

Herring (*Clupea harengus*) in Subdivision 28.1 (Gulf of Riga)

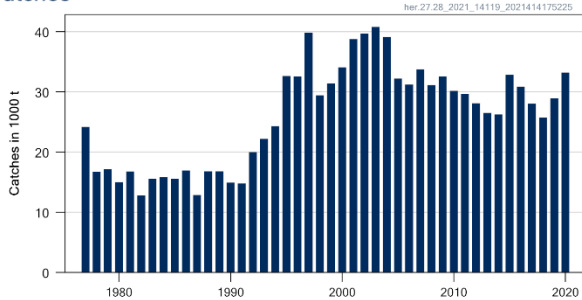
ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the Baltic Sea is applied, the catches in 2022 that correspond to the F ranges in the plan are between 34 797 tonnes and 52 132 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (44 945 tonnes) can only be taken under conditions specified in the plan, whilst the entire range is considered precautionary when applying ICES advice rule. This advice applies to all catches from the stock in subdivisions 28.1 and 28.2.

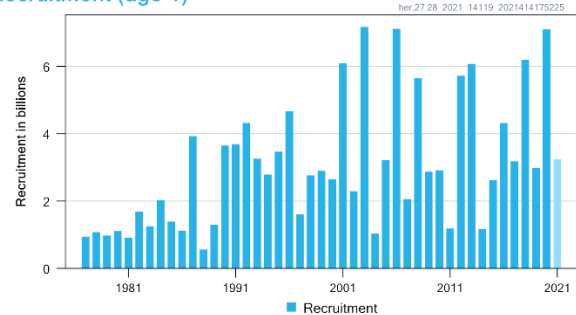
Stock development over time

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

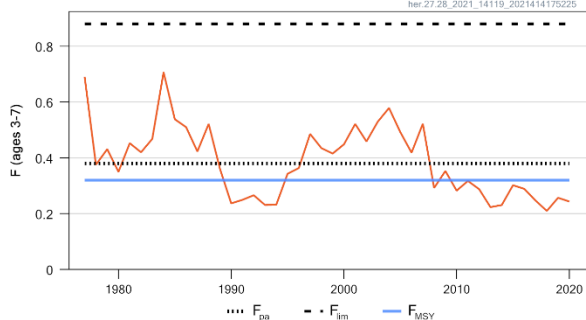
Catches



Recruitment (age 1)



F



SSB

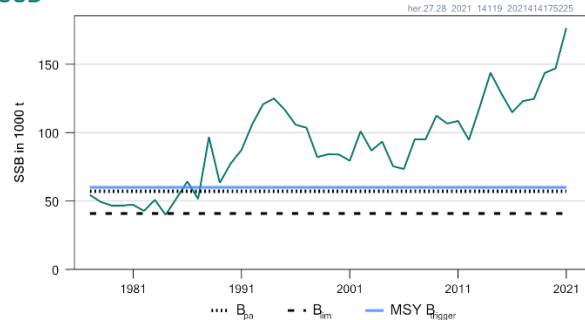


Figure 1 Herring in Subdivision 28.1. Summary of the stock assessment. The assumed recruitment for 2021 is shaded in a lighter colour. SSB at spawning time in 2021 is predicted.

Catch scenarios

Table 1 Herring in Subdivision 28.1. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 3-7}$ (2021)	0.24	F based on catch constraint
SSB (2021)	176560	Projected SSB at spawning time; tonnes
$R_{age\ 1}$ (2021–2023)	3243312	Geometric mean of year classes 1989–2018; thousands
Total catch (2021)	35 771	Catch constraint of 35 771 tonnes*

* Catch constraint in 2021: TAC for Gulf of Riga management area (39 446 tonnes) + Gulf of Riga herring caught in the central Baltic (514 tonnes) – central Baltic herring caught in the Gulf of Riga (4189) tonnes = 35 771 tonnes.

Table 2 Herring in Subdivision 28.1. 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}	44 945	0.32	167 666	147 612	-12%	26%
EU MAP *: F_{lower}	34 797	0.24	170 010	158 979	-6.5%	26%^
EU MAP *: F_{upper}	52 132	0.38	165 931	139 671	-16%	26%^
Other scenarios						
F_{MSY}	44 945	0.32	167 666	147 612	-12%	26%
$F = 0$	0	0	177 244	199 221	12%	-100%
$F = F_{pa}$	52 132	0.38	165 931	139 671	-16%	46%
$F = F_{lim}$	100 226	0.88	152 173	89 128	-41%	180%
Advice for 2022 limited by +20% [§]	42 925	0.30	168 143	149 861	-11%	20%
SSB (2023) = SSB (2022)	21 992	0.146	172 805	173 567	0.44%	-39%
SSB (2023) = B_{lim}	152 363	1.81	129 575	40 800	-69%	326%
SSB (2023) = B_{pa}	133 758	1.40	139 098	57 100	-59%	274%
SSB (2023) = MSY $B_{trigger}$	130 579	1.34	140 527	60 000	-57%	265%
$F = F_{2021}$	35 242	0.24	169 909	158 477	-6.7%	-1.48%

* MAP multiannual plan (EU, 2016).

