4660,	.4750,	.5910,
+gp,	.6470,	.5630,	.5510,	.5470,	.5590,	.6230,	.6580,
SOPCOFAC,	.9985,	1.0031,	.9989,	1.0005,	1.0008,	1.0008,	.9767,

Table 2 Catch weights at age (kg)

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.1390,	.1180,	.0000,	.0000,	.0000,	.0000,	.1200,	.0000,	.0880,	.0000,
2,	.1700,	.1970,	.1800,	.1870,	.1890,	.1740,	.2130,	.1880,	.2090,	.1620,
3,	.2170,	.2480,	.2410,	.2370,	.2540,	.2260,	.2080,	.2510,	.2420,	.2250,
4,	.2860,	.3020,	.3030,	.3270,	.3430,	.3220,	.2760,	.2720,	.3040,	.2960,
5,	.3230,	.3560,	.3900,	.4230,	.3890,	.3820,	.3450,	.3070,	.3790,	.3580,
6,	.3900,	.3990,	.4390,	.4600,	.5250,	.4780,	.4240,	.3900,	.3890,	.3890,
7,	.4540,	.5020,	.3770,	.4680,	.5600,	.5150,	.4950,	.4190,	.4780,	.4690,
8,	.4130,	.4630,	.4860,	.4770,	.6090,	.5340,	.5070,	.4750,	.5390,	.5200,
9,	.4750,	.5170,	.4890,	.5650,	.6460,	.5990,	.5200,	.5320,	.5590,	.5310,
+gp,	.5980,	.6400,	.6310,	.6650,	.7240,	.6620,	.6200,	.6450,	.6400,	.6830,
SOPCOFAC,	1.0008,	1.0017,	.9914,	1.0085,	1.0002,	.9974,	1.0055,	.9960,	1.0046,	1.0060,

Table 2 Catch weights at age (kg)

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.1070,	.0940,	.1090,	.1080,	.1400,	.1010,	.0980,	.0730,	.1210,	.1240,
2,	.1660,	.1880,	.1610,	.1590,	.1990,	.1850,	.1690,	.1410,	.1820,	.1850,
3,	.2180,	.2450,	.2420,	.2170,	.2640,	.2650,	.2260,	.2060,	.2400,	.2440,
4,	.3160,	.3070,	.3010,	.2940,	.3200,	.3430,	.3120,	.2670,	.2950,	.2990,
5,	.3780,	.3810,	.3890,	.3290,	.3830,	.4250,	.3870,	.3240,	.3460,	.3500,
6,	.4230,	.4860,	.4380,	.3720,	.4020,	.4490,	.4690,	.3780,	.3940,	.3980,
7,	.4680,	.4260,	.4870,	.4580,	.4880,	.5220,	.4920,	.4280,	.4390,	.4420,
8,	.5410,	.4820,	.5610,	.5080,	.4930,	.5540,	.5650,	.4740,	.4810,	.4830,
9,	.5040,	.5750,	.6050,	.5130,	.5120,	.5910,	.5770,	.5170,	.5200,	.5200,
+gp,	.6320,	.6760,	.6980,	.6540,	.6220,	.7240,	.6930,	.6210,	.6170,	.6250,
SOPCOFAC,	.9978,	.9989,	1.0004,	.9918,	1.0037,	.9916,	.9933,	.9981,	.9998,	.9985,

Table 3.3.6 Western Channel sole stock weights at age.

Run title : Sole in VIIe (run: XSACDD01/X01)

At 4-Sep-96 18:03:36

Table 3 Stock weights at age (kg)

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE							
1,	.0400,	.0450,	.0300,	.0550,	.0350,	.0400,	.0710,
2,	.1250,	.1200,	.0900,	.1300,	.1050,	.1250,	.1440,
3,	.2000,	.1950,	.1700,	.2000,	.1700,	.2000,	.2210,
4,	.2700,	.2550,	.2400,	.2650,	.2350,	.2650,	.2670,
5,	.3300,	.3050,	.2950,	.3250,	.2900,	.3200,	.3270,
6,	.3800,	.3550,	.3450,	.3800,	.3400,	.3700,	.3850,
7,	.4250,	.3950,	.3900,	.4200,	.3900,	.4100,	.4350,
8,	.4600,	.4300,	.4200,	.4600,	.4350,	.4550,	.4790,
9,	.4900,	.4650,	.4450,	.4900,	.4750,	.4900,	.5160,
+gp,	.5840,	.5230,	.5170,	.5460,	.5710,	.5520,	.6130,

Table 3 Stock weights at age (kg)

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.0950,	.0860,	.0900,	.0640,	.0520,	.0380,	.0380,	.0400,	.0320,	.0950,
2,	.1460,	.1560,	.1560,	.1410,	.1250,	.1190,	.1170,	.1200,	.1080,	.1500,
3,	.1980,	.2210,	.2170,	.2160,	.2060,	.1970,	.1950,	.1950,	.1920,	.2040,
4,	.2470,	.2780,	.2760,	.2870,	.2880,	.2760,	.2650,	.2500,	.2680,	.2580,
5,	.2940,	.3320,	.3300,	.3520,	.3600,	.3580,	.3350,	.3070,	.3390,	.3110,
6,	.3380,	.3820,	.3800,	.4140,	.4360,	.4270,	.3980,	.3650,	.4000,	.3640,
7,	.3800,	.4250,	.4250,	.4630,	.5130,	.4900,	.4550,	.4200,	.4530,	.4160,
8,	.4170,	.4620,	.4630,	.5020,	.5750,	.5430,	.5060,	.4750,	.5010,	.4680,
9,	.4560,	.4970,	.4980,	.5390,	.6200,	.5820,	.5360,	.5200,	.5450,	.5200,
+gp,	.5720,	.6060,	.6080,	.6760,	.6970,	.6750,	.6120,	.6720,	.6690,	.6920,

Table 3 Stock weights at age (kg)

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.0720,	.0600,	.0480,	.0800,	.1250,	.0690,	.0530,	.0380,	.0890,	.0910,
2,	.1420,	.1400,	.1330,	.1410,	.1830,	.1500,	.1350,	.1080,	.1520,	.1550,
3,	.2080,	.2140,	.2110,	.2000,	.2380,	.2270,	.2120,	.1740,	.2110,	.2150,
4,	.2700,	.2830,	.2850,	.2570,	.2900,	.2990,	.2830,	.2370,	.2680,	.2720,
5,	.3290,	.3460,	.3530,	.3120,	.3390,	.3660,	.3500,	.2960,	.3210,	.3250,
6,	.3840,	.4040,	.4150,	.3640,	.3840,	.4280,	.4110,	.3510,	.3710,	.3740,
7,	.4350,	.4570,	.4720,	.4130,	.4270,	.4860,	.4670,	.4030,	.4170,	.4200,
8,	.4830,	.5040,	.5220,	.4610,	.4670,	.5390,	.5170,	.4510,	.4610,	.4630,
9,	.5270,	.5460,	.5680,	.5060,	.5030,	.5870,	.5630,	.4960,	.5010,	.5020,
+gp,	.6310,	.6400,	.6790,	.6350,	.6010,	.7130,	.6750,	.6050,	.6030,	.6140,

Table 3.3.7 Western Channel sole tuning fleet data sets.

The SAS System 08:26 Wednesday, September 4, 199

SOL-ECHW: Sole in the Western English Channel (Fishing Area VIIe)

FLT01: UK Inshore fleet

Year	Fishing effort	Catch, age 2	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12	Catch, age 13	Catch, age 14	Catch, age 15
1973	15.76	28.3	142.9	145.8	28.7	28.7	33.8	4.9	15.2	8.4	1.0	8.4	12.7	1.2	14.3
1974	12.58	17.2	117.7	67.5	51.6	18.0	19.3	11.0	8.2	5.8	12.0	3.1	4.8	2.9	12.2
1975	12.84	30.0	163.3	41.9	45.1	21.2	4.8	10.0	4.9	3.7	3.7	7.0	3.8	5.2	10.2
1976	12.58	63.6	137.5	139.9	44.9	32.6	21.4	11.4	14.4	11.7	2.9	3.7	16.0	4.6	21.1
1977	14.01	169.7	106.7	114.5	57.4	24.3	15.8	18.1	2.5	5.3	6.4	3.5	4.5	8.2	15.3
1978	22.31	117.8	449.7	124.4	72.1	54.5	28.5	21.1	22.5	10.4	6.7	5.8	5.9	3.5	31.9
1979	31.15	114.2	342.9	310.5	89.6	70.2	51.1	32.4	28.1	30.2	7.3	6.8	17.3	3.6	46.0
1980	42.40	131.4	322.7	221.1	257.7	36.9	46.3	37.1	18.1	13.7	32.5	9.2	7.6	8.9	52.3
1981	46.36	161.9	478.9	320.6	190.5	123.1	52.6	37.8	22.1	15.7	12.1	11.3	3.4	3.7	33.2
1982	51.68	86.0	857.6	442.0	215.7	113.5	70.6	43.0	33.6	22.2	16.7	10.3	8.2	7.6	44.2
1983	51.09	76.8	353.4	623.5	210.6	80.1	78.3	94.1	33.8	26.4	5.3	6.5	34.8	5.1	20.9
1984	48.21	177.7	280.2	309.0	257.0	88.6	43.9	39.6	38.1	8.5	5.9	13.9	17.5	4.0	27.7
1985	54.87	57.7	598.4	320.7	168.7	198.1	37.2	29.9	45.9	32.4	17.7	7.6	4.2	5.6	25.3
1986	53.46	103.2	823.1	361.7	111.3	82.9	87.1	23.2	9.3	7.6	17.8	4.2	5.1	9.4	19.2
1987	35.61	116.6	183.2	269.3	93.4	17.1	16.7	32.0	5.9	9.0	3.6	7.8	4.5	5.2	18.4
1988	43.18	78.0	325.9	135.8	201.8	101.1	25.4	26.5	17.4	4.0	1.8	8.4	14.1	1.4	18.3
1989	62.53	79.4	295.8	225.3	81.7	109.0	22.2	17.2	16.6	8.8	14.4	4.3	5.0	4.6	22.6
1990	63.64	123.9	339.6	153.6	125.0	29.8	83.7	14.0	24.2	9.2	16.9	2.2	0.0	6.7	21.1
1991	36.16	292.3	150.9	112.2	53.0	46.4	14.1	34.3	5.1	10.2	4.2	6.8	2.0	0.8	6.6
1992	38.29	133.7	442.1	105.9	74.7	22.5	28.1	9.1	16.9	4.7	2.4	3.1	4.6	6.4	10.9
1993	34.19	115.8	255.6	343.6	59.5	46.3	29.3	23.1	13.0	10.8	6.2	2.8	2.4	3.0	6.9
1994	42.35	34.8	293.4	211.2	198.6	30.0	28.2	12.5	19.9	8.2	11.3	5.4	7.1	2.8	10.0
1995	42.47	49.0	118.9	280.1	156.3	157.8	28.4	18.1	13.8	11.8	3.1	9.1	5.5	2.7	10.8

FLT02: UK Offshore fleet

Year	Fishing effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12	Catch, age 13	Catch, age 14	Catch, age 15
1973	5.64	24.6	37.3	8.9	13.0	16.8	2.1	6.6	4.3	0.7	4.3	4.3	0.7	11.6
1974	6.72	30.3	25.7	23.8	12.2	14.4	7.1	5.4	4.5	11.3	2.3	2.4	2.4	14.9
1975	13.94	85.2	32.5	42.1	29.2	7.3	13.1	6.4	5.8	6.9	10.8	3.8	8.7	25.3
1976	7.36	38.6	58.4	22.7	24.2	17.3	8.1	10.2	9.8	2.9	3.0	8.8	4.2	28.1
1977	9.88	36.1	57.7	34.9	21.7	15.5	15.3	2.1	5.3	7.9	3.5	3.0	8.8	24.5
1978	14.50	140.5	57.7	40.4	44.9	25.8	16.6	17.9	9.7	7.7	5.3	3.6	3.5	47.2
1979	20.38	107.9	145.1	50.6	58.2	46.4	25.5	22.4	28.3	8.3	6.3	10.6	3.7	68.4
1980	28.18	103.1	104.9	147.7	31.1	42.7	29.7	14.7	13.0	37.9	8.8	4.7	9.0	79.1
1981	28.75	142.8	142.1	101.9	96.6	45.3	28.2	16.7	13.9	13.1	10.0	2.0	3.5	46.7
1982	39.85	317.9	243.4	143.3	110.7	75.7	39.9	31.6	24.5	22.5	11.3	5.9	9.0	77.4
1983	66.45	104.1	433.6	167.6	116.5	100.9	104.4	47.8	27.7	19.8	9.2	18.7	10.2	91.4
1984	49.07	152.8	234.7	214.8	133.2	69.9	22.9	54.3	28.5	7.8	29.7	8.2	6.7	55.4
1985	47.15	245.2	130.3	110.8	211.1	75.6	26.7	31.6	15.5	7.1	0.0	7.9	6.8	43.7
1986	34.66	425.5	215.7	100.2	79.1	70.0	15.2	7.9	30.1	28.6	5.3	13.7	7.6	28.0
1987	47.41	158.4	344.2	138.8	53.3	50.7	95.7	22.7	19.0	26.1	13.8	14.2	14.6	36.3
1988	60.72	437.5	302.3	295.9	111.4	45.0	46.6	53.6	12.4	29.4	10.9	14.8	7.6	26.9
1989	68.96	176.3	245.2	132.4	153.4	70.7	28.0	24.7	20.6	13.0	10.2	11.6	7.3	27.1
1990	51.16	164.0	140.8	97.3	68.6	66.9	31.7	18.1	13.6	10.2	7.1	10.9	5.7	28.9
1991	47.77	98.5	104.1	103.8	58.2	33.2	27.9	21.9	8.7	5.0	10.6	3.3	5.5	23.8
1992	32.40	265.2	97.5	71.4	35.3	24.6	17.6	21.2	5.2	4.5	3.1	4.2	1.6	16.5
1993	36.24	90.2	224.2	121.2	67.3	51.8	22.4	20.4	22.2	12.9	3.2	5.2	7.7	15.8
1994	41.67	106.3	161.3	174.8	51.2	46.7	25.1	18.7	22.7	24.8	10.7	4.9	5.8	24.0
1995	46.37	88.8	191.4	143.3	130.5	46.1	36.8	21.9	12.5	6.8	14.4	5.1	3.2	23.9

FLT03: UK Beam trawl survey

Year	Fishing effort	Catch, age 1	Catch, age 2	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6
1984	168.4	0	117	143	112	135	45
1985	132.7	0	107	165	42	61	46
1986	147.7	0	50	295	123	55	32
1987	134.3	0	68	114	114	51	20
1988	128.2	2	39	129	52	75	22
1989	165.7	5	56	120	107	34	40
1990	175.7	23	52	76	31	24	7
1991	171.7	11	231	79	51	23	21
1992	196.6	5	140	316	44	36	12
1993	189.2	5	54	115	105	14	10
1994	205.9	6	47	106	62	44	5
1995	187.2	14	37	44	42	26	31

Table 3.3.8 Western Channel sole XSA diagnostic output.

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Lowestoft VPA Version 3.1

   4-Sep-96  18:03:00

Extended Survivors Analysis

Sole in VIIe (run: XSACDD01/X01)

CPUE data from file /users/fish/ifad/ifapwork/wgssds/sol_echw/FLEET.X01

Catch data for  27 years. 1969 to 1995. Ages  1 to  10.

     Fleet,            First, Last, First, Last, Alpha,  Beta
                   ,    year, year,  age ,  age
FLT01: UK Inshore fl,   1986, 1995,   2,     9,   .000,  1.000
FLT02: UK Offshore f,   1986, 1995,   3,     9,   .000,  1.000
FLT03: UK Beam trawl,   1986, 1995,   1,     6,   .750,   .800


Time series weights :

     Tapered time weighting not applied


Catchability analysis :

     Catchability dependent on stock size for ages <    7

        Regression type = C
        Minimum of   5 points used for regression
        Survivor estimates shrunk to the population mean for ages <  7


     Catchability independent of age for ages >=    7


Terminal population estimation :

     Survivor estimates shrunk towards the mean F
     of the final   5 years or the   3 oldest ages.

     S.E. of the mean to which the estimates  are shrunk =   1.000

     Minimum standard error for population
     estimates derived from each fleet =    .100

