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

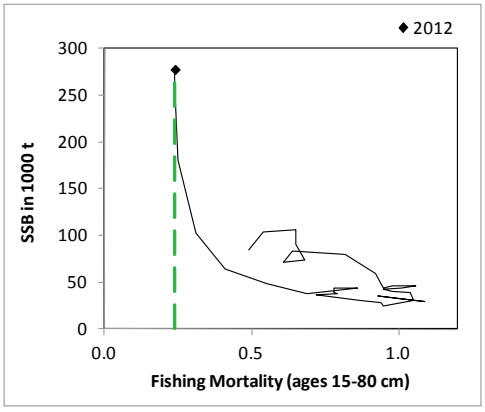
Advice for 2014

ICES advises on the basis of the MSY approach that landings should be no more than 81 846 t in 2014. Even though some discards are included in the assessment, the total amount of discards cannot be quantified. Therefore total catches cannot be calculated.

Stock status

F (Fishing Mortality)	2010	2011	2012	
MSY (F_{MSY})	✗	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2011	2012	2013	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined
Qualitative evaluation	↗	↗	✓	Above poss. reference points



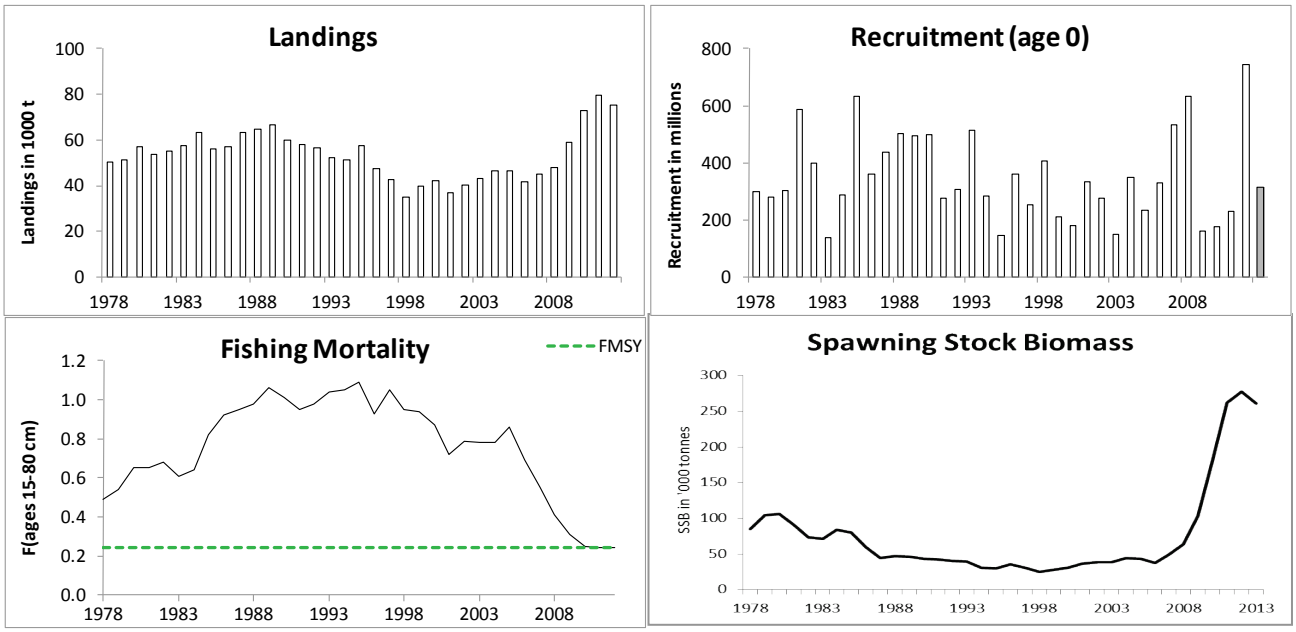


Figure 9.4.10.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Summary of stock assessment (weights in thousand tonnes). Assumed values are shaded. Top right: SSB/F for the time-series used in the assessment.

The spawning biomass has been increasing since 1998 and is estimated to be record high in 2013. Fishing mortality has decreased sharply in recent years and was equal to the F_{MSY} proxy in 2011 and 2012. Recruitment fluctuations appear to be without substantial trend over the whole series. After low recruitments in 2009, 2010, and 2011, the last recruitment (2012) is estimated to be the highest in the time-series.