** SSB 2023 relative to SSB 2022.

*** Total catch in 2022 relative to ICES advice for 2021 (35 771 tonnes for the Gulf of Riga herring stock).

^ ICES advice for F_{lower} for 2022 relative to ICES advice for F_{lower} for 2021 (27 702 tonnes).

^^ ICES advice for F_{upper} for 2022 relative to ICES advice for F_{upper} for 2021 (41 423 tonnes).

§ Advised catch given for 2022 limited by a 20% increase.

The catch advice for 2022 is higher due to the strong 2019 year class.

Basis of the advice

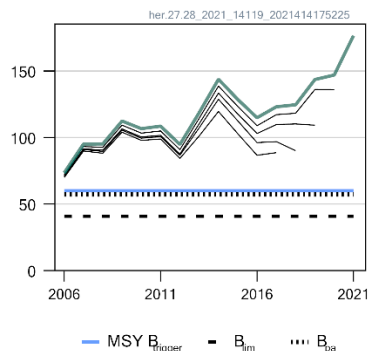
Table 3 Herring in Subdivision 28.1. The basis of the advice.

Advice basis	EU Baltic multiannual plan
Management plan	The 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.

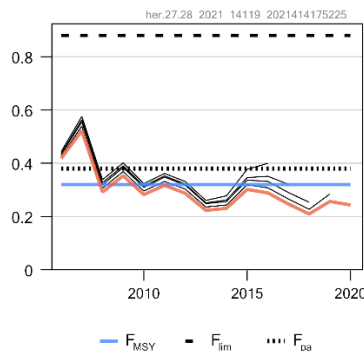
Quality of the assessment

Historical assessments have generally shown an overall upward revision in SSB and a downward revision in fishing mortality. The reasons for both these trends are not fully understood.

SSB (1000 t)



F (ages 3-7)



Rec (age 1; Billions)

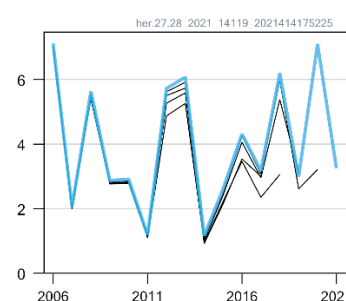


Figure 2 Herring in Subdivision 28.1. Historical assessment results. (Recruitment in the final year is based on a geometric mean assumption.)

Issues relevant for the advice

The assessment and the advice take account of all of the Gulf of Riga herring stock, both that harvested in the Gulf of Riga and that harvested outside of it. The TAC proposed for the Gulf of Riga area is based on the advised catch for the Gulf of Riga herring stock, plus the assumed catch of central Baltic herring harvested in the Gulf of Riga, minus the assumed catch of Gulf of Riga herring taken outside the Gulf of Riga. The values of the two latter are given by the average over the last five years.

1. Central Baltic herring assumed to be taken in the Gulf of Riga in 2022 (Subdivision 28.1) is 3448 tonnes (average 2016–2020).
2. Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2022 is 696 tonnes (average 2016–2020).

As an example, following ICES MSY approach (here identical to the MAP F_{MSY}), catches from the Gulf of Riga herring stock in 2022 should be no more than 44 945 tonnes. The corresponding TAC in the Gulf of Riga management area for 2022 would be calculated as: 44 945 tonnes – 696 tonnes + 3448 tonnes = 47 697 tonnes.

