

ECOREGION **Widely Distributed and Migratory Stocks**
STOCK **Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d**
(Northern stock)

Advice for 2012

ICES advises on the basis of the transition to the MSY approach that landings in 2012 should be no more than 51 900 t.

Stock status

F (Fishing Mortality)				
	2008	2009	2010	
MSY (F_{MSY})	✘	✘	✘	Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	?	Undefined
SSB (Spawning-Stock Biomass)				
	2009	2010	2011	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa}, B_{lim})	?	?	?	Undefined
Qualitative evaluation	↗	↗	✓	Above poss. reference points

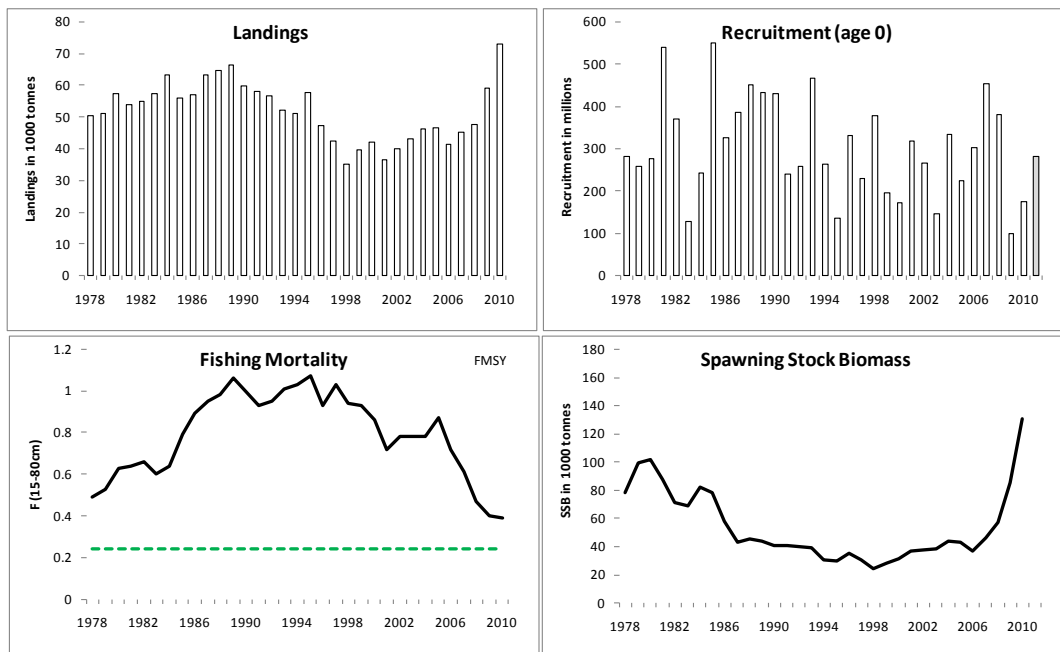
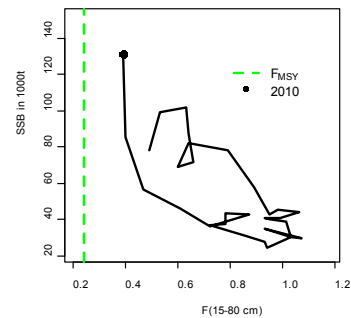


Figure 9.4.1.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment: landings, recruitment, F, and SSB over the years.

The spawning biomass has been increasing since 1998 and is estimated to be record high in 2011. Fishing mortality has been decreasing in recent years, but is still above F_{MSY} . Recruitment fluctuations appear to be without substantial trend over the whole series. After several high recruitments in 2006 to 2008, the last two recruitments are estimated to be low.

Management plans

A recovery plan has been agreed by the EU in 2004 ([EC Reg. No. 811/2004](#)). The aim of the plan is to increase the SSB to above 140 000 t with a fishing mortality (F_{MP}) of 0.25, constrained by a year-to-year change in TAC of 15% when SSB is above 100 000 t.

Biology

European hake is widely distributed over the Northeast Atlantic shelf. Although, there is no clear evidence of multiple populations in the Northeast Atlantic, ICES assumes two different stock units. The Northern stock is distributed over a wide area. There are two major nursery areas: in the Bay of Biscay and off southern Ireland. Hake growth is now known to be faster than previously estimated.

