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

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2016 should be no more than 26 200 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 2013 year class is poor while the 2011 and 2012 year classes are well above average. F has been fluctuating between F_{pa} and F_{MSY} since 2008 and is estimated to be slightly above F_{MSY} in 2014.

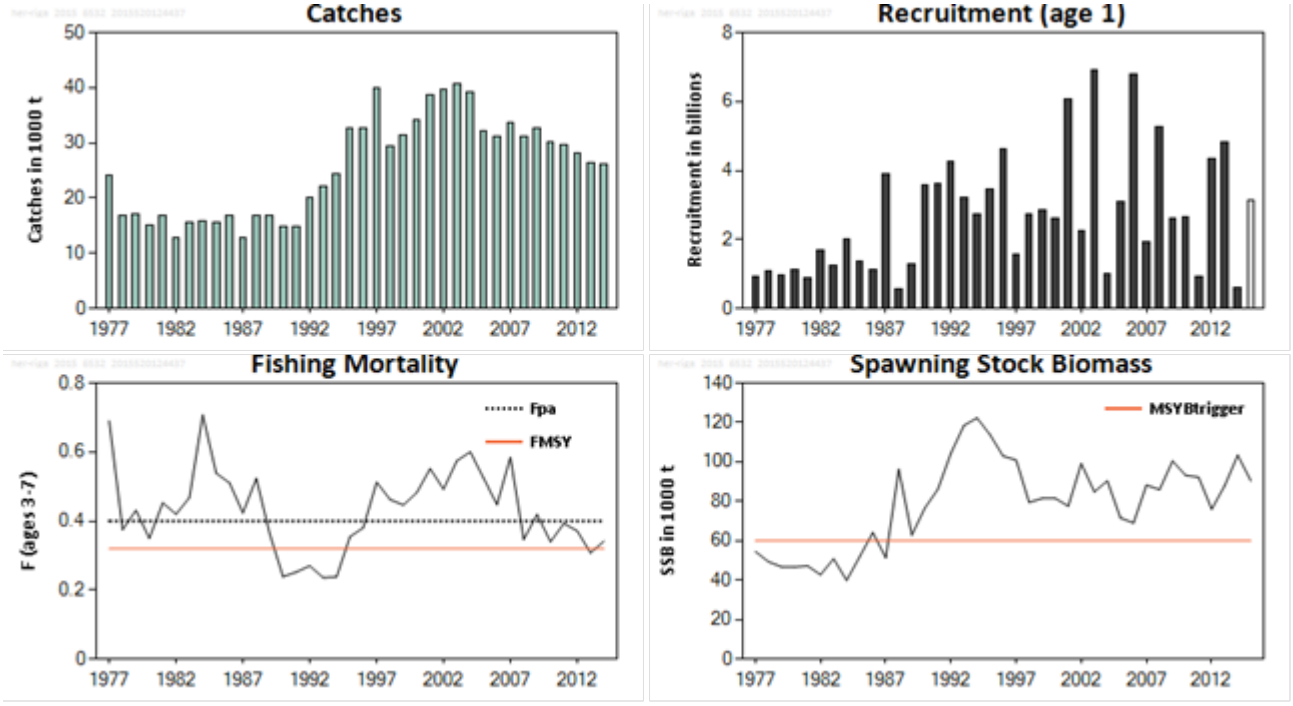

Figure 8.3.9.1 Herring in Subdivision 28.1. Summary of stock assessment (weights in thousand tonnes). Predicted values are not shaded. SSB at spawning time in 2015 is predicted.

Stock and exploitation status

Table 8.3.9.1 Herring in Subdivision 28.1. State of the stock and fishery, relative to reference points.

		Fishing pressure				Stock size			
		2012	2013	2014		2013	2014	2015	
Maximum Sustainable Yield	F_{MSY}	✗	✓	✗	Above	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity*
Management Plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

*Above candidate B_{pa} and B_{lim} values

Catch options

Table 8.3.9.2 Herring in Subdivision 28.1. The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–7 (2015)	0.34	ICES (2015a)	*Status quo* F (3-year average)
SSB (2015)	90 347 t	ICES (2015a)	
R_{age1} (2015)	3119 millions	ICES (2015a)	Geometric mean 1989–2012
R_{age1} (2016)	3119 millions	ICES (2015a)	Geometric mean 1989–2012
R_{age1} (2017)	3119 millions	ICES (2015a)	Geometric mean 1989–2012
Total catch (2015)	28 445 t	ICES (2015a)	
Commercial landings (2015)	28 445 t	ICES (2015a)	
Discards (2015)	0	ICES (2015a)	

Table 8.3.9.3 Herring in Subdivision 28.1. The catch options. Weights in tonnes.

