8.4.7 **Advice May 2013**

ECOREGION **Baltic Sea**

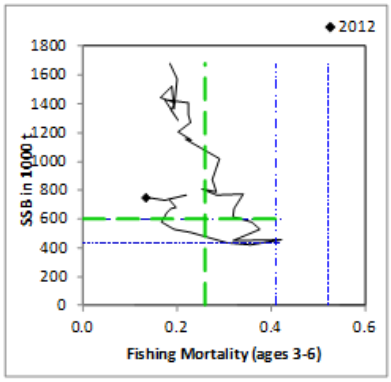
STOCK **Herring in Subdivisions 25–29 and 32 (excluding Gulf of Riga)**

Advice for 2014

ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 164 kt. This applies to all catches from the stock. All catches are assumed to be landed.

Stock status

F (Fishing Mortality)				
	2010	2011	**2012**	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	✓	✓	✓	Harvested sustainably
SSB (Spawning-Stock Biomass)				
	2011	2012	**2013**	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



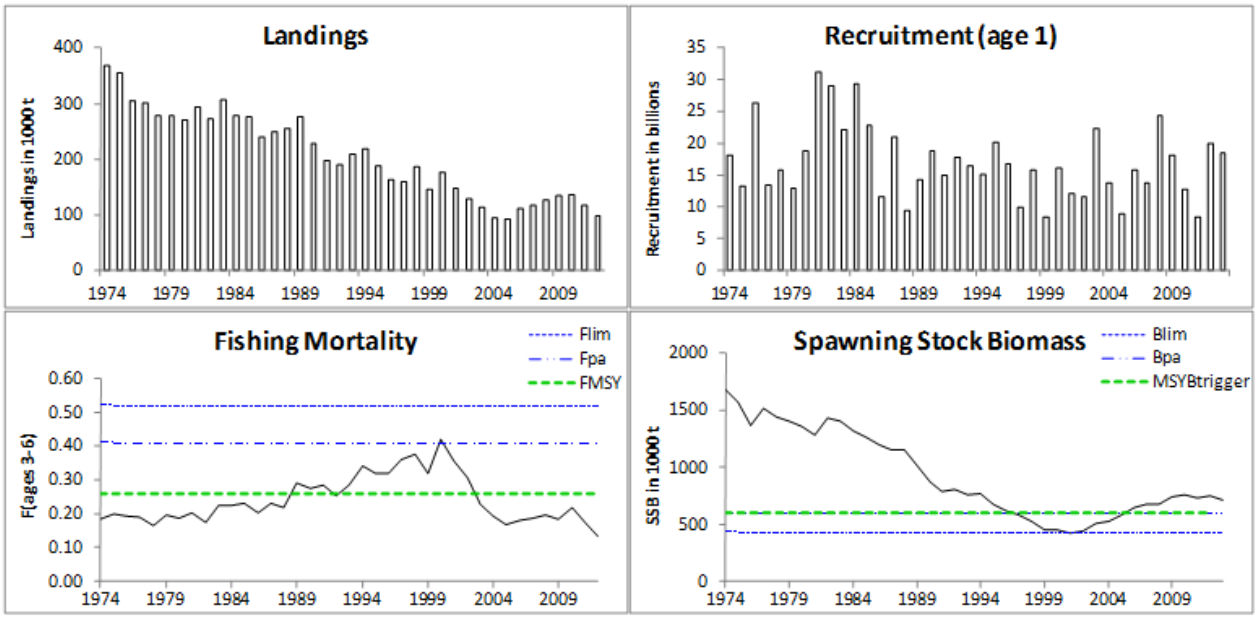


Figure 8.4.6.1 Herring in Subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Summary of stock assessment (SSB and recruitment in 2012 predicted). Top right: SSB and F for the time-series used in the assessment.

SSB declined until 2001 and then increased, and is currently stable above MSY $B_{trigger}$. Fishing mortality increasde until 2000, and then decreased, and has been below F_{MSY} since 2003. Recruitment has generally been lower since the 1980s.

Management plans

No specific management objectives are known to ICES.

Biology

Herring biomass is dependent on the cod stock through predator–prey interactions, and on sprat through competition. Regional differences in growth rate result in a high proportion of small individuals in the north (Subdivisions 28.2, 29, and 32) and large individuals in the south (Subdivisions 25 and 26). The strong increase in sprat stock size since the early 1990s in the northern areas (Subdivisions 27–29 and 32) exacerbated the interspecific competition and the decrease in herring weight-at-age, especially in these northern areas. Despite a slight increase in mean weights-at-age in recent years weights are low.

