

9.3.32 Hake (*Merluccius merluccius*) in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d, Northern stock (Greater North Sea, Celtic Seas, and the northern Bay of Biscay)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 123 777 tonnes.

Since this stock is only partially under the EU landing obligation, ICES is not in a position to advise on landings corresponding to the advised catch.

Stock development over time

The spawning-stock biomass (SSB) has increased significantly since 2006 and is well above MSY $B_{trigger}$. Fishing mortality (F) has decreased significantly over the last decade and has been below F_{MSY} since 2011. Recruitment (R) has been around average since 2009.

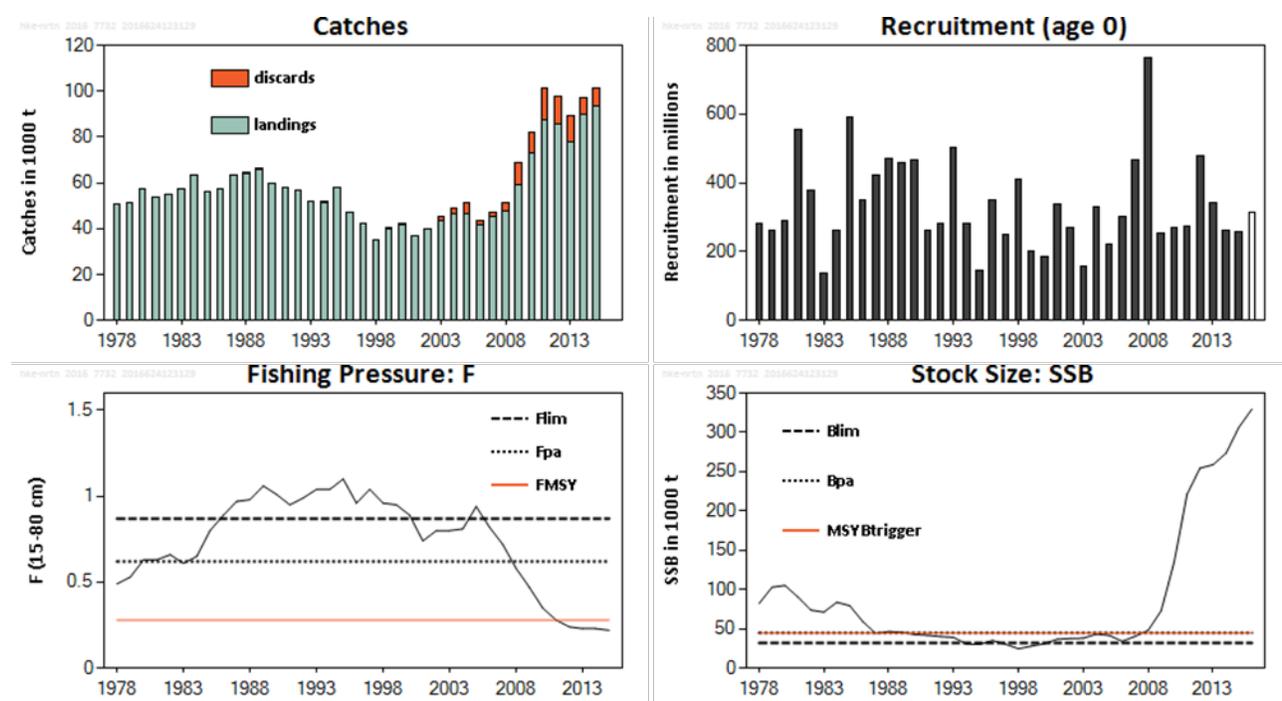


Figure 9.3.32.1 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). ICES estimated landings and discards (for the years with available discard data); R, F, and SSB from the summary of stock assessment (weights in thousand tonnes). Assumed R values are unshaded.

Stock and exploitation status

Table 9.3.32.1 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size					
		2013	2014	2015	2014	2015	2016			
Maximum sustainable yield	F_{MSY}	✓	✓	✓	$MSY B_{trigger}$	✓	✓	✓	Appropriate	Above trigger
Precautionary approach	F_{pa} , F_{lim}	✓	✓	✓	B_{pa} , B_{lim}	✓	✓	✓	Harvested sustainably	Full reproductive capacity
Management plan	F_{MGT}	-	-	-	SSB_{MGT}	-	-	-	Not applicable	Not applicable

Catch options

Table 9.3.32.2 Hake in Subareas 4, 6, and 7 and Divisions 3.a, 8.a, 8.b, and 8.d (Northern stock). The basis for the catch options.

Variable	Value	Source	Notes
F (2016)	0.23	ICES (2016a)	Mean $F_{2013-2015}$
SSB (2017)	321533 t	ICES (2016a)	
R(2016/2017)	315575	ICES (2016a)	GM 1978–2013
Total catch (2016)	109213 t	ICES (2016a)	Forecasted catch from the assessment model (based on $F(2016) = \text{Mean } F_{2013-2015}$), plus additional discards
Wanted catch (2016)	98842 t	ICES (2016a)	Based on average discard rates observed during 2013–2015
Unwanted catch (2016)	10371 t	ICES (2016a)	Based on average discard rates observed during 2013–2015

Table 9.3.32.3 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). The catch options. All weights are in tonnes.

