6 Bay of Biscay Sole

Type of assessment in 2011: update.

Data revisions this year: Compared to last year assessment, there is only very limited change in data due to small revisions of 2009 landings and of 2009 commercial LPUE.

Review Group issues:

- The RG wondered about the risk of underestimating the decrease in stock abundance by using 10% limit on the species percentage to ensure that only trips which target the species of interest are included in the LPUE for this species.

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 2011 and management applicable to 2010 and 2011

ICES advice for 2011:

Two advice options were provided for 2011:

Following the transition scheme towards the ICES MSY framework implies fishing mortality to be reduced to 0.32, resulting in landings of 4200 t in 2011.

Following the Precautionary Approach, fishing mortality in 2011 should be no more than F_{pa} corresponding to landings of less than 5300 t in 2011.

Management applicable to 2010 and 2011

The sole landings in the Bay of Biscay are subject to a TAC regulation. The 2010 TAC was set at 4829 t. The 2011 TAC is set at 4250 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.

The 2009 landings estimate was revised 1.4% higher to 3650 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 3650t in 2009 and increasing to 3966 t in 2010 (Table 6.1a).

The 2010 landings figure is 4 % below the landings predicted by the 2010 WG at status quo mortality (4142 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, this survey allowed affirmation that the discards of offshore trawlers are low at age 2 and above. This low level has been confirmed by observations at sea in recent years. These observations have also shown that discards of beam trawlers and gillnetters are generally low but that the inshore trawlers fleet may have occasionally high discards of sole. Unfortunately, they are difficult to estimate because the effort data of inshore trawlers are not precise enough to allow estimating them by relevant areas.

6.2.2 Biological sampling

The quarterly French sampling for length compositions is by gear (trawl or fixed net) and by 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 2009 split was slightly revised because of small correction in the database (Table 6.1 b).

Length compositions are available on a quarterly basis from 1984 for the French fleets and from 1994 for the Belgian beam trawlers. The 2010 sampling level is given in table 1.3. The French length distributions are shown on Figures 6.4 a, b & c from 1984 onwards. The relative length distribution of landings in 2010 is shown by country in Table 6.3.

Even though age reading from otoliths now uses the same method in France and Belgium (see Stock Annex), the discrepancy between French and Belgian mean weight at age, noticed by preceding WGs, was 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 used in France and straight estimate in Belgium) and should be investigated. International age compositions are estimated using the same procedure as in previous years, as described in Stock Annex. International mean weights at age of the catch are French-Belgian quarterly weighted mean weights. The catch numbers at age are shown in Table 6.4 and Figures 6.5 a & b, and the mean catch weight at age in 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. The WKFLAT 2011 workshop, in which this stock was benchmarked, decided not to include the RESSGASC series in the revised tuning process because the survey terminated in 2002 and no longer contributes to the estimates of terminal population numbers in the assessment.

Since 2007, a new beam trawl survey (ORHAGO) is carried out by France to provide a sole abundance index in the Bay of Biscay. This survey is coordinated by the ICES WGBEAM. The series was presented to the WKFLAT 2011 which considered that this series should be used to tune the assessment in the near future but its length is still too short to be inserted in the tuning process in the 2011 assessment. The WKFLAT 2011 highlighted that "*A particular attention must be paid to the tuning series which evolve by the adding of the ORHAGO survey as soon as its series is five years long*".

6.2.4 Commercial catch- effort data

The French La Rochelle and Les Sables trawler series of commercial fishing effort data and CPUE 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.

The risk that the sole 10 % threshold may lead to an underestimate of the decrease in stock abundance was pointed out by RG in 2010. This general point is acknowledged by this working group. However in this particular case using the knowledge about the fishery this threshold was set to avoid the effect of changing target species, which may also affect the trend in CPUE. Indeed, the choice of target species may affect effort repartition between sole major habitat and peripheral areas where sole abundance is lower. Because 10% is a minimum for sole percentage in catch when carrying out mixed species trawling on sole grounds, according to fishermen, this percentage was retained to ensure that sole CPUE are not driven by a fishing strategy evolution (the targeting of cephalopods more particularly).

The La Rochelle CPUE 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 (Table 6.2.a and Figure 6.1). 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.

Two new series of tuning were added to the assessment according to the WKFLAT 2011: the Bay of Biscay offshore trawler fleet (14 – 18 m) in the second quarter (FR-BB-OFF-Q2) and the Bay of Biscay inshore trawler fleet (10 – 12 m) in the fourth quarter (FR-BB-IN-Q4) for 2000 to the last year. A selection of fishing days was made by a

double threshold (sole landings > 6% and *nephrops* landings <= 10%) The process is described in the Stock Annex.

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 until 2009 (no available value in 2010).

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; this was confirmed by the WKFLAT 2011.

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

The year range used is 1984-2010.

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.

Four commercial cpue series are used in the assessment: La Rochelle offshore trawlers (FR-ROCHELLE), Les Sables d'Olonne offshore trawlers (FR-SABLES), the Bay of Biscay offshore trawlers in the second quarter (FR-BB-OFF-Q2) and the Bay of Biscay inshore trawlers in the last quarter (FR-BB-IN-Q4). The data for these four tuning series are in table 6.6. The last two of these tuning series were incorporated during the benchmark assessment performed at WKFLAT 2011 and, hence, are used in the WGHMM assessment for the first time this year.

The tuning fleets of La Rochelle and Les Sables are based on a list of vessels. In recent years the number of active vessels in this list is steadily declining (Figure 6.2). For Les Sables, the numbers of vessels is 3 in the first quarter of 2010 and 2 in the rest of the year (zero in the second quarter). The number of vessels for La Rochelle is 3 for the beginning of the year and 4 for the third and fourth quarters. The main problem for La Rochelle is not only the decreasing numbers of vessels but the large decrease in effort in recent years. As a consequence, there is a strong concern that these series may no longer be representative of stock abundance.

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 – 2010	1 – 8	<1 %
Offshore otter trawlers	FR-ROCHELLE	1991 – 2010	1 – 8	<1 %
Inshore otter trawlers	FR-BB-IN-Q4	2000 – 2010	1 – 8	<1 %
Offshore otter trawlers	FR-BB-OFF-Q2	2000 – 2010	1 – 8	<1 %

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 all fleets.

Exploratory runs

To analyze the effect of the above-mentioned changes a retrospective analysis was made including the year 2010 for these two fleets and excluding year 2010 for them (figure 6.3, left and right panels, respectively). The trends in F, SSB and recruits at age 2 are different at the end of the series when the CPUE 2010 for Les Sables and La Rochelle are included. F increases substantially in 2009 and, conversely, SSB also decreases in 2009. Regarding the results for the retrospective graphs excluding the 2010 CPUE values for these series, they seem similar to previous assessments. Taking into account the change in the trend graph and, especially, the low number of vessels now in these tuning fleets, the WGHMM conclusion was to withdraw the 2010 CPUE value for the Les Sables and La Rochelle. This is in agreement with the decision of WKFLAT 2011 to withdraw these series when they became no longer relevant. The assessment this year is done by keeping these series from 1991 to 2009.

Final XSA run

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

			2010 XSA			**2011 XSA**
Catch data range			84-09			84-10
Catch age range			2-8+			2-8+
Fleets	FR – SABLES	91-09	2-7	FR – SABLES	91-09	2-7
	FR – ROCHELLE	91-09	2-7	FR – ROCHELLE	91-09	2-7
	FR – RESSGASC2	87-02	2-7	FR-BB-IN-Q4	00-10	3-7
	FR – RESSGASC4	87-02	2-7	FR-BB-OFF-Q2	00-10	2-6
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 6.7. The log-catchability residuals are shown in Figure 6.6 and retrospective results in Figure 6.7. The main difference in the retrospective patterns with respect to those obtained in last year's assessment is the large reduction of the diverging trends observed prior to 1991 with RESSGASC survey series due to the removal of them.

Only the fleet FR-BB-OFF-Q2 allows an information of survivors for age 2. Commercial fleet estimates are similar for ages 4 and 5 for all fleets, while Les Sables has a higher weight for ages 4 to 7. Les Sables and La Rochelle dominate the estimates for ages 6 and 7. Estimates of the two new fleets are higher for ages 2 and 3.

Fishing mortalities and stock numbers at age are given in Tables 6.8 and 6.9 respectively. The results are summarised in Table 6.10. Trends in yield, F, SSB and recruitments are plotted in Figure 6.8. Fishing mortality in 2010 is estimated by XSA to have been at 0.39. Fishing mortality in 2009 is now estimated at 0.37, a bit lower than last year WG report (0.39).

6.3.3 Assessment results

6.3.3.1 Estimating year class abundance

The 2007 year class is estimated to be 23.1 million 2 year olds by XSA. Last year's WG XSA estimate (19.9 million) was not accepted by the WG which preferred to overwrite this year class with the $GM_{93\text{-}07}$ (22.8 million) because of the lack of reliability of the XSA estimates that shows the retrospective analysis. The present value indicates that this year class strength is over the 1993-2008 average ($GM_{93\text{-}08}$ = 22.4 million). However, this year class strength is not largely above those of 2005-2006 year classes, as it was expected from the new ORHAGO survey indices (Figure 6.9).

The 2008 year class is estimated to be at 5.8 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 $GM_{93\text{-}08}$, as in previous WG assessment. The estimates are provided by only one tuning fleet and the F shrinkage mean. Furthermore, the new ORHAGO survey indices indicate that the 2008 year class strength should be above those of 2005-2006 year classes (Figure 6.9).

The XSA estimate was consequently overwritten by a short series $GM_{93\text{-}08}$ from 1993 up to two years before the terminal years (2008), as in preceding assessments, since there is observed fall in stock numbers at age 2 after 1993. This $GM_{93\text{-}08}$ is also used to estimate subsequent recruitments.

Recruitment at age 2

YEAR CLASS	THOUSANDS	BASIS	SURVEYS	COMMERCIAL	SHRINKAGE
2007	23074	XSA	0 %	83 %	17 %
2008	22443	GM(93-08)			
2009 & subsequent	22443	GM(93-08)			

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 6.10 and illustrated in Figure 6.8.

Since 1984, fishing mortality gradually has increased, peaked in 2002 and decreased substantially the following two years. It increased in 2005 and, later on stabilized at around 0.4. Fishing mortality was 0.43 in 2008, 0.37 in 2009 and 0.39 in 2010.

SSB trend in earlier years increases from 12300 t in 1984 to 16 500 t in 1993, afterwards it shows a continuous decrease to 9 700 t in 2003. After a 29 % increase between 2003 and 2006, the SSB remains close to 12000 t from 2007 onwards. It is estimated to be 11800 t in 2010, 1% lower than in 2009.

The recruitment values are lower since 1993. Since 2004 the series is fluctuating, but few values below the average are worth noting since 2001.

6.3.4 Catch options and prognosis

The exploitation pattern is the mean over the period 2008-2010 (over 2008-2009 at age 2), considering the absence of 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 2011 to 2013 are assumed equal to $GM_{93\text{-}08}$. Stock numbers at age 3 in 2011 are derived from $GM_{93\text{-}08}$ reduced by total estimated mortality (M plus the average F at age 2 for years 2008 and 2009). Stock numbers at ages 4 and above in 2011 are the XSA survivor estimates.

Weights at age in the landings are the 2008-2010 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 2008-2010 means using the old fresh/gutted transformation coefficient of French landing (1.11). The predicted spawning biomass is 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 6.11.

The landings forecasts is 4364 t in 2011 (TAC is set at 4250 t), 9 % higher than the 2010 landings.

Assuming recruitment at $GM_{93\text{-}08,}$ the SSB is predicted to increase to 13400 t in 2011 and to 13900 t in 2012, fishing at *status quo* F in 2011. It will continue to grow at *status quo* F, to reach 14200 t in 2013 (Tables 6.12 and 6.13).

The proportional contributions of recent year classes to the landings in 2012 and to the SSB in 2013 are given in Table 6.14. Year classes for which $GM_{93\text{-}08}$ recruitment has been assumed (2008 to 2011) contribute 61 % of the 2012 landings and 67.5 % of the 2013 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 6.15 and in Figure 6.10. The $\mathbf{F}_{sq}$ (0.40) is 36 % above $\mathbf{F}_{max}$ (= 0.25) and 3.2 times $\mathbf{F}_{0.1}$ (=0.12). Long-term equilibrium landings and SSB (at F *status quo* and assuming GM recruitment) are estimated to be 4800 t and 14900 t respectively.

6.3.5 Biological reference points

WGHMM 2010 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 Approach	MSY $B_{trigger}$	13000 t	Bpa
	F_{MSY}	0.26	Fmax (as estimated by WGHMM 2010) 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

The WKFLAT 2011 decided that F_{max} remains unchanged as well as F_{MSY} which is set to F_{max}. The basis for setting F_{lim} was kept (historical response of the stock) and its value remains coherent with the historical SSB trend. Consequently, F_{pa} is unchanged.

The fishing mortality pattern is known with a low uncertainty because of the limited discards and the satisfactory sampling level of the catches.

6.3.6 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 several year class at age 2 but this series must be continued to allow a better estimate of the incoming recruitment. Stopping the use of fleets of La Rochelle and Les Sables tuning series leads to a lack of information at age 2, which is now only given by the Offshore Q2 new tuning fleet. Therefore the rapid incorporation of ORHAGO in the assessment will be necessary.

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 data available for discard do not seem representative to use them in the assessment but the WKFLAT 2011 recommended that further work should include investigation on the monitoring of the inshore trawlers discards.

Consistency

The RESSGASC series has been removed in the tuning series at WKFLAT 2011. They do not contribute to terminal year estimates, the removal of these series changes rather substantially the earlier part of the trends.

