

Herring (*Clupea harengus*) in subdivisions 30 and 31 (Gulf of Bothnia)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the Baltic Sea is applied, catches in 2022 that correspond to the F ranges in the plan are between 86 729 tonnes and 111 714 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (111 345 tonnes) can only be taken under conditions specified in the plan, whilst the entire range is considered precautionary when applying ICES advice rule.

Stock development over time

Fishing pressure on the stock is below F_{MSY} and spawning-stock size is above $MSY B_{trigger}$, B_{pa} , and B_{lim} .

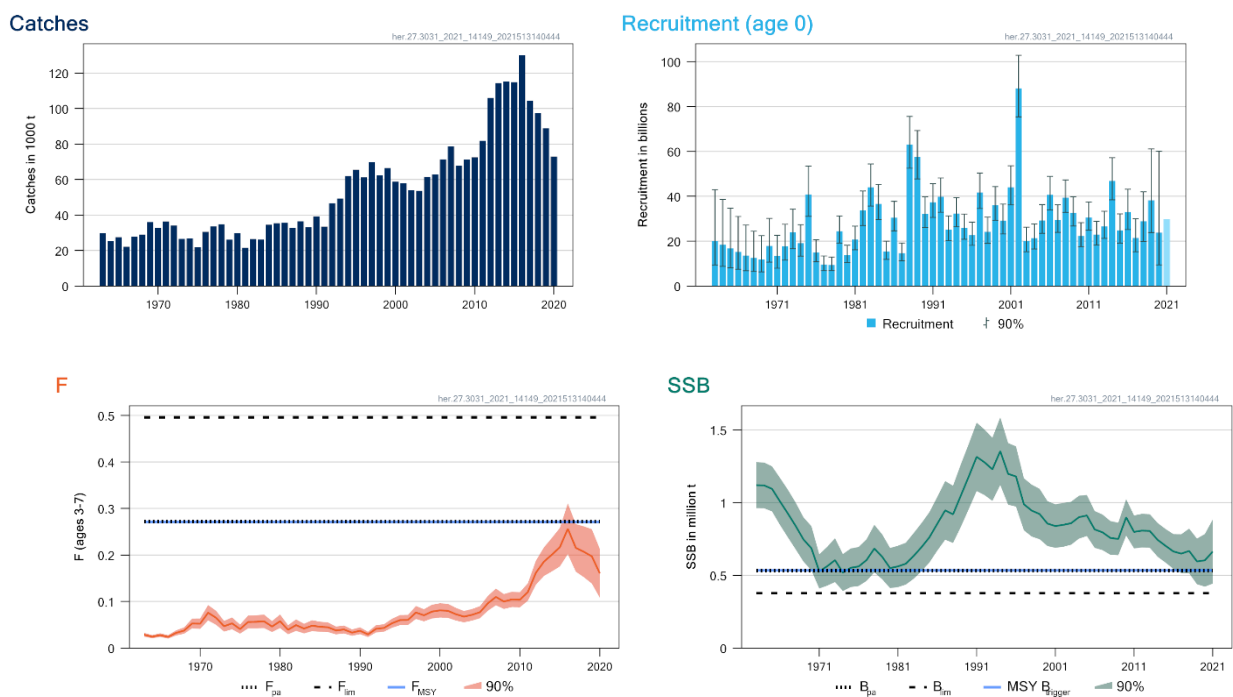


Figure 1 Catches from herring in subdivisions 30 and 31. The assumed recruitment value for 2021 is shaded in a lighter colour.

