

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 advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2020 should be no more than 104 763 tonnes.

Stock development over time

The spawning-stock biomass (SSB) has increased substantially since 2006. In 2016 it reached the maximum in the time series, and since then it has declined slightly. Fishing mortality (F) decreased markedly between 2005 and 2012, and has been stable below F_{MSY} since then. Recruitment is variable without trend. Recent recruitment is uncertain.

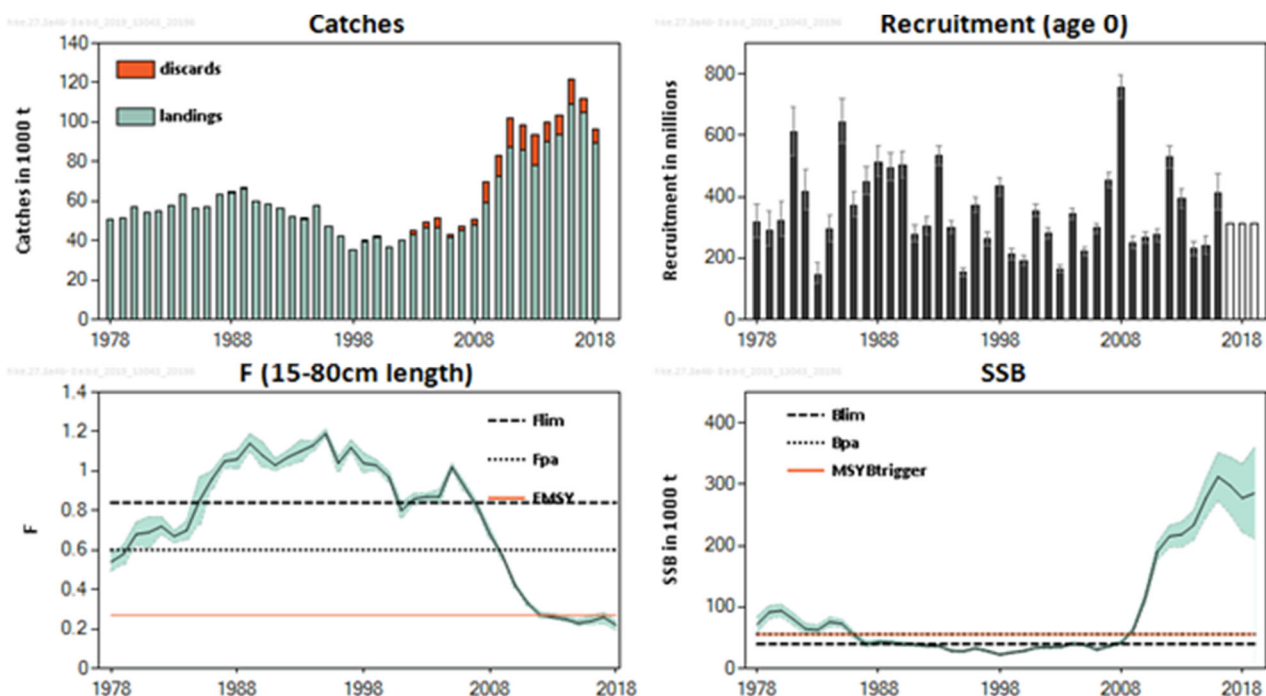


Figure 1 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Summary of the stock assessment. Complete discard estimates are available only since 2003. Plots show 95% confidence intervals (shaded area). F confidence intervals derived from standard deviations calculated internally by the model for F at-age values. Assumed recruitment values are unshaded.

Stock and exploitation status

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

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				
		2016	2017	2018	2017	2018	2019		
Maximum sustainable yield	F_{MSY}	✓	✓	✓	MSY	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	–	–	–	B_{MGT}	–	–	–	Not applicable

Catch scenarios

Table 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F (2019)	0.24	Mean $F_{2017-2019}$
SSB (2020)	276 565	Tonnes; short-term forecast
R (2019–2020)	310 754	Thousands; geometric mean 1990–2016
Total catch (2019)	100 240	Tonnes; forecast catch from the assessment model (based on $F_{2019} = \text{mean } F$)
Wanted catch (2019)	93 834	Tonnes; assuming average landings rate during 2016–2018
Unwanted catch (2019)	6 406	Tonnes; assuming average discards rate during 2016–2018