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 assessments. This GM estimate has a very large contribution in predicted

landings and SSB. Furthermore, it is worth noting that variability of the recruit series has increased since 2001 and that, in recent period, the use of GM estimate has led several times to forecast an increase in SSB which was superior to the one observed in following years.

The retrospective pattern in F is low for the two last years of the assessment (Figure 6.7). The addition of two new tuning fleets decided at the benchmark (WKFLAT 2011) increased slightly the F mortality but does not change the general trend in the retrospective pattern

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.

The comparison with the last assessment WGHMM shows a change in SSB trends in the earlier part of this series (due to the removal of the RESSGASC survey-series from the tuning-series) has slightly modified the recruitment and SSB plots (Figure 6.11).
At the end of the series a higher fishing mortality is shown after 2007, between 9-13 % but it is decreasing every year. The difference for the SSB is lower, between 6-7%, and seems stable at the end.

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 2011 WGHMM to assess the state of the Bay of Biscay sole stock. Participants expressed no reservations about these data or about the addition of the 2 news tuning fleets and the withdrawal from year 2010 of LA ROCHELLE and LES SABLES tuning series.

6.3.7 Management considerations

The assessment indicates that SSB has decreased continuously to 9700 t in 2003, since a peak in 1993 (16 500 t), has increased to 12500t in 2006 but it remains close to 12000 t thereafter, especially in 2008. It is estimated to be 13400t (above Bpa = 13000 t) in 2011 assuming GM recruitment for 2010.

The (EC) 388/2006 management plan is agreed for the Bay of Biscay sole but a long-term F target has not yet been set. The WKFLAT 2011 has confirmed the robustness of WGHMM assessment and indicated that there is no need to change the biological reference points. This plan was not evaluated by ICES.

Table 6.1 a: Bay of Biscay sole (Division VIIIa,b). Internationals 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	na	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	364	4391				4755	3650	-	-
2010	451	4248				4699	3966	-	-

[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

Year	2009	2010
Shrimp trawlers	0	0
Inshore trawlers	6	8
Offshore otter trawlers	21	19
Offshore beam trawlers	10	11
Fixed nets	63	61

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

Year	CPUE		LPUE	LPUE	LPUE	LPUE	effort index
	Inshore (10-12 m) trawlers of French sole fishery	Offshore (14-18m) trawlers of French sole fishery	La Rochelle offshore trawlers of French sole fishery	Les Sables offshore trawlers of French sole fishery	Other harbours * offshore trawlers of French sole fishery	All offshore trawlers of French sole fishery	All offshore trawlers of French sole fishery
	Q4	Q2	(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	-	-	6.6	5.9	4.6	5.4	816
1988	-	-	6.4	6.7	4.1	5.1	944
1989	-	-	5.5	6.1	4.5	5.1	996
1990	-	-	7.1	6.3	4.9	5.7	975
1991	-	-	6.5	6.5	4.7	5.4	954
1992	-	-	5.4	5.6	4.9	5.1	884
1993	-	-	4.6	6.4	4.9	5.2	791
1994	-	-	5.0	6.6	5.8	5.6	944
1995	-	-	4.6	5.4	5.0	5.2	742
1996	-	-	4.9	6.0	5.0	5.4	628
1997	-	-	4.1	5.3	4.6	4.7	774
1998	-	-	4.2	5.3	4.2	4.2	834
1999	-	-	3.7	5.9	4.2	4.5	524
2000	6.3	3.6	4.0	5.7	4.7	4.7	577
2001	5.8	3.4	3.4	4.0	5.2	4.7	454
2002	4.8	4.3	4.4	5.0	4.6	4.6	430
2003	5.9	4.1	4.1	3.9	4.8	4.6	447
2004	5.5	3.6	4.0	4.1	4.7	4.4	448
2005	5.3	3.3	3.9	5.2	4.2	4.2	495
2006	6.4	2.2	3.4	5.4	4.5	4.5	465
2007	5.4	3.7	3.5	5.3	4.6	4.5	440
2008	4.4	3.2	4.1	5.6	4.6	4.5	468
2009	5.1	3.6	3.3	5.2	na	na	na
2010	4.7	3.4	3.6	5.7	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
2010	451.3	na	na

Table 6.3 : Bay of Biscay Sole - 2010
French and Belgian relative length distribution of landings

Length(cm)	France	Belgium
13	0.00	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	0.03	0.01
22	0.33	0.30
23	2.93	6.24
24	7.58	12.29
25	9.85	14.53
26	10.89	13.03
27	10.72	12.60
28	10.17	10.94
29	11.19	7.58
30	9.71	7.15
31	7.99	4.42
32	5.39	3.21
33	3.35	2.22
34	2.36	1.52
35	1.59	1.12
36	1.31	1.03
37	1.03	0.68
38	0.71	0.47
39	0.60	0.27
40	0.51	0.17
41	0.40	0.09
42	0.37	0.05
43	0.24	0.03
44	0.22	0.01
45	0.15	0.01
46	0.15	0.00
47	0.07	0.01
48	0.06	0.00
49	0.04	0.00
50	0.02	0.00
51	0.01	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

MLS= 24 cm

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

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

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2	2603	3249	3027	3801	4096	2851	5677	3180	5198	4274
3	5502	5663	5180	9079	5550	5113	7015	6528	4777	6309
4	8803	6356	5409	5380	6351	4870	5143	4948	4932	2236
5	5040	3644	2343	3063	2306	2764	2542	1776	3095	1220
6	1968	1795	1697	1578	1237	1314	955	899	1269	729
7	970	843	1366	692	785	902	421	513	615	377
+gp	696	986	1319	877	1188	977	444	486	432	250
TOTALNUM	25582	22536	20341	24470	21513	18791	22197	18330	20318	15395
TONSLAND	7229	6205	5854	6259	6027	5249	5760	4836	5486	4108
SOPCOF %	100	100	100	100	101	100	101	101	101	101

Year	2004	2005	2006	2007	2008	2009	2010
2	3411	3976	3535	3885	3173	2860	2074
3	5415	3464	4436	5181	4794	3986	7722
4	3291	3738	2747	2615	2886	2233	3832
5	917	2309	2012	1419	1353	1501	1303
6	661	991	1030	1262	938	946	494
7	272	461	530	686	892	541	274
+gp	333	508	1537	946	1193	960	283
TOTALNUM	14300	15447	15827	15994	15229	13027	15982
TONSLAND	4002	4539	4793	4363	4299	3650	3966
SOPCOF %	101	102	101	100	100	102	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
Age										
2	0.121	0.106	0.102	0.141	0.134	0.136	0.131	0.143	0.146	0.145
3	0.168	0.174	0.173	0.201	0.19	0.188	0.179	0.192	0.196	0.197
4	0.213	0.252	0.245	0.285	0.272	0.258	0.241	0.26	0.262	0.267
5	0.269	0.313	0.328	0.376	0.357	0.354	0.348	0.325	0.341	0.341
6	0.329	0.39	0.409	0.467	0.495	0.437	0.436	0.437	0.404	0.439
7	0.368	0.457	0.498	0.497	0.503	0.543	0.601	0.535	0.49	0.569
+gp	0.573	0.698	0.657	0.682	0.604	0.799	0.854	0.715	0.715	0.677
SOPCOFAC	1.0712	1.0302	1.0197	1.0248	1.008	1.0055	1.0039	1.0183	1.0004	1.0008

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Age										
2	0.147	0.16	0.159	0.142	0.161	0.177	0.171	0.152	0.171	0.18
3	0.195	0.206	0.204	0.193	0.212	0.219	0.207	0.22	0.208	0.226
4	0.251	0.252	0.268	0.256	0.257	0.246	0.276	0.265	0.263	0.307
5	0.324	0.308	0.319	0.319	0.335	0.305	0.343	0.341	0.32	0.361
6	0.421	0.403	0.399	0.406	0.41	0.404	0.452	0.428	0.466	0.487
7	0.569	0.484	0.453	0.502	0.501	0.533	0.573	0.519	0.592	0.657
+gp	0.774	0.658	0.625	0.678	0.7	0.582	0.755	0.619	0.681	0.642
SOPCOFAC	1.0016	1.0023	0.9998	1.0048	1.0091	1.0006	1.0066	1.01	1.0122	1.0056

Year	2004	2005	2006	2007*	2008*	2009*	2010*
Age							
2	0.19	0.189	0.195	0.176	0.174	0.17	0.179
3	0.227	0.226	0.242	0.225	0.229	0.215	0.205
4	0.29	0.298	0.282	0.298	0.287	0.275	0.267
5	0.391	0.367	0.347	0.326	0.352	0.317	0.33
6	0.493	0.43	0.42	0.388	0.392	0.361	0.406
7	0.643	0.468	0.455	0.419	0.401	0.447	0.471
+gp	0.81	0.656	0.533	0.511	0.519	0.601	0.775
SOPCOFAC	1.0104	1.0153	1.0136	1.0026	1	1.0158	1.0024

(*) for 2007 to 2010, 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: Sole 8ab, available tuning data (landings); SOLE VIIIa,b commercial landings (N in 10-3) - 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	2.3	**32.9**	**64.5**	**35.2**	**9.5**	**5.5**	**3.1**	2.2
2002	10344	7.2	**76.9**	**60.3**	**37.5**	**19.3**	**8.4**	**3.9**	1.7
2003	7354	1.5	**38.9**	**49.1**	**14.3**	**7.8**	**4.0**	**1.7**	0.6
2004	6909	2.7	**38.4**	**36.5**	**22.7**	**5.7**	**3.8**	**1.7**	1.8
2005	6571	6.6	**46.4**	**26.6**	**25.2**	**15.3**	**6.4**	**3.3**	3.2
2006	6223	7.7	**63.1**	**29.7**	**11.9**	**6.6**	**3.7**	**2.4**	6.3
2007	5954	1.0	**32.6**	**28.4**	**18.0**	**12.4**	**10.6**	**6.6**	8.2
2008	4321	0.0	**22.8**	**22.8**	**16.4**	**8.1**	**5.2**	**4.9**	7.8
2009	3577	0.7	**23.0**	**22.2**	**9.8**	**7.1**	**4.2**	**2.4**	5.7
2010	2305	0.6	16.0	36.1	5.8	1.1	0.4	0.2	0.2

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	4.8	**64.0**	**44.4**	**19.2**	**6.7**	**2.8**	**1.5**	2.5
2001	7074	2.3	**24.7**	**39.9**	**23.7**	**5.5**	**3.3**	**1.9**	1.8
2002	6957	9.0	**89.2**	**36.3**	**11.8**	**5.4**	**2.3**	**1.3**	0.4
2003	5028	2.2	**37.8**	**40.0**	**9.1**	**3.7**	**1.7**	**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	**17.3**	**10.5**	**8.8**	**5.2**	**2.4**	**1.1**	1.3
2006	2304	1.5	**11.0**	**8.3**	**3.9**	**2.4**	**1.3**	**0.6**	1.9
2007	2553	0.2	**12.3**	**21.5**	**4.5**	**1.8**	**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	**4.8**	**7.1**	**2.3**	**1.3**	**0.7**	**0.4**	0.6
2010	1028	0.3	6.4	11.6	2.4	0.5	0.2	0.1	0.1

FR-BB-IN-Q4

Year	Fishing effort	1	2	3	4	5	6	7	8
2000	1336	4.23	21.85	**11.66**	**3.47**	**1.04**	**0.35**	**0.24**	**0.09**
2001	2451	24.26	49.94	**8.82**	**2.73**	**1.04**	**0.88**	**0.42**	**0.69**
2002	2942	19.73	31.21	**14.52**	**2.13**	**1.30**	**1.30**	**0.84**	**0.66**
2003	3423	1.98	35.50	**38.68**	**5.46**	**1.04**	**0.63**	**0.46**	**0.60**
2004	2725	3.84	22.03	**21.64**	**7.90**	**3.14**	**2.67**	**0.50**	**1.25**
2005	4432	8.84	42.24	**14.57**	**11.70**	**4.75**	**1.89**	**0.99**	**2.42**
2006	5212	18.97	67.59	**22.00**	**5.47**	**3.76**	**3.17**	**2.12**	**4.93**
2007	3139	2.31	29.16	**13.61**	**6.15**	**3.15**	**2.61**	**0.58**	**1.86**
2008	3082	0.51	12.32	**14.05**	**7.62**	**2.64**	**1.48**	**1.09**	**1.10**
2009	1828	1.56	28.03	**8.62**	**1.97**	**1.06**	**0.90**	**0.37**	**0.80**
2010	2633	0.94	13.80	**21.21**	**6.00**	**1.91**	**0.60**	**0.28**	**0.67**

FR-BB-OFF-Q2

Year	Fishing effort	1	2	3	4	5	6	7	8
2000	4940	0.00	**20.77**	**25.67**	**21.00**	**8.64**	**2.47**	0.82	1.50
2001	4538	0.01	**13.50**	**27.47**	**18.90**	**5.17**	**3.31**	1.29	0.98
2002	4639	0.01	**31.90**	**29.40**	**14.88**	**7.87**	**3.55**	1.84	0.46
2003	3252	0.02	**23.23**	**28.04**	**7.10**	**1.88**	**0.82**	0.08	0.03
2004	4810	0.00	**14.05**	**44.18**	**14.60**	**1.38**	**0.70**	0.27	0.41
2005	4468	3.58	**12.78**	**19.09**	**15.79**	**5.63**	**0.54**	0.42	0.56
2006	2111	0.00	**3.29**	**8.97**	**2.73**	**1.41**	**0.91**	0.31	0.29
2007	3972	0.00	**13.33**	**45.84**	**6.37**	**1.17**	**1.68**	0.24	0.54
2008	3005	0.00	**15.28**	**21.67**	**6.78**	**2.15**	**0.36**	0.77	0.45
2009	1360	0.00	**1.69**	**12.24**	**4.09**	**1.29**	**0.39**	0.25	0.55
2010	2100	0.00	**1.41**	**24.88**	**7.22**	**1.96**	**0.10**	0.02	0.06

