

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

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 23 078 tonnes. This applies to all catches from the stock in subdivisions 28.1 and 28.2.

Stock development over time

Following high recruitment, spawning-stock biomass (SSB) increased in the late 1980s and is estimated to have been above the MSY $B_{trigger}$ since then. The 2011 and 2012 year classes are well above average, the 2013 year class is poor, and the 2014 year class is below average. Fishing mortality (F) has been close to F_{MSY} since 2008 but generally above F_{MSY} .

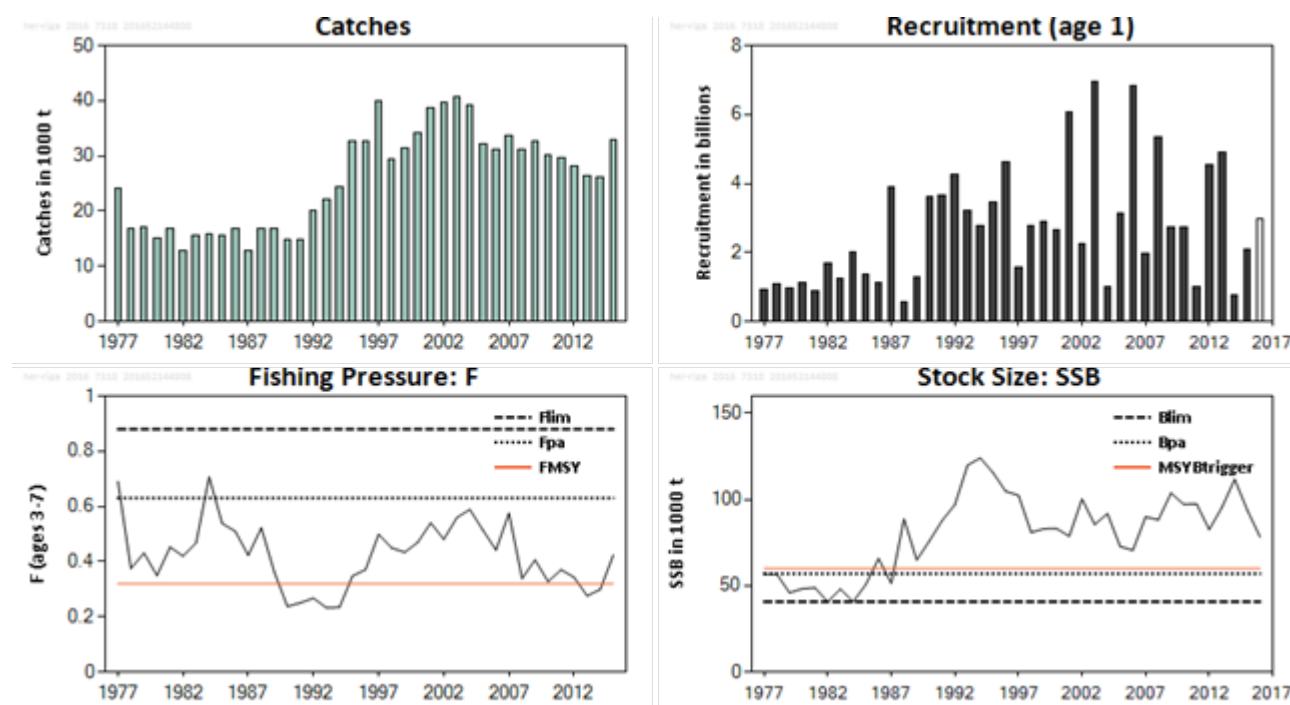


Figure 8.3.11.1 Herring in Subdivision 28.1. Summary of stock assessment (weights in thousand tonnes). Predicted recruitment values are not shaded. SSB at spawning time in 2016 is predicted.

Stock and exploitation status

Table 8.3.11.1 Herring in Subdivision 28.1. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size		
		2013	2014	2015		2014	2015	2016
Maximum sustainable yield	F_{MSY}	✓	✓	✗	Above	MSY	✓	✓
Precautionary approach	F_{pa} , F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa} , B_{lim}	✓	✓
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-
						$B_{trigger}$	✓	✓
							✓	✓
								✓
								Full reproductive capacity
								Not applicable

Catch options

Table 8.3.11.2 Herring in Subdivision 28.1. The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–7 (2016)	0.4165	ICES (2016a)	<i>Catch constraint</i> (30 515 t, TAC of 2016 minus the average catch of central Baltic herring in the Gulf of Riga, plus the average catch of Gulf of Riga herring in the central Baltic)
SSB (2016)	78215 t	ICES (2016a)	
R _{age1} (2016)	2988875 thousands	ICES (2016a)	Geometric mean 1989–2013
R _{age1} (2017)	2988875 thousands	ICES (2016a)	Geometric mean 1989–2013
R _{age1} (2018)	2988875 thousands	ICES (2016a)	Geometric mean 1989–2013
Total catch (2016)	30515 t	ICES (2016a)	
Commercial landings (2016)	30515 t	ICES (2016a)	
Discards (2016)	0	ICES (2016a)	

Table 8.3.11.3 Herring in Subdivision 28.1. The catch options. Weights in tonnes.

