ECOREGION Baltic Sea
STOCK Herring in Subdivision 28.1 (Gulf of Riga)

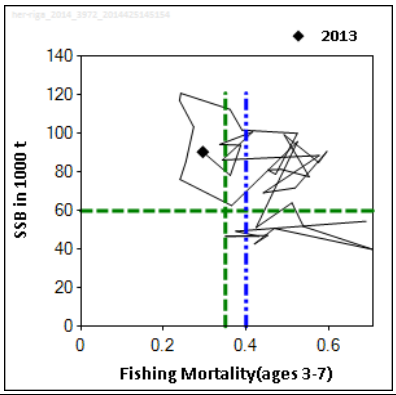
Advice for 2015

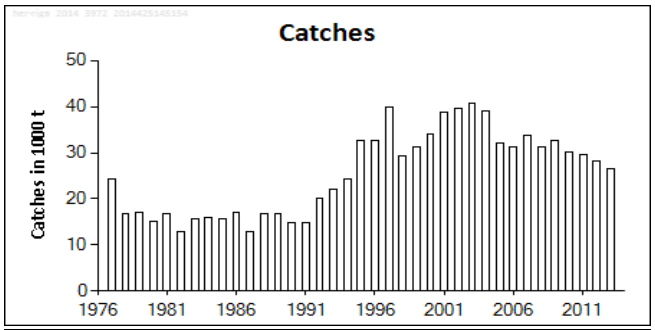
ICES advises on the basis of the MSY approach that catches in 2015 should be no more than 34 300 tonnes. This applies to all catches from the stock in Subdivisions 28.1 and 28.2.

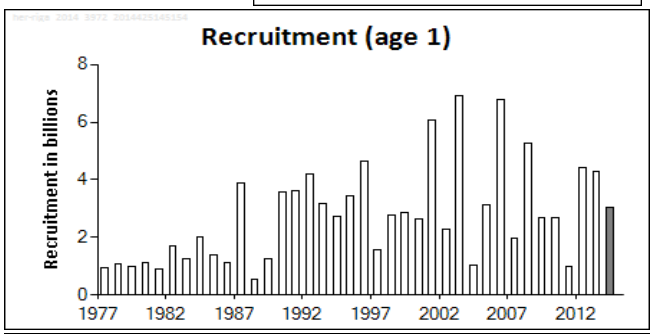
Stock status

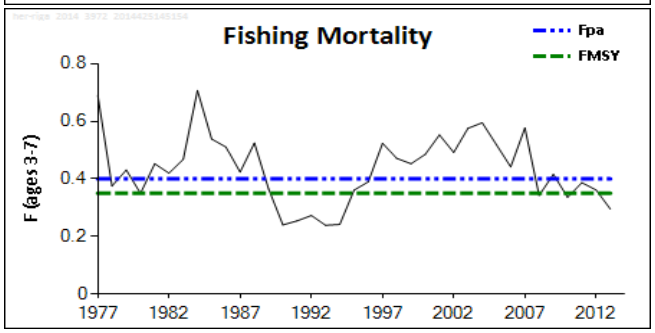
Fishing pressure	2011	2012	2013	
MSY (F_{MSY})	✗	✗	✓	Below target
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably

Stock size	2012	2013	2014	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined









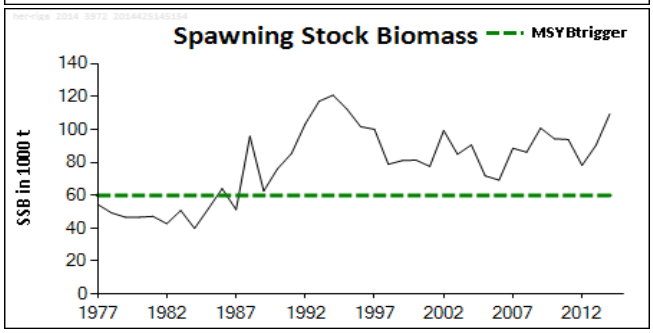


Figure 8.3.11.1 Herring in Subdivision 28.1 (Gulf of Riga). Summary of stock assessment (weights in thousand tonnes). Predicted values are shaded. SSB at spawning time in 2014 is predicted. Top right: SSB and F over the years.

