Preliminary estimate of the Gulf of Riga (ICES subd.28.1) herring stock 2015 year-class and its influence on the prediction and fishing mortality levels in 2017

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The assessment of the Gulf of Riga herring is performed in the ICES Baltic fisheries assessment working group. For the assessment the results of the hydro-acoustic survey are used as tuning fleet. The hydro-acoustic survey is performed in the end of July- beginning of August jointly by Estonia (EE) and Latvia (LV) and since 1999 and since 2005 the results are used for the assessment of the Gulf of Riga herring. For the prediction of the Gulf of Riga herring stock, the recruitment at age 1 is taken as the average value from 1989 onwards.

For the data analysis the average age composition of the trawl catches performed during the hydro-acoustic survey was available and it has not been combined with the acoustic recordings (Table 1). However, results of the hydro-acoustic surveys indicate that there is a significant correlation between the percentage of the age group 1 in the hydro-acoustic survey and the estimate of this age group which is performed next spring after the hydro-acoustic survey takes place (Figure 1, Table 2).

Table 1.
Average age composition of herring in the trawl catches of the hydro-acoustic surveys in the Gulf of Riga, (%). 1999-2015 data from the WGBFAS report and data of 2016 obtained from the age determination of trawl samples performed during hydro-acoustic survey.

Year	Age							
	1	2	3	4	5	6	7	8+
1999	40.1	33.0	10.2	8.8	3.5	2.4	1.6	0.5
2000	36.7	32.8	14.7	5.0	5.6	2.8	1.2	1.2
2001	61.0	16.1	11.7	6.2	1.7	2.4	0.5	0.5
2002	33.1	49.6	8.8	4.3	1.8	0.7	1.4	0.3
2003	71.3	9.3	12.9	2.4	1.5	1.5	0.3	0.8
2004	19.3	65.1	4.1	8.2	1.3	1.2	0.5	0.2
2005	52.7	10.1	29.2	2.2	4.4	0.6	0.5	0.4
2006	77.3	12.7	1.4	6.0	0.7	1.4	0.2	0.2
2007	19.0	47.2	16.3	1.8	12.5	1.5	1.3	0.3
2008	54.0	12.3	25.7	4.8	0.8	2.1	0.1	0.1
2009	45.1	33.0	6.1	12.0	2.0	0.2	1.6	0.1
2010	50.3	22.8	17.0	2.4	5.8	1.0	0.1	0.5
2011	20.3	33.9	16.1	18.9	3.8	5.5	1.0	0.4
2012	54.8	7.0	14.1	7.1	9.5	3.4	2.8	1.2
2013	50.6	29.8	3.2	6.7	2.6	4.4	1.0	1.7
2014	12.4	42.7	24.9	3.1	6.3	4.9	5.2	0.5
2015	41.6	7.0	24.5	14.3	3.3	4.5	2.3	2.5
2016	67.0	9.1	3.0	10.3	6.1	1.1	1.8	1.6