Table 3 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern 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 (2020)	Wanted catch (2020)	Unwanted catch (2020)	F_{total} (2020)	F_{wanted} (2020)	F_{unwanted} (2020)	SSB (2021)	% SSB change **	% Advice change ***
ICES advice basis									
MSY approach = F_{MSY}	104763	97949	6814	0.26	0.21	0.048	263204	-5%	-26%
Other scenarios									
EU MAP ^: F_{MSY}	104763	97949	6814	0.26	0.21	0.048	263204	-5%	-26%
F = MAP F_{MSY} lower	76334	71455	4878	0.18	0.147	0.033	290273	5%	-46%
F = MAP F_{MSY} upper	147839	137934	9905	0.40	0.33	0.074	222251	-20%	4%
F = 0	0	0	0	0	0	0	363109	31%	-100%
F_{pa}	197127	183380	13747	0.60	0.49	0.111	175485	-37%	39%
F_{lim}	241643	224025	17618	0.84	0.68	0.155	133316	-52%	70%
SSB (2021) = B_{lim}	339516	310343	29174	2.0	1.64	0.37	40037	-86%	139%
SSB (2021) = B_{pa}	323035	296383	26652	1.66	1.35	0.31	56000	-80%	127%
SSB (2021) = MSY B_{trigger}	323035	296383	26652	1.66	1.35	0.31	56000	-80%	127%
F = F_{2019}	97699	91373	6326	0.24	0.195	0.044	269927	-2%	-31%
EU Recovery Plan ^^	101394	94814	6580	0.25	0.20	0.046	266410	-4%	-29%

** SSB 2021 relative to SSB 2020.

*** Total catch 2020 relative to the catch advice for 2019 (142 240 tonnes).

^ MAP multiannual plan (EU, 2019).

^^ Catch scenario corresponds to $F_{2020} = 0.25$.

The catch for 2020 corresponding to the MSY framework is 26% lower than the advice given for 2019 (ICES, 2018). The decrease is a consequence of rescaling of stock size following the interbenchmark, re-estimated lower reference points, and a lower assumption this year of recruitment in 2017.

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 EU multiannual plan (MAP) for stocks in the Western Waters and adjacent has been agreed by the EU for this stock (EU, 2019). This plan is not adopted by Norway; thus, it was not used as the basis of the advice for this shared stock. ICES was requested to provide advice based on the MSY approach and to include the MAP as a catch option.

Quality of the assessment

An interbenchmark was conducted on the stock in early 2019 and resulted in the inclusion of discard estimates which were missing for some of the fleets. The assessment is now based on total catch estimates. Reference points were revised as a result.

The historical FR-EVHOE-WIBTS-Q4 survey was revised and resulted in some minor changes in the perception of the stock.

The recruitment in 2017 and 2018 were replaced by the geometric mean of the recruitments from 1990 to 2016, owing to the uncertainty of the 2017 estimate, retrospective pattern in the recruitment, and lack of EVHOE survey in 2017.

Given the expansion of the stock into northern areas (ICES, 2017), northern abundance indices, biological sampling and discard quantification in the northern area may be limited and should be considered in the future.

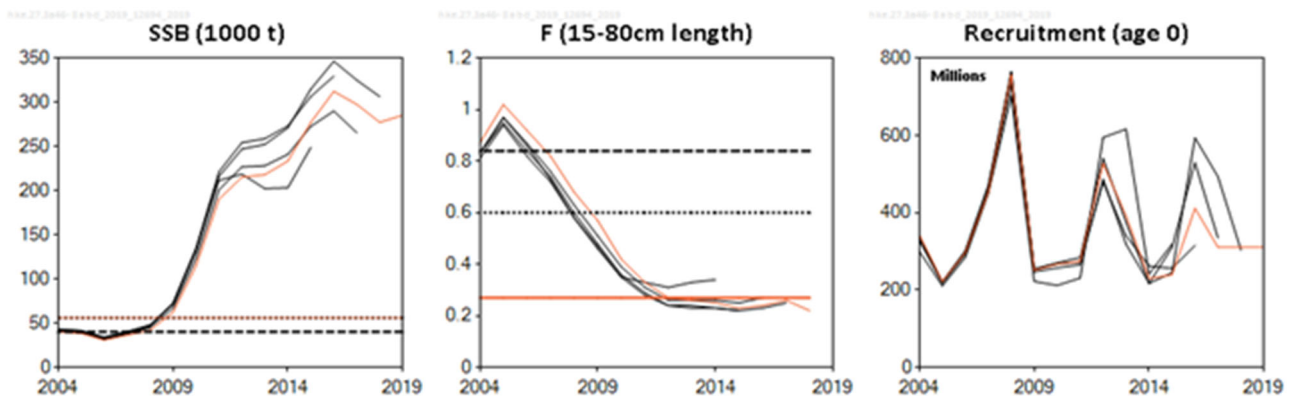


Figure 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Historical assessment results. Last three years of geometric mean recruitment included.

