6 Bay of Biscay Sole

Type of assessment in 2010: update.

Data revisions this year: Compared to last year assessment, there is only very limited change in data due to small revisions of 2008 landings and of 2008 commercial LPUE.

Review Group issues:

- To avoid the repetitions between the report and the Stock annex, the ecosystem aspect, the fishery description and the input date (sections 6.1.1, 6.1.2 and 6.3.1) are completely transferred to the Stock annex.
- The RG question "Is the certainty of the catch time series the same for each year of the time series?" is addressed in the first paragraph of the section 6.2.1.
- The need to make clearer the explanation of the mean weight calculations is addressed in the Stock annex.

6.1 General

6.1.1 Ecosystem aspects

See Stock Annex

6.1.2 Fishery description

See Stock Annex

6.1.3 Summary of ICES advice for 2010 and management applicable to 2009 and 2010

ICES advice for 2010:

ICES advises on the basis of exploitation boundaries in relation to precautionary considerations that landings for 2010 should not exceed 4 900 t.

Management applicable to 2009 and 2010

The sole landings in the Bay of Biscay are subject to a TAC regulation. The 2009 TAC was set at 4390 t. The 2010 TAC is set at 4829 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 was 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 has to 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 above the SSB target in 2008 by ICES in 2009, the long-term target fishing mortality rate and the associated rate of reduction have not yet been set.

6.2 Data

6.2.1 Commercial catches and discards

The WG estimates of landings and catches are shown in Table 6.1a. 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. The French catches are predominant. They are nearly exclusively landed in Bay of Biscay harbours. The record of the auction sales allows thus to consider that the reliability of the WG estimates is satisfactory all along the series, to answer to the RG question about the certainty of these data

The 2008 landings estimate was revised 0.02% lower to 4299 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 before falling to 3600t in 2009. According to the fishing industry, this marked decrease is due in 2009 to a change in target species of the fleet (growing interest for squids and cuttle fish) and to unfavourable meteorological and hydrodynamic conditions in the first quarter of the year.

The 2009 figure is 26 % below the landings predicted by the 2009 WG at status quo mortality (4867 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 also 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 2009 sampling level is given in table 1.3. The French length distributions are shown on Figures 6.2 a, b & c from 1984 onwards. The relative length distribution of landings in 2009 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 12 m long). The split of the French landings in these components is made as described in Stock Annex. The 2008 split was slightly revised because of small correction in the database (Table 6.1 b).

The age distribution of catches was revised from 2005 onwards because the change in the age reading method in France. This latter was formerly carried out on burning

otolith sections and it is now performed on otolith slices as in Belgium. This change causes only small differences in the total age distribution (Working document in ICES files). The discrepancy between French and Belgian mean weight at age, noticed by preceding WG, was thus only slightly reduced. A better agreement between French and Belgian age readers would certainly reduce this gap a bit more (about 80% of agreement for a reading comparison carried out in 2006 on a set of otoliths). However, a likely effect of the weight at age samples process may also be presumed (weight-length relationship in France and straight estimate) and should be investigated.

International 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).

6.2.3 Abundance indices from surveys

Two CPUE RESSGASC 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.

Since 2007, a new beam trawl survey is carried out by France to provide a sole abundance index in the Bay of Biscay. This survey is coordinated by the ICES WGBEAM. During its three first years, a particular attention has been paid to the effect of luminosity on the CPUE to check the need to work at night as underlined by the industry.

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 was not updated for 2009 because some errors were found in the record of daily fishing effort in the data file and it was not possible to correct them before the WG meeting (contrary to La Rochelle and Les Sables trawler LPUE series which have been checked using copies of logbook provided by the producer organisations).

For the same reason, the estimate of the total effort of French offshore trawlers (using LPUE calculated for the whole trawler fleet) is not available in 2009 (Table 6.2a and Figure 6.1a). Up to 2008, this index shows that, after a decrease until 1999, the effort of this French trawler fleet has been stable in recent years. The effort time series of the Belgian beam trawl fleet does not show also any trend in recent years but some large variations.

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 a short increase in 2004-2005 but the trend is flat from 2005 onwards. 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

See stock annex

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 1984-2009.

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 – 2009	1 – 8	<1 %
Offshore otter trawlers	FR-ROCHELLE	1991 – 2009	1 – 8	<1 %
Offshore beam trawlers	BEL-BT	1997 – 2009	1 – 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 noticed by the previous WG, they increase the fishing mortalities before 1992 and, inversely, lower the SSB (Figure 6.9). 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.

			2009 XSA			2010 XSA
Catch data range			84-08			84-09
Catch age range			2-8+			2-8+
Fleets	FR – SABLES	91-07	2-7	FR – SABLES	91-**09**	2-7
	FR – ROCHELLE	91-07	2-7	FR – ROCHELLE	91-**09**	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 ages 3 to 7 but at age 2, Les Sables estimate is 61% above La Rochelle estimate. However, they 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 2009 is estimated by XSA to have been at 0.33. Fishing mortality in 2008 is now estimated at 0.39, a bit higher than last year WG report (0.38).

6.3.3 Assessment results

6.3.3.1 Estimating year class abundance

The 2006 year class is estimated to be 21.3 million 2 year olds by XSA. Last year's WG XSA estimate (21.2 million) was not accepted by the WG which preferred to overwrite this year class with the $GM_{93\text{-}07}$ (23.2 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 below the average.

The 2007 year class is estimated to be at 19.9 million 2 year olds by XSA. The WG considered that the reliability of XSA recruitment estimate in terminal year remains too low to change the usual process of overwriting it by the $GM_{93\text{-}07}$, as in previous WG assessment. The estimates provided by each tuning fleet are largely different and,

furthermore, the new ORHAGO survey indices tend to confirm the low precision of the XSA estimate of the recruitment in terminal year. Indeed, this survey indicates that the 2007 year class might be above recent year classes (Figure 6.7).

The XSA estimate was consequently overwritten by a short series $GM_{93\text{-}07}$ from 1993 up to two years before the terminal years (2007), as in preceding assessments, since there is observed fall in stock numbers at age 2 after 1993. This $GM_{93\text{-}07}$ is also used to estimate subsequent recruitments.

Recruitment at age 2

YEAR CLASS	THOUSANDS	BASIS	SURVEYS	COMMERCIAL	SHRINKAGE
2006	21299	XSA	0 %	98 %	2 %
2007	22809	GM(93-07)			
2008 & subsequent	22809	GM(93-07)			

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. It increased in 2005 and, later on, a decreasing trend is observed again, fishing mortality being 0.45 in 2005 and 0.39 in 2008 and 0.33 in 2009.

SSB trend in earlier years increases from 10600 t in 1984 to 16 600 t in 1993, afterwards it shows a continuous decrease to 9 800 t in 2003. After a 24 % increase between 2003 and 2006, the SSB remains close to 13000 t. It is estimated to be 12800 t in 2009, 3% lower than 2008.

The recruitment values are lower since 1993. Afterwards, the series is relatively stable, but few values below the average are worth noting since 2001.

6.3.4 Catch options and prognosis

The exploitation pattern is the scaled mean over the period 2007-2009 (over 2007-2008 at age 2), considering the decreasing trend in F in the last three years of the assessment and the information given by the industry on low catch in the beginning of the year (fixed net best fishing season) in 2010 because unfavourable meteorological and hydrodynamic conditions. This *status quo* F is estimated at 0.33.

The recruits at age 2 from 2010 to 2012 are assumed equal to $GM_{93\text{-}07}$. Stock number at age 3 in 2010 is derived from $GM_{93\text{-}07}$ reduced by total estimated mortality. Stock numbers at ages 4 and above in 2009 are the XSA estimates.

Weights at age in the landings are the 2007-2009 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 2007-2009 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 4142 t in 2010 (TAC is set at 4829 t), 13 % higher than the 2009 landings.

Assuming recruitment at $GM_{93\text{-}07}$, the SSB is predicted to increase to 14100 t in 2010 and to 14900 t in 2011, at *status quo* F. It will continue to grow at *status quo* F, to reach 15500t in 2012 (Tables 6.13 and 6.14).

The proportional contributions of recent year classes to the landings in 2011 and to the SSB in 2012 are given in Table 6.15. Year classes for which $GM_{93\text{-}07}$ recruitment has been assumed (2007 to 2010) contribute 58 % of the 2011 landings and 68 % of the 2012 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 6.8. The $\mathbf{F}_{sq}$ (0.33) is 27 % above $\mathbf{F}_{max}$ (= 0.26) and 3 times $\mathbf{F}_{0.1}$ (=0.11). Long-term equilibrium landings and SSB (at F *status quo* and assuming GM recruitment) are estimated to be 4900 t and 16900 t respectively.

6.3.5 Biological reference points

The WG proposals for MSY approach reference points are given below with technical basis with the value adopted for the precautionary approach reference points:

	Type	***Value***	***Technical basis***
MSY	MSY $B_{trigger}$	13000 t	Bpa
Approach	F_{MSY}	0.26	Fmax because no stock-recruitment relationship, limited variations of recruitment, Fishing mortality pattern known with a low uncertainty
Precautionary Approach	B_{lim}	Not defined	
	B_{pa}	13 000t	The probability of reduced recruitment increases when SSB is below 13 000 t, based on the historical development of the stock.
	F_{lim}	0.58	Based on the historical response of the stock.
	F_{pa}	0.42	F_{lim} * 0.72

Bpa is proposed as MSY $B_{trigger}$ in a first approach but it could be revised at the forthcoming benchmark (planned for this stock in early 2011).

Fmax is proposed as F_{MSY}. This proposal is supported by the absence of stock-recruitment relationship and the limited variations of recruitment, even at an exploitation rate largely above Fmax. This Fmax is relatively stable, the present value being equal to the mean of the value of Fmax estimated by the three last WGHMM for this stock. The fishing mortality pattern is known with a low uncertainty because of the limited discards and the satisfactory sampling level of the catches.

Comments on the assessment

Sampling

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

The ORHAGO survey provides information on the 2007 year class at age 2 but this series must be continued to allow a better estimate of the incoming recruitment.

The same age reading method is now adopted by France and Belgium, however a discrepancy still exist between French and Belgian weights at age which has to be investigated (otoliths exchange and analysis of weight at age estimate process).

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 (Figure 6.9). 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.

The retrospective pattern in F is worth noting up to 2007 but it is low in 2008 (Figure 6.5).

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 limiting the effect of long term change in fishing power (technological creep) and of 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 some 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 2010 WGHMM to assess the state of the Bay of Biscay sole stock. The participants did not express reservations on these data. An explanation of the catch decrease in 2009 was provided and it was indicated that the catch in the beginning of 2010 are also lower than before 2009. A working plan was adopted to be able to present new tuning fleets at the next benchmark with the cooperation of the industry.

6.3.6 Management considerations

The assessment indicates that SSB has decreased continuously to 9800 t in 2003, since a peak in 1993 (16 600 t), has increased to 12900t in 2006 but it remains close to 13000 t thereafter. It is forecast to be 14100t in 2010 at *status quo* F and 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 and the previous one carried out by the 2009 WGHHM, this aim has been reached and the plan should enter in its second step, with a decision on the 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						WG	Discards [2]	WG
Years	Belgium	France[1]	Nether.	Spain	Others	Total	landings		catches
1979	0	2376		62*		2443	2619	-	-
1980	33*	2549		107*		2689	2986	-	-
1981	4*	2581*	13*	96*		2694	2936	-	-
1982	19*	1618*	52*	57*		1746	3813	-	-
1983	9*	2590	32*	38*		2669	3628	-	-
1984		2968	175*	40*		3183	4038	99	4137
1985	25*	3424	169*	308*		3925	4251	64	4315
1986	52*	4228	213*	75*		4567	4805	27	4832
1987	124*	4009	145*	101*		4379	5086	198	5284
1988	135*	4308		0		4443	5382	254	5636
1989	311*	5471		0		5782	5845	356	6201
1990	301*	5231		0		5532	5916	303	6219
1991	389*	4315		3		4707	5569	198	5767
1992	440*	5928		0		6359	6550	123	6673
1993	400*	6096		13		6496	6420	104	6524
1994	466*	6627		2***		7095	7229	184	7413
1995	546*	5326		0		5872	6205	130	6335
1996	460*	3842		0		4302	5854	142	5996
1997	435*	4526		0		4961	6259	118	6377
1998	469*	3821	44	0		4334	6027	127	6154
1999	504	3280		0		3784	5249	110	5359
2000	451	5293		5***		5749	5760	51	5811
2001	361	4350	201	0		4912	4836	39	4875
2002	303	3680		2***		3985	5486	21	5507
2003	296	3805		4***		4105	4108	20	4128
2004	324	3739		9***		4072	4002	-	-
2005	358	4003		10		4371	4539	-	-
2006	393	4030		9		4432	4793	-	-
2007	401	3707		9		4117	4363	-	-
2008	305	3018		11	2*	3336	4299	-	
2009	363	na					3600		