The fisheries

Hake is caught in mixed fisheries together with megrim, anglerfish, and *Nephrops*. Discards of juvenile hake can be substantial in some areas and fleets. An important increase in landings has occurred in the northern part of the distribution area (Division IIIa, and Subareas IV and VI) in recent years. Since the introduction of the high vertical opening trawls in the mid-1990s, no significant changes in fishing technology have been introduced.

Catch by fleet	Total landings (2010) = 73 kt (31% trawl, 20% gillnet, 29% longline, and 21% unspecified gears); discards 6.7 kt (underestimated, only estimated and assumed for part of the trawl fleets).
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Quality considerations

This stock was benchmarked in 2010 and now the assessment is carried out using a length-based model (without age data, as no age-reading criterion exists at present). For this year's assessment, the modelled time period has been extended back to 1978. This provides a clearer perspective of the historical development of the stock and has improved the quality of the assessment. The uncertainty of SSB and F estimates is lower. The current assessment suffers from some shortage of tuning data, particularly in relation to earlier years, for areas outside VII and VIII and the larger individuals in the population.

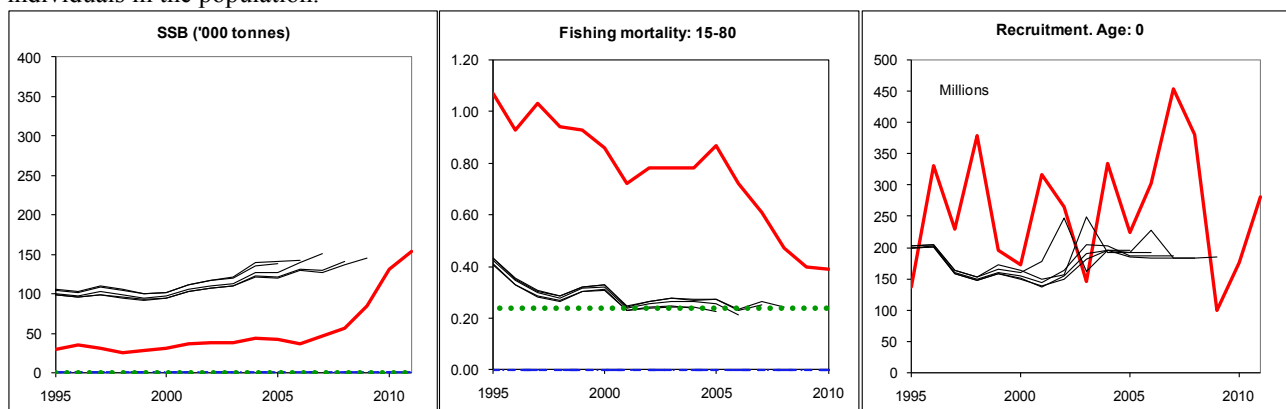


Figure 9.4.1.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Historical assessment results (final year recruitment estimates included). F is based on lengths 15–80 cm, corresponding to approximately 1–5 years old; in previous assessment years the F age range was 2–6 years old.

Scientific basis

Assessment type	Length-based model (SS3).
Input data	Four survey indices (EVHOE-WIBTS-Q4, SpPGFS-WIBTS-Q4, IGFS-WIBTS-Q4, RESSGASC) .
Discards and bycatch	Discards included in the assessment.
Indicators	None.
Other information	This stock was benchmarked in 2010 (WKROUND).
Working group report	WGHMM

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	0.24	$F_{30\%SPR}$ (Section 9.3.2.1 , ICES, 2010).
Precautionary Approach	B_{lim}	Not defined.	
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(unchanged since: 2010)

Yield and spawning biomass per Recruit F-reference points (2011):

	Fish Mort (Length 15–80cm)	Yield/R	SSB/R
F_{max}	0.29	0.28	0.79
$F_{0.1}$	0.19	0.26	1.18
$F_{35\%SPR}$	0.20	0.26	1.12
$F_{30\%SPR}$	0.24	0.27	0.96

Outlook for 2012

Basis: $F(2011) = \text{Mean } F_{08-10} = 0.42$; $\text{SSB}(2012) = 131$; $R(2011) = 281$ million (GM 1978–2010); Landings (2011) = 77.4; Discards (2011) = 1.8.

