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Report of the Baltic International Fish Survey Working Group (WGBIFS)

21–25 March 2013

Tartu, Estonia

ICES
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Contents

Executive summary

The ICES Working Group on Baltic International Fish Surveys (WGBIFS) met at rented conference room in the conference and party centre Atlantis, Tartu, Estonia 21–25 March 2013 to compile the survey results from 2012 and first half of 2013 and to coordinate and plan the schedule for surveys in second half of 2013 and first half of 2014. Furthermore, the common survey manuals were updated according to decisions made during the meeting. All fish stock assessment relevant surveys in the Baltic Sea with international participation (both bottom-trawl surveys and acoustic surveys) were coordinated. Totally, 20 participants, representing nine countries around the Baltic Sea, attended in the WGBIFS meeting. One of the participants was a representative of the ICES Data Centre. The group was chaired by Olavi Kaljuste, Sweden.

The results of the survey (BIAS, BASS, BITS) standard data compilation can be found under the relevant sections. Time-series of the acoustic tuning fleets are presented in Annex 5.

The evaluation of the realized trawl and acoustic surveys showed that stock indices based on the surveys present realistic estimates of the current stocks. Only the results of the BIAS survey in the ICES Subdivision 30 in 2012 might be biased because of the reduced survey effort (in 2012 Sweden could not support the funding of the survey in the Bothnian Sea due to economic difficulties within the DCF program and therefore the coverage of the SD30 had to be based on Finnish funding which resulted in half the normal effort).

The discussion of the survey results and the planning of the next surveys clearly showed that it is necessary that the cruise leaders inform the coordinators of the surveys very fast if planned control-stations cannot be realized or planned areas cannot be covered due to technical failure or weather conditions to offer the opportunity of alternative solutions.

Different methodical aspects of the acoustic surveys were discussed. However, statistical analyses were commonly based on a subset of the data because currently there exists no functioning database for acoustic source data.

During the first two days of the meeting the questions concerning the DATRAS database and the necessary actions needed to improve the quality of the products provided by ICES Data Centre based on BITS data were intensively discussed. One person from ICES Data Centre - data systems analyst Vaishav Soni, who is mainly working with the development and maintenance of the DATRAS-database, was present in the meeting. He informed the Group about the current developments of DATRAS and advised WGBIFS in the process of preparation of requests addressed to ICES Data Centre.

Large part of the working time was committed by discussions of additional terms of reference based on recommendations of other expert groups of EU and ICES. All these requests are replied in the current report.

1 Opening of the meeting

The meeting took place from 21 to 25 March 2013 at rented conference room in the conference and party centre Atlantis, Tartu, Estonia. The meeting was opened by the Chair at 10 am.

The Terms of Reference for the meeting were:

The **Baltic International Fish Survey Working Group** (WGBIFS), chaired by Olavi Kaljuste, Sweden, will meet in Tartu, Estonia, 21–25 March 2013 to:

a) Combine and analyse the results of spring and autumn 2012 acoustic surveys and experiments and report to WGBFAS;

b) Update the BIAS and BASS hydroacoustic databases;

c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2013 and spring 2014;

d) Discuss the results from BITS surveys performed in autumn 2012 and spring 2013 and evaluate the characteristics of TVL and TVS standard gears used in BITS;

e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2013 and spring 2014;

f) Update and correct the Tow Database;

g) Review and update the Baltic International Trawl Survey (BITS) manual;

h) Review and update the manual of International Baltic Acoustic Surveys;

i) Review of new results on the abundance of the pelagic cod;

j) Discuss the indices of acoustic surveys based on different methods for combining the data of fishing stations in compilation of acoustic indices and draft recommendations as appropriate;

k) Review and update the structure of the BIAS database to incorporate the estimates of two herring stocks in one subdivision;

l) Evaluate the proportion of WBSS in SD 25 and SD 26 during the BIAS;

m) Coordinate stomach sampling programme in the Baltic International Trawl Survey (BITS);

n) Evaluate the new information how to estimate the acoustic survey sampling variance;

o) Ensure that the most recent version of the survey manual is submitted to the Series of ICES Survey Protocols (SISP).

Additional Terms of Reference were added based on the recommendations made by other Experts groups:

- Investigate the effect of the partial lack of BITS coverage in the cod and flatfish cpues. In particular, an attempt to reconstruct the missing observation in SD 26 2012 should be attempted. (Rec. by WGBFAS)
- Fill in the WKCATDAT 2012 table by country and survey, as an exercise, to identify the current state regarding data collection towards an ecosystem survey and MSFD. (Rec. by WGISUR)

2 Adoption of the agenda and organization of the meeting

The agenda was presented by the Chair (see Annex 2) and was adopted without any changes. To each task one delegate was assigned as "text responsible" and one or more as "assistant text responsible".

Two subgroups were formed; the first one dealing with demersal trawl survey (BITS) issues and the other one dealing with issues related to acoustic surveys (BIAS, BASS). The subgroups were responsible for the discussion of the relevant issues listed in the meeting agenda. The "text responsible" persons were obligated for the preparation of the draft text and the presentations in plenary. Plenary was held whenever needed and before the end of the meeting all responsible persons presented their results in plenary.

3 Combine and analyse the results of spring (BASS) and autumn (BIAS) 2012 acoustic surveys and experiments and report to WGBFAS

3.1 Combined results of the Baltic International Acoustic Survey (BIAS)

In 2012, the following acoustic surveys were conducted in September - October:

Vessel	Country	ICES Subdivisions
Dana	Sweden	25, 26, 27, 28, 29,
Dana	Finland/Sweden	30
Baltica	Poland	Parts of 24, 25 and 26
Baltica	Latvia/Poland	Parts of 26 and 28
Baltica	Estonia/ Finland/ Poland	Parts of 28, 29 and 32
Darius	Lithuania	Part of 26
Solea	Germany/Denmark	21, 22, 23, 24

Stock indices of herring, sprat and cod by age groups of the different cruises are stored in the BIAS-database of WGBIFS. The standard reports from German-Danish, Latvian-Polish, Estonian-Finnish-Polish, Polish, Swedish and Lithuanian BIAS 2012 cruises are presented in Annex 8 using the standard format.

3.1.1 Area under investigation and overlapping areas

Each the ICES statistical rectangle of the area under investigation was allocated to one country during the WGBIFS meeting in 2005, thus each country has a mandatory responsible area. That means that area shall be acoustically investigated by about 60 NM and at least two fish control-hauls. However, it is allowed for all nations to cover also other areas, the results from the responsible country are used if these data are available.

The Figure 3.1.1.1 illustrates that the planned coverage of the Baltic Sea during the acoustic (BIAS) survey in September-October 2012, was realized. The area coverage of the Baltic with the BIAS/2012 survey was the same as required by the WGBIFS 2012. However, the Russian – St Petersburg BIAS/2012 survey was not realized.

It should be mentioned that in July 2012, the Estonian-Latvian acoustic survey in the Gulf of Riga was accomplished, as was planned during WGBIFS 2012 meeting. The survey results from recent years are accessible at the national level, however, were not uploaded to the WGBIFS database.

Since autumn 2006, the Baltic International Acoustic Survey is covering the western and middle parts of the Gulf of Finland (SD 32), i.e. in the Estonian and Finnish EEZs only. The recent BIAS surveys were performed on the Polish RV “BALTICA”.

The summary of most the BIAS and BASS national cruises results from 2012 is presented in the Annex 8, however some reports during WGBIFS/2013 meeting were not ready yet. The Polish and Swedish BIAS/2012 survey reports were recently uploaded on the WGBIFS/2013 SharePoint.

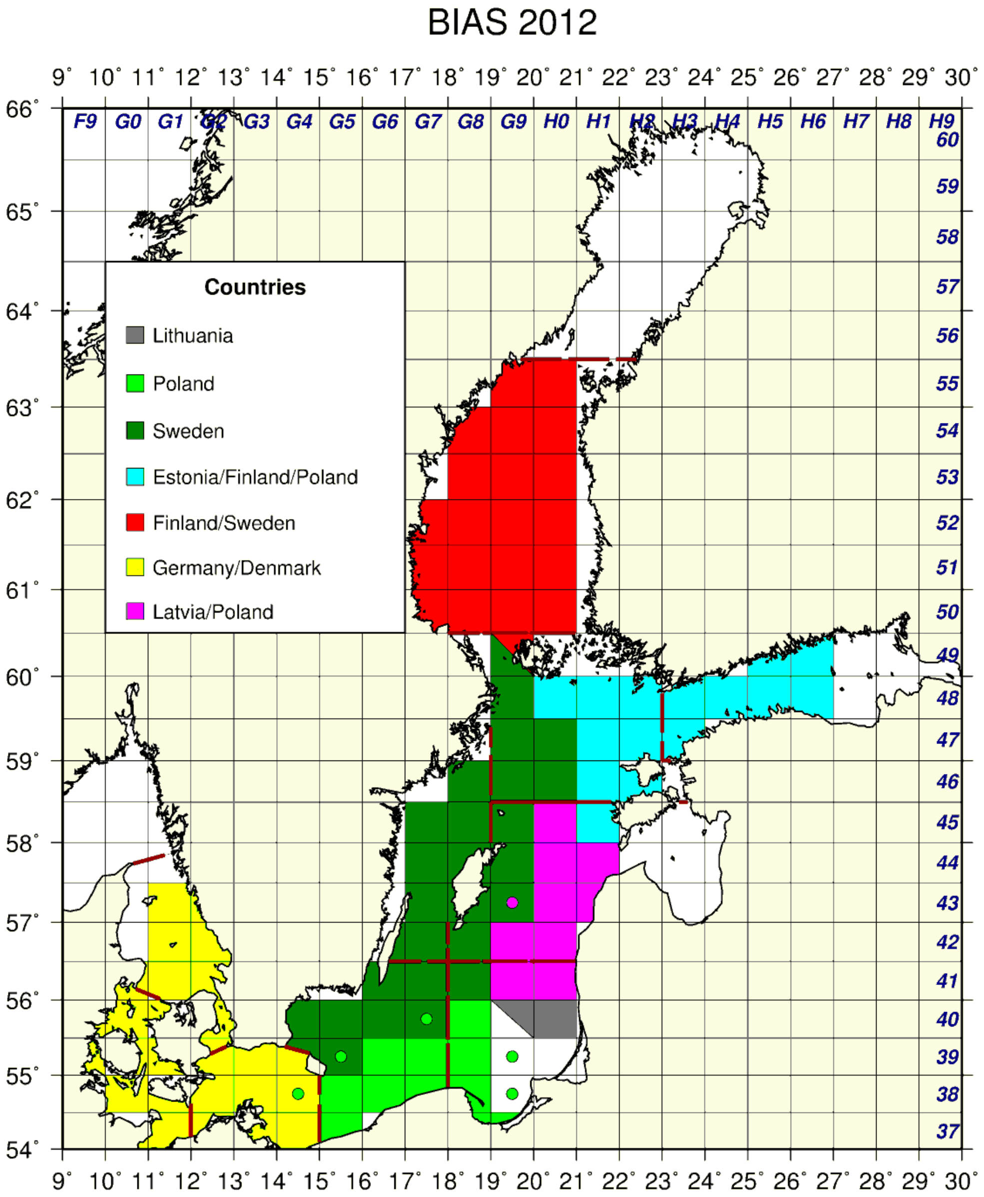


Figure 3.1.1.1. Map of the BIAS surveys conducted in September-October 2012. Various colours indicate the countries, which covered specific ICES-rectangles and delivered data to BIAS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BIAS-database partly or totally covered by other countries.

3.1.2 Total results

The fish abundance estimates, which are based on the BIAS surveys in September-October 2012, are presented per ICES rectangles and age groups and are specified in Tables 3.1.2.1, 3.1.2.2 and 3.1.2.3 for herring, sprat and cod, respectively. In addition, the abundance estimates for herring and sprat are presented in Tables 3.1.2.4 and 3.1.2.5 per ICES Subdivisions and fish age groups. Geographical distribution of herring, sprat and cod abundance in the Baltic, according to inspected the ICES rectangles is illustrated in Figures 3.1.2.1–3.1.2.3.

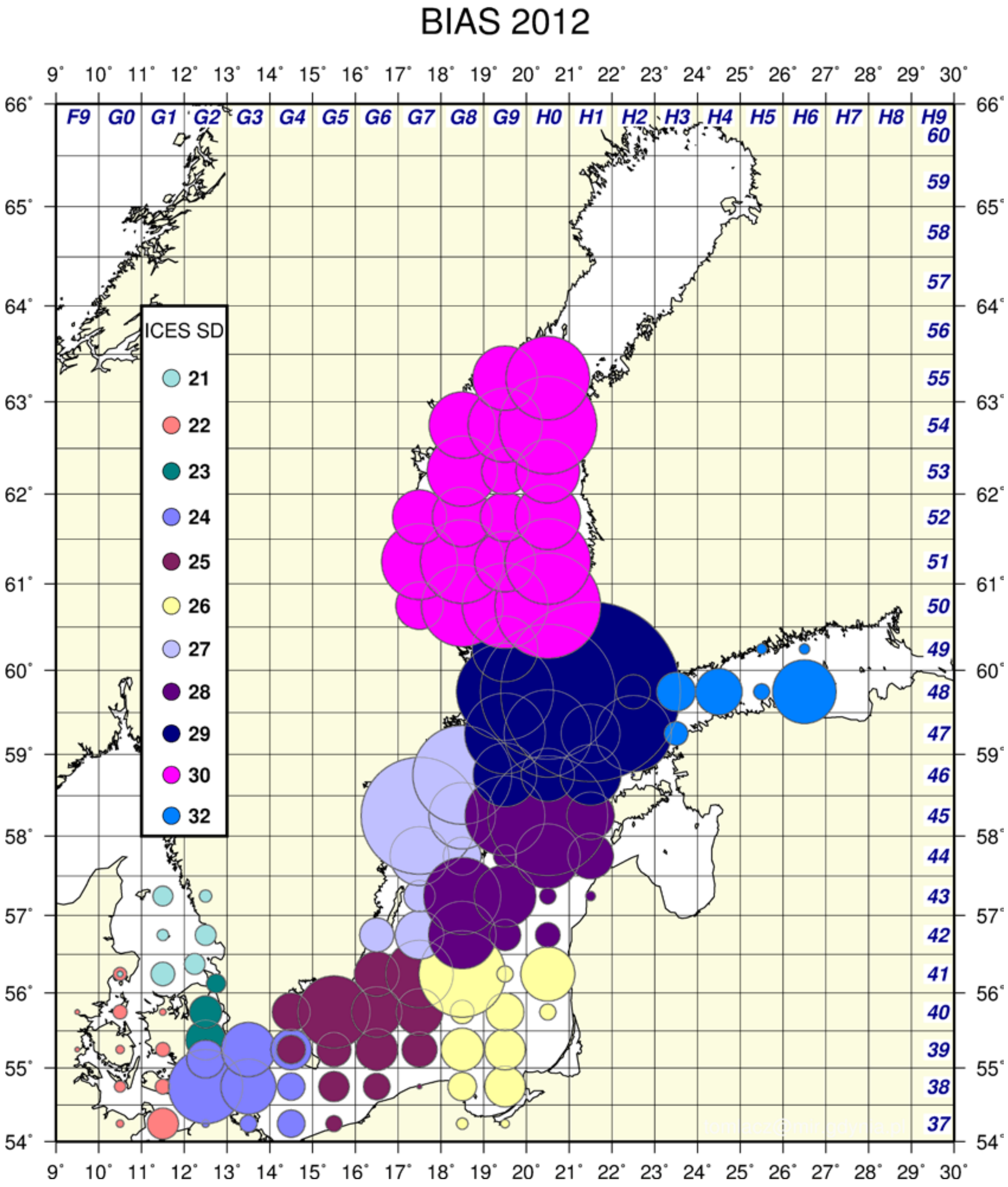


Figure 3.1.2.1. Covered the ICES-rectangles in September-October 2012 with the abundance of herring (the area of the circles indicates the estimate number of herring in 10^6 indiv. in the rectangle, the colour indicates the ICES Subdivision).

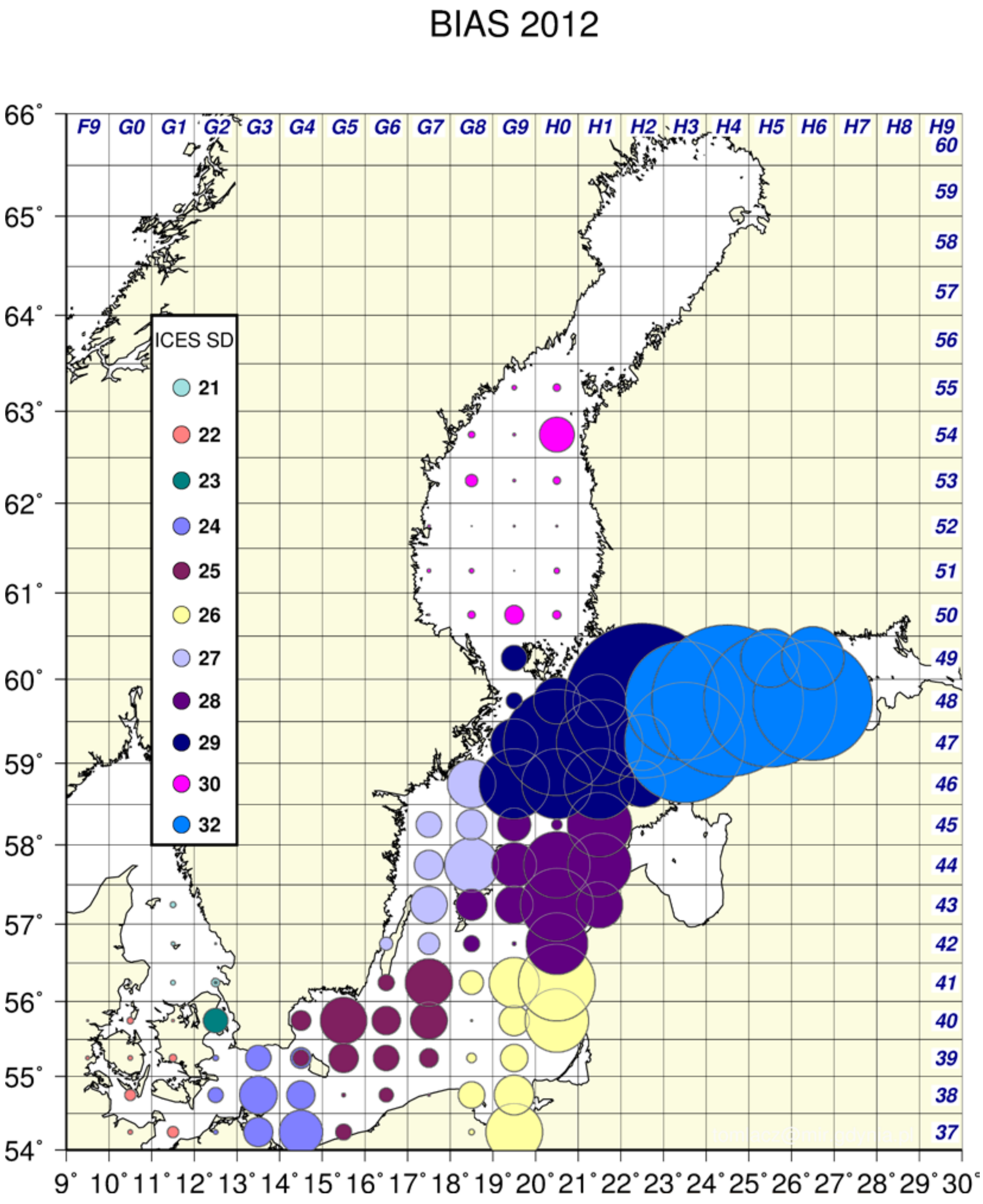


Figure 3.1.2.2. Covered the ICES-rectangles in September-October 2012 with the abundance of sprat (the area of the circles indicates the estimate number of sprat in 10^6 indiv. in the rectangle, the colour indicates the ICES Subdivision).

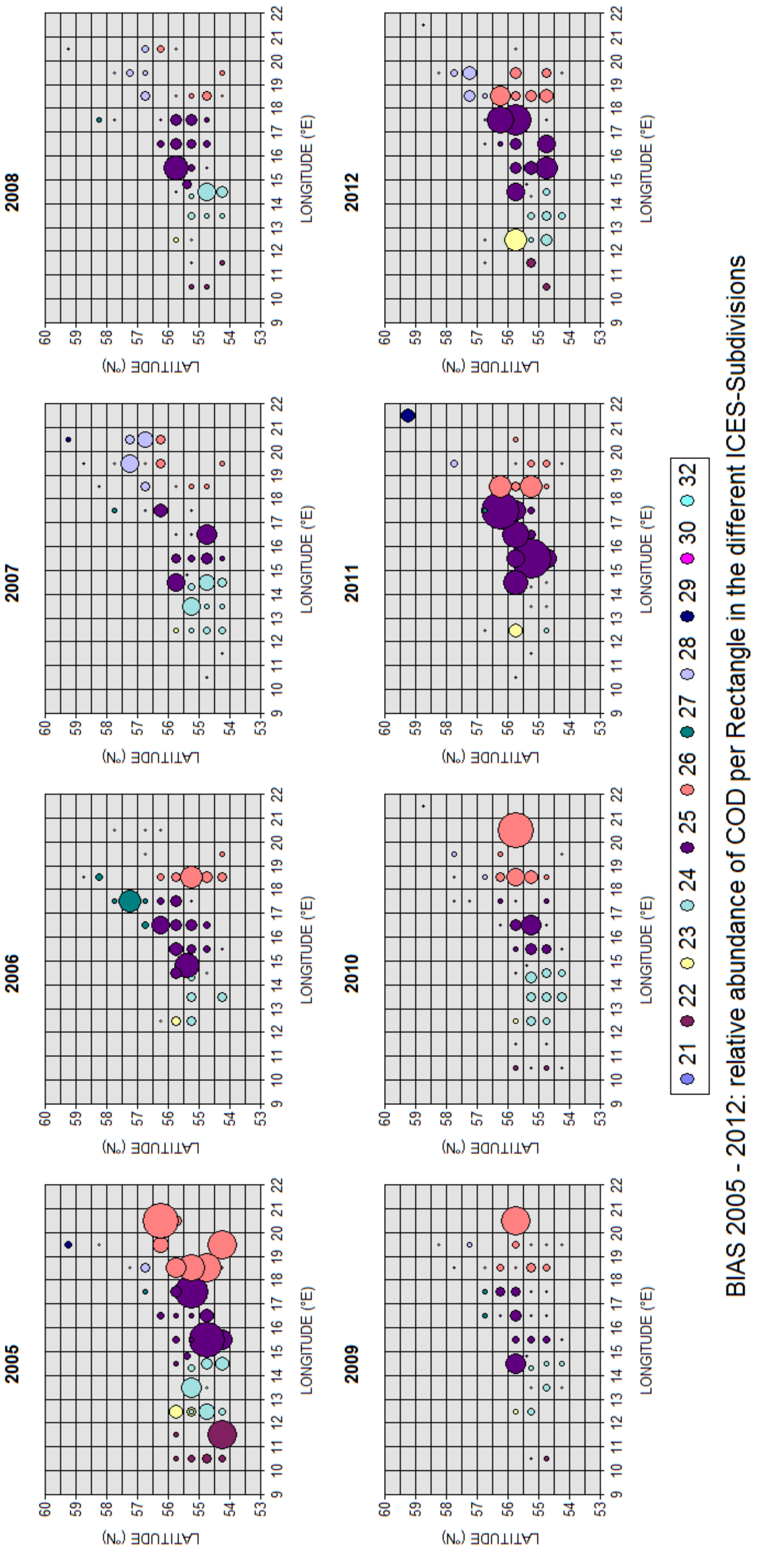


Figure 3.1.2.3. Covered the ICES-rectangles in September-October 2005-2012 with the abundance of cod (the area of the circles indicates the estimate number of cod in 10^6 indiv. in the rectangle, the colour indicates the ICES Subdivision).

3.1.3 Area corrected data

During WGBIFS meeting in 2006 possible improvement of presenting the results from acoustic surveys was discussed, and correction factor for each ICES Subdivision and year was introduced because of the coverage of the investigated area differed in the years. This factor is the proportion between the total area of the ICES Subdivision that are presented in the BIAS manual (see Table 2.2 in BIAS manual) and the area of rectangles, which was covered during the survey. Some disagreements appeared about the appropriate area of ICES Subdivision 28. It was agreed that the Gulf of Riga (ICES Subdivision 28.1) must be excluded from the total area. All other subdivision kept their areas from the manual (see section 3.3). The area corrected abundance estimates for herring and sprat per ICES Subdivisions and age groups are summarized in Tables 3.1.3.1 and 3.1.3.2, respectively. Biomass for herring and sprat per ICES Subdivisions and age groups are given in Tables 3.1.3.3 and 3.1.3.4.

3.1.4 Tuning fleets for WGBFAS

3.1.4.1 Herring in the ICES Subdivisions 25–29

Following tuning fleets was derived from the 1991-2012 BIAS (September-October) surveys for the herring assessment of the Central Baltic stock and is presented in the Annex 5:

- the area corrected numbers per age groups from 1 to 8+ of the ICES Subdivisions 25–29, without inclusion of inconsistent data of the ICES Subdivision 29N (Annex 5, Table 1),
- the area corrected recruitment index for herring (age 0) of the ICES Subdivisions 25–29, without inclusion of inconsistent data of the ICES Subdivision 29N (Annex 5, Table 2).

In the years, 1993, 1995 and 1997 the area coverage was very poor. The results were therefore not recommended to be used. It is recommended that these data should also not be used in future.

The coverage of the ICES Subdivision 29N was very inconsistent until 2007. Because of that, these data were not included at these tuning fleets. Nevertheless, high density of herring has been recorded there always.

Because of that two further tuning fleets was calculated in the same way but with inclusion of the data from the ICES SD 29N (Annex 5, Tables 6 and 7). It is recommended that the time-series of 2007-2012 of the tuning fleet can be used for testing in the next assessment of Central Baltic herring.

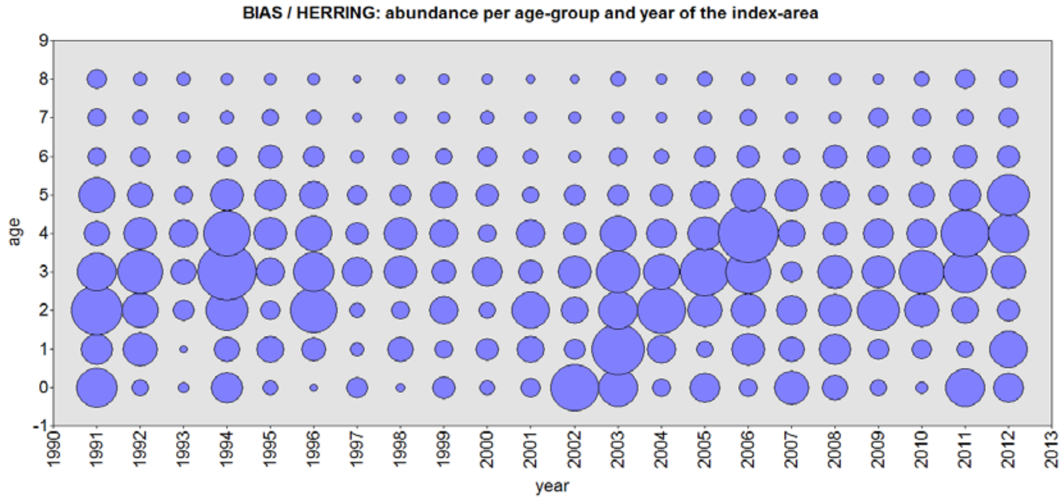


Figure 3.1.4.1.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years) for herring in the ICES Subdivisions 25-29; without data from the ICES SD 29N.

3.1.4.2 Sprat in the ICES Subdivisions 22–29

Tuning fleet is presented from the September/October 1991-2012 BIAS surveys for the sprat assessment of the Central Baltic stock, the area corrected combined results of the ICES Subdivisions 22–29 are presented in Annex 5 (Table 3) and recruitment index for sprat (age 0) in the ICES Subdivisions 22-29 is presented in Annex 5 (Table 4). Older data than for 1991 does not exist in the current BIAS database. In the years, 1993, 1995 and 1997 the area coverage was very poor. The results were therefore not recommended to be used. It is recommended that these data should also not be used in future.

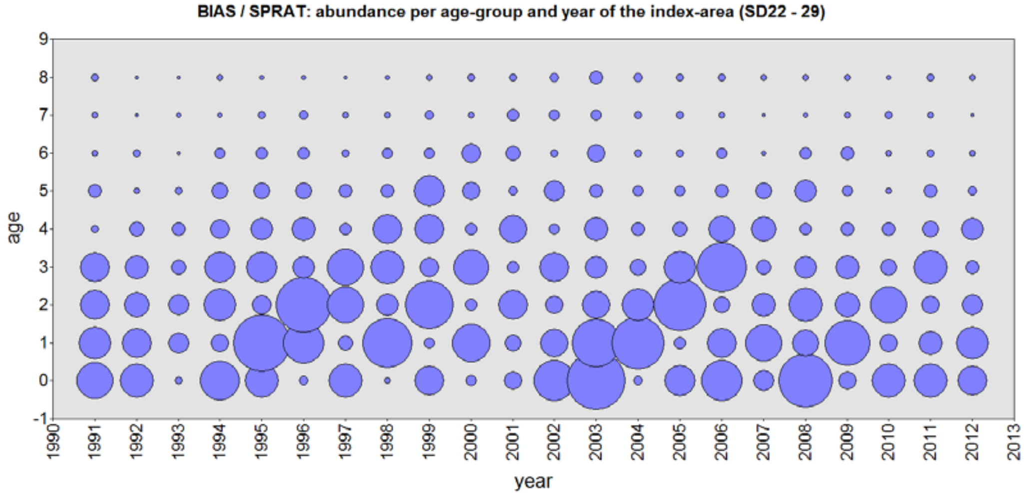


Figure 3.1.4.2.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years) for sprat in the ICES Subdivisions 22-29.

3.1.5 Herring in the ICES Subdivision 30

Tuning fleet is presented from the October 1991, 2000, 2007-2012 BIAS surveys for the herring assessment of the Bothnian Sea (the ICES Subdivision 30) stock, the area corrected combined results are presented in Table 3.1.4.3.1. The results from 2012 survey are not consistent with the results from previous years. The drastic changes in the age composition cannot easily be explained by natural causes or fishing impact. Most probably this bias in the results was caused by small number of control hauls and low area coverage of the Bothnian Sea in 2012. In 2012 Sweden could not support the funding of the survey in the Bothnian Sea due to economic difficulties within the DCF program and therefore the coverage of the SD30 had to be based on Finnish funding which resulted in half the normal effort (the decision was made at WGBIFS in 2012 that each square in SD30 should be evenly covered by half the distance in each square and half the number of hauls in each square compared to normal coverage).

3.1.6 Recommendations to WGBFAS

- *WGBIFS recommends that, the BIAS-dataset, including the valid data from 2012, can be used in the assessment of the herring and sprat stocks in the Baltic Sea with the restriction that the following years are excluded from the index series: 1993, 1995 and 1997.*

- *The additional tuning fleets, presented in Annex 5; Tables 6 and 7, can be used for the assessment of the Central Baltic herring with the restriction that the years 1991 to 2006 are excluded from the index series.*
- *WGBIFS recommends that the new BIAS index series can be used in the assessment of the Bothnian Sea herring with the restriction that the year 1999 is excluded from the dataset. Second, year 2012 should be treated with caution due to half of the coverage and reduced number of samples in 2012.*

Table 3.1.2.1. Estimated numbers (millions) of herring in September-October 2012, by the ICES rectangles, accordingly to age groups.

year	SD	RECT	total	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2012	21	41G0	9,32	0,67	6,70	1,95	0,00	0,00	0,00	0,00	0,00	0,00
2012	21	41G1	143,98	10,35	103,57	30,06	0,00	0,00	0,00	0,00	0,00	0,00
2012	21	41G2	117,20	85,77	29,86	1,57	0,00	0,00	0,00	0,00	0,00	0,00
2012	21	42G1	35,76	19,57	15,22	0,97	0,00	0,00	0,00	0,00	0,00	0,00
2012	21	42G2	114,85	89,59	25,14	0,12	0,00	0,00	0,00	0,00	0,00	0,00
2012	21	43G1	103,26	77,99	21,81	1,39	1,95	0,00	0,12	0,00	0,00	0,00
2012	21	43G2	40,57	32,98	7,59	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	37G0	13,59	10,59	2,50	0,18	0,32	0,00	0,00	0,00	0,00	0,00
2012	22	37G1	258,12	255,46	2,66	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	38G0	31,27	27,69	2,55	1,03	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	38G1	60,95	60,67	0,28	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	39F9	5,24	5,09	0,15	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	39G0	17,65	11,49	5,92	0,24	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	39G1	49,46	49,46	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	40F9	5,73	3,18	2,44	0,11	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	40G0	54,71	30,38	23,32	1,01	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	40G1	10,60	5,88	4,52	0,20	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	41G0	46,34	19,74	26,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	23	39G2	417,41	395,67	21,40	0,00	0,00	0,34	0,00	0,00	0,00	0,00
2012	23	40G2	269,17	46,02	2,19	9,55	67,28	59,10	32,40	24,98	16,69	10,96
2012	23	41G2	91,19	39,01	51,06	0,30	0,49	0,14	0,09	0,05	0,05	0,00
2012	24	37G2	16,78	10,45	5,04	0,44	0,29	0,20	0,21	0,10	0,05	0,00
2012	24	37G3	73,13	30,40	3,81	7,73	10,38	8,30	6,19	2,84	1,55	1,93
2012	24	37G4	190,78	180,75	0,00	3,90	2,23	1,67	1,67	0,00	0,00	0,56
2012	24	38G2	1 436,77	1330,41	99,34	2,01	0,77	2,03	0,72	1,42	0,07	0,00
2012	24	38G3	783,22	698,83	44,83	17,76	7,55	5,40	4,55	2,00	1,58	0,72
2012	24	38G4	197,48	48,61	10,31	39,29	32,70	25,62	21,21	8,31	4,56	6,87
2012	24	39G2	381,06	361,21	19,54	0,00	0,00	0,31	0,00	0,00	0,00	0,00
2012	24	39G3	763,30	328,89	184,42	87,50	52,13	44,87	35,88	13,12	8,23	8,26
2012	24	39G4	423,70	158,28	75,19	100,04	32,41	22,88	21,45	4,73	5,80	2,92
2012	25	37G5	66,59	59,88	0,66	0,25	0,28	0,29	0,97	0,90	1,16	2,20
2012	25	38G5	241,88	6,92	10,34	15,00	11,13	17,41	47,05	45,48	35,98	52,57
2012	25	38G6	179,55	84,50	1,20	4,22	4,32	4,70	16,72	16,90	17,16	29,83
2012	25	38G7	6,97	1,41	0,61	0,37	0,30	0,85	1,67	0,66	0,46	0,64
2012	25	39G4	204,14	11,95	34,06	44,61	19,92	39,83	37,24	14,54	0,00	1,99
2012	25	39G5	308,91	33,06	57,75	48,94	18,99	63,77	52,51	20,88	13,01	0,00
2012	25	39G6	450,99	73,97	34,30	27,23	17,39	29,56	77,24	60,41	48,21	82,68
2012	25	39G7	322,23	31,63	16,18	20,76	13,12	23,70	60,53	54,81	39,18	62,32
2012	25	40G4	374,88	12,27	55,72	43,81	28,35	62,01	123,15	16,48	27,84	5,25
2012	25	40G5	1 367,45	14,53	108,45	139,21	169,80	490,58	352,22	24,83	27,48	40,35
2012	25	40G6	664,13	3,39	26,04	166,38	42,57	130,32	162,81	68,97	54,75	8,90
2012	25	40G7	573,50	1,21	33,28	17,41	76,87	193,71	171,85	34,72	34,68	9,77
2012	25	41G6	522,65	44,61	37,18	20,32	42,84	159,98	158,70	25,16	31,94	1,92
2012	25	41G7	1 182,91	1,21	0,60	20,84	68,03	288,07	377,56	190,74	138,89	96,97
2012	26	37G8	35,11	10,80	6,62	1,00	1,18	1,41	3,52	2,81	2,81	4,96
2012	26	37G9	19,18	7,76	2,87	0,57	0,52	0,83	1,95	1,52	1,19	1,97
2012	26	38G8	214,90	19,61	10,65	7,93	8,62	9,40	27,64	29,52	31,92	69,61
2012	26	38G9	434,74	60,53	48,09	18,91	16,02	22,76	62,19	53,65	52,54	100,05
2012	26	39G8	466,19	9,07	21,83	31,54	20,85	36,09	94,82	82,28	64,23	105,48
2012	26	39G9	423,41	17,31	17,59	25,01	18,08	27,15	72,93	67,76	61,18	116,40
2012	26	40G8	143,78	1,16	9,49	12,76	7,30	13,15	35,25	26,47	18,10	20,10
2012	26	40G9	376,68	0,00	20,78	12,80	19,42	78,07	94,95	81,84	40,91	27,91
2012	26	40H0	67,70	12,78	15,30	6,99	2,58	6,06	11,72	4,20	4,99	3,08
2012	26	41G8	1 948,11	3,74	5,74	0,00	253,00	390,06	847,57	205,75	71,13	171,12
2012	26	41G9	69,10	0,00	4,20	4,00	4,40	8,60	18,10	9,00	14,30	6,50
2012	26	41H0	753,50	33,40	48,50	42,30	46,60	88,20	188,40	92,60	146,80	66,70
2012	27	42G6	304,43	7,47	38,97	8,43	39,57	83,36	98,68	18,03	5,41	4,51
2012	27	42G7	598,27	7,38	104,75	21,23	98,92	122,93	207,82	28,84	0,00	6,40
2012	27	43G7	249,83	63,63	28,47	17,19	12,85	53,64	49,74	11,63	7,38	5,30
2012	27	44G7	906,34	494,39	88,78	45,00	100,69	137,05	18,12	14,23	6,51	1,57
2012	27	44G8	376,35	147,97	37,05	13,52	61,75	96,01	16,55	1,17	2,33	0,00
2012	27	45G7	3 518,78	822,17	1 188,98	317,88	275,14	461,68	434,33	8,66	0,00	9,94
2012	27	45G8	1 148,52	23,98	161,64	179,23	231,94	262,59	189,00	93,87	0,00	6,27
2012	27	46G8	2 536,22	208,23	1 188,38	105,93	635,20	220,45	146,33	15,99	5,05	10,66
2012	28_2	42G8	1 194,41	15,91	8,20	0,00	70,52	236,56	520,69	78,11	192,37	72,05
2012	28_2	42G9	252,60	0,00	4,80	2,30	31,70	57,70	73,20	30,10	28,60	24,20
2012	28_2	42H0	153,00	5,30	36,30	10,30	11,70	25,00	32,20	7,00	15,70	9,50
2012	28_2	43G8	1 527,15	55,94	26,85	0,00	111,88	303,19	660,09	88,38	205,86	74,96
2012	28_2	43G9	985,62	2,93	34,88	0,00	100,64	343,95	324,53	119,62	23,16	35,91
2012	28_2	43H0	65,10	28,10	17,80	2,00	3,00	6,50	6,20	1,50	0,00	0,00
2012	28_2	43H1	23,50	10,70	6,80	0,80	1,00	1,80	1,90	0,40	0,10	0,00
2012	28_2	44G9	140,25	79,35	8,08	0,00	13,61	22,36	14,18	1,45	1,22	0,00
2012	28_2	44H0	1 083,80	1,40	230,50	37,70	217,20	168,10	219,30	99,70	71,20	38,70
2012	28_2	44H1	543,90	1,80	121,20	19,50	106,90	82,70	109,10	49,00	34,80	18,90
2012	28_2	45G9	1 653,29	465,77	98,68	34,99	436,95	331,42	227,61	20,19	20,19	17,49
2012	28_2	45H0	3 739,40	0,00	18,80	307,10	392,00	1 259,00	1 112,70	370,70	206,70	72,40
2012	28_2	45H1	583,91	7,93	215,07	61,30	68,17	57,07	90,89	32,23	19,55	31,70
2012	29	46G9	1 058,44	22,29	86,13	58,22	204,27	563,82	70,84	20,53	29,21	3,13
2012	29	46H0	723,72	17,71	293,12	91,03	258,86	59,40	3,60	0,00	0,00	0,00
2012	29	46H1	963,28	3,86	130,69	97,10	199,99	207,35	168,69	63,73	28,18	63,69
2012	29	46H2	2,78	2,78	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2012	29	47G9	1 703,00	41,50	363,32	69,98	550,94	453,63	189,32	31,53	0,00	2,78
2012	29	47H0	1 961,16	1148,23	603,96	45,64	102,21	59,72	1,40	0,00	0,00	0,00
2012	29	47H1	902,40	42,67	313,17	79,76	173,47	119,55	88,41	24,62	22,64	38,11
2012	29	47H2	1 505,19	15,96	555,19	154,92	336,83	183,53	146,56	16,17	47,84	48,19
2012	29	48G9	2 415,87	157,28	1 975,48	148,48	70,46	51,59	12,58	0,00	0,00	0,00
2012	29	48H0	4 695,50	2136,94	1 488,34	209,58	391,70	178,77	104,78	15,59	68,55	101,25
2012	29	48H1	8 375,15	3407,46	3 314,04	366,54	601,89	244,09	122,58	23,03	118,21	177,31
2012	29	48H2	295,89	250,30	31,39	2,62	4,81	2,06	2,79	0,13	0,86	0,93
2012	29	49G9	1 113,98	144,22	419,23	126,32	179,53	125,32	82,06	15,42	21,88	0,00
2012	30	50G7	586,41	45,83	207,06	50,77	70,51	93,54	15,28	6,82	14,81	81,79
2012	30	50G8	1 730,11	0,00	524,05	214,17	207,48	221,53	246,97	260,35	4,02	51,54
2012	30	50G9	1 879,68	31,33	1 111,05	460,45	39,34	185,78	22,59	29,14	0,00	0,00
2012	30	50H0	2 888,92	552,71	1 623,95	486,61	88,89	54,70	62,68	0,00	5,70	13,68
2012	30	51G7	1 479,98	125,14	505,16	147,40	194,12	149,20	97,86	73,40	113,10	74,60
2012	30	51G8	1 818,69	0,00	491,95	293,36	152,60	432,03	234,13	131,70	23,69	59,23
2012	30	51G9	953,82	0,00	140,68	162,02	241,72	135,45	58,36	55,31	111,50	48,78
2012	30	51H0	1 900,61	52,56	886,01	194,28	141,72	47,87	120,14	119,20	7,51	331,32
2012	30	52G7	767,34	4,44	92,85	88,71	184,81	122,42	80,43	43,17	44,06	106,45
2012	30	52G8	934,45	0,00	5,55	54,90	166,37	181,90	134,76	138,64	35,49	216,84
2012	30	52G9	623,47	5,10	81,54	49,95	53,68	69,65	59,12	84,26	46,55	173,62
2012	30	52H0	1 118,79	3,75	335,64	183,21	156,18	17,27	70,21	73,96	49,93	228,64
2012	30	53G8	1 283,03	105,66	384,37	109,44	229,65	161,73	40,97	63,61	69,00	118,60
2012	30	53G9	567,24	0,00	45,96	126,84	65,92	116,86	71,43	52,52	13,13	74,58
2012	30	53H0	1 050,44	72,01	689,66	104,67	50,11	10,39	30,81	28,95	19,30	44,54
2012	30	54G8	1 147,50	50,00	157,00	163,50	255,00	140,50	152,50	100,00	18,00	111,00
2012	30	54G9	1 429,17	0,00	61,68	192,01	309,29	198,09	76,45	190,27	214,59	186,79
2012	30	54H0	2 483,50	85,50	1 843,96	244,42	101,91	54,41	22,46	36,27	41,46	53,11
2012	30	55G9	1 074,23	44,41	96,04	83,83	148,78	99,93	118,80	71,62	81,61	329,21
2012	30	55H0	1 832,24	118,73	1 492,18	143,65	18,32	35,91	12,46	7,33	0,00	3,66
2012	32	47H3	145,24	101,50	25,03	3,52	6,70	1,94	2,21	2,17	0,00	2,17
2012	32	48H3	389,93	376,83	4,51	2,02	2,35	1,49	1,46	0,61	0,05	0,61
2012	32	48H4	551,83	123,51	202,63	51,89	98,23	23,87	24,12	10,16	4,01	13,41
2012	32	48H5	64,25	20,32	31,38	4,40	5,65	1,25	0,82	0,09	0,25	0,09
2012	32	48H6	1 050,68	123,12	762,42	60,22	64,48	17,88	15,66	2,37	0,82	3,71
2012	32	49H5	26,40	4,53	20,44	0,65	0,52	0,20	0,06	0,00	0,00	0,00
2012	32	49H6	29,97	5,15	23,21	0,73	0,59	0,22	0,07	0,00	0,00	0,00

Table 3.1.2.2. Estimated numbers (millions) of sprat in September-October 2012, by the ICES rectangles, accordingly to age groups.

year	SD	RECT	total	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2012	21	41G0	1,19	0,00	0,08	0,60	0,47	0,03	0,01	0,00	0,00	0,00
2012	21	41G1	18,50	0,00	1,30	9,30	7,32	0,46	0,12	0,00	0,00	0,00
2012	21	41G2	52,83	18,75	7,82	11,88	12,52	1,37	0,46	0,03	0,00	0,00
2012	21	42G1	10,73	0,00	0,67	2,99	4,89	1,26	0,73	0,19	0,00	0,00
2012	21	42G2	3,23	3,09	0,04	0,07	0,03	0,00	0,00	0,00	0,00	0,00
2012	21	43G1	22,13	0,69	20,80	0,31	0,26	0,01	0,05	0,01	0,00	0,00
2012	21	43G2	0,04	0,00	0,03	0,01	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	37G0	19,08	0,00	1,14	16,80	0,89	0,25	0,00	0,00	0,00	0,00
2012	22	37G1	96,37	0,98	11,39	80,38	3,31	0,31	0,00	0,00	0,00	0,00
2012	22	38G0	97,03	0,00	4,94	86,44	3,94	1,18	0,00	0,00	0,00	0,53
2012	22	38G1	0,05	0,00	0,01	0,04	0,00	0,00	0,00	0,00	0,00	0,00
2012	22	39F9	13,20	0,85	2,58	9,36	0,40	0,01	0,00	0,00	0,00	0,00
2012	22	39G0	15,65	0,95	1,00	12,78	0,88	0,04	0,00	0,00	0,00	0,00
2012	22	39G1	51,00	49,15	0,37	1,42	0,06	0,00	0,00	0,00	0,00	0,00
2012	22	40F9	3,40	0,27	0,26	2,71	0,14	0,02	0,00	0,00	0,00	0,00
2012	22	40G0	32,43	2,59	2,48	25,87	1,31	0,18	0,00	0,00	0,00	0,00
2012	22	40G1	6,28	0,50	0,48	5,01	0,25	0,04	0,00	0,00	0,00	0,00
2012	22	41G0	4,63	0,00	0,25	4,24	0,14	0,00	0,00	0,00	0,00	0,00
2012	23	39G2	26,87	0,69	8,24	13,04	2,62	1,61	0,67	0,00	0,00	0,00
2012	23	40G2	492,17	96,33	44,82	186,98	84,69	44,72	22,40	8,24	2,86	1,13
2012	23	41G2	5,36	2,04	1,09	1,38	0,48	0,19	0,13	0,02	0,02	0,01
2012	24	37G2	16,39	0,00	3,71	8,65	2,05	1,44	0,52	0,02	0,00	0,00
2012	24	37G3	681,11	508,36	147,99	17,52	3,94	0,39	2,91	0,00	0,00	0,00
2012	24	37G4	1 526,28	765,53	531,11	168,27	36,55	6,11	18,71	0,00	0,00	0,00
2012	24	38G2	186,02	6,13	86,31	69,15	13,52	6,71	4,19	0,01	0,00	0,00
2012	24	38G3	1 134,85	172,95	539,16	297,59	65,80	31,36	27,99	0,00	0,00	0,00
2012	24	38G4	636,79	101,12	279,82	186,00	39,07	18,44	11,69	0,65	0,00	0,00
2012	24	39G2	24,54	0,63	7,53	11,91	2,39	1,47	0,61	0,00	0,00	0,00
2012	24	39G3	520,26	14,05	138,11	237,36	64,17	48,36	17,47	0,74	0,00	0,00
2012	24	39G4	340,33	0,98	89,52	143,23	50,83	42,45	12,36	0,96	0,00	0,00
2012	25	37G5	199,63	6,11	87,91	51,00	19,06	28,92	1,36	4,06	0,00	1,21
2012	25	38G5	11,11	0,00	4,10	2,99	1,29	2,20	0,21	0,24	0,00	0,08
2012	25	38G6	156,17	9,10	73,51	38,34	12,80	18,32	0,56	2,86	0,00	0,68
2012	25	38G7	6,78	0,10	3,22	1,62	0,62	0,99	0,08	0,11	0,00	0,04
2012	25	39G4	199,29	0,00	27,00	39,86	31,29	87,86	5,14	6,64	0,00	1,50
2012	25	39G5	667,96	1,66	47,60	286,20	121,51	152,59	38,34	5,20	14,86	0,00
2012	25	39G6	506,11	0,00	215,24	130,48	52,45	87,34	6,75	9,88	0,00	3,97
2012	25	39G7	301,11	3,98	153,21	67,42	25,67	40,67	4,16	4,28	0,20	1,52
2012	25	40G4	320,80	14,59	48,41	0,60	87,33	110,31	5,93	8,49	0,00	45,14
2012	25	40G5	1 717,92	11,27	209,05	398,43	239,10	665,80	16,07	159,21	18,99	0,00
2012	25	40G6	633,40	0,00	24,97	232,48	80,52	205,65	28,14	43,75	0,00	17,89
2012	25	40G7	1 090,19	2,15	121,47	216,68	188,00	401,08	138,89	18,12	3,80	0,00
2012	25	41G6	201,56	178,42	8,10	2,52	0,00	4,28	0,00	6,43	0,00	1,81
2012	25	41G7	1 759,23	47,93	325,17	264,00	0,00	800,16	206,51	95,06	20,40	0,00
2012	26	37G8	26,42	0,00	12,43	7,76	2,95	2,67	0,35	0,26	0,00	0,00
2012	26	37G9	2 590,98	1 437,50	840,28	196,50	91,44	20,76	1,74	2,76	0,00	0,00
2012	26	38G8	573,16	2,85	282,93	165,58	60,08	50,23	4,99	6,50	0,00	0,00
2012	26	38G9	1 272,41	299,03	377,80	271,63	142,77	146,67	21,44	13,07	0,00	0,00
2012	26	39G8	69,15	0,00	17,03	21,09	12,74	14,86	2,19	1,24	0,00	0,00
2012	26	39G9	614,13	0,00	152,41	181,34	116,88	132,99	20,14	10,37	0,00	0,00
2012	26	40G8	4,15	0,00	0,95	1,44	0,68	0,91	0,11	0,06	0,00	0,00
2012	26	40G9	728,77	55,51	56,03	136,53	86,83	320,72	45,29	13,35	14,51	0,00
2012	26	40H0	3 193,79	2 618,43	300,76	65,29	58,70	110,62	26,99	6,50	0,00	6,50
2012	26	41G8	432,76	83,72	44,66	27,26	36,76	145,48	53,54	8,78	14,00	18,56
2012	26	41G9	2 048,33	220,83	311,52	323,11	303,95	662,01	131,33	42,52	34,03	19,03
2012	26	41H0	4 712,44	2 955,49	438,69	261,91	241,54	547,09	93,12	95,30	26,92	52,38
2012	27	42G6	141,33	92,33	9,37	3,75	5,33	19,26	0,00	7,00	2,60	1,69
2012	27	42G7	365,39	209,87	22,68	10,13	24,11	80,48	0,00	6,43	11,69	0,00
2012	27	43G7	1 095,88	988,07	36,20	11,47	21,14	24,11	5,75	0,00	0,00	9,14
2012	27	44G7	709,13	665,32	16,54	2,65	3,38	16,56	0,43	1,60	0,00	2,65
2012	27	44G8	2 295,40	2 090,20	23,86	36,27	22,91	76,35	4,77	24,82	4,77	11,45
2012	27	45G7	526,46	439,60	7,86	7,43	11,41	46,11	7,27	0,00	0,00	6,78
2012	27	45G8	730,48	563,71	41,92	36,84	7,96	56,02	13,65	0,00	6,12	4,26
2012	27	46G8	1 876,29	1 484,67	100,94	57,08	0,00	134,88	4,65	24,80	17,97	51,30
2012	28_2	42G8	218,20	21,98	32,02	12,23	26,66	82,55	24,98	9,21	0,00	8,57
2012	28_2	42G9	12,55	7,71	0,86	0,77	0,40	1,68	0,61	0,19	0,27	0,06
2012	28_2	42H0	3 043,60	262,28	838,90	506,01	314,25	818,45	120,24	100,28	29,61	53,58
2012	28_2	43G8	757,53	77,30	108,22	42,51	92,76	288,32	87,35	30,92	0,00	30,15
2012	28_2	43G9	1 121,36	136,07	125,87	171,74	109,39	371,70	60,42	25,89	21,98	98,30
2012	28_2	43H0	4 226,41	776,43	1 298,94	779,03	102,07	638,77	221,08	201,98	68,80	139,31
2012	28_2	43H1	1 711,36	288,68	724,86	269,13	49,84	201,22	72,54	51,70	20,11	33,28
2012	28_2	44G9	1 595,54	670,62	214,29	300,82	50,32	236,72	31,05	20,95	70,77	0,00
2012	28_2	44H0	3 486,63	292,58	1 728,27	686,80	264,65	326,14	144,04	24,22	18,37	1,56
2012	28_2	44H1	3 196,82	200,45	1 610,54	600,69	192,72	406,71	121,82	40,25	22,88	0,76
2012	28_2	45G9	894,80	280,06	217,73	159,11	39,50	145,11	34,93	9,60	0,00	8,76
2012	28_2	45H0	89,99	37,74	27,58	6,63	4,11	8,27	3,44	0,48	0,63	1,11
2012	28_2	45H1	3 300,40	31,96	1 741,75	422,69	326,33	509,17	110,52	114,46	19,79	23,73
2012	29	46G9	3 945,85	3 283,36	241,64	91,16	95,87	162,94	31,71	0,00	21,79	17,38
2012	29	46H0	3 926,70	1 813,98	642,41	491,99	343,65	505,09	47,17	0,00	76,44	5,97
2012	29	46H1	3 983,52	765,25	1 347,87	628,80	324,99	671,12	144,98	38,42	0,00	62,09
2012	29	46H2	1 742,43	178,71	1 090,36	224,45	70,08	139,15	28,94	5,12	0,00	5,62
2012	29	47G9	1 767,82	631,35	299,64	100,88	103,47	373,26	41,68	0,00	12,08	205,46
2012	29	47H0	9 061,17	3 056,19	2 401,98	875,96	631,00	1 869,18	117,88	27,01	0,00	81,97
2012	29	47H1	5 991,40	8,99	3 183,72	1 009,60	457,59	975,38	203,57	73,74	0,00	78,81
2012	29	47H2	2 479,83	11,37	1 457,29	367,20	181,88	345,32	73,29	21,94	0,00	21,54
2012	29	48G9	196,94	161,51	13,84	1,98	1,98	7,25	1,48	1,15	0,00	7,75
2012	29	48H0	1 738,06	1 147,28	306,96	73,53	58,85	113,93	23,58	6,12	0,00	7,81
2012	29	48H1	2 223,18	65,07	1 060,55	314,98	163,58	463,31	90,34	33,82	0,00	31,53
2012	29	48H2	19 034,99	94,34	11 919,33	2 614,05	1 107,61	2 505,97	509,17	183,97	0,00	100,55
2012	29	49G9	522,46	343,14	71,73	36,75	3,54	39,41	7,97	0,00	0,00	19,92
2012	30	50G7	1,77	0,44	0,22	0,22	0,00	0,00	0,00	0,00	0,00	0,89
2012	30	50G8	42,47	1,57	8,34	0,79	0,00	0,79	0,00	4,40	1,57	25,01
2012	30	50G9	300,21	278,96	2,90	0,97	0,97	2,90	1,16	3,28	0,00	9,07
2012	30	50H0	58,68	0,00	2,35	2,35	5,40	6,57	3,76	4,22	2,58	31,45
2012	30	51G7	8,96	0,00	0,60	0,00	0,60	0,00	1,19	0,60	0,00	5,97
2012	30	51G8	15,99	0,00	1,27	0,36	1,17	2,99	0,66	0,51	0,61	8,42
2012	30	51G9	1,00	0,00	0,14	0,00	0,00	0,00	0,00	0,00	0,00	0,86
2012	30	51H0	23,40	0,00	4,07	1,02	0,00	4,88	1,22	1,02	0,00	11,19
2012	30	52G7	7,56	0,00	0,00	0,28	0,28	1,57	0,28	0,00	0,00	5,15
2012	30	52G8	0,51	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,51	0,00
2012	30	52G9	2,92	0,00	0,00	0,00	0,00	0,00	0,00	1,25	0,00	1,67
2012	30	52H0	1,62	0,00	0,54	0,00	0,00	0,00	0,00	0,54	0,00	0,54
2012	30	53G8	123,81	0,62	19,66	9,21	5,85	4,73	8,71	6,35	0,00	68,68
2012	30	53G9	4,63	0,00	1,07	0,00	0,00	1,07	0,36	0,71	0,00	1,42
2012	30	53H0	40,52	0,00	1,23	0,00	1,60	2,09	0,00	10,19	0,00	25,41
2012	30	54G8	38,54	1,03	6,68	0,00	4,93	2,36	2,67	3,39	1,75	15,73
2012	30	54G9	6,87	0,00	0,00	0,00	0,00	0,00	0,00	1,53	0,00	5,34
2012	30	54H0	976,15	0,00	73,71	10,96	29,88	61,76	14,94	153,39	78,69	552,82
2012	30	55G9	19,02	0,48	2,85	1,90	0,67	2,28	0,00	2,28	0,00	8,56
2012	30	55H0	45,74	0,00	4,20	5,25	0,00	9,50	0,00	1,40	0,00	25,39
2012	32	47H3	11 543,95	0,00	6 438,83	1 142,12	650,05	2 448,84	276,29	162,34	136,70	288,78
2012	32	48H3	11 244,95	329,15	6 948,12	1 087,60	482,40	1 749,38	210,16	105,54	97,84	234,76
2012	32	48H4	18 371,77	430,80	8 647,77	1 700,96	1 299,18	4 527,53	645,89	381,76	311,02	426,86
2012	32	48H5	14 058,24	0,00	7 991,30	1 468,50	851,65	2 780,70	320,19	169,91	168,35	307,64
2012	32	48H6	11 324,45	0,00	6 302,50	1 205,11	676,99	2 280,06	286,13	144,35	131,30	298,01
2012	32	49H5	2 773,76	0,00	1 704,01	272,14	156,13	483,29	54,95	23,99	26,60	52,65
2012	32	49H6	3 148,62	0,00	1 934,30	308,92	177,23	548,60	62,38	27,23	30,20	59,76

Table 3.1.2.3. Estimated numbers (millions) of cod in September-October 2005-2012, by the ICES rectangles.

Sub_Div	RECT	Area (NM^2)	2005	2006	2007	2008	2009	2010	2011	2012
24	37G2	192,4	2,17	0,00	1,82	0,00	0,00	0,00	0,00	0,00
24	37G3	167,7	0,00	4,14	0,87	1,18	0,72	4,26	0,00	1,99
24	37G4	875,1	9,50	0,13	4,27	5,16	1,41	2,60	0,02	0,00
24	38G2	832,9	10,86	0,00	1,95	0,00	0,00	1,93	1,07	5,97
24	38G3	865,7	0,28	0,00	1,61	1,07	1,97	3,57	0,40	4,39
24	38G4	1034,8	3,10	0,27	4,86	6,85	0,48	2,18	0,20	1,03
24	39G2	406,1	1,49	3,89	1,76	0,41	1,97	3,77	0,05	0,87
24	39G3	765	17,92	3,78	13,93	2,76	0,55	3,80	0,35	2,08
24	39G4	524,8	2,70	1,82	2,44	1,19	1,58	7,09	0,21	0,38
25	37G5	642,2	17,83	0,25	1,31	0,00	0,38	0,21	0,00	0,00
25	38G5	1035,7	57,28	2,06	5,20	0,74	2,92	4,54	18,40	19,88
25	38G6	940,2	9,54	3,00	17,12	2,52	0,27	0,23	0,00	15,48
25	38G7	471,7	0,00	0,13	0,04	0,92	0,37	0,85	0,00	0,21
25	39G4	287,3	2,67	28,46	0,22	4,36	0,35	0,29	0,22	0,57
25	39G5	979	0,75	1,80	0,90	1,57	1,25	3,10	35,67	4,46
25	39G6	1026	0,86	6,50	0,69	4,05	0,48	16,71	3,48	0,04
25	39G7	1026	47,40	0,52	0,44	5,78	0,26	0,18	2,18	0,00
25	40G4	677,2	1,38	5,54	15,86	0,22	19,19	0,33	25,27	15,24
25	40G5	1012,9	2,40	7,60	4,89	25,09	1,81	0,81	14,00	5,45
25	40G6	1013	1,13	6,53	0,24	5,94	6,54	7,03	30,84	5,66
25	40G7	1013	2,85	2,89	0,00	3,13	1,75	0,25	9,31	21,37
25	41G6	764,4	2,69	14,80	0,00	2,53	0,63	0,36	0,00	1,03
25	41G7	1000	0,08	1,90	8,71	0,25	4,40	1,12	61,89	29,81
26	37G8	86	0,46	3,25	0,00	0,23	0,00	0,03	0,00	0,08
26	37G9	151,6	37,64	0,89	1,59	0,99	0,32	0,21	0,51	0,59
26	38G8	624,6	37,05	4,97	1,68	3,39	2,01	1,43	1,29	7,19
26	38G9	918,2	0,00	0,00	0,00	0,00	0,26	0,00	1,31	4,53
26	39G8	1026	32,28	22,10	1,63	0,83	4,33	4,71	19,88	5,18
26	39G9	1026	0,00	0,00	0,00	0,00	0,35	0,00	0,92	0,00
26	39H0	881,6					0,00	0,00	0,02	
26	40G8	1013	17,82	4,57	0,54	0,21	0,55	6,77	3,96	3,18
26	40G9	1013	0,00		0,00	0,00	1,51	0,00	0,21	5,86
26	40H0	1012,1	5,10		0,00	0,71	34,59	51,72	1,12	0,23
26	41G8	1000	0,00	2,62		0,04	1,16	1,59	21,93	19,24
26	41G9	1000	10,00	0,07	3,21	0,18	0,00	1,05	0,00	0,00
26	41H0	953,3	54,47	0,24	3,39	1,92	0,00	0,09	0,00	0,00
27	42G6	266		2,23	0,04	0,00	1,14	0,02	0,00	0,26
27	42G7	986,9	1,02	1,14	0,49	0,02	0,88	0,00	1,57	0,61
27	43G6	269,8				0,00				
27	43G7	913,8	0,00	22,02	0,00	0,08	0,00	0,50	0,09	0,00
27	44G7	960,5	0,00	1,19	1,25	0,42	0,00	0,23	0,00	0,00
27	44G8	456,6	0,00	0,00	0,00	0,03	0,51	0,23	0,09	0,00
27	45G7	908,7	0,00	0,00	0,00	1,57	0,00	0,00	0,00	0,00
27	45G8	947,2	0,00	2,22	0,23	0,00	0,00	0,00	0,00	0,00
27	46G8	884,8	0,00	0,21	0,00	0,00	0,00	0,00	0,07	0,00
29	46G9	933,8	0,03	0,00	0,48	0,18	0,00	0,00	0,00	0,00
29	46H0	933,8	0,00	0,00	0,00	0,13	0,00	0,00	0,00	0,00
29	46H1	921,5	0,00	0,00	0,00	0,00	0,00	0,42	0,00	0,70
29	46H2	258	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
29	47G9	876,2	2,82	0,00	0,00	0,00	0,00	0,00	0,00	0,00
29	47H0	920,3	0,00	0,00	0,63	0,29	0,00	0,00	0,00	0,00
29	47H1	920,3	0,00	0,00	0,00	0,00	0,00	0,00	8,77	0,00
29	47H2	793,9	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
29	48G9	772,8	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
29	48H0	730,3			0,00	0,00	0,00	0,00	0,00	0,00
29	48H1	544			0,00		0,00	0,00	0,00	0,00
29	48H2	597			0,00	0,00	0,00	0,00	0,00	0,00
29	49G9	564,2			0,00	0,00	0,00	0,00	0,00	0,00

Table 3.1.2.4. Estimated numbers (millions) of herring by the ICES Subdivisions, accordingly to age groups; September-October 2012.

YEAR	Sub_Div	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
2012	21	316,92	209,89	36,06	1,95	0,00	0,12	0,00	0,00	0,00
2012	22	479,63	70,94	2,77	0,32	0,00	0,00	0,00	0,00	0,00
2012	23	480,70	74,65	9,85	67,77	59,58	32,49	25,03	16,74	10,96
2012	24	3 147,83	442,48	258,67	138,46	111,28	91,88	32,52	21,84	21,26
2012	25	380,54	416,37	569,35	513,91	1 504,78	1 640,22	575,48	470,74	395,39
2012	26	176,16	211,66	163,81	398,57	681,78	1 459,04	657,40	510,10	693,88
2012	27	1 775,22	2 837,02	708,41	1 456,06	1 437,71	1 160,57	192,42	26,68	44,65
2012	28_2	675,13	827,96	475,99	1 565,27	2 895,35	3 392,59	898,38	819,45	395,81
2012	29	7 391,20	9 574,06	1 450,19	3 074,96	2 248,83	993,61	210,75	337,37	435,39
2012	30	1 297,17	10 776,34	3 554,19	2 876,40	2 529,16	1 728,41	1 566,52	913,45	2 307,98
2012	32	754,96	1 069,62	123,43	178,52	46,85	44,40	15,40	5,13	19,99

Table 3.1.2.5. Estimated numbers (millions) of sprat by the ICES Subdivisions, accordingly to age groups; September-October 2012.

YEAR	Sub_Div	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
2012	21	22,53	30,74	25,16	25,49	3,13	1,37	0,23	0,00	0,00
2012	22	55,29	24,90	245,05	11,32	2,03	0,00	0,00	0,00	0,53
2012	23	99,06	54,15	201,40	87,79	46,52	23,20	8,26	2,88	1,14
2012	24	1 569,75	1 823,26	1 139,68	278,32	156,73	96,45	2,38	0,00	0,00
2012	25	275,31	1 348,96	1 732,62	859,64	2 606,17	452,14	364,33	58,25	73,84
2012	26	7 673,36	2 835,49	1 659,44	1 155,32	2 155,01	401,23	200,71	89,46	96,47
2012	27	6 533,77	259,37	165,62	96,24	453,77	36,52	64,65	43,15	87,27
2012	28_2	3 083,86	8 669,83	3 958,16	1 573,00	4 034,81	1 033,02	630,13	273,21	399,17
2012	29	11 560,54	24 037,32	6 831,33	3 544,09	8 171,31	1 321,76	391,29	110,31	646,40
2012	30	283,10	129,83	33,31	51,35	103,49	34,95	195,06	85,71	803,57
2012	32	759,95	39 966,83	7 185,35	4 293,63	14 818,40	1 855,99	1 015,12	902,01	1 668,46

Table 3.1.3.1. Area corrected numbers (millions) of herring by the ICES Subdivisions and age groups (September-October 2012).

Sub_Div	AREA_CORR_FACTOR	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
21	1,22	385,63	255,39	43,88	2,37	0,00	0,15	0,00	0,00	0,00
22	1,02	489,52	72,40	2,83	0,33	0,00	0,00	0,00	0,00	0,00
23	1,00	480,70	74,65	9,85	67,77	59,58	32,49	25,03	16,74	10,96
24	1,00	3 147,83	442,48	258,67	138,46	111,28	91,88	32,52	21,84	21,26
25	1,03	392,71	429,69	587,56	530,35	1 552,92	1 692,69	593,89	485,80	408,04
26	1,10	194,18	233,32	180,57	439,35	751,53	1 608,32	724,66	562,29	764,87
27	1,23	2 184,83	3 491,63	871,87	1 792,03	1 769,44	1 428,36	236,82	32,84	54,95
28_2	1,01	683,98	838,81	482,23	1 585,79	2 933,30	3 437,06	910,16	830,19	401,00
29	1,04	7 684,92	9 954,53	1 507,82	3 197,16	2 338,20	1 033,10	219,13	350,78	452,69
30	1,08	1 402,04	11 647,55	3 841,53	3 108,94	2 733,63	1 868,14	1 693,16	987,30	2 494,57
32	1,69	1 279,49	1 812,77	209,19	302,55	79,40	75,25	26,10	8,69	33,88

Table 3.1.3.2. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (September-October 2012).

YEAR	Sub_Div	AREA_CORR_FACTOR	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
2012	21	1,22	27,41	37,40	30,61	31,02	3,81	1,67	0,28	0,00	0,00
2012	22	1,02	56,43	25,41	250,10	11,55	2,07	0,00	0,00	0,00	0,54
2012	23	1,00	99,06	54,15	201,40	87,79	46,52	23,20	8,26	2,88	1,14
2012	24	1,00	1 569,75	1 823,26	1 139,68	278,32	156,73	96,45	2,38	0,00	0,00
2012	25	1,03	284,12	1 392,11	1 788,04	887,14	2 689,54	466,60	375,98	60,11	76,20
2012	26	1,10	8 458,44	3 125,60	1 829,22	1 273,52	2 375,50	442,28	221,25	98,61	106,34
2012	27	1,23	8 041,36	319,22	203,83	118,45	558,47	44,95	79,57	53,11	107,41
2012	28_2	1,01	3 124,28	8 783,47	4 010,04	1 593,62	4 087,70	1 046,56	638,39	276,79	404,40
2012	29	1,04	12 019,95	24 992,55	7 102,80	3 684,93	8 496,03	1 374,29	406,84	114,69	672,09
2012	30	1,08	305,99	140,33	36,00	55,50	111,86	37,78	210,83	92,64	868,53
2012	32	1,69	1 287,95	67 735,00	12 177,59	7 276,76	25 113,93	3 145,50	1 720,41	1 528,71	2 827,67

Table 3.1.3.3. Estimated biomass (in tons) of herring in September-October 2012.

Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
25	1,03	4 626,76	13 422,08	31 512,89	28 210,69	79 584,19	93 698,05	32 898,19	31 708,69	28 620,54
26	1,10	2 141,51	7 721,20	8 845,59	18 540,94	34 976,08	78 281,71	40 365,15	32 255,20	51 385,29
27	1,23	10 205,41	58 723,33	21 307,55	48 536,02	59 399,91	55 449,67	10 249,27	1 689,14	2 407,58
28_2	1,01	3 851,08	17 927,59	13 163,23	50 769,64	99 362,25	131 621,81	37 517,47	35 206,03	19 101,05
29	1,04	40 616,60	157 411,20	30 829,72	73 407,50	61 866,26	28 496,33	6 641,44	7 873,63	9 203,06
30	1,08	7 912,80	165 276,64	79 465,72	75 925,23	75 243,04	56 381,14	57 226,90	33 585,54	116 585,99
32	1,69	7 702,31	25 100,18	3 688,06	5 969,37	1 708,90	1 572,49	585,68	202,84	792,83

Table 3.1.3.4. Estimated biomass (in tons) of sprat in September-October 2012.

Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
21	1,22	55,12	363,54	583,03	635,06	86,85	41,84	7,67		
22	1,02	197,51	308,85	3 595,19	170,82	35,33				9,74
23	1,00	480,07	862,74	3 739,69	1 830,53	1 060,17	557,05	215,65	72,69	29,91
24	1,00	7 893,39	23 594,23	17 116,70	4 454,22	2 746,59	1 465,55	49,76		
25	1,03	899,39	16 567,54	25 965,35	14 218,79	44 950,39	8 113,14	6 475,55	913,06	1 303,05
26	1,10	25 047,67	31 807,12	22 453,05	17 321,52	34 537,86	6 514,62	3 397,87	1 563,42	1 769,25
27	1,23	22 326,11	2 804,19	2 174,19	1 493,76	7 337,70	636,96	1 009,40	729,03	1 430,00
28_2	1,01	10 686,88	86 651,54	44 684,88	20 452,70	53 936,41	13 795,57	8 635,64	3 830,63	5 798,52
29	1,04	32 969,06	221 892,74	73 672,84	42 590,67	103 848,68	16 020,22	5 144,70	1 547,84	8 410,33
30	1,08	764,58	1 368,85	385,52	634,83	1 386,17	442,58	2 977,97	1 376,55	12 555,07
32	1,69	3 377,38	565 496,56	108 264,61	73 629,09	256 511,13	33 882,98	19 396,56	16 341,12	27 626,70

Table 3.1.4.3.1. Correction factor and area corrected numbers (millions) of herring per age groups in the ICES Subdivision 30.

YEAR	HER_TOTAL_age1_8	HER_AGE1	HER_AGE2	HER_AGE3	HER_AGE4	HER_AGE5	HER_AGE6	HER_AGE7	HER_AGE8
1999	1 967,69	187,68	561,32	252,25	228,34	252,55	140,65	156,24	188,65
2000	28 665,50	3 846,00	928,57	1 794,16	4 429,95	2 048,50	2 704,11	4 361,30	8 552,91
2007	23 809,82	5 670,78	4 916,19	1 845,69	1 507,59	5 254,43	1 441,11	826,08	2 347,95
2008	22 036,55	2 669,79	4 846,31	3 386,30	1 649,49	1 825,30	3 344,39	1 265,96	3 049,00
2009	26 834,34	3 573,39	5 089,63	5 558,51	2 438,03	1 282,91	1 518,46	3 615,98	3 757,41
2010	25 490,64	3 989,84	6 534,82	3 500,95	3 535,59	1 576,84	982,35	891,26	4 479,00
2011	29 358,92	3 699,81	6 100,51	7 384,00	3 086,23	3 133,75	1 442,21	641,73	3 870,69
2012	28 374,82	11 647,55	3 841,53	3 108,94	2 733,63	1 868,14	1 693,16	987,30	2 494,57

3.2 Combined results of the Baltic Acoustic Spring Survey (BASS)

In 2012, the following acoustic surveys were conducted in May–June.

Vessel	Country	ICES Subdivisions
Walther Herwig III	Germany	24, 25, parts of 26 and 28
Darius	Latvia	Parts of 26 and 28
Darius	Lithuania	Part of 26

Stock indices of sprat by age groups of the different BASS cruises are stored in the in the BASS-database of WGBIFS (previously in the BAD1 database). The standard reports from BASS/2012 cruises are presented in Annex 8.

3.2.1 Area under investigation and overlapping areas

The BASS/2012 surveys were realized by Germany, Lithuania and Latvia in the ICES Subdivisions 24, 25, 26 and 28. One statistical rectangle (42G9) were inspected by more than one country (Figure 3.2.1.1). The area coverage of the Baltic Sea with the BASS/2012 survey was the same as required by the WGBIFS 2012.

Differences in the results of these overlapped areas have no significant effect on the calculation of the tuning fleet indices. Therefore, in the calculation of the indices, the data from the country responsible for specific rectangle was used.

The estimated numbers of sprat per age groups and the ICES rectangles are presented in Table 3.2.1.1. The geographical distribution of the sprat abundance is demonstrated in Figure 3.2.1.2.

During late spring, sprat is concentrated in the deeper Baltic basins for spawning. Herring stays at this time primarily in shallow water areas close to coasts however, small fraction of herring started to migrate to deeper waters for feeding after spawning. The portion of herring is much smaller than 10% in most areas. These numbers should not be used for a real investigation of abundance. Therefore, only the distribution of sprat is examined in farther.

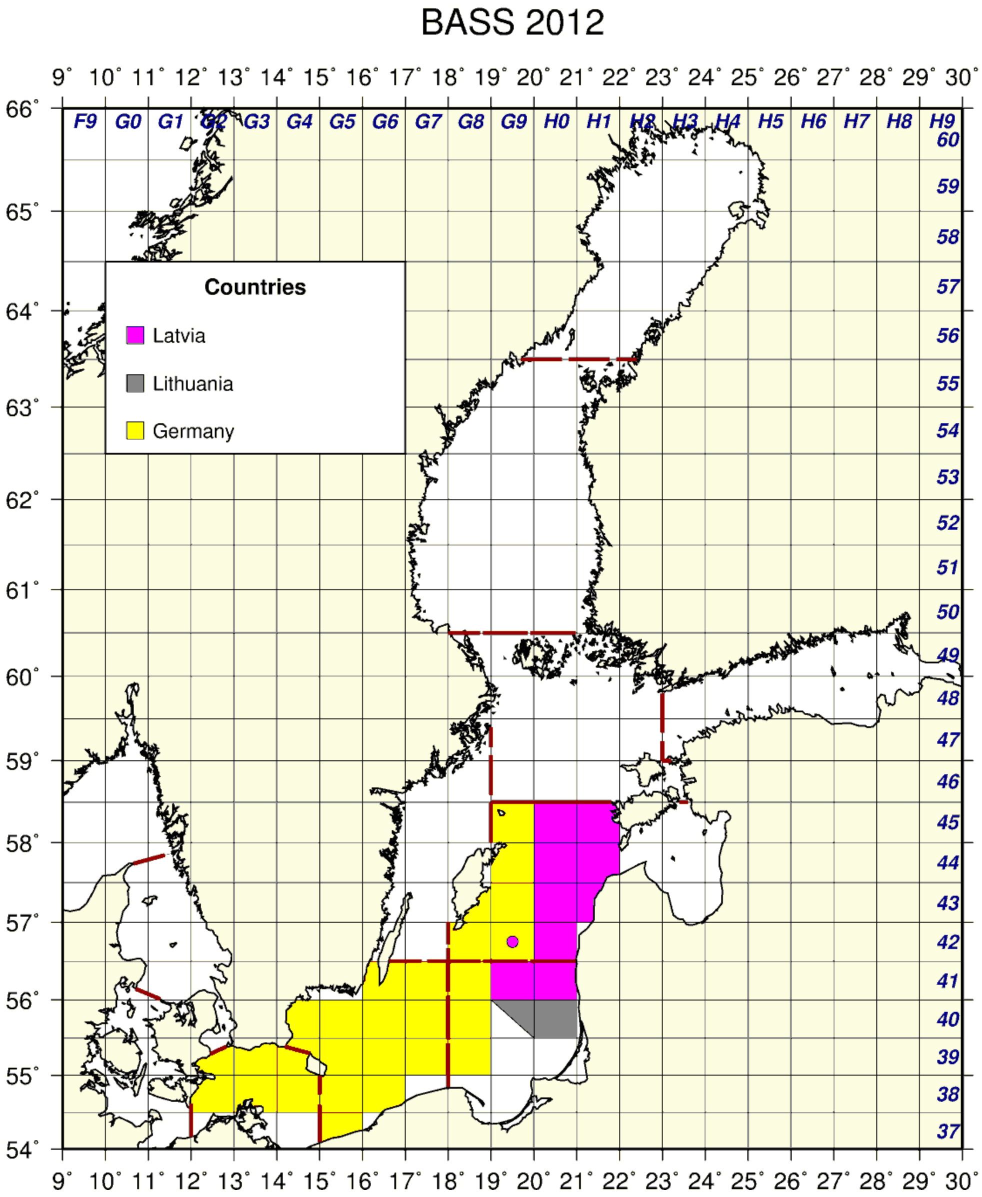


Figure 3.2.1.1. Map of BASS surveys conducted in May 2012. Colours indicate the countries, which covered specific ICES-rectangles and delivered data to BASS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BASS-database partly or totally covered by other countries.

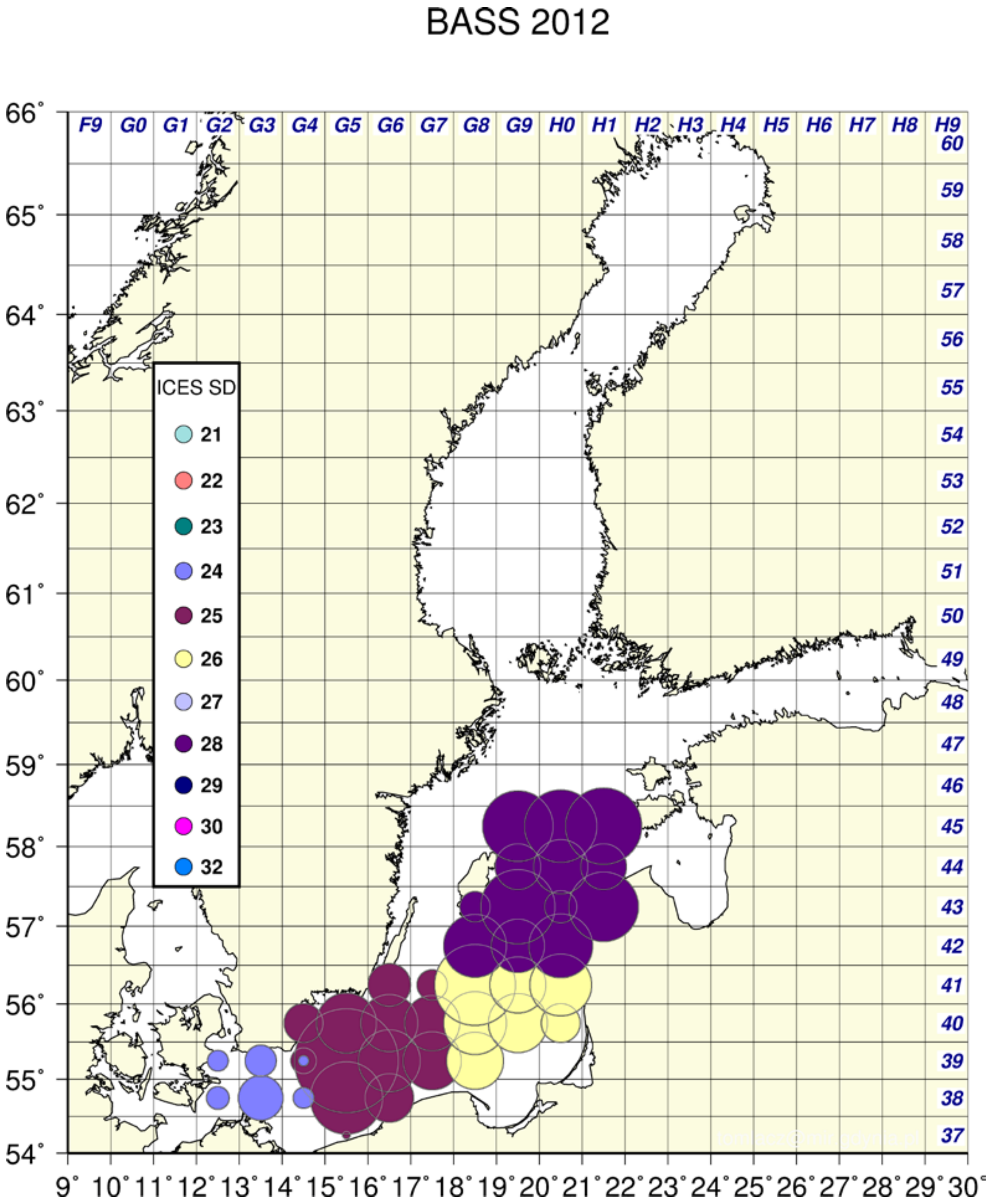


Figure 3.2.1.2. Covered the ICES-rectangles in May 2012 with the abundance of sprat (the area of the circles indicates the estimate number of sprat in 10^6 indiv. in the rectangle, the colour indicates the ICES Subdivision).

3.2.2 Combined results and area corrected data

The Baltic sprat stock abundance estimates per the ICES Subdivisions and age groups are presented in Table 3.2.2.1.

During the WGBIFS 2006 meeting possible improvement of the results from acoustic surveys were discussed, and a correction factor for each ICES Subdivision and year was introduced because of the coverage of the investigated area differed in the years. This factor is the proportion to the total area of the ICES Subdivision (see BIAS manual) and the area of rectangles covered during the survey. The correction factors, calculated by ICES Subdivisions for 2012 are included in Tables 3.2.2.2 and 3.2.2.3. The area corrected abundance estimates for sprat per ICES Subdivision are summarized in Table 3.2.2.2. The corresponding biomass estimates of sprat are given in the Table 3.2.2.3.

3.2.2.1 Sprat in the ICES Subdivisions 24 - 26 and 28

Tuning Fleets for WGBFAS

The complete time-series (2001 to 2012) of the area-corrected sprat abundance in the ICES Subdivisions 24, 25, 26 and 28 (without Gulf of Riga) is given in Annex 5; Table 5 and in Figure 3.2.2.1.1. The ICES Subdivision 27 was not sufficiently covered and therefore the results from the ICES SD 27 should not be applied for the index calculation.

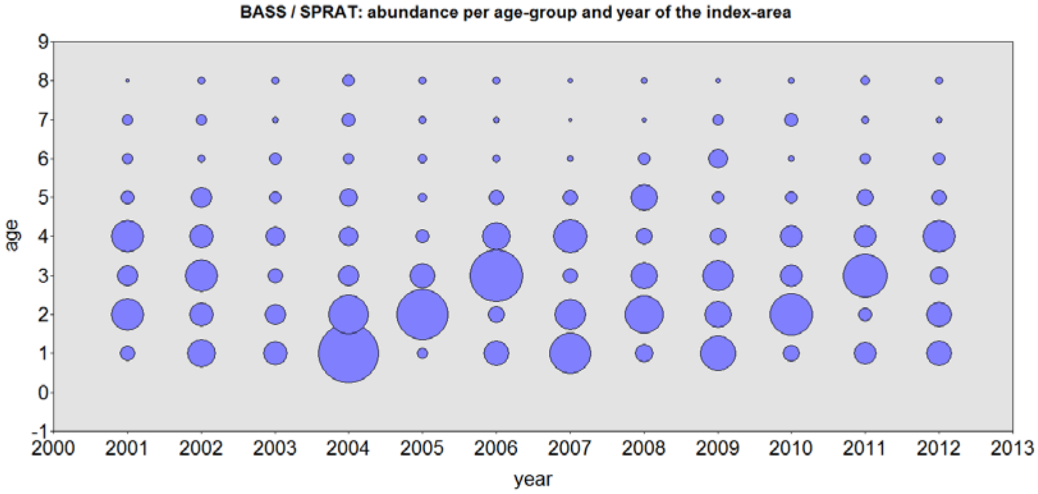


Figure 3.2.2.1.1. Spring (BASS) tuning fleet index (abundance per age groups and years) for sprat in the ICES Subdivisions 24, 25, 26 and 28.

3.2.3 Recommendation to WGBFAS

- *WGBIFS recommends that, the BASS-dataset with the valid data of 2012 can be used in the assessment of the sprat stock in the Baltic Sea.*

Table 3.2.1.1. Estimated abundance (millions) of sprat in May 2012, per age groups and the ICES rectangles.

SD	rect	total	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
24	38G2	396,57	14,31	39,23	113,99	179,26	49,57		0,07	0,14
24	38G3	1 609,99	281,86	142,73	376,98	618,34	187,90		0,73	1,45
24	38G4	348,59	35,19	41,46	92,35	144,65	34,94			
24	39G2	344,41	119,08	28,21	67,25	100,44	29,25		0,06	0,12
24	39G3	803,83	277,92	65,84	156,95	234,43	68,26		0,14	0,29
24	39G4	87,35	8,97	9,28	19,43	35,00	13,12		0,52	1,03
25	37G5	46,81	4,00	6,68	4,98	22,14	3,64	4,01	0,91	0,45
25	38G5	4 132,39	314,51	703,35	465,74	1 928,48	289,49	325,77	74,39	30,66
25	38G6	1 877,70	80,19	519,28	247,90	810,09	91,11	101,67	21,78	5,68
25	39G4	534,78	98,19	63,62	49,20	223,64	41,52	42,74	11,26	4,61
25	39G5	8 542,76	240,75	1 583,58	1 048,80	4 144,30	619,44	680,45	159,58	65,86
25	39G6	3 026,95	60,30	741,63	406,94	1 398,28	176,80	188,97	38,92	15,11
25	39G7	2 634,01	215,39	988,67	352,04	915,64	80,30	67,37	10,98	3,62
25	40G4	1 181,56	216,94	140,57	108,71	494,12	91,74	94,44	24,87	10,17
25	40G5	2 847,17	84,65	482,50	339,55	1 397,47	214,72	244,52	56,81	26,95
25	40G6	2 584,48	93,97	608,77	353,05	1 195,29	135,24	155,38	34,21	8,57
25	40G7	2 379,34	216,51	752,05	306,51	906,17	85,06	91,34	15,88	5,82
25	41G6	1 466,42	193,15	483,88	173,74	509,53	45,22	49,60	8,76	2,54
25	41G7	730,91	55,24	211,62	103,56	300,29	26,10	28,20	4,77	1,13
26	39G8	2 592,36	571,78	350,92	269,62	983,55	264,59	57,71	1,90	92,29
26	40G8	3 144,11	155,18	702,89	427,12	1 404,16	297,47	47,72	1,04	108,53
26	40G9	2 753,77	744,96	365,00	283,38	563,15	439,83	183,31	103,08	71,06
26	40H0	1 215,78	867,57	102,70	35,92	72,76	68,69	34,49	19,15	14,50
26	41G8	5 137,28	837,01	1 613,20	509,01	1 675,60	338,92	41,99	0,39	121,16
26	41G9	2 512,78	385,10	634,82	277,08	866,43	98,82	148,81	43,24	58,48
26	41H0	2 991,36	780,59	942,37	61,10	630,04	92,87	250,26	108,02	126,11
28_2	42G8	3 167,37	198,62	582,54	492,13	1 209,98	327,18	209,31	57,40	90,21
28_2	42G9	2 237,31	140,30	411,48	347,62	854,68	231,11	147,85	40,55	63,72
28_2	42H0	3 210,82	430,19	971,56	165,22	1 067,15	204,70	113,26	15,59	243,15
28_2	43G8	754,39	167,32	122,87	96,93	232,76	63,73	41,72	11,21	17,85
28_2	43G9	4 360,94	753,51	780,97	592,35	1 397,78	386,94	262,02	69,33	118,04
28_2	43H0	813,46	229,53	166,21	39,82	211,37	82,01	44,41	18,80	21,31
28_2	43H1	3 871,23	430,14	586,55	273,72	1 329,51	664,76	312,83	156,41	117,31
28_2	44G9	1 680,63	144,37	414,25	249,68	526,07	149,71	116,66	26,07	53,82
28_2	44H0	2 337,81	1163,99	395,14	164,41	372,91	77,56	93,49	7,18	63,13
28_2	44H1	1 662,67	827,84	281,03	116,93	265,22	55,16	66,49	5,10	44,90
28_2	45G9	3 961,56	2017,62	752,34	300,16	557,42	152,89	113,08	16,89	51,16
28_2	45H0	4 157,14	3024,32	479,97	97,85	404,78	39,99	35,12	4,83	70,28
28_2	45H1	4 599,19	3345,91	531,01	108,26	447,82	44,24	38,86	5,34	77,75

Table 3.2.2.1. Estimated numbers of sprat (millions) by the ICES Subdivisions, according to age groups (May 2012).

Sub_Div	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
24	737,33	326,75	826,95	1 312,12	383,04		1,52	3,03
25	1 873,79	7 286,20	3 960,72	14 245,44	1 900,38	2 074,46	463,12	181,17
26	4 342,19	4 711,90	1 863,23	6 195,69	1 601,19	764,29	276,82	592,13
28_2	12 873,66	6 475,92	3 045,08	8 877,45	2 479,98	1 595,10	434,70	1 032,63

Table 3.2.2.2. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (May 2012).

Sub_Div	AREA_CORR_FACTOR	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
24	1,28	942,95	417,87	1 057,56	1 678,03	489,86		1,94	3,87
25	1,07	2 013,62	7 829,94	4 256,29	15 308,52	2 042,20	2 229,27	497,68	194,69
26	1,54	6 700,65	7 271,17	2 875,24	9 560,88	2 470,88	1 179,41	427,17	913,75
28_2	1,01	13 042,40	6 560,80	3 084,99	8 993,81	2 512,49	1 616,01	440,40	1 046,16

Table 3.2.1.3. Corrected sprat biomass (in tonnes) according to the ICES Subdivisions and age groups (May 2012).

Sub_Div	AREA_CORR_FACTOR	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
24	1,28	7 539,16	5 730,06	18 439,09	29 984,04	9 559,75		49,34	98,35
25	1,07	12 076,89	80 796,20	50 184,45	196 679,89	29 527,07	34 585,80	7 536,34	6 712,89
26	1,54	32 044,94	61 625,13	29 309,49	100 740,07	28 352,63	21 852,56	5 221,28	16 289,11
28_2	1,01	53 354,89	54 022,62	29 086,84	91 689,88	28 105,17	17 087,91	5 351,51	15 448,77

4 Update of the acoustic databases BASS_DB and BIAS_DB

Until 2009, the results of the acoustic surveys aggregated by the ICES-rectangle were stored as Excel data sheets (BAD1 database). In 2010, these data tables were transformed in a more database-oriented structure and transferred in Access-Databases. Since that time, the data of the **Baltic Acoustic Spring Survey (BASS)** are stored in the **BASS_DB.mdb**. The data of **the Baltic International Acoustic Survey (BIAS)** are stored in the **BIAS_DB.mdb**.

These Access-files also include queries with the used algorithms for creation of the report tables and the calculation of the different tuning fleets.

An evaluation of acoustic time-series was requested by the Benchmark Workshop on Baltic Multispecies Assessments (WKBALT). The requested evaluation of these time-series was done by two WGBIFS experts.

Following updates and corrections in the acoustic surveys data (Baltic International Acoustic Survey and Baltic Acoustic Spring Survey) were made:

- new data from the RV "Solea" survey in 1991 were added into the BIAS database (it contained the data for rectangles 39G1 and 40F9 of ICES SD 25, and rectangle 37G2 of ICES SD 24). As a result, the survey area coverage of the ICES Subdivisions 24 and 25 improved in 1991 and the fish abundance figures changed accordingly,
- the structure and the contents of data tables in the database were checked and an assignment correction of three ICES rectangles (43H4, 44H4, 45H4) was done; in the rectangles table "TB_3_ICES_RECT" of the database were the ICES rectangles 43H4, 44H4 and 45H4 so far assigned to ICES SD 28.2, but they in fact belongs to the ICES SD 28.1 – this mistake has been now corrected in both, BIAS and BASS databases,
- the queries, which produce the acoustic indices were checked in the database.

Following three corrections were made in the queries:

1) The previously used queries calculated the area correction factor correctly, if the sum of the "flags" for a single ICES rectangle was equal to 1. This has been the normal case for the data delivered so far. Therefore, no error occurred up until now. The value of the "flag" is used to calculate the rectangle-mean for the abundance and mean individual weight at multiple covered rectangles. For the calculation of an alternative tuning index with the exclusion of the data from inconsistently covered area of the ICES Subdivision 29N, the "flags" for these rectangles were set to zeros. In the calculations, the data from consistently covered the ICES Subdivision 29S was used instead and extrapolated for whole area of the ICES Subdivision 29. As a result, the fish abundance estimates of ICES SD 29N rectangles were excluded in the index calculations, but the areas of these rectangles were not automatically excluded from the subdivision's total area calculation. The queries have been now corrected in both, BIAS and BASS databases, so that the algorithm for the calculation of the area-correction factor gives us the correct values even if the sum of the "flags" for a single rectangle does not equal to 1.

2) During the WGBIFS/2008 meeting it was required that all acoustic indices should be recalculated as area-corrected time-series. This requirement was for some unexplainable reason not implemented in the query algorithms for the calculation of her-

ring and sprat recruitment indices in the BIAS database. This mistake in the query was now corrected.

3) Finally a mistake in the query for the tuning fleet for "Baltic sprat ICES SD 24-29" was discovered in the BIAS database. The data from the ICES SDs 22 and 23 were included by mistake into the index calculation. This mistake was corrected now (WGBIFS/2013) and as an alternative a new acoustic index "Baltic sprat ICES SD 22-29" was created.

Short description of the corrections made in the acoustic databases.

1 Inclusion of the new data into the BIAS database.
2 Correction of the rectangle assignments in the rectangle table.
3 Correction of the algorithm for the calculation of the area-correction factor.
4 The area-correction function was added to the query algorithm for the calculation of BIAS herring and sprat recruitment indices.
5 An incorrect query for the calculation of "Baltic sprat ICES SD 24-29" tuning fleet was corrected in the BIAS database.

The data from the year 2012, after validation, were added to both databases. The current versions of the databases are located in the folder “Data” of the WGBIFS-SharePoint (https://groupnet.ices.dk/wgbifs2013/Data/Forms/AllItems.aspx).

During discussion on the WGBIFS meeting in March 2012 was concluded that, the structure of the BIAS database should be adapted by manager of these records to allow the incorporation of the estimates of two herring stocks (Western Baltic Spring Spawner and Central Baltic Herring) by the ICES Subdivisions. U. Boettcher, accordingly to the above-mentioned requirements created the new version of the BIAS database. Until March 2013, the current version of the BIAS database contents German data only. Delivered Swedish data must be checked before the entry in the database.

5 Plans, decisions and experiments to be conducted in 2013 and 2014 acoustic surveys

5.1 Planned acoustic survey activities

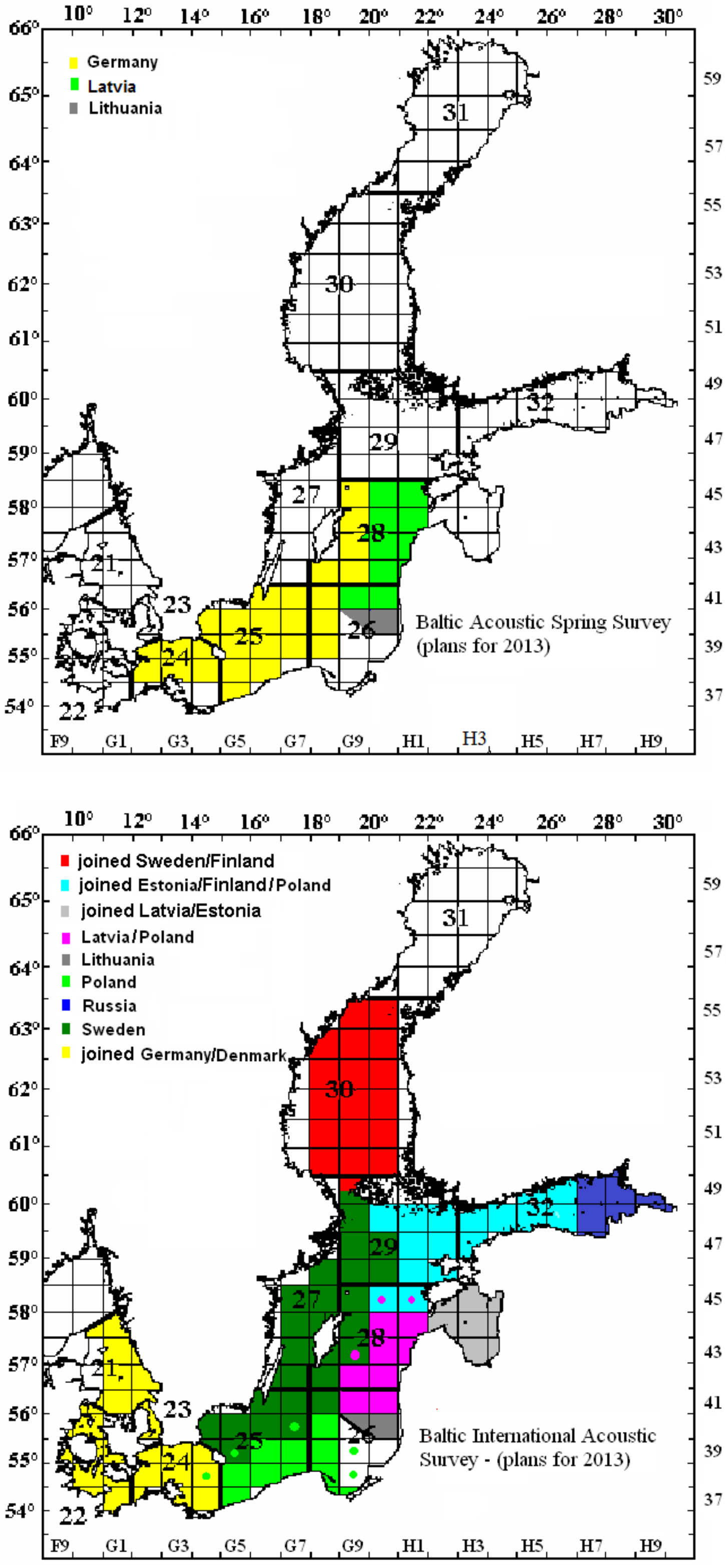
All the Baltic Sea countries (with the exception of Russia – Kaliningrad) intend to take part in acoustic surveys and experiments in 2013 (Figures 5.1.1 and 5.1.2). The list of participating research vessels and initially planned periods of particular surveys are given in the following table:

Vessel	Country	Area of investigation (ICES Subdivisions)	(Preliminary) period of investigations	Duration (days)
DARIUS	Lithuania	26 (the Lithuanian EEZ)	May	3
Fishing trawler type MRTK	Latvia	26 (N), 28	May	10
SOLEA	Germany	24, 25, 26 (part), 28 (part)	02–22.05.2013	21
CHARTER	Latvia/Estonia	28 (Gulf of Riga)	24.07.-02.08.2013	10
BALTICA	Poland	24 (part), 25, 26	17.09.-04.10.2013	18
BALTICA	Latvia/Poland	26 (N), 28	09-18.10.2013	10
BALTICA	Estonia, Finland?, Poland	28 (part), 29 (N), 32 (W)	19-30.10.2013	12
DANA	Sweden	25 (N), 27, 28 (W), 29 (W)	02–16.10.2013	14
ARANDA	Sweden, Finland	29 (N), 30, 32 (N)	Sept.-Oct. 2014	12
DARIUS	Lithuania	26 (the Lithuanian EEZ)	October	2
Fishing trawler type MRTK	Russia (St. Petersburg)	32 (E)	15–22.10.2013	7
SOLEA	Germany, Denmark	21, 22, 23, 24	30.09.–19.10.2013	20

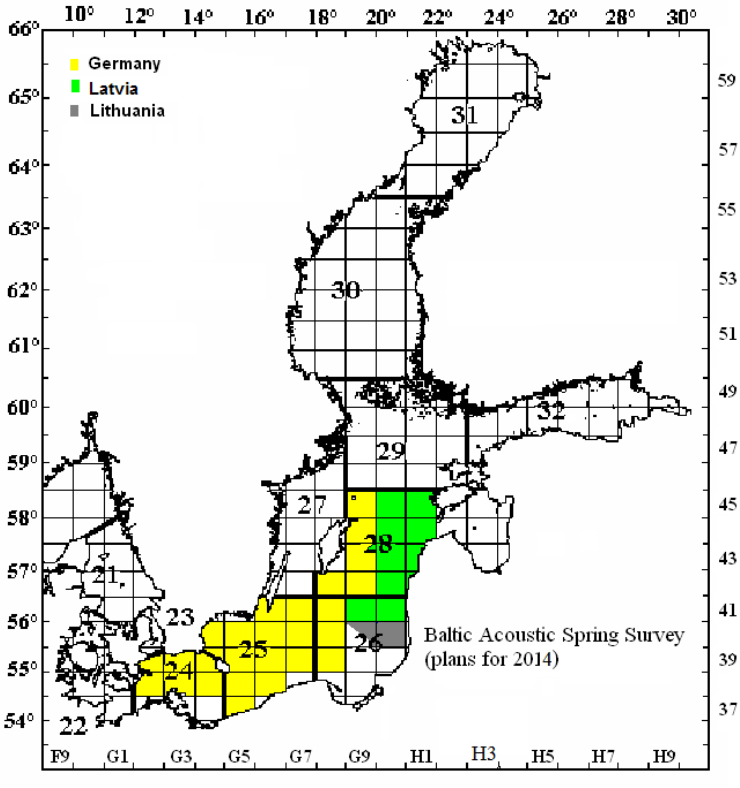
The preliminary plan for acoustic surveys and experiments in 2014 (Figures 5.1.3 and 5.1.4) for majority of institutes is presented in the text table below however, the final outline of plans will be available after verification of budgets.

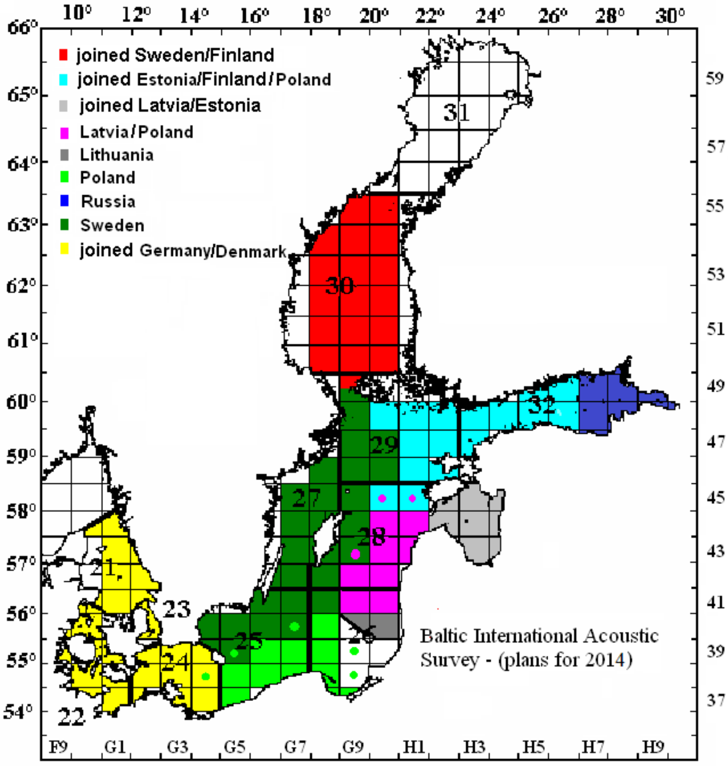
Vessel	Country	Area of investigation (ICES Subdivisions)	(Preliminary) period of investigations	Duration (days)
DARIUS	Lithuania	26 (the Lithuanian EEZ)	May	3
Fishing trawler type MRTK	Latvia	26 (N), 28	May	10
SOLEA	Germany	24, 25, 26 (part), 28 (part)	02–22.05.2014	21
CHARTER	Latvia, Estonia	28 (Gulf of Riga)	29.07.-07.08.2014	10
BALTICA	Poland	24 (part), 25, 26	17.09.-04.10.2014	18
BALTICA	Latvia, Poland	26 (N), 28	09-18.10.2014	10
BALTICA	Estonia, Finland?, Poland	28 (part), 29 (N), 32 (W)	19-30.10.2014	12
DANA	Sweden	25 (N), 27, 28 (W), 29 (W)	02–16.10.2014	14

ARANDA	Sweden, Finland	29 (N), 30, 32 (N)	Sept.-Oct. 2014	12
DARIUS	Lithuania	26 (the Lithuanian EEZ)	Oct. 2014	2
Fishing trawler type MRTK	Russia (St. Petersburg)	32 (E)	15–22.10.2014	7
SOLEA	Germany, Denmark	21, 22, 23, 24	30.09.–19.10.2014	20



Figures 5.1.1–5.1.2. The planned coverage of the Baltic Sea and the assignment of the national/joint acoustic surveys to the rectangles during the May and the September/October surveys in 2013 (from top to bottom). Base colours of rectangles indicate the country or joint survey, which is responsible for this ICES-rectangle. Coloured dots indicate overlapping coverage by other countries (sometimes only parts of rectangle are covered).





Figures 5.1.3–5.1.4. Proposed preliminary partitioning (assignment of the national/joint surveys to rectangles) for the May and the September/October surveys in 2014 (from top to bottom). Base colours of rectangles indicate the country or joint survey, which is responsible for this ICES-rectangle. Coloured dots indicate overlapping coverage by other countries (sometime only parts of rectangle are covered).

5.2 Data delivery and analysis

The main results of both types of international acoustic surveys (BIAS, BASS), carried out in 2013, should be summarized in table format according the Manual for the International Baltic Acoustic Surveys (ICES CM 2012/SSGESST:02, Addendum 2) and uploaded latest one month before the WGBIFS meeting of the next year to the current data folder of the ICES-SharePoint of WGBIFS 2014.

Before the next meeting of WGBIFS the acoustic data must be integrated into the database by the database manager. The integrated data will be checked for errors and preliminary analysis and will be performed in order to present the data to the WGBIFS meeting for further evaluations and discussion. If the countries do not submit the data to database manager in the agreed time, this work cannot be done during the meeting with the required quality.

The inclusion of the data, which are not delivered by agreed deadline before the meeting, into the relevant evaluation/tuning index calculation, is considered by WGBIFS only in exceptional cases.

5.3 Recommendations

- *WGBIFS recommends that in 2014, Sweden will start participating to the BASS survey, covering at least the ICES Subdivision 27, and the issue is discussed during the Baltic RCM meeting in 2013,*
- *Russia is strongly requested to participate in the BIAS and BASS surveys covering the SE part of the ICES Subdivision 26,*
- *in 2013 and forthcoming years, the BIAS area will be extended to the Russian EEZ in the ICES Subdivision 32, and the Russian GosNIORH (St. Petersburg) will be managing this surveys.*

6 Discuss the results from BITS surveys performed in autumn 2012 and spring 2013

6.1 BITS 4th quarter 2012

During quarter 4^{th} BITS in 2012, the level of realized valid hauls represented 97% of the planned stations (Table 6.1.1). This level of valid hauls was considered by WGBIFS as appropriate for tuning series and is recommended for the assessment of Baltic cod stocks.

Higher level of valid hauls was obtained in the ICES Subdivisions 22–24 (>100%) compared to ICES Subdivisions 25–29. However even here, the overall coverage of valid hauls was higher than in 4th quarter survey of 2011 (94%). Lowest coverage was observed in SD 26, particularly due to the poor results from depth stratum 3. In this respect the results were similar to those obtained in November 2011. Lower level of valid stations in Eastern Baltic Sea can also be explained by bad weather conditions during the Lithuanian and partly Estonian surveys. All planned station in the Baltic Sea with a depth of less than 40 m were realized. On average, 100%, 98%, 106% and 94% of planned stations were conducted in depth strata 2, 3, 4 and 5, respectively.

Russia did not participate in the survey.

Table 6.1.1. Comparison of the planned and realized fishing stations by the ICES Subdivisions and depth layers during BITS 4th quarter 2012.

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (1–6)	Number of hauls planned	Number of valid hauls realized using “Standard” groundgear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
22	TVS	1	5	5	0	0	0	0	100
24	TVS	1	30	21	0	0	0	0	70
24	TVS	2	22	25	0	0	0	0	136
25	TVL	1	4	4	0	0	2	0	100
25	TVL	2	27	26	0	0	4	0	96
25	TVL	3	31	33	0	7	4	0	106
25	TVL	4	16	15	0	11	0	0	100
26	TVL, TVS	2	9	8	1	0	0	0	100
26	TVL, TVS	3	8	5	0	1	2	0	63
26	TVL, TVS	4	9	8	1	1	2	0	90
26	TVL	5	6	6	2	0	1	1	120
26	TVL	6	6	5	2	3	0	0	100
27	TVL	2	2	2	0	0	0	0	100
27	TVL	3	4	4	0	0	0	0	100
27	TVL	4	1	1	0	1	0	0	100
27	TVL	5	3	3	0	3	0	0	100
28	TVL	1	1	1	0	0	0	0	100
28	TVS, TVL	2	5	3	2	0	0	0	100
28	TVS, TVL	3	4	2	2	0	0	0	100
28	TVS, TVL	4	8	7	4	1	0	0	100
28	TVS, TVL	5	6	0	4	1	0	1	83
29	TVS	2	2	2	0	0	0	0	100
29	TVS	3	2	2	0	0	0	0	100
29	TVS	4	1	1	0	0	0	0	100
29	TVS	5	1	0	0	0	0	0	0

6.2 BITS 1st quarter 2013

The average level of realized valid hauls in relation to the planned hauls was relatively similar to the 4th BITS in 2012 with 100% in ICES Subdivisions 22–24 and 95% in the ICES Subdivisions 25-28 (Table 6.1.2). Although in some strata the percentage of realized hauls was lower (e.g. 71% in stratum 6, SD 26), average coverage of subdivisions was close still 100%. All planned stations with a depth of less than 40 m were realized except in SD 28 where one haul was invalid and could not be replaced.

On average, all strata 2-4 were fully covered. The average coverage of stratum 5 was 89%.

The RV “Baltica” did not receive the permission for trawl hauls in Estonian EEZ, so the four tracks were shifted to the Latvian EEZ.

Table 6.2.1. Comparison of the planned and realized fishing stations by the ICES Subdivisions and depth layers during BITS 1st quarter 2013.

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (1–6)	Number of hauls planned	Number of valid hauls realized using “Standard” groundgear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
22	TVS	1	6	6	0	0	0	0	100
24	TVS	2	30	30	0	0	0	0	100
24	TVS	3	24	24	0	0	0	0	100
25	TVL	1	4	4	0	0	0	0	100
25	TVL	2	39	37	0	0	8	0	95
25	TVL	3	43	41	0	0	7	2	95
25	TVL	4	17	16	0	0	1	0	94
25	TVL	5	2	2	0	0	0	0	100
26	TVL	1	1	1	0	0	0	0	100
26	TVL, TVS	2	11	9	0	0	0	0	81
26	TVL, TVS	3	12	14	0	0	0	0	117
26	TVL, TVS	4	15	22	0	0	0	0	147
26	TVL	5	18	16	1	1	0	1	100
26	TVL	6	7	4	1	0	1	0	71
27	TVL	2	2	2	0	0	0	0	100
27	TVL	3	4	4	0	0	0	0	100
27	TVL	4	1	1	0	0	0	0	100
27	TVL	5	3	3	0	3	0	0	100
28	TVL	1	1	0	0	0	0	1	0
28	TVL	2	7	7	6	0	1	0	100
28	TVL	3	8	2	6	0	1	0	100
28	TVL	4	15	4	11	0	0	0	100
28	TVL	5	4	0	2	2	0	0	100

The participating nations also performed the standard gear check procedures, and presented the results to WGBIFS.

Standard reports giving overviews of the result of 1st and 4th quarter surveys from each country can be found in Annex 6. More detailed descriptions of most of the individual surveys can be found in Annex 7.

7 Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2013 and spring 2014

The procedure which is used for allocating stations to the ICES Subdivisions and depth layers is described in Annex 3 "Method used for planning the Baltic International Trawl Survey" of the WGBIFS report in 2004. The DATRAS Database (version from March 2010) was used to estimate the 5 years – running means of distribution pattern of both cod stocks by depth layer and the ICES Subdivision. The running mean of spring BITS indices of age-group 1+ of cod from 2008–2012 was used based on the current used version of conversion factors which are stored in the DATRAS system.

The most of the participating institutes plan the same numbers of hauls during BITS surveys in autumn 2013 and spring 2014 as in the years before. Small variations did not lead to a significantly changed of the total number of stations by surveys. The stable total number of stations of the quarter 1 and 4 surveys gives the opportunity that most countries can realize the planned fishing stations within the own national economical zone. However, it must be pointed out that all countries should be able to work also in economical zones of other countries to fulfil the requirements of the international coordinated surveys.

The total number of available stations (Table 7.1) was used in the combination with the results of relative distribution of stations by the ICES Subdivision and depth layer (Tables 7.2 and 7.3) to allocate the number of total planned stations by the ICES Subdivision and depth layer for the different surveys. Tables 7.4 and 7.5 present the allocated hauls by the ICES Subdivision and the depth layer for autumn survey in 2013. Furthermore, the number of hauls to be carried out by countries in the different Subdivisions is given. Tables 7.6 and 7.7 show the data corresponding for the survey in spring 2014.

Table 7.1. Total numbers of stations planned by country during BITS in autumn 2013 and spring 2014.

		NUMBER OF PLANNED STATIONS IN AUTUMN	NUMBER OF PLANNED STATIONS IN SPRING
COUNTRY	VESSEL	2013	2014
Germany	Solea	57	60
Denmark	Havfisken	23	23
	Total 22 + 24	**80**	**83**
Denmark	Dana	50	50
Estonia	Commercial vessel	10	0
Finland	Aranda	45	0
Latvia	Chartered vessel	25	25
Lithuania	Darius	6	6
Poland	Baltica	33	50
Russia	Atlantniro/Atlantida	0	33
Sweden	Dana	30	50
	Total 25 - 28	**149**	**214**

The planned stations by country and the ICES Subdivision are preliminary. It is possible that the number of stations can be slightly changed to minimize the total distance between the assigned hauls by country. Furthermore, it is required that hauls are planned within the national zones if possible (at least in the 12 nm zones) to reduce problems with national permissions.

Estonia is participating at the 4 quarter BITS survey, performing five trawl hauls in the Estonian EEZ of SD 28 only using the chartered commercial vessel. In order to charter the vessel the particular tendering rules applicable in Estonia should be followed. Due to that the particular survey vessel will be known only very shortly before the planned survey which does not allow necessary period to apply for the permission for the working in foreign EEZ. Therefore, five stations are planned in SD 28.

WGBIFS notes that Russia has decided not to participate in the BITS survey in autumn 2013. Since other ICES Member Countries will not be able to get permission to work in the EEZ of Russia, the negative affect on the quality of the survey results of 2013 autumn BITS survey would be eminent. *Therefore WGBIFS strongly recommends that Russia should reconsider its decision and perform its indispensable part of the 2013 BITS survey in the Russian EEZ, at least partially.*

Table 7.2. Basic data for allocating hauls for survey by ICES Subdivision.

ICES SUB.-DIV.	Total area of the depth layer 10-120 m	Proportion of the SUBDIVISIONs (weight=0.6)	Running mean of the cpue value of age-groups 1+ (2008-2012)	Proportion of the index values (weight=0.4)	Proportion of the stations COUNTRY	Special decisions (additional stations)
SD	[nm²]	[%]		[%]	[%]	
22	3673	39	307	24	33	
23	0	0	0	0	0	3
24	5724	61	996	76	67	
Total	**9397**	**100**	**1273**	**100**	**100**	
25	13762	43	1222	61	50	
26	9879	31	743	37	33	
27	0	0	0	0	0	10
28	8516	26	48	2	17	
Total	**32156**	**100**	**2013**	**100**	**100**	

Table 7.3. Basic data for allocating hauls according to depth layer for survey by ICES Subdivision.

ICES Sub-div.	Depth layer	Total area of the depth layer	Proportion of the depth layer (WEIGHT=0.6)	Running mean of the cpue value of age-group 1+ (2008-2012)	Proportion of the depth layer (WEIGHT=0.4)	Proportion of the depth layer
	[m]	[nm²]	[%]		[%]	[%]
24	10 - 39	4174	73	240	11	48
	40 – 59	1550	27	1485	66	43
	60 – 79	29	1	519	23	10
	Total	**5753**	**100**	**2244**	**100**	**100**
25	10 - 39	4532	37	236	5	24
	40 - 59	3254	26	1327	26	26
	60 - 79	3037	25	2189	43	32
	80 – 99	1461	12	5035	25	17
	Total	**12284**	**100**	**4867**	**100**	**100**
26	10 - 39	2379	23	135	4	16
	40 - 59	1519	15	748	22	18
	60 - 79	1911	19	1195	35	25
	80 - 100	2872	28	1138	33	30
	100 - 120	1504	15	227	7	12
	Total	**10185**	**100**	**3444**	**100**	**100**
27	10 - 39	1642	31	0	0	18
	40 - 59	1101	21	12	11	17
	60 - 79	996	19	91	88	46
	80 - 99	1596	30	1	1	18
	Total	**5335**	**100**	**103**	**100**	**100**

ICES Sub-div.	Depth layer	Total area of the depth layer	Proportion of the depth layer (WEIGHT=0.6)	Running mean of the cpue value of age-group 1+ (2008-2012)	Proportion of the depth layer (WEIGHT=0.4)	Proportion of the depth layer
28	10 - 39	2589	39	5	2	24
	40 - 59	1598	24	40	19	22
	60 - 79	1101	16	99	46	28
	80 - 100	1389	21	73	34	26
	Total	**6677**	**100**	**217**	**100**	**100**

Table 7.4. Allocation of planned stations by country and ICES Subdivision in autumn 2013.

		Subdivision						
Country	Total	22	23	24	25	26	27	28
Denmark	73	20	3		44	6		
Estonia	10							10
Finland	0							
Germany	57	5		52				
Latvia	25					15		10
Lithuania	6					6		
Poland	33				18	15		
Russia	0							
Sweden	30				8	4	10	8
Total	**229**	**25**	**3**	**52**	**71**	**44**	**10**	**24**

Table 7.5. Allocation of planned stations by ICES Subdivision and depth layer in autumn 2013.

Subdivision	22	23	24	25	26	27	28
Depth layer [m]							
10 – 39	25	3	25	17	7	3	6
40 – 59			22	19	8	2	5
60 – 79			5	22	12	2	6
80 – 100				12	14	3	6
100 – 120					5		
Total	**25**	**3**	**52**	**70**	**46**	**10**	**23**

Table 7.6. Allocation of planned stations by country and ICES Subdivision in spring 2014.

		Subdivision						
Country	Total	22	23	24	25	26	27	28
Denmark	73	20	3		44	6		
Estonia	0							
Finland	0							
Germany	60	6		54				
Latvia	25					11		14
Lithuania	6					6		
Poland	50				26	24		
Russia	33				12	21		
Sweden	50				20		10	20
Total	**298**	**26**	**3**	**54**	**101**	**68**	**10**	**34**

Table 7.7. Allocation of planned stations by ICES Subdivision and depth layer in spring 2014.

SubdivISION	22	23	24	25	26	27	28
Depth layer [m]							
10 – 39	26	3	26	24	11	3	8
40 – 59			23	27	12	2	7
60 – 79			5	33	17	2	10
80 – 100				18	20	3	9
100 – 120					8		
Total	**26**	**3**	**54**	**102**	**68**	**10**	**34**

8 Update and correct the tow database

8.1 Reworking of the Tow Database

Feedbacks of the last surveys have demonstrated that the structure of the Tow Database is suitable for the routine use. Changes of the structure were not proposed and discussed. The current used structure was described in the report of the WGBIFS meeting in 2005 and in the BITS manual.

The feedbacks of the surveys in November 2014 and partly of the survey in spring 2013 were used to update the Tow Database. Some stations were deleted (stones, wrecks, area with munitions, …) or were corrected dependent on the information of the different countries (correction of depth, shift of the positions, etc.). New hauls were provided by the most countries in areas where the density of available stations was low. More than 90% of the stations which are stored in the Tow Database were already successfully used at least one time. On the other hand trawls were damaged at stations which were already successfully used at least one time. Those hauls were further used in the Tow Database, but the datasets are marked. The stations are deleted if similar problems were found during the next surveys.

Final version of the Tow Database was not available during the meeting because the feedback of the BITS in spring 2013 was not available before the meeting started. The missing feedback will be used immediately after submission by the countries. Then the version TD_2013V1.XLS will be made available for all countries. To speed up this process it is necessary that all countries submit the feedback according to the given description mentioned below immediately after the survey. The EXCEL file "Feedback.xls" will be provided for the standard reports.

8.2 Feedback of the BITS

Structure of feedback of the BITS was agreed two year ago. This structure should be used for reporting the information from the realized hauls. The aim of the structure is to make it as easy as possible to rework the Tow Database. The experiences of the last years made it necessary to explain some codes more detailed.

The following information of all realized stations of BITS should be submitted to Germany.

- New version of haul number for the Tow Database
- ICES Subdivision
- Start position (latitude, longitude)
- Mean depth
- Depth range
- TV3 version 1 – TV3#520, 2 – TV3#930
- Used groundrope 1 – standard groundrope, 2 – rock-hopper groundrope
- Code of the haul
- Reason for deleting the haul

Set of codes (see table below) for characterizing the different type of realization of hauls was defined.

Code		Case
A		The position and the mean depth are suitable. Small changes of the positions are possible as a result of weather condition, gillnets, …. Data of the Tow database must not be changed in these cases.
B	1	The position is suitable, depth must be corrected. Small differences of the water depth which not significantly influence the assignment of the haul to the depth layer and which probably are determined by the variability of the surface layer must not be marked by this code.
B	2	Depth is ok; position must be corrected (reason). This code must be used when the position must be permanent changed as a result of reasons which will not be changed in future
B	3	The required depth is not stable, new position is proposed with flat bottom
C		The position is not suitable and it should be deleted (reason)
D		New haul for the database

It was agreed that:

- The feedback of realized surveys should be submitted to Rainer Oeberst (rainer.oeberst@vti.bund.de), Germany using the proposed standard format not later than **20 December** (autumn survey) **and immediately after spring survey.**
- The standard groundrope must be used when the station was successfully carried out during earlier surveys with this gear (see the columns TV3 and groundrope in the TD).
- New haul positions should be submitted to Rainer Oeberst (rainer.oeberst@vti.bund.de), Germany as soon as possible. Especially, hauls in the "white areas" are necessary to cover the total distribution area of the target species. It was proposed that time should be used during surveys to allocate new haul positions in the "white areas".

EXCEL file was provided to the group which contains standard structure of feedback.

9 Review and update the Baltic International Trawl Survey (BITS) Manual

The Manual for the Baltic International Trawl Surveys (BITS) from the WGBIFS meeting in March 2013 was reviewed and some technical aspects regarding methods of flounder data collection during the BITS surveys were discussed.

The following aspects concerning the BITS surveys realization were discussed:

a) There was discussion regarding the number of fish required to be sampled depending on the number of length classes. To clarify this point, it was suggested to use either table (p. 9, Addendum 1, BITS Manual 2013) or directly the relationship shown in Fig 1 (p. 10, Addendum 1, BITS Manual 2013). In that way, for example if 26 length classes are present, the required minimum number of samples is 250 according to Figure 1, and 300 according to the table. The following modification was applied to the text of the BITS Manual: "During the length measurements, the number of fish of each species per length group, *as specified either in the table above or Figure 1*, are collected and stored separately by the length-groups for age, sex, individual mass and maturity estimations".

b) According to the current BITS Manual, the number of otoliths to be sampled per length-class for each trawl haul within a Subdivision should be chosen depending on the fish length distribution (p. 12, Addendum 1, BITS Manual 2013). However, due to time limitations or lack of proper facilities, it is not always practically feasible to estimate the proportion of different length classes during the actual survey. In these cases, it was suggested to use information from previous surveys to estimate the proportion of different length classes. Therefore the BITS Manual was changed as follow: "Because the collection of the otoliths should be distributed over the whole survey time in the ICES Subdivision, the actual length frequency of the survey can be used to choose the number of otoliths per length-class. *If this is not possible, the length frequency from the last 1 to 3 surveys in the same Subdivision and quarter should be used*.

c) The extra sampling of flounder (and other flatfish) to improve length and maturity data by sex –recommendation to sample 20 individuals per length-class (p. 9, Addendum 1, BITS Manual 2013) – leads to oversampling of the most represented sex in the tails of the length distribution; i.e. males among the smaller and females among the larger. It was suggested to reduce this number to 10 individuals for those length-classes that constitute < 5% of the total length distribution (i.e. the tails of the length distribution). But one important point is the forecast of the recruitment based on SSB or other parameters. That means that information concerning the proportion of spawners will get increasing importance. In this case a reduction of sampling is not really helpful. A detailed overview of available data like length measurements by sex etc. can help to optimize the sampling design. It would be one option to prepare such type of analyses until the next meeting to have a background for possible changes.

10 Vertical distribution of cod

The vertical distribution of cod in the water column has been investigated since 2004 without producing any solution for how to taking into account that cod might migrate vertical into the pelagic or horizontal if they are exposed to oxygen deficiency near the bottom. For a detailed description of the investigations and the implication for the bottom-trawl survey index, please look into the WGBIFS reports in the period 2008 – 2010 and for a synopsis please see the 2012 BIFS report. Except for the Russian investigations described below, the latest investigations was carried out in 2012 where Germany presented a WD (R. Oeberst, WD BIFS 20012) analysing the problem based on German acoustic data from BIAS only in Subdivision 26. It was suggested that additional data from all countries carrying out acoustic surveys were made available in order to include a more complete spatial coverage in the analysis. Unfortunately these data were not made available and consequently no additional analysis was made this year. The data submission was discussed again and it was agreed that the countries (Sweden, Germany and Poland) where significant amount of cod were caught during the acoustic surveys increase the effort to fulfil the submission of the requested data. It was agreed that the period after 2008 has first priority but that a longer time-series (2001 and onwards) would provide a much better foundation for the analysis. The countries are encouraged to extend the dataseries back to 2001. Furthermore, all countries carrying out acoustic surveys in the Baltic are encouraged to submit the data if possible.

Rainer Oeberst will coordinate the submission of data, provide the format for the data submission and send out reminders when approaching the submission deadline (November 2013).

The vertical distribution of cod in the near - bottom layers has furthermore been investigated based on acoustic data collected during Russian bottom-trawl surveys 2010, 2013 carried out in the frame of annual BITS (the first quarter). Using acoustic indices Sa values from the near- bottom layers of 2.5 m and 6m it was investigated fish distribution in the layers corresponded to the vertical opining of small standard trawl type TV-3#520 (TVS) and the larger standard trawl type TV-3#930 (TVL). For a detailed description of the investigations please look into the WD (S. Kasatkina and A. Malyshko) presented in the WGBIFS 2013 report. It was revealed significant differences between acoustic density indices obtained in the near- bottom layers of 2.5 m and 6m on the trawl stations as well as along the cruise track between trawl stations. Moreover, revealed spatial-temporal heterogeneity of fish density vertical distribution has demonstrated that the bottom survey results depend on the trawl effective zone parameters and efficiency of CF among two types of standard trawls (TVL and TVS) can significantly varies by years and subdivisions. All countries participating BITS are encouraged to accompany its bottom-trawl surveys with acoustic observations the near bottom layers. These acoustic observations are important to analyse the spatial-temporal distribution of cod in the near bottom layer as a major factor influencing the BITS results, and, in particular, conversion factors (CF) estimates.

New information on the vertical distribution of cod in the pelagic water column above near-bottom layers fished by gears during BITS has not been submitted to the WGBIFS 2013. It was noted a concern that the problem related to possible underestimating cod from BITS are still not appropriately investigated.

11 Review and update the Manual for International Baltic Acoustic Surveys (IBAS)

Current review of the text of the IBAS manual (previously updated (BIAS) in 2011) as well as presentations and discussion during WGBIFS-2013 meeting indicated that some clarifications are needed.

The name of the manual was renewed in WGBIFS-2012 meeting because the abbreviation BIAS was described as an acoustic autumn survey in Baltic Sea. Thus, the new name of the manual is "Manual for International Baltic Acoustics Surveys (IBAS)". The manual covers both Baltic Acoustic Spring Survey (SPRASS/BASS) and Baltic International Acoustic Survey (BIAS) those are carried out yearly in Baltic Sea.

The date of BAD1 database is not updated any more. The data of the Baltic Acoustic Spring Survey (SPRASS/BASS) are stored in the **BASS_DB.mdb**. The data of the Baltic International Acoustic Survey (BIAS) are stored in the **BIAS_DB.mdb**. Structures in BIAS and BASS database and exchange format are presented in the Table 6.1 in Addendum 2 (ICES, 2012).

The main results of the recently conducted the acoustic survey (SPRASS/BASS and BIAS) should be summarized and uploaded one month before the WGBIFS meeting of the next year to the data folder of the current WGBIFS-SharePoint. In addition, information about any changes in the planned acoustic transects pattern for given survey (vessel) as well as any difficulties concerning the acoustic survey realization should be immediately transferred to the acoustic surveys coordinators within the WGBIFS, i.e. Niklas Larson, Lysekil – Sweden (niklas.larson@slu.se) and Uwe Boettcher, Rostock – Germany (uwe.boettcher@vti.bund.de), with a copy to the WGBIFS chair.

11.1 Reference

ICES. 2012. Report of the Baltic International Fish Survey Working Group (WGBIFS), 26–30 March 2012, Helsinki, Finland. ICES CM 2012/SSGESST:02. 531 pp.

12 Discuss the indices of acoustic surveys based on different methods for combining the data of fishing stations in compilation of acoustic indices and draft recommendations as appropriate

Two studies were presented during the meeting which describe the relation of the s_A values of detected target species during the fishing stations of acoustic surveys in the Baltic Sea. First study analyses the data of the German acoustic survey in October (BIAS) between 2001 and 2011 (Oeberst and Gröhsler, WD of WGBIFS 2013). The analyses extend the study based on the German BIAS from 2008 to 2010 (Oeberst and Gröhsler, WD of WGBIFS 2012). The data of the different SD's clearly showed that s_A values of one or more target species are correlated with the total s_A value of the total water column during the fishing stations. In addition, at least one target species exist where the s_A values are not correlated with the total s_A values.

The relations are presented for two years in SD 21 to 24 as example.

The analyses clearly support that the new method is appropriate to estimate unbiased stock indices for the BIAS in SD 21 to 24 and that the application of the arithmetic mean as given in the BIAS manual results in biased estimates. Unfortunately, the method is only applied for SD 21 to 24 of BIAS until now. WGBIFS recommends that the method is applied for all ICEES SD covered during the BIAS to have large basis for evaluating the internal and external consistency of the new stock indices and for final discussion whether the new method should be used as new standard for BIAS.

The second study investigated the relations between s_A values of detected target species and total s_A values during the German part of the BASS between 2001 and 2011 (Oeberst and Böttcher, WD of WGBIFS 2013). The analyses extend the study based on the German BASS from 2008 to 2010 (Oeberst and Böttcher, WD of WGBIFS 2012). The results clearly showed that the requirements of the new proposed model are fulfilled because s_A values of one or more target species are correlated with the total s_A value of the total water column during the fishing stations. In addition, at least one target species exist where the s_A values are not correlated with the total s_A values.

The relations between the total s_A values and the s_A values of target species are presented for two year of the SD 24 – 27 as examples. The results support the hypothesis that the new model is appropriate to estimated unbiased stock indices based on the acoustic surveys and that the application of the arithmetic mean of the data of fishing stations results in biased estimates. Unfortunately, German vessel covered only parts of most SD. The other parts were investigated by other countries. Therefore, descriptions for the total area of SD 25 – 28 are not possible based on the German data. Therefore, WGBIFS recommends that the method is also applied by all participating countries of BASS and BIAS to have the possibility to get stock indices and to evaluate the consistency of the new stock indices. Based on these analyses final decision will be possible whether the new proposed method should be used as new standard method for BASS and BIAS.

Russia is not able to provide the necessary data for the historical BIAS data for the estimation.

12.1 Reference

Oeberst, R., Gröhsler, T. 2013. Comparison of stock indices based on GERAS estimated with the standard procedure and by the new proposed method. Working document of WGBIFS 2013. 9 pp.

Oeberst, R., Böttcher, R. 2013. Comparison of stock indices based on BASS estimated with standard procedure and new proposed method. Working document of WGBIFS 2013. 4 pp.

13 Review and update the structure of the BIAS database to incorporate the estimates of two herring stocks in one subdivision

During discussion on the WGBIFS meeting in March 2012 was concluded that the structure of the BIAS database will be updated before the next WGBIFS meeting accordingly to incorporate the estimates of two herring stocks (Western Baltic Spring Spawner and Central Baltic Herring) in one ICES Subdivision. The updates in the structure of the BIAS database have been done by the database manager Uwe Böttcher (see for more information in Section 4).

14 Evaluate the proportion of WBSSH and CBH in SD 22 and SD 26 during the BIAS

Method was developed to assign individuals of herring to one of the both Baltic herring stocks, Western Baltic Spring Spawning Herring (WBSSH) and Central Baltic Herring (CBH; Gröhsler *et al.,* submitted). Analyses have shown that growth of both herring stocks differ between 2005 and 2010. The different growth was used to estimate a separation function which can be used to quantify the proportion of WBSSH and CBH during the acoustic surveys (Gröhsler *et al.*, 2013).

Data of German BIAS in SD 21 and SD 23 as well as data of German BASS in SD 27 and 28 as well as from Swedish BIAS in SD 27 and SD 28 in 2011 and 2012 was used to evaluate the applicability of the separation function also for the years 2011 and 2012 (Oeberst *et al.,* WD WGBIFS 2013).

Growth functions of WBSSH between 2005 and 2010 did not significantly differ from the growth functions in 2011 and 2012. Similar results were observed for the growth functions of CBH in the different periods. The length of herring in the baseline sample of WBSSH was only in a very small number of datasets smaller than the separation function (see Figures 1 and 2 of the working document). On the other hand, only for a small number of datasets of the baseline data of CBH the length was larger than the separation function (see Figures 3 and 4 of the working document. The results lead to the conclusion that the separation function for 2005 to 2012 can also be used for 2011 and 2012.

Therefore, the separation function was used to quantify the mixing of both stocks in SD 22 and 24 during the German BIAS in 2011 and 2012 (Oeberst *et al.,* 2013). In additions, Sweden applied the separation function to quantify the mixing of both herring stocks in SD 25 to SD 30 in the same period. Herring of age groups 1 and 2 in SD 25 is dominated by WBSSH in both years. In some rectangles CBH was not observed (Tables 14.1 and 14.2). The proportion of WBSSH was low for older herring in the same SD. Larger proportions of WBSSH were also estimated for age group 1 in the other areas covered during the surveys, but, WBSSH was not detected for older herring. The results correspond to analyses based on the single fish data of Swedish and Polish BIAS between (Gröhsler *et al.*, 2012).

The analyses clearly showed that both Baltic herring stock stay in SD 24 and SD 25 during BIAS. The results also suggest that mixing of both stocks in SD 26 during BIAS must be evaluated. WGBIFS recommends that analyses in SD 25 are required from 2001 to 2012. Similar analyses are required for stock indices in SD 26 for the same period.

Table 14.1. Proportion of WBSSH per subdivision, ICES square and age for 2011.

SD	RECT	NHer0	NHer1	NHer2	NHer3	NHer4	NHer5	NHer6	NHer7	NHer8
25	39G4	0	100%	78%	44%	37%	5%	0%	0%	0%
25	39G5	0	98%	9%	3%	0%	0%	1%	0%	0%
25	40G4	0	100%	100%	30%	7%	4%	3%	0%	0%
25	40G5	0	98%	77%	7%	4%	0%	0%	0%	0%
25	40G6	0	97%	80%	4%	2%	6%	0%	7%	0%
25	40G7	0	100%	0%	0%	0%	0%	0%	0%	0%
25	41G6	0	0%	0%	0%	0%	0%	0%	0%	0%
25	41G7	0	0%	79%	0%	2%	0%	6%	0%	2%
26	41G8	0	0%	0%	0%	0%	0%	0%	0%	0%
27	42G6	0	0%	0%	0%	0%	0%	0%	0%	0%
27	42G7	0	0%	0%	0%	0%	0%	0%	0%	0%
27	43G7	0	0%	0%	0%	0%	0%	0%	0%	0%
27	44G7	0	0%	0%	0%	0%	0%	0%	0%	1%
27	44G8	0	34%	0%	0%	0%	0%	0%	0%	0%
27	45G7	0	0%	0%	0%	0%	0%	0%	0%	0%
27	45G8	0	0%	0%	0%	0%	0%	0%	0%	0%
27	46G8	0	0%	0%	0%	0%	0%	0%	0%	0%
28	42G8	0	0%	0%	0%	0%	0%	0%	0%	0%
28	43G8	0	0%	0%	0%	0%	0%	0%	0%	0%
28	43G9	0	0%	0%	0%	0%	0%	0%	0%	0%
28	44G9	0	0%	0%	0%	0%	0%	0%	0%	0%
28	45G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	46G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	46H0	0	0%	0%	0%	0%	0%	0%	0%	0%
29	47G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	47H0	0	0%	0%	0%	0%	0%	0%	0%	0%
29	48G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	49G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52H0	0	0%	0%	0%	0%	0%	0%	0%	2%
30	53G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	53G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	53G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	53H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	55G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	55H0	0	0%	0%	0%	0%	0%	0%	0%	0%

Table 14.2. Proportion of WBSSH per subdivision, ICES square and age for 2012.

SD	RECT	NHerW0	NHerW1	NHerW2	NHerW3	NHerW4	NHerW5	NHerW6	NHerW7	NHerW8
25	39G4	0	97%	100%	64%	41%	19%	0%	0%	0%
25	39G5	0	96%	99%	78%	8%	2%	0%	0%	0%
25	40G4	0	99%	98%	71%	12%	3%	8%	0%	15%
25	40G5	0	94%	98%	46%	2%	2%	12%	0%	0%
25	40G6	0	98%	96%	28%	4%	0%	0%	0%	22%
25	40G7	0	100%	85%	19%	4%	1%	4%	0%	14%
25	41G6	0	68%	84%	4%	1%	1%	0%	0%	0%
25	41G7	0	0%	100%	18%	0%	2%	0%	0%	0%
26	41G8	0	100%	0%	0%	0%	0%	0%	0%	0%
27	42G6	0	60%	54%	0%	0%	1%	0%	0%	0%
27	42G7	0	66%	0%	0%	0%	0%	0%	0%	0%
27	43G7	0	46%	0%	0%	0%	0%	0%	0%	0%
27	44G7	0	24%	0%	0%	0%	0%	0%	0%	0%
27	44G8	0	29%	0%	0%	0%	0%	0%	0%	0%
27	45G7	0	6%	0%	0%	0%	0%	0%	0%	0%
27	45G8	0	28%	0%	0%	0%	0%	0%	0%	0%
27	46G8	0	0%	0%	0%	0%	0%	0%	0%	0%
28	42G8	0	42%	0%	0%	0%	0%	0%	0%	0%
28	43G8	0	38%	0%	0%	0%	0%	0%	0%	0%
28	43G9	0	88%	0%	0%	0%	0%	0%	0%	0%
28	44G9	0	57%	0%	0%	0%	0%	0%	0%	0%
28	45G9	0	53%	0%	0%	0%	0%	0%	0%	0%
29	46G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	46H0	0	35%	0%	0%	0%	0%	0%	0%	0%
29	47G9	0	21%	0%	0%	0%	0%	0%	0%	0%
29	47H0	0	6%	0%	0%	0%	0%	0%	0%	0%
29	48G9	0	0%	0%	0%	0%	0%	0%	0%	0%
29	49G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	50H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G7	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	51H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52G7	0	28%	0%	0%	0%	0%	0%	0%	0%
30	52G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	52H0	0	0%	0%	0%	0%	0%	0%	0%	1%
30	53G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	53G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	53H0	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54G8	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	54H0	0	0%	0%	0%	0%	0%	0%	0%	1%
30	55G9	0	0%	0%	0%	0%	0%	0%	0%	0%
30	55H0	0	0%	0%	0%	0%	0%	0%	0%	0%

14.1 References

Gröhsler, T., Oeberst, R., Schaber, M. 2012. Mixing of Western Baltic Spring Spawning and Central Baltic Herring (*Clupea harengus* L.) Stocks – Implications and Consequences for Stock Assessment. Working document of WGBIFS 2012.

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Gröhsler, T., Oeberst, R., Schaber, M., Larson, N., Kornilovs.G. (submitted 2012 to ICES Journal) Discrimination of Western Baltic Spring Spawning and Central Baltic herring (*Clupea harengus* L.) based on growth versus natural tag information.

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Oeberst, R., Gröhsler, T., Schaber, M., Larson, N. 2013. Applicability of the Separation Function (SF) in 2011 and 2012. Working document for Herring Assessment Working Group for the area South of 62° North (HAWG)/WBSSH, 12 – 21 March 2013. 7 pp. / Working document for Baltic International Fish Survey Working Group (WGBIFS), 21 – 25 March 2013.

15 Evaluate the new information how to estimate the acoustic survey sampling variance

WGBIFS received a recommendation from WGMG regarding calculations of the survey sampling variance. Earlier WGBIFS has recommended WGMG to facilitate the introduction of survey sampling variance calculations. The reason for WGBIFS to suggest this is that WGBIFS thinks that a standard method implemented in a similar way in all or most surveys is preferred compared to that the different surveys present individually selected methods which probably won't be comparable. Also the expertise for selecting method is not always present in the survey groups.

A way forward was discussed and had to be handled differently for the two surveys managed by WGBIFS. For the BITS a survey sampling variance is already available via the DATRAS database (the link is given below here).

http://datras.ices.dk/Data_products/Download/Download_Data_public.aspx (In the field "Data products" Bootstrap Data should be chosen).

The precision of acoustic surveys can be obtained through a wide variety of methods. Many of the model-based estimation techniques incorporate estimates of variance based on certain distribution. Moreover, the whole survey variance could be estimated by using predominantly bootstrap resampling methods where the errors are assumed to be independent. Thus regarding BIAS and BASS a sampling variance and confidential interval could be produced using the bootstrap method for each subdivision which is the current resolution of the indices that WGBIFS produces. But due to lack of a common database for this less aggregated survey data that is needed when performing these calculations, and the fact that the subdivisions in most cases is divided in between two or more countries, it is currently not possible to present a survey sampling variance for all subdivisions.

15.1 Previous studies on variance of BIAS estimates

a) The method for quantifying and summarizing components of the overall uncertainty in acoustically derived abundance indices from Baltic International Acoustic surveys have been proposed by Kasatkina and Gasyukov (2006; 2009; 2011). The spatial variability of the nautical area scattering coefficient (NASC), fish species composition and their size structure within the surveyed area, and the uncertainty of the target strength were chosen as the main sources of overall survey uncertainty. The proposed method allows estimating the contribution of each uncertainty source and their cumulative effect in overall sampling variance. The effects of these sources were simulated by applying bootstrap resampling for the spatial variability, and Monte Carlo simulation in the case of the TS-defining parameters. Suggested simulating method was also based on the current algorithms of BIAS data processing (WGBIFS Manual).

Uncertainty in TS estimates ($TS= 20 \log L +B_{20}$) were modelled by variability of length and species composition of fish as well as statistical characteristics of parameter B_{20}, including mean and standard deviation. According to Foot (1986), the applied equation of target strength ($TS= 20 \text{ Log } L -71.2$) may be characterized by standard deviation s.d. (B_{20}) =1.2 dB. To illustrate the impact of standard deviation s.d. (B_{20}) on uncertainty in biomass and abundance values, the calculations were made with the following parameters: s.d. (B_{20})= 1.2 dB and s.d. (B_{20})= 0.5 dB (Figure 1; Kasatkina and Gasyukov, 2006; Kasatkina 2008).

Uncertainty in the abundance indices of herring and sprat was estimated on the basis of BIAS 2004–2006 data using the different level of stratification of BIAS polygon: ICES rectangles and areas covered by vessel within ICES Subdivision. It was revealed that estimates of herring and sprat abundance and total fish abundance obtained within each stratum have different accuracy. Standard deviation of abundance indices considerably vary by strata and by years for each age group. The relationships between the abundance indices variance and indices value for all age-groups of herring and sprat were revealed.

It was shown that number of hauls in most ICES statistical rectangles (1–2 hauls) is insufficient for simulation uncertainty in abundances indices stipulated by variability of fish species composition and size structure. So, statistical rectangles cannot be used insufficient for modelling uncertainty in acoustically derived abundance indices.

Traditionally, the stock assessment method (XSA) realized in the ICES software is based on the hypothesis that the abundance indices variance is constant by years for each age-group. Integration of the abundance indices variance into XSA was resulted not only in new estimates of fish stocks and population parameters (recruitment, total and spawning biomasses, mean fishing mortality rate), but also changed the temporal trends in fish stocks dynamics (Figures 15.1.1–15.1.3). It demonstrated that estimating variance of acoustically derived abundance indices based on BIAS surveys and subsequent integration of these accuracy estimates into the stock assessment model are very important in view of ICES initiatives to revise stocks assessment methods (Gasyukov and Kasatkina, 2011).

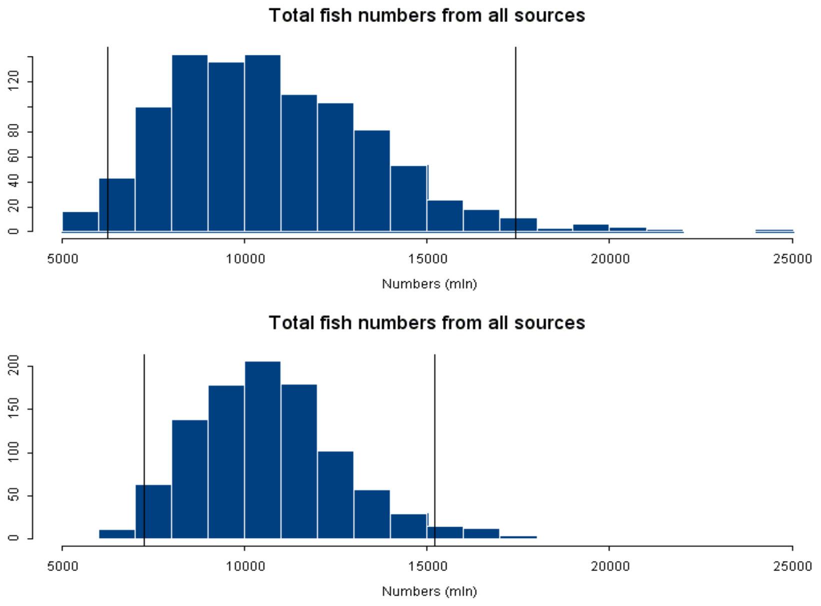

Figure 15.1.1. Histograms of total abundance simulated taking into account all sources of uncertainty (under example of Russian survey in 26SD, October 2005). Upper figure is related to s.d. (B_{20}) =1.2 dB, Lowe figure is related to s.d. (B_{20}) = 0.5 dB.

Figure 15.1.2. Estimates of herring stocks and population parameters (recruitment, total and spawning biomasses, mean fishing mortality rate) in the Central basin of the Baltic Sea based on traditional XSA (brown colour) and new XSA version (blue colour).

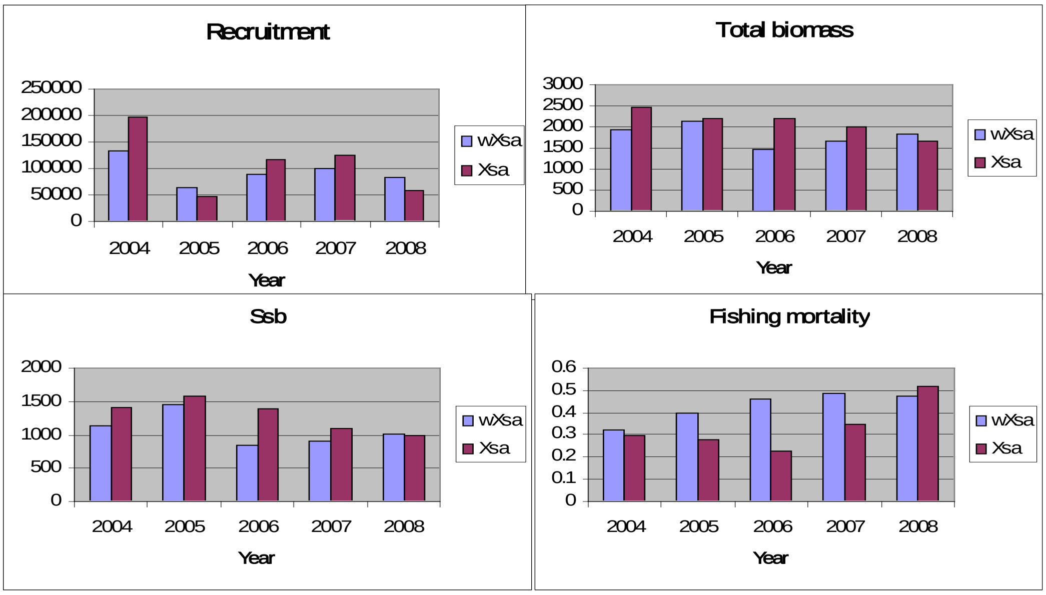

Figure 15.1.3. Estimates of the Baltic sprat stocks and population parameters (recruitment, total and spawning biomasses, mean fishing mortality rate) based on traditional XSA (brown colour) and new XSA version (blue colour).

b) The additional analysis of the spatial-temporal variability of abundance indices and their uncertainty obtained from BIAS have been analysed using the Variational Bayesian PCA (VBPCA; Gasyukov and Kasatkina, WGBIFS 2013). It was revealed a significant variability of uncertainty in abundance indices by rectangle in the range of years used for tuning XSA (1991–2011). Moreover, herring and sprat have different temporal patterns of abundance indices and its uncertainty in each rectangle. The possible approach to reducing survey-related error is improvements in sampling design, firstly, in the rectangles with significant long-term variability of abundance indices. It is important to understand whether used survey design in rectangles meets spatial-temporal variability of fish distribution. The current survey design (each statistical rectangle should be investigated by about 60 miles and least two control hauls) have been used since 2000. However, the compliance of this survey design to the fish spatial patterns remains uninvestigated until now. Comparison of the acoustic survey data from overlapping rectangles in Subdivision 26 have been revealed significant differences in the NASC indices values, species-length fish composition, and, as a result, in the herring and sprat abundance values obtained in each rectangle investigated by two vessels. It was noted that the species-length fish compositions in overlapping rectangles appear to be disparate neither at 2, 3 nor 4 hauls obtained in rectangle by each vessel. It is proposed to use data from overlapping rectangles for testing BIAS sampling design.

The above said analysis of the uncertainty has provided additional evidence that ICES rectangles cannot be used for simulation overall uncertainty in abundances indices.

Main outcomes of the above said studies are following*:*

1) The ICES statistical rectangles are insufficient for modelling uncertainty in acoustically derived abundance indices. The possible level of BIAS polygon stratification for uncertainty modelling is ICES Subdivisions or areas covered by vessel within subdivision. Simulating method should be based on the algorithms of BIAS data processing. Then, abundance indices and their uncertainty should be directly estimated by strata appropriated for simulating overall survey variance. Correspondent strata should be defined. In this case, trawl and acoustic samples should be combined by these strata for the subsequent estimating abundance indices by age groups and their overall variances. Appropriated changes should be included into the BIAS Manual.

2) Uncertainty in TS estimates provides the significant contribution into overall survey variance. For summarizing components of the overall survey variance it is needed to review the applied TS regression for definition of statistical characteristics of parameter B20.

3) Simulating method for quantifying and summarizing components of the overall uncertainty in acoustically derived abundance indices should be used for estimating overall survey variance of BIAS.

15.2 Reference

Kasatkina, S., and Gasyukov, P. 2006. Estimating uncertainty in biomass and abundance assessments from result acoustic surveys. (WGBIFS, 2006).

Kasatkina, S. M., Gasyukov, P. G. Estimating uncertainty in the Baltic acoustic survey results applying geostatistics techniques and simulation. ICES Annual Science Conference, Maastricht, Netherlands, 17–26 September 2006. ICES Document CM 2006/I: 14. 2006. 17p.

Kasatkina, S., and Gasyukov, P. 2007. Target strength of Baltic herring and sprat in relation to changes of their biological characteristics: effects on acoustic abundance indices estimates. ICES Annual Science Conference, Helsinki, Finland, September 2006. ICES CM 2007/H:06.

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Kasatkina, S., and Gasyukov, P. 2007. Estimation of Abundance Index Uncertainty from the Data of the Baltic International Acoustic Survey at Different Level of its Area Stratification. In the ICES CM 2007/LRC:06, c 155–165.

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Kasatkina, S. M., and Gasyukov, P. S. 2011. Improved approach to stock assessment of the Baltic herring and sprat based on data from international surveys (BIAS)”. In the Report of the WGBIFS 2011.

Gasyukov P. S., and Kasatkina S. M. 2011. Some reasons generated the retrospective bias in the stock assessment models. In the Report of ICES WGMG 2011 (ICES CM 2001/SSGSUE:08): 111–120.

15.3 New progress made to estimate the acoustic survey sampling variance

During the meeting initial work has been made towards the start of a common database for WGBIFS acoustic data and hauls that significantly could facilitate the calculations of some estimates on the survey sampling variance.

For SD 27 Sweden made and presented a preliminary bootstrap on the survey statistics table for the 2012 survey. The results and confidence interval is presented in Figures 15.2.1–15.2.6. The bootstrap was based on the same calculations as used when producing the survey result, the NASC values (N=397) was individually randomly selected by replacement and for the fishing stations (N=15) a catch composition was randomly selected out of all hauls and assigned to the position of each haul. The bootstrap script was made in R 2.15.3 (http://cran.r-project.org/) and the presented figures are based on 1000 randomized results. The convergence interval was defined as the area between the 25′th lowest and highest value which is marked by black lines in the figures, the result from the survey is marked by a red line.

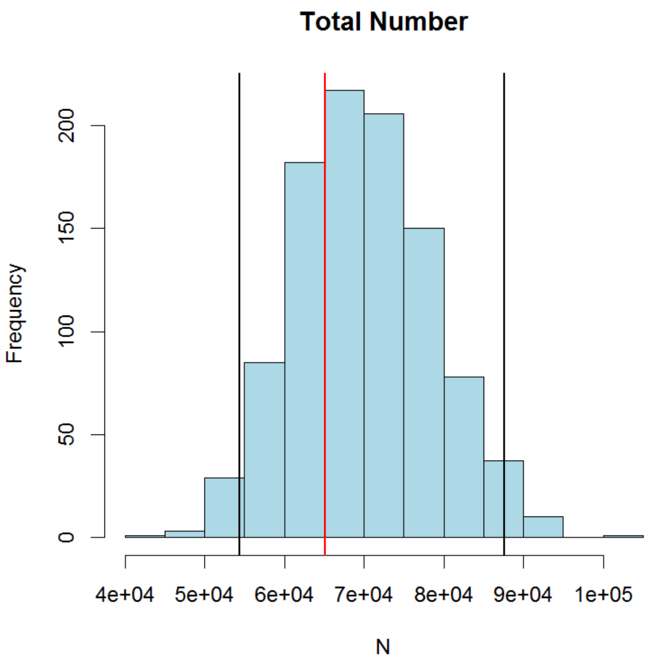


Figure 15.2.1. Total number of fish.

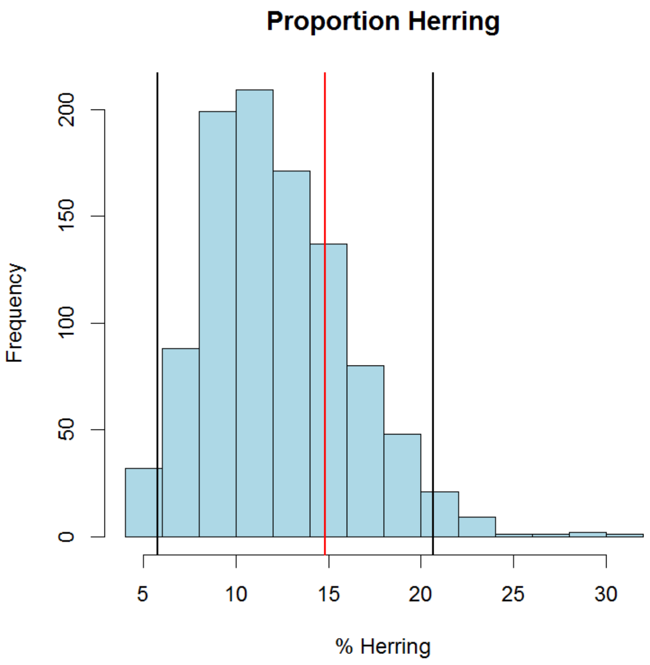


Figure 15.2.2. Proportion of herring.

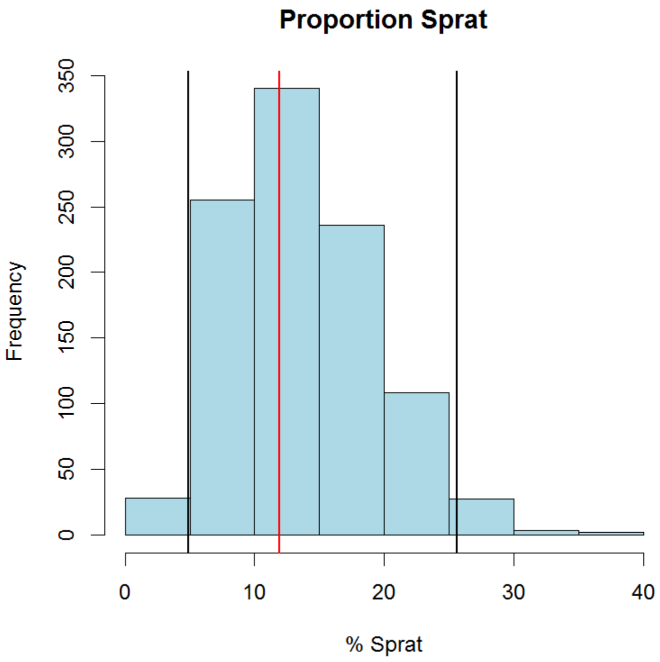


Figure 15.2.3. Proportion of sprat.

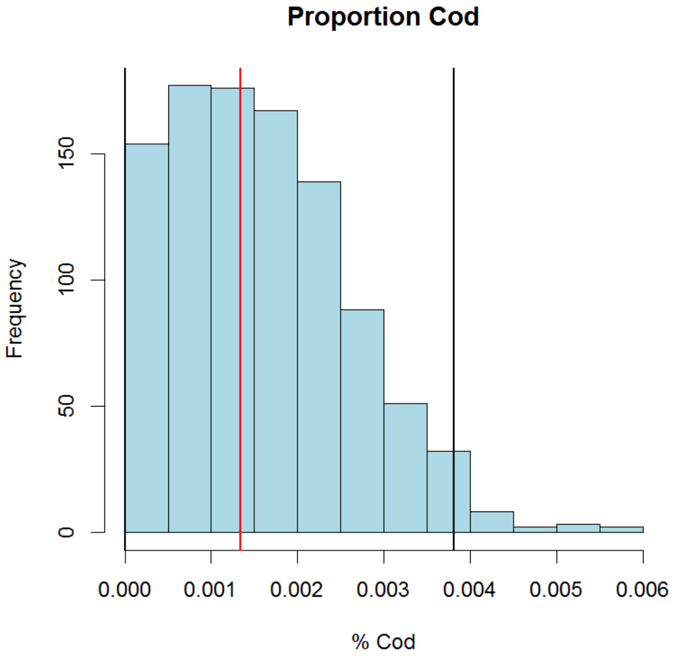


Figure 15.2.4. Proportion of cod.

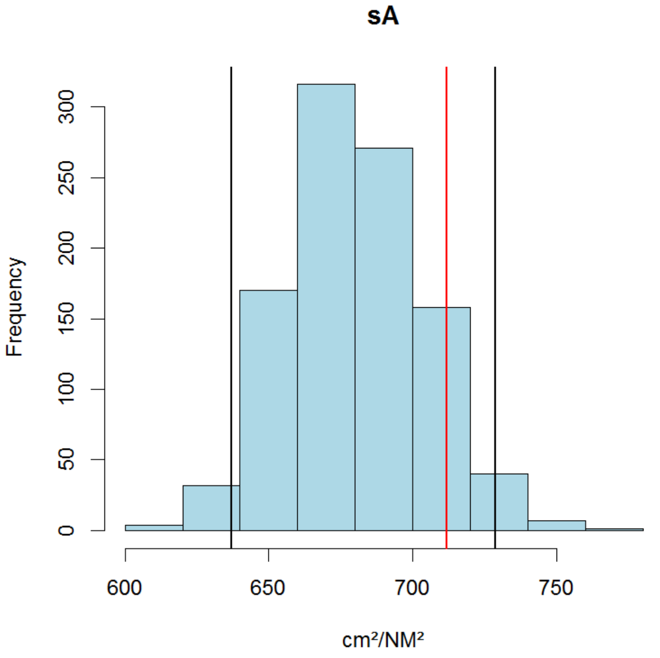


Figure 15.2.5. Mean Nautical Area Scattering Coefficient.

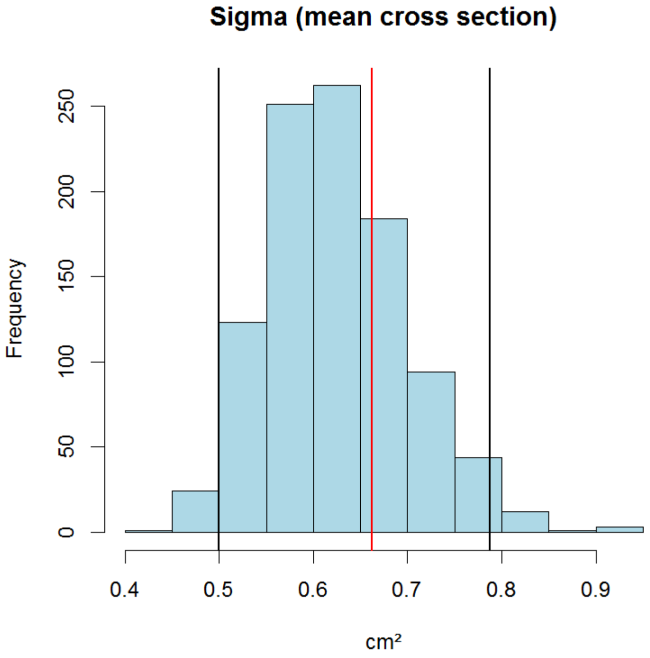


Figure 15.2.6. Mean cross section of fish.

16 Follow up of the cod stomach sampling program framed by WGSAM

The Working group on Multispecies Assessment Methods (WGSAM) in 2010 proposed the realization of stomach samples of the main predators in the North Sea and the Baltic Sea to improve the basic knowledge concerning the species interactions in relation to the multispecies approach. The group found that cod is the only important predator for the Baltic Sea and also proposed standard procedures for stomach sampling.

Five stomachs are required per 5 cm length intervals beginning with 5 cm in all ICES SD's according to the extended sampling level proposed by WGSAM. The group agreed that the amount of the sampling is realized by each subdivision because of the strong biological variability from west to east of the Baltic Sea due to the high salinity gradient. Different vessels cover different areas of the same ICES Subdivision during the BITS (like SD 25 "Dana" and "Baltica"). To get the best possible spatial distribution of the stomach samples it is necessary that all vessels which work in the same SD carry out sampling. About 80 stomach samples are required for each ICES SD and in total, about 560 stomach samples during each BITS.

To avoid a strong oversampling the group proposed that each vessel samples 5 stomachs per 5 cm length intervals beginning with 5 cm in each SD and stores the samples in freezer to protect the samples for extended analyses level in the lab. The sampling of the vessels takes into account that high spatial dispersion is required. All samples of the same SD are summarized and a random subsample is selected for the analyses taking into account the spatial and temporal distribution of the available samples. The group also pointed out, that stomach samples from bottom-trawl surveys are only available from the periods of middle of February to end of March and November, based on the BITS surveys.

Denmark has done regularly stomach sampling in BITS surveys in SD 25 already since 2007.

The cod stomach samples collected in Q4 2012 and Q1 2013 BITS surveys are listed in the Table 16.1 below.

Table 16.1. Cod stomach samples collected in Q4 2012 and Q1 2013 BITS surveys.

		SD 22	SD 24	SD 25	SD 26	SD 27	SD 28	Total
Q4 2012	Poland			171	197			368
	Germany	14	200					214
	Latvia				29		131	160
	Denmark			523				523
	Lithuania				107			107
	Sweden			205		12	82	299
Q4 2012 Total		14	200	899	333	12	213	**1671**
Q1 2013	Poland			201	181			382
	Germany	70	303					373
	Latvia				165		82	247
	Denmark			520	114			634
	Sweden			222		195	160	577
Q1 2013 Total		70	303	943	460	195	242	**2213**

On top these cod stomach samples Germany and Sweden collected whiting stomachs (Germany: in Q4 2012: 15from SD 22 and 33 from SD 24, and in Q1 2013 66 samples from SD 24; Sweden: Q1 2013 20 samples from SD 25.

In 2011 the group proposed two options for processing the stomach samples: either the national labs would get expertise and financial support for the processing, or preferably all stomach samples would be analysed in one institute which gets the expertise and financial support. It seems to be possible to get funding for this from the EU Commission, but at the moment, it is not yet confirmed.

17 DATRAS related issues

17.1 Discussion about the conversion factors used in DATRAS for BITS

Conversion factors are used in DATRAS to transfer the cpue values of the small TVS and the former used national gears into units of the TVL. Inter-calibration experiments were conducted between 1999 and 2002 according to the proposed procedure of paired hauls. During the inter-calibration experiments haul of the second gear were immediately conducted after the first haul at the same track in the same direction with opposite sequences of the compared gears. The CF was defined by cpue(standard trawl) / cpue(national gear). CF's were estimated for 5 cm length intervals. Different models were developed to estimate the conversion factors.

CF(1) assumes that the disturbance effect of the compared gears

CF(2) incorporates the option of different disturbance effects of the compared gears

CF(3) is based on the horizontal net opening of the compared gears

The methods were documented and intensively discussed during the meetings of WGBIFS between 2001 and 2005. In preparation of the benchmark assessment of WGBFAS in 2013 the available estimates were evaluated (Oeberst, WD WKBALT 2012, presented in WGBIFS 2013). The analyses detected two main problems. The conversion factors between TVS and TVL were estimated in 2002 and 2003 with the agreed method (see Report and WD's of WGBIFS reports). Unfortunately, the conversion factors were estimated in different was in both years. In 2002 conversion factors were estimated by

$$CF(2, TVL, TVS, 2002) = \frac{CPUE(TVL)}{CPUE(TVS)}$$

and the estimates of the next year was calculated based on an extended dataset by

$$CF(2, TVS, TVL, DATRAS) = \frac{CPUE(TVS)}{CPUE(TVL)}.$$

The CF(2,TVS,TVL,DATRAS) are currently used in DATRAS.

The estimates of both years were estimated in the opposite way. Figure 17.1.1 presents the conversion factor and illustrates the opposite values of CF for the different length classes. CF(2,TVS,TVL,DATRAS) is used in DATRAS according to the following equation

$$CPUE(TVL) = CF * CPUE(TVS).$$

Results in biased length and age based estimates of cpue per haul, depth layer, ICES SD and stock.

Comparisons of the conversion factors of the different methods CF(1), 1/CF(2) and CF(3; Figure 17.1.2) showed that CF(1) and 1/CF(2) have the same trend with increasing length. For cod larger than 20 cm the estimates of CF(1) and 1/CF(2) are close to CF(3).

The second main problem is also shown in Figures 17.1.1 and 17.1.2. The conversion factors strongly fluctuate for neighbouring 5 cm length intervals, also for cod larger than 20 cm. These fluctuations and the decreased for largest cod cannot be explained by the selectivity characteristics of the codend of both gear because both gears use the same codend mesh size.

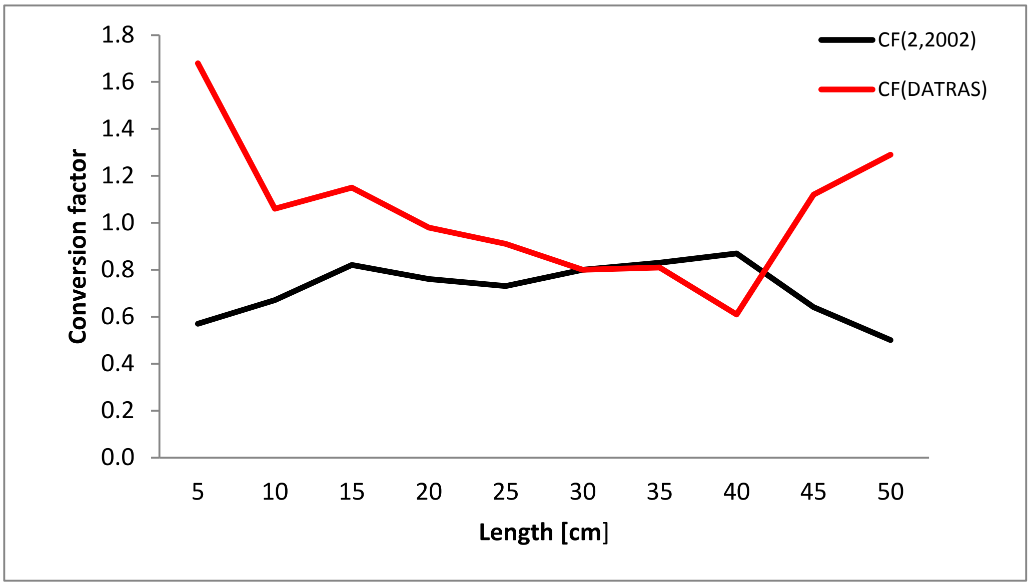


Figure 17.1.1. Conversion factors between TVL and TVS estimated with the agreed method in 2002 and 2003.

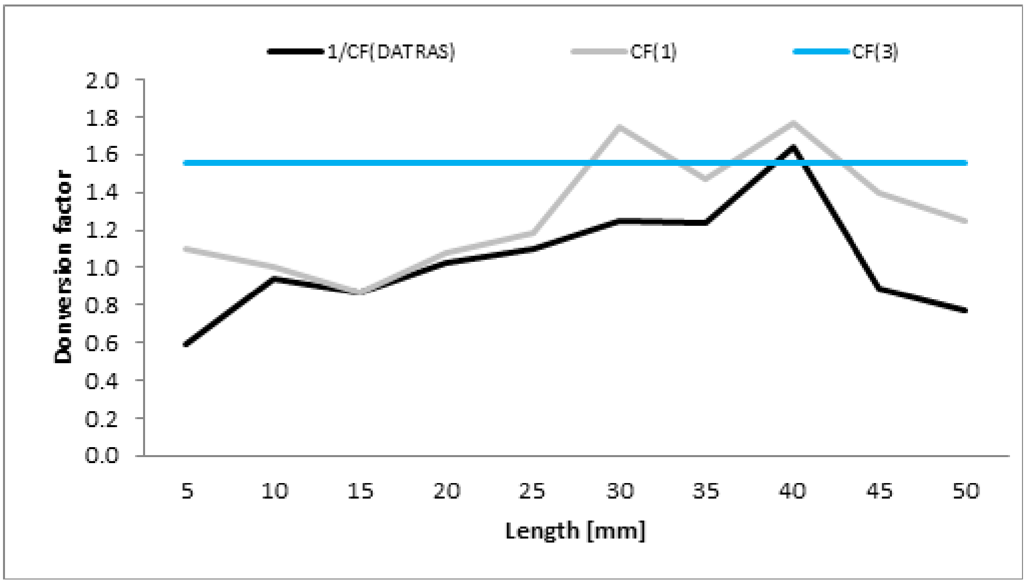


Figure 17.1.2. Comparison of the estimated conversion factors based on the different methods CF(1), 1/CF(2) and CF(3) for the gears TVL and TVS.

The fluctuations are partly influenced by the small number of datasets which could be used for the estimation. Table 1 presents the number of dataset by 5 cm classes used during the estimation of CF. The data for CF(2,DATRAS) summarizes the number of dataset of the different types of inter-calibration experiments. Type 1 denotes the sequence TVL followed by TVS, Type 2 denotes the sequence TVS followed by TVL and Type 3 denotes the sequence TVS followed by TVS. Type 3 experiments are used to estimate the disturbance effect of TVS. The number of dataset used for estimating CF(1) version 1 are given in the following columns. For estimating CF(1) datasets were only used if the catch per hour within the 5 cm length class was larger than 3 individuals in both gears compared. In addition, the numbers of datasets are given where the catch per hour was larger than 10 individual in both gear. The data clearly show that the cpue values of smallest and largest cod were low and that the estimates of CF(2) are based on a large number of dataset with low cpue values resulting in a high uncertainty as it was presented in the corresponding working documents in the report of WGBIFS in 2002 and 2003. Due to the high fluctuation of the conversion factors for larger cod which cannot be explained by the characteristics of the codend, the high uncertainty of the conversion factors influenced by the small number of dataset with high cpue values and the close relation between the conversion factors and the relation between the horizontal net opening of the gears it was proposed to use CF(3) for cod larger or equal to 20. In addition it was proposed to use CF(1) for smaller cod because analyses suggested that the disturbance effect of both gears is similar (see working doc).

The same analyses were also realized for all national gears for that inter-calibration experiments were conducted. The analyses showed similar problems for all estimated. Therefore, new conversion factors were proposed based on CF(3) for cod larger than 20 cm and based on CF(1) for smaller cod. The expected effect of the changes from the currently used conversion factor to the newly proposed conversion factors was presented in the working document.

The analyses were discussed during the WKBALT in November. WKBALT suggested that WGBIFS discuss the proposed conversion factors by mail until the next meeting of WKBALT in February. The results of the discussion by mail were summarized by the chair of WGBIFS, Olavi Kaljuste, in a mail to the chair of WKBALT at 18 January 2013.

"I have proposed to the WGBIFS that we would suggest WKBALT to use the DATRAS indices calculated by the new method (presented by Rainer) in the benchmark assessment 2013. Four WGBIFS members were in favour (Rainer Oeberst, Michele Casini, Henrik Degel and Olavi Kaljuste) and three against (Svetlana Kasatkina, Pavel Gasyukov and Andrey Pedchenko) of that proposal.

Therefore, WGBIFS suggests WKBALT to use the DATRAS indices calculated by the new method (presented by Rainer) in the benchmark assessment 2013. "

The results were again presented during the meeting of WGBIFS and the application of the proposed new conversion factors were again supported by the majority of the group.

Oeberst, R. 2012. Conversion factors used in DATRAS for BITS. Working doc WKBALT, Copenhagen, Denmark, 20–22.11.2012. 23 pp. (added to the report of WGBIFS 2013.

17.2 Other DATRAS related issues

It is assumed that issues related to the ongoing development of DATRAS are a more or less continues process involving also intercessional input from the users. The overall coordination across regions is taken care of by dedicated workshops or facilitated by the DUAP forum but in order to be able to coordinate and facilitate a smooth and fast responding unit for the Baltic Region a permanent subgroup of the WG BIFS was established. The subgroup consists of Vaishav Soni (ICES Data Center), Rainer Oeberst (Germany), Marijus Spegys (Lithuania) and Henrik Degel (Denmark). The subgroup operates on mandate from the WGBIFS and its task is to prepare draft solutions to be presented for the WGBIFS if needed and to support the ICES Data Center in general issues related to the inclusion of BITS results into the DATRAS database.

DATRAS tasks to be dealt with during and after the WGBIFS meeting.

Issues for which the WGBIFS DATRAS subgroup are responsible

The correct procedure for initiating the tasks listed below is for each issue to formulate a formal request, which is included in the WG report and will be separately submitted to the ICES Data Center. The ICES Data Center will then react on these requests.

1) Screening procedure. Suggestion of new procedures to be included in the DATRAS screening in connection with data uploads. See table below for detailed list of suggested checks.

2) Check of data processing in DATRAS. Parallel calculation of key values using alternative software.

3) “Species positive list”. Specification of closed list of accepted species scientific names and Worms codes. This list includes definitions of accepted species complexes (Species which cannot be identified to species on board)

4) Conversion factors. Agreement of method to calculate conversion factors from converting cpue from TV3S to TV3L.

5) Description and documentation of data processing. Mathematical definition of algorithms as well as explained in text.

6) Weight at age report. Development of new output which gives the weight at age by stratum.

7) Maturity ogive. Development of new output which gives the maturity ogive using the agreed methods.

8) Inclusion of ages for herring and sprat into the acoustic database holding BIAS- and BASS data for possible later use for index calculation. (Way to go has to be discussed)

9) Making all data available on the website used in the data processing. This includes strata areas (SD- and depth strata) and conversion factors.

10) Verification of the field ranges and checks made during upload to DATRAS.

11) Development of quality report (internal- and external consistency checks) for calculated indices.

12) Comparison of the DATRAS Exchange Format before and after 2004 with the suggestion to collect the whole time-series in one common format.

13) Presentation of cpue values based on BITS at the ICES website

SUBJECT (REFERS TO LIST ABOVE)	TO BE DISCUSSED DURING THE 2013 WGBIFS MEETING	TO BE APPROVED BY THE 2013 WGBIFS MEETING	TO BE CIRCULATED TO THE DATRAS SUBGROUP AFTER THE 2013 WGBIFS MEETING	FIRST DRAFT RESPONSIBLE SUBGROUP MEMBER	TO BE EFFECTUATED BY:	COMMENTS
1	Yes	Yes		?	ICES data group	See table below for detailed list of suggested checks.
2	Yes		Yes	Rainer/Henrik	DATRAS subgroup	ICES will provide intermediate products from DATRAS indices calculation procedure with description to Rainer and Henrik per Survey, year ,quarter
3	Yes		Yes	Vaishav	ICES data group	ICES will provide initial list of the BITS species name including TSN and Scientific name of current accepted species list
4	Yes	Yes		Rainer	ICES data group	Documentation of changes of CF in WG report to be send to users on request.
5			Yes	Vaishav	DATRAS subgroup	Initial document listing intermediate results of the processing to be provided by ICES
6			Yes	Rainer	DATRAS subgroup	Additional output report to DATRAS
7			Yes	Rainer	DATRAS subgroup	Additional output report to DATRAS
8	Yes	Yes		?	WGBIFS	Exploratory analyses to be done
9	Yes	Yes		Vaishav	ICES data group	
10	Yes	Yes		Vaishav	ICES data group	Already available on SharePoint
11	Yes		Yes	Henrik	ICES data group	Low priority

12	Yes	?	(Yes)	Rainer	ICES data group	To be done before submitters are asked to re-upload old data for additional screening.