Following high recruitment, SSB increased in the late 1980s and is estimated to have been above the MSY $B_{trigger}$ since then. The 2010 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 below F_{MSY} in 2013.

Management plans

No specific management objectives are known to ICES.

Biology

The year-class strength of the Gulf of Riga herring is influenced by the severity of winter, which determines the water temperature, and the abundance of zooplankton in spring. In the earlier period before 1986 recruitment was low. A series of mild winters since 1989 has been favourable for the reproduction of Gulf herring and resulted in a series of rich year classes for the period 1989–2012, with year classes being below the average only in 1996, 2003, 2006, and

2010 after cold winters. The mean weight-at-age started to decrease in the mid-1980s and reached its lowest values in 1997. Afterwards the mean weight-at-age increased and has fluctuated without clear trend since 2000, remaining still much lower than in the 1980s. In 2011–2013 the mean-weight-at-age was slightly higher than in the previous decade.

Environmental influence on the stock

The Gulf of Riga is a semi-enclosed ecosystem of the Baltic Sea characterized by low salinity that restricts the occurrence of marine species. The predation mortality by cod is low because cod is found in the Gulf of Riga only when the cod stock size is very high and widely dispersed (last time in the early 1980s).

The fisheries

The herring fishery in the Gulf of Riga is performed by Estonia and Latvia, using both trawls and trapnets. In the recent years the share of trapnets has been around 30% and has been rather stable. Herring catches in the Gulf of Riga include the local Gulf herring and the open-sea herring, which enters the Gulf of Riga for spawning. All landings are for human consumption.

Catch distribution	Total herring catches of the Gulf of Riga stock (2013) were 26.5 kt. Herring catches from the Gulf of Riga area were 30.4 kt (71% trawls, 29% trapnets). Discards and unallocated removals are considered negligible.

Effects of the fisheries on the ecosystem

Pelagic trawl is the main fishing gear used in the trawl fishery. The bycatch of sprat is low (about 10% in recent years), and bycatch of other species is insignificant. The bycatch of other species in herring trapnets is also very low. Discarding in the herring fishery is not allowed and has not been recorded during on-board sampling.

Quality considerations

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. The biological sampling of catches has been performed by Estonia and Latvia on a regular basis, and is considered to be appropriate.

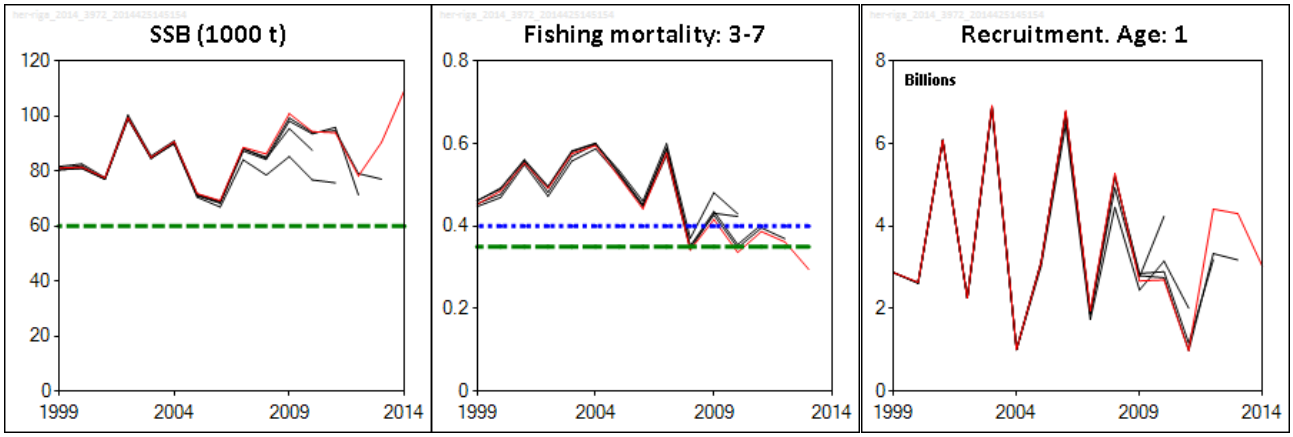


Figure 8.3.11.2 Herring in Subdivision 28.1 (Gulf of Riga). Historical assessment results (final-year recruitment estimates included).