Table 6.7

```
Lowestoft VPA Version 3.1

    7/05/2011  21:54

 Extended Survivors Analysis

 SOLE VIIIa,b

 CPUE data from file tunfiltLRLS09.dat

 Catch data for  27 years. 1984 to 2010. Ages  2 to   8.

      Fleet,            First, Last, First, Last, Alpha,  Beta
                     ,    year, year,  age ,  age
 FR-SABLES            ,   1991, 2010,   2,     7,   .000,  1.000
 FR-ROCHELLE          ,   1991, 2010,   2,     7,   .000,  1.000
 FR-BB-IN-Q4          ,   2000, 2010,   3,     7,   .750,  1.000
 FR-BB-OFF-Q2         ,   2000, 2010,   2,     6,   .250,   .500


 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 =     .00106

 Final year F values
 Age          ,      2,      3,      4,      5,      6,      7
 Iteration 29,  .4718,  .5927,  .4638,  .3250,  .1850,  .2024
 Iteration 30,  .4717,  .5925,  .4636,  .3248,  .1848,  .2021


 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,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009,  2010

      2,  .220,  .246,  .202,  .233,  .253,  .204,  .239,  .171,  .140,  .472
      3,  .509,  .524,  .468,  .376,  .348,  .439,  .456,  .460,  .300,  .593
      4,  .650,  .808,  .441,  .422,  .429,  .455,  .444,  .439,  .358,  .464
      5,  .579, 1.001,  .416,  .289,  .522,  .384,  .399,  .386,  .381,  .325
      6,  .531,  .966,  .594,  .369,  .511,  .412,  .392,  .443,  .452,  .185
      7,  .520,  .754,  .764,  .408,  .422,  .501,  .471,  .469,  .438,  .202
```

Table 6.7 (cont'd)

```
1
 XSA population numbers (Thousands)

                               AGE
 YEAR ,        2,         3,       4,       5,       6,        7,

 2001 ,    1.70E+04, 1.72E+04, 1.09E+04, 4.25E+03, 2.29E+03, 1.33E+03,
 2002 ,    2.51E+04, 1.23E+04, 9.35E+03, 5.14E+03, 2.15E+03, 1.22E+03,
 2003 ,    2.45E+04, 1.77E+04, 6.60E+03, 3.77E+03, 1.71E+03, 7.42E+02,
 2004 ,    1.73E+04, 1.81E+04, 1.01E+04, 3.84E+03, 2.25E+03, 8.54E+02,
 2005 ,    1.87E+04, 1.24E+04, 1.13E+04, 5.97E+03, 2.60E+03, 1.41E+03,
 2006 ,    2.02E+04, 1.31E+04, 7.90E+03, 6.64E+03, 3.20E+03, 1.41E+03,
 2007 ,    1.92E+04, 1.49E+04, 7.66E+03, 4.54E+03, 4.09E+03, 1.92E+03,
 2008 ,    2.12E+04, 1.37E+04, 8.54E+03, 4.44E+03, 2.76E+03, 2.50E+03,
 2009 ,    2.31E+04, 1.62E+04, 7.81E+03, 4.98E+03, 2.73E+03, 1.60E+03,
 2010 ,    5.80E+03, 1.82E+04, 1.09E+04, 4.94E+03, 3.08E+03, 1.57E+03,

 Estimated population abundance at 1st Jan 2011

    ,     0.00E+00, 3.27E+03, 9.09E+03, 6.18E+03, 3.23E+03, 2.32E+03,

 Taper weighted geometric mean of the VPA populations:

    ,     2.33E+04, 1.81E+04, 1.11E+04, 6.06E+03, 3.32E+03, 1.81E+03,

 Standard error of the weighted Log(VPA populations) :

    ,        .3371,    .2106,    .2391,    .2507,    .2796,    .3980,
1

 Log catchability residuals.


 Fleet : FR-SABLES

  Age  ,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998,  1999,  2000
     2 ,  -.23,  -.14,  -.38,  -.41,  -.09,  -.21,  -.12,  -.03,  -.18,   .19
     3 ,   .13,  -.16,   .19,  -.08,  -.15,   .00,   .23,   .02,  -.39,   .42
     4 ,   .15,  -.25,  -.07,   .39,   .17,   .04,   .03,   .46,  -.20,   .16
     5 ,   .10,  -.14,  -.09,   .25,   .02,  -.10,  -.22,   .17,   .29,  -.06
     6 ,  -.18,   .18,  -.38,   .04,  -.24,   .25,  -.01,  -.39,   .42,  -.04
     7 ,  -.06,  -.15,  -.27,   .17,   .06,   .47,  -.02,   .11,   .54,   .06

  Age  ,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009,  2010
     2 ,  -.17,   .21,  -.13,   .28,   .45,   .72,   .17,   .00,   .09, 99.99
     3 ,   .10,   .28,   .02,  -.27,  -.17,  -.02,  -.14,   .05,  -.03, 99.99
     4 ,  -.03,   .16,  -.27,  -.18,  -.13,  -.46,   .02,   .14,  -.14, 99.99
     5 ,  -.25,   .36,  -.14,  -.47,   .23,  -.73,   .34,   .25,   .19, 99.99
     6 ,  -.21,   .38,   .05,  -.32,   .17,  -.57,   .27,   .30,   .28, 99.99
     7 ,  -.24,   .09,   .10,  -.14,   .08,  -.15,   .59,   .35,   .25, 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,  -15.0706,  -14.5473,  -14.5057,  -14.6919,  -14.6814,  -14.6814,
 S.E(Log q),     .2841,     .1975,     .2307,     .2886,     .2930,     .2703,

 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,    3.50,   -2.478,     27.58,     .05,     19,     .88,  -15.07,
  3,     .91,     .491,     14.13,     .65,     19,     .18,  -14.55,
  4,     .74,    1.962,     13.15,     .77,     19,     .16,  -14.51,
  5,     .97,     .107,     14.53,     .47,     19,     .29,  -14.69,
  6,    1.35,    -.952,     17.00,     .31,     19,     .40,  -14.68,
  7,     .73,    2.385,     12.64,     .82,     19,     .16,  -14.58,
1
```

Table 6.7 (cont'd)

Fleet : FR-ROCHELLE

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
2	-.09	-.18	-.46	-.40	-.05	.32	-.06	.19	-.03	.19
3	.22	-.02	.02	-.19	-.09	.08	.14	-.07	-.46	-.24
4	.47	.15	-.19	.32	.33	-.12	-.05	.50	-.22	-.08
5	.48	.19	-.06	.22	.24	-.33	-.33	.02	.20	-.14
6	.13	.35	-.25	.12	-.34	-.10	.00	-.52	.52	-.30
7	.02	.08	-.04	-.01	-.07	-.11	-.11	.02	.23	-.24

Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
2	-.23	.69	.15	.35	.09	-.10	-.03	.06	-.43	99.99
3	-.05	.21	.24	-.07	-.37	-.26	.47	.47	-.02	99.99
4	.17	-.29	-.04	-.23	-.19	-.28	-.22	.16	-.17	99.99
5	-.03	-.04	-.04	-.45	.32	-.27	-.27	.20	.08	99.99
6	.11	.02	.11	-.18	.42	-.09	-.24	.11	.14	99.99
7	.10	-.08	-.20	-.04	.21	.00	-.27	.22	.11	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	-15.0049	-14.5886	-14.8086	-15.1660	-15.2188	-15.2188
S.E(Log q)	.2861	.2527	.2577	.2530	.2686	.1466

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	1.13	-.344	15.65	.29	19	.33	-15.00
3	1.01	-.044	14.64	.48	19	.26	-14.59
4	.72	1.976	13.25	.74	19	.17	-14.81
5	.80	1.155	13.84	.65	19	.20	-15.17
6	1.54	-1.461	19.12	.30	19	.40	-15.22
7	.85	1.786	14.08	.90	19	.12	-15.23

1

Fleet : FR-BB-IN-Q4

Age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
2	No data for this fleet at this age									
3	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	.26
4	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	.54
5	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	.26
6	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	-.41
7	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	-.14

Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
2	No data for this fleet at this age									
3	-.48	.19	.60	.15	-.38	-.11	-.19	-.05	-.33	.35
4	-.48	-.62	.19	.35	.15	-.39	.25	.37	-.44	.07
5	-.27	-.05	-.63	.58	.27	-.35	.37	.22	-.29	-.10
6	-.01	.64	-.33	.87	.02	.08	.13	.02	.06	-1.06
7	-.21	.58	.34	.20	-.09	.57	-.55	-.17	-.31	-1.14

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

Age	3	4	5	6	7
Mean Log q	-14.3707	-14.9571	-15.2578	-15.1082	-15.1082
S.E(Log q)	.3369	.4070	.3663	.5097	.5113

Table 6.7 (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

  3,     .55,    1.332,     12.25,     .49,     11,     .18,  -14.37,
  4,     .92,     .109,     14.51,     .18,     11,     .40,  -14.96,
  5,    1.13,    -.167,     16.16,     .15,     11,     .44,  -15.26,
  6,    1.53,    -.480,     18.98,     .08,     11,     .81,  -15.11,
  7,    3.56,   -1.659,     35.57,     .04,     11,    1.65,  -15.19,
1

 Fleet : FR-BB-OFF-Q2

  Age  ,  1991,  1992,  1993,  1994,  1995,  1996,  1997,  1998,  1999,  2000
     2 , 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99,   .10
     3 , 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99,  -.53
     4 , 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99,   .42
     5 , 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99,   .79
     6 , 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99, 99.99,   .72
     7 , No data for this fleet at this age

  Age  ,  2001,  2002,  2003,  2004,  2005,  2006,  2007,  2008,  2009,  2010
     2 ,   .12,   .57,   .62,   .09,  -.01,  -.71,   .12,   .41, -1.09,  -.20
     3 ,  -.25,   .14,   .06,   .07,  -.33,  -.36,   .52,   .14,   .13,   .40
     4 ,   .29,   .24,   .06,  -.04,   .01,  -.64,  -.39,  -.16,   .18,   .03
     5 ,   .51,   .87,  -.11,  -.88,   .25,  -.54,  -.98,  -.07,   .09,   .07
     6 ,  1.17,  1.45,   .43,  -.48,  -.76,   .27,   .00,  -.85,   .04, -1.98
     7 , No data for this fleet at this age


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

    Age ,         2,         3,         4,         5,         6
 Mean Log q,  -15.5528,  -14.3853,  -14.7827,  -15.3880,  -15.8992,
 S.E(Log q),     .5160,     .3281,     .3071,     .6124,     .9838,


 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,     .83,     .510,     14.56,     .49,     11,     .44,  -15.55,
  3,     .98,     .025,     14.31,     .21,     11,     .34,  -14.39,
  4,     .58,    1.360,     12.41,     .54,     11,     .17,  -14.78,
  5,     .57,     .661,     12.40,     .21,     11,     .36,  -15.39,
  6,   -1.49,   -1.281,     -4.08,     .03,     11,    1.42,  -15.90,
1
 Terminal year survivor and F summaries :

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

 Year class = 2008

 Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,                Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
 FR-SABLES          ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-ROCHELLE        ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-BB-IN-Q4        ,         1.,   .000,       .000,    .00,   0,  .000,     .000
 FR-BB-OFF-Q2       ,      2667.,   .539,       .000,    .00,   1,  .829,     .554

   F shrinkage mean  ,      8827.,   1.50,,,,                          .171,     .202

 Weighted prediction :

 Survivors,        Int,      Ext,    N,    Var,     F
 at end of year,   s.e,      s.e,     ,   Ratio,
      3274.,       .52,      .50,    2,    .962,   .472
```

Table 6.7 (cont'd)

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

Year class = 2007

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
FR-SABLES	9987.,	.291,	.000,	.00,	1,	.251,	.551
FR-ROCHELLE	5937.,	.294,	.000,	.00,	1,	.248,	.805
FR-BB-IN-Q4	12855.,	.352,	.000,	.00,	1,	.198,	.452
FR-BB-OFF-Q2	9196.,	.290,	.656,	2.26,	2,	.283,	.587
F shrinkage mean	14857.,	1.50,,,,				.020,	.402

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
9088.,	.15,	.20,	6,	1.308,	.593

1

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

Year class = 2006

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
FR-SABLES	6024.,	.167,	.013,	.08,	2,	.343,	.473
FR-ROCHELLE	6243.,	.195,	.037,	.19,	2,	.247,	.460
FR-BB-IN-Q4	5393.,	.274,	.201,	.73,	2,	.155,	.516
FR-BB-OFF-Q2	6892.,	.218,	.085,	.39,	3,	.245,	.425
F shrinkage mean	6856.,	1.50,,,,				.010,	.426

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
6182.,	.10,	.04,	10,	.417,	.464

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

Year class = 2005

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
FR-SABLES	3169.,	.141,	.081,	.57,	3,	.355,	.330
FR-ROCHELLE	3436.,	.163,	.202,	1.24,	3,	.268,	.308
FR-BB-IN-Q4	2691.,	.234,	.111,	.48,	3,	.185,	.379
FR-BB-OFF-Q2	3740.,	.214,	.025,	.12,	4,	.184,	.286
F shrinkage mean	2406.,	1.50,,,,				.008,	.416

Weighted prediction :

Survivors, at end of year,	Int, s.e,	Ext, s.e,	N,	Var, Ratio,	F
3232.,	.09,	.06,	14,	.646,	.325

1

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

Year class = 2004

Fleet,	Estimated, Survivors,	Int, s.e,	Ext, s.e,	Var, Ratio,	N,	Scaled, Weights,	Estimated F
FR-SABLES	2661.,	.134,	.138,	1.03,	4,	.350,	.163
FR-ROCHELLE	2685.,	.146,	.096,	.66,	4,	.323,	.161
FR-BB-IN-Q4	1619.,	.225,	.285,	1.26,	4,	.179,	.255
FR-BB-OFF-Q2	1951.,	.218,	.338,	1.55,	5,	.140,	.216
F shrinkage mean	842.,	1.50,,,,				.007,	.443

Weighted prediction :

Table 6.7 (cont'd)