1. Screening procedure. Suggestion of new procedures to be included in the DATRAS screening in connection with data uploads. See table below for detailed list of suggested checks

Intensive evaluation of the data of BITS stored in the DATRAS database has shown that datasets exist in the data of each BITS which contains errors. These errors were not detected during the screening procedure of DATRAS during the upload of data because these types of errors were not taken into account. Therefore, additional procedures for screening the BITS data during the uploading process were discussed during the meeting. WGBIFS recommends that the proposed screening procedures given in the table below should be implemented as fast as possible. After the implementation and check of the new procedures WGBIFS will be informed by the ICES data center and all countries will upload the data of the BITS from 2001 onwards again to improve the quality of the data stored in the DATRAS database.

- Checks of the positions which is not already done during screening
- Assignment of hauls to ICES SD?
- Record structure consistency check. Identification orphan records. E.g. CA records with AreaType=0 without corresponding HH records and HL records without corresponding HH records
- Definition of a positive list of accepted species codes connected with error message.
- Cross check to be established
- Hauls with validity code V or N are only possible for gears TVL and TVS from 2001 onwards.
- Error message during screening if
- Abs(HL.TotalNo >> HL.SubFactor * Sum(HL.NOAtLngt)) > defined limit (=5 individuals)
- Error during screening if
- HH.Validity = V, HL.SpecVal = 0 and HL.HLNoAtLngth >0 occur for at least one species

4. Conversion factors. Agreement of method to calculate conversion factors from converting cpue

New conversion factors for cod were proposed during the WKBALT in November and, WGBIFS discussed by mail until mid of January. The majority of WGBIFS supported the used of the new conversion factors. The new conversion factors were again presented during the meeting of WGBIFS (see working document and Section 18.1). WGBIFS recommends the application of the new proposed conversion factors.

11. Verification of the field ranges and checks made during upload to DATRAS

During WKDATR the structure of BITS data in DATRAS were discussed and changes were proposed dependent on new developments and critical review of the structure. The proposed changes were discussed during the meeting of WGBIFS and list of changes were accepted. WGBIFS recommends that the check procedures for BITS data in DATRAS should be applied in future after the implementation by ICES data center.

12. Comparison of the DATRAS Exchange Format before and after 2004 with the suggestion to collect the whole time-series in one common format

Two versions of data format are currently used in DATRAS. One format was used for the data uploaded before 2004. New structure has been applied since 2004. Both structures were compared. Differences occurred only in the ranges which were accepted during the upload of data in 13 fields.

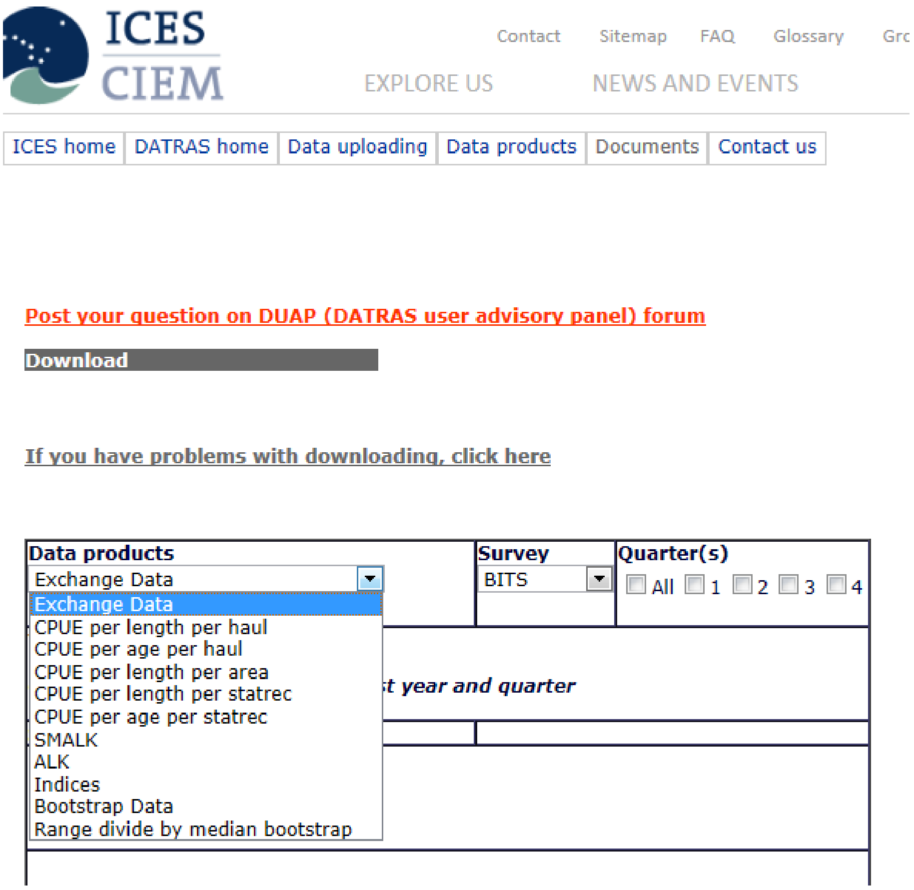
WGBIFS recommends the application of the structure which has been used since 2004 for the total period.

			Before 2004	After 2004	
Recor	No	Field	Description	Description	ErrorWarning
HH	14	TimeShot	Not in the range specified1.0000000000002400.000000000000	Not in the range specified 0.0000000000002400.000000000000	warning
HH	16	HaulDur	Not in the range specified5.000000000000150.000000000000	Not in the range specified0.00000000000090.000000000000	warning
HH	23	Depth	Not in the range specified5.000000000000150.000000000000	Not in the range specified5.000000000000300.000000000000	warning
HH	32	Distance	Not in the range specified1850.0000000000009999.000000000000	Not in the range specified0.0000000000009999.000000000000	warning
HH	33	Warplngt	Not in the range specified100.000000000000999.000000000000	Not in the range specified75.000000000000999.000000000000	warning
HH	38	DoorSpread	Not in the range specified25.000000000000200.000000000000	Not in the range specified48.000000000000180.000000000000	warning
HH	40	Buoyancy	Not in the range specified50.000000000000300.000000000000	Not in the range specified50.000000000000220.000000000000	warning
HH	43	TowDir	Not in the range specified1.000000000000360.000000000000	Not in the range specified-1.000000000000360.000000000000	warning
HH	55	BotTemp	Not in the range specified1.00000000000020.000000000000	Not in the range specified-1.00000000000020.000000000000	warning
HH	56	SurSal	Not in the range specified10.00000000000038.000000000000	Not in the range specified5.00000000000030.000000000000	warning
HH	57	BotSal	Not in the range specified20.00000000000038.000000000000	Not in the range specified5.00000000000030.000000000000	warning
HL	21	CatCatchW	Not in the range specified0.00000000000010000000.000000000000	Not in the range specified0.00000000000099999999.000000000000	warning
CA	21	AgeRings	Not in the range specified0.00000000000015.000000000000	Not in the range specified0.00000000000099.000000000000	warning

13. CPUE data provided by ICES DATRAS database for the BITS.

Countries participating in the BITS upload data of the realized hauls in the exchange format to the ICES database DATRAS. These data are used to estimate length and age based cpue values of cod and flatfish (Figure 17.2.1). The calculated cpue values are available at the DTRAS website of ICES. Length based estimates are cpue per length and haul, CPUE per length and stratum and cpue per length per subdivision.

Age based estimates are cpue per age and haul, cpue per age and stratum, cpue per age per subdivision and stock indices.



Data products: Exchange Data
Survey: BITS
Quarter(s): ☐ All ☐ 1 ☐ 2 ☐ 3 ☐ 4

Figure 17.2.1. Copy of the DATRAS website for selecting data of BITS for download.

Evaluation of the different steps of data processing showed that the length bases cpue values do not take into account the conversion factors for transferring the cpue values of the small TVS and the former national used gears into the cpue values of the TVL. That means that the cpue values per stratum and subdivision can be based on the cpue values per length and haul from different gears. Due to this applied procedure it is difficult to compare estimates per stratum and subdivision of different years because the estimates might combine hauls of gears with different catchability.

On the other hand age based cpue values are given in units of the gear TVL because the conversion factors are applied during data processing. Until now it is not described at the website and in the downloaded data whether the conversion factor are applied.

To improve the usability of the cpue data provided at the DATRAS website WGBIFS proposes that length based cpue values are also given in units of the TVL which requires the application of the conversion factors if the cpue per length per haul are calculated. In addition, WGBIFS proposed that it is clearly stated within the downloaded file that the cpue are presented in units of the TVL.

WGBIFS recommends that length based cpue values which are estimated by ICES based on the BITS data of the DATRAS are given in units of TVL. WGBIFS further recommends that within the downloaded file of cpue values and of stock indices it is clearly stated that the data are given in units of the TVL.

18 Inquiries from other Expert Groups

18.1 Investigate the effect of the partial lack of BITS coverage in the cod and flatfish cpues. In particular, an attempt to reconstruct the missing observation in SD 26 2012 should be attempted

The BITS survey is designed to cover the geographical distribution of the cod stocks accessed by WGBFAS. The trawl stations are geographical distributed based on a random (depth range and Subdivision stratified) design. The trawl stations are randomly drawn from a closed list of verified trawling tracks. The selected trawling positions are distributed among the participating countries. Unfortunately, Russia was not able to carry out their part of the IV quarter BITS survey in 2009 and 2012 (and I quarter in 2010). The number of hauls normally allocated to Russia is 35 out of the total number of 285 for the whole survey. Approx. 22 hauls (varies from year to year due to the survey design) out of the 35 hauls allocated to Russia is situated in the Russian zone (Figure 18.1.1). Other countries have been able to take over the responsibility for the remaining approx. 11 hauls, but as the admittance to Russian zone is very restricted for foreign vessels (read: virtually impossible) it has not been possible for other countries to take over the responsibility for the hauls in the Russian zone. This has of cause a consequence for the quality of the indices calculated based on the results of the BITS surveys.

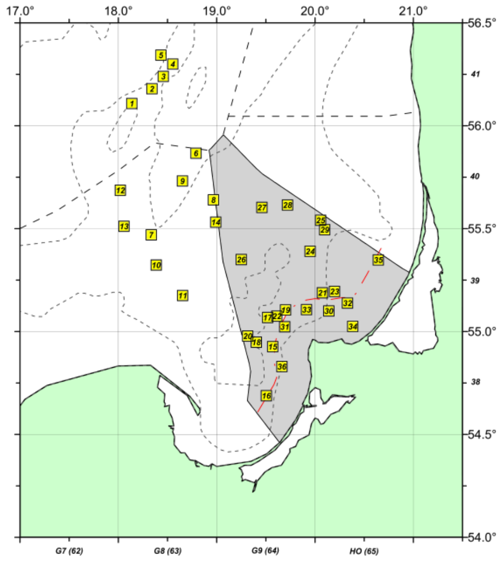


Figure 18.1.1. Allocated haul stations during 1st quarter BITS 2012 with indication of the Russian zone (grey shaded).

The problem was (on request from WGBFAS) discussed during the WGBIFS meeting in 2010 based on a working document by Rainer Oeberst (R. Oeberst 2010). The conclusions were as stated in the 2010 WGBIFS report as:

> "The density of cod expressed as cpue values in the Russian zone can only be estimated based on the cpue values of other national zones in SD 26 with high accuracy for larger cod in depth layer 3 (Table 12 of the working document)."
>
> The relative low effects of the hydrographical parameters related to the cpue values of cod support the hypothesis that larger areas can be combined into

> one unit, like the combination of depth layer 3 and 4, for improving the estimated stock indices by increase of the number of stations by strata.
>
> The studies suggest further, that cod density within the western and eastern area of SD 26 significantly differ during autumn surveys. Therefore, it seems to be useful that the combination of SD 25 and SD 26 as one unit should be evaluated to improve the accuracy of the stock indices based on BITS.
>
> The study clearly showed that it is necessary that all areas are covered during BITS because estimates of a part of the total area of SD 26 based on the neighbouring areas are very uncertain due to the high patchiness of the distribution of the different length groups of cod."

Because no other alternative was possible, the solution then (in 2010) was to calculate the mean cpue based of the stations outside the Russian zone and extrapolate this to the whole Subdivision 26.

To repeat the analysis done in 2010 including the additional 2 years of data, will probably not change the conclusions made in 2010 for cod and therefore the WG has no other choice than to suggest the same solution for cod as suggested in 2010.

It has not been possible to carry out a similar analysis for the flounders, but it is recommended that an analysis similar to the one made for cod in 2010 is made for flounder. Therefor the only solution at present is the same as for cod.

This solution has no implication on the way the indices are calculated on routine basis by the processing in DATRAS.

The WGBIFS strongly recommends that Russia do participate in the BITS at least in Subdivision 26 in future and that it is discussed during the WGBFAS meeting if the WGBFAS can support this request.

18.2 Fill in the WKCATDAT 2012 table by country and survey, as an exercise, to identify the current state regarding data collection towards an ecosystem survey and MSFD

WGBIFS addressed the recommendation by WGISUR (Working Group on Integrating Surveys for the Ecosystem Approach) 2012: "It is recommended that the WKCATDAT 2012 table is filled in by country and survey, as an exercise, to identify the current state regarding data collection towards an ecosystem survey and MSFD".

The tables were compiled by Denmark, Germany, Latvia, Russia and Sweden for the surveys under WGBIFS coordination (the acoustic surveys BIAS and BASS, and the bottom-trawl survey BITS). These tables are presented in Annex 11.

Overall, several countries are already collecting data beyond the ordinary data requested under DCF. However, several of these activities are ad-hoc and not internationally coordinated. An international coordination would be necessary for the implementation of a proper ecosystem survey. Moreover, additional funding, man power, and time were indicated by several countries as necessary to fulfil the requirement of a full ecosystem survey.

19 Selection of the venue for the next meeting

There was one proposal for the venue of the next meeting: Gdynia, Poland. The majority of the group supported the idea to organize the next meeting in the proposed venue.

Annex 1: List of participants

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Annex 2: Agenda

Introduction

1. Welcome and introduction
2. Households remarks
3. Discussion and adoption of the agenda
4. Allocation of tasks between participants
5. Presentation of time schedule

Acoustic surveys and data

6. Combine and analyse the results of spring and autumn 2011 acoustic surveys and experiments and report to WGBFAS. (ToR a)
7. Status of BIAS standard survey reports.
8. Update the hydroacoustic databases BAD1 and FishFrame. (ToR b)
9. Plan and decide on acoustic surveys and experiments to be conducted in autumn 2012 and spring 2013. (ToR c)
10. Review and update the Baltic International Acoustic Survey (BIAS) manual. (ToR h)
11. Discuss the indices of acoustic surveys based on different methods for combining the data of fishing stations in compilation of acoustic indices and draft recommendations as appropriate. (ToR j)
12. Evaluate the new uncertainty estimates for the BIAS abundance indices derived from a simulation model and draft recommendations as appropriate. (ToR k)
13. Review and update the structure of the BIAS database to incorporate the estimates of two herring stocks in one subdivision. (Rec. by WGBIFS)
14. Evaluate the proportion of WBSS in SD 25 and SD 26 during the BIAS. (Rec. by WGBIFS)

Bottom-trawl surveys and data

15. Discuss the results from BITS surveys performed in autumn 2011 and spring 2012 and review of the upload and development status of DATRAS. (ToR d)
16. Status of BITS standard survey reports.
17. Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2012 and spring 2013. (ToR e)
18. Update and correct the Tow Database. (ToR f)
19. Review and update the Baltic International Trawl Survey (BITS) manual. (ToR g)
20. Review of new results on the vertical distribution of the cod during the BITS. (ToR i)

21. Evaluate the characteristics of TVL and TVS standard gears used in BITS based on the details gear check according to the BITS manual and provide written documentation of findings. (ToR l)
22. Evaluate the BITS data stored in DATRAS for describing biodiversity in the Baltic Sea covers by BITS in spring and autumn and draft recommendations as appropriate. (ToR m)
23. Coordinate stomach sampling programme in the Baltic International Trawl Survey (BITS). (ToR n)
24. Discuss the suggested new maturity scales for flatfish. (Outcome of WKMSSPDF2)
25. Discuss the suggested increase of the spatial overlap between "Solea" and "Havfisken". (Rec. by WGBFAS)
26. Discuss whether a modification of the BITS survey design would give a better sampling of the older age classes of cod. (Rec. by WGBFAS)
27. Discuss how to provide standardized time-series of flounder and plaice from the BITS survey. (Rec. by WGBFAS)
28. Discuss the suggested collection and storage of marine litter information in the Baltic International Trawl Survey. (Based on EC's Marine Strategy Framework Directive (MSFD), WKMAL)

Joint acoustic and bottom-trawl survey issues

29. Discuss how to estimate the survey sampling variance. (Rec. by WGMG)

Final issues

30. Agreeing on new ToRs for next meeting
31. Selection of the venue for the next meeting

Recommendations from other expert groups

ID	Year	EG	Recommendation	Comments	Status	Recipient
18	2012	WGBFAS	WGBIFS is requested to investigate the effect of the partial lack of BITS coverage in the cod and flatfish CPUEs. In particular, an attempt to reconstruct the missing observation in SD 26 2012 should be attempted.		None	WGBIFS;#167
54	2012	WKMSSPDF2	WKMSSPDF recommends that the Baltic institutes keep their national maturity staging scales, and transfer it to the internationally accepted maturity stage in DATRAS, from a certain date onwards. Old data should not be changed. There will be a clear break in the DATRAS timeseries with respect to the maturity. The BITS manual should describe this change well. (see section 3)		None	WGBIFS;#167
133	2012	WGISUR	It is recommended that the WKCATDAT 2012 table is filled in by country and survey, as an exercise, to identify the current state regarding data collection towards an ecosystem survey and MSFD (don't do it for WGISUR).		None	IBTSWG;#173;#WGACEGG;#127;#WGBEAM;#213;#WGBIFS;#167;#WGIPS;#132;#WGMEGS;#182;#WGNEACS;#214;#SGNEPS;#116
227	2012	WKMSTB	It is recommended that the Baltic institutes keep their national maturity staging scales, and transfer it to the internationally accepted maturity stage in DATRAS, from a certain date onwards. Old data should not be changed. There will be a clear break in the DATRAS timeseries with respect to the maturity. The BITS manual should describe this change well.		None	WGBIFS;#167

Annex 3: Terms of references for the next meeting

The **Baltic International Fish Survey Working Group** (WGBIFS), chaired by Olavi Kaljuste, Sweden, will meet in Gdynia, Poland, 24–28 March 2014 to:

a) Combine and analyse the results of spring and autumn 2013 acoustic surveys and experiments and report to WGBFAS;
b) Update the BIAS and BASS hydroacoustic databases;
c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2014 and spring 2015;
d) Discuss the results from BITS surveys performed in autumn 2013 and spring 2014 and evaluate the characteristics of TVL and TVS standard gears used in BITS;
e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2014 and spring 2015;
f) Update and correct the Tow Database;
g) Review and update the Baltic International Trawl Survey (BITS) manual;
h) Review and update the manual of International Baltic Acoustic Surveys;
i) Discuss the indices of acoustic surveys based on different methods for combining the data of fishing stations in compilation of acoustic indices and draft recommendations as appropriate;
j) Evaluate the proportion of WBSS in SD 25 and SD 26 during the BIAS;
k) Coordinate stomach sampling programme in the Baltic International Trawl Survey (BITS);
l) Evaluate new information on how to estimate the acoustic survey sampling variance.

WGBIFS will report by 15 May 2014 (via SSGESST) for the attention of SCICOM and ACOM.

Supporting information

Priority	The scientific surveys coordinated by this Group provide major fishery-independent tuning information for the assessment of several fish stocks in the Baltic Sea. Consequently, these activities are considered to have a very high priority.
Scientific justification	The main objective of WGBIFS is to coordinate and standardize national research surveys in the Baltic for the benefit of accurate resource assessment of Baltic and Kattegat fish stocks. From 1996 to 2003 attention has been put on evaluations of traditional surveys, introduction of survey manuals and consideration of sampling design and standard gears as well as coordinated data exchange format. Since 1995 activities have been devoted to coordinate international coordinated demersal trawl surveys using the new standard gear TV3. The most important future activities are to combine and analyse the time-series of tuning indices for the Baltic Fisheries Assessment Working Group, to develope a database for disaggregated hydro-acoustic data, and plan and decide on surveys and experiments to be conducted.

Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 15–20 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to advisory committees	ACOM: The quality of stock assessments and management advice of Baltic herring, sprat, cod and flatfish stocks.
Linkages to other committees or groups	WGBFAS, WGFAST, SSGESST
Linkages to other organizations	No direct linkage to other organizations.

Annex 4: Recommendations

Recommendation	Addressed to
1. WGBIFS recommends that the BIAS-dataset including the data from 2012 can be used in the assessment of the herring and sprat stocks in the Baltic Sea with the restriction that the following years are excluded from the index series: 1993, 1995 and 1997.	WGBFAS
2. WGBIFS is proposing the additional tuning fleets presented in Annex 5 Table 6 and 7 for testing during the next benchmark assessment of Central Baltic herring with the restriction that the years 1991 to 2006 are excluded from the index series.	WGBFAS
3. WGBIFS recommends that the new BIAS index series can be used in the assessment of the Bothnian Sea herring with the restriction that the year 1999 is excluded from the dataset. Second, year 2012 should be treated with caution due to half of the coverage and reduced number of samples in 2012.	WGBFAS
4. WGBIFS recommends that the BASS-dataset including the data of 2012 can be used in the assessment of the sprat stock in the Baltic Sea.	WGBFAS
5. WGBIFS recommends that the DATRAS indices, including the results of the BITS 4th quarter 2012 and BITS 1st quarter surveys 2013, calculated by the new method can be used in the assessment of the cod stocks in the Baltic Sea.	WGBFAS
6. WGBIFS strongly recommends that Russia do participate in the BITS at least in Subdivision 26 in future and that it is discussed during the WGBFAS meeting if the WGBFAS can support this request.	WGBFAS
7. WGBIFS recommends that the new method taking into account the relation of the NASC values of detected target species during the fishing stations of acoustic surveys is applied by all participating countries of BASS and BIAS to have the possibility to get stock indices and to evaluate the consistency of the new stock indices.	WGBIFS
8. WGBIFS recommends WGMG to make a suggestion on one common method for calculating the survey variance. One method (one for bottom-trawl and another for acoustic survey), that can be easyly implemented and is preferably same for the surveys in different areas, is needed.	WGMG
9. WGBIFS recommends that in 2014, Sweden will start participating to the BASS survey, covering at least the ICES Subdivision 27, and the issue is discussed during the RCM Baltic meeting in 2013.	RCM Baltic
10. WGBIFS recommends the application of the new proposed conversion factors for converting age- and length-based cpue values from TV3S to TV3L in DATRAS.	ICES Data Centre
11. WGBIFS recommends that WGSAM provides detailed information on how to work up the Cod stomach samples and provides a database for storing the data.	WGSAM

Annex 5: Whole time-series for tuning indices

Table 1. Autumn acoustic (BIAS) tuning fleet index (numbers in millions) for Central Baltic herring (the ICES Subdivisions 25–27, 28.2 and 29*).

YEAR	HER_TOTAL_age1_8	HER_AGE1	HER_AGE2	HER_AGE3	HER_AGE4	HER_AGE5	HER_AGE6	HER_AGE7	HER_AGE8
1991	53 727,85	6 129,11	18 023,72	9 995,98	4 045,10	8 789,34	2 252,71	2 127,00	2 364,90
1992	45 994,83	7 416,92	9 155,99	13 177,55	7 156,18	4 107,91	2 273,74	1 539,52	1 167,03
1993	28 396,39	709,95	4 539,70	6 809,39	7 830,70	3 619,01	2 054,43	1 089,66	1 743,56
1994	57 157,97	3 924,41	11 881,25	20 303,84	11 526,53	5 653,24	2 098,90	940,75	829,04
1995	28 048,83	4 663,87	2 235,90	4 464,12	5 908,26	5 286,76	3 156,91	1 503,95	829,06
1996	43 944,57	3 985,13	13 761,96	9 989,35	7 360,96	4 532,76	2 358,59	1 178,87	776,94
1997	15 438,37	1 447,81	1 544,65	5 182,71	3 237,17	2 156,86	1 091,15	466,71	311,32
1998	24 922,96	4 285,08	2 170,72	6 617,17	6 520,67	2 584,07	1 523,58	791,27	430,41
1999	21 369,72	1 729,74	4 952,25	3 368,24	4 542,17	3 889,30	1 431,52	854,91	601,59
2000	20 505,09	3 182,53	1 778,32	6 170,25	2 117,23	3 202,21	2 402,97	1 036,28	615,30
2001	24 300,57	4 028,51	8 194,34	3 286,15	4 660,79	1 567,36	1 238,05	861,26	464,12
2002	20 672,28	2 686,92	4 242,02	6 508,41	2 842,26	2 326,29	869,78	741,28	455,30
2003	49 161,77	16 704,18	9 115,70	10 643,33	6 689,95	2 319,57	1 777,96	755,07	1 156,00
2004	34 519,87	4 913,56	13 229,49	6 788,89	4 672,24	2 500,08	1 132,10	603,52	679,98
2005	39 637,80	1 569,07	7 920,70	14 408,73	7 019,82	4 140,78	2 406,18	1 051,67	1 120,85
2006	61 367,79	6 624,26	7 390,52	12 263,74	21 706,47	7 356,94	3 118,99	1 713,97	1 192,90
2007	24 575,64	3 935,81	5 282,83	2 541,87	3 875,28	5 959,98	1 472,19	794,92	712,76
2008	32 546,02	5 821,25	6 488,81	6 981,37	3 651,05	4 722,96	3 306,42	805,86	768,29
2009	31 717,54	2 753,13	10 181,18	6 086,80	5 171,38	2 024,72	2 879,96	2 037,65	582,72
2010	33 991,99	2 440,92	7 232,50	11 256,12	4 865,92	3 389,41	1 630,08	1 785,04	1 391,99
2011	41 713,99	1 635,51	4 456,04	10 780,80	12 458,74	5 655,93	3 167,27	1 411,12	2 148,58
2012	44294,08122	8625,37688	3046,09054	7175,80184	9557,43513	9202,03285	2707,974	2109,11079	1870,25918

***The numbers for ICES SD 29 were calculated on base the data of ICES SD 29_South in all years. Existing data of ICES SD 29_North were not used.**

**** In the years, 1993, 1995 and 1997 the coverage was very poor. It is recommended that these data should not be used.**

Table 2. Autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for Central Baltic herring (the ICES Subdivisions 25-27, 28.2 and 29*).

YEAR	HER_AGE_0
1991	9504.69
1992	1607.67
1993	1297.73
1994	6122.03
1995	1356.71
1996	336.39
1997	4050.41
1998	507.52
1999	2946.54
2000	1177.75
2001	2122.76
2002	16046.38
2003	9066.54
2004	1586.72
2005	5955.77
2006	2027.55
2007	7910.53
2008	3891.79
2009	1521.30
2010	868.82
2011	8382.84
2012	5460.90

***The numbers for ICES SD 29 were calculated on base the data of ICES SD 29_South in all years. Existing data of ICES SD 29_North were not used.**

**** In the years 1993, 1995 and 1997 the coverage was very poor. It is recommended that these data should not be used**

Table 3. Autumn acoustic (BIAS) tuning fleet index (numbers in millions) for Baltic sprat (the ICES Subdivisions 24–29).

YEAR	SPR_TOTAL_age1_8	SPR_AGE1	SPR_AGE2	SPR_AGE3	SPR_AGE4	SPR_AGE5	SPR_AGE6	SPR_AGE7	SPR_AGE8
1991	149 058,78	46 487,55	40 298,51	43 681,07	2 743,40	8 923,78	1 850,70	1 956,55	3 117,22
1992	102 482,10	36 519,48	26 991,22	24 050,54	9 289,37	1 920,67	2 436,59	714,03	560,20
1993	98 533,51	30 598,67	30 890,12	16 143,51	12 681,94	4 602,94	989,26	1 451,80	1 175,27
1994	137 290,10	12 531,57	44 587,69	43 274,48	17 271,54	11 924,82	5 111,65	1 028,95	1 559,41
1995	231 515,93	133 193,30	16 471,15	39 297,74	22 146,93	11 336,09	5 565,78	2 104,11	1 400,83
1996	268 983,16	69 994,44	130 760,26	20 797,14	23 240,90	12 777,76	6 405,11	3 696,69	1 310,87
1997	143 508,24	9 279,48	57 189,82	56 067,88	8 711,23	7 627,08	2 577,01	1 638,94	416,80
1998	229 727,74	100 615,48	21 975,06	55 422,01	36 291,46	8 055,62	4 734,54	1 623,02	1 010,56
1999	195 727,24	4 892,39	90 049,98	15 989,26	35 716,70	38 820,46	5 230,64	3 289,62	1 738,19
2000	153 298,39	58 702,70	5 284,94	49 634,73	5 676,06	13 932,76	15 834,60	1 554,39	2 678,20
2001	107 308,72	12 047,44	35 686,65	6 927,47	30 236,94	4 028,43	9 605,64	6 369,57	2 406,58
2002	118 874,55	31 208,71	14 414,86	36 762,80	5 733,13	18 735,12	2 638,09	5 036,99	4 344,84
2003	213 178,23	99 128,90	32 269,59	24 035,40	23 198,49	8 015,62	13 163,37	4 830,62	8 536,25
2004	199 357,55	119 497,31	47 026,76	11 638,43	7 928,99	4 875,78	2 449,65	2 388,71	3 551,91
2005	204 805,07	7 082,11	125 148,06	48 723,56	10 035,20	5 115,68	3 010,70	2 364,40	3 325,36
2006	201 584,17	36 531,26	11 773,53	103 289,44	32 411,85	7 937,24	4 582,91	2 110,57	2 947,37
2007	120 744,73	51 888,04	21 665,20	8 174,54	26 102,00	9 800,35	1 066,69	470,39	1 577,52
2008	127 064,04	28 804,63	45 117,75	20 134,34	5 350,44	18 819,87	5 678,43	1 241,37	1 917,21
2009	145 140,98	77 342,78	25 333,42	20 839,86	6 546,99	4 667,38	7 023,48	2 011,35	1 375,72
2010	87 660,06	11 638,26	51 321,28	10 654,47	6 663,29	1 684,43	1 958,11	2 571,94	1 168,28
2011	99 587,07	20 620,08	11 656,53	43 356,67	9 989,74	6 746,61	2 614,83	1 794,67	2 807,94
2012	90 590,08	40 515,77	16 525,13	7 935,32	18 412,56	3 494,33	1 732,67	606,20	1 368,12

*** In the years, 1993, 1995 and 1997 the coverage was very poor. It is recommended that these data should not be used.**

Table 4. Autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for sprat (the ICES Subdivisions 22-29).

YEAR	SPR_AGE0
1991	59 472,84
1992	48 035,33
1993	5 173,57
1994	64 092,10
1995	44 364,82
1996	3 841,55
1997	45 947,64
1998	1 279,14
1999	33 320,45
2000	4 601,26
2001	12 000,66
2002	79 550,86
2003	146 334,99
2004	3 562,32
2005	41 862,94
2006	66 125,22
2007	17 821,04
2008	115 698,22
2009	12 798,16
2010	41 915,73
2011	45 186,05
2012	33 653,39

*** In the years, 1993, 1995 and 1997 the coverage was very poor. It is recommended that these data should not be used.**

Table 5. Spring acoustic (BASS) tuning fleet index (numbers in millions) for sprat in the ICES Subdivisions 24, 25, 26 and 28.2.

YEAR	SPR_TOTAL	SPR_AGE1	SPR_AGE2	SPR_AGE3	SPR_AGE4	SPR_AGE5	SPR_AGE6	SPR_AGE7	SPR_AGE8
2001	109 404,16	8 225,02	35 734,86	12 970,86	37 327,77	5 384,44	4 635,49	4 526,01	599,71
2002	125 782,95	27 412,12	18 982,00	36 813,57	19 044,89	14 758,59	2 517,12	3 669,81	2 584,85
2003	84 986,61	26 468,98	16 471,45	8 422,95	15 532,70	5 653,45	7 169,73	1 660,01	3 607,34
2004	258 606,73	136 162,06	65 565,92	15 783,74	11 042,29	12 655,24	3 270,65	7 805,79	6 321,05
2005	134 373,52	4 358,61	88 829,99	23 556,64	7 258,25	3 516,63	2 780,51	1 829,96	2 242,94
2006	130 287,13	13 416,63	7 980,49	76 703,20	21 045,81	5 701,71	1 970,41	1 525,76	1 943,11
2007	132 637,19	51 568,74	28 713,21	6 377,16	36 006,21	7 480,56	1 261,14	532,65	697,52
2008	102 722,51	9 029,20	40 269,65	20 164,14	5 627,08	21 187,94	4 209,97	757,16	1 477,38
2009	139 641,22	39 412,17	26 701,03	36 255,42	10 548,51	6 312,12	14 106,27	5 341,22	964,48
2010	112 784,60	9 387,20	58 680,01	15 199,18	15 963,48	5 061,93	1 653,59	5 566,35	1 272,87
2011	128 153,97	18 091,69	6 790,99	66 159,99	16 689,00	10 564,65	4 076,69	2 399,13	3 381,83
2012	107 660,52	22 699,62	22 079,78	11 274,09	35 541,24	7 515,42	5 024,69	1 367,20	2 158,48

Table 6. Autumn (BIAS) tuning fleet index for Central Baltic herring in the ICES Subdivisions 25–27, 28.2 and 29* (numbers in millions).

YEAR	HER_TOTAL_age1_8	HER_AGE1	HER_AGE2	HER_AGE3	HER_AGE4	HER_AGE5	HER_AGE6	HER_AGE7	HER_AGE8
1991	59 944,22	6 942,71	20 002,43	11 963,95	4 148,43	9 642,76	2 511,21	2 280,03	2 452,71
1992	45 994,83	7 416,92	9 155,99	13 177,55	7 156,18	4 107,91	2 273,74	1 539,52	1 167,03
1993	28 396,39	709,95	4 539,70	6 809,39	7 830,70	3 619,01	2 054,43	1 089,66	1 743,56
1994	57 157,97	3 924,41	11 881,25	20 303,84	11 526,53	5 653,24	2 098,90	940,75	829,04
1995	28 048,83	4 663,87	2 235,90	4 464,12	5 908,26	5 286,76	3 156,91	1 503,95	829,06
1996	43 944,57	3 985,13	13 761,96	9 989,35	7 360,96	4 532,76	2 358,59	1 178,87	776,94
1997	15 438,37	1 447,81	1 544,65	5 182,71	3 237,17	2 156,86	1 091,15	466,71	311,32
1998	24 922,96	4 285,08	2 170,72	6 617,17	6 520,67	2 584,07	1 523,58	791,27	430,41
1999	20 511,86	1 754,15	4 741,92	3 193,65	4 251,46	3 679,73	1 427,81	833,20	629,96
2000	40 924,36	10 151,18	2 560,04	9 873,66	4 837,59	5 200,35	3 234,04	3 006,83	2 060,67
2001	24 300,57	4 028,51	8 194,34	3 286,15	4 660,79	1 567,36	1 238,05	861,26	464,12
2002	20 672,28	2 686,92	4 242,02	6 508,41	2 842,26	2 326,29	869,78	741,28	455,30
2003	49 161,77	16 704,18	9 115,70	10 643,33	6 689,95	2 319,57	1 777,96	755,07	1 156,00
2004	34 519,87	4 913,56	13 229,49	6 788,89	4 672,24	2 500,08	1 132,10	603,52	679,98
2005	41 760,33	1 920,24	8 250,78	15 344,88	7 123,19	4 355,80	2 540,70	1 095,95	1 128,80
2006	62 514,29	7 316,60	8 059,84	12 700,27	21 120,77	7 336,31	3 068,12	1 700,65	1 211,72
2007	29 634,05	5 400,70	6 587,26	2 974,88	4 191,03	7 092,91	1 696,87	882,93	807,46
2008	34 602,82	6 722,91	6 718,16	7 539,43	3 626,69	4 938,77	3 434,69	830,20	791,98
2009	38 653,24	6 408,78	12 141,39	6 820,28	5 551,44	2 058,64	2 969,48	2 089,22	614,00
2010	38 061,50	3 847,03	8 351,25	12 128,20	5 023,04	3 525,29	1 681,28	1 902,00	1 603,41
2011	44 141,66	2 338,71	5 667,81	10 992,95	12 668,94	5 525,30	3 257,40	1 448,43	2 242,12
2012	51 695,69	14 947,97	3 630,05	7 544,67	9 345,39	9 199,52	2 684,65	2 261,89	2 081,55

*** including the existing data of ICES SD 29 North**

**** In the years, 1991-1999 and 2001-2006 the coverage was poor especially in the northern parts. It is recommended that these data should not be used.**

Table 7. Autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for Central Baltic herring (the ICES Subdivisions 25-27, 28.2 and 29*).

YEAR	HER_AGE_0
1991	13732.73
1992	1607.67
1993	1297.73
1994	6122.03
1995	1356.71
1996	336.39
1997	4050.41
1998	507.52
1999	2591.05
2000	1318.96
2001	2122.76
2002	16046.38
2003	9066.54
2004	1586.72
2005	5567.63
2006	1990.13
2007	12197.22
2008	8679.78
2009	3365.99
2010	1177.97

*** including the existing data of ICES SD 29 North**

**** In the years, 1991-1999 and 2001-2006 the coverage was poor especially in the northern parts. It is recommended that these data should not be used.**

Annex 6: Standard Reports of BITS in quarter 4 in 2012 and quarter 1 in 2013

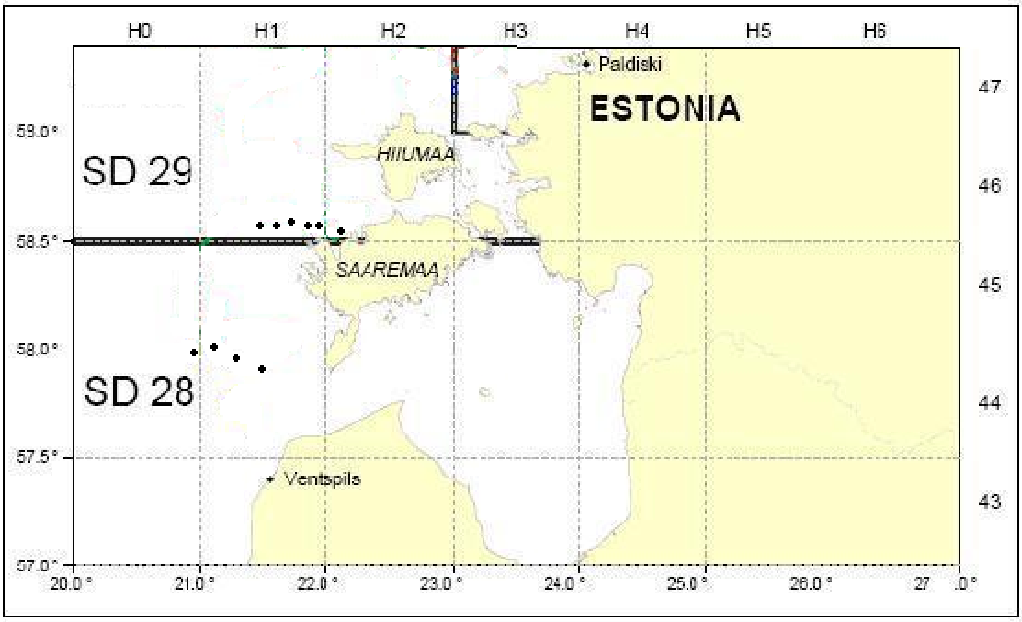
Extended cruise reports of BITS with more detailed descriptions are summarized in Annex 7.

NATION:	**ESTONIA**	**VESSEL:**	**CEV**
Survey:	BITS12IVQRT	Dates:	13-16/11/2012

Cruise	
Gear details:	The small (530) standard TV3 trawl was used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	The survey was carried out as planned. Survey started from Port of Haapsalu late evening on 12. November 2012. Next day all planned hauls were realized in Subdivision 28-2 without major problems. On November 14,. The survey was continued in Subdivision 29. Weather conditions were rather bad , and only 3 hauls were performed. Next possibility to go to sea was on November 16, however the weather was bad again and 2 of planned 3 hauls were executed. The deepest haul in stratum 80-99m was decided not to perform since the weather forecast was still bad (>15 m/s; http://www.emhi.ee/index.php?ide=21&ts=1353047915&go=1).
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planed	Number of valid hauls realized using "Standard" groundgear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	% stations fished
28	TVS	3	1	1	0	0	0	0	100
28	TVS	4	3	3	0	0	0	0	100
29	TVS	2	2	2	0	0	0	0	100
29	TVS	3	2	2	0	0	0	0	100
29	TVS	4	1	1	0	0	0	0	100
29	TVS	5	1	0	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):		
Species	Age	Length
Gadus morhua	154	640
Sprattus sprattus	200	1105
Clupea harengus	207	1763
Platichthys flesus	1084	1879



Haul positions during Estonian BITS survey n 4 QRT 2012.

NATION:	**LATVIA**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q4/2012	Dates:	03-11/12/2012

Cruise	No. 2/2012
Gear details:	The hard bottom groundrope (rock-hopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	The RV "Baltica" realized 22 bottom trawl control-hauls from the 25 planned. Four hauls were not performed due to low oxygen concentration (below 1 ml/l) near bottom. All trawl catches were performed in the daylight. The standard trawling duration was 30 minutes. However, in the case of 15 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder. The mean speed of vessel while trawling was 3.0 knots. Overall, 4 hauls were conducted in Sweden EEZ and 18 hauls within the Latvian EEZ (incl. the Latvian territorial waters, Figure 1). The bad weather affected the fulfilling the survey tasks. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 22 fish catch-stations starting positions and 27 standard hydrographic stations, determined along the research profile of the southern Baltic, were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACEMENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
26	TVL	2	1	0	1	0	0	0	100
26	TVL	3	2	0	0	0	0	0	0
26	TVL	4	2	0	1	0	0	0	50
26	TVL	5	2	0	2	0	0	0	100
26	TVL	6	5	0	2	3	0	0	100
28	TVL	2	2	0	2	0	0	0	100
28	TVL	3	2	0	2	0	0	0	67
28	TVL	4	4	0	4	0	0	0	100
28	TVL	5	5	0	4	1	0	0	100

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Gadus morhua	780	203
Platichthys flesus	803	128
Clupea harengus	1466	0
Sprattus sprattus	1237	0
Zoarces viviparus	2	0
Psetta maxima	10	0
Cyclopterus lumpus	21	0
Triglopsis quadricornis	1	0
Gasterosteus aculeatus	54	0
Osmerus eperlanus	30	0

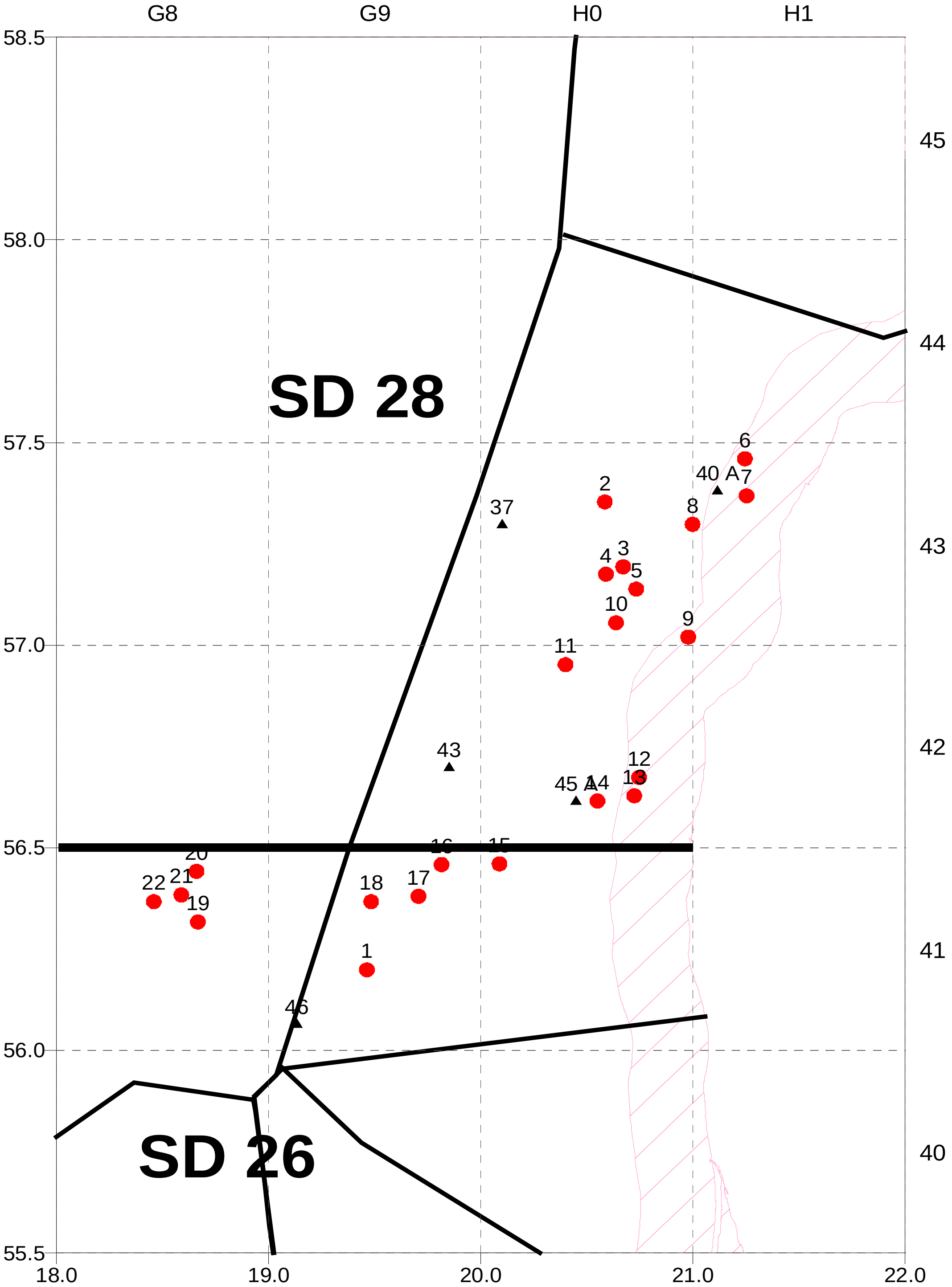


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with black triangles), black lines - national fishing zone borders.

Nation:	**Lithuania**	**Vessel:**	**RV "Darius"**
Survey:	BITS-Q4/2012	Dates:	03-04 and 12/12/2012

Cruise	
Gear details:	The small (530) standard TV3 trawl was used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	Total 8 trawls were made. Weather conditions were bad , so the survey was skipped into two parts. 4 hauls were performed on December 03-04. Next possibility to go to sea was on December 12. One haul was incorrect in 80 - 99 m depth stratum was incorrect, because trawl was destroyed to rocks.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUNDGEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
26	TVS	2	2	2	0	0	0	0	100
26	TVS	3	2	2	0	0	0	0	100
26	TVS	4	3	3	0	0	0	0	100
28	TVS	5	1	0	0	0	0	1	0

Number of biological samples (maturity and age material, *maturity only):

Species	Age	Length	Maturity
Gadus morhua	213	2239	2013
Platichthys flesus	236	1169	236
Pleuronectes platessa	8	8	8
Psetta maxima	5	5	5
Clupea harengus	111	291	111
Sprattus sprattus	70	182	70
Osmerus eperlanus		1	
Myoxocephalus scorpius		9	
Pomatoschistus minutus		8	

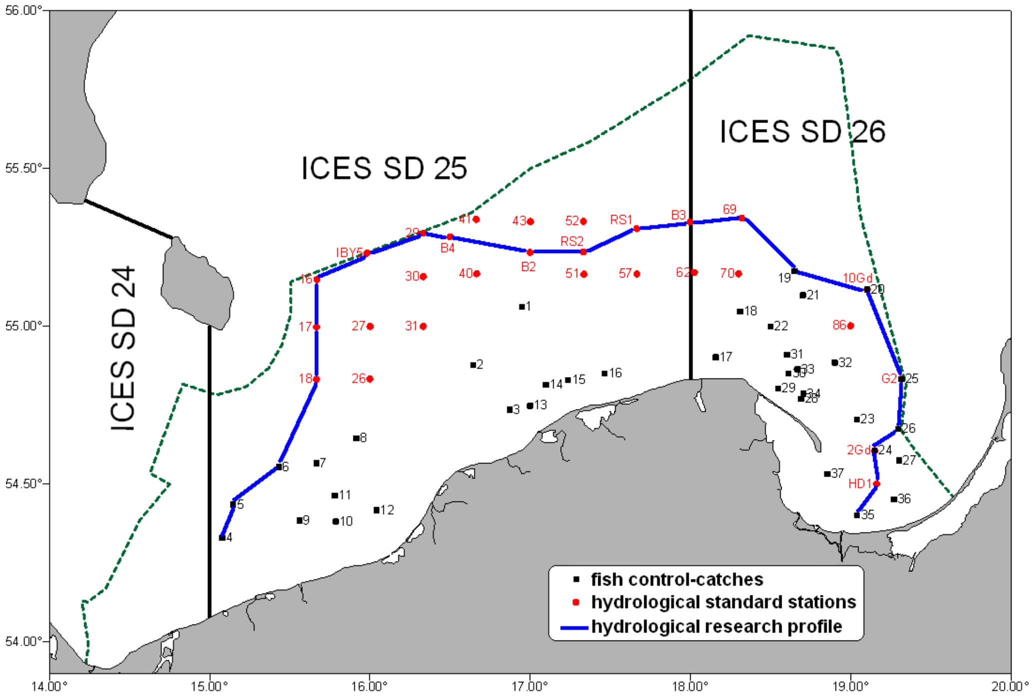
NATION:	**POLAND**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q4/2012	Dates:	16-28/11/2012

Cruise	No. 17/2012/MIR
Gear details:	The standard rigging cod ground trawl type TV-3#930, with 10-mm mesh bar length in the codend was applied for fish control-catches realization. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	After correction made by WGBIFS, the vessel "Baltica", was recommended to cover parts of the ICES Subdivisions 25 and 26 with totally 34 randomly selected control-hauls, including three hauls previously designated to the Danish vessel "Dana". The catch-stations were located at the bottom depth range of 16 - 108 m. Totally, 34 fish catch-stations can be accepted as representative and three other control-hauls were initiated only by hydrological measurements and due to insufficient oxygen content (below critical minimum, i.e. 1.5 ml/l) in the bottom waters, trawling was omitted. Zero catches were not achieved. Haul No. 25025 was shortened to 15 minutes due to a rocky bottom. Additional haul No. 25018 was slightly shifted because, according to the TowDatabase, it was located on the vessels separation traffic road. This haul was made instead of haul No. 25013, which is located within permanently closed a navy military training area. Additional haul No. 25003 was slightly shifted because, according to the TowDatabase, it was located on the vessels separation traffic road. This haul was made instead of haul No. 25014, which is located within permanently closed a navy military training area. Haul No. 26272 (additional) was conducted instead of haul No. 26091, however the oxygen content near bottom was slightly below demanded threshold of oxygen; commercial cutters operated very close to the RV "Baltica". Haul No. 26269 - depth of the bottom was somewhat smaller than in the TowDatabase. Haul No. 26087 - not fully sufficient oxygen content (1,27 ml/l) near bottom. Haul No. 26037 - location of haul was somewhat modified due to not sufficient depth on primary selected (TowDatabase) position. Haul No. 26015 (modified) - location of haul and depth was slightly changed due to not accessible primary selected site, where the set gill nets were distributed. Haul No. 26217 (modified) - location of haul was considerably changed due to not accessible primary selected site, where the set gill nets were distributed in a large area. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 37 fish catch-stations starting positions and 28 standard hydrographic stations, determined along the research profile of the southern Baltic, were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (1–6)	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25	TVL	1	2	2	0	0	1	0	100
25	TVL	2	10	10	0	0	1	0	100
25	TVL	3	3	4	0	0	0	0	133
25	TVL	4	1	0	0	0	0	0	0
25	TVL	5	0	0	0	0	0	0	0
26	TVL	1	0	0	0	0	0	0	0
26	TVL	2	5	5	0	0	0	0	100
26	TVL	3	3	2	0	0	2	0	67
26	TVL	4	3	4	0	0	2	0	133
26	TVL	5	3	6	0	0	1	2	200
26	TVL	6	1	0	0	0	0	0	0

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Gadus morhua	4079	385
Platichthys flesus	1389	431
Clupea harengus	4499	657
Sprattus sprattus	2480	338
Pleuronectes platessa	267	141
Psetta maxima	7	7
Cyclopterus lumpus	4	0
Enchelyopus cimbrius	16	0
Melanogrammus aeglefinus	1	0
Ammodytes lanceolatus	1006	0
Ammodytes tobianus	15	0
Osmerus eperlanus	135	0
Merlangius merlangus	4	0
Myoxocephalus scorpius	8	0
Salmo salar	2	0
Pomatoschistus minutus	2	0
Alosa fallax	2	0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■ fish control-catches
● hydrological standard stations
hydrological research profile

NATION:	**GERMANY**	**VESSEL:**	**FRV "SOLEA"**
Survey:	BITS-Q4/2012	Dates:	24/10-09/11/2012

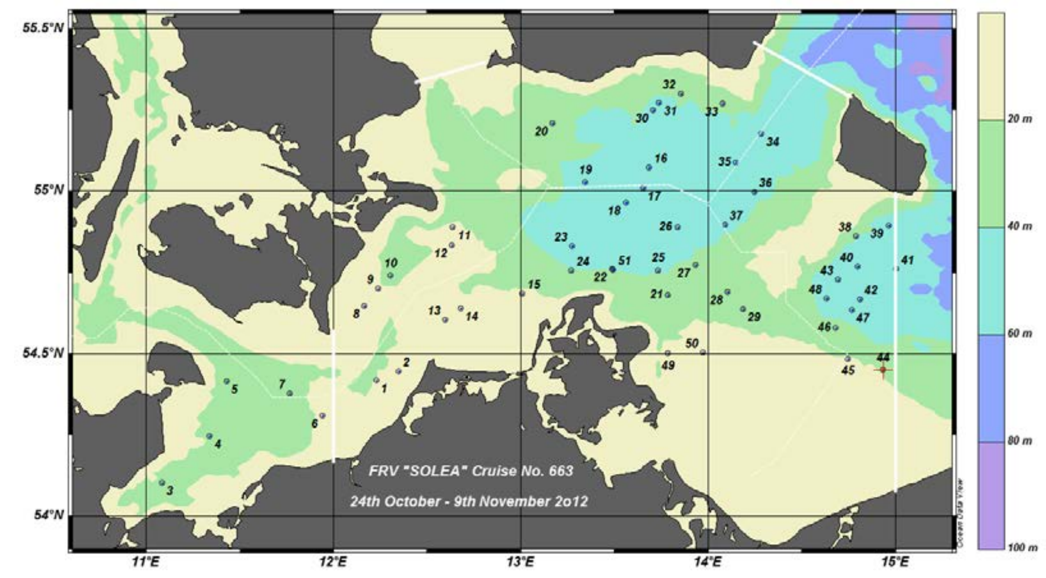
Cruise	
Gear details:	The small (520#) standard TV3 trawl was used. All Tow Database stations are fished without rock-hoppers. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	Technical problems and severe weather conditions caused some interruptions. Total 51 fishing hauls and 51 hydrographical stations were performed.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (1–5)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUNDGEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
22	TVS	1	5	5	0	0	0	0	100
24	TVS	1	30	21	0	0	0	0	70
24	TVS	2	22	25	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Gadus morhua	9340	945
Platichthys flesus	5156	672
Limanda limanda	5893	652
Pleuronectes platessa	3707	531
Psetta maxima	150	150
Scophthalmus rhombus	1	1
Clupea harengus	4599	-
Sprattus sprattus	4360	-

Other species may need to be added for your survey



FRV "SOLEA" Cruise No. 663

24th October - 9th November 2o12

Nation:	**Denmark**	**Vessel:**	**RV “Dana”**
Survey:	BITS-Q4/2012	Dates:	29/10-16/11/2012

Cruise	
Gear details:	The big (#920) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual. No rock-hopper was used. The gear was properly check-measured before the cruise.
Notes from survey (e.g. problems, additional work etc.):	54 stations were attempted fished in total. 51 stations were fished successfully. 0 of those stations were invalid due to gear damage. 3 (25456 and 25159) could not be fished due to commercial wrecks in the trawl track and one (25080) was situated in new gas pipe. These stations are substituted by other hauls.
Additional comments	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planed	Number of valid hauls realized using “Standard” ground gear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25	TVL	2	1	1	0	0	1	0	100
25	TVL	3	11	11	0	0	2	0	100
25	TVL	4	24	24	0	6	1	0	100
25	TVL	5	15	15	0	11	0	0	100

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Herring		Flounder	
Cod	523	Dab	
Sprat		Turbot	
Plaice		Brill	

NATION:	**SWEDEN**	**VESSEL:**	**RV "DANA"**
Survey:	BITS Q4/2012	Dates:	20-27/11/2012

Cruise	
Gear details:	The large (930#) standard TV3 trawl was used. No tows are done with the rock-hopper groundgear on harder ground stations. The trawl construction is according to the specification in the BITS manual.
Notes from survey (e.g. problems, additional work etc.):	30 haul stations out of the 30 allocated were trawled.
Additional comments:	

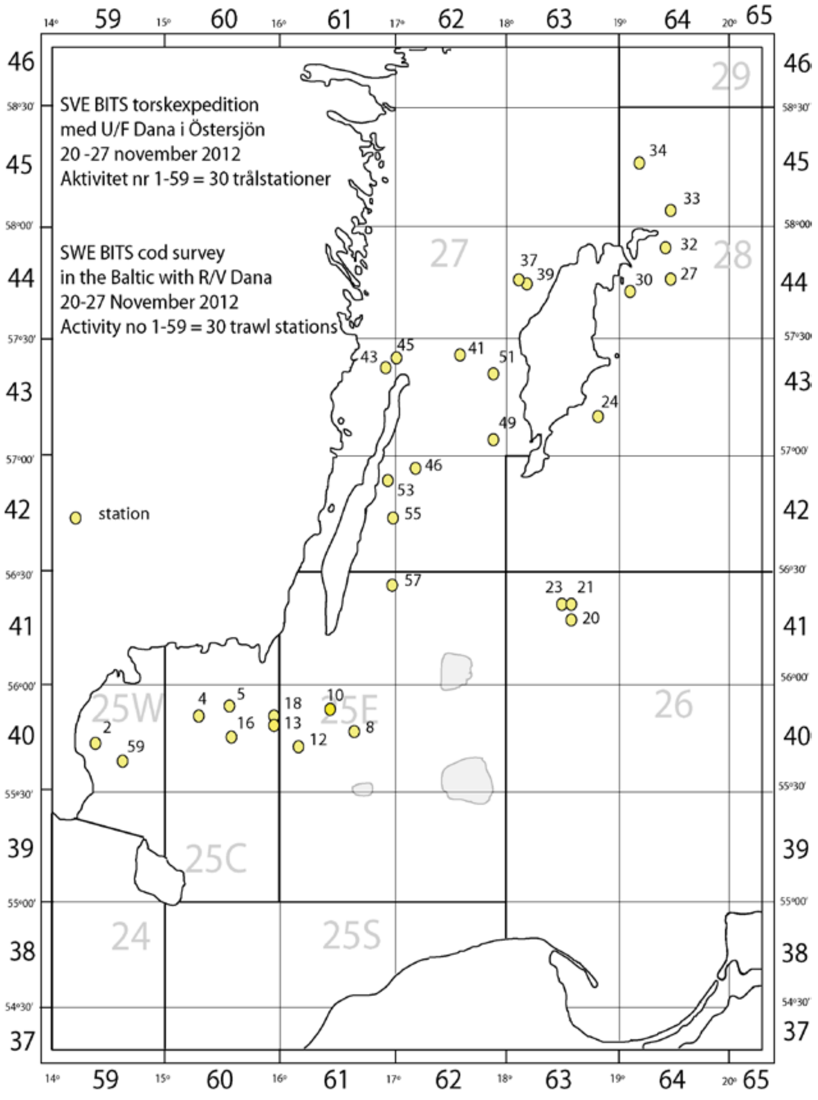
ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACEMENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
25	TVL	2	1	1	0	0	0	0	100
25	TVL	3	6	5	0	0	1	0	83
25	TVL	4	4	5	0	1	3	0	125
26	TVL	3	1	1	0	0	0	0	100
26	TVL	4	1	1	0	1	0	0	100
26	TVL	5	1	1	0	1	0	0	100
27	TVL	3	2	2	0	0	0	0	100
27	TVL	4	4	4	0	3	0	0	100
27	TVL	5	1	1	0	1	0	0	100
27	TVL	6	3	3	0	3	0	0	100
28	TVL	2	1	1	0	0	0	0	100
28	TVL	3	3	3	0	0	0	0	100
28	TVL	4	1	1	0	1	0	0	100
28	TVL	5	1	1	0	1	0	0	100

Remarks: % figures deviating from 100% depend on stations with depth close to depth strata limit.

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Clupea harengus	4268	
Cyclopterus lumpus	15	
Enchelyopus cimbrius	3	

Gadus morhua	5129	616
Gasterosteus aculeatus	78	
Lumpenus lampretaeformis	10	
Merlangius merlangus	2	
Myoxocephalus quadricornis	669	
Myoxocephalus scorpius	245	
Platichthys flesus	1790	844
Pleuronectes platessa	244	
Pomatoschistus	8	
Psetta maxima	8	
Spinachia spinachia	8	
Sprattus sprattus	1651	
Zoarces viviparus	69	



Trawl positions

NATION:	**LATVIA**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q1/2013	Dates:	05-13/03/2013

Cruise	No. 1/2013
Gear details:	The hard bottom groundrope (rock-hopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. Five additional tracks with standard TV-3#930 were made in SD 26 in Lithuanian EEZ. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	The original surveys plan provided that 23 control-hauls will be realized in the Latvian EEZ and 4 control-hauls in the Estonian EEZ. Unfortunately, RV "Baltica" did not received permission for work in the Estonian EEZ, as a result 4 planed tracks were shifted to the northern part of Latvian EEZ. The RV "Baltica" realized 27 bottom trawl control-hauls from the 27 planned (Table1). Two hauls were not performed due to low oxygen concentration (below 1 ml/l) near bottom. All trawl catches were performed in the daylight. The hard bottom groundrope (rock-hopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The standard trawling duration was 30 minutes. However, in the case of 16 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder. Five additional control hauls were realized in Lithuanian EEZ. The standard TV-3#930 trawl were used. Information about these tracks is not included in the summary table for realized previously selected control hauls. The mean speed of vessel while trawling was 3.0 knots. Overall, 5 hauls were conducted in Lithuanian EEZ and 27 hauls within the Latvian EEZ (incl. the Latvian territorial waters; Figure 1). Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 32 fish catch-stations starting positions and 37 standard hydrographic stations, determined along the research profile of the southern Baltic, were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2-6)	Number of hauls planed	Number of valid hauls realized using "Standard" groundgear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	% stations fished
26	TVL	5	2	0	2	0	0	0	100
26	TVL	6	1	0	1	0	0	0	100
28	TVL	2	3	0	3	0	0	0	100
28	TVL	3	6	0	6	0	0	0	100
28	TVL	4	11	0	11	0	0	0	100
28	TVL	5	4	0	2	2	0	0	100

Number of biological samples (maturity and age material, *maturity only):		
Species	Length	Age
Gadus morhua	3421	303
Platichthys flesus	3029	331
Clupea harengus	2566	0
Sprattus sprattus	1904	0
Zoarces viviparus	26	0
Psetta maxima	3	0
Pleuronectes platessa	11	0
Cyclopterus lumpus	17	0
Myoxocephalus scorpius	55	0
Gasterosteus pungitius	1	0
Gasterosteus aculeatus	33	0
Osmerus eperlanus	359	0

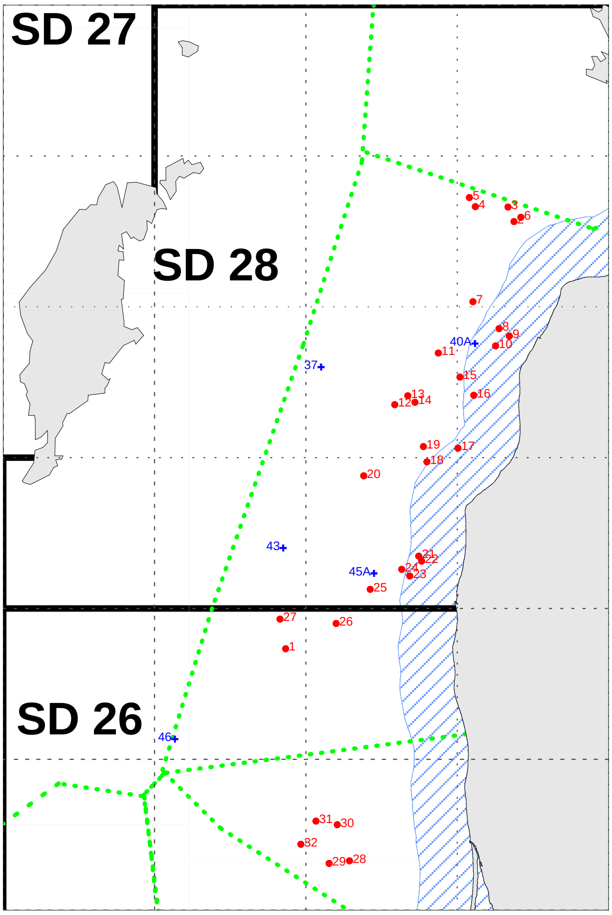


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with blue crosses), green lines - national fishing zone borders.

Nation:	**LITHUANIA**	**Vessel:**	**RV "DARIUS"**
Survey:	BITS-Q1/2013	Dates:	26-27/02/2013

Cruise	
Gear details:	The small (530) standard TV3 trawl was used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	Total 8 trawls were made. One haul was incorrect 80 - 99 m depth stratum was incorrect, because trawl was destroyed to rocks.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUNDGEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
26	TVS	2	1	1	0	0	0	0	100
26	TVS	3	2	2	0	0	0	0	100
26	TVS	4	4	4	0	0	0	0	100
26	TVS	5	1	0	0	0	0	1	0

Number of biological samples (maturity and age material, *maturity only):

Species	Age	Length	Maturity
Gadus morhua	227	2971	227
Platichthys flesus	236	984	236
Pleuronectes platessa	10	10	10
Psetta maxima	2	2	2
Clupea harengus		876	
Sprattus sprattus		237	
Alosa fallax		3	
Osmerus eperlanus		26	
Myoxocephalus scorpius		15	
Gasterosteus aculeatus		1	

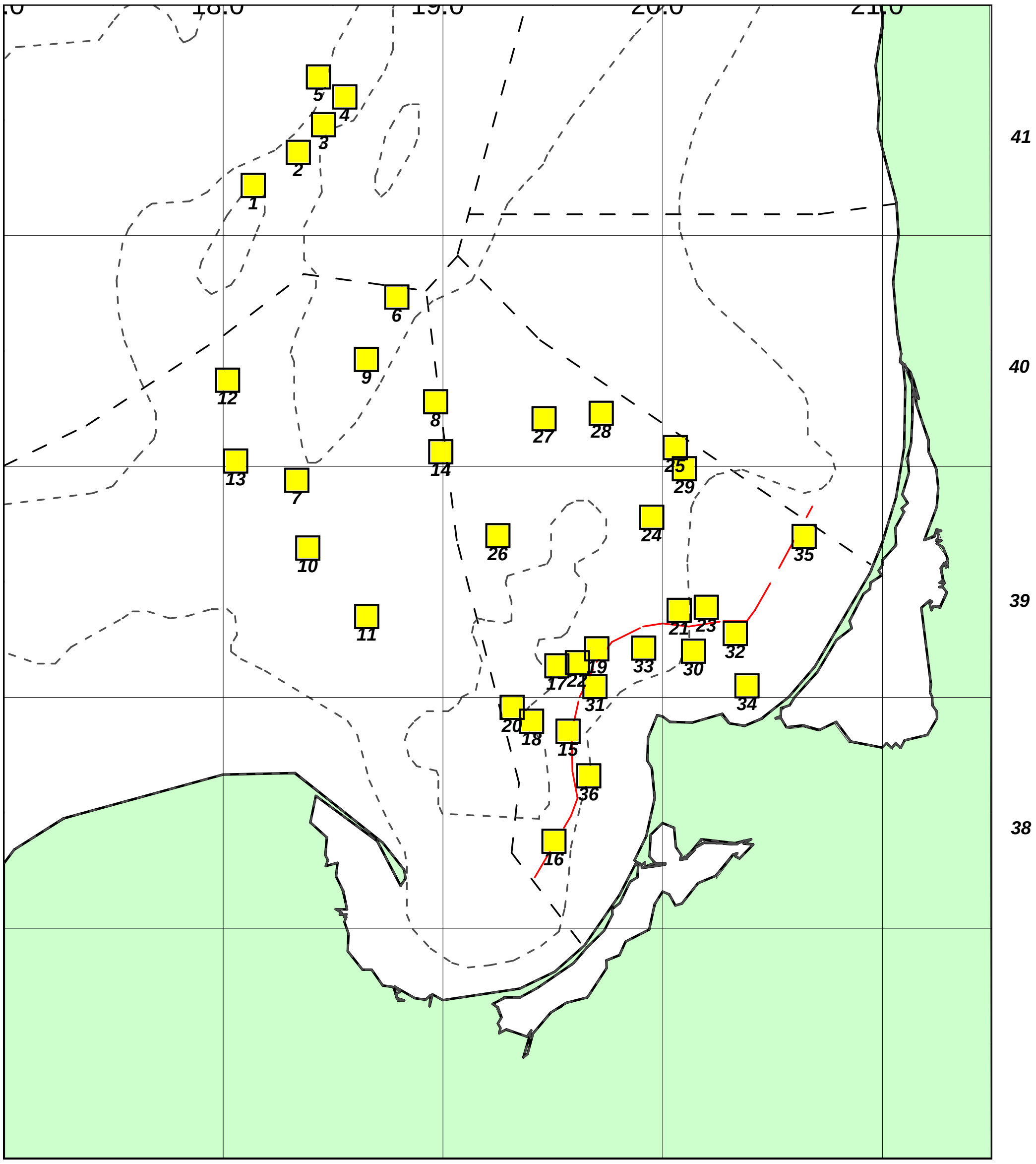
Nation:	**RUSSIA**	**Vessel:**	**RV "ATLANTIDA"**
Survey:	BITS-Q1/2013	Dates:	22/02-15/03/2013

Cruise	60
Gear details:	The large standard TV3 trawl is used. Following the recommendations in the TOW database stations are fished either without rockhoppers. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	No problems were experienced during the survey. Nine subsidiary trawl stations and four hauls originally allocated to Sweden have been made. Low content of oxygen in one trawl station 26221, 26119 (depth >100 m) – therefore hydrological researches have been made only.
Additional comments:	The national scientific program causes performance of trawl stations 26099, 26053, 26161 – Poland; 26089, 26147, 26092, 26024, 26148, 26051, 26048, 26023, 26042 – Russia. These trawl stations have been made in addition to the planned BITS stations. Trawl station 26129 have been made instead of 26130. Trawl stations 26121 did not carried after 2009 (invalid in March 2009). Trawl stations 26017, 26127, 26146 break down – military zone. Trawl stations 26145, 26259, 26081 in EEZ Latvian did not planned.

ICES SUB-DIVISIONS	**GEAR (TVL, TVS)**	**DEPTH STRATA (2–6)**	**NUMBER OF HAULS PLANED**	**NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR**	**NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS**	**NUMBER OF ASSUMED ZERO-CATCH HAULS**	**NUMBER OF REPLACEMENT HAULS**	**NUMBER OF INVALID HAULS**	**% STATIONS FISHED**
26	TVL	2	4	2	0	0	0	0	50
26	TVL	3	5	6	0	0	0	0	120
26	TVL	4	5	12	0	0	0	0	240
26	TVL	5	11	13	0	0	0	0	118
26	TVL	6	5	3	0	0	1	0	60

Number of biological samples (maturity and age material, *maturity only):			
Species	Length	maturity	Age
Clupea harengus	8061	1956	1398
Gadus morhua	7171	2480	1344
Platichthys flesus	3513	1524	1040
Psetta maxima	13	13	0
Sprattus sprattus	2489	380	300

Other species may need to be added for your survey.



Trawl positions for RV "ATLANTIDA" in February-March 2013

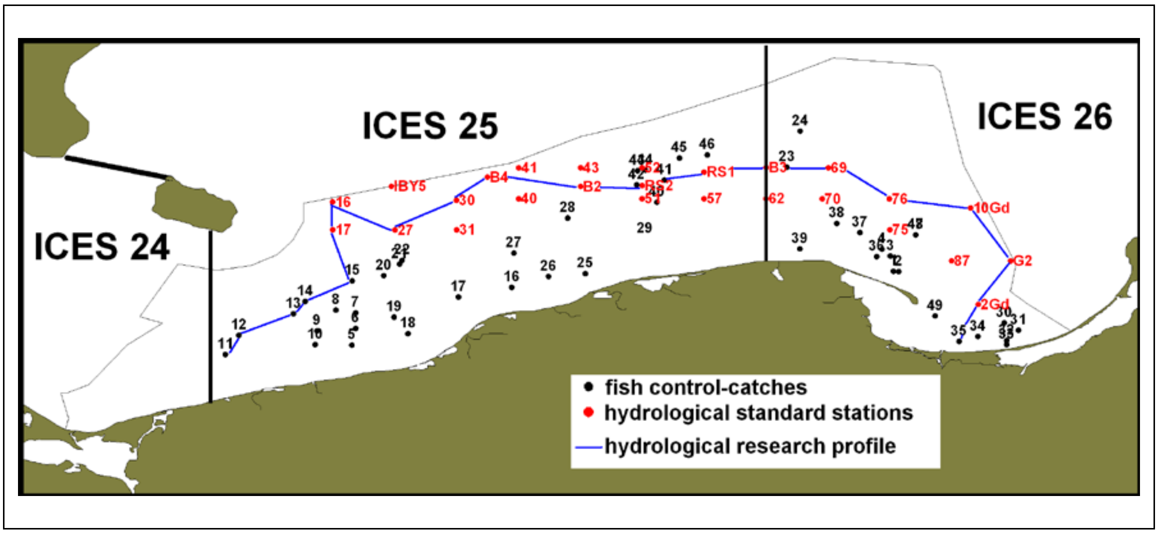
NATION:	**POLAND**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q1/2013	Dates:	14/02-01/03/2013

Cruise	No. 2/2013/MIR
Gear details:	The standard rigging cod ground trawl type TV-3#930, with 10-mm mesh bar length in the codend was applied for fish control-catches realization. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	According to the WGBIFS recent (March 2012) recommendations, the vessel "Baltica" was designated to cover parts of the ICES Subdivisions 25 and 26 with totally 49 randomly selected fish control-hauls. The catch-stations were located at the bottom depth range of 19 - 102 m. Totally, 47 fish catch-stations can be accepted as representative, while one haul was considered as invalid due to fishing gear damage and another planned catch was omitted, due to appearance of oxygen depletion in the near bottom waters. Due to a rocky bottom appearance at part of trawling transects connected with hauls No. 25014, 26046, 26172, 25002, 25025, 25231, 25232, 25088, 25089 fishing was shortened to 15 minutes. In the cases of hauls No. 26169, 26020, 26037, 26019, 26172, 25002, 26167 depth of the bottom was slightly different from in the TowDatabase. However, in particular, the real depth of the planned haul No. 26037 was in the depth layer lower than listed in TowDatabase. The real depth on the geographical position of haul No. 26167 was much lower than listed in TowDatabase. Therefore in case of haul No. 26167, the geographical position was modified, within the same ICES rectangle area. The same solution in case of haul No. 26037 was not implemented due to unsafe bottom in the area around the planned haul. At the haul No. 26257 oxygen content near bottom was bellow critical minimum and amounted 0.94 ml/l, catching was not performed. During trawling at position of haul No. 25465 the fishing gear was seriously damaged, the former position of haul should be excluded from the TowDatabase. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 49 fish catch-stations starting positions and 26 standard hydrographic stations were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES Sub-divisions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	10	10	0	0	0	0	100
25	TVL	3	9	10	0	0	0	1	111
25	TVL	4	7	6	0	0	0	0	86
25	TVL	5	2	2	0	0	0	0	100
26	TVL	1	0	0	0	0	0	0	0
26	TVL	2	5	5	0	0	0	0	100
26	TVL	3	4	5	0	0	0	0	125
26	TVL	4	6	6	0	0	0	0	100
26	TVL	5	3	2	0	0	0	0	67
26	TVL	6	1	1	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age and maturity
Gadus morhua	8223	411
Platichthys flesus	3898	299
Clupea harengus	5289	564
Sprattus sprattus	4293	510
Pleuronectes platessa	383	151
Psetta maxima	12	12
Cyclopterus lumpus	15	13
Enchelyopus cimbrius	119	119
Hyperoplus lanceolatus	3	2
Osmerus eperlanus	49	46
Merlangius merlangus	6	6
Myoxocephalus scorpius	21	18
Salmo salar	2	2
Pomatoschistus minutus	1	0
Zoarces viviparus	4	4
Sander lucioperca	1	1
Alosa fallax	1	1
Liparis liparis	1	1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● fish control-catches
● hydrological standard stations
hydrological research profile

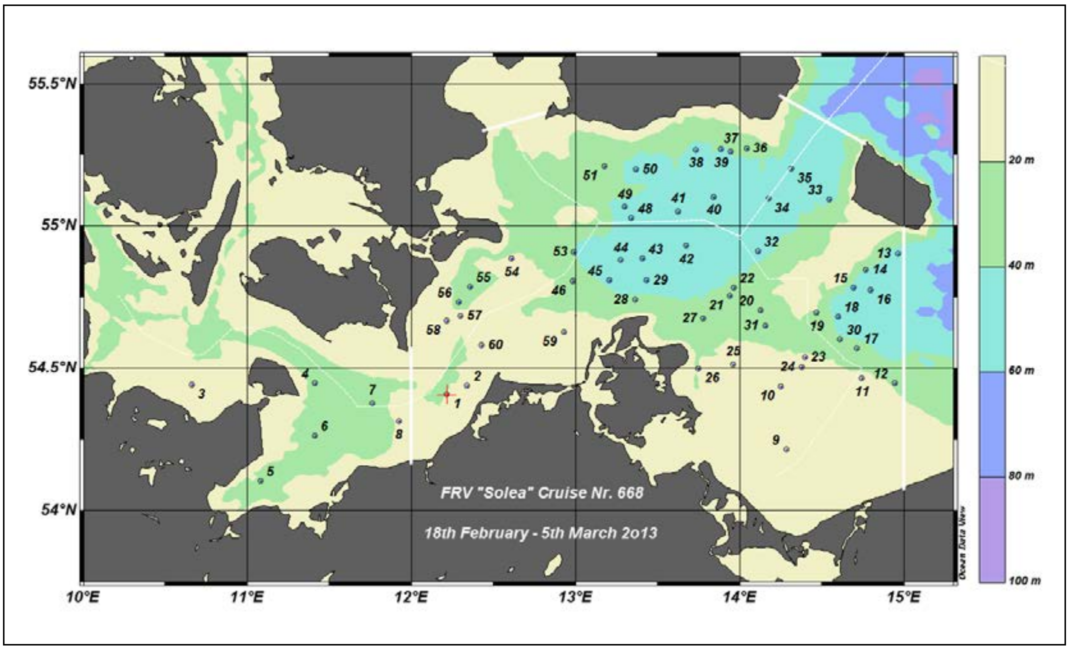
NATION:	GERMANY	VESSEL:	FRV "SOLEA"
Survey:	BITS-Q1/2013	Dates:	18/02-05/03/2013

Cruise	
Gear details:	The small (520#) standard TV3 trawl was used. All Tow Database stations are fished without rock-hoppers. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	Total 60 fishing hauls and 59 hydrographical stations were performed.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (1–5)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK-HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACEMENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
22	TVS	1	6	6	0	0	0	0	100
24	TVS	2	30	30	0	0	0	0	100
24	TVS	3	24	24	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Gadus morhua	7578	1015
Platichthys flesus	5097	645
Limanda limanda	1710	746
Pleuronectes platessa	1673	535
Psetta maxima	91	91
Scophthalmus rhombus	1	1
Clupea harengus	6523	-
Sprattus sprattus	6343	-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FRV "Solea" Cruise Nr. 668
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Nation:	**DENMARK**	**Vessel:**	**RV "DANA"**
Survey:	BITS-Q1/2013	Dates:	5-23/3/2013

Cruise	
Gear details:	The big (#920) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual. No rock-hopper was used. The gear was properly check-measured before the cruise.
Notes from survey (e.g. problems, additional work etc.):	52 stations were attempted fished in total. 47 stations were fished successfully. 4 stations were invalid due to gear damage. 8 stations could not be fished due to obstructions in station track and substituted. 1 of the substitutes suffers gear damage.
Additional comments	

ICES Sub-Divisions	**Gear (TVL, TVS)**	**Depth strata (2–6)**	**Number of hauls planed**	**Number of valid hauls realized using "Standard" ground gear**	**Number of valid hauls realized using Rock-hoppers**	**Number of assumed zero-catch hauls**	**Number of replacement hauls**	**Number of invalid hauls**	**% stations fished**
25	TVL	2	1	1	0	0	0	0	100
25	TVL	3	11	8	0	0	1	0	72
25	TVL	4	28	26	0	0	6	1	93
25	TVL	5	10	10	0	0	1	0	100

Number of biological samples (maturity and age material, *maturity only):

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Herring		Flounder	
Cod	634	Dab	
Sprat		Turbot	
Plaice		Brill	

NATION:	**SWEDEN**	**VESSEL:**	**RV "DANA"**
Survey:	BITS Q1/2013	Dates:	22/02-05/03/2013

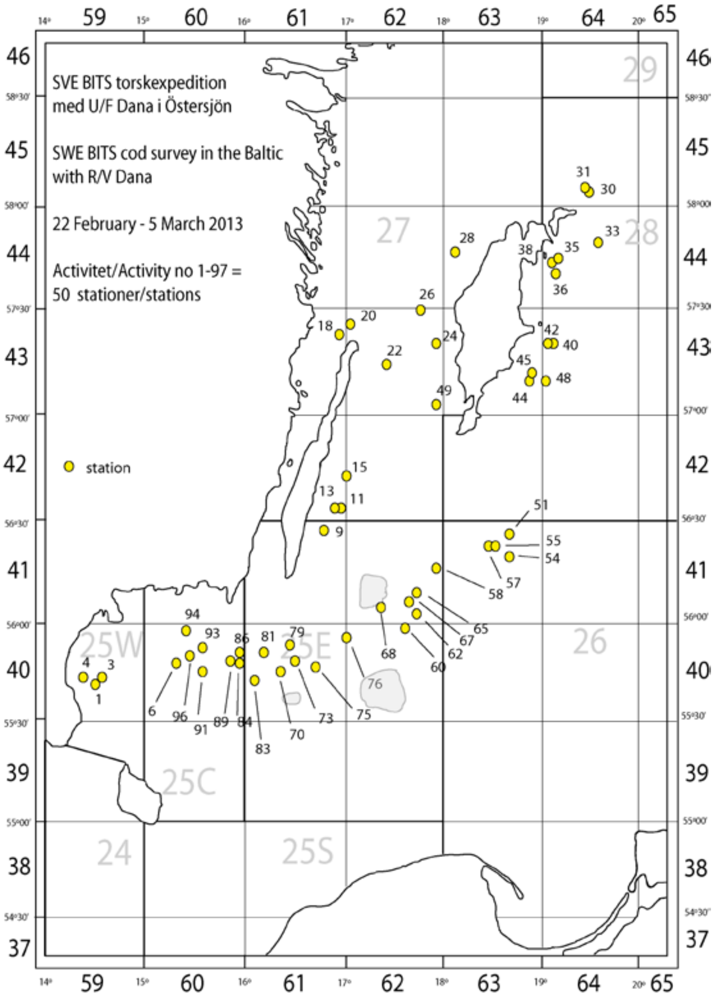
Cruise	
Gear details:	The large (930#) standard TV3 trawl was used. No tows are done with the rock-hopper groundgear on harder ground stations. The trawl construction is according to the specification in the BITS manual.
Notes from survey (e.g. problems, additional work etc.):	50 haul stations out of the 50 allocated were trawled but one haul was invalid and could not be replaced.
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planed	Number of valid hauls realized using "Standard" groundgear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25	TVL	2	1	1	0	0	0	0	100
25	TVL	3	18	19	0	0	7	0	106
25	TVL	4	6	5	0	0	1	0	83
26	TVL	2	1	1	0	0	0	0	100
26	TVL	3	1	1	0	0	0	0	100
26	TVL	4	1	1	0	0	0	0	100
26	TVL	6	1	1	0	1	0	0	100
27	TVL	3	2	2	0	0	0	0	100
27	TVL	4	4	4	0	0	0	0	100
27	TVL	5	1	1	0	0	0	0	100
27	TVL	6	3	3	0	3	0	0	100
28	TVL	2	1	0	0	0	0	1	0
28	TVL	3	4	4	0	0	1	0	100
28	TVL	4	2	2	0	0	1	0	100
28	TVL	5	4	4	0	0	0	0	100

Remarks: % figures deviating from 100% depend on stations with depth close to depth strata limit.

Number of biological samples (maturity and age material, *maturity only):

Species	Length	Age
Ammodytes	2	
Clupea harengus	8559	
Cyclopterus lumpus	74	
Enchelyopus cimbrius	3	
Gadus morhua	9263	977
Gasterosteus aculeatus	282	
Hyperoplus lanceolatus	11	
Limanda limanda	6	
Lumpenus lampretaeformis	1	
Melanogrammus aeglefinus	1	
Merlangius merlangus	25	25
Myoxocephalus quadricornis	589	
Myoxocephalus scorpius	771	
Osmerus eperlanus	9	
Platichthys flesus	5564	1442
Pleuronectes platessa	437	
Psetta maxima	19	
Pungitius pungitius	4	
Spinachia spinachia	2	
Sprattus sprattus	3957	
Zoarces viviparus	171	



Trawl positions.

Annex 7: Cruise reports of BITS in quarter 4 in 2012 and quarter 1 in 2013

DTU Aqua
Cruise Report

DANA, BITS 2, 2012

Vessel: DANA	Cruise dates (planned): 31/10-16/11 2012
Cruise number: 10	Cruise name: BITS-2

Port of departure:	Copenhagen	**Date:** 31/10-2012	**Time:** 19.30
Port of arrival:	Ystad	**Date:** 16/11-2012	**Time:** 08.00
Other ports:	Rønne	**Date and justification:** 8/11-2012	

Participants

Leg 1:

Name	**Institute**	**Function and main tasks**
Henrik Degel	DTU-Aqua	Cruise-leader
Susanne Hansen	DTU-Aqua	Assistant cruise-leader
Svend-Erik Levinsky	DTU-Aqua	Length measurements
Rasmus Frydenlund	DTU-Aqua	Length measurements
Peter V. Larsen	DTU-Aqua	Individual fish measurements
Eva Maria Pedersen	DTU-Aqua	Individual fish measurements
Bastian Huwer	DTU-Aqua	Night assistant cruise leader
Martin M. Karsen	DMU	Guest
Eik Ehlert Britsch	DTU-Aqua	Technician

Leg 2:

Name	**Institute**	**Function and main tasks**
Stina B. S. Hansen	DTU-Aqua	Cruise-leader
Susanne Hansen	DTU-Aqua	Assistant cruise-leader
Helle Rasmussen	DTU-Aqua	Individual fish measurements
Aage Thaarup	DTU-Aqua	Individual fish measurements
Jan Pedersen	DTU-Aqua	Length measurements
Jukka Pönni	FGFRI	Maturity estimates
Bastian Huwer	DTU-Aqua	Night assistant cruise leader
Eik Ehlert Britsch	DTU-Aqua	Technician

Objectives

Daytime:

- To estimate the abundance and the year class strength of the Baltic cod stock in ICES Subdivision 24, 25 and 26. The 1st quarter survey is together with the fall survey, the Danish contribution to the ”Baltic International Trawl Survey” (BITS). The main goal of the surveys is to provide fishery independent data to the Baltic assessment working group for use in the stock assessment, which is performed during the ICES working group in April. Furthermore, all fish species are species determined, measured and weighed.

- To measure temperature, salinity and oxygen at the fishing location. The measurements are conducted with a CTD. Calibration of the CTD is conducted before the survey.

- To take individual samples of cod for analyses of age, sex, weight, stomach and liver condition. Data is used to produce maturity ogives, mean weights per age and condition, which is used for Eastern Baltic cod stock assessment.

Night time

- To investigate the abundance and distribution of zoo- and ichthyoplankton as well as the invasive ctenophore *Mnemiopsis leidyi* in the central Baltic Sea. The analysis is conducted with a Bongo net on a grid consisting of 45 stations, covering areas > 60 m in SD 25. Double oblique hauls are conducted at a trawling speed of 3 kn. Samples are collected from three nets with mesh sizes of 150, 335 and 500 µm.

- To investigate the abundance and distribution of ctenophore larvae by performing hauls with a WP2 net on selected stations.

- To conduct hauls with a MIK net on selected stations in order to investigate if there are any pelagic cod juveniles in the area which may result from an extraordinary spawning activity which was observed on the 4.quarter BITS in November 2011.

Itinerary

The Danish research vessel Dana R/V was built in 1980-81 and is a versatile multi-purpose vessel with five large laboratories and 38 cabins.

The Baltic cod stock has been monitored annually since 1982 through bottom trawl surveys carried out by most countries surrounding the Baltic. The national research vessels have each surveyed part of the area, applying a depth stratified sampling design, with some overlap in coverage. However, different gears and design were applied and in 1985 ICES established a Study Group on Young Fish Surveys in the Baltic in order to standardize the surveys. After agreement a common standard trawl gear and standard sampling procedures were implemented in 2000 resulting in the coverage of the whole Baltic Sea.

To calibrate the national surveys from before 2000 with the TV3 gear used from 2000, a set of conversion factors are produced by making comparative hauls. The work with standardising gear and creating conversion factors for old data was done under the EU project ISDBITS and gear specifications and conversion factors can be found in the report (ISDBITS 2001).

The type of trawl is called TV3 with 930 meshes. The design and construction of the standard trawls are given in ICES (1997) and can also be found in the BITS manual (Anon. 2000). Until November 2007 Denmark was still using the rock hopper gear on hard fishing ground but since 2008 only the standard TV3 has been used.

The BITS is conducted as a depth-stratified survey. The strata are based on Sub divisions and depth layers. Each year the necessary stations are randomly selected before the beginning of the international trawl surveys from a list of clear haul data. These stations are a selected sub-sample of the possible trawl tracks. If the number of possible tracks is not large enough for a random selection then some strata fixed stations can be used every year.

The standard haul is a 30 minute haul with a towing speed of 3 knots. Trawling only takes place during daylight, defined as the time between 15 minutes before sunrise until 15 minutes past sunset.

The catches are made up according to the BITS manual (Manual for the Baltic international demersal trawl surveys).

- At each tow the catch is sorted by species groups. When catches are large sub samples are taken. The total weight of the catches and total weights of each species group are registered (including invertebrates). However, herring and sprat are very often measured as a subsample.
- All fish species are measured. Under normal circumstances all cod are measured, but if the catch is too big to measure all fish, a weighted sub sample is measured (level 1).
- If the bottom oxygen levels are below 1.5ml/L, the station is assessed visually on the echosounder to see if there are any fish near the bottom. The trawl height is 5-5½ meters, so if there are fish observed within this range, the trawl could be set. If there is no oxygen present and no fish observed by the echosounder within the range then an acoustic data collection will be taken over the haul area using the same speed and distance. This means that a 0-oxygen station was treated as a 0 catch station and treated as an AKU in the sis-system.

Achievements

On the first part of the cruise Henrik Degel was cruise leader with Susanne Hansen as assistant cruise leader. On the second part Stina Hansen was cruise leader with Susanne Hansen as the assistant cruise leader. In this survey we had Captain Jesper J. B. Rasmussen on board the whole cruise.

We found bottom oxygen conditions above the threshold level of 1.5 ml/l at 28 stations and 18 stations were below the oxygen level which was treated as a 0-station and measured acoustically.

One station was abandoned as there was no alternative station. 4 stations were replaced with alternative stations.

From a total of 51 stations, 50 were valid and fished with the TV3 trawl or measured acoustically.

We also had the time to perform two extra stations.

Beside the fishing we had 50 Bongos, 45 MIK and 4 station doing Haps collections for DMU.

CTD casts were conducted on every fishing station as well as on selected Bongo stations, adding up to a total of 88 CTD casts.

Results

Cod

The following single fish data from subsamples of 10 cod per cm group per ICES SD were collected: liver weight, gonad weight and gutted and total weight in both the spring and fall surveys. Furthermore otolith and stomach samples are taken from these cod. During the spring surveys, additional determination of maturity is performed by visual inspection of the gonads according to the “Manual to determine gonadal maturity of Baltic cod” (Tomkiewicz et al., 2002).

During this survey a total of 10.200 kg cod were caught, 34.356 cod were length measured (see figure 1) and single fish data and otolith and stomach samples and were collected from 523 individual fish.

Sprat and herring

10 sprat and herring per scm group were collected from each sub division. The fish were frozen on board and brought back to the laboratory for further analyses of maturity, age, weight and length.

Extra tasks

Sampling of zooplankton, ichthyoplankton and *Mnemiopsis leidyi*:

The alien species *Mnemiopsis leidyi* was detected east of Bornholm for the first time in spring 2007. In November 2007 DTU Aqua initiated monitoring the distribution of this species during the night time on the Danish BITS and in 2008 we adopted the station grid for zooplankton investigations used by our colleagues from GEOMAR in Kiel, Germany. During the present survey, it was again one of the tasks to investigate the distribution and abundance of different zooplankton species in the survey area during night time. A total of 186 plankton samples were collected with the different plankton sampling gears for later examination in the laboratory. No specimens of *Mnemiopsis leidyi* were detected in the survey area during this cruise.

Whiting:

Stomachs of whiting were collected from the few ones caught.

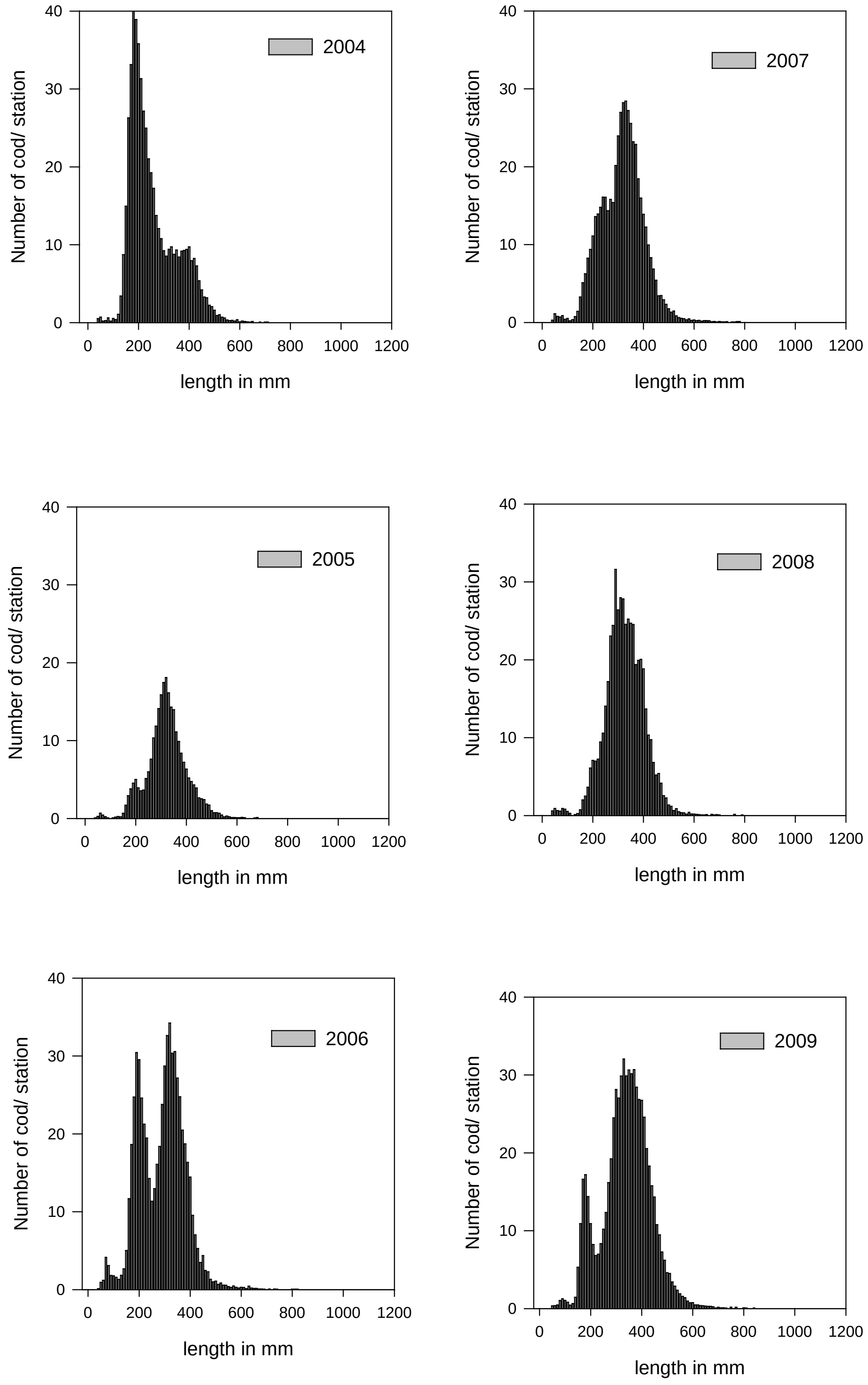


Figure 1. Average length distribution of number of cod on the BITS Q.4 surveys 2004-2009.

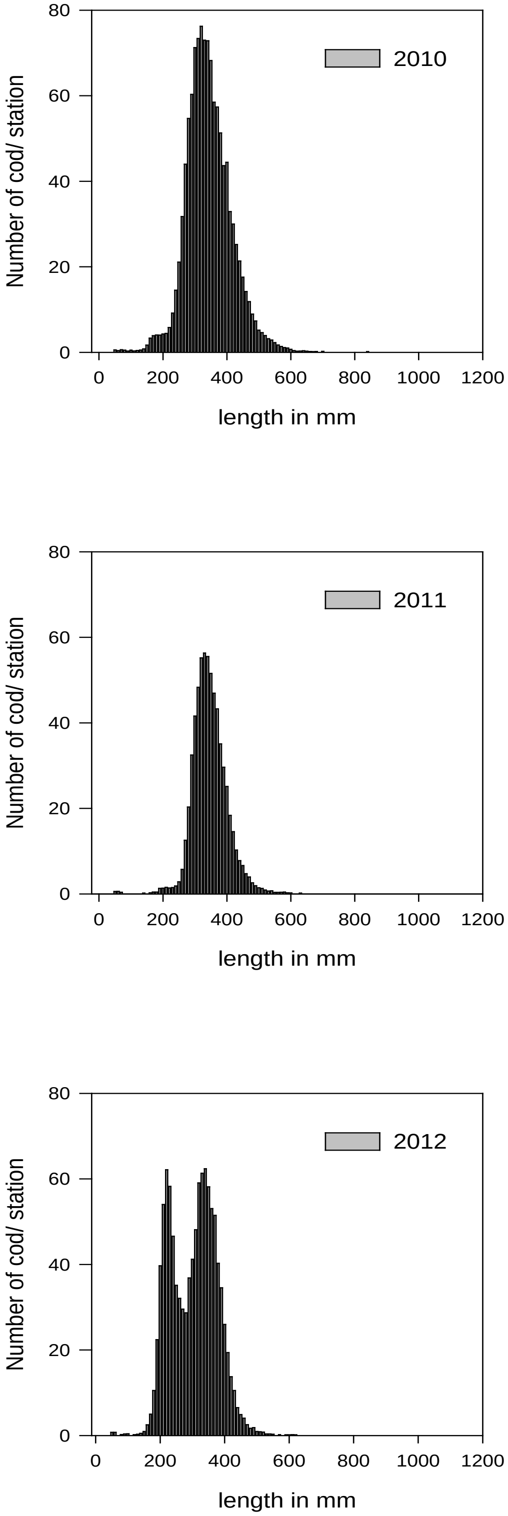


Figure 1 cont. Average length distribution of number of cod on the BITS Q.4 2010-2012

Table 1. Species caught in the survey

speciesCode	number
AF1	
AF2	
AF4	
AF5	
BMS	
BRS	38224
FHK	299
HVL	14
ISG	1
MAK	1
PGH	56
RSP	154
SAD	
SAK	1
SIL	138564
SKL	
SKR	394
STB	4
STG	
TAN	
THS	2
TOR	34507
ULK	9

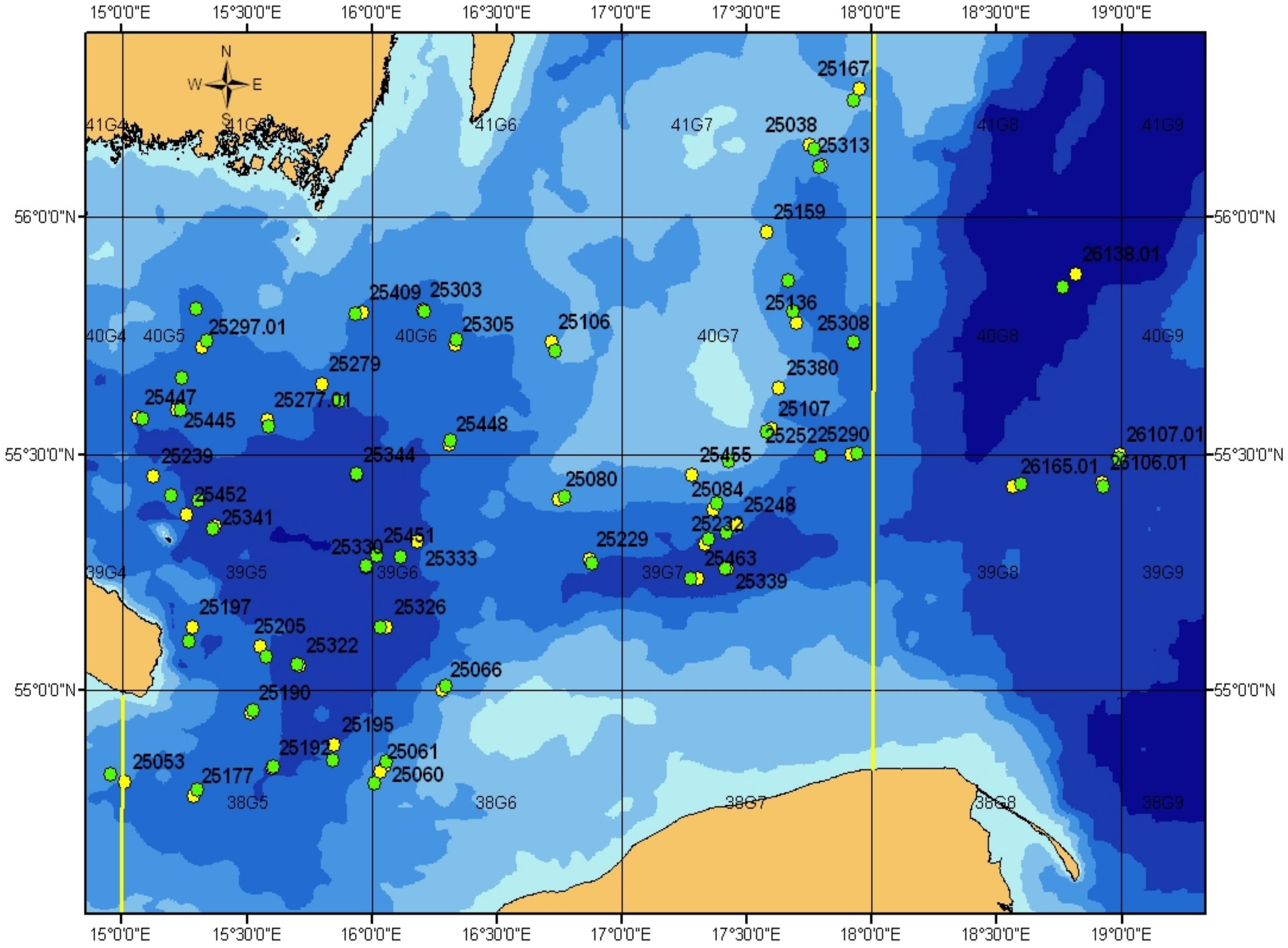


Fig. 3: Survey map with stations. Green dots indicate conducted stations and yellow dots planned stations.

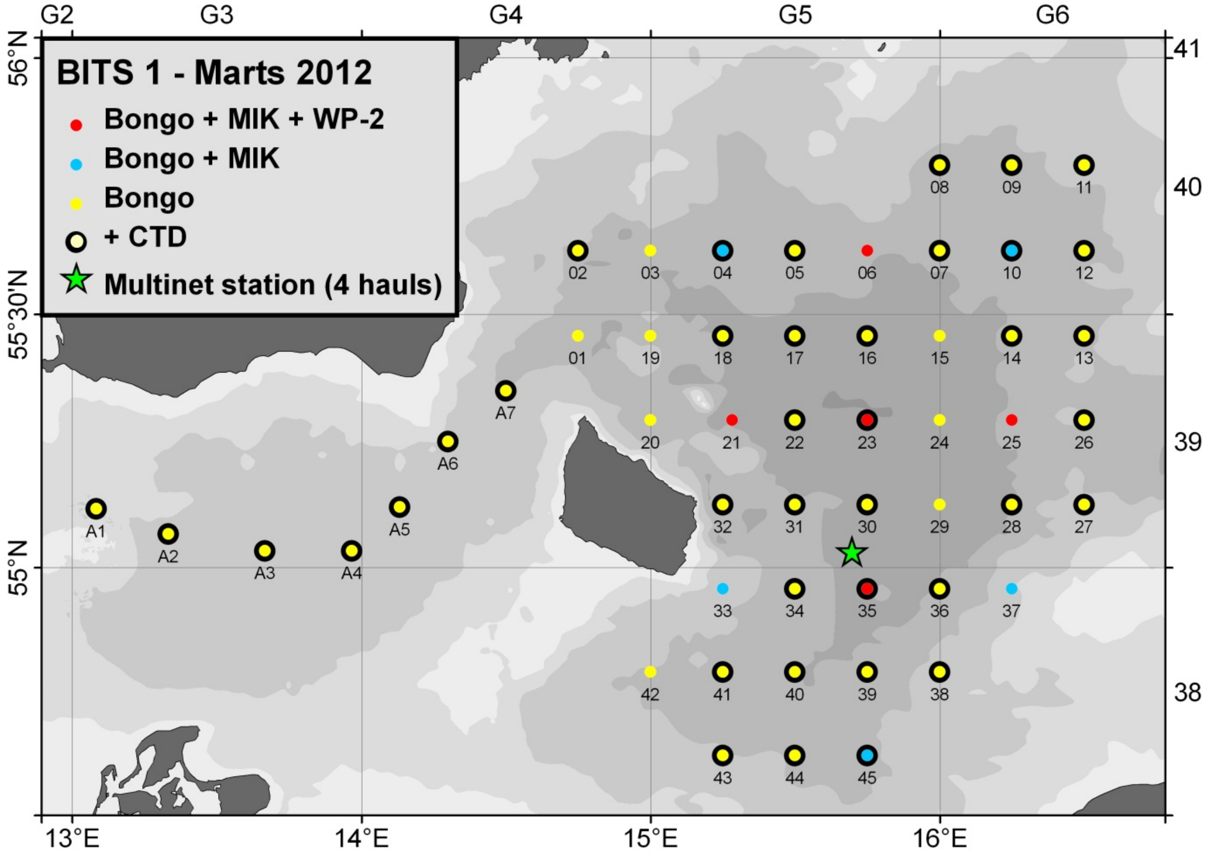


Fig. 4: Survey map showing the Bongo, MIK, WP2 and Multinet hauls conducted during the night time on the BITS-1 2012.

**Federal Institute for Rural Areas,
Forestry and Fisheries**

Institute of Baltic Sea Fisheries

vTI
Johann Heinrich
von Thünen-Institut
Bundesforschungsinstitut
für Ländliche Räume, Wald
und Fischerei

Alter Hafen Süd 2, 18069 Rostock Fon + 49 381 8116-123 Fax +49 381 8116-199 30.11.2011 andres.velasco@ti.bund.de

Cruise report
Cruise number 663 FRV „SOLEA“
24/10/- 09/11/2012

Baltic International Trawl Autumn Survey (BITS) in the Arkona Sea and in the Mecklenburg Bight (ICES SD 24+22)

Scientist in charge: **Dr. A. Velasco**

1. Summary

The 663th cruise of the FRV “SOLEA” is the 31st November survey since 1981. It was part of the Baltic International Trawl Survey (BITS) which was coordinated by ICES WGBIFS. The main objective of the survey was the estimation of fishery independent stock indices for both Baltic cod stocks, flounder and other flat fish. Technical problems and bad weather conditions caused a few interruptions. In total 51 fishery and 50 hydrography stations were carried out.

A preliminary analysis of the survey results suggests a stronger year class of cod in 2011 as compared with the previous year class 2010 (recruits at length range 10-25 cm). The proportion of recruits between 26-40 cm was lower in all depth layers as compared to the previous year.

The abundance of flounder decreased in all depth layers as compared to the previous year, too.

The oxygen concentration close to the bottom was above 2 $ml*l^{-1}$, with exception of two stations.

Verteiler:
BLE, Hamburg
Schiffsführung FFS „Solea“
BMELV, Ref. 614
vTI, Präsidialbüro (M. Welling)
vTI, Verwaltung Hamburg
vTI, FOE
vTI, OSF
vTI, SF
vTI, FIZ-Fischerei
Verantw. Seeeinsatzplanung, Frau A. Sell
BFEL Hamburg, FB Fischqualität
IFM-GEOMAR, Kiel
Institut für Fischerei der Landesforschungsanstalt
LA für Landwirtschaft, Lebensmittels. u. Fischerei
BSH, Hamburg
Deutscher Fischerei-Verband e. V., Hamburg
Leibniz-Institut für Ostseeforschung
Doggerbank GmbH
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Kutter- und Küstenfisch Sassnitz
Landesverband der Kutter- und Küstenfischer
Sassnitzer Seefischer
Deutsche Fischfang Union Cuxhaven
Fahrtteilnehmer

2. Research programme

The cruise took place from 24th October until 09th November 2012. Corresponding to the recommendations of the WGBIFS in 2007, the survey of the FRV “SOLEA” covered the subdivisions 22 and 24 (Figure 1).

The following stock assessment objectives were covered during the survey:

- Collecting data for assessing stock indices, the structure and recruitment of the stocks, especially for cod and flatfish
- Monitoring the composition of fish species in the western Baltic Sea
- Collecting samples of cod and flounder for biological investigations (i.e. sex, maturity, fecundity, age)
- Monitoring the actual hydrographical situation in the survey area

3. Narrative

The internationally coordinated trawl survey is planned as a Stratified Random Survey where ICES subdivisions and depth layers are used as strata. A total of 57 stations (52 in subdivision 24 and 5 in subdivision 22) were planned for the German part of the survey which covered the southern part of ICES subdivision 22 and subdivision 24 in total. The haul positions were selected from the TOW Database by the coordinator of the BITS surveys (ICES 2008, WGBIFS report as reference). 51 fishing stations were realized and can be used for stock assessment. The fishing hauls were carried out between 7:00 and 15:00 UTC (8:00 and 16:00 local time).

The positions of the trawl hauls are shown in Figure 1. 5 fishing hauls and 5 hydrographic stations were done in subdivision 22, and 46 fishing hauls and 45 hydrographical stations were realized in subdivision 24.

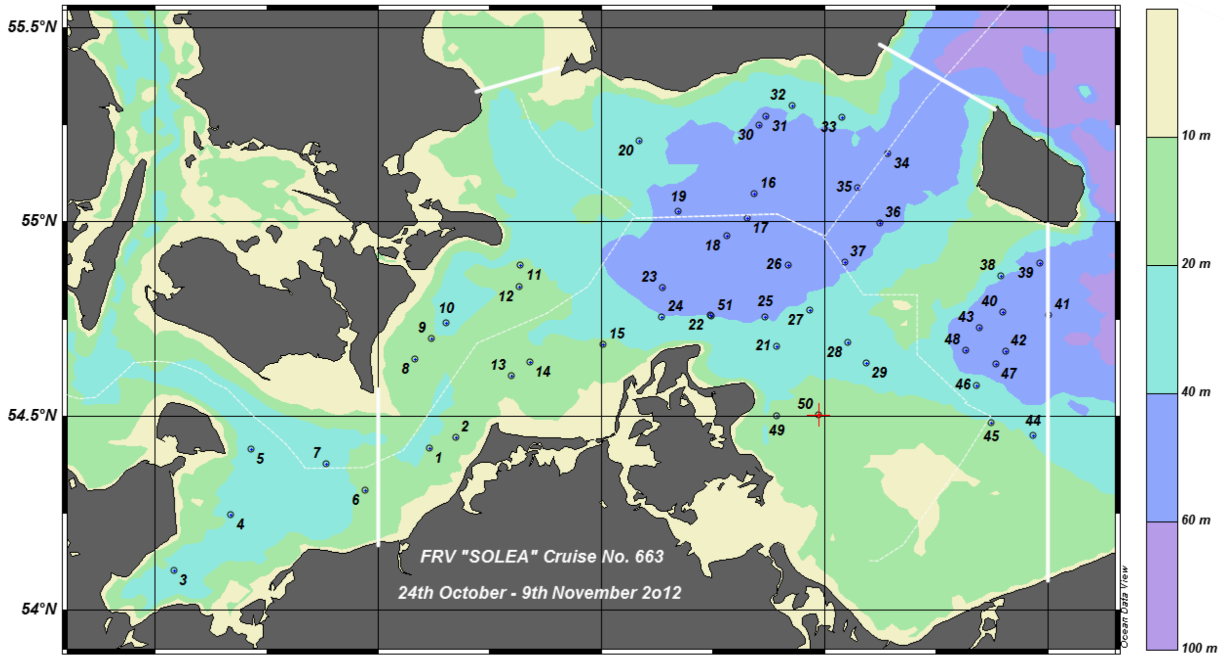

Figure 1 Stations of the 663th FRV “SOLEA” cruise (Ocean Data View, R. Schlitzer, www.awi-bremerhaven.de/GEO/ODV)

The numbers of fishing hauls and hydrographic stations by subdivision and 10 m depth layers are given in Table 1. Most hauls in subdivision 22 were located at depths from 20 m to 29 m and 25 of 46 hauls in subdivision 24 between 40 and 59 m.

Tab. 1 Sampling intensity (evaluated fishing stations)

Area		Stations		
Subdivision	**Stratum Depth [m]**	**Total trawl distance [sm]**	**Fishing [n]**	**Hydrography [n]**
22	**2 [10-19]**	1.47	1	1
	3 [20-29]	6.16	4	4
24	**2 [10-19]**	15.66	10	10
	3 [20-29]	8.09	5	5
	4 [30-39]	9.20	6	5
	5 [40-49]	27.46	18	18
	6 [50-59]	10.64	7	7

Trawling was done with the standard BITS trawl “TV3 520#“. The stretched mesh size in the codend was 20 mm. The duration of each haul was 30 minutes at a velocity of 3 kn as required in the BITS manual. The total catch of a haul was analysed to determine species composition in weight and number as well as the length distribution of all species. Subsamples of cod, flounder, plaice, dab and turbot were investigated concerning sex, maturity and age.
Vertical profiles of the hydrographical parameters temperature, salinity and oxygen were sampled from the surface to the bottom immediately after every fishing haul with a CTDO probe (Sea Bird 19+ 4346).

4. Preliminary results

4.1 Biological data

In total 945 cod, 672 flounder, 652 dab, 531 plaice and 150 turbot were collected for measuring length, weight, sex, maturity and age. The total catches and numbers of length samples of cod and flounder are given in Table 2 by subdivision and depth stratum.

Tab. 2: Numbers of length measurements of cod and flounder by depth stratum and ICES subdivision

Area		Sample			
		Cod		Flounder	
Subdivision	**Depth [m]**	**Weight [kg]**	**Number [n]**	**Weight [kg]**	**Number [n]**
22	**10-29**	28.0	305	34.2	174
24	**10-19**	125.2	651	182.5	719
	20-39	986.3	2559	386.8	2364
	40-59	2189.5	9290	944.8	4089

The mean catch per half hour (CPUE) was 43.1 kg of cod and 20.1 kg of flounder. In general the catch composition was dominated by cod. However, flounder, dab and plaice were also abundant in the catches. The mean fraction of cod biomass in the hauls was 42.2 % and mean fraction of flounder, dab and plaice was 19.6 %, 7.8 % and 14.3 %, respectively. Sprat and herring represented 8.8 % of the total biomass in mean.
The highest abundances in weight and number of cod and flounder were observed in subdivision 24 in depths between 40 - 59 m for cod and in depths between 20 – 39 m for flounder.
Mean CPUE of cod and flounder are given in Table 3 by subdivision and depth stratum.

Tab. 3 Mean CPUE of cod and flounder and average individual weights by subdivision and depth

Area		Catch							
		Cod				Flounder			
Subdivision	**Depth [m]**	**Weight [kg/sm]**	**Number [n/sm]**	**Avg-Weight [g]**	**Stations [n]**	**Weight [kg/sm]**	**Number [n/sm]**	**Avg-Weight [g]**	**Stations [n]**
22	**10-29**	3.7	40	91.8	5	4.5	23	196.8	5
24	**10-19**	8.0	42	192.3	10	11.6	46	253.8	10
	20-39	57.0	148	385.4	11	22.4	137	163.6	11
	40-59	57.5	244	235.7	25	24.8	107	231.1	25

The frequencies of cod grouped by subdivision and depth strata are presented in Figures 1 to 3.

Noteworthy is the abundance of cod recruits ranging in length from 10 to 25 cm in subdivision 22 of the year class 2010. The length range 10–25 cm of young cod has also increased compared to the previous year in all depth layers in subdivision 24. (Table 4 and Figures 1 to 3).

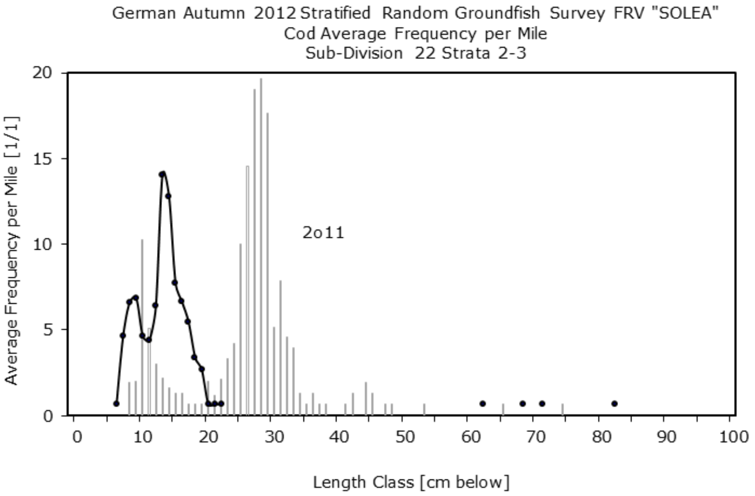

Fig. 1 Length frequencies of cod in number per mile in depth strata 10 m to 29 m in SD 22 2012 (line) and 2011 (bars), (5 Hauls)

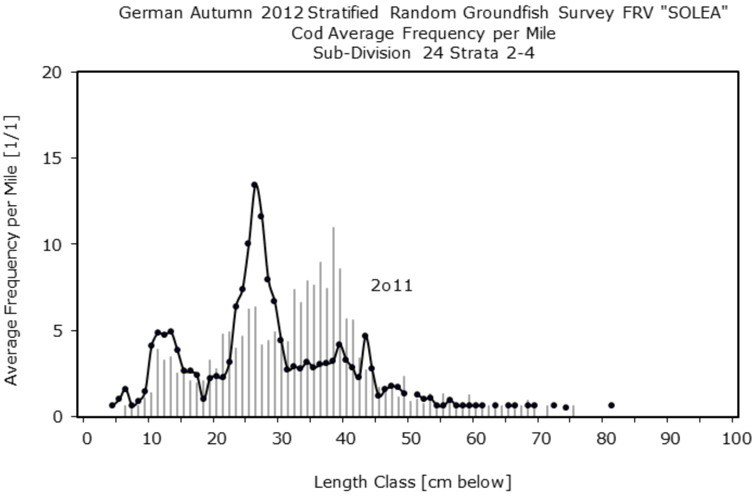

Fig. 2 Length frequencies of cod in number per mile in depth strata 10 m to 39 m in SD 24 2012 (line) and 2011 (bars), (21 Hauls)

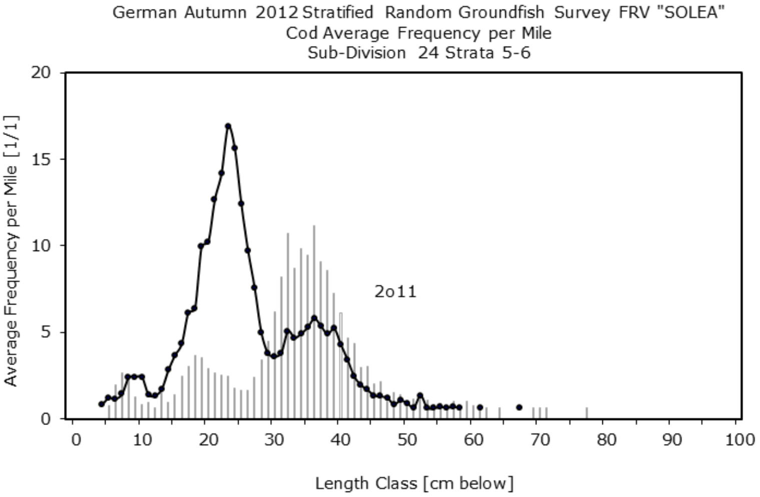

Fig. 3 Length frequencies of cod in number per mile in depth strata 40 m to 59 m in SD 24 2012 (line) and 2011 (bars), (25 Hauls)

Tab. 4 Recruitment of length groups of the year 2012 in comparison to the previous year

Area		Catch	2012		
Subdivision	Depth [m]	Length range [cm]	Number [n]	Number/ Mile [n/sm]	Trawl distance [sm]
22	10-29	26 - 40	0	0	7.6
24	10-19	26 - 40	73	5	15.7
	20-39	26 - 40	1103	64	17.3
	40-59	26 - 40	2591	68	38.1
22 - 24	10-59	26 - 40	3767	48	78.7
22	10-29	10 - 25	283	37	7.6
24	10-19	10 - 25	514	33	15.7
	20-39	10 - 25	442	26	17.3
	40-59	10 - 25	3348	88	38.1
22 - 24	10-59	10 - 25	4587	58	78.7

Area		Catch	2011		
Subdivision	Depth [m]	Length range [cm]	Number [n]	Number/ Mile [n/sm]	Trawl distance [sm]
22	10-29	26 - 40	207	17	12.0
24	10-19	26 - 40	61	5	12.2
	20-39	26 - 40	1374	56	24.4
	40-59	26 - 40	3543	88	40.2
22 - 24	10-59	26 - 40	5185	58	88.8
22	10-29	10 - 25	275	23	12.0
24	10-19	10 - 25	112	9	12.2
	20-39	10 - 25	511	21	24.4
	40-59	10 - 25	724	18	40.2
22 - 24	10-59	10 - 25	1622	18	88.8

Under the assumption that the survey covered all nursery grounds of one-year old cod, a stronger year class 2011 than the one-year class 2010 can be assumed.

4.2 Hydrographical data

Figure 4 shows the distribution of temperature, salinity and oxygen near the bottom and at the surface in the covered area.

The hydrography was characterised by typical autumn conditions with surface temperatures between 8.2 °C and 11.1 °C. The salinity of the surface water decreas from 11 to 7.6 from west to east. The lowest temperature value was found in the area southwest of Bornholm at 5.4 °C. The salinity above the permanent halocline at a depth of 30 m in the Arkona Basin was approx. 8.1. The salinity increased below the halocline up to 17.5 at a depth of 45 m. The maximum salinity was observed in the Mecklenburg Bight with 20.8 at 12.7 °C (water depth of 21.2 m).

The oxygen concentration close to the bottom was above 2 ml*l^{-1} (2.24-7.43 ml*l^{-1}), with exception of two stations (41: 1.58 ml*l^{-1} and 16: 1.61 ml*l^{-1}).

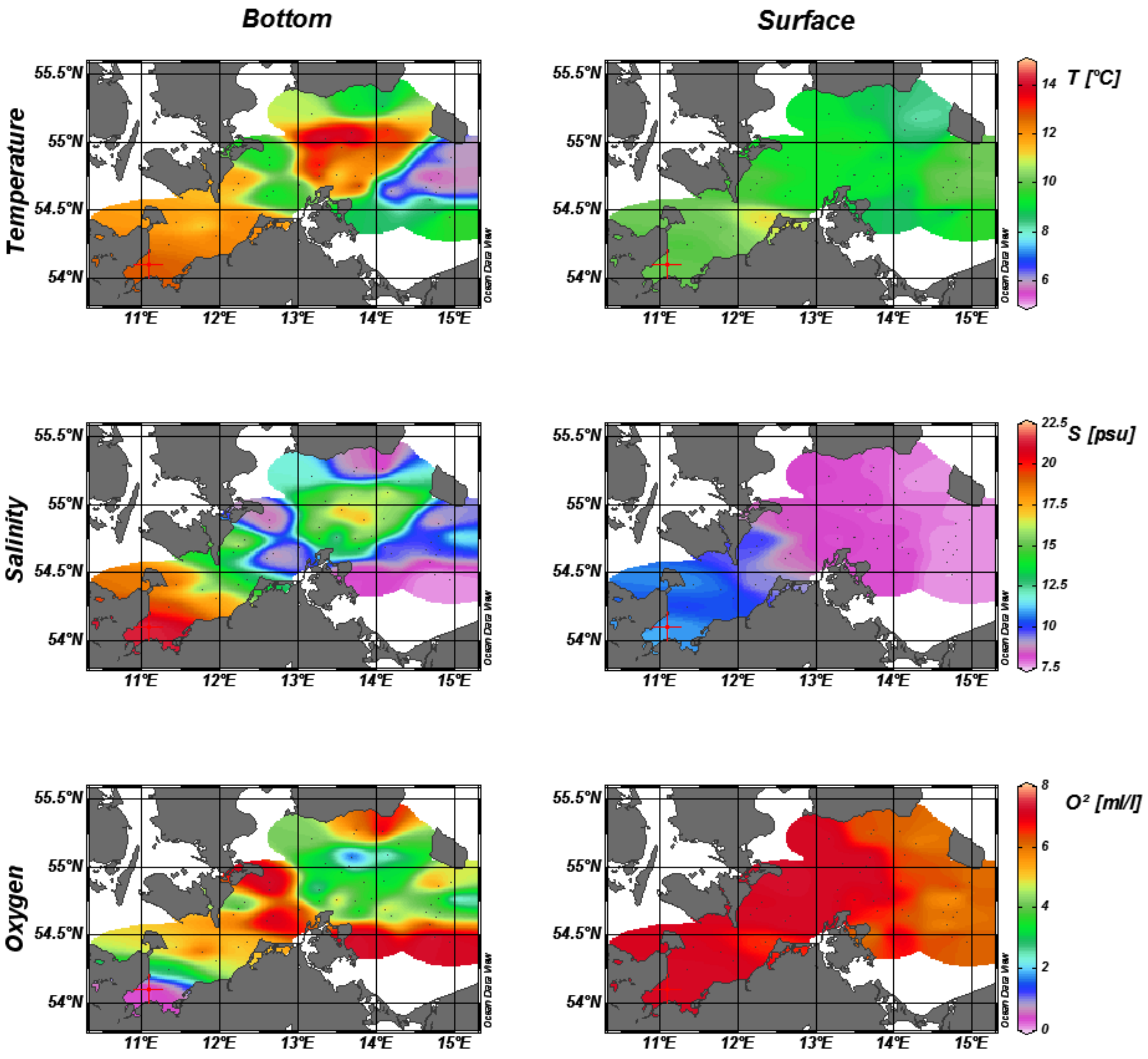

Fig. 4: Hydrography of the survey near the bottom (left) and at the surface (right)

6. Participants

A. Velasco	vTI-OSF	Scientist in charge
A. Müller	vTI-OSF	Technician
T. Rohde	vTI-OSF	Technician
S. Peters	vTI-OSF	Technician
R. Wiechert	vTI-OSF	Technician
L. Weiand	University of Bremen	Student helper
H. Rohde	University of Greifswald	Student helper

7. Acknowledgements

I would like to express my gratitude to Capt. Karow and his crew on the FRV "Solea" for their cooperation.

Scientist in charge

National Marine Fisheries Research Institute, Gdynia (Poland)
Institute of Food Safety, Animal Health and Environment
"BIOR" Riga (Latvia)

THE CRUISE REPORT

FROM THE JOINT LATVIAN-POLISH BITS 4 Q SURVEY ON THE POLISH R.V. "BALTICA" IN THE CENTRAL-EASTERN BALTIC

(03-11 December 2012)

by
Ivo Sics*, Zaporowski Radosław ** and Bartosz Witalis**

* Institute of Food Safety, Animal Health and Environment "BIOR" Riga (Latvia),

** National Marine Fisheries Research Institute, Gdynia (Poland)

photo: Włodzimierz Grygiel

Gdynia - Riga, December 2012

INTRODUCTION

The joint Latvian-Polish BITS survey, conducted in the period of 03-11.12.2012 on the r.v. “Baltica” , was based on the agreement between the Institute of Food Safety, Animal Health and Environment “BIOR” in Riga and the National Marine Fisheries Research Institute (NMFRI”) in Gdynia. The joint Latvian-Polish BITS 4Q survey was conducted in the Latvian and Sweden EEZs (the ICES Sub-divisions 26N and 28). It was part of the Baltic International Trawl Survey (BITS) which was coordinated by ICES WGBIFS.

The main aims of reported cruise were:

1. The collecting material to investigate the distribution, abundance and biological structure of cod stock,
2. Determine distribution and abundance of cod recruits. Estimates of year – class strength of cod,
3. The collecting material to investigate the distribution abundance and biological structure of flounder and turbot stocks,
4. Collect data on cod feeding,
5. Collect samples of oceanography (temperature, salinity, oxygen)
6. Hydro-acoustic recording during trawl stations and in time of trip between trawls stations.

MATERIALS AND METHODS

Personnel

The BITS Q4 - 2012 survey scientific staff was composed of nine persons, i.e.:
Zaporowski Radosław, NMFRI, Poland - cruise leader,
Krzystof Radtke, NMFRI, Poland - ichthyologist.
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Narrative

The reported survey took place during the period of 03-11 December 2012. The at sea researches were conducted within the Latvian and Sweden EEZs (the ICES Subdivisions 26N and 28) moreover, inside the Latvian territorial waters not shallower than 20 m (the ICES Sub-division 28).

The vessel left the Gdynia port (Poland) on 03.12.2012 after midnight and was navigated towards the south-western corner of the Latvian waters (Fig. 1). The direct at sea researches begins on 03.12.2012 noon and were ended on 10.12.2012, and the r/v “Baltica” returned back to the homeport. The survey was formally ended on 11.12.2012 in Gdynia. The bad weather affected the fulfilling the survey tasks.

Overall, nine days were utilized for fulfilling the Latvian-Polish BITS survey research tasks, including a time for the vessel translocation in/out the research area.

Survey design and realization

The r.v.“Baltica” realized 22 bottom trawl control-hauls from the 30 planned (Table 1). Four hauls were not performed due to low oxygen concentration (below 1 ml/l) near bottom. All trawl catches were performed in the daylight. The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The standard trawling duration was 30 minutes. However, in the case of 15 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder. The mean speed of vessel while trawling was 3.0 knots. Overall, 4 hauls were conducted in Sweden EEZ and 18 hauls within the Latvian EEZ (incl. the Latvian territorial waters; Fig. 1).

The length measurements in the 1.0-cm classes was realised for 581 cod, 675 flounder, 3 turbot. The length measurements in the 0.5-cm classes was realised for 1466 herring and 1237 sprat. In total, 199 cod and 128 flounder individuals were taken for biological analysis. The details about fish biological sampling are presented in Table 2.

Acoustic data, i.e. the echo-integration records (S_A = NASCs; Nautical Area Scattering (Strength) Coefficient) were collected with the EK-60 scientific echosounder during fishing operations and on the distances between consecutive hauls. Echo-sounding data collected during the BITS survey were delivered to the Latvian researchers for further analysis.

Directly before every haul, the seawater temperature, salinity and oxygen content were measured continuously from the sea surface to a bottom. The seawater samples were taken also at the standard HELCOM stations. Totally, 27 hydrological stations were inspected with the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler’s method.

Meteorological observations of wind velocity and directions and the sea state were realized at the actual geographic position of each control-haul.

RESULTS

Fish catches and biological data

The control-catches basic results collected in December 2012 during the Latvian-Polish BITS-4Q survey are presented in Table 1. Overall, 11 fish species were recognized in hauls performed in the central-eastern Baltic. Herring dominated by mass in the ICES Sub-divisions 26N and 28 with the average share of 58.9%, respectively. Flounder was the next species most frequently represented in terms of mass in SD 28 (21.7%), while the share of flounder mass amounted in SD 26 was 0.01% only. Sprat was the third species most frequently represented in terms of mass in SD 26 and 28 (16.6%). Share of cod in SD 26 and SD 28 were 0.2 and 2.3% respectively. By-catch of other fishes was insignificant.

Mean CPUE for all species in investigated areas amounted 218.5 kg/h, and in this 25.5, 264.2, 584.2 and 215.1 kg/h were for cod, flounder, herring and sprat, respectively. The mean CPUE of cod in the ICES Sub-division 26N was 9.1 kg/h, but in the ICES SD 28 was 32.8 kg/h. The mean CPUE of flounder in the ICES Sub-division 26 was 0.9 kg/h, and in the ICES Sub-division 28 was 330 kg/h.

Total catch of fishes and total number of realized hauls in the Latvian and Sweden EEZ's during reported BITS survey is presented in the table below:

EEZ	Number of hauls	Total catch kg				
		Cod	Herring	Sprat	Flounder	Others
Latvian EEZ	18	116.28	2271.11	755.16	1003.49	9.33
Sweden EEZ	4	0.38	458.07	14.79		1.62

The length distribution of cod, flounder, herring and sprat, according to the ICES Subdivisions 26N and 28 and particular hauls is shown in Figures 2-5 and Tables 3-6.

Cod

The total length of cod noted in samples ranged from 5 to 48 cm and specimens from the length classes of 19-27 cm dominated in samples from the ICES Sub-division 28, respectively. The smaller fish, with a length range of 6-19 cm occurred in ICES Sub-division 28 and constituted about 10 % of all measured cod in that sub-division (Fig. 2).

Flounder

The total length of flounder in samples ranged from 14 to 36 cm, with dominating length classes of 19-27 cm in the ICES Sub-division 28 (Fig. 3).

Herring

The length range of collected herring was 10-25 cm, and specimens from the length classes of 16-21 cm were most frequently represented in samples from the ICES Subdivision 26N and 28, respectively (Fig. 4).

Sprat

The length range of collected sprat was 7-14 cm, and the length distribution considerably differed between the ICES Sub-divisions 26N and 28. The length frequency apexes of 12-cm and 8-cm were characteristically for sprat samples from the ICES Sub-divisions 26N and 28, respectively (Fig. 5).

Hydrological and meteorological characteristics

Graphic illustration of the main hydrological parameters changes in the Gotland Basin is shown in Figures. Hydrological parameters were measured at each catch – station location and at some the standard HELCOM hydrological stations (Fig.1.). Measurements were inspected with the Neil-Brown CTD-probe combined with the rosette sampler. Oxygen content was determined by the standard Winkler's method. The STD row data aggregated to the 1-m depth stratum. The Oxygen probes ware taken on every 10 meters. The salinity parameter was presented in Practical Salinity Unit (PSU).

The most frequently wind (Fig. 6.) was: SSE. The wind speed varied from 0.5 m/s to 15.3 m/s and average speed was 7,9 m/s. The air temperature ranged from -2.3 °C to 4.8 °C, and average temperature was 1.1 °C.

On the surface (Fig.7.) seawater for all hydrological points oxygen content range from 7.19 (haul 19) to 8.76 ml/l (haul 06). Salinity varied between 6.67 (hydrological station 43) and 7.16 (haul 13). Temperature varied from 5.44°C (haul 21) to 8.86°C (hydrological station 40A). The average of measurements was: oxygen content 7.86 ml/l, salinity 7.01 and temperature 6.81 °C.

The temperature of near bottom (Fig.8.) layer was changing in range from 4.28 °C at the haul 11 to 8.05 °C at haul 12. The mean near bottom temperature was 5.89°C. Salinity in the bottom waters varied from 7.09 to 12.09 (the mean was 8.81). The low values of salinity were noticed haul 07. The highest values of salinity were noticed in Gotland Deep hydrological station 37. Oxygen content varied from 0.00 ml/l in deepest parts of investigated area to 9.32 ml/l at haul 07. The mean oxygen content in near bottom water was 3.79 ml/l.

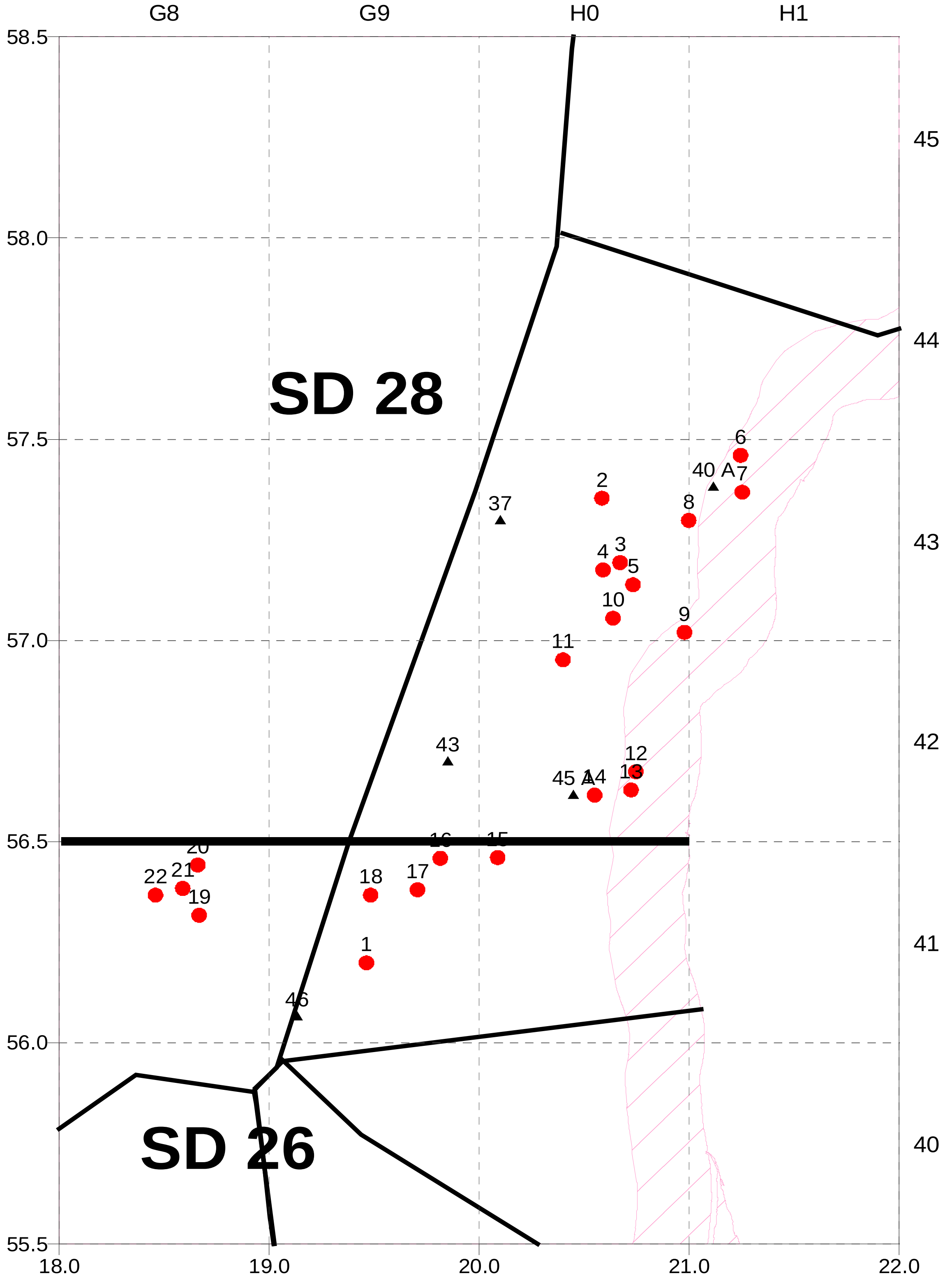

Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with black triangles), black lines - national fishing zone borders.

Table 1. Catch results during the Latvian-Polish BITS; r/v "Baltica" 03-11 December 2012.

Haul number	Track number	Date	ICES rectangle	ICES Sub-div.	Depth (m)	Geographical position of the catch station				Time of		Haul duration [min.]	Total catch kg	all species CPUE [kg/h]
						start		end						
						latitude 00°00' N	longitude 00°00'E	latitude 00°00' N	longitude 00°00'E	shutting net	pulling up net			
1	26142	03.12.2012	41G9	26	102	56°11′ 9	019°27′ 8	56°11′ 5	019°27′ 1	15:00	15:15	15	417.515	1670.06
2	28092	04.12.2012	43H0	28	91	57°21′ 2	020°35′1	57°22′ 2	020°35′4	8:10	8:40	30	194.256	388.512
3	28075	04.12.2012	43H0	28	83	57°11′ 6	020°40′3	57°13′ 2	020°40′3	11:15	11:45	30	243.27	486.54
4	28074	04.12.2012	43H0	28	95	57°10′ 5	020°35′4	57°11′ 2	020°35′6	13:25	13:40	15		
5	28042	04.12.2012	43H0	28	64	57°08′ 3	020°44′0	57°09′ 0	020°44′2	14:50	15:05	15	12.57	50.28
6	28124	06.12.2012	43H1	28	66	57°27′ 6	021°14′7	57°29′ 0	021°14′8	8:05	8:35	30	799.358	1598.716
7	28121	06.12.2012	43H1	28	55	57°22′ 1	021°15′2	57°22′ 8	021°15′5	10:40	10:55	15	362.808	1451.232
8	28140	06.12.2012	43H1	28	65	57°17′ 9	020°59′9	57°18′ 7	021°00′2	13:20	13:35	15	138.484	553.936
9	28138	07.12.2012	43H0	28	30	57°01′ 2	020°58′7	57°01′ 6	020°59′6	8:50	9:05	15	90.795	363.18
10	28068	07.12.2012	43H0	28	87	57°03′ 3	020°38′3	57°03′ 8	020°38′9	11:25	11:40	15	1118.628	4474.512
11	28904	07.12.2012	42H0	28	86	56°57′ 1	020°24′0	56°58′ 3	020°25′3	14:05	14:35	30	47.53	95.06
12	28001	08.12.2012	42H0	28	43	56°40' 4	020°44′8	56°39′ 8	020°44′3	8:05	8:20	15	19.4	77.6
13	28161	08.12.2012	42H0	28	39	56°37' 7	020°43′4	56°37′ 1	020°42′6	8:55	9:10	15	314.097	1256.388
14	28169	08.12.2012	42H0	28	65	56°36' 9	020°33′0	56°36′ 5	020°32′3	10:20	10:35	15	375.49	1501.96
15	26160	08.12.2012	41H0	26	86	56°27' 6	020°05′3	56°27′ 2	020°04′3	13:20	13:35	15	18.334	73.336
16	26145	08.12.2012	41H0	26	113	56°27' 5	019°48′9	56°27′ 1	019°47′9	14:55	15:10	15	3.075	12.3
17	26199	08.12.2012	41G9	26	110	56°22' 8	019°42′4							
18	26144	08.12.2012	41G9	26	143	56°22' 0	019°29′0							
19	26141	09.12.2012	41G8	26	109	56°19' 0	018°40′0							
20	26125	09.12.2012	41G8	26	80	56°26' 5	018°39′6	56°27′ 1	018°40′1	8:45	9:00	15	215.45	861.8
21	26074	09.12.2012	41G8	26	74	56°23' 0	018°35′3	56°26′ 3	018°36′0	10:40	10:55	15	0.144	0.576
22	26224	09.12.2012	41G8	26	39	56°22' 0	018°27′5	56°27' 5	018°28′5	12:30	12:45	15	259.266	1037.064

Table 1 - continuation. Catch results during the Latvian-Polish BITS; r/v "Baltica" 03-11 december 2012.

Haul number	Track number	CPUE of particular fish species [kg/h]										
		Cod	Flounder	Turbot	Herring	Sprat	Eelpout	Three-spined stickleback	Lumpfish	Smelt	Four-horned sculpin	Sea scorpion
1	26142	34.54	1.12		53.692	1580.708						
2	28092	0.262	1.53		379.34	7.38						
3	28075	3.76			447.368	35.412						
4	28074											
5	28042					50.28						
6	28124	131.36	1370.814	2.200	88.904		0.020			3.658	0.420	1.34
7	28121	53.928	1101.792	6.564	280.464		0.4			1.384		6.7
8	28140	8.12	28.08		228.608	288.072				0.1056		
9	28138	7.6	52.64	3.14	85.412	214.388						
10	28068	0.232	0.64		4473.64							
11	28904				69.26	25.8						
12	28001				31.4	46.2						
13	28161	55.064	77.08	1.068	521.036	600.484						1.656
14	28169	34.44	7.24		1361.324	97.916						1.04
15	26160	0.4136	0.688		68.24	3.996						
16	26145	0.0128			10.86	1.428						
17	26199											
18	26144											
19	26141											
20	26125	1.536			798.152	59.1		3.012				
21	26074				0.516	0.0456		0.0144				
22	26224				1033.6			0.136	0.788			2.54

Table 2. Numbers of fish biologically analyzed during the BITS-4q survey in the ICES Sub-divisions 26N and 28; r.v. "Baltica" (03-11 December 2012).

Species	ICES SD	Number of samples	Number of fish measured	Number of fish analyzed
Cod	26	4		34
	28	9	581	165
	Total	13	581	199
Flounder	26	2	2	
	28	8	673	128
	Total	10	675	128
Turbot	26			
	28	4	3	7
	Total	4	3	7
Herring	26	6	355	
	28	11	1111	
	Total	17	1466	
Sprat	26	5	381	
	28	9	856	
	Total	18	1237	
All other species	26	5	57	
	28	10	52	
	Total	15	109	
Total	26	22	795	34
	28	51	6333	300
	Total	73	4071	334

Fig. 2. Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03 - 11 December 2012

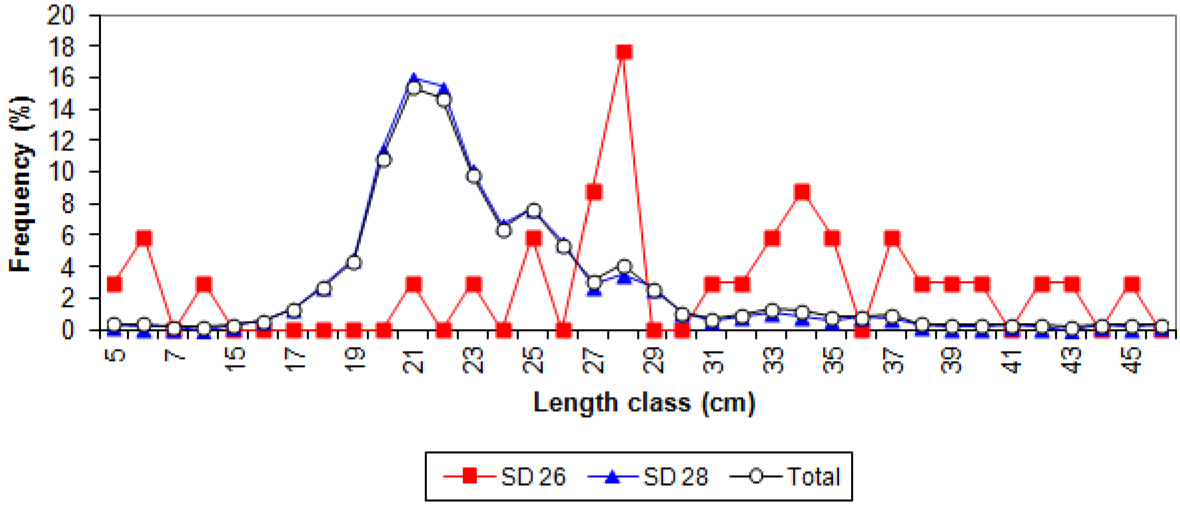

Fig. 3. Length frequency of flounder from Sub-Division 28 in the control catches during the r/v "Baltica" BITS survey, 03 - 11 December 2012

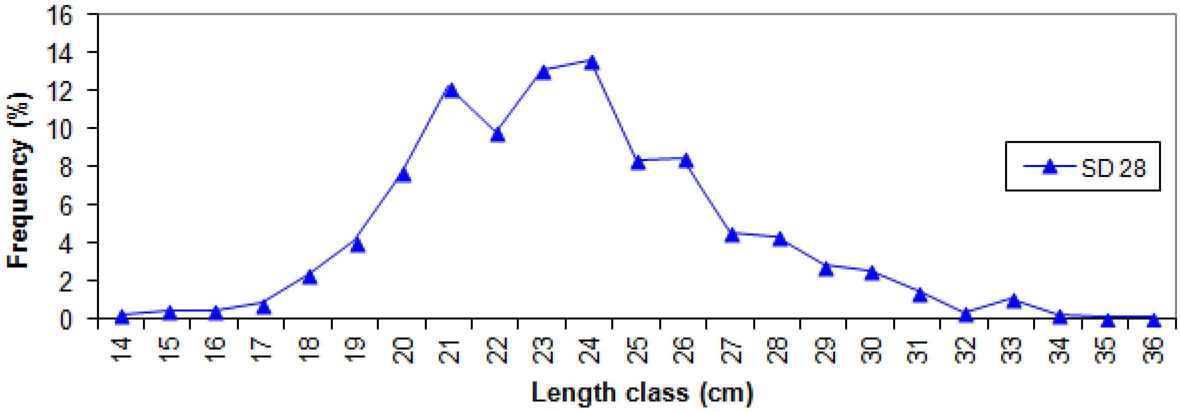

Fig. 4. Length frequency of sprat from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03 - 11 December 2012

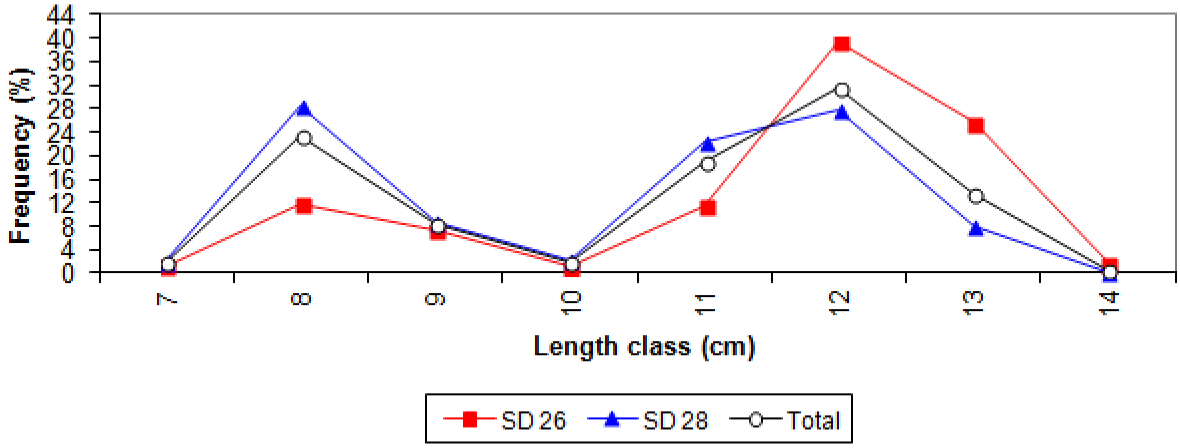

Fig. 5. Length frequency of herring from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03 - 11 December 2012

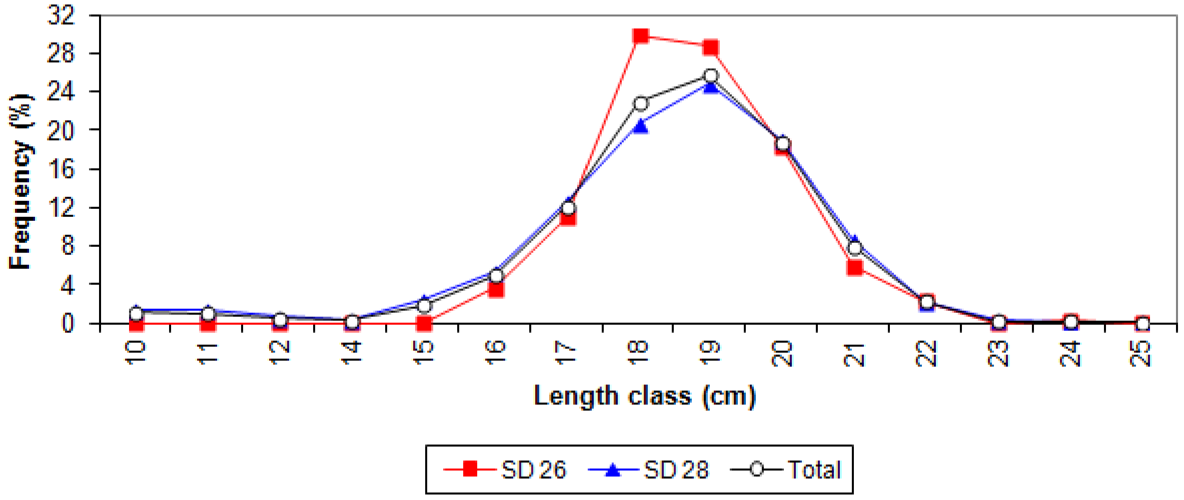

Table 3. Cod length measurements by hauls in the r/v “Baltica” Latvian - Polish BITS survey (03 - 11 December 2012); specimens grouped by 5-cm length classes.

		cm_groups								
Haul no	SD	5-9	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Sum
1	26			1	11	6	6	3	1	28
2	28				1					1
3	28			2	5	1	1			9
6	28	4	48	276	101	20	10	2	2	463
7	28		2	34	20	3	4	2	1	66
8	28		3	10	2		1			16
9	28			1	3	1	2			7
10	28		1							1
13	28		7	72	25	4		1		109
14	28		10	50	10	3		1		74
15	26	3		1						4
16	26	1								1
20	26					1				1
SD 26		4		2	11	7	6	3	1	34
SD 28		4	71	445	167	32	18	6	3	746
Total		8	71	447	178	39	24	9	4	780

Table 4. Flounder length measurements by hauls in the r/v “Baltica” Latvian - Polish BITS survey (03 - 11 December 2012); specimens grouped by 2-cm length classes.

Haul no	SD	cm groups											Sum
		14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-36	
1	26									1			1
2	28							3					3
6	28	1	3	17	53	81	78	32	17	16	4	2	304
7	28	3	4	24	53	53	42	28	23	3	3	2	238
8	28		2	4	14	8	7	10	2	1			48
9	28		1	4	21	26	17	13	3	4			89
10	28	1			1								2
13	28	1	1	1	16	14	32	17	13	8	4		107
14	28			2	2	2		2		1	1		10
15	26						1						1
SD 26		0	0	0	0	0	1	0	0	1	0	0	2
SD 28		6	11	52	160	184	176	105	58	33	12	4	801
Total		6	11	52	160	184	177	105	58	34	12	4	803

Table 5. Sprat length measurements by hauls in the r/v “Baltica” Latvian-Polish BITS survey (03-11 December 2012); specimens grouped by 1-cm length classes.

Haul no	SD	cm_group								Sum
		7	8	9	10	11	12	13	14	
1	26		13	13	1	13	55	40	4	139
2	28		3		1	10	16	8		38
3	28		6	2	1	19	40	21		89
5	28		1		1	28	42	5		77
8	28	4	58	8	3	24	23	5		125
9	28	9	70	19		5	1	1		105
11	28		18	7		21	36	18	1	101
12	28	5	69	31	6	19	13	1		144
13	28		6	2	7	45	33			93
14	28		12	6	1	21	35	9		84
15	26	2	2	2	2	11	45	17	1	82
16	26	3	23	8		4	7	7		52
20	26		5	4	1	16	43	34	2	105
21	26		2	1						3
SD 26		5	45	28	4	44	150	98	7	381
SD 28		18	243	75	20	192	239	68	1	856
Total		23	288	103	24	236	389	166	8	1237

Table 6. Herring length measurements by hauls in the r/v “Baltica” Latvian-Polish BITS survey (03-11 December 2012); specimens grouped by 1-cm length classes.

Haul no	SD	cm_group															Sum
		10	11	12	14	15	16	17	18	19	20	21	22	23	24	25	
1	26						2	2	5	9	3						21
2	28							4	13	22	27	8	4	1			79
3	28						2	9	25	27	19	3	2		1		88
6	28					8	18	27	32	16	7	3	3			1	115
7	28					2		15	37	29	25	4	4			1	117
8	28	16	10		3	8	8	13	14	29	12	9	2				124
9	28		1	2	1	7	12	20	26	16	6	1					92
10	28					1	2	13	18	37	26	7		1			105
11	28							5	16	26	23	18	4				92
12	28		2	1			5	9	11	18	21	9	1		1		78
13	28		2	4		1	12	17	26	27	16	18	1				124
14	28						1	7	12	28	29	15	4	1			97
15	26						1	9	30	21	20	11	2		1		95
16	26							1	12	21	14	3	3				54
20	26						7	20	30	26	11	4	3				101
21	26							1	1	1							3
22	26						3	6	28	24	17	3					81
SD 26							13	39	106	102	65	21	8		1		355
SD 28		16	15	7	4	27	60	139	230	275	211	95	25	3	2	2	1111
Total		16	15	7	4	27	73	178	336	377	276	116	33	3	3	2	1466

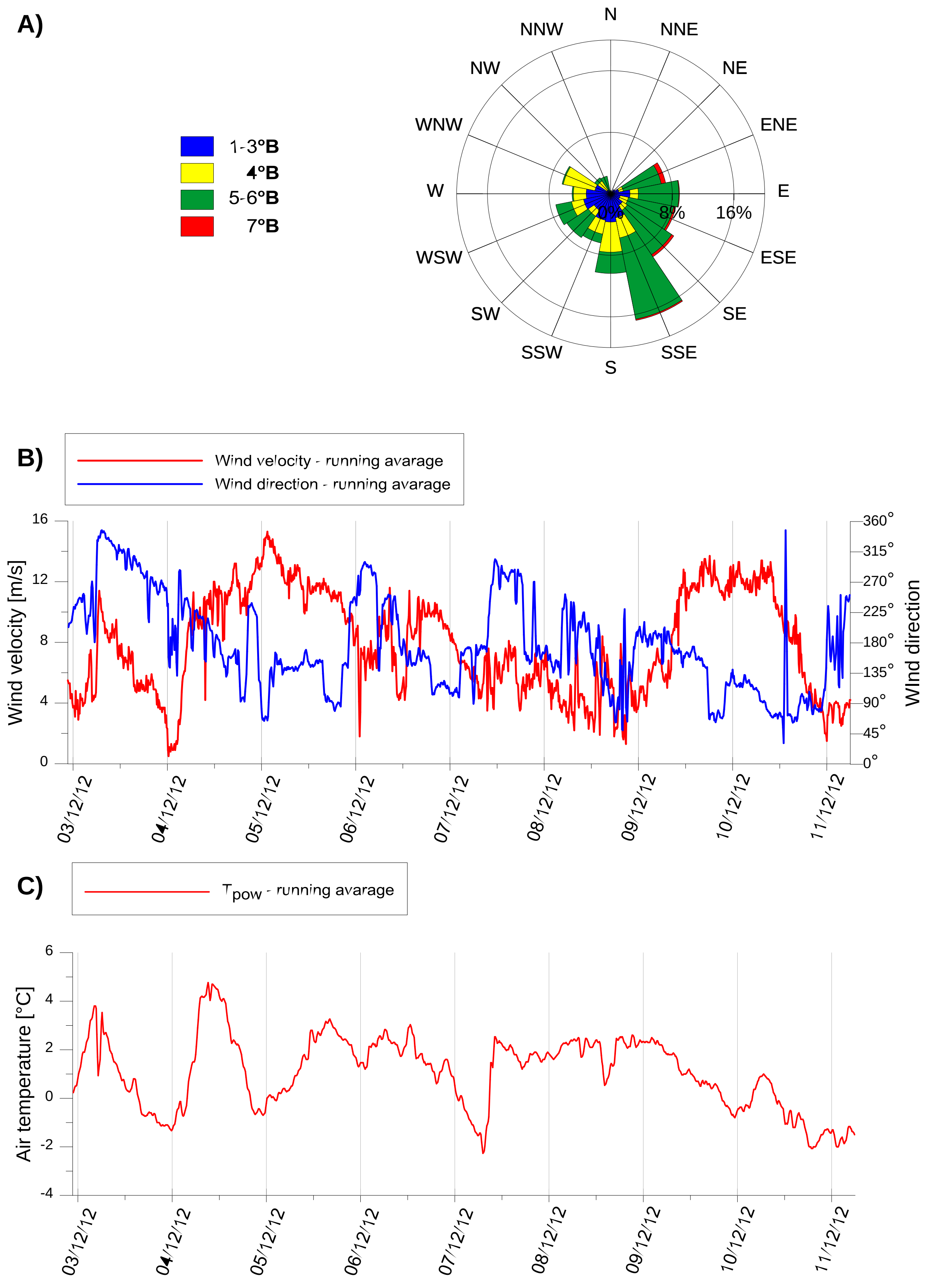

Fig. 6. Changes of the main meteorological parameters in (December 2012)

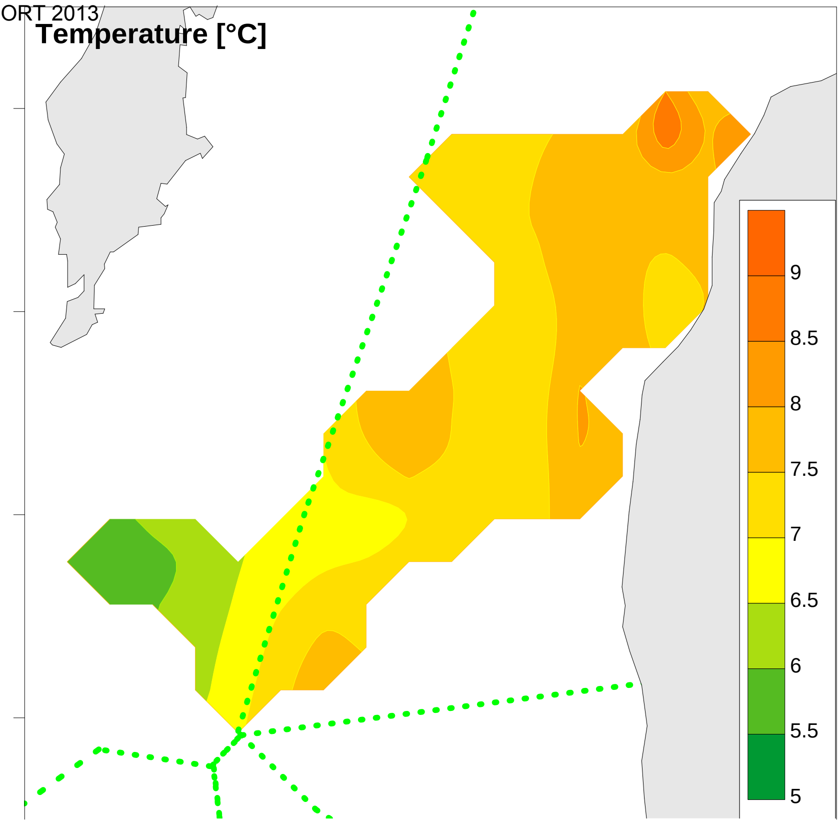

Fig. 7A. Distribution of the seawater temperature content in the surface layer (December 2012)

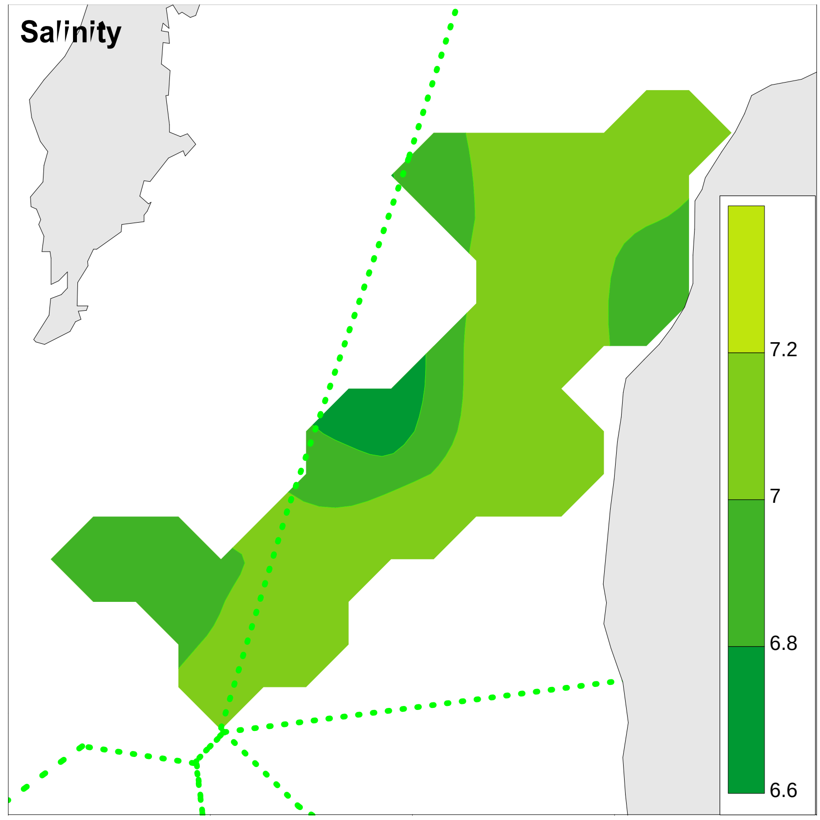

Fig. 7B Distribution of the seawater salinity content in the surface layer (December 2012)

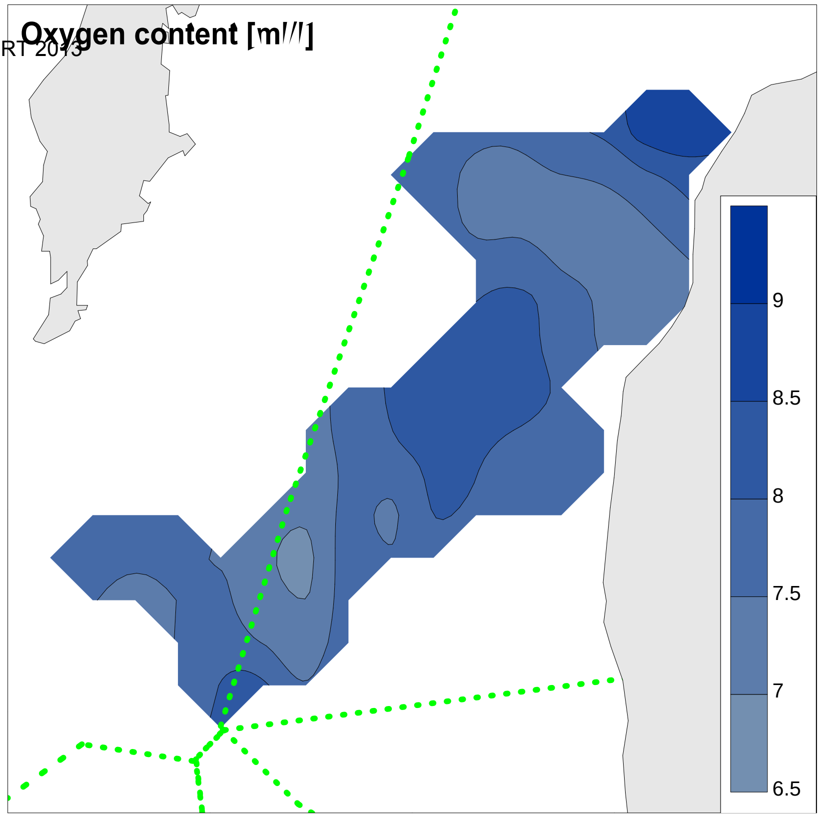

Fig. 7C Distribution of the seawater oxygen content in the surface layer (December 2012)

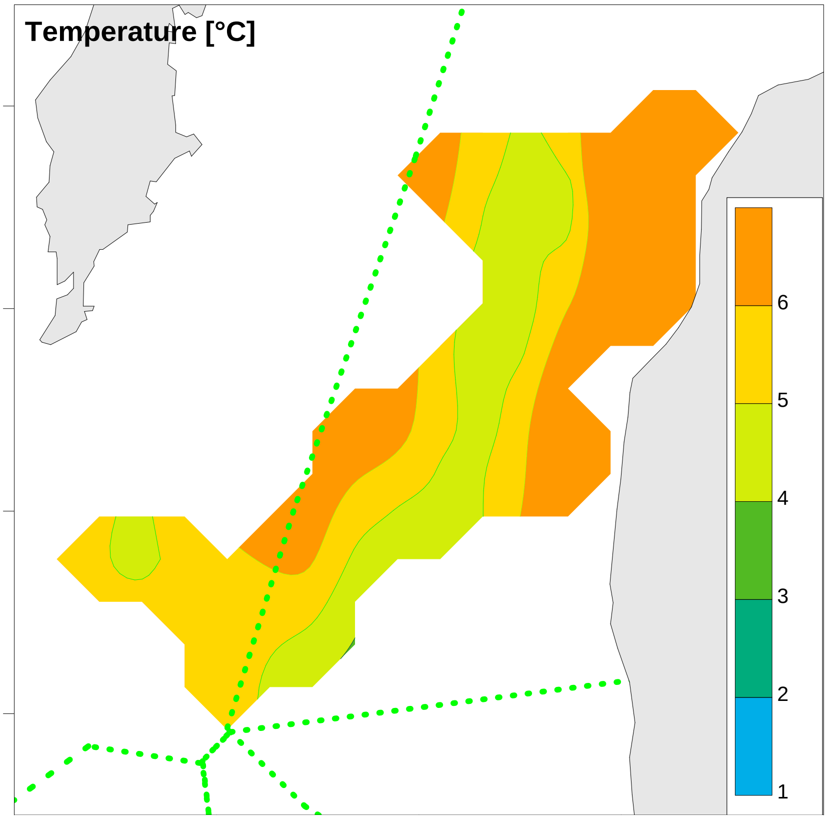

Fig. 8A. Distribution of the seawater temperature content in the near bottom waters (December 2012)

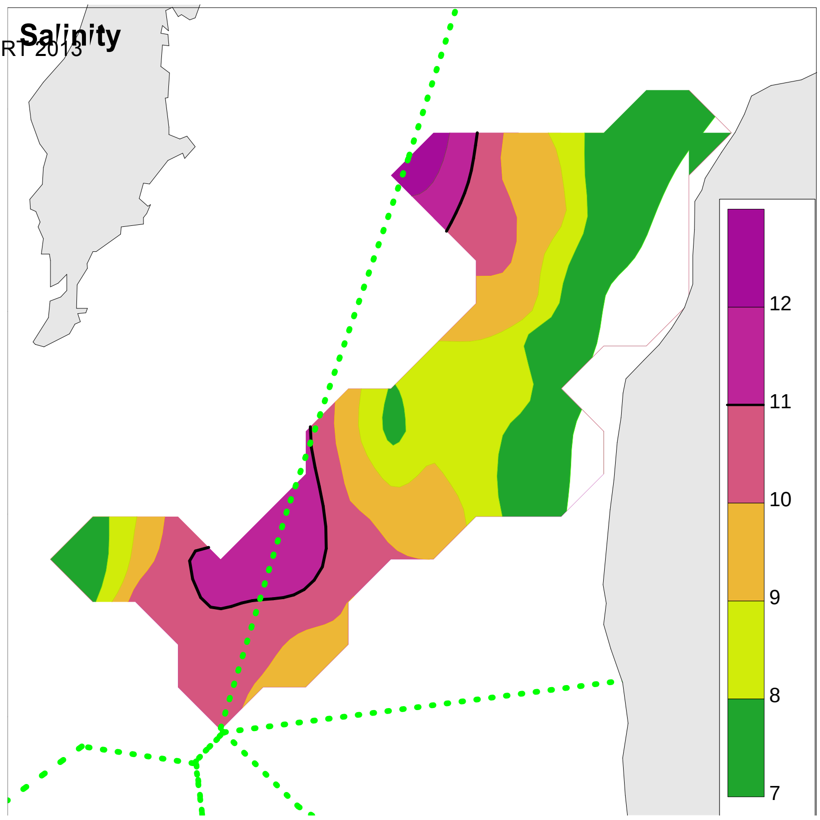

Fig. 8B Distribution of the seawater salinity content in the near bottom waters (December 2012)

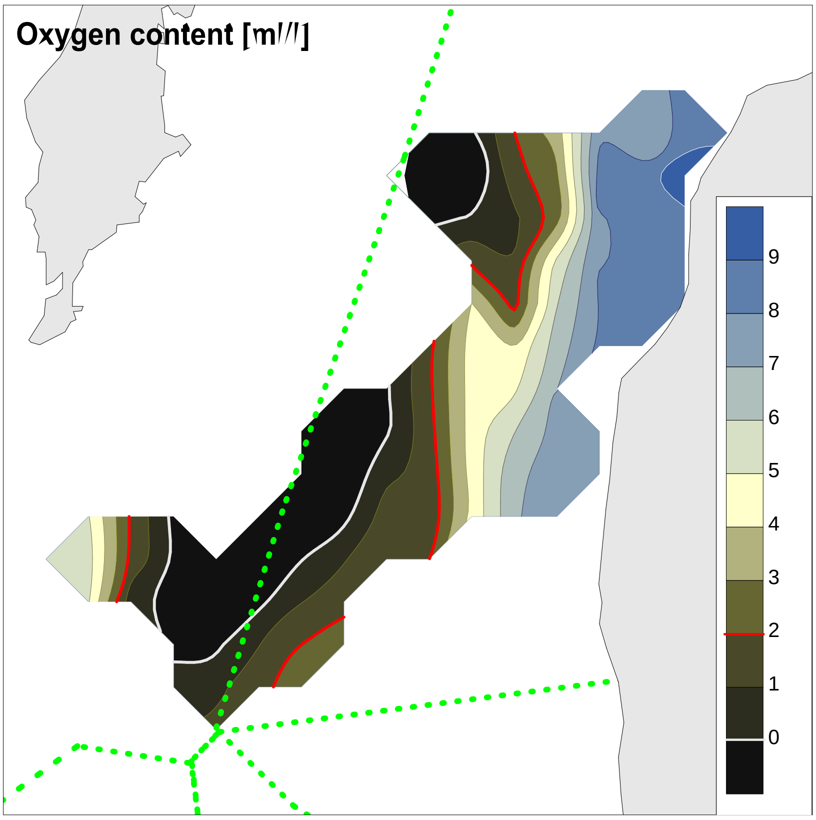

Fig. 8C Distribution of the seawater oxygen content in the near bottom waters (December 2012)

Working paper on the WGBIFS meeting in Tartu (Estonia);
21-25.03.2013

RESEARCH REPORT FROM THE BALTIC INTERNATIONAL TRAWL SURVEY (BITS-4Q) IN THE POLISH PART OF THE SOUTHERN BALTIC (16-28 Nov. 2012)

by
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INTRODUCTION

Since 1995, the Polish r.v. "Baltica" has systematically participated in the Baltic International Trawl Surveys curried out in autumn (BITS-4Q) and winter/spring (BITS-1Q). The above-mentioned vessel is managed by the Sea Fisheries Institute (SFI) in Gdynia, from June 2011, renamed on – the National Marine Fisheries Research Institute in Gdynia (NMFRI). In November 1999, fishery research institutes located in countries surrounding the Baltic Sea began using the TV-3 cod bottom trawl (the Danish design) as a new standard fishing gear (Anon. 1998, Nielsen et al. 2001, Grygiel 2004, 2011, Oeberst and Grygiel 2004). The large version of the standard bottom trawl, i.e. a model of TV-3#930 was recommended to biggest vessels, like e.g. the r/v "Baltica", and the small version of the trawl, i.e. a model of TV-3#520, was designated to smallest vessels and chartered commercial cutters.

The principal methods of investigations, timing of the BITS surveys and the current scheme of randomly selected control-hauls spatial distribution in the bottom zone of the Baltic were designed and co-ordinated by the ICES Baltic International Fish Survey Working Group [WGBIFS] (Anon. 2012). The Polish Fisheries Data Collection Programme for 2012 and the European Union (the Commission Regulations Nos. 1639/2001, 1581/2004, 665/2008, 1078/2008, 199/2008, 2008/949/EC, EC665/2008, 2010/93/EU) financially and logistically supported the BITS-4q/2012 survey, which has the highest priority within the EU research surveys hierarchy.

The main aim of below described the BITS-4q ground-trawl survey, which was conducted in November 2012, was monitoring of the spatial distribution and abundance of Baltic cod, flounder, sprat and herring recruiting year-classes, taking into consideration the principal hydrological parameters vertical and horizontal variations in the Polish parts of the ICES Sub-divisions 25 and 26. Moreover, the survey was focused on evaluation of the fishing efficiency (catch per unit effort; CPUE), and analyse of the southern Baltic ichthyofauna biodiversity as well as on sampling materials for the main species principal biological parameters characteristics.

MATERIALS AND METHODS

Personnel

The r.v. „Baltica" BITS-4q/2012 survey, marked with the number 17/2012/MIR, was realized by the NMFRI in Gdynia, nine members of the scientific team, with Włodzimierz Grygiel as a cruise leader. The scientific team was composed of:

- seven ichthyologists, including technicians (W. Grygiel, K. Radtke, M. Nowakowski, I. Wybierała, G. Modrzejewski, M. Wyszyński, P. Rosa) - responsible for fish catches species composition determination, fish biological analyses and data processing,
- hydrologist (T. Wodzinowski) - responsible for seawater sampling and analysing as well as for meteorological monitoring,

- fish technology and biochemistry technician (L. Barcz) - responsible for fish sampling for biochemical and technological analyses and assistance in the fish control-catches composition determination and herring biological analyses.

Narrative

The Polish ground-trawl survey on board of the r.v. "Baltica" took place during the period of 16–28 Nov. 2012. The vessel left the port of Gdynia on 16.11.2012 (late evening) and the direct at sea researches begun on a next day (17.11.2012) in the vicinity of the Słupsk Furrow (Fig. 1, Table 2). The survey was ended on 28.11.2013 in the Gdynia port after 12 days not interrupted works at sea in the Polish parts of the southern Baltic. Favourable weather conditions appeared during BITS-4q survey made possible the realization of all scheduled survey tasks.

Survey design and realisation – sampling description

Totally, 12 full working days at sea was utilized for accomplishment the Polish BITS-4q/2012 survey purposes. Accordingly to the WGBIFS plans (Anon. 2012), the r/v “Baltica” was recommended to cover the Polish parts of the ICES Sub-divisions 25 and 26 with respectively, 16 and 15 randomly selected control-hauls. After correction made by the WGBIFS on the beginning of autumn 2012, the Polish vessel was recommended to cover parts of the Bornholm Basin and the Gdansk Basin with totally 34 randomly selected control-hauls, including three additional hauls, previously designated to the Danish vessel “Dana”. The catch-stations were planned at the bottom depth range of 16 - 108 m.

