

ECOREGION Bay of Biscay and Atlantic Iberian Seas
STOCK Anchovy in Subarea VIII (Bay of Biscay)

Advice for the period 1st July 2011 –30th June 2012

ICES advises on the basis of the precautionary approach that catches from 1st July 2011 to 30th June 2012 should be no more than 47 000 t.

Stock status

F (Fishing Mortality)			
	2008	2009	2010
MSY (F_{MSY})	?	?	? Undefined
Precautionary approach (F_{pa}, F_{lim})	✓	✓	✓ Harvested sustainably

SSB (Spawning Stock Biomass)			
	2009	2010	2011
MSY ($B_{trigger}$)	✗	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	○	✓	✓ Full reproductive capacity

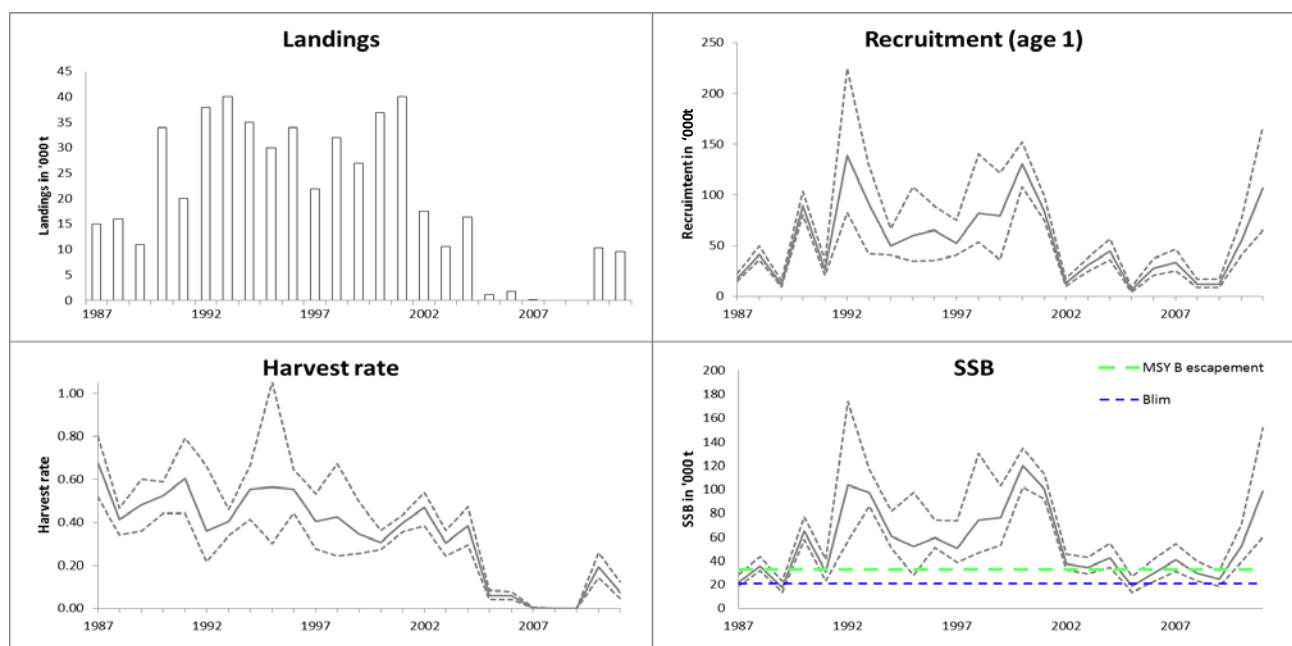


Figure 7.4.8.1 Anchovy in Subarea VIII (Bay of Biscay). Trends in landings, recruitment* (age 1 biomass in January), harvest rates (catch/SSB) and spawning-stock biomass. Solid lines - posterior median; dashed lines - 95% probability intervals.

The median SSB in 2011 is estimated at 98 450 t which is above B_{lim} with a 100% probability. This is the fourth highest levels of the population since 1987, indicating a recovery from the low levels of SSB in period 2002-2009. Recruitment in 2011 is the most abundant since 2001. The harvest rate in 2010 was about 0.19, well below the average (0.45) of the historical series from 1987 to 2004 (2005-2009 were excluded due to fishery closures).