Rationale	Total catch (2017)	Wanted catch *** (2017)	Unwanted catch ***,^ (2017)	Basis	F total (2017)	F Wanted catch (2017)	F Unwanted catch (2017)	SSB (2018)	% Advice change*	% SSB change **
MSY approach	123777	111865	11912	F_{MSY}	0.28	0.23	0.05	286717	13%	-11%
Recovery plan	112549	101739	10810	$F_{recovery-plan}$	0.25	0.21	0.04	297225	3%	-8%
Precautionary approach	225069	202925	22144	F_{pa}	0.62	0.51	0.11	192244	105%	-40%
Zero catch	0	0	0	$F = 0$	0	0.00	0.00	402891	-100%	25%
Other options	11701	10595	1106	$F_{sq} \times 0.1$	0.02	0.02	0.00	391878	-89%	22%
	34102	30867	3235	$F_{sq} \times 0.3$	0.07	0.06	0.01	370814	-69%	15%
	55228	49973	5255	$F_{sq} \times 0.5$	0.11	0.09	0.02	350966	-50%	9%
	75158	67985	7173	$F_{sq} \times 0.7$	0.16	0.13	0.03	332262	-31%	3%
	93962	84966	8996	$F_{sq} \times 0.9$	0.20	0.17	0.04	314633	-14%	-2%
	102972	93098	9874	$F_{sq} \times 1$	0.23	0.19	0.04	306193	-6%	-5%
	120199	108639	11560	$F_{sq} \times 1.2$	0.27	0.22	0.05	290064	10%	-10%
	276261	248660	27601	F_{lim}	0.87	0.72	0.15	144730	152%	-55%
	383666	343082	40584	$SSB(2018) = MSY B_{trigger} = B_{pa}$	2.00	1.65	0.35	45000	250%	-86%
397417	354765	42652	$SSB(2018) = B_{lim}$	2.37	1.95	0.42	32000	263%	-90%	

* Total catch 2017 relative to the catch advice for 2016 (109 592 t).

** SSB 2018 relative to SSB 2017.

*** “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation.

^ Unwanted catch includes forecasted unwanted catch (discards included in the assessment) and additional unwanted catch (the discards that were not included in the assessment, amounting to approximately 3.3% of the total catch).

Basis of the advice

Table 9.3.32.4 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.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

The uncertainty in the assessment is relatively high with large changes in biomass estimates in consecutive years.

There is a lack of tuning data, particularly for the earlier years of the assessment, for some areas outside of subareas 7 and 8, and for the larger individuals in the population. Changes in the method used to compile the length frequencies have also contributed to changes in the assessment.

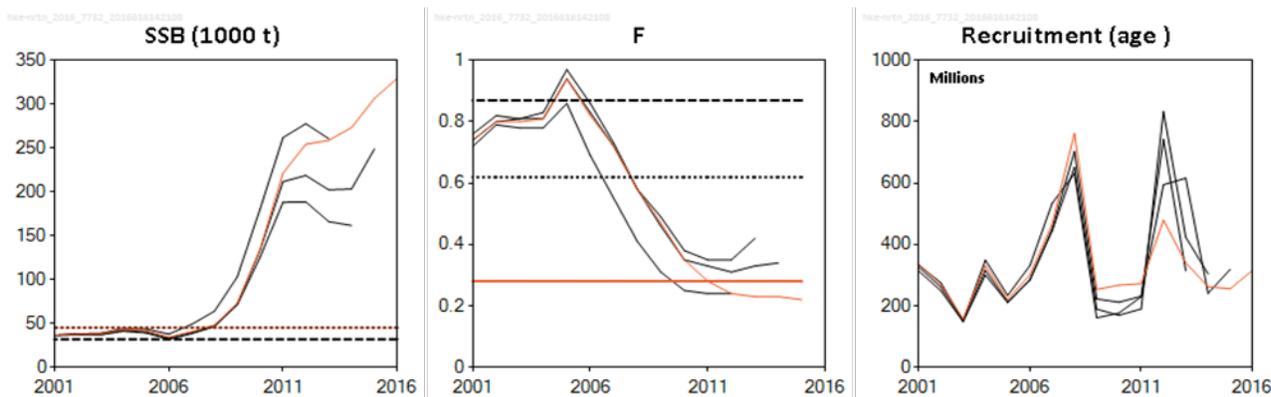


Figure 9.3.32.2 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

Discarding of juvenile hake can be substantial in some areas and fleets. Discarding of large individuals has increased in recent years because of quota restrictions in certain fleets.

Some fleets fishing this stock are under the EU landing obligation from 2016.