Catch scenarios

Table 1 Herring in subdivisions 30 and 31. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 3-7}$ (2021)	0.271	$F_{2021} = F_{MSY}$
SSB (2021)	663 182	Assessment estimates; tonnes
$R_{age\ 0}$ (2021–2023)	29 689 960	Average of recruitment (2011–2020); thousands
Total catch (2021)	117 485	Based on updated F_{MSY} advice for 2021; tonnes

Table 2 Herring in subdivisions 30 and 31. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2022)	F (2022)	SSB (2022)*	SSB (2023)	% SSB change **	% Advice change ***
ICES advice basis						
EU MAP ^{^^^} : F_{MSY}	111345	0.271	598969	579522	-3.2	-5.2
EU MAP ^{^^^} : F_{lower}	86729	0.206	599117	608030	1.5	-5.2 [^]
EU MAP ^{^^^} : F_{upper}	111714	0.272	600221	581962	-3.0	-5.2 ^{^^}
Other scenarios						
F_{MSY}	111345	0.271	598969	579522	-3.2	-5.2
$F = 0$	0	0	605437	688221	14	-100
$F = F_{pa}$	111714	0.272	600221	581962	-3.0	-4.9
$F = F_{lim}$	187695	0.496	600820	505496	-16	60
$SSB(2023) = B_{lim}$	331309	1.06	601324	368407 [#]	-39	182
$SSB(2023) = B_{pa}$	171191	0.44	602045	523586 [#]	-13	46
$SSB(2023) = MSY B_{trigger}$	171191	0.44	602045	523586 [#]	-13	46
$SSB(2023) = SSB(2022)$	90018	0.21	599960	601967 [#]	0.33	-23
$F = F_{2021}$	111345	0.27	598969	579522	-3.2	-5.2

* Based on stochastic calculations.

** SSB 2023 relative to SSB 2022.

*** Advice value in 2022 relative to advice value for EU MAP: F_{MSY} 2021 (117 485 tonnes, updated in May 2021).

[^] Advice value for 2022 relative to advice value for EU MAP: F_{lower} 2021 (91 494 tonnes, updated in May 2021).

^{^^} Advice value for 2022 relative to advice value for EU MAP: F_{upper} 2021 (117 875 tonnes, updated in May 2021).

^{^^^} MAP multiannual plan (EU, 2016).

[#] Based on stochastic forecasts, using the F with three decimals getting the closest to the biomass target. $SSB(2023) = B_{lim}$: -2.2%; $SSB(2023) = B_{pa} = MSY B_{trigger}$: -1.9%; $SSB(2023) = SSB(2022)$: 0.33%.

Basis of the advice

Table 3 Herring in subdivisions 30 and 31. The basis of the advice.

Advice basis	EU Baltic multiannual plan
Management plan	An EU multiannual plan (MAP) in place for stocks in the Baltic Sea includes herring (EU, 2016, 2019). The advice, based on the F_{MSY} ranges used in the management plan, is considered precautionary.

Quality of the assessment

The stock was benchmarked in 2021 (ICES, 2021a), where the stock assessment model and reference points were revised. Revisions were made to input data, including survey information, which was quality assured.

This stock was downgraded from category 1 to category 3 in 2019 and then to category 5 in 2020; historical assessment results are not shown in Figure 2 for these three years.

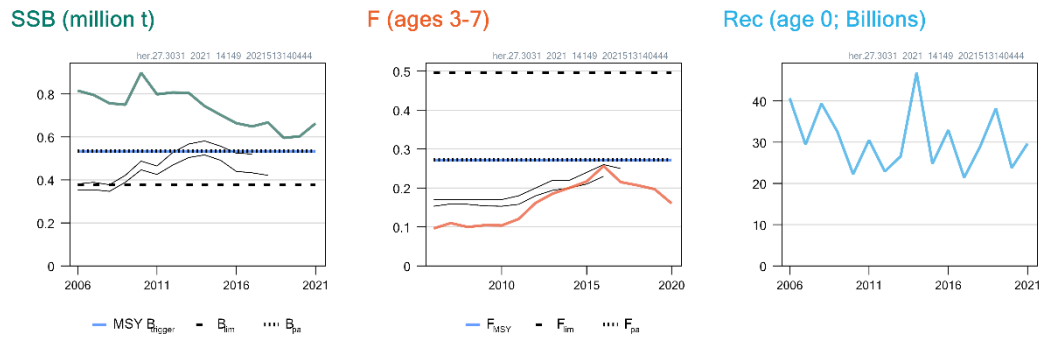


Figure 2 Herring in subdivisions 30 and 31. Historical assessment results (final-year recruitment estimates included). The reference points were revised in 2021 following a benchmark, and only assessment results from the last year should be compared to the reference points indicated.