Management plans

* Version 2: Recruitment unit corrected

No specific management objectives are known to ICES. A draft management plan is proposed by EC in 2009 ([COM/2009/399 final](#)). Last year the EU Council of fisheries used the proposed HCR to set the TAC for July 2010 – June 2011. ICES has not evaluated this proposal.

Biology

Anchovy is a short-lived species, with the fishable stock consisting primarily of one-year-old fish.

Environmental influence on the stock

Anchovy is a prey species for other pelagic and demersal species, and also for cetaceans and birds. Recruitment depends strongly on environmental factors, and several recruitment predictions have been proposed in the past based on environmental variables. Work on their use for management purposes is ongoing.

The fisheries

The fisheries for anchovy are targeted by trawlers and purse-seiners. The Spanish and French fleets fishing for anchovy in Subarea VIII are spatially and temporally well separated. The Spanish fleet operates mainly in Divisions VIIIc and VIIIb in spring, while the French fleets operate in Division VIIIa in summer and autumn and in Division VIIIb in winter and summer. Since 2003 the fleets of both countries have been reduced.

Catch by fleet Total catch Spain 5 744 t ; Total catch France (4 573t)

Quality considerations

The current assessment is mainly driven by inputs provided by the spring surveys (DEPM and acoustics). The output of the assessment is consistent with the past year assessment.

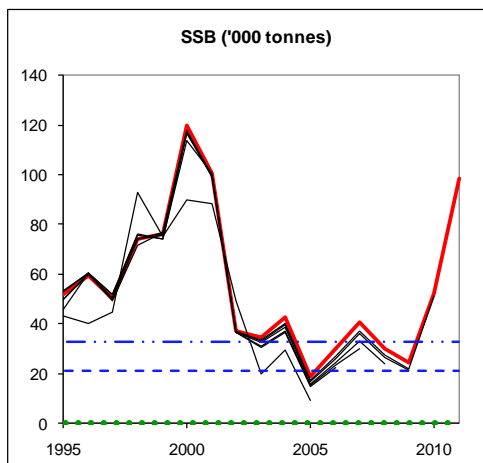


Figure 7.4.8.2 Anchovy in Subarea VIII (Bay of Biscay). Historical assessment results for median SSB (final year estimate included).

Scientific basis

Assessment type	Two-stage Bayesian biomass dynamic model (BBM) assessment
Input data	2 survey indices: Daily Egg Production Method survey (BIOMAN) and acoustic survey (PELGAS)
Discards and bycatch	Commercial catch information
Indicators	Not included in the assessment
Other information	None
Working group report	The assessment was benchmarked in 2009 (WKSHORT) WGANSA

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Reference points

	Type	Value	Technical basis
MSY Approach	MSY $B_{\text{escapement}}$	33 000 t	Provisional value based on B_{pa}
	F_{MSY}	Not defined	
Precautionary approach	B_{lim}	21 000 t	$B_{\text{lim}}: B_{\text{loss}} = 21\ 000\ \text{t}$ (1989 SSB).
	B_{pa}	33 000 t	$B_{\text{pa}} = B_{\text{loss}} \times \exp(1.645\sigma)$.
	F_{lim}	-	Not defined.
	F_{pa}	1.0–1.2	$F_{\text{pa}}: = F$ for 50% spawning potential ratio, i.e. the F at which the SSB/R is half of what it would have been in the absence of fishing.

(unchanged since 2010)

Because the assessment provides the probability distributions for the SSB, it is possible to estimate directly the risk of the SSB falling below B_{lim} . B_{pa} and F_{pa} reference points may become unnecessary.

Outlook for the period 1st July 2011 –30th June 2012

Basis: Undetermined recruitment scenario: $R(2012)$ from distribution of recruitment at age 1 in biomass (1987–2011).
 Total catch: 30% allocated to second half of 2011 and 70% to first half of 2012.