[1] including reported in VIII or VIIIc,d [2] Discards = Partial estimates for the French offshore trawlers fleet

* reported in VIII ** Preliminary *** reported as S*olea* spp (*Solea lascaris* and s*olea 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	2009
Shrimp trawlers	1	0	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	6
Offshore otter trawlers	29	26	26	30	30	24	21	24	18	24	23	21	19	21	19	18
Offshore beam trawlers	6	9	8	7	8	10	8	8	6	7	8	8	9	9	7	10
Fixed nets	52	53	54	52	52	61	63	59	70	60	60	63	64	61	69	66

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
2009	-	-	3.3	5.2	na	na	na

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

na : non available

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
2009	363.3	16.2	22.5

Table 6.3 : Bay of Biscay Sole - 2009
French and Belgian relative length distribution of landings

Length(cm)	France	Belgium
13	0.01	0.00
14	0.00	0.00
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	0.01	0.00
22	0.23	0.24
23	2.48	2.02
24	6.40	6.24
25	7.91	10.33
26	7.07	10.32
27	7.64	13.10
28	8.71	16.69
29	9.07	10.57
30	10.09	7.59
31	9.19	5.45
32	6.87	4.69
33	5.53	3.99
34	3.97	2.17
35	2.99	2.22
36	2.37	1.50
37	1.96	1.09
38	1.58	0.74
39	1.48	0.44
40	1.03	0.38
41	0.79	0.10
42	0.72	0.08
43	0.59	0.04
44	0.44	0.01
45	0.26	0.01
46	0.21	0.00
47	0.15	0.00
48	0.12	0.00
49	0.07	0.00
50	0.03	0.00
51	0.02	0.00
52	0.01	0.00
53	0.00	0.00
54	0.00	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	1996
Age													
2	5901	8493	6126	3794	4962	4918	7122	4562	4640	1897	2603	3249	3027
3	3164	4606	4208	5634	5928	6551	6312	6302	7279	7816	5502	5663	5180
4	2786	2479	2673	3578	4191	3802	4423	4512	4920	6879	8803	6356	5409
5	2034	1962	2301	2005	2293	3147	2833	2083	2991	3661	5040	3644	2343
6	1164	906	1512	1482	1388	2046	972	1113	2236	1625	1968	1795	1697
7	880	708	1044	690	874	967	1018	1063	1124	566	970	843	1366
+gp	1181	729	1235	714	766	499	870	981	951	708	696	986	1319
TOTALNUM	17110	19883	19099	17897	20402	21930	23550	20616	24141	23152	25582	22536	20341
TONSLAND	4038	4251	4805	5086	5382	5845	5916	5569	6550	6420	7229	6205	5854
SOPCOF %	107	103	102	102	101	101	100	102	100	100	100	100	100

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
2	3801	4096	2851	5677	3004	5192	4213	3396	3973	3574	3821	3172	2432
3	9079	5550	5113	7015	6447	4770	6315	5391	3467	4443	5175	4782	3894
4	5380	6351	4870	5143	4942	4945	2246	3300	3743	2746	2617	2882	2259
5	3063	2306	2764	2542	1807	3095	1225	920	2307	2009	1422	1352	1545
6	1578	1237	1314	955	929	1261	730	662	988	1029	1264	939	974
7	692	785	902	421	522	613	377	272	460	529	687	893	567
+gp	877	1188	977	444	489	437	251	333	509	1531	949	1195	991
TOTALNUM	24470	21513	18791	22197	18140	20313	15357	14274	15447	15861	15935	15215	12662
TONSLAND	6259	6027	5249	5760	4836	5486	4108	4002	4539	4793	4363	4299	3600
SOPCOF %	100	101	100	101	101	101	101	101	102	101	100	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	1996
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	0.159
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	0.204
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	0.268
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	0.319
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	0.399
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	0.453
+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	0.625
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	0.9998

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007*	2008*	2009*
Age													
2	0.142	0.161	0.177	0.171	0.153	0.171	0.18	0.19	0.189	0.194	0.176	0.174	0.173
3	0.193	0.212	0.219	0.207	0.22	0.209	0.226	0.228	0.226	0.242	0.226	0.229	0.217
4	0.256	0.257	0.246	0.276	0.266	0.263	0.307	0.291	0.298	0.282	0.299	0.287	0.277
5	0.319	0.335	0.305	0.343	0.344	0.319	0.362	0.391	0.367	0.347	0.327	0.352	0.32
6	0.406	0.41	0.404	0.452	0.429	0.465	0.487	0.493	0.43	0.42	0.388	0.392	0.363
7	0.502	0.501	0.533	0.573	0.52	0.592	0.657	0.643	0.468	0.455	0.42	0.402	0.453
+gp	0.678	0.7	0.582	0.755	0.62	0.686	0.643	0.81	0.658	0.531	0.513	0.52	0.601
SOPCOFAC	1.0048	1.0091	1.0006	1.0066	1.0102	1.0119	1.0061	1.0092	1.0151	1.0142	1.0018	1.0001	1.0023

(*) In 2007, 2008 and 2009, 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	6.6	**46.3**	**26.0**	**24.8**	**15.4**	**6.5**	**3.3**	3.3
2006	6223	7.6	**62.5**	**29.6**	**11.9**	**6.6**	**3.7**	**2.4**	6.3
2007	5954	1.0	**31.5**	**28.4**	**18.2**	**12.5**	**10.7**	**6.6**	8.2
2008	4321	0.0	**22.8**	**23.0**	**16.7**	**8.1**	**5.3**	**4.9**	7.7
2009	3577	0.7	**23.0**	**22.6**	**9.9**	**7.1**	**4.2**	**2.4**	5.6

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	2.4	**17.5**	**10.6**	**8.8**	**5.3**	**2.4**	**1.1**	1.3
2006	2304	1.5	**10.8**	**8.2**	**3.8**	**2.4**	**1.3**	**0.6**	1.9
2007	2553	0.2	**12.3**	**21.4**	**4.5**	**1.9**	**1.6**	**0.7**	1.0
2008	1887	0.2	**11.3**	**14.6**	**5.4**	**2.1**	**1.1**	**1.1**	1.5
2009	1176	0.1	**4.9**	**7.1**	**2.3**	**1.3**	**0.7**	**0.4**	0.6

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
2009	16159		99.7	692.5	357.8	187.0	99.6	86.9	123.3

Table 6.8

```
Lowestoft VPA Version 3.1

   6/05/2010  11:23

Extended Survivors Analysis

SOLE VIIIa,b

CPUE data from file tunfilt.dat

Catch data for  26 years. 1984 to 2009. Ages  2 to   8.

     Fleet,            First, Last, First, Last, Alpha,  Beta
                     ,   year, year,  age ,  age
FR-SABLES             ,   1991, 2009,   2,     7,   .000,  1.000
FR-ROCHELLE           ,   1991, 2009,   2,     7,   .000,  1.000
FR-RESSGASC-2         ,   1987, 2009,   2,     7,   .270,   .500
FR-RESSGASC-4         ,   1987, 2009,   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 =     .00034

Final year F values
Age         ,      2,      3,      4,      5,      6,      7
Iteration 29,  .1376,  .2902,  .3427,  .3047,  .3775,  .4018
Iteration 30,  .1376,  .2901,  .3426,  .3047,  .3774,  .4017



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,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009

     2,  .272,  .209,  .245,  .198,  .227,  .241,  .189,  .230,  .170,  .138
     3,  .476,  .499,  .524,  .466,  .370,  .339,  .412,  .405,  .442,  .290
     4,  .760,  .645,  .796,  .444,  .420,  .421,  .435,  .403,  .367,  .343
     5,  .710,  .584,  .985,  .405,  .291,  .515,  .372,  .374,  .333,  .305
     6,  .502,  .541,  .946,  .575,  .354,  .514,  .404,  .375,  .403,  .377
     7,  .416,  .501,  .742,  .735,  .386,  .395,  .506,  .458,  .440,  .402
```

Table 6.8 (cont'd)

XSA population numbers (Thousands)

YEAR	AGE 2	3	4	5	6	7
2000	2.50E+04	1.95E+04	1.02E+04	5.25E+03	2.54E+03	1.30E+03
2001	1.67E+04	1.72E+04	1.09E+04	4.30E+03	2.34E+03	1.39E+03
2002	2.52E+04	1.23E+04	9.47E+03	5.19E+03	2.17E+03	1.23E+03
2003	2.47E+04	1.78E+04	6.59E+03	3.87E+03	1.75E+03	7.62E+02
2004	1.76E+04	1.83E+04	1.01E+04	3.82E+03	2.33E+03	8.93E+02
2005	1.95E+04	1.27E+04	1.15E+04	6.02E+03	2.59E+03	1.48E+03
2006	2.18E+04	1.38E+04	8.18E+03	6.80E+03	3.25E+03	1.40E+03
2007	1.96E+04	1.63E+04	8.30E+03	4.79E+03	4.24E+03	1.97E+03
2008	2.13E+04	1.41E+04	9.86E+03	5.02E+03	2.98E+03	2.64E+03
2009	1.99E+04	1.63E+04	8.19E+03	6.18E+03	3.26E+03	1.80E+03

Estimated population abundance at 1st Jan 2010

	0.00E+00	1.57E+04	1.10E+04	5.26E+03	4.13E+03	2.02E+03

Taper weighted geometric mean of the VPA populations:

	2.45E+04	1.81E+04	1.10E+04	6.00E+03	3.19E+03	1.66E+03

Standard error of the weighted Log(VPA populations) :

	.1911	.2148	.2393	.2264	.2295	.3299

1

Log catchability residuals.

Fleet : FR-SABLES

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2	99.99	-.23	-.14	-.39	-.41	-.09	-.21	-.12	-.04	-.18
3	99.99	.14	-.15	.19	-.08	-.14	.00	.24	.03	-.38
4	99.99	.17	-.23	-.05	.40	.17	.05	.04	.48	-.18
5	99.99	.14	-.10	-.06	.28	.03	-.08	-.19	.18	.31
6	99.99	-.08	.21	-.36	.05	-.22	.23	-.02	-.38	.41
7	99.99	.20	.00	-.25	.19	.05	.45	-.09	.04	.54

Age	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
2	.19	-.10	.21	-.13	.27	.41	.62	.11	-.01	.24
3	.43	.15	.30	.04	-.27	-.21	-.08	-.24	.03	-.01
4	.18	.00	.17	-.25	-.15	-.15	-.48	-.04	.00	-.16
5	-.03	-.30	.39	-.13	-.43	.27	-.71	.32	.14	-.02
6	-.04	-.26	.39	.05	-.30	.23	-.56	.27	.26	.11
7	.01	-.33	.09	.10	-.15	.06	-.10	.60	.32	.16

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	-15.0731	-14.5622	-14.5298	-14.7331	-14.7185	-14.7185
S.E(Log q)	.2693	.2097	.2321	.2828	.2807	.2675

Regression statistics :

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

Table 6.8 (cont'd)

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


  2,    3.03,   -2.423,     25.20,     .08,     19,     .72,  -15.07,
  3,     .89,     .592,     14.03,     .62,     19,     .19,  -14.56,
  4,     .70,    2.402,     12.95,     .79,     19,     .14,  -14.53,
  5,     .89,     .488,     14.04,     .52,     19,     .26,  -14.73,
  6,    1.23,    -.700,     16.25,     .36,     19,     .35,  -14.72,
  7,     .67,    3.448,     12.26,     .87,     19,     .13,  -14.62,
1

 Fleet : FR-ROCHELLE

  Age  ,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998,  1999
     2 , 99.99,  -.08,  -.18,  -.46,  -.39,  -.04,   .33,  -.05,   .20,  -.02
     3 , 99.99,   .23,   .00,   .03,  -.18,  -.07,   .09,   .15,  -.06,  -.44
     4 , 99.99,   .49,   .17,  -.17,   .34,   .34,  -.10,  -.04,   .51,  -.20
     5 , 99.99,   .51,   .22,  -.04,   .23,   .24,  -.33,  -.32,   .03,   .21
     6 , 99.99,   .21,   .37,  -.23,   .13,  -.34,  -.13,  -.02,  -.52,   .49
     7 , 99.99,   .27,   .22,  -.02,  -.01,  -.09,  -.13,  -.20,  -.05,   .21