```
Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     2317.,       .08,      .10,   18,   1.239,   .185


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

Year class = 2003

Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                Survivors,    s.e,       s.e,   Ratio,    , Weights,    F
FR-SABLES          ,      1383.,   .131,       .076,    .58,   5,  .355,     .173
FR-ROCHELLE        ,      1218.,   .137,       .091,    .66,   5,  .357,     .194
FR-BB-IN-Q4        ,       902.,   .225,       .294,   1.31,   5,  .181,     .254
FR-BB-OFF-Q2       ,       896.,   .218,       .085,    .39,   5,  .099,     .255

  F shrinkage mean  ,       678.,   1.50,,,,                        .008,     .325

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     1165.,       .08,      .08,   21,    .929,   .202


     1
     1
```

Table 6.8: Bay of Biscay Sole, Fishing mortality (F) at age

Terminal Fs derived using XSA (With F shrinkage)

YEAR / AGE	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
2	0.2965	0.3597	0.2572	0.1741	0.2167	0.2023	0.265	0.1437	0.1483	0.0833
3	0.2429	0.3534	0.2706	0.3539	0.3979	0.4354	0.3828	0.352	0.3183	0.3532
4	0.3356	0.2719	0.3173	0.3453	0.4294	0.4253	0.5227	0.4595	0.4525	0.4966
5	0.3476	0.3716	0.3864	0.3704	0.3455	0.5889	0.5736	0.4422	0.5574	0.636
6	0.3193	0.2289	0.4834	0.4091	0.4201	0.5225	0.3199	0.41	1.0781	0.5942
7	0.3351	0.2915	0.3969	0.3761	0.3996	0.5142	0.4738	0.608	0.8338	0.782
+gp	0.3351	0.2915	0.3969	0.3761	0.3996	0.5142	0.4738	0.608	0.8338	0.782
0 FBAR 3- 6	0.3113	0.3065	0.3644	0.3697	0.3982	0.493	0.4497	0.4159	0.6016	0.52

YEAR / AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2	0.1099	0.1558	0.1142	0.1844	0.2116	0.1308	0.2731	0.2197	0.2458	0.2022
3	0.3265	0.3277	0.3524	0.5122	0.3957	0.3931	0.4781	0.5092	0.524	0.468
4	0.7492	0.6792	0.5264	0.6635	0.7282	0.6363	0.7663	0.6497	0.8085	0.4405
5	0.7355	0.7138	0.5044	0.5684	0.5906	0.7242	0.7197	0.5791	1.0011	0.4158
6	0.7511	0.558	0.7682	0.67	0.418	0.7072	0.5207	0.5308	0.9661	0.5943
7	0.7666	0.7547	0.9899	0.7359	0.7437	0.5417	0.4527	0.5202	0.7538	0.7645
+gp	0.7666	0.7547	0.9899	0.7359	0.7437	0.5417	0.4527	0.5202	0.7538	0.7645
0 FBAR 3- 6	0.6406	0.5697	0.5379	0.6035	0.5331	0.6152	0.6212	0.5672	0.8249	0.4797

YEAR / AGE	2004	2005	2006	2007	2008	2009	2010	FBAR **-**
2	0.2328	0.2531	0.2037	0.2393	0.1709	0.1396	0.4717	0.2607
3	0.3765	0.3485	0.4388	0.4557	0.46	0.2995	0.5925	0.4507
4	0.4217	0.4289	0.4547	0.4445	0.4391	0.3577	0.4636	0.4201
5	0.2889	0.5221	0.3836	0.3985	0.3857	0.3811	0.3248	0.3639
6	0.3692	0.5108	0.4124	0.3917	0.4427	0.4521	0.1848	0.3599
7	0.4075	0.422	0.501	0.4712	0.4693	0.4385	0.2021	0.37
+gp	0.4075	0.422	0.501	0.4712	0.4693	0.4385	0.2021	
0 FBAR 3- 6	0.3641	0.4526	0.4224	0.4226	0.4319	0.3726	0.3914	

Table 6.9: Bay of Biscay Sole, Stock number at age (start of year) Numbers*10**-3

Terminal Fs derived using XSA (With F shrinkage)

YEAR / AGE	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
2	24178	29550	28402	24968	26778	28230	32166	35821	35397	24941
3	15425	16264	18659	19872	18983	19510	20866	22330	28072	27615
