

Hake (*Merluccius merluccius*) in subareas 4, 6, and 7, and in 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 2018 should be no more than 115 335 tonnes.

Stock development over time

The spawning-stock biomass (SSB) has increased significantly since 2006 and is well above historical estimates. Fishing mortality (F) has decreased significantly after 2005, and has been below F_{MSY} since 2012. The recruitment (R) estimate for 2016 is above average.

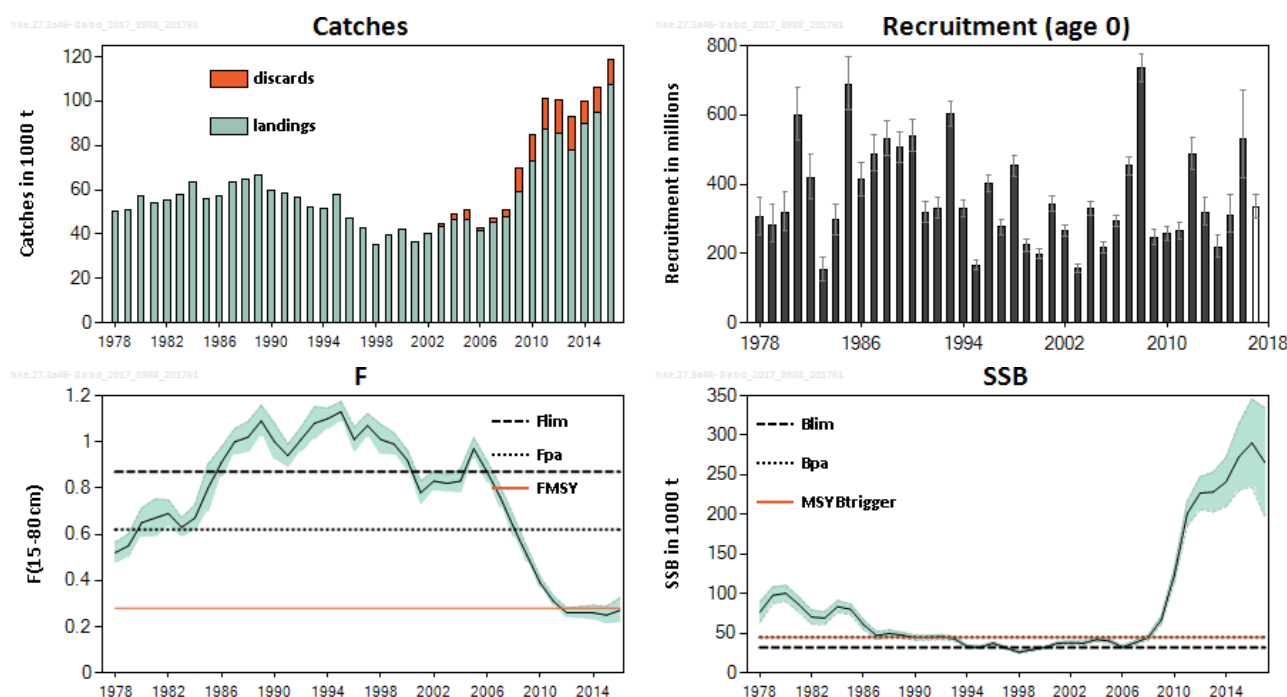


Figure 1 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Summary of the stock assessment. Recruitment, F, and SSB plots show 95% confidence intervals (shaded area). Assumed recruitment values are unshaded.

Stock and exploitation status

Table 1 Hake in subareas 4, 6, and 7, and in 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		
		2014	2015	2016	2015	2016	2017
Maximum sustainable yield	F_{MSY}	✓	✓	✓ At F_{MSY}	MSY $B_{trigger}$	✓	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	—	—	— Not applicable	SSB_{MGT}	—	— Not applicable

Catch options

Table 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. The basis for the catch options. All weights are in tonnes.

