

Hake (*Merluccius merluccius*) in divisions 8.c and 9.a, Southern stock (Cantabrian Sea and Atlantic Iberian waters)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 8281 tonnes.

Stock development over time

The spawning-stock biomass (SSB) has increased since 1998 and has been above MSY $B_{trigger}$, B_{pa} , and B_{lim} since 2007. The fishing mortality (F) is decreasing although is above F_{MSY} , but below F_{pa} and F_{lim} . Since 2010, recruitment (R) has been close to the historical average.

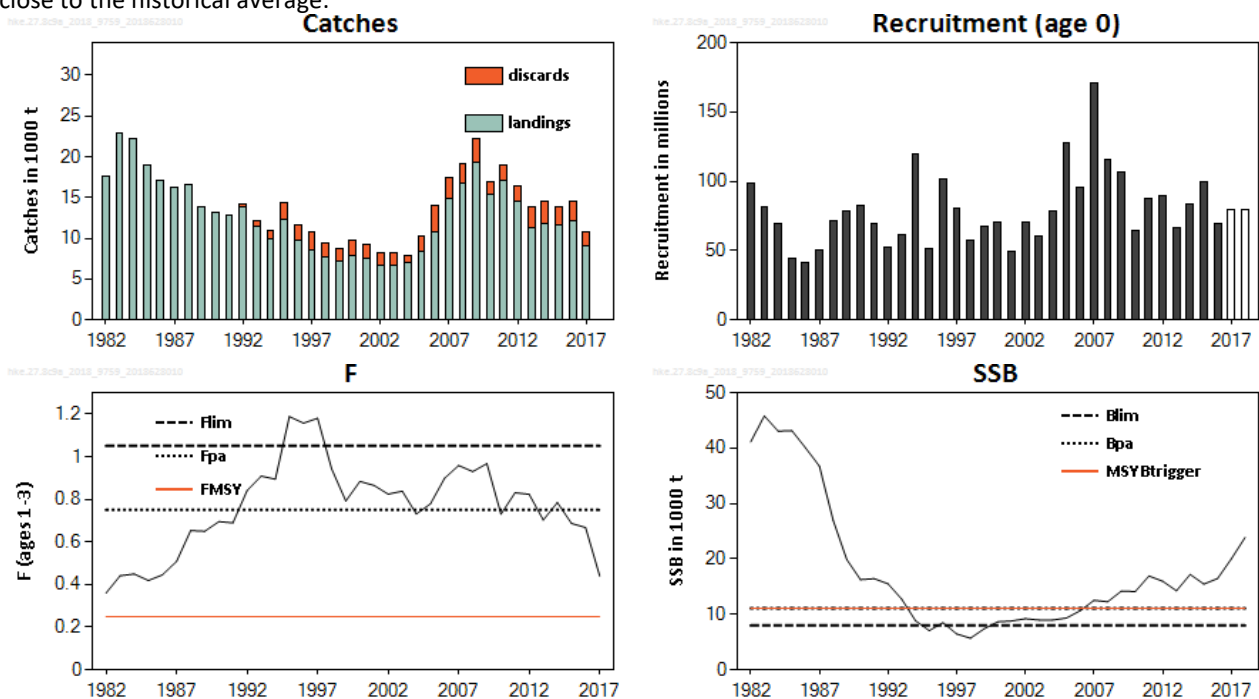


Figure 1 Hake in divisions 8.c and 9.a, Southern stock. Summary of the stock assessment. Assumed recruitment values are unshaded.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is above F_{MSY} but below F_{pa} and F_{lim} and that spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

Table 1 Hake in divisions 8.c and 9.a, Southern stock. State of the stock and fishery relative to reference points.

	Fishing pressure			Stock size						
	2015	2016	2017	2016	2017	2018				
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	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	B_{MGT}	—	—	—	Not applicable

Catch scenarios

Table 2 Hake in divisions 8.c and 9.a, Southern stock. Assumptions made for the interim year and in the forecast. SSB and catches in tonnes and recruitment in thousands.

Variable	Value	Notes
F (2018)	0.60	Mean F (2015–2017)
SSB (2019)	23904	Short term forecast
R (2018)	79427	GM (1989–2016)
R (2019)	79427	GM (1989–2016)
Catch (2018)	16709	Based on $F_{2018} = \text{mean } F (2015–2017)$

Table 3 Hake in divisions 8.c and 9.a, Southern stock. Annual catch scenarios. All weights are in tonnes. Note: The % change in TAC is not computed because the stock area does not correspond to the area for the TAC.