Reference points

Table 9.3.32.5 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	45 000 t	B_{pa}	ICES (2016b)
	F_{MSY}	0.28	Stochastic simulations on a segmented regression stock–recruitment relationship	ICES (2016b)
Precautionary approach	B_{lim}	32 000 t	A low biomass which was followed by a quick recovery	ICES (2016c)
	B_{pa}	45 000 t	$B_{lim} \times e^{1.645\sigma}$; $\sigma = 0.20$	ICES (2016c)
	F_{lim}	0.87	Fishing mortality resulting in a 5% probability of SSB falling below B_{lim}	ICES(2016c)
	F_{pa}	0.62	$F_{lim} \times e^{-1.645\sigma}$; $\sigma = 0.20$	ICES(2016c)
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

Basis of the assessment

Table 9.3.32.6 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). The basis of the assessment.

ICES stock data category	1 (ICES, 2016d)
Assessment type	Length-based model (SS3; ICES, 2016a) that uses landings and some discards in the model. 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, 2016a). The discards not used in the assessment are used to top up the catch advice.
Indicators	None
Other information	Last benchmarked in 2014 WKSOUTH (ICES, 2014).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE)

Information from stakeholders

There is no information available.

History of the advice, catch, and management

Table 9.3.32.7 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.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	95.0	10.9	105.9
2016	MSY approach	≤ 109.592	≤ 96.651	108.764			
2017	MSY approach	≤ 123.777					

* Sum of area TACs, corresponding to northern stock plus Division 2.a (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 9.3.32.8 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (Northern stock). Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings				Discards
105.9kt	4% unspecified gears	44% longline	19% gillnet	33% trawl	10.9 kt
	95.0 kt				

Table 9.3.32.9 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.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***
	Div. 3a	Subarea 4	Subarea 6	Total 3.a, 4, & 6	Subarea 7	Divisions 8.a & 8.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

Year	ICES estimated landings*								ICES estimated discards**	ICES estimated catches***
	Div. 3a	Subarea 4	Subarea 6	Total 3.a, 4, & 6	Subarea 7	Divisions 8.a & 8.b	Unallocated	Total	Total	Total
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	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	0.3	10.7	5.2	16.2	28.5	19.9	13.1	77.7	15.8	93.5
2014	0.4	12.1	11.4	23.9	39.6	23.7	2.7	89.9	9.8	99.7
2015	0.4	14.7	7.1	22.1	44.0	26.2	2.7	95.0	10.9	105.9

* Spanish data for 1961–1972 are not revised, data for Subarea 8 in 1973–1978 include data for divisions 8.a and 8.b only. Data for 1979–1981 are revised based on French surveillance data. Divisions 3.a, 4.b, and 4.c are included in the column “Total 3.a, 4, & 6” only after 1976.

** In years marked with #, partial discard estimates are available and included in the assessment. In 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 8, and the “other fleet” category are included in the assessment.

*** From 1978 total catches used by ICES.

Summary of the assessment

Table 9.3.32.10 Hake in subareas 4, 6, and 7 and divisions 3.a, 8.a–b, and 8.d (northern stock). Assessment summary. Weights are in tonnes.

Year	Recruitment	Stock size: SSB tonnes	Landings tonnes	Discards tonnes	Fishing pressure: F
	Age 0				15–80cm
	thousands				Year-1
1978	281637	82187	50551	-	0.49
1979	260639	102990	51096	-	0.53
1980	290485	105271	57265	-	0.63
1981	555498	90498	53918	-	0.63
1982	378599	73877	54994	-	0.66
1983	135756	71340	57507	-	0.61
1984	261746	83803	63286	-	0.65
1985	589947	79394	56099	-	0.8
1986	351557	59280	57092	-	0.89
1987	420334	44027	63369	-	0.97
1988	469557	46689	64823	2	0.98
1989	458102	45727	66473	73	1.06
1990	465839	42915	59954	-	1.01
1991	260556	41778	58129	-	0.95
1992	281499	40233	56617	-	0.99
1993	503517	39098	52144	-	1.04
1994	281769	30796	51259	356	1.04
1995	144080	30125	57621	-	1.1
1996	350084	35173	47210	-	0.96
1997	247985	30487	42465	-	1.04
1998	408474	24707	35060	-	0.96
1999	203240	28069	39814	349	0.95
2000	184012	31070	42026	83	0.89
2001	336013	36828	36675	-	0.74
2002	267942	37758	40107	-	0.8
2003	157810	38150	43162	2110	0.8
2004	330745	43297	46417	2552	0.81
2005	221437	41714	46550	4676	0.94
2006	300857	34234	41467	1816	0.82
2007	466132	40583	45028	2191	0.72
2008	762072	48196	47739	3248	0.58
2009	253592	73034	58818	9871	0.47
2010	267738	134723	72799	9415	0.35
2011	272167	221394	87540	13775	0.28
2012	479486	254447	85677	12225	0.24
2013	340348	258861	77753	11637	0.23
2014	262186	273372	89940	7047	0.23
2015	255810	306639	93670	7396	0.22
2016	315575*	329685			

* GM (1978–2013).

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

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