6 Bay of Biscay Sole

Type of assessment in 2009: update.

Data revisions this year: Compared to last year assessment, there is only very limited change in data due to small revisions of 2007 landings and of 2007 commercial LPUE.

Review Group issues:

RG comments on the 2008 assessment have already been addressed in the minutes. RG agreed two WG options which were discussed by 2008 WG:

- the continued use of the RESSGASC surveys in order to ensure historic results that are in line with the basis for the agreed reference points,
- the use of a GM from 1993 to antepenultimate year in the assessment to replace the last estimate of the youngest age group because this latter is always uncertain.

6.1 General

6.1.1 Ecosystem aspects

The Bay of Biscay sole stock extends on shelf that lies along Atlantic French coast from the Spanish boarder to the West point of Brittany. Spawning grounds spread at depth from 30 to 100 m. Nursery grounds are located in the coastal waters, in bays and estuaries (map in Stock Annex in annex F).

Studies in Vilaine Bay (South Brittany) showed a significant positive relationship between the flow of Vilaine River in winter-spring and the size of the sole nursery in this area. This result led the WGSSDS (former WG "parent " of this stock) to investigate if a relationship could be found between the river flows and the sole recruitment in the Bay of Biscay at its 2006 meeting, but without any success. The environmental effect on the sole recruitment is likely to be more complex at the Bay of Biscay scale. Its knowledge is the aim of two surveys series which are planned in 2007-2009 in the Charente sounds (La Rochelle area) and in the Loire estuary.

6.1.2 Fishery description

The Bay of Biscay sole fishery (a more detailed description is provided in the Stock Annex) has two main components: the major one is a French gill net fishery directed at sole (about two third of total catches) and the other one is a French and Belgian trawl fishery (French otter or twin trawlers and Belgian beam trawlers). The otter and twin trawlers have more mixed species catches than beam trawlers which are directed at sole. The French coastal boats of these two fisheries have a larger proportion of young fish in their catch than offshore boats.

6.1.3 Summary of ICES advice for 2009 and management applicable to 2008 and 2009

ICES advice for 2009:

ICES recommends that the landings in 2009 should not exceed 4430 t; this is in accordance with the precautionary approach.

Management applicable to 2008 and 2009

The sole landings in the Bay of Biscay are subject to a TAC regulation. The 2008 TAC was set at 4582 t (4170 t increased by 412t in 2008 due to underutilisation of 2007 French quota). The 2009 TAC is set at 4390 t. The minimum landing size is 24 cm and the minimum mesh size is 70 mm for trawls and 100 mm for fixed nets, when directed on sole. Since 2002, the hake recovery plan has increased the minimum mesh size for trawl to 100 mm in a large part of the Bay of Biscay but since 2006 trawlers using a square mesh panel were allowed to use 70 mm mesh size in this area.

Since the end of 2006, the French vessels must have a Special Fishing Permit when their sole annual landing is above 2 t or to be allowed to have more than 100 kg on board.

The Belgian vessel owners get monthly non transferable individual quota for sole. The amount is related to the capacity of the vessel.

A regulation establishing a management plan has been adopted in February 2006. The objective is to bring the spawning stock biomass of Bay of Biscay sole above the precautionary level of 13 000 tonnes in 2008 by gradually reducing the fishing mortality rate on the stock. Once this target is reached, the Council should decide on a long-term target fishing mortality and a rate of reduction in the fishing mortality for application until the target has been reached. However, although the stock was estimated close to the SSB target in 2008, the long-term target fishing mortality rate and the associated rate of reduction has not yet been set. The management plan established in 2006 has not been evaluated by ICES.

6.2 Data

6.2.1 Commercial catches and discards

The WG estimates of landings and catches are shown in Table 6.1a with official landings. The WG landing estimates are the figure obtained by crossing auction sales, available logbooks and data communicated by the administrations of countries involved in the Bay of Biscay sole fishery. They can be largely different from the official landings in some years, for instance when official figures are still provisional or when the TAC is largely overshot (year 2002).

The 2007 landings estimate was revised 2% higher to 4363 t.

In 2002, landings were increased to 5486 t by hydrodynamic conditions very favourable to the fixed nets' fishery (frequent strong swell periods in the first quarter). In the absence of such apparently rare conditions, the landings in 2003-2008 were ranging from between 4000t and 4800t. The 2008 figure is 10 % below the landings predicted by the 2008 WG at *status quo* mortality (4754 t).

Discards estimates were provided for the French offshore trawler fleet from 1984 to 2003 using the RESSGASC surveys. Because these estimates depend largely on some questionable hypothesis, their monitoring was not continued in 2004 and they are no longer used in the assessment. However, they show that discards of offshore trawlers at age 2 and above are likely low in recent years.

Available discards estimates for a limited number of trips have shown that discards of beam trawlers and gillnetters are generally low but they show that the inshore trawlers fleet may have occasionally high discards of sole (mainly at age 1).

6.2.2 Biological sampling

Length compositions are available on a quarterly basis from 1984 for the French fleets and from 1994 for the Belgian beam trawlers. The French length distributions are shown on Figures 6.2 a, b & c from 1984 onwards. The relative length distribution of landings in 2008 is shown by country in Table 6.3.

The quarterly French sampling for length compositions is by gear (trawl or fixed net) and boat length (below or over 12m long). The split of the French landings in these components is made as described in Stock Annex. The 2007 split was slightly revised because some late recording of logbooks in the database in 2007 (Table 6.1 b).

Age compositions are estimated using the same procedure as in previous years, as described in Stock Annex (Table 6.4 and Figures 6.3 a & b).

International mean weights at age of the catch are French-Belgian quarterly weighted mean weights (Table 6.5). In 2007 and 2008, the estimate is calculated using the new fresh/gutted transformation coefficient of the French landing which was changed from 1.11 to 1.04 in 2007.

The discrepancy between French and Belgian mean weight at age still exists (ICES files). An investigation of this problem was carried out in 2005-2006. It has shown that the discrepancy results from differences in age reading due to the reading methods (on burning sections in France and on slices in Belgium) and, to a lesser extend, to the age readers (about 80% of agreement on a set of otoliths). The reading is now carried out in France using the two methods, to be able to a have a new homogeneous international series in the future.

6.2.3 Abundance indices from surveys

Two CPUE FR-RESSGASC-S surveys are available for the tuning process from 1987, but they are both terminated after 2002. Indices of abundance, measured in number per 100 hours, are presented in Table 6.6.

6.2.4 Commercial catch- effort data

The French La Rochelle and Les Sables trawler series of commercial fishing effort data and LPUE indices were completely revised in 2005. A selection of fishing days (or trips before 1999) was made by a double threshold (sole landings >10% and *nephrops* landings <=10%) for a group of vessels. The process is described in the Stock Annex.

A third French commercial fleet LPUE series was added in 2005. It is formed by offshore trawlers landing sole in other harbours than Les Sables and La Rochelle fleets. It adds information on LPUE in the northern part of the Bay of Biscay, but the quality is lower because it was not possible to carry out the same selection process of vessels than for the two other fleets.

These three series were revised because some 2007 logbooks were not available at the time of the 2008 WG meeting. An estimate of the total effort of French offshore trawlers (using LPUE calculated for the whole trawler fleet) shows that, after a decrease until 1999, the effort of this fleet is stable in recent years (Table 6.2a and Figure 6.1a). After a low in 2003-2004, the effort of the Belgian beam trawl fleet has returned to its previous 2001-2002 level, but it has decreased again in 2008.

The La Rochelle LPUE series (FR-ROCHELLE) shows a decreasing trend from 1990 to 2001. Later on, the series does not exhibit any trend but some up and down variations

(Figure 6.1b). The Les Sables d'Olonne LPUE series (FR-SABLES) shows also a declining trend up to 2003. Thereafter, it shows an increasing trend but this latter is moderate since 2005. The "other French trawlers" series has remained relatively stable.

The Belgian LPUE series was relatively constant from 1990 to 1996, declined severely afterwards until 2002 but has increased in 2003 to return to the 1997-2000 level (Table 6.2b). Later on, its trend is flat.

6.3 Assessment

6.3.1 Input data

Stock weights are set to the catch weights, using the same fresh/gutted transformation coefficient for the French landings in 2007 and 2008 than the preceding years (1.11).

As in previous assessments, natural mortality is assumed to be 0.1 for all age groups and all years.

The following observed maturity ogive (estimation described in Stock Annex) is used in all years:

AGE	≤ 1	2	3	4	≥ 5
Mature	0	0.32	0.83	0.97	1

Proportions of F and M before spawning were set to zero, as in previous years, to reflect SSB at 1st January.

6.3.2 Model

As in previous years, the model chosen by the Group to assess this stock was XSA.

The age range in the assessment is 2-8+, as last year assessment.

The year range used is 1984-2008.

Catch-at-age analysis and Data screening

The results of exploratory XSA runs, which are not included in this report, are available in ICES files.

A separable VPA was run to screen the catch-at-age data. The same settings as last year were used: terminal F of 0.6 on age 4 and terminal S of 0.9. There were no anomalous residuals apparent in recent years.

Three commercial fleets (FR-SABLES, FR-ROCHELLE French offshore trawlers and BEL-BT Belgian beam trawlers) and two quarterly FR-RESSGASC-S survey CPUE series (from 1987 to 2002) are available for tuning (Table 6.7). The table below summarizes the available information on the commercial tuning fleets.

FLEET TYPE	ACRONYM	PERIOD	AGE RANGE	LANDING CONTRIBUTION
Offshore otter trawlers	FR-SABLES	1991 – 2008	0 – 8	<1 %
Offshore otter trawlers	FR-ROCHELLE	1991 – 2008	0 – 8	<1 %
Offshore beam trawlers	BEL-BT	1997 – 2008	0 – 8	7 %

XSA tuning runs (low shrinkage s.e. = 2.5, no taper, other settings as in last year tuning) were carried out on data from each fleet individually. The results showed small residuals for FR-SABLES and FR-ROCHELLE.

The Belgian beam trawlers fleet presents high residuals in comparison with the French commercial fleets and was excluded because of the discrepancy in age reading between France and Belgium as in preceding years.

Exploratory run

The two RESSGASC fleets have no effect on recent years trends but, as notice by the previous WG, they increase the fishing mortalities before 1992 and, inversely, lower the SSB. In order to limit change in historical trends and to have some coherence with preceding assessments, two series are kept in the tuning files, as agreed by the 2008 RG. The management plan in force for this stock, which includes a biomass target largely based on the SSB trend, reinforces particularly the need to be consistent in that case on choices which affect long term trend of the SSB.

Final XSA run

The final XSA was run using the same settings than in last year assessment.

			2008 XSA			2009 XSA
Catch data range			84-07			84-08
Catch age range			2-8+			2-8+
Fleets	FR – SABLES	91-07	2-7	FR – SABLES	91-**08**	2-7
	FR – ROCHELLE	91-07	2-7	FR – ROCHELLE	91-**08**	2-7
	FR – RESSGASC2	87-02	2-7	FR – RESSGASC2	87-02	2-7
	FR – RESSGASC4	87-02	2-7	FR – RESSGASC4	87-02	2-7
Taper			No			No
Ages catch dep.			No			No
Q plateau			6			6
F shrinkage se			1.5			1.5
Year range			5			5
age range			3			3
Fleet se threshold			0.2			0.2
F bar range			3-6			3-6

The results are given in Table 6.8. The log-catchability residuals are shown in Figure 6.4 a & b and retrospective results in Figure 6.5. As in last year assessment, the retrospective patterns shows some diverging trends prior to 1991. This lack of convergence is reduced by the removal of the RESSGASC survey series. Differences in lengths of commercial series and in those of survey series and in their trend are likely to be the cause of this problem.

The two commercial fleets drive almost entirely the estimates of survivors. The FR-RESSGASC-S surveys have no weight at any age and the F shrinkage receives less than 2 % throughout. Commercial fleet estimates are close at all ages and also receive a close weight at all ages.

Fishing mortalities and stock numbers at age are given in Tables 6.9 and 6.10 respectively. The results are summarised in Table 6.11. Trends in yield, F, SSB and recruitments are plotted in Figure 6.6. Fishing mortality in 2008 is estimated by XSA to have been at 0.38. Fishing mortality in 2007 is now estimated at 0.38, lower than in last year WG report (0.45).

6.3.3 Assessment results

6.3.3.1 Estimating year class abundance

The 2005 year class is estimated to be 23.1 million 2 year olds by XSA. Last year's WG XSA estimate (21.5 million) was not accepted by the WG which preferred to overwrite this year class with the GM (22.9 million) because the lack of reliability of the XSA estimates that shows the retrospective analysis. The present value indicates that this year class strength is close to the average.

The 2006 year class is estimated to be at 21.3 million 2 year olds by XSA. The WG considered that this XSA recruitment estimate in terminal year could not be accepted because it is no more reliable than in the preceding year. It was overwritten by a short series GM from 1993 as in preceding assessments since there is observed fall in stock numbers at age 2 after 1993. As in last year assessment, a mean from 1993 up to two years before the terminal years (2006) was preferred to a mean to one year before the terminal year (2007) because the retrospective pattern shows that convergence may not be before two years when terminal year estimate differs largely from posterior annual estimate. The $GM_{93\text{-}06}$ is also used to estimate subsequent recruitments.

Recruitment at age 2

YEAR CLASS	THOUSANDS	BASIS	SURVEYS	COMMERCIAL	SHRINKAGE
2005	23068	XSA	0 %	99 %	1 %
2006	23191	GM(93-06)			
2007 & subsequent	23191	GM(93-06)			

6.3.3.2 Historic trends in biomass, fishing mortality and recruitment

A full summary of the time series of XSA results is given in Table 6.11 and illustrated in Figure 6.6.

Since 1984, fishing mortality gradually has increased, peaked in 2002 and decreased substantially the following two years. Later on, the trend is much more flat, fishing mortality ranging between 0.43 in 2005 and 0.38 in 2007 and 2008.

SSB trend in earlier years increases from 10600 t in 1984 to 16 600 t in 1993, afterwards it shows a continuous decrease to 9 700 t in 2003. After a 18 % increase in 2004, a lower but continuous increase is observed from 2004 onwards. It leads to an SSB estimate of 13700 t in 2008.

The recruitment values are lower since 1993. Afterwards, the series is relatively stable, but three low values are worth noting in 2001, 2004 and 2005.

6.3.4 Catch options and prognosis

The exploitation pattern is the unscaled mean over the period 2006-2008 (over 2006-2007 at age 2), considering there is no trend in F in the last three years of the assessment. This *status quo* F is estimated at 0.39.

The recruits at age 2 from 2009 to 2011 are assumed equal to $GM_{93\text{-}06}$. Stock number at age 3 in 2009 is derived from $GM_{93\text{-}06}$ reduced by total estimated mortality. Stock numbers at ages 4 and above in 2008 are the XSA estimates.