Catch (t) (July 2011–June 2012)	Probability $SSB_{2012} < B_{\text{lim}}$	Median SSB 2012
0	0	85.6
10	0	79.9
20	0	74.2
30	0.01	68.4
33	0.01	66.7
47	0.05	58.7
91	0.34	33.4

Weights in '000 tonnes

MSY approach

With the objective to maintain the spawning stock biomass above the provisional reference level of MSY $B_{\text{escapement}}$ by 2012, a catch of less than 91 000 t can be taken in the period 1st July 2011 30th June 2012. Such a catch is not considered precautionary as it leads to a risk of 0.34 that SSB being below B_{lim} by 2012.

PA approach

To reduce the risk to less than 5% that SSB in 2011 will be below B_{lim} , catch should be less than 47 000 t for the period 1st July 2011 - 30th June 2012.

Proposed management plan

Following the European Commission proposed management plan, the TAC for the fishing season running from 1st July 2011 to 30th June 2012 should be established at 29 700 tonnes (as stated in Annex 1 of the proposal for an SSB in the range 98 001-99 000 t).

Additional considerations

In the past, a TAC was set independently of the state of the stock in the range of 30 000 t - 33 000 t, and the TAC had limited impact in regulating catches in the fishery.

Recent developments in management have been moving towards an in-year monitoring regime, as recommended previously by ICES. The assessment of anchovy is based on the survey results in the spring and catch data. Hence, the most up-to-date assessment can be obtained in June as done in this assessment. TACs may be set for the whole period July–June.

Harvest control rules (HCR) for anchovy have been tested outside ICES, for the EC proposal of a long term management plan for this fishery. A draft management plan has now been proposed by the EC in cooperation between science (STEFCF) and stakeholders (South Western RAC). This plan has not yet been formally adopted by the EU. The plan is based on a constant harvest rate (30%), and sets a TAC as a percentage of the point estimate of the SSB as assessed at the start of the TAC period which runs from 1st July to 30th June, but with an upper bound on the TAC (of 33 000 t), and with a minimum TAC level (of 7 000 t) applicable at SSB estimates between 24 000 t and 33 000 t. ICES notes that the criterion for accepting the HCR as precautionary would include rules that imply a low risk of reducing the SSB to a level which may imply further reduction in recruitment. Supplementary measures (area closures, minimum landing size) may be considered in addition to TACs.

Catch options for the next year depends very much on the next coming recruitment for which there is no information yet. The JUVENA survey now has been conducted for eight years. Last year ICES considered the possibility to review the June advice once indications of the next incoming recruitment become available from the autumn acoustic survey. However, in July the EC established the TAC from 1st July 2010 to 30th June 2011 according to the long term management plan proposal and ICES did not reviewed its June advice according to the JUVENA results. Although the shape of the relationship between the juvenile abundance index and the actual recruitment is still uncertain and the predictive power of the survey may be limited, the correlation between survey index and recruitment appears to be quite strong and it is statistically significant. This year ICES emphasized on the possibility of revising the June advice in case the JUVENA 2011 survey indicates a next low incoming recruitment. In any case, if managers would want to revise the advice for 2012, this could be done once results from the autumn acoustic survey are available.

Data and methods

A two-stage Bayesian biomass dynamic model (BBM) assessment was used, based on the Daily Egg Production Method (DEPM) survey (since 1987), acoustic surveys (since 1989) and catches from the French and Spanish fisheries. The assessment method is consistent with that used last year.

Uncertainties in assessment and forecast

The current assessment is mainly driven by inputs provided by the surveys (SSB and proportion of 1-group). For the DEPM survey, uncertainties include the assumed spawning frequency (which is under revision). For the acoustic estimate, uncertainties may remain concerning the possible underestimate of 1 year old in the very coastal area.

The main uncertainties of the model are that the growth and natural mortality of anchovy are assumed independent of age. Similarly, there is no age differential catchability in the surveys. The assumption that DEPM survey data measures the spawning biomass in absolute terms might also increase uncertainty. Stock assessment modelling results do not reflect the additional uncertainty stemming from these factors.

The current Bayesian model provides a formal statistical estimate of the precision of the results and these are translated into risk that can be included in harvest rules. The 95% probability intervals indicate that SSB in 2011 is between 60 000 and 152 000 t, with a median at 98 000 t.

The observed variability in recruitments is due to variable climatic, oceanographic, ecological and fishing factors. There have been significant gains in understanding how some of these factors operate with anchovy but still there is no sufficient knowledge to forecast with confidence the recruitment levels.