4	10274	10947	10335	12881	12621	11538	11422	12876	14210	18477
5	7283	6646	7548	6809	8252	7434	6823	6127	7359	8178
6	4477	4655	4147	4641	4254	5285	3733	3479	3563	3813
7	3249	2943	3350	2314	2789	2529	2836	2453	2089	1097
+gp	4347	3022	3948	2386	2435	1299	2413	2251	1755	1363
0 TOTAL	69232	74028	76389	73870	76112	75824	80258	85337	92445	85484

YEAR / AGE	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
2	26286	23679	29498	23728	22583	24445	24974	16951	25077	24546
3	20763	21308	18335	23811	17854	16538	19406	17198	12313	17746
4	17552	13554	13894	11663	12909	10876	10101	10887	9351	6597
5	10175	7508	6218	7426	5435	5639	5208	4247	5144	3770
6	3917	4413	3327	3397	3806	2725	2473	2295	2154	1711
7	1905	1673	2285	1396	1573	2267	1215	1330	1221	742
+gp	1357	1943	2188	1758	2365	2444	1277	1254	852	488
0 TOTAL	81956	74078	75745	73181	66526	64934	64655	54160	56112	55600

YEAR / AGE	2004	2005	2006	2007	2008	2009	2010	2011	GMST 84-**	AMST 84-**
2	17264	18691	20163	19189	21229	23074	(5798)	(0)	24685	25149
3	18144	12376	13130	14882	13667	16190	18158	(3274)	18183	18603
4	10056	11267	7904	7661	8537	7807	10858	9088	11228	11536
5	3842	5968	6639	4538	4444	4980	4940	6182	6159	6346
6	2251	2604	3204	4093	2757	2734	3078	3232	3359	3487
7	854	1408	1414	1919	2503	1602	1574	2317	1829	1974
+gp	1042	1545	4082	2635	3334	2832	1623	2365		
0 TOTAL	53454	53860	56535	54918	56472	59219	46028	26458		

( ) age 2 replaced by GM 93-2008 =	22443
( ) age 3 replaced by GM e-(F08-09+M) =	17387

Table 6.10: 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	24178	14823	12328	4038	0.3276	0.3113
1985	29550	16071	13377	4251	0.3178	0.3065
1986	28402	17091	14497	4805	0.3315	0.3644
1987	24968	18691	15507	5086	0.328	0.3697
1988	26778	18553	15397	5382	0.3495	0.3982
1989	28230	17836	14512	5845	0.4028	0.493
1990	32166	18468	14886	5916	0.3974	0.4497
1991	35821	19191	14879	5569	0.3743	0.4159
1992	35397	20620	16059	6550	0.4079	0.6016
1993	24941	19999	16467	6420	0.3899	0.52
1994	26286	19399	15951	7229	0.4532	0.6406
1995	23679	17773	14348	6205	0.4325	0.5697
1996	29498	17868	13931	5854	0.4202	0.5379
1997	23728	16592	13430	6259	0.466	0.6035
1998	22583	16564	13348	6027	0.4515	0.5331
1999	24445	16075	12437	5249	0.422	0.6152
2000	24974	15640	11970	5760	0.4812	0.6212
2001	16951	13142	10660	4836	0.4537	0.5672
2002	25077	13262	9836	5486	0.5577	0.8249
2003	24546	13449	9702	4108	0.4234	0.4797
2004	17264	14320	11302	4002	0.3541	0.3641
2005	18691	14670	11692	4539	0.3882	0.4526
2006	20163	15806	12526	4793	0.3827	0.4224
2007	19189	15095	11990	4363	0.3639	0.4226
2008	21229	15555	12258	4299	0.3507	0.4319
2009	23074	15411	11878	3650	0.3073	0.3726
2010	(5798)	13279	11764	3966	0.3371	0.3914
Arith. Mean	24356	16491	13220	5203	0.3953	0.4845
0 Units	(Thousands)	(Tonnes)	(Tonnes)	(Tonnes)		
GM 93-2008 =	22443					

Table 6.11: Multifleet prediction input data

Sole in Bay of Biscay
Multi fleet input data

MFDP version 1a
Run: WG2011_BoB_sol
Time and date: 17:50 06/05/2011
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input Fs are 2008-2009 means at age 2
Input Fs are 2008-2010 means at age 3 to 8
Catch and stock wts are 2008-2010 means
Recruits are 1993-2008 GM