Weights at age in the landings are the 2006-2008 unweighted means using the new fresh/gutted transformation coefficient of French landing which was changed from 1.11 to 1.04 in 2007. Weights at age in the stock are the 2006-2008 unweighted means

using the old fresh/gutted transformation coefficient of French landing (1.11). The predicted spawning biomass are consequently still comparable to the biomass reference point of the management plan.

6.3.4.1 Short term predictions

Input values for the catch forecast are given in Table 6.12.

The landings forecasts is 4867 t in 2009 (TAC is set at 4390 t), 13 % higher than the 2008 landings.

Assuming recruitment at GM $_{93\text{-}06,}$ the SSB is predicted to increase slowly to 14500 t in 2009 and to 14600 t in 2010, at *status quo* F. It will keep the same low growth at *status quo* F, to reach 14700t in 2011 (Tables 6.13 and 6.14).

The proportional contributions of recent year classes to the landings in 2010 and to the SSB in 2011 are given in Table 6.15. Year classes for which GM recruitment has been assumed (2006 to 2008) contribute 57 % of the 2010 landings and 70 % of the 2011 SSB.

6.3.4.2 Yield and Biomass Per Recruit

Results for yield and SSB per recruit, conditional on *status quo* F, are given in Table 6.16 and in Figure 6.7. The landings $\mathbf{F}_{sq}$ (0.39) is 62 % above $\mathbf{F}_{max}$ (= 0.24) and 4 times $\mathbf{F}_{0.1}$ (=0.10). Long-term equilibrium landings and SSB (at F *status quo* and assuming GM recruitment) are estimated to be 5000 t and 14900t respectively.

6.3.5 Biological reference points

The values and the basis of present and past reference points and the conclusion of 2004 WGSSDS examination are given below :

	ACFM 1998	ACFM 1999	WG & ACFM	WG 2004	ACFM 2006
			Change in maturity ogive	Change in recruitment age and in Fbar age range	Change in Fbar age range
$\mathbf{F}_{lim}$	Not defined	Not defined	0.5 (potential collapse)	Not defined	$\mathbf{F}_{lim}$=0.58 (potential collapse)
$\mathbf{F}_{pa}$	0.40 (*prob* (SSB_{MT}<$\mathbf{B}_{pa}$)<.1)	0.45 (*prob* (SSB_{MT}<$\mathbf{B}_{pa}$)<.05)	$\mathbf{F}_{pa} = \mathbf{F}_{lim}\ e^{(-1.645 * .2)} = 0.36$.	F proposal to promote SSB increase in the short- to medium-term	$\mathbf{F}_{pa} = \mathbf{F}_{lim}\ e^{(-1.645 * .2)} = 0.42$
$\mathbf{B}_{lim}$	Not defined	Not defined	Not defined	Not defined	Not defined
$\mathbf{B}_{pa}$	11 300 t ($\mathbf{B}_{loss}$)	11 300 t ($\mathbf{B}_{loss}$)	13 000 t	Not relevant	13 000t

6.3.6 Comments on the assessment

Sampling

The sampling level (table 1.3) for this stock is considered to be satisfactory.

The Working Group considers that the lack of survey index, especially for estimating the incoming recruitment, is an important deficiency in this assessment.

An age reading discrepancy causes a gap between the French and Belgian numbers at age distribution and the weights at age.

Discarding

Available data on discards have shown that discards may be important at age 1 but they are likely low at age 2 and above in recent years. The limited available discards sampling does not allow to have an estimate of these discards.

Consistency

The RESSGASC series has been kept in the tuning series in view to have consistency in historical trends in F and SSB. Even if they do not contribute to terminal year estimates, the removal of these series changes rather substantially the earlier part of the trends. The WG preferred consequently to keep them in the tuning file to be consistent with preceding WGs. The implementation on a management plan aiming at a SSB target reinforces this need of consistency in trend on which are based reference points.

The retrospective results show that the XSA recruitment estimate in terminal year is very uncertain; it was consequently overwritten with a GM estimate, as in previous WG assessment. This GM estimate has a very large contribution in predicted landings and SSB. Furthermore, it is worth noting that variability of recruit series has increased since 2001 and that, in recent period, the use of GM estimate has lead several times to forecast an increase in SSB which was superior to the observed one in following years.

A retrospective pattern in F is also worth noting. It leads to a downward revision of F in 2007, which is now estimated to be below F_{pa}.

The definition of reference groups of vessels and the use of thresholds on species percentage to build the French series of commercial fishing effort data and LPUE indices is considered to provide representative LPUE of change in stock abundance by taking into account long term change in fishing power and change in fishing practices in the sole fishery.

Misreporting

Misreporting is likely to be limited for this stock but it may have occurred for fish of the smallest market size category in recent years.

Industry input

A meeting with representatives of the fishing industry was held in France prior to the WG to present the data used by the 2009 WG to assess the Bay of Biscay sole stock. The participants did not express reservations on these data.

6.3.7 Management considerations

The assessment indicates that SSB has decreased continuously to 9700 t in 2003, since a peak in 1993 (16 600 t), has increased to 11500t in 2004 but more slowly since then to reach 13700 t in 2008. The SSB is forecast to be 14500t in 2009 assuming GM recruitment.

The management plan agreed in 2006 for this stock aims to bring the SSB at 13000 t in 2008 in a first step. According to the last forecast, this aim has been reached and the plan should enter in its second step, with a new agreement on long term target as well as on the rules to reach it.

Table 6.1 a : Bay of Biscay sole (Division VIIIa,b). Internationnal landings and catches used by the Working Group (in tonnes).

	Official landings						Unallocated	WG	Discards [2]	WG
Years	Belgium	France[1]	Nether.	Spain	Others	Total	landings	landings		catches
1979	0	2376		62*		2443	176	2619	-	-
1980	33*	2549		107*		2689	297	2986	-	-
1981	4*	2581*	13*	96*		2694	242	2936	-	-
1982	19*	1618*	52*	57*		1746	2067	3813	-	-
1983	9*	2590	32*	38*		2669	959	3628	-	-
1984		2968	175*	40*		3183	855	4038	99	4137
1985	25*	3424	169*	308*		3925	326	4251	64	4315
1986	52*	4228	213*	75*		4567	238	4805	27	4832
1987	124*	4009	145*	101*		4379	707	5086	198	5284
1988	135*	4308		0		4443	939	5382	254	5636
1989	311*	5471		0		5782	63	5845	356	6201
1990	301*	5231		0		5532	384	5916	303	6219
1991	389*	4315		3		4707	862	5569	198	5767
1992	440*	5928		0		6359	191	6550	123	6673
1993	400*	6096		13		6496	-76	6420	104	6524
1994	466*	6627		2***		7095	134	7229	184	7413
1995	546*	5326		0		5872	333	6205	130	6335
1996	460*	3842		0		4302	1552	5854	142	5996
1997	435*	4526		0		4961	1298	6259	118	6377
1998	469*	3821	44	0		4334	1693	6027	127	6154
1999	504	3280		0		3784	1465	5249	110	5359
2000	451	5293		5***		5749	11	5760	51	5811
2001	361	4350	201	0		4912	-76	4836	39	4875
2002	303	3680		2***		3985	1501	5486	21	5507
2003	296	3805		4***		4105	3	4108	20	4128
2004	324	3739		9***		4072	-70	4002	-	-
2005	358	4003		10		4371	168	4539	-	-
2006	393	4030		9		4432	361	4793	-	-
2007	401	3707		9		4117	246	4363	-	-
2008	305	2514**			2*	2821	1479	4300		

[1] including reported in VIII or VIIIc,d [2] Discards = Partial estimates for the French offshore trawlers fleet
* reported in VIII ** Preliminary *** reported as *Solea* spp (*Solea lascaris* and *solea solea*) in VIII

Table 6.1 b : Bay of Biscay sole (Division VIIIa,b). Contribution (in %) to the total landings by differents fleets.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Shrimp trawlers	7	7	8	11	6	5	4	3	3	2	2	2	1	1	1
Inshore trawlers	29	28	27	25	31	29	30	25	27	25	17	13	13	12	13
Offshore otter trawlers	61	62	60	60	59	60	45	45	47	46	41	41	39	31	28
Offshore beam trawlers	0	1	0	0	0	0	1	1	2	3	5	5	7	7	6
Fixed nets	3	3	5	4	4	6	20	26	20	24	35	39	40	49	52

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Shrimp trawlers	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inshore trawlers	11	13	12	11	10	5	8	9	7	8	9	7	8	9	6
Offshore otter trawlers	29	26	26	30	30	24	21	24	18	24	23	21	19	21	19
Offshore beam trawlers	6	9	8	7	8	10	8	8	6	7	8	8	9	9	7
Fixed nets	52	53	54	52	52	61	63	59	70	60	60	63	64	61	69

Table **6.2 a** : Bay of Biscay sole LPUE and indices of fishing effort for French offshore trawlers.

Year	CPUE RESSGASC survey (kg/H) term		LPUE La Rochelle offshore trawlers of French sole fishery	LPUE Les Sables offshore trawlers of French sole fishery	LPUE Other harbours * offshore trawlers of French sole fishery	LPUE All offshore trawlers of French sole fishery	effort index All offshore trawlers of French sole fishery
	2	4	(kg/h)	(kg/h)	(kg/h)	(kg/h)	(1000 h)
1984	-	-	6.0	6.9	5.0	5.9	557
1985	-	-	5.6	6.5	4.3	4.9	454
1986	-	-	7.2	7.2	4.5	5.5	526
1987	0.7	1.1	6.6	5.9	4.6	5.4	816
1988	1.6	0.7	6.4	6.7	4.1	5.1	944
1989	1.2	0.9	5.5	6.1	4.5	5.1	996
1990	1.0	1.6	7.1	6.3	4.9	5.7	975
1991	1.1	2.2	6.5	6.5	4.7	5.4	954
1992	0.8	2.1	5.4	5.6	4.9	5.1	884
1993	1.0	1.5	4.6	6.4	4.9	5.2	791
1994	1.0	1.8	5.0	6.6	5.8	5.6	944
1995	1.0	1.8	4.6	5.4	5.0	5.2	742
1996	1.8	2.1	4.9	6.0	5.0	5.4	628
1997	1.2	1.4	4.1	5.3	4.6	4.7	774
1998	1.9	2.2	4.2	5.3	4.2	4.2	834
1999	1.1	0.9	3.7	5.9	4.2	4.5	524
2000	0.9	0.7	4.0	5.7	4.7	4.7	577
2001	1.0	1.0	3.4	4.0	5.2	4.7	454
2002	0.8	1.2	4.4	5.0	4.6	4.6	430
2003	-	-	4.1	3.9	4.8	4.6	447
2004	-	-	4.0	4.1	4.7	4.4	448
2005	-	-	3.9	5.2	4.2	4.2	495
2006	-	-	3.4	5.4	4.5	4.5	465
2007	-	-	3.5	5.3	4.6	4.5	440
2008	-	-	4.1	5.6	4.6	4.5	468

* French offshore trawlers in other harbours than in La Rochelle and Les Sables

Table 6.2 b : Bay of Biscay sole fishing effort and LPUE for Belgian beam trawlers.

Year	Landing (t)	Effort (1000 h)	LPUE (kg/h)
1976	26.3	1.7	15.5
1977	64.4	3.4	18.7
1978	29.8	1.7	17.7
1979			
1980	33.1	1.9	17.9
1981	4.1	0.3	16.4
1982	20.5	1.1	18.6
1983	10.2	0.6	17.3
1984			
1985	26.7	1.6	17.2
1986	52.0	2.8	18.4
1987	124.0	7.7	16.1
1988	134.7	5.6	24.1
1989	311.0	16.7	18.6
1990	309.4	9.0	34.3
1991	400.5	9.8	41.0
1992	452.9	14.8	30.6
1993	399.7	10.7	37.5
1994	467.6	13.5	34.6
1995	446.7	13.5	33.0
1996	459.8	13.6	33.9
1997	435.4	16.2	26.9
1998	463.1	17.8	26.1
1999	498.7	20.8	24.0
2000	459.2	19.2	23.9
2001	368.2	17.5	21.1
2002	310.6	16.5	18.8
2003	295.8	12.5	23.6
2004	318.7	12.2	26.2
2005	365.1	15.0	24.3
2006	392.9	16.7	23.5
2007	404.2	16.3	24.8
2008	305.1	12.9	23.6

Table 6.3 : Bay of Biscay Sole - 2008
French and Belgian relative length distribution of landings

Length(cm)	France	Belgium
15	0.00	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00
19	0.00	0.00
20	0.00	0.00
21	0.00	0.00
22	0.23	0.25
23	1.37	3.25
24	5.02	9.21
25	6.72	11.61
26	7.55	9.72
27	7.75	17.07
28	9.61	13.49
29	11.00	11.69
30	11.04	7.90
31	8.97	4.90
32	7.25	4.13
33	5.20	2.39
34	4.34	1.67
35	3.01	0.96
36	2.24	0.72
37	1.90	0.48
38	1.46	0.28
39	1.16	0.17
40	1.06	0.08
41	0.87	0.01
42	0.63	0.01
43	0.43	0.01
44	0.38	0.00
45	0.26	0.00
46	0.20	0.00
47	0.10	0.00
48	0.11	0.00
49	0.05	0.00
50	0.04	0.00
51	0.02	0.00
52	0.01	0.00
53	0.02	0.00
54	0.01	0.00
55	0.00	0.00
Total	100.00	100.00

Table 6.4 : Bay of Biscay Sole, Catch number at age (in thousands)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	
Age													
2	5901	8493	6126	3794	4962	4918	7122	4562	4640	1897	2603	3249	
3	3164	4606	4208	5634	5928	6551	6312	6302	7279	7816	5502	5663	
4	2786	2479	2673	3578	4191	3802	4423	4512	4920	6879	8803	6356	
5	2034	1962	2301	2005	2293	3147	2833	2083	2991	3661	5040	3644	
6	1164	906	1512	1482	1388	2046	972	1113	2236	1625	1968	1795	
7	880	708	1044	690	874	967	1018	1063	1124	566	970	843	
+gp	1181	729	1235	714	766	499	870	981	951	708	696	986	
TOTALNUM	17110	19883	19099	17897	20402	21930	23550	20616	24141	23152	25582	22536	
TONSLAND	4038	4251	4805	5086	5382	5845	5916	5569	6550	6420	7229	6205	
SOPCOF %	107	103	102	102	101	101	100	102	100	100	100	100	

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Age													
2	3027	3801	4096	2851	5677	3004	5192	4213	3396	4114	3421	3952	3154
3	5180	9079	5550	5113	7015	6447	4770	6315	5391	3428	4081	5006	4710
4	5409	5380	6351	4870	5143	4942	4945	2246	3300	3604	3673	2574	2931
5	2343	3063	2306	2764	2542	1807	3095	1225	920	2224	1960	1652	1363
6	1697	1578	1237	1314	955	929	1261	730	662	922	993	1179	1227
7	1366	692	785	902	421	522	613	377	272	487	612	640	916
+gp	1319	877	1188	977	444	489	437	251	333	503	1081	905	907
TOTALNUM	20341	24470	21513	18791	22197	18140	20313	15357	14274	15282	15821	15908	15208
TONSLAND	5854	6259	6027	5249	5760	4836	5486	4108	4002	4539	4793	4363	4300
SOPCOF %	100	100	101	100	101	101	101	101	101	102	102	100	100