Environmental influence on the stock

The decline in SSB of Central Baltic herring in the 1970s to the 1990s was partly caused by a reduction in mean weights-at-age. Growth rate tends to change due to salinity variations, changes in zooplankton (prey) community, and competition with the Baltic sprat, i.e. a density-dependent effect.

Recently, a strong increase in cod density has occurred in the southern Baltic (mainly in Subdivision 25 and, to a lesser degree, in Subdivision 26), whereas no significant increase has been noticed in the northern areas (Subdivisions 27–32). The increase of cod in Subdivision 25 may have a significant effect on herring in this area, but very limited effect on the whole Central Baltic herring stock.

The fisheries

The pelagic fisheries take a mixture of herring and sprat. The extent to which species misreporting has occurred is assumed to be minor.

Catch distribution	Total herring landings of the Central Baltic stock (2012) were 98 kt (mainly pelagic trawl). Herring landings from the Central Baltic Sea were 94.2 kt. Discards are considered negligible.

Effects of the fisheries on the ecosystem

As both herring and sprat are the major prey of cod, the pelagic fishery can indirectly affect the cod stock.

Quality considerations

The overall biological sampling (length and age data) seems to be sufficient. The recent benchmark assessment led to a change in the perception of stock development, which now shows an overall upwards revision in SSB and a downwards revision in fishing mortality. These changes were to a larger extent caused by changes in natural mortality estimates (depending on cod predation) and revisions in the acoustic data used for tuning.

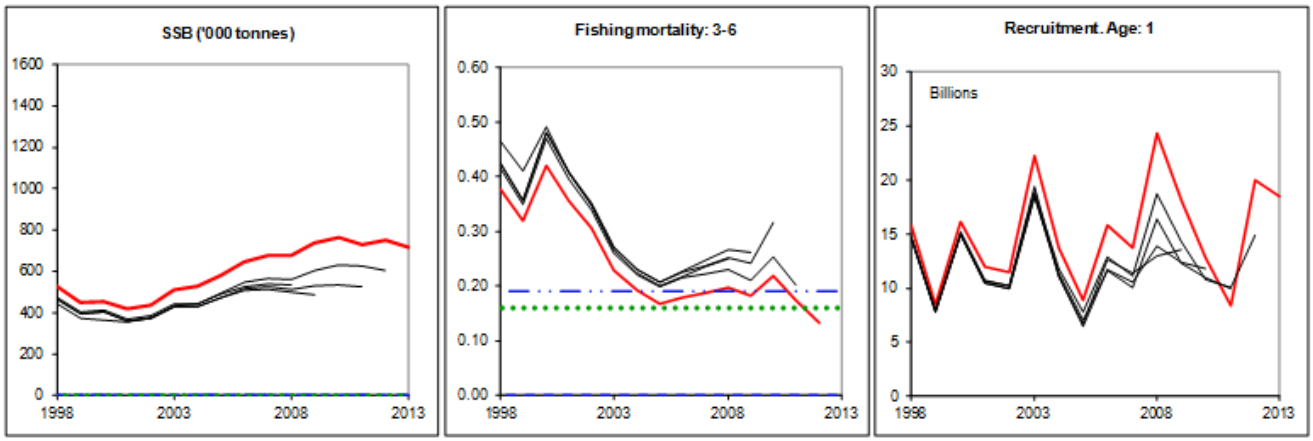


Figure 8.4.6.2 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Historical performance of the assessments. The assessment was benchmarked in 2013.

Scientific Basis

Assessment type	Age-based analytical assessment (XSA).
Stock data category	Category 1
Input data	Commercial catches (international landings, age and length frequencies from catch sampling); one survey acoustic index (BIAS); natural mortalities from multispecies model (SMS); fixed maturity ogive.
Discards and bycatch	Discards are not included and assumed negligible.
Indicators	None.
Other information	The latest benchmark was performed in 2013 (ICES, 2013a).
Expert Group report	WGBFAS

8.4.7 **Supporting information May 2013**

ECOREGION **Baltic Sea**

STOCK **Herring in Subdivisions 25–29 and 32 (excluding Gulf of Riga)**

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	600 000 t	B_{pa}.
	F_{MSY}	0.26	Stochastic simulations, including S–R relationship.
	Multispecies F_{MSY}	~0.30	SMS.
Precautionary Approach	B_{lim}	430 000 t	B_{loss}.
	B_{pa}	600 000 t	1.4 × B_{lim}.
	F_{lim}	0.52	Consistent with B_{lim}.
	F_{pa}	0.41	Consistent with B_{pa}.

(Changed in 2013, WKBALT (ICES, 2013a)).