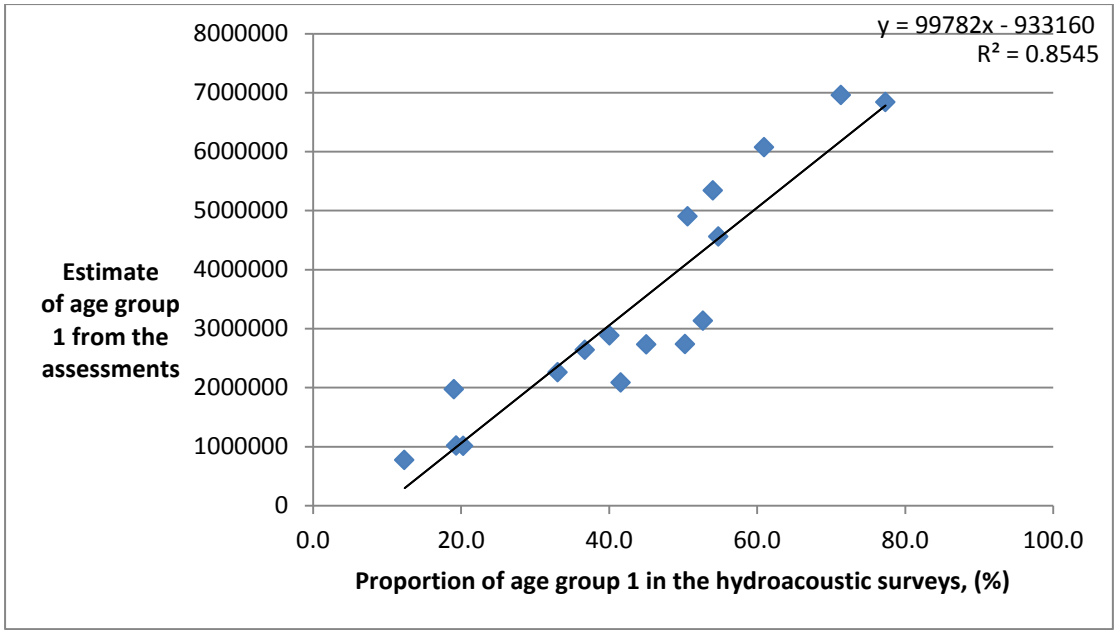

Figure 1. Relationship between proportion of age group 1 herring in the hydro-acoustic surveys and the age group 1 estimate from the assessment performed at ICES WGBFAS.

Table 2. Data used for the relationship

	Percentage of age group 1 in the surveys	Estimate of age group 1 from the assessments, thou
1999	40.1	2881773
2000	36.7	2637417
2001	61.0	6075974
2002	33.1	2262487
2003	71.3	6959875
2004	19.3	1014777
2005	52.7	3132862
2006	77.3	6839933
2007	19.0	1973385
2008	54.0	5344126
2009	45.1	2733762
2010	50.3	2738980
2011	20.3	1013508
2012	54.8	4559331
2013	50.6	4904046
2014	12.4	774679
2015	41.6	2088033

The equation from the relationship was used for the calculation of the possible number of age group 1 herring in the beginning of 2016 and the resulting value was 5752234 thousand indicating that 2015 year-class is rich. Y=99782*67-933160=5752234. Although in the assessment of the Gulf of Riga herring that will be performed next spring the recruitment estimate for 2016 could differ from the value that EE and LV institutes have obtained from

the observed relationship it could be declared with high confidence that the 2015 year-class is rich and well above the average level. This is also confirmed by the high abundance of this year-class observed in the commercial fishery.
The obtained value of the 2015 year-class was used in the new prediction for the Gulf of Riga herring stock as the number of age group 1 in 2016. The results of the prediction are presented in Table 2. Other input variables of the prediction were not changed. The results show that the SSB in 2017 will considerably increase because the 2015 year-class will add to the spawning stock. Besides also the catches in 2017 are predicted to be higher at similar fishing mortality levels. Since the proportion of this age group in the catches will be higher than predicted it will decrease the fishing pressure on older age groups therefore the resulting fishing mortality could be lower than predicted previously. The fishing mortality for the Gulf of Riga herring within ICES is calculated as the average for age groups 3-7. Therefore the catch level of the Gulf of Riga herring as it proposed for fishing opportunities in 2017 by EE and LV - 26770 t (without exchange with the Baltic Sea area), in practice corresponds to much lower fishing mortality than F=0,38 as it was based on previous prediction data and would be below F=0.3 while the Fmsy=0.32.

Table 2. Prediction of the Gulf of Riga herring with the calculated new recruitment value for age group 1 in 2016.

2016						
Biomass	SSB	FMult	FBar	Landings		
146446	78936	1.1021	0.3671	30515		
2017					2018	
Biomass	SSB	FMult	FBar	Landings	Biomass	SSB
148852	109226	0	0	0	181043	140043
.	108597	0.1	0.0333	3413	177329	135818
.	107972	0.2	0.0666	6734	173715	131732
.	107351	0.3	0.0999	9967	170197	127778
.	106734	0.4	0.1333	13114	166774	123953
.	106120	0.5	0.1666	16177	163442	120253
.	105510	0.6	0.1999	19159	160198	116672
.	104903	0.7	0.2332	22062	157041	113206
.	104301	0.8	0.2665	24888	153968	109852
.	103701	0.9	0.2998	27640	150976	106606
.	103106	1	0.3331	30320	148063	103464
.	102513	1.1	0.3665	32930	145227	100423
.	101925	1.2	0.3998	35472	142466	97479
.	101340	1.3	0.4331	37947	139776	94628
.	100758	1.4	0.4664	40358	137158	91869
.	100180	1.5	0.4997	42706	134608	89196
.	99605	1.6	0.533	44994	132124	86609
.	99034	1.7	0.5663	47223	129705	84102
.	98466	1.8	0.5997	49394	127348	81675
.	97901	1.9	0.633	51510	125053	79324
.	97340	2	0.6663	53572	122817	77047

