6.4.11 Sole in Division VIId (Eastern Channel)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long-term yield	Fishing mortality in relation to agreed management targets	Comment
Full reproductive capacity	Increased risk	Overfished	NA	

Based on the most recent estimate of SSB (in 2009) and fishing mortality (in 2008), ICES classifies the stock as having full reproductive capacity and at risk of being harvested unsustainably. The spawning-stock biomass has been fluctuating around a mean of about 10 000 t since 1982, and has been above B_{pa} since 2002. The fishing mortality has decreased since 1999 and has been around F_{pa} from 2001 until 2005. In the last 3 years fishing mortality has increased and fluctuated between F_{pa} and F_{lim}. The 2001, 2004 and 2005 year classes were the three highest since 1990. The 2007 year class is the weakest in the time-series.

Management objectives

No explicit management objectives are set for this stock.

Reference points

	Type	Value	Technical basis
Precautionary approach	B_{lim}	Not defined	Poor biological basis for definition
	B_{pa}	8000 t	This is the lowest observed biomass at which there is no indication of impaired recruitment. Smoothed B_{loss}
	F_{lim}	0.55	F_{loss}, but poorly defined; analogy to North Sea and setting of 1.4 F_{pa} = 0.55. This is a fishing mortality at or above which the stock has shown continued decline.
	F_{pa}	0.4	Between F_{med} and 5th percentile of F_{loss}; SSB>B_{pa} and probability (SSB_{mt}<B_{pa}), 10%: 0.4.
Targets	F_y	Not defined	

(unchanged since 1998)

Yield and spawning biomass per Recruit F-reference points (2009):

	Fish Mort Ages 3-8	Yield/R	SSB/R
Average last 3 years	0.47	0.16	0.36
Fmax	0.27	0.17	0.64
F0.1	0.10	0.15	1.44
Fmed	0.41	0.17	0.43

Candidates for reference points which are consistent with high long-term yields and a low risk of depleting the productive potential of the stock are in the range of $F_{0.1}$-F_{max}.

Single-stock exploitation boundaries

Considering the options below, ICES advises on the basis of precautionary limits that fishing mortality in 2010 should be no more than Fpa corresponding to landings of less than 3190 t in 2010

Exploitation boundaries in relation to high long-term yield, low risk of depletion of production potential, and considering ecosystem effects

Fishing mortality in 2008 is estimated at 0.45, above the range that would lead to high long-term yields and low risk of stock depletion.

Exploitation boundaries in relation to precautionary limits

The fishing mortality in 2010 should be below F_{pa} corresponding to landings less than 3190 t in 2010, which is expected to keep SSB above B_{pa} in 2011.

Short-term implications

Outlook for 2010

Basis: F(2009) = Fsq = mean F(06-08) = 0.47; R(2009) = GM 1982-2006 = 23.6 million; SSB(2009) = 10.6 ; SSB(2010) = 7.91; landings (2009) = 4.19

Rationale	Landings (2010) [1)]	Basis	F(2010)	SSB(2011)	%SSB change [2)]	%TAC Change [3)]
Zero catch	0.00	F=0	0.00	11.8	49%	-100%
High long term yield	2.27	F(long term yield)	0.27	9.3	18%	-57%
Status quo	2.38	Fsq *0.6	0.28	9.2	17%	-55%
	2.72	Fsq *0.7	0.33	8.9	12%	-49%
	3.04	Fsq *0.8	0.38	8.5	8%	-42%
	3.19	Fsq *0.85	0.40	8.4	6%	-40%
	3.35	Fsq *0.9	0.42	8.2	3%	-36%
	3.65	Fsq *1	0.47	7.9	-1%	-31%
	3.94	Fsq *1.1	0.52	7.6	-4%	-25%
	4.22	Fsq *1.2	0.56	7.3	-8%	-20%
	4.48	Fsq *1.31	0.62	7.0	-12%	-15%

Weights in '000 t.
Shaded scenarios are considered not consistent with precautionary approach.
[1)] It is assumed that the TAC will be implemented and that the landings in 2010 therefore correspond to the TAC.
[2)] SSB 2011 relative to SSB 2010.
[3)] Landings 2010 relative to TAC 2009.