  Age  ,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009
     2 ,   .19,  -.32,   .70,   .14,   .34,   .07,  -.20,  -.04,   .06,  -.25
     3 ,  -.21,  -.09,   .23,   .26,  -.06,  -.37,  -.32,   .37,   .45,  -.01
     4 ,  -.06,   .20,  -.28,  -.01,  -.21,  -.18,  -.32,  -.29,   .01,  -.20
     5 ,  -.15,   .11,  -.03,  -.04,  -.41,   .35,  -.27,  -.25,   .08,  -.15
     6 ,  -.34,   .26,   .03,   .16,  -.20,   .46,  -.08,  -.25,   .04,  -.04
     7 ,  -.37,   .12,  -.14,  -.22,  -.07,   .18,   .04,  -.27,   .18,   .00



 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,  -15.0142,  -14.6086,  -14.8365,  -15.1952,  -15.2464,  -15.2464,
 S.E(Log q),     .2820,     .2446,     .2660,     .2554,     .2821,     .1814,



 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,    1.00,     .001,     15.01,     .34,     19,     .29,  -15.01,
  3,     .94,     .271,     14.30,     .52,     19,     .24,  -14.61,
  4,     .67,    2.310,     13.04,     .75,     19,     .16,  -14.84,
  5,     .79,    1.156,     13.82,     .64,     19,     .20,  -15.20,
  6,    1.72,   -1.663,     20.42,     .24,     19,     .46,  -15.25,
  7,     .81,    1.992,     13.74,     .86,     19,     .13,  -15.26,
1


 Fleet : FR-RESSGASC-2

  Age  ,  1987,  1988,  1989
     2 ,  -.53,  1.07,   .32
     3 ,  -.79,   .24,   .08
     4 ,  -.75,  -.16,  -.49
     5 ,  -.84,  -.05,  -.34
     6 ,  -.14,  -.07,  -.41
     7 ,  -.67,  -.48,   .33
```

Table 6.8 (cont'd)

```
 Age  ,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998,  1999
    2 ,   .67,  -.34, -1.21, -1.48,   .10,  -.12,   .49,   .04,   .84,   .19
    3 ,  -.44,  -.19,  -.69,  -.59,  -.22,  -.24,  1.03,   .57,   .68,   .35
    4 ,  -.35,   .08,  -.13,  -.14,  -.10,  -.37,   .75,   .26,  1.06,   .00
    5 ,  -.25,   .05,  -.17,   .59,  -.52,  -.11,   .19,  -.20,   .80,   .11
    6 , -1.46,   .01,   .21,   .32,  -.68,   .13,   .55,  -.15,   .33,   .71
    7 ,  -.36,  -.39, -1.06,  1.01,  -.24,   .97,   .09,   .14,   .74,  -.38


 Age  ,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009
    2 ,  -.14,   .40,  -.30, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    3 ,  -.15,   .13,   .23, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    4 ,   .42,   .13,  -.21, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    5 ,   .38,   .18,   .17, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    6 ,  -.06,   .68,   .01, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    7 ,  -.06,   .53,   .10, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99


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

   Age ,         2,         3,         4,         5,         6,         7
Mean Log q,   -9.4234,   -9.0650,   -9.0801,   -9.3593,   -9.5768,   -9.5768,
S.E(Log q),     .6828,     .5111,     .4558,     .4065,     .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,    5.84,    -.860,      5.78,     .00,     16,    4.02,   -9.42,
  3,   -4.24,   -2.061,     13.45,     .01,     16,    1.96,   -9.06,
  4,     .87,     .218,      9.13,     .18,     16,     .41,   -9.08,
  5,    3.08,   -1.394,     10.57,     .03,     16,    1.21,   -9.36,
  6,    2.76,    -.935,     12.17,     .02,     16,    1.50,   -9.58,
  7,    2.87,   -1.033,     13.61,     .02,     16,    1.70,   -9.56,
1

 Fleet : FR-RESSGASC-4

 Age  ,  1987,  1988,  1989
    2 ,  -.38,  -.47,  -.64
    3 ,  -.48,  -.74,  -.59
    4 ,  -.47, -1.24,  -.53
    5 ,  -.33, -1.02,   .04
    6 ,  -.18,  -.22,   .72
    7 ,   .13,   .30,   .48


 Age  ,  1990,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998,  1999
    2 ,   .33,   .46,   .91,  -.17,   .23,   .70,   .55,  -.23,   .58,  -.33
    3 ,   .08,   .36,   .05,  -.09,   .31,   .13,   .26,   .35,   .91,  -.26
    4 ,   .01,  -.05,  -.46,  -.14,   .27,   .26,   .02,   .39,  1.12,   .28
    5 ,   .41,  -.56,  -.42,   .15,  -.02,   .30,  -.23,   .15,   .17,  -.18
    6 ,  -.41,  -.50,  -.03,   .48,  -.76,  -.37,  -.37,   .40,   .00,   .33
    7 ,   .69,  -.65,  -.46,  -.95,  -.25,  -.32,   .48,   .79,   .35,  -.17


 Age  ,  2000,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009
    2 , -1.08,  -.16,  -.31, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    3 ,  -.70,   .02,   .41, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    4 ,   .19,   .33,   .02, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    5 ,   .43,   .43,   .69, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    6 ,  -.36,   .15,  1.14, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99
    7 ,  -.33,  -.97,   .25, 99.99, 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,   -9.0202,   -8.8853,   -9.0533,   -9.2955,   -9.5465,   -9.5465,
S.E(Log q),     .5533,     .4575,     .5199,     .4406,     .5046,     .5566,


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,    1.452,      9.62,     .36,     16,     .26,   -9.02,
 3,    1.11,    -.160,      8.78,     .13,     16,     .52,   -8.89,
 4,     .95,     .065,      9.07,     .12,     16,     .51,   -9.05,
 5,    2.29,   -1.045,      9.96,     .04,     16,    1.01,   -9.30,
 6,    5.21,   -1.302,     15.61,     .01,     16,    2.57,   -9.55,
 7,     .74,     .586,      9.01,     .26,     16,     .42,   -9.59,


Terminal year survivor and F summaries :

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

Year class = 2007

Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
FR-SABLES          ,     20034.,   .276,       .000,    .00,   1,  .513,     .109
FR-ROCHELLE        ,     12240.,   .289,       .000,    .00,   1,  .467,     .173
FR-RESSGASC-2      ,         1.,   .000,       .000,    .00,   0,  .000,     .000
FR-RESSGASC-4      ,         1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean ,      9803.,   1.50,,,,                        .020,     .212

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    15687.,       .20,      .18,    3,    .903,   .138


Age  3   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          ,     10914.,   .170,       .002,    .01,   2,  .552,     .292
FR-ROCHELLE        ,     11213.,   .190,       .034,    .18,   2,  .438,     .285
FR-RESSGASC-2      ,         1.,   .000,       .000,    .00,   0,  .000,     .000
FR-RESSGASC-4      ,         1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean ,      7656.,   1.50,,,,                        .010,     .395
```

Table 6.8 (cont'd)

```
Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    11005.,       .13,      .02,    5,    .179,   .290


Age  4   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          ,      5046.,   .143,       .078,    .54,   3,  .557,     .355
FR-ROCHELLE        ,      5571.,   .162,       .206,   1.28,   3,  .434,     .326
FR-RESSGASC-2      ,         1.,   .000,       .000,    .00,   0,  .000,     .000
FR-RESSGASC-4      ,         1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean ,      4235.,   1.50,,,,                        .009,     .410

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     5259.,       .11,      .09,    7,    .823,   .343


Age  5   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          ,      4173.,   .133,       .147,   1.11,   4,  .518,     .302
FR-ROCHELLE        ,      4095.,   .143,       .117,    .82,   4,  .474,     .307
FR-RESSGASC-2      ,         1.,   .000,       .000,    .00,   0,  .000,     .000
FR-RESSGASC-4      ,         1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean ,      3197.,   1.50,,,,                        .008,
.378


Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     4127.,       .10,      .08,    9,    .844,   .305


1
Age  6   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          ,      2181.,   .128,       .066,    .52,   5,  .511,     .354
FR-ROCHELLE        ,      1868.,   .135,       .079,    .59,   5,  .481,     .403
FR-RESSGASC-2      ,         1.,   .000,       .000,    .00,   0,  .000,     .000
FR-RESSGASC-4      ,         1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean ,      1821.,   1.50,,,,                        .008,     .411

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     2021.,       .09,      .05,   11,    .558,   .377
```

Table 6.8 (cont'd)

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

 Year class = 2002

 Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES           ,      1179.,   .126,       .119,    .94,   6,  .439,     .377
 FR-ROCHELLE         ,      1024.,   .122,       .074,    .61,   6,  .554,     .423
 FR-RESSGASC-2       ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-RESSGASC-4       ,         1.,   .000,       .000,    .00,   0,  .000,     .000

   F shrinkage mean  ,      1320.,   1.50,,,,                       .008,     .342

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      1091.,       .09,      .07,   13,    .746,   .402



1
1
```

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
	AGE													
	2	0.3162	0.3869	0.2633	0.1758	0.2165	0.202	0.2641	0.1433	0.1474	0.0827	0.1094	0.1548	0.1137
	3	0.2815	0.3869	0.2993	0.3655	0.4034	0.435	0.3819	0.3504	0.3169	0.3506	0.3233	0.3256	0.3495
	4	0.414	0.3306	0.3609	0.3973	0.4506	0.4343	0.5219	0.458	0.4496	0.4935	0.7396	0.6682	0.5213
	5	0.4172	0.5094	0.514	0.4467	0.4238	0.6394	0.5939	0.441	0.5544	0.6289	0.7269	0.6951	0.4899
	6	0.3849	0.2942	0.8341	0.6508	0.5637	0.7349	0.3648	0.4341	1.0716	0.5886	0.7342	0.5458	0.7272
	7	0.4066	0.3792	0.5719	1.0701	0.9105	0.8746	0.9082	0.7593	0.9333	0.7703	0.7522	0.7197	0.943
	+gp	0.4066	0.3792	0.5719	1.0701	0.9105	0.8746	0.9082	0.7593	0.9333	0.7703	0.7522	0.7197	0.943
0	FBAR 3- 6	0.3744	0.3803	0.5021	0.4651	0.4604	0.5609	0.4656	0.4209	0.5981	0.5154	0.631	0.5587	0.522

	YEAR	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	FBAR **-**
	AGE													
	2	0.2109	0.1305	0.2724	0.209	0.2445	0.1978	0.2269	0.2414	0.189	0.2297	0.1703	0.1376	0.1792
	3	0.3942	0.3914	0.4764	0.4992	0.524	0.4658	0.37	0.3388	0.4115	0.4048	0.4419	0.2901	0.379
	4	0.7211	0.6321	0.7603	0.6447	0.796	0.4438	0.4195	0.4209	0.4355	0.4026	0.3669	0.3426	0.3707
	5	0.5754	0.7097	0.7104	0.5839	0.9852	0.4051	0.2915	0.5154	0.3717	0.3744	0.3328	0.3047	0.3373
	6	0.4069	0.6731	0.5019	0.5412	0.9457	0.5754	0.3542	0.5136	0.404	0.3755	0.4026	0.3774	0.3851
	7	0.6708	0.5186	0.4155	0.5005	0.7417	0.7346	0.3861	0.3952	0.5062	0.4578	0.4397	0.4017	0.4331
	+gp	0.6708	0.5186	0.4155	0.5005	0.7417	0.7346	0.3861	0.3952	0.5062	0.4578	0.4397	0.4017	
0	FBAR 3- 6	0.5244	0.6016	0.6123	0.5673	0.8127	0.4725	0.3588	0.4472	0.4057	0.3893	0.386	0.3287	

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
	AGE													
	2	22884	27831	27821	24734	26796	28270	32256	35931	35584	25132	26411	23821	29603
	3	13557	15093	17104	19346	18772	19526	20902	22412	28172	27784	20936	21422	18464
	4	8640	9258	9276	11473	12146	11346	11436	12909	14284	18567	17705	13710	13997
	5	6269	5168	6018	5850	6978	7003	6650	6141	7388	8245	10257	7646	6359
	6	3830	3737	2810	3257	3386	4133	3343	3322	3575	3840	3978	4486	3453
	7	2769	2359	2520	1104	1537	1744	1793	2101	1947	1108	1929	1727	2352
	+gp	3702	2420	2965	1132	1337	893	1521	1926	1634	1376	1375	2007	2253
0	TOTAL	61651	65865	68514	66897	70952	72916	77901	84740	92585	86052	82590	74820	76480