Table 6.5 : Bay of Biscay Sole, Catch weight at age (in kg)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	
Age													
2	0.121	0.106	0.102	0.141	0.134	0.136	0.131	0.143	0.146	0.145	0.147	0.16	
3	0.168	0.174	0.173	0.201	0.19	0.188	0.179	0.192	0.196	0.197	0.195	0.206	
4	0.213	0.252	0.245	0.285	0.272	0.258	0.241	0.26	0.262	0.267	0.251	0.252	
5	0.269	0.313	0.328	0.376	0.357	0.354	0.348	0.325	0.341	0.341	0.324	0.308	
6	0.329	0.39	0.409	0.467	0.495	0.437	0.436	0.437	0.404	0.439	0.421	0.403	
7	0.368	0.457	0.498	0.497	0.503	0.543	0.601	0.535	0.49	0.569	0.569	0.484	
+gp	0.573	0.698	0.657	0.682	0.604	0.799	0.854	0.715	0.715	0.677	0.774	0.658	
SOPCOFAC	1.0712	1.0302	1.0197	1.0248	1.008	1.0055	1.0039	1.0183	1.0004	1.0008	1.0016	1.0023	

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007*	2008*
Age													
2	0.159	0.142	0.161	0.177	0.171	0.153	0.171	0.18	0.19	0.191	0.196	0.174	0.176
3	0.204	0.193	0.212	0.219	0.207	0.22	0.209	0.226	0.228	0.231	0.241	0.229	0.228
4	0.268	0.256	0.257	0.246	0.276	0.266	0.263	0.307	0.291	0.301	0.275	0.294	0.286
5	0.319	0.319	0.335	0.305	0.343	0.344	0.319	0.362	0.391	0.369	0.344	0.317	0.353
6	0.399	0.406	0.41	0.404	0.452	0.429	0.465	0.487	0.493	0.428	0.448	0.397	0.375
7	0.453	0.502	0.501	0.533	0.573	0.52	0.592	0.657	0.643	0.468	0.441	0.463	0.388
+gp	0.625	0.678	0.7	0.582	0.755	0.62	0.686	0.643	0.81	0.677	0.617	0.521	0.586
SOPCOFAC	0.9998	1.0048	1.0091	1.0006	1.0066	1.0102	1.0119	1.0061	1.0092	1.0209	1.0154	1.0029	1.0011

(*) In 2007 and 2008, French catch weight at age computed using the new fresh/gutted transformation coefficient (1.04)
Before 2007, the French fresh/gutted transformation coefficient is 1.11
The Belgian fresh/gutted transformation coefficient is 1.05

Table 6.6 : Ressgasc indices of sole VIIIa,b abundance (No/100h)

FR - RESSGASC 2

Year \ Age	1	2	3	4	5	6	7	8
1987	9	106	85	51	18	15	3	15
1988	215	557	228	95	47	17	4	2
1989	21	279	200	64	32	14	12	6
1990	7	441	129	73	34	4	6	2
1991	7	189	181	128	45	19	7	13
1992	0	78	139	116	42	19	3	13
1993	0	43	150	146	97	28	15	13
1994	3	218	166	133	38	10	8	5
1995	30	155	165	80	44	28	23	10
1996	18	359	504	266	53	30	12	11
1997	24	180	385	130	41	16	9	13
1998	1	375	338	311	82	31	18	4
1999	5	220	226	94	41	30	9	2
2000	2	153	156	126	48	13	7	6
2001	11	179	181	106	34	25	13	5
2002	4	132	140	62	35	10	7	3

FR - RESSGASC 4

Year \ Age	1	2	3	4	5	6	7	8
1987	503	160	109	54	24	10	3	3
1988	212	152	79	25	14	11	6	1
1989	87	137	93	48	35	29	8	5
1990	67	390	203	77	49	10	10	10
1991	397	553	298	88	20	9	4	3
1992	107	860	283	65	25	9	3	4
1993	87	218	234	111	46	24	1	0
1994	99	333	272	128	44	6	5	12
1995	201	463	230	105	47	12	4	4
1996	323	513	221	96	27	8	11	11
1997	76	177	272	103	44	19	12	13
1998	75	371	396	224	33	18	9	6
1999	15	174	114	88	21	14	8	2
2000	23	74	79	66	36	7	4	3
2001	26	132	143	92	33	11	2	2
2002	54	164	146	51	36	19	5	3

Table 6.7 : Sole 8ab, available tuning data (landings)
SOLE VIIIa,b commercial landings (N in 10**-3) and survey catch - Fishing effort in hours
Series, year and range used in tuning are shown in bold type

FR - SABLES

Year	Fishing effort	1	2	3	4	5	6	7	8
1991	33763	30.5	**242.1**	**332.8**	**194.7**	**73.8**	**32.4**	**23.6**	19.5
1992	30445	3.7	**236.8**	**285.8**	**130.2**	**59.5**	**32.1**	**15.0**	11.9
1993	34273	3.7	**152.0**	**441.3**	**224.0**	**75.7**	**27.0**	**8.0**	10.9
1994	20997	1.2	**94.1**	**157.4**	**184.3**	**77.3**	**24.2**	**13.4**	10.8
1995	31759	7.3	**173.4**	**228.1**	**177.1**	**69.1**	**34.1**	**15.9**	19.5
1996	31518	13.0	**193.0**	**222.6**	**169.8**	**55.6**	**37.8**	**29.4**	23.2
1997	27040	5.0	**140.9**	**290.9**	**114.2**	**49.0**	**26.7**	**10.6**	11.4
1998	16260	0.8	**86.9**	**112.1**	**113.6**	**31.4**	**13.8**	**8.1**	7.7
1999	12528	0.0	**64.9**	**53.2**	**39.7**	**26.8**	**15.0**	**15.2**	17.6
2000	11271	3.4	**81.3**	**121.3**	**45.0**	**15.7**	**8.4**	**4.7**	4.7
2001	9459	2.4	**35.2**	**67.8**	**35.8**	**8.7**	**5.1**	**2.9**	2.0
2002	10344	7.2	**76.9**	**60.5**	**37.7**	**19.4**	**8.3**	**3.8**	1.7
2003	7354	1.5	**39.1**	**49.3**	**14.3**	**7.8**	**4.0**	**1.7**	0.6
2004	6909	2.7	**38.7**	**36.4**	**23.0**	**5.7**	**3.9**	**1.7**	1.8
2005	6571	11.2	**46.4**	**23.5**	**23.4**	**14.8**	**6.4**	**3.5**	3.2
2006	6223	8.6	**61.4**	**31.0**	**14.4**	**5.8**	**3.3**	**2.2**	3.9
2007	5954	1.1	**32.2**	**26.4**	**18.3**	**15.4**	**9.9**	**6.0**	7.8
2008	4321	0.0	**22.0**	**23.2**	**16.5**	**8.4**	**7.0**	**5.0**	5.8

FR - ROCHEL

Year	Fishing effort	1	2	3	4	5	6	7	8
1991	15250	14.7	**134.8**	**157.4**	**88.9**	**30.3**	**11.6**	**6.7**	5.5
1992	12491	0.8	**99.4**	**130.1**	**58.7**	**21.2**	**9.1**	**4.5**	2.8
1993	12146	0.6	**53.3**	**126.5**	**51.8**	**17.2**	**6.4**	**2.1**	2.0
1994	8745	0.7	**42.4**	**56.5**	**52.9**	**19.4**	**6.4**	**2.7**	1.5
1995	4260	1.9	**25.9**	**31.3**	**20.7**	**7.2**	**2.4**	**1.1**	1.1
1996	10124	10.6	**113.1**	**74.6**	**34.3**	**8.8**	**5.0**	**3.1**	2.8
1997	12491	3.8	**74.1**	**117.6**	**35.8**	**12.6**	**7.3**	**2.6**	2.6
1998	10841	1.6	**77.7**	**65.4**	**57.9**	**11.3**	**4.7**	**2.9**	2.8
1999	8311	0.0	**53.7**	**31.6**	**19.0**	**10.1**	**6.4**	**4.3**	2.1
2000	8334	3.6	**63.3**	**45.1**	**19.3**	**6.5**	**2.7**	**1.4**	2.6
2001	7074	2.1	**22.4**	**38.1**	**23.9**	**6.2**	**3.8**	**2.0**	1.9
2002	6957	9.1	**90.1**	**36.2**	**11.8**	**5.4**	**2.3**	**1.2**	0.4
2003	5028	2.2	**37.4**	**40.0**	**9.1**	**3.7**	**1.8**	**0.5**	0.2
2004	1899	1.0	**12.1**	**11.8**	**4.4**	**1.0**	**0.7**	**0.3**	0.4
2005	3292	2.5	**18.2**	**10.5**	**8.5**	**5.0**	**2.2**	**1.2**	1.3
2006	2304	1.6	**10.5**	**7.8**	**5.6**	**2.3**	**1.1**	**0.6**	1.2
2007	2553	0.4	**14.3**	**19.9**	**3.6**	**2.3**	**1.5**	**0.6**	1.0
2008	1887	0.3	**10.9**	**14.4**	**5.9**	**2.1**	**1.5**	**1.1**	1.0

FR - RESSGASC 2

Year	Fishing effort	1	2	3	4	5	6	7	8
1987	80	7.0	**84.9**	**67.7**	**40.9**	**14.1**	**11.8**	**2.0**	11.7
1988	85	182.9	**473.2**	**193.6**	**81.1**	**39.9**	**14.5**	**3.8**	2.0
1989	82	17.3	**228.9**	**163.6**	**52.8**	**26.6**	**11.3**	**9.5**	5.0
1990	85	6.2	**375.2**	**110.0**	**61.7**	**29.0**	**3.8**	**5.0**	2.0
1991	87	6.0	**164.2**	**157.1**	**111.7**	**39.3**	**16.5**	**6.2**	11.0
1992	85	0.0	**66.5**	**118.1**	**98.6**	**35.6**	**16.5**	**2.7**	11.0
1993	76	0.0	**32.7**	**113.6**	**111.3**	**73.9**	**21.4**	**11.5**	9.5
1994	79	2.7	**172.4**	**130.9**	**104.7**	**30.3**	**8.0**	**6.0**	4.0
1995	82	24.3	**126.8**	**135.3**	**65.7**	**35.8**	**22.7**	**19.0**	8.4
1996	74	13.0	**265.9**	**372.7**	**196.6**	**39.0**	**22.4**	**8.9**	8.5
1997	98	23.4	**176.4**	**377.7**	**127.7**	**40.4**	**15.6**	**8.8**	13.0
1998	85	0.6	**318.5**	**287.2**	**264.4**	**69.8**	**26.3**	**15.6**	3.6
1999	82	4.0	**180.3**	**185.5**	**77.4**	**33.2**	**24.3**	**7.2**	2.0
2000	78	1.4	**119.4**	**121.4**	**98.3**	**37.7**	**10.3**	**5.4**	5.0
2001	84	9.4	**150.2**	**152.2**	**89.4**	**28.5**	**21.1**	**11.0**	4.2
2002	47	2.0	**61.9**	**66.0**	**29.2**	**16.4**	**4.8**	**3.2**	1.5

FR - RESSGASC 4

Year	Fishing effort	1	2	3	4	5	6	7	8
1987	79	397.7	**126.7**	**86.1**	**42.4**	**18.8**	**7.8**	**2.5**	2.0
1988	93	197.6	**141.2**	**73.7**	**23.3**	**13.4**	**10.0**	**5.6**	1.2
1989	65	56.5	**89.1**	**60.2**	**31.5**	**22.5**	**18.8**	**5.5**	3.0
1990	72	48.5	**280.9**	**146.1**	**55.6**	**35.5**	**7.5**	**7.5**	7.5
1991	74	293.5	**409.1**	**220.2**	**64.8**	**14.6**	**6.6**	**2.7**	2.5
1992	72	76.7	**619.4**	**203.8**	**46.5**	**17.9**	**6.2**	**2.5**	3.0
1993	71	62.1	**155.1**	**166.2**	**79.1**	**32.5**	**17.0**	**1.0**	0.0
1994	60	59.2	**199.9**	**162.9**	**76.8**	**26.4**	**3.8**	**3.0**	7.0
1995	90	180.8	**416.7**	**206.9**	**94.3**	**42.0**	**11.2**	**3.9**	3.3
1996	61	196.8	**312.8**	**135.1**	**58.6**	**16.6**	**5.0**	**6.5**	6.5
1997	67	50.8	**118.7**	**182.5**	**69.3**	**29.7**	**13.0**	**8.1**	8.8
1998	73	55.0	**270.7**	**288.7**	**163.7**	**24.1**	**12.9**	**6.3**	4.6
1999	78	12.0	**135.8**	**88.6**	**68.3**	**16.5**	**10.9**	**6.3**	1.5
2000	38	8.6	**28.0**	**30.2**	**25.2**	**13.6**	**2.8**	**1.6**	1.0
2001	77	20.0	**101.3**	**109.8**	**70.6**	**25.3**	**8.4**	**1.7**	1.8
2002	68	36.4	**111.7**	**99.4**	**34.5**	**24.6**	**12.9**	**3.6**	1.7

BEL-BT

Year	Fishing effort	1	2	3	4	5	6	7	8
1997	10740		179.5	390.3	192.1	148.7	61.5	49.0	83.3
1998	11162		48.3	176.1	216.1	99.1	91.6	59.8	196.8
1999	14668		19.0	367.4	420.6	293.2	159.0	118.2	316.0
2000	11566		433.3	656.7	208.8	68.8	25.2	15.3	21.2
2001	13278		144.7	313.3	298.6	184.8	77.7	57.7	81.7
2002	12851		0.0	85.8	309.0	272.0	131.3	56.9	137.4
2003	11198		113.3	599.1	183.0	78.3	44.0	29.7	106.8
2004	12175		393.1	801.0	190.5	67.4	46.9	17.3	42.6
2005	15017		336.5	565.7	318.2	145.3	90.3	31.3	70.0
2006	16699		141.0	605.6	385.0	255.4	127.3	71.4	69.0
2007	16270		554.1	691.6	335.6	151.9	71.6	37.5	113.6
2008	12946		402.8	794.0	140.9	61.8	50.7	20.3	28.2