unscaled F

2011

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22443	0.1	0.32	0	0	0.185	0.1553	0.174
3	17387	0.1	0.83	0	0	0.229	0.4507	0.216
4	9088	0.1	0.97	0	0	0.293	0.4201	0.276
5	6182	0.1	1	0	0	0.353	0.3639	0.333
6	3232	0.1	1	0	0	0.410	0.3599	0.386
7	2317	0.1	1	0	0	0.466	0.3700	0.440
8	2365	0.1	1	0	0	0.671	0.3700	0.632

2012

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22443	0.1	0.32	0	0	0.185	0.1553	0.174
3		0.1	0.83	0	0	0.229	0.4507	0.216
4		0.1	0.97	0	0	0.293	0.4201	0.276
5		0.1	1	0	0	0.353	0.3639	0.333
6		0.1	1	0	0	0.410	0.3599	0.386
7		0.1	1	0	0	0.466	0.3700	0.440
8		0.1	1	0	0	0.671	0.3700	0.632

2013

Age	N	M	Mat	PF	PM	Stock Wt	F Landings	Landing WT
2	22443	0.1	0.32	0	0	0.185	0.1553	0.174
3		0.1	0.83	0	0	0.229	0.4507	0.216
4		0.1	0.97	0	0	0.293	0.4201	0.276
5		0.1	1	0	0	0.353	0.3639	0.333
6		0.1	1	0	0	0.410	0.3599	0.386
7		0.1	1	0	0	0.466	0.3700	0.440
8		0.1	1	0	0	0.671	0.3700	0.632

Table 6.12: Bay of Biscay Sole Multifleet prediction, management option table

MFDP version 1a
Run: WG2011_BoB_sol
Time and date: 17:50 06/05/2011
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Basis
F(2011) = mean F(08–09) unscaled (age 2)
F(2011) = mean F(08–10) unscaled (age 3 to above)
R10–12 = GM(93–08) = 22.4 million

2011

Biomass	SSB	Landings FMult	Landings FBar	Yield
16975	13391	1.0000	0.3986	4364

2012

Biomass	SSB	Landings FMult	Landings FBar	Landing Yield	2013 Biomass	2013 SSB
17491	13898	0.0000	0.0000	0	23279	19522
.	13898	0.1000	0.0399	530	22633	18895
.	13898	0.2000	0.0797	1041	22011	18291
.	13898	0.3000	0.1196	1534	21413	17710
.	13898	0.4000	0.1595	2008	20836	17150
.	13898	0.5000	0.1993	2465	20281	16612
.	13898	0.6000	0.2392	2906	19747	16094
.	13898	0.7000	0.2790	3330	19232	15595
.	13898	0.8000	0.3189	3740	18736	15114
.	13898	0.9000	0.3588	4134	18259	14652
.	13898	1.0000	0.3986	4515	17799	14206
.	13898	1.1000	0.4385	4881	17355	13777
.	13898	1.2000	0.4784	5235	16928	13364
.	13898	1.3000	0.5182	5576	16517	12966
.	13898	1.4000	0.5581	5905	16120	12583
.	13898	1.5000	0.5980	6223	15738	12214
.	13898	1.6000	0.6378	6529	15370	11858
.	13898	1.7000	0.6777	6824	15014	11515
.	13898	1.8000	0.7175	7109	14672	11185
.	13898	1.9000	0.7574	7384	14342	10867
.	13898	2.0000	0.7973	7650	14024	10560

Bpa = 13000 t
Fpa = 0.42

Input units are thousands and kg - output in tonnes

Table 6.13: Bay of Biscay sole

Detailed predictions

MFDP version 1a
Run: WG2011_BoB_sol
Time and date: 17:50 06/05/2011
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Year: 2011 F multiplier: 1 Fleet1 HCFba 0.3986

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1553	3076	536	22443	4159	7182	1331	7182	1331
3	0.4507	6025	1303	17387	3976	14431	3300	14431	3300
4	0.4201	2977	823	9088	2666	8815	2586	8815	2586
5	0.3639	1800	599	6182	2184	6182	2184	6182	2184
6	0.3599	932	360	3232	1324	3232	1324	3232	1324
7	0.37	684	301	2317	1080	2317	1080	2317	1080
8	0.37	698	441	2365	1586	2365	1586	2365	1586
Total		16193	4364	63014	16975	44524	13391	44524	13391

Year: 2012 F multiplier: 1 Fleet1 HCFba 0.3986

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1553	3076	536	22443	4159	7182	1331	7182	1331