	YEAR	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	AGE													
	2	22648	24502	25027	16747	25161	24682	17585	19477	21818	19571	21299	19893	0
	3	17911	16597	19458	17245	12296	17828	18326	12682	13844	16342	14074	16255	15687
	4	12995	10927	10154	10934	9472	6588	10125	11454	8177	8301	9865	8186	11005
	5	5541	5717	5255	4295	5192	3866	3825	6022	6803	4787	5021	6184	5259
	6	3890	2820	2544	2337	2168	1754	2333	2586	3255	4245	2978	3257	4127
	7	1689	2343	1302	1394	1231	762	893	1481	1400	1966	2639	1802	2021
	+gp	2540	2526	1368	1299	872	504	1089	1633	4033	2704	3517	3137	2991
0	TOTAL	67214	65432	65107	54251	56391	55985	54176	55335	59330	57916	59393	58715	41090

( ) age 2 replaced by GM 93-2007 = 22809
( ) age 3 replaced by GM e-(F07-08+M) = 16897

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	22884	12974	10648	4038	0.3792	0.3744
1985	27831	13751	11229	4251	0.3786	0.3803
1986	27821	14396	11895	4805	0.404	0.5021
1987	24734	15687	12557	5086	0.405	0.4651
1988	26796	16209	13062	5382	0.412	0.4604
1989	28270	16389	13062	5845	0.4475	0.5609
1990	32256	16871	13279	5916	0.4455	0.4656
1991	35931	18746	14419	5569	0.3862	0.4209
1992	35584	20546	15962	6550	0.4103	0.5981
1993	25132	20134	16577	6420	0.3873	0.5154
1994	26411	19568	16101	7229	0.449	0.631
1995	23821	17999	14554	6205	0.4264	0.5587
1996	29603	18104	14151	5854	0.4137	0.522
1997	23790	16885	13713	6259	0.4564	0.5897
1998	22648	16859	13634	6027	0.4421	0.5244
1999	24502	16262	12614	5249	0.4161	0.6016
2000	25027	15840	12162	5760	0.4736	0.6123
2001	16747	13275	10800	4836	0.4478	0.5673
2002	25161	13354	9917	5486	0.5532	0.8127
2003	24682	13573	9806	4108	0.4189	0.4725
2004	17585	14568	11497	4002	0.3481	0.3588
2005	19477	15050	11958	4539	0.3796	0.4472
2006	21818	16395	12878	4793	0.3722	0.4057
2007	19571	15944	12726	4363	0.3428	0.3893
2008	21299	16546	13212	4299	0.3254	0.386
2009	(19893)	16011	12817	3600	0.2809	0.3287
Arith. Mean	24972	16228	12893	5249	0.4078	0.4981
Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)		

GM 93-2007 = 22809

Table 6.12 Multifleet prediction input data

Sole in Bay of Biscay
Multi fleet input data

MFDP version 1a
Run: BBSole_wg10
Time and date: 18:41 06/05/2010
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input Fs are 2007-2008 means at age 2
Input Fs are 2007-2009 means at age 3 to 8
Catch and stock wts are 2007-2009 means
Recruits are 1993-2007 GM
scale F

2010

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22809	0.1	0.32	0	0	0.185	0.1786	0.174
3	16897	0.1	0.83	0	0	0.237	0.3384	0.224
4	11005	0.1	0.97	0	0	0.305	0.3311	0.288
5	5259	0.1	1	0	0	0.354	0.3013	0.333
6	4127	0.1	1	0	0	0.405	0.3440	0.381
7	2021	0.1	1	0	0	0.452	0.3868	0.425
8	2991	0.1	1	0	0	0.579	0.3868	0.545

2011

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22809	0.1	0.32	0	0	0.185	0.1786	0.174
3		0.1	0.83	0	0	0.237	0.3384	0.224
4		0.1	0.97	0	0	0.305	0.3311	0.288
5		0.1	1	0	0	0.354	0.3013	0.333
6		0.1	1	0	0	0.405	0.3440	0.381
7		0.1	1	0	0	0.452	0.3868	0.425
8		0.1	1	0	0	0.579	0.3868	0.545

2012

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22809	0.1	0.32	0	0	0.185	0.1786	0.174
3		0.1	0.83	0	0	0.237	0.3384	0.224
4		0.1	0.97	0	0	0.305	0.3311	0.288
5		0.1	1	0	0	0.354	0.3013	0.333
6		0.1	1	0	0	0.405	0.3440	0.381
7		0.1	1	0	0	0.452	0.3868	0.425
8		0.1	1	0	0	0.579	0.3868	0.545

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

MFDP version 1a
Run: BBSole_wg10
Time and date: 18:41 06/05/2010
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Basis
F(2010) = Fsq = mean F(07–09) scaled to F 2009 = 0.33
R10–11 = GM(93–07) = 22.8 million

2010

Biomass	SSB	Landings FMult	Landings FBar	Yield
17751	14106	1.0000	0.3287	4142

2011

Biomass	SSB	Landings FMult	Landings FBar	Landing Yield	2012 Biomass	2012 SSB
18564	14906	0.0000	0.0000	0	24421	20583
.	14906	0.1000	0.0329	498	23822	20003
.	14906	0.2000	0.0657	981	23241	19442
.	14906	0.3000	0.0986	1449	22679	18898
.	14906	0.4000	0.1315	1903	22134	18372
.	14906	0.5000	0.1644	2342	21606	17862
.	14906	0.6000	0.1972	2768	21095	17368
.	14906	0.7000	0.2301	3181	20600	16890
.	14906	0.8000	0.2630	3581	20120	16427
.	14906	0.9000	0.2958	3969	19655	15978
.	14906	1.0000	0.3287	4345	19204	15544
.	14906	1.1000	0.3616	4709	18768	15123
.	14906	1.2000	0.3944	5062	18345	14715
.	14906	1.3000	0.4273	5405	17935	14320
.	14906	1.4000	0.4602	5737	17537	13938
.	14906	1.5000	0.4931	6059	17152	13567
.	14906	1.6000	0.5259	6371	16779	13208
.	14906	1.7000	0.5588	6674	16417	12860
.	14906	1.8000	0.5917	6967	16067	12523
.	14906	1.9000	0.6245	7252	15727	12196
.	14906	2.0000	0.6574	7528	15397	11880

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_wg10
Time and date: 18:41 06/05/2010
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Year: 2010 F multiplier: 1 Fleet1 HCFba 0.3287

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1786	3556	620	22809	4212	7299	1348	7299	1348
3	0.3384	4630	1037	16897	3999	14025	3319	14025	3319
4	0.3311	2960	851	11005	3360	10675	3259	10675	3259
5	0.3013	1305	435	5259	1862	5259	1862	5259	1862
6	0.344	1146	437	4127	1673	4127	1673	4127	1673
7	0.3868	619	263	2021	913	2021	913	2021	913
8	0.3868	916	499	2991	1733	2991	1733	2991	1733
Total		15132	4142	65109	17751	46396	14106	46396	14106

Year: 2011 F multiplier: 1 Fleet1 HCFba 0.3287

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1786	3556	620	22809	4212	7299	1348	7299	1348
3	0.3384	4730	1059	17262	4085	14328	3391	14328	3391
4	0.3311	2931	843	10899	3328	10572	3228	10572	3228
5	0.3013	1775	591	7151	2531	7151	2531	7151	2531
6	0.344	978	373	3521	1427	3521	1427	3521	1427
7	0.3868	811	345	2647	1196	2647	1196	2647	1196
8	0.3868	943	514	3080	1785	3080	1785	3080	1785
Total		15724	4345	67370	18564	48598	14906	48598	14906

Year: 2012 F multiplier: 1 Fleet1 HCFba 0.3287

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1786	3556	620	22809	4212	7299	1348	7299	1348
3	0.3384	4730	1059	17262	4085	14328	3391	14328	3391
4	0.3311	2995	862	11135	3400	10801	3298	10801	3298
5	0.3013	1757	585	7082	2507	7082	2507	7082	2507
6	0.344	1330	507	4787	1941	4787	1941	4787	1941
7	0.3868	692	294	2258	1020	2258	1020	2258	1020
8	0.3868	1078	587	3520	2039	3520	2039	3520	2039
Total		16138	4514	68855	19204	50076	15544	50076	15544

Input units are thousands and kg - output in tonnes

Table 6.15 Sole in VIIIa,b

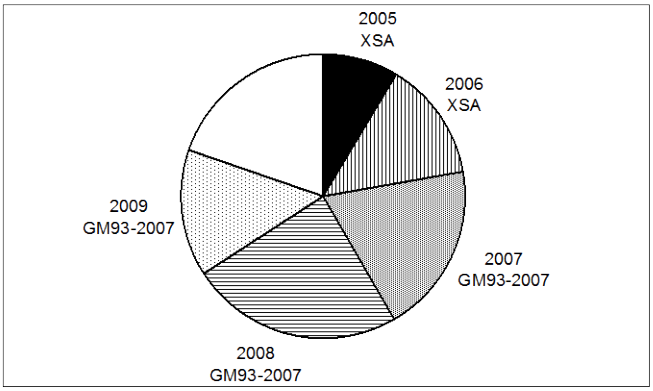
Stock numbers of recruits and their source for recent year classes used in predictions, and the relative (%) contributions to landings and SSB (by weight) of these year classes

Year-class	2005	2006	2007	2008	2009	2010
Stock No. (thousands) of 2 year-olds	19571	21299	22809	22809	22809	22809
Source	XSA	XSA	GM93-2007	GM93-2007	GM93-2007	GM93-2007
Status Quo F:						
% in 2010 landings	10.5	20.5	25.0	15.0	-	-
% in 2011	8.6	13.6	19.4	24.4	14.3	-
% in 2010 SSB	13.2	23.1	23.5	9.6	-	-
% in 2011 SSB	9.6	17.0	21.7	22.7	9.0	-
% in 2012 SSB	6.6	12.5	16.1	21.2	21.8	8.7

GM : geometric mean recruitment

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

a) 2011 landings



XSA 2005 XSA 2006 GM93-2007 2007 GM93-2007 2008 GM93-2007 2009 GM93-2007 2010

b) 2012 SSB

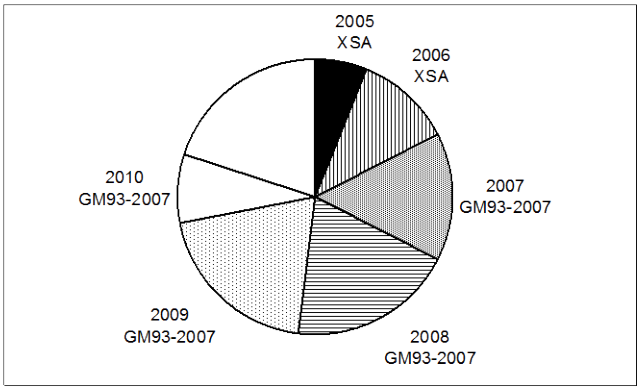


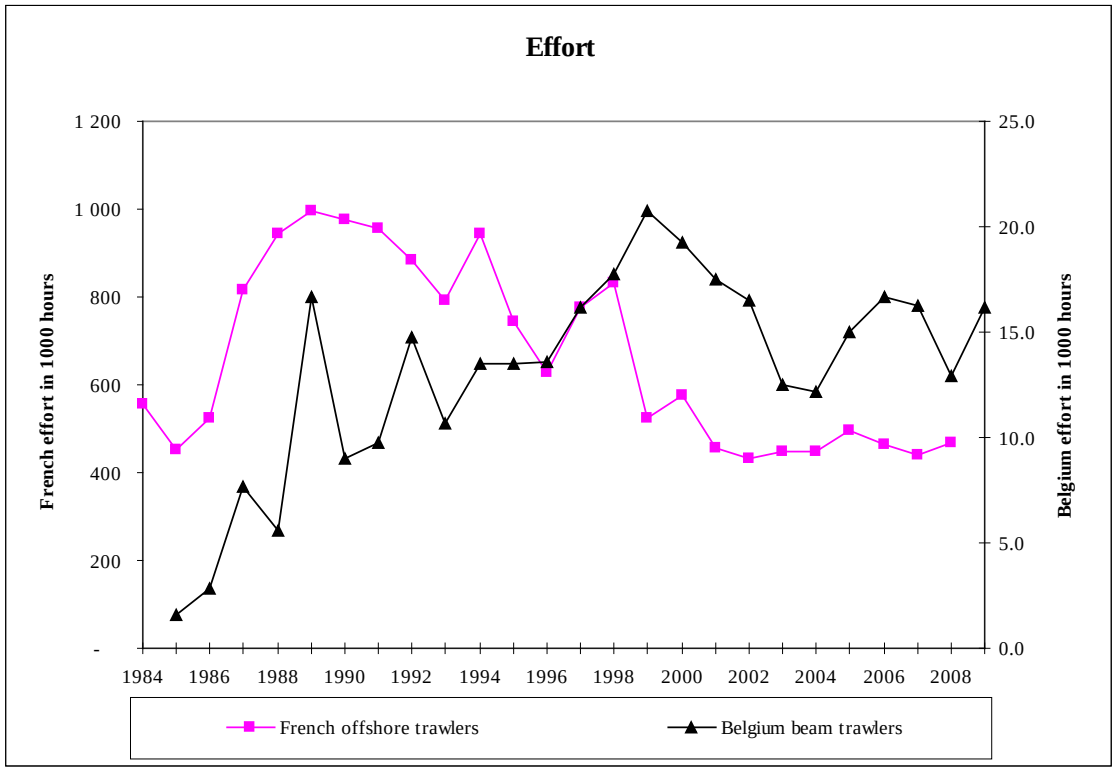
Table 6.16 : Bay of Biscay Sole Multifleet Yield per recruit