Reference points

Table 4 Herring in Subdivision 28.1. Reference points, values, and their technical basis. Weights in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	60 000	From stock–recruitment relationship	ICES (2009, 2015)
	F_{MSY}	0.32	Stochastic simulations with Beverton, Ricker, and segmented regression stock–recruitment model from the full time-series (1977–2013)	ICES (2015)
Precautionary approach	B_{lim}	40 800	$B_{lim} = B_{loss}$	ICES (2015)
	B_{pa}	57 100	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$ with the default value $\sigma = 0.2$.	ICES (2015)
	F_{lim}	0.88	F_{lim} derived from the curve of SSB/R against F	ICES (2015)
	F_{pa}	0.38	F_{p05} . The F that leads to $SSB \geq B_{lim}$ with 95% probability	ICES (2021a)
Management plan	MAP MSY $B_{trigger}$	60 000	MSY $B_{trigger}$	EU (2016 – Annex II column A)
	MAP B_{lim}	Not defined		EU (2016 – Annex II column B)
	MAP F_{MSY}	0.32	F_{MSY}	EU (2016 – Annex I columns A and B)
	MAP target range $F_{lower} - F_{MSY}$	0.24–0.32	Consistent with the ranges provided by ICES (2015), resulting in no more than 5% reduction in long-term yield compared with MSY	ICES (2015) and EU (2016 – Annex I column A)
	MAP target range $F_{MSY} - F_{upper}$	0.32–0.38	Consistent with the ranges provided by ICES (2015), resulting in no more than 5% reduction in long-term yield compared with MSY	ICES (2015) and EU (2016 – Annex I column B)

Basis of the assessment

Table 5 Herring in Subdivision 28.1. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2021b)
Assessment type	Age-based analytical assessment XSA (ICES, 2021a) that uses catches in the model and in the forecast
Input data	Commercial catches; one acoustic survey index (GRAHS, A2217); one commercial CPUE index (trapnets); fixed maturity ogive; natural mortality is assumed to be constant at 0.2 for all years except 1979–1983, when it was 0.25
Discards and bycatch	Not included, considered negligible
Indicators	None
Other information	The latest benchmark was performed in 2008 (ICES, 2008)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

History of the advice, catch, and management

Table 6 Herring in Subdivision 28.1. ICES advice, TAC for the Gulf of Riga, and catches of Gulf of Riga herring stock from the Gulf of Riga. All weights are in tonnes.

Year	ICES advice	Catch from stock corresp. to advice	Agreed TAC for Gulf of Riga	Catches of Gulf of Riga herring stock
1987	Reduce F towards $F_{0.1}$	8000	-	12884
1988	Reduce F towards $F_{0.1}$	6000	-	16791
1989	F should not exceed present level	20000	-	16783
1990	F should not exceed present level	20000	-	14931
1991	No separate advice for this stock	-	-	14791
1992	No separate advice for this stock	-	-	20000
1993	No separate advice for this stock	-	-	22200
1994	No separate advice for this stock	-	-	24300
1995	No separate advice for this stock	-	-	32656
1996	No separate advice for this stock	-	-	32584
1997	Current exploitation rate within safe biological limits	35000	-	39843
1998	Current exploitation rate within safe biological limits	35000	-	29443
1999	Current exploitation rate within safe biological limits	34000	-	31403
2000	Current exploitation rate within safe biological limits	37000	-	34069
2001	Current exploitation rate within safe biological limits	34100	-	38785
2002	Current exploitation rate within safe biological limits	33200	-	39701
2003	F below F_{pa}	< 41000	41000	40803
2004	$F = F_{sq}$	39000	39300	39115
2005	$F = F_{sq}$	35300	38000	32225
2006	$F = F_{pa}$	39900	40000	31232
2007	$F = F_{pa}$	33900	37500	33742
2008	$F < F_{pa}$	< 30100	36100	31137
2009	$F < F_{pa}$	< 31500	34900	32554
2010	$F < F_{pa}$	< 33400	36400	30174
2011	$F < F_{pa}$	< 33000	32700	29639
2012	MSY transition	< 25500	30600	28115
2013	MSY framework	< 23200	30600	26511
2014	MSY	< 25800	30700	26253
2015	MSY ($F_{MSY} = 0.35$)	< 34300	38800	32851
2016	MSY approach ($F_{MSY} = 0.32$)	≤ 26200	34900	30865
2017	MSY approach ($F_{MSY} = 0.32$)	≤ 23100	31100	28058

Year	ICES advice	Catch from stock corresp. to advice	Agreed TAC for Gulf of Riga	Catches of Gulf of Riga herring stock
2018	MAP target F ranges: F_{lower} to F_{upper} (0.24–0.38), but F higher than $F_{MSY} = 0.32$ only under conditions specified in the MAP	19396–29195, but catch higher than 24919 only under conditions specified in the MAP	28999	25747
2019	MAP target F ranges: F_{lower} to F_{upper} (0.24–0.38), but F higher than $F_{MSY} = 0.32$ only under conditions specified in the MAP	20664–31237, but catch higher than 26932 only under conditions specified in the MAP	31044	28922
2020	MAP target F ranges: F_{lower} to F_{upper} (0.24–0.38), but F higher than $F_{MSY} = 0.32$ only under conditions specified in the MAP	23395–35094, but catch higher than 30382 only under conditions specified in the MAP	34445	33215
2021	Management Plan	35771 (ranges 27702–41423)	39446	
2022	Management Plan	44945 (range 34797–52132)		

History of the catch and landings

Table 7 Herring in Subdivision 28.1. Catch distribution by fleet in 2020 as estimated by ICES.