Rationale	Total catch (2016)	Basis	F (2016)	SSB (2016)	SSB (2017)	%SSB change*	%Advice change**
MSY approach	26 223	F_{MSY}	0.32	90 250	94 438	+4.6%	−23.5%
F_{MSY} ranges without Advice Rule***	20 163	MSY F_{lower}	0.24	91 559	101 519	+10%	−41.2%
	26 223	MSY F_{upper}	0.32	90 250	94 438	+4.6%	−23.5%
F_{MSY} range with Advice Rule included***	20 163	MSY $F_{lower(AR)}$	0.24	91 559	101 519	+10%	−41.2%
	30512	MSY $F_{upper(AR)}$	0.38	89 281	89 490	+0.2%	–11.04%
Precautionary approach	32 352	F_{pa}	0.4	88 854	87 384	−1.7%	–5.7%
Zero catch	0	$F_{2015} \times 0$	0	95 491	125 796	+31.7%	–100%
Other options	29 155	$F_{2015} \times 1.06$	0.361	89 800	91 050	+1.4%	–15%
	34 300	$F_{2015} \times 1.29$	0.438	88 394	85 167	−3.7%	0%
	39 445	$F_{2015} \times 1.53$	0.519	87 137	79 365	−8.9%	+15%
	27 676	$F_{2015} \times 1$	0.34	89 926	92 756	+3.1%	–19.3%

* SSB 2017 relative to SSB 2016.

** Total catch 2016 relative to ICES advice 2015 for the Gulf of Riga herring stock.

*** According to ICES (2015c), F_{MSY} ranges are specified with and without the ICES Advice Rule (AR). For ranges without the AR F_{lower} and F_{upper} are not modified by SSB in the catch advice year . For the ranges with the AR, SSB_{2015} > MSY $B_{trigger}$; therefore, $F_{lower(AR)}$ and $F_{upper(AR)}$ are not reduced.

Basis of the advice

Table 8.3.9.4 Herring in Subdivision 28.1. The basis of the advice.

Advice basis	MSY approach
Management plan	There is no management plan for herring in this area.

Quality of the assessment

The amount of unallocated catches has been gradually decreasing in recent years and it is considered that there have been no unallocated catches of Gulf of Riga herring since 2011.

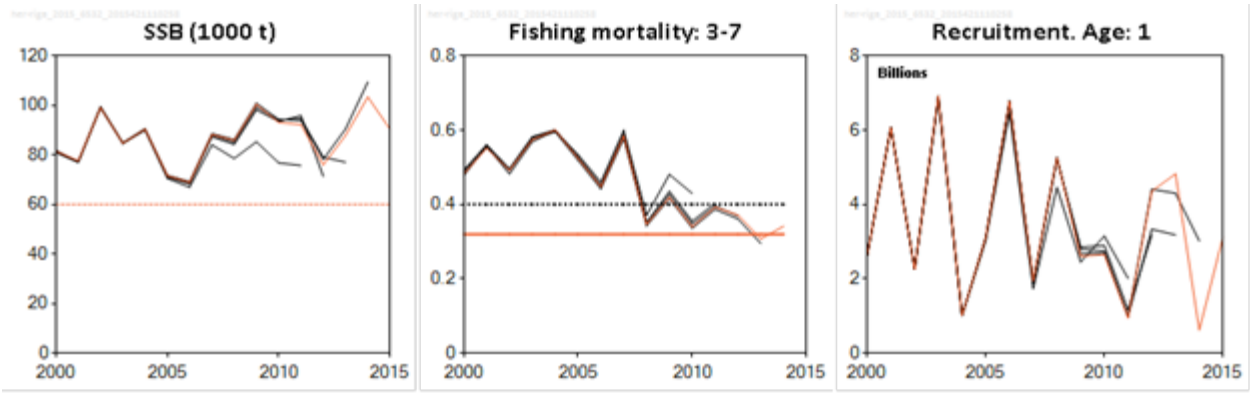

Figure 8.3.9.2 Herring in Subdivision 28.1. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

New fishing mortality reference points were defined in 2015 (ICES, 2015c) and adopted for the stock (see Table 8.3.9.5). F_{MSY} (0.32) was estimated lower than the previous estimate (0.35).

