ECOREGION Widely distributed and migratory stocks
STOCK Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d (Northern stock)

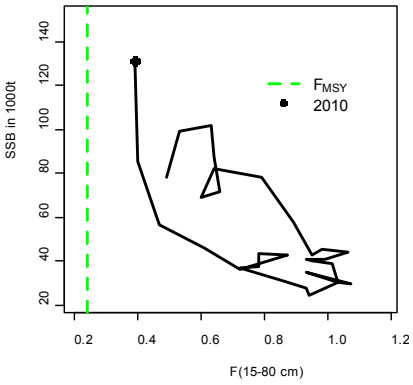
Advice for 2013

ICES advises on the basis of the transition to the MSY approach that landings in 2013 should be no more than 45 400 t.

Stock status

F (Fishing Mortality)	2009	2010	2011	
MSY (F_{MSY})	✗	✗	?	Not available
Precautionary approach (F_{pa},F_{lim})	?	?	?	Not available

SSB (Spawning-Stock Biomass)	2010	2011	2012	
MSY ($B_{trigger}$)	?	?	?	Not available
Precautionary approach (B_{pa},B_{lim})	?	?	?	Not available
Qualitative evaluation	↗	↗	✓	Above poss. reference points



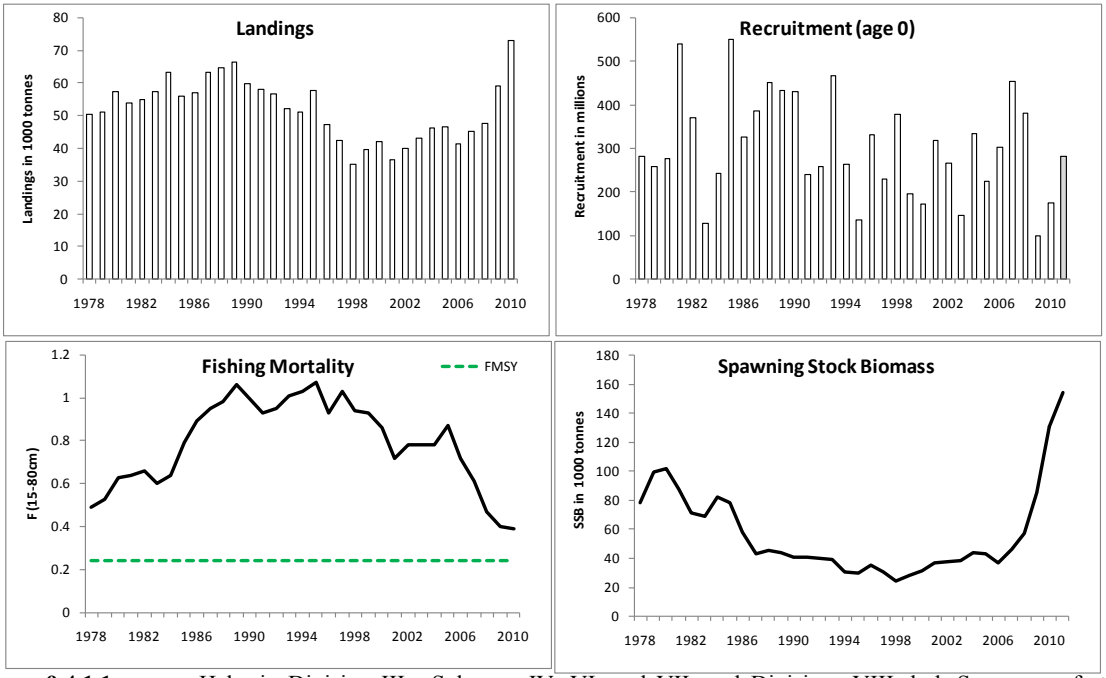


Figure 9.4.1.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment (weights in thousand tonnes). Assumed values are shaded. Top right: SSB/F for the time-series used in the assessment

No assessment has been carried out in 2012. The stock status is based on last year's assessment. The spawning-stock 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 two most recent recruitments (2009 and 2010) are estimated to be low.

Management plans

A recovery plan was 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. This plan has not been evaluated by ICES.