Table 6.8

```
Lowestoft VPA Version 3.1

  21/04/2009  19:50

Extended Survivors Analysis

SOLE VIIIa,b

CPUE data from file tunfilt.dat

Catch data for  25 years. 1984 to 2008. Ages  2 to   8.

     Fleet,            First, Last, First, Last, Alpha,  Beta
                  ,    year, year,  age ,  age
FR-SABLES          ,   1991, 2008,   2,     7,   .000,  1.000
FR-ROCHELLE        ,   1991, 2008,   2,     7,   .000,  1.000
FR-RESSGASC-2      ,   1987, 2008,   2,     7,   .270,   .500
FR-RESSGASC-4      ,   1987, 2008,   2,     7,   .830,   .960


Time series weights :

     Tapered time weighting not applied


Catchability analysis :

     Catchability independent of stock size for all ages

     Catchability independent of age for ages >=    6


Terminal population estimation :

     Survivor estimates shrunk towards the mean F
     of the final   5 years or the   3 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 =    .200

     Prior weighting not applied


Tuning had not converged after   30 iterations


Total absolute residual between iterations
29 and  30 =     .00019

Final year F values
Age         ,      2,      3,      4,      5,      6,      7
Iteration 29,  .1696,  .3416,  .3394,  .3490,  .4726,  .4568
Iteration 30,  .1696,  .3416,  .3394,  .3490,  .4726,  .4567


Regression weights
      , 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000, 1.000



Fishing mortalities
   Age,  1999,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008

     2,  .131,  .271,  .210,  .251,  .201,  .200,  .259,  .174,  .199,  .170
     3,  .391,  .477,  .495,  .528,  .483,  .379,  .283,  .392,  .368,  .342
     4,  .632,  .760,  .645,  .782,  .449,  .444,  .416,  .490,  .408,  .339
     5,  .708,  .710,  .584,  .987,  .392,  .297,  .538,  .372,  .378,  .349
     6,  .679,  .500,  .541,  .946,  .578,  .338,  .482,  .434,  .356,  .473
     7,  .515,  .421,  .498,  .741,  .735,  .389,  .396,  .606,  .489,  .457
```

Table 6.8 (Cont'd)
1
XSA population numbers (Thousands)

YEAR	AGE 2	3	4	5	6	7
1999	2.45E+04	1.66E+04	1.09E+04	5.72E+03	2.80E+03	2.36E+03
2000	2.52E+04	1.95E+04	1.02E+04	5.26E+03	2.55E+03	1.29E+03
2001	1.67E+04	1.74E+04	1.09E+04	4.29E+03	2.34E+03	1.40E+03
2002	2.46E+04	1.22E+04	9.59E+03	5.19E+03	2.17E+03	1.23E+03
2003	2.43E+04	1.73E+04	6.53E+03	3.97E+03	1.75E+03	7.61E+02
2004	1.97E+04	1.80E+04	9.68E+03	3.77E+03	2.43E+03	8.88E+02
2005	1.89E+04	1.46E+04	1.11E+04	5.62E+03	2.53E+03	1.57E+03
2006	2.25E+04	1.32E+04	9.96E+03	6.64E+03	2.97E+03	1.42E+03
2007	2.31E+04	1.71E+04	8.08E+03	5.52E+03	4.14E+03	1.74E+03
2008	2.13E+04	1.71E+04	1.07E+04	4.86E+03	3.43E+03	2.63E+03
Estimated population abundance at 1st Jan 2009						
	0.00E+00	1.62E+04	1.10E+04	6.90E+03	3.10E+03	1.93E+03
Taper weighted geometric mean of the VPA populations:						
	2.50E+04	1.83E+04	1.12E+04	6.00E+03	3.19E+03	1.65E+03
Standard error of the weighted Log(VPA populations) :						
	.1781	.2062	.2307	.2272	.2326	.3344

1
Log catchability residuals.

Fleet : FR-SABLES

Age	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
2	99.99	99.99	-.20	-.11	-.36	-.38	-.06	-.18	-.09	-.01
3	99.99	99.99	.17	-.12	.22	-.05	-.11	.03	.26	.06
4	99.99	99.99	.17	-.24	-.05	.40	.17	.05	.04	.47
5	99.99	99.99	.14	-.11	-.06	.27	.03	-.09	-.20	.18
6	99.99	99.99	-.08	.22	-.35	.06	-.22	.24	-.02	-.38
7	99.99	99.99	.21	.00	-.25	.20	.05	.46	-.08	.04

Age	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
2	-.15	.22	-.06	.26	-.08	.17	.48	.60	-.02	-.01
3	-.35	.46	.17	.33	.10	-.22	-.45	.03	-.35	-.17
4	-.19	.17	.00	.15	-.24	-.10	-.18	-.47	-.02	-.11
5	.31	-.04	-.31	.39	-.17	-.41	.30	-.82	.38	.21
6	.42	-.04	-.26	.39	.06	-.34	.23	-.56	.21	.43
7	.53	.03	-.33	.09	.10	-.14	.07	-.15	.64	.35

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

Age	2	3	4	5	6	7
Mean Log q	-15.1030	-14.5892	-14.5230	-14.7282	-14.7219	-14.7219
S.E(Log q)	.2589	.2511	.2326	.3158	.3009	.2829

Regression statistics :

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
2	2.40	-1.922	22.13	.11	18	.58	-15.10
3	.84	.682	13.84	.54	18	.21	-14.59
4	.73	1.783	13.13	.73	18	.16	-14.52
5	.87	.485	13.96	.48	18	.28	-14.73
6	1.15	-.457	15.74	.36	18	.36	-14.72
7	.68	2.969	12.30	.84	18	.15	-14.62

Table 6.8 (Cont'd)

Fleet : FR-ROCHELLE

Age	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
2	99.99	99.99	-.09	-.18	-.46	-.40	-.05	.32	-.06	.19
3	99.99	99.99	.26	.03	.06	-.15	-.04	.12	.18	-.03
4	99.99	99.99	.48	.16	-.18	.32	.33	-.12	-.05	.50
5	99.99	99.99	.50	.21	-.05	.22	.23	-.34	-.33	.02
6	99.99	99.99	.21	.37	-.23	.13	-.34	-.13	-.02	-.53
7	99.99	99.99	.27	.22	-.02	-.01	-.08	-.13	-.19	-.05

Age	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
2	-.03	.17	-.32	.72	.16	.21	.14	-.27	-.08	.02
3	-.42	-.18	-.07	.26	.32	-.01	-.52	-.30	.26	.23
4	-.21	-.07	.18	-.32	-.01	-.16	-.21	-.12	-.50	-.01
5	.19	-.16	.10	-.04	-.08	-.41	.36	-.30	-.22	.11
6	.50	-.35	.26	.03	.16	-.24	.37	-.14	-.30	.24
7	.21	-.36	.12	-.14	-.22	-.06	.21	.07	-.29	.19

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

Age	2	3	4	5	6	7
Mean Log q	-15.0081	-14.6371	-14.8222	-15.1825	-15.2458	-15.2458
S.E(Log q)	.2850	.2434	.2744	.2604	.2969	.1892

Regression statistics :

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

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
2	1.04	-.100	15.20	.30	18	.30	-15.01
3	.81	.893	13.72	.58	18	.20	-14.64
4	.67	2.030	13.04	.71	18	.17	-14.82
5	.81	.942	13.97	.61	18	.21	-15.18
6	1.66	-1.465	19.98	.24	18	.48	-15.25
7	.79	2.136	13.60	.87	18	.14	-15.26

1

Fleet : FR-RESSGASC-2

Age	1987	1988
2	-.53	1.06
3	-.79	.24
4	-.75	-.16
5	-.84	-.05
6	-.14	-.07
7	-.67	-.48

Age	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
2	.31	.67	-.34	-1.21	-1.48	.10	-.12	.49	.04	.83
3	.08	-.44	-.19	-.69	-.59	-.22	-.24	1.03	.57	.68
4	-.49	-.34	.08	-.13	-.14	-.10	-.37	.75	.26	1.06
5	-.34	-.25	.05	-.17	.59	-.52	-.11	.19	-.20	.81
6	-.41	-1.46	.01	.21	.32	-.68	.13	.55	-.15	.33
7	.33	-.36	-.38	-1.06	1.01	-.24	.98	.09	.14	.74

Age	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
2	.19	-.14	.40	-.28	99.99	99.99	99.99	99.99	99.99	99.99
3	.35	-.15	.12	.23	99.99	99.99	99.99	99.99	99.99	99.99
4	.01	.42	.13	-.23	99.99	99.99	99.99	99.99	99.99	99.99
5	.11	.38	.18	.17	99.99	99.99	99.99	99.99	99.99	99.99
6	.72	-.06	.68	.01	99.99	99.99	99.99	99.99	99.99	99.99
7	-.39	-.05	.53	.10	99.99	99.99	99.99	99.99	99.99	99.99

Table 6.8 (Cont'd)

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

Age ,	2,	3,	4,	5,	6,	7
Mean Log q,	-9.4219,	-9.0650,	-9.0811,	-9.3590,	-9.5764,	-9.5764,
S.E(Log q),	.6824,	.5112,	.4561,	.4070,	.5402,	.5916,

Regression statistics :

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

Age,	Slope ,	t-value ,	Intercept,	RSquare,	No Pts,	Reg s.e,	Mean Q
2,	5.50,	-.854,	6.04,	.00,	16,	3.79,	-9.42,
3,	-4.28,	-2.064,	13.48,	.01,	16,	1.98,	-9.07,
4,	.87,	.229,	9.13,	.18,	16,	.41,	-9.08,
5,	3.11,	-1.403,	10.59,	.03,	16,	1.23,	-9.36,
6,	2.75,	-.934,	12.16,	.02,	16,	1.49,	-9.58,
7,	2.87,	-1.036,	13.60,	.02,	16,	1.69,	-9.56,

1

Fleet : FR-RESSGASC-4

Age ,	1987,	1988
2 ,	-.38,	-.48
3 ,	-.48,	-.74
4 ,	-.47,	-1.24
5 ,	-.33,	-1.02
6 ,	-.18,	-.22
7 ,	.13,	.30

Age ,	1989,	1990,	1991,	1992,	1993,	1994,	1995,	1996,	1997,	1998
2 ,	-.65,	.32,	.46,	.91,	-.17,	.23,	.70,	.55,	-.23,	.58
3 ,	-.59,	.08,	.36,	.05,	-.09,	.31,	.12,	.26,	.35,	.91
4 ,	-.53,	.01,	-.04,	-.46,	-.14,	.27,	.26,	.02,	.39,	1.12
5 ,	.04,	.41,	-.56,	-.42,	.15,	-.02,	.30,	-.23,	.14,	.18
6 ,	.72,	-.41,	-.50,	-.03,	.48,	-.75,	-.37,	-.37,	.39,	-.01
7 ,	.48,	.69,	-.64,	-.46,	-.95,	-.25,	-.32,	.48,	.80,	.35

Age ,	1999,	2000,	2001,	2002,	2003,	2004,	2005,	2006,	2007,	2008
2 ,	-.33,	-1.09,	-.15,	-.28,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99
3 ,	-.26,	-.70,	.01,	.42,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99
4 ,	.28,	.19,	.34,	.00,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99
5 ,	-.19,	.43,	.43,	.70,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99
6 ,	.34,	-.37,	.15,	1.14,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99
7 ,	-.18,	-.32,	-.98,	.24,	99.99,	99.99,	99.99,	99.99,	99.99,	99.99

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

Age ,	2,	3,	4,	5,	6,	7
Mean Log q,	-9.0185,	-8.8853,	-9.0547,	-9.2950,	-9.5460,	-9.5460,
S.E(Log q),	.5533,	.4579,	.5196,	.4412,	.5045,	.5564,

Table 6.8 (Cont'd)

```
 Regression statistics :


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

 Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e,  Mean Q

  2,     .48,    1.433,      9.61,     .36,     16,     .26,   -9.02,
  3,    1.12,    -.172,      8.77,     .13,     16,     .53,   -8.89,
  4,     .94,     .086,      9.08,     .12,     16,     .50,   -9.05,
  5,    2.31,   -1.051,      9.97,     .04,     16,    1.01,   -9.30,
  6,    5.20,   -1.302,     15.59,     .01,     16,    2.56,   -9.55,
  7,     .74,     .579,      9.02,     .26,     16,     .42,   -9.58,
1


 Terminal year survivor and F summaries :

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

 Year class = 2006

 Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,     16074.,   .266,       .000,    .00,   1,  .537,     .171
 FR-ROCHELLE         ,     16586.,   .293,       .000,    .00,   1,  .443,     .166
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,     13043.,   1.50,,,,                        .020,     .207

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
    16231.,        .20,      .02,    3,    .127,   .170


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

 Year class = 2005

 Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      9906.,   .186,       .077,    .41,   2,  .504,     .373
 FR-ROCHELLE         ,     12320.,   .191,       .147,    .77,   2,  .484,     .310
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      9625.,   1.50,,,,                        .012,     .382

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
    11005.,        .13,      .08,    5,    .600,   .342

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

 Year class = 2004

 Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      6768.,   .150,       .247,   1.65,   3,  .538,     .345
 FR-ROCHELLE         ,      7108.,   .162,       .142,    .88,   3,  .453,     .331
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      5003.,   1.50,,,,                        .009,     .443

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
     6900.,        .11,      .12,    7,   1.086,   .339
```

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

 Year class = 2003

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      3548.,   .143,       .099,    .69,   4,  .490,     .311
 FR-ROCHELLE         ,      2733.,   .146,       .155,   1.06,   4,  .501,     .388
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      2665.,   1.50,,,,                        .009,     .396

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      3105.,       .10,      .09,    9,    .897,   .349

1
 Age  6   Catchability constant w.r.t. time and dependent on age

 Year class = 2002

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      2056.,   .138,       .204,   1.48,   5,  .488,     .450
 FR-ROCHELLE         ,      1815.,   .139,       .136,    .98,   5,  .502,     .497
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      2119.,   1.50,,,,                        .011,     .439

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      1932.,       .10,      .11,   11,   1.128,   .473

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

 Year class = 2001

 Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                  Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      1504.,   .134,       .173,   1.30,   6,  .415,     .457
 FR-ROCHELLE         ,      1502.,   .123,       .100,    .81,   6,  .577,     .457
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      1837.,   1.50,,,,                        .008,     .388