Rationale	Total catch (2017)	Basis	F (2017)	SSB (2017)	SSB (2018)	%SSB change*	%Advice change**
MSY approach	23078	F _{MSY}	0.32	76701	82052	+7.0%	–11.9%
F _{MSY} range with Advice Rule included***	17865	MSY F _{lower(AR)}	0.24	77817	88158	+13.3%	–31.8%
	26770	MSY F _{upper(AR)}	0.38	75875	77781	+2.6%	+2.2%
Precautionary approach	40530	F _{pa}	0.63	72489	62282	–14.1%	+54.7%
Zero catch	0	F = 0	0	81265	109715	+35.0%	–100.0%
Other options	18536	MSY F _{lower(AR)} differing by 0.01	0.25	77676	87368	+12.5%	–29.3%
	19200	MSY F _{lower(AR)} differing by 0.02	0.26	77536	86586	+11.7%	–26.7%
	19860	MSY F _{lower(AR)} differing by 0.03	0.27	77396	85811	+10.9%	–24.2%
	20514	MSY F _{lower(AR)} differing by 0.04	0.28	77257	85045	+10.1%	–21.7%
	21163	MSY F _{lower(AR)} differing by 0.05	0.29	77117	84285	+9.3%	–19.2%
	21806	MSY F _{lower(AR)} differing by 0.06	0.30	76978	83534	+8.5%	–16.8%
	22444	MSY F _{lower(AR)} differing by 0.07	0.31	76840	82789	+7.7%	–14.3%
	23078	MSY F _{upper(AR)} differing by 0.06	0.32	76701	82052	+7.0%	–11.9%
	23705	MSY F _{upper(AR)} differing by 0.05	0.33	76563	81323	+6.2%	–9.5%
	24328	MSY F _{upper(AR)} differing by 0.04	0.34	76425	80600	+5.5%	–7.2%
	24946	MSY F _{upper(AR)} differing by 0.03	0.35	76287	79885	+4.7%	–4.8%
	25559	MSY F _{upper(AR)} differing by 0.02	0.36	76150	79177	+4.0%	–2.5%
	26167	MSY F _{upper(AR)} differing by 0.01	0.37	76012	78475	+3.2%	–0.1%
	51523	F _{lim}	0.88	69341	50453	–27.3%	+96.7%
	29133	F _{2016 sq}	0.42	75330	75071	–0.3%	+11.2%
	60824	SSB ₂₀₁₈ = B _{lim}	1.13	66255	40800	–38.4%	+132.2%

Rationale	Total catch (2017)	Basis	F (2017)	SSB (2017)	SSB (2018)	%SSB change*	%Advice change**
	45240	SSB ₂₀₁₈ = B _{pa}	0.73	71195	57100	-19.9%	+72.7%
	42621	SSB ₂₀₁₈ = MSY B _{trigger}	0.68	71925	60000	-16.6%	+62.7%

* SSB 2018 relative to SSB 2017.

** Total catch 2017 relative to ICES advice for 2016 for the Gulf of Riga herring stock (26 200 tonnes).

*** Ranges with the advice rule (AR) advised by ICES in 2015 (ICES, 2015). Taking into account that $SSB_{2017} \geq MSY B_{trigger}$, $F_{lower(AR)}$ and $F_{upper(AR)}$ are not reduced by the factor $SSB / MSY B_{trigger}$ (ICES, 2015).

Basis of the advice

Table 8.3.11.4 Herring in Subdivision 28.1. The basis of the advice.

Advice basis	MSY approach.
Management plan	There is a proposed EU management plan for the Baltic Sea. The plan has not been formally implemented.

Quality of the assessment

It is considered that there have been no unallocated catches of Gulf of Riga herring since 2011.