     Prior weighting not applied


Tuning had not converged after   60 iterations


Total absolute residual between iterations
59 and  60 =     .00649

Final year F values
Age          ,      1,      2,      3,      4,      5,      6,      7,      8,      9
Iteration 59,  .0000,  .0325,  .1618,  .3003,  .2740,  .3146,  .2236,  .2134,  .2094
Iteration 60,  .0000,  .0324,  .1608,  .3007,  .2745,  .3162,  .2224,  .2128,  .2083
```

Table 3.3.8(cont) Western Channel sole XSA diagnostic output.

Log catchability residuals.

Fleet : FLT01: UK Inshore fl

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	No data for this fleet at this age									
2	-.08	-.19	-.04	-.28	.16	.14	.14	.21	-.05	.00
3	.07	-.06	-.15	.02	.02	.03	-.03	.08	.09	-.07
4	.05	-.10	-.06	-.20	-.03	-.02	-.01	.11	.02	.24
5	.03	-.07	-.01	-.16	.00	.06	.01	.03	.01	.10
6	-.06	-.18	.14	-.14	-.12	.24	-.02	.10	-.02	.06
7	.24	-.42	.05	-.62	.48	-.34	.26	.38	-.04	.02
8	.08	.06	.36	-.28	-.63	.53	-.57	.50	-.37	-.20
9	.14	-.55	-.37	.10	.56	-.67	.06	.18	.45	-.01

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

Age	7	8	9
Mean Log q	-6.6575	-6.6575	-6.6575
S.E(Log q)	.3642	.4289	.4052

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
2	.52	2.563	7.68	.78	10	.17	-7.25
3	.66	4.104	6.69	.95	10	.08	-6.00
4	.58	2.612	6.72	.83	10	.13	-5.98
5	.54	4.315	6.68	.92	10	.08	-6.18
6	.38	3.115	6.70	.76	10	.14	-6.50

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
7	.79	.562	6.62	.48	10	.30	-6.66
8	.68	.794	6.51	.44	10	.30	-6.71
9	1.60	-.840	7.29	.20	10	.66	-6.67

Table 3.3.8(cont) Western Channel sole XSA diagnostic output.

Fleet : FLT02: UK Offshore f

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	No data for this fleet at this age									
2	No data for this fleet at this age									
3	.11	.02	.07	.02	.05	.01	-.01	-.23	-.16	.13
4	.14	.03	.29	-.16	.04	-.28	.04	-.04	-.09	.03
5	.13	-.09	.15	-.18	-.23	.06	-.13	.35	.00	-.06
6	.08	-.10	-.03	-.07	.09	.00	-.05	.12	-.05	.00
7	.01	-.04	-.16	.00	.04	-.20	-.14	.46	.04	-.02
8	-.34	.43	.15	-.33	-.03	-.39	-.18	-.02	-.09	-.01
9	-.02	.07	-.02	-.04	.05	.07	.02	.13	-.03	-.07

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

Age	7	8	9
Mean Log q	-6.2209	-6.2209	-6.2209
S.E(Log q)	.1831	.2653	.0663

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
3	.52	3.925	7.25	.89	10	.12	-6.54
4	.75	1.188	6.50	.73	10	.17	-6.08
5	.92	.283	6.11	.64	10	.19	-6.01
6	.69	2.825	6.36	.91	10	.08	-6.16

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
7	.93	.333	6.24	.72	10	.18	-6.22
8	.60	2.550	6.21	.83	10	.12	-6.30
9	1.02	-.245	6.21	.96	10	.07	-6.20

Table 3.3.8(cont) Western Channel sole XSA diagnostic output.

Fleet : FLT03: UK Beam trawl

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	99.99	99.99	-.61	.03	.20	.19	-.30	.20	.14	.15
2	-.09	-.23	-.07	-.07	.08	.23	.28	-.20	.14	-.07
3	.04	.18	-.07	.24	-.12	.08	.01	-.11	-.14	-.11
4	.21	.00	.17	.21	-.05	.06	-.01	-.17	-.18	-.25
5	.49	.26	.30	.18	-.11	.03	.02	-.44	-.34	-.39
6	.15	.31	.10	.06	-.14	.28	.03	-.22	-.41	-.18
7	No data for this fleet at this age									
8	No data for this fleet at this age									
9	No data for this fleet at this age									

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
1	.63	.993	10.20	.54	8	.32	-11.37
2	.60	1.997	8.62	.76	10	.18	-8.95
3	.52	3.376	8.07	.86	10	.14	-8.09
4	.50	2.233	8.01	.71	10	.18	-8.31
5	.63	.791	8.04	.36	10	.34	-8.51
6	.40	1.785	7.62	.52	10	.24	-8.84

Terminal year survivor and F summaries :

Age 1 Catchability dependent on age and year class strength

Year class = 1994

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT01: UK Inshore fl	1.	.000	.000	.00	0	.000	.000
FLT02: UK Offshore f	1.	.000	.000	.00	0	.000	.000
FLT03: UK Beam trawl	5005.	.360	.000	.00	1	.597	.000
P shrinkage mean	3461.	.44				.403	.000
F shrinkage mean	0.	1.00				.000	.000

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
4313.	.28	.23	2	.843	.000

Age 2 Catchability dependent on age and year class strength

Year class = 1993

Fleet	Estimated Survivors	Int s.e	Ext s.e	Var Ratio	N	Scaled Weights	Estimated F
FLT01: UK Inshore fl	2109.	.191	.000	.00	1	.419	.032
FLT02: UK Offshore f	1.	.000	.000	.00	0	.000	.000
FLT03: UK Beam trawl	2070.	.177	.094	.53	2	.486	.033
P shrinkage mean	2925.	.44				.080	.023
F shrinkage mean	839.	1.00				.016	.080

Weighted prediction :

Survivors at end of year	Int s.e	Ext s.e	N	Var Ratio	F
2115.	.12	.08	5	.660	.032

Table 3.3.8(cont) Western Channel sole XSA diagnostic output.

Age 3 Catchability dependent on age and year class strength

Year class = 1992

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	1337.,	.090,	.007,	.08,	2,	.491,	.171
FLT02: UK Offshore f,	1633.,	.135,	.000,	.00,	1,	.219,	.142
FLT03: UK Beam trawl,	1448.,	.121,	.095,	.78,	3,	.265,	.159
P shrinkage mean ,	1988.,	.48,,,,				.021,	.118
F shrinkage mean ,	870.,	1.00,,,,				.005,	.252

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
1436.,	.06,	.05,	8,	.719,	.161

Age 4 Catchability dependent on age and year class strength

Year class = 1991

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	1683.,	.074,	.052,	.69,	3,	.469,	.262
FLT02: UK Offshore f,	1319.,	.105,	.094,	.89,	2,	.241,	.324
FLT03: UK Beam trawl,	1179.,	.098,	.031,	.32,	4,	.266,	.356
P shrinkage mean ,	1296.,	.45,,,,				.020,	.329
F shrinkage mean ,	1448.,	1.00,,,,				.004,	.299

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
1435.,	.05,	.05,	11,	1.057,	.301

Age 5 Catchability dependent on age and year class strength

Year class = 1990

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	1194.,	.061,	.021,	.34,	4,	.565,	.255
FLT02: UK Offshore f,	955.,	.094,	.055,	.59,	3,	.222,	.310
FLT03: UK Beam trawl,	1027.,	.095,	.100,	1.05,	5,	.194,	.291
P shrinkage mean ,	904.,	.46,,,,				.016,	.325
F shrinkage mean ,	948.,	1.00,,,,				.003,	.312

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
1097.,	.04,	.04,	14,	.866,	.274

Table 3.3.8(cont) Western Channel sole XSA diagnostic output.

Age 6 Catchability dependent on age and year class strength

Year class = 1989

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	923.,	.061,	.025,	.41,	5,	.451,	.308
FLT02: UK Offshore f,	891.,	.074,	.008,	.10,	4,	.385,	.317
FLT03: UK Beam trawl,	822.,	.101,	.073,	.72,	6,	.149,	.340
P shrinkage mean ,	584.,	.56,,,,				.011,	.451
F shrinkage mean ,	1274.,	1.00,,,,				.003,	.232

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
891.,	.04,	.02,	17,	.554,	.316

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

Year class = 1988

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	442.,	.058,	.019,	.32,	6,	.447,	.218
FLT02: UK Offshore f,	436.,	.068,	.057,	.83,	5,	.410,	.220
FLT03: UK Beam trawl,	404.,	.095,	.091,	.96,	6,	.140,	.236
F shrinkage mean ,	397.,	1.00,,,,				.003,	.239

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
434.,	.04,	.03,	18,	.679,	.222

Age 8 Catchability constant w.r.t. time and age (fixed at the value for age) 7

Year class = 1987

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	345.,	.058,	.035,	.60,	7,	.440,	.213
FLT02: UK Offshore f,	358.,	.067,	.052,	.77,	6,	.420,	.206
FLT03: UK Beam trawl,	314.,	.094,	.064,	.69,	6,	.136,	.231
F shrinkage mean ,	340.,	1.00,,,,				.004,	.216

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
346.,	.04,	.03,	20,	.657,	.213

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 7

Year class = 1986

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: UK Inshore fl,	221.,	.060,	.041,	.68,	8,	.326,	.205
FLT02: UK Offshore f,	216.,	.059,	.059,	1.01,	7,	.581,	.210
FLT03: UK Beam trawl,	231.,	.100,	.061,	.61,	5,	.090,	.198
F shrinkage mean ,	177.,	1.00,,,,				.003,	.251

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
219.,	.04,	.03,	21,	.740,	.208

Table 3.3.9 Western Channel sole XSA estimated fishing mortality at age

Run title : Sole in VIIe (run: XSACDD01/X01)

At 4-Sep-96 18:03:36

Terminal Fs derived using XSA (With F shrinkage)

Table 8 Fishing mortality (F) at age

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE							
1,	.0000,	.0000,	.0004,	.0000,	.0000,	.0000,	.0034,
2,	.0530,	.0545,	.0194,	.0633,	.0360,	.0151,	.0273,
3,	.2171,	.1707,	.2679,	.1924,	.2181,	.2221,	.2377,
4,	.1544,	.3119,	.2460,	.3313,	.2829,	.1621,	.1437,
5,	.2134,	.2327,	.2860,	.1556,	.2632,	.1608,	.1935,
6,	.1084,	.1583,	.2346,	.2342,	.1746,	.3084,	.1330,
7,	.2171,	.0699,	.2018,	.0650,	.3707,	.1867,	.1713,
8,	.1529,	.1813,	.1181,	.0804,	.0945,	.1957,	.1629,
9,	.1597,	.1367,	.1852,	.1267,	.2137,	.2308,	.1560,
+gp,	.1597,	.1367,	.1852,	.1267,	.2137,	.2308,	.1560,
FBAR 3- 7,	.1821,	.1887,	.2472,	.1957,	.2619,	.2080,	.1759,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.0012,	.0004,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0020,	.0000,
2,	.0648,	.0748,	.0613,	.0626,	.0406,	.0328,	.0312,	.0269,	.0637,	.0501,
3,	.1698,	.1518,	.2564,	.2541,	.1934,	.2372,	.2461,	.2306,	.2481,	.4640,
4,	.2835,	.2076,	.2203,	.2657,	.2205,	.3211,	.4098,	.4068,	.3776,	.4383,
