

9.3.14 Hake (*Merluccius merluccius*) in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock) (Greater North Sea, Celtic Seas, Northern Bay of Biscay)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2016 should be no more than 109 592 tonnes. If this stock is not under the EU landing obligation in 2016 and discard rates do not change from the average of the last three years (2012–2014), this implies landings of no more than 96 651 tonnes.

Stock development over time

The spawning-stock biomass (SSB) has increased significantly since 2006 and it is above recent historical estimates. Fishing mortality (F) has decreased significantly over the last decade and is currently still above F_{MSY} . Recruitment (R) in 2012 and 2013 are among the highest in the time-series.

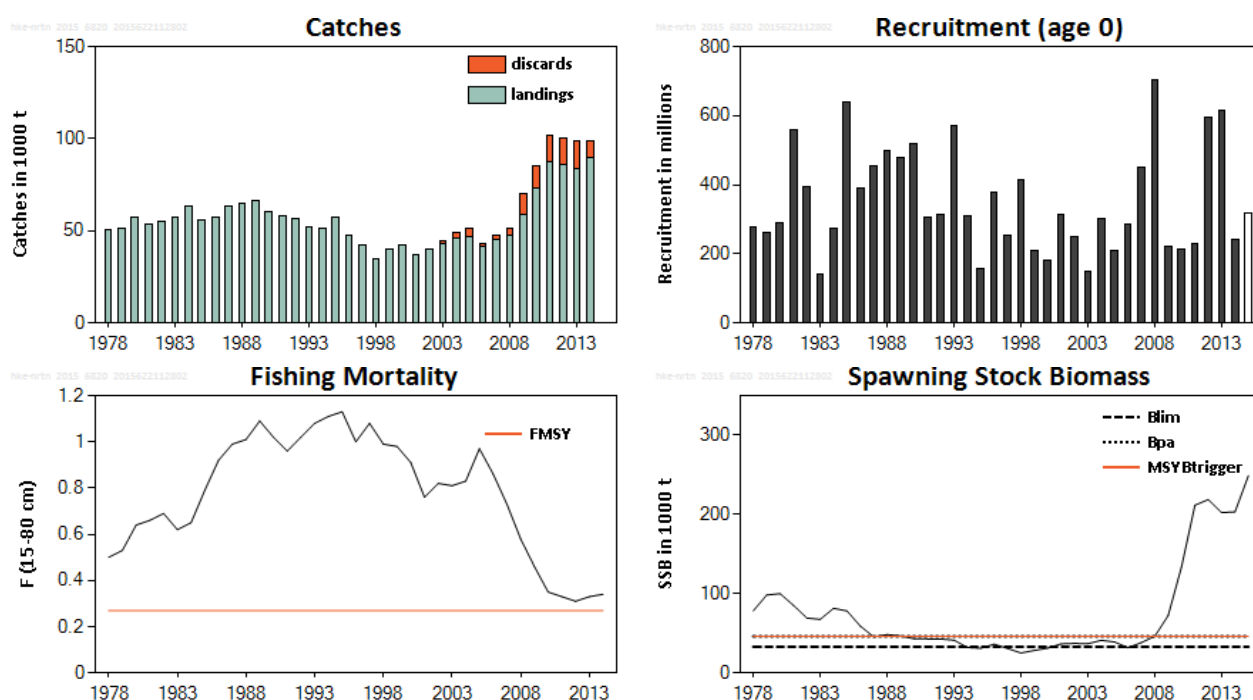


Figure 9.3.14.1 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). ICES estimated landings and discards (for the years with available discard data); R, F, and SSB from the summary of stock assessment (weights in thousand tonnes). Estimated R values are unshaded.

Stock and exploitation status

Table 9.3.14.1 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size		
		2012	2013	2014	2013	2014	2015
Maximum Sustainable Yield	F_{MSY}	✘	✘	✘ Above	MSY $B_{trigger}$	✔	✔ Above trigger
Precautionary approach	F_{pa} , F_{lim}	?	?	? Undefined	B_{pa} , B_{lim}	✔	✔ Full reproductive capacity
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	- Not applicable

Catch options

Table 9.3.14.2 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). The basis for the catch options.