Management considerations

Sole is mainly caught in beam trawl fisheries with plaice or in mixed demersal fisheries using otter trawls. There is also a directed fishery during parts of the year by inshore trawlers and netters on the English and French coasts.

Due to the minimum mesh size (80 mm) in the mixed beam trawl fishery, a large number of (undersized) plaice are discarded. The 80 mm mesh size is not matched to the minimum landing size of plaice. Measures to reduce discarding of plaice in the sole fishery would greatly benefit the plaice stock and future yields. Mesh enlargement would reduce the catch of undersized plaice, but would also result in short-term loss of marketable sole. An increase in the minimum landing size of sole could provide an incentive to fish with larger mesh sizes and therefore mean a reduction in the discarding of plaice.

Under-reporting of catches and misreporting of sole into Division VIId from Division VIIe is thought to be significant and should be avoided. This will also improve the quality of the assessment.

Factors affecting the fisheries and the stock

There are five main commercial fleets fishing for sole in Division VIId. Belgian and English offshore beam trawlers (> 300 HP) fish mainly for sole, but can switch to scallops or move to adjacent areas. French offshore trawlers target roundfish and take sole as bycatch. Numerous inshore vessels (under 10 m) on the English and French coasts target sole in the spring and autumn, using mainly fixed nets. The inshore vessels take half the reported landings and sole forms their main source of income. Effort from the beam trawl fleet can change considerably depending on whether the fleet moves to other areas or directs effort at other species such as scallops and cuttlefish.

Regulations and their effects

The minimum landing size for sole is 24 cm. Demersal gears are permitted to catch sole with mesh size 80 mm for beam and otter trawling. For static gear the minimum mesh size is 120 mm, with exceptions for trammelnets (100 mm) and static gear targeting red mullet and sea bass (90 mm).

In previous years, effort from the beam trawl fleet has not been restricted. The new EU Council Regulation (EC) N°43/2009 does not reduce the effort for this fleet.

Changes in fishing technology and fishing patterns

Effort for the Belgian beam trawl fleet increased to the highest level in 2007. This was mainly due to the unrestrictive "days-at-sea" EU regulation in ICES Subdivision VIId from 2006 until 2008.

Impact of fisheries on the environment

Currently the sole fishery is dominated by bottom trawls, with bycatch of both commercial (for instance plaice) and non-commercial species and physical impact on the seabed. Chronic fishing with bottom trawls has caused a shift from communities dominated by relatively sessile, emergent, high biomass species to communities dominated by infaunal, smaller-bodied fauna (Kaiser *et al.*, 2000).

Scientific basis

Data and methods

The XSA assessment, which was benchmarked in 2009, is based on landings data, two commercial cpue indices, and three research-vessel survey indices.

Discards are not included in the assessment. Routine discard sampling since 2003 under the EU Data Collection Regulations indicates overall discarding of sole in the order of 5% in weight and discards are therefore considered to be a minor bias to the assessment results.

Uncertainties in assessment and forecast

Under-reporting from the inshore fleets and misreporting into Division VIId by beam trawlers fishing in VIIe is thought to be significant. Historical landings have been adjusted for misreporting between the Eastern and Western Channel since 1986. In recent years there have been substantial changes in the estimates of recruitment which impact on the forecast.

Comparison with previous assessment and advice

In 2009 the Young fish survey was separated into two components due to the cessation of the UK component in 2007. The current assessment has revised the value of SSB in 2007 and 2008 downward by 14% and 10% respectively (Figure 6.4.11.3). The estimate of fishing mortality in 2007 was revised upwards by 26%. Past recruitment estimates were subject to considerable annual revision. The strong 2004 year class has been confirmed by the latest four assessments. The weak year class 2006 has been revised upward in this year's assessment by 78% and the assumed GM for the incoming 2007 year class in last year's assessment has now been revised downward by 62%..