Issues relevant for the advice

Following the benchmark, the stock status was changed from category 5 to category 1. This has changed the basis for the advice – from that based on scaling recent catches with a precautionary reduction (in 2019) to that based on F_{MSY} from a new assessment which gives a different perspective of the scale of SSB over time.

The advice for 2021 has been updated because of a special request for advice being received after the 2021 benchmark (ICES, 2021a).

The agreed TAC for 2021 at the time of the release of the present advice (65 018 tonnes) is much lower than the updated 2021 catch advice (117 485 tonnes). In the forecast it is assumed that the TAC will be increased in line with the revised advice (117 485 tonnes) and that this level of catch will be taken in 2021. If the realized catches are significantly different from the assumption in the forecast, the catch forecast presented here can be revised.

Reference points

Table 4 Herring in subdivisions 30 and 31. Reference points, values, and their technical basis. Weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	533 515	B_{pa}	ICES (2021b)
	F_{MSY}	0.271	Stochastic simulations (EqSim) with segmented regression fixed at B_{pa}	ICES (2021c)
Precautionary approach	B_{lim}	376 571	$B_{lim} = B_{pa}/\exp(1.645 * \sigma)$, $\sigma = 0.212$ (variance in SSB 2020)	ICES (2021b)
	B_{pa}	533 515	$B_{pa} = B_{loss}$ (lowest observed SSB during 1980–2019)	ICES (2021b)
	F_{lim}	0.496	The F that on average leads to B_{lim} from EqSim	ICES (2021c)
	F_{pa}	0.272	F_{P05} . The F that leads to $SSB \geq B_{lim}$ with 95% probability	ICES (2021c)
Management plan	MAP MSY $B_{trigger}$	533 515	MSY $B_{trigger}$	ICES (2021b)
	MAP B_{lim}	376 571	B_{lim}	ICES (2021b)
	MAP F_{MSY}	0.271	F_{MSY}	ICES (2021c)
	MAP target range $F_{lower}-F_{MSY}$	0.206–0.271	Consistent with the ranges which result in no more than a 5% reduction in long-term yield compared to F_{MSY}	ICES (2021c)
	MAP target range $F_{MSY}-F_{upper}$	0.271–0.272	Consistent with the ranges which result in no more than a 5% reduction in long-term yield compared to F_{MSY}	ICES (2021c)

Basis of the assessment

Table 5 Herring in subdivisions 30 and 31. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2021d).
Assessment type	Age-based analytical assessment, Stock Synthesis (ICES, 2021c)
Input data	Commercial catches (since 1963); two tuning fleets: one acoustic survey, since 2007 (BIAS, A1588) and one commercial survey, 1990–2006 (trapnet). Annual maturity data from Finnish commercial trawl catches before spawning; age-specific natural mortalities, constant through time.
Discards and bycatch	Not included; discarding and bycatch are considered negligible
Indicators	None
Other information	Last benchmarked in 2021 (ICES, 2021b)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

History of the advice, catch, and management

Table 6a Herring in subdivisions 30 and 31. ICES advice, TAC, and catches. All weights are in tonnes.