Scientific basis

Stock data category	1 (ICES, 2014a)
Assessment type	Age-based analytical assessment (XSA).
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 and are considered negligible.
Indicators	None.
Other information	The latest benchmark was performed in 2008.
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

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Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	60 000 t	WKMAMPEL (ICES, 2009).
	F_{MSY}	0.35	WKMAMPEL (ICES, 2009), based on stochastic simulations.
Precautionary Approach	B_{lim}	not defined	
	B_{pa}	not defined	
	F_{lim}	not defined	
	F_{pa}	0.4	From medium-term projections.

(Last changed in: 2010)

Outlook for 2015

Basis: F (2014) = TAC constr.[1)] = 0.285; SSB (2014) = 109.5; R (2014–2016) = 3.0 billions (GM: 1989–2010); Catches (2014) = Landings (2014) = 27; Discard (2014) = negligible.

Rationale	Total catch (2015)	Basis	F (2015)	SSB (2015)	SSB (2016)	%SSB change[2)]	%Advice change[3)]
MSY approach	34.3	F_{MSY}	0.35	112.1	107.5	-4.1%	+32.9%
Precautionary approach	38.3	F_{pa}	0.4	111.2	102.9	-7.5%	+48.4%
Zero catch	0	F = 0	0	119.3	147.9	+24%	-100%
Other options	21.9	$F_{2014} \times 0.74$	0.21	114.9	121.8	+6.0%	-15%
	22.0	$F_{2014} \times 0.75$	0.21	114.9	121.6	+5.8%	-14.7%
	25.8	$F_{2014} \times 0.88$	0.25	114.1	117.2	+2.7%	0%
	28.6	$F_{2014} \times 1$	0.29	113.5	114.0	+0.4%	+10.9%
	29.7	$F_{2014} \times 1.09$	0.31	113.2	112.6	-0.5%	+15%
	34.7	$F_{2014} \times 1.25$	0.36	112.1	107.0	-4.5%	+34.5%

Weight in thousand tonnes.
[1)] TAC constraint 27 kt: TAC_{2014} minus average catch of the central Baltic herring in the Gulf of Riga for 2012–2013 plus average catch of Gulf of Riga herring stock outside of the Gulf of Riga for 2012–2013 (30.7−3.95+0.25 = 27 kt). The TAC of 2012–2014 was 30.6–30.7 kt.
[2)] SSB 2016 relative to SSB 2015.
[3)] Total catch 2015 relative to ICES advice 2014 for the Gulf of Riga herring stock.

MSY approach

Following the ICES MSY approach implies fishing at F = 0.35, which implies catches of no more than 34.3 kt in 2015. This is expected to lead to an SSB of 107.5 kt in 2016.

Precautionary approach

The fishing mortality in 2015 should be no more than F_{pa}, corresponding to catches of less than 38.3 kt in 2015. This is expected to lead to an SSB of 102.9 kt in 2016.

Additional considerations

Management considerations

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. The TAC is set for herring caught in the Gulf of Riga, which includes also 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 2015 (Subdivision 28.1) is 4700 t (average 2009–2013);
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2015 is 220 t (average 2009–2013).

Catches of less than 34.3 kt as advised according to the ICES MSY approach correspond to a catch in the Gulf of Riga management area of 38.78 kt in 2015 (34.3 − 0.22 +4.7).

The WKMAMPEL (ICES, 2009) recommended a trigger spawning-stock biomass of 60 000 t for the Gulf of Riga herring stock. The evaluations performed by WKMAMPEL using a stochastic model and a forecast model suggested two candidates for F_{MSY}: F_{MSY} = 0.35 and $F_{MSY} = F_{0.1}$ = 0.26, These target Fs were tested as the basis of a management plan with an interannual variation in TAC for the two F options of 20% and 15%, respectively. The evaluation showed that high F value should not be used with a 15% limit on interannual variation in TAC but was acceptable with the higher limit of 20%. The use of the higher target F with no interannual constraint on TAC is acceptable for for MSY advice.