MFYPR version 2a
Run: BBSole_WG10
Time and date: 18:46 06/05/2010
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	4.7978	9.6499	4.6283	9.6499	4.6283
0.1000	0.0329	0.2533	0.1070	7.9785	3.3859	7.1241	3.2175	7.1241	3.2175
0.2000	0.0657	0.3976	0.1585	6.5377	2.6003	5.6871	2.4329	5.6871	2.4329
0.3000	0.0986	0.4914	0.1856	5.6023	2.1035	4.7555	1.9370	4.7555	1.9370
0.4000	0.1315	0.5576	0.2006	4.9434	1.7629	4.1002	1.5974	4.1002	1.5974
0.5000	0.1644	0.6069	0.2087	4.4523	1.5163	3.6126	1.3517	3.6126	1.3517
0.6000	0.1972	0.6453	0.2130	4.0711	1.3303	3.2349	1.1665	3.2349	1.1665
0.7000	0.2301	0.6761	0.2149	3.7658	1.1856	2.9330	1.0227	2.9330	1.0227
0.8000	0.2630	0.7013	0.2154	3.5154	1.0702	2.6859	0.9081	2.6859	0.9081
0.9000	0.2958	0.7225	0.2150	3.3060	0.9763	2.4796	0.8150	2.4796	0.8150
1.0000	0.3287	0.7405	0.2141	3.1281	0.8986	2.3048	0.7381	2.3048	0.7381
1.1000	0.3616	0.7561	0.2128	2.9748	0.8334	2.1545	0.6736	2.1545	0.6736
1.2000	0.3944	0.7696	0.2114	2.8413	0.7780	2.0240	0.6190	2.0240	0.6190
1.3000	0.4273	0.7816	0.2099	2.7240	0.7304	1.9095	0.5721	1.9095	0.5721
1.4000	0.4602	0.7922	0.2084	2.6200	0.6891	1.8083	0.5316	1.8083	0.5316
1.5000	0.4931	0.8017	0.2069	2.5271	0.6531	1.7181	0.4962	1.7181	0.4962
1.6000	0.5259	0.8103	0.2055	2.4436	0.6213	1.6373	0.4651	1.6373	0.4651
1.7000	0.5588	0.8180	0.2040	2.3681	0.5932	1.5644	0.4376	1.5644	0.4376
1.8000	0.5917	0.8251	0.2027	2.2996	0.5680	1.4984	0.4131	1.4984	0.4131
1.9000	0.6245	0.8315	0.2014	2.2370	0.5455	1.4383	0.3912	1.4383	0.3912
2.0000	0.6574	0.8374	0.2002	2.1797	0.5252	1.3834	0.3715	1.3834	0.3715

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3287
FMax	0.7971	0.2620
F0.1	0.3383	0.1112
F35%SPR	0.3922	0.1289

Weights in kilograms



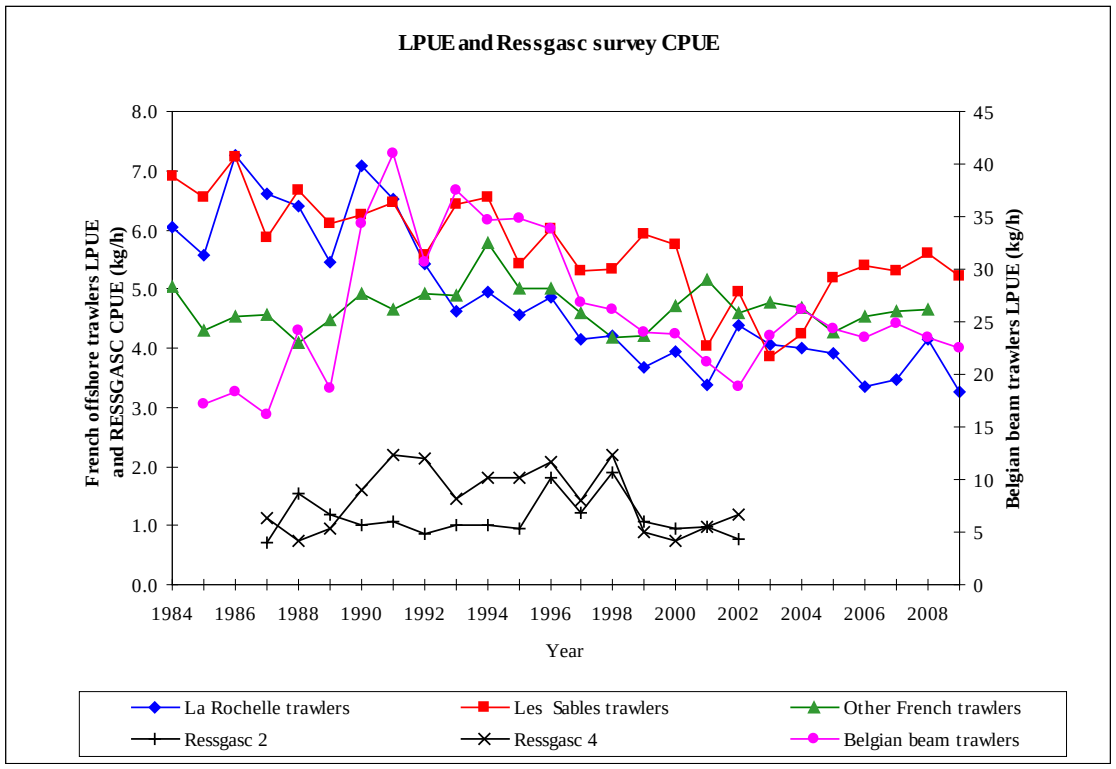


Figure 6.1 : Bay of Biscay sole (Division VIIIa,b)

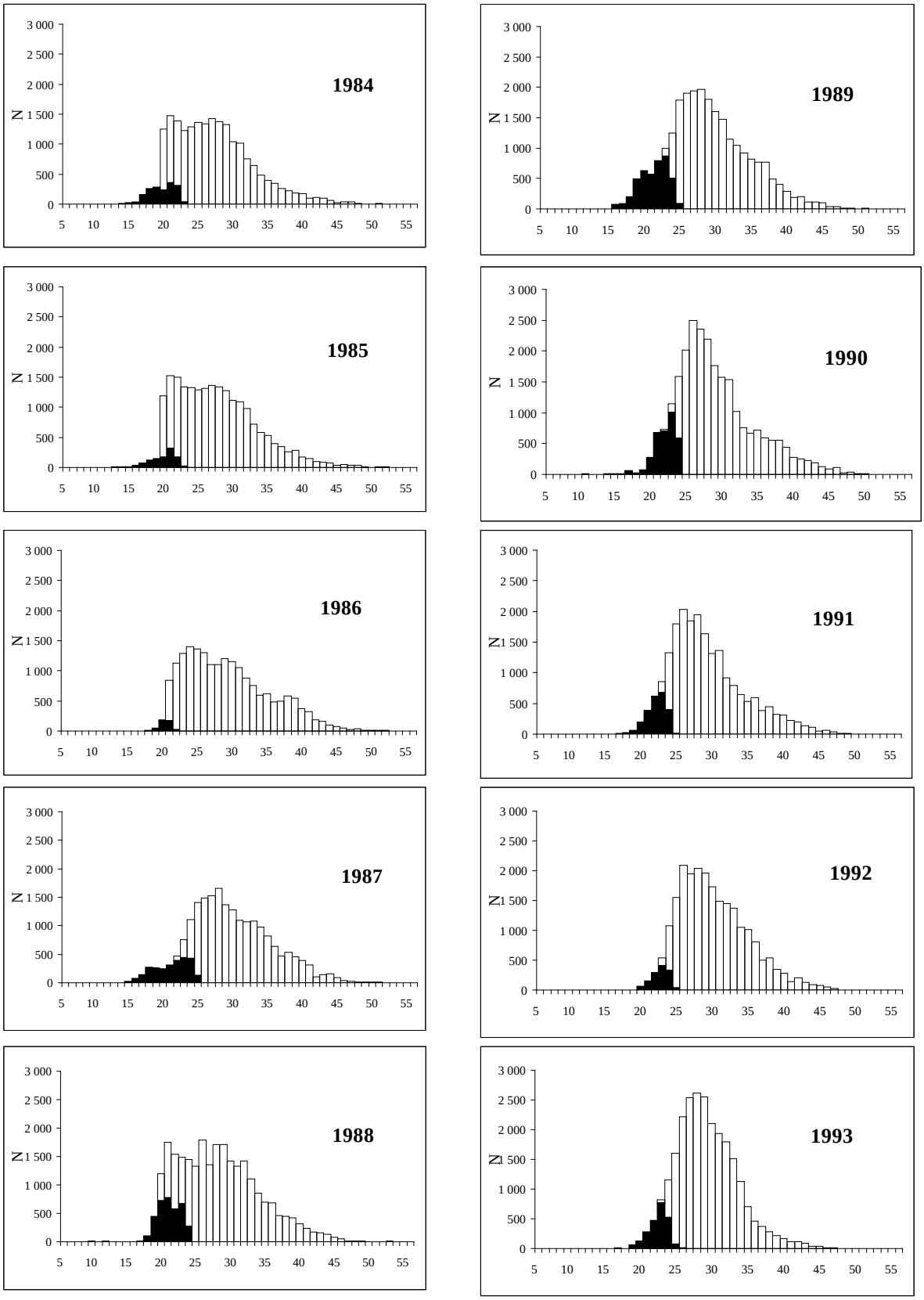


Figure 6.2 a : Bay of Biscay sole French length distribution from 1984 to 1993

Total French landings

Discard estimates of the French offshore trawlers fleet

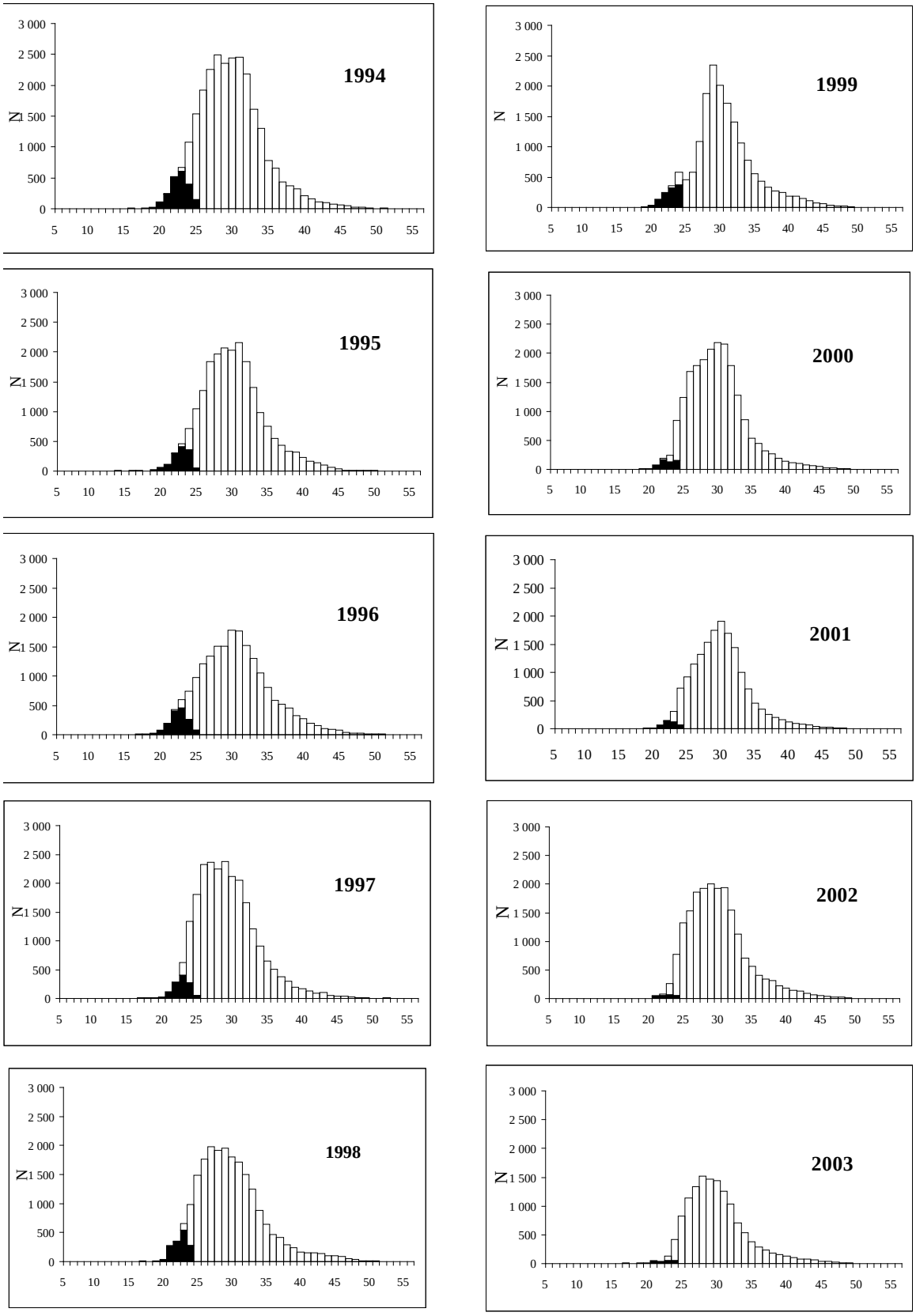


Figure 6.2 b : **Bay of Biscay sole French length distribution from 1994 to 2003**