Management plans

A recovery plan was agreed by the EU in 2004 (EC Reg. No. 811/2004, Annex 9.4.10). 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.

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. Several changes in fishing technology have occured in the fishery in recent years : increased mesh sizes in several gears, introduction of the high vertical opening trawls in the mid-1990s, and introduction of selective gears in the *Nephrops* trawl fishery of the Bay of Biscay (square mesh panel).

Catch distribution	Total landings (2012) = 75.2 kt (20% trawl, 21% gillnet, 18% longline, and 41% unspecified gears). Discards of 14.6 kt (16% of catches). Discard data are only available for some of the fleets and not all data are included in the assessment.

Effects of the fisheries on the ecosystem

Because hake is a top predator, its abundance has implications on the survival of conspecifics (cannibalism) and other species, e. g. blue whiting, horse mackerel, and sardine.

Quality considerations

The assessment suffers from some shortage of tuning data, particularly in relation to earlier years, for areas outside of Subareas VII and VIII and for the larger individuals in the population. Discards have increased sharply in the last year in northern areas (Subareas IV and VI), but they are not included in the assessment. Some discards from Subareas VII and VIII are included in the assessment. Model growth estimates are uncertain, but they are in accordance with the tagging information.

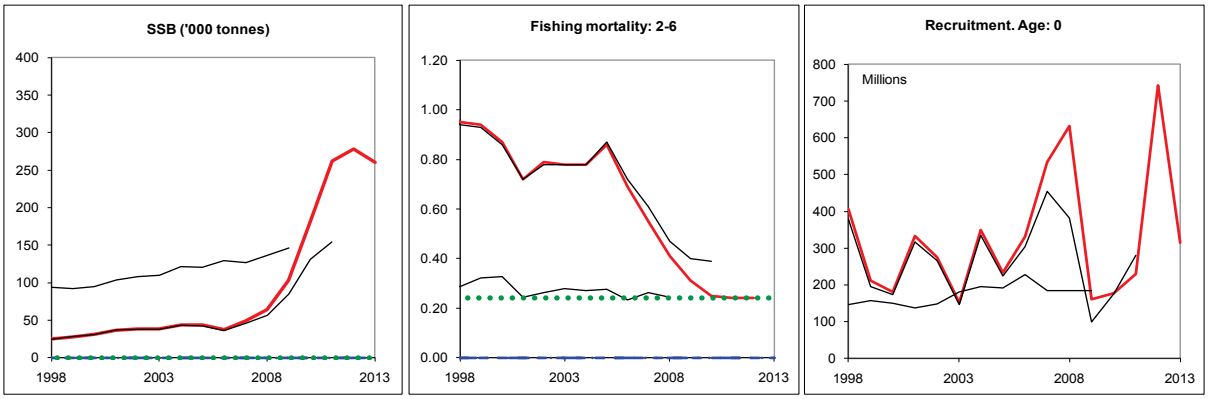


Figure 9.4.10.2 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Historical assessment results (final-year recruitment estimates are included). F is based on lengths 15–80 cm, corresponding to approximately 1–5 years old; in previous assessment years the F age range was 2–6 years old.

Scientific basis

Assessment type	Length-based model (SS3).
Stock data category	Category 1.
Input data	Commercial landings; Four survey indices (EVHOE-WIBTS-Q4, SpPGFS-WIBTS-Q4, IGFS-WIBTS-Q4, and RESSGASC); Maturity data: constant maturity used (Martin, 1991); Natural mortality: constant value (0.4) used.
Discards and bycatch	Partial discard estimates have been included in the assessment since 2003.
Indicators	None.
Other information	This stock will be benchmarked in 2014.
Working group report	WGHMM (ICES, 2013).

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

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 2014

Basis: F (2013) = Mean $F_{2010–12}$ = 0.24; SSB (2014) = 269.937; R (2013) = 315 million (GM 1979–2010); landings (2013) = 69.440; discards (2013) = 3.823.