The fishery

The herring fishery in the Gulf of Riga is performed by Estonia and Latvia, using both trawls and trapnets. The proportion of catches taken by trawls and trapnets has been rather stable in recent years. The number of trawlers and their engine power is limited in the Gulf of Riga. The performance of the trawl fleet is gradually improving due to replacement of older vessels by a smaller number of new vessels. The misreporting has decreased along with this renewal and decrease in the number of vessels.

Environmental conditions

The period since the end of the 1980s, when the majority of winters have been mild, has been favourable for the reproductive success of Gulf of Riga herring. The year-class strength of the Gulf of Riga herring has been negatively correlated with the severity of the winter. Recruitment predictions were based on average water temperature in the 0–20 m layer in May, during the peak spawning and the biomass of the copepod *Eurytemora affinis*, when the hatching of larvae begins.

Data and methods

The assessment is based on catch data, a commercial cpue index (passive gear), and an acoustic index. The model used to estimate the recruitment did not predict the rich year classes adequately; therefore, since 2012, the recruitment used in the short-term forecast was set as the geometric mean of the 1989–2010.

Discrimination between the central Baltic herring and the Gulf of Riga stocks is based on the different otolith structure due to different feeding conditions and growth of herring in the Gulf of Riga and the Baltic Proper.

Uncertainties in the assessment and forecast

The 2013 SSB has been revised upwards by 17% compared to last year's assessment. In recent years the level of unallocated catches has gradually decreased and in 2011–2013 it was considered that there were no misreported catches of the Gulf of Riga herring.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year.

The basis for the advice this year is the same as last year: the MSY approach.

Sources

ICES. 2009. Workshop on Multiannual Management of Pelagic Stocks in the Baltic. 23–27 February 2009, ICES Headquarters, Copenhagen. ICES CM 2009/ACOM:38.

ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.

ICES. 2014b. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 3–10 April 2014, ICES Headquarters, Copenhagen. ICES CM 2014/ACOM:10.

Putnis, I., Müller-Karulis, B., and Kornilovs, G. 2011. Changes in the reproductive success of Gulf of Riga herring. ICES CM 2011/H:13.

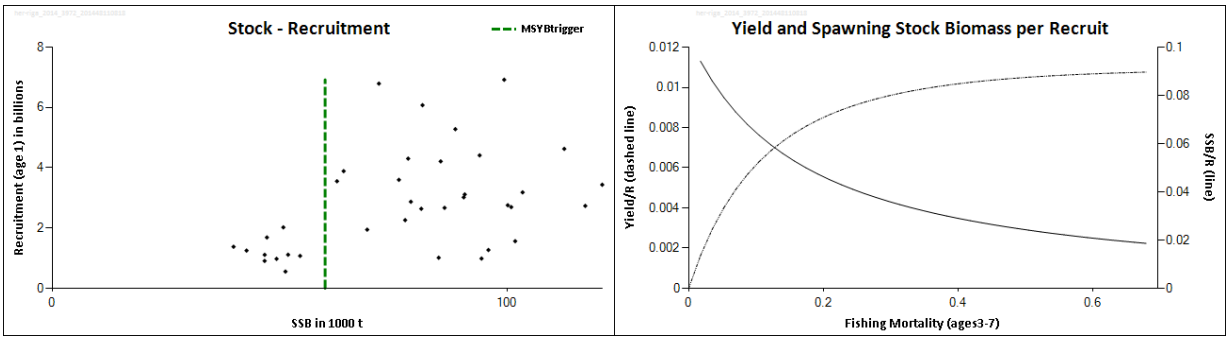

Figure 8.3.11.3 Herring in Subdivision 28.1 (Gulf of Riga). Stock–recruitment (left panel) and yield-per-recruit analysis plots (right panel).