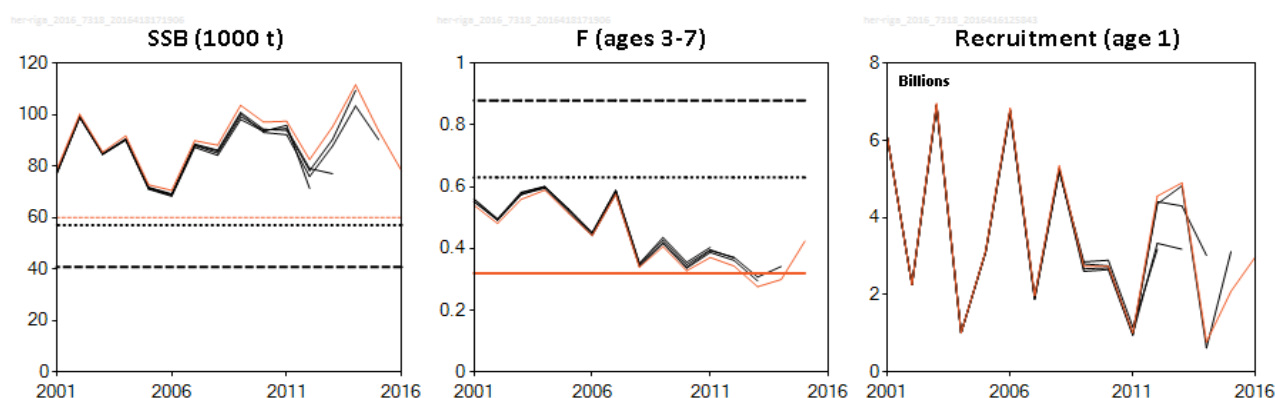


Figure 8.3.11.2 Herring in Subdivision 28.1. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

New precautionary reference points were estimated in 2016 (ICES, 2016a) and adopted for the stock (see Table 8.3.11.5).

A mixture of central Baltic herring (subdivisions 25–27, 28.2, 29, and 32) and the Gulf of Riga (Subdivision 28.1) herring is caught in subdivisions 28.1 and 28.2. The assessment and the advice consider the Gulf of Riga herring stock taken both in and outside the Gulf of Riga. The TAC is set for herring caught in the Gulf of Riga, which also includes a certain amount of central Baltic herring caught in the Gulf of Riga, but does not include Gulf of Riga herring taken outside the Gulf of Riga.

The TAC value 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 herring from the central Baltic stock taken in the Gulf of Riga, minus the assumed catch of the 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:

- Central Baltic herring assumed to be taken in the Gulf of Riga in 2017 (Subdivision 28.1) is 4574 t (average 2011–2015);
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2017 is 223 t (average 2011–2015).

Following the ICES MSY approach catches in 2017 should be no more than 23 078 t. The corresponding TAC in the Gulf of Riga management area for 2017 would be calculated as $23\,078\text{ t} - 223\text{ t} + 4574\text{ t} = 27\,429\text{ t}$.

Reference points

Table 8.3.11.5 Herring in Subdivision 28.1. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	F_{MSY}	0.32	Stochastic simulations with Beverton, Ricker, and segmented regression stock–recruitment curve from the full time-series (1977–2013).	ICES (2015)
	MSY $B_{trigger}$	60 000 t	From stock–recruitment relationship	ICES (2009)
Precautionary approach	B_{lim}	40 800 t	$B_{lim} = B_{loss}$	ICES (2016a)
	B_{pa}	57 100 t	$B_{pa} = B_{lim} \times \exp(\sigma \times 1.645)$ with the default value $\sigma = 0.2$	ICES (2016a)
	F_{lim}	0.88	F_{lim} derived from the curve of SSB/R against F	ICES (2016a)
	F_{pa}	0.63	$F_{pa} = F_{lim} \times \exp(-\sigma \times 1.645)$ with the default value $\sigma = 0.2$	ICES (2016a)
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

Basis of the assessment

Table 8.3.11.6 Herring in Subdivision 28.1. The basis of the assessment.

ICES stock data category	1 (ICES, 2016b)
Assessment type	Age-based analytical assessment (XSA; ICES, 2015) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); one acoustic survey index (BIAS); 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)

Information from stakeholders

There is no available information.