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 distribution	Total landings (2010) = 73 kt (31% trawl, 20% gillnet, 29% longline, and 21% unspecified gears). In addition, discards were estimated at 6.7 kt (underestimated, only estimated and assumed for part of the trawl fleets). There were insufficient data to update this information for 2011; however, values for 2010 are still considered appropriate.

Quality considerations

It was not possible to include Spanish commercial data for 2011 in the assessment. Therefore, the assessment model could not be updated this year. Projections for catch options and management advice for 2013 were based on the assessment conducted in 2011. This implies that assumptions on recruitment and fishing mortality have to be made for two intermediate years (2011 and 2012) instead of one (2012), which resulted in a larger uncertainty in the results of the forecast for 2013 and 2014. The proportion of 2013 landings that depends on average recruitment assumptions (year classes 2011–2013) is 35%.

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 last year's assessment, the modelled time period was extended back to 1978. This provided a more comprehensive picture of the historical development of the stock and has improved the quality of the assessment. SSB and F are now estimated with greater certainty. The assessment suffers from a lack of tuning data representative of the whole stock, particularly in relation to areas outside Subareas VII and VIII, the larger individuals in the population, and for earlier years.

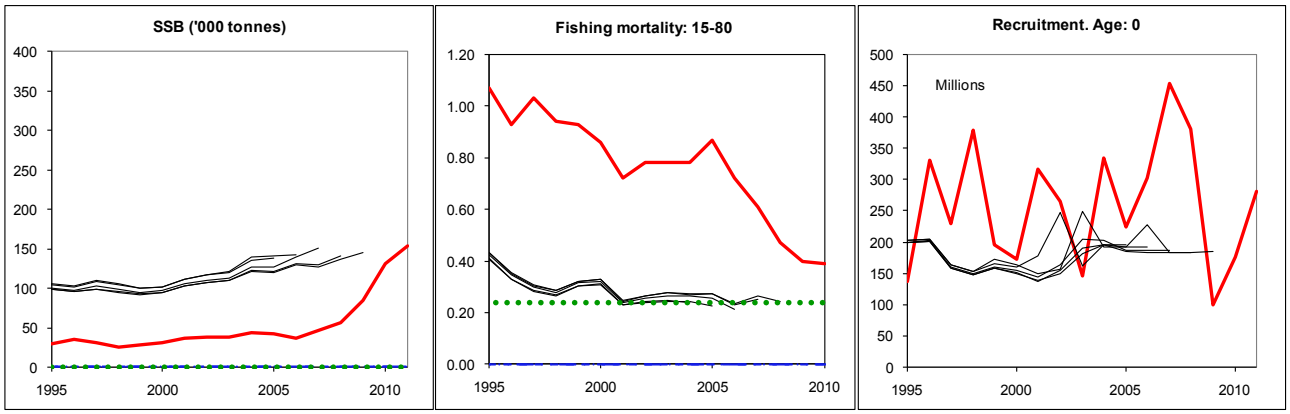


Figure 9.4.1.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Historical assessment results (final-year recruitment estimates included). F is based on lengths 15–80 cm, corresponding to approximately 1–5 years old; in previous assessment years the F age range was 2–6 years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

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

(unchanged since: 2010)

Outlook for 2013

Basis: F (2011) and F (2012) = Mean $F_{2008–10}$ = 0.42; SSB (2013) = 114 252; R (2011) and R (2012) = 294 million (GM 1978–2008); landings (2011) = 77.4 and landings (2012) = 63.2; discards (2011) = 1.8 and discards (2012) = 2.7.