Overall, 37 catch-stations was accomplished (16 and 21 hauls respectively, in the ICES SDs 25 and 26; Fig. 1), and 34 hauls can be accepted as representative. Additional three control-catches were conducted instead of hauls, where the oxygen depletion (below critical minimum level of 1.5 ml/l) was recognized in the near bottom waters (Table 2). The above-mentioned hydrological situation concern location of hauls Nos. 26091, 26276 and 26191, planned in the eastern part of the Gdansk Deep, namely - very close to the Polish-Russian marine border (Fig. 1), where the bottom depths was 93-108 m. Two other hauls Nos. 25013 and 25014 were located within permanently closed (16–28 Nov. 2012) a navy military training area. Instead of aforementioned hauls two new hauls Nos. 25018 and 25003 were conducted however, the original (Tow-Database) geographical positions were slightly changed because they were located on the new vessels separation traffic road (active from 01.12.2010). The location and depth of haul No. 26015 was slightly changed due to not accessible primary selected (by WGBIFS) site, where the set gillnets were distributed. In the case of haul No. 26217, trawling position was considerably changed due to not accessible primary selected site, where the set gillnets and operating cutters were dense distributed in a large area (photo 1).

Trawling was done with the standard rigging cod ground trawl type TV-3#930 (without bobbins and additional chains connected with the footrope), with 10-mm mesh bar length in the codend. Fish control-hauls were conducted at the daylight, at 3.0 knots vessel speed, and in the case of 32 hauls, trawling duration was 30 minutes for each, and for other two hauls was 15 and 20 minutes, respectively (Table 2). The EK-60 scientific echosounder and a standard vertical fish-sounder monitored the trawling depth and controlled values of the acoustic parameter S_A (= NASC; Nautical Area Scattering (Strength) Coefficient), which to reflect temporal size of fish aggregations vs. depth. Usually a 7÷8 m vertical net opening of the TV-3#930 trawl was achieved.

The catch per unit effort (CPUE) of particular species was recalculated per ½ hour of trawling (Table 2). In order of the species composition determination and the CPUE of single species evaluation (Figs. 2-4, Table 2), each control-haul was sorted out, fishes were weighed and the samples of dominants were taken to determine - the length distribution (Fig. 5), age-length-mass relationships, sex, stage of gonads development, feeding conditions. In the case of plaice and turbot and in the most hauls - regarding to cod and flounder, every caught specimen was taken to the total length and mass measurements. In the case of clupeids, the sub-samples were investigated. The total length (*longitudo totalis*) distribution and the mean mass at the 0.5-cm classes - in the case of clupeids and 1-cm classes in the case of other species were determined. Overall, 13917 specimens from 18 species were taken for the length and mass determination, including following numbers of dominants:

- cod – 4079,
- herring – 4499,
- sprat – 2480,
- flounder (separated by sex) – 1389,
- plaice (separated by sex) – 267,
- greater sand eel – 1006,
- some specimens from remaining species (Table 1).

Materials collected during fish length measurements were used for an evaluation of the juvenile, undersized specimens' numerical share in samples (Fig. 6). The length of 38, 23 (ICES SD 25) and 21 (ICES SD 26), 16 and 10 cm was taken into account as a separation (protective) length between juvenile and commercially sized cod, flounder and plaice (differed by the ICES Sub-divisions), herring and sprat, respectively. Totally, of 385 cod, 657 herring, 338 sprat, 431 flounder, 141 plaice and 7 turbot individuals were taken to the standard biological analyses, including ageing. Biological analyses of fishes were made accordingly to the standard methodological procedures, directly on board of surveying vessel.

Overall, 368 cod stomachs samples from the ICES Sub-divisions 25 and 26 were collected for detail analyses of food spectrum. Moreover, the stage of cod bile-bladder fullness (in 5-stages scale) was determined. The above-mentioned materials were sampled and elaborated in the framework of international study project MARE/2012/02 "Study on stomach contents of fish to support the assessment of good environmental status of marine food webs and the prediction of MSY after stock restoration". Baltic cod feeding investigations are supported by WGBIFS (Report 2012) however, some methodological matters and logistic details concerns sampling and elaborating of materials still needs clarification.

Every control-haul was preceded by the basic hydrological parameters (the seawater temperature, salinity, oxygen content) measurements, made continuously from the sea-surface to a bottom. The hydrological data were aggregated and archived per each 1-m depth interval. Overall, 37 fish catch-stations starting positions and 28 additional standard hydrographic stations determined along the research profile of the southern Baltic, were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method. Meteorological observations of air temperature, wind speed and direction and atmospheric pressure were realized at actual geographical position of each research station, with applied automated station type MILOS-500.

RESULTS

Fish catches and biological data

Overall, 18 fish species were recognized in 34 scrutinized control-catches carried out in November 2012 by the r.v. "Baltica" in the bottom zone of the Polish waters. Cod was dominated with respect to frequency of occurrence in catches (was appeared in every haul), the share in mass of caught fishes (29 and 58% on average respectively, in the ICES SDs 25 and 26) and CPUE (Figs. 2-4, Table 1). The share of cod in mass of four catches was about 90%. The mean CPUE of cod in the Gdansk Basin was twice higher comparing with the Bornholm Basin and amounted 141.0 and 64.0 kg/0.5 h, adequately. The highest record of cod CPUE, i.e. 1108.4 kg/0.5 h (Table 2, Figs. 2 and 3) was noticed in haul No. 37 (Fig. 1) conducted nearby the

Peninsula of Hel, at the depth of 41-44 m. It should be underlined, that in November 2012 cod body condition and feeding intensity in the Gdansk Basin (with exception of haul No. 37) was lower comparing with the Bornholm Basin, what can resulted from late spawning, and higher surface density (higher competition for food) of cod in the eastern part of the southern Baltic.

Herring was the second in turn dominants in research control-catches realised in November 2012, and was appeared in 88% of hauls number. The mean share of herring in mass of catches realised in the ICES SDs 25 and 26 was 44 and 26%, respectively (Fig. 4). The mean CPUE of herring in the Bornholm Basin was distinctly higher comparing with the Gdansk Basin and amounted 97.8 and 62.9 kg/0.5 h, adequately. The highest record of herring CPUE, i.e. 514.3 kg/0.5 h (Table 2, Figs. 2 and 3) was noticed also in haul No. 37, conducted nearby the Peninsula of Hel.

Sprat and flounder were the next species also dominated in catches realised in November 2012, inside the Polish EEZ. The above-mentioned species were appeared respectively, in 79 and 91% of hauls number. The mean share of sprat and flounder in mass of catches realised in entire monitored areas was 12 and 6%, respectively. The mean CPUE of both recently mentioned species was distinctly lower comparing with cod and herring, and amounted 27.3 and 13.6 kg/0.5 h. The highest record of flounder CPUE, i.e. 183.7 kg/0.5 h (Table 2, Figs. 2 and 3) was noticed in the same haul No. 37, conducted nearby the Peninsula of Hel however, for sprat (554.9 kg/0.5 h) was obtained in haul No. 11, realised nearby Kołobrzeg (middle-west coast), at the depth of 50 m. Four above-mentioned species constituted 96% of the total mass of all catches. Greater sand eel was also played somewhat important role, especially in the Bornholm Basin, where the mean share in mass of catches was 5%. The highest record of greater sand eel CPUE, i.e. 114.2 kg/0.5 h (Table 2, Figs. 2 and 3) was noticed in haul No. 12, conducted nearby Kołobrzeg (Figs. 1 and 3) at the depth of 26 m.

The mean share in mass of catches and CPUE of the cod, herring, sprat and greater sand eel was considerably differentiated in two monitored basins of the southern Baltic (Fig. 4). In November 2012, similarly like in February 2012, cod and flounder dominated in catches realised in the ICES Sub-division 26 (the Gdansk Basin; Grygiel and Wodzinowski 2012). However, herring, sprat and greater sand eel were prevailed in catches conducted in the ICES Sub-division 25 (the Bornholm Basin).

By-catch of other fishes was insignificant, i.e. below 0.1% on average per species (with the exception of plaice – 0.9%). Any sea-mammals and any sea-birds wasn’t detected in the control-catches.

The results of cod, herring, sprat, flounder, plaice, greater sand eel and smelt length measurements were applied for plot the length distribution curves, which reflect numerical share of specimens per 1-cm or 0.5-cm classes in samples collected from the bottom control-catches conducted in November 2012 in given ICES Sub-division (Fig. 5). The total length of specimens from the above-mentioned species in all monitored areas ranged as follows:

- cod, from 5.0 to 94.0 cm,
- herring, from 9.5 to 29.5 cm,
- sprat, from 7.0 to 16.0 cm,
- flounder, from 9.0 to 40.0 cm,
- plaice, from 18.0 to 40.0 cm,
- greater sand eel, from 13.0 to 32.0 cm,
- smelt, from 7.0 to 21.0 cm,

The shape of analysed fishes length distribution curves was somewhat differed in two monitored ICES Sub-divisions (Fig. 5). The frequency maximum in samples collected in the ICES Sub-division 25, comparing with the ICES Sub-division 26, was shifted to the largest length classes within the above-mentioned length ranges. The length distribution curves for cod and flounder was uni-modal and for other species was bimodal. For cod and flounder, the frequency apex was formed at length classes 38 and 23-26 cm, respectively. The above-mentioned lengths are adequate to commercial size of both species. In the case of herring and sprat two frequency apexes were formed, i.e. the highest apex representing the young, undersized fraction of fishes and the second - lower frequency apex, adequate to commercially sized fraction.

The mean length and mean weight of basic fish species, originated from samples collected in the Polish waters (Nov. 2012) was as follows:

ICES SDs	parameter	sprat	herring	cod	flounder	plaice
25	mean	10,64	17,07	36,1	26,7	28,4
26	length	10,49	17,57	35,6	24,8	25,4
the all areas	[cm]	10,55	17,34	35,8	25,6	27,6
25	mean	8,60	39,66	499,4	256,7	267,3
26	weight	7,89	40,53	435,9	189,4	166,2
the all areas	[g]	8,17	40,12	460,5	217,4	238,9

The mean numerical share of young, undersized cod (<38.0 cm) in samples investigated in November 2012 was 56 and 66% respectively, in the ICES Sub-divisions 25 and 26 (Fig. 6), and was nearly the same like in November 2011 (Grygiel and Witalis 2012). The mean numerical share of herring from the length classes lower than protective size (16.0 cm) in samples collected in Nov. 2012 was 57 and 43% respectively, in the ICES Sub-divisions 25 and 26, and was somewhat higher than in Nov. 2011. In November 2012, the by-catch of sprat from the length classes lower than minimum commercial size (10.0 cm) was 58 and 54% on average, adequately in the ICES Sub-divisions 25 and 26, and was about 10% higher like in November 2011. The mean share of fraction “undersized specimens” in all investigated areas of the Polish EEZ in the case of flounder and plaice was 19 and 2% (Fig. 6). The highest mean by-catch of undersized cod, herring, and to some extent sprat and flounder specimens was achieved in the same ICES Sub-division like the highest mean CPUE of all sized fish.

Hydro-meteorological characteristics of the southern Baltic

The changes of hydro-meteorological parameters monitored during reported survey (Nov. 2012) are illustrated in Figures 7-10. The above-mentioned parameters registered during towing process are listed in Table 3.

The mild (1-3°B) and moderate (4°B) winds were most frequently observed, i.e. in 78% of time of the fishing operations, and in remaining 22% of time, occurred strong winds (5-6°B; Table 3). The very strong (>6°B) and stormy weather conditions not appeared during survey realization. Winds from the southern sectors were prevailed in 84% of the survey time. The air temperature ranged from 2.9 to 9.3°C (Fig. 7).

The process of temperature changes between seawater and atmosphere, and short-time appearance of the strong winds in the second half of November 2012 only partly affected the hydrological conditions in the surface layer of the southern Baltic. The seawater temperature in the surface layers varied from 7.85°C – noticed at the position of haul No. 5 to 9.71°C measured at the starting position of haul No. 26 (the mean for all study areas was 8.90°C; Fig. 8). The minimum value of salinity in the surface layers, i.e. 6.53 was recorded nearby the Vistula River mouth, the maximum of salinity, i.e. 7.69 was measured at the hydrological station No. 7 (Kołobrzeg fishing ground), and the average salinity in inspected part of the southern Baltic surface waters was 7.39 (in the PSU scale). The oxygen content in the monitored surface layers of the Polish waters varied in the range of 7.31 – 7.95 ml/l (the mean was 7.57 ml/l).

The seawater temperature of near bottom layer of monitored part of the southern Baltic (Figs. 9, 10) was changing from 4.20°C at the hydrographic standard station No. 41 (eastern part of the Bornholm Deep) to 9.23°C at the catch-station No. 1 (Figs. 1, 10). Salinity in the bottom waters decreased from 15.36 at the hydrographic station No. IBY5 (the Bornholm Deep) to 12.15 in the Slupsk Furrow (station No. RS2) and to 11.16 in the deeper part of the Gdansk Deep (station No. G2). At recently mentioned station, oxygen content was the lowest (0.22 ml/l) from measured in inspected areas. The highest value of oxygen content (2.58 ml/l) in the near bottom layer was measured at the station RS2. The analysis of water temperature vertical distribution in scrutinized part of the southern Baltic (Fig. 10) indicate that, below homogenous waters layer in respect to salinity, the halocline in the Bornholm Deep was formed at depth 45 m and was shifted to the depth of 70 m in the Gdansk Deep.

DISCUSSION

The ICES Baltic International Fish Survey Working Group and the Baltic Fisheries Assessment Working Group for evaluation the southern Baltic main fish species CPUE, year-class strength and their spatial distribution analyses as well as for hydro-meteorological characteristics of the area can apply the Polish BITS-4q/2012 survey data, obtained by the r.v. “Baltica” scientific team. Results presented in this paper can be considered as representative for the Polish EEZ (the ICES Sub-divisions 25 and 26). The basic survey data collected in November 2012 will be stored in the DATRAS, in the Tow-Data, the ROSCOP and the ICES Data-Centre international hydrological databases, managed by the ICES Secretariat and designated experts from the WGBIFS.

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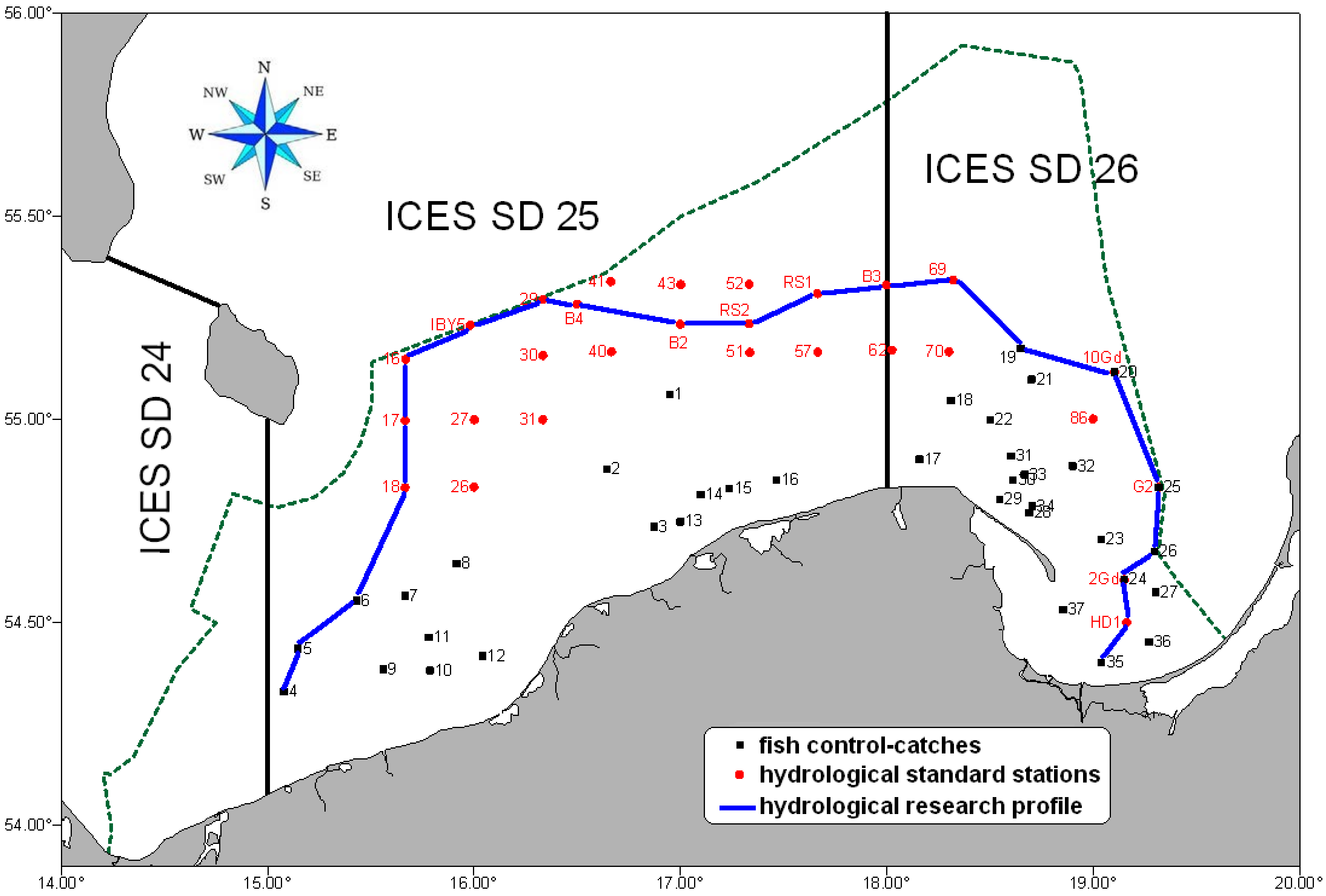


Fig. 1. Location of the bottom trawl hauls (Nos. 1-37) and the hydrological standard stations inspected by the r.v. “Baltica” during the BITS-4Q/2012 survey accomplished in the Polish EEZ (green dashed line).

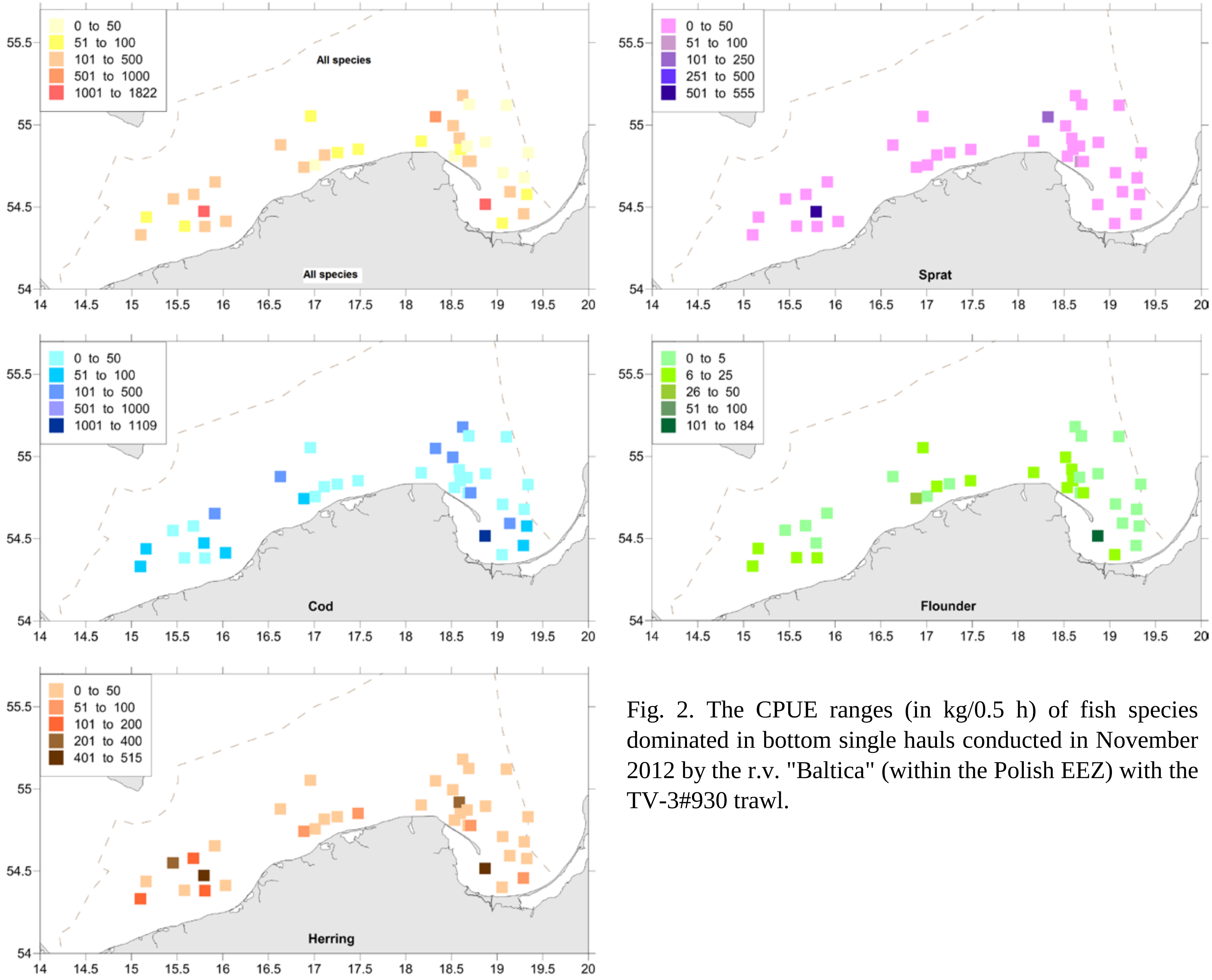


Fig. 2. The CPUE ranges (in kg/0.5 h) of fish species dominated in bottom single hauls conducted in November 2012 by the r.v. "Baltica" (within the Polish EEZ) with the TV-3#930 trawl.

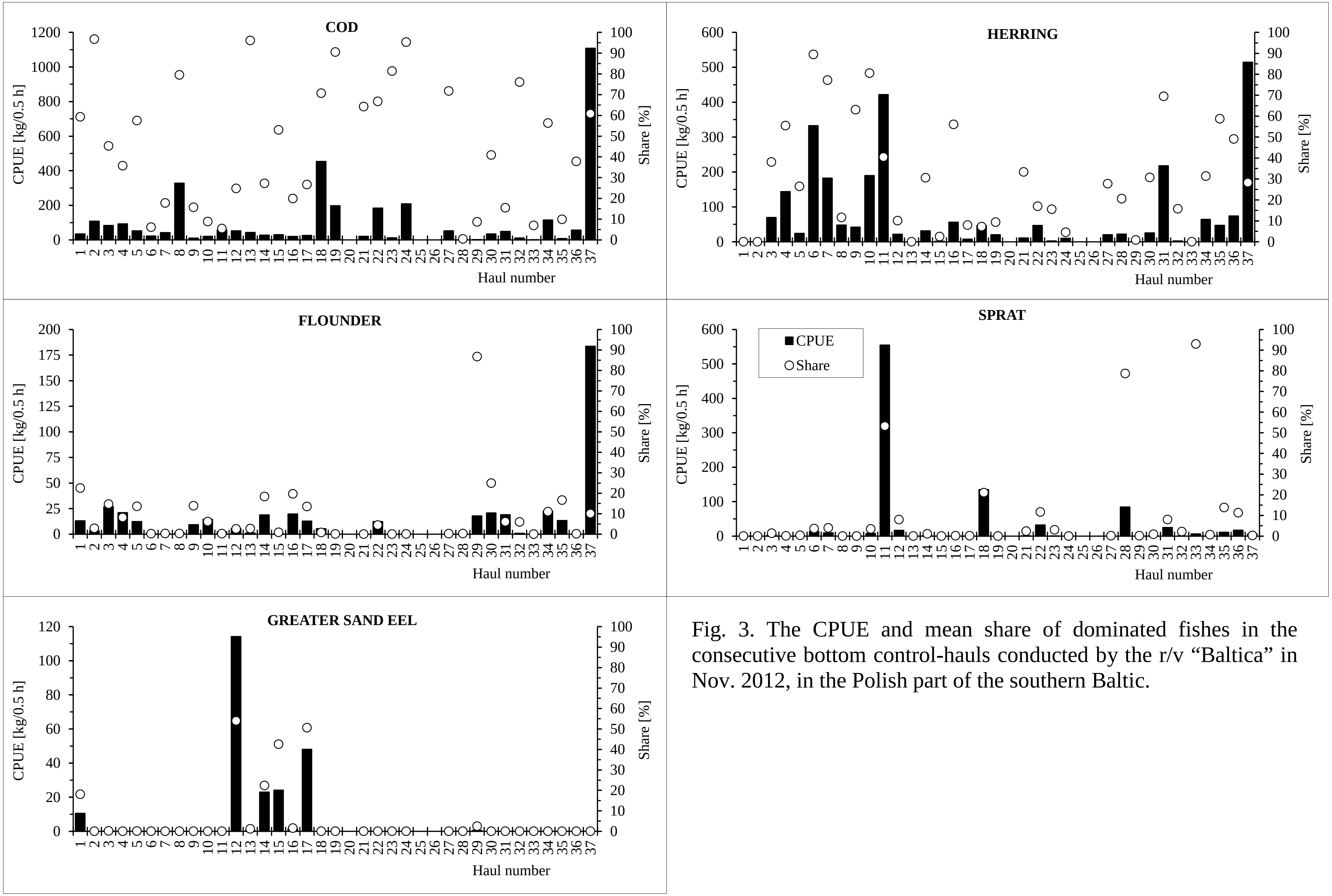


Fig. 3. The CPUE and mean share of dominated fishes in the consecutive bottom control-hauls conducted by the r/v “Baltica” in Nov. 2012, in the Polish part of the southern Baltic.

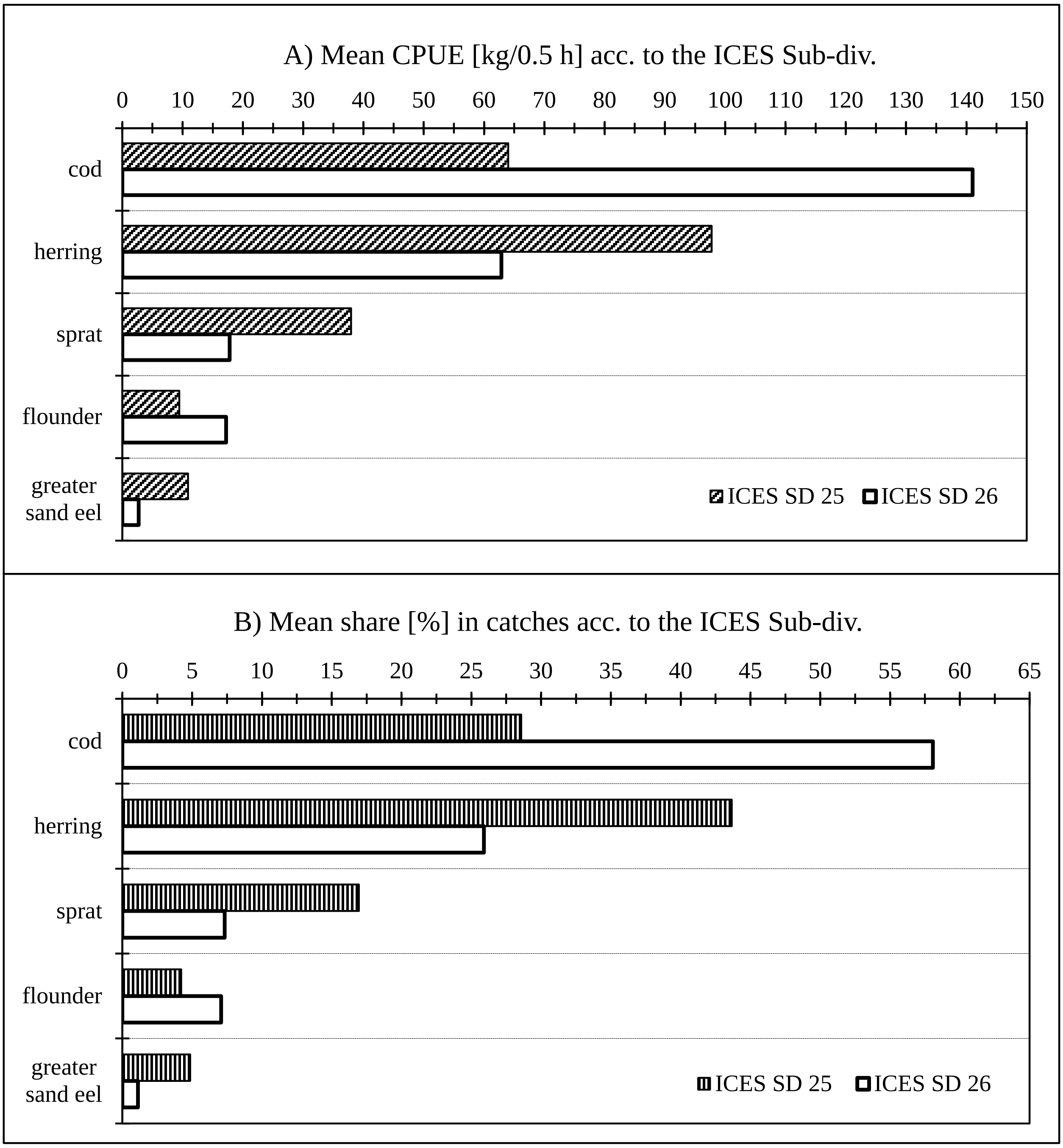


Fig. 4. The mean CPUE (A) and mean share (B) of dominated fishes in the bottom control-hauls conducted by the r/v “Baltica” in Nov. 2012, inside the Polish part of the ICES Sub-divisions 25 and 26.

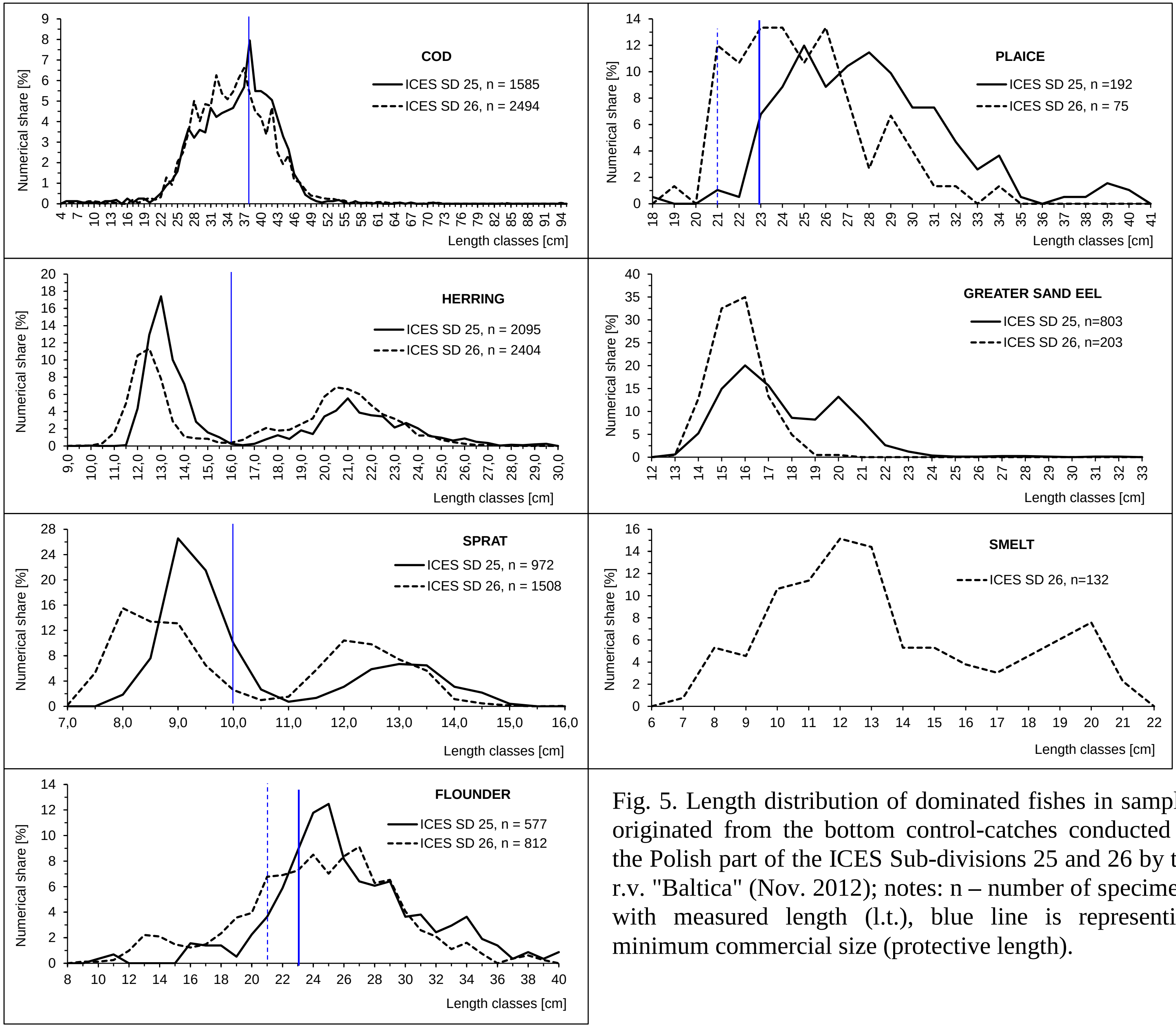


Fig. 5. Length distribution of dominated fishes in samples originated from the bottom control-catches conducted in the Polish part of the ICES Sub-divisions 25 and 26 by the r.v. "Baltica" (Nov. 2012); notes: n – number of specimens with measured length (l.t.), blue line is representing minimum commercial size (protective length).

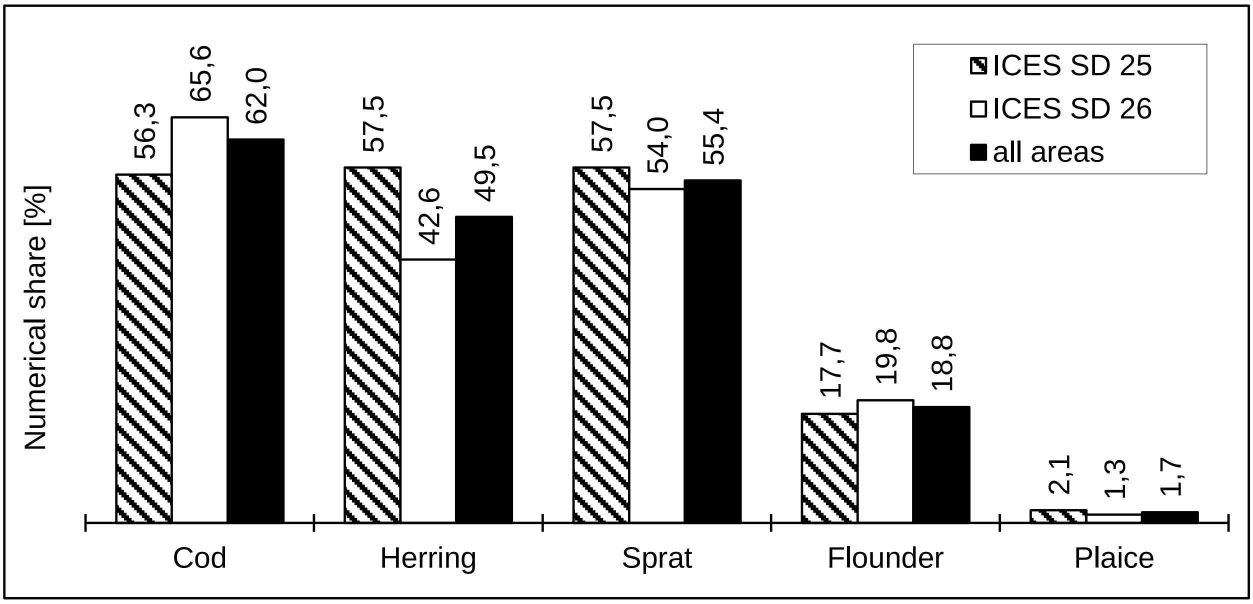


Fig. 6. The mean numerical share of young, undersized fishes in samples collected from the bottom research catches conducted by the r.v. "Baltica" in November 2012, according to the ICES Sub-divisions.

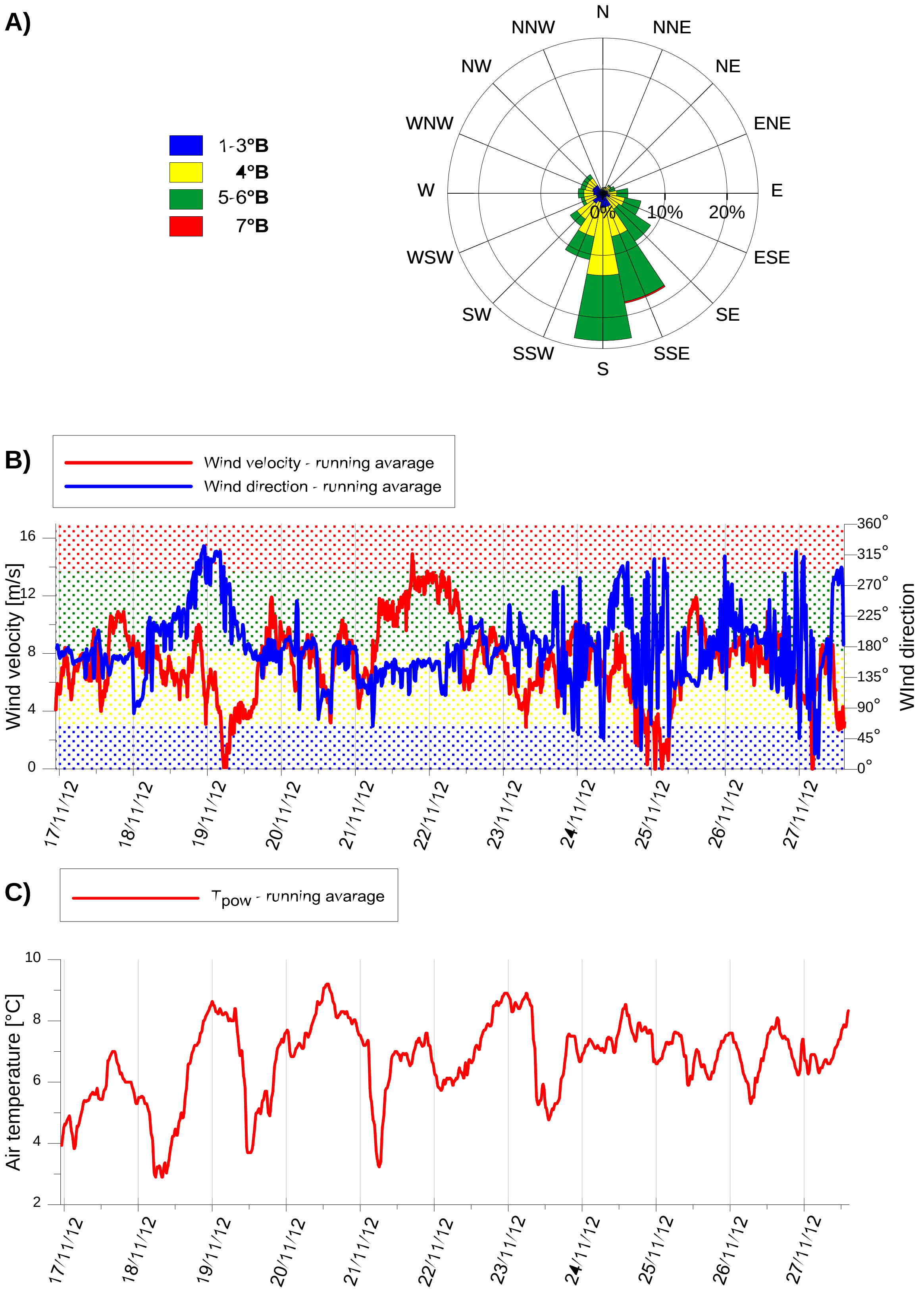


Fig. 7. Fluctuations of the main meteorological parameters recorded in Nov. 2012 during the BITS-4q survey; wind rose (part A), wind velocity and directions (part B), and the air temperature (part C).

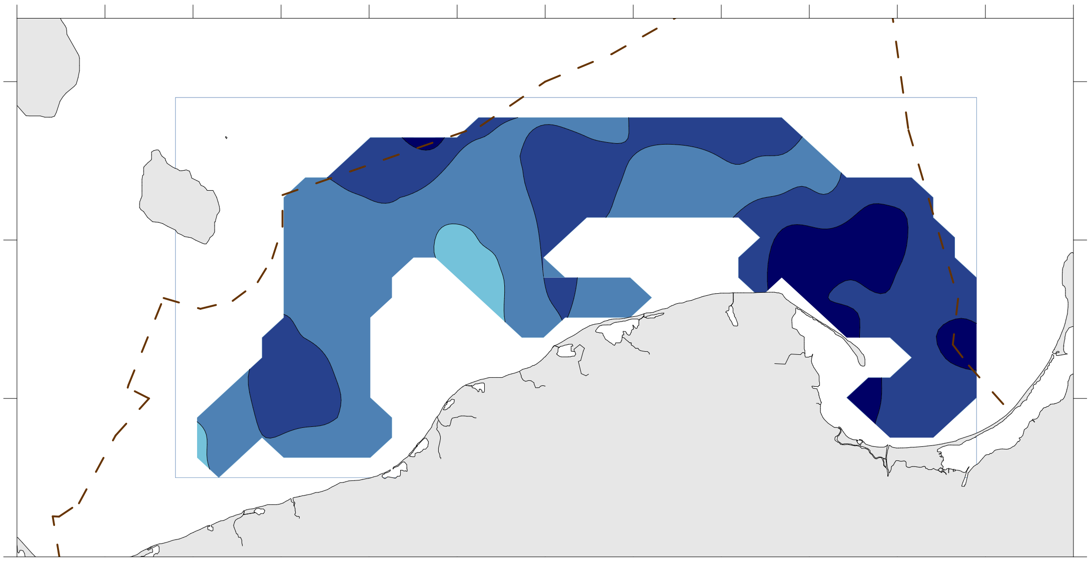


Fig. 8. Horizontal distribution of the seawater temperature, salinity and oxygen content in the surface layers of the Polish marine waters (Nov. 2012).

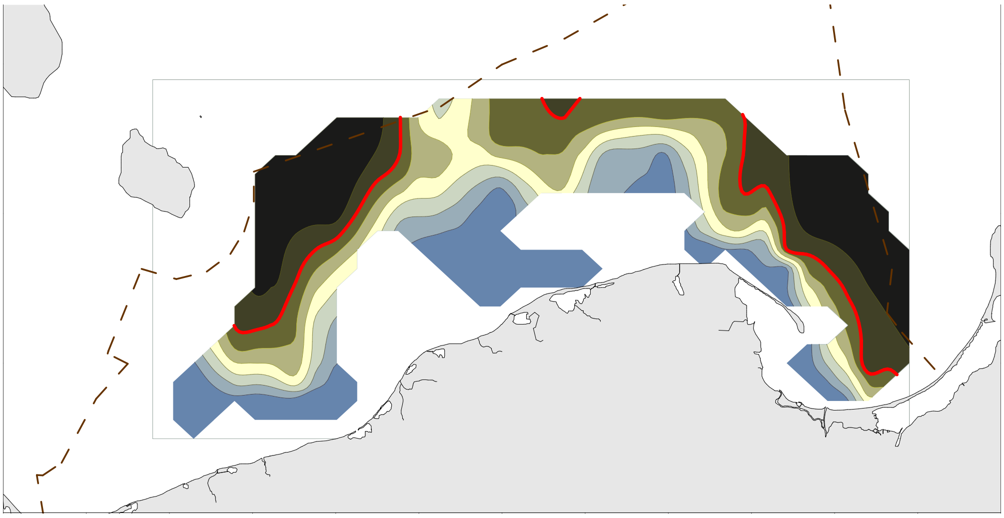


Fig. 9. Horizontal distribution of the seawater temperature, salinity and oxygen content in the near-bottom layers of the southern Baltic (the Polish EEZ, Nov. 2012).

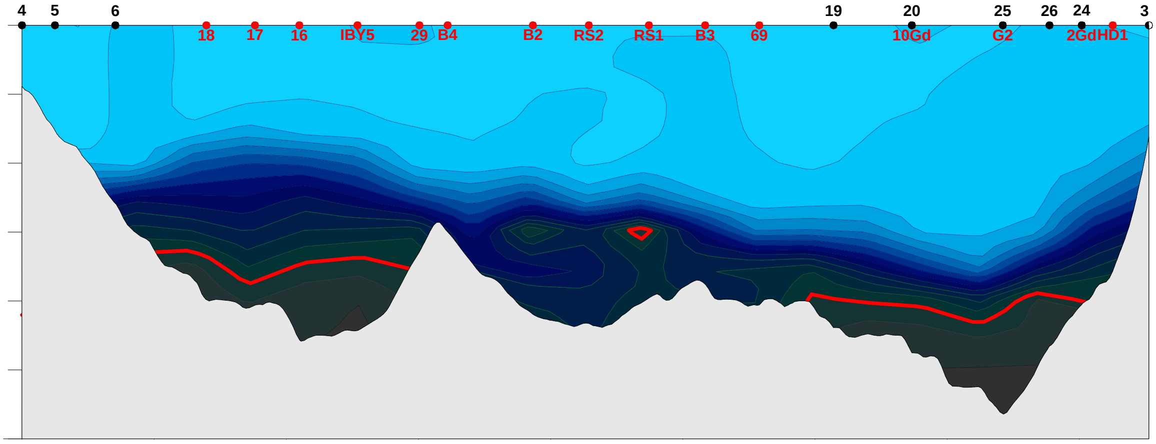
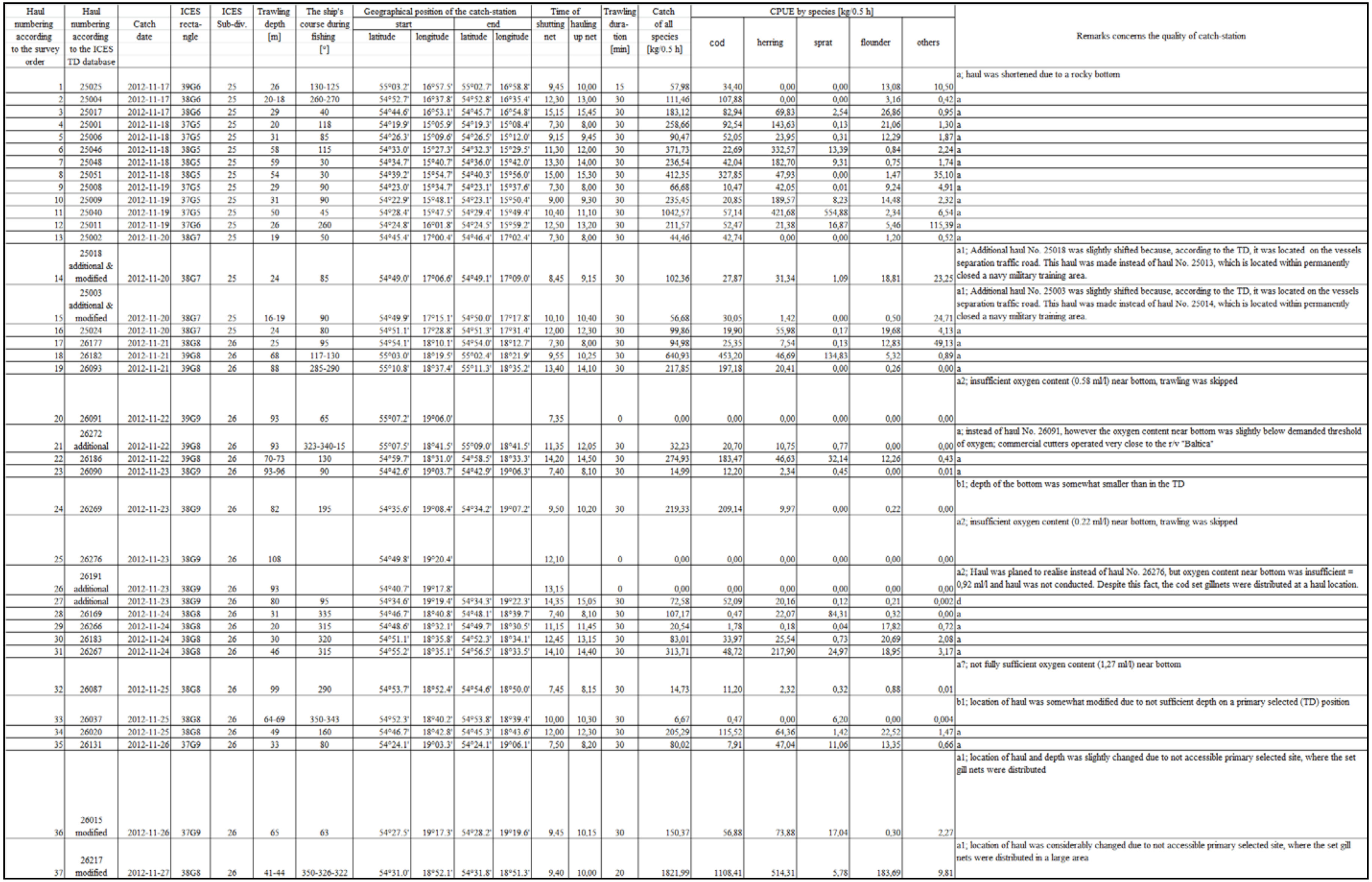


Fig. 10. Vertical distribution of the seawater temperature, salinity and oxygen content along the hydrological research profile of the southern Baltic (the Polish EEZ, Nov. 2012); on the axis X was marked the distance (in kilometres) between start and end of determined the profile, and on the axis Y - the bottom depth (in meters).

Table 1. The list of fish species collected for the length measurements (l.t.) and biologically analysed in Nov. 2012, during the Polish BITS-4q survey.

Species	Number of specimens measured (l.t.) and weighed			Number of fish in detail biological analyses (aged)		
	ICES SD 25	ICES SD 26	total	ICES SD 25	ICES SD 26	total
cod	1585	2494	4079	179	206	385
sprat	972	1508	2480	153	185	338
herring	2095	2404	4499	368	289	657
flounder	577	812	1389	195	236	431
plaice	192	75	267	105	36	141
turbot	5	2	7	5	2	7
lumpfish	4	0	4	0	0	0
fourbeard rockling	15	1	16	0	0	0
haddock	1	0	1	0	0	0
greater sand eel	803	203	1006	0	0	0
lesser sand eel	15	0	15	0	0	0
smelt	3	132	135	0	0	0
whiting	4	0	4	0	0	0
sea scorpion	8	0	8	0	0	0
salmon	1	1	2	0	0	0
freckled goby	0	2	2	0	0	0
broad-nosed pipefish	0	1	1	0	0	0
twaite shad	0	2	2	0	0	0
total	6280	7637	13917	1005	954	1959

Table 2. Results of fish control-catches conducted by the r.v. "Baltica" in Nov. 2012 during the Polish BITS-4q survey. The standard rigging cod bottom trawl type TV-3#930 was applied.



Haul numbering according to the survey order	Haul numbering according to the ICES TD database	Catch date	ICES recta-ngle	ICES Sub-div.	Trawling depth [m]	The ship's course during fishing [°]	Geographical position of the catch-station				Time of		Trawling dura-tion [min]	Catch of all species [kg/0.5 h]	CPUE by species [kg/0.5 h]					Remarks concerns the quality of catch-station
							start		end		shutting	hauling								
							latitude	longitude	latitude	longitude	net	up net			cod	herring	sprat	flounder	others	
1	25025	2012-11-17	39G6	25	26	130-125	55°03.2'	16°57.5'	55°02.7'	16°58.8'	9,45	10,00	15	57,98	34,40	0,00	0,00	13,08	10,50	a; haul was shortened due to a rocky bottom
2	25004	2012-11-17	38G6	25	20-18	260-270	54°52.7'	16°37.8'	54°52.8'	16°35.4'	12,30	13,00	30	111,46	107,88	0,00	0,00	3,16	0,42	a
3	25017	2012-11-17	38G6	25	29	40	54°44.6'	16°53.1'	54°45.7'	16°54.8'	15,15	15,45	30	183,12	82,94	69,83	2,54	26,86	0,95	a
4	25001	2012-11-18	37G5	25	20	118	54°19.9'	15°05.9'	54°19.3'	15°08.4'	7,30	8,00	30	258,66	92,54	143,63	0,13	21,06	1,30	a
5	25006	2012-11-18	37G5	25	31	85	54°26.3'	15°09.6'	54°26.5'	15°12.0'	9,15	9,45	30	90,47	52,05	23,95	0,31	12,29	1,87	a
6	25046	2012-11-18	38G5	25	58	115	54°33.0'	15°27.3'	54°32.3'	15°29.5'	11,30	12,00	30	371,73	22,69	332,57	13,39	0,84	2,24	a
7	25048	2012-11-18	38G5	25	59	30	54°34.7'	15°40.7'	54°36.0'	15°42.0'	13,30	14,00	30	236,54	42,04	182,70	9,31	0,75	1,74	a
8	25051	2012-11-18	38G5	25	54	30	54°39.2'	15°54.7'	54°40.3'	15°56.0'	15,00	15,30	30	412,35	327,85	47,93	0,00	1,47	35,10	a
9	25008	2012-11-19	37G5	25	29	90	54°23.0'	15°34.7'	54°23.1'	15°37.6'	7,30	8,00	30	66,68	10,47	42,05	0,01	9,24	4,91	a
10	25009	2012-11-19	37G5	25	31	90	54°22.9'	15°48.1'	54°23.1'	15°50.4'	9,00	9,30	30	235,45	20,85	189,57	8,23	14,48	2,32	a
11	25040	2012-11-19	37G5	25	50	45	54°28.4'	15°47.5'	54°29.4'	15°49.4'	10,40	11,10	30	1042,57	57,14	421,68	554,88	2,34	6,54	a
12	25011	2012-11-19	37G6	25	26	260	54°24.8'	16°01.8'	54°24.5'	15°59.2'	12,50	13,20	30	211,57	52,47	21,38	16,87	5,46	115,39	a
13	25002	2012-11-20	38G7	25	19	50	54°45.4'	17°00.4'	54°46.4'	17°02.4'	7,30	8,00	30	44,46	42,74	0,00	0,00	1,20	0,52	a
14	25018 additional & modified	2012-11-20	38G7	25	24	85	54°49.0'	17°06.6'	54°49.1'	17°09.0'	8,45	9,15	30	102,36	27,87	31,34	1,09	18,81	23,25	a1; Additional haul No. 25018 was slightly shifted because, according to the TD, it was located on the vessels separation traffic road. This haul was made instead of haul No. 25013, which is located within permanently closed a navy military training area.
15	25003 additional & modified	2012-11-20	38G7	25	16-19	90	54°49.9'	17°15.1'	54°50.0'	17°17.8'	10,10	10,40	30	56,68	30,05	1,42	0,00	0,50	24,71	a1; Additional haul No. 25003 was slightly shifted because, according to the TD, it was located on the vessels separation traffic road. This haul was made instead of haul No. 25014, which is located within permanently closed a navy military training area.
16	25024	2012-11-20	38G7	25	24	80	54°51.1'	17°28.8'	54°51.3'	17°31.4'	12,00	12,30	30	99,86	19,90	55,98	0,17	19,68	4,13	a
17	26177	2012-11-21	38G8	26	25	95	54°54.1'	18°10.1'	54°54.0'	18°12.7'	7,30	8,00	30	94,98	25,35	7,54	0,13	12,83	49,13	a
18	26182	2012-11-21	39G8	26	68	117-130	55°03.0'	18°19.5'	55°02.4'	18°21.9'	9,55	10,25	30	640,93	453,20	46,69	134,83	5,32	0,89	a
19	26093	2012-11-21	39G8	26	88	285-290	55°10.8'	18°37.4'	55°11.3'	18°35.2'	13,40	14,10	30	217,85	197,18	20,41	0,00	0,26	0,00	a
20	26091	2012-11-22	39G9	26	93	65	55°07.2'	19°06.0'			7,35		0	0,00	0,00	0,00	0,00	0,00	0,00	a2; insufficient oxygen content (0.58 ml/l) near bottom, trawling was skipped
21	26272 additional	2012-11-22	39G8	26	93	323-340-15	55°07.5'	18°41.5'	55°09.0'	18°41.5'	11,35	12,05	30	32,23	20,70	10,75	0,77	0,00	0,00	a; instead of haul No. 26091, however the oxygen content near bottom was slightly below demanded threshold of oxygen; commercial cutters operated very close to the r/v "Baltica"
22	26186	2012-11-22	39G8	26	70-73	130	54°59.7'	18°31.0'	54°58.5'	18°33.3'	14,20	14,50	30	274,93	183,47	46,63	32,14	12,26	0,43	a
23	26090	2012-11-23	38G9	26	93-96	90	54°42.6'	19°03.7'	54°42.9'	19°06.3'	7,40	8,10	30	14,99	12,20	2,34	0,45	0,00	0,01	a
24	26269	2012-11-23	38G9	26	82	195	54°35.6'	19°08.4'	54°34.2'	19°07.2'	9,50	10,20	30	219,33	209,14	9,97	0,00	0,22	0,00	b1; depth of the bottom was somewhat smaller than in the TD
25	26276	2012-11-23	38G9	26	108		54°49.8'	19°20.4'			12,10		0	0,00	0,00	0,00	0,00	0,00	0,00	a2; insufficient oxygen content (0.22 ml/l) near bottom, trawling was skipped
26	26191 additional	2012-11-23	38G9	26	93		54°40.7'	19°17.8'			13,15		0	0,00	0,00	0,00	0,00	0,00	0,00	a2; Haul was planed to realise instead of haul No. 26276, but oxygen content near bottom was insufficient = 0,92 ml/l and haul was not conducted. Despite this fact, the cod set gillnets were distributed at a haul location.
27	additional	2012-11-23	38G9	26	80	95	54°34.6'	19°19.4'	54°34.3'	19°22.3'	14,35	15,05	30	72,58	52,09	20,16	0,12	0,21	0,002	d
28	26169	2012-11-24	38G8	26	31	335	54°46.7'	18°40.8'	54°48.1'	18°39.7'	7,40	8,10	30	107,17	0,47	22,07	84,31	0,32	0,00	a
29	26266	2012-11-24	38G8	26	20	315	54°48.6'	18°32.1'	54°49.7'	18°30.5'	11,15	11,45	30	20,54	1,78	0,18	0,04	17,82	0,72	a
30	26183	2012-11-24	38G8	26	30	320	54°51.1'	18°35.8'	54°52.3'	18°34.1'	12,45	13,15	30	83,01	33,97	25,54	0,73	20,69	2,08	a
31	26267	2012-11-24	38G8	26	46	315	54°55.2'	18°35.1'	54°56.5'	18°33.5'	14,10	14,40	30	313,71	48,72	217,90	24,97	18,95	3,17	a
32	26087	2012-11-25	38G8	26	99	290	54°53.7'	18°52.4'	54°54.6'	18°50.0'	7,45	8,15	30	14,73	11,20	2,32	0,32	0,88	0,01	a?; not fully sufficient oxygen content (1,27 ml/l) near bottom
33	26037	2012-11-25	38G8	26	64-69	350-343	54°52.3'	18°40.2'	54°53.8'	18°39.4'	10,00	10,30	30	6,67	0,47	0,00	6,20	0,00	0,004	b1; location of haul was somewhat modified due to not sufficient depth on a primary selected (TD) position
34	26020	2012-11-25	38G8	26	49	160	54°46.7'	18°42.8'	54°45.3'	18°43.6'	12,00	12,30	30	205,29	115,52	64,36	1,42	22,52	1,47	a
35	26131	2012-11-26	37G9	26	33	80	54°24.1'	19°03.3'	54°24.1'	19°06.1'	7,50	8,20	30	80,02	7,91	47,04	11,06	13,35	0,66	a
36	26015 modified	2012-11-26	37G9	26	65	63	54°27.5'	19°17.3'	54°28.2'	19°19.6'	9,45	10,15	30	150,37	56,88	73,88	17,04	0,30	2,27	a1; location of haul and depth was slightly changed due to not accessible primary selected site, where the set gill nets were distributed
37	26217 modified	2012-11-27	38G8	26	41-44	350-326-322	54°31.0'	18°52.1'	54°31.8'	18°51.3'	9,40	10,00	20	1821,99	1108,41	514,31	5,78	183,69	9,81	a1; location of haul was considerably changed due to not accessible primary selected site, where the set gill nets were distributed in a large area

Table 3. The values of basic hydrological and meteorological parameters recorded in November 2012 on the positions of the r.v. "Baltica" fish control-catches.

Haul number	Catch date	Hydrological parameters			Meteorological parameters		
		temperature [°C]	salinity	oxygen content [ml/l]	wind direction	wind force [°B]	sea state
1	2012-11-17	9,23	7,59	7,52	S	3	2
2	2012-11-17	8,88	7,54	7,61	S	5	3
3	2012-11-17	8,70	7,57	7,79	S	4	2
4	2012-11-18	8,00	7,76	7,84	SW	4	3
5	2012-11-18	7,82	7,78	7,93	SW	4	3
6	2012-11-18	5,60	12,22	2,69	SW	4	3
7	2012-11-18	5,84	12,75	2,80	SW	5	3
8	2012-11-18	5,65	10,59	5,30	SW	4	2
9	2012-11-19	8,92	7,70	7,67	changeable	1	1
10	2012-11-19	9,04	7,67	7,51	changeable	1	1
11	2012-11-19	5,91	9,96	4,31	changeable	1	1
12	2012-11-19	8,73	7,68	7,59	changeable	1	1
13	2012-11-20	8,58	7,54	7,64	S	3	2
14	2012-11-20	9,03	7,58	7,57	S	3	2
15	2012-11-20	8,50	7,55	7,75	S	4	3
16	2012-11-20	8,33	7,46	7,65	S	4	2
17	2012-11-21	8,83	7,52	7,66	SE	4	2
18	2012-11-21	4,60	10,03	2,40	SE	5	3
19	2012-11-21	4,83	10,40	1,33	SSE	6	3
20	2012-11-22	4,92	10,66	0,58	SSE	6	4
21	2012-11-22	4,85	10,66	1,07	S	5	3
22	2012-11-22	4,71	10,37	2,07	SSW	5	3
23	2012-11-23	4,64	10,50	2,20	SW	3	2
24	2012-11-23	4,66	10,42	1,56	SW	3	2
25	2012-11-23	5,15	11,16	0,22	S	3	2
26	2012-11-23	4,76	10,62	0,92	S	3	2
27	2012-11-23	4,68	10,38	1,35	S	3	2
28	2012-11-24	4,29	7,39	6,18	S	3	2
29	2012-11-24	8,51	7,39	7,13	S	3	2
30	2012-11-24	5,65	7,64	6,98	S	3	2
31	2012-11-24	5,35	7,99	6,37	W	5	3
32	2012-11-25	4,87	10,76	1,27	changeable	2	1
33	2012-11-25	4,47	9,27	2,43	S	3	2
34	2012-11-25	8,95	7,33	7,27	SSE	4	3
35	2012-11-26	8,63	7,45	7,00	SW	4	2
36	2012-11-26	4,78	10,01	2,47	SE	4	2
37	2012-11-27	7,64	7,76	7,21	SSE	3	2

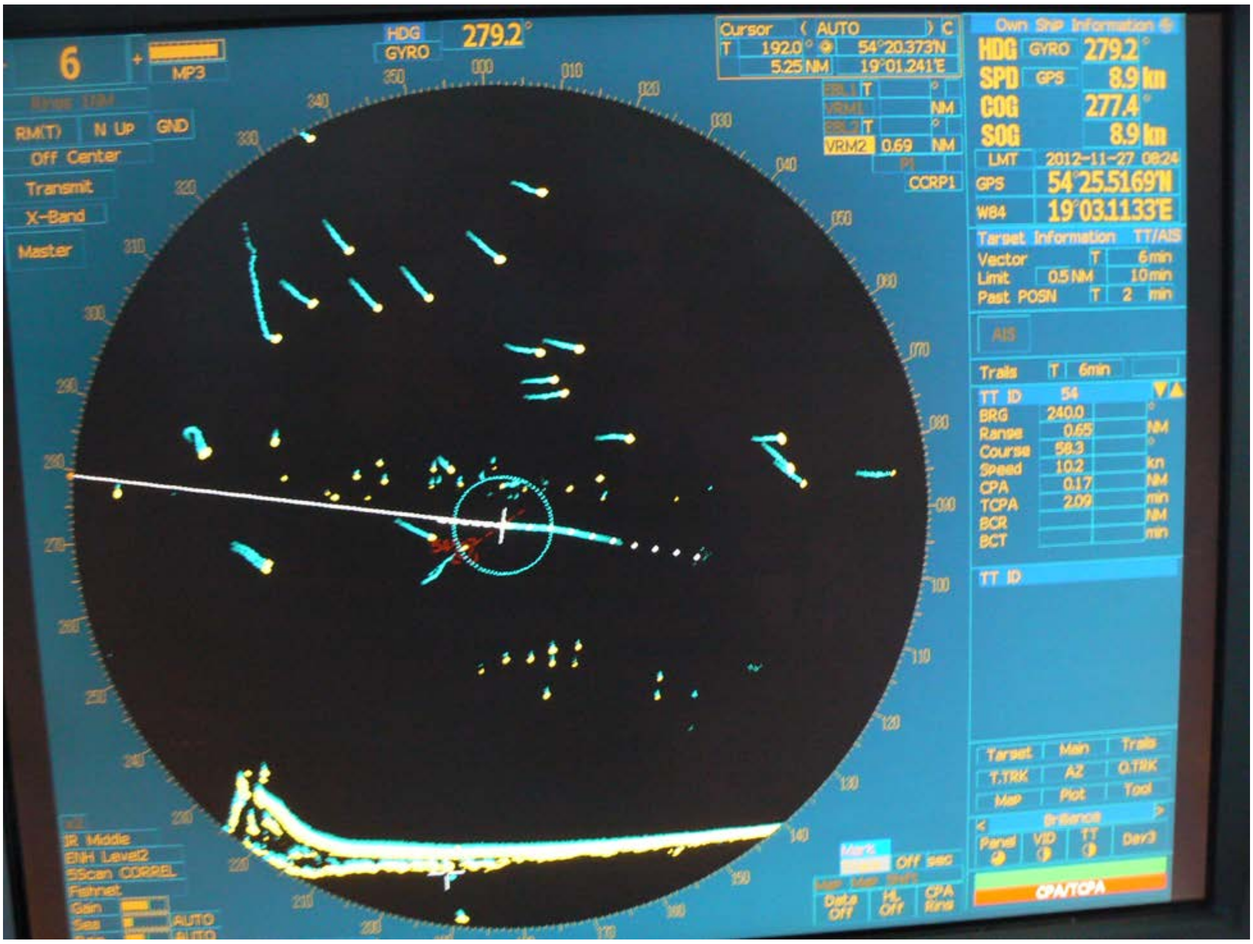


Photo 1. The commercial fishing fleet (yellow bullets) and the set gillnets distribution in an area surrounding the r/v "Baltica" (central point on the radar screen), on 27.11.2012 at the position of primary selected haul No. 26217 (catching site was changed).

Baltic International Trawl Survey (BITS)
U/F Dana, 20 – 27 November 2012

Expedition leader : Ann-Christin Rudolphi
Scientific leader : Michele Casini

Summary

The survey was conducted using the TV3L demersal trawl according to the BITS manual (Anon., 2012a). Sweden was assigned 30 randomly selected hauls of which Dana realized all.

Overall, Dana made 30 hauls with TV3L demersal trawl (including 12 fictitious hauls which were not trawled because the oxygen concentration close to the bottom was < 1.5 ml/l) and covered parts of SD 25, 26, 27 and 28 this year. During the whole survey, acoustic data were continuously recorded.

During this survey 16 fish species were caught. The total catch, in terms of weight, was dominated by herring, cod, sprat and flounder.

The hydrographical conditions were observed and measured at most of the stations. Only the oxygen concentration at the bottom is presented here.

Background

The expedition was performed according to the BITS manual (Anon., 2012a) and the recommendations from WGBIFS 2012 (ICES 2012b). Sweden is one of the seven countries performing the BITS survey during this period of the year.

The expedition started in Ystad on Monday 19 November and ended in the same place on Tuesday 27 November. Weather conditions did not cause particular problems, and the survey could be conducted as planned.

Sweden was allocated 30 random stations: 11 in SD 25, 3 in SD 26, 10 in SD 27 and 6 in SD 28 (Fig. 1, Table 1). Trawling could be performed only in 14 stations of the 30 allocated. This was due to oxygen concentration < 1.5 ml/l (12 stations, so called fictive stations) or bottoms judged not suitable for trawling with TV3-trawl (4 stations). These latter 4 stations were replaced by other 4 stations in the same depth interval and SD. Overall, Dana performed 30 valid trawl hauls (including the 12 fictive stations) that can be used in stock assessment. The fictive stations are used in stock assessment as 0-cacth stations.

Hydrography

Hydrographical measurements with CTD and oxygen probe were taken at most of the trawl stations (Fig. 2). Oxygen concentrations at 1m from the bottom are presented in Fig. 2.

Fish catches

Overall, 16 different species were caught (Table 2). Totally, 18.2 tons of fish were caught, of which 3.4 tons of cod (17 011 individuals), 12.9 tons of herring and 1.3 ton of sprat.

Sampling

Almost all cod were measured. At stations with high cod catches, a subsample was analysed. Otoliths were collected for age determination with the aim to sample 5 individuals per 1 cm-class and area. In SD 25 individuals were sampled in each of the areas 25W, 25C and 25E. Overall, 616 cods were age-estimated.

For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 844 flounder otoliths were sampled.

The other fish species were measured, weighed and total catch recorded.

Ad-hoc studies and sampling were performed:

- Collection of cod stomach content, and additional biological parameters, for the ”EU tender MARE 2012/02, Study on stomach content of fish to support the assessment of good environmental status of marine food webs and the prediction of MSY after stock restoration”.
- Collection of herring and cod for radioactivity analysis conducted at CEFAS, Lowestoft, England;

Other

The results of BITS Argos expeditions are presented yearly in a report by SLU-Department of Aquatic Resources.

All Swedish BITS data are uploaded into FISKDATA database at SLU-Aqua and are delivered to ICES database DATRAS for international compilation. The data from this survey are used within the Baltic International Fish Survey Working Group (WGBIFS) and Baltic Fisheries Assessment Working Group (WGBFAS) in ICES.

We thank all the participants, scientists, technicians and crew, which contributed to the accomplishment of the expedition.

Participants

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References

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Anon., 2012b. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES C.M. 2012/ SSGESST:02.

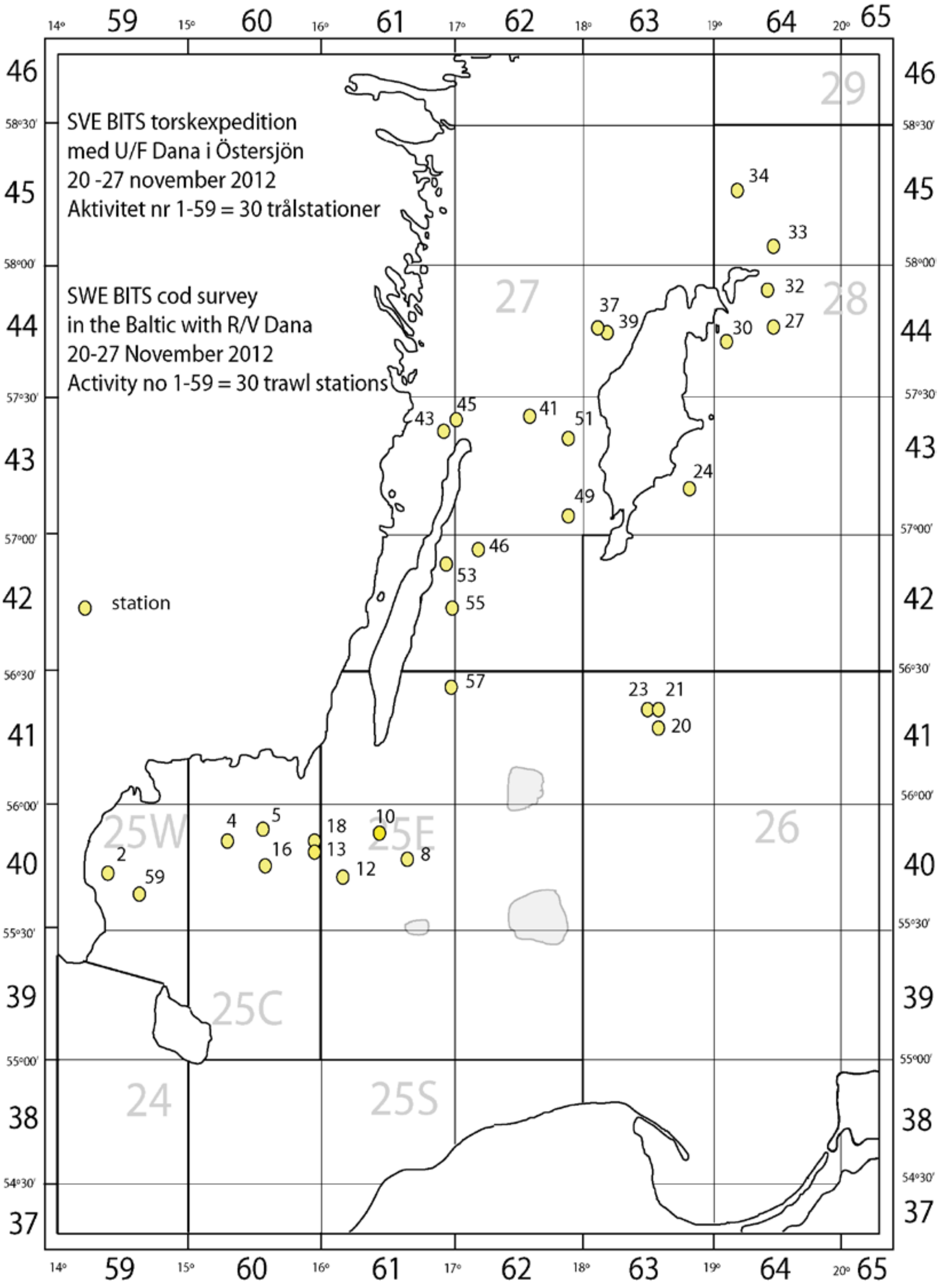

Figure 1. Map of the trawl stations performed during the Swedish BITS Quarter 4 2012.

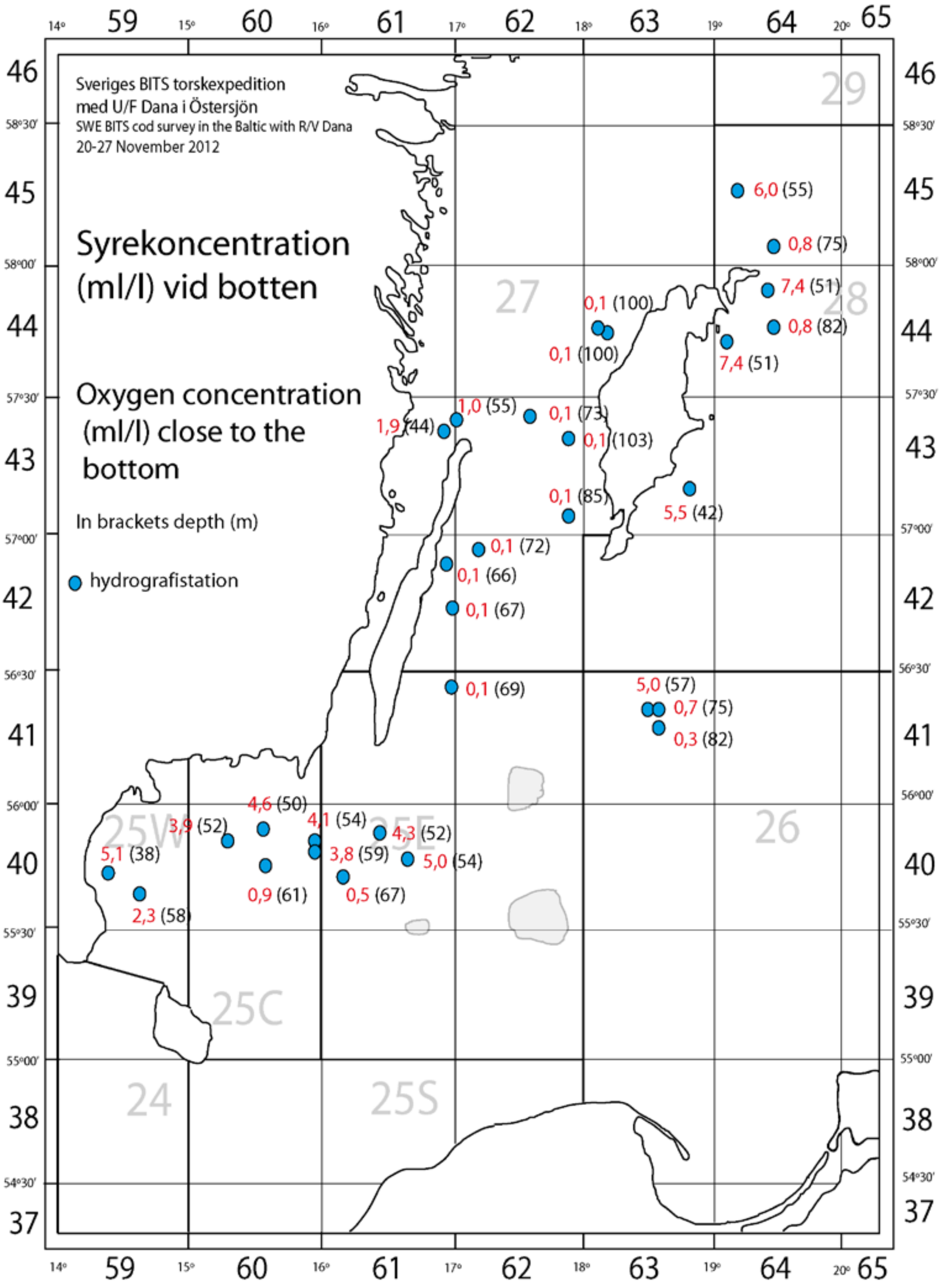

Figure 2. Oxygen concentration (red numbers) 1 m from the bottom at the trawl stations. Numbers in brakets (black) indicate bottom depth. Swedish BITS, Quarter 4 2012.

Table 1. Summary of all stations. Swedish BITS quarter 4 2012.

Trålstationer gjorda/stations realized :	
slumpade giltiga/randomized valid	**26**
fiktiva (syrebrist)/oxygen deficiency	**12**
giltiga ersättningsdrag/valid replacement hauls	**4**
kompletteringsdrag/complementary hauls	**0**
ogiltiga drag/invalid hauls	**0**
Slumpade stationer ej trålade/rand. stations, not trawled	**4**

Giltiga "monitoring"drag/Valid hauls for assessment:		
Tilldelade drag/	SD28	**6**
Allocated hauls	SD27	**10**
	SD26	**3**
	SD25	**11**
Giltiga drag/	SD28	**6**
Realized hauls	SD27	**10**
	SD26	**3**
	SD25	**11**

🟨	TV3 trawl station
🟩	Fictitious haul/oxygen deficier
▨	Invalid haul
☐	Hydrographic station (SEA)

Date	Act. no	Area SD	Rect.	Latitude	Longitude	New haul no	Station name	Gear	Duration min	Trawldepth m	Depth m	Oxygen ml/l	Total catch all species (kg)	Cod catch kg	Cod catch antal/nos.	Remarks
2012-11-23	23	26	4163	5619,71	1827,69	26032	14 S HOBURG BANK	TV3	30	54.1			462.2	6.6	50	
2012-11-22	21	26	4163	5619,5	1833,35	26070	15 S HOBURG BANK	TV3	30	75			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-22	20	26	4163	5618,55	1833,7	26124	16 S HOBURG BANK	TV3	30	82.8			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-22	19	26	4163	5619.63	1834.86	26124	16 S HOBURG BANK	SEA	-	-	86	0,2	-	-	-	
2012-11-23	22	26	4163	5618.61	1827.64	26032	14 S HOBURG BANK	SEA	-	-	56.5	5,0	-	-	-	
2012-11-25	43	27	4361	5721,77	1655,21	27020	4 NW BYXELKROK	TV3	29	44.2			2602.8	0.9	3	
2012-11-25	45	27	4362	5725,32	1701,15	27003	5 N BYXELKROK	TV3	30	56			1792.4	0	0	
2012-11-26	53	27	4261	5634.00	1651.10	27021	6 SE BLÄSINGE	TV3	30	64			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-26	55	27	4261	5643.50	1659.60	27022	9 SE KAPELLUDDEN	TV3	30	66			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-24	41	27	4362	5729,2	1733,8	27011	5 SSE KNOLLS GRUND	TV3	30	73			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-25	46	27	4262	5658,24	1711,35	27005	10 E KÅREHAMN	TV3	30	73.2			18.0	1.2	9	
2012-11-25	49	27	4362	5702,45	1752.40	27013	11,5 NW HOBURG	TV3	30	86			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-24	39	27	4463	5745.00	1810.00	27018	6 NW VISBY	TV3	30	101			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-24	37	27	4463	5746,75	1807,2	27027	10 NW VISBY	TV3	30	104			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-25	51	27	4362	5720,35	1753,15	27016	4 NW ST. KARLSÖ	TV3	30	108			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-24	36	27	4463	5747.33	1807.43	27027	10 NW VISBY	SEA	-	-	99.5	0,1	-	-	-	
2012-11-24	38	27	4463	5745.55	1809.69	27018	6 NW VISBY	SEA	-	-	100	0,1	-	-	-	
2012-11-24	40	27	4362	5728.96	1734.18	27011	5 SSE KNOLLS GRUND	SEA	-	-	75	0.1	-	-	-	
2012-11-25	42	27	4361	5720.71	1657.13	27020	4 NW BYXELKROK	SEA	-	-	46.5	1,7	-	-	-	
2012-11-25	44	27	4362	5724.81	1701.67	27003	5 N BYXELKROK	SEA	-	-	55	1,0	-	-	-	
2012-11-25	47	27	4262	5657.35	1711.83	27005	10 E KÅREHAMN	SEA	-	-	72	0,1	-	-	-	
2012-11-25	48	27	4362	5703.63	1751.06	27013	11,5 NW HOBURG	SEA	-	-	85	0.1	-	-	-	
2012-11-25	50	27	4362	5720.54	1753.02	27016	4 NW ST. KARLSÖ	SEA	-	-	103	0,1	-	-	-	
2012-11-26	52	27	4261	5633.81	1688.45	27021	6 SE BLÄSINGE	SEA	-	-	65.5	0,1	-	-	-	
2012-11-26	54	27	4261	5641.12	1658.91	27022	9 SE KAPELLUDDEN	SEA	-	-	66.5	0,1	-	-	-	
2012-11-24	30	28	4464	5740,31	1903,96	28185	3 SE GRAUTEN	TV3	30	36			388.7	1.0	27	
2012-11-23	24	28	4363	5709,2	1847,93	28177	4,5 SE NÄR	TV3	30	40.7			324.3	1.6	9	
2012-11-24	32	28	4464	5752,53	1925,2	28027	5 SE FÅRÖ	TV3	21	49			1539.7	2.4	246	
2012-11-24	34	28	4564	5818,09	1910,72	28100	4 SW GOTSKA SANDÖN	TV3	30	54.9			131.4	0.1	2	
2012-11-24	33	28	4564	5804,45	1926,3	28106	2 E SALVOREV	TV3	30	75			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-23	27	28	4464	5744,2	1928,2	28182	13 SSE FÅRÖ	TV3	30	81.5			0	0	0	Only hydrography. Oxygen deficiency.
2012-11-23	25	28	4363	5710.04	1849.31	28177	4,5 SE NÄR	SEA	-	-	41.5	5,5	-	-	-	
2012-11-23	26	28	4464	5743.62	1929.07	28182	13 SSE FÅRÖ	SEA	-	-	83	0.7	-	-	-	
2012-11-23	28	28	4464	5802.93	1927.08	28106	2 E SALVOREV	SEA	-	-	79	0,2	-	-	-	
2012-11-24	29	28	4464	5738.97	1904.04	28185	3 SE GRAUTEN	SEA	-	-	35.5	6.7	-	-	-	
2012-11-24	31	28	4464	5751.73	1925.39	28027	5 SE FÅRÖ	SEA	-	-	50.5	7.4	-	-	-	
2012-11-24	35	28	4564	5816.20	1911.39	28100	4 SW GOTSKA SANDÖN	SEA	-	-	54.5	6,0	-	-	-	
2012-11-20	3	25C	4060	5548.47	1515.14	25426	3 NW VÄSTRA NABBEN	SEA	-	-	52	3,9	-	-	-	
2012-11-20	6	25C	4060	5553.02	1534.07	25405	5SSW UTKLIPPAN	SEA	-	-	49.5	4,6	-	-	-	
2012-11-21	14	25C	4060	5548.34	1557.95	25299	INRE U10	SEA	-	-	58.5	3,8	-	-	-	
2012-11-22	15	25C	4060	5544.11	1532.97	25298	6 W TÅNGEN	SEA	-	-	60.5	0,9	-	-	-	
2012-11-22	17	25C	4060	5549.62	1555.31	25413	11 SE UTKLIPPAN	SEA	-	-	53.5	4,1	-	-	-	
2012-11-21	7	25E	4061	5545.54	1639.71	25428	1 S TENERIFFA	SEA	-	-	53.5	5,0	-	-	-	
2012-11-21	9	25E	4061	5551.62	1630.39	25403	7 NW TENERIFFA	SEA	-	-	52	4.3	-	-	-	
2012-11-21	11	25E	4061	5540.90	1612.44	25301	11 E TÅNGEN	SEA	-	-	67	0,5	-	-	-	
2012-11-26	56	25E	4161	5630.69	1657.50	25315	15 NE SEGERSTAD	SEA	-	-	68.5	0,1	-	-	-	
2012-11-20	1	25W	4059	5538.25	1437.12	25093	11 E STENSHUVUD	SEA	-	-	58	2,3	-	-	-	
2012-11-27	58	25W	4059	5541.67	1424.17	25418	RACKAPUTT 38 M	SEA	-	-	37.5	5,1	-	-	-	
2012-11-27	59	25W	4059	5542,46	1422,81	25418	RACKAPUTT 38 M	TV3	24	37.6			885.4	614.1	4897	
2012-11-20	5	25C	4060	5553,04	1534,05	25405	5SSW UTKLIPPAN	TV3	30	50.9			1058.7	16.7	141	
2012-11-20	4	25C	4060	5549,04	1515,35	25426	3 NW VÄSTRA NABBEN	TV3	30	51.5			1785.9	155.7	1163	
2012-11-21	10	25E	4061	5551,86	1628,69	25403	7 NW TENERIFFA	TV3	30	53			1290.5	99.8	365	
2012-11-21	8	25E	4061	5545,85	1639,85	25428	1 S TENERIFFA	TV3	30	55.7			1448.0	256.5	1089	Replaced 25390
2012-11-22	18	25C	4060	5550,15	1556,64	25413	11 SE UTKLIPPAN	TV3	30	57.4			1075.0	103.0	832	
2012-11-21	13	25C	4060	5548	1554,47	25299	INRE U10	TV3	30	60.8			1250.5	952.6	3743	
2012-11-20	2	25W	4059	5538,88	1438,43	25093	11 E STENSHUVUD	TV3	30	60.8			844.3	406.3	1557	Replaced 25354
2012-11-22	16	25C	4060	5544,08	1533,34	25298	6 W TÅNGEN	TV3	30	62.2			1197.2	716.3	2772	Replaced 25392
2012-11-21	12	25E	4061	5540,83	1611,44	25301	11 E TÅNGEN	TV3	30	69.6			113.0	44.1	107	Replaced 25315:2
2012-11-26	57	25E	4161	5629.00	1657.40	25315	15 NE SEGERSTAD	TV3	30	70			0	0	0	Only hydrography. Oxygen deficiency.
TOTAL FÅNGST (KG), TORSKFÅNGST, VIKT (KG) OCH ANTAL / Total catch (kg), cod catch, weight (kg) and numbers													**18 208**	**3 379**	**17 011**	

Table 2. Summary of the species in the catches. Swedish BITS, quarter 4 2012.

Namn	Latinskt namn	SD 25W		SD 25C		SD 25E		SD 26		SD 27		SD 28		Totalt	
Local name	Species	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)
TORSK	*Gadus morhua*	6 454	1 020.5	8 651	1 944.3	1 561	400.4	50	6.6	12	2.0	284	5.0	17 011	3 378.8
SILL	*Clupea harengus*	8 218	466.9	67 427	3 427.7	41 641	2 377.2	8 531	432.0	187 145	4 198.0	68 041	1 988.8	381 004	12 890.4
SKARPSILL	*Sprattus sprattus*	5 663	94.2	56 988	889.0	3 625	45.0	67	0.7	24 846	155.3	23 059	149.4	114 248	1 333.6
SJURYGG	*Cyclopterus lumpus*	2	0.8	5	1.7	1	0.3	1	0.4			6	1.5	15	4.7
FYRTÖMMAD SKÄRLÅNGA	*Enchelyopus cimbrius*	3	0.3											3	0.3
STORSPIGG	*Gasterosteus aculeatus*									503	0.8	37	0.1	540	0.8
SPETSSTJÄRTAT LÅNGEBARN	*Lumpenus lampretaeformis*											10	0.1	10	0.1
VITLING	*Merlangius merlangus*	1	0.2	1	0.1									2	0.3
HORNSIMPA	*Myoxocephalus quadricornis*									593	29.4	507	33.0	1 100	62.4
RÖTSIMPA	*Myoxocephalus scorpius*			5	0.8			55	13.1			185	34.6	245	48.4
SKRUBBSKÄDDA	*Platichthys flesus*	275	82.4	392	84.8	99	24.2	31	7.2	167	27.6	982	156.2	1 946	382.3
RÖDSPÄTTA	*Pleuronectes platessa*	266	59.9	74	16.3	7	3.2	1	0.3			1	0.1	349	79.7
POMATOSCHISTUS (SLÄKTE)	*Pomatoschistus*											348	0.3	348	0.3
PIGGVAR	*Psetta maxima*	6	3.4									2	0.8	8	4.2
TÅNGSPIGG	*Spinachia spinachia*											8	0.02	8	0.02
ÅLKUSA	*Zoarces viviparus*									2	0.1	67	0.6	69	0.7
SUMMA	TOTAL	20 889	1 729	133 543	6 365	46 934	2 850	8 737	460	213 267	4 413	93 538	2 370	516 907	18 187

Institute of
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Cruise report
Cruise number 668 FRV „Solea“
18/02/- 5/03/2013

Baltic International Trawl Spring Survey (BITS) in the Arkona Sea, Mecklenburg- and Kiel Bight (ICES SD 24+22)

Scientist in charge**: Dr. A. Velasco**

1. Summary

The 668th cruise of the FRV “Solea” is the 32th German Spring survey since 1981. It was part of the Baltic International Trawl Survey (BITS), which was coordinated by ICES (WGBIFS). The main objective of the survey was to estimate fishery independent stock indices for the two Baltic cod stocks, flounder and other flat fish.
In total 60 fishery hauls and 59 hydrography stations were carried out.
A preliminary analysis of the survey results suggests a stronger year class of cod in 2012 as compared with the previous year class 2011 (recruits at length range 10-25 cm). The proportion of recruits between 26-40 cm was lower in all depth layers as compared to the previous year, with the exception of the depth layer of 20-39 meters in subdivision 24 and of the depth layer of 10-29 meters in subdivision 22.
The abundance of flounder increased substantially in all depth layers as compared to the previous year.
During the survey high salinity-gradients were observed.
The oxygen concentration was sufficiently high at all stations down to the bottom.

Verteiler:

BLE, Hamburg
Schiffsführung FFS „Solea“
BMELV, Ref. 614
TI, Pressestelle (Dr. Welling)
TI, Präsidialbüro
TI, FI
TI, SF
TI, OF

TI, FIZ-Fischerei
Fahrtteilnehmer
BFEL Hamburg, FB Fischqualität
IFM-GEOMAR, Kiel
Institut für Fischerei der Landesforschungsanstalt
LA für Landwirtschaft, Lebensmittels. u. Fischerei
BSH, Hamburg

Deutscher Fischerei-Verband e. V., Hamburg
Leibniz Institut für Ostseeforschung
Doggerbank GmbH
Mecklenburger Hochseefischerei Sassnitz
Kutter- und Küstenfisch Sassnitz
Landesverband der Kutter- und Küstenfischer
Sassnitzer Seefischer
Deutsche Fischfang Union Cuxhaven
Schiffseinsatzplanung, Herr Dr. Rohlf
Euro-Baltic Mukran

2. Research program

The cruise took place from the 18th February until the 5th of March 2013. Corresponding to the recommendations of the WGBIFS in 2007, the survey of the FRV “Solea” covered the subdivisions 22 and 24 (Figure 1).

The following stock assessment objectives were covered during the survey:

- Collecting data for assessing stock indices, the structure and recruitment of the stocks, especially for cod and flatfish
- Monitoring the composition of fish species in the western Baltic Sea
- Collecting samples of cod and flounder for biological investigations (i.e. sex, maturity, fecundity, age)
- Monitoring the actual hydrographical situation in the survey area

3. Narrative

The internationally coordinated trawl survey is planned as a Stratified Random Survey where ICES subdivisions and depth layers are used as strata. A total of 60 stations (54 in subdivision 24 and 6 in subdivision 22) were planned for the German part of the survey, which covered the southern part of ICES subdivision 22 and subdivision 24 in total. The haul positions were selected from the TOW Database by the coordinator of the BITS surveys (ICES 2008, WGBIFS report). 60 fishing stations were covered and can be used for stock assessment. The fishing hauls were carried out between 7:00 and 15:00 UTC (8:00 and 16:00 local time).

The positions of the trawl hauls are shown in Figure 1. 6 fishing hauls and 6 hydrographic stations were done in subdivision 22, and 54 fishing hauls and 53 hydrographical stations were realized in subdivision 24.

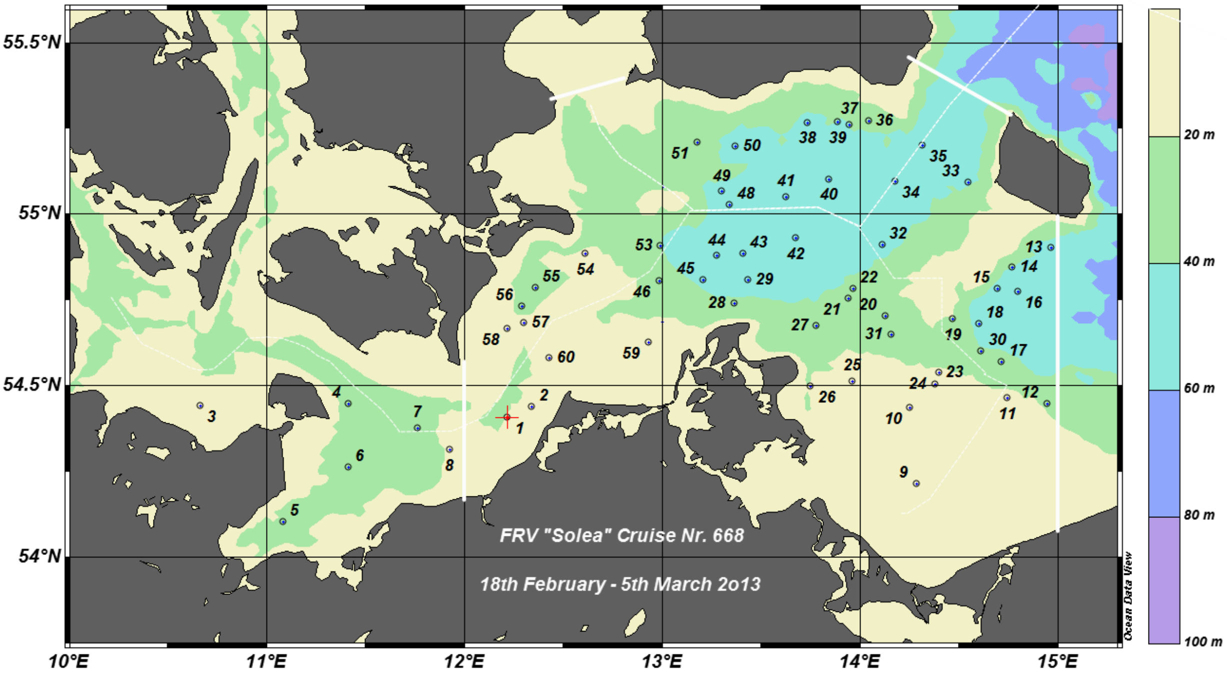

Figure 1: Stations of the 668th FRV “SOLEA” cruise (Ocean Data View, R. Schlitzer, www.awi-bremerhaven.de/GEO/ODV)

The numbers of fishing hauls and hydrographic stations by subdivision and 10 m depth layers are given in Table 1. Most hauls in subdivision 22 were located at depths from 20 m to 29 m and 24 of 54 hauls in subdivision 24 between 40 and 49 m.

Table 1: Sampling intensity (evaluated fishing stations)

Area		Stations		
Subdivision	**Stratum Depth [m]**	**Total trawl distance [sm]**	**Fishing [n]**	**Hydrography [n]**
22	**2 [10-19]**	1.7	1	1
	3 [20-29]	8.2	5	5
24	**2 [10-19]**	16.7	11	11
	3 [20-29]	16.5	11	10
	4 [30-39]	12.2	8	8
	5 [40-49]	34.9	23	23
	6 [50-59]	1.5	1	1

Trawling was done following the standard BITS trawl “TV3 520#“. The stretched mesh size in the codend was 20 mm. The duration of each haul was 30 minutes at a velocity of 3 kn as required in the BITS manual. The total catch of each haul was analysed to determine species composition in weight and number as well as the length distribution of all species. Subsamples of cod, flounder, plaice and turbot were investigated concerning sex, maturity and age.

Vertical profiles of the hydrographical parameters temperature, salinity and oxygen were sampled from the surface to the bottom immediately after every fishing haul with a CTDO probe (Sea Bird 19+ 4346).

4. Preliminary results

4.1 Biological data

In total 1015 cod, 645 flounder, 746 dab, 535 plaice and 91 turbot were collected for measuring length, weight, sex, maturity and age. The total catches and numbers of length samples of cod and flounder are given in Table 2 by subdivision and depth stratum.

Table 2: Numbers of length measurements of cod and flounder by depth stratum and ICES subdivision

Area		Sample			
		Cod		Flounder	
Subdivision	**Depth [m]**	**Weight [kg]**	**Number [n]**	**Weight [kg]**	**Number [n]**
22	**10-29**	214.5	444	62.4	175
24	**10-19**	39.1	107	147.0	1894
	20-39	214.7	881	118.5	858
	40-59	2473.5	10196	525.0	3098

The mean catch per half hour (CPUE) was 32.2 kg of cod and 9.5 kg of flounder. In general the catch composition was dominated by cod. However, flounder, plaice and dab were also abundant in the catches. The mean fraction of cod biomass in the hauls was 51.3 % and mean fraction of flounder, plaice, dab and turbot was 15.1 %, 6.1 %, 5 % and 0.8 %, respectively. Sprat and herring represented 18.8 % of the total biomass in mean.
The highest abundances in weight and number of cod and flounder were observed in subdivision 24 in depths between 40 - 59 m.

Mean CPUE of cod and flounder are given in Table 3 by subdivision and depth stratum.

Table 3: Mean CPUE of cod and flounder and average individual weights by subdivision and depth

Area		Catch							
		Cod				Flounder			
Subdivision	**Depth [m]**	**Weight [kg/sm]**	**Number [n/sm]**	**Avg-Weight [g]**	**Stations [n]**	**Weight [kg/sm]**	**Number [n/sm]**	**Avg-Weight [g]**	**Stations [n]**
22	**10-29**	21.8	45	483.2	6	6.3	18	356.6	6
24	**10-19**	2.3	6	365.9	11	8.8	113	77.6	11
	20-39	7.5	31	243.7	20	4.1	30	138.1	20
	40-59	67.9	280	242.6	24	14.4	85	169.5	24

The frequencies of cod grouped by subdivision and depth strata are presented in figures 1 to 3.

Noteworthy is the abundance of cod recruits ranging in length from 10 to 25 cm in subdivisions 22 and 24. Compared to last year, the frequency of cod in the length range 10–25 increased in all depth layers. (Table 4 and Figures 2 to 4).

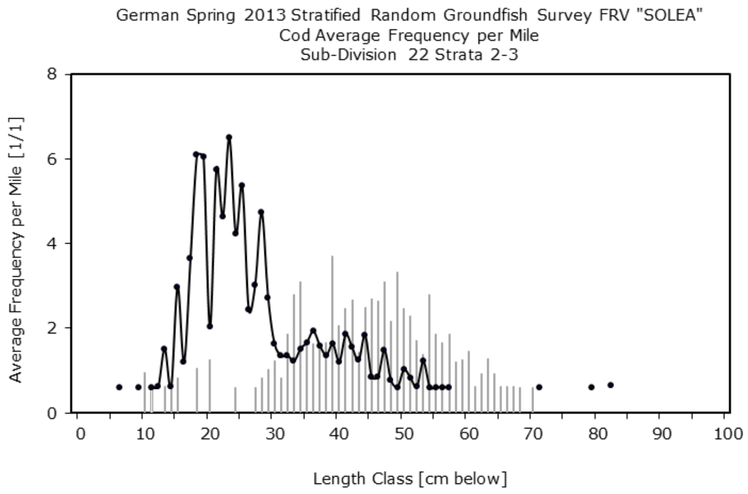

Figure 2: Length frequencies of cod in number per mile in depth strata 10 m to 29 m in SD 22 2013 (line) and 2012 (bars), (6 Hauls)

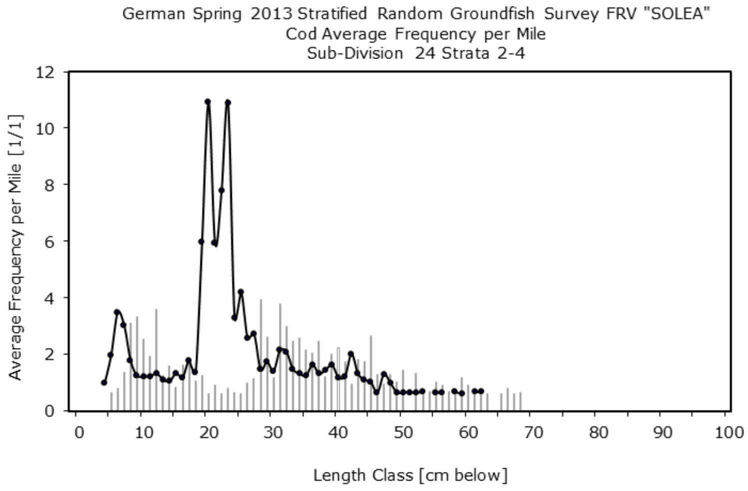

Figure 3: Length frequencies of cod in number per mile in depth strata 10 m to 39 m in SD 24 2013 (line) and 2012 (bars), (30 Hauls)

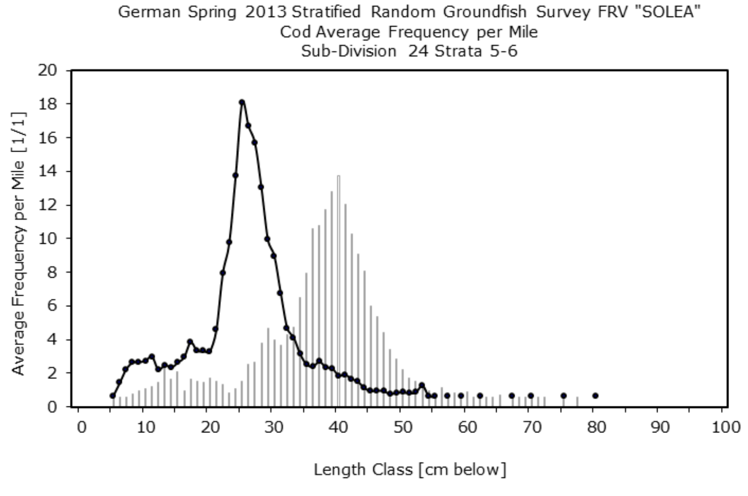

Figure 4: Length frequencies of cod in number per mile in depth strata 40 m to 59 m in SD 24 2013 (line) and 2012 (bars), (24 Hauls)

Table 4: Recruitment by length group of the year 2013 in comparison to the previous year

Area		Catch	2013		
Subdivision	**Depth [m]**	**Length range [cm]**	**Number [n]**	**Number / Mile [n/sm]**	**Trawl distance [sm]**
22	**10-29**	**26 - 40**	173	18	9.8
24	**10-19**	**26 - 40**	23	1	16.7
	20-39	**26 - 40**	245	9	28.7
	40-59	**26 - 40**	3755	103	36.4
22 - 24	**10-59**	**26 - 40**	4196	46	91.7
22	**10-29**	**10 - 25**	139	14	9.8
24	**10-19**	**10 - 25**	27	2	16.7
	20-39	**10 - 25**	274	9	28.7
	40-59	**10 - 25**	1658	46	36.4
22 - 24	**10-59**	**10 - 25**	2098	23	91.7

Area		Catch	2012		
Subdivision	**Depth [m]**	**Length range [cm]**	**Number [n]**	**Number / Mile [n/sm]**	**Trawl distance [sm]**
22	**10-29**	**26 - 40**	109	13	8.2
24	**10-19**	**26 - 40**	102	7	14.8
	20-39	**26 - 40**	221	9	24.2
	40-59	**26 - 40**	4117	94	44.0
22 - 24	**10-59**	**26 - 40**	4556	50	91.1
22	**10-29**	**10 - 25**	20	2	8.2
24	**10-19**	**10 - 25**	23	2	14.8
	20-39	**10 - 25**	119	5	24.2
	40-59	**10 - 25**	595	14	44.0
22 - 24	**10-59**	**10 - 25**	779	9	91.1

Under the assumption that the survey covered the entire nursery ground of one-year old cod, a stronger year class 2012 than the year class 2011 must be assumed.

4.2 Hydrographical data

Figure 5 shows the distribution of temperature, salinity and oxygen near the bottom and at the surface in the covered area.

The hydrography was characterised by typical winter conditions with surface temperatures between 0.4 °C and 2.3 °C. The salinity of the surface water decreased from 13.6 to 6.9 from west to east. The lowest temperature value was found in the area west of Rügen with 0.3 °C (water depth 15 m). The salinity above the permanent halocline at a depth of 40 m in the Arkona Basin was approximately 7.3. The salinity increased below the halocline up to 12.9 at a depth of 44.8 m (Figure 5).The maximum salinity was observed in the Arkona Sea with 20.9 at 3.6 °C (water depth 43 m).

The oxygen concentration close to the bottom was sufficiently high (5.5 – 9.5 ml*l-1) at all stations.

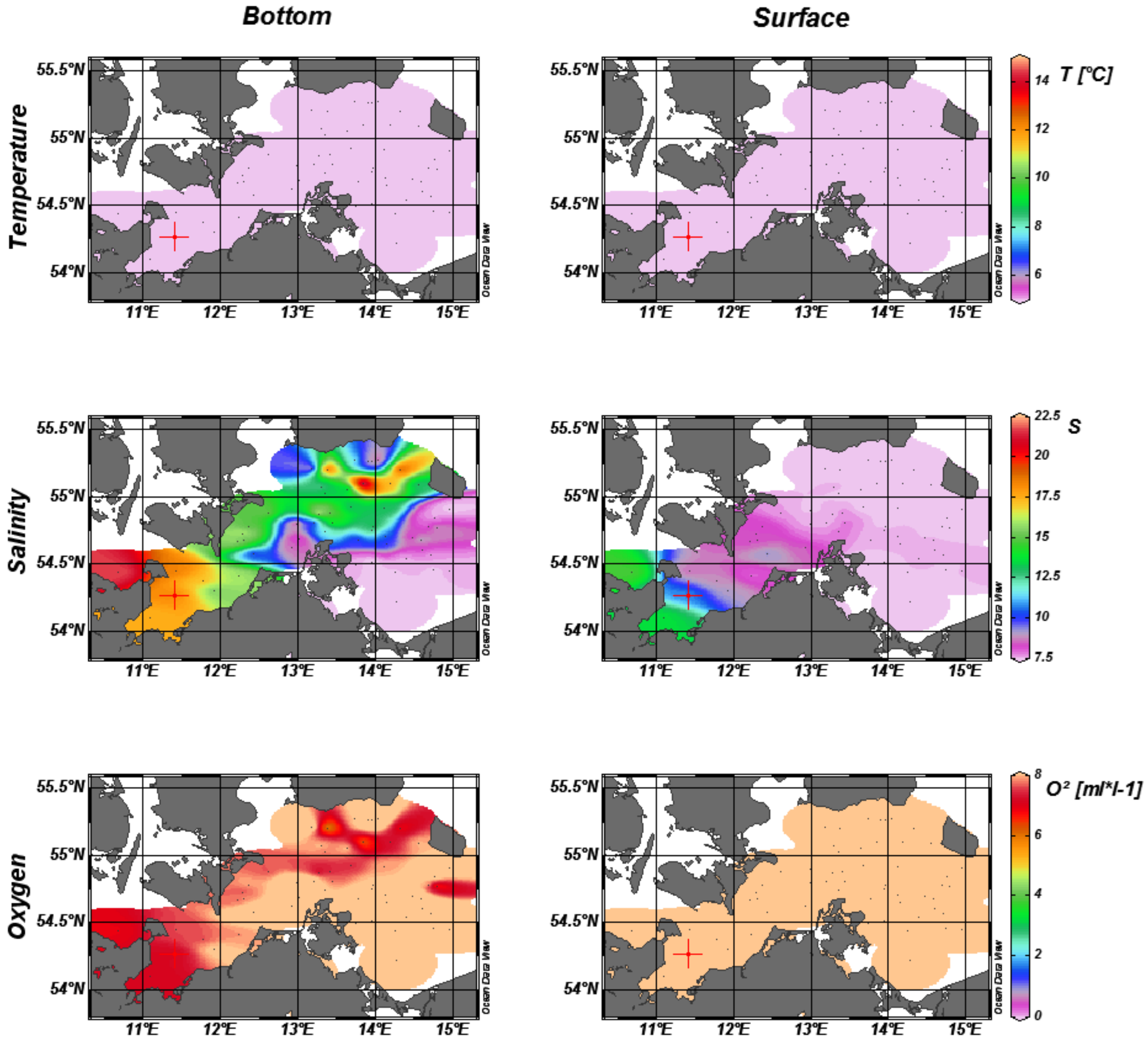

Figure 5: Hydrography of the survey near the bottom (left) and at the surface (right)

5. Participants

A. Velasco	TI-OF	Scientist in charge
A. Müller	TI-OF	Technician
T. Rohde	TI-OF	Technician
C. Albrecht	TI-OF	Technician
T. Jankiewicz	TI-OF	Technician
J. Fouquet	University of Lille	Student helper
I. Kratzer	University of Rostock	Student helper

6. Acknowdgelements

I would like to express my gratitude to Capt. Koops and his crew on the FRV "Solea" for their cooperation.

Scientist in charge

Institute of Food Safety, Animal Health and Environment “BIOR” Riga (Latvia)
National Marine Fisheries Research Institute, Gdynia (Poland)

THE CRUISE REPORT

FROM THE JOINT LATVIAN-POLISH BITS 1Q SURVEY ON THE POLISH R.V. “BALTICA” IN THE CENTRAL-EASTERN BALTIC(05-13 March 2013)

by
Ivo Sics*, Włodzimierz Grygiel** and Tycjan Wodzinowski**

* Institute of Food Safety, Animal Health and Environment “BIOR” Riga (Latvia),

** National Marine Fisheries Research Institute, Gdynia (Poland)

Gdynia - Riga, March 2013

INTRODUCTION

The joint Latvian-Polish BITS survey, conducted in the period of 05-13.03.2013 on the r.v. “Baltica” , was based on the agreement between the Institute of Food Safety, Animal Health and Environment “BIOR” in Riga and the National Marine Fisheries Research Institute (NMFRI”) in Gdynia. The joint Latvian-Polish BITS 1Q survey was conducted in the Latvian and Lithuania EEZs (the ICES Sub-divisions 26N and 28). It was part of the Baltic International Trawl Survey (BITS), which was coordinated by the ICES Baltic International Fish Survey Working Group [WGBIFS] (Anon. 2012).

The main aims of reported cruise were:

1. Collecting materials to investigate the distribution, abundance and biological structure of cod stock.
2. Determine distribution and abundance of cod recruits. Estimates of year – class strength of cod.
3. Collecting materials to investigate the distribution abundance and biological structure of flounder and turbot stocks.
4. Collect data on cod feeding.
5. Collect samples of ichthyoplankton.
6. Analysis of the hydro-meteorological conditions (seawater temperature, salinity, oxygen content, air temperature, atmospheric pressure, wind velocity and directions) in the ICES Sub-divisions 26N and 28.
7. Acoustical data recording during trawling and on the distance between consecutive catch-stations.

MATERIALS AND METHODS

Personnel

The BITS Q1 - 2013 survey scientific staff was composed of nine persons, i.e.:
W. Grygiel, NMFRI, Poland - cruise leader,
J. Słembarski, NMFRI, Poland - acoustician,
T.Wodzinowski, NMFRI, Poland - hydrologist,
I. Sics, BIOR, Latvia - scientific staff leader,
E. Kruze, BIOR, Latvia - ichthyologist,
I. Kazmers, BIOR, Latvia - ichthyologist,
A. Minde, BIOR, Latvia - ichthyologist,
I. Putnis, BIOR, Latvia – ichthyologist,
J. Aizups, BIOR, Latvia – ichthyologist.

Narrative

The reported survey research tasks realization took place during the period of 05-13 March 2013 and overall nine full days was devoted survey plan accomplishment. The at sea researches were conducted within the Latvian and Lithuanian EEZs (the ICES Sub-divisions 26N and 28) moreover, inside the Latvian territorial waters not shallower than 20 m (the ICES Sub-division 28).

The vessel left the Gdynia port (Poland) on 04.03.2013 at 22.00 o’clock and was navigated towards the south-western corner of the Latvian waters (Fig. 1). The direct at sea researches begins on 05.03.2013, at noon and were ended on 12.03.2013, and in the next day the r/v

"Baltica" returned back to the homeport.

Survey design and realization

The original surveys plan provided that 23 control-hauls will be realized in the Latvian EEZ and 4 control-hauls in the Estonian EEZ. Unfortunately, the r.v. "Baltica" did not received permission for fishing in the Estonian EEZ, as a result 4 planed catch-stations were shifted to the northern part of the Latvian EEZ.

The r.v."Baltica" realized 27 bottom trawl control-hauls from the 27 planned, incl. the Latvian territorial waters (Fig. 1, Table 1). Two catch-stations were only initiated by hydrological parameters measurement and due to very low oxygen concentration (below 1 ml/l) near bottom, fishing was omitted.

All trawl catches were performed in the daylight. The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches in the Latvian EEZ. The standard trawling duration was 30 minutes. The mean speed of vessel while trawling was 3.0 knots. However, in the case of 16 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder. Five additional control-hauls were realized in Lithuanian EEZ. The standard rigging TV-3#930 trawl was used in the above-mentioned waters.

The length measurements in the 1.0-cm classes was realised for 3421 cod and 3029 flounder. Length measurements in the 0.5-cm classes was realised for 2566 herring and 1904 sprat. In total, 303 cod and 331 flounder individuals were taken for biological analysis. The details about fish biological sampling are presented in Table 2.

Acoustic data, i.e. the echo-integration records (S_A = NASCs; Nautical Area Scattering (Strength) Coefficient) were collected with the EK-60 scientific echosounder during fishing operations and on the distances between consecutive hauls. Echo-sounding data collected during the BITS survey were delivered to the Latvian researchers for further analysis.

Directly before every haul, the seawater temperature, salinity and oxygen content were measured continuously from the sea surface to a bottom. The seawater samples were taken also at the standard HELCOM stations. Totally, 37 hydrological stations were inspected with the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.

Meteorological observations of wind velocity and directions and the sea state were realized at the actual geographic position of each control-haul.

RESULTS

Fish catches and biological data

The control-catches basic results collected in March 2013 during the Latvian-Polish BITS-1Q survey are presented in Table 1. Overall, 12 fish species were recognized in hauls performed in the central-eastern Baltic. Herring dominated by mass in the ICES Sub- divisions 26N and 28 with the average share of 45.3% and 76.7%, respectively. Sprat was the next species most frequently represented in terms of mass, i.e. in 18 and 12%, respectively in the ICES SDs 28 and 26N. Cod was the third species most frequently represented in terms of mass in the ICES SDs 26 and 28 (mean share was 33.2 and 0.3%, respectively). Share of flounder in control-catches curried out in the ICES SDs 26 and SD 28 was 9.7 and 4.9%, respectively. By-catch of other fishes was insignificant.

The mean CPUE for all species in investigated the Baltic areas amounted 603.2 kg/0.5h, and in this 41.0, 34.7, 421.3 and 100.2 kg/0.5h were for cod, flounder, herring and sprat, respectively.

The mean CPUE of cod in the ICES Sub-division 26N was 142.8 kg/0.5h, but in the ICES SD 28 was 2.0 kg/0.5h. The mean CPUE of flounder in the ICES Sub-division 26 was 41.8 kg/0.5h, and in the ICES Sub-division 28 was 29.6 kg/0.5h.

Total catch of fishes and the number of realized hauls in the Latvian and Lithuanian EEZs, during reported BITS survey is presented in the text-table below:

EEZ	Number of hauls	Total catch kg				
		Cod	Herring	Sprat	Flounder	Others
Latvian EEZ	27	66.6	11293.1	2643.8	306.6	173.2
Lithuanian EEZ	5	1122.6	1346.4	362.6	239.3	1.1

The length distribution of cod, flounder, herring and sprat, according to the ICES Sub-divisions 26N and 28 and particular hauls is illustrated in Figures 2-5 and Tables 3-6.

Cod

The total length of cod in scrutinized samples ranged from 6 to 67 cm and specimens from the length classes of 26 and 29 cm dominated in samples from the ICES Sub-divisions 26 and 28, respectively. The smaller fish, with a length range of 20-32 cm occurred in ICES Sub-division 26 and constituted about 83% of all measured cod in that sub-division (Fig. 2).

Flounder

The total length of flounder in samples ranged from 13 to 40 cm, with dominating length classes of 18-29 cm in the ICES Sub-division 28 and 20-32 cm in the ICES Sub-division 26 (Fig. 3).

Herring

The length range of collected herring was 9-32 cm, and specimens from the length classes of 18-24 cm were most frequently represented in samples from the ICES Sub-division 26N and from length classes of 15-21 cm prevailed in the ICES SD 28 (Fig. 4).

Sprat

The length range of collected sprat was 5-14 cm, and the length distribution considerably differed between the ICES Sub-divisions 26N and 28. The length frequency apexes of 7-8 cm and 11-12 cm were characteristically for sprat samples from the ICES Sub-divisions 26N and 28, respectively (Fig. 5).

Hydrological and meteorological characteristics

Graphic illustration of the main hydro-meteorological parameters changes in the Gotland Basin is shown in Figures 6 and 7, and Table 7. Hydrological parameters were measured at each catch-station location and at some the standard HELCOM hydrological stations (Fig. 1). Measurements were inspected with the Neil-Brown CTD-probe combined with the rosette sampler. Oxygen content was determined by the standard Winkler’s method. The STD row data were aggregated to the 1-m depth stratum. The oxygen probes ware taken on every 10 meter depth level. The salinity parameter is presented in Practical Salinity Unit (PSU).

The most frequently appeared wind (Fig. 6 and Table 7.) was from the south-west direction. The wind speed varied from 0.2 to 14.8 m/s and average speed was 8.0 m/s. The air temperature ranged from -7.1 to 4.8°C, and average temperature was -1.5°C.

Oxygen content in the surface waters range from 7.78 to 9.42 ml/l. Salinity varied between 6.94 and 7.35 and temperature varied from 0.93 to 2.53°C. The average values of measured parameters were: oxygen content 9.10 ml/l, salinity 7.17 and temperature 1.74°C.

The seawater temperature in the near bottom zone (Fig.7.) was changing in the range from 1.21°C at the haul No. 17 to 6.43°C at hydrological station No. 37. Salinity in the bottom waters varied from 7.09 to 12.05. The low values of salinity were noticed at haul No. 17. The highest values of salinity were noticed in the Gotland Deep (at station No. 37). Oxygen content varied from 0.00 ml/l in deepest parts of investigated area to 9.30 ml/l at haul No. 17.

The halocline generally was recognized on the depth of 55-60 m, and on near shore stations on depth even around 30 m.

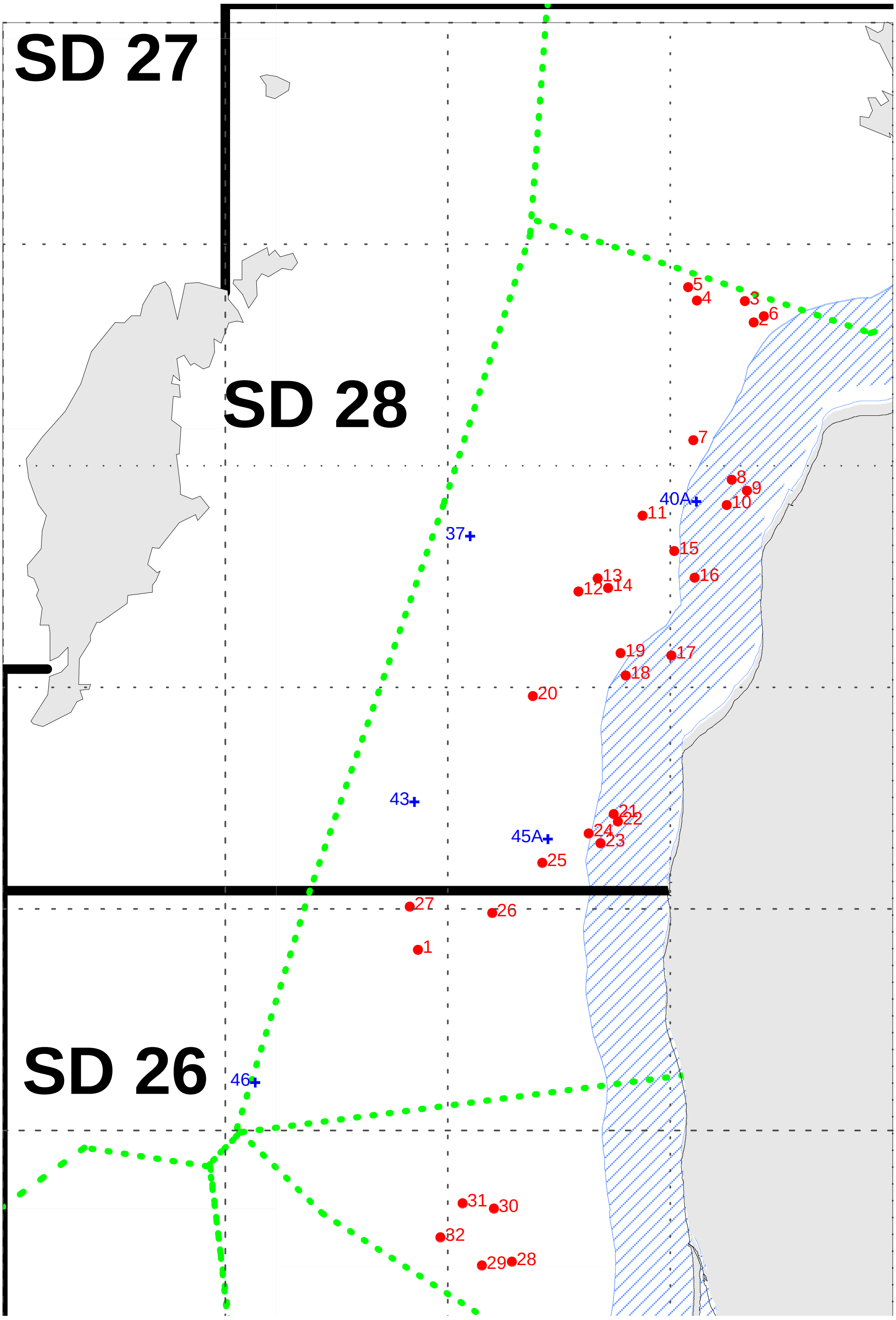

Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with blue crosses), green lines - national fishing zone borders.

Table 1. Catch results from the Latvian-Polish BITS 1Q survey; r/v "Baltica", 05-13 March 2013.

Haul numbering according to the survey order	Haul numbering according to the ICES TD database	Catch date	ICES recta-ngle	ICES Sub-div.	EEZ	Trawling depth [m]	The ship's course during fishing [°]	Geographical position of the catch-station				Time of		Trawling dura-tion [min]	Catch of all species [kg/0.5 h]	CPUE of particular fish species [kg/0.5 h]					Technical remarks
								start		end		shutting net	hauling up net			cod	herring	sprat	flounder	others	
								latitude	longitude	latitude	longitude										
1	26259	2013-03-05	41G9	26	LAT	89-91	70	56°22.3'	19°49.4'	56°22.8'	19°51.6'	16,00	16,30	30	332,285	20,080	210,710	19,900	81,470	0,125	
2	28055	2013-03-06	44H1	28	LAT	70	325	57°46.5'	21°23.6'	57°47.0'	21°23.1'	7,25	7,40	15	602,680	1,818	516,806	76,740	5,480	1,836	
3	additional	2013-03-06	44H1	28	LAT	72-73	275	57°49.7'	21°21.2'	57°49.8'	21°19.9'	8,30	8,45	15	1552,056	0,806	1331,200	215,620	4,160	0,270	additional haul shifted from the Estonian EEZ
4	additional	2013-03-06	44H1	28	LAT	75-76	95	57°50.0'	21°05.1'	57°50.0'	21°07.7'	10,45	11,15	30	399,732	2,520	265,370	106,510	25,240	0,092	additional haul shifted from the Estonian EEZ
5	additional	2013-03-06	44H1	28	LAT	78-80	130	57°52.3'	21°03.3'	57°51.5'	21°05.4'	12,45	13,15	30	164,600	2,020	142,676	13,784	6,070	0,050	additional haul shifted from the Estonian EEZ
6	28116	2013-03-06	44H1	28	LAT	62-65	200	57°46.8'	21°25.4'	57°46.1'	21°25.2'	15,55	16,10	15	2763,540	0,000	2014,760	744,640	1,290	2,850	haul from TD, instead of haul planned in the Estonian EEZ
7	28178	2013-03-07	44H1	28	LAT	66	195	57°32.0'	21°06.9'	57°30.7'	21°06.4'	7,15	7,45	30	267,153	11,030	150,680	35,580	66,140	3,723	
8	28023	2013-03-07	43H1	28	LAT	58-63	200	57°25.9'	21°16.9'	57°24.7'	21°16.1'	9,35	10,05	30	733,751	4,100	634,380	0,547	44,520	50,204	
9	28009	2013-03-07	43H1	28	LAT	33-35	173	57°26.3'	21°20.1'	57°25.5'	21°20.3'	11,45	12,00	15	545,010		529,880	0,000	11,800	3,330	depth was slightly to high acc. to the TD
10	28008	2013-03-07	43H1	28	LAT	53-56	195	57°22.8'	21°15.7'	57°22.2'	21°15.4'	12,45	13,00	15	4,952	0,000	1,230	0,000	3,500	0,222	haul No. 28007 should be deleted from the TD list because of appearance of a very hard bottom, and instead of this one haul No. 28008 (primary not selected) was made
11	28006	2013-03-07	43H0	28	LAT	58-59	205	57°22.7'	20°54.1'	57°22.0'	20°53.7'	15,30	15,45	15	398,048	0,658	216,560	167,200	11,660	1,970	trawling depth was slightly lower than in the TD
12	28074	2013-03-08	43H0	28	LAT	95-96	10	57°10.5'	20°35.2'			6,55	-	-						0,000	oxygen depletion in the bottom waters; 0,69 ml/l of O_2
13	28075	2013-03-08	43H0	28	LAT	83	10	57°12.6'	20°40.5'			7,40	-	-						0,000	oxygen depletion in the bottom waters; 0,92 ml/l of O_2
14	28043	2013-03-08	43H0	28	LAT	77-78	5	57°11.7'	20°43.0'	57°13.1'	20°43.0'	8,30	9,00	30	27,417	0,127	20,450	1,647	5,180	0,013	
15	28022	2013-03-08	43H1	28	LAT	63-64	325	57°16.2'	21°01.2'	57°16.7'	21°00.6'	11,00	11,15	15	825,916	2,666	57,580	754,500	6,940	4,230	
16	28005	2013-03-08	43H1	28	LAT	43-46	30	57°12.5'	21°06.6'	57°13.3'	21°07.4'	12,50	13,05	15	1933,114	6,060	1796,280	57,920	38,860	33,994	
17	28136	2013-03-08	43H1	28	LAT	28-32	210	57°03.6'	21°02.2'	57°02.4'	21°00.1'	14,50	15,20	30	113,999	0,658	1,101	0,000	111,290	0,950	
18	28036	2013-03-09	42H0	28	LAT	67-70	360	56°59.5'	20°48.0'	57°00.0'	20°47.9'	6,55	7,10	15	974,868	3,226	896,260	3,600	70,980	0,802	
19	28041	2013-03-09	43H0	28	LAT	72-70	165	57°03.7'	20°46.4'	57°03.0'	20°46.5'	8,25	8,40	15	832,350	1,404	401,680	404,752	24,120	0,394	
20	28094	2013-03-09	42H0	28	LAT	87-83	200-205	56°57.9'	20°24.6'	56°56.6'	20°23.3'	12,05	12,35	30	86,576	0,000	35,240	1,559	49,777	0,000	
21	28001	2013-03-10	42H0	28	LAT	43	205	56°40.1'	20°44.6'	56°39.4'	20°43.9'	7,45	8,00	15	628,734	2,310	596,560	0,000	28,000	1,864	
22	28157	2013-03-10	42H0	28	LAT	39-41	225	56°38.8'	20°44.8'	56°38.1'	20°43.8'	8,55	9,10	15	991,400	1,266	914,900	2,212	27,180	45,842	
23	28002	2013-03-10	42H0	28	LAT	40-38	205	56°37.6'	20°42.2'	56°36.9'	20°41.4'	10,20	10,35	15	373,498	0,822	315,460	2,576	43,200	11,440	
24	28011	2013-03-10	42H0	28	LAT	48-46	195	56°37.6'	20°37.9'	56°37.0'	20°37.5'	13,55	14,10	15	350,480	5,000	210,960	14,560	110,980	8,980	
25	28031	2013-03-11	42H0	28	LAT	76	250	56°33.7'	20°24.8'	56°33.5'	20°23.5'	7,35	7,50	15	46,134	0,000	30,320	0,912	14,880	0,022	
26	26081	2013-03-11	41H0	26	LAT	85-82	175	56°29.5'	20°13.0'	56°28.8'	20°12.7'	9,20	9,35	15	14,812	0,000	1,586	0,954	12,240	0,032	
27	26145	2013-03-11	41G9	26	LAT	113-117	225	56°27.7'	19°48.8'	56°26.7'	19°46.8'	12,30	13,00	30	20,252	0,000	0,446	18,100	1,706	0,000	
28	26193	2013-03-12	40H0	26	LIT	70-71	240	55°39.7'	20°16.9'	55°39.2'	20°15.6'	6,45	7,00	15	628,664	462,080	105,102	12,056	49,426	0,000	standard rigging trawl
29	26194	2013-03-12	40H0	26	LIT	74	175	55°38.4'	20°09.2'	55°37.8'	20°09.3'	8,45	9,00	15	207,860	53,540	67,480	0,000	86,840	0,000	standard rigging trawl
30	26026	2013-03-12	40H0	26	LIT	62-61	345	55°45.1'	20°13.1'	55°45.9'	20°12.7'	10,35	10,50	15	1472,834	95,680	985,412	344,968	45,980	0,794	standard rigging trawl
31	26197	2013-03-12	40H0	26	LIT	67	185	55°47.0'	20°04.1'	55°45.7'	20°04.2'	12,25	12,55	30	497,486	407,240	37,280	0,000	52,680	0,286	standard rigging trawl
32	26057	2013-03-12	40G9	26	LIT	75-78	165-170	55°42.4'	19°58.4'	55°40.8'	19°58.8'	14,15	14,45	30	265,063	104,020	151,143	5,550	4,350	0,000	standard rigging trawl
													Mean	ICES SD 26N	429,907	142,830	194,895	50,191	41,837	0,155	
														ICES SD 28	664,465	2,214	503,652	118,403	32,329	7,212	
														total	603,209	41,005	421,316	100,213	34,865	5,447	
													Sum	Latvian EEZ	14983,357	66,571	11293,075	2643,813	806,663	173,235	
														Lithuanian EEZ	3071,907	1122,560	1346,417	362,574	239,276	1,080	

Table 2. Numbers of fish biologically analysed during the BITS-1q survey in the ICES Sub-divisions 26N and 28; r.v. "Baltica" (05-13 March 2013).

Species	ICES SD	Number of samples	Number of fish	
			measured	analysed
Cod	26	6	3421	187
	28	17	0	116
	Total	23	3421	303
Flounder	26	8	964	163
	28	22	2065	168
	Total	30	3029	331
Turbot	26	1	1	
	28	2	2	
	Total	3	3	
Plaice	26	3	6	
	28	3	5	
	Total	6	11	
Herring	26	8	499	
	28	22	2067	
	Total	30	2566	
Sprat	26	6	469	
	28	18	1435	
	Total	24	1904	
All other species	26	1	7	
	28	20	484	
	Total	21	491	
Total	26	33	5367	350
	28	104	6058	284
	Total	137	11425	821

Fig. 2. Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 5 - 13 March 2013

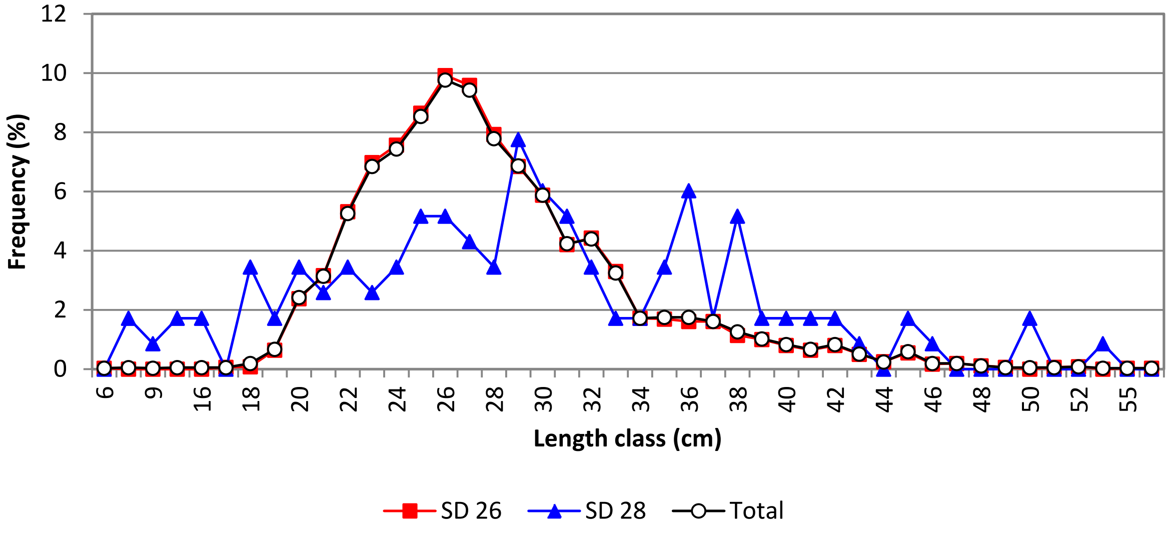

Fig. 3. Length frequency of flounder from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 5 - 13 March 2013

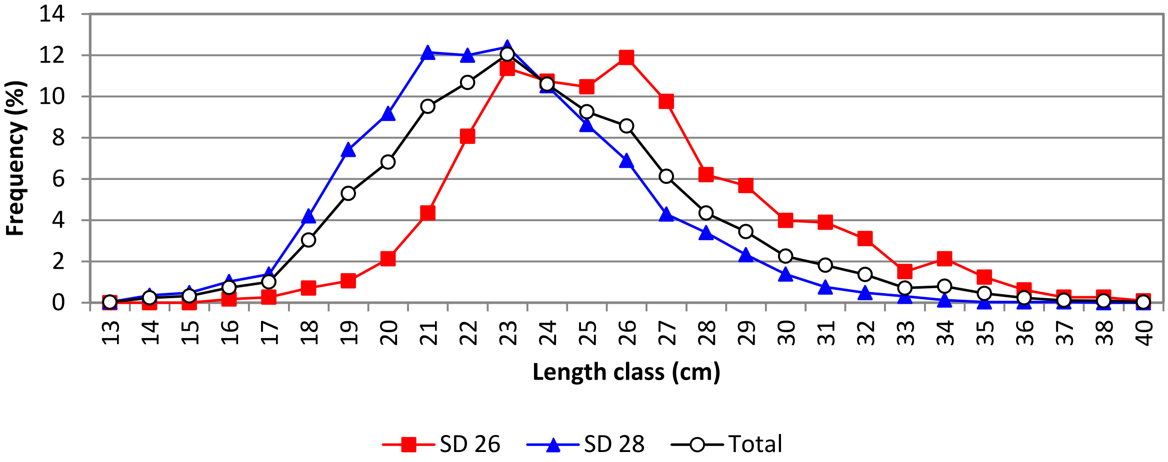

Fig. 4. Length frequency of sprat from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 5 - 13 March 2013

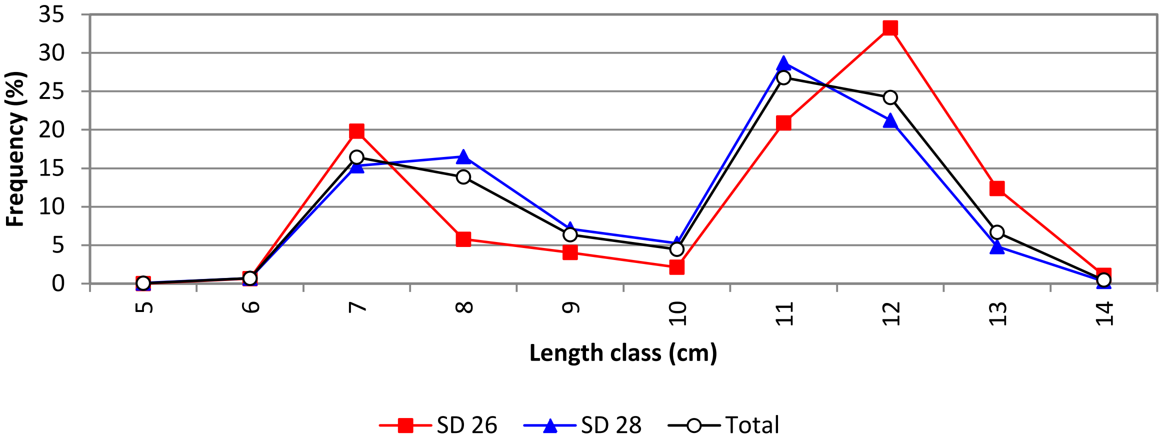

Fig. 5. Length frequency of herring from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 5 - 13 March 2013

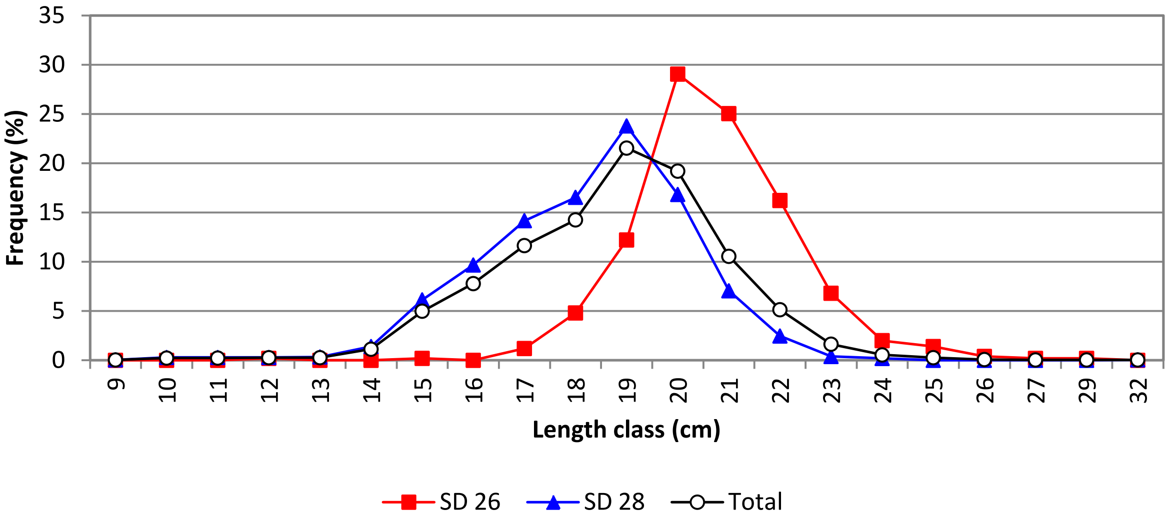

Table 3. Cod length measurements by consecutive hauls in the r/v “Baltica” Latvian - Polish BITS survey (05- 13 March 2013); specimens grouped by 5-cm length classes.

Haul No.	ICES SD	cm_groups												Sum
		5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	65-69	
1	26				4	7	16	11	8	1	1	1		49
2	28							2						2
3	28				1		1							2
4	28			3	5	6	6							20
5	28				2	3	4	1						10
7	28		1		2	8	5	8	3	1	1			29
8	28				1	2	2	1	1		1			8
11	28				1	1								2
14	28				1									1
15	28					2		2						4
16	28							2		1	1			4
17	28								1					1
18	28			1	2	3	1		1					8
19	28			1		1	1							3
21	28	1	1			2				1				5
22	28					1		1						2
23	28							1						1
24	28	2		3	3	1	1	3	1					14
28	26			10	262	477	228	57	19	6	1			1060
29	26				4	40	26	11	6	3				90
30	26			4	157	129	16	5	1					312
31	26			14	487	869	370	99	33	8				1880
32	26	1			3	27	49	71	41	21	3		1	217
SD 26		1		28	917	1549	705	254	108	39	5	1	1	3608
SD 28		3	2	8	18	30	21	21	7	3	3			116
Total		4	2	36	935	1579	726	275	115	42	8	1	1	3724

Table 4. Flounder length measurements by consecutive hauls in the r/v "Baltica" Latvian - Polish BITS survey (05- 13 March 2013); specimens grouped by 2-cm length classes.

Haul No.	ICES SD	cm_group														Sum
		13-14	15-16	17-18	19-20	21-22	23-24	25-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	
1	26			1	9	52	125	145	78	39	9	6	1			465
2	28		1	5	3	6	3	2		2						22
3	28		1	1	1	5	3	2	2							15
4	28	1	3	14	38	35	32	20	17	8	7	1		1		177
5	28			6	9	14	5	10	2	3						49
6	28		1	3	1		1	1								7
7	28	2	7	22	60	96	56	23	16	7	1					290
8	28	3	10	13	22	39	30	16	8	2	1					144
9	28	1	1	3	12	18	12	7	2							56
10	28				3	3	3	1	1		1					12
11	28			3	4	5	12	5	3	4						36
14	28		2		5	13	11	5	1	2						39
15	28			5	7	8	8	3								31
16	28		4	15	31	40	33	22	4	5						154
17	28	1	1	11	66	68	62	29	16	7	1					262
18	28			8	35	35	50	53	25	11	4	2	1			224
19	28		1	2	6	13	19	18	8	6	2					75
20	28			5	12	26	32	35	14	5						129
21	28		1	5	12	24	32	19	8	1						102
22	28		1	3	20	17	28	17	7	1		2				96
23	28			1	6	33	40	34	11	8	3					136
24	28	1			14	33	19	16	21	10	8	5	1			128
25	28				4	8	21	9	6	1						49
26	26				2	4	10	9	9	1			1			36
27	26				2	2	3	2	1		1					11
28	26				2	12	19	11	8	9	13	11	1			86
29	26			7	12	34	40	40	31	19	22	7	2	1		215
30	26		2	2	5	15	22	14	15	10	5	6	4	1		101
31	26			1	3	19	27	29	34	26	27	11	12	4	1	194
32	26				1	2	3	2	4	5	2					19
SD 26		0	2	11	36	140	249	252	180	109	79	41	21	6	1	1127
SD 28		9	34	125	371	539	512	347	172	83	28	10	2	1	0	2233
Total		9	36	136	407	679	761	599	352	192	107	51	23	7	1	3360

Table 5. Sprat length measurements by consecutive hauls in the r/v "Baltica" Latvian-Polish BITS survey (05-1 March 2013); specimens grouped by 1-cm length classes.

Haul No.	ICES SD	cm_groups										Sum
		5	6	7	8	9	10	11	12	13	14	
1	26				3	7	2	10	23	8		53
2	28			1	4	1	7	44	15	2		74
3	28		4	25	22	9	7	24	7	1		99
4	28			11	14	2	10	29	31	6		103
5	28			8	13	8	6	40	28	2		105
6	28			1	4	4	8	40	21	7		85
7	28			16	33	11	7	28	12	4		111
8	28										1	1
11	28		3	11	10	11	7	42	15	4		103
14	28		1	7	9	2	6	29	34	4		92
15	28			38	18	1	1	27	44	16		145
16	28			1			4	34	28	2	1	70
18	28			6	13			3	1			23
19	28			13	17	10	6	27	27	4		104
20	28			9	22	19	1	19	23	14	2	109
22	28			8	3			1	1			13
23	28	1	2	22	9	4		1				39
24	28			22	24	16	2	9	8	2		83
25	28			21	22	4	3	15	10	1		76
26	26		3	93	15	1	1	4	8	4		129
27	26				1	1	2	42	34	6		86
28	26					3		10	33	13	3	62
30	26				6	3	3	20	38	22	1	93
32	26				2	4	2	12	20	5	1	46
SD 26			3	93	27	19	10	98	156	58	5	469
SD 28		1	10	220	237	102	75	412	305	69	4	1435
Total		1	13	313	264	121	85	510	461	127	9	1904

Table 6. Herring length measurements by consecutive hauls in the r/v “Baltica” Latvian-Polish BITS survey (05-13 March 2013); specimens grouped by 1-cm length classes.

		cm_group																					
Haul no	SD	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	29	32	Sum
1	26										4	14	22	24	7	1							72
2	28						2	8	15	22	12	23	19	5	1								107
3	28						6	9	11	9	19	23	15	5									97
4	28						1	4	5	13	26	35	16	8									108
5	28							7	13	22	31	23	16	5	3								120
6	28						1	8	16	26	16	19	9	3	2								100
7	28	1		1			3	3	4	11	13	26	12	11									85
8	28				2	3	1	11	19	21	14	14	20	4	6								115
9	28							13	19	28	21	7	2	1									91
10	28							2	3	4	1	2	2	1	1								16
11	28						2	3	5	5	12	32	21	9	6	3							98
14	28						3	9	14	18	15	19	11	7									96
15	28						2	4	4	7	8	8	11	1	1								46
16	28			1		1	1	8	18	28	27	30	10	4	1	1							130
17	28							3	3	1	2	6	3	3								1	22
18	28					1	1	5	9	7	15	33	24	6	8	1							110
19	28		1	2	1	1	1	6	4	5	12	42	23	14	2								114
20	28			1	3	1		8	1	5	11	19	31	11	4								95
21	28						2	7	8	15	19	26	18	6	4	1	1						107
22	28						1	3	12	15	19	20	16	12	1								99
23	28							2	12	19	16	29	15	9	1	1	1						105
24	28		5	1			2	3	1	8	17	38	21	5	2	1	2						106
25	28							1	4	4	16	18	33	16	8								100
26	26				1			1			2	1	5	2	3								15
27	26												3	2		1							6
28	26									1	1	7	27	23	14	11	5	2	1	1			93
29	26									1	4	7	25	15	15	2		1	1				71
30	26									2	7	8	25	16	10	5							73
31	26									2	6	17	26	23	22	7	1						104
32	26											7	12	20	10	7	4	4			1		65
SD 26					1			1		6	24	61	145	125	81	34	10	7	2	1	1		499
SD 28		1	6	6	6	7	29	127	200	293	342	492	348	146	51	8	4					1	2067
Total		1	6	6	7	7	29	128	200	299	366	553	493	271	132	42	14	7	2	1	1	1	2566

Table 7. The values of basic hydrological and meteorological parameters registered at the catching depths during the r.v. “Baltica” Latvian-Polish BITS survey in March 2013.

Haul number	Date	Hydrological parameters			Meteorological parameters		
		temperature [°C]	salinity	oxygen [ml/l]	wind direction	wind force [°B]	sea state
1	2013-03-05	4,90	9,10	3,00	SW	3	2
2	2013-03-06	4,65	9,23	1,96	SW	3	2
3	2013-03-06	4,62	9,22	2,04	SW	3	2
4	2013-03-06	4,75	9,41	1,50	WSW	4	3
5	2013-03-06	4,74	9,40	1,60	WSW	4	3
6	2013-03-06	4,27	8,73	4,60	W	4	3
7	2013-03-07	2,99	7,59	8,36	N	5	3
8	2013-03-07	1,82	7,20	8,93	N	5	3
9	2013-03-07	1,55	7,14	9,28	N	4	2
10	2013-03-07	1,93	7,21	9,02	N	3	2
11	2013-03-07	3,43	7,71	6,96	N	3	2
12	2013-03-08	5,15	10,23	0,69	ENE	4	2
13	2013-03-08	5,04	10,06	0,92	ENE	4	2
14	2013-03-08	4,91	9,67	1,22	E	3-4	2
15	2013-03-08	3,02	7,54	7,70	E	4	3
16	2013-03-08	2,48	7,33	8,40	E	3	2
17	2013-03-08	1,21	7,09	9,30	E	3	2
18	2013-03-09	4,68	9,06	2,70	NE	4-5	3
19	2013-03-09	4,85	9,42	1,77	NE	6	4
20	2013-03-09	4,99	9,67	1,33	NE	6	4
21	2013-03-10	4,42	8,80	4,63	NE	6	3
22	2013-03-10	4,46	8,82	4,20	NE	6	3
23	2013-03-10	3,96	8,14	5,49	NE	6	3
24	2013-03-10	5,01	9,59	2,80	NE	6	3
25	2013-03-11	5,62	10,60	1,19	ENE	5	3
26	2013-03-11	5,14	9,92	1,26	ENE	5	3
27	2013-03-11	5,65	10,66	1,27	ENE	6	4
28	2013-03-12	4,65	9,03	3,87	NE	4	3
29	2013-03-12	5,09	10,02	2,35	NE	4	3
30	2013-03-12	3,88	8,31	7,88	NE	3	2
31	2013-03-12	4,38	9,15	6,83	NE	3	2
32	2013-03-12	5,03	9,92	2,13	NE	3	2

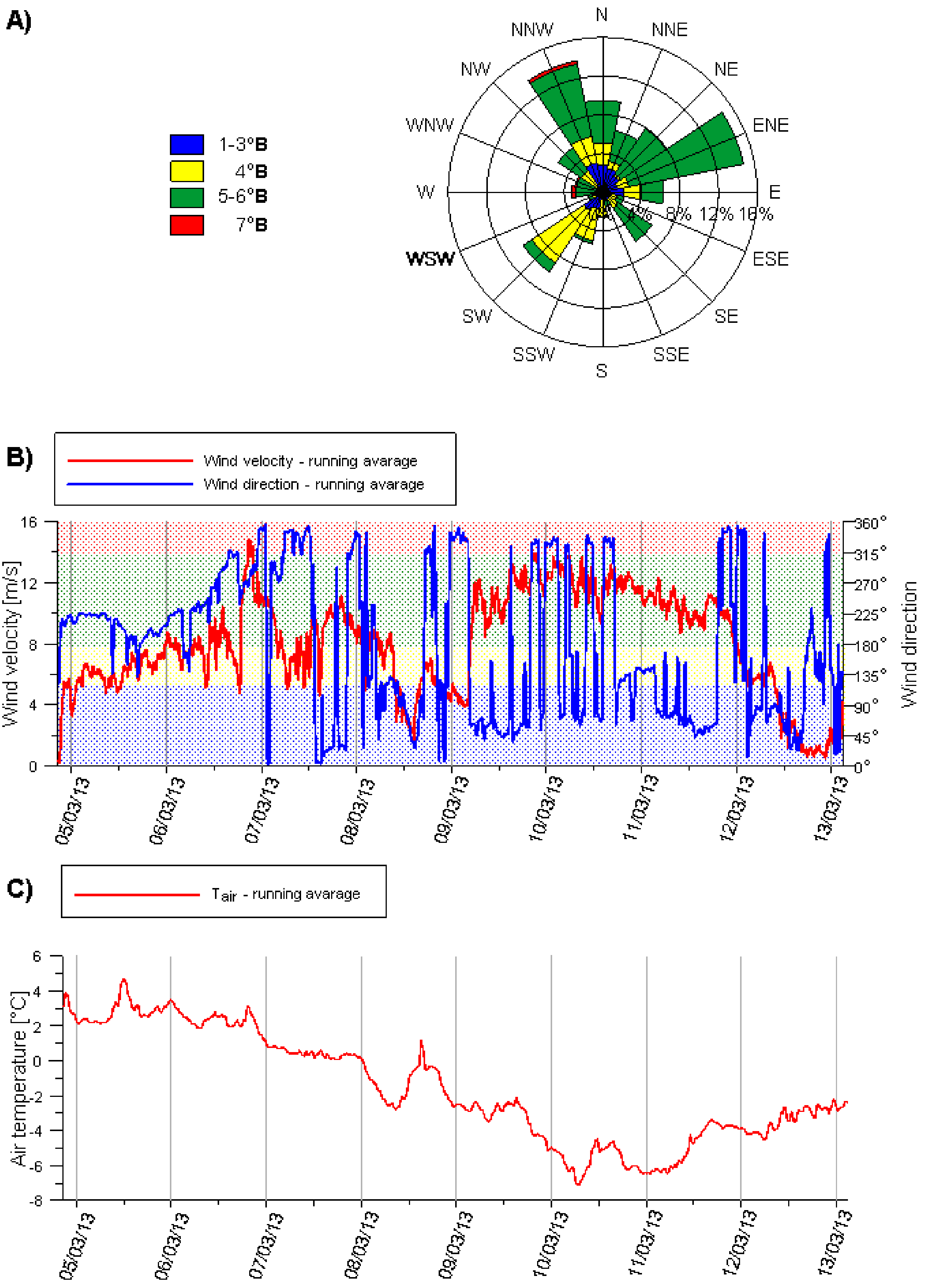

Fig. 6. Changes of the main meteorological parameters during the Latvian-Polish BITS-1q survey in March 2013.

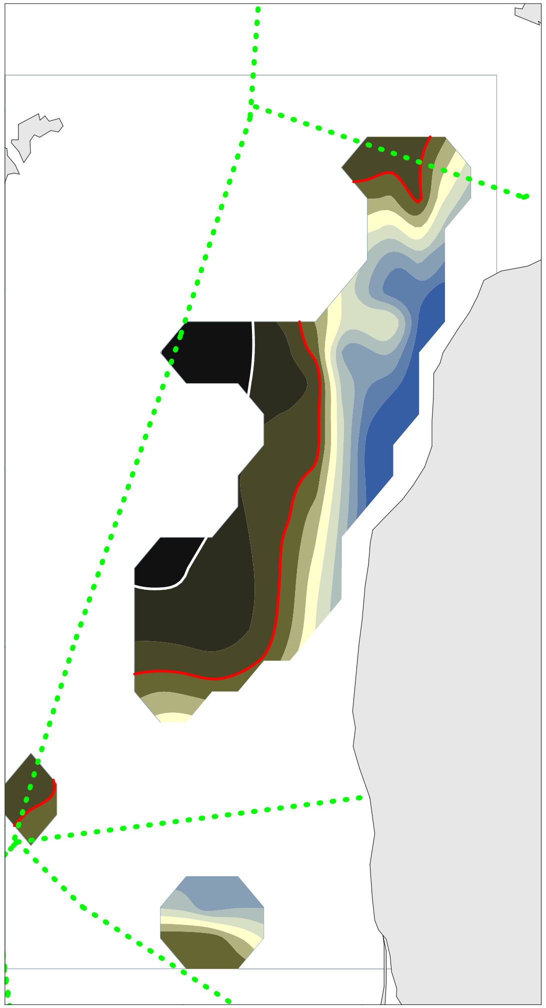

Fig. 7. Distribution of the seawater temperature, salinity and oxygen content in the near bottom waters during the Latvian-Polish BITS-1q survey in March 2013.

Survey Report for RV "ATLANTIDA"
22.02-15.03.2013

by A. Zezera, A. Karpushevskaja, I. Karpushevskiy

Atlantic Scientific Research Institute of Marine Fisheries and Oceanography (AtlantNIRO),
Kaliningrad, Russia

1 INTRODUCTION

The main objective is to assess recruits resources of cod in the Baltic Sea. The demersal trawl survey is conducted two times annually - in the autumn and in the spring to supply the ICES with the data on amount young cod and cod of advanced ages. The present survey data will provide to the ICES Baltic Fisheries Assessment Working Group (WGBFAS). These data are necessary for an estimation of the stock size of cod in East part of the Baltic Sea (Sub-divisions 25-32).

2 METHODS

2.1 Personnel

A. Zezera	AtlantNIRO, Kaliningrad, Russia - cruise leader
Y. Priemko	AtlantNIRO, Kaliningrad, Russia - scientific leader
A. Malishko	AtlantNIRO, Kaliningrad, Russia - acoustic
S. Alekseev	AtlantNIRO, Kaliningrad, Russia - hydrologist
T. Vasilieva	AtlantNIRO, Kaliningrad, Russia - engineer
S. Ivanov	AtlantNIRO, Kaliningrad, Russia - engineer
A. Karpushevskaja	AtlantNIRO, Kaliningrad, Russia - engineer
N. Kalinina	AtlantNIRO, Kaliningrad, Russia - engineer
I. Trufanova	AtlantNIRO, Kaliningrad, Russia - engineer
A. Gusev	AtlantNIRO, Kaliningrad, Russia - engineer
V. Shopov	AtlantNIRO, Kaliningrad, Russia - engineer

2.2 Narrative

The RV'ATLANTIDA' cruise number 60, 2013, has been conducted from the 22 February and continued to 15 March of 2013. The demersal trawl survey was carried out also from 22 February till 15 March, 2013. The ground trawl survey was intended to cover areas of Sweden, Poland and Russia.

2.3 Survey design

The international bottom trawl survey are carried out in from of a stratified random survey. The depth of demersal trawls is in the range between 27 and 117 m. The number of trawl stations to the depth strata according to recommendations ICES (ICES CM 2002/G:05 Ref. H) and according to solution ICES WGBIFS (ICES CM 2008/LRC:08 Ref. Acom). The survey zone to cover areas of Sweden, Poland and Russia (fig. 1).

2.4 Biological data – fishing stations

Trawling was done with the standard ground trawl –TV3#930 in a bottom. The mesh size in the codend was 6.5 mm. The trawling depth and the net opening were controlled by a netsonde. Normally a net opening was achieved of about 5-6 m. The trawling time lasted 30 minutes, but in dense concentrations the trawling time duration was reduced to 15 (one fishing station in the Russian zone) and 20 minutes (one fishing stations in the Polish zone). From each haul sub-samples were taken to determine of length and weight of fish. Samples of cod, flounder, herring and sprat were investigated onboard a vessel (i.e. sex, maturity, age). After each trawl haul it was intended to investigate the hydrographic condition by a CTD-probe.

3 RESULTS

3.1 Biological data

It was in total made 36 control ground trawls in areas of Sweden, Poland and Russia (5 fishing stations in the Swedish zone, 9 – in the Polish zone, 22 – in the Russian zone). Catches of a fish were from 12.7 kg up to 2858.8 kg for 30 minutes of a trawl (cod – 21.5%, flounder – 9.7%, herring – 64.2%, sprat - 4.2%). The average catch for a trawl has made 441.9 kg. The results of the catch composition are presented in Table 1.

Cod catches were insignificant and varied from 0.729 up 446.0 kg (abundance from 2 up to 3364) for 30 minutes of a trawl. Flounder catches varied from 0.840 up 512.3 kg. 2480 cod, 1524 flounder, herring and sprat were investigated in lab onboard a vessel. Age samples of cod 1344 and age samples of flounder 1040 have been researched in institute.

Landings of cod (kg) and landings of young cod in length up to 30 cm (in numbers) for 30 minutes of a haul in February-March 2013 are presented in Figures 2 – 3. Landings of flounder (kg) for 30 minutes of a haul in February-March 2013 are presented in Figure 4.

The length distributions of cod and flounder are presented in Fig. 5-6.

3.2 Hydrographic data

In the period from 22 February till 15 March on a water area of economic region of Sweden, Poland and Russia oceanographic survey has been made (79 hydrological stations). The water temperature, salinity and the oxygen concentrations were determined by a sonde SBE-19Plus (Sea Bird Electronic, Ltd., USA).

The water temperature on the surface had been changing from 0.3°C up to 3.0°C. Seasonal thermocline was found at the depth of 45-55 m.

Salinity of water on the surface had been changing within the limits of 7.0‰-7.4‰. High limit of a halocline was found at the depth of 55-65 m. The maximum values of salinity have been fixed in a benthic stratum in the south part of Gotland Deep (11.5-11.9‰).

The oxygen concentration was high 8.5-9.8 ml/l on the surface, saturation of water 90-105%. A distinctive feature of this survey is not favorable gas regime of deep and bottom water in large parts of the deep waters (depths greater than 80 m), where oxygen concentrations exceed 1.0-1.5 ml/l at saturation less than 15-20%. Higher values of oxygen in the bottom layer (more than 1.0-1.5 ml/l) were observed in a area in the south of the Gdansk Deep (south of 54°55'N) and to east from the Slupsk channel and in the limited area of the south Gotland Deep.

The locations of stations, temperature, salinity distribution and the oxygen concentration at the bottom, vertical distribution are shown on fig. 7-12.

4 DISCUSSION

Structure of catches of demersal trawl survey is shown on table 1.

The total length of main fish species ranged as follows:

- cod – 6 –80 cm (average length of 31.6 cm, average weight 316 g)
- flounder – 14-46 cm (average length of 27.0 cm, average weight 252 g)

- herring – 8.0 – 32.5 cm (average length of 20.3 cm, average weight 56.7 g)
- sprat – 7.0 – 14.5 cm (average length of 11.0 cm, average weight 9.16 g)

5 REFERENCES

Report of the Baltic International Fish Survey Working Group. ICES CM 2012/SSGESST:02 Ref. Acom Manual for the Baltic International Trawl Surveys (BITS).