The prediction also shows that if the TAC will be set according to ICES advice (23 078 t) the SSB in 2018 will be above 110 thou t that may increase the feeding competition, and cause slower growth, lower condition factor and quality of the fishes and finally lower income for the fishermen. The predicted SSB will be 37.5% higher than the long-term average value of SSB. The data analysis show that there is a negative correlation (r=-0.75) between SSB and average weight of herring in age groups 2-7 (Figure 2). The density dependent growth of

Clupeids in the Baltic Sea has been described in several publications (Casini et al., 2006; Casini et al., 2011).

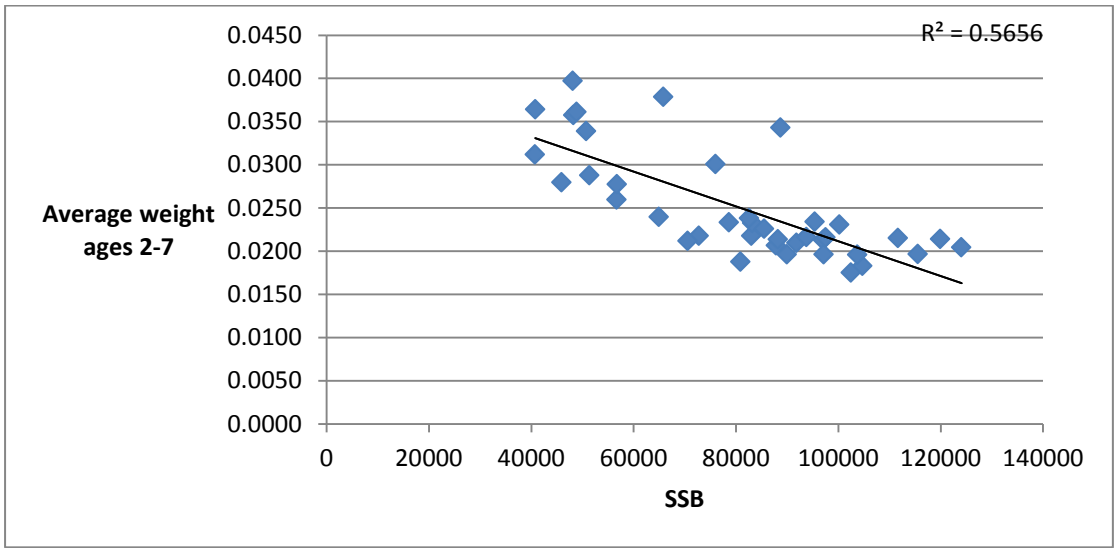

Figure 2. Relationship between average weight of 2-7 years old herring and spawning stock biomass in the Gulf of Riga

Main conclusions:

1. The results of the Gulf of Riga herring hydro-acoustic survey indicate that the 2015 year-class is very strong and it will define significant increase of SSB in 2017-2018.

2. The high proportion of this year-class in the catches will diminish the fishing pressure on older year-classes therefore the resulting fishing mortality will be much lower than predicted and even below Fmsy level.

3. If the TAC is adopted at the level proposed by the European Commission the SSB will increase considerably causing high feeding competition, slower growth, lower condition factor and quality of the fishes and finally lower income for the fishermen.

4. The TAC proposed by EE and LV at a level F=0,38 is based on the data from ICES advice released on May 2016. However, the new prediction that used the data from the latest EE and LV joint hydro-acoustic survey (August 2016) shows that the real level of F in 2017 with a high probability would not exceed F=0,30 that is below the Fmsy level.

The data analysis and prediction were performed by Tiit Raid from Estonian Marine Institute, Estonia and Georgs Kornilovs from Institute of Food Safety, Animal Health and Environment BIOR, Latvia. Both scientists would like to underline that the ICES advice was the best possible with the available data at the moment when advice was elaborated. The present data analysis and prediction have included the data from hydro-acoustic survey which was performed after the release of ICES advice.

References

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