

Herring (*Clupea harengus*) in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k (Irish Sea, Celtic Sea, and southwest of Ireland)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, there should be zero catch in 2020.

Stock development over time

The spawning-stock biomass (SSB) has been decreasing significantly since 2011 and has been below B_{lim} since 2017. The fishing mortality (F) has increased since 2008 and has been above F_{lim} in 2016 and 2017, but decreased in 2018; it remains above F_{MSY} . Recruitment has been below average since 2013.

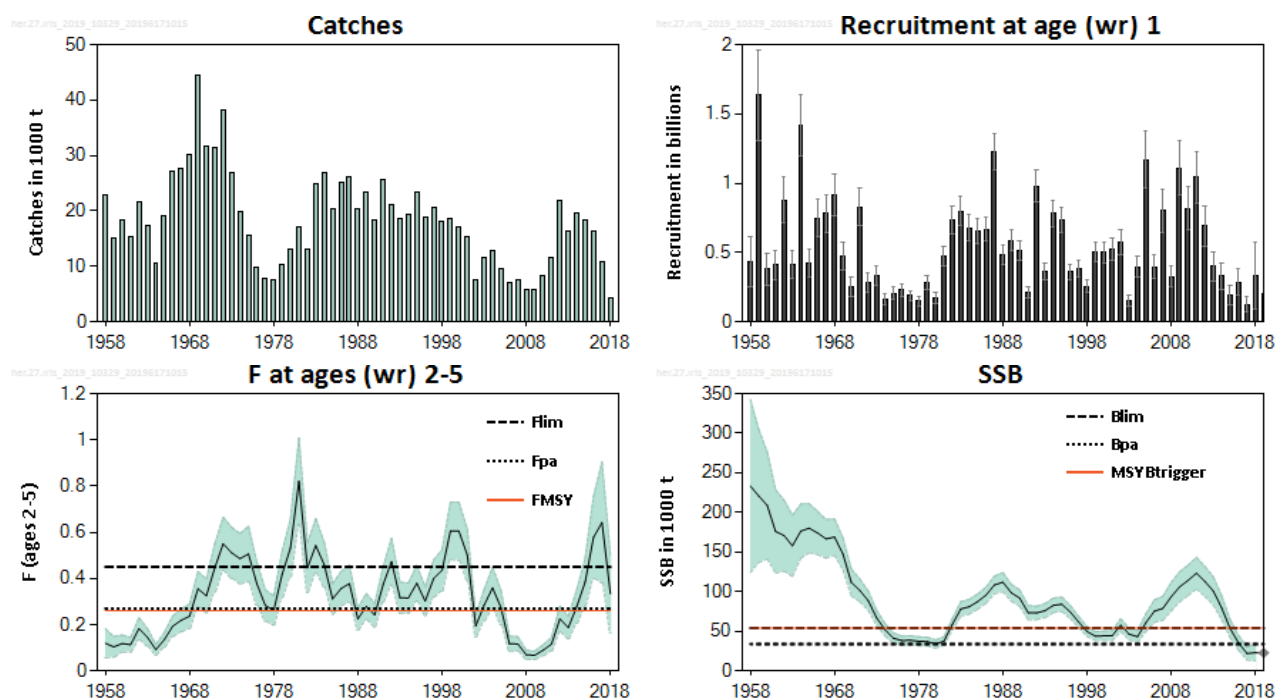


Figure 1 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Summary of the stock assessment. The assumed recruitment is unshaded and the forecast SSB value is designated by a grey diamond. The shaded areas on the F and SSB plots represent 95% confidence intervals.

Stock and exploitation status

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

Table 1 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. 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}	✘	✘	✘	Above	MSY $B_{trigger}$	✘	✘	✘	Below trigger
Precautionary approach	F_{pa}, F_{lim}	✘	✘	○	Increased risk	B_{pa}, B_{lim}	✘	✘	✘	Reduced reproductive capacity
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—	—	Not applicable

Catch scenarios

Table 2 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages(wr) 2-5}$ (2019)	0.34	F corresponding to the assumed total catch for 2019
$R_{age(wr) 1}$ (2019-2020)	204 340	Stock-recruitment relationship based on the SSB_{2017} from the assessment output (in thousands)
SSB (2019)	22 787	Tonnes; Calculated in the short term forecast based on the assumptions for the intermediate year
Total catch (2019)	5320	Tonnes; TAC adjusted for estimated uptake, carry over of national quota