Outlook for 2013

Basis: F2013 = TAC constraint = 0.15; SSB (2013) = 717 kt; Recruitment (age 1 in 2013) = 19 billion (RCT3 estimate); Recruitment (age 1 in 2014 and 2015) = 14.2 billion (GM 1988–2011); Catches (2013) 101 kt.

Rationale	**Catches (2014)**	**Basis**	**F 2014**	**SSB 2014**	**SSB 2015**	**%SSB change[1)]**	**%Advice change[2)]**
MSY approach	164	F_{MSY}	0.26	717	659	− 8%	+40%
Precautionary approach	217	B_{pa} (F_{sq} × 2.04)	0.36	696	600	− 14%	+85%
Zero catch	0	F = 0	0	775	853	10%	100%
Other options	86	F_{sq} × 0.74	0.13	746	748	0%	− 26%
	101	F_{sq} × 0.87	0.15	740	731	− 1%	− 14%
	117	F_{sq} × 1.02	0.18	735	713	− 3%	0%
	115	F_{sq} × 1	0.18	735	715	− 3%	− 2%
	136	F_{sq} ×1.2	0.21	728	691	− 5%	+16%
	146	F_{sq} × 1.3	0.23	724	679	− 6%	+25%
	156	F_{sq} × 1.4	0.25	720	668	− 7%	+33%
	250	F_{pa}	0.41	685	562	− 18%	+114%
	187	Multispecies F_{MSY}	0.3	708	634	− 11%	+60%

Weights in thousand tonnes.

1) SSB 2015 relative to SSB 2014.

2) Catches in 2014 relative to 2012 ICES advice for 2013.

MSY approach

Following the ICES MSY approach implies fishing at 0.26, corresponding to catches of no more than 164 kt in 2014. This is expected to lead to an SSB of 659 kt in 2015. All catches are assumed to be landed.

No transition is needed as the current fishing mortality is below F_{MSY}.

Precautionary approach

Fishing at F_{pa} would lead to an SSB in 2015 lower than B_{pa}. Therefore, the precautionary advice is based on reaching B_{pa} in 2015, which correspondes to catches of 217 kt. All catches are assumed to be landed.

Multispecies considerations

Herring multispecies F_{MSY} given as one value does not exist in a multispecies context, as the natural mortality of herring depends on the population size of the other stocks in the Baltic. Long-term yield of herring (estimated from the SMS model) is determined more by the population size of its predator cod than by the F (in the range of 0.25–0.35) on herring itself. The multispecies F_{MSY} (0.3) value for herring used in the outlook table gives the highest long-term yield, based on a biomass of cod that is associated with fishing mortality on cod in the range of 0.4–0.6. See Section 8.3.3 for details on how the multispecies F_{MSY} used in the outlook table was derived. Fishing at multispecies F_{MSY} = 0.3 would give catches in 2014 equal to 187 kt and SSB in 2015 at 634 kt.

Additional considerations

ICES recommends that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and construction on the spawning grounds, should not occur.

Management considerations

ICES recommends that a spatial management plan be developed for the clupeid stocks. The density of cod in Subdivisions 25–26 is at a historical high and cod growth is considered to be limited due to food limitation. Sprat and herring are the major food items for cod, but the present high biomass of the two prey stocks is mainly distributed outside the distribution area for cod. Any fishery on the two prey species in the cod distribution area will potentially decrease the local prey density, which may lead to increased food deprivation for cod. The relative landing proportion of central Baltic herring in the main cod distribution area has since 2008 increased from 30% of the total landings to 47% in 2012. This increase in fishing pressure may exacerbate the food condition for cod as the availability of sprat and herring decreases. Restrictions on herring landings taken in the main cod area (Subdivisions 25–26) should be established, especially as the 2013 TAC for Central Baltic herring has increased. Redistribution of the fishery to the northern areas (Subdivisions 27–32) may also reduce the density-dependent effect, i.e. increase growth for the clupeids in the area.

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 the central Baltic Sea.

The assessment and the advice consider that the Central Baltic herring stock is caught both in and outside the central Baltic. The TAC is set for herring caught in the central Baltic, which includes also a small amount of Gulf of Riga herring caught in the central Baltic but does not include Central Baltic herring taken outside the central Baltic Sea. The calculation is based on five-year average catches of Gulf of Riga herring outside Gulf of Riga and five-year average catches of Central Baltic herring in the Gulf of Riga.

- Central Baltic herring assumed to be taken in the Gulf of Riga in 2014 (Subdivision 28.1) is 5100 t (average 2008–2012);
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2014 is 180 t (average 2008–2012).

Following the ICES MSY approach of catches less than 164 kt, the corresponding catch in the central Baltic management area for 2014 would be 159.08 kt, calculated as 164+0.18−5.1.