Rationale	Human consumption landings (2012)	Basis	F Total (2012)	F HC (2012)	F Disc (2012)	Disc. (2012)	Catch Total (2012)	SSB (2013)	%SSB change ₁₎	%TAC change ₂₎
MSY framework	39.4	F_{MSY} ($F_{\text{sq}} * 0.57$)	0.24	0.20	0.04	1.6	41.0	138	+6%	-28%
MSY transition	51.9	$0.6 * F_{2010} + 0.4 * F_{\text{MSY}}$ ($F_{\text{sq}} * 0.78$)	0.33	0.28	0.05	2.1	54.0	125	-4%	-6%
Recovery Plan	46.839	-15% TAC ($F_{\text{sq}} * 0.69$)	0.29	0.25	0.04	1.9	48.7	131	0%	-15%
Zero catch	0.0	$F=0.0$	0.00	0.00	0.00	0.0	0.0	179	+37%	-100%
<i>Status quo</i>	7.7	$F_{\text{sq}} * 0.1$	0.04	0.04	0.01	0.3	8.0	171	+31%	-86%
	22.2	$F_{\text{sq}} * 0.3$	0.13	0.11	0.02	0.9	23.0	156	+20%	-60%
	35.3	$F_{\text{sq}} * 0.5$	0.21	0.18	0.03	1.4	36.6	143	+9%	-36%
	47.2	$F_{\text{sq}} * 0.7$	0.30	0.25	0.04	1.9	49.1	130	0%	-14%
	46.8	-15% TAC ($F_{\text{sq}} * 0.69$)	0.29	0.25	0.04	1.9	48.7	131	0%	-15%
	55.1	Equal TAC ($F_{\text{sq}} * 0.85$)	0.36	0.30	0.05	2.3	57.4	122	-7%	0%
	58.0	$F_{\text{sq}} * 0.9$	0.38	0.32	0.06	2.4	60.4	119	-9%	+5%
	63.0	$F_{\text{sq}} * 1$	0.42	0.36	0.06	2.6	65.6	114	-13%	+14%
	63.4	+15% TAC ($F_{\text{sq}} * 1.01$)	0.43	0.36	0.06	2.6	66.0	113	-13%	+15%
72.4	$F_{\text{sq}} * 1.2$	0.51	0.43	0.08	3.1	75.4	104	-20%	+31%	

Units: '000 tonnes.

¹⁾ SSB 2013 relative to SSB 2012.

²⁾ Human consumption landings 2012 relative to TAC 2011.

Management plan(s)

Due to the new perspective of historical stock trends, resulting from the new assessment, the previously defined precautionary reference points are no longer appropriate. In particular, the absolute levels of spawning biomass, fishing mortality, and recruitment have shifted to different scales. As a consequence, the TAC corresponding to the current recovery plan ([EC Reg. No. 811/2004](#)) should not be considered, because the plan uses target values based on precautionary reference points that are no longer appropriate.

MSY approach

The stock is considered to be above any potential MSY $B_{trigger}$. Following the ICES MSY framework implies fishing mortality to be reduced to 0.24, resulting in landings of 39 400 tonnes in 2012. This is expected to lead to an SSB of 138 000 tonnes in 2013.

Following the transition scheme towards the ICES MSY framework implies fishing mortality be reduced to 0.33 and corresponding to landing of 51 900 tonnes. This is expected to lead to an SSB of 125 000 tonnes in 2013.

Additional considerations

Discards of juvenile hake can be substantial in some areas and fleets. The spawning biomass and the long-term yield can be substantially improved by reducing mortality of small fish. This could be achieved by measures that reduce unwanted bycatch through shifting the selection pattern towards larger fish.

The application of a new assessment method has resulted in a change in the perception of the historical stock. Thus, the previous defined precautionary reference points, on which the recovery plan is based, are no longer appropriate.

Hake in the ICES area is managed and assessed as two separate stocks. There is no biological basis for the current ICES stock definition of northern and southern hake. These stocks have similar biology with an unknown degree of mixing.