Table 3 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	F_{2-5} (2020)	SSB * (2020)	% SSB change **	SSB * (2021)	% TAC change ***	% Advice change ^
ICES advice basis							
MSY approach: zero catch	0	0	24248	6.4	27628	-100	-100
Other scenarios							
F_{MSY}	4258	0.26	22018	-3.4	19871	-10.2	-10.2
$F_{MSY} \times SSB_{2019} / MSY B_{trigger}$	1919	0.11	23271	2	21352	-59.5	-59.5
$F = 0$	0	0	24248	6.4	27628	-100	-100
F_{pa}	4404	0.27	21938	-3.7	19779	-7.1	-7.1
F_{lim}	6823	0.45	20553	-9.8	18263	43.9	43.9
$SSB_{2020} = B_{lim}$ ^^							
$SSB_{2020} = B_{pa}$ ^^							
$SSB_{2020} = MSY B_{trigger}$ ^^							
$F = F_{2019}$	5334	0.34	21416	-6	19194	12.5	12.5

* For this autumn-spawning stock, the SSB is determined at spawning time and is influenced by fisheries between 1 April and spawning (October).

** SSB 2020 relative to SSB 2019.

*** Total catch in 2020 relative to TAC in 2019 (4742 tonnes).

^ Advice value for 2020 relative to the advice value for 2019 (4742 tonnes).

^^ These catch scenarios are left blank because the stated SSB cannot be achieved, even with $F = 0$.

There are no catch scenarios that will rebuild the stock above B_{lim} by 2021, therefore ICES advises zero catch.

Basis of the advice

Table 4 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. The basis of the advice.

Advice basis	MSY Approach
Management plan	The long-term management strategy for Celtic Sea herring that was proposed by the Pelagic AC in 2011 (Pelagic AC, 2011) was re-evaluated by ICES in 2018. ICES advises that the harvest control rule is no longer consistent with the precautionary approach. The management strategy results in a greater than 5% probability of the stock falling below B_{lim} in several years throughout the 20-year simulated period (ICES, 2018a). A rebuilding plan is currently being developed for this stock.

Quality of the assessment

The survey time-series used in the assessment includes data from 2002–2018 (excluding 2004 and 2017). The 2017 acoustic survey estimate was not used in the assessment (ICES, 2018b) because the survey collected only one biological sample, which was not considered representative. Herring have been observed close to the bottom since 2014, and are considered to be less reliably estimated by the acoustic survey. Uncertainty is thus added to the assessment.

The 2018 assessment revises the SSB downwards and the mean F upwards. This revision is most likely the result of the lack of the 2017 survey index, and because of the 2018 abundance estimate from the acoustic survey being the lowest in the time series.

Recruitment estimates are uncertain, due to a lack of recruitment indices. In the Irish Sea, mixing occurs between Celtic Sea and Irish Sea fish, but the level of mixing is unknown.

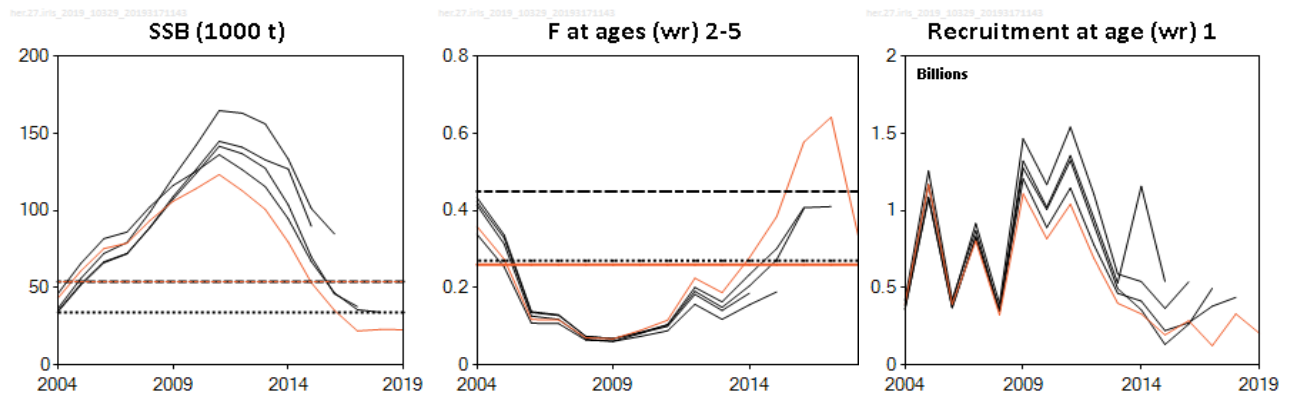


Figure 2 Herring in divisions 7.a South of 52°30'N, 7.g-h, and 7.j-k. Historical assessment results. Final year recruitment and SSB estimates included. The assessment was benchmarked in 2015 and inter-benchmarked in 2018.