Preliminary investigations indicate that western Baltic spring-spawning herring (Division IIIa and Subdivisions 22–24) and central Baltic herring (Subdivisions 25–29 and 32, excluding Gulf of Riga herring) are mixing in Subdivisions 24–26.

Regulations and their effects

From 2005 onwards, EU vessels operating in the sprat and herring fishery have not been allowed to land unsorted catches, unless there is a proper sampling scheme to monitor species composition. This is thought to have led to a reduction in the amount of species misreporting.

The fishery

All passive gears and purse-seiners, which are directed for human consumption, can be regarded as a fishery that almost exclusively takes herring. Some pelagic trawl fishery takes a mixture of herring and sprat, but landings by species are quantified.

Multispecies considerations

The mean weights-at-age for this stock have decreased during 1980–1998 (Figure 8.4.7.4) after which the weights fluctuated without clear trend. The decrease in weight-at-age has been relatively more pronounced in the northern areas (Subdivisions 27–29) where the sprat stock has been concentrated since the beginning of the 1990s. This could result from interspecific density-dependent effects (Casini *et al.*, 2011).

The herring stock is affected by cod predation. However, the present species distribution pattern (ICES, 2012) implies that an increase in F on cod will not necessarily result in Baltic-wide herring stock size increase. Conversely, a decrease in F on cod will not necessarily result in a decrease of herring stock size if it is not accompanied by a cod expansion into northern areas. All of these considerations depend on the spatial overlap of the species.

An increase in sprat F in the northern areas (Subdivisions 27–32), where the sprat stock is currently mainly concentrated, would be potentially beneficial for herring growth by releasing density dependence.

Data and methods

The stock was benchmarked this year (ICES, 2013a). The assessment is based on catch data and on an international acoustic survey. Natural mortality (M) is now derived from a multispecies model, taking cod predation into account. Catches of Central Baltic herring stock taken from the Gulf of Riga are included in the assessment and the catches of Gulf of Riga herring stock taken from the central Baltic Sea are excluded.

Uncertainties in the assessment and forecast

Herring in the central Baltic is composed of a number of local populations differing in biological parameters and population dynamics.

Among other factors recruitment success for the separate populations influences the future mean weight-at-age of the stock. Separate trial assessments for different populations conducted in 2013 (ICES, 2013a), however, showed only a limited impact of this complex stock structure on the perception of the overall stock dynamics.

Comparison with previous assessment and advice

Compared to last year's advice, fishing mortality in 2011 has been revised downwards by 14% and SSB in 2012 revised upwards by 24%.

The basis for the advice is the same as last year, i.e. the MSY approach, with an F_{MSY} value revised this year.

Sources

Casini, M., Kornilovs, G., Cardinale, M., Möllmann, M., Grygiel, W., Jonsson, P., Raid, T., Flinkman, J., and Feldman, V. 2011. Spatial and temporal density-dependence regulates the condition of central Baltic Sea clupeids: compelling evidence using an extensive international acoustic survey. Population Ecology, 53: 511–523.

ICES. 2009. Report of the ICES Advisory Committee, 2009. ICES Advice, 2009. Book 8. 132 pp.

ICES. 2011. Report of the Baltic Fisheries Assessment Working Group (WGBFAS). 12–19 April 2011, ICES Headquarters, Copenhagen. ICES CM 2011/ACOM:10.

ICES. 2012. Report of the Study Group on Spatial Analyses for the Baltic Sea (SGSPATIAL). 6–8 November 2012, Lysekil, Sweden. ICES CM 2012/SSGRSP:07.

ICES. 2013a. Report of the Benchmark Workshop on Baltic Multispecies Assessments (WKBALT 2013). 4–8 February 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:43.

ICES. 2013b. Report of the Baltic Fisheries Assessment Working Group (WGBFAS), 10–17 April 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:10.