History of advice, catch, and management

Table 8.3.11.7 Herring in Subdivision 28.1. History of ICES advice, the agreed TAC, and ICES estimates of catches. Weights in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice*	Agreed TAC**	Catches of Gulf of Riga herring stock
1987	Reduce F towards $F_{0.1}$	8	-	13
1988	Reduce F towards $F_{0.1}$	6	-	17
1989	F should not exceed present level	20	-	17
1990	F should not exceed present level	20	-	15
1991	No separate advice for this stock	-	-	15
1992	No separate advice for this stock	-	-	20
1993	No separate advice for this stock	-	-	22
1994	No separate advice for this stock	-	-	24
1995	No separate advice for this stock	-	-	33
1996	No separate advice for this stock	-	-	33
1997	Current exploitation rate within safe biological limits	35	-	40
1998	Current exploitation rate within safe biological limits	35	-	29
1999	Current exploitation rate within safe biological limits	34	-	31
2000	Current exploitation rate within safe biological limits	37	-	34
2001	Current exploitation rate within safe biological limits	34.1	-	39
2002	Current exploitation rate within safe biological limits	33.2	-	40
2003	F below F_{pa}	< 41.0	41	40.8
2004	$F = F_{sq}$	39.0	39.3	39.1
2005	$F = F_{sq}$	35.3	38.0	32.2
2006	$F = F_{pa}$	39.9	40.0	31.2
2007	$F = F_{pa}$	33.9	37.5	33.7
2008	$F < F_{pa}$	< 30.1	36.1	31.1
2009	$F < F_{pa}$	< 31.5	34.9	32.6
2010	$F < F_{pa}$	< 33.4	36.4	30.2
2011	$F < F_{pa}$	< 33.0	32.7	29.6
2012	MSY transition	< 25.5	30.6	28.1
2013	MSY framework	< 23.2	30.6	26.5
2014	MSY	< 25.8	30.7	26.3
2015	MSY ($F_{MSY} = 0.35$)	< 34.3	38.8	32.9
2016	MSY approach ($F_{MSY} = 0.32$)	≤ 26.2	34.9	
2017	MSY approach ($F_{MSY} = 0.32$)	≤ 23.1		

* The catch of central Baltic herring stock is not included.

** The total catch of herring in the Gulf of Riga area.

History of catch and landings

Table 8.3.11.8 Herring in Subdivision 28.1. Catch distribution by fleet in 2015 as estimated by ICES.

Total herring catch in the Gulf of Riga management area (2015)	Total catch of stock (2015)	Landings		Discards
37.5 kt	32.9 kt	82.7% trawls	17.3% trapnets	Discarding is considered to be negligible.
		32.9 kt		

Table 8.3.11.9 Herring in Subdivision 28.1 ICES estimates of total catches of herring in the Gulf of Riga by country (weights in thousand tonnes).

Year	Estonia	Latvia	Unallocated landings	Total
1991	7.420	13.481	-	20.901
1992	9.742	14.204	-	23.946
1993	9.537	13.554	3.446	26.537
1994	9.636	14.050	3.512	27.198
1995	16.008	17.016	3.401	36.425
1996	11.788	17.362	3.473	32.623
1997	15.819	21.116	4.223	41.158
1998	11.313	16.125	3.225	30.663
1999	10.245	20.511	3.077	33.833
2000	12.514	21.624	3.244	37.382
2001	14.311	22.775	3.416	40.502
2002	16.962	22.441	3.366	42.769
2003	19.647	21.780	3.267	44.694
2004	18.218	20.903	3.136	42.257
2005	11.213	19.741	2.961	33.915
2006	11.924	19.186	2.878	33.988
2007	12.764	19.425	2.914	35.103
2008	15.877	19.290	1.929	37.096
2009	17.167	18.323	1.832	37.322
2010	15.422	17.751	1.775	34.948
2011	14.721	20.203	-	35.024
2012	13.789	17.944	-	31.733
2013	11.898	18.462	-	30.360
2014	10.561	20.065	-	30.626
2015	16.501	21.002	-	37.503

Table 8.3.11.10 Herring in Subdivision 28.1. Total catches in the Gulf of Riga by stock and total catches of the Gulf of Riga herring stock by area (in thousand tonnes).