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      1506.,       .09,      .09,   13,    .961,   .457
```

Table 6.9 : Bay of Biscay Sole, Fishing mortality (F) at age

Terminal Fs derived using XSA (With F shrinkage)

	YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	AGE														
	2	0.3162	0.3868	0.2634	0.1759	0.2165	0.202	0.2642	0.1433	0.1475	0.0827	0.1093	0.1549	0.1137	0.1839
	3	0.2815	0.3869	0.2993	0.3657	0.4035	0.435	0.3819	0.3506	0.317	0.3507	0.3233	0.3252	0.35	0.5093
	4	0.414	0.3306	0.3609	0.3972	0.451	0.4343	0.5219	0.4579	0.4498	0.4937	0.7398	0.6679	0.5204	0.6557
	5	0.4172	0.5094	0.5141	0.4467	0.4238	0.6405	0.594	0.4411	0.5542	0.6295	0.7275	0.6955	0.4896	0.5574
	6	0.3849	0.2942	0.8341	0.6508	0.5636	0.7348	0.3658	0.4342	1.0721	0.5882	0.7357	0.5467	0.728	0.6351
	7	0.4066	0.3792	0.5719	1.0702	0.9107	0.8744	0.9079	0.7631	0.9337	0.7712	0.7513	0.7226	0.9464	0.659
	+gp	0.4066	0.3792	0.5719	1.0702	0.9107	0.8744	0.9079	0.7631	0.9337	0.7712	0.7513	0.7226	0.9464	0.659
0	FBAR 3- 6	0.3744	0.3803	0.5021	0.4651	0.4605	0.5611	0.4659	0.421	0.5983	0.5155	0.6316	0.5588	0.522	0.5894

	YEAR	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	FBAR **-**
	AGE												
	2	0.2109	0.1305	0.2707	0.21	0.2507	0.2014	0.1997	0.2593	0.1742	0.1986	0.1696	0.1808
	3	0.3941	0.3914	0.4767	0.4945	0.5279	0.4829	0.3791	0.2831	0.3923	0.3679	0.3416	0.3673
	4	0.7205	0.632	0.7604	0.6452	0.7816	0.4491	0.4439	0.4164	0.4902	0.4077	0.3394	0.4124
	5	0.5779	0.7085	0.7102	0.584	0.9872	0.3921	0.2966	0.5382	0.3716	0.3776	0.349	0.3661
	6	0.405	0.6785	0.5003	0.541	0.946	0.5778	0.338	0.482	0.4336	0.3556	0.4726	0.4206
	7	0.6691	0.5147	0.4213	0.4979	0.741	0.7351	0.3887	0.3959	0.6057	0.4888	0.4567	0.517
	+gp	0.6691	0.5147	0.4213	0.4979	0.741	0.7351	0.3887	0.3959	0.6057	0.4888	0.4567	
0	FBAR 3- 6	0.5244	0.6026	0.6119	0.5662	0.8107	0.4755	0.3644	0.4299	0.4219	0.3772	0.3756	
	1												

Table 6.10 : Bay of Biscay Sole, Stock number at age (start of year) **Numbers*10**-3**

Terminal Fs derived using XSA (With F shrinkage)

	YEAR	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	AGE														
	2	22885	27832	27809	24733	26794	28273	32248	35923	35580	25137	26434	23797	29612	23792
	3	13557	15094	17104	19336	18771	19525	20904	22404	28165	27780	20940	21442	18442	23915
	4	8640	9257	9276	11474	12136	11346	11435	12911	14278	18560	17702	13714	14015	11760
	5	6269	5168	6018	5851	6979	6995	6649	6140	7390	8239	10251	7643	6363	7536
	6	3830	3737	2810	3257	3387	4133	3336	3322	3574	3842	3972	4481	3450	3529
	7	2769	2359	2520	1104	1537	1744	1794	2094	1947	1107	1930	1722	2347	1507
	+gp	3702	2420	2965	1132	1337	893	1521	1919	1634	1375	1376	2002	2248	1899
0	TOTAL	61651	65866	68502	66886	70940	72908	77887	84712	92567	86040	82605	74802	76477	73937

	YEAR	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	GMST 84-**	AMST 84-**
	AGE														
	2	22647	24494	25167	16670	24615	24281	19723	18937	22490	23068	(21253)	0	25246	25647
	3	17912	16596	19451	17372	12227	17334	17963	14616	13221	17096	17113	(16231)	18461	18873
	4	13003	10928	10153	10927	9586	6526	9677	11125	9964	8081	10707	11005	11376	11669
	5	5523	5724	5256	4295	5186	3970	3768	5617	6638	5522	4864	6900	6081	6238
	6	3905	2804	2550	2337	2167	1749	2427	2534	2967	4142	3425	3105	3142	3222
	7	1692	2357	1287	1399	1231	761	888	1566	1416	1740	2627	1932	1615	1699
	+gp	2545	2541	1352	1305	872	504	1083	1612	2488	2450	2590	2990		
0	TOTAL	67227	65444	65216	54305	55884	55124	55529	56007	59186	62099	62579	42162		