Total French landings

Discard estimates of the French offshore trawler fleet (1994 to 2003)

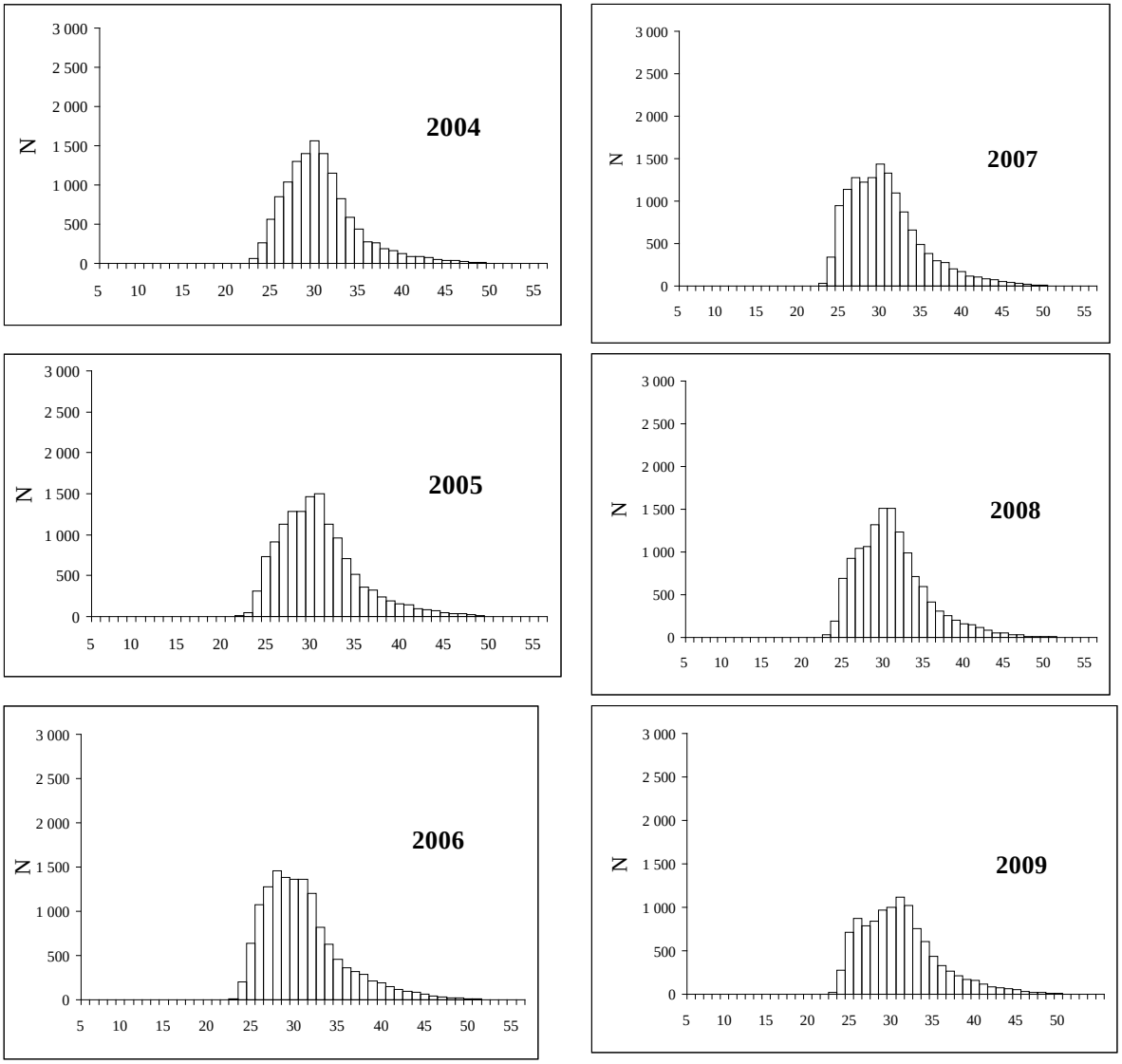
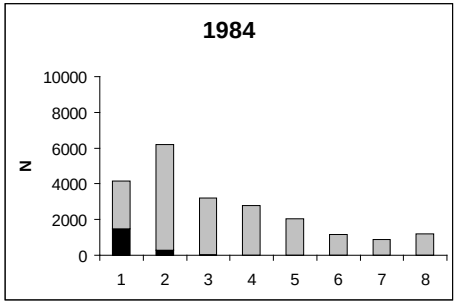
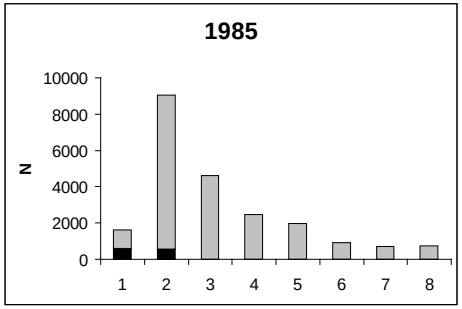
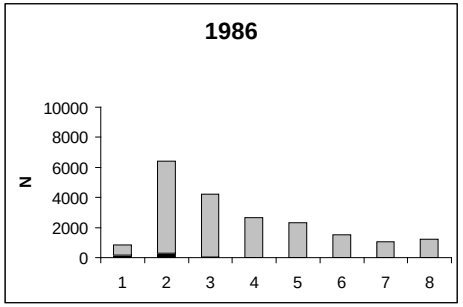


Figure 6.2 c : Bay of Biscay sole French length distribution from 2004 to 2009


1984
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8


1985
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8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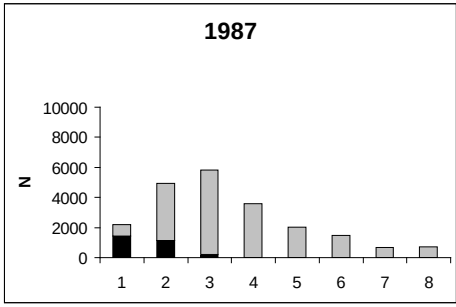
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8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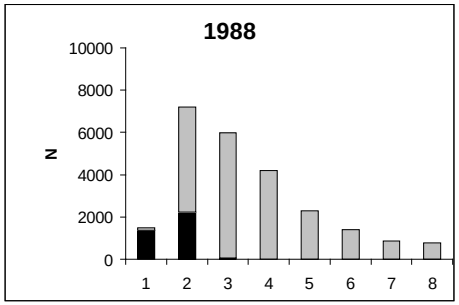
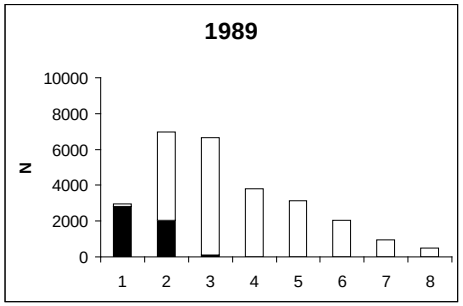
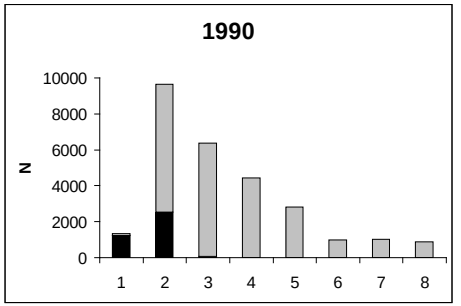
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8


1988
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8


1989
N
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8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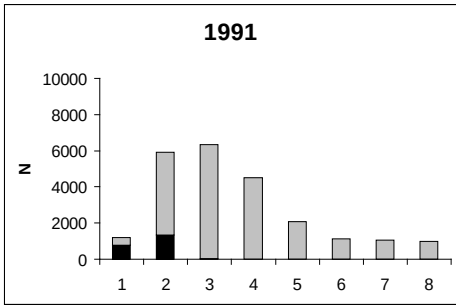
1 2 3 4 5 6 7 8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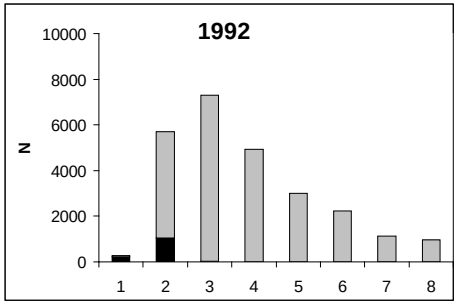
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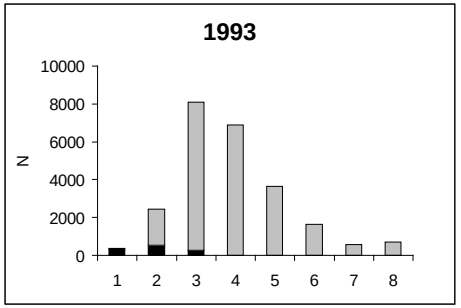
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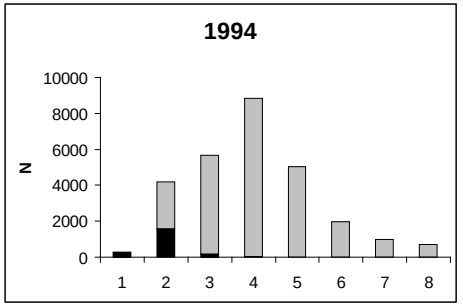
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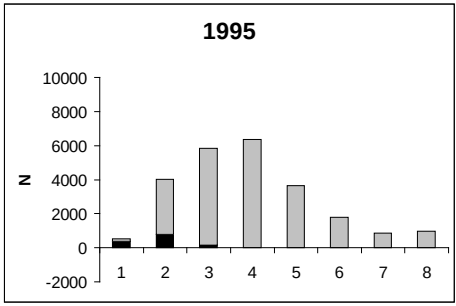
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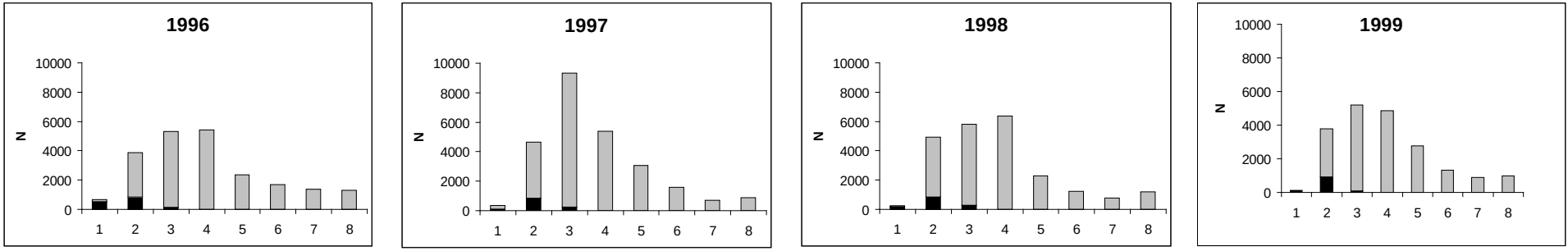