Quality considerations

Last year, the assessment was found to be limited in its ability to precisely estimate current stock abundance and mortality. This was mainly due to the time period, 1990–2009, which did not exhibit strong contrasts in the available data and little information was available on large fish. All this led to large uncertainties associated with the main population parameters (SSB, F, and recruitment), particularly regarding the rate of decrease in F and increase in SSB in the most recent years. This year, the time period has been extended back to 1978. This has improved the model's ability to determine the degree to which various levels of fishing reduced hake abundance during the mid-1980s and the 1990s and thus provides a clearer perspective of the historical development of the stock.

The assessment is now carried out with discards included. There is large uncertainty associated with estimation of discards, which is reflected in the projected discard values.

Management considerations

The fast growth rate and the assumed high natural mortality generates a more rapid turn-over of the hake stock dynamics than previously assumed. This means that short-term projections of SSB and landings are more sensitive to variations in recruitment. The short-term forecasts of SSB and yield obtained this year are influenced by the low recruitment estimates for 2009 and 2010.

Comparison with previous assessment

Last year's assessment was indicative of trends. This year's assessment is consistent with last year's F and SSB trends.

The basis for the advice is the same as last year.

Sources

ICES. 2010. Report of the ICES Advisory Committee, 2010. ICES Advice, 2010. Book 9. 299 pp.

ICES. 2011. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 5–11 May 2011, ICES Headquarters, Copenhagen. ICES CM 2011/ACOM:11.

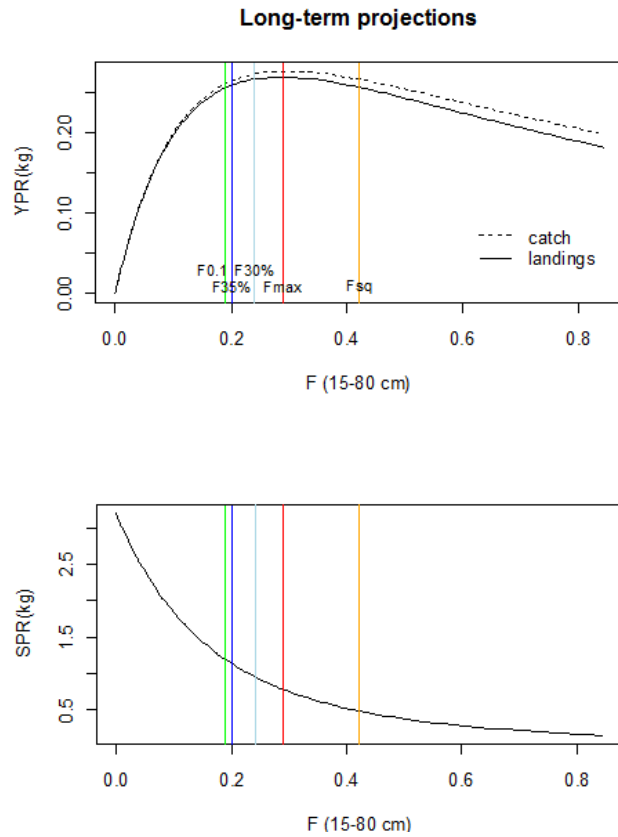


Figure 9.4.1.3 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Equilibrium projections of long-term yield-per-recruit (upper panel) and SSB-per-recruit (lower panel) at different fishing mortality rates.