Issues relevant for the advice

Activities that have a negative impact on the spawning habitat of herring should not occur, unless the effects of these activities have been assessed and shown not to be detrimental to the productivity of the stock (ICES, 2013, 2015a).

There has been an increase in marine anthropogenic activity. Activities that have a negative impact on the spawning habitat of herring, such as the dumping of dredge spoil, the extraction of marine aggregates (e.g. gravel and sand), and the erection of structures in the vicinity of spawning grounds, are a cause for concern (see for example Groot, 1979, 1996; ICES, 2003, 2015a). This is because a gravel substratum is an essential habitat for herring spawning.

Reference points

Table 5 Herring in divisions 7.a South of 52°30'N, 7.g-h, and 7.j-k. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	54000	B_{pa}	ICES (2018b)
	F_{MSY}	0.26	Stochastic simulations using a segmented regression stock–recruitment relationship from 1970–2014.	ICES (2018b)
Precautionary approach	B_{lim}	34000	B_{loss} = the lowest observed SSB (1980).	ICES (2018b)
	B_{pa}	54000	$B_{pa} = B_{lim} \times \exp(1.645 \times \sigma_B)$, with $\sigma_B = 0.29$ from assessment uncertainty in the terminal year.	ICES (2018b)
	F_{lim}	0.45	Equilibrium F maintaining SSB > B_{lim} with 50% probability.	ICES (2018b)
	F_{pa}	0.27	$F_{pa} = F_{lim} \times \exp(-1.645 \times \sigma_F)$, where $\sigma_F = 0.30$ from assessment uncertainty (capped) in the terminal year.	ICES (2018b)

Basis of the assessment

Table 6 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018c)
Assessment type	Age-based analytical assessment (ASAP; ICES, 2019) that uses catches in the model and in the forecast.
Input data	Commercial catches (weights, ages, and length frequencies from catch sampling); Acoustic survey index (CSHAS) (excluding 2017); annual weights in the stock; fixed maturity ogive; natural mortality assumed constant.
Discards and bycatch	Included in the assessment.
Indicators	None
Other information	Benchmarked in WKWEST (ICES, 2015b) and inter-benchmarked in 2018 (ICES, 2018b). Assessed on a seasonal basis, 1 April–31 March, to allow for the inclusion of the spawning cycle in the assessment period. This is an autumn-/winter-spawning stock. Age is given in winter rings (wr), so for example: a 2-year-old fish is termed “1-winter ring” as fish do not lay down a ring in their first winter.
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

Information from stakeholders

The PelAC has been actively pursuing a rebuilding plan for Celtic Sea herring in light of the results of the inter-benchmark and most recent assessment. In order to support future stock assessments, the PelAC is seeking advice on the relevant timeframe for any fishery, the geographical areas where each fleet should operate, and a level of catches that would not impair the recovery of the stock but would be sufficient to allow collection of fisheries-dependent data.

History of the advice, catch, and management

Table 7 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. ICES advice, official landings, and ICES estimated catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official landings	ICES landings	Discards	ICES estimated catch ^
1987	Precautionary TAC	18000	18000		18000	4200	27300
1988	TAC	13000	18000	16800	16800	2400	19200
1989	TAC	20000	20000	17900	19200	3500	22700
1990	TAC	15000	17500	17000	17700	2500	20200
1991	TAC (TAC excluding discards)	15000 (12500)	21000	21100	21700	1900	23600
1992	TAC	27000	21000	18600	20900	2100	23000
1993	Precautionary TAC (including discards)	20000–24000	21000	20300	19200	1900	21100
1994	Precautionary TAC (including discards)	20000–24000	21000	18900	17400	1700	19100
1995	No specific advice		21000	18500	18300	700	19000
1996	TAC	9800	16500–21000 **	20600	18800	3000	21800
1997	If required, precautionary TAC	< 25000	22000	20700	18100	700	18800
1998	Catches below 25	< 25000	22000	20500	20300	0	20300
1999	F = 0.4	19000	21000	19400	18100	0	18100
2000	F < 0.3	20000	21000	18884	18267	0	18267
2001	F < 0.34	17900	20000	19307	17729	0	17729
2002	F < 0.35	11000	11000	11541	10550	0	10550
2003	Substantially less than recent catches	-	13000	12381	10875	0	10875
2004	60% of average catch 1997–2000	11000	13000	11866	11065	0	11065
2005	60% of average catch 1997–2000	11000	13000	10222	8452	0	8452
2006	Further reduction 60% avg. catch 2002–2004	6700	11000	9053	8530	0	8530
2007	No fishing without rebuilding plan		9400	9623	8268	0	8268