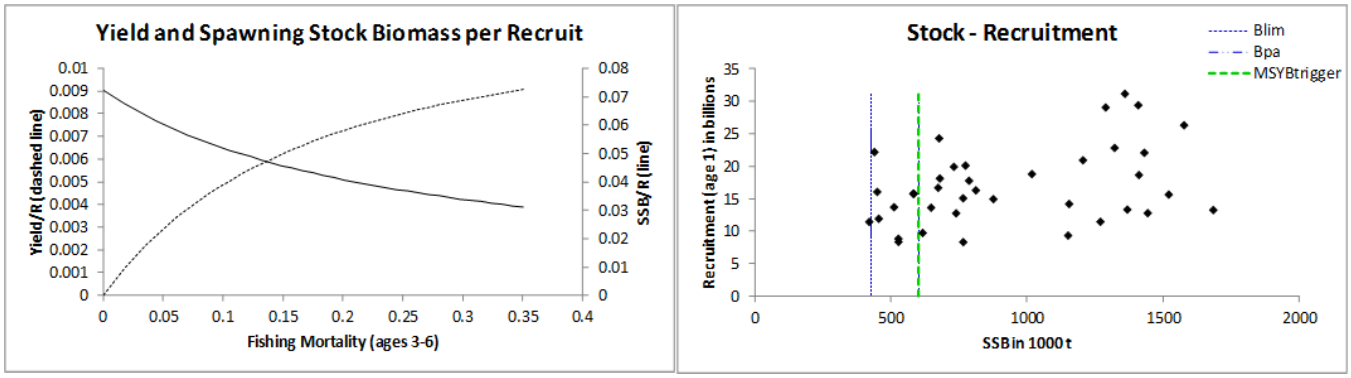


Figure 8.4.7.3 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Yield-per-recruit analysis (left panel) and stock–recruitment plot (right panel).

Table 8.4.7.1 Herring in Subdivisions 25–29 and 32 (excluding Gulf of Riga herring). ICES advice, management, and official landings.

Year	ICES Advice	Predicted landings corresp. to advice	Agreed TAC[1]	Official landings		
				22–24	25–29+32	Total
1988[4]		204	399	99	286	385
1989[4]		176	399	95	290	385
1990[4]		112	399	78	244	322
1991[4]	TAC for entire area	293	402	70	213	283
1992[4]	F near present level	343	402	85	210	295
1993[4]	Increase in yield at higher F	371	560	81	231	312
1994[4]	Increase in yield at higher F	317–463	560	66	242	308
1995[4]	TAC	394	560	74	221	295
1996[4]	TAC	394	560	58	195	253
1997[4]	No advice	-	560	67	208	276
1998[4]	No advice	-	560	51	212	263
1999[4]	Proposed F_{pa} = (0.17)	117	476	50	178	228
2000[4]	Proposed F_{pa} = (0.17)	95	405	54	208	262
2001[4]	Proposed F_{pa} = (0.17)	60	300	64	188	252
2002[4]	$F < F_{pa}$	< 73	Not agreed	53	168	221
2003	$F < F_{pa}$	< 72	143	41	154	195
2004	$F < F_{pa}$	< 80	171	**	93*	
2005	$F < F_{pa}$ (single-stock exploitation boundaries)	< 130	130[2]	**	92*	
2006	$F < F_{pa}$ (single-stock exploitation boundaries)	< 120	128[2]	**	110*	
2007	$F < F_{pa}$ (single-stock exploitation boundaries)	< 164	133[3]	**	116*	
2008	$F < F_{pa}$ (single-stock exploitation boundaries)	< 194	153[3]	**	126*	
2009	$F < F_{pa}$ (single-stock exploitation boundaries)	< 147	144[3]	**	132*	
2010	$F < F_{pa}$ (single-stock exploitation boundaries)	< 103	126[3]	**	137*	
2011	MSY Framework (F = 0.19)	< 95	107[3]	**	117*	
2012	MSY transition ($F = F_{pa} = 0.19$)	< 92	78[3]	**	98*[5]	
2013	MSY transition ($F = F_{pa} = 0.19$)	< 117	90[3]			
2014	MSY approach	< 164				

Weights in thousand tonnes.
[1] TAC for Subdivisions 22–29S and 32.
[2] TAC for Subdivisions 25–28.2, 29, and 32.
[3] EU quota for Subdivisions 25–28.2, 29, and 32.
[4] 1987–2002 incl. Gulf of Riga herring.
[5] Prelimary.
* Excl. GoR (Subdivision 28.1).
** Separate management since 2004.

Table 8.4.7.2 Herring in Subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Catches (in thousand tonnes) from the central Baltic management area and of the Central Baltic stock.