5,	.1765,	.1721,	.1532,	.2184,	.3028,	.2960,	.4392,	.4405,	.3111,	.3395,
6,	.1744,	.1467,	.2112,	.2180,	.1462,	.2762,	.3383,	.4891,	.4170,	.3729,
7,	.1345,	.1157,	.1919,	.2735,	.2422,	.2838,	.2445,	.4116,	.5195,	.3783,
8,	.4257,	.1369,	.1501,	.2664,	.3282,	.2338,	.3224,	.4699,	.3173,	.4431,
9,	.2454,	.1333,	.1848,	.2532,	.2394,	.2653,	.3026,	.4587,	.4197,	.3998,
+gp,	.2454,	.1333,	.1848,	.2532,	.2394,	.2653,	.3026,	.4587,	.4197,	.3998,
FBAR 3- 7,	.1877,	.1588,	.2066,	.2459,	.2210,	.2829,	.3356,	.3957,	.3747,	.3986,

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	FBAR 93-95
AGE											
1,	.0000,	.0003,	.0055,	.0049,	.0080,	.0033,	.0006,	.0000,	.0000,	.0000,	.0000,
2,	.0760,	.0963,	.1459,	.1231,	.1189,	.0938,	.0883,	.0576,	.0387,	.0324,	.0429,
3,	.3690,	.3079,	.4038,	.3636,	.3321,	.1836,	.3056,	.2210,	.2143,	.1608,	.1987,
4,	.4458,	.3634,	.3483,	.5551,	.3600,	.2675,	.2561,	.3616,	.2452,	.3007,	.3025,
5,	.3976,	.2918,	.4026,	.4036,	.4577,	.2528,	.2355,	.3210,	.2889,	.2745,	.2948,
6,	.3513,	.2929,	.4128,	.3821,	.3135,	.2786,	.1634,	.2573,	.1454,	.3162,	.2396,
7,	.3262,	.3793,	.3314,	.3608,	.3342,	.1777,	.2283,	.2827,	.1719,	.2224,	.2257,
8,	.2613,	.3139,	.4652,	.3333,	.3769,	.2071,	.1524,	.2106,	.1293,	.2128,	.1842,
9,	.6351,	.1877,	.2254,	.4892,	.5185,	.2240,	.1892,	.2143,	.2148,	.2083,	.2125,
+gp,	.6351,	.1877,	.2254,	.4892,	.5185,	.2240,	.1892,	.2143,	.2148,	.2083,	
FBAR 3- 7,	.3780,	.3271,	.3798,	.4130,	.3595,	.2320,	.2378,	.2887,	.2131,	.2549,	

Run title : Sole in VIIe (run: XSACDD01/X01)

Table 3.3.10 Western Channel sole XSA estimated population numbers at age.

At 4-Sep-96 18:03:36

Terminal Fs derived using XSA (With F shrinkage)

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1969,	1970,	1971,	1972,	1973,	1974,	1975,
AGE							
1,	1160,	3082,	2765,	2333,	3494,	3541,	3103,
2,	1812,	1050,	2789,	2501,	2111,	3161,	3204,
3,	1735,	1554,	899,	2475,	2124,	1842,	2817,
4,	588,	1263,	1186,	622,	1847,	1545,	1335,
5,	815,	456,	837,	839,	404,	1260,	1189,
6,	2149,	596,	327,	569,	650,	281,	970,
7,	113,	1745,	460,	234,	407,	494,	187,
8,	371,	82,	1472,	340,	198,	254,	371,
9,	185,	288,	62,	1184,	284,	163,	189,
+gp,	654,	1536,	1254,	1746,	927,	942,	1577,
TOTAL,	9581,	11652,	12051,	12843,	12446,	13483,	14942,

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	6878,	4887,	4345,	5104,	8826,	4843,	3980,	6267,	6834,	3811,
2,	2799,	6216,	4420,	3932,	4619,	7986,	4382,	3602,	5670,	6171,
3,	2821,	2373,	5219,	3762,	3342,	4013,	6993,	3843,	3172,	4814,
4,	2010,	2154,	1845,	3654,	2640,	2492,	2864,	4947,	2761,	2240,
5,	1046,	1370,	1584,	1339,	2535,	1916,	1636,	1720,	2980,	1713,
6,	887,	793,	1043,	1229,	974,	1695,	1289,	954,	1002,	1976,
7,	769,	674,	620,	764,	894,	762,	1163,	832,	529,	597,
8,	143,	608,	543,	463,	526,	635,	519,	824,	499,	285,
9,	285,	84,	480,	423,	321,	343,	455,	340,	466,	329,
+gp,	1340,	1800,	1673,	1978,	2601,	1458,	1746,	1056,	1030,	760,
TOTAL,	18976,	20960,	21773,	22649,	27278,	26142,	25028,	24385,	24944,	22694,

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	GMST 69-93	AMST 69-93
AGE													
1,	5630,	3603,	3824,	3041,	6446,	4166,	3803,	2354,	2660,	4764,	0,	3987,	4325,
2,	3448,	5095,	3259,	3441,	2738,	5786,	3757,	3439,	2130,	2407,	4313,	3580,	3895,
3,	5311,	2892,	4186,	2549,	2753,	2200,	4767,	3112,	2938,	1854,	2115,	2978,	3263,
4,	2739,	3323,	1923,	2530,	1603,	1787,	1656,	3177,	2258,	2146,	1436,	1972,	2189,
5,	1308,	1587,	2090,	1228,	1314,	1012,	1238,	1160,	2003,	1599,	1435,	1263,	1383,
6,	1104,	795,	1072,	1265,	742,	752,	711,	885,	762,	1357,	1097,	896,	988,
7,	1231,	703,	537,	642,	781,	491,	515,	546,	619,	596,	891,	582,	668,
8,	370,	804,	435,	349,	405,	506,	372,	371,	373,	472,	434,	406,	470,
9,	165,	258,	531,	247,	226,	251,	372,	289,	272,	296,	346,	280,	329,
+gp,	618,	1361,	1279,	820,	877,	920,	755,	767,	928,	921,	895,		
TOTAL,	21924,	20419,	19137,	16110,	17885,	17871,	17946,	16101,	14942,	16411,	12963,		

Table 3.3.11 Western Channel sole XSA summary table

Run title : Sole in VIIe (run: XSACDD01/X01)

At 4-Sep-96 18:03:37

Table 16 Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS, Age 1	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 7,
1969,	1160,	2556,	2283,	353,	.1546,	.1821,
1970,	3082,	2902,	2638,	391,	.1482,	.1887,
1971,	2765,	2605,	2271,	432,	.1902,	.2472,
1972,	2333,	3391,	2937,	437,	.1488,	.1957,
1973,	3494,	2387,	2043,	459,	.2247,	.2619,
1974,	3541,	2740,	2203,	427,	.1938,	.2080,
1975,	3103,	3746,	3065,	491,	.1602,	.1759,
1976,	6878,	3972,	2910,	616,	.2117,	.1877,
1977,	4887,	4971,	3581,	606,	.1692,	.1588,
1978,	4345,	5413,	4332,	861,	.1988,	.2066,
1979,	5104,	5874,	4993,	1181,	.2365,	.2459,
1980,	8826,	6596,	5559,	1269,	.2283,	.2210,
1981,	4843,	5924,	4790,	1215,	.2537,	.2829,
1982,	3980,	5952,	5288,	1446,	.2734,	.3356,
1983,	6267,	5173,	4490,	1498,	.3336,	.3957,
1984,	6834,	5024,	4193,	1370,	.3268,	.3747,
1985,	3811,	5178,	3890,	1409,	.3622,	.3986,
1986,	5630,	4785,	3890,	1368,	.3517,	.3780,
1987,	3603,	5097,	4168,	1159,	.2781,	.3271,
1988,	3824,	4882,	4265,	1350,	.3165,	.3798,
1989,	3041,	3803,	3075,	1161,	.3776,	.4130,
1990,	6446,	4321,	3014,	1082,	.3590,	.3595,
1991,	4166,	4196,	3041,	731,	.2404,	.2320,
1992,	3803,	4065,	3357,	769,	.2291,	.2378,
1993,	2354,	3404,	2943,	762,	.2589,	.2887,
1994,	2660,	3837,	3276,	678,	.2070,	.2131,
1995,	4764,	3999,	3192,	724,	.2268,	.2549,
Arith. Mean ,	4279,	4326,	3544,	898,	.2467,	.2723,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 3.3.12

Sole in the Western English Channel (Fishing Area VIIe)

Single option prediction: Input data

Year: 1996								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	3987.000	0.1000	0.0000	0.0000	0.0000	0.073	0.0000	0.106
2	4313.000	0.1000	0.0000	0.0000	0.0000	0.138	0.0433	0.169
3	2115.000	0.1000	1.0000	0.0000	0.0000	0.200	0.2008	0.230
4	1436.000	0.1000	1.0000	0.0000	0.0000	0.259	0.3057	0.287
5	1435.000	0.1000	1.0000	0.0000	0.0000	0.314	0.2979	0.340
6	1097.000	0.1000	1.0000	0.0000	0.0000	0.365	0.2421	0.390
7	891.000	0.1000	1.0000	0.0000	0.0000	0.413	0.2281	0.436
8	434.000	0.1000	1.0000	0.0000	0.0000	0.458	0.1861	0.479
9	346.000	0.1000	1.0000	0.0000	0.0000	0.500	0.2147	0.519
10+	895.000	0.1000	1.0000	0.0000	0.0000	0.607	0.2147	0.621
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1997								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	3987.000	0.1000	0.0000	0.0000	0.0000	0.073	0.0000	0.106
2	.	0.1000	0.0000	0.0000	0.0000	0.138	0.0433	0.169
3	.	0.1000	1.0000	0.0000	0.0000	0.200	0.2008	0.230
4	.	0.1000	1.0000	0.0000	0.0000	0.259	0.3057	0.287
5	.	0.1000	1.0000	0.0000	0.0000	0.314	0.2979	0.340
6	.	0.1000	1.0000	0.0000	0.0000	0.365	0.2421	0.390
7	.	0.1000	1.0000	0.0000	0.0000	0.413	0.2281	0.436
8	.	0.1000	1.0000	0.0000	0.0000	0.458	0.1861	0.479
9	.	0.1000	1.0000	0.0000	0.0000	0.500	0.2147	0.519
10+	.	0.1000	1.0000	0.0000	0.0000	0.607	0.2147	0.621
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1998								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	3987.000	0.1000	0.0000	0.0000	0.0000	0.073	0.0000	0.106
2	.	0.1000	0.0000	0.0000	0.0000	0.138	0.0433	0.169
3	.	0.1000	1.0000	0.0000	0.0000	0.200	0.2008	0.230
4	.	0.1000	1.0000	0.0000	0.0000	0.259	0.3057	0.287
5	.	0.1000	1.0000	0.0000	0.0000	0.314	0.2979	0.340
6	.	0.1000	1.0000	0.0000	0.0000	0.365	0.2421	0.390
7	.	0.1000	1.0000	0.0000	0.0000	0.413	0.2281	0.436
8	.	0.1000	1.0000	0.0000	0.0000	0.458	0.1861	0.479
9	.	0.1000	1.0000	0.0000	0.0000	0.500	0.2147	0.519
10+	.	0.1000	1.0000	0.0000	0.0000	0.607	0.2147	0.621
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : SPRCDD01
Date and time: 07SEP96:13:57

Table 3.3.13

The SAS System 13:56 Saturday, September 7, 1996

Sole in the Western English Channel (Fishing Area VIIe)

Prediction with management option table

Year: 1996					Year: 1997					Year: 1998	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0000	0.2549	3816	2930	670	0.0000	0.0000	3924	3135	0	4729	3941
.	.	.	.	.	0.1000	0.0255	.	3135	77	4651	3862
.	.	.	.	.	0.2000	0.0510	.	3135	152	4574	3785
.	.	.	.	.	0.3000	0.0765	.	3135	225	4499	3710
.	.	.	.	.	0.4000	0.1020	.	3135	297	4426	3637
.	.	.	.	.	0.5000	0.1275	.	3135	367	4354	3565
.	.	.	.	.	0.6000	0.1530	.	3135	435	4284	3496
.	.	.	.	.	0.7000	0.1784	.	3135	502	4216	3427
.	.	.	.	.	0.8000	0.2039	.	3135	568	4149	3360
.	.	.	.	.	0.9000	0.2294	.	3135	632	4084	3295
.	.	.	.	.	1.0000	0.2549	.	3135	694	4020	3231
.	.	.	.	.	1.1000	0.2804	.	3135	756	3958	3169
.	.	.	.	.	1.2000	0.3059	.	3135	815	3897	3108
.	.	.	.	.	1.3000	0.3314	.	3135	874	3837	3049
.	.	.	.	.	1.4000	0.3569	.	3135	931	3779	2990
.	.	.	.	.	1.5000	0.3824	.	3135	987	3722	2934
.	.	.	.	.	1.6000	0.4079	.	3135	1041	3667	2878
.	.	.	.	.	1.7000	0.4334	.	3135	1095	3613	2824
.	.	.	.	.	1.8000	0.4589	.	3135	1147	3559	2771
.	.	.	.	.	1.9000	0.4843	.	3135	1198	3508	2719
.	.	.	.	.	2.0000	0.5098	.	3135	1248	3457	2668
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : MANCDD01
Date and time : 07SEP96:14:30
Computation of ref. F: Simple mean, age 3 - 7
Basis for 1996 : F factors

Table 3.3.14