3	0.4507	6025	1303	17386	3976	14431	3300	14431	3300
4	0.4201	3284	907	10025	2941	9724	2852	9724	2852
5	0.3639	1573	524	5402	1909	5402	1909	5402	1909
6	0.3599	1121	433	3888	1593	3888	1593	3888	1593
7	0.37	602	265	2041	951	2041	951	2041	951
8	0.37	864	546	2926	1963	2926	1963	2926	1963
Total		16545	4515	64111	17491	45593	13898	45593	13898

Year: 2013 F multiplier: 1 Fleet1 HCFba 0.3986

Age	Landings F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)	SSNos(ST)	SSB(ST)
2	0.1553	3076	536	22443	4159	7182	1331	7182	1331
3	0.4507	6025	1303	17386	3976	14431	3300	14431	3300
4	0.4201	3284	907	10024	2940	9724	2852	9724	2852
5	0.3639	1735	578	5959	2106	5959	2106	5959	2106
6	0.3599	980	379	3397	1392	3397	1392	3397	1392
7	0.37	725	319	2454	1144	2454	1144	2454	1144
8	0.37	916	579	3104	2082	3104	2082	3104	2082
Total		16741	4601	64769	17799	46251	14206	46251	14206

Input units are thousands and kg - output in tonnes

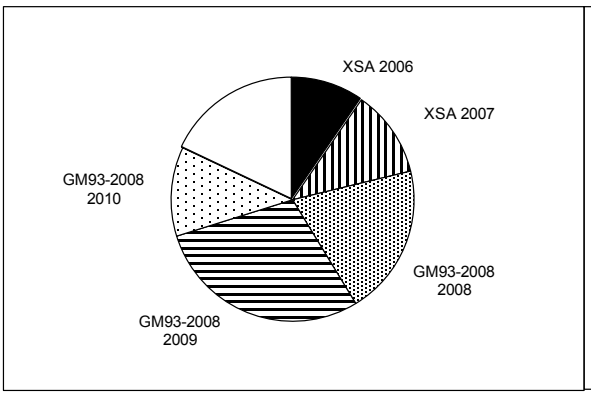
Table 6.14: Stock numbers of recruits and their source for recent year classes used in predictions and the relative (%) contributions to landings and SSB (by weight) of these year classes

Year-class	2006	2007	2008	2009	2010	2011
Stock No. (thousands) of 2 year-olds	21229	23074	22443	22443	22443	22443
Source	XSA	XSA	GM93-2008	GM93-2008	GM93-2008	GM93-2008
Status Quo F:						
% in 2011 landings	13.7	18.9	29.9	12.3	-	-
% in 2012	9.6	11.6	20.1	28.9	11.9	-
% in 2011 SSB	16.3	19.3	24.6	9.9	-	-
% in 2012 SSB	11.5	13.7	20.5	23.7	9.6	-
% in 2013 SSB	8.1	9.8	14.8	20.1	23.2	9.4

GM : geometric mean recruitment

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

a) 2012 landings



b) 2013 SSB

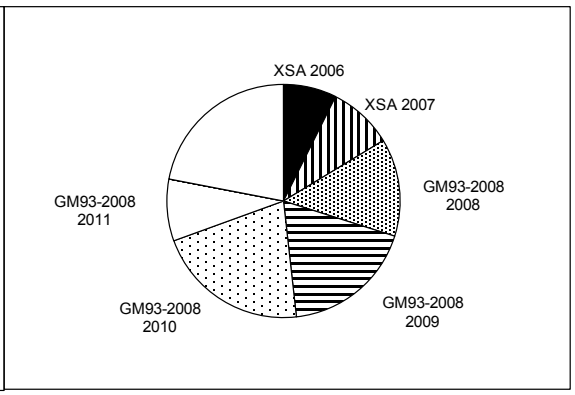


Table 6.15: Bay of Biscay Sole Multifleet Yield per recruit

MFYPR version 2a
Run: WG2011_BoB_sol
Time and date: 17:54 06/05/2011
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	5.3192	9.6499	5.1508	9.6499	5.1508
0.1000	0.0399	0.2621	0.1176	7.8904	3.6533	7.0358	3.4859	7.0358	3.4859
0.2000	0.0797	0.4124	0.1717	6.3899	2.7274	5.5391	2.5609	5.5391	2.5609
0.3000	0.1196	0.5098	0.1982	5.4189	2.1481	4.5716	1.9825	4.5716	1.9825
0.4000	0.1595	0.5780	0.2111	4.7402	1.7575	3.8963	1.5928	3.8963	1.5928
0.5000	0.1993	0.6284	0.2170	4.2397	1.4801	3.3992	1.3162	3.3992	1.3162
0.6000	0.2392	0.6670	0.2189	3.8560	1.2752	3.0188	1.1121	3.0188	1.1121
0.7000	0.2790	0.6977	0.2187	3.5527	1.1193	2.7187	0.9570	2.7187	0.9570
0.8000	0.3189	0.7225	0.2174	3.3073	0.9977	2.4763	0.8362	2.4763	0.8362
0.9000	0.3588	0.7430	0.2154	3.1048	0.9010	2.2768	0.7402	2.2768	0.7402
1.0000	0.3986	0.7603	0.2132	2.9349	0.8227	2.1098	0.6626	2.1098	0.6626
1.1000	0.4385	0.7750	0.2109	2.7906	0.7584	1.9683	0.5990	1.9683	0.5990
1.2000	0.4784	0.7877	0.2086	2.6664	0.7049	1.8469	0.5462	1.8469	0.5462
1.3000	0.5182	0.7988	0.2064	2.5586	0.6598	1.7417	0.5018	1.7417	0.5018
1.4000	0.5581	0.8085	0.2044	2.4640	0.6215	1.6497	0.4641	1.6497	0.4641
1.5000	0.5980	0.8171	0.2024	2.3805	0.5887	1.5687	0.4319	1.5687	0.4319
1.6000	0.6378	0.8248	0.2006	2.3061	0.5602	1.4968	0.4040	1.4968	0.4040
1.7000	0.6777	0.8317	0.1990	2.2395	0.5353	1.4326	0.3797	1.4326	0.3797