Issues relevant for the advice

Discarding of juvenile hake (undersized and above minimum conservation reference size) can be substantial in some areas and fleets. In the most recent period, discarding of large individuals increased because of quota restrictions in certain fleets and continued monitoring is required. Since 2015, the observed discards have decreased.

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. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	56000	B_{pa}	ICES (2019b)
	F_{MSY}	0.26	Stochastic simulations on a segmented regression stock–recruitment relationship	ICES (2019b)
Precautionary approach	B_{lim}	40000	The breakpoint of the segmented regression stock–recruitment relationship	ICES (2019b)
	B_{pa}	56000	$1.4 \times B_{lim}$	ICES (2019b)
	F_{lim}	0.84	†Fishing mortality resulting in a 50% probability of SSB falling below B_{lim}	ICES(2019b)
	F_{pa}	0.6	$F_{lim} / 1.4$	ICES(2019b)
Management plan	F_{MGT}	Not defined		
	SSB_{MGT}	Not defined		
	MAP MSY $B_{trigger}$	56000	MSY $B_{trigger}$	ICES (2019b) and EU (2019)
	MAP B_{lim}	40000	B_{lim}	ICES (2019b) and EU (2019)
	MAP F_{MSY}	0.27	F_{MSY}	ICES (2019b) and EU (2019)
	MAP range F_{lower}	0.180	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b)	ICES (2019b) and EU (2019)
	MAP range F_{upper}	0.40	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY (ICES, 2019b)	ICES (2019b) and EU (2019)

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, 2018).
Assessment type	Length-based model (SS3; ICES, 2019a) that uses landings and discards in the assessment and forecast.
Input data	Commercial landings; four survey indices (FR-EVHOE-WIBTS-Q4, SP-PORC-WIBTS-Q3, IE-IGFS-WIBTS-Q4, and RESSGASC); maturity data: constant maturity (Martin, 1991); natural mortality: constant value of 0.4.
Discards and bycatch	Data series from most fleets are available. All the observed discards are included in the assessment (ICES, 2019a, 2019b).
Indicators	None.
Other information	Benchmark in 2014 (ICES, 2014). Interbenchmark in 2019 (ICES, 2019a).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE).

Information from stakeholders

Anecdotal information provided by industry suggests that the mean weight at length of individuals has decreased since 2011. This was corroborated by analyses using national laboratories data (ICES, 2019b).

† Version 2: Corrected typo.

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	Catch corresponding to advice	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	104670	7100	111770
2018	MSY approach	≤ 115335		111785	89695	6493	96188
2019	MSY approach	≤ 142240		141160			
2020	MSY approach	≤ 104763					

* Sum of area TACs, corresponding to northern stock plus Division 2.a (EC zone only) and 3.b-d (except for 2019).

** 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 2018 as estimated by ICES.

Catch (2018)	Landings				Discards
	7% unspecified gear	31% longline	32% gillnet	30% trawl	
96 188 tonnes	89 695 tonnes				6 493 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	Unallocated	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
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

Year	Landings *							Discards **							Total catches ***
	3	4	6	7	8abd	Unallocated	Total	3	4	6	7	8abd	Total		
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	
2017	775	19690	9614 ^^	45737	28853	0	104670	148	1777	314	1168	3692	7100	111770	
2018	698	18915	7281 ^^	36906	25894	0	89695	287	1395	273	2281	2257	6493	96188	

* Spanish data for 1961–1972 are not revised; data for Subarea 8 for 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 and 4.b–c are included in the column "3, 4, and 6" only after 1976. There are some unallocated landings (moreover for the period 1961–1970).

** Discard estimates from observer programmes.

*** The working group used total catches from 1978.

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

^^ Landings and discards data from Subarea 5 are included.

Table 10 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. History of commercial catches by country. All weights are in tonnes.