Sole in the Western English Channel (Fishing Area VIIe)

Single option prediction: Detailed tables

Year: 1996 F-factor: 1.0000 Reference F: 0.2549						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0000	0	0	3987	290	0	0	0	0
2	0.0433	174	29	4313	597	0	0	0	0
3	0.2008	367	84	2115	423	2115	423	2115	423
4	0.3057	361	104	1436	372	1436	372	1436	372
5	0.2979	353	120	1435	451	1435	451	1435	451
6	0.2421	225	88	1097	401	1097	401	1097	401
7	0.2281	173	76	891	368	891	368	891	368
8	0.1861	70	34	434	199	434	199	434	199
9	0.2147	64	33	346	173	346	173	346	173
10+	0.2147	165	102	895	543	895	543	895	543
Total		1951	670	16949	3816	8649	2930	8649	2930
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1997 F-factor: 1.0000 Reference F: 0.2549						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0000	0	0	3987	290	0	0	0	0
2	0.0433	146	25	3608	499	0	0	0	0
3	0.2008	648	149	3737	747	3737	747	3737	747
4	0.3057	393	113	1566	405	1566	405	1566	405
5	0.2979	235	80	957	301	957	301	957	301
6	0.2421	198	77	964	352	964	352	964	352
7	0.2281	152	66	779	322	779	322	779	322
8	0.1861	104	50	642	294	642	294	642	294
9	0.2147	60	31	326	163	326	163	326	163
10+	0.2147	167	104	906	550	906	550	906	550
Total		2102	694	17471	3924	9877	3135	9877	3135
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1998 F-factor: 1.0000 Reference F: 0.2549						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0000	0	0	3987	290	0	0	0	0
2	0.0433	146	25	3608	499	0	0	0	0
3	0.2008	542	125	3126	625	3126	625	3126	625
4	0.3057	695	200	2766	716	2766	716	2766	716
5	0.2979	256	87	1043	328	1043	328	1043	328
6	0.2421	132	51	643	235	643	235	643	235
7	0.2281	133	58	685	283	685	283	685	283
8	0.1861	91	44	561	257	561	257	561	257
9	0.2147	89	46	482	241	482	241	482	241
10+	0.2147	166	103	899	546	899	546	899	546
Total		2249	738	17801	4020	10206	3231	10206	3231
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SPRCDD01
Date and time : 07SEP96:14:40
Computation of ref. F: Simple mean, age 3 - 7
Prediction basis : F factors

Table 3.3.15 Western Channel Sole. Stock numbers of recruits and their source for recent year classes used in predictions, and the relative (%) contributions to landings and SSB (by weight) of these year classes

Year-class	1992	1993	1994	1995	1996
Stock No. (thousands) of one-year-olds	2354	2660	4764	3987	3987
Source	VPA	VPA	VPA	GM	GM
Status Quo F:					
% in 1996 catch	15.8	12.7	4.4	0.0	-
% in 1997 catch	11.7	16.5	21.8	3.7	0.0
% in 1996 SSB	12.7	14.4	0.0	0.0	-
% in 1997 SSB	9.6	12.9	23.8	0.0	0.0
% in 1998 SSB	7.3	10.2	22.2	19.3	0.0

GM = geometric mean recruitment

VIIe sole : Year-class % contribution to a) 1997 landings and b) 1998 SSB

a b

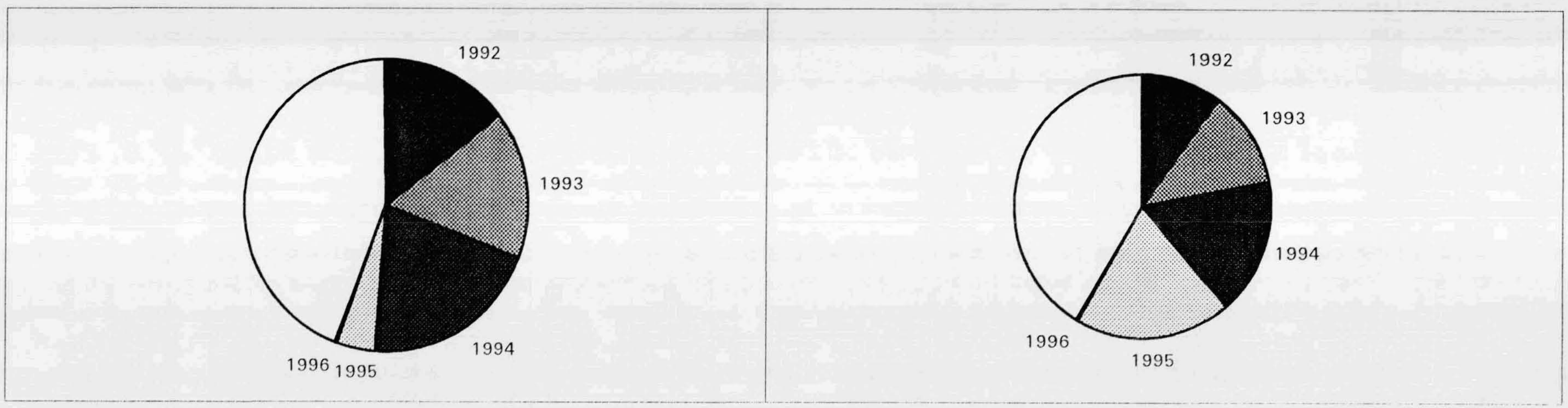

Table 3.3.16 The input parameters for the Sole in the Western Channel sensitivity analysis and medium term predictions

Input to sensitivity analysis			SOL	7E
1	10	1996	3	
1	0	0		

N1	3987	0.43	Population numbers
N2	4313	0.28	
N3	2115	0.12	
N4	1436	0.06	
N5	1435	0.05	
N6	1097	0.04	
N7	891	0.04	
N8	434	0.04	
N9	346	0.04	
N10	895	0.04	
sH1	0	1.84	Fishing mortality in the final year
sH2	0.043	0.48	
sH3	0.201	0.29	
sH4	0.306	0.05	
sH5	0.298	0.12	
sH6	0.242	0.29	
sH7	0.228	0.11	
sH8	0.186	0.17	
sH9	0.215	0.13	
sH10	0.215	0.13	
WH1	0.106	0.27	Weight at age in the catch
WH2	0.169	0.15	
WH3	0.23	0.09	
WH4	0.287	0.06	
WH5	0.34	0.04	
WH6	0.39	0.03	
WH7	0.436	0.02	
WH8	0.479	0.01	
WH9	0.519	0	
WH10	0.621	0.01	
WS1	0.073	0.41	Weight at age in the stock
WS2	0.138	0.19	
WS3	0.2	0.11	
WS4	0.259	0.07	
WS5	0.314	0.05	
WS6	0.365	0.03	
WS7	0.413	0.02	
WS8	0.458	0.01	
WS9	0.5	0.01	
WS10	0.602	0	

M1	0.1	0.1	Natural mortality
M2	0.1	0.1	
M3	0.1	0.1	
M4	0.1	0.1	
M5	0.1	0.1	
M6	0.1	0.1	
M7	0.1	0.1	
M8	0.1	0.1	
M9	0.1	0.1	
M10	0.1	0.1	
MT1	0	0	Maturity
MT2	0	0.1	
MT3	1	0.1	
MT4	1	0	
MT5	1	0	
MT6	1	0	
MT7	1	0	
MT8	1	0	
MT9	1	0	
MT10	1	0	
R97	3987	0.43	GM recruitment
R98	3987	0.43	
HF96	1	0.12	Fishing mortality multiplier
HF97	1	0.12	
HF98	1	0.12	
K96	1	0.1	
K97	1	0.1	
K98	1	0.1	

Sole
Western Channel
1
1 10 1
1
H.cons.
3 7
1969 1995
Stock numbers in 1996 are VPA survivors.
-1

Table 3.3.17

The SAS System 13:56 Saturday, September 7, 1996

Sole in the Western English Channel (Fishing Area VIIe)

Yield per recruit: Summary table

						1 January		Spawning time	
F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
0.0000	0.0000	0.000	0.000	10.508	4258.638	8.603	4060.802	8.603	4060.802
0.1000	0.0255	0.157	71.005	8.942	3364.446	7.037	3166.610	7.037	3166.610
0.2000	0.0510	0.266	115.141	7.854	2756.266	5.950	2558.430	5.950	2558.430
0.3000	0.0765	0.346	143.737	7.058	2320.283	5.153	2122.447	5.153	2122.447
0.4000	0.1020	0.406	162.765	6.451	1995.457	4.546	1797.621	4.546	1797.621
0.5000	0.1275	0.454	175.634	5.974	1746.180	4.069	1548.344	4.069	1548.344
0.6000	0.1530	0.493	184.408	5.591	1550.326	3.686	1352.490	3.686	1352.490
0.7000	0.1784	0.524	190.389	5.276	1393.455	3.371	1195.619	3.371	1195.619
0.8000	0.2039	0.551	194.432	5.014	1265.768	3.109	1067.932	3.109	1067.932
0.9000	0.2294	0.573	197.108	4.793	1160.396	2.888	962.560	2.888	962.560
1.0000	0.2549	0.592	198.812	4.603	1072.395	2.698	874.559	2.698	874.559
1.1000	0.2804	0.609	199.818	4.440	998.127	2.535	800.291	2.535	800.291
1.2000	0.3059	0.623	200.322	4.297	934.859	2.392	737.023	2.392	737.023
1.3000	0.3314	0.636	200.464	4.172	880.508	2.267	682.672	2.267	682.672
1.4000	0.3569	0.647	200.346	4.061	833.460	2.156	635.624	2.156	635.624
1.5000	0.3824	0.657	200.040	3.962	792.448	2.057	594.612	2.057	594.612
1.6000	0.4079	0.666	199.602	3.874	756.468	1.969	558.632	1.969	558.632
1.7000	0.4334	0.674	199.072	3.794	724.714	1.889	526.878	1.889	526.878
1.8000	0.4589	0.682	198.478	3.722	696.536	1.817	498.700	1.817	498.700
1.9000	0.4843	0.688	197.844	3.656	671.401	1.752	473.566	1.752	473.566
2.0000	0.5098	0.694	197.186	3.596	648.873	1.692	451.037	1.692	451.037
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

Notes: Run name : YLDCDD01
Date and time : 07SEP96:14:06
Computation of ref. F: Simple mean, age 3 - 7
F-0.1 factor : 0.5397
F-max factor : 1.2990
F-0.1 reference F : 0.1376
F-max reference F : 0.3311
Recruitment : Single recruit

Table 3.3.18 The parameter estimates and stadard errors for the Beverton Holt stock and recruitment curve fitted in the medium term projections

Western Channel Sole

Beverton-Holt curve Moving average term NOT fitted

IFAIL on exit from E04FDF =	0	
Residual sum of squares=	2.1943	
Number of observations=	26	
Number of parameters =	2	
Residual mean square =	0.0914	
Coefficient of determination =	0.2768	
Adj. coeff. of determination =	0.2466	
IFAIL from E04YCF=	0	
Parameter Correlation matrix	1	
	-0.9848	1

Parameter	s.d.
1.8614	0.6348
6.5138	6.2999

Table 3.4.1 English Channel PLAICE. Nominal landings (tonnes) in Division VIIe, as used by the Working Group.

Year	Belgium	Denmark	France	UK (Engl. & Wales)	Others	Total reported	Unallocated[2]	Total as used by WG
1976	5	-[1]	323	312	-	640	-	640
1977	3	-[1]	336	363	-	702	-	702
1978	3	-[1]	314	467	-	78	-	784
1979	2	-[1]	458	515	-	975	2	977
1980	23	-[1]	325	609	9	966	113	1,079
1981	27	-	537	953	-	1,517	-16	1,501
1982	81	-	363	1,109	-	1,553	135	1,688
1983	20	-	371	1,195	-	1,586	-91	1,495
1984	24	-	278	1,144	-	1,446	101	1,547
1985	39	-	197	1,122	-	1,358	83	1,441
1986	26	-	276	1,389	-[1]	1,691	119	1,810
1987	68	-	435	1,419	-	1,922	36	1,958
1988	90	-	584	1,654	-	2,328	130	2,458
1989	89	-	448[2]	1,708	2	2,247	111	2,358
1990	82	2	N/A[3]	1,873	18	1,975	618	2,593
1991	57	-	251[2]	1,314	16	1,638	210	1,848
1992	25	-	277[2]	1,110	19	1,431	193	1,624
1993	56	-	279[2]	1,079	4	1,417	-	1,417
1994	10	-	148[2]	996	3	1,156	-	1,156
1995	13	-	145[2]	859	-	1,017	-	1,017

[1]Included in Division VIId.
[2]Estimated by the Working Group.
[3]Divisions VIId,e = 14,739 t.

Table 3.4.2 Division VIIe PLAICE CPUE and effort data. UK (E+W) >40' vessels, corrected for fishing power. Also autumn beam trawl survey CPUE,

Year	(CPUE kg/hr). West Sector Otter	Beam	North Sector Otter	Beam	South Sector Beam	(CPUE kg/10 km) Survey
1972	2.31	-	4.50	-	-	-
1973	2.25	-	3.85	-	-	-
1974	1.65	-	3.47	-	-	-
1975	1.78	-	3.53	-	-	-
1976	1.89	-	3.62	-	-	-
1977	1.37	-	3.10	-	-	-
1978	1.61	5.41	3.63	10.35	11.84	-
1979	1.84	4.16	4.58	7.37	6.58	-
1980	2.02	3.15	5.82	6.06	6.45	-
1981	2.61	4.44	10.98	8.35	8.33	-
1982	3.28	4.43	10.77	9.23	7.69	-
1983	2.57	2.76	11.03	9.64	5.71	-
1984	2.95	4.08	10.92	10.38	7.80	-
1985	2.60	3.79	8.81	9.00	6.38	15.21
1986	3.25	.30	10.94	12.21	6.85	16.46
1987	3.56	5.37	11.02	9.69	7.45	20.59
1988	3.90	3.50	15.38	6.51	4.85	25.34
1989	2.69	6.50	10.87	14.25	6.88	14.80
1990	2.95	6.52	7.77	15.64	10.17	11.60
1991	2.80	6.16	5.08	13.24	7.47	8.73
1992	1.92	6.30	3.51	10.61	9.69	7.45
1993	1.39	6.14	3.03	11.04	7.17	6.20
1994	1.46	4.62	2.48	9.17	6.47	5.70
1995	1.61	4.60	2.01	6.29	5.36	5.14

Effort (Effective hours fishing)

Year	West Sector Otter	Beam	North Sector Otter	Beam	South Sector Beam
1972	40,290	-	24,312	-	-
1973	43,764	-	25,779	-	-
1974	30,560	-	17,967	-	-
1975	31,895	-	16,051	-	-