Comparison with previous assessment and advice

The basis for the assessment is the same as last year. The basis for advice is the same as last year but extended to refer to the EC proposed management plan (COM(2009) 399 final).

Sources

ICES. 2011. Report of the Working Group on Anchovy and Sardine (WGANSAs), 24 - 28 June 2011, Vigo, Spain.

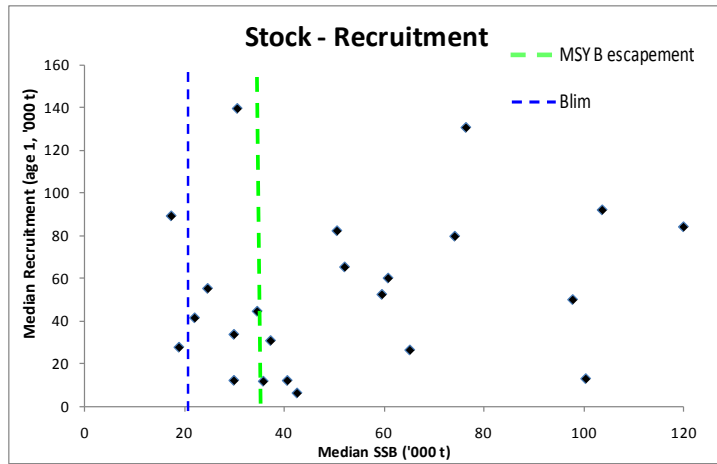


Figure 7.4.8.3 Anchovy in Subarea VIII (Bay of Biscay). Stock–recruitment plot based on median values.

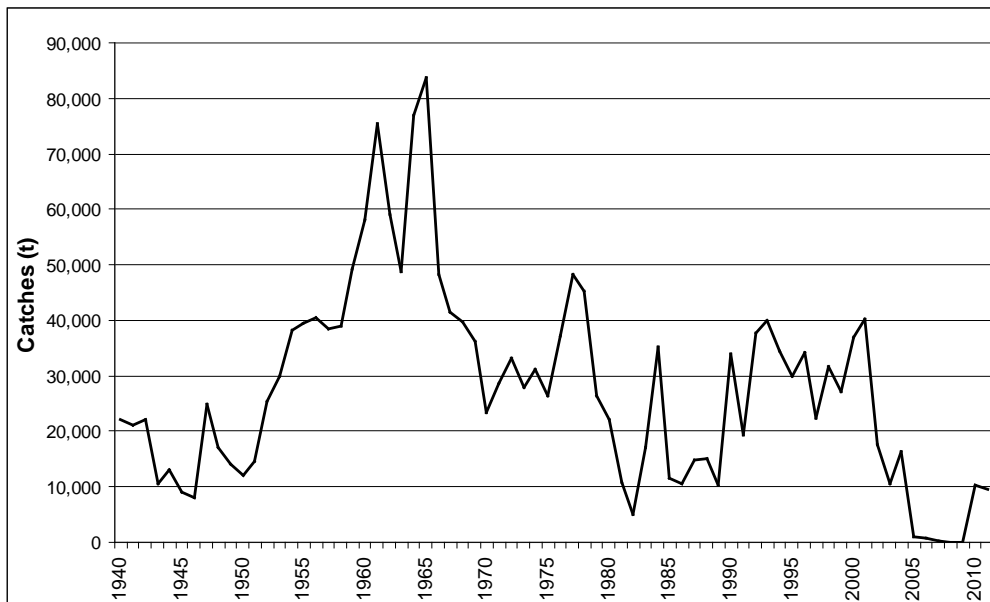


Figure 7.4.8.4 Anchovy in Subarea VIII (Bay of Biscay). Catches (in tonnes) from the beginning of the time series. Catches in 2011 are until the end of May.