Year	ICES advice for Subdivision 30	ICES advice for Subdivision 31	Catch corresponding to advice	Agreed TAC*	ICES catch
1987	Not available	Not available			32628
1988	Not available	Not available			36418
1989	Not available	Not available			33086
1990	Not available	Not available			39180
1991	TAC for the eastern part of the subdivision, allowance for the western part	TAC for the eastern part of the subdivision, allowance for the western part	41000	84000	33419
1992	<i>Status quo</i> F	<i>Status quo</i> F	47000	84000	46610
1993	<i>Status quo</i> F	Increase in yield by increasing F	39000	90000	49314
1994	No specific advice	Increase in yield by increasing F	41000	90000	61986
1995	TAC	Increase in yield by increasing F	91400	110000	65547
1996	TAC	Increase in yield by increasing F	91400	110000	61303
1997	$F(97) = 1.4 \times F(95)$	Increase in yield by increasing F	78000	110000	69808
1998	<i>Status quo</i> F	Increase in yield by increasing F	50000	110000	62474
1999	Reduce catches	Increase in yield by increasing F	-	94000	66502
2000	Reduce catches	Increase in yield by increasing F	-	85000	58852
2001	$F_{pa} = 0.21$	Exploitation rate should not be increased	36000	72000	57806
2002	F below F_{pa}	Exploitation rate should be decreased	53000	64000	53969
2003	F below F_{pa}	No increase in catches	53000	60000	53644
2004	F below F_{pa}	No increase in catches	53000	61200	61423
2005	F below F_{pa}	No increase in catches	63700	64000	62911
2006	F below F_{pa}	Less than average catches (2002–2004)	92600/97600	91600	71318
2007	F below F_{pa}	Less than average catches (2002–2005)	88100	82800	78678
2008	F below F_{pa}	No increase in catches	70300	87000	67914
2009	Same advice as last year	Same advice as last year	70300	82700	71248
2010	F below F_{pa}	Same advice as last year	112600	103300	72590
2011	F below F_{pa}	No basis for advice	118000	104400	81850
2012	MSY framework	No increase in catches	107000	106000	106007

Year	ICES advice for Subdivision 30	ICES advice for Subdivision 31	Catch corresponding to advice	Agreed TAC*	ICES catch
2013	MSY framework (F_{MSY})	Reduce catches by more than 20%	99100	106000	114396
2014	MSY approach (F_{MSY})	Increase catches by no more than 20%	142300	138000	115366
2015	MSY approach (F_{MSY})	Increase catches by no more than 20%	186434	158470	114942
2016	MSY approach ($F_{MSY} = 0.15$)	Precautionary approach ($\leq 20\%$ increase in catch)	103254	103254	130029
2017	MSY approach ($F_{MSY} = 0.15$)	Precautionary approach	140998	140998	104358

* TAC for subdivisions 29N, 30, and 31 (IBSFC Management Unit 3), and from 2005 for subdivisions 30 and 31.

Table 6b Herring in subdivisions 30 and 31. ICES advice, TAC, and catches. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
2018	MSY approach ($F_{MSY} = 0.21$)	≤ 95566	84599	97366
2019	MSY approach ($F_{MSY} = 0.21$)	≤ 88703	88703	88907
2020	Precautionary approach	≤ 65018	65018	72956
2021	Management plan	117 485 (range 91 494–117 875)*	65018**	
2022	Management plan	111 345 (range 86 729 – 111 714)		

*Advised catch value for 2021 (previously 65 018 tonnes), updated in May 2021.

** Agreed TAC following the former advice.

History of the catch and landings

Table 7 Herring in subdivisions 30 and 31. Catch distribution by fleet in 2020, as estimated by ICES.

Catch (2020)	Landings			Discards
	94.3 % trawls	4.8 % trapnets	0.9 % gillnets	
72 956 tonnes	72 956 tonnes			Discarding is negligible

Table 8 Herring in subdivisions 30 and 31. History of ICES commercial catches by subdivision (SD) for each country participating in the fishery. All weights are in tonnes.

Year	Finland		Sweden		Total		Grand total
	SD 30	SD 31	SD 30	SD 31	SD 30	SD 31	
1980	18758	8899	1392	760	20150	9659	29809
1981	12410	7206	1290	620	13700	7826	21526
1982	16117	7982	1730	670	17847	8652	26499
1983	16104	7011	2397	696	18501	7707	26208
1984	23228	8322	2401	594	25629	8916	34545
1985	24235	8595	1885	717	26120	9312	35432
1986	23988	8754	2501	336	26489	9090	35579
1987	22615	7788	1905	320	24520	8108	32628
1988	24478	8501	3172	267	27650	8768	36418
1989	25453	4005	3205	423	28658	4428	33086
1990	28815	7603	2467	295	31282	7898	39180
1991	23219	6800	3000	400	26219	7200	33419
1992	35610	6900	3700	400	39310	7300	46610
1993	36600	8752	3579	383	40179	9135	49314
1994	53860	5195	2520	411	56380	5606	61986
1995	58806	3898	2280	563	61086	4461	65547
1996	54372	5080	1737	114	56109	5194	61303
1997	63532	4195	1995	86	65527	4281	69808
1998	54115	5358	2777	224	56892	5582	62474
1999	60483	3909	1862	248	62345	4157	66502
2000	54886	2479	1374	113	56260	2592	58852
2001	52987	2755	1997	67	54984	2822	57806