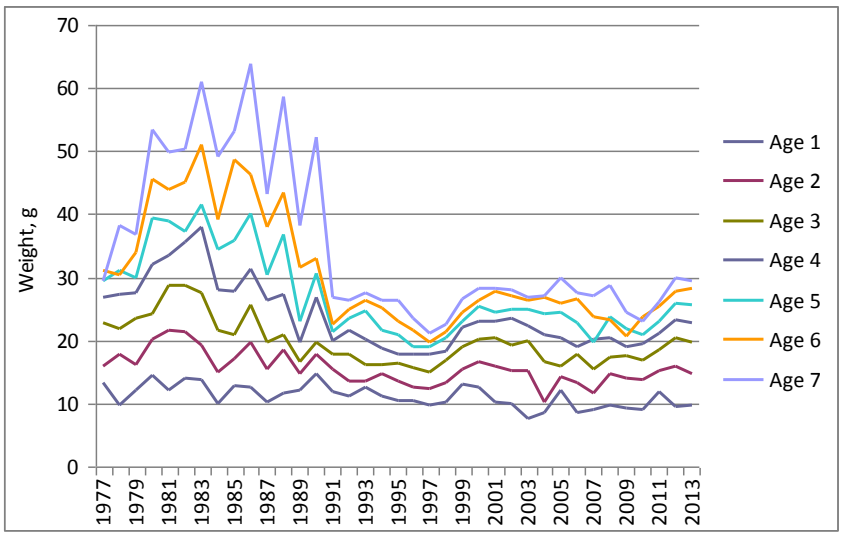

Figure 8.3.11.4 Herring in Subdivision 28.1 (Gulf of Riga). Mean weight-at-age (in grammes) of the Gulf of Riga herring stock.

Table 8.3.11.1 Herring in Subdivision 28.1 (Gulf of Riga). ICES advice, management, and catches.

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	
2015	MSY	< 34.3		

Weights in thousand tonnes.
* The catch of central Baltic herring stock is not included.
** The total catch of herring in the Gulf of Riga area.

Table 8.3.11.2 Herring in Subdivision 28.1 (Gulf of Riga). Catches in the Gulf of Riga area by country (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

Table 8.3.11.3 Herring in Subdivision 28.1 (Gulf of Riga). Catches of Gulf of Riga herring stock and catches of herring from the Gulf of Riga (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

Table 8.3.11.4 Gulf of Riga herring stock. Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB** tonnes	Total catch tonnes	Mean F Ages 3–7
1977	943184	54521	24186	0.69
1978	1076442	49355	16728	0.375
1979	976874	46737	17142	0.431
1980	1110233	46709	14998	0.35
1981	908294	47217	16769	0.453
1982	1687907	42751	12777	0.42
1983	1253013	50837	15541	0.468
1984	2023980	39890	15843	0.707
1985	1379425	51870	15575	0.539
1986	1114280	64078	16927	0.511
1987	3889364	51283	12884	0.424
1988	555017	95897	16791	0.525
1989	1271296	62632	16783	0.365
1990	3552850	76214	14931	0.24
1991	3599571	85396	14791	0.254
1992	4213171	103410	20000	0.273
1993	3185001	117188	22200	0.239
1994	2736112	120903	24300	0.242
1995	3437216	112561	32656	0.361
1996	4628539	101783	32584	0.39
1997	1563920	100143	39843	0.524
1998	2757734	78857	29443	0.471
1999	2873343	81132	31403	0.453
2000	2638691	81406	34069	0.485
2001	6078680	77590	38785	0.553
2002	2263234	99367	39701	0.492
2003	6921302	84976	40803	0.576
2004	1014224	90700	39115	0.595
2005	3115395	71839	32225	0.519
2006	6793439	69267	31232	0.442
2007	1946652	88629	33742	0.577
2008	5281210	86269	31137	0.342
2009	2671027	100909	32554	0.416
2010	2696059	94377	30174	0.336
2011	987035	93962	29639	0.387
2012	4413463	78265	28115	0.362
2013	4303805	90465	26511	0.295
2014	3020614*	109498		
Average	2760042	78918	25484	0.435

* Geometric mean 1989–2010.
** At spawning time.