The advice basis is the same as last year. The advice for 2010 is considerably lower than last year because of a downward revision of estimated stock size and poor incoming recruitment.

Sources of information

Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak, 6-12 May 2009 (ICES CM 2009/ACOM:10).

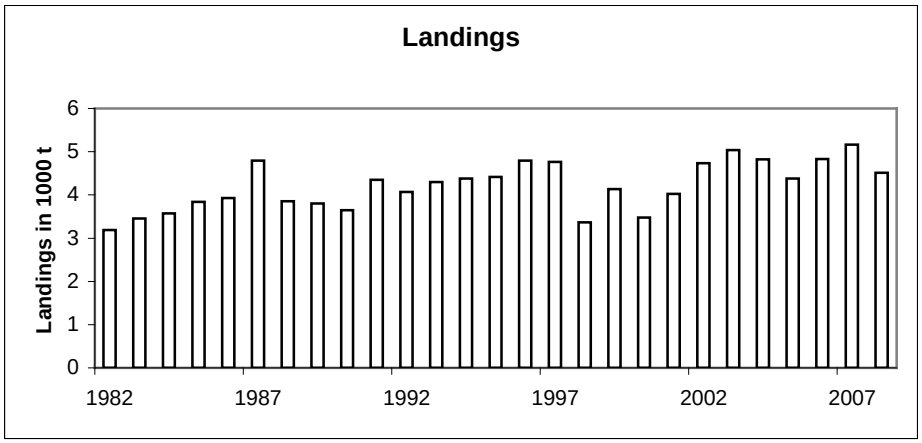
ICES. 2009. Report of the Benchmark and Data Compilation Workshop for Flatfish (WKFLAT 2009), 6–13 February 2009, Copenhagen, Denmark. ICES CM 2009/ACOM:31.

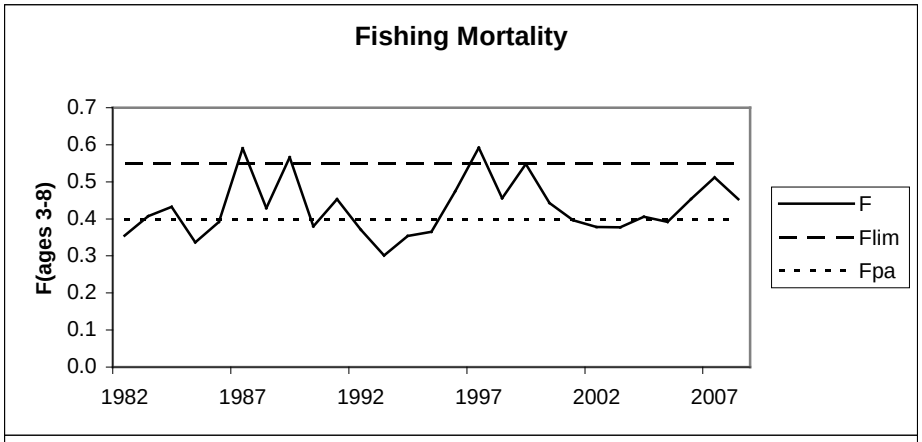
Kaiser, M. J., Ramsay, K., Richardson, C. A., Spence, F. E., and Brand, A. R. 2000. Chronic fishing disturbance has changed shelf sea benthic community structure. Journal of Animal Ecology, 69: 494–503.