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 2016 (Subdivision 28.1) is 4620 t (average 2010–2014);
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2015 is 220 t (average 2010–2014).

Catches of less than 26.2 kt, as advised according to the ICES MSY approach, correspond to a catch in the Gulf of Riga management area of 30.6 kt in 2016 (26.2 − 0.22 + 4.62).

There are indications from catch samples that the 2014 year class is strong.

Reference points

Table 8.3.9.5 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		ICES (2015c)
	MSY $B_{trigger}$	60 000 t	WKMAMPEL.	ICES (2009)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	0.4	From medium-term projections.	ICES (2009)
	SSB_{MGT}	Not defined		
Management plan	F_{MGT}	Not defined		

Basis of the assessment

Table 8.3.9.6 Herring in Subdivision 28.1. The basis of the assessment.

ICES stock data category	1 (ICES, 2015b)
Assessment type	Age-based analytical assessment (XSA; ICES, 2015a) 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 8.3.9.7 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	
2016	MSY approach (F_{MSY} = 0.32)	≤ 26.2		

* 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 8.3.9.8 Herring in Subdivision 28.1. Catch distribution by fleet in 2014 as estimated by ICES.

Total catch (2014)	Landings		Discards
26.3 kt	67.2% trawls	32.8% trapnets	Discards are considered negligible.
	26.3 kt		

Table 8.3.9.9 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	14.05	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	21.78	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

Table 8.3.9.10 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

Summary of the assessment

Table 8.3.9.11 Herring in Subdivision 28.1. Assessment summary of Gulf of Riga herring stock. Weights in tonnes. Recruits in thousands.

Year	Recruitment (age 1)	Total biomass	SSB**	Catch	F (ages 3–7)
1977	943 198	76 734	54 522	24 186	0.6903
1978	1 076 457	66 255	49 355	16 728	0.3751
1979	976 901	66 129	46 737	17 142	0.431
1980	1 110 273	69 527	46 710	14 998	0.3498
1981	908 342	65 528	47 219	16 769	0.4526
1982	1 688 316	72 892	42 753	12 777	0.4198
1983	1 253 252	76 264	50 845	15 541	0.4679
1984	2 025 191	66 122	39 899	15 843	0.7071
1985	1 382 652	77 366	51 895	15 575	0.5384
1986	1 116 533	86 573	64 155	16 927	0.5105
1987	3 904 236	97 201	51 373	12 884	0.4236
1988	557 235	115 724	96 200	16 791	0.5234
1989	1 278 873	85 498	62 881	16 783	0.3634
1990	3 590 466	137 621	76 630	14 931	0.2388
1991	3 630 526	139 644	86 130	14 791	0.2523
1992	4 245 148	164 531	104 434	20 000	0.2702
1993	3 202 706	172 531	118 460	22 200	0.2357
1994	2 741 908	166 966	122 244	24 300	0.2381
1995	3 440 148	163 536	113 805	32 656	0.3543
1996	4 626 028	164 511	102 933	32 584	0.3805
1997	1 566 281	131 060	100 901	39 843	0.5123
1998	2 755 064	117 673	79 436	29 443	0.4623
1999	2 871 835	133 759	81 516	31 403	0.4463
2000	2 633 858	130 265	81 505	34 069	0.4819
2001	6 066 772	154 970	77 540	38 785	0.5519
2002	2 260 420	142 080	99 111	39 701	0.4922
2003	6 919 267	154 345	84 773	40 803	0.5743
2004	1 012 183	118 806	90 379	39 115	0.6003
2005	3 112 373	122 224	71 574	32 225	0.5243
2006	6 775 945	140 321	68 967	31 232	0.4477
2007	1 945 031	123 174	88 226	33 742	0.5848
2008	5 257 057	151 491	85 910	31 137	0.3467
2009	2 607 299	142 485	100 413	32 554	0.419
2010	2 652 806	132 088	93 128	30 174	0.34
2011	948 469	119 099	92 260	29 639	0.393
2012	4 357 052	129 057	76 022	28 115	0.3713
2013	4 824 102	149 135	87 909	26 511	0.3075
2014	620 549	126 200	103 405	26 253	0.3417
2015	3 119 442*		90 347***		
Arith. mean	2 707 493	119 721	78 741	25 504	0.4321

* Geometric mean 1989–2012.

** At spawning time.

*** Predicted.

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