Variable	Value	Source	Notes
F (2015)	0.33	ICES (2015a)	Mean $F_{2012-2014}$
SSB (2016)	287177 t	ICES (2015a)	
R(2015/2016)	319 million	ICES (2015a)	GM 1978–2012
Total catch (2015)	124467 t	ICES (2015a)	Forecasted catch from the assessment model (based on $F(2015) = \text{Mean } F_{2012-2014}$) plus additional discards **
Landings (2015)	105877 t	ICES (2015a)	According to 2012–2014 average discard rates at length estimated by the assessment.
Partial discards (2015)*	15837 t	ICES (2015a)	According to 2012–2014 average discard rates at length estimated by the assessment.
Additional discards (2015)**	2753 t		Mean of the last three years of discards that are not included in the assessment (2012–2014), equal to 2.6% of the stock landings.

* Corresponding to discards included in the assessment and forecast.

** Corresponding to discards not included in the assessment, but used to top up the catch advice.

Table 9.3.14.3 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). The catch options. All weights are in thousand tonnes.

Rationale	Total catch [^] (2016)	Additional unwanted catch ^{^^} (2016)	From the forecast ^{***}								
			Wanted catch (2016)	Unwanted catch (2016)	Basis	F total (2016)	F wanted catch (2016)	F unwanted catch (2016)	SSB (2017)	%TAC change*	%SSB change**
MSY approach	109592	2513	96651	10428	F_{MSY} ($F_{sq} \times 0.82$)	0.27	0.21	0.06	291799	+6%	+2%
Recovery plan	102455	2350	90385	9720	$F_{recovery-plan}$ ($F_{sq} \times 0.76$)	0.25	0.19	0.06	298739	-1%	+4%
Zero catch	0	0	0	0	$F = 0$	0	0	0	398305	-100%	+39%
Other options	15346	353	13583	1410	$F_{sq} \times 0.1$	0.03	0.03	0.01	383396	-85%	+34%
	44273	1018	39147	4108	$F_{sq} \times 0.3$	0.10	0.08	0.02	355292	-57%	+24%
	70997	1631	62713	6653	$F_{sq} \times 0.5$	0.17	0.13	0.04	329322	-31%	+15%
	87480	2008	77222	8250	-15% TAC ($F_{sq} \times 0.632$)	0.21	0.16	0.05	313299	-15%	+9%
	95686	2195	84438	9053	$F_{sq} \times 0.7$	0.23	0.18	0.05	305320	-7%	+6%
	102983	2362	90849	9772	0% TAC change	0.25	0.19	0.06	298225	0%	+4%
	118511	2716	104476	11319	+15% TAC ($F_{sq} \times 0.9$)	0.30	0.23	0.07	283133	+15%	-1%
	118503	2716	104468	11319	$F_{sq} \times 0.9$	0.30	0.23	0.07	283133	+15%	-1%
	129252	2961	113888	12403	$F_{sq} \times 1$	0.33	0.25	0.08	272675	+25%	-5%
149522	3422	131619	14481	$F_{sq} \times 1.2$	0.40	0.30	0.09	252950	+45%	-12%	

* Wanted catch 2016 relative to TAC 2015.

** SSB 2017 relative to SSB 2016.

*** "Wanted" and "unwanted" catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on discarding ogives estimated by the assessment model.

[^] Total catch = forecasted wanted catch + forecasted unwanted catch + additional unwanted catch (from the discards not included in the assessment). See ^{^^} footnote for a description of the additional unwanted catch.

^{^^} Additional unwanted catch = 0.026 × forecasted wanted catch.

Basis of the advice

Table 9.3.14.4 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). The basis of the advice.

Advice basis	MSY approach
Management plan	The current recovery plan (EU, 2004) is based on precautionary reference points that are no longer appropriate. ICES has not evaluated this plan.

Quality of the assessment

Assessment data arrived after the ICES data call deadline, thus reducing time to review and audit the assessment results. Although the data were used, the delay may reduce ICES quality assurance.

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 of large fish have increased sharply in the last years for some gears in Subareas IV, VI, VII, and VIII, but not all discards are included in the assessment. Model growth estimates are uncertain, but they are in accordance with the tagging information.

Not all discards are included in the assessment. Discard estimates for non-Spanish trawlers in Subareas VII and VIII are not included in the assessment. They represent 2195 tonnes on average during the last three years, which is 2.6% of the total stock landings (approximately 2.2% - 2.3% of the total stock catches).