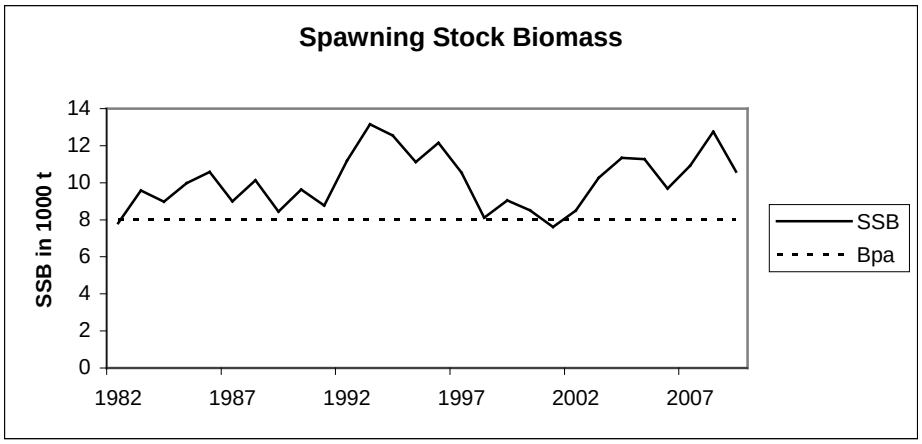
Table 6.4.11.3 Sole in Division VIId (Eastern Channel), Single stock exploitation boundaries (advice), management and landings.

Year	ICES advice	Single-Stock Exploitation Boundaries	Predicted catch corresp. to advice	Predicted catch corresp. to Single-Stock Exploitation Boundaries	Agreed TAC	Official landings	ICES landings
1987	Precautionary TAC		3.1		3.85	3.8	4.8
1988	*Status quo* (Shot) TAC		3.4		3.85	3.3	3.9
1989	*Status quo* (Shot) TAC		3.8		3.85	2.9	3.8
1990	No effort increase; TAC		3.7		3.85	3.0	3.6
1991	*Status quo* F; TAC		3.4		3.85	3.8	4.4
1992	TAC		≤2.7		3.5	3.8	4.1
1993	70% of F(91)~2 800 t		2.8		3.2	3.8	4.3
1994	Reduce F		<3.8		3.8	4.0	4.4
1995	No increase in F		3.8		3.8	3.7	4.4
1996	No long-term gain in increasing F		4.7		3.5	4.1	4.8
1997	No advice		-		5.23	3.9	4.8
1998	No increase in effort		4.5		5.23	3.0	3.4
1999	Reduce F to F_{pa}		3.8		4.7	3.9	4.1
2000	$F < F_{pa}$		<3.9		4.1	3.8	3.5
2001	$F < F_{pa}$		<4.7		4.6	4.6	4.0
2002	$F < F_{pa}$		<5.2		5.2	5.4	4.7
2003	$F < F_{pa}$		<5.4		5.4	6.2	5.0
2004	[1)]	$F < F_{pa}$	[1)]	<5.9	5.9	5.7	4.8
2005	[1)]	$F < F_{pa}$	[1)]	<5.7	5.7	4.6	4.4
2006	[1)]	$F < F_{pa}$	[1)]	<5.7	5.72	4.8	4.8
2007	[1)]	$F < F_{pa}$	[1)]	<6.44	6.22	5.3	5.2
2008	[1)]	$F < F_{pa}$	[1)]	<6.59	6.59	4.4	4.5
2009	[1)]	$F < F_{pa}$	[1)]	<4.38	5.274		
2010	[1)]	$F < F_{pa}$	[1)]	<3.19			

Weights in '000 t.
[1)] Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.