Year	Finland		Sweden		Total		Grand total
	SD 30	SD 31	SD 30	SD 31	SD 30	SD 31	
2002	46315	3532	3903	219	50218	3751	53969
2003	45932	3855	3707	150	49639	4005	53644
2004	50236	5831	5214	142	55450	5973	61423
2005	55422	4800	2520	169	57942	4969	62911
2006	66962	2684	1403	269	68365	2953	71318
2007	72116	2992	3317	253	75433	3245	78678
2008	61756	2309	3674	175	65430	2484	67914
2009	64881	2166	3992	209	68873	2375	71248
2010	68760	1898	1755	177	70515	2075	72590
2011	75130	3218	3370	132	78500	3350	81850
2012	94248	5206	6392	161	100640	5367	106007
2013	98935	4486	10849	126	109784	4612	114396
2014	97779	4637	12755	195	110534	4832	115366
2015	96414	4370	14001	157	110415	4527	114942
2016	103432	4371	22067	159	125499	4530	130029
2017	90490	3068	10672	127	101162	3195	104358
2018	78770	2100	16 210	286	94980	2386	97366
2019	71113	2130	15473	190	86586	2320	88907
2020	59357	1187	12082	330	71439	1517	72956

Summary of the assessment

Table 9 Herring in subdivisions 30 and 31. Assessment summary. Weights are in tonnes. Recruitment in thousands.

Year	Recruitment			SSB*			Total Catch	F		
	Age 0	95%	5%	SSB	95%	5%		Ages 3–7	95%	5%
	thousands			tonnes			tonnes			
1963	20042700	42909495	9361793	1120390	1278714	962066	29739	0.028	0.032	0.024
1964	18345200	38611686	8716179	1118500	1275924	961076	25204	0.024	0.028	0.021
1965	16755300	34686095	8093736	1094410	1249470	939350	27541	0.028	0.032	0.024
1966	15211300	30993690	7465508	1008850	1170713	846987	22164	0.024	0.028	0.020
1967	13569300	27173263	6775995	925738	1089548	761928	27772	0.032	0.038	0.027
1968	12502200	24413368	6402435	839426	1000324	678528	28966	0.037	0.044	0.031
1969	11893200	22446431	6301590	745927	898132	593722	35996	0.053	0.063	0.042
1970	17882800	30125008	10615583	686162	838067	534257	32790	0.052	0.063	0.041
1971	13382600	22614428	7919457	526683	644273	409093	36347	0.076	0.092	0.059
1972	17808000	27527364	11520350	562187	695470	428904	34092	0.065	0.080	0.050
1973	23848400	34275363	16593440	604242	755187	453297	26507	0.047	0.058	0.035
1974	19106300	27376785	13334316	518804	646041	391567	26776	0.053	0.066	0.040
1975	40777900	53533221	31061780	551700	684392	419008	21811	0.041	0.050	0.031
1976	14930800	20599883	10821847	560580	694895	426265	30520	0.056	0.070	0.042
1977	9577780	13388299	6851794	604148	747400	460896	33634	0.056	0.070	0.042
1978	9400640	12869628	6866712	684082	847662	520502	34873	0.057	0.072	0.043
1979	24405900	31191892	19096243	626874	781396	472352	26109	0.046	0.058	0.034
1980	13724500	18129907	10389568	549730	687815	411645	29809	0.057	0.072	0.043
1981	20733600	26676418	16114688	561098	703401	418795	21526	0.039	0.049	0.029
1982	33777200	42349558	26940051	579980	723969	435991	26499	0.049	0.061	0.037
1983	44027800	54398285	35634343	633687	791129	476245	26208	0.042	0.052	0.031
1984	36592000	45324750	29541795	694068	859397	528739	34545	0.048	0.060	0.036
1985	15387700	19996532	11841119	761597	934862	588332	35432	0.046	0.057	0.035
1986	30432600	37689574	24572927	854736	1039583	669889	35579	0.045	0.055	0.034
1987	14645200	19138802	11206652	946747	1148513	744981	32628	0.038	0.046	0.029
1988	62998900	75576437	52514535	919398	1116283	722513	36418	0.040	0.048	0.031
1989	57505900	69286126	47728581	1049680	1265015	834345	33086	0.033	0.040	0.026
1990	32177500	39707485	26075474	1180220	1404381	956059	39180	0.037	0.044	0.030
1991	37347400	45664647	30545036	1314930	1550399	1079461	33419	0.029	0.035	0.024