( ) age 2 replaced by GM 93-2006 = 23191
( ) age 3 replaced by GM e-(F06-07+M) = 17416

Table 6.11 : Bay of Biscay Sole, Summary (without SOP correction)

Terminal Fs derived using XSA (With F shrinkage)

	RECRUITS Age 2	TOTALBIO	TOTSPBIO	LANDINGS	YIELD/SSB	FBAR 3- 6
1984	22885	12974	10648	4038	0.3792	0.3744
1985	27832	13751	11229	4251	0.3786	0.3803
1986	27809	14394	11894	4805	0.404	0.5021
1987	24733	15685	12555	5086	0.4051	0.4651
1988	26794	16206	13059	5382	0.4121	0.4605
1989	28273	16386	13059	5845	0.4476	0.5611
1990	32248	16867	13276	5916	0.4456	0.4659
1991	35923	18735	14410	5569	0.3865	0.421
1992	35580	20542	15959	6550	0.4104	0.5983
1993	25137	20130	16572	6420	0.3874	0.5155
1994	26434	19569	16099	7229	0.449	0.6316
1995	23797	17991	14548	6205	0.4265	0.5588
1996	29612	18101	14147	5854	0.4138	0.522
1997	23792	16885	13713	6259	0.4564	0.5894
1998	22647	16866	13641	6027	0.4418	0.5244
1999	24494	16272	12625	5249	0.4157	0.6026
2000	25167	15846	12151	5760	0.474	0.6119
2001	16670	13296	10824	4836	0.4468	0.5662
2002	24615	13275	9903	5486	0.554	0.8107
2003	24281	13404	9706	4108	0.4232	0.4755
2004	19723	14777	11448	4002	0.3496	0.3644
2005	18937	15323	12190	4539	0.3724	0.4299
2006	22490	16107	12486	4793	0.3839	0.4219
2007	23068	16750	13069	4363	0.3338	0.3772
2008	(21253)	17237	13750	4300	0.3127	0.3756
Arith. Mean	25368	16295	12918	5315	0.4124	0.5043
0 Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)		
GM 93-2006 =	23191					

Table 6.12 Multifleet prediction input data

Sole in Bay of Biscay
Multi fleet input data

MFDP version 1a
Run: BBsole-WG09
Time and date: 13:33 08/05/2009
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input Fs are 2006-2007 means at age 2
Input Fs are 2006-2008 means at age 3 to 8
Catch and stock wts are 2006-2008 means
Recruits are 1993-2006 GM

2009

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	23191	0.1	0.32	0	0	0.189	0.1864	0.178
3	17416	0.1	0.83	0	0	0.241	0.3673	0.228
4	11005	0.1	0.97	0	0	0.297	0.4124	0.280
5	6900	0.1	1	0	0	0.352	0.3661	0.332
6	3105	0.1	1	0	0	0.423	0.4206	0.398
7	1932	0.1	1	0	0	0.449	0.5171	0.422
8	2990	0.1	1	0	0	0.599	0.5171	0.562

2010

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	23191	0.1	0.32	0	0	0.189	0.1864	0.178
3		0.1	0.83	0	0	0.241	0.3673	0.228
4		0.1	0.97	0	0	0.297	0.4124	0.280
5		0.1	1	0	0	0.352	0.3661	0.332
6		0.1	1	0	0	0.423	0.4206	0.398
7		0.1	1	0	0	0.449	0.5171	0.422
8		0.1	1	0	0	0.599	0.5171	0.562

2011

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	23191	0.1	0.32	0	0	0.189	0.1864	0.178
3		0.1	0.83	0	0	0.241	0.3673	0.228
4		0.1	0.97	0	0	0.297	0.4124	0.280
5		0.1	1	0	0	0.352	0.3661	0.332
6		0.1	1	0	0	0.423	0.4206	0.398
7		0.1	1	0	0	0.449	0.5171	0.422
8		0.1	1	0	0	0.599	0.5171	0.562

Table 6.13 : Bay of Biscay Sole Multifleet prediction, management option table

MFDP version 1a
Run: BBsole-WG09
Time and date: 13:33 08/05/2009
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Basis
F(2009) = Fsq = mean F(06-–08) = 0.39
R09–10 = GM(93–06) = 23.2 million

2009

Biomass	SSB	Landings FMult	Landings FBar	Yield
18258	14465	1.0000	0.3916	4867

2010

Biomass	SSB	Landings FMult	Landings FBar	Landing Yield	2011 Biomass	SSB
18402	14610	0.0000	0.0000	0	24330	20349
.	14610	0.1000	0.0392	578	23641	19681
.	14610	0.2000	0.0783	1134	22978	19038
.	14610	0.3000	0.1175	1669	22340	18420
.	14610	0.4000	0.1566	2185	21726	17825
.	14610	0.5000	0.1958	2681	21135	17253
.	14610	0.6000	0.2350	3159	20565	16702
.	14610	0.7000	0.2741	3620	20017	16173