Rationale	Human consump. landings (2014)	Basis	F Total (2014)	F HC (2014)	F Disc (2014)	Disc. (2014)	Catch Total (2014)	SSB (2015)	%SSB change [1)]	%TAC change [2)]
MSY approach	81.846	F_{MSY} (F_{sq} × 0.99)	0.24	0.20	0.04	2.265	84.111	333	+23%	+49%
Recovery plan	63.397	+15% TAC (F_{sq} × 0.745)	0.18	0.15	0.03	1.733	65.129	352	30%	15%
Zero catch	0.0	F = 0	0.00	0.00	0.00	0.0	0.0	417	+55%	−100%
Other options	9.195	F_{sq} × 0.1	0.02	0.02	0.00	0.243	9.438	408	+51%	−83%
	26.924	F_{sq} × 0.3	0.07	0.06	0.01	0.719	27.644	390	+44%	−51%
	46.679	−15% TAC (F_{sq} × 0.535)	0.13	0.11	0.02	1.262	47.941	370	+37%	−15%
	43.808	F_{sq} × 0.5	0.12	0.10	0.02	1.183	44.991	372	+38%	−21%
	55.145	Equal TAC (F_{sq} × 0.64)	0.16	0.13	0.02	1.499	56.644	361	+34%	+0%
	63.397	+15% TAC (F_{sq} × 0.745)	0.18	0.15	0.03	1.733	65.129	352	30%	15%
	59.886	F_{sq} × 0.7	0.17	0.14	0.03	1.633	61.519	356	+32%	+10%
	75.197	F_{sq} × 0.9	0.22	0.19	0.03	2.071	77.268	340	+26%	+36%
	82.576	F_{sq} × 1	0.24	0.21	0.04	2.286	84.862	332	+23%	+50%
	96.804	F_{sq} × 1.2	0.29	0.25	0.04	2.707	99.511	318	+18%	+76%

Weights in thousand tonnes.
[1)] SSB 2015 relative to SSB 2014.
[2)] Human consumption landings 2014 relative to TAC 2013.

MSY approach

Because MSY $B_{trigger}$ has not been identified for this stock, the ICES MSY approach has been applied without considering SSB in relation to MSY $B_{trigger}$.

Following the ICES MSY approach implies fishing mortality at F_{MSY} = 0.24, resulting in catches of no more than 84 111 t in 2014. This is expected to lead to an SSB of 333 kt in 2015. If discard rates do not change, this implies landings of no more than 81 846 t in 2014.

Not all discards are accounted for in the model and in the forecast, and therefore cannot be quantified even though they are substantial (in 2012 other observed, but also partial, discards accounted for 10% by weight of the total catch).

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. TACs have been ineffective in regulating the fishery in recent years as landings greatly exceeded the TACs.

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 partial 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 a 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 rapid turn-over of the hake stock dynamics. This means that short-term projections of SSB and landings are more sensitive to variations in recruitment.

The current SSB is above any potential candidate value for MSY $B_{trigger}$.

Uncertainties in assessment and forecast

There is some concern that the steep estimated increase in SSB and decrease in F may not be totally accurate, although all signals coming from the surveys and the fishery are consistent in showing a strong increase in stock biomass. The strong 2008 year class can be seen clearly in the landings. There will be a benchmark in 2014, where issues with the assessment will be considered.

The short-term forecast of SSB and yield obtained by this year's assessment are influenced by the high recruitment estimated in 2012, which is based on consistent observations from two surveys.

Only partial discards are included in the assessment and forecast.

The overall dynamics of the stock are sensitive to the growth parameters estimated in the model.

Comparison with previous assessment

There was no assessment in 2012. Compared to the 2011 assessment, the current assessment estimates of SSB in 2011 have been revised upwards by 70% and the F in 2010 revised downwards by 36% because of upward revisions of incoming recruits. The advice is based on the MSY approach.

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.
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Martín, I. 1991. A preliminary analysis of some biological aspects of hake (*Merluccius merluccius)* L.1758) in the Bay of Biscay. ICES CM 1991/G :54.