Rationale	Human consump. landings (2013)	Basis	F Total (2013)	F HC (2013)	F Disc (2013)	Disc. (2013)	Catch Total (2013)	SSB (2014)	%SSB change [1]	%TAC change [2]
MSY framework	37.2	F_{MSY} (F_{sq}*0.57)	0.24	0.20	0.04	1.7	39.0	141.9	+24%	−32%
MSY transition	45.4	0.4*F_{2010}+0.6*F_{MSY} (F_{sq}*0.71)	0.30	0.26	0.04	2.1	47.6	133.4	+17%	−18%
Recovery Plan	46.8	−15% TAC (F_{sq}*0.75)	0.31	0.27	0.05	2.2	49.0	132.0	+16%	−15%
Zero catch	0.0	F=0	0.00	0.00	0.00	0.0	0.0	180.3	+58%	−100%
Other options	7.3	F_{sq} *0.1	0.04	0.04	0.01	0.3	7.6	172.8	+51%	−87%
	20.9	F_{sq} *0.3	0.13	0.11	0.02	0.9	21.8	158.8	+39%	−62%
	33.3	F_{sq} *0.5	0.21	0.18	0.03	1.5	34.9	146.0	+28%	−40%
	44.7	F_{sq} *0.7	0.30	0.25	0.04	2.1	46.8	134.2	+17%	−19%
	46.8	−15% TAC (F_{sq}*0.75)	0.31	0.27	0.05	2.2	49.0	132.0	+16%	−15%
	55.1	Equal TAC (F_{sq}*0.91)	0.38	0.32	0.06	2.7	57.8	123.3	+8%	0%
	55.0	F_{sq} *0.9	0.38	0.32	0.06	2.7	57.7	123.4	+8%	0%
	59.9	F_{sq} *1	0.42	0.36	0.06	2.9	62.8	118.4	+4%	+9%
	63.3	+15% TAC (F_{sq}*1.08)	0.454	0.39	0.07	3.1	66.4	114.7	0%	+15%
	68.9	F_{sq} *1.2	0.51	0.43	0.07	3.4	72.3	108.9	−5%	+25%

Weights in thousand tonnes.
[1] SSB 2014 relative to SSB 2013.
[2] Human consumption landings 2013 relative to TAC 2012.

MSY approach

The stock is considered to be above any potential MSY $B_{trigger}$. Following the ICES MSY framework implies fishing mortality should be reduced to 0.24, resulting in landings of 37 200 tonnes in 2013. This is expected to lead to an SSB of 142 000 tonnes in 2014.

Following the transition scheme towards the ICES MSY framework implies fishing mortality should be reduced to 0.30, corresponding to landings of 45 400 tonnes. This is expected to lead to an SSB of 133 400 tonnes in 2014.

Management plan(s)

The current recovery plan (EC Reg. No. 811/2004) uses target values based on precautionary reference points that are no longer appropriate.

Additional considerations

Discards of juvenile hake can be substantial in some areas and fleets. The spawning-stock 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.

Data and methods

The assessment is carried out with discards included. There is large uncertainty associated with estimation of discards.

In order to reduce uncertainty in discards estimates, an increased sampling level for on-board observer programmes is needed for some fleets (non-*Nephrops* trawlers, gillnetters, and longliners). Hake otoliths are currently collected but not used in the assessment due to lack of validated ageing method. It is therefore important that research on hake ageing from otoliths be continued.

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.

As no assessment has been carried out this year, assumptions have been made on recruitment and fishing mortality for both 2011 and 2012. The short-term forecasts of SSB and yield obtained this year are influenced by the low recruitment estimates for 2009 and 2010 and by the assumed values on recruitment and F for 2011 and 2012. The proportion of 2013 landings that depends on average recruitments assumptions (year classes 2011–2013) is 35%.

Comparison with previous assessment

No assessment has been carried out this year. The basis for the advice is the same as last year, the MSY framework.

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.
ICES. 2012. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 10–16 May 2012, ICES Headquarters, Copenhagen. ICES CM 2012/ACOM:11.