.	14610	0.8000	0.3133	4063	19490	15663
.	14610	0.9000	0.3524	4490	18981	15172
.	14610	1.0000	0.3916	4902	18492	14700
.	14610	1.1000	0.4308	5298	18021	14245
.	14610	1.2000	0.4699	5680	17567	13807
.	14610	1.3000	0.5091	6049	17129	13386
.	14610	1.4000	0.5482	6403	16708	12980
.	14610	1.5000	0.5874	6746	16302	12589
.	14610	1.6000	0.6265	7075	15910	12213
.	14610	1.7000	0.6657	7393	15533	11850
.	14610	1.8000	0.7049	7700	15170	11501
.	14610	1.9000	0.7440	7995	14819	11165
.	14610	2.0000	0.7832	8280	14482	10841

Bpa = 13000 t
Fpa = 0.42

Input units are thousands and kg - output in tonnes

Table 6.14 : Bay of Biscay sole Detailed predictions

MFDP version 1a
Run: BBsole-WG09
Time and date: 13:33 08/05/2009
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Year: 2009 F multiplier: 1 Fleet1 HCFba 0.3916

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1864	3759	669	23191	4383	7421	1403	7421	1403
3	0.3673	5110	1167	17416	4203	14455	3489	14455	3489
4	0.4124	3551	993	11005	3268	10675	3170	10675	3170
5	0.3661	2019	670	6900	2431	6900	2431	6900	2431
6	0.4206	1018	405	3105	1314	3105	1314	3105	1314
7	0.5171	745	315	1932	868	1932	868	1932	868
8	0.5171	1154	648	2990	1790	2990	1790	2990	1790
Total		17356	4867	66539	18258	47478	14465	47478	14465

Year: 2010 F multiplier: 1 Fleet1 HCFba 0.3916

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1864	3759	669	23191	4383	7421	1403	7421	1403
3	0.3673	5110	1167	17416	4203	14455	3488	14455	3488
4	0.4124	3522	985	10915	3242	10587	3144	10587	3144
5	0.3661	1929	640	6592	2323	6592	2323	6592	2323
6	0.4206	1420	565	4330	1833	4330	1833	4330	1833
7	0.5171	712	300	1845	829	1845	829	1845	829
8	0.5171	1025	576	2656	1590	2656	1590	2656	1590
Total		17476	4902	66944	18402	47886	14610	47886	14610

Year: 2011 F multiplier: 1 Fleet1 HCFba 0.3916

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1864	3759	669	23191	4383	7421	1403	7421	1403
3	0.3673	5110	1167	17416	4203	14455	3488	14455	3488
4	0.4124	3522	985	10915	3242	10587	3144	10587	3144
5	0.3661	1913	635	6538	2304	6538	2304	6538	2304
6	0.4206	1356	540	4136	1751	4136	1751	4136	1751
7	0.5171	993	419	2572	1156	2572	1156	2572	1156
8	0.5171	937	527	2428	1454	2428	1454	2428	1454
Total		17590	4941	67197	18492	48139	14700	48139	14700

Input units are thousands and kg - output in tonnes

Table 6.15 Sole in VIIa,b

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	2004	2005	2006	2007	2008	2009
Stock No. (thousands) of 2 year-olds	22490	23068	23191	23191	23191	23191
Source	XSA	XSA	GM93-2006	GM93-2006	GM93-2006	GM93-2006
Status Quo F:						
% in 2009 landings	13.8	20.4	24.0	13.7	-	-
% in 2010	11.5	13.1	20.1	23.8	13.6	-
% in 2009 SSB	16.8	21.9	24.1	9.7	-	-
% in 2010 SSB	12.5	15.9	21.5	23.9	9.6	-
% in 2011 SSB	7.9	11.9	15.7	21.4	23.7	9.5

GM : geometric mean recruitment

Sole in VIIa,b : Year-class % contribution to

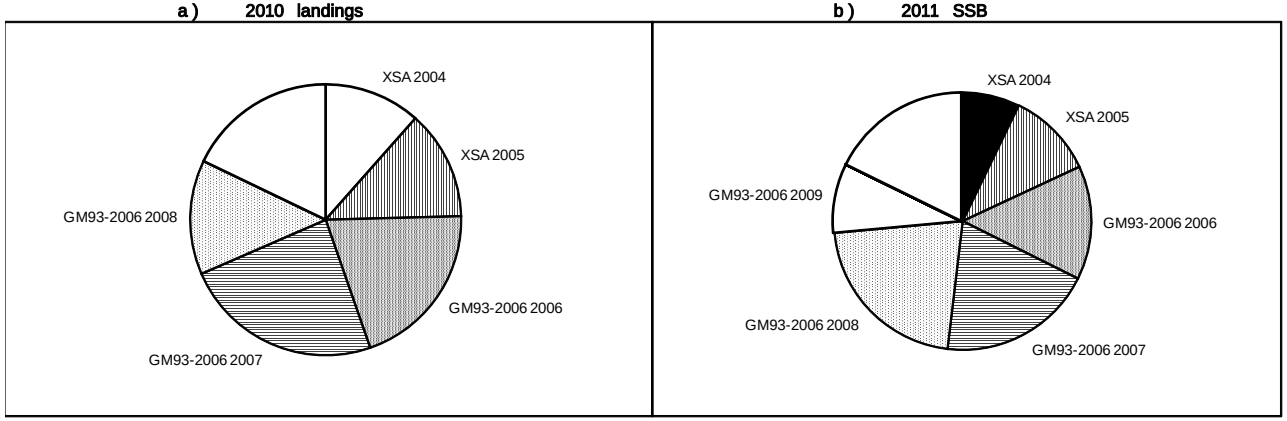


Table 6.16 : Bay of Biscay Sole Multifleet Yield per recruit

MFYPR version 2a
Run: BBsole-WG09
Time and date: 13:42 08/05/2009
Yield per results

Landings FMult	Landings Fbar	CatchNos	Yield	StockNos	Biomass	SpwnNosJan	SSBJan	SpwnNosSpwn	SSBSpwn
0.0000	0.0000	0.0000	0.0000	10.5083	4.9204	9.6499	4.7475	9.6499	4.7475
0.1000	0.0392	0.2974	0.1293	7.5383	3.2076	6.6841	3.0358	6.6841	3.0358
0.2000	0.0783	0.4466	0.1809	6.0497	2.3752	5.1995	2.2044	5.1995	2.2044
0.3000	0.1175	0.5373	0.2042	5.1450	1.8867	4.2988	1.7169	4.2988	1.7169
0.4000	0.1566	0.5990	0.2150	4.5314	1.5672	3.6889	1.3984	3.6889	1.3984