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official landings	ICES landings	Discards	ICES estimated catch ^
2008	No targeted fishing without rebuilding plan		7900	7838	6853	0	6853
2009	No targeted fishing without rebuilding plan		5900	6259	5760	0	5760
2010	$F_{mgt} = 0.19$	10150	10150	9645	8406	0	8406
2011	See scenarios		13200	11751	11503	0	11503
2012	MSY approach	< 26900	21100	19500	21604	161	21765
2013	MSY approach	< 18500	17200	16067	16067	118	16185
2014	MSY approach	< 35942	22300	18930	18930	644	19574
2015	MSY approach	< 15140	15700 *	17579	17579	247	17826
2016	MSY approach	< 23164	15400 *	16587	16136	182	16318
2017	MSY approach	< 16145	14500 *	10637	10637	130	10767
2018	MSY approach	≤ 5445	10100 *	4834	4589	0	4589
2019	MSY approach	≤ 4742	4742				
2020	MSY approach	0					

* Initial TAC before carry-over of unused quota from previous year.

** Revised in 1996 after the ACFM May meeting.

^ By calendar year.

History of the catch and landings

Table 8 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Catch (2018)	Landings		Discards
4589	Pelagic trawlers 100%	Driftnets (negligible)	Negligible
	4589		

Table 9 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. History of official landings by country; . All weights are in tonnes.

Year	France	Germany	Ireland	Netherlands	U.K.	Total
1988			16800			16800
1989	+		16000	1900		17900
1990	+		15800	1000	200	17000
1991	+	100	19400	1600		21100
1992	500		18000	100	+	18600
1993			19000	1300	+	20300
1994	+	200	17400	1300	+	18900
1995	200	200	18000	100	+	18500
1996	1000	0	18600	1000		20600
1997	1300	0	18000	1400		20700
1998	+		19300	1200		20500
1999		200	17900	1300	+	19400
2000	573	228	18038	44	1	18884
2001	1359	219	17729			19307
2002	734		10550	257		11541
2003	800		10875	692	14	12381
2004	801	41	11024			11866
2005	821	150	8452	799		10222
2006			8530	518	5	9053
2007	581	248	8268	463	63	9623
2008	503	191	6853	291		7838
2009	364	135	5760			6259
2010	636	278	8406	325		9645

Year	France	Germany	Ireland	Netherlands	U.K.	Total
2011	241		11503	7		11751
2012	3	230	16132	3135		19500
2013		450	14785	832		16067
2014	244	578	17287	821		18930
2015		477	15798	1304	+	17579
2016		419	14584	1025	559	16587
2017		298	9627	648	64	10637
2018			4398	436		4834

* Added in 2014 after report of 1% discarding.

+ Designates catch of less than 0.5 tonnes.

Summary of the assessment

Table 10 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Assessment summary. All weights are in tonnes and recruitment is in thousands. High and Low refers to 95% confidence intervals.