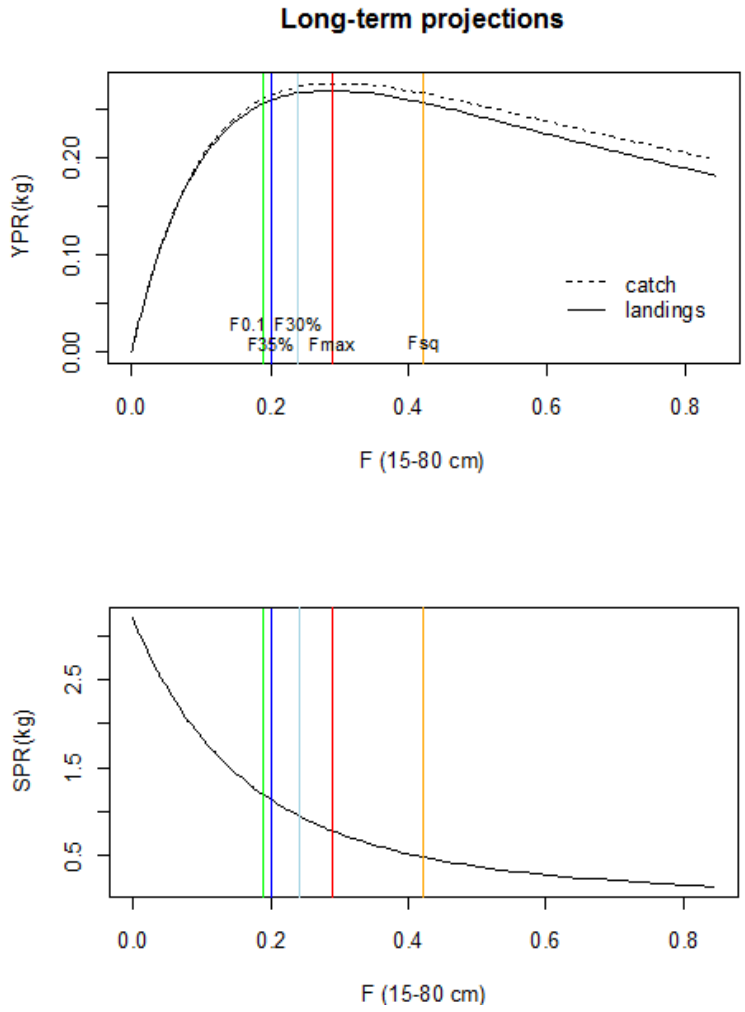

Figure 9.4.1.3 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Equilibrium projections of long-term yield-per-recruit (upper panel) and SSB-per-recruit (lower panel) at different fishing mortality rates.

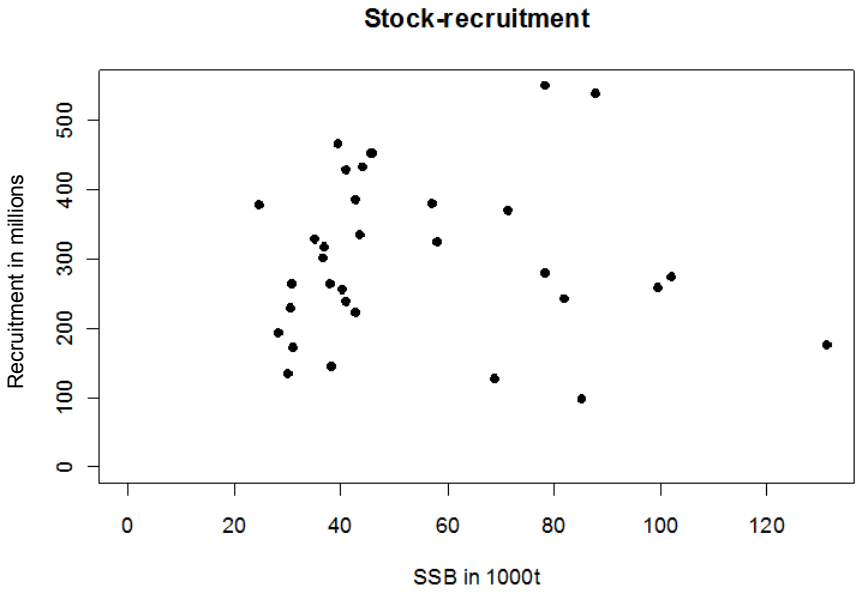

Figure 9.4.1.4 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Stock–recruitment plot.

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	35.5[3]	2.6[3]	38.1[3]
2012	MSY transition	51.9	55.1			
2013	MSY transition	45.4				

Weights in thousand tonnes.

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

[2]2010 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.

[3]Without Spanish data.