Year	Recruitment			SSB*			Total Catch	F		
	Age 0	95%	5%	SSB	95%	5%		Ages 3–7	95%	5%
	thousands			tonnes			tonnes			
1992	39778500	48155901	32858466	1277320	1502761	1051879	46610	0.041	0.049	0.033
1993	25092500	31288489	20123489	1229060	1446279	1011841	49314	0.043	0.051	0.035
1994	32287800	39463599	26416800	1354170	1586972	1121368	61986	0.053	0.063	0.044
1995	25833100	32054468	20819221	1197740	1410096	985384	65547	0.060	0.071	0.049
1996	22709800	28491945	18101081	1179880	1386984	972776	61303	0.060	0.071	0.049
1997	41708700	50346200	34553068	988876	1167915	809837	69808	0.076	0.090	0.062
1998	24160500	30725424	18998265	945061	1123644	766478	62474	0.070	0.083	0.057
1999	36018700	44304241	29282677	921555	1094880	748230	66502	0.078	0.093	0.063
2000	29106600	36505376	23207381	855817	1010414	701220	58852	0.081	0.096	0.065
2001	44024300	53614113	36149791	838760	988278	689242	57806	0.080	0.095	0.065
2002	88089100	102861248	75438415	847048	997804	696292	53969	0.073	0.086	0.059
2003	20017400	26224694	15279351	858220	1006125	710315	53644	0.067	0.080	0.055
2004	21364200	27718237	16466741	899777	1047330	752224	61423	0.071	0.084	0.059
2005	29210000	36297711	23506278	911411	1052754	770068	62911	0.077	0.090	0.064
2006	40683600	48874780	33865223	815494	942211	688777	71318	0.096	0.112	0.080
2007	29437900	36237534	23914154	795393	917962	672824	78678	0.110	0.128	0.092
2008	39391500	47339103	32778194	756804	872813	640795	67914	0.100	0.116	0.084
2009	32614800	39774559	26743858	750026	861865	638187	71248	0.104	0.121	0.088
2010	22225700	28200776	17516601	898799	1024222	773376	72590	0.104	0.120	0.088
2011	30526100	37463127	24873599	798376	911837	684915	81850	0.120	0.139	0.102
2012	22906900	28837307	18196084	807161	922799	691523	106007	0.162	0.187	0.136
2013	26605500	33319166	21244608	804867	920138	689596	114396	0.185	0.22	0.155
2014	46862800	57212139	38385595	743725	860050	627400	115366	0.20	0.24	0.165
2015	24770400	32142657	19089048	703018	818601	587435	114942	0.22	0.26	0.175
2016	32958300	43166963	25163909	664108	783619	544597	130029	0.26	0.31	0.20
2017	21415300	29998801	15287780	648924	782246	515602	104358	0.22	0.27	0.164
2018	28864300	41964475	19853645	667541	821012	514070	97366	0.21	0.26	0.152
2019	38197600	61125444	23869874	595463	752692	438234	88907	0.197	0.26	0.139
2020	23792400	60100201	9418909	602967	783942	421992	72956	0.160	0.21	0.108
2021	29689960**			663182	883600	442764				

* 1 January.

** Average of years 2011–2020.

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[Download the stock assessment data and figures.](#)

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