Year ^	Recruitment at age (wr) 1	High	Low	SSB **	High	Low	Total Catch^	F at ages (wr) 2–5	High	Low
1958	432921	612710	253130	233325	342550	124110	22978	0.120	0.182	0.057
1959	1635380	1963250	1307550	220788	304665	136915	15086	0.104	0.149	0.060
1960	380345	497240	263460	208855	276378	141342	18283	0.118	0.155	0.082
1961	411312	517410	305210	175958	228534	123386	15372	0.113	0.144	0.083
1962	876079	1042450	709710	170916	215622	126218	21552	0.183	0.23	0.135
1963	417379	517860	316900	157804	196431	119169	17349	0.146	0.183	0.108
1964	1416300	1634710	1197890	176475	210611	142349	10599	0.092	0.115	0.068
1965	426955	527790	326110	180087	210937	149243	19126	0.134	0.166	0.103
1966	749003	886030	611970	174004	201257	146743	27030	0.193	0.24	0.149
1967	781200	919870	642530	166671	191114	142226	27658	0.22	0.27	0.169
1968	912571	1063020	762120	168961	191827	146093	30236	0.24	0.29	0.184
1969	468508	569090	367930	147456	167754	127166	44389	0.36	0.43	0.28
1970	253287	327092	179488	111593	128592	94588	31727	0.33	0.40	0.25
1971	827508	966020	689000	101635	115869	87411	31396	0.45	0.55	0.34
1972	283975	355408	212552	88827	101063	76591	38203	0.55	0.67	0.44
1973	330198	398160	262240	66939	76522	57356	26936	0.51	0.62	0.40
1974	162981	204696	121264	51969	59881	44057	19940	0.49	0.59	0.38
1975	205075	250421	159719	41249	47830	34668	15588	0.51	0.63	0.39
1976	229833	274648	185012	38230	44019	32441	9771	0.38	0.47	0.29
1977	187854	224950	150750	38727	44382	33072	7833	0.28	0.35	0.22
1978	147816	179446	116194	37387	43001	31773	7559	0.26	0.33	0.198
1979	281942	331470	232410	37090	42449	31731	10321	0.42	0.52	0.32
1980	169396	207988	130812	33959	39152	28766	13130	0.53	0.66	0.41
1981	471852	544982	398718	37537	42894	32180	17103	0.82	1.01	0.63
1982	736210	838030	634390	58759	66124	51394	13000	0.45	0.55	0.34
1983	797560	905690	689430	78168	87283	69053	24981	0.54	0.66	0.43
1984	678457	774659	582261	80971	90239	71703	26779	0.46	0.56	0.36
1985	654705	744445	564975	87319	96973	77665	20426	0.31	0.38	0.25
1986	667243	754187	580293	95648	105906	85388	25024	0.36	0.43	0.28
1987	1223210	1355010	1091390	108449	119588	97312	26200	0.38	0.46	0.30
1988	484625	552385	416855	112106	124069	100151	20447	0.22	0.27	0.177
1989	586679	664898	508462	98534	109209	87859	23254	0.28	0.34	0.22
1990	512524	585018	440022	91935	102325	81545	18404	0.24	0.29	0.191
1991	211557	253358	169762	73439	82441	64437	25562	0.37	0.45	0.30
1992	978544	1092610	864470	73225	81582	64869	21127	0.47	0.57	0.37
1993	365941	426133	305747	75914	84758	67070	18618	0.32	0.38	0.25
1994	780801	878486	683114	82712	91847	73577	19300	0.32	0.38	0.25
1995	733569	826644	640496	84144	93088	75200	23305	0.38	0.46	0.30
1996	358158	415861	300459	74460	82738	66182	18816	0.30	0.36	0.24
1997	379927	440430	319430	61708	68825	54591	20496	0.40	0.48	0.32
1998	254369	301109	207631	49665	55873	43457	18041	0.44	0.52	0.35

Year ^	Recruitment at age (wr) 1	High	Low	SSB **	High	Low	Total Catch^	F at ages (wr) 2–5	High	Low
1999	502744	574929	430551	43794	49322	38266	18485	0.61	0.73	0.48
2000	498757	571909	425611	44349	50189	38509	17191	0.60	0.73	0.48
2001	520736	600360	441120	44550	50891	38209	15269	0.50	0.61	0.39
2002	571806	661912	481708	57700	65859	49541	7465	0.195	0.24	0.148
2003	152742	190856	114624	46422	53632	39212	11536	0.28	0.35	0.22
2004	393483	469458	317502	43225	50950	35500	12743	0.36	0.45	0.27
2005	1169160	1376230	962170	60953	72121	49785	9494	0.27	0.35	0.200
2006	393857	478152	309568	75416	89604	61226	6944	0.118	0.150	0.085
2007	803252	958390	648110	78923	94029	63817	7636	0.117	0.148	0.085
2008	324154	400926	247374	93644	111624	75664	5872	0.070	0.089	0.051
2009	1108940	1306530	911270	106082	125084	87076	5745	0.068	0.086	0.049
2010	817497	974210	660790	114286	133481	95099	8370	0.090	0.113	0.066
2011	1041780	1231010	852590	123378	143359	103401	11470	0.116	0.145	0.086
2012	689412	832230	546590	112915	131682	94138	21820	0.22	0.28	0.169
2013	399890	505020	294760	100858	118721	82999	16247	0.187	0.24	0.139
2014	330244	427344	233136	79531	94526	64536	19574	0.28	0.35	0.21
2015	194060	265017	123103	53288	64618	41958	18355	0.38	0.49	0.28
2016	286552	385393	187707	35398	44708	26088	16318	0.58	0.76	0.40
2017	124377	181574	67186	21999	30211	13787	10767	0.64	0.90	0.38
2018	330242	569120	91360	22977	33251	12703	4418	0.33	0.50	0.166
2019	204340 ***			22787 *						

* From the short-term forecast

** SSB estimated at spawning time (1st October).

*** Stock-recruit relationship based on SSB₂₀₁₇ from the assessment output.

^ Assessment year (1 April–31 March).

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