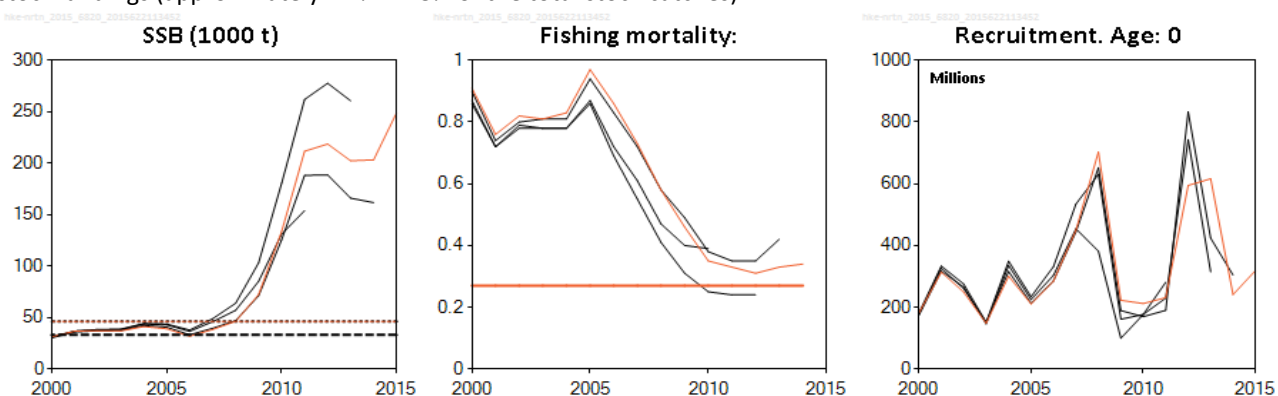


Figure 9.3.14.2 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

To produce a total catch advice for 2016, accounting also for the discards not included in the assessment, an “additional unwanted catch” was calculated multiplying the wanted catch forecasted by the model (96 651 tonnes) by 0.026; this results in 2513 tonnes of additional unwanted catch. The additional unwanted catch was then added to the forecasted catch (96 651 + 10 428 = 107 079 tonnes) to produce the total catch advice for 2016 (109 592 tonnes).

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 through measures to shift the selection pattern towards larger fish. TACs have been ineffective in regulating the fishery in recent years as landings greatly exceeded the TACs. Discards of large individuals have increased in recent years because of quota restrictions in certain fleets.

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.

Reference points

Table 9.3.14.5 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	46200 t	B_{pa}	ICES (2014a)
	F_{MSY}	0.27	Stochastic simulations on a combined stock–recruitment relationship.	ICES (2014a)
Precautionary approach	B_{lim}	33000 t	A low biomass which was followed by a quick recovery.	ICES (2014a)
	B_{pa}	46200 t	$1.4 \times B_{lim}$	ICES (2014a)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

Basis of the assessment

Table 9.3.14.6 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). The basis of the assessment.

ICES stock data category	1 (ICES, 2015b).
Assessment type	Length-based model (SS3; ICES, 2015a) that uses landings and some discards in the model, and additional discards are then included to calculate a catch forecast.
Input data	Commercial landings; four survey indices (EVHOE-WIBTS-Q4, SpPGFS-WIBTS-Q3, IGFS-WIBTS-Q4, and RESSGASC); maturity data: constant maturity (Martin, 1991); natural mortality: constant value (0.4).
Discards and bycatch	Data series from most fleets are available; 75% of the observed discards are included in the assessment (ICES, 2014a). Additional discards (2.6% of landings) are used to top up the advice.
Indicators	None.
Other information	Benchmarked in WKSOUTH (ICES, 2014b).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE).

Information from stakeholders

There is no available information.

History of advice, catch, and management

Table 9.3.14.7 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). History of ICES advice, the agreed TAC, and ICES estimates of landings. All weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Predicted landings corresponding to advice	Agreed TAC*	ICES landings	Discards**	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	43.2	1.4	44.6
2004	70% reduction in F or recovery plan#		< 13.8	39.1	46.4	2.6	49.0
2005	F = 0.19		33	42.6	46.6	4.6	51.1
2006	F = 0.25		44	43.9	41.5	1.2	42.7
2007	Recovery plan limits		50.5	52.7	45.1	2.2	47.3
2008	Recovery plan limits		54	54	47.8	3.4	51.2
2009	F = 0.25 = F_{pa}		51.5	51.5	59.0	11.0	69.8
2010	F = 0.25 = F_{pa}		55.2	55.1	73.1	12.1	84.9
2011	See scenarios		50.6	55.1	87.5	13.9	101.4
2012	MSY transition		51.9	55.1	85.6	14.9	100.5
2013	MSY transition		45.4	69.4	77.7	15.8	93.5
2014	MSY approach		81.846	81.8	91.5	9.1	100.6
2015	MSY approach		78.457	90.849			
2016	MSY approach	≤ 109.592	≤ 96.651				

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

** 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.

See ** footnote.