Variable	Value	Source	Notes
F (2017)	0.26	ICES (2017a)	Mean F(2014–2016).
SSB (2018)	267673	ICES (2017a)	
R (2017/2018)	335071	ICES (2017a)	GM (1978–2014); in thousands.
Total catch (2017)	105223	ICES (2017a)	Forecasted catch from the assessment model (based on F(2017) = Mean F(2014–2016) plus additional discards.
Wanted catch (2017)	93588	ICES (2017a)	Based on average discard rates observed during 2014–2016.
Unwanted catch (2017)	11635	ICES (2017a)	Based on average discard rates observed during 2014–2016.

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

Basis	Total catch (2018)	Wanted catch* (2018)	Unwanted catch*. [^] (2018)	F _{total} (2018)	F _{wanted} (2018)	F _{unwanted} (2018)	SSB (2019)	% SSB change **	% Advice change ***
ICES advice basis									
MSY approach: F _{MSY}	115335	104060	11275	0.28	0.233	0.047	295193	10%	-7%
Other options									
F = 0	0	0	0	0	0	0	401929	50%	-100%
F _{pa}	211827	190172	21655	0.62	0.515	0.105	206120	-23%	71%
F _{lim}	261716	234150	27566	0.87	0.723	0.147	160047	-40%	111%
SSB (2019) = B _{lim}	383469	337722	45746	2.293	1.904	0.389	44975	-83%	210%
SSB (2019) = B _{pa}	395825	347392	48433	2.731	2.268	0.463	32001	-88%	220%
SSB (2019) = MSY B _{trigger}	395825	347392	48433	2.731	2.268	0.463	32001	-88%	220%
F = F ₂₀₁₇	108119	97580	10540	0.259	0.215	0.044	301860	13%	-13%
EU Recovery Plan ^{^^}	104736	94539	10196	0.25	0.208	0.042	304987	14%	-15%

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

** SSB 2019 relative to SSB 2018.

*** Total catch 2018 relative to the catch advice for 2017 (123 777 t).

[^] 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 2.6% of the total catch).

^{^^} Catch option corresponds to F(2018) = 0.25.

Basis of the advice

Table 4 Hake in subareas 4, 6, and 7, and in 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. The model confidence intervals are an underestimate of uncertainty because they are narrower than interannual changes in estimates in consecutive years.

There is a lack of tuning data for the earlier years of the assessment, for some areas outside of subareas 7 and 8, and for the larger individuals in the population. Given the expansion of the stock into northern areas (ICES, 2017b), there is a potential that not all catches are reported for this stock. Biological sampling from these areas is also limited.

The data compilation of this stock is very complicated because it is exploited by several countries and the assessment model configuration is complex. In turn, the assessment model is very sensitive to the data and the settings used. Hence,

it is extremely important for the quality of the assessment to have the complete data for all the countries on time and in the right format.

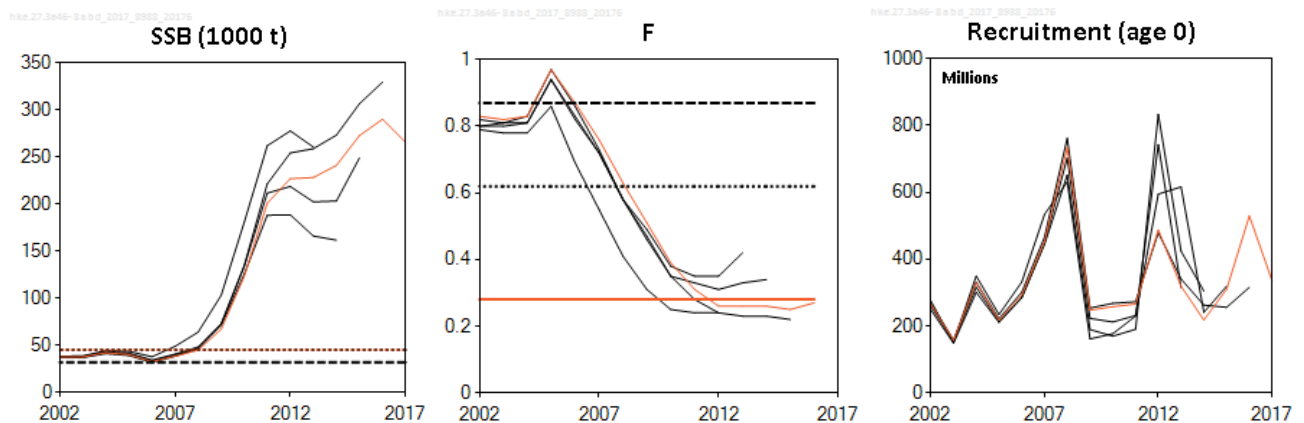


Figure 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Historical assessment results.