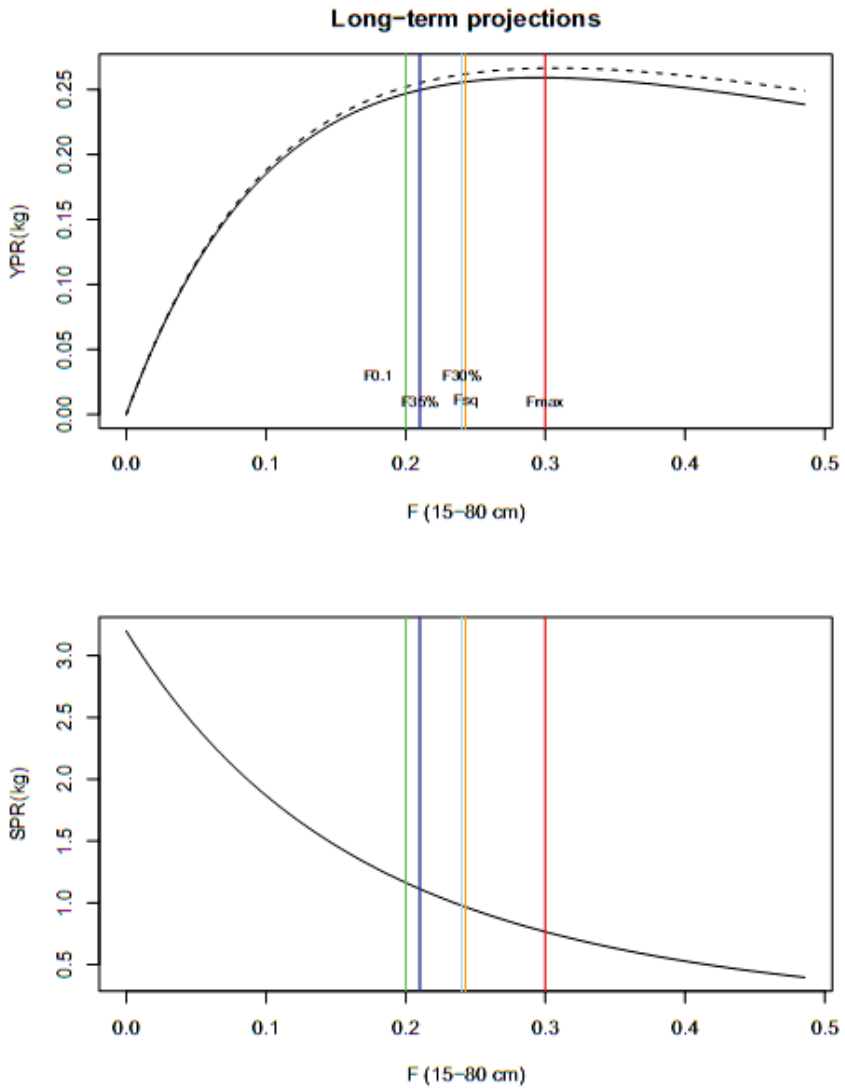

Figure 9.4.10.3 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Equilibrium projections of long-term yield-per-recruit (upper panel) and SSB-per-recruit (lower panel) at different fishing mortality rates.

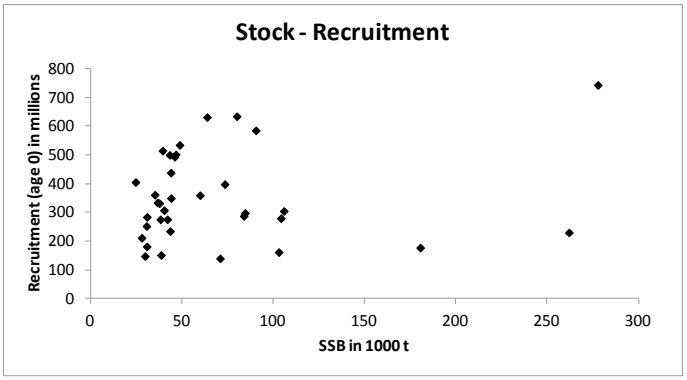

Figure 9.4.10.4 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. Stock–recruitment plot.

Table 9.4.10.1 Hake in Division IIIa, Subareas IV, VI, and VII, and Divisions VIIIa,b,d. ICES advice, management, 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	79.6	8.0	87.6
2012	MSY transition	51.9	55.1	75.2	14.6	83.2
2013	MSY transition	45.4	55.1			
2014	MSY approach	81.846				

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.