History of catch and landings

Table 9.3.14.8 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Landings				Discards
98.9 kt	11% unspecified gear	39% longline	27% gillnet	23% trawl	9.1 kt
	89.8 kt				

Table 9.3.14.9 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). History of commercial catch, discards, and landings as estimated by ICES. All weights are in thousand tonnes. Estimated landings are presented by area.

Year	ICES estimated landings*					ICES estimated discards**	ICES estimated catches***
	Division IVa + Subarea VI	Subarea VII	Divisions 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

Year	ICES estimated landings*					ICES estimated discards**	ICES estimated catches***
	Division IVa + Subarea VI	Subarea VII	Divisions VIIIa,b	Unallocated	Total	Total	Total
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	1.4	44.6
2004	4.4	27.5	14.5	0.0	46.4	2.6	49.0
2005	5.5	26.6	14.5	0.0	46.6	4.6	51.1
2006	6.1	24.7	10.6	0.0	41.5	1.2	42.7
2007	7.0	27.5	10.6	0.0	45.1	2.2	47.3
2008	10.7	22.8	14.3	0.0	47.8	3.4	51.2
2009	13.1	25.3	20.4	0.0	58.8	11.0	69.8
2010	14.2	33.5	25.1	0.0	72.8	12.1	84.9
2011	19.4	19.1	17.1	32.0	87.5	13.9	101.4
2012	24.2	23.9	18.1	19.3	85.6	14.9	100.5
2013	17.6	31.0	21.6	13.1	77.7	15.8	93.5
2014	23.8	39.6	23.7	2.7	91.5	9.1	100.6

* Spanish data for 1961–1972 not revised, data for Subarea 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).

** In years marked with #, partial discard estimates are available and included in the assessment. For 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 presented, only discards from Spanish trawlers, French *Nephrops* trawlers in Subarea VIII, and the "other fleet" category are included in the assessment.

*** From 1978 total catches used by ICES.

Summary of the assessment

Table 9.3.14.10 Hake in Subareas IV, VI, and VII and Divisions IIIa, VIIIa,b,d (Northern stock). Assessment summary with weights (in tonnes).

Year	Recruitment Age 0 thousands	SSB tonnes	Mean F (15–80 cm)	Landings tonnes	Discards** tonnes
1978	278207	78348	0.5	50551	-
1979	260879	98288	0.53	51096	-
1980	291624	100026	0.64	57265	-
1981	560384	85396	0.66	53918	-
1982	395575	69192	0.69	54994	-
1983	140176	67545	0.62	57507	-
1984	274256	81486	0.65	63286	-
1985	641019	78178	0.79	56099	-
1986	388654	59039	0.92	57092	-
1987	455759	45471	0.99	63369	-
1988	499560	48394	1.01	64823	2
1989	477088	46630	1.09	66473	73
1990	518776	43215	1.02	59954	-
1991	306863	42817	0.96	58129	-
1992	313837	42780	1.02	56617	-
1993	569747	41317	1.08	52144	-
1994	310500	32095	1.11	51259	356
1995	158246	31143	1.13	57621	
1996	376608	36259	1	47210	
1997	254237	30892	1.08	42465	
1998	412616	25087	0.99	35060	
1999	209695	28356	0.98	39814	349
2000	180639	31192	0.91	42026	83
2001	313920	36645	0.76	36675	-
2002	248984	37233	0.82	40107	-
2003	148106	36863	0.81	43162	2110
2004	300555	41090	0.83	46417	2552
2005	210359	39033	0.97	46550	4676
2006	284384	31772	0.86	41467	1816
2007	449482	38250	0.73	45028	2191
2008	703128	46257	0.58	47739	3248
2009	222405	72260	0.46	58818	9871
2010	211925	133658	0.35	72799	9415
2011	231134	211670	0.33	87540	13775
2012	594886	218747	0.31	85677	12225
2013	616422	202374	0.33	77753	11637
2014	240888	203296	0.34	91525	6548
2015	319133*	249017			
Average	351859	74771	0.78	55676	4760

* GM (1978–2012).

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

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