Total herring catch in the Gulf of Riga management area (2020)	Total catch of stock (2020)	Landings		Discards
		Trawls 79%	Trapnets 21%	
33249 tonnes	33215 tonnes	33215 tonnes		Discarding is considered to be negligible

Table 8 Herring in Subdivision 28.1. ICES estimates of total catches of herring in the Gulf of Riga by country. All weights are in tonnes.

Year	Estonia	Latvia	Unallocated landings	Total
1991	7410	13481	-	20891
1992	9742	14204	-	23946
1993	9537	13554	2209	25300
1994	9636	14050	3514	27200
1995	16008	17016	3332	36356
1996	11788	17362	3534	32684
1997	15819	21116	4308	41243
1998	11313	16125	3305	30743
1999	10245	20511	3077	33803
2000	12514	21624	2631	36769
2001	14311	22775	3399	40485
2002	16962	22441	3398	42801
2003	19647	21780	3276	44703
2004	18218	20903	3094	42215
2005	11213	19741	3071	34025
2006	11924	19186	2922	34032
2007	12764	19425	2953	35142
2008	15877	19290	1970	37137
2009	17167	18323	1864	37354
2010	15422	17751	1791	34974
2011	14721	20218	-	35039
2012	13789	17926	-	31715
2013	11898	18413	-	30311

Year	Estonia	Latvia	Unallocated landings	Total
2014	10541	20012	-	30553
2015	16509	21010	-	37519
2016	15814	19066	-	34880
2017	13772	17948	-	31720
2018	12521	16904	-	29424
2019	13320	17961	-	31281
2020	12231	21019	-	33249

Table 9 Herring in Subdivision 28.1. Total catches (in tonnes) in the Gulf of Riga by stock and of the Gulf of Riga herring stock by area.

Year	Catches in the Gulf of Riga			Gulf of Riga herring catches	
	Gulf of Riga herring	Central Baltic herring	Total	In the central Baltic	Total
1977	24186	2400	26586	-	24186
1978	16728	6300	23028	-	16728
1979	17142	4700	21842	-	17142
1980	14998	5700	20698	-	14998
1981	16769	5900	22669	-	16769
1982	12777	4700	17477	-	12777
1983	15541	4800	20341	-	15541
1984	15843	3800	19643	-	15843
1985	15575	4600	20175	-	15575
1986	16927	1300	18227	-	16927
1987	12884	4800	17684	-	12884
1988	16791	3000	19791	-	16791
1989	16783	5900	22683	-	16783
1990	14931	6000	20931	-	14931
1991	14791	6100	20891	-	14791
1992	18700	3500	23946	1300	20000
1993	21000	4300	25300	1200	22200
1994	22200	5000	27200	2100	24300
1995	30256	6100	36356	2400	32656
1996	28284	4400	32684	4300	32584
1997	36943	4300	41243	2900	39843
1998	26643	4100	30743	2800	29443
1999	29503	4300	33803	1900	31403
2000	32169	4600	36769	1900	34069
2001	37585	2900	40485	1200	38785
2002	39301	3500	42801	400	39701
2003	40403	4300	44703	400	40803
2004	38915	3300	42215	200	39115
2005	31725	2300	34025	500	32225
2006	30832	3200	34032	400	31232
2007	33642	1500	35142	100	33742
2008	31037	6100	37137	100	31137
2009	32454	4900	37354	100	32554
2010	29774	5200	34974	400	30174
2011	29539	5500	35039	100	29639
2012	27915	3800	31715	200	28115
2013	26211	4100	30311	300	26511
2014	26053	4500	30553	200	26253
2015	32551	4968	37519	316	32851
2016	30565	4315	34880	289	30865
2017	27824	3896	31720	234	28058
2018	25217	4208	29424	530	25747
2019	27721	3560	31281	1200	28922
2020	31986	1264	33249	1229	33215

Summary of the assessment

Table 10 Herring in Subdivision 28.1. Assessment summary. Weights are in tonnes; recruitment in thousands.