Basis	Total catch (2019)	Wanted catch* (2019)	Unwanted catch* (2019)	F_{total} (2019)	F_{wanted} (2019)	F_{unwanted} (2019)	SSB (2020)	% SSB change **	% Advice change ***
ICES advice basis									
MSY approach: F_{MSY}	8281	7220	1061	0.25	0.22	0.030	36104	51	-3.3
Other scenarios									
$F = 0$	0	0	0	0	0	0	49332	106	-100
$\text{SSB (2020)} = B_{\text{lim}}$	27478	23780	3698	1.48	1.28	0.20	8000	-67	221
$\text{SSB (2020)} = B_{\text{pa}} = \text{MSY } B_{\text{trg}}$	25204	21845	3359	1.21	1.05	0.160	11100	-54	194
F_{lim}	23516	20401	3115	1.05	0.91	0.140	13443	-44	175
F_{pa}	19323	16793	2530	0.75	0.65	0.100	19421	-18.8	126
EU Recovery Plan [^] : $F (2019) = F_{\text{sq}} - 10\%$	10647	9278	1369	0.34	0.30	0.040	32426	36	24
TAC constraint (-15%)	7869	6862	1007	0.24	0.21	0.030	36749	54	-8.1
TAC constraint (+15%)	10647	9278	1369	0.34	0.30	0.040	32426	36	24
$F = F_{\text{MSY lower}}$	5873	5124	749	0.170	0.15	0.020	39900	67	-31
$F = F_{\text{MSY upper}}$	11264	9814	1450	0.36	0.31	0.050	31475	32	32
equal SSB	16269	14155	2114	0.58	0.50	0.080	23904	0	90
equal TAC	9258	8070	1188	0.28	0.24	0.040	34578	45	8.1
F_{sq}	16583	14426	2157	0.60	0.52	0.080	23439	-1.95	94

* “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 discard rates at length estimated by the assessment model for 2015–2017.

** SSB 2020 relative to SSB 2019.

*** Total catch in 2019 relative to the advised catch for 2018 (8 561 tonnes).

[^] Applying a 10% reduction in F relative to F_{2018} corresponds to a total catch in 2019, which is more than 15% greater than the 2018 TAC. Therefore, ICES has calculated this option as corresponding to a total catch in 2019 equal to $\text{TAC}_{2018} \times 1.15$.

The advice based on the MSY approach produces a reduction of 3.3% compared to last year advice due mainly to a downward revision of SSB estimates compared to the previous assessment.

Basis of the advice

Table 4 Hake in divisions 8.c and 9.a, Southern stock. The basis of the advice.

Advice basis	MSY approach
Management plan	A recovery plan was agreed by the EU in 2005 (EU, 2005, Appendix 7.3.7). This plan is based on precautionary reference points that are no longer appropriate. The EC has proposed a multiannual management plan (MAP) for the Western Waters, which is not yet finalised (EU, 2018).

Quality of the assessment

The assessment has shown a retrospective tendency to overestimate SSB and underestimate F . The reasons for this pattern are not understood and ICES has not been able to solve this issue so far. The forecast for 2019 assumes that F in 2018 is equal to the average F of 2015–2017; this is higher than the F estimated for 2017, but it is considered a more appropriate assumption given the observed retrospective pattern. This procedure is considered to improve the estimate of the hake population size at the start of 2019 and, therefore, to provide the most suitable basis for the calculation of

catch options for 2019. However, it should be noted that it results in a likely overestimate of the catch in 2018 and, therefore, the 2018 catch value in Table 2 should not be interpreted as a prediction of the likely catch in this year.