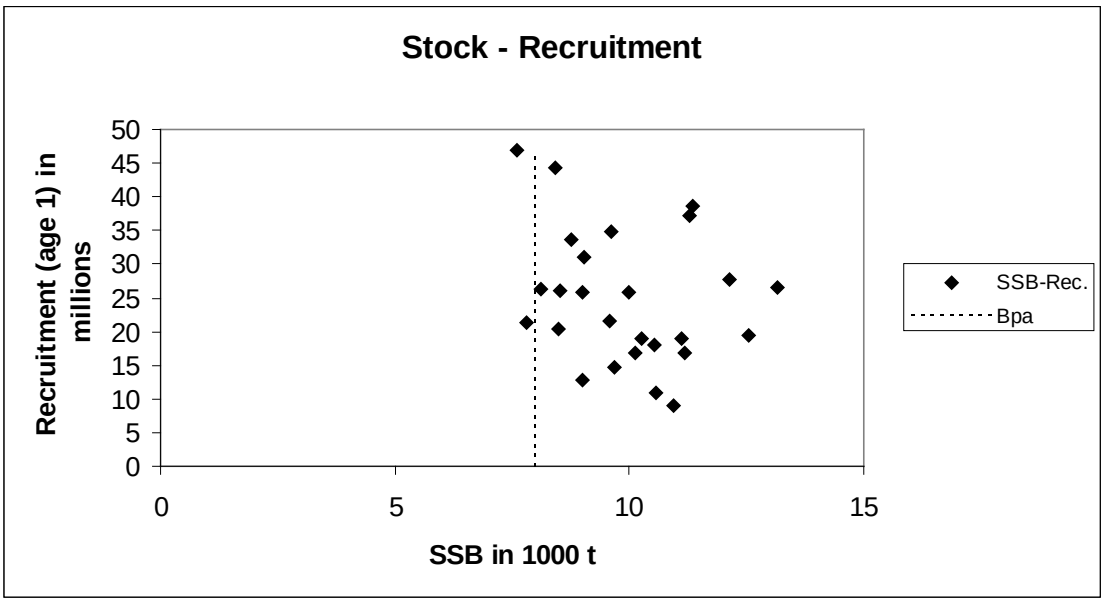


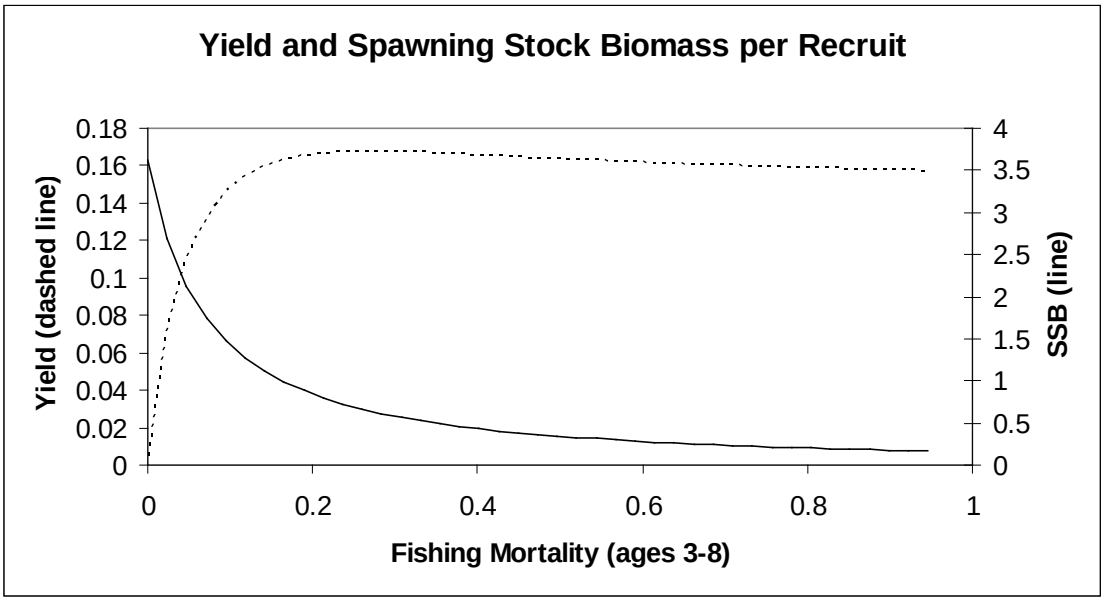




Shaded recruitment: GM 1982-2006

Figure 6.4.11.1 Sole in Division VIId (Eastern Channel). Landings, fishing mortality, recruitment, and SSB.