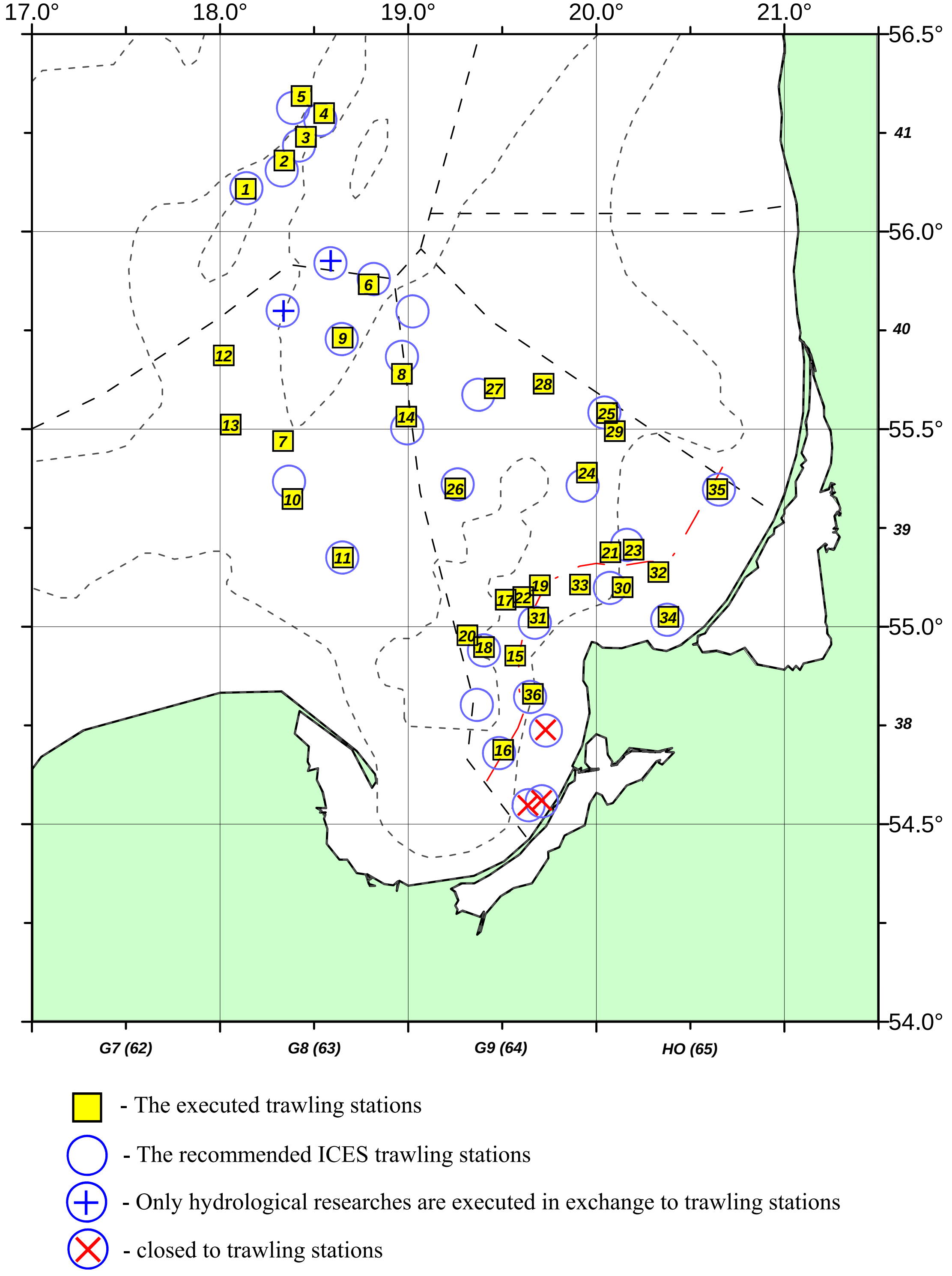

Fig. 1. Trawl positions for RV "ATLANTIDA" in February-March 2013

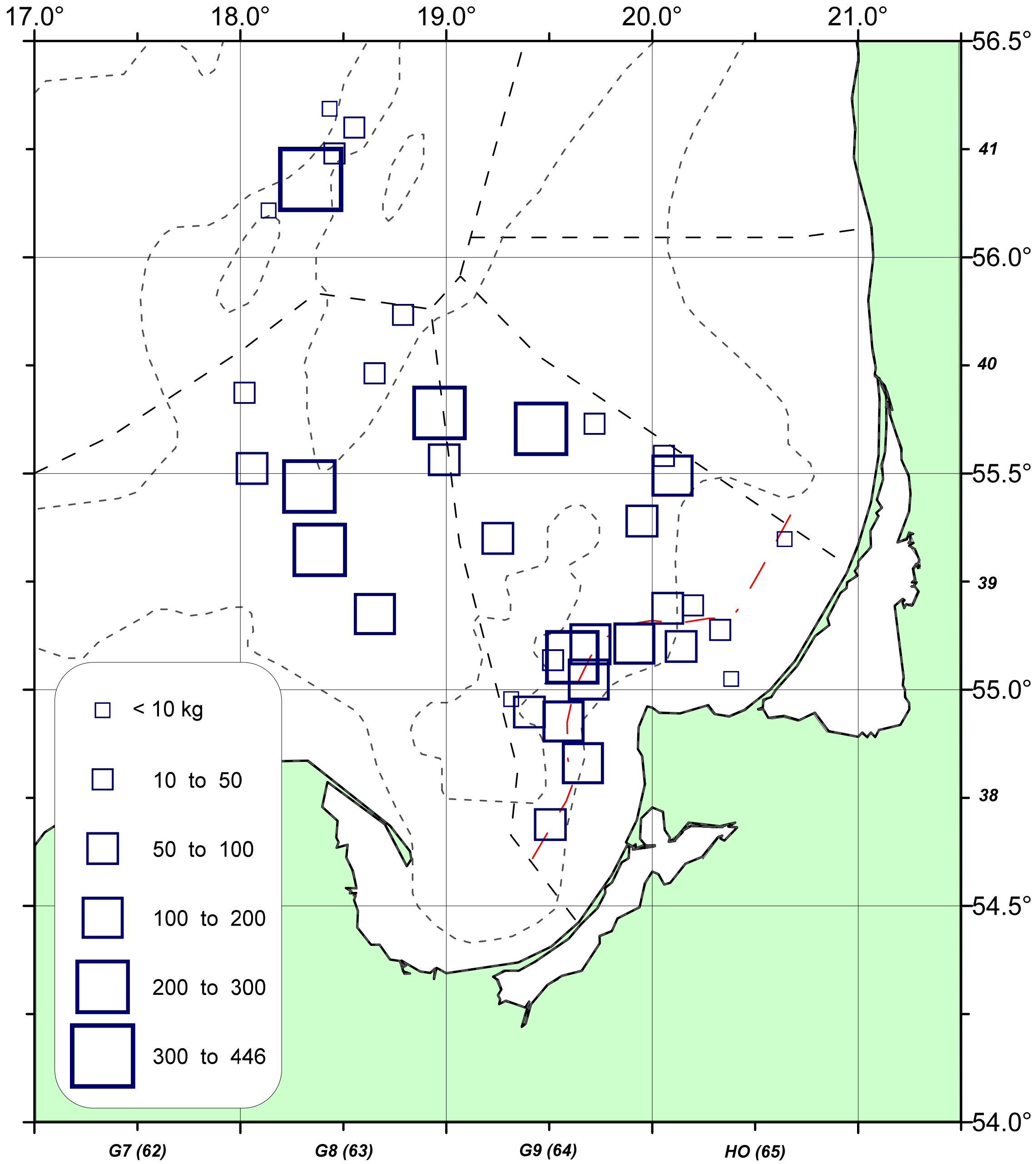

Fig. 2. Landings of cod (kg) for 30 minutes of a haul in February-March 2013

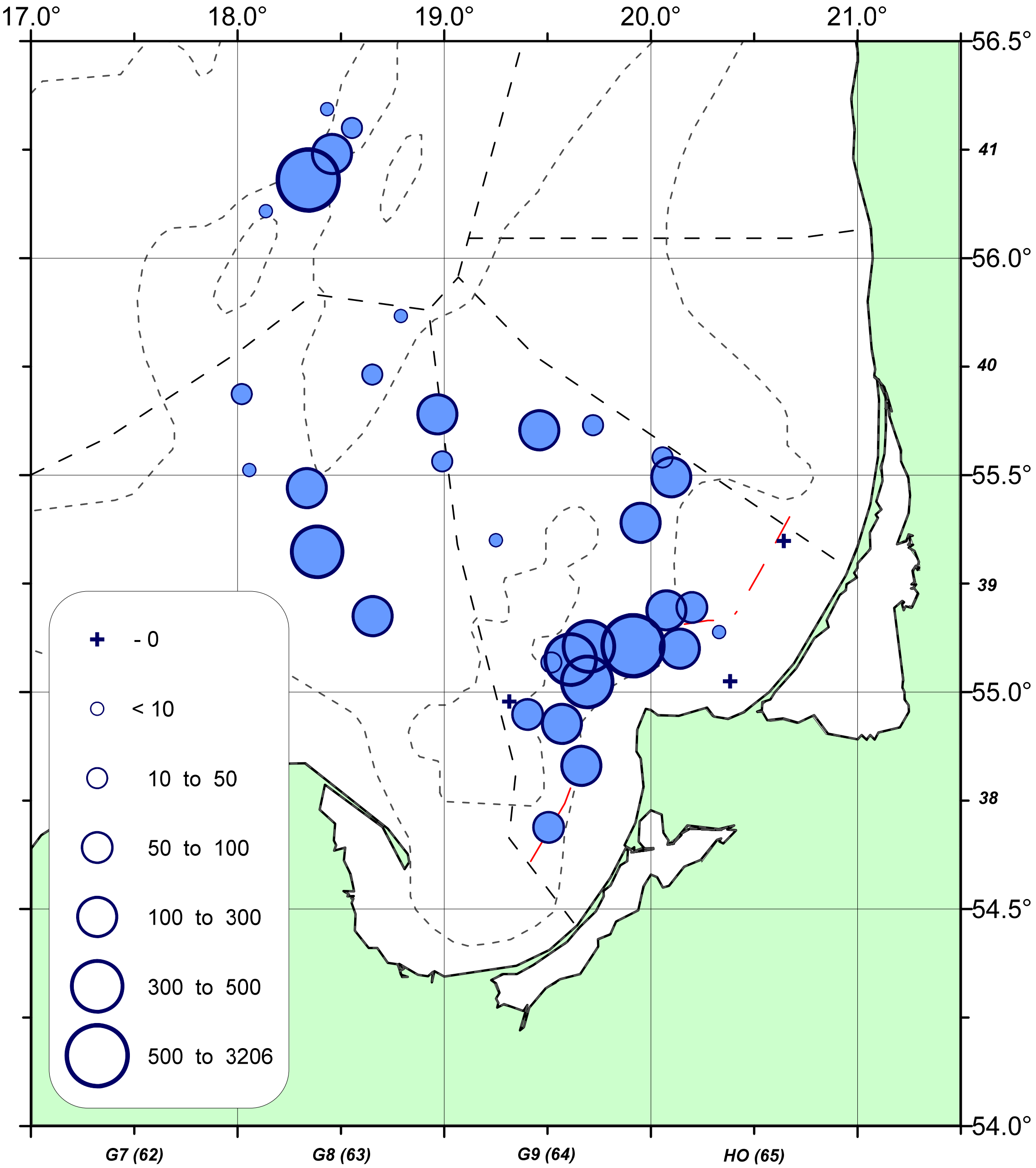

Fig. 3. Landings of young cod in length up to 30 cm (in numbers)
for 30 minutes of a haul in February-March 2013

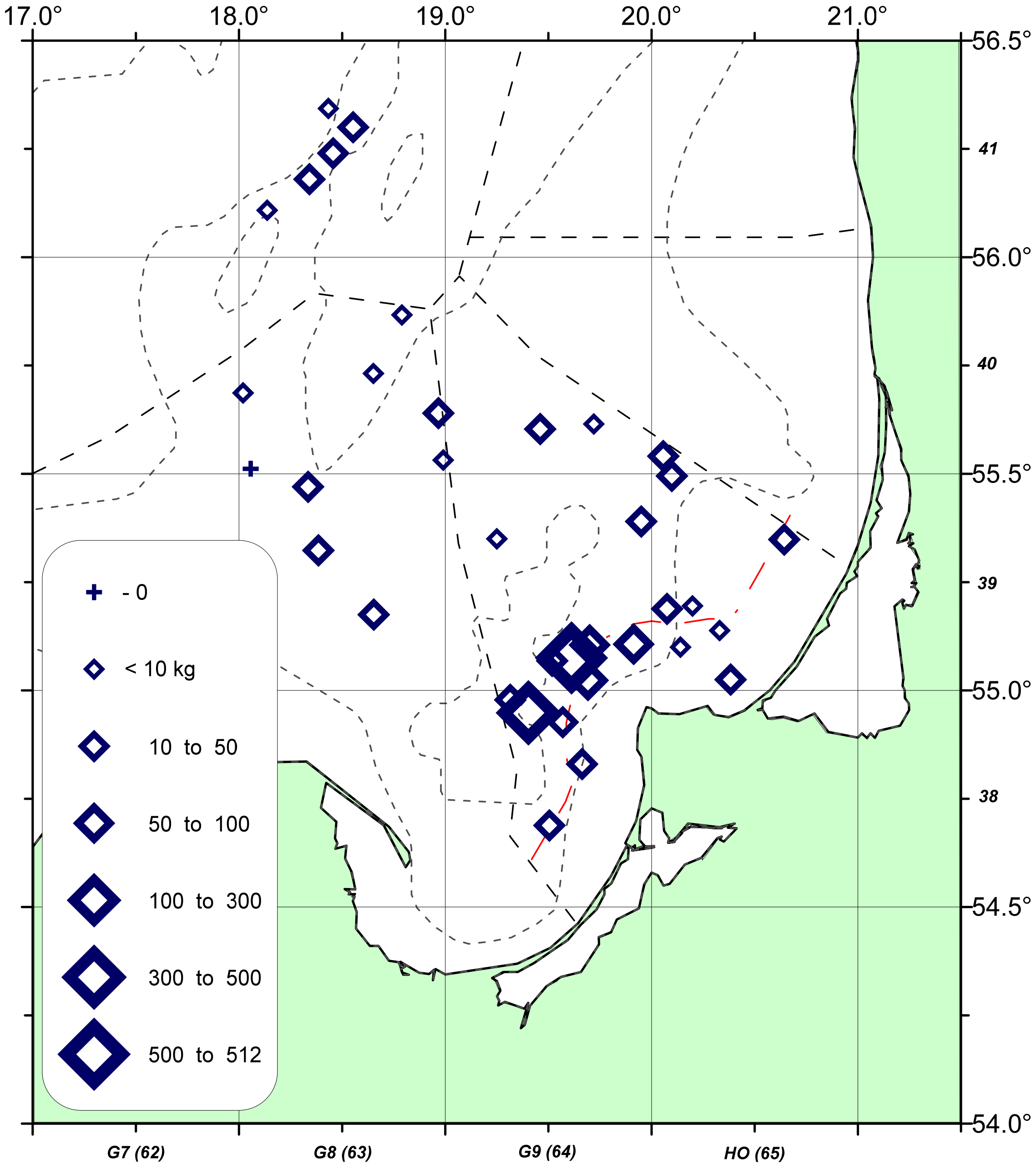

Fig. 4. Landings of flounder (kg) for 30 minutes of a haul in February-March 2013

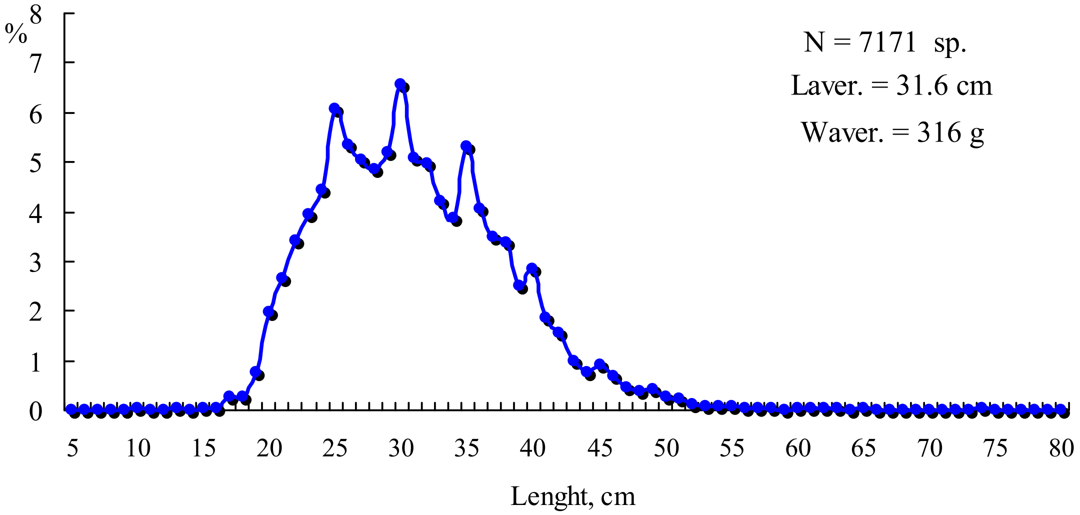

Fig. 5. Length distribution of ***cod*** in area of Sweden, Poland and Russia (Sub-division 26) in February-March 2013 (materials of international demersal trawl survey)

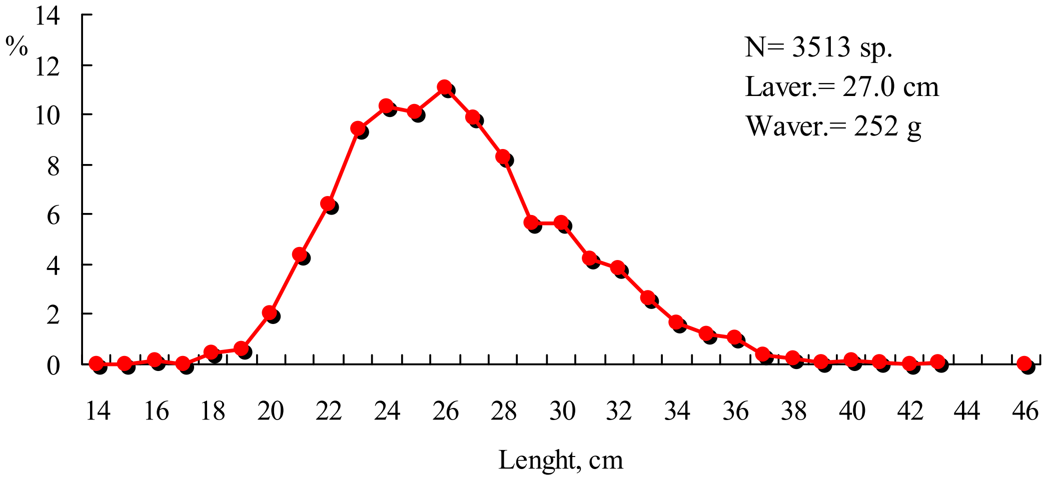

Fig. 6. Length distribution of ***flounder*** in area of Sweden, Poland and Russia (Sub-division 26) in February-March 2013 (materials of international demersal trawl survey)

Table 1

Catch composition on the International demersal trawl survey in February-March 2013

Sub-Division: 26 Vessel: STM - "Atlantida" Net type: bottom trawl - TV-3#930
Month/Year: Febr.-March. 2013 Haul duration: 30 minute Mesh bar size: 6.5 mm

Total of hauls	rectangle	depth meter	haul duration	total catch, kg	cod		flounder		herring		sprat	
					kg	%	kg	%	kg	%	kg	%
36	4163, 4063, 4064, 4065, 3963, 3864, 3964, 3965	27-117	30	15909.3	3423.9	21.5	1544.4	9.7	10219.1	64.2	660.6	4.2

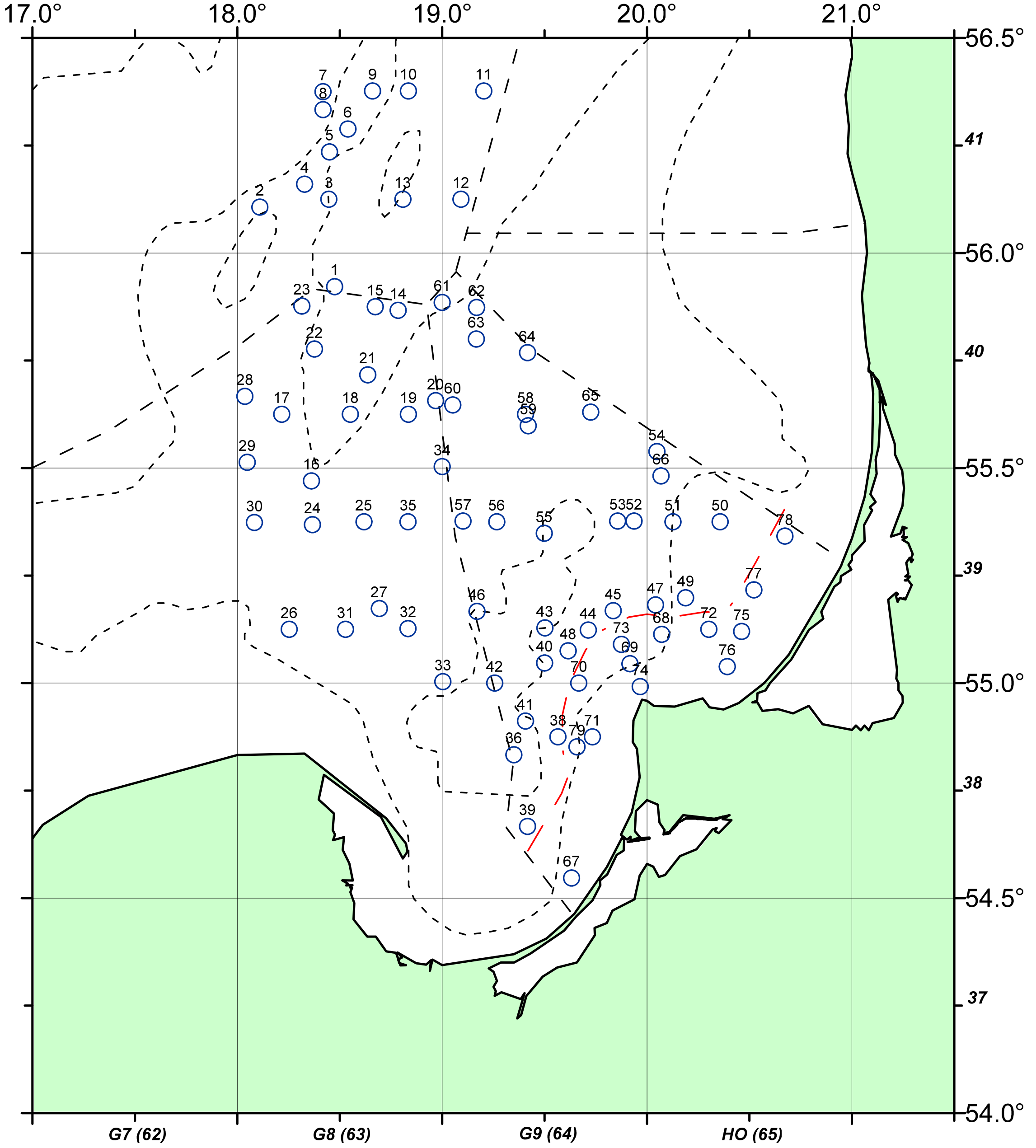

Fig. 7. Location of hydrographic stations in February-March 2013, RV “ATLANTIDA”

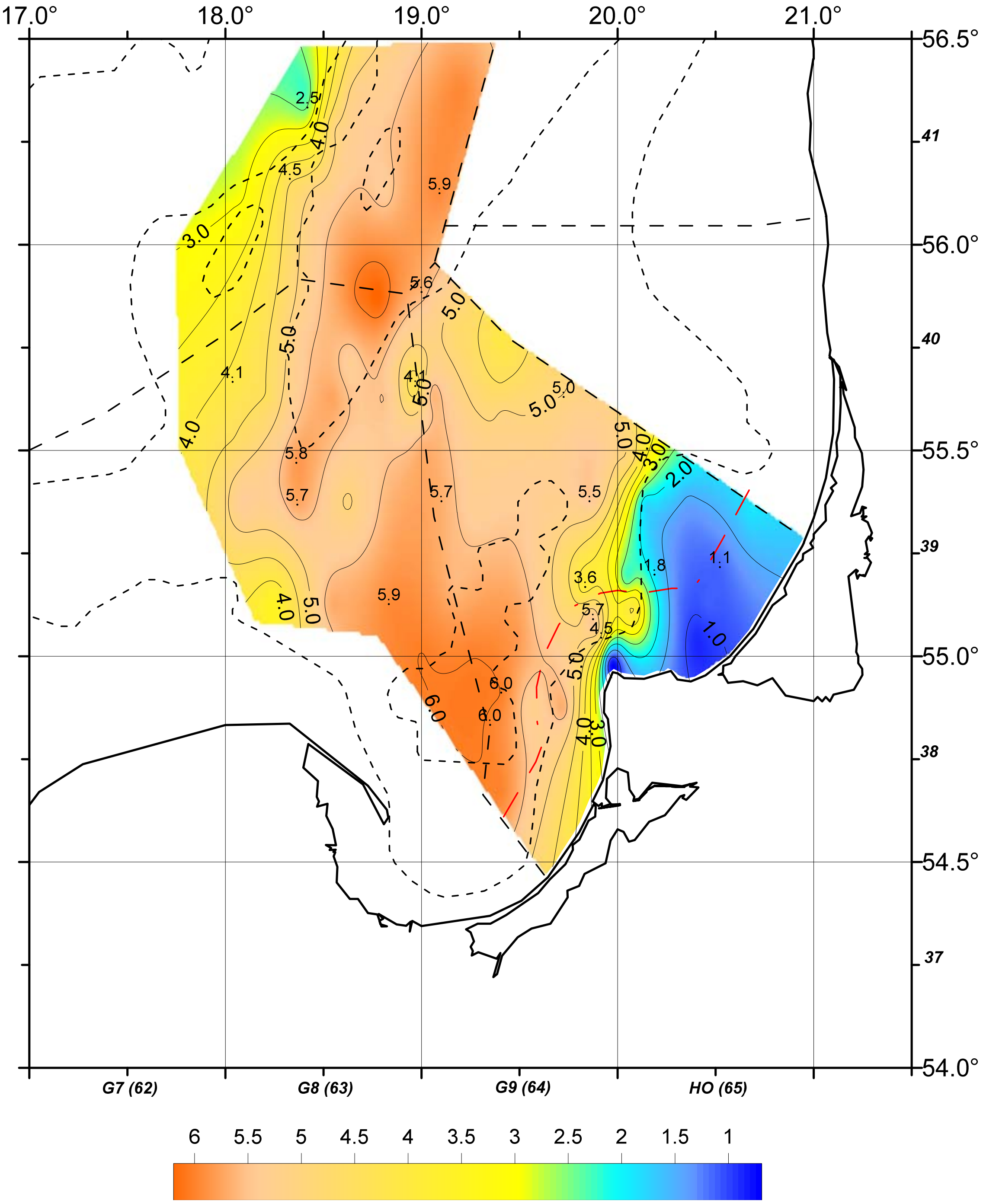

Fig. 8. Bottom water temperature distribution (°C) in February-March 2013, RV "ATLANTIDA"

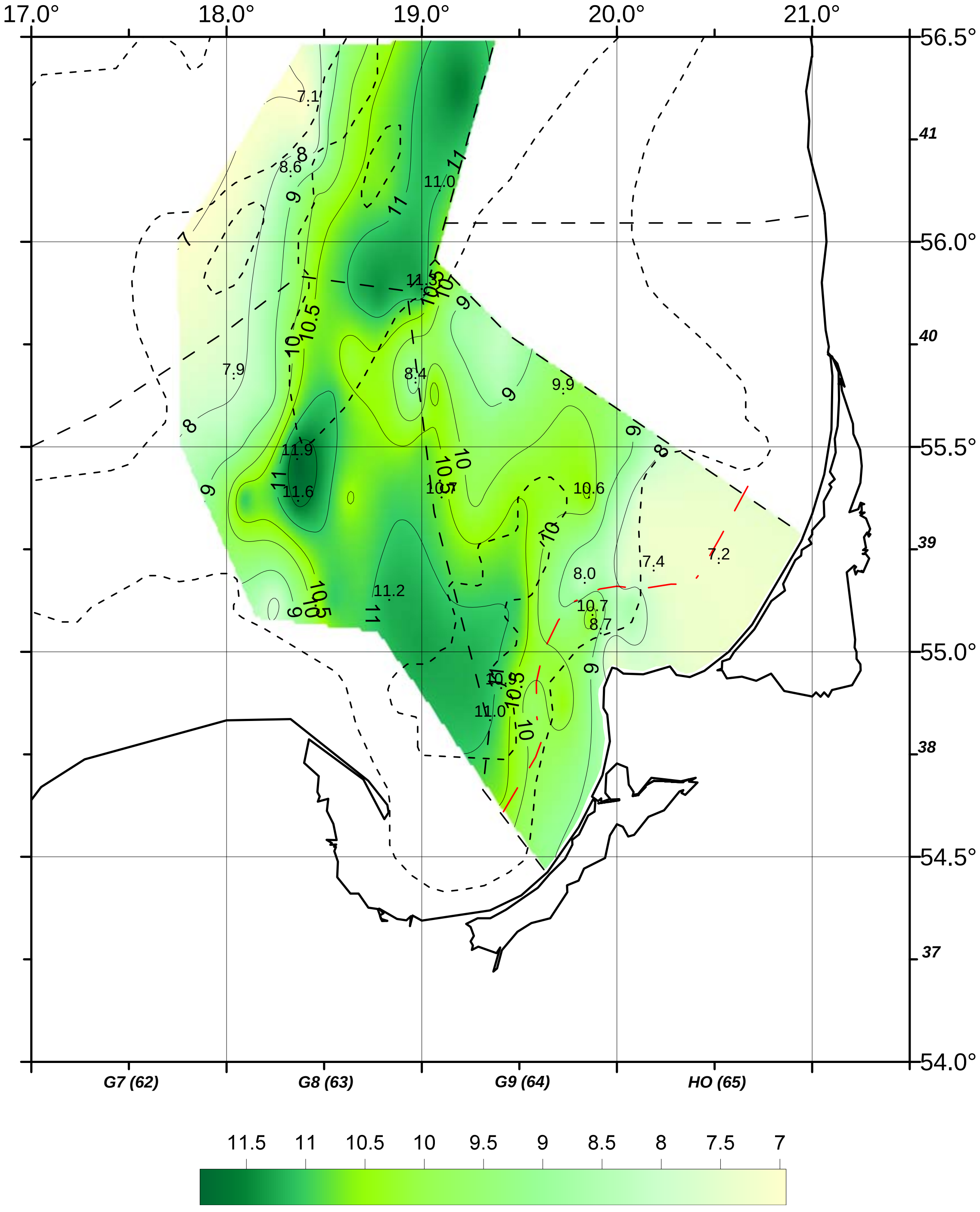

Fig. 9. Bottom water salinity distribution (‰) in February-March 2013, RV “ATLANTIDA”

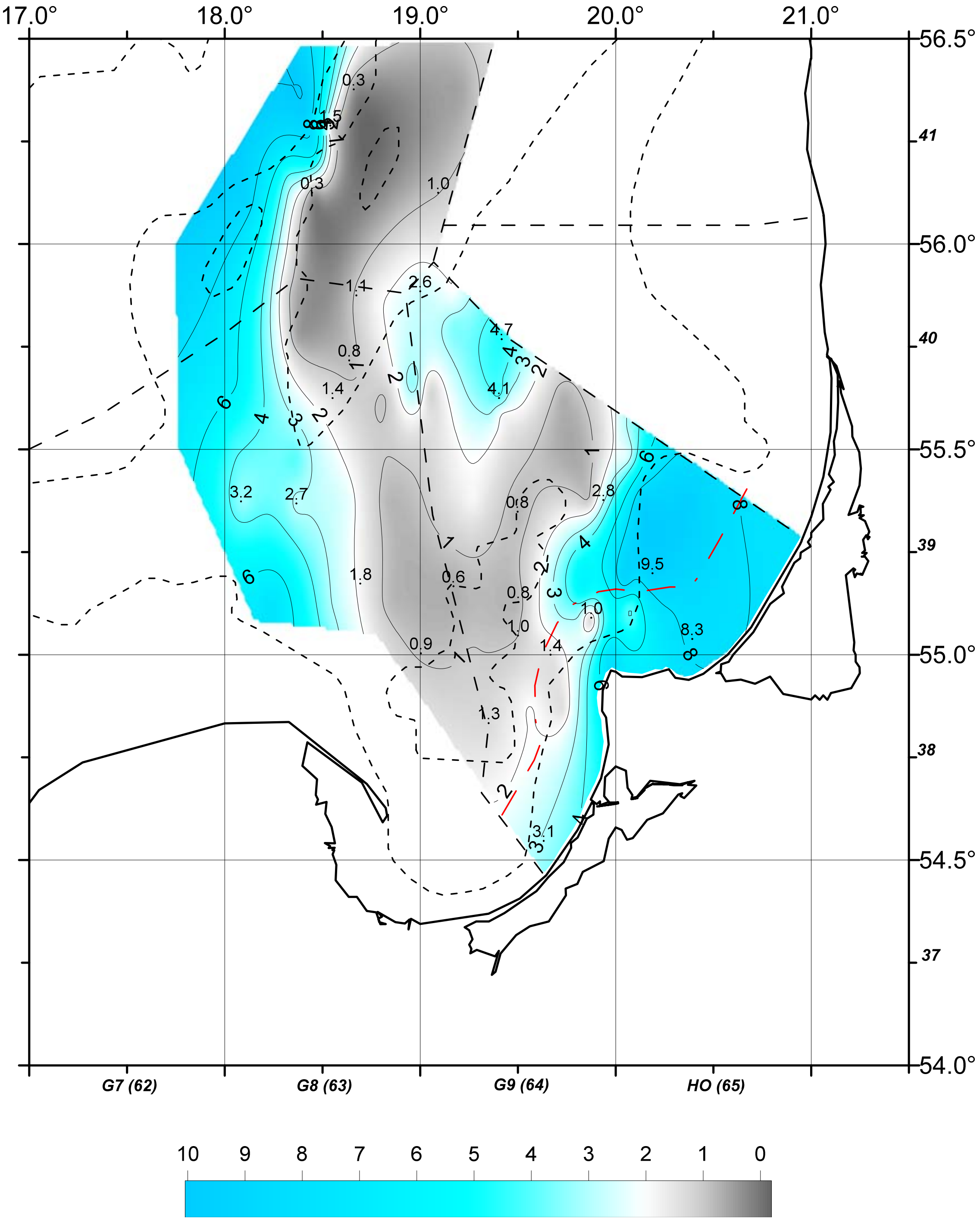

Fig. 10. Bottom water oxygen concentration (ml/l) in February-March 2013, RV "ATLANTIDA"

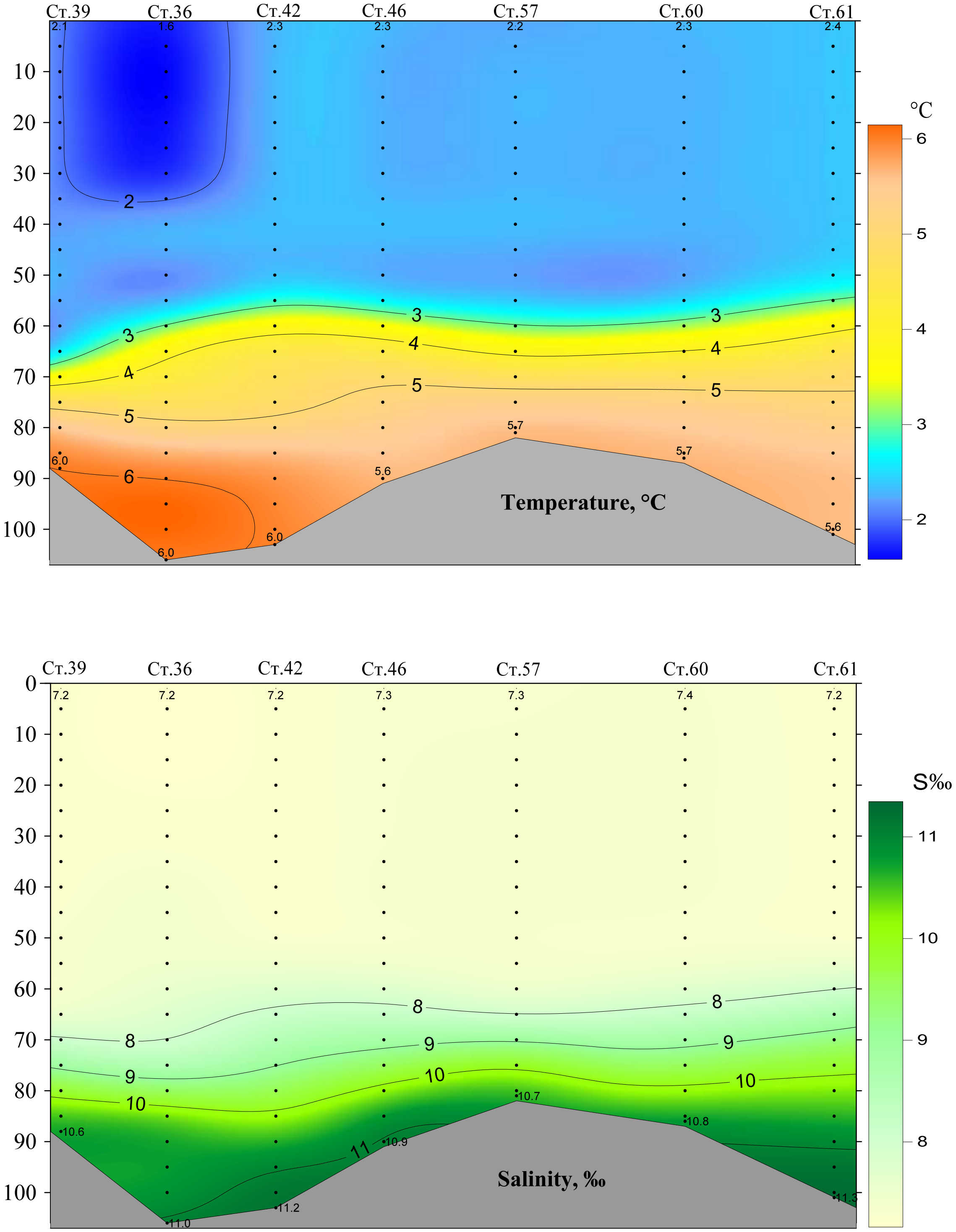

Fig. 11. The vertical distribution of the seawater temperature (°C) and salinity (‰) in February-March 2013 on the research profile through Gdansk Deep and south part of Gotland Deep, RV "ATLANTIDA"

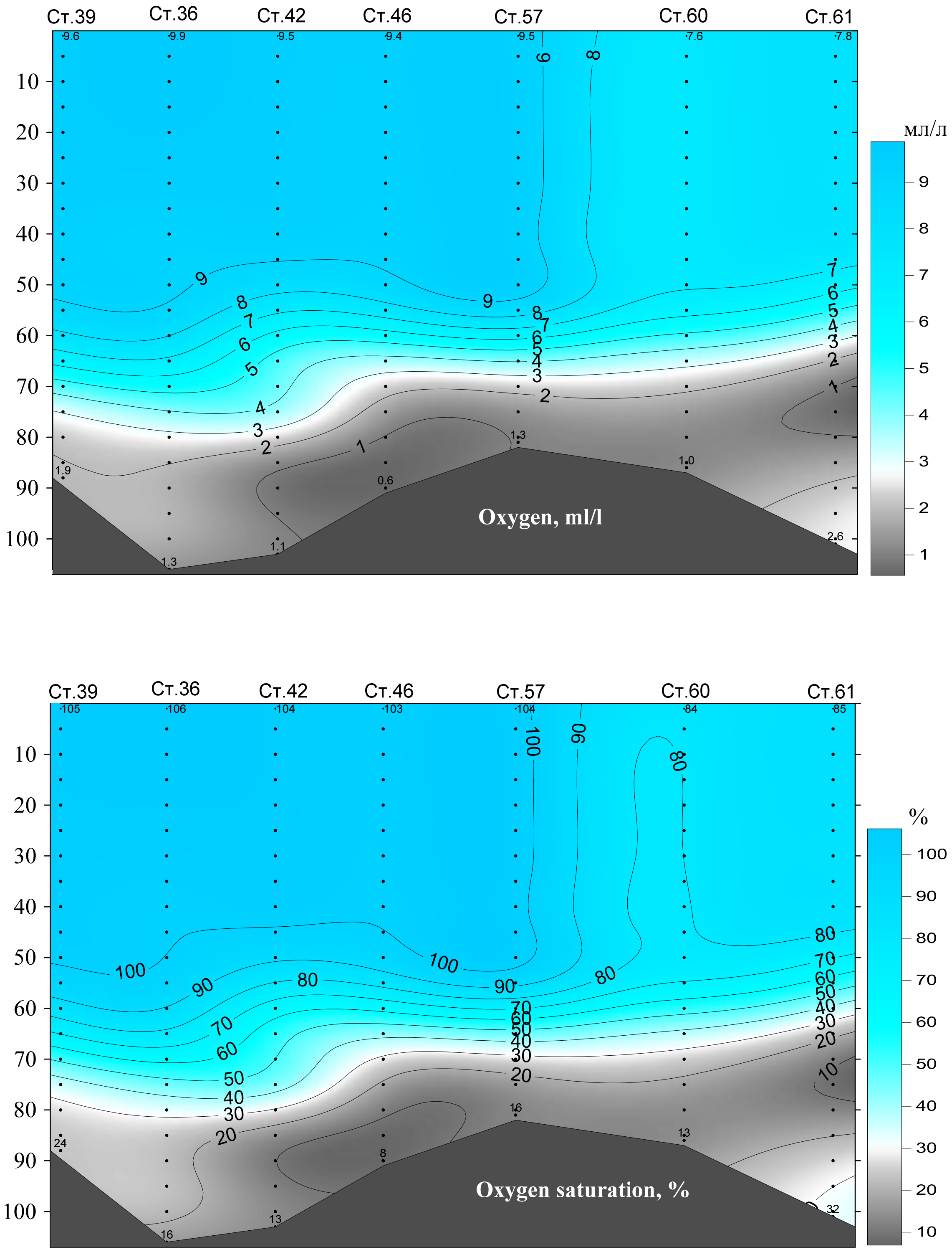

Fig. 12. The vertical distribution of the oxygen concentration (ml/l) and oxygen saturation (%) in February-March 2013 on the research profile through Gdansk Deep and south part of Gotland Deep, RV “ATLANTIDA”

Baltic International Trawl Survey (BITS)
U/F Dana, 22 February – 5 March 2013

Expedition leader : Ann-Christin Rudolphi
Scientific leader : Michele Casini

Summary

The survey was conducted using the TV3L demersal trawl according to the BITS manual (Anon., 2012a). Sweden was assigned 50 randomly selected hauls of which Dana realized all.

Overall, Dana made 49 hauls with TV3L demersal trawl (including 4 fictitious hauls which were not trawled because the oxygen concentration close to the bottom was less than 1.5 ml/l) and covered parts of SD 25, 26, 27 and 28 this year. During the whole survey, acoustic data were continuously recorded.

During this survey 21 fish species were caught. The total catch, in terms of weight, was dominated by herring, cod, sprat and flounder.

The hydrographical conditions were observed and measured at most of the stations. Only the oxygen concentration at the bottom is presented here.

Background

The expedition was performed according to the BITS manual (Anon., 2012a) and the recommendations from WGBIFS 2012 (ICES 2012b). Sweden is one of the seven countries performing the BITS survey during this period of the year.

The expedition started in Copenhagen on Thursday 21 February and ended in Ystad on Tuesday 5 March. Weather conditions did not cause particular problems, and the survey could be conducted as planned.

Sweden was allocated 50 random stations: 25 in SD 25, 4 in SD 26, 10 in SD 27 and 11 in SD 28 (Fig. 1, Table 1). Trawling could be performed only in 36 stations of the 50 allocated. This was due to oxygen concentration < 1.5 ml/l (4 stations, so called fictive stations) or bottoms judged not suitable for trawling with TV3-trawl (10 stations). These latter 10 stations were replaced by other 10 stations in the same depth interval and SD. In one station in SD28, the trawl was damaged, and this station could not be replaced. Overall, Dana performed 49 valid trawl hauls (including the 4 fictive stations) that can be used in stock assessment. The fictive stations are used in stock assessment as 0-cacth stations.

Hydrography

Hydrographical measurements with CTD and oxygen probe were taken at most of the trawl stations (Fig. 2). Oxygen concentrations at 1m from the bottom are presented in Fig. 2.

Fish catches

Overall, 21 different species were caught (Table 2). Totally, 36.2 tons of fish were caught, of which 6.8 tons of cod (41 598 individuals), 24.7 tons of herring and 2.6 ton of sprat.

Sampling

Almost all cod were measured. At stations with high cod catches, a subsample was analysed. Otoliths were collected for age determination with the aim to sample 5 individuals per 1 cm-class and area. In SD 25 individuals were sampled in each of the areas 25W, 25C and 25E. Overall, 977 cods were age-estimated.

For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 1 442 flounder otoliths were sampled.

The other fish species were measured, weighed and total catch recorded.

Ad-hoc studies and sampling were performed:

- Collection of cod stomach content, and additional biological parameters, for the ”EU tender MARE 2012/02, Study on stomach content of fish to support the assessment of good environmental status of marine food webs and the prediction of MSY after stock restoration”.
- Collection of herring and cod for radioactivity analysis conducted at CEFAS, Lowestoft, England;
- Collection of herring for dioxin-analyses to Livsmedelsverket (National Food Agency).

Other

The results of BITS Argos expeditions are presented yearly in a report by SLU-Department of Aquatic Resources.

All Swedish BITS data are uploaded into FISKDATA database at SLU-Aqua and are delivered to ICES database DATRAS for international compilation. The data from this survey are used within the Baltic International Fish Survey Working Group (WGBIFS) and Baltic Fisheries Assessment Working Group (WGBFAS) in ICES.

We thank all the participants, scientists, technicians and crew, which contributed to the accomplishment of the expedition.

Participants

Johnnie Bengtsson	SLU, Havsfiskelaboratoriet
Eva Ilic	SLU, Havsfiskelaboratoriet
Marianne Johansson	SLU, Havsfiskelaboratoriet
Marie Leiditz	SLU, Havsfiskelaboratoriet
Fredrik Nilsson	SLU, Havsfiskelaboratoriet
Mikael Ovegård	SLU, Kustlaboratoriet
Mikael Pettersson	SLU, Kustlaboratoriet
Ann-Christin Rudolphi, exp.ledare	SLU, Havsfiskelaboratoriet
Rajlie Sjöberg	SLU, Havsfiskelaboratoriet

References

Anon., 2012a. Manual for the Baltic International Trawl Surveys. Addendum 1: WGBIFS BITS Manual 2012. ICES C.M. 2012/ SSGESST:02.

Anon., 2012b. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES C.M. 2012/ SSGESST:02.

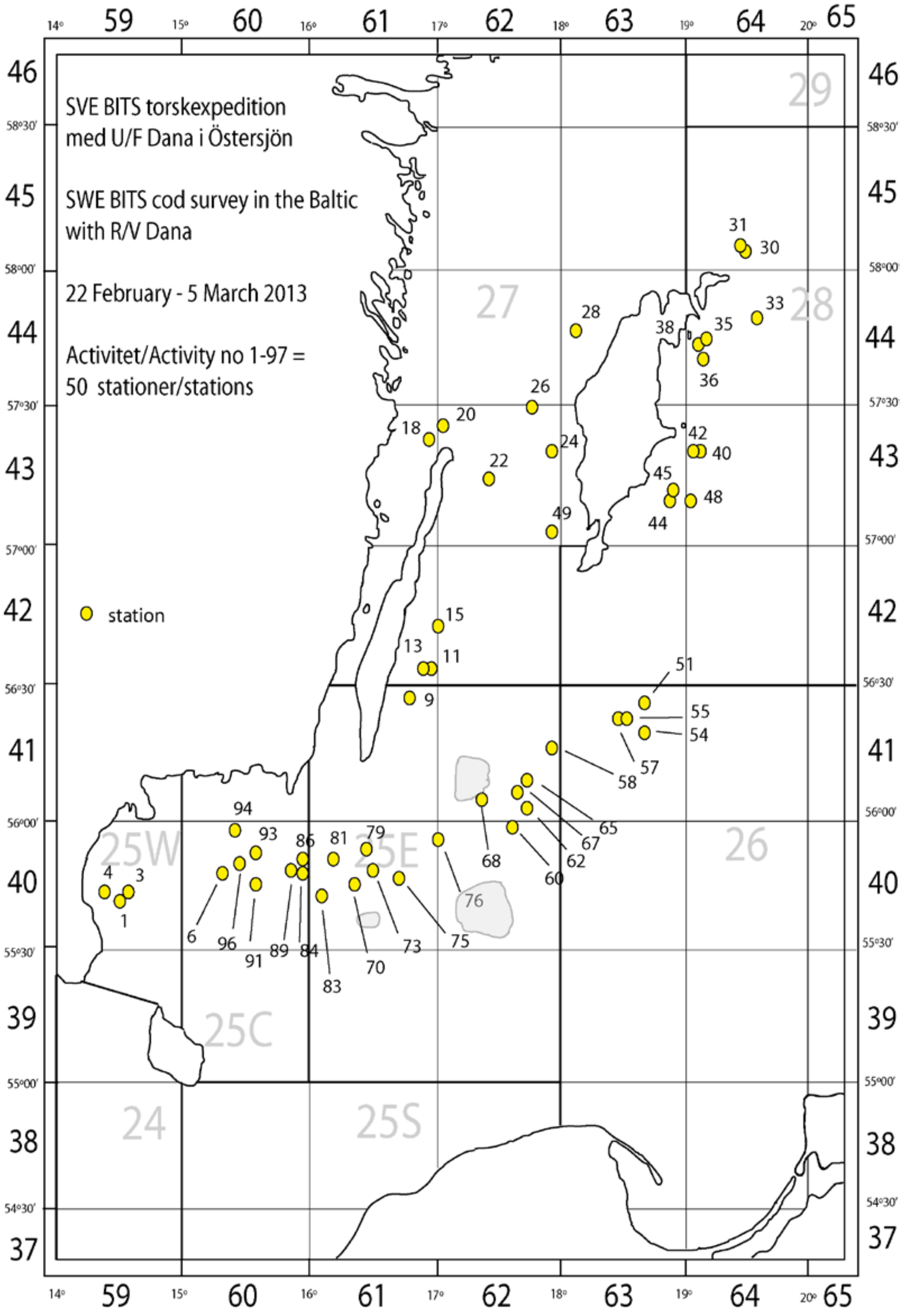

Figure 1. Map of the trawl stations performed during the Swedish BITS, Quarter 1 2013.

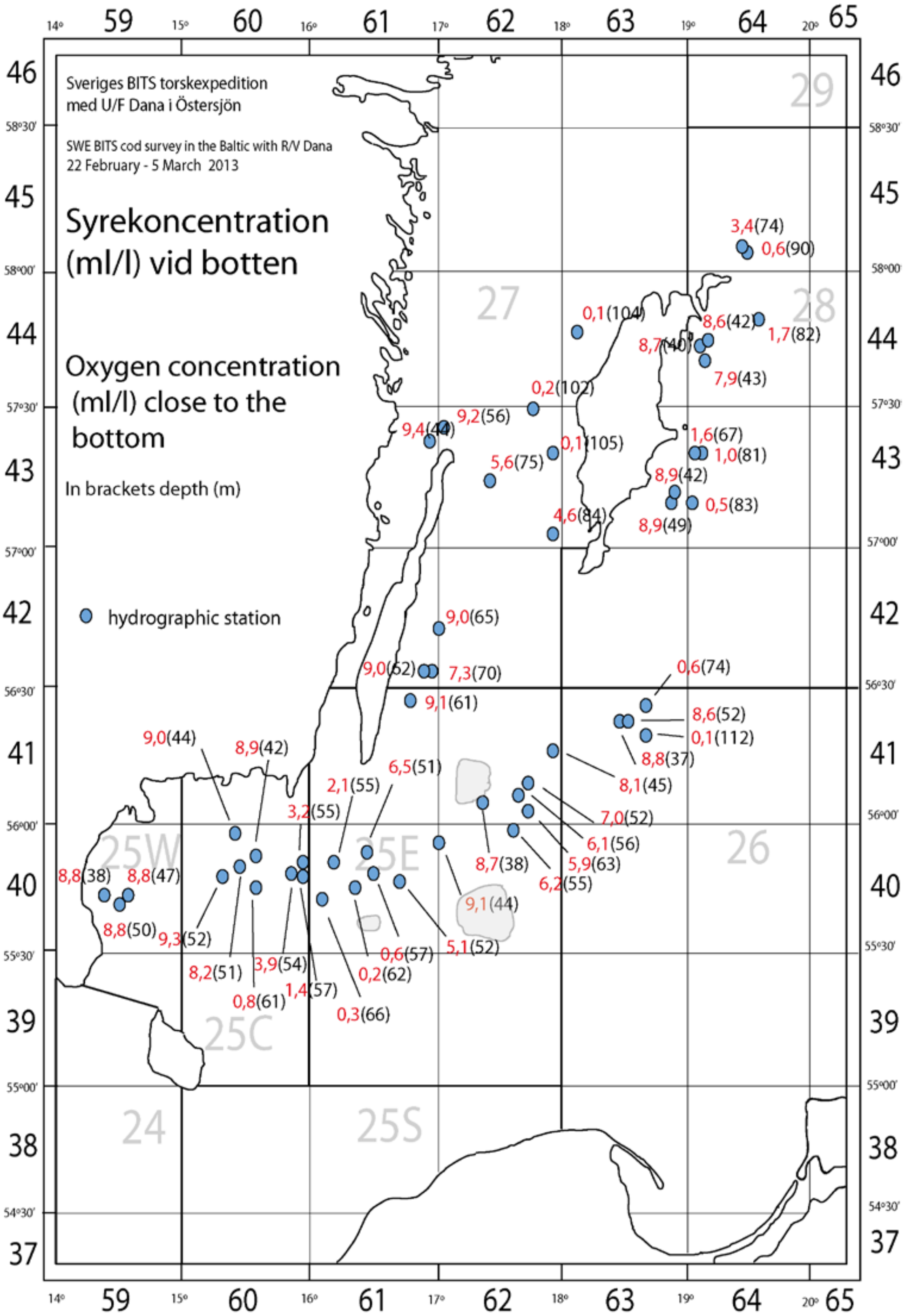

Figure 2. Oxygen concentration (red numbers) 1 m from the bottom at the trawl stations. Numbers in brakets (black) indicate bottom depth. Swedish BITS, Quarter 1 2013.

Table 1. Summary of all stations. Swedish BITS, quarter 1 2013.

Trålstationer gjorda/stations realized :	
slumpade giltiga/randomized valid	**39**
fiktiva (syrebrist)/oxygen deficiency	**4**
giltiga ersättningsdrag/valid replacement hauls	**10**
kompletteringsdrag/complementary hauls	**0**
ogiltiga drag/invalid hauls	**1**
Slumpade stationer ej trålade/rand. stations, not trawled	**11**

Giltiga "monitoring"drag/Valid hauls for assessment:		
Tilldelade drag/	SD28	**11**
Allocated hauls	SD27	**10**
	SD26	**4**
	SD25	**25**
Giltiga drag/	SD28	**10**
Realized hauls	SD27	**10**
	SD26	**4**
	SD25	**25**

🟨	TV3 trawl station
🟩	Fictitious haul/oxygen deficiency
▨	Invalid haul
	Hydrographic station (SEA)

Date	Act. no	Area SD	Rect.	Latitude	Longitude	New haul no	Station name	Gear	Duration min	Trawldepth m	Depth m	Oxygen ml/l	Total catch all species (kg)	Cod catch kg	antal/nos.	Remarks
2013-02-22	1	25W	4059	5540500	1429097	-	RACKAPUTT E	TV3	30	50.1	50	8,8	1178.2	1127.7	7780	Replaced 25354.
2013-02-22	2	25W	4059	5539178	1431688	-	RACKAPUTT E	SEA	-	-	52.5	8,8	-	-	-	
2013-02-22	3	25W	4059	5541971	1432275	25353	RACKAPUTT NORD	TV3	30	47.3	47.1	8,8	150.6	139.0	737	
2013-02-22	4	25W	4059	5542162	1422271	25401	5 NE STENS HUVUD	TV3	30	37.6	37.7	8,8	209.7	175.5	450	
2013-02-22	5	25W	4059	5542418	1425688	25401	5 NE STENS HUVUD	SEA	-	-	37.7	8,8	-	-	-	
2013-02-22	6	25C	4060	5548345	1517194	25123	3 N VÄSTRA NABBEN	TV3	30	54.9	52.0	9,3	455.4	103.2	862	Replaced 25120.
2013-02-22	7	25C	4060	5548693	1519436	25123	3 N VÄSTRA NABBEN	SEA	-	-	52.0	9,3	-	-	-	
2013-02-23	8	25E	4161	5625261	1646320	25169	6,5 NE SEGERSTAD	SEA	-	-	64.4	7,1	-	-	-	
2013-02-23	9	25E	4161	5625874	1645514	25169	6,5 NE SEGERSTAD	TV3	30	60.9	60.9	9,1	212.7	0.2	3	
2013-02-23	10	27	4261	5632074	1655132	27004	8 SE BLÄSINGE	SEA	-	-	69.8	7,3	-	-	-	
2013-02-23	11	27	4261	5632469	1655064	27004	8 SE BLÄSINGE	TV3	30	72.9	69.8	7,3	1004.5	27.5	185	
2013-02-23	12	27	4261	5631773	1650676	27021	6 SE BLÄSINGE	SEA	-	-	63.4	9,0	-	-	-	
2013-02-23	13	27	4261	5632698	1650339	27021	6 SE BLÄSINGE	TV3	30	62.6	62.4	9,0	146.9	1.1	6	
2013-02-23	14	27	4261	5640929	1658989	27022	9 SE KAPELLUDDEN	SEA	-	-	65.4	9,0	-	-	-	
2013-02-23	15	27	4261	5642023	1659267	27022	9 SE KAPELLUDDEN	TV3	30	65.9	65.4	9,0	742.5	5.1	10	
2013-02-23	16	27	4362	5702811	1751708	27013	11,5 NW HOBURG	SEA	-	-	84.2	2,2	-	-	-	Only hydrography.
2013-02-24	17	27	4361	5720720	1657300	27020	4 NW BYXELKROK	SEA	-	-	48.5	9,4	-	-	-	
2013-02-24	18	27	4361	5721811	1655197	27020	4 NW BYXELKROK	TV3	30	43.6	43.6	9,4	2005.2	3.9	15	
2013-02-24	19	27	4362	5724937	1701646	27003	5 N BYXELKROK	SEA	-	-	55.5	9,2	-	-	-	
2013-02-24	20	27	4362	5725133	1701389	27003	5 N BYXELKROK	TV3	30	55.3	55.5	9,2	1397.0	4.0	14	
2013-02-24	21	27	4362	5718793	1726863	27030	11 E BÖDA	SEA	-	-	75.8	5,3	-	-	-	
2013-02-24	22	27	4362	5717616	1724861	27030	11 E BÖDA	TV3	30	74.9	74.8	5,6	1899.3	1.6	4	
2013-02-24	23	27	4362	5720174	1752159	27016	4 NW ST. KARLSÖ	SEA	-	-	104.5	0,1	-	-	-	
2013-02-24	24	27	4362	5721521	1750485	27016	4 NW ST. KARLSÖ	TV3	30	108	104.5	0,1	-	-	-	Oxygen deficiency haul.
2013-02-24	25	27	4362	5727587	1744597	27026	10 SE KNOLLS GRUND	SEA	-	-	101.5	0,2	-	-	-	
2013-02-24	26	27	4362	5727496	1744436	27026	10 SE KNOLLS GRUND	TV3	30	109	101.5	0,2	-	-	-	Oxygen deficiency haul.
2013-02-24	27	27	4463	5746000	1808034	27027	10 NW VISBY	SEA	-	-	104.0	0,1	-	-	-	
2013-02-24	28	27	4463	5745934	1808045	27027	10 NW VISBY	TV3	30	104	104	0,1	-	-	-	Oxygen deficiency haul.
2013-02-25	29	28	4564	5802357	1929578	28078	E SALVOREV	SEA	-	-	98.1	0,1	-	-	-	
2013-02-25	30	28	4564	5802996	1927789	28078	E SALVOREV	TV3	30	89.5	89.6	0,6	516.7	0.4	2	
2013-02-25	31	28	4564	5804611	1926281	28106	2 E SALVOREV	TV3	30	74.5	74.3	3,4	465.2	4.9	35	
2013-02-25	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No station.
2013-02-25	33	28	4464	5749928	1931771	28099	8 SE FÅRÖ	TV3	30	82.1	82.2	1,7	508.6	1.8	9	
2013-02-25	34	28	4464	5747901	1932341	28099	8 SE FÅRÖ	SEA	-	-	83.2	1,6	-	-	-	
2013-02-25	35	28	4464	5743150	1910599	28186a	3,8 SE GRAUTEN NORD	TV3	30	41.9	41.6	8,6	352.0	0.8	3	
2013-02-25	36	28	4464	5739314	1907591	28187	6 SSE GRAUTEN	TV3	30	44.3	43.1	7,9	496.7	2.0	11	
2013-02-25	37	28	4464	5737153	1907239	28187	6 SSE GRAUTEN	SEA	-	-	43.1	7,9	-	-	-	
2013-02-26	38	28	4464	5741897	1908133	28186b	3,8 SE GRAUTEN SYD	TV3	30	40.2	40.1	8,7	-	-	-	Invalid. Replaced 28185.
2013-02-26	39	28	4364	5722619	1912955	28098	8 SE ÖSTERGARN NORD	SEA	-	-	89.6	0,6	-	-	-	
2013-02-26	40	28	4364	5721974	1910938	28098	8 SE ÖSTERGARN NORD	TV3	30	80.6	80.7	1,0	1363.7	1.0	6	
2013-02-26	41	28	4364	5717753	1904057	28103	12 E LJUGARN	SEA	-	-	69.3	1,1	-	-	-	
2013-02-26	42	28	4364	5717946	1903033	28103	12 E LJUGARN	TV3	30	67.5	67.4	1,6	354.9	27.6	183	Replaced 28053.
2013-02-26	43	28	4363	5710900	1853072	28096	5 SE NÄR	SEA	-	-	51.5	8,8	-	-	-	
2013-02-26	44	28	4363	5710570	1852086	28096	5 SE NÄR	TV3	30	49.0	49.0	8,9	738.7	40.5	244	

Table 1. cont.

Date	Act. no	Area SD	Rect.	Latitude	Longitude	New haul no	Station name	Gear	Duration min	Trawldepth m	Depth m	Oxygen ml/l	Total catch all species (kg)	Cod catch kg	Cod catch antal/nos.	Remarks
2013-02-27	45	28	4363	5711484	1849383	28179	5 ESE NÄR	TV3	30	42.2	42.1	8,9	87.2	1.6	14	Replaced 28016.
2013-02-27	46	28	4363	5713088	1852466	28179	5 ESE NÄR	SEA	-	-	44.1	8,9	-	-	-	
2013-02-27	47	28	4364	5710969	1903810	28071	12 E NÄR	SEA	-	-	87.7	0,5	-	-	-	
2013-02-27	48	28	4364	5712101	1903077	28071	12 E NÄR	TV3	30	83.4	83.2	0,5	1363.9	0.3	1	
2013-02-27	49	27	4362	5702282	1752461	27013	11,5 NW HOBURG	TV3	30	84.7	84.2	4,6	1153.8	27.5	253	
2013-02-27	50	27	4362	5702801	1751487	27013	11,5 NW HOBURG	SEA	-	-	84.2	4,6	-	-	-	
2013-02-28	51	26	4163	5622489	1843280	26077	8 S HOBURG BANK	TV3	30	74.5	74.3	0,6	816.5	2.6	16	
2013-02-28	52	26	4163	5622021	1843732	26077	8 S HOBURG BANK	SEA	-	-	75.8	0,4	-	-	-	
2013-02-28	53	26	4163	5619933	1842737	26141	6 NW BANANBANKEN	SEA	-	-	111.9	0.1	-	-	-	
2013-02-28	54	26	4163	5620052	1842884	26141	6 NW BANANBANKEN	TV3	30	112	111.9	0.1	-	-	-	Oxygen deficiency haul.
2013-02-28	55	26	4163	5619614	1827611	26032	14 S HOBURG BANK	TV3	30	53.3	51.5	8,6	32.6	1.9	28	
2013-02-28	56	26	4163	5621322	1829952	26032	14 S HOBURG BANK	SEA	-	-	51.5	8,6	-	-	-	
2013-02-28	57	26	4163	5623800	1829594	26013	11 S HOBURG BANK	TV3	30	37.1	37.2	8.8	37.0	0.001	1	
2013-02-28	58	25E	4162	5615614	1753451	25167	18 ENE NORRA MIDSJÖBANK	TV3	30	44.4	44.6	8.1	11.5	0.2	3	
2013-02-28	59	25E	4162	5613461	1753034	25167	18 ENE NORRA MIDSJÖBANK	SEA	-	-	48.0	8,0	-	-	-	
2013-03-01	60	25E	4062	5559314	1735090	25159	18 SE NORRA MIDSJÖBANKE	TV3	22	55.6	55.0	6,2	2047.2	27.7	114	
2013-03-01	61	25E	4062	5557962	1735509	25159	18 SE NORRA MIDSJÖBANKE	SEA	-	-	55.0	6,2	-	-	-	
2013-03-01	62	25E	4162	5603329	1744821	25311	SE NORRA MIDSJÖBANKEN	TV3	30	63.6	62.9	5,9	904.6	66.5	383	
2013-03-01	63	25E	4162	5605547	1746810	25311	SE NORRA MIDSJÖBANKEN	SEA	-	-	62.9	5,9	-	-	-	
2013-03-01	64	25E	4162	5608825	1745167	25038	13 E NORRA MIDSJÖBANKEN	SEA	-	-	53.5	6,9	-	-	-	
2013-03-01	65	25E	4162	5608693	1741725	25038	13 E NORRA MIDSJÖBANKEN	TV3	30	51.4	51.5	7,0	320.0	1.8	9	
2013-03-01	66	25E	4162	5607340	1740070	25166	11 SE NORRA MIDSJÖBANKE	SEA	-	-	58.5	5,9	-	-	-	
2013-03-01	67	25E	4162	5607287	1739106	25166	11 SE NORRA MIDSJÖBANKE	TV3	30	55.3	55.5	6,1	249.2	6.1	63	Replaced 25464.
2013-03-01	68	25E	4162	5605251	1725235	25461	4 SE NORRA MIDSJÖBANKEN	TV3	30	41.1	37.7	8,7	30.2	1.9	4	
2013-03-01	69	25E	4162	5604044	1722146	25461	4 SE NORRA MIDSJÖBANKEN	SEA	-	-	37.7	8,7	-	-	-	
2013-03-02	70	25E	4061	5546331	1620077	25305	5 NW HOLGERS STEN	TV3	30	62.3	62.4	0,2	53	42	104	
2013-03-02	71	25E	4061	5542935	1618566	25305	5 NW HOLGERS STEN	SEA	-	-	62.9	0,2	-	-	-	
2013-03-02	72	25E	4061	5546781	1626257	25359	3 W TENERIFFA	SEA	-	-	57.0	0,6	-	-	-	
2013-03-02	73	25E	4061	5547554	1628560	25359	3 W TENERIFFA	TV3	30	56.4	56.5	0,6	1114.7	617.5	2009	Replaced 25 357.
2013-03-02	74	25E	4061	5544917	1640787	25428	7 NNE HOLGERS STEN	SEA	-	-	52.0	5,1	-	-	-	
2013-03-02	75	25E	4061	5545737	1639938	25428	7 NNE HOLGERS STEN	TV3	22	55.4	52.0	5,1	2093.4	1284.7	11777	Replaced 25106.
2013-03-02	76	25E	4062	5554468	1700948	25390	2 SW MIDSJÖHÅLET	TV3	30	46.8	44.1	9,1	105.1	1.6	7	
2013-03-02	77	25E	4062	5553969	1704523	25390	2 SW MIDSJÖHÅLET	SEA	-	-	44.1	9,1	-	-	-	
2013-03-03	78	25E	4061	5551886	1630212	25417	7 NW TENERIFFA	SEA	-	-	51.0	6.5	-	-	-	
2013-03-03	79	25E	4061	5551864	1628659	25417	7 NW TENERIFFA	TV3	20	53.0	51.0	6.5	1711.9	114.1	973	Replaced 25149.
2013-03-03	80	25E	4061	5550252	1612080	25145	18 SE UTKLIPPAN	SEA	-	-	54.5	2.1	-	-	-	
2013-03-03	81	25E	4061	5550173	1611936	25145	18 SE UTKLIPPAN	TV3	22	57.1	54.5	2.1	3108.0	2394.4	11975	
2013-03-03	82	25E	4061	5540650	1613795	25301	11 E TÅNGEN	SEA	-	-	66.4	0.3	-	-	-	
2013-03-03	83	25E	4061	5540734	1612417	25301	11 E TÅNGEN	TV3	30	69.2	66.4	0.3	4.4	3.6	11	Replaced 25300.
2013-03-03	84	25C	4060	5547877	1557255	25299	INRE U10	TV3	30	60.4	57.0	1,4	529.6	182.8	670	
2013-03-03	85	25C	4060	5547497	1553776	25299	INRE U10	SEA	-	-	57.0	1,4	-	-	-	
2013-03-04	86	25C	4060	5550148	1556826	25347	11 SE UTKLIPPAN	TV3	21	56.8	54.5	3,2	2196	144	1296	
2013-03-04	87	25C	4060	5550648	1558914	25347	11 SE UTKLIPPAN	SEA	-	-	54.5	3,2	-	-	-	
2013-03-04	88	25C	4060	5548965	1553150	25427	5 N TÅNGEN	SEA	-	-	53.5	3,9	-	-	-	
2013-03-04	89	25C	4060	5548500	1550708	25427	5 N TÅNGEN	TV3	20	56.1	53.5	3,9	2077.3	31.8	220	Replaced 25127.
2013-03-04	90	25C	4060	5542115	1530250	25298	6 W TÅNGEN	SEA	-	-	62.4	1,0	-	-	-	
2013-03-04	91	25C	4060	5544419	1535643	25298	6 W TÅNGEN	TV3	22	61.5	61.4	0,8	882.1	148.1	990	
2013-03-04	92	25C	4060	5549941	1530852	25140	KLIPPEBANK	SEA	-	-	48.1	8,8	-	-	-	
2013-03-04	93	25C	4060	5550654	1533842	25140	KLIPPEBANK	TV3	37	42.3	42.1	8,9	16.4	3.7	20	
2013-03-04	94	25C	4060	5556309	1524131	25429	1 S INNERTORPET	TV3	30	45.9	44.1	9,0	873.0	3.2	74	
2013-03-04	95	25C	4060	5558170	1524840	25429	1 S INNERTORPET	SEA	-	-	44.1	9,0	-	-	-	
2013-03-05	96	25C	4060	5549594	1526245	25404	YTTERTORPET	TV3	30	50.8	50.5	8.2	174.6	4.1	23	
2013-03-05	97	25C	4060	5548551	1522720	25404	YTTERTORPET	SEA	-	-	50.5	8.2	-	-	-	
TOTAL FÅNGST (KG), TORSKFÅNGST, VIKT (KG) OCH ANTAL / Total catch (kg), cod catch, weight (kg) and numbers													**36 192**	**6 781**	**41 598**	

Table 2. Summary of the species in the catches. Swedish BITS, quarter 1 2013.

Namn Local name	Latinskt namn Species	SD 25W		SD 25C		SD 25E		SD 26		SD 27		SD 28		Totalt	
		Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)	Antal No.	Vikt (kg) Weight (kg)
TORSK	*Gadus morhua*	8 967	1 442.3	4 155	620.8	27 436	4 562.5	45	4.4	487	70.7	508	80.8	41 598	6 781.5
SILL	*Clupea harengus*	398	22.2	112 234	5 641.1	127 024	6 562.4	17 835	762.8	331 730	7 232.8	145 807	4 484.8	735 028	24 706.0
SKARPSILL	*Sprattus sprattus*	6	0.1	57 236	741.2	62 139	608.4	3 172	31.6	110 369	700.1	50 504	517.6	283 426	2 598.9
FYRTÖMMAD SKÄRLÅNGA	*Enchelyopus cimbrius*			2	0.3	1	0.002							3	0.3
HORNSIMPA	*Myoxocephalus quadricornis*					7	1.6	1	0.1	1 424	94.2	5 005	556.0	6 436	652.0
KOLJA	*Melanogrammus aeglefinus*			1	0.1									1	0.1
NORS	*Osmerus eperlanus*			1	0.01	1	0.03	1	0.002	1	0.004	5	0.04	9	0.1
PIGGVAR	*Psetta maxima*	13	8.8	1	0.4	2	0.7					3	1.4	19	11.3
RÖDSPÄTTA	*Pleuronectes platessa*	109	25.1	153	31.8	140	26.2	1	0.1	26	4.1	8	0.4	437	87.7
RÖTSIMPA	*Myoxocephalus scorpius*	7	1.3	16	3.2	220	38.8	126	29.0	173	28.9	229	45.6	771	146.8
SANDSKÄDDA	*Limanda limanda*	3	0.5	3	0.4									6	0.9
SJURYGG	*Cyclopterus lumpus*	4	1.4	16	4.0	17	3.4	18	3.0	5	1.0	14	2.3	74	15.1
SKRUBBSKÄDDA	*Platichthys flesus*	157	34.4	640	148.0	648	150.0	274	52.4	1 223	205.8	3 293	543.2	6 235	1 133.7
SMÅSPIGG	*Pungitius pungitius*							1	0.002			3	0.002	4	0.004
SPETSSTJÄRTAT LÅNGEBARN	*Lumpenus lampretaeformis*											1	0.03	1	0.03
STORSPIGG	*Gasterosteus aculeatus*	13	0.02	7 750	5.5	68	0.1	2	0.004	591	1.4	13	0.03	8 436	7.1
TOBISAR (SLÄKTE)	*Ammodytes*			1	0.01							1	0.01	2	0.02
TOBISKUNG	*Hyperoplus lanceolatus*					11	0.1							11	0.1
TÅNGSPIGG	*Spinachia spinachia*											2	0.01	2	0.01
VITLING	*Merlangius merlangus*			20	2.6	5	0.8							25	3.3
ÅLKUSA	*Zoarces viviparus*					2	0.1	2	0.2	158	10.1	62	2.9	224	13.3
SUMMA	TOTAL	9 677	1 536	182 229	7 199	217 720	11 955	21 478	883	446 187	8 349	205 458	6 235	1 082 748	36 158

Annex 8: Cruise reports of acoustic surveys BASS and BIAS in 2012

RESEARCH REPORT FROM THE GERMAN BALTIC ACOUSTIC SPRING SURVEY (GerBASS) ON BOARD OF THE R.V. "WALTHER HERWIG III"

(Cruise no. 354, 02.05. – 22.05.2012)

Uwe Böttcher
Thünen-Institute of Baltic Sea Fisheries, Rostock

1. Introduction

The international **Baltic Acoustic Spring Survey (BASS)** is conducted every year since 2001 in the framework of the long-term ICES Baltic Surveys programme.

Timing, surveying area and the principal methods of investigations were internationally co-ordinated by the WGBIFS (ICES Baltic International Fish Survey Working Group).

The main objective of this survey is to assess the sprat stock in the Baltic Proper and to supply the **ICES 'Baltic Fisheries Assessment Working Group (WGBFAS)'** with an index value for the stock size of sprat in the Baltic area (Subdivisions 24 - 26 and 28).

Echo-integration results along the pre-selected tracks are the basic materials for fish stock biomass calculations and supply information about the geographical and bathymetrical distribution of clupeids in the Baltic Sea. The analyses of pelagic research catches carried out during the acoustic survey provide data about the age and size structure of the stocks. Hydrological measurements deliver the information about abiotic environmental factors (seawater temperature, salinity, oxygen content) influencing the spatial distribution of sprat and herring.

Germany has participated each year on these investigations and covered in 2012 with the R.V. "W. Herwig" (Cruise no. 354) the ICES subdivisions 24, 25 and the western parts of subdivisions 26 and subdivision 28 (Figure 1).

The German Fisheries Data Collection Program for 2012 in accordance with the EU Commission Regulations Nos. 1639/2001, 1581/2005, 665/2008, 199/2008) financially and logistically supported the BASS survey.

2. Methods

2.1. Personal

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1	Dr. U. Böttcher	Thünen-Institute of Baltic Sea Fisheries, Rostock
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7	Helge Wehrmann	University Hamburg
8	N. Fricke	Thünen-Institute of Fisheries Ecology, Cuxhafen
9	J. Ipse	Thünen-Institute of Fisheries Ecology, Cuxhafen
10	S. Valassas	Volonteer
11	A. Thoma	Volonteer

2.2. Narrative

The cruise started on 02th May in Warnemünde and ended on 22th May in Bremerhaven. The investigation of RV "W. Herwig III" covered the whole Subdivisions 24 and 25 as well the Polish and Swedish areas of Subdivision 26 and 28.

Eighteen days were utilized for fulfilling the survey purposes (calibration of the hydroacustic equipment, hydroacoustic tracks, fishing and hydrographical stations). It remained time for additional investigations due to good weather conditions and an optimal course of the cruise. Because of that one day could was used for an enlarged of investigations directed on the herring distribution around the ile of Rügen.Two days were used for crossing to the area of investigation and back to the homeport.

2.3. Survey design

The acoustic and ichthyologic sampling stratification was based on ICES statistical rectangles. The size of these rectangles amounts 0.5 degree in latitude and 1 degree in longitude, whereby only areas with water deeper than 10 m were taken into account. The daily surveyed distance amounted to approximately 90-100 nautical miles. In agreement with the rules the acoustic measurements were conducted on parallel transects with a distance of 15 - 18 nautical miles.

The standard acoustic investigations and the fishing hauls were carried out at daylight from 4:00 - 18:00 UTC (6:00 and 20:00 local time). The survey speed was 10 knots. In general, each ICES-rectangle was covered with two transects, corresponding to acoustic measurements of approx. 60 nautical miles per statistical rectangle

2.4. Calibration

The hull mounted 38 kHz transducer was calibrated on the 19th April (cruise no. 353) in the coastal area of the Mecklenburg Bay. The ship was anchored to bow and stern to reduce ship movement. The calibration procedure was carried out as described in the ‘Manual for International Baltic Acoustic Surveys (IBAS)’ (ICES 2012).

2.5. Acoustic data collection

Acoustic data were recorded with an echosounder SIMRAD EK60. The standard frequency for the survey was 38 kHz. The specific settings of the acoustic equipment were used according the IBAS-manual.

2.6. Biological data – fishing stations

Trawling was done with the pelagic gear “PSN205” in the midwater as well as near the bottom to identify the echo signals. The intention was to conduct at least two hauls per ICES statistical rectangle. The trawling time lasted usually 30 minutes. The trawling speed ranged from 2.8 to 4.1 knots. According to the IBAS-manual was used codend-inlets with stretched mesh sizes of 20 mm in the Subdivision 24 respectively 12 mm in Subdivision 25 to 28. Additional hauls were carried out with a stretched mesh size of 50 mm in the cod end and with a bottom trawl However, these hauls were directed on special investigations and not used for the hydroacoustic analyse.

The trawling depth and the net opening were controlled by an Atlas net probe and Scanmar press sensor. Generally a net opening of about 15 to 18 m was achieved. The trawl depth (headrope below the surface) was chosen in accordance to ‘characteristic indications’ of the echogram and ranged from 15 to 100 m. The bottom depth varied from 31 to 231 m at the pelagic trawling positions.

Samples were taken from each haul in order to determine the length and weight distribution of fish. Sub-samples of herring and sprat were investigated concerning sex, maturity and age. Samples of whole fishes and parts of different organs/tissues were taken for later investigations in the lab.

2.7. Hydrography

A Seabird-CTD-probe with a carousel water sampler and oxygen sensor was used for hydrographical measurements. Vertical profiles were acquired on a fixed station grid along the track and after each trawl station. The profiles covered the entire water column to about 2 m above the sea bottom. Additionally, water samples were taken once per day from different depths to check the oxygen data by Winkler titration and to collect reference salinity samples. The hydrological row data were aggregated to 1 m depth strata. Additional meteorological observations of air temperature, atmospheric pressure, wind speed and direction were recorded on all hydrographical stations.

2.8. Data analysis

The pelagic target species sprat and herring are usually distibuted in mixed layers and in combination with other species so that the integrator readings cannot be allocated directly to a single species. Therefore, the species composition used for the conversion of echointegrals into fish abundance, was based on trawl catch results accordingly. For each rectangle the species composition and length distribution was determined as the unweighted mean of all trawl results in this rectangle. In case of missing hauls within an individual ICES rectangle (due to gear problems or other limitations), hauls results from neighbouring rectangles with similar hydrographic features was used.

From these distributions, the mean acoustic cross section σ was calculated according to the following target strength-length (TS) relations:

Clupeids	TS = 20 log L (cm) - 71.2	(ICES 1983)
Gadoids	TS = 20 log L (cm) - 67.5	(Foote et al. 1986)

The total number of fish (total N) in one rectangle was estimated as the product of the mean nautical area backscattering coefficient (i.e. echo integral) (s_A in m²/n.mi.²) and the rectangle area (n.mi.²), divided by the corresponding mean cross section. The total number of fish was separeted into herring and sprat according to the mean catch composition. In accordance with the guidelines in the ‘Manual for the Baltic International Acoustic Surveys (ICES 2010)’, the further calculation was performed in the following way:

- **Fish species considered:**

  Clupea harengus
  Gadus morhua
  Gasterosteus aculeatus
  Merlangius merlangus
  Sprattus sprattus

- **Exclusion of trawl hauls with low catch level:**
  - haul 14
  - haul 19
  - haul 26
  - haul 61
  - haul 62
- **Exclusion of trawl hauls with objectives out of the hydroacoustic survey:**
  - haul 49-53
  - haul 63-69
- **Usage of neighbouring trawl information for rectangles, which contain only acoustic investigations:**
  - haul 2 (25-40G4) to 25-39G4
  - haul 3 (25-40G4) to 25-39G4
  - haul 7 (25-38G5) to 25-37G5
  - haul 8 (25-38G5) to 25-37G5
  - haul 9 (25-38G5) to 25-38G6
  - haul 12 (25-39G5) to 25-40G5
  - haul 16 (25-39G6) to 25-40G6
  - haul 18 (25-39G6) to 25-38G6
  - haul 21 (25-40G7) to 25-41G6
  - haul 21 (25-40G7) to 25-41G7
  - haul 25 (25-39G7) to 25-40G7
  - haul 39 (28-43G9) to 28-43G8
  - haul 47 (28-42G8) to 28-42G9
  - haul 47 (28-42G8) to 28-43G8
  - haul 48 (28-42G9) to 28-42G8
  - haul 54 (24-38G3) to 24-38G4
  - haul 55 (24-39G4) to 24-38G4
  - haul 58 (24-39G3) to 24-38G2
  - haul 58 (24-39G3) to 24-39G2
  - haul 59 (24-38G3) to 24-39G2
  - haul 59 (24-38G3) to 24-39G3
  - haul 60 (24-38G3) to 24-38G2

○

3. Results

3.1. Biological data

Totally 69 hauls were were carried out on the cruise. 50 hauls was conducted with the standard gear PSN205 along the hydroacoustic track and could be used for the further analyse. 5 haul without or with very small catches were excluded.

Furthermore 5 hauls were carried out directed on cod in the dumping areas with the PSN205 without an inlet in the codend. The stretched mesh size of the codend amounted in this case 50 mm.

In the shallower areas around the isle of Rügen (water depth 18 - 39 m) 8 hauls were carried out with a 140‘bottom trawl (20 mm stretched meshes in the codend) to sample herring for special investigation. This hauls were not used for the standard hydroacoustic analyse.

The geographical distribution of the fishing stations and the catch composition of the hauls are presented in Figure 1, respectively Table 1.

Totally, 9 fish species were recorded in the 50 pelagic control hauls.

Hol no. 14 and 26 indicated “clean” stickleback layers in the investigated area. The haul and the backscattering values of these layers were excluded of the further calculations.

The CPUE of all fish species ranged from 3 to 638 kg/0.5h. The mean catch reached a medium level related to the preceeding years of the time series (Figure 3).

In general the catch composition was dominated by sprat. Herring and cod also occurred regularly in the trawl catches. The average biomass fraction amounted 92 % for sprat and 8 % for herring in hauls related to the acoustic investigations. Hauls with a high proportion of herring occurred in the Arkona Sea, Bornholm Sea and western Gotland Sea. Cod was caught in 43 hauls. The average biomass fraction of cod amounted to 4 %. Most cod was found in the Bornholm basin. The biomass of all other species was negligible.

The length distributions of sprat and herring of the years 2011 and 2012 are presented by Subdivision in Figure 4. From the western to the eastern areas, the length distribution shows the typical shift to smaller individuals. However, in all Subdivisions larger sprats (>11 cm) dominate the catches. The contribution of the new incoming year-class (<10 cm) is especially in SD 25 and 26 very low

3.2. Acoustic data

The valid measured cruise track totally reached a distance of 1545 nautical miles. The basic results are given in Table 2 (survey area, mean s_A, mean scattering cross section σ, estimated total number of fish and percentage of herring and sprat per rectangle).

The echo distribution along the hydroacoustic track is shown in Figure 5. High values were found especially in the Bornholm basin (represented manly by sprat) and in the area around Rügen (mainly herring). Somewhat lower but constant fish concentration occurred in the basin of Subdivision 26 and 28.

The mean NASC per Subdivision was in SD 25, 26 and 28 in the range of the long-time average (Figure 6). The NASC in SD 24 is the highest of the time-serie. The major cause is the inclusion of the herring concentration areas in the immediate vicinity of Rügen in this year.

The vertical distribution of the NASC in the Basins was characterized by high values below the halocline represented mainly by sprat.(Figure 7).

3.3. Abundance estimates

The calculated total abundance of sprat is presented in Table 2. The estimated number of sprat by age group and rectangle are given in Table 3. The corresponding mean weights by age and rectangle are shown in Table 4. The estimates of sprat biomass by age group and rectangle are summarized in Table 5.

3.4. Hydrographic data

The seawater temperature varied from 5 ºC to 8 ºC in the surface layer and 3-4 ºC in the intermediate layer about the halocline (Fig. 7). These are normal ranges for this season. Below the halocline the temperature amounts 5 - 6 ºC.

Compared to last year the oxygen content increased distinctly in the bottom near water of the Bornholm and south-west Gotland basin. This increase can be explained by the inflow event in November/December 2011. Aerobic conditions in the bottom near water layer were found in the whole area of the Bornholm basin and Stolpe

Channel as well as in the south western part of the Gotland basin (Fig 8). The salinity of the deepwater also slightly increased in this area due to the inflow event in 2011.

3.5. References

ICES 1983: Report of the Planning Group on ICES co-ordinated herring and sprat acoustic surveys. ICES CM 1983/H:12.

ICES 2010. Addendum 2: Manual for the Baltic International Acoustic Survey (BIAS) Version 0.82. Report of the Baltic International Fish Survey Working Group (WGBIFS), 22–26 March 2010, Klaipeda, Lithuania; pp. 428-460, [in:] ICES CM 2010/SSGESST:07, REF. SCICOM, WGISUR, ACOM.

Foote, K.G. Aglen, A. & Nakken, O. 1986: Measurements of fish target strength with a split-beam echosounder. J. Acoust. Soc. Am. 80 (2): 612-621

3.6. *Figures and Tables*

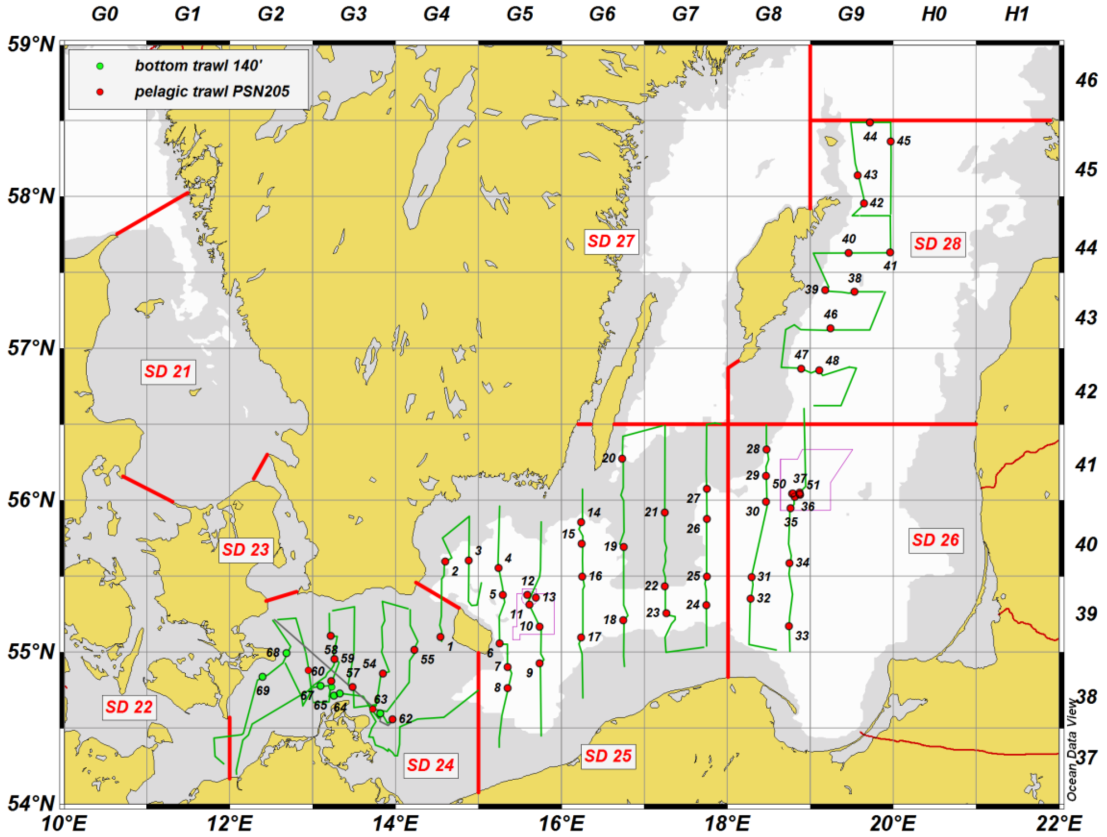

Figure 1[i]: Hydroacoustic tracks (green: day, black: night) and trawl stations (red: PSN205, green: bottom trawl) on Cruise No. 354 of RV “W. Herwig III” in May 2012.

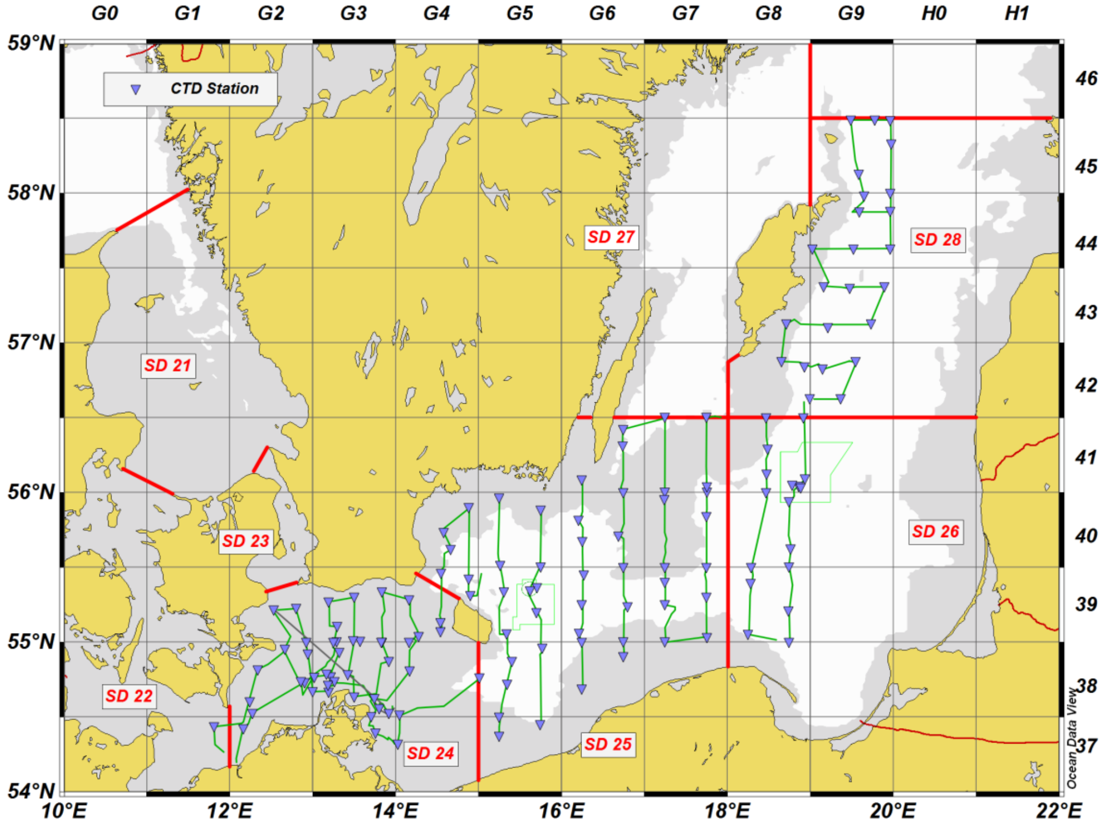

Figure 2: Distribution of CTD- and bottle-stations on the hydroacoustic transects (Cruise No. 354 of RV “W. Herwig III” in May 2012).

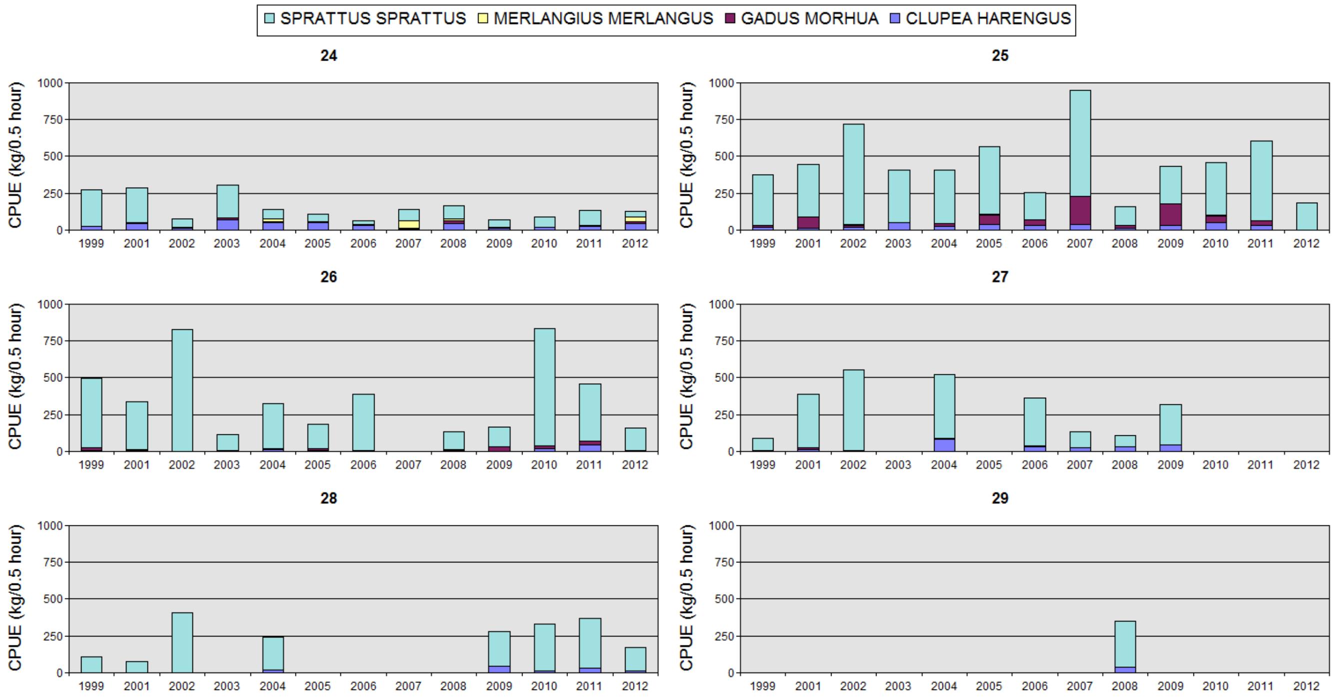

Figure 3: CPUE (kg/0,5 hour) in the ICES-subdivisions on the May hydroacoustic survey 1999 to 2012.

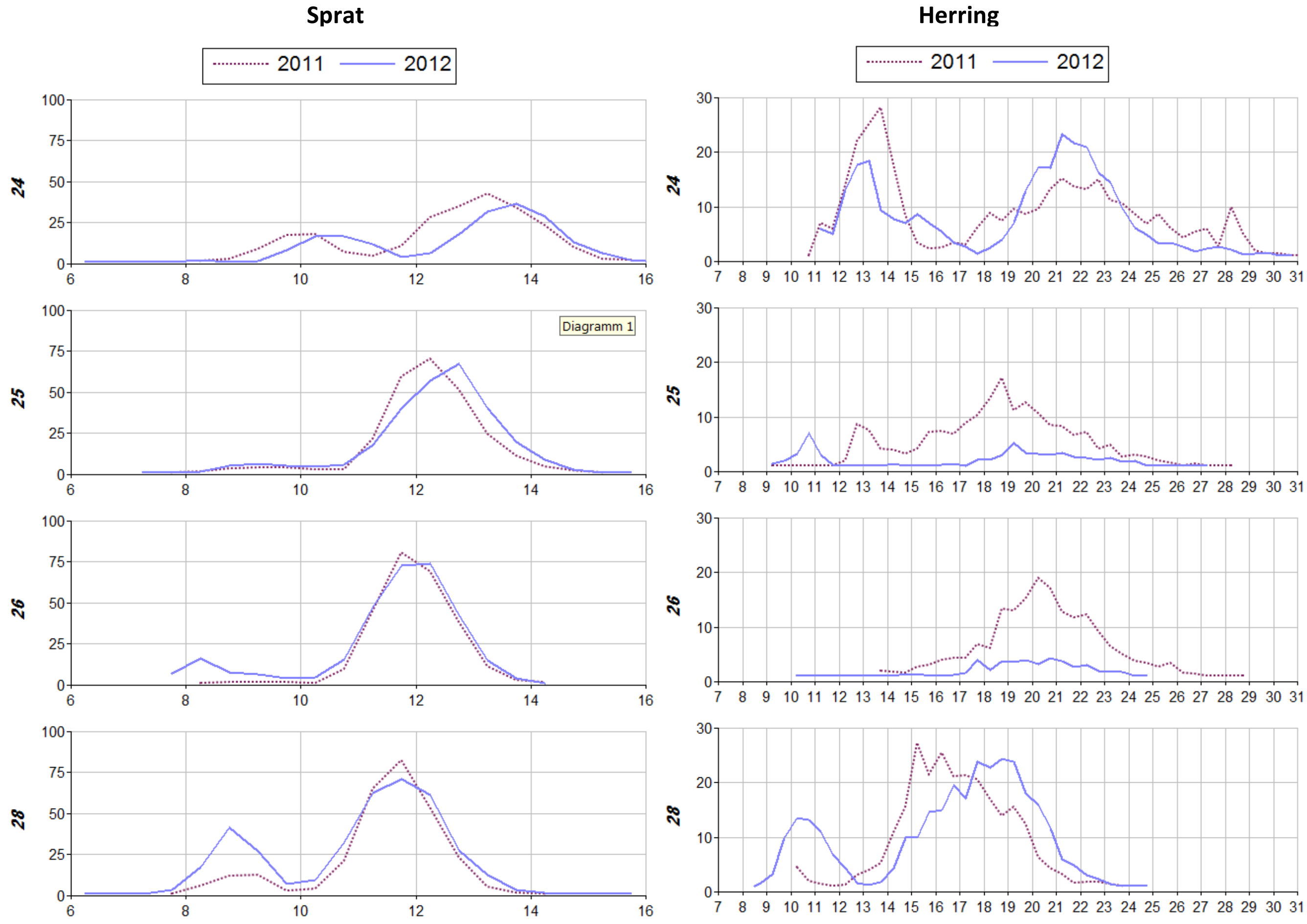

Figure 4: Length distribution in numbers of sprat (left) and herring (right) in Subdivisions 24 - 28 in May 2011 and 2012.

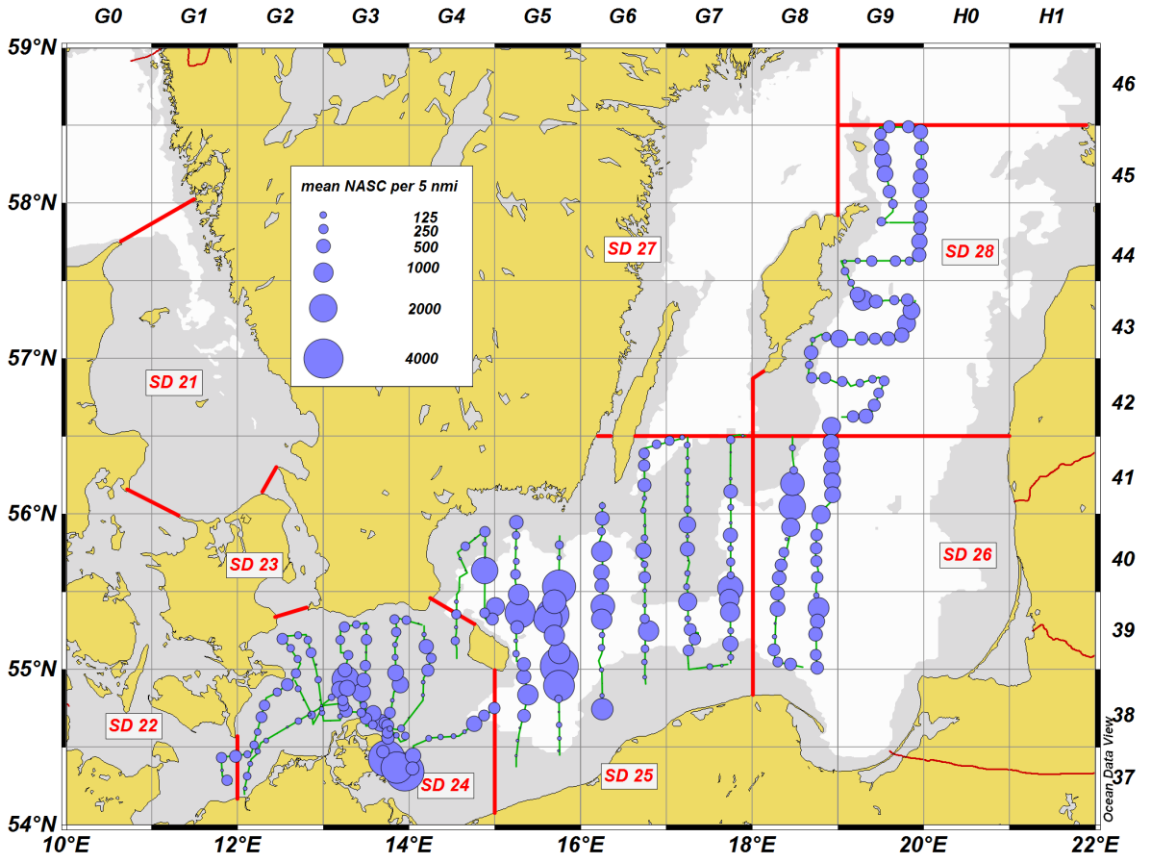

Figure 5: Echo distribution along the hydroacoustic track (Cruise No. 354 of RV "W. Herwig III" in May 2012). Shown is the mean nautical area backscattering coefficient NASC per 5 n.mi. interval.

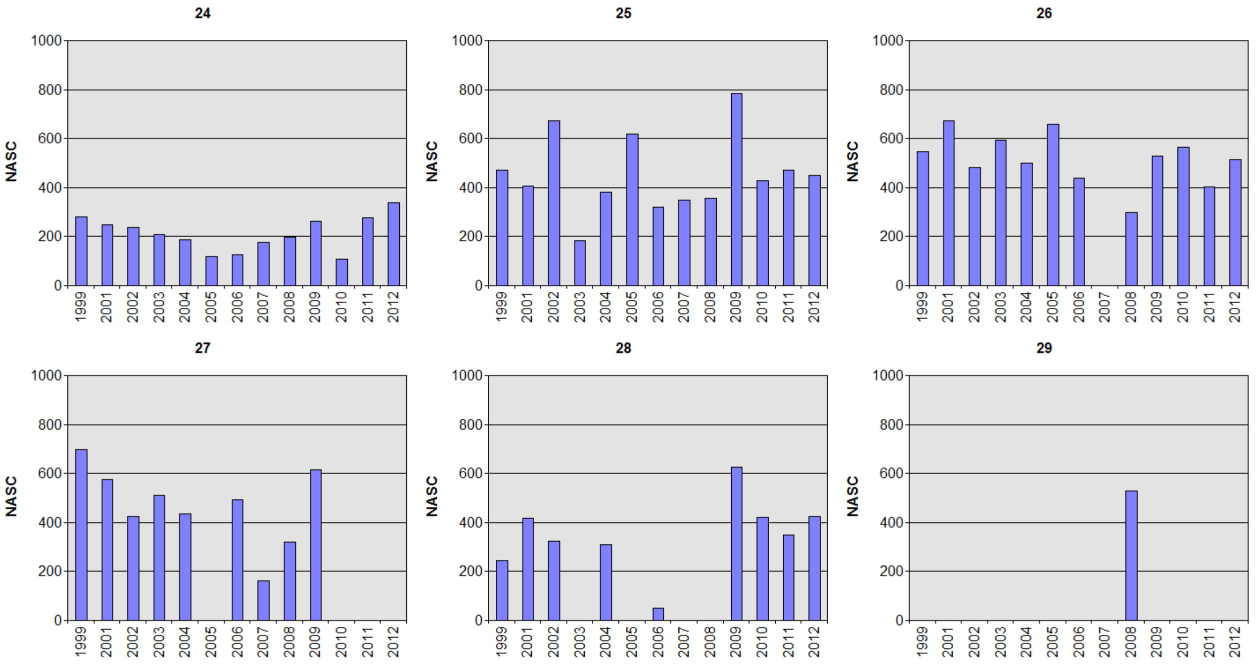

Figure 6: Mean NASC per Subdivision and year

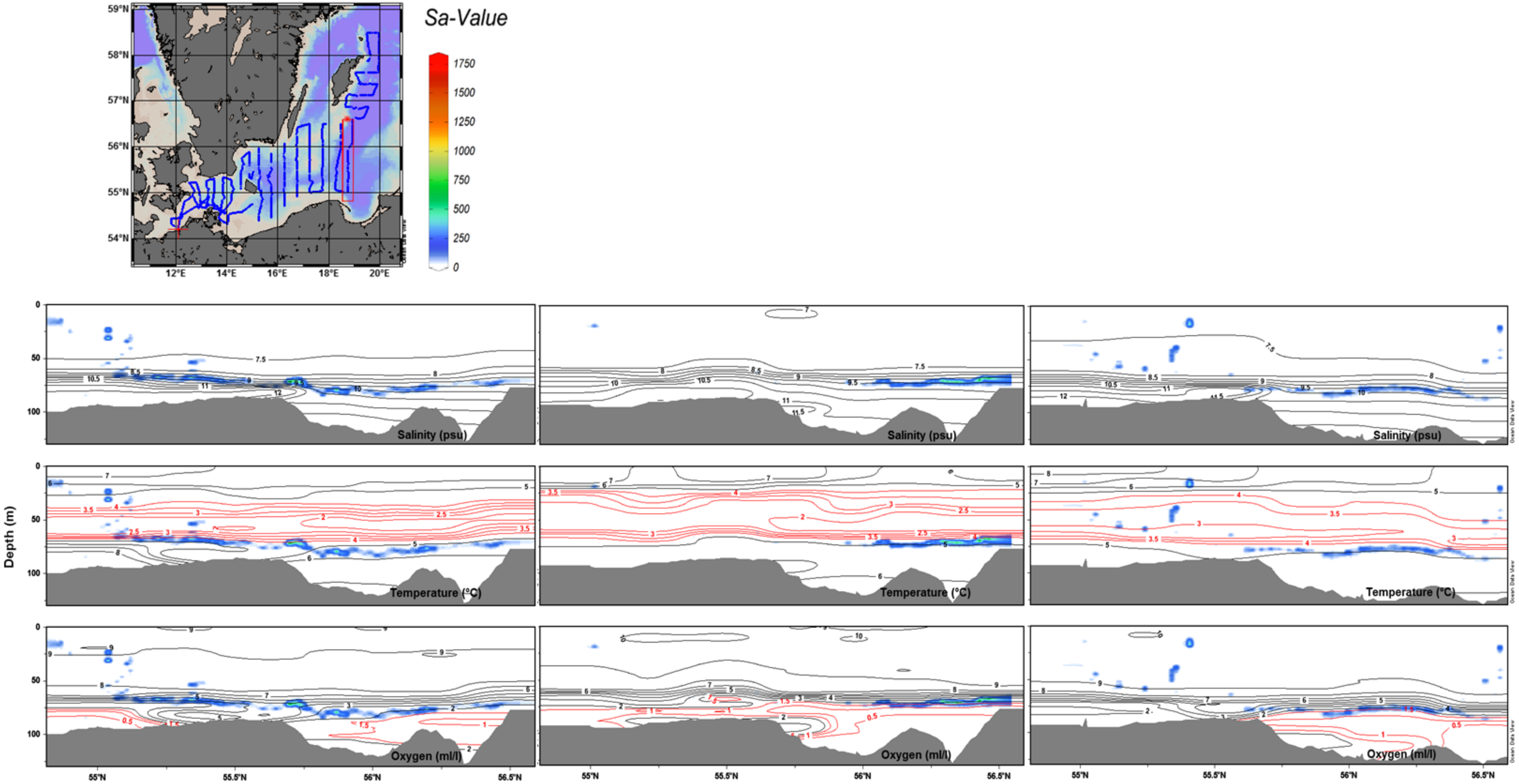

Figure 7: Vertical distribution of NASC related to the Salinity, temperature and oxygen on a transect in the Bornholm basin in 2010 (left) and 2011 (mid) and 2012 (right)

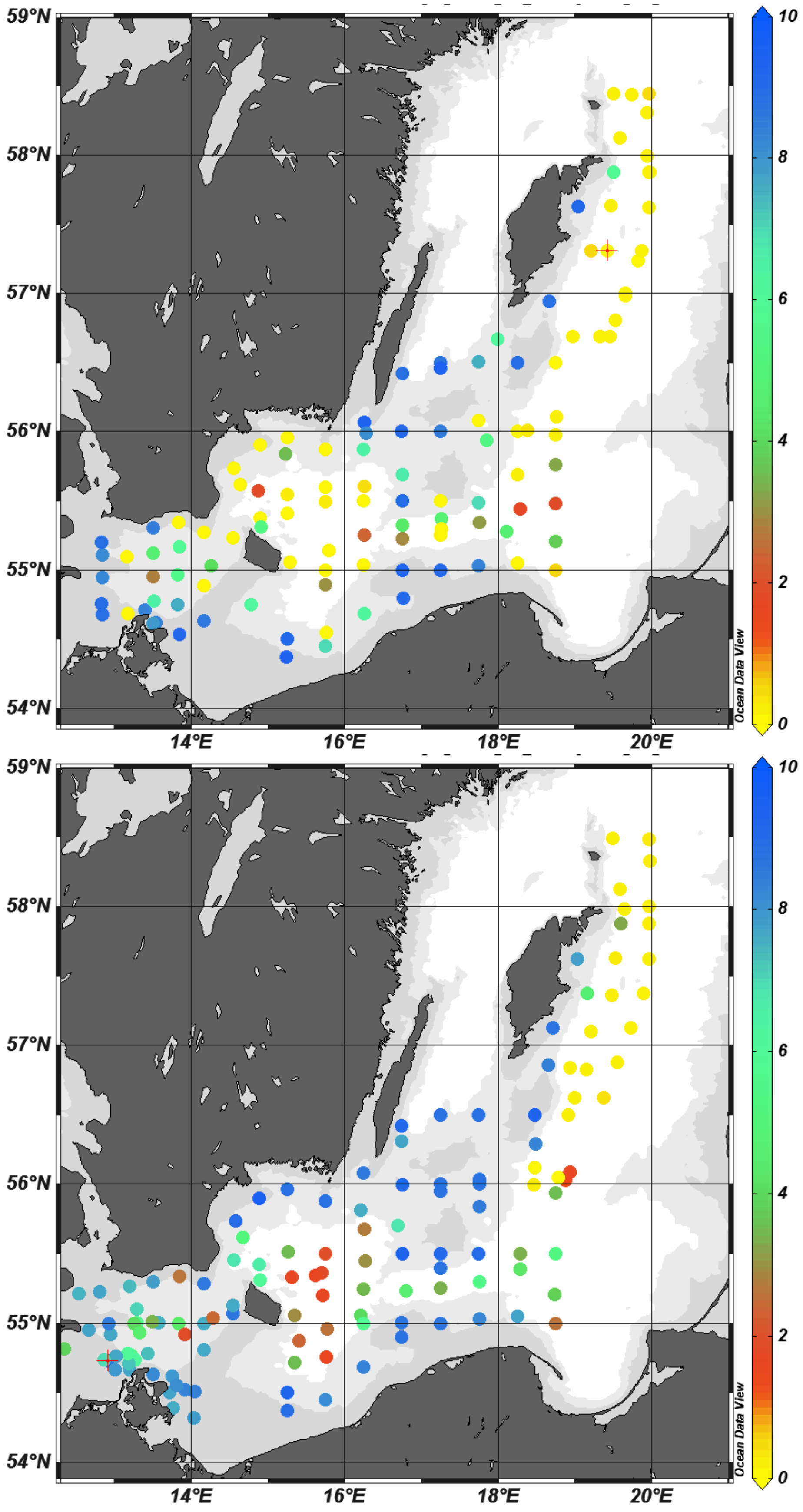

Figure 8[ii]: Oxygen content in the bottom-near water on the CTD-stations in 2011 (top) and 2012 (down).

Table 1: Catch composition (kg/0.5 h) per fishing haul with the pelagic gear PSN205 (RV "Walther Herwig III" , May 2012)

station	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**18**	**15**	**16**	**17**	**19**
sub-division	24	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
rectangle	39G4	40G4	40G4	40G5	39G5	39G5	38G5	38G5	38G5	39G5	39G5	39G5	39G5	40G6	39G6	40G6	39G6	39G6	40G6
trawl_typ	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205
cod_end	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
trawl_time (min)	30	30	30	30	30	30	30	30	30	30	60	60	37	30	30	31	30	30	30
bottom_depth (m)	43.0	67.0	77.5	76.5	90.5	71.0	73.0	68.5	81.5	93.0	96.0	95.5	99.0	55.5	81.0	67.5	72.5	76.5	53.5
mean_headline_depth (m)	27.0	48.0	58.0	58.0	72.0	50.0	55.0	50.0	64.0	68.0	75.0	72.0	71.0	36.0	59.0	48.0	56.0	56.0	35.0
trawl_distance (n.mi.)	2.15	1.74	1.87	1.83	1.78	1.74	1.75	1.72	1.67	1.74	3.41	3.34	2.10	1.88	1.66	1.91	1.82	1.63	1.86
CLUPEA HARENGUS	11.03	0.48	1.21	0.03	2.07	0.46	2.44	4.97	2.01	1.79	0.84	0.93	0.53	0.31	0.71	0.19	0.82	0.10	0.11
CYCLOPTERUS LUMPUS		0.23																	
GADUS MORHUA			1.36		1.58		0.23		1.67	0.80	0.99	6.76			0.53				
GASTEROSTEUS ACULEATUS		0.00	0.04											0.32		0.07			
MERLANGIUS MERLANGUS					0.24							0.41							
PLATICHTHYS FLESUS				0.19	0.48		0.51												
SPRATTUS SPRATTUS	0.20	51.80	98.60	31.50	610.50	7.80	333.20	395.25	433.20	615.40	269.20	369.30	384.89	0.20	55.30	105.87	154.40	7.10	0.01
Total (kg)	**11.23**	**52.52**	**101.21**	**31.72**	**614.87**	**8.26**	**336.37**	**400.22**	**436.88**	**617.98**	**271.02**	**377.40**	**385.42**	**0.83**	**56.53**	**106.13**	**155.22**	**7.20**	**0.12**

station	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
sub-division	25	25	25	25	25	25	25	25	26	26	26	26	26	26	26	26	26	26	28
rectangle	41G6	40G7	39G7	39G7	39G7	39G7	40G7	41G7	41G8	41G8	40G8	39G8	39G8	39G8	40G8	40G8	41G8	41G8	43G9
trawl_typ	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205
cod_end	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
trawl_time (min)	30	30	30	30	30	40	30	30	30	30	30	30	30	30	30	30	30	60	30
bottom_depth (m)	62.0	47.0	89.0	89.0	80.0	72.0	61.5	63.5	60.5	99.5	105.5	85.5	81.5	92.0	86.5	119.5	124.5	125.5	118.5
mean_headline_depth (m)	42.0	29.0	29.0	29.0	59.0	49.0	38.0	40.0	38.0	68.0	73.0	63.0	62.0	65.0	60.0	90.0	94.0	68.0	77.0
trawl_distance (n.mi.)	1.71	1.77	1.54	1.69	1.73	1.83	1.54	1.52	1.86	1.50	1.47	1.61	1.73	1.70	1.77	1.36	1.41	2.81	1.45
CLUPEA HARENGUS	0.27	0.65	0.01	0.33	0.99	4.70			1.81	3.41	1.17	1.81	2.46	2.82		0.26	0.28	1.00	4.12
CYCLOPTERUS LUMPUS																			
GADUS MORHUA				1.32	1.43	2.40				0.90	1.12	0.25	0.33	4.36		0.67	0.95	1.12	0.53
GASTEROSTEUS ACULEATUS	2.21	0.01	0.00				0.07	0.14	1.26	0.49			0.00				0.42		0.29
PLATICHTHYS FLESUS										0.26	2.05				0.58	0.27	1.76	3.75	2.12
SPRATTUS SPRATTUS	139.90	159.20	106.80	109.80	30.80	45.53		4.05	0.01	474.90	314.28	578.29	66.30	1.67	279.20	9.90	17.30	562.47	83.30
Total (kg)	**142.37**	**159.86**	**106.81**	**111.45**	**33.22**	**52.62**	**0.07**	**4.19**	**3.08**	**479.96**	**318.62**	**580.35**	**69.08**	**8.85**	**279.78**	**11.09**	**20.72**	**568.35**	**90.36**

station	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**
sub-division	28	28	28	28	28	28	28	28	28	28	26	26	26	26	26	24	24	24	24
rectangle	43G9	44G9	44G9	44G9	45G9	45G9	45G9	43G9	42G8	42G9	41G8	41G8	41G8	41G8	41G8	38G3	41G4	38G3	38G3
trawl_typ	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205
cod_end	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	50 mm	50 mm	50 mm	50 mm	50 mm	20 mm	20 mm	20 mm	20 mm
trawl_time (min)	30	30	30	30	30	30	30	20	30	30	60	60	60	60	30	30	30	30	30
bottom_depth (m)	85.5	94.5	128.0	132.5	152.5	142.5	114.5	152.5	126.0	158.0	122.0	122.0	123.0	122.0	122.5	44.5	45.5	29.5	42.5
mean_headline_depth (m)	62.5	69.0	77.0	78.0	74.0	74.0	74.0	72.0	75.0	75.0	100.0	100.0	100.0	100.0	80.0	28.0	8.0	9.5	24.0
trawl_distance (n.mi.)	1.47	1.42	1.38	1.33	1.40	1.32	1.37	1.47	1.41	1.48	2.74	2.64	2.84	2.62	1.35	1.86	1.72	2.03	1.80
CLUPEA HARENGUS	11.27	6.17	11.25	8.68	49.25	16.22	13.31	7.19	14.00	2.38	0.07	0.11	0.12	0.07	3.56	457.25	25.89	2.85	8.47
GADUS MORHUA	0.21		2.02	0.63	1.17	0.51	0.25	3.71		0.35	10.78	10.00	4.32	4.01	3.81				1.06
GASTEROSTEUS ACULEATUS	3.85	0.70	0.26	0.93	2.16	0.76	1.27	0.07	0.83	0.05	0.00	0.01							
HYPEROPLUS LANCEOLATUS									0.20										0.05
MERLANGIUS MERLANGUS																			0.28
PLATICHTHYS FLESUS	0.11	0.25	1.34	3.49	0.54	0.39	0.30	1.62	2.07	2.08	0.13	0.10	0.10		1.37				
SALMO SALAR																	4.56		
SPRATTUS SPRATTUS	578.23	167.20	35.50	25.60	171.27	55.40	51.50	286.20	166.80	91.80	1.94	2.94	3.36	4.12	23.20	181.04	9.30	24.50	86.50
Total (kg)	**593.67**	**174.33**	**50.37**	**39.33**	**224.39**	**73.28**	**66.63**	**298.78**	**183.90**	**96.66**	**12.91**	**13.17**	**7.89**	**8.21**	**31.94**	**638.30**	**39.75**	**27.35**	**96.36**

Table 2: Survey statistics of the Cruise No. 343 of RV “W. Herwig III” in May 2012

Sub-division	Rect-angel	Area (nm²)	Sa (m²/nm²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	Cod (%)	Nherring (million)	Nsprat (million)
24	**38G2**	832.9	130.71	2.12	513.49	22.56	77.23	0	115.84	396.57
24	**38G3**	865.7	407.51	1.91	1846.87	12.73	87.17	0.01	235.14	1609.99
24	**38G4**	1034.8	156.26	2.792	579.24	39.82	60.18	0	230.65	348.58
24	**39G2**	406.1	172.26	1.653	423.32	18.63	81.36	0	78.88	344.42
24	**39G3**	765	213.42	1.653	987.98	18.63	81.36	0	184.1	803.83
24	**39G4**	524.8	180.5	3.53	268.34	67.45	32.55	0	180.99	87.35
25	**37G5**	642.2	11.3	1.546	46.93	0.26	99.73	0	0.12	46.81
25	**38G5**	1035.7	610.96	1.528	4141.57	0.22	99.78	0	8.99	4132.38
25	**38G6**	940.2	295.49	1.476	1882.41	0.24	99.75	0.02	4.43	1877.69
25	**39G4**	287.3	277.98	1.487	537.2	0.33	99.55	0.01	1.77	534.79
25	**39G5**	979	1367.05	1.561	8571.37	0.33	99.67	0	28.15	8542.75
25	**39G6**	1026	447.3	1.512	3035.99	0.29	99.7	0.01	8.85	3026.95
25	**39G7**	1026	362.32	1.403	2649.33	0.5	99.42	0.08	13.16	2634.02
25	**40G4**	677.2	260.56	1.487	1186.9	0.33	99.55	0.01	3.92	1181.57
25	**40G5**	1012.9	442	1.572	2848.7	0.05	99.95	0	1.37	2847.18
25	**40G6**	1013	381.63	1.492	2591.48	0.1	99.73	0	2.5	2584.47
25	**40G7**	1013	342.98	1.444	2406.05	0.98	98.89	0.12	23.62	2379.35
25	**41G6**	764.4	265.02	1.329	1523.88	0.18	96.23	0	2.79	1466.42
25	**41G7**	1000	105.79	1.353	781.9	0.09	93.48	0	0.69	730.93
26	**39G8**	1026	418.91	1.561	2753.29	5.21	94.16	0.63	143.55	2592.36
26	**40G8**	1013	420.72	1.353	3150.95	0.15	99.78	0.07	4.76	3144.12
26	**41G8**	1000	738.58	1.047	7051.17	1.51	72.86	0.04	106.76	5137.28
28	**42G8**	945.4	455.4	1.342	3207.48	1.03	98.75	0.01	32.89	3167.36
28	**42G9**	986.9	308.15	1.342	2265.64	1.03	98.75	0.01	23.23	2237.3
28	**43G8**	296.2	318.11	1.231	765.44	1.21	98.56	0	9.23	754.39
28	**43G9**	973.7	573.49	1.26	4431.51	1.01	98.41	0.02	44.93	4360.94
28	**44G9**	876.6	282.54	1.333	1857.8	4.68	90.46	0.05	86.87	1680.62
28	**45G9**	924.5	507.34	1.061	4420.88	5.55	89.61	0.02	245.46	3961.56

Table 3: Estimated numbers (millions) of sprat on Cruise No. 343 of RV “W. Herwig III” in May 2012

Sub-division	Rect-angle	Age group								
		1	2	3	4	5	6	7	8+	Total
24	**38G2**	14.31	39.23	113.99	179.26	49.57	0	0.07	0.14	396.57
24	**38G3**	281.86	142.73	376.98	618.34	187.9	0	0.73	1.45	1609.99
24	**38G4**	35.19	41.46	92.35	144.65	34.94	0	0	0	348.58
24	**39G2**	119.08	28.21	67.25	100.44	29.25	0	0.06	0.12	344.42
24	**39G3**	277.92	65.84	156.95	234.43	68.26	0	0.14	0.29	803.83
24	**39G4**	8.97	9.28	19.43	35	13.12	0	0.52	1.03	87.35
25	**37G5**	4	6.68	4.98	22.14	3.64	4.01	0.91	0.45	46.81
25	**38G5**	314.51	703.35	465.74	1928.48	289.49	325.77	74.39	30.66	4132.38
25	**38G6**	80.19	519.28	247.9	810.09	91.11	101.67	21.78	5.68	1877.69
25	**39G4**	98.19	63.62	49.2	223.64	41.52	42.74	11.26	4.61	534.79
25	**39G5**	240.75	1583.58	1048.8	4144.3	619.44	680.45	159.58	65.86	8542.75
25	**39G6**	60.3	741.63	406.94	1398.28	176.8	188.97	38.92	15.11	3026.95
25	**39G7**	215.39	988.67	352.04	915.64	80.3	67.37	10.98	3.62	2634.02
25	**40G4**	216.94	140.57	108.71	494.12	91.74	94.44	24.87	10.17	1181.57
25	**40G5**	84.65	482.5	339.55	1397.47	214.72	244.52	56.81	26.95	2847.18
25	**40G6**	93.97	608.77	353.05	1195.29	135.24	155.38	34.21	8.57	2584.47
25	**40G7**	216.51	752.05	306.51	906.17	85.06	91.34	15.88	5.82	2379.35
25	**41G6**	193.15	483.88	173.74	509.53	45.22	49.6	8.76	2.54	1466.42
25	**41G7**	55.24	211.62	103.56	300.29	26.1	28.2	4.77	1.13	730.93
26	**39G8**	571.78	350.92	269.62	983.55	264.59	57.71	1.9	92.29	2592.36
26	**40G8**	155.18	702.89	427.12	1404.16	297.47	47.72	1.04	108.53	3144.12
26	**41G8**	837.01	1613.2	509.01	1675.6	338.92	41.99	0.39	121.16	5137.28
28	**42G8**	198.62	582.54	492.13	1209.98	327.18	209.31	57.4	90.21	3167.36
28	**42G9**	140.3	411.48	347.62	854.68	231.11	147.85	40.55	63.72	2237.3
28	**43G8**	167.32	122.87	96.93	232.76	63.73	41.72	11.21	17.85	754.39
28	**43G9**	753.51	780.97	592.35	1397.78	386.94	262.02	69.33	118.04	4360.94
28	**44G9**	144.37	414.25	249.68	526.07	149.71	116.66	26.07	53.82	1680.62
28	**45G9**	2017.62	752.34	300.16	557.42	152.89	113.08	16.89	51.16	3961.56

Table 4: Sprat mean weight (g) per age group on Cruise No. 343 of RV "W. Herwig III" in May 2012

Sub-division	Rect-angle	Age group								
		1	2	3	4	5	6	7	8+	Total
24	**38G2**	8.76	14.37	17.42	17.82	19.55	0	25.38	25.38	17.26
24	**38G3**	8.02	13.88	17.56	17.96	19.67	0	25.38	25.38	15.97
24	**38G4**	7.33	14.32	16.95	17.25	18.74	0	0	0	15.97
24	**39G2**	8.08	12.88	17.45	17.95	19.38	0	25.38	25.38	14.15
24	**39G3**	8.08	12.88	17.45	17.95	19.38	0	25.38	25.38	14.15
24	**39G4**	4.86	14.08	17.25	18.28	20.24	0	25.38	25.38	16.65
25	**37G5**	6.05	10.85	12.28	13.4	14.99	14.64	15.29	35.09	12.58
25	**38G5**	6.07	10.68	12.05	13.17	14.7	14.48	15.11	35.09	12.35
25	**38G6**	6.48	10.25	11.47	12.46	13.7	14.01	14.55	15.63	11.64
25	**39G4**	5.29	10.89	12.25	13.54	15.31	14.92	15.62	35.09	11.9
25	**39G5**	6.33	10.66	12.01	13.15	14.88	14.61	15.4	35.09	12.66
25	**39G6**	7.3	10.38	11.65	12.66	14.04	14.18	14.59	35.09	12.08
25	**39G7**	5.88	9.77	11.2	11.77	12.65	13.75	14.18	35.09	10.55
25	**40G4**	5.29	10.89	12.25	13.54	15.31	14.92	15.62	35.09	11.9
25	**40G5**	6.52	10.74	12.24	13.33	14.92	14.78	15.43	35.09	12.88
25	**40G6**	6.67	10.4	11.67	12.6	14.03	14.14	14.98	35.09	11.95
25	**40G7**	5.97	9.89	11.49	12.19	13.24	13.93	14.4	35.09	10.93
25	**41G6**	5.64	9.78	11.4	12.09	13.22	13.81	14.42	35.09	10.51
25	**41G7**	5.92	10.08	11.49	12.13	12.94	13.7	14.4	35.09	11.08
26	**39G8**	3.55	8.63	10.33	10.86	11.85	12.98	15.89	23.5	9.08
26	**40G8**	4.26	8.39	9.95	10.19	11.04	12.53	15.89	23.23	9.63
26	**41G8**	3.91	7.81	9.95	10.01	10.93	12.57	15.89	23.18	8.43
28	**42G8**	4.05	8.1	9.43	10.15	10.48	10.07	12.57	21.12	9.34
28	**42G9**	4.05	8.1	9.43	10.15	10.48	10.07	12.57	21.12	9.34
28	**43G8**	3.87	8.03	9.37	10.11	10.46	10.09	12.5	21.13	8.34
28	**43G9**	3.88	8	9.33	10.11	10.59	10.11	12.57	21.09	8.62
28	**44G9**	4.03	7.84	9.06	9.96	10.28	10.13	12.55	21.06	8.86
28	**45G9**	3.85	7.43	8.78	9.72	9.92	9.61	12.25	20.98	6.23

Table 5: Sprat total biomass (t) per age group on Cruise No. 343 of RV “W. Herwig III” in May 2011

Sub-division	**Rect-angle**	**Age group**								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8+**	**Total**
24	**38G2**	125.4	563.7	1985.7	3194.4	969.1	0	1.8	3.6	6844.8
24	**38G3**	2260.5	1981.1	6619.8	11105.4	3696	0	18.5	36.8	25711.5
24	**38G4**	257.9	593.7	1565.3	2495.2	654.8	0	0	0	5566.8
24	**39G2**	962.2	363.3	1173.5	1802.9	566.9	0	1.5	3	4873.5
24	**39G3**	2245.6	848	2738.8	4208	1322.9	0	3.6	7.4	11374.2
24	**39G4**	43.6	130.7	335.2	639.8	265.5	0	13.2	26.1	1454.4
25	**37G5**	24.2	72.5	61.2	296.7	54.6	58.7	13.9	7.3	588.9
25	**38G5**	1909.1	7511.8	5612.2	25398.1	4255.5	4717.1	1124	489.9	51034.9
25	**38G6**	519.6	5322.6	2843.4	10093.7	1248.2	1424.4	316.9	88.8	21856.3
25	**39G4**	519.4	692.8	602.7	3028.1	635.7	637.7	175.9	74.5	6364
25	**39G5**	1523.9	16881	12596.1	54497.5	9217.3	9941.4	2457.5	1059.1	108151.2
25	**39G6**	440.2	7698.1	4740.9	17702.2	2482.3	2679.6	567.8	241	36565.6
25	**39G7**	1266.5	9659.3	3942.8	10777.1	1015.8	926.3	155.7	58.3	27788.9
25	**40G4**	1147.6	1530.8	1331.7	6690.4	1404.5	1409	388.5	164.4	14060.7
25	**40G5**	551.9	5182.1	4156.1	18628.3	3203.6	3614	876.6	443.8	36671.7
25	**40G6**	626.8	6331.2	4120.1	15060.7	1897.4	2197.1	512.5	135.8	30884.4
25	**40G7**	1292.6	7437.8	3521.8	11046.2	1126.2	1272.4	228.7	95.4	26006.3
25	**41G6**	1089.4	4732.3	1980.6	6160.2	597.8	685	126.3	40.5	15412.1
25	**41G7**	327	2133.1	1189.9	3642.5	337.7	386.3	68.7	18	8098.7
26	**39G8**	2029.8	3028.4	2785.2	10681.4	3135.4	749.1	30.2	1096.3	23538.6
26	**40G8**	661.1	5897.2	4249.8	14308.4	3284.1	597.9	16.5	1248.5	30277.9
26	**41G8**	3272.7	12599.1	5064.6	16772.8	3704.4	527.8	6.2	1367.3	43307.3
28	**42G8**	804.4	4718.6	4640.8	12281.3	3428.8	2107.8	721.5	885.4	29583.1
28	**42G9**	568.2	3333	3278.1	8675	2422	1488.8	509.7	625.3	20896.4
28	**43G8**	647.5	986.6	908.2	2353.2	666.6	421	140.1	171	6291.6
28	**43G9**	2923.6	6247.8	5526.6	14131.6	4097.7	2649	871.5	1159.8	37591.3
28	**44G9**	581.8	3247.7	2262.1	5239.7	1539	1181.8	327.2	514.4	14890.3
28	**45G9**	7767.8	5589.9	2635.4	5418.1	1516.7	1086.7	206.9	444.2	24680.5

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[i] E:\ODV\ODV DATA\H354\Stationen\Stationen.Data\views\Gesamtgebiet

[ii] E:\ODV\ODV DATA\03_BASS_CTDO_SA_1999_2010\cfg

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Institute of Food Safety, Animal Health and Environment – BIOR, Riga (Latvia)
Fishery Research Laboratory – FLR, Klaipeda (Lithuania)

THE CRUISE REPORT

FROM THE JOINT LATVIAN-LITHUANIAN BALTIC ACOUSTIC SPRING SURVEY – BASS 2012 ON THE R/V "DARIUS" IN THE ICES SUBDIVISIONS 26N AND 28 OF THE BALTIC SEA

(31 May – 8 June 2012)

•FAUSTS SVECOVS•GUNTARS STRODS•VIESTURS BERZINS•ANDREJS MAKARCUKS•
•IVARS PUTNIS•ERIKS KRUZE•

Riga – Klaipeda, February 2013

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INTRODUCTION

More less regular acoustic estimations of pelagic fish stocks in the Baltic Sea initiated by BaltNIIRH (now BIOR) and Institute für Hochseefischerei in Rostock (DDR) was performed since 1983, but the first scattered surveys was made since 1977 (Shvetsov 1983, Hoziosky et al. 1987, Shvetsov et al. 1988). Several years in May (2005-2008) BIOR as assignee of BaltNIIRH, LatFRI and LatFRA cooperated with Polish SFI in Gdynia and in 2003-2004 with AtlantNIRO in Kaliningrad, Russia.

The first joint Latvian-Lithuanian Baltic Acoustic Spring Survey (BASS) in the ICES Sub-divisions 26N and 28 was conducted by the r/v "Darius" in May 2010. This was the third joint Latvian-Lithuanian Baltic Acoustic Spring Survey (BASS) on the Lithuanian r/v "Darius". The reported cruise was organized on the basis of the agreement between the Institute of Food Safety, Animal Health and Environment (BIOR) from Riga and the Fisheries Research Laboratory (FLR) from Klaipeda. The vessel was operated within the Latvian and Swedish EEZs (ICES Sub-divisions 26N and 28). The "Latvian National Fisheries Data Collection Programme, 2012" in accordance with the EU Commission Regulations No.1639/2001 and No.1581/2004 was partly subsidized this cruise. It was coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS).

Pelagic research catches carried out during an acoustic survey are the information source, independent from topical preferences in fishery, about quantitative changes in a process of clupeids geographical and bathymetrical distribution in the Baltic. Hydrological parameters measurements are the information source about abiotic factors (seawater temperature, salinity, oxygen content) influencing sprat and herring spatial distribution. Echo-integration results along the pre-selected tracks are the basic materials for fish stock biomass calculation.

The ICES Baltic Fisheries Assessment Working Group (WGBFAS) can apply the present BASS data for clupeids (especially for sprat) stock biomass assessment and spatial distribution updating. The basic acoustic and biological data collected during recently carried out survey are stored in the BAD1 and FishFrame Acoustic (former BAD2) international databases, managed by the ICES Secretariat.

The main aims of cruise were:

- to collect the echo-integration data for the estimation of the clupeids stocks biomass and abundance in the central-eastern Baltic;
- to collect materials from the fish control catches for investigations of the Baltic sprat, and in lesser degree herring, spawning stocks spatial distribution in the offshore waters of Latvia and Sweden, moreover for analyses of the age-length structure and recruiting year-class strength of these fishes populations;
- to collect sprat and herring stomachs samples for feeding condition and food components analyses;
- to analyse the vertical and horizontal changes of the basic hydrological parameters (temperature, salinity and oxygen content) at the trawling positions and at the standard HELCOM hydrological stations;
- to collect the zooplankton and ichthyoplankton samples at the referring area.

MATERIALS AND METHODS

Personnel

The scientific staff was composed of four persons:

Dr. F. Svecovs, BIOR, Latvia – scientific staff and cruise leader, acoustic team

G. Strods, BIOR, Latvia – fish sampling team and hydrology

I. Putnis, BIOR, Latvia – fish sampling team and plankton

E. Kruze, BIOR, Latvia – fish sampling team and plankton.

Survey description

The reported BASS survey of the r/v "Darius" took place during the period of 31 May – 8 June 2012. The vessel left the port of Klaipeda on 31.05.2012 at 00:05 o'clock GMT+02:00. The sea researches were conducted in the period of 31.05-08.06.2012 within Latvian and Estonian EEZs (ICES Sub-divisions 26N and 28). The research activity had been stopped at 12:00 o'clock GMT+02:00 on 8th of June and the vessel returned back to the port of Klaipeda for the scientific team disembarkation there. Due to unfavorable weather conditions from 2nd until 4th of June the survey was suspended. The almost full eight working days were utilized for fulfilling the survey purposes.

Survey performance

The survey echo-integration tracks were planned in a similar pattern as in the previous years, due to historical comparability of the data, but due to vessel had not received permission for work in Swedish EEZ tracks was shorter. The final pattern of transects was covered with a relatively good density. The area covered in May-June 2012 was 8854.5 nm^2, in the northern part of the ICES Sub-division 26 – 1953.3 nm^2 and in Sub-division 28 – 6901.2 nm^2 (Fig. 1).

Calibration of the r/v "Darius" acoustic system composed of SIMRAD EY500 echo-sounder with 38 kHz and EK60 with 70kHz was performed in coastal waters near Klaipeda before cruise according to BIAS manual (Anon. 2003).

The pre-selection of the pelagic fish catches based on the ICES statistical rectangle area (with range of 0.5 degree in latitude and 1 degree in longitude) and the clupeids present density vertical distribution pattern along a transect. The intention was to carry out at least two control hauls per the ICES statistical rectangle. The water depth range-layer with sufficient for fish oxygen content (minimum 1.5-2.0 ml/l) were taken into account in the process of the hauls distribution.

Totally 11 control haul in the pelagic offshore zone were conducted with the pelagic trawl with max. 49 m horizontal opening, max. 13 m vertical opening and 10 mm mesh bar length in the codend. The trawl No 9 was invalid due to broken lines of trawl. The trawling depth and the net opening were controlled by the sonar type SCANMAR. The trawl headrope positions in particular hauls were localized on the depth range from 9 to 76 m from the sea surface (Tab. 1). Mean headrope depth location in all investigated areas was 48 m. The trawl mouth vertical opening ranged from 12 to 13 m (mean – 12 m) and horizontal opening ranged from 31 to 49 m (mean – 41 m). The mean bottom depth at trawling positions varied from 28 to 234 m (mean for all investigated area – 92 m). Totally, 4 hauls were localized in the ICES Sub-division 26 and 9 hauls in the ICES Sub-division 28. On the whole, 9 catch samples were taken in the Latvian EEZ, 2 samples in the Estonian EEZ. All hauls were conducted outside the territorial waters of these countries. The catches were made at the daylight between 07:35 a.m. and 21:41 p.m. GMT+02:00. The mean speed of the vessel during trawling was 2.6 knots. The trawling time of the single valid haul lasted for 30 minutes, with an exception of 1 haul with 60 minutes duration. 10 hauls can be accepted as representative (valid from technical point of view).

The samples of sprat, herring and cod were taken from each catch station to determine the species proportion, length-mass relationship, sex, maturity and age-length relationship. Totally, the length and mass were measured for 1924 sprat, 282 herring, 100 cod, 82 three-spined sticklebacks, 4 flounders and 1 great sandeel. 797 and 97 individuals of sprat and herring were aged respectively and 38 cod individuals, too. Detailed ichthyological analyses were made according to standard procedures, directly on board of surveying vessel.

Species composition and fish length distributions were based on trawl catch results. Mean target strength of clupeid fishes was calculated according to the following formula (Anon. 1983):

TS = 20logL-71.2.

The total number of fish in each ICES rectangle was estimated as a product of the mean area scattering cross-section – NASC (S_A) and the rectangle area, divided by corresponding mean acoustic cross-section. Fish abundance was separated into different species according to the mean catch composition in the given rectangle.

The basic hydrological parameters (seawater temperature, salinity and oxygen contents) were measured from the surface to the bottom after every haul if weather conditions was favorable. Totally, 10 hydrological stations were inspected in May 2012 by r/v "Darius". The hydrological and hydrobiological research profiles location is presented in Fig. 2. The Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette) was used for above-mentioned measurements. Oxygen content was analysed with Winkler method. The row data were aggregated to the 5 m depth stratums.

Ichthyoplankton and zooplankton samples were collected at the positions of the hydrological stations or after trawling. Totally 10 zooplankton, 10 ichthyoplankton and 10 ichthyoplankton with circulation stations were realized. The ichthyoplankton samples were taken with ichthyoplankton net IKS-80, which had the mouth opening 0.5 m^2 and mesh size 500 µm. This net was operated vertically from bottom or 140 m depth to the water surface with speed of 0.4 m/s. Low speed of lifting allowed preventing eggs from destroying by mechanic forces. The same net was towed on the water surface at the speed of ca. 2 knots, when the vessel performed the circulation, which made the net going alongside the vessel avoiding its wake. Zooplankton has been collected with Judday net (mouth opening 0.1 m^2, mesh size 160 µm). This net was towed vertically from the depths 50 and 100, or from the bottom in case of lesser depth, to the water surface. Samples were conserved in 2.5% unbuffered formaldehyde solution with sea water and processed during the year. All fish eggs were placed into the Bogorov tray, defined to species, counted, and at least 100 eggs were staged and their size measured under the 40X magnification using micrometer scale. One unit of this scale was equal ca. 0.025 mm. If the eggs had an irregular shape, lesser diameter was measured. Stages of development of eggs were determined according to the 4-stage system by Rass and Kazanova (1965). Eggs on each stage were divided into alive and dead ones arbitrary following morphological criteria (shape of egg and yolk), and the condition of chorion and embryo in the main (Rass and Kazanova, 1965).

RESULTS

Biological data

Catch statistics

The essential data of each control haul and sprat catch – target fish species of the survey are given in Tab. 2-5.

Totally, six fish species were recorded in the 11 pelagic control hauls taking place in the central-eastern Baltic (ICES Sub-divisions: 26N and 28). Sprat dominated very distinctly – over 90 % in 5 catches of fishes (Tab. 6) and 88.01 % on average in mass of all catches, but herring, cod, flounder, three-spined stickleback and greater sandeel were the following frequently occurred species: 6.85 %, 5.01 %, 0.07 %, 0.05 %, and >0.01% in the total mass respectively. Herring dominated in one haul – 84.06 % and as considerable proportion was found in two hauls conducted in the ICES rectangles 44H0 and 44H1 – 13.07 % and 16.11 % in mass respectively. The average share in the catches of herring, stickleback and particularly flounder in May 2012 was lower, but cod had increasing tendency of average share comparing to average share in May of period 2005-2008 and 2010-2011 (Grygiel et al. 2006a, 2006b, 2007, 2009, Svecovs et al. 2010, 2011, Wyszynski et al. 2007). Overall the by-catch of other fish specimens was rather symbolic with the exception in ICES SD 28 rectangle 43H0, haul No 1 where herring share in numbers was 49.85 %, in rectangle 44H1 haul No 2 where herring and stickleback share was 8.93 % and 13.37 % respectively, but in ICES SD 26 rectangle 41G9, haul No 7 where cod specimen share was 4.99 % (Tab. 7).

The decreasing tendency in average catch per unit efforts (CPUEs) for sprat was observed in the period of years 2005-2008 in the investigated areas: from 1249.7 kg/h in 2005 to 756.8 kg/h in 2008. In 2010 the average CPUE of sprat was 1084.7 kg/h, in 2011 it was decreased to 504.9 kg/h, but in 2012 it was dramatically decreased to 141.2 kg/h. The herring average CPUEs in the period of years 2005-2008 had the inverse tendency than sprat CPUEs: from 51.7 kg/h in 2005 to 119.0 kg/h in 2008. In 2010 it decreased to 41.8 kg/h, in 2011 CPUE was moving down to 29.4 kg/h and in 2012 had fallen to 16.5 kg/h. Significantly higher average CPUEs for sprat and herring were noted in Sub-division 28 in comparison to Sub-division 26N, but cod had the inverse pattern. The distribution of CPUE scopes for sprat and herring per single haul is shown in Fig. 3.

The mean length and mean weight distributions of dominant fish species (sprat and herring) by the ICES Sub-divisions 26 and 28 are shown in Tab. 8. The total length of these fish species ranged as follows:

- sprat – 7.5÷14.5 cm (average TL = 10.9 cm), 2.3÷19.5 g (average W = 8.4 g);
- herring – 9.5÷25.5 cm (average TL = 17.4 cm), 5.1÷104.0 (average W = 34.1 g).

  Sprat mean length had decreased and mean weight had increased, but mean length and mean weight of herring had slightly increased.

Acoustical and biological estimates

The basic acoustic and biological data (surveyed area statistics, mean NASC, the mean scattering cross-section, the total number of fish, percentages of herring and sprat) per ICES rectangles, collected in May 2012, are given in Tab. 9. The estimated abundance and biomass of sprat and herring per above mentioned rectangles are listed in Tab. 10. The age structured data of sprat and herring are aggregated in Tab. 11-20. The geographical distribution of NASC, sprat and herring stock densities in the central-eastern Baltic in May 2012 is shown in Fig. 4-6.

The pelagic fish stock was represented practically by sprat. Herring was represented only in small numbers (1.9 % in average). The highest sprat stock density (10.46 n×10^6/nm^2) were recorded in ICES rectangle 43H1 in the eastern part of the ICES Sub-division 28. The highest average parameters of the sprat stock densities were recorded in ICES rectangles 43H1 and 45H1. The distribution of the high density sprat concentrations in May-June 2012 was more-less equal to May 2011 but differed comparing with that from May of previous year, when sprat density increased from northeast to southwest. Sprat concentrations in May had more-less the same pattern as years before 2010 when them found mostly in the central and northern parts of the investigated area.

The herring stock density was significantly lower in comparison to sprat stock density. The highest density values (over 1.0 n×10^6/nm^2) was noted in eastern part of the investigated area (in Sub-division 28, rectangle 43H1).

Comparison of the acoustic results from May of 2003-2008 and 2010-2012 indicated that investigated sprat stock abundance has decreasing tendency as well as herring stock. The geographical distribution of main sprat stock shows similar pattern as in years before 2010 and differs from 2010 when stock had pattern the same as in years with low population abundance since 1983 (Shvetsov et al. 1988, 1989, 1992, 2002).

Ichthyoplankton estimates

Sprat eggs and larvae prevailed in the ichthyoplankton in May 2012. The average number of sprat eggs in the investigated region was 127 n/m2, i. e. slightly less than the average value for the previous years (159 n/m2). Average amount of sprat larvae here constituted 8.6 n/m2, which was more than two times less than the mean value for previous years (20 n/m2). These comparisons are not entirely correct though, as the areas covered with plankton surveys differed among the years. The number of eggs increased with the depth, but their numbers were approximately the same in the central and southern parts of the Gotland Basin. The amount of sprat larvae increased in the southward direction very sharply. Much more larvae have been registered over the big depths (Fig. 7). Number of sprat and larvae in the near-surface water layer was much lower compared with previous years, and that must be a proof for the late spawning this year.

Biodiversity in the ichthyoplankton was on low level. From other common species (cod, four-bearded rockling and flounder) only several eggs of cod were found in the southwestern corner of the Latvian zone this May. No larvae other than those of sprat were caught during this survey.

Meteorological and hydrological data

The mean hydrological parameters in the central-eastern Baltic in May 2012 are presented in Tab. 21 and 22.

Temperatures in the surface layer at 0-5 m of the sea water changed during the survey from 5.14°C on average of whole layer at the central part of Gotland Deep to about 7.33°C at southern part of investigated area, and despite the relatively temperate winter the water temperature in this layer was less than the multi-annual average value. The highest surface water salinity was in the southern part of Gotland Basin – up to 7.14 PSU, but the lowest in northern area of basin – 6.83 PSU. In comparison to long-term values salinity was less for about 0.6 PSU. The oxygen content at the sea surface ranged from 6.54 at the central part of Gotland basin to 11.57 ml/l at the southern part of investigated area. The mean oxygen content was higher than in2011 but still less than long-term values.

Due to bad weather conditions hydrological parameters in several stations was doubtful not allowing to estimate the real state of environment during survey.

DISCUSSION

The data collected in May 2012, during the r/v “Darius” BASS or SPRAS survey, can be considered as representative for the central-eastern Baltic. The collected data shows that sprat population in ICES SD 26N and 28 had decreasing tendency of abundance. The geographical distribution of sprat densities in the May 2012 had more-less similar pattern as in recent years. The main sprat stock was settled among the cold winter and hypoxic waters in quite narrow layer where oxygen content was 3.28 ml/l on average or over the cold winter waters where oxygen content was 14.36 ml/l on average. In 2012 the pattern of pelagic stock concentrations was determined not only by hydrological conditions but by cod too due to evident increasing of cod stock in southern part of investigated area as the same as in 2011.

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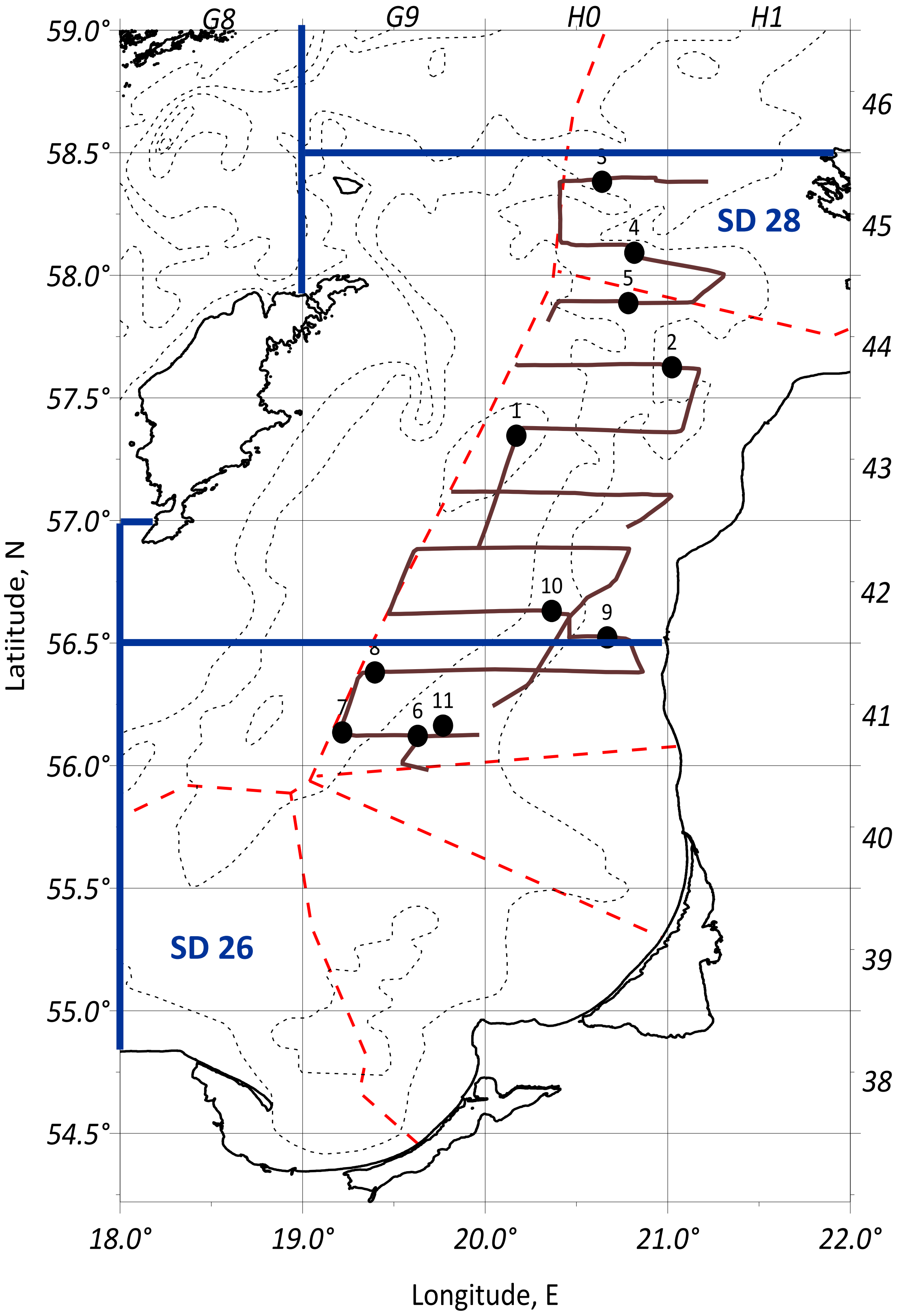

Figure 1. Cruise track design and hauls of the Latvian-Lithuanian hydroacoustic survey on the r/v "Darius", 31.05-08.06.2012.

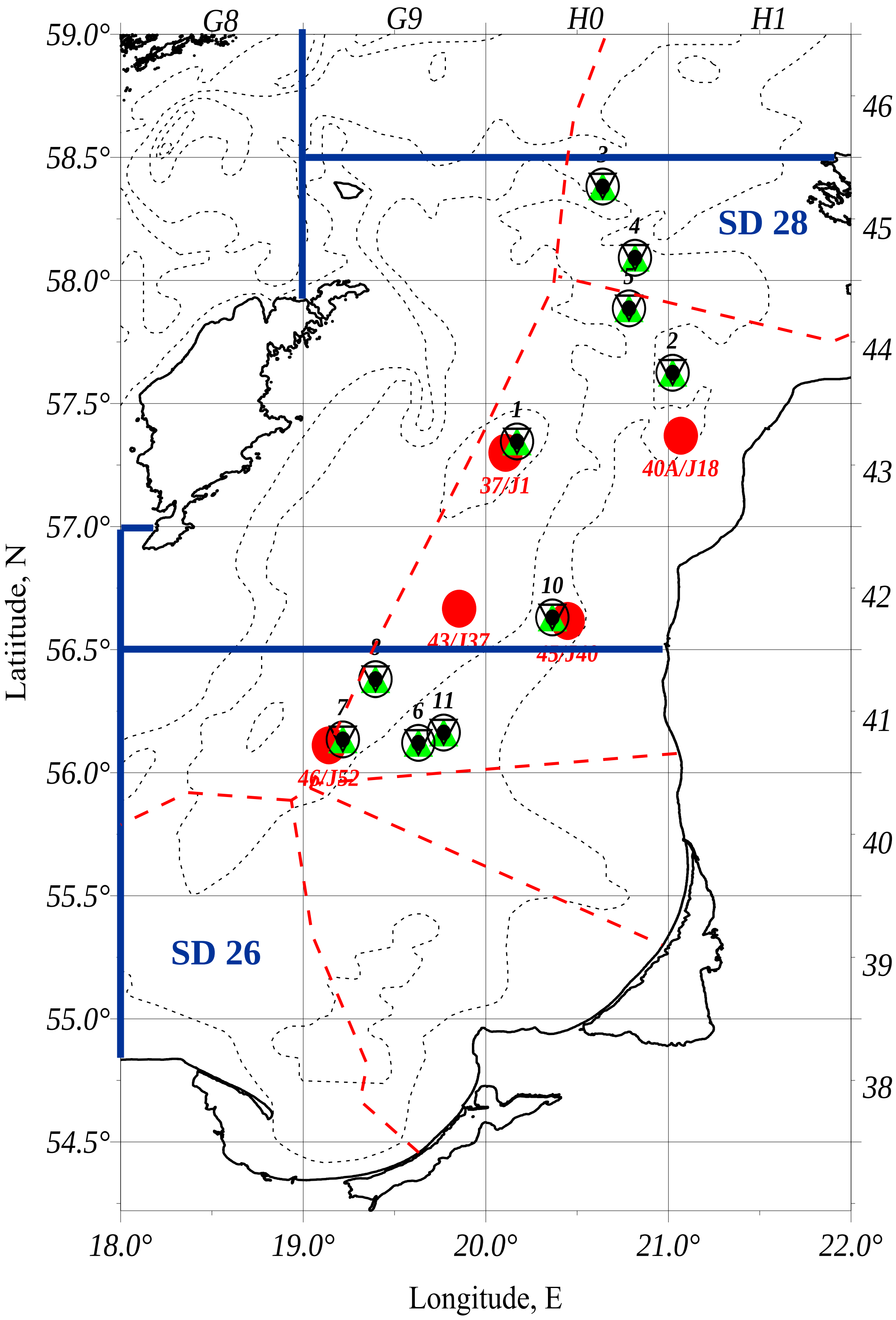

Figure 2. Locations of the hydrological and hydrobiological stations performed during the Latvian-Lithuanian hydroacoustic survey on the r/v "Darius", 31.05-08.06.2012 (● - HELCOM stations; ○ - hydrological stations; ▽ - ichthyoplankton stations; ● - ichthyoplankton stations with circulation; ▲ - zooplankton stations).

Table 1. Fish control-catch results in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	*Date*	*ICES rectangle*	*ICES SD*	*Mean bottom depth [m]*	*Headrope depth [m]*	*Horizontal opening [m]*	*Vertical opening [m]*	*Trawling speed [knt]*	*Trawling direction [°]*	*Geographical position*				*Time Start*	*Haul duration [min]*	*Total catch [kg]*
										Start		*End*				
										Latitude 00°00.0'N	*Longitude 00°00.0'E*	*Latitude 00°00.0'N*	*Longitude 00°00.0'E*			
1	2012.05.31	43H0	28	234	74	34	12	2.5	360	57°20.8'	20°10.3'	57°22.1'	20°10.5'	12:31	30	23.842
2	2012.05.31	44H1	28	56	14	34	12	2.8	270	57°37.5'	21°01.4'	57°38.0'	20°58.4'	19:46	30	5.085
3	2012.06.01	45H0	28	89	65	48	12	2.6	270	58°22.9'	20°58.4'	58°23.2'	20°56.1'	08:25	30	294.265
4	2012.06.01	45H0	28	78	59	47	12	2.4	163	58°05.5'	20°49.0'	58°04.4'	20°49.8'	15:40	30	81.120
5	2012.06.01	44H0	28	101	63	45	13	2.5	270	57°53.2'	20°47.0'	57°53.5'	20°44.5'	21:41	30	35.295
6	2012.06.05	41G9	26	52	18	31	12	2.7	90	56°07.3'	19°37.8'	56°07.3'	19°40.4'	16:08	30	90.000
7	2012.06.05	41G9	26	127	76	49	12	2.5	270	56°08.1'	19°13.0'	56°08.6'	19°11.0'	20:03	30	40.674
8	2012.06.06	41G9	26	135	76	47	13	2.5	90	56°22.8'	19°23.8'	56°22.9'	19°26.5'	20:10	30	51.610
9	2012.06.06	42H0	28	28	9	47	12	2.7	90	56°31.4'	20°40.1'	56°31.5'	20°41.1'	16:15	10	Invalid
10	2012.06.07	42H0	28	78	15	31	12	2.6	270	56°37.9'	20°21.9'	56°37.9'	20°19.5'	07:35	30	150.000
11	2012.06.08	41G9	26	95	19	34	13	3.0	220	56°09.8'	19°46.2'	56°07.6'	19°40.8'	07:45	60	70.038

Table 2. Fish control-catch results by species in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	*Total catch [kg]*	*Catch per species [kg]*					
		Sprat	*Herring*	*Cod*	*Flounder*	*Three-spined stickleback*	*Great sandeel*
1	23.842	3.458	20.042	0.124	0.218		
2	5.085	4.01	0.819		0.132	0.124	
3	294.265	274.607	19.083	0.508		0.067	
4	81.120	73.2	7.86			0.060	
5	35.295	30.227	4.612	0.028	0.267	0.161	
6	90.000	90					
7	40.674	12.15	1.838	26.686			
8	51.610	33.3	3.456	14.854			
9	Invalid						
10	150.000	150					
11	70.038	70					0.038
Total	841.929	740.952	57.71	42.2	0.617	0.412	0.038

Table 3. Catch per unit effort results by species in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	***Total CPUE [kg/h]***	***CPUE per species [kg/h]***					
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Great sandeel***
1	47.684	6.916	40.084	0.248	0.436		
2	10.170	8.020	1.638		0.264	0.248	
3	588.530	549.214	38.166	1.016		0.134	
4	162.240	146.400	15.720			0.120	
5	70.590	60.454	9.224	0.056	0.534	0.322	
6	180.000	180.000					
7	81.348	24.300	3.676	53.372			
8	103.220	66.600	6.912	29.708			
9	Invalid						
10	300.000	300.000					
11	70.038	70.000					0.038
Average	161.382	141.190	16.489	16.880	0.411	0.206	0.038

Table 4. Number of sprat individuals in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul	***Length class, cm***															***Total***
number	***7.5***	***8.0***	***8.5***	***9.0***	***9.5***	***10.0***	***10.5***	***11.0***	***11.5***	***12.0***	***12.5***	***13.0***	***13.5***	***14.0***	***14.5***	
1	5	5	74	94	27	17	54	99	74	39	17	5	2			512
2		4	4	16	16	8	8	63	83	91	47	43	8			390
3		2596	15314	13497	5191	0	2855	4412	3374	2596	519	519				50872
4	68	683	3414	4575	1570	341	614	614	683	751	273	137	68			13792
5	24	212	1058	1011	165	94	494	658	494	353	165	24				4748
6			41	123	82	123	164	698	1355	3120	1971	534	82	41		8334
7					5	22	43	124	238	319	151	157	22	11		1092
8			17	133	183	233	167	433	699	733	383	266	83	17	17	3364
9																
10				298	1265	521	670	1861	3201	4317	2456	670	74			15333
11			36		254	1088	617	907	1379	1778	834	399	109			7402
Total	97	3499	19957	19745	8759	2448	5686	9870	11579	14096	6817	2753	449	69	17	105839

Table 5. Mean weight [g] of sprat in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul	***Length class, cm***															***Average***
	7.5	***8.0***	***8.5***	***9.0***	***9.5***	***10.0***	***10.5***	***11.0***	***11.5***	***12.0***	***12.5***	***13.0***	***13.5***	***14.0***	***14.5***	
1	2.4	2.9	3.7	4.2	5.1	6.0	6.8	8.0	8.9	10.0	12.0	15.2	15.0			6.7
2		2.5	3.6	5.5	5.8	6.5	8.5	8.6	10.0	11.6	11.8	13.5	16.5			10.3
3		3.0	3.7	4.2	4.8		7.3	7.6	9.7	10.8	12.0	14.0				5.4
4	2.3	3.2	3.8	4.2	4.9	6.0	6.9	8.2	8.8	10.5	11.0	12.0	13.8			5.3
5	2.8	3.6	3.8	4.4	4.6	6.0	6.9	8.2	9.7	10.9	11.4	15.3				6.4
6			3.8	4.4	5.4	6.4	6.8	8.6	9.4	10.8	12.5	14.5	15.1	18.2		10.8
7					4.5	6.5	7.0	8.3	9.7	11.2	13.0	14.7	15.5	18.0		11.1
8			4.0	4.8	5.5	6.3	7.2	8.3	9.7	11.0	12.9	13.9	15.6	16.2	19.5	9.9
9																
10				4.8	5.3	6.3	7.1	8.3	9.7	11.0	12.2	13.3	14.0			9.8
11			3.3		5.7	6.5	7.4	8.4	9.3	10.5	12.3	14.7	15.3			9.5
Average	2.4	3.1	3.7	4.3	4.9	6.3	7.2	8.0	9.5	10.8	12.3	14.0	14.9	17.7	19.5	8.4

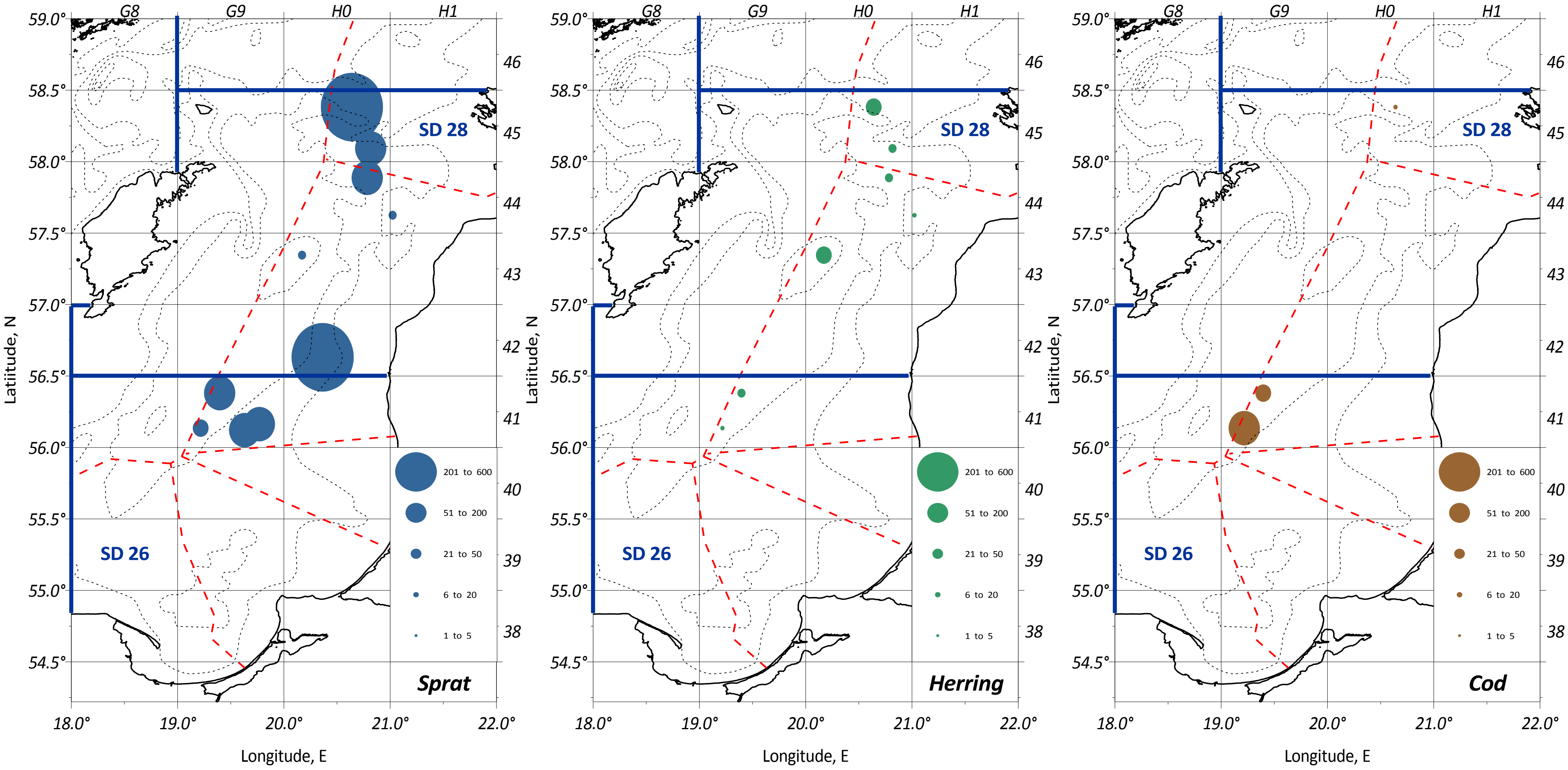

Figure 3. CPUE [kg/h] ranges distribution of sprat, herring and cod in the catch hauls in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Table 6. Share of fish species in mass of the control catches in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	***ICES rectangle***	***ICES SD***	***Catch share [%]***						
			Total	***Sprat***	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Great sandeel***
1	43H0	28	100.00	14.50	84.06	0.52	0.91		
2	44H1	28	100.00	78.86	16.11		2.60	2.44	
3	45H0	28	100.00	93.32	6.48	0.17		0.02	
4	45H0	28	100.00	90.24	9.69			0.07	
5	44H0	28	100.00	85.64	13.07	0.08	0.76	0.46	
6	41G9	26	100.00	100.00					
7	41G9	26	100.00	29.87	4.52	65.61			
8	41G9	26	100.00	64.52	6.70	28.78			
9	42H0	28							
10	42H0	28	100.00	100.00					
11	41G9	26	100.00	99.95					0.05
Total			100.00	88.01	6.85	5.01	0.07	0.05	<0.01

Table 7. Share of fish species in numbers of the control catches in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	***ICES rectangle***	***ICES SD***	***Catch share [%]***						
			Total	***Sprat***	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Great sandeel***
1	43H0	28	100.00	49.86	49.85	0.10	0.19		
2	44H1	28	100.00	77.50	8.93		0.20	13.37	
3	45H0	28	100.00	98.32	1.61	0.01		0.06	
4	45H0	28	100.00	97.46	2.37			0.17	
5	44H0	28	100.00	93.45	3.19	0.02	0.04	3.30	
6	41G9	26	100.00	100.00					
7	41G9	26	100.00	92.23	2.79	4.99			
8	41G9	26	100.00	96.69	2.33	0.98			
9	42H0	28							
10	42H0	28	100.00	100.00					
11	41G9	26	100.00	99.99					0.01
Total			100.00	97.78	1.85	0.09	<0.01	0.27	<0.01

Table 8. The biological data collected during the Latvian-Lithuanian BASS survey
in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Haul No	Herring		Sprat	
			L [cm]	W [g]	L [cm]	W [g]
28	45H1	3,4	15.9	23.0	9.7	5.4
	45H0	3,4	15.9	23.0	9.7	5.4
	44H1	2,5	16.0	26.2	10.3	6.7
	44H0	2,5	16.0	26.2	10.3	6.7
	43H1	2	14.3	18.2	11.8	10.3
	43H0	1,2	18.4	37.4	11.1	8.3
	42H0	9,10			11.8	9.8
	42G9	1,8,10	18.9	39.6	11.7	9.7
26	41H0	9,11			11.6	9.5
	41G9	6,7,8,11	20.0	46.4	11.9	10.2

Table 9. Hydroacoustic survey statistics from the Latvian-Lithuanian BASS survey
in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Area [nm^2]	NASC [m^2/nm^2]	$\sigma \times 10^4$ m^2	Total abundance [n×10^6]	Species composition [%]	
						Herring	Sprat
28	45H1	827.1	536.4	0.94747	4682.5	1.78	98.22
	45H0	947.2	423.4	0.94747	4232.4	1.78	98.22
	44H1	824.6	228.8	1.09069	1729.7	3.88	96.13
	44H0	960.5	276.2	1.09069	2432.1	3.88	96.12
	43H1	412.7	1475.8	1.41068	4317.5	10.33	89.66
	43H0	973.7	267.8	1.98212	1315.7	38.17	61.83
	42H0	968.5	439.9	1.32678	3210.8		100.00
	42G9	986.9	207.0	1.38242	1478.0	3.00	97.00
26	41H0	953.3	408.5	1.30181	2991.4		100.00
	41G9	1000.0	346.6	1.37148	2527.0	0.56	99.44

Table 10. Estimated abundance and biomass of prevalent fish species in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Area [nm^2]	ρ [n10^6/nm^2]	Quantity [n×10^6]			Biomass [kg×10^3]		
				Total	Herring	Sprat	Total	Herring	Sprat
28	45H1	827.1	5.66	4682.5	83.3	4599.2	26653.7	1916.3	24737.4
	45H0	947.2	4.47	4232.4	75.3	4157.1	24091.9	1732.1	22359.8
	44H1	824.6	2.10	1729.7	67.1	1662.7	12836.8	1757.5	11079.3
	44H0	960.5	2.53	2432.1	94.3	2337.8	18049.2	2471.1	15578.1
	43H1	412.7	10.46	4317.5	446.2	3871.2	47885.6	8121.4	39764.2
	43H0	973.7	1.35	1315.7	502.2	813.5	25526.9	18797.6	6729.3
	42H0	968.5	3.32	3210.8		3210.8	31409.9		31409.9
	42G9	986.9	1.50	1478.0	44.3	1433.7	15692.8	1753.8	13939.0
26	41H0	953.3	3.14	2991.4		2991.4	28290.3		28290.3
	41G9	1000.0	2.53	2527.0	14.2	2512.8	26227.7	658.9	25568.8

Sprat in ICES SD 26N and 28

Table 11. Sprat age composition [%] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
28	45H1	72.8	11.5	2.4	9.7	1.0	0.8	0.1	1.7	100.0
	45H0	72.8	11.5	2.4	9.7	1.0	0.8	0.1	1.7	100.0
	44H1	49.8	16.9	7.0	16.0	3.3	4.0	0.3	2.7	100.0
	44H0	49.8	16.9	7.0	16.0	3.3	4.0	0.3	2.7	100.0
	43H1	11.1	15.2	7.1	34.3	17.2	8.1	4.0	3.0	100.0
	43H0	28.2	20.4	4.9	26.0	10.1	5.5	2.3	2.6	100.0
	42H0	13.4	30.3	5.1	33.2	6.4	3.5	0.5	7.6	100.0
	42G9	15.0	29.0	6.2	32.2	6.9	3.4	0.7	6.5	100.0
26	41H0	26.1	31.5	2.0	21.1	3.1	8.4	3.6	4.2	100.0
	41G9	15.3	25.3	11.0	34.5	3.9	5.9	1.7	2.3	100.0

Table 12. Sprat age composition [n×10^6] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
28	45H1	3345.9	531.0	108.3	447.8	44.2	38.9	5.3	77.8	4599.2
	45H0	3024.3	480.0	97.9	404.8	40.0	35.1	4.8	70.3	4157.1
	44H1	827.8	281.0	116.9	265.2	55.2	66.5	5.1	44.9	1662.7
	44H0	1164.0	395.1	164.4	372.9	77.6	93.5	7.2	63.1	2337.8
	43H1	430.1	586.5	273.7	1329.5	664.8	312.8	156.4	117.3	3871.2
	43H0	229.5	166.2	39.8	211.4	82.0	44.4	18.8	21.3	813.5
	42H0	430.2	971.6	165.2	1067.2	204.7	113.3	15.6	243.1	3210.8
	42G9	215.1	415.1	89.0	462.2	99.6	49.4	9.6	93.8	1433.7
26	41H0	780.6	942.4	61.1	630.0	92.9	250.3	108.0	126.1	2991.4
	41G9	385.1	634.8	277.1	866.4	98.8	148.8	43.2	58.5	2512.8

Table 13. Sprat mean weight [g] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	ICES rectangle	Age								Average
		1	2	3	4	5	6	7	8+	
28	45H1	4.0	8.2	9.4	9.4	9.6	11.1	10.5	10.2	5.4
	45H0	4.0	8.2	9.4	9.4	9.6	11.1	10.5	10.2	5.4
	44H1	4.1	7.7	8.7	9.7	12.1	10.8	11.7	10.8	6.7
	44H0	4.1	7.7	8.7	9.7	12.1	10.8	11.7	10.8	6.7
	43H1	5.2	8.9	10.8	10.9	12.5	11.0	11.7	10.6	10.3
	43H0	4.3	7.9	10.2	10.2	12.0	10.4	11.5	9.7	8.3
	42H0	5.5	9.4	10.5	10.8	11.6	11.2	13.3	11.5	9.8
	42G9	5.4	9.3	10.9	10.8	11.7	11.6	12.4	11.6	9.7
26	41H0	6.6	9.3	12.9	11.2	11.3	11.3	12.3	10.0	9.5
	41G9	6.3	9.5	11.4	11.4	12.3	11.5	12.1	11.2	10.2

Table 14. Sprat biomass [tonnes] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	***ICES rectangle***	***Age***								***Total***
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
28	45H1	13456.1	4361.0	1013.4	4202.2	424.2	432.5	56.3	791.6	24737.4
	45H0	12162.8	3941.9	916.0	3798.3	383.5	390.9	50.9	715.6	22359.8
	44H1	3395.4	2168.3	1017.9	2571.1	664.8	718.0	59.7	484.1	11079.3
	44H0	4774.1	3048.7	1431.3	3615.1	934.7	1009.6	84.0	680.7	15578.1
	43H1	2244.5	5225.6	2945.5	14540.5	8307.6	3428.7	1829.9	1241.7	39764.2
	43H0	988.2	1312.1	404.7	2153.1	985.5	461.9	216.6	207.2	6729.3
	42H0	2361.5	9138.5	1729.1	11528.5	2369.1	1271.9	207.8	2803.5	31409.9
	42G9	1169.7	3865.7	965.9	4995.7	1167.0	571.0	118.3	1085.7	13939.0
26	41H0	5183.5	8774.6	788.9	7072.7	1053.8	2827.1	1332.4	1257.2	28290.3
	41G9	2432.4	6013.3	3153.1	9867.1	1212.8	1712.8	523.0	654.2	25568.8

Table 15. Sprat mean length [cm] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	***ICES rectangle***	***Age***								***Average***
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
28	45H1	9.1	11.2	11.8	11.8	11.9	12.5	12.3	12.2	9.7
	45H0	9.1	11.2	11.8	11.8	11.9	12.5	12.3	12.2	9.7
	44H1	9.0	11.0	11.4	11.8	12.6	12.2	12.5	12.3	10.3
	44H0	9.0	11.0	11.4	11.8	12.6	12.2	12.5	12.3	10.3
	43H1	9.4	11.3	12.1	12.2	12.8	12.1	12.5	11.9	11.8
	43H0	9.2	11.1	12.0	12.0	12.6	12.0	12.5	11.8	11.1
	42H0	9.8	11.6	12.1	12.2	12.5	12.4	13.3	12.5	11.8
	42G9	9.8	11.6	12.2	12.2	12.5	12.5	12.8	12.5	11.7
26	41H0	10.3	11.7	12.9	12.4	12.5	12.4	12.6	12.0	11.6
	41G9	10.2	11.7	12.4	12.4	12.7	12.5	12.6	12.4	11.9

Herring in ICES SD 26N and 28

Table 16. Herring age composition [%] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	*ICES rectangle*	*Age*								*Total*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
28	45H1	13.7	9.8	13.5	9.0	21.2	19.2	7.0	6.7	100.0
	45H0	13.7	9.8	13.5	9.0	21.2	19.2	7.0	6.7	100.0
	44H1	30.9	0.5	10.6	5.8	17.9	11.1	14.5	8.7	100.0
	44H0	30.9	0.5	10.6	5.8	17.9	11.1	14.5	8.7	100.0
	43H1	62.2	2.2	8.9	6.7	2.2	11.1	6.7		100.0
	43H0	6.5	0.9	1.5	10.2	22.9	14.5	17.4	25.9	100.0
	42H0									
	42G9	1.4	2.2	0.7	9.1	22.9	15.8	17.4	30.4	100.0
26	41H0									
	41G9		7.9			8.8	22.8	16.7	43.9	100.0

Table 17. Herring age composition [n×10^6] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	*ICES rectangle*	*Age*								*Total*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
28	45H1	11.4	8.2	11.2	7.5	17.7	16.0	5.8	5.6	83.3
	45H0	10.3	7.4	10.1	6.8	16.0	14.4	5.2	5.1	75.3
	44H1	20.7	0.3	7.1	3.9	12.0	7.5	9.7	5.8	67.1
	44H0	29.1	0.5	10.0	5.5	16.9	10.5	13.7	8.2	94.3
	43H1	277.7	9.9	39.7	29.7	9.9	49.6	29.7		446.2
	43H0	32.7	4.6	7.3	51.5	115.2	73.0	87.6	130.3	502.2
	42H0									
	42G9	0.6	1.0	0.3	4.0	10.1	7.0	7.7	13.5	44.3
26	41H0									
	41G9		1.1			1.2	3.2	2.4	6.2	14.2

Table 18. Herring mean weight [g] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	*ICES rectangle*	*Age*								*Average*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
28	45H1	8.1	17.3	18.6	26.3	26.5	26.6	35.0	32.4	23.0
	45H0	8.1	17.3	18.6	26.3	26.5	26.6	35.0	32.4	23.0
	44H1	9.1	18.0	21.5	31.0	29.5	34.9	39.9	49.5	26.2
	44H0	9.1	18.0	21.5	31.0	29.5	34.9	39.9	49.5	26.2
	43H1	11.9	18.0	21.3	33.9	28.7	28.5	37.0		18.2
	43H0	10.7	16.0	20.1	33.1	36.2	35.8	40.0	47.9	37.4
	42H0									
	42G9	6.8	17.2	19.0	33.0	37.1	37.7	39.1	48.4	39.6
26	41H0									
	41G9		18.0			49.0	44.6	47.5	51.6	46.4

Table 19. Herring biomass [tonnes] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	***ICES rectangle***	***Age***								***Total***
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
28	45H1	92.9	141.4	208.8	197.3	468.0	423.9	202.5	181.4	1916.3
	45H0	84.0	127.8	188.7	178.4	423.1	383.2	183.0	164.0	1732.1
	44H1	188.0	5.8	152.9	120.4	353.5	260.1	387.9	288.8	1757.5
	44H0	264.3	8.2	215.1	169.3	497.1	365.7	545.5	406.1	2471.1
	43H1	3292.2	178.5	842.9	1008.2	284.3	1414.7	1100.7		8121.4
	43H0	349.4	73.9	147.3	1702.8	4167.3	2612.9	3506.8	6237.1	18797.6
	42H0									
	42G9	4.2	16.9	5.9	133.5	376.0	264.2	301.0	652.3	1753.8
26	41H0									
	41G9		20.2			61.0	144.3	112.2	321.2	658.9

Table 20. Herring mean length [cm] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

ICES SD	***ICES rectangle***	***Age***								***Average***
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
28	45H1	11.0	14.4	15.3	16.8	17.0	17.0	18.6	18.2	15.9
	45H0	11.0	14.4	15.3	16.8	17.0	17.0	18.6	18.2	15.9
	44H1	11.6	14.3	15.3	17.5	17.3	18.4	19.5	20.5	16.0
	44H0	11.6	14.3	15.3	17.5	17.3	18.4	19.5	20.5	16.0
	43H1	12.6	14.3	15.4	18.1	17.3	17.3	18.8		14.3
	43H0	12.1	13.8	15.3	17.8	18.4	18.3	19.1	20.1	18.4
	42H0									
	42G9	10.3	14.4	15.3	17.8	18.5	18.6	19.0	20.3	18.9
26	41H0									
	41G9		14.8			20.7	19.8	19.9	21.0	20.0

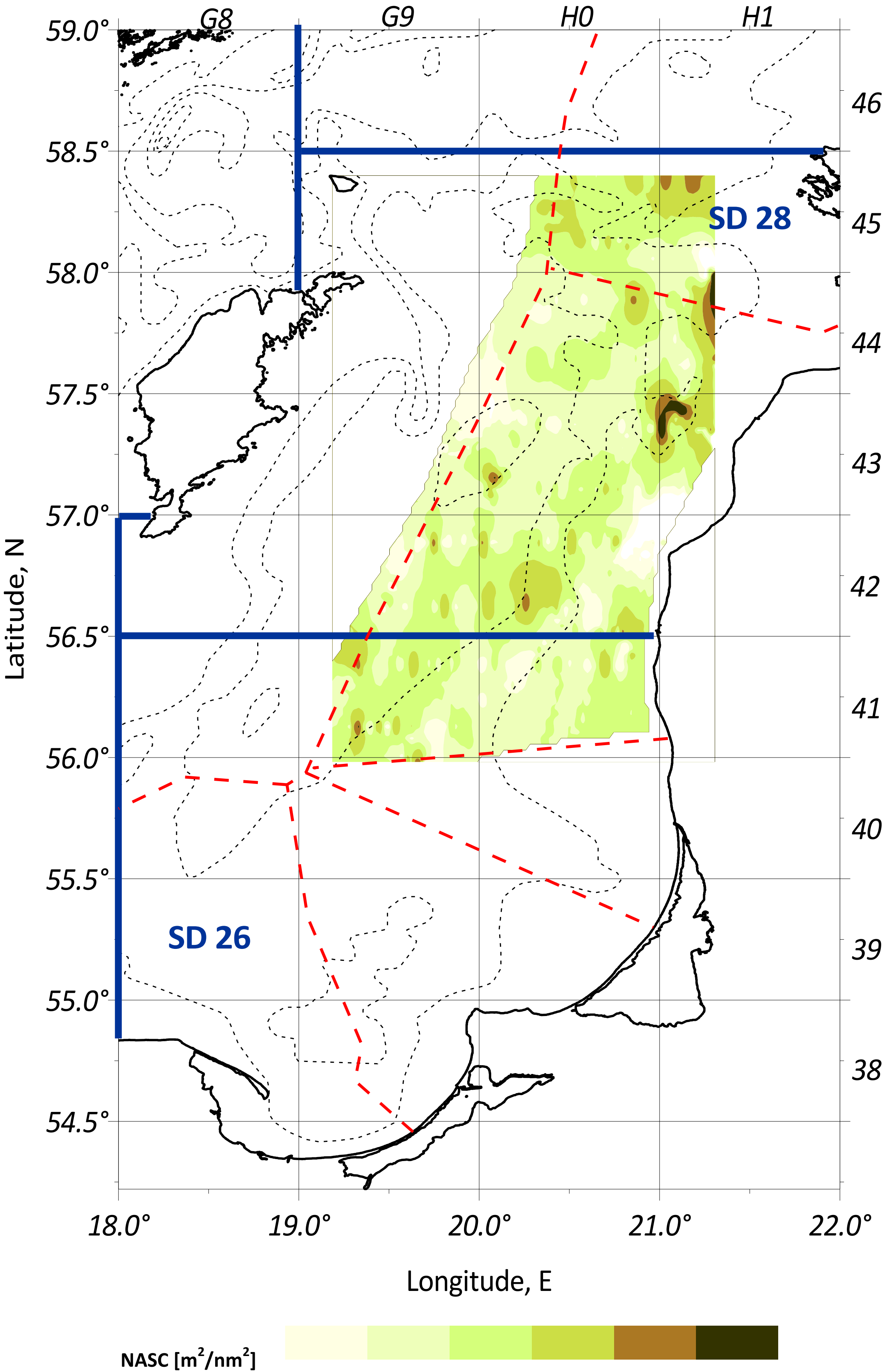

Figure 4. Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N and 28
from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

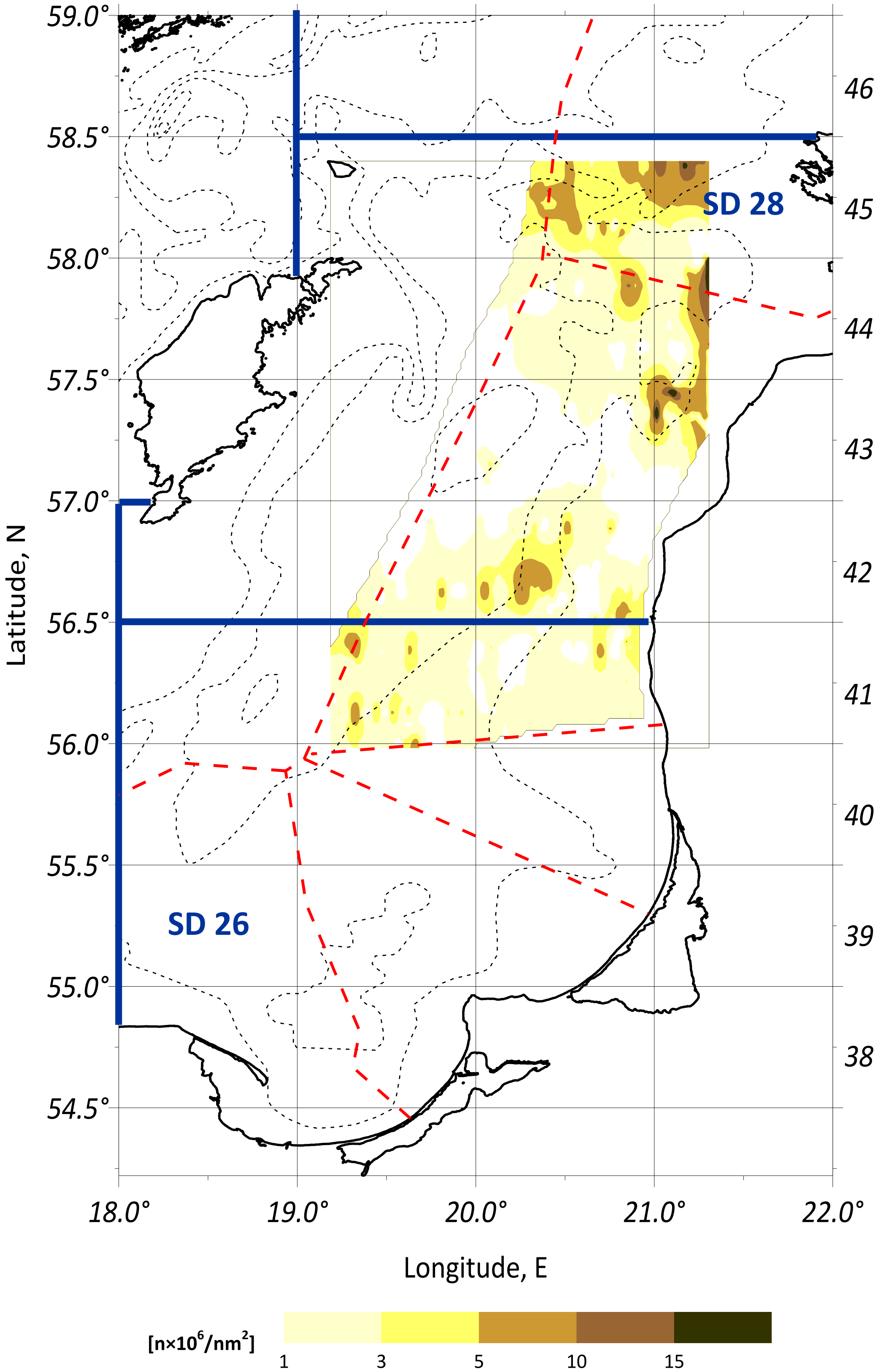

Figure 5. Sprat distribution (n×10^6) in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

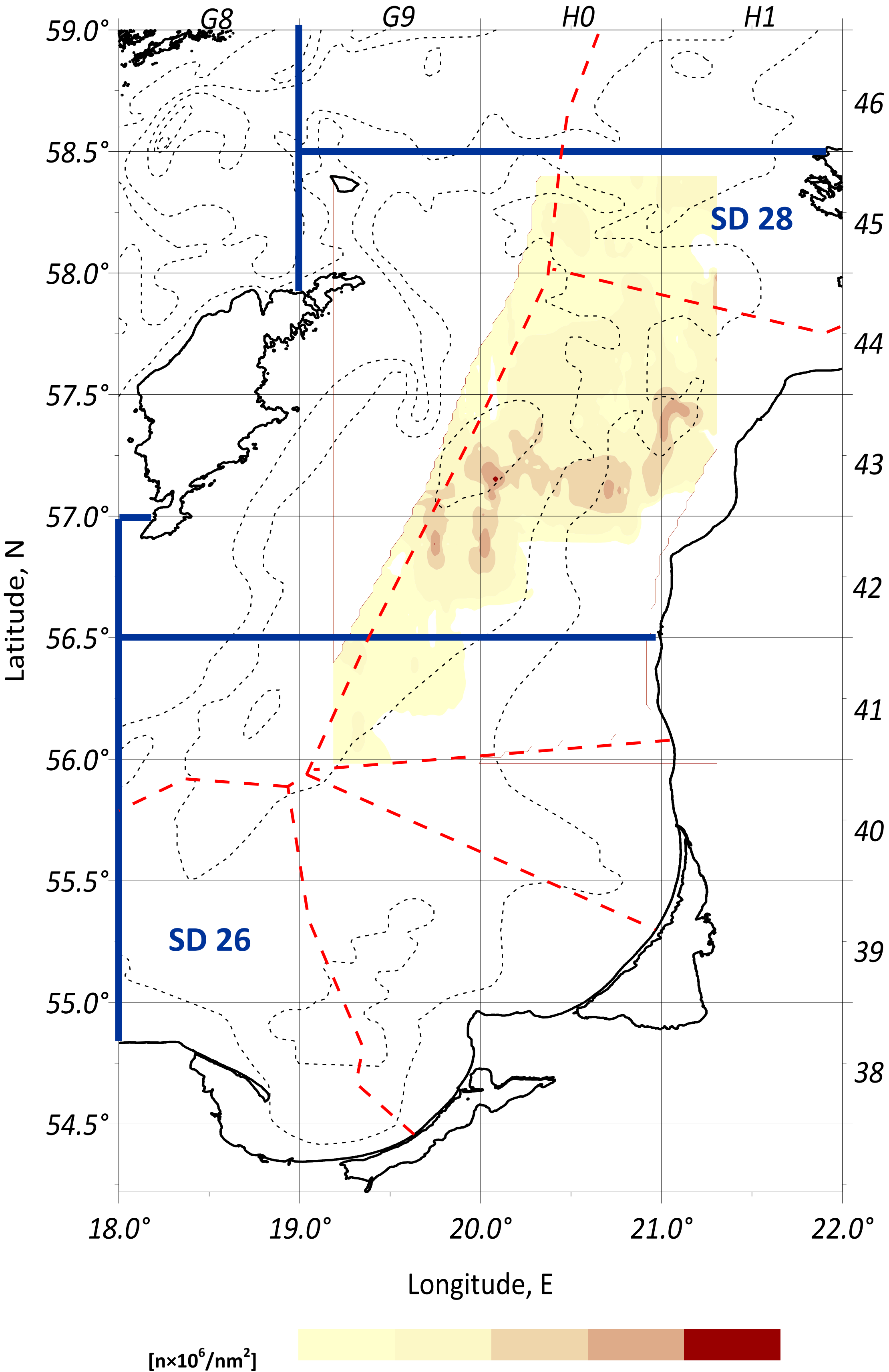

Figure 6. Herring distribution (n×10^6) in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

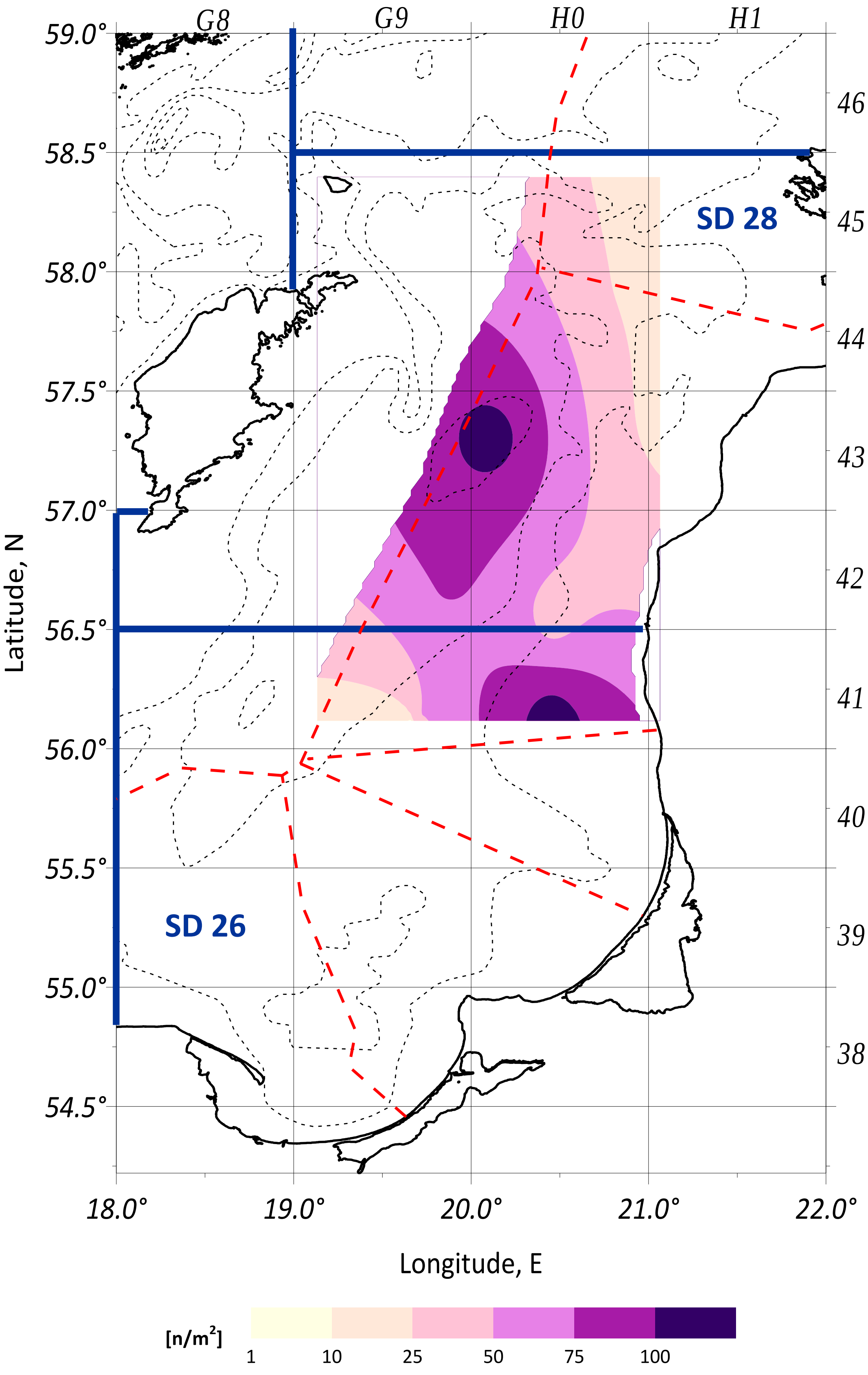

Figure 7. Distribution of sprat eggs on development stage 1 in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Table 21. The values of hydrological parameters registered at the catching depth in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Haul number	***Date of catch***	***Mean trawling depth [m]***	***Hydrological parameters***		
			Temperature [°C]	***Salinity [PSU]***	***Oxygen [ml/l]***
1	2012.05.31	80	5.83	10.01	2.62
2	2012.05.31	20	4.51	7.23	11.43
3	2012.06.01	71	5.50	9.47	2.09
4	2012.06.01	65	4.94	8.90	6.29
5	2012.06.01	70	5.67	9.60	2.11
6	2012.06.05	24	2.84	7.46	17.36
7	2012.06.05	82			
8	2012.06.06	83			
9	2012.06.06	15			
10	2012.06.07	21			
11	2012.06.08	26	4.33	7.29	14.29
Average		51	4.81	8.57	8.03

Table 22. Mean values of the sea water temperature (**T**), salinity (**S**) and oxygen content (**O_2**) in surface layer (0-5m), winter cold layer (24-62m) and deep layer (over 90m) recorded in the Baltic Sea ICES SD 26N and 28 from the Latvian-Lithuanian BASS survey conducted by r/v "Darius" in the period of 31.05-08.06.2012.