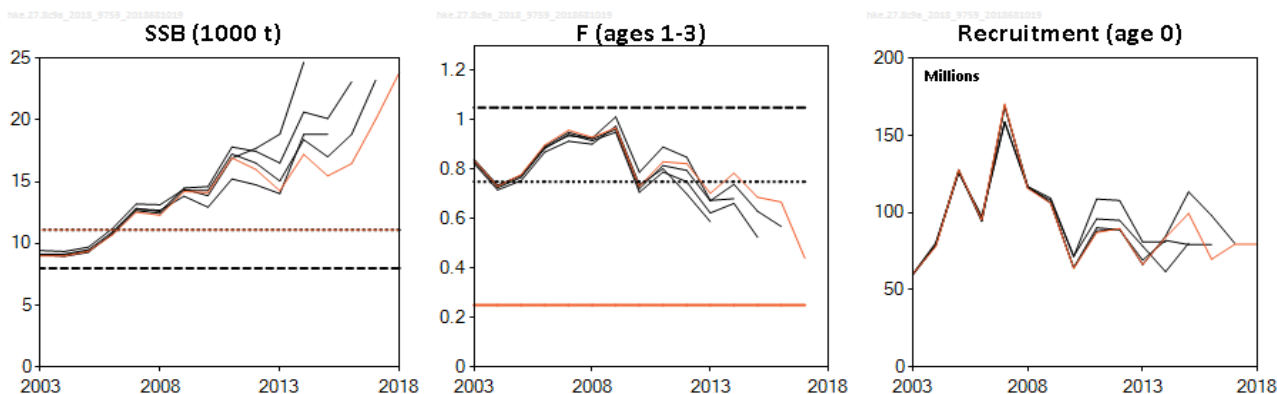


Figure 2 Hake in divisions 8.c and 9.a, Southern stock. Historical assessment results.

Issues relevant for the advice

SSB is increasing and has been above B_{pa} for the last decade. Fishing mortality has been under F_{pa} since 2013. However, the stock has been exploited above F_{MSY} since the beginning of the assessment period (1982). This implies that even though the stock can withstand the current fishing pressure, it is not optimal in terms of achieving maximum long-term yield.

Some fleets fishing this stock have been under the EU landing obligation since 2016.

A mixed-fisheries analysis covering the Iberian waters stocks of hake, megrim, four-spot megrim, and white anglerfish was provided in ICES (2018a).

Reference points

Table 5 Hake in divisions 8.c and 9.a, Southern stock. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	11100	B_{pa}	ICES (2016a)
	F_{MSY}	0.25	Stochastic simulations using segmented regression	ICES (2016a)
Precautionary approach	B_{lim}	8000	Break point in segmented regression	ICES (2016b)
	B_{pa}	11100	$B_{lim} \times e^{1.645\sigma}$; $\sigma = 0.20$	ICES (2016b)
	F_{lim}	1.05	F corresponding with the slope of the segmented regression	ICES (2016b)
	F_{pa}	0.75	$F_{lim} \times e^{-1.645\sigma}$; $\sigma = 0.20$	ICES (2016b)
Management plan	SSB _{mgt}	Not defined		
	F _{mgt}	Not defined		
	MAP			
	MSY $B_{trigger}$	11100	B_{pa}	
	MAP B_{lim}	8000	Break point in segmented regression	
	MAP F_{MSY}	0.25	Stochastic simulations using segmented regression	
	MAP range F_{lower}	0.170	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2016a)	
MAP range F_{upper}	0.36	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2016a)		

Basis of the assessment

Table 6 Hake in divisions 8.c and 9.a, Southern stock. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Length–age analytical assessment (GADGET; ICES, 2018b) that uses catches in the model and in the forecast
Input data	Commercial catches (international landings, discards, and length frequencies from catch sampling); three survey indices (SP-NSGFS-WIBTS-Q4 [1983 to 2017], SPGCGFS-WIBTS-Q4 [1997 to 2017], and Pt-PGFS-Q4 [1989-2017]); two commercial indices (SP-CORUTR [1985 to 2012] and P-TR [1989 to 2017]); annual maturity data from commercial catch; for natural mortality a constant value (0.4) was used.
Discards and bycatch	Included in the assessment since 1992 and considered negligible before. Data series from the main fleets raised to the effort.
Indicators	None
Other information	Benchmarked in 2014 (ICES, 2014)
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE)

Information from stakeholders

There is no additional information available.