1976	32,936	-	22,771	-	-
1977	33,219	-	21,194	-	-
1978	31,741	3,996	16,823	10,353	7,739
1979	32,591	7,766	16,981	22,091	9,523
1980	36,033	11,792	13,647	38,212	12,154
1981	31,638	12,832	15,172	37,830	14,627
1982	24,090	22,548	14,422	42,281	14,765
1983	33,410	40,959	19,117	36,935	16,765
1984	36,869	36,892	15,800	27,046	25,171
1985	40,068	42,082	17,545	30,739	19,367
1986	28,757	34,143	20,758	25,373	16,815
1987	26,967	41,219	17,995	20,866	24,964
1988	35,589	44,972	17,366	28,166	30,222
1989	33,522	46,523	21,113	29,769	33,655
1990	32,220	41,495	20,605	34,635	24,817
1991	24,519	40,398	16,005	25,055	18,121
1992	22,760	29,114	16,840	35,190	16,561
1993	22,793	32,453	15,298	31,353	20,112
1994	22,824	37,812	14,878	32,626	29,977
1995	20,028	45,445	15,015	32,419	24,035

Table 3.4.3

WESTERN CHANNEL PLAICE.

Annual length distributions by fleet 1995. * Lower limit for UK

Length* (cm)	UK (England & Wales) Beam trawl	All gears bar beam & dredge
22		
23	18	
24	70	900
25	3161	10105
26	9588	13707
27	17660	24844
28	31428	39213
29	44620	44204
30	65553	58441
31	80855	55142
32	106699	67742
33	112309	53957
34	106107	54833
35	92459	34935
36	78521	25760
37	67754	25142
38	55524	19946
39	39300	17816
40	31590	9602
41	26559	8407
42	19810	7686
43	17317	3308
44	16650	4393
45	13374	4043
46	11706	1638
47	13646	2247
48	11292	1493
49	10281	2769
50	10509	855
51	8484	529
52	6726	1331
53	5322	533
54	3428	564
55	2290	400
56	1686	389
57	929	0
58	862	197
59	1079	196
60	69	292
61	86	102
62	302	0
63	65	0
64	464	0
65	31	56
66	36	
TOTAL	1126219	597717

Table 3.4.4

Run title : Plaice in VIIe (run: XSASF101/X01)

At 4-Sep-96 20:16:59

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	25,	6,	46,	20,	19,	41,	72,	3,	77,	3,
2,	106,	621,	242,	519,	743,	657,	273,	708,	920,	573,
3,	620,	304,	914,	697,	712,	1854,	1710,	698,	1419,	1228,
4,	156,	266,	103,	543,	205,	381,	1131,	1184,	455,	971,
5,	110,	84,	136,	70,	188,	95,	198,	514,	372,	122,
6,	58,	50,	49,	75,	56,	89,	71,	84,	150,	201,
7,	59,	31,	29,	35,	59,	16,	74,	33,	71,	127,
8,	37,	46,	26,	23,	19,	43,	11,	38,	20,	19,
9,	14,	15,	21,	14,	13,	14,	26,	2,	30,	4,
+gp,	79,	59,	66,	82,	130,	80,	115,	92,	43,	48,
TOTALNUM,	1264,	1482,	1632,	2078,	2144,	3270,	3681,	3356,	3557,	3296,
TONSLAND,	640,	702,	784,	977,	1079,	1501,	1688,	1495,	1547,	1441,
SOPCOF %,	100,	100,	100,	100,	100,	100,	100,	100,	100,	100,

Table 1 Catch numbers at age Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	10,	74,	12,	10,	57,	41,	90,	36,	84,	6,
2,	894,	1029,	1797,	254,	320,	533,	674,	639,	311,	300,
3,	2104,	1846,	4033,	2520,	2875,	1020,	1159,	1256,	1283,	630,
4,	642,	1103,	731,	2186,	2233,	1547,	609,	540,	605,	719,
5,	364,	550,	369,	617,	917,	766,	553,	220,	184,	188,
6,	67,	195,	108,	223,	202,	381,	361,	231,	74,	99,
7,	106,	50,	76,	95,	113,	80,	201,	189,	91,	32,
8,	61,	37,	28,	80,	60,	34,	53,	143,	57,	61,
9,	27,	36,	16,	25,	42,	24,	23,	31,	63,	58,
+gp,	59,	46,	40,	86,	55,	42,	41,	74,	41,	68,
TOTALNUM,	4334,	4966,	7210,	6096,	6874,	4468,	3764,	3359,	2793,	2161,
TONSLAND,	1810,	1958,	2458,	2358,	2593,	1848,	1624,	1417,	1156,	1017,
SOPCOF %,	100,	100,	100,	100,	100,	100,	100,	100,	100,	100,

Table 3.4.5

Run title : Plaice in VIIe (run: XSASF101/X01)

At 4-Sep-96 20:16:59

Table 2 Catch weights at age (kg)

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.1860,	.1990,	.1980,	.1950,	.2480,	.1540,	.1980,	.1150,	.1520,	.1070,
2,	.2850,	.3050,	.3020,	.2990,	.3370,	.2870,	.2910,	.2410,	.2670,	.2340,
3,	.3830,	.4090,	.4060,	.4010,	.4270,	.4170,	.3840,	.3600,	.3840,	.3580,
4,	.4790,	.5120,	.5080,	.5020,	.5180,	.5430,	.4770,	.4710,	.5000,	.4770,
5,	.5750,	.6150,	.6100,	.6030,	.6110,	.6660,	.5680,	.5760,	.6160,	.5930,
6,	.6690,	.7160,	.7100,	.7020,	.7050,	.7850,	.6600,	.6720,	.7320,	.7040,
7,	.7630,	.8160,	.8090,	.8000,	.8000,	.9000,	.7490,	.7620,	.8480,	.8120,
8,	.8550,	.9150,	.9080,	.8970,	.8970,	1.0130,	.8390,	.8450,	.9640,	.9140,
9,	.9470,	1.0140,	1.0050,	.9940,	.9950,	1.1210,	.9270,	.9200,	1.0800,	1.0140,
+gp,	1.2840,	1.3680,	1.4030,	1.3200,	1.4030,	1.4850,	1.2980,	1.1190,	1.5560,	1.3690,
SOPCOFAC,	.9993,	1.0001,	.9998,	1.0002,	.9998,	1.0004,	1.0005,	1.0004,	.9997,	.9998,

Table 2 Catch weights at age (kg)

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.1810,	.2570,	.1430,	.1680,	.2480,	.2060,	.2500,	.2140,	.2180,	.2260,
2,	.2710,	.2940,	.2290,	.2340,	.2800,	.2610,	.2910,	.2710,	.2800,	.2980,
3,	.3650,	.3440,	.3230,	.3080,	.3230,	.3260,	.3460,	.3350,	.3490,	.3740,
4,	.4620,	.4110,	.4260,	.3880,	.3770,	.4010,	.4140,	.4080,	.4230,	.4540,
5,	.5630,	.4900,	.5380,	.4750,	.4420,	.4850,	.4970,	.4880,	.5030,	.5370,
6,	.6670,	.5840,	.6600,	.5700,	.5180,	.5800,	.5930,	.5760,	.5880,	.6240,
7,	.7750,	.6930,	.7900,	.6710,	.6060,	.6840,	.7030,	.6720,	.6800,	.7140,
8,	.8870,	.8160,	.9290,	.7800,	.7040,	.7980,	.8260,	.7750,	.7770,	.8080,
9,	1.0030,	.9530,	1.0770,	.8960,	.8140,	.9210,	.9640,	.8870,	.8800,	.9060,
+gp,	1.5070,	1.4170,	1.4490,	1.2110,	1.1320,	1.2990,	1.3610,	1.2110,	1.2100,	1.1190,
SOPCOFAC,	.9997,	1.0002,	.9999,	.9999,	1.0006,	.9981,	1.0002,	.9998,	.9997,	1.0007,

Table 3.4.6

Run title : Plaice in VIIe (run: XSASF101/X01)

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Table 3 Stock weights at age (kg)

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.1090,	.1160,	.1150,	.1140,	.1140,	.1260,	.1080,	.1160,	.1110,	.1120,
2,	.2150,	.2300,	.2280,	.2260,	.2270,	.2500,	.2140,	.2280,	.2220,	.2220,
3,	.3200,	.3420,	.3390,	.3350,	.3380,	.3730,	.3180,	.3350,	.3340,	.3310,
4,	.4220,	.4520,	.4480,	.4430,	.4470,	.4920,	.4190,	.4360,	.4460,	.4380,
5,	.5240,	.5600,	.5560,	.5490,	.5540,	.6090,	.5170,	.5320,	.5600,	.5430,
6,	.6220,	.6660,	.6600,	.6530,	.6600,	.7250,	.6150,	.6230,	.6730,	.6470,
7,	.7190,	.7700,	.7630,	.7550,	.7640,	.8380,	.7100,	.7100,	.7880,	.7490,
8,	.8140,	.8720,	.8640,	.8540,	.8670,	.9490,	.8020,	.7910,	.9030,	.8490,
9,	.9080,	.9720,	.9630,	.9530,	.9670,	1.0570,	.8930,	.8670,	1.0180,	.9480,
+gp,	1.2410,	1.3220,	1.3550,	1.2750,	1.3510,	1.4350,	1.2550,	1.0940,	1.4980,	1.3290,

Table 3 Stock weights at age (kg)

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,
AGE										
1,	.0960,	.0680,	.1030,	.1380,	.2360,	.1820,	.2350,	.1880,	.1880,	.1920,
2,	.1950,	.1450,	.1840,	.2000,	.2620,	.2320,	.2690,	.2410,	.2480,	.2620,
3,	.2970,	.2320,	.2750,	.2700,	.3000,	.2920,	.3170,	.3020,	.3140,	.3360,
4,	.4010,	.3260,	.3730,	.3470,	.3490,	.3620,	.3780,	.3710,	.3850,	.4130,
5,	.5070,	.4290,	.4810,	.4310,	.4080,	.4420,	.4540,	.4470,	.4620,	.4950,
6,	.6150,	.5390,	.5980,	.5220,	.4790,	.5310,	.5430,	.5310,	.5450,	.5800,
7,	.7270,	.6590,	.7230,	.6200,	.5610,	.6310,	.6460,	.6230,	.6330,	.6680,
8,	.8400,	.7880,	.8580,	.7250,	.6540,	.7400,	.7630,	.7230,	.7280,	.7600,
9,	.9550,	.9240,	1.0020,	.8370,	.7580,	.8580,	.8930,	.8300,	.8280,	.8560,
+gp,	1.4420,	1.3470,	1.3630,	1.1430,	1.0640,	1.2230,	1.2740,	1.1450,	1.1500,	1.0660,

Table 3.4.7

PLE-ECHW: Plaice in the Western English Channel (Fishing Area VIIe)

FLT02: UK(E+W)Otter trawl

Year	Fishing effort	Catch, age 2	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12	Catch, age 13	Catch, age 14
1984	52.886	161	293	97	81	28	12	3	6	1	1	1	0	0
1985	57.685	125	258	194	23	32	15	2	1	2	0	1	0	0
1986	49.521	191	427	130	50	9	15	7	4	1	1	0	1	0
1987	45.112	194	381	223	100	25	6	3	5	3	0	0	0	0
1988	53.402	392	754	117	52	15	10	3	2	3	0	0	0	1
1989	54.707	43	494	360	77	26	7	6	1	4	1	0	0	0
1990	53.050	22	347	266	85	18	11	6	3	2	1	0	0	0
1991	40.789	28	89	135	65	30	6	3	2	1	0	1	0	0
1992	39.909	26	72	46	40	25	13	4	1	1	1	0	0	0
1993	39.174	40	76	33	12	12	10	8	2	1	1	1	0	0
1994	38.768	23	86	37	10	3	4	2	3	0	0	0	0	0
1995	35.264	28	48	49	11	6	1	3	2	1	0	0	0	0

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PLE-ECHW: Plaice in the Western English Channel (Fishing Area VIIe)

FLT03: UK(E+W)Beam trawl

Year	Fishing effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12	Catch, age 13	Catch, age 14
1984	87.631	511	149	130	58	25	8	10	2	3	1	2	2
1985	92.188	461	360	45	65	46	7	2	5	1	2	2	1
1986	76.331	656	228	117	24	39	20	11	3	5	1	3	3
1987	87.049	493	305	176	82	22	20	15	10	4	3	1	1
1988	103.360	825	197	118	34	26	10	6	9	1	1	1	2
1989	109.947	923	785	210	97	49	35	7	16	10	3	1	2
1990	100.947	1054	827	327	77	54	23	13	12	7	3	1	1
1991	83.574	366	641	356	160	36	11	8	4	2	4	1	1
1992	80.865	466	308	294	172	89	26	10	5	5	2	1	0
1993	83.918	544	248	103	115	90	67	14	12	7	6	1	2
1994	100.415	659	313	104	43	53	35	38	10	4	4	4	1
1995	101.899	289	347	103	52	19	35	34	24	8	3	4	3

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PLE-ECHW: Plaice in the Western English Channel (Fishing Area VIIe)

FLT01: VIIE B/Trawl Survey

Year	Fishing effort	Catch, age 1	Catch, age 2	Catch, age 3	Catch, age 4	Catch, age 5
1986	147.68	91	128	249	95	35
1987	134.34	536	148	140	73	37
1988	128.23	139	371	340	97	22
1989	165.66	31	70	281	188	23
1990	176.04	25	38	220	87	75
1991	171.59	22	27	63	79	62
1992	196.60	152	44	72	24	40
1993	188.26	21	70	60	24	13
1994	205.87	34	32	98	30	10
1995	187.50	50	46	45	48	12

Table 3.4.8