Year	Catches of herring from the Central Baltic			CB herring stock catches	Total catch of central Baltic herring stock
	Central Baltic herring stock	Gulf of Riga herring stock	Total	From the Gulf of Riga	
1977	261.9	-	261.9	2.4	264.3
1978	276.6	-	276.6	6.3	282.9
1979	297.8	-	297.8	4.7	302.5
1980	282.7	-	282.7	5.7	288.4
1981	269.2	-	269.2	5.9	275.1
1982	292.6	-	292.6	4.7	297.3
1983	280.6	-	280.6	4.8	285.4
1984	269.3	-	269.3	3.8	273.1
1985	267.7	-	267.7	4.6	272.3
1986	248.3	-	248.3	1.3	249.6
1987	231.6	-	231.6	4.8	236.4
1988	262.5	-	262.5	3.0	265.5
1989	263.6	-	263.6	5.9	269.5
1990	223.3	-	223.3	6.0	229.3
1991	188.5	-	188.5	6.1	194.6
1992	185.7	1.3	187.0	3.5	189.2
1993	204.0	1.2	205.2	4.3	208.3
1994	213.6	2.1	215.7	5.0	218.6
1995	183.2	2.4	185.6	6.1	189.3
1996	162.3	4.3	166.6	4.4	166.7
1997	167.7	2.9	170.6	4.3	172.0
1998	181.8	2.8	184.6	4.1	185.9
1999	144.4	1.9	146.3	4.3	148.7
2000	170.5	1.9	172.4	4.6	175.1
2001	147.3	1.2	148.5	2.9	150.2
2002	125.6	0.4	126.0	3.5	129.1
2003	109.5	0.4	109.9	4.3	113.8
2004	89.7	0.2	89.9	3.3	93.0
2005	89.3	0.5	89.8	2.3	91.6
2006	107.2	0.4	107.6	3.2	110.4
2007	114.5	0.1	114.6	1.5	116.0
2008	120.1	0.1	120.2	6.1	126.2
2009	129.2	0.1	129.3	4.9	134.1
2010	131.5	0.4	131.9	5.2	136.7
2011	111.3	0.1	111.4	5.5	116.8
2012	94.0	0.2	94.2	3.8*	97.8

* Preliminary.

Table 8.4.7.3 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Landings (thousand tonnes) of the Central Baltic stock.

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia**	Sweden	Total
1977	11.9		33.7	0.0			57.2	112.8	48.7	264.3
1978	13.9		38.3	0.1			61.3	113.9	55.4	282.9
1979	19.4		40.4	0.0			70.4	101.0	71.3	302.5
1980	10.6		44.0	0.0			58.3	103.0	72.5	288.4
1981	14.1		42.5	1.0			51.2	93.4	72.9	275.1
1982	15.3		47.5	1.3			63.0	86.4	83.8	297.3
1983	10.5		59.1	1.0			67.1	69.1	78.6	285.4
1984	6.5		54.1	0.0			65.8	89.8	56.9	273.1
1985	7.6		54.2	0.0			72.8	95.2	42.5	272.3
1986	3.9		49.4	0.0			67.8	98.8	29.7	249.6
1987	4.2		50.4	0.0			55.5	100.9	25.4	236.4
1988	10.8		58.1	0.0			57.2	106.0	33.4	265.5
1989	7.3		50.0	0.0			51.8	105.0	55.4	269.5
1990	4.6		26.9	0.0			52.3	101.3	44.2	229.3
1991	6.8	27.0	18.1	0.0	20.7	6.5	47.1	31.9	36.5	194.6
1992	8.1	22.3	30.0	0.0	12.5	4.6	39.2	29.5	43.0	189.2
1993	8.9	25.4	32.3	0.0	9.6	3.0	41.1	21.6	66.4	208.3
1994	11.3	26.3	38.2	3.7	9.8	4.9	46.1	16.7	61.6	218.6
1995	11.4	30.7	31.4	0.0	9.3	3.6	38.7	17.0	47.2	189.3
1996	12.1	35.9	31.5	0.0	11.6	4.2	30.7	14.6	25.9	166.7
1997	9.4	42.6	23.7	0.0	10.1	3.3	26.2	12.5	44.1	172.0
1998	13.9	34.0	24.8	0.0	10.0	2.4	19.3	10.5	71.0	185.9
1999	6.2	35.4	17.9	0.0	8.3	1.3	18.1	12.7	48.9	148.7
2000	15.8	30.1	23.3	0.0	6.7	1.1	23.1	14.8	60.2	175.1
2001	15.8	27.4	26.1	0.0	5.2	1.6	28.4	15.8	29.8	150.2
2002	4.6	21.0	25.7	0.3	3.9	1.5	28.5	14.2	29.4	129.1
2003	5.3	13.3	14.7	3.9	3.1	2.1	26.3	13.4	31.8	113.8
2004	0.2	10.9	14.5	4.3	2.7	1.8	22.8	6.5	29.3	93.0
2005	3.1	10.8	6.4	3.7	2.0	0.7	18.5	7.0	39.4	91.6
2006	0.1	13.4	9.6	3.2	3.0	1.2	16.8	7.6	55.3	110.4
2007	1.4	14.0	13.9	1.7	3.2	3.5	19.8	8.8	49.9	116.0
2008	1.2	21.6	19.1	3.4	3.5	1.7	13.3	8.6	53.7	126.2
2009	1.5	19.9	23.3	1.3	4.1	3.6	18.4***	11.8	50.2	134.1
2010	5.4	17.9	21.6	2.2	3.9	1.5	25.09.1		50.0	136.7
2011	1.8	14.9	19.2	2.7	3.4	2.0	28.08.5		36.2	116.8
*2012	1.4	8.3	18.0	0.9	2.6	1.8	25.5	13.0	26.2	97.8

* Preliminary.