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 have been under the EU landing obligation since 2016.

Reference points

Table 5 Hake in subareas 4, 6, and 7, and in 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 $B_{trigger}$	45000 t	B_{pa}	ICES (2016a)
	F_{MSY}	0.28	Stochastic simulations on a segmented regression stock–recruitment relationship.	ICES (2016a)
Precautionary approach	B_{lim}	32000 t	A low biomass which was followed by a quick recovery.	ICES (2016b)
	B_{pa}	45000 t	$1.4 \times B_{lim}$	ICES (2016b)
	F_{lim}	0.87	Fishing mortality resulting in a 5% probability of SSB falling below B_{lim} .	ICES(2016b)
	F_{pa}	0.62	$F_{lim}/1.4$	ICES(2016b)
Management plan	SSB_{MGT}	Not defined		

Basis of the assessment

Table 6 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016c).
Assessment type	Length-based model (SS3; ICES, 2017a) 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, 2017a). 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 7 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. ICES advice and catch. All weights are in 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			63500	63369		
1988	Precautionary TAC; juvenile protection		54000	66200	64823	**	
1989	Precautionary TAC; juvenile protection		54000	59700	66473	**	
1990	Precautionary TAC; juvenile protection		59000	65100	59954		
1991	Precautionary TAC; juvenile protection		59000	67000	58129		
1992	If required, precautionary TAC		61500	69000	56617		
1993	Enforce juvenile protection legislation		-	71500	52144		
1994	F significantly reduced		-	60000	51259	**	
1995	30% reduction in F		31000	55100	57621		
1996	30% reduction in F		39000	51100	47210		
1997	20% reduction in F		54000	60100	42465		
1998	20% reduction in F		45000	59100	35060		
1999	Reduce F below F_{pa}		-	55100	39814	**	
2000	50% reduction in F		-	42100	42026	**	
2001	Lowest possible catch, recovery plan		-	22600	36675		
2002	Lowest possible catch / recovery plan		-	27000	40105		
2003	Lowest possible catch / recovery plan		-	30000	43162	1393	44555
2004	70% reduction in F or recovery plan		-	39100	46416	2614	49029
2005	$F = 0.19$		33000	42600	46550	4583	51133
2006	$F = 0.25$		44000	43900	41469	1222	42691
2007	Recovery plan limits		50500	52700	45093	2165	47258
2008	Recovery plan limits		54000	54000	47822	3368	51190
2009	$F = 0.25 = F_{pa}$		51500	51500	58781	11033	69814
2010	$F = 0.25 = F_{pa}$		55200	55105	72760	12118	84878
2011	See scenarios		50600	55105	87540	13903	101443
2012	MSY transition		51900	55105	85677	14870	100547
2013	MSY transition		45400	69440	77708	15400	93108
2014	MSY approach		81846	81846	89928	9800	99728
2015	MSY approach		78457	90849	95023	10900	105923
2016	MSY approach	≤ 109592	≤ 96651	108764	107530	11114	118644
2017	MSY approach	≤ 123777		119765			
2018	MSY approach	≤ 115335					

* Sum of area TACs, corresponding to northern stock plus Division 2.a (EC zone only).

** 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.

History of the catch and landings

Table 8 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings				Discards
	4% unspecified gear	39% longline	24% gillnet	33% trawl	
118 644 tonnes	107 530 tonnes				11 114 tonnes