Figure 6.3 a : Bay of Biscay sole landings and discards age distributions from 1984 to 1999 (numbers in thousands)

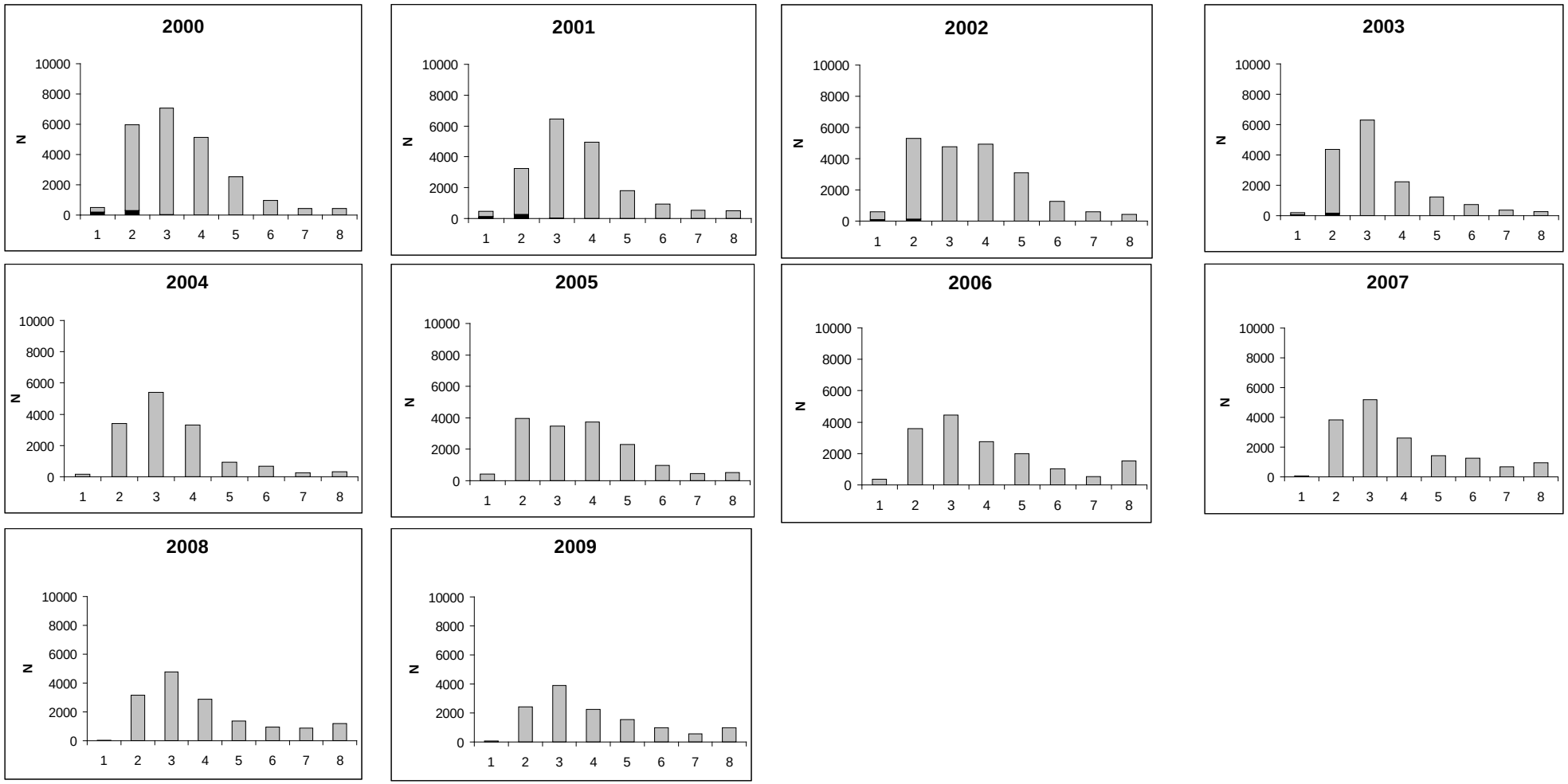


Figure 6.3 b : Bay of Biscay sole landings and discards age distributions from 2000 to 2004 landings age distribtion since 2004 (numbers in thousands)

LOG CATCHABILITY RESIDUAL PLOTS (XSA)

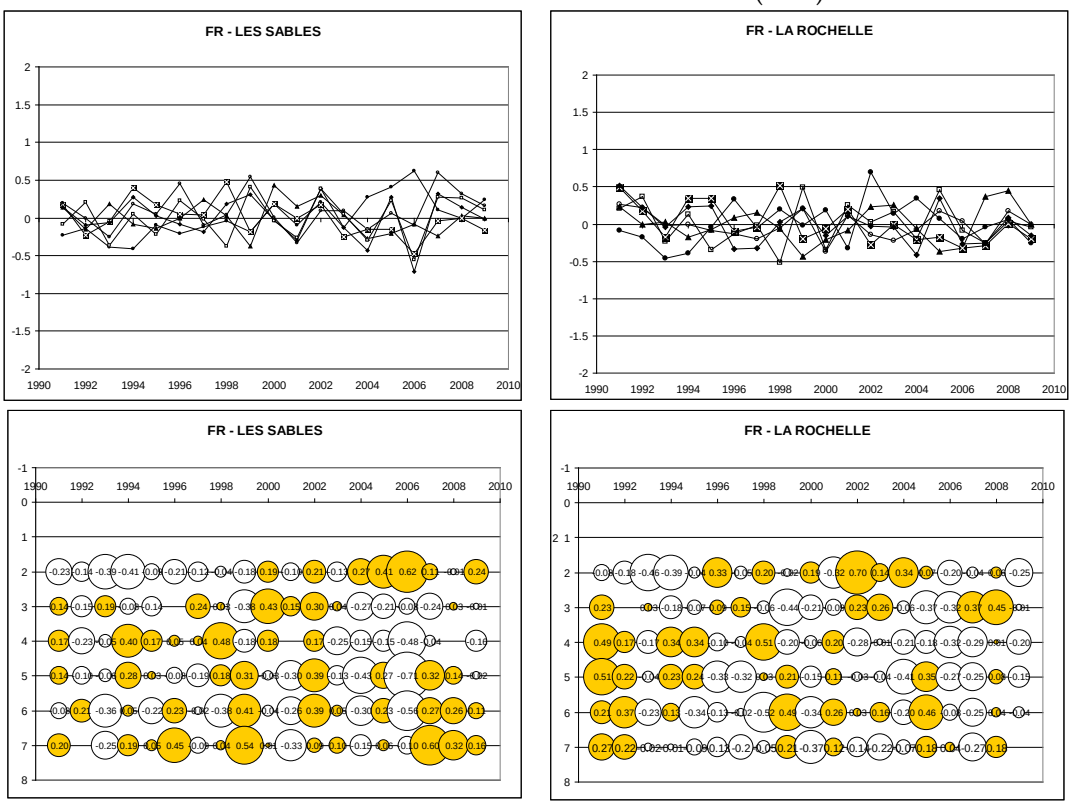


Figure 6.4 a : Bay of Biscay sole (Division VIIIa,b)

XSA (No Taper, mean q, s.e. shrink = 1.5, s.e. min = .2)

LOG CATCHABILITY RESIDUAL PLOTS (XSA)

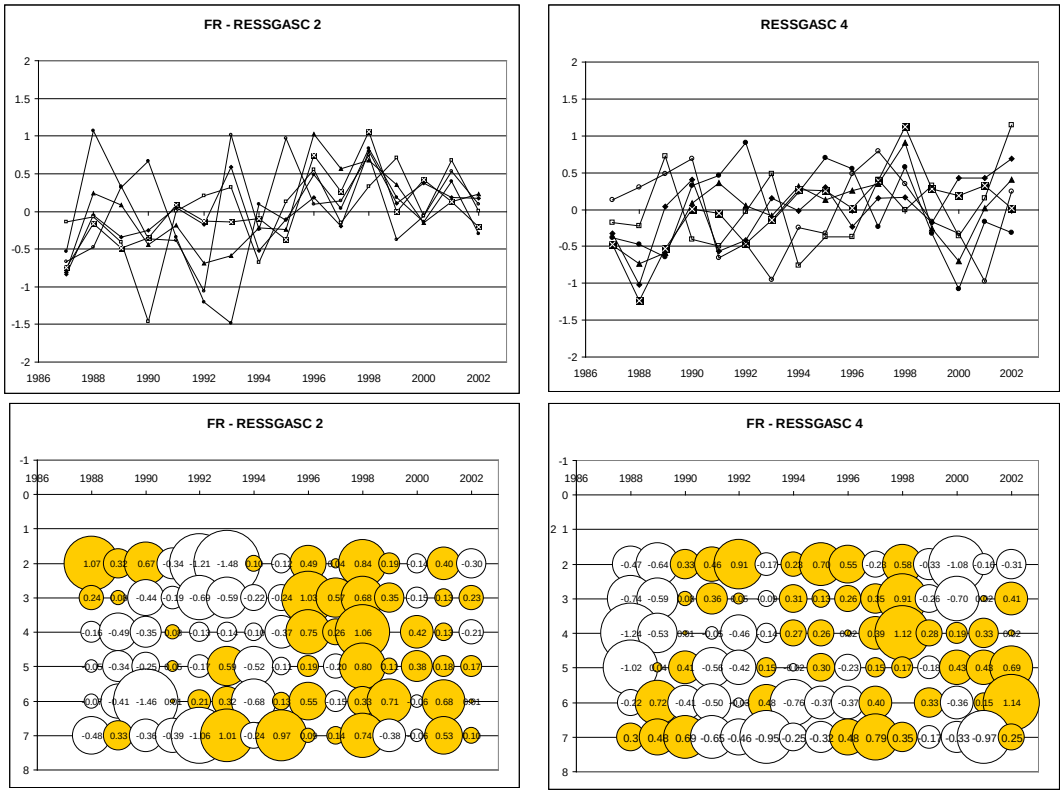


Figure 6.4 b : Bay of Biscay sole (Division VIIIa,b)

XSA (No Taper, mean q, s.e. shrink = 1.5, s.e. min = .2)

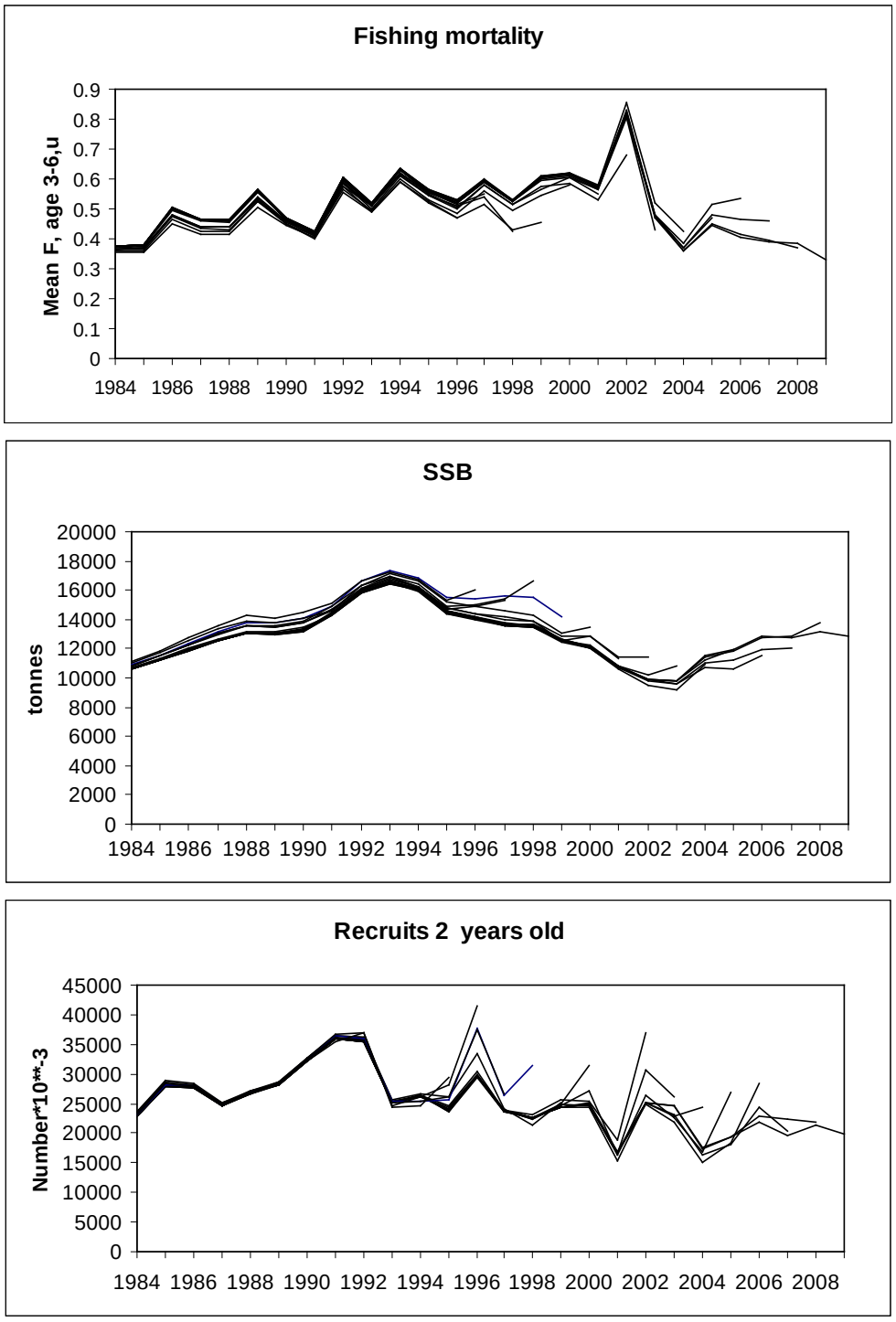


Figure 6.5 : Bay of Biscay sole (Division VIIIa,b) - Retrospective results
(No taper, q indep. stock size all ages, q indep. of age>=6, shr.=1.5)