** In 1977–1990 sum of catches for Estonia, Latvia, Lithuania, and Russia.

*** Updated in 2011.

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Table 8.4.7.4 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Summary of stock assessment (weights in tonnes).

Year	Recruitment Age 1 thousands	SSB* tonnes	Landings tonnes	Mean F Ages 3–6
1974	18114350	1682759	368652	0.1845
1975	13329187	1575652	354851	0.2003
1976	26359014	1367174	305420	0.1935
1977	13399401	1519328	301952	0.1887
1978	15700763	1441704	278966	0.1644
1979	12854589	1409571	278182	0.1954
1980	18712220	1358308	270282	0.1872
1981	31187638	1287411	293615	0.2028
1982	29092700	1429329	273134	0.1739
1983	22125626	1407294	307601	0.2241
1984	29443314	1320395	277926	0.2236
1985	22873272	1268246	275760	0.2296
1986	11526417	1204136	240516	0.2022
1987	20984622	1149592	248653	0.2304
1988	9406685	1153449	255734	0.2186
1989	14258286	1016674	275501	0.2897
1990	18847974	875217	228572	0.2746
1991	15001659	785813	197676	0.2828
1992	17831434	810631	189781	0.2524
1993	16354785	763851	209094	0.2838
1994	15139537	772684	218260	0.3409
1995	20157136	672307	188181	0.3205
1996	16741856	615535	162578	0.3191
1997	9807990	582983	160002	0.3590
1998	15820867	526616	185780	0.3767
1999	8428082	448599	145922	0.3189
2000	16112913	453937	175646	0.4211
2001	11993458	419189	148404	0.3568
2002	11509632	438026	129222	0.3058
2003	22235842	510068	113584	0.2281
2004	13766157	526364	93006	0.1932
2005	8916026	581184	91592	0.1675
2006	15835071	646287	110372	0.1792
2007	13684522	675830	116030	0.1877
2008	24342632	678432	126155	0.1971
2009	18177624	738324	134127	0.1822
2010	12826167	764421	136706	0.2190
2011	8394028	730206	116785	0.1736
2012	19970836	751456	97773	0.1331
2013	**18517000	***716586		
Average	16994533	926889	207231	0.2406

* At spawning time.
** Output from RCT3 analysis.
***Predicted.