History of the advice, catch, and management

Table 7 Hake in divisions 8.c and 9.a, Southern stock. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Landings corresponding to advice	Agreed TAC***	ICES estimated landings	ICES estimated discards	ICES estimated catch
1987	Precautionary TAC; juvenile protection	15000	25000	16185	-	-
1988	TAC; juvenile protection	15000	25000	16653	-	-
1989	TAC; juvenile protection	15000	20000	13786	-	-
1990	TAC; juvenile protection	15000	20000	13190	-	-
1991	Precautionary TAC	10000	18000	12827	-	-
1992	Precautionary TAC	10300	16000	13798	473	14271
1993	F = 10% of F ₉₁	1000	12000	11489	683	12172
1994	F lowest possible, at least reduced by 80%	2000	11500	9865	994	10859
1995	F lowest possible	-	8500	12239	2102	14341
1996	F lowest possible	-	9000	9730	1910	11640
1997	F lowest possible	-	9000	8499	2270	10769
1998	60% reduction in F	4000	8200	7683	1681	9364
1999	Reduce F below F _{pa}	9500	9000	7171	1519	8690
2000	20% reduction from 1994–98 average landings	< 7700	8500	7902	1835	9737
2001	Reduce F below F _{pa} ; no increase in landings	8500	8900	7581	1662	9243
2002	F below F _{pa}	< 8000	8000	6697	1492	8189
2003	Lowest possible catch / rebuilding plan	0	7000	6745	1461	8206
2004	Zero catch	0	5950	6940	913	7854
2005	Zero catch	0	5968	8302	1978	10280
2006	Zero catch	0	6661	10799	3262	14061
2007	Zero catch	0	6128	14934	2504	17438
2008	Zero catch	0	7047	16773	2311	19084
2009	Zero catch	0	8104	19242	2935	22177
2010	Reach B _{pa} in 2011	4900	9300	15736	1580	17316
2011	See scenarios	< 9900	10695	17072	1948	19020
2012	MSY transition	< 14323	12299	14573	1822	16395
2013	MSY transition	< 10552	14144	11661	2549	14209
2014	MSY transition	< 13123*	16266	12011	2602	14614
2015	MSY approach	< 8417*	13826	11786	2292	14077
2016	MSY approach	≤ 6078**	10674	12443	2313	14756
2017	MSY approach	≤ 8049**	10520	9171	1676	10847
2018	MSY approach	≤ 8561**	9258			
2019	MSY approach	≤ 8281**				

* This value refers to total catch, including discards.

** This value refers to total catch, including unwanted catch.

*** Applies to ICES Division 8.c and subareas 9 and 10; EU waters of CECAF 34.1.1.

History of the catch and landings

Table 8 Hake in divisions 8.c and 9.a, Southern stock. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Catch (2017)	Landings			Discards
	38% trawlers	53% other fleets	9% unallocated	
10847	9171			1676

Table 9 Hake in divisions 8.c and 9.a, Southern 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	Spain									Portugal				France*	Unallocated**	Total		
	Artisanal	Gillnet	Longline	Cd-Trw	Pr-Bk TRW	Pa-Trw	Ba-Trw	Discards	Landings	Artisanal	Trawl	Discards	Landings	Total		Discards	Landings	Catch
1972					10200				17300	4700	4100		8800	0		26100	26100	
1973					12300				20800	6500	7300		13800	200		34800	34800	
1974			2200		8300				14100	5100	3500		8600	100		22800	22800	
1975			3000		11200				19000	6100	4300		10400	100		29500	29500	
1976			2600		10000				16900	6000	3100		9100	100		26100	26100	
1977			1300		5800				9200	4500	1600		6100	200		15500	15500	
1978			2100		4900				8500	3400	1400		4800	100		13400	13400	
1979			2100		7200				11200	3900	1900		5800			17000	17000	
1980			5000		5300				12700	4500	2300		6800			19500	19500	
1981			4600		4100				10500	4100	1900		6000			16500	16500	
1982			4177	485	3923				10098	5009	2485		7494			17592	17592	
1983			6568	574	5293				14906	5185	2859		8044			22950	22950	
1984			7521	694	5844				16664	4296	1219		5515			22179	22179	
1985			4420	789	5334				13121	3768	2052		5820			18941	18941	
1986			3464	976	4861				12207	3159	1788		4947	7		17161	17161	
1987			4409	952	3501				11362	3470	1328		4798	25		16185	16185	
1988			2967	986	3977				10612	4303	1714		6017	24		16653	16653	
1989			1950	899	3920				9187	2736	1847		4583	16		13786	13786	
1990			2128	1196	4131				9765	2261	1138		3399	26		13190	13190	
1991	417	1406	2201	1210	3632				8866	2710	1245		3955	6		12827	12827	
1992	404	7100		975	3788			143	8700	3773	1325	329	5098		473	13798	14271	
1993	367	8500		541	2671			242	7577	3042	870	441	3912		683	11489	12172	
1994	374	1000	2600	325		820	1898	286	6778	2298	789	709	3087		994	9865	10859	
1995	365	1300	3500	457		2337	2937	927	8648	2565	1026	1175	3591		2102	12239	14341	
1996	227	1200	3100	976		1462	2174	915	6966	2007	758	995	2765		1910	9730	11640	
1997	304	600	1500	879		1317	1778	1070	6084	1519	897	1199	2415		2270	8499	10769	
1998	318	100	1400	525		878	1953	571	5045	1668	970	1110	2638		1681	7683	9364	
1999	335	200	1700	570		867	1588	353	3961	2120	1090	1166	3210		1519	7171	8690	
2000	260	200	2200	584		827	1980	622	4651	2092	1158	1213	3251		1835	7902	9737	
2001	317	300	1500	1203		1055	1124	370	4359	2023	1198	1292	3222		1662	7581	9243	