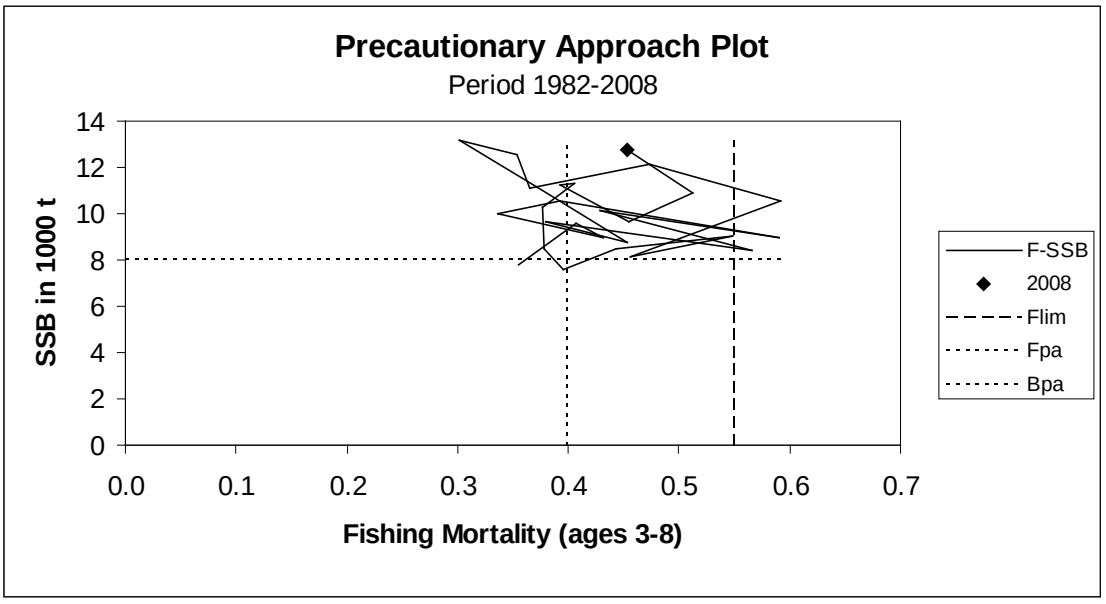


Figure 6.4.11.2 Sole in Division VIId (Eastern Channel). Stock-recruitment, Yield-per-recruit, and precautionary approach plot.

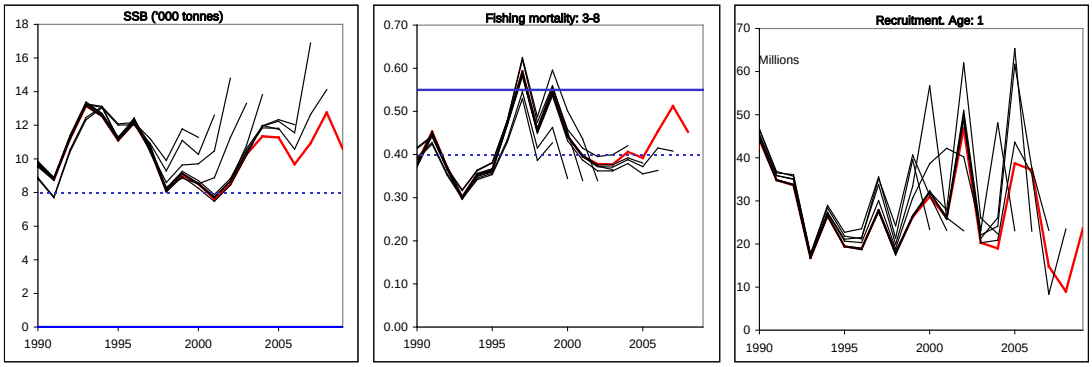


Figure 6.4.11.3 Sole in Division VIId (Eastern Channel). Historical performance of the assessments. Note: some assessments have been indicative of trends only.