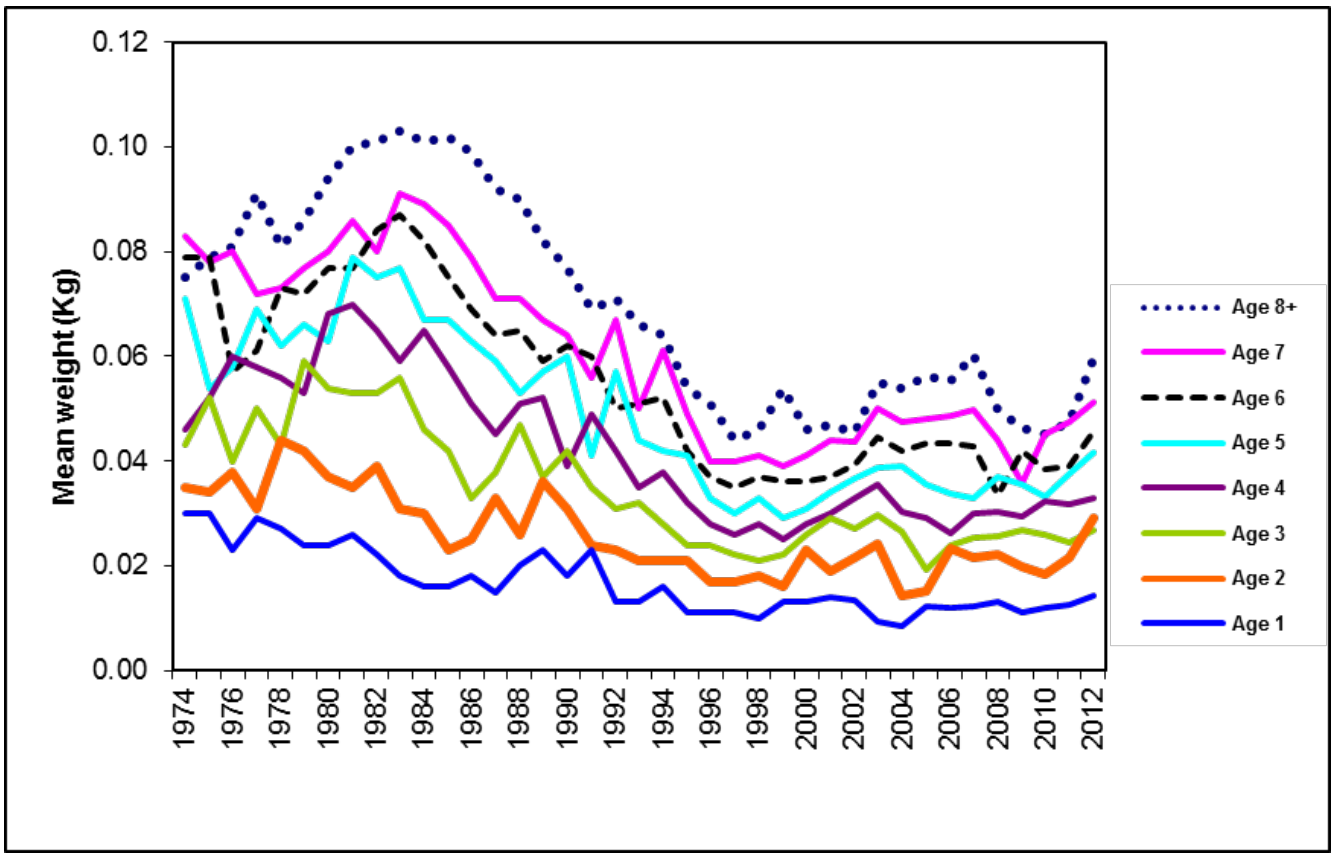

Figure 8.4.7.4 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Trends in the mean weights-at-age (kg) in the catch.

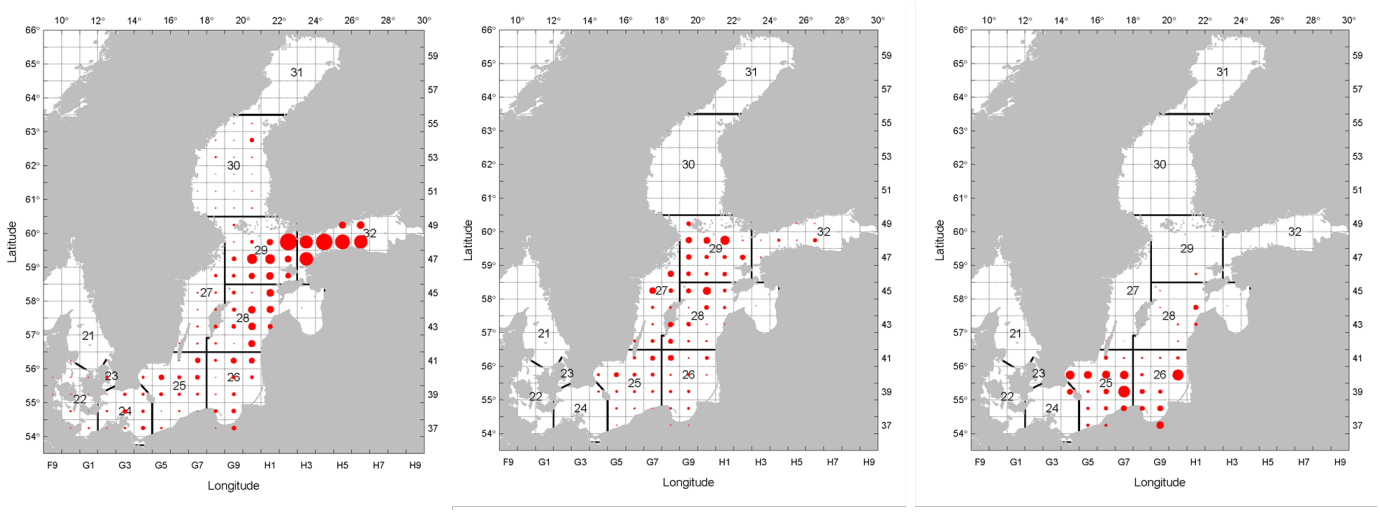

Figure 8.4.7.5 Herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga. Distribution of Baltic sprat from the acoustic survey (BIAS) in the 4th quarter in 2012 (in Subdivisions 22–30) (left panel); herring in Subdivisions 25 to 29 and 32, excluding the Gulf of Riga from the BIAS survey (BIAS) in the 4th quarter in 2012 (in Subdivisions 25–29+32)(middle panel); Eastern Baltic Sea cod (Subdivisions 25–32) from the bottom trawl survey (BITS) in the 4th quarter in 2012 (in Subdivisions 25–29 South) (right panel).