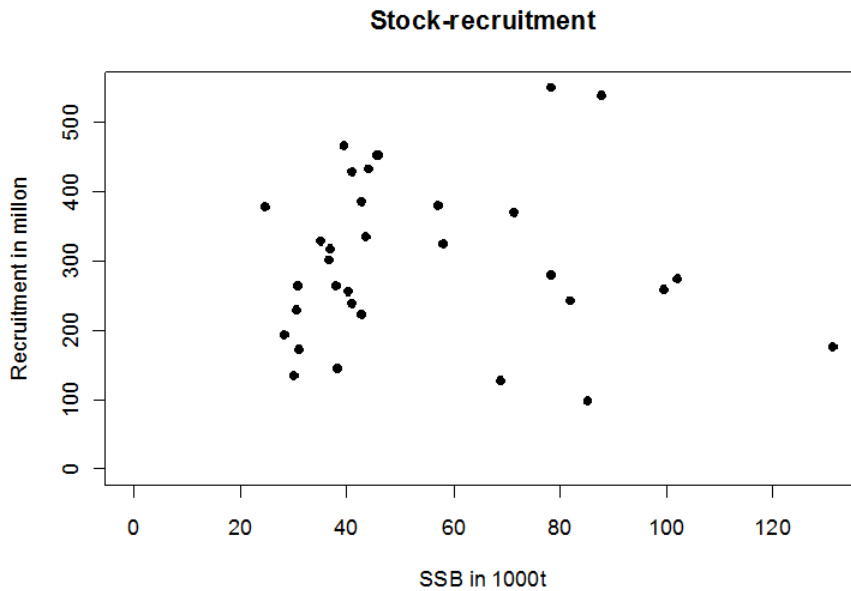


Figure 9.4.1.4 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Stock–recruitment plot.

Table 9.4.1.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. ICES advice, management and landings, discards, and catches.

Year	ICES Advice	Predicted landings corresp. to advice	Agreed TAC ¹	ICES landings	Discards ²	ICES catch
1987	Precautionary TAC; juvenile protection	-	63.5	63.4		
1988	Precautionary TAC; juvenile protection	54	66.2	64.8		
1989	Precautionary TAC; juvenile protection	54	59.7	66.5		
1990	Precautionary TAC; juvenile protection	59	65.1	60.0		
1991	Precautionary TAC; juvenile protection	59	67.0	58.1		
1992	If required, precautionary TAC	61.5	69.0	56.6		
1993	Enforce juvenile protection legislation	-	71.5	52.1		
1994	F significantly reduced	<46	60.0	51.3	*	
1995	30% reduction in F	31	55.1	57.6		
1996	30% reduction in F	39	51.1	47.2		
1997	20% reduction in F	54	60.1	42.6		
1998	20% reduction in F	45	59.1	35.0		
1999	Reduce F below F_{pa}	<36	55.1	39.8	*	
2000	50% reduction in F	<20	42.1	42.0	*	
2001	Lowest possible catch, recovery plan	-	22.6	36.7		
2002	Lowest possible catch / recovery plan	-	27.0	40.0		
2003	Lowest possible catch / recovery plan	-	30.0	43.1	*	
2004	70% reduction in F or recovery plan*	<13.8	39.1	46.4	*	
2005	F=0.19	33	42.6	46.6	4.0	50.6
2006	F=0.25	44	43.9	41.5	*	
2007	Recovery plan limits	50.5	52.7	45.1	2.1	47.2
2008	Recovery plan limits	54	54	47.8	3.5	51.3
2009	F =0.25 = F_{pa}	51.5	51.5	59.0	7.1	66.1
2010	F =0.25 = F_{pa}	55.2	55.1	73.1	6.5	79.6
2011	See scenarios	50.6	55.1			
2012	MSY transition	51.9				

Weights in '000 t.

¹Sum of area TACs corresponding to northern stock plus Division IIa (EC zone only).

²2010 new discard estimates. In years marked with *, partial discard estimates are available and used in the assessment. For remaining years for which no values are presented, some estimates are available but not considered valid and thus not used in the assessment.

Table 9.4.1.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Estimated landings (in thousand tonnes), by ICES area.

