

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

Advice summary for the period 1st July 2010 –30th June 2011

Management Objective (s)	Landings, 1 st July 2010 –30 th June 2011
MSY approach with caution at low stock size	Less than 11 100 t
Cautiously avoid impaired recruitment (Precautionary Approach)	Less than 6 000 t
Cautiously avoid impaired recruitment and achieve other objective(s) of a management plan (e.g., catch stability)	n/a

Stock status

Fishing mortality	2008	2009	2010*
F_{MSY}	Undefined	Undefined	Undefined
Spawning Stock Biomass (SSB)	2008	2009	2010
MSY $B_{escapement}$	Below	Below	Above
B_{PA}/B_{lim}	Between	Between	Above

* first 6 months

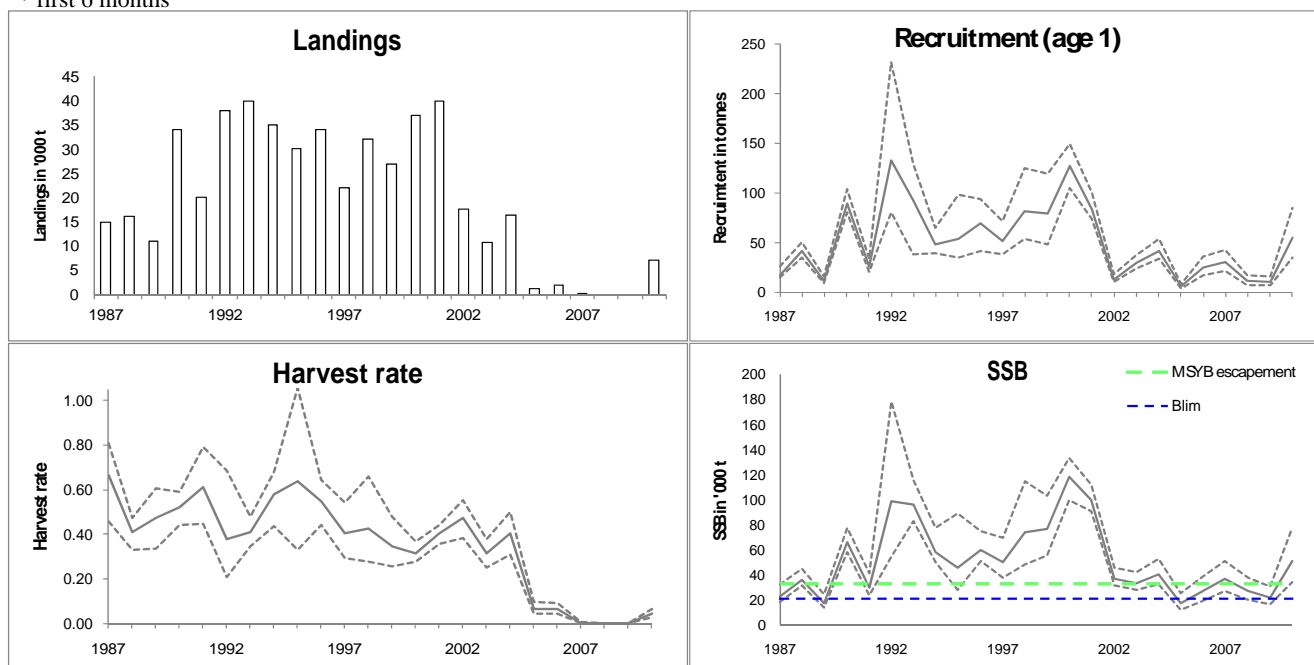


Figure 7.4.8.1 Anchovy in Subarea VIII (Bay of Biscay). Trends in landings, recruitment (age 1 in January), harvest rates (catch/SSB) and spawning-stock biomass. Solid lines - posterior median; dashed lines - 95% probability intervals.

The closure of the fishery for the last five years due to low biomasses has led to the estimated median SSB in 2010 at 51 400 t which is above B_{lim} with a 100% probability. This implies a recovery of population levels, in comparison with the last 5 years when the fishery was closed due to low biomasses. This recovery reflects good recruitment in 2010 and the most abundant since the recruitment in 2001.

Management plans

No specific management objectives are known to ICES. But a draft management plan is proposed by EC and it is understood that the proposed HCR may be used to set the next coming TAC by the EU Council of fisheries. ICES has not evaluated this proposal.