1.8000	0.7175	0.8379	0.1975	2.1796	0.5135	1.3750	0.3585	1.3750	0.3585
1.9000	0.7574	0.8436	0.1961	2.1253	0.4942	1.3230	0.3397	1.3230	0.3397
2.0000	0.7973	0.8488	0.1948	2.0759	0.4770	1.2759	0.3231	1.2759	0.3231

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3986
FMax	0.6357	0.2534
F0.1	0.3059	0.1219
F35%SPR	0.3416	0.1362

Weights in kilograms

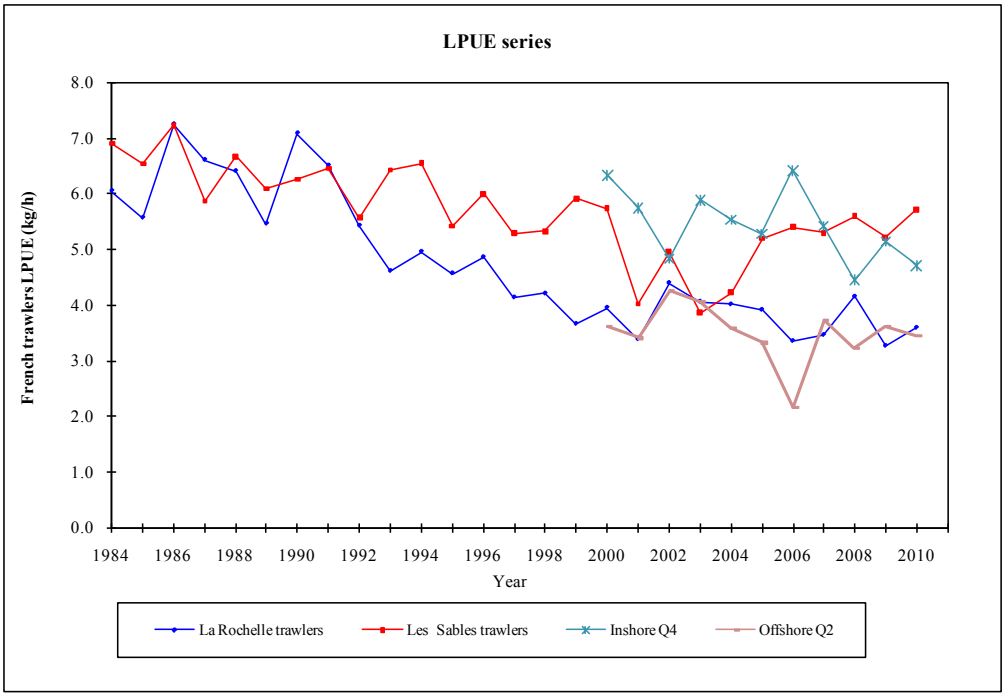


Figure 6.1: Bay of Biscay sole (Division VIIIa,b). LPUE trends of the 4 tuning fleets

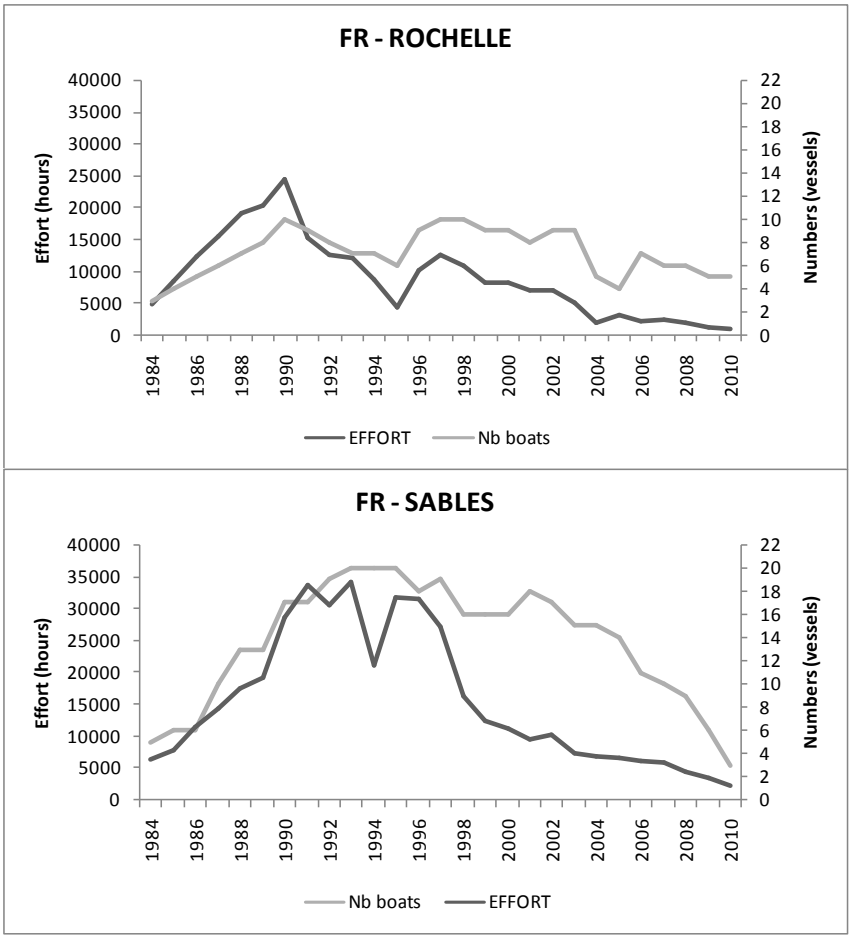


Figure 6.2: Bay of Biscay sole (Division VIIIa,b)Numbers of boats and effort (in hours) of the La Rochelle and Les Sables tuning fleets

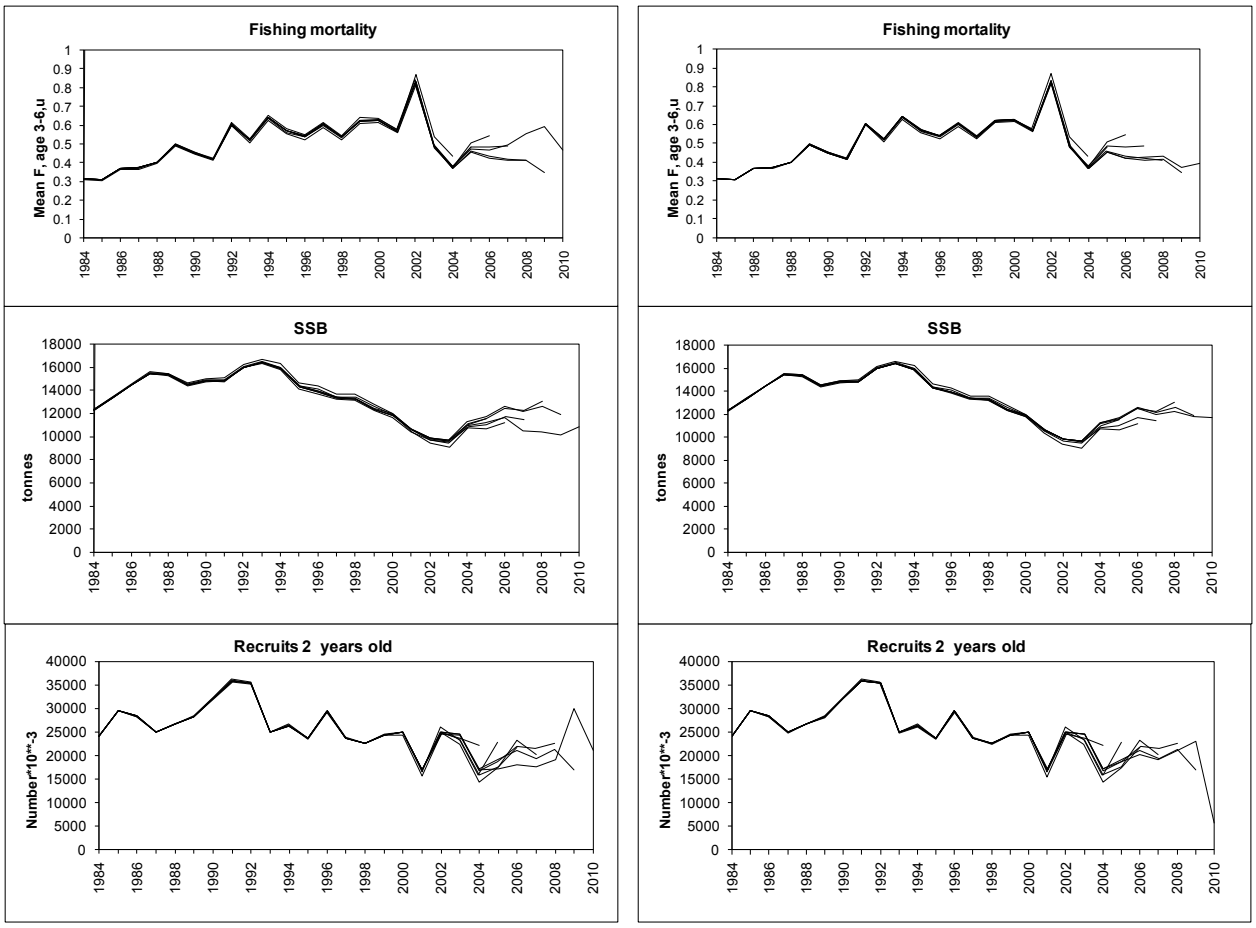


Figure 6.3: Bay of Biscay sole (Division VIIIa,b) - Retrospective results Comparison between assessment with and without 2010 for FR - ROCHELLE and FR – SABLES. (In the left, retrospective with 2010 for FR - ROCHELLE and FR - SABLES and without in the right)

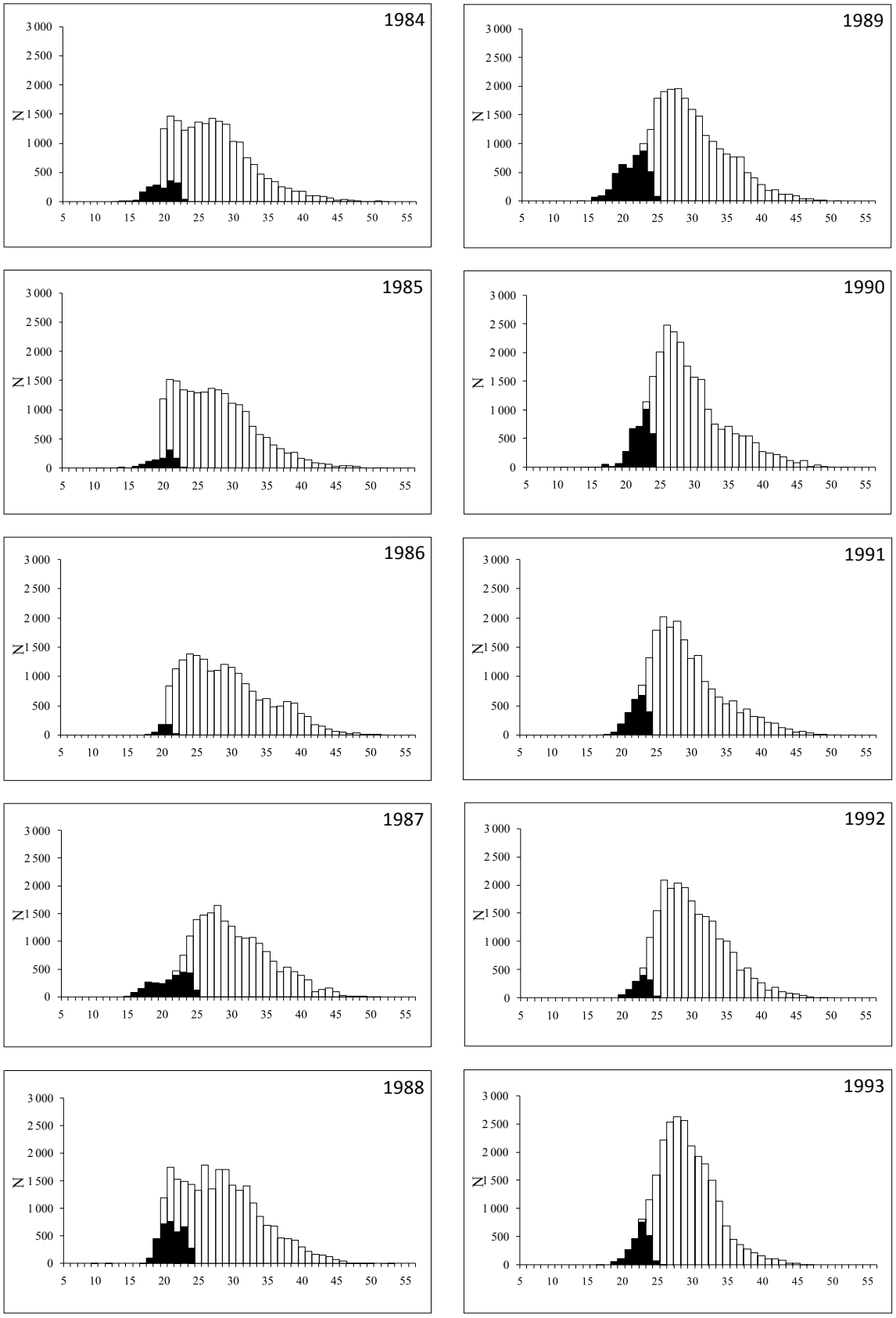


Figure 6.4 a: **Bay of Biscay sole French length distribution from 1984 to 1993**

Total French landings

Discard estimates of the French offshore trawlers fleet

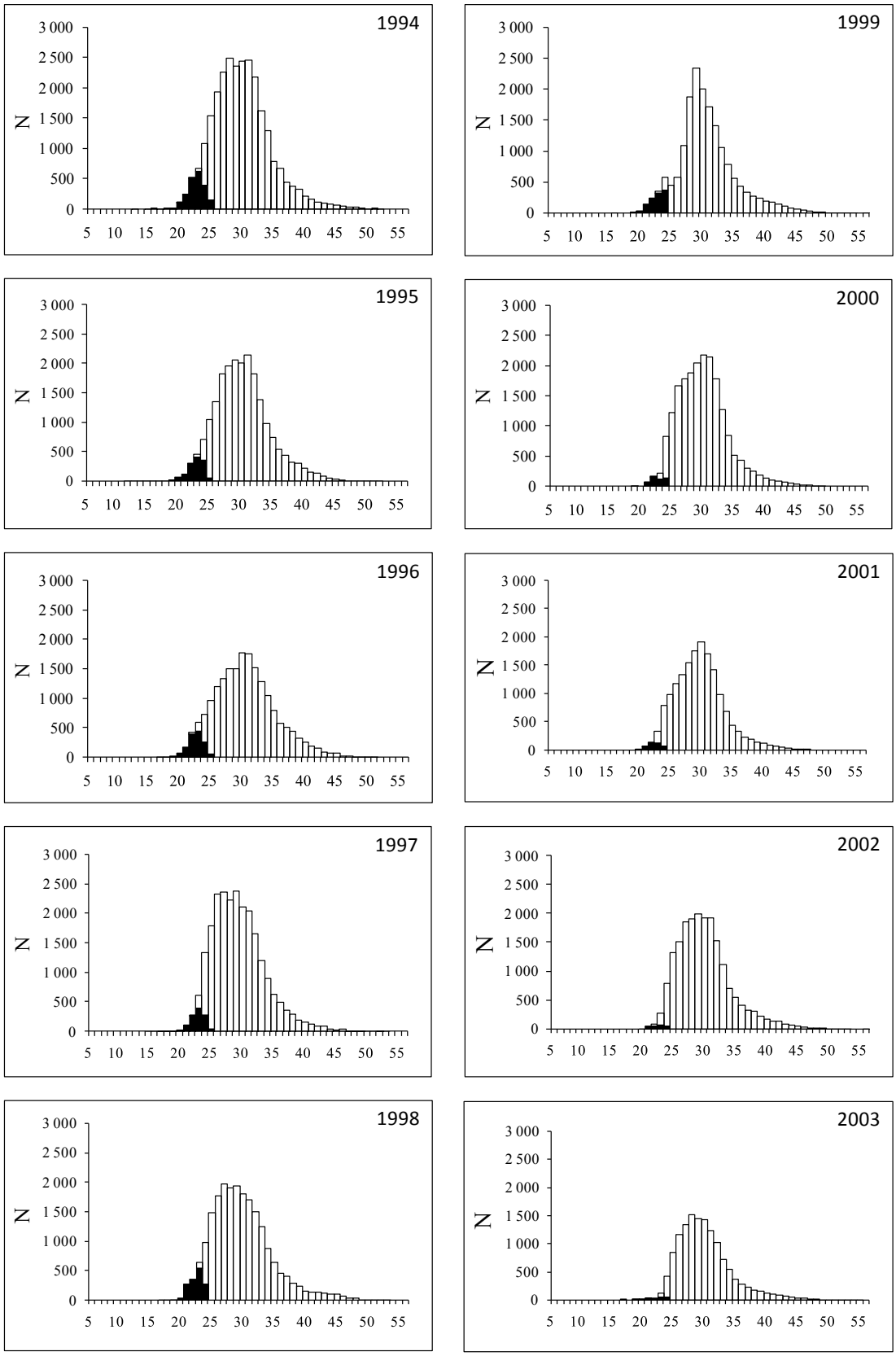


Figure 6.4 b: **Bay of Biscay sole French length distribution from 1994 to 2003**

Total French landings

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

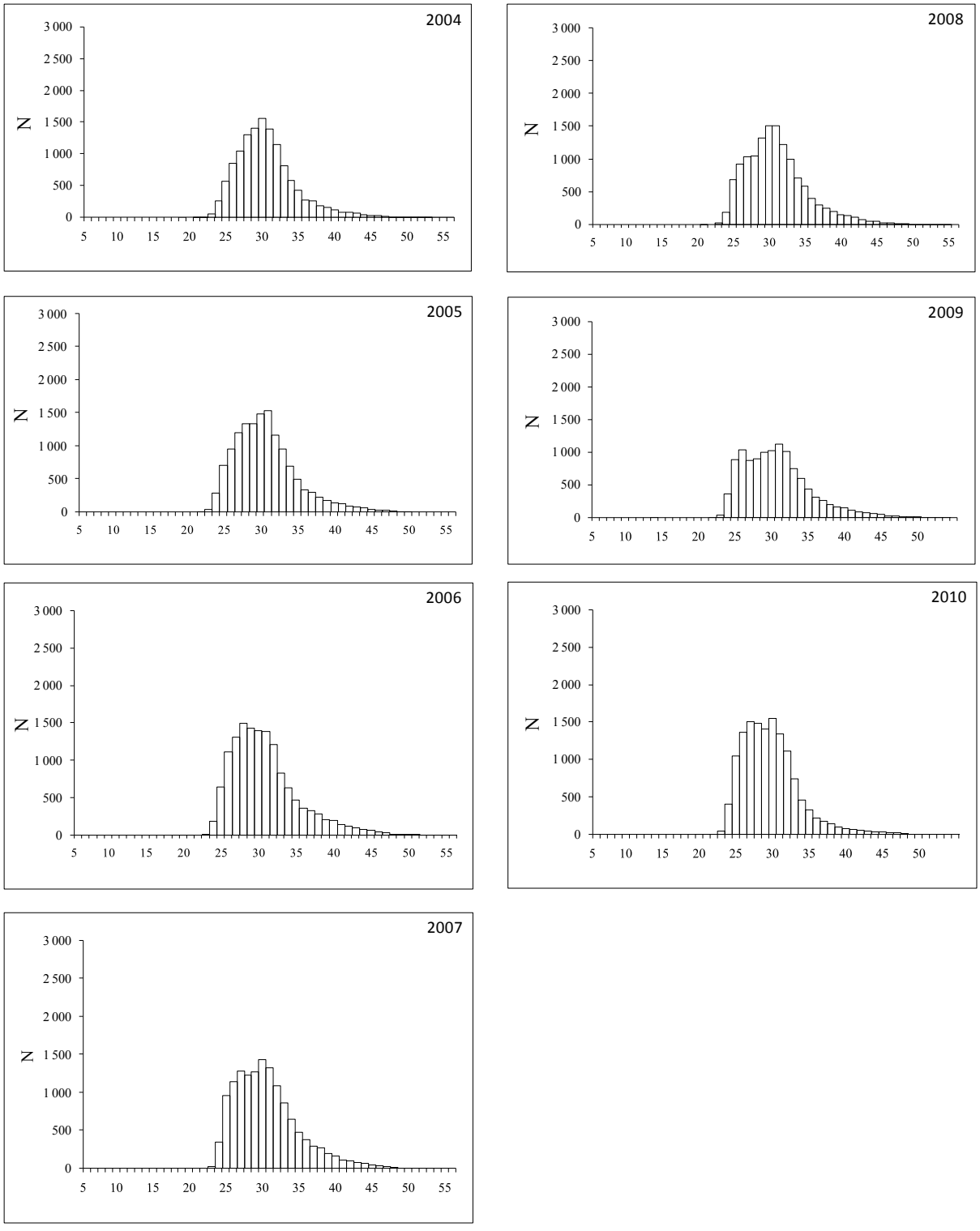


Figure 6.4 c: Bay of Biscay sole French length distribution from 2004 to 2010

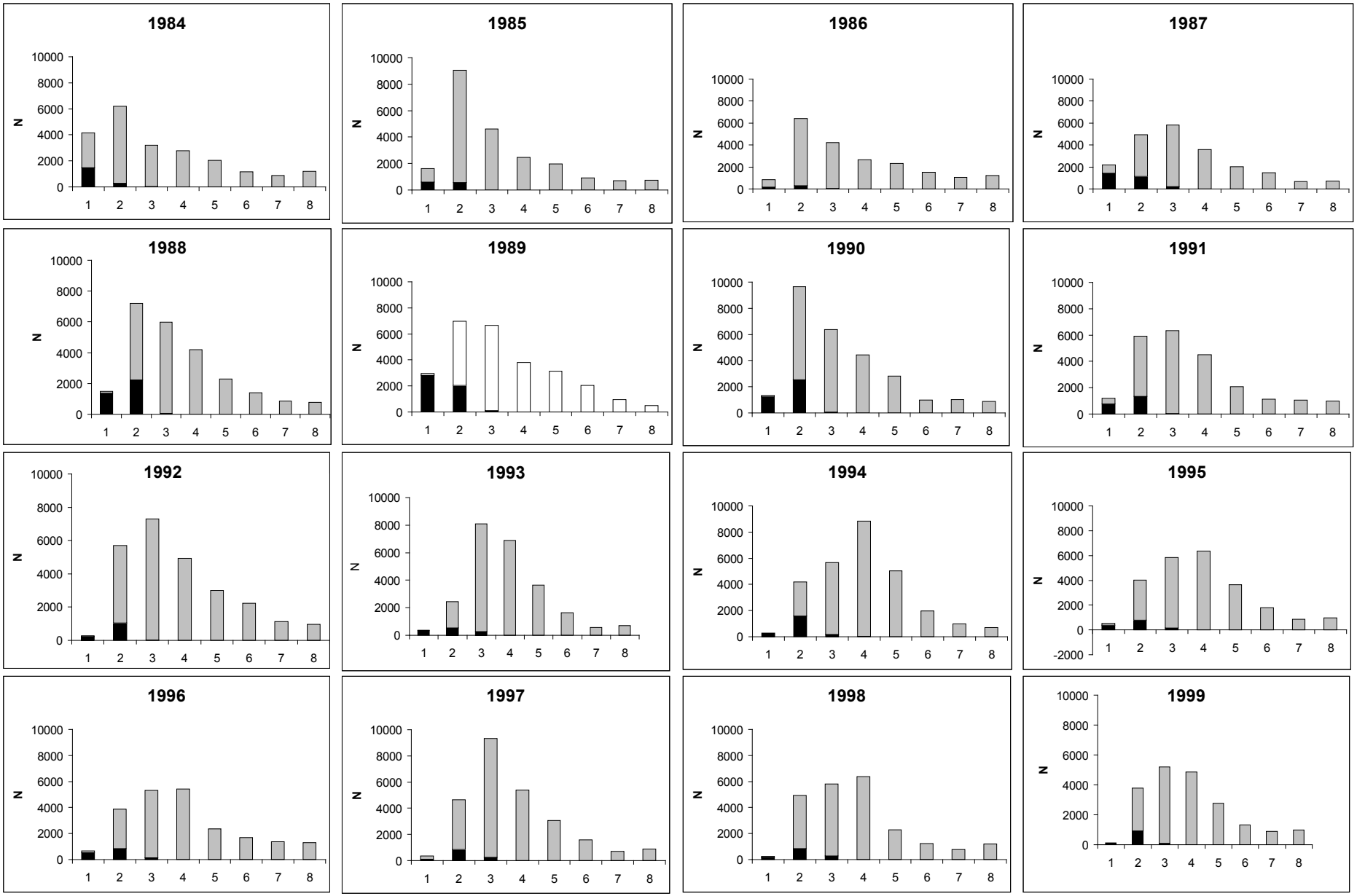


Figure 6.5 a: Bay of Biscay sole landings and discards age distributions from 1984 to 19 (numbers in thousands)

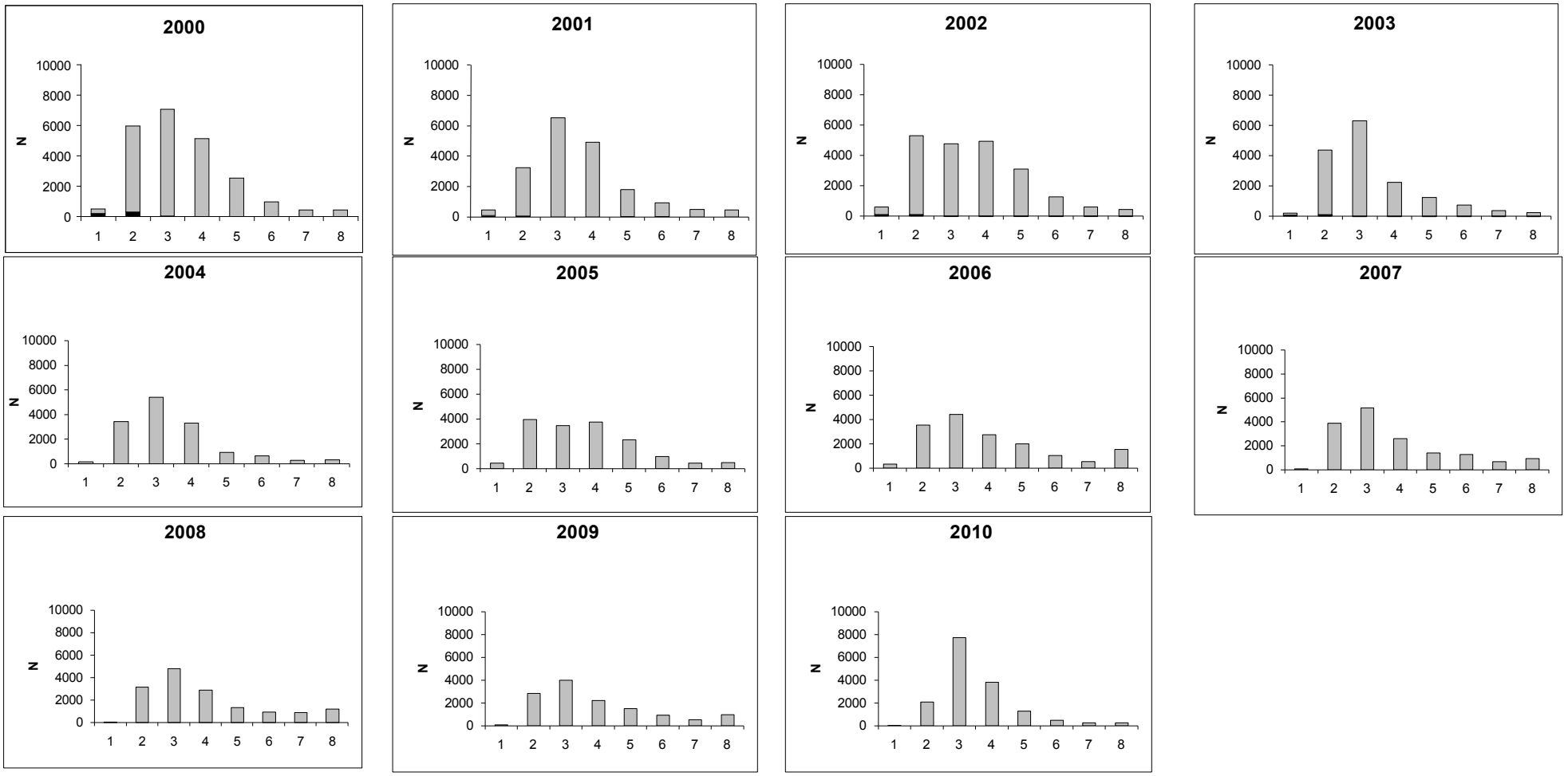


Figure 6.5 b: **Bay of Biscay sole landings and discards age distributions from 2000 to 2010 ; landings age distribtion since 2004 (numbers in thousands)**

LOG CATCHABILITY RESIDUAL PLOTS (XSA)

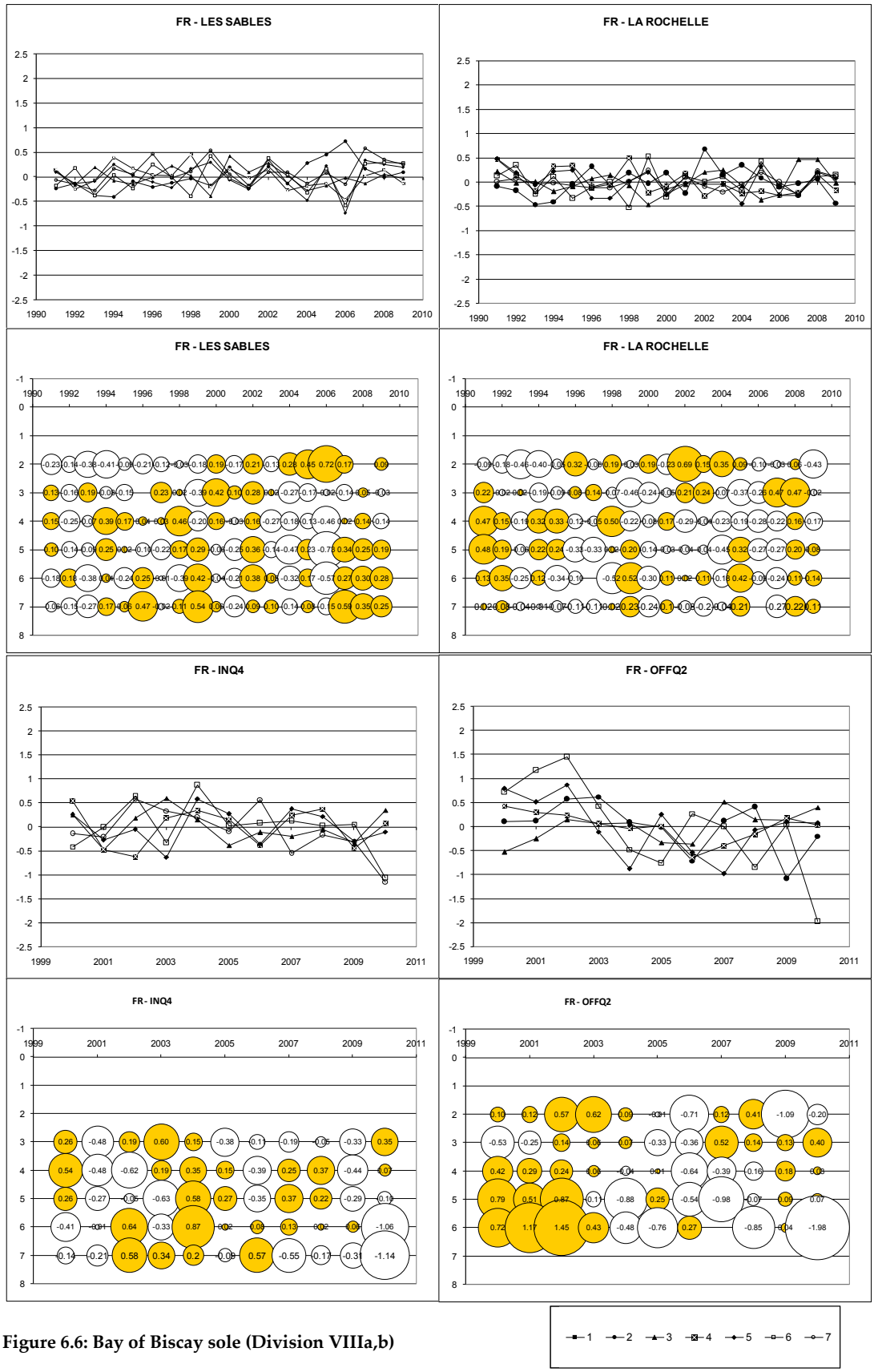


Figure 6.6: Bay of Biscay sole (Division VIIIa,b)

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

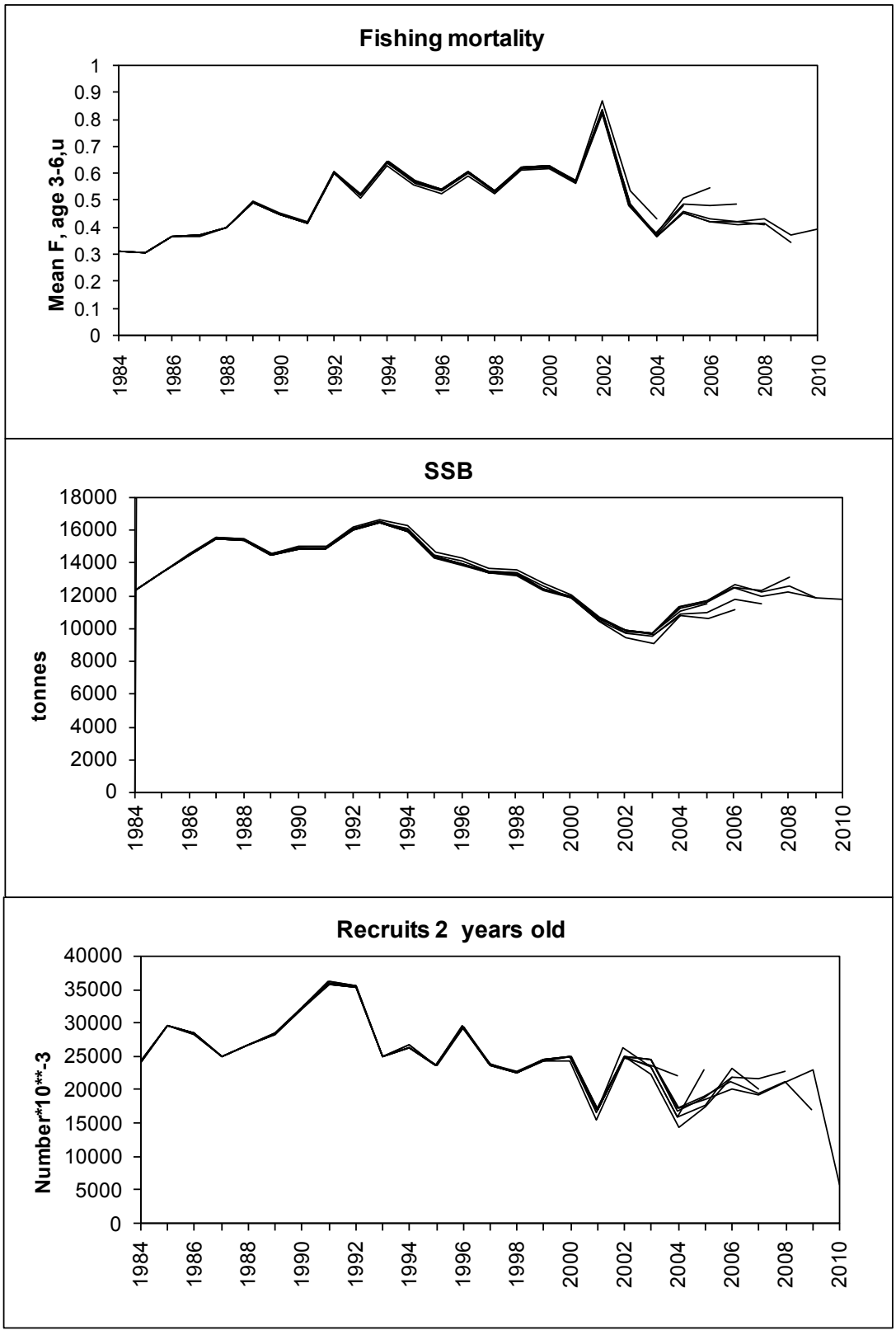


Figure 6.7: Bay of Biscay sole (Division VIIIa,b) - Retrospective results

(No taper, q indep. stock size all ages, q indep. of age>=6, shr.=1.5)

Figure 6.8: Sole in Division VIIIa,b (Bay of Biscay)

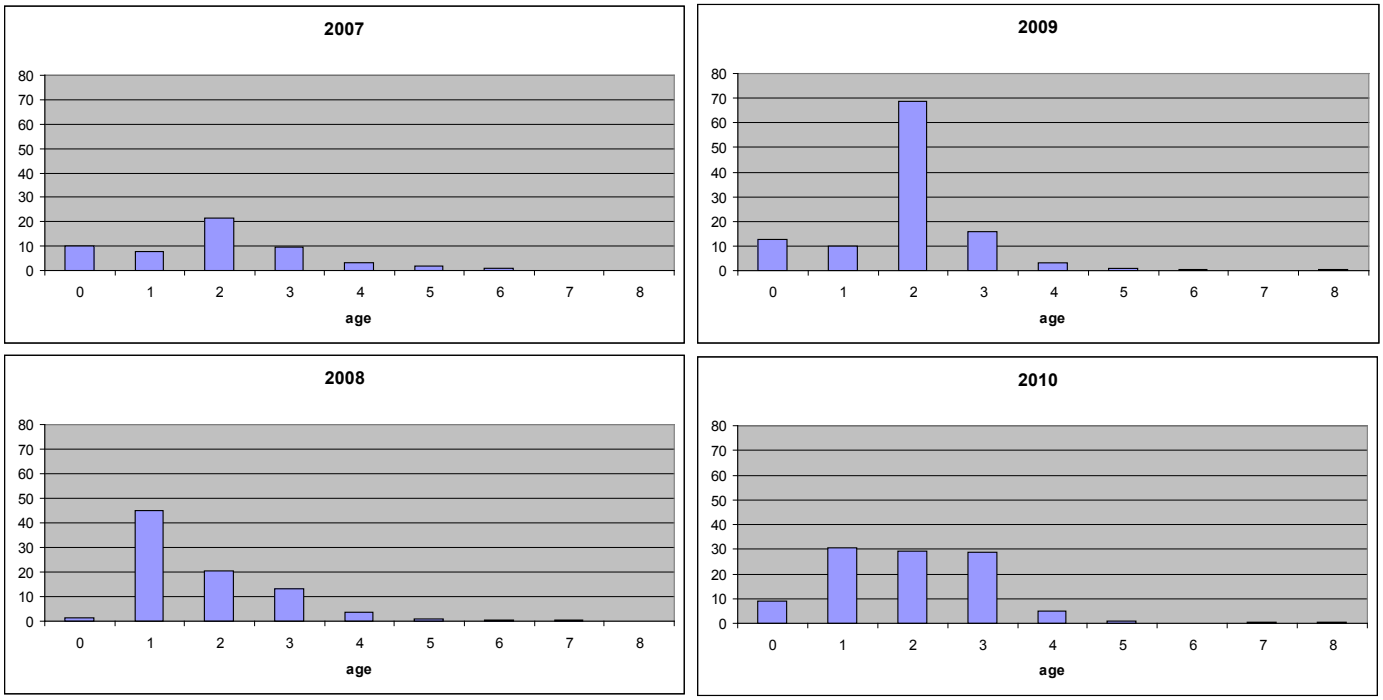
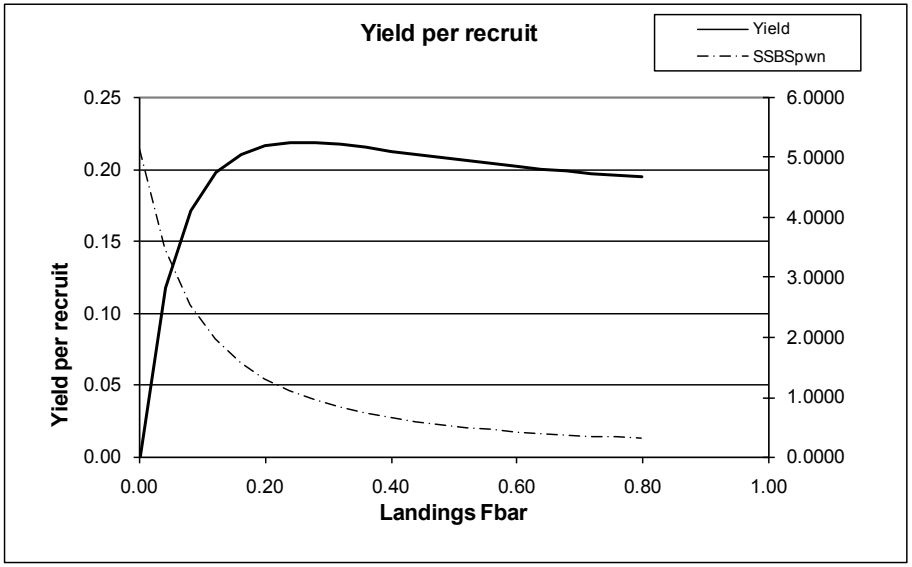


Figure 6.9: Sole in Division VIIIa,b (Bay of Biscay) – 2007 – 2010 ORHAGO numbers at age

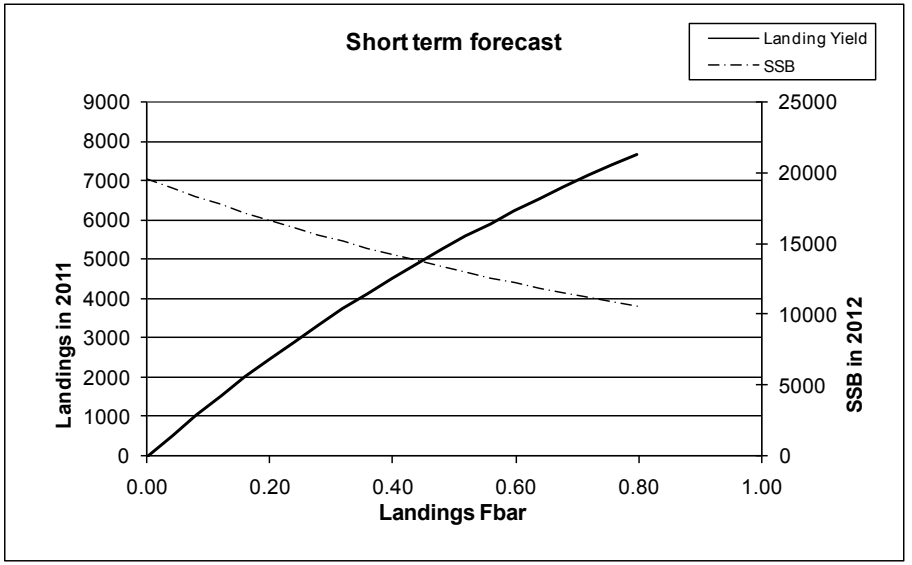
(Numbers/10 nautical miles)



MFYPR version 2a
Run: WG2011_BoB_sol
Time and date: 17:54 06/05/2011

Reference point	F multiplier	Absolute F
Fleet1 Landings Fbar(3-6)	1.0000	0.3986
FMax	0.6357	0.2534
F0.1	0.3059	0.1219
F35%SPR	0.3416	0.1362

Weights in kilograms



MFDP version 1a
Run: WG2011_BoB_sol
Time and date: 17:50 06/05/2011
Fbar age range (Total) : 3-6
Fbar age range Fleet 1 : 3-6

Input units are thousands and kg - output in tonnes

Figure 6.10: Sole in Division VIIIa,b (Bay of Biscay)

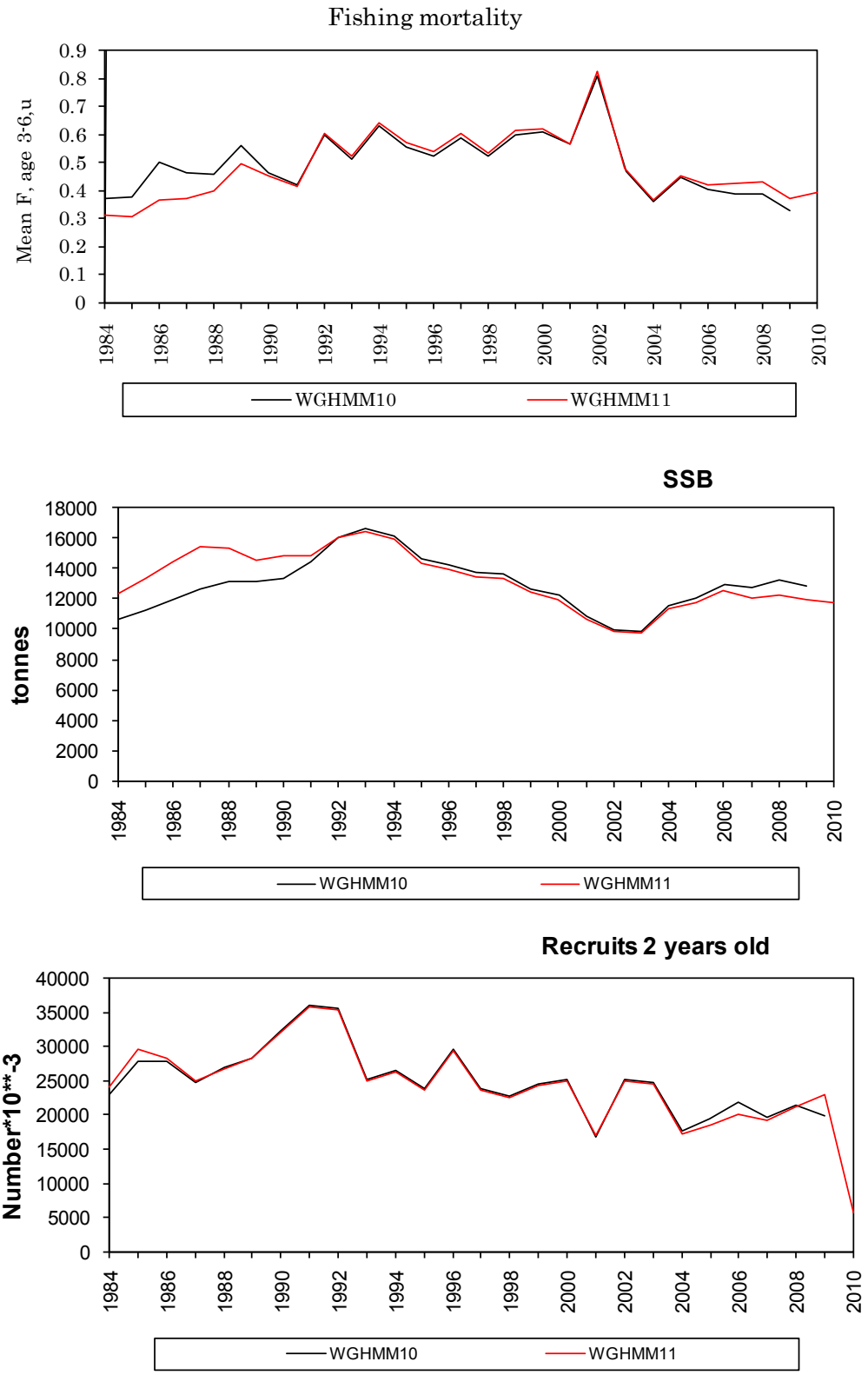


Figure 6.11: Bay of Biscay sole (Division VIIIa,b) - WG11 / WG10 comparison