Year	Recruitment (age 1)	SSB*	Catches	F (ages 3–7)
1977	943222	54522	24186	0.69
1978	1076482	49356	16728	0.38
1979	976944	46739	17142	0.43
1980	1110340	46712	14998	0.35
1981	908421	47221	16769	0.45
1982	1689000	42758	12777	0.42
1983	1253653	50858	15541	0.47
1984	2027213	39914	15843	0.71
1985	1388054	51937	15575	0.54
1986	1120343	64284	16927	0.51
1987	3928624	51522	12884	0.42
1988	560967	96701	16791	0.52
1989	1292385	63293	16783	0.36
1990	3645492	77332	14931	0.24
1991	3689914	87277	14791	0.25
1992	4319311	106141	20000	0.27
1993	3257248	120787	22200	0.23
1994	2788376	124965	24300	0.23
1995	3469542	116708	32656	0.34
1996	4668037	105795	32584	0.36
1997	1598978	103574	39843	0.49
1998	2763269	82140	29443	0.43
1999	2897394	84194	31403	0.42
2000	2645554	84025	34069	0.45
2001	6088728	79443	38785	0.52
2002	2291719	101021	39701	0.46
2003	7172071	86918	40803	0.53
2004	1034657	93406	39115	0.58
2005	3216351	75411	32225	0.49
2006	7116258	73416	31232	0.42
2007	2057771	95052	33742	0.52
2008	5641770	95083	31137	0.29
2009	2874764	112381	32554	0.35
2010	2915262	106631	30174	0.28
2011	1188641	108524	29639	0.32
2012	5724457	94730	28115	0.29
2013	6072780	118689	26511	0.22
2014	1164668	143791	26253	0.23
2015	2619073	128582	32851	0.30
2016	4314619	114876	30865	0.29
2017	3179703	123092	28058	0.25
2018	6193234	124599	25747	0.21
2019	2988617	143579	28921	0.26
2020	7101760	146956	33215	0.24
2021	3243312**	176560***		

* At spawning time.

** Geometric mean of year classes 1989–2018.

*** Predicted.

Sources and references

- EU. 2016. Regulation (EU) 2016/1139 of the European Parliament and of the Council of 6 July 2016 establishing a multiannual plan for the stocks of cod, herring and sprat in the Baltic Sea and the fisheries exploiting those stocks, amending Council Regulation (EC) No 2187/2005 and repealing Council Regulation (EC) No 1098/2007. Official Journal of the European Union, L 191, 15.7.2016. 15 pp. <http://data.europa.eu/eli/reg/2016/1139/oj>.
- EU. 2019. Regulation (EU) 2019/472 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 March 2019 establishing a multiannual plan for stocks fished in the Western Waters and adjacent waters, and for fisheries exploiting those stocks, amending Regulations (EU) 2016/1139 and (EU) 2018/973, and repealing Council Regulations (EC) No 811/2004, (EC) No 2166/2005, (EC) No 388/2006, (EC) No 509/2007 and (EC) No 1300/2008. Official Journal of the European Union, L 83, 25.3.2019. 17 pp. <http://data.europa.eu/eli/reg/2019/472/oj>.
- ICES. 2008. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 8–17 April 2008, ICES Headquarters, Copenhagen, Denmark. ICES CM 2008\ACOM:06. 692 pp.
- ICES. 2009. Workshop on Multiannual Management of Pelagic Stocks in the Baltic, 23–27 February 2009, ICES Headquarters, Copenhagen. ICES CM 2009/ACOM:38. 126 pp.
- ICES. 2015. EU request to ICES to provide F_{MSY} ranges for selected North Sea and Baltic Sea stocks. *In* Report of the ICES Advisory Committee, 2015. ICES Advice 2015, Book 6, Section 6.2.3.1. 11pp. https://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_FMSY_ranges_for_selected_NS_and_BS_stocks.pdf.
- ICES. 2021a. Baltic Fisheries Assessment Working Group (WGBFAS). ICES Scientific Reports, 3:53. 717 pp. <http://doi.org/10.17895/ices.pub.8187>
- ICES. 2021b. Advice on fishing opportunities. *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, section 1.1.1. <https://doi.org/10.17895/ices.advice.7720>.

[Download the stock assessment graphs.](#)

Recommended citation: ICES. 2021. Herring (*Clupea harengus*) in Subdivision 28.1 (Gulf of Riga). *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, her.27.28. <https://doi.org/10.17895/ices.advice.7768>.