In light of the EU policy paper on fisheries management (17 May 2010, [COM\(2010\) 241](#)) this stock is classified under category 5

Biology

Anchovy is a short-lived species, with the fishable stock consisting primarily of one-year-old fish. The estimate of recruitment at age 1 in June is a key factor in determining catch limits for that year.

Environmental influence on the stock

Anchovy is a prey species for other pelagic and demersal species, and also for cetaceans and birds. Although recruitment depends strongly on environmental factors, and several recruitment predictions have been proposed in the past based on environmental variables, none has demonstrated its capacity to predict recruitment for several years.

The fisheries

After 5 years of closures the fishery was re-opened in 2010 with a provisional TAC of 7 000 t. Usually 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 the beginning of the closure the fleets of both countries has been reduced.

Catch by fleet	Not available
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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. The confidence interval of the SSB estimates is wider than in former years because of the differences in the spring survey indices.

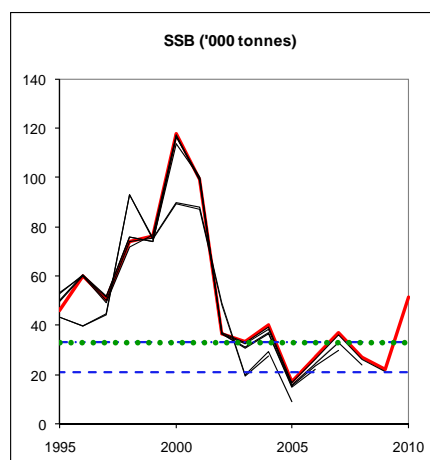


Figure 7.4.8.2 Anchovy in Subarea VIII (Bay of Biscay). Historical assessment results for median SSB (final year estimate included).

Scientific basis

Assessment type	Two-stage Bayesian biomass dynamic model (BBM) assessment
Input data	2 survey indices Daily Egg Production Method (DEPM) and acoustic survey (PELGAS)
	Commercial catch information
Discards and bycatch	Not included in the assessment
Indicators	None
Other information	The assessment was benchmarked in 2009 (WKSHORT)
Working group report	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 2011

Basis: Low recruitment scenario: $R(2011)$ from distribution of recruitment at age 1 in biomass (2002–2009). Total catch: 30% allocated to second half of 2010 and 70% to first half of 2011.

Catch (t) (July 2010–June 2011)	Probability $SSB_{2011} < B_{\text{lim}}$	Median SSB 2011
0	0.01	39 300
6 000	0.05	35 900
10 000	0.10	33 600
11 100	0.11	33 000
13 000	0.13	31 900
15 600	0.19	30 400

Weights in tonnes

MSY approach

With the objective to maintain the spawning stock biomass above a reference level of MSY $B_{\text{escapement}}$ by 2011 then a catch of less than 11 100 t can be taken in the period 1st July 2010 –30th June 2011.

PA approach

To reduce the risk to less than 5% that SSB in 2011 will be below B_{lim} , catch should be less than 6 000 t for the period 1st July 2010 - 30th June 2011.

Policy paper

In light of the EU policy paper on fisheries management (17 May 2010, [COM\(2010\) 241](#)) this stock is classified under category 5 because this is a shortlived species.

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.

The closure of the fishery for the last five years has led to an increase in the abundance of older anchovy and helped sustaining the biomass.

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 the 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, as the only input data for the time being are available in spring.

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 (STECF) and stakeholders (Southwestern RAC). This plan has not yet been formally adopted by the EU. The plan is based on a constant harvest rate, 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. Surveys to estimate juvenile abundance in autumn have now been conducted for seven years. So far, ICES has abstained from using it as a recruitment indicator, because the experience was limited up to 2009 to a period with only poor recruitment. The last year class, which was of intermediate strength, was associated with the highest survey index in the series. The correlation between survey index and recruitment now appears to be quite strong and it is statistically significant. Although the predictive power of the survey may still be limited, it is likely that this survey can serve to select, at least in a qualitative way, likely scenarios of next coming recruitment to improve the basis for the management advice for next year. Therefore, ICES is considering the possibility to review the current advice once indications of the next incoming recruitment become available from the autumn survey.

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 (see more details in [WGACEGG](#), ICES 2009).

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 2010 is between 34 000 and 78 000 t, with a median at 51 000 t. The uncertainty in recruitment and harvest rate is relatively low.

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 by MSY considerations.