Station No.	***Date***	***Sinking depth [m]***	***Surface layer***			***Winter cold layer***			***Bottom layer***		
			T [°C]	***S [PSU]***	***O_2 [ml/l]***	***T [°C]***	***S [PSU]***	***O_2 [ml/l]***	***T [°C]***	***S [PSU]***	***O_2 [ml/l]***
1	2012.05.31	117	5.14	6.98	6.54	2.11	7.63	12.01	6.58	11.20	1.49
2	2012.05.31	56	5.38	6.96	8.59	2.20	7.61	18.32	6.86	11.34	0.18
3	2012.06.01	89				2.15	7.55	8.25			
4	2012.06.01	78	5.71	6.83	7.56	2.16	7.53	13.93			
5	2012.06.01	97	5.39	7.14	7.19	1.94	7.63	9.18	6.37	10.63	0.60
6	2012.06.05	52	5.38	7.14	11.57	2.08	7.58	17.44			
7	2012.06.05	39	7.33	6.73	8.43	2.74	7.48	12.73			
8	2012.06.06	69				2.13	7.63	8.94			
9	2012.06.06										
10	2012.06.07	78									
11	2012.06.08	96				2.16	7.59	15.17	6.46	10.71	0.59
Average		77	6.96	5.72	6.96	8.31	2.19	7.58	12.88	6.56	10.98

Survey Report for RV “DARIUS”
07-08.05.2012

Fisheries Service under the Ministry of Agriculture of Republic of Lithuania,
Fishery Research and Science State
Klaipeda, Lithuania

1 INTRODUCTION

The main objective is to assess clupeoid resources in the Baltic Sea. The Lithuanian survey is coordinated within the frame of the **Baltic International Acoustic Survey (BIAS).** The reported acoustic survey is conducted to supply the ICES Baltic Fisheries Assessment Working Group (WGBFAS) and the Fisheries Service under the Ministry of Agriculture of Republic of Lithuania with an index value for the stock size of herring and sprat in parts of the ICES subdivision (SD) 26 (Lithuanian Exclusive Economic Zone).

2 METHODS

2.1 Personnel

M. Špegys	Fisheries Service under the Ministery of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda – cruise leader and acoustics;
E. Fedotova	Fisheries Service under the Ministery of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda - scientific leader and fish sampling

2.2 Narrative

The 1st cruise of RV “Darius” took place from 7 th to 8 th of May 2012. The cruise was intended to cover parts of ICES subdivisions (SD) 26, constituting the Lithuanian Exclusive Economic zones.

2.3 Survey design

The statistical rectangles were used as strata (ICES 2003). The area is limited by the 10 m depth line. The scheme of transects is defined as the regular. The average speed of a vessel for the period of acoustic survey was 8 knots. The average speed of the vessel with a trawl was 3 knots. Duration of trawling was 30 minutes. The survey was conducted in the daytime from 08.00 up to 20.00. The survey area was 1520 nm^2 and the distance used for acoustic estimates was 112 nm. The entire cruise track with positions of the trawling is shown in Fig. 1.

2.4 Calibration

The SIMRAD EK60 echo sounder with split beam transducer ES38 - 12 was calibrated (12 of April 2012) at the site of 30 m depth, located 3.5 nm northwest of Klaipeda harbour according to the BIAS manual (ICES 2011). S_v transducer gain after calibration was set to 21.0 dB.

2.5 Acoustic data collection

The acoustic sampling was performed around the clock. The main pelagic species of interest were herring and sprat. The SIMRAD EK60 echo sounder with hull mounted 38 kHz transducer ES38-12 was used during the cruise. The specific settings of the hydroacoustic equipment were used as described in the BIAS manual (ICES 2011). The post-processing of the stored echo signals was made using the Sonar4 (Balk & Lindem, 2005). The mean volume back scattering values S_v, were integrated over 1 nm intervals, from 7 m below the surface to the bottom. Contributions from air bubbles, bottom structures and noise scattering layers were removed from the echogram using Sonar4.

2.6 Biological data – fishing stations

All trawling was done with the pelagic gear „OTM“ in the midwater as well as near the bottom. The mesh size in the codend was 10 mm. The intention was to carry out at least two hauls per ICES statistical rectangle. The trawling depth was chosen by the echogram, in accordance to the characteristic of echo records from the fish. Normally, the trawl had vertical opening of about 12 m. The trawling time lasted 30 minutes. From each haul sub-samples were taken to determine length and weight composition of fish. Samples of herring and sprat were analyzed for further investigations on the board of vessel (i.e. sex, maturity, age).

2.7 Data analysis

The pelagic target species sprat and herring are usually distributed in mixed layers in combination with other species, so that it is impossible to allocate the integrator readings to a single species. Therefore the species composition was based on the trawl catch results. For each rectangle the species composition and length distribution were determined as the mean - weighted of all trawl results in this rectangle. From these distributions the mean acoustic cross section **σ** was calculated according to the following target strength-length (TS) relationships:

Clupeoids	$TS = 20 \log L (cm) - 71.2$	(ICES 1983/H:12)
Gadoids	$TS = 20 \log L (cm) - 67.5$	(Foote et al. 1986)

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section (Sa) and the rectangle area, divided by the corresponding mean cross section (σ). The total number were separated into herring and sprat according to the mean catch composition.

3 RESULTS

3.1 Biological data

In total 8 trawl hauls were carried out: 520 herring and 2229 sprat were measured and 227 herring and 629 sprat were aged. Herring didn’t catched in 40G9 ICES rectangle.

The results of the catch composition are presented in Table 1. In the catch composition was dominated by sprat and to a lower extend by herring .

The length distributions of herring and sprat of the May 2012 presented in Fig. 2 and 3. Herings length distribution have two picks juvenile 12.5 – 13cm length class and adult 16.5-19 cm lengh class. Sprat dominated 8.5 – 10 cm length class in 40H0 ICES rectangle and 11 -12.5 cm length class in 40G9 rectangle.

3.2 Acoustic data

The survey statistics concerning the survey area, the mean Sa, the mean scattering cross section **σ**, the estimated total number of fish, the percentages of herring, sprat per rectangle are shown in Table 2-4.

3.3 Abundance estimates

The total abundance of herring and sprat are presented in Table 2. The estimated number sprat by age group and rectangle are given in Table 5. The corresponding mean weights by age group and rectangle are shown in Table 6. The estimates of sprat biomass by age group and rectangle are summarised in Table 7.

The herring stock was estimated to be $187.37 \cdot 10^6$ fish or about 3810 tonnes.

The estimated sprat stock was $3969.54 \cdot 10^6$ fish or 31703 tonnes.

The abundance estimates of sprat were dominated by 1age fish in rectangle 40H0 and by 1-2, 4-5 ages fish in rectangle 40G9 (Fig. 2 and Table 5).

3.4. Hydrographic data

The seawater temperature was about 6 ºC in the surface layer. This is in the normal range for this season. Termocline was about 30-40 m and temperature in termocline. Temperaute below termocline about 3 ºC. Salinity in surface about 7.2‰. Halocline starts from 60 to 70 m depth. The temperature below halocline layer lay was more then 5 °C. (Fig. 4). The oxygen-containing layer with less than 1 ml/l was in haul no. 5 below 70 m depth.

4 REFERENCES

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Foote, K.G., Aglen, A. & Nakken, O. 1986. Measurement of fish target strength with a split-beam echosounder. J.Acoust.Soc.Am. 80(2):612-621.

Figure1 The survey grid ant trawl hauls position of R/V “Darius” 07-08 May 2012

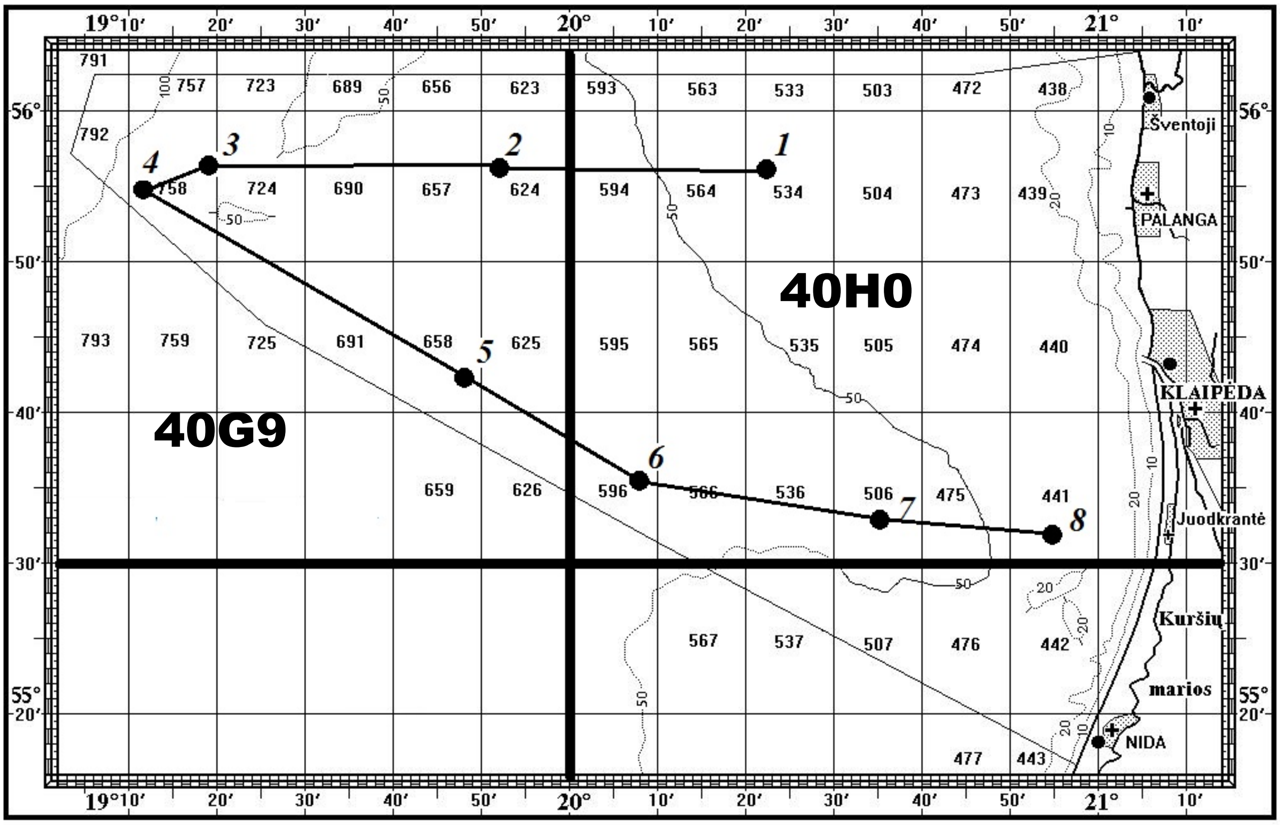


Table 1 Catch composition (kg/1hour) per haul (R/V "Darius", 07-08.05.2012)

ICES subdivision 26								
Haul No	1	2	3	4	5	6	7	8
Date	2012.05.7	2012.05.7	2012.05.7	2012.05.7	2012.05.8	2012.05.8	2012.05.8	2012.05.8
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	40H0	40G9	40G9	40G9	40G9	40H0	40H0	40H0
Clupea hrengus	26.0	0.0	0.0	0.0	0	68.04	0.832	0.0
Sprattus spratus	8.0	0.0	80.0	100.0	80.0	31.96	100.0	0.0
Platichtys flesus				0.298				
Total	34.0	0.0	80.0	100.298	80.0	100.0	100.832	0.0

Figure 2 Length composition of herring (%) (R/V "Darius", 07-08.05.2012)

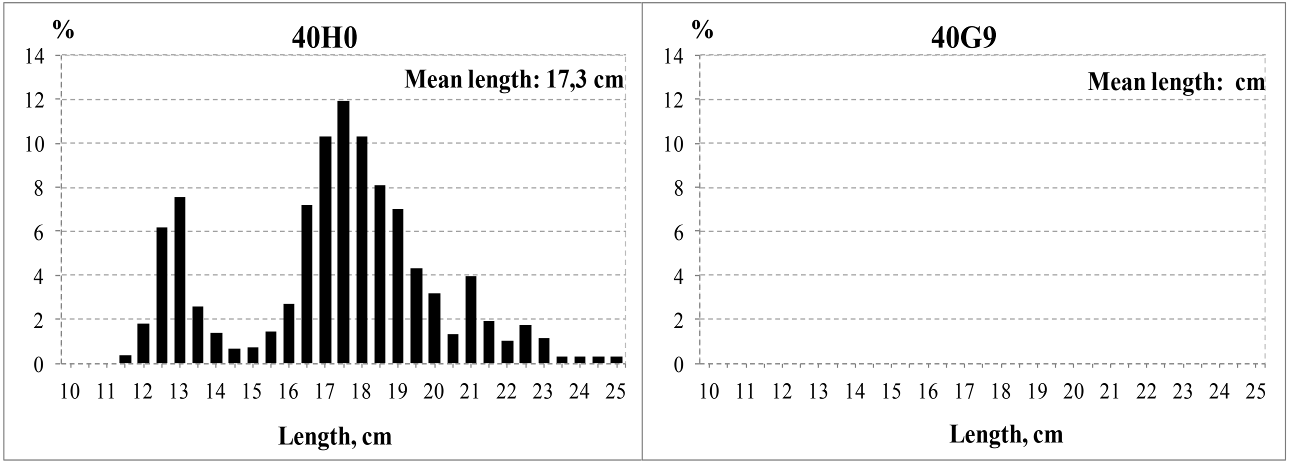


Figure 3 Length distribution of sprat (%) (R/V "Darius", 07-08.05.2012)

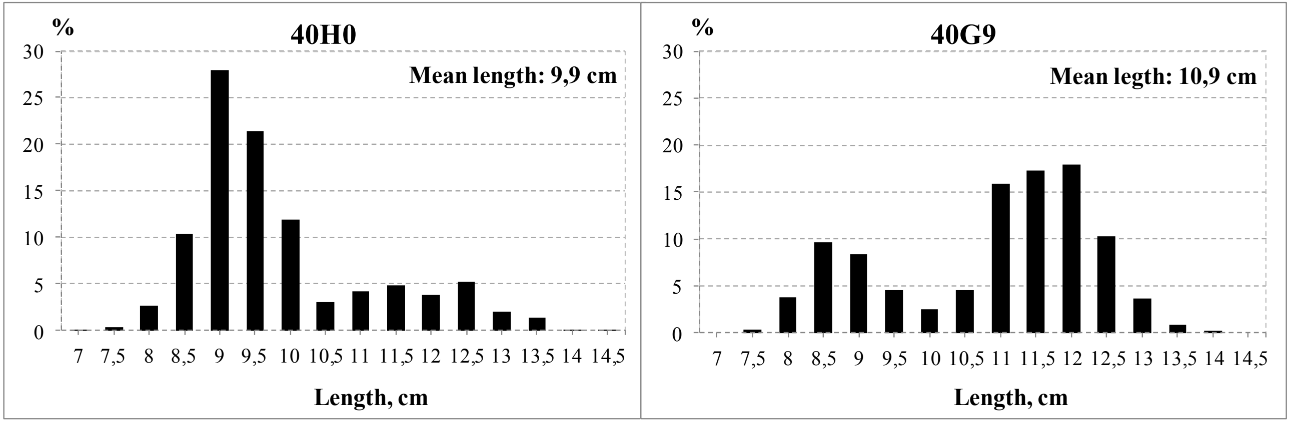


Table 2 R/V "DARIUS" survey statistics (abundance of herring and sprat),), 07-08.05.2012

ICES	ICES	Area	ρ	Abundance, mln			Biomass, tonn		
SD	Rect.	nm^2	mln/nm^2	N sum	N her	N spr	W sum	W her	W spr
26	40H0	1012.1	1.31	1324.1	108.4	1215.8	11609	3810	7799
	40G9	1013.0	2.72	2753.8	0.0	2753.8	23904	0	23904

Table 3 R/V "DARIUS" survey statistics (aggregated data of herring and sprat),), 07-08.05.2012

ICES	ICES	No	Herring			Sprat			SA	TS calc.
SD	Rect.	trawl	L, cm	w, g	Numb.,%	L, cm	w, g	Numb.,%	m^2/nm^2	dB
26	40H0	1,6,7,8	17,53	35,16	8,18	10,10	6,41	91,82	151,0	-50,4
	40G9	2,3,4,5	0,00	0,00	0,00	11,12	8,68	100,00	326,0	-50,2

Table 4 R/V "DARIUS" survey statistics (herring and sprat), 07-08.05.2012

ICES	ICES	Area	SA	σ *10^4	Abundance	Species composition (%)	
SD	Rect.	nm^2	m^2/nm^2	nm^2	mln	herring	sprat
26	40H0	1012	151,0	1,15416	1324,1	8,18	91,82
	40G9	1013	326,0	1,19922	2753,8	0,00	100,00

Table 5 R/V "Darius" estimated number (millions) of sprat, 07-08.05.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	1215,8	0,0	867,6	102,7	35,9	72,8	68,7	34,5	19,1	14,5
	40G9	2753,8	0,0	745,0	365,0	283,4	563,2	439,8	183,3	103,1	71,1

Table 6 R/V "Darius" estimated mean weights (g) of sprat, 07-08.05.2012

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	6,41		4,6	7,1	9,8	11,7	12,9	13,6	14,3	14,2
	40G9	8,68		4,2	7,9	9,2	10,2	11,6	12,5	11,7	13,2

Table 7 R/V "Darius" estimated biomass (in tonnes) of sprat,), 07-08.05.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	7799	0	4031	730	350	848	889	470	274	206
	40G9	23904	0	3152	2894	2603	5728	5094	2291	1202	940

Table 8 R/V "Darius" estimated number (millions) of herring,), 07-08.05.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	108,4	0,0	21,9	22,6	14,3	13,3	14,6	8,5	6,6	6,6
	40G9	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

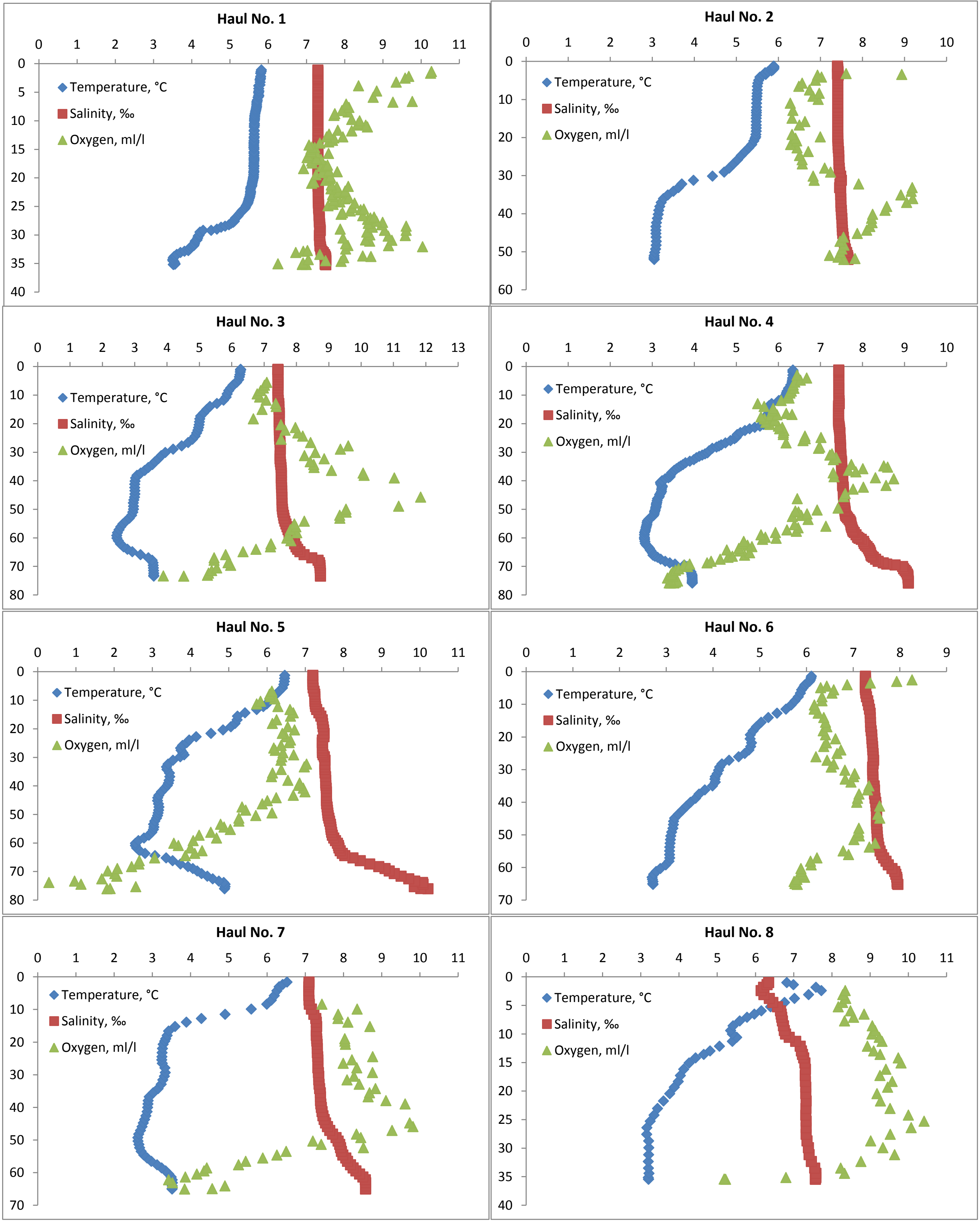
Table 9 R/V "Darius" estimated mean weights (g) of herring,), 07-08.05.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	35,2	0,0	14,6	30,9	37,0	36,5	41,8	49,4	48,8	64,8
	40G9	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

Table 10 R/V "Darius" estimated biomass (in tonnes) of herring,), 07-08.05.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	3810	0	320	698	528	485	612	422	320	426
	40G9	0	0	0	0	0	0	0	0	0	0

Figure 4. Salinity, temperature and oxygen in trawling hauls



Survey Report for FRV “SOLEA”
2 – 21 October 2012

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1 INTRODUCTION

The joint German/Danish survey is part of the **Baltic International Acoustic Survey (BIAS),** which is co-ordinated within the scope of ICES and has the main objective to annually assess the clupeoid resources of herring and sprat in the Baltic Sea in autumn. The reported acoustic survey is conducted every year to supply the ICES

- Herring Assessment Working Group for the Area South of 62°N (HAWG) and
- Baltic Fisheries Assessment Working Group (WGBFAS)

with an index value for the stock size of herring and sprat in the Western Baltic area (Kattegat/Subdivisions 21 and Subdivisions 22, 23 and 24).

2 METHODS

2.1 Personnel

Calibration of acoustic equipment (02. – 04.10.2012)	
S.-E. Levinsky	DTU Aqua, Charlottenlund, Denmark
M. Schaber	Thünen Institute of Sea Fisheries (TI-SF), Hamburg, in charge
B. Stefanowitsch	Thünen Institute of Baltic Sea Fisheries (TI-OF), Rostock
Acoustic survey (04. – 21.10.2012)	
M. Koth	Thünen Institute of Baltic Sea Fisheries (TI-OF), Rostock
S.-E. Levinsky	DTU Aqua, Charlottenlund, Denmark
M. Mertzen	Thünen Institute of Sea Fisheries (TI-SF), Hamburg
A.K.M. Püts	Thünen Institute of Sea Fisheries (TI-SF), Hamburg
I. Rottgardt	Thünen Institute of Baltic Sea Fisheries (TI-OF), Rostock
M. Schaber	Thünen Institute of Sea Fisheries (TI-SF), Hamburg, in charge
B. Stefanowitsch	Thünen Institute of Baltic Sea Fisheries (TI-OF), Rostock

2.2 Narrative

The 662th cruise of FRV “SOLEA” represents the 25th subsequent BIAS survey. FRV “SOLEA” left the port of Rostock/Marienehe on 2 October 2012. The acoustic survey covered the whole area of Subdivision (SD) 21, SD 22, SD 23 and SD 24. The survey ended on 21 October 2012 in Rostock/Marienehe.

2.3 Survey design

ICES statistical rectangles were used as strata for all Subdivisions (ICES 2012). The area was limited by the 10 m depth line. The survey area in the Western Baltic Sea is characterised by a number of islands and sounds. Consequently, parallel transects would lead to an unsuitable coverage of the survey area. Therefore a zig-zag track was adopted to cover all depth strata regularly and sufficiently. Overall cruise track length was 1 280 nm covering a survey area of 13 206 nm^2 (Figure 1).

2.4 Calibration

All hull mounted transducers were calibrated during daytime on 2 October 2012 off Kühlungsborn. The calibration site was chosen according to prevailing weather conditions providing ideal conditions for calibration for the remaining day and evening. The calibration procedure was carried out as described in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES 2012). Both the 38 and 120 kHz transducer were calibrated with calibration values regarded as very good. Calibration results for the 38 kHz transducer are given in Table 1.

2.5 Acoustic data collection

Generally, survey operations were conducted during nighttime to account for the more pelagic distribution of clupeids during that time.

The main pelagic species of interest were herring and sprat. The acoustic equipment used was a Simrad scientific echosounder EK60 operated at 38 kHz (120 kHz). Specific settings of the hydroacoustic equipment were used as described in the "Manual for the Baltic International Acoustic Survey (BIAS)" (ICES 2012). Corresponding settings are listed in Table 1. Echo-integration, i.e. the integration and allocation of NASC values to species abundance and biomass was accomplished using Echoview 5.3 post-processing software. Mean volume back scattering values (s_v) were integrated over 1 nm intervals from ca**. 8 m** below the surface to the bottom. Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram.

2.6 Biological data – fishing stations

Trawl hauls were conducted with a pelagic gear "PSN388" in midwater layers as well as near the seafloor. Mesh size in the codend was 10 mm. It was planned to carry out at least two hauls per ICES statistical rectangle. Both trawling depth and net opening were continuously controlled by a netsonde during fishing operations. Trawl depth was chosen in accordance with echo distributions on the echogram. Normally, a vertical net opening of about 8-10 m was achieved. The trawling time usually lasted 30 minutes but was shortened when echograms and netsounder indicated large catches. From each haul sub-samples were taken to determine length and weight of fish. Samples of herring and sprat were frozen for additional investigations (e.g. determining sex, maturity, age). Hydrographic conditions (temperature, salinity, oxygen concentration) were measured after each trawl haul by vertically deployed CTD probe casts.

2.7 Data analysis

The pelagic target species sprat and herring are often distributed in mixed layers together with other species. Thus, echorecordings cannot be allocated to a single species. Therefore the species composition allocated to echorecordings was based on corresponding trawl catch results. For each rectangle species composition and length distributions were determined as the unweighted mean of all trawl results in this rectangle. From these distributions the mean acoustic cross section σ was calculated according to the following target strength-length (TS) relation:

	TS	References
Clupeoids	= 20 log L (cm) - 71.2	ICES 1983
Gadoids	= 20 log L (cm) - 67.5	Foote et al. 1986

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section (s_A) and the rectangle area, divided by the corresponding mean cross section. The total number was separated into herring and sprat according to the mean catch composition.

In accordance with the guidelines in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES 2012) further calculations were performed as follows:

Fish species considered:

Clupea harengus
Crystallogobius linearis
Gadus morhua
Gasterosteus aculeatus
Merlangius merlangus
Pomatoschistus minutus
Sprattus sprattus
Trachurus trachurus

Exclusion of trawl hauls with low catch level:

Haul No.	Rectangle	Subdivision (SD)
1	37G1	22
2	37G1	22
13	40G1	22
14	40G0	22
18	38G0	22
39	39G2	24
44	41G2	21
46	41G1	21

Despite low catch levels of both herring and sprat, hauls 7 (38G0/SD 22), 8 (39G0/SD 22), 12 (41G0/SD 22), 17 (39G1/SD22), 19 (37G2/SD22), 26 (37G4/SD24) and 43 (41G2/SD 21) were not excluded from the analysis as they were the only trawl hauls conducted in the corresponding rectangles and thus provided the only available information on species composition in these rectangles. Hauls 5 (38G0/SD22), 6 (37G0/SD22), 23 (38G4/SD 24) and 28 (38G4/SD 24) were included in the analysis as the overall number of herring and sprat was only slightly below the required 100 specimens.

Usage of neighbouring trawl information for rectangles which contain only acoustic investigations:

Rectangle/SD to be filled	with Haul No.	of Rectangle/SD
41G0/21	45	41G1/21
40G1/22	10, 11	40G0/22
40F9/22	10, 11	40G0/22
39G2/23	32	39G2/24

3 RESULTS

3.1 Biological data

In total 56 trawl hauls were carried out:

Subdivision	No. of Hauls
21	13
22	18
23	4
24	21

Altogether, 1 836 individual herring, 932 sprat and 33 European anchovies were frozen for further investigations (e.g. determining sex, maturity, age).

Results of catch compositions by Subdivision are presented in Tables 2-5. Altogether, 43 different species were recorded. Herring were caught in 53, sprat in 47 hauls. Mean catch rates per station (kg 0.5 h^{-1}) were lowest in SD 22 as in the previous year. All other subdivisions were characterized by distinctly higher catch rates. Higher catch levels (as compared to data from most of the previous surveys) were yielded in SD 24. European anchovies (*Engraulis encrasicolus*) appeared only in very small numbers in SD 21 and SD 22 in 2012. As in last year, sardines (*Sardina pilchardus*) were not recorded in the survey area.

Figures 2 and 3 show relative length-frequency distributions of herring and sprat in ICES SD 21, 22, 23 and 24 for the years 2011 and 2012. Compared to results from the previous survey in 2010, the following conclusions for herring can be drawn (Fig. 2):

- Catches in SD 21 were dominated by the incoming year class. In contrast to 2011, when a bimodal distribution indicated presence of both new year class and one year old fishes, the latter were mostly absent in 2012.
- In SD 22, the length-frequency distribution revealed several modes. The incoming year class showed a trimodal distribution with modes at 9.25 cm, 12.75 cm and 14.75 cm, while older fishes showed another mode at 18.25 cm.
- In SD23, big herring (> 25 cm) dominated catches with modes at 27.25 cm and 28.75 cm. Herring of the incoming year class (mode at ca. 13.25 cm) contributed to a lesser extent to catches as compared to 2011, while one year old herring (mode at 18.75 cm) and older herring clearly dominated.
- In SD24, the herring length-frequency distribution was similar to 2011 with a bimodal distribution of both incoming year class and one year old herring. The latter contributed to a higher extent as compared to 2011.

Relative length-frequency distributions of sprat in the years 2011 and 2012 (Fig. 3) can be characterized as follows:

- Altogether, the present year class (< 10 cm) seemed to be very weak with a possible exception in SD 21 (different sub-population?)
- In SD 21, sprat > 12 cm were almost absent as compared to 2011 when catches almost exclusively consisted of sprat of corresponding size/age.
- In SD 22, 23 and 24, growth of the 2011 year class led to the dominance of bigger sprat as compared to 2011. However, the 2012 incoming year class was virtually absent.

3.2 Acoustic data

Statistics concerning survey area, mean S_A (NASC), mean scattering cross section σ, estimated total number of fish, as well as proportion of herring and sprat per SD/rectangle are shown in Table 6.

Figure 4 depicts the spatial distribution of mean NASC values (5 nm intervals) measured on hydroacoustic transects covered in 2012. Mean values were below the long time survey average (1999-2011) in SD 22 and most parts of SD 21 but partially distinctly higher in SD 23 and 24. However, compared to results from 2011, mean NASC values recorded were distinctly higher in most parts of the survey area with the exception of the southern Kattegat (SD 21) and some parts of the central Arkona Basin (SD 24) where values were lower than in the previous year. In SD 22, NASC values were still below the long time average and below values measured in 2010, but exceeded the comparatively low levels measured in 2011 in all but one statistical rectangles of SD 22. Also in SD 23, the large aggregations of big herring usually recorded in the Öre Sound near Ven Island were again present in autumn 2012 and indicated an expansion north- and southward. In SD 24, NASC values measured were again higher than the increased levels observed in most rectangles of the subdivision in the previous year, with two exceptions in central and easterly rectangles of the Arkona Basin. Altogether, increased fish densities were recorded north and east of Rügen Island as well as south of the Swedish coast and in westerly regions of the Arkona Sea.

3.3 Abundance estimates incl. Central Baltic herring

The total abundance of herring and sprat is presented in Table 6. Estimated numbers of herring and sprat by age group and SD/rectangle are given in Table 7 and Table 10. Corresponding mean weights by age group and SD/rectangle are shown in Table 8 and Table 11. Estimates of herring and sprat biomass by age group and SD/rectangle are summarised in Table 9 and Table 12.

The **herring** stock in Subdivisions 21-24 was estimated to be 6.2 x 10^9 fish (Table 7) or about 185.1 x 10^3 tonnes (Table 9). For the included area of Subdivisions 22-24 the number of herring was calculated to be 5.6 x 10^9 fish or about 166.6 x 10^3 tonnes. The overall abundance estimate was dominated by young herring as in former years (Figure 2 and Table 7).

The estimated **sprat** stock in Subdivisions 21-24 was 6.0 x 10^9 fish (Table 10) or 71.9 x 10^3 tonnes (Table 12). For the included area of Subdivisions 22-24 the number of sprat was calculated to be 5.9 x 10^9 fish or 70.4 x 10^3 tonnes. The overall abundance estimate, which was last year dominated by one year old sprat, is now dominated by one and two year old sprat (Figure 3 and Table 10).

3.4 Abundance estimates excl. Central Baltic herring

In the western Baltic, the distribution areas of two stocks, the Western Baltic Spring Spawning herring (WBSSH) and the Central Baltic herring (CBH) overlap. Survey results indicated in the recent years that in SD 24, which is part of the WBSSH management area, a considerable fraction of CBH is present and correspondingly erroneously allocated to WBSSH stock indices. Accordingly, a stock separation function (SF) based on growth parameters in 2005 to 2010 has been proposed in the recent benchmark (WKPELA 2013) to quantify the proportion of CBH and WBSSH in the area (Gröhsler et al. 2012, Gröhsler et al., 2013a). The estimates of the growth parameters based on baseline samples of WBSSH and CBH in 2011 and 2012 support the applicability of SF (Oeberst et al., 2013b). Thus, SF was applied to correct the GERAS index for WBSS from 2005–2012. Results showed a distinct fraction of CBH in SD 24 and indicated that applying the SF greatly improved both abundance and biomass indices for WBSSH.

Estimated numbers of herring excluding CBH by age group and SD/rectangle for 2012 are given in Table 13 (SF was also applied to ICES rectangle 39G2 of SD 23 since biological samples of 39G2 of SD 24 were used to raise the corresponding recorded Sa values). Corresponding mean weights by age group and SD/rectangle are shown in Table 14. Estimates of herring biomass excluding CBH by age group and SD/rectangle are summarised in Table 15. The application of the SF to survey data from 2012 led to an overall reduction of both numbers and biomass of WBSSH since 2005, indicating a lower contribution of CBH to the index in 2012 (Figure 5). Removal of the CBH fraction from herring survey indices in 2012 resulted in biomass reductions of ca. 4.9 % with corresponding reductions in numbers of 2.2 %.

The ICES Herring Assessment Working Group for the area south of 62° N (HAWG)) is yearly supplied with an index for this survey, which now excludes CBH in 2005-2012 and in general covers the total standard survey area, excluding ICES rectangles 43G1 and 43G2 in SD 21 and 37G3 and 37G4 in SD 24, which were not covered in 1994-2004.

4 DISCUSSION

Compared to last year’s results (incl. CBH and excl. ICES rectangles 43G1 and 43G2 in SD 21 in 2012), the present estimates of **herring** show an increase in abundance, whereas they indicate a decrease in biomass:

Herring	Difference compared to 2011	
Area	Numbers %)	Biomass (%)
Subdivisions 22-24	+25	-4
Subdivisions 21-24	+10	-12

The present higher abundance estimates are mainly caused by a higher contribution of the new year-class (2012/2011: age group 0: +47 %). This increase in numbers was somehow compensated by a decrease in older herring (age groups 3+: -33 %). The low numbers of two year old herring do not correspond to the dominance of one year old herring in 2011 and to the stronger year-class in 2010, respectively. The lower contribution of older herring (age groups 3+) led to an overall decrease in biomass. The exceptionally high contribution of age groups 3+ that was recorded previous to 2011 could again not be found during this survey. Results of SD 24 (which SD characterized the results in 2010) show a far lower contribution of these older herring (2012/2011 age groups 3+: -44 % in numbers) like in the previous year. The pronounced high numbers and biomass of older, small sized herring in SD 24 in 2010 was explained by an increased immigration of slow growing Central Baltic herring (CBH) from easterly adjacent areas (SD 25-27, 28.2, 29 and 32). Last year’s results as this year’s results give a far lower contribution of older herring. Applying the SF in 2012 only led to a small removal of the CBH fraction, which indicates a less pronounced immigration rate of CBH.

Compared to last year’s results (excl. ICES rectangles 43G1 and 43G2 in SD 21 in 2012), the present estimates of **sprat** show a pronounced decrease in abundance and biomass:

Sprat	Difference compared to 2011	
Area	Numbers (%)	Biomass (%)
Subdivisions 22-24	-29	-31
Subdivisions 21-24	-32	-36

The abundance of sprat**,** which had increased significantly (2010/2009: SD 21-24: +401 % and SD 22-24: +403 %), is now decreasing since 2011. The overall decrease in 2012 is characterised by higher abundance estimates in SD 23 (+153 %) and far lower values in all other areas (SD 21: -81 %, SD 22: -42 % and SD 24: -33 %). The decrease in numbers is mostly related to a low contribution of age group 1 (2012/2011 in SD 21-24: -51 %). This corresponds with previous (2011) results, which only indicated a weak incoming year-class. The contribution of the new year-class abundance in SD 21-24, as well as in SD 22-24 was 72 % in 2009, 88 % in 2010, 14-15 % in 2011 and 29 % in 2012. The share of the 0-group of the total biomass in 2012 is, as in the previous year, low (2012: 12 %, 2011: 6 %), whereas it was 64 % in 2010 (in SD 21-24, as well as in SD 22-24).

5 REFERENCES

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6 FIGURES AND TABLES

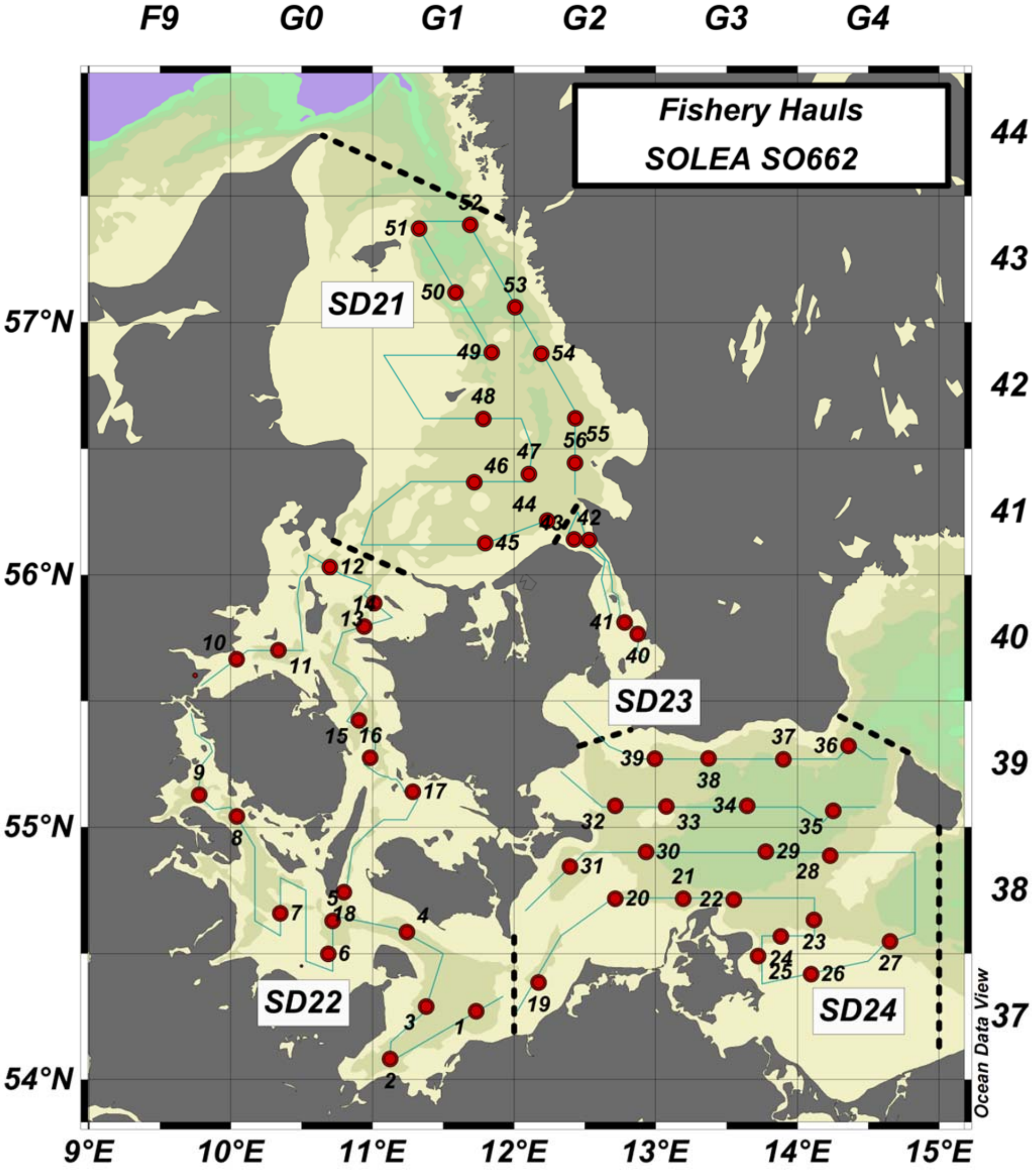

Figure 1: Cruise track (lines) and fishery hauls (dots) of FRV "SOLEA" cruise 662. ICES statistical rectangles are indicated in the top and right axis.

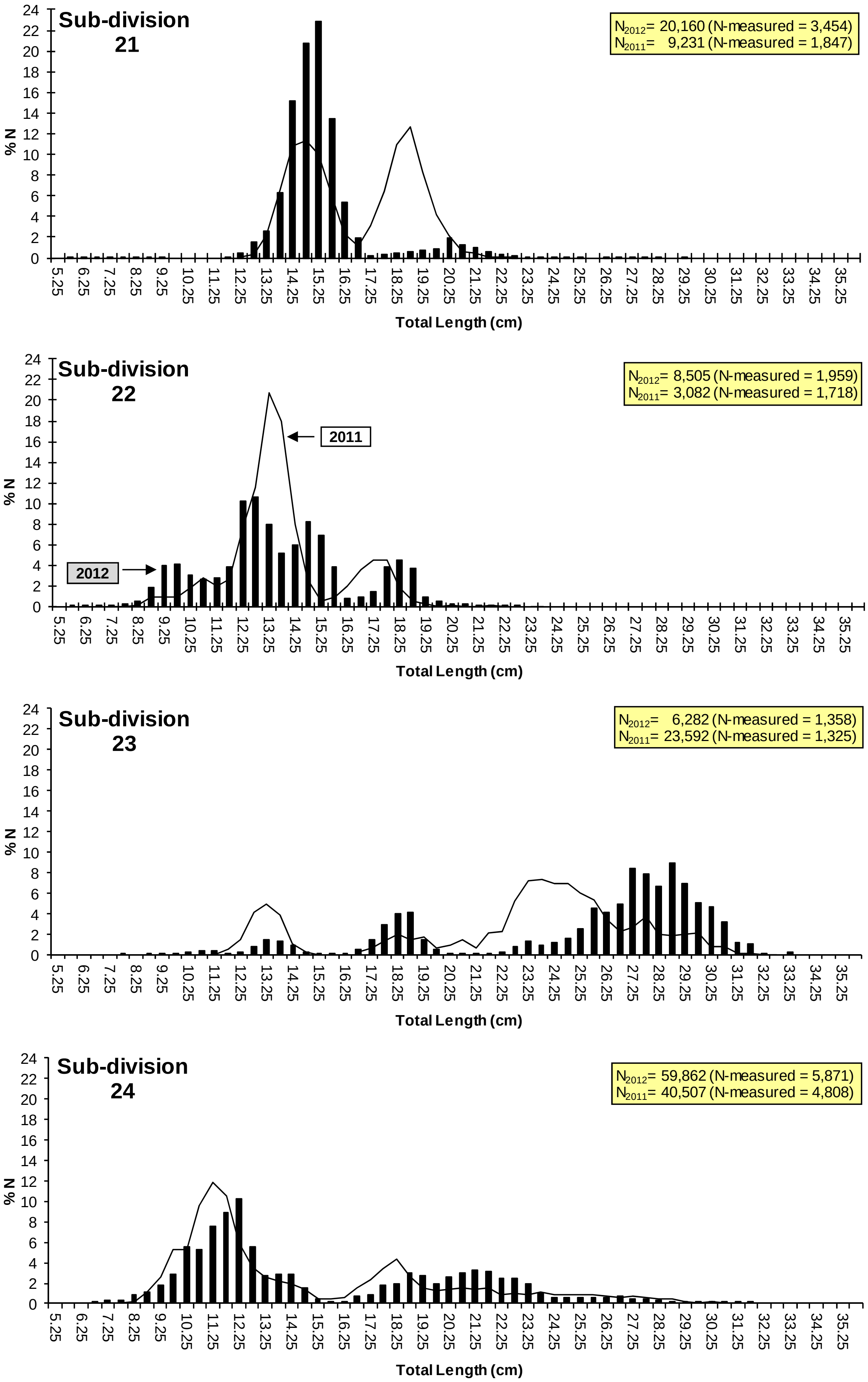

Figure 2: Length distribution of herring (*Clupea harengus*) in Subdivisions 21, 22, 23 and 24 in 2011 (line) and 2012 (bars).

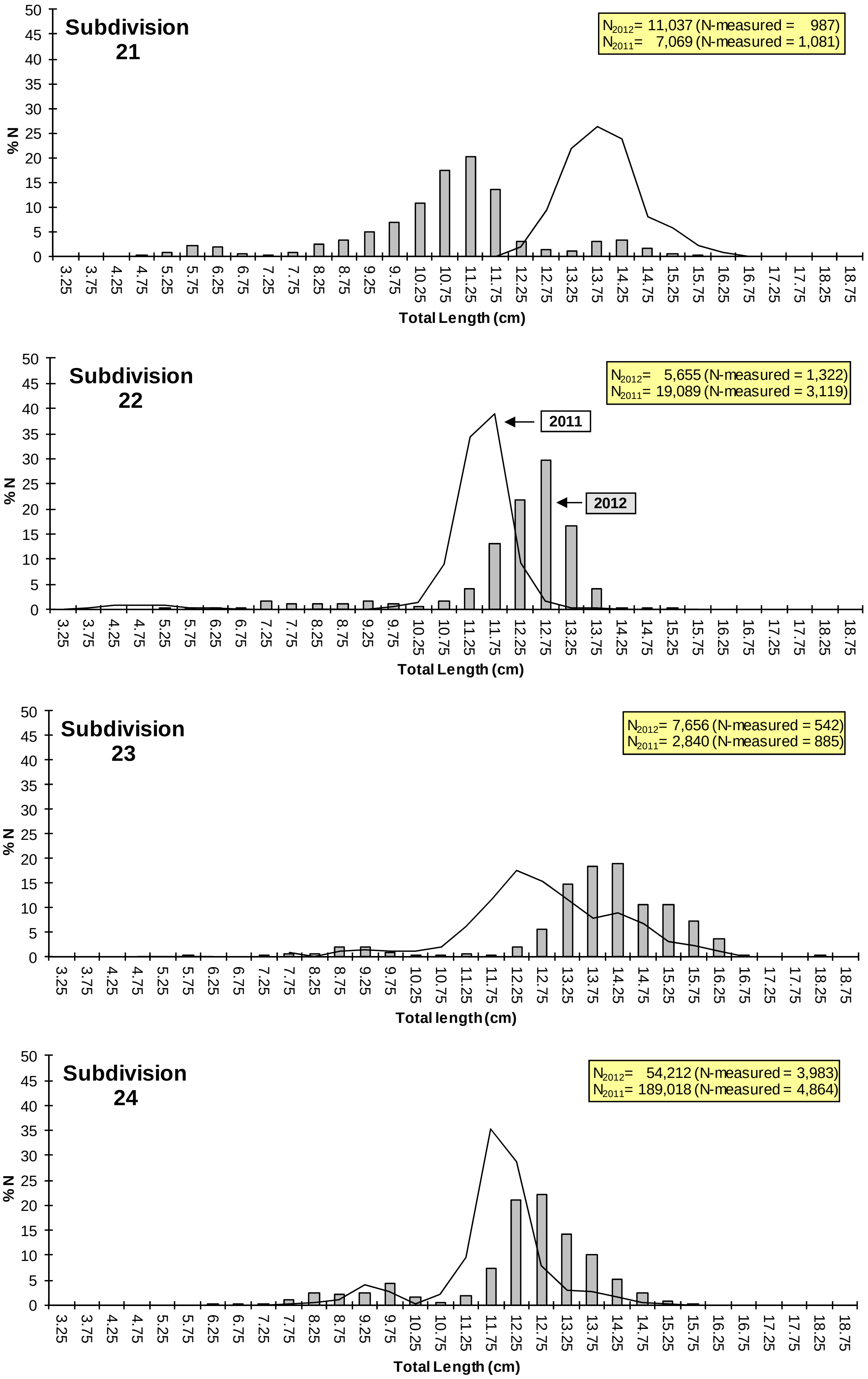

Figure 3: Length distribution of sprat (*Sprattus sprattus*) in Subdivisions 21, 22, 23 and 24 in 2011 (line) and 2012 (bars).

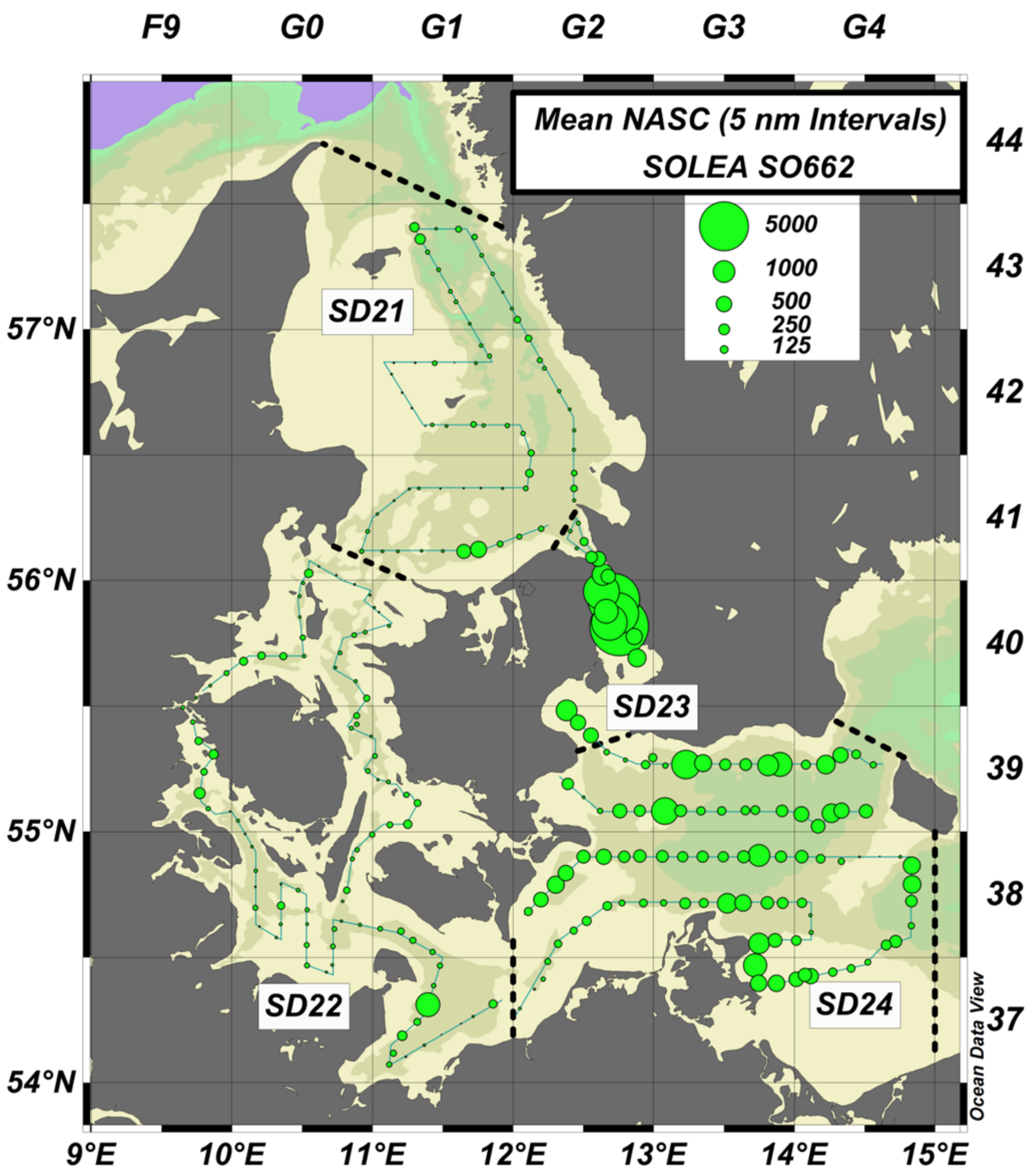

Figure 4: Cruise track (lines) and mean NASC/SA (5nm intervals, bubbles) of FRV "SOLEA" cruise 662. ICES statistical rectangles are indicated in the top and right axis.

Figure 5 Relative changes in abundance and biomass of Western Baltic Spring Spawning herring in ICES Subdivisions 21-24 (2005-2012) after application of the stock separation function to the abundance and biomass index generated from German acoustic survey data.

Table 1: Simrad EK60 calibration settings and results used during FRV “SOLEA” in Oct 2012.

```
#  Calibration  Version   2.1.0.12
#
#  Date:  02.10.2012
#
#  Comments:
#
#
#  Reference Target:
#    TS                  -33.60 dB       Min. Distance         14.00 m
#    TS Deviation          2.0 dB        Max. Distance         16.00 m
#
#  Transducer:  ES38B  Serial No.   30545
#    Frequency            38000 Hz       Beamtype                Split
#    Gain                 26.27 dB       Two Way Beam Angle   -20.6 dB
#    Athw. Angle Sens.      21.70        Along. Angle Sens.      21.70
#    Athw. Beam Angle     7.08 deg       Along. Beam Angle    7.11 deg
#    Athw. Offset Angle  -0.07 deg       Along. Offset Angle  0.01 deg
#    SaCorrection         -0.57 dB       Depth                 4.00  m
#
#  Transceiver:  GPT  38 kHz 009072056b06 3-1 ES38B
#    Pulse Duration       1.024 ms       Sample Interval     0.190   m
#    Power                 2000  W       Receiver Bandwidth   2.43 kHz
#
#  Sounder Type:
#    EK60 Version  2.2.0
#
#  TS Detection:
#    Min. Value           -50.0 dB       Min. Spacing            100 %
#    Max. Beam Comp.        6.0 dB       Min. Echolength          80 %
#    Max. Phase Dev.          8.0        Max. Echolength         180 %
#
#  Environment:
#    Absorption Coeff.   4.1 dB/km       Sound Velocity     1483.8 m/s
#
#  Beam Model results:
#    Transducer Gain    = 26.44 dB       SaCorrection       = -0.58 dB
#    Athw. Beam Angle   = 7.07 deg       Along. Beam Angle  = 7.12 deg
#    Athw. Offset Angle =-0.03 deg       Along. Offset Angle=-0.02 deg
#
#  Data deviation from beam model:
#    RMS =    0.18 dB
#    Max =    0.92 dB  No. =    72  Athw. = -4.8 deg  Along =  1.8 deg
#    Min =   -0.85 dB  No. =    36  Athw. =  2.3 deg  Along = -0.1 deg
#
#  Data deviation from polynomial model:
#    RMS =    0.17 dB
#    Max =    1.02 dB  No. =    72  Athw. = -4.8 deg  Along =  1.8 deg
#    Min =   -0.81 dB  No. =    36  Athw. =  2.3 deg  Along = -0.1 deg
```

Table 2: Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 21 (FRV "SOLEA" 662, Oct 2012).

Haul No. Species/ICES Rectangle	44 41G2	45 41G1	46 41G1	47 41G2	48 42G1	49 42G1	50 43G1	51 43G1	52 43G1	53 43G2	54 42G2	55 42G2	56 41G2	Total
ARGENTINA SPHYRAENA					+									+
CARCINUS								+	0.02		+			**0.02**
CLUPEA HARENGUS	1.80	46.78		52.35	9.62	1.01	9.47	241.17	15.43	62.94	8.67	9.32	39.14	**497.70**
CRANGON CRANGON					+				0.06	0.01	0.03		0.01	**0.11**
CRYSTALLOGOBIUS LINEARIS	+	+					+		0.05	+	0.06	+	0.01	**0.12**
CYCLOPTERUS LUMPUS											2.03			**2.03**
ENGRAULIS ENCRASICOLUS	+	0.11			0.04			0.01		0.01	0.01	0.01	0.01	**0.20**
EUTRIGLA GURNARDUS					0.02								+	**0.02**
GADUS MORHUA						2.77						7.47		**10.24**
GASTEROSTEUS ACULEATUS		0.01	+			+								**0.01**
HIPPOGLOSSOIDES PLATESSOIDES		0.03			0.02				+					**0.05**
LIMANDA LIMANDA					1.07			0.30	0.14				0.18	**1.69**
LOLIGO FORBESI		0.02	0.02	0.04	0.05	0.02	0.04	0.96	0.25	0.01	0.19	0.04	0.01	**1.65**
MERLANGIUS MERLANGUS		0.01	0.01	0.04	0.58		0.01	0.01	0.07	0.01		0.10	0.16	**1.00**
MERLUCCIUS MERLUCCIUS								0.02	0.01	0.12	0.09	+	+	**0.24**
MYSIDACEA								+	0.03					**0.03**
POLLACHIUS VIRENS								0.15						**0.15**
POMATOSCHISTUS MINUTUS		+			+	+	+		0.01	+	0.01	+	0.01	**0.03**
SCOMBER SCOMBRUS				0.33		0.24	0.45	2.02	0.12		0.05	0.41	0.16	**3.78**
SEPIOLA							+		0.01	0.02	0.03	+	+	**0.06**
SPRATTUS SPRATTUS	0.06	1.96		16.04	1.50	0.28		90.87		0.03		0.05	3.54	**114.33**
SQUALUS ACANTHIAS					3.06		2.01			4.18				**9.25**
SYNGNATHUS TYPHLE	+													+
TRACHINUS DRACO		0.08	5.28	5.23	4.51	0.18	2.72	1.57		0.87	0.27	0.09	0.08	**20.88**
TRACHURUS TRACHURUS	0.02	0.08		0.01	0.07	0.02	0.03	0.04	+	0.01	0.03	0.04	0.07	**0.42**
TRISOPTERUS ESMARKI							+	0.04	0.13		0.03	0.01		**0.21**
TRISOPTERUS MINUTUS					0.09									**0.09**
Total	**1.88**	**49.08**	**5.31**	**74.04**	**20.63**	**4.52**	**14.73**	**337.16**	**16.33**	**68.21**	**11.50**	**17.54**	**43.38**	**664.31**
Medusae	1.66	4.01	5.88	2.98	0.84	4.58	0.85	2.66	1.80	2.40	0.79	0.01	1.08	**29.53**

+ = < 0.01 kg

Table 3: Catch composition (kg 0.5h^{-1}) by trawl haul in SD 22 (FRV "SOLEA" 662, Oct 2012).

Haul No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Species/ICES Rectangle	**37G1**	**37G1**	**37G1**	**38G1**	**38G0**	**37G0**	**38G0**	**39G0**	**39F9**	**40G0**	**40G0**	**41G0**	**40G1**	**40G0**
AGONUS CATAPHRACTUS											0.01			+
ANGUILLA ANGUILLA														
BELONE BELONE														
CLUPEA HARENGUS	0.11	1.16	10.51	26.93	0.49	0.82	0.38		9.96	64.11	29.73	0.63		0.05
CRANGON CRANGON														
CRYSTALLOGOBIUS LINEARIS						+				+	+	+		+
CTENOLABRUS RUPESTRIS														
CYCLOPTERUS LUMPUS							0.34							
ENGRAULIS ENCRASICOLUS														
EUTRIGLA GURNARDUS														
GADUS MORHUA		0.49	0.01	0.04			0.39		0.01	0.35	0.06			0.03
GASTEROSTEUS ACULEATUS		25.80	1.52	0.03	+		0.01	8.58	69.22	0.99				
GOBIUS NIGER														
LEANDER										+	+			0.01
LIMANDA LIMANDA				1.87	0.07		0.53	0.17		0.17	0.04			0.05
LOLIGO FORBESI										+	+			
MERLANGIUS MERLANGUS	+	0.01	0.03	0.07		0.05	0.06	0.01	0.13	1.02	0.65			0.01
MULLUS SURMULETUS														+
PLATICHTHYS FLESUS				0.09										
POMATOSCHISTUS MINUTUS		+	+	+		+	+	+		0.01	+			0.01
SCOMBER SCOMBRUS		0.02												
SPINACHIA SPINACHIA							+							
SPRATTUS SPRATTUS	0.04		7.50	0.02	1.40	0.87	0.88		19.33	24.24	6.46	0.03		
SYNGNATHUS ROSTELLATUS					+									
TRACHINUS DRACO										0.09		0.15		0.11
TRACHURUS TRACHURUS	0.03		0.06		0.01	0.02	0.04			0.01	0.03	0.02	0.01	+
Total	**0.18**	**27.48**	**19.63**	**29.05**	**1.97**	**1.76**	**2.63**	**8.76**	**98.65**	**90.99**	**36.98**	**0.83**	**0.01**	**0.27**
Medusae	4.1	6.9	6.5	3.4	2.9	3.2	10.8	0.6	4.8	2.5	3.7	4.4	10.0	5.0

Haul No.	15	16	17	18	Total
Species/ICES Rectangle	**39G0**	**39G0**	**39G1**	**38G0**	
AGONUS CATAPHRACTUS		0.02			**0.03**
ANGUILLA ANGUILLA		0.51			**0.51**
BELONE BELONE				0.50	**0.50**
CLUPEA HARENGUS	3.29	4.82	0.11	0.10	**153.20**
CRANGON CRANGON		+	+		**+**
CRYSTALLOGOBIUS LINEARIS	+	+	0.06		**0.06**
CTENOLABRUS RUPESTRIS	+	0.01	0.03		**0.04**
CYCLOPTERUS LUMPUS		1.32		0.28	**1.94**
ENGRAULIS ENCRASICOLUS	0.01		0.01		**0.02**
EUTRIGLA GURNARDUS			0.01		**0.01**
GADUS MORHUA	+		0.08	0.08	**1.54**
GASTEROSTEUS ACULEATUS	+	+		+	**106.15**
GOBIUS NIGER		+			**+**
LEANDER	+				**0.01**
LIMANDA LIMANDA	0.11	0.05	0.50	0.36	**3.92**
LOLIGO FORBESI			+		**0.00**
MERLANGIUS MERLANGUS	0.01	0.03	0.02		**2.10**
MULLUS SURMULETUS	+				**+**
PLATICHTHYS FLESUS		0.54	0.54		**1.17**
POMATOSCHISTUS MINUTUS	+	0.01	0.05	+	**0.08**
SCOMBER SCOMBRUS				0.42	**0.44**
SPINACHIA SPINACHIA					**+**
SPRATTUS SPRATTUS	0.23	12.31	0.14	0.12	**73.57**
SYNGNATHUS ROSTELLATUS			+		**+**
TRACHINUS DRACO	0.12				**0.47**
TRACHURUS TRACHURUS	0.01	0.01	0.01	0.06	**0.32**
Total	**3.78**	**19.63**	**1.56**	**1.92**	**346.08**
Medusae	4.7	7.8	2.2	6.1	**89.7**

+ = < 0.01 kg

Table 4: Catch composition (kg 0.5h^{-1}) by trawl haul in SD 23 (FRV "SOLEA" 662, Oct 2012).

Haul No.	40	41	42	43	Total
Species/ICES Rectangle	**40G2**	**40G2**	**41G2**	**41G2**	
ANGUILLA ANGUILLA		0.87			**0.87**
CLUPEA HARENGUS	44.64	778.02	41.82	1.84	**866.32**
CRYSTALLOGOBIUS LINEARIS				+	**+**
GADUS MORHUA	201.25	138.82			**340.07**
GASTEROSTEUS ACULEATUS	0.01		0.05	0.05	**0.11**
LABRUS BERGYLTA				0.03	**+**
LIMANDA LIMANDA			0.17	0.56	**0.73**
LOLIGO FORBESI				0.01	**0.01**
MERLANGIUS MERLANGUS	0.18	0.06	0.12	0.02	**0.38**
POMATOSCHISTUS MINUTUS				+	**+**
SCOMBER SCOMBRUS		0.65			**0.65**
SPRATTUS SPRATTUS	13.14	136.44	0.67	0.07	**150.32**
SYNGNATHUS ROSTELLATUS			+		**0.00**
TRACHINUS DRACO			0.08	0.01	
TRACHURUS TRACHURUS	0.01	0.03	0.02	0.05	**0.11**
Total	**259.23**	**1054.89**	**42.93**	**2.64**	**1359.69**
Medusae	0.8	2.6	0.3	1.7	**5.4**

+ = < 0.01 kg

Table 5: Catch composition (kg 0.5h^{-1}) by trawl haul in SD 24 (FRV "SOLEA" 662, Oct 2012).

Haul No. Species/ICES Rectangle	19 37G2	20 38G2	21 38G3	22 38G3	23 38G4	24 38G3	25 37G3	26 37G4	27 38G4	28 38G4	29 38G3	30 38G2	31 38G2	32 39G2
ANGUILLA ANGUILLA							0.29							
CLUPEA HARENGUS	1.00	2.80	3.21	65.54	0.69	15.37	40.00	0.25	54.10	6.50	16.48	49.56	92.45	19.62
CRANGON CRANGON		+	+			+	+		+	+				+
CYCLOPTERUS LUMPUS		0.22			0.42								0.55	
GADUS MORHUA		0.05	0.03	13.90	0.59	11.50	19.84		2.76	1.11		+		0.01
GASTEROSTEUS ACULEATUS	+	0.05	0.08	0.04		+		+				0.08	0.04	0.06
GOBIUS NIGER							0.01							0.01
HYPEROPLUS LANCEOLATUS				0.06										
LIMANDA LIMANDA		+												
MERLANGIUS MERLANGUS	0.01	0.01		0.02			11.08			4.56	4.68		0.01	0.01
OSMERUS EPERLANUS							1.12							
PLATICHTHYS FLESUS				1.90		0.26	0.11	0.10		0.31				0.30
PLEURONECTES PLATESSA											0.15			
POMATOSCHISTUS MINUTUS		+	+	+		0.02	0.02			0.01	+	0.01		0.03
SALMO TRUTTA							3.46	2.23						
SPRATTUS SPRATTUS	0.70	0.62	0.23	77.00	5.09	49.23	32.90	1.36	11.80	6.39	158.00	10.63	4.79	1.29
STIZOSTEDION LUCIOPERCA							12.51							
TRACHURUS TRACHURUS	0.01	0.01	0.05			+	+				0.01	+ +	+	
Total	**1.72**	**3.76**	**3.60**	**158.46**	**6.79**	**76.38**	**121.34**	**3.94**	**68.66**	**18.88**	**179.32**	**60.28**	**97.84**	**21.33**
Medusae	16.20	10.10	12.76	2.80	9.42	31.10	35.64	12.77	0.88	4.91	2.68	2.81	72.19	20.01

Haul No. Species/ICES Rectangle	33 39G3	34 39G3	35 39G4	36 39G4	37 39G3	38 39G3	39 39G2	Total
ANGUILLA ANGUILLA	2.41							**2.70**
CLUPEA HARENGUS	97.35	22.52	45.06	290.50	797.72	360.84	2.26	**1983.82**
CRANGON CRANGON	+							**+**
CYCLOPTERUS LUMPUS						0.63		**1.82**
GADUS MORHUA	+	0.44		0.07	2.00		0.41	**52.71**
GASTEROSTEUS ACULEATUS	0.01	+						**0.36**
GOBIUS NIGER								**0.02**
HYPEROPLUS LANCEOLATUS								**0.06**
LIMANDA LIMANDA								**+**
MERLANGIUS MERLANGUS		5.83	4.57				0.02	**30.80**
OSMERUS EPERLANUS								**1.12**
PLATICHTHYS FLESUS				0.17				**3.15**
PLEURONECTES PLATESSA		0.36	0.18					**0.69**
POMATOSCHISTUS MINUTUS	0.05	0.01	+		+		0.02	**0.17**
SALMO TRUTTA								**5.69**
SPRATTUS SPRATTUS	32.73	12.53	94.48	11.04	89.64	95.76		**696.21**
STIZOSTEDION LUCIOPERCA								**12.51**
TRACHURUS TRACHURUS	0.10						0.01	**0.19**
Total	**132.65**	**41.69**	**144.29**	**301.78**	**889.36**	**457.23**	**2.72**	**2792.02**
Medusae	7.93	3.22	11.98	1.40	2.59	2.90	9.80	**274.1**

+ = < 0.01 kg

Table 6: Survey statistics by area (FRV "SOLEA" 662, Oct 2012).

Sub-division	ICES Rectangle	Area (nm²)	Sa (m²/NM²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	NHerring (million)	NSprat (million)
21	**41G0**	108.1	36.1	3.489	11.19	83.28	10.70	9.32	1.20
21	**41G1**	946.8	63.7	3.489	172.88	83.28	10.70	143.98	18.50
21	**41G2**	432.3	78.0	1.924	175.23	66.89	30.15	117.21	52.82
21	**42G1**	884.2	19.3	2.809	60.75	58.86	17.64	35.76	10.72
21	**42G2**	606.8	46.6	1.788	158.15	72.62	2.04	114.85	3.23
21	**43G1**	699.0	38.8	1.923	141.03	73.22	15.70	103.27	22.14
21	**43G2**	107.0	78.6	2.061	40.82	99.40	0.09	40.57	0.04
21	**Total**	**3,784.2**			**760.05**			**564.96**	**108.65**
22	**37G0**	209.9	30.9	1.531	42.37	32.06	45.04	13.58	19.08
22	**37G1**	723.3	62.8	0.895	507.44	50.87	18.99	258.13	96.37
22	**38G0**	735.3	34.8	1.622	157.79	19.82	61.50	31.27	97.04
22	**38G1**	173.2	53.5	1.488	62.26	97.90	0.09	60.95	0.05
22	**39F9**	159.3	84.2	0.434	309.26	1.69	4.27	5.24	13.20
22	**39G0**	201.7	33.4	1.246	54.05	32.66	28.95	17.65	15.65
22	**39G1**	250.0	74.0	0.224	826.95	5.98	6.17	49.46	51.01
22	**40F9**	51.3	40.1	2.064	9.97	57.50	34.09	5.73	3.40
22	**40G0**	538.1	36.5	2.064	95.15	57.50	34.09	54.71	32.43
22	**40G1**	174.5	21.8	2.064	18.43	57.50	34.09	10.60	6.28
22	**41G0**	173.1	83.8	1.565	92.68	50.00	5.00	46.34	4.63
22	**Total**	**3,389.7**			**2,176.35**			**553.66**	**339.14**
23	**39G2**	130.9	580.1	1.589	477.97	87.33	5.62	417.41	26.88
23	**40G2**	164.0	2,682.3	5.602	785.29	34.27	62.67	269.15	492.16
23	**41G2**	72.3	357.7	1.890	136.83	66.64	3.92	91.18	5.36
23	**Total**	**367.2**			**1,400.09**			**777.74**	**524.40**
24	**37G2**	192.4	34.7	1.746	38.24	43.88	42.86	16.78	16.39
24	**37G3**	167.7	656.8	1.442	764.04	9.57	89.15	73.14	681.11
24	**37G4**	875.1	224.9	1.140	1,727.12	11.05	88.37	190.79	1,526.30
24	**38G2**	832.9	303.4	1.439	1,755.75	81.83	10.60	1,436.76	186.04
24	**38G3**	865.7	362.6	1.502	2,090.16	37.47	54.29	783.21	1,134.85
24	**38G4**	1,034.8	196.7	2.377	856.24	23.06	74.37	197.48	636.78
24	**39G2**	406.1	170.7	1.589	436.34	87.33	5.62	381.06	24.54
24	**39G3**	765.0	453.6	2.674	1,297.87	58.81	40.09	763.29	520.26
24	**39G4**	524.8	377.8	2.591	765.17	55.37	44.48	423.71	340.33
24	**Total**	**5,664.5**			**9,730.93**			**4,266.22**	**5,066.60**
22-24	**Total**	**9,421.4**			**13,307.37**			**5,597.62**	**5,930.14**
21-24	**Total**	**13,205.6**			**14,067.42**			**6,162.58**	**6,038.79**

Table 7: Numbers (millions) of herring incl. CBH by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	**41G0**	0.67	6.70	1.95							9.32
21	**41G1**	10.35	103.57	30.06							143.98
21	**41G2**	85.77	29.86	1.57							117.20
21	**42G1**	19.57	15.22	0.97							35.76
21	**42G2**	89.59	25.14	0.12							114.85
21	**43G1**	77.99	21.81	1.39	1.95		0.12				103.26
21	**43G2**	32.98	7.59								40.57
21	**Total**	316.92	209.89	36.06	1.95	0.00	0.12	0.00	0.00	0.00	564.94
22	**37G0**	10.59	2.50	0.18	0.32						13.59
22	**37G1**	255.46	2.66								258.12
22	**38G0**	27.69	2.55	1.03							31.27
22	**38G1**	60.67	0.28								60.95
22	**39F9**	5.09	0.15								5.24
22	**39G0**	11.49	5.92	0.24							17.65
22	**39G1**	49.46	0.00	0.00							49.46
22	**40F9**	3.18	2.44	0.11							5.73
22	**40G0**	30.38	23.32	1.01							54.71
22	**40G1**	5.88	4.52	0.20							10.60
22	**41G0**	19.74	26.60								46.34
22	**Total**	479.63	70.94	2.77	0.32	0.00	0.00	0.00	0.00	0.00	553.66
23	**39G2**	395.67	21.40			0.34					417.41
23	**40G2**	46.02	2.19	9.55	67.28	59.1	32.4	24.98	16.69	10.96	269.17
23	**41G2**	39.01	51.06	0.3	0.49	0.14	0.09	0.05	0.05		91.19
23	**Total**	480.70	74.65	9.85	67.77	59.58	32.49	25.03	16.74	10.96	777.77
24	**37G2**	10.45	5.04	0.44	0.29	0.20	0.21	0.10	0.05		16.78
24	**37G3**	30.40	3.81	7.73	10.38	8.30	6.19	2.84	1.55	1.93	73.13
24	**37G4**	180.75		3.90	2.23	1.67	1.67			0.56	190.78
24	**38G2**	1,330.41	99.34	2.01	0.77	2.03	0.72	1.42	0.07		1,436.77
24	**38G3**	698.83	44.83	17.76	7.55	5.40	4.55	2.00	1.58	0.72	783.22
24	**38G4**	48.61	10.31	39.29	32.70	25.62	21.21	8.31	4.56	6.87	197.48
24	**39G2**	361.21	19.54			0.31					381.06
24	**39G3**	328.89	184.42	87.50	52.13	44.87	35.88	13.12	8.23	8.26	763.30
24	**39G4**	158.28	75.19	100.04	32.41	22.88	21.45	4.73	5.80	2.92	423.70
24	**Total**	3,147.83	442.48	258.67	138.46	111.28	91.88	32.52	21.84	21.26	4,266.22
22-24	**Total**	4,108.16	588.07	271.29	206.55	170.86	124.37	57.55	38.58	32.22	5,597.65
21-24	**Total**	4,425.08	797.96	307.35	208.50	170.86	124.49	57.55	38.58	32.22	6,162.59

Table 8: Mean weight (g) of herring incl. CBH by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	**41G0**	23.35	55.41	72.10							56.59
21	**41G1**	23.35	55.41	72.10							56.59
21	**41G2**	20.80	33.11	66.12							24.54
21	**42G1**	21.93	41.06	69.87							31.38
21	**42G2**	19.80	23.49	57.94							20.65
21	**43G1**	21.42	27.57	91.63	146.97		187.00				26.23
21	**43G2**	20.26	20.34								20.28
21	**Total**	20.77	43.21	72.49	146.97		187.00				32.88
22	**37G0**	13.67	39.78	49.21	76.00						20.41
22	**37G1**	6.59	39.81								6.93
22	**38G0**	14.93	34.93	56.39							17.92
22	**38G1**	11.91	28.94								11.98
22	**39F9**	14.52	31.49								14.99
22	**39G0**	13.07	37.93	57.81							22.02
22	**39G1**	3.27									3.27
22	**40F9**	19.85	38.25	54.67							28.33
22	**40G0**	19.85	38.25	54.67							28.33
22	**40G1**	19.85	38.25	54.67							28.33
22	**41G0**	23.44	38.30								31.97
22	**Total**	9.58	38.18	55.23	76.00						13.51
23	**39G2**	13.61	32.90			34.65					14.61
23	**40G2**	8.60	41.36	104.67	143.11	173.16	178.07	193.95	209.76	208.63	140.24
23	**41G2**	15.04	36.18	66.10	103.43	156.75	178.00	196.05	222.07		28.09
23	**Total**	13.25	35.39	103.49	142.82	172.33	178.07	193.96	209.80	208.63	59.68
24	**37G2**	12.22	31.66	64.09	89.41	83.25	67.57	51.47	114.54		22.84
24	**37G3**	7.94	38.87	76.45	115.46	129.11	134.82	153.70	128.28	137.45	68.16
24	**37G4**	9.19		80.99	80.99	80.99	80.99			80.99	12.97
24	**38G2**	11.16	33.84	60.13	62.81	38.55	58.61	30.89	64.88		12.91
24	**38G3**	9.06	36.82	66.09	83.68	83.37	83.40	102.28	88.68	103.54	14.09
24	**38G4**	10.62	41.97	71.09	107.27	122.14	127.09	144.04	102.00	131.90	79.21
24	**39G2**	13.61	32.90			34.65					14.61
24	**39G3**	13.42	38.42	65.85	105.24	114.71	112.68	140.85	111.54	126.91	46.83
24	**39G4**	12.01	42.41	63.62	77.99	76.65	70.01	84.43	71.77	77.65	43.14
24	**Total**	11.10	37.67	66.30	98.27	105.97	104.98	127.14	98.37	120.71	26.41
22-24	**Total**	11.18	37.45	67.54	112.85	129.11	124.08	156.20	146.72	150.61	29.76
21-24	**Total**	11.86	38.96	68.12	113.17	129.11	124.14	156.20	146.72	150.61	30.04

Table 9: Total biomass (t) of herring incl. CBH by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	**41G0**	15.6	371.2	140.6							527.4
21	**41G1**	241.7	5,738.8	2,167.3							8,147.8
21	**41G2**	1,784.0	988.7	103.8							2,876.5
21	**42G1**	429.2	624.9	67.8							1,121.9
21	**42G2**	1,773.9	590.5	7.0							2,371.4
21	**43G1**	1,670.5	601.3	127.4	286.6		22.4				2,708.2
21	**43G2**	668.2	154.4								822.6
21	**Total**	6,583.1	9,069.8	2,613.9	286.6	0.0	22.4	0.0	0.0	0.0	18,575.8
22	**37G0**	144.8	99.5	8.9	24.3						277.5
22	**37G1**	1,683.5	105.9								1,789.4
22	**38G0**	413.4	89.1	58.1							560.6
22	**38G1**	722.6	8.1								730.7
22	**39F9**	73.9	4.7								78.6
22	**39G0**	150.2	224.5	13.9							388.6
22	**39G1**	161.7									161.7
22	**40F9**	63.1	93.3	6.0							162.4
22	**40G0**	603.0	892.0	55.2							1,550.2
22	**40G1**	116.7	172.9	10.9							300.5
22	**41G0**	462.7	1,018.8								1,481.5
22	**Total**	4,595.6	2,708.8	153.0	24.30	0.0	0.0	0.00	0.00	0.0	7,481.7
23	**39G2**	5,385.1	704.1			11.8					6,101.0
23	**40G2**	395.8	90.6	999.6	9,628.4	10,233.8	5,769.5	4,844.9	3,500.9	2,286.5	37,750.0
23	**41G2**	586.7	1,847.4	19.8	50.7	21.9	16.0	9.8	11.1		2,563.4
23	**Total**	6,367.6	2,642.1	1,019.4	9,679.1	10,267.5	5,785.5	4,854.7	3,512.0	2,286.5	46,414.4
24	**37G2**	127.7	159.6	28.2	25.9	16.7	14.2	5.1	5.7		383.1
24	**37G3**	241.4	148.1	591.0	1,198.5	1,071.6	834.5	436.5	198.8	265.2	4,985.6
24	**37G4**	1,661.1		315.9	180.6	135.3	135.3			45.4	2,473.6
24	**38G2**	14,847.4	3,361.7	120.9	48.4	78.3	42.2	43.9	4.5		18,547.3
24	**38G3**	6,331.4	1,650.6	1,173.8	631.8	450.2	379.5	204.6	140.1	74.5	11,036.5
24	**38G4**	516.2	432.7	2,793.1	3,507.7	3,129.2	2,695.6	1,197.0	465.1	906.2	15,642.8
24	**39G2**	4,916.1	642.9			10.7					5,569.7
24	**39G3**	4,413.7	7,085.4	5,761.9	5,486.2	5,147.0	4,043.0	1,848.0	918.0	1,048.3	35,751.5
24	**39G4**	1,900.9	3,188.8	6,364.5	2,527.7	1,753.8	1,501.7	399.4	416.3	226.7	18,279.8
24	**Total**	34,955.9	16,669.8	17,149.3	13,606.8	11,792.8	9,646.0	4,134.5	2,148.5	2,566.3	112,669.9
22-24	**Total**	45,919.1	22,020.7	18,321.7	23,310.2	22,060.3	15,431.5	8,989.2	5,660.5	4,852.8	166,566.0
21-24	**Total**	52,502.2	31,090.5	20,935.6	23,596.8	22,060.3	15,453.9	8,989.2	5,660.5	4,852.8	185,141.8

Table 10: Numbers (millions) of sprat by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	**41G0**		0.08	0.60	0.47	0.03	0.01				1.19
21	**41G1**		1.30	9.30	7.32	0.46	0.12				18.50
21	**41G2**	18.75	7.82	11.88	12.52	1.37	0.46	0.03			52.83
21	**42G1**		0.67	2.99	4.89	1.26	0.73	0.19			10.73
21	**42G2**	3.09	0.04	0.07	0.03						3.23
21	**43G1**	0.69	20.80	0.31	0.26	0.01	0.05	0.01			22.13
21	**43G2**		0.03	0.01							0.04
21	**Total**	22.53	30.74	25.16	25.49	3.13	1.37	0.23	0.00	0.00	108.65
22	**37G0**		1.14	16.80	0.89	0.25					19.08
22	**37G1**	0.98	11.39	80.38	3.31	0.31					96.37
22	**38G0**		4.94	86.44	3.94	1.18				0.53	97.03
22	**38G1**		0.01	0.04							0.05
22	**39F9**	0.85	2.58	9.36	0.40	0.01					13.20
22	**39G0**	0.95	1.00	12.78	0.88	0.04					15.65
22	**39G1**	49.15	0.37	1.42	0.06	0.00					51.00
22	**40F9**	0.27	0.26	2.71	0.14	0.02					3.40
22	**40G0**	2.59	2.48	25.87	1.31	0.18					32.43
22	**40G1**	0.50	0.48	5.01	0.25	0.04					6.28
22	**41G0**		0.25	4.24	0.14						4.63
22	**Total**	55.29	24.90	245.05	11.32	2.03	0.00	0.00	0.00	0.53	339.12
23	**39G2**	0.69	8.24	13.04	2.62	1.61	0.67				26.87
23	**40G2**	96.33	44.82	186.98	84.69	44.72	22.40	8.24	2.86	1.13	492.17
23	**41G2**	2.04	1.09	1.38	0.48	0.19	0.13	0.02	0.02	0.01	5.36
23	**Total**	99.06	54.15	201.40	87.79	46.52	23.20	8.26	2.88	1.14	524.40
24	**37G2**		3.71	8.65	2.05	1.44	0.52	0.02			16.39
24	**37G3**	508.36	147.99	17.52	3.94	0.39	2.91				681.11
24	**37G4**	765.53	531.11	168.27	36.55	6.11	18.71				1,526.28
24	**38G2**	6.13	86.31	69.15	13.52	6.71	4.19	0.01			186.02
24	**38G3**	172.95	539.16	297.59	65.80	31.36	27.99				1,134.85
24	**38G4**	101.12	279.82	186.00	39.07	18.44	11.69	0.65			636.79
24	**39G2**	0.63	7.53	11.91	2.39	1.47	0.61				24.54
24	**39G3**	14.05	138.11	237.36	64.17	48.36	17.47	0.74			520.26
24	**39G4**	0.98	89.52	143.23	50.83	42.45	12.36	0.96			340.33
24	**Total**	1,569.75	1,823.26	1,139.68	278.32	156.73	96.45	2.38	0.00	0.00	5,066.57
22-24	**Total**	1,724.10	1,902.31	1,586.13	377.43	205.28	119.65	10.64	2.88	1.67	5,930.09
21-24	**Total**	1,746.63	1,933.05	1,611.29	402.92	208.41	121.02	10.87	2.88	1.67	6,038.74

Table 11: Mean weight (g) of sprat by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0		15.22	18.47	19.49	22.21	22.71				18.77
21	41G1		15.22	18.47	19.49	22.21	22.71				18.77
21	41G2	1.90	8.21	19.39	20.60	22.45	23.53	27.40			11.93
21	42G1		13.53	19.90	21.88	23.42	26.43	27.40			21.40
21	42G2	1.66	15.54	15.54	15.54						2.27
21	43G1	6.59	9.79	16.77	18.12	22.34	26.23	27.40			9.94
21	43G2	3.20	8.05	15.54	15.54						9.48
21	Total	2.01	9.72	19.05	20.48	22.81	25.04	27.40			13.41
22	37G0		13.36	14.84	15.42	17.05					14.81
22	37G1	5.01	11.69	13.88	13.89	17.05					13.54
22	38G0		13.60	14.84	15.30	17.05				18.00	14.84
22	38G1		12.19	12.98	12.92						12.88
22	39F9	4.86	10.93	13.42	13.40	17.05					12.38
22	39G0	4.53	12.70	14.44	15.67	17.05					13.80
22	39G1	3.46	7.40	15.82	15.82						3.85
22	40F9	3.01	12.37	14.40	14.87	17.05					13.37
22	40G0	3.01	12.37	14.40	14.87	17.05					13.37
22	40G1	3.01	12.37	14.40	14.87	17.05					13.37
22	41G0		13.81	13.67	14.32						13.70
22	Total	3.50	12.15	14.37	14.79	17.05				18.00	12.47
23	39G2	5.46	14.16	15.42	15.63	16.1	16.04				14.85
23	40G2	4.86	16.3	18.8	21.02	23.03	24.26	26.11	25.24	26.24	17.04
23	41G2	3.99	14.22	16.95	19.57	22.86	22.17	24.98	25.25	26.24	12.09
23	Total	4.85	15.93	18.57	20.85	22.79	24.01	26.10	25.24	26.24	16.87
24	37G2		14.88	15.66	16.22	16.66	16.70	20.45			15.68
24	37G3	4.65	11.55	13.40	13.33	15.40	12.94				6.47
24	37G4	4.79	12.75	13.86	13.61	15.12	12.74				8.91
24	38G2	6.72	13.25	14.95	15.40	16.59	15.15	20.45			13.99
24	38G3	6.10	12.86	14.94	15.69	17.31	15.10				12.72
24	38G4	6.72	13.16	14.62	15.58	17.33	15.04	21.00			12.88
24	39G2	5.46	14.16	15.42	15.63	16.10	16.04				14.85
24	39G3	5.37	14.14	15.78	16.95	17.62	16.86	20.94			15.42
24	39G4	8.19	13.84	15.96	17.64	18.25	17.36	20.83			15.98
24	Total	5.03	12.94	15.02	16.00	17.52	15.20	20.92			11.31
22-24	Total	4.97	13.02	15.37	17.10	18.71	16.90	24.94	25.24	23.65	11.87
21-24	Total	4.93	12.96	15.43	17.31	18.77	17.00	25.00	25.24	23.65	11.90

Table 12: Total biomass (t) of sprat by age and area (FRV “SOLEA” 662, Oct 2012).

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0		1.2	11.1	9.2	0.7	0.2				22.4
21	41G1		19.8	171.8	142.7	10.2	2.7				347.2
21	41G2	35.6	64.2	230.4	257.9	30.8	10.8	0.8			630.5
21	42G1		9.1	59.5	107.0	29.5	19.3	5.2			229.6
21	42G2	5.1	0.6	1.1	0.5	0.0	0.0				7.3
21	43G1	4.5	203.6	5.2	4.7	0.2	1.3	0.3			219.8
21	43G2		0.2	0.2							0.4
21	Total	45.2	298.7	479.3	522.0	71.4	34.3	6.3	0.0	0.0	1,457.2
22	37G0		15.2	249.3	13.7	4.3					282.5
22	37G1	4.9	133.1	1,115.7	46.0	5.3					1,305.0
22	38G0		67.2	1,282.8	60.3	20.1				9.5	1,439.9
22	38G1		0.1	0.5							0.6
22	39F9	4.1	28.2	125.6	5.4	0.2					163.5
22	39G0	4.3	12.7	184.5	13.8	0.7					216.0
22	39G1	170.1	2.7	22.5	0.9						196.2
22	40F9	0.8	3.2	39.0	2.1	0.3					45.4
22	40G0	7.8	30.7	372.5	19.5	3.1					433.6
22	40G1	1.5	5.9	72.1	3.7	0.7					83.9
22	41G0		3.5	58.0	2.0						63.5
22	Total	193.5	302.5	3,522.5	167.4	34.7	0.0	0.0	0.0	9.5	4,230.1
23	39G2	3.8	116.7	201.1	41.0	25.9	10.7				399.2
23	40G2	468.2	730.6	3,515.2	1,780.2	1,029.9	543.4	215.1	72.2	29.7	8,384.5
23	41G2	8.1	15.5	23.4	9.4	4.3	2.9	0.5	0.5	0.3	64.9
23	Total	480.1	862.8	3,739.7	1,830.6	1,060.1	557.0	215.6	72.7	30.0	8,848.6
24	37G2		55.2	135.5	33.3	24.0	8.7	0.4			257.1
24	37G3	2,363.9	1,709.3	234.8	52.5	6.0	37.7				4,404.2
24	37G4	3,666.9	6,771.7	2,332.2	497.4	92.4	238.4				13,599.0
24	38G2	41.2	1,143.6	1,033.8	208.2	111.3	63.5	0.2			2,601.8
24	38G3	1,055.0	6,933.6	4,446.0	1,032.4	542.8	422.6				14,432.4
24	38G4	679.5	3,682.4	2,719.3	608.7	319.6	175.8	13.7			8,199.0
24	39G2	3.4	106.6	183.7	37.4	23.7	9.8				364.6
24	39G3	75.4	1,952.9	3,745.5	1,087.7	852.1	294.5	15.5			8,023.6
24	39G4	8.0	1,239.0	2,286.0	896.6	774.7	214.6	20.0			5,438.9
24	Total	7,893.3	23,594.3	17,116.8	4,454.2	2,746.6	1,465.6	49.8	0.0	0.0	57,320.6
22-24	Total	8,566.9	24,759.6	24,379.0	6,452.2	3,841.4	2,022.6	265.4	72.7	39.5	70,399.3
21-24	Total	8,612.1	25,058.3	24,858.3	6,974.2	3,912.8	2,056.9	271.7	72.7	39.5	71,856.5

Table 13: Numbers (m) of herring excl. CBH by age and area (FRV “SOLEA” 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	0.67	6.70	1.95							9.32	
21	41G1	10.35	103.57	30.06							143.98	
21	41G2	85.77	29.86	1.57							117.20	
21	42G1	19.57	15.22	0.97							35.76	
21	42G2	89.59	25.14	0.12							114.85	
21	43G1	77.99	21.81	1.39	1.95		0.12				103.26	
21	43G2	32.98	7.59								40.57	
21	Total	316.92	209.89	36.06	1.95	0.00	0.12	0.00	0.00	0.00	564.94	
22	37G0	10.59	2.50	0.18	0.32						13.59	
22	37G1	255.46	2.66								258.12	
22	38G0	27.69	2.55	1.03							31.27	
22	38G1	60.67	0.28								60.95	
22	39F9	5.09	0.15								5.24	
22	39G0	11.49	5.92	0.24							17.65	
22	39G1	49.46	0.00	0.00							49.46	
22	40F9	3.18	2.44	0.11							5.73	
22	40G0	30.38	23.32	1.01							54.71	
22	40G1	5.88	4.52	0.20							10.60	
22	41G0	19.74	26.60								46.34	
22	Total	479.63	70.94	2.77	0.32	0.00	0.00	0.00	0.00	0.00	553.66	
23	39G2	395.70	19.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	415.02	
23	40G2	46.02	2.19	9.55	67.28	59.1	32.4	24.98	16.69	10.96	269.17	
23	41G2	39.01	51.06	0.3	0.49	0.14	0.09	0.05	0.05		91.19	
23	Total	480.73	72.56	9.85	67.77	59.24	32.49	25.03	16.74	10.96	775.38	
24	37G2	10.45	4.96	0.44	0.29	0.10	0.03	0.03	0.05	0.00	16.35	
24	37G3	30.41	3.76	7.73	10.38	7.58	4.77	2.67	1.02	1.45	69.78	
24	37G4	180.75	0.00	3.90	2.23	1.67	0.00	0.00	0.00	0.00	188.56	
24	38G2	1,330.54	97.15	2.01	0.77	0.00	0.00	0.00	0.00	0.00	1,430.46	**excl. CBH**
24	38G3	698.84	44.67	17.71	7.57	2.43	1.57	1.03	0.19	0.23	774.24	
24	38G4	48.61	10.06	39.30	32.71	20.71	14.18	6.86	1.54	4.24	178.20	
24	39G2	361.24	17.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	378.87	
24	39G3	328.97	181.93	87.50	52.10	32.96	19.09	10.35	3.60	5.62	722.12	
24	39G4	158.21	74.64	100.00	32.44	9.11	2.78	1.72	0.40	0.37	379.66	
24	Total	3,148.03	434.80	258.59	138.49	74.57	42.42	22.66	6.79	11.89	4,138.25	
22-24	Total	4,108.39	578.31	271.21	206.58	133.81	74.91	47.69	23.53	22.85	5,467.29	
21-24	Total	4,425.31	788.20	307.27	208.53	133.81	75.03	47.69	23.53	22.85	6,032.23	

Table 14: Mean weight (g) of herring excl. CBH by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	23.35	55.41	72.10							56.59	
21	41G1	23.35	55.41	72.10							56.59	
21	41G2	20.80	33.11	66.12							24.54	
21	42G1	21.93	41.06	69.87							31.38	
21	42G2	19.80	23.49	57.94							20.65	
21	43G1	21.42	27.57	91.63	146.97		187.00				26.23	
21	43G2	20.26	20.34								20.28	
21	Total	20.77	43.21	72.49	146.97		187.00				32.88	
22	37G0	13.67	39.78	49.21	76.00						20.41	
22	37G1	6.59	39.81								6.93	
22	38G0	14.93	34.93	56.39							17.92	
22	38G1	11.91	28.94								11.98	
22	39F9	14.52	31.49								14.99	
22	39G0	13.07	37.93	57.81							22.02	
22	39G1	3.27									3.27	
22	40F9	19.85	38.25	54.67							28.33	
22	40G0	19.85	38.25	54.67							28.33	
22	40G1	19.85	38.25	54.67							28.33	
22	41G0	23.44	38.30								31.97	
22	Total	9.58	38.18	55.23	76.00						13.51	
23	39G2	13.10	33.69								14.06	
23	40G2	8.60	41.36	104.67	143.11	173.16	178.07	193.95	209.76	208.63	140.24	
23	41G2	15.04	36.18	66.10	103.43	156.75	178.00	196.05	222.07		28.09	
23	Total	12.83	35.68	103.49	142.82	173.12	178.07	193.96	209.80	208.63	59.52	
24	37G2	11.76	31.26	64.56	90.26	115.73	115.73	115.73	115.73		21.83	
24	37G3	7.70	38.89	78.50	115.51	134.59	152.93	159.04	154.44	152.37	67.93	
24	37G4	8.90		84.57	84.57	84.57					12.03	
24	38G2	10.78	33.48	61.33	64.36						12.42	
24	38G3	8.78	36.54	68.58	85.66	109.37	123.13	147.54	197.89	150.61	13.32	excl. CBH
24	38G4	10.27	42.37	73.42	107.84	135.59	155.11	160.71	163.68	156.60	80.60	
24	39G2	13.10	33.69								14.06	
24	39G3	12.99	38.40	67.63	105.82	134.01	155.17	161.69	163.83	150.83	45.95	
24	39G4	11.64	42.42	65.52	80.11	98.23	110.48	115.94	126.05	123.09	41.23	
24	Total	10.73	37.63	68.29	99.30	128.20	150.76	156.92	160.76	152.21	25.12	
22-24	Total	10.84	37.45	69.43	113.54	148.09	162.60	176.36	195.64	179.26	28.83	
21-24	Total	11.56	38.98	69.79	113.85	148.09	162.64	176.36	195.64	179.26	29.21	

Table 15: Total biomass (t) of herring excl. CBH by age and area (FRV "SOLEA" 662, Oct 2012).

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	15.6	371.2	140.6							527.4	
21	41G1	241.7	5,738.8	2,167.3							8,147.8	
21	41G2	1,784.0	988.7	103.8							2,876.5	
21	42G1	429.2	624.9	67.8							1,121.9	
21	42G2	1,773.9	590.5	7.0							2,371.4	
21	43G1	1,670.5	601.3	127.4	286.6		22.4				2,708.2	
21	43G2	668.2	154.4								822.6	
21	Total	6,583.1	9,069.8	2,613.9	286.6	0.0	22.4	0.0	0.0	0.0	18,575.8	
22	37G0	144.8	99.5	8.9	24.3						277.5	
22	37G1	1,683.5	105.9								1,789.4	
22	38G0	413.4	89.1	58.1							560.6	
22	38G1	722.6	8.1								730.7	
22	39F9	73.9	4.7								78.6	
22	39G0	150.2	224.5	13.9							388.6	
22	39G1	161.7									161.7	
22	40F9	63.1	93.3	6.0							162.4	
22	40G0	603.0	892.0	55.2							1,550.2	
22	40G1	116.7	172.9	10.9							300.5	
22	41G0	462.7	1,018.8								1,481.5	
22	Total	4,595.6	2,708.8	153.0	24.30	0.0	0.0	0.00	0.00	0.0	7,481.7	
23	39G2	5,185.6	650.8								5,836.4	
23	40G2	395.8	90.6	999.6	9,628.4	10,233.8	5,769.5	4,844.9	3,500.9	2,286.5	37,750.0	
23	41G2	586.7	1,847.4	19.8	50.7	21.9	16.0	9.8	11.1		2,563.4	
23	Total	6,168.1	2,588.8	1,019.4	9,679.1	10,255.7	5,785.5	4,854.7	3,512.0	2,286.5	46,149.8	
24	37G2	123.0	155.0	28.3	26.5	12.1	3.0	3.0	6.0		357.0	
24	37G3	234.2	146.4	607.0	1,198.8	1,020.9	730.1	425.2	156.8	220.9	4,740.3	
24	37G4	1,609.1		330.1	188.6	141.5					2,269.3	
24	38G2	14,339.1	3,252.9	123.4	49.2						17,764.6	
24	38G3	6,138.1	1,632.4	1,214.3	648.7	265.8	193.2	152.5	37.8	33.9	10,316.6	excl. CBH
24	38G4	499.0	426.3	2,885.0	3,527.6	2,808.3	2,199.0	1,102.3	251.9	663.3	14,362.5	
24	39G2	4,734.0	594.1								5,328.1	
24	39G3	4,272.9	6,986.8	5,917.9	5,513.5	4,416.4	2,962.4	1,673.9	589.6	846.9	33,180.2	
24	39G4	1,841.0	3,166.2	6,552.4	2,598.8	894.6	307.3	198.9	50.3	45.3	15,654.8	
24	Total	33,790.4	16,360.1	17,658.4	13,751.8	9,559.4	6,395.0	3,555.8	1,092.4	1,810.4	103,973.5	
22-24	Total	44,554.1	21,657.6	18,830.8	23,455.2	19,815.1	12,180.5	8,410.5	4,604.4	4,096.9	157,605.0	
21-24	Total	51,137.2	30,727.4	21,444.7	23,741.8	19,815.1	12,202.9	8,410.5	4,604.4	4,096.9	176,180.8	

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National Marine Fisheries Research Institute – NMFRI, Gdynia (Poland)

THE CRUISE REPORT

FROM THE JOINT LATVIAN-POLISH BALTIC INTERNATIONAL ACOUSTIC SURVEY – BIAS 2012 ON THE R/V "BALTICA" IN THE ICES SUBDIVISIONS 26N AND 28 OF THE BALTIC SEA

(10-19 October 2012)

Working paper on the WGBIFS meeting in Tartu, Estonia, 20-25.03.2013

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Riga – Gdynia, February 2013

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INTRODUCTION

More less regular acoustic estimations of pelagic fish stocks in the Baltic Sea initiated by BaltNIIRH (now BIOR) and Institute für Hochseefischerei in Rostock (DDR) was performed since 1983, but the first scattered surveys was made since 1977 [Hoziosky et al. 1987, Shvetsov 1983, Shvetsov et al. 1988]. The first joint Latvian-Polish acoustic survey on the research vessel "Issledovatel Baltiki" (renamed on the r/v "Baltijas Petnieks") of former BaltNIRH was realised in October 1991 and was performed for the estimations of the biomas of Baltic clupeid stocks in the pelagic offshore zone of the ICES Sub-divisions 25-29 [Shvetsov et al. 1992]. The next joint acoustic survey in cooperation of scientists from Poland, Latvia and Estonia were performed on the Polish r/v "Baltica" in October 1996 [Grygiel 2006, Orłowski et al. 1997]. Several years in October (1994-2004) and May (2003-2004) BIOR as assignee of BaltNIIRH, LatFRI (in noted period) and LatFRA cooperated with Russian AtlantNIRO in Kaliningrad, but since 2005 the superb regular collaboration has been formed with Polish SFI (since June 2011 named as National Marine Fisheries Research Institute – NMFRI) in Gdynia and as a result we have made 4 BASS and 8 BIAS on pelagic fish stocks and 13 BITS on demersal fish stocks.

This was the 8th joint Latvian-Polish Baltic International Acoustic Survey (BIAS) in the ICES Sub-divisions 26N and 28 conducted by the r/v "Baltica" in October 2012. The reported cruise was organized on the basis of the agreement between the Institute of Food Safety, Animal Health and Environment (BIOR) from Riga and the National Marine Fisheries Research Institute (NMFRI) from Gdynia. The vessel was operated within the Latvian, Estonian and Swedish EEZs (ICES Sub-divisions 26N and 28). The "Latvian National Fisheries Data Collection Programme, 2012" in accordance with the EU Commission Regulations No. 1639/2001, 1581/2004, 665/2008, 1078/2008 and 199/2008 was partly subsidized this cruise. It was coordinated by the ICES Baltic International Fish Survey Working Group – WGBIFS [ICES 2012].

Pelagic research catches carried out during an acoustic survey are the information source, independent from topical preferences in fishery, about quantitative changes in a process of clupeids geographical and bathymetrical distribution in the Baltic Sea. The data from hydrological measurements are the information source about abiotic environmental factors (seawater temperature, salinity, oxygen content) influencing sprat and herring spatial distribution. Echo-integration results along the pre-selected tracks are the basic materials for fish stock biomass calculations.

The ICES Baltic Fisheries Assessment Working Group (WGBFAS) applies the BIAS data for clupeids (sprat and herring) stock biomass assessment and spatial distribution updating. The basic acoustic and biological data collected during recently carried out survey are stored in the BAD1 and FishFrame Acoustic (former BAD2) international databases, managed by the ICES Secretariat.

The main aims of cruise were:

- to collect the echo-integration data for the estimation of the clupeids stocks biomass and abundance in the central-eastern Baltic;
- to collect materials from the fish control catches for investigations of the Baltic sprat, and in lesser degree herring, spawning stocks spatial distribution in the offshore waters of Latvia, Estonia and Sweden, moreover for analyses of the age-length structure and recruiting year-class strength of these fishes populations;
- to collect sprat and herring stomachs samples for feeding condition and food components analyses;
- to analyse the vertical and horizontal changes of the basic hydrological parameters (temperature, salinity and oxygen content) at the trawling positions and at the standard HELCOM hydrological stations;
- to collect the zooplankton and ichthyoplankton samples at the referring area.

1. MATERIALS AND METHODS

1.1. Personnel assignment

The scientific staff – seven persons:

F. Svecovs, (BIOR, Riga – Latvia) – scientific staff leader, acoustic team;
W. Grygiel (NMFRI, Gdynia – Poland) – cruise leader, fish sampling team;
A. Grelowski (NMFRI, Gdynia – Poland) – hydrologist, hydrology team;
J. Slembarski (NMFRI, Gdynia – Poland) – acoustician, acoustic team;
G. Strods (BIOR, Riga – Latvia) – ichthyologist, acoustic and fish sampling team;
I. Putnis (BIOR, Riga – Latvia) – hydrobiologist, zooplankton and fish sampling team;
V. Cervoncevs (BIOR, Riga – Latvia) – ichthyologist, fish sampling team;
I. Kazmers (BIOR, Riga – Latvia) – hydrobiologist, zooplankton and fish sampling team.

1.2. Survey description

The reported BIAS survey of the r/v "Baltica" took place during the period of 10-19 October 2012. The vessel left the port of Gdynia on 10.10.2011 at 22:00 (GMT+01:00) and was navigated in the north-eastern direction to the geographical position 56°07'N 019°08'E at the HELCOM station No 46/J52. The direct at sea researches began on 11.10.2012 in the afternoon. The sea researches were conducted in the period of 11-18.10.2012 within Latvian, Estonian and Sweden EEZs (ICES Sub-divisions 26N and 28) and were ended on 19.10.2012 morning. Then the r/v "Baltica" was navigated to the port Ventspils (Latvia), reaching it on 19.10.2012 morning.

1.3. Survey methods and performance

1.3.1. Acoustical and trawling methods

Acoustic data were collected with the SIMRAD EK-60 38 kHz and 120 kHz two frequency split beam scientific echo-sounder equipped with "EchoView Version 4.10" software for the data analysis. These data collected during the described here BIAS were delivered to the Latvian researchers for further elaboration. The survey echo-integration tracks were planned in the similar pattern as in the previous years, due to historical comparability of the data. Overall 668 nautical miles long survey tracks was observed and recorded with hydroacoustic equipment. The final pattern of transects was covered with a relatively good density. The area covered in October 2012 was 1953.3 nm^2 in the northern part of the ICES Sub-division 26 and 7047.8 nm^2 in Sub-division 28, totally 9001.1 nm^2 (Fig. 1).

The calibration of acoustic equipment was made on 13.09.2012, nearby the north-eastern part of the Peninsula of Hel (Poland) at the geographical position 54°33.9'N, 018°55.7'E. New applied values of acoustic parameter Sv (transducer gain) for the transducers type ES38-B and ES120-7C were 24.22 and 26.72 dB, respectively. The above-mentioned apparatus as well as the hull-mounted transducer of the beam angle (ATHW) equal to 7.06°x7.20° were applied for echo-sounding as a standard technical device.

The pre-selection of the pelagic fish catches based on the ICES statistical rectangle area (with range of 0.5 degree in latitude and 1 degree in longitude) and the present density pattern of vertical distribution of clupeids along a transect. The intention was to carry out at least two control hauls per the ICES statistical rectangle [ICES 2003]. The water depth range-layer with sufficient for fish oxygen content (minimum 1.0÷2.0 ml/l) were taken into account in the process of the hauls distribution.

Totally 19 control hauls in the pelagic offshore zone were conducted with the pelagic trawl WP53/64×4 with 6 mm mesh bar length in the codend. The trawling depth and the net opening were controlled by the sonar type SCANMAR. The trawl headrope positions in particular hauls were localized on the depth range from 10 to 65 m from the sea surface (Tab. 1). Mean headrope depth location in all investigated areas was 33 m. The trawl mouth opening ranged from 16 to 20 m (mean – 18 m). The mean bottom depth at trawling positions varied from 32 to 173 m (mean for all investigated area – 90 m). Totally, 4 hauls were localized in the ICES Sub-division 26 and 15 hauls in the ICES Sub-division 28. On the whole, 11 catch samples were taken in the Latvian EEZ, 7 samples in the Sweden EEZ and 1 sample in the Estonian EEZ. All hauls were conducted outside the territorial waters of these countries. The catches were made at the daylight between 07:20 am and 18:10 pm (GMT+01:00). The speed of the vessel during trawling was 3.4 knots. The trawling time of the single haul lasted for 30 minutes. Each haul can be accepted as representative (valid from technical point of view).

1.3.2. Biological sampling

The samples of sprat and herring were taken from each catch station to determine the species proportion, length-mass relationship, sex, maturity and age-length relationship. Totally, the length and mass were measured for 3188 (int. al. 797 individuals of 0 year class) sprat, 1671 (int. al. 163 individuals of 0 year class) herring, 308 three-spined sticklebacks, 22 cods, 19 lumpfish, 11 smelts, 8 flounders, 4 salmons and 4 ninespine sticklebacks, and for one great sandeel and shorthorn sculpin. 699 (int. al. 51 individuals of 0 year class) and 1212 (int. al. 141 individuals of 0 year class) individuals of herring and sprat were aged respectively. The number of measured and analysed (aged) fish specimens during survey are aggregated in Tab. 2. Detailed ichthyological analyses were made according to standard procedures, directly on board of surveying vessel.

Due to herring and sprat normally cannot be distinguished from other species by visual inspection of the echogram species composition and fish length distributions were based on trawl catch results. Mean target strength of fish was calculated according to the following formulas [Foote et al. 1986, ICES 1983, 2011]:

for clupeids: $TS = 20\log L - 71.2$;
for gadoids: $TS = 20\log L - 67.5$;
cross section $\sigma = 4\pi 10^{a/10} \times L^{b/10}$.

The total number of fish in each ICES rectangle was estimated as a product of the mean area scattering cross-section – NASC (S_A) and the rectangle area, divided by corresponding mean acoustic cross-section. Fish abundance was separated into different species according to the mean catch composition in the given rectangle.

Zooplankton samples were collected at the positions of the hydrological stations or after trawling. Totally 17 zooplankton stations were realized (Fig. 2). Zooplankton has been collected with Judday net (mouth opening 0.1 m^2, mesh size 160 µm). This net was towed vertically from the depths 50 and 100, or from the bottom in case of lesser depth, to the water surface with speed of 0.4 m/s. Low speed of lifting allowed preventing plankton objects from destroying by mechanic forces. Samples were conserved in 2.5% unbuffered formaldehyde solution with sea water and processed during the year.

1.3.2. Hydrological and meteorological observations

The measurements of the basic hydrological parameters were realized in the period of 11-21 October 2011, totally at 24 stations, int. al. at 19 fish catch-stations and 4 HELCOM stations located in the central-eastern part of the Baltic Sea (Fig. 3). Results presented in this paper are linked with sites of the standard HELCOM stations and locations of the catch-stations during pelagic trawl hauling up. Hydrological stations were inspected with the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method. The hydrological row data, originated from measuring realized from the sea surface layer up to the bottom, were aggregated to the 1-m depth stratums, were information source about the abiotic factors potentially influencing fishes spatial distribution.

Meteorological observations of air temperature, wind velocity and directions and atmospheric pressure were realized at the actual geographic position of each control-haul and in every 10 minutes interval over the whole survey. The automatic meteorological station type "Milosz" was applied for measurements of the above-mentioned parameters. The values of meteorological and hydrological parameters registered at trawling stations are aggregated in Tab. 3.

2. RESULTS

2.1. Biological data

2.1.1. Catch statistics

Totally 11 fish species were recorded in the 19 pelagic control hauls taking place in ICES Sub-divisions 26N and 28 of the central-eastern Baltic Sea. In all hauls was dominated clupeids (totally 6640.6 kg or 98.6 % on average in mass of all catches) and by-catch of other species was negligible – 91.0 kg or 1.4 % of fish mass (Tab. 4 and 5). Sprat dominated very distinctly in catches of clupeids from ICES SD 26 as 88.6 % on average in mass of all clupeids and 93.6 % average per rectangle (Tab. 6 and 7). In catches from ICES SD 28 proportion of herring increased to 31.8 %, but the average share of herring per rectangle increased to 37.9 %. The herring average share in the catches in October 2010 was 28.3 % – for about 1.9 % less than it was in October 2011 and 9.4 % less than it was in October

2009 and 2.4 % more comparing to average share in October of period 2005-2009 [Grygiel et al. 2006, 2007, 2008, 2009, 2010, Svecovs et al. 2011].

Mean catch per unit effort (CPUE) for all species in investigated area amounted 740.4 kg/h, and in this 507.4 kg/h and 224.0 kg/h for sprat and herring respectively. The mean CPUEs of sprat were 631.5.0 kg/h and 466.0 kg/h respectively for ICES SD 26N and SD 28, making the total 93.5 % and 61.2% of all catch in mentioned areas (Tab. 8 and 9). The mean CPUEs of herring were 43.1 kg/h for SD 26N and 284.3 kg/h for SD 28. The distribution of CPUE scopes for sprat and herring per single haul is shown in Fig. 4 and per exclusive economic zones of countries in Fig. 5. The sprat CPUEs was considerably fluctuating in period of years 2005-2012 with decreasing tendency in the investigated areas. The slight increasing tendency in average CPUEs for herring in the period of years 2005-2011 in the investigated areas was observed in the same period (Fig. 6). In 2012 the average CPUE of sprat was almost two times less than in 2006 and 2010. Significantly higher average CPUEs for sprat in 2012 were noted in Sub-division 26N in comparison to Sub-division 28 in the period of years 2005-2010 was the opposite pattern, but CPUEs for herring were higher in SD 28 contrary to sprat.

2.1.2. Acoustical and biological estimates

The basic acoustic and biological data (surveyed area statistics, mean NASC, the mean scattering cross-section, the total number of fish, percentages of herring and sprat) per ICES rectangles and the estimated abundance and biomass of sprat and herring per above mentioned rectangles, collected in October 2012, are given in Tab. 10 and 11, for cod in Tab. 30. The geographical distributions of NASC and pelagic fish stock densities in the central-eastern Baltic Sea in October 2012 are shown in Fig. 7, 8 and 9.

The pelagic fish stock was represented mostly by sprat – 78.6 %. Herring was represented as 21.4 %, in comparison – 31.4 % in 2011. The highest sprat stock density (over 20.0 n×10^6/nm^2) were recorded in three ICES rectangles of the ICES Sub-divisions 26 and 28 – 41H0, 44H0 and 45H0 of investigated area. The highest average parameters of the sprat stock densities were recorded in the northern part of investigated area in ICES rectangles 44H0 and southern part 41H0. The distribution of the high density sprat concentrations in October 2012 slightly differed comparing with that from October of previous years, when high density sprat concentrations had found mostly in the central and northern parts of the investigated area. In 2012 sprat distribution pattern more-less was emulating pattern observed in years till 1992 [Hoziosky et al. 1988, Shvetsov et al. 1988, 1989, 1992, 2002], but not so evident as it was in 2010.

The herring stock density was significantly lower in comparison to sprat stock density. The highest density values (over 15.0 n×10^6/nm^2) was noted only in northern part of the investigated area in Sub-division 28 – rectangle 45H0.

Comparison of the acoustic results from October of 2005-2012 indicated that investigated sprat stock abundance and biomass has decreasing tendency, but herring stock has a slight increase (Fig. 10 and 11). The geographical distribution of main sprat stock shows similar pattern as in years with low population abundance since 1983 and establishes the fact observed during BASS in May [Svecovs et al. 2010, 2011, 2012].

The mean length and mean weight distributions of dominant fish species (sprat and herring) by hauls and rectangles in the ICES Sub-divisions 26 and 28 are shown in Tab. 12, 13, 14, 15, 16 and-17, Fig. 12 and 13, the same data for cod are shown in Tab. 30. The total length and mean weight in control hauls of sprat, herring and cod ranged as follows:

- sprat – 6.5÷16.0 cm (average TL = 11.4 cm), 1.6÷23.8 g (average W = 8.9 g)
- herring – 8.0÷22.5 cm (average TL = 17.0 cm), 3.6÷85.0 g (average W = 32.8 g)
- cod – 4.0÷46.5 cm (average TL = 26.0 cm), 2.0÷717.0 g (average W = 212.0 g)

Sprat at the smallest length classes had even composition of mean weights and lengths in whole area, but by increasing age the differences of mean weights appears in the investigated area – towards the south-southwest sprat became heavier, the same tendency was observed in previous years. Herring had more evident differences at length classes than it was observed at sprat. The age structured data of sprat and herring are aggregated in Tab. 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28 and 29. Sprat stock was composed mainly of year class 0 and 1 specimens (21.9 % and 29.5 % respectively) and year class 2 and 4 (16.0 % and 17.2 % respectively) as well. Herring stock was composed mainly of year class 4 and 5 specimens (25.4 % and 26.4 % respectively). The year-class 0 of sprat was represented by length-classes 6.5÷9.5 cm (8.2 cm on average) with mean weights 1.6÷6.0 g (3.6 g on average). The year-class 0 of herring was represented by length-classes 8.0÷11.5 cm (10.3 cm on average) with mean weights 3.6÷14.0 g (7.4 g on average).

2.1.3. Zooplankton estimates

Samples not yet processed. Work in progress.

2.2. Meteorological and hydrological data

2.2.1. Weather conditions

During trawling, following meteorological conditions were noticed (Fig. 14): wind force was fluctuated from 1 to 6°B, and strong winds (5÷6°B) occurred in 51% time of fishing operations, however not affected on the fish catches accomplishment. The moderate (4°B) and mild (1÷3°B) winds were appeared during overall 47% of time of the fishing operations. Winds from south-west and south-east directions, appeared in 53% time of trawling. Winds from west and east directions occurred in equal percentage (16%) of time of trawling. The air temperature gradually increased during survey, i.e. from 8.0°C (11.10.2012) to 14.5°C (19.10.2012).

2.2.2. Hydrology of the Gotland Deep

Vertical distribution of the seawater temperature, salinity and oxygen content along the hydrological research profile of the central-eastern Baltic is illustrated in Fig. 15, the hydrological situation of all investigated area are shown in Fig. 16, 17 and 18. The seawater temperature in the surface layer was changed from 11.19°C – at the deepest parts of the Gotland Deep to 14.42°C in the coastal waters. In the above-mentioned two different areas, salinity was fluctuated in the surface layer from 6.43 to 7.23 PSU and oxygen content changed from 6.97 to 7.65 ml/l. The analysis of the main hydrological parameters vertical distribution in scrutinized area indicate that, below the homogenous waters layer in respect to main hydrological parameters, the thermocline was located under 40 m depth, and the halocline and oxycline were formed below 55 m depth. Below the main thermocline, at the depth range 56÷70 m, where the winter waters occurred, temperature was ranged from 3.21 to 4.11°C (average 3.38°C). In the winter waters layer, where the minimum temperature was measured, the halocline was changed in the range of 7.50÷8.03 PSU, and oxycline geographically fluctuated from 4.62 to 7.27 ml/l. In the deeper waters, i.e. where the bottom depth was over 80 m, temperature was changed from 4.74 to 6.44°C (average 5.81°C), salinity - from 9.28 to 12.11 PSU (average 11.26 PSU), and oxygen content - from 0.00 to 2.47 ml/l (average 0.46 ml/l).

3. DISCUSSION

The data of the Latvian-Polish BIAS in the 4th quarter of 2012 were considered by the ICES BIFS Working Group (Helsinki, Finland meeting, 26-30.03.2012) as representative for the central-eastern Baltic for the estimation of abundance and spatial distribution of pelagic fishes (herring and sprat) recruiting year classes and were provided to the Baltic Fisheries Assessment Working Group (WGBFAS) as the input data for fish stocks resources calculation. The acoustic, catch, biological and hydrological data, collected during reported survey were uploaded to the BAD1, FishFrame and DATRAS international databases managed by the ICES Secretariat.

The collected data shows that sprat population in ICES SD 26N and 28 had decreasing tendency of abundance. The mean length and weight had the opposite tendency to abundance. The geographical distribution of sprat densities in the October 2012 had similar pattern as in years with low sprat abundance and establishes the fact observed during BASS and BIAS in 2010 and 2011.

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Table 1. Fish control-catch statistics in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Date***	***ICES rectangle***	***ICES SD***	***Mean bottom depth [m]***	***Headrope depth [m]***	***Vertical opening [m]***	***Trawling speed [knt]***	***Trawling direction [°]***	***Geographical position***				***Time***		***Haul duration [min]***	***Total catch [kg]***
									start		***end***					
									Latitude 00°00.0'N	***Longitude 00°00.0'E***	***Latitude 00°00.0'N***	***Longitude 00°00.0'E***	***start***	***end***		
1	2012-10-11	41G9	26-LAT	61	10	19	3.4	150	56°04.4'	19°50.9'	56°03.1'	19°52.4'	16:20	16:50	30	191.462
2	2012-10-12	41G8	26-SWE	126	20	19	3.4	355	56°07.9'	18°59.6'	56°09.4'	18°59.3'	07:20	07:50	30	696.275
3	2012-10-12	41H0	26-LAT	73	22/50	17/19	3.4	70	56°22.3'	20°06.5'	56°23.0'	20°09.4'	14:10	14:40	30	221.615
4	2012-10-12	41H0	26-LAT	32-36	10	20	3.4	245	56°21.5'	20°26.6'	56°20.8'	20°24.1'	17:45	18:15	30	29.610
5	2012-10-13	42H0	28-LAT	49-53	27	17	3.4	345	56°38.6'	20°40.1'	56°40.1'	20°39.4'	08:20	08:50	30	79.693
6	2012-10-13	42G9	28-SWE	153	23	18	3.4	305	56°42.2'	19°04.1'	56°43.3'	19°01.9'	18:10	18:40	30	59.520
7	2012-10-14	42G9	28-SWE	163-173	60	17	3.4	90	56°54.0'	19°17.1'	56°54.1'	19°20.0'	07:25	07:55	30	650.856
8	2012-10-14	42H0	28-LAT	60-68	40-48	16	3.4	90	56°54.3'	20°22.3'	56°54.4'	20°25.8'	12:50	13:20	30	1140.209
9	2012-10-14	42H0	28-LAT	51-53	33	17	3.4	280	56°58.7'	20°45.7'	56°59.3'	20°43.0'	16:10	16:40	30	323.740
10	2012-10-15	43G9	28-SWE	146-153	24	19	3.4	360	57°06.5'	19°38.4'	57°08.0'	19°38.2'	09:45	10:15	30	63.898
11	2012-10-15	43G9	28-SWE	148	20	20	3.4	340	57°16.8'	19°22.7'	57°18.3'	19°23.0'	14:10	14:40	30	226.623
12	2012-10-16	43H0	28-LAT	55-59	33-37	17	3.4	83	57°22.3'	20°51.6'	57°22.7'	20°54.5'	08:45	09:15	30	595.873
13	2012-10-16	43H1	28-LAT	63-68	38-42	16	3.4	80	57°29.4'	21°10.8'	57°29.8'	21°13.7'	13:25	13:55	30	564.871
14	2012-10-16	44H1	28-LAT	55-59	34-38	17	3.4	85-110	57°38.2'	21°08.2'	57°38.0'	21°10.9'	16:00	16:30	30	499.245
15	2012-10-17	44G9	28-SWE	126	24	19	3.4	25	57°38.5'	19°55.7'	57°40.0'	19°57.0'	08:10	08:40	30	54.804
16	2012-10-17	44H0/44H1	28-LAT/EST	82-87	42/65	17	3.4	45	57°55.2'	20°58.8'	57°56.4'	21°01.4'	15:20	15:50	30	544.935
17	2012-10-18	45H0	28-SWE	131	61	18	3.4	35-42	58°06.9'	20°07.7'	58°08.0'	20°09.4'	07:40	08:10	30	253.660
18	2012-10-18	45H0	28-EST	57	34	18	3.4	80	58°06.6'	20°50.9'	58°06.7'	20°53.8'	11:55	12:25	30	1.853
19	2012-10-18	44H1	28-EST	55-60	28-33	17	3.4	44	57°56.3'	21°23.9'	57°57.6'	21°26.1'	16:05	16:35	30	532.850

Table 2. Number of measured and aged fish individuals in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Fish species	***Number of measured individuals***			***Number of aged individuals***		
	SD 26	***SD 28***	***Total***	***SD 26***	***SD 28***	***Total***
Sprat (all)	728	2460	3188	272	940	1212
Sprat (yearclass 0)	172	625	797	27	114	141
Herring (all)	290	1381	1671	100	599	699
Herring (yearclass 0)	64	99	163		51	51
Herring (GoR population)	6	276	282	2	118	120
Cod	1	21	22			
Flounder	1	7	8			
Three-spined stickleback		308	308			
Ninespine stickleback		4	4			
Smelt		11	11			
Lumpfish	5	14	19			
Great sandeel		1	1			
Salmon	1	3	4			
Shorthorn sculpin	1		1			
Total	1027	4183	5210	372	1500	1872

Table 3. The values of meteorological and hydrological parameters registered at the trawling depth
in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Date of catch***	***Mean trawling depth [m]***	***Hydrological parameters***			***Meteorological parameters***				
			Temperature [°C]	***Salinity [PSU]***	***Oxygen [ml/l]***	***Wind direction***	***Wind direction deg***	***Wind force Beaufort***	***Wind speed m/s***	***Sea state WMO***
1	2012-10-11	20	3.48	7.80	6.07	NNW	338	6	12.3	4
2	2012-10-12	30	4.75	7.29	7.20	NW	315	3	4.4	3
3	2012-10-12	31/59	12.60/3.52	7.15/7.56	7.15/6.97	E	90	3	4.4	2
4	2012-10-12	20	14.19	7.21	6.78	NESW	0-360	1	0.9	1
5	2012-10-13	36	14.26	7.20	6.70	SE	135	4	6.7	2
6	2012-10-13	32	10.90	6.94	7.11	SE	135	6	12.3	4
7	2012-10-14	69	3.94	8.55	3.19	SE	135	3	4.4	2
8	2012-10-14	52	7.00	7.32	6.26	ESE	113	4	6.7	3
9	2012-10-14	42	13.91	7.22	6.73	ESE	113	4	6.7	3
10	2012-10-15	34	5.43	7.25	6.80	SE	135	4	6.7	3
11	2012-10-15	30	9.36	6.89	7.10	SSE	158	6	12.3	3
12	2012-10-16	44	13.65	7.16	6.67	WSW	248	6	12.3	4
13	2012-10-16	48	13.76	7.16	6.75	WSW	248	6	12.3	5
14	2012-10-16	45	13.81	7.18	6.80	WSW	248	6	12.3	4
15	2012-10-17	34	4.85	7.09	7.26	SW	225	2	2.5	2
16	2012-10-17	51/74	13.45/4.37	7.10/8.73	6.76/4.28	SW	225	6	12.3	4
17	2012-10-18	70	3.69	8.04	5.69	SW	225	5	9.4	3
18	2012-10-18	43	13.30	7.08	6.79	SSW	203	5	9.4	3
19	2012-10-18	39	13.57	7.15	6.78	SSW	203	6	12.3	4

Table 4. Fish control-catch results by species in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Total catch [kg]***	***Catch per species [kg]***										
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Ninespine stickleback***	***Smelt***	***Lumpfish***	***Great sandeel***	***Salmon***	***Shorthorn sculpin***
1	191.462	190.620							0.202		0.640	
2	696.275	695.870							0.405			
3	221.615	94.263	127.117	0.089								0.146
4	29.610	27.160	2.250		0.200							
5	79.693	77.750	1.830		0.113							
6	59.520	6.400	51.540	0.015		1.280			0.277	0.008		
7	650.856		649.150	1.706								
8	1140.209	919.928	219.300	0.717					0.264			
9	323.740	322.640	1.100									
10	63.898	28.890	0.079			31.540			0.304		3.085	
11	226.623	202.179	0.820	0.016		22.790	0.009		0.436		0.373	
12	595.873	568.360	27.220		0.180			0.113				
13	564.871	553.570	10.950		0.310			0.041				
14	499.245	482.160	16.110	0.128	0.347			0.500				
15	54.804	31.580	0.070	0.002		22.950	0.020		0.182			
16	544.935	33.260	510.990			0.110			0.575			
17	253.660		252.910	0.461		0.051			0.238			
18	1.853	1.506	0.184			0.057	0.001		0.105			
19	532.850	524.430	8.420									
SD 26	1138.962	1007.913	129.367	0.089	0.200				0.607		0.640	0.146
SD 28	5592.630	3752.653	1750.673	3.045	0.950	78.778	0.030	0.654	2.381	0.008	3.458	
SD 26+28	6731.592	4760.566	1880.040	3.134	1.150	78.778	0.030	0.654	2.988	0.008	4.098	0.146

Table 5. Share of fish species in mass by hauls in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Total catch [%]***	***Catch per species [%]***										
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Ninespine stickleback***	***Smelt***	***Lumpfish***	***Great sandeel***	***Salmon***	***Shorthorn sculpin***
1	100.000	99.560							0.106		0.334	
2	100.000	99.942							0.058			
3	100.000	42.535	57.359	0.040								0.066
4	100.000	91.726	7.599		0.675							
5	100.000	97.562	2.296		0.142							
6	100.000	10.753	86.593	0.025		2.151			0.465	0.013		
7	100.000		99.738	0.262								
8	100.000	80.681	19.233	0.063					0.023			
9	100.000	99.660	0.340									
10	100.000	45.213	0.124			49.360			0.476		4.828	
11	100.000	89.214	0.362	0.007		10.056	0.004		0.192		0.165	
12	100.000	95.383	4.568		0.030			0.019				
13	100.000	97.999	1.938		0.055			0.007				
14	100.000	96.578	3.227	0.026	0.070			0.100				
15	100.000	57.624	0.128	0.004		41.877	0.036		0.332			
16	100.000	6.103	93.771			0.020			0.106			
17	100.000		99.704	0.182		0.020			0.094			
18	100.000	81.274	9.930			3.076	0.054		5.666			
19	100.000	98.420	1.580									
SD 26	100.000	88.494	11.358	0.008	0.018				0.053		0.056	0.013
SD 28	100.000	67.100	31.303	0.054	0.017	1.409	0.001	0.012	0.043		0.062	
SD 26+28	100.000	70.720	27.929	0.047	0.017	1.170		0.010	0.044		0.061	0.002

Table 6. Share of dominant fish species in mass of the control catches in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Catch share***					
	Total [kg]	***Sprat [kg]***	***Herring [kg]***	***Total [%]***	***Sprat [%]***	***Herring [%]***
1	190.620	190.620		100.00	100.00	
2	695.870	695.870		100.00	100.00	
3	221.380	94.263	127.117	100.00	42.58	57.42
4	29.410	27.160	2.250	100.00	92.35	7.65
5	79.580	77.750	1.830	100.00	97.70	2.30
6	57.940	6.400	51.540	100.00	11.05	88.95
7	649.150		649.150	100.00		100.00
8	1139.228	919.928	219.300	100.00	80.75	19.25
9	323.740	322.640	1.100	100.00	99.66	0.34
10	28.969	28.890	0.079	100.00	99.73	0.27
11	202.999	202.179	0.820	100.00	99.60	0.40
12	595.580	568.360	27.220	100.00	95.43	4.57
13	564.520	553.570	10.950	100.00	98.06	1.94
14	498.270	482.160	16.110	100.00	96.77	3.23
15	31.650	31.580	0.070	100.00	99.79	0.22
16	544.250	33.260	510.990	100.00	6.11	93.89
17	252.910		252.910	100.00		100.00
18	1.690	1.506	0.184	100.00	89.11	10.89
19	532.850	524.430	8.420	100.00	98.42	1.58
SD 26	1137.280	1007.913	129.367	100.00	88.63	11.37
SD 28	5503.326	3752.653	1750.673	100.00	68.19	31.81
SD 26+28	6640.606	4760.566	1880.040	100.00	71.69	28.31

Table 7. Share of dominant fish species in mass by rectangles in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Haul No***	***Catch share***					
			Total [kg]	***Sprat [kg]***	***Herring [kg]***	***Total [%]***	***Sprat [%]***	***Herring [%]***
26	41G8	2	695.870	695.870		100.000	100.000	
	41G9	1	190.620	190.620		100.000	100.000	
	41H0	3, 4	125.395	60.712	64.684	100.000	48.416	51.584
28	42G9	6, 7	356.745	6.400	350.345	100.000	1.794	98.206
	42H0	5, 8, 9	514.183	440.106	74.077	100.000	85.593	14.407
	43G9	10, 11	115.984	115.535	0.450	100.000	99.612	0.388
	43H0	12	595.580	568.360	27.220	100.000	95.430	4.570
	43H1	13	564.520	553.570	10.950	100.000	98.060	1.940
	44G9	15	31.650	31.580	0.070	100.000	99.779	0.221
	44H0	16	544.250	33.260	510.990	100.000	6.111	93.889
	44H1	14, 16, 19	525.123	346.617	178.507	100.000	66.007	33.993
	45H0	17, 18	128.053	1.506	126.547	100.000	1.176	98.824
SD 26	41G8-41H0	1-4	337.295	315.734	21.561	100.000	93.608	6.392
SD 28	42G9-45H0	5-19	375.121	232.993	142.128	100.000	62.111	37.889
SD 26+28	41G8-45H0	1-19	365.664	253.678	111.987	100.000	69.375	30.625

Table 8. Catch per unit effort results by species in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Haul number*	*Total CPUE [kg/h]*	*CPUE per species [kg/h]*										
				Sprat	*Herring*	*Cod*	*Flounder*	*Three-spined stickleback*	*Ninespine stickleback*	*Smelt*	*Lumpfish*	*Great sandeel*	*Salmon*	*Shorthorn sculpin*
26	41G8	2	1392.550	1391.740							0.810			
	41G9	1	382.924	381.240							0.404		1.280	
	41H0	3, 4	251.225	121.423	129.367	0.178	0.400							0.292
28	42G9	6, 7	710.376	12.800	700.690	1.721		2.560			0.554	0.016		
	42H0	5, 8, 9	1029.095	880.212	148.153	1.434	0.226				0.528			
	43G9	10, 11	290.521	231.069	0.899	0.032		54.330	0.018		0.740		3.458	
	43H0	12	1191.746	1136.720	54.440		0.360			0.226				
	43H1	13	1129.742	1107.140	21.900		0.620			0.082				
	44G9	15	109.608	63.160	0.140	0.004		45.900	0.040		0.364			
	44H0	16	1089.870	66.520	1021.980			0.220			1.150			
	44H1	14, 16, 19	1051.353	693.233	357.013	0.256	0.694	0.220		1.000	1.150			
	45H0	17, 18	255.513	3.012	253.094	0.922		0.108	0.002		0.343			
26	41G8-41H0	1-4	675.566	631.468	43.122	0.059	0.133				0.405		0.427	0.097
28	42G9-45H0	5-19	761.980	465.985	284.257	0.485	0.211	11.482	0.007	0.145	0.537	0.002	0.384	
26+28	41G8-45H0	1-19	740.377	507.356	223.973	0.379	0.192	8.612	0.005	0.109	0.504	0.001	0.395	0.024

Table 9. Share of fish species in mass by rectangles in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Haul number***	***Total catch [%]***	***Catch per species [%]***										
				Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Ninespine stickleback***	***Smelt***	***Lumpfish***	***Great sandeel***	***Salmon***	***Shorthorn sculpin***
26	41G8	2	100.000	99.942							0.058			
	41G9	1	100.000	99.560							0.106		0.334	
	41H0	3, 4	100.000	48.332	51.494	0.071	0.159							0.116
28	42G9	6, 7	100.000	1.802	98.636	0.242		0.360			0.078	0.002		
	42H0	5, 8, 9	100.000	85.533	14.396	0.139	0.022				0.051			
	43G9	10, 11	100.000	79.536	0.309	0.011		18.701	0.006		0.255		1.190	
	43H0	12	100.000	95.383	4.568		0.030			0.019				
	43H1	13	100.000	97.999	1.938		0.055			0.007				
	44G9	15	100.000	57.624	0.128	0.004		41.877	0.036		0.332			
	44H0	16	100.000	6.103	93.771			0.020			0.106			
	44H1	14, 16, 19	100.000	65.937	33.957	0.024	0.066	0.021		0.095	0.109			
	45H0	17, 18	100.000	1.179	99.053	0.361		0.042	0.001		0.134			
26	41G8-41H0	1-4	100.000	93.472	6.383	0.009	0.020				0.060		0.063	0.014
28	42G9-45H0	5-19	100.000	61.154	37.305	0.064	0.028	1.507	0.001	0.019	0.070	<0.001	0.050	
26+28	41G8-45H0	1-19	100.000	68.527	30.251	0.051	0.026	1.163	0.001	0.015	0.068	<0.001	0.053	0.003

Table 10. Hydroacoustic survey statistics from the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	ICES rectangle	Area [nm^2]	NASC [m^2/nm^2]	$\sigma \times 10^4$ m^2	TS calc. dB	Total abundance [$n \times 10^6$]	Species composition [%]	
							Herring	Sprat
26	41G9	1000.0	334.0	1.57769	-49.0	2117.3	3.26	96.74
	41H0	953.3	765.1	1.33445	-49.7	5465.8	13.78	86.22
28	42G9	986.9	81.9	3.04775	-46.2	265.2	95.27	4.73
	42H0	968.5	490.6	1.48626	-49.3	3196.8	4.79	95.21
	43G9	973.7	290.6	1.39790	-49.5	2024.0		100.00
	43H0	973.7	565.7	1.28359	-49.9	4291.4	1.51	98.49
	43H1	412.7	521.2	1.23994	-50.1	1734.9	1.36	98.64
	44H0	960.5	767.9	1.61383	-48.9	4570.4	23.71	76.29
	44H1	824.6	679.7	1.49825	-49.2	3740.7	14.54	85.46
	45H0	947.2	1089.7	2.69539	-46.7	3829.5	97.65	2.35
SD 28		1953.3	549.6	1.45607	-49.4	7583.2	10.84	89.16
SD 26		7047.8	560.9	1.78286	-48.7	23652.8	24.78	75.22
SD 26+28		9001.1	558.6	1.71750	-48.9	31236.0	21.40	78.60

Table 11. Estimated abundance and biomass of prevalent fish species in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	ICES rectangle	Area [nm^2]	ρ [$n10^6/nm^2$]	Quantity [$n \times 10^6$]			Biomass [$kg \times 10^3$]		
				Total	Herring	Sprat	Total	Herring	Sprat
26	41G9	1000.0	2.117	2117.3	69.0	2048.3	30287.5	3475.2	26812.3
	41H0	953.3	5.734	5465.8	753.4	4712.4	70212.2	36218.1	33994.1
28	42G9	986.9	0.269	265.2	252.6	12.5	10283.2	10190.1	93.1
	42H0	968.5	3.301	3196.8	153.2	3043.6	41039.5	5887.4	35152.1
	43G9	973.7	2.079	2024.0		2024.0	24175.2		24175.2
	43H0	973.7	4.407	4291.4	65.0	4226.4	44090.2	1307.0	42783.2
	43H1	412.7	4.204	1734.9	23.5	1711.4	17011.1	437.9	16573.2
	44H0	960.5	4.758	4570.4	1083.8	3486.6	69415.5	34064.7	35350.8
	44H1	824.6	4.536	3740.7	543.9	3196.8	49785.8	16923.8	32862.0
	45H0	947.2	4.043	3829.5	3739.5	90.0	123060.7	122359.1	701.5
SD 28		1953.3	3.925	7583.2	822.4	6760.8	100499.7	39693.3	60806.4
SD 26		7047.8	3.450	23652.8	5861.5	17791.3	378861.0	191170.0	187690.9
SD 26+28		9001.1	3.545	31236.0	6683.9	24552.1	479360.7	230863.4	248497.3

Table 12. Number of sprat individuals in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***L, cm***																				***Total n in catch***	***Mean L, cm***
	6.5	***7.0***	***7.5***	***8.0***	***8.5***	***9.0***	***9.5***	***10.0***	***10.5***	***11.0***	***11.5***	***12.0***	***12.5***	***13.0***	***13.5***	***14.0***	***14.5***	***15.0***	***15.5***	***16.0***		
1										264	1651	3962	3764	2443	1453	462					13999	12.7
2			254	763	2799	2545				763	1272	7635	11707	15779	6617	2545	254				52935	12.5
3				78	546	1052	39			156	546	1169	1910	1442	819	234					7991	12.0
4		773	3863	3434	515	258															8842	8.0
5		489	3787	2932	733	366			61	244	1405	1771	855	183	61						12888	9.5
6		8	109	206	164	34	8				21	109	105	59	29	8					863	10.1
7																						
8			711	355						4620	12439	17059	18126	13505	4976	1066				355	73213	12.5
9		278	139						417	4448	6672	5977	6672	3336	278						28216	12.1
10				157	134	45				67	134	426	739	537	134	22					2396	12.2
11		85	85	1107	1192	341				170	1789	4173	3833	2896	1022	256					16949	12.0
12			875	6126	6418	2042	292		875	8752	12544	10794	7293	3209	292	292					59803	11.1
13		300	1499	3897	2098	1199		1499	6295	24579	11990	4796	1199	1798							61148	11.0
14			227	909	454			227	1136	14995	13405	9542	3862	1363		227					46348	11.7
15			177	383	206				88	235	559	647	559	265	118						3237	11.3
16			43	426	1001	639	64		106	192	745	362	447	277	64						4365	10.5
17																						
18	1		1	28	37	10	1	1	11	22	23	26	13	9	2	1					186	10.6
19			704	469	704	704		469	938	13374	15251	9150	6100	2346	235						50444	11.7
SD 26		773	4117	4275	3860	3855	39			1184	3469	12766	17381	19664	8888	3241	254				83766	11.8
SD 28	1	1160	8357	16995	13142	5379	365	2196	9928	71698	76976	64834	49803	29784	7211	1872				355	360057	11.4
26+28	1	1933	12474	21270	17002	9234	404	2196	9928	72882	80445	77600	67184	49448	16099	5114	254			355	443823	11.4

Table 13. Mean weight [g] of sprat in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	**L, cm**																				**Total catch kg**	**Mean W, g**
	6.5	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**	**10.5**	**11.0**	**11.5**	**12.0**	**12.5**	**13.0**	**13.5**	**14.0**	**14.5**	**15.0**	**15.5**	**16.0**		
1										10.2	11.2	12.3	13.8	15.0	16.5	17.9					190.620	13.6
2			2.6	3.4	4.0	4.7				9.5	11.2	12.6	13.6	15.0	16.2	17.0	18.4				695.870	13.1
3				3.3	4.2	4.9	5.6			9.3	11.2	12.0	13.6	14.9	16.0	17.8					94.263	11.8
4		2.4	2.9	3.2	3.9	4.5															27.160	3.1
5		2.2	2.7	3.2	4.0	4.5			7.8	9.7	10.4	11.7	12.9	13.9	15.6						77.750	6.0
6		2.5	3.0	3.5	4.0	4.7	5.6				11.0	12.2	13.4	14.6	16.6	16.8					6.400	7.4
7																						
8			2.6	3.6						9.3	10.5	11.8	13.3	14.6	15.7	16.8				23.8	919.928	12.6
9		2.2	3.0						8.2	9.2	10.1	11.7	13.1	14.4	14.9						322.640	11.4
10				3.5	4.1	4.9				9.7	10.8	12.1	13.6	14.6	15.4	16.8					28.890	12.1
11		2.6	2.8	3.6	4.1	4.7				10.0	11.3	12.5	13.8	14.9	16.2	17.3					202.179	11.9
12			2.9	3.5	4.1	4.6	6.0		8.7	9.7	10.5	11.9	13.2	15.1	15.2	18.2					568.360	9.5
13		2.2	2.8	3.5	4.0	4.7		7.4	8.4	9.5	10.6	11.6	13.7	14.1							553.570	9.1
14			3.2	3.3	3.4			6.2	8.7	9.4	10.5	11.5	12.9	14.6		17.0					482.160	10.4
15			2.6	3.2	3.9				8.4	9.2	10.5	11.8	12.9	13.8	14.9						31.580	9.8
16			2.8	3.3	4.1	4.6	4.7		7.7	8.7	10.4	11.5	12.3	13.3	13.9						33.260	7.6
17																						
18	1.6		3.0	3.3	4.0	4.4	5.6	7.0	8.0	9.3	10.2	11.4	11.9	13.9	16.8	13.0					1.506	7.8
19			2.7	3.5	4.1	5.0		7.2	8.6	9.2	10.5	11.8	12.6	13.8	16.4						524.430	10.4
SD 26		2.4	2.9	3.2	4.1	4.8	5.6			9.6	11.2	12.3	13.7	15.0	16.2	17.5	18.4				1007.913	11.5
SD 28	1.6	2.3	2.8	3.4	4.0	4.6	5.3	7.2	8.3	9.4	10.5	11.8	13.1	14.4	15.7	16.7				23.8	3752.653	8.1
26+28	1.6	2.3	2.8	3.3	4.0	4.7	5.3	7.2	8.3	9.4	10.6	11.9	13.3	14.7	16.0	17.2	18.4			23.8	4760.566	8.9

Table 14. Number of herring individuals in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***L, cm***															
	8.0	***8.5***	***9.0***	***9.5***	***10.0***	***10.5***	***11.0***	***11.5***	***12.0***	***12.5***	***13.0***	***13.5***	***14.0***	***14.5***	***15.0***	***15.5***
1																
2																
3																
4		4	11	20	35	35	7	2	4						4	6
5	2		5	39	60	56	19	7	12	2	2		5	5	5	2
6																6
7																
8														84	56	84
9																
10																
11																
12			46	69	161	115	103	69	23	11	57	34	23	69	57	34
13			40	110	119	50	10	10	10		60	20	10	40	90	40
14					22						22	22	56	56	45	56
15																
16											162	728	485	1052	647	1052
17														39	350	1165
18																
19					9	17	0	9		52	113	35	17	17	52	
SD 26		4	11	20	35	35	7	2	4						4	6
SD 28	2		91	217	371	237	133	95	45	66	416	839	596	1361	1301	2439
26+28	2	4	102	238	407	273	140	97	49	66	416	839	596	1361	1305	2445

Table 14. Continued

Haul number	***L, cm***														***Total n in catch***	***Mean L, cm***
	16.0	***16.5***	***17.0***	***17.5***	***18.0***	***18.5***	***19.0***	***19.5***	***20.0***	***20.5***	***21.0***	***21.5***	***22.0***	***22.5***		
1																
2																
3	13	63	139	139	227	240	404	366	454	189	164	63	38	25	2523	19.5
4	17	7	9	2	2	2									168	12.1
5															222	10.9
6	58	96	167	256	192	186	147	83	58	13	13		6		1282	18.3
7	1046	1126	2252	2735	3540	1931	1770	1126	483	80					16089	18.1
8	251	614	810	1061	782	587	503	391	196	84	28				5530	18.0
9																
10																
11																
12	103	92	92	80	46	46	11	11							1354	13.8
13	20	20	20	10			10		10						697	12.8
14	78	56	56		22	22		11	11		22				558	16.0
15																
16	2750	2184	2427	2103	1132	566	647	243							16179	16.7
17	1243	1359	1631	893	427	583	39								7729	16.9
18																
19	43	26	43		9										442	14.4
SD 26	29	71	148	141	229	242	404	366	454	189	164	63	38	25	2691	18.8
SD 28	5593	5574	7498	7140	6151	3920	3127	1866	757	177	63		6		50082	16.9
26+28	5622	5644	7646	7280	6380	4162	3531	2232	1211	366	227	63	44	25	52773	17.0

Table 15. Mean weight [g] of herring in catch in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***L, cm***															
	8.0	***8.5***	***9.0***	***9.5***	***10.0***	***10.5***	***11.0***	***11.5***	***12.0***	***12.5***	***13.0***	***13.5***	***14.0***	***14.5***	***15.0***	***15.5***
1																
2																
3																
4		4.3	4.8	5.8	6.4	7.3	8.9	10.0	12.0						22.8	24.7
5	3.6		5.0	5.6	6.5	7.5	8.6	9.7	11.0	13.0	14.6		17.8	19.2	20.9	22.8
6																26.2
7																
8														20.8	23.1	25.1
9																
10																
11																
12			5.0	6.0	6.8	7.7	8.4	9.8	11.1	14.0	15.0	17.1	19.5	21.7	22.8	24.6
13			5.1	5.8	6.7	7.8	9.0	12.0	12.2		15.2	15.5	19.0	19.8	22.2	24.5
14					5.8						16.0	16.2	17.6	19.6	22.3	26.8
15																
16											16.2	16.4	18.7	20.6	23.5	25.6
17														19.4	24.2	26.5
18																
19					6.0	7.5		10.2		14.0	14.7	15.8	19.0	19.5	21.7	
SD 26		4.3	4.8	5.8	6.4	7.3	8.9	10.0	12.0						22.8	24.7
SD 28	3.6		5.0	5.8	6.6	7.6	8.5	10.0	11.2	13.9	15.0	16.3	18.4	20.4	22.8	26.0
26+28	3.6	4.3	5.0	5.8	6.5	7.5	8.6	10.0	11.3	13.9	15.0	16.3	18.4	20.4	22.8	25.9

Table 15. Continued

Haul number	***L, cm***														***Total n in catch***	***Mean L, cm***
	16.0	***16.5***	***17.0***	***17.5***	***18.0***	***18.5***	***19.0***	***19.5***	***20.0***	***20.5***	***21.0***	***21.5***	***22.0***	***22.5***		
1																
2																
3	25.4	30.6	34.2	37.5	41.6	45.8	47.5	50.8	56.0	61.0	64.1	70.2	70.0	85.0	127.117	50.4
4	27.1	29.8	32.6	36.0	40.0	55.0									2.250	13.4
5															1.830	8.2
6	29.9	31.6	33.2	36.4	39.6	42.3	46.7	51.0	54.1	57.0	65.6		70.0		51.540	40.2
7	29.6	31.6	34.4	37.8	40.9	44.9	47.9	48.7	53.3	61.0					649.150	40.3
8	27.6	31.1	34.2	37.3	42.0	43.8	49.7	52.1	53.6	53.3	70.2				219.300	39.7
9																
10																
11																
12	27.6	31.0	35.9	37.6	38.8	48.0	50.0	47.0							27.220	20.1
13	29.0	29.3	41.5	41.0			48.0		56.0						10.950	15.7
14	27.6	31.0	33.2		41.0	37.5		50.0	54.0		68.0				16.110	27.9
15																
16	28.4	32.4	34.5	37.4	39.9	43.0	46.4	52.3							510.990	31.6
17	28.8	31.5	34.2	36.6	41.5	44.5	57.0								252.910	32.7
18																
19	24.4	29.7	28.2		44.0										8.420	19.1
SD 26	26.9	30.2	33.7	37.4	41.6	46.3	47.5	50.8	56.0	61.0	64.1	70.2	70.0	85.0	129.367	38.9
SD 28	28.4	31.5	34.1	37.1	40.7	43.7	47.9	50.6	53.8	55.8	67.5		70.0		1750.673	31.5
26+28	28.3	31.4	34.0	37.2	40.8	44.2	47.8	50.7	55.1	59.5	65.0	70.2	70.0	85.0	1880.040	32.8

Table 16. The basic biological data collected during the Latvian-Polish BIAS survey by hauls in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Baltica" in the period of 11.-18.10.2012

Haul number	***Sprat***		***Herring***	
	L [cm]	***W [g]***	***L [cm]***	***W [g]***
1	12.7	13.6		
2	12.5	13.1		
3	12.0	11.8	19.5	50.4
4	8.0	3.1	12.1	13.4
5	9.5	6.0	10.9	8.2
6	10.1	7.4	18.3	40.2
7			18.1	40.3
8	12.5	12.6	18.0	39.7
9	12.1	11.4		
10	12.2	12.1		
11	12.0	11.9		
12	11.1	9.5	13.8	20.1
13	11.0	9.1	12.8	15.7
14	11.7	10.4	16.0	27.9
15	11.3	9.8		
16	10.5	7.6	16.7	31.6
17			16.9	32.7
18	10.6	7.8		
19	11.7	10.4	14.4	19.1
SD 26	11.8	11.5	18.8	38.9
SD 28	11.4	8.1	16.9	31.5
SD 26+28	11.4	8.9	17.0	32.8

Table 17. The basic biological data collected during the Latvian-Polish BIAS survey by rectangles in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Haul No***	***Sprat***		***Herring***	
			L [cm]	***W [g]***	***L [cm]***	***W [g]***
26	41G9	1,2,3	12.5	13.1	19.5	50.4
	41H0	3,4	9.9	7.2	19.0	48.1
28	42G9	6,7	10.1	7.4	18.1	40.3
	42H0	5,8,9	12.1	11.5	17.7	38.4
	43G9	10,11	12.0	11.9		
	43H0	9,12	11.5	10.1	13.8	20.1
	43H1	9,12,13	11.3	9.7	13.5	18.6
	44H0	14,15,16	11.6	10.1	16.7	31.4
	44H1	14,16,19	11.6	10.3	16.6	31.1
	45H0	17,18	10.6	7.8	16.9	32.7
SD 26	41G8-41H0	1-4	10.7	9.0	19.1	48.3
SD 28	42G9-45H0	5-19	11.7	10.5	16.9	32.6
SD 26+28	41G8-45H0	1-19	11.4	10.1	17.1	34.5

Sprat in ICES SD 26N and 28

Table 18. Sprat age composition [%] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Age group*									*Total*
		0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
26	41G9	10.78	15.21	15.77	14.84	32.32	6.41	2.08	1.66	0.93	100.00
	41H0	62.72	9.31	5.56	5.13	11.61	1.98	2.02	0.57	1.11	100.00
28	42G9	61.46	6.86	6.15	3.15	13.37	4.85	1.50	2.18	0.49	100.00
	42H0	8.62	27.56	16.63	10.32	26.89	3.95	3.29	0.97	1.76	100.00
	43G9	16.27	13.16	24.79	5.54	29.64	5.80	2.78	0.64	1.38	100.00
	43H0	18.37	30.73	18.43	2.42	15.11	5.23	4.78	1.63	3.30	100.00
	43H1	16.87	42.36	15.73	2.91	11.76	4.24	3.02	1.17	1.94	100.00
	44H0	8.39	49.57	19.70	7.59	9.35	4.13	0.69	0.53	0.04	100.00
	44H1	6.27	50.38	18.79	6.03	12.72	3.81	1.26	0.72	0.02	100.00
	45H0	41.94	30.65	7.37	4.57	9.19	3.82	0.54	0.70	1.24	100.00
SD 28		46.98	11.10	8.65	8.07	17.88	3.32	2.04	0.90	1.06	100.00
SD 26		12.34	36.51	18.83	5.85	16.87	4.50	2.67	0.98	1.45	100.00
SD 26+28		21.88	29.51	16.03	6.46	17.15	4.18	2.50	0.96	1.34	100.00

Table 19. Sprat age composition [$n\times10^6$] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Age group*									*Total*
		0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
26	41G9	220.8	311.5	323.1	303.9	662.0	131.3	42.5	34.0	19.0	2048.3
	41H0	2955.5	438.7	261.9	241.5	547.1	93.1	95.3	26.9	52.4	4712.4
28	42G9	7.7	0.9	0.8	0.4	1.7	0.6	0.2	0.3	0.1	12.5
	42H0	262.3	838.9	506.0	314.2	818.4	120.2	100.3	29.6	53.6	3043.6
	43G9	329.2	266.3	501.8	112.0	600.0	117.5	56.3	13.0	27.9	2024.0
	43H0	776.4	1298.9	779.0	102.1	638.8	221.1	202.0	68.8	139.3	4226.4
	43H1	288.7	724.9	269.1	49.8	201.2	72.5	51.7	20.1	33.3	1711.4
	44H0	292.6	1728.3	686.8	264.6	326.1	144.0	24.2	18.4	1.6	3486.6
	44H1	200.5	1610.5	600.7	192.7	406.7	121.8	40.3	22.9	0.8	3196.8
	45H0	37.7	27.6	6.6	4.1	8.3	3.4	0.5	0.6	1.1	90.0
SD 28		3176.3	750.2	585.0	545.5	1209.1	224.5	137.8	61.0	71.4	6760.8
SD 26		2195.1	6496.2	3350.8	1040.1	3001.2	801.2	475.4	173.7	257.5	17791.3
SD 26+28		5371.4	7246.4	3935.9	1585.6	4210.3	1025.7	613.2	234.7	328.9	24552.1

Table 20. Sprat biomass [tonnes] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Total***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9	2890.6	4077.7	4229.5	3978.6	8665.6	1719.1	556.5	445.5	249.1	26812.3
	41H0	21320.0	3164.6	1889.3	1742.4	3946.6	671.8	687.5	194.2	377.9	33994.1
28	42G9	57.2	6.4	5.7	2.9	12.4	4.5	1.4	2.0	0.5	93.1
	42H0	3029.2	9688.9	5844.2	3629.4	9452.7	1388.7	1158.2	341.9	618.8	35152.1
	43G9	3932.2	3180.8	5993.4	1338.3	7166.6	1403.0	672.5	155.7	332.7	24175.2
	43H0	7859.7	13148.9	7886.0	1033.3	6466.1	2238.0	2044.6	696.5	1410.2	42783.2
	43H1	2795.6	7019.7	2606.3	482.6	1948.7	702.5	500.7	194.7	322.3	16573.2
	44H0	2966.4	17522.8	6963.5	2683.2	3306.7	1460.4	245.5	186.3	15.8	35350.8
	44H1	2060.6	16555.6	6174.8	1981.0	4180.8	1252.3	413.8	235.2	7.8	32862.0
	45H0	294.2	215.0	51.7	32.1	64.5	26.8	3.8	4.9	8.7	701.5
SD 28		24210.6	7242.3	6118.8	5721.0	12612.2	2390.8	1244.0	639.7	627.0	60806.4
SD 26		22995.1	67338.0	35525.6	11182.9	32598.6	8476.1	5040.5	1817.3	2716.8	187690.9
SD 26+28		47205.7	74580.4	41644.4	16903.9	45210.8	10867.0	6284.6	2457.0	3343.7	248497.3

Table 21. Sprat proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Total***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9	10.78	15.21	15.77	14.84	32.32	6.41	2.08	1.66	0.93	100.00
	41H0	62.72	9.31	5.56	5.13	11.61	1.98	2.02	0.57	1.11	100.00
28	42G9	61.46	6.86	6.15	3.15	13.37	4.85	1.50	2.18	0.49	100.00
	42H0	8.62	27.56	16.63	10.32	26.89	3.95	3.29	0.97	1.76	100.00
	43G9	16.27	13.16	24.79	5.54	29.64	5.80	2.78	0.64	1.38	100.00
	43H0	18.37	30.73	18.43	2.42	15.11	5.23	4.78	1.63	3.30	100.00
	43H1	16.87	42.36	15.73	2.91	11.76	4.24	3.02	1.17	1.94	100.00
	44H0	8.39	49.57	19.70	7.59	9.35	4.13	0.69	0.53	0.04	100.00
	44H1	6.27	50.38	18.79	6.03	12.72	3.81	1.26	0.72	0.02	100.00
	45H0	41.94	30.65	7.37	4.57	9.19	3.82	0.54	0.70	1.24	100.00
SD 28		39.82	11.91	10.06	9.41	20.74	3.93	2.05	1.05	1.03	100.00
SD 26		12.25	35.88	18.93	5.96	17.37	4.52	2.69	0.97	1.45	100.00
SD 26+28		19.00	30.01	16.76	6.80	18.19	4.37	2.53	0.99	1.35	100.00

Table 22. Sprat mean weight [g] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Average***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9	4.2	12.2	13.3	15.1	14.6	15.3	15.4	15.1	16.9	13.1
	41H0	3.3	11.9	12.8	14.0	14.8	14.8	15.6	14.9	16.8	7.2
28	42G9	3.6	12.2	12.8	13.3	13.9	14.0	14.0	14.2	16.8	7.4
	42H0	3.0	10.3	12.1	14.0	13.4	14.1	14.1	13.4	13.9	11.5
	43G9	3.9	12.0	12.8	14.2	14.3	14.7	14.2	16.1	13.5	11.9
	43H0	3.9	10.1	11.1	13.3	12.9	12.9	13.3	13.8	13.6	10.1
	43H1	3.8	9.7	10.9	12.2	12.7	12.7	13.4	13.4	13.6	9.7
	44H0	3.7	10.0	10.6	11.5	12.6	12.7	16.0	14.4	11.5	10.1
	44H1	3.8	9.9	10.7	11.8	12.6	12.4	13.0	14.0	11.5	10.3
	45H0	3.8	9.6	11.1	12.4	12.6	11.2	13.9	11.9	12.4	7.8
SD 28		3.4	12.1	13.1	14.6	14.7	15.1	15.5	15.1	16.8	9.0
SD 26		3.7	10.1	11.3	12.8	13.2	13.2	13.7	13.9	13.7	10.5
SD 26+28		3.5	10.3	11.6	13.4	13.6	13.6	14.1	14.2	14.3	10.1

Table 23. Sprat mean length [cm] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Average***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9	8.9	12.2	12.6	13.3	13.1	13.4	13.4	13.3	14.2	12.5
	41H0	8.2	12.2	12.5	12.9	13.2	13.2	13.5	13.3	14.0	9.9
28	42G9	8.4	12.2	12.5	12.7	12.9	12.9	13.0	13.1	14.3	10.1
	42H0	8.0	11.7	12.4	13.0	12.8	13.1	13.1	12.9	13.0	12.1
	43G9	8.5	12.1	12.4	13.0	13.0	13.1	13.0	13.8	12.7	12.0
	43H0	8.6	11.5	12.0	12.8	12.6	12.7	12.8	12.9	12.9	11.5
	43H1	8.5	11.4	11.9	12.4	12.6	12.6	12.8	12.8	12.9	11.3
	44H0	8.5	11.5	11.8	12.2	12.6	12.7	14.0	13.3	12.3	11.6
	44H1	8.6	11.5	11.8	12.3	12.7	12.6	12.8	13.3	12.3	11.6
	45H0	8.6	11.4	12.1	12.6	12.8	12.2	13.3	12.8	13.4	10.6
SD 28		8.2	12.2	12.5	13.1	13.2	13.3	13.5	13.3	14.0	10.7
SD 26		8.5	11.6	12.0	12.6	12.8	12.8	12.9	13.0	12.9	11.7
SD 26+28		8.3	11.6	12.1	12.8	12.9	12.9	13.1	13.1	13.2	11.4

Herring in ICES SD 26N and 28

Table 24. Herring age composition [%] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Age group*									*Total*
		0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
26	41G9		6.07	5.77	6.37	12.41	26.27	13.03	20.70	9.37	100.00
	41H0	4.43	6.44	5.61	6.18	11.70	25.00	12.29	19.48	8.86	100.00
28	42G9		1.89	0.90	12.56	22.84	28.98	11.92	11.31	9.59	100.00
	42H0	3.49	23.72	6.75	7.64	16.31	21.05	4.55	10.28	6.23	100.00
	43G9										
	43H0	43.22	27.33	3.00	4.66	10.03	9.50	2.26			100.00
	43H1	45.52	29.05	3.28	4.09	7.75	8.01	1.82	0.49		100.00
	44H0	0.13	21.27	3.48	20.04	15.51	20.24	9.20	6.57	3.57	100.00
	44H1	0.33	22.28	3.58	19.66	15.20	20.05	9.01	6.40	3.48	100.00
	45H0		0.50	8.21	10.48	33.67	29.75	9.91	5.53	1.94	100.00
SD 28		4.06	6.41	5.63	6.20	11.76	25.11	12.35	19.58	8.90	100.00
SD 26		0.81	7.44	6.48	13.03	27.31	26.52	9.53	6.09	2.79	100.00
SD 26+28		1.21	7.31	6.37	12.19	25.40	26.35	9.87	7.75	3.55	100.00

Table 25. Herring age composition [$n \times 10^6$] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Age group*									*Total*
		0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
26	41G9		4.2	4.0	4.4	8.6	18.1	9.0	14.3	6.5	69.0
	41H0	33.4	48.5	42.3	46.6	88.2	188.4	92.6	146.8	66.7	753.4
28	42G9		4.8	2.3	31.7	57.7	73.2	30.1	28.6	24.2	252.6
	42H0	5.3	36.3	10.3	11.7	25.0	32.2	7.0	15.7	9.5	153.2
	43G9										
	43H0	28.1	17.8	2.0	3.0	6.5	6.2	1.5			65.0
	43H1	10.7	6.8	0.8	1.0	1.8	1.9	0.4	0.1		23.5
	44H0	1.4	230.5	37.7	217.2	168.1	219.3	99.7	71.2	38.7	1083.8
	44H1	1.8	121.2	19.5	106.9	82.7	109.1	49.0	34.8	18.9	543.9
	45H0		18.8	307.1	392.0	1259.0	1112.7	370.7	206.7	72.4	3739.5
SD 28		33.4	52.7	46.3	51.0	96.7	206.5	101.6	161.0	73.2	822.4
SD 26		47.4	436.2	379.7	763.5	1600.8	1554.6	558.4	357.1	163.8	5861.5
SD 26+28		80.8	488.9	426.0	814.5	1697.6	1761.0	660.0	518.2	237.0	6683.9

Table 26. Herring biomass [tonnes] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Total***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9		211.0	200.5	221.5	431.2	913.0	453.0	719.4	325.6	3475.2
	41H0	1604.6	2331.8	2033.2	2240.0	4238.7	9055.1	4452.0	7055.3	3207.5	36218.1
28	42G9		192.5	91.5	1279.8	2327.4	2953.4	1214.9	1152.8	977.6	10190.1
	42H0	205.2	1396.5	397.1	449.7	960.1	1239.2	267.8	605.1	366.6	5887.4
	43G9										
	43H0	564.9	357.2	39.2	60.9	131.1	124.1	29.5			1307.0
	43H1	199.4	127.2	14.3	17.9	34.0	35.1	8.0	2.1		437.9
	44H0	45.3	7245.7	1185.5	6826.9	5283.2	6893.1	3132.5	2236.4	1216.0	34064.7
	44H1	56.0	3771.4	606.5	3327.4	2573.0	3393.5	1524.9	1082.6	588.6	16923.8
	45H0		614.9	10050.0	12825.8	41196.6	36407.3	12130.0	6764.2	2370.3	122359.1
SD 28		1604.6	2542.8	2233.6	2461.5	4669.9	9968.1	4904.9	7774.7	3533.2	39693.3
SD 26		1070.8	13705.3	12384.2	24788.5	52505.3	51045.8	18307.6	11843.3	5519.2	191170.0
SD 26+28		2675.4	16248.1	14617.9	27250.0	57175.2	61013.9	23212.6	19618.0	9052.3	230863.4

Table 27. Herring proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Total***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9		6.07	5.77	6.37	12.41	26.27	13.03	20.70	9.37	100.00
	41H0	4.43	6.44	5.61	6.18	11.70	25.00	12.29	19.48	8.86	100.00
28	42G9		1.89	0.90	12.56	22.84	28.98	11.92	11.31	9.59	100.00
	42H0	3.49	23.72	6.75	7.64	16.31	21.05	4.55	10.28	6.23	100.00
	43G9										
	43H0	43.22	27.33	3.00	4.66	10.03	9.50	2.26			100.00
	43H1	45.52	29.05	3.28	4.09	7.75	8.01	1.82	0.49		100.00
	44H0	0.13	21.27	3.48	20.04	15.51	20.24	9.20	6.57	3.57	100.00
	44H1	0.33	22.28	3.58	19.66	15.20	20.05	9.01	6.40	3.48	100.00
	45H0		0.50	8.21	10.48	33.67	29.75	9.91	5.53	1.94	100.00
SD 28		4.04	6.41	5.63	6.20	11.76	25.11	12.36	19.59	8.90	100.00
SD 26		0.56	7.17	6.48	12.97	27.47	26.70	9.58	6.20	2.89	100.00
SD 26+28		1.16	7.04	6.33	11.80	24.77	26.43	10.05	8.50	3.92	100.00

Table 28. Herring mean weight [g] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Average***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9		33.8	48.9	44.7	47.5	53.2	54.1	54.7	57.4	50.4
	41H0	7.7	33.0	48.1	44.3	47.5	52.9	54.1	54.7	57.4	48.1
28	42G9		35.6	38.0	38.9	41.0	41.2	43.6	41.7	44.0	40.3
	42H0	8.1	32.3	36.7	40.1	44.3	41.3	42.9	47.7	51.1	38.4
	43G9										
	43H0	8.6	23.5	30.2	34.8	40.9	37.1	36.9			20.1
	43H1	8.3	22.6	28.1	33.7	41.1	35.3	37.9	57.0		18.6
	44H0	6.8	22.9	28.5	32.3	34.0	35.5	39.6	36.6	44.5	31.4
	44H1	8.0	22.6	28.3	32.2	34.0	35.4	39.5	36.6	44.5	31.1
	45H0		20.4	27.7	34.7	32.1	35.9	35.1	33.2	45.5	32.7
SD 28		7.7	33.1	48.2	44.4	47.5	52.9	54.1	54.7	57.4	48.3
SD 26		8.4	23.7	28.2	33.9	33.0	36.2	36.9	35.5	45.3	32.6
SD 26+28		8.1	24.7	30.3	34.6	33.8	38.2	39.5	41.5	49.0	34.5

Table 29. Herring mean length [cm] in the Baltic Sea ICES SD 26N and 28
from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	***ICES rectangle***	***Age group***									***Average***
		0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8+***	
26	41G9		17.1	19.3	18.6	19.0	19.7	19.9	19.9	20.2	19.5
	41H0	10.3	17.0	19.1	18.6	19.0	19.7	19.9	19.9	20.2	19.0
28	42G9		17.1	17.6	17.8	18.1	18.1	18.6	18.2	18.5	18.1
	42H0	10.5	16.7	17.5	18.0	18.5	18.1	18.4	19.1	19.4	17.7
	43G9										
	43H0	10.6	15.0	16.4	17.2	18.0	17.4	17.3			13.8
	43H1	10.5	14.9	16.0	17.0	18.0	17.1	17.3	20.3		13.5
	44H0	10.3	14.9	16.1	16.7	17.0	17.3	17.9	17.4	18.7	16.7
	44H1	10.6	14.8	16.0	16.7	17.0	17.2	17.9	17.4	18.7	16.6
	45H0		14.8	15.7	17.1	16.7	17.3	17.1	16.9	18.6	16.9
SD 28		10.3	17.0	19.2	18.6	19.0	19.7	19.9	19.9	20.2	19.1
SD 26		10.6	15.0	15.8	17.0	16.8	17.4	17.4	17.2	18.7	16.9
SD 26+28		10.5	15.3	16.2	17.1	16.9	17.6	17.8	18.1	19.1	17.1

Cod in ICES SD 26N and 28

Table 30. Hydroacoustic survey statistics related to cod, abundance and biological data of cod from the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Baltica" in the period of 11.-18.10.2012

ICES SD	*ICES rectangle*	*Area [nm^2]*	*Haul No*	*NASC [m^2/nm^2]*	*$\sigma \times 10^4$ m^2*	*ρ [$n10^6/nm^2$]*	*TS calc. dB*	*Total abundance [$n \times 10^6$]*	*Biomass [$kg \times 10^3$]*	*L [cm]*	*W [g]*
26	41G9	1000.0	1,2,3	0.040	14.53082	0.00003	-39.4	0.027	2.433	25.5	89.0
	41H0	953.3	3,4	0.427	14.53082	0.00029	-39.4	0.280	24.917	25.5	89.0
28	42G9	986.9	6,7	0.002	1.61454	14.73597	-48.9	0.015	0.218	8.5	15.0
	42H0	968.5	5,8,9	0.133	48.31876	27.48990	-34.2	0.027	19.089	46.5	717.0
	43G9	973.7	10,11	0.010	0.94414	107.44908	-51.2	0.105	1.674	6.5	16.0
	44H0	960.5	14,15,16	0.137	10.19560	0.00013	-40.9	0.129	8.401	18.0	65.0
	44H1	824.6	14,16,19	0.075	19.44706	0.00004	-38.1	0.032	4.045	29.5	128.0
	45H0	947.2	17,18	2.126	20.81020	0.00102	-37.8	0.968	273.834	29.0	283.0
SD 26		1953.3	1-4	0.233	14.53082	0.00016	-39.4	0.307	27.350	25.5	89.0
SD 28		5661.4	5-11, 14-19	0.414	16.88838	24.94603	-41.9	1.274	307.262	26.2	241.0
SD 26+28		7614.7	1-11, 14-19	0.369	16.29899	18.70956	-41.2	1.582	334.612	26.0	212.0

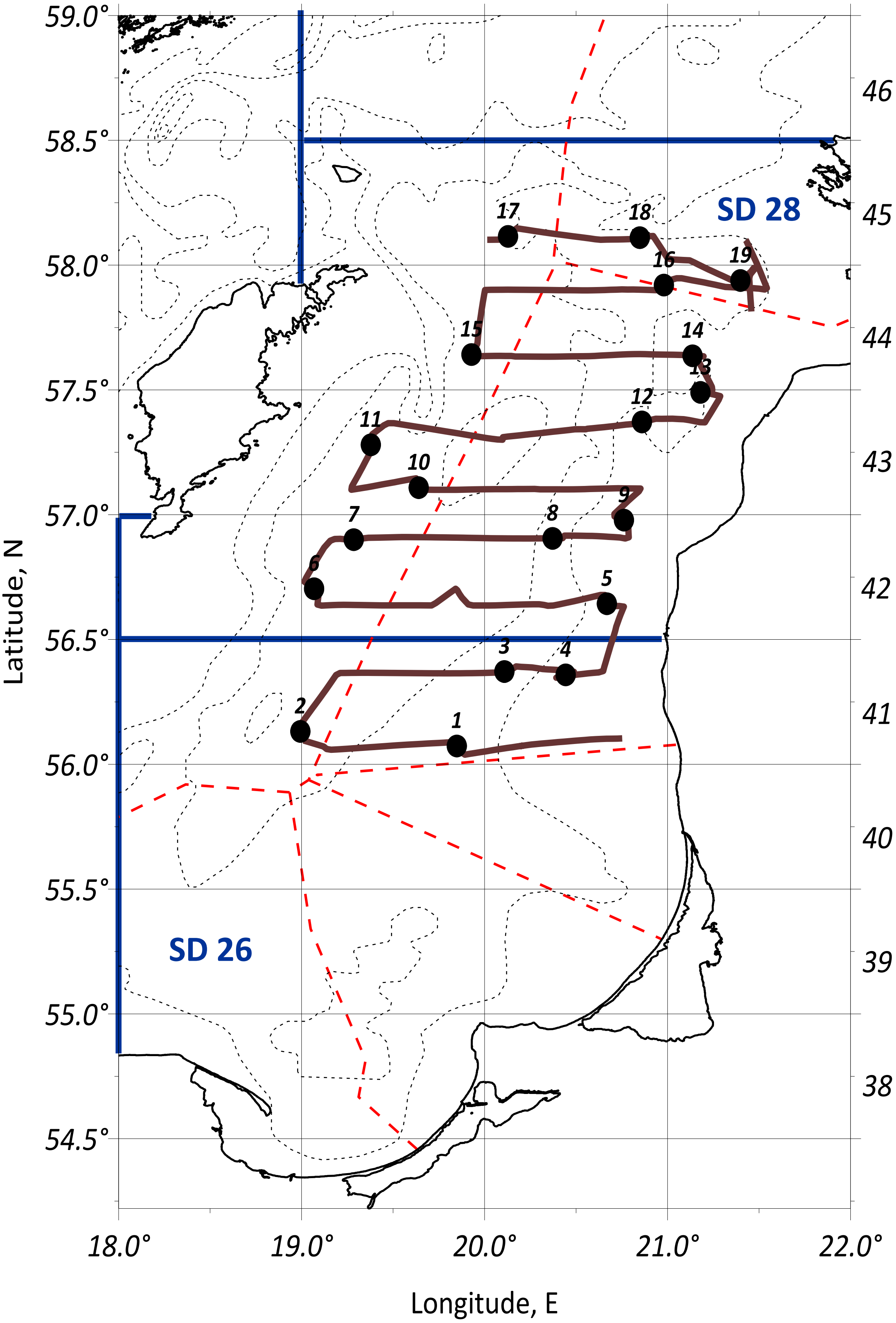
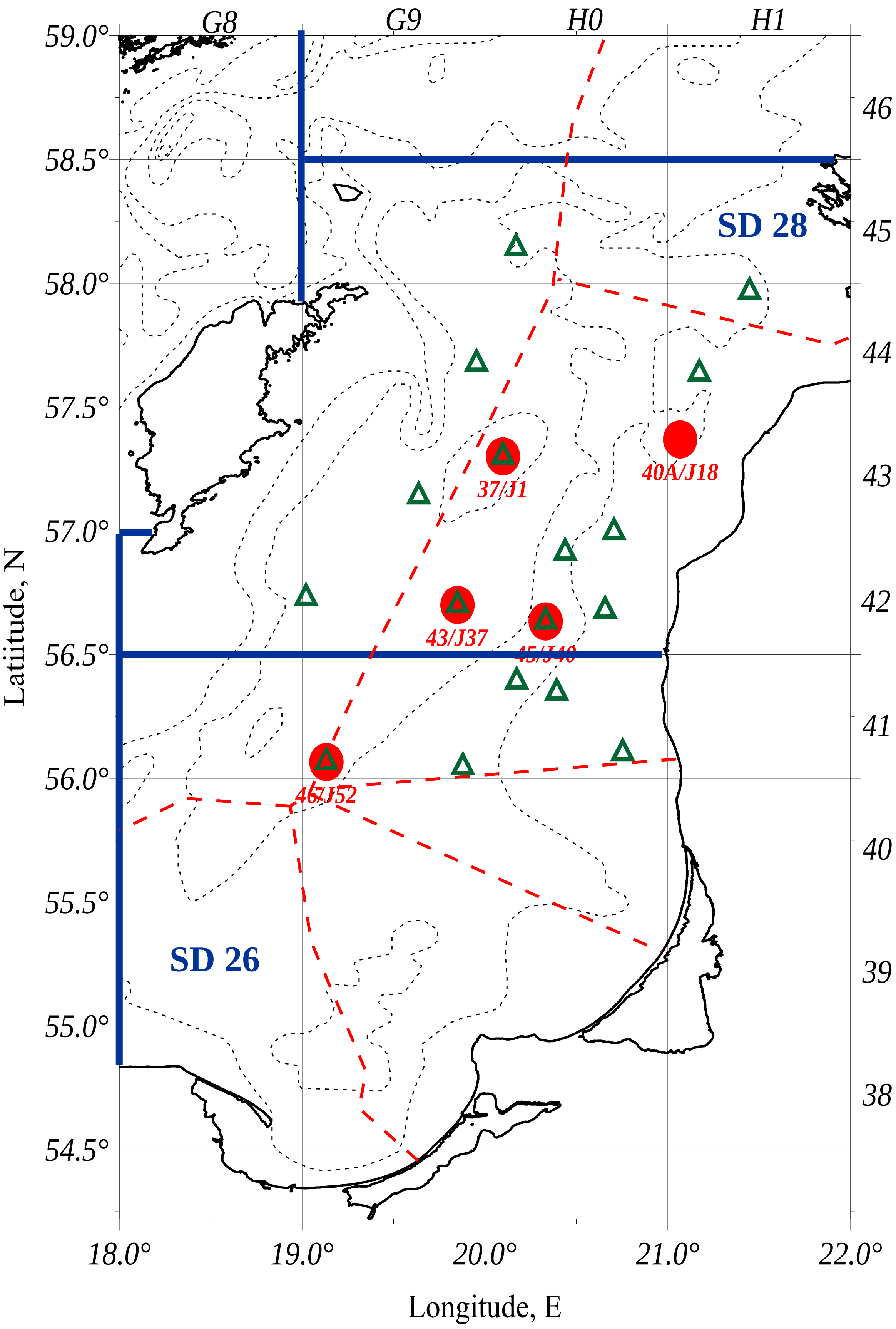


Figure 1: Cruise track design and trawling positions of the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 11.-18.10.2012.