Table 9.4.10.2 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	IVa+VI	VII	VIIIa,b	Unallocated	Total	Total	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	-	50.6
1979	8.7	17.6	27.2	-2.4	51.1	-	51.1
1980	9.7	22.0	28.4	-2.8	57.3	-	57.3
1981	8.8	25.6	22.3	-2.8	53.9	-	53.9
1982	5.9	25.2	26.2	-2.3	55.0	-	55.0
1983	6.2	26.3	27.1	-2.1	57.5	-	57.5
1984	9.5	33.0	22.9	-2.1	63.3	-	63.3
1985	9.2	27.5	21.0	-1.6	56.1	-	56.1
1986	7.3	27.4	23.9	-1.5	57.1	-	57.1
1987	7.8	32.9	24.7	-2.0	63.4	-	63.4
1988	8.8	30.9	26.6	-1.5	64.8	-	64.8
1989	7.4	26.9	32.0	0.2	66.5	-	66.5
1990	6.7	23.0	34.4	-4.2	60.0	-	60.0
1991	8.3	21.5	31.6	-3.4	58.1	-	58.1
1992	8.6	22.5	23.5	2.1	56.6	-	56.6
1993	8.5	20.5	19.8	3.3	52.1	-	52.1
1994	5.4	21.1	24.7	0.0	51.3	*	51.3
1995	5.3	24.1	28.1	0.1	57.6	-	57.6
1996	4.4	24.7	18.0	0.0	47.2	-	47.2
1997	3.3	18.9	20.3	-0.1	42.5	-	42.5
1998	3.2	18.7	13.1	0.0	35.1	-	35.1
1999	4.3	24.0	11.6	0.0	39.8	*	39.8
2000	4.0	26.0	12.0	0.0	42.0	*	42.0
2001	4.4	23.1	9.2	0.0	36.7	-	36.7
2002	2.9	21.2	15.9	0.0	40.1	-	40.1
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	50.6
2006	6.1	24.7	10.6	0.0	41.5	*	41.5
2007	7.0	27.5	10.6	0.0	45.1	2.1	47.2
2008	10.7	22.8	14.3	0.0	47.8	3.5	51.3
2009	13.1	25.3	20.4	0.0	58.8	7.1	65.9
2010	14.2	33.5	25.1	0.0	72.8	6.5	79.3
2011	18.8	18.6	16.6	25.7	79.7	8.0	87.7
2012	22.4	22.2	16.7	13.9	75.2	14.6	89.8

(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 In the years with data, only discards from Spanish trawlers and French Nephrops trawlers are included.

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

Table 9.4.10.3 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	Discards[(1)]	Catch	Yield/SSB	F (15–80 cm)
1978	297262	122583	84662	50551	-	50551	0.6	0.49
1979	278999	131744	104320	51096	-	51096	0.49	0.54
1980	304135	128884	105914	57265	-	57265	0.54	0.65
1981	585050	110911	90579	53918	-	53918	0.6	0.65
1982	397753	101948	73550	54994	-	54994	0.75	0.68
1983	139173	107878	71003	57507	-	57507	0.81	0.61
1984	287105	113716	83975	63286	-	63286	0.75	0.64
1985	634204	99158	80138	56099	-	56099	0.7	0.82
1986	359131	81764	59999	57092	-	57092	0.95	0.92
1987	437719	76002	44039	63369	-	63369	1.44	0.95
1988	501222	77776	46755	64823	2	64825	1.39	0.98
1989	493085	78076	46067	66473	73	66546	1.44	1.06
1990	499562	71904	43387	59954	-	59954	1.38	1.01
1991	275234	68435	42122	58129	-	58129	1.38	0.95
1992	307086	67310	40359	56617	-	56617	1.4	0.98
1993	514309	59988	39523	52144	-	52144	1.32	1.04
1994	283699	53176	30970	51259	356	51615	1.66	1.05
1995	147168	59270	29878	57621	-	57621	1.93	1.09
1996	360880	54758	35278	47210	-	47210	1.34	0.93
1997	251875	47505	30735	42465	-	42465	1.38	1.05
1998	405088	44459	24740	35060	-	35060	1.42	0.95
1999	210872	48747	28101	39814	349	40163	1.42	0.94
2000	180789	54147	30895	42026	83	42109	1.36	0.87
2001	333523	54665	36748	36675	-	36675	1	0.72
2002	275228	58001	38342	40107	-	40107	1.05	0.79
2003	150981	63026	38685	43162	1752	44914	1.12	0.78
2004	349111	66202	44149	46417	2393	48810	1.05	0.78
2005	234131	63158	43648	46550	3802	50352	1.07	0.86
2006	331394	63125	37774	41467	1331	42798	1.1	0.69
2007	534271	75990	48870	45028	1801	46829	0.92	0.55
2008	631126	104096	63878	47739	2802	50541	0.75	0.41
2009	161039	166893	103116	58818	6735	65553	0.57	0.31
2010	176706	251106	180564	72799	4989	77788	0.4	0.25
2011	229398	303098	261990	79628	6241	85869	0.3	0.24
2012	743242	307548	277794	75232	6042	81274	0.27	0.24
2013	31453*		260690					
Arith.Mean	351473	98201	69787	53497	2583	54604		
Units	Thousands	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes		

[(1)] Discards used in the assessment. In years with (-) discards are not available or considered unreliable.