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

	Landings (1)					Discards (2)	Catches (3)
Year	IIIa, IV and VI	VII	VIIIa,b	Unallocated	Total	VIIIa,b	Total
1961	-	-	-	95.6	95.6	-	95.6
1962	-	-	-	86.3	86.3	-	86.3
1963	-	-	-	86.2	86.2	-	86.2
1964	-	-	-	76.8	76.8	-	76.8
1965	-	-	-	64.7	64.7	-	64.7
1966	-	-	-	60.9	60.9	-	60.9
1967	-	-	-	62.1	62.1	-	62.1
1968	-	-	-	62.0	62.0	-	62.0
1969	-	-	-	54.9	54.9	-	54.9
1970	-	-	-	64.9	64.9	-	64.9
1971	8.5	19.4	23.4	0	51.3	-	51.3
1972	9.4	14.9	41.2	0	65.5	-	65.5
1973	9.5	31.2	37.6	0	78.3	-	78.3
1974	9.7	28.9	34.5	0	73.1	-	73.1
1975	11.0	29.2	32.5	0	72.7	-	72.7
1976	12.9	26.7	28.5	0	68.1	-	68.1
1977	8.5	21.0	24.7	0	54.2	-	54.2
1978	8.0	20.3	24.5	-2.2	50.6	-	52.9
1979	8.7	17.6	27.2	-2.4	51.1	-	53.8
1980	9.7	22.0	28.4	-2.8	57.3	-	60.5
1981	8.8	25.6	22.3	-2.8	53.9	-	56.3
1982	5.9	25.2	26.2	-2.3	55.0	-	58.1
1983	6.2	26.3	27.1	-2.1	57.5	-	60.1
1984	9.5	33.0	22.9	-2.1	63.3	-	65.1
1985	9.2	27.5	21.0	-1.6	56.1	-	59.9
1986	7.3	27.4	23.9	-1.5	57.1	-	60.1
1987	7.8	32.9	24.7	-2.0	63.4	-	65.3
1988	8.8	30.9	26.6	-1.5	64.8	-	66.8
1989	7.4	26.9	32.0	0.2	66.5	-	68.8
1990	6.7	23.0	34.4	-4.2	60.0	-	61.5
1991	8.3	21.5	31.6	-3.4	58.1	-	59.8
1992	8.6	22.5	23.5	2.1	56.6	-	58.3
1993	8.5	20.5	19.8	3.3	52.1	-	53.6
1994	5.4	21.1	24.7	0.0	51.3	*	53.1
1995	5.3	24.1	28.1	0.1	57.6	-	58.9
1996	4.4	24.7	18.0	0.0	47.2	-	48.8
1997	3.3	18.9	20.3	-0.1	42.5	-	44.2
1998	3.2	18.7	13.1	0.0	35.1	-	35.9
1999	4.3	24.0	11.6	0.0	39.8	*	40.6
2000	4.0	26.0	12.0	0.0	42.0	*	42.6
2001	4.4	23.1	9.2	0.0	36.7	-	37.2
2002	2.9	21.2	15.9	0.0	40.1	-	40.4
2003	3.3	25.4	14.4	0.0	43.2	*	43.2
2004	4.4	27.5	14.5	0.0	46.4	*	46.4
2005	5.5	26.6	14.5	0.0	46.6	4.0	46.6
2006	6.1	24.7	10.6	0.0	41.5	*	41.5
2007	7.0	27.4	10.6	0.0	45.0	2.1	45.0
2008	10.7	22.8	14.3	0.0	47.7	3.5	47.7
2009	13.1	25.3	20.4	0.0	58.8	7.1	58.8
2010	14.2	33.5	25.1	0.0	72.8	6.5	72.8
2011(4)	15.0	9.9	10.6	0.0	35.5	2.6	35.5

(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. Divisions IIIa and IVb,c are included in column "IIIa, IV and VI" only after 1976. There are some unallocated landings (moreover for the period 1961-1970).

(2) Discard estimates from observer programmes. 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

(3) From 1978 total catches used for the Working Group.

(4) Without Spanish data

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	1.00	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	0.40
2010	176248	174907	131075	73125	0.56	0.39
2011	294822(*)		153890			
Arith. Mean	304620	80237	57014	52066		
Units	Thousands	Tonnes	Tonnes	Tonnes		

(*) GM(1978–2008).