● - HELCOM stations; △ - zooplankton stations.

Figure 2: Locations of the zooplankton stations performed during the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 11.-18.10.2012.

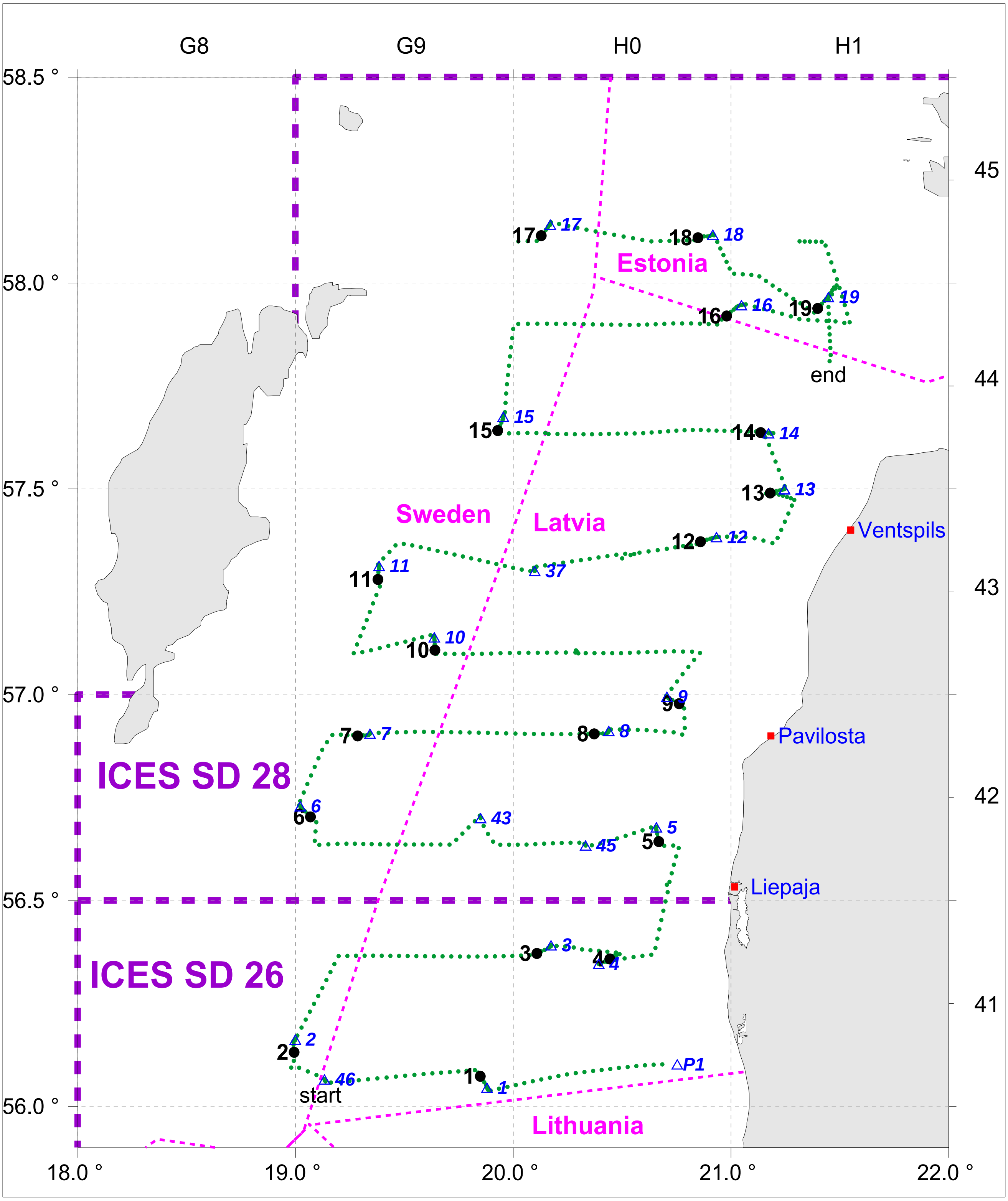


Figure 3: Locations of the hydrological stations performed during the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 11.-18.10.2012 (green dotted line – echo-integration transects, black rings – trawl stations, blue triangles – hydrological stations).

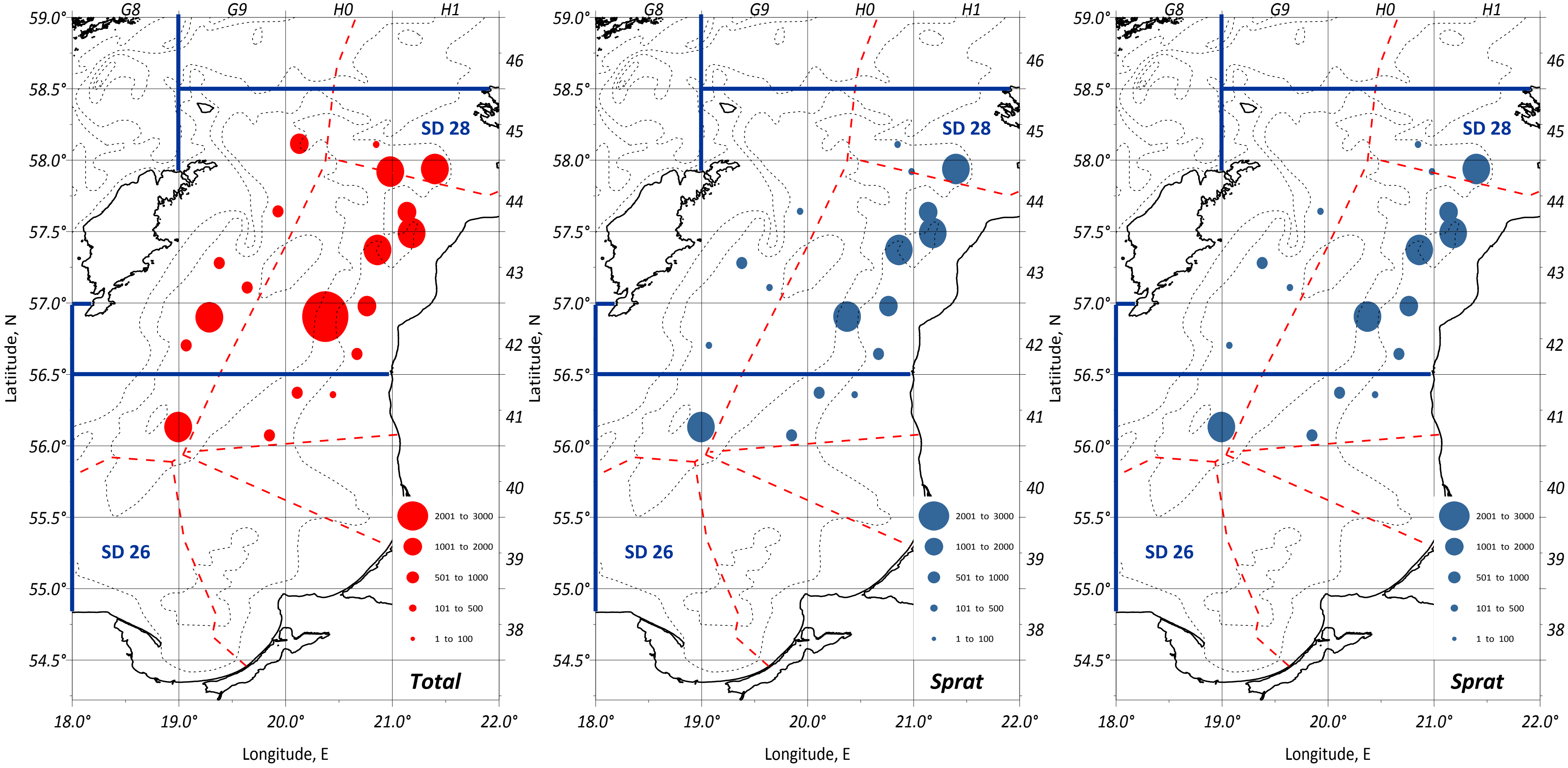


Figure 4: CPUE [kg/h] ranges distribution of fish in the catch hauls in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

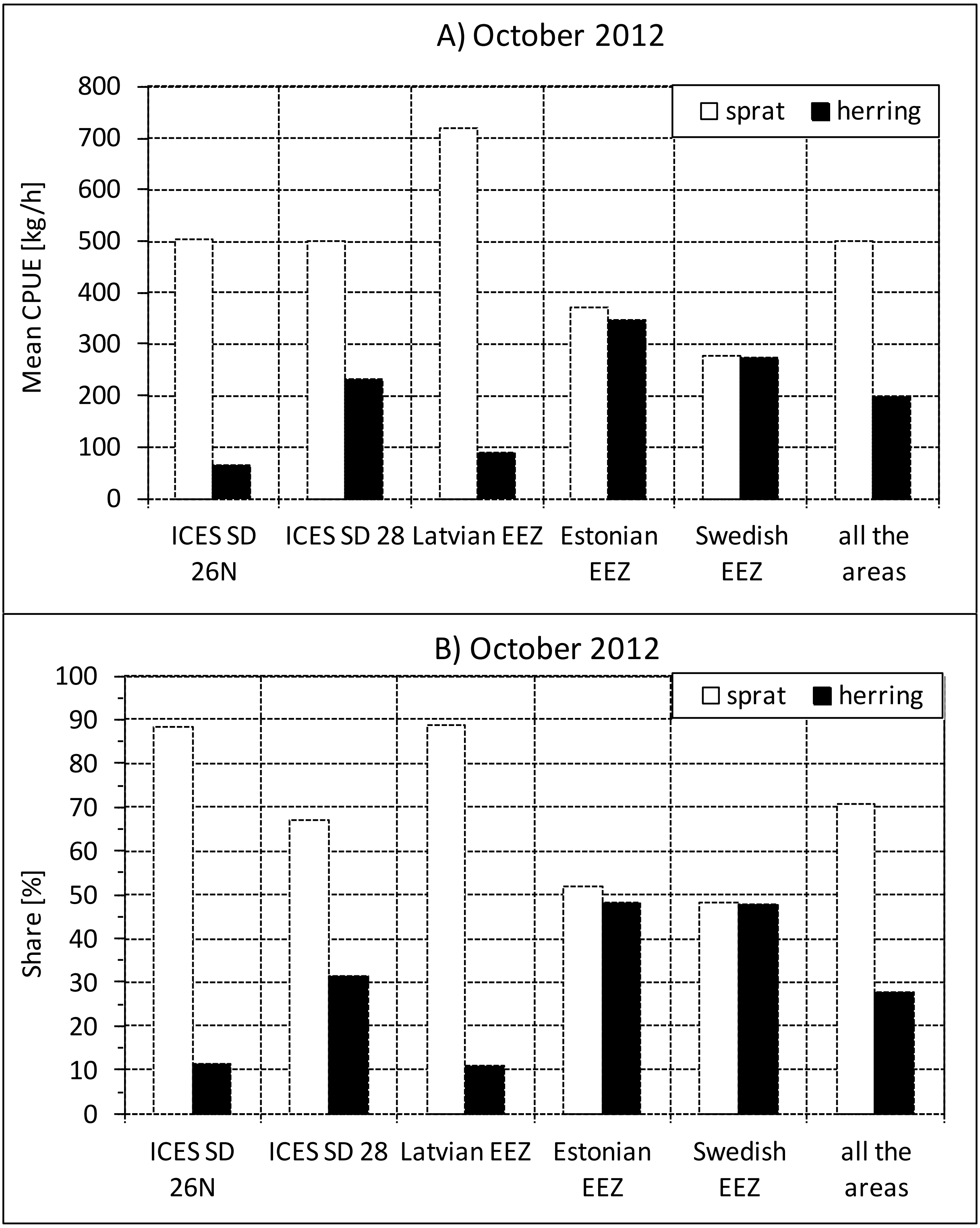


Figure 5: A) CPUE [kg/h] and B) share [%] distribution of dominant pelagic fish in the exclusive economic zones of countries in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

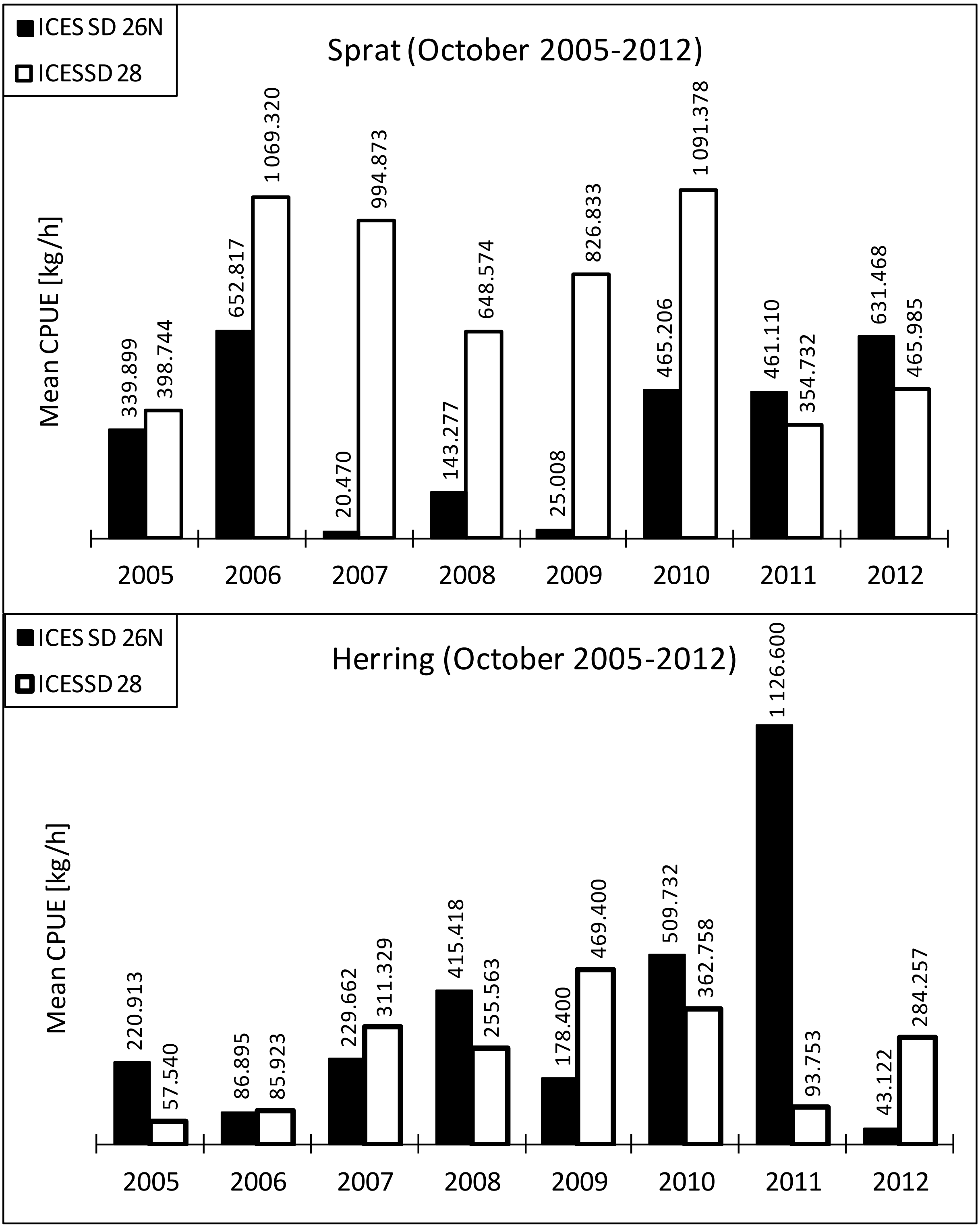


Figure 6: CPUE [kg/h] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2012.

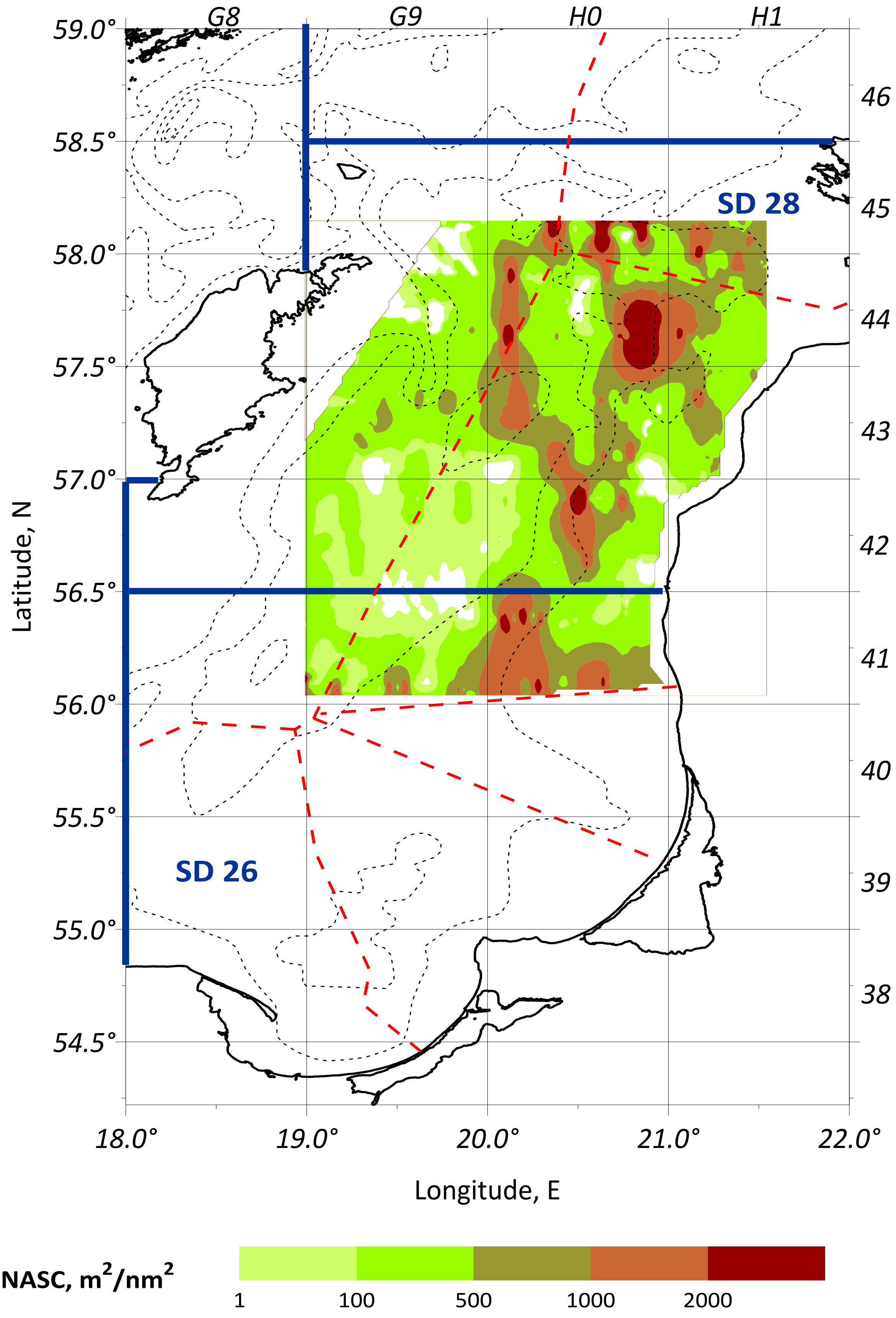


Figure 7: Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

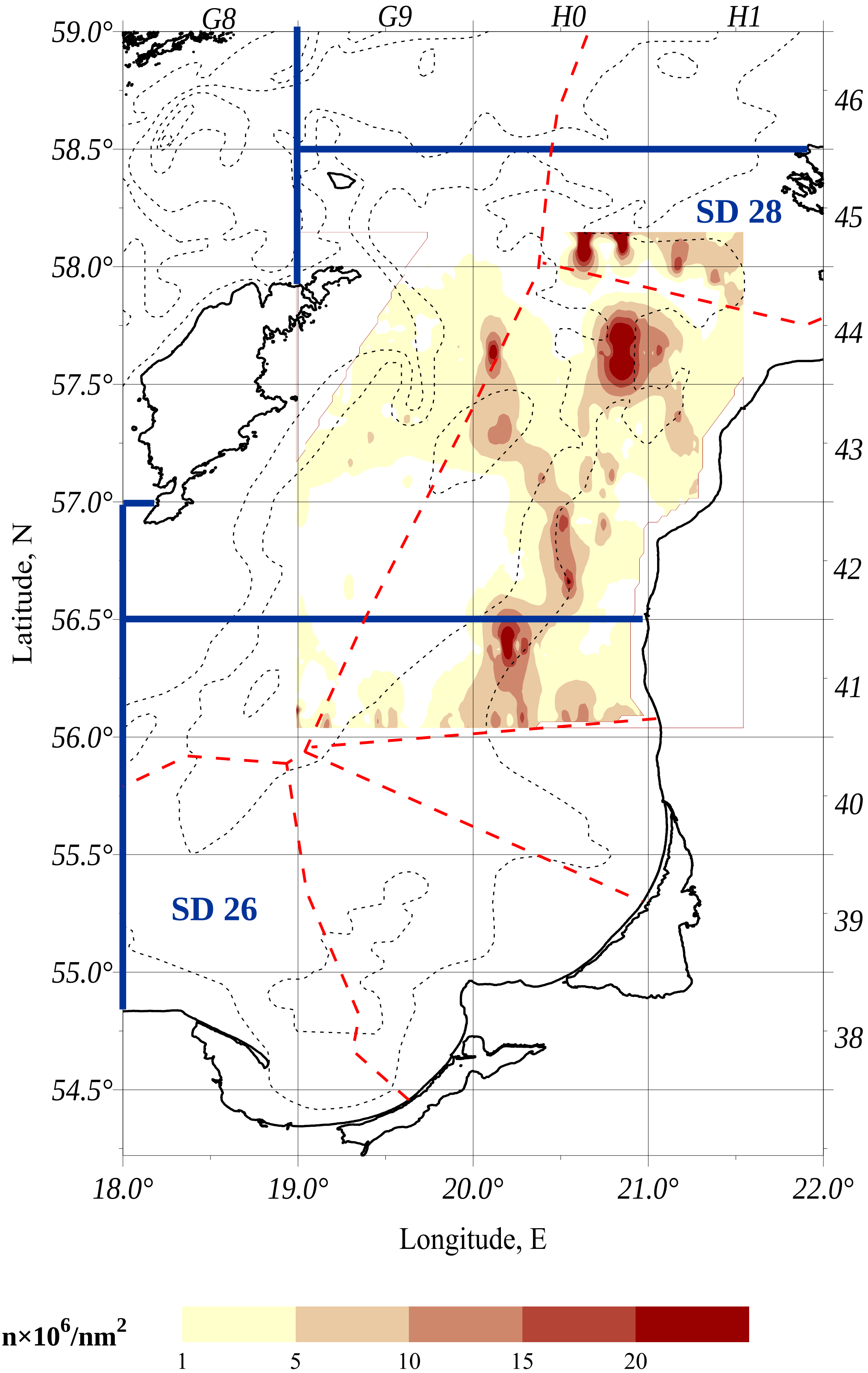


Figure 8: Sprat distribution in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

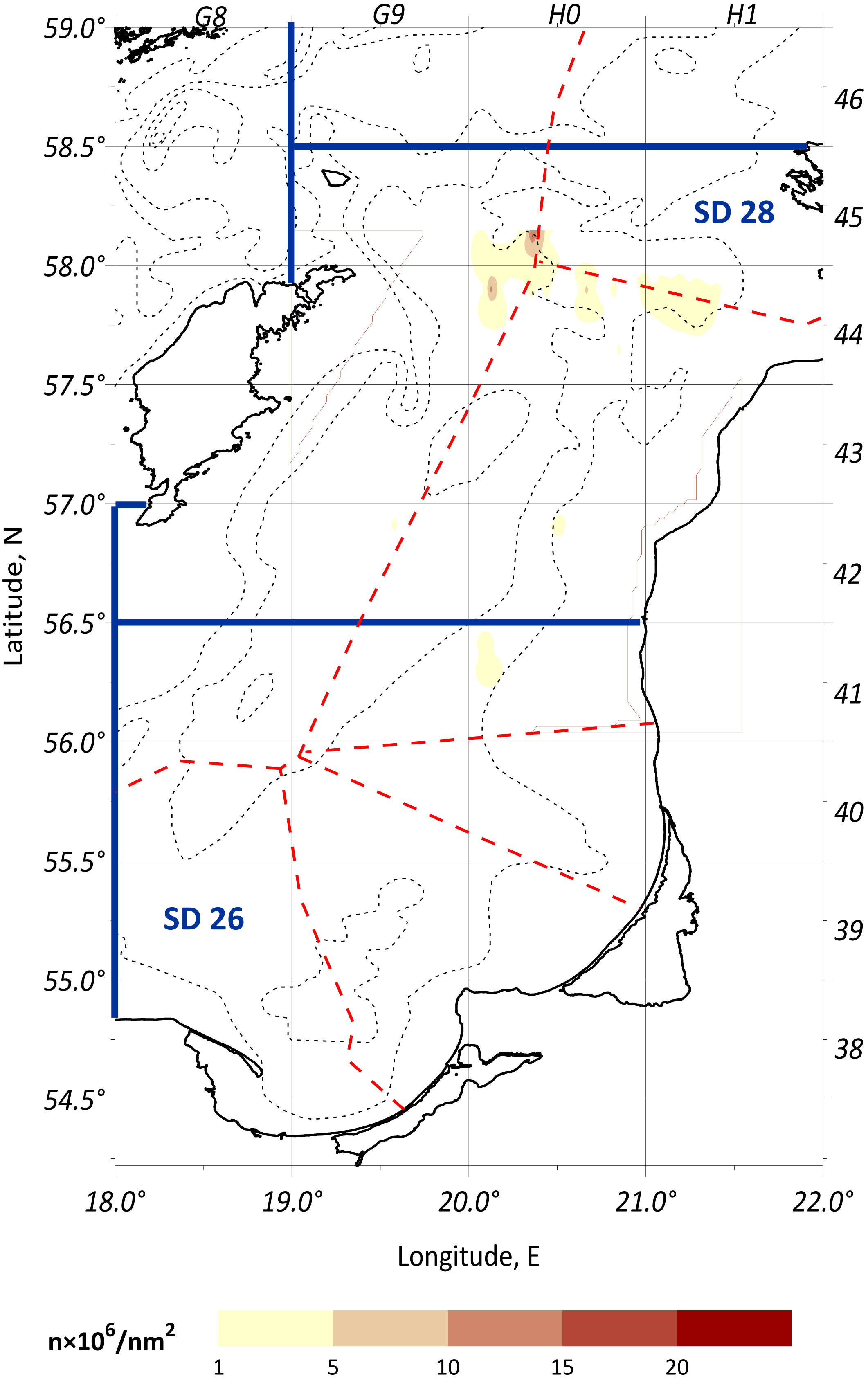
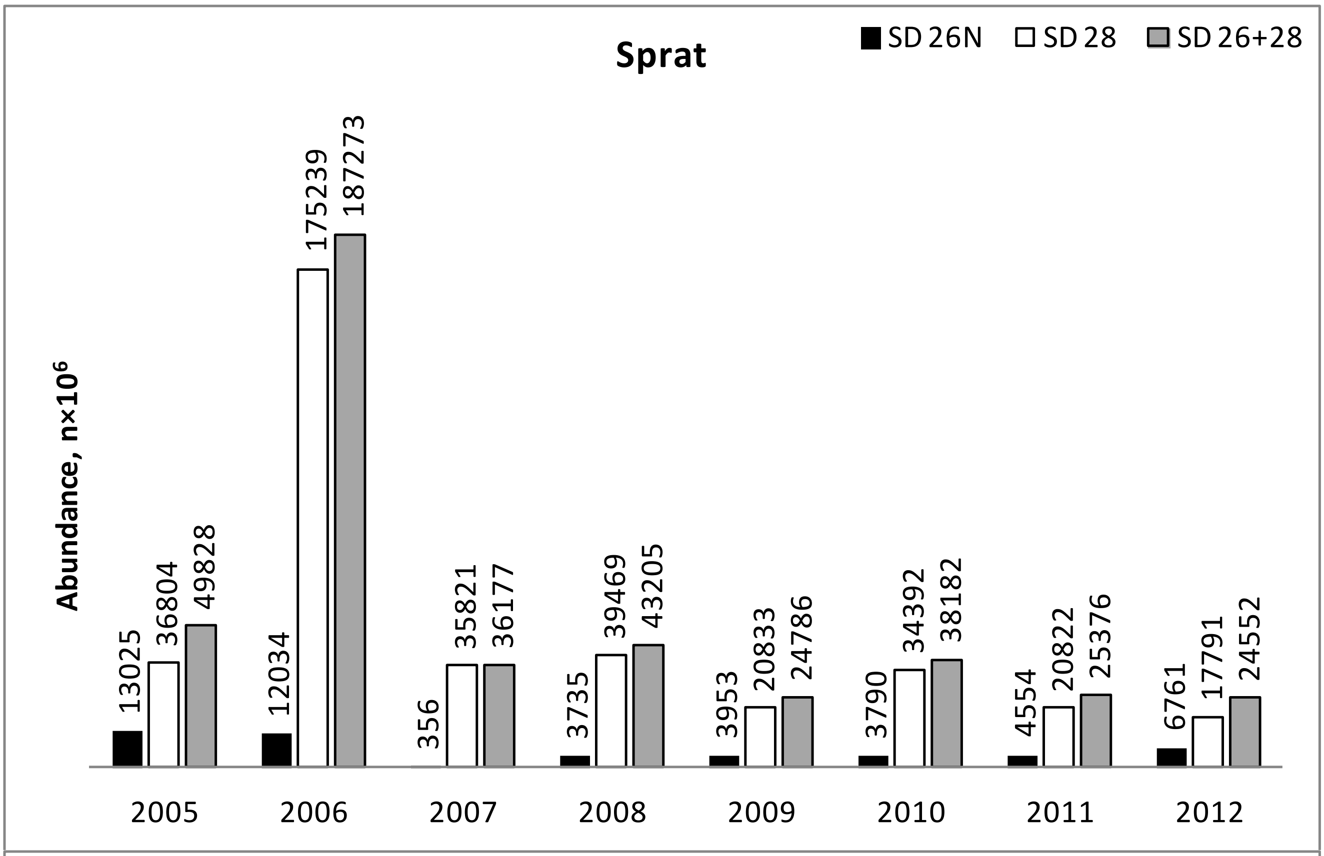


Figure 9: Herring distribution in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.



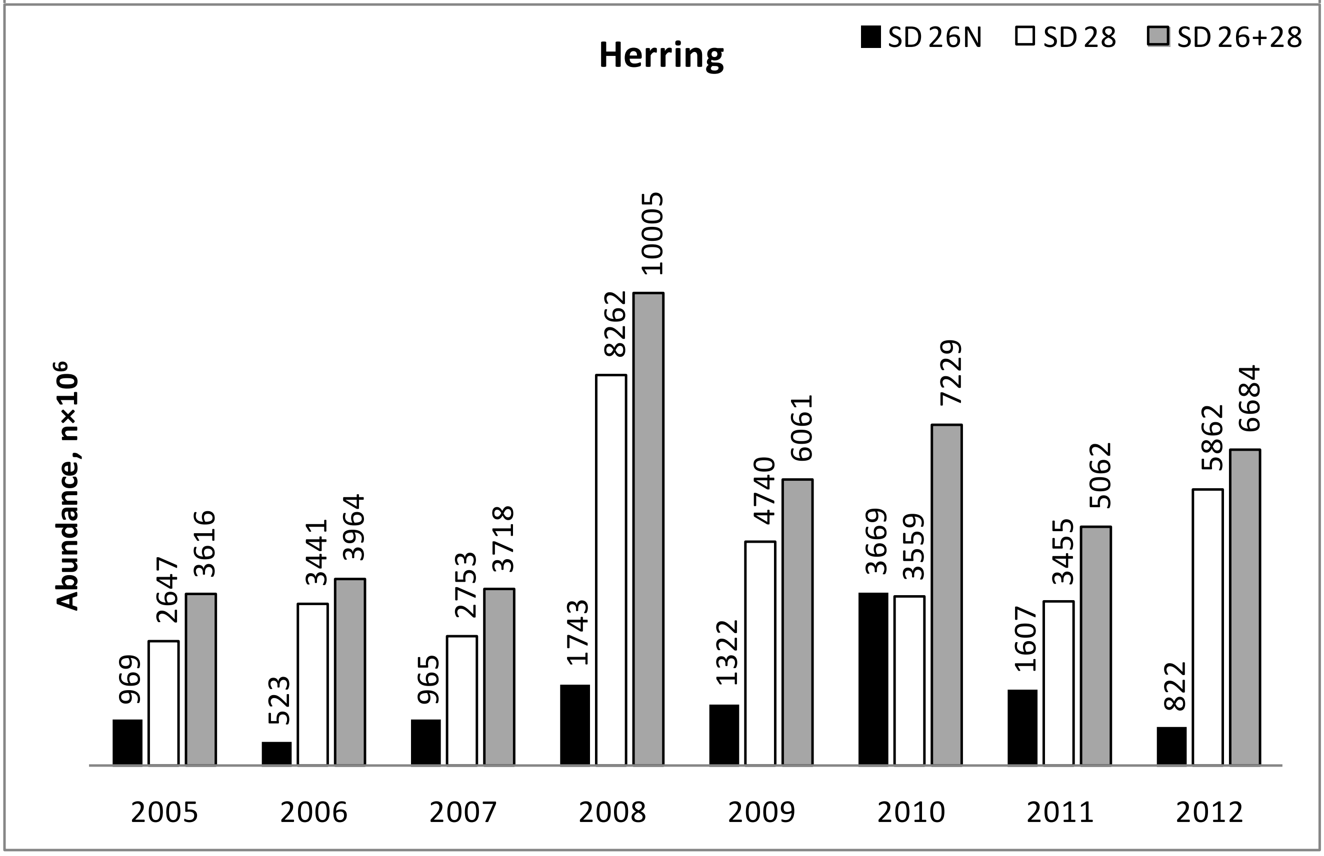


Figure 10: Abundance [n×10^6] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2012.

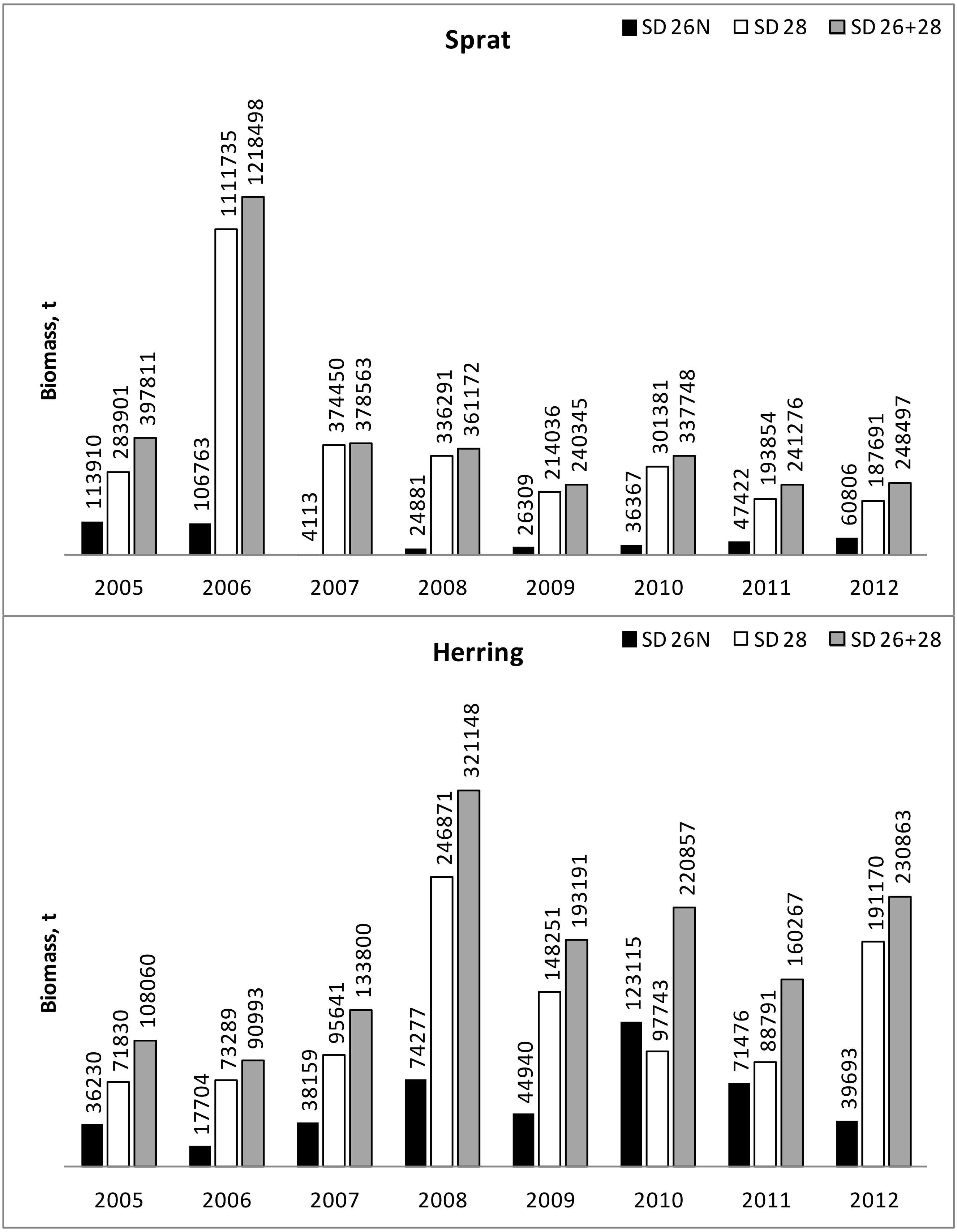


Figure 11: Biomass [t] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2012.

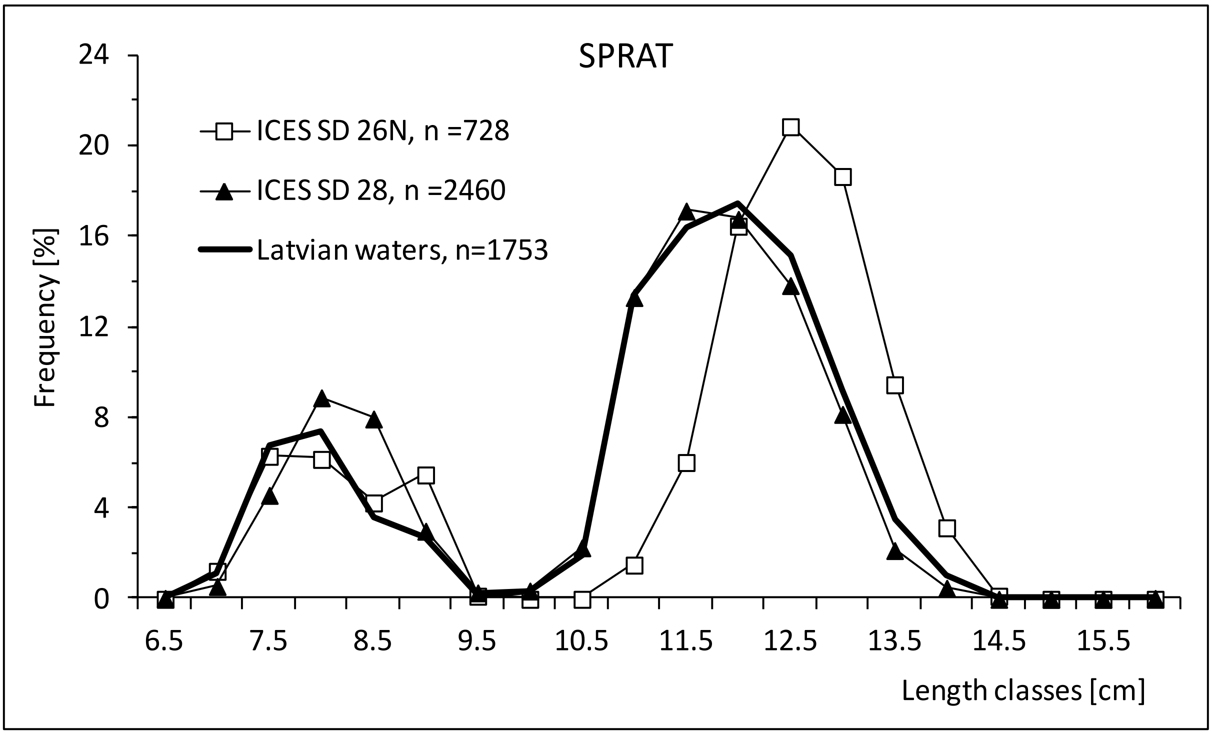


Figure 12: Sprat length distributions in control catches in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

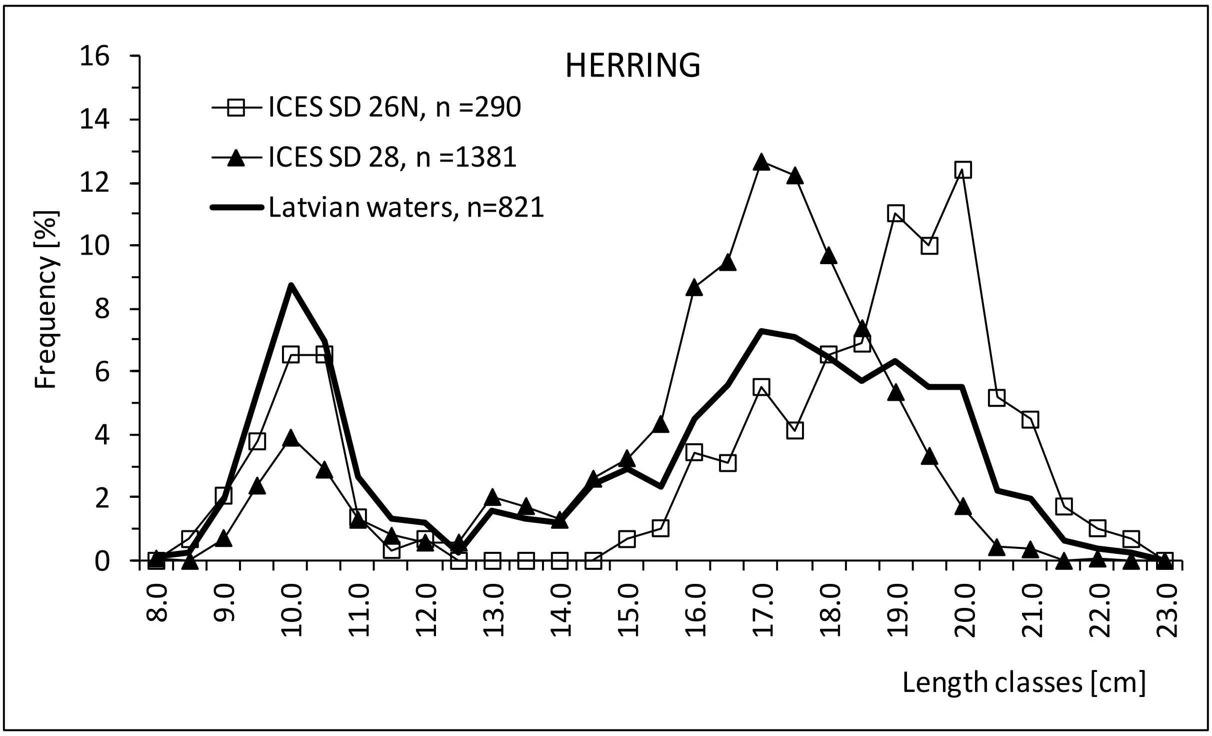


Figure 13: Herring length distributions in control catches in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

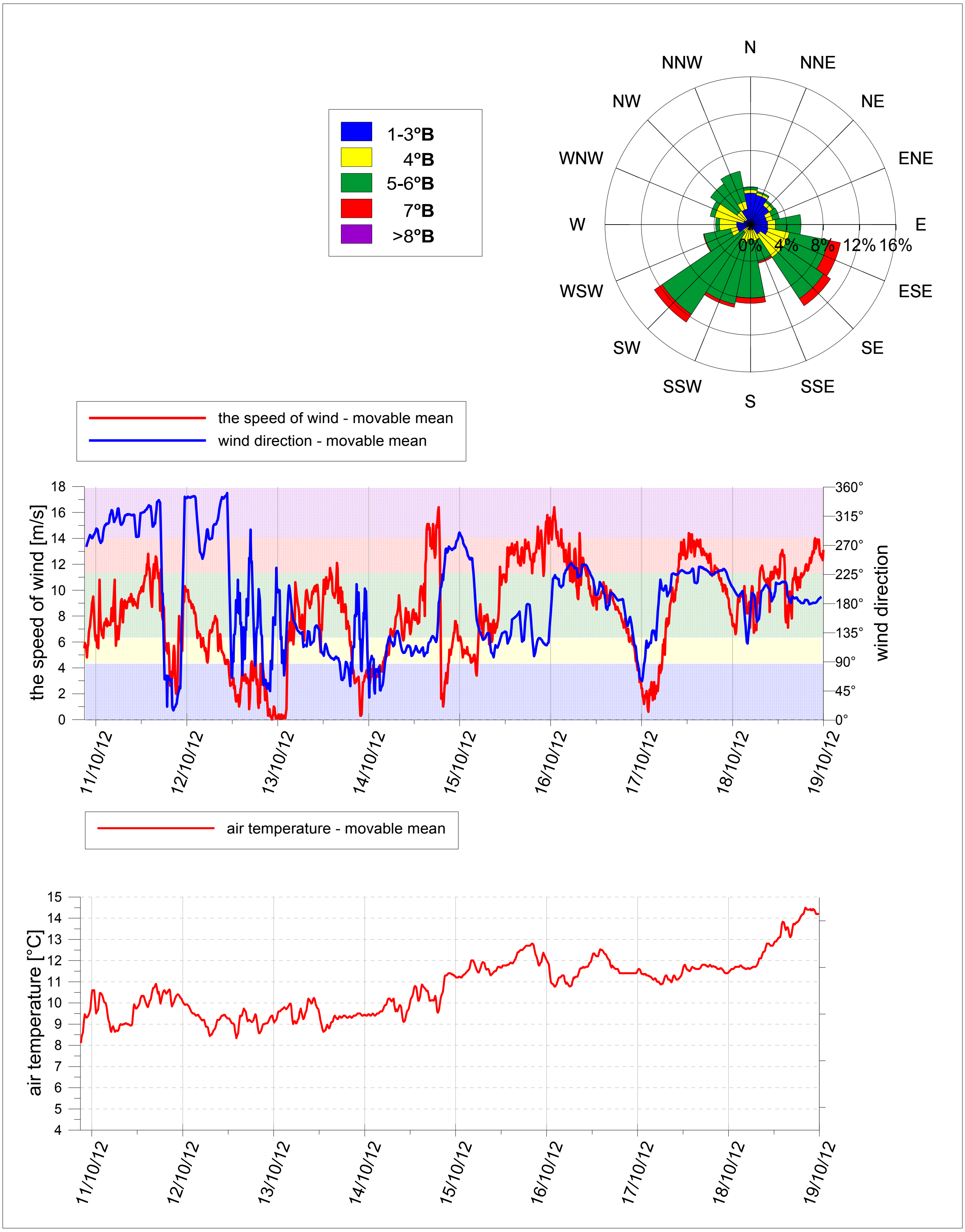


Figure 14: Changes of the main meteorological parameters (wind force, direction and the daily air temperature) during the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28 conducted by r/v "Baltica" in the period of 11.-18.10.2012.

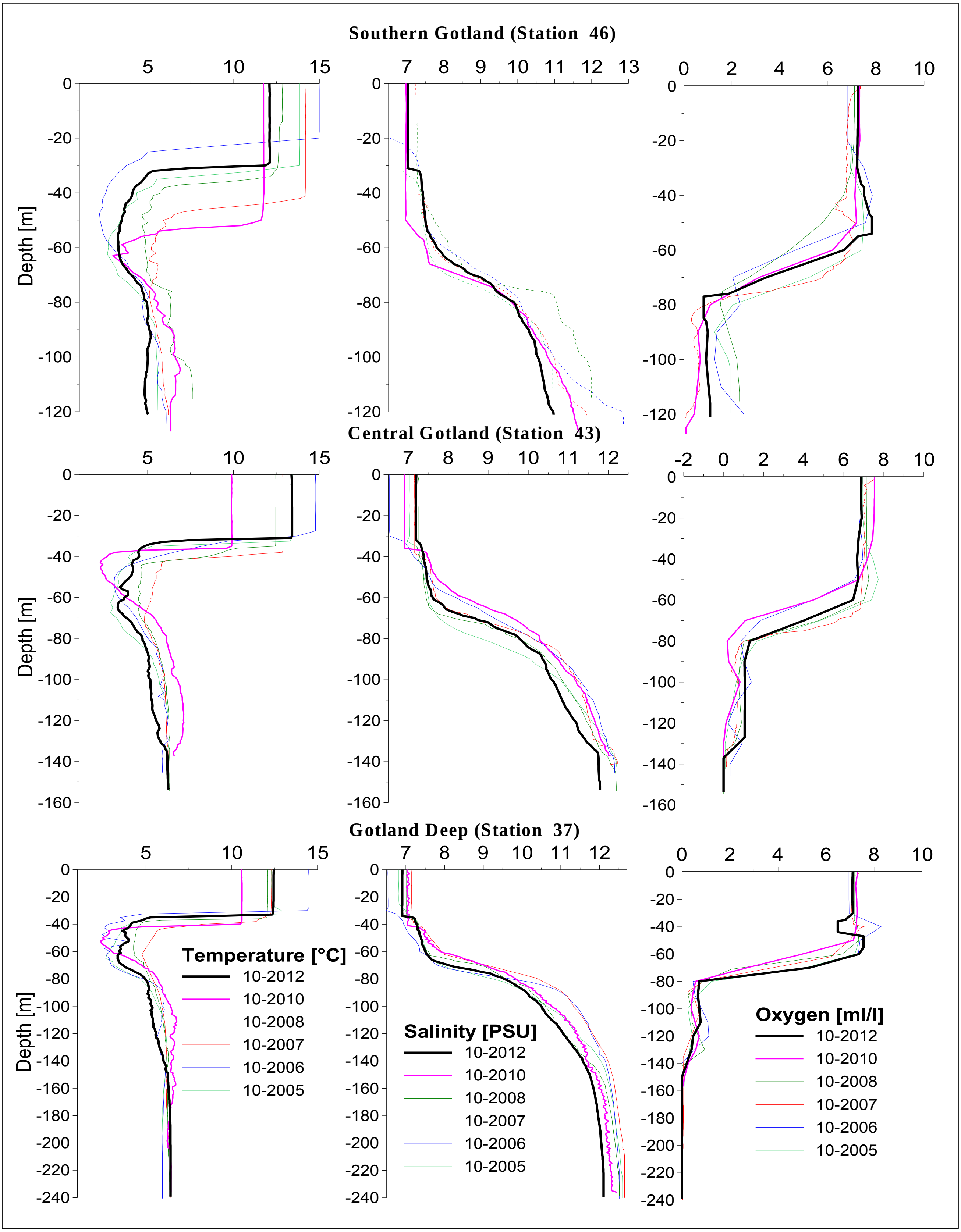


Figure 15: Vertical distribution of the seawater temperature, salinity and oxygen content at three different parts of the Gotland Basin in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

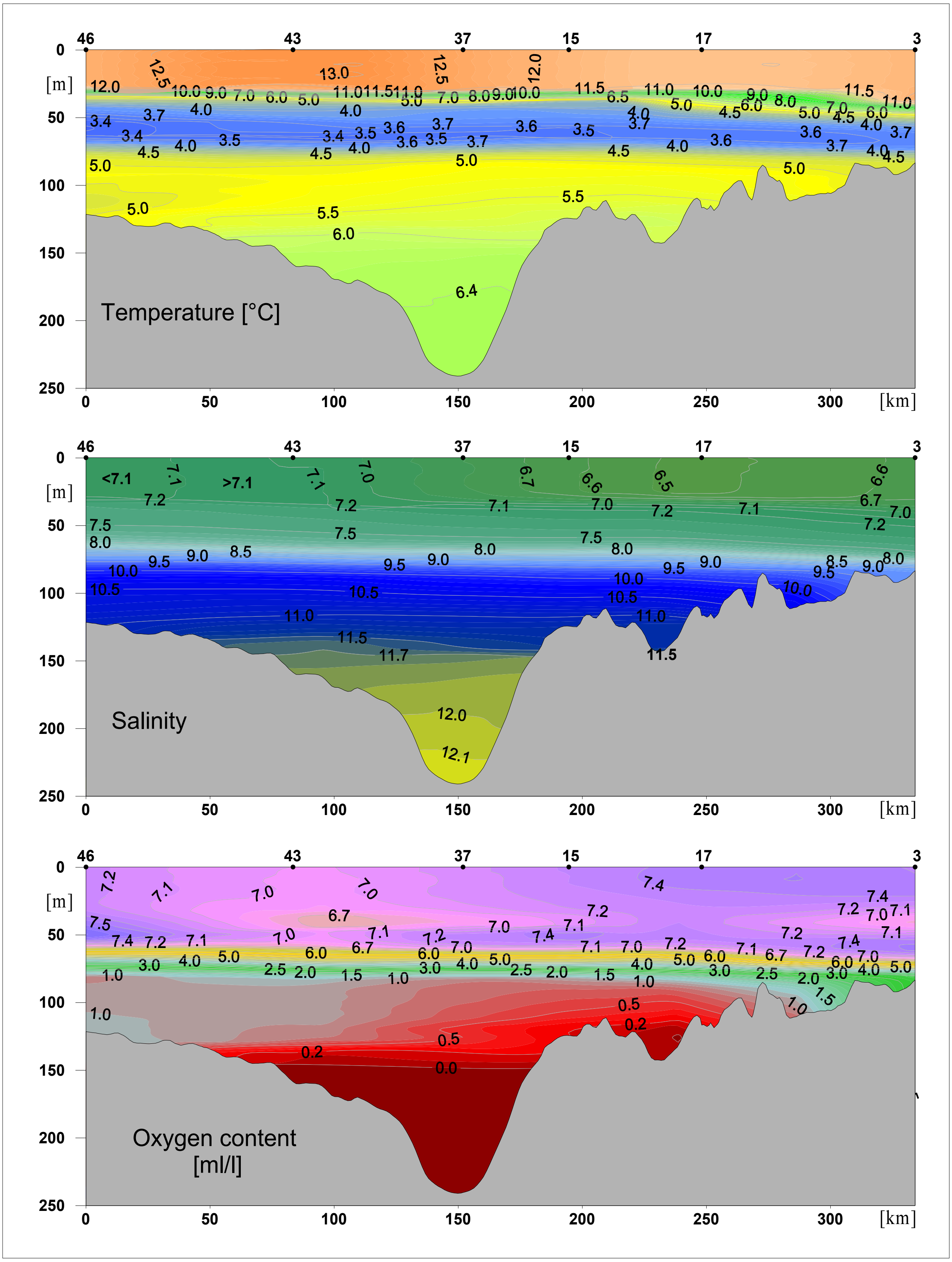


Figure 16: Vertical distribution of the seawater temperature, salinity and oxygen content along the hydrological research profile in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012; on the axis Y - depth to the bottom, on the axis X - distance.

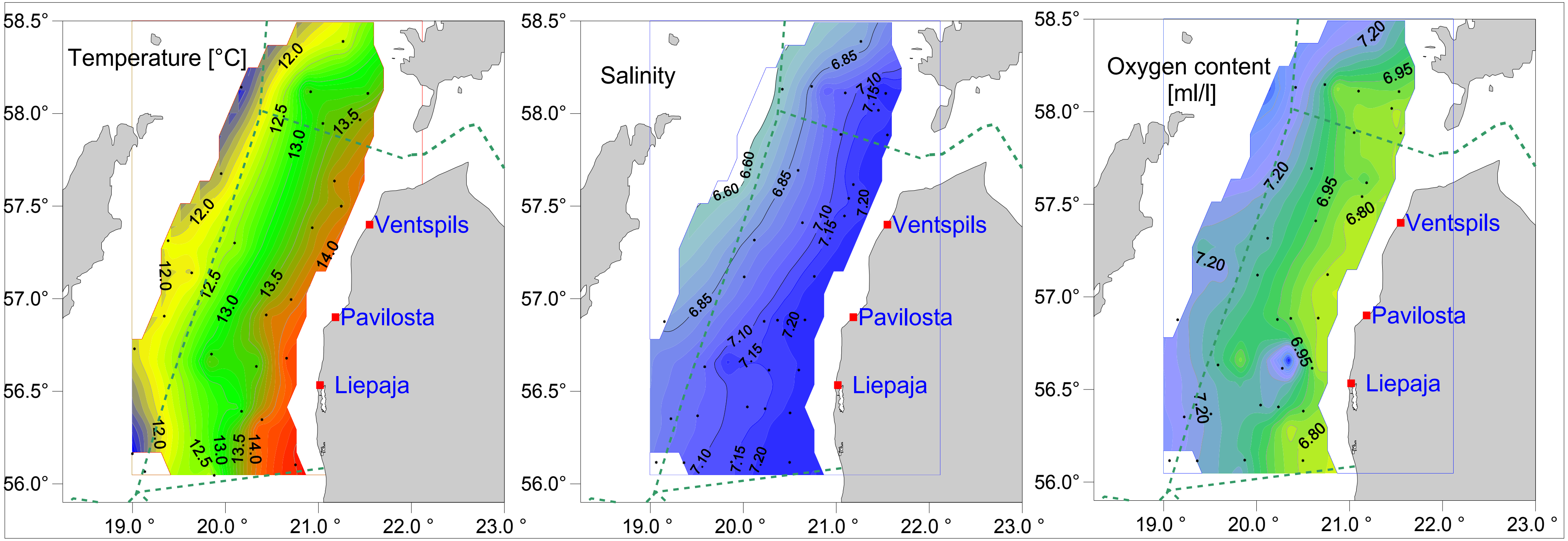


Figure 17: Horizontal distribution of the main hydrological parameters (temperature, salinity, oxygen content) measured in the surface water layer of the Gotland Deep in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

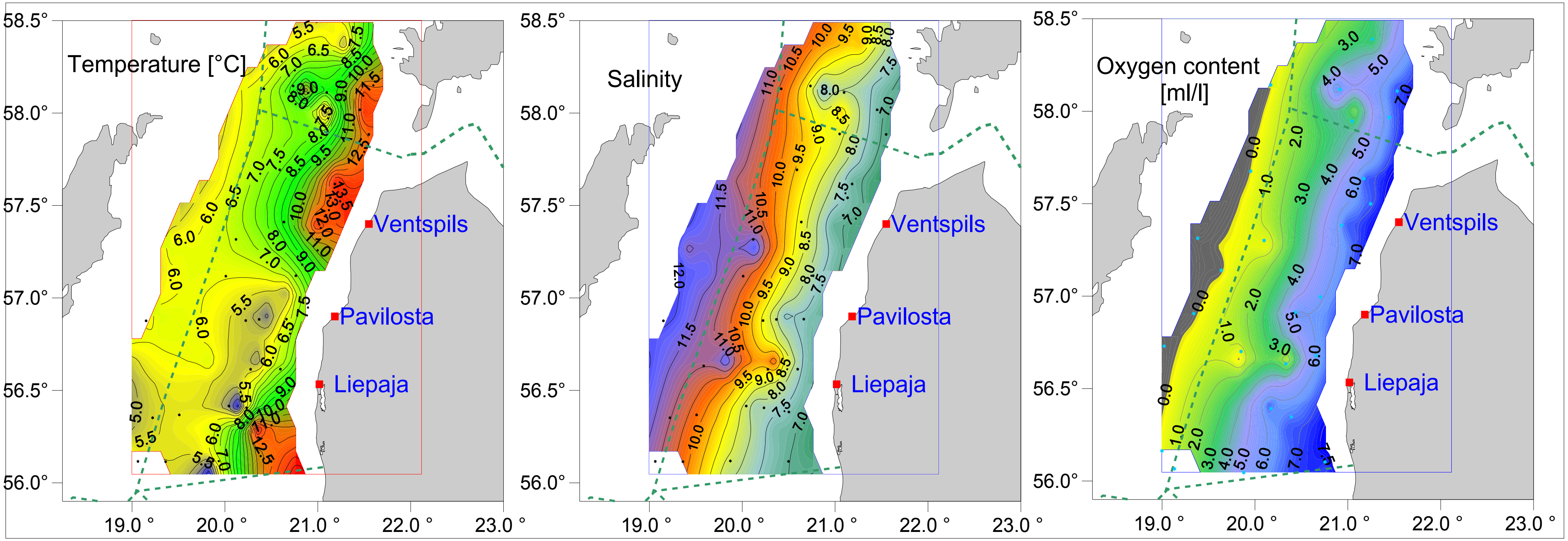


Figure 18: Horizontal distribution of the main hydrological parameters (temperature, salinity, oxygen content) measured in the bottom water layer of the Gotland Deep in the Baltic Sea ICES SD 26N and 28 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 11.-18.10.2012.

SURVEY REPOPRT FROM THE JOINT ESTONIAN-FINNISH-POLISH BIAS 2012 CONDUCTED BY THE R.V. “BALTICA” IN THE NORTH-EASTERN BALTIC SEA

by
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INTRODUCTION

The first joint Polish-Estonian-Latvian acoustic investigations of the Baltic fish resources were realised in October 1996, in the ICES Sub-divisions 24, 25 and 26 (Orłowski et al. 1997) on the Polish r.v. “Baltica”, managed by the Sea Fisheries Institute in Gdynia (SFI). The initial Finnish-Estonian-Polish (FIN-EST-POL) research survey on the r.v. “Baltica” was realised in October 2006 (Grygiel et al. 2007), in the framework of the long-term ICES Baltic International Acoustic Surveys (BIAS) programme. The common FIN-EST-POL BIAS surveys on the r.v. “Baltica” were continued in next years, until October 2012 (Grygiel et al. 2007, 2008, 2009, 2010, Grygiel 2010, Wyszyński et al. 2010, 2012). The bilateral scientific agreements between the SFI in Gdynia (in June 2011 renamed on National Marine Fisheries Research Institute - NMFRI) and the Estonian Marine Institute-University of Tartu in Tallinn (EMI/UT) as well as with the Finnish Game and Fisheries Research Institute in Helsinki (FGFRI), determined the above-mentioned direct at sea scientific cooperation. The BIAS surveys were focused on an acoustic assessment of sprat and herring stocks biomass and their geographical distribution in the ICES Sub-divisions 28N, 29 and 32. Timing, surveying area and the principal methods of investigations concerns reported surveys were co-ordinated by the ICES Baltic International Fish Survey Working Group [WGBIFS] (Anon. 2012).

Reported October 2012 BIAS surveys on board of the Polish r/v “Baltica” were devoted sprat and herring stocks size estimation and their geographical distribution monitoring in the Estonian and Finnish EEZs (the north-eastern Baltic), realised with applied an acoustic method. The survey was carried out in the season of herring and sprat an ending phase of intensive feeding and at the beginning of a new year-class recruiting to the stocks, exploited in the ICES Sub-divisions 28N, 29 and 32. The other aims of the BIAS survey were:

- to collect echo-integration data (value of an acoustic parameter S_A = NASC [Nautical Area Scattering (Strength) Coefficient] along pre-selected transects in the north-eastern Baltic,
- determination of sprat and herring (usually dominants in catches) proportion by mass and numbers in control-catches and an evaluation of clupeids fishing efficiency,
- characteristics of sprat and herring age-length-mass structure, sexual maturation and feeding conditions in consecutive hauls conducted in the Estonian and Finnish EEZs,
- a preliminary evaluation of herring and sprat new recruiting (2012) year-class strength,
- analysis of the hydro-meteorological conditions (seawater temperature, salinity, oxygen content, air temperature, atmospheric pressure, wind velocity and directions in the ICES Sub-divisions 28, 29 and 32.

MATERIALS AND METHODS

PERSONNEL

The above-mentioned purposes of October 2012 BIAS surveys on board of the r.v. "Baltica" were realized jointly by the EMI/UT (Tallinn), FGFRI (Helsinki) and the NMFRI (Gdynia) scientific team, with Włodzimierz Grygiel as a cruise leader and Tiit Raid as the Estonian scientific staff co-leader and Jukka Pönni as the Finnish scientific staff co-leader. The group of researchers was composed of:

– five ichthyologists (W. Grygiel, T. Raid, A. Lankov, J. Pönni, T. Saari) responsible for fish control-catches composition determination, dominants biological analyses and data processing moreover,
– three specialists of the acoustic matters (E. Jaala, E. Sepp, J. Słembarski), responsible for echo-sounding, acoustic data archiving and the electronics equipment services,
– one hydrologist (A. Grelowski), responsible for seawater sampling and analysing as well as for meteorological monitoring.

NARRATIVE

The r/v “Baltica” left the Ventspils-port (Latvia) on 19.10.2012 late afternoon and the direct at sea researches begins next day morning on the fish catch-station No. 1, located nearby the western coast of the Saaremaa Island (the Estonian EEZ; Fig. 1, Table 2). Investigations were continued in the northern direction and next in the east direction of the Gulf of Finland, up to the Estonian – Russian marine border and back to the Hanko-port (Finland). All at sea researches were finalised on 28.10.2012 morning and vessel enter to the Hanko-port for the disembarkation of the Estonian-Finnish scientific team. In the next days, the r.v. “Baltica” returned to the vessel home-port in Gdynia, and formally survey was ended on 30.10.2012.

The Estonian-Polish and Finnish-Polish BIAS surveys were realised one by one, without any break in time. Interruptions in the BIAS surveys tasks realisation because of the vessel technical fault were not occurred. However, one half day break in works realisation, due to a stormy weather, was appeared on 26.10.2012, during the Finnish-Polish BIAS survey.

SURVEYS DESIGN AND REALIZATION – SAMPLING DESCRIPTION

The Estonian-Polish BIAS survey, marked with the number 15/2012/MIR/EMI-UT, was conducted in the period of 19-25.10.2012, during seven days at sea equivalent to six full days of vessel exploitation. Overall, 12 fish control-hauls and a very same number of hydrological stations was inspected by the r.v. “Baltica” in the Estonian EEZ, including territorial waters.

The Finnish-Polish BIAS survey, marked with the number 15A/2012/MIR/FGFRI, was conducted in the period of 25-30.10.2012, during six days of vessel exploitation. Overall, 10 fish control-hauls and a very same number of hydrological stations was inspected by the r.v. “Baltica” in the Finnish EEZ, including territorial waters (Fig. 1, Table 2). Totally, 2, 11 and 9 hauls were located in the Estonian and Finnish parts of the ICES Sub-divisions 28, 29 and 32, respectively.

The very same scientific team members accomplished both surveys research tasks. The common surveys were realised within the framework of separate the Commissioned Research Bilateral Agreements and the ICES long-term BIAS type of surveys programme as well as in the Estonian Fisheries Data Collection Programme for 2012 and Finnish Fisheries Data Collection Programme for 2012.

The principal part of the cooperative surveys was preceded by calibration of the SIMRAD EK-60 split beam scientific echosounder (with frequencies of 38 and 120 kHz) used by the r/v “Baltica”. This kind of work was made on 13.09.2012, at the geographical position: φ=54°33.9’N, λ=018°55.7’E, i.e. nearby the north-eastern part of the Peninsula of Hel (Poland).

New applied values of acoustic parameter *Sv* (transducer gain) for the transducers type ES38-B and ES120-7C were 24.22 and 26.72 dB, respectively. The above-mentioned apparatus as well as the hull-mounted transducer of the beam angle (ATHW) equal to 7.06°x7.20° were applied for echosounding as a standard technical device.

The acoustic and ichthyological sampling stratification was based on the ICES statistical rectangles, with range of 0.5 degree in latitude and 1 degree in longitude, in given the ICES Sub-division and the clupeids stocks present vertical distribution pattern on a transect (Anon. 2003). Recent investigations in the framework of BIAS surveys were realised in October 2012 within following geographical positions:

- φ = 58º06'N - 60º02'N,
- λ = 020º46'E - 026º23'E (Fig. 1).

The intention was to carry out at least two fish control-hauls per the ICES statistical rectangle. Fish control-catches (at daylight) were conducted with the herring small-meshes pelagic trawl, type WP53/64x4 (6-mm mesh bar length in the codend; Table 2, Fig. 1). The trawling duration for 10 single hauls was 30 minutes and for 12 hauls was shortened to 15 minutes for each because of very high fish concentration occurrences in fishing areas. Hauls were made with the vessel speed of 3.3-3.4 knots. Because of a relatively high vertical opening (15-20 m) of applied a pelagic trawl and the technical-acoustics disturbances from a set vessel-trawl, the areas shallower as 30-m were not inspected. Fish catches were localised on the depth ranged from 9 to 69 m (position of the headrope from the sea surface; Table 2). Depth to the bottom at trawling positions varied from 32 to 183 m. All from totally, 22 realised hauls can be accepted as representative from technical and ichthyological points of view – zero catches were not noticed (Table 2).

Caught fishes were separated by species and weighed, and the species composition (proportion) as well as the fishing efficiency (catch per unit effort – CPUE; in kg/0.5 h) was determined for each control-haul. The results of CPUE and the main fish species average share in pelagic catches are presented in Table 2 and Figure 2. The samples of fish dominants were taken from each control-haul for the length-mass-age structure analyses. Sprat length distribution and the avg. mass in the 0.5-cm classes were determined for overall, 4688 specimens originated from 22 representative samples (Table 1). Overall, 587 specimens were taken for detail biological analyses, i.e. for determination total length, age, sex, maturity and stomach fullness. Herring length distribution and the avg. mass in the 0.5-cm classes were determined for overall, 2913 specimens originated from 15 representative samples. Overall, 616 specimens were taken for detail biological analyses. Ichthyological analyses were performed directly on board of surveying vessel, according to the ICES standard procedures. Overall, 545 individuals from remaining 12 species, constitute by-catch in both surveys, i.e. Estonian-Polish and Finnish-Polish, made one by one, were taken for the total length measurements in 1.0-cm classes.

Due to historical comparability of data, pre-selected echo-integration transects were planned in a similar pattern as was in the previous years. The current echosounding (echo-integration) data were collected along the acoustic transects (Fig. 1), within 14 ICES statistical rectangles, overall on the distance of 674 NM (ESDU), covering the all areas planned to control. The small fragment of the Estonian waters, located nearby the Estonian-Latvian marine border, which was acoustically monitored during preceded the Latvian-Polish BIAS/2012 survey was omitted from the recent investigations. The values of the S_A parameter for each Elementary Standard Distance Unit (ESDU) were the input data for fish stocks biomass estimation. The echo-integration data, which originated mostly from the layers of 10-m depth interval, were collected during a day. Because of a vessel hull reverberations and aeration zone, an echo-integration started at about 10-m depth from a sea surface.

Every control-haul was linked with the basic hydrological parameters (the seawater temperature, salinity, oxygen content) measurements, made continuously from the sea-surface to a bottom. The hydrological data were aggregated and archived per each 1-m depth interval. Totally, 22 hydrological stations (12 and 10 stations respectively, in the Estonian and Finnish EEZs) connected with trawling ending positions were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.

Meteorological observations of air temperature, wind speed and direction and atmospheric pressure were realized at actual geographical position of each research site, with applied automated station type MILOS-500.

RESULTS

FISH CATCHES, BIOLOGICAL AND HYDRO-METEOROLOGICAL DATA

Overall, 11 fish species were recorded in 12 scrutinized pelagic control-hauls taking place in the Estonian EEZ, including territorial waters. Fish catches were conducted in the north-eastern part of the ICES Sub-division 28 and the south-eastern part of the ICES Sub-division 29 (nearby the Hiiumaa and Saaremaa islands) and the southern part of the ICES Sub-division 32 (the Gulf of Finland, up to the marine border with Russia; Fig. 1, Table 2). Sprat, which appeared in each control-haul, with the mean share of 89.8% in mass of catches, was a dominant in inspected parts of the Estonian waters (Fig. 2). Sprat was dominated over herring and other species in respect to fishing efficiency (CPUE). The mean CPUE of sprat in the Estonian waters was 528.9 kg/0.5 h (Fig. 2, Table 2). The mean share of herring, as the second most common species occurred in the control-catches realised in the Estonian waters, was 9.7% and the mean CPUE was 57.2 kg/0.5 h, i.e. 9.2-times lower than for sprat. Summarized mass of sprat and herring in 6-days control-catches realized in the Estonian EEZ was adequately, 3457.0 and 600.6 kg (for all species was 4075.7 kg; Table 2).

Totally, nine fish species and one representative of sea lamprey were recorded in 10 scrutinized pelagic control-hauls taking place in the Finnish EEZ, including territorial waters. Fish catches were conducted in the north-eastern part of the ICES Sub-division 29 and the northern part of the ICES Sub-division 32 (the Gulf of Finland, up to the marine border with Russia; Fig. 1, Table 2). Sprat, which appeared in each control-haul, with the mean share of 84.2% in mass of catches, was a dominant in inspected parts of the Finnish waters (Fig. 2). Sprat was dominated over herring and other species in respect to the CPUE. The mean CPUE of sprat in the Finnish waters was 686.3 kg/0.5 h (Fig. 2, Table 2). The mean share of herring, as the second most common species occurred in the control-catches realised in the Finnish waters, was 15.5% and the mean CPUE was 126.5 kg/0.5 h, i.e. 5.4-times lower than for sprat. Summarized mass of sprat and herring in 5-days control-catches realized in the Finnish EEZ was adequately, 4957.1 and 1231.7 kg (for all species was 6203.7 kg; Table 2).

Despite the fact that the mean share of sprat in catches realised in the Estonian waters was higher by 5.6% than in the Finnish waters, the CPUE was lower by 157.4 kg/0.5 h, on average (Fig. 2). Sprat dominated particularly in the ICES Sub-division 32 (the Gulf of Finland), where the mean share in mass of research catches in both monitored EEZs was 96.4%, and next in the north-eastern part of the ICES Sub-division 28 (87.6%). Higher share of herring in control-catches was noticed in the ICES Sub-division 29, where amounted 23.7%, on average.

Threespine stickleback and smelt were most frequently noticed within the fraction of by-catch (totally, 12 species), however the mean share of the above-mentioned species was slightly below 0.2%. In haul No. 10, curried out in the ICES rectangle 48H2 (the Finnish part of the ICES Sub-division 29) 150.1 kg of jellyfish was caught.

On the fish catching depth (the central point of a trawl vertical opening), the following average values of hydrological parameters were recorded (Table 3):

Study area	Seawater temperature [°C]	Salinity	Oxygen content [ml/l]
ICES SD 28N	8.46	7.37	6.14
ICES SD 29	10.39	6.85	6.24
ICES SD 32	10.07	6.00	5.88
Estonian EEZ	9.64	6.73	5.97
Finnish EEZ	10.62	6.34	6.23
all areas	10.08	6.55	6.09
range acc. to single catches in the all areas	3.70-13.21	5.39-7.62	2.74-7.16

Vertical distribution of the seawater temperature, salinity and oxygen content in the open part of the north-eastern Baltic, and entryway to the Gulf of Finland, and inside the Gulf of Finland, analysed for October 2007, 2009 and 2012 is illustrated in Figure 5. The seawater temperature in the surface layer of the Gulf of Finland was changed from 10.6 to 12.1ºC, and in areas westward from the meridian 23º00'E – from 12.9 to 13.3ºC. In the above-mentioned two different areas, salinity was fluctuated in the surface layer from 4.8 to 6.4 and from 7.0 to 7.3, respectively. Oxygen content distribution in the surface layer was irregular, within the range of 6.9-7.3 ml/l. The analysis of the main hydrological parameters vertical distribution in scrutinized area indicate that, below the homogenous waters layer in respect to temperature and salinity, the thermocline, halocline and oxycline were formed under 40 m depth in the Gulf of Finland and under 55 m depth in waters surrounding the Alands Islands and in entryway to the Gulf of Finland. Temperature in the mixed waters layer in last two mentioned areas was slightly higher (0.5-1.0ºC) in October 2012, than in previous surveys (Fig. 5). Salinity in the mixed waters layer of the Gulf of Finland was by 0.6-1.5 lowers in October 2012 than in previous years. Below the main thermocline, at the depths of 65÷78 m occurred the winter waters, and in October 2012 temperature was ranged from 3.61 to 5.22ºC (avg. 4.41ºC). In the winter waters layer, where the minimum temperature was measured, the halocline was changed in the range of 6.57÷8.54 (avg. 7.49). Oxygen content on the depth, where the oxycline were formed, was geographically changed from 2.0 to 7.14 ml/l. In the deeper waters of the Gulf of Finland, i.e. where the bottom depth was over 80 m, temperature was changed in October 2012 from 4.03 to 5.26ºC (avg. 4.70ºC), salinity fluctuated from 6.57 to 9.82 (avg. 7.41), oxygen content oscillated in the range of 0.26 to 3.57 ml/l (avg. 1.96 ml/l). In the deeper waters (below 80 m depth) westward from the Gulf of Finland, temperature was changed from 4.85 to 5.68ºC (avg. 5.16ºC), salinity fluctuated from 8.18 to 10.01 (avg. 9.17), oxygen content oscillated in the range of 0.0 (below 135 m depth) to 4.84 ml/l (avg. 1.81 ml/l; Fig. 5). In October 2012, temperature and salinity in the deeper waters were lower than in October 2007 and 2009, but oxygen content was slightly higher (by 0.1 ml/l) than measured in previous years.

In the period of 20-28.10.2013, following meteorological conditions were noticed (Fig. 4): weak and mild winds, with force 1-3°B, occurred in 73.3% time of survey realisation. Moderate and strong winds (4-6°B) appeared in 22.5% of survey time, and very strong wind (7°B) was noticed in 4.2% of survey time. On 26.10.2012 (half day), the stormy weather condition was occurred, and wind speed was ranged from 20 to 23 m/sec. During survey tasks realisation prevailed winds from north-west and north-north-east directions, and appeared in 27 and 15% time, respectively. The air temperature gradually decreased during surveys, i.e. from 12.5ºC (20.10.2012) to 0.0ºC (27.10.2012; Fig. 4).

The total length of sprat and herring from the all investigated areas ranged as follow: 5.0÷14.5 and 7.0÷22.0 cm, respectively. The mean length and mean weight of clupeids in samples collected in October 2012 was as follow:

	Mean length [cm]		Mean weight [g]	
ICES Sub-div.	sprat	herring	sprat	herring
28	11.9	15.5	10.7	24.3
29	11.2	13.8	9.1	17.0
32	11.3	12.0	8.9	10.7
Estonian EEZ	11.4	14.7	9.4	20.1
Finnish EEZ	11.2	11.7	8.9	10.2

The shape of length distribution curves (numerical share acc. to 0.5-cm classes') for sprat from inspected in October 2012 the Estonian and Finnish waters were nearly the same, but for herring were distinctly different (Fig. 3). In sprat frequency distribution one apex was formed, at 10.5-11.5 cm length. Such shape of sprat length distribution curves is not typical to autumn and can initially indicate, that new recruiting year-class 2012 will be poor abundant in the north-eastern Baltic. In herring originated from the Finnish waters, two distinct frequency apexes were formed in the length distribution – one higher apex, proper to juvenile, undersized specimens (with maximum at 9.0-10.0 cm) and the second somewhat lower apex – representing commercially sized fishes (with maximum at 13.5-14.5 cm). In herring originated from the Estonian waters, one distinct frequency apex was formed in the length distribution, with maximum at 13.0-15.5 cm. By-catch of juvenile, undersized herring specimens was marginal in the Estonian waters.

ABUNDANCE ESTIMATES

The total abundance of herring and sprat is presented in Table 4. Estimated numbers of herring and sprat by age group and Subdivision/rectangle are given in Table 5 and Table 8, respectively. Corresponding mean weights by age group and Subdivision/rectangle are shown in Table 6 and Table 9, respectively. Estimates of herring and sprat biomass by age group and Subdivision/rectangle are summarized in Table 7 and Table 10, respectively.

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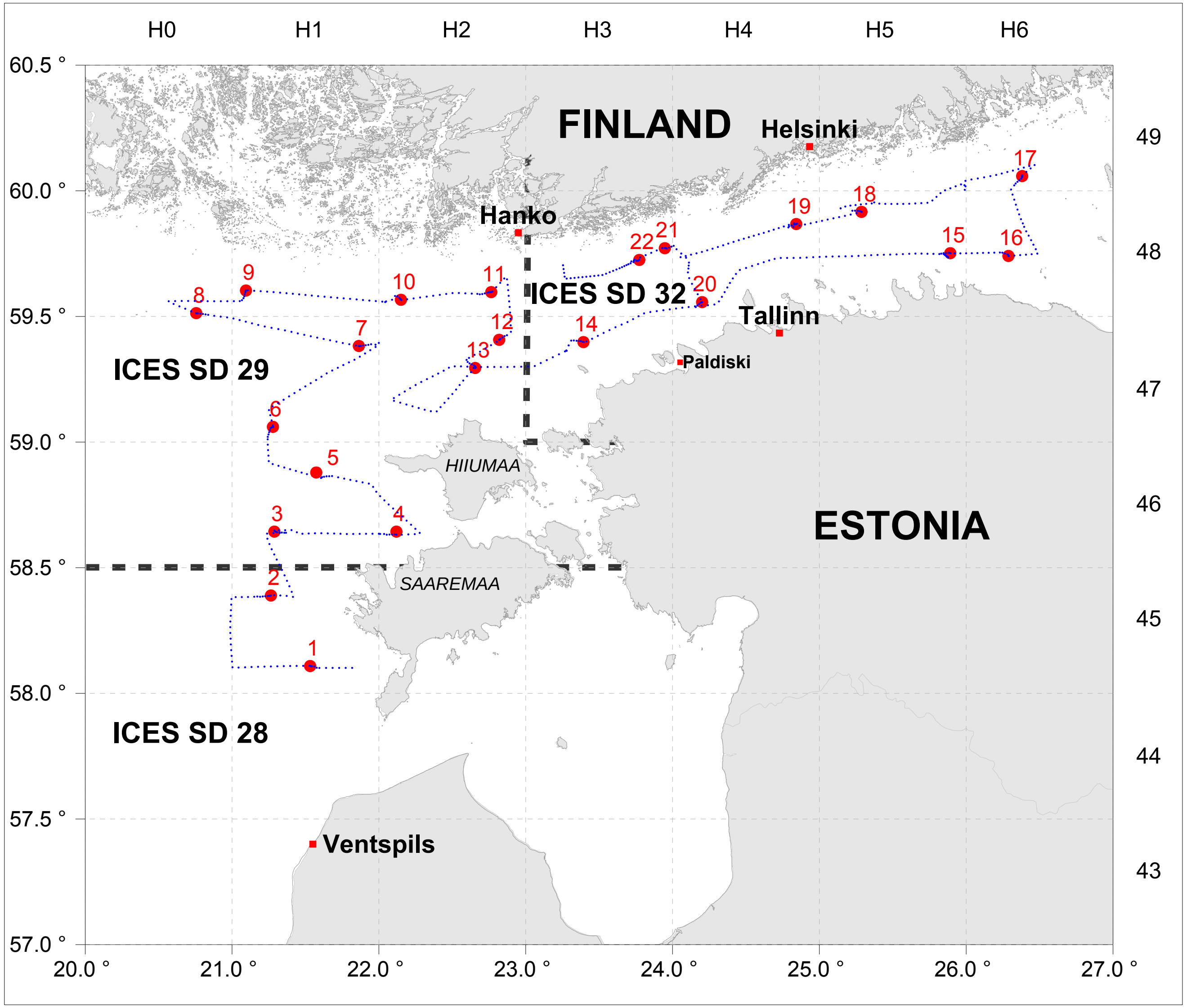

Fig. 1. Location of the fish control-catches and hydrological stations (red bullets Nos. 1-6; 12-16; 20 – in the Estonian EEZ and Nos. 7-11, 17-19, 21-22 – in the Finnish EEZ) inspected by the r.v. "Baltica" along the acoustic transect (blue dotted line) located in the north-eastern Baltic (October 2012).

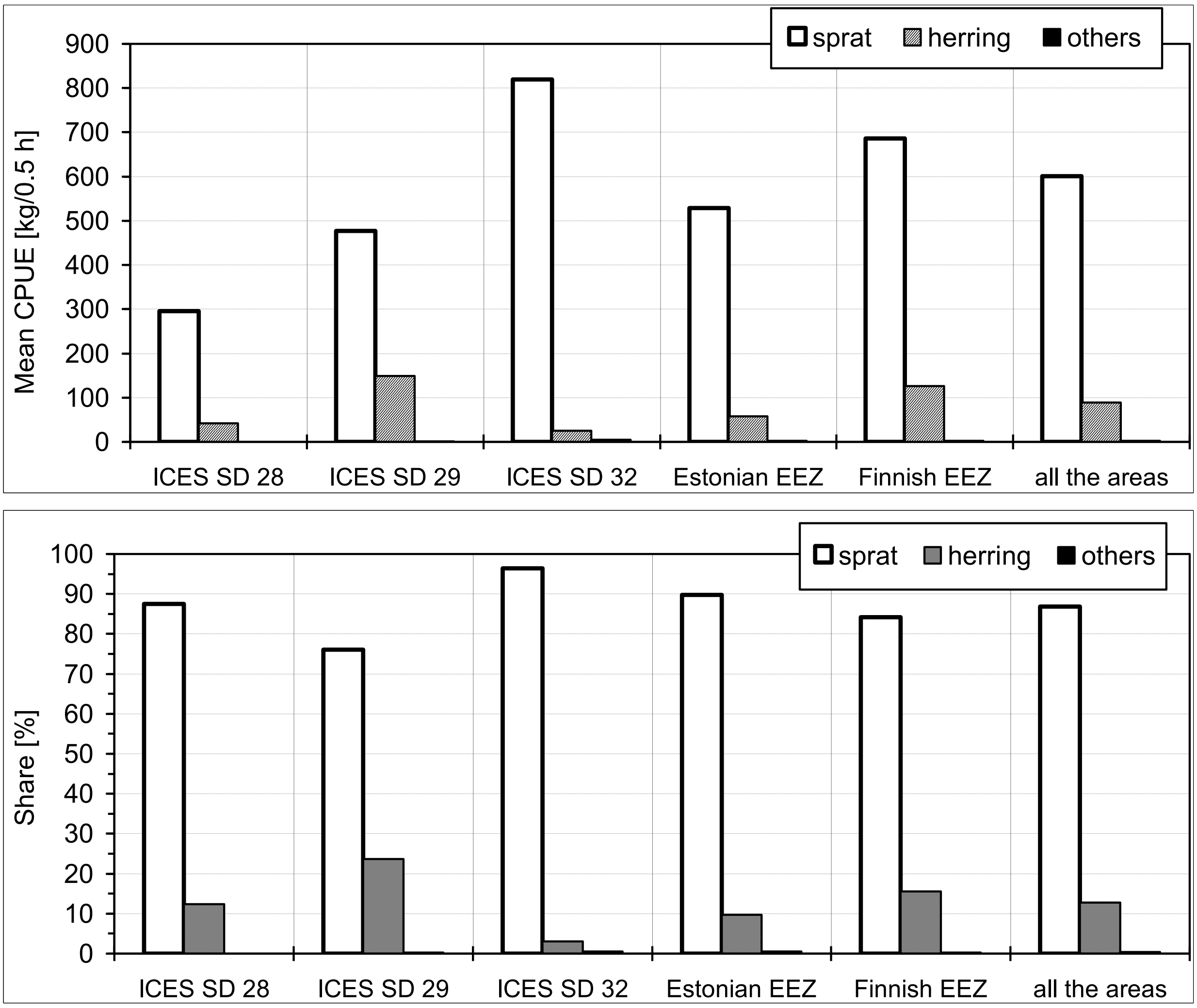

Fig. 2. The mean CPUE (upper part) and share (lower part) of sprat and herring (dominated fishes) in the pelagic control-hauls, conducted by the r/v “Baltica” in the north-eastern Baltic (October 2012).

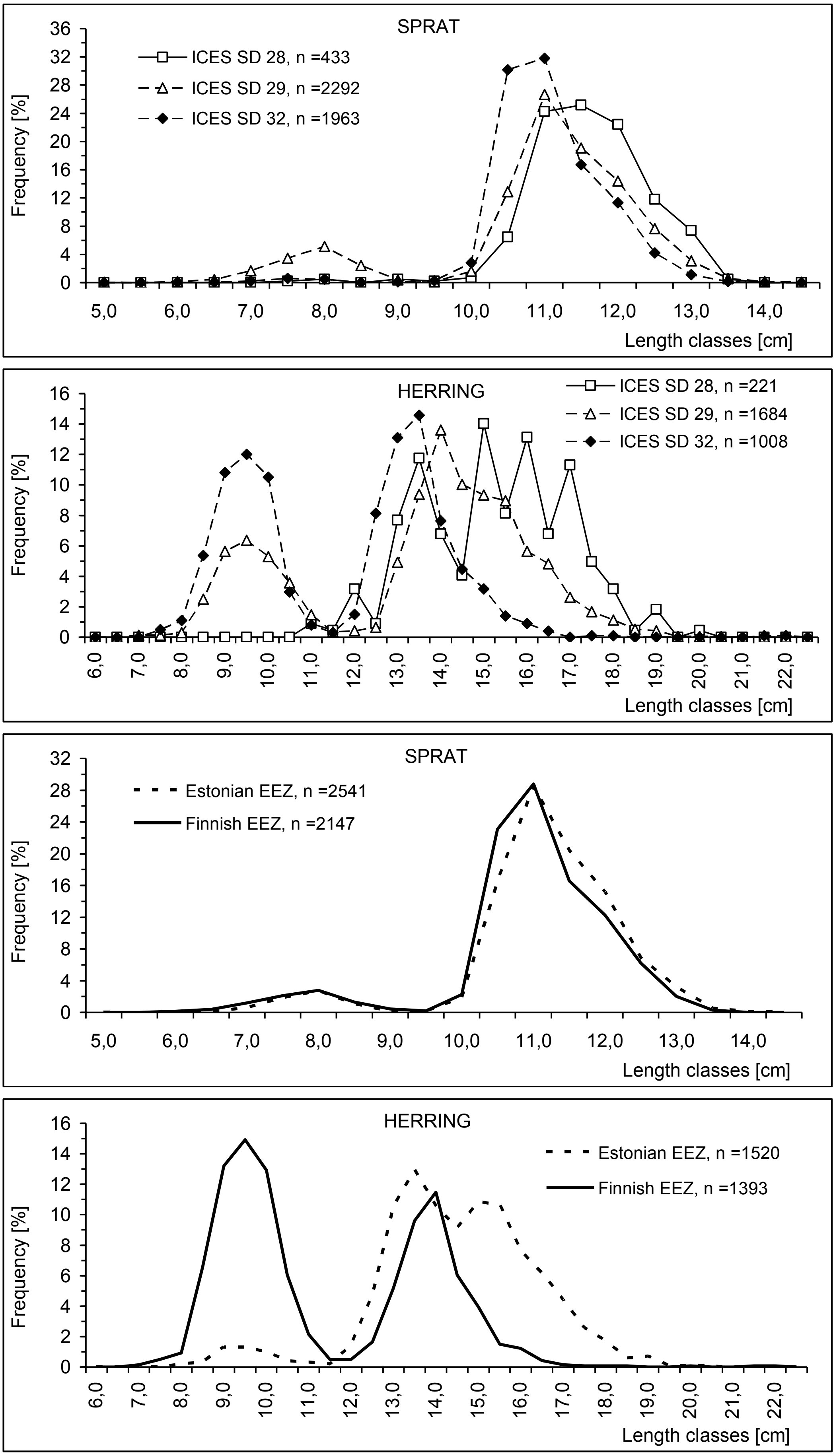

Fig. 3. Length distribution of sprat and herring in samples originated from the pelagic control-catches conducted in the ICES Sub-divisions 28, 29 and 32 (the Estonian and Finnish EEZs) by the r.v. "Baltica" (October 2012); n – number of specimens with measured total length and weight.

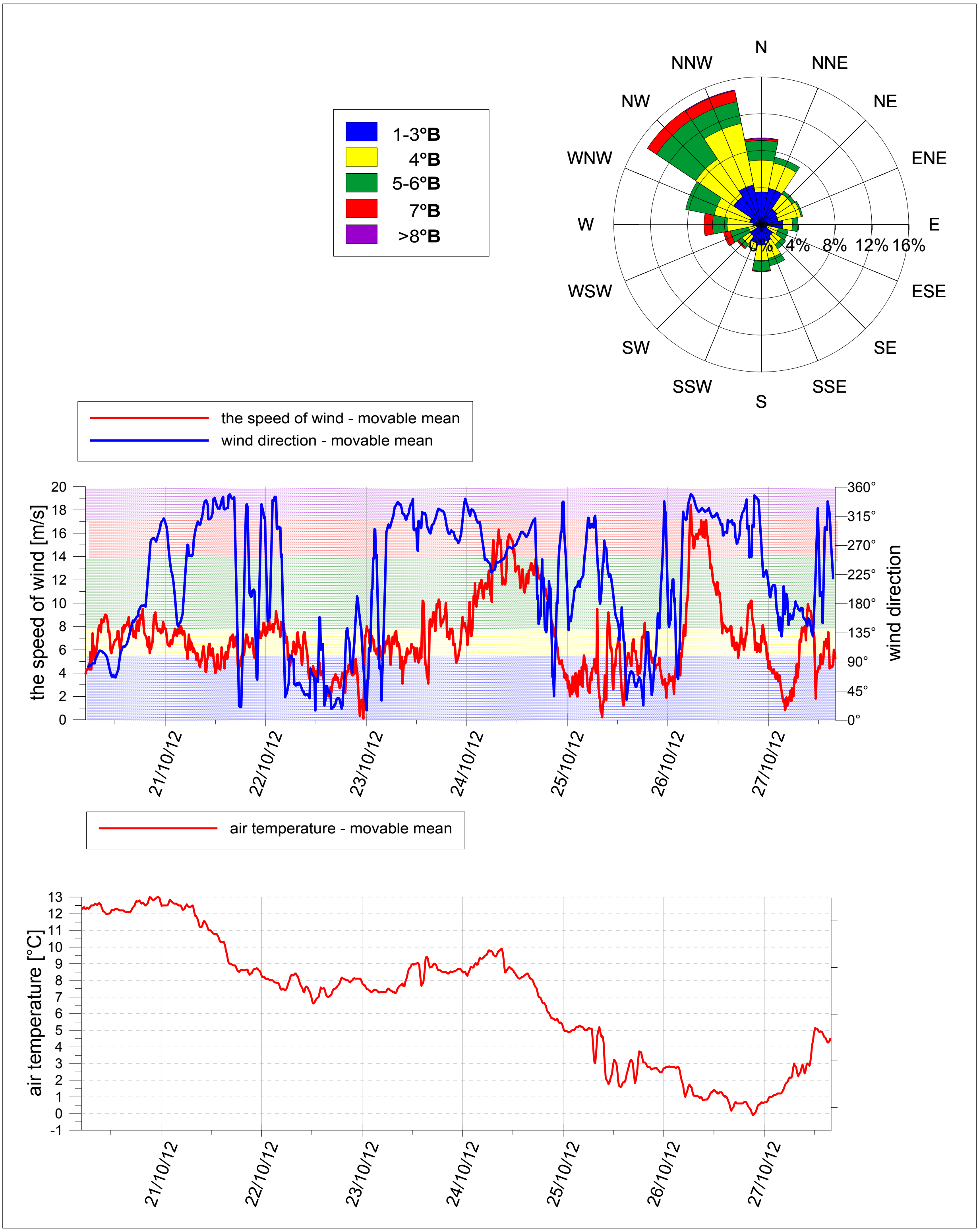

Fig. 4. Fluctuations of the main meteorological parameters – wind rose (upper part), wind velocity and direction (middle part), and the air temperature (lower part) in October 2012, in the entire monitored areas of the north-eastern Baltic.

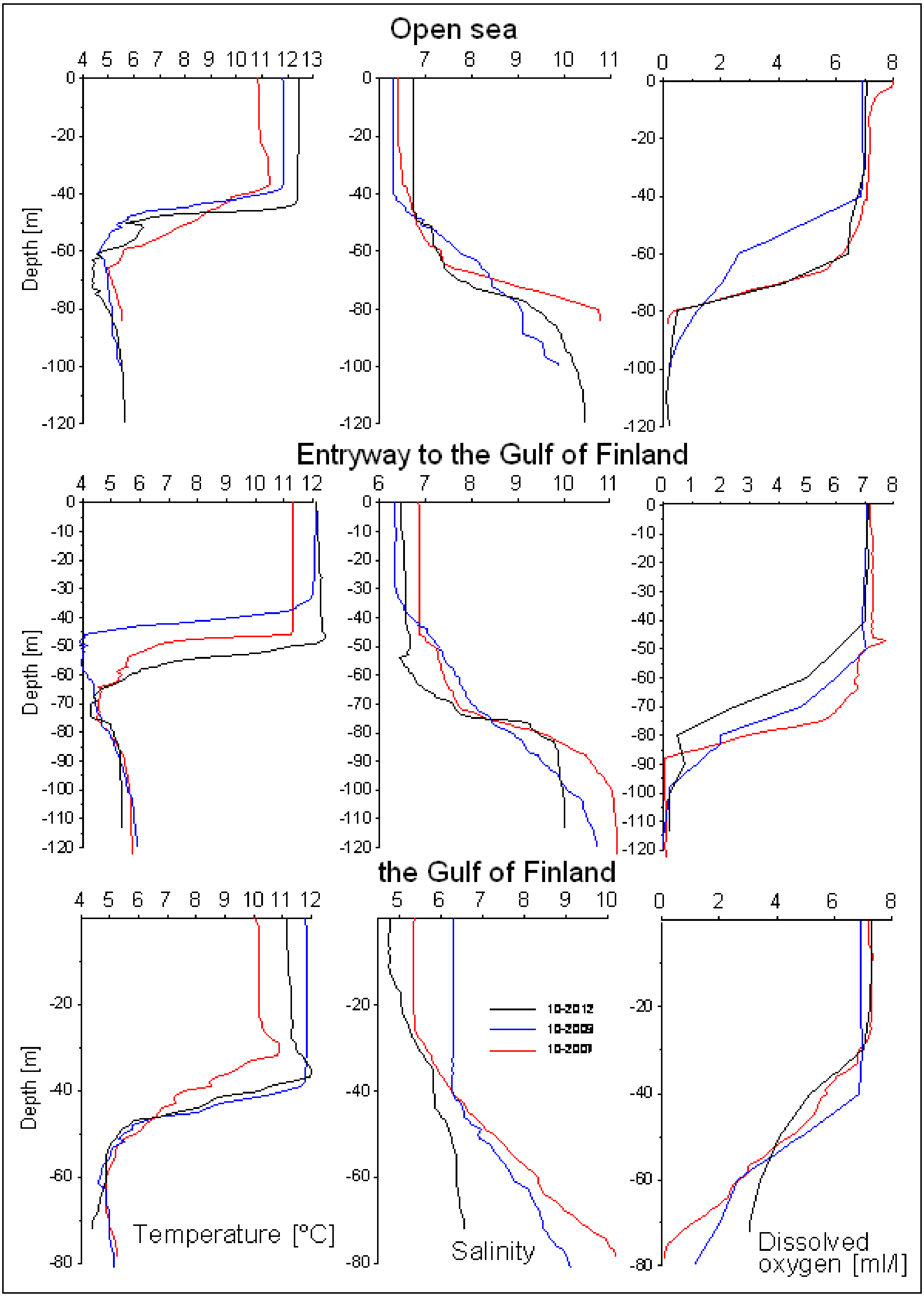

Fig. 5. Vertical distribution of the seawater temperature (left part), salinity (inner part) and oxygen content (right part) at three inspected areas in the north-eastern Baltic (October 2007, 2009, 2012).

Table 1. The list of fish species taken to the total length measurements and weighed, and aged, according to the ICES Sub-divisions (October 2012).

	Number of measured (l.t.) and weighed fish				Number of fish in detail biological analyses (aged)			
Species	ICES SD 28	ICES SD 29	ICES SD 32	total	ICES SD 28	ICES SD 29	ICES SD 32	total
sprat	433	2292	1963	4688	119	269	199	587
herring	221	1684	1008	2913	71	304	241	616
cod	0	2	0	2	0	0	0	0
flounder	0	3	1	4	0	0	0	0
threespine stickleback	2	130	299	431	0	0	0	0
ninespine stickleback	0	7	8	15	0	0	0	0
smelt	2	14	55	71	0	0	0	0
sea scorpion	0	0	1	1	0	0	0	0
fourhorn sculpin	0	2	0	2	0	0	0	0
salmon	0	2	0	2	0	0	0	0
greater sand eel	0	1	0	1	0	0	0	0
lumpfish	0	10	4	14	0	0	0	0
goby	0	1	0	1	0	0	0	0
sea lamprey	0	0	1	1	0	0	0	0
total	658	4148	3340	8146	190	573	440	1203

Table 2. Fish control-catches results from the Estonian-Polish (upper part) and Finnish-Polish (lower part) BIAS surveys conducted by the r/v "Baltica" in the north-eastern Baltic (October 2012) with the herring pelagic trawl type WP 53/64x4 (6-mm mesh bar length in the codend).

Haul number	Date of catch	ICES rectangle	ICES Sub-div. and EEZ	Depth to the bottom [m]	Headrope depth - from the surface [m]	Vertical net opening [m]	The ship's course during fishing [°]	Geographical position of the catch-station				Time of		CPUE of all species [kg/0.5 h]	CPUE of particular fish species [kg/0.5 h]										
								start		end		shutting net	hauling up net		sprat	herring	cod	flounder	threespine stickleback	ninespine stickleback	smelt	lumpfish	greater sand eel	sea scorpion	goby
								latitude	longitude	latitude	longitude														
1	2012-10-20	45H1	28-EST	32-36	11	20	300-270	58°06.2'	21°34.0'	58°06.4'	21°32.7'	8,05	8,20	404,140	404,140										
2	2012-10-20	45H1	28-EST	85-91	63-69	17	85	58°23.1'	21°11.7'	58°23.2'	21°14.8'	13,45	14,15	271,451	187,440	83,930			0,027		0,054				
3	2012-10-20	46H1	29-EST	84	30	19	270	58°38.3'	21°20.7'	58°38.4'	21°18.1'	18,05	18,35	102,917	61,060	41,070	0,030	0,142	0,215		0,003	0,397			
4	2012-10-21	46H2	29-EST	36-38	9	20	110	58°37.9'	22°02.8'	58°37.9'	22°06.4'	7,20	7,50	264,532	263,520	0,420	0,001		0,238	0,053		0,252	0,048		
5	2012-10-21	46H1	29-EST	53-58	28	18	265	58°51.8'	21°38.9'	58°51.6'	21°36.8'	12,10	12,25	704,060	704,060										
6	2012-10-21	47H1	29-EST	148-183	44	19	15-20	59°01.6'	21°14.8'	59°03.3'	21°15.7'	15,30	16,00	68,777	37,568	30,858			0,146	0,002	0,001	0,200			0,002
12	2012-10-23	47H2	29-EST	91	42	19	232	59°25.1'	22°50.9'	59°24.7'	22°49.7'	14,05	14,20	1159,812	1153,320	2,320			0,232		3,940				
13	2012-10-23	47H2	29-EST	114	60	19	140-115-126	59°18.9'	22°36.4'	59°18.2'	22°39.0'	16,05	16,35	377,899	17,910	358,500			0,680	0,015	0,680	0,114			
14	2012-10-24	47H3	32-EST	113	40	19	97	59°24.2'	23°20.2'	59°24.1'	23°21.8'	7,35	7,50	796,540	783,720	9,860		0,198	0,720	0,080	1,114	0,302		0,546	
15	2012-10-25	48H5	32-EST	71-78	23	20	84	59°45.1'	25°50.9'	59°45.2'	25°52.7'	7,15	7,30	743,260	733,380	5,940			2,680		1,260				
16	2012-10-25	48H6	32-EST	83	33	20	115	59°45.1'	26°15.1'	59°44.8'	26°16.6'	9,35	9,50	1685,262	1529,410	141,902			10,120	0,050	3,780				
20	2012-10-27	48H4	32-EST	74-85	40	19	45	59°32.6'	24°10.2'	59°33.2'	24°11.4'	7,15	7,30	487,150	470,980	11,540			0,390	0,020	4,040	0,180			
										Mean CPUE in the Estonian EEZ [kg/0.5 h]				588,817	528,876	57,195	0,003	0,028	1,287	0,018	1,239	0,120	0,004	0,046	0,000
										Total catches in the Estonian EEZ [kg]				4075,688	3457,003	600,559	0,031	0,241	8,377	0,145	7,805	1,204	0,048	0,273	0,002

Haul number	Date of catch	ICES rectangle	ICES Sub-div. and EEZ	Depth to the bottom [m]	Headrope depth - from the surface [m]	Vertical net opening [m]	The ship's course during fishing [°]	Geographical position of the catch-station				Time of		CPUE of all species [kg/0.5 h]	CPUE of particular fish species [kg/0.5 h]									
								start		end		shutting net	hauling up net		sprat	herring	flounder	threespine stickleback	ninespine stickleback	smelt	lumpfish	fourhorn sculpin	salmon	sea lamprey
								latitude	longitude	latitude	longitude													
7	2012-10-22	47H1	29-FIN	62-79	35	19	260	59°23.2'	21°55.6'	59°22.9'	21°52.8'	7,20	7,50	705,897	697,584	8,045	0,140	0,071		0,057				
8	2012-10-22	48H0	29-FIN	51-70	26	15	280	59°30.5'	20°49.0'	59°30.7'	20°46.0'	12,25	12,55	622,016	167,894	453,580		0,124	0,012			0,406		
9	2012-10-22	48H1	29-FIN	83-97	40	19	35-14	59°34.2'	21°04.5'	59°35.6'	21°05.3'	16,10	16,40	907,182	190,240	716,670		0,272						
10	2012-10-23	48H2	29-FIN	64	22-24	20	137	59°34.8'	22°07.6'	59°34.2'	22°08.6'	7,30	7,45	454,060	445,840	7,980		0,240						
11	2012-10-23	48H2	29-FIN	65-68	39-44	19	95-73	59°35.2'	22°41.4'	59°35.7'	22°44.5'	10,25	10,55	1529,216	1508,530	15,576				2,900			2,210	
17	2012-10-25	49H6	32-FIN	64-69	29	20	42-35	60°01.8'	26°20.4'	60°03.0'	26°22.7'	13,55	14,25	492,660	486,460	4,630		1,080		0,490				
18	2012-10-26	48H5	32-FIN	63	38	20	95	59°55.2'	25°14.6'	59°55.2'	25°15.9'	15,00	15,15	937,200	930,640	2,820		3,740						
19	2012-10-26	48H4	32-FIN	70-77	30	20	67-72	59°51.6'	24°48.1'	59°51.9'	24°49.5'	18,05	18,20	637,092	606,360	23,420		2,100	0,020	4,460	0,542			0,190
21	2012-10-27	48H3	32-FIN	60	22-30	20	245	59°46.6'	23°59.4'	59°46.2'	23°57.8'	10,15	10,30	1375,420	1365,640	7,020		0,280		2,480				
22	2012-10-27	48H3	32-FIN	59-61	24	20	80-90-105	59°43.3'	23°44.1'	59°43.2'	23°45.5'	12,10	12,25	489,696	464,280	25,180		0,196		0,040				
										Mean CPUE in the Finnish EEZ [kg/0.5 h]				815,044	686,347	126,492	0,014	0,810	0,003	1,043	0,054	0,041	0,221	0,019
										Total catches in the Finnish EEZ [kg]				6203,705	4957,088	1231,711	0,140	4,825	0,022	6,937	0,271	0,406	2,210	0,095

Table 3. The values of basic hydrological and meteorological parameters registered at the catching depth (the central point of a trawl vertical opening), during the r.v. "Baltica" Estonian-Polish (upper part) and Finnish-Polish (lower part) BIAS surveys in October 2012.

Haul number	Date of catch	Hydrological parameters			Meteorological parameters		
		temperature [°C]	salinity	oxygen [ml/l]	wind direction	wind force [°B]	sea state
1	2012-10-20	13.21	7.12	7.00	changeable	1	1
2	2012-10-20	3.70	7.62	5.28	E	4	2
3	2012-10-20	11.89	6.99	6.68	SE	4-5	3
4	2012-10-21	12.44	6.85	7.05	W	2-3	2
5	2012-10-21	12.94	6.98	6.96	NW	4	2
6	2012-10-21	6.14	7.15	6.45	NW	4	2
12	2012-10-23	10.91	6.51	6.06	NW	3	2
13	2012-10-23	4.30	7.60	2.74	NW	3	2
14	2012-10-24	9.70	6.54	5.92	W	6	4
15	2012-10-25	11.40	5.39	7.16	changeable	2	1
16	2012-10-25	9.65	5.62	5.02	N	3	2
20	2012-10-27	9.34	6.33	5.33	changeable	1	2
7	2012-10-22	12.52	6.80	6.92	NE	4	2
8	2012-10-22	11.94	6.67	6.85	NE	4	2
9	2012-10-22	8.48	6.72	6.11	NE	3	2
10	2012-10-23	11.84	6.62	6.82	NW	3	2
11	2012-10-23	10.84	6.47	6.02	NW	3	2
17	2012-10-25	10.52	5.83	5.34	SSE	3	2
18	2012-10-26	6.03	6.25	4.29	WNW	6	4
19	2012-10-26	11.52	5.88	6.37	NNW	6	4
21	2012-10-27	11.56	6.20	6.80	SW	4	3
22	2012-10-27	10.90	5.98	6.73	S	5	3

Table 4. Survey statistics by area (r.v. “Baltica”October 2012).

Subdiv.	Rect.	Area (nm²)	Sa (m²/nm²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	Cod (%)	Nherring (million)	Nsprat (million)
28	45H1	827.1	739	1.573	3885	15.0	85.0	0.000	574.39	3 300.40
29	46H1	921.5	832	1.544	4965	19.4	80.2	0.014	963.28	3 983.51
29	46H2	258.0	750	1.107	1749	0.2	99.6	0.000	2.78	1 742.42
29	47H1	920.3	1109	1.479	6905	13.1	86.8	0.000	902.40	5 991.39
29	47H2	793.9	728	1.444	4000	37.6	62.0	0.000	1 505.19	2 479.83
29	48H0	730.3	1131	1.282	6439	72.9	27.0	0.000	4 695.51	1 738.06
29	48H1	544.0	2797	1.435	10602	79.0	21.0	0.000	8 375.15	2 223.18
29	48H2	597.0	4152	1.280	19358	1.5	98.3	0.000	295.89	19 034.99
32	47H3	536.2	2671	1.221	11733	1.2	98.4	0.000	145.23	11 543.95
32	48H3	615.7	2058	1.088	11647	3.3	96.5	0.000	389.92	11 244.95
32	48H4	835.1	2989	1.305	19120	2.9	96.1	0.000	551.83	18 371.77
32	48H5	767.2	1994	1.079	14185	0.5	99.1	0.000	64.25	14 058.24
32	48H6	776.1	2406	1.497	12478	8.4	90.8	0.000	1 050.71	11 324.45
32	49H5	306.9	989	1.080	2809	0.9	98.7	0.000	26.40	2 773.77
32	49H6	586.5	587	1.080	3189	0.9	98.7	0.000	29.97	3 148.63

Table 5. Numbers (millions) of herring by age and area (r.v. “Baltica” October 2012).

Subdiv.	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	7.9	215.1	61.3	68.2	57.1	90.9	32.2	19.6	31.7	583.9
29	46H1	3.9	130.7	97.1	200.0	207.4	168.7	63.7	28.2	63.7	963.3
29	46H2	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8
29	47H1	42.7	313.2	79.8	173.5	119.5	88.4	24.6	22.6	38.1	902.4
29	47H2	16.0	555.2	154.9	336.8	183.5	146.6	16.2	47.8	48.2	1505.2
29	48H0	2136.9	1488.3	209.6	391.7	178.8	104.8	15.6	68.6	101.3	4695.5
29	48H1	3407.5	3314.0	366.5	601.9	244.1	122.6	23.0	118.2	177.3	8375.2
29	48H2	250.3	31.4	2.6	4.8	2.1	2.8	0.1	0.9	0.9	295.9
32	47H3	101.5	25.0	3.5	6.7	1.9	2.2	2.2	0.0	2.2	145.2
32	48H3	376.8	4.5	2.0	2.3	1.5	1.5	0.6	0.1	0.6	389.9
32	48H4	123.5	202.6	51.9	98.2	23.9	24.1	10.2	4.0	13.4	551.8
32	48H5	20.3	31.4	4.4	5.7	1.2	0.8	0.1	0.3	0.1	64.3
32	48H6	123.1	762.4	60.2	64.5	17.9	15.7	2.4	0.8	3.7	1050.7
32	49H5	4.5	20.4	0.6	0.5	0.2	0.1	0.0	0.0	0.0	26.4
32	49H6	5.1	23.2	0.7	0.6	0.2	0.1	0.0	0.0	0.0	30.0

Table 6. Mean weight (g) of herring by age and area (r.v. "Baltica" October 2012).

Subdiv.	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	7.83	17.19	22.87	26.60	32.87	30.12	31.25	31.39	31.15	24.31
29	46H1	7.07	20.65	24.54	24.83	28.49	29.31	30.55	25.65	26.28	26.23
29	46H2	4.12									4.12
29	47H1	6.01	16.89	21.72	22.13	24.79	26.54	29.14	22.66	25.21	20.63
29	47H2	8.29	16.82	21.08	21.08	21.95	23.29	27.76	21.80	21.49	19.80
29	48H0	5.09	16.13	18.82	19.88	21.46	22.95	27.54	19.02	18.29	12.02
29	48H1	5.32	15.67	18.38	19.46	21.22	22.64	26.12	18.90	17.29	12.22
29	48H2	5.36	14.98	18.98	19.94	20.86	24.96	25.74	20.06	17.68	7.13
32	47H3	4.90	14.08	18.13	19.56	20.48	21.64	23.30		23.30	8.49
32	48H3	4.40	12.65	27.33	20.43	62.76	46.90	23.12	23.33	23.12	5.15
32	48H4	5.57	14.63	18.35	20.36	21.58	20.88	22.51	23.33	23.51	14.97
32	48H5	5.37	13.85	17.36	19.54	17.98	17.62	20.04	23.33	20.04	12.09
32	48H6	12.14	13.68	16.70	18.83	18.48	18.61	21.27	23.33	23.20	14.20
32	49H5	10.08	13.10	16.57	16.78	16.85	15.68				12.77
32	49H6	10.08	13.10	16.57	16.78	16.85	15.68				12.77

Table 7. Total biomass (t) of herring by age and area (r.v. "Baltica" October 2012).

Subdiv.	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	62.1	3697.6	1401.6	1813.0	1875.9	2737.2	1007.2	613.8	987.6	14195.9
29	46H1	27.3	2698.8	2382.8	4965.9	5907.4	4943.7	1947.0	722.9	1674.0	25269.7
29	46H2	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4
29	47H1	256.5	5289.7	1732.0	3839.8	2963.3	2346.4	717.3	513.0	960.7	18618.6
29	47H2	132.3	9336.1	3265.2	7100.6	4028.6	3413.4	448.9	1043.2	1035.4	29803.7
29	48H0	10883.0	24003.9	3944.6	7788.1	3837.0	2404.6	429.3	1304.0	1852.4	56446.8
29	48H1	18110.9	51937.9	6738.6	11714.3	5179.1	2775.2	601.6	2234.6	3064.8	102357.1
29	48H2	1342.7	470.3	49.7	95.9	42.9	69.6	3.4	17.3	16.4	2108.4
32	47H3	497.7	352.5	63.8	131.0	39.8	47.9	50.5	0.0	50.5	1233.6
32	48H3	1656.5	57.0	55.1	48.0	93.3	68.3	14.0	1.3	14.0	2007.6
32	48H4	687.7	2963.6	952.1	1999.8	515.2	503.5	228.6	93.6	315.4	8259.4
32	48H5	109.2	434.5	76.4	110.4	22.4	14.4	1.8	5.9	1.8	776.9
32	48H6	1494.4	10429.0	1006.0	1214.3	330.4	291.4	50.5	19.2	86.2	14921.4
32	49H5	45.7	267.8	10.7	8.7	3.3	1.0	0.0	0.0	0.0	337.1
32	49H6	51.9	304.0	12.1	9.9	3.7	1.1	0.0	0.0	0.0	382.7

Table 8. Numbers (millions) of sprat by age and area (r.v. “Baltica” October 2012).

Subdiv.	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	31.96	1741.75	422.69	326.33	509.17	110.52	114.46	19.79	23.73	3300.40
29	46H1	765.25	1347.87	628.80	324.99	671.12	144.98	38.42	0.00	62.09	3983.51
29	46H2	178.71	1090.36	224.45	70.08	139.15	28.94	5.12	0.00	5.62	1742.42
29	47H1	8.99	3183.72	1009.60	457.59	975.38	203.57	73.74	0.00	78.81	5991.39
29	47H2	11.37	1457.29	367.20	181.88	345.32	73.29	21.94	0.00	21.54	2479.83
29	48H0	1147.28	306.96	73.53	58.85	113.93	23.58	6.12	0.00	7.81	1738.06
29	48H1	65.07	1060.55	314.98	163.58	463.31	90.34	33.82	0.00	31.53	2223.18
29	48H2	94.34	11919.33	2614.05	1107.61	2505.97	509.17	183.97	0.00	100.55	19034.99
32	47H3	0.00	6438.83	1142.12	650.05	2448.84	276.29	162.34	136.70	288.78	11543.95
32	48H3	329.15	6948.12	1087.60	482.40	1749.38	210.16	105.54	97.84	234.76	11244.95
32	48H4	430.80	8647.77	1700.96	1299.18	4527.53	645.89	381.76	311.02	426.86	18371.77
32	48H5	0.00	7991.30	1468.50	851.65	2780.70	320.19	169.91	168.35	307.64	14058.24
32	48H6	0.00	6302.50	1205.11	676.99	2280.06	286.13	144.35	131.30	298.01	11324.45
32	49H5	0.00	1704.01	272.14	156.13	483.29	54.95	23.99	26.60	52.65	2773.77
32	49H6	0.00	1934.30	308.92	177.23	548.60	62.38	27.23	30.20	59.76	3148.63

Table 9. Mean weight (g) of sprat by age and area (r.v. “Baltica” October 2012).

MeanW	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	3.80	9.60	10.80	12.02	12.28	12.12	12.39	12.33	13.57	10.58
29	46H1	3.17	9.43	10.43	11.32	11.75	11.59	12.82	0.00	13.01	9.10
29	46H2	3.13	8.98	10.07	11.11	10.90	11.09	12.14	0.00	11.67	8.81
29	47H1	3.25	9.19	10.29	11.32	11.57	11.51	12.68	0.00	13.16	10.09
29	47H2	2.74	8.95	10.22	11.37	11.40	11.44	12.38	0.00	12.17	9.76
29	48H0	3.10	8.93	10.55	11.52	11.70	11.72	12.22	0.00	11.85	5.48
29	48H1	3.30	9.22	10.37	11.45	11.96	11.90	12.58	0.00	12.82	10.15
29	48H2	3.34	8.86	10.17	11.37	11.51	11.51	12.16	0.00	11.91	9.63
32	47H3	0.00	8.46	9.04	10.14	10.18	10.79	11.31	10.70	9.43	9.12
32	48H3	2.73	8.24	8.66	10.11	10.07	10.70	11.15	10.60	9.75	8.61
32	48H4	2.54	8.44	9.13	10.15	10.38	10.90	11.39	10.90	9.86	9.19
32	48H5	0.00	8.35	8.82	10.08	10.13	10.75	11.33	10.63	9.44	9.00
32	48H6	0.00	8.25	8.70	10.12	10.23	10.65	11.08	10.50	10.52	8.99
32	49H5	0.00	8.31	8.90	10.06	10.00	10.51	10.92	10.28	9.26	8.86
32	49H6	0.00	8.31	8.90	10.06	10.00	10.51	10.92	10.28	9.26	8.86

Table 10. Total biomass (t) of sprat by age and area (r.v. “Baltica” October 2012).

Subdiv.	Rect.	0	1	2	3	4	5	6	7	8+	Total
28	45H1	121.5	16718.8	4566.7	3921.4	6253.0	1339.8	1417.9	244.1	322.1	34905.3
29	46H1	2427.6	12709.7	6555.8	3680.1	7888.5	1680.5	492.3	0.0	807.8	36242.3
29	46H2	559.7	9790.5	2259.8	778.8	1516.7	320.8	62.1	0.0	65.6	15354.0
29	47H1	29.2	29256.5	10387.6	5179.9	11286.2	2342.7	935.4	0.0	1037.0	60454.6
29	47H2	31.2	13041.1	3751.9	2067.3	3937.2	838.2	271.6	0.0	262.3	24200.7
29	48H0	3560.0	2740.4	775.4	678.0	1333.1	276.3	74.8	0.0	92.5	9530.5
29	48H1	214.6	9773.7	3267.5	1872.9	5542.3	1075.4	425.4	0.0	404.1	22575.9
29	48H2	314.9	105629.6	26573.5	12589.4	28835.7	5862.1	2236.7	0.0	1197.9	183239.8
32	47H3	0.0	54482.1	10325.2	6589.7	24924.7	2982.0	1835.9	1462.2	2723.4	105325.2
32	48H3	899.9	57242.3	9422.8	4874.8	17616.5	2249.3	1177.0	1037.0	2290.1	96809.6
32	48H4	1092.4	72956.6	15532.4	13187.7	47007.7	7038.5	4350.0	3389.3	4209.7	168764.4
32	48H5	0.0	66743.0	12958.4	8582.4	28157.8	3441.9	1924.4	1790.3	2905.3	126503.5
32	48H6	0.0	51986.0	10486.5	6848.1	23319.4	3047.6	1598.8	1378.7	3135.7	101800.9
32	49H5	0.0	14158.5	2423.1	1571.2	4833.9	577.8	261.9	273.5	487.5	24587.2
32	49H6	0.0	16071.9	2750.5	1783.6	5487.2	655.8	297.2	310.5	553.4	27910.1

Survey Report for RV "DARIUS"
22-24 October 2012

Fisheries Service under the Ministry of Agriculture of Republic of Lithuania,
Fishery Research and Science State
Klaipeda, Lithuania

1 INTRODUCTION

The main objective is to assess clupeoid resources in the Baltic Sea. The international acoustic survey in October is traditionally coordinated within the frame of the **Baltic International Acoustic Survey (BIAS).** The reported acoustic survey is conducted every year to supply the ICES: 'Baltic Fisheries Assessment Working Group (WGBFAS)' and Fisheries Service under the Ministry of Agriculture of The Republic of Lithuania with an index value for the stock size of herring, sprat and other species in the Subdivision 26 of the Baltic area.

2 METHODS

2.1 Personnel

M. Spegys	Fisheries Service under the Ministry of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda – cruise leader and acoustics;
J. Fedotova	Fisheries Service under the Ministry of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda - scientific leader and fish sampling

2.2 Narrative

The 2nd cruise of RV "Darius" took place from 22 to 24 October in 2012. The cruise was intended to cover parts of ICES subdivision (SD) 26, constituting the Lithuanian Exclusive Economic Zone.

2.3 Survey design

The area of international acoustic survey is limited by the 10 m depth line. The statistical rectangles of Subdivision 26 were used as strata (BIAS, ver. 0.82, ICES CM 2010/j:1 Ref. Assess). The scheme of transects has been defined as the regular, of rectangular form, with the distance between transects of 15 nm. The average speed of a vessel for the all period of acoustic survey was 8.0 knots. The average speed of the vessel with a trawl was 3 knots; the trawling duration was standard 30 minutes. The survey was conducted in the daytime from 08:00 up to 17.00 of local time. All investigated area of survey constitutes the 3838.8 nm^2. The full cruise track with positions of the trawling is shown on Figure 1.

2.4 Calibration

The SIMRAD EK60 echo sounder with split beam transducer ES38 - 12 were calibrated in the Baltic Sea shore area The calibration procedure was carried out with a standard calibrated copper sphere, in accordance with the 'Manual for the Baltic International Acoustic Surveys (BIAS) ("Manual for the Baltic International Acoustic Survey", Version 0.3-0.82, WGBIFS 2011 ICES CM 2011/ SSGESST:07).

THE RESULTS OF CALIBRATION PROCEDURE FOR EK60 SCIENTIFIC ECHOSOUNDER	
Date: 12.04.2011	Place : near Klaipeda port
Type of transducer	Split – beam for 38 kHz
Gain (38 kHz)	21dB
Athw. Angle Sens	12.5
Along. Angle Sens	12.5
Athw. Beam Angle	11.96
Along. Beam Angle	11.77
Athw. Offset Angle	0.13
Along. Offset Angle	-0.20
SA Correction (38 kHz)	0.00 dB

2.5 Acoustic data collection

The acoustic sampling was performed around the clock. The main pelagic species of interest were herring and sprat. The SIMRAD EK60 echo sounder with hull mounted 38 kHz transducer ES38-12 was used during the cruise. The specific settings of the hydro acoustic equipment were used as described in the BIAS manual (ICES 2011). The post-processing of the stored echo signals was made using the Sonar4 (Balk & Lindem, 2005). The mean volume back scattering values Sv, were integrated over 1 nm intervals, from 10 m below the surface to the bottom. Contributions from air bubbles, bottom structures and noise scattering layers were removed from the echogram using Sonar4.

2.6 Biological data – fishing stations

All trawling was done with the pelagic gear „OTM" in the midwater as well as near the bottom. The mesh size in the codend was 10 mm. The intention was to carry out at least two hauls per ICES statistical rectangle. The trawling depth was chosen by the echogram, in accordance to the characteristic of echo records from the fish. Normally, the trawl had vertical opening of about 12 m. The trawling time lasted 30 minutes. From each haul sub-samples were taken to determine length and weight composition of fish. Samples of herring and sprat were analyzed for further investigations on the board of vessel (i.e. sex, maturity, age).

2.7 Data analysis

The pelagic target species sprat and herring are usually distributed in mixed layers in combination with other species, so that it is impossible to allocate the integrator readings to a single species. Therefore the species composition was based on the trawl catch results. For each rectangle the species composition and length distribution were determined as the mean- weighted of all trawl results in this rectangle. From these distributions the mean acoustic cross section was calculated according to the following target strength-length (TS) relationships:

Clupeoids	$TS = 20 \log L (cm) - 71.2$	(ICES 1983/H:12)
Gadoids	$TS = 20 \log L (cm) - 67.5$	(Foote et al. 1986)

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section (Sa) and the rectangle area, divided by the corresponding mean cross section. The total number were separated into herring and sprat according to the mean catch composition.

2.8 Data analysis

After finalization of each trawling, a hydrographic measurement was executed. The vertical profiles of hydrographical parameters, (temperature, salinity of water and the oxygen dissolved in water) were taken with a "SBE-19 plus" probe.

3. RESULTS

3.1 Biological data

In total 7 trawl hauls were carried out: 1001 herrings, 1397 sprats and 18 cods were measured and 636 herrings and 773 sprats were aged.

The results of the catch composition are presented in Table 1. As in former years the catch composition was dominated by sprat and to a lower extends by herring.

The length distributions of herring and sprat of the October 2012 presented in Fig. 2 and 3. Herrings length dominated 16 – 20.5 cm length class in 40H0 ICES rectangle and 18 – 20.5 cm length class in 40G9 ICES rectangle. There is no smaller herring when 15 cm catches in 40G9 rectangle. Sprat dominated 7 – 8 cm length class in 40H0 ICES rectangle and 11.5 -13 cm length class in 40G9 rectangle.

3.2 Acoustic data

The survey statistics concerning the survey area, the mean S_a, the mean scattering cross-section σ, the estimated total number of fish, the percentages of herring, sprat per rectangle are shown in Table 2-4.

3.3 Abundance estimates

The total abundance of herring and sprat are presented in Table 2. The estimated number of herring and sprat by age group and rectangle are given in Table 5 and 8. The corresponding mean weights by age group and rectangle are shown in Table 6 and 9. The estimates of herring and sprat biomass by age group and rectangle are summarized in Table 7 and 10.

The herring stock was estimated to be $444.37*10^6$ fish or about 22842 tones. The abundance estimates were dominated by age 0, 1, and 5 - 8 ages herring in rectangle 40H0 and by 3-8 ages herring in rectangle 40G9 (Fig. 2 and Table 8).

The sprat stock was estimated to be $3922.56*10^6$ fish or about 23077.3 tones The abundance estimates of sprat were dominated by age 0 and 1 in rectangle 40H0 and by ages 2-4 fish in rectangle 40G9 (Fig. 3 and Table 5).

3.4 Hydrologic data

The seawater temperature varied from 10 ºC to 12 ºC in the surface layer in 40H0 ICES rectangle and 7 – 10 ºC in 40G9 ICES rectangle. There is no thermocline layer in 22-24 of October 2012. There was started water turbulence of autumn. The salinity is 7.4 ‰ in all area and strata. There was no oxygen deficit in this survey.

4.0 REFERENCES

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ICES. 2011. Report of the Baltic International Fish Survey Working Group (WGBIFS), March 2011, Kaliningrad, Russia. ICES CM 2011/SSGESST:07. 102 p.

Figure 1. The survey grid and traul hauls position of R/V "DARIUS" (22-24 October 2012)

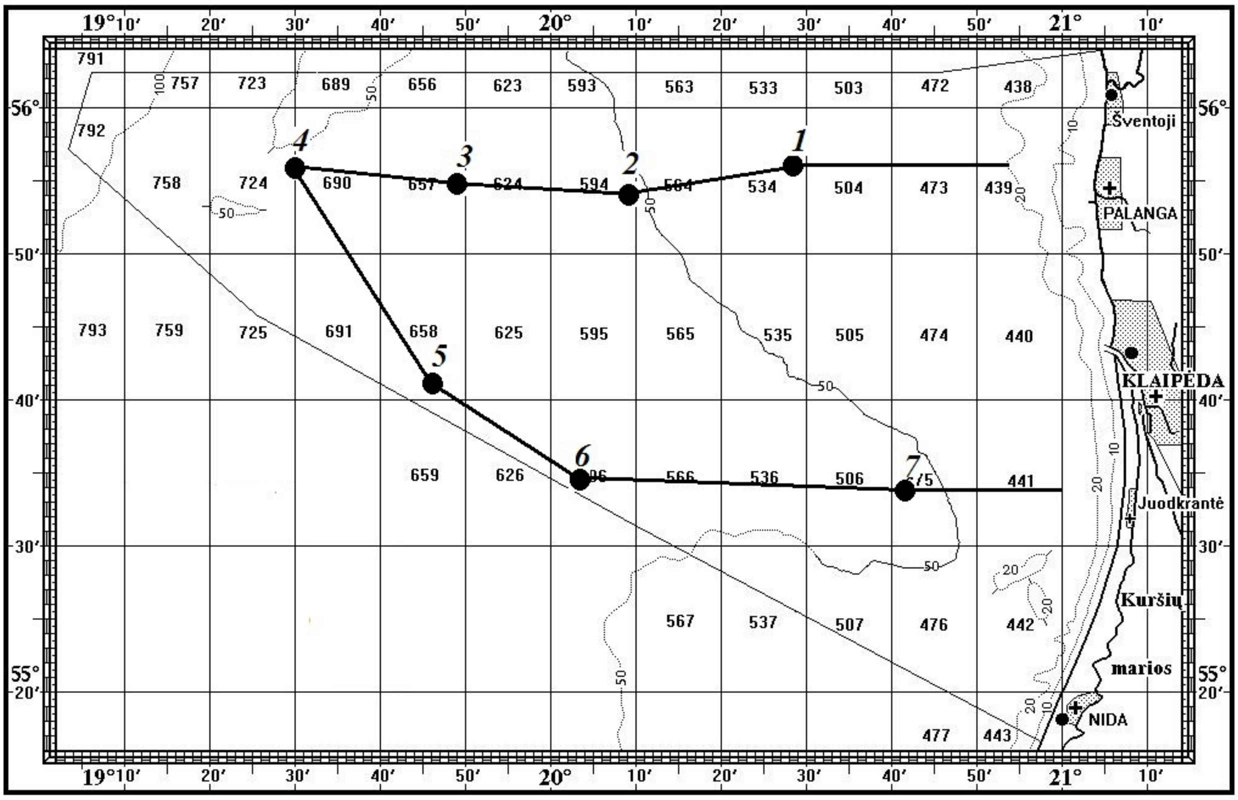


Table 1 Catch composition (kg/1hour) per haul (R/V "Darius", 22.10- 24.10.2012)

ICES subdivision 26							
Haul No	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Date	**2012.10.22**	**2012.10.22**	**2012.10.22**	**2012.10.22**	**2012.10.23**	**2012.10.23**	**2012.10.24**
Validity	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**
Species/ICES rectangle	**40H0**	**40H0**	**40G9**	**40G9**	**40G9**	**40H0**	**40H0**
CLUPEA HARENGUS		26.01	68.942	37.07	4.518	17.392	2.262
SPRATTUS SPRATTUS	15.98	213.99	49.678	3.38	0.504		117.738
GADUS MORHUA			1.38	3.16		1.292	
LUMPFISH				0.20			
STICKLEBACK				0.01			
Total	15.98	240.00	120.00	43.82	5.022	18.684	120

Figure 2 Length composition of herring (%) (R/V "Darius", 22.10- 24.10.2012)

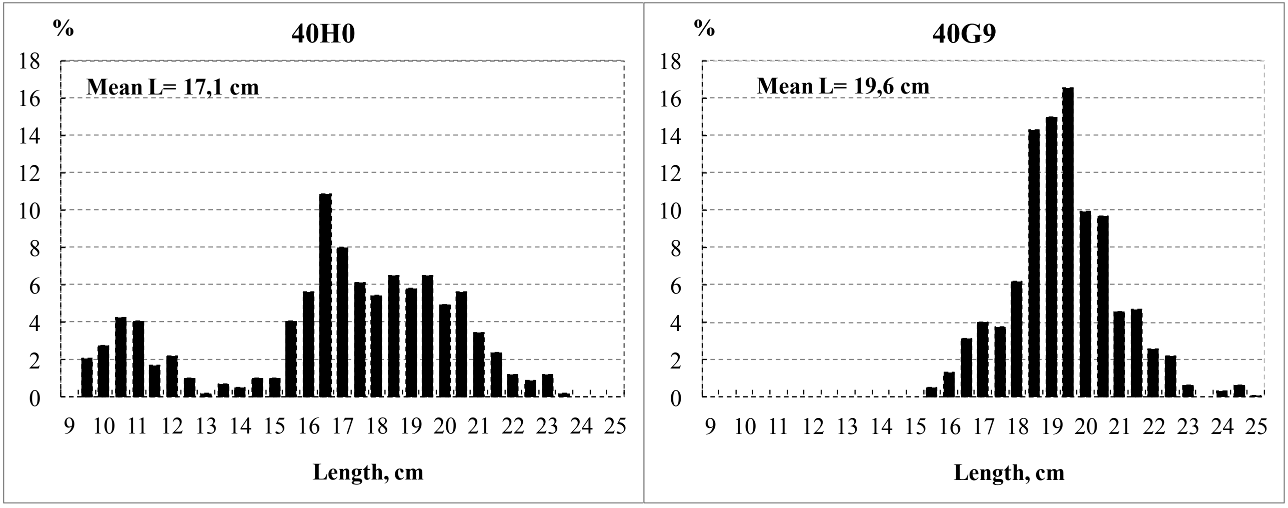


Figure 3 Length distribution of sprat (%) (R/V "Darius", 22.10- 24.10.2012)

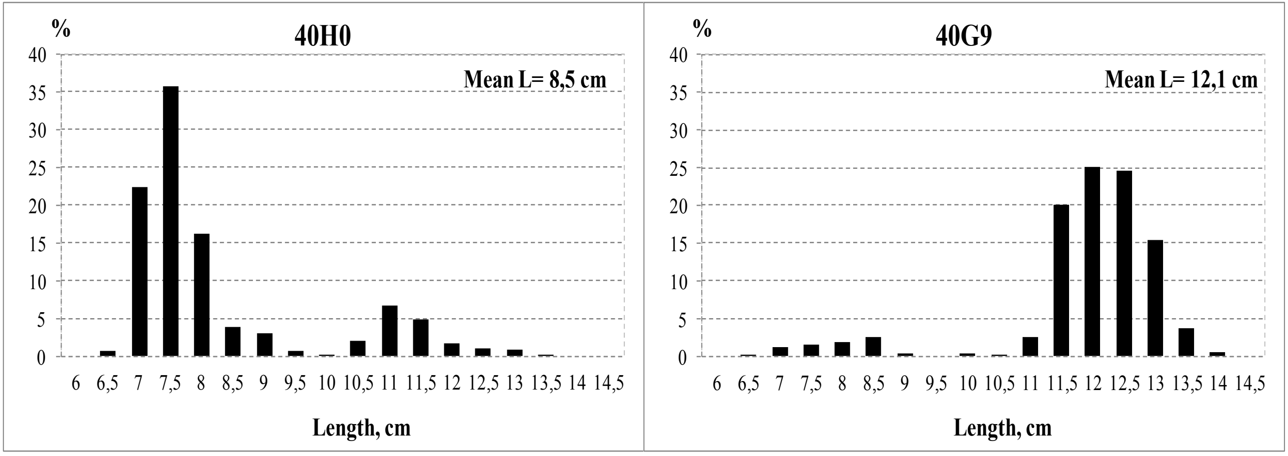


Table 2 R/V "DARIUS" survey statistics (abundance of herring and sprat), 22.10- 24.10.2012

ICES SD	ICES Rect.	Area nm^2	ρ mln/nm^2	Abundance, mln			Biomass, tonn		
				N sum	N her	N spr	W sum	W her	W spr
26	40H0	1012.1	1277,8	3,18	3215,1	66,7	3148,4	15635	2557
	40G9	1013.0	924,5	1,07	1079,3	367,8	711,6	29349	19769

Table 3 R/V "DARIUS" survey statistics (aggregated data of herring and sprat), 22.10- 24.10.2012

ICES SD	ICES Rect.	No trawl	Herring			Sprat			SA m^2/nm^2	TS calc. dB
			L, cm	w, g	Numb.,%	L, cm	w, g	Numb.,%		
26	40H0	1,2,8,12	17,11	38,32	2,08	8,49	4,15	97,92	239,8	-52,2
	40G9	3,5,7	19,62	53,75	34,07	12,15	13,46	65,93	233,9	-47,6

Table 4 R/V "DARIUS" survey statistics (herring and sprat), 22.10- 24.10.2012

ICES SD	ICES Rect.	Area nm^2	SA m^2/nm^2	σ *10^4 nm^2	Abundance mln	Species composition (%)	
						herring	sprat
26	40H0	1012	239,8	0,75502	3215,1	2,08	97,92
	40G9	1013	233,9	2,19552	1079,3	34,07	65,93

Table 5 R/V "Darius" estimated number (millions) of sprat, 22.10- 24.10.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	3148,4	2581,2	296,5	64,4	57,9	109,0	26,6	6,4	0,0	6,4
	40G9	711,6	54,2	54,7	133,3	84,8	313,1	44,2	13,0	14,2	0,0

Table 6 R/V "Darius" estimated mean weights (g) of sprat, 22.10- 24.10.2012

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	4,15	2,8	9,1	11,0	10,7	11,9	11,4	13,6		13,6
	40G9	13,46	3,7	11,8	13,1	13,5	14,9	16,0	18,1	16,6	

Table 7 R/V "Darius" estimated biomass (in tonnes) of sprat, 22.10- 24.10.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	14159	3454	553	4190	2772	2211	740	81	76	81
	40G9	2177	14	10	631	466	365	179	127	177	207

Table 8 R/V "Darius" estimated number (millions) of herring, 22.10- 24.10.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	92.3	18.0	3.9	2.9	5.9	6.3	16.6	9.7	10.9	18.1
	40G9	264.8	0.0	2.2	21.9	29.5	41.4	76.3	40.3	16.4	36.7

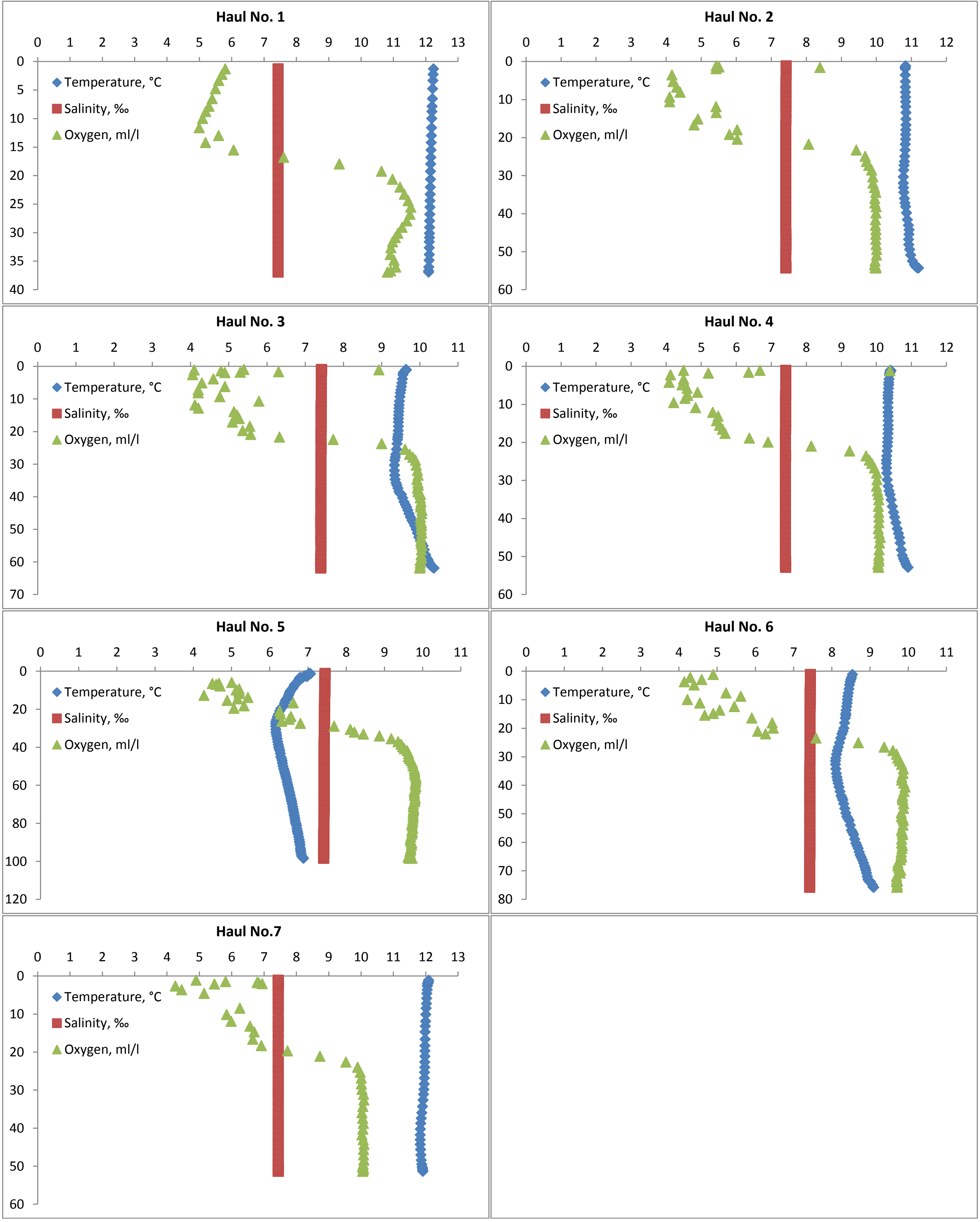
Table 9 R/V "Darius" estimated mean weights (g) of herring, 22.10- 24.10.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	41.1	11.0	25.9	30.5	30.8	37.5	46.2	46.5	53.7	65.5
	40G9	46.3	0.0	29.9	42.2	36.9	38.1	44.7	52.4	55.6	59.1

Table 10 R/V "Darius" estimated biomass (in tonnes) of herring, 22.10- 24.10.2012

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	3794	198	101	87	180	235	769	453	585	1186
	40G9	12268	0	67	924	1091	1578	3414	2115	910	2171

Figure. 4. Salinity, temperature and oxygen in trawling hauls



Baltic International Acoustic Survey Report for R/V Dana

2012-10-05 - 2012-10-21

Niklas Larson
SLU - Institute of Marine Research, Lysekil, Sweden

1 Introduction

International hydroacoustic surveys have been conducted in the Baltic Sea since 1978. The starting point was the cooperation between Institute of Marine Research (IMR) in Lysekil, Sweden and the Institute für Hochseefisherei und Fishverarbeitung in Rostock, German Democratic Republic in October 1978, which produced the first acoustic estimates of total biomass of herring and sprat in the Baltic Main basin (Håkansson et al., 1979). Since then there has been at least one annual hydroacoustic survey for herring and sprat stocks and results have been reported to ICES.

The Baltic International Acoustic Survey (BIAS), is mandatory for the countries that have exclusive economic zone (EEZ) in the Baltic Sea, and is a part of the Data Collection Framework as stipulated by the European Council and the Commission (Council Regulation (EC) No 199/2008 and the Commission DCF web page).

IMR in Lysekil is part of the Department of Aquatic Resources within Swedish University of Agricultural Sciences and is responsible for the Swedish part of the EU Data Collection Framework and surveys in the marine environment. The Institute assesses the status of the marine ecosystems, develops and provides biological advices for managers for the sustainable use of aquatic resources.

The BIAS survey in September/October are co-ordinated and managed by the ICES working group WGBIFS. The main objective of BIAS is to assess clupeoid resources in the Baltic Sea. The survey will provide data to the ICES Baltic Fisheries Assessment Working Group (WGBFAS). Since 2007 Finland and Sweden join together to additionally cover Bothnian Bay (ICES Subdivision 30).

Contents

2 Methods

2.1 Narrative

Due to that R/V Argos was taken out of order, Sweden rented R/V Dana for the 2011 and the 2012 BIAS survey. The scientific staff was a mix of Swedish and Finnish personnel similar or same as previous years, and the ship crew was Danish in the 2012 survey.

This year's calibration of the SIMRAD EK60 sounder was made at Gåsfjärden south of Västervik, 2012-10-05 to 2012-10-06, the location change occurred 2011 because the normal calibration site at Högön is inaccessible for Dana due to deeper draft. The first part of the cruise started 2012-10-06 from Gåsfjärden and ended 2012-10-15 in Oxelösund. ICES Subdivision 30 and part of 27 and 29 were covered. The second part of the cruise started 2012-10-15 from Oxelösund and ended 2012-10-19 outside Grönhögen (Lat:56.2589,Lon:16.3933). Parts of ICES Subdivision 27 and 28 were covered. The last part of the cruise started 2012-10-19 from Grönhögen and ended in Karlskrona 2012-10-21. Each stop was short (just a few hours) and at each stop part of crew and scientific staff was exchanged. The total cruise covered ICES subdivision (SD) 27 and 30 as well as parts of SD 25, 26, 28 and 29.

2.2 Survey design

The stratification is based on ICES statistical rectangles with a range of 0.5 degrees in latitude and 1 degree in longitude. The areas of all strata are limited by the 10 m depth line (ICES CM 2011/SSGESST:05 Addendum 2). The aim is to use parallel transects spaced on regular rectangle basis at a maximum distance of 15 nautical miles and with a transect density of about 60 nautical miles per 1000 square nautical miles. The irregular shape of the survey area assigned to Sweden and the weather conditions makes it difficult to fulfill this aim. This year Sweden could not support the funding of the survey in SD30 due to economical difficulties within the DCF programme and therefore the coverage of the SD30 had to be based on Finnish funding which resulted in half the normal effort. Therfore the desicion was made at WGBIFS that each square in SD30 should be evenly covered by half the distance in each square and half the number of hauls in each square compared to normal coverage.

The total area covered by the Swedish survey and the Finnish-Swedish survey was 38271 square nautical miles and the distance used for acoustic estimates was 2055 nautical miles. The cruise track and positions of trawl hauls is shown in figure 1.

2.3 Calibration

The SIMRAD EK60 echo sounder with the transducer ES38B was calibrated at Gåsfjärden 2012-10-05 according to the BIAS manual (ICES CM 2011/SSGESST:05, Addendum 2). Values from the calibration were within required accuracy.

2.4 Acoustic data collection

The acoustic sampling was performed around the clock. SIMRAD EK60 echo sounder with the 38 kHz transducer (ES38b) mounted on a towed body is used for the acoustic transect data collection, additionally a hull mounted 38 kHz transducer (ES38B) was used during the fishing stations (the towed body is taken aboard when fishing). The settings of the hydroacoustic equipment were as described in the BIAS manual (ICES CM 2011/SSGESST:02, Addendum 2). The post processing of the stored raw data was made using the software LSSS (www.marec.no/english/products.htm) for SD25 - SD29, SD30 was processed in Echoview (www.echoview.com). The mean volume back scattering values (Sv) were integrated over 1 nautical mile elementary sampling units (ESDUs) from 10 m below the surface to the bottom. Contributions from air bubbles, bottom structures and scattering layers were removed from the echogram by using LSSS.

2.5 Data analysis

The pelagic target species sprat and herring are usually distributed in mixed layers in combination with other species so that it is impossible to allocate the integrator readings to a single species. Therefore the species composition was based on the trawl catch results. For each rectangle the species composition and length distribution were determined as the unweighted mean of all trawl results in this rectangle. In the case of lack of sample hauls within an individual ICES rectangle (due to gear problems, bad weather conditions or other limitations) a mean from hauls from neighboring rectangles was used. From these distributions the mean acoustic cross-section was calculated according to the target strength-length (TS) relationships found in table 2.

Clupeoids	TS = 20 log L (cm) - 71.2	(ICES 1983/H:12)
Gadoids	TS = 20 log L (cm) - 67.5	(Foote et al. 1986)
Trachurus trachurus	TS = 20 log L (cm) - 73.0	(Misund, 1997 in Peña, 2007)
Fish without swim bladder	TS = 20 log L (cm) - 84.9	ICES CM2011/SSGESST:02,Addendum 2
Salmonids and 3-spined stickleback were assumed to have the same acoustic properties as herring.		

Table 1: Target strength-length (TS) relationships

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section s_A and the rectangle area, divided by the corresponding mean cross section σ.

The total number was separated into different fish species according to the mean catch composition in the rectangle.

2.6 Hydrographic data

CTD casts were made with a "Seabird 9+" CTD when calibrating the acoustic instruments and whenever a haul was conducted, additional hydrographic data was collected on a selection of these stations.

2.7 Personnel

The participating scientific crew can be seen in table 2

Bland, Barbara	IMR, Lysekil, Sweden	Acoustics
Iliç, Eva	IMR, Lysekil, Sweden	Fish sampling
Jernberg, Carina	IMR, Lysekil, Sweden	Fish sampling
Johansson, Jan-Erik	IMR, Lysekil, Sweden	Acoustics
Larson, Niklas	IMR, Lysekil, Sweden	Scientific & Expedition leader, Acoustics
Leiditz, Marie	IMR, Lysekil, Sweden	Fish sampling
Lövgren, Olof	IMR, Lysekil, Sweden	Acoustics
Palmen-Bratt, Anne-Marie	IMR, Lysekil, Sweden	Fish sampling
Rudolphi, Ann-Christin	IMR, Lysekil, Sweden	Fish sampling
Sjöberg, Rajlie	IMR, Lysekil, Sweden	Fish sampling
Svenson, Anders	IMR, Lysekil, Sweden	Expedition leader, Acoustics
Heimbrandt, Yvette	ICR, Öregrund, Sweden	Fish sampling
Kaljuste, Marju	ICR, Öregrund, Sweden	Fish sampling
Odelström, Anne	ICR, Öregrund, Sweden	Fish sampling
Tärnlund, Susanne	ICR, Öregrund, Sweden	Fish sampling
Harjunpää , Hannu	FGFRI, Finland	Fish sampling
Lilja, Juha	FGFRI, Finland	Expedition leader, Acoustics
Pönni, Jukka	FGFRI, Finland	Fish sampling
Saari, Tero	FGFRI, Finland	Fish sampling
Szaron, Jan	SMHI, Gothenburg	Oceanography

Table 2: Participating scientific crew

3 Results

3.1 Biological data

In total 71 trawl hauls were carried out, 15 in SD 25, 2 in SD 26, 15 in SD 27, 9 in SD 28, 10 hauls in SD 29 and 20 in SD 30. 4354 herrings and 2130 sprats were aged. Catch compositions by trawl haul is presented in Table 8 to 15. Length distributions for herring and sprat by ICES subdivision are shown in figures 2 to 13.

3.2 Acoustic data

The survey statistics concerning the survey area, the mean backscatter [s_A], the mean scattering cross section [σ], the estimated total number of fish, the percentages of herring, sprat and cod per Subdivision/rectangle are shown in Table 3.

3.3 Abundance estimates

The total abundances of herring and sprat by age group per rectangle are presented in Table 4 and 6. The corresponding mean weights by age group per rectangle are shown in Tables 5 and 7.

4 Discussion

The data collected during the survey should be considered as representative for the abundance of the pelagic species during the BIAS in 2012 for SD25 to 29. When using the results for SD30 in this years survey it should be noted that deviation has been made from the manual in the coverage of each square.