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
1976	27.4	4.5	31.9	-	27.4
1977	24.2	2.4	26.6	-	24.2
1978	16.7	6.3	23	-	16.7
1979	17.1	4.7	21.8	-	17.1
1980	15.0	5.7	20.7	-	15
1981	16.8	5.9	22.7	-	16.8
1982	12.8	4.7	17.5	-	12.8
1983	15.5	4.8	20.3	-	15.5
1984	15.8	3.8	19.6	-	15.8
1985	15.6	4.6	20.2	-	15.6
1986	16.9	1.3	18.2	-	16.9
1987	12.9	4.8	17.7	-	12.9
1988	16.8	3.0	19.8	-	16.8
1989	16.8	5.9	22.7	-	16.8
1990	14.8	6.0	20.8	-	14.8
1991	14.8	6.1	20.9	-	14.8
1992	20.5	3.5	23.9	1.3	21.8
1993	22.2	4.3	26.5	1.2	23.4
1994	22.2	5.0	27.2	2.1	24.3
1995	30.3	6.1	36.4	2.4	32.7
1996	28.2	4.4	32.6	4.3	32.5
1997	36.9	4.3	41.2	2.9	39.8
1998	26.6	4.1	30.7	2.8	29.4
1999	29.5	4.3	33.8	1.9	31.4
2000	32.8	4.6	37.4	1.9	34.7
2001	37.6	2.9	40.5	1.2	38.8
2002	39.2	3.5	42.8	0.4	39.7
2003	40.4	4.3	44.7	0.4	40.8
2004	38.9	3.3	42.3	0.2	39.1
2005	31.7	2.3	33.9	0.5	32.2
2006	30.8	3.2	34.0	0.4	31.2
2007	33.6	1.5	35.1	0.1	33.7
2008	31.0	6.1	37.1	0.1	31.1
2009	32.4	4.9	37.3	0.1	32.6
2010	29.7	5.2	34.9	0.4	30.2
2011	29.6	5.5	35.0	0.1	29.7
2012	27.9	3.8	31.7	0.2	28.1
2013	26.3	4.1	30.4	0.3	26.6
2014	26.1	4.5	30.6	0.2	26.3
2015	32.5	5.0	37.5	0.3	32.9

Summary of the assessment

Table 8.3.11.11 Herring in Subdivision 28.1. Assessment summary of Gulf of Riga herring stock. Weights in tonnes. Recruits in thousands.

Year	Recruitment (Age 1)	Total stock biomass	SSB**	Catch	Fishing pressure: F (Ages 3–7)
1977	943211	79748	56664	24186	0.6903
1978	1076471	76206	56768	16728	0.3751
1979	976925	65000	45939	17142	0.431
1980	1110310	71820	48251	14998	0.3498
1981	908386	67791	48849	16769	0.4526
1982	1688694	69512	40769	12777	0.4198
1983	1253474	72182	48123	15541	0.4679
1984	2026310	67542	40752	15843	0.707
1985	1385639	75705	50761	15575	0.5382
1986	1118631	88797	65796	16927	0.5101
1987	3917812	97293	51384	12884	0.4231
1988	559298	106751	88741	16791	0.5223
1989	1286157	88300	64924	16783	0.3621
1990	3622452	136697	76009	14931	0.2377
1991	3662168	142418	87814	14791	0.2507
1992	4281211	152804	97020	20000	0.2678
1993	3228416	174502	119901	22200	0.2329
1994	2756882	169246	124081	24300	0.2347
1995	3453056	165665	115551	32656	0.348
1996	4640618	166775	104713	32584	0.3714
1997	1573163	132848	102444	39843	0.4992
1998	2764246	119506	80920	29443	0.4498
1999	2881773	135684	83001	31403	0.4338
2000	2637417	132513	83199	34069	0.4697
2001	6075974	156609	78672	38785	0.5405
2002	2262487	143483	100252	39701	0.4809
2003	6959875	155544	85519	40803	0.5593
2004	1014777	120545	91840	39115	0.589
2005	3132862	124017	72768	32225	0.5142
2006	6839933	143412	70590	31232	0.4418
2007	1973385	125423	89937	33742	0.5752
2008	5344126	155286	88211	31137	0.3391
2009	2733762	147536	103713	32554	0.406
2010	2738980	137500	97179	30174	0.3278
2011	1013508	125660	97504	29639	0.3707
2012	4559331	138733	82585	28115	0.3431
2013	4904046	158219	95377	26511	0.276
2014	774679	136753	111654	26253	0.2996

Year	Recruitment (Age 1)	Total stock biomass	SSB**	Catch	Fishing pressure: F (Ages 3–7)
2015	2088033	128253	93762	32851	0.4239
2016	2988875*		78215***		
Average	2722268	121853	80563	25692	0.4239

* Geometric mean 1989–2013.

** At spawning time.

*** Predicted.

Sources and references

ICES. 2008. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 8–17 April 2008, ICES Headquarters, Copenhagen. 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, 20125. ICES Advice 20125, Book 6, Section 6.2.3.1.

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_FMSY_ranges_for_selected_NS_and_BS_stocks.pdf.

ICES 2016a. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), ICES Headquarters, 12–19 April 2016. ICES CM 2016/ACOM:11.

ICES. 2016b. General context of ICES advice. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.