Year	Spain									Portugal				France*	Unallocated**	Total		
	Artisanal	Gillnet	Longline	Cd-Trw	Pr-Bk TRW	Pa-Trw	Ba-Trw	Discards	Landings	Artisanal	Trawl	Discards	Landings	Total		Discards	Landings	Catch
2002	221	265	1249	883		1372	748	379	3923	1808	965	1112	2774			1492	6697	8189
2003	373	374	2097	1251		1363	1065	411	4653	1129	962	1050	2092			1461	6745	8206
2004	476	333	2272	1062		1657	1131	222	4875	1266	799	691	2065			913	6940	7854
2005	717	768	1810	885		2769	1143	379	6241	1096	965	1599	2061			1978	8302	10280
2006	479	833	2073	634		4699	1808	2654	8673	1218	908	608	2126			3262	10799	14061
2007	827	533	1967	505		6709	2069	1192	12802	1408	724	1312	2132			2504	14934	17438
2008	1115	697	1985	529		6325	2436	1455	14563	1274	936	856	2210			2311	16773	19084
2009	1412	555	1863	551		7370	2537	976	16889	1390	964	1959	2353			2935	19242	22177
2010	724	587	1723	680		6332	1711	1004	13033	1614	727	575	2341	362		1580	15736	17316
2011	419	1091	761	527		2184	1479	1209	6462	1721	493	739	2214		8396	1948	17072	19020
2012	340	851	1079	500		1644	1416	1352	5831	1793	814	470	2607		6136	1822	14573	16395
2013	641	1751	1110	624		1863	1165	2219	7154	1933	812	330	2744	308	1455	2549	11661	14209
2014	754	1458	1604	540		1716	1184	2020	7256	1713	661	582	2374	136	2246	2602	12011	14614
2015	902	1115	1234	359		2014	1134	2061	6758	1238	763	231	2000	238	2789	2292	11786	14077
2016	909	1641	1305	419		2279	1509	2149	8063	1221	752	164	1973	233	2174	2313	12443	14756
2017	687	1514	1714	267		1599	1075	1432	6857	909	575	244	1484	67	763	1676	9171	10847

* French catches are not considered in the assessment until the full time-series has been reviewed.

** Unallocated landings have been estimated and included since 2011.

Summary of the assessment

Table 10 Hake in divisions 8.c and 9.a, Southern stock. Assessment summary. Weights are in tonnes.

Year	Recruitment	SSB	Landings**	Discards	F
	Age 0 (in thousands)				Ages 1-3
1982	98400	41104	17592	0	0.36
1983	81482	45800	22950	0	0.44
1984	69480	43047	22179	0	0.45
1985	44091	43140	18941	0	0.42
1986	40965	40024	17161	0	0.45
1987	50138	36765	16185	0	0.51
1988	71238	27027	16653	0	0.65
1989	78062	19897	13786	0	0.65
1990	82328	16280	13190	0	0.70
1991	69844	16453	12827	0	0.69
1992	52390	15515	13798	473	0.84
1993	61120	12757	11484	683	0.91
1994	119531	8884	9865	994	0.89
1995	51186	7078	12239	2102	1.19
1996	101100	8509	9715	1910	1.16
1997	80825	6483	8498	2270	1.18
1998	57824	5709	7683	1681	0.94
1999	67037	7411	7170	1519	0.79
2000	70322	8677	7902	1835	0.88
2001	49553	8820	7580	1662	0.86
2002	70748	9223	6690	1492	0.82
2003	60084	8992	6744	1461	0.84
2004	77941	8989	6942	913	0.73
2005	127712	9361	8333	1978	0.78
2006	95337	10685	10816	3262	0.90
2007	170452	12534	14932	2504	0.96
2008	115667	12287	16795	2311	0.93
2009	106117	14214	19240	2935	0.97
2010	63902	14128	15368	1580	0.73
2011	87094	16933	17062	1948	0.83
2012	89704	15996	14573	1823	0.82
2013	66372	14268	11353	2553	0.70
2014	83921	17221	11875	2602	0.78
2015	99510	15480	11547	2292	0.69
2016	69765	16476	12210	2313	0.67
2017	79427*	20041	9103	1676	0.44
2018	79427*	23885			

* Geometric mean 1989–2016.

**Landings do not include the French landings presented in Table 9.

Sources and references

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