Sources

- ICES. 2009. Report of the Working Group on Acoustic and Egg Surveys for Sardine and Anchovy in ICES Areas VIII and IX (WGACEGG), 16-20 November 2009, Lisbon, Portugal. ICES CM 2009/LRC:20.
- ICES. 2010. Report of the Working Group on Anchovy and Sardine (WGANSa), 24 - 28 June 2010, Vigo, Spain. ICES CM 2010/ACOM:16.

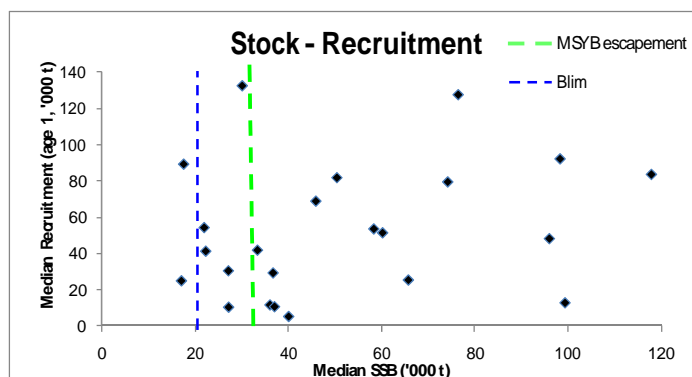


Figure 7.4.8.3 Anchovy in Subarea VIII (Bay of Biscay). Stock–recruitment plot based on median values

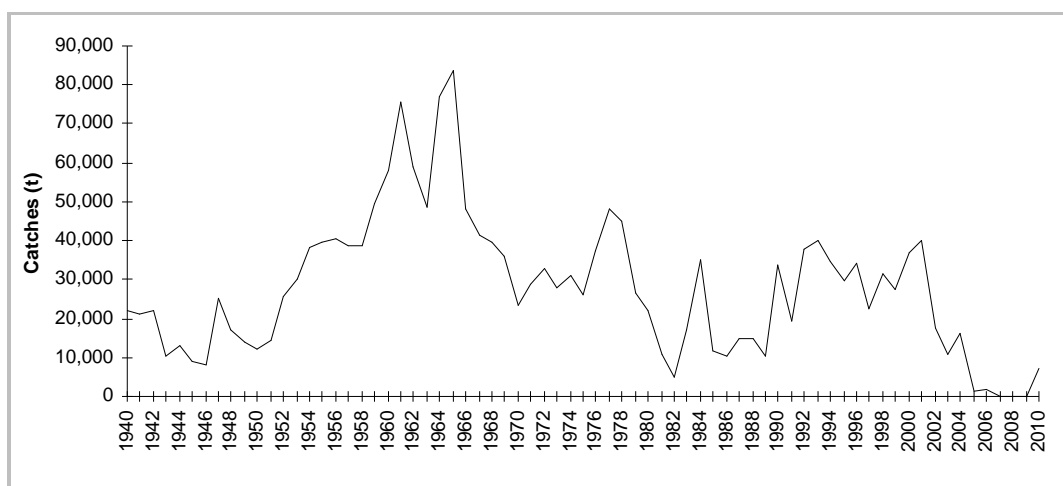


Figure 7.4.8.4 Anchovy in Subarea VIII (Bay of Biscay). Catches (in tonnes) from the beginning of the time series.