0.5000	0.1958	0.6440	0.2196	4.0844	1.3431	3.2457	1.1752	3.2457	1.1752
0.6000	0.2350	0.6785	0.2210	3.7424	1.1778	2.9073	1.0109	2.9073	1.0109
0.7000	0.2741	0.7059	0.2207	3.4710	1.0513	2.6394	0.8853	2.6394	0.8853
0.8000	0.3133	0.7283	0.2195	3.2497	0.9517	2.4214	0.7865	2.4214	0.7865
0.9000	0.3524	0.7470	0.2178	3.0652	0.8713	2.2402	0.7069	2.2402	0.7069
1.0000	0.3916	0.7629	0.2159	2.9087	0.8052	2.0869	0.6417	2.0869	0.6417
1.1000	0.4308	0.7766	0.2140	2.7741	0.7500	1.9554	0.5873	1.9554	0.5873
1.2000	0.4699	0.7885	0.2120	2.6569	0.7032	1.8412	0.5413	1.8412	0.5413
1.3000	0.5091	0.7991	0.2102	2.5538	0.6632	1.7411	0.5020	1.7411	0.5020
1.4000	0.5482	0.8084	0.2085	2.4624	0.6285	1.6526	0.4680	1.6526	0.4680
1.5000	0.5874	0.8168	0.2068	2.3808	0.5982	1.5738	0.4384	1.5738	0.4384
1.6000	0.6265	0.8244	0.2053	2.3073	0.5715	1.5030	0.4124	1.5030	0.4124
1.7000	0.6657	0.8312	0.2038	2.2409	0.5479	1.4392	0.3895	1.4392	0.3895
1.8000	0.7049	0.8375	0.2025	2.1805	0.5267	1.3814	0.3690	1.3814	0.3690
1.9000	0.7440	0.8432	0.2012	2.1253	0.5078	1.3287	0.3507	1.3287	0.3507
2.0000	0.7832	0.8485	0.2001	2.0746	0.4907	1.2806	0.3342	1.2806	0.3342

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3916
FMax	0.6238	0.2443
F0.1	0.2601	0.1019
F35%SPR	0.3148	0.1233

Weights in kilograms

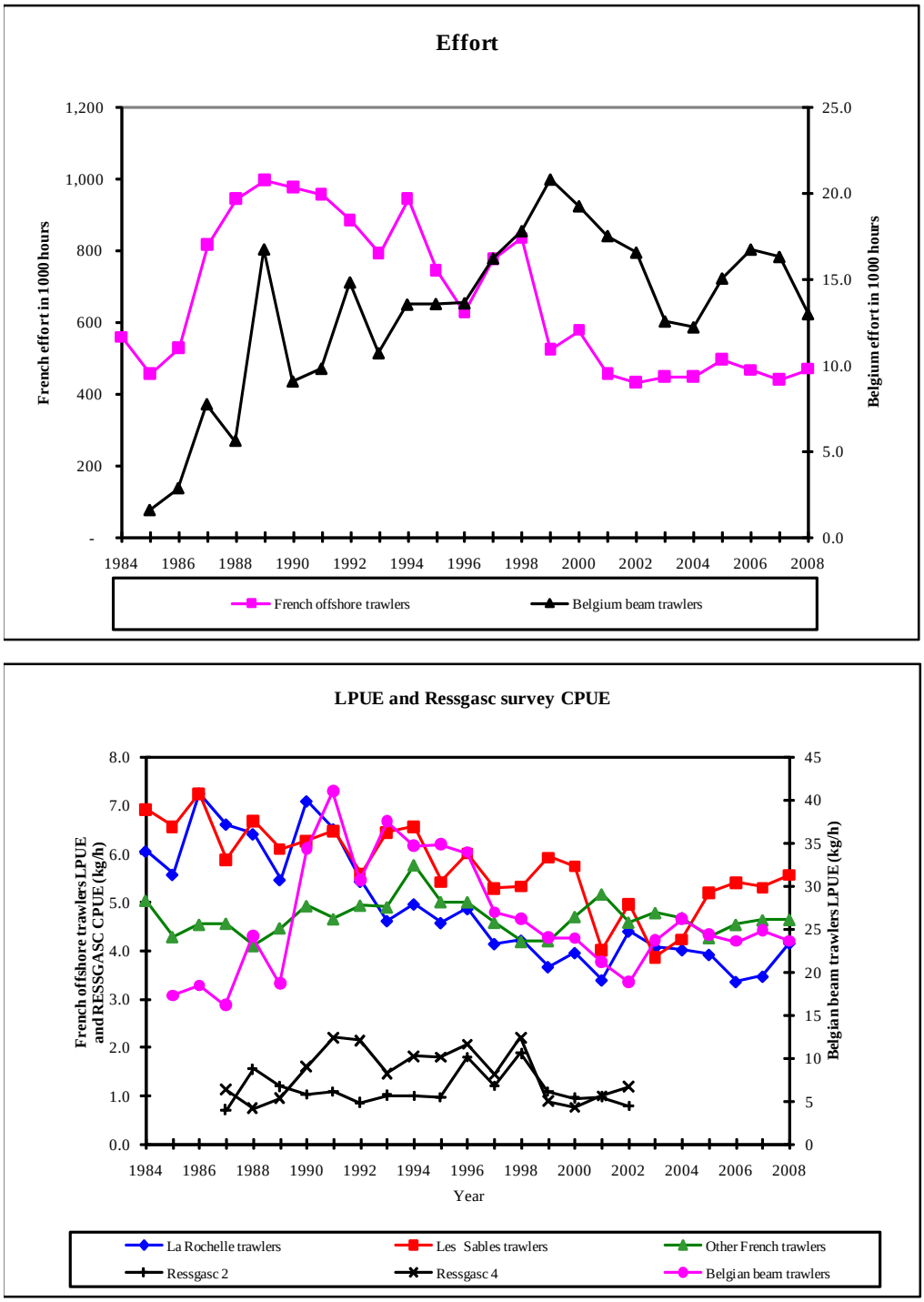


Figure 6.1 : Bay of Biscay sole (Division VIIIa,b)

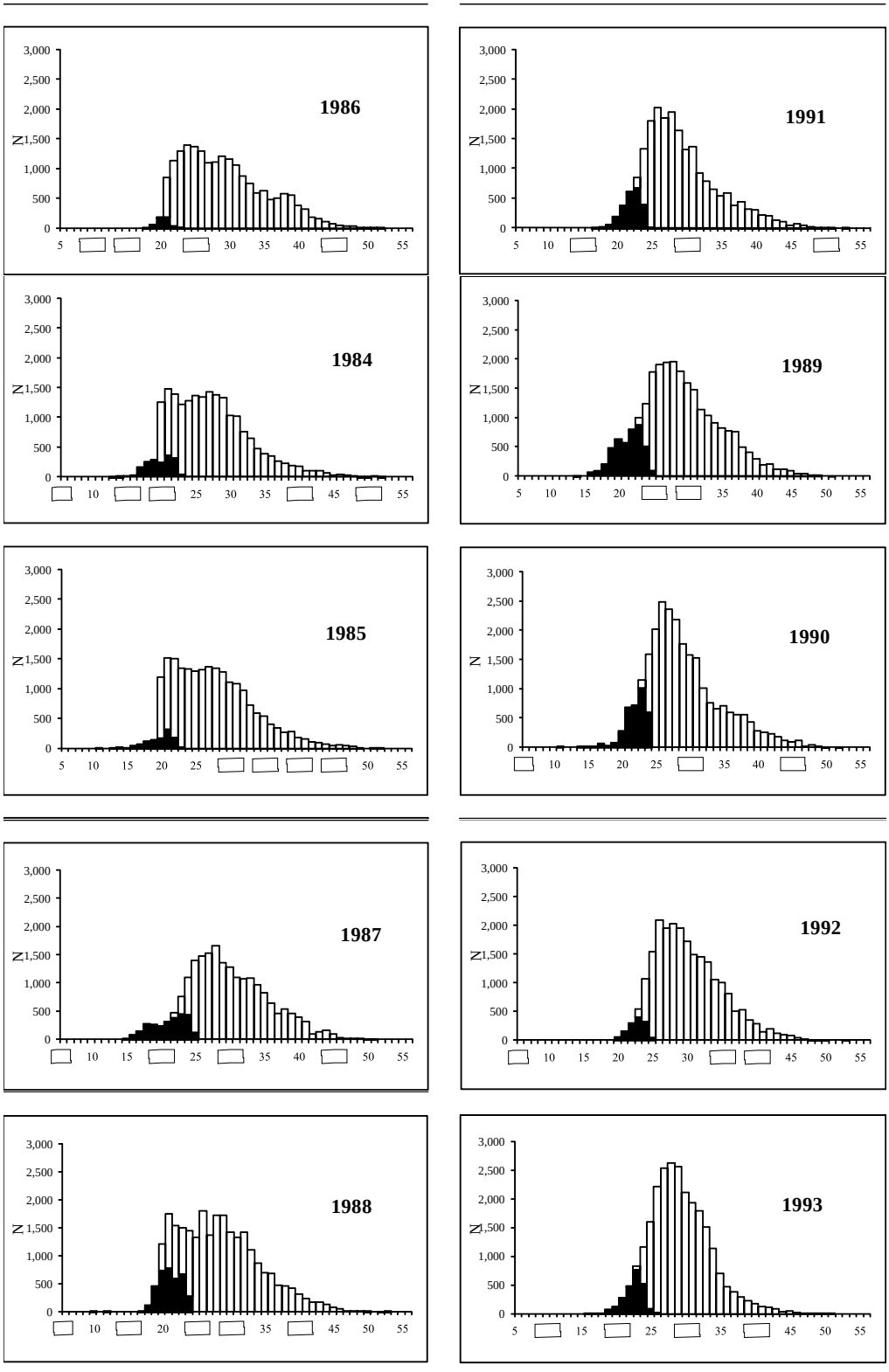


Figure 6.2 a : Bay of Biscay sole French length distribution from 1984 to 1993

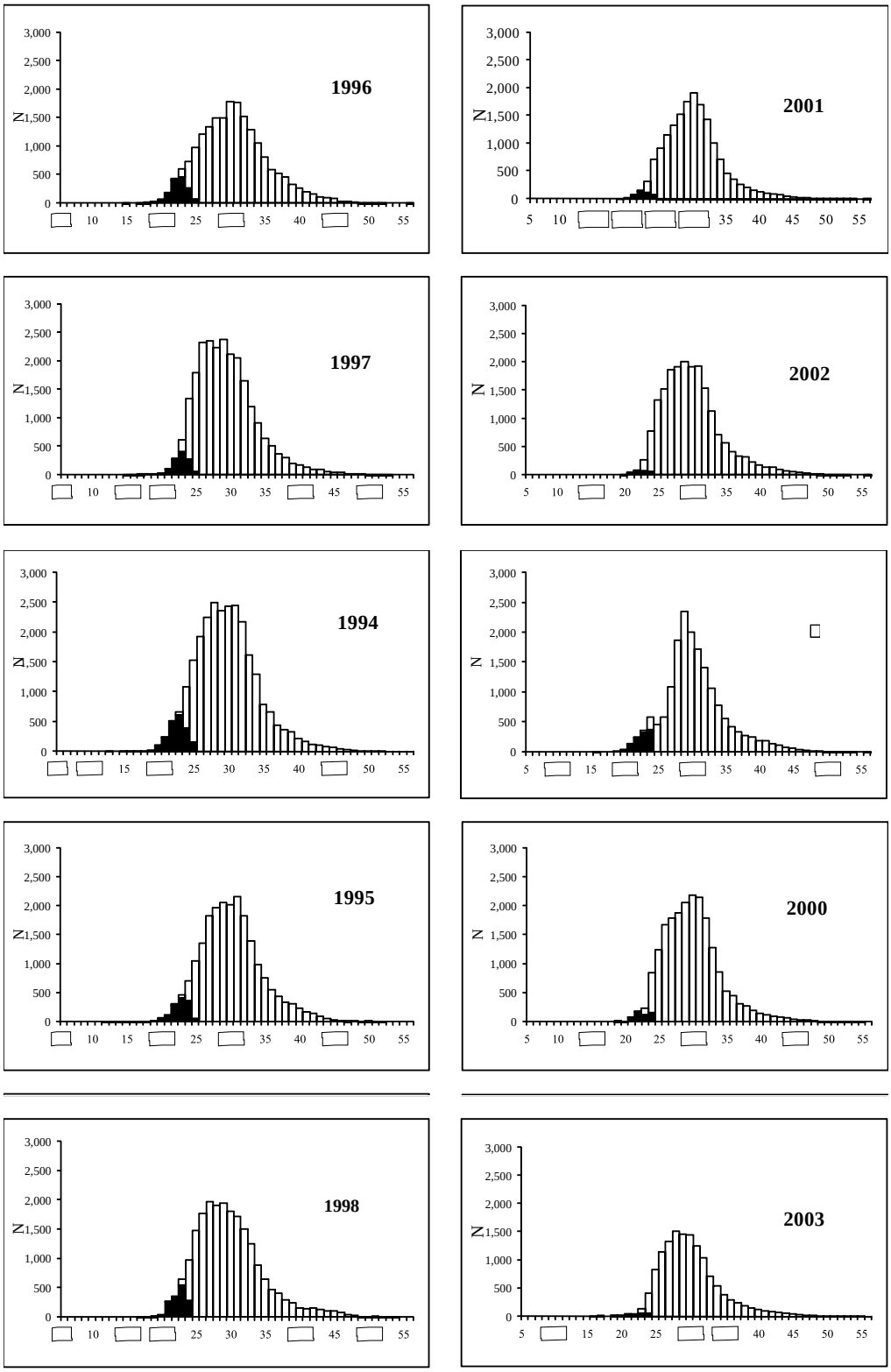


Figure 6.2 b : Bay of Biscay sole French length distribution from 1994 to 2003

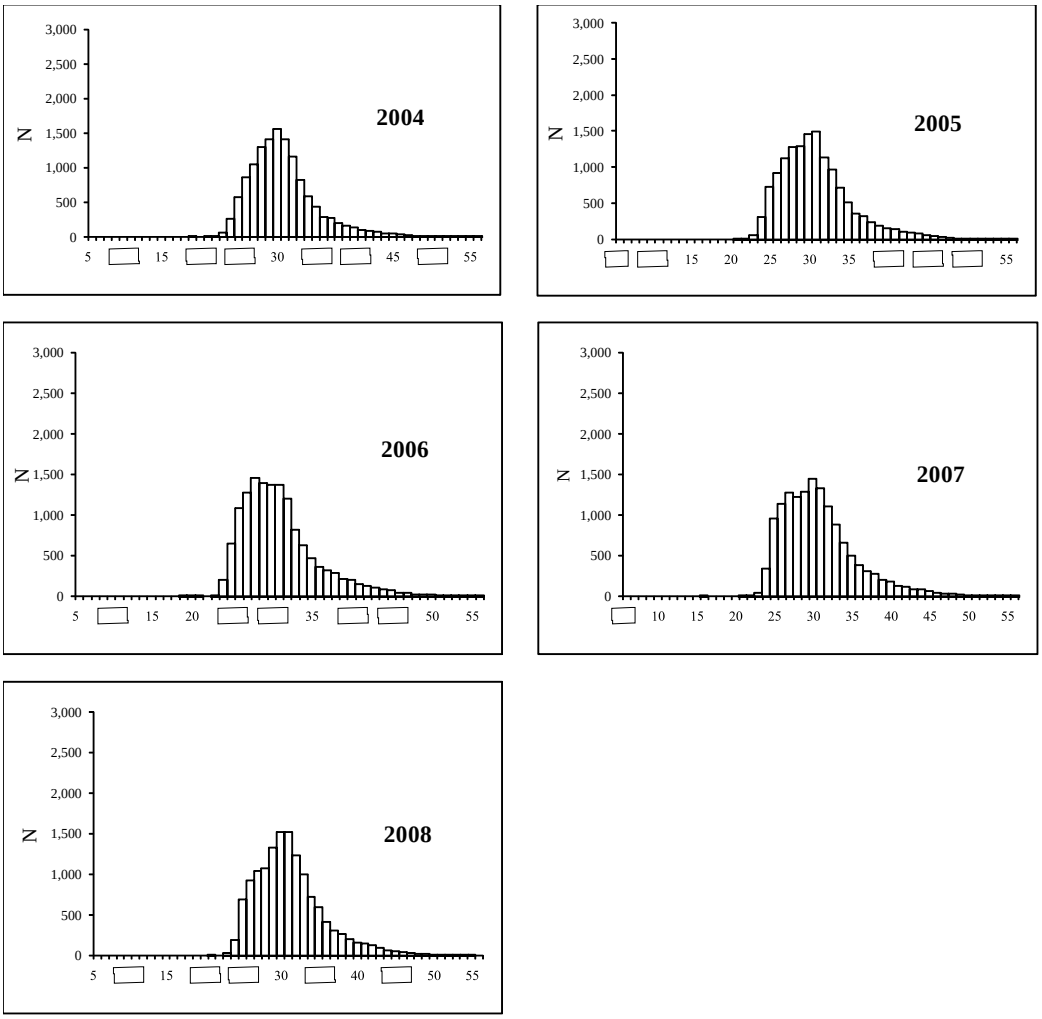


Figure 6.2 c : Bay of Biscay sole French length distribution from 2004 to 2008

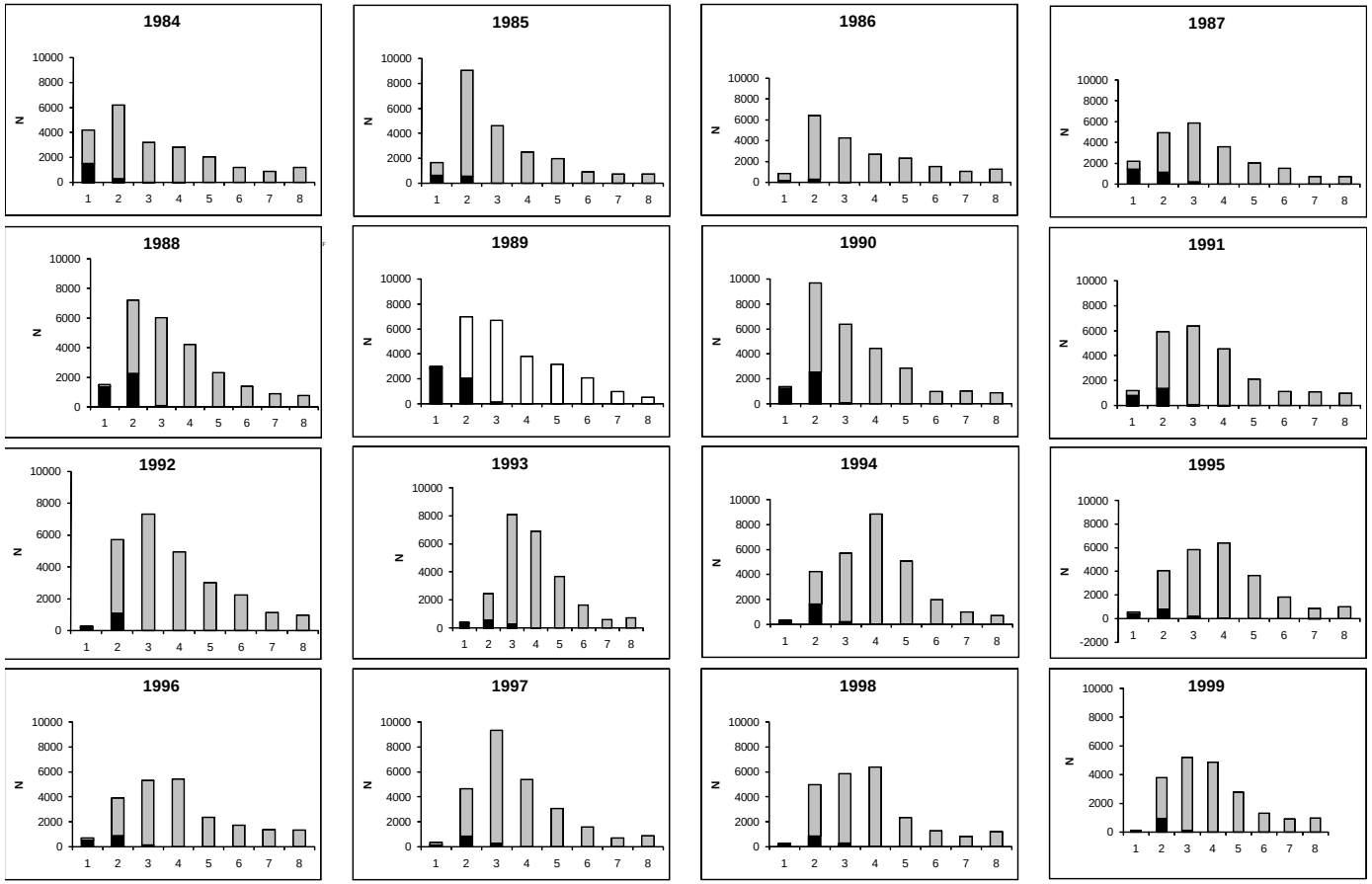


Figure 6.3 a : Bay of Biscay sole landings and discards age distributions from 1984 to 1999 (numbers in thousands)

Total landings

Discard estimates of the French offshore trawlers fleet

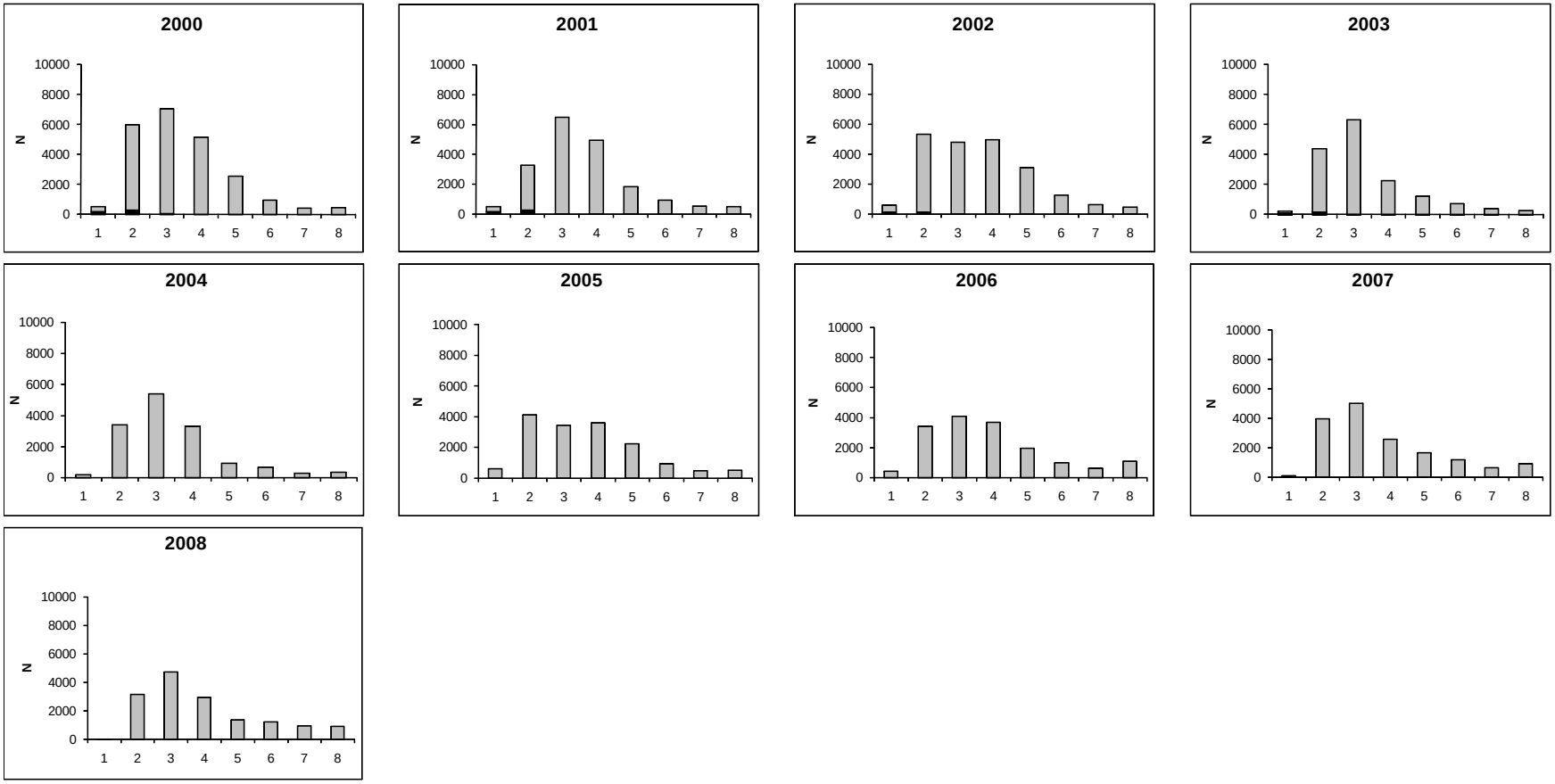


Figure 6.3 b : Bay of Biscay sole landings and discards age distributions from 2000 to 2004 ; landings age distribtion since 2004 (numbers in thousands)

Total landings

Discard estimates of the French offshore trawlers fleet

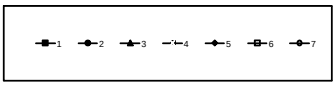
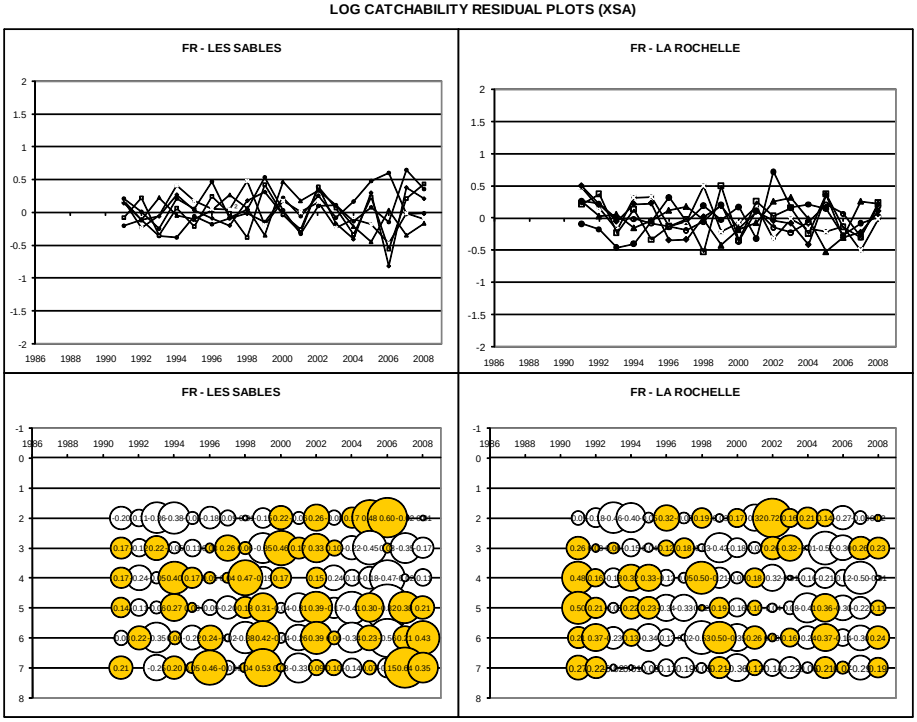


Figure 6.4 a : Bay of Biscay sole (Division VIIIa,b) - XSA (No Taper, mean q, s.e. shrink = 1.5, s.e. min =



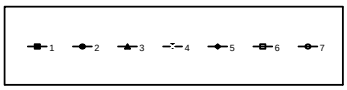
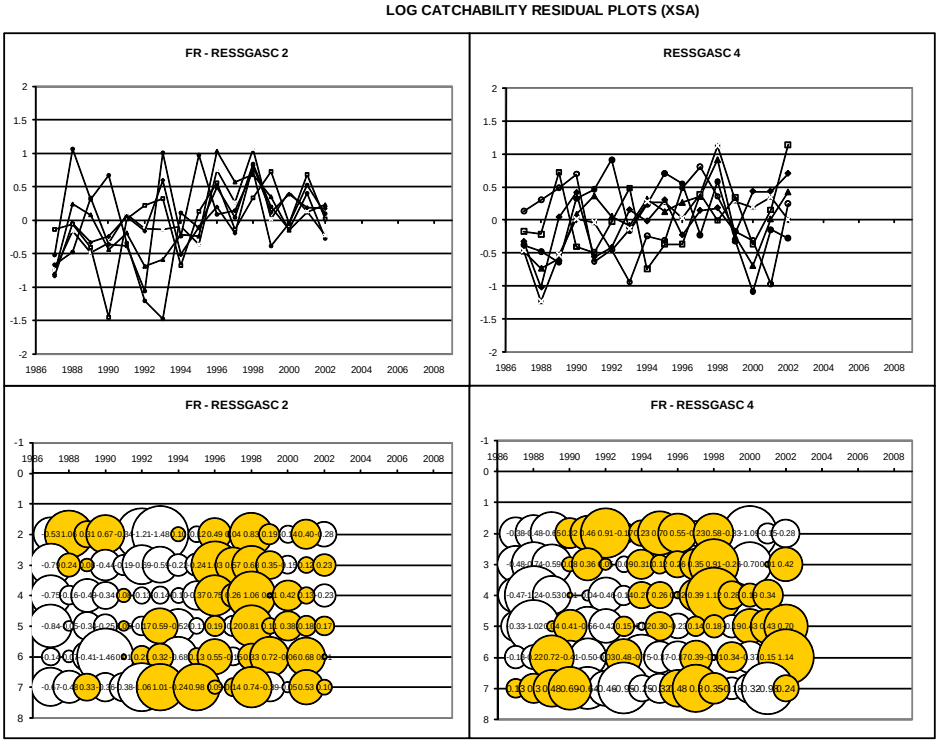


Figure 6.4 b : Bay of Biscay sole (Division VIIIa,b) - XSA (No Taper, mean q, s.e. shrink = 1.5, s.e. min



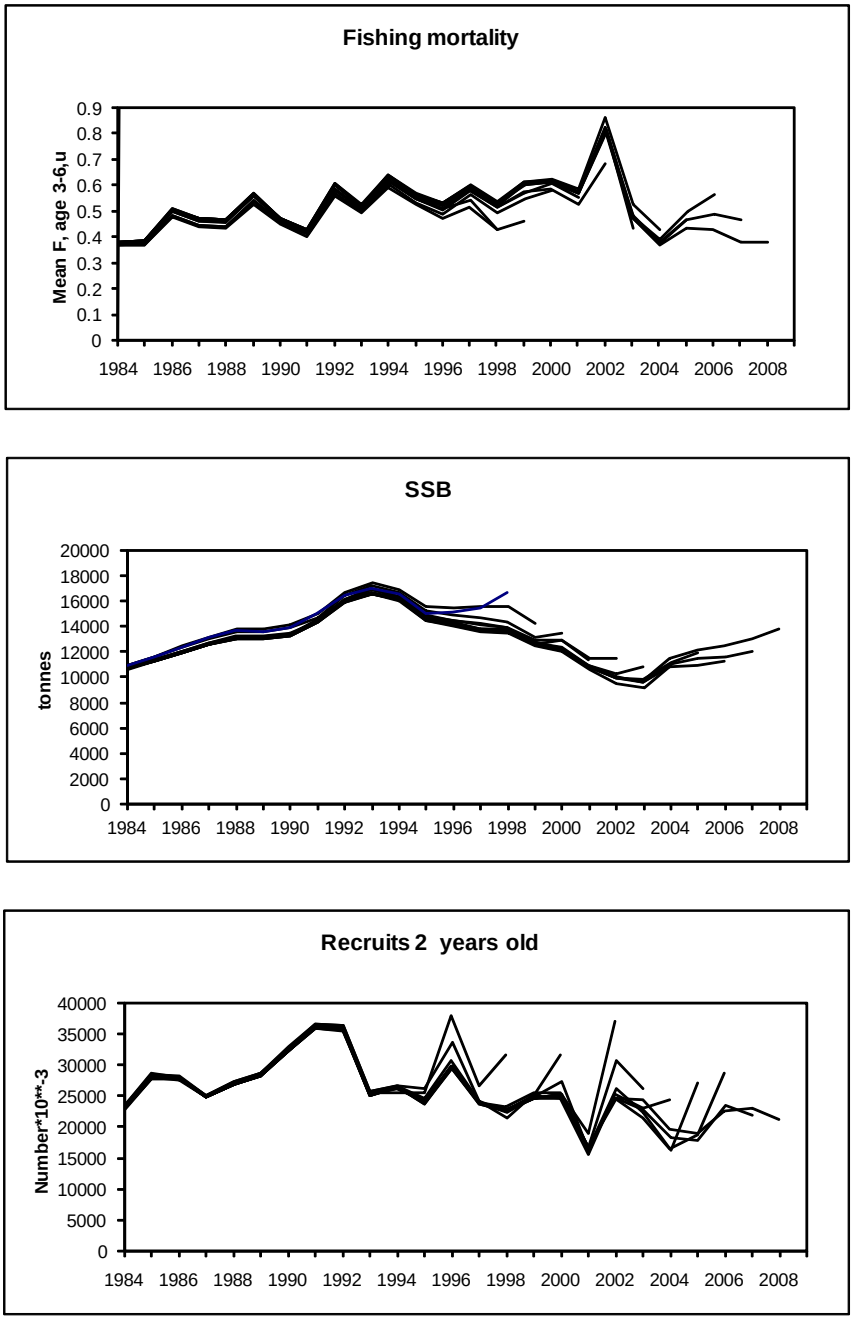


Figure 6.5 : Bay of Biscay sole (Division VIIIa,b) - Retrospective results
(No taper, q indep. stock size all ages, q indep. of age>=6, shr.=1.5)

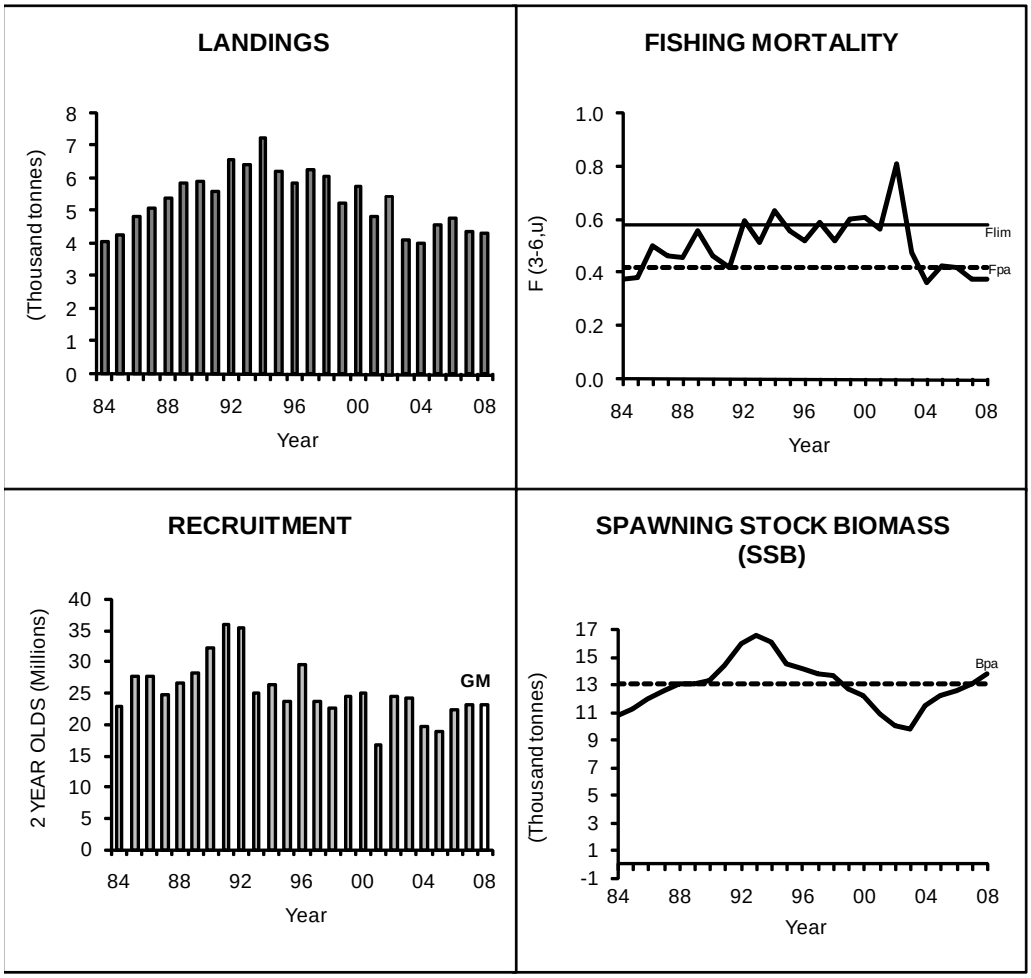
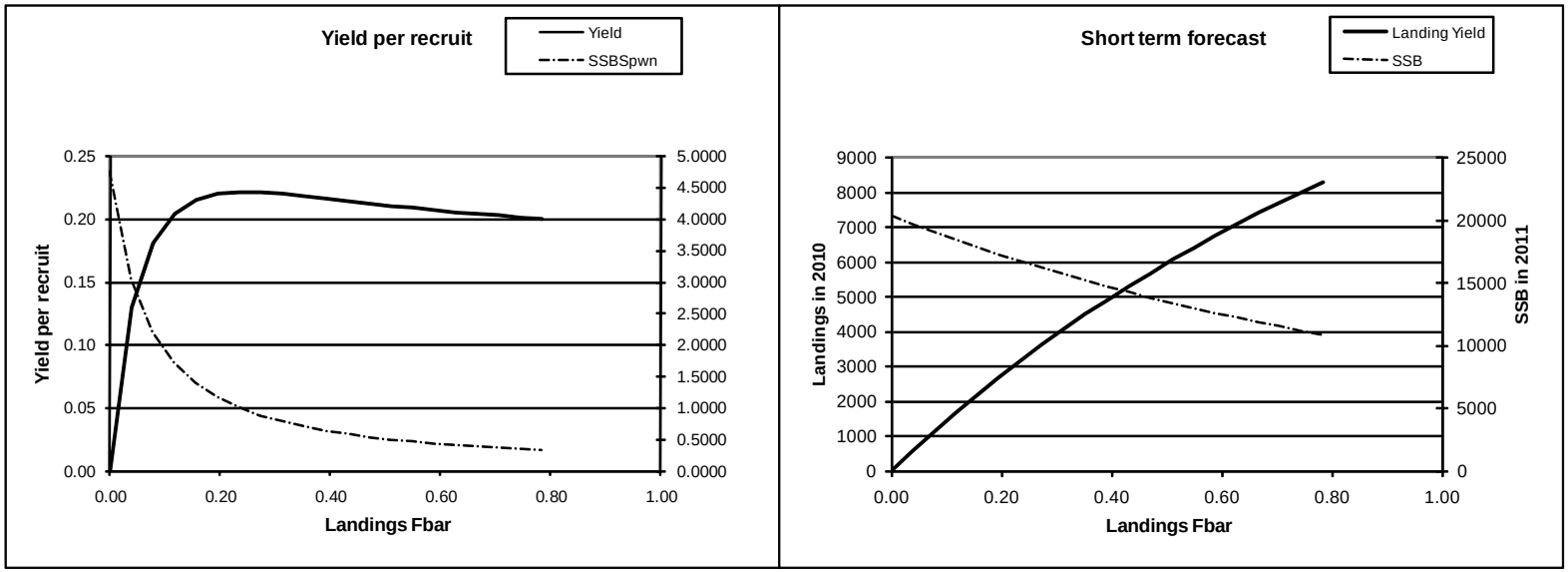


Figure 6.6 Sole in Division VIIIa,b (Bay of Biscay)



MFYPR version 2a
Run: BBsole-WG09
Time and date: 13:42 08/05/2009

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3916
FMax	0.6238	0.2443
F0.1	0.2601	0.1019
F35%SPR	0.3148	0.1233

Weights in kilograms

MFDP version 1a
Run: BBsole-WG09
Time and date: 13:33 08/05/2009
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input units are thousands and kg - output in tonnes

Figure 6.7 : Bay of Biscay sole

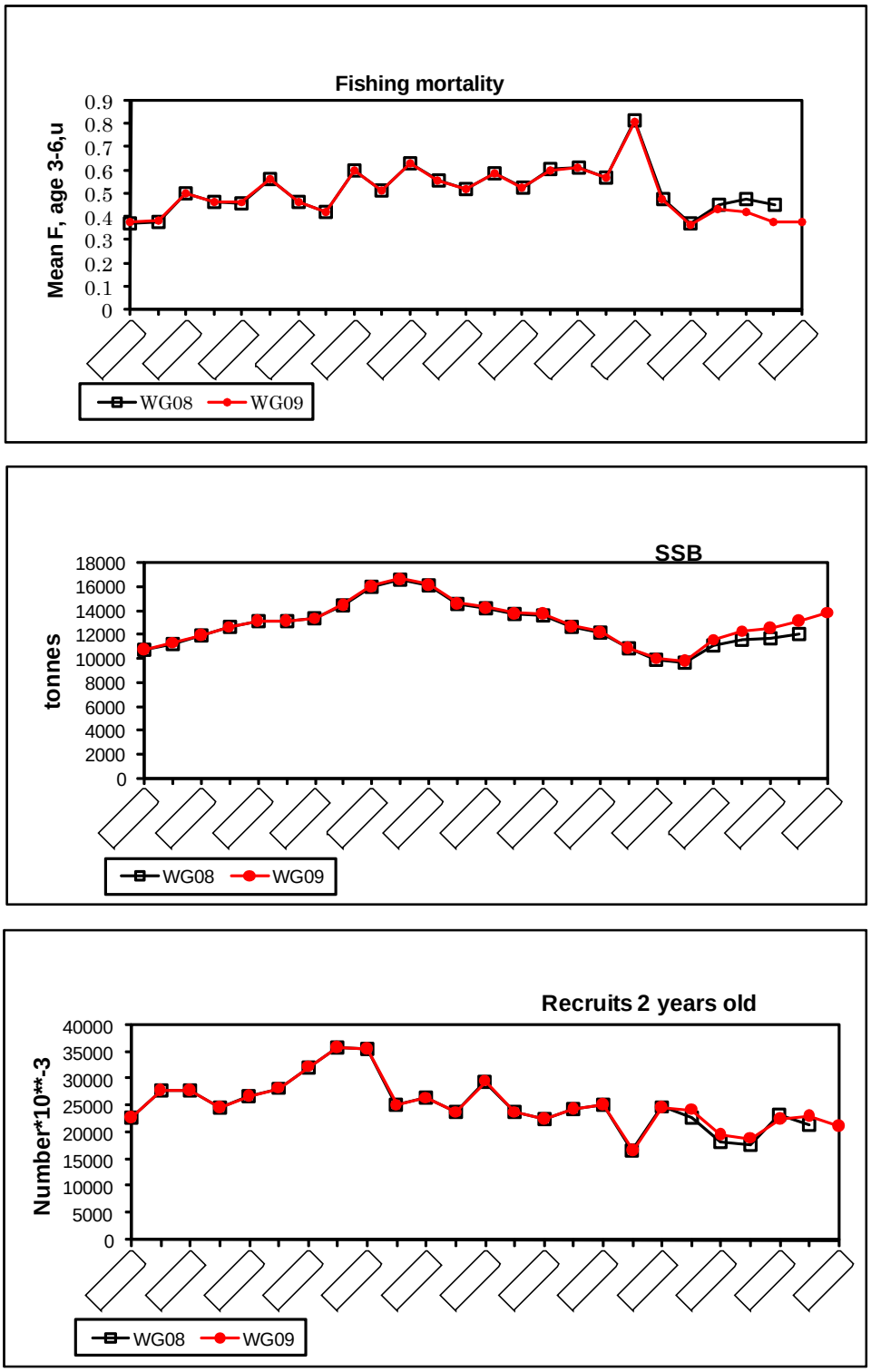


Figure 6.8 : Bay of Biscay sole (Division VIIIa,b) - WG09 / WG08 comparison