Table 6.4.11.2 Sole in Division VIId (Eastern Channel). Nominal landings (tonnes) as officially reported to ICES and used by the Working Group.

Year	Belgium	France		UK(E+W)	others	reported	Unallocated*	Total used by WG	TAC
1974	159	383		309	3	854	30	884	
1975	132	464		244	1	841	41	882	
1976	203	599		404	.	1206	99	1305	
1977	225	737		315	.	1277	58	1335	
1978	241	782		366	.	1389	200	1589	
1979	311	1129		402	.	1842	373	2215	
1980	302	1075		159	.	1536	387	1923	
1981	464	1513		160	.	2137	340	2477	
1982	525	1828		317	4	2674	516	3190	
1983	502	1120		419	.	2041	1417	3458	
1984	592	1309		505	.	2406	1169	3575	
1985	568	2545		520	.	3633	204	3837	
1986	858	1528		551	.	2937	995	3932	
1987	1100	2086		655	.	3841	950	4791	3850
1988	667	2057		578	.	3302	551	3853	3850
1989	646	1610		689	.	2945	860	3805	3850
1990	996	1255		785	.	3036	611	3647	3850
1991	904	2054		826	.	3784	567	4351	3850
1992	891	2187		706	10	3794	278	4072	3500
1993	917	2322		610	13	3862	437	4299	3200
1994	940	2382		701	14	4037	346	4383	3800
1995	817	2248		669	9	3743	677	4420	3800
1996	899	2322		877	.	4098	699	4797	3500
1997	1306	1702		933	.	3941	823	4764	5230
1998	541	1703		803	.	3047	316	3363	5230
1999	880	2251		769	.	3900	235	4135	4700
2000	1021	2190		621	.	3832	-356	3476	4100
2001	1313	2482		822	.	4617	-592	4025	4600
2002	1643	2780		976	.	5399	-666	4733	5200
2003	1657	3475		1114	1	6247	-1209	5038	5400
2004	1485	3070		1112	.	5667	-841	4826	5900
2005	1221	2832		567	.	4620	-236	4384	5700
2006	1547	2627		678	.	4852	-18	4834	5720
2007	1530	2968		801	1	5300	-134	5166	6220
2008	1367	2284	**	715	.	4366	144	4510	6593

* Unallocated mainly due misreporting

** Preliminary

Table 6.4.11.3 Sole in Division VIId (Eastern Channel), summary of the assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-8
1982	12725	7813	3190	0.355
1983	21324	9576	3458	0.407
1984	21514	8983	3575	0.432
1985	12913	9979	3837	0.337
1986	25731	10584	3932	0.392
1987	10975	8987	4791	0.590
1988	25798	10139	3853	0.429
1989	16807	8435	3805	0.566
1990	44246	9624	3647	0.380
1991	34847	8774	4351	0.453
1992	33639	11194	4072	0.371
1993	16773	13156	4299	0.301
1994	26557	12558	4383	0.354
1995	19420	11110	4420	0.365
1996	18912	12148	4797	0.474
1997	27767	10551	4764	0.592
1998	17985	8114	3363	0.456
1999	26257	9040	4135	0.548
2000	30990	8512	3476	0.443
2001	26119	7616	4025	0.396
2002	46812	8489	4733	0.378
2003	20282	10270	5038	0.377
2004	18965	11343	4826	0.406
2005	38702	11270	4383	0.392
2006	37184	9679	4833	0.454
2007	14773	10929	5166	0.512
2008	9003	12762	4510	0.453
2009	23623*	10607		
Average	24309	10080	4210	0.430

* Recruitment 2009: GM 1982-2006