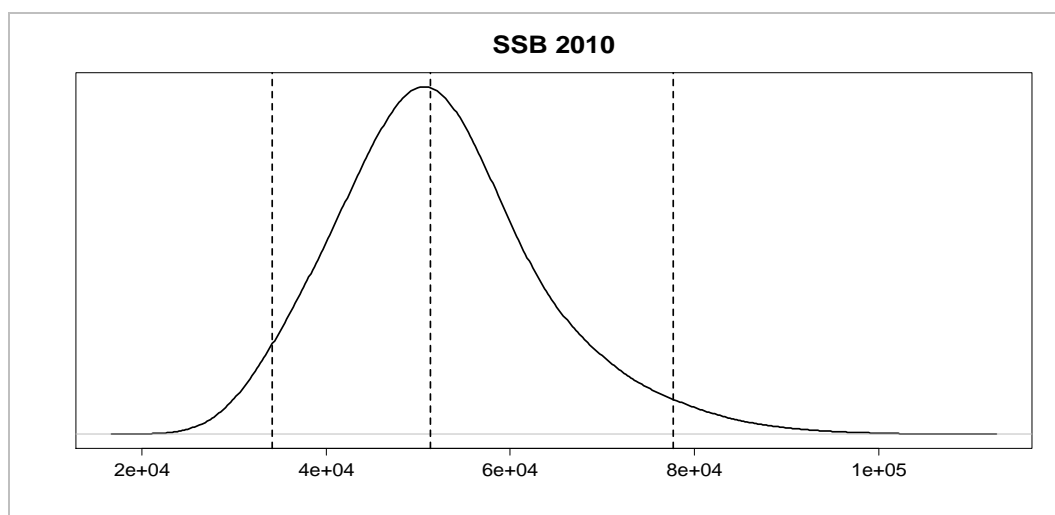


Figure 7.4.8.5 Anchovy in Subarea VIII (Bay of Biscay). Posterior distribution of spawning biomass in 2010. Vertical dashed lines correspond to posterior median and 95% probability intervals.

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	7 ³	n/a
2011	See scenarios ⁴	-			

Weights in '000 t.

¹ Mean catch of 1985–1987.² Experimental fisheries.³ Preliminary estimate of catches up to 1st of July.⁴ Advice for 1st July 2010 – 30st June 2011.

n/a: not available.

Table 7.4.8.2

Anchovy in Subarea VIII (Bay of Biscay). Annual catches (in tonnes) as estimated by the Working Group members.

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	141.2
2008	0	0	0	0
2009	0	0	0	0
2010	1600	5400		7000
AVERAGE (1990-04)	6394	26337	318	32824

** Experimental Fishery

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.

	R (tonnes)			SSB (tonnes)			Harvest rate			SSB/SSB ₁₉₈₉		
Year	2.50%	Median	97.50%	2.50%	Median	97.50%	2.50%	Median	97.50%	2.50%	Median	97.50%
1987	14250	17400	25541	18420	22325	32300	0.460	0.666	0.807	0.967	1.282	1.755
1988	35280	41490	50710	31480	36110	45050	0.329	0.410	0.471	1.761	2.054	2.354
1989	9287	11850	16120	13730	17590	24900	0.334	0.473	0.606	1.000	1.000	1.000
1990	80250	89470	104200	58100	65780	77680	0.440	0.519	0.588	2.711	3.735	4.914
1991	19790	25580	34150	23290	30150	41080	0.448	0.610	0.789	1.131	1.717	2.453
1992	79930	132700	231303	54400	98315	178600	0.209	0.380	0.687	2.930	5.525	10.411
1993	37929	92400	129400	82570	96030	115103	0.344	0.412	0.480	3.623	5.512	7.380
1994	39070	48400	64960	49710	58380	77810	0.434	0.578	0.679	2.214	3.356	4.825
1995	34830	53765	98711	27820	45945	88620	0.331	0.639	1.056	1.481	2.605	5.194
1996	41710	69060	93271	51340	60260	74850	0.442	0.549	0.644	2.468	3.414	4.657
1997	38430	51630	71100	37870	50460	69870	0.293	0.406	0.541	1.843	2.856	4.302
1998	54150	82010	125003	47970	74230	114800	0.275	0.425	0.658	2.464	4.150	6.857
1999	48099	79670	119403	54980	76470	103003	0.256	0.345	0.480	2.697	4.293	6.320
2000	104600	127750	150000	99730	117900	133400	0.277	0.313	0.370	4.412	6.693	8.805
2001	73759	83800	100300	90419	99380	112000	0.358	0.404	0.444	3.997	5.673	7.409
2002	10340	13010	18190	31750	36770	45580	0.384	0.476	0.551	1.504	2.096	2.851
2003	23280	29500	36920	27740	33430	42091	0.249	0.313	0.378	1.307	1.902	2.621
2004	34090	42040	53800	32430	40120	52530	0.310	0.406	0.502	1.540	2.285	3.232
2005	3506	5468	8094	12230	17110	24950	0.047	0.068	0.095	0.599	0.969	1.497
2006	17370	25165	36260	19560	27190	38451	0.046	0.065	0.090	0.933	1.535	2.389
2007	21920	30660	43120	27360	37080	51200	0.003	0.004	0.005	1.336	2.089	3.133
2008	7285	10880	16710	20120	27235	38030	0.000	0.000	0.000	0.989	1.532	2.323
2009	7334	10610	15690	16300	22000	30800	0.000	0.000	0.000	0.785	1.246	1.877
2010	34920	54490	84531	34140	51350	77662	0.028	0.043	0.065	1.611	2.922	4.728