5 References

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Commission DCF web page:
http://datacollection.jrc.ec.europa.eu/dcf-legislation

6 Tables, map and figures

SD	RECT	AREA	SA	SIGMA	NTOT	HHer	HSpr	HCod
25	39G4	287.3	414.1	2.945	404.06	50.52	49.32	0.142
25	39G5	979.0	237.4	2.355	986.68	31.31	67.70	0.905
25	40G4	677.2	363.7	3.464	710.98	52.73	45.12	2.143
25	40G5	1012.9	828.8	2.710	3097.71	44.14	55.46	0.176
25	40G6	1013.0	370.2	2.455	1527.72	43.47	41.46	0.371
25	40G7	1013.0	427.6	2.128	2035.23	28.18	53.57	2.100
25	41G6	764.4	509.3	0.510	7637.41	6.84	2.64	0.013
25	41G7	1000.0	787.7	2.221	3546.66	33.35	49.60	0.841
26	41G8	1000.0	751.3	3.096	2426.46	80.29	17.84	0.793
27	42G6	266.0	715.5	0.653	2915.79	10.44	4.85	0.009
27	42G7	986.9	569.4	0.544	10320.88	5.80	3.54	0.006
27	43G7	913.8	479.8	0.429	10214.89	2.45	10.73	0.000
27	44G7	960.5	525.0	0.485	10394.27	8.72	6.82	0.000
27	44G8	456.6	514.3	0.711	3304.77	11.39	69.46	0.000
27	45G7	908.7	1201.4	0.798	13681.39	25.72	3.85	0.000
27	45G8	947.2	596.2	0.694	8134.55	14.12	8.98	0.000
27	46G8	884.8	821.4	1.188	6117.92	41.46	30.67	0.000
28	42G8	945.4	451.8	2.735	1561.64	76.48	13.97	0.104
28	43G8	296.2	2037.6	2.198	2745.45	55.62	27.59	0.203
28	43G9	973.7	569.0	1.257	4408.52	22.36	25.44	0.187
28	44G9	876.6	767.8	0.503	13382.27	1.05	11.92	0.019
28	45G9	924.5	741.3	0.884	7752.97	21.32	11.54	0.008
29	46G9	933.8	663.2	0.803	7711.68	13.73	51.17	0.000
29	46H0	933.8	619.3	1.159	4987.18	14.51	78.74	0.000
29	47G9	876.2	706.7	1.446	4283.35	39.76	41.27	0.000
29	47H0	920.3	1383.4	1.049	12136.81	16.16	74.66	0.000
29	48G9	772.8	666.1	1.177	4374.90	55.22	4.50	0.000
29	49G9	564.2	477.7	1.382	1950.36	57.12	26.79	0.000
30	50G7	403.1	348.9	2.258	622.94	94.13	0.28	0.000
30	50G8	833.4	555.7	1.989	2328.28	74.31	1.82	0.000
30	50G9	879.5	457.8	1.453	2771.89	67.81	10.83	0.000
30	50H0	795.1	631.1	1.623	3091.25	93.45	1.90	0.000
30	51G7	614.5	580.8	2.121	1682.70	87.95	0.53	0.000
30	51G8	863.7	545.3	1.963	2398.96	75.81	0.67	0.000
30	51G9	865.8	308.9	1.658	1613.62	59.11	0.06	0.000
30	51H0	865.7	697.1	0.987	6112.75	31.09	0.38	0.000
30	52G7	482.6	466.4	1.747	1288.15	59.57	0.59	0.000
30	52G8	852.0	343.7	2.724	1075.06	86.92	0.05	0.000
30	52G9	852.0	215.3	2.445	750.14	83.11	0.39	0.000
30	52H0	852.0	594.5	0.719	7039.41	15.89	0.02	0.000
30	53G8	838.1	398.5	2.139	1561.06	82.19	7.93	0.000
30	53G9	838.1	186.1	2.406	648.42	87.48	0.71	0.000
30	53H0	838.1	388.7	0.767	4248.60	24.72	0.95	0.000
30	54G8	642.2	461.3	2.055	1441.42	79.61	2.67	0.000
30	54G9	824.2	494.1	2.452	1661.00	86.04	0.41	0.000
30	54H0	727.9	897.6	1.715	3810.25	65.18	25.62	0.000
30	55G9	625.6	470.6	2.597	1133.75	94.75	1.68	0.000
30	55H0	688.6	487.5	1.747	1922.13	95.32	2.38	0.000

Table 3: Survey statistics

SD	RECT	NSprTOT	NSpr0	NSpr1	NSpr2	NSpr3	NSpr4	NSpr5	NSpr6	NSpr7	NSpr8
25	39G4	199.30	0.00	27.00	39.86	31.29	87.86	5.14	6.64	0.00	1.50
25	39G5	667.95	1.66	47.60	286.20	121.51	152.59	38.34	5.20	14.86	0.00
25	40G4	320.80	14.59	48.41	0.60	87.33	110.31	5.93	8.49	0.00	45.14
25	40G5	1717.91	11.27	209.05	398.43	239.10	665.80	16.07	159.21	18.99	0.00
25	40G6	633.40	0.00	24.97	232.48	80.52	205.65	28.14	43.75	0.00	17.89
25	40G7	1090.18	2.15	121.47	216.68	188.00	401.08	138.89	18.12	3.80	0.00
25	41G6	201.55	178.42	8.10	2.52	0.00	4.28	0.00	6.43	0.00	1.81
25	41G7	1759.23	47.93	325.17	264.00	0.00	800.16	206.51	95.06	20.40	0.00
26	41G8	432.76	83.72	44.66	27.26	36.76	145.48	53.54	8.78	14.00	18.56
27	42G6	141.32	92.33	9.37	3.75	5.33	19.26	0.00	7.00	2.60	1.69
27	42G7	365.39	209.87	22.68	10.13	24.11	80.48	0.00	6.43	11.69	0.00
28	42G8	218.20	21.98	32.02	12.23	26.66	82.55	24.98	9.21	0.00	8.57
27	43G7	1095.89	988.07	36.20	11.47	21.14	24.11	5.75	0.00	0.00	9.14
28	43G8	757.51	77.30	108.22	42.51	92.76	288.32	87.35	30.92	0.00	30.15
28	43G9	1121.36	136.07	125.87	171.74	109.39	371.70	60.42	25.89	21.98	98.30
27	44G7	709.12	665.32	16.54	2.65	3.38	16.56	0.43	1.60	0.00	2.65
27	44G8	2295.41	2090.20	23.86	36.27	22.91	76.35	4.77	24.82	4.77	11.45
28	44G9	1595.54	670.62	214.29	300.82	50.32	236.72	31.05	20.95	70.77	0.00
27	45G7	526.46	439.60	7.86	7.43	11.41	46.11	7.27	0.00	0.00	6.78
27	45G8	730.50	563.71	41.92	36.84	7.96	56.02	13.65	0.00	6.12	4.26
28	45G9	894.81	280.06	217.73	159.11	39.50	145.11	34.93	9.60	0.00	8.76
27	46G8	1876.27	1484.67	100.94	57.08	0.00	134.88	4.65	24.80	17.97	51.30
29	46G9	3945.85	3283.36	241.64	91.16	95.87	162.94	31.71	0.00	21.79	17.38
29	46H0	3926.70	1813.98	642.41	491.99	343.65	505.09	47.17	0.00	76.44	5.97
29	47G9	1767.82	631.35	299.64	100.88	103.47	373.26	41.68	0.00	12.08	205.46
29	47H0	9061.17	3056.19	2401.98	875.96	631.00	1869.18	117.88	27.01	0.00	81.97
29	48G9	196.95	161.51	13.84	1.98	1.98	7.25	1.48	1.15	0.00	7.75
29	49G9	522.45	343.14	71.73	36.75	3.54	39.41	7.97	0.00	0.00	19.92
30	50G7	1.77	0.44	0.22	0.22	0.00	0.00	0.00	0.00	0.00	0.89
30	50G8	42.47	1.57	8.34	0.79	0.00	0.79	0.00	4.40	1.57	25.01
30	50G9	300.20	278.96	2.90	0.97	0.97	2.90	1.16	3.28	0.00	9.07
30	50H0	58.68	0.00	2.35	2.35	5.40	6.57	3.76	4.22	2.58	31.45
30	51G7	8.95	0.00	0.60	0.00	0.60	0.00	1.19	0.60	0.00	5.97
30	51G8	15.98	0.00	1.27	0.36	1.17	2.99	0.66	0.51	0.61	8.42
30	51G9	1.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.86
30	51H0	23.41	0.00	4.07	1.02	0.00	4.88	1.22	1.02	0.00	11.19
30	52G7	7.56	0.00	0.00	0.28	0.28	1.57	0.28	0.00	0.00	5.15
30	52G8	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00
30	52G9	2.92	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	1.67
30	52H0	1.63	0.00	0.54	0.00	0.00	0.00	0.00	0.54	0.00	0.54
30	53G8	123.80	0.62	19.66	9.21	5.85	4.73	8.71	6.35	0.00	68.68
30	53G9	4.62	0.00	1.07	0.00	0.00	1.07	0.36	0.71	0.00	1.42
30	53H0	40.50	0.00	1.23	0.00	1.60	2.09	0.00	10.19	0.00	25.41
30	54G8	38.55	1.03	6.68	0.00	4.93	2.36	2.67	3.39	1.75	15.73
30	54G9	6.86	0.00	0.00	0.00	0.00	0.00	0.00	1.53	0.00	5.34
30	54H0	976.15	0.00	73.71	10.96	29.88	61.76	14.94	153.39	78.69	552.82
30	55G9	19.02	0.48	2.85	1.90	0.67	2.28	0.00	2.28	0.00	8.56
30	55H0	45.74	0.00	4.20	5.25	0.00	9.50	0.00	1.40	0.00	25.39

Table 4: Estimated number (millions) of sprat

SD	RECT	WSpr0	WSpr1	WSpr2	WSpr3	WSpr4	WSpr5	WSpr6	WSpr7	WSpr8
25	39G4		12.86	13.60	15.00	16.75	18.00	18.00		18.00
25	39G5	3.00	11.38	15.73	16.60	18.10	17.00	19.67	19.50	
25	40G4	3.38	12.10	10.00	14.67	15.77	20.67	18.50		16.67
25	40G5	4.50	11.73	14.40	17.25	17.56	20.00	16.00	11.00	
25	40G6		12.60	14.89	15.33	17.50	18.75	16.50		19.00
25	40G7	6.00	11.60	15.40	15.80	17.09	18.33	19.00	20.00	
25	41G6	2.79	8.00	12.00		13.40		15.12		17.00
25	41G7	3.33	10.27	13.00		15.79	16.33	19.67	15.00	
26	41G8	3.48	10.67	13.50	15.00	15.55	13.67	16.50	18.50	17.00
27	42G6	2.79	8.65	9.75	13.33	14.40		14.50	15.00	17.00
27	42G7	2.59	9.55	9.67	13.33	14.44		14.00	15.00	
28	42G8	3.17	10.60	16.00	14.75	14.56	14.00	14.00		16.67
27	43G7	2.87	9.25	10.40	12.60	12.29	12.00			13.50
28	43G8	3.17	10.60	16.00	14.75	14.56	14.00	14.00		16.67
28	43G9	3.52	10.88	12.00	14.00	14.30	16.00	17.67	17.00	15.00
27	44G7	2.55	7.62	10.00	12.00	12.17	12.00	13.00		13.67
27	44G8	2.88	8.80	10.33	13.00	12.89	16.00	12.00	18.00	13.50
28	44G9	2.77	8.45	11.00	15.00	13.22	13.00	11.33	13.50	
27	45G7	2.86	8.75	10.50	12.00	11.88	13.67			13.00
27	45G8	2.33	9.33	11.40	10.00	13.92	14.33		12.50	12.00
28	45G9	3.12	8.36	11.14	12.00	14.10	13.67	14.00		16.00
27	46G8	2.84	8.42	10.75		12.70	15.50	12.50	12.00	13.25
29	46G9	2.50	9.15	11.00	11.50	13.00	14.00		12.00	14.33
29	46H0	2.90	9.42	12.33	12.25	14.58	13.00		14.00	16.00
29	47G9	2.97	8.10	10.50	13.33	12.93	13.00		13.00	11.60
29	47H0	2.55	7.94	10.00	11.67	13.20	11.00	16.00		14.00
29	48G9	2.54	8.54	10.50	9.50	12.00	13.00	15.00		12.57
29	49G9	3.00	8.43	9.83	11.00	11.89	12.33			12.50
30	50G7	2.00	11.00	10.00						15.00
30	50G8	3.00	10.70	11.00		13.00		13.67	13.00	13.71
30	50G9	2.50	8.00	9.00	11.00	13.33	12.00	12.33		13.00
30	50H0		10.00	12.00	12.50	12.00	13.50	14.00	14.00	14.76
30	51G7		11.00		17.00		12.50	13.00		14.60
30	51G8		10.60	11.00	11.00	12.60	14.50	13.00	9.50	14.20
30	51G9		11.00							15.00
30	51H0		10.50	11.00		13.00	13.00	16.00		12.89
30	52G7			10.00	13.00	13.20	11.00			14.79
30	52G8								16.00	
30	52G9							11.67		13.25
30	52H0		10.00					13.00		17.00
30	53G8	3.00	9.12	10.00	10.00	12.50	12.50	11.00		14.43
30	53G9		10.00			13.00	16.00	15.50		12.75
30	53H0		9.50		13.00	16.00		12.62		13.79
30	54G8	2.00	9.73		13.75	12.33	14.00	14.00	13.00	13.83
30	54G9							14.00		13.57
30	54H0		9.80	11.00	11.00	12.00	10.00	14.50	15.00	14.59
30	55G9	1.00	10.33	11.33	10.00	12.67		11.67		14.36
30	55H0		9.45	10.80		13.40		10.00		14.50

Table 5: Estimated mean weights (g) of sprat

SD	RECT	NHerTOT	NHer0	NHer1	NHer2	NHer3	NHer4	NHer5	NHer6	NHer7	NHer8
25	39G4	204.15	11.95	34.06	44.61	19.92	39.83	37.24	14.54	0.00	1.99
25	39G5	308.92	33.06	57.75	48.94	18.99	63.77	52.51	20.88	13.01	0.00
25	40G4	374.87	12.27	55.72	43.81	28.35	62.01	123.15	16.48	27.84	5.25
25	40G5	1367.44	14.53	108.45	139.21	169.80	490.58	352.22	24.83	27.48	40.35
25	40G6	664.14	3.39	26.04	166.38	42.57	130.32	162.81	68.97	54.75	8.90
25	40G7	573.50	1.21	33.28	17.41	76.87	193.71	171.85	34.72	34.68	9.77
25	41G6	522.65	44.61	37.18	20.32	42.84	159.98	158.70	25.16	31.94	1.92
25	41G7	1182.92	1.21	0.60	20.84	68.03	288.07	377.56	190.74	138.89	96.97
26	41G8	1948.09	3.74	5.74	0.00	253.00	390.06	847.57	205.75	71.13	171.12
27	42G6	304.44	7.47	38.97	8.43	39.57	83.36	98.68	18.03	5.41	4.51
27	42G7	598.27	7.38	104.75	21.23	98.92	122.93	207.82	28.84	0.00	6.40
28	42G8	1194.41	15.91	8.20	0.00	70.52	236.56	520.69	78.11	192.37	72.05
27	43G7	249.82	63.63	28.47	17.19	12.85	53.64	49.74	11.63	7.38	5.30
28	43G8	1527.16	55.94	26.85	0.00	111.88	303.19	660.09	88.38	205.86	74.96
28	43G9	985.62	2.93	34.88	0.00	100.64	343.95	324.53	119.62	23.16	35.91
27	44G7	906.33	494.39	88.78	45.00	100.69	137.05	18.12	14.23	6.51	1.57
27	44G8	376.34	147.97	37.05	13.52	61.75	96.01	16.55	1.17	2.33	0.00
28	44G9	140.24	79.35	8.08	0.00	13.61	22.36	14.18	1.45	1.22	0.00
27	45G7	3518.78	822.17	1188.98	317.88	275.14	461.68	434.33	8.66	0.00	9.94
27	45G8	1148.53	23.98	161.64	179.23	231.94	262.59	189.00	93.87	0.00	6.27
28	45G9	1653.29	465.77	98.68	34.99	436.95	331.42	227.61	20.19	20.19	17.49
27	46G8	2536.21	208.23	1188.38	105.93	635.20	220.45	146.33	15.99	5.05	10.66
29	46G9	1058.45	22.29	86.13	58.22	204.27	563.82	70.84	20.53	29.21	3.13
29	46H0	723.73	17.71	293.12	91.03	258.86	59.40	3.60	0.00	0.00	0.00
29	47G9	1703.01	41.50	363.32	69.98	550.94	453.63	189.32	31.53	0.00	2.78
29	47H0	1961.16	1148.23	603.96	45.64	102.21	59.72	1.40	0.00	0.00	0.00
29	48G9	2415.87	157.28	1975.48	148.48	70.46	51.59	12.58	0.00	0.00	0.00
29	49G9	1113.96	144.22	419.23	126.32	179.53	125.32	82.06	15.42	21.88	0.00
30	50G7	586.39	45.83	207.06	50.77	70.51	93.54	15.28	6.82	14.81	81.79
30	50G8	1730.11	0.00	524.05	214.17	207.48	221.53	246.97	260.35	4.02	51.54
30	50G9	1879.68	31.33	1111.05	460.45	39.34	185.78	22.59	29.14	0.00	0.00
30	50H0	2888.92	552.71	1623.95	486.61	88.89	54.70	62.68	0.00	5.70	13.68
30	51G7	1479.98	125.14	505.16	147.40	194.12	149.20	97.86	73.40	113.10	74.60
30	51G8	1818.70	0.00	491.95	293.36	152.60	432.03	234.13	131.70	23.69	59.23
30	51G9	953.83	0.00	140.68	162.02	241.72	135.45	58.36	55.31	111.50	48.78
30	51H0	1900.60	52.56	886.01	194.28	141.72	47.87	120.14	119.20	7.51	331.32
30	52G7	767.32	4.44	92.85	88.71	184.81	122.42	80.43	43.17	44.06	106.45
30	52G8	934.45	0.00	5.55	54.90	166.37	181.90	134.76	138.64	35.49	216.84
30	52G9	623.46	5.10	81.54	49.95	53.68	69.65	59.12	84.26	46.55	173.62
30	52H0	1118.81	3.75	335.64	183.21	156.18	17.27	70.21	73.96	49.93	228.64
30	53G8	1283.05	105.66	384.37	109.44	229.65	161.73	40.97	63.61	69.00	118.60
30	53G9	567.24	0.00	45.96	126.84	65.92	116.86	71.43	52.52	13.13	74.58
30	53H0	1050.45	72.01	689.66	104.67	50.11	10.39	30.81	28.95	19.30	44.54
30	54G8	1147.52	50.00	157.00	163.50	255.00	140.50	152.50	100.00	18.00	111.00
30	54G9	1429.18	0.00	61.68	192.01	309.29	198.09	76.45	190.27	214.59	186.79
30	54H0	2483.51	85.50	1843.96	244.42	101.91	54.41	22.46	36.27	41.46	53.11
30	55G9	1074.23	44.41	96.04	83.83	148.78	99.93	118.80	71.62	81.61	329.21
30	55H0	1832.24	118.73	1492.18	143.65	18.32	35.91	12.46	7.33	0.00	3.66

Table 6: Estimated number (millions) of herring

SD	RECT	WHer0	WHer1	WHer2	WHer3	WHer4	WHer5	WHer6	WHer7	WHer8
25	39G4	15.58	36.79	61.91	58.50	66.56	69.20	52.40		71.00
25	39G5	15.94	32.54	56.20	66.64	56.71	63.33	63.60	58.00	
25	40G4	15.59	30.73	60.67	55.50	56.93	58.04	70.75	62.60	97.67
25	40G5	13.60	29.07	56.29	63.71	59.48	58.63	74.33	72.00	60.00
25	40G6	18.86	29.62	52.36	50.88	50.56	58.81	56.25	65.40	81.33
25	40G7	19.00	33.00	38.67	43.36	51.70	58.83	66.57	70.57	84.50
25	41G6	5.39	21.61	33.00	34.38	41.05	54.82	51.75	62.60	63.00
25	41G7	4.50	17.00	55.00	39.86	41.93	50.89	49.44	71.60	70.60
26	41G8	15.00	27.00		37.20	44.80	45.17	52.50	46.50	56.86
27	42G6	6.00	20.91	31.25	30.29	40.29	50.41	50.00	59.67	52.00
27	42G7	5.10	21.79	26.00	29.90	39.73	46.89	48.60		52.00
28	42G8	7.50	20.25		32.50	33.77	42.05	54.60	49.83	53.50
27	43G7	4.85	18.83	25.60	26.75	38.56	44.06	48.50	51.00	64.50
28	43G8	7.50	20.25		32.50	33.77	40.00	54.75	48.00	53.50
28	43G9	5.60	23.33		32.60	35.07	39.83	45.38	42.00	50.80
27	44G7	5.13	18.31	31.67	27.33	36.67	42.60	51.14	57.00	46.00
27	44G8	4.11	17.83	29.00	23.64	28.61	32.50	37.00	36.50	
28	44G9	5.24	24.00		29.43	32.00	40.25	32.00	40.00	
27	45G7	4.55	17.53	22.00	28.80	31.25	34.55	34.00		43.00
27	45G8	4.50	17.50	24.67	31.40	29.70	36.17	41.20		38.00
28	45G9	5.09	19.91	26.00	29.27	37.54	40.20	43.00	47.50	44.00
27	46G8	4.36	15.25	26.67	24.43	36.08	34.11	33.00	43.00	29.00
29	46G9	4.73	16.18	18.50	26.20	27.83	36.20	36.00	29.00	47.00
29	46H0	5.00	17.95	24.00	27.00	30.89	30.00			
29	47G9	4.93	17.23	23.00	26.14	30.00	30.14	30.00		36.00
29	47H0	5.58	17.00	21.00	24.40	28.62	61.00			
29	48G9	4.91	14.45	22.62	24.17	24.20	34.00			
29	49G9	4.94	14.15	18.60	23.18	27.53	31.22	36.00	40.75	
30	50G7	8.47	14.40	20.33	25.56	31.00	38.00	32.00	36.00	52.89
30	50G8		15.17	22.75	25.88	30.29	31.78	33.55	43.00	49.93
30	50G9	5.50	12.40	19.42	26.00	24.73	28.00	20.00		
30	50H0	4.97	13.52	20.62	22.50	18.00	27.80		33.00	22.00
30	51G7	10.18	15.18	20.86	26.12	28.78	33.67	40.90	37.17	51.94
30	51G8		16.19	22.43	25.33	26.40	31.56	32.33	36.50	44.83
30	51G9		15.19	22.00	23.18	27.75	28.60	32.50	29.20	41.25
30	51H0	6.43	15.52	21.12	27.14	31.33	28.33	33.14	46.00	45.30
30	52G7	7.33	15.21	19.00	25.09	23.14	32.71	38.83	42.50	52.07
30	52G8		17.50	22.60	23.58	31.75	29.60	37.62	33.00	47.04
30	52G9	10.00	16.40	21.00	22.50	25.71	28.50	33.33	38.00	48.51
30	52H0	7.50	14.05	20.20	23.45	35.50	30.60	28.83	33.25	50.27
30	53G8	4.00	15.00	21.71	27.00	29.44	31.00	35.00	32.60	48.74
30	53G9		15.90	20.92	22.00	28.50	27.00	33.29	42.50	44.26
30	53H0	4.60	13.79	21.27	26.43	29.50	30.00	36.29	25.67	42.53
30	54G8	5.47	14.17	19.10	23.69	27.43	25.29	35.00	30.00	42.79
30	54G9		14.73	19.55	22.45	27.00	35.33	32.86	33.88	41.60
30	54H0	6.00	13.77	19.78	25.50	23.25	33.00	31.33	31.25	65.33
30	55G9	3.43	14.13	18.40	21.30	25.20	28.60	34.00	32.20	43.64
30	55H0	5.03	14.26	21.80	27.67	29.86	26.50	30.00		33.00

Table 7: Estimated mean weights (g) of herring

Species/Trawlnumber	1	3	5	7	9	11	13	15
Ammodytidae		0.05						
Clupea harengus	24.40	36.51	17.78	10.05	29.45	217.66	209.06	35.78
Coregonus lavaretus								
Cyclopterus lumpus	0.06			0.40	1.23	1.26	0.67	0.39
Enchelyopus cimbrius								
Entelurus aequoreus								
Gadus morhua								
Gasterosteus aculeatus	21.30	7.06	20.78	166.07	3.96	5.93	8.43	16.56
Hyperoplus lanceolatus								
Liparis liparis								
Merlangius merlangus								
Myoxocephalus quadricornis								
Nerophis ophidion	0.00			0.00				
Osmerus eperlanus								
Platichthys flesus				0.15				
Pomatoschistus								
Psetta maxima								
Pungitius pungitius	0.00	0.01	0.01	0.19	0.04	0.04	0.03	0.02
Salmo salar					1.40			
Sprattus sprattus	6.00	48.81	10.65	137.32	238.97	184.25	127.45	26.90
Zoarces viviparus								
Zoarcidae								

Table 8: Catch composition per haul

Species/Trawlnumber	17	19	21	23	25	27	29	31
Ammodytidae								
Clupea harengus	343.25	18.88	61.73	230.01	65.98	265.20	119.99	93.45
Coregonus lavaretus								
Cyclopterus lumpus	0.12	0.50	0.61					
Enchelyopus cimbrius								
Entelurus aequoreus								
Gadus morhua								
Gasterosteus aculeatus	16.05	4.22	5.60	6.18	2.65	2.95	23.42	82.27
Hyperoplus lanceolatus								
Liparis liparis							0.04	0.06
Merlangius merlangus								
Myoxocephalus quadricornis								
Nerophis ophidion			0.01		0.00			
Osmerus eperlanus								
Platichthys flesus								
Pomatoschistus								
Psetta maxima		0.38						
Pungitius pungitius	0.01	0.36	0.01	0.01		0.01		
Salmo salar		3.84			0.25			
Sprattus sprattus	63.26	1273.73	36.24	34.27	2.19	5.30	0.82	0.14
Zoarces viviparus								
Zoarcidae						0.04		

Table 9: Catch composition per haul. (continued)

Species/Trawlnumber	33	35	37	39	41	43	45	47
Ammodytidae								
Clupea harengus	65.10	97.18	190.28	140.59	134.72	97.47	78.81	68.49
Coregonus lavaretus								
Cyclopterus lumpus								
Enchelyopus cimbrius								
Entelurus aequoreus								
Gadus morhua								
Gasterosteus aculeatus	22.22	1.24	0.81	0.39	1.48	1.08	0.51	0.68
Hyperoplus lanceolatus								
Liparis liparis	0.17			0.33	0.50	0.10	0.03	0.05
Merlangius merlangus								
Myoxocephalus quadricornis								
Nerophis ophidion				0.00	0.00	0.00		
Osmerus eperlanus	0.02	2.42	0.48	0.17		0.24	0.03	
Platichthys flesus								
Pomatoschistus								
Psetta maxima								
Pungitius pungitius		0.00				0.03		
Salmo salar								
Sprattus sprattus	2.02	31.26	40.63	1.14	0.35	1.72	3.83	0.30
Zoarces viviparus								
Zoarcidae								

Table 10: Catch composition per haul. (continued)

Species/Trawlnumber	49	51	53	55	57	59	61	63	65
Ammodytidae									
Clupea harengus	94.93	60.50	77.70	144.35	65.80	165.90	175.15	125.67	132.98
Coregonus lavaretus								0.65	
Cyclopterus lumpus									
Enchelyopus cimbrius									
Entelurus aequoreus									
Gadus morhua									
Gasterosteus aculeatus	1.34	0.58	3.38	1.78	0.36	9.68	4.61	3.57	11.33
Hyperoplus lanceolatus									
Liparis liparis	0.07	0.53	0.18	0.06		0.28	0.55	0.22	
Merlangius merlangus									
Myoxocephalus quadricornis			0.08	0.04					
Nerophis ophidion									
Osmerus eperlanus					0.01	0.03			
Platichthys flesus									
Pomatoschistus									
Psetta maxima									
Pungitius pungitius							0.00	0.00	0.00
Salmo salar									
Sprattus sprattus	0.19	0.02	0.37	0.66	0.06	0.10	0.87	1.68	2.96
Zoarces viviparus							0.00		
Zoarcidae					0.01				

Table 11: Catch composition per haul. (continued)

Species/Trawlnumber	67	69	71	73	75	77	79	81	83
Ammodytidae			0.01						
Clupea harengus	254.92	1455.17	95.92	80.65	1.07	52.05	65.06	408.77	290.67
Coregonus lavaretus									
Cyclopterus lumpus	0.55	0.28	0.34		0.28	0.15	0.78	0.16	0.52
Enchelyopus cimbrius									
Entelurus aequoreus									
Gadus morhua									
Gasterosteus aculeatus	10.03	23.48	42.19	44.02	48.99	65.22	119.23	68.41	70.38
Hyperoplus lanceolatus		0.23	0.01				0.01		
Liparis liparis									
Merlangius merlangus									
Myoxocephalus quadricornis									
Nerophis ophidion									
Osmerus eperlanus									
Platichthys flesus		0.12				0.23			
Pomatoschistus									
Psetta maxima									
Pungitius pungitius	0.02			0.01	0.02	0.02	0.01		0.04
Salmo salar									
Sprattus sprattus	154.95	140.51	80.96	2.02	21.21	2.39	3.04	16.81	3.55
Zoarces viviparus									
Zoarcidae									

Table 12: Catch composition per haul. (continued)

Species/Trawlnumber	85	87	89	91	93	95	97	99	101
Ammodytidae									0.00
Clupea harengus	330.94	10.97	1.44	30.35	315.16	929.28	2054.96	168.36	262.17
Coregonus lavaretus									
Cyclopterus lumpus		0.26	0.24	0.66	0.89	0.79		0.21	0.55
Enchelyopus cimbrius					0.01				
Entelurus aequoreus	0.00								
Gadus morhua	0.15	0.18	0.03	0.04	0.07	0.30	0.28	0.07	0.25
Gasterosteus aculeatus	34.63	72.64	106.65	41.08	19.65	16.81	2.57	0.21	0.02
Hyperoplus lanceolatus	0.01				0.11	0.05		0.02	
Liparis liparis									
Merlangius merlangus									
Myoxocephalus quadricornis									
Nerophis ophidion									
Osmerus eperlanus									
Platichthys flesus	0.26					0.26	0.15		
Pomatoschistus									
Psetta maxima									
Pungitius pungitius		0.06	0.16	0.04	0.01				
Salmo salar			1.90						
Sprattus sprattus	19.18	19.16	76.20	141.81	31.80	158.79	2.39	1.29	35.43
Zoarces viviparus									
Zoarcidae									

Table 13: Catch composition per haul. (continued)

Species/Trawlnumber	103	105	107	109	110	112	114	116	118
Ammodytidae								0.00	0.00
Clupea harengus	528.17	12.34	0.37	0.16	184.61	171.81	316.16	132.10	110.34
Coregonus lavaretus									
Cyclopterus lumpus	0.68	0.12	0.08	0.30	0.13	1.27	0.14		
Enchelyopus cimbrius						0.01		0.00	
Entelurus aequoreus									
Gadus morhua	22.82		0.01		0.18	0.01	0.11	0.03	14.93
Gasterosteus aculeatus	0.16	53.23	61.93	110.95	44.74	90.50	165.92	1.53	0.24
Hyperoplus lanceolatus						0.02			
Liparis liparis									
Merlangius merlangus									
Myoxocephalus quadricornis									
Nerophis ophidion									
Osmerus eperlanus									
Platichthys flesus	0.26				0.21	0.12	0.23		0.37
Pomatoschistus	0.02	0.02	0.00					0.00	0.80
Psetta maxima									
Pungitius pungitius		0.07	0.06	0.10		0.03			
Salmo salar									
Sprattus sprattus	72.13	647.95	4.07	1.72	18.25	10.32	5.39	1.16	57.82
Zoarces viviparus									
Zoarcidae									

Table 14: Catch composition per haul. (continued)

Species/Trawlnumber	120	122	125	126	128	130	132	134	136
Ammodytidae				0.01	0.00	0.02			
Clupea harengus	337.48	38.85	98.10	135.73	68.35	797.63	230.81	291.10	263.85
Coregonus lavaretus									
Cyclopterus lumpus				0.53	0.37	0.28	0.58		
Enchelyopus cimbrius	0.01								
Entelurus aequoreus									
Gadus morhua	35.04			0.14	0.01	0.80	0.02	143.60	0.99
Gasterosteus aculeatus		0.00			0.01				
Hyperoplus lanceolatus									
Liparis liparis									
Merlangius merlangus									0.17
Myoxocephalus quadricornis									
Nerophis ophidion									
Osmerus eperlanus									
Platichthys flesus	0.14								
Pomatoschistus	0.01	0.00							
Psetta maxima									
Pungitius pungitius									
Salmo salar									
Sprattus sprattus	199.37	58.23	53.76	128.65	44.40	165.91	91.76	48.03	72.55
Zoarces viviparus									
Zoarcidae									

Table 15: Catch composition per haul. (continued)

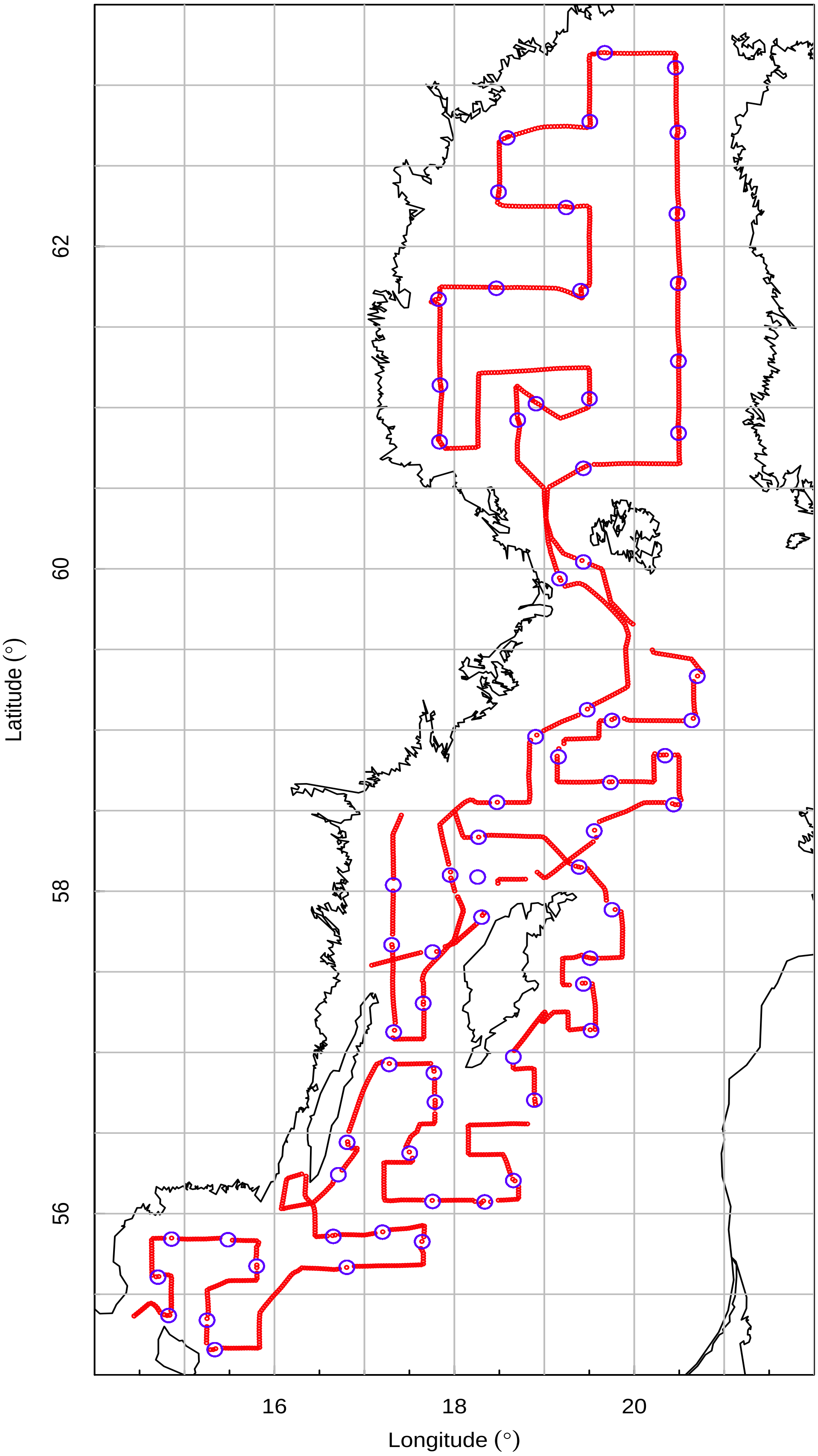

Figure 1: cruise track(red), positions of trawl hauls (blue) and survey grid (ICES squares)(grey)

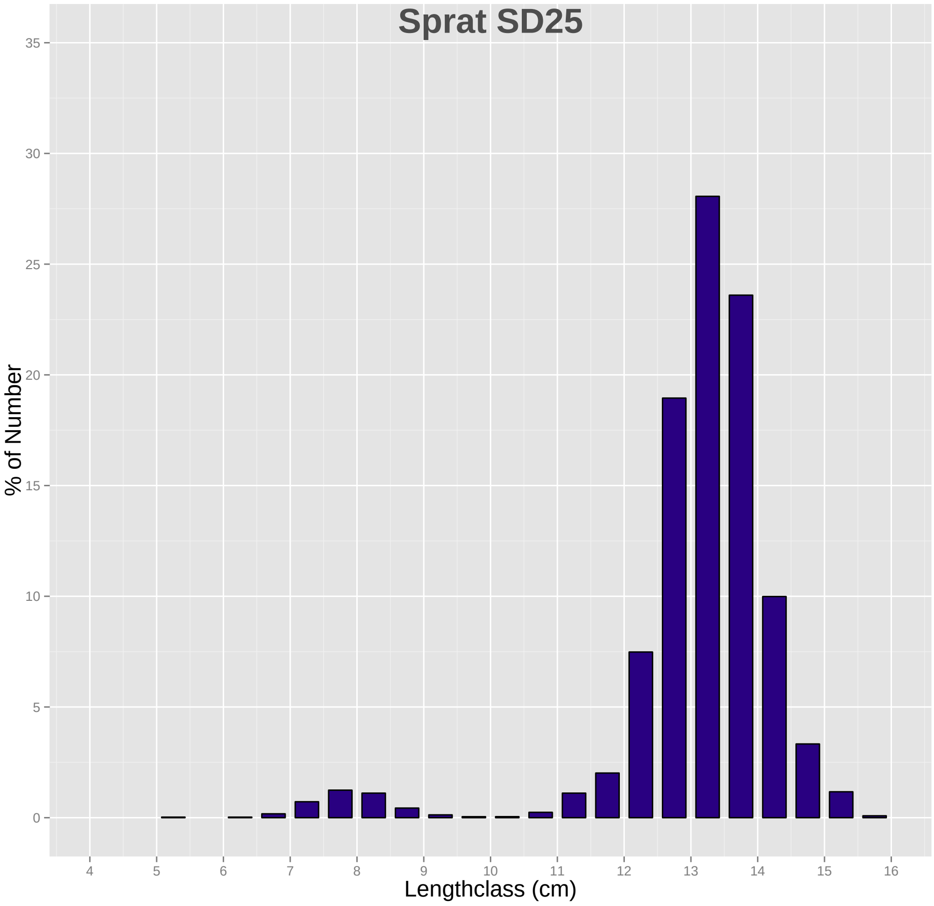

Figure 2: Length distribution of sprat

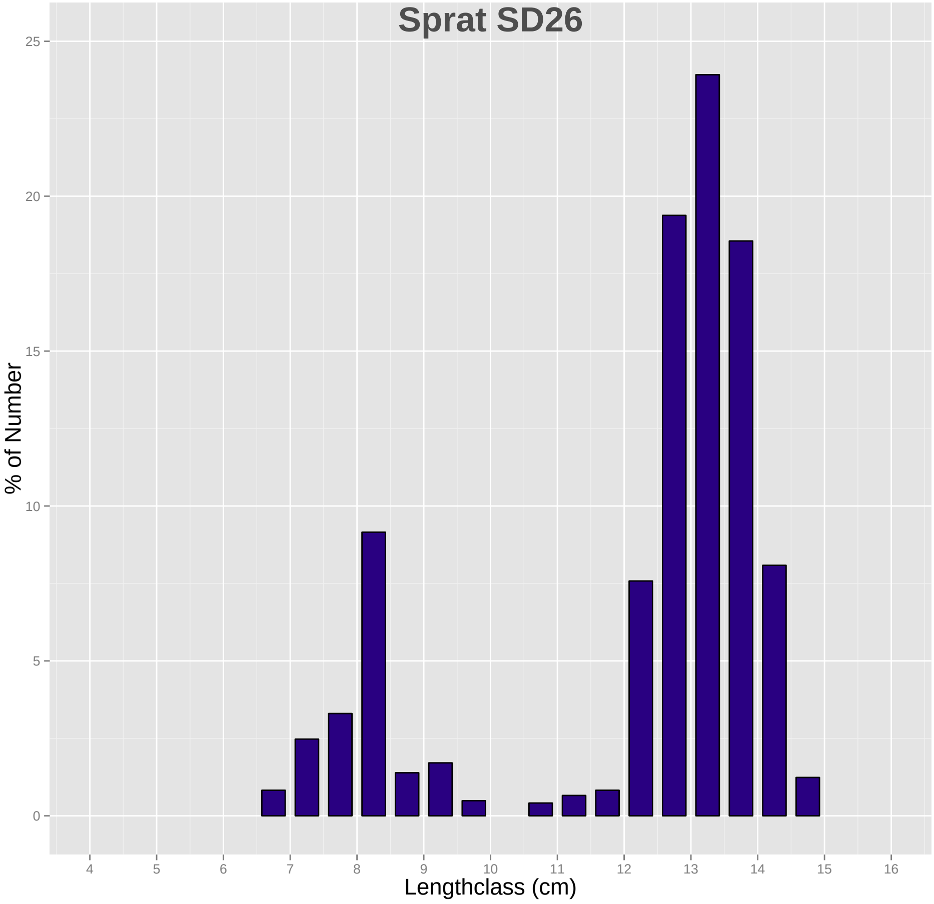

Figure 3: Length distribution of sprat

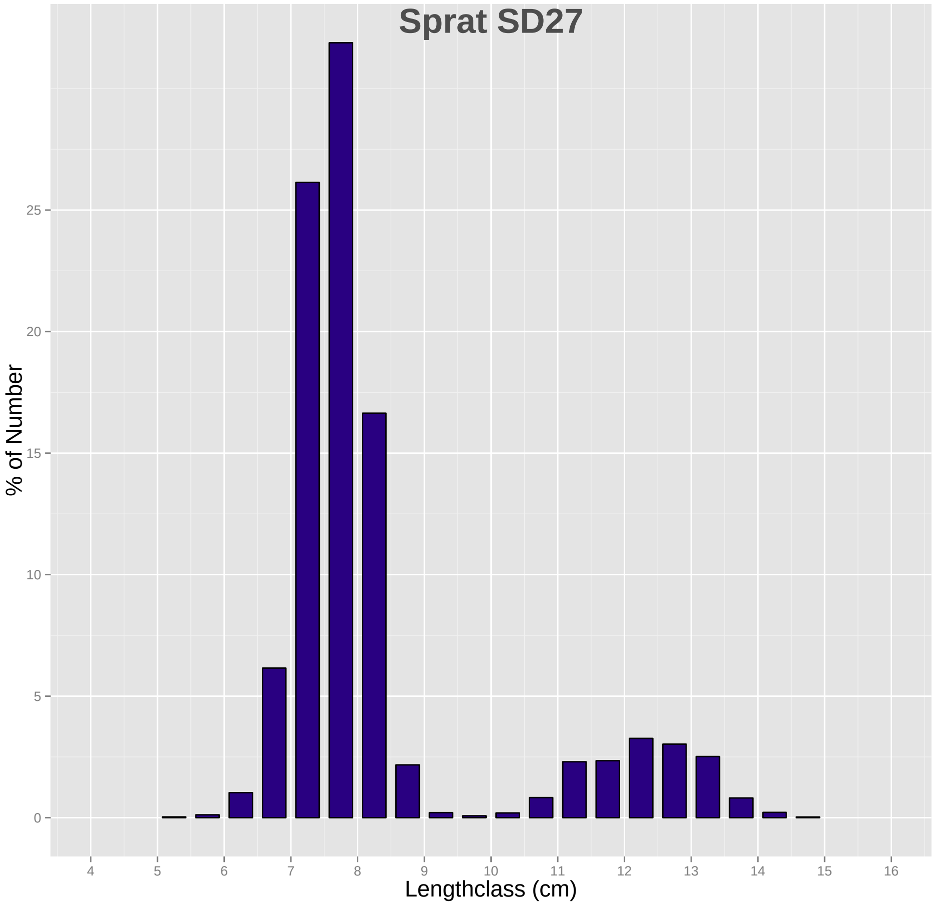

Figure 4: Length distribution of sprat

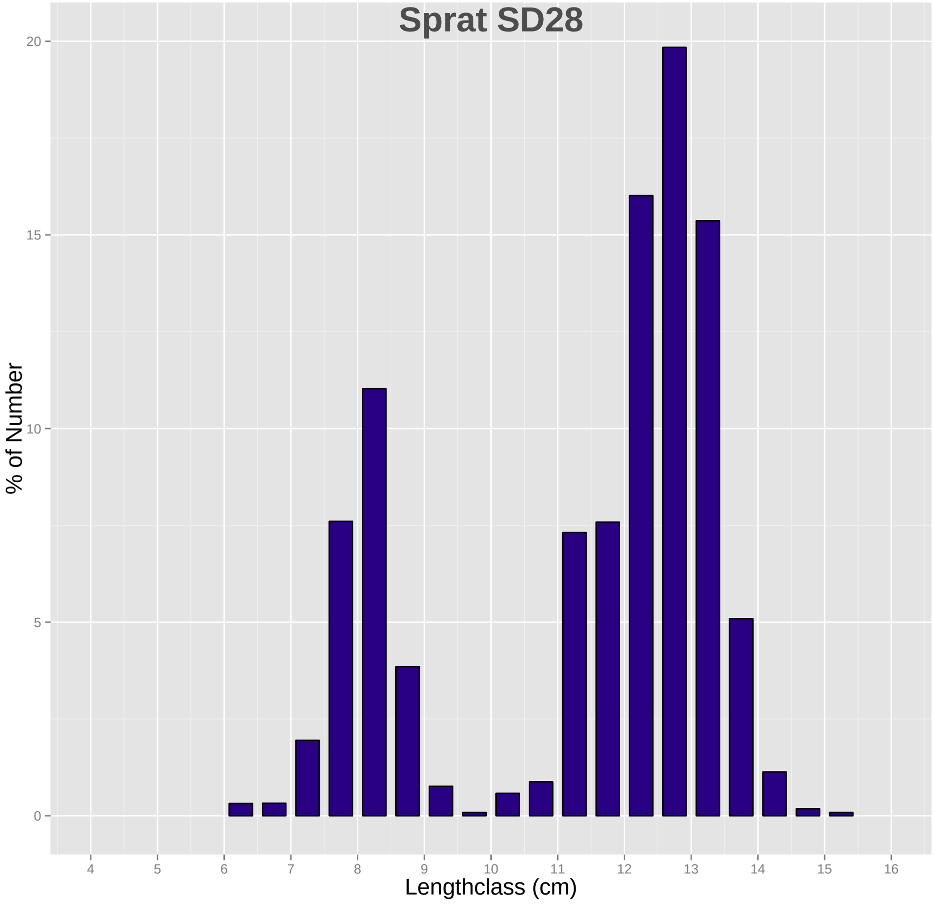

Figure 5: Length distribution of sprat

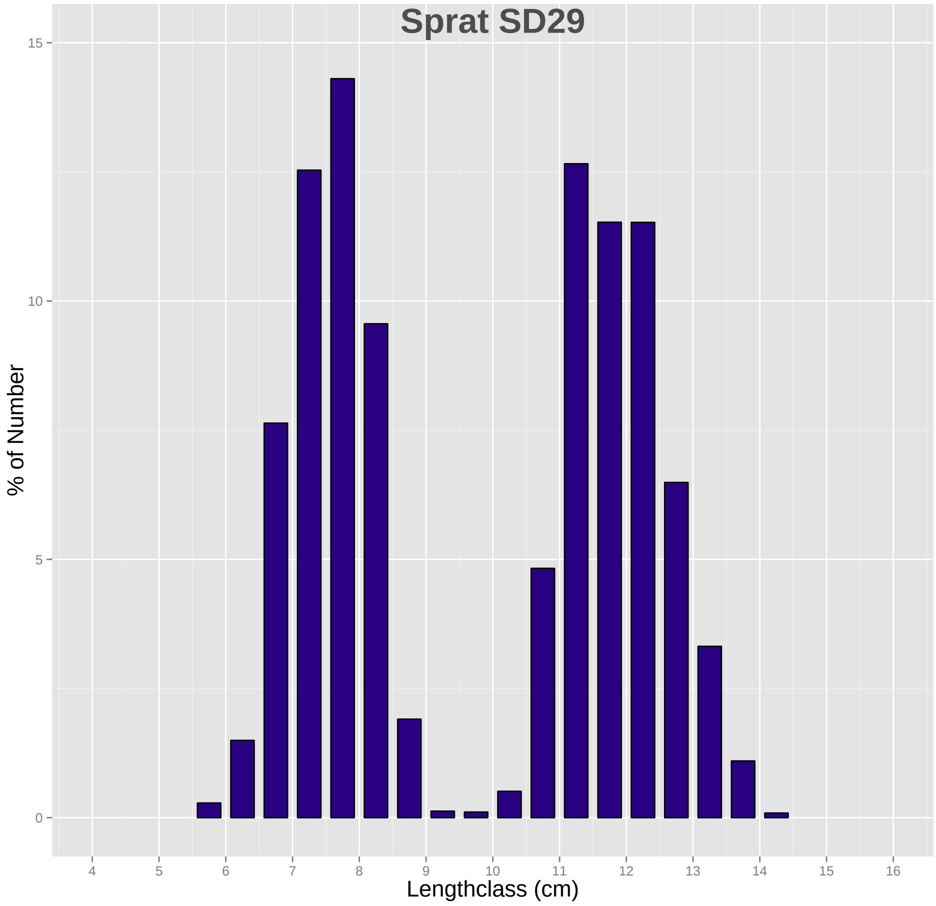

Figure 6: Length distribution of sprat

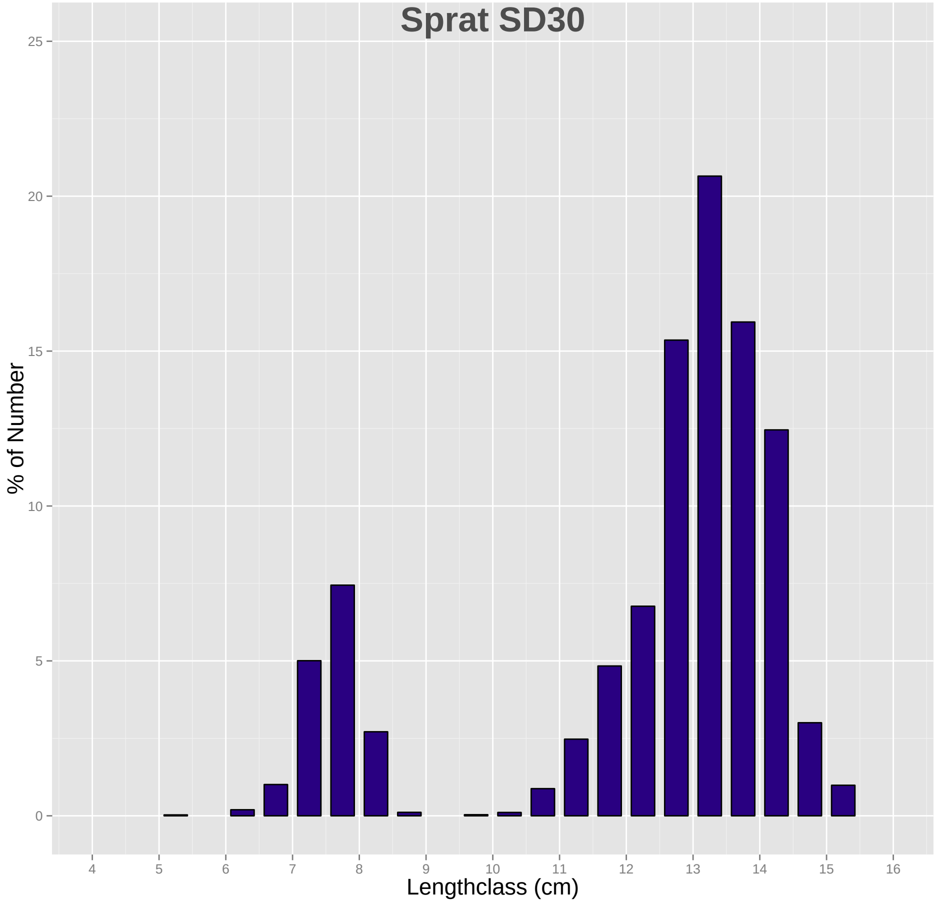

Figure 7: Length distribution of sprat

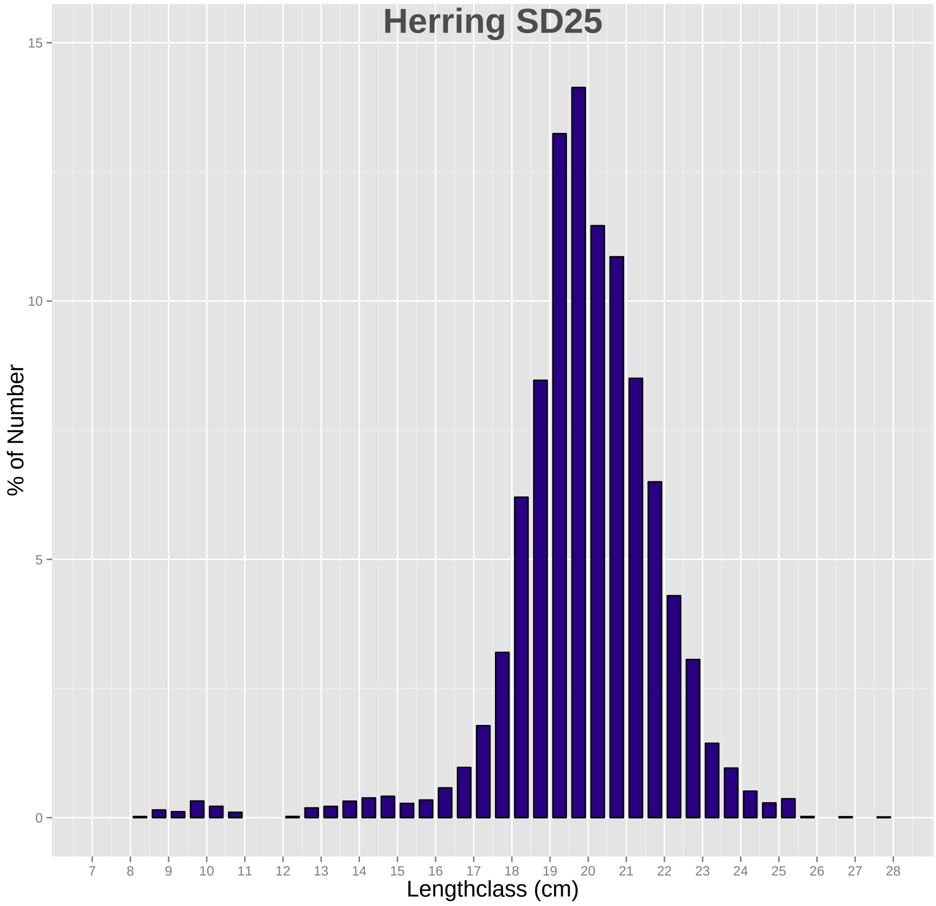

Figure 8: Length distribution of herring

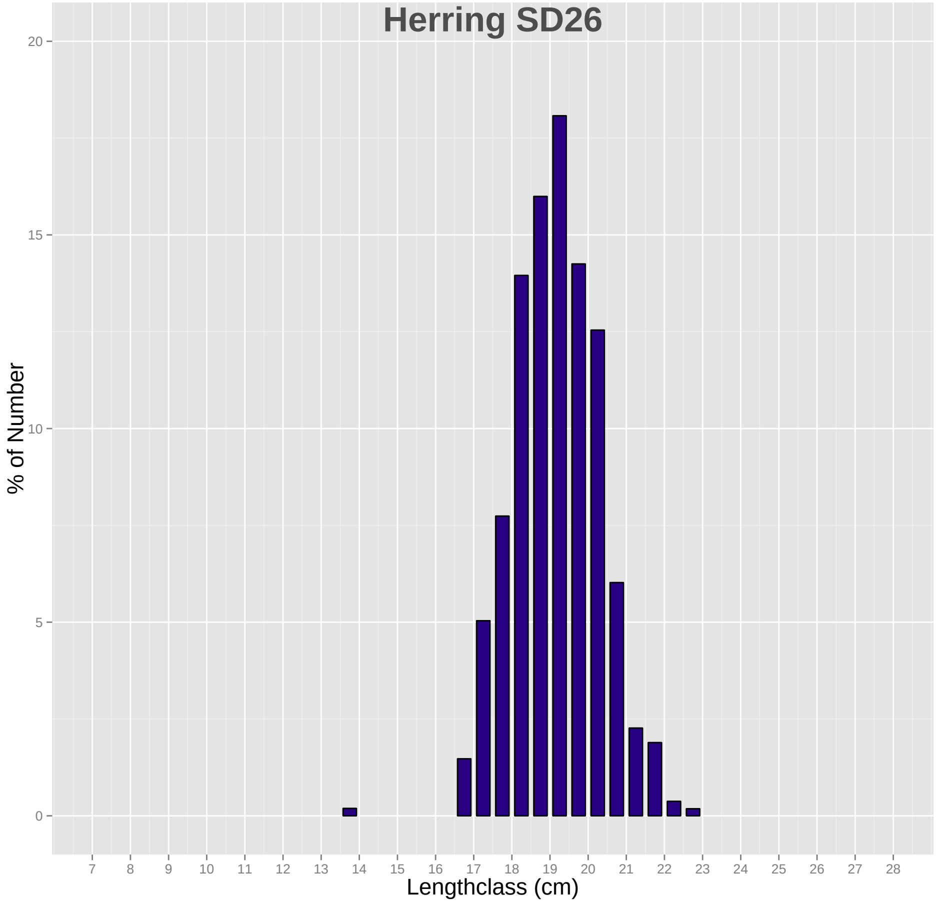

Figure 9: Length distribution of herring

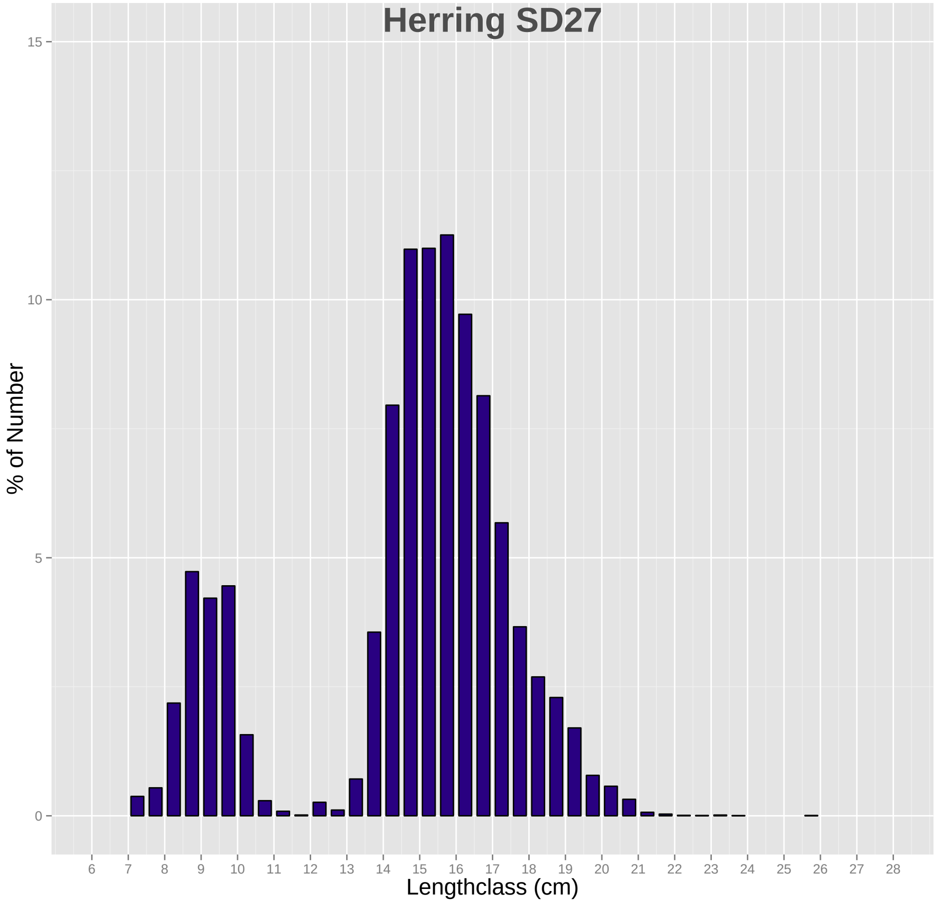

Figure 10: Length distribution of herring

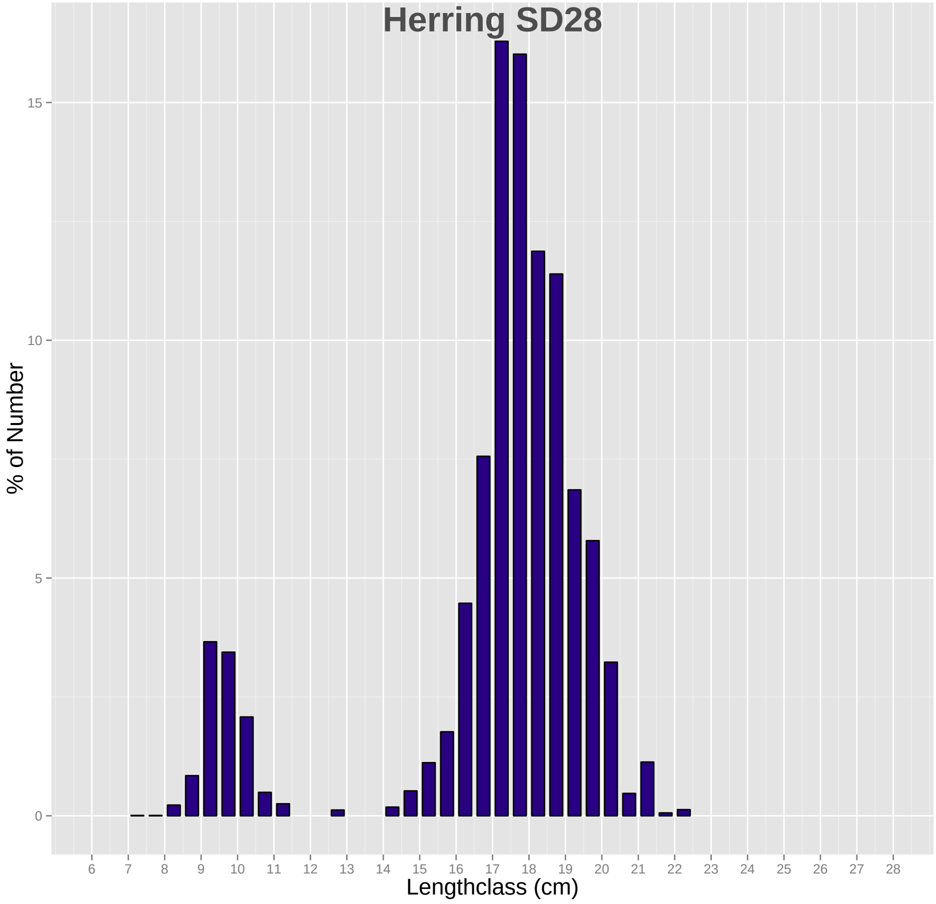

Figure 11: Length distribution of herring

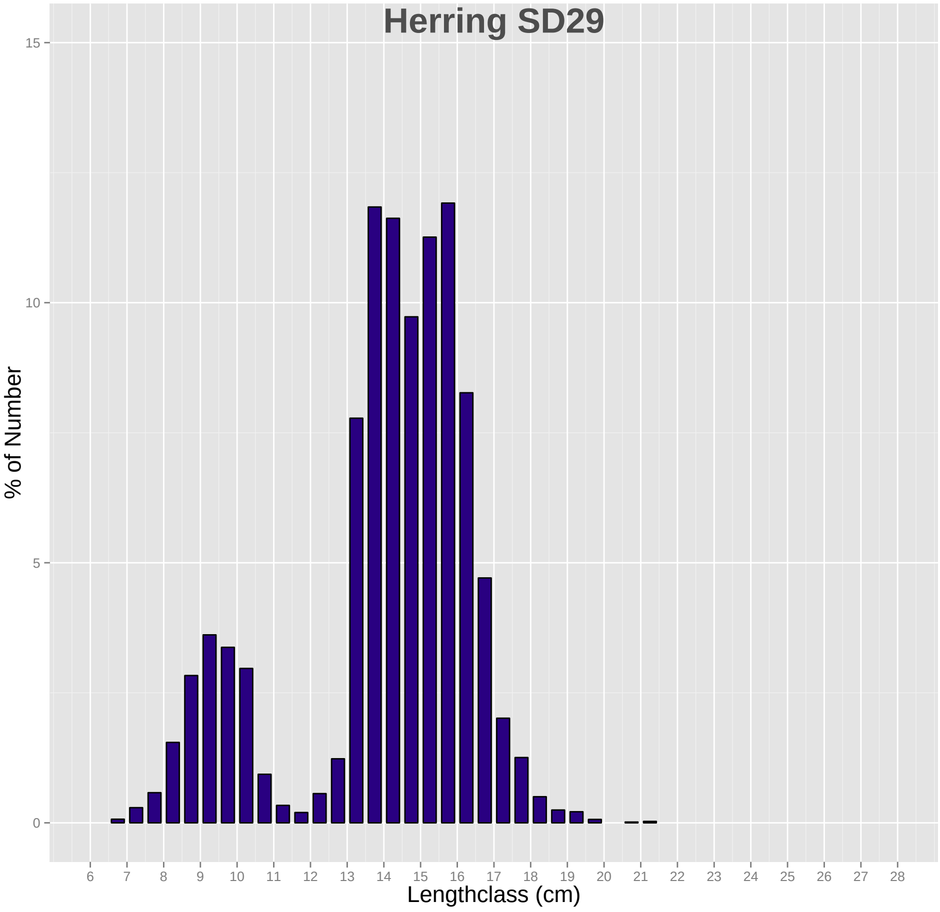

Figure 12: Length distribution of herring

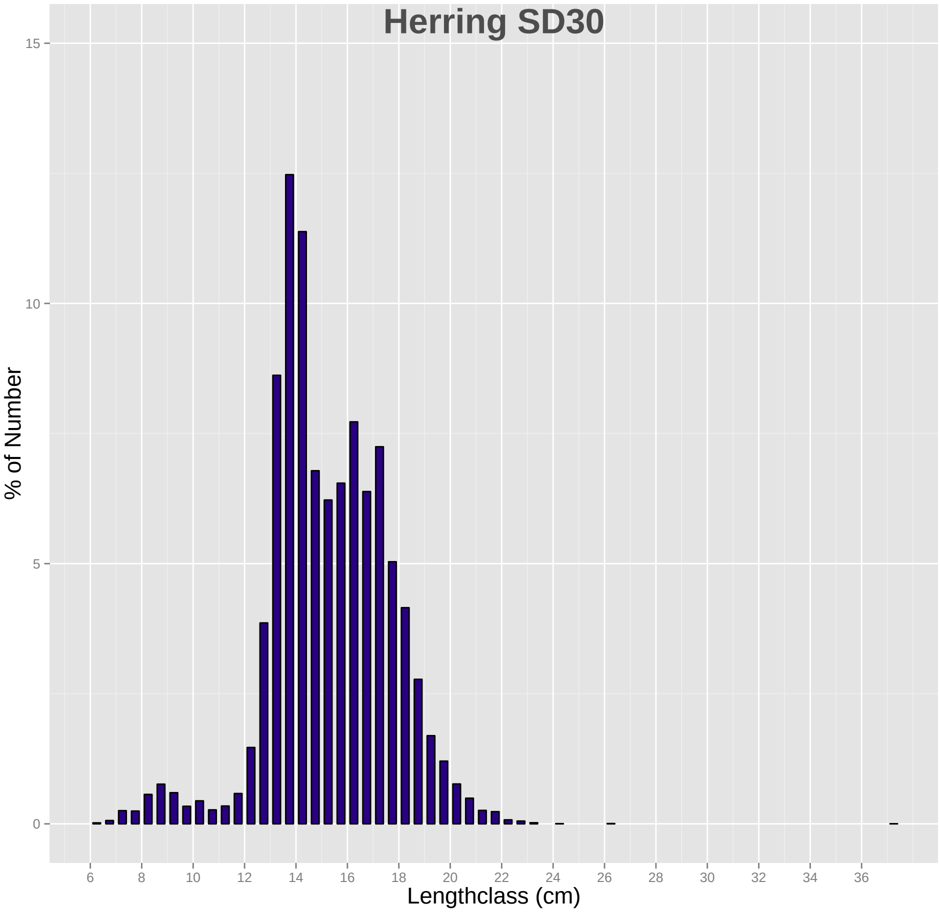

Figure 13: Length distribution of herring

Annex 9: Working documents presented during the WGBIFS 2013 meeting

Oeberst, R., Gröhsler, T. 2013. Comparison of stock indices based on GERAS estimated with the standard procedure and by the new proposed method.

Oeberst, R. and Böttcher, U. 2013. Comparison of stock indices based on BASS estimated with standard procedure and new proposed method.

Oeberst, R., Gröhsler, T., Schaber, M, Larson, N. 2013. Applicability of the Separation Function (SF) in 2011 and 2012.

Kasatkina, S. and Gasyukov, P. 2013. Spatial-temporal variability of the Baltic herring and sprat as influencing factor on BIAS uncertainty.

Kasatkina, S. and Malyshko, A. 2013. Cod spatial distribution in the near-bottom layers fished by standard gears during the BITS: analysis of data from acoustic observations.

Florin, A.B., 2013. Suggestions for changes of instructions for sampling of flounder during the BITS surveys.

Comparison of stock indices based on GERAS estimated with the standard procedure and by the new proposed method

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Abstract

The relation between the s_A values of target species and total s_A values at the fishing stations were analysed for data of the German autumn acoustic survey (GERAS) in SD 21 – 24 in October between 2001 and 2007 as well as 2011. The results support the application of the newly proposed method (Oeberst, 2005) to get unbiased estimates of stock indices because the requirements of the currently used standard method are not fulfilled.

Introduction

Two international acoustic surveys are carried out in the Baltic Sea every year, (ICES 2012), one during spring time (May) and the other one during autumn time (October). The aim of the acoustic survey in May is to estimate stock indices of sprat, which can easily be separated by length into two categories of target groups (Age group 1 and Age group 2+). Low densities of herring, cod and other species occur in the scattered layer. Sprat and herring are the main target species of the annually conducted acoustic survey in October. Both species can be separated into two target groups by length (Age group 0 and Age group 1+). Besides these main target groups, cod, whiting and other species are observed within the survey. During both acoustic surveys the total densities of the scattered layer are mainly determined by the main target groups. Trawling stations are used to estimate the relative distribution of the target types and to assess the acoustic characteristics. The allocation of traces to species is only possible in cases of large cod. It is assumed that the relative species composition within the layer of the trawling stations is similar to the total depth distribution observed by the acoustic measurements. Coverage of 60 nautical miles and at least two trawling stations are required for each stratification unit (rectangle of 30’ N x 1 °E). Trawl catches within each ICES rectangle are combined to give an average species composition of the catch. Each trawl catch is given equal weight, unless it is decided that a trawl catch is not representative of the fish concentrations sampled. In this case, the particular trawl catch is not used (ICES 2012, BIAS manual). The new method for combining the results of fishing stations during acoustic surveys was described by Oeberst (2005, 2011). Oeberst and Götze (2006) compared the stock indices of sprat and herring, which were estimated based on the standard method and the new approach for the acoustic surveys in ICES subdivision 25 in May 2003 and 2004. Oeberst and Gröhsler (2012) applied the new method to estimate the indices of herring and sprat in SD 21 – 24 during GERAS in 2008 to 2010. This study extends the time series of GERAS to the period from 2001 to 2007 and 2011.

Material and Methods

The standard method for combining the results of fishing stations during acoustic surveys in the Baltic Sea is given in the BIAS manual of WGBIFS in 2012 (ICES, 2012). Stock indices by species and age group are estimated by rectangle and are then summarized by ICES SD. s_A value sampled during the fishing stations are not taken into account.

The new approach for combining the results of fishing stations during the acoustic surveys is presented in Oeberst (2005 and 2011). The new method was applied to estimate stock indices of youngest age group of sprat (Spr(YoY)) and for older sprat (Spr(+)), which were separated by length as well as for herring, Herring (Her), cod and whiting (Whi) for all ICES subdivisions covered during the German acoustic surveys in October 2001 to 2011. In addition, anchovy, stickleback, whiting, mackerel and two gobidae (crystallogobius linearis (Gobi_214) and pomatoschistus minutus (Gobi_617)) were also taken into account if the number of species presented more than 1 % in all stations sampled (BIAS manual). The new approach uses the ICES SD as smallest unit. Estimates for rectangles are not produced. To compare the estimates of both methods the results by ICES SD are used. Following notation was used to identify the estimates of both methods:

Spr(YoY) estimate of youngest age group of sprat based on the new approach

Spr(YoY) estimate of youngest age group of sprat based on the standard method

Separation of the stock indices of herring into the components of WBSSH and CBH (Gröhsler et al. submitted) were not applied because the proposed separation function (SF) cannot be applied between 2001 and 2004 due different growth parameters at that time (Oeberst et al. 2013, WKPELA 2013). In addition, the stock indices, which are stored in the BIAS database, are not split into both components of WBSSH and CBH.

The relation between the estimates of new the method (NM) and the standard method (SM) was described by a linear regression.

Results

Analyses of the GERAS by SD and Year showed that the s_A values of certain species is not in all cases correlated with the total s_A value during the fishing station. Thus indicating that the new proposed method is more appropriate for estimation stock indices than the standard method. The results correspond with the findings of Oeberst & Gröhsler (2012, WD WGBIFS). Species like stickleback, gobidae, whiting, cod etc. were caught almost on all fishing stations, but, the s_A values of these species were always low and not correlated with the total s_A value. Figure 1 presents some examples of the relation between the total s_A value and the s_A value of different species. The number of species, which were correlated with the total s_A value varied from SD to SD and from year to year. In SD 21 in 2003 of density of SP(+) was low and the s_A values of SP(+) were not correlated with total s_A value. One year later the s_A values of SP(+) and total s_A value were correlated (Fig. 1a). Herring was dominant in SD 22 in 2002 as was YoY of sprat in 2003 in the same area (Fig. 1b). In SD 23 the s_A values of herring were always correlated to the total s_A values (Fig. 1c). Variable species compositions were observed in SD 24 (Fig. 1d). In 2005 s_A values of herring and YoY sprat were correlated with total s_A values and whereas this was in 2007 only the case for SP(+).

The linear regression between NM and SM of herring (all age groups), of YoY sprat and SP(+) by ICES SD and year were estimated for the period 2001 and 2011.

SM (species) = a + b NM (species).

The mean stock indices of both methods for herring were similar in mean (Fig. 2) because the slope of the regression is ~1. However, the deviation of the single points from the regression line is large in some cases resulting in r^2 of 0.59. The new method estimates higher indices of YoY and older sprat. The slopes of the linear regressions were 0.67 (Fig. 3) and 0.73 (Fig. 4) for YoY and older sprat, respectively.

The consistency of the acoustic estimates of the year classes were estimated for age group 0 to 7 by means of the following linear regression

N(a+1y+1) = b1 + b2 * N(a,y)

where a denotes the age group and y denotes the year. Estimates were calculated for data of the new model and the standard model for age groups 0 to 6 (Fig. 6a – 6g).

For most age groups the R^2 values of the linear regression was low regarding both models. Estimates of age group 0 to 2 of year class 2003 significantly differed from data of other year classes. Only for age group 2 to 3 R^2 values were > 0.45.

Data of sprat are canot be taken as representative because GERAS only covers a small part of the total distribution area of Baltic sprat.

Discussion

The application of the new methods results in downscaling of sprat indices. The effect concerning the indices of herring is low, but, may result in strong differences by SD.

The new method did not result in an improvement of the internal consistency by following the different cohorts. One possible reason for the low internal consistency of the data of the standard model is the mixture of WBSSH and CBH in the Arkona Sea (Gröhsler et al., 2013). These results showed that consistency of the stock indices based on GERAS is influenced by different factors. The low consistency of the estimates of age group 0 and 1 correspond with observations between the estimate of the year class based on the larvae index, N20, and the estimates of age group 0 and 1 based on GERAS (Oeberst et al. 2009). The poor internal consistency between the estimates of age group 3 and older cannot be explained.

The results indicate that requirements of the new proposed method (NM) are fulfilled and that the application of the standard method (SM) may lead to biased stock indices, at least for sprat.

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Figures

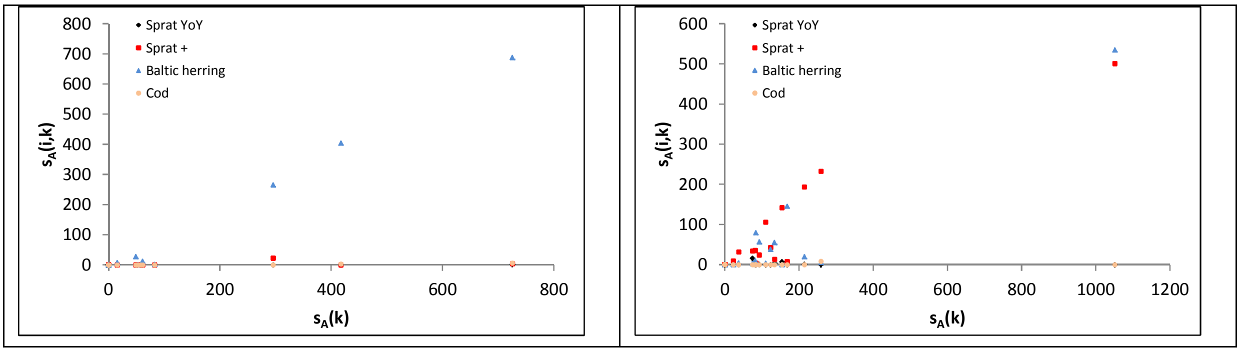

Figure 1a: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 21 in 2003 (left panel) and in 2004 (right panel).

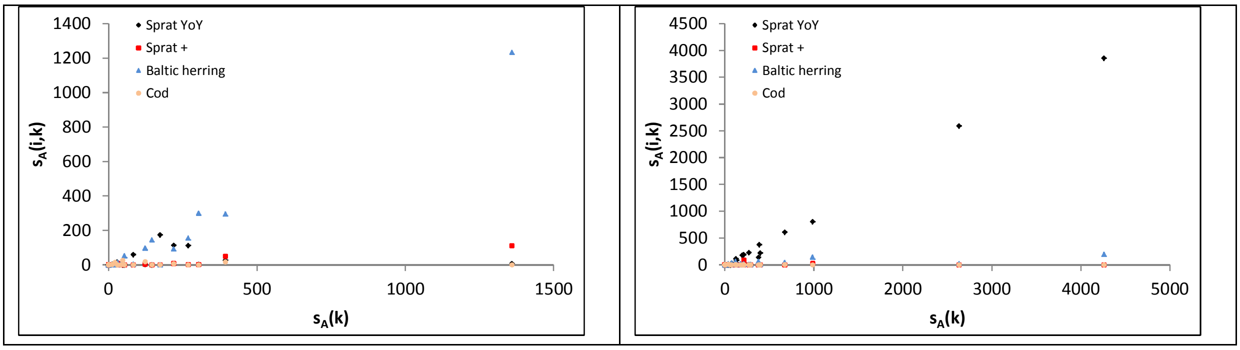

Figure 1b: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 22 in 2002 (left panel) and in 2003 (right panel).

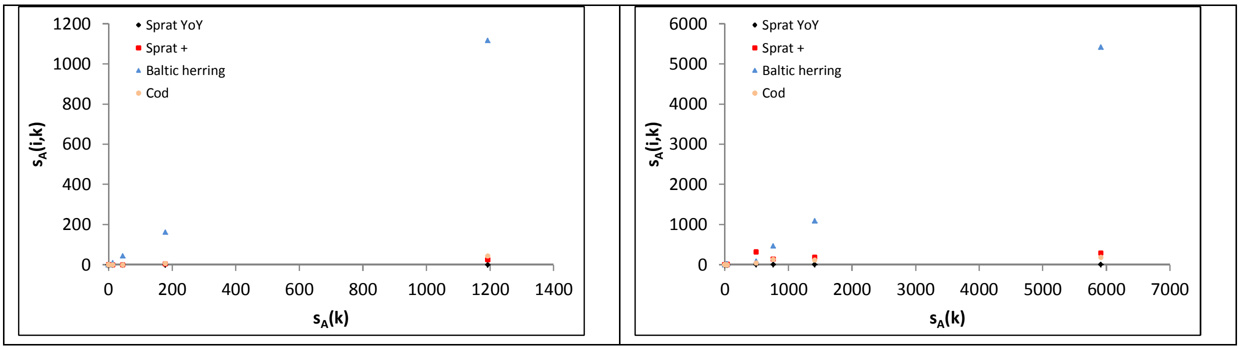

Figure 1c: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 23 in 2004 (left panel) and in 2007 (right panel).

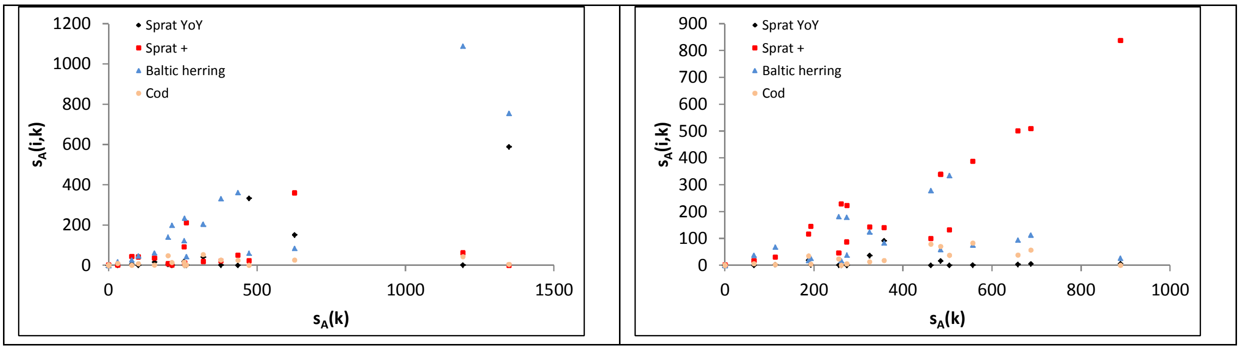

Figure 1d: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 24 in 2005 (left panel) and in 2007 (right panel).

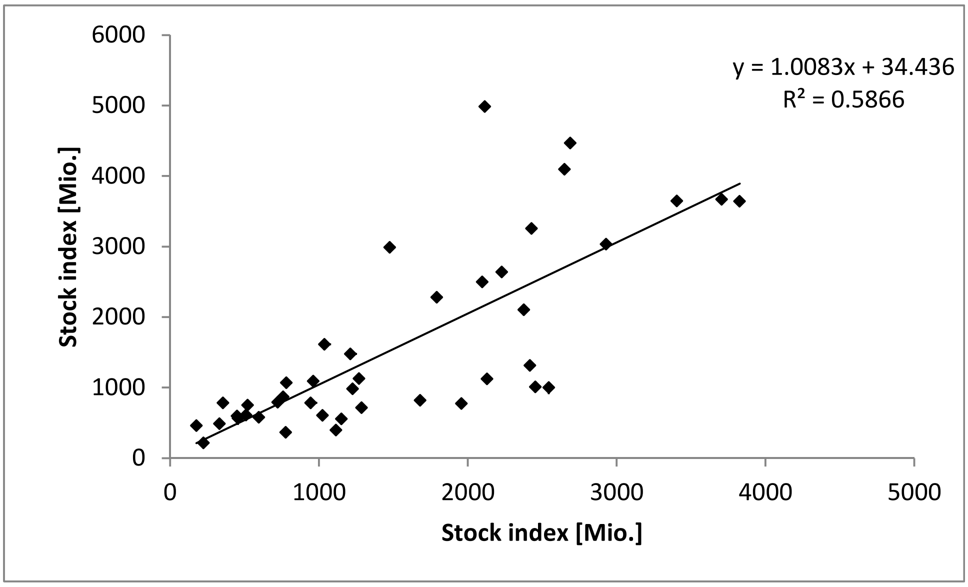

Figure 2: Relation between the stock indices of herring (all age groups) of the new proposed method (x-axis) and the standard method (y-axis) by ICES SD and year estimated between 2001 and 2011 (N = 42).

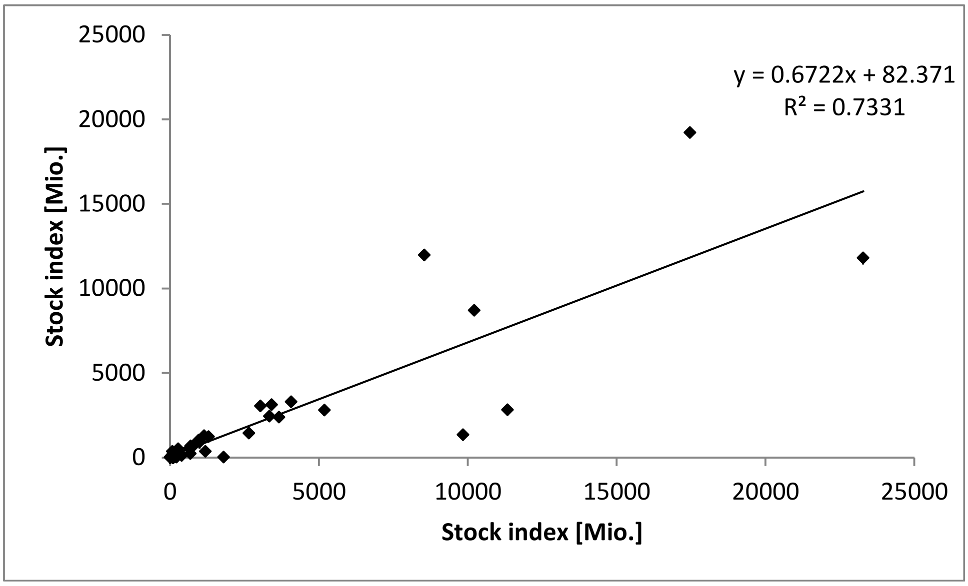

Figure 3: Relation between the stock indices of Young-of-Year sprat of the new proposed method (x-axis) and the standard method (y-axis) by ICES SD and year estimated between 2001 and 2011 (N = 42).

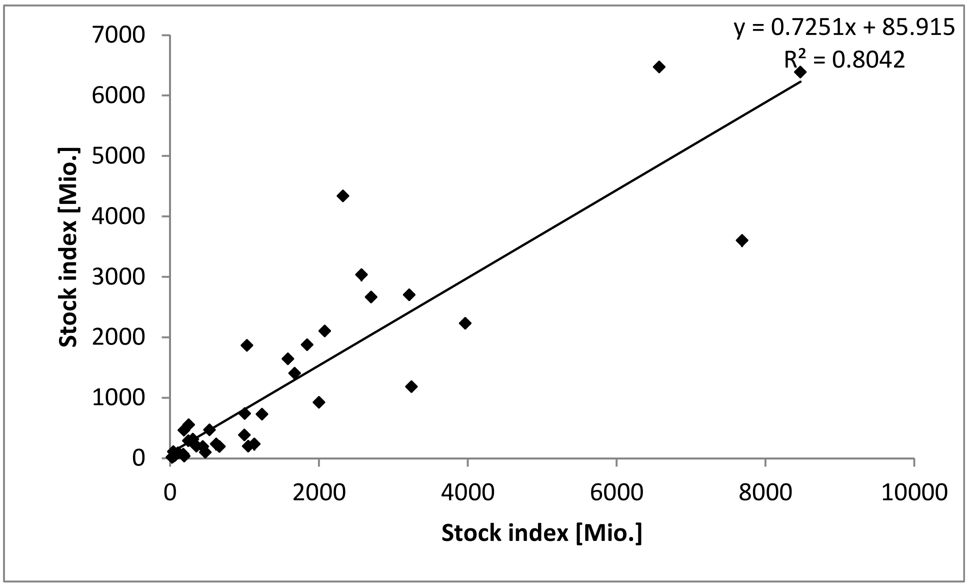

Figure 4: Relation between the stock indices of older sprat of the new proposed method (x-axis) and the standard method (y-axis) by ICES SD and year estimated between 2001 and 2011 (N = 42).

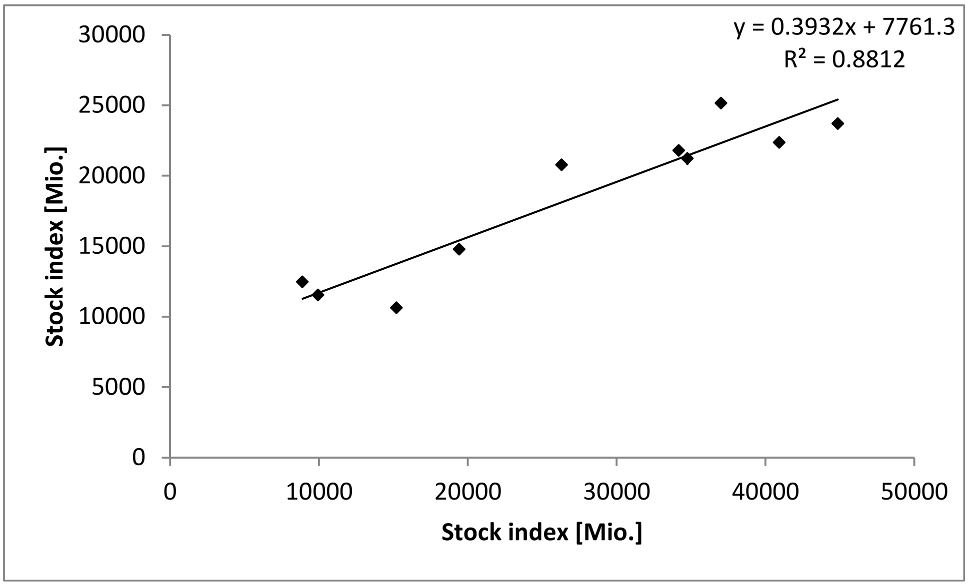

Figure 5 Relation between the stock indices of herring standard stocks (SD 22 – SD 24) by year estimated with the new proposed method (y-axis) and the standard method (y-axis) between 2001 and 2011 (N = 10).

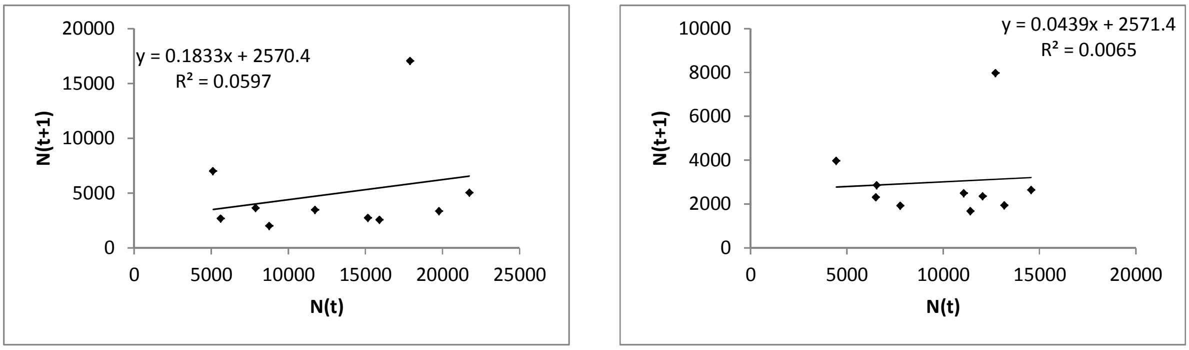

Figure 6a: Relation between the acoustic indices of age group 0 and 1 based the new model (left panel) and the standard model (right panel).

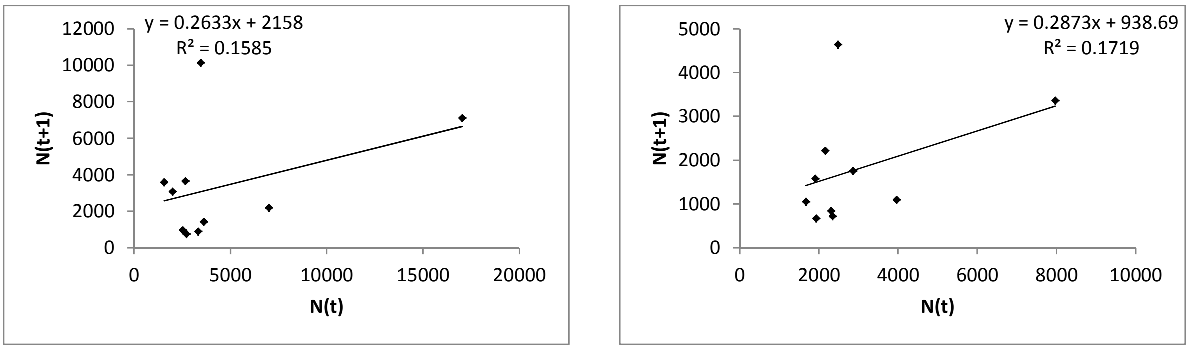

Figure 6b: Relation between the acoustic indices of age group 1 and 2 based the new model (left panel) and the standard model (right panel).

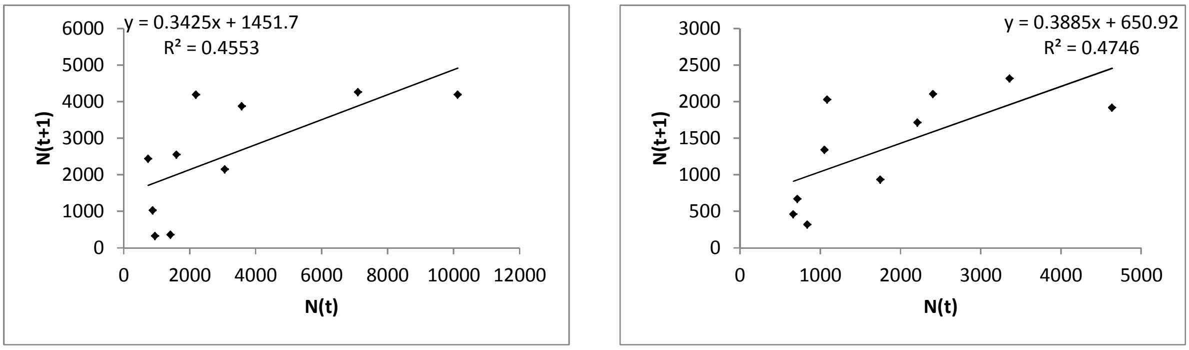

Figure 6c: Relation between the acoustic indices of age group 2 and 3 based the new model (left panel) and the standard model (right panel).

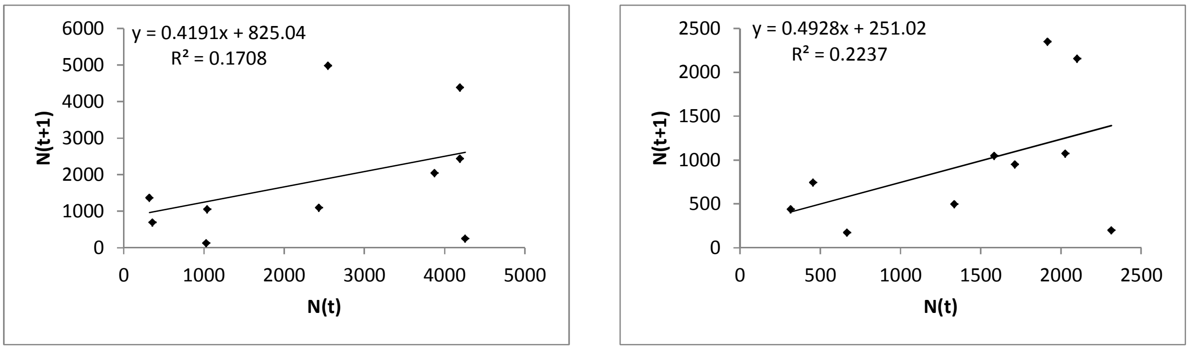

Figure 6d: Relation between the acoustic indices of age group 3 and 4 based the new model (left panel) and the standard model (right panel).

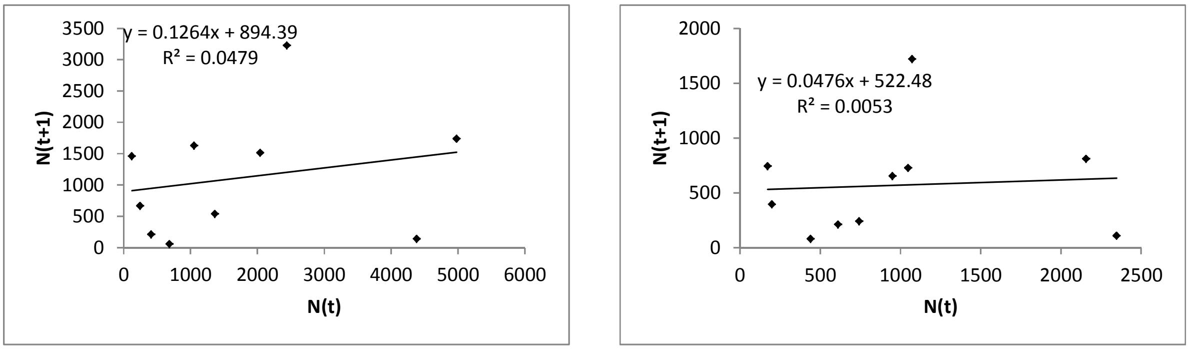

Figure 6e: Relation between the acoustic indices of age group 4 and 5 based the new model (left panel) and the standard model (right panel).

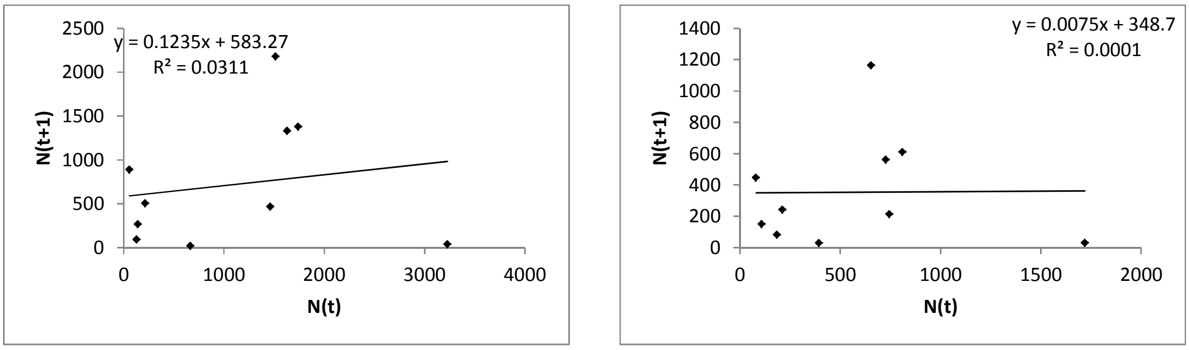

Figure 6f: Relation between the acoustic indices of age group 5 and 6 based the new model (left panel) and the standard model (right panel).

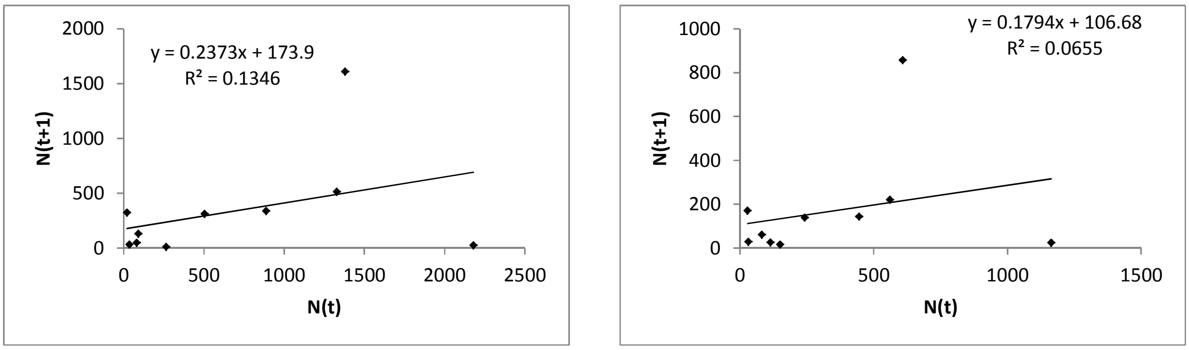

Figure 6g: Relation between the acoustic indices of age group 6 and 7 based the new model (left panel) and the standard model (right panel).

Comparison of stock indices based on BASS estimated with standard procedure and new proposed method

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Abstract

The relation between the s_A values of target species and total s_A values during the fishing stations were analysed for the data of acoustic surveys in SD 21 – 24 in October between 2001 and 2007 as well as 2011 (GERAS). The results clearly support the application of the newly proposed method to get unbiased estimates of stock indices because the requirements of the currently used standard method are not fulfilled.

Introduction

Two international acoustic surveys are carried out in the Baltic Sea every year (ICES 2012). The aim of the acoustic survey in May is to estimate stock indices of sprat which can easily be separated by length into two categories of target / target groups (Age group 1 and Age group 2+). In addition, low densities of herring, cod and other species occur in the scattered layer. Sprat and herring are the main target species of the yearly acoustic survey in October. Both species can be separated into two target groups by length (Age group 0 and Age group 1+). Besides these main target groups, cod, whiting and other species are observed by the acoustic measurements and the trawling stations. During both acoustic surveys the total densities of the scattered layer are mainly determined by the main target groups. Trawling stations are used to estimate the relative distribution of the target types and to assess their acoustic characteristics. Allocation of traces to species is only possible sometimes, in cases of large cod. It is assumed that the relative species composition within the layer of the trawling stations is similar to the total depth observed by the acoustic measurements. Coverage of 60 nautical miles and at least two trawling stations are required for each stratification unit, a rectangle of 30’ N x 1 °E. “Trawl catches within each ICES rectangle are combined to give an average species composition of the catch. Each trawl catch is given equal weight, unless it is decided that a trawl catch is not representative of the fish concentrations sampled. In this case, the particular trawl catch is not used (ICES 2012, BIAS manual). New method for combining the results of fishing stations during acoustic surveys was described by Oeberst (1985, 1986, 2005, 2011). Oeberst and Götze (2006) compared the stock indices of sprat and herring which were estimated based on the standard method and the new approach for the acoustic surveys in ICES subdivision 25 in May 2003 and 2004 and Oeberst and Böttcher (2012) applied the new method to estimate the indices of herring and sprat in SD 24 – 28 during German BASS in 2008 to 2010. This study extends the time series to the period from 2001 to 2007 and 2011 to evaluate whether the requirements of the new method concerning the relations between the s_A values of species and total s_A values during the fishing stations are fulfilled in the German data.

Material and Methods

The standard method for combining the results of fishing stations during acoustic surveys in the Baltic Sea is given in the BIAS manual of WGBIFS in 2012 (ICES, 2012). Stock indices by species and age group are estimated for rectangles and are summarized by ICES SD. s_A value sampled during the fishing stations are not taken into account.

The new approach for combining the results of fishing stations during the acoustic surveys is presented in Oeberst (2005 and 2011). The new method was applied to estimate stock indices of youngest age group of sprat, Spr(YoY) and for older sprat, Spr(+), which were separated by length as well as for herring, cod and whiting for all ICES subdivisions covered during the German acoustic surveys in May 2001 to 2011. The new approach uses the ICES SD as smallest unit. Estimates for rectangles are not produced. To compare the estimates of both methods the results by ICES SD are used.

Separation of the stock indices of herring into the components of WBSSH and CBH (Gröhsler et al. submitted) were not realized because the applied separation function can not be applied between 2001 and 2004 (Oeberst et al. 2013, WKPELA 2013). In addition, the stock indices stored in the BASS database are not split into the both components.

Results

German RV Herwig only covered parts of the SD where the vessel worked. The acoustic investigations in the other part of SD were realized by other countries. Therefore, the results present only preliminary assessments for the SD, especially where the number of conducted fishing stations was low.

Analyses of the German BASS by SD and Year clearly showed that always species exist where the s_A values of the species is not correlated with the total s_A value during the fishing station indicating that the new proposed method is more appropriate for estimation stock indices based on German BASS.

The results correspond with the findings of Oeberst & Böttcher (2012, WD WGBIFS). Herring, cod and whiting were captured during the many fishing stations, but, the s_A values of these species were low and not correlated with the total s_A value in most cases. Figure 1 presents some examples of the relation between the total s_A value and the s_A value of species.

s_A values of SP(+) were correlated with the total s_A value in most cases, but in years with abundance of SP(YoY) s_A values of this target type was also correlated with total s_A values like in SD 25 in 2003 and in SD 26 in 2003 (Fig. 1a – 1d). s_A values of cod and whiting were not correlated with total s_A values. Totally different relation was observed in SD 27 in 2007. Total s_A values during the fishing stations were less than 350 indicating low total density in this area. The s_A values by species varied within wide ranges. Similar relations were found for total s_A values of less than 300 in SD 24 in 2004. However, the data in this area clearly showed that the s_A values of herring and cod did not increase with increasing total s_A values.

The results clearly showed that requirements of the new proposed method are fulfilled and that the application of the standard method results in biased stock indices.

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Figures

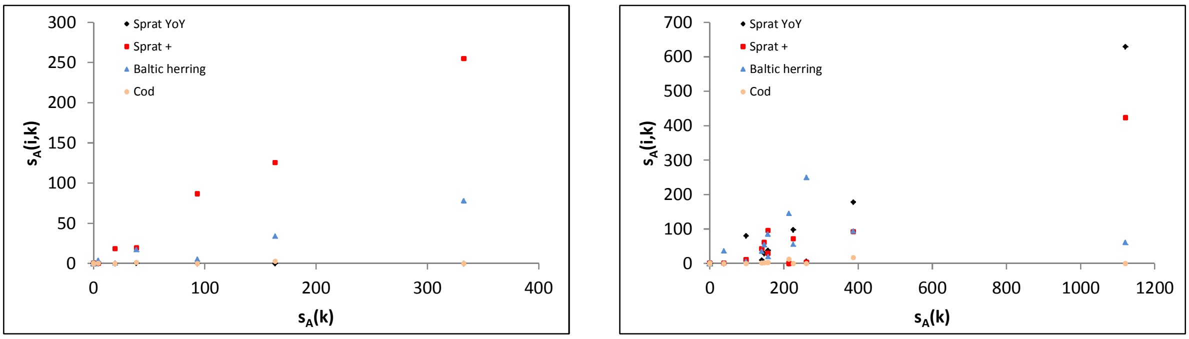

Figure 1a: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 24 in 2001 (left panel) and in 2004 (right panel).

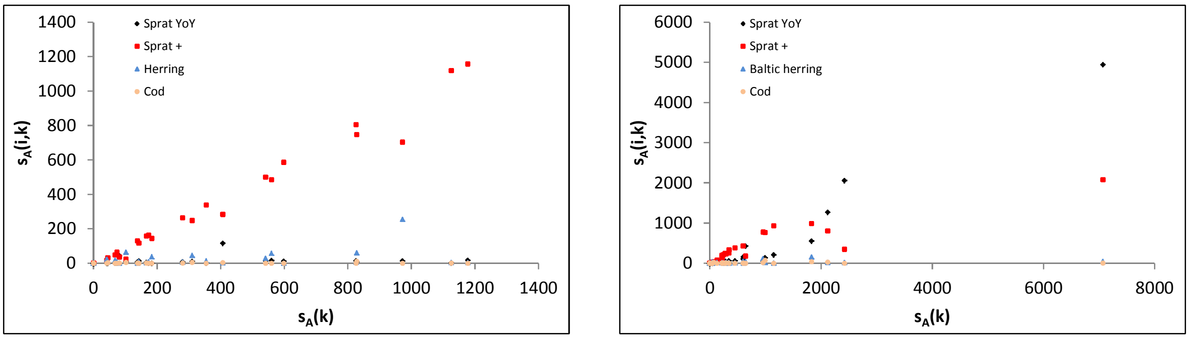

Figure 1b: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 25 in 2003 (left panel) and in 2005 (right panel).

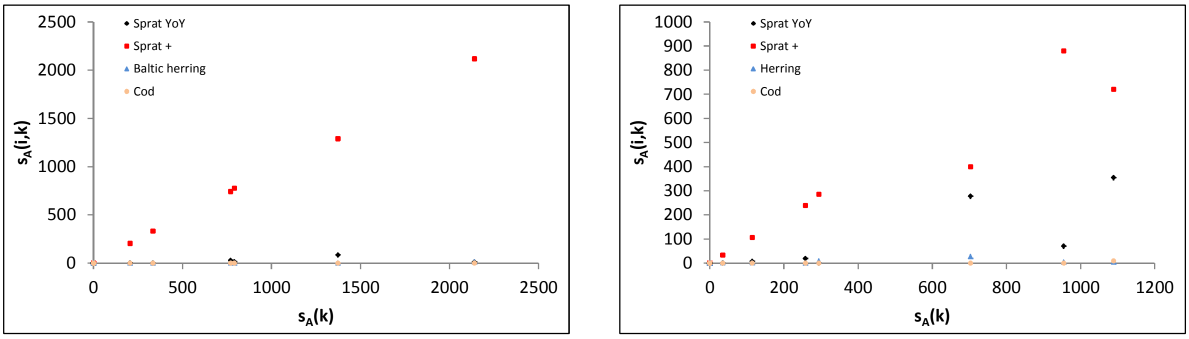

Figure 1c: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 26 in 2002 (left panel) and in 2003 (right panel).

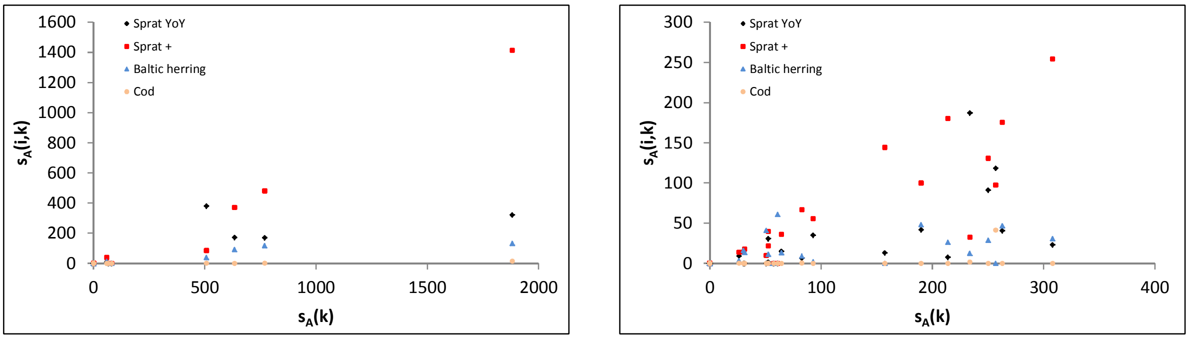

Figure 1d: xy plot of the s_A values by species, $s_A(i,k)$, and total s_A values, s_A (k), during fishing stations, k, in SD 27 in 2004 (left panel) and in 2007 (right panel).

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Applicability of the Separation Function (SF) in 2011 and 2012

by

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Abstract

Length-at-age data of herring sampled during the German Autumn Acoustic Survey (GERAS) in SD 21 and 23, German 'Baltic Acoustic Spring Survey (BASS)' in SD 28 and Swedish 'Baltic International Autumn Acoustic Survey (BIAS)' in SD 27 and 28 were used to estimate the parameters of the Bertalanffy growth function (BGF) for Western Baltic Spring Spawning herring (WBSSH) and Central Baltic herring (CBH) in 2011 and 2012. The BGF parameters of 2011 and 2012 were almost similar compared to the ones estimated for the period 2005 – 2010. As expected, almost all herring captured in SD 21 and 23 (GERAS) were assigned to WBSSH ($TL>=SF_{2005-2010}$), whereas in most cases herring captured during German BASS in SD 28 and during Swedish BIAS in SD 27 and 28 were assigned to CBH ($TL<SF_{2005-2010}$). The results clearly support the applicability of the $SF_{2005-2010}$ for the years 2011 and 2012.

Introduction

Atlantic herring (*Clupea harengus* L.) constitute an important fraction of catches in the European commercial fisheries. The management of herring stocks includes the definition of either management- or distribution area, respectively. Due to the migratory behavior of older herring characterized by extended migrations between feeding and spawning areas, the static stock boundaries used for management can hereby lead to problems in the assessment.

In the Baltic Sea, several herring stocks are surveyed and managed separately. The distribution area of the most westerly located Western Baltic Spring Spawning herring (WBSSH) stock covers the Skagerrak/Kattegat (ICES Division IIIa) and ICES Subdivisions (SDs) 22-24. The main spawning area of WBSSH is considered to be the Greifswalder Bodden at Rügen Island (ICES CM 1998/H:1). Herring caught in Division IIIa also comprises a stock component of the North Sea Autumn Spawning herring (NSASH) distributed in adjacent North Sea areas. The separation of NSASH and WBSSH in Division IIIa within the assessment process is presently based on vertebrae counts and otolith microstructure analysis (ICES CM 2012/ACOM:06).

The areas of the southern and central Baltic Sea (SDs 25-29, 32 excluding the Gulf of Riga) are inhabited by the Central Baltic herring (CBH) stock. Stock separation for assessment purposes so far has been based on ICES Subdivisions with herring originating from SDs 22-24 being by definition allocated to WBSSH and specimens from SDs 25-32 to CBH

Gröhsler et al. (2012) developed a separation function (SF) to assign individuals to one of the both Baltic herring stocks. The SF is based on the different growth function of both herring stocks and involves the parameters length, month of capture and age of individuals. The method was used to quantify the mixing of both herring stocks during the acoustic surveys BASS and BIAS in parts of the Baltic Sea and during the commercial fishery in SD 22, 24 and 25.

The aim of this study was to estimate the parameters of BGF of WBSSH and CBH based on baseline samples from GERAS in SD 21 & 23 (WBSSH) and German BASS in SD 28 & Swedish BIAS in SD

27 and 28 (CBH). The results in 2011 and 2012 were compared with the ones estimated for 2005 – 2010 in order to check the applicability of the $SF_{2005\text{-}2010}$.

Material and Methods

Length-at-age data of herring captured during the German BASS in SD 28 in 2011 and 2012 as well as data of Swedish BIAS in SD 27 and 28 were used to estimate annual parameters of BGF for CBH. The BGF parameters for WBSSH were estimated based on length-at-age data of GERAS in SD 21 and SD 23.

Individual herring were allocated to a defined 0.5 cm length class by adding half of the length class to the measured total length TL (e.g. TL 20.5 cm = length class 20.75 cm). Age (winter rings, AWR) was converted to age in months, AM (with a “theoretical birthday” of January 1st), by the following equation

$$A_M = A_{WR} \times 12 + T \qquad (1)$$

with T representing survey / sampling month (the German acoustic surveys were conducted in May (T = 5, BASS) and October (T = 10, GERAS)).

Individual age and length data from the baseline samples were used to derive growth parameters for both WBSS and CB herring using the von Bertalanffy growth equation

$$L_{S,A_M} = L_{\infty,S} \times \left(1 - e^{\left(-k_S \times \left(\frac{A_M}{12} - t_{0,S}\right)\right)}\right) \qquad (2)$$

with L_{S,A_M} = length of an individual of the corresponding stock S at age A_M, $L_{\infty,S}$ = mean maximum length, k_S = growth parameter and $t_{0,S}$ = theoretical age at length zero of the corresponding stock.

Statistical analyses were conducted with the statistical software program Statgraphics (Statgraphics Centurion, Version XV, StatPoint, Inc.).

Results

Germany only covered parts of SD 28 during the BASS in 2011 and 2012. Therefore, the numbers of herring length-at-age data for estimating the parameters of BGF of CBH were low with N = 278 and N = 155 in 2011 and 2012, respectively. Length-at-age data of 892 and 908 herring were available from Swedish BIAS in 2011 and 2012, respectively. In total 838 and 878 herring were available from German GERAS in SD 21 and 23 to estimate the parameters of BGF of WBSSH in 2011 and 2012, respectively.

The parameters L_∞ and k of the BGF of WBSSH were close to the estimates of 2005 and 2006 (Table 1) and the mean length-at-age of these years was close to the estimates of the BGF 2005 – 2010 (Fig. 1 & 2). The GERAS length-at-age data in SD 21 and SD 23 in 2011 and 2012 were always larger than the estimate of SF (2005 – 2010) with only one exception. The parameters of BGF of CBH in 2011 and 2012 were close to the estimates of 2008 and 2010 and close to the mean BGF based on 2005 - 2010 (Table 2, Fig. 3 & 4).

The parameters of L_∞ and k for WBSSH and CBH of the years 2011 and 2012 were in correspondence to the parameters estimated for 2005-2010 (Fig. 5). The data also clearly showed the differences between the relation of L_∞ and k of WBSSH and CBH.

Conclusion

The estimates of BGF based on baseline samples of WBSSH and CBH in 2011 and 2012 clearly support the applicability of SF based on 2005 to 2010.

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Tables

Table 1: Parameters of the von Bertalanffy growth function (BGF) of Western Baltic Spring Spawning Herring (WBSSH, *Clupea harengus*) by year and total period. L_∞ - mean maximum length (cm), k – growth parameter, t_0 – theoretical age at length zero, N – number of sampled herring, r^2 – coefficient of determination, SE – standard error.

Year	L∞	k	t0	N	r²	SE
2005	31.16	0.36	-0.733	1 299	0.86	2.02
2006	31.81	0.365	-0.547	1 401	0.92	1.9
2007	29.92	0.525	-0.201	1 151	0.89	1.99
2008	29.84	0.539	-0.194	1 048	0.88	2.27
2009	29.34	0.552	-0.133	956	0.87	2.11
2010	30.82	0.482	-0.157	1 025	0.92	2.12
Total	30.57	0.453	-0.337	6 680	0.89	2.12
2011	32.01	0.375	-1.067	838	0.88	1.89
2012	31.33	0.402	-0.859	879	0.90	2.01

Table 2. Parameters of the von Bertalanffy growth function of Central Baltic Herring (CBH, *Clupea harengus*) by year and total period. L_∞ - mean maximum length (cm), k – growth parameter, t_0 – theoretical age at length zero, N – number of sampled herring, r^2 – coefficient of determination, SE – standard error.

Year	L∞	k	t0	N	r²	SE
2005	25.16	0.153	-2.821	1 053	0.66	1.63
2006	23.21	0.186	-2.435	1 317	0.66	1.86
2007	19.64	0.377	-1.097	1 790	0.78	1.75
2008	20.22	0.418	-0.826	1 683	0.8	1.68
2009	21.37	0.331	-0.977	1 580	0.75	1.63

2010	22.28	0.244	-1.701	1 136	0.69	1.69
Total	21.56	0.269	-1.585	8 559	0.74	1.75
2011	21.37	0.265	-1.304	1047	0.89	1.38
2012	20.65	0.364	-0.918	1146	0.86	1.58

Figures

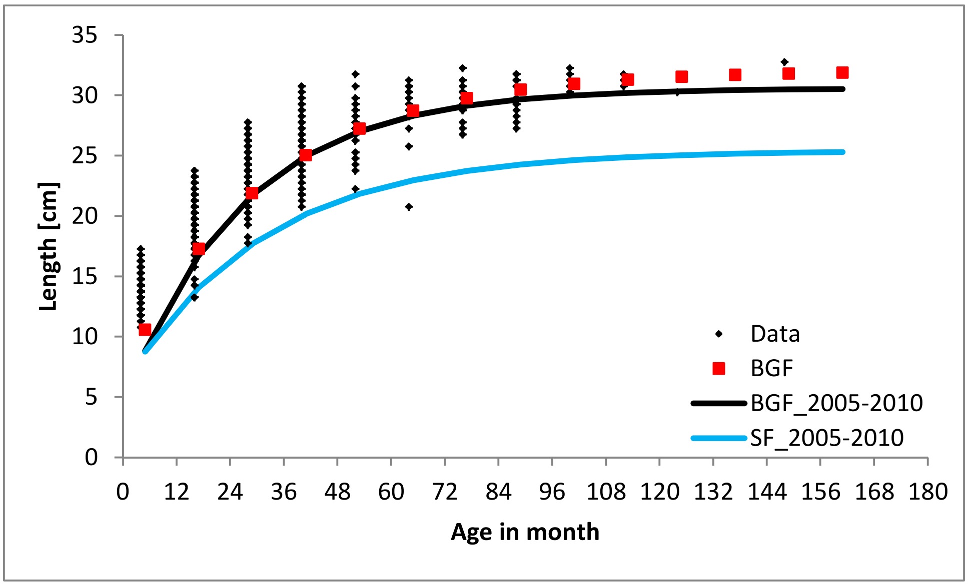

Figure 1: Length-at-age (in months) data of herring captured during GERAS in SD 21 & 23 in 2011 (black dots), BGF based on 2011 data (black line), mean length-at-age based on the BGF of WBSSH 2005 – 2010 (red dots) and estimates of $SF_{2005-2010}$ (blue line).

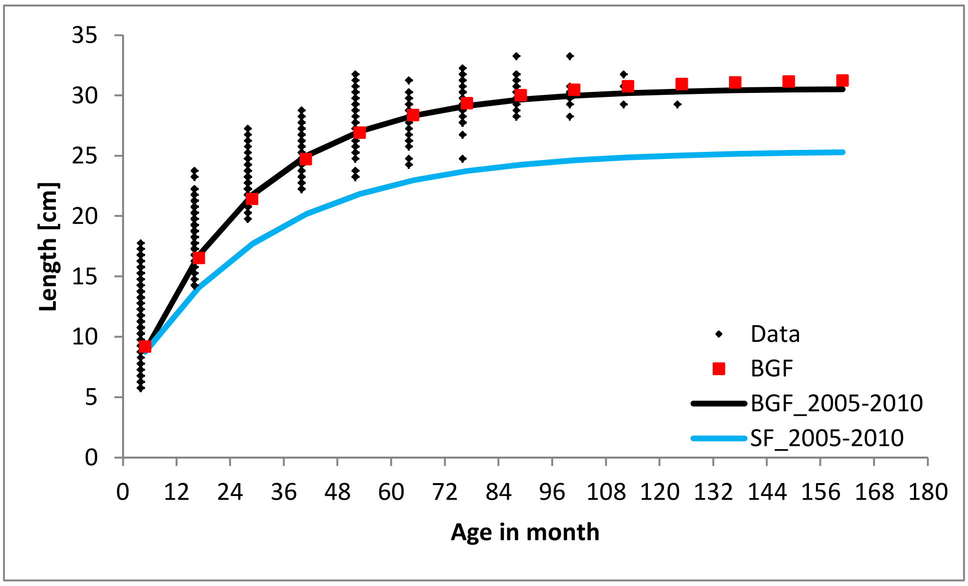

Figure 2: Length-at-age (in months) data of herring captured during GERAS in SD 21 & 23 in 2012 (black dots), BGF based on 2012 data (black line), mean length-at-age based on the BGF of WBSSH 2005 – 2010 (red dots) and estimates of $SF_{2005-2010}$ (blue line).

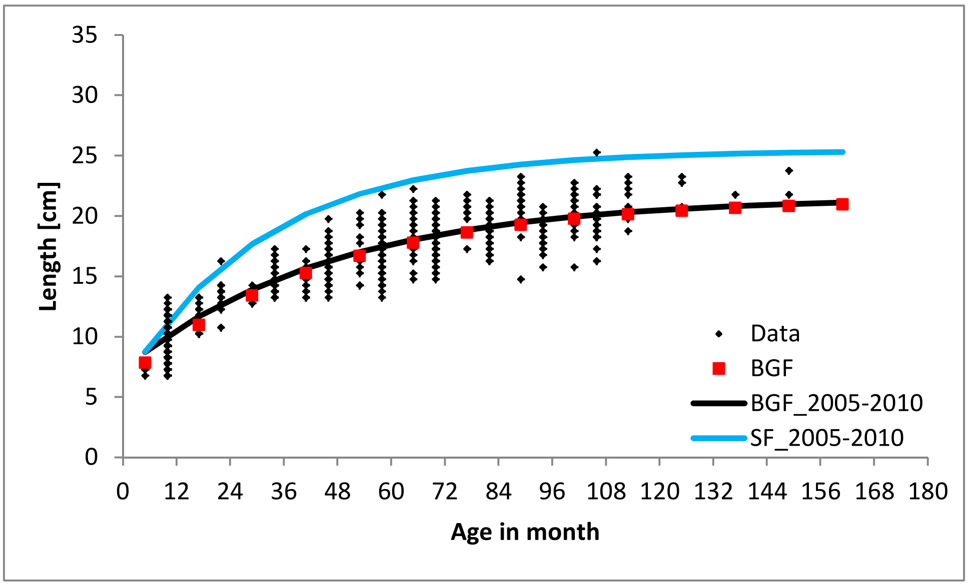

Figure 3: Length-at-age(in months) data of herring captured during German BASS in SD 28 in 2011 (black dots), BGF based on 2011 data (black line), mean length-at-age based on the BGF of WBSSH 2005 – 2010 (red dots) and estimates of $\text{SF}_{2005-2010}$ (blue line).

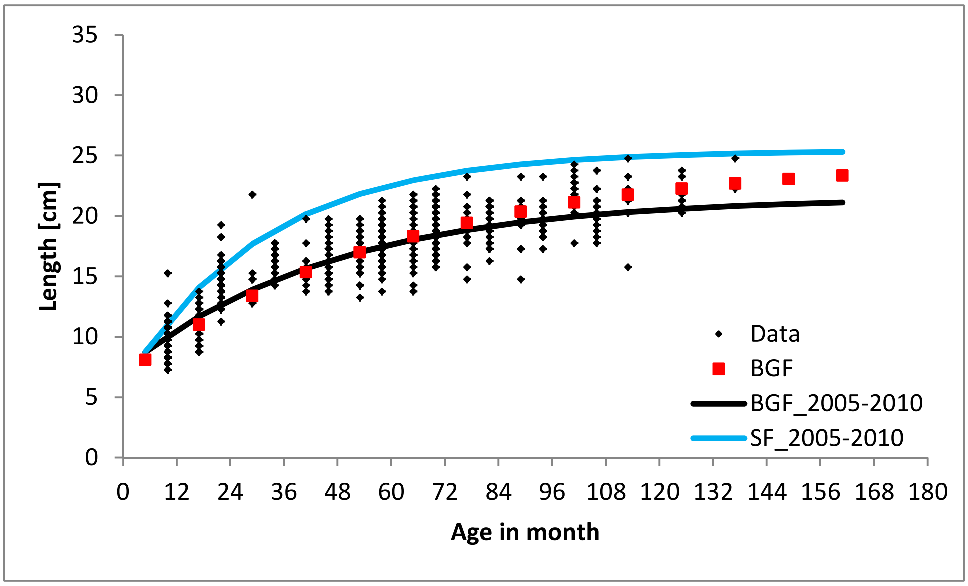

Figure 4: Length-at-age (in months) data of herring captured during German BASS in SD 28 in 2012 (black dots), BGF based on 2012 data (black line), mean length-at-age-based on the BGF of WBSSH 2005 – 2010 (red dots) and estimates of $\text{SF}_{2005-2010}$ (blue line).

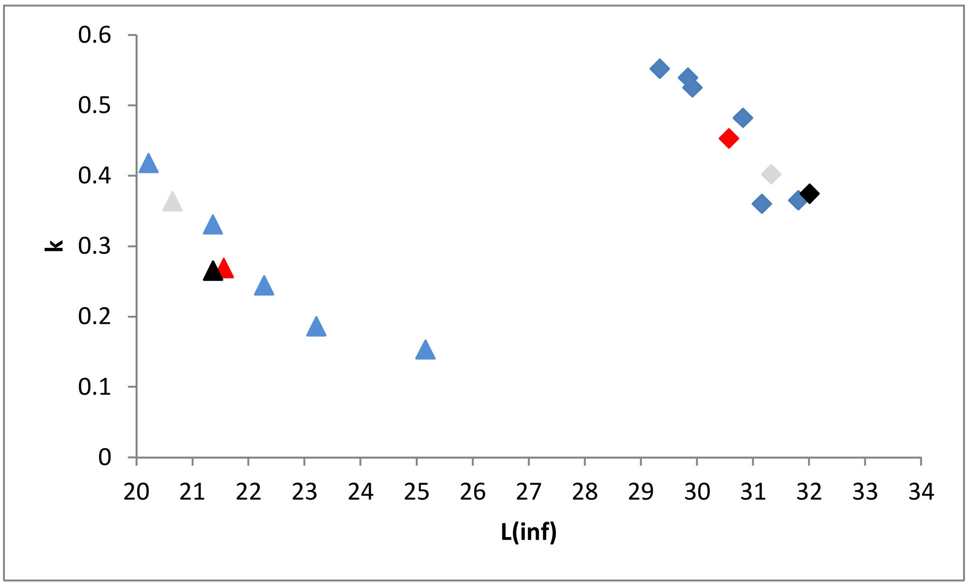

Figure 5 Relation between the parameters of the BGF L(inf) and k for WBBSH (◆) and CBH (▲). The mean estimates based on 2005 – 2010 are marked red, whereas the estimates for 2011 an2012 are marked black and grey, respectively.

Working document

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Spatial-temporal variability of the Baltic herring and sprat as influencing factor on BIAS uncertainty.

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The authors used the Variational Bayesian PCA (VBPCA) for describing the spatial patterns and temporal changes in these patterns for the Baltic herring and sprat (Kasatkina and Gasyukov, 2012). This method belongs to the group of probabilistic PCA methods. The VBPCA has several advantages as compared to the classical PCA: 1) incorporation of the noise component into the model, 2) the algorithm has the normalization property, 3) the algorithm reduces overfitting; 4) provides statistical characteristics of estimates and confidential intervals. This method can be used when there are missed observations in the data set. Assumption that the observations have the normal distribution is valid in this case but to reduce it some transformation (normalisation, log transformation and other) can be applied. (Ilin and Raiko, 2008; Smidl and Quinn, 2006.).

As the example the above said analysis was made for herring and sprat recruitment indices obtained from the results of the Baltic International Acoustic Surveys. Recruitment indices estimated by ICES rectangles for range of years for tuning XSA (1991-2011) were used.

It was revealed a significant spatial and temporal variability of absolute values and uncertainty in recruitment indices derived from the Baltic acoustic surveys. Significant uncertainty was obtained in the ICES rectangles (survey strata) with high absolute values of these indices. In additional, herring and sprat have different spatial-temporal patterns of recruitment indices and its uncertainty (Fig.1 and 2).

The possible approach to reducing survey-related error is improvements in sampling design, firstly, in the rectangles with significant long-term variability of abundance indices.

The key parameters of BIAS sampling design (each statistical rectangle shall be investigated by about 60 miles and at least two control hauls) that have been used since 2000 were chosen without spatial-temporal variability indices in fish distribution on the whole both at the survey area and the certain statistical rectangle used for the stratification of this area . The compliance of the survey sampling design to the spatial fish distribution remains uninvestigated until now.

The table 1 given below show the acoustic survey data in overlapping rectangles using several overlapping rectangles in Subdivision 26 as an example. These rectangles were investigated by two vessels (RV «Baltica» - RV «Atlantida», RV « Darius» - RV «Atlantida»). The given data revealed significant differences in the NASC indices values, species-length fish composition, and, as a result, in the herring and sprat abundance values obtained in each rectangle investigated by two vessels. The differences observed indicate that BIAS sampling design doesn't correspond to the spatial fish distribution, at least, in the examined rectangles. These rectangles were investigated by two vessels (RV «Baltica» - RV «Atlantida», RV « Darius» - RV «Atlantida»).

It draws our attention that the species-length fish composition values in overlapping rectangles appear to be disparate neither at 2, 3 nor 4 trawlings made in rectangle by each vessel. This fact, in a considerable degree, can be due to use of the trawl constructions that have different trawl opening area while surveying, which makes trawl sampling sensitive to the spatial heterogeneity of the fish distribution. The Russian trawl's mouth vertical opening is twice as much as the other vessels' ones that are participate in surveys. (15 m for RV «Baltica», 12m for RV « Darius»» and 32 m for RV «Atlantida») (Reports of WGBIFS 2006, 2010, 2011).

Therefore, the improvement of the survey sampling design in accordance with the herring and sprat spatial-temporal dynamics is the urgent problem for improving the abundance and biomass estimates obtained from BIAS international surveys. The overlapping rectangles system can be used for testing sampling design parameters. The number and spatial arrangement of overlapping rectangles requires discussion.

Reference

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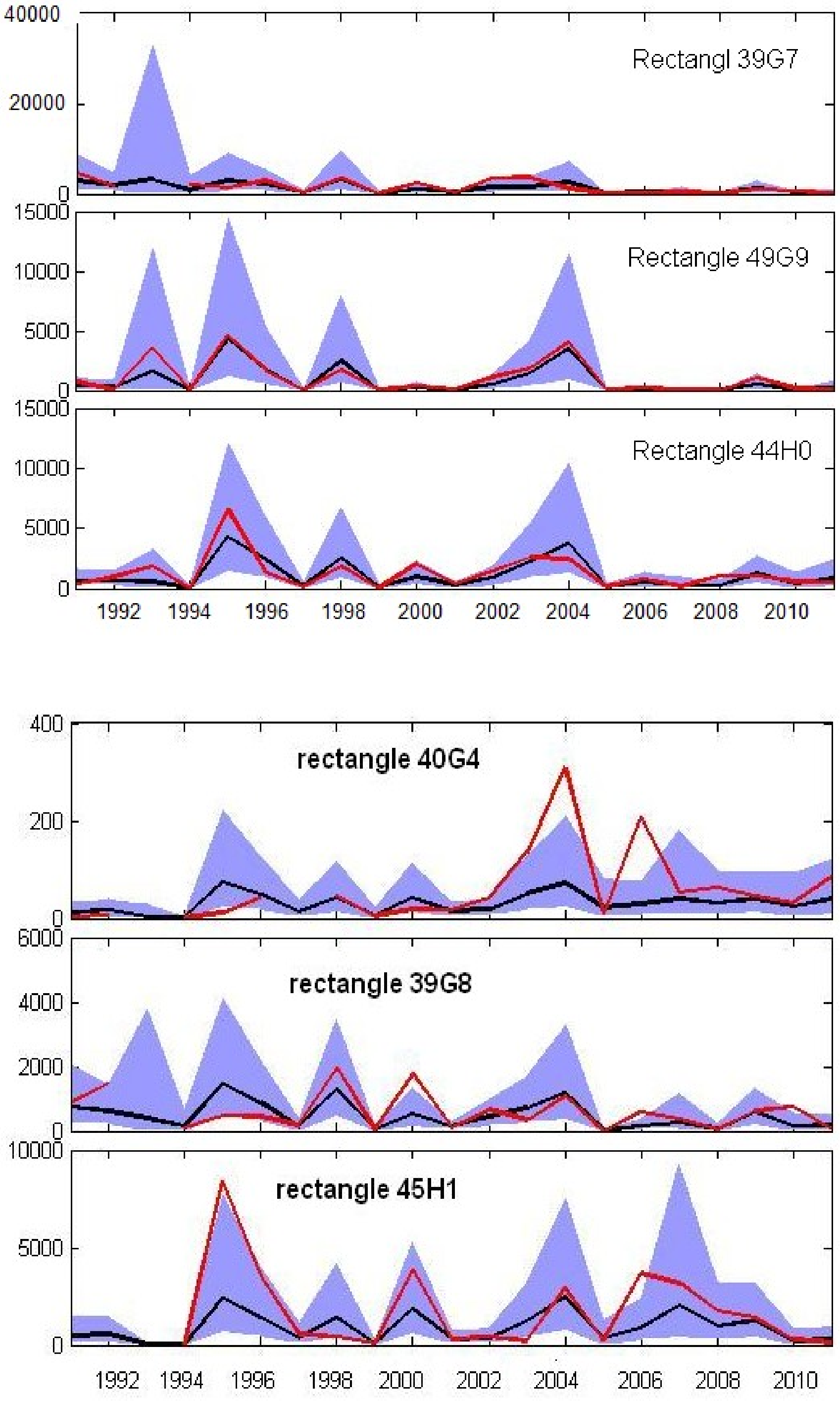

Fig.1. Spatial-temporal variability of sprat recruitment indices and its uncertainty in several ICES rectangle as the example.
The 95% confidence intervals are shown by blue color:
Observed indices are shown by the red lines;
Reconstructed and filtered indices are shown by the black lines.

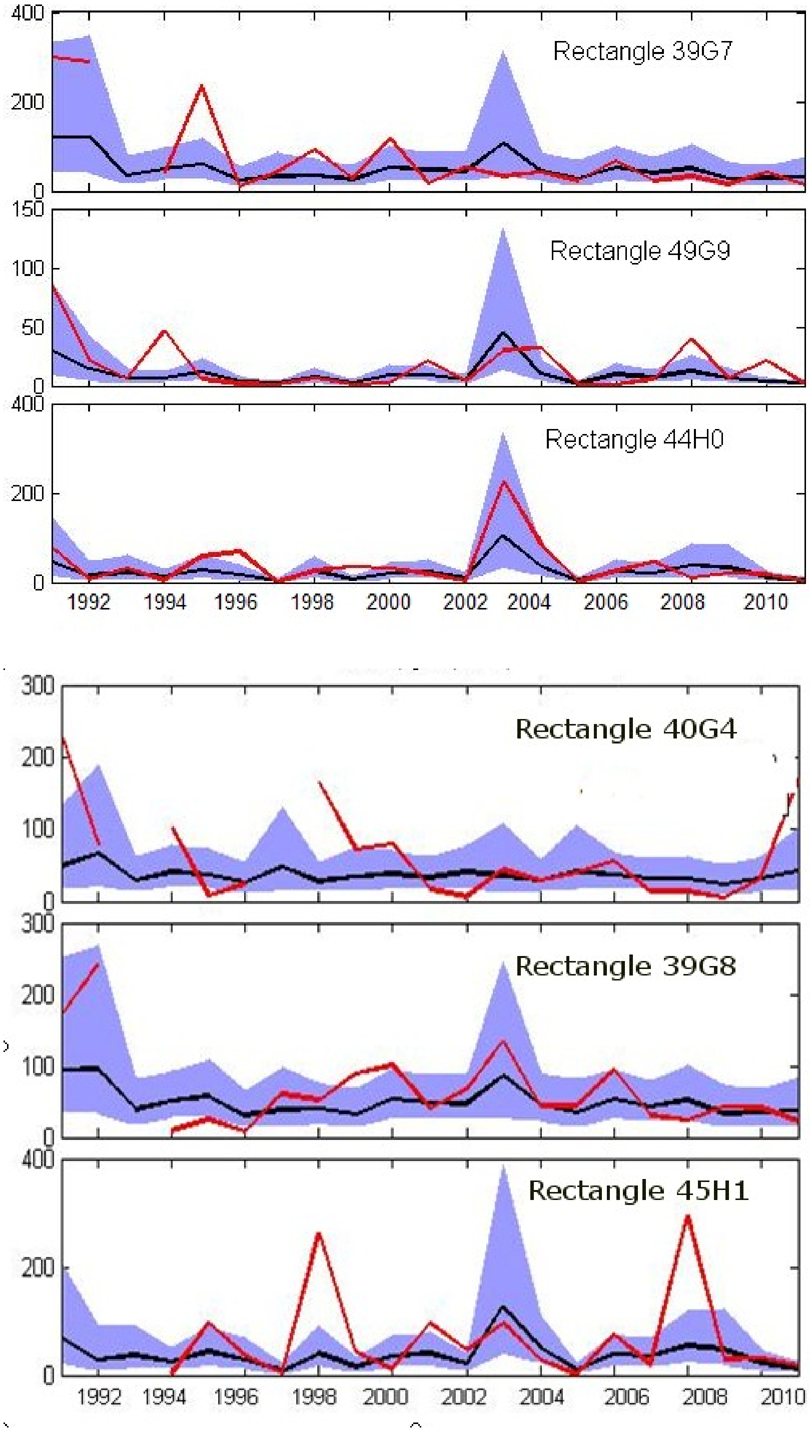

Fig.2. Spatial-temporal variability of herring recruitment indices and its uncertainty for several ICES rectangle as the example.
The 95% confidence intervals are shown by blue color:
Observed indices shown by the red lines;
Reconstructed and filtered indices are shown by the black lines.

Table 2. Comparison of results acoustic surveys in the overlaping area investigated by two vessels.

Year	overlapping rectangles	Vessels	NASC	Number of trawl station	Fish comppositions, %		Fish abundance, mln sp		Vessel	NASC	Number of trawl stations	Fish comppositions, %		Fish abundance, mln sp	
					herring	sprat	herring	sprat				herring	sprat	herring	sprat
2005															
	40G8	RV"Baltica"	158	3	84	16	463	85	RV"Atlantida"	90	3	66	34	213	113
	39G8	RV"Baltica"	284	3	91	9	756	75	RV"Atlantida"	130	3	67	33	303	163
	40G9	RV"Darius"	114	2	60	40	264	178	RV"Atlantida"	154	3	92	8	430	39
	39G9	V"Baltica"	227	1	87	13	580	81	RV"Atlantida"	238	3	28	72	336	839
	38G9	V"Baltica"	583	1	57	43	1100	812	RV"Atlantida"	353	3	44	56	637	791
2006	40G8	RV"Baltica"	1266	4	25	75	1869	5743	RV"Atlantida"	209	3	27	73	353	974
	39G8	RV"Baltica"	614	2	40	60	1415	2175	RV"Atlantida"	350	3	23	77	573	1791
	38G8	RV"Baltica"							RV"Atlantida"						
	39G9	V"Baltica"	510	1	23	77	731	2508	RV"Atlantida"	438	3	31	69	808	1819
	38G9	V"Baltica"	820	2	24	76	1052	7337	RV"Atlantida"	1089	4	12	88	958	6803
2008	40G8	RV"Baltica"	76.3	3	89.7	10.3	208.3	24	RV"Atlantida"	348.9	3	6.05	93.95	210.2	3261
	39G8	RV"Baltica"	88.45	3	39.2	60.8	146.6	227.8	RV"Atlantida"	346.8	3	23.55	76.45	596.3	1936
	38G8	RV"Baltica"							RV"Atlantida"						
	39G9	RV"Baltica"	49.8	2	31.6	68.4	89.1	193.3	RV"Atlantida"	481.1	4	24.35	75.62	739.9	2298
	38G9	RV"Baltica"	674.5	3	23.8	76.2	860	2761	RV"Atlantida"	755	4	2.1	97.88	129.1	5965
2010	40G9	RV"Darius"	136	3	31.2	68.8	232	512	RV"Atlantida"	312	3	48.4	51.6	723	771
2011	40G9	RV "Darius"	430	4	48	52	912	990	RV"Atlantida"	457	3	5	95	177	3379
	39G9	RV"Baltica"	180	1	70	30	352	144	RV"Atlantida"	422	3	5	95	166	2936
	38G8	RV"Baltica"	451	2	69	31	1018	459	RV"Atlantida"	258	2	11	89	230	1910

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Cod spatial distribution in the near-bottom layers fished by standard gears during the BITS: analysis of data from acoustic observations.

by
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Introduction

The TV-3 bottom trawl with two types is used as standard fishing gears during the BITS since 2001. The small standard trawl type TV-3#520 (TVS) and the larger standard trawl type TV-3#930 (TVL) are used for vessels with different towing power (BITS Manual):

- for TVS: horizontal opening of mouth is 13.5-14.5m, verticall opening of mouth is 2.2-2.5m;
- for TVL: horinzontal opening of mouth is 26-27m, vertical opening of mouth is 5.5-6.5m;

All BITS observations from the small standard trawl type TV-3#520 (TVS) have been recalculated into those as if they were obtained by larger standard fishing gear TV-3#930 (TVL). The conversion factors were used for these recalculations. The conversion factors (CF) among two types of standard fishing gear have been estimated from data of inter-calibration experiments 2000, 2003. These conversion factors have been used during 2001 -2012.

New CFs was obtained from re-analysis data of inter-calibration experiments 2000, 2003. (Oeberst, 2012). These new CFs calculations takes into account only the difference in the horizontal mouth opening of two trawls in the assumption that cod is distributed in the near bottom layer equal to TVS trawl's vertical opening (i.e. in the near bottom layer of 2-2.5 m). However, there are no investigation data confirming such a way of cod distribution.

There is still no scientifically based answer to the question: ***whether new CFs should be the best possible solution for this use in the cod stock assessment.***

The significant differences in the trawl opening parameters of TVS and TVL give us possibility to assume that heterogeneity in both the vertical and horizontal cod distribution in the near bottom layer should influence observations from two types of trawls. Therefore, it is important to analyze the spatial-temporal cod distribution in the near bottom layer as a major factor influencing the BITS results, and, in particular, CF estimates. This analysis will provide information in relation to above said question.

The available source of information on cod distribution in the near bottom layer is the acoustic data following the bottom trawl surveys. In this document the authors shown some results revealed from analysis of such acoustic data from the Russian trawl surveys in 2010 and 2013.

Material and Methods

Acoustic data collected during the Russian bottom trawl survey 2010, 2013 (RV «Atlantida») were analyzed. These surveys were carries out as the Russian part of the international coordinated trawl surveys in the first quarter (BITS).

Acoustic data (NASC values) were collected using a Simrad EK60 echosounder, 38 kHz hull-mounted transducers, and SonarData's EchoLog_Ek data logging software. Ping intervals were 2 sec and pulse duration were 1 msec for all frequencies. The echosounder EK60 was calibrated using copper spheres as standard acoustic targets. The post-processing of acoustic data was fulfilled using SonarData Echoview ver. 3.50.59.4151.

Acoustic data were collected during trawl tracks and the cruise track between trawl stations. NASC values were obtained in the near-bottom layers of 0.1 -2.5 m and 0.1-6m.

Results

Bottom trawl survey 2010

Number of trawl stations is 36. Number of NASC records obtained on cruise track between trawl stations is 839.

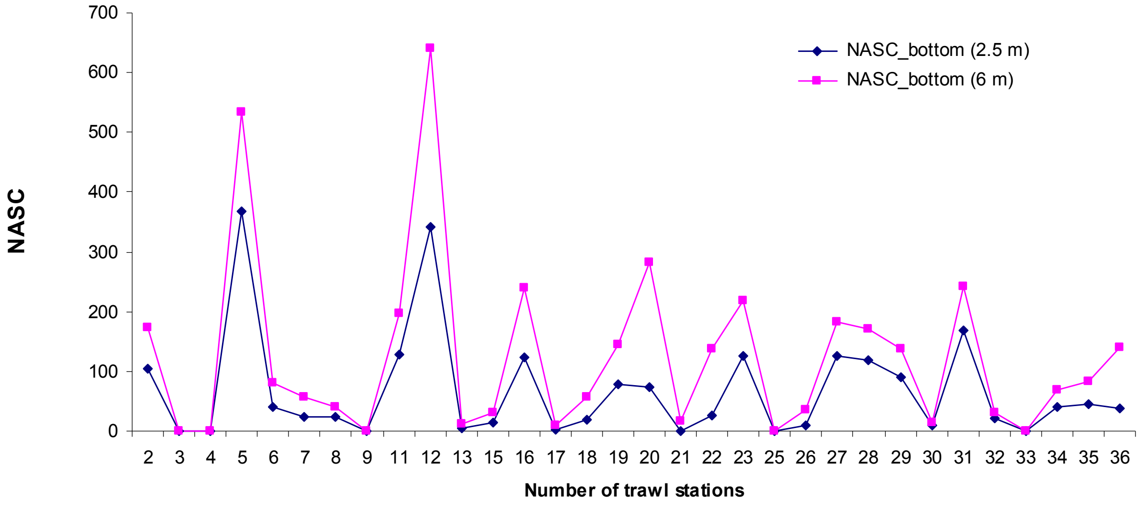

Fig.1. NASC values obtained in the near bottom layer of 2.5m and 6m on the trawl stations during survey 2010

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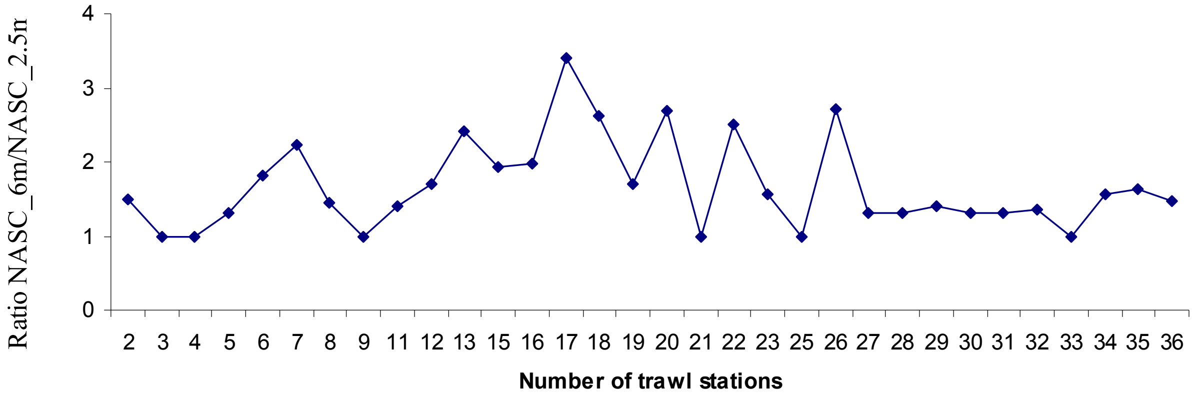

Fig.2. The Ratios (NASC_6m /NASC_2.5m) on the trawl stations (survey 2010).

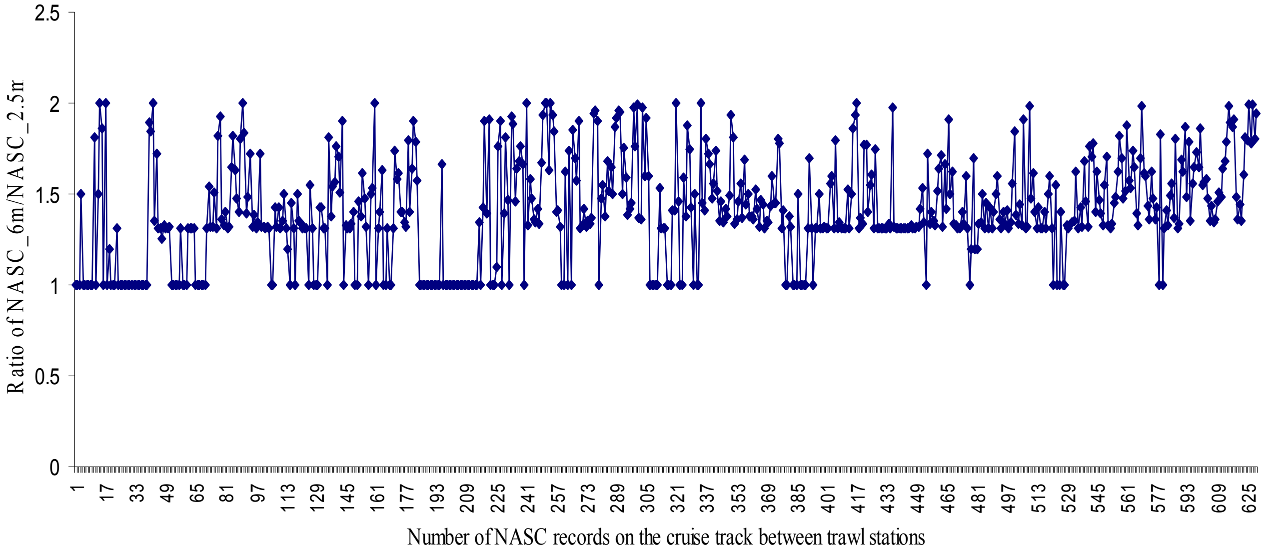

Fig. 3. The Ratios of NASC _6m / NASC_2.5m, obtained on the cruise track between trawl stations for (2 ≥ Ratio ≥ 1) , survey 2010 (reference to the Table 3) .

Table 1. Distribution of the Ratio of NASC_6m / NASC_2.5m obtained on the trawl stations 2010 and 2013.

Ratio of NASC_6m / NASC _2.5m	Part of trawl stations with different ratio values (%)	
	Trawl survey 2010	Trawl survey 2013
1	15	23
between 1 and 2	60	68
above 2	15	9

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Table 2. Estimates of the Ratio of NASC_6m / NASC_2.5m based on sets of the trawl stations during survey 2010, 2013 .

Ratio of NASC_6m / NASC _2.5m	Trawl survey 2010	Trawl survey 2013
mean CV (%)	1,59 39	1,47 26

Table 3. Distribution of the Ratio of NASC_6m / NASC_2.5m obtained along cruise track between trawl stations (survey 2010)

Ratio of NASC_6m / NASC _2.5m	% of NASC records between trawl stations
1	18
between 1 and 2	70
above 2	12

Bottom Trawl survey 2013

Number of trawl stations is 36. Number of NASC records obtained on cruise track between trawl stations is 1024

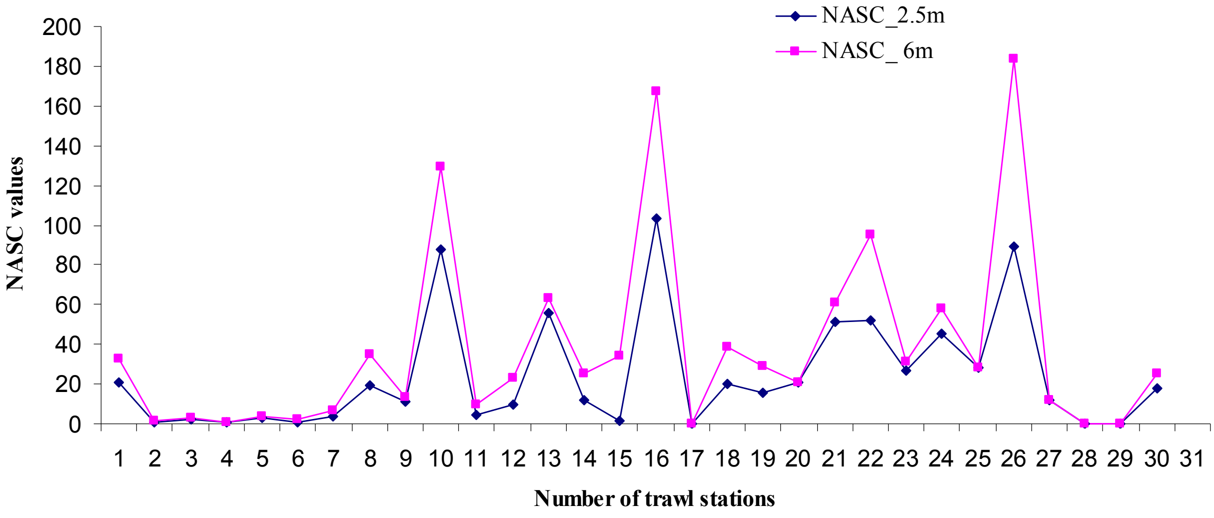

Fig.4. NASC values obtained in the near bottom layers of 2.5m and 6m on the trawl stations, survey 2013

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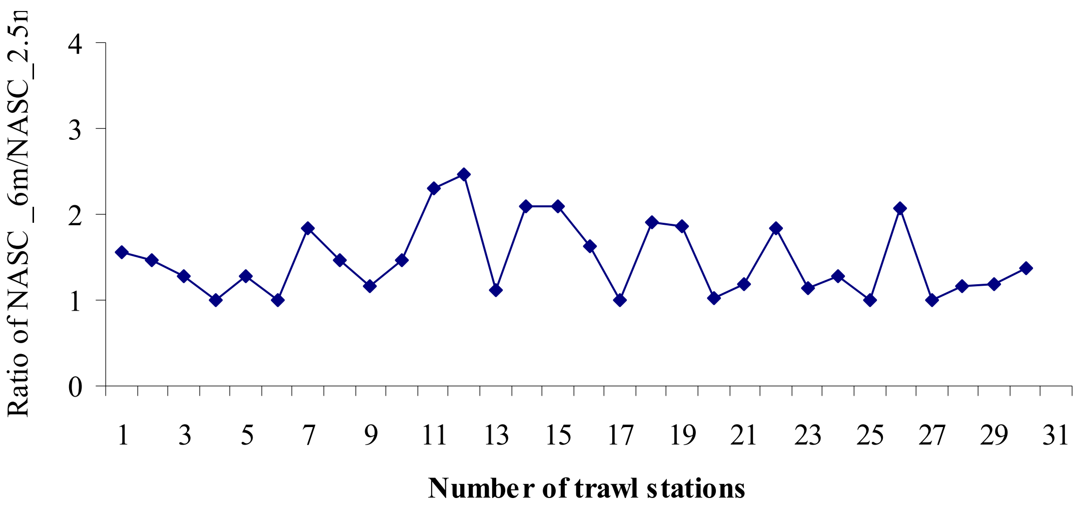

Fig.5. The Ratio (NASC_6m /NASC_2.5m) along cruise track between trawl stations (survey 2013).

Discussion and conclusion

Acoustic observations show that fish can extend upwards above the seabed higher than the headline height of TVS. Besides, heterogeneity of fish density vertical distribution was revealed in the near-bottom layer. So, results significant differences between acoustic indices of fish density obtained in the near bottom layer corresponded to the opening of TVL and TVS were obtained (fig.1-5). These data demonstrate that the bottom survey results depend on the trawl effective zone parameters. Moreover, comparison of acoustic observations accompanied bottom trawl surveys 2010 and 2013 revealed significant inter-annual variability of the statistical characteristics of the Ratio of NASC_6m/ NASC_2.5 (Table 2,3).

The acoustic observations revealed heterogeneity of fish horizontal distribution in the near-bottom layer along cruise track between the bottom trawl stations. The coefficient of variation of the acoustic density between the trawl stations may exceed 100%. The latter evidence that trawl survey results are often of random nature and depend on the location of trawl stations. Shifting a trawl station positions in 1-2 miles may drastically affect survey result.

Taking into account the above said it is necessary to note that there is several questions are raised:

1) Would it be possible to use the CFs as constant values by years ?
2) Would it be possible to use the same CFs for spring and autumn surveys?
3) Would it be possible to use new CFs based on experimental data 2000 and 2003 for current BITS?

It is proposed to accompany all national bottom trawl surveys as parts of BITS surveys by acoustic observations into near-bottom layers corresponded to vertical opining TVS and TVL. Analysis of these data will be useful in the relation to above said questions.

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Suggestions for changes of instructions for sampling of flounder during the BITS surveys.

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The sampling of flounder during the BITS survey is quite extensive and we have problems of fulfilling our obligations of age reading of flounder according to the manual. The flounder is slow growing and long lived resulting in sampled lengths from below 10 cm and above 40 cm and sampled ages from 1 and over 20 (see example in table 1) and an individual flounder of a specified length, for example 25cm, can be anything from 3 to 16 years old. Following the current instructions of the manual results in more than 2000 age readings yearly. I believe that here might be room for refining the sampling of flounder by changing some of the instructions at section 3.3 and 3.4 and/or giving SWEDEN permission for deterrogations as suggested below.

	Age																	
Lengthcl	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
80	1																	
160		1	1															
170			4	2														
180			8	7	1													
190			4	10	5		1											
200		1	1	8	4	1	3	2										
210			3	8	4	2	2		1									
220				6		3	4	1	3	3	1							
230				3	5	1	7	2	1	1								
240				2	4	2	3	2		2		1	1	2				
250			1	1	3	3	3	3		1	1	1		2		1		
260							3	3	4	1	3	2	1	2				
270							5	2	2	3	1	1			2			1
280				2		3	3	2	2	5				1				2
290				1		2			3	3		3	1	2	1		1	
300				1					1	1		2	1	2	2		2	
310						1	1			2		2	2	1	2			
320							1					1		2				
330														1				1
340									1		1							
350																1		1
360												1						
370																		
380																		1

1. Reduced length sampling by following the figure instead of the table

Regarding the size of the length sample it should be possible to instead of using the recommendations in the table (p.9, section 3.3, BITS manual 2012) to directly use Fig 1 (p.10, section 3.3 BITS manual). In that way the length samples could be reduced; for example 26 length classes require a sample of 250 according to Fig1 but 300 according to the table. I suggest that you insert “in the table or in Fig1” after “the above-specified number” in the instructions. Then you could use either the table or the figure to reduce the number of samples if necessary and you have enough knowledge about number of length classes but otherwise stick to the recommendations in the table.

2. Reduced age sampling by adding an intermediate recommendation of 16 samples per length class for length classes making up less than 10% but more than 5% of the length distribution.

Due to the rather flat length distribution of flounder (see Fig. 1 below) the length classes between 20 and 30 cm each make up more than 5% (but often less than 10%) of the total length distribution and hence following the manual we need to sample 20 flounder of each length class for all fishes between 20 and 30 cm. I suggest that you add an intermediate level of sampling effort that if proportion of length classes is more than 5% but less than 10% it is ok with a minimum of 16 samples (Table in p. 12; section 3.4 in BITS manual 2012).

In addition it is not practically feasible to estimate the proportion of different length classes during the time of the survey; instead it should be ok to use data from previous survey to estimate the proportion of different length classes. I would like to add a sentence: “If this is not possible the length frequency from the last (1-3) surveys in the same SD and quarter should be used” after the Table in p 12, section 3.4 in BITS manual 2012

Proportion of length class																															
SD	60	80	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380
25	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.2%	0.3%	0.9%	1.5%	2.1%	3.7%	4.2%	4.4%	6.4%	7.0%	7.7%	8.2%	9.2%	7.3%	7.6%	7.1%	5.0%	4.1%	3.9%	2.7%	2.2%	1.6%	0.9%
26	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	0.9%	2.5%	3.7%	4.8%	7.5%	7.8%	11.8%	11.5%	9.5%	9.0%	8.0%	6.1%	4.8%	3.5%	3.1%	2.2%	1.6%	0.6%	0.3%	0.3%	0.1%
27	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.6%	1.7%	3.2%	5.8%	7.9%	9.7%	10.8%	11.3%	10.0%	10.0%	7.7%	6.1%	4.7%	3.9%	2.4%	1.6%	1.0%	0.5%	0.2%	0.3%	0.2%	0.0%
28	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.4%	0.6%	1.2%	2.0%	4.1%	5.7%	7.7%	8.5%	9.0%	10.2%	9.9%	9.7%	8.3%	6.5%	5.0%	3.6%	2.7%	1.6%	1.2%	0.8%	0.5%	0.3%	0.1%	0.1%	0.0%

Fig.1. Proportion of different length classes in the Swedish BITS surveys 2008-2012 q1. Yellow marked ones make up more than 5%.

3. Reduce the extra sampling of flounder maturity by taking notice of sex distribution

The extra sampling of flounder (and other flatfish) to improve length and maturity data by sex – the recommendation of 20 per length group (p9, section 3.3) – leads to oversampling of the common sex in the end of the length distribution; i.e. males among the smaller and females among the larger (see Fig 2. below).

It should be enough with half of the number (i.e. 10) of the common sex and all of the uncommon sex in the part of the length distribution that is less than 5%. For example for Swedish flounder 20 (or 16 if following the suggestion nr 2) per length group should be taken in the interval 20-30cm but for individuals below 20cm or above 30cm it is ok to sample a maximum of 10 (or eight if following the suggestion number 2) for each sex. I would suggest to add the sentence: “ In case the sex-ratio is very squewed it is ok to restrict the sampling of the dominant sex to half of the number recommended” at the end of p.9.

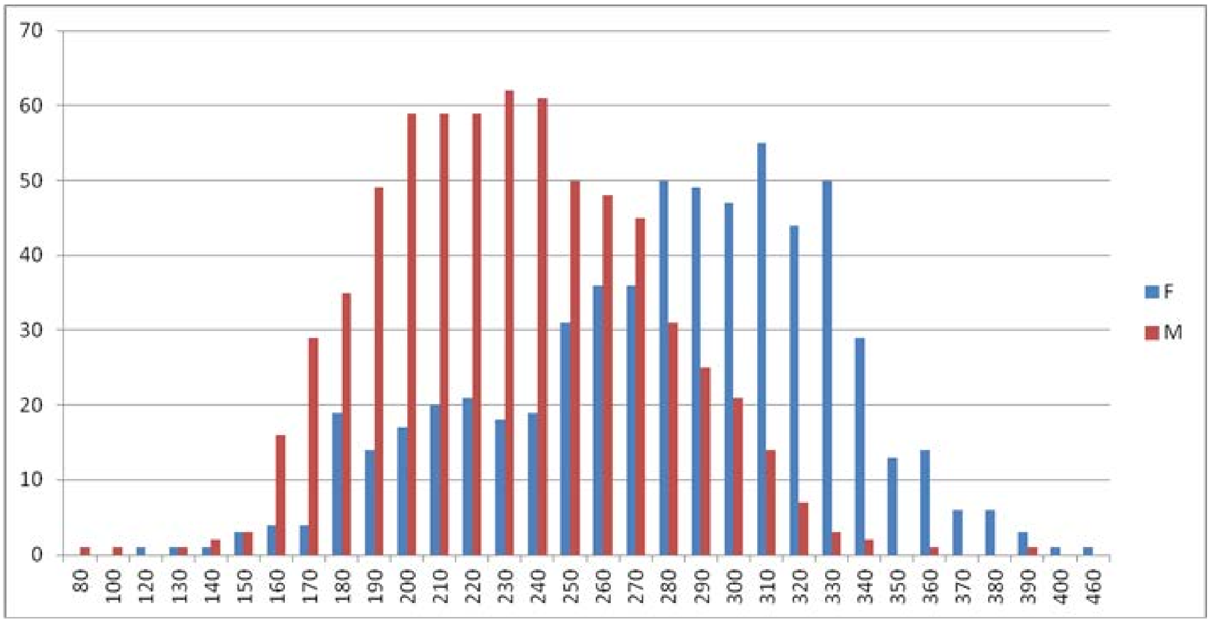


Fig.2 Number of individuals per length group in the Swedish BITS age sampling in SD 25 in 2012. F= Females, M=Males.

4. Delete the obligation for age reading in SD 26 for Sweden

Sweden regularly performs hauls in SD 25, 27 & 28 and only occasionally in SD 26. Since the Swedish part of the number of hauls in SD 26 is small (in 2012 Q1 we had 7 out of 42 hauls) we would like to refrain from individual measurements of age, length, maturity and sex of flounder in that area. Could the limit of 5% of the total number of hauls be changed to 20% for flounder to allow for skipping the individual measurements? Or a derogation for Sweden in this area be allowed?

Annex 10: Action list

ACTIONS RECOMMENDED AND AGREED IN WGBIFS 2013

1. It is suggested that Sweden continues participation in BIAS surveys in ICES Subdivision 30 and the area coverage of that survey should be kept at the same level as in 2007-2011.

2. Russia is strongly requested to participate in the BIAS and BASS surveys in 2013-2014 covering the southeastern part of the ICES Subdivision 26.

3. In 2013 and forthcoming years, the BIAS area will be extended to the Russian EEZ in the ICES Subdivision 32, and the Russian GosNIORH (St. Petersburg) will be managing these surveys.

4. The feedback of realized BITS surveys should be submitted to Rainer Oeberst (rainer.oeberst@vti.bund.de), Germany using the proposed standard format not later than 20th of December (autumn survey) and immediately after spring survey.

5. The standard groundrope must be used in BITS when the control-station was successfully carried out during earlier surveys with this gear.

6. New BITS haul positions should be submitted to Rainer Oeberst (rainer.oeberst@vti.bund.de), Germany as soon as possible. Especially, hauls in the "white areas" are necessary to cover the total distribution area of the target species. It was proposed that time should be used during surveys to allocate new haul positions in the "white areas".

7. Before the survey start should national BITS survey leaders together with experienced ship navigators carefully check all the proposed haul-locations (geographical positions and depths), allocated inside their own EEZ, to every vessel designated to survey realization, vs. various current navigational conditions, even when a particular haul-location was in the past recommended by users; it is suggested that the local BITS cruises leader will inform the Tow-Database manager Rainer Oeberst (rainer.oeberst@vti.bund.de), Germany about current status of accessibility of catch-stations.

8. It was agreed that the countries (Sweden, Germany and Poland) where significant amount of cod were caught during the acoustic surveys increase the effort to fulfill the submission of the requested data. It was agreed that the period after 2008 has first priority but that a longer time-series (2001 and onwards) would provide a much better foundation for the analysis. The countries are encouraged to extend the dataseries back to 2001. Furthermore, all countries carrying out acoustic surveys in the Baltic are encouraged to submit the data if possible. Rainer Oeberst will coordinate the submission of data, provide the format for the data submission and send out reminders when approaching the submission deadline (November 2013).

9. It is suggested that all countries should measure length and weight of all fish species during the BITS surveys and input data should be submitted to the DATRAS database.

10. The technical parameters of the standard fishing gear applied for BITS surveys should be checked once per year and obtained data should be reported in standard format to WGBIFS next meeting.

11. The information on fish maturity should be uploaded to the DATRAS database accordingly to the national scale applied, and next the ICES Secretariat Data manager will convert these data to needed scale level, however the table with proposed conversion data should be delivered by particular countries.

12. The main results of the recently conducted the acoustic survey (BASS and BIAS) should be summarized and uploaded one month before the WGBIFS meeting of the next year to the data folder of the current WGBIFS SharePoint.

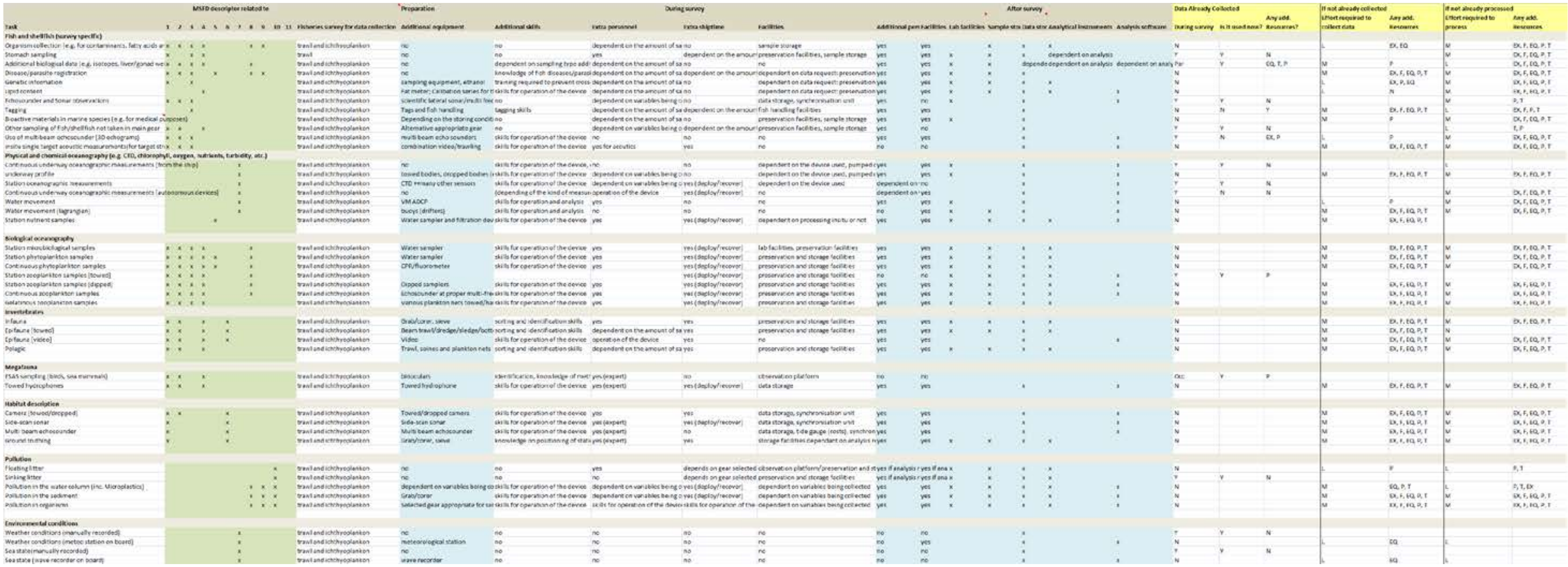
13. Information about any changes in the planned acoustic transects pattern for given survey (vessel) as well as any difficulties concern the acoustic survey realization should by immediately transferred to the acoustic surveys coordinators within the WGBIFS, i.e. Niklas Larson, Lysekil – Sweden (niklas.larson@slu.se) and Uwe Boettcher, Rostock – Germany (uwe.boettcher@vti.bund.de), with a copy to the WGBIFS chair.

14. The information about marine litter (as one of the environment descriptors – see the Report from the joint MEDPOL/Blacksea/JRC/ICES Workshop on Marine Litters; WKMAL/2011), in relation to the Marine Strategy Framework Directive, is proposed to be noticed by the cruise leader during BITS surveys and the data will be transferred to the national correspondent – responsible for National Fisheries Data Collection Programme, and other scientific-body under requests.

ACTIONS RECOMMENDED AND AGREED IN WGBIFS 2013
15. After the implementation and check of the new screening procedures WGBIFS will be informed by the ICES data center and all countries will upload the data of the BITS from 2001 onwards again to improve the quality of the data stored in the DATRAS database.
16. WGBIFS recommends the application of the DATRAS Exchange Format which has been used since 2004 for the total period.

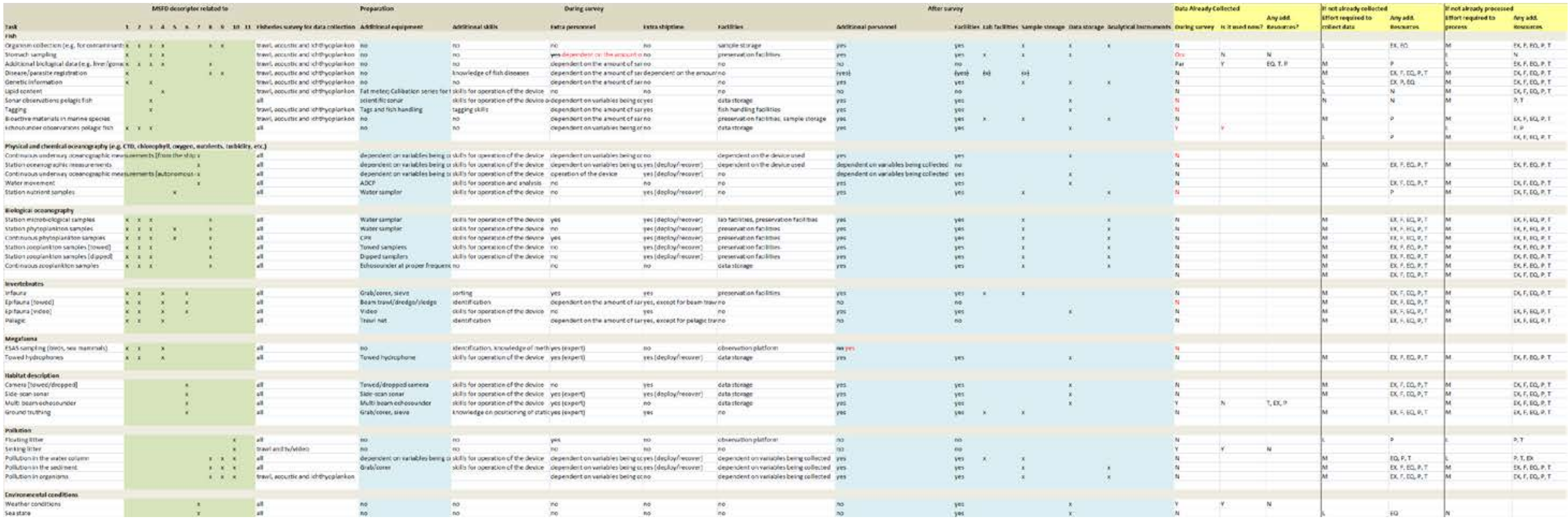
Annex 11: Filled WKCATDAT 2012 tables by country and survey

Table 1. WKCATDAT 2012 table for the Danish BITS surveys.



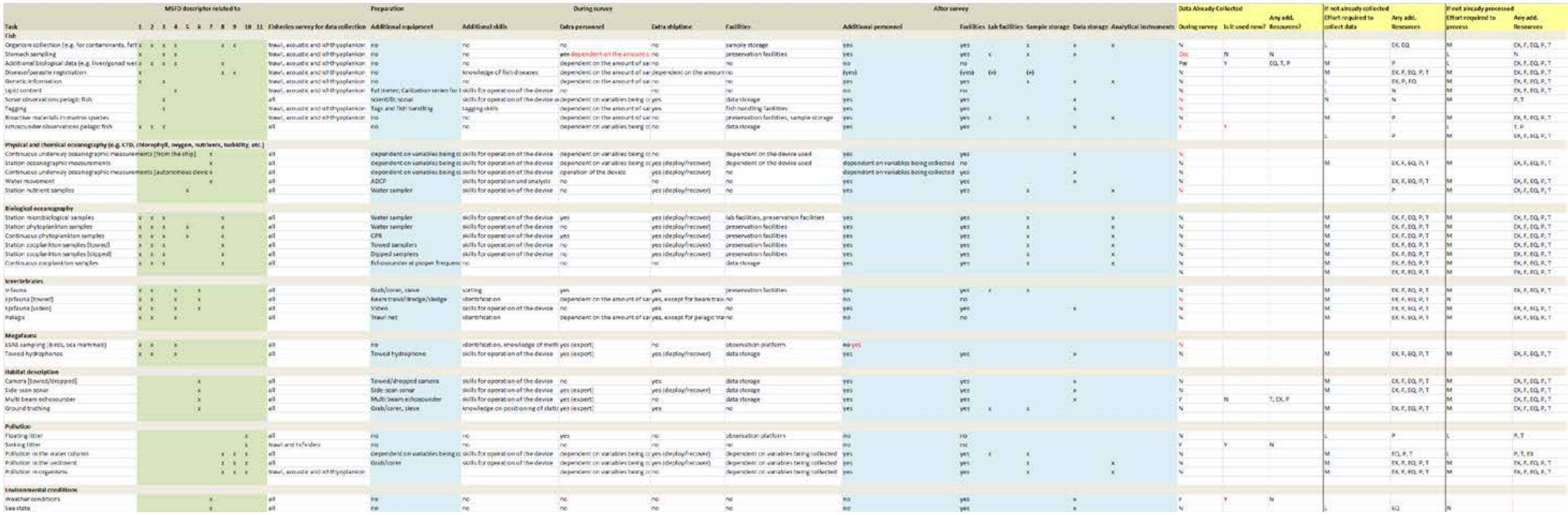
	MSFD descriptor related to												Preparation	During survey					After survey							Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional pers	Facilities	Lab facilities	Sample sto	Data stor	Analytical instruments	Analysis software	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish and shellfish (survey specific)																															
Organism collection (e.g. for contaminants, fatty acids ar	x	x	x	x				x	x			trawl and ichthyoplankton	no	no	dependent on the amount of sa	no	sample storage	yes	yes		x	x	x		N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl	no	no	yes	dependent on the amoun	preservation facilities, sample storage	yes	yes	x	x	x	dependent on analysis		Y	Y	N			M	EX, F, EQ, P, T
Additional biological data (e.g. isotopes, liver/gonad we	x	x	x	x				x				trawl and ichthyoplankton	no	dependent on sampling type addi	dependent on the amount of sa	no	no	yes	yes	x	x	depende	dependent on analysis	dependent on analy	Par	Y	EQ, T, P	M	P	L	EX, F, EQ, P, T
Disease/parasite registration	x	x	x		x			x	x			trawl and ichthyoplankton	no	knowledge of fish diseases/parasi	dependent on the amount of sa	dependent on the amoun	dependent on data request: preservation	yes	yes	x	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl and ichthyoplankton	sampling equipment, ethanol	training required to prevent cross-	dependent on the amount of sa	no	dependent on data request: preservation	yes	yes	x	x	x	x		N			L	EX, P, EQ	M	EX, F, EQ, P, T
Lipid content				x								trawl and ichthyoplankton	Fat meter; Calibration series for th	skills for operation of the device	dependent on the amount of sa	no	dependent on data request: preservation	yes	yes	x	x	x	x	x	N			L	N	M	EX, F, EQ, P, T
Echosounder and Sonar observations	x	x	x									trawl and ichthyoplankton	scientific lateral sonar/multi freq	no	dependent on variables being c	no	data storage, synchronisation unit	yes	no	x		x		x	Y	Y	N			M	P, T
Tagging			x									trawl and ichthyoplankton	Tags and fish handling	tagging skills	dependent on the amount of sa	dependent on the amoun	fish handling facilities	yes	yes			x			N	N	Y	M	EX, F, EQ, P, T	L	EX, F, P, T
Bioactive materials in marine species (e.g. for medical purposes)												trawl and ichthyoplankton	Depending on the storing conditi	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x		x			N			M	P	M	EX, F, EQ, P, T
Other sampling of fish/shellfish not taken in main gear	x	x		x								trawl and ichthyoplankton	Alternative appropriate gear	no	dependent on variables being c	dependent on the amoun	preservation facilities, sample storage	yes	no			x			Y	Y	N			L	F, P
Use of multibeam echosounder (3D echograms)	x	x	x									trawl and ichthyoplankton	multi beam echo sounders	skills for operation of the device	no	no	no	yes	yes			x		x	Y	N	EX, P	L	P	M	EX, F, EQ, P, T
insitu single target acoustic measurements(for target str	x	x	x									trawl and ichthyoplankton	combination video/trawling	skills for operation of the device	yes for acoutics	yes	no	no	no			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																															
Continuous underway oceanographic measurements (from the ship)							x					trawl and ichthyoplankton	no	skills for operation of the device, i	no	no	dependent on the device used, pumped c	yes	yes	x		x		x	Y	Y	N			L	
underway profile							x					trawl and ichthyoplankton	towed bodies, dropped bodies (i	skills for operation of the device	dependent on variables being c	no	dependent on the device used, pumped i	yes	yes	x		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station oceanographic measurements							x					trawl and ichthyoplankton	CTD +many other sensors	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on the device used	dependent on	no			x		x	Y	Y	N				
Continuous underway oceanographic measurements (autonomous devices)							x					trawl and ichthyoplankton	no	(depending of the kind of measur	operation of the device	yes (deploy/recover)	no	dependent on	yes			x		x	Y	N	N			M	EX, F, EQ, P, T
Water movement							x					trawl and ichthyoplankton	VM ADCP	skills for operation and analysis	yes	no	no	yes	yes	x		x		x	N			L	P	M	EX, F, EQ, P, T
Water movement (lagrangian)							x					trawl and ichthyoplankton	buoys (drifters)	skills for operation and analysis	no	no	no	no	yes	x	x	x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							trawl and ichthyoplankton	Water sampler and filtration dev	skills for operation of the device	yes	yes (deploy/recover)	dependent on processing insitu or not	yes	yes	x	x	x	x	x	N			M	EX, F, EQ, P, T		
Biological oceanography																															
Station microbiological samples	x	x	x	x				x				trawl and ichthyoplankton	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x	x	x			x				trawl and ichthyoplankton	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x	x	x			x				trawl and ichthyoplankton	CPR/fluorometer	skills for operation of the device	yes	yes (deploy/recover)	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x	x				x				trawl and ichthyoplankton				yes (deploy/recover)	preservation and storage facilities	no	no	x	x	x	x	x	Y	Y	P				
Station zooplankton samples (dipped)	x	x	x	x				x				trawl and ichthyoplankton	Dipped samplers	skills for operation of the device	yes	yes (deploy/recover)	preservation and storage facilities	yes	yes	x	x	x	x	x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous zooplankton samples	x	x	x	x				x				trawl and ichthyoplankton	Echosounder at proper multi-fre	skills for operation of the device	yes	yes (deploy/recover)	preservation and storage facilities	yes	yes	x	x	x	x	x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Gelatinous zooplankton samples	x	x	x	x								trawl and ichthyoplankton	various plankton nets towed/ha	skills for operation of the device	yes	yes (deploy/recover)	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																															
Infauna	x	x		x		x						trawl and ichthyoplankton	Grab/corer, sieve	sorting and identification skills	yes	yes	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						trawl and ichthyoplankton	Beam trawl/dredge/sledge/botto	sorting and identification skills	dependent on the amount of sa	yes	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						trawl and ichthyoplankton	Video	skills for operation of the device	operation of the device	yes	no	yes	yes			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								trawl and ichthyoplankton	Trawl, seines and plankton nets	sorting and identification skills	dependent on the amount of sa	yes	preservation and storage facilities	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																															
ESAS sampling (birds, sea mammals)	x	x		x								trawl and ichthyoplankton	binoculars	identification, knowledge of met	yes (expert)	no	observation platform	no	no						Occ	Y	P				
Towed hydrophones	x	x		x								trawl and ichthyoplankton	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																															
Camera (towed/dropped)	x	x				x						trawl and ichthyoplankton	Towed/dropped camera	skills for operation of the device	yes	yes	data storage, synchronisation unit	yes	yes			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar	x					x						trawl and ichthyoplankton	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage, synchronisation unit	yes	yes			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder	x					x						trawl and ichthyoplankton	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage, tide gauge (rosts), synchron	yes	yes			x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Ground truthing	x					x						trawl and ichthyoplankton	Grab/corer, sieve	knowledge on positioning of statio	yes (expert)	yes	storage facilities dependant on analysis n	yes	yes	x	x	x	x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																															
Floating litter										x		trawl and ichthyoplankton	no	no	yes	depends on gear selected	observation platform/preservation and st	yes if analysis r	yes if ana	x	x	x	x		N			L	P	L	P, T
Sinking litter										x		trawl and ichthyoplankton	no	no	no	depends on gear selected	preservation and storage facilities	yes if analysis r	yes if ana	x	x	x	x		Y	Y	N				
Pollution in the water column (inc. Microplastics)								x	x	x		trawl and ichthyoplankton	dependent on variables being co	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x	x	x	x	N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		trawl and ichthyoplankton	Grab/corer	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x	x	x	x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl and ichthyoplankton	selected gear appropriate for sa	skills for operation of the device	skills for operation of the devic	skills for operation of the	dependent on variables being collected	yes	yes	x	x	x	x	x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																															
Weather conditions (manually recorded)							x					trawl and ichthyoplankton	no	no	no	no	no	no	no			x			Y	Y	N				
Weather conditions (metoc station on board)							x					trawl and ichthyoplankton	meteorological station	no	no	no	no	no	yes			x		x	N			L	EQ	L	
Sea state(manually recorded)							x					trawl and ichthyoplankton	no	no	no	no	no	no	no			x			Y	Y	N				
Sea state (wave recorder on board)							x					trawl and ichthyoplankton	wave recorder	no	no	no	no	no	no			x		x	N			L	EQ	L	

Table 2. WKCATDAT 2012 table for the German BASS surveys.



	MSFD descriptor related to												Preparation		During survey			After survey						Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminants	x	x	x	x				x	x			trawl, acoustic and ichthyoplankon	no	no	no	no	sample storage	yes	yes		x	x	x	N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl, acoustic and ichthyoplankon	no	no	~~yes~~ dependent on the amount o	no	preservation facilities	yes	yes	x	x	x		Occ	N	N			L	N
Additional biological data (e.g. liver/gona	x	x	x	x				x				trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	no	no	no					Par	Y	EQ, T, P	M	P	L	EX, F, EQ, P, T
Disease/parasite registration	x							x	x			trawl, acoustic and ichthyoplankon	no	knowledge of fish diseases	dependent on the amount of sa	dependent on the amoun	no	~~(yes)~~	~~(yes)~~	~~(x)~~	~~(x)~~			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	N			L	EX, P, EQ	M	EX, F, EQ, P, T
Lipid content				x								trawl, acoustic and ichthyoplankon	Fat meter; Calibation series for t	skills for operation of the device	no	no	no	no	no					N			L	N	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device o	dependent on variables being co	yes	data storage	yes	yes			x		N			N	N	M	P, T
Tagging			x									trawl, acoustic and ichthyoplankon	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		N						
Bioactive materials in marine species												trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	N			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	no	dependent on variables being co	no	data storage	yes	yes			x		Y	Y				L	F, P
																											L	P	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being co	no	dependent on the device used	yes	yes			x		N						
Station oceanographic measurements							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous underway oceanographic measurements (autonomous -							x					all	dependent on variables being co	skills for operation of the device	operation of the device	yes (deploy/recover)	no	dependent on variables being collected	yes			x		N						
Water movement							x					all	ADCP	skills for operation and analysis	no	no	no	yes	yes			x		N				EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	N				P	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	CPR	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	no	no	no	data storage	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
																								N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sa	yes, except for beam traw	no	no	no					N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	~~no~~ yes						N						
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		Y	N	T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					N			L	P	L	P, T
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					Y	Y	N				
Pollution in the water column								x	x	x		all	dependent on variables being co	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankon			dependent on variables being co	no	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				
Sea state							x					all	no	no	no	no	no	no	yes			x		N			L	EQ	N	

Table 3. WKCATDAT 2012 table for the German BIAS surveys.

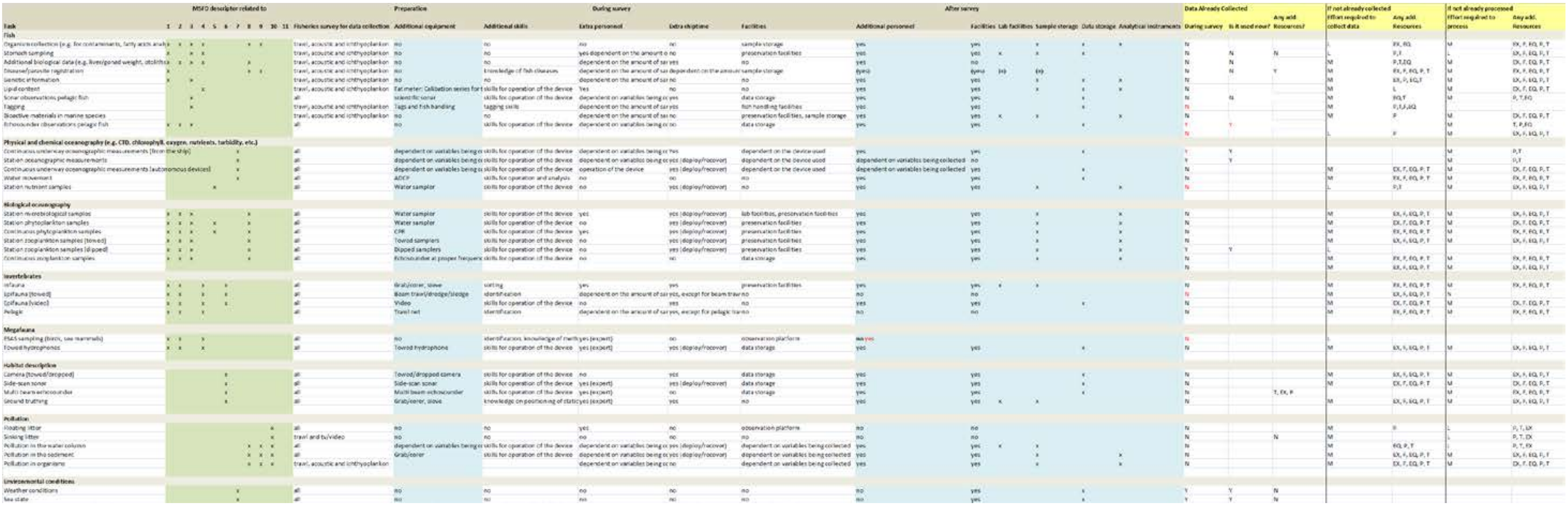


	MSFD descriptor related to												Preparation		During survey				After survey					Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminants, fatt	x	x	x	x				x	x			trawl, acoustic and ichthyoplankon	no	no	no	no	sample storage	yes	yes		x	x	x	N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl, acoustic and ichthyoplankon	no	no	yes dependent on the amount c	no	preservation facilities	yes	yes	x	x	x		Dec	N	N			L	N
Additional biological data (e.g. liver/gonad wei	x	x	x	x				x				trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	no	no	no					Par	Y	EQ, T, P	M	P	L	EX, F, EQ, P, T
Disease/parasite registration	x							x	x			trawl, acoustic and ichthyoplankon	no	knowledge of fish diseases	dependent on the amount of sa	dependent on the amount	no	(yes)	(yes)	(x)	(x)			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	N			L	EX, P, EQ	M	EX, F, EQ, P, T
Lipid content				x								trawl, acoustic and ichthyoplankon	Fat meter; Calibration series for t	skills for operation of the device	no	no	no	no	no					N			L	N	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device a	dependent on variables being cc	yes	data storage	yes	yes			x		N			N	N	M	P, T
Tagging			x									trawl, acoustic and ichthyoplankon	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		N						
Bioactive materials in marine species												trawl, acoustic and ichthyoplankon	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	N			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	no	dependent on variables being cc	no	data storage	yes	yes			x		F	Y				L	T, P
																											L	P	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements [from the ship]							x					all	dependent on variables being cc	skills for operation of the device	dependent on variables being cc	no	dependent on the device used	yes	yes			x		N						
Station oceanographic measurements							x					all	dependent on variables being cc	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous underway oceanographic measurements [autonomous devic							x					all	dependent on variables being cc	skills for operation of the device	operation of the device	yes (deploy/recover)	no	dependent on variables being collected	yes			x		N						
Water movement							x					all	ADCP	skills for operation and analysis	no	no	no	yes	yes			x		N				EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	N				P	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	CPR	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	no	no	no	data storage	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
																								N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sa	yes, except for beam traw	no	no	no					N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	no yes						N						
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		F	N	T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					N			L	P	L	P, T
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					F	Y	N				
Pollution in the water column								x	x	x		all	dependent on variables being cc	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankon			dependent on variables being cc	no	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		F	Y	N				
Sea state							x					all	no	no	no	no	no	no	yes			x		N			L	EQ	N	

Table 4. WKCATDAT 2012 table for the German BITS surveys.

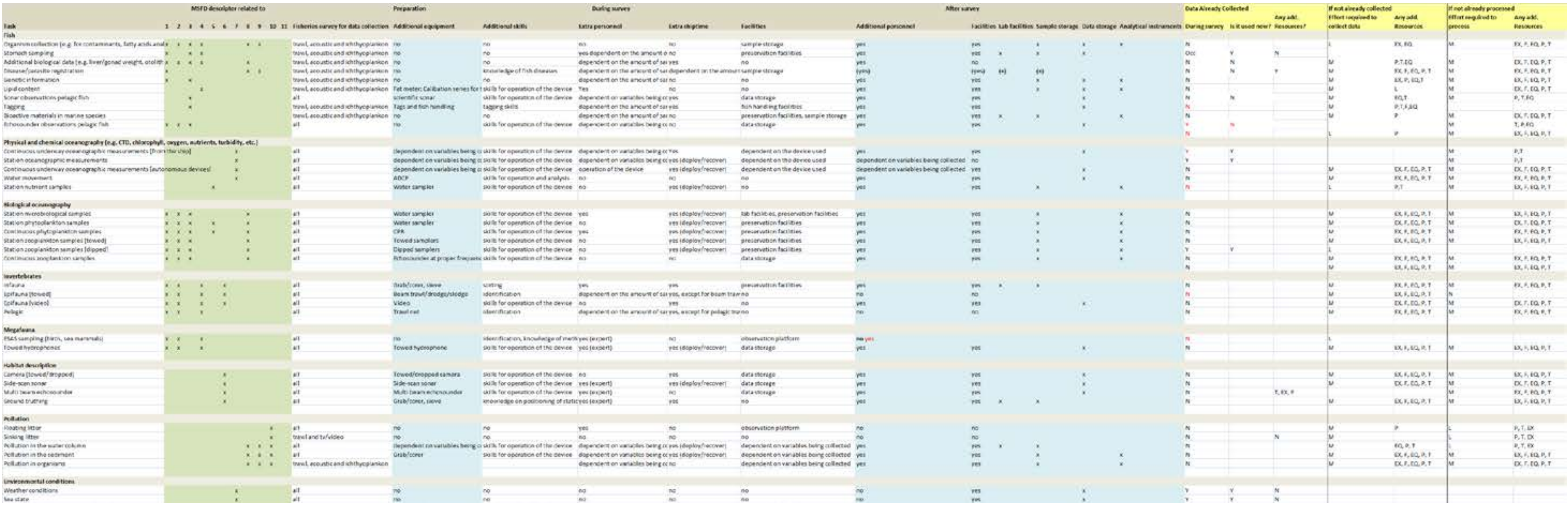
	MSFD descriptor related to												Preparation		During survey			After survey						Data Already Collected			If not already collected		If not already processed	
Task	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Fisheries survey for data collection**	**Additional equipment**	**Additional skills**	**Extra personnel**	**Extra shiptime**	**Facilities**	**Additional personnel**	**Facilities**	**Lab facilities**	**Sample storage**	**Data storage**	**Analytical instruments**	**During survey**	**Is it used now?**	**Any add. Resources?**	**Effort required to collect data**	**Any add. Resources**	**Effort required to process**	**Any add. Resources**
Fish																														
Organism collection (e.g. for contaminants, fatty acids analy	x	x	x	x				x	x			trawl, acoustic and ichthyoplankton	no	no	no	no	sample storage	yes	yes		x	x	x	N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl, acoustic and ichthyoplankton	no	no	~~yes~~ dependent on the amount o	no	preservation facilities	yes	yes	x	x	x		Occ	N	N			L	N
Additional biological data (e.g. liver/gonad weight, otoliths	x	x	x	x				x				trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	no	no	no					Par	Y	EQ, T, P	M	P	L	EX, F, EQ, P, T
Disease/parasite registration	x							x	x			trawl, acoustic and ichthyoplankton	no	knowledge of fish diseases	dependent on the amount of sa	dependent on the amoun	no	(yes)	(yes)	(x)	(x)			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	N			L	EX, P, EQ	M	EX, F, EQ, P, T
Lipid content				x								trawl, acoustic and ichthyoplankton	Fat meter: Calibration series for t	skills for operation of the device	no	no	no	no	no					N			L	N	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device	dependent on variables being co	yes	data storage	yes	yes			x		N			N	N	M	P, T
Tagging			x									trawl, acoustic and ichthyoplankton	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		N						
Bioactive materials in marine species												trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	N			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	no	dependent on variables being co	no	data storage	yes	yes			x		N			M	N	L	T, P
																								N			L	P	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship)							x					all	dependent on variables being c	skills for operation of the device	dependent on variables being co	no	dependant on the device used	yes	yes			x		N						
Station oceanographic measurements							x					all	dependent on variables being c	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous underway oceanographic measurements (autonomous devices)							x					all	dependent on variables being c	skills for operation of the device	operation of the device	yes (deploy/recover)	no	dependent on variables being collected	yes			x		N						
Water movement							x					all	ADCP	skills for operation and analysis	no	no	no	yes	yes			x		N				EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	N				P	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	CPR	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	no	no	no	data storage	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
																								N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sa	yes, except for beam traw	no	no	no					N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	~~no~~ yes						N						
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		Y	N	T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					N			L	P	L	P, T
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					Y	Y	N				
Pollution in the water column								x	x	x		all	dependent on variables being c	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankton			dependent on variables being co	no	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				
Sea state							x					all	no	no	no	no	no	no	yes			x		N			L	EQ	N	

Table 5. WKCATDAT 2012 table for the Latvian BIAS surveys.



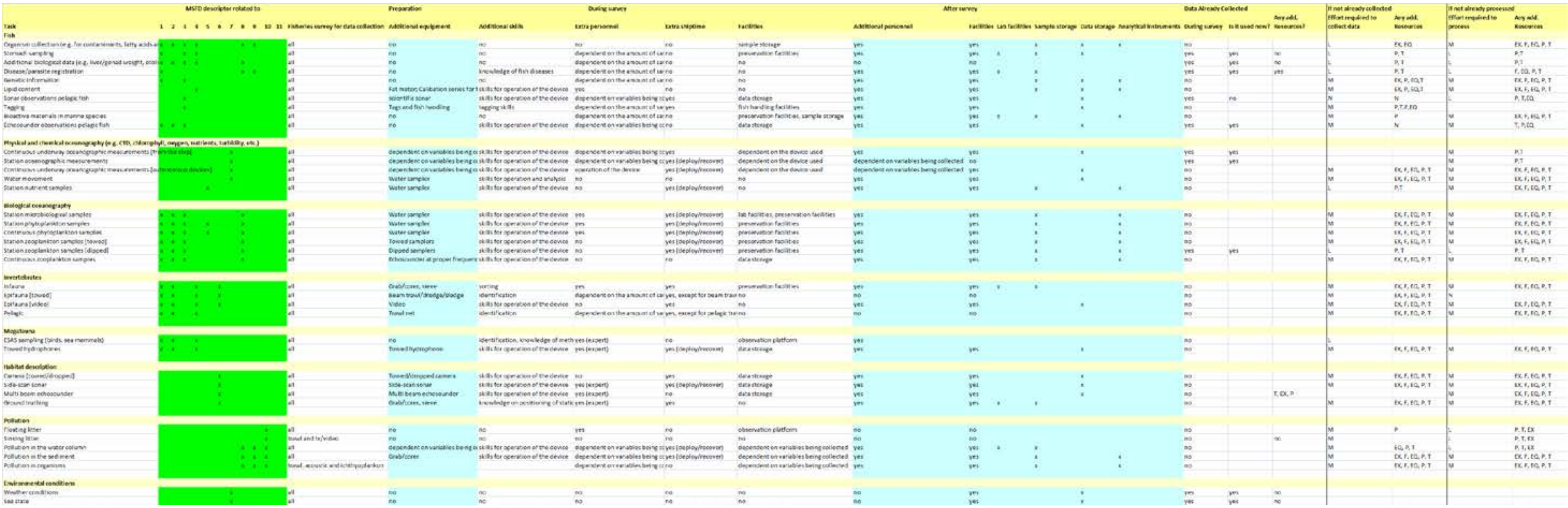
	MSFD descriptor related to												Preparation		During survey			After survey						Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminants, fatty acids analy	x	x	x	x				x	x			trawl, acoustic and ichthyoplankton	no	no	no	no	sample storage	yes	yes		x	x	x	N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl, acoustic and ichthyoplankton	no	no	yes dependent on the amount o	no	preservation facilities	yes	yes	x	x	x		N	N	N	L	P, T	L	EX, F, EQ, P, T
Additional biological data (e.g. liver/gonad weight, otolith	x	x	x	x				x				trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	yes	no	yes	no					N	N		M	P,T,EQ	M	EX, F, EQ, P, T
Disease/parasite registration	x							x	x			trawl, acoustic and ichthyoplankton	no	knowledge of fish diseases	dependent on the amount of sa	dependent on the amoun	sample storage	(yes)	(yes)	(x)	(x)			N	N	Y	M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	N			M	EX, P, EQ, T	M	EX, F, EQ, P, T
Lipid content				x								trawl, acoustic and ichthyoplankton	Fat meter: Calibation series for t	skills for operation of the device	Yes	no	no	yes	yes		x	x	x	N			M	L	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device	dependent on variables being cc	yes	data storage	yes	yes			x		N	N		M	EQ, T	M	P, T, EQ
Tagging			x									trawl, acoustic and ichthyoplankton	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		N			M	P,T,F,EQ		
Bioactive materials in marine species												trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	N			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	skills for operation of the device	dependent on variables being cc	no	data storage	yes	yes			x		Y	Y				M	T, P, EQ
																								N			L	P	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship)							x					all	dependent on variables being c	skills for operation of the device	dependent on variables being c	Yes	dependent on the device used	yes	yes			x		Y	Y				M	P,T
Station oceanographic measurements							x					all	dependent on variables being c	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					Y	Y				M	P,T
Continuous underway oceanographic measurements (autonomous devices)							x					all	dependent on variables being c	skills for operation of the device	operation of the device	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Water movement							x					all	ADCP	skills for operation and analysis	no	no	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	N			L	P,T	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	CPR	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	Y	Y		L			
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	skills for operation of the device	no	no	data storage	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
																								N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sa	yes, except for beam traw	no	no	no					N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	no yes						N			L			
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		N		T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					N			M	P	L	P, T, EX
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					N		N	M		L	P, T, EX
Pollution in the water column								x	x	x		all	dependent on variables being c	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being c	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankton			dependent on variables being c	no	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				
Sea state							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				

Table 6. WKCATDAT 2012 table for the Latvian BITS surveys.



	MSFD descriptor related to												Preparation		During survey				After survey					Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminants, fatty acids anal	x	x	x	x				x	x			trawl, acoustic and ichthyoplankton	no	no	no	no	sample storage	yes	yes		x	x	x	N			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								trawl, acoustic and ichthyoplankton	no	no	yes dependent on the amount o	no	preservation facilities	yes	yes	x	x	x		Occ	Y	N				
Additional biological data (e.g. liver/gonad weight, otolith	x	x	x	x				x				trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	yes	no	yes	no					N	N		M	P,T,EQ	M	EX, T, EQ, P, T
Disease/parasite registration	x							x	x			trawl, acoustic and ichthyoplankton	no	knowledge of fish diseases	dependent on the amount of sa	dependent on the amoun	sample storage	(yes)	(yes)	(x)	(x)			N	N	Y	M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Genetic information	x		x									trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	N			M	EX, P, EQ,T	M	EX, F, EQ, P, T
Lipid content				x								trawl, acoustic and ichthyoplankton	Fat meter; Calibration series for t	skills for operation of the device	Yes	no	no	yes	yes		x	x	x	N			M	L	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device	dependent on variables being co	yes	data storage	yes	yes			x		N	N		M	EQ,T	M	P, T,EQ
Tagging			x									trawl, acoustic and ichthyoplankton	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		N			M	P,T,F,EQ		
Bioactive materials in marine species												trawl, acoustic and ichthyoplankton	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	N			M	P	M	EX, T, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	skills for operation of the device	dependent on variables being co	no	data storage	yes	yes			x		Y	N				M	T, P,EQ
																								N			L	P	M	EX, F, EQ, P, T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship)							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being co	Yes	dependent on the device used	yes	yes			x		Y	Y				M	P,T
Station oceanographic measurements							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					Y	Y				M	P,T
Continuous underway oceanographic measurements (autonomous devices)							x					all	dependent on variables being co	skills for operation of the device	operation of the device	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	yes			x		N			M	EX, F, EQ, P, T	M	EX, T, EQ, P, T
Water movement							x					all	ADCP	skills for operation and analysis	no	no	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	N			L	P,T	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, T, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	CPR	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	Y	Y		L			
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	skills for operation of the device	no	no	data storage	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
																								N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sa	yes, except for beam traw	no	no	no					N			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, T, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	no yes						N			L			
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		N			M	EX, F, EQ, P, T	M	EX, T, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		N		T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					N			M	P	L	P, T, EX
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					N		N	M		L	P, T, EX
Pollution in the water column								x	x	x		all	dependent on variables being co	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			N			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being co	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankton			dependent on variables being co	no	dependent on variables being collected	yes	yes		x		x	N			M	EX, F, EQ, P, T	M	EX, T, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				
Sea state							x					all	no	no	no	no	no	no	yes			x		Y	Y	N				

Table 7. WKCATDAT 2012 table for the Russian BIAS surveys.