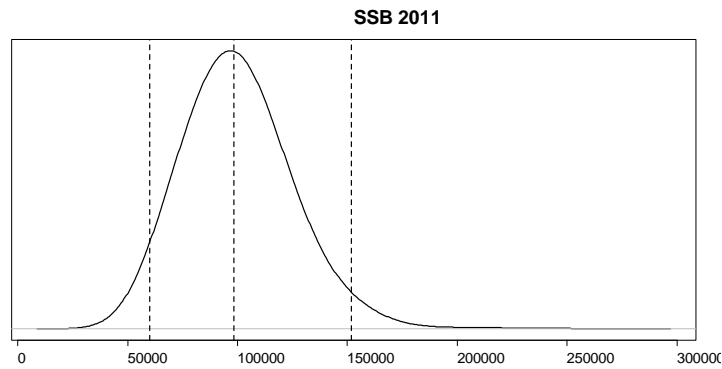


Figure 7.4.8.5 Anchovy in Subarea VIII (Bay of Biscay). Posterior distribution of spawning biomass in 2011. Vertical dashed lines correspond to posterior median and 95% probability intervals.

Table 7.4.8.1 Anchovy in Subarea VIII (Bay of Biscay). Advice, management and landings.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings
1987	Not assessed	-	32	14	15
1988	Not assessed	-	32	14	16
1989	Increase SSB; TAC	10.0 ¹	32	n/a	11
1990	Precautionary TAC	12.3	30	n/a	34
1991	Precautionary TAC	14.0	30	n/a	20
1992	No advice	-	30	n/a	38
1993	Reduced F on juveniles; closed area	-	30	n/a	40
1994	Reduced F on juveniles; closed area	-	30	n/a	35
1995	Reduced F on juveniles; closed area	-	33	n/a	30
1996	Reduced F on juveniles; closed area	-	33	n/a	34
1997	Reduced F on juveniles; closed area	-	33	n/a	22
1998	Reduced F on juveniles; closed area	-	33	n/a	32
1999	Reduced F on juveniles, closed area	-	33	n/a	27
2000	Closure of the fishery	0	33	n/a	37
2001	Preliminary TAC corresponding to recent exploitation	18	33	n/a	40
2002	Preliminary TAC corresponding to recent exploitation	33	33	n/a	17.5
2003	Preliminary TAC corresponding to recent exploitation	12.5	33	n/a	10.6
2004	Preliminary TAC corresponding to recent exploitation	11	33	n/a	16.4
2005	Rebuilding SSB	5	30	n/a	1.1
2006	Closure of the fishery	0	5	-	1.8
2007	Closure of the fishery	0	0	-	0.1 ²
2008	Closure of the fishery	0	0	-	0
2009	Closure of the fishery	0	0	-	0
2010	Closure of the fishery	0	7	n/a	6.1 ³
2011	See scenarios ⁴	-	15.6 ⁴		
2012	Risk of SSB falling below $B_{lim} < 5\%$ ⁴	< 47			

Weights in '000 t.

¹ Mean catch of 1986–1988.

² Experimental fisheries.

³ Catches up to 1st of July.

⁴ From 1st July year before – 30st June current year.

n/a: not available.

Table 7.4.8.2

Anchovy in Subarea VIII (Bay of Biscay). ICES estimates of catches (in tonnes).

Country	France	Spain	Spain	International
Year	VIIIab	VIIIbc, Landings	Live Bait Catches	VIII
1960	1085	57000	n/a	58085
1961	1494	74000	n/a	75494
1962	1123	58000	n/a	59123
1963	652	48000	n/a	48652
1964	1973	75000	n/a	76973
1965	2615	81000	n/a	83615
1966	839	47519	n/a	48358
1967	1812	39363	n/a	41175
1968	1190	38429	n/a	39619
1969	2991	33092	n/a	36083
1970	3665	19820	n/a	23485
1971	4825	23787	n/a	28612
1972	6150	26917	n/a	33067
1973	4395	23614	n/a	28009
1974	3835	27282	n/a	31117
1975	2913	23389	n/a	26302
1976	1095	36166	n/a	37261
1977	3807	44384	n/a	48191
1978	3683	41536	n/a	45219
1979	1349	25000	n/a	26349
1980	1564	20538	n/a	22102
1981	1021	9794	n/a	10815
1982	381	4610	n/a	4991
1983	1911	12242	n/a	14153
1984	1711	33468	n/a	35179
1985	3005	8481	n/a	11486
1986	2311	5612	n/a	7923
1987	4899	9863	546	15308
1988	6822	8266	493	15581
1989	2255	8174	185	10614
1990	10598	23258	416	34272
1991	9708	9573	353	19634
1992	15217	22468	200	37885
1993	20914	19173	306	40393
1994	16934	17554	143	34631
1995	10892	18950	273	30115
1996	15238	18937	198	34373
1997	12020	9939	378	22337
1998	22987	8455	176	31617
1999	13649	13145	465	27259
2000	17765	19230	n/a	36994
2001	17097	23052	n/a	40149
2002	10988	6519	n/a	17507
2003	7593	3002	n/a	10595
2004	8781	7580	n/a	16361
2005	952	176	0	1128
2006	913	840	0	1753
2007	140 **	1.2 **	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	4573	5744	n/a	10317
2011 (Until end May)	0	9621	n/a	9621
AVERAGE (1960-2004)	6394	26337	318	32824