* GM (1979–2010).

Annex 9.4.10 Extract from recovery plan for Northern hake: Council Regulation (EC) No. 811/2004

Article 1
Subject-matter

This Regulation establishes a recovery plan for the Northern hake stock which inhabits the ICES Division IIIa, ICES Sub-area IV, ICES Divisions V(b) (Community waters), VIa (Community waters), ICES Sub-area VII and ICES Divisions VIIIa,b,d,e ("the Northern hake stock").

Article 2
Purpose of the recovery plan

The recovery plan referred to in Article 1 shall aim to increase the quantities of mature fish of the Northern hake stock concerned to values equal to or greater than 140 000 tonnes.

Article 3
Reaching of target levels

Where the Commission finds, on the basis of advice from ICES and following agreement on that advice by the Scientific Technical and Economic Committee for Fisheries (STECF), that for two consecutive years the target level for the Northern hake stock concerned has been reached, the Council shall decide by qualified majority on a proposal from the Commission to replace the recovery plan by a management plan for the stock in accordance with Article 6 of Regulation (EC) No 2371/2002.

Article 4
Setting of TACs

A TAC shall be set in accordance with Article 5 where, for the Northern hake stock concerned the quantities of mature Northern hake have been estimated by the STECF, in the light of the most recent report of ICES, to be equal to or above 100 000 tonnes.

Article 5
Procedure of setting TACs

1. Each year, the Council shall decide by qualified majority on a proposal from the Commission on a TAC for the following year for the Northern hake stock concerned.

2. For 2004, the TAC shall be set at a level corresponding to a fishing mortality of 0,25, 4% less than status quo fishing mortality. For the subsequent years of the recovery plan, the TAC shall not exceed a level of catches which scientific evaluations carried out by the STECF, in the light of the most recent reports of ICES, indicate will correspond to a fishing mortality rate of 0,25.

3. The Council shall not adopt a TAC whose capture is predicted by the STECF, in the light of the most recent report of the ICES, to lead to a decrease in spawning stock biomass in its year of application.

4. Where it is expected that the setting of the TAC for a given year in accordance with paragraph 2 will result in a quantity of mature fish at the end of that year in excess of the target level indicated in Article 2, the Commission will carry out a review of the recovery plan and propose any adjustments necessary on the basis of the latest scientific evaluations. Such a review shall in any event be carried out not later than 3 years following the adoption of this Regulation with the aim of ensuring that the objectives of the recovery plan are achieved.

5. Except for the first year of application of this Regulation, the following rules shall apply:

(a) where the rules provided for in paragraphs 2 or 4 would lead to a TAC for a given year which exceeds the TAC of the preceding year by more than 15%, the Council shall adopt a TAC which shall not be more than 15% greater than the TAC of that year or;.

(b) where the rule provided for in paragraphs 2 or 4 would lead to a TAC for a given year which is more than 15% less than the TAC of the preceding year, the Council shall adopt a TAC which is not more than 15% less than the TAC of that year.

Article 6
Setting of TACs in exceptional circumstances

Where the quantities of mature fish of the Northern hake stock concerned have been estimated by the STECF, in the light of the most recent report of the ICES, to be less than 100 000 tonnes, the following rules shall apply:

(a) Article 5 shall apply where its application is expected to result in an increase in the quantities of mature fish of the Northern hake stock concerned, at the end of the year of application of the TAC to a quantity equal to or greater than 100 000 tonnes;

(b) where the application of Article 5 is not expected to result in an increase in the quantities of mature fish of the Northern hake stock concerned, at the end of the year of application of the TAC, to a quantity equal to or greater than 100 000 tonnes, the Council shall decide by a qualified majority, on a proposal from the Commission, on a TAC for the following year that is lower than the TAC resulting from the application of the method described on Article 5.