Table 9 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

Year	Landings*							Discards**						Total catches***	
	3	4	6	7	8abd	Unn.	Total	3	4	6	7	8abd	Total		
1961			-	-	-	95600	95600							-	95600
1962			-	-	-	86300	86300							-	86300
1963			-	-	-	86200	86200							-	86200
1964			-	-	-	76800	76800							-	76800
1965			-	-	-	64700	64700							-	64700
1966			-	-	-	60900	60900							-	60900
1967			-	-	-	62100	62100							-	62100
1968			-	-	-	62000	62000							-	62000
1969			-	-	-	54900	54900							-	54900
1970			-	-	-	64900	64900							-	64900
1971			8500	19400	23400	0	51300							-	51300
1972			9400	14900	41200	0	65500							-	65500
1973			9500	31200	37600	0	78300							-	78300
1974			9700	28900	34500	0	73100							-	73100
1975			11000	29200	32500	0	72700							-	72700
1976			12900	26700	28500	0	68100							-	68100
1977			8500	21000	24700	0	54200							-	54200
1978			8000	20300	24500	-2249	50551							-	50551
1979			8700	17600	27200	-2404	51096							-	51096
1980			9700	22000	28400	-2835	57265							-	57265
1981			8800	25600	22300	-2782	53918							-	53918
1982			5900	25200	26200	-2306	54994							-	54994
1983			6200	26300	27100	-2093	57507							-	57507
1984			9500	33000	22900	-2114	63286							-	63286
1985			9224	27459	21044	-1628	56099							-	56099
1986			7320	27408	23903	-1539	57092							-	57092
1987			7800	32900	24700	-2031	63369							-	63369
1988			8800	30900	26600	-1477	64823							-	64823
1989			7375	26938	31957	203	66473							-	66473
1990			6680	23011	34424	-4161	59954							-	59954
1991			8328	21546	31635	-3380	58129							-	58129
1992			8561	22475	23465	2116	56617							-	56617

Year	Landings*						Discards**						Total catches***	
	3	4	6	7	8abd	Unn.	Total	3	4	6	7	8abd		Total
1993			8484	20465	19849	3346	52144						-	52144
1994			5421	21080	24727	31	51259						*	51259
1995			5335	24056	28144	86	57621						-	57621
1996			4445	24738	18036	-9	47210						-	47210
1997			3312	18949	20339	-135	42465						-	42465
1998			3208	18705	13147	0	35060						-	35060
1999			4256	23955	11604	-1	39814						*	39814
2000			4033	25991	11998	4	42026						*	42026
2001			4367	23065	9244	0	36675						-	36675
2002			2944	21226	15935	0	40105						-	40105
2003#			3284	25438	14440	0	43162						1393	44555
2004#			4438	27483	14494	0	46416						2614	49029
2005#			5461	26623	14467	0	46550						4583	51133
2006#			6127	24709	10633	0	41469						1222	42691
2007#			7017	27456	10620	0	45093						2165	47258
2008#			10654	22834	14334	0	47822						3368	51190
2009#			13057	25300	20424	0	58781						11033	69814
2010#			14187	33500	25073	0	72760						12118	84878
2011#			18789	18574	16604	32000^	87540						13903	101443
2012#			22415	22166	16716	19300^	85677						14870	100547
2013#	292	10684	5232	28500	19900	13100^	77708	313	2942	1545	6583	4059	15400	93108
2014#	348	12077	11415	40536	25552	0^	89928	287	3105	951	4021	1458	9800	99728
2015#	447	14618	7065	44396	28497	0^	95023	93	3444	71	4208	3096	10900	105923
2016#	695	19603	11365	49377	26490	0	107530	142	4189	344	2281	4150	11114	118644

* Spanish data for 1961–1972 are not revised, data for Subarea 8 for 1973–1978 include data for divisions 8.a,b only. Data for 1979–1981 are revised based on French surveillance data. Divisions 3.a and 4.b,c are included in the column "3.a, 4, and 6" only after 1976. There are some unallocated landings (moreover for the period 1961–1970).

** Discard estimates from observer programmes. In years marked with # partial discard estimates are available and used in the assessment. For the remaining years where no values are presented, some estimates are available but are not considered valid and thus not used in the assessment. In the years with data only Spanish discards and discards from French *Nephrops* trawlers are included.

*** The Working Group used total catches from 1978.

^ Unallocated landings for the years 2011–2014 were revised in 2015.

See ** footnote.

Summary of the assessment

Table 10 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Assessment summary. Weights are in tonnes. Highs and lows are 95% confidence intervals.