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

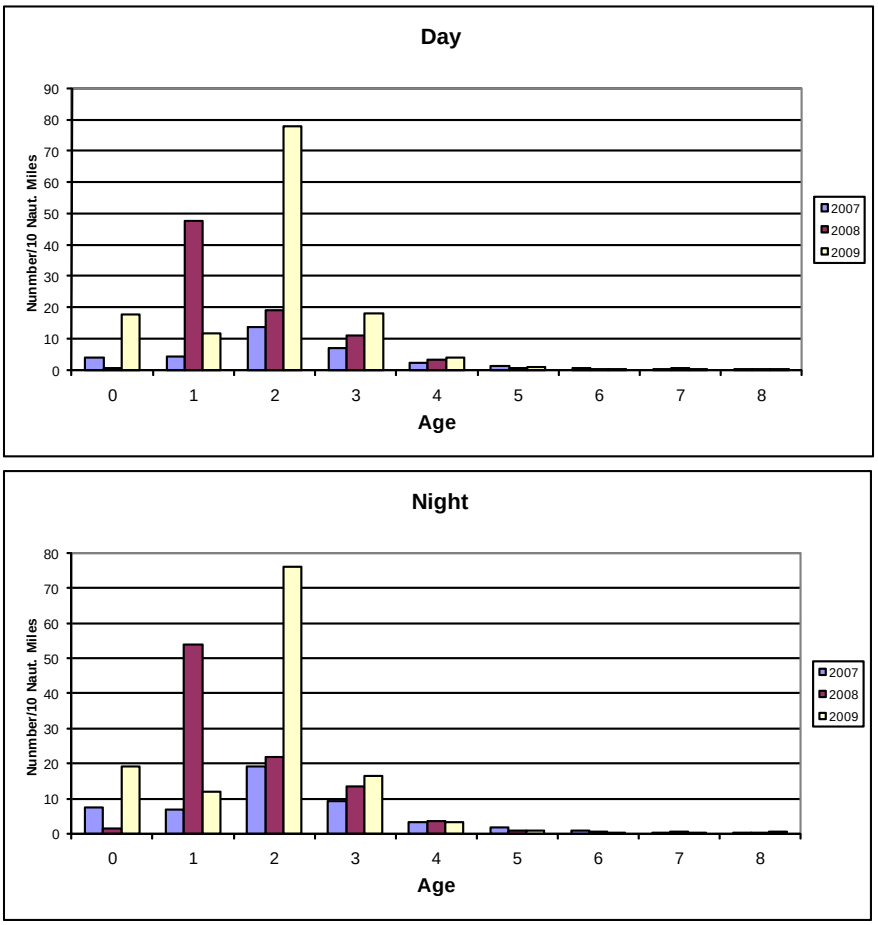
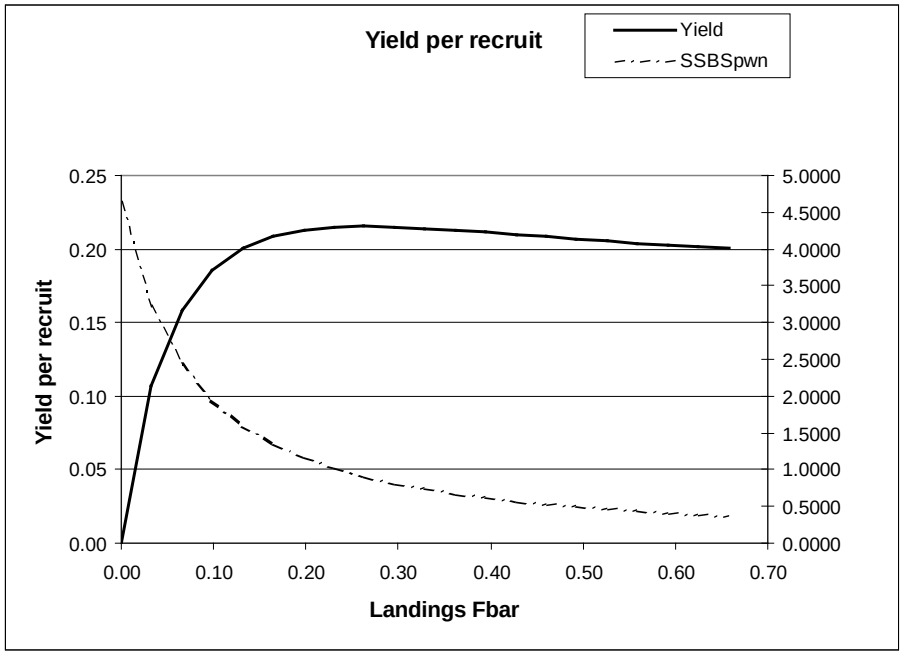


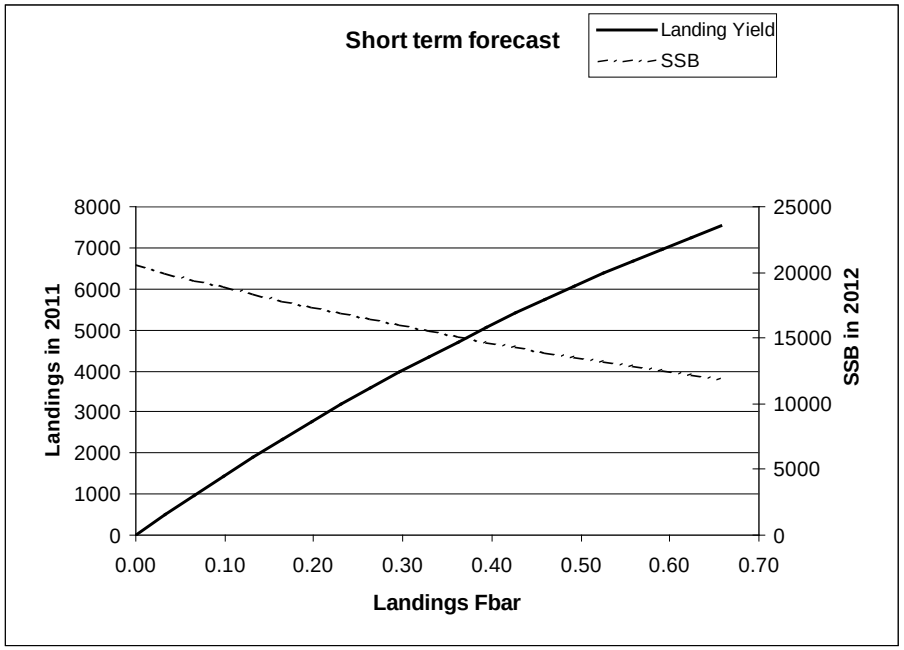
Figure 6.7 : Bay of Biscay sole (Division VIIIa,b) - 2007-2009 ORHAGO Indices
(Numbers/10 nautical miles by daylight and at night)



MFYPR version 2a
Run: BBSole_WG10
Time and date: 18:46 06/05/2010

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3287
FMax	0.7971	0.2620
F0.1	0.3383	0.1112
F35%SPR	0.3922	0.1289

Weights in kilograms



MFDP version 1a
Run: BBSole_wg10
Time and date: 18:41 06/05/2010
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input units are thousands and kg - output in tonnes

Figure 6.8 : Bay of Biscay sole

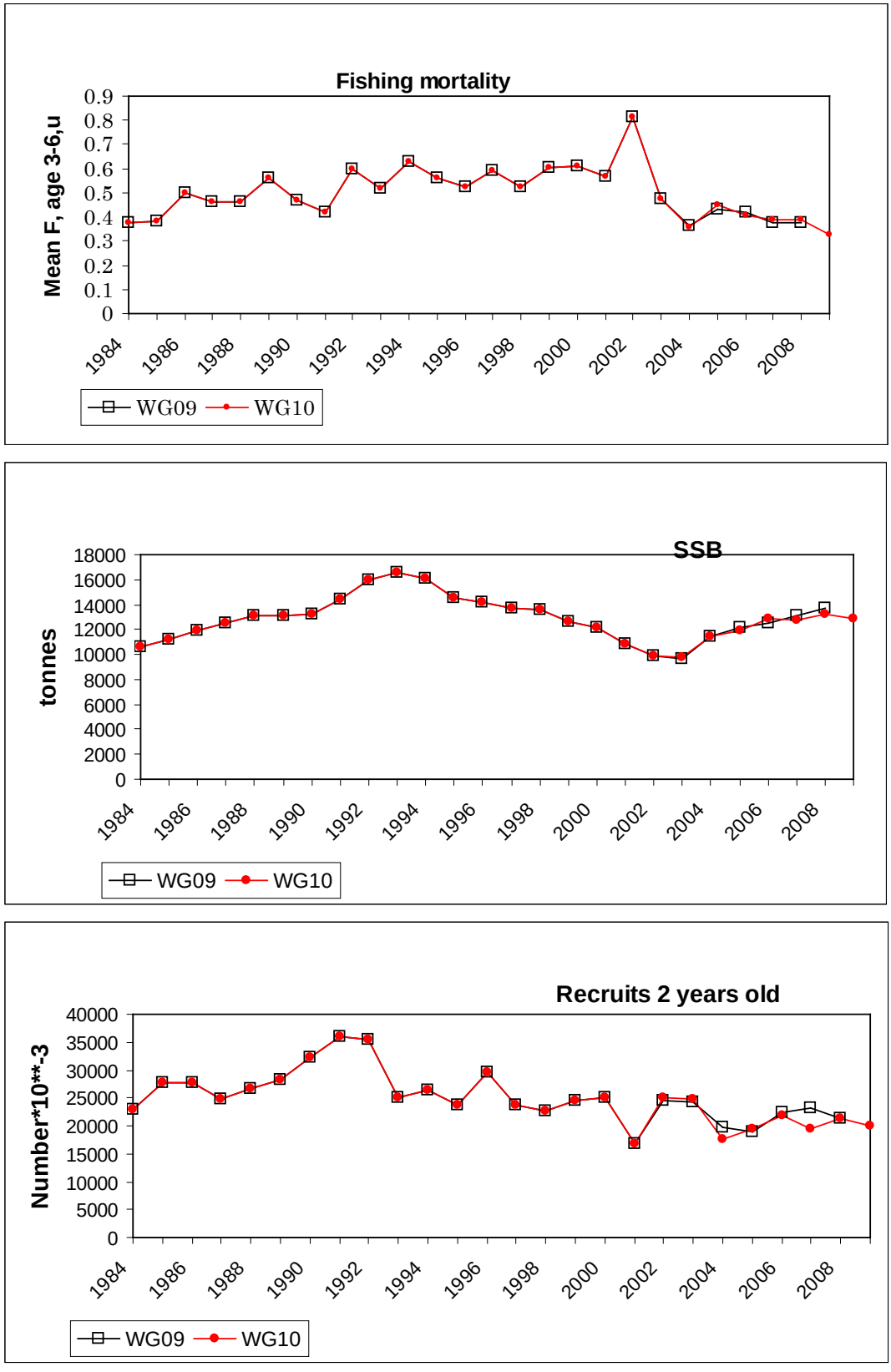


Figure 6.9 : Bay of Biscay sole (Division VIIIa,b) - WG10 / WG09 comparison