Lowestoft VPA Version 3.1

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Extended Survivors Analysis

Plaice in VIIe (run: XSASF101/X01)

CPUE data from file /users/fish/ifad/ifapwork/wgssds/ple_echw/FLEET.X01

Catch data for 20 years. 1976 to 1995. Ages 1 to 10.

Fleet,	First, year,	Last, year,	First, age ,	Last, age	Alpha,	Beta
FLT01: VIIE B/Trawl ,	1986,	1995,	1,	5,	.750,	.800
FLT02: UK(E+W)Otter ,	1986,	1995,	2,	9,	.000,	1.000
FLT03: UK(E+W)Beam t,	1986,	1995,	3,	9,	.000,	1.000

Time series weights :

Tapered time weighting not applied

Catchability analysis :

Catchability dependent on stock size for ages < 4

Regression type = C
Minimum of 5 points used for regression
Survivor estimates shrunk to the population mean for ages < 4

Catchability independent of age for ages >= 7

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 5 years or the 4 oldest ages.

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

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

Prior weighting not applied

Tuning had not converged after 30 iterations

Total absolute residual between iterations
29 and 30 = .00068

Final year F values

Age ,	1,	2,	3,	4,	5,	6,	7,	8,	9
Iteration 29,	.0017,	.1044,	.4950,	.7621,	.7338,	.7593,	.6599,	.6015,	.8720
Iteration 30,	.0017,	.1044,	.4950,	.7621,	.7339,	.7594,	.6600,	.6016,	.8724

Table 3.4.8 (continued)

Log catchability residuals.

Fleet : FLT01: VIIE B/Trawl

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	-.66	.56	.14	.04	-.23	-.38	.55	.00	-.13	.11
2	.30	-.29	.55	-.49	.03	-.25	-.08	.12	.10	.03
3	.39	.11	-.01	-.18	-.11	.01	.03	-.12	-.06	-.06
4	.44	.30	.45	.23	-.43	-.11	-.39	-.35	-.15	.01
5	.19	.53	-.08	-.35	.05	.11	-.03	.07	-.46	-.01
6	No data for this fleet at this age									
7	No data for this fleet at this age									
8	No data for this fleet at this age									
9	No data for this fleet at this age									

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

Age	4	5
Mean Log q	-7.9553	-8.0228
S.E(Log q)	.3380	.2743

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
1	.58	1.751	9.08	.69	10	.40	-9.46
2	.67	1.774	8.92	.78	10	.32	-9.15
3	.72	2.862	8.07	.93	10	.17	-7.99

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
4	.88	.678	7.91	.79	10	.31	-7.96
5	.90	.757	7.90	.87	10	.25	-8.02

Table 3.4.8 (continued)

Fleet : FLT02: UK(E+W)Otter

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	No data for this fleet at this age									
2	.57	-.09	.45	-.81	-.30	-.03	-.14	.04	.24	.07
3	.33	.38	-.04	-.17	-.17	.05	-.09	-.09	-.19	-.02
4	.09	.66	-.24	.16	.03	-.01	-.04	-.32	-.18	-.15
5	.02	.89	.03	.25	-.27	-.06	-.11	-.17	-.44	-.12
6	.01	.33	-.15	.31	-.07	-.10	.03	-.24	-.36	.24
7	.82	.38	-.07	-.27	.43	-.16	-.19	.02	-.53	-.44
8	.09	.06	.15	.00	.29	.16	.04	.01	-.89	-.08
9	.22	.40	.09	-.04	.18	.17	-.23	.00	-.23	-.06

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

Age	4	5	6	7	8	9
Mean Log q	-6.3751	-6.5948	-6.8846	-7.0131	-7.0131	-7.0131
S.E(Log q)	.2773	.3632	.2330	.4237	.3239	.2066

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
2	.69	1.292	8.23	.68	10	.41	-8.12
3	.72	2.276	6.99	.89	10	.21	-6.50

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
4	.82	1.367	6.59	.88	10	.22	-6.38
5	.88	.677	6.62	.79	10	.33	-6.59
6	.96	.346	6.85	.89	10	.23	-6.88
7	1.00	-.002	7.01	.64	10	.45	-7.01
8	1.31	-.934	7.68	.53	10	.43	-7.03
9	.95	.285	6.84	.83	10	.20	-6.96

Table 3.4.8 (continued)

Fleet : FLT03: UK(E+W)Beam t

Age	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	No data for this fleet at this age									
2	No data for this fleet at this age									
3	.42	-.36	-.48	-.27	.51	-.22	.37	.58	.33	-.88
4	-.33	-.24	-.94	-.32	-.04	.28	.60	.37	.44	.18
5	-.34	.02	-.59	-.21	-.34	.15	.40	.45	.17	.28
6	-.36	-.05	-.91	.01	-.18	-.05	.34	.34	.44	.42
7	.25	-.06	-.87	-.12	.29	-.17	-.06	.37	.01	.36
8	-.38	.21	-.39	-.02	-.10	-.35	.11	.28	-.07	.23
9	-.29	-.25	-.57	.11	-.09	-.25	.28	.10	.27	.62

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

Age	4	5	6	7	8	9
Mean Log q	-5.8162	-5.8228	-5.9694	-5.9232	-5.9232	-5.9232
S.E(Log q)	.4656	.3517	.4203	.3665	.2634	.3490

Regression statistics :

Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
3	1.98	-3.178	3.93	.57	10	.53	-6.07

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
4	1.74	-1.669	4.51	.39	10	.74	-5.82
5	1.38	-1.549	5.45	.67	10	.45	-5.82
6	1.08	-.296	5.96	.65	10	.48	-5.97
7	1.18	-.681	6.01	.65	10	.45	-5.92
8	.79	1.404	5.76	.85	10	.19	-5.97
9	.82	.768	5.64	.70	10	.29	-5.93

Table 3.4.8 (continued)

Terminal year survivor and F summaries :

Age 1 Catchability dependent on age and year class strength

Year class = 1994

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	3791.,	.424,	.000,	.00,	1,	.642,	.001
FLT02: UK(E+W)Otter ,	1.,	.000,	.000,	.00,	0,	.000,	.000
FLT03: UK(E+W)Beam t,	1.,	.000,	.000,	.00,	0,	.000,	.000
P shrinkage mean ,	3974.,	.61,,,,				.307,	.001
F shrinkage mean ,	322.,	1.50,,,,				.051,	.017

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
3388.,	.34,	.40,	3,	1.164,	.002

Age 2 Catchability dependent on age and year class strength

Year class = 1993

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	2488.,	.267,	.074,	.28,	2,	.623,	.108
FLT02: UK(E+W)Otter ,	2747.,	.437,	.000,	.00,	1,	.234,	.098
FLT03: UK(E+W)Beam t,	1.,	.000,	.000,	.00,	0,	.000,	.000
P shrinkage mean ,	2942.,	.64,,,,				.121,	.092
F shrinkage mean ,	1473.,	1.50,,,,				.022,	.175

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
2568.,	.21,	.06,	5,	.280,	.104

Age 3 Catchability dependent on age and year class strength

Year class = 1992

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	928.,	.203,	.049,	.24,	3,	.509,	.494
FLT02: UK(E+W)Otter ,	974.,	.249,	.116,	.46,	2,	.352,	.476
FLT03: UK(E+W)Beam t,	384.,	.683,	.000,	.00,	1,	.049,	.934
P shrinkage mean ,	1411.,	.71,,,,				.074,	.351
F shrinkage mean ,	620.,	1.50,,,,				.017,	.671

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
926.,	.15,	.09,	8,	.624,	.495

Table 3.4.8 (continued)

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

Year class = 1991

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	638.,	.184,	.105,	.57,	4,	.436,	.723
FLT02: UK(E+W)Otter ,	515.,	.201,	.048,	.24,	3,	.417,	.839
FLT03: UK(E+W)Beam t,	744.,	.382,	.067,	.18,	2,	.127,	.647
F shrinkage mean ,	516.,	1.50,,,,				.020,	.838

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
593.,	.13,	.06,	10,	.478,	.762

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

Year class = 1990

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	152.,	.195,	.043,	.22,	5,	.428,	.771
FLT02: UK(E+W)Otter ,	143.,	.213,	.019,	.09,	4,	.329,	.807
FLT03: UK(E+W)Beam t,	227.,	.296,	.063,	.21,	3,	.222,	.577
F shrinkage mean ,	183.,	1.50,,,,				.021,	.677

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
163.,	.13,	.06,	13,	.427,	.734

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

Year class = 1989

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	58.,	.189,	.080,	.42,	5,	.254,	.960
FLT02: UK(E+W)Otter ,	82.,	.194,	.146,	.75,	5,	.469,	.760
FLT03: UK(E+W)Beam t,	113.,	.262,	.066,	.25,	4,	.254,	.602
F shrinkage mean ,	114.,	1.50,,,,				.023,	.596

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
82.,	.13,	.09,	15,	.694,	.759

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

Year class = 1988

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	32.,	.187,	.084,	.45,	5,	.140,	.670
FLT02: UK(E+W)Otter ,	23.,	.208,	.062,	.30,	6,	.455,	.831
FLT03: UK(E+W)Beam t,	47.,	.253,	.044,	.17,	5,	.376,	.491
F shrinkage mean ,	40.,	1.50,,,,				.028,	.563

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
32.,	.14,	.09,	17,	.610,	.660

Table 3.4.8 (continued)

Age 8 Catchability constant w.r.t. time and age (fixed at the value for age) 7

Year class = 1987

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	63.,	.183,	.072,	.40,	5,	.085,	.645
FLT02: UK(E+W)Otter ,	57.,	.191,	.074,	.39,	7,	.442,	.696
FLT03: UK(E+W)Beam t,	85.,	.203,	.053,	.26,	6,	.453,	.514
F shrinkage mean ,	81.,	1.50,,,,				.020,	.539

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
70.,	.13,	.06,	19,	.447,	.602

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 7

Year class = 1986

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N, ,	Scaled, Weights,	Estimated F
FLT01: VIIE B/Trawl ,	40.,	.185,	.141,	.76,	5,	.045,	.861
FLT02: UK(E+W)Otter ,	30.,	.180,	.142,	.79,	8,	.501,	1.032
FLT03: UK(E+W)Beam t,	52.,	.192,	.127,	.66,	7,	.430,	.719
F shrinkage mean ,	55.,	1.50,,,,				.024,	.692

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N, ,	Var, Ratio,	F
39.,	.13,	.10,	21,	.755,	.872

Table 3.4.9

Run title : Plaice in VIIe (run: XSASF101/X01)

At 4-Sep-96 20:16:59

Terminal Fs derived using XSA (With F shrinkage)

Table 8 Fishing mortality (F) at age

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	.0071,	.0032,	.0156,	.0030,	.0032,	.0167,	.0131,	.0006,	.0121,	.0005,
2,	.1359,	.2213,	.1568,	.2233,	.1360,	.1317,	.1356,	.1575,	.2278,	.1075,