Year	Recruitment (age 0) thousands	High	Low	SSB tonnes	High	Low	Landings tonnes	Discards tonnes **	F Ages Year–1	High	Low
1978	304112	362711	254980	76696	89581	63811	50551	–	0.52	0.565	0.475
1979	283534	342511	234714	97911	108473	87349	51096	–	0.55	0.601	0.499
1980	316489	376737	265874	100483	110526	90440	57265	–	0.65	0.713	0.587
1981	599540	680311	528359	86475	95863	77086	53918	–	0.67	0.752	0.588
1982	418396	487682	358954	70398	79222	61574	54994	–	0.69	0.749	0.631
1983	152160	191109	121149	69158	77200	61116	57507	–	0.63	0.671	0.589
1984	295900	343830	254653	83620	91213	76028	63286	–	0.67	0.726	0.614
1985	686703	766526	615192	80312	86995	73628	56099	–	0.8	0.904	0.696
1986	412289	462981	367147	61012	67071	54953	57092	–	0.91	0.977	0.843
1987	487329	540858	439098	47228	52278	42178	63369	–	1	1.057	0.943
1988	530902	583411	483117	49688	54103	45273	64823	–	1.02	1.087	0.953
1989	506464	552550	464222	47762	51587	43936	66473	–	1.09	1.158	1.022
1990	538463	585622	495101	44295	47404	41185	59954	–	1	1.08	0.92
1991	317821	349116	289331	44539	47527	41551	58129	–	0.94	0.989	0.891
1992	330559	361573	302205	45268	48325	42211	56617	–	1.01	1.064	0.956
1993	602754	640500	567230	43205	45886	40525	52144	–	1.08	1.151	1.009
1994	329784	354433	306851	33366	35622	31109	51259	–	1.1	1.146	1.054
1995	165603	180611	151842	32134	34162	30106	57621	–	1.13	1.174	1.086
1996	401880	427143	378109	37306	39383	35229	47210	–	1.01	1.063	0.957
1997	275848	299072	254427	31651	33574	29729	42465	–	1.07	1.123	1.017
1998	452656	483675	423626	25997	27613	24381	35060	–	1.01	1.075	0.945
1999	223378	242690	205605	29147	30891	27404	39814	–	0.99	1.037	0.943
2000	199135	214799	184613	31971	33845	30098	42026	–	0.92	0.964	0.876
2001	341926	364027	321169	37514	39600	35428	36675	–	0.78	0.83	0.73
2002	265328	283455	248360	37769	40061	35477	40105	–	0.83	0.874	0.786
2003	157143	169378	145792	37543	39925	35162	43162	1393	0.82	0.858	0.782
2004	329055	348489	310705	42139	44647	39631	46416	2614	0.83	0.881	0.779
2005	217285	232589	202988	40113	42638	37587	46550	4583	0.97	1.017	0.923
2006	292674	309904	276403	32475	34774	30176	41469	1222	0.87	0.917	0.823
2007	452723	479690	427272	38281	40979	35583	45093	2165	0.76	0.808	0.712
2008	734328	774005	696685	44733	48212	41253	47822	3368	0.63	0.676	0.584
2009	247176	269542	226664	67034	72383	61685	58781	11033	0.51	0.545	0.475
2010	257528	279068	237649	123089	132395	113783	72760	12118	0.39	0.415	0.365
2011	265486	290682	242474	201049	216570	185528	87500	13903	0.31	0.332	0.288
2012	487330	535317	443645	227026	247677	206375	85600	14870	0.26	0.282	0.238
2013	318837	360376	282088	228246	253220	203272	77708	15400	0.26	0.287	0.233
2014	217489	251947	187744	241117	272077	210157	89900	9800	0.26	0.292	0.228
2015	309968	368540	260703	272795	314705	230885	95000	10900	0.25	0.288	0.212
2016	529458	669948	418429	290234	345570	234898	107534	11100	0.27	0.324	0.216
2017	335071*	370115	303346	265666	334331	197000					

* GM 1978–2014.

** Discard estimates are from observer programmes (the discard values included in the assessment are lower than the values in this table, but the discarding missing from the assessment is used to top-up the catch forecast). In years with (-) discard numbers are not available or are considered unreliable.

Sources and references

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