Year	Belgium	Denmark	France	Germany	Ireland	Netherlands	Norway	Spain	Sweden	UK (England)	UK (Northern Ireland)	UK (Scotland)
2013	177	3727	31684	565	4205	135	2666	46374	89	1905	66	10004
2014	218	3407	41290	835	4919	221	3031	30747	106	2310	29	12659
2015	144	4242	46034	786	3873	693	4181	33471	103	3148	134	9154
2016	155	4617	49103	845	4168	883	5781	34503	94	2722	116	15675
2017	451	5125	47557	737	3477	188	3974	33317	90	2329	222	14303
2018	212	4529	41260	1212	4440	519	3960	26078	119	2689	130	11039

Summary of the assessment

Table 11 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	High	Low	SSB	High	Low	Landings	Discards	F 15–80 cm length	High	Low
1978	316562	377770	265271	71702	84329	59076	50551		0.54	0.58	0.50
1979	291398	352814	240673	91895	102240	81551	51096		0.58	0.62	0.53
1980	321687	383486	269847	94241	104046	84437	57265		0.68	0.74	0.62
1981	608284	690769	535649	80167	89268	71066	53918		0.69	0.77	0.61
1982	418243	487572	358772	64406	72878	55935	54994		0.72	0.77	0.68
1983	147050	185041	116861	62898	70599	55198	57507		0.67	0.70	0.64
1984	293380	341321	252173	76056	83396	68716	63286		0.70	0.75	0.65
1985	643145	719072	575235	72957	79373	66541	56099		0.85	0.97	0.73
1986	373157	417909	333199	54100	59837	48363	57092		0.96	1.00	0.91
1987	449506	498813	405073	39906	44650	35162	63369		1.05	1.08	1.02
1988	511711	563657	464552	43169	47312	39025	64823	2	1.06	1.11	1.01
1989	495038	541631	452453	42492	46113	38871	66473	73	1.14	1.19	1.10
1990	503507	548798	461954	39704	42640	36769	59954		1.08	1.15	1.02
1991	277635	305905	251979	38676	41469	35882	58129		1.03	1.06	1.01
1992	303104	333112	275799	37236	39984	34489	56617		1.07	1.10	1.03
1993	532745	565563	501831	36649	39058	34239	52144		1.10	1.16	1.05
1994	300750	322712	280281	28823	30890	26756	51259	356	1.13	1.15	1.10
1995	152607	166245	140088	28062	29948	26175	57621		1.19	1.21	1.17
1996	372604	396138	350468	33133	35093	31173	47210		1.04	1.07	1.00
1997	262295	284793	241575	28370	30213	26527	42465		1.12	1.16	1.09
1998	432554	462950	404154	22678	24202	21154	35060		1.04	1.09	0.99
1999	213948	232442	196926	26026	27684	24368	39814	349	1.03	1.06	1.00
2000	192163	207486	177972	28722	30529	26914	42026	83	0.97	1.00	0.95
2001	354782	377710	333246	34027	36055	31999	36675		0.80	0.84	0.77
2002	281646	300816	263698	34673	36906	32440	40107		0.86	0.89	0.83
2003	163911	176642	152098	35009	37310	32708	43162	2110	0.87	0.89	0.85
2004	343418	363574	324379	40085	42502	37667	46417	2552	0.87	0.91	0.84
2005	221999	237615	207409	38523	40939	36106	46550	4676	1.02	1.04	0.99
2006	296671	313949	280344	30822	32969	28675	41467	1816	0.92	0.94	0.90
2007	453127	479568	428144	36353	38857	33849	45028	2191	0.82	0.84	0.79
2008	756719	795226	720076	41909	45092	38726	47739	3248	0.68	0.71	0.66
2009	251180	272770	231298	62188	67024	57353	58818	10590	0.57	0.58	0.55
2010	267234	287033	248799	114775	123059	106491	72799	9978	0.42	0.43	0.41
2011	274040	296056	253661	190397	203990	176804	87540	14156	0.33	0.34	0.32
2012	527664	565325	492512	215395	232931	197859	85677	12680	0.27	0.28	0.26
2013	392229	426629	360602	218143	238538	197748	77753	15886	0.26	0.28	0.25
2014	230026	255073	207439	233524	257489	209559	89940	9913	0.25	0.26	0.24
2015	239321	270040	212096	277274	307847	246701	93670	9820	0.23	0.25	0.22
2016	411718	474980	356882	312407	351334	273480	109106	12741	0.24	0.27	0.22
2017	310754 *			297848	344168	251528	104671	7386	0.26	0.28	0.23
2018	310754 *			277482	332692	222272	89695	6493	0.22	0.24	0.196
2019	310754 *			285371	359344	211398					

* Geometric mean.

Sources and references

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