3,	.5404,	.6363,	.5296,	.8017,	.4893,	.5275,	.5327,	.5422,	.4871,	.4861,
4,	.4135,	.4256,	.4152,	.6305,	.5237,	.4793,	.6497,	.7969,	.7529,	.6619,
5,	.4820,	.3724,	.3651,	.5015,	.4200,	.4456,	.4469,	.6327,	.5651,	.4149,
6,	.3814,	.3818,	.3521,	.3202,	.8852,	.3265,	.6408,	.3140,	.3431,	.6214,
7,	.3620,	.3283,	.3625,	.4154,	.4075,	.6136,	.4495,	.6361,	.4332,	.4956,
8,	.5370,	.4836,	.4579,	.4954,	.3786,	.5334,	1.0688,	.3983,	.9353,	.1786,
9,	.4424,	.3930,	.3858,	.4348,	.5252,	.4819,	.6549,	.4975,	.5719,	.4293,
+gp,	.4424,	.3930,	.3858,	.4348,	.5252,	.4819,	.6549,	.4975,	.5719,	.4293,
FBAR 3- 7,	.4359,	.4289,	.4049,	.5338,	.5451,	.4785,	.5439,	.5844,	.5163,	.5360,

Table 8 Fishing mortality (F) at age

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	FBAR 93-95
AGE											
1,	.0008,	.0066,	.0015,	.0032,	.0162,	.0107,	.0208,	.0149,	.0243,	.0017,	.0136,
2,	.1760,	.0957,	.2014,	.0366,	.1214,	.1893,	.2226,	.1841,	.1578,	.1044,	.1488,
3,	.6345,	.5942,	.5868,	.4351,	.6453,	.6232,	.7152,	.7420,	.6120,	.4950,	.6163,
4,	.4604,	.7417,	.4500,	.6690,	.7866,	.7985,	.8727,	.7958,	.9099,	.7621,	.8226,
5,	.5053,	.8320,	.5357,	.7784,	.5986,	.6209,	.6785,	.8383,	.6297,	.7339,	.7339,
6,	.3833,	.5061,	.3388,	.6595,	.5707,	.4844,	.6112,	.6112,	.6886,	.7594,	.6864,
7,	.7180,	.4993,	.3418,	.5107,	.7625,	.4210,	.4631,	.6880,	.4688,	.6600,	.6056,
8,	.4268,	.5334,	.5257,	.6609,	.6437,	.4910,	.4959,	.6395,	.4103,	.6016,	.5505,
9,	.3760,	.4373,	.4210,	1.1915,	.8083,	.5233,	.6606,	.5506,	.5885,	.8724,	.6705,
+gp,	.3760,	.4373,	.4210,	1.1915,	.8083,	.5233,	.6606,	.5506,	.5885,	.8724,	
FBAR 3- 7,	.5403,	.6347,	.4506,	.6105,	.6727,	.5896,	.6682,	.7351,	.6618,	.6821,	

Table 3.4.10

Run title : Plaice in VIIe (run: XSASF101/X01)

At 4-Sep-96 20:16:59

Terminal Fs derived using XSA (With F shrinkage)

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,
AGE										
1,	3771,	2002,	3154,	7016,	6396,	2622,	5892,	5410,	6813,	6635,
2,	886,	3321,	1770,	2754,	6204,	5655,	2287,	5158,	4796,	5970,
3,	1577,	686,	2361,	1342,	1954,	4802,	4396,	1771,	3908,	3387,
4,	489,	815,	322,	1233,	534,	1062,	2513,	2289,	913,	2130,
5,	305,	287,	472,	188,	582,	281,	583,	1164,	915,	381,
6,	194,	167,	175,	291,	101,	339,	159,	331,	548,	461,
7,	206,	118,	101,	109,	187,	37,	217,	74,	214,	345,
8,	95,	127,	75,	63,	64,	110,	18,	123,	35,	123,
9,	42,	49,	70,	42,	34,	39,	57,	5,	73,	12,
+gp,	233,	192,	218,	246,	336,	221,	252,	248,	104,	145,
TOTAL,	7798,	7764,	8718,	13284,	16391,	15168,	16376,	16573,	18320,	19591,

Table 10 Stock number at age (start of year) Numbers*10**-3

YEAR,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	GMST 76-93	AMST 76-93
AGE													
1,	13507,	11872,	8478,	3363,	3761,	4087,	4644,	2589,	3713,	3826,	0,	4969,	5667,
2,	5882,	11970,	10460,	7508,	2973,	3282,	3586,	4034,	2262,	3214,	3388,	4149,	4916,
3,	4756,	4375,	9648,	7585,	6420,	2335,	2409,	2546,	2976,	1713,	2568,	3030,	3681,
4,	1847,	2236,	2142,	4759,	4354,	2987,	1111,	1045,	1075,	1432,	926,	1432,	1821,
5,	974,	1034,	945,	1211,	2162,	1758,	1192,	412,	418,	384,	593,	665,	825,
6,	223,	521,	399,	490,	493,	1054,	838,	536,	158,	198,	163,	342,	407,
7,	220,	135,	279,	252,	225,	247,	576,	403,	258,	70,	82,	184,	219,
8,	186,	95,	73,	176,	134,	93,	144,	321,	180,	143,	32,	96,	114,
9,	91,	108,	49,	38,	80,	63,	51,	78,	150,	106,	70,	46,	55,
+gp,	199,	137,	123,	130,	104,	109,	89,	184,	97,	123,	85,		
TOTAL,	27887,	32484,	32596,	25512,	20707,	16015,	14640,	12149,	11289,	11209,	7907,		

Table 3.4.11

Run title : Plaice in VIIe (run: XSASF101/X01)

At 4-Sep-96 20:16:59

Table 16 Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS, Age 1	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 7,
1976,	3771,	2146,	1328,	640,	.4820,	.4359,
1977,	2002,	2374,	1367,	702,	.5134,	.4289,
1978,	3154,	2594,	1506,	784,	.5206,	.4049,
1979,	7016,	3201,	1639,	977,	.5962,	.5338,
1980,	6396,	4111,	1865,	1079,	.5787,	.5451,
1981,	2622,	4969,	2574,	1501,	.5831,	.4785,
1982,	5892,	4513,	2761,	1688,	.6113,	.5439,
1983,	5410,	4646,	2700,	1495,	.5537,	.5844,
1984,	6813,	4846,	2555,	1547,	.6055,	.5163,
1985,	6635,	5196,	2762,	1441,	.5218,	.5360,
1986,	13507,	5919,	2954,	1810,	.6127,	.5403,
1987,	11872,	5460,	2671,	1958,	.7330,	.6347,
1988,	8478,	7424,	3636,	2458,	.6760,	.4506,
1989,	3363,	6907,	4138,	2358,	.5699,	.6105,
1990,	3761,	6616,	4101,	2593,	.6323,	.6727,
1991,	4087,	5017,	3262,	1848,	.5665,	.5896,
1992,	4644,	4877,	2590,	1624,	.6271,	.6682,
1993,	2589,	3844,	2154,	1417,	.6579,	.7351,
1994,	3713,	3418,	1787,	1156,	.6470,	.6618,
1995,	3826,	3426,	1681,	1017,	.6049,	.6821,
Arith. Mean ,	5478,	4575,	2501,	1505,	.5947,	.5627,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 3.4.12

Plaice in the Western English Channel (Fishing Area VIIe)

Prediction with management option table: Input data

Year: 1996								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	4969.000	0.1200	0.0000	0.0000	0.0000	0.189	0.0130	0.219
2	3388.000	0.1200	0.1500	0.0000	0.0000	0.250	0.1460	0.283
3	2568.000	0.1200	0.5300	0.0000	0.0000	0.317	0.6060	0.353
4	926.000	0.1200	0.9600	0.0000	0.0000	0.390	0.8100	0.428
5	593.000	0.1200	1.0000	0.0000	0.0000	0.468	0.7220	0.509
6	163.000	0.1200	1.0000	0.0000	0.0000	0.552	0.6750	0.596
7	82.000	0.1200	1.0000	0.0000	0.0000	0.641	0.5950	0.689
8	32.000	0.1200	1.0000	0.0000	0.0000	0.737	0.5410	0.787
9	70.000	0.1200	1.0000	0.0000	0.0000	0.838	0.6590	0.891
10+	85.000	0.1200	1.0000	0.0000	0.0000	1.120	0.6590	1.180
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1997								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	4969.000	0.1200	0.0000	0.0000	0.0000	0.189	0.0130	0.219
2	.	0.1200	0.1500	0.0000	0.0000	0.250	0.1460	0.283
3	.	0.1200	0.5300	0.0000	0.0000	0.317	0.6060	0.353
4	.	0.1200	0.9600	0.0000	0.0000	0.390	0.8100	0.428
5	.	0.1200	1.0000	0.0000	0.0000	0.468	0.7220	0.509
6	.	0.1200	1.0000	0.0000	0.0000	0.552	0.6750	0.596
7	.	0.1200	1.0000	0.0000	0.0000	0.641	0.5950	0.689
8	.	0.1200	1.0000	0.0000	0.0000	0.737	0.5410	0.787
9	.	0.1200	1.0000	0.0000	0.0000	0.838	0.6590	0.891
10+	.	0.1200	1.0000	0.0000	0.0000	1.120	0.6590	1.180
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1998								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	4969.000	0.1200	0.0000	0.0000	0.0000	0.189	0.0130	0.219
2	.	0.1200	0.1500	0.0000	0.0000	0.250	0.1460	0.283
3	.	0.1200	0.5300	0.0000	0.0000	0.317	0.6060	0.353
4	.	0.1200	0.9600	0.0000	0.0000	0.390	0.8100	0.428
5	.	0.1200	1.0000	0.0000	0.0000	0.468	0.7220	0.509
6	.	0.1200	1.0000	0.0000	0.0000	0.552	0.6750	0.596
7	.	0.1200	1.0000	0.0000	0.0000	0.641	0.5950	0.689
8	.	0.1200	1.0000	0.0000	0.0000	0.737	0.5410	0.787
9	.	0.1200	1.0000	0.0000	0.0000	0.838	0.6590	0.891
10+	.	0.1200	1.0000	0.0000	0.0000	1.120	0.6590	1.180
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : MANSF101
Date and time: 08SEP96:20:12

Table 3.4.13

Plaice in the Western English Channel (Fishing Area VIIe)

Prediction with management option table

Year: 1996					Year: 1997					Year: 1998	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0000	0.6816	3562	1503	1037	0.0000	0.0000	3820	1547	0	5171	2681
.	.	.	.	.	0.1000	0.0682	.	1547	140	5027	2549
.	.	.	.	.	0.2000	0.1363	.	1547	271	4891	2425
.	.	.	.	.	0.3000	0.2045	.	1547	395	4764	2309
.	.	.	.	.	0.4000	0.2726	.	1547	512	4644	2200
.	.	.	.	.	0.5000	0.3408	.	1547	622	4531	2097
.	.	.	.	.	0.6000	0.4090	.	1547	726	4425	2002
.	.	.	.	.	0.7000	0.4771	.	1547	824	4325	1912
.	.	.	.	.	0.8000	0.5453	.	1547	917	4230	1827
.	.	.	.	.	0.9000	0.6134	.	1547	1005	4141	1748
.	.	.	.	.	1.0000	0.6816	.	1547	1087	4057	1673
.	.	.	.	.	1.1000	0.7498	.	1547	1165	3977	1603
.	.	.	.	.	1.2000	0.8179	.	1547	1239	3902	1537
.	.	.	.	.	1.3000	0.8861	.	1547	1309	3831	1476
.	.	.	.	.	1.4000	0.9542	.	1547	1376	3763	1417
.	.	.	.	.	1.5000	1.0224	.	1547	1439	3700	1362
.	.	.	.	.	1.6000	1.0906	.	1547	1499	3639	1311
.	.	.	.	.	1.7000	1.1587	.	1547	1555	3582	1262
.	.	.	.	.	1.8000	1.2269	.	1547	1609	3528	1216
.	.	.	.	.	1.9000	1.2950	.	1547	1660	3476	1173
.	.	.	.	.	2.0000	1.3632	.	1547	1709	3427	1132
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : MANSF101
Date and time : 08SEP96:20:12
Computation of ref. F: Simple mean, age 3 - 7
Basis for 1996 : F factors

Table 3.4.14

The SAS System 20:09 Sunday, September 8, 1996

Plaice in the Western English Channel (Fishing Area VIIe)

Single option prediction: Detailed tables

Year: 1996	F-factor: 1.0000	Reference F: 0.6816				1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0130	60	13	4969	941	0	0	0	0
2	0.1460	434	123	3388	848	508	127	508	127
3	0.6060	1106	390	2568	815	1361	432	1361	432
4	0.8100	488	209	926	361	889	346	889	346
5	0.7220	289	147	593	278	593	278	593	278
6	0.6750	76	45	163	90	163	90	163	90
7	0.5950	35	24	82	53	82	53	82	53
8	0.5410	13	10	32	24	32	24	32	24
9	0.6590	32	29	70	59	70	59	70	59
10+	0.6590	39	46	85	95	85	95	85	95
Total		2573	1037	12876	3562	3783	1503	3783	1503
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1997	F-factor: 1.0000	Reference F: 0.6816				1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0130	60	13	4969	941	0	0	0	0