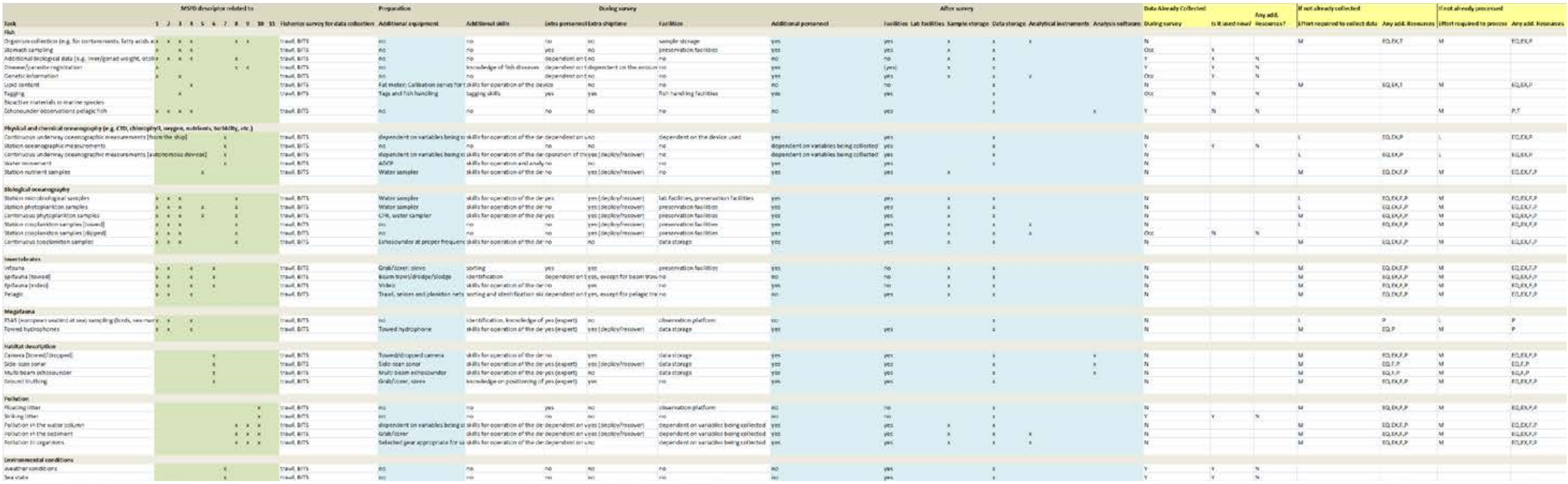


	MSFD descriptor related to												Preparation		During survey			After survey						Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminents, fatty acids a	x	x	x	x				x	x			all	no	no	no	no	sample storage	yes	yes		x	x	x	no			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								all	no	no	dependent on the amount of sar	no	preservation facilities	yes	yes	x	x	x		yes	yes	no	L	P, T	L	P,T
Additional biological data (e.g. liver/gonad weight, otoli	x	x	x	x				x				all	no	no	dependent on the amount of sar	no	no	no	no					yes	yes	no	L	P, T	L	P,T
Disease/parasite registration	x							x	x			all	no	knowledge of fish diseases	dependent on the amount of sar	no	no	yes	yes	x	x			yes	yes	yes	L	P, T	L	F, EQ, P, T
Genetic information	x		x									all	no	no	dependent on the amount of sar	no	no	yes	yes		x	x	x	no			M	EX, P, EQ,T	M	EX, F, EQ, P, T
Lipid content				x								all	Fat meter; Calibration series for t	skills for operation of the device	yes	no	no	yes	yes		x	x	x	no			M	EX, P, EQ,T	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device	dependent on variables being cc	yes	data storage	yes	yes			x		yes	no		N	N	L	P, T,EQ
Tagging			x									all	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		no			M	P,T,F,EQ		
Bioactive materials in marine species												all	no	no	dependent on the amount of sar	no	preservation facilities, sample storage	yes	yes	x	x		x	no			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	skills for operation of the device	dependent on variables being cc	no	data storage	yes	yes			x		yes	yes		M	N	M	T, P,EQ
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship)							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being cc	yes	dependent on the device used	yes	yes			x		yes	yes				M	P,T
Station oceanographic measurements							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					yes	yes				M	P,T
Continuous underway oceanographic measurements (autonomous devices)							x					all	dependent on variables being c	skills for operation of the device	operation of the device	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Water movement							x					all	Water sampler	skills for operation and analysis	no	no	no	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	no			L	P,T	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	yes	yes		L	P, T	L	P, T
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	skills for operation of the device	no	no	data storage	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of car	yes, except for beam trav	no	no	no					no			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	yes						no			L			
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		no		T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					no			M	P	L	P, T, EX
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					no		no	M		L	P, T, EX
Pollution in the water column								x	x	x		all	dependent on variables being c	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			no			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankton			dependent on variables being cc	no	dependent on variables being collected	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		yes	yes	no				
Sea state							x					all	no	no	no	no	no	no	yes			x		yes	yes	no				

Table 8. WKCATDAT 2012 table for the Russian BITS surveys.

	MSFD descriptor related to												Preparation		During survey			After survey						Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	During survey	Is it used now?	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																														
Organism collection (e.g. for contaminants, fatty acids a	x	x	x	x				x	x			all	no	no	no	no	sample storage	yes	yes		x	x	x	no			L	EX, EQ	M	EX, F, EQ, P, T
Stomach sampling	x		x	x								all	no	no	dependent on the amount of sa	no	preservation facilities	yes	yes	x	x	x		yes	yes	no	L	P, T	L	P,T
Additional biological data (e.g. liver/gonad weight, otoli	x	x	x	x				x				all	no	no	dependent on the amount of sa	no	no	no	no					yes	yes	no	L	P, T	L	P,T
Disease/parasite registration	x							x	x			all	no	knowledge of fish diseases	dependent on the amount of sa	no	no	yes	yes	x	x			yes	yes	yes	L	P, T	L	F, EQ, P, T
Genetic information	x		x									all	no	no	dependent on the amount of sa	no	no	yes	yes		x	x	x	no			M	EX, P, EQ,T	M	EX, F, EQ, P, T
Lipid content				x								all	Fat meter; Calibration series for t	skills for operation of the device	yes	no	no	yes	yes		x	x	x	no			M	EX, P, EQ,T	M	EX, F, EQ, P, T
Sonar observations pelagic fish			x									all	scientific sonar	skills for operation of the device	dependent on variables being cc	yes	data storage	yes	yes			x		yes	no		N	N	L	P, T,EQ
Tagging			x									all	Tags and fish handling	tagging skills	dependent on the amount of sa	yes	fish handling facilities	yes	yes			x		no			M	P,T,F,EQ		
Bioactive materials in marine species												all	no	no	dependent on the amount of sa	no	preservation facilities, sample storage	yes	yes	x	x		x	no			M	P	M	EX, F, EQ, P, T
Echosounder observations pelagic fish	x	x	x									all	no	skills for operation of the device	dependent on variables being cc	no	data storage	yes	yes			x		yes	yes		M	N	M	T, P,EQ
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																														
Continuous underway oceanographic measurements (from the ship)							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being cc	yes	dependent on the device used	yes	yes			x		yes	yes				M	P,T
Station oceanographic measurements							x					all	dependent on variables being co	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	no					yes	yes				M	P,T
Continuous underway oceanographic measurements (autonomous devices)							x					all	dependent on variables being co	skills for operation of the device	operation of the device	yes (deploy/recover)	dependent on the device used	dependent on variables being collected	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Water movement							x					all	Water sampler	skills for operation and analysis	no	no	no	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station nutrient samples					x							all	Water sampler	skills for operation of the device	no	yes (deploy/recover)	no	yes	yes		x		x	no			L	P,T	M	EX, F, EQ, P, T
Biological oceanography																														
Station microbiological samples	x	x	x					x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Continuous phytoplankton samples	x	x	x		x			x				all	Water sampler	skills for operation of the device	yes	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (towed)	x	x	x					x				all	Towed samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Station zooplankton samples (dipped)	x	x	x					x				all	Dipped samplers	skills for operation of the device	no	yes (deploy/recover)	preservation facilities	yes	yes		x		x	yes	yes		L	P, T	L	P, T
Continuous zooplankton samples	x	x	x					x				all	Echosounder at proper frequenc	skills for operation of the device	no	no	data storage	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Invertebrates																														
Infauna	x	x		x		x						all	Grab/corer, sieve	sorting	yes	yes	preservation facilities	yes	yes	x	x			no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Epifauna (towed)	x	x		x		x						all	Beam trawl/dredge/sledge	identification	dependent on the amount of sar	yes, except for beam traw	no	no	no					no			M	EX, F, EQ, P, T	N	
Epifauna (video)	x	x		x		x						all	Video	skills for operation of the device	no	yes	no	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pelagic	x	x		x								all	Trawl net	identification	dependent on the amount of sa	yes, except for pelagic tra	no	no	no					no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Megafauna																														
ESAS sampling (birds, sea mammals)	x	x		x								all	no	identification, knowledge of meth	yes (expert)	no	observation platform	yes						no			L			
Towed hydrophones	x	x		x								all	Towed hydrophone	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Habitat description																														
Camera (towed/dropped)						x						all	Towed/dropped camera	skills for operation of the device	no	yes	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Side-scan sonar						x						all	Side-scan sonar	skills for operation of the device	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Multi beam echosounder						x						all	Multi beam echosounder	skills for operation of the device	yes (expert)	no	data storage	yes	yes			x		no		T, EX, P			M	EX, F, EQ, P, T
Ground truthing						x						all	Grab/corer, sieve	knowledge on positioning of static	yes (expert)	yes	no	yes	yes	x	x			no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution																														
Floating litter										x		all	no	no	yes	no	observation platform	no	no					no			M	P	L	P, T, EX
Sinking litter										x		trawl and tv/video	no	no	no	no	no	no	no					no		no	M		L	P, T, EX
Pollution in the water column								x	x	x		all	dependent on variables being co	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes	x	x			no			M	EQ, P, T	L	P, T, EX
Pollution in the sediment								x	x	x		all	Grab/corer	skills for operation of the device	dependent on variables being cc	yes (deploy/recover)	dependent on variables being collected	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Pollution in organisms								x	x	x		trawl, acoustic and ichthyoplankton			dependent on variables being cc	no	dependent on variables being collected	yes	yes		x		x	no			M	EX, F, EQ, P, T	M	EX, F, EQ, P, T
Environmental conditions																														
Weather conditions							x					all	no	no	no	no	no	no	yes			x		yes	yes	no				
Sea state							x					all	no	no	no	no	no	no	yes			x		yes	yes	no				

Table 9. WKCATDAT 2012 table for the Swedish BITS surveys.



	MSFD descriptor related to												Preparation	During survey				After survey							Data Already Collected			If not already collected		If not already processed	
Task	1	2	3	4	5	6	7	8	9	10	11	Fisheries survey for data collection	Additional equipment	Additional skills	Extra personnel	Extra shiptime	Facilities	Additional personnel	Facilities	Lab facilities	Sample storage	Data storage	Analytical instruments	Analysis software	During survey	Is it used now/	Any add. Resources?	Effort required to collect data	Any add. Resources	Effort required to process	Any add. Resources
Fish																															
Organism collection (e.g. for contaminents, fatty acids a	x	x	x	x				x	x			trawl, BITS	no	no	no	no	sample storage	yes	yes		x	x	x		N			M	EQ,EX,T	M	EQ,EX,P
Stomach sampling	x		x	x								trawl, BITS	no	no	yes	no	preservation facilities	yes	yes		x	x			Occ	Y					
Additional biological data (e.g. liver/gonad weight, otolit	x	x	x	x				x				trawl, BITS	no	no	dependent on t	no	no	no	no		x	x			Y	Y	N				
Disease/parasite registration	x							x	x			trawl, BITS	no	knowledge of fish diseases	dependent on t	dependent on the amoun	no	yes	(yes)		x	x			Y	Y	N				
Genetic information	x		x									trawl, BITS	no	no	dependent on t	no	no	yes	yes		x	x	x		Occ	Y	N				
Lipid content				x								trawl, BITS	Fat meter; Calibration series for t	skills for operation of the device		no	no	no	no			x			N			M	EQ,EX,T	M	EQ,EX,P
Tagging			x									trawl, BITS	Tags and fish handling	tagging skills	yes	yes	fish handling facilities	yes	yes			x			Occ	N	N				
Bioactive materials in marine species																						x									
Echosounder observations pelagic fish	x	x	x	x								trawl, BITS	no	no	no	no	no	no	yes			x		x	Y	N	N			M	P,T
Physical and chemical oceanography (e.g. CTD, chlorophyll, oxygen, nutrients, turbidity, etc.)																															
Continuous underway oceanographic measurements (from the ship)							x					trawl, BITS	dependent on variables being c	skills for operation of the de	dependent on v	no	dependent on the device used	yes	yes			x			N			L	EQ,EX,P	L	EQ,EX,P
Station oceanographic measurements							x					trawl, BITS	no	no	no	no	no	dependent on variables being collected	yes			x			Y	Y	N				
Continuous underway oceanographic measurements (autonomous devices)							x					trawl, BITS	dependent on variables being c	skills for operation of the de	operation of th	yes (deploy/recover)	no	dependent on variables being collected	yes			x			N			L	EQ,EX,P	L	EQ,EX,P
Water movement							x					trawl, BITS	ADCP	skills for operation and analy	no	no	no	yes	yes			x			N						
Station nutrient samples					x							trawl, BITS	Water sampler	skills for operation of the de	no	yes (deploy/recover)	no	yes	yes		x				N			M	EQ,EX,F,P	M	EQ,EX,F,P
Biological oceanography																															
Station microbiological samples	x	x	x					x				trawl, BITS	Water sampler	skills for operation of the de	yes	yes (deploy/recover)	lab facilities, preservation facilities	yes	yes		x	x			N			L	EQ,EX,F,P	M	EQ,EX,F,P
Station phytoplankton samples	x	x	x		x			x				trawl, BITS	Water sampler	skills for operation of the de	no	yes (deploy/recover)	preservation facilities	yes	yes		x	x			N			L	EQ,EX,F,P	M	EQ,EX,F,P
Continuous phytoplankton samples	x	x	x		x			x				trawl, BITS	CPR, water sampler	skills for operation of the de	yes	yes (deploy/recover)	preservation facilities	yes	yes		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Station zooplankton samples (towed)	x	x	x					x				trawl, BITS	no	no	no	yes (deploy/recover)	preservation facilities	yes	yes		x	x	x		N			L	EQ,EX,F,P	M	EQ,EX,F,P
Station zooplankton samples (dipped)	x	x	x					x				trawl, BITS	no	no	no	yes (deploy/recover)	preservation facilities	yes	yes		x	x	x		Occ	N	N				
Continuous zooplankton samples	x	x	x					x				trawl, BITS	Echosounder at proper frequenc	skills for operation of the de	no	no	data storage	yes	yes		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Invertebrates																															
Infauna	x	x		x		x						trawl, BITS	Grab/corer; sieve	sorting	yes	yes	preservation facilities	yes	no		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Epifauna (towed)	x	x		x		x						trawl, BITS	Beam trawl/dredge/sledge	identification	dependent on t	yes, except for beam traw	no	no	no		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Epifauna (video)	x	x		x		x						trawl, BITS	Video	skills for operation of the de	no	yes	no	yes	no		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Pelagic	x	x		x								trawl, BITS	Trawl, seines and plankton nets	sorting and identification ski	dependent on t	yes, except for pelagic tra	no	no	yes		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Megafauna																															
ESAS (european seabird at sea) sampling (birds, sea mam	x	x		x								trawl, BITS	no	identification, knowledge of	yes (expert)	no	observation platform	no				x			N			L	P	L	P
Towed hydrophones	x	x		x								trawl, BITS	Towed hydrophone	skills for operation of the de	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x			N			M	EQ,P	M	P
Habitat description																															
Camera (towed/dropped)						x						trawl, BITS	Towed/dropped camera	skills for operation of the de	no	yes	data storage	yes	yes			x		x	N			M	EQ,EX,F,P	M	EQ,EX,F,P
Side-scan sonar						x						trawl, BITS	Side-scan sonar	skills for operation of the de	yes (expert)	yes (deploy/recover)	data storage	yes	yes			x		x	N			M	EQ,F,P	M	EQ,F,P
Multi beam echosounder						x						trawl, BITS	Multi beam echosounder	skills for operation of the de	yes (expert)	no	data storage	yes	yes			x		x	N			M	EQ,F,P	M	EQ,F,P
Ground truthing						x						trawl, BITS	Grab/corer, sieve	knowledge on positioning of	yes (expert)	yes	no	yes	yes			x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Pollution																															
Floating litter										x		trawl, BITS	no	no	yes	no	observation platform	no	no			x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Sinking litter										x		trawl, BITS	no	no	no	no	no	no	no			x			Y	Y	N				
Pollution in the water column								x	x	x		trawl, BITS	dependent on variables being c	skills for operation of the de	dependent on v	yes (deploy/recover)	dependent on variables being collected	yes	yes		x	x			N			M	EQ,EX,F,P	M	EQ,EX,F,P
Pollution in the sediment								x	x	x		trawl, BITS	Grab/corer	skills for operation of the de	dependent on v	yes (deploy/recover)	dependent on variables being collected	yes	yes		x	x	x		N			M	EQ,EX,F,P	M	EQ,EX,F,P
Pollution in organisms								x	x	x		trawl, BITS	Selected gear appropriate for sa	skills for operation of the de	dependent on v	no	dependent on variables being collected	yes	yes		x	x	x		N			M	EQ,EX,F,P	M	EQ,EX,F,P
Environmental conditions																															
Weather conditions							x					trawl, BITS	no	no	no	no	no	no	yes			x			Y	Y	N				
Sea state							x					trawl, BITS	no	no	no	no	no	no	yes			x			Y	Y	N				

ADDENDUM 1: WGBIFS BITS MANUAL 2013

Manual for the Baltic International Trawl Surveys

March 2013

Tartu, Estonia

ICES
International Council for the Exploration of the Sea
CIEM
Conseil International pour l'Exploration de la Mer

Conseil International pour l'Exploration de la Mer

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Contents

1 Introduction

First young fish trawl surveys in the Baltic Sea were carried out by Poland in 1962 (Netzel, 1974). Most of the Baltic countries also developed national trawl surveys during subsequent years. However, it was difficult to combine the results of these national surveys because the fishing gears, the realization of fishing hauls and the survey periods varied.

The first attempts to coordinate national surveys of the Baltic young fish were made in 1985 (ICES, 1985), and they were continued with varying intensity in subsequent years and, several attempts were made to determine the conversion factors among different fishing gears (Schulz and Grygiel, 1984; 1987, ICES, 1987; Oeberst and Frieß 1994, Oeberst and Grygiel, 2004). A robust method for compiling trawl survey data used in the assessment of cod inhabiting in the central Baltic Sea was developed by Sparholt and Tomkiewicz (2000). Authors applied generalized linear models to calculate the "fishing power" of national bottom trawls. The "fishing power" factors are used to transform the national catch per unit of effort into cpue-values of the former standard GOV trawl.

A further attempt to establish internationally coordinated trawl surveys in the Baltic Sea was made in 1995 (ICES, 1995). The first meeting of the ICES Working Group on Baltic International Fish Survey (WGBIFS; ICES 1996) considered the design of trawl surveys for cod assessment and started the development of bottom-trawl manual. The EU Study Project No. 98/099 (Anon. 2001a) provided funding for the development of new standard fishing gears (type TV3#520 and TV3#930). From autumn 1999, a number of fishery laboratories of the Baltic countries conducted inter-calibration experiments between national and new standard gear (ICES 2001a, 2003) and conversion factors between the new standard and the national gears were estimated (Anon, 2001a, ICES, 2002, Oeberst and Grygiel 2002, 2004, Lewy *et al.*, 2004).

New coordinated survey design was established in 2001. Stratified random trawl surveys use the ICES Subdivisions and their depth layers as strata to reflect the variability of the distribution pattern of target species. Besides the traditional survey in spring (15 February – 31 March) additional coordinated survey has been conducted in November since 2001. Different step for improving the survey design were realized between the different meetings of the WGBIFS. Because it was necessary that vessels work in areas where own experiences did not exist. The tow Database was established in 2001 and was improved based on the feedbacks from the realized surveys. This Tow Database contains positions where demersal trawls can be realized with the standard gears in the Baltic Sea. The different steps for planning and realizing the surveys and for estimating stock indices were documented in the reports and in the Manual of the Baltic International Trawl Survey (BITS).

2 The fishing method

2.1 Main target species

The international coordinated trawl surveys are directed to the demersal species i.e. cod and flounder and other flatfish in the Baltic Sea, however in the recent two years other species are also intensively investigated to support ecosystem analyses. Baltic Sea with the ICES Subdivisions and rectangle codes are given in the **Annex 1**. **Annex 2** presents the assignment of quarter of rectangles to the ICES Subdivisions. **Annex 12** presents the list of fish species relatively frequently recorded in the research control-catches, and which are used in the DATRAS checking program.

2.2 Survey periods

National parts of the international coordinated fish surveys should be carried out in the first quarter between 15 February and 31 March (spring survey) and in the fourth quarter between 1 and 30 November (autumn survey).

2.3 Survey area and stratification of the Baltic Sea

The total distribution area of cod should be covered by the BITS trawl survey. It was agreed by the responsible ICES WGBIFS that the ICES Subdivisions 22–28 should be covered with fish control-hauls during the trawl surveys because the stock size of the eastern Baltic cod is relatively low and is currently concentrated in the ICES Subdivisions 25–26. Expansion of the area under investigation in northern areas of the Baltic Sea (ICES Subdivisions 29–32) is possible dependent on the development of the eastern Baltic cod stock size and its spatial distribution pattern.

The international trawl surveys are carried out in form of a stratified random survey. The ICES Subdivisions and depth layers within an ICES Subdivision are used as strata. Only depth layers from 10 to 120 m depending on the ICES Subdivision are covered by the surveys. The areas aggregated on 10-m depth layers per the ICES rectangle are given in **Annex 3**. Following strata are used:

ICES Subdivision	**Strata**
22	10 – 39 m
23	10 – 39 m
24	10 – 39m, 40 – 59 m
25	20 – 39 m, 40 – 59 m, 60 – 79 m, 80 – 99 m
26	20 – 39 m, 40 – 59 m, 60 – 79 m, 80 – 99 m, 100 – 120 m
27	20 – 39 m, 40 – 59 m, 60 – 79 m, 80 – 99 m, 100 – 120 m
28	20 – 39 m, 40 – 59 m, 60 – 79 m, 80 – 99 m

2.4 Fishing gears

The TV-3 bottom trawl must be used as standard fishing gear during the BITS surveys in the Baltic Sea. Two types of the TV-3 trawl were developed for different sizes of research vessels, one small of 520 meshes and one large of 930 meshes in circumference. The description and use of the trawls are given in **Annexes 4 and 5,** respectively. These trawls have been used since 2001. The small standard trawl type TV-3#520 should be used for vessels up to around 800 HP and the larger standard trawl type TV-3#930 for vessels with higher towing power.

Small adaptation of large TV-3 was carried out by Denmark, which added a stone panel to reduce the danger of trawl damage by large stones.

It was agreed by WGBIFS that the Denmark and Germany realize all hauls in the ICES Subdivisions 22–24 in order to reduce the effects of the conversion factors between the small and large version of the new standard trawls. Vessels of both countries (RV "Havfisken" and RV "Solea") use the small version of the standard trawl. The large version of the standard trawl is used by Denmark (RV "Dana"), Poland, Russia and Sweden in the ICES Subdivisions 22–28. The ICES Subdivision 28 and small part of the ICES Subdivision 26 are covered by Estonia, Latvia, and Lithuania, which also use the small version of TV-3.

Quality control

During use, the trawls shall be checked at regular intervals by taking a number of check measurements on the geometry of the trawl. The intervals and a list of check measurements are given in the detailed trawl specifications in the **Annexes 4 and 5**.

2.5 Fishing operation

The haul shall be performed using a standard towing speed of 3 knots. The speed should be measured as the speed over the ground.

The duration of the standard haul is 30 minutes (**for the DATRAS Database each single catch should be normalized to catch per 1 hour**). Start time is defined as the moment when the vertical net opening is stable at the stated towing speed and the gear has bottom contact. Stop is defined as the starts of hauling back the trawl.

Trawling shall only take place during daylight, defined in the checking program as the time between 15 minutes before sunrise until 15 minutes after sunset.

Quality control

The horizontal distance between the upper wing-ends must be monitored if possible during the whole tow. The following table gives the limits of the wing-end distance and the corresponding height of the trawl at the centre of the headline.

Trawl measurements at 3 knots in metres	Distance between upper wing-ends	Approximate corresponding height at centre of headline
TV-3, #520 meshes	13.5 – 14.5	2.2 – 2.5
TV-3, #930 meshes	26 – 27	5.5 – 6.5

2.6 Allocation of trawl stations

The aim of the trawl surveys is to cover the main distribution area of the target species - cod and flounder. For allocating the planned stations to the different strata the size and spatial distribution pattern of cod are used. Besides the size of both Baltic cod stocks, the actual hydrographical conditions may influence the spatial distribution of the target species. These aspects should be considered during the process of allocation of hauls to the different strata. However, the relationship between the hydrographical parameters and the cod distribution cannot be accurately described at this date. Furthermore, the hydrographical conditions during the surveys cannot be predicted. Therefore, it was agreed that the number of planned stations should be distributed dependent on the size of the areas of the ICES Subdivisions and using depth range from 10 to 120 m. The significant decrease of the eastern Baltic cod stock in the period 1985–1990 suggests that the trawl stations should be also allocated according to the distribution and density pattern of the cod stocks. It was agreed during the WGBIFS meeting in February 2001 that a running 5 years mean of the cpue derived from the BITS survey in spring should be used for describing the distribution of cod.

The factors - area of the ICES Subdivision, and distribution pattern of cod - are used with different weights. A weighting factor of 0.6 was defined for area, and a weighting factor of 0.4 was defined for mean distribution of cod (running 5 years mean). The running mean of the cod (age-group 1+) cpue should be adapted every year based on the results of spring surveys. The same weights were used for the parameters - area and running mean of the distribution patter - for allocating the number of stations in all the depth layers for the different ICES Subdivisions. The areas by rectangle, in nm^2 of 10 m depth layers are given in **Annex 3.**

In the first step, the numbers of planned stations of all participating countries are summarized for the western Baltic region (ICES Subdivisions 22–24) and for the eastern region (ICES Subdivisions 25–28). Then the total number of planned trawl stations is allocated to subdivisions according to the area and the 5 years running mean as mentioned above for each region. The number of planned stations of each the ICES Subdivision is then allocated to the depth layers.

2.7 Fishing positions

The new survey design which was introduced in 2001 requires that vessels work in areas where they have not experience with the bottom types and possible dangers for the trawls like rocky bottom, wrecks etc. Furthermore, large areas are closed for fishing activities in the Baltic Sea as a result of munitions, electrical cables, gas pipelines, dense ships traffic etc. Therefore, the Tow Database was established. These database contains all positions where demersal trawls can be successfully realized with the different versions of the standard gear. The feedbacks from the surveys of the last years were used to update and improve the quality of the Tow Database. Unfortunately, the available haul positions are heterogeneously distributed in many depth layers. Therefore, it is not possible to use a generator of equally distributed random numbers to select hauls from the Tow Database for a planned survey because such algorithm produces a biased selection as a result of different probability of areas to come into the selected pool of hauls (ICES, 2002; 2003). Method for selecting hauls from the Tow Database was proposed in 2003 (Oeberst, 2003). The working group WGBIFS stated in 2004 (ICES, 2004) that the proposed method is suitable to solve the problem of heterogeneity of hauls which are available in the Tow Database. The analyses have revealed that the use of a unit size of 10’N x 20’E is the best compromise for the trawl surveys in the Baltic Sea if it is taken into account that the same unit size should be used for selecting hauls in depth layers of all ICES Subdivisions. The first step of selection haul position from the Tow Database for a given depth layer of an ICES Subdivision is a random selection of a unit within the same depth layers where a generator of equally distributed random numbers is used. Then one of the haul positions within the selected unit is randomly selected.

The selected hauls are assigned to the participating countries in such a way that the distance between the planned hauls is minimal as possible and that the national zones are covered if possible. When the selected stations cannot be realized as a result of wrecks, gillnets, navy military training or other reasons the hauls should be realized in the same depth layer as close as possible to the selected station.

Selected hauls should be omitted in the case when the results of at least two stations in the same depth layers have revealed that fish not appeared in the zone which was covered by the net opening and when hydrographical observations have revealed that oxygen content is less that 1.5 ml/l in the layer of vertical net opening. However, it is necessary that datasets must be added to the DATRAS database with the haul position and the validity code "N" to avoid biased estimated of the stock indices in the depth layer.

2.8 Tow Database

The use and the reworking of the Tow Database have demonstrated that changes of the structure can improve the handling of the database and can make the structure more understandable. Therefore, the structure of the Tow Databases was partly changed until 2005. The structure is given in the subsequent table.

The first column contains the notation of the survey where the station was used the last time. The haul number (HrHaul) summarizes two parts. The first two digits present the number of the ICES Subdivision. The following three digits present the number of haul in given the ICES Subdivisions. The two next columns contain the notation of the rectangles and of the ICES Subdivision. Then follows the latitude of the first position is stored in two columns (degree and minutes separately) followed by the longitude of the first position (degree and minutes separately). This structure is used for all possible ten positions of the hauls. Then the depth data are given. The first value presets the mean depth of the haul in metre. This value is used for the assignment of the haul to the depth stratum. Then up to ten depth data in metre can be stored. The column "source" informs wherefrom the data were made available. The column "TV3" is used to store the countries, which have already realized the stations. These data are used for assigning the selected stations to one of the participating countries. The next column informs whether a standard groundrope can be used (1) or the rock-hopper equipment (2) must be used. Then the main direction of the haul (zero – main direction from west to east) and the distance between the first and last position of the haul in nm follow.

Column	Structure of Tow Database – valid since autumn 2004			
A	Last realization			Q404
B		NrHaul		28002
C		Rectangle		42H0
D		ICES SD		28
E	1. position	Latitude	Degree	56
F			Minutes	36.5
G		Longitude	Degree	20
H			Minutes	41.3
I	2. position	Latitude	Degree	56
J			Minutes	36.9
K		Longitude	Degree	20
L			Minutes	41.9
M	3. position	Latitude	Degree	56
N			Minutes	37.2
O		Longitude	Degree	20

Column	Structure of Tow Database – valid since autumn 2004			
P			Minutes	42.6
Q	4. position	Latitude	Degree	56
R			Minutes	37.6
S		Longitude	Degree	20
T			Minutes	43.2
U	5. position	Latitude	Degree	0
V			Minutes	0
W		Longitude	Degree	0
X			Minutes	0
Y	6. position	Latitude	Degree	0
Z			Minutes	0
AA		Longitude	Degree	0
AB			Minutes	0
AC	7. position	Latitude	Degree	0
AD			Minutes	0
AE		Longitude	Degree	0
AF			Minutes	0
AH	8. position	Latitude	Degree	0
AI			Minutes	0
AJ		Longitude	Degree	0
AK			Minutes	0
AL	9. position	Latitude	Degree	0
AM			Minutes	0
AN		Longitude	Degree	0
AO			Minutes	0
AP	10. position	Latitude	Degree	0
AQ			Minutes	0
AR		Longitude	Degree	0
AS			Minutes	0
AT				
AU		Mean depth	Metre	38
AV	1. position	Depth	Metre	0
AW	2. position	Depth	Metre	0
AX				0
AY				0
AZ				0
BA				0
BB				0
BC				0
BD				0
BE	10. position		Metre	0
BF		Source	Latvia	
BG		TV3		L
BH		Ground	rope	1
BI		Direction		0

3 Sampling of trawl catches

The following guidelines are to be used for each haul during the survey. All forms should be filled in using a pencil in order to allow correcting and stay waterproof if not using electronic registration. The working up of the catch can be seen as a number of processes succeeding each other.

3.1 Estimating the total mass (weight) of the catch

Purpose

Measurement or estimation of the total mass of the fish and “other” caught in the given haul.

Methods

The total catch mass (weight) of haul can be estimated by one of the following methods.

1. Weighing the total catch by use of a sea compensated balance.
2. Counting the number of standard filled baskets/boxes. The average weight of the baskets/boxes is estimated by weighing at least five random selected baskets/boxes.
3. By adding up the total estimated mass or weighed mass of each species (will often be achieved during an estimation of the species composition).

The results are recorded in kilograms.

3.2 Estimating of the catch by species

Purpose

Measurement or estimation of the total mass (weight) and number of specimens of given species in catch.

Methods

Total catch should be sorted out by species, storing different species separately in boxes or baskets for further analyses. In order to simplify further working up of the catch, only boxes or baskets of same size and material should be used.

Certain species that are hard to distinguish from each other may be grouped by genus or higher taxonomic units.

In cases of exceptionally large catches (e.g. over 500 kg) or other circumstances which do not allow the sorting of total catch, the species composition should be estimated using subsampling.

The procedure for subsampling is one of the following depending on the circumstances:

1. If all species appear fairly frequently in the catch, simultaneous subsampling of all species in the whole catch should be used:
   A. Three subsamples each weighing app. 100 kg’s, depending of the impression of the species included in the catch are sorted by species. The samples must be taken from the first, middle and last sections of the trawl codend. Be

aware of, that the three subsamples together should represent the whole catch.

B. Each species from the three subsamples are pooled and each species are weighed separately. The weights are recorded.

C. The total mass (weight) of all species (c) in the three subsamples is estimated by adding the weight of the three samples.

D. The total catch mass (weight) of each species is estimated by raising the subsample mass for a given species with the ratio between the total catch weight and the summed mass of all subsamples.

E. All total and subsample masses (weights) are recorded.

2 If some species appears in very small numbers in the catch, although other species appears in large numbers, subsampling of only the frequent species in the catch may be applied.

A. The species appearing with low frequency are sorted out of the whole catch by species and weighed.

B. The rest of the catch is treated as specified in method 1.

C. All total and subsample masses (weights) are recorded on the species-form.

Non-fish species should be recorded as well. This group might be grouped and recorded as invertebrates, botanicals or just “Other1”. Non-organic material (stones, barrels etc.) should be recorded as “Other2”.

The sorted and weighed fish are then used for the following **length, age, sex and maturity sampling**.

3.3 Length composition

Purpose

Measurement or estimation of the absolute or relative length frequency by species.

Methods

Length distribution should be recorded at least for main species like cod, herring, sprat and flatfish however, is strongly recommended to perform the length measurement for all detected species, and transfer the data to the ICES DATRAS database.

If the number of a given species does not significantly exceed the number recommended in the table below all individuals are measured.

If the number of individuals of a given species significantly exceed the number recommended in the table below the following procedure must be adapted:

1. All individuals of a given species in the catch are subdivided into a number of subsamples. Each subsample should approximately have the size, which is recommended in the table below.
2. One of the subsamples is randomly selected for length measurements.

Always measure the whole subsample. Never stop in the middle because you have realized that your subsample is too large. In most cases, a biased length distribution will be the result.

If you realize that, your subsample is too small then randomly selects another of the subsample and continue obtaining the length frequency measuring all of it. If you must, divide this subsample into a number of sub-subsamples and continue the measuring procedure by measuring one or more randomly selected sub-subsamples completely).

Length of the fish is defined as total length (measured from the tip of the nose to the tip of caudal fin).

Length is measured to 0.5-cm below for herring and sprat (e.g. lengths in the range of 10.0–10.4 cm are equal to 10.0-cm class and lengths 10.5–10.9 cm is equal to 10.5-cm class). For all other species the length is measured to 1-cm below, (e.g. lengths in the range of 20.0–20.9 cm are equal to 20.0-cm class).

If a certain species is caught in two clearly distinct size categories, both of these size categories should be sampled separately. The number of fish from each sample should follow the sample sizes given below.

Minimum number of individuals to be length measured (in sample or subsample):

Number of length-classes	Number of individuals
1 - 10	100
11 - 20	200
more then 20	300

The relation between number of length-classes of the total length range and the number of individuals to be measured is illustrated in Figure 1 (Müller, 1996).

During the length measurements, the number of fish of each species per length group, as specified either in the table above or Figure 1, are collected and stored separately by the length-groups for age, sex, individual mass and maturity estimations.

To improve the data of flounder, plaice, turbot, dab and brill, sex separated length distribution and maturity information are needed. Therefore, it is recommended that this be done on the BITS survey. Each country should obtain at least 20 specimens per length class per ICES Subdivision, per survey. However, the standard biological analysis can be carried out for each sex for the same purpose.

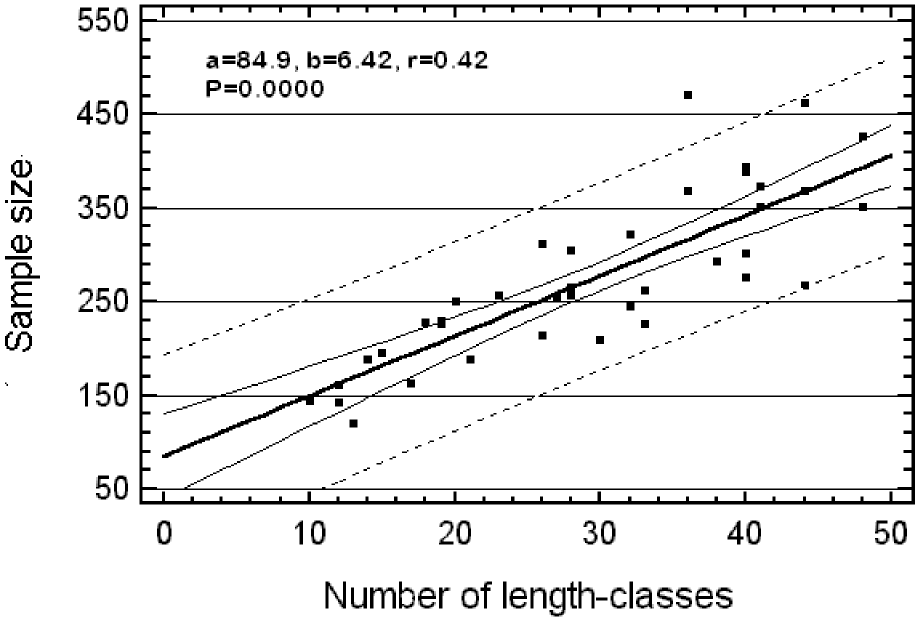

Figure 1. Relationship between the number to be measured and the number of length groups of the total length range in the sample of the catch (after Müller, 1996).

3.4 Age, sex, individual mass (weight) and maturity sampling procedure

Purpose:

Estimation of the fractions of age-groups, sex ration, mass and fractions of the different maturity stages by length-class and species.

Age, sex, mass and maturity estimates are at least required for the main target species:

- cod
- *flounder*

However, the same data should be sampled for herring, sprat and flatfish only when capacities are available.

The complete number of age determinations is used to establish age–length-keys (ALK) by the ICES Subdivision and quarter. ALKs are used for converting the length distribution of given aggregation level into an age distribution. The determination of sex and maturity stage is done to produce maturity ogives for estimating the Spawning-stock biomass (SSB). The individual mass is used for calculating the mean mass per length class, to convert catch in weight into catch in numbers and the mean mass of age-groups for calculating the SSB and total biomass. Apart from the mentioned purposes, there might be additional purposes (identifying stock components etc.).

If one country realizes less than 5% of the total number of hauls made by all countries in an ICES Subdivision then collection of fish age samples is not necessary.

Methods

The fish samples are collected based on country, quarter and the ICES Subdivision stratification.

It is recommended that each country collect otoliths by each haul to make safe that sampled otoliths come from all parts of the ICES Subdivision.

The procedure of re-measuring the fish, weighing, estimating of sex, maturity stage and the cutting of otoliths might be made most efficient at one work-procedure for each individual in the above-mentioned sequence.

Consequently, the number of fish selected for estimating of sex, maturity stage and cutting of otoliths are equal.

It is recommended sampling flounder regularly for sex, maturity, age and length and applying the slicing and staining or the burning and breaking methods to determine the age. Reading whole otoliths is not considered as appropriate.

Estimating individual/mean mass (weight)

After length measuring the individual mass of each fish is weighed and recorded. If it is impossible to achieve the individual weight, the number and total mass of group of individuals with the same length are recorded to calculate the mean mass of the individuals in the length class. The mass (weight) is estimated by use of an electronic balance. The mass (weight) is measured in grammes. A minimum of five specimens must be weighed although less is used for cutting of otoliths.

Estimation of sex and maturity stage

The abdomen of each individual is cut open and the gonads are examined in order to estimate the sex. If the individual is mature, the sexes can easily be distinguished, but for immature individuals the task is difficult and special literature about the subject have to consult.

In the same process, the maturity stage is determined according to the classification description of the different stages given in **Annex 6** or according to the code practised on the national level. If a national code is used the national coding must be converted into the BITS 5 stage code according to **Annex 7** before the data are submitted to ICES Data Centre. If a common reference collection of maturity is established, this should be used.

Cutting of otoliths

The technique for cutting otoliths depends on the species. For descriptions of these techniques, please consult the literature about the subject.

The optimum number of otoliths per length class and the ICES Subdivision cannot be given in a universal form. A description of the optimum sample size of age readings and length measurements dependent on a universal cost function is given paper prepared in Oeberst (2000).

The analyses showed that the necessary number age readings in a length class depend on:

- the portion of the length class within the length frequency,
- the maximum variance of the portions of the age-groups within the length class.

The table below gives the minimum number of otoliths by length class, which must be cut per country, survey, the ICES Subdivision and species based on the length distribution.

Length-class	**Minimum number of age readings**
With probably only one age-group (age-group 0, 1)	2 to 5
With probably more than on age-group	
Portion of the length class less than 5%	10
Portion of the length class more than 5%	20

Because the collection of the otoliths should be distributed over the whole survey time in the ICES Subdivision, the actual length frequency of the survey can be used to choose the number of otoliths per length-class. If this is not possible, the length frequency from the last 1 to 3 surveys in the same Subdivision and quarter should be used.

The otoliths may be:

1) read during the survey, if proper facilities and experienced age readers are available on board; store the otoliths in ice-boxes, envelopes or other suitable containers,

2) stored for later age determination.

In both cases, the containers must be labelled with indication of: species, cruise number, date, ICES Subdivision, length class.

4 Environmental data

Purpose

Measurements of environmental parameters, which might influence the temporal and spatial distribution of the different species.

Methods

As minimum following hydrographical data should be collected at each station:

- seawater temperature and salinity in the surface layer,
- seawater temperature, salinity and oxygen content in the bottom layer.

The sampling procedure of the hydrographical data should be implemented according to the standards specified by the ICES. If possible, the CTD profiles from the surface to the bottom should be sampled. These data should be delivered to the ICES oceanographers.

5 Estimation of stock indices

5.1 Stock indices

Following notations are used for describing the algorithms.

$c_{l,h,s,t}$ denotes the catch per hour of species with length l, in haul h of strata s captured with trawl type t. The number of trawl stations in strata s is denoted by n_s, and A_s denotes the area of strata s.

To combine the cpue values of both the new standard gears conversion factors were estimated based on inter-calibration experiments (literature). The conversion factors ($conf_t$) are used to transform the cpue values of trawl type t in standard cpue's which are expressed in units of the larger TV-3.

$$C_{l,h,s} = c_{l,h,s,t} * conf_t$$

Different ways are possible the aggregate the data of the hauls in stock indices by age-group and the ICES Subdivision. One option is that $C_{l,h,s}$ are transformed in cpue by age-group for each haul $C_{a,h,s}$. where a denotes age-group. Then the means by depth layers and the ICES Subdivision are estimated. Second way which is described here estimates the means by depth layer and the ICES Subdivision by length classes. The mean length frequency of the stock in the subdivision is then transformed in stock indices by age-groups. Both ways estimates the same stock indices.

Using the $C_{l,h,s}$ the mean standardized cpue of species with length l in strata based on ns hauls by depth layers is estimated.

$$\overline{C}_{l,s} = \frac{1}{n_s} \sum_{k=1}^{n_s} C_{l,k,s}$$

The stratified mean of the ICES Subdivision by length class ($\hat{C}_{st,l}$) uses the areas of the strata (depth layer) as weighting factors and can be calculated by:

$$\hat{C}_{st,l} = \frac{1}{\sum_s A_s} \sum_s A_s \overline{C}_{l,s} .$$

$\hat{C}_{st,l}$ presents the length distribution of the stock in the ICES Subdivision.

The variance (V) of $\hat{C}_{st,l}$ can be estimated by:

$$V(\hat{C}_{st,l}) = \frac{1}{(\sum_s A_s)^2} \sum_s A_s^2 V(\overline{C}_{l,s}) / n_s$$

where $V(\overline{C}_{l,s})$ presents the variance of the cpue values by length interval in strata s.

The mean length frequency in the ICES Subdivision can then be transformed in cpue vales by age-group using the data of ALK key.

X_{la} may be the number of aged individuals with length l and age a and

$X_{l.} = \sum_a X_{ja}$ denotes the total number of individuals aged in length class l.

Proportion of age-group a in the stock can be estimated by

$$p_a = \sum_l \frac{\hat{C}_{st,l}}{\sum_l \hat{C}_{st,l}} \frac{X_{la}}{\sum_j X_{la}}$$

Stock index of age-group a, C_a, is estimated by

$$C_a = p_a \sum_l \hat{C}_{st,l}$$

5.2 Weight at age

Weight of individuals, which is stored in CA data, are used to estimate mean weight-at-age where weight samples are stratified by length class. Mean weights per length class must be used for converting the length distribution of the cpue on a given aggregation level, X, (as depth layer or ICES Subdivision) into mean weight-at-age (ICES, 2002).

$\overline{W_{l,a}}$ donates the mean weight of individuals in length class l with age a based on CA data of the used aggregation level. Missing mean weights of length class where $\overline{C_{X,l}}$ exist are substituted by the length-weight relationship of the corresponding data.

$$W = kL^b$$

where k and b denote the parameter of the length-weight relationship.

Mean weight-at-age, $\overline{W_a}$, of the aggregation level is calculated by

$$\overline{W_a} = \frac{\sum_l \overline{W_{a,l}} * \overline{C_{X,l}}}{\sum_l \overline{C_{X,l}}}$$

Criteria for calculating mean weight-at-age:

__No missing age values
__No missing weight values
__Both valid and invalid data

Selections:

__Year
__Survey
__Aggregation level (depth layer or subdivision)
__Species

5.3 Maturity-at-age

The maturity ogive is calculated as the fraction of mature fish at age-group a chosen aggregation level, X, (depth layer or ICES Subdivision). Mean fraction of matured fish per length class must be used for converting the length distribution of the cpue on a given aggregation level, X, (as depth layer or ICES Subdivision) into mean fraction of matured individuals at age (ICES, 2002).

In the DATRAS system, the maturity stages have the codes from 1 to 6, where 1 - is immature and 2 – resting, 3–5 are different stages of mature fish, 6 – fish with abnormal gonads development, e.g. as a result of diseases, atresia or intersexes. To create maturity ogive the codes 1 to 6 is transferred into a two aggregated codes – mature (M) and immature (I; Annex 6).

Currently, the information on fish maturity should be uploaded to DATRAS database according to the national scale, and next the ICES Data manager will convert these data to needed scale level, however the table with proposed conversion data should be delivered by particular countries.

$N_{M,l,a,s}$ denotes the number of matured individuals in length class l with age a and sex s and $N_{I,l,a,s}$ denotes the number of immature individuals in the same length class and age-group with the same sex.

The fraction of matured individuals by length class, age-group and sex can be estimated by

$$p_{M,l,a,s} = \frac{N_{M,l,a,s}}{N_{M,l,a,s} + N_{I,l,a,s}}$$

Missing $p_{M,l,a,s}$ of length class l is substituted by

$$p_{M,l,a,s} = (p_{M,l-1,a,s} + p_{M,l+1,a,s})/2$$

with

$p_{M,a,l,s} = 0.0$ for total length smaller than 20 cm and

$p_{M,a,l,s} = 0.95$ for individuals larger than 60 cm or

$p_{M,a,l,s}$ of the nearest neighbour when more than one length-class are missing.

The fraction of matured age-group a for a given aggregation level X, $p_{M,X,a,s}$ can be calculated by:

$$p_{M,X,a,s} = Ogive_{M,X,a,s} = \frac{\sum_l p_{M,X,l,a,s}\overline{C}_{X,l}}{\sum_l C_{X,l}}$$

Criteria for creating of maturity ogive:

__No missing age values
__No missing maturity values
__Both valid and invalid data

Selections:

__Year
__Survey
__Aggregation level (depth layer or subdivision)
__Species

6 Exchange specifications for the Baltic International Trawl Survey data

Data of BITS are used for estimating different stock indices and stock parameters for Baltic cod and flounder. For this purpose DATRAS system was developed which stores the sampled data, checks the data quality by screening tools and estimates different stock parameters. It was agreed by WGBIFS that participating countries submit all data in DATRAS exchange format to the ICES Secretariat in Copenhagen.

6.1 Deadlines of reporting

It was agreed that data should be submitted to the following deadlines:

Data	Deadlines
Preliminary data 1q (HL and CA records only for cod, flounder, herring, sprat)	Before WGBFAS in April
Final data 1q	1 June
Final data 4q	1 April

The option of submitting preliminary data of the first quarter survey was made available to support the assessment working group with newest data. In some cases, it is not possible to prepare final version of the data because the surveys finished late in March and the ICES assessment working group (WGBFAS) starts on the beginning of April. However, it is pointed out that final data should be available until the agreed deadline.

6.2 Screening of data

Before the data (in ASCII coding) are submitted to the ICES Secretariat, they should be checked by the screening program available from the ICES Secretariat. It can be found in the website (www.ices.dk/datacentre/datsu/selrep.asp). Checks, which are realized during the data screening, are given on the same website of the ICES. Furthermore, the CA data should be screened based on ICES and additional agreed tools, which are defined by WGBIFS.

6.3 Format of data

Three distinct types of computer records have been defined for standard storage of the DATRAS data:

HH:	Record with detailed haul information
HL:	Length frequency data
CA:	Sex-maturity-age–length keys (SMALK's) for the ICES Subdivision.

The detailed formats of these three record types are given Sections 6.4.1 - 6.4.3 of the present manual. For the reference, codes please check ICES website http://www.ices.dk/datacentre/reco/.

Details of environmental data should be submitted to the Hydrographic Service of ICES according to established procedures. The national hydrographical station number should be reported in record type HH to allow the link to be made between haul data and environmental data.

6.4 File structure and name

When delivering the data to the ICES Secretariat one file should only contain data from one year and one survey. The name of the file should be contains month (the first day of the survey), country (ICES country code) and year, e.g. 03EST98.csv. Later corrections and updates are possible after that the data are uploaded.

The records must be ordered in such a way that each record of TYPE HH be followed by all records of TYPE HL of the same haul, ordered by species. The number and kind of species recorded must agree with the species recording code as specified in record TYPE HH. For examples of the various codes, see **Annex 5**.

Records of TYPE CA should follow at the end of the file after the last species record of TYPE HL for the last haul.

6.4.1 Record type HH

Mandatory Record HH Haul Information, fields are separated by comma

Field	**Start**	**Width**	**Mandatory**	**Key**	**Range**	**Comments ICES website**	**Example**
RecordType	1	2	✓	char	HH	Fixed value: HH	HH
Quarter	2	1	✓	int	1 to 4		1
Country	3	3	✓	char	See Annex 8	TS_Country	GFR
Ship	4	4	✓	char	See Annex 8	TS_Ship	SOL
Gear	5	6	✓	char	See Annex 9	Gear	TVS
SweepLngt	6	3		int	0 to 999.0		-9
GearExp	7	2		char		TS_GearExp	S
DoorType	8	2		char		TS_DoorType	-9
StNo	9	6	✓	char		National coding system Coding system of Tow Database	22005
HaulNo	10	3	✓	int	1 to 999	Sequential numbering by cruise	1
Year	11	4	✓	char	1900 to 2099		2008
Month	12	2	✓	Int	1 to 12.0		11
Day	13	2	✓	Int	1 to 28/29/30/31		12
TimeShot	14	4	✓✓	char	0001 to 2400	In UTC	0830
Stratum	15	4		char		TS_DepthStratum	-9
HaulDur	16	3	✓	int	0 to 90*)	In minutes	30
DayNight	17	2	✓	char	D, N	TS_DayNight (link tolNOAA website)	D
ShootLat	18	8	✓	decimal4	53.0000to 66.0000	Shooting latitude in decimal degrees	54.4248
ShootLong	19	9	✓	decimal4	9.0000 to 30.0000	Shooting longitude in decimal degrees	10.7238
HaulLat	20	8	✓	decimal4	53.0000 to 66.0000	Hauling latitude in decimal degrees	54.4052

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
HaulLong	21	9	✓	decimal4	9.0000 to 30.0000	Hauling longitude in decimal degrees	10.7532
StatRec	22	4		char	See Annex 1		36G0
Depth	23	4	✓	int	5 to 300, -9	Depth from surface in metres, -9=not known	18
HaulVal	24	1	✓	char	I, V, N, C, A, M	Invalid =I, Valid =V or no oxygen = N, C = calibration, A=additional haul, M=pelagic haul TS_HaulVal	V
HydroStNo	25	8	✓	char		Station No as reported to the ICES hydrographer	22005
StdSpecRecCode	26	1	✓	char	See Annex 10	Use position 26 for standard and 27 for bycatch codes TS_StdSpecRecCode	1
BycSpecRecCode	27	1	✓	char		TS_BySpecRecCode	1
DataType	28	2	✓	char		TS_DataType	R
Netopening	29	4		decimal1	1.5 to 10.0	in metre	-9
Rigging	30	2		char		*Not used in this format*	-9
Tickler	31	2		int		*Not used in this format*	-9
Distance	32	4		int	0 to 9999.0	Distance towed over ground (m)	2896
Warplngt	33	4		Int	75 to 999	in metre	100
Warpdia	34	2		decimal1	10.0 to 60.0	in millimetre	-9
WarpDen	35	2		decimal2	0.50 to 2.00	See BITS manual	-9
DoorSurface	36	4		decimal1	1.0 to 10.0	in square metres	-9
DoorWgt	37	4		int	50 to 2000	in kilogramme	-9
DoorSpread	38	3		int	48 to 180	in metre	-9

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
WingSpread	39	2		int	12 to 30		-9
Buoyancy	40	4		int	50 to 220	in kilogramme	-9
KiteDim	41	3		decimal1	0.5 to 2.0	in square metre	-9
WgtGroundRope	42	4		int	0.0 to 800.0	in kilogramme	-9
TowDir	43	3		int	1 to 360, 999	999=varying	148
GroundSpeed	44	3		decimal1	2.0 to 6.0	ground speed of trawl in knots	-9
SpeedWater	45	3		decimal1	1.0 to 9.0	trawl speed through in knots	-9
SurCurDir	46	3		int	0 to 360	Slack water =0	-9
SurCurSpeed	47	4		decimal1	0.0 to 10.0	metres per sec	-9
BotCurDir	48	3		int	0 to 360	slack water =0	-9
BotCurSpeed	49	4		decimal1	0.0 to 10.0	metres per sec	-9
WindDir	50	3		int	0 to 360, 999	0 = calm, 999=varying	273
WindSpeed	51	3		int	0 to 100	metres per sec	6
SwellDir	52	3		int	0 to 360.		-9
SwellHeight	53	4		decimal1	0.0 to 25.0	in metre	-9
SurTemp	54	4	✓	decimal1	-1.0 to 30.0	in °C	11.0
BotTemp	55	4	✓	decimal1	-1.0 to 20.0	in °C	12.5
SurSal	56	5	✓	decimal2	5.00 to 30.00	in PSU	18.43
BotSal	57	5	✓	decimal2	5.00 to 30.00	in PSU	24.31
ThermoCline	58	2		char		TS_ThermoCline	-9
ThClineDepth	59	4		int	5 to 100	in metre	-9

***) 15 to 90 minutes if the validity code is "V". Zero minutes if the haul validity is "N". Zero to 90 minutes if haul validity is "I".**

Following changes were recommended by the WGBIFS (meeting in Lysekil; 30.03.-03.04.2009) in record type HH:

The variable is separated into two variables: H_Val ("V"=Valid, "I"=Invalid) and Station_type ("S"= Standard haul, "C"=Calibration haul, "N"=No oxygen at bottom (assumed zero catch), "A"= additional haul not allocated according to standard haul allocation procedure, "M"= trawling in the pelagic zone with midwater trawl).

The selection of which stations should be included in calculation of standard indices for assessments will then be defined based on the combination of the two information types by the following rules:

included= “V” and (“S” or “N”),

not included= “I” and/or (“A”, #M” or “C”)

6.4.2 Record type HL

Mandatory Record HL Length frequency distribution, fields are separated by comma

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
RecordType	1	2	✓	char	HL	Fixed value: HL	HL
Quarter	2	1	✓	int	1.0 to 4.0		4
Country	3	3	✓	char	See Annex 8	TS_Country	GFR
Ship	4	4	✓	char	See Annex 8	TS_Ship	SOL
Gear	5	6	✓	char	See Annex 9	Gear	TVS
SweepLngt	6	3		int	0 to 999		-9
GearExp	7	2		char		TS_GearExp	S
DoorType	8	2		char		TS_DoorType	-9
StNo	9	6	✓	char			22005
HaulNo	10	3	✓	int	1 to 999		5
Year	11	4	✓	char	1900 to 2099		2008
SpecCode Type	12	1	✓	char	T	T - TSN code TS_SpecCodeType	T
SpecCode	13	10	✓	char	See Annex 12	Official TSN code	161722
SpecVal	14	2	✓	char	See Annex 11	TS_SpecVal	1
Sex	15	2		char	F, M, U, -9	Male = M, Female =F, Unsexed = U, -9=unknown, TS_Sex	-9
TotalNo	16	9		decimal 2	1.00 to 9999999.00	No specimen caught per hour	56
CatIdentifier	17	2	✓	int	1 to 5		1
NoMeas	18	4	✓	int	1 to 5000		56
SubFactor	19	9	✓	decimal 4	1.0000 to 1000.0000	Raising factor*)	1

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
SubWgt	20	6		Int	0 to 500000.0		-9
CatCatchWgt	21	8	✓	Int	0 to 99999999		839
LngtCode	22	2	✓	char	., 0, 1, 9	-9 – missing value, . 1mm, 0 – 0.5 cm, 1 – 1cm TS_LngtCode	0
LngtClass	23	4	✓	Int	1 to 999	Identifier of lower bound of length distribution, e.g.. 65-70 cm=65 For classes less than 1 cm there will be an implied decimal point after the second digit, e.g. 30.5-31.0 cm=305	105
HLNoAtLngt	24	6	✓	Decimal 2	1.00 to 999999.00	Length classes with zero catch should be excluded from the record (no/hour equals the sum of no at length).	1

***) raising factor for converting observed catch into ???**

6.4.3 Record type CA

Optional Record CA SMALK, fields are separated by comma

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
RecordType	1	2	✓	char	CA	Fixed value: CA	CA
Quarter	2	1	✓	int	1 to 4		1
Country	3	3	✓	char	See Annex 8	TS_Country	GFR
Ship	4	4	✓	char	See Annex 8	TS_Ship	SOL
Gear	5	6	✓	char	See Annex 9	Gear	TVS
SweepLngt	6	3		int	0 to 999, Standard=75		-9
GearExp	7	2		char		TS_GearExp	S
DoorType	8	2		char		TS_DoorType	-9
StNo	9	6	✓	char			22005
HaulNo	10	3	✓	int	1 to 999		5
Year	11	4	✓	char	1900 to 2099		2008
SpecCodeType	12	1	✓✓	char	T	TS_SpecCodeType	T
SpecCode	13	10	✓	char	See Annex 12	Official TSN code	161722
AreaType	14	2	✓	char	-9, 0, 4	-9 - not provided, 0 - ICES statistical rectangle, 4 - Baltic ICES Subdivision, TS_AreaType	0
AreaCode	15	4	✓	char			37G0
LngtCode	16	2	✓	char	-9, ., 0, 1	-9 - missing value, . 1mm, 0 - 0.5 cm, 1 - 1cm TS_LngthCode	1

Field	Start	Width	Mandatory	Key	Range	Comments ICES website	Example
LngtClass	17	4	✓	int	1 to 999	Identifier of lower bound of length distribution, e.g.. 65-70 cm=65 For classes less than 1 cm there will be an implied decimal point after the second digit, e.g. 30.5-31.0 cm=305	27
Sex	18	2	✓	char	-9, M, F, U	-9 - unknown, M - Male, F - Female, U - Unsexed TS_Sex	F
Maturity*)	19	2	✓	char	-9, 1 to 6	-9 - missing value and Annex 1, TS_Maturity	5
PlusGr	20	2		char	+, -9	Plus group = +, else -9 TS_PlusGR	-9
AgeRings	21	2	✓	int	0. to 99, -9	Unknown age =-9	5
CANoAtLngt	22	3	✓	int	1 to 999		1
IndWgt	23	5		Decimal 1	1.0 to 99999.0	The mean weight of the number of fish in the record (in gram).	238

***) The ICES Planning Group on Commercial Catches, Discards and Biological Sampling [PGCCDBS], meeting in March 2008 in Nicosia/Cyprus.**

Example of conversion of fish maturity scale:

ICES (WGBIFS) modified scale	I	II	III	IV	V	VI
Maier’s scale (modified)	I	III-V	VI-VII	VIII	II	IX

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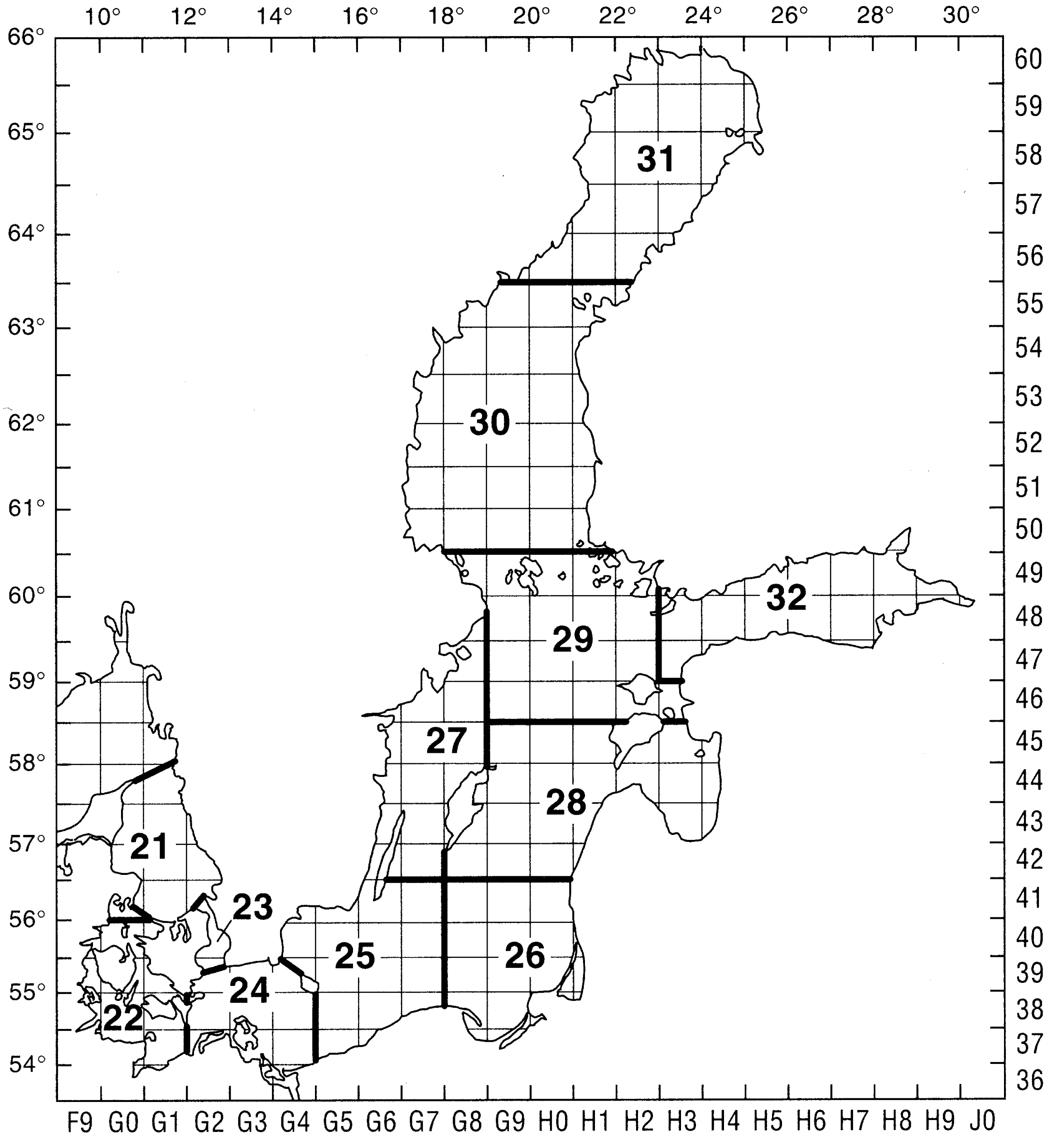
Annex 1: Baltic Sea with the ICES Subdivisions and rectangle codes



Annex 2: Assignment of quarters of rectangles to the ICES Subdivisions

				10°00				12°00				14°00				16°00				18°00				20°00					
		F9	F9	G0	G0	G1	G1	G2	G2	G3	G3	G4	G4	G5	G5	G6	G6	G7	G7	G8	G8	G9	G9	H0	H0	H1	H1	H2	H2
	50																												
60°30	50																												
	49																			29	29	29	29	29	29	29	29	29	29
60°00	49																			29	29	29	29	29	29	29	29	29	29
	48																					29	29	29	29	29	29	29	29
59°30	48																				29	29	29	29	29	29	29	29	29
	47																			27	27	29	29	29	29	29	29	29	29
59°00	47																			27	27	29	29	29	29	29	29	29	29
	46																	27	27	27	27	29	29	29	29	29	29	29	29
58°30	46															27	27	27	27	27	27	29	29	29	29	29	29	29	29
	45															27	27	27	27	27	27	28	28	28	28	28	28		
58°00	45																27	27	27	27	27	28	28	28	28	28	28		
	44					21	21									27	27	27	27	27	27	28	28	28	28	28	28		
57°30	44				21	21	21										27	27	27	27	28	28	28	28	28	28	28		
	43				21	21	21	21								27	27	27	27	27	28	28	28	28	28	28	28		
57°00	43			21	21	21	21	21								27	27	27	27	27	28	28	28	28	28	28			
	42			21	21	21	21	21	21							27	27	27	27	28	28	28	28	28	28	28			
56°30	42			21	21	21	21	21	21							27	27	27	27	28	28	28	28	28	28	28			
	41				21	21	21	21	21							25	25	25	25	26	26	26	26	26	26				
56°00	41			22	22	21	21	23	23			25	25	25	25	25	25	25	25	26	26	26	26	26	26	26			
	40			22	22	22	22	23	23			25	25	25	25	25	25	25	25	26	26	26	26	26	26	26			
55°30	40		22	22	22	22		23	23			25	25	25	25	25	25	25	25	26	26	26	26	26	26	26			
	39		22		22	22		23	23	24	24	24	25	25	25	25	25	25	25	26	26	26	26	26	26	26			
55°00	39		22	22	22	22	22	24	24	24	24	24	24	25	25	25	25	25	25	26	26	26	26	26	26				
	38		22	22	22	22	22	24	24	24	24	24	24	25	25	25	25	25	25	26	26	26	26	26					
54°30	38		22	22	22	22	22	24	24	24	24	24	24	25	25	25	25	25		26	26	26	26	26	26				
	37			22	22	22	22	24	24	24	24	24	24	25	25	25					26	26	26						
54°00	37				22	22	22	24		24	24	24	24	25	25														
	36				22																								
	36																												
		F9	F9	G0	G0	G1	G1	G2	G2	G3	G3	G4	G4	G5	G5	G6	G6	G7	G7	G8	G8	G9	G9	H0	H0	H1	H1	H2	H2

Annex 3: Areas in nm² by 10 m depth layer and rectangle

Strata	**SD 21**	44G0	44G1	43G0	43G1	43G2	42G0	42G1	42G2	41G0	41G1	39G0
Depth interval												
total	**6123.3**	**233.7**	**612.6**	**507.4**	**926.1**	**143.9**	**662.3**	**980.3**	**647.0**	**62.2**	**993.3**	**354.4**
0 - 9	**1166.6**	12.8	79.0	278.0	214.2	35.7	355.3	92.1	37.3	13.3	31.1	17.8
10 - 19	**1677.5**	39.5	44.8	143.9	121.2	37.9	307.0	438.6	154.6	41.1	298.9	50.0
20 - 29	**1419.5**	100.3	12.8	46.5	77.9	27.0	0.0	182.0	198.5	7.8	575.6	191.1
30 - 39	**846.8**	75.8	81.1	31.4	109.3	15.1	0.0	196.3	162.3	0.0	83.3	92.2
40 - 49	**467.7**	5.3	120.6	7.6	168.8	16.2	0.0	58.1	83.3	0.0	4.4	3.3
50 - 59	**255.1**	0.0	106.7	0.0	123.3	11.9	0.0	3.3	9.9	0.0	0.0	0.0
60 - 69	**100.1**	0.0	43.8	0.0	50.8	0.0	0.0	4.4	1.1	0.0	0.0	0.0
70 - 79	**79.4**	0.0	47.0	0.0	30.3	0.0	0.0	2.2	0.0	0.0	0.0	0.0
80 - 89	**46.1**	0.0	28.8	0.0	16.2	0.0	0.0	1.1	0.0	0.0	0.0	0.0
90 - 99	**32.1**	0.0	23.5	0.0	7.6	0.0	0.0	1.1	0.0	0.0	0.0	0.0
100 - 150	**32.1**	0.0	24.5	0.0	6.5	0.0	0.0	1.1	0.0	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

strata	**SD 22**	41G0	40F9	40G0	40G1	39F9	39G0	39G1	38F9	38G0	38G1	37G0	37G1	36G0
Depth interval														
total	**5162.8**	**186.7**	**90.0**	**790.1**	**282.5**	**263.3**	**338.6**	**412.7**	**90.0**	**928.1**	**528.7**	**278.1**	**820.2**	**153.7**
0 - 9	**1489.5**	32.2	21.4	238.6	117.1	83.2	99.2	161.9	27.7	166.2	334.8	72.4	99.3	35.5
10 - 19	**2132.9**	55.6	67.5	327.5	159.8	91.2	142.5	206.3	30.0	417.9	105.0	171.8	243.0	114.7
20 - 29	**1436.9**	94.4	1.1	184.6	4.5	84.4	90.1	31.9	32.3	312.8	85.4	33.9	477.9	3.5
30 - 39	**92.3**	3.3	0.0	32.6	1.1	4.6	6.8	9.1	0.0	31.2	3.5	0.0	0.0	0.0
40 - 49	**10.1**	1.1	0.0	6.8	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
50 - 59	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 - 69	**1.1**	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0
70 - 79	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80 - 89	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90 - 99	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100 - 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

strata	**SD 23**	41g2	40g2	39g2
Depth interval				
total	**896.5**	**186.7**	**384.9**	**324.9**
0 - 9	**319.2**	32.2	200.3	86.6
10 - 19	**403.4**	55.6	165.5	182.4
20 - 29	**166.1**	94.4	15.8	55.9
30 - 39	**6.7**	3.3	3.4	0.0
40 - 49	**1.1**	1.1	0.0	0.0
50 - 59	**0.0**	0.0	0.0	0.0
60 - 69	**0.0**	0.0	0.0	0.0
70 - 79	**0.0**	0.0	0.0	0.0
80 - 89	**0.0**	0.0	0.0	0.0
90 - 99	**0.0**	0.0	0.0	0.0
100 - 150	**0.0**	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0

strata	**SD 24**	39G2	39G3	39G4	38G2	38G3	38G4	37G2	37G3	37G4
Depth interval										
total	**6509.3**	**430.9**	**819.7**	**598.5**	**948.9**	**939.6**	**1038.9**	**266.4**	**461.5**	**1004.9**
0 - 9	**785.4**	88.9	31.9	21.7	85.4	78.5	2.3	92.3	271.1	113.3
10 - 19	**2461.5**	205.2	76.4	83.2	557.5	99.3	255.1	136.7	182.3	865.8
20 - 29	**1091.3**	127.7	114.0	63.8	252.8	170.8	292.0	37.4	8.2	24.5
30 - 39	**621.4**	9.1	176.7	65.0	49.6	152.4	167.4	0.0	0.0	1.2
40 - 49	**1396.6**	0.0	420.7	328.3	3.5	438.6	205.5	0.0	0.0	0.0
50 - 59	**124.3**	0.0	0.0	28.5	0.0	0.0	95.8	0.0	0.0	0.0
60 - 69	**28.8**	0.0	0.0	8.0	0.0	0.0	20.8	0.0	0.0	0.0
70 - 79	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80 - 89	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90 - 99	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100 - 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

strata	**SD 25**	41G4	41G5	41G6	41G7	40G4	40G5	40G6	40G7	39G4	39G5	39G6	39G7	38G5	38G6	38G7	37G5	37G6
Depth interval																		
total	**12615.9**	**113.3**	**307.8**	**876.7**	**1000.0**	**747.4**	**1013.0**	**1013.0**	**1013.0**	**249.7**	**986.1**	**1026.0**	**1026.0**	**1038.9**	**940.8**	**475.6**	**657.8**	**130.9**
0 - 9	**332.5**	41.1	88.9	88.9	0.0	39.4	1.1	0.0	0.0	2.3	4.6	0.0	0.0	1.2	10.4	20.8	24.5	9.3
10 - 19	**1110.7**	21.1	57.8	132.2	26.7	122.7	7.9	0.0	63.0	2.3	4.6	8.0	0.0	3.5	188.2	118.9	289.8	64.3
20 - 29	**1324.6**	20.0	61.1	101.1	140.0	135.1	11.3	0.0	115.9	11.4	6.8	51.3	0.0	4.6	207.8	277.0	140.2	40.9
30 - 39	**2096.5**	31.1	82.2	250.0	358.9	86.7	88.9	185.7	318.5	10.3	9.1	67.3	78.7	33.5	301.3	58.9	119.2	16.4
40 - 49	**1749.4**	0.0	17.8	128.9	231.1	162.1	221.7	261.1	118.2	36.5	18.2	78.7	183.5	86.6	151.2	0.0	53.7	0.0
50 - 59	**1504.4**	0.0	0.0	96.7	184.4	70.9	139.6	174.5	129.4	47.9	34.2	109.4	189.2	249.3	48.5	0.0	30.4	0.0
60 - 69	**1531.6**	0.0	0.0	72.2	57.8	46.1	180.1	171.1	243.1	53.6	49.0	199.5	119.7	322.1	17.3	0.0	0.0	0.0
70 - 79	**1505.4**	0.0	0.0	6.7	1.1	75.4	228.5	197.0	24.8	73.0	169.9	249.7	239.4	223.9	16.2	0.0	0.0	0.0
80 - 89	**797.5**	0.0	0.0	0.0	0.0	9.0	115.9	23.6	0.0	12.5	212.0	158.5	151.6	114.3	0.0	0.0	0.0	0.0
90 - 99	**638.2**	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	457.1	103.7	59.3	0.0	0.0	0.0	0.0	0.0
100 - 150	**25.1**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	0.0	4.6	0.0	0.0	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

strata	**SD 26**	41G8	41G9	41H0	41H1	40G8	40G9	40H0	40H1	39G8	39G9	39H0	39H1	38G8	38G9	38H0	37G8	37G9
Depth interval																		
total	**10967.1**	**1000.0**	**1000.0**	**982.2**	**15.6**	**1013.0**	**1013.0**	**1013.0**	**69.8**	**1026.0**	**1026.0**	**877.8**	**11.4**	**698.4**	**922.3**	**40.4**	**107.5**	**150.7**
0 - 9	**218.0**	0.0	0.0	37.8	8.9	0.0	0.0	4.5	28.1	0.0	0.0	11.4	4.6	60.0	21.9	9.2	18.7	12.9
10 - 19	**475.3**	2.2	0.0	123.3	6.7	0.0	0.0	28.1	14.6	0.0	0.0	46.7	4.6	110.8	50.8	23.1	46.7	17.5
20 - 29	**713.9**	85.6	0.0	157.8	0.0	0.0	0.0	48.4	27.0	4.6	0.0	177.8	2.3	121.2	48.5	8.1	15.2	17.5
30 - 39	**1189.8**	142.2	0.0	355.6	0.0	0.0	0.0	208.2	0.0	25.1	2.3	274.7	0.0	78.5	68.1	0.0	11.7	23.4
40 - 49	**674.0**	78.9	7.8	81.1	0.0	0.0	0.0	203.7	0.0	17.1	9.1	177.8	0.0	35.8	32.3	0.0	5.8	24.5
50 - 59	**844.5**	72.2	95.6	101.1	0.0	39.4	65.3	206.0	0.0	36.5	17.1	101.5	0.0	31.2	54.3	0.0	7.0	17.5
60 - 69	**966.4**	32.2	137.8	58.9	0.0	85.5	182.3	141.8	0.0	69.5	76.4	66.1	0.0	46.2	38.1	0.0	2.3	29.2
70 - 79	**944.4**	47.8	63.3	36.7	0.0	68.7	194.7	100.2	0.0	148.2	102.6	17.1	0.0	39.2	117.7	0.0	0.0	8.2
80 - 89	**1488.2**	48.9	54.4	18.9	0.0	168.8	328.7	72.0	0.0	438.9	204.1	4.6	0.0	45.0	103.9	0.0	0.0	0.0
90 - 99	**1383.4**	104.4	61.1	10.0	0.0	210.5	192.5	0.0	0.0	283.9	336.3	0.0	0.0	71.6	113.1	0.0	0.0	0.0
100 - 150	**2069.2**	385.6	580.0	1.1	0.0	440.1	49.5	0.0	0.0	2.3	278.2	0.0	0.0	58.9	273.6	0.0	0.0	0.0
> 150	**0.0**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

strata	**SD 27**	42G6	42G7	43G6	43G7	43G8	44G6	44G7	44G8	45G6	45G7	45G8	46G6	46G7	46G8	47G8
Depth interval																
total	**8826.6**	**427.7**	**986.9**	**389.5**	**945.6**	**189.3**	**331.9**	**960.5**	**435.4**	**194.7**	**947.2**	**947.2**	**78.2**	**598.1**	**915.9**	**478.6**
0 - 9	**1014.8**	150.2	0.0	108.2	26.0	66.0	121.7	0.0	8.5	117.9	28.4	0.0	36.5	121.9	28.1	201.4
10 - 19	**700.5**	111.8	0.0	60.6	45.4	53.0	61.9	1.1	10.7	42.1	36.8	0.0	28.1	102.1	28.1	118.6
20 - 29	**525.3**	31.8	3.3	114.7	41.1	30.3	44.8	1.1	11.7	20.0	46.3	0.0	8.3	91.7	20.8	59.3
30 - 39	**415.7**	23.0	14.3	70.3	47.6	38.9	27.7	3.2	8.5	10.5	33.7	1.1	4.2	74.0	20.8	37.8
40 - 49	**538.2**	23.0	24.1	32.5	92.0	1.1	55.5	24.5	18.1	4.2	92.6	13.7	1.0	75.0	54.2	26.6
50 - 59	**562.5**	25.2	205.1	3.2	76.8	0.0	17.1	45.9	9.6	0.0	52.6	13.7	0.0	51.1	45.8	16.4
60 - 69	**463.9**	23.0	168.9	0.0	66.0	0.0	3.2	39.5	10.7	0.0	52.6	11.6	0.0	26.1	57.3	5.1
70 - 79	**532.3**	38.4	190.8	0.0	100.6	0.0	0.0	50.2	23.5	0.0	57.9	23.2	0.0	14.6	26.1	7.2
80 - 89	**634.0**	1.1	201.8	0.0	110.4	0.0	0.0	64.0	54.4	0.0	91.6	42.1	0.0	19.8	43.8	5.1
90 - 99	**961.6**	0.0	154.6	0.0	145.0	0.0	0.0	233.7	124.9	0.0	90.5	144.2	0.0	15.6	53.1	0.0
100 - 150	**1782.0**	0.0	24.1	0.0	194.7	0.0	0.0	399.1	154.7	0.0	280.0	521.0	0.0	6.3	201.1	1.0
> 150	**695.8**	0.0	0.0	0.0	0.0	0.0	0.0	98.2	0.0	0.0	84.2	176.8	0.0	0.0	336.6	0.0

strata	**SD 28**	42G8	42G9	42H0	42H1	43G8	43G9	43H0	43H1	44G8	44G9	44H0	44H1	45G9	45H0	45H1
Depth interval																
total	**11398.4**	**963.9**	**986.9**	**982.5**	**75.7**	**347.3**	**973.7**	**973.7**	**434.9**	**100.3**	**923.1**	**960.5**	**887.9**	**937.7**	**947.2**	**903.0**
0 - 9	**353.5**	9.9	0.0	18.6	28.5	41.1	1.1	0.0	38.9	13.9	34.2	0.0	72.6	16.8	0.0	77.9
10 - 19	**733.7**	62.5	0.0	66.9	30.7	56.3	2.2	5.4	117.9	22.4	44.8	4.3	180.4	28.4	0.0	111.6
20 - 29	**974.3**	239.0	0.0	84.4	16.4	59.5	10.8	40.0	114.7	39.5	30.9	4.3	151.5	25.3	0.0	157.9
30 - 39	**881.0**	227.0	0.0	102.0	0.0	56.3	18.4	64.9	49.8	24.5	63.0	2.1	112.1	31.6	14.7	114.7
40 - 49	**772.7**	117.3	0.0	89.9	0.0	35.7	19.5	97.4	26.0	0.0	60.8	25.6	112.1	62.1	23.2	103.1
50 - 59	**825.2**	68.0	0.0	112.9	0.0	33.5	30.3	94.1	28.1	0.0	65.1	37.4	149.4	46.3	25.3	134.7
60 - 69	**621.4**	23.0	0.0	73.5	0.0	17.3	40.0	51.9	54.1	0.0	57.6	55.5	76.8	51.6	41.0	78.9
70 - 79	**479.7**	48.2	0.0	65.8	0.0	11.9	44.4	49.8	5.4	0.0	53.4	52.3	14.9	53.7	42.1	37.9
80 - 89	**614.3**	36.2	0.0	38.4	0.0	8.7	59.5	82.2	0.0	0.0	73.6	60.8	13.9	58.9	147.3	34.7
90 - 99	**774.5**	37.3	0.0	37.3	0.0	8.7	71.4	73.6	0.0	0.0	105.7	122.7	4.3	89.5	175.8	48.4
100 - 150	**2935.0**	95.4	540.6	219.3	0.0	18.4	440.3	135.2	0.0	0.0	265.7	470.6	0.0	301.0	445.2	3.2
> 150	**1433.1**	0.0	446.3	73.5	0.0	0.0	235.9	279.1	0.0	0.0	68.3	124.9	0.0	172.6	32.6	0.0

Annex 4: Manual of the construction and use of the International Standard Trawl for the Baltic Demersal Surveys, TV-3#520

TV-3#520 meshes

References

Anonymous 1998. Report of the Baltic International Fish Survey Working Group. Karlskrona, 8–13 June 1998. ICES CM 1998/H:4.

Contents

Two trawls are specified as International Standard Trawls for Baltic Demersal Surveys:

- TV3 520 meshes in the circumference for vessels less than 600 KW (This manual)
- TV3 930 meshes in the circumference for vessels of more than 600 KW (Separate manual)

This manual includes:

- Parts list
- A plot of the specifications of the net
- Three pages of detailed drawings of selected items
- Check lists
- Check guide

Notes to the construction

The nets should be made from good quality polyethylene netting, except the codend, which is made from polyamide. It will however not be possible for the net manufacturer always to obtain sheet netting of exactly the same length as specified in this manual. Thorough care must be taken to obtain materials with properties as close as possible to the ones specified here. The denomination of the sheet netting differs from manufacturer to manufacturer, but the following table should give the most common 'translations'.

	Chemical Composition	Construction	Diameter	International denomination	Trade 'name'
Front part and font belly	PE	Twisted	2.17	500/36	3/12
Rear belly	PE	Twisted	1.71	500/24	3/8
Codend	PA	Twisted	1.32	210/30	no. 10

IMPORTANT: It is very important to maintain the original relationship (hanging ratio, difference in length) between the netting lengths and the framing ropes along the headline and footrope. So if the headline in a section shall be 10% longer than the net according to this manual, it must be so, also if the dimensions of the net differ from the present specification.

Operation of the standard trawls

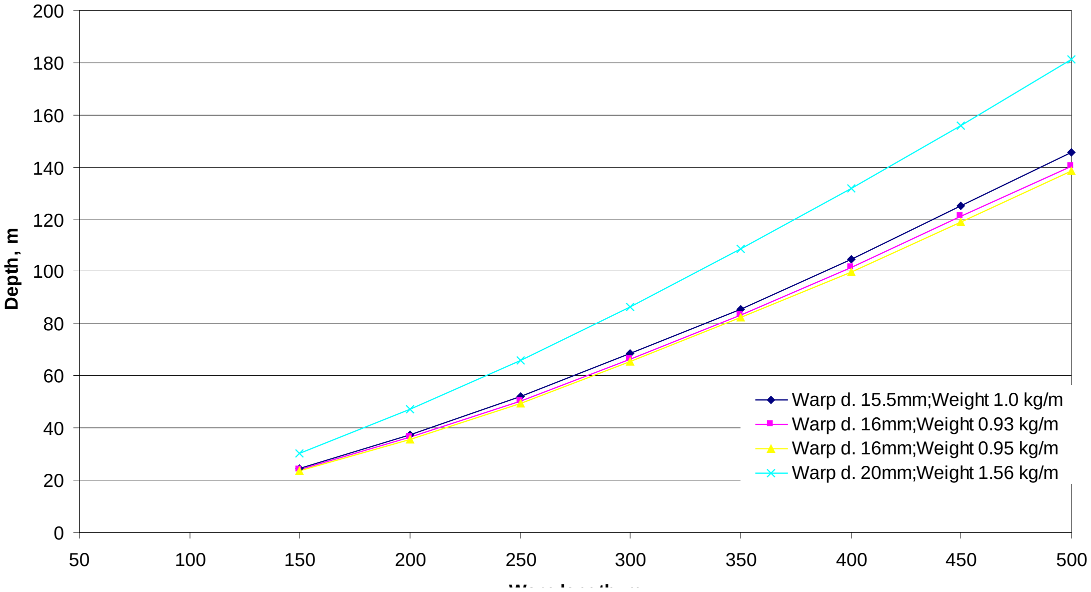
Towing speed

The towing speed should be 3.0 knots.

Warp length

It is recommended to use the following table for finding the correct warp length to be used at various fishing depths. The table gives different warp lengths for a range of warp constructions given by diameter and weight per metre.

It is recommended according to practical experience that the warps length should not less than 125 metre as it will decrease the door spread too much.



(The figures have been obtained using software developed at Kaliningrad State Technical University, by Professor Rosenstein).

The recommended warp length in the upper figure for warp diameter 15/16 mm should be taken as maximum. When using warps 15/16 mm their length could be less the results from the figure, but not less than the results from the curve of 20 mm.

Trawl geometry

The shape of the trawl is depending on many parameters of which some are being standardized here by using the same procedures. Nevertheless, when working on different depths and using different lengths of towing warp the door spread will change, and therefore also the height of the net. Table 2 below shows the relationship between the basic geometric parameters for the standard trawl using the specified 97.2 m distance between trawl door and the net (8 + 75 + 2.1 + 9.1 + 3 m). They are based on model measurements and full-scale measurements at sea using acoustic measuring devices.

Door spread, m	**50**	**55**	**60**	**65**
Trawl vertical opening, m	2,3	2,1	1,8	1,7
Headline spread, m	13	14,5	16	17,5
Angle of sweeps, degrees	11	12	13	14

If trawl monitoring instruments (like SCANMAR) are used on the trawl the table can be used to check if the trawl is working properly. Care should be taken that the instruments are neutrally buoyant in water.

Maintenance

The net should be regularly checked for wear and tear and all damages shall be repaired upon discovery.

The net will eventually stretch under normal fishing conditions. It is important for its fishing performance and for maintaining a constant fishing efficiency at regularly intervals to check the length of the bridles, sweeps, extensions, netting sections etc.

The overall status for the net should be checked at the beginning of every cruise. Every year a detailed check should be made of all net and rope dimensions. (The interval between checks is depending on the time the net is in use. An annual check is regarded sufficient if the net is used for one or two normal surveys a year). The special check guide attached to this manual can be used.

IMPORTANT: Special attention should be given to ensure that the relationship (difference) between the length of the netting sections in the top and bottom panels are maintained. Lower sections are a half mesh or a full mesh longer than the corresponding top section. These differences have to be maintained by monitoring the net at regular intervals.

In the case that the difference is larger than 1 mesh size the bottom section must be shortened to the proper size.

Also the relationship between the length of the framing ropes and the nets in the wings and arms must be retained. The percentage the net is stretched on the headline and footrope is given in the specification. When the netting after a period of use loses its stretch, the headline and footrope must be cut off, the net in the wings and arms shortened and remounted on the ropes again.

TV-3#520

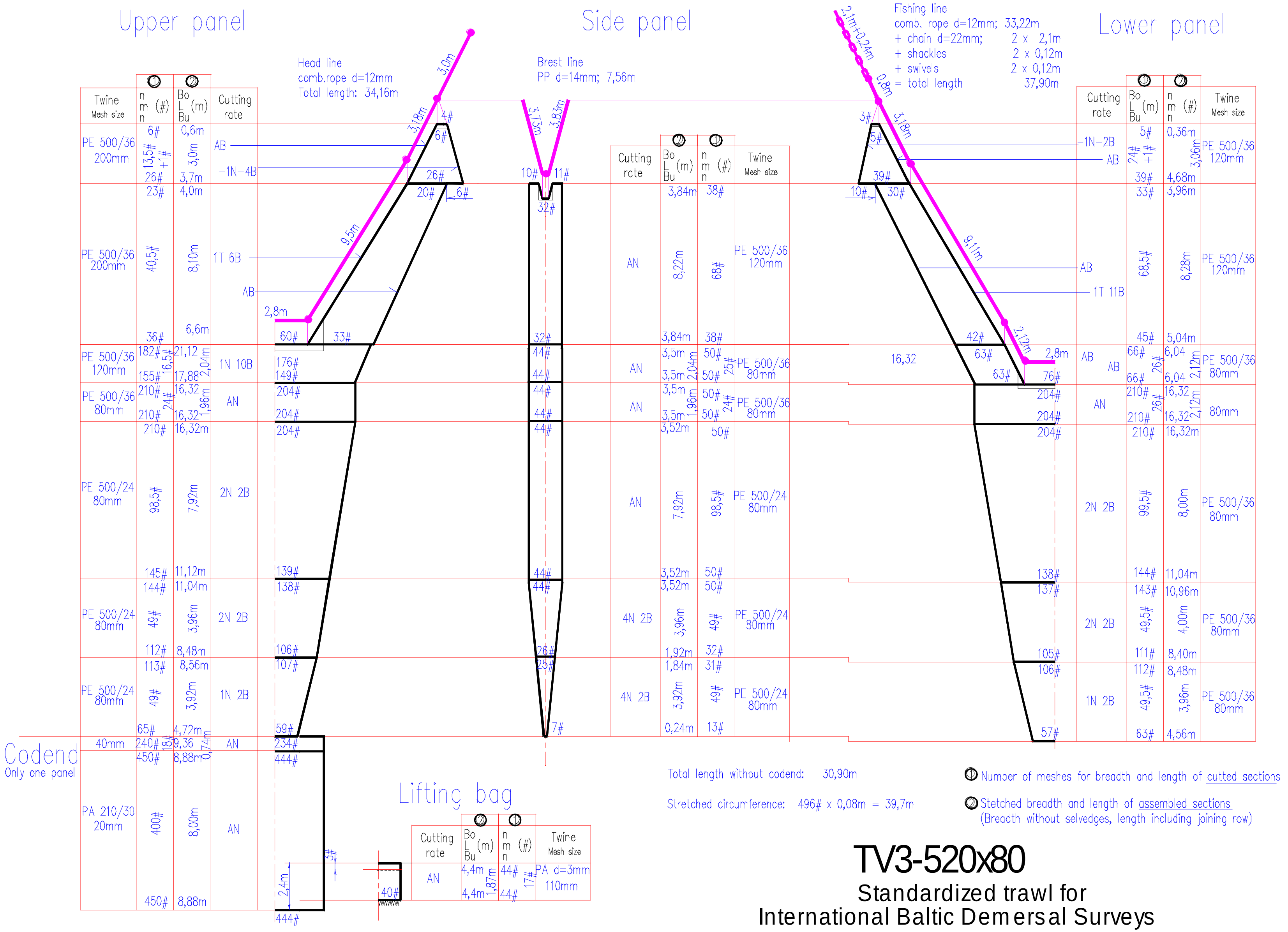
Parts List

International Standard Trawl for Baltic Demersal Surveys

Note: In this list, the term weight is used for mass and the unit is kg.

	No	Item	Description	Size
Trawl doors				
	2	Doors	Cambered V-doors, Type: Thyborøn Trawl Doors Type 2	1.78 m² (63 inch) Weight 235 kg
		Front Chain	Recommended setting: 18 links using link 3 for warp attachment	Inside length of link 80 mm
		Back Chain	Recommended setting Top chain: 7 links Horizontal chain: 18 links Bottom chain: 5 links	Inside length of link: 63 mm
	2	Back strop	Combination rope	Ø = no standard Length 8 m
Sweeps				
	2	Sweep	Wire	Ø = 10 mm Length 75 metre Weight per metre 0.36 kg
			Rubber disks	Ø = 35 mm
Chain between sweeps and bridles				
	2	Chain	Iron	Length 2.1 m Weight: 20 kg
Bridles				
	4	Upper bridle	Combination rope	Ø = 12 mm Length: 9.1 m Weight per metre 0.2 kg
	2	Lower bridle	Wire	Ø = 10 mm Length 9.1 m Weight per metre 0.36
			Rubber discs	Ø = 35 mm
			Lead weights with centre hole distributed evenly, every 40 cm	22 pieces of 250 g each on each lower bridle
Floats				
	(11)	Floats	(4 litre (same as 200 mm, 8 inch) plastic floats)	Total lifting force: 38.5 kg (equivalent to 11 pcs. of 200 mm plastic floats)

Headline and Fishing line				
	1	Headline	Combination rope, stainless	Ø = 12 mm Length 34.16 m incl. extension Weight per metre 0.2 kg
	1	Fishing line	Combination rope, stainless Chain weight	Ø = 12 mm Length 37.66 m incl. extension and weight Weight per metre 0.2 kg Length 2.1 m Weight 20 kg
Footrope				
		Centre Wire	Stainless steel wire	Ø = 9.5 mm Weight per metre 0.34 kg
	108	Rubber discs	Rubber discs with side hole	100 mm
		Filling the space between rubber discs	Plastic or rubber tube Rubber discs on each side of rubber disc 28 pcs. of lead, (1 every third space)	Ø = 12 mm/14 mm Ø = 35 mm 250 g each piece
		Rope to mount the gear	Danline mounted in bights on the fishing line and through the rubber discs.	Ø = 12 mm The size of the bights makes the footrope disc periphery hang 4 cm below the fishing line
Attachments				
		Lazy deckie	No standard	
		Tackle strop	No standard	



Total length without codend: 30,90m

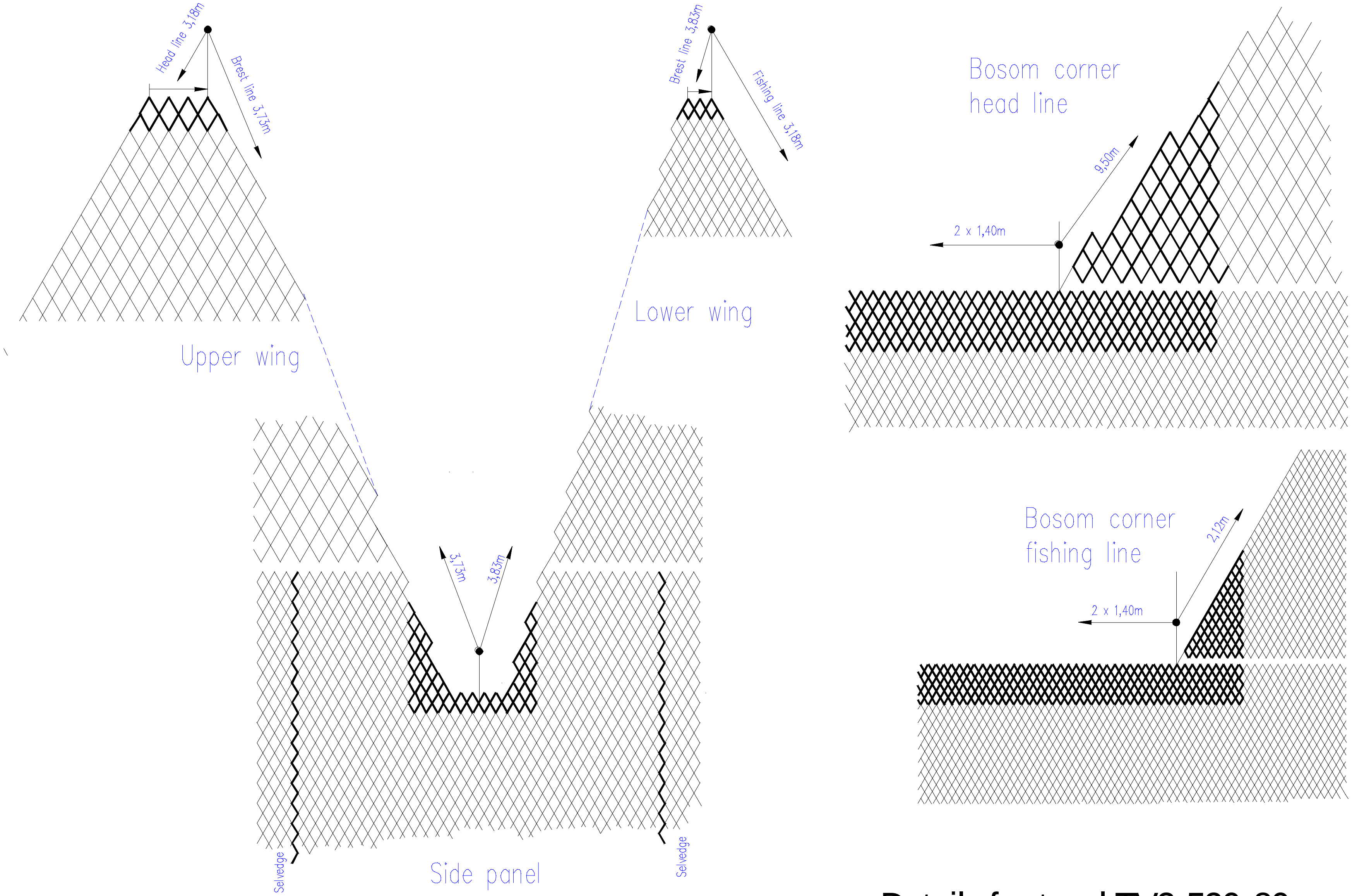
Stretched circumference: 496# x 0,08m = 39,7m

① Number of meshes for breadth and length of cutted sections

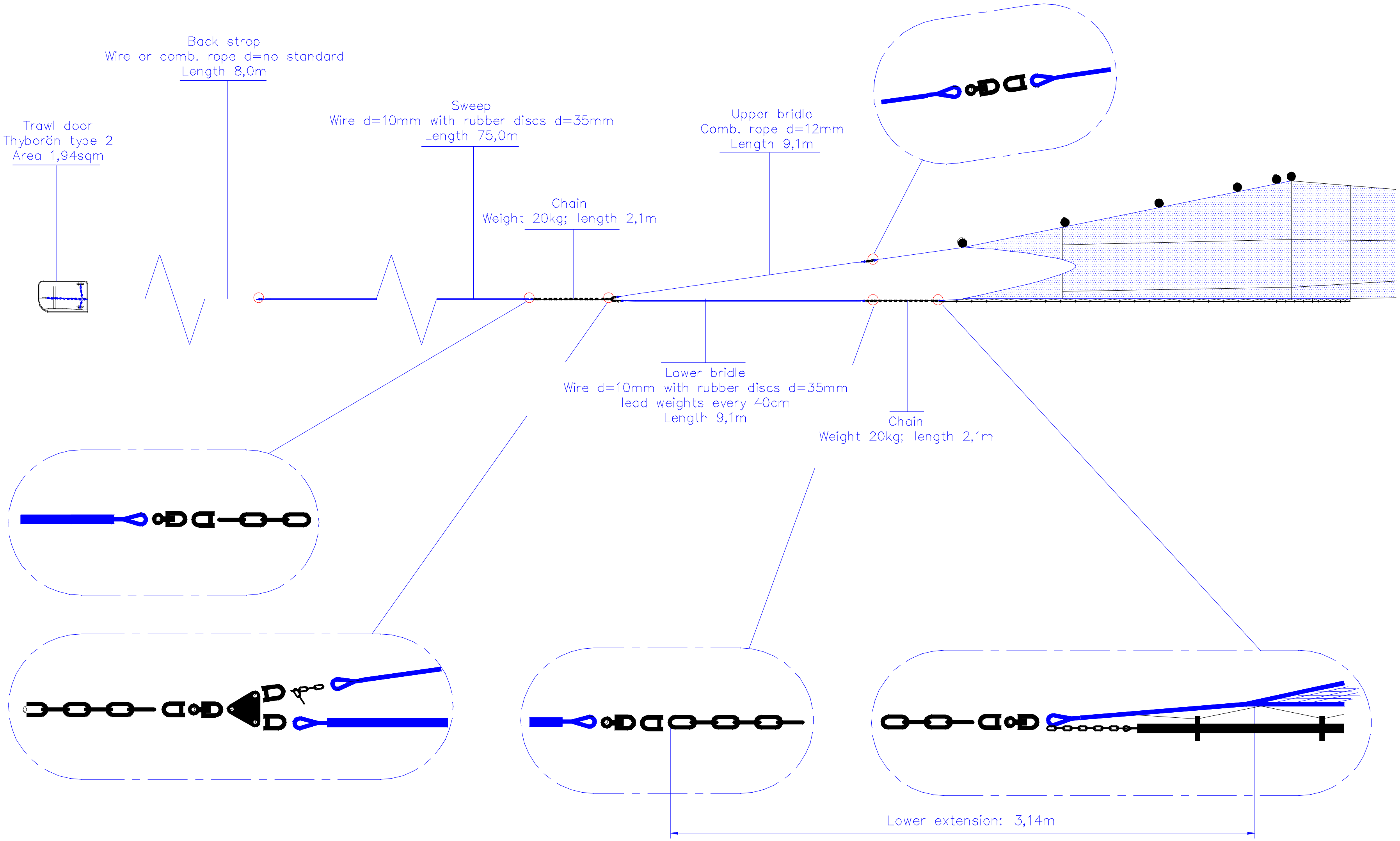
② Stetched breadth and length of assembled sections
(Breadth without selvedges, length including joining row)

TV3-520x80

Standardized trawl for
International Baltic Demersal Surveys

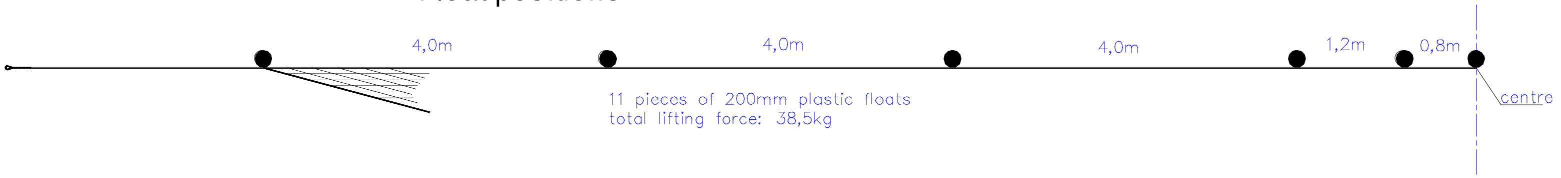


Details for trawl TV3-520x80



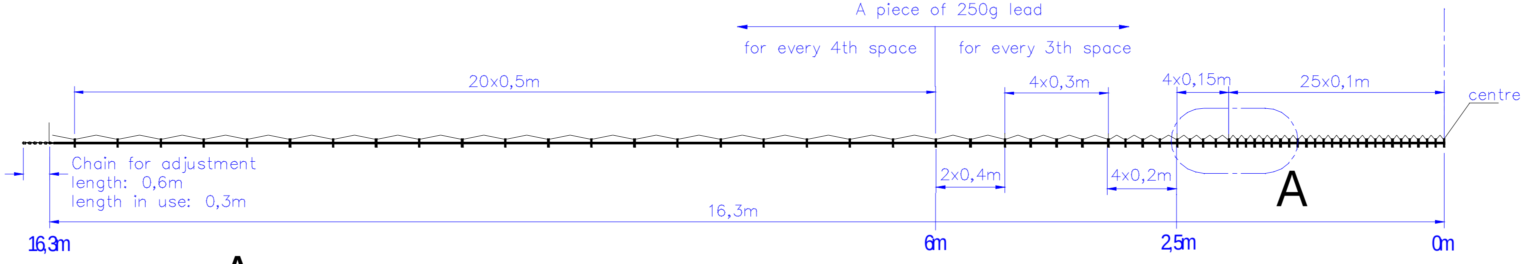
Rigg details (1) for trawl TV3- 520x80

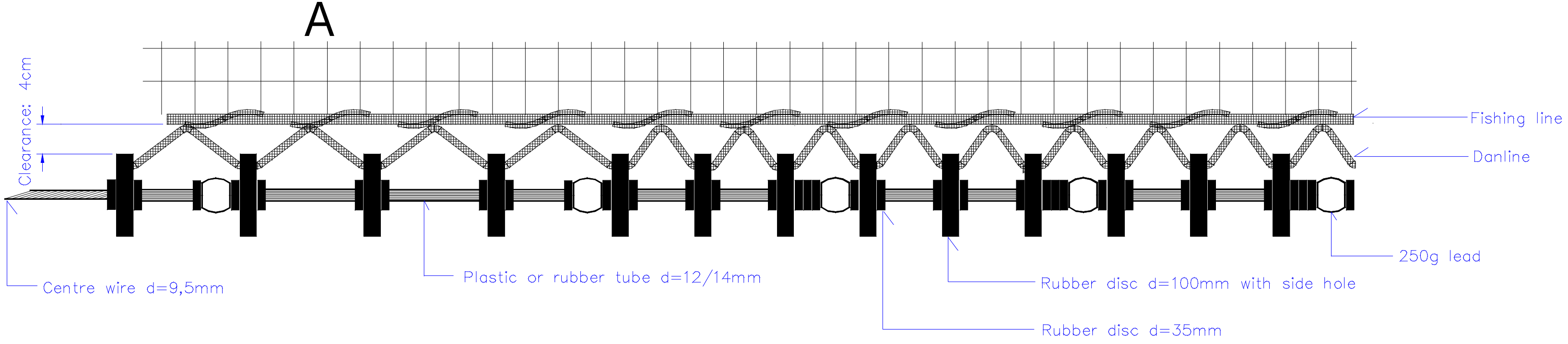
Float positions



Footrope

0 – 2,5m:	100mm rubber discs with side hole, 100mm distance
2,5 – 6m:	100mm rubber discs with side hole, distance increasing from 100 to 500mm
6 – 16,3m:	100mm rubber discs with side hole, 500mm distance
0 – 16,3:	12/14mmrubber or plastic tube and 45mm rubber discs filling all the space between the large discs





Rigg details (2) for trawl TV3- 520x80

Section 1

1B1	1A1	1A2	1B2	1C1	1C2
8,22m	8,10m	8,10m	8,22m	8,28m	8,28m

Section 2

2B1	2A	2B2	2C1	2C2
2,04m	2,04m	2,04m	2,12m	2,12m

Section 3

3B1	3A	3B2	3C
1,96m	1,96m	1,96m	2,12m

Section 4

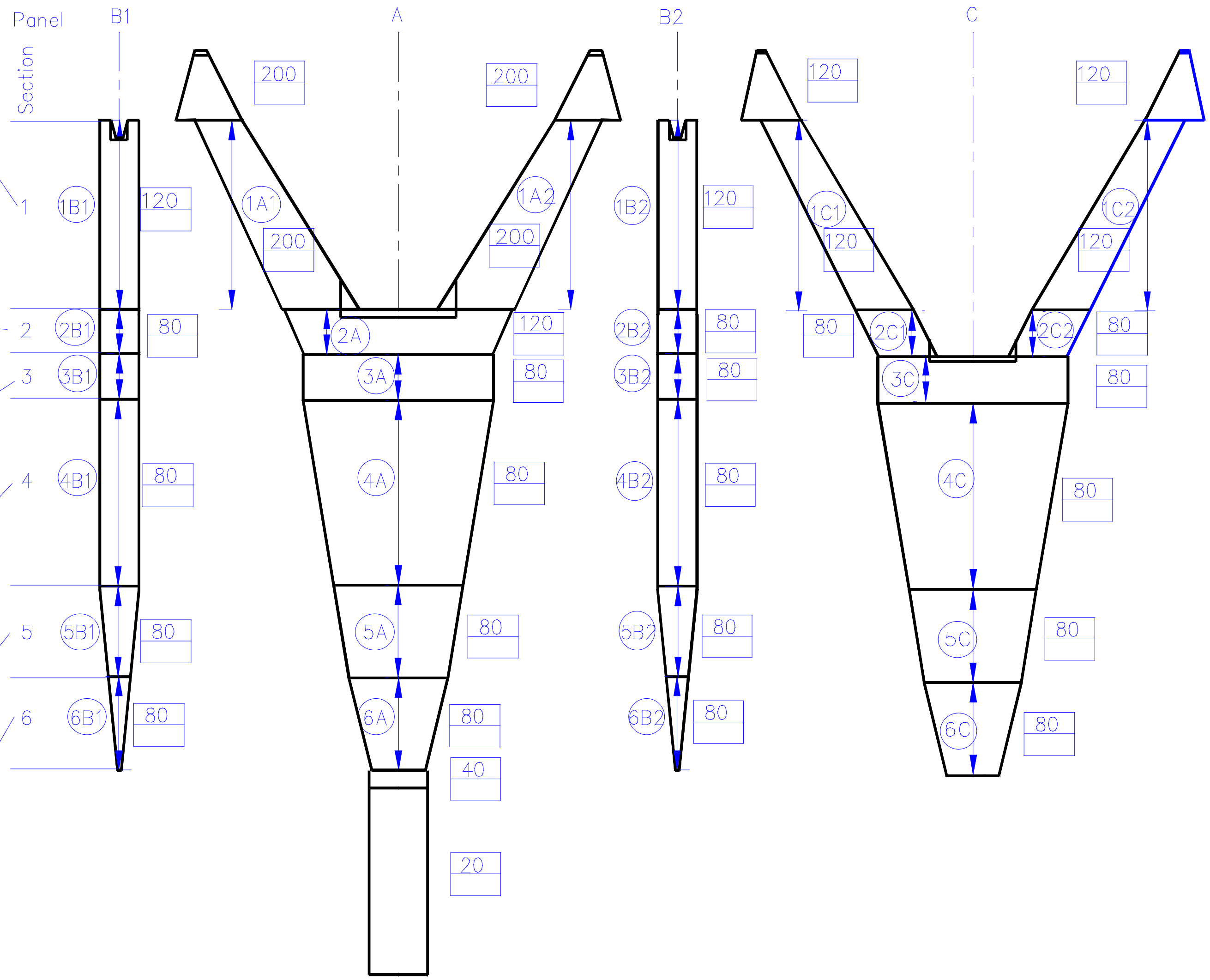
4B1	4A	4B2	4C
7,92m	7,92m	7,92m	8,00m

Section 5

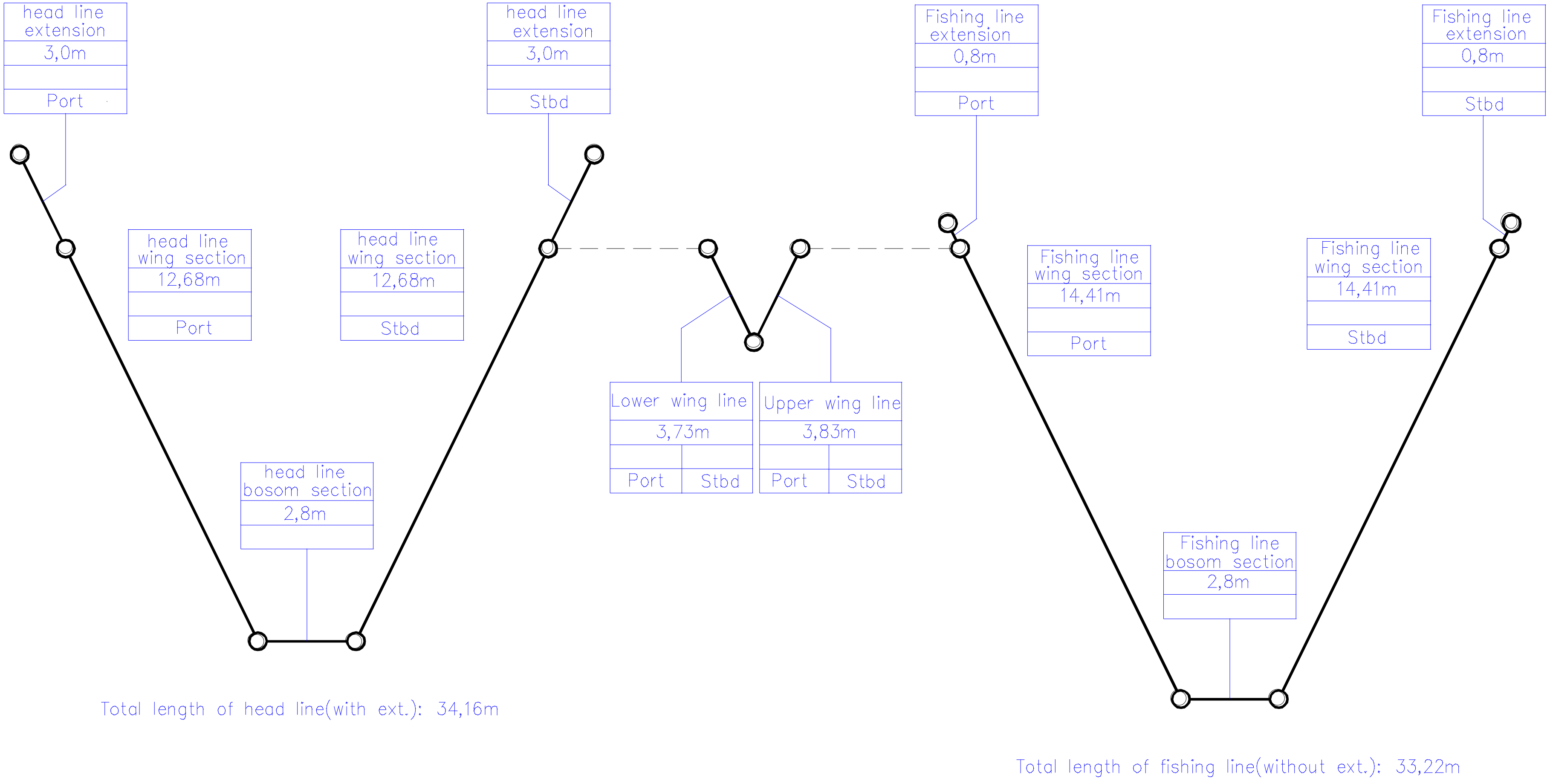
5B1	5A	5B2	5C
3,96m	3,96m	3,96m	4,00m

Section 6

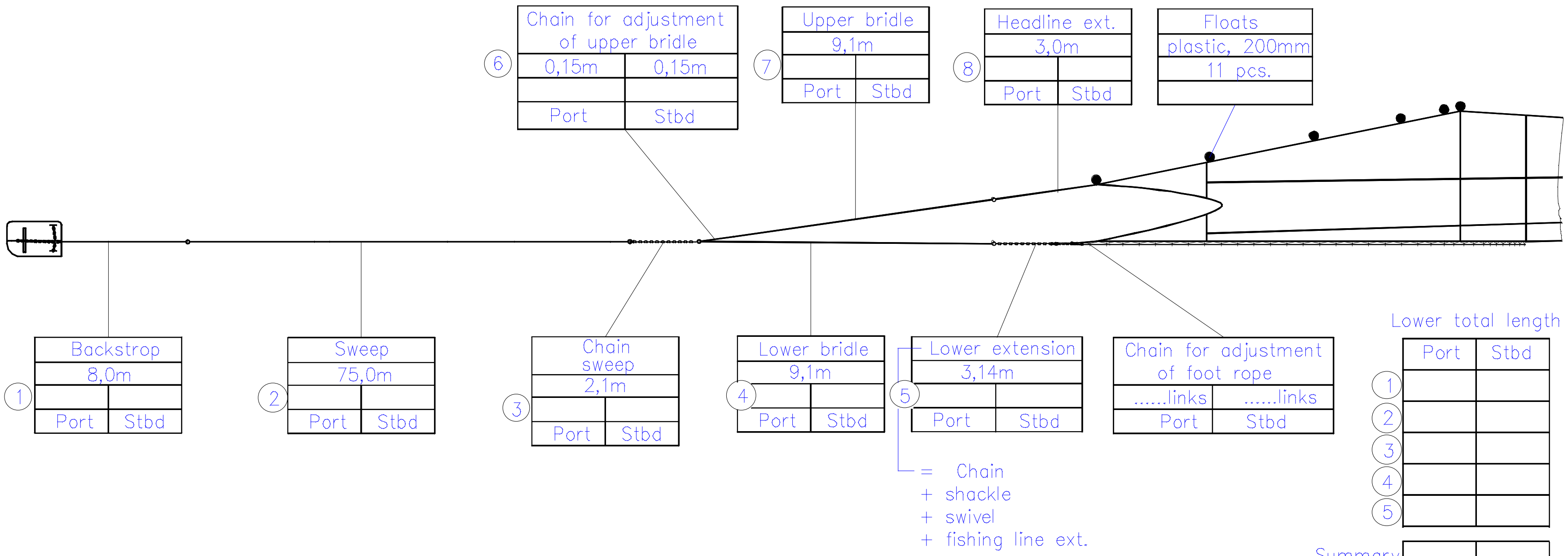
6B1	6A	6B2	6C
3,92m	3,92m	3,92m	3,96m

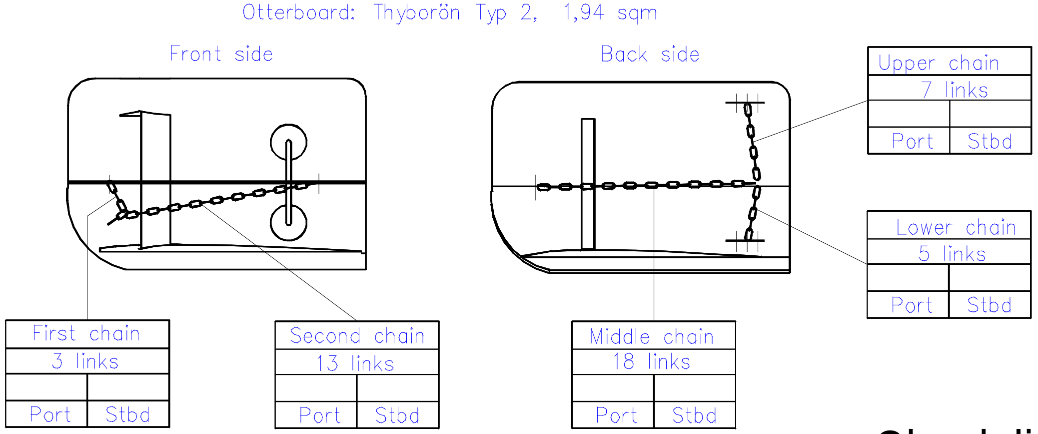


Check list for trawl TV3-520x80



Check list for frame ropes of trawl TV3-520x80





Upper length

	Port	Stbd
④		
⑤		
Summary		

Lower length

	Port	Stbd
⑥		
⑦		
⑧		
Summary		

Check list for rigg of trawl TV3-520x80

TV-3 520#

Check Guide

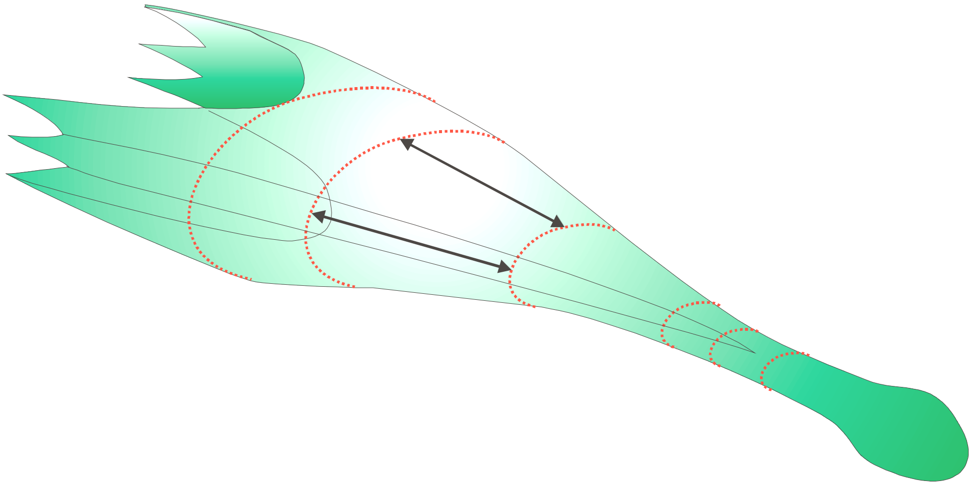
International Standard Trawl for Baltic Demersal Surveys

In order to maintain the properties and performance of the net it must be checked at regular intervals.

Before every cruise

Length of net sections

The trawl consists of four panels: top, bottom and side panels. Each panel has several sections. It is necessary to check the relative length of each netting section. They are all compared with the corresponding sections in the other panels in the way that the top and bottom panel sections are checked against the side panel sections.



Comparison of the lengths of two sections from the top and side panels – indicated by arrows: Approx 10 meshes from around the centre line of the top panel is hold against approx. 10 meshes from around the centre line of the side panel.

The best method to compare two sections is to let two persons – one in each end of the section – take around 10 meshes from the centre line of one section in one hand and hold it against 10 meshes from the centre line of the other section in the other hand. The sections must then be stretched and the difference in length observed.

- Length of side and top panel sections must be equal;
- Length of bottom panel sections must be about 1 mesh longer than corresponding side panel sections.

The procedure is repeated for each section. In case the difference differs more than 4 cm (or half a mesh) from the specified difference, a skilled netmaker should be consulted to evaluate a possible shortening

Length of wings

The specified shortening of the side wing shall be measured from the joining round between the wing and arms to the eye at the end of the headline, footrope and breastline extensions respectively.

- The length of side wing must be 0.65 meter shorter than the top wing and bottom wing.

Length of groundrope

The length of the groundrope and fishing line must be compared by holding the two together. The length is adjusted by means of the adjustment chain on the groundrope.

- The groundrope must be two links shorter than the fishing line (equal to shortening the groundrope one link in each side).

Annex 5: Manual for the construction and use of the International Standard Trawls for Baltic Demersal Surveys, TV-3#930

TV-3 930 meshes

References

Anonymous 1998: Report of the Baltic International Fish Survey Working Group. Karlskrona, 8 – 13 June 1998. ICES CM 1998/H:4.

Contents

Two trawls are specified as International Standard Trawls for Baltic Demersal Surveys:

- TV3 930 meshes in the circumference for vessels more than 600 KW (This manual)
- TV3 520 meshes in the circumference for vessels of less than 600 KW (Separate manual)

This manual includes:

- Parts list
- A plot of the specifications of the net
- Detailed drawings of selected items
- Check lists
- Check guide
- Optional stone excluding panel for lower panel

Notes to the construction

The nets should be made from good quality polyethylene netting, except the codend that is made from polyamide. It will however not be possible for the net manufacturer always to obtain sheet netting of exactly the same length as specified in this manual. Thorough care must be taken to obtain materials with properties as close as possible to the ones specified here. The denomination of the sheet netting differs from manufacturer to manufacturer, but the following table should give the most common ‘translations’.

	Chemical composition	Construction	Diameter	International denomination	Trade ‘name’
Front part and front belly	PE	Braided	3.0	500/36	3/12
Central belly	PE	Twisted	1.71	500/24	3/8
Rear belly and codend	PA	Twisted	1.32	210/30	no. 10

IMPORTANT: It is very important to maintain the original relationship (hanging ratio, difference) between the netting lengths and the framing ropes along the headline and footrope. So if the headline in a section shall be 10% longer than the net according to this manual, it must be so, also if the dimensions of the net differ from the present specification.

Operation of the standard trawls

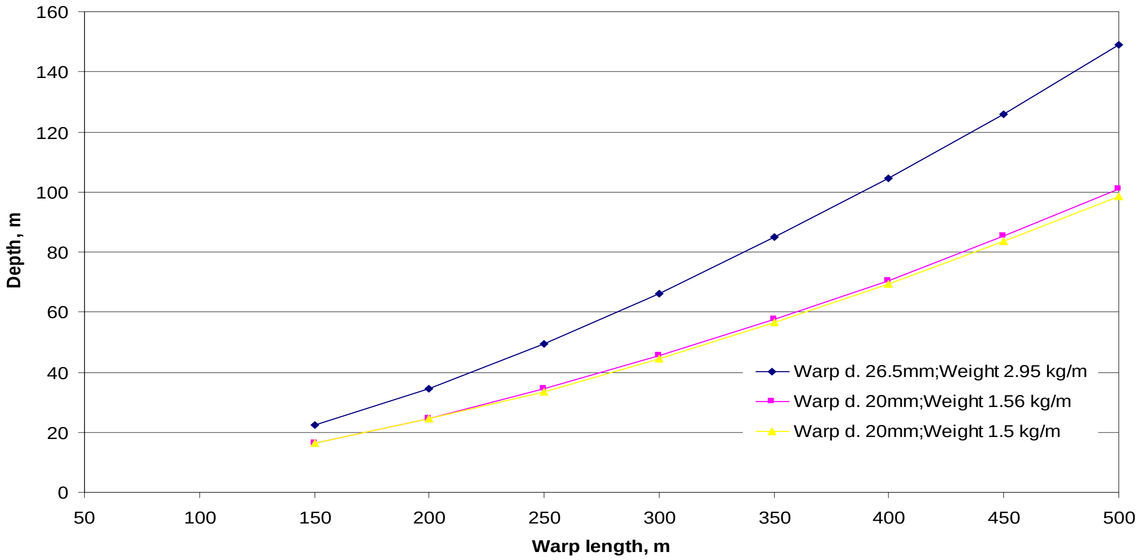
Towing speed

The towing speed should be 3.0 knots.

Warp length

It is recommended to use the following table for finding the correct warp length to be used at various fishing depths. The table gives different warp lengths for a range of warp constructions given by diameter and weight per metre.

The tables are calculated based on the specifications of the net and doors. They should be taken as a starting point. Preliminary tests during the year 2000 suggest that the warp length should be 50 metres more than the table specifies. Also it is recommended that the warps length should not less than 200 metres as it will decrease the door spread too much.



(The figures have been obtained using software developed at Kaliningrad State Technical University, by Professor Rosenstein).

Trawl geometry

The shape of the trawl is depending on many parameters of which some are being standardized here by using the same procedures. Nevertheless, when working on different depths and using different lengths of towing warp the door spread will change, and therefore also the height of the net. Table 2 below shows the relationship between the basic geometric parameters for the standard trawl using the specified 118,1 m distance between trawl door and the net (8 + 75 + 3.6 + 27.5 + 4 m). They are based on model measurements and full-scale measurements at sea using acoustic measuring devices.

Door spread, m	60	70	80	90
Trawl vertical opening, m	7.3	6.7	6.1	5.6
Headline spread, m	no data	22.5	26	no data
Angle of sweeps, degrees	11	12	14	16

If trawl monitoring instruments (like SCANMAR) are used on the trawl the table can be used to check if the trawl is working properly. Care should be taken that the instruments are neutrally buoyant in water.

Maintenance

The net should be regularly checked for wear and tear and all damages shall be repaired upon discovery.

The net will eventually stretch under normal fishing conditions. It is important for its fishing performance and for maintaining a constant fishing efficiency at regularly intervals to check the length of the bridles, sweeps, extensions, netting sections etc.

The overall status for the net should be checked at the beginning of every cruise. Every year a detailed check should be made of all net and rope dimensions. (The interval between checks is depending on the time the net is in use. An annual check is regarded sufficient if the net is used for one or two normal surveys a year). The special checklists attached to this manual can be used.

IMPORTANT: Special attention should be given to ensure that the relationship (difference) between the length of the netting sections in the top and bottom panels are maintained. Lower sections are a half mesh or a full mesh longer than the corresponding top section. These differences have to be maintained by monitoring the net at regular intervals. In the case that the difference is too small the particular bottom section must be shortened be cutting up the joining round and cut away half a mesh or a full mesh from the length.

Also the relationship between the length of the framing ropes and the nets in the wings and arms must be retained. The percentage the net is stretched on the headline and footrope is given in the specification. When the netting after a period of use loses its stretch, the headline and footrope must be cut off, the net in the wings and arms shortened and remounted on the ropes again.

TV-3#930

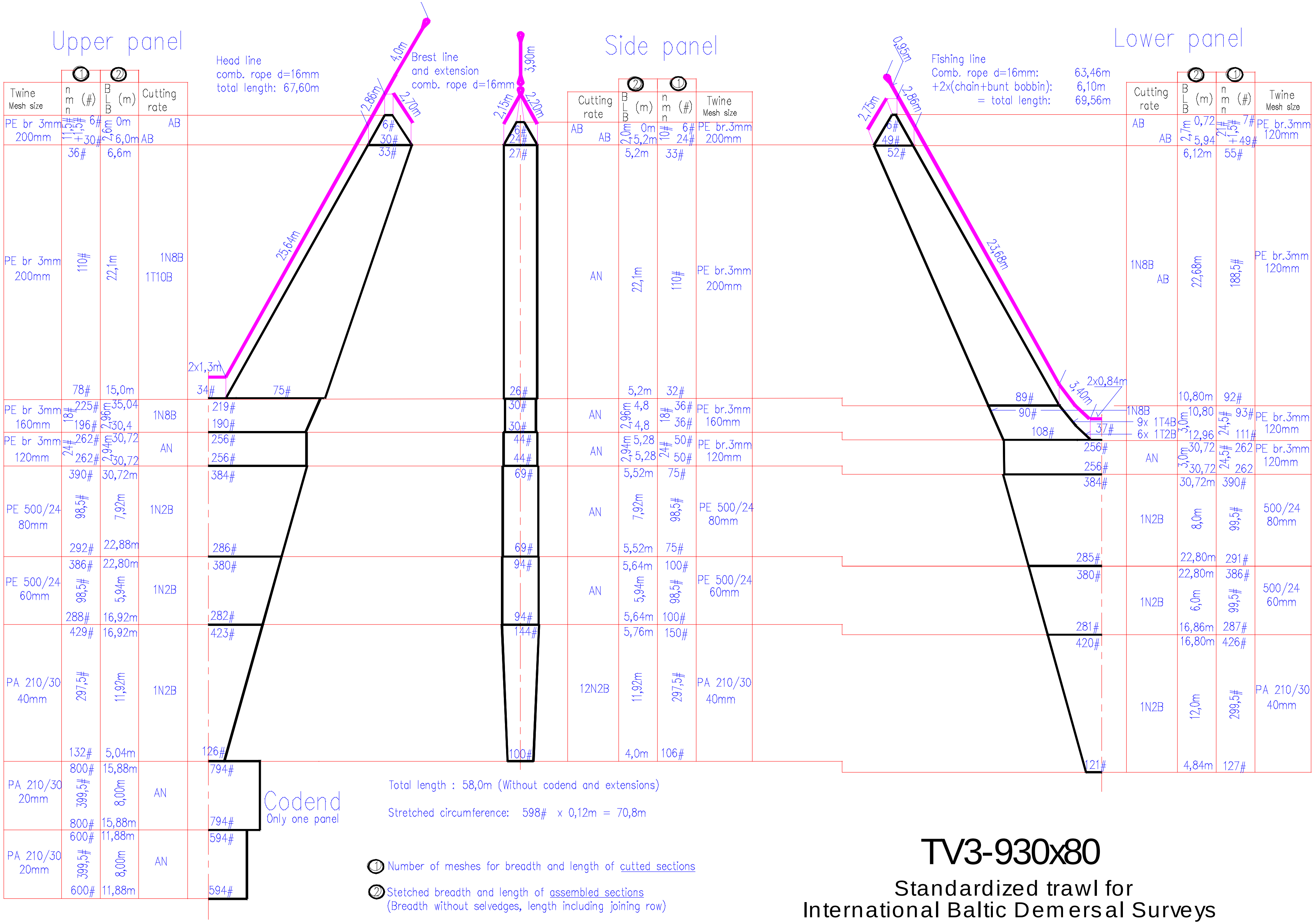
Parts List

International Standard Trawl for Baltic Demersal Surveys

Note: In this list the term weight is used for mass and the unit is kg.

	No	Item	Description	Size
Trawl doors				
	2	Doors	Cambered V-doors, Type: Thyborøn Trawl Doors Type 2	4.35 m^2 Weight 520 kg
		Front Chain	Recommended setting: 23 links using link 6 for warp attachment	Inside length of link 100 mm
		Back Chain	Top chain: 10 links Horizontal chain: 24 links Bottom chain: 9 links	Inside length of link: 80 mm
	2	Back strop	Wire or combination rope	Ø = no standard Length 8 m
Sweeps				
	2	Sweep	Combination rope (light)	Ø = 40 mm Length 75 metre Weight per metre 1.60 kg
Chain between sweeps and bridles				
	2	Chain	Iron	Length 3.02 m Weight: 50 kg
Bridles				
	4	Upper and centre bridles	Combination rope	Ø = 18 mm Length: 27.5 m Weight per metre 0.46 kg
	2	Lower bridle	Wire Rubber discs	Ø = 16 mm Length 27,5 m Weight per metre 0.95 kg Ø = 50 mm
Floats				
	(25)	Floats	(11 litre (same as 280 mm, 11 inch) plastic floats)	Total lifting force: 212.5 kg equivalent to 25 pcs. of 280 mm plastic floats)
Headline and Fishing line				
	1	Headline	Combination rope, stainless	Ø = 16 mm Length 67.60 m incl. extension Weight per metre 0.39 kg

	No	**Item**	**Description**	**Size**
	1	Fishing line	Combination rope, stainless	Ø = 16 mm Length 69.64 m incl extension and weight Weight per metre 0.39 kg
	2		Chain weight at bosom corner	14 kg each side
	2		Chain weight at mid-arm	14 kg each arm
	2		Chain weight at wingend	Length 3.02 m Weight: 50 kg each wingend
	2		Semi-spherical rubber bunt bobbins	Ø = 230 mm
Footrope				
		Centre Wire	Wire, stainless steel	Ø = 13 mm Weight per metre 0.66 kg
		Large rubber discs		Ø = 200 mm
		Small rubber discs		Ø = 150 mm
		Filling	rubber discs	Ø = 45 mm
		Rope to mount the gear	Combination rope mounted in bights on the fishing line and through the rubber discs	Ø = 12 mm Weight per metre 0.20 kg The length of the bights shall make the disc periphery hang 4 cm from the fishing line
		Wire lockers	To mount the wire to the fishing line	
Attachments				
		Lazy deckie	No standard	
		Tackle strop	No standard	



Total length : 58,0m (Without codend and extensions)

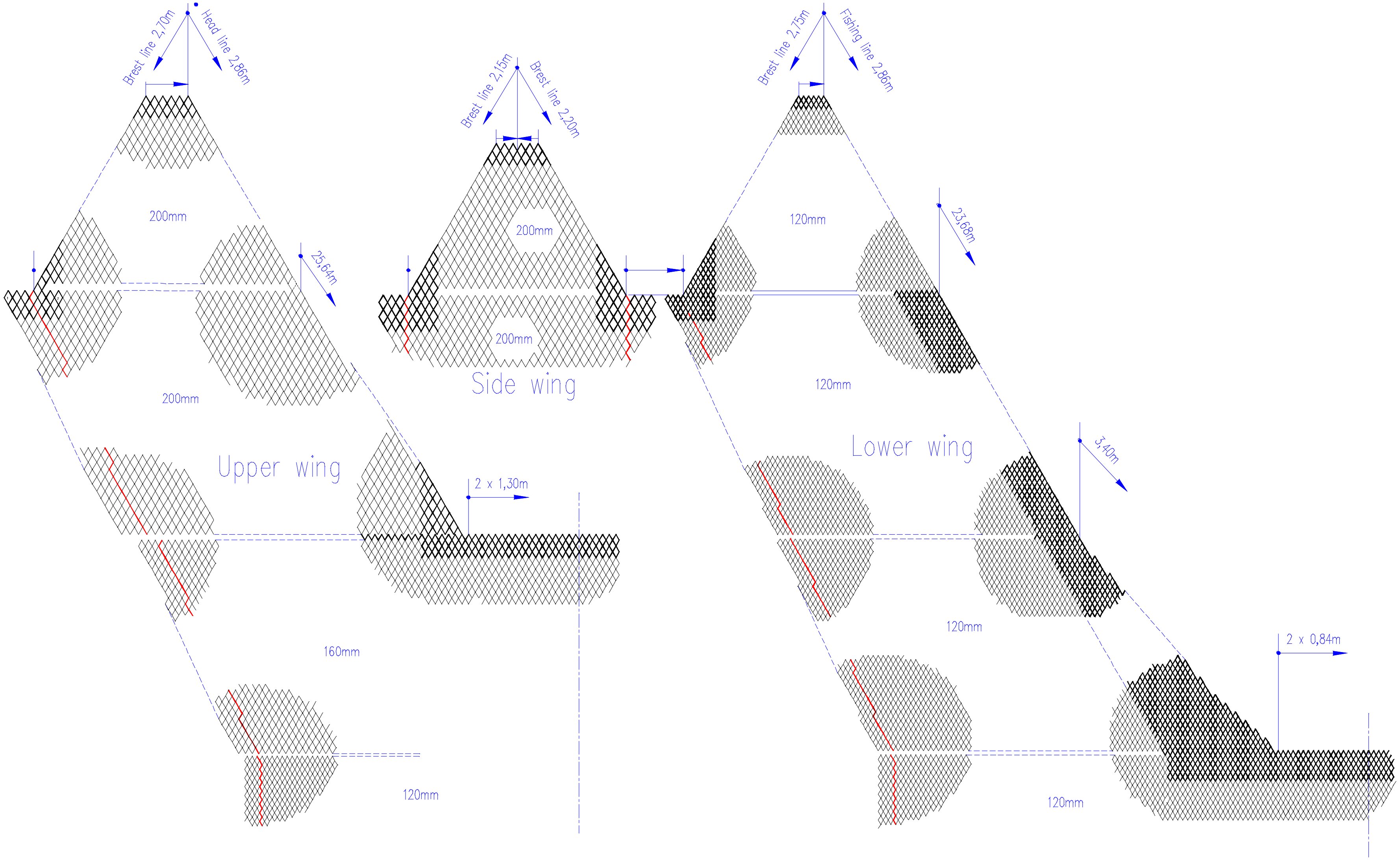
Stretched circumference: 598# x 0,12m = 70,8m

① Number of meshes for breadth and length of cutted sections

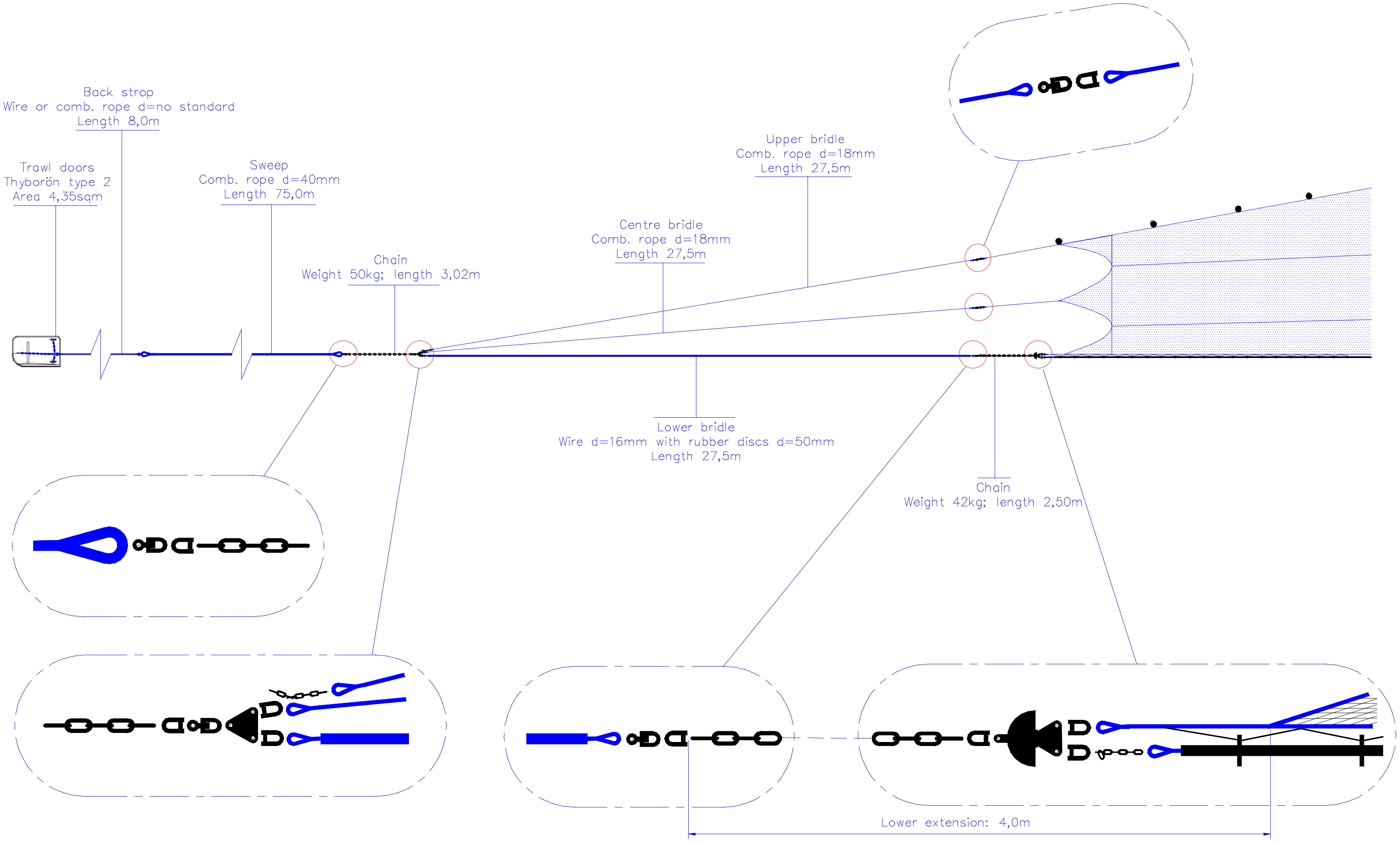
② Stetched breadth and length of assembled sections
(Breadth without selvedges, length including joining row)

TV3-930x80

Standardized trawl for
International Baltic Demersal Surveys

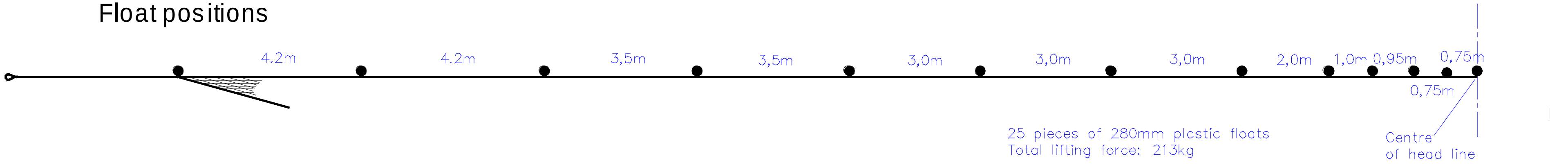


Details for trawl TV3-930x80



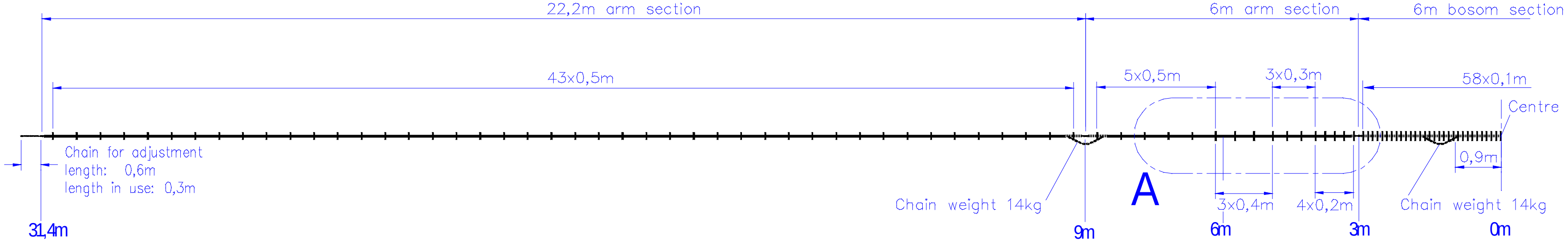
Rigg details (1) for trawl TV3- 930x80

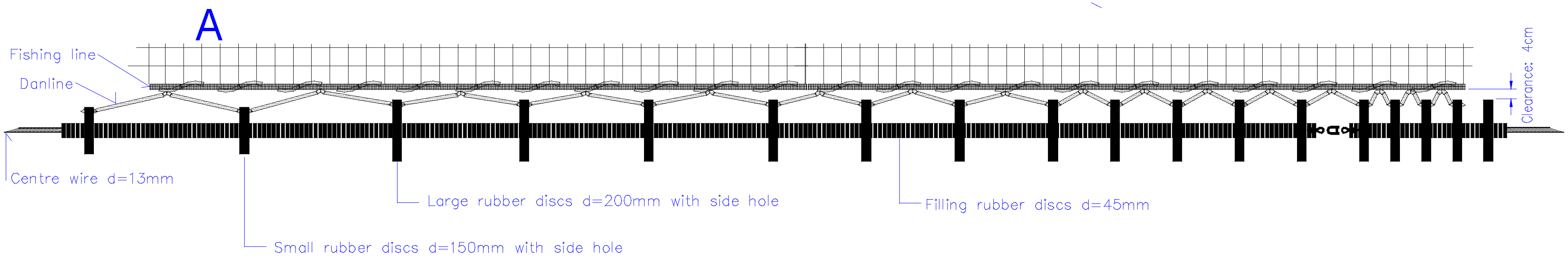
Float positions



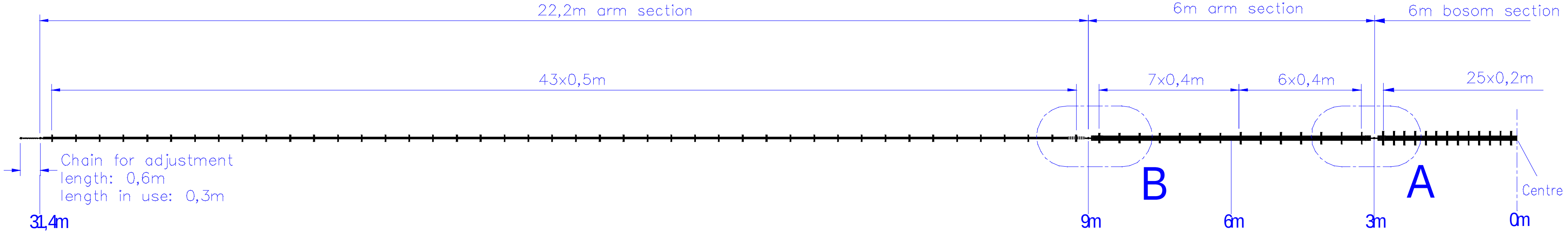
Normal standard footrope

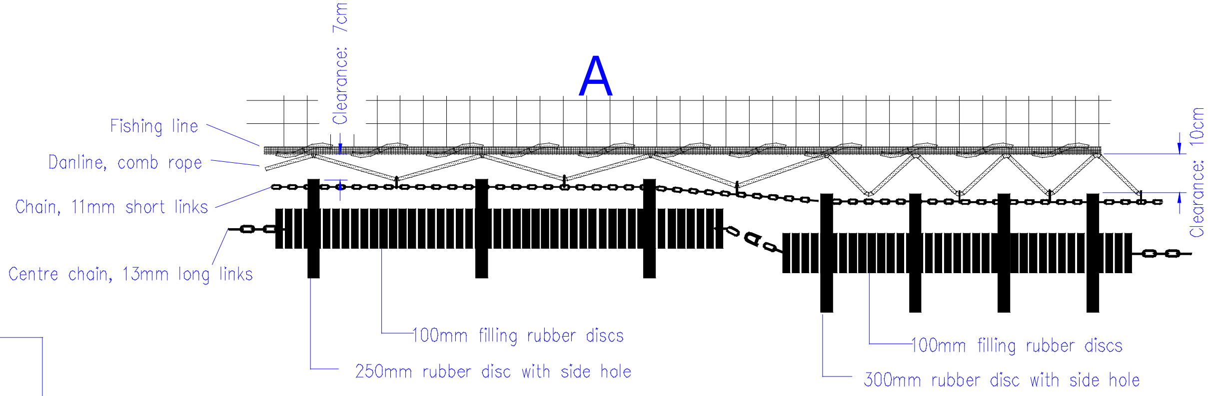
0 – 3m:	200mm rubber discs with side hole, 100mm distance
3– 6m:	200mm rubber discs with side hole, distance increasing from100mm to 500mm
6 – 31,4m:	150mm rubber discs with side hole, 500mm distance
0 – 31,4m:	45mm rubber discs filling all the space between the large discs





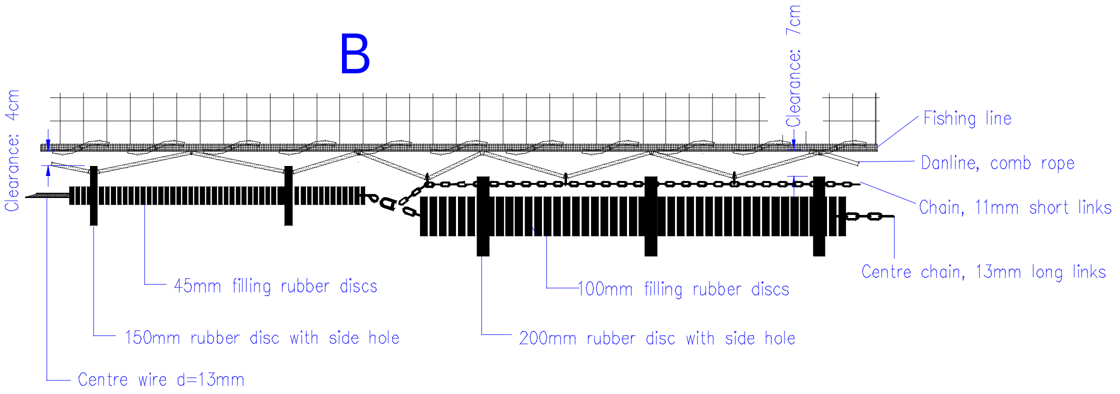
Rigg details (2) for trawl TV3- 930x80





Hard bottom footrope

0 – 3m:	300mm rubber discs with side hole, 200mm distance
3 – 6m:	250mm rubber discs with side hole, 400mm distance
6 – 9m:	200mm rubber diiscs with side hole, 400mm distance
0 – 9m:	100mm rubber discs filling all the spaces between the large discs
9 – 31,4m:	150mm rubber discs with side hole, 500mm distance
9 – 31,4m:	45 mm rubber discs filling all the spaces between the large discs



Rigg details (3) for trawl TV3- 930x80

Section 1

1B1	1A1	1A2	1B2	1C1	1C2
22,10m	22,10m	22,10m	22,10m	8,28m	8,28

Section 2

2B1	2A	2B2	2C1	2C2
2,96m	2,96m	2,96m	3,00m	3,00m

Section 3

3B1	3A	3B2	3C
2,94m	2,94m	2,94m	3,00m

Section 4

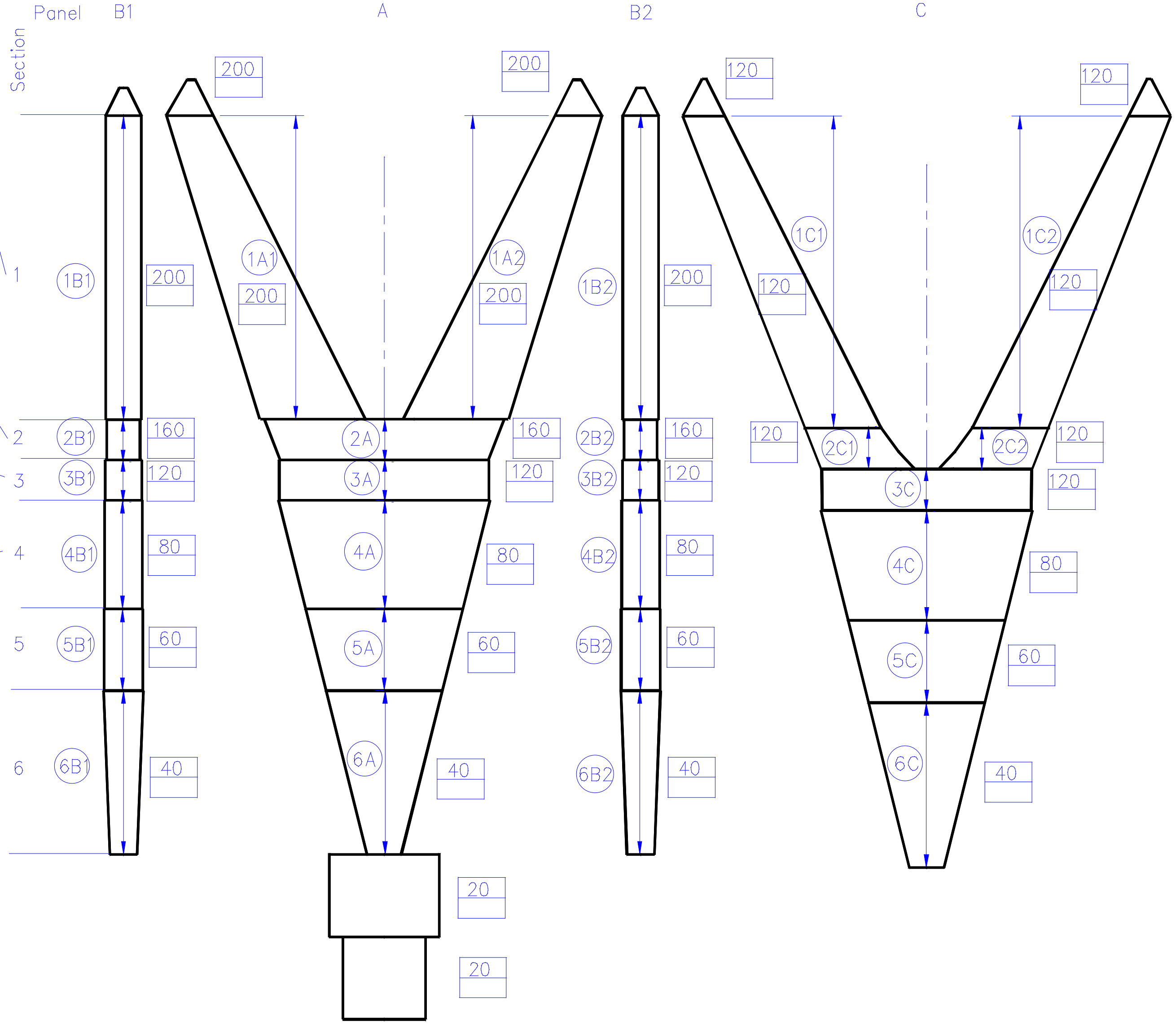
4B1	4A	4B2	4C
7,92m	7,92m	7,92m	8,00m

Section 5

5B1	5A	5B2	5C
5,94m	5,94m	5,94m	6,00m

Section 6

6B1	6A	6B2	6C
11,92m	11,92m	11,92m	12,00m



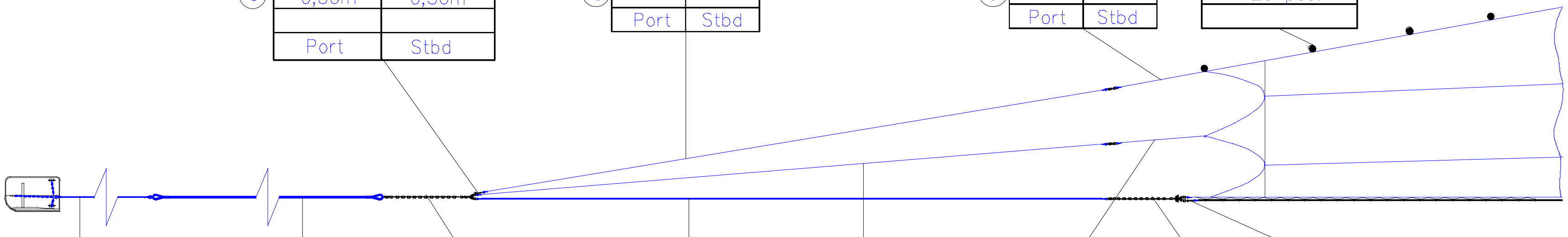
Check list for trawl TV3-930x80

⑥ Chain for adjustment of upper bridle	
0,30m	0,30m
Port	Stbd

⑧ Upper bridle	
27,5m	
Port	Stbd

⑨ Headline ext.	
4,0m	
Port	Stbd

Floats
plastic, 280mm
25 pcs.



① Backstrop	
8,0m	
Port	Stbd

② Sweep	
75,0m	
Port	Stbd

③ Chain sweep	
3,02m	
Port	Stbd

④ Lower bridle	
27,5m	
Port	Stbd

⑥ Centre bridle	
27,5m	
Port	Stbd

⑦ Brest line ext.	
3,9m	
Port	Stbd

⑤ Lower Extension	
4,0m	
Port	Stbd

= Chain
+ Bunt bobbin
+ Fishing line ext.

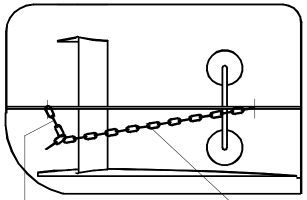
Chain for adjustment of foot rope	
......links	......links
Port	Stbd

Upper length

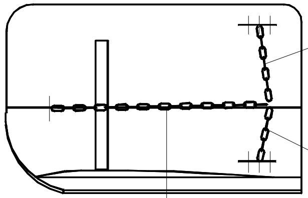
	Port	Stbd
⑥		
⑧		
⑨		
Summary		

Otterboard: Thyborön Typ 2; 4,35sqm

Front side



Back side



Top chain	
10 links	
Port	Stbd

Bottom chain	
9 links	
Port	Stbd

First chain	
6 links	
Port	Stbd

Second chain	
17 links	
Port	Stbd

Horiz. chain	
24 links	
Port	Stbd

Lower total length

	Port	Stbd
①		
②		
③		
④		
⑤		
Summary		

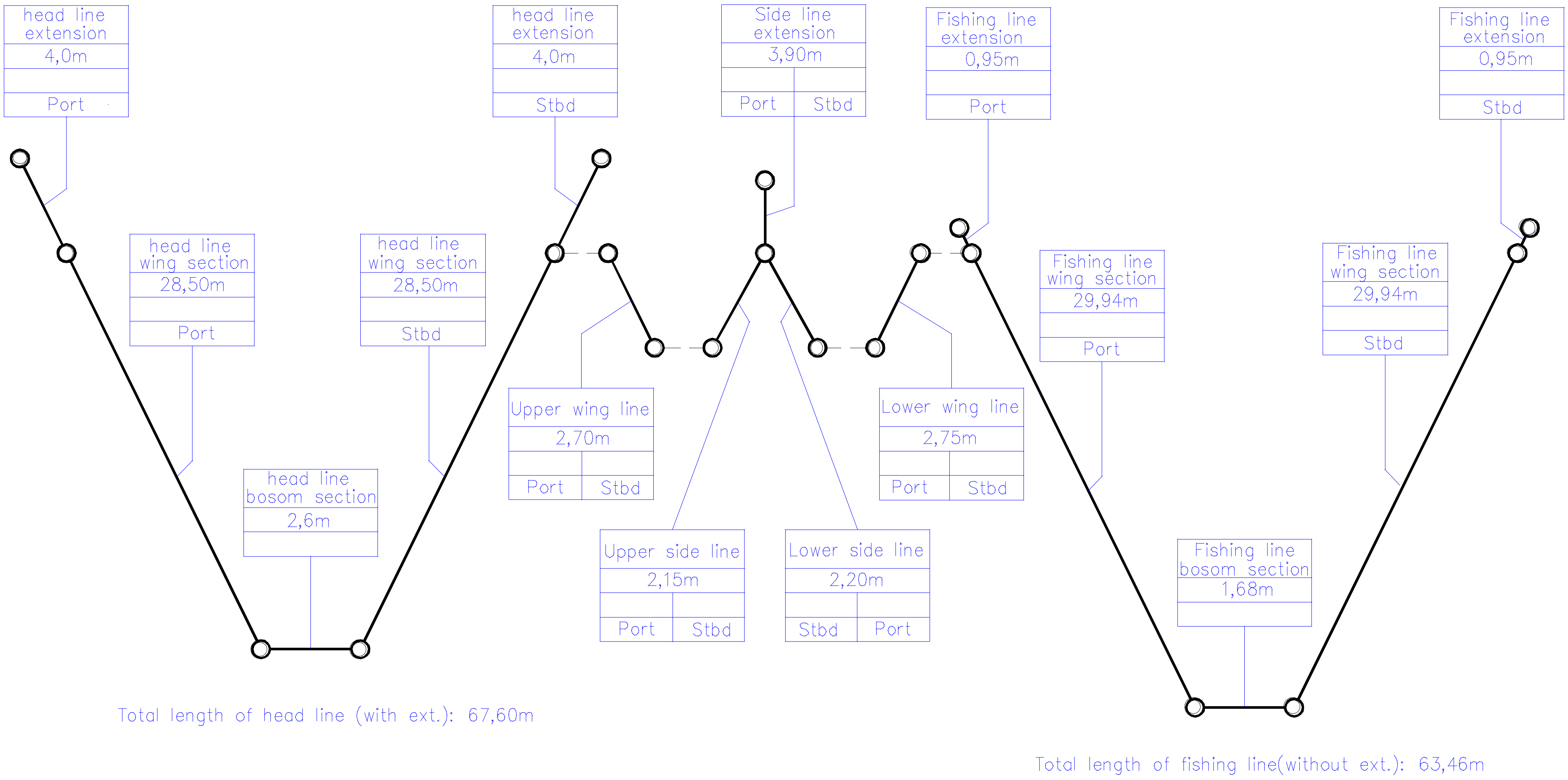
Centre length

	Port	Stbd
⑥		
⑦		
Summary		

Lower length

	Port	Stbd
④		
⑤		
Summary		

Check list for rigg of trawl TV3-930x80



Check list for frame ropes of trawl TV3-930x80

TV-3#930

Check Guide

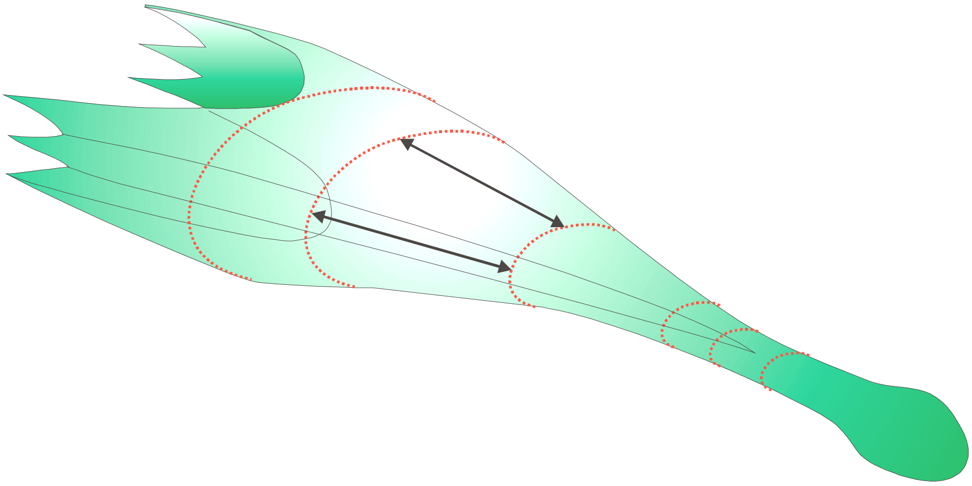
International Standard Trawl for Baltic Demersal Surveys

In order to maintain the properties and performance of the net it must be checked at regular intervals.

Before every cruise

Length of net sections

The trawl consists of four panels: top, bottom and side panels. Each panel has several sections. It is necessary to check the relative length of each netting section. They are all compared with the corresponding sections in the other panels in the way that the top and bottom panel sections are checked against the side panel sections.



Comparison of the lengths of two sections from the top and side panels – indicated by arrows: Approx 10 meshes from around the centre line of the top panel is hold against approx. 10 meshes from around the centre line of the side panel.

The best method to compare two sections is to let two persons – one in each end of the section – take around 10 meshes from the centre line of one section in one hand and hold it against 10 meshes from the centre line of the other section in the other hand. The sections must then be stretched and the difference in length observed.

- Length of side and top panel sections must be equal;
- Length of bottom panel sections must be about 1 mesh longer than corresponding side panel sections.

The procedure is repeated for each section. In case the difference differs more than 4 cm (or half a mesh) from the specified difference, a skilled netmaker should be consulted to evaluate a possible shortening.

Length of wings

The specified shortening of the side wing shall be measured from the joining round between the wing and arms to the eye at the end of the headline, footrope and breastline extensions respectively.

- The length of side wing must be 0.65 meter shorter than the top wing and bottom wing.

Length of groundrope

The length of the groundrope and fishing line must be compared by holding the two together. The length is adjusted by means of the adjustment chain on the groundrope.

- The groundrope must be two links shorter than the fishing line (equal to shortening the groundrope one link in each side).

Annex 6: Maturity key

Key	MATRITY STAGE	Male	Female
1	Virgin	Testes very thin translucent ribbon lying along an unbranched blood vessel. No sign of development.	Ovaries small, elongated, whitish, translucent. No sign of development.
2	Maturing	Development has obviously started, colour is progressing towards creamy white and the testes are filling more and more of the body cavity but sperm cannot be extruded with only moderate pressure.	Development has obviously started, eggs are becoming larger and the ovaries are filling more and more of the body cavity but eggs cannot be extruded with only moderate pressure.
3	Spawning	Will extrude sperm under moderate pressure to advanced stage of extruding sperm freely with some sperm still in the gonad.	Will extrude eggs under moderate pressure to advanced stage of extruding eggs freely with some eggs still in the gonad.
4	Spent	Testes shrunken with little sperm in the gonads but often some in the gonoducts, which can be extruded under light pressure.	Ovaries shrunken with few residual eggs and much slime.
5	Resting	Testes firm, not translucent, showing no development.	Ovaries firm, not translucent, showing no development.
6	Abnormal	Fish with abnormal gonads, e.g. as a result of disease, atresia or intersexes	Fish with abnormal gonads, e.g. as a result of disease, atresia or intersexes

Resting (see remarks in ICES CM 1997/J:4, Section 2.5)

Possibilities to classify the maturity stages of the BITS key:

Maturity stage	Purpose of classification	
(BITS code)	Estimation of	
	spawning stock size	sexual maturity
1. VIRGIN	Immature (non-spawner)	immature
2. MATURING	mature (spawner)	mature
3. SPAWNING	mature (spawner)	mature
4. SPENT	mature (spawner)	mature
5. RESTING	‘immature’ (non-spawner)	mature
6. ABNORMAL	(non-spawner)	(non-spawner)

Annex 7: Conversion tables for maturity keys

The table converts the codes of the national maturity keys into the codes of the BITS key for cod.

Country	BITS	Denmark	Estonia	Finland	Germany	Latvia	Poland	Russia	Sweden
Species	All	Cod	All		Cod	Cod	Cod	Cod	Cod
Source	ICES (1997)	Modif. from	Kiselevich (1923)		Modif. from	Kiselevich (1923)	Maier (1908)	Sorokin (1957; 1960)	Modif. from
		Maier (1908)	Pravdin (1966)	not available	Maier (1908)	Pravdin (1966)	Chrzan (1951)	Mod.by Alekseev, Allekseeva (1996)	Maier (1908)
		Berner (1960)			Berner (1960)				
Maturity stage	Code								
([1])									
VIRGIN	1	I,II	I		I	Juvenis, II	I	Juv., II	I
(immature)									
MATURING	2	III–V	II–IV		III–V	III, IV	III–V	III, IV	III–V
(mature)									
SPAWNING	3	VI,VII	V		VI,VII	V	VI,VII	V, VI (V),	VI
(mature)								VI (IV)	
SPENT	4	VIII	VI		VIII	VI	VIII	VI	VII,VIII
(mature)									

Country	BITS	Denmark	Estonia	Finland	Germany	Latvia	Poland	Russia	Sweden
RESTING	5	IX,X	II		II	II	II	VI – II	II
(mature/									
immature[2])									

1sexual maturity for estimating the proportion of spawners.

2should be used when the investigation was during the prespawning and early spawning time (still no spent individuals).

Individuals will not contribute to the spawning stock in the present year.

The table converts the codes of the national maturity key into the codes of the BITS key for herring.

Country	BITS	Denmark	Estonia	Finland	Germany	Latvia	Poland	Russia	Sweden
Species	All		All		Herring	Herring	Herring	Herring	Herring
Source	ICES (1997)		Kiselevich (1923)		Modif. from	Kiselevich (1923)	Modified from Maier scale.	Kiselevich (1923)	ICES (1962)
			Pravdin (1966)	not available	Heincke (1998)		Popiel (1955)		
							Strzyzewska (1969); Grygiel & Wyszynski (2002, 2003)		
Maturity stage	Code								
([1])									
VIRGIN	1		I		I	I	I,II	Juv., II	I,II
(immature)									
MATURING	2		II–IV		III,IV	III, IV	III–V	III, IV	III–V
(mature)									
SPAWNING	3		V		V,VI	V	VI,VII	V	VI
(mature)									
SPENT	4		VI		VII,VIII	VI	VIII	VI	VII

Country	BITS	Denmark	Estonia	Finland	Germany	Latvia	Poland	Russia	Sweden
(mature)									
RESTING	5		II		II, IX	II (VI)	-	VI (II)	VIII
(mature/									
immature[2])									

1sexual maturity for estimating the proportion of spawners.

2should be used when the investigation was during the prespawning and early spawning time (still no spent individuals).

Individuals will not contribute to the spawning stock in the present year.

The table converts the codes of the national maturity key into the codes of the BITS key for sprat.

Country	**BITS**	**Denmark**	**Estonia**	**Finland**	**Germany**	**Latvia**	**Poland**	**Russia**	**Sweden**
Species	All		All		Sprat	Sprat	Sprat	Sprat	
Source	ICES(1997)	No estimations	Kiselevich (1923)		Rechlin	Aleksjeev,	Maier (1908),	Alekseev,	
			Pravdin (1966)	not available	(unpublished)	Aleksjeeva (1996)	Elwertowski (1957); Grygiel & Wyszynski (2002, 2003)	Alekseeva (1996)	not available
Maturity stage	Code								
(1)									
VIRGIN	1		I		I	I	I	Juv., II	
(immature)									
MATURING	2		II–IV		III,IV	III, IV, VI (III)	III–V	III, IV	
(mature)						VI (IV)			
SPAWNING	3		V		V,VI	V, VI (V)	VI,VII	V, VI (V),	
(mature)								VI (IV)	
SPENT	4		VI		VII,VIII	VI	VIII	VI	
(mature)									
RESTING	5		II		II	II	II	VI (II)	
(mature/									
immature[2])									

1sexual maturity for estimating the proportion of spawners (mature individuals).

2should be used when the investigation was during the prespawning and early spawning time (still no spent individuals)

Individuals will not contribute to the spawning stock in the present year.

The table converts the codes of the national maturity key into the codes of the BITS key for flatfish.

Country	BITS	Denmark	Estonia	Finland	Germany	Latvia	Poland	Russia	Sweden
Species	All		All		Flatfish		Flatfish	Alekseev,	
Source	ICES (1997)	not available	Kiselevich (1923)	not available	Maier (1908)	Kiselevich (1923),	Maier (1908)	Alekseeva (1996)	not available
			Pravdin (1966)			Pravdin (1966)			
Maturity stage	Code								
(1)									
VIRGIN	1		I		I	Juvenis, II	I	Juv., II	
(immature)									
MATURING	2		II–IV		III–V	III, VI	III–V	III, IV	
(mature)									
SPAWNING	3		V		VI,VII	V	VI,VII	V, VI (V),	
(mature)								VI (IV)	
SPENT	4		VI		VIII	VI	VIII	VI	
(mature)									
RESTING	5		II		II	II	II	VI (II)	
(mature/									
immature[2])									

1 sexual maturity for estimating the proportion of spawners (mature individuals).

2 should be used when the investigation was during the prespawning and early spawning time (still no spent individuals). Individuals will not contribute to the spawning stock in the present year.

Annex 8: Alpha codes for countries and ships

COUNTRY	ICES CODE 1)	SHIP´S NAME	BITS CODE
Denmark	DEN	Dana (old)	DAN
		Dana (new)	DAN2
		J.C. Svabo	JCS
		Havfisken	HAF
		Havkatten	HAK
Germany	GFR	Anton Dohrn (old)	AND
		Anton Dohrn (new)	AND2
		Solea	SOL
		Walther Herwig	WAH
		Clupea	CLP
		Eisbär (old)	EIS
Sweden	SWE	Thesis	THE
		Skagerrak	SKA
		Argos	ARG
		Ancylus	ACY
Estonia	EST	Koha	KOH
		Solveig Charter	SLG CEV
Finland	FIN		
Latvia	LAT 1)	Baltijas Petnieks (old)	BPE
		Commercial Latvia Vessel	CLV
Poland	POL	Baltica	BAL
Russia	RUS	ATLANTIDA	ATLD
		ATLANTNIRO	ATL
Lithuania	LTU 1)	Darius	DAR

Note 1). Country code for Latvia and Lithuania codes refer to the FAO, ISO Alpha 3 code system.

Annex 9: Alphanumeric codes for demersal trawl gears

TRAWL SPECIFICATION	TRAWL POPULAR NAME	RESEARCH VESSEL
DT	Russian bottom trawl	Monokristal
LPT	Latvian Pelagic Trawl	Baltijas Petnieks, Zvezda Baltiki
LBT	Latvian Bottom trawl	Baltijas Petnieks
GOV	Grand Overture Verticale	Argos, Dana
DBT	Danish bottom trawl	Dana
EXP	Danish winged bottom trawl	Dana
SON	Sonderborg trawl	Clupea, Solea
H20	Herring ground trawl (H20/25)	Solea, Eisbär
P20	Herring bottom trawl (P20/25)	Commercial Vessel, Baltica
TV1	Large TV trawl	Havfisken
TV2	Small TV trawl	Havkatten
FOT	Fotö bottom trawl	Argos
LCT	Lithuanian cod trawl	Darius
ESB	Estonian small bottom trawl	Koha
HAK	Hake-4M	AtlantNIRO, Atlántida
CHP	Cod Hopper	Solea
MWT	Mid water trawl 664	Solea
TV3	TV trawl	All vessels
TVL	TV3 930 meshes	All vessels participating in the BITS besides vessels using TVS
TVS	TV3 520 meshes	Havfisken, Solea, Solveig, CEV(Estonian Commercial Vessel), LAT?

Within the gear field the following positions have been reserved for recording various types of rigging:

Position 14–16: Sweep length in m. (Numeric, right justified, zero filled. Spaces for unknown. Code 000 indicates the semi-pelagic rigging; this specification is associated with the GOV.)

Position 17: Exceptions (B=Bobbins used, D=Double sweeps, space=standard or not known).

Position 18: Door type (P=Polyvalent, V=Vee F=Flat, K=Karm Waco, space=others or not known).

Further quantitative numeric information on rigging of gear is defined in positions 74–95, in Record Type HH.

NB: This code must still be considered as a preliminary one. More detailed information on the gears used in the past is required before a completely comprehensive coding system can be developed.

Annex 10: Recorded species codes used in Record Type HH

NODC and TSN species codes are given in **Annex 12.**

NB: Zero catches of a particular species in a haul may be included in or excluded from the file. However, any species deliberately excluded from a subset, or an invalid species for a particular haul, should be included for each haul with a species validity code 0 !!.

RECORDED STANDARD SPECIES LIST CODES (POSITION 65)

1 = All (4) standard species recorded
3 = Bottom (2) standard species recorded 1)
4 = Individual (1) standard species recorded 2)

RECORDED BYCATCH SPECIES LIST CODES (POSITION 66)

1 = Open ended bycatch list - All species recorded
4 = Closed bycatch list - Only flatfish (4) species recorded 1)

1) For definition see Annex 11.

2) If this code is applied, zero catches of the species recorded must be recorded in Record Type 2 format.

Annex 11: Species validity code

0 =	INVALID INFORMATION	Information lost. A note should be given with the cause for the classification as invalid.
1 =	VALID INFORMATION	No per hour and total length composition recorded; applies also when No per hour is zero.
4 =	TOTAL NO PER HOUR ONLY	Catch sampled for No per hour only; no length measurements.

Annex 12: Species names, TSN and NOCD codes and max. recorded length of fish species, which is used in the DATRAS checking program

TSN code	NODC code	Latin name	English name	Max. length [cm]
161722	8747010201	*Clupea harengus*	Herring	40
161789	8747011701	*Sprattus sprattus*	Sprat	17
161716	8747010109	*Alosa fallax*	Twaite shad	50
161831	8747020104	*Engraulis encrasicolus*	European anchovy	25
161997	8755010306	*Salmo trutta*	Sea trout	95
161989	8755010211	*Oncorhynchus mykiss*	Rainbow trout	50
161950	8755010115	*Coregonus lavaretus*	Whitefish = powan	65
162039	8755030301	*Osmerus eperlanus*	Smelt	29
162139	8758010101	*Esox lucius*	Pike	120
164712	8791030402	*Gadus morrhua*	Cod	135
164748	8791031501	*Enchelyopus cimbrius*	Fourbeard rockling	40
164758	8791031801	*Merlangius merlangus*	Whiting	60
172894	8857041402	*Platichthys flesus*	Flounder	52
172902	8857041502	*Pleuronectes platessa*	Plaice	57
172881	8857040904	*Limanda limanda*	Common dab	40
616195 or 172748	8857030402	*Psetta maxima*	Turbot	60
168510	8835200403	*Stizostedion lucioperca*	Pikeperch/Zander	85
168470	8835200202	*Perca fluviatilis*	Perch	40
168520	8835200601	*Gymnocephalus cernua*	Ruffe	15
171645	8842130209	*Pholis gunnellus*	Butterfish	20
631023 or 171588	8842120905	*Lumpenus lampretaeformis*	Serpent blenny= snakeblenny	35
165324	8793012001	*Zoarces viviparus*	Viviporous eelpout	40
171676	8845010105	*Ammodytes tobianus*	Lesser sandeel	20
171682	8845010301	*Hyperoplus lanceolatus*	Greater sandeel	35
172414	8850030302	*Scomber scombrus*	Mackerel	65
168588	8835280103	*Trachurus trachurus*	Horse mackerel	45
172072	8847017505	*Neogobius melanostomus*	Round goby	20
167318	8831022207	*Myoxocephalus scorpius*	Sea scorpion = Shorthorn sculpin	25
167454	8831080803	*Agonus cataphractus*	Pogge	20
167612	8831091501	*Cyclopterus lumpus*	Lumpfish	35
167578	8831090828	*Liparis liparis*	Sea snail	10
166365	8818010101	*Gasterosteus aculeatus*	Threespine stickleback	8
163666	8776014901	*Abramis brama*	Bream	60
639696	8776010601	*Vimba vimba*	vimba	40
163761	8776017401	*Rutilus rutilus*	Roach	30
161128	8741010102	*Anguilla anguilla*	Eel	180
159722	8603010301	*Petromyzon marinus*	Sea lamprey	90
159719	8603010217	*Lampetra fluviatilis*	River lamprey	65

Note: the information set concerns the name of fish species orders was deleted from the Annex 12, because the DATRAS scanning program does not accept the name of order instead of name of species. Moreover, the Latin name of some fish occurred in the Baltic Sea, which are marked in red (see Annex 12), are not listed on the ICES Data Centre web side: http://www.ices.dk/datacentre/datsu/rptSpc.asp?Id=59 and due to this fact, the DATRAS database manager is requested to solve occurred discrepancy.