Year	Landings (1)				Total
	IVa+VI	VII	VIIIa,b	Unallocated	
1961	-	-	-	95.6	95.6
1962	-	-	-	86.3	86.3
1963	-	-	-	86.2	86.2
1964	-	-	-	76.8	76.8
1965	-	-	-	64.7	64.7
1966	-	-	-	60.9	60.9
1967	-	-	-	62.1	62.1
1968	-	-	-	62.0	62.0
1969	-	-	-	54.9	54.9
1970	-	-	-	64.9	64.9
1971	8.5	19.4	23.4	0	51.3
1972	9.4	14.9	41.2	0	65.5
1973	9.5	31.2	37.6	0	78.3
1974	9.7	28.9	34.5	0	73.1
1975	11.0	29.2	32.5	0	72.7
1976	12.9	26.7	28.5	0	68.1
1977	8.5	21.0	24.7	0	54.2
1978	8.0	20.3	24.5	-2.2	50.6
1979	8.7	17.6	27.2	-2.4	51.1
1980	9.7	22.0	28.4	-2.8	57.3
1981	8.8	25.6	22.3	-2.8	53.9
1982	5.9	25.2	26.2	-2.3	55.0
1983	6.2	26.3	27.1	-2.1	57.5
1984	9.5	33.0	22.9	-2.1	63.3
1985	9.2	27.5	21.0	-1.6	56.1
1986	7.3	27.4	23.9	-1.5	57.1
1987	7.8	32.9	24.7	-2.0	63.4
1988	8.8	30.9	26.6	-1.5	64.8
1989	7.4	26.9	32.0	0.2	66.5
1990	6.7	23.0	34.4	-4.2	60.0
1991	8.3	21.5	31.6	-3.4	58.1
1992	8.6	22.5	23.5	2.1	56.6
1993	8.5	20.5	19.8	3.3	52.1
1994	5.4	21.1	24.7	0.0	51.3
1995	5.3	24.1	28.1	0.1	57.6
1996	4.4	24.7	18.0	0.0	47.2
1997	3.3	18.9	20.3	-0.1	42.5
1998	3.2	18.7	13.1	0.0	35.1
1999	4.3	24.0	11.6	0.0	39.8
2000	4.0	26.0	12.0	0.0	42.0
2001	4.4	23.1	9.2	0.0	36.7
2002	2.9	21.2	15.9	0.0	40.1
2003*	3.3	25.4	14.4	0.0	43.2
2004*	4.4	27.5	14.5	0.0	46.4
2005*	5.5	26.6	14.5	0.0	46.6
2006*	6.1	24.7	10.6	0.0	41.5
2007*	7.0	27.5	10.6	0.0	45.1
2008*	10.7	22.8	14.3	0.0	47.8
2009*	13.1	25.5	20.4	0.0	59.0
2010*	14.2	33.9	25.1	0.0	73.1

(1) Spanish data for 1961-1972 not revised, data for Sub-area VIII for 1973-1978 include data for Divisions VIIIa,b only. Data for 1979-1981 are revised based on French surveillance data. Includes Divisions IIIa, IVb,c from 1976.

There are some unallocated landings (moreover for the period 1961-1970).

Table 9.4.1.3

Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment.

Year	Recruit Age 0	Total Biomass	Total SSB	Landings	Yield/SSB	F (15–80 cm)
1978	280631	116459	78177	50551	0.65	0.49
1979	258652	126414	99476	51096	0.51	0.53
1980	276005	124635	101917	57265	0.56	0.63
1981	538869	107689	87727	53918	0.61	0.64
1982	370360	98643	71402	54994	0.77	0.66
1983	128493	105040	68866	57507	0.84	0.6
1984	243448	111442	81881	63286	0.77	0.64
1985	550445	96291	78221	56099	0.72	0.79
1986	326490	78788	57999	57092	0.98	0.89
1987	387231	74529	42763	63369	1.48	0.95
1988	452547	75117	45644	64823	1.42	0.98
1989	433097	74731	43982	66473	1.51	1.06
1990	430813	69258	41029	59954	1.46	0.99
1991	238950	67117	40943	58129	1.42	0.93
1992	257803	66545	40131	56617	1.41	0.95
1993	467945	59108	39296	52144	1.33	1.01
1994	264551	52822	30737	51259	1.67	1.03
1995	136309	58978	30037	57621	1.92	1.07
1996	330345	54544	35188	47210	1.34	0.93
1997	229932	46728	30507	42465	1.39	1.03
1998	378378	44200	24603	35060	1.43	0.94
1999	194931	48612	28062	39814	1.42	0.93
2000	173072	54342	31083	42026	1.35	0.86
2001	317173	54478	36791	36675	1	0.72
2002	265151	57279	37888	40107	1.06	0.78
2003	145895	62443	38161	43162	1.13	0.78
2004	334983	65433	43609	46417	1.06	0.78
2005	224857	62059	42802	46550	1.09	0.87
2006	303304	61200	36530	41467	1.14	0.72
2007	454286	71402	45909	45098	0.98	0.61
2008	381687	92250	56968	47823	0.84	0.47
2009	99576	134346	85181	58975	0.69	0.4
2010	176248	174907	131075	73125	0.56	0.39
2011	280869 ^(*)		153890			
Arith. Mean	304620	80237	57014	52066		
	Units	Thousands	Tonnes	Tonnes	Tonnes	

(*) GM(1978–2010).