2	0.1460	558	158	4350	1089	653	163	653	163
3	0.6060	1119	395	2597	824	1376	437	1376	437
4	0.8100	655	281	1243	484	1193	465	1193	465
5	0.7220	178	91	365	171	365	171	365	171
6	0.6750	119	71	255	141	255	141	255	141
7	0.5950	31	22	74	47	74	47	74	47
8	0.5410	16	12	40	30	40	30	40	30
9	0.6590	8	7	17	14	17	14	17	14
10+	0.6590	33	38	71	80	71	80	71	80
Total		2777	1087	13981	3820	4044	1547	4044	1547
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1998	F-factor: 1.0000	Reference F: 0.6816				1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0130	60	13	4969	941	0	0	0	0
2	0.1460	558	158	4350	1089	653	163	653	163
3	0.6060	1436	507	3334	1058	1767	561	1767	561
4	0.8100	663	284	1256	490	1206	470	1206	470
5	0.7220	239	122	490	229	490	229	490	229
6	0.6750	73	44	157	87	157	87	157	87
7	0.5950	49	34	115	74	115	74	115	74
8	0.5410	14	11	36	27	36	27	36	27
9	0.6590	9	8	21	17	21	17	21	17
10+	0.6590	18	22	40	45	40	45	40	45
Total		3121	1202	14770	4057	4486	1673	4486	1673
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SPRSF101
Date and time : 08SEP96:20:10
Computation of ref. F: Simple mean, age 3 - 7
Prediction basis : F factors

Table3.4.15 VIIe plaice. Stock numbers of recruits and their source for recent year classes used in predictions, and the relative (%) contributions to landings and SSB (by weight) of these year classes

Year-class	1992	1993	1994	1995	1996
Stock No. (thousands) of one-year-olds	2589	3713	3826	4969	4969
Source	XSA	XSA	XSA	GM	GM
Status Quo F:					
% in 1996 catch	20.2	37.6	11.9	1.3	-
% in 1997 catch	8.4	25.8	36.3	14.5	1.2
% in 1996 SSB	23.0	28.7	8.4	0.0	-
% in 1997 SSB	11.0	30.0	28.2	10.5	0.0
% in 1998 SSB	5.2	13.7	28.1	33.5	9.7

GM = geometric mean recruitment

VIIe plaice : Year-class % contribution to a) 1997 landings and b) 1998 SSB

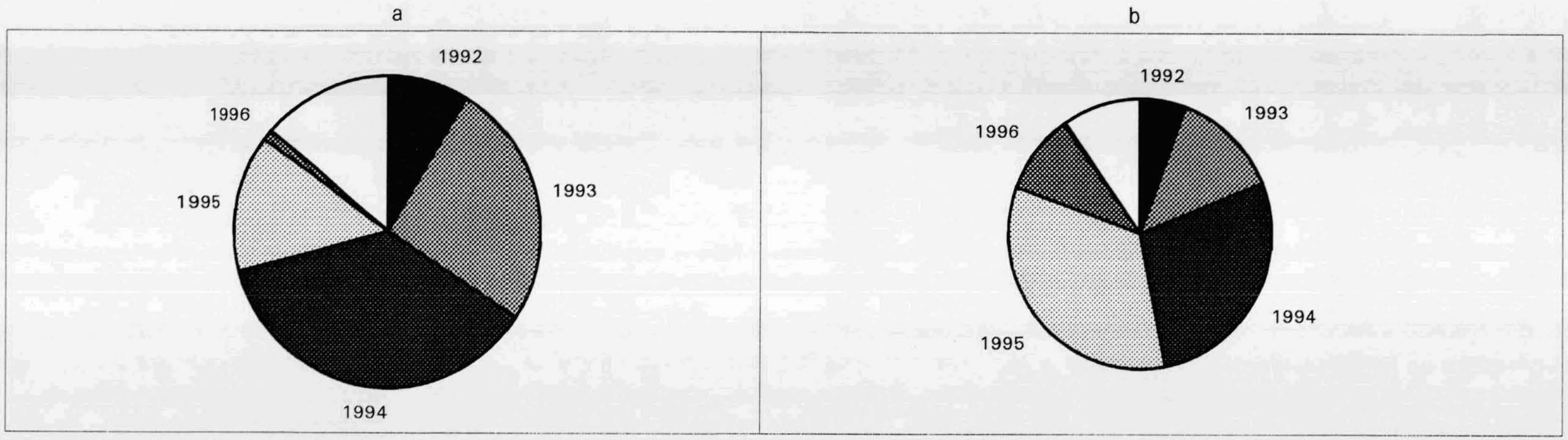


Table 3.4.16 VIIe plaice: input to sensitivity analysis and medium term predictions

1	10	1996	3				
1	0	0					
N1	4969	0.52	Population numbers	M1	0.12	0.1	Natural mortality
N2	3388	0.4		M2	0.12	0.1	
N3	2567	0.21		M3	0.12	0.1	
N4	926	0.15		M4	0.12	0.1	
N5	593	0.13		M5	0.12	0.1	
N6	162	0.13		M6	0.12	0.1	
N7	81	0.13		M7	0.12	0.1	
N8	32	0.14		M8	0.12	0.1	
N9	69	0.13		M9	0.12	0.1	
N10	84	0.13		M10	0.12	0.1	
sH1	0.013	0.61	Fishing mortality	MT1	0	0.1	Maturity
sH2	0.146	0.28		MT2	0.15	0.1	
sH3	0.606	0.15		MT3	0.53	0.1	
sH4	0.809	0.11		MT4	0.96	0.1	
sH5	0.722	0.07		MT5	1	0.1	
sH6	0.675	0.14		MT6	1	0	
sH7	0.595	0.17		MT7	1	0	
sH8	0.541	0.14		MT8	1	0	
sH9	0.659	0.21		MT9	1	0	
sH10	0.659	0.21		MT10	1	0	
WH1	0.219	0.03	Weight at age in the catch	R97	4969	0.52	GM recruitment
WH2	0.283	0.05		R98	4969	0.52	
WH3	0.353	0.06		HF96	1	0.08	F multiplier
WH4	0.428	0.05		HF97	1	0.08	
WH5	0.509	0.05		HF98	1	0.08	
WH6	0.596	0.04		K96	1	0.1	
WH7	0.689	0.03		K97	1	0.1	
WH8	0.787	0.02		K98	1	0.1	
WH9	0.891	0.02					
WH10	1.18	0.04		Western Channel			
WS1	0.189	0.01	Weight at age in the stock	1			
WS2	0.25	0.04		1	10	1	
WS3	0.317	0.05		1			
WS4	0.39	0.05		H.cons.			
WS5	0.468	0.05		3	7		
WS6	0.552	0.05		1976	1995		
WS7	0.641	0.04		Stock numbers in 1996 are VPA survivors			
WS8	0.737	0.03					
WS9	0.838	0.02					
WS10	0.945	0.01					

Table 3.4.17

Plaice in the Western English Channel (Fishing Area VIIe)

Yield per recruit: Summary table

F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January Sp.stock size	1 January Sp.stock biomass	Spawning time Sp.stock size	Spawning time Sp.stock biomass
0.0000	0.0000	0.000	0.000	8.843	5840.667	6.692	5334.414	6.692	5334.414
0.1000	0.0682	0.290	200.007	6.432	3456.302	4.289	2952.946	4.289	2952.946
0.2000	0.1363	0.429	260.289	5.280	2416.530	3.146	1915.982	3.146	1915.982
0.3000	0.2045	0.510	279.590	4.607	1862.341	2.482	1364.518	2.482	1364.518
0.4000	0.2726	0.563	284.669	4.167	1530.639	2.050	1035.461	2.050	1035.461
0.5000	0.3408	0.601	284.549	3.857	1315.893	1.748	823.286	1.748	823.286
0.6000	0.4090	0.629	282.603	3.628	1168.514	1.526	678.405	1.526	678.405
0.7000	0.4771	0.651	280.152	3.452	1062.605	1.358	574.929	1.358	574.929
0.8000	0.5453	0.668	277.705	3.312	983.577	1.225	498.268	1.225	498.268
0.9000	0.6134	0.682	275.444	3.198	922.713	1.118	439.710	1.118	439.710
1.0000	0.6816	0.694	273.414	3.103	874.560	1.031	393.806	1.031	393.806
1.1000	0.7498	0.704	271.611	3.023	835.572	0.958	357.011	0.958	357.011
1.2000	0.8179	0.712	270.010	2.954	803.366	0.896	326.946	0.896	326.946
1.3000	0.8861	0.720	268.584	2.895	776.294	0.843	301.965	0.843	301.965
1.4000	0.9542	0.726	267.307	2.842	753.190	0.796	280.903	0.796	280.903
1.5000	1.0224	0.732	266.156	2.796	733.208	0.756	262.917	0.756	262.917
1.6000	1.0906	0.738	265.113	2.754	715.722	0.721	247.384	0.721	247.384
1.7000	1.1587	0.743	264.161	2.716	700.262	0.689	233.835	0.689	233.835
1.8000	1.2269	0.747	263.287	2.682	686.469	0.661	221.912	0.661	221.912
1.9000	1.2950	0.751	262.482	2.650	674.063	0.635	211.337	0.635	211.337
2.0000	1.3632	0.755	261.736	2.621	662.823	0.612	201.892	0.612	201.892
-	-	Numbers	Grams	Numbers	Grams	Numbers	Grams	Numbers	Grams

Notes: Run name : YLDSF101
Date and time : 08SEP96:20:14
Computation of ref. F: Simple mean, age 3 - 7
F-0.1 factor : 0.1906
F-max factor : 0.4418
F-0.1 reference F : 0.1299
F-max reference F : 0.3011
Recruitment : Single recruit

Figure 3.3.1 VIIe SOLE RETROSPECTIVE XSA : qp=7 S.E. thres 0.1
rec=1-6 shr=1.0
10 yr flat tuning

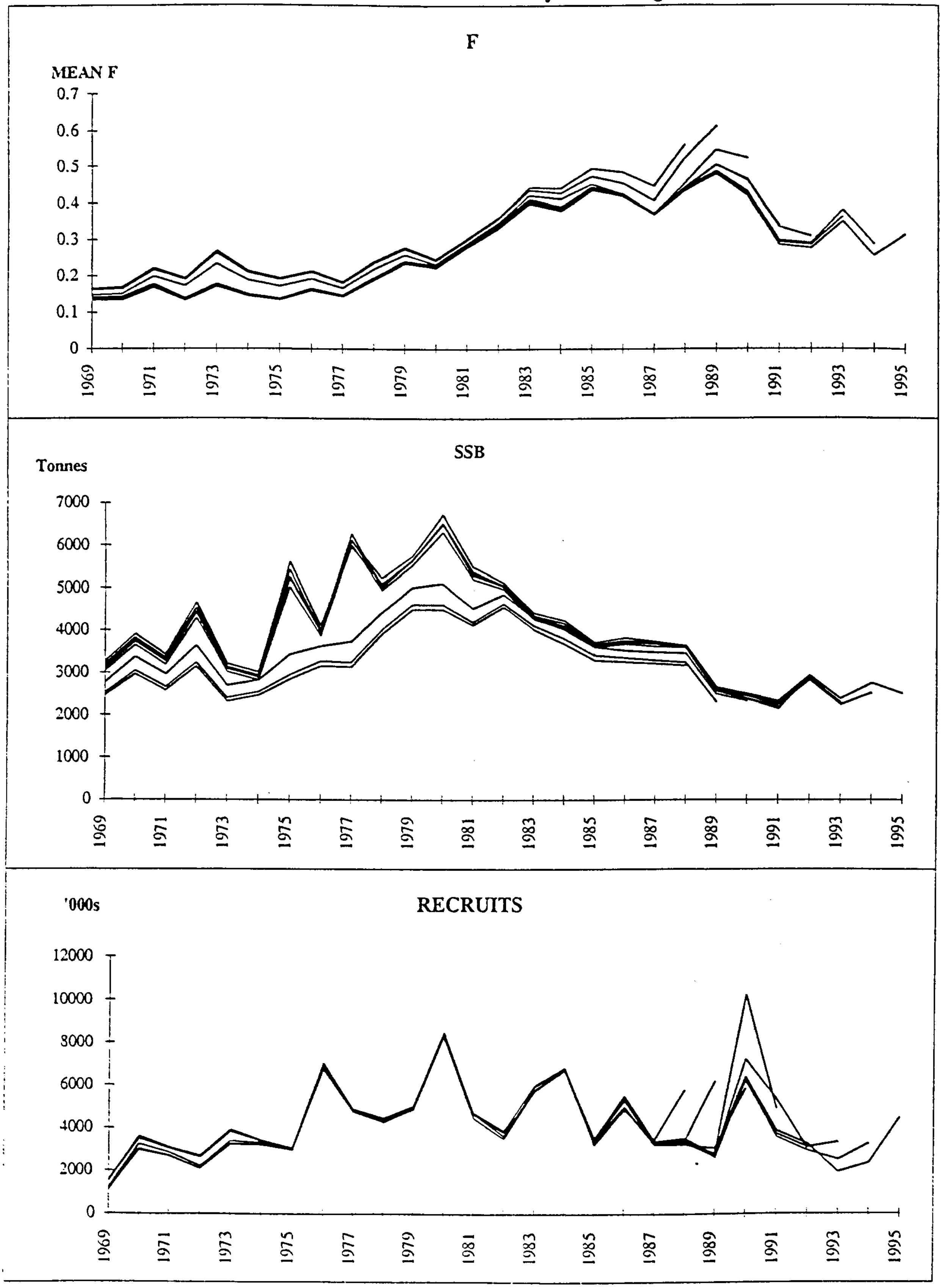


Figure 3.3.2a

VIIe SOLE XSA LOG CATCHABILITY RESIDUAL PLOTS (AGES 1-6)

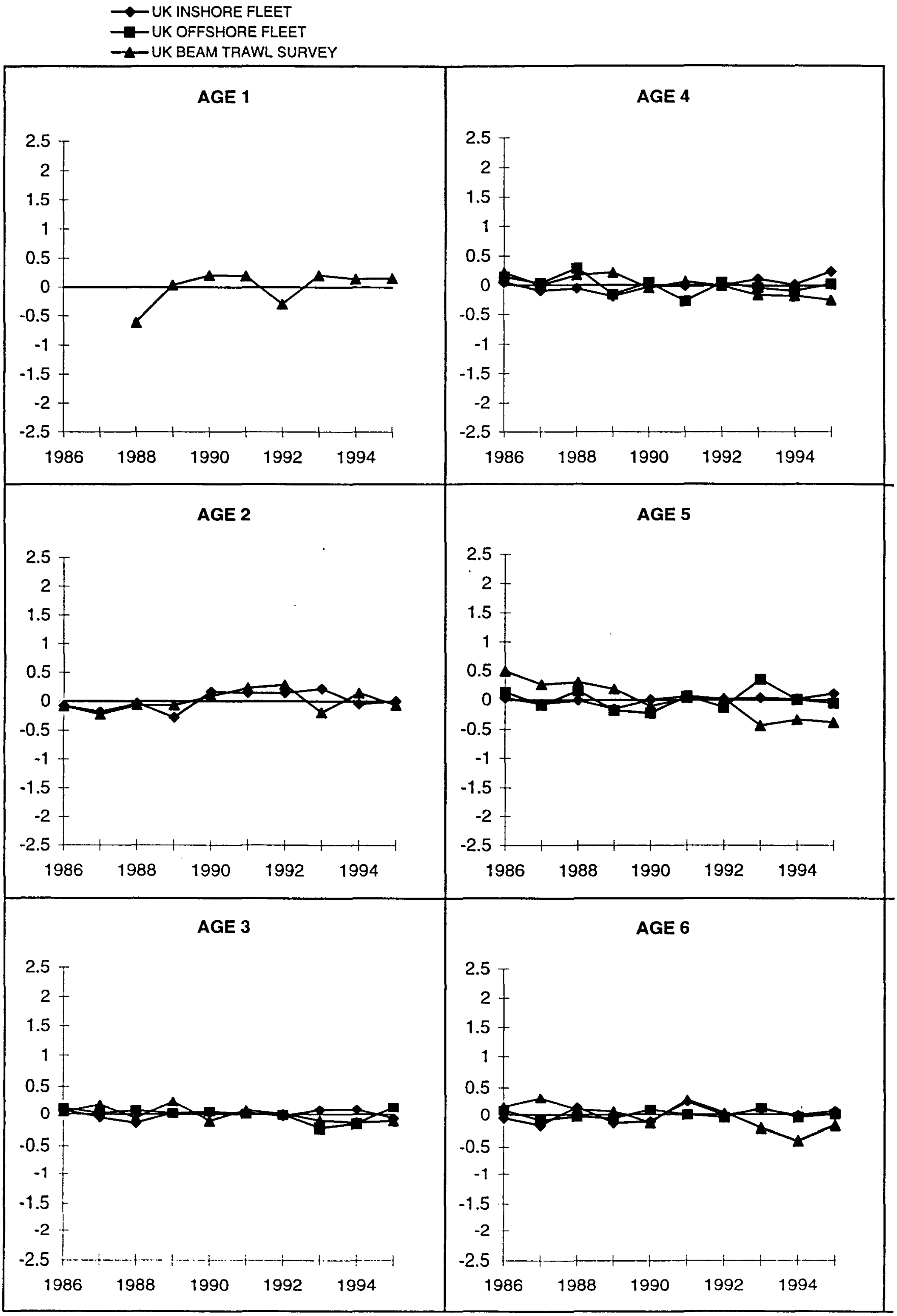


Figure 3.3.2b

VIIe SOLE XSA LOG CATCHABILITY RESIDUAL PLOTS (AGES 7-9)

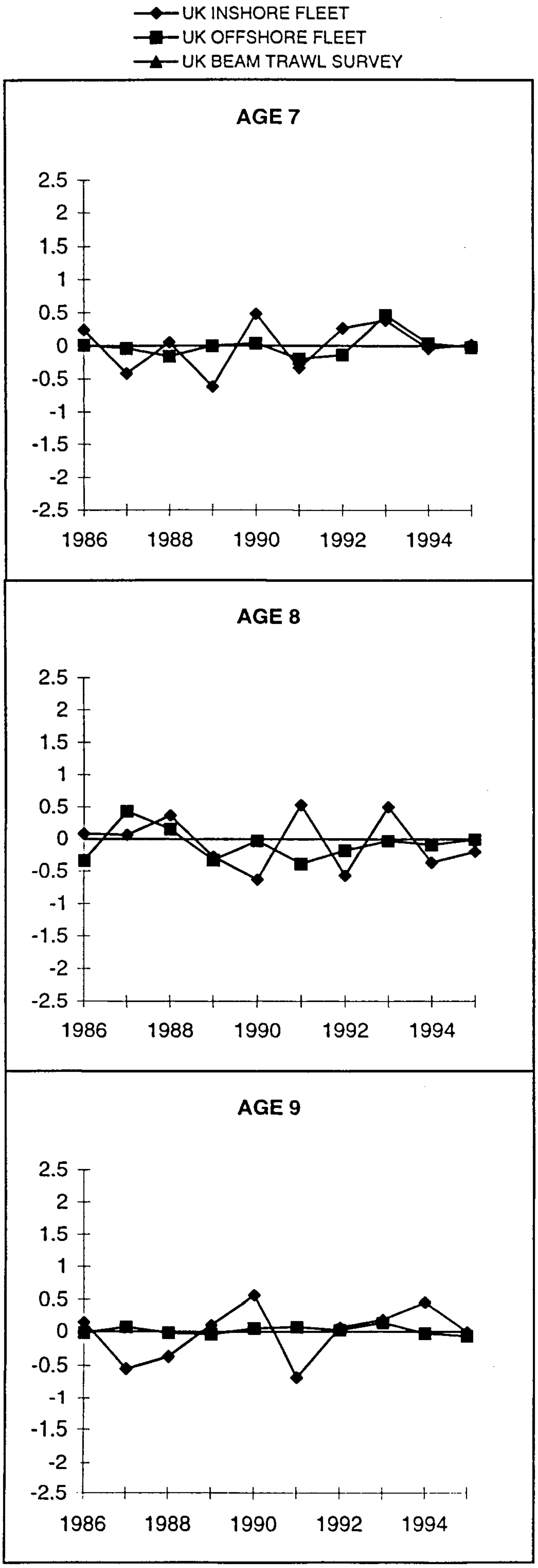


Figure 3.3.3

Sole in the Western English Channel (Fishing Area VIIe)
4-9-1996

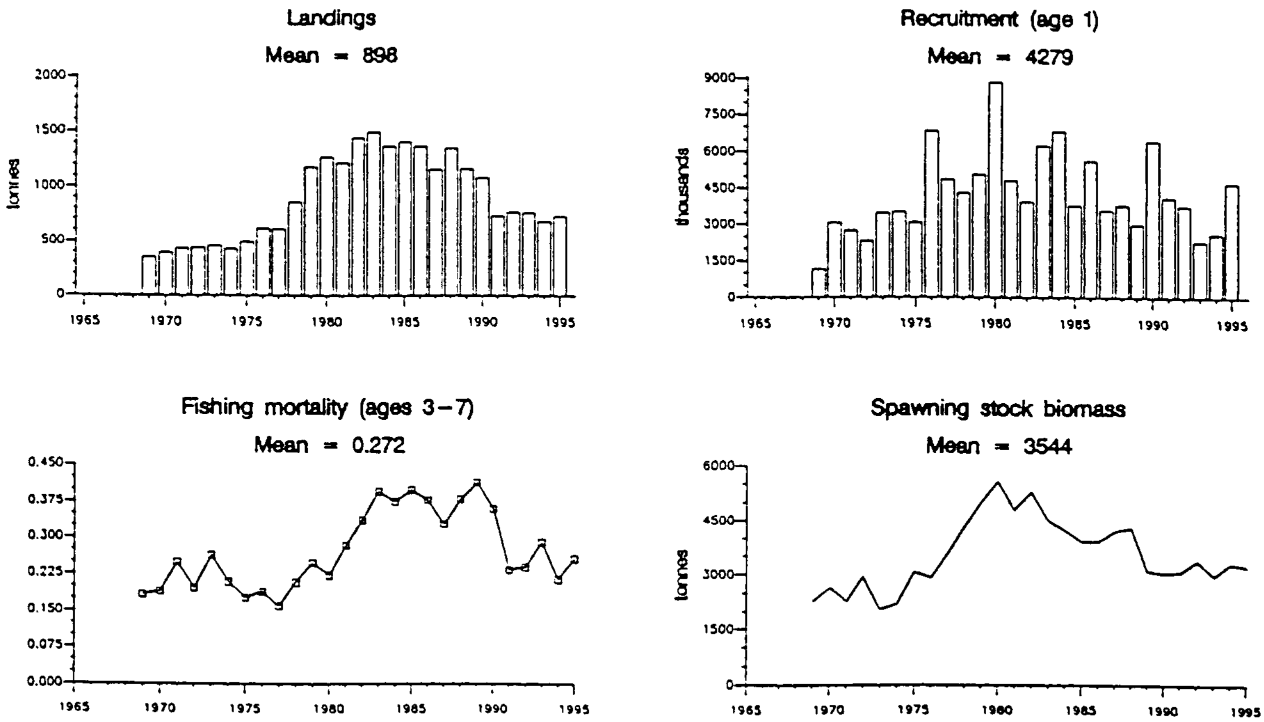


Figure 3.3.4

Fish Stock Summary
Sole in the Western English Channel (Fishing Area VIIe)
8-9-1996

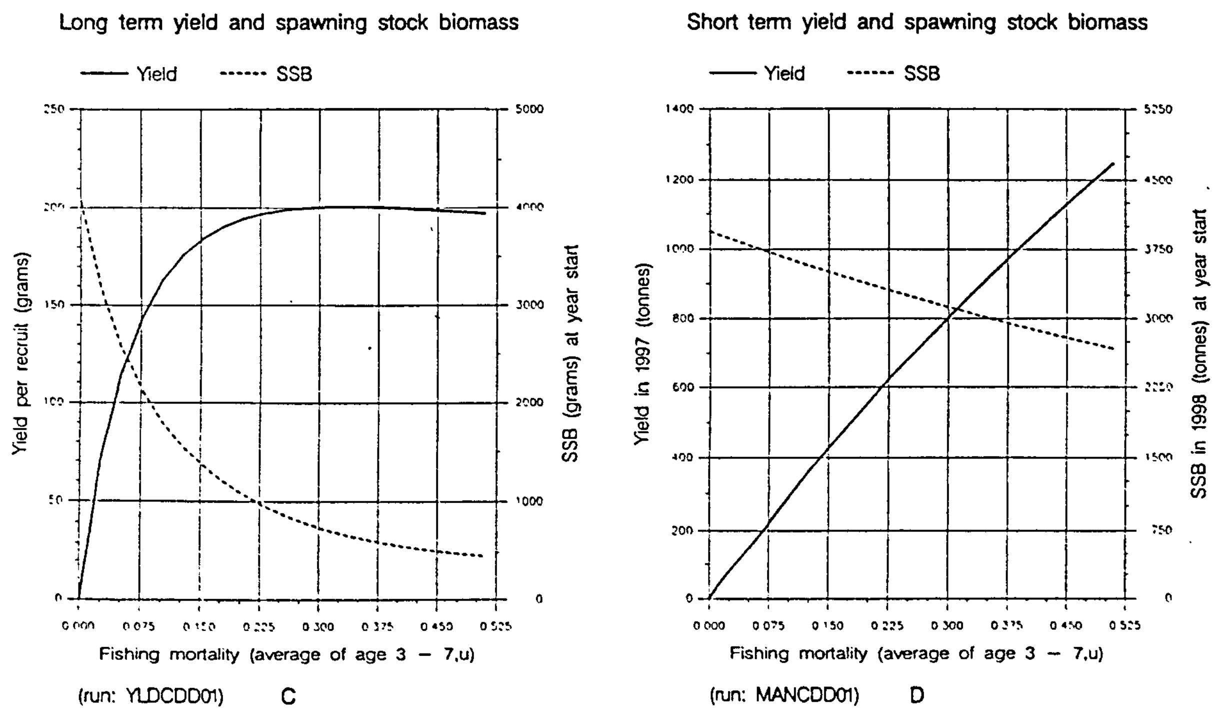


Figure 3.3.5 Sole,Western Channel. Sensitivity analysis of short term forecast.

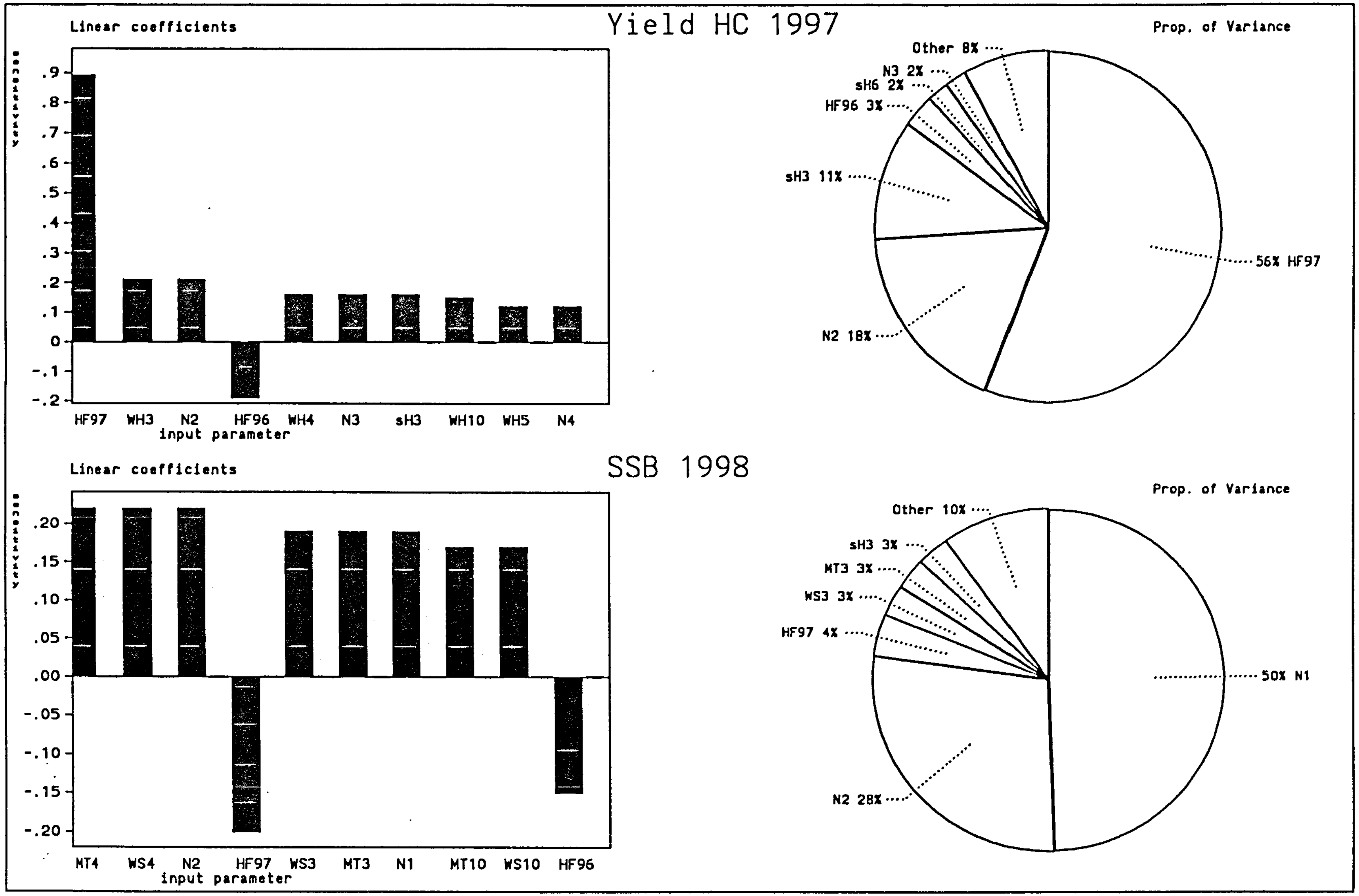
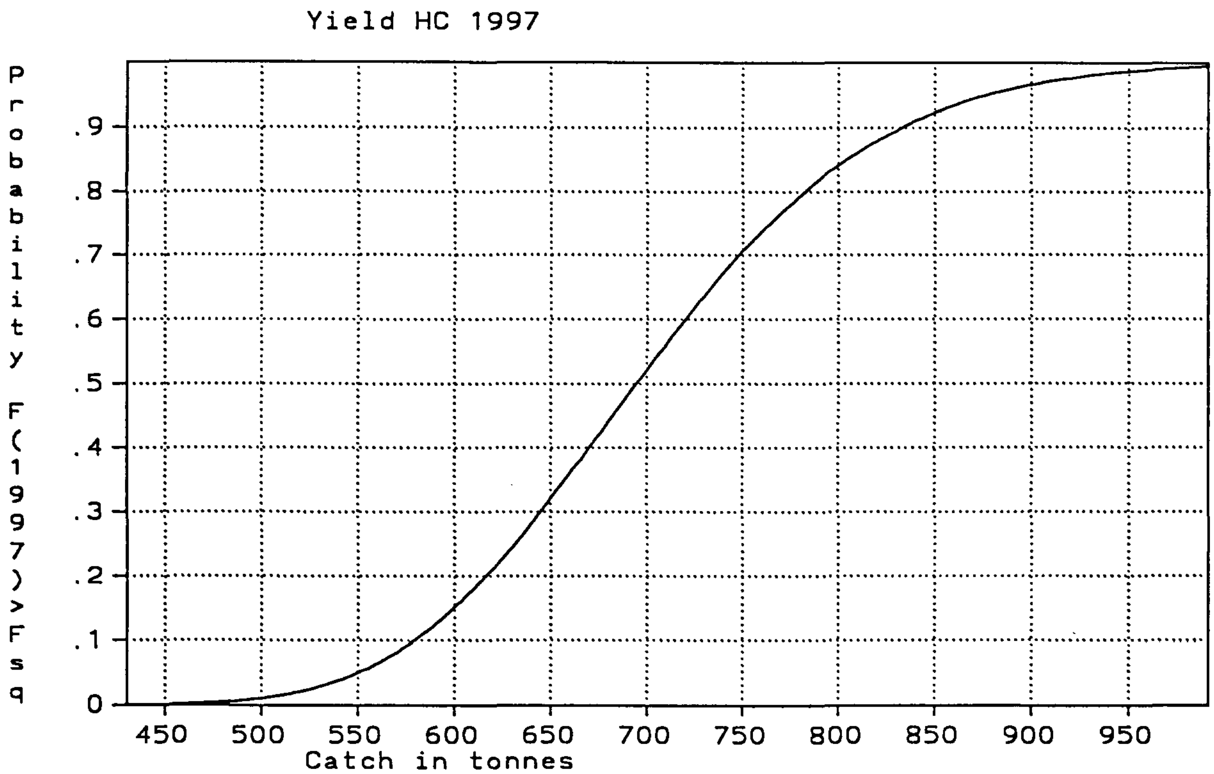


Figure 3.3.6 Sole,Western Channel. Probability profiles for short term forecast.



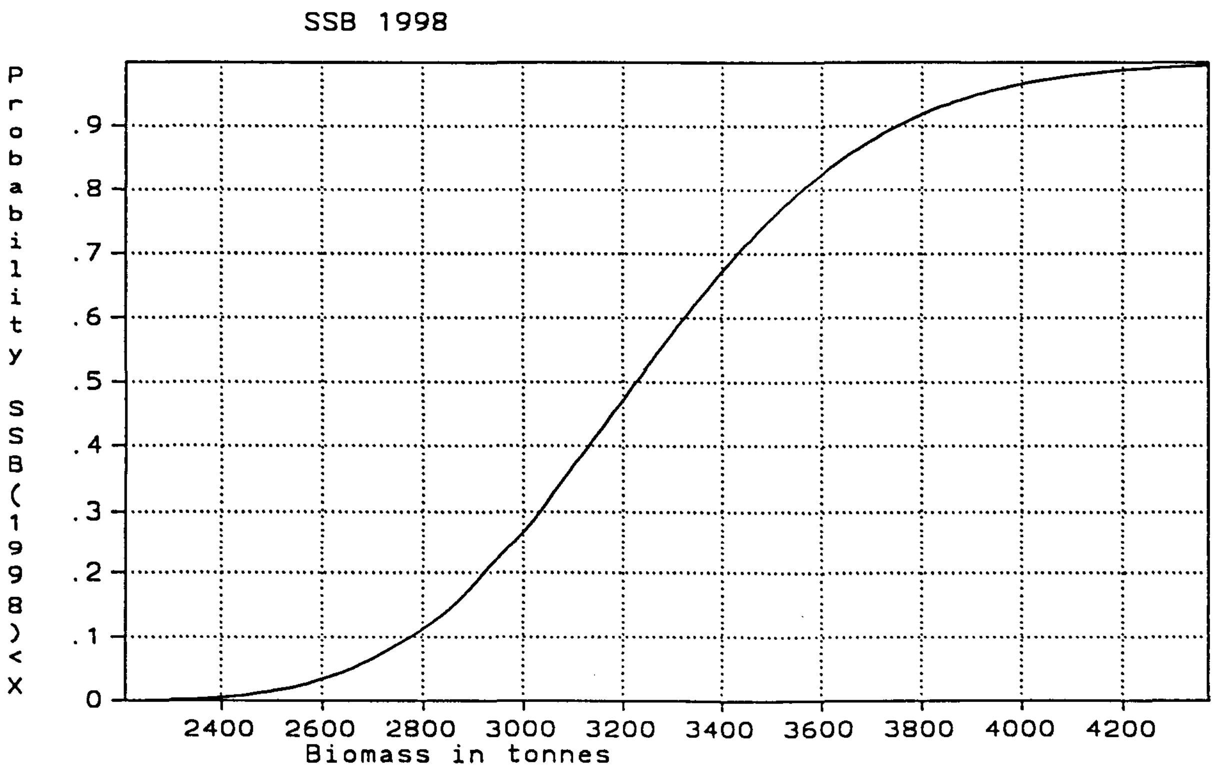
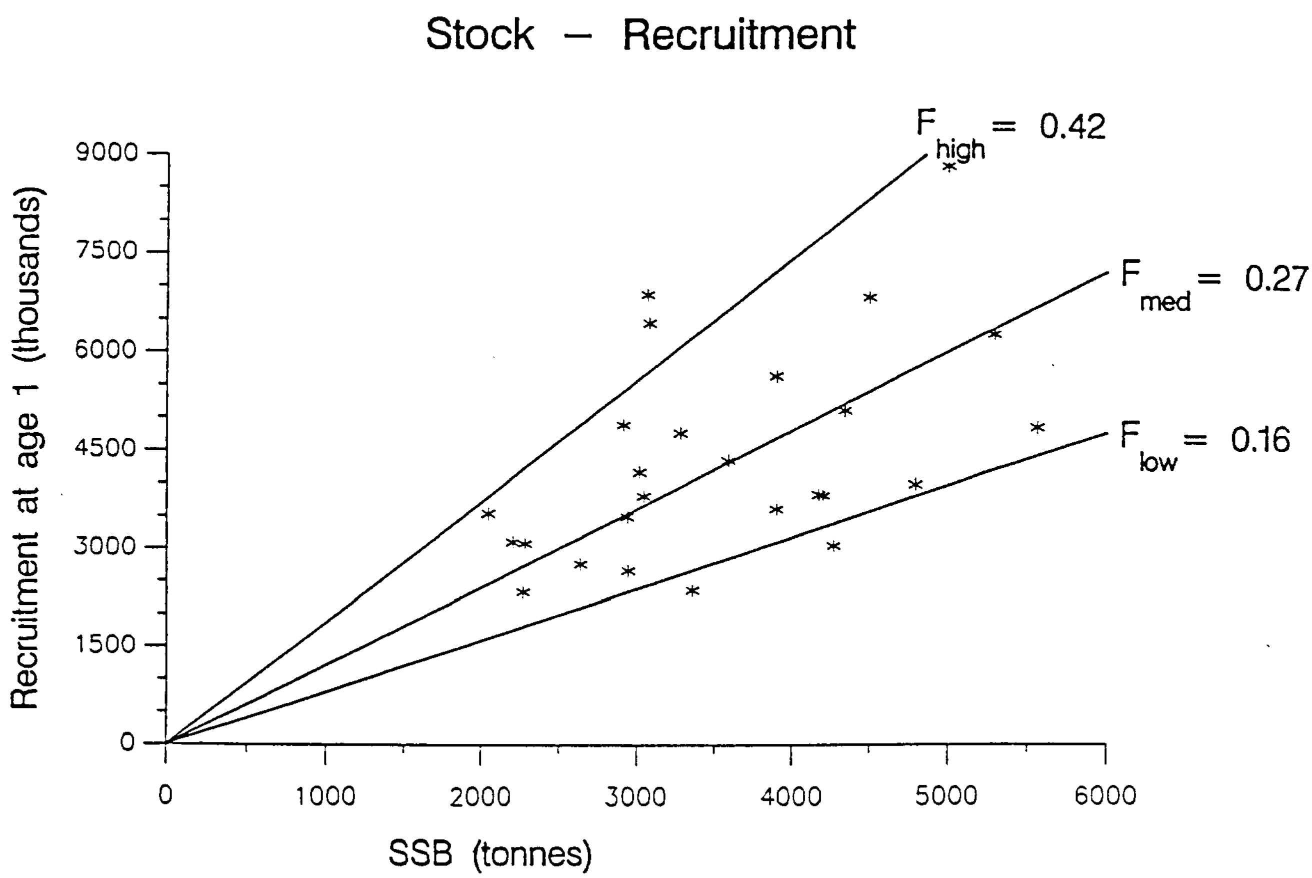


Figure 3.3.7

Sole in the Western English Channel (Fishing Area VIIe)
4–9–1996



(run: XSACDD01)

Figure 3.3.8 **Western Channel Sole. Medium term projections. Solid lines show 5, 25, 50, 75 and 95 percentiles**
Beverton Holt stock-recruitment relationship (no running mean)
number of simulations 500 Relative Cons. effort = 1.00

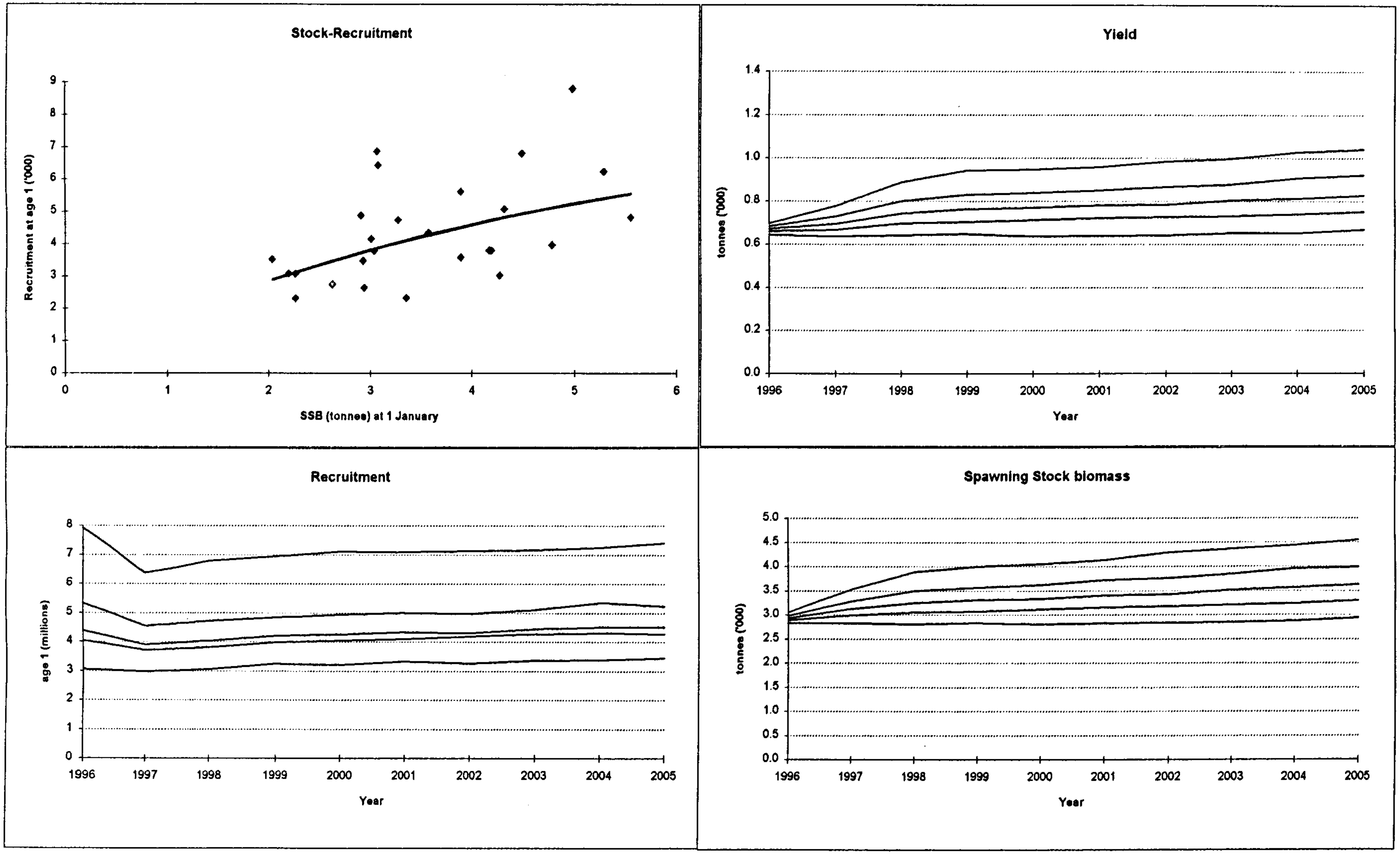


Figure 3.3.9 Sole VIIe - Medium term predictions showing 5th,25th,50th,75th and 95th percentiles of SSB in tenth year (2005) for different F-factors applied to estimated 1995 F
Beverton Holt stock-recruitment relationship (no running mean)
500 simulations

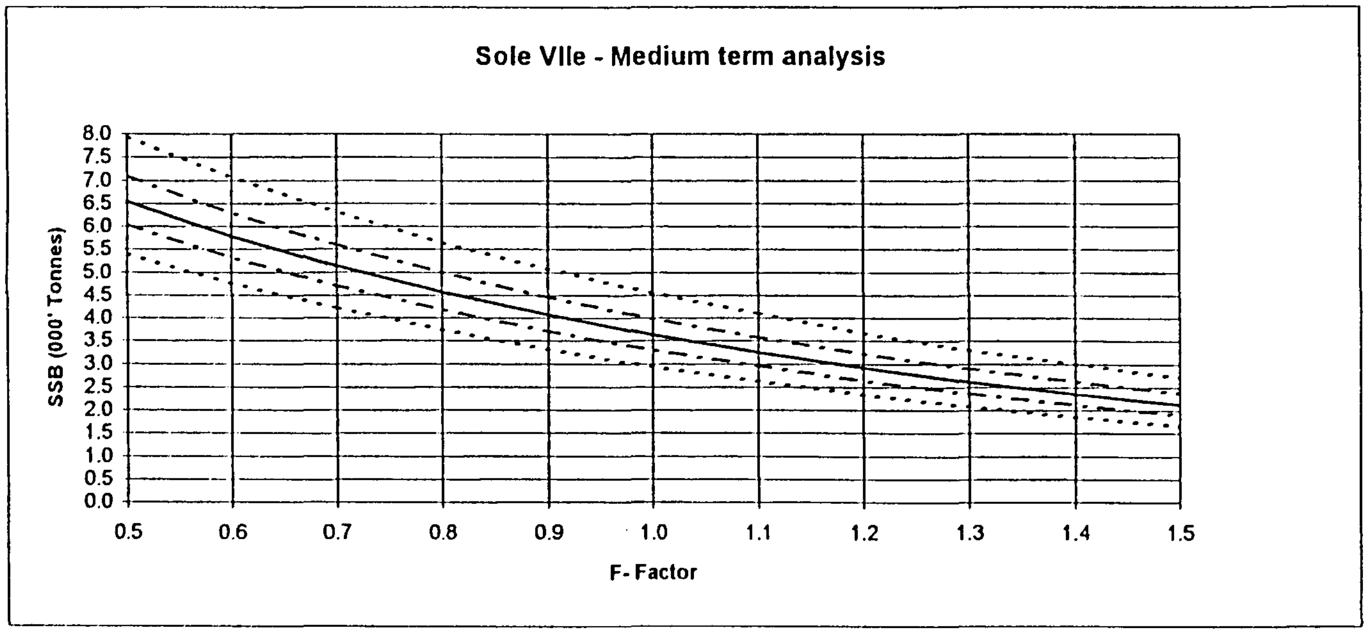


Figure 3.4.1 **VIIe PLAICE RETROSPECTIVE XSA :** qp=7 shr = 1.5 Thr = 0.3 rec=1-3

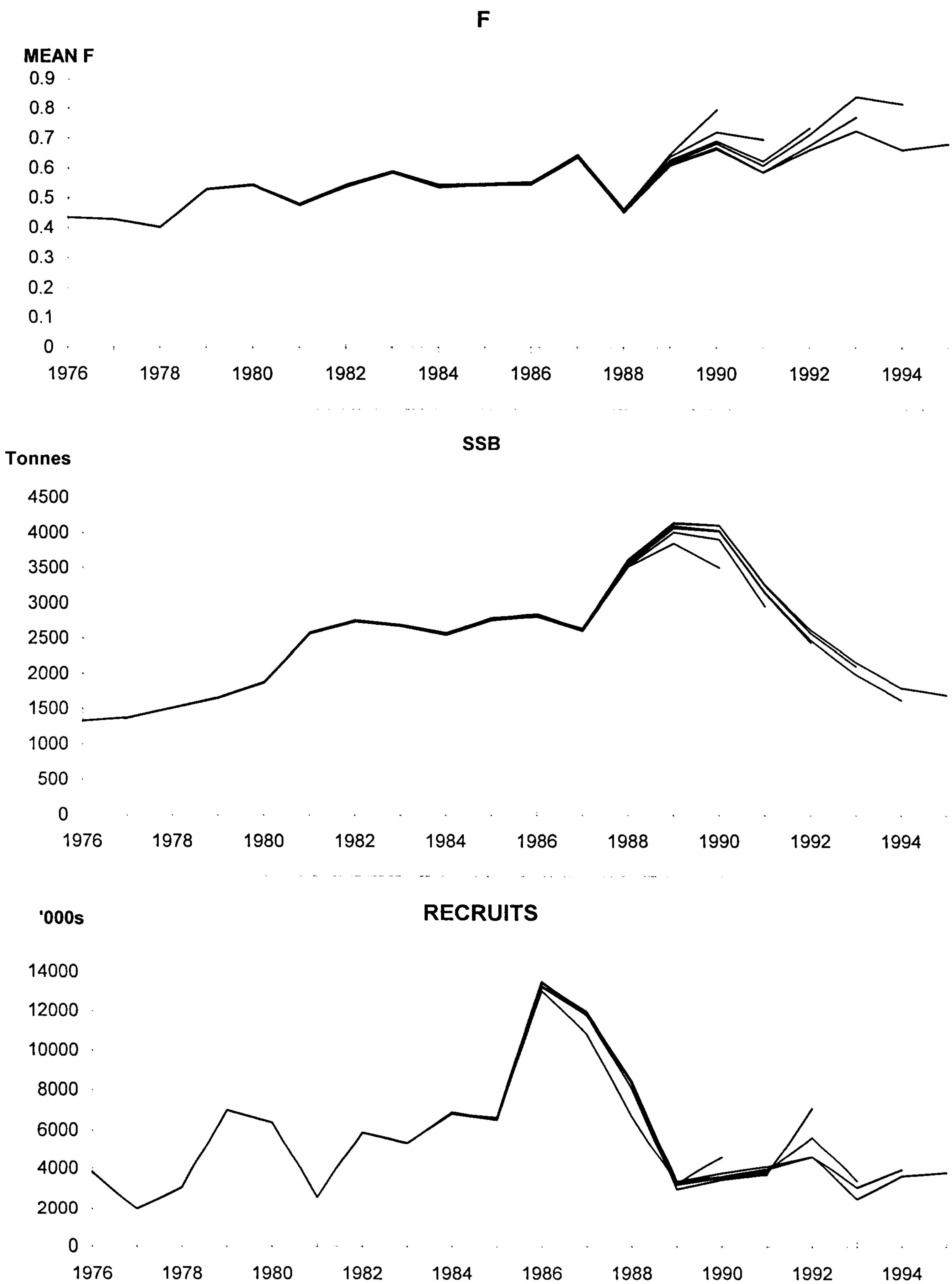


Figure 3.4.2 VIIe PLAICE RETROSPECTIVE XSA : qp=7

shr = 0.8 Thr = 0.3

rec=1-3

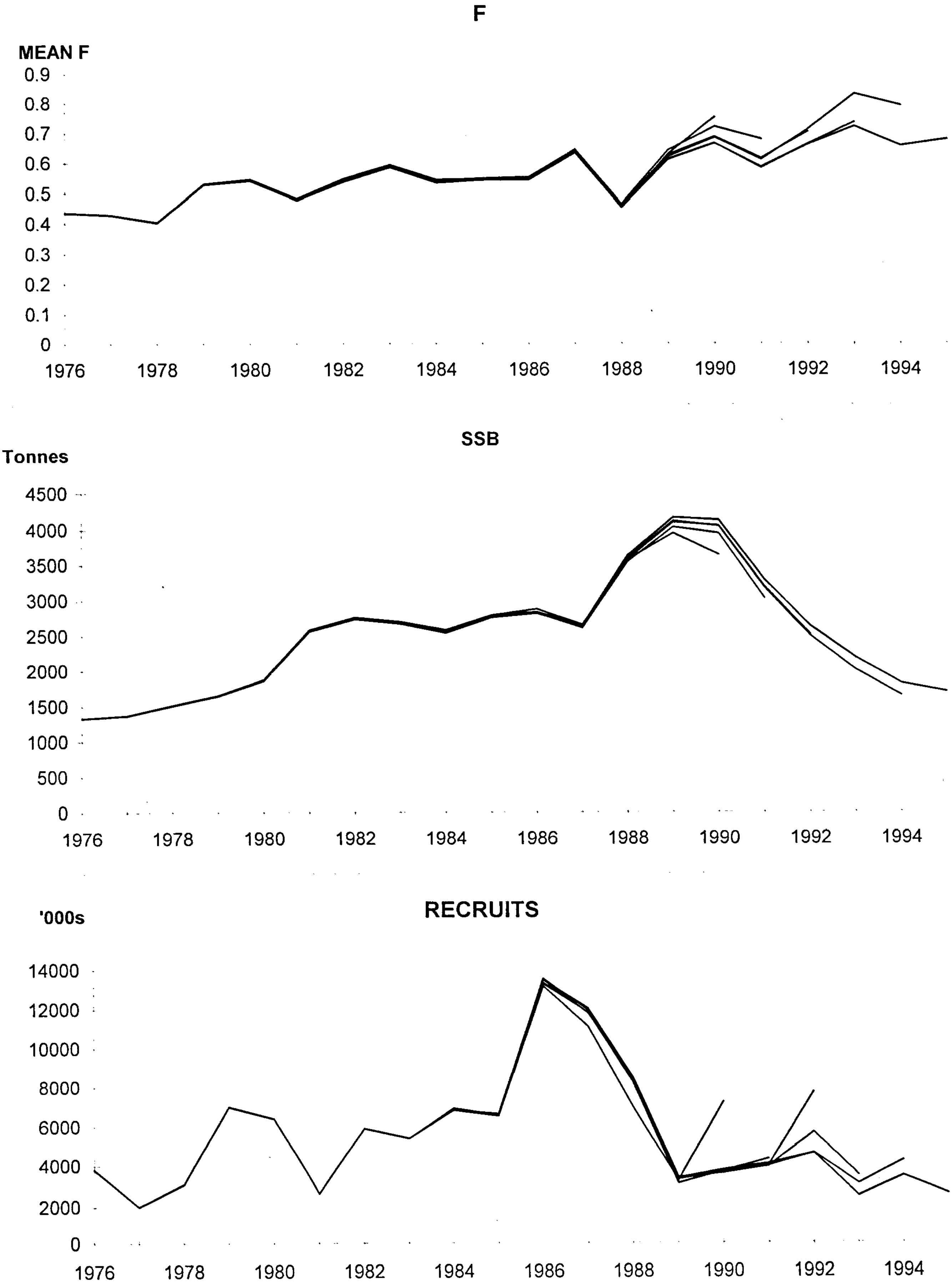


Figure 3.4.3

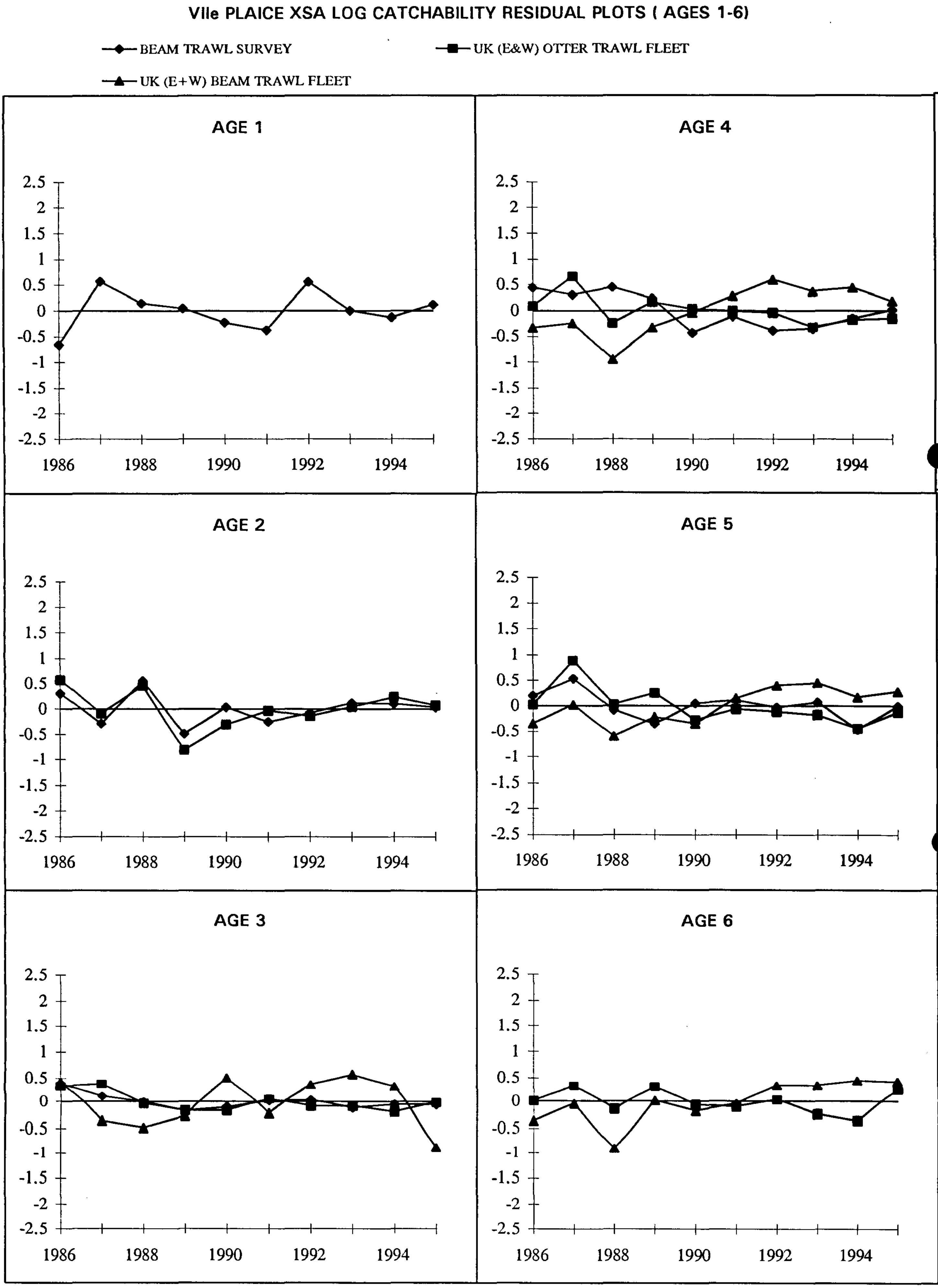

VIIe PLAICE XSA LOG CATCHABILITY RESIDUAL PLOTS (AGES 1-6)
BEAM TRAWL SURVEY
UK (E&W) OTTER TRAWL FLEET
UK (E+W) BEAM TRAWL FLEET
AGE 1
AGE 4
AGE 2
AGE 5
AGE 3
AGE 6
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
1986
1988
1990
1992
1994

Figure 3.4.3 (continued)

VIIe PLAICE XSA LOG CATCHABILITY RESIDUAL PLOTS (AGES 7-9)

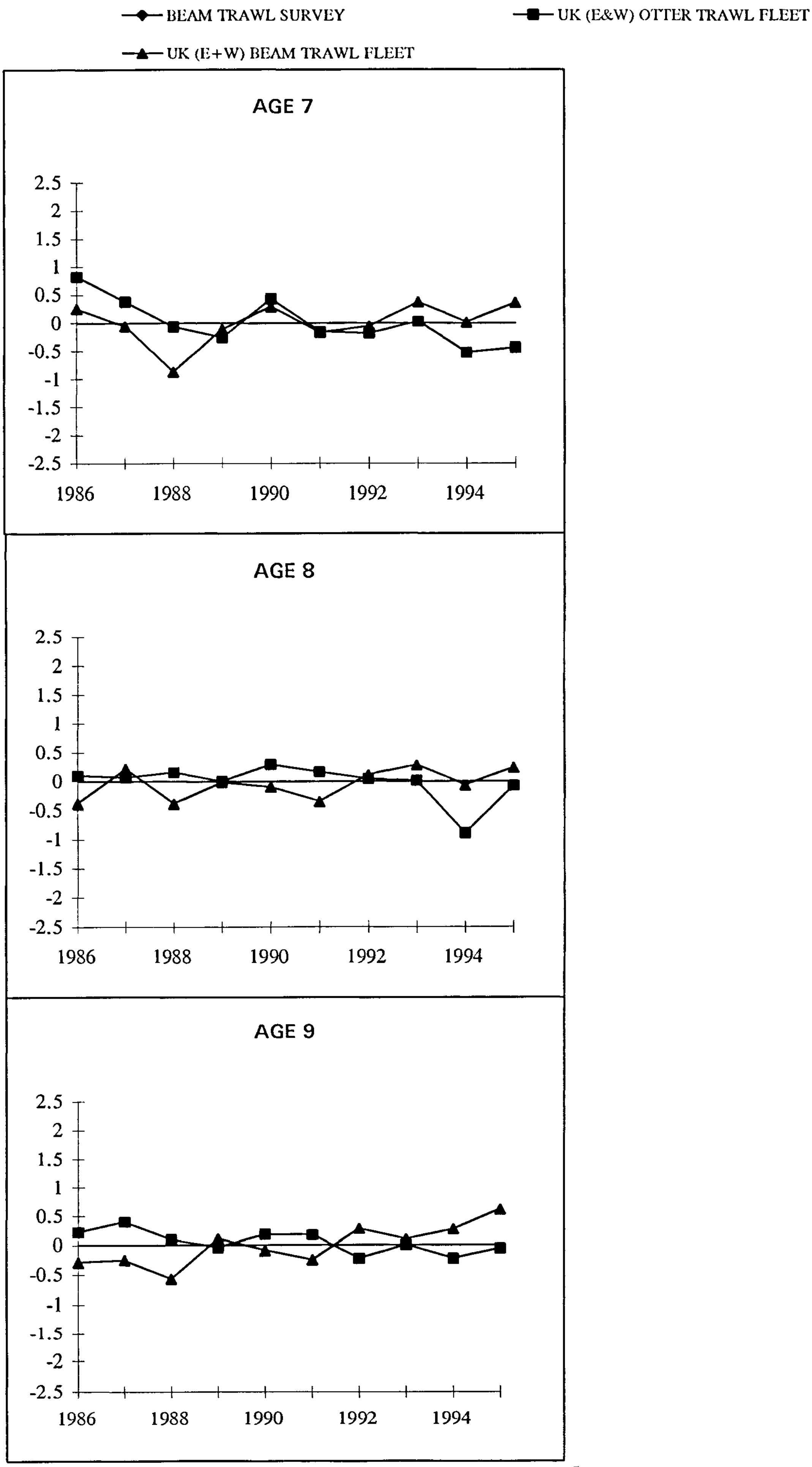
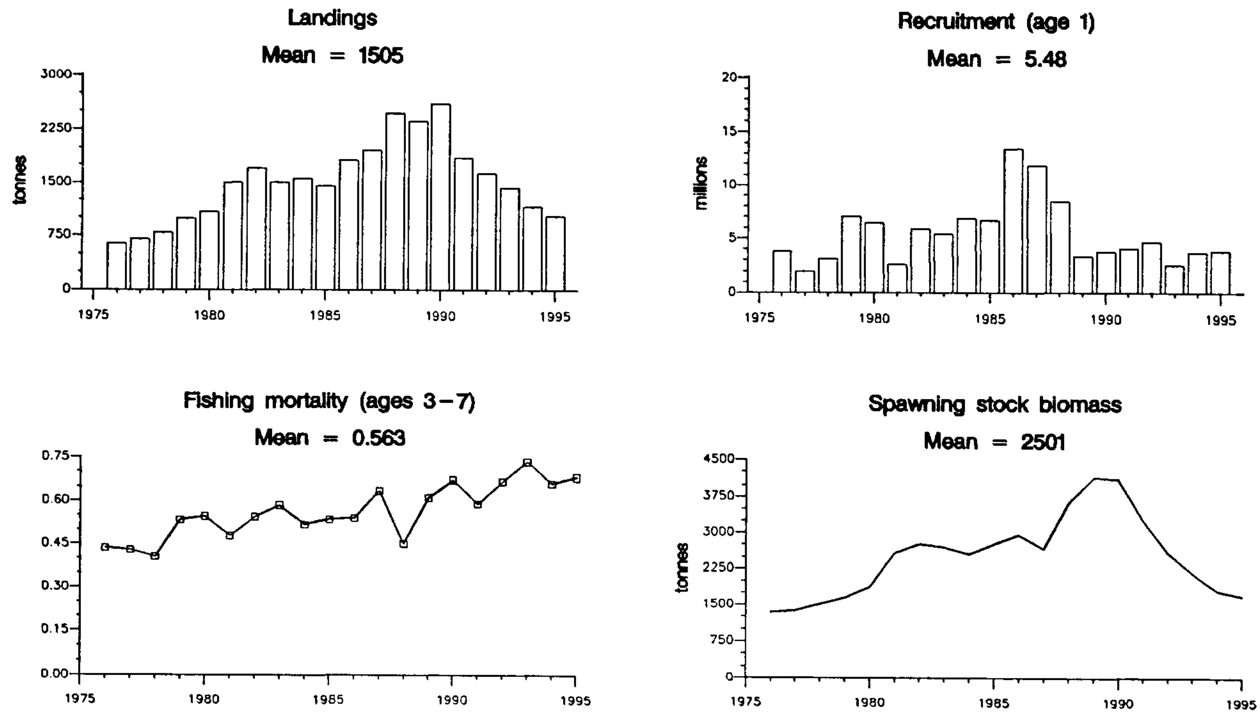


Figure 3.4.4

Plaice in the Western English Channel (Fishing Area VIIe)
4-9-1996

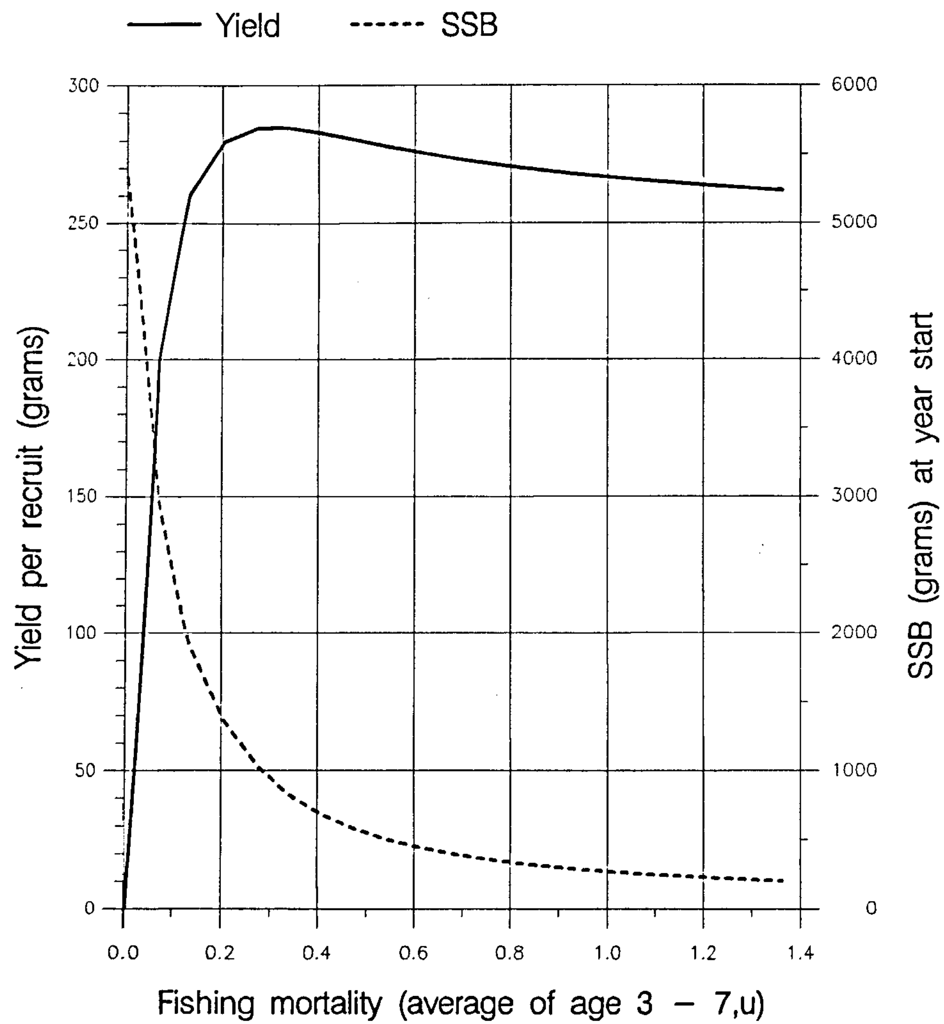


J:\IFAPEXIM\WGSSDS\PLE_ECHW\FIN_VPA4.W6M

Figure 3.4.5

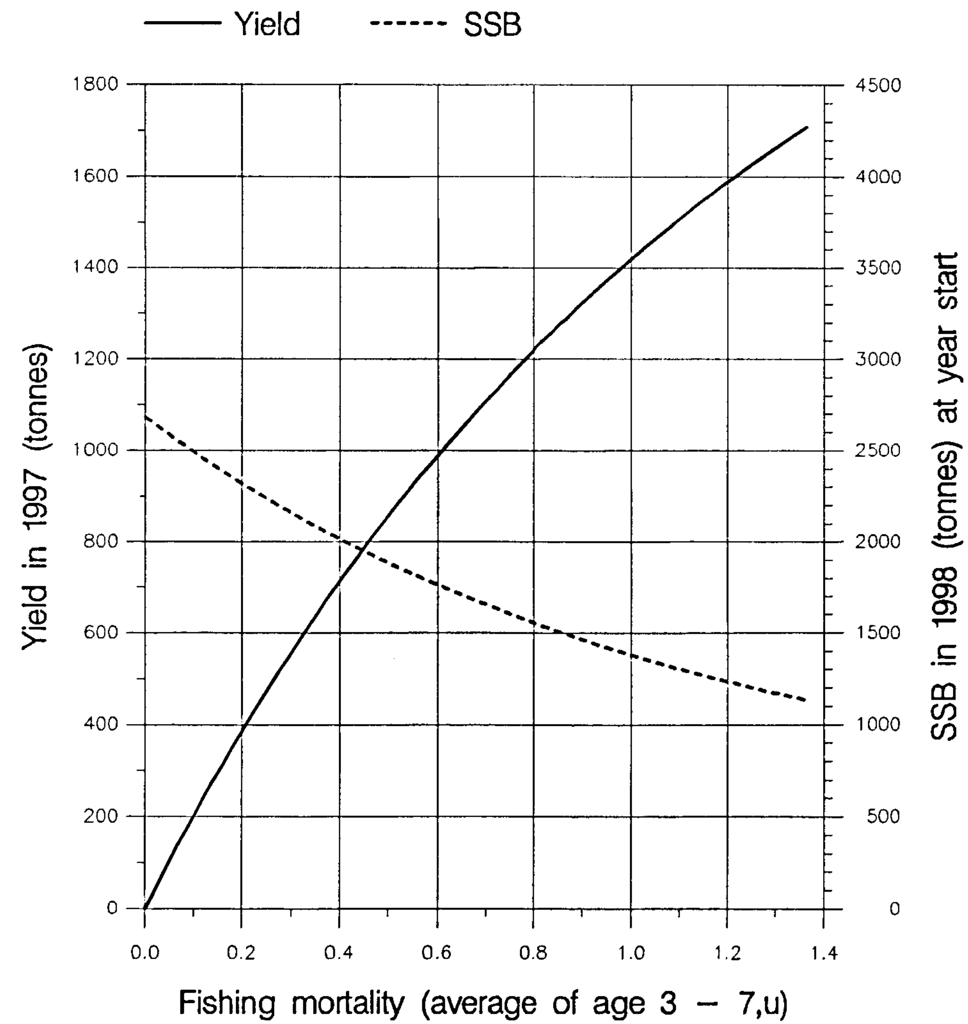
Fish Stock Summary
Plaice in the Western English Channel (Fishing Area VIIe)
8 – 9 – 1996

Long term yield and spawning stock biomass



(run: YLDSF101) C

Short term yield and spawning stock biomass



(run: MANSF101) D

Figure 3.4.6 · plaice, Western Channel. Sensitivity analysis of short term forecast.

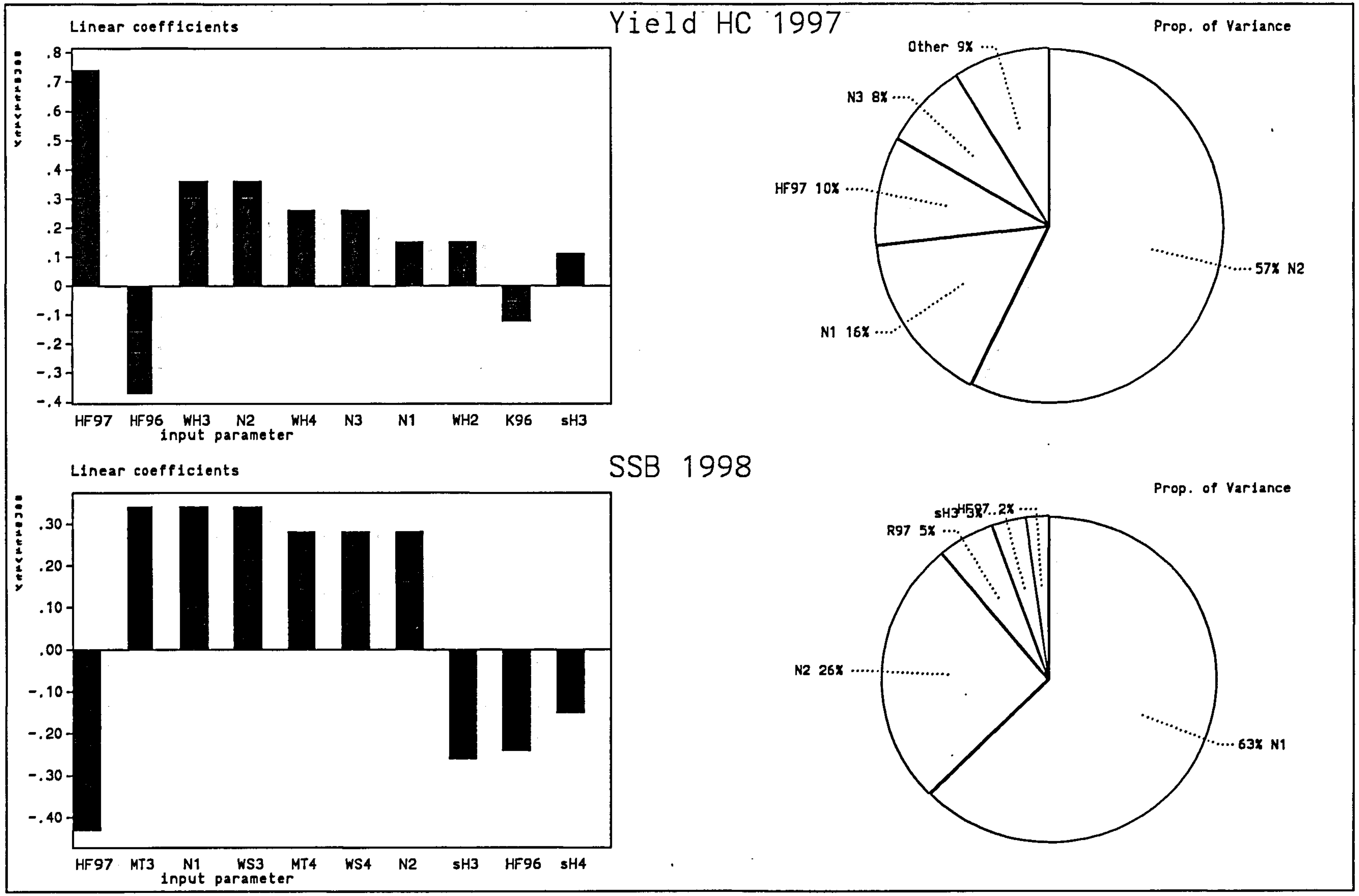
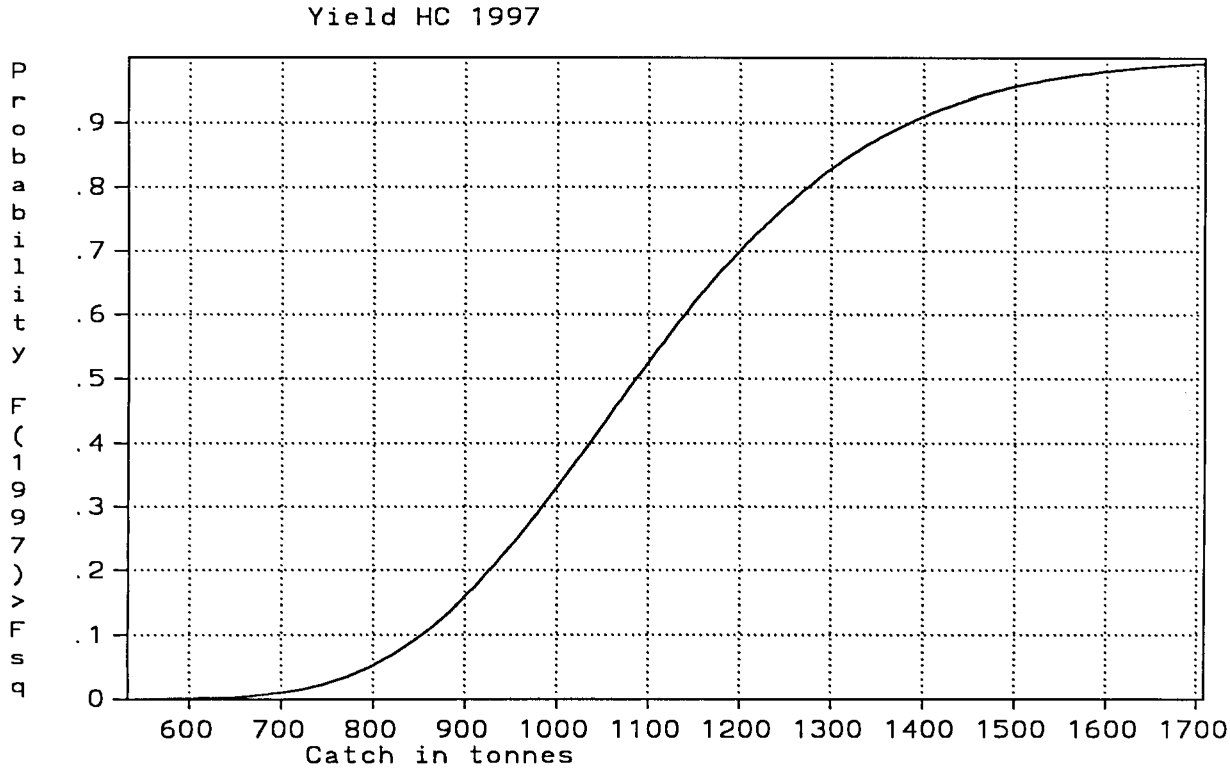


Figure 3.4.7 plaice,Western Channel. Probability profiles for short term forecast.



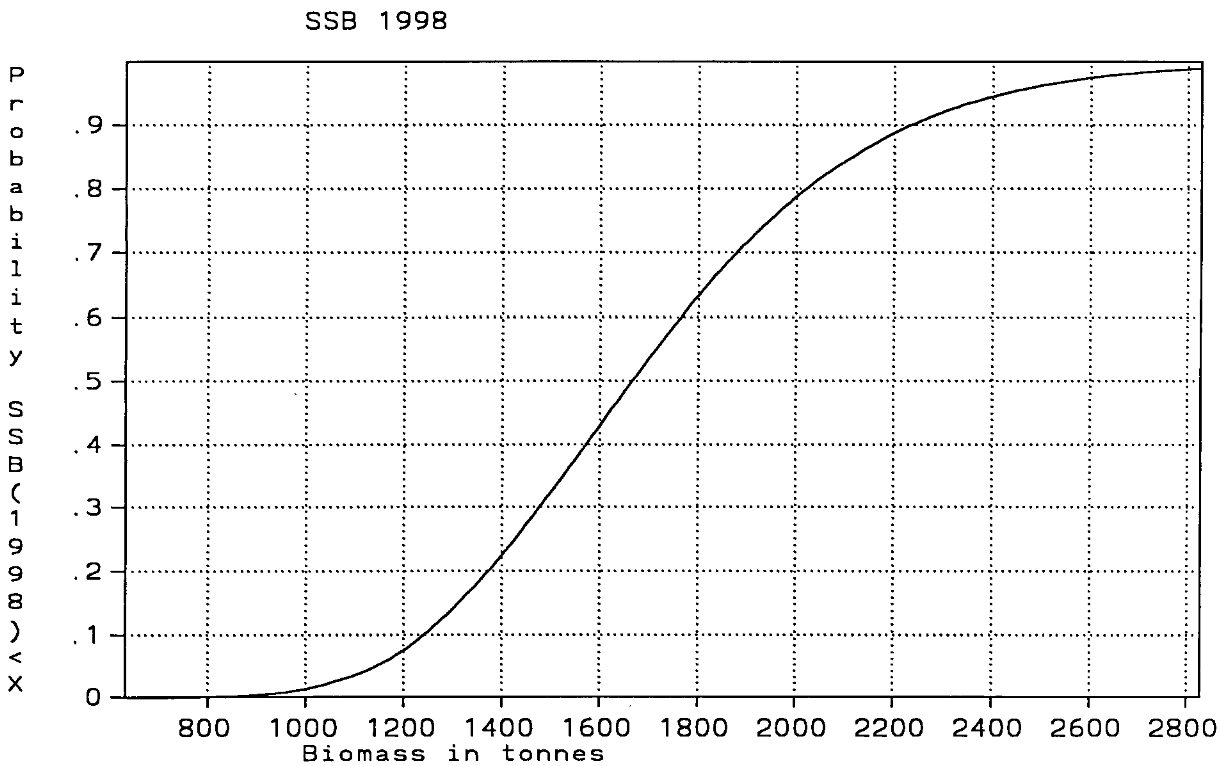


Figure 3.4.8 Plaice in the Western English Channel (Fishing Area VIIe)
4-9-1996

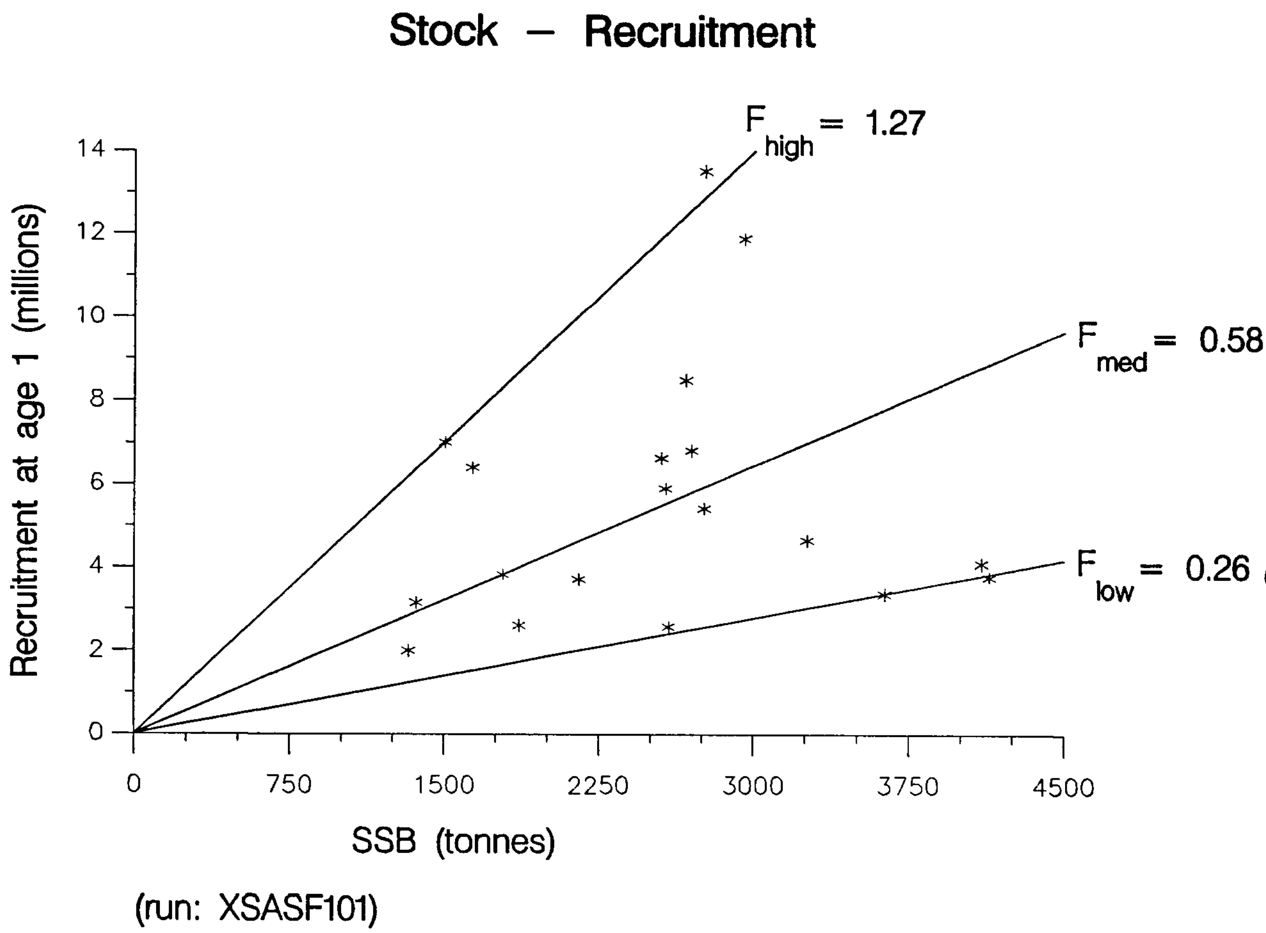


Figure 3.4.9 **VIIe plaice. Medium term projections. Solid lines show 5, 25, 50, 75 and 95 percentiles**

no stock-recruitment relationship

number of simulations 500

Relative Cons. effort = 1.00

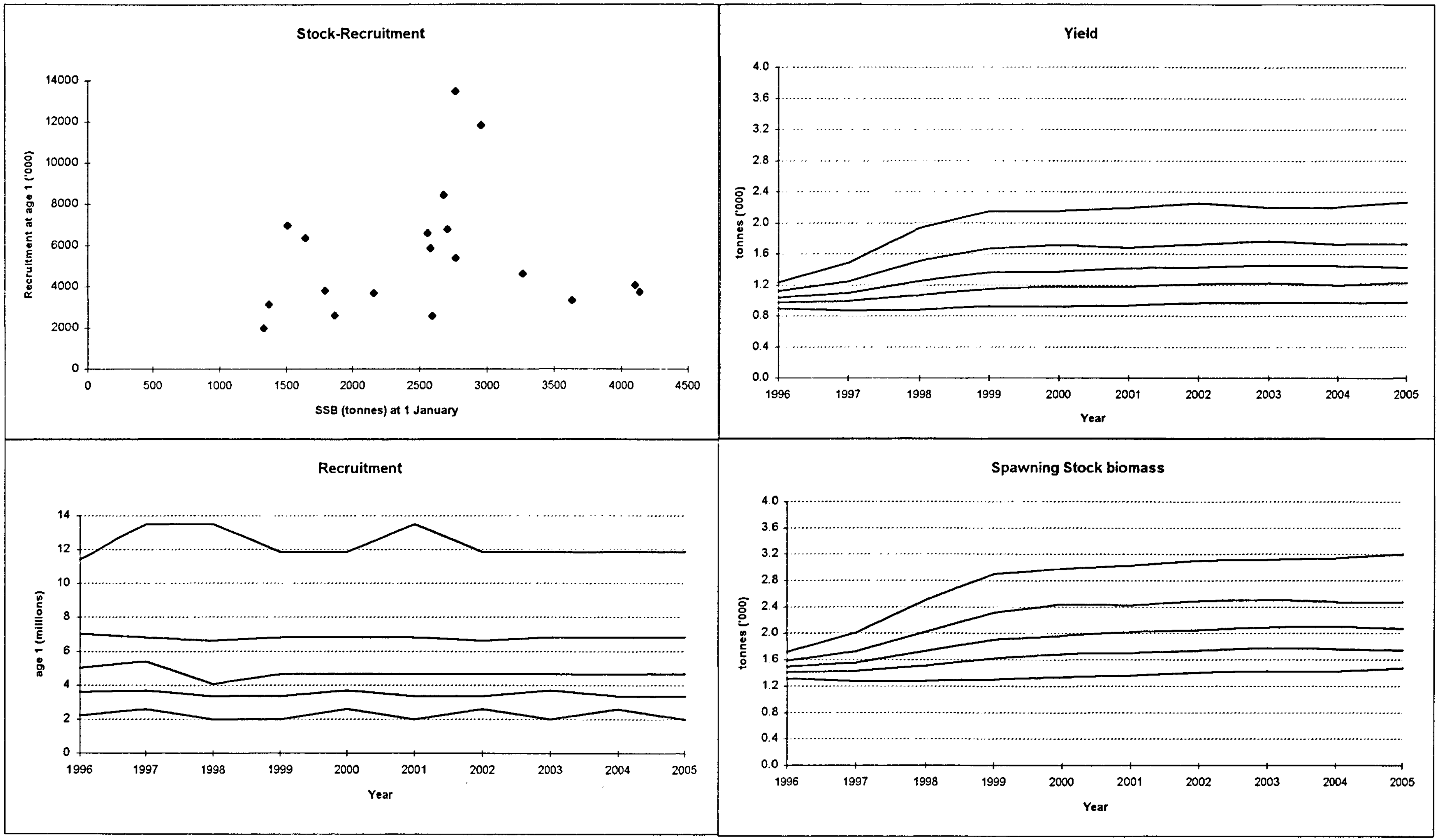


Figure 3.4.10 Plaice VIIe - Medium term predictions showing 5th,25th,50th,75th and 95th percentiles of SSB in tenth year (2005) for different F-factors applied to estimated 1995 F
No stock-recruitment relationship
500 simulations