Table 7.4.8.3 Anchovy in Subarea VIII (Bay of Biscay). Summary of the assessment. Median and 95% probability intervals for recruitment (age 1 in January), spawning-stock biomass, harvest rates (Catch/SSB), and the ratio of SSB with respect to SSB in 1989 as derived from the BBM.

Year	R (tonnes)			SSB (tonnes)			Harvest rate			SSB/SSB ₁₉₈₉		
	2.50%	Median	97.50%	2.50%	Median	97.50%	2.50%	Median	97.50%	2.50%	Median	97.50%
1987	14440	17120	22560	18600	21940	28580	0.520	0.677	0.799	0.984	1.279	1.624
1988	36380	41330	49500	31660	35720	43370	0.342	0.415	0.468	1.809	2.074	2.333
1989	9466	11650	15140	13870	17250	23130	0.360	0.482	0.600	1.000	1.000	1.000
1990	80300	89030	103503	58020	65110	77050	0.443	0.524	0.589	2.882	3.768	4.792
1991	20510	26270	34640	23190	30495	41510	0.443	0.603	0.793	1.241	1.752	2.431
1992	82737	139300	224800	56538	103700	173503	0.216	0.361	0.661	3.201	5.940	10.122
1993	41880	91835	130203	85890	97780	116900	0.339	0.405	0.461	4.123	5.681	7.448
1994	40820	49850	66870	50710	60760	81300	0.415	0.555	0.666	2.498	3.512	5.059
1995	35060	59925	107703	27920	52030	97761	0.300	0.564	1.052	1.532	2.950	5.997
1996	35510	65120	89421	51160	59510	74210	0.446	0.556	0.647	2.514	3.441	4.681
1997	40340	52280	74791	38410	50500	73570	0.279	0.406	0.533	1.960	2.894	4.528
1998	53780	82075	140503	46730	74120	130300	0.242	0.426	0.676	2.568	4.217	7.933
1999	35969	79505	121400	53550	76365	102800	0.257	0.346	0.493	2.765	4.370	6.499
2000	108100	130400	152300	102100	120000	134400	0.274	0.307	0.361	4.869	6.959	8.817
2001	74900	83920	99270	92200	100400	113000	0.355	0.400	0.435	4.310	5.837	7.326
2002	10360	12850	17430	32460	37180	45520	0.384	0.470	0.539	1.577	2.161	2.832
2003	24610	30660	37990	29010	34490	42920	0.244	0.304	0.361	1.389	2.009	2.650
2004	36020	44400	56621	34429	42490	55191	0.295	0.383	0.473	1.684	2.478	3.380
2005	4125	6137	9021	13550	18800	27051	0.043	0.062	0.086	0.678	1.096	1.618
2006	20650	27565	37421	22590	29825	41220	0.043	0.059	0.078	1.119	1.741	2.495
2007	25170	33580	46281	31240	40530	54590	0.003	0.003	0.004	1.607	2.345	3.374
2008	8594	12000	16810	22900	29820	39601	0.000	0.000	0.000	1.199	1.720	2.465
2009	8633	12050	16680	18680	24550	32070	0.000	0.000	0.000	0.994	1.406	2.015
2010	40909	55070	76100	38900	52280	70550	0.143	0.193	0.260	2.105	2.990	4.238
2011	65520	106800	167403	60179	98450	151800	0.